BEFORE THE LAND USE BOARD OF APPEALS

OF THE STATE OF OREGON

COLUMBIA PACIFIC BUILDING TRADES COUNCIL, PORTLAND BUSINESS ALLIANCE, OREGON BUSINESS & INDUSTRY, AND WESTERN STATES PETROLEUM ASSOCIATION, Petitioners, and WORKING WATERFRONT COALITION, Intervenor-Petitioners, v. CITY OF PORTLAND, Respondent, and COLUMBIA RIVERKEEPER, CENTER FOR SUSTAINABLE ECONOMY, OREGON PHYSICIANS FOR SOCIAL RESPONSIBILITY, AND PORTLAND AUDUBON SOCIETY, Intervenors-Respondent.	LUBA No. 2020-009

RESPONDENT CITY OF PORTLAND'S RECORD

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*Testimony is organized by the date it was uploaded into the City's testimony database rather than the date it was submitted.

***Items Retained by City Until Time of Oral Argument Under OAR 661-010-0025(2) and OAR 661-010-0025(4)(a)(B)

Record Item No.	**Description**
Item No. 6	Audio file of December 18, 2019 City Council meeting***
Item No. 8	Audio file of November 20, 2019 City Council meeting***
Item No. 12	Video testimony from November 20, 2019 City Council meeting (11/20/2019)***

Armstrong, Tom

From: DLCD Plan Amendments <plan.amendments@state.or.us>
Sent: Monday, January 6, 2020 4:44 PM
To: Armstrong, Tom
Subject: Confirmation of PAPA Online submittal to DLCD

Portland

Your notice of adoption of a change to a comprehensive plan or land use regulation has been received by the Oregon Department of Land Conservation and Development.
Local File #: Fossil Fuel Terminal Zoning Re-adoption
DLCD File #: 006-19
Original Proposal Received: 10/16/2019
Adoption Notice Received: 12/18/2019
Submitted by: tarmstrong

If you have any questions about this notice, please reply or send an email to plan.amendments@state.or.us.

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.

January 6, 2020

NOTICE OF ADOPTION: Fossil Fuel Terminal Zoning Amendments

This is to notify you that the Portland City Council recently adopted the Fossil Fuel Terminal Zoning Amendments ordinance, which included zoning code amendments. The adopting ordinance was passed by the City Council on December 18, 2019 and became effective on December 18, 2019.

Pursuant to ORS 197.615, notice of Adoption of a Post Acknowledgement Plan Amendment for the project was filed with the Oregon Department of Land Conservation and Development on January 6, 2020.

The ordinance, supporting documents, and a summary of the changes are available on the BPS website: https://www.portlandoregon.gov/bps/71118.

To review the adopting ordinances, exhibits and findings, please contact:

Tom Armstrong, Supervising Planner
Bureau of Planning and Sustainability
1900 SW Fourth Ave. Suite 7100
Portland OR 97201
Phone: 503-823-3527
Email: tom.armstrong@portlandoregon.gov

The City Council's decision is the City's final decision. This decision may be appealed to the Oregon Land Use Board of Appeals (LUBA) by filing a Notice of Intent to Appeal with LUBA within 21 days of the date of this notice, as specified in the Oregon Revised Statute (ORS) 197.830(9). Among other things, ORS 197.830 requires that a petitioner at LUBA must have appeared orally or in writing during the City's proceedings on this land review. LUBA's address is: DSL Building, 775 Summer Street NE, Suite 330, Salem, OR 97301-1283. For more information on filing an appeal, call LUBA at 503-373-1265 or visit LUBA's website (www.oregon.gov/LUBA).

Per ORS 197.830(9), copies of the notice of intent to appeal shall be served upon the City. The notice shall be served and filed in the form and manner prescribed by rule of the board and shall be accompanied by a filing fee of $200 and a deposit for costs to be established by the board.

Fossil Fuel Terminal Zoning Amendments
Notice of Adoption Mailing List

First Name	Last Name	Business	Address	City/State/Zip
Cathy	Sampson-Kruse		2255 W. Burnside St	Portland
Elijah	Cetas		4628 SW Oakridge Rd	Portland
Kelly	O'Hanley		700 NE Multnomah St	Portland
Mario	Mijares		2075 Sunray Cir	West Linn
A	Todd		PO Box 41783	Eugene ,OR 97404
Aaron	Schalon		2032 NE Liberty	Portland ,OR 97232
Adriana	Cvitkovic		1502 NE 84th	Portland ,OR 97216
Akash	Singh		3967 NE Ceasar Chavez	Portland ,OR 97213
Alan	Smith		5908 SE 17th	Portland ,OR 97202
Alan	Smith		924 NE 65th	Portland ,OR 97201
Alastair	Roxburgh		1503 N Hayden	Portland ,OR 97217
Alissa	Leavitt		8205 SE 45th	Portland ,OR 97231
Alys	Kennedy		2823 Birchwood	Bellingham ,WA 98225
Amanda	Hughes		7605 SE Lincoln	Portland ,OR 97209
Amanda	Moore		9136 SW 8th	Portland ,OR 97217
Amber	Buhl		5521 SE 57th Ave	PORTLAND ,OR 97206
Amirah	Field		3437 NE 48th	Portland ,OR 97218
Amy	Robbins		1905 SW Sunset	Portland ,OR 97203
Amy	Monahan		7225 SW 13th	Portland ,OR 97219
Anandi	Gefroh		3100 SE 10th	Portland ,OR 97214
Andrew	Crosby		3225 SW View	Portland ,OR 97205
Andrew	Butz		3735 SE 9th	Portland ,OR 97202
Andrew	Stone		5817 SE Lafayette	Portland ,OR 97206
Andrew	Stone		9315 SW 37th	Portland ,OR 97206
Angela	Zehava		10046 N Oswego	Portland ,OR 97202
Angelica	Pray		4117 N Haight	Portland ,OR 97213
Ann	Clarkson		5035 N Depaux	Portland ,OR 97202
Annie	Corbett		6844 Greeley	Portland ,OR 97217
Anthony	Albert		285 NW 35th	Corvallis ,OR 97330
April	Christenson		777 NW 19th	Portland ,OR 97209
Arlene	Burns		606 3rd	Mosier ,OR 97040
Arlys	Fones		9114 SW Trail	Portland ,OR 97219
Babtist	Lumley		12937 NW Newberry	Portland ,OR 97232
Barbara	Quinn		13817 SW Mistletoe	Portland ,OR 97203
Barbara	Godlman		15066 SE Robinette	Portland ,OR 97216
Barbara	Brower		2889 NE Edgehill	Portland ,OR 97212
Barbara	Tombleson		3841 SE 51st	Portland ,OR 97219
Barbara	Bartschi		5117 SE Naef	Milwaukie ,OR 97267
Barbara	Erlich		7521 N Edgewater	Portland ,OR 97203
Barbara	Roberts		9227 N Central	Portland ,OR 97212
Becky	Hawkins		4839 N Kerby	Portland ,OR 97215
Ben	Basin		515 SE 19th	Portland ,OR 97214
Betsy	White		42852 SW Dudney	Forest Grove ,OR 97116
Betsy	Toll		6126 SE Grant	Portland ,OR 97206
Bill	Michtom		5035 NE 25th	Portland ,OR 97205
Blaine	Ackley		655 NW 229th	Hillsboro ,OR 97214
Brian	Smith		1148 SE 50th	Portland ,OR 97213
Cale	Christi		5109 N Oberlin	Portland ,OR 97203
Cam	Taylor		2806 SE 15th	Portland ,OR 97214
Cam	Taylor		705 SE 32nd	Portland ,OR 97214

Fossil Fuel Terminal Zoning Amendments
Notice of Adoption Mailing List

First Name	Last Name	Business	Address	City/State/Zip
Carla	Pacheco		7410 N Willamette	Portland ,OR 97219
Carole	Warner		260 NW Pittock	Portland ,OR 97202
Carolyn	Stuart		3656 NE Wasco	Portland ,OR 97218
Carolyn	Eckel		PO Box 33707	Portland ,OR 97292
Casey	Sundermann		4920 NE 55th	Portland ,OR 97211
Casey	Remy		6356 N Wilbur	Portland ,OR 97429
Cass	Martinez		5704 N Omaha	Portland ,OR 97231
Cathy	Bledsoe		10151 SW Washington	Portland ,OR 97225
Cecilia	Youngs		2317 NE 9th	Mercer Island ,WA 98040
Charles	Brod		2728 SE Tibbetts	portland ,OR 97202
Charles	Townsend		623 NE Morris	Portland ,OR 97212
Chelsea	Grubbs		3224 NE 17th	Portland ,OR 97211
Chelsea	Davis		7215 SW 126TH CT	BEAVERTON ,OR 97008
Chris	Turner		2007 NE Mason	Longview ,WA 98632
Christine	Yun		730 NE 31st	Portland ,OR 97214
Claudia	Montagne		7225 SW 13th	Portland ,OR 97219
Clyde	Lockler		6222 SW 36th	Portland ,OR 97221
Cody	Tucker		7324 SE Madison	Portland ,OR 97221
Colleen	McNally		7112 SW 53rd	Porltnad ,OR 97213
Collin	Murphy		630 NE Lawrence	Portland ,OR 97202
Craig	Perry		12222 NW Marina	Portland ,OR 97212
Craig	Heverly		8830 NE Hancock	Portland ,OR 97202
Cyntha	Gedes		5112 NE 28th	Portland ,OR 97202
Cynthia	Enlow		1460 NW Ashley	Albany ,OR 97321
Damon	Storey		1502 SE 84th	Portland ,OR 97216
Damon	Storey		7314 N Williams	Portland ,OR 97216
Dana	Brown		722 Meadow	Portland ,OR 97212
Daniel	Wasil		3633 SE 27th	Portland ,OR 97213
Daniel	Stillwaggon		4829 N Congress	Portland ,OR 97215
Daniel	Dixon		6312 SW Capitol	Portland ,OR 97239
David	Bennett		1061 SE 57th	Portland ,OR 97215
David	Hermanns		11935 SW Edgewood	Portland ,OR 97203
David	Regan		1820 NE 21st	Portland ,OR 97205
David	Vanthof		2790 SW Carolina	Portland ,OR 97205
David	Chatfield		3105 SE 51st	Portland ,OR 97206
David	Nichols		5107 NE Couch	Portland ,OR 97213
David	Kreisman		730 NE 31st	Portland ,OR 97267
David	Powell		8508 SE 11th	Portland ,OR 97217
David	King		8887 SW 67th	Portland ,OR 97203
David	Nichols		8951 N Van	Portland ,OR 97213
Dawn	Griffin		21341 S Ferguson	Portland ,OR 97213
Deborah	Einbender		1326 SE Pine	Portland ,OR 97214
Deborah	Romereu		2058 SE Elliott	Portland ,OR 97212
Deborah	Tramposh		623 NE Morris	Portland ,OR 97233
Debra	Poscharscky		3220 SE 43rd	Portland ,OR 97233
Dee	Packard		8935 SW Excalibur	Portland ,OR 97215
Denise	Busch		7160 SW Raleihgwood	Portland ,OR 97225
Deva	Sunya		5847 NE 31st	Portland ,OR 97202
Deva	Flemming		6420 NE 42nd	Portland ,OR 97218
Diana	Talcott		17469 SE Main	Portland ,OR 97202

Fossil Fuel Terminal Zoning Amendments
Notice of Adoption Mailing List

First Name	Last Name	Business	Address	City/State/Zip
Diana	Bright		4146 SE Crystal Springs	Portland ,OR 97202
Diana	Boom		PO Box 328	Lake Oswego ,OR 97034
Diane	Jacobs		4822 SE 47th	Portland ,OR 97213
Don	Dumond		1744 Moss	Eugene ,OR 97403
Don	Jacobson		3104 SE Morrison	Porltand ,OR 97201
Don	Steinke		PO Box 822393	Vancouver ,WA 98682
Donna	Murphy		2134 NE 37th	Portland ,OR 97212
Douglas	Hayner		7254 SW 53rd	Portland ,OR 97218
E	Reid		6109 NW Nevada	Portland ,OR 97217
Earl	Switzer		3414 SE 21st	Portland ,OR 97233
Ed	Kaiel		8265 SW Ernst	Portland ,OR 97217
Eliot	Cole		1635 NE Couch	Portland ,OR 97211
Elizabeth	Britt		1406 27th	Portland ,OR 97214
Elizabeth	Milner		5834 NE 23rd	Portland ,OR 97202
Elle	West		2132 NE 13th	Portland ,OR 97232
Ellen	Thayer		710 13th	White Salmon ,WA 98672
Emily	Platt		6109 SE Insley	Portland ,OR 97202
Eric	Lambart		18141 SE Troge	Portland ,OR 97217
Eric	Canon		1923 Elm	Forest Grove ,OR 97116
Eric	Schmall		3250 NE 73rd	Portland ,OR 97405
Eric	Kaiser		6311 N Commercial	Portland ,OR 97212
Erin	Madden		2007 NE 65th	Portland ,OR 97202
Eve	Heidtmann		7405 SE Market	Portland ,OR 97225
Faye	Bennett		3965 SE Oak	Portland ,OR 97214
Fiona	Yun		1915 SE Alder	Portland ,OR 97203
Frank	Roberts		3617 NE 10th	Portland ,OR 97212
Frank	Holmes		975 Carpenter Rd	Lacey ,WA 98516
Gail	O'Hara		6134 NE Alameda	Portland ,OR 97213
Gavin	Everard		5944 N Kerby	Portland ,OR 97217
George	Jacobs		2828 NE 69th	Portland ,OR 97214
Gisela	Ray		532 SE 15th	Gresham ,OR 97080
Glenda	Goldwater		4406 SE Taylor	Portland ,OR 97214
Grady	Preston		4822 NE Glisan	Portland ,OR 97232
Greg	Peden		2833 SE 45th	Portland ,OR 97201
Gregg	Hayward		3414 SE 21st	Portland ,OR 97220
Gregory	Monahan		1845 SE Elliott	Portland ,OR 97219
Hal	Anthony		3995 Russell	Grants Pass ,OR 97526
Heidi	Alford		4032 SE Crystal Springs	Portland ,OR 97202
Ian	Shelley		2414 SE 30th	Portland ,OR 97225
Ineke	Deruyter		9322 N Oswego	Portland ,OR 97203
Ineke	Deruyter		9332 N Oswego	Portland ,OR 97203
Jack	Herbert		5262 NE 31st	Portland ,OR 97225
Jacob	Braverman		1815 NW 27th	Portland ,OR 97210
Jacqueline	Glyde		1821 SE Ankeny	Portland ,OR 97252
James	Clapp		22500 NE 113th	Vancouver ,WA 98682
James	Nielson		2331 N Terry	Portland ,OR 97218
Jamison	Cavallaro		2614 SE 67th	Portland ,OR 97206
Jan	Polychronis		PO Box 639	The Dales ,OR 97058
Jane	Stackhouse		2643 NE 43rd	Portland ,OR 97213
Janet	Madill		3756 SE Lafayette	Portland ,OR 97212

Fossil Fuel Terminal Zoning Amendments
Notice of Adoption Mailing List

First Name	Last Name	Business	Address	City/State/Zip
Janet	Roxburgh		4334 NE 23rd	Portland ,OR 97217
Jared	Naimark		7227 SW Linette	Portland ,OR 97201
Jason	Fiske		2704 SE 47th	Portland ,OR 97206
Jason	Chin		614 SW Nevada	Portland ,OR 97219
Jean	Wyman		7314 SE Division	Portland ,OR 97213
Jeff	Kipilman		8728 N Edison	Portland ,OR 97212
Jeffrey	Whte		42852 SW Dudney	Forest Grove ,OR 97116
Jennifer	Gerlach		2825 SE Hawthorne	Portland ,OR 97214
Jennifer	Adkins		3414 SE 21st	Portland ,OR 97202
Jennifer	Parks		941 SE Bidwell	Portland ,OR 97225
Jeremiah	Jenkins		10055 NE Weidler	Portland ,OR 97213
Jim	Breithaup		1880 SW Edgewood	Portland ,OR 97201
Joan	Andon		2411 NW Stimpson	Portland ,OR 97229
Joana	Kirchhoff		3023 SW Cascade	Portland ,OR 97210
Joanne	Walters		5113 SE Taylor	Portland ,OR 97227
Joanne	Delmonico		9601 NW Leahy	Portland ,OR 97229
Jody	Bleyle		120 SE 53rd	Portland ,OR 97215
Jody	Guth		2625 NE 41st	Portland ,OR 97212
Joe	Chasse		22313 V	Ocean Park ,WA 98640
John	Gillette		1132 8th	Portland ,OR 97209
John	Francini		2308 NE Rodney	Portland ,OR 97218
John	Nettleton		3438 SE Mary	portland ,OR 97202
John	Nicol		5107 NE Couch	Portland ,OR 97217
John	Sievertsen		7705 SW Miner	Portland ,OR 97225
John	Wadsworth		9103 SW 23rd	Portland ,OR 97219
Jonnel	Covault		1414 SE Redwood	Portland ,OR 97267
Joseph	Miller		3161 SE Balfour	Portland ,OR 97201
Joseph	Miller		3214 NE Ceasar Chavez	Portland ,OR 97201
Josh	Chernoff		4008 SE Mall	Portland ,OR 97202
Joshua	Bergeer		2124 NE 41st	Portland ,OR 97212
Judith	Eda		4655 NE Killingsworth	Portland ,OR 97218
Judy	Romano		5105 SW Richardson	Portland ,OR 97214
Jules	Elias		6435 NE Yamhill	Portland ,OR 97215
Julia	Tomes		7526 SW Capitol Hill	Portland ,OR 97202
Julie	Chapman		2005 SE Reedway	Portland ,OR 97202
Julio	Forges		1820 NE 21st	Portland ,OR 97202
Jynx	Houston		7605 SE LINCOLN ST	PORTLAND , 97215
Kaley	Frank		8523 N Curtis	Portland ,OR 97217
Karen	Stolzberg		4105 N Massachusetts	Portland ,OR 97219
Karen	Christensen		446 NE Fargo	Portland ,OR 97212
Karen	Brown		6111 SW 33rd	Portland ,OR 97239
Kat	Majors		4346 NE Skidmore	Portland ,OR 97220
Kathleen	Shelley		50 SW 97th	Vida ,OR 97488
Kathryn	Alexandra		4311 Ginnett	Anacortes ,WA 98221
Kathryn	Behrendt		6706 NE Rodney	Portland ,OR 97211
Kathy	Austen		2628 SE 109TH AVE	PORTLAND ,OR 97266
Kathy	Bangertt		4540 SE Taylor	Portland ,OR 97215
Kayleigh	O'Hara		4523 NE Hoyt	Portland ,OR 97211
Kellen	Ferguson		3220 NE Emerson	Portland ,OR 97211
Kelly	Campbell		1020 SW Taylor	Portland ,OR 97214

Fossil Fuel Terminal Zoning Amendments
Notice of Adoption Mailing List

First Name	Last Name	Business	Address	City/State/Zip
Kelly	McConnell		2823 NW Savier	Tigard ,OR 97223
Kellyn	Bardeen		5709 SE Reedway	Portland ,OR 97206
Kim	Fortin		2023 SE Madison	Portland ,OR 97214
Kristen	Lee		9437 NW Germantown	Portland ,OR 97219
Kristi	Schaefer		7025 SW 28th	Portland ,OR 97211
Kyle	Collins		1026 Jackson	Eugene ,OR 97402
Laraine	Vonfeldt		16 SW Canby	Portland ,OR 97217
Laura	Berg		1115 SE Rex	Milwaukie ,OR 97222
Laura	Kurtz		11439 SE Market	Portland ,OR 97203
Laura	Ohanian		PO Box 811	Eugene ,OR 97440
Laurie	Fisher		10414 SW Bonanza	Tigard ,OR 97224
Lenny	Dee		2580 NE 31st	Portland ,OR 97217
Leslie	Davis		2016 NE 25th	Portland ,OR 97212
Linda	Cargill		2020 NW Northup	Portland ,OR 97209
Linda	Magnumson		2717 NE 12th	Portland ,OR 97218
Linda	Levin		2800 NE Edgehill	Portland ,OR 97201
Linda	hayden		4344 SE Main	Portland ,OR 97216
Linda	Magnuson		4346 NE Skidmore	Portland ,OR 97218
Linda	Engels		636 NE 61st	Portland ,OR 97213
Linda Kay	Stevens		1830 23rd St	Portland ,OR 97217
Lisa	Cohn		3141 NW Greenbriar	Portland ,OR 97210
Lisa	Laakso		7217 N Lombard	Portland ,OR 97201
Liz	Terhaar		111 3rd	Hood River ,OR 97031
Lorraine	Heller		7820 SW Walnut	Portland ,OR 97229
Lynda	Byeers		2171 NE Schuyler	Portland ,OR 97212
Lynn	Youngbar		516 SE 200th	Portland ,OR 97212
Maja	Jarrad		3414 SE 21st	Portland ,OR 97202
Manly	Norris		9723 SW Quail Post	Portland ,OR 97232
Maren	Souders		8524 NE Thompson	Portland ,OR 97206
Marilee	Dea		4613 NE Killingsworth	Portland ,OR 97213
Marilyn	Cohen		12145 SW 33rd	Portland ,OR 97219
Marjorie	Kircher		3315 NE 41st	Portland ,OR 97205
Marjory	Bryan		2232 SE Pine	Portland ,OR 97214
Mark	Braverman		1815 NW 27th	Portland ,OR 97210
Martin	Donohoe		5031H Foothills	Lake Oswego ,OR 97034
Marty	Bankhead		17709 Hill	Lake Oswego ,OR 97035
Mary	Griffiths		1347 NE 47th	Portland ,OR 97214
Mary	Barrow		1531 SW Harrison	Portland ,OR 97201
Mary	Fifield		1927 SE 35th	Portland ,OR 97214
Mary	Rose		3512 NE 23rd	Portland ,OR 97211
Mary Ann	Dougherty		19170 Bryant	Lake Oswego ,OR 97034
Mary Ellen	McFadden		313 S Maricara	Portland ,OR 97230
Mary Sue	Evers		11675 SW Park	Portland ,OR 97225
Mason	Hiatt		6204 SE 40th	Portland ,OR 97212
Mauria	McClay		1029 N Winchell	Portland ,OR 97218
Maurine	Canarsky		1977 SE 22nd	Portland ,OR 97214
Maxine	Schwartz		2833 NE 49th	Portland ,OR 97202
Maya	Jarrad		1820 NE 21st	Portland ,OR 97202
Melba	Dlugonski		6735 SE 78TH AVE	PORTLAND ,OR 97206
Melissa	Scherling		2033 NE Couch	Portland ,OR 97213

Fossil Fuel Terminal Zoning Amendments
Notice of Adoption Mailing List

First Name	Last Name	Business	Address	City/State/Zip
Mia	Reback		408 NW 12th	Portland ,OR 97212
Micah	Meskel		260 NW Pittock	Portland ,OR 97211
Michael	Schumann		4210 NE Skidmore	Portland ,OR 97213
Michael	Pope		6405 SE 62nd	Portland ,OR 97206
Monica	Card		5104 SE Clinton	Portland ,OR 97206
Mukta	Akter		3414 SE 21st	Portland ,OR 97202
Nancy	Bishop		1725 N Alberta	Portland ,OR 97217
Nancy	Anderson		5325 SW Dosch	Portland ,OR 97215
Nancy	Anderson		7306 SE Main	Portland ,OR 97215
Naomi	Berg		4017 SE Filbert	Portland ,OR 97202
Natalie	Marburger		5606 SW Riverside	Portland ,OR 97239
Nathaniel	Eggers		5501 NW Front	Portland ,OR 97202
Nia	Hansen		1908 SE 35th	Portland ,OR 97239
Nicholas	Caces		1136 SE 50th	Portland ,OR 97215
Nicholas	Cutright		12345 Lake City	Seattle ,WA 98125
Nick	Caleb		1820 NE 21st	Portland ,OR 97212
Nicole	Martinez		8734 NW Wood	Portland ,OR 97217
Noah	Jenkins		3537 NE 81st	Portland ,OR 97206
Nora	Polk		1610 NE Tillamook	Portland ,OR 97206
P	Horter		4619 NE 30th	Portland ,OR 97231
Pat	Bowman		1021 NW Skyline	Portland ,OR 97229
Patricia	Always		10511 W Kingswood	Sun City ,AZ 85351
Patricia	Bellamy		3214 NE Cesar Chaves	Portland ,OR 97212
Patrick	Jones		4032 SE Crystal Springs	Portland ,OR 97229
Paul	Thompson		2755 NE 35th	Portland ,OR 97202
Paula	Casner		3249 NE 81st	Portland ,OR 97213
Pennelloppe	Allee		17139 SW Berkeley	Beaverton ,OR 97003
Peter	Cornelison		205 Oak	Hood River ,OR 97031
Philip	Brunner		1920 N Schofield	Portland ,OR 97217
Priscilla	Lane		2009 SE Taylor	Portland ,OR 97215
Priscilla	Carlson		2607 NE Mason	Portland ,OR 97211
Rachael	Hawkey		1900 SW Sunset	Portland ,OR 97217
Randall	Webb		4221 NE Glisan	Portland ,OR 97210
Ray	Ashmun		3018 NE 15th	Portland ,OR 97212
Rebecca	Brownlie		3236 Carrington	Bellingham ,WA 98226
Rebecca	Clarke		5035 N DePaul	Portland ,OR 97203
Regna	Merritt		2216 SE 58th	Portland ,OR 97210
Renee	Elias		6435 NE Yamhill	Portland ,OR 97215
Rhonda	Sabala		14139 NW Charlton	Portland ,OR 97211
Richard	Emery		3439 NE Sandy	Portland ,OR 97232
Robert	Fordham		2016 NE 25th	Portland ,OR 97212
Robert	Deering		5528 N Moore	Portland ,OR 97217
Robert	Grossman		7234 SE 17th	Portland ,OR 97212
Robert	Spies		9271 E Clay	Portland ,OR 97216
Robert	Breaks		PO Box 2733	Oregon City ,OR 97045
Robert	Kaplan		PO Box 577	Port Angeles ,WA 98362
Robin	Vesey		6608 SE 81st	Portland ,OR 97219
Ron	Delp		5622 SE Raymond	Portland ,OR 97206
Rose	Christopher		14707 NW Cedar	Portland ,OR 97231
Ruba	Leech		5803 SW Garden Home	Portland ,OR 97211

Fossil Fuel Terminal Zoning Amendments
Notice of Adoption Mailing List

First Name	Last Name	Business	Address	City/State/Zip
Ryan	Francesconi		2833 SE 45th	Portland ,OR 97206
Sabolch	Horvat		17827 NW Sauvie	Portland ,OR 97212
Samantha	Baily		9930 SE Caruthers	Portland ,OR 97216
Sandra	Joos		9527 NW Marvin	Portland ,OR 97239
Sandy	Polishuk		7112 SW 53rd	Portland ,OR 97212
Sara	Dolph		149 SE 134th	Portland ,OR 97233
Sara	Crowley		4116 SE Stark	Portland ,OR 97214
Sascha	Krader		3735 SE Yamill	Portland ,OR 97232
Sasha	Samuels		5151 NW Cornell	Portland ,OR 97219
Scott	Trinkle		1525 SE 139th	Portland ,OR 97201
Sean	Tenney		1732 N Blandena	Portland ,OR 97205
Seemin	Qayum		1927 N Jantzen	Portland ,OR 97223
Shannon	Ferguson		7910 N Fiske	Portland ,OR 97203
Sharon	Collver		2306 NE Siskiyou	Portland ,OR 97212
Sharon	McDonald		3125 SE Yamhill	Portland ,OR 97266
Sharon	Miller		3214 NE Cesar	Portland ,OR 97212
Shawn	Looney		12937 NW Newberry	Portland ,OR 97231
Shawn	Looney		2257 NW Raleigh	Portland ,OR 97231
Shawn	Looney		8521 NE 15th	Portland ,OR 97210
Sheelagh	Oliveria		6356 N Wilbur	Portland ,OR 97206
Sheila	Golden		9455 NE Alderwood	Porltand ,OR 97232
Sierra	Ansley		762 NW Harvest Moon	Portland ,OR 97124
Sonya	Bastendorff		5325 SW Dosch	Portland ,OR 97239
Stephanie	Christensen		7502 SW Miles	Portland ,OR 97219
Stephen	Bachhuber		3428 SE 9th	Portland ,OR 97202
Stephen	Bartlett		659 N Tomahawk Island	Portland ,OR 97217
Steve	Elliot		15036 Stagecoach	Swisshome ,OR 97480
Steve	Cheseborough		2735 NE 37th	Portland ,OR 97212
Steve	Rauworth		2944 SW 55th	Portland ,OR 97214
Steve	Wheeler		628 SE 58th	Portland ,OR 97213
Susan	Buswell		17628 SE Cook	Milwaukie ,OR 97267
Susan	Braverman		1815 NW 27th	Portland ,OR 97210
Susan	Wechsler		2785 NW Marshall	Corvallis ,OR 97330
Susan	Economon		4655 NE Killingsworth	Portland ,OR 97218
Susanna	Askins		14640 NE Russell	Portland ,OR 97230
Taylor	St Clair		6130 SW Nevada	Portland ,OR 97217
Ted	Dreier		7037 SW 54th	Portland ,OR 97219
Teresa	McFarland		2357 NE 151st	Portland ,OR 97219
Terri	Burdette		6603 N Bank	Portland ,OR 97203
Thomas	Keys		9322 N Oswego	Gresham ,OR 97080
Tim	Norgren		PO Box 297	Stevenson ,WA 98648
Tobias	Boyd		130 NE 72nd	Portland ,OR 97213
Todd	Corbett		10815 Hubbard Creek	Umpqua ,OR 97486
Tom	Cloud		289D Cape labelle	Tonasket ,WA 98855
Tom	Blackburn		3500 SE Concord	Portland ,OR 97267
Tom	Sincic		3959 NE 42nd	Portland ,OR 97212
Tom	Noll		5745 NE Church	Portland ,OR 97219
Tony	DeCristofaro		472 N Hayden Island	Portland ,OR 97217
Tori	Cole		1635 NE Couch	Portland ,OR 97232
Tracy	Ceravolo		1721 NE 209th	Vancouver ,WA 98642

Fossil Fuel Terminal Zoning Amendments
Notice of Adoption Mailing List

First Name	Last Name	Business	Address	City/State/Zip
Trisha	Broeke		5609 SE 65th	Portland ,OR 97206
Tyler	Wagner		9271 SW 3rd	Portland ,OR 97214
Victoria	Cole		4639 NE 30th	Portland ,OR 97232
Vincent	Alvarez		12671 SE Where Else Ln	Milwaukie ,OR 97222
Virginia	Wiseman		2652 SE 48th	Portland ,OR 97211
Vivianne	Clark		3655 SW 144th	Portland ,OR 97244
Wade	Stoddard		68 57th	Portland ,OR 97217
Walter	Demaree		11535 N Force	Portland ,OR 97217
Walter	Lichtenberg		4625 NE 38th	Portland ,OR 97202
Willy	Myers		82270 Red Bluff	Portland ,OR 97266
Dane	Pikkola		2255 W. Burnside St #508	Portland, OR 97210
TOM ARMSTRONG		BUREAU OF PLAN	1900 SW 4TH AVE STE 7100	PORTLAND 97201
LAUREN KING		OFFICE OF THE CI	1221 SW FOURTH AVE SUITE 430	PORTLAND OR 97204
OCCUPANT		GATX TANK STOR	1100 W TOWN AND COUNTRY RD	ORANGE CA 92868
OCCUPANT		KINDER MORGAN	1100 W TOWN AND COUNTRY RD	ORANGE CA 92868
WILLIAM RASMUSSEN		MILLER NASH GR.	111 SW FIFTH AVE SUITE 3400	PORTLAND OR 97204
PHILLIP GRILLO		DAVIS WRIGHT TI	1300 SW FIFTH AVE SUITE 2400	PORTLAND OR 97201
Nina Carlson		NORTHWEST NAT	220 NW 2ND AVE	PORTLAND OR 97209
TYLER GILLIGAN		KINDER MORGAN	3250 LACEY RD SUITE 700	DOWNERS GROVE IL 60515
OCCUPANT		ZENITH ENERGY T	3900 ESSEX LN STE 700	HOUSTON TX 77027
OCCUPANT		MC CALL OIL & CI	5480 NW FRONT AVE	PORTLAND OR 97210
KEVIN JONES		MC CALL OIL & CI	5480 NW FRONT AVE	PORTLAND OR 97210
OCCUPANT		MOREC FRONT LL	5480 NW FRONT AVE	PORTLAND OR 97210
OCCUPANT		TANKER BASIN LL	5480 NW FRONT AVE	PORTLAND OR 97210
OCCUPANT		OLYMPIC PIPE LIN	550 WESTLAKE PARK BLVD M/C1930D	HOUSTON TX 77079
DIRK KRAMER		ZENITH ENERGY T	5501 NW FRONT AVE	PORTLAND OR 97210
NICK GIOTTA		PHILLIPS 66 COM	5528 NW DOANE AVE	PORTLAND OR 97210
JERRY HENDERSON		CHEVRON USA IN	5531 NW DOANE AVE	PORTLAND OR 97210
ANDREW HOLBROOK		KINDER MORGAN	5880 NW ST HELENS RD	PORTLAND OR 97210
ALLISON REYNOLDS		STOEL RIVES	760 SW NINTH AVE SUITE 3000	PORTLAND OR 97205
KEVIN BUFFUM		PACIFIC TERMINA	7900 NW ST HELENS RD	PORTLAND OR 97210
MAURA FAHEY		CRAG LAW CENTI	917 SW OAK STREET SUITE 417	PORTLAND OR 97205
STEVE KOBER		NUSTAR ENERGY	9420 NW ST HELENS RD	PORTLAND OR 97231
OCCUPANT		CHEVRON USA IN	PO BOX 285	HOUSTON TX 77001
OCCUPANT		PHILLIPS 66 COM	PO BOX 5600	BARTLESVILLE OK 74005
OCCUPANT		SEAPORT MIDSTR	PO BOX 5660	DENVER CO 80218
OCCUPANT		EXXONMOBIL OIL	PO BOX 64106	SPRING TX 77387
OCCUPANT		SHORE TERMINAL	PO BOX 780339	SAN ANTONIO TX 78278

Armstrong, Tom

From: Armstrong, Tom
Sent: Monday, January 6, 2020 4:46 PM
To: Armstrong, Tom
Cc: King, Lauren
Subject: Notice of Adoption – Fossil Fuels Terminal Zoning Amendments

NOTICE OF ADOPTION: Fossil Fuel Terminal Zoning Amendments

This is to notify you that the Portland City Council recently adopted the Fossil Fuel Terminal Zoning Amendments ordinance, which included zoning code amendments. The adopting ordinance was passed by the City Council on December 18, 2019 and became effective on December 18, 2019.

Pursuant to ORS 197.615, notice of Adoption of a Post Acknowledgement Plan Amendment for the project was filed with the Oregon Department of Land Conservation and Development on January 6, 2020.

The ordinance, supporting documents, and a summary of the changes are available on the BPS website: https://www.portlandoregon.gov/bps/71118.

To review the adopting ordinances, exhibits and findings, please contact:

Tom Armstrong, Supervising Planner
Bureau of Planning and Sustainability
1900 SW Fourth Ave. Suite 7100
Portland OR 97201
Phone: 503-823-3527
Email: tom.armstrong@portlandoregon.gov

The City Council's decision is the City's final decision. This decision may be appealed to the Oregon Land Use Board of Appeals (LUBA) by filing a Notice of Intent to Appeal with LUBA within 21 days of the date of this notice, as specified in the Oregon Revised Statute (ORS) 197.830(9). Among other things, ORS 197.830 requires that a petitioner at LUBA must have appeared orally or in writing during the City's proceedings on this land review. LUBA's address is: DSL Building, 775 Summer Street NE, Suite 330, Salem, OR 97301-1283. For more information on filing an appeal, call LUBA at 503-373-1265 or visit LUBA's website (www.oregon.gov/LUBA).

Per ORS 197.830(9), copies of the notice of intent to appeal shall be served upon the City. The notice shall be served and filed in the form and manner prescribed by rule of the board and shall be accompanied by a filing fee of $200 and a deposit for costs to be established by the board.

Tom Armstrong, Supervising Planner
he/him
City of Portland Bureau of Planning and Sustainability
503-823-3527
1900 SW Fourth Ave, Suite 7100
Portland, OR 97201

The City of Portland is committed to providing meaningful access. For accommodations, modifications, translation, interpretation or other services, please contact at 503-823-7700 or use City TTY 503-823-6868.

Fossil Fuels Terminal Zoning Amendments
Notice of Adoption Email List

First Name	Last Name	Address	City/State/Zip	Email Address
Alona	Steinke	PO Box 822393	Vancouver ,WA 98682	alonakotkasteinke@hotmail.com
Robert Carroll		15937 Ne Airport Way	Portland	bob@ibew48.com
Robert Curcio		6305 NW Old Lower River Road	Vancouver	bob@tidewater.com
Alicia	Cohen	2240 SE 24TH AVE	PORTLAND ,OR 97214	cohenalicia@gmail.com
Daniel Serres		1125 SE Madison	Portland	dan@columbiariverkeeper.org
Aja DeCoteau		NO ADDRESS	Portland	deca@critfc.org
Adrienne	Dickinson	14900 SE RUPERT DR	PORTLAND ,OR 97267	dickinsonfam@hotmail.com
Susheela Jayapal		NO ADDRESS	Portland	district2@multco.us
Ella Shriner		NO ADDRESS	Portland	ellashriner21@gmail.com
Ellen Wax		200 SW Market Street	Portland	ellen.wax@workingwaterfrontpor
Dianne	Ensign	11600 SW LANCASTER RD	PORTLAND ,OR 97219	ensign@lclark.edu
Virginia	Feldman	11230 SW COLLINA AVE	PORTLAND ,OR 97219	feldmanvi@gmail.com
Farrah	Chaichi	12320 SW CENTER ST APT 41	BEAVERTON ,OR 97005	fnchaichi@gail.com
Heather	Dennett	6835 N WALL AVE	PORTLAND ,OR 97203	heathervanhoof@hotmail.com
Harriet	Cooke	3126 SW CARSON ST	PORTLAND ,OR 97219	holisticooke@aol.com
Catherine H. Reheis-Boyd		975 Carpenter Road NE	Lacey, WA	Holli@wspa.org
Jon Isaacs		121 SW Salmon St.	Portland	jisaacs@portlandalliance.com
Joana	Kirchhoff	3414 NE 73RD AVE	PORTLAND ,OR 97213	joanakirchhoff@gmail.com
Joshua	Berger	PO Box 2863	PORTLAND ,OR 97208	josh@plazm.com
JT Hendrix		5501 NW Front Avenue	Portland	JT.Hendrix@zenithterminals.com
Luke	Anavi	2431 NE FLANDERS ST	PORTLAND ,OR 97232	lanavi@ymail.com
Sarita Vasquez		4110 SE Hawthorne Blvd	Portland	lifeisyummy@gmail.com
Heidi	Trinkle	1205 SW CARDINELL DR APT 603	PORTLAND ,OR 97201	liggig@gmail.com
Marilee	Dea	4613 NE KILLINGSWORTH ST UNI	PORTLAND ,OR 97218	marileedea@comcast.net
Mark	Darienzo	6923 NE MORRIS ST	PORTLAND ,OR 97213	markdari@pacifier.com
Merle	Clifton	4457 NE CAMPAIGN ST	PORTLAND ,OR 97218	merle_c_2000@yahoo.com
Michael	Andersen	924 NE 65TH AVE UNIT 8	PORTLAND ,OR 97213	michael@portlandafoot.org
Mike Meyers		NO ADDRESS	Portland	Mike.J.Myers@portlandoregon.go
Nancy Hiser		No Address	Portland	nancyhiser@comcast.net
Nancy	Crumpacker	2351 NW WESTOVER RD APT 70	PORTLAND ,OR 97210	ncrumpacker@comcast.net
Nancy	Fleming	802 SW TERWILLIGER PL	PORTLAND ,OR 97239	nflemingrn@aol.com
Kathryn Williams		220 NW 2nd Ave	Portland	nina.carlson@nwnatural.com
Dolores	Wood	4834 SE 115TH AVE	PORTLAND ,OR 97266	pgna_greening@yahoo.com
Rick	Brown	3425 SW 12TH AVE	PORTLAND ,OR 97239	rtb22@comcast.net
Ryan Rittenhouse		NO ADDRESS	Portland	ryan@gorgefriends.org
Susan	Arthur	3909 E Fourth Plain BLVD UNIT 5	Vancouver ,WA 98661	sarthur624@hotmail.com
Sue Tarjan		7401 N Ivanhoe St	Portland	soozyti@me.com
Todd Aschoff		4016 NE 42nd Ave	Portland	tbaschoff@me.com
Heather	Carver	4613 NE KILLINGSWORTH ST UNI	PORTLAND ,OR 97218	tierrabodhi@gmail.com
Trine	Beach	4023 SE LONG ST	PORTLAND ,OR 97202	trinebeach@comcast.net
Willy	Myers	3535 SE 86TH AVE	PORTLAND ,OR 97266	willy@cpbctc.com
Monica Zazueta		NO ADDRESS	Vancouver	zazuetamonica0813@gmail.com
Tom	Armstrong	City of Portland		tom.armstrong@portlandoregon.g
Lauren	King	City of Portland		lauren.king@portlandoregon.gov

ORDINANCE NO. 189307 **As Amended**

*Readopt remanded Ordinance No. 188142 to restrict bulk fossil fuel terminals. (Ordinance; Amend Title 33, Planning and Zoning)

The City of Portland ordains:

Section 1. The Council finds:

General Findings

1. The rapid development of fossil fuel resources in the western U.S. and Canada has resulted in numerous facility and infrastructure projects proposed to transport coal, diluted bitumen, natural gas, propane or other fossil fuels through the West Coast.

2. Fossil fuels pose risks to safety, health, and livability, including mobility of people, other freight, and other commercial vehicles.

3. The State of Oregon and the greater Pacific Northwest are vulnerable to powerful subduction zone earthquakes that occur with periodic frequency along the Juan de Fuqua and North American plates.

4. In the past, both the Huu-ay-aht First Nation peoples and the Makah tribe shared similar stories of lost land and peoples as a result of these earthquakes and tsunamis, which scientific research has matched with Japanese tsunami records and on-the-ground geologic field research to reconstruct the Cascadia earthquake of 1700. This research shows that subduction zone earthquakes have occurred along the Pacific Northwest with relative regularity over the last 10,000 years, and if averages from past events are predictive, the region could be overdue for another powerful subduction zone earthquake.

5. Many of the city's buildings and critical infrastructure were built before the city's seismic exposure was widely understood. This infrastructure includes Oregon's primary liquid fuel storage facilities, the Critical Energy Infrastructure (CEI) hub, which is located in northwest Portland and receives 90 percent of the state's liquid fuel supply either via pipeline or marine vessel. Most of the storage tanks within the CEI hub have been built prior to any design and performance lessons learned from the damaging Great Alaskan earthquake of 1964 and the many other documented earthquakes that followed.

6. The CEI hub is vulnerable to failure in the event of subduction zone earthquake. A 2012 Oregon Department of Geology and Mineral Industries (DOGAMI) Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report states that a magnitude 8 or 9 Cascadia Subduction Zone earthquake would impact the CEI Hub with: ground shaking; liquefaction (soil behavior phenomenon in which a saturated sand softens and loses strength during strong earthquake ground shaking); lateral spreading (where surficial soil permanently moves laterally due to earthquake shaking); landslides; co-seismic settlement (where the ground surface is permanently lowered due to seismic

shaking); and bearing capacity failures (when the foundation soil cannot support the structure it is intended to support). The study also notes that, at the time, only three existing storage tanks were known to have addressed liquefaction vulnerabilities.

7. The 2013 Oregon Resilience Plan raised concerns about the sturdiness of CEI facilities constructed on soils susceptible to liquefaction, and infrastructure not built to current standards given the hub's age-range of structures.

8. The Portland Bureau of Emergency Management's Mitigation Action Plan (MAP) identifies how natural hazard events like floods, landslides, and earthquakes might affect the City of Portland. The Portland area has experienced numerous earthquakes in the past, ranging from Magnitude 4.5 to 9.0. Portland is certain to experience seismic events in the future. Many of Portland's fossil fuel storage tanks were built before seismic design requirements in building codes were adopted.

9. Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake.

10. The extraction and combustion of fossil fuels are significant sources of greenhouse gas emissions and major contributors to climate change and pollution.

11. Coal contains toxic heavy metals, including mercury, arsenic and lead, and exposure to these toxic heavy metals is linked to cancer, birth defects and other health problems.

12. A Union Pacific train carrying oil from North Dakota to Tacoma derailed in Mosier, Oregon on June 3, 2016, spilling 42,000 gallons of crude oil, igniting a fire, and leading to the evacuation of one-quarter of the town's residents.

13. Tribal communities in Oregon and Washington have expressed concerns about the safety risks of fossil fuel infrastructure and the related threats to human health, cultural heritage, and environmental quality.

14. The City's 2015 Climate Action Plan (adopted by Resolution 37135) identifies the need to establish a "fossil fuel export policy that considers lifecycle emissions, safety, economics, neighborhood livability and environmental impacts" (Climate Action Plan, action 3G, page 69).

15. The City committed in its 2015 Climate Action Plan to advancing policy and programs to reduce local fossil fuel use both in the City's own operations and through community-wide initiatives.

16. In Resolutions 36959 and 36962 adopted in 2012, the Council expressed opposition to coal trains traveling through Portland until a programmatic, comprehensive and area-

wide Environmental Impact Statement and comprehensive Health Impact Assessment are completed.

17. Resolution 37168, adopted November 12, 2015, expressed the City Council's opposition to the "expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." It also expressed the Council's intent not to restrict improvements in safety, efficiency, or seismic resilience; the provision of service directly to end users; or infrastructure that will accelerate the transition to non-fossil fuel energy sources.

18. The 2035 Comprehensive Plan sets policy direction (Policies 4.75 and 4.76) to encourage disaster-resilient development and specifically to reduce natural hazard risks to critical energy and transportation infrastructure in Portland Harbor.

19. The first step in making the current situation better is to ensure that the situation does not get worse. Continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a moderate to high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals.

20. These Zoning Code amendments create a new land use category with development standards that limit the size of new terminals and prohibit the expansion of existing terminals.

21. The amendments promote major benefits to human health and safety, environmental health and resilience, with minor impacts to economic prosperity and equity.

22. The amendments will prohibit expansion at existing fuel terminals and limit new terminal development, potentially impacting associated job growth and tax revenue. At the same time, the code restrictions on fossil fuel terminal development will also limit potential financial risks from a major accident involving fossil fuel infrastructure.

23. The amendments will limit the risk of low, but potentially catastrophic, safety risks associated with fossil fuel infrastructure.

24. The amendments will allow for the continued operation, but prohibit expansion of storage capacity, with some exceptions, at existing fuel terminals and limit new terminal development.

25. The amendments will restrict development of fossil fuel terminals consistent with City and State objectives on climate change and public safety. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, substituting these fuels for higher-carbon fuels does not begin to approach the goal of an 80% reduction in

carbon emissions by 2050 established in Portland's Climate Action Plan or the State of Oregon's 75% reduction goal.

26. In Resolution 37168, the City Council expressed support for accelerating the transition to non-fossil fuel energy sources. As part of that transition, the Oregon Department of Environmental Quality (ODEQ) is implementing the Oregon Clean Fuels Program, which requires a 10 percent reduction in average carbon intensity by 2025. Fuels that could be used to achieve the standards include ethanol, biodiesel, electricity, hydrogen, natural gas, propane, and biogas, which may require additional storage capacity. In order to facilitate implementation of the Clean Fuels Program, non-fossil fuel storage tanks are not subject to the capacity limits.

27. Ordinance No. 188142 was appealed to the Oregon Land Use Board of Appeals (LUBA). LUBA issued an order reversing the City's Ordinance in *Columbia Pacific Building Trades Council et al v. City of Portland*, LUBA Case No. 2017-001, July 19 2017).

28. LUBA's decision was appealed to the Oregon Court of Appeals, which overturned LUBA's decision which was affirmed in part and reversed in part in *Columbia Pacific Building Trades Council v. City of Portland*, 289 Or App 739 (2018).

29. The Oregon Court of Appeals decision was appealed to the Oregon Supreme Court, which denied review in *Columbia Pacific Building Trades Council v. City of Portland*, 363 Or 390 (2018).

30. On October 5, 2018, LUBA remanded *Columbia Pacific Building Trades Council et al v. City of Portland*, LUBA Case No. 2017-001 to assignments of error that LUBA sustained and were either affirmed or not challenged on appeal to the Court of Appeals.

31. A general notification of the November 20, 2019, City Council public hearing on the remand of Ordinance No. 188142 was sent to the City's legislative notice list, the fossil fuel terminal property owners, and the parties to the appeal.

32. On November 20, 2019, the Portland City Council held a public hearing and received testimony on the re-adoption of the fossil fuel terminal zoning restrictions.

Conclusion

33. The City Council has considered applicable policies, as described in Exhibit A, to determine that this ordinance on the whole complies with the 2035 Comprehensive Plan and on balance is equally or more supportive of the goals and policies of the 2035 Comprehensive Plan than the current regulations. In reaching this conclusion, City Council has weighed and balanced competing policy directions. In particular, the Council finds that:
    a. Statewide Planning Goal 7 (Natural Hazards) and 2035 Comprehensive Plan Goal 4.D with Policies 4.79 and 4.80, requires reducing risk to people and property from natural hazards. The FFTZ amendments further these goals and policies because by limiting the risks of storing large volumes of hazardous materials in an

area with moderate to high susceptibility to an earthquake. Large fossil fuel terminals represent a risk to people, property and the natural environments that the City Council finds as a compelling reason to limit future risk by limiting the size of new facilities and prohibit the expansion of existing facilities. Continuing to allow an unlimited increase in storage capacity at FFTs in a moderate to high risk area would be less supportive of the 2035 Comprehensive Plan than adopting the FFTZ amendments

b. Policy 6.48 provides direction to limit fossil fuel terminals to what is necessary to serve the regional. The City Council recognizes that Portland's fossil fuel terminals handle 90 percent of the fossil fuel for the State of Oregon and Southwest Washington. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs. In addition, limiting storage capacity to the existing facilities reduces risk from a major earthquake, which outweighs the policy direction to provide capacity to accommodate any potential future increase in fossil fuel consumption, in part, because continuing to consolidate fossil fuel storage capacity in Portland is counter to resiliency principles that emphasize redundancy and distributed facilities.
c. Statewide Planning Goal 9 (Economic Development) and 2035 Comprehensive Plan Goal 6.C with Policies 6.20 and 6.36, among others, provide for the retention and growth of businesses, especially those in the traded sector. The City Council interprets these policies apply to the economy in general, rather than specific types of business. These changes and restrictions only apply to a narrowly defined new land use category, Bulk Fossil Fuel Terminals, and do not have a significant effect on the other allowed uses in industrial and employment zones. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial and employment areas of Portland. These amendments are narrowly constructed to apply to one class of businesses that make up a small portion of the city, regional and state economy. Further, these regulations only limit future expansion of these fossil fuel terminals, with some key exceptions, and designate these businesses as a limited use that allows their continued operation.
d. Guilds Lake Industrial Sanctuary (GLIS) Plan policies provide direction to maintain, protect and enhance businesses in the sanctuary. This plan was adopted in 2001 and does not address the need for resiliency in a high and medium liquefaction susceptibility area. The City Council interprets these policies to apply to the GLIS as a whole and not individual businesses. The City Council interprets the legislative intent of the GLISP is to maintain the area as an industrial sanctuary and to prohibit incompatible land uses. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses that could undermine the viability of the industrial sanctuary. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The remaining industrial uses to continue to operate under current

regulations. The impact of the limits on fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and make upgrades and supports limited enhancement through exceptions to the storage capacity restrictions.

NOW THEREFORE, The Council directs:

a. Adopt Exhibit A Findings of Fact Report (as amended) December 2019 as additional findings.
b. Amend Title 33, Planning and Zoning, as shown in Exhibit B, Fossil Fuel Terminal Zoning Amendments, Remand Report, dated December 18, 2019.
c. Adopt the commentary in Exhibit B, Fossil Fuel Terminal Zoning Amendments, Remand Report, dated December 18, 2019, as legislative intent and further findings.
d. Adopt Exhibit C. LUBA Record for *Columbia Pacific Building Trades Council et al v. City of Portland*, LUBA Case No. 2017-001, as additional evidence.
e. The Bureau of Planning and Sustainability shall report to City Council no later than December 31, 2021 on the implementation of this ordinance, including:
    - the number and description of any requests by existing terminal operators to upgrade and replace storage capacity at their facilities;
    - the number and description of building permits issued for fossil fuel tanks between 125,000 and 2 million gallons;
    - the trends in fossil fuel energy use and non-fossil energy use in Oregon;
    - the status of local and state regulatory proceedings that may improve seismic resilience of fossil fuel storage infrastructure; and
    - information on compliance with the Oregon Clean Fuels Program.

f. City Bureaus, including BDS, PBEM and Fire, shall work with the State of Oregon to develop policy options to require seismic upgrades of storage tanks within a firm deadline for replacement of older, unsafe tanks.

Section 2.
The Council declares that an emergency exists due to the fact that Portland is currently at risk of a major earthquake; therefore, this ordinance shall be in full force and effect from and after its passage by the Council.

Section 3.
If any section, subsection, sentence, clause, phrase, diagram, designation, or drawing contained in this Ordinance, or the plan, map or code it adopts or amends, is held to be deficient, invalid or unconstitutional, that shall not affect the validity of the remaining portions. The Council declares that it would have adopted the plan, map, or code and each section, subsection, sentence, clause, phrase, diagram, designation, and drawing thereof, regardless of the fact that any one or more sections, subsections, sentences, clauses, phrases, diagrams, designations, or drawings contained in this Ordinance, may be found to be deficient, invalid or unconstitutional.

189807

Passed by the Council: DEC 18 2019

Mary Hull Caballero
Auditor of the City of Portland
By Keela Deputy

Mayor Ted Wheeler

Prepared by: T. Armstrong
Date Prepared: October 31, 2019

~~1082~~ 1194

Agenda No.
ORDINANCE NO. 189807 As Amended
Title

*Readopt remanded Ordinance No. 188142 to restrict bulk fossil fuel terminals. (Ordinance; Amend Title 33, Planning and Zoning)

INTRODUCED BY Commissioner/Auditor: **Mayor Wheeler**	CLERK USE: DATE FILED 11/12/2019
COMMISSIONER APPROVAL Mayor—Finance & Administration - Wheeler Position 1/Utilities - Fritz Position 2/Works - Fish Position 3/Affairs - Hardesty Position 4/Safety - Eudaly	Mary Hull Caballero Auditor of the City of Portland By: Keela Deputy
BUREAU APPROVAL Bureau: Planning and Sustainability Bureau Head: Andrea Durbin	**ACTION TAKEN:** NOV 20 2019 **Continued to December 18, 2019 at 3:00 p.m. Time Certain As Amended**
Prepared by: Tom Armstrong Date Prepared: 10/29/19	
Impact Statement Completed ☒ Amends Budget ☐	
Portland Policy Document If "Yes" requires City Policy paragraph stated in document. Yes ☐ No ☒	
City Auditor Office Approval: required for Code Ordinances	
City Attorney Approval: KAK required for contract, code, easement, franchise, comp plan, charter	
Council Meeting Date **11/20/19**	

AGENDA
TIME CERTAIN ☒ **Start time: 2:00 p.m.** **Total amount of time needed: 2 hours** **(for presentation, testimony and discussion)**
CONSENT ☐
REGULAR ☐ **Total amount of time needed: _____** **(for presentation, testimony and discussion)**

FOUR-FIFTHS AGENDA	COMMISSIONERS VOTED AS FOLLOWS:	YEAS	NAYS
1. Fritz	1. Fritz	✓	
2. Fish	2. Fish	—	
3. Hardesty	3. Hardesty	✓	
4. Eudaly	4. Eudaly	✓	
Wheeler	Wheeler	✓	

Exhibit A:
Findings of Fact Report (as amended)
December 2019

Text amendments to the Zoning Code, which is an implementation tool of the Comprehensive Plan, must comply with the Comprehensive Plan. "Comply" means that amendments must be evaluated against the Comprehensive Plan's applicable goals and policies and on balance be equally or more supportive of the Comprehensive Plan as a whole than the existing language or designation. (Policy 1.10)

Text amendments to the zoning code also must be found to be consistent with the Metro's Urban Growth Management Functional Plan and the Statewide Planning Goals. The 2035 Comprehensive Plan defines "consistent with" as the subject meets the requirements of, satisfies, or adheres to the regulations, mandate, or plan listed in the goal or policy. In addition, the amendments must be consistent with the intent or purpose statement for the base zone, overlay zone, and plan district where the amendment is proposed, and any plan associated with the regulations. (33.835.040)

1. Finding: As detailed below, the City Council has identified and addressed all relevant and applicable goals and policies in this document.
2. Finding: Additionally, the Council has considered whether the amendments are consistent with the intent or purpose statement of the Employment and Industrial Zones (33.140) and the Description of Use Categories (33.920) that are directly amended by this ordinance.
3. Finding: The City Council has considered the public testimony on this matter and has weighed all applicable goals and policies has found that the Fossil Fuel Terminal Zoning amendments (the FFTZ amendments) on balance are equally or more supportive of the Comprehensive Plan as a whole and are consistent with Metro's Urban Growth Management Functional Plan, the Statewide Planning Goals, and the applicable purpose statements of the Zoning Code.

As demonstrated by these findings, the FFTZ amendments effectively and efficiently implement the Comprehensive Plan. Specifically:

The City Council has considered applicable policies to determine that this ordinance on the whole complies with the 2035 Comprehensive Plan and on balance is equally or more supportive of the goals and policies of the 2035 Comprehensive Plan than the current regulations. In reaching this conclusion, City Council has weighed and balanced competing policy directions.

In particular, the Council finds that Goal 4.D with Policies 4.79 and 4.80, requires evaluating and reducing risk to people and property from natural hazards. The FFTZ amendments further these goals and policies because by limiting the risks of storing large volumes of hazardous materials in an area with high susceptibility to an earthquake. Large fossil fuel terminals represent a risk to people, property and the natural environments that the City Council finds as a compelling reason to limit future risk by limiting the size of new facilities and prohibit the expansion of existing facilities. Continuing to allow an unlimited increase in storage capacity at FFTs in a high risk area would be less supportive of the 2035 Comprehensive Plan than adopting the FFTZ amendments

The City Council further finds that Policy 6.48 provides direction to limit fossil fuel terminals to what is necessary to serve the region. The City Council recognizes that Portland's fossil fuel terminals handle 90 percent of the fossil fuel for the State of Oregon and Southwest Washington. BPS

presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington, during a period of a thriving economy. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. The more recent cargo forecasts project a modest growth in volumes, but those volumes do not exceed the historic peak volumes that were handled by the Portland terminals. No other evidence of future demand for fossil fuels was submitted in testimony. Therefore, the City Council finds that the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety. In addition, limiting storage capacity to the existing facilities reduces risk from a major earthquake, which outweighs the policy direction to provide capacity to accommodate any potential future increase in fossil fuel consumption, in part, because continuing to consolidate fossil fuel storage capacity in Portland is counter to resiliency principles that emphasize redundancy and distributed facilities.

At the same time, the City Council finds that Goal 6.C with Policies 6.20 and 6.36, among others, provide for the retention and growth of businesses, especially those in the traded sector. However, the City Council interprets these policies apply to the economy in general, rather than specific types of business. These changes and restrictions only apply to a narrowly defined new land use category, Bulk Fossil Fuel Terminals, and do not have a significant effect on the other allowed uses in industrial and employment zones. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial and employment areas of Portland. These amendments are narrowly constructed to apply to one class of businesses that make up a small portion of the city, regional and state economy. Further, these regulations only limit future expansion of these fossil fuel terminals, with some key exceptions, and designate these businesses as a limited use that allows their continued operation.

Guilds Lake Industrial Sanctuary (GLIS) Plan policies provide direction to maintain, protect and enhance businesses in the sanctuary. This plan was adopted in 2001 and does not address the need for resiliency in a high and medium liquefaction susceptibility area. The City Council interprets these policies to apply to the GLIS as a whole and not individual businesses. The City Council interprets the legislative intent of the GLISP is to maintain the area as an industrial sanctuary and to prohibit incompatible land uses. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses that could undermine the viability of the industrial sanctuary. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The remaining industrial uses to continue to operate under current regulations. The impact of the limits on fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and make upgrades and supports limited enhancement through exceptions to the fossil fuel storage capacity restrictions.

Part I. Statewide Planning Goals

State planning statutes require cities to adopt and amend comprehensive plans and land use regulations in compliance with the Statewide Planning Goals.

The Statewide Planning Goals that apply to Portland are:

Goal 1 Citizen Involvement
Goal 2 Land Use Planning
Goal 5 Natural Resources, Scenic and Historic Areas, and Open Spaces
Goal 6 Air, Water and Land Resource Quality
Goal 7 Areas Subject to Natural Hazards
Goal 8 Recreational Needs
Goal 9 Economic Development
Goal 10 Housing
Goal 11 Public Facilities and Services
Goal 12 Transportation
Goal 13 Energy Conservation
Goal 14 Urbanization
Goal 15 Willamette River Greenway

There are approximately 560 acres of land both within Portland's municipal boundaries and beyond the regional urban service boundary that can be classified as rural land. In 1991, as part of Ordinance 164517, the City Council took an exception to Goal 3 and 4 the agriculture and forestry goals. Because of the acknowledged exception, the following goals do not apply:

Goal 3 Agricultural Lands
Goal 4 Forest Lands

Other Statewide Planning Goals apply only within Oregon's coastal zone. Since Portland is not within Oregon's coastal zone, the following goals do not apply to this decision:

Goal 16 Estuarine Resources
Goal 17 Coastal Shorelands
Goal 18 Beaches and Dunes
Goal 19 Ocean Resources

Goal 1. Citizen Involvement. To develop a citizen involvement program that insures the opportunity for citizens to be involved in all phases of the planning process.

4. Finding: The preparation of these amendments has provided numerous opportunities for public involvement, including:

Concept Phase. In 2016, prior to the initiation of the legislative project, BPS conducted four stakeholder focus groups meetings. These meetings included participants with a range of perspectives and experience, including community group representatives, fuel terminal representatives, environmental organizations, and business organizations. These meetings served as a forum for discussing issues and potential approaches, and to help inform project staff develop concepts. In addition to the stakeholder focus groups, BPS staff met with several fuel terminals to explain the proposal, answer questions, and discuss their individual concerns. These meetings were needed because antitrust regulations constrained discussion about certain topics, for example supply chains, in the presence of representatives from other fuel terminals.

Discussion Draft. On June 29, 2016, the Fossil Fuel Terminal Zoning Amendments Discussion Draft was published and posted on the Bureau website.

Proposed Draft. On August 12, 2016, the Fossil Fuel Terminal Zoning *Proposed Draft* was published in preparation for the Planning and Sustainability Commission (PSC) review and recommendation. In support of this process, the BPS website had a project page dedicated to this project, an email address for submitting testimony. As part of the Proposed Draft publication and legislative process requirements, the following legal notices were also sent:

- Form 1 35-day Notice
  Sent to the Department of Land Conservation and Development (DLCD)
- Legislative Notice
  Sent to interested parties, recognized organizations, affected bureaus, TriMet, Metro and ODOT and published in the Daily Journal of Commerce
- Measure 56 Notice
  Required by Ballot Measure 56, this mailed notice was sent to property owners with industrial or employment base zoning.

The PSC held a public hearing on September 13, 2016. On October 11, 2016, the Planning and Sustainability Commission voted to recommend the Fossil Fuel Terminal Zoning Amendments to City Council, including PSC-recommended modifications to the Proposed Draft. All PSC meetings were streamed live and available for viewing on the Bureau website.

Recommended Draft. On October 24, 2016 the Fossil Fuel Terminal Zoning Amendments *Recommended Draft* was published to present the PSC recommendations to City Council. On October 25, 2016, notice of the City Council hearing on the Fossil Fuel Terminal Zoning Amendments was mailed. The City Council held public hearings on November 10 and 16, 2016, to receive testimony on the *Recommended Draft*. On December 8, 2016, the City Council voted to adopt the Fossil Fuel Terminal Zoning Amendments.

Ordinance No. 188142 was appealed to the Oregon Land Use Board of Appeals (LUBA). LUBA reversed the City's decision with a number of assignments of error in *Columbia Pacific Building Trades Council et al v. City of Portland*, LUBA Case No. 2017-001, July 19, 2017. LUBA's decision was appealed to the Oregon Court of Appeals, LUBA's decision was affirmed in part and reversed in part in *Columbia Pacific Building Trades Council v. City of Portland*, 289 Or App 739 (2018). The Oregon Court of Appeals decision was appealed to the Oregon Supreme Court, which denied review, 363 Or 390 (2018). On October 5, 2018, LUBA remanded *Columbia Pacific Building Trades Council et al v. City of Portland*, LUBA Case No. 2017-001. The assignments of error that LUBA sustained and were either affirmed or not challenged on appeal to the Court of Appeals concern insufficient findings or evidence or misconstruction of law that do not support a conclusion that the decision is prohibited as a matter of law.

The City of Portland does not have adopted code or policies to establish a decision-making process for a remand decision. The Council finds that the proposed amendments are a continuation of the initial legislative proceeding. Accordingly, the City Council determined that it was appropriate to bring the ordinance directly back to City Council, given the extensive public process that happened as part of the initial adoption of the ordinance in 2016 and that no substantive changes to the Zoning Code are required to address the remand issues. Notification of the November 20, 2019, City Council public hearing on the remand of Ordinance No. 188142 was sent to the City's legislative notice list, the fossil fuel terminal property owners, and the parties to the appeal.

On November 20, 2019, the Portland City Council held a public hearing and received testimony on the re-adoption of the fossil fuel terminal zoning restrictions. The written record was left open for additional testimony until December 2, 2019. The evidentiary record from the initial decision is incorporated by reference and supplemented by additional evidence provided by BPS staff, the testimony Council received at the November 20 hearing and the written testimony received by December 2.

Testimony by the Portland Business Alliance et al raised concerns that there was no public involvement activities as part of the remand process. As explained above, no specific process is required by City code or policy. The City Council determined that the regular legislative process, with a public hearing and opportunity to submit written testimony, would be sufficient to address the insufficient evidence errors in the remand decision.

Testimony by Zenith Energy raised the concern that there has been two years since Court of Appeals confirmed the evidentiary deficiencies and that there is no justification for treating this decision as an emergency ordinance. The City Council has the discretion to declare an emergency. As evidenced in the oral testimony at the November 20 public hearing, this is an urgent issue that requires immediate action. The City has determined that an emergency is appropriate here due to the fact that Portland is currently at risk of a major earthquake.

As noted below in these findings, the FFTZ amendments are consistent with the goals and policies of Chapter 2 (Community Involvement) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. The events and outreach strategies summarized here demonstrate consistency with the requirements of Statewide Planning Goal 1.

Goal 2. Land Use Planning. To establish a land use planning process and policy framework as a basis for all decisions and actions related to use of land and to assure an adequate factual base for such decisions and actions.

5. Finding: The City followed procedures for legislative amendments to the Zoning Code, which are found in 33.740 (Legislative Procedure). The amendments support Goal 2 because, as demonstrated by these findings and detailed in this ordinance, the FFTZ amendments were developed consistent with the Statewide Planning Goals, the Metro Urban Growth Management Functional Plan, and 2035 Comprehensive Plan.
6. Finding: On October 16, 2019 BPS filed a 35-day DLCD notice and on October 30, 2019 the City sent a legislative notice, to notify other government agencies and interested parties that the City would be reconsidering the remanded ordinance. Multnomah County and the Columbia River Intertribal Fish Commission testified in support of the ordinance. No other government agencies submitted testimony. In the initial adoption of the ordinance, the City received testimony from the Port of Portland. The City responded to the issues raised by the Port by amending the code to include an exception for the storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, drydock, ship or barge servicing facility, rail yard, or as part of a fleet vehicle servicing facility. The City did not receive any requests from other government agencies to modify the FFTZ amendments.
7. Finding: The City Council's decision is based on the findings in this document, which are based on the factual evidence presented to the Planning and Sustainability Commission and City Council as part of the initial adoption in 2016 as well as the evidence presented as part of the reconsideration of this ordinance that is incorporated in the record that provides the adequate factual base for this decision.

8. Finding: On remand from the Court of Appeals, the remaining assignments of error before LUBA concern insufficient findings or evidence. LUBA held that the City failed to demonstrate consistency with former Comprehensive Plan Policies 5.1, Objective C and 5.4, Objective A. Those policies have since been repealed from the Comprehensive Plan and replaced with *2035 Comprehensive Plan* policies outlined below. Next, LUBA held that the City failed to adopt findings addressing consistency with the Guilds Lake Industrial Sanctuary Plan (GLISP). As detailed below, the City Council finds that the FFT Amendments are consistent with the GLISP. Third, LUBA found that the City's finding that demand for fossil fuels will plateau or decline was not supported by substantial evidence in the record. As described in the findings for Policy 6.48, BPS staff provided a memo in the record to provide evidence that the City Council expects that the existing FFT storage capacity, with the allowed exceptions, is enough to serve the region out to a 2050 planning horizon. The Council finds the BPS staff memo compelling and considered the evidence against other assertions that speculated the demand for fossil fuels would increase. Still, the Council notes that no single finding serves as exclusive support for the Council's decision. Rather, the Council considers all of the evidence in the record and determines whether there is an adequate factual base for the decision.
9. Finding: In addition to understanding the storage capacity necessary to serve the region, the City Council also considered significant seismic risks that FFTs pose because most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. The FFTs have significant seismic risks because most of the tanks have been constructed without any or only limited seismic design criteria, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

Goal 5. Open Space, Scenic and Historic Areas, and Natural Resources. To protect natural resources and conserve scenic and historic areas and open spaces.

10. Finding:

Open Spaces. The FFTZ amendments do not include Comprehensive Plan map or Zoning Map changes. There are no designated open spaces (OS map designations) on any of the existing fossil fuel terminals (FFTs).

Scenic Resources. In 1991, the City adopted the Scenic Resources Protection Plan and applied a scenic (s) overlay zone to protect significant scenic resources. Two of the FFTs (BP West Coast and NuStar/Shore Terminals) are in a (s) overlay zone. The scenic resource protections (Chapter 33.480) are not amended by this ordinance and the height limits associated with the (s) overlay zone will continue to apply to the two FFT sites.

Historic Resources. Historic resources are located throughout the City, but very few are in the industrial zones. There are no designated Historic Landmarks or Districts in or immediately adjacent to any of the existing FFTs. Existing historic resource protections are not being amended (Chapter 33.445).

Natural Resources. There are significant natural resources in industrial zones, especially along on the Willamette and Columbia Rivers. Six of the existing FFTs have frontage on the Willamette River with designated natural resources that are protected by the Greenway Overlay Zone (Chapters 33.440), which is not amended by this ordinance.

Generally. As noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 4 (Design and Development, including Historic and Cultural Resources) and Chapter 7 (Environment and Watershed Health) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, FFTZ amendments are consistent with the requirements of Statewide Planning Goal 5.

Goal 6. Air, Water, and Land Resource Quality. To maintain and improve the quality of the air, water and land resources of the state.

11. Finding: Goal 6 requires the maintenance and improvement of the quality of air, water, and land resources. The State has not adopted administrative rules for complying with Statewide Planning Goal 6. The City complies with federal and state environmental standards and statutes, including the federal Clean Water Act and Clean Air Act. Existing City regulations including Title 10 (Erosion Control) and the Stormwater Management Manual will remain in effect and are applicable to future development. As noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 7 (Environment and Watershed Health) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, FFTZ amendments are consistent with the requirements of Statewide Planning Goal 6.

Goal 7. **Areas Subject to Natural Disasters and Hazards.** To protect people and property from natural hazards.

12. Finding: The State has not adopted administrative rules for complying with Statewide Planning Goal 7. Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. According to the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report, a magnitude 8 or 9 Cascadia Subduction Zone earthquake would impact the CEI Hub with: ground shaking; liquefaction (soil behavior phenomenon in which a saturated sand softens and loses strength during strong earthquake ground shaking); lateral spreading (where surficial soil permanently moves laterally due to earthquake shaking); landslides; co-seismic settlement (where the ground surface is permanently lowered due to seismic shaking); and bearing capacity failures (when the foundation soil cannot support the structure it is intended to support).

According to the 2012 DOGAMI report, liquefaction and lateral spreading hazards are of primary concern to the fossil fuel terminals. As described in the 2012 Oregon State Energy Assurance Plan, this Critical Energy Infrastructure Hub (CEI Hub) sits on top of very poor soils that are highly susceptible to earthquake-induced permanent ground deformation. The CEI Hub is adjacent to the Willamette River and has extensive deposits of highly liquefiable soils. These soils (made of sands, silts, gravels and clays) have been naturally deposited by river activity as well as been created from man-made activities, such as hydraulically placed material from river dredging or debris placed as landfill.

In 2016, the City Council adopt Resolution #37242 to adopt the 2016 Natural Hazard Mitigation Plan, which identified the Critical Energy Infrastructure Hub as one of two of the City's most serious

vulnerabilities to natural hazards. The 2016 Natural Hazard Mitigation Plan includes Appendix D. Critical Energy Infrastructure Hub Study that is included in the record for this decision.

The FFTs have significant seismic risks because most of the tanks have been constructed without any or only limited seismic design criteria on soils with moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

Testimony from the Portland Business Alliance et al., the Working Water Coalition, the Western States Petroleum Association and Zenith Energy called for the ordinance to specifically allow for safety and seismic upgrades in conjunction with expansion of storage capacity, otherwise there will be fewer tank upgrades. The testimony does not define or explain the economics of upgrades; or what is meant by “market-based infrastructure changes”; or what are the “business impacts” of regulating tank capacity; or why FFTs need to expand fossil fuel storage tank capacity in order to make safety upgrades. The FFTZ amendments designate existing FFTs as a limited use specifically to continue to operate to supply fossil fuels and to allow for safety and seismic upgrades. Transloading facilities are a defining characteristic of a Bulk Fossil Fuel Terminal, however, the ordinance the ordinance does not regulate transloading facilities and only limits new fossil fuel storage tank capacity. Existing fossil fuel storage tank capacity can be reconfigured. Other aspects of terminal infrastructure (pipelines, docks, transloading facilities) are not regulated by this ordinance. Renewable fuels and aviation fuels are exempt from these regulations. Only three storage tank upgrades with significant capacity expansion have occurred in the past 10 years under development standards that allowed for the unlimited capacity expansion. Therefore, there is no evidence that allowing for storage tank capacity expansion is an incentive that will encourage safety and seismic upgrades. Nothing in state land use law requires local jurisdictions to allow expansion of a use to make safety upgrades.

Testimony by the Working Waterfront Coalition asserts that it is important for FFTs to invest in facilities as “unforeseen emergencies continue to exist”. The testimony does not define or explain what is meant by the phrase “unforeseen emergencies”. To the contrary, the record contains ample evidence that a major earthquake is a foreseen event that state and local agencies have begun to prepare for. This ordinance specifically addresses that emergency by limiting expansion of storage capacity in an area at high risk for liquefaction. The City Council finds that the FFTZ amendments designate existing FFTs as a limited use specifically to continue to operate to supply fossil fuels and to allow for safety and seismic upgrades.

Testimony by the Western States Petroleum Association claims that the ordinance will lock existing infrastructure in place, which prevents efficiency, environmental, and safety improvements. This assertion is an oversimplification of the ordinance. The testimony does not define or specify what efficiency, environmental, and safety improvements are prevented by the ordinance. The FFTZ amendments only regulates fossil fuel storage capacity. The ordinance allows existing tank capacity to be replaced, and allows, through exceptions, for additional storage capacity for aviation fuel and

renewable fuels. Existing FFTs are designated as a limited use specifically to allow them to continue to operate and make efficiency, environmental, and safety improvements.

Testimony by the Western States Petroleum Association claims that the City is requiring fossil fuel tanks to be located in liquefaction zones by prohibiting relocation of fossil fuel tanks outside of mapped liquefaction areas in Portland. The City Council finds that ordinance does not require locating fossil fuel tanks in liquefaction hazard areas. The ordinance allows existing fossil fuel tank capacity to continue to operate and even be reconfigured into newer, safer tanks. Further, there is a map in the record that shows that there are very few areas in Portland's industrial zones, including no areas that have marine/harbor access, that are outside of the high-risk liquefaction areas. Therefore, the ordinance prohibits new FFTs in all industrial and employment zones in Portland. No evidence has been presented to support the assertion that FFTs have to be located in Portland.

Testimony by Zenith Energy cites previous (2016) testimony that terminal operators are unable to invest in upgrades without incentives. No evidence is provided on the economics of upgrades or what kind of incentives are needed. Current regulations have provided unlimited storage tank capacity expansion and very few upgrades (three tanks in 2012) have been made in the last 10 years, since the seismic vulnerability of the Critical Energy Infrastructure (CEI) hub has become a state and local concern. Nothing in State law requires City to provide incentives as an offset to restrictive land use regulations.

Testimony by Zenith Energy claims that safety upgrades require the construction of new infrastructure without interrupting service to customers – new storage tanks are needed before old tanks can be taken out of service. No evidence is provided on storage tank capacity utilization or available land area at existing FFTs or the length of time that it takes to replace or retrofit a storage tank that indicates that new storage capacity is needed before existing storage capacity can be retrofitted or replaced. Recently, Zenith Energy expanded transloading capacity without expanding storage tank capacity and proposed adding new transloading/intermodal pipeline capacity to utilize existing storage capacity.

As noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 7 (Environment and Watershed Health) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, FFTZ amendments are consistent with the requirements of Statewide Planning Goal 7.

Goal 8. Recreational Needs. To satisfy the recreational needs of the citizens of the state and visitors and, where appropriate, to provide for the siting of necessary recreational facilities including destination resorts.

13. Finding: Goal 8 focuses on the provision of destination resorts. However, it does impose a general obligation on the City to plan for meeting its residents' recreational needs: "(1) in coordination with private enterprise; (2) in appropriate proportions; and (3) in such quantity, quality and locations as is consistent with the availability of the resources to meet such requirements."

Goal 8 provides that "Recreation Needs -- refers to existing and future demand by citizens and visitors for recreations areas, facilities and opportunities." Goal 8 also provides that "Recreation Areas, Facilities and Opportunities -- provide for human development and enrichment, and include but are not limited to: open space and scenic landscapes; recreational lands; history, archaeology and natural science resources; scenic roads and travelers; sports and cultural events; camping, picnicking and recreational lodging; tourist facilities and accommodations; trails; waterway use

facilities; hunting; angling; winter sports; mineral resources; active and passive games and activities."

The City of Portland has robust and diverse system of parks, recreation areas and open spaces. However, there are no parks adjacent to the existing FFTs. Further, the ordinance limits development for a single type of use, which will reduce negative impacts to parks that are near industrial areas, especially Forest Park, which is located across Highway 30 from the Northwest Industrial District where the existing FFTs are located.

As noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 8 (Public Facilities and Services) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, FFTZ amendments are consistent with the requirements of Statewide Planning Goal 8.

Goal 9. Economic Development. To provide adequate opportunities throughout the state for a variety of economic activities vital to health, welfare, and prosperity of Oregon's citizens.

14. Finding: Goal 9 requires cities to consider economic activities vital to the health, welfare, and prosperity of Oregon's citizens. Comprehensive plans for urban areas are required to include, among other things: an analysis of economic patterns, potentialities, strengths, and deficiencies; policies concerning economic development; and land use maps that provide for at least an adequate supply of sites for a variety of industrial and commercial uses.

The 2035 Comprehensive Plan demonstrates compliance with Goal 9. Land needs for a variety of industrial and commercial uses are identified in the Economic Opportunities Analysis (EOA), which was adopted (Ordinance 187831) and acknowledged by LCDC on April 25, 2017.

The City's acknowledged EOA analyzed and demonstrated adequate growth capacity for a diverse range of employment uses, which are organized into different geographies that represent business district types with a distinct mix of business sectors and building types. In each of the geographies, the City analyzed the future land demand for employment growth and the developable land supply to accommodate that growth. The EOA analyzed future demand for industrial land in four different broad geographies: Harbor Access Lands (which is includes all or a portion of nine of the existing FFTs); Harbor and Airport Districts (which includes all or a portion of five of the existing FFTs); Columbia East (no existing FFTs) and Dispersed Employment (no existing FFTs). The future demand for industrial land is primarily based on generalized employment growth for the mix of businesses in these geographies without specific demand for FFT capacity. The EOA future land demand also includes an estimate for marine terminals based on future cargo/commodity flow forecasts. FFTs handle "liquid bulks", which are primarily petroleum products. Estimates of existing cargo capacity are difficult to obtain, particularly for privately owned marine terminals, like the fossil fuel terminals. ECONorthwest (2012) prepared an estimate based on historical data for total cargo volumes for the years 2000 and 2010. For private marine terminals, the assumption was that recent historical peaks are a reasonable estimate of maximum existing capacity. Based on that capacity estimate, ECONorthwest found that no additional land is needed for new liquid bulk terminals in Portland through the year 2040. The EOA demand analysis did not distinguish between types of liquid bulks, such as specific land needs associated with expanding aviation fuels or non-fossil mixing fuels. Instead, the EOA analysis addressed overall liquid bulk demand and capacity, aggregating the increase of some bulk types and reduction in others. No testimony was submitted into the record contradicting the EOA analysis.

The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not reduce the employment land base and continue to support a strong and diverse economy.

Testimony by the Portland Business Alliance et al. raises concern that the FFTZ amendments would hurt the local economy. The City Council finds that this is an unsupported assertion that provides no details or explanation as to how this ordinance will hurt the local economy. City Council notes that BPS staff provided evidence in the Council presentation and the written record that demonstrates the ordinance has been narrowly written to minimize impacts to the existing fossil fuel terminals (FFTs), while limiting risk from future natural hazards.

Testimony by the Working Waterfront Coalition asserts that it is important for FFTs to invest in facilities as "demand continues". The testimony does not define or explain what is meant by the phrase "as demand continues". BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington, during a period of a thriving economy. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. The more recent cargo forecasts project a modest growth in volumes, but those volumes do not exceed the historic peak volumes that were handled by the Portland terminals. No other evidence of future demand for fossil fuels was submitted in testimony. Therefore, the City Council finds that the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs.

Testimony by the Western States Petroleum Association claims that the FFTZ amendments will inflict negative impacts on the local, state, and regional economy. The City Council finds that "negative impacts" to the economy are not defined or explained. BPS presented evidence that the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs. The ordinance specifically exempts new storage capacity for renewable fuels as a means to support compliance with DEQ's Clean Fuels Program and a transition away from fossil fuels.

Testimony by the Western States Petroleum Association claims that the ordinance will introduce a "host of ambiguities and uncertainties" into the marketplace that is "necessary for a thriving economy". The vague terms "ambiguities and uncertainties" are not defined or explained. The FFTZ amendments designate existing FFTs as a limited use specifically to allow the FFTs to continue to operate to supply fossil fuels and to allow for safety and seismic upgrades. Transloading facilities are a defining characteristic of a Bulk Fossil Fuel Terminal, however, the ordinance the ordinance does not regulate transloading facilities and only limits new fossil fuel storage tank capacity. Existing fossil fuel storage tank capacity can be reconfigured. Other aspects of terminal infrastructure (pipelines, docks, transloading facilities) are not regulated by this ordinance. What is "necessary for a thriving economy" is not defined. BPS staff presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington, during a period of a thriving economy. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. Therefore, the City Council finds that the fossil fuel storage capacity at the existing FFTs is sufficient to support the regional economy.

Testimony by the Western States Petroleum Association claims that the regional demand for fossil fuels is an example of a product with inelastic demand. The City Council finds that no evidence is provided to demonstrate that the demand for fuel is inelastic. BPS staff presented information from the Federal Reserve Bank of St. Louis that shows an elastic relationship between fuel prices and vehicle miles travelled. An elastic demand is one in which demand is responsive to changes in price. In this case, vehicle miles travelled in an indirect measure of fossil fuel consumption and the chart

shows that since 2009, as gas prices have increased, vehicle miles traveled decreased and since 2014, when gas prices decreased, vehicle miles traveled increased. The City Council concurs with the statement that the ordinance does not limit the regional demand for fuel. However, the Western States Petroleum Association does not provide any evidence on what the regional demand for fuel is. BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington, during a period of a thriving economy. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. Therefore, the City Council concludes that the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs.

As noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 6 (Economic Development) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, FFTZ amendments are consistent with the requirements of Statewide Planning Goal 9.

Goal 10. Housing. To provide for the housing needs of citizens of the state.

15. Finding: Goal 10 specifies that each city must plan for and accommodate needed housing types. As used in ORS 197.307 "needed housing" means all housing on land zoned for residential use or mixed residential and commercial use that is determined to meet the need shown for housing within an urban growth boundary at price ranges and rent levels that are affordable to households within the county with a variety of incomes, including but not limited to households with low incomes, very low incomes and extremely low incomes, and includes attached and detached single-family housing and multiple family housing for both owner and renter occupancy.

Goal 10 requires each city to inventory its buildable residential lands, forecast future needs, and zone enough buildable land to meet those needs. The FFTZ amendments do not include comprehensive plan map amendments, and, therefore, do not affect the residential development capacity of Portland.

As noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 5 (Housing) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, FFTZ amendments are consistent with the requirements of Statewide Planning Goal 10.

Goal 11. Public Facilities and Services. To plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development.

16. Finding: Statewide Planning Goal 11, Public Facilities, requires cities to adopt and update public facilities plans. Public facilities plans ensure that urban development is guided and supported by types and levels of water, sewer and transportation facilities appropriate for the needs and requirements of the urban areas to be serviced, and that those facilities and services are provided in a timely, orderly and efficient arrangement.

The adopted 2035 Comprehensive Plan includes the Citywide Systems Plan (CSP), which was adopted (Ordinance 185657) and acknowledged by LCDC on April 25, 2017. The CSP includes the Public Facilities Plan with information on current and future transportation, water, sanitary sewer, and stormwater infrastructure needs and projects, consistent with the requirements of Statewide Planning Goal 11.

The FFTZ amendments do not include comprehensive plan map amendments and do not amend the CSP. These regulations apply to only one type of use that makes up a minority part of the uses

found in Portland's industrial districts. The remaining industrial uses continue to be regulated under the current development regulations and do not intensify the development capacity. Therefore, these changes will not adversely impact the City's public facilities.

As noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 8 (Public Facilities and Services) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, FFTZ amendments are consistent with the requirements of Statewide Planning Goal 11.

Goal 12. Transportation. To provide and encourage a safe, convenient and economic transportation system.

17. Finding: Goal 12 is "to provide and encourage a safe, convenient and economic transportation system."

The FFTZ amendments maintains Portland's role as a multimodal freight hub with enhanced freight access because it does not amend the City's adopted Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the industrial areas where the FFTs are located. Also, the ordinance only restricts new fossil fuel storage tank capacity and does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system.

Goal 12 requires local governments to adopt transportation plans. The adopted 2035 Comprehensive Plan includes the Transportation System Plan (TSP), which was adopted in three phases (Ordinance 187832, 188177, and 188957). Phase 1 and 2 was submitted as part Task Four of Periodic Review; and both were approved by LCDC Order 18 – WKTSK – 001897 on August 8, 2018. Phase 3 of the Transportation System Plan was adopted as a post-acknowledgement plan amendment by Ordinance No. 188957, became effective on June 23, 2018. The FFTZ amendments do not amend the TSP.

OAR 660-012-0060 (1) requires: If an amendment to a functional plan, an acknowledged comprehensive plan, or a land use regulation (including a zoning map) would significantly affect an existing or planned transportation facility, then the local government must put in place measures as provided in section (2) of this rule, unless the amendment is allowed under section (3), (9) or (10) of this rule. A plan or land use regulation amendment significantly affects a transportation facility if it would:

(a) Change the functional classification of an existing or planned transportation facility (exclusive of correction of map errors in an adopted plan);
(b) Change standards implementing a functional classification system; or
(c) Result in any of the effects listed in paragraphs (A) through (C) of this subsection based on projected conditions measured at the end of the planning period identified in the adopted TSP. As part of evaluating projected conditions, the amount of traffic projected to be generated within the area of the amendment may be reduced if the amendment includes an enforceable, ongoing requirement that would demonstrably limit traffic generation, including, but not limited to, transportation demand management. This reduction may diminish or completely eliminate the significant effect of the amendment.
    (A) Types or levels of travel or access that are inconsistent with the functional classification of an existing or planned transportation facility;

(B) Degrade the performance of an existing or planned transportation facility such that it would not meet the performance standards identified in the TSP or comprehensive plan; or
(C) Degrade the performance of an existing or planned transportation facility that is otherwise projected to not meet the performance standards identified in the TSP or comprehensive plan.

The FFTZ amendments do not change the functional classification of any existing or proposed transportation facility, nor do they change the standards implementing a functional classification system. Therefore, the amendments do not have a significant effect under (a) or (b).

The FFTZ amendments limit one type of use allowed in industrial areas. The remaining industrial uses continue to be regulated under the current development regulations and do not intensify the development capacity. Therefore, the amendments do not have a significant effect under (c).

Portland's Air, Rail, Water Pipeline Plan (ARWP) is adopted into the acknowledged TSP in compliance with OAR 660-012-0020(2)(e). The ARWP includes information on the location and extent of existing or planned facilities, as specified by the rule. The ARWP does not have functional classification or performance standards, and the rule does not require them.

Testimony from the Portland Business Alliance et al., the Working Water Coalition, and the Western States Petroleum Association raised the concern that the ordinance would force fuels to be transported by truck and increase vehicle miles travelled and emissions. The City Council finds that this unsupported assertion provides no details or explanation as to how this ordinance will force a change in transportation modes. There is no explanation or evidence on future demand, pipeline capacity utilization, or storage tank utilization or how or why truck traffic would increase. BPS staff provided evidence in the Council presentation and the written record that demonstrates that there is a reasonable expectation that the demand for fossil fuels will be flat and that the existing FFT storage capacity, with the allowed exceptions, will be sufficient to meet the future demand for fossil fuels.

Furthermore, as noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 9 (Transportation) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, the FFTZ amendments are consistent with the requirements of Statewide Planning Goal 12.

Goal 13. Energy Conservation. To conserve energy.

18. Finding: The State has not adopted specific rules for complying with Statewide Planning Goal 13. Goal 13 generally requires that land use plans contribute to energy conservation. The guidelines refer to land use planning to minimize the depletion of non-renewable sources of energy; to re-use land; and increase density along high capacity transportation corridors. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses that would change the City's development pattern that will have a material impact on energy efficiency.

The City has a few provisions in the Zoning Code to support energy conservation, including energy efficiency or renewable energy improvements do not trigger nonconforming upgrade improvements (PCC 33.258); development standards for small, urban-wind turbines (PCC 33.299); and a requirement that new development in the Central City Plan District must register for green building certification (PCC 33.510). The FFTZ amendments do not amend any of these implementing provisions.

Testimony from the Portland Business Alliance et al., the Working Water Coalition, and the Western States Petroleum Association raised the concern that the ordinance would force fuels to be transported by truck and increase vehicle miles travelled and emissions. The City Council finds that this unsupported assertion provides no details or explanation as to how this ordinance will force a change in transportation modes. There is no explanation or evidence on future demand, pipeline capacity utilization, or storage tank utilization or how or why truck traffic would increase. BPS staff provided evidence in the Council presentation and the written record that demonstrates that there is a reasonable expectation that the demand for fossil fuels will be flat and that the existing FFT storage capacity, with the allowed exceptions, will be sufficient to meet the future demand for fossil fuels.

Therefore, the FFTZ amendments are consistent with the requirements of Statewide Planning Goal 13.

Goal 14. Urbanization. To provide for an orderly and efficient transition from rural to urban land use, to accommodate urban population and urban employment inside urban growth boundaries, to ensure efficient use of land, and to provide for livable communities.

19. Finding: Metro is responsible for Goal 14 compliance on behalf of Portland and other cities within the metropolitan region. Metro has adopted an Urban Growth Management Functional Plan and compliance with this plan by constituent cities assures compliance with Goal 14, which is discussed in Part II of this document and those findings are incorporated by reference.

As discussed above under Goal 9, the FFTZ amendments will not change the employment development capacity inside the urban growth boundary and the City will continue to have adequate capacity to accommodate its allocated forecasted growth. Therefore, FFTZ amendments are consistent with the requirements of Statewide Land Use Goal 14.

Goal 15. Willamette River Greenway. To protect, conserve, enhance and maintain the natural, scenic, historical, agricultural, economic and recreational qualities of lands along the Willamette River as the Willamette River Greenway.

20. Finding: Six of the 11 existing FFTs have frontage on the Willamette River. However, these parcels will continue to be subject to development regulations for flood plains or natural resources. Furthermore, no changes to existing protections afforded through the greenway overlay zones are proposed.

Therefore, FFTZ amendments are consistent with the requirements of Statewide Land Use Goal 15 because they do not change the protections to affected lands within the Willamette River Greenway Overlay Zone.

Part II. Metro

Under ORS 268.380 and its Charter, Metro has the authority to adopt regional plans and require city and county comprehensive plans to comply with regional plan. Metro adopted the Urban Growth Management Functional Plan and the Regional Transportation Functional Plan under this authority.

Urban Growth Management Functional Plan

In its June 2011 update to its 2010 compliance report Metro found, “The City of Portland is in compliance with all Urban Growth Management Functional Plan requirements in effect on December

15, 2010, except for Title 13, Nature in Neighborhoods." On January 16, 2013 the City received a letter from Metro stating that Portland had achieved compliance with Title 13.

Title 1. Housing Capacity. The Regional Framework Plan calls for a compact urban form and a "fair-share" approach to meeting regional housing needs. Title 1 requires each city and county to maintain or increase its housing capacity, especially in centers, corridors, main streets, and station communities, except as provided in section 3.07.120.

21. Finding: The FFTZ amendments do not reduce housing potential in any part of the City because the amendments affect a use of industrial land and does not change the designation of residential lands.

    Therefore, the FFTZ amendments are consistent with the requirements of Title 1.

Title 2. Regional Parking Policy. (repealed in 1997)

Title 3. Water Quality and Flood Management. To protect the beneficial water uses and functions and values of resources within the Water Quality and Flood Management Areas by limiting or mitigating the impact on these areas from development activities and protecting life and property from dangers associated with flooding.

22. Finding: Title 3 calls for the protection of the beneficial uses and functional values of resources within Metro-defined Water Quality and Flood Management Areas by limiting or mitigating the impact of development in these areas. Title 3 establishes performance standards for 1) flood management; 2) erosion and sediment control; and 3) water quality. The City has adopted overlay zones and land use regulations, including Title 10 Erosion Control and the balanced cut-and-fill standards in Title 24 Building Regulations, that, in the June 2011 update to its 2010 compliance report, Metro found sufficient to comply with Title 3. This ordinance does not change any of these overlays or regulations.

    FFTs are located in the 100-year floodplain. In the Zoning Code, the City of Portland's Title 3 program is implemented primarily through the greenway overlay zones, which are unchanged by these amendments and will ensure any new development will be done in a way to protect people and property and the functions and values of the floodplain.

Title 4. Industrial and Other Employment Areas. The Regional Framework Plan calls for a strong regional economy. To improve the economy, Title 4 seeks to provide and protect a supply of sites for employment by limiting the types and scale of non-industrial uses in Regionally Significant Industrial Areas (RSIAs), Industrial and Employment Areas. Title 4 also seeks to provide the benefits of "clustering" to those industries that operate more productively and efficiently in proximity to one another than in dispersed locations. Title 4 further seeks to protect the capacity and efficiency of the region's transportation system for the movement of goods and services and to encourage the location of other types of employment in Centers, Corridors, Main Streets and Station Communities. The Metro Council will evaluate the effectiveness of Title 4 in achieving these purposes as part of its periodic analysis of the capacity of the urban growth boundary.

23. Finding: The purpose of Title 4 is to maintain a regional supply of existing industrial and employment land by limiting competing uses for this land. Metro has not adopted a Statewide Planning Goal 9 economic opportunities analysis for the region, so Title 4 is not based on an assessment of the land needed for various employment types, nor do the Title 4 maps necessarily depict lands most suitable to accommodate future job growth. Rather, Title 4 seeks to protect the manufacturing, warehousing, and distribution of goods within three types of mapped areas by

limiting competing uses. These three areas are Regionally Significant Industrial Areas (RSIAs), Industrial Areas, and Employment Areas.

The existing FFTs are located in the northwest industrial district, which is a designated RSIA. The RSIA regulations do not include special provisions for FFTs. The other RSIAs in Portland do not have existing FFTs and new FFTs are prohibited. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, the FFTZ amendments are consistent with the requirements of Metro Title 4.

Title 5. Neighboring Cities (repealed 1997)

Title 6. Centers, Corridors, Station Communities and Main Streets. The Regional Framework Plan identifies Centers, Corridors, Main Streets and Station Communities throughout the region and recognizes them as the principal centers of urban life in the region. Title 6 calls for actions and investments by cities and counties, complemented by regional investments, to enhance this role. A regional investment is an investment in a new high-capacity transit line or designated a regional investment in a grant or funding program administered by Metro or subject to Metro's approval.

24. Finding: Title 6 establishes eligibility criteria for certain regional investments, and the use of more flexible trip generation assumptions when evaluating transportation impacts. Title 6 also contains aspirational activity level targets for different Metro 2040 place types. This title is incentive-based, so these findings simply serve to document intent. There are no specific mandatory compliance standards in Title 6 that apply to this ordinance.

The existing FFTs are not located in designated Title 6 areas, therefore this title does not apply.

Title 7. Housing Choice. The Regional Framework Plan calls for establishment of voluntary affordable housing production goals to be adopted by local governments and assistance from local governments on reports on progress towards increasing the supply of affordable housing. It is the intent of Title 7 to implement these policies of the Regional Framework Plan.

25. Finding: Title 7 addresses housing choice. Metro adopted voluntary affordable housing goals for each city and county in the region for the years 2001 to 2006, but never updated them. Title 7 does not apply. The FFTZ amendments change the City's industrial zones and do not impact the City of Portland's residential development capacity or affordable housing programs.

Title 8. Compliance Procedures. Title 8 addresses compliance procedures and establishes a process for ensuring city or county compliance with requirements of the Urban Growth Management Functional Plan. A city or county proposing an amendment to a comprehensive plan or land use regulation shall submit the proposed amendment to METRO at least 35 days prior to the first evidentiary hearing on the amendment.

26. Finding: On October 16, 2019 BPS filed a 35-day DLCD notice and on October 30, 2019 the City sent a legislative notice, to notify other government agencies, including Metro, that the City would be reconsidering the remanded ordinance. Metro was provided with the 35-day DLCD notice and the City's standard legislative notice. Title 8 also requires the City to provide findings of compliance with the *Urban Growth Management Functional Plan*, as described here. All applicable requirements of Title 8 have been met.

Title 9. Performance Measures. (repealed in 2010)

Title 10. Functional Plan Definitions. Title 10 contains definitions. When 2035 Comprehensive Plan uses a term found in Title 10 either the term has the same meaning found in Title 10, or the difference is explained.

27. Finding: The FFTZ amendments do not change any definitions in the 2035 Comprehensive Plan that are also found in Title 10. All applicable requirements of Title 10 have been met.

Title 11. Planning for New Urban Areas. (not directly applicable)

Title 12. Protection of Residential Neighborhoods. Existing neighborhoods are essential to the success of the 2040 Growth Concept. The intent of Title 12 of the Urban Growth Management Functional Plan is to protect the region's residential neighborhoods. The purpose of Title 12 is to help implement the policy of the Regional Framework Plan to protect existing residential neighborhoods from air and water pollution, noise, and crime and to provide adequate levels of public services.

28. Finding: Title 12 addresses protection of residential neighborhoods. This title largely restricts Metro's authority to plan and regulate density in single-family neighborhoods. Further, the 2035 Comprehensive Plan does not employ any of the optional provisions of Title 12. The FFTZ amendments were originated by the City's legislative process and do not affect residential neighborhoods. Therefore, this title does not apply to this ordinance.

Title 13. Nature in Neighborhoods. The purposes of this program are to (1) conserve, protect, and restore a continuous ecologically viable streamside corridor system, from the streams' headwaters to their confluence with other streams and rivers, and with their floodplains in a manner that is integrated with upland wildlife habitat and with the surrounding urban landscape; and (2) to control and prevent water pollution for the protection of the public health and safety, and to maintain and improve water quality throughout the region.

29. Finding: Title 13 is expressly intended to provide a minimum baseline level of protection for identified Habitat Conservation Areas. Local jurisdictions may achieve substantial compliance with Title 13 using regulatory and/or non-regulatory tools. The City of Portland implements Title 13 through its adopted Natural Resources Inventory (NRI) and subsequent protection measures through the environmental overlay zones, which Metro has found to be in substantial compliance with Title 13.

    No changes to the environmental or greenway overlay zones are proposed as part of this project. Therefore, FFTZ amendments are consistent with the requirements of Title 13.

Title 14. Urban Growth Management Plan. Title 14 addresses the regional urban growth boundary. Since this ordinance does not require, nor initiate, a boundary change, Title 14 does not apply.

Summary, Urban Growth Management Functional Plan Findings

30. Finding: The Metro Title 10 definition of comply or compliance means "substantial" rather than absolute compliance. "Substantial compliance" means city comprehensive plans and implementing ordinances, on the whole, conform with the purposes of the performance standards in the functional plan and any failure to meet individual performance standard requirements is technical or minor in nature.

    For the facts and reasons stated above this ordinance substantially complies with all Urban Growth Management Functional Plan requirements applicable to the FFTZ amendments.

Regional Transportation Functional Plan

The Regional Transportation Functional Plan (RTFP) implements the goals, objectives and policies of the Regional Transportation Plan (RTP). Local implementation of the RTP by cities and counties are carried out in their comprehensive plans, transportation system plans (TSPs), other land use regulations and transportation project development.

31. Finding: The City Council finds that there is no statutory or code requirement that the Council consider and demonstrate whether the proposed amendments are consistent with the RTFP. However, to the extent the demonstrating compliance is necessary, the Council finds that the proposed amendments are compliant with the RTFP as discussed below.

32. Finding: Titles 1-4 address transportation system design, development of transportation system plans, transportation project development and parking management. These titles concern public transportation projects design and system plans and do not address development on private land. These titles do not apply.

Title 5. Amendment of Comprehensive Plans. Title 5 addresses factors that a city or county needs to consider when amending their comprehensive plan or transportation system plan. Cities are required to consider the transportation strategies, such as transit, bicycle and pedestrian system improvements, as part of the analysis to determine if the change will result in a significant effect on the transportation system.

33. Finding: The FFTZ amendments do not change the functional classification of any existing or proposed transportation facility, nor do they change the standards implementing a functional classification system.

    The FFTZ amendments limit one type of use allowed in industrial areas. The remaining industrial uses continue to be regulated under the current development regulations and do not intensify the development capacity. Therefore, the amendments do not have a significant effect on the transportation system.

    Testimony from the Portland Business Alliance et al., the Working Water Coalition, and the Western States Petroleum Association raised the concern that the ordinance would force fuels to be transported by truck and increase vehicle miles travelled and emissions. The City Council finds that this unsupported assertion provides no details or explanation as to how this ordinance will force a change in transportation modes. There is no explanation or evidence on future demand, pipeline capacity utilization, or storage tank utilization or how or why truck traffic would increase. BPS staff provided evidence in the Council presentation and the written record that demonstrates that there is a reasonable expectation that the demand for fossil fuels will be flat and that the existing FFT storage capacity, with the allowed exceptions, will continue to meet the future demand for fossil fuels. Therefore, the City Council concludes that the existing FFT storage capacity is sufficient, and there is no evidence that the FFTZ amendments will result in an increase in truck traffic, vehicle miles travelled or emissions.

    Furthermore, as noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 9 (Transportation) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, the FFTZ amendments are consistent with the requirements of Title 5.

Part III. Portland's Comprehensive Plan

Portland's 2035 Comprehensive Plan was adopted as part of Task Four of Periodic Review. Task Four was adopted by Ordinance No. 187832 on June 15, 2016. The 2035 Comprehensive Plan was amended as part of Task Five of Periodic Review, which was adopted by Ordinance No. 188177 on December 21, 2016. Both ordinances were made effective on May 24, 2018 by Ordinance No. 188695, and both Tasks Four and Five were approved by LCDC Order 18 – WKTSK – 001897 on August 8, 2018.

34. **Finding:** The City Council has identified the following guiding principles, goals and policies to be applicable to the FFTZ amendments.

Guiding Principles

The 2035 Comprehensive Plan adopted five "guiding principles" in addition to the goals and policies in a comprehensive plan. These principles recognize that implementation of the plan needs to be balanced, integrated and multi-disciplinary, and the influence of each principle helps to shape the overall all policy framework of the plan.

35. **Finding:** The City Council interprets the requirement in Policy 1.10.a to demonstrate how the FFTZ amendments comply with the Guiding Principles as one that requires a general overview discussion that does not require addressing specific language in specific policies.

The FFTZ amendments further these guiding principles as described below.

Economic Prosperity. Support a low-carbon economy and foster employment growth, competitiveness and equitably distributed household prosperity.

36. **Finding:** The City Council interprets this guiding principle to support a robust and resilient regional economy, thriving local businesses and growth in living-wage jobs and household prosperity. The FFTZ amendments support a low-carbon economy by providing an exception for additional storage capacity for non-fossil, renewable fuels. It fosters employment growth, competitiveness, and contributes to more equitably distributed household prosperity because the regulations are narrowly crafted to apply to one type of use and maintains the development capacity of Portland's industrial areas. Further, the FFTZ amendments preserve existing industrial sites because the ordinance does not include comprehensive plan or zoning map changes. Finally, the ordinance does allow FFTs to grow and intensify their level of use by only regulating fossil fuel storage tank capacity and allowing exceptions for aviation and renewable fuels.

    As noted elsewhere in the findings, the FFTZ amendments are consistent with Statewide Planning Goal 9 (Economic Development) and the goals and policies of Chapter 6 (Economic Development) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference.

Human Health. Avoid or minimize negative health impacts and improve opportunities for Portlanders to lead healthy, active lives.

37. **Finding:** The FFTZ amendments further the objectives to avoid or minimize negative health impacts associated with FFTs by reducing the risks associated with a major earthquake. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district, the Willamette River and Portland as a whole. The first step in making the current situation better is to ensure that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a moderate to high risk. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which can minimize health impacts in the event of a major earthquake.

Environmental Health. Weave nature into the city and foster a healthy environment that sustains people, neighborhoods, and fish and wildlife. Recognize the intrinsic value of nature and sustain the ecosystem services of Portland's air, water and land.

38. Finding: The FFTZ amendments foster a healthy environment and sustain the ecosystem services of Portland's air, water and land by reducing the risk associated with a major earthquake. The first step in making the current situation better is to ensure that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a high risk area. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which can minimize environmental impacts in the event of a major earthquake. No changes to the environmental or greenway overlay zones are proposed as part of this project, therefore the natural resource values and functions will be sustained.

As noted elsewhere in the findings, the FFTZ amendments are consistent with Statewide Planning Goal 5 (Natural Resources) and the goals and policies of Chapter 4 (Design and Development, including Historic and Cultural Resources) and Chapter 7 (Environment and Watershed Health) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference.

Equity. Promote equity and environmental justice by reducing disparities, minimizing burdens, extending community benefits, increasing the amount of affordable housing, affirmatively furthering fair housing, proactively fighting displacement, and improving socio-economic opportunities for under-served and under-represented populations. Intentionally engage under-served and under-represented populations in decisions that affect them. Specifically recognize, address and prevent repetition of the injustices suffered by communities of color throughout Portland's history.

39. Finding: This guiding principle provides a framework to ensure Portlanders more equitably share in the benefits and burdens of growth and development. A fundamental purpose of the FFTZ amendments is to reduce the risks associated with a major earthquake. Continuing to allow the increase in FFTs in a high risk area increases the risk to Portland's environment, especially the Willamette River. The first step in making the current situation better is to ensure that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a moderate to high risk. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which can minimize environmental impacts in the event of a major earthquake.

The amendments also maintain socio-economic opportunities for under-served and under-represented populations because the regulations are narrowly crafted to apply to one type of use and maintains the development capacity of Portland's industrial areas, which is a good source of middle-wage jobs for people without college degrees.

Resilience. Reduce risk and improve the ability of individuals, communities, economic systems, and the natural and built environments to withstand, recover from, and adapt to changes from natural hazards, human-made disasters, climate change, and economic shifts.

40. Finding: The 2035 Comprehensive Plan describes resilience as "reducing the vulnerability of our neighborhoods, businesses, and built and natural infrastructure to withstand challenges – environmental, economic and social – that may result from major hazardous events." Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. The FFTZ amendments support this principle by taking the first step in making Portland more resilient is to stop increasing the risk. The FFTs have significant seismic risks because most of the tanks have been constructed without any or only limited seismic design criteria on soils with moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district, the Willamette River and Portland as a whole. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

Testimony from the Portland Business Alliance et al. raised the concern that the ordinance would hinder the city's climate and safety goals. The City Council finds that this unsupported assertion provides no details or explanation as to how this ordinance will hinder climate or safety goals. BPS staff provided evidence in the Council presentation and the written record that demonstrates the ordinance has been narrowly written to support climate and safety goals. Specifically, the ordinance exempts new storage capacity for non-fossil, renewable fuels and designates the existing FFTs as a limited use to allow those businesses to continue to operate and make safety improvements.

Testimony from the Portland Business Alliance et al. raised the concern that the ordinance needs to explicitly allow the development of infrastructure that is necessary to transition towards lower emission fuel sources such as blending tanks and new intermodal links. No explanation or evidence was provided to support the assertion that additional tanks are needed. New blending tanks that contain more than 5% fossil fuel are not allowed by the ordinance, but new storage tanks for renewable fuels are allowed. New intermodal links are not regulated by this ordinance.

Testimony from the Portland Business Alliance et al. and Zenith Energy raised the concern that the decision to deny a permit application for pipes that would have been used exclusively for clean fuels undermines the ordinance's exemption for renewable fuels, because the infrastructure for renewable fuels is essentially the same for fossil fuels. The City Council finds that the Office of Community Technology decision is in regards to a pipe in the public right-of-way and is based on the City's franchise agreement with Zenith, and is not a land use decision and is not an indicator as to how the City will make future land use decisions that involve this ordinance.

Testimony by the Western States Petroleum Association claims that the ordinance will inflict significant impacts on the ability to supply fuel and change fuel types as the region grows, technology advances, and fuel standards change. "Significant impacts" are not defined or

supported by evidence. The letter does not explain how technology advances and fuel standard changes will create the need for additional fossil fuel storage capacity. The ordinance specifically exempts new storage capacity for renewable fuels as a means to support DEQ's Clean Fuels Program.

Testimony by the Western States Petroleum Association claims that the ordinance will inflict negative impacts on the ability to transition energy sources. The testimony does not define or explain what are the "negative impacts" or what is needed to transition energy resources. The ordinance specifically exempts new storage capacity for renewable fuels as a means to support compliance with DEQ's Clean Fuels Program and a transition away from fossil fuels.

Testimony by Zenith Energy claims that safety upgrades require the construction of new infrastructure without interrupting service to customers – new storage tanks are needed before old tanks can be taken out of service. No evidence is provided on storage tank capacity utilization or available land area at existing FFTs or the length of time that it takes to replace or retrofit a storage tank that indicates that new storage capacity is needed before existing storage capacity can be retrofitted or replaced. Recently, Zenith Energy expanded transloading capacity without expanding storage tank capacity and proposed adding new transloading/intermodal pipeline capacity to utilize existing storage capacity.

Testimony by NW Natural raised concerns that the definition of renewable fuels was not clear. The Remand Report (Exhibit B) has been revised to clarify the legislative intent that renewable fuels are those fuels derived from biomass (plant or animal material), such as recycled cooking oil, soybean oil, or animal fats; renewable natural gas/biogas is fuel captured from the waste stream, such as methane from landfills, waste water treatment plants, and agricultural or food waste, but does not include methane and other hydrocarbons produced from fossil fuels; and renewable hydrogen is hydrogen produced using renewable energy derived from wind power sited in ecologically responsible ways, solar, existing and low-impact hydroelectric, geothermal, biogas (including biogas produced from biomass), and ocean/wave technology sources.

As noted elsewhere in these findings, the FFTZ amendments are consistent with Statewide Planning Goal 7 (Natural Hazards) and the goals and policies of Chapter 7 (Environment and Watershed Health) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference.

Chapter 1: The Plan

Goal 1.A: Multiple goals
Portland's Comprehensive Plan provides a framework to guide land use, development, and public facility investments. It is based on a set of Guiding Principles that call for integrated approaches, actions, and outcomes that meet multiple goals to ensure Portland is prosperous, healthy, equitable, and resilient.

41. Finding: The FFTZ amendments are an amendment to the Zoning Code and do not amend the 2035 Comprehensive Plan. As noted above, FFTZ amendments are consistent with the guiding principles of the 2035 Comprehensive Plan. As part of an integrated approach to meet multiple goals, the City Council has considered, weighed and balanced applicable policies, as described on page HTU-5 of the 2035 Comprehensive Plan, to determine that this ordinance on the whole complies with the 2035 Comprehensive Plan. As described below, the City Council's decision to adopt the FFTZ amendments have considered the multiple goals of the comprehensive plan, including the guiding principles, to determine that the adoption of this ordinance will ensure that Portland is prosperous, healthy, equitable, and resilient by minimizing the risk posed by fossil fuel terminals.

Goal 1.B: Regional partnership. Portland's Comprehensive Plan acknowledges Portland's role within the region, and it is coordinated with the policies of governmental partners.

42. Finding: The findings show how the amendments are consistent with Metro's Urban Growth Management Functional Plan and the Statewide Planning Goals, including Goal 2 which requires coordination. In 2016, as part of the original adoption process, Metro, TriMet, and other state agencies received notice of the proposed FFTZ amendments from the 35-day DLCD notice and the City's legislative notice. In 2019, as part of the re-adoption of the remanded ordinance, the City posted a new 35-day DLCD notice and sent a legislative notice to government partners for the November 20, 2019 City Council hearing.

Goal 1.C: A well-functioning plan. Portland's Comprehensive Plan is effective, its elements are aligned, and it is updated periodically to be current and to address mandates, community needs, and identified problems.

43. Finding: The City Council defines "effective" as being successful in producing a desired or intended result. The desired or intended result is embodied in the Guiding Principles and goals and policies of the 2035 Comprehensive Plan. These findings demonstrate how the FFTZ amendments are consistent with the 2035 Comprehensive Plan, including advancing multiple goals. These changes represent updating regulatory implementation tools that respond to community needs and identified problems, especially in addressing the considerable risks fossil fuel terminals pose in the event of a major earthquake, as documented by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016).

Goal 1.D: Implementation tools. Portland's Comprehensive Plan is executed through a variety of implementation tools, both regulatory and non-regulatory. Implementation tools comply with the Comprehensive Plan and are carried out in a coordinated and efficient manner. They protect the public's current and future interests and balance the need for providing certainty for future development with the need for flexibility and the opportunity to promote innovation.

44. Finding: The City Council interprets this goal to mean that the first step in making the current situation better is to ensure that the situation does not get worse. Continuing to allow the increase in storage tank capacity in FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments are changes to the Zoning Code, which is a primary implementation tool. The City Council finds that the public's current and future interests are embodied in the Vision and Guiding Principles that address prosperity, human and environmental health, equity and resilience. In the event of a major earthquake, fossil fuel terminals pose considerable risks to all of those interests, as documented by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016). Continuing to allow the unlimited increase in storage capacity at FFTs in a high risk area does not protect the public's current or future interests. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which will be an improvement compared to the current regulations that allow for unlimited growth in FFTs.

The Zoning Code amendments change development standards and limit future expansion of storage capacity at FFTs, which may create uncertainty for the existing terminals. However, the uncertainty is mitigated by designating the existing FFTs as a limited use, as opposed to a prohibited or non-conforming use, that allows the terminals to continue to operate and invest in upgrades, as well as supporting opportunities for enhancement through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions. If the existing FFTs had been designated as a

prohibited use, as in the Proposed Draft of the amendments, then the existing FFTs would be nonconforming uses, which in some cases has been a barrier to obtaining financing for improvements and upgrades.

The City Council defines "flexibility" as a capability to adapt to new, different, or changing requirements and "innovation" as the introduction of something new. The amendments incorporate flexibility and innovation by designating the existing FFTs as a limited use that allows the terminals to continue to operate and invest in upgrades, as well as supporting opportunities for enhancement for aviation or renewable fuels among other exceptions.

Goal 1.E: Administration. Portland's Comprehensive Plan is administered efficiently and effectively and in ways that forward the intent of the Plan. It is administered in accordance with regional plans and state and federal law.

45. Finding: The 2035 Comprehensive Plan complies with state and federal law and is not amended by this ordinance. The FFTZ amendments add clear and objective regulations to the Zoning Code that can be administered by the City in an efficient and effective way that minimizes future risk and allows FFTs to invest in safety upgrades to decrease risk over time. These findings demonstrate how the FFTZ amendments are consistent with the intent of the 2035 Comprehensive Plan. As noted above, the findings show how the amendments are consistent with Metro's Urban Growth Management Functional Plan and the Statewide Planning Goals. The regulations are focused on what the City has jurisdiction over – land use regulation for public health and safety – and does not exceed its authority into areas covered by state and federal law, such railroads and interstate commerce.

The Comprehensive Plan

Policy 1.1. Comprehensive Plan elements. Maintain a Comprehensive Plan that includes these elements:

- **Vision and Guiding Principles.** The Vision is a statement of where the City aspires to be in 2035. The Guiding Principles call for decisions that meet multiple goals to ensure Portland is prosperous, healthy, equitable, and resilient.
- **Goals and policies.** The goals and policies of the Comprehensive Plan, including the Urban Design Framework, provide the long-range planning direction for the development and redevelopment of the city.
- **Comprehensive Plan Map.** The Comprehensive Plan Map is the official long-range planning guide for spatially defining the desired land uses and development in Portland. The Comprehensive Plan Map is a series of maps, which together show the boundaries of municipal incorporation, the Urban Service Boundary, land use designations, and the recognized boundaries of the Central City, Gateway regional center, town centers, and neighborhood centers.
- **List of Significant Projects.** The List of Significant Projects identifies the public facility projects needed to serve designated land uses through 2035. including expected new housing and jobs. It is based on the framework provided by a supporting Public Facilities Plan (PFP). The Citywide Systems Plan (CSP) is the City's public facilities plan. The Transportation System Plan (TSP) includes the transportation-related list of significant projects. The list element of the TSP is also an element of the Comprehensive Plan.

- **Transportation policies, street classifications, and street plans.** The policies, street classifications, and street plan maps contained in the Transportation System Plan (TSP) are an element of the Comprehensive Plan. Other parts of the TSP function as a supporting document, as described in Policy 1.2.

46. Finding: The FFTZ amendments do not include changes to any of the Comprehensive Plan elements The FFTZ amendments do not change the List of Significant Projects, nor do they change policies, street classifications, or street plan maps contained in the Transportation System Plan (TSP).

Supporting Documents

Policy 1.2. Comprehensive Plan supporting documents. Maintain and periodically update the following Comprehensive Plan supporting documents.

1. **Inventories and analyses**. The following inventories and analyses are supporting documents to the Comprehensive Plan:
   - Economic Opportunities Analysis (EOA)
   - Buildable Lands Inventory (BLI)
   - Natural Resource Inventory (NRI)
   - Housing Needs Analysis (HNA)

47. Finding: The FFTZ amendments were developed consistent with the supporting documents of the adopted 2035 Comprehensive Plan. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not impact the industrial land designated in Portland and do not impact the employment development capacity identified in the EOA and the BLI.

The FFTZ amendments do not change the NRI or the implementing environmental or greenway overlay zones.

The FFTZ amendments do not impact residential land and do not change the Housing Needs Analysis.

2. **Public Facilities Plan**. The Public Facilities Plan (PFP) is a coordinated plan for the provision of urban public facilities and services within Portland's Urban Services Boundary. The Citywide Systems Plan (CSP) is the City's public facilities plan.

48. Finding: As demonstrated in the findings for Statewide Planning Goal 11, the FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not impact the provision of public services and are consistent with the adopted Citywide Systems Plan (CSP). The CSP, which was adopted (Ordinance 185657) and acknowledged by LCDC on April 25, 2017, includes the Public Facilities Plan with information on current and future transportation, water, sanitary sewer, and stormwater infrastructure needs and projects, consistent with the requirements of Statewide Planning Goal 11.

The FFTZ amendments do not amend the Citywide System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the infrastructure in the northwest industrial area where the FFTs are located. As noted below in the findings for goals and policies of Chapter 8 (Public Facilities and Services), which are incorporated by reference, the FFTZ amendments are consistent with the CSP.

3. **Transportation System Plan (TSP)**. The TSP is the detailed long-range plan to guide transportation system functions and investments. The TSP ensures that new development and allowed land uses are consistent with the identified function and capacity of, and adopted performance measures for, affected transportation facilities. The TSP includes a financial plan to identify revenue sources for planned transportation facilities included on the List of Significant Projects. The TSP is the transportation element of the Public Facilities Plan. Certain components of the TSP are elements of the Comprehensive Plan. S*ee Policy 1.1*.

49. Finding: As demonstrated in the findings for Statewide Planning Goal 12 (Transportation) and the goals and policies of Chapter 9 (Transportation), the FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not impact the transportation system. The FFTZ amendments do not amend the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located.

4. **School Facility Plans.** School facility plans that were developed in consultation with the City, adopted by school districts serving the City, and that meet the requirements of ORS 195 are considered supporting documents to the Comprehensive Plan.

50. Finding: The FFTZ amendments apply to only one type of industrial use that makes up a small part of the businesses found in Portland's industrial districts, therefore, these changes will not impact school facility plans.

Implementation tools

Policy 1.3. Implementation tools subject to the Comprehensive Plan. Maintain Comprehensive Plan implementation tools that are derived from, and comply with, the Comprehensive Plan. *Implementation tools include those identified in policies 1.4 through 1.9.*

Policy 1.4. Zoning Code. Maintain a Zoning Code that establishes the regulations that apply to various zones, districts, uses, and development types.

51. Finding: The FFTZ amendments include Zoning Code amendments that create a new use category (bulk fossil fuel terminals) and applies it to the base zones. The definition of the use limits the size of new fossil fuel terminals and prohibits the expansion of fossil fuel storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. The FFTZ regulations designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Further, the use limitations (33.140.100.B.17.a) provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety.

Policy 1.5 Zoning Map. Maintain a Zoning Map that identifies the boundaries of various zones, districts, and other special features.

52. Finding: The FFTZ amendments do not include Zoning Map amendments. This policy does not apply.

Policy 1.6 Service coordination agreements. Maintain coordination agreements with local governments of adjoining jurisdictions concerning mutual recognition of urban service boundaries; special service districts concerning public facilities and services within Portland's Urban Services Boundary; and public school districts concerning educational facilities within Portland's Urban Services Boundary.

Policy 1.7 Annexations. Provide a process incorporating urban and urbanizable land within the City's Urban Services Boundary through annexation. See policies 8.11-8.19 for service extension requirements for annexations.

Policy 1.8 Urban renewal plans. Coordinate Comprehensive Plan implementation with urban renewal plans and implementation activities. A decision to adopt a new urban renewal district, adopt or amend goals and objectives that will guide investment priorities within a district, or amend the boundaries of an existing district, must comply with the Comprehensive Plan.

Policy 1.9 Development agreements. Consider development agreements entered into by the City of Portland and pursuant to Oregon Revised Statute 94 a Comprehensive Plan implementation tool.

53. Finding: For policies 1.6 through 1.9, the FFTZ amendments do not include changes or amendments to service coordination agreements, annexation processes, urban renewal plans, or development agreements. Therefore, these policies are not applicable to the FFTZ amendments.

Administration

Policy 1.10. Compliance with the Comprehensive Plan. Ensure that amendments to the Comprehensive Plan's elements, supporting documents, and implementation tools comply with the Comprehensive Plan. "Comply" means that amendments must be evaluated against the Comprehensive Plan's applicable goals and policies and on balance be equally or more supportive of the Comprehensive Plan as a whole than the existing language or designation.

1.10.a Legislative amendments to the Comprehensive Plan's elements and implementation tools must also comply with the Guiding Principles.

1.10.b Legislative amendments to the Comprehensive Plan's elements should be based on the factual basis established in the supporting documents as updated and amended over time.

1.10.c Amendments to the Zoning Map are in compliance with the Comprehensive Plan if they are consistent with the Comprehensive Plan Map.

54. Finding: The City Council finds that this is a fundamental policy of the Comprehensive Plan that guides the manner in which the City Council considers amendments to the Plan itself or any implementing regulations, such as the Zoning Code. The City Council interprets the policy to require the Council to consider whether, after considering all relevant facts, an amendment is equally or more supportive of the Comprehensive Plan. The City Council finds that an amendment is equally supportive when it is on its face directly supported by goals and policies in the Plan. The City Council finds that an amendment is more supportive of the Comprehensive Plan when the amendment will further advance goals and policies, particularly those that are aspirational in nature. The City Council finds that the policy requires consideration as to whether amendments are equally or more supportive of the Plan *as a whole*. The City Council finds that amendments do not need to be equally or more supportive with individual goals and policies, but rather amendments must be equally or more supportive of the entire Comprehensive Plan. Therefore, the City Council finds that there may be instances where specific goals and policies are not supported by the amendments but still the amendment is equally or more supportive of the entire Comprehensive Plan when considered cumulatively. The City Council finds that there is no precise mathematical equation for determining when the Plan as a whole is supported but rather such consideration requires City Council discretion in evaluating the competing interests and objectives of the plan.

The Council notes that the Comprehensive Plan introduction explains that "[t]he Comprehensive Plan contains a broad range of policies Council to consider. Each policy describes a desirable outcome. But it is unlikely that all policies are relevant to a particular decision and that a particular decision could be expected to advance all of the policies in the plan equally well. . . [E]ven the strongest policies do not automatically trump other policies. Every decision is different, with different facts. The particular policies that matter will change from one decision to another. There is no set formula – no particular number of "heavier" polies equals a larger set of "lighter" policies. In cases where there are competing directions embodied by different policies, City Council may choose the direction they believe best embodies the plan as a whole."

The FFTZ amendments are a legislative amendment to the Zoning Code, an implementation tool of the 2035 Comprehensive Plan. These findings identify how the FFTZ amendments comply with the 2035 Comprehensive Plan. That is, the amendments are evaluated against the 2035 Comprehensive Plan's Guiding Principles, goals, and policies, as detailed throughout this set of findings. As described in the finding for Policy 1.2, the factual basis of the supporting documents is not changed by this ordinance. Specifically, the employment capacity, as defined in the EOA, is not impacted by these changes – there are no map amendments, all industrial land use designations remain the same. The other supporting documents have been considered but are not impacted by these changes. The City Council finds that these amendments are equally or more supportive of the Comprehensive Plan than the existing Zoning Code regulations because they limit the considerable risks fossil fuel terminals pose in the event of a major earthquake, while allowing the existing terminals to continue to operate with limited opportunities for expansion, such as aviation fuel or renewable fuels.

The City Council finds that the evaluation to determine if the FFTZ amendments are on balance equally or more supportive than the existing language or designation must consider all of the goals and policies, as demonstrated by these findings. However, these amendments embody a situation where there are competing directions embodied by different policies. There are some policies where the amendments are equally supportive—not more or less so—but there are other policies where the amendments a more supportive and the code changes better embody the direction in the Comprehensive Plan as a whole.

For the reasons stated in these findings, the City Council concludes that the FFTZ amendments are on balance more supportive of the goals and policies of the 2035 Comprehensive Plan than the current regulations. The City Council has considered all applicable goals and policies to achieve an optimum outcome. Goals and policies are considered as factors which must be weighed, balanced and met on the whole, not as criteria that must be individually met. The purposes of the FFTZ amendments are to enhance public safety and protect the environment. The City Council has weighed and balanced the applicable goals and policies and concludes that, on the whole, continuing to allow an unlimited increase in storage capacity at FFTs in a high risk area would be less supportive of the 2035 Comprehensive Plan than adopting the FFTZ amendments.

As demonstrated by these findings, the FFTZ amendments effectively and efficiently implement the Comprehensive Plan. Specifically:

The City Council has considered applicable policies to determine that this ordinance on the whole complies with the 2035 Comprehensive Plan and on balance is equally or more supportive of the goals and policies of the 2035 Comprehensive Plan than the current regulations. In reaching this conclusion, City Council has weighed and balanced competing policy directions.

In particular, the Council finds that Goal 4.D with Policies 4.79 and 4.80, requires evaluating and reducing risk to people and property from natural hazards. The FFTZ amendments further these goals and policies because by limiting the risks of storing large volumes of hazardous materials in an area with high susceptibility to an earthquake. Large fossil fuel terminals represent a risk to people, property and the natural environments that the City Council finds as a compelling reason to limit future risk by limiting the size of new facilities and prohibit the expansion of existing facilities. Continuing to allow an unlimited increase in storage capacity at FFTs in a high risk area would be less supportive of the 2035 Comprehensive Plan than adopting the FFTZ amendments

The City Council further finds that Policy 6.48 provides direction to limit fossil fuel terminals to what is necessary to serve the region. The City Council recognizes that Portland's fossil fuel terminals handle 90 percent of the fossil fuel for the State of Oregon and Southwest Washington. BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington, during a period of a thriving economy. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. The more recent cargo forecasts project a modest growth in volumes, but those volumes do not exceed the historic peak volumes that were handled by the Portland terminals. No other evidence of future demand for fossil fuels was submitted in testimony. Therefore, the City Council finds that the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety. In addition, limiting storage capacity to the existing facilities reduces risk from a major earthquake, which outweighs the policy direction to provide capacity to accommodate any potential future increase in fossil fuel consumption, in part, because continuing to consolidate fossil fuel storage capacity in Portland is counter to resiliency principles that emphasize redundancy and distributed facilities.

At the same time, the City Council finds that Goal 6.C with Policies 6.20 and 6.36, among others, provide for the retention and growth of businesses, especially those in the traded sector. However, the City Council interprets these policies apply to the economy in general, rather than specific types of business. These changes and restrictions only apply to a narrowly defined new land use category, Bulk Fossil Fuel Terminals, and do not have a significant effect on the other allowed uses in industrial and employment zones. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial and employment areas of Portland. These amendments are narrowly constructed to apply to one class of businesses that make up a small portion of the city, regional and state economy. Further, these regulations only limit future expansion of these fossil fuel terminals, with some key exceptions, and designate these businesses as a limited use that allows their continued operation.

Guilds Lake Industrial Sanctuary (GLIS) Plan policies provide direction to maintain, protect and enhance businesses in the sanctuary. This plan was adopted in 2001 and does not address the need for resiliency in a high and medium liquefaction susceptibility area. The City Council interprets these policies to apply to the GLIS as a whole and not individual businesses. The City Council interprets the legislative intent of the GLISP is to maintain the area as an industrial sanctuary and to prohibit incompatible land uses. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses that could undermine the viability of the industrial sanctuary. These regulations apply to only one type of business that makes up a minority part of the businesses

found in GLIS. The remaining industrial uses to continue to operate under current regulations. The impact of the limits on fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and make upgrades and supports limited enhancement through exceptions to the fossil fuel storage capacity restrictions.

Testimony by Zenith Energy claims that Resolution 37168 (Opposition to Fossil Fuel Infrastructure) prohibits City from restricting safety improvements and service to end users, and development of backup capacity. The testimony mischaracterizes the requirements of the resolution. The text says that "this resolution does not restrict" safety improvements, service directly to end users, and development of emergency backup capacity. The City Council interprets this phrase as applying to the resolution itself, but not an adopted land use regulation that is applied directly to land use decisions. The resolution provides guidance and direction on future City actions, such as directing BPS to develop proposed code changes to advance the resolution. However, in the context of making a legislative land use decision (amending the Zoning Code), the 2035 Comprehensive Plan and Title 33 (Planning and Zoning) establish the procedures and approval criteria, which do not reference other resolutions that have not been incorporated into the 2035 Comprehensive Plan goals and policies.

Resolution 37168 was adopted as a binding city policy. A "binding city policy" excludes Comprehensive Plan policies. PCC 33.835 requires that when the City amends the Zoning Code it must be found consistent with the Comprehensive Plan. Binding City policies are not approval criteria for amending the Zoning Code.

Even if the City Council were to consider the binding policies as approval criteria for amending the Zoning Code, the FFTZ amendments are consistent with Resolution 37168. The Council interprets the resolution to require the following:

1. Improvements in the safety, or efficiency, seismic resilience, or operations of existing infrastructure;

   The FFTZ amendments designate existing FFTs as a limited use specifically to allow them to continue to operate to supply fossil fuels and to allow for safety and seismic upgrades. Transloading facilities are a defining characteristic of a Bulk Fossil Fuel Terminal, however, the ordinance the ordinance does not regulate transloading facilities and only limits new fossil fuel storage tank capacity. Existing fossil fuel storage tank capacity can be replaced and reconfigured as part of safety or seismic resilience improvements. Other aspects of terminal infrastructure (pipelines, docks, transloading facilities) are not regulated by this ordinance.

2. The provision of service directly to end users;

   The City Council interprets the term "end users" to be those users that consume the fossil fuel, i.e. motor vehicle operators or residential customers that use natural gas to heat their residence. The FFTZ amendments specifically exempt gas stations and other retail sales of fossil fuels.

3. The development of emergency backup capacity;

   The City Council interprets the term "emergency backup capacity" as infrastructure that is needed to restore functions at a facility, such as a diesel generator for electricity to power the facility, and not the wholesale duplication of the facility itself. In this case, existing FFTs are designated as a limited use, which allows them to continue to operate as a limited use, which allows them to make safety and seismic improvements, including facilities that serve as emergency backup capacity.

4. Infrastructure that enables recovery or re-processing of used petroleum products; and

   The FFTZ amendments specifically exempt uses that recover or reprocess used petroleum products.

5. Infrastructure that will accelerate the transition to non-fossil fuel energy sources

   The FFTZ amendments specifically define fossil fuels as fuels that "are made from decayed plants and animals that lived millions of years ago and are a source of energy" as a means to exclude other types of fuels that come from renewable energy, such as ethanol, biodiesel/renewable diesel and renewable hydrogen, as long as that fuel has less than 5 percent fossil fuel content. The ordinance only limits new fossil fuel storage tank capacity. Other aspects of terminal infrastructure (pipelines, docks, transloading facilities) are not regulated by this ordinance.

Therefore, although the Council is not required to consider consistency with the Resolution as it is not approval criteria for a legislative land use decision, the City Council nonetheless finds that the FFTZ amendments are consistent with Resolution 37168.

Policy 1.11. Consistency with Metro Urban Growth Management Functional Plan and Urban Growth Boundary. Ensure that the Comprehensive Plan remains consistent with the Metro Urban Growth Management Functional Plan and supports a tight urban growth boundary for the Portland metropolitan area.

Policy 1.12. Consistency with Statewide Planning Goals. Ensure that the Comprehensive Plan, supporting documents, and implementation tools remain consistent with the Oregon Statewide Planning Goals.

55. Finding: As noted earlier in these findings, the FFTZ amendments are consistent with and designed to further the applicable elements of the Metro Urban Growth Management Functional Plan and Statewide Planning Goals, consistent with the directives of policies 1.11 and 1.12.

Policy 1.13. Consistency with state and federal regulations. Ensure that the Comprehensive Plan remains consistent with all applicable state and federal regulations, and that implementation measures for the Comprehensive Plan are well coordinated with other City activities that respond to state and federal regulations.

56. Finding: The FFTZ amendments were developed to be consistent with applicable state and federal regulations and do not amend any Zoning Code sections that are required by state or federal regulations, including FEMA flood regulations and state building code requirements.

    Testimony by the Western States Petroleum Association claims that the ordinance will prevent and discourage equipment upgrades necessary to comply with federal and state clean fuels law. Compliance with federal and state law is not defined, no specific citations are provided. Only new fossil storage tank capacity is restricted, other equipment upgrades are allowed. The ordinance specifically exempts new storage capacity for renewable fuels as a means to support compliance with DEQ's Clean Fuels Program.

    Testimony by the Western States Petroleum Association claims that the ordinance will prevent and discourage the transition to newer lower-carbon-fuel sources in opposition to Oregon's low-carbon-fuel standards, Oregon's Renewable Fuel Standards, federal Renewable Fuel Standards, and similar laws. The testimony does not define what infrastructure that is required for the "transition to newer lower-carbon-fuel sources". Compliance with federal and state law is not defined, no

specific citations are provided. The ordinance specifically exempts new storage capacity for renewable fuels as a means to support compliance with DEQ's Clean Fuels Program.

Testimony by the Western States Petroleum Association claims that the ordinance is not in alignment with state and federal policy regarding siting energy infrastructure or transportation of fuels. The testimony does not cite any specific state or federal energy siting or transportation policy. The testimony does not acknowledge or address the risks in citing energy infrastructure in an area of high risk of liquefaction.

Policy 1.14. Public facility adequacy. Consider impacts on the existing and future availability and capacity of urban public facilities and services when amending Comprehensive Plan elements and implementation tools. Urban public facilities and services include those provided by the City, neighboring jurisdictions, and partners within Portland's urban services boundaries, as established by Policies 8.2 and 8.6.

57. Finding: As demonstrated in the findings for Statewide Planning Goal 11 and Chapter 8 (Public Facilities and Services) of the 2035 Comprehensive Plan, the FFTZ amendments do not significantly impact the provision of public services.

Policy 1.15. Intergovernmental coordination. Strive to administer the Comprehensive Plan elements and implementation tools in a manner that supports the efforts and fiscal health of the City, county and regional governments, and partner agencies such as school districts and transit agencies.

58. Finding: As demonstrated in the findings for Statewide Planning Goal 2, the City filed the required 35-day notice with Oregon Department of Land Conservation and Development to notify other government agencies of the proposed FFTZ amendments. In addition, the City sent a separate legislative notice to Multnomah County, adjacent cities, Metro and TriMet. The Port of Portland was the only government agency that raised issues or concerns with the original ordinance. The Port of Portland appreciated that the ordinance was amended to address their concerns about the supply of aviation fuel to Portland International Airport (PDX) and marine fuel suppliers.

Policy 1.16. Planning and Sustainability Commission review. Ensure the Planning and Sustainability Commission (PSC) reviews and makes recommendations to the City Council on all proposed legislative amendments to Comprehensive Plan elements, supporting documents, and implementation tools. The PSC advises City Council on the City's long-range goals, policies, and programs for land use, planning, and sustainability. The membership and powers and duties of the PSC are described in the Zoning Code.

59. Finding: The City Council interprets this policy as requiring the PSC to hold at least one public hearing before making a recommendation on a legislative matter as required by PCC 33.740. The PSC reviewed and recommended the original FFTZ amendments in 2016. The City Council finds that this ordinance is a continuation of the initial legislative action that began in 2016 and was remanded to the Council to take additional action. The City Council does not interpret this policy to require the remand go back to PSC because it is a continuation of the same legislative proposal. The City Council did not refer this ordinance back to the PSC for another recommendation because no substantive changes are required by the legal decisions. The assignment of errors are a lack evidence to support the decision, not the code itself. The purpose of this ordinance is to provide additional findings, including findings that address the goals and policies in the 2035 Comprehensive Plan, to support the decision and confirm that the decision is supported by an adequate factual base with minor technical changes to the code to conform to the current zoning code.

Policy 1.17. Community Involvement Committee. Establish a Community Involvement Committee to oversee the Community Involvement Program as recognized by Oregon Statewide Planning Goal 1 – Community Involvement and policies 2.15-2.18 of this Comprehensive Plan.

60. Finding: This policy only requires the establishment of a Citizen Involvement Committee, which was appointed in June 2018 and reviews and advises the way City staff engage with the public in land use and transportation planning. This policy does not apply.

Policy 1.18. **Quasi-judicial amendments to the Comprehensive Plan Map.** Applicants for quasi-judicial amendments to the Comprehensive Plan Map must show that the requested change adheres to Policies 1.10 through 1.15 and:

- Is compatible with the land use pattern established by the Comprehensive Plan Map.
- Is not in conflict with applicable adopted area-specific plans as described in Policy 1.19, or the applicable hearings body determines that the identified conflict represents a circumstance where the area specific plan is in conflict with the Comprehensive Plan and the proposed amendment is consistent with the Comprehensive Plan.

The Hearings Officer must review and make recommendations to the City Council on all quasi-judicial amendments to the Comprehensive Plan Map using procedures outlined in the Zoning Code.

61. Finding: This policy concerns quasi-judicial amendments to the Comprehensive Plan Map and is not applicable to this project, which is a legislative project.

Policy 1.19. Area-specific plans. Use area-specific plans to provide additional detail or refinements applicable at a smaller geographic scale, such as for centers and corridors, within the policy framework provided by the overall Comprehensive Plan.

1.19.a Area-specific plans that are adopted after May 24, 2018, should clearly identify which components amend Comprehensive Plan elements, supporting documents, or implementation tools. Such amendments should be appropriate to the scope of the Comprehensive Plan; be intended to guide land use decisions; and provide geographically-specific detail. Such amendments could include policies specific to the plan area, land use designation changes, zoning map changes, zoning code changes, and public facility projects necessary to serve designated land uses.

1.19.b Area-specific plan components intended as context, general guidance, or directives for future community-driven efforts should not amend the Comprehensive Plan elements or implementation tools but be adopted by resolution as intent. These components include vision statements, historical context, existing conditions, action plans, design preferences, and other background information.

1.19.c Community, area, neighborhood, and other area-specific plans that were adopted by ordinance prior to January 1, 2018 are still in effect. However, the elements of this Comprehensive Plan supersede any goals or policies of a community, area, or neighborhood plan that are inconsistent with this Plan.

62. Finding: Council interprets the policy to require the Council "use" or "consider" area-specific plans as additional detail or refinement of policies as applied to a smaller geographic area. The only area-specific plan that applies to the FFTZ amendments is the Guilds Lake Industrial Sanctuary Plan (GLISP). The additional detail provided in that plan are addressed below. Council finds that the GLISP policies and objectives for preserving and enhancing industrial businesses and employment opportunities are consistent with the goals and policies in Chapter 6 (Economic Development) of

the 2035 Comprehensive Plan. However, the GLISP does not address other relevant policies identified in the 2035 Comprehensive Plan, especially Goal 4.D with Policies 4.79 and 4.80, which require reducing risk to people and property from natural hazards. Therefore, the City Council considers GLISP and the Comprehensive Plan together and finds that on balance, the FFTZ amendments are consistent with the comprehensive plan and GLISP.

Chapter 2: Community Involvement

Goal 2.A: Community involvement as a partnership. The City of Portland works together as a genuine partner with all Portland communities and interests. The City promotes, builds, and maintains relationships, and communicates with individuals, communities, neighborhoods, businesses, organizations, institutions, and other governments to ensure meaningful community involvement in planning and investment decisions.

Goal 2.B: Social justice and equity. The City of Portland seeks social justice by expanding choice and opportunity for all community members, recognizing a special responsibility to identify and engage, as genuine partners, under-served and under-represented communities in planning, investment, implementation, and enforcement processes, particularly those with potential to be adversely affected by the results of decisions. The City actively works to improve its planning and investment-related decisions to achieve equitable distribution of burdens and benefits and address past injustices.

Goal 2.C: Value community wisdom and participation. Portland values and encourages community and civic participation. The City seeks and considers community wisdom and diverse cultural perspectives, and integrates them with technical analysis, to strengthen land use decisions.

Goal 2.D: Transparency and accountability. City planning and investment decision-making processes are clear, open, and documented. Through these processes a diverse range of community interests are heard and balanced. The City makes it clear to the community who is responsible for making decisions and how community input is considered. Accountability includes monitoring and reporting outcomes.

Goal 2.E: Meaningful participation. Community members have meaningful opportunities to participate in and influence all stages of planning and decision making. Public processes engage the full diversity of affected community members, including under-served and under-represented individuals and communities. The City will seek and facilitate the involvement of those potentially affected by planning and decision making.

Goal 2.F: Accessible and effective participation. City planning and investment decision-making processes are designed to be culturally accessible and effective. The City draws from acknowledged best practices and uses a wide variety of tools, including those developed and recommended by under-served and under-represented communities, to promote inclusive, collaborative, culturally-specific, and robust community involvement.

Goal 2.G: Strong civic infrastructure. Civic institutions, organizations, and processes encourage active and meaningful community involvement and strengthen the capacity of individuals and communities to participate in planning processes and civic life.

63. Finding: The City Council interprets these goals and policies as together requiring a robust public process when making a land use decision. This is implemented through the Legislative procedure requirements in PCC 33.740. Neither the Code nor the policies provide explicit direction for responding to a LUBA remand. Council finds that this legislative action is a continuation of the 2016 legislative action and, therefore, it is appropriate and consistent with the applicable policies to bring the ordinance before Council with a notice and a hearing.

64. **Finding:** The 2016 adoption of the ordinance provided opportunities for all interested parties to comment on and influence the Fossil Fuel Terminal Zoning proposal. The preparation of these amendments provided numerous opportunities for public involvement, including:

Concept Phase. In 2016, prior to the initiation of the legislative project, BPS conducted four stakeholder focus groups meetings. These meetings included participants with a range of perspectives and experience, including community group representatives, fuel terminal representatives, environmental organizations, and business organizations. These meetings served as a forum for discussing issues and potential approaches, and to help inform project staff develop concepts. In addition to the stakeholder focus groups, BPS staff met with several fuel terminals to explain the proposal, answer questions, and discuss their individual concerns. These meetings were needed because antitrust regulations constrained discussion about certain topics, for example supply chains, in the presence of representatives from other fuel terminals.

Discussion Draft. On June 29, 2016, the Fossil Fuel Terminal Zoning Amendments Discussion Draft was published and posted on the Bureau website.

Proposed Draft. On August 12, 2016, the Fossil Fuel Terminal Zoning Proposed Draft was published in preparation for the Planning and Sustainability Commission (PSC) review and recommendation. In support of this process, the BPS website had a project page dedicated to this project, an email address for submitting testimony. As part of the Proposed Draft publication and legislative process requirements, the following legal notices were also sent:

Form 1 35-day Notice. Sent to the Department of Land Conservation and Development (DLCD)

Legislative Notice. Sent to interested parties, recognized organizations, affected bureaus, TriMet, Metro and ODOT and published in the Daily Journal of Commerce

Measure 56 Notice. Required by Ballot Measure 56, this mailed notice was sent to property owners with industrial or employment base zoning.

The PSC held a public hearing on September 13, 2016. On October 11, 2016, the Planning and Sustainability Commission voted to recommend the Fossil Fuel Terminal Zoning Amendments to City Council, including PSC-recommended modifications to the Proposed Draft. All PSC meetings were streamed live and available for viewing on the Bureau website.

Recommended Draft. On October 24, 2016. the Fossil Fuel Terminal Zoning Amendments Recommended Draft was published to present the PSC recommendations to City Council. On October 25, 2016, notice of the City Council hearing on the Fossil Fuel Terminal Zoning Amendments was mailed. The City Council held public hearings on November 10 and 16, 2016, to receive testimony on the Recommended Draft. On December 8, 2016, the City Council voted to adopt the Fossil Fuel Terminal Zoning Amendments.

Ordinance No. 188142 was appealed to the Oregon Land Use Board of Appeals (LUBA). LUBA reversed the City's decision with a number of assignments of error in Columbia Pacific Building Trades Council et al v. City of Portland, LUBA Case No. 2017-001, July 19, 2017. LUBA's decision was appealed to the Oregon Court of Appeals, which overturned LUBA's decision which was affirmed in part and reversed in part in Columbia Pacific Building Trades Council v. City of Portland, 289 Or App 739 (2018). The Oregon Court of Appeals decision was appealed to the Oregon Supreme Court, which denied review, 363 Or 390 (2018). On October 5, 2018, LUBA remanded Columbia Pacific Building Trades Council et al v. City of Portland, LUBA Case No. 2017-001. The assignments of error that LUBA sustained and were either affirmed or not challenged on appeal to

the Court of Appeals concern insufficient findings or evidence or misconstruction of law that do not support a conclusion that the decision is prohibited as a matter of law.

The City of Portland does not have adopted code or policies to establish a decision-making process for a remand decision. The City Council determined that it was appropriate to bring the ordinance directly back to City Council, given the extensive public process that happened as part of the initial adoption of the ordinance in 2016 and that no substantive changes to the Zoning Code are required to address the remand issues. Notification of the November 20, 2019, City Council public hearing on the remand of Ordinance No. 188142 was sent to the City's legislative notice list, the fossil fuel terminal property owners, and the parties to the appeal.

On November 20, 2019, the Portland City Council held a public hearing and received testimony on the re-adoption of the fossil fuel terminal zoning restrictions. The written record was left open for additional testimony until December 2, 2019. The evidentiary record from the initial decision is incorporated by reference and supplemented by additional evidence provided by BPS staff, the testimony Council received at the November 20 hearing and the written testimony received by December 2.

Partners in decision making

Policy 2.1. Partnerships and coordination. Maintain partnerships and coordinate land use engagement with:

2.1.a Individual community members.

2.1.b Communities of color, low-income populations, Limited English Proficient (LEP) communities, Native American communities, and other under-served and under-represented communities.

2.1.c District coalitions, neighborhood associations, and business district associations as local experts and communication channels for place-based projects.

2.1.d Businesses, unions, employees, and related organizations that reflect Portland's diversity as the center of regional economic and cultural activity.

2.1.e Community-based, faith-based, artistic and cultural, and interest-based non-profits, organizations, and groups.

2.1.f Institutions, governments, and Sovereign tribes.

65. Finding: The 2035 Comprehensive Plan defines the verb "maintain" to mean keep what you have; conserve; preserve; continue. The City Council interprets these policies as requiring diverse community engagement with district interests represented, however, the policies do not require Council to only accept the opinion, argument, or evidence of any one group. The City Council ultimately will evaluate the information and make a policy determination that is consistent with the goals and policies.

As described in the Statewide Planning Goal 1 findings, the initial adoption of the FFTZ amendments were informed by a broad range of individuals and groups. Prior to the initiation of the legislative project, BPS conducted four stakeholder focus groups meetings. These meetings included participants with a range of perspectives and experience, including community group representatives, fuel terminal representatives, environmental organizations, and business

organizations. These meetings served as a forum for discussing issues and potential approaches, and to help inform project staff develop concepts. In addition to the stakeholder focus groups, BPS staff met with several fuel terminals to explain the proposal, answer questions, and discuss their individual concerns.

Policy 2.2. Broaden partnerships. Work with district coalitions, neighborhood associations, and business district associations to increase participation and to help them reflect the diversity of the people and institutions they serve. Facilitate greater communication and collaboration among district coalitions, neighborhood associations, business district associations, culturally-specific organizations, and community-based organizations.

66. Finding: The City Council interprets this policy to guide how the City works with a broad range of partners over time, beyond the context of a specific land use decision. This policy does not apply.

Environmental justice

Policy 2.3. Extend benefits. Ensure plans and investments promote environmental justice by extending the community benefits associated with environmental assets, land use, and public investments to communities of color, low-income populations, and other under-served or under-represented groups impacted by the decision. Maximize economic, cultural, political, and environmental benefits through ongoing partnerships.

Policy 2.4. Eliminate burdens. Ensure plans and investments eliminate associated disproportionate burdens (e.g. adverse environmental, economic, or community impacts) for communities of color, low-income populations, and other under-served or under-represented groups impacted by the decision.

2.4.a, Minimize or mitigate disproportionate burdens in cases where they cannot be eliminated.

2.4.b, Use plans and investments to address disproportionate burdens of previous decisions.

67. Finding: The City Council finds that Policies 2.3 and 2.4 work together to address the benefits and burdens of planning and investment decisions have on under-served and under-represented groups. The verb "ensure", which is defined in the 2035 Comprehensive Plan, means to make sure that something will happen or be available. In terms of benefits, the City Council finds that the FFTZ amendments seek to reduce the risk of adverse environmental impacts associated with a major earthquake and FFTs, which will be an improvement compared to the current regulations that allow for unlimited growth in FFTs. In terms of burdens, the City Council finds that one of the important factors is the impact on job opportunities across a wide range of wage scales, especially middle wage jobs, which can provide for economic prosperity for under-served or under-represented groups, especially for those people without college degrees. Specifically, those middle-wage opportunities are found in Portland's industrial districts. The City Council finds that the ordinance has been narrowly written to minimize impacts to the existing fossil fuel terminals (FFTs). Further, the FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not reduce the employment land base and continue to support employment opportunities in a strong and diverse economy.

Invest in education and training

Policy 2.5. Community capacity building. Enhance the ability of community members, particularly those in under-served and/or under-represented groups, to develop the relationships, knowledge, and skills to effectively participate in plan and investment processes.

Policy 2.6. **Land use literacy.** Provide training and educational opportunities to build the public's

understanding of land use, transportation, housing, and related topics, and increase capacity for meaningful participation in planning and investment processes.

Policy 2.7. Agency capacity building. Increase City staff's capacity, tools, and skills to design and implement processes that engage a broad diversity of affected and interested communities, including under-served and under-represented communities, in meaningful and appropriate ways.

68. Finding: Policies 2.5 through 2.7 concern broad approaches to educating community members and City staff about planning processes, and are not applicable to these Zoning Code amendments.

Community assessment

Policy 2.8. Channels of communication. Maintain channels of communication among City Council, the Planning and Sustainability Commission (PSC), project advisory committees, City staff, and community members.

69. Finding: The City Council interprets this policy to create the opportunity for the community and advisory committees to have opportunities to communicate their issues and concerns to the PSC and City Council outside of the formal legislative process. These changes are a legislative process with formal opportunities to testify to communicate directly with City Council. Therefore, this policy does not apply.

Policy 2.9. Community analysis. Collect and evaluate data, including community-validated population data and information, to understand the needs, priorities, and trends and historical context affecting different communities in Portland.

Policy 2.10. Community participation in data collection. Provide meaningful opportunities for individuals and communities to be involved in inventories, mapping, data analysis, and the development of alternatives.

Policy 2.11. Open Data. Ensure planning and investment decisions are a collaboration among stakeholders, including those listed in Policy 2.1. Where appropriate, encourage publication, accessibility, and wide-spread sharing of data collected and generated by the City.

70. Finding: Policies 2.9 through 2.11 concern how the City collects and makes available data that supports land use decisions. In this case, the City published data concerning the storage capacity of existing FFTs as part of the discussion draft, proposed draft, and recommendation draft with an opportunity for the community and terminal owners to validate that data.

Transparency and accountability

Policy 2.12. Roles and responsibilities. Establish clear roles, rights, and responsibilities for participants and decision makers in planning and investment processes. Address roles of City bureaus, elected officials, and participants, including community and neighborhood leadership, business, organizations, and individuals.

Policy 2.13. Project scope. Establish clear expectations about land use project sponsorship, purpose, design, and how decision makers will use the process results.

Policy 2.14. Community influence. At each stage of the process, identify which elements of a planning and investment process can be influenced or changed through community involvement. Clarify the extent to which those elements can be influenced or changed.

Policy 2.15. Documentation and feedback. Provide clear documentation for the rationale supporting decisions in planning and investment processes. Communicate to participants about the issues raised in the community involvement process, how public input affected outcomes, and the rationale used to make decisions.

71. Finding: Policies 2.12 Through 2.15 guide the process for making planning and investment decisions. As described in the findings for Statewide Planning Goal 1 (Citizen Involvement), the original legislative process was clearly outlined in notices, documents and on the project website as to how to testify to influence the Proposed Draft at the PSC, which amended the proposal. Then the Recommended Draft was published with the opportunity to testify to the City Council at the 2016 public hearings.

    For the re-adoption of the FFTZ amendments, the notice for the remand explicitly identified what the City Council was considering (the same ordinance) and how to participate in the hearing or submit written testimony. The City Council received public testimony at the November 20, 2019 hearing on the substance of the regulations and the written record was left open for additional testimony until December 2, 2019.

    The findings in this document respond to the public testimony and explain the rationale used to make this decision.

    Testimony by Zenith Energy raised concerns that the additional facts or evidence was not identified or made available for public review. The initial findings were available as part of ordinance filing. BPS staff presented additional evidence as part of November 20, 2019 City Council hearing (and posted to the project website). The written record was left open for 11 days to provide an opportunity for any interested party to respond. In addition, the record of evidence was publicly available, and, as of November 30, no requests were made to review the record.

Community involvement program

Policies 2.16 through 2.23.

72. Finding: These policies concern the City's Community Involvement Program and are not applicable because the FFTZ amendments do not change this program.

Process design and evaluation

Policy 2.24. Representation. Facilitate participation of a cross-section of the full diversity of affected Portlanders during planning and investment processes. This diversity includes individuals, stakeholders, and communities represented by race, color, national origin, English proficiency, gender, age, disability, religion, sexual orientation, gender identity, and source of income.

Policy 2.25. Early involvement. Improve opportunities for interested and affected community members to participate early in planning and investment processes, including identifying and prioritizing issues, needs, and opportunities; participating in process design; and recommending and prioritizing projects and/or other types of implementation.

Policy 2.26. Verifying data. Use data, including community-validated population data, to guide planning and investment processes and priority setting and to shape community involvement and decision-making efforts.

Policy 2.27. Demographics. Identify the demographics of potentially affected communities when initiating a planning or investment project.

Policy 2.28. Historical understanding. To better understand concerns and conditions when initiating a

project, research the history, culture, past plans, and other needs of the affected community, particularly under-represented and under-served groups, and persons with limited English proficiency (LEP). Review preliminary findings with members of the community who have institutional and historical knowledge.

Policy 2.29. Project-specific needs. Customize community involvement processes to meet the needs of those potentially affected by the planning or investment project. Use community involvement techniques that fit the scope, character, and potential impact of the planning or investment decision under consideration.

Policy 2.30. Culturally-appropriate processes. Consult with communities to design culturally-appropriate processes to meet the needs of those affected by a planning or investment project. Evaluate, use, and document creative and culturally-appropriate methods, tools, technologies, and spaces to inform and engage people from under-served and under-represented groups about planning or investment projects.

Policy 2.31. Innovative engagement methods. Develop and document innovative methods, tools, and technologies for community involvement processes for plan and investment projects.

Policy 2.32. Inclusive participation beyond Portland residents. Design public processes for planning and investment projects to engage affected and interested people who may not live in Portland such as property owners, employees, employers, and students, among others, as practicable.

Policy 2.33. Inclusive participation in Central City planning. Design public processes for the Central City that recognize its unique role as the region's center. Engage a wide range of stakeholders from the Central City and throughout the region including employees, employers, social service providers, students, and visitors, as well as regional tourism, institutional, recreation, transportation, and local/regional government representatives, as appropriate.

Policy 2.34. Accessibility. Ensure that community involvement processes for planning and investment projects are broadly accessible in terms of location, time, and language, and that they support the engagement of individuals with a variety of abilities and limitations on participation.

Policy 2.35. Participation monitoring. Evaluate and document participant demographics throughout planning and investment processes to assess whether participation reflects the demographics of affected communities. Adapt involvement practices and activities accordingly to increase effectiveness at reaching targeted audiences.

Policy 2.36. Adaptability. Adapt community involvement processes for planning and investment projects as appropriate to flexibly respond to changes in the scope and priority of the issues, needs, and other factors that may affect the process.

Policy 2.37. Process evaluation. Evaluate each community involvement process for planning or investment projects from both the City staff and participants' perspectives, and consider feedback and lessons learned to enhance future involvement efforts.

73. Finding: Policies 2.24 through 2.37 concern how the community involvement program is designed and developed to support planning and investment projects. The community involvement process conducted in support of initial adoption of the FFTZ amendments engaged a broad range of stakeholders. As part of the concept development of the zoning code changes, BPS held stakeholder focus group meetings with representatives from energy providers (the FFTs, the Western States Petroleum Association, Northwest Natural, and business organizations) and environmental organizations. The Discussion Draft was crafted in response to these discussions. In

turn, comments on the Discussion Draft informed changes that were incorporated in the Proposed Draft. A large number of people testified at both the PSC and City Council public hearings, which resulted in amendments to the regulations.

For this reconsideration of the remanded notice, a legislative notice was sent to the City's legislative notice list as well as the FFT owners and the attorneys that participated in the appeal. People testifies at the November 20, 2019, public hearing.

Information design and development

Policy 2.38. Accommodation. Ensure accommodations to let individuals with disabilities participate in administrative, quasi-judicial, and legislative land use decisions, consistent with federal regulations.

74. Finding: The City Council hearing on November 20, 2019 was held at City Hall, an accessible location.

Policy 2.39. Notification. Notify affected and interested community members and recognized organizations about administrative, quasi-judicial, and legislative land use decisions with enough lead time to enable effective participation. Consider notification to both property owners and renters.

75. Finding: For the original adoption of the FFTZ amendments, the City sent the required Measure 56 notice to all owners of industrial zoned properties when it published the Proposed Draft prior to the PSC hearing. The City also sent a legislative notice to interested parties, including neighborhood associations, business associations, and other affected jurisdictions, that have requested notice of proposed land use changes.

The City Council's action on remand is a continuation of the initial legislative proceeding. Prior to conducting a hearing, the City sent a legislative notice to interested parties, FFT owners and the attorneys that participated in the appeal to inform them of the opportunity to testify at the November 20, 2019, City Council public hearing. Additionally, Council left the written record open until December 2, 2019, to provide additional opportunities to participate.

Policy 2.40. Tools for effective participation. Provide clear and easy access to information about administrative, quasi-judicial, and legislative land use decisions in multiple formats and through technological advancements and other ways.

Policy 2.41. Limited English Proficiency (LEP). Ensure that limited English proficient (LEP) individuals are provided meaningful access to information about administrative, quasi-judicial, and legislative land use decisions, consistent with federal regulations.

76. Finding: Regular communications about the original adoption of the FFTZ project and opportunities to participate and provide input were made available through the project website.

Chapter 3: Urban Form

77. Finding: The City Council interprets that the overall intent of these policies is to foster a compact urban form, make corridors vibrant, enhance public realm. The policies relate to design and the physical structure. The FFTZ amendments limit one type of use and do not impact or change design or physical development requirements. Therefore, the goals and policies of this chapter are generally not applicable. However, to the extent a policy could be deemed applicable, the City Council provides further findings below.

GOAL 3.A: A city designed for people. Portland's built environment is designed to serve the needs and aspirations of all Portlanders, promoting prosperity, health, equity, and resiliency. New development,

redevelopment, and public investments reduce disparities and encourage social interaction to create a healthy connected city.

78. Finding: The City Council interprets this goal to guide the design of new development and the impact it has on Portland's built environment. This goal is not directly applicable to the FFTZ amendments because this ordinance regulates one type of use in Portland's industrial and employment zones. The FFTZ amendments do promote prosperity and equity by preserving the industrial development capacity to support employment growth, which contributes to more equitably distributed household prosperity. Further, the FFTZ amendments promote health and resiliency by limiting future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of fossil fuel storage capacity at existing FFTs, with limited exceptions for aviation and renewable fuels. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

GOAL 3.B: A climate and hazard resilient urban form. Portland's compact urban form, sustainable building development practices, green infrastructure, and active transportation system reduce carbon emissions, reduce natural hazard risks and impacts, and improve resilience to the effects of climate change.

79. Finding: This goal does not apply because the FFTZ amendments do not change Portland's compact urban form, sustainable building practices, green infrastructure, or active transportation because this ordinance regulates one type of use in Portland's industrial and employment zones.

The ordinance does reduce natural hazard risks and impacts because most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. The FFTZ amendments are a regulatory approach that improves Portland's ability to withstand and recover from an earthquake by limiting the size of new fossil fuel terminals and prohibiting the expansion of fossil fuel storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which is an improvement over the current regulations that allow for unlimited growth in FFTs. The FFTZ regulations focus on limiting risk by limiting new development (fossil fuel storage capacity), but designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety.

GOAL 3.C: Focused growth. Household and employment growth is focused in the Central City and other centers, corridors, and transit station areas, creating compact urban development in areas with a high level of service and amenities, while allowing the relative stability of lower-density single-family residential areas.

80. Finding: The FFTZ amendments are focused on changes to allowed uses in the City's industrial areas and do not affect the City's goal in creating compact urban development. This goal does not apply.

GOAL 3.D: A system of centers and corridors. Portland's interconnected system of centers and corridors provides diverse housing options and employment opportunities, robust multimodal transportation connections, access to local services and amenities, and supports low-carbon complete, healthy, and equitable communities.

81. Finding: The FFTZ amendments are focused on changes to allowed uses in the City's industrial areas and do not affect the City's goal in creating a system of centers and corridors. This goal does not apply.

GOAL 3.E: Connected public realm and open spaces. A network of parks, streets, City Greenways, and other public spaces supports community interaction; connects neighborhoods, districts, and destinations; and improves air, water, land quality, and environmental health.

82. Finding: The FFTZ amendments are focused on changes to the City's industrial areas, which play a limited role in the City's connected network of parks and open spaces. Six of the existing FFTs have frontage on the Willamette River with designated natural resources that are protected by the Greenway Overlay Zone (Chapters 33.440), which is not amended by this ordinance. This goal does not apply.

GOAL 3.F: Employment districts. Portland supports job growth in a variety of employment districts to maintain a diverse economy.

83. Finding: The 2035 Comprehensive Plan defines the verb "maintain" to mean keep what you have; conserve; preserve; continue. As described in the Economic Opportunities Analysis (EOA), Portland has a diverse economy with a wide range of businesses and employment opportunities that are distributed across the Central City, neighborhood commercial areas, campus institutions and industrial areas. The City Council interprets this goal to apply to the City's economy in general and not specific industries. The City Council finds that the policy means that the City will support job growth in all employment districts in order to maintain a diverse economy, but the policy does not require the City to support the job growth of specific industries at all costs. The FFTZ amendments maintain Portland's diverse economy because the changes do not include map changes, nor do they allow for new incompatible land uses in industrial areas. Therefore, these changes will continue to provide the same opportunities for employment in Portland's employment districts. The FFTZ regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's employment districts. The limits on expansion of fossil fuel storage capacity at FFTs are mitigated by designating existing FFTs as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their intermodal facilities and supports opportunities for growth through a number of exceptions, such as aviation or renewable fuels, to the storage capacity restrictions.

GOAL 3.G: Nature in the city. A system of habitat corridors weaves nature into the city, enhances habitat connectivity, and preserves natural resources and the ecosystem services they provide.

84. Finding: The Willamette and Columbia rivers play a major role in the habitat corridors that weave nature into Portland. Six of the existing FFTs have frontage on the Willamette River with designated natural resources that are protected by the Greenway Overlay Zone (Chapters 33.440), which is not amended by this ordinance. In considering the natural hazard risks that the FFTs pose to the ecosystem functions on the river, as identified by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016), the City Council finds that continuing to allow the unlimited increase in storage capacity at FFTs in a high risk area does not enhance the current or future natural resource functions of the rivers. Therefore, the FFTZ regulations focus on limiting risk by limiting fossil fuel storage capacity, but designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety. These regulations will limit the risks to the natural resource habitat functions and ecosystem services provided by the rivers.

Citywide design and development

Policy 3.1. Urban Design Framework. Use the Urban Design Framework (UDF) as a guide to create inclusive and enduring places, while providing flexibility for implementation at the local scale to meet the needs of local communities.

85. Finding: The UDF is a guide at the citywide scale. The UDF identifies the Rivers pattern area, which encompasses most of Portland's industrial and employment areas, including all of the existing FFTs. The FFTZ amendments are focused on changes to allowed uses in the City's industrial areas. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses. Therefore, these changes are consistent with this policy because they do not change the location or character of the Rivers pattern area.

Policy 3.2. Growth and stability. Direct the majority of growth and change to centers, corridors, and transit station areas, allowing the continuation of the scale and characteristics of Portland's residential neighborhoods.

86. Finding: The FFTZ amendments are focused on changes to allowed uses in the City's industrial areas. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. These changes will not affect the City's policies to direct most growth to centers and corridors or affect the scale and characteristics of Portland's residential neighborhoods.

Policy 3.3. Equitable development. Guide development, growth, and public facility investment to reduce disparities, ensure equitable access to opportunities, mitigate the impacts of development on income disparity, displacement and produce positive outcomes for all Portlanders.

3.3.a. Anticipate, avoid, reduce, and mitigate negative public facility and development impacts, especially where those impacts inequitably burden communities of color, under-served and under-represented communities, and other vulnerable populations.

3.3.b. Make needed investments in areas that are deficient in public facilities to reduce disparities and increase equity. Accompany these investments with proactive measures to avoid displacement and increase affordable housing.

3.3.c. Encourage use of plans, agreements, incentives, and other tools to promote equitable outcomes from development projects that benefit from public financial assistance.

3.3.d. Incorporate requirements into the Zoning Code to provide public and community benefits as a condition for development projects to receive increased development allowances.

3.3.e. When private property value is increased by public plans and investments, require development to address or mitigate displacement impacts and impacts on housing affordability, in ways that are related and roughly proportional to these impacts.

3.3.f. Coordinate housing, economic development, and public facility plans and investments to create an integrated community development approach to restore communities impacted by past decisions.

3.3.g. Encourage developers to engage directly with a broad range of impacted communities to identify potential impacts of private development projects, develop mitigation measures, and provide community benefits to address adverse impacts.

87. Finding: One of the ways to reduce disparities and produce positive outcomes for all Portlanders is to create more opportunities for middle wage jobs, especially for people without college degrees. Those opportunities can be found in Portland's industrial areas. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to encourage growth in Portland's industrial districts. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under current regulations. These changes support the retention of existing fossil fuel terminals by designating them as a limited use, as opposed to a non-conforming use, that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions.

The City Council finds that the other types of anti-displacement mitigation measures identified in this policy are not applicable to Zoning Code changes that affect allowed uses in industrial zones.

Policy 3.4. All ages and abilities. Strive for a built environment that provides a safe, healthful, and attractive environment for people of all ages and abilities.

88. Finding: The City Council interprets this policy to be focused on creating a supportive built environment for children, the elderly and people with disabilities. Specifically, the policy is focused on the built environment of centers, corridors and residential areas where children, the elderly and people with disabilities inhabit the city. The FFTZ amendments are limited to changes allowed in industrial zones and do not impact centers, corridors and residential areas. Therefore, Council finds that this policy does not apply.

To the extent the policy does apply to individuals that work in the industrial zones, the FFTZ amendments maintain Portland's diverse employment opportunities because the changes do not include map changes, nor do they allow for new incompatible land uses in industrial areas. Therefore, these changes will continue to provide the same opportunities for employment in Portland's employment districts.

Policy 3.5. Energy and resource efficiency. Support energy-efficient, resource-efficient, and sustainable development and transportation patterns through land use and transportation planning.

89. Findings: The City Council interprets this policy to mean that land use and transportation planning should aid in creating efficient and sustainable development patterns. The City Council finds that this policy applies to the city as whole and does not require the City Council to ensure that individual businesses or industries are more energy-efficient, resource-efficient, or sustainable. Rather, the policy requires City Council to consider how city-wide development and transportation plans can create patterns that are more efficient. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, will not significantly change the development pattern in Portland's industrial districts. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan. Therefore, these changes will continue to support the sustainable development and transportation patterns across the city as a whole.

Policy 3.6. Land efficiency. Provide strategic investments and incentives to leverage infill, redevelopment, and promote intensification of scarce urban land while protecting environmental quality.

90. Findings: The City Council interprets this policy to guide investment and incentive decisions, this ordinance is not that type of decision. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, which guide the City's infrastructure investment decisions. The City's Enterprise Zone program, which provides a property tax exemption to industrial firms, is one of the programs in which the City of Portland provides strategic assistance to businesses. These changes do not affect that program, and FFTs that make new capital investments remain eligible for that program. The FFTZ amendments do not amend the Greenway Overlay Zone standards or review process. Therefore, the City continues to plan for strategic investments and incentives in the industrial districts, while protecting environmental quality.

Policy 3.7. Integrate nature. Integrate nature and use green infrastructure throughout Portland.

91. Findings: No changes to greenway or environmental overlay zones, stormwater requirements, or tree code are a part of this ordinance. This policy does not apply.

Policy 3.8. Leadership and innovation in design. Encourage high-performance design and development that demonstrates Portland's leadership in the design of the built environment, commitment to a more equitable city, and ability to experiment and generate innovative design solutions.

92. Finding: The FFTZ amendments are use limitations for one type of use found in Portland's industrial areas. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations encourage innovation to FFTs to replace and reconfigure existing storage tank capacity to increase safety.

Policy 3.9. Growth and development. Evaluate the potential impacts of planning and investment decisions, significant new infrastructure, and significant new development on the physical characteristics of neighborhoods and their residents, particularly under-served and under-represented communities, with attention to displacement and affordability impacts. Identify and implement strategies to mitigate the anticipated impacts.

93. Finding: The City Council finds that this policy requires the City Council to assess the impacts of planning decisions on neighborhoods and their residents, particularly those that are under-served and under-represented. The City Council finds that one of the ways that under-served and under-represented communities can be impacted is through access to employment opportunities, especially in industrial areas that can have more jobs with higher wages for people without college degrees. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain employment opportunities in Portland's industrial districts. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under current regulations. These changes apply to one type of use in the industrial zones, therefore, these changes will not have a significant impact on industrial areas, including the employment opportunities. These changes will not impact the physical characteristics of neighborhoods or result in increased displacement or affordability impacts, therefore no mitigations strategies have been identified.

Policy 3.10. Rural, urbanizable, and urban land. Preserve the rural character of rural land outside the Regional Urban Growth Boundary. Limit urban development of urbanizable land beyond the City Limits until it is annexed and full urban services are extended.

94. Finding: The FFTZ amendments apply to one type of use in the industrial zones, therefore, these changes will not have a significant impact on rural land outside the UGB. This policy does not apply.

Policy 3.11. Significant places. Enhance and celebrate significant places throughout Portland with symbolic features or iconic structures that reinforce local identity, histories, and cultures and contribute to way-finding throughout the city. Consider these especially at:

- High-visibility intersections
- Attractions
- Schools, libraries, parks, and other civic places
- Bridges
- Rivers
- Viewpoints and view corridor locations
- Historically or culturally significant places
- Connections to volcanic buttes and other geologic and natural landscape features
- Neighborhood boundaries and transitions

95. Finding: The existing FFTs are near significant places, such as the St Johns Bridge and the Willamette River, but are not considered significant places that should be enhanced or celebrated. This policy does not apply.

Centers

Policy 3.12. Role of centers. Enhance centers as anchors of complete neighborhoods that include concentrations of commercial and public services, housing, employment, gathering places, and green spaces.

Policy 3.13. Variety of centers. Plan for a range of centers across the city to enhance local, equitable access to services, and expand housing opportunities.

Policy 3.14. Housing in centers. Provide housing capacity for enough population to support a broad range of commercial services, focusing higher-density housing within a half-mile of the center core.

Policy 3.15. Investments in centers. Encourage public and private investment in infrastructure, economic development, and community services in centers to ensure that all centers will support the populations they serve.

Policy 3.16. Government services. Encourage the placement of services in centers, including schools and colleges, health services, community centers, daycare, parks and plazas, library services, and justice services.

Policy 3.17. Arts and culture. Ensure that land use plans and infrastructure investments allow for and incorporate arts, culture, and performance arts as central components of centers.

Policy 3.18. Accessibility. Design centers to be compact, safe, attractive, and accessible places, where the street environment makes access by transit, walking, biking, and mobility devices such as wheelchairs, safe and attractive for people of all ages and abilities.

Policy 3.19. Center connections. Connect centers to each other and to other key local and regional destinations, such as schools, parks, and employment areas, by frequent and convenient transit, bicycle sharing, bicycle routes, pedestrian trails and sidewalks, and electric vehicle charging stations.

Policy 3.20. Green infrastructure in centers. Integrate nature and green infrastructure into centers and enhance public views and connections to the surrounding natural features.

96. Finding: Policies 3.12 through 3.20 provide direction on the desired characteristics and functions of centers. The FFTZ amendments do not change the center designations on the Urban Design Framework. The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in centers. These policies do not apply.

Central City

Policy 3.21. Role of the Central City. Encourage continued growth and investment in the Central City, and recognize its unique role as the region's premier center for jobs, services, and civic and cultural institutions that support the entire city and region.

Policy 3.22. Model Urban Center. Promote the Central City as a living laboratory that demonstrates how the design and function of a dense urban center can concurrently provide equitable benefits to human health, the natural environment, and the local economy.

Policy 3.23. Central City employment. Encourage the growth of the Central City's regional share of employment and continue its growth as the region's unique center for innovation and exchange through commerce, employment, arts, culture, entertainment, tourism, education, and government.

Policy 3.24. Central City housing. Encourage the growth of the Central City as Portland's and the region's largest center with the highest concentrations of housing and with a diversity of housing options and services.

Policy 3.25. Transportation hub. Enhance the Central City as the region's multimodal transportation hub and optimize regional access as well as the movement of people and goods among key destinations.

Policy 3.26. Public places. Promote public places and the Willamette River waterfront in the Central City as places of business and social activity and gathering for the people of its districts and the broader region.

97. Finding: Policies 3.21 through 3.26 provide direction on the desired characteristics and functions of the Central City. The FFTZ amendments do not change the Central City boundary on the Urban Design Framework. The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in the Central City. These policies do not apply.

Gateway Regional Center

Policy 3.27 Role of Gateway. Encourage growth and investment in Gateway to enhance its role as East Portland's center of employment, commercial, and public services.

Policy 3.28 Housing. Encourage housing in Gateway, to create East Portland's largest concentration of high-density housing**.**

Policy 3.29 Transportation. Enhance Gateway's role as a regional high-capacity transit hub that serves as an anchor for East Portland's multimodal transportation system.

Policy 3.30 Public places. Enhance the public realm and public places in Gateway to provide a vibrant and attractive setting for business and social activity that serves East Portland residents and the region.

98. Finding: Policies 3.27 through 3.30 provide direction on the desired characteristics and functions of the Gateway Regional Center. The FFTZ amendments do not change the regional center boundary on the Urban Design Framework. The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in the Gateway Regional Center. These policies do not apply.

Town Centers

Policy 3.31 Role of Town Centers. Enhance Town Centers as successful places that serve the needs of surrounding neighborhoods as well as a wider area, and contain higher concentrations of employment, institutions, commercial and community services, and a wide range of housing options.

Policy 3.32 Housing. Provide for a wide range of housing types in Town Centers, which are intended to generally be larger in scale than the surrounding residential areas. There should be sufficient zoning capacity within a half-mile walking distance of a Town Center to accommodate 7,000 households.

Policy 3.33 Transportation. Improve Town Centers as multimodal transportation hubs that optimize access from the broad area of the city they serve and are linked to the region's high-capacity transit system.

Policy 3.34 Public places. Provide parks or public squares within or near Town Centers to support their roles as places of focused business and social activity.

99. Finding: Policies 3.31 through 3.34 provide direction on the desired characteristics and functions of the town centers. The FFTZ amendments do not change the boundary any of the Town Centers on the Urban Design Framework. The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in town centers. These policies do not apply.

Neighborhood Centers

Policy 3.35 Role of Neighborhood Centers. Enhance Neighborhood Centers as successful places that serve the needs of surrounding neighborhoods. In Neighborhood Centers, provide for higher concentrations of development, employment, commercial and community services, and a wider range of housing options than the surrounding neighborhoods.

Policy 3.36 Housing. Provide for a wide range of housing types in Neighborhood Centers, which are intended to generally be larger in scale than the surrounding residential areas, but smaller than Town Centers. There should be sufficient zoning capacity within a half-mile walking distance of a Neighborhood Center to accommodate 3,500 households.

Policy 3.37 Transportation. Design Neighborhood Centers as multimodal transportation hubs that are served by frequent-service transit and optimize pedestrian and bicycle access from adjacent neighborhoods.

Policy 3.38 Public places. Provide small parks or plazas within or near Neighborhood Centers to support their roles as places of local activity and gathering.

100. Finding: Policies 3.35 through 3.38 provide direction on the desired characteristics and functions of neighborhood centers. The FFTZ amendments do not change the neighborhood center boundaries on the Urban Design Framework. The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in neighborhood centers. These policies do not apply.

Inner Ring Districts

Policy 3.39 Growth. Expand the range of housing and employment opportunities in the Inner Ring Districts. Emphasize growth that replaces gaps in the historic urban fabric, such as redevelopment of surface parking lots and 20th century auto-oriented development.

Policy 3.40 Corridors. Guide growth in corridors to transition to mid-rise scale close to the Central City, especially along Civic Corridors.

Policy 3.41 Distinct identities. Maintain and enhance the distinct identities of the Inner Ring Districts and their corridors. Use and expand existing historic preservation and design review tools to accommodate growth in ways that identify and preserve historic resources and enhance the distinctive characteristics of the Inner Ring Districts, especially in areas experiencing significant development.

Policy 3.42 Diverse residential areas. Provide a diversity of housing opportunities in the Inner Ring Districts' residential areas. Encourage approaches that preserve or are compatible with existing historic properties in these areas. Acknowledge that these areas are historic assets and should retain their established characteristics and development patterns, even as Inner Ring centers and corridors grow. Apply base zones in a manner that takes historic character and adopted design guidelines into account.

Policy 3.43 Active transportation. Enhance the role of the Inner Ring Districts' extensive transit, bicycle, and pedestrian networks in conjunction with land uses that optimize the ability for more people to utilize this network. Improve the safety of pedestrian and bike connections to the Central City. Strengthen transit connections between the Inner Ring Districts and to the Central City.

101. Finding: Policies 3.39 through 3.43 provide direction on the desired characteristics and functions of the Inner Ring Districts. The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in the Inner Ring Districts. These policies do not apply.

Corridors

Policy 3.44. Growth and mobility. Coordinate transportation and land use strategies along corridors to accommodate growth and mobility needs for people of all ages and abilities.

Policy 3.45. Connections. Improve corridors as multimodal connections providing transit, pedestrian, bicycle, and motor vehicle access and that serve the freight needs of centers and neighborhood business districts.

Policy 3.46. Design. Encourage street design that balances the important transportation functions of corridors with their roles as the setting for commercial activity and residential living.

Policy 3.47. Green infrastructure in corridors. Enhance corridors with distinctive green infrastructure, including landscaped stormwater facilities, extensive tree plantings, and other landscaping that both provide environmental function and contribute to a quality pedestrian environment.

102. Finding: Policies 3.44 through 3.47 provide direction on the desired characteristics and functions of corridors. The FFTZ amendments do not change the boundary of corridors on the Urban Design Framework. The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in corridors. These policies do not apply.

Civic Corridors

Policy 3.48. Integrated land use and mobility. Enhance Civic Corridors as distinctive places that are models of ecological urban design, with transit-supportive densities of housing and employment, prominent street trees and other green features, and high-quality transit service and pedestrian and bicycle facilities.

Policy 3.49. Design great places. Improve public streets and sidewalks along Civic Corridors to support the vitality of business districts, create distinctive places, provide a safe, healthy, and attractive pedestrian environment, and contribute to quality living environments for residents.

Policy 3.50. Mobility corridors. Improve Civic Corridors as key mobility corridors of citywide importance that accommodate all modes of transportation within their right-of-way or on nearby parallel routes.

Policy 3.51. Freight. Maintain freight mobility and access on Civic Corridors that are also Major or Priority Truck Streets.

103. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in civic corridors. These policies do not apply.

Neighborhood Corridors

Policy 3.52. Neighborhood Corridors. Enhance Neighborhood Corridors as important places that support vibrant neighborhood business districts with quality multi-family housing, while providing transportation connections that link neighborhoods.

104. Finding: Policies 3.48 through 3.51 provide direction on the desired characteristics and functions of civic corridors. The FFTZ amendments do not change the boundary of civic corridors on the Urban Design Framework. The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in neighborhood corridors. These policies do not apply.

Transit Station Areas

Policy 3.53. Transit-oriented development. Encourage transit-oriented development and transit-supportive concentrations of housing and jobs, and multimodal connections at and adjacent to high-capacity transit stations.

Policy 3.54. Community connections. Integrate transit stations into surrounding communities and enhance pedestrian and bicycle facilities (including bike sharing) to provide safe and accessible connections to key destinations beyond the station area.

Policy 3.55. Transit station area safety. Design transit areas to improve pedestrian, bicycle, and personal safety.

Policy 3.56. Center stations. Encourage transit stations in centers to provide high density concentrations of housing and commercial uses that maximize the ability of residents to live close to both high-quality transit and commercial services.

Policy 3.57. Employment stations. Encourage concentrations of jobs and employment-focused land uses in and around stations in employment-zoned areas.

Policy 3.58. Transit neighborhood stations. Encourage concentrations of mixed-income residential development and supportive commercial services close to transit neighborhood stations. Transit neighborhood stations serve mixed-use areas that are not in major centers.

Policy 3.59. Destination stations. Enhance connections between major destinations and transit facilities and strengthen the role of these station areas as places of focused activity.

105. Finding: Policies 3.53 through 3.59 provide direction on the desired characteristics and functions of transit station areas. The FFTZ amendments do not change the boundary of civic corridors on the Urban Design Framework. The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in transit station areas. These policies do not apply.

City Greenways

Policy 3.60. Connections. Create a network of distinctive and attractive City Greenways that link centers, parks, schools, rivers, natural areas, and other key community destinations.

Policy 3.61. Integrated system. Create an integrated City Greenways system that includes regional trails through natural areas and along Portland's rivers, connected to neighborhood greenways, and heritage parkways.

Policy 3.62. Multiple benefits. Design City Greenways that provide multiple benefits that contribute to Portland's pedestrian, bicycle, green infrastructure, and parks and open space systems.

Policy 3.63. Design. Use design options such as distinctive street design, motor vehicle diversion, landscaping, tree plantings, scenic views, and other appropriate design options, to create City Greenways that extend the experience of open spaces and nature into neighborhoods, while improving stormwater management and calming traffic.

106. Finding: Policies 3.60 through 3.63 provide direction on the desired characteristics and functions of city greenways. The FFTZ amendments do not change the city greenway designations on the Urban Design Framework. The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located along city greenways. These policies do not apply.

Urban habitat corridors

Policy 3.64. Urban habitat corridors. Establish a system of connected, well-functioning, and diverse habitat corridors that link habitats in Portland and the region, facilitate safe fish and wildlife access and movement through and between habitat areas, enhance the quality and connectivity of existing habitat corridors, and establish new habitat corridors in developed areas.

Policy 3.65. Habitat connection tools. Improve habitat corridors using a mix of tools including natural resource protection, property acquisition, natural resource restoration, tree planting and landscaping with native plants, and ecological design integrated with new development.

Policy 3.66. Connect habitat corridors. Ensure that planned connections between habitat corridors, greenways, and trails are located and designed to support the functions of each element, and create positive interrelationships between the elements, while also protecting habitat functions, fish, and wildlife.

107. Finding: Policies 3.64 through 3.66 provide direction on the desired characteristics and functions of urban habitat corridors. The FFTZ amendments do not change the urban habitat corridor designations on the Urban Design Framework. The Willamette and Columbia Rivers are considered urban habitat corridors. The FFTZ amendments support the urban habitat corridor policies by reducing the risk associated with a major earthquake. The first step in making the current situation better is to ensure that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a high risk area. The FFTZ amendments are a

regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which can minimize environmental impacts in the event of a major earthquake. No changes to the environmental or greenway overlay zones are proposed as part of this project, therefore the natural resource values and functions that contribute the habitat functions will be maintained.

Employment areas

Policy 3.67. Employment area geographies. Consider the land development and transportation needs of Portland's employment geographies when creating and amending land use plans and making infrastructure investments.

108. The City Council interprets this policy to require the City Council to consider the development and transportation needs of Portland's employment geographies when making planning and investment decisions, but the policy does not require the City Council to accommodate all industries and all geographies.

As described in the Economic Opportunities Analysis (EOA), Portland has a diverse economy with a wide range of businesses and employment opportunities that are distributed across the Central City, neighborhood commercial areas, campus institutions and industrial areas. The FFTZ amendments maintain Portland's diverse economy because the changes do not include map changes, nor do they allow for new incompatible land uses in industrial areas. Therefore, these changes will continue to provide the same opportunities for employment in Portland's employment area geographies. The FFTZ regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's employment districts. Further, the City Council considered the unique needs of the FFTs and mitigated the limits on expansion of fossil fuel storage capacity by designating existing fossil fuel terminals as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their intermodal facilities and supports opportunities for growth through a number of exceptions, such as aviation or renewable fuels, to the storage capacity restrictions.

Policy 3.68. Regional Truck Corridors. Enhance designated streets to accommodate forecast freight growth and support intensified industrial use in nearby freight districts. *See Figure 3-7 — Employment Areas.* Designated regional truckways and priority truck streets (Transportation System Plan classifications are shown to illustrate this network).

109. Finding: The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The City Council interprets this policy to acknowledge the role that regional truck corridors play in our transportation system and to take steps to improve those functions. Portland's approach to regional truck corridors is unchanged because the FFTZ amendments change the Zoning Code and do not amend the Citywide System Plan or the Transportation System Plan. This policy does not apply.

Rivers Pattern Area

Policy 3.69. Historic and multi-cultural significance. Recognize, restore, and protect the historic and multi-cultural significance of the Willamette and Columbia Rivers, including current activities such as subsistence fishing of legally-permitted fish species.

110. Finding: The verb "recognize" is defined in the 2035 Comprehensive Plan as to acknowledge and treat as valid. The City Council interprets this policy to acknowledge the multi-cultural significance that the rivers play in our community and to take steps to improve those functions. Most of Portland's employment and industrial zones, including the Portland Harbor, are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. Continuing to allow the unlimited increase in storage capacity at FFTs in a high risk area increases the risk to the Willamette and Columbia Rivers. The FFTZ amendments are a regulatory approach to help protect the rivers by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which is an improvement over the current regulations that allow for unlimited growth in FFTs.

Policy 3.70. River transportation. Recognize and enhance the roles of the Willamette and Columbia rivers as part of Portland's historic, current, and future transportation infrastructure, including for freight, commerce, commuting, and other public and private transportation functions.

111. Finding: The verb "recognize" is defined in the 2035 Comprehensive Plan as to acknowledge and treat as valid. The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The City Council interprets this policy to acknowledge the role that the rivers play in our transportation system and to take steps to improve those functions. The City Council finds that the policy concerns transportation infrastructure, which is managed through the CSP and TSP. This policy does not apply because the ordinance does not amend the City's adopted CSP or TSP.

Policy 3.71. Recreation. Improve conditions along and within the Willamette and Columbia rivers to accommodate a diverse mix of recreational users and activities. Designate and invest in strategically-located sites along the length of Portland's riverfronts for passive or active recreation activities that are compatible with nearby land uses, historically and culturally important sites, significant habitat areas, restoration sites, and native fish and wildlife usage.

112. Finding: Six of the 11 existing FFTs have frontage on the Willamette River. However, there are no recreation access points near these terminals. These amendments do not change any plans for recreation sites on the Willamette and Columbia rivers, therefore this policy does not apply.

Policy 3.72 Industry and port facilities. Enhance the regionally significant economic infrastructure that includes Oregon's largest seaport and largest airport, unique multimodal freight, rail, and harbor access; the region's critical energy hub; and proximity to anchor manufacturing and distribution facilities.

113. Finding: The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The City Council finds that the policy requires Council to improve the regionally significant infrastructure, which is done through the CSP and TSP. This policy does not apply because the ordinance does not amend the City's adopted CSP or TSP, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the industrial areas where the FFTs are located.

Further, the City Council acknowledges that the FFTs make up a significant portion of the region's critical energy infrastructure hub in the Portland Harbor. The FFTZ amendments support private investment to enhance the unique multimodal freight, rail, and harbor access because the

ordinance only restricts new fossil fuel storage tank capacity and does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system. Existing FFTs and other industrial uses can make investments in multimodal freight facilities.

Policy 3.73. Habitat. Enhance the roles of the Willamette and Columbia rivers and their confluence as an ecological hub that provides locally and regionally significant habitat for fish and wildlife and habitat restoration opportunities.

114. Finding: Six of the 11 existing FFTs have frontage on the Willamette River. These parcels will continue to be subject to development regulations for flood plains and natural resources that protect significant habitat. Furthermore, no changes to existing protections in the greenway overlay zones are proposed. This policy does not apply.

Policy 3.74. Commercial activities. Enhance the roles of the Willamette and Columbia rivers in supporting local and regional business and commerce, including commercial fishing, tourism, recreation, and leisure.

115. Finding: The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The FFTZ regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's employment districts, therefore, the FFTZ amendments support Portland's diverse economy because the changes do not include map changes, nor do they allow for new incompatible land uses in industrial areas, therefore there is no adverse impact to the land supply and economic opportunities along the Willamette and Columbia rivers. The limits on expansion of fossil fuel storage capacity are mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their intermodal facilities and supports opportunities for growth through a number of exceptions, such as aviation or renewable fuels, to the storage capacity restrictions. In addition, the ordinance does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system. Existing FFTs and other industrial uses can make investments in multimodal freight facilities.

With respect to fishing, tourism, recreation and leisure, the City Council interprets this policy to require that the first step in making the current situation better is to ensure that the situation does not get worse. Continuing to allow the increase in FFTs in a high risk area increases the risk to other businesses that rely on the rivers. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which will be an improvement compared to the current regulations that allow for unlimited growth in FFTs. The FFTZ regulations support other commercial uses of the rivers by designating existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Further, the use limitations (33.140.100.B.17.a) provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety.

Policy 3.75. River neighborhoods. Enhance the strong river orientation of residential areas that are located along the Willamette and Columbia Rivers.

116. Finding: The FFTZ amendments regulate the allowed uses in Portland's industrial areas. None of the FFTs are in residential areas. This policy does not apply.

Policy 3.76. River access. Enhance and complete Portland's system of river access points and riverside trails, including the Willamette Greenway Trail, and strengthen active transportation connections between neighborhoods and the rivers.

117. Finding: Six of the 11 existing FFTs have frontage on the Willamette River. However, there are no access points near these terminals. These amendments do not change any plans for recreation sites on the Willamette and Columbia rivers, therefore this policy does not apply.

Policy 3.77. River management and coordination. Coordinate with federal, state, regional, special districts, and other agencies to address issues of mutual interest and concern, including economic development, recreation, water transportation, flood and floodplain management and protection, regulatory compliance, permitting, emergency management, endangered species recovery, climate change preparation, Portland Harbor Superfund, brownfield cleanup, and habitat restoration.

118. Finding: The City Council interprets this policy to guide intergovernmental coordination on the management of the rivers. Other government agencies received notice from the 35-day DLCD notice and the City's legislative notice. In the initial adoption of the ordinance, the City received testimony from the Port of Portland. The City responded to the issues raised by the Port by amending the code to include an exception for the storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, drydock, ship or barge servicing facility, rail yard, or as part of a fleet vehicle servicing facility. The City did not receive any requests from other government agencies to modify the FFTZ amendments.

The City has an established procedure for coordinated review of river-related development, including docks, in areas where city, state and federal agencies all have jurisdiction. The Streamlining Team was established pursuant to a 2003 Intergovernmental Agreement between the City of Portland (City), NOAA Fisheries, Army Corps of Engineers (Corps), and the U.S. Fish and Wildlife Service (USFWS). The FFTZ amendments do not change these procedures and there is no impact to this coordinated process.

Policy 3.78 Columbia River. Enhance the role of the Columbia River for river dependent industry, fish and wildlife habitat, subsistence and commercial fisheries, floating- and land-based neighborhoods, recreational uses, and water transportation.

119. Finding: The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The City Council interprets this policy to acknowledge the role that the Columbia River plays in our city and to take steps to improve those functions. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will continue to provide the same opportunities on the Columbia River. The City Council interprets this goal to apply to districts as whole and not to individual businesses or sectors of business. These regulations apply to only one type of business that is not found on the Columbia River. The remaining industrial uses continue to operate under current regulations.

Policy 3.79 Willamette River North Reach. Enhance the role of the Willamette River North Reach for river dependent industry, fish and wildlife habitat, and as an amenity for riverfront neighborhoods and recreational users.

120. Finding: The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The FFTZ regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's employment districts, therefore, the FFTZ amendments support Portland's diverse economy because the

changes do not include map changes, nor do they allow for new incompatible land uses in industrial areas, therefore there is no adverse impact to the land supply and economic opportunities along the Willamette and Columbia rivers. The limits on expansion of fossil fuel storage capacity are mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their intermodal facilities and supports opportunities for growth through a number of exceptions, such as aviation or renewable fuels, to the storage capacity restrictions. These regulations apply to only one type of river dependent industry. The remaining industrial uses continue to operate under current regulations.

Policy 3.80. Willamette River Central Reach. Enhance the role of the Willamette River Central Reach as the Central City and region's primary riverfront destination for recreation, history and culture, emergency response, water transportation, and as habitat for fish and wildlife.

Policy 3.81 Willamette River South Reach. Enhance the role of the Willamette River South Reach as fish and wildlife habitat, a place to recreate, and as an amenity for riverfront neighborhoods and others.

121. Finding: For policies 3.80 and 3.81, the City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The City Council interprets this policy to acknowledge the role that the Willamette River plays in our city and to take steps to improve those functions. These regulations apply to only one type of business that is not found on Central and South reaches of the Willamette River. The remaining industrial uses continue to operate under current regulations. These policies do not apply.

Policy 3.82. Willamette River Greenway. Maintain multi-objective plans and regulations to guide development, infrastructure investments, and natural resource protection and enhancement within and along the Willamette Greenway.

122. Finding: The City Council finds that this policy is implemented through the Greenway Overlay Zones (PCC 33.440), which is not amended by this ordinance. This policy does not apply.

Central City Pattern Area

Policy 3.83. Central City districts. Enhance the distinct identities of the Central City's districts.

Policy 3.84. Central City river orientation. Enhance and strengthen access and orientation to the Willamette River in the Central City and increase river-focused activities.

Policy 3.85. Central City pedestrian system. Maintain and expand the Central City's highly interconnected pedestrian system.

Policy 3.86. Central City bicycle system. Expand and improve the Central City's bicycle system.

123. Finding: Policies 3.83 through 3.86 provide direction on the desired characteristics and functions of the Central City Pattern Area. The FFTZ amendments affect allowed uses in industrial zones outside the Central City. These policies do not apply.

Inner Neighborhoods Pattern Area

Policy 3.87 Inner Neighborhoods main streets. Maintain and enhance the Streetcar Era pattern of street-oriented buildings along Civic and Neighborhood corridors.

Policy 3.88 Inner Neighborhoods street patterns. Preserve the area's urban fabric of compact blocks and its highly interconnected grid of streets.

Policy 3.89 Inner Neighborhoods infill. Fill gaps in the urban fabric through infill development on

vacant and underutilized sites and in the reuse of historic buildings on adopted inventories.

Policy 3.90 Inner Neighborhoods active transportation. Use the extensive street, sidewalk, and bikeway system and multiple connections to the Central City as a key part of Portland's active transportation system

Policy 3.91 Inner Neighborhoods residential areas. Continue the patterns of small, connected blocks, regular lot patterns, and streets lined by planting strips and street trees in Inner Neighborhood residential areas.

124. Finding: Policies 3.87 through 3.91 provide direction on the desired characteristics and functions of the Inner Neighborhoods Pattern Area. The FFTZ amendments affect allowed uses in industrial zones. There are not existing FFTs in the Inner Neighborhoods Pattern Area. These policies do not apply.

Eastern Neighborhoods Pattern Area

Policy 3.92 Eastern Neighborhoods street, block, and lot pattern. Guide the evolving street and block system in the Eastern Neighborhoods in ways that build on positive aspects of the area's large blocks, such as opportunities to continue mid-block open space patterns and create new connections through blocks that make it easier to access community destinations.

Policy 3.93 Eastern Neighborhoods site development. Require that land be aggregated into larger sites before land divisions and other redevelopment occurs. Require site plans which advance design and street connectivity goals.

Policy 3.94 Eastern Neighborhoods trees and natural features. Encourage development and right-of-way design that preserves and incorporates Douglas fir trees and groves, and that protects the area's streams, forests, wetlands, steep slopes, and buttes.

Policy 3.95 Eastern Neighborhoods buttes. Enhance public views of the area's skyline of buttes and stands of tall Douglas fir trees.

Policy 3.96 Eastern Neighborhoods corridor landscaping. Encourage landscaped building setbacks along residential corridors on major streets.

Policy 3.97 Eastern Neighborhoods active transportation. Enhance access to centers, employment areas, and other community destinations in Eastern Neighborhoods by ensuring that corridors have safe and accessible pedestrian and bicycle facilities and creating additional secondary connections that provide low-stress pedestrian and bicycle access.

125. Finding: Policies 3.92 through 3.97 provide direction on the desired characteristics and functions of the Eastern Neighborhoods Pattern Area. The FFTZ amendments affect allowed uses in industrial zones. There are not existing FFTs in the Eastern Neighborhoods Pattern Area. These policies do not apply.

Western Neighborhoods Pattern Area

Policy 3.98 Western Neighborhoods village character. Enhance the village character of the Western Neighborhoods' small commercial districts and increase opportunities for more people to live within walking distance of these neighborhood anchors.

Policy 3.99 Western Neighborhoods active transportation. Provide safe and accessible pedestrian and bicycle connections, as well as off-street trail connections, to and from residential neighborhoods.

Policy 3.100 Western Neighborhoods development. Encourage new development and infrastructure to be designed to minimize impacts on the area's streams, ravines, and forested slopes.

Policy 3.101 Western Neighborhoods habitat corridors. Preserve, enhance, and connect the area's network of habitat areas and corridors, streams, parks, and tree canopy.

Policy 3.102 Western Neighborhoods trails. Develop pedestrian-oriented connections and enhance the Western Neighborhoods' distinctive system of trails to increase safety, expand mobility, access to nature, and active living opportunities in the area.

126. Finding: Policies 3.98 through 3.102 provide direction on the desired characteristics and functions of the Western Neighborhoods Pattern Area. The FFTZ amendments affect allowed uses in industrial zones. There are not existing FFTs in the Western Neighborhoods Pattern Area. These policies do not apply.

Chapter 4: Design and Development

Goal 4.A: Context-sensitive design and development. New development is designed to respond to and enhance the distinctive physical, historic, and cultural qualities of its location, while accommodating growth and change.

127. Finding: The City Council interprets the goals and policies of this chapter to address site design and the relationship between building, site, streets and public realm, historic/ cultural preservation, and the integration of nature. The City Council finds that this chapter is about how Portland looks and functions and how development should respect context. Most importantly, this chapter provides the direction to protect human and environmental health and minimizes risk from natural hazards.

The FFTZ amendments regulate a land use (Bulk Fossil Fuel Terminals), but do not impose new standards that regulate site design, or the relationship to the street or adjacent land uses. Additionally, the changes do not impact how the terminals function beyond limits to fossil fuel storage capacity.

Goal 4.B: Historic and cultural resources. Historic and cultural resources are integral parts of an urban environment that continue to evolve and are preserved.

128. Finding: Historic and cultural resources are located throughout the City, but very few are located in the industrial zones where the FFTZ amendments change the allowed uses. There are no designated Historic Landmarks or Districts in or immediately adjacent to any of the existing FFTs. Existing historic resource protections are not being amended (Chapter 33.445).

Goal 4.C: Human and environmental health. Neighborhoods and development are efficiently designed and built to enhance human and environmental health: they protect safety and livability; support local access to healthy food; limit negative impacts on water, hydrology, and air quality; reduce carbon emissions; encourage active and sustainable design; protect wildlife; address urban heat islands; and integrate nature and the built environment.

129. Finding: As relevant here, the City Council finds that this goal seeks to ensure that development is designed and built in a manner that improves human and environmental health. Human and environmental health are improved by development that results in more safety and minimizes negative impacts on the environment. Portland's FFTs are within a disaster-prone area that is at risk for a catastrophic Cascadia earthquake disaster. Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the

2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks to human and environmental health in the event of a major earthquake.

The City Council interprets this goal to mean that the first step in enhancing human and environmental health is to stop increasing the risk. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and Portland as a whole. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can protect human and environmental health.

Goal 4.D: Urban resilience. Buildings, streets, and open spaces are designed to ensure long-term resilience and to adjust to changing demographics, climate, and economy, and withstand and recover from natural disasters.

130. Finding: Portland's FFTs are within a disaster-prone area that is at risk for a catastrophic Cascadia earthquake disaster. Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks to human and environmental health in the event of a major earthquake.

The City Council interprets this goal to mean building are designed for long-term resilience and can recover from natural disasters. The City Council finds that the first step in making Portland more resilient is to stop increasing the risk. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

Context

Policy 4.1. Pattern areas. Encourage building and site designs that respect the unique built, natural, historic, and cultural characteristics of Portland's five pattern areas described in Chapter 3: Urban Form.

Policy 4.2. Community identity. Encourage the development of character-giving design features that are responsive to place and the cultures of communities.

Policy 4.3. Site and context. Encourage development that responds to and enhances the positive qualities of site and context — the neighborhood, the block, the public realm, and natural features.

131. Finding: The City Council interprets policies 4.1 through 4.3 as to provide general policy direction on how to consider context for design and development standards. The City Council finds that in the City's industrial areas, the physical design features are less important and are less sensitive to changes from new development. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones.

Policy 4.4. Natural features and green infrastructure. Integrate natural and green infrastructure such as trees, green spaces, ecoroofs, gardens, green walls, and vegetated stormwater management systems, into the urban environment. Encourage stormwater facilities that are designed to be a functional and attractive element of public spaces, especially in centers and corridors.

132. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones, including those that apply to natural features and green infrastructure.

Policy 4.5. Pedestrian-oriented design. Enhance the pedestrian experience throughout Portland through public and private development that creates accessible, safe, and attractive places for all those who walk and/or use wheelchairs or other mobility devices.

133. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones, including those that apply to pedestrian-oriented design features.

Policy 4.6. Street orientation. Promote building and site designs that enhance the pedestrian experience with windows, entrances, pathways, and other features that provide connections to the street environment.

134. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones, including those that apply to street orientation.

Policy 4.7. Development and public spaces. Guide development to help create high-quality public places and street environments while considering the role of adjacent development in framing, shaping, and activating the public space of streets and urban parks.

135. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones.

Policy 4.8. Alleys. Encourage the continued use of alleys for parking access, while preserving pedestrian access. Expand the number of alley-facing accessory dwelling units.

136. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones, including those that apply to alleys.

Policy 4.9. Transitional urbanism. Encourage temporary activities and structures in places that are transitioning to urban areas to promote job creation, entrepreneurship, active streets, and human interaction.

137. Finding: The City Council interprets this policy to relate to temporary commercial activities and public gathering places outside of industrial areas. This policy does not apply.

Health and safety

Policy 4.10. Design for active living. Encourage development and building and site design that promotes a healthy level of physical activity in daily life.

Policy 4.11. Access to light and air. Provide for public access to light and air by managing and shaping the height and mass of buildings while accommodating urban-scale development.

Policy 4.12. Privacy and solar access. Encourage building and site designs that consider privacy and solar access for residents and neighbors while accommodating urban-scale development.

Policy 4.13. Crime-preventive design. Encourage building, site, and public infrastructure design approaches that help prevent crime.

Policy 4.14. Fire prevention and safety. Encourage building and site design that improves fire prevention, safety, and reduces seismic risks.

138. Finding: The City Council interprets policies 4.10 through 4.14 to relate to development in areas where people live. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. This policy does not apply.

Residential areas

Policy 4.15. Residential area continuity and adaptability. Encourage more housing choices to accommodate a wider diversity of family sizes, incomes, and ages, and the changing needs of households over time. Allow adaptive reuse of existing buildings, the creation of accessory dwelling units, and other arrangements that bring housing diversity that is compatible with the general scale and patterns of residential areas.

Policy 4.16. Scale and patterns. Encourage design and development that complements the general scale, character, and natural landscape features of neighborhoods. Consider building forms, scale, street frontage relationships, setbacks, open space patterns, and landscaping. Allow for a range of architectural styles and expression.

Policy 4.17. **Demolitions.** Encourage alternatives to the demolition of sound housing, such as rehabilitation and adaptive reuse, especially affordable housing, and when new development would provide no additional housing opportunities beyond replacement.

Policy 4.18. **Compact single-family options**. Encourage development and preservation of small resource-efficient and affordable single-family homes in all areas of the city.

Policy 4.19. Resource efficient and healthy residential design and development. Support resource efficient and healthy residential design and development.

139. Finding: The City Council interprets policies 4.15 through 4.19 to relate to development inside residential areas. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in residential areas. This policy does not apply.

Design and development of centers and corridors

Policy 4.20. Walkable scale. Focus services and higher-density housing in the core of centers to support a critical mass of demand for commercial services and more walkable access for customers.

Policy 4.21. Street environment. Encourage development in centers and corridors to include amenities that create a pedestrian-oriented environment and provide places for people to sit, spend time, and gather.

Policy 4.22. Relationship between building height and street size. Encourage development in centers and corridors that is responsive to street space width, thus allowing taller buildings on wider streets.

Policy 4.23. Design for pedestrian and bicycle access. Provide accessible sidewalks, high-quality bicycle access, and frequent street connections and crossings in centers and corridors.

Policy 4.24. Drive-through facilities. Prohibit drive through facilities in the Central City, and limit new development of new ones in the Inner Ring Districts and centers to support a pedestrian-oriented

environment.

Policy 4.25. Residential uses on busy streets. Improve the livability of places and streets with high motor vehicle volumes. Encourage landscaped front setbacks, street trees, and other design approaches to buffer residents from street traffic.

Policy 4.26. Active gathering places. Locate public squares, plazas, and other gathering places in centers and corridors to provide places for community activity and social connections. Encourage location of businesses, services, and arts adjacent to these spaces that relate to and promote the use of the space.

Policy 4.27. Protect defining features. Protect and enhance defining places and features of centers and corridors, including landmarks, natural features, and historic and cultural resources.

Policy 4.28. Historic buildings in centers and corridors. Protect and encourage the restoration and improvement of historic resources in centers and corridors.

Policy 4.29. Public art. Encourage new development and public places to include design elements and public art that contribute to the distinct identities of centers and corridors, and that highlight the history and diverse cultures of neighborhoods.

140. Finding: Policies 4.20 through 4.29 provide direction regarding design and development in centers and corridors. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in centers and corridors. There are no existing FFTs in centers and corridors. These policies does not apply.

Transitions

Policy 4.30. Scale transitions. Create transitions in building scale in locations where higher-density and higher-intensity development is adjacent to smaller-scale single-dwelling zoning. Ensure that new high-density and large-scale infill development adjacent to single dwelling zones incorporates design elements that soften transitions in scale and limit light and privacy impacts on adjacent residents.

Policy 4.31. Land use transitions. Improve the interface between non-residential uses and residential uses in areas where commercial or employment uses are adjacent to residentially-zoned land.

Policy 4.32. Industrial edge. Protect non-industrially zoned parcels from the adverse impacts of facilities and uses on industrially zoned parcels using a variety of tools, including but not limited to vegetation, physical separation, land acquisition, and insulation to establish buffers between industrial sanctuaries and adjacent residential or mixed-use areas to protect both the viability of long-term industrial operations and the livability of adjacent areas.

141. Finding: Policies 4.30 through 4.32 provide direction regarding transitions between different types of land uses. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. These policies do not apply.

Off-site impacts

Policy 4.33. Off-site impacts. Limit and mitigate public health impacts, such as odor, noise, glare, light pollution, air pollutants, and vibration that public facilities, land uses, or development may have on adjacent residential or institutional uses, and on significant fish and wildlife habitat areas. Pay attention to limiting and mitigating impacts to under-served and under-represented communities.

142. Finding: The 2035 Comprehensive Plan defines the verb “limit” to mean to minimize or reduce

something or the effects of something relative to the current situation or to a potential future situation. The verb "mitigate", which is not defined in the 2035 Comprehensive Plan, means to make less severe. The City Council finds that this policy relates to impacts that public facilities or land uses may have on neighboring residential or institutional uses and on significant habitats. Further, the City Council interprets this policy to apply to non-residential uses, such as those allowed in commercial and employment zones, that can have negative public health impacts on adjacent residential and institutional uses. The FFTZ amendments do not change any of the development standards that regulate these types of uses. These policies do not apply.

Policy 4.34. Auto-oriented facilities, uses, and exterior displays. Minimize the adverse impacts of highways, auto-oriented uses, vehicle areas, drive-through areas, signage, and exterior display and storage areas on adjacent residential uses.

Policy 4.35. Noise impacts. Encourage building and landscape design and land use patterns that limit and/or mitigate negative noise impacts to building users and residents, particularly in areas near freeways, regional truckways, major city traffic streets, and other sources of noise.

Policy 4.36. Air quality impacts. Encourage building and landscape design and land use patterns that limit and/or mitigate negative air quality impacts to building users and residents, particularly in areas near freeways, regional truckways, high traffic streets, and other sources of air pollution.

Policy 4.37. Diesel emissions. Encourage best practices to reduce diesel emissions and related impacts when considering land use and public facilities that will increase truck or train traffic.

Policy 4.38. Light pollution. Encourage lighting design and practices that reduce the negative impacts of light pollution, including sky glow, glare, energy waste, impacts to public health and safety, disruption of ecosystems, and hazards to wildlife.

Policy 4.39. Airport noise. Partner with the Port of Portland to require compatible land use designations and development within the noise-affected area of Portland International Airport, while providing disclosure of the level of aircraft noise and mitigating the potential impact of noise within the affected area.

Policy 4.40. Telecommunication facility impacts. Mitigate the visual impact of telecommunications and broadcast facilities near residentially-zoned areas through physical design solutions.

143. Finding: Policies 4.34 through 4.40 provide direction regarding transitions between different types of land uses. The City Council interprets these policies to apply to non-residential uses that can have negative impacts on adjacent residential and institutional uses. The FFTZ amendments do not change any of the development standards that regulate these types of uses. These policies do not apply.

Scenic resources

Policy 4.41. Scenic resources**.** Enhance and celebrate Portland's scenic resources to reinforce local identity, histories, and cultures and contribute toward way-finding throughout the city. Consider views of mountains, hills, buttes, rivers, streams, wetlands, parks, bridges, the Central City skyline, buildings, roads, art, landmarks, or other elements valued for their aesthetic appearance or symbolism.

Policy 4.42. Scenic resource protection. Protect and manage designated significant scenic resources by maintaining scenic resource inventories, protection plans, regulations, and other tools.

Policy 4.43. Vegetation management. Maintain regulations and other tools for managing vegetation in a manner that preserves or enhances designated significant scenic resources.

Policy 4.44. Building placement, height, and massing. Maintain regulations and other tools related to building placement, height, and massing to preserve designated significant scenic resources.

Policy 4.45. Future development. Encourage new public and private development to create new public viewpoints providing views of Portland's rivers, bridges, surrounding mountains, hills and buttes, the Central City skyline, and other landmark features.

144. Finding: Policies 4.41 through 4.45 provide direction regarding Portland's designated scenic resources. The FFTZ amendments do not affect management of designated scenic resources. In 1991, the City adopted the Scenic Resources Protection Plan and applied a scenic (s) overlay zone to protect significant scenic resources. Two of the FFTs (BP West Coast and NuStar/Shore Terminals) are in a (s) overlay zone. The scenic resource protections (Chapter 33.480) are not amended by this ordinance and the height limits associated with the (s) overlay zone will continue to apply to the two FFT sites.

Historic and cultural resources

Policy 4.46. Historic and cultural resource protection. Protect and encourage the restoration of historic buildings, places, and districts that contribute to the distinctive character and history of Portland's evolving urban environment.

Policy 4.47. State and federal historic resource support. Advocate for state and federal policies, programs, and legislation that would enable stronger historic resource designations, protections, and rehabilitation programs.

Policy 4.48. Continuity with established patterns. Encourage development that fills in vacant and underutilized gaps within the established urban fabric, while preserving and complementing historic resources.

Policy 4.49. Resolution of conflicts. Adopt and periodically update design guidelines for unique historic districts. Refine base zoning in historic districts to consider the character of the historic resources in the district.

Policy 4.50. Demolition. Protect historic resources from demolition. Provide opportunities for public comment, and encourage pursuit of alternatives to demolition or other actions that mitigate for the loss.

Policy 4.51. City-owned historic resources. Maintain City-owned historic resources with necessary upkeep and repair.

Policy 4.52. Historic Resources Inventory. Maintain and periodically update Portland's Historic Resources Inventory to inform historic and cultural resource preservation strategies.

Policy 4.53. Preservation equity. Expand historic preservation inventories, regulations, and programs to encourage historic preservation in areas and in communities that have not benefited from past historic preservation efforts, especially in areas with high concentrations of under-served and/or under-represented people.

Policy 4.54. Cultural diversity. Work with Portland's diverse communities to identify and preserve places of historic and cultural significance.

Policy 4.55. Cultural and social significance. Encourage awareness and appreciation of cultural diversity and the social significance of historic places and their roles in enhancing community identity and sense of place.

Policy 4.56. Community structures. Encourage the adaptive reuse of historic community structures, such as former schools, meeting halls, and places of worship, for arts, cultural, and community uses that continue their role as anchors for community and culture.

Policy 4.57. Economic viability. Provide options for financial and regulatory incentives to allow for the productive, reasonable, and adaptive reuse of historic resources.

Policy 4.58. Archaeological resources. Protect and preserve archaeological resources, especially those sites and objects associated with Native American cultures. Work in partnership with Sovereign tribes, Native American communities, and the state to protect against disturbance to Native American archaeological resources.

145. Finding: The City Council interprets that policies 4.46 through 4.58 relate to implementation approaches directly related to the preservation of historic and cultural resources, which is not impacted by the FFTZ amendments. Historic and cultural resources are located throughout Portland, but very few are in the industrial zones where the FFTZ amendments change the allowed uses. There are no designated Historic Landmarks or Districts in or immediately adjacent to any of the existing FFTs. Existing historic resource protections are not being amended (Chapter 33.445). Therefore, the policies do not apply.

Public art

Policy 4.59. Public art and development. Create incentives for public art as part of public and private development projects.

146. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not create incentives for public art. This policy does not apply.

Resource-efficient design and development

Policy 4.60. Rehabilitation and adaptive reuse. Encourage rehabilitation and adaptive reuse of buildings, especially those of historic or cultural significance, to conserve natural resources, reduce waste, and demonstrate stewardship of the built environment.

147. Finding: The City Council interprets this policy to generally apply to the rehabilitation and adaptive reuse of buildings, particularly those with historic or cultural significance. The Council finds that the FFTs are not buildings with historic or cultural significant. Nonetheless, the FFTZ regulations encourage the rehabilitation of existing FFTs, as a whole, by designating them as a limited use, which allows the terminals to continue to operate and invest in facilities that improve their ability to withstand a major earthquake. Further, the use limitations provide flexibility to FFTs to rehabilitate existing fossil fuel storage tank capacity to increase safety.

Policy 4.61. Compact housing. Promote the development of compact, space- and energy-efficient housing types that minimize use of resources such as smaller detached homes or accessory dwellings and attached homes.

148. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to housing. This policy does not apply.

Policy 4.62. Seismic and energy retrofits. Promote seismic and energy-efficiency retrofits of historic buildings and other existing structures to reduce carbon emissions, save money, and improve public safety.

149. Finding: The City Council finds that "promote" means to "further the progress of, advance, or raise." Further, the City Council finds that seismic and energy-efficiency retrofits can be promoted

through incentives or regulatory measures. The purpose of the policy is to reduce carbon emissions, save money and improve public safety. The City Council finds that the policy does not require all three elements are satisfied with every action. Rather, those are three outcomes that may be achieved when the City Council promotes seismic and energy-efficiency retrofits.

Here, the City Council finds that the FFTZ regulations promote seismic retrofits of existing FFTs by designating them as a limited use, which allows the terminals to continue to operate and invest in facilities that improve their ability to withstand a major earthquake. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety.

Policy 4.63. Life cycle efficiency. Encourage use of technologies, techniques, and materials in building design, construction, and removal that result in the least environmental impact over the life cycle of the structure.

Policy 4.64. Deconstruction. Encourage salvage and reuse of building elements when demolition is necessary or appropriate.

Policy 4.65. Materials and practices. Encourage use of natural, resource-efficient, recycled, recycled content, and non-toxic building materials and energy-efficient building practices.

Policy 4.66. Water use efficiency. Encourage site and building designs that use water efficiently and manage stormwater as a resource.

Policy 4.67. Optimizing benefits. Provide mechanisms to evaluate and optimize the range of benefits from solar and renewable resources, tree canopy, ecoroofs, and building design.

Policy 4.68. Energy efficiency. Encourage and promote energy efficiency significantly beyond the Statewide Building Code and the use of solar and other renewable resources in individual buildings and at a district scale.

Policy 4.69. Reduce carbon emissions. Encourage a development pattern that minimizes carbon emissions from building and transportation energy use.

Policy 4.70. District energy systems. Encourage and remove barriers to the development and expansion of low-carbon heating and cooling systems that serve multiple buildings or a broader district.

Policy 4.71. Ecodistricts. Encourage ecodistricts, where multiple partners work together to achieve sustainability and resource efficiency goals at a district scale.

Policy 4.72. Energy-producing development. Encourage and promote development that uses renewable resources, such as solar, wind, and water to generate power on-site and to contribute to the energy grid.

150. Finding: Policies 4.63 through 4.72 provide direction regarding resource-efficient design and development. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. These policies do not apply.

Designing with nature

Policy 4.73. Design with nature. Encourage design and site development practices that enhance, and avoid the degradation of, watershed health and ecosystem services and that incorporate trees and vegetation.

Policy 4.74. Flexible development options. Encouraging flexibility in the division of land, the siting and design of buildings, and other improvements to reduce the impact of development on environmentally-sensitive areas and to retain healthy native and beneficial vegetation and trees.

Policy 4.75. Low-impact development and best practices. Encourage use of low-impact development, habitat-friendly development, bird-friendly design, and green infrastructure.

Policy 4.76. Impervious surfaces. Limit use of and strive to reduce impervious surfaces and associated impacts on hydrologic function, air and water quality, habitat connectivity, tree canopy, and urban heat island effects.

Policy 4.77. Hazards to wildlife. Encourage building, lighting, site, and infrastructure design and practices that provide safe fish and wildlife passage, and reduce or mitigate hazards to birds, bats, and other wildlife.

Policy 4.78. Access to nature. Promote equitable, safe, and well-designed physical and visual access to nature for all Portlanders, while also maintaining the functions and values of significant natural resources, fish, and wildlife. Provide access to major natural features, including:

- Water bodies such as the Willamette and Columbia rivers, Smith and Bybee Lakes, creeks, streams, and sloughs.
- Major topographic features such as the West Hills, Mt. Tabor, and the East Buttes.
- Natural areas such as Forest Park and Oaks Bottom.

151. Finding: Policies 4.73 through 4.78 provide direction regarding the interface between development and natural features and functions. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. These policies do not apply.

Hazard-resilient design

Policy 4.79. Natural hazards and climate change risks and impacts. Limit development in or near areas prone to natural hazards, using the most current hazard and climate change-related information and maps.

152. Finding: The 2035 Comprehensive Plan defines "limit" as to minimize or reduce something or the effects of something relative to the current situation or to a potential future situation. Most of Portland's industrial zoning are in areas with high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. The FFTZ amendments will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which will minimize the risk from a future major earthquake compared to the current regulations that allow for unlimited growth in FFTs.

Policy 4.80. Geological hazards. Evaluate slope and soil characteristics, including liquefaction potential, landslide hazards, and other geologic hazards.

153. Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. According to the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report, a magnitude 8 or 9 Cascadia Subduction Zone earthquake would impact the CEI Hub with: ground shaking; liquefaction (soil behavior phenomenon in which a saturated sand softens

and loses strength during strong earthquake ground shaking); lateral spreading (where surficial soil permanently moves laterally due to earthquake shaking); landslides; co-seismic settlement (where the ground surface is permanently lowered due to seismic shaking); and bearing capacity failures (when the foundation soil cannot support the structure it is intended to support).

According to the 2012 DOGAMI report, liquefaction and lateral spreading hazards are of primary concern to the fossil fuel terminals. As described in the 2012 Oregon State Energy Assurance Plan, this Critical Energy Infrastructure Hub (CEI Hub) sits on top of very poor soils that are highly susceptible to earthquake-induced permanent ground deformation. The CEI Hub is adjacent to the Willamette River and has extensive deposits of highly liquefiable soils. These soils (made of sands, silts, gravels and clays) have been naturally deposited by river activity as well as been created from man-made activities, such as hydraulically placed material from river dredging or debris placed as landfill.

The FFTs have significant seismic risks because most of the tanks have been constructed without any or only limited seismic design criteria on soils with moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

Policy 4.81. Disaster-resilient development. Encourage development and site-management approaches that reduce the risks and impacts of natural disasters or other major disturbances and that improve the ability of people, wildlife, natural systems, and property to withstand and recover from such events.

154. Finding: The verb “encourage”, which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. Council finds that development reduces the risks and impacts of natural disasters when the risk is lessened relative to the current situation. Additionally, the ability to withstand and recover from such events is improved when the current situation is made better.

Most of Portland’s employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Continuing to allow the unlimited increase in storage capacity at FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments are a regulatory approach that improves Portland’s ability to withstand and recover from an earthquake by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which is an improvement over the current regulations that allow for unlimited growth in FFTs. The FFTZ regulations focus on limiting risk by limiting fossil fuel storage capacity, but designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety.

Policy 4.82. Portland Harbor facilities. Reduce natural hazard risks to critical public and private energy and transportation facilities in the Portland Harbor.

155. Finding: Critical Energy Infrastructure Hub is located in the Portland Harbor. Most of the Portland Harbor is an area rated with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. The FFTZ amendments support this policy by restricting new fossil fuel storage capacity in order to stop increasing the risk, effectively lessening the risk relative to the current situation. The FFTs have significant seismic risks because most of the tanks have been constructed without any or only limited seismic design criteria on soils with moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. Continuing to allow the increase fossil fuel storage tank capacity in a high risk area increases the risk to the surrounding industrial district, the Willamette River and Portland as a whole. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of fossil fuel storage capacity at existing FFTs, with limited exceptions. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can reduce the natural hazards risk.

Policy 4.83. Urban heat islands. Encourage development, building, landscaping, and infrastructure design that reduce urban heat island effects.

156. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. This policy does not apply.

Policy 4.84. Planning and disaster recovery. Facilitate effective disaster recovery by providing recommended updates to land use designations and development codes, in preparation for natural disasters.

157. Finding: The City Council finds that it can "facilitate" disaster recovery by evaluating and adopting changes to land use designations and development codes in a manner that better prepares the city for a natural disaster. The FFTZ amendments are an update to the allowed uses in employment and industrial zones. The FFTZ amendments are a regulatory approach that improves Portland's ability to withstand and recover from an earthquake by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which is an improvement over the current regulations that allow for unlimited growth in FFTs. The FFTZ regulations focus on limiting risk by limiting fossil fuel storage capacity, but designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake.

Healthy food

Policy 4.85. Grocery stores and markets in centers. Facilitate the retention and development of grocery stores, neighborhood-based markets, and farmer's markets offering fresh produce in centers.

Policy 4.86. Neighborhood food access. Encourage small, neighborhood-based retail food opportunities, such as corner markets, food co-ops, food buying clubs, and community-supported agriculture pickup/drop-off sites, to fill in service gaps in food access across the city.

Policy 4.87. Growing food. Increase opportunities to grow food for personal consumption, donation, sales, and educational purposes.

Policy 4.88. Access to community gardens. Ensure that community gardens are allowed in areas close to or accessible via transit to people living in areas zoned for mixed-use or multi-dwelling development, where residents have few opportunities to grow food in yards.

158. Finding: Policies 4.85 through 4.88 provide direction regarding the role of development in contributing to access to healthy foods. The City Council interprets this policy to relate to development outside of industrial areas. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. These policies do not apply.

Chapter 5: Housing

Goal 5.A: Housing diversity. Portlanders have access to high-quality affordable housing that accommodates their needs, preferences, and financial capabilities in terms of different types, tenures, density, sizes, costs, and locations.

Goal 5.B: Equitable access to housing. Portland ensures equitable access to housing, making a special effort to remove disparities in housing access for people with disabilities, people of color, low-income households, diverse household types, and older adults.

Goal 5.C: Healthy connected city. Portlanders live in safe, healthy housing that provides convenient access to jobs and to goods and services that meet daily needs. This housing is connected to the rest of the city and region by safe, convenient, and affordable multimodal transportation.

Goal 5.D: Affordable housing. Portland has an adequate supply of affordable housing units to meet the needs of residents vulnerable to increasing housing costs.

Goal 5.E: High-performance housing. Portland residents have access to resource-efficient and high-performance housing for people of all abilities and income levels.

159. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not affect housing development. Except for Policies 5.11 to 5.16, which City Council interprets as requiring evaluation and analysis as to who will benefit and who will be burdened by a planning decision, the City Council finds that these goals and policies do not apply.

Diverse and expanding housing supply

Policy 5.1. Housing supply. Maintain sufficient residential development capacity to accommodate Portland's projected share of regional household growth.

Policy 5.2. Housing growth. Strive to capture at least 25 percent of the seven-county region's residential growth (Multnomah, Washington, Clackamas, Yamhill, Columbia, Clark, and Skamania counties).

Policy 5.3. Housing potential. Evaluate plans and investments for their impact on housing capacity, particularly the impact on the supply of housing units that can serve low- and moderate-income households, and identify opportunities to meet future demand.

Policy 5.4. **Housing types.** Encourage new and innovative housing types that meet the evolving needs of Portland households, and expand housing choices in all neighborhoods. These housing types include but are not limited to single-dwelling units; multi-dwelling units; accessory dwelling units;

small units; pre-fabricated homes such as manufactured, modular, and mobile homes; co-housing; and clustered housing/clustered services.

Policy 5.5. Housing in centers. Apply zoning in and around centers that allows for and supports a diversity of housing that can accommodate a broad range of households, including multi-dwelling and family-friendly housing options.

Policy 5.6. Middle housing. Enable and encourage development of middle housing. This includes multi-unit or clustered residential buildings that provide relatively smaller, less expensive units; more units; and a scale transition between the core of the mixed use center and surrounding single family areas. Where appropriate, apply zoning that would allow this within a quarter mile of designated centers, corridors with frequent service transit, high capacity transit stations, and within the Inner Ring around the Central City.

Policy 5.7. Adaptable housing. Encourage adaption of existing housing and the development of new housing that can be adapted in the future to accommodate the changing variety of household types.

Policy 5.8. Physically-accessible housing. Allow and support a robust and diverse supply of affordable, accessible housing to meet the needs of older adults and people with disabilities, especially in centers, station areas, and other places that are proximate to services and transit.

Policy 5.9. Accessible design for all. Encourage new construction and retrofitting to create physically-accessible housing, extending from the individual unit to the community, using Universal Design Principles.

Policy 5.10. Coordinate with fair housing programs. Foster inclusive communities, overcome disparities in access to community assets, and enhance housing choice for people in protected classes throughout the city by coordinating plans and investments to affirmatively further fair housing.

Housing access

Policy 5.11. Remove barriers. Remove potential regulatory barriers to housing choice for people in protected classes to ensure freedom of choice in housing type, tenure, and location.

Policy 5.12. Impact analysis. Evaluate plans and investments, significant new infrastructure, and significant new development to identify potential disparate impacts on housing choice, access, and affordability for protected classes and low-income households. Identify and implement strategies to mitigate the anticipated impacts.

Policy 5.13. Housing stability. Coordinate plans and investments with programs that prevent avoidable, involuntary evictions and foreclosures.

Policy 5.14. Preserve communities. Encourage plans and investments to protect and/or restore the socioeconomic diversity and cultural stability of established communities.

Policy 5.15. Gentrification/displacement risk. Evaluate plans and investments, significant new infrastructure, and significant new development for the potential to increase housing costs for, or cause displacement of communities of color, low- and moderate-income households, and renters. Identify and implement strategies to mitigate the anticipated impacts.

Policy 5.16. Involuntary displacement. When plans and investments are expected to create neighborhood change, limit the involuntary displacement of those who are under-served and under-represented. Use public investments and programs, and coordinate with nonprofit housing organizations (such as land trusts and housing providers) to create permanently-affordable housing

and to mitigate the impacts of market pressures that cause involuntary displacement.

160. Finding: The City Council interprets Policies 5.11 to 5.16 as requiring evaluation and analysis as to who will benefit and who will be burdened by a planning decision, including amendments to the Zoning Code. The City Council finds that one factor in housing stability and displacement is access to job opportunities across a wide range of wage scales, especially middle wage jobs such as those found in Portland's industrial districts. The FFTZ amendments apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not change the land capacity in Portland's industrial districts and continue to support continued growth in those districts.

The regulations are narrowly crafted to support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels.

Policy 5.17. Land banking. Support and coordinate with community organizations to hold land in reserve for affordable housing, as an anti-displacement tool, and for other community development purposes.

Policy 5.18. **Rebuild communities**. Coordinate plans and investments with programs that enable communities impacted by involuntary displacement to maintain social and cultural connections, and re-establish a stable presence and participation in the impacted neighborhoods.

Policy 5.19. **Aging in place.** Encourage a range of housing options and supportive environments to enable older adults to remain in their communities as their needs change.

Housing location

Policy 5.20. Coordinate housing needs in high-poverty areas. Meet the housing needs of under-served and under-represented populations living in high-poverty areas by coordinating plans and investments with housing programs.

Policy 5.21. Access to opportunities. Improve equitable access to active transportation, jobs, open spaces, high-quality schools, and supportive services and amenities in areas with high concentrations of under-served and under-represented populations and an existing supply of affordable housing.

Policy 5.22. New development in opportunity areas. Locate new affordable housing in areas that have high/medium levels of opportunity in terms of access to active transportation, jobs, open spaces, high-quality schools, and supportive services and amenities.

Policy 5.23. Higher-density housing. Locate higher-density housing, including units that are affordable and accessible, in and around centers to take advantage of the access to active transportation, jobs, open spaces, schools, and various services and amenities.

Policy 5.24. Impact of housing on schools. Evaluate plans and investments for the effect of housing development on school enrollment, financial stability, and student mobility. Coordinate with school districts to ensure plans are aligned with school facility plans.

Housing affordability

Policy 5.25. Housing preservation. Preserve and produce affordable housing to meet needs that are not met by the private market by coordinating plans and investments with housing providers and

organizations.

Policy 5.26. Regulated affordable housing target. Strive to produce at least 10,000 new regulated affordable housing units citywide by 2035 that will be affordable to households in the 0-80 percent MFI bracket.

Policy 5.27. Funding plan. Encourage development or financial or regulatory mechanisms to achieve the regulated affordable housing target set forth for 2035.

Policy 5.28. Inventory of regulated affordable housing. Coordinate periodic inventories of the supply of regulated affordable housing in the four-county (Clackamas, Clark, Multnomah and Washington) region with Metro.

Policy 5.29. Permanently-affordable housing. Increase the supply of permanently-affordable housing, including both rental and homeownership opportunities.

Policy 5.30. Housing cost burden. Evaluate plans and investments for their impact on household cost, and consider ways to reduce the combined cost of housing, utilities, and/or transportation. Encourage energy-efficiency investments to reduce overall housing costs.

Policy 5.31. Household prosperity. Facilitate expanding the variety of types and sizes of affordable housing units, and do so in locations that provide low-income households with greater access to convenient transit and transportation, education and training opportunities, the Central City, industrial districts, and other employment areas.

Policy 5.32. **Affordable housing in centers.** Encourage income diversity in and around centers by allowing a mix of housing types and tenures.

Policy 5.33. Central City affordable housing. Encourage the preservation and production of affordable housing in the Central City to take advantage of the area's unique concentration of active transportation access, jobs, open spaces, and supportive services and amenities.

Policy 5.34. Affordable housing resources. Pursue a variety of funding sources and mechanisms including new financial and regulatory tools to preserve and develop housing units and various assistance programs for households whose needs are not met by the private market.

Policy 5.35. Inclusionary housing. Use inclusionary zoning and other regulatory tools to effectively link the production of affordable housing to the production of market-rate housing.

Policy 5.36. Impact of regulations on affordability. Evaluate how existing and new regulations affect private development of affordable housing, and minimize negative impacts where possible. Avoid regulations that facilitate economically-exclusive neighborhoods.

Policy 5.37. Mobile home parks. Encourage preservation of mobile home parks as a low/moderate-income housing option. Evaluate plans and investments for potential redevelopment pressures on existing mobile home parks and impacts on park residents and protect this low/moderate-income housing option. Facilitate replacement and alteration of manufactured homes within an existing mobile home park.

Policy 5.38. Workforce housing. Encourage private development of a robust supply of housing that is affordable to moderate-income households located near convenient multimodal transportation that provides access to education and training opportunities, the Central City, industrial districts, and other employment areas.

Policy 5.39. Compact single-family options. Encourage development and preservation of small resource-efficient and affordable single-family homes in all areas of the city.

Policy 5.40 Employer-assisted housing. Encourage employer-assisted affordable housing in conjunction with major employment development.

Policy 5.41 Affordable homeownership. Align plans and investments to support improving homeownership rates and locational choice for people of color and other groups who have been historically under-served and under-represented.

Policy 5.42 Homeownership retention. Support opportunities for homeownership retention for people of color and other groups who have been historically under-served and under-represented.

Policy 5.43 Variety in homeownership opportunities. Encourage a variety of ownership opportunities and choices by allowing and supporting including but not limited to condominiums, cooperatives, mutual housing associations, limited equity cooperatives, land trusts, and sweat equity.

Policy 5.44 Regional cooperation. Facilitate opportunities for greater regional cooperation in addressing housing needs in the Portland metropolitan area, especially for the homeless, low- and moderate-income households, and historically under-served and under-represented communities.

Policy 5.45 Regional balance. Encourage development of a "regional balance" strategy to secure greater regional participation to address the housing needs of homeless people and communities of color, low- and moderate-income households, and historically under-served and under-represented communities throughout the region.

Homelessness

Policy 5.46. Housing continuum. Prevent homelessness and reduce the time spent being homeless by ensuring that a continuum of safe and affordable housing opportunities and related supportive services are allowed, including but not limited to Permanent Supportive Housing, transitional housing, self-built micro housing communities, emergency shelters, temporary shelters such as warming centers, and transitional campgrounds.

Health, safety, and well-being

Policy 5.47 Healthy housing. Encourage development and maintenance of all housing, especially multi-dwelling housing, that protects the health and safety of residents and encourages healthy lifestyles and active living.

Policy 5.48 Housing safety. Require safe and healthy housing free of hazardous materials such as lead, asbestos, and radon.

Policy 5.49. Housing quality. Encourage housing that provides high indoor air quality, access to sunlight and outdoor spaces, and is protected from excessive noise, pests, and hazardous environmental conditions.

Policy 5.50. High-performance housing. Encourage energy efficiency, green building practices, materials, and design to produce healthy, efficient, durable, and adaptable homes that are affordable or reasonably priced.

Policy 5.51. Healthy and active living. Encourage housing that provides features supportive of healthy eating and active living such as useable open areas, recreation areas, community gardens, crime-preventive design, and community kitchens in multifamily housing.

Policy 5.52. Walkable surroundings. Encourage active transportation in residential areas through the development of pathways, sidewalks, and high-quality onsite amenities such as secure bicycle parking.

Policy 5.53. Responding to social isolation. Encourage site designs and relationship to adjacent developments that reduce social isolation for groups that often experience it, such as older adults, people with disabilities, communities of color, and immigrant communities.

Policy 5.54 Renter protections. Enhance renter health, safety, and stability through education, expansion of enhanced inspections, and support of regulations and incentives that protect tenants and prevent involuntary displacement.

Chapter 6: Economic Development

Goal 6.A: Prosperity. Portland has vigorous economic growth and a healthy, diverse economy that supports prosperity and equitable access to employment opportunities for an increasingly diverse population. A strong economy that is keeping up with population growth and attracting resources and talent can:

- Create opportunity for people to achieve their full potential.
- Improve public health.
- Support a healthy environment.
- Support the fiscal well-being of the city.

161. Finding: The City Council interprets this goal to apply to the city as whole and not to individual businesses or sectors of business. The City Council interprets this goal to mean that Portland has a strong economy with employment opportunities for a diverse population. The City Council finds that an important factor in a diverse economy is to provide access to job opportunities across a wide range of wage scales, especially middle wage jobs such as those found in Portland's industrial districts.

The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's employment land supply to create opportunities for a growing economy.

These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under the current development review system. The FFTZ amendments establish clear definitions for fossil fuels and the Bulk Fossil Fuel Terminal use category. These changes are fair to existing FFTs by designating them as a limited use that allows the terminals to continue to operate and. The limited use designation also allows the FFTs to invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity, such as consolidating smaller tanks into larger tanks.

Goal 6.B: Development. Portland supports an attractive environment for industrial, commercial, and institutional job growth and development by: 1) maintaining an adequate land supply; 2) a local development review system that is nimble, predictable, and fair; and 3) high-quality public facilities and services.

162. Finding: The verb "support", which is defined in the 2035 Comprehensive Plan, means to aid the cause of. The City Council interprets this goal to apply to the city as whole and not to individual businesses or sectors of business. The City Council interprets this goal to mean that an attractive

environment for economic development has three elements: 1) adequate land supply; 2) a predictable development review system; and 3) high-quality public services. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's employment land supply.

These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under the current development review system. The FFTZ amendments establish clear definitions for fossil fuels and the Bulk Fossil Fuel Terminal use category. These changes are fair to existing FFTs by designating them as a limited use that allows the terminals to continue to operate and. The limited use designation also allows the FFTs to invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity, such as consolidating smaller tanks into larger tanks.

The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the industrial districts where the FFTs are located.

Goal 6.C: Business district vitality. Portland implements land use policy and investments to:

- Ensure that commercial, institutional, and industrial districts support business retention and expansion.

163. Finding: The verb "ensure", which is defined in the 2035 Comprehensive Plan, means to make sure that something will happen or be available. The City Council interprets this goal to apply to the city as whole and not to individual businesses or sectors of business. Further, the City Council interprets this goal to mean that the City will provide an adequate land base that is supported by public infrastructure investments that are needed to support businesses. The FFTZ amendments are consistent with this goal because they do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to support business retention and expansion in Portland's industrial districts. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for expansion through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the industrial districts where the FFTs are located.

- Encourage the growth of districts that support productive and creative synergies among local businesses.

164. Finding: The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. The City Council interprets this goal to apply to the growth of districts in the city as whole and not to individual businesses or sectors of business. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to encourage growth in Portland's industrial districts. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial

districts. The remaining industrial uses continue to operate under current regulations. These changes support the retention of existing fossil fuel terminals by designating them as a limited use, as opposed to a non-conforming use, that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions.

- Provide convenient access to goods, services, and markets.

165. **Finding:** The verb "provide", which is defined in the 2035 Comprehensive Plan, means to supply, offer, or make available. The adjective "convenient", which is not defined in the 2035 Comprehensive Plan, means to be situated to allow easy access. The City Council interprets this goal to apply to the city as whole and not to individual businesses or sectors of business. The City Council finds that the goal provides that the City will implement land use policies that will result in easy access to goods, services, and markets. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to facilitate access to goods, services and markets. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under current regulations. These changes support the retention of existing fossil fuel terminals by designating them as a limited use, as opposed to a non-conforming use, that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. The limits and exceptions will enable the FFTs to maintain their ability to provide goods and services to their markets. The ordinance does not restrict the markets that can be served by the existing FFTs.

These regulations allow the existing FFTs to continue to operate as a limited use. The regulations also provide exceptions to the storage capacity limits for aviation and renewable fuels.

BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington, during a period of a thriving economy. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. The more recent cargo forecasts project a modest growth in volumes, but those volumes do not exceed the historic peak volumes that were handled by the Portland terminals. No other evidence of future demand for fossil fuels was submitted in testimony. Therefore, the City Council finds that the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs.

Further, the City finds that reducing risk from a major earthquake outweighs the marginal impact to accommodating future demand for fossil fuels. In addition, continuing to locate all of the fossil fuel storage capacity in a high risk area in Portland is counter to 2013 Oregon Resilience Plan that recommends the diversification of locations for the storage of liquid fuels and identification of new liquid fuel energy corridors.

- Take advantage of our location and quality of life advantages as a gateway to world-class natural landscapes in Northwest Oregon, Southwest Washington, and the Columbia River Basin, and a robust interconnected system of natural landscapes within the region's Urban Growth Boundary.

166. **Finding:** The City Council interprets this goal to apply to the city as whole and not to individual businesses or sectors of business. Further, the City Council interprets the intent of this goal is to leverage location, access and quality of life as an advantage to attracting and retaining businesses

and employees to Portland. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, that could undermine business retention and expansion in Portland's industrial districts. Therefore, these changes do not conflict with the intent of this goal to encourage business district vitality in Portland.

Diverse, expanding city economy

Policy 6.1. Diverse and growing community. Expand economic opportunity and improve economic equity for Portland's diverse, growing population through sustained business growth.

167. Finding: The City Council interprets this policy to apply to the city as whole and not to individual businesses or sectors of business. The City Council finds that this policy requires business growth that makes economic opportunity available to a more diverse and growth community. The City Council finds that an important factor in improving economic equity is to provide access to job opportunities across a wide range of wage scales, especially middle wage jobs such as those found in Portland's industrial districts.

The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's employment land supply to create opportunities for a growing economy.

These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under the current development review system. The FFTZ amendments establish clear definitions for fossil fuels and the Bulk Fossil Fuel Terminal use category. These changes are fair to existing FFTs by designating them as a limited use that allows the terminals to continue to operate and. The limited use designation also allows the FFTs to invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity, such as consolidating smaller tanks into larger tanks.

Policy 6.2. Diverse and expanding economy. Align plans and investments to maintain the diversity of Portland's economy and status as Oregon's largest job center with growth across all sectors (commercial, industrial, creative, and institutional) and across all parts of the city.

Policy 6.3. Employment growth. Strive to capture at least 25 percent of the seven-county region's employment growth (Multnomah, Washington, Clackamas, Yamhill, Columbia, Clark, and Skamania counties).

Policy 6.4. Fiscally-stable city. Promote a high citywide jobs-to-households ratio that supports tax revenue growth at pace with residential demand for municipal services.

168. Finding: The City Council interprets Policies 6.2 through 6.3 to apply to the city as whole and not to individual businesses or sectors of business. The City Council interprets these policies to support a growing economy as described in the EOA. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's employment land supply to create opportunities for a growing economy consistent with the EOA.

Policy 6.5. Economic resilience. Improve Portland's economic resilience to impacts from climate change and natural disasters through a strong local economy and equitable opportunities for prosperity.

169. Finding: The verb "improve", which is defined in the 2035 Comprehensive Plan, means to make the current situation better; increase; enhance. "Resilience" means the "reducing the vulnerability of

our neighborhoods, businesses, and built and natural infrastructure to withstand challenges – environmental, economic and social – that may result from major hazardous events." The City Council finds that "economic resilience" is improved when the local economy is strong and everyone has access to opportunities for prosperity.

The Council finds that the first step in making the current situation better is to ensure that the situation does not get worse. Continuing to allow the increase in FFTs in a high-risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which will be an improvement compared to the current regulations that allow for unlimited growth in FFTs. Continuing to allow the unlimited increase in storage capacity at FFTs in a high-risk area increases the risk to the surrounding industrial district and the Willamette River in the event of a major earthquake. The FFTZ regulations improve resilience by designating existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Allowing the FFTs to continue to operate and invest in upgrades will help support a strong local economy by providing for a continuing supply of fossil fuels. Further, the use limitations (33.140.100.B.17.a) provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety.

Policy 6.6. Low-carbon and renewable energy economy. Align plans and investments with efforts to improve energy efficiency and reduce lifecycle carbon emissions from business operations. Promote employment opportunities associated with the production of renewable energy, energy efficiency projects, waste reduction, production of more durable goods, and recycling.

170. Finding: The City Council interprets this policy to support changes to business operations to become more energy efficient and reduce carbon emissions. Further, this policy encourages renewable energy, including renewable fuels as an alternative to fossil fuels. The FFTZ amendments are consistent with this policy by providing an exception that allows for new storage capacity for renewable, non-fossil fuels.

Policy 6.7. Competitive advantages. Maintain and strengthen the city's comparative economic advantages including access to a high-quality workforce, business diversity, competitive business climate, and multimodal transportation infrastructure.

171. Finding: The verb "maintain", which is defined in the 2035 Comprehensive Plan, means to keep what you have; conserve; preserve; continue. The verb "strengthen", which is not defined in the 2035 Comprehensive Plan, means to make stronger, improve. The City Council interprets this policy to apply to the city as whole and not to individual businesses or sectors of business. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland, therefore will not have a significant impact on the workforce. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, that could undermine the business retention and expansion in Portland's industrial districts, which in turn supports Portland's business diversity across the city as a whole.

The regulations maintain a competitive business climate by being narrowly crafted to support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and

strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located.

Policy 6.8. Business environment. Use plans and investments to help create a positive business environment in the city and provide strategic assistance to retain, expand, and attract businesses.

172. Finding: The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. The City Council also determines that creating a positive business environment does not mean allowing for the unlimited expansion of all business types. These regulations are narrowly crafted to apply to only one type of business that makes up a minority part of the businesses found in Portland.

As outlined in Goal 6.B, the City Council defines a "positive business environment" as providing an adequate land capacity that is supported by high-quality infrastructure, with predictable and fair development review regulations. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not change the land capacity in Portland's industrial districts. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in Portland's industrial districts.

The regulations only limit one type of business (FFTs), due to the moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. However, the regulations maintain a competitive business climate by being narrowly crafted to support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions.

The City's Enterprise Zone program, which provides a property tax exemption to industrial firms, is one of the main ways in which the City of Portland provides strategic assistance to businesses. These changes do not affect that program, and FFTs that make new capital investments remain eligible for that program.

Policy 6.9. Small business development. Facilitate the success and growth of small businesses and coordinate plans and investments with programs that provide technical and financial assistance to promote sustainable operating practices.

173. Finding: The City Council interprets this policy to provide direction to the City to provide technical and financial assistance to small businesses, such as Prosper Portland's Inclusive Business Resource Network or the Thriving Small Business Loan Program. The FFTZ amendments is a land use decision that amends the Zoning Code and does not change programs that provide technical and financial assistance to small businesses. This policy does not apply.

Policy 6.10. Business innovation. Encourage innovation, research, development, and commercialization of new technologies, products, and services through responsive regulations and public sector approaches.

174. Finding: The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. These regulations apply to only one type of business that makes up a minority

part of the businesses found in Portland's industrial districts. These changes support innovation at existing fossil fuel terminals by designating them as a limited use, as opposed to a non-conforming use, that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety.

Policy 6.11. Sharing economy. Encourage mechanisms that enable individuals, corporations, non-profits, and government to market, distribute, share, and reuse excess capacity in goods and services. This includes peer-to-peer transactions, crowd funding platforms, and a variety of business models to facilitate borrowing and renting unused resources.

175. Finding: The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. This policy does not apply.

Policy 6.12. Economic role of livability and ecosystem services. Conserve and enhance Portland's cultural, historic, recreational, educational, food-related, and ecosystem assets and services for their contribution to the local economy and their importance for retention and attraction of skilled workers and businesses.

176. Finding: The FFTZ map amendments do not affect Portland's cultural, historic, recreational, educational, food-related, and ecosystem assets and services for their contribution to the local economy. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. In considering the natural hazard risks that the FFTs pose to the ecosystem services on the river, as identified by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016), the City Council finds that continuing to allow the unlimited increase in storage capacity at FFTs in a high risk area does not enhance the current or future ecosystem services of the rivers. Therefore, the FFTZ regulations focus on limiting risk by limiting fossil fuel storage capacity, but designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. These regulations will limit the risks to the natural resource habitat functions and ecosystem services provided by the rivers.

Land development

Policy 6.13. Land supply. Provide supplies of employment land that are sufficient to meet the long-term and short-term employment growth forecasts, adequate in terms of amounts and types of sites, available and practical for development and intended uses. Types of sites are distinguished primarily by employment geographies identified in the Economic Opportunities Analysis, although capacity needs for building types with similar site characteristics can be met in other employment geographies.

177. Finding: The verb "provide", which is defined in the 2035 Comprehensive Plan, means to supply, offer, or make available. The City Council interprets this policy to mean that the City will provide an adequate land base that is supported by public infrastructure investments that are needed to support businesses. The FFTZ amendments are consistent with this policy because they do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to provide an adequate land supply in Portland's industrial districts, as defined in the EOA. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The other industrial uses

continue to operate under current regulations. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the industrial districts where the FFTs are located.

Policy 6.14. Brownfield redevelopment. Overcome financial-feasibility gaps to cleanup and redevelop 60 percent of brownfield acreage by 2035.

178. Finding: The City Council interprets this policy to mean that the City will create programs to support the brownfield cleanup target. The FFTZ amendments are Zoning Code changes that are not directly related to the cleanup of brownfields. However, the changes designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities, including brownfield remediation.

Policy 6.15. Regionally-competitive development sites. Improve the competitiveness of vacant and underutilized sites located in Portland's employment areas using incentives, and regional and state assistance for needed infrastructure and site readiness improvements.

179. Finding: The verb "improve", which is defined in the 2035 Comprehensive Plan, means to make the current situation better; increase; enhance. The City Council interprets this policy to apply to the city as whole and not to individual businesses or sectors of business. The FFTZ amendments are consistent with this policy because they do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain an adequate land supply in Portland's industrial districts. Further, these regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the industrial districts where the FFTs are located. Finally, the City's Enterprise Zone program, which provides a property tax exemption to industrial firms, is one of the key incentives that the City of Portland offers to encourage businesses to invest in sites. These changes do not affect that program.

Policy 6.16. Regulatory climate. Improve development review processes and regulations to encourage predictability and support local and equitable employment growth and encourage business retention, including:

180. Finding: The verb "improve", which is defined in the 2035 Comprehensive Plan, means to make the current situation better; increase; enhance. The City Council interprets this policy to mean that changes to development regulations should consider how those changes affect predictability, equitable employment growth, and business retention. The City Council interprets this policy to apply to the city as whole and not to individual businesses or sectors of business.

In terms of predictability, these development regulations apply to only one type of business that makes up a minority part of the businesses found in Portland. The development regulations are clear and objective, with clearly defined terms, such as what is a fossil fuel, to provide predictability in regulating FFTs.

The City Council defines equitable employment growth as providing for job opportunities across a wide range of wage scales, especially middle wage jobs such as those found in Portland's industrial districts. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not change

the land capacity in Portland's industrial districts and continue to support continued growth in those districts.

The regulations are narrowly crafted to support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels.

6.16.a. Assess and understand cumulative regulatory costs to promote Portland's financial competitiveness with other comparable cities.

181. Finding: The City Council interprets this policy to apply to a consideration of the cost, in terms of the time it takes to go through the development review process, the permit fees, and the system development charges, associated with the development review process. This policy applies to the city as whole and not to individual businesses or sectors of business. These regulations apply to only one type of business that makes up a small part of the businesses found in Portland's industrial districts, therefore the regulatory cost impact is limited. The FFTZ amendments do not change any of the associated permit fees or system development charges, therefore it does not impact Portland's financial competitiveness.

6.16.b. Promote certainty for new development through appropriate allowed uses and "clear and objective" standards to permit typical development types without a discretionary review.

6.16.c. Allow discretionary-review to facilitate flexible and innovative approaches to meet requirements.

182. Finding: The City Council interprets policy 6.16.b and 6.16.c to work in tandem. Under policy 6.16.b, the direction is to promote certainty through appropriate allowed uses and "clear and objective" standards. apply to the city as whole and not to individual businesses or sectors of business. The regulations promote certainty by being narrowly crafted to apply only to fossil fuel terminals. Designating FFTs as a limited use, as opposed to a non-conforming use, allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, through clear and objective standards and definitions.

The City Council did not establish a discretionary conditional use review for the FFT use, due to the moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. The City Council finds that reducing risk from a major earthquake outweighs the policy direction to provide flexible and innovative approaches to accommodating additional storage capacity through a discretionary review process, in part, because continuing to locate all of the fossil fuel storage capacity in a high risk area in Portland is counter to the 2013 Oregon Resilience Plan that recommends the diversification of locations for the storage of liquid fuels and identification of new liquid fuel energy corridors.. The FFTs with access to the river are within the Greenway Overlay Zone (33.440), which establishes a discretionary review process to allow for industrial development, while preserving and enhancing the riparian habitat along the river. The FFTZ amendments do not amend the Greenway Overlay Zone standards or review process.

6.16.d. Design and monitor development review processes to avoid unnecessary delays.

183. Finding: The FFTZ amendments do not modify the development review process for FFTs. Designating the FFTs as a limited use does not subject those uses to new or additional development

reviews. This ordinance includes a directive for BPS to monitor the effectiveness of this regulation and report back to City Council in two years.

6.16.e. Promote cost effective compliance with federal and state mandates, productive intergovernmental coordination, and efficient, well-coordinated development review and permitting procedures.

184. Finding: The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. The City has an established procedure for coordinated review of river-related development, including docks, in areas where city, state and federal agencies all have jurisdiction. The Streamlining Team was established pursuant to a 2003 Intergovernmental Agreement between the City of Portland (City), NOAA Fisheries, Army Corps of Engineers (Corps), and the U.S. Fish and Wildlife Service (USFWS). The FFTZ amendments do not change these procedures and there is no impact to this coordinated process.

6.16.f. Consider short-term market conditions and how area development patterns will transition over time when creating new development regulations.

185. Finding: The City Council interprets this policy to apply to the city as whole and not to individual businesses or sectors of business. As described in the adopted EOA, Portland has a tight supply of industrial land. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will not affect Portland's short-term industrial land supply. These regulations are consistent with Policy 6.37 (Industrial Sanctuaries) in that the City does not expect the industrial character and development pattern in these districts to transition over time. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels.

Policy 6.17. Short-term land supply. Provide for a competitive supply of development-ready sites with different site sizes and types, to meet five-year demand for employment growth in the Central City, industrial areas, campus institutions, and neighborhood business districts.

186. Finding: The verb "provide", which is defined in the 2035 Comprehensive Plan, means to supply, offer, or make available. The City Council interprets this policy to mean that the City will provide an adequate land base that is supported by public infrastructure investments that are needed to support businesses. The FFTZ amendments are consistent with this policy because they do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to provide an adequate land supply in Portland's industrial districts. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the industrial districts where the FFTs are located.

Policy 6.18. Evaluate land needs. Update the Economic Opportunities Analysis and short-term land supply strategies every five to seven years.

187. Finding: The City Council interprets this policy to provide direction to the city to update the EOA. The EOA was adopted in 2016 and is still within the time range. The FFTZ amendments do not amend the EOA. Therefore, this policy does not apply.

Policy 6.19. Corporate headquarters. Provide land opportunities for development of corporate headquarters campuses in locations with suitable transportation facilities.

188. Finding: The verb "provide", which is defined in the 2035 Comprehensive Plan, means to supply, offer, or make available. The City Council interprets this policy to mean that the City will provide an adequate land base that is supported by public infrastructure investments that are needed for corporate headquarters. The FFTZ amendments are consistent with this policy because they do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to provide an adequate land supply in Portland's industrial districts. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the industrial districts where the FFTs are located.

Traded sector competitiveness

Policy 6.20. Traded sector competitiveness. Align plans and investments with efforts to improve the city and regional business environment for traded sector and export growth. Participate in regional and statewide initiatives.

Policy 6.21. Traded sector diversity. Encourage partnerships to foster the growth, small business vitality, and diversity of traded sectors.

Policy 6.22. Clusters. Align plans and investments with efforts that direct strategic business development resources to enhance the competitiveness of businesses in traded sector clusters.

189. Finding: The 2035 Comprehensive Plan defines "traded sector" as a business sector consisting of companies that compete in markets extending beyond the metropolitan region. The City Council interprets policies 6.20 through 6.22 to apply to the city as whole and does not require the City to allow for the unlimited expansion of individual businesses or sectors of business. The City Council finds that fossil fuel energy is not identified as a key traded sector in city, regional or statewide initiatives. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to maintain Portland's industrial districts as part of the efforts to support trade sector and export growth over time. These changes support the retention of existing fossil fuel terminals by designating them as a limited use, as opposed to a non-conforming use, that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area as part of the City's traded sector economic development strategy.

Policy 6.23. Trade and freight hub. Encourage investment in transportation systems and services that will retain and expand Portland's competitive position as a West Coast trade gateway and freight distribution hub.

190. Finding: The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. The City Council interprets this policy to apply to the city as whole and not to individual businesses or sectors of business. The City Council interprets the policy in two ways. First, the City will promote

and encourage public sector investments in the freight transportation system, including those by the City, the Port of Portland, Metro, and the State of Oregon. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located.

Second, these changes support the continuing investment in existing fossil fuel terminals by designating them as a limited use, as opposed to a non-conforming use, that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. In addition, the ordinance does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system. Existing FFTs and other industrial uses can make investments in multimodal freight facilities.

Finally, the City's Enterprise Zone program, which provides a property tax exemption to industrial firms, is one of the key incentives that the City of Portland offers to encourage businesses to invest in their facilities, including private multi-modal transportation systems such as docks, pipelines and transloading facilities. These changes do not affect that program, and FFTs that make new capital investments remain eligible for that program.

Testimony by the Western States Petroleum Association claims that the ordinance will exclude Portland from the national and international energy markets. There is no explanation of what the opportunity is in national and international energy markets and no explanation as to how the ordinance excludes Portland from those markets. Only fossil tank capacity is regulated. Other types of infrastructure are not regulated by this ordinance. Furthermore, local and regional economic development strategies do not identify the energy sector as a key target industry.

Policy 6.24. Traded sector land supply. Foster traded sector retention, growth, and competitive advantages in industrial districts and the Central City. Recognize the concentration of traded-sector businesses in these districts.

191. Finding: The verb "foster", which is defined in the 2035 Comprehensive Plan, means to encourage or guide the incremental development of something over a long period of time. The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, the retention, growth, and competitive advantages of Portland's industrial districts are maintained over time. These regulations are consistent with Policy 6.37 (Industrial Sanctuaries) in that the City does not expect the industrial character and development pattern in these districts to transition over time. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located.

Policy 6.25. Import substitution. Encourage local goods production and service delivery that substitute for imports and help keep the money Portlanders earn in the local economy.

192. Finding: The Council interprets this policy to encourage a strong local manufacturing and service delivery sector. The policy is not intended to and should not be read to discourage imported goods or services or place any burdens on interstate commerce. The FFTZ amendments do not include

map changes, nor do they allow for new incompatible land uses; therefore, these changes do not conflict with the intent to maintain Portland's industrial districts over time, which provides a land supply for local businesses that produce goods and deliver services. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan; therefore, the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area that can support service delivery.

Policy 6.26. Business opportunities in urban innovation. Strive to have Portland's built environment, businesses, and infrastructure systems showcase examples of best practices of innovation and sustainability.

193. **Finding:** These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. This policy does not apply.

Equitable household prosperity

Policy 6.27. Income self-sufficiency. Expand access to self-sufficient wage levels and career ladders for low-income people by maintaining an adequate and viable supply of employment land and public facilities to support and expand opportunities in Portland for middle- and high-wage jobs that do not require a 4-year college degree.

6.27.a. Support the role of industrial districts as a leading source of middle-wage jobs that do not require a 4-year college degree and as a major source of wage-disparity reduction for under-served and under-represented communities.

6.27.b. Evaluate and limit negative impacts of plans and investments on middle and high wage job creation and retention.

194. **Finding:** The 2035 Comprehensive Plan defines "expand" as make something that already exists more extensive. The City Council finds income self-sufficiency is dependent on access to job opportunities across a wide range of wage scales, especially middle wage jobs such as those found in Portland's industrial districts. The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. The FFTZ amendments apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not change the land capacity in Portland's industrial districts and continue to support continued employment growth in those districts.

The regulations are narrowly crafted to support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels.

The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area that can support the growth of middle wage jobs.

Policy 6.28. East Portland job growth. Encourage investment in, and alignment of, poverty-reduction efforts that address economic development, land use, transportation, housing, social services, public health, community development, and workforce development.

195. **Finding:** The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. There are no FFTs in East Portland. The FFTZ amendments apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not change the land capacity in Portland's industrial districts and continue to support continued employment growth in those districts, including the existing industrial and employment land in East Portland.

Policy 6.29. Poverty reduction. Encourage investment in, and alignment of, poverty-reduction efforts that address economic development, land use, transportation, housing, social services, public health, community development, and workforce development.

Policy 6.30. Disparity reduction. Encourage investment in, and alignment of, public efforts to reduce racial, ethnic, and disability-related disparities in income and employment opportunity.

196. **Finding:** For policies 6.29 and 6.30, the City Council finds that access to job opportunities across a wide range of wage scales, especially middle wage jobs such as those found in Portland's industrial districts is a key element of poverty and disparity reduction efforts. The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. The FFTZ amendments apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not change the land capacity in Portland's industrial districts and continue to support continued employment growth in those districts.

Policy 6.31. Minority-owned, woman-owned and emerging small business (MWESB) assistance. Ensure that plans and investments improve access to contracting opportunities for minority-owned, woman-owned, and emerging small businesses.

197. **Finding:** The City Council interprets this policy to focused on supporting minority-owned, woman-owned, and emerging small businesses through City programs. This policy does not apply.

Policy 6.32. Urban renewal plans. Encourage urban renewal plans to primarily benefit existing residents and businesses within the urban renewal area through:

1. Revitalization of neighborhoods.
2. Expansion of housing choices.
3. Creation of business and job opportunities.
4. Provision of transportation linkages.
5. Protection of residents and businesses from the threats posed by gentrification and displacement.
6. The creation and enhancement of those features which improve the quality of life within the urban renewal area.

198. **Finding:** The City Council interprets this policy to focused on urban renewal plans and not the Zoning Code. There are three urban renewal areas (Central Eastside, Willamette Industrial and Airport Way) that have industrial zoning that is amended by this ordinance. None of the existing FFTs are in the URAs. The FFTZ amendments do not include changes to any urban renewal plans. This policy does not apply.

Central City

Policy 6.33. Central City. Improve the Central City's regional share of employment and continue its growth as the unique center of both the city and the region for innovation and exchange through

commerce, employment, arts, culture, entertainment, tourism, education, and government.

Policy 6.34. Central City industrial districts. Protect and facilitate the long-term success of Central City industrial districts, while supporting their evolution into places with a broad mix of businesses with high employment densities.

Policy 6.35. Innovation districts. Provide for expanding campus institutions in the Central City and Marquam Hill, and encourage business development that builds on their research and development strengths.

199. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in the Central City. These policies do not apply.

Industrial and employment districts

Policy 6.36. Industrial land. Provide industrial land that encourages industrial business retention, growth, and traded sector competitiveness as a West Coast trade and freight hub, a regional center of diverse manufacturing, and a widely-accessible base of family-wage jobs, particularly for under-served and under-represented people.

200. Finding: The verb "provide", which is defined in the 2035 Comprehensive Plan, means to supply, offer, or make available. The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. The City Council interprets this policy to be satisfied by maintaining an adequate industrial land base as determined by the EOA. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not reduce the industrial land designated in Portland. This ordinance does not amend the EOA. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions.

Policy 6.37. Industrial sanctuaries. Protect industrial land as industrial sanctuaries identified on the Comprehensive Plan Map primarily for manufacturing and distribution uses and to encourage the growth of industrial activities in the city.

201. Finding: The verb "protect", which is defined in the 2035 Comprehensive Plan, means to defend or guard against loss, injury, or destruction. The City Council interprets this policy to apply to the city as whole and does not require the City to allow for the unlimited expansion of individual businesses or sectors of business. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will maintain Portland's industrial sanctuaries as part of strategy to maintain an adequate industrial land base as determined by the EOA. These regulations are consistent with this policy in that the City does not expect the industrial character and development pattern in these districts to transition over time. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located.

Policy 6.38. Prime industrial land retention. Protect the multimodal freight-hub industrial districts at the Portland Harbor, Columbia Corridor, and Brooklyn Yard as prime industrial land that is prioritized for long-term retention.

202. Finding: The City Council finds that this policy is implemented through the Prime Industrial Overlay Zone. The FFTZ amendments do not include changes to the overlay zone or to the Zoning Map where it is applied. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will maintain the prime industrial land for long-term retention.

6.38.a. Protect prime industrial lands from quasi-judicial Comprehensive Plan Map amendments that convert prime industrial land to non-industrial uses, and consider the potential for other map amendments to otherwise diminish the economic competitiveness or viability of prime industrial land.

203. Finding: The City Council finds that this policy applies to quasi-judicial decisions. Even if it did apply here, the City Council finds that this policy is implemented through the Prime Industrial Overlay Zone. The FFTZ amendments do not include changes to the overlay zone or to the Zoning Map where it is applied. The FFTZ amendments do not allow for new incompatible land uses or other map amendments, therefore, these changes will maintain the economic competitiveness or viability of prime industrial land.

6.38.b. Limit conversion of prime industrial land through land use plans, regulations, or public land acquisition for non-industrial uses, especially land that can be used by river-dependent and river-related industrial uses.

204. Finding: The City Council finds that this policy is implemented through the Prime Industrial Overlay Zone. The FFTZ amendments do not include changes to the overlay zone or to the Zoning Map where it is applied. The FFTZ amendments apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, that would lead to the conversion of prime industrial land. The ordinance does not authorize public land acquisition.

6.38.c. Limit regulatory impacts on the capacity, affordability, and viability of industrial uses in the prime industrial area while ensuring environmental resources are also protected.

205. Finding: The City Council interprets this policy to require a balance between minimizing regulations on industrial uses while at the same time protecting environmental resources. Council finds that the limits here are storage limitations as it applies to one industrial use. Those limitations are carefully crafted to ensure that the industrial uses remain viable while still protecting the environmental resources.

6.38.d. Strive to offset the reduction of development capacity as needed, with additional prime industrial capacity that includes consideration of comparable site characteristics. Offsets may include but are not limited to additional brownfield remediation, industrial use intensification, strategic investments, and other innovative tools and partnerships that increase industrial utilization of industrial land.

206. Finding: The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. The FFTZ amendments do not include changes to the overlay zone or to the Zoning Map where it is applied. The FFTZ amendments apply to only one type of use

that makes up a minority part of the uses found in Portland's industrial districts. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, that would lead to the conversion of prime industrial land, therefore, there is no reduction in development capacity.

Further, BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington, during a period of a thriving economy. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. The more recent cargo forecasts project a modest growth in volumes, but those volumes do not exceed the historic peak volumes that were handled by the Portland terminals. No other evidence of future demand for fossil fuels was submitted in testimony. Therefore, the City Council finds that the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs. Therefore, no offsets are needed.

6.38.e. Protect prime industrial land for siting of parks, schools, large-format places of assembly, and large-format retail sales.

207. Finding: The City Council finds that this policy is implemented through the Prime Industrial Overlay Zone. The FFTZ amendments do not include changes to the overlay zone or to the Zoning Map where it is applied.

6.38.f. Promote efficient use of freight hub infrastructure and prime industrial land by limiting non-industrial uses that do not need to be in the prime industrial area.

208. Finding: The City Council finds that this policy is implemented through the Prime Industrial Overlay Zone. The FFTZ amendments do not include changes to the overlay zone or to the Zoning Map where it is applied. The FFTZ amendments do not allow for new incompatible land uses. Therefore, non-industrial uses continue to be limited.

Policy 6.39. **Harbor access lands**. Limit use of harbor access lands to river- or rail-dependent or related industrial land uses due to the unique and necessary infrastructure and site characteristics of harbor access lands for river-dependent industrial uses.

209. Finding: The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will maintain Portland's harbor access lands for river- or rail-dependent or related industrial uses.

Policy 6.40. **Portland Harbor Superfund Site**. Take a leadership role to facilitate a cleanup of the Portland Harbor that moves forward as quickly as possible and that allocates cleanup costs fairly and equitably. Encourage a science-based and cost-effective cleanup solution that facilitates re-use of land for river- or rail-dependent or related industrial uses.

210. Finding: The City Council interprets this policy to mean that the City will take a lead role to facilitate cleanup of the Portland Harbor. The FFTZ amendments are Zoning Code changes that are not directly related to the cleanup of Portland Harbor. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will maintain Portland's industrial sanctuaries for river- or rail-dependent or related industrial uses. However, the changes designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities, including brownfield remediation related to the Portland Harbor cleanup efforts.

Policy 6.41. Multimodal freight corridors. Encourage freight-oriented industrial development to locate where it can maximize the use of and support reinvestment in multimodal freight corridors.

211. Finding: The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. The City Council finds that the policy requires the City to promote freight-oriented industrial development to locate near existing multimodal freight corridors, which is primarily done through applying industrial zoning. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes continue to support freight-oriented industrial development. These regulations apply to only one type of business that makes up a small part of the businesses found in Portland's industrial districts. Transloading facilities are a defining characteristic of a Bulk Fossil Fuel Terminal, however, the ordinance does not regulate transloading facilities and only limits new fossil fuel storage tank capacity. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades to their intermodal facilities and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Finally, the ordinance does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system. Existing FFTs and other industrial uses can make investments in multimodal freight facilities. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located.

Policy 6.42. Columbia East. Provide a mix of industrial and limited business park development in Columbia East (east of 82nd Avenue) that expand employment opportunities supported by proximity to Portland International Airport and multimodal freight access.

212. Finding: The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes are consistent with the intent to provide a mix of industrial and limited business park development in Columbia East. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. None of the existing FFTs are located in the Columbia East geography.

Policy 6.43. Dispersed employment areas. Provide small, dispersed employment areas for a flexible and affordable mix of office, creative services, small-scale manufacturing, traded sector and distribution, and other small-format light industrial and commercial uses with access to nearby freeways or truck streets.

213. Finding: The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes are consistent with the intent to provide small, dispersed employment areas across Portland. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. None of the existing FFTs are located in these dispersed employment areas.

Policy 6.44. Industrial land use intensification. Encourage reinvestment in, and intensification of, industrial land use, as measured by output and throughput per acre.

214. **Finding:** The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. The City Council interprets this policy to apply to industrial districts as whole and not to individual businesses or sectors of business. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes are consistent with the intent to maintain Portland's industrial districts over time. These changes support the reinvestment in existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations (33.140.100.B.17.a) provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety.

The City's Enterprise Zone program, which provides a property tax exemption to industrial firms, is one of the key incentives that the City of Portland offers to encourage businesses to invest in their facilities, including private multi-modal transportation systems such as docks, pipelines and transloading facilities. These changes do not affect that program, and FFTs that make new capital investments remain eligible for that program.

Policy 6.45. **Industrial brownfield redevelopment**. Provide incentives, investments, technical assistance and other direct support to overcome financial-feasibility gaps to enable remediation and redevelopment of brownfields for industrial growth.

215. **Finding:** The City Council interprets this policy to mean that the City will create programs to support brownfield cleanup in industrial areas. The FFTZ amendments are Zoning Code changes that are not directly related to the cleanup of brownfields. However, the changes designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities, including brownfield remediation.

Policy 6.46. Impact analysis. Evaluate and monitor the impacts on industrial land capacity that may result from land use plans, regulations, public land acquisition, public facility development, and other public actions to protect and preserve existing industrial lands.

216. **Finding:** The City Council interprets this policy to provide direction to the city to evaluate and monitor industrial land capacity and development trends that result from plan and zoning changes. The ordinance includes a directive for BPS to monitor the effectiveness of this regulation and report back to City Council in two years.

Policy 6.47. Clean, safe, and green. Encourage improvements to the cleanliness, safety, and ecological performance of industrial development and freight corridors by facilitating adoption of market feasible new technology and design.

217. **Finding**: The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. These changes encourage improvements by designating existing FFTs as a limited use that allows the terminals to continue to operate and invest in upgrades that can improve the cleanliness, safety, and ecological performance of FFTs.

Policy 6.48. Fossil fuel distribution. Limit fossil fuels distribution and storage facilities to those necessary to serve the regional market.

218. **Finding:** The 2035 Comprehensive Plan defines "limit" as to minimize or reduce relative to the current situation or to a potential future situation. The City Council interprets the phrase "regional market" to mean the state of Oregon and Southwest Washington in recognition that Portland's fossil fuel terminals currently handle 90% of the fossil fuels consumed in Oregon and Southwest Washington. BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington, during a period of a thriving economy. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. The more recent cargo forecasts project a modest growth in volumes, but those volumes do not exceed the historic peak volumes that were handled by the Portland terminals. No other evidence of future demand for fossil fuels was submitted in testimony. Therefore, the City Council finds that the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs.

These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations (33.140.100.B.17.a) provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety. In addition, limiting storage capacity to the existing facilities, with some exceptions, reduces risk from a major earthquake, which outweighs the policy direction to provide capacity to accommodate any potential future increase in fossil fuel consumption, in part, because continuing to locate all of the fossil fuel storage capacity in a high risk area in Portland is counter to the 2013 Oregon Resilience Plan that recommends the diversification of locations for the storage of liquid fuels and identification of new liquid fuel energy corridors.

Testimony by the Working Waterfront Coalition asserts that it is important for FFTs to invest in facilities as "demand continues". The testimony does not define or explain what is meant by the phrase "as demand continues". BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. No other evidence of future demand for fossil fuels was submitted in testimony. Therefore, the City Council finds that the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs.

Testimony by the Western States Petroleum Association claims that the ordinance will undercut the ability to meet future energy needs; prevent and discourage equipment upgrades necessary to meet market demand; or fail to provide sufficient facilities and tank capacity to serve future energy needs. Only new fossil storage tank capacity is restricted, other equipment upgrades are allowed. "Future energy needs" are not defined. No supporting evidence is provided to define "market demand" or what is needed to meet "future energy needs". Additional testimony by the Western States Petroleum Association claims that the ordinance will freeze current infrastructure in place and would be insufficient for future fuel demand, by both quantity and type of fuel. "Future fuel demand" is not defined. The ordinance will not "freeze current infrastructure in place". The FFTZ amendments designate existing FFTs as a limited use specifically to allow the FFTs to continue to operate to supply fossil fuels and to allow for safety and seismic upgrades. Transloading facilities are a defining characteristic of a Bulk Fossil Fuel Terminal, however, the ordinance only limits new fossil fuel storage tank capacity. Existing fossil fuel storage tank capacity can be reconfigured. Other aspects of terminal infrastructure (pipelines, docks, transloading facilities) are not regulated by this ordinance. BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington, during a period of a thriving economy. In addition, ODOT is forecasting a decline in motor fuel consumption

over the medium term to 2029. Therefore, the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs.

Testimony by Zenith Energy claims that the ordinance will inhibit infrastructure upgrades to "meet changing market demands". There is no explanation of what are "changing market demands" or as why to storage capacity expansion is needed in conjunction with other infrastructure upgrades. The ordinance restricts new fossil storage tank capacity, other safety upgrades are allowed. BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. Therefore, the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs.

Policy 6.49. Industrial growth and watershed health. Facilitate concurrent strategies to protect and improve industrial capacity and watershed health in the Portland Harbor and Columbia Corridor areas.

219. Finding: The 2035 Comprehensive Plan defines "facilitate" to mean to make something easier, to help bring about or make run more smoothly. The verb "improve", which is defined in the 2035 Comprehensive Plan, means to make the current situation better; increase; enhance. Council interprets the policy to mean that the city should make strategies that both protect and improve industrial capacity will also protect and improve the watershed health easier. The City Council finds that the first step in making the current situation better is to ensure that the situation does not get worse. Continuing to allow the increase in FFTs in a high risk area increases the risk to watershed health. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which will be an improvement compared to the current regulations that allow for unlimited growth in FFTs. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's industrial capacity. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under current regulations. The FFTZ regulations designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Allowing the FFTs to continue to operate and invest in upgrades will help support a strong local economy by providing for a continuing supply of fossil fuels to support a strong local economy. Therefore, the FFT amendments do not impact the industrial capacity but at the same time they do protect and improve the watershed health.

Policy 6.50. **District expansion**. Provide opportunities for expansion of industrial areas based on evaluation of forecasted need and the ability to meet environmental, social, economic, and other goals.

220. Finding: The City Council interprets this policy to apply to Comprehensive Plan Map and Zoning Map amendments to expand industrial land use designations. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's industrial capacity. This policy does not apply.

Policy 6.51. Golf course reuse and redevelopment. Facilitate a mix of industrial, natural resource, and public open space uses on privately-owned golf course sites in the Columbia Corridor that property

owners make available for reuse.

221. **Finding:** The City Council interprets this policy to apply to Comprehensive Plan Map and Zoning Map amendments. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's industrial capacity. This policy does not apply.

Policy 6.52. Residential and commercial reuse. Facilitate compatible industrial or employment redevelopment on residential or commercial sites that become available for reuse if the site is in or near prime industrial areas, and near a freeway or on a freight street.

222. **Finding**: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. This policy does not apply.

Policy 6.53. Mitigation banks. Facilitate industrial site development by promoting and allowing environmental mitigation banks that serve industrial land uses on prime industrial land.

223. **Finding**: The 2035 Comprehensive Plan defines "facilitate" to mean to make something easier, to help bring about or make run more smoothly. The City Council interprets this policy means to assist, but is not a requirement. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones, including environmental mitigation banks. This policy does not apply.

Policy 6.54. **Neighborhood buffers**. Maintain and enhance major natural areas, open spaces, and constructed features as boundaries and buffers for the Portland Harbor and Columbia Corridor industrial areas.

224. **Finding**: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. This policy does not apply.

Policy 6.55. Neighborhood park use. Allow neighborhood park development within industrial zones where needed to provide adequate park service within one-half mile of every resident.

225. **Finding**: This policy addresses park development in industrial zones. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. This policy does not apply.

Campus institutions

Policy 6.56. Campus institutions. Provide for the stability and growth of Portland's major campus institutions as essential service providers, centers of innovation, workforce development resources, and major employers.

Policy 6.57. Campus land use. Provide for major campus institutions as a type of employment land, allowing uses typically associated with health care and higher education institutions. Coordinate with institutions in changing campus zoning to provide land supply that is practical for development and intended uses.

Policy 6.58. Development impacts. Protect the livability of surrounding neighborhoods through adequate infrastructure and campus development standards that foster suitable density and attractive campus design. Minimize off-site impacts in collaboration with institutions and neighbors, especially to

reduce automobile traffic and parking impacts.

Policy 6.59. Community amenities and services. Encourage campus development that provides amenities and services to surrounding neighborhoods, emphasizing the role of campuses as centers of community activity.

Policy 6.60. **Campus edges**. Provide for context-sensitive, transitional uses, and development at the edges of campus institutions to enhance their integration into surrounding neighborhoods, including mixed-use and neighborhood-serving commercial uses where appropriate.

Policy 6.61. Satellite facilities. Encourage opportunities for expansion of uses, not integral to campus functions, to locate in centers and corridors to support their economic vitality.

226. Finding: Policies 6.56 through 6.61 provide direction regarding campus institutions. The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located on campus institutions. These policies do not apply.

Neighborhood business districts

Policy 6.62. Neighborhood business districts. Provide for the growth, economic equity, and vitality of neighborhood business districts.

Policy 6.63. District function. Enhance the function of neighborhood business districts as a foundation of neighborhood livability.

Policy 6.64. Small, independent businesses. Facilitate the retention and growth of small and locally-owned businesses.

Policy 6.65. Home-based businesses. Encourage and expand allowances for small, low-impact home based businesses in residential areas, including office or personal service uses with infrequent or by-appointment customer or client visits to the site. Allow a limited number of employees, within the scale of activity typical in residential areas. Allow home-based businesses on sites with accessory dwelling units.

Policy 6.66. Neighborhood-serving business. Provide for neighborhood business districts and small commercial nodes in areas between centers to expand local access to goods and services. Allow nodes of small-scale neighborhood-serving commercial uses in large planned developments and as a ground floor use in high density residential areas.

Policy 6.67. Retail development. Provide for a competitive supply of retail sites that support the wide range of consumer needs for convenience, affordability, accessibility, and diversity of goods and services, especially in under-served areas of Portland.

Policy 6.68. Investment priority. Prioritize commercial revitalization investments in neighborhoods that serve communities with limited access to goods
and services.

Policy 6.69. Non-conforming neighborhood business uses. Limit non-conforming uses to reduce adverse impacts on nearby residential uses while avoiding displacement of existing neighborhood businesses.

Policy 6.70. Involuntary commercial displacement. Evaluate plans and investments for their impact on existing businesses.

6.70.a. Limit involuntary commercial displacement in areas at risk of gentrification, and incorporate tools to reduce the cost burden of rapid neighborhood change on small business owners vulnerable to displacement.

6.70.b. Encourage the preservation and creation of affordable neighborhood commercial space to support a broad range of small business owners.

Policy 6.71. Temporary and informal markets and structures. Acknowledge and support the role that temporary markets (farmer's markets, craft markets, flea markets, etc.) and other temporary or mobile-vending structures play in enabling startup business activity. Also, acknowledge that temporary uses may ultimately be replaced by more permanent development and uses.

Policy 6.72 Community economic development. Encourage collaborative approaches to align land use and neighborhood economic development for residents and business owners to better connect and compete in the regional economy.

Policy 6.73. Centers. Encourage concentrations of commercial services and employment opportunities in centers.

6.73.a. Encourage a broad range of neighborhood commercial services in centers to help residents and others in the area meet daily needs and/or serve as neighborhood gathering places.

6.73.b. Encourage the retention and further development of grocery stores and local markets as essential elements of centers.

6.73.c. Enhance opportunities for services and activities in centers that are responsive to the needs of the populations and cultural groups of the surrounding area.

6.73.d. Require ground-level building spaces in core areas of centers accommodate commercial or other street-activating uses and services.

6.73.e. Encourage employment opportunities as a key function of centers, including connections between centers, institutions, and other major employers to reinforce their roles as vibrant centers of activity.

227. Finding: Policies 6.62 through 6.73 provide direction regarding neighborhood business districts. The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in neighborhood business districts. These policies do not apply.

Chapter 7: Environmental and Watershed Health

Goal 7.A: Climate. Carbon emissions are reduced to 50 percent below 1990 levels by 2035.

228. Finding: The City Council finds that in order to achieve this goal, each legislative action should consider whether it can play a role in reducing the carbon emissions The FFTZ amendments will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. The FFTZ amendments help provide a transition to a reliable, low-carbon energy infrastructure by designating existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities to increase safety and reliability. In addition, the definition of fossil fuels explicitly does not include ethanol, biodiesel/renewable diesel other fuel additives that will allows FTTs to

add storage capacity to provide reliable low-carbon fuels to help meet the carbon emissions reduction goals.

Goal 7.B: Healthy watersheds and environment. Ecosystem services and ecosystem functions are maintained and watershed conditions have improved over time, supporting public health and safety, environmental quality, fish and wildlife, cultural values, economic prosperity, and the intrinsic value of nature.

229. Finding: The FFTZ amendments foster a healthy environment and sustain the ecosystem services of Portland's air, water and land by reducing the risk associated with a major earthquake. The first step in making the current situation better is to ensure that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a high risk area. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which can minimize environmental impacts in the event of a major earthquake. No changes to the environmental or greenway overlay zones are proposed as part of this project, therefore the natural resource values and functions will be sustained.

Goal 7.C: Resilience. Portland's built and natural environments function in complementary ways and are resilient in the face of climate change and natural hazards.

230. Finding: The City Council finds that the built and natural environments function in complementary ways when they both function without harming the other. The 2035 Comprehensive Plan defines "resilience" as the capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment. Portland's FFTs are within a disaster-prone area that is at risk for a catastrophic Cascadia earthquake disaster. Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake.

According to the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report, a magnitude 8 or 9 Cascadia Subduction Zone earthquake would impact the CEI Hub with: ground shaking; liquefaction (soil behavior phenomenon in which a saturated sand softens and loses strength during strong earthquake ground shaking); lateral spreading (where surficial soil permanently moves laterally due to earthquake shaking); landslides; co-seismic settlement (where the ground surface is permanently lowered due to seismic shaking); and bearing capacity failures (when the foundation soil cannot support the structure it is intended to support).

According to the 2012 DOGAMI report, liquefaction and lateral spreading hazards are of primary concern to the fossil fuel terminals. The CEI Hub is adjacent to the Willamette River and has extensive deposits of highly liquefiable soils. These soils (made of sands, silts, gravels and clays) have been naturally deposited by river activity as well as been created from man-made activities, such as hydraulically placed material from river dredging or debris placed as landfill.

The FFTs have significant seismic risks because most of the tanks have been constructed without any or only limited seismic design criteria on soils with high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy

Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. The City Council interprets this goal to mean that the first step in making Portland more resilient is to stop increasing the risk. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

Goal 7.D: Environmental equity. All Portlanders have access to clean air and water, can experience nature in their daily lives, and benefit from development designed to lessen the impacts of natural hazards and environmental contamination.

231. Finding: The City Council interprets this goal to mean that the first step in lessening the impacts of natural hazards and environmental contamination is to stop increasing the risk. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding neighborhoods and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake.

Goal 7.E: Community stewardship. Portlanders actively participate in efforts to maintain and improve the environment, including watershed health.

232. Finding: The City Council interprets this goal to mean that the City should have programs focused on community involvement in improving the environment. The FFTZ amendments change the Zoning Code and do not include other changes to stewardship programs. This goal does not apply.

Improving environmental quality and resilience

Policy 7.1. Environmental quality. Protect or support efforts to protect air, water, and soil quality, and associated benefits to public and ecological health and safety, through plans and investments.

Policy 7.2. Environmental equity. Prevent or reduce adverse environment-related disparities affecting under-served and under-represented communities through plans and investments. This includes addressing disparities relating to air and water quality, natural hazards, contamination, climate change, and access to nature.

233. Finding: The Council interprets policies 7.1 and 7.2 in tandem. The City Council finds that the policies seek to defend and protect environmental quality and equity. Further, the City Council finds that environmental equity is achieved when disparities are prevented or reduced. The City Council finds that that the first step in lessening the impacts of natural hazards and environmental contamination is to stop increasing the risk. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding neighborhoods and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. Further, by designating existing FFTs as a limited use, as opposed to a

prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake.

Policy 7.3. Ecosystem services. Consider the benefits provided by healthy ecosystems that contribute to the livability and economic health of the city.

234. **Finding:** The FFTZ amendments foster a healthy environment and sustain the ecosystem services of Portland's air, water and land by reducing the risk associated with a major earthquake. The first step in making the current situation better is to ensure that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a high risk area. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which can minimize environmental impacts in the event of a major earthquake. No changes to the environmental or greenway overlay zones are proposed as part of this project, therefore the natural resource values and functions will be sustained.

Policy 7.4. Climate change. Update and implement strategies to reduce carbon emissions and impacts and increase resilience through plans and investments and public education.

7.4.a. Carbon sequestration. Enhance the capacity of Portland's urban forest, soils, wetlands, and other water bodies to serve as carbon reserves.

7.4.b. Climate adaptation and resilience. Enhance the ability of rivers, streams, wetlands, floodplains, urban forest, habitats, and wildlife to limit and adapt to climate-exacerbated flooding, landslides, wildfire, and urban heat island effects.

235. **Finding:** The FFTZ amendments help reduce carbon emissions by providing for a transition to a reliable, low-carbon energy infrastructure by designating existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities to increase safety and reliability. In addition, the definition of fossil fuels explicitly does not include ethanol, biodiesel/renewable diesel other fuel additives that will allows FTTs to add storage capacity to provide reliable low-carbon fuels to help meet the carbon emissions reduction goals.

The 2035 Comprehensive Plan defines "resilience" as the capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment. Portland's FFTs are within a disaster-prone area that is at risk for a catastrophic Cascadia earthquake disaster. The FFTs have significant seismic risks because most of the tanks have been constructed without any or only limited seismic design criteria on soils with high levels of liquefaction susceptibility. The City Council finds that the first step in making Portland more resilient is to stop increasing the risk. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding to the Willamette River and associated floodplains. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

Policy 7.5. Air quality. Improve, or support efforts to improve, air quality through plans and investments, including reducing exposure to air toxics, criteria pollutants, and urban heat island effects. Consider the impacts of air quality on the health of all Portlanders.

Policy 7.6. Hydrology. Through plans and investments, improve or support efforts to improve watershed hydrology to achieve more natural flow and enhance conveyance and storage capacity in rivers, streams, floodplains, wetlands, and aquifers. Minimize impacts from development and associated impervious surfaces, especially in areas with poorly-infiltrating soils and limited public stormwater discharge points, and encourage restoration of degraded hydrologic functions.

Policy 7.7. Water quality. Improve, or support efforts to improve, water quality in rivers, streams, floodplains, groundwater, and wetlands through land use plans and investments, to address water quality issues including toxics, bacteria, temperature, metals, and sediment pollution. Consider the impacts of water quality on the health of all Portlanders.

Policy 7.8. Biodiversity. Strive to achieve and maintain self-sustaining populations of native species, including native plants, native resident and migratory fish and wildlife species, at-risk species, and beneficial insects (such as pollinators) through plans and investments.

Policy 7.9. Habitat and biological communities. Ensure that plans and investments are consistent with and advance efforts to improve, or support efforts to improve fish and wildlife habitat and biological communities. Use plans and investments to enhance the diversity, quantity, and quality of habitats habitat corridors, and especially habitats that:

- Are rare or declining.
- Support at-risk plant and animal species and communities.
- Support recovery of species under the Endangered Species Act, and prevent new listings.
- Provide culturally important food sources, including those associated with Native American fishing rights.

Policy 7.10. Habitat connectivity. Improve or support efforts to improve terrestrial and aquatic habitat connectivity for fish and wildlife by using plans and investments, to:

- Prevent and repair habitat fragmentation.
- Improve habitat quality.
- Weave habitat into sites as new development occurs.
- Enhance or create habitat corridors that allow fish and wildlife to safely access and move through and between habitat areas.
- Promote restoration and protection of floodplains.

Policy 7.11. Urban forest. Improve, or support efforts to improve the quantity, quality, and equitable distribution of Portland's urban forest through plans and investments.

7.11.a. Tree preservation. Require or encourage preservation of large healthy trees, native trees and vegetation, tree groves, and forested areas.

7.11.b. Urban forest diversity. Coordinate plans and investments with efforts to improve tree species diversity and age diversity.

7.11.c. Tree canopy. Support progress toward meeting City tree canopy targets.

7.11.d. Tree planting. Invest in tree planting and maintenance, especially in low-canopy areas, neighborhoods with under-served or under-represented communities, and within and near urban habitat corridors.

7.11.e. Vegetation in natural resource areas. Require native trees and vegetation in significant natural resource areas.

7.11.f. Resilient urban forest. Encourage planting of Pacific Northwest hardy and climate change resilient native trees and vegetation generally, and especially in urban habitat corridors.

7.11.g. Trees in land use planning. Identify priority areas for tree preservation and planting in land use plans.

7.11.h. Managing wildfire risk. Address wildfire hazard risks and management priorities through plans and investments.

Policy 7.12. Invasive species. Prevent the spread of invasive plants, and support efforts to reduce the impacts of invasive plants, animals, and insects, through plans, investments, and education.

Policy 7.13. Soils. Coordinate plans and investments with programs that address human-induced soil loss, erosion, contamination, or other impairments to soil quality and function.

236. Finding: The City Council interprets policies 7.5 through 7.13 as providing guidance to foster a healthy environment and sustain the ecosystem services of Portland's air, water and land resources. The FFTZ amendments support these policies by reducing the risk associated with a major earthquake. The first step in making the current situation better is to ensure that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a high risk area. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which can minimize environmental impacts in the event of a major earthquake. No changes to the environmental or greenway overlay zones are proposed as part of this project, therefore the natural resource values and functions will be sustained.

Policy 7.14. Natural hazards. Prevent development-related degradation of natural systems and associated increases in landslide, wildfire, flooding, and earthquake risks.

237. Finding: The 2035 Comprehensive Plan defines "prevent" as proactively avoid or hinder adverse impacts or outcomes. Development-related degradation means development that has adverse impacts on natural systems. For example, development in a floodplain that increases impervious surface can result in increased run-off that increases flooding. Further, Council finds that the policy seeks to avoid increasing risks associated with natural disasters, including earthquakes.

According to the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report, a magnitude 8 or 9 Cascadia Subduction Zone earthquake would impact the CEI Hub with: ground shaking; liquefaction (soil behavior phenomenon in which a saturated sand softens and loses strength during strong earthquake ground shaking); lateral spreading (where surficial soil permanently moves laterally due to earthquake shaking); landslides; co-seismic settlement (where the ground surface is permanently lowered due to seismic shaking); and bearing capacity failures (when the foundation soil cannot support the structure it is intended to support).

According to the 2012 DOGAMI report, liquefaction and lateral spreading hazards are of primary concern to the fossil fuel terminals. As described in the 2012 Oregon State Energy Assurance Plan, this Critical Energy Infrastructure Hub (CEI Hub), where the existing FFTs are located, sits on top of very poor soils that are highly susceptible to earthquake-induced permanent ground deformation. The CEI Hub is adjacent to the Willamette River and has extensive deposits of highly liquefiable soils. These soils (made of sands, silts, gravels and clays) have been naturally deposited by river activity as well as been created from man-made activities, such as hydraulically placed material from river dredging or debris placed as landfill.

Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. The first step in making the current situation better is to ensure that the situation does not get worse. Continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a high risk area increases the risk to the Willamette River. The City Council interprets this policy to mean development regulations should not increase the risk from natural hazards. The current regulations that allow unlimited expansion of storage tank capacity increase the risk from natural hazards. The FFTZ amendments proactively limit future earthquake risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety.

Policy 7.15. Brownfield remediation. Improve environmental quality and watershed health by promoting and facilitating brownfield remediation and redevelopment that incorporates ecological site design and resource enhancement.

238. Finding: The City Council interprets this policy to mean that the City will create programs to support brownfield cleanup. The FFTZ amendments are Zoning Code changes that are not directly related to the cleanup of brownfields. However, the changes designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities, including brownfield remediation.

Policy 7.16. Adaptive management. Evaluate trends in watershed and environmental health using current monitoring data and information to guide and support improvements in the effectiveness of City plans and investments.

Policy 7.17. Restoration partnerships. Coordinate plans and investments with other jurisdictions, air and water quality regulators, watershed councils, soil and water conservation districts, Sovereign nations, and community organizations and groups including under-served and under-represented communities, to optimize the benefits, distribution, and cost-effectiveness of watershed restoration and enhancement efforts.

Policy 7.18. Community stewardship. Encourage voluntary cooperation between property owners, community organizations, and public agencies to restore or re-create habitat on their property, including removing invasive plants and planting native species.

239. Finding: The City Council interprets policies 7.16. through 7.18 to mean that the City will create programs to support restoration and community stewardship. The FFTZ amendments are Zoning Code changes that are not directly related to watershed restoration. These policies do not apply.

Planning for natural resource protection

Policy 7.19. Natural resource protection. Protect the quantity, quality, and function of significant natural resources identified in the City's natural resource inventory, including:

- Rivers, streams, sloughs, and drainageways.
- Floodplains.
- Riparian corridors.
- Wetlands.
- Groundwater.
- Native and other beneficial vegetation species and communities.
- Aquatic and terrestrial habitats, including special habitats or habitats of concern, large anchor habitats, habitat complexes and corridors, rare and declining habitats such as wetlands, native oak, bottomland hardwood forest, grassland habitat, shallow water habitat, and habitats that support special-status or at-risk plant and wildlife species.
- Other resources identified in natural resource inventories.

Policy 7.20. Natural resource inventory. Maintain an up-to-date inventory by identifying the location and evaluating the relative quantity and quality of natural resources.

Policy 7.21. Environmental plans and regulations. Maintain up-to-date environmental protection plans and regulations that specify the significant natural resources to be protected and the types of protections to be applied, based on the best data and science available and on an evaluation of cumulative environmental, social, and economic impacts and tradeoffs. *See Figure 7-2 — Adopted Environmental Plans.*

7.21.a. Improve the effectiveness of environmental protection plans and regulations to protect and encourage enhancement of ecological functions and ecosystem services.

Policy 7.22. Land acquisition priorities and coordination. Maintain a land acquisition program as a tool to protect and support natural resources and their functions. Coordinate land acquisition with the programs of City bureaus and other agencies and organizations.

240. Finding: The City Council interprets policies 7.19 through 7.22 as providing guidance to the City as to how to protect significant natural resources. The *2035 Comprehensive Plan* background documents included an updated Natural Resources Inventory (NRI), which was adopted (Ordinance 185657) and acknowledged by LCDC on June 13, 2014. The NRI identified the location, quantity, and quality of all significant natural resources as required by the inventory provisions of Statewide Planning Goal 5. From the set of all significant resources, high and medium quality resources, ranked primarily from riparian corridor and wildlife habitat considerations, were identified to comply with the inventory requirements of Title 13 of Metro's Urban Growth Management Functional Plan.

Environmental zones protect resources and functional values that have been identified by the City as providing benefits to the public. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major

earthquake, which can minimize environmental impacts in the event of a major earthquake. No changes to the environmental or greenway overlay zones are proposed as part of this project, therefore the natural resource values and functions will continue to be protected.

Protecting natural resources in development situations

Policy 7.23. Impact evaluation. Evaluate the potential adverse impacts of proposed development on significant natural resources, their functions, and the ecosystem services they provide to inform and guide development design and mitigation consistent with policies 7.24-7.26. and other relevant Comprehensive Plan policies.

Policy 7.24. Regulatory hierarchy: avoid, minimize, mitigate. Maintain regulations requiring that the potential adverse impacts of new development on significant natural resources and their functions first be avoided where practicable, then minimized, then lastly, mitigated.

Policy 7.25. Mitigation effectiveness. Require that mitigation approaches compensate fully for adverse impacts on locally and regionally significant natural resources and functions. Require mitigation to be located as close to the impact as possible. Mitigation must also take place within the same watershed or portion of the watershed that is within the Portland Urban Services Boundary, unless mitigating outside of these areas will provide a greater local ecological benefit. Mitigation will be subject to the following preference hierarchy:

- On the site of the resource subject to impact with the same kind of resource; if that is not possible, then
- Off-site with the same kind of resource; if that is not possible, then
- On-site with a different kind of resource; if that is not possible, then
- Off-site with a different kind of resource.

Policy 7.26. Improving environmental conditions through development. Encourage ecological site design, site enhancement, or other tools to improve ecological functions and ecosystem services in conjunction with new development and alterations to existing development.

241. The City Council interprets policies 7.23 through 7.26 as providing guidance to the City as to how to protect significant natural resources. The City's environmental and greenway overlay zones are the regulations that control development in order to protect the resources and functional values while allowing environmentally sensitive urban development. No changes to the environmental or greenway overlay zones are proposed as part of this project, therefore the natural resource values and functions will continue to be protected.

Aggregate resources

Policy 7.27. **Aggregate resource protection.** Protect aggregate resource sites for current and future use where there are no major conflicts with urban needs, or where these conflicts may be resolved**.**

Policy 7.28. **Aggregate resource development**. When aggregate resources are developed, ensure that development minimizes adverse environmental impacts and impacts on adjacent land uses.

Policy 7.29. Mining site reclamation. Ensure that the reclamation of mining sites protects public health and safety, protects fish and wildlife (including at-risk species), enhances or restores habitat (including rare and declining habitat types), restores adequate watershed conditions and functions on the site, and is compatible with the surrounding land uses and conditions of nearby land.

242. Finding: Policies 7.27 through 7.29 provide guidance on aggregate resources. The FFTZ amendments are Zoning Code changes that affect one allowed use in the employment and industrial zones and are not directly related to aggregate. These policies do not apply.

Watershed-specific policies

The policies above guide planning, actions, and investments citywide. The following policies are intended to augment the citywide Watershed Health and Environment policies by providing additional guidance relating and responding to the characteristics within each of Portland's distinctive watersheds. They address watershed-specific habitat types, hydrology, water quality issues, and stormwater management challenges. Together, the citywide and watershed-specific policies support the close coordination of watershed health and land use programs, guiding land use planning-related activities and future infrastructure investments. While these watersheds are not entirely within Portland's urban services boundary, Portland's actions can have significant benefits for the watershed as a whole.

Columbia River Watershed

Policy 7.30. In-water habitat. Enhance in-water habitat for native fish and wildlife, particularly in the Oregon Slough and near-shore environments along the Columbia River.

Policy 7.31. Sensitive habitats. Enhance grassland, beach, riverbanks, wetlands, bottomland forests, shallow water habitats, and other key habitats for wildlife traveling along the Columbia River migratory corridor, while continuing to manage the levees and floodplain for flood control.

Policy 7.32. **River-dependent and river-related uses.** Maintain plans and regulations that recognize the needs of river-dependent and river-related uses while also supporting ecologically-sensitive site design and practices.

243. Finding: None of the existing FFTs have frontage on the Columbia River. The Columbia River plays a major role in the habitat corridors that weave nature into Portland, with designated natural resources that are protected by the Environmental Overlay Zone, which is not amended by this ordinance. In considering the natural hazard risks that the FFTs pose to the ecosystem functions on the river, as identified by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016), the City Council finds that continuing to allow FFTs in a high risk area does not enhance the current or future natural resource functions of the Columbia River. These regulations apply to only one type of allowed that makes up a minority part of the uses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations, including other river-dependent and river-related uses. Therefore, this ordinance maintains the needs of river-dependent and river-related uses, except for FFTs, while supporting ecologically-sensitive site design.

Willamette River Watershed

Policy 7.33. Fish habitat. Provide adequate intervals of ecologically-functional shallow-water habitat for native fish along the entire length of the Willamette River within the city, and at the confluences of its tributaries.

Policy 7.34. Stream connectivity. Improve stream connectivity between the Willamette River and its tributaries.

Policy 7.35. River bank conditions. Preserve existing river bank habitat and encourage the

rehabilitation of river bank sections that have been significantly altered due to development with more fish and wildlife friendly riverbank conditions.

Policy 7.37. Contaminated sites. Promote and support programs that facilitate the cleanup, reuse, and restoration of the Portland Harbor Superfund site and other contaminated upland sites.

Policy 7.38. Sensitive habitats. Protect and enhance grasslands, beaches, floodplains, wetlands, remnant native oak, bottomland hardwood forest, and other key habitats for native wildlife including shorebirds, waterfowl, and species that migrate along the Pacific Flyway and the Willamette River corridor.

Policy 7.39. Riparian corridors. Increase the width and quality of vegetated Riparian buffers along the Willamette River.

Policy 7.40. Connected upland and river habitats. Enhance habitat quality and connectivity between the Willamette riverfront, the Willamette's floodplain, and upland natural resource areas.

Policy 7.41. River-dependent and river-related uses. Develop and maintain plans and regulations that recognize the needs of river-dependent and river-related uses, while also supporting ecologically-sensitive site design and practices.

244. Finding: Policies 7.33 through 7.41 provide direction regarding the environment and watershed health in the Willamette River Watershed. The eleven existing FFTs have frontage on the Willamette River. The Willamette River plays a major role in the habitat corridors that weave nature into Portland, with designated natural resources that are protected by the Greenway Overlay Zone, which is not amended by this ordinance. In considering the natural hazard risks that the FFTs pose to the ecosystem functions on the river, as identified by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016), the City Council finds that continuing to allow FFTs in a high risk area does not enhance the current or future natural resource functions of the Willamette River. This ordinance balances environmental and watershed health by narrowly crafting the regulations to apply to only one type of allowed that makes up a minority part of the uses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations, including other river-dependent and river-related uses.

Columbia Slough Watershed

Policy 7.43. Fish passage. Restore in-stream habitat and improve fish passage within the Columbia Slough, including for salmonids in the lower slough.

Policy 7.44. Flow constriction removal. Reduce constriction, such as culverts, in the slough channels, to improve the flow of water and water quality.

Policy 7.45. Riparian corridors. Increase the width, quality, and native plant diversity of vegetated riparian buffers along Columbia Slough channels and other drainageways within the watershed, while also managing the slough for
flood control.

Policy 7.46. Sensitive habitats. Enhance grasslands and wetland habitats in the Columbia Slough, such as those found in the Smith and Bybee Lakes and at the St. Johns Landfill site, to provide habitat for sensitive species, and for wildlife traveling along the Columbia and Willamette river migratory corridors.

Policy 7.47. Connected rivers habitats. Enhance upland habitat connections to the Willamette and Columbia rivers.

Policy 7.48. Contaminated sites. Ensure that plans and investments are consistent with and advance programs that facilitate the cleanup, reuse, and restoration of contaminated sites that are adjacent, or that discharge stormwater, to the Columbia Slough.

Policy 7.49. Portland International Airport. Protect, restore, and enhance natural resources and functions in the Portland International Airport plan district, as identified in Portland International Airport/Middle Columbia Slough Natural Resources Inventory. Accomplish this through regulations, voluntary strategies, and the implementation of special development standards.

245. Finding: Policies 7.43 through 7.49 provide direction regarding the environment and watershed health in the Columbia Slough Watershed. There are no existing FFTs in the Columbia Slough watershed. The Columbia Slough plays a major role in the habitat corridors that weave nature into Portland, with designated natural resources that are protected by the Environmental Overlay Zone, which is not amended by this ordinance. This ordinance helps to advance these policies by prohibiting new FFTs in these watersheds. These regulations apply to only one type of allowed uses that makes up a minority part of the uses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations.

Fanno and Tryon Creek Watersheds

Policy 7.50 **Stream connectivity.** Encourage the daylighting of piped portions of Tryon and Fanno creeks and their tributaries.

Policy 7.51 **Riparian and habitat corridors.** Protect and enhance riparian habitat quality and connectivity along Tryon and Fanno creeks and their tributaries. Enhance connections between riparian areas, parks, anchor habitats, and areas with significant tree canopy. Enhance in-stream and upland habitat connections between Tryon Creek State Natural Area and the Willamette River.

Policy 7.52 **Reduced hazard risks.** Reduce the risks of landslides and streambank erosion by protecting trees and vegetation that absorb stormwater, especially in areas with steep slopes or limited access to stormwater infrastructure.

246. Finding: Policies 7.50 through 7.52 provide direction regarding habitat and river-related uses in the Fanno and Tryon Creek Watersheds. There are no existing FFTs in the Fanno and Tryon Creek watersheds, which play a major role in the habitat corridors that weave nature into Portland, with designated natural resources that are protected by the Environmental Overlay Zone, which is not amended by this ordinance. This ordinance helps to advance these policies by prohibiting new FFTs in these watersheds.

Johnson Creek Watershed

Policy 7.53 **In-stream and riparian habitat.** Enhance in-stream and riparian habitat and improve fish passage for salmonids along Johnson Creek and its tributaries.

Policy 7.54 **Floodplain restoration.** Enhance Johnson Creek floodplain functions to increase flood-storage capacity, improve water quality, and enhance fish and wildlife habitat.

Policy 7.55 **Connected floodplains, springs, and wetlands.** Enhance hydrologic and habitat connectivity between the Johnson Creek floodplain and its springs and wetlands.

Policy 7.56 **Reduced natural hazards.** Reduce the risks of landslides, streambank erosion and

downstream flooding by protecting seeps, springs, trees, vegetation, and soils that absorb stormwater in the East Buttes.

Policy 7.57 **Greenspace network.** Enhance the network of parks, trails, and natural areas near the Springwater Corridor Trail and the East Buttes to enhance habitat connectivity and nature-based recreation in East Portland.

247. Finding: Policies 7.53 through 7.57 provide direction regarding the environment and watershed health in the Johnson Creek Watershed. There are no existing FFTs in the Fanno and Tryon Creek watersheds, which play a major role in the habitat corridors that weave nature into Portland, with designated natural resources that are protected by the Environmental Overlay Zone, which is not amended by this ordinance. These regulations apply to only one type of allowed that makes up a minority part of the uses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations, including other river-dependent and river-related uses. This ordinance helps to advance these policies by prohibiting new FFTs in this watershed.

Chapter 8: Public Facilities and Services

Goal 8.A: Quality public facilities and services. High-quality public facilities and services provide Portlanders with optimal levels of service throughout the city, based on system needs and community goals, and in compliance with regulatory mandates.

Goal 8.B: Multiple benefits. Public facility and service investments improve equitable service provision, support economic prosperity, and enhance human and environmental health.

Goal 8.C: Reliability and resiliency. Public facilities and services are reliable, able to withstand or recover from catastrophic natural and manmade events, and are adaptable and resilient in the face of long-term changes in the climate, economy, and technology.

Goal 8.D: Public rights-of-way. Public rights-of-way enhance the public realm and provide a multi-purpose, connected, safe, and healthy physical space for movement and travel, public and private utilities, and other appropriate public functions and uses.

Goal 8.E: Sanitary and stormwater systems. Wastewater and stormwater are managed, conveyed, and/or treated to protect public health, safety, and the environment, and to meet the needs of the community on an equitable, efficient, and sustainable basis.

Goal 8.F: Flood management. Flood management systems and facilities support watershed health and manage flooding to reduce adverse impacts on Portlanders' health, safety, and property.

Goal 8.G: Water. Reliable and adequate water supply and delivery systems provide sufficient quantities of high-quality water at adequate pressures to meet the needs of the community on an equitable, efficient, and sustainable basis.

Goal 8.H: Parks, natural areas, and recreation. All Portlanders have safe, convenient, and equitable access to high-quality parks, natural areas, trails, and recreational opportunities in their daily lives, which contribute to their health and well-being. The City manages its natural areas and urban forest to protect unique urban habitats and offer Portlanders an opportunity to connect with nature.

Goal 8.I: Public safety and emergency response. Portland is a safe, resilient, and peaceful community where public safety, emergency response, and emergency management facilities and services are coordinated and able to effectively and efficiently meet community needs.

Goal 8.J: Solid waste management. Residents and businesses have access to waste management services and are encouraged to be thoughtful consumers to minimize upstream impacts and avoid generating waste destined for the landfill. Solid waste — including food, yard debris, recyclables, electronics, and construction and demolition debris — is managed, recycled, and composted to ensure the highest and best use of materials.

Goal 8.K: School facilities. Public schools are honored places of learning as well as multifunctional neighborhood anchors serving Portlanders of all ages, abilities, and cultures.

Goal 8.L: Technology and communications. All Portland residences, businesses, and institutions have access to universal, affordable, and reliable state-of-the-art communication and technology services.

Goal 8.M: Energy infrastructure and services. Residents, businesses, and institutions are served by reliable energy infrastructure that provides efficient, low-carbon, affordable energy through decision-making based on integrated resource planning.

248. Finding: The City Council interprets the Chapter 8 goals to provide general guidance to public agencies in how to provide basic services to Portlanders. The adopted 2035 Comprehensive Plan includes the Citywide Systems Plan (CSP), which was adopted (Ordinance 185657) and acknowledged by LCDC on April 25, 2017. The CSP includes the Public Facilities Plan with information on current and future transportation, water, sanitary sewer, and stormwater infrastructure needs and projects, consistent with the requirements of Statewide Planning Goal 11.

The FFTZ amendments do not include comprehensive plan map amendments and do not amend the CSP. These regulations apply to only one type of use that makes up a minority part of the uses found in Portland's industrial districts. The remaining industrial uses continue to be regulated under the current development regulations and do not intensify the development capacity. Therefore, these changes will not adversely impact the City's public facilities or services. Therefore, the City continues to plan for public infrastructure investments in the industrial districts where the FFTs are located.

Goal 8.M (energy infrastructure) is the one goal that is applicable to this ordinance. Oregon Administrative Rules (OAR 860-027-0400) define integrated resource plans (IRP) as investor-owned energy utility's written plan detailing its future long-term resource needs, its analysis of the expected costs and associated risks of the alternatives to meet those needs, and its action plan to select the best portfolio of resources to meet those needs. The NW Natural LNG Storage facility is the only FFT in Portland that is part of an investor-owned utility. NW Natural's 2018 IRP identifies the replacement of mechanical process equipment used for the liquefaction, vaporization, or storage of LNG, but not expansion of storage capacity. The FFTZ amendments only regulate fossil fuel storage tank capacity, therefore these changes are consistent with the NW Natural IRP.

As documented in the 2012 DOGAMI report, the current CEI hub infrastructure is not reliable in the event of a magnitude 8 or 9 Cascadia Subduction Zone earthquake. The FFTZ amendments will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels, which will minimize the risk from a future major earthquake compared to the current regulations that allow for unlimited growth in FFTs. The FFTZ amendments help provide a reliable, low-carbon energy infrastructure by designating existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities to increase safety and reliability. In addition, the definition of fossil fuels (33.910.030) explicitly does not include ethanol, biodiesel/renewable diesel other fuel additives that will allows FTTs to add storage capacity to provide reliable low-carbon fuels.

Service provision and urbanization

Policy 8.1. Urban services boundary. Maintain an Urban Services Boundary for the City of Portland that is consistent with the regional urban growth policy, in cooperation with neighboring jurisdictions. The Urban Services Boundary is shown on the Comprehensive Plan Map.

Policy 8.2. Rural, urbanizable, and urban public facility needs. Recognize the different public facility needs in rural, urbanizable and urban land as defined by the Regional Urban Growth Boundary, the City Urban Services Boundary, and the City Boundaries of Municipal Incorporation. See Figure 8-1 — Urban, Urbanizable, and Rural Lands.

Policy 8.3. Urban service delivery. Provide the following public facilities and services at urban levels of service to urban lands within the City's boundaries of incorporation:

- Public rights-of-way, streets, and public trails
- Sanitary sewers and wastewater treatment
- Stormwater management and conveyance
- Flood management
- Protection of the waterways of the state
- Water supply
- Police, fire, and emergency response
- Parks, natural areas, and recreation
- Solid waste regulation

Policy 8.4. Supporting facilities and systems. Maintain supporting facilities and systems, including public buildings, technology, fleet, and internal service infrastructure, to enable the provision of public facilities and services.

Policy 8.5. Planning service delivery. Provide planning, zoning, building, and subdivision control services within the boundaries of incorporation, and as otherwise provided by intergovernmental agreement within the City's Urban Services Boundary.

249. Finding: The City Council interprets policies 8.1 through 8.5 provide direction on the provision of public facilities and services. The FFTZ amendments do not include new public facility or infrastructure projects. These policies do not apply.

Service coordination

Policy 8.6. Interagency coordination. Maintain interagency coordination agreements with neighboring jurisdictions and partner agencies that provide urban public facilities and services within the City of Portland's Urban Services Boundary to ensure effective and efficient service delivery. See Policy 8.3 for the list of services included. Such jurisdictions and agencies include, but may not be limited to:

- Multnomah County for transportation facilities and public safety.
- State of Oregon for transportation and parks facilities and services.
- TriMet for public transit facilities and services.
- Port of Portland for air and marine facilities and services.
- Metro for regional parks and natural areas, and for solid waste, composting, and recycling

facilities and transfer stations.

- Gresham, Milwaukie, Clackamas County Service District #1, and Clean Water Services for sanitary sewer conveyance and treatment.
- Multnomah County Drainage District No. 1, Peninsula Drainage District No 1, and Peninsula Drainage District No. 2 for stormwater management and conveyance, and for flood mitigation, protection, and control.
- Rockwood People's Utility District; Sunrise Water Authority; and the Burlington, Tualatin Valley, Valley View, West Slope, Palatine Hill, Alto Park, and Clackamas River Water Districts for water distribution.
- Portland Public Schools and the David Douglas, Parkrose, Reynolds, Centennial, and Riverdale school districts for public education, park, trail, and recreational facilities.

Policy 8.7. Outside contracts. Coordinate with jurisdictions and agencies outside of Portland where the City provides services under agreement.

Policy 8.8. Public service coordination. Coordinate with the planning efforts of agencies providing public education, public health services, community centers, urban forest management, library services, justice services, energy, and technology and communications services.

Policy 8.9. Internal coordination. Coordinate planning and provision of public facilities and services, including land acquisition, among City agencies, including internal service bureaus.

Policy 8.10. Co-location. Encourage co-location of public facilities and services across providers where co-location improves service delivery efficiency and access for historically under-represented and under-served communities.

250. Finding: The City Council interprets policies 8.6 through 8.10 provide direction on coordination with neighboring jurisdictions and partner agencies that provide urban public facilities and services within the City of Portland's Urban Services Boundary. The FFTZ amendments do not include new public facility or infrastructure projects or amendments to public service coordination agreements. These policies do not apply.

Service extension

Policy 8.11. Annexation. Require annexation of unincorporated urbanizable areas within the City's Urban Services Boundary as a prerequisite to receive urban services.

Policy 8.12. Feasibility of service. Evaluate the physical feasibility and cost-effectiveness of extending urban public services to candidate annexation areas to ensure sensible investment and to set reasonable expectations.

Policy 8.13. Orderly service extension. Establish or improve urban public services in newly-annexed areas to serve designated land uses at established levels of service, as funds are available and as responsible engineering practice allows.

Policy 8.14. Coordination of service extension. Coordinate provision of urban public services to newly-annexed areas so that provision of any given service does not stimulate development that significantly hinders the City's ability to provide other urban services at uniform levels.

Policy 8.15. Services to unincorporated urban pockets. Plan for future delivery of urban services to urbanizable areas that are within the Urban Services Boundary but outside the city limits.

Policy 8.16. Orderly urbanization. Coordinate with counties, neighboring jurisdictions, and other

special districts to ensure consistent management of annexation requests, and to establish rational and orderly process of urbanization that maximize efficient use of public funds.

Policy 8.17. Services outside the city limits. Prohibit City provision of new urban services, or expansion of the capacity of existing services, in areas outside city limits, except in cases where the City has agreements or contracts in place.

Policy 8.18. Service district expansion. Prohibit service district expansion or creation within the City's Urban Services Boundary without the City's expressed consent.

Policy 8.19. Rural service delivery. Provide the public facilities and services identified in Policy 8.3 in rural areas only at levels necessary to support designated rural residential land uses and protect public health and safety. Prohibit sanitary sewer extensions into rural land and limit other urban services.

251. Finding: The City Council interprets policies 8.11 through 8.19 provide direction on extending public services. The FFTZ amendments do not include new public facility or infrastructure projects or service extensions. These policies do not apply.

Public investment

Policy 8.20. Regulatory compliance. Ensure public facilities and services remain in compliance with state and federal regulations. Work toward cost-effective compliance with federal and state mandates through intergovernmental coordination and problem solving.

Policy 8.21. System capacity. Establish, improve, and maintain public facilities and services at levels appropriate to support land use patterns, densities, and anticipated residential and employment growth, as physically feasible and as sufficient funds are available.

Policy 8.22. Equitable service. Provide public facilities and services to alleviate service deficiencies and meet level-of-service standards for all Portlanders, including individuals, businesses, and property owners.

8.22.a. In places that are not expected to grow significantly but have existing deficiencies, invest to reduce disparity and improve livability.

8.22.b. In places that lack basic public facilities or services and also have significant growth potential, invest to enhance neighborhoods, fill gaps, maintain affordability, and accommodate growth.

8.22.c. In places that are not expected to grow significantly and already have access to complete public facilities and services, invest primarily to maintain existing facilities and retain livability.

8.22.d. In places that already have access to complete public facilities and services, but also have significant growth potential, invest to fill remaining gaps, maintain affordability, and accommodate growth.

Policy 8.23. Asset management. Improve and maintain public facility systems using asset management principles to optimize preventative maintenance, reduce unplanned reactive maintenance, achieve scheduled service delivery, and protect the quality, reliability, and adequacy of City services.

Policy 8.24. Risk management. Maintain and improve Portland's public facilities to minimize or eliminate economic, social, public health and safety, and environmental risks.

Policy 8.25. **Critical infrastructure**. Increase the resilience of high-risk and critical infrastructure

through monitoring, planning, maintenance, investment, adaptive technology, and continuity planning.

Policy 8.26. Capital programming. Maintain long-term capital improvement programs that balance acquisition and construction of new public facilities with maintenance and operations of existing facilities.

252. Finding: The City Council interprets policies 8.20 through 8.26 provide direction on investment priorities for public facilities. The FFTZ amendments do not include new public facility or infrastructure projects. These policies do not apply.

Funding

Policy 8.27. Cost-effectiveness. Establish, improve, and maintain the public facilities necessary to serve designated land uses in ways that cost-effectively provide desired levels of service, consider facilities' lifecycle costs, and maintain the City's long-term financial sustainability.

Policy 8.28. Shared costs. Ensure the costs of constructing and providing public facilities and services are equitably shared by those who benefit from the provision of those facilities and services.

Policy 8.29. System development. Require private or public entities whose prospective development or redevelopment actions contribute to the need for public facility improvements, extensions, or construction to bear a proportional share of the costs.

Policy 8.30. Partnerships. Maintain or establish public and private partnerships for the development, management, or stewardship of public facilities necessary to serve designated land uses, as appropriate.

253. Finding: The City Council interprets policies 8.27 through 8.30 provide direction on funding public facilities and services within the City of Portland's Urban Services Boundary. The FFTZ amendments do not include new public facility or infrastructure projects. These policies do not apply.

Public benefits

Policy 8.31. Application of Guiding Principles. Plan and invest in public facilities in ways that promote and balance the Guiding Principles established in The Vision and Guiding Principles of this Comprehensive Plan.

Policy 8.32. Community benefit agreements. Encourage the use of negotiated community benefit agreements for large public facility projects as appropriate to address environmental justice policies in Chapter 2: Community Involvement.

Policy 8.33. Community knowledge and experience. Encourage public engagement processes and strategies for larger public facility projects to include community members in identifying potential impacts, mitigation measures and community benefits.

Policy 8.34. Resource efficiency. Reduce the energy and resource use, waste, and carbon emissions from facilities necessary to serve designated land uses to meet adopted City goals and targets.

Policy 8.35. Natural systems. Protect, enhance, and restore natural systems and features for their infrastructure service and other values.

Policy 8.36. Context-sensitive infrastructure. Design, improve, and maintain public rights-of-way and facilities in ways that are compatible with, and that minimize negative impacts on, their physical, environmental, and community context.

Policy 8.37. Site- and area-specific needs. Allow for site- and area-specific public facility standards,

requirements, tools, and policies as needed to address distinct topographical, geologic, environmental, and other conditions.

Policy 8.38. Age-friendly public facilities. Promote public facility designs that make Portland more age-friendly.

254. Finding: The City Council interprets policies 8.31 through 8.38 provide direction on the associated public benefits that should be considered in conjunction with investment in public facilities and services within the City of Portland's Urban Services Boundary. The FFTZ amendments do not include new public facility or infrastructure projects. These policies do not apply.

Public rights-of-way

Policy 8.39. Interconnected network. Establish a safe and connected rights-of-way system that equitably provides infrastructure services throughout the city.

Policy 8.40. Transportation function. Improve and maintain the right-of-way to support multimodal transportation mobility and access to goods and services as is consistent with the designated street classification.

Policy 8.41. Utility function. Improve and maintain the right-of-way to support equitable distribution of utilities, including water, sanitary sewer, stormwater management, energy, and communications, as appropriate.

Policy 8.42. Stormwater management function. Improve rights-of-way to integrate green infrastructure and other stormwater management facilities to meet desired levels-of-service and economic, social, and environmental objectives.

Policy 8.43. Trees in rights-of-way. Integrate trees into public rights-of-way to support City canopy goals, transportation functions, and economic, social, and environmental objectives.

Policy 8.44. Community uses. Allow community use of rights-of-way for purposes such as public gathering space, events, or temporary festivals, if the community uses are integrated in ways that balance and minimize conflict with the designated through movement and access roles of rights-of-ways.

Policy 8.45. Pedestrian amenities. Encourage facilities that enhance pedestrian enjoyment, such as transit shelters, garbage containers, benches, etc. in the right-of-way.

Policy 8.46. Commercial uses. Accommodate allowable commercial uses of the rights-of-way for enhancing commercial vitality, if the commercial uses can be integrated in ways that balance and minimize conflict with the other functions of the right-of-way.

Policy 8.47. Flexible design. Allow flexibility in right-of-way design and development standards to appropriately reflect the pattern area and other relevant physical, community, and environmental contexts and local needs.

> **8.47.a.** Use a variety of transportation resources in developing and designing projects for all City streets, such as the City of Portland's Pedestrian Design Guide, Bicycle Master Plan-Appendix A, NACTO Urban Bikeway Design Guide, NACTO Urban Street Design Guide, Portland Parks and Recreation Trail Design Guidelines, Designing for Truck Movements and Other Large Vehicles, and City of Portland Green Street Policy, Stormwater Management Manual, Design Guide for Public Street Improvements, and Neighborhood Greenways. (TSP objective 8.1.e.).

Policy 8.48. Corridors and City Greenways. Ensure public facilities located along Civic Corridors,

Neighborhood Corridors, and City Greenways support the multiple objectives established for these corridors.

Policy 8.49. Coordination. Coordinate the planning, design, development, improvement, and maintenance of public rights-of-way among appropriate public agencies, private providers, and adjacent landowners.

8.49.a. Coordination efforts should include the public facilities necessary to support the uses and functions of rights-of-way, as established in policies 8.40 to 8.46.

8.49.b. Coordinate transportation and stormwater system plans and investments, especially in unimproved or substandard rights-of-way, to improve water quality, public safety, including for pedestrians and bicyclists, and neighborhood livability.

Policy 8.50. Undergrounding. Encourage undergrounding of electrical and telecommunications facilities within public rights-of-way, especially in centers and along Civic Corridors.

Policy 8.51. Right-of-way vacations. Maintain rights-of-way if there is an established existing or future need for them, such as for transportation facilities or for other public functions established in policies 8.40 to 8.46.

Policy 8.52. Rail rights-of-way. Preserve existing and abandoned rail rights-of-way for future rail or public trail uses.

255. Finding: The City Council interprets policies 8.39 through 8.52 to apply to new public facilities or infrastructure projects in the right-of-way. The FFTZ amendments do not include new public facility or infrastructure projects in the right-of-way. These policies do not apply.

Trails

Policy 8.53. Public trails. Establish, improve, and maintain a citywide system of public trails that provide transportation and/or recreation options and are a component of larger network of facilities for bicyclists, pedestrians, and recreational users.

Policy 8.54. Trail system connectivity. Plan, improve, and maintain the citywide trail system so that it connects and improves access to Portland's neighborhoods, commercial areas, employment centers, schools, parks, natural areas, recreational facilities, regional destinations, the regional trail system, and other key places that Portlanders access in their daily lives.

Policy 8.55. Trail coordination. Coordinate planning, design, improvement, and maintenance of the trail system among City agencies, other public agencies, non-governmental partners, and adjacent landowners.

Policy 8.56. Trail diversity. Allow a variety of trail types to reflect a trail's transportation and recreation roles, requirements, and physical context.

Policy 8.57. Public access requirements. Require public access and improvement of public trails along the future public trail alignments shown in Figure 8-2 — Future Public Trail Alignments**.**

Policy 8.58. Trail and City Greenway coordination. Coordinate the planning and improvement of trails as part of the City Greenways system.

Policy 8.59. Trail and Habitat Corridor coordination. Coordinate the planning and improvement of trails with the establishment, enhancement, preservation, and access to habitat corridors.

Policy 8.60. Intertwine coordination. Coordinate with the Intertwine Alliance and its partners, including local and regional parks providers, to integrate Portland's trail and active transportation network with the bi-state regional trail system.

256. Finding: The City Council interprets policies 8.53 through 8.60 to apply to designated trails. While designated trail alignments are included in public rights of way adjacent industrial zones, the FFTZ amendments do not amend the designated trail alignments. These policies do not apply.

Sanitary system

Policy 8.61. Sewer connections. Require all developments within the city limits to be connected to sanitary sewers unless the public sanitary system is not physically or legally available per City Code and state requirements; or the existing onsite septic system is functioning properly without failure or complaints per City Code and state requirements; and the system has all necessary state and county permits.

Policy 8.62. Combined sewer overflows. Provide adequate public facilities to limit combined sewer overflows to frequencies established by regulatory permits.

Policy 8.63. Sanitary sewer overflows. Provide adequate public facilities to prevent sewage releases to surface waters as consistent with regulatory permits.

Policy 8.64. Private sewage treatment systems. Adopt land use regulations that require any proposed private sewage treatment system to demonstrate that all necessary state and county permits are obtained.

Policy 8.65. Sewer extensions. Prioritize sewer system extensions to areas that are already developed at urban densities and where health hazards exist.

Policy 8.66. Pollution prevention. Reduce the need for wastewater treatment capacity through land use programs and public facility investments that manage pollution as close to its source as practical and that reduce the amount of pollution entering the sanitary system.

Policy 8.67. Treatment. Provide adequate wastewater treatment facilities to ensure compliance with effluent standards established in regulatory permits.

257. Finding: The City Council interprets policies 8.61 through 8.67 to apply to the provision of sanitary sewer facilities. The FFTZ amendments do not include comprehensive plan map amendments and do not amend the CSP. These regulations apply to only one type of use that makes up a minority part of the uses found in Portland's industrial districts. The remaining industrial uses continue to be regulated under the current development regulations and do not intensify the development capacity. Therefore, these changes will not adversely impact the City's sanitary sewer system.

Stormwater Systems

Policy 8.68. Stormwater facilities. Provide adequate stormwater facilities for conveyance, flow control, and pollution reduction.

Policy 8.69. Stormwater as a resource. Manage stormwater as a resource for watershed health and public use in ways that protect and restore the natural hydrology, water quality, and habitat of Portland's watersheds.

Policy 8.70 Natural systems. Protect and enhance the stormwater management capacity of natural resources such as rivers, streams, creeks, drainageways, wetlands, and floodplains.

Policy 8.71. Green infrastructure. Promote the use of green infrastructure, such as natural areas, the

urban forest, and landscaped stormwater facilities, to manage stormwater.

Policy 8.72. Stormwater discharge. Avoid or minimize the impact of stormwater discharges on the water and habitat quality of rivers and streams.

Policy 8.73. On-site stormwater management. Encourage on-site stormwater management, or management as close to the source as practical, through land use decisions and public facility investments.

Policy 8.74. Pollution prevention. Coordinate policies, programs, and investments with partners to prevent pollutants from entering the stormwater system by managing point and non-point pollution sources through public and private facilities, local regulations, and education.

Policy 8.75. Stormwater partnerships. Provide stormwater management through coordinated public and private facilities, public-private partnerships, and community stewardship.

258. Finding: The City Council interprets policies 8.68 through 8.75 to apply to the provision of stormwater facilities. The FFTZ amendments do not include comprehensive plan map amendments and do not amend the CSP. These regulations apply to only one type of use that makes up a minority part of the uses found in Portland's industrial districts. The remaining industrial uses continue to be regulated under the current development regulations and do not intensify the development capacity. Therefore, these changes will not adversely impact the City's stormwater systems.

Flood management

Policy 8.76. Flood management. Improve and maintain the functions of natural and managed drainageways, wetlands, and floodplains to protect health, safety, and property, provide water conveyance and storage, improve water quality, and maintain and enhance fish and wildlife habitat.

Policy 8.77. Floodplain management. Manage floodplains to protect and restore associated natural resources and functions and to minimize the risks to life and property from flooding.

Policy 8.78. Flood management facilities. Establish, improve, and maintain flood management facilities to serve designated land uses through planning, investment and regulatory requirements.

Policy 8.79. Drainage district coordination. Coordinate with drainage districts that provide stormwater management, conveyance, and flood mitigation, protection, and control services within the City's Urban Services Boundary.

Policy 8.80. Levee coordination. Coordinate plans and investments with special districts and agencies responsible for managing and maintaining certification of levees along the Columbia River.

259. The City Council interprets policies 8.76 through 8.80 to apply to the management of floodplains. Six of the existing FFTs have frontage on the Willamette River, with portions of the sites in the FEMA designated 100-year floodplain. For sites in flood prone areas, the FFTZ amendments do not amend the environmental overlay maps, nor do they change City programs that regulate development in the floodplain (i.e., Title 33.631 Sites in Flood Hazard Areas; Title 10 Erosion Control, and the balanced cut and fill requirements of Title 24).

Water systems

Policy 8.81. Primary supply source. Protect the Bull Run watershed as the primary water supply source for Portland.

Policy 8.82. Bull Run protection. Maintain a source-protection program and practices to safeguard the

Bull Run watershed as a drinking water supply.

Policy 8.83. Secondary supply sources. Protect, improve, and maintain the Columbia South Shore wellfield groundwater system, the Powell Valley wellfield groundwater system, and any other alternative water sources designated as secondary water supplies.

Policy 8.84. Groundwater wellfield protection. Maintain a groundwater protection program and practices to safeguard the Columbia South Shore wellfield and the Powell Valley wellfield as drinking water supplies.

Policy 8.85. Water quality. Maintain compliance with state and federal drinking water quality regulations.

Policy 8.86. Storage. Provide sufficient in-city water storage capacity to serve designated land uses, meet demand fluctuations, maintain system pressure, and ensure supply reliability.

Policy 8.87. Fire protection. Provide adequate water facilities to serve the fire protection needs of all Portlanders and businesses.

Policy 8.88. Water pressure. Provide adequate water facilities to maintain water pressure in order to protect water quality and provide for the needs
of customers.

Policy 8.89. Water efficiency. Reduce the need for additional water facility capacity and maintain compliance with state water resource regulations by encouraging efficient use of water by customers within the city.

Policy 8.90. Service interruptions. Maintain and improve water facilities to limit interruptions in water service to customers.

Policy 8.91. Outside user contracts. Coordinate long-term water supply planning and delivery with outside-city water purveyors through long-term
wholesale contracts.

260. Finding: The City Council interprets policies 8.81 through 8.91 to apply to the provision of water service. The FFTZ amendments do not include comprehensive plan map amendments and do not amend the CSP. These regulations apply to only one type of use that makes up a minority part of the uses found in Portland's industrial districts. The remaining industrial uses continue to be regulated under the current development regulations and do not intensify the development capacity. Therefore, these changes will not adversely impact the City's water system.

Parks and recreation

Policy 8.92. Acquisition, development, and maintenance. Provide and maintain an adequate supply and variety of parkland and recreational facilities to serve the city's current and future population based on identified level-of-service standards and community needs.

Policy 8.93. Service equity. Invest in acquisition and development of parks and recreation facilities in areas where service-level deficiencies exist.

Policy 8.94. Capital programming. Maintain a long-range park capital improvement program, with criteria that considers acquisition, development, and operations; provides opportunities for public input; and emphasizes creative and flexible financing strategies.

Policy 8.95. Park planning. Improve parks, recreational facilities, natural areas, and the urban forest in accordance with current master plans, management plans, or adopted strategies that reflect user

group needs, development priorities, development and maintenance costs, program opportunities, financing strategies, and community input.

Policy 8.96. Recreational trails. Establish, improve, and maintain a complete and connected system of public recreational trails, consistent with Portland Parks & Recreation's trail strategy.

Policy 8.97. Natural resources. Preserve, enhance, and manage City-owned natural areas and resources to protect and improve their ecological health, in accordance with both the natural area acquisition and restoration strategies, and to provide compatible public access.

Policy 8.98. Urban forest management. Manage urban trees as green infrastructure with associated ecological, community, and economic functions, through planning, planting, and maintenance activities, education, and regulation.

Policy 8.99. Recreational facilities. Provide a variety of recreational facilities and services that contribute to the health and well-being of Portlanders of all ages and abilities.

261. Finding: The City Council interprets policies 8.92 through 8.103 to address City-owned parks and natural areas and not development on private land. These policies do not apply.

Public safety and emergency response

Policy 8.104. Emergency preparedness, response, and recovery coordination. Coordinate land use plans and public facility investments between City bureaus, other public and jurisdictional agencies, businesses, community partners, and other emergency response providers, to ensure coordinated and comprehensive emergency and disaster risk reduction, preparedness, response, and recovery.

Policy 8.105. Emergency management facilities. Provide adequate public facilities – such as emergency coordination centers, communications infrastructure, and dispatch systems – to support emergency management, response, and recovery.

Policy 8.106. Police facilities. Improve and maintain police facilities to allow police personnel to efficiently and effectively respond to public safety needs and serve designated land uses.

Policy 8.107. Community safety centers. Establish, coordinate, and co-locate public safety and other community services in centers.

Policy 8.108. Fire facilities. Improve and maintain fire facilities to serve designated land uses, ensure equitable and reliable response, and provide fire and life safety protection that meets or exceeds minimum established service levels.

Policy 8.109. Mutual aid. Maintain mutual aid coordination with regional emergency response providers as appropriate to protect life and ensure safety.

Policy 8.110. Community preparedness. Enhance community preparedness and capacity to prevent, withstand, and recover from emergencies and natural disasters through land use decisions and public facility investments.

Policy 8.111. Continuity of operations. Maintain and enhance the City's ability to withstand and recover from natural disasters and human-made disruptions in order to minimize disruptions to public services.

262. Finding: The City Council interprets policies 8.104 through 8.111 to address the provision of public safety and emergency response services and not development on private land. These policies do not apply.

Solid waste management

Policy 8.112. Waste management. Ensure land use programs, rights-of-way regulations, and public facility investments allow the City to manage waste effectively and prioritize waste management in the following order: waste reduction, recycling, anaerobic digestion, composting, energy recovery, and then landfill.

263. Finding: The City Council interprets this policy to address the provision of waste management services and not development on private land. These policies do not apply.

School facilities

Policy 8.113. School district capacity. Consider the overall enrollment capacity of a school district – as defined in an adopted school facility plan that meets the requirements of Oregon Revised Statute 195 – as a factor in land use decisions that increase capacity for residential development.

Policy 8.114. Facilities Planning. Facilitate coordinated planning among school districts and City bureaus, including Portland Parks and Recreation, to accommodate school site/facility needs in response to most up-to-date growth forecasts.

Policy 8.115. Co-location. Encourage public school districts, Multnomah County, the City of Portland, and other providers to co-locate facilities and programs in ways that optimize service provision and intergenerational and intercultural use.

Policy 8.116. Community use. Encourage public use of public school grounds for community purposes while meeting educational and student safety needs and balancing impacts on surrounding neighborhoods.

Policy 8.117. Recreational use. Encourage publicly-available recreational amenities (e.g. athletic fields, green spaces, community gardens, and playgrounds) on public school grounds for public recreational use, particularly in neighborhoods with limited access to parks.

Policy 8.118. Schools as emergency aid centers. Encourage the use of seismically-safe school facilities as gathering and aid-distribution locations during natural disasters and other emergencies.

Policy 8.119. Facility adaptability. Ensure that public schools may be upgraded to flexibly accommodate multiple community-serving uses and adapt to changes in educational approaches, technology, and student needs over time.

Policy 8.120. Leverage public investment. Encourage City public facility investments that complement and leverage local public school districts' major capital investments.

Policy 8.121. School access. Encourage public school districts to consider the ability of students to safely walk and bike to school when making decisions about the site locations and attendance boundaries of schools.

Policy 8.122. Private institutions. Encourage collaboration with private schools and educational institutions to support community and recreational use of their facilities.

264. Finding: The City Council interprets policies 8.115 through 8.122 to address school facilities and not development on private land. These policies do not apply.

Technology and communications

Policy 8.123. Technology and communication systems. Maintain and enhance the City's technology and communication facilities to ensure public safety, facilitate access to information, and maintain City operations.

Policy 8.124. Equity, capacity, and reliability. Encourage plans and investments in technology and communication infrastructure to ensure access in all areas of the city, reduce disparities in capacity, and affordability, and to provide innovative high-performance, reliable service for Portland's residents and businesses.

265. Finding: The City Council interprets policies 8.123 and 8.124 to address the provision technology and communication services and not development on private land. This policy does not apply.

Energy infrastructure

Policy 8.125. Energy efficiency. Promote efficient and sustainable production and use of energy resources by residents and businesses, including low-carbon renewable energy sources, district energy systems, and distributed generation, through land use plans, zoning, and other legislative land use decisions.

Policy 8.126. Coordination. Coordinate with energy providers to encourage investments that ensure reliable, equitable, efficient, and affordable energy for Portland residents and businesses.

266. Finding: The City Council finds that "promote" means to "further the progress of, advance, or raise." The 2035 Comprehensive Plan defines "coordinate" as work together with others toward a common goal; collaborate. The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. The City Council finds that these policies work together to promote efficient and sustainable production and use of energy. Also, the City Council finds that this is done by coordinating with energy providers to encourage investments that will result in reliable, equitable, efficient and affordable energy. As part of the concept development of the zoning code changes, in June 2016 BPS held stakeholder focus group meetings with representatives from energy providers - the FFTs, the Western States Petroleum Association and Northwest Natural. The Proposed Draft was crafted in response to these discussions and additional comments on the Discussion Draft. Further, in response to testimony at the Planning and Sustainability Commission, changes were made to the use regulations to designate FFTs as a limited use (rather than a prohibited use) and allow for a ten percent expansion of storage capacity in conjunction with seismic safety upgrades. The City Council received testimony from energy providers that a ten percent capacity increase limit would be a severe limitation and would not justify the private investment needed to replace existing tanks. However, the City Council found that the energy providers' proposed Energy Corridor Overlay zone and definition of "region" as a seven state area (PADD-5) was not consistent with other City goals and policies to reduce seismic risk. Further, the City does not have the administrative authority and capacity to monitor and enforce regulations to control the destination of fossil fuels flowing through Portland to a seven-state region. Also, allowing for unlimited expansion of Portland's FFTs is not consistent with the DOGAMI recommendation to mitigate seismic vulnerability by increasing redundancy and reserve capacity in Oregon's liquid fuel supply by replacing, relocating, or adding redundant systems elsewhere. The FFTZ amendments designate existing FFTs as a limited use, as opposed to a prohibited or nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Further, the use limitations (33.140.100.B.17.a) provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety.

The City has a few provisions in the Zoning Code to support energy conservation, including energy efficiency or renewable energy improvements do not trigger nonconforming upgrade improvements (PCC 33.258); development standards for small, urban-wind turbines (PCC 33.299); and a requirement that new development in the Central City Plan District must register for green

building certification (PCC 33.510). The FFTZ amendments do not amend any of these implementing provisions.

Chapter 9 Transportation

GOAL 9.A: Safety. Transportation safety impacts the livability of a city and the comfort and security of those using City streets. Comprehensive efforts to improve transportation safety through engineering, education, enforcement and evaluation will be used to eliminate traffic-related fatalities and serious injuries from Portland's transportation system.

Goal 9.B: Multiple goals. Portland's transportation system is funded and maintained to achieve multiple goals and measurable outcomes for people and the environment. The transportation system is safe, complete, interconnected, multimodal, and fulfills daily needs for people and businesses.

GOAL 9.C: Great places. Portland's transportation system enhances quality of life for all Portlanders, reinforces existing neighborhoods and great places, and helps make new great places in town centers, neighborhood centers and corridors, and civic corridors.

GOAL 9.D: Environmentally sustainable. The transportation system increasingly uses active transportation, renewable energy, or electricity from renewable sources, achieves adopted carbon reduction targets, and reduces air pollution, water pollution, noise, and Portlanders' reliance on private vehicles.

GOAL 9.E: Equitable transportation. The transportation system provides all Portlanders options to move about the city and meet their daily needs by using a variety of safe, efficient, convenient, and affordable modes of transportation. Transportation investments are responsive to the distinct needs of each community.

GOAL 9.F: Positive health outcomes. The transportation system promotes positive health outcomes and minimizes negative impacts for all Portlanders by supporting active transportation, physical activity, and community and individual health.

GOAL 9.G: Opportunities for prosperity. The transportation system supports a strong and diverse economy, enhances the competitiveness of the city and region, and maintains Portland's role as a West Coast trade gateway and freight hub by providing efficient and reliable goods movement, multimodal access to employment areas and educational institutions, as well as enhanced freight access to industrial areas and intermodal freight facilities. The transportation system helps people and businesses reduce spending and keep money in the local economy by providing affordable alternatives to driving.

GOAL 9.H: Cost effectiveness. The City analyzes and prioritizes capital and operating investments to cost effectively achieve the above goals while responsibly managing and protecting our past investments in existing assets.

GOAL 9.I: Airport Futures. Promote a sustainable airport (Portland International Airport [PDX]) by meeting the region's air transportation needs without compromising livability and quality of life for future generations.

267. Finding: The City Council interprets these goals to address transportation improvements, programming, funding priorities and provide policy guidance for developing and implementing the Transportation System Plan. The adopted 2035 Comprehensive Plan includes the Transportation System Plan (TSP), which was adopted in three phases (Ordinance 187832, 188177, and 188957). Phase 1 and 2 was submitted as part Task Four of Periodic Review; and both were approved by

LCDC Order 18 – WKTSK – 001897 on August 8, 2018. Phase 3 of the Transportation System Plan was adopted as a post-acknowledgement plan amendment by Ordinance No. 188957, became effective on June 23, 2018. The FFTZ amendments do not amend the TSP.

The City Council interprets these goals to apply to the transportation system as whole and not to individual components of the transportation system. The FFTZ amendments limit one type of use allowed in industrial areas. The remaining industrial uses continue to be regulated under the current development regulations and do not intensify the development capacity. Therefore, the amendments do not have a significant effect on the transportation system.

Specifically, the City Council finds that Goal 9.G requires Portland to maintain Portland's role as a multimodal freight hub as part of supporting a strong and diverse economy. The FFTZ amendments maintains Portland's role as a multimodal freight hub with enhanced freight access because they do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the industrial areas where the existing FFTs are located. The regulations are narrowly crafted to support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Finally, even though transloading facilities are a defining characteristic of a Bulk Fossil Fuel Terminal, the ordinance only limits new fossil fuel storage tank capacity. It does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system. Existing FFTs and other industrial uses can make investments in multimodal freight facilities.

Testimony from the Portland Business Alliance et al., the Working Water Coalition, and the Western States Petroleum Association raised the concern that the ordinance would force fuels to be transported by truck and increase vehicle miles travelled and emissions. The City Council finds that this unsupported assertion provides no details or explanation as to how this ordinance will force a change in transportation modes. There is no explanation or evidence on future demand, pipeline capacity utilization, or storage tank utilization or how or why truck traffic would increase. BPS staff provided evidence in the Council presentation and the written record that demonstrates that there is a reasonable expectation that the demand for fossil fuels will be flat and that the existing FFT storage capacity, with the allowed exceptions, will continue to meet the future demand for fossil fuels.

Designing and planning

Policy 9.1. Street design classifications. Maintain and implement street design classifications consistent with land use plans, environmental context, urban design pattern areas, and the Neighborhood Corridor and Civic Corridor Urban Design Framework designations.

Policy 9.2. Street policy classifications. Maintain and implement street policy classifications for pedestrian, bicycle, transit, freight, emergency vehicle, and automotive movement, while considering access for all modes, connectivity, adjacent planned land uses, and state and regional requirements.

9.2.a. Designate district classifications that emphasize freight mobility and access in industrial and employment areas serving high levels of truck traffic and to accommodate the needs of intermodal freight movement.

9.2.b. Designate district classifications that give priority to pedestrian access in areas where high levels of pedestrian activity exist or are planned, including the Central City, Gateway regional

center, town centers, neighborhood centers, and transit station areas.

9.2.c. Designate district classifications that give priority to bicycle access and mobility in areas where high levels of bicycle activity exist or are planned, including Downtown, the River District, Lloyd District, Gateway Regional Center, town centers, neighborhood centers, and transit station areas.

Policy 9.3. Transportation System Plan. Maintain and implement the Transportation System Plan (TSP) as the decision-making tool for transportation-related projects, policies, programs, and street design.

Policy 9.4. Use of classifications. Plan, develop, implement, and manage the transportation system in accordance with street design and policy classifications outlined in the Transportation System Plan.

9.4.a. Classification descriptions are used to describe how streets should function for each mode of travel, not necessarily how they are functioning at present.

268. Finding: The FFTZ amendments do not change the functional classification of any existing or proposed transportation facility, nor do they change the standards implementing a functional classification system.

Policy 9.5. Mode share goals and Vehicle Miles Travelled (VMT) reduction. Increase the share of trips made using active and low-carbon transportation modes. Reduce VMT to achieve targets set in the most current Climate Action Plan and Transportation System Plan, and meet or exceed Metro's mode share and VMT targets.

Policy 9.6. Transportation strategy for people movement. Design the system to accommodate the most vulnerable users, including those that need special accommodation under the Americans with Disabilities Act (ADA). Implement a prioritization of modes for people movement by making transportation system decisions per the following ordered list:

- Walking
- Bicycling
- Transit
- Fleets of electric, fully automated, multiple passenger vehicles
- Other shared vehicles
- Low or no occupancy vehicles, fossil-fueled non-transit vehicles

When implementing this prioritization ensure that:

- The needs and safety of each group of users are considered, and changes do not make existing conditions worse for the most vulnerable users.
- All users' needs are balanced with the intent of optimizing the right of way for multiple modes on the same street.
- When necessary to ensure safety, accommodate some users on parallel streets as part of multi-street corridors.
- Land use and system plans, network functionality for all modes, other street functions, and complete street policies, are maintained.
- Policy-based rationale is provided if modes lower in the ordered list are prioritized.

Policy 9.7. Moving goods and delivering services. In tandem with people movement, maintain efficient and reliable movement of goods and services as a critical transportation system function.

Prioritize freight system reliability improvements over single-occupancy vehicle mobility where there are solutions that distinctly address those different needs.

269. Finding: The City Council interprets policies 9.5 through 9.7 to mean that people movement and freight movement are critical functions of the transportation system that should be prioritized over single-occupancy vehicles. Further, the City Council interprets this policy to apply to transportation system design and investment decisions, and not land use decisions. Portland's role as a multimodal freight hub is maintained because the FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan. Therefore, the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located. The ordinance regulates storage capacity, it does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system.

Testimony from the Portland Business Alliance et al., the Working Water Coalition, and the Western States Petroleum Association raised the concern that the ordinance would force fuels to be transported by truck and increase vehicle miles travelled and emissions. The City Council finds that this unsupported assertion provides no details or explanation as to how this ordinance will force a change in transportation modes. There is no explanation or evidence on future demand, pipeline capacity utilization, or storage tank utilization or how or why truck traffic would increase. BPS staff provided evidence in the Council presentation and the written record that demonstrates that there is a reasonable expectation that the demand for fossil fuels will be flat and that the existing FFT storage capacity, with the allowed exceptions, will continue to meet the future demand for fossil fuels.

Policy 9.8. Affordability. Improve and maintain the transportation system to increase access to convenient and affordable transportation options for all Portlanders, especially those who have traditionally been under-served or under-represented or have historically borne unequal burdens.

Policy 9.9. Accessible and age-friendly transportation system. Ensure that transportation facilities are accessible to people of all ages and abilities, and that all improvements to the transportation system (traffic, transit, bicycle, and pedestrian) in the public right-of-way comply with the Americans with Disabilities Act of 1990. Improve and adapt the transportation system to better meet the needs of the most vulnerable users, including the young, older adults, and people with different abilities.

Policy 9.10. Geographic policies. Adopt geographically-specific policies in the Transportation System Plan to ensure that transportation infrastructure reflects the unique topography, historic character, natural features, system gaps, economic needs, demographics, and land uses of each area. Use the Pattern Areas identified in Chapter 3: Urban Form as the basis for area policies.

9.10.a. Refer to adopted area plans for additional applicable geographic objectives related to transportation. Land use, development, and placemaking

270. Finding: Policies 9.8 through 9.10 address the design and planning of transportation facilities and not development on private land. These policies do not apply.

Land use, development, and placemaking

Policy 9.11. Land use and transportation coordination. Implement the Comprehensive Plan Map and the Urban Design Framework though coordinated long-range transportation and land use planning. Ensure that street policy and design classifications and land uses complement one another.

Policy 9.12. Growth strategy. Use street design and policy classifications to support Goals 3A-3G in

Chapter 3: Urban Form. Consider the different design contexts and transportation functions in Town Centers, Neighborhood Centers, Neighborhood Corridors, Employment Areas, Freight Corridors, Civic Corridors, Transit Station Areas, and Greenways.

Policy 9.13. Development and street design. Evaluate adjacent land uses to help inform street classifications in framing, shaping, and activating the public space of streets. Guide development and land use to create the kinds of places and street environments intended for different types of streets.

271. Finding: For policies 9.11 through 9.13, the City Council interprets these policies as providing direction to ensure that the transportation system, specifically the street classifications, support the Comprehensive Plan Map (and land use designations). The FFTZ amendments do not change the functional classification of any existing or proposed transportation facility, nor do they change the standards implementing a functional classification system. The FFTZ amendments limit one type of use allowed in industrial areas. The remaining industrial uses continue to be regulated under the current development regulations and do not intensify the development capacity. Therefore, the long-range transportation and land use plan continue to be coordinated.

Streets as public spaces

Policy 9.14. Streets for transportation and public spaces. Integrate both placemaking and transportation functions when designing and managing streets by encouraging design, development, and operation of streets to enhance opportunities for them to serve as places for community interaction, environmental function, open space, tree canopy, recreation, and other community purposes.

Policy 9.15. Repurposing street space. Encourage repurposing street segments that are not critical for transportation connectivity to other community purposes.

Policy 9.16. Design with nature. Promote street alignments and designs that respond to topography and natural features, when feasible, and protect streams, wildlife habitat, and native trees.

272. Finding: These policies address the design and use of public streets and not development on private land. These policies do not apply.

Modal policies

Policy 9.17. Pedestrian transportation. Encourage walking as the most attractive mode of transportation for most short trips, within and to centers, corridors, and major destinations, and as a means for accessing transit.

Policy 9.18. Pedestrian networks. Create more complete networks of pedestrian facilities, and improve the quality of the pedestrian environment.

Policy 9.19. Pedestrian safety and accessibility. Improve pedestrian safety, accessibility, and convenience for people of all ages and abilities.

Policy 9.20. Bicycle transportation. Create conditions that make bicycling more attractive than driving for most trips of approximately three miles or less.

Policy 9.21. Accessible bicycle system. Create a bicycle transportation system that is safe, comfortable, and accessible to people of all ages and abilities.

Policy 9.22. Public transportation. Coordinate with public transit agencies to create conditions that make transit the preferred mode of travel for trips that are not made by walking or bicycling.

Policy 9.23. Transportation to job centers. Promote and enhance transit to be more convenient and

economical than the automobile for people travelling more than three miles to and from the Central City and Gateway. Enhance regional access to the Central City and access from Portland to other regional job centers.

Policy 9.24. Transit service. In partnership with TriMet, develop a public transportation system that conveniently, safely, comfortably, and equitably serves residents and workers 24 hours a day, 7 days a week.

Policy 9.25. Transit equity. In partnership with TriMet, maintain and expand high-quality frequent transit service to all Town Centers, Civic Corridors, Neighborhood Centers, Neighborhood Corridors, and other major concentrations of employment, and improve service to areas with high concentrations of poverty and historically under-served and under-represented communities.

> **9.25.a.** Support a public transit system and regional transportation that address the transportation needs of historically marginalized communities and provide increased mobility options and access.

Policy 9.26. Transit funding. Consider funding strategies and partnership opportunities that improve access to and equity in transit service, such as raising metro-wide funding to improve service and decrease user fees/fares.

Policy 9.27. Transit service to centers and corridors. Use transit investments to shape the city's growth and increase transit use. In partnership with TriMet and Metro**,** maintain, expand, and enhance Portland Streetcar, frequent service bus, and high-capacity transit, to better serve centers and corridors with the highest intensity of potential employment and household growth.

> **9.27.a.** Locate major park-and-ride lots only where transit ridership is increased significantly, vehicle miles traveled are reduced, transit-supportive development is not hampered, bus service is not available or is inadequate, and the surrounding area is not negatively impacted.

Policy 9.28. Intercity passenger service. Coordinate planning and project development to expand intercity passenger transportation services in the Willamette Valley, and from Portland to Seattle and Vancouver, BC.

Policy 9.29. Regional trafficways and transitways. Maintain capacity of regional transitways and existing regional trafficways to accommodate through-traffic.

273. Finding: Policies 9.17 through 9.29 address the design and planning of transportation facilities and not development on private land. These policies do not apply.

Policy 9.30. Multimodal goods movement. Develop, maintain, and enhance a multimodal freight transportation system for the safe, reliable, sustainable, and efficient movement of goods within and through the city.

Policy 9.31. Economic development and industrial lands. Ensure that the transportation system supports traded sector economic development plans and full utilization of prime industrial land, including brownfield redevelopment.

Policy 9.32. Multimodal system and hub. Maintain Portland's role as a multimodal hub for global and regional movement of goods. Enhance Portland's network of multimodal freight corridors.

Policy 9.33. Freight network. Develop, manage, and maintain a safe, efficient, and reliable freight street network to provide freight access to and from intermodal freight facilities, industrial and commercial districts, and the regional transportation system. Invest to accommodate forecasted growth of interregional freight volumes and provide access to truck, marine, rail, and air

transportation systems. Ensure designated routes and facilities are adequate for over-dimensional trucks and emergency equipment.

Policy 9.34. Sustainable freight system. Support the efficient delivery of goods and services to businesses and neighborhoods, while also reducing environmental and neighborhood impacts. Encourage the use of energy efficient and clean delivery vehicles, and manage on- and off-street loading spaces to ensure adequate access for deliveries to businesses, while maintaining access to homes and businesses.

Policy 9.35. Freight rail network. Coordinate with stakeholders and regional partners to support continued reinvestment in, and modernization of, the freight rail network.

Policy 9.36. Portland Harbor. Coordinate with the Port of Portland, private stakeholders, and regional partners to improve and maintain access to marine terminals and related river-dependent uses in Portland Harbor.

9.36.a. Support continued reinvestment in, and modernization of, marine terminals in Portland Harbor.

9.36.b. Facilitate continued maintenance of the shipping channels in Portland Harbor and the Columbia River.

9.36.c. Support shifting more long-distance, high-volume movement of goods to river and oceangoing ships and rail.

274. Finding: Policies 9.30 through 9.36 direct the City to develop, maintain, and enhance a multimodal freight transportation system. The City Council interprets these policies to apply to transportation system design and city investment decisions that are embodied in the Freight Master Plan, which is one of the modal plans of the TSP. The Freight Master Plan includes capital projects, programs and activities to improve mobility, reduce community conflicts, and promote a multimodal transportation system to support long-term economic development. The FFTZ amendments maintain Portland's multimodal freight hub because they do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located. Further, the changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Finally, even though transloading facilities are a defining characteristic of a Bulk Fossil Fuel Terminal, the ordinance only limits new fossil fuel storage tank capacity and does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system. Existing FFTs and other industrial uses can make investments in multimodal freight facilities.

Testimony from the Portland Business Alliance et al., the Working Water Coalition, and the Western States Petroleum Association raised the concern that the ordinance would force fuels to be transported by truck and increase vehicle miles travelled and emissions. The City Council finds that this unsupported assertion provides no details or explanation as to how this ordinance will force a change in transportation modes. There is no explanation or evidence on future demand, pipeline capacity utilization, or storage tank utilization or how or why truck traffic would increase. BPS staff provided evidence in the Council presentation and the written record that demonstrates that there

is a reasonable expectation that the demand for fossil fuels will be flat and that the existing FFT storage capacity, with the allowed exceptions, will continue to meet the future demand for fossil fuels.

Policy 9.37. Portland Heliport. Maintain Portland's Heliport functionality in the Central City.

275. Finding: This policy applies to the Central City. There are no FFTs in the Central City. This policy does not apply.

Policy 9.38. Automobile transportation. Maintain acceptable levels of mobility and access for private automobiles while reducing overall vehicle miles traveled (VMT) and negative impacts of private automobiles on the environment and human health.

Policy 9.39. Automobile efficiency. Coordinate land use and transportation plans and programs with other public and private stakeholders to encourage vehicle technology innovation, shifts toward electric and other cleaner, more energy-efficient vehicles and fuels, integration of smart vehicle technology with intelligent transportation systems, and greater use of options such as car-share, carpool, and taxi.

Policy 9.40. Emergency response. Maintain a network of accessible emergency response streets to facilitate safe and expedient emergency response and evacuation. Ensure that police, fire, ambulance, and other emergency providers can reach their destinations in a timely fashion, without negatively impacting traffic calming and other measures intended to reduce crashes and improve safety.

276. Finding: Policies 9.38 through 9.40 address the design and use of public streets and not development on private land. These policies do not apply.

Airport Futures

Policy 9.41. Portland International Airport. Maintain the Portland International Airport as an important regional, national, and international transportation hub serving the bi-state economy.

Policy 9.42. Airport regulations. Implement the Airport Futures Plan through the implementation of the Portland International Airport Plan District.

9.42.a. Prohibit the development of a potential third parallel runway at PDX unless need for its construction is established through a transparent, thorough, and regional planning process.

9.42.b. Support implementation of the Aircraft Landing Zone to provide safer operating conditions for aircraft in the vicinity of Portland International Airport by limiting the height of structures, vegetation, and construction equipment.

9.42.c. Support the Port of Portland's Wildlife Hazard Management Plan by implementing airport-specific landscaping requirements in the Portland International Airport Plan District to reduce conflicts between wildlife and aircraft.

Policy 9.43. Airport partnerships. Partner with the Port of Portland and the regional community to address the critical interconnection between economic development, environmental stewardship, and social responsibility. Support an ongoing public advisory committee for PDX to:

9.43.a. Support meaningful and collaborative public dialogue and engagement on airport related planning and development.

9.43.b. Provide an opportunity for the community to inform the decision-making related to the airport of the Port, the City of Portland, and other jurisdictions/organizations in the region.

9.43.c. Raise public knowledge about PDX and impacted communities.

Policy 9.44. Airport investments. Ensure that new development and redevelopment of airport facilities supports the City's and the Port's sustainability goals and policies, and is in accordance with Figure 9-3 — Portland International Airport. Allow the Port flexibility in configuring airport facilities to preserve future development options, minimize environmental impacts, use land resources efficiently, maximize operational efficiency, ensure development can be effectively phased, and address Federal Aviation Administration's airport design criteria.

277. Finding: Policies 9.41 through 9.44 provide policy direction related to Portland International Airport. The FFTZ amendments include an exemption for fossil fuel storage facilities for the exclusive use at airports to maintain a supply of aviation fuel to Portland International Airport (PDX).

System management

Policy 9.45. System management. Give preference to transportation improvements that use existing roadway capacity efficiently and that improve the safety of the system for all users.

9.45.a. Support regional equity measures for transportation system evaluation.

Policy 9.46. Traffic management. Evaluate and encourage traffic speed and volume to be consistent with street classifications and desired land uses to improve safety, preserve and enhance neighborhood livability, and meet system goals of calming vehicle traffic through a combination of enforcement, engineering, and education efforts.

9.46.a. Use traffic calming tools, traffic diversion and other available tools and methods to create and maintain sufficiently low automotive volumes and speeds on neighborhood greenways to ensure comfortable cycling environment on the street.

Policy 9.47. Connectivity. Establish an interconnected, multimodal transportation system to serve centers and other significant locations. Promote a logical, direct, and connected street system through street spacing guidelines and district-specific street plans found in the Transportation System Plan, and prioritize access to specific places by certain modes in accordance with policies 9.6 and 9.7.

9.47.a. Develop conceptual master street plans for areas of the City that have significant amounts of vacant or underdeveloped land and where the street network does not meet City and Metro connectivity guidelines.

9.47.b. As areas with adopted Street Plans develop, provide connectivity for all modes by developing the streets and accessways as shown on the Master Street Plan Maps in the Comp Plan.

9.47.c. Continue to provide connectivity in areas with adopted Street Plans for all modes of travel by developing public and private streets as shown on the Master Street Plan Maps in the Comp Plan.

9.47.d. Provide street connections with spacing of no more than 530 feet between connections except where prevented by barriers such as topography, railroads, freeways, or environmental constraints. Where streets must cross over protected water features, provide crossings at an average spacing of 800 to 1000 feet, unless exceptional habitat quality of length of crossing prevents a full street connection.

9.47.e Provide bike and pedestrian connections at approximately 330 feet intervals on public easements or rights-of-way when full street connections are not possible, except where

prevented by barriers s such as topography, railroads, freeways, or environmental constraints. Bike and pedestrian connections that cross protected water features should have an average spacing of no more than 530 feet, unless exceptional habitat quality or length of connection prevents a connection.

Policy 9.48 Technology. Encourage the use of emerging vehicle and parking technology to improve real-time management of the transportation network and to manage and allocate parking supply and demand.

Policy 9.49 Performance measures. Establish multimodal performance measures and measures of system completeness to evaluate and monitor the adequacy of transportation services based on performance measures in goals 9.A. through 9.I. Use these measures to evaluate overall system performance, inform corridor and area-specific plans and investments, identify project and program needs, evaluate and prioritize investments, and regulate development, institutional campus growth, zone changes, Comprehensive Plan Map amendments, and conditional uses.

9.49.a. Eliminate deaths and serious injuries for all who share Portland streets by 2025.

9.49.b. Maintain or decrease the number of peak period non-freight motor vehicle trips, system-wide and within each mobility corridor to reduce or manage congestion.

9.49.c. By 2035, reduce the number of miles Portlanders travel by car to 11 miles per day or less, on average.

9.49.d. Establish mode split targets in 2040 Growth Concept areas within the City, consistent with Metro's targets for these areas.

9.49.e. By 2035, increase the mode share of daily non-drive alone trips to 70 percent citywide, and to the following in the five pattern areas:

Pattern Area	2035 daily target mode share
Central City	85%
Inner Neighborhoods	70%
Western Neighborhoods	65%
Eastern Neighborhoods	65%
Industrial and River	55%

9.49.f. By 2035, 70 percent of commuters walk, bike, take transit, carpool, or work from home at approximately the following rates:

Mode	Mode Share
Walk	7.5%
Bicycle	25%

Transit	25%
Carpool	10%
Single Occupant Vehicle (SOV)	30% or less
Work at home	10% below the line (calculated outside of the modal targets above)

9.49.g. By 2035, reduce Portland's transportation-related carbon emissions to 50% below 1990 levels, at approximately 934,000 metric tons.

9.49.h. By 2025, increase the percentage of new mixed use zone building households not owning an automobile from approximately 13% (2014) to 25%, and reduce the percentage of households owning two automobiles from approximately 24% to 10%.

9.49.i. Develop and use alternatives to the level-of-service measure to improve safety, encourage multimodal transportation, and to evaluate and mitigate maintenance and new trip impacts from new development.

9.49.j. Use level-of-service, consistent with Table 9.1*, as one measure to evaluate the adequacy of transportation facilities in the vicinity of sites subject to land use review.

9.49.k. Maintain acceptable levels of performance on state facilities and the regional arterial and throughway network, consistent with the interim standard in Table 9.2*, in the development and adoption of, and amendments to, the Transportation System Plan and in legislative amendments to the Comprehensive Plan Map.

9.49.l. In areas identified by Metro that exceed the level-of-service in Table 9.2* and are planned to, but do not currently meet the alternative performance criteria, establish an action plan that does the following:

- Anticipates growth and future impacts of motor vehicle traffic on multimodal travel in the area
- Establishes strategies for mitigating the future impacts of motor vehicles
- Establishes performance standards for monitoring and implementing the action plan.

*Note: Referenced Tables 9.1 and 9.2 are contained within the Transportation System Plan and should not be confused with tables or figures within the 2035 Comprehensive Plan.

9.49.m. Develop performance measures to track progress in creating and maintaining the transportation system.

Policy 9.50 Regional congestion management. Coordinate with Metro to establish new regional multimodal mobility standards that prioritize transit, freight, and system completeness.

9.50.a. Create a regional congestion management approach, including a market-based system, to price or charge for auto trips and parking, better account for the cost of auto trips, and to more efficiently manage the regional system.

Policy 9.51. Multimodal Mixed-Use Area. Manage Central City Plan amendments in accordance with the designated Central City Multimodal Mixed-Use Area (MMA) in the geography indicated in Figure 9-

2. The MMA renders congestion / mobility standards inapplicable to any proposed plan amendments under OAR 660-0012-0060(10).

278. Finding: Policies 9.45 through 9.51 address the management of the City's transportation system and not development on private land. These policies do not apply.

Transportation Demand Management

Policy 9.52. Outreach. Create and maintain TDM outreach programs that work with Transportation Management Associations (TMA), residents, employers, and employees that increase the modal share of walking, bicycling, and shared vehicle trips while reducing private vehicle ownership, parking demand, and drive-alone trips, especially during peak periods.

Policy 9.53. New development. Create and maintain TDM regulations and services that prevent and reduce traffic and parking impacts from new development and redevelopment. Encourage coordinated area-wide delivery of TDM programs. Monitor and improve the performance of private-sector TDM programs.

Policy 9.54. Projects and programs. Integrate TDM information into transportation project and program development and implementation to increase use of new multimodal transportation projects and services.

279. Finding: Policies 9.52 through 9.54 address TDM programs. The FFTZ amendments affect one type of allowed use in employment and industrial zones. The City Council has not applied the TDM program to industrial development and those changes are not part of this ordinance.

Parking management

Policy 9.55. Parking management. Reduce parking demand and manage supply to improve pedestrian, bicycle and transit mode share, neighborhood livability, safety, business district vitality, vehicle miles traveled (VMT) reduction, and air quality. Implement strategies that reduce demand for new parking and private vehicle ownership, and that help maintain optimal parking occupancy and availability.

Policy 9.56. Curb Zone. Recognize that the Curb Zone is a public space, a physical and spatial asset that has value and cost. Evaluate whether, when, and where parking is the highest and best use of this public space in support of broad City policy goals and local land use context. Establish thresholds to utilize parking management and pricing tools in areas with high parking demand to ensure adequate on-street parking supply during peak periods.

Policy 9.57. On-street parking. Manage parking and loading demand, supply, and operations in the public right of way to achieve mode share objectives, and to encourage safety, economic vitality, and livability. Use transportation demand management and pricing of parking in areas with high parking demand.

Policy 9.58. Off-street parking. Limit the development of new parking spaces to achieve land use, transportation, and environmental goals, especially in locations with frequent transit service. Regulate off-street parking to achieve mode share objectives, promote compact and walkable urban form, encourage lower rates of car ownership, and promote the vitality of commercial and employment areas. Use transportation demand management and pricing of parking in areas with high parking demand.

Policy 9.59. Share space and resources. Encourage the shared use of parking and vehicles to maximize the efficient use of limited urban space.

Policy 9.60. Cost and price. Recognize the high public and private cost of parking by encouraging prices that reflect the cost of providing parking and balance demand and supply. Discourage employee and resident parking subsidies.

Policy 9.61. Bicycle parking. Promote the development of new bicycle parking facilities including dedicated bike parking in the public right-of-way. Provide sufficient bicycle parking at high-capacity transit stations to enhance bicycle connection opportunities. Require provision of adequate off-street bicycle parking for new development and redevelopment. Encourage the provision of parking for different types of bicycles. In establishing the standards for long-term bicycle parking, consider the needs of persons with different levels of ability.

280. Finding: Policies 9.55 through 9.61 address parking. The FFTZ amendments do not change parking requirements or development standards affecting parking or the use of the right-of-way for parking. These policies do not apply.

Finance, programs, and coordination

Policy 9.62. Coordination. Coordinate with state and federal agencies, local and regional governments, special districts, other City bureaus, and providers of transportation services when planning for, developing, and funding transportation facilities and services.

Policy 9.63. New development impacts. Prevent, reduce, and mitigate the impacts of new development and redevelopment on the transportation system. Utilize strategies including transportation and parking demand management, transportation system analysis, and system and local impact mitigation improvements and fees.

Policy 9.64. Education and encouragement. Create, maintain, and coordinate educational and encouragement programs that support multimodal transportation and that emphasize safety for all modes of transportation. Ensure that these programs are accessible to historically under-served and under-represented populations.

Policy 9.65. Telecommuting. Promote telecommuting and the use of communications technology to reduce travel demand.

Policy 9.66. Project and program selection criteria. Establish transportation project and program selection criteria consistent with goals 9A through 9I, to cost-effectively achieve access, placemaking, sustainability, equity, health, prosperity, and safety goals.

Policy 9.67. Funding. Encourage the development of a range of stable transportation funding sources that provide adequate resources to build and maintain an equitable and sustainable transportation system.

281. Finding: Policies 9.62 through 9.67 address the funding and management of the City's transportation system and not development on private land. These policies do not apply.

Connected and Automated Vehicles

Policy 9.68 Connected and Automated Vehicles Priorities and Outcomes. Prioritize connected and automated vehicles that are fleet/shared ownership, fully automated, electric and, for passenger vehicles, shared by multiple passengers (known by the acronym FAVES). Develop and implement strategies for each following topic.

> **9.68.a.** Ensure that all levels of automated vehicles advance Vision Zero by operating safely for all users, especially for vulnerable road users. Require adequate insurance coverage for operators, customers, and the public-at-large by providers of commercial connected and

autonomous vehicle services.

9.68.b. Ensure that connected and automated vehicles improve travel time reliability and system efficiency by:

1. maintaining or reducing the number of vehicle trips during peak congestion periods;
2. reducing low occupancy vehicle trips during peak congestion periods;
3. paying for use of, and impact on, Portland's transportation system including factors such as congestion level, vehicle miles traveled, vehicle occupancy, and vehicle energy efficiency; and
4. supporting and encouraging use of public transportation.

9.68.c. Cut vehicle carbon pollution by reducing low occupancy "empty miles" traveled by passenger vehicles with zero or one passengers. Prioritize electric and other zero direct emission vehicles operated by fleets and carrying multiple passengers.

9.68.d. Make the benefits of automated mobility available on an equitable basis to all segments of the community while ensuring traditionally disadvantaged communities are not disproportionately hurt by connected and autonomous vehicle use. This includes people with disabilities, as well as communities of color, women, and geographically underserved communities.

9.68.e Identify, prevent, and mitigate potential adverse impacts from connected and automated vehicles.

Policy 9.69 Connected and Automated Vehicles Tools. Use a full range of tools to ensure that connected and automated vehicles and private data communications devices installed in the City right of way contribute to achieving Comprehensive Plan and Transportation System Plan goals and policies.

9.69.a. Maintain City authority to identify and develop appropriate data sharing requirements to inform and support safe, efficient, and effective management of the transportation system. Ensure that when connected and automated vehicles use City rights-of-way or when vehicles connect with smart infrastructure within the City they share information including, but not limited to, vehicle type, occupancy, speed, travel routes, and travel times, with appropriate privacy controls. Ensure that private data communications devices installed in the City right of way are required to share anonymized transportation data.

9.69.b. Design and manage the mobility zone, curb zone, and traffic control devices, e.g. to limit speeds to increase safety, to minimize cut-through traffic, evaluate future demand for pick-up and drop-off zones, and to prioritize automated electric vehicles carrying more passengers in congested times and locations;

9.69.c. Evaluate the public cost and benefit of investments in wayside communication systems serving connected and automated vehicles. Develop a criteria-driven automated vehicle wayside infrastructure investment plan.

9.69.d. Develop sustainable user-pays funding mechanisms to support connected and automated vehicle infrastructure and service investments, transportation system maintenance, and efficient system management.

9.69.e. Ensure that automated vehicles and vehicles that connect to smart City infrastructure, and private data communications devices installed in the City right of way, help pay for infrastructure and service investments, and support system reliability and efficiency. Develop a tiered pricing structure that reflects vehicle impacts on the transportation system, including factors such as congestion level, vehicle miles traveled, vehicle occupancy, and vehicle energy efficiency.

282. Finding: Policies 9.68 and 9.69 address the management of automated vehicles and not development on private land. These policies do not apply.

Chapter 10: Land Use Designations and Zoning

Goal 10.A: Land use designations and zoning. Effectively and efficiently carry out the goals and policies of the Comprehensive Plan through the land use designations, Zoning Map, and the Zoning Code.

283. The FFTZ amendments do not change the land use designations, nor do they amend the Comprehensive Plan Map or the Zoning Map. These findings show how the changes carry out the goals and policies of the Comprehensive Plan through the Zoning Code.

Land use designations

Policy 10.1. Land use designations. Apply a land use designation to all land and water within the City's Urban Services Boundary. Apply the designation that best advances the Comprehensive Plan goals and policies. The land use designations are shown on the adopted Land Use Map and on official Zoning Maps.

284. The FFTZ amendments do not change the land use designations, nor do they amend the Comprehensive Plan Map or the Zoning Map. These findings show how the changes carry out the goals and policies of the Comprehensive Plan through the Zoning Code.

The Zoning Map and the Zoning Code

Policy 10.2. Relationship of land use designations to base zones. Apply a base zone to all land and water within the City's urban services boundary. The base zone applied must either be a zone that corresponds to the land use designation or be a zone that does not correspond but is allowed per Figure 10-1 — Corresponding and Less-Intense Zones for Each Plan Map Designation. In some situations, there are long-term or short-term obstacles to achieving the level of development intended by the land use designation (e.g., an infrastructure improvement to serve the higher level of development is planned but not yet funded). In these situations, a less intense zone (listed in Figure 10-1) may be applied. When a land use designation is amended, the zone may also have to be changed to a corresponding zone or a zone that does not correspond but is allowed.

Policy 10.3. Amending the Zoning Map.

10.3.a. Amending a base zone may be done legislatively or quasi-judicially.

10.3.b. When amending a base zone quasi-judicially, the amendment must be to a corresponding zone (*see Figure 10-1 — Corresponding and Allowed Zones for Each Land Use Designation*). When a designation has more than one corresponding zone, the most appropriate

zone, based on the purpose of the zone and the zoning and general land uses of surrounding lands, will be applied.

10.3.c. When amending a base zone legislatively, the amendment may be to a corresponding zone or to a zone that is does not correspond but is allowed (*see Figure 10-1 — Corresponding and Allowed Zones for each Land Use Designation for zones that are allowed*). A legislative Zoning Map amendment may not be to a zone that is not allowed.

10.3.d. An amendment to a base zone consistent with the land use designation must be approved when it is found that current public services can support the uses allowed by the zone, or that public services can be made capable by the time the development is complete. The adequacy of services is based on the proposed use and development. If a specific use and development proposal is not submitted, services must be able to support the range of uses and development allowed by the zone. For the purposes of this requirement, services include water supply, sanitary sewage disposal, stormwater management, transportation, school district capacity (where a school facility plan exists), and police and fire protection.

10.3.e. An amendment to apply or remove an overlay zone or plan district may be done legislatively or quasi-judicially, and must be based on a study or plan document that identifies a specific characteristic, situation, or problem that is not adequately addressed by the base zone or other regulations.

285. Finding: The FFTZ amendments do not amend the Zoning Map. The changes only define the allowed uses in the base zones in the Zoning Code. This policy does not apply.

Policy 10.4. Amending the Zoning Code. Amendments to the zoning regulations must be done legislatively and should be clear, concise, and applicable to a broad range of development situations faced by a growing city. Amendments should:

286. Finding: The FFTZ amendments were initially adopted by a legislative process and the reconsideration on remand is a continuation of the initial legislative procedure at City Council. The regulations are clear and concise in creating one use category with clear definition of terms and is applicable to all employment and industrial zones.

10.4.a. Promote good planning:

- Effectively and efficiently implement the Comprehensive Plan.

287. Finding: As demonstrated by these findings, the FFTZ amendments effectively and efficiently implement the Comprehensive Plan. Specifically:

The City Council has considered applicable policies to determine that this ordinance on the whole complies with the 2035 Comprehensive Plan and on balance is equally or more supportive of the goals and policies of the 2035 Comprehensive Plan than the current regulations. In reaching this conclusion, City Council has weighed and balanced competing policy directions.

In particular, the Council finds that Goal 4.D with Policies 4.79 and 4.80, requires evaluating and reducing risk to people and property from natural hazards. The FFTZ amendments further these goals and policies because by limiting the risks of storing large volumes of hazardous materials in an area with high susceptibility to an earthquake. Large fossil fuel terminals represent a risk to people, property and the natural environments that the City Council finds as a compelling reason to limit future risk by limiting the size of new facilities and prohibit the expansion of existing facilities. Continuing to allow an unlimited increase in storage capacity at FFTs in a high risk area would be less supportive of the 2035 Comprehensive Plan than adopting the FFTZ amendments

The City Council further finds that Policy 6.48 provides direction to limit fossil fuel terminals to what is necessary to serve the region. The City Council recognizes that Portland's fossil fuel terminals handle 90 percent of the fossil fuel for the State of Oregon and Southwest Washington. BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington, during a period of a thriving economy. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. The more recent cargo forecasts project a modest growth in volumes, but those volumes do not exceed the historic peak volumes that were handled by the Portland terminals. No other evidence of future demand for fossil fuels was submitted in testimony. Therefore, the City Council finds that the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety. In addition, limiting storage capacity to the existing facilities reduces risk from a major earthquake, which outweighs the policy direction to provide capacity to accommodate any potential future increase in fossil fuel consumption, in part, because continuing to consolidate fossil fuel storage capacity in Portland is counter to resiliency principles that emphasize redundancy and distributed facilities.

At the same time, the City Council finds that Goal 6.C with Policies 6.20 and 6.36, among others, provide for the retention and growth of businesses, especially those in the traded sector. However, the City Council interprets these policies apply to the economy in general, rather than specific types of business. These changes and restrictions only apply to a narrowly defined new land use category, Bulk Fossil Fuel Terminals, and do not have a significant effect on the other allowed uses in industrial and employment zones. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial and employment areas of Portland. These amendments are narrowly constructed to apply to one class of businesses that make up a small portion of the city, regional and state economy. Further, these regulations only limit future expansion of these fossil fuel terminals, with some key exceptions, and designate these businesses as a limited use that allows their continued operation.

Guilds Lake Industrial Sanctuary (GLIS) Plan policies provide direction to maintain, protect and enhance businesses in the sanctuary. This plan was adopted in 2001 and does not address the need for resiliency in a high and medium liquefaction susceptibility area. The City Council interprets these policies to apply to the GLIS as a whole and not individual businesses. The City Council interprets the legislative intent of the GLISP is to maintain the area as an industrial sanctuary and to prohibit incompatible land uses. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses that could undermine the viability of the industrial sanctuary. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The remaining industrial uses to continue to operate under current regulations. The impact of the limits on fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and make upgrades and supports limited enhancement through exceptions to the fossil fuel storage capacity restrictions.

- Address existing and potential land use problems.

288. **Finding:** Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major

earthquake. The FFTs have significant seismic risks because most of the tanks have been constructed without any or only limited seismic design criteria on soils with moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions for aviation and renewable fuels.

- Balance the benefits of regulations against the costs of implementation and compliance.

289. The FFTZ amendments balance the benefits and costs by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

Testimony by the Portland Business Alliance, the Working Waterfront Coalition, and others implied that the regulations will not be cost effective because existing FFTs cannot expand to meet market demand. The City Council finds that based on the evidence in the record the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs. There also is testimony that implies that the cost of seismically upgrading is too expensive without expanding storage capacity. The City Council rejects this assertion because no explanation or evidence was provided to support the assertion that additional tanks are needed.

- Maintain Portland's competitiveness with other jurisdictions as a location in which to live, invest, and do business.

290. Finding: The City Council interprets this policy to require the City maintain an adequate supply of employment and housing land, but that it does not require the City to accommodate specific individual businesses or sectors. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's employment land supply to create opportunities for a growing economy. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under the current development review system.

10.4.b. Ensure good administration of land use regulations:

- Keep regulations as simple as possible.

291. Finding: The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's employment land supply to create opportunities for a growing economy. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under the current development review system.

- Use clear and objective standards wherever possible.

292. Finding: The FFTZ amendments establish clear definitions for fossil fuels and the Bulk Fossil Fuel Terminal use category.

- Maintain consistent procedures and limit their number.
- Establish specific approval criteria for land use reviews.
- Establish application requirements that are as reasonable as possible, and ensure they are

directly tied to approval criteria.
- Emphasize administrative procedures for land use reviews.
- Avoid overlapping reviews.

293. **Finding:** The FFTZ amendments do not establish new procedures or land use reviews. The FFTZ amendments establish clear definitions for fossil fuels and the Bulk Fossil Fuel Terminal use category. These regulations apply to only one type of use that makes up a minority part of the uses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. Designating the existing FFTs as a limited use, as opposed to a prohibited nonconforming or conditional use, allows the terminals to continue to operate and invest in upgrades without additional discretionary land use reviews. tank capacity, such as consolidating smaller tanks into larger tanks.

10.4.c. Strive to improve the code document:

- Use clear language.
- Maintain a clear and logical organization.
- Use a format and layout that enables use of the document by lay people as well as professionals.
- Use tables and drawings to clarify and shorten the document.
- Identify and act on regulatory improvement suggestions.

294. **Finding:** The FFTZ amendments create a new use category consistent with the format used described and regulate other types of uses. The Zoning Code amendments are presented in as clear and objective of a way possible to ensure the intended users will be able understand and utilize the Zoning Code as it applies to their development proposals, land use, and properties, consistent with Comprehensive Plan Policy 10.4.

Part IV. Adopted Area Plans

Pursuant to PCC 33.835.040(A), the City Council considers whether the FFTZ amendments are consistent with any adopted area plan associated with the regulations. The City Council finds that "consistent" means "the ordinance meets the requirements of, satisfies, or adheres to the regulations, mandate, or plan listed in the goal or policy. The City Council finds that Guild's Lake Industrial Sanctuary Plan (GLISP) is the only plan associated with the FFTZ amendments.

Guilds Lake Industrial Sanctuary Plan (2001)
The Guild's Lake Industrial Sanctuary (GLIS) Plan provides a policy framework to protect and promote the area's long-term economic viability as an industrial district for a broad variety of industrial land uses and businesses. The GLIS is an area that runs northwest of NW Vaughn Street along the Willamette River to the St. Johns Bridge. The plan recognizes the unique role of industrial land in Portland's economy and the importance of industrial businesses in providing living-wage jobs. The plan's vision statement, policies and objectives have been adopted as part of Portland's Comprehensive Plan and are implemented through the Zoning Code through the GLIS Plan District (33.531), which adds land use prohibitions and limits that were (at the time) above and beyond the limits in the industrial base zones.

295. **Finding:** The City Council finds that the central the purpose of the GLISP and its policies and objectives is to protect the industrial area from encroachment from the neighboring residential and commercial areas.

Policy 1: Jobs and Economic Development
Maintain and expand industrial business and employment opportunities in the Guild's Lake Industrial Sanctuary. Stimulate investment in the area's public and private infrastructure and industrial facilities.

296. **Finding:** The City Council interprets this policy and objectives to apply to the GLISP area as whole and not to individual businesses or sectors of business. The GLISP seeks to provide a public policy framework and foster a business environment that will create more certainty and encourage continued private sector investment in facilities. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the policy intent to maintain the area as an industrial sanctuary. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The remaining industrial uses continue to operate under current regulations. The impact of the limits on fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use, as opposed to a prohibited or non-conforming use, that allows the terminals to continue to operate and invest in upgrades and supports opportunities for enhancement through exceptions, such as aviation or renewable fuels.

The City Council interprets the verb "stimulate" to mean "encourage", which is defined in the 2035 Comprehensive Plan as to promote or foster using some combination of voluntary approaches, regulations, or incentives. The FFTZ amendments apply to only one type of business that makes up a minority part of the businesses found in GLIS. The remaining industrial uses continue to operate under current regulations. The limits on expansion of storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and invest in upgrades. In addition, even though transloading facilities are a defining characteristic of a Bulk Fossil Fuel Terminal, the ordinance only limits new fossil fuel storage tank capacity and does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system. Existing FFTs and other industrial uses can make investments in multimodal freight facilities. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the area.

As noted in the findings above, the FFTZ amendments are consistent with the goals and policies of Chapter 6 (Economic Development) of the 2035 Comprehensive Plan and Statewide Planning Goal 9. The findings in response to those goals and policies are incorporated by reference.

Objective 1. Provide new employment opportunities by reusing or redeveloping reclaimed, underutilized and vacant land and buildings in the GLIS.

297. **Finding:** The City Council interprets the GLISP objectives as subpolicies that support the policy. The City Council does not interpret the objectives as mandatory requirements that must be satisfied with every legislative action.

The City Council finds that the objective does not require the City to provide new employment opportunities with every legislative action but instead requires that the City maintain an adequate supply of vacant and underutilized industrial land that can provide for new employment opportunities, as defined in the EOA. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will continue to provide opportunities for industrial redevelopment in the GLIS. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades, which maintains the current employment opportunities at these businesses. The regulations also provide opportunities for growth through

exceptions, such as aviation or renewable fuels, which can provide additional employment opportunities.

Objective 2. Foster a business and public policy environment that promotes continued private and public sector investments in infrastructure, facilities, equipment and jobs.

298. **Finding:** The City Council interprets this objective seeks to encourage an environment that furthers public and private sector investments. The City Council finds that the City's role is through land use regulations, such as industrial zoning protections, maintaining an adequate supply of land; and public infrastructure investments. The FFTZ amendments maintain industrial zoning protections because the ordinance does not include changes to the Prime Industrial Overlay Zone, the GLIS Plan District, or to the Zoning Map where they are applied. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will continue to provide an adequate industrial land base for employment growth. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The limits on expansion of storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and invest in other types of upgrades. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the area.

Objective 3. Enhance the GLIS as a competitive and forward-thinking industrial area by fostering innovative and environmentally-sensitive industrial projects and practices that improve the operational efficiency of GLIS firms while conserving natural resources and reducing pollution.

299. **Finding:** The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The verb "foster", which is defined in the 2035 Comprehensive Plan, means to encourage or guide the incremental development of something over a long period of time. The City Council interprets this policy to mean that industrial development should incorporate green building practices, such as on-site stormwater management, and natural resource conservation, such as riverbank restoration. The City has achieved this objective through other regulatory programs, such as the Stormwater Management Manual and the Greenway Overlay Zone, that are not amended by this ordinance. The limits on expansion of storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and invest in other types of upgrades that conserve natural resources and reduce pollution.

Policy 2: Transportation

Maintain, preserve and improve the intermodal and multimodal transportation system to provide for the smooth movement of goods and employees into and through the Guild's Lake Industrial Sanctuary.

300. **Finding:** The Council finds that this policy seeks to maintain and improve the intermodal and multimodal transportation system. The City Council interprets this policy and the objectives to apply to the GLISP area as whole and not to individual businesses or sectors of business. The transportation policy discussion and action plan in the GLISP is focused on a street system that accommodates all modes of traffic while preserving operational characteristics that support truck movement. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will not significantly impact the performance of the transportation system. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure

investments in the area that seeks to accommodate all modes of traffic consistent with the freight classifications for the district's roadways.

The fossil fuel terminals are privately-owned, specialized intermodal facilities that exclusively transport liquid bulk products into and out of the GLISP area via pipeline, barge, rail and truck. There is no evidence that these terminals are used by other businesses to move other types of goods. The limits on expansion of storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their intermodal facilities to provide for the continued movement of goods through the GLIS. Finally, the ordinance does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system. Existing FFTs and other industrial uses can make investments in multimodal freight facilities.

As noted in the findings above, the FFTZ amendments are consistent with the goals and policies of Chapter 9 (Transportation) of the 2035 Comprehensive Plan and Statewide Planning Goal 12. The findings in response to those goals and policies are incorporated by reference.

Objective 1. Maintain, protect, and enhance the public and private multimodal transportation investments in the GLIS, including rail and marine terminal facilities, to ensure its continued viability as a major center for the import and export of industrial products in the state of Oregon.

301. **Finding:** The 2035 Comprehensive Plan defines the verb "maintain" to mean keep what you have; conserve; preserve; continue. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will continue to provide the same opportunities for investment to provide for the continued movement of goods through the GLIS. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the area to provide for the continued viability as a major industrial center in Oregon.

The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The FFTZ regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The limits on expansion of storage capacity at fossil fuel terminals are mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their intermodal facilities to provide for the continued movement of fossil fuels through the GLIS and supports opportunities for enhancement through exceptions, such as aviation or renewable fuels. Finally, even though transloading facilities are a defining characteristic of a Bulk Fossil Fuel Terminal, the ordinance only limits new fossil fuel storage tank capacity and does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system. Existing FFTs and other industrial uses can make investments in multimodal freight facilities.

Objective 2. Maintain operational characteristics on roads and at intersections that support truck movements and industrial economic growth, while accommodating traffic, transit, and emergency access needs.

302. **Finding:** The Council finds that this policy applies to functional classifications as designated in the adopted TSP. The FFTZ amendments do not change the functional classification of any roads in the GLIS. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the operational characteristics of the roads and intersections continue to support truck movements and industrial economic growth.

Objective 3. Minimize traffic conflicts between industrial and nonindustrial uses.

303. **Finding:** The City Council interprets the verb "minimize" to mean to reduce something to the smallest possible amount. Minimizing traffic conflicts is a function of transportation policy. The FFTZ amendments do not change any transportation policies, including the functional classification of any roads in the GLIS. The FFTZ amendments do not include map changes, nor do they allow for new incompatible nonindustrial land uses that could be expected increase traffic conflicts.

Objective 4. Manage congestion on highways and roads within the GLIS through regional and area-wide systems planning and maximize the efficiency of transportation facilities for all modes of travel, with the participation of private industry.

304. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will continue to provide the same opportunities for investment in the GLIS. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the area to manage congestion on highways and roads within the GLIS.

The City Council interprets the verb "maximize", which is not defined in the 2035 Comprehensive Plan, to mean to make the best use of. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The limits on expansion of storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and invest in other types of upgrades to all modes of travel. The FFTZ regulations allow terminals to maximize the efficiency of their private transportation facilities (docks and pipelines) by providing expanded opportunities through exceptions, such as for aviation or renewable fuels, to the storage capacity restrictions. The ordinance does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system. Existing FFTs and other industrial uses can make investments in multimodal freight facilities.

Testimony from the Portland Business Alliance et al., the Working Water Coalition, and the Western States Petroleum Association raised the concern that the ordinance would force fuels to be transported by truck and increase vehicle miles travelled and emissions. The City Council finds that this unsupported assertion provides no details or explanation as to how this ordinance will force a change in transportation modes. There is no explanation or evidence on future demand, pipeline capacity utilization, or storage tank utilization or how or why truck traffic would increase. BPS staff provided evidence in the Council presentation and the written record that demonstrates that there is a reasonable expectation that the demand for fossil fuels will be flat and that the existing FFT storage capacity, with the allowed exceptions, will continue to meet the future demand for fossil fuels.

Objective 5. Develop alternative transportation options for employees of the GLIS, including transit, carpools, bicycling, and walking to reduce parking needs, vehicle emissions, and congestion levels.

305. **Finding:** The City Council interprets this policy to focus on the commute modes of employees of the GLIS. Developing alternative transportation options is a function of transportation policy. The FFTZ amendments do not change any transportation policies, therefore, this policy does not apply. Further, employment at FFTs is a small share of the overall employment of the GLIS. The limits on expansion of storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate, which can maintain these employment levels, which can maintain ridership for the existing transit service. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the area to support this objective.

Objective 6. Locate safe pedestrian and bicycle routes within the GLIS that minimize conflicts with industrial traffic. Improve pedestrian and bicycle connections to nearby residential areas to reduce congestion levels and auto emissions, preserve capacity of the street system, and reduce parking needs.

306. **Finding:** The City Council interprets this policy to focus on the investment in pedestrian and bicycle routes in the GLIS, which is a function of transportation policy. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore this policy does not apply.

Objective 7. Recognize the role of NW Vaughn Street as an important multimodal access route to the Guild's Lake Industrial Sanctuary and Northwest Portland.

307. **Finding:** The City Council interprets this policy to focus on the functional classification of NW Vaughn Street, which is a function of transportation policy. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore this policy does not apply.

Policy 3: Land Use

Preserve and protect land primarily for industrial uses, and minimize land use conflicts in the Guild's Lake Industrial Sanctuary. Allow compatible nonindustrial uses within the GLIS that provide retail and business services primarily to support industrial employees and businesses.

308. **Finding:** The City Council interprets this policy and the objectives to apply to the GLISP area as whole and not to individual businesses or sectors of business. The City Council interprets this policy to mean that the most effective way to preserve and protect industrial uses is to minimize land use conflicts by limiting nonindustrial uses, which is the reason why the City Council applied the Prime Industrial Overlay Zone to the GLIS as part of the 2035 Comprehensive Plan adoption. The Prime Industrial Overlay Zone restricts non-industrial uses, such as self-service storage and major event entertainment, that are allowed in the industrial base zones. The FFTZ amendments maintain industrial zoning protections because the ordinance does not amend the Prime Industrial Overlay Zone, the GLIS Plan District, or the Zoning Map where they are applied. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, with these changes, the GLIS will continue to be used primarily for industrial uses and land use conflicts will be minimized.

Objective 1. Preserve the overall industrial character of the Guild's Lake Industrial Sanctuary.

309. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, the overall industrial character of the GLIS will be preserved.

Objective 2. Preserve the physical continuity of the area designated as Industrial Sanctuary within the Guild's Lake Industrial Sanctuary.

310. Finding: The FFTZ amendments do not include map changes, including to the plan district boundaries, therefore, with the physical continuity of the GLIS is preserved.

Objective 3. Minimize conflicts between industrial and nonindustrial land uses.

311. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, the GLIS will continue to be used primarily for industrial uses and land use conflicts will be minimized.

Objective 4. Prohibit new residential uses within the GLIS.

312. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, residential uses within the GLIS will continue to be prohibited.

Objective 5. Allow the provision of support services to employees and businesses in the GLIS to reduce trips outside of the GLIS.

313. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new nonindustrial land uses, therefore, this objective does not apply.

Objective 6. Encourage industrial businesses to locate their accessory offices and showrooms along NW Vaughn Street.

314. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new nonindustrial land uses. Additionally, there are no FFTs located on NW Vaughn, therefore, this objective does not apply.

Objective 7. Preserve the GLIS's Willamette River waterfront as a location for river-dependent and river-related industrial uses.

315. **Finding:** The existing fossil fuel terminals are designated as a limited use that allows the terminals to continue to operate and invest in upgrades, including their waterfront facilities. The FFTZ amendments do not include map changes, nor do they allow for new nonindustrial land uses, therefore, the Willamette River waterfront is preserved as a location for river-dependent and river-related industrial uses.

Objective 8. Recognize the Willamette River as a valuable economic, transportation, natural and recreational resource for the entire city. Coordinate GLIS Plan policies and implementation measures with ongoing and future citywide planning efforts that address the significance of the river and the city's industrial land supply.

316. **Finding:** The verb "recognize" is defined in the 2035 Comprehensive Plan as to acknowledge and treat as valid. The 2035 Comprehensive Plan defines "coordinate" as work together with others toward a common goal; collaborate. The FFTZ amendments do not include map changes, nor do they allow for new nonindustrial land uses, therefore, the city's industrial land supply is maintained. The FFTZ amendments do not include changes that impact the economic, transportation, natural, and recreational resource function of the Willamette River. The waterfront is preserved as a location for river-dependent and river-related industrial uses. Finally, the ordinance does not regulate transloading facilities, docks or pipelines – facilities that are key components of utilizing the Willamette River as part of the multimodal freight transportation system. As noted in the findings above, the FFTZ amendments are consistent with the policies 3.70, 3.72, 4.82, and 9.36 of the 2035 Comprehensive Plan, and the findings in response to those policies are incorporated by reference.

Objective 9. The industrial character and economic viability of the Guild's Lake Industrial Sanctuary must continue to be the priority when considering the public need for expanded access to the Willamette River. Design and implement any greenway enhancements along the river so as to avoid or minimize negative impacts on industrial operations.

317. Finding: The FFTZ amendments do not include changes to the greenway enhancement requirements in Chapter 33.440, therefore this objective does not apply.

Objective 10. Contribute to the maintenance and enhancement of all of Northwest Portland as a diverse urban environment that includes opportunities for housing, commercial services, and industrial employment in relatively close proximity.

318. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new nonindustrial land uses, therefore, the diverse urban environment of Northwest Portland is maintained.

The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The FFTZ regulations apply to only one type of business that makes up a minority part of the industrial businesses found in GLIS. The limits on expansion of

storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their intermodal facilities to provide for the continued movement of fossil fuels through the GLIS and supports opportunities for enhancement through a number of exceptions, such as aviation or renewable fuels, to the storage capacity restrictions; therefore the FFTZ changes contribute maintain and enhancing the industrial employment in this part of Northwest Portland.

Part V. Zoning Code Amendment Criteria

33.835.040 Approval Criteria

A. Amendments to the zoning code. Text amendments to the zoning code must be found to be consistent with the Comprehensive Plan, Urban Growth Management Functional Plan, and the Statewide Planning Goals. In addition, the amendments must be consistent with the intent or purpose statement for the base zone, overlay zone, plan district, use and development, or land division regulation where the amendment is proposed, and any plan associated with the regulations. The creation of a new plan district is subject to the approval criteria stated in 33.500.050.

319. **Finding:** The findings in this exhibit demonstrate how the FFTZ amendments are consistent with the 2035 Comprehensive Plan, the Urban Growth Management Functional Plan, and the Statewide Planning Goals.

The City Council interprets this criterion to require the FFTZ amendments show consistency. The Council finds that "consistent" means "the subject meets the requirements of, satisfies, or adheres to the regulations, mandate, or plan listed in the goal or policy." The City Council has applied all applicable policies and the findings in this exhibit demonstrate how the FFTZ amendments to the zoning code are, on balance, consistent with the 2035 Comprehensive Plan, the Urban Growth Management Functional Plan, and with the Statewide Planning Goals.

Council finds that this criterion operates in conjunction with Comprehensive Plan Policy 1.10 which requires that amendments to the Comprehensive Plan's supporting documents, such as the Zoning Code, must "comply" with the Comprehensive Plan." "Comply" means "that amendments must be evaluated against the Comprehensive Plan's applicable goals and policies and on balance be equally or more supportive of the Comprehensive Plan as a whole than the existing language or designation."

The City Council finds that a proposed amendment is equally supportive when it is on its face directly supported by goals and policies in the Plan. The City Council finds that an amendment is more supportive of the Comprehensive Plan when the amendment will further advance goals and policies, particularly those that are aspirational in nature. The City Council finds that the policy requires consideration as to whether amendments are equally or more supportive of the Plan *as a whole*. The City Council finds that amendments do not need to be equally or more supportive with individual goals and policies, but rather amendments must be equally or more supportive of the entire Comprehensive Plan. Therefore, the City Council finds that there may be instances where specific goals and policies are not supported by the amendments but still the amendment is equally or more supportive of the entire Comprehensive Plan when considered cumulatively. The City Council finds that there is no precise mathematical equation for determining when the Plan as a

whole is supported but rather such consideration requires City Council discretion in evaluating the competing interests and objectives of the plan.

Applying both the Zoning Code criterion and Policy 1.10 together, as discussed above, the Council finds that the amendments are consistent with the Comprehensive Plan, Urban Growth Management Functional Plan, and Statewide Planning Goals. Additionally, as discussed below, the Council finds that the FFTZ amendments are consistent with the intent or purpose statement for the base zones and the GLISP, the only plan associated with the regulations.

In considering the proposed amendments on balance, the City Council finds that the City Council has considered applicable policies to determine that this ordinance on the whole complies with the 2035 Comprehensive Plan and on balance is equally or more supportive of the goals and policies of the 2035 Comprehensive Plan than the current regulations. In reaching this conclusion, City Council has weighed and balanced competing policy directions.

In particular, the Council finds that Goal 4.D with Policies 4.79 and 4.80, requires evaluating and reducing risk to people and property from natural hazards. The FFTZ amendments further these goals and policies because by limiting the risks of storing large volumes of hazardous materials in an area with high susceptibility to an earthquake. Large fossil fuel terminals represent a risk to people, property and the natural environments that the City Council finds as a compelling reason to limit future risk by limiting the size of new facilities and prohibit the expansion of existing facilities. Continuing to allow an unlimited increase in storage capacity at FFTs in a high risk area would be less supportive of the 2035 Comprehensive Plan than adopting the FFTZ amendments

The City Council further finds that Policy 6.48 provides direction to limit fossil fuel terminals to what is necessary to serve the region. The City Council recognizes that Portland's fossil fuel terminals handle 90 percent of the fossil fuel for the State of Oregon and Southwest Washington. BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington, during a period of a thriving economy. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. The more recent cargo forecasts project a modest growth in volumes, but those volumes do not exceed the historic peak volumes that were handled by the Portland terminals. No other evidence of future demand for fossil fuels was submitted in testimony. Therefore, the City Council finds that the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety. In addition, limiting storage capacity to the existing facilities reduces risk from a major earthquake, which outweighs the policy direction to provide capacity to accommodate any potential future increase in fossil fuel consumption, in part, because continuing to consolidate fossil fuel storage capacity in Portland is counter to resiliency principles that emphasize redundancy and distributed facilities.

At the same time, the City Council finds that Goal 6.C with Policies 6.20 and 6.36, among others, provide for the retention and growth of businesses, especially those in the traded sector. However, the City Council interprets these policies apply to the economy in general, rather than specific types of business. These changes and restrictions only apply to a narrowly defined new land use category, Bulk Fossil Fuel Terminals, and do not have a significant effect on the other allowed uses in industrial and employment zones. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial and

employment areas of Portland. These amendments are narrowly constructed to apply to one class of businesses that make up a small portion of the city, regional and state economy. Further, these regulations only limit future expansion of these fossil fuel terminals, with some key exceptions, and designate these businesses as a limited use that allows their continued operation.

Guilds Lake Industrial Sanctuary (GLIS) Plan policies provide direction to maintain, protect and enhance businesses in the sanctuary. This plan was adopted in 2001 and does not address the need for resiliency in a high and medium liquefaction susceptibility area. The City Council interprets these policies to apply to the GLIS as a whole and not individual businesses. The City Council interprets the legislative intent of the GLISP is to maintain the area as an industrial sanctuary and to prohibit incompatible land uses. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses that could undermine the viability of the industrial sanctuary. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The remaining industrial uses to continue to operate under current regulations. The impact of the limits on fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and make upgrades and supports limited enhancement through exceptions to the fossil fuel storage capacity restrictions.

Further, the Council finds that the FFTZ amendments amend the allowed uses in all of the base zones. The City Council finds that because the amendments prohibit FFTs in the open space, residential, commercial/mixed use, and campus institution base zones that these amendments are consistent with the purpose statements of those zones.

The City Council finds that because the FFTZ amendments do not amend overlay zones or plan districts, or land division regulations, and therefore these purpose statements do not apply.

The purpose statements for the Employment and Industrial Zones and the Use Categories that are amended by this ordinance are addressed below.

No new plan district has been proposed, therefore the criteria in 33.500.050 do not apply.

Testimony by Zenith Energy implied that Resolution 37168 should be considered additional approval criteria. The City Council rejects this interpretation. Resolutions provide guidance on future City actions, such as directing BPS to develop proposed code changes to advance the resolution. However, in the context of making a legislative land use decision (amending the Zoning Code), the 2035 Comprehensive Plan and Title 33 (Planning and Zoning) establish the procedures and approval criteria for making these decisions. Neither the 2035 Comprehensive Plan nor Title 33 include references to include other resolutions that have not been incorporated into the 2035 Comprehensive Plan goals and policies.

Part VI. Zoning Code Purpose Statements

33.140 Employment and Industrial Zones
33.140.010 General Purpose of the Zones
The employment and industrial zones are for areas of the City that are reserved for industrial uses and for areas that have a mix of uses with a strong industrial orientation. The zones reflect the diversity of industrial and business areas in the City. The zones differ in the mix of allowed uses, the allowed intensity of development, and the development standards. The regulations promote areas which consist of uses and developments which will support the economic viability of the specific zoning district and of the City. The regulations protect the health, safety and welfare of the public, address area character,

and address environmental concerns. In addition, the regulations provide certainty to property owners, developers, and neighbors about the limits of what is allowed.

320. Finding: The City Council interprets this purpose statement to require that the employment and industrial zones focus on a mix of industrial uses in general, but that it does not require every type of industrial use, especially when considering the protection of health and safety of the public and the environment. The FFTZ amendments do not allow for new incompatible land uses, therefore, these changes are consistent with the intent to allow a mix of uses with a strong industrial orientation in Portland's industrial districts. These regulations apply to only one type of use that makes up a minority part of the uses found in Portland's industrial districts. The remaining industrial uses continue to operate under current regulations. The FFTZ amendments protect the health, safety and welfare of the public and address environmental concerns by reducing the risk associated with a major earthquake by ensuring that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a high risk area. The regulations provide certainty by designating existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake.

33.920 Description of Use Categories
33.920.010 Purpose
This Chapter classifies land uses and activities into use categories on the basis of common functional, product, or physical characteristics. Characteristics include the type and amount of activity, the type of customers or residents, how goods or services are sold or delivered, and certain site factors. The use categories provide a systematic basis for assignment of present and future uses to zones. The decision to allow or prohibit the use categories in the various zones is based on the goals and policies of the Comprehensive Plan.

321. Finding: The FFTZ amendments create a new use category – Bulk Fossil Fuel Terminals – based on the function, the type of product handled or produced, the type and amount of activity, and how the goods are sold or delivered. The use category has been assigned to the base zones. The designation of a prohibited or limited use is based on the findings in this exhibit that demonstrate how, on balance, the designation is consistent with the goals and policies of 2035 Comprehensive Plan.

33.531 Guild's Lake Industrial Sanctuary Plan District
33.531.010 Purpose
The Guild's Lake Industrial Sanctuary plan district fosters the preservation and growth of this premier industrial area adjacent to Portland's central city. The plan district's large number of well-established industrial firms are dependent on the area's multimodal transportation system, including marine, rail, and trucking facilities, and on the ability of area streets to accommodate truck movements. Because of its proximity to inner-city neighborhoods with high concentrations of commercial and residential uses, the Guild's Lake Industrial Sanctuary is particularly vulnerable to impacts from, and redevelopment to, nonindustrial uses. The provisions of the plan district recognize that the displacement of industrial uses by inappropriate nonindustrial uses potentially threatens the integrity of this district and investments in public and private infrastructure. The provisions of this chapter protect the area from incompatible uses which threaten the district's integrity, stability and vitality and compromise its transportation system. This chapter also includes provisions to ensure a more pedestrian- and transit-oriented streetscape along NW Vaughn Street and an improved interface with the mixed-use neighborhood to the south.

322. Finding: The City Council finds that the Guild's Lake Industrial Sanctuary (GLIS) Plan seeks to protect and promote the area's long-term economic viability as an industrial district for a broad variety of

industrial land uses and businesses. The FFTZ amendments maintain industrial zoning protections because the ordinance does not include changes to the Prime Industrial Overlay Zone, the GLIS Plan District, or to the Zoning Map where they are applied. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will continue to provide an adequate industrial land base for employment growth. The City Council finds that the purpose statement does not require that every industrial use is allowed or allowed to have unlimited growth. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The limits on expansion of storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and invest in other types of upgrades.

As noted above, the findings in response to Statewide Planning Goal 9, the goals and policies of Chapter 6 (Economic Development) of the 2035 Comprehensive Plan, and the Guilds Lake Industrial Sanctuary Plan are incorporated by reference. Therefore, FFTZ amendments are consistent with the purpose of the plan district.











Fossil Fuel Terminal Zoning Amendments

Exhibit B
Remand Report
As Amended

City of Portland, Oregon

December 18, 2019

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.
City of Portland, Oregon

Proposed Action

The City of Portland is considering the re-adoption of the Fossil Fuel Terminal Zoning Amendments. On December 14, 2016, the Portland City Council adopted Ordinance No. 188142 which amended the Zoning Code to create a new land use category (Bulk Fossil Fuel Terminals) with development standards to regulate the storage tank capacity. The amendments prohibited expansion of storage tank capacity at existing fuel terminals and limited new terminal development to 2 million gallons of storage tank capacity. The storage of coal at Bulk Fossil Fuel Terminals was prohibited.

The amendments allowed for the continued operation of existing terminals as a limited use in the industrial and employment zones. Terminals can continue to operate and invest in seismic and safety upgrades. The prohibition on the expansion of storage capacity included exceptions to the storage capacity limits to address issues identified in previous City Council resolutions, particularly for aviation fuels and renewable fuels.

Ordinance No. 188142 was appealed to the Oregon Land Use Board of Appeals (LUBA). In *Columbia Pacific Building Trades Council v. City of Portland*, LUBA Case No. 2017-001, LUBA reversed the Ordinance holding that the City's decision was unconstitutional; failed to demonstrate compliance with the Guild's Lake Industrial Sanctuary Plan (GLISP) and Statewide Planning Goal 12; and was not supported by an adequate factual base.

LUBA's decision was appealed to the Oregon Court of Appeals. In *Columbia Pacific Building Trades Council v. City of Portland*, 289 Or App 739 (2018), the court reversed LUBA's decision in part and affirmed in part. The Court found that the amendments are constitutional, and the City adequately demonstrated compliance with Goal 12.

The Court of Appeals decision was appealed to the Oregon Supreme Court. The Supreme Court denied review in *Columbia Pacific Building Trades Council v. City of Portland*, 363 Or 390 (2018).

On October 5, 2018, LUBA remanded Ordinance No. 188142 for City Council to demonstrate compliance with GLISP and demonstrate that the decision was supported by an adequate factual base.

The City intends to readopt the Fossil Fuel Terminal Zoning Amendments to comply with LUBA's Order. The Zoning Code amendments are similar to the changes adopted in 2016, except for a few minor adjustments to reconcile the Fossil Fuel Terminal Zoning Amendments with subsequent changes to the Zoning Code that have been adopted since 2016.

On November 20, 2019, the City Council held a public hearing on the consideration of additional evidence to ensure that the amendments are supported by an adequate factual base. Additionally, the findings will demonstrate that the amendments comply with the goals and policies in the 2035 Comprehensive Plan, which was adopted subsequent to the initial adoption of Ordinance No. 188142.

Timeline

In Resolutions 36959 and 36962, adopted in 2012, the City Council expressed opposition to coal trains traveling through Portland until a programmatic, comprehensive and area-wide Environmental Impact Statement and comprehensive Health Impact Assessment are completed.

The City's 2015 Climate Action Plan (adopted by Resolution 37135) identifies the need to establish a "fossil fuel export policy that considers lifecycle emissions, safety, economics, neighborhood livability and environmental impacts" (Climate Action Plan, action 3G, page 69). The City committed in its 2015 Climate Action Plan to advancing policy and programs to reduce local fossil fuel use both in the City's own operations and through community-wide initiatives.

Resolution 37168, adopted November 12, 2015, expressed the City Council's opposition to the "expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." It also expressed the Council's intent not to restrict improvements in safety, efficiency, or seismic resilience; the provision of service directly to end users; or infrastructure that will accelerate the transition to non-fossil fuel energy sources. The City Council also expressed support for accelerating the transition to non-fossil fuel energy sources. As part of that transition, the Oregon Department of Environmental Quality (ODEQ) is implementing the Oregon Clean Fuels Program, which requires a 10 percent reduction in average carbon intensity by 2025. Fuels that could be used to achieve the standards include ethanol, biodiesel, electricity, hydrogen, natural gas, propane, and biogas, which may require additional storage capacity. In order to facilitate implementation of the Clean Fuels Program, non-fossil fuel storage tanks are not subject to the capacity limits.

Portland's existing fossil fuel terminals

Portland's industrial districts are Oregon's largest seaport, rail hub and truck distribution center. The Northwest Industrial District in Portland is also the end of the Olympic Pipeline, which supplies most of Oregon's petroleum fuels from Puget Sound refineries. The ten petroleum terminals located in Northwest Portland are the gateway distribution facilities serving Oregon and Southern Washington markets. Additionally, NW Natural's GasCo terminal provides peak-consumption storage of natural gas for the region. In Northwest Portland, these "tank farm" storage facilities have direct access to pipeline, deep-water port, railroad and truck route infrastructure.



Figure 1. An example of petroleum terminals located in the Willbridge area of NW Portland.

Figure 2. Existing fossil fuel terminals in Northwest Portland

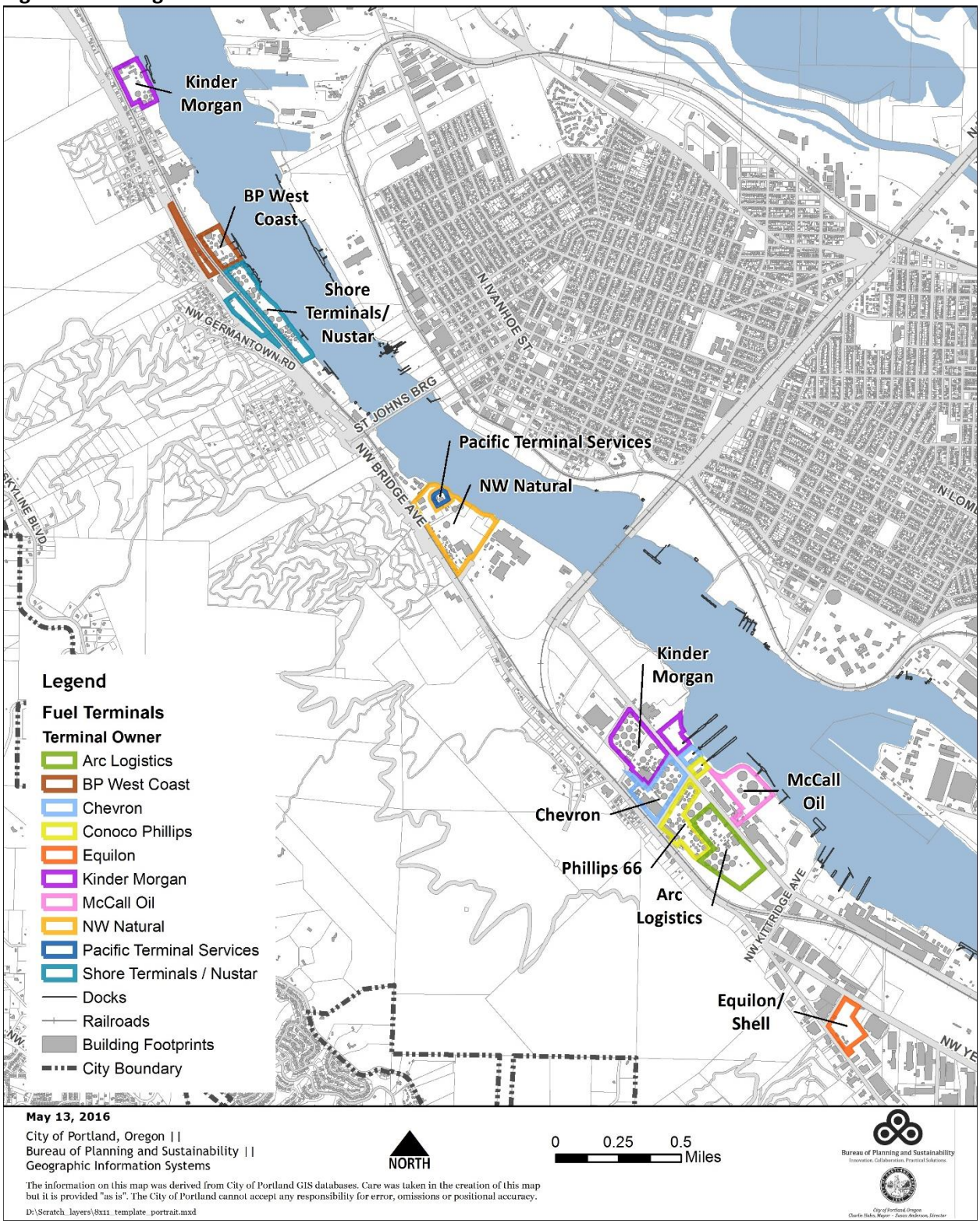


Figure 3. Estimated storage capacity at existing fossil fuel terminals

Operator	*Facility type*	*Site acres*	*Existing Storage capacity*	
Petroleum fuels			barrels	gallons
Chevron	Petroleum terminal	21	1,600,000	67,200,000
Kinder Morgan Willbridge	Petroleum terminal	33	1,551,000	65,142,000
Zenith (Arc Logistics)	Petroleum/crude oil	39	1,518,200	63,764,400
NuStar	Petroleum terminal	22	1,191,000	50,022,000
McCall Oil	Petroleum terminal	19	930,000	39,060,000
Conoco Phillips	Petroleum terminal	21	760,000	31,920,000
BP West Coast	Petroleum terminal	18	601,500	25,263,000
Kinder Morgan Linnton	Petroleum terminal	13	420,000	17,640,000
Equilon/Shell	Petroleum terminal	13	400,000	16,800,000
Pacific Terminal Services	Petroleum terminal	2	278,000	11,676,000
Total			*9,249,700*	*388,487,400*
Gaseous fuels			Dth	
NW Natural GasCo	LNG plant/terminal	41	7,500,000	

Terminology: bbls = barrels, Dth = decatherms, LNG = liquified natural gas
Sources: Oregon DEQ for petroleum tank data. NW Natural 2014 Integrated Resource Plan for existing capacity

Zoning code changes

This section of the report specifies the adopted code language, along with code commentary pages that clarify expected implementation. The section is formatted to facilitate readability, showing adopted code changes on the right-hand pages and related code commentary on the facing left-hand pages.

Commentary

Table 100-1 Open Space Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in the Open Space base zone.

Table 100-1 **Open Space Zone Primary Uses**	
Use Categories	**OS Zone**
Residential Categories	
Household Living	N
Group Living	N
Commercial Categories	
Retail Sales And Service	CU [1]
Office	N
Quick Vehicle Servicing	N
Vehicle Repair	N
Commercial Parking	N
Self-Service Storage	N
Commercial Outdoor Recreation	CU
Major Event Entertainment	N
Industrial Categories	
Manufacturing And Production	CU [6]
Warehouse And Freight Movement	N
Wholesale Sales	N
Industrial Service	N
Bulk Fossil Fuel Terminal	N
Railroad Yards	N
Waste-Related	N
Institutional Categories	
Basic Utilities	L/CU [5]
Community Service	CU [4]
Parks And Open Areas	L/CU [2]
Schools	CU
Colleges	N
Medical Centers	N
Religious Institutions	N
Daycare	CU
Other Categories	
Agriculture	L[7]
Aviation And Surface Passenger Terminals	N
Detention Facilities	N
Mining	CU
Radio Frequency Transmission Facilities	L/CU [3]
Rail Lines And Utility Corridors	CU

Y = Yes, Allowed L = Allowed, But Special Limitations CU = Conditional Use Review Required
N = No, Prohibited
Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.100.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Commentary

Table 110-1 Single-Dwelling Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in single-dwelling base zones.

Table 110-1 Single-Dwelling Zone Primary Uses						
Use Categories	**RF**	**R20**	**R10**	**R7**	**R5**	**R2.5**
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	CU	CU	CU	CU	CU	CU
Commercial Categories						
Retail Sales And Service	CU [10]	CU [10]	CU [10]	CU [10]	CU [10]	CU [10]
Office	N	N	N	N	N	N
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	N	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	N
Industrial Categories						
Manufacturing And Production	CU [6]	N	N	N	N	N
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	N
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]
Community Service	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]
Parks And Open Areas	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]
Schools	CU	CU	CU	CU	CU	CU
Colleges	CU	CU	CU	CU	CU	CU
Medical Centers	CU	CU	CU	CU	CU	CU
Religious Institutions	CU	CU	CU	CU	CU	CU
Daycare	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]
Other Categories						
Agriculture	L [7]	L [7]	L/CU [8]	L/CU [8]	L [9]	L [9]
Aviation And Surface Passenger Terminals	CU	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	CU	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]
Railroad Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.110.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Table 120-1 Multi-Dwelling Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in the multi-dwelling base zones.

Table 120-1
Multi-Dwelling Zone Primary Uses

Use Categories	R3	R2	R1	RH	RX	RMP
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	N]
Commercial Categories						
Retail Sales And Service	L [12]	L [12]	L [12]	CU[2]	L/CU [3]	L [13]
Office	N	N	N	CU[2]	L/CU [3]	N
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	CU [4]	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	CU
Industrial Categories						
Manufacturing And Production	N	N	N	N	N	CU
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	CU
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [10]	L/CU [10]	L/CU [10]	L/CU [10]	L/CU [10]	L/CU [10]
Community Service	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [5]	L/CU [6]
Parks And Open Areas	L/CU [7]	L/CU [7]	L/CU [7]	Y	Y	L/CU [7]
Schools	CU	CU	CU	CU	L/CU [5]	CU
Colleges	CU	CU	CU	CU	CU	CU
Medical Centers	CU	CU	CU	CU	CU	CU]
Religious Institutions	CU	CU	CU	CU	CU	CU
Daycare	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	Y	L/CU [8]
Other Categories						
Agriculture	L [11]	L [11]	L [11]	L [11]	L [11]	L [11]
Aviation And Surface Passenger Terminals	N	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]
Rail Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.120.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Commentary

Table 130-1 Commercial/Mixed Use Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in the commercial/mixed use base zones.

Table 130-1
Commercial/Mixed Use Zone Primary Uses

Use Categories	CR	CM1	CM2	CM3	CE	CX
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]
Commercial Categories						
Retail Sales And Service	L [2]	L [2]	Y	Y	Y	Y
Office	L [2]	L [2]	Y	Y	Y	Y
Quick Vehicle Servicing	N	L [2]	L [2]	L [2]	Y	N
Vehicle Repair	N	N	Y	Y	Y	L [5]
Commercial Parking	N	N	L [9]	L [9]	Y	CU [9]
Self-Service Storage	N	N	N	L [4]	L [4]	L [4]
Commercial Outdoor Recreation	N	N	Y	Y	Y	Y
Major Event Entertainment	N	N	CU	CU	CU	Y
Industrial Categories						
Manufacturing and Production	N	L/CU [3,5]	L/CU [3,5]	L/CU [3,5]	L/CU [3,5]	L/CU [3,5]
Warehouse and Freight Movement	N	N	N	L [3,5]	L [3,5]	N
Wholesale Sales	N	N	L [3,5]	L [3,5]	L [3,5]	L [3,5]
Industrial Service	N	N	CU [3,5]	CU [3,5]	CU [3,5]	CU [3,5]
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	Y/CU [8]	Y/CU [8]	Y/CU [8]	Y/CU [8]	Y/CU [8]	Y/CU [8]
Community Service	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]
Parks and Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	Y	Y	Y
Colleges	N	Y	Y	Y	Y	Y
Medical Centers	N	Y	Y	Y	Y	Y
Religious Institutions	Y	Y	Y	Y	Y	Y
Daycare	Y	Y	Y	Y	Y	Y
Other Categories						
Agriculture	L [10]	L [10]	L/CU [11]	L/CU [12]	L/CU [12]	L/CU [11]
Aviation and Surface Passenger Terminals	N	N	N	N	CU	CU
Detention Facilities	N	N	N	CU	CU	CU
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	N	L/CU [7]	L/CU [7]	L/CU [7]	L/CU [7]	L/CU [7]
Rail Lines and Utility Corridors	N	CU	CU	CU	CU	CU
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	N	L/CU [7]	L/CU [7]	L/CU [7]	L/CU [7]	L/CU [7]
Rail Lines and Utility Corridors	N	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.130.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

33.140 Employment and Industrial Zones

140

Sections:

General

- 33.140.010 General Purpose of the Zones
- 33.140.020 List of the Employment and Industrial Zones
- 33.140.030 Characteristics of the Zones
- 33.140.040 Other Zoning Regulations
- 33.140.050 Neighborhood Contact in EG and I Zones
- 33.140.055 Neighborhood Contact in EX Zone

Use Regulations

- 33.140.100 Primary Uses
- 33.140.110 Accessory Uses
- 33.140.130 Nuisance-Related Impacts
- 33.140.140 On-Site Waste Disposal

Site Development Standards

- 33.140.200 Lot Size
- 33.140.205 Floor Area Ratio
- 33.140.210 Height
- 33.140.215 Setbacks
- 33.140.220 Building Coverage
- 33.140.225 Landscaped Areas
- 33.140.227 Trees
- 33.140.230 Ground Floor Windows in the EX Zones
- 33.140.235 Screening
- 33.140.240 Pedestrian Standards
- 33.140.242 Transit Street Main Entrance
- 33.140.245 Exterior Display, Storage, and Work Activities
- 33.140.250 Trucks and Equipment
- 33.140.255 Drive-Through Facilities
- 33.140.265 Residential Development
- 33.140.270 Detached Accessory Structures
- 33.140.275 Fences
- 33.140.280 Demolitions
- 33.140.290 Nonconforming Development
- 33.140.295 Parking and Loading
- 33.140.300 Signs
- 33.140.310 Superblock Requirements
- 33.140.315 Recycling Areas

Commentary

33.140.050 Neighborhood Contact

As an alternative to a land use review, a public notice and meeting requirement applies to development of fuel storage structure, such as a new tank, at a Bulk Fossil Fuel Terminal, similar to the requirement for multi-dwelling residential development. This notice and meeting would create public awareness about the project and serve to discuss a proposal in an informal basis.

33.140.050 Neighborhood Contact in EG and I Zones

A. Purpose. Neighborhood contact is required when a new storage structure for any type of fuel will be built on a Bulk Fossil Fuel Terminal because of the impacts that fuel projects can have on the surrounding community.

B. Neighborhood contact requirement. Proposals meeting the following conditions are subject to the neighborhood contact requirement steps of 33.705.020.B., Neighborhood Contact II. All of the steps in 33.705.020.B. must be completed before an application for a building permit can be submitted:

1. The proposed development has not been subject to a land use review; and

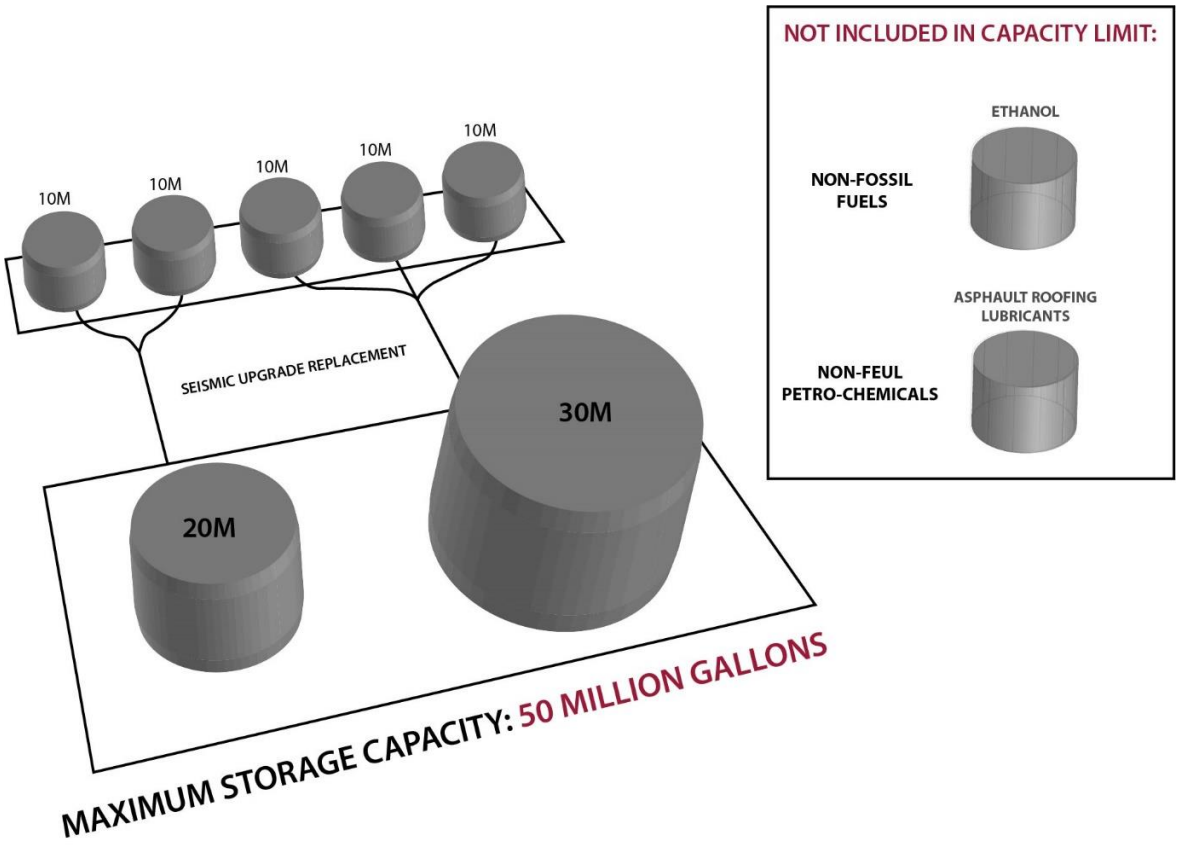
2. The proposed development includes at least one new structure for the storage of any type of fuel on a site with a Bulk Fossil Fuel Terminal use.

Commentary

33.140.100 Primary Uses

The amendments to this section reflect changes to prohibit new Bulk Fossil Fuel Terminals in the employment and industrial base zones and reclassify existing terminals as limited uses. Regulation of Bulk Fossil Fuel Terminals implements policy direction in City of Portland Resolution 37168 (adopted November 2015) and, 2035 Comprehensive Plan Policies 4.79, 4.81, 4.82, 6.48, and 7.14 which address reducing natural hazard risks and fossil fuel distribution and storage facilities.

The limited use designation prohibits expansion of fossil fuel tank capacity at existing Bulk Fossil Fuel Terminals, but allows for the replacement and reconfiguration of existing fossil fuel tank capacity as of the date of adoption as a way to facilitate seismic and safety upgrades.



33.140.100 Primary Uses

A. No change

B. Limited uses. Uses allowed that are subject to limitations are listed in Table 140-1 with an "L". These uses are allowed if they comply with the limitations listed below and the development standards and other regulations of this Title. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters. The paragraphs listed below contain the limitations and correspond with the footnote numbers from Table 140-1.

1. – 16. No change

17. Bulk Fossil Fuel Terminals. This regulation applies to all parts of Table 140-1 that have a [17].

    a. Existing Bulk Fossil Fuel Terminals. Bulk Fossil Fuel Terminals that existed on [insert effective date] are allowed, but the total amount of fossil fuel that can be stored on the site in storage tanks is limited to the fossil fuel storage tank capacity that existed on [insert effective date]. Total fossil fuel storage tank capacity on the site in excess of the capacity that existed on [insert effective date] is prohibited. Storing coal on the site is prohibited.

    b. New Bulk Fossil Fuel Terminals are prohibited.

Commentary

Table 140-1 Employment and Industrial Zone Primary Uses

The amendments to this section reflect changes to prohibit new Bulk Fossil Fuel Terminals in all employment and industrial base zones and reclassify existing terminals as limited uses.

Table 140-1
Employment and Industrial Zone Primary Uses

Use Categories	EG1	EG2	EX	IG1	IG2	IH
Residential Categories						
Household Living	N	N	Y	CU [1]	CU [1]	CU [1]
Group Living	N	N	L/CU [2]	N	N	N
Commercial Categories						
Retail Sales And Service	L/CU [3]	L/CU [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Office	Y	Y	Y	L/CU [4]	L/CU [5]	L/CU [6]
Quick Vehicle Servicing	Y	Y	N	Y	Y	Y
Vehicle Repair	Y	Y	Y	Y	Y	Y
Commercial Parking	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]
Self-Service Storage	Y	Y	L [7]	Y	Y	Y
Commercial Outdoor Recreation	Y	Y	Y	CU	CU	CU
Major Event Entertainment	CU	CU	CU	CU	CU	CU
Industrial Categories						
Manufacturing And Production	Y	Y	Y	Y	Y	Y
Warehouse And Freight Movement	Y	Y	Y	Y	Y	Y
Wholesale Sales	Y	Y	Y	Y	Y	Y
Industrial Service	Y	Y	Y	Y	Y	Y
Bulk Fossil Fuel Terminal	L [17]	L [17]	N	L [17]	L [17]	L [17]
Railroad Yards	N	N	N	Y	Y	Y
Waste-Related	N	N	N	L/CU [8]	L/CU [8]	L/CU [8]
Institutional Categories						
Basic Utilities	Y/CU [12]	Y/CU [12]	Y/CU [12]	Y/CU [13]	Y/CU [13]	Y/CU 13]
Community Service	L/CU [9]	L/CU [9]	L/CU [10]	L/CU [11]	L/CU [11]	L/CU [11]
Parks And Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	N	N	N
Colleges	Y	Y	Y	N	N	N
Medical Centers	Y	Y	Y	N	N	N
Religious Institutions	Y	Y	Y	N	N	N
Daycare	Y	Y	Y	L/CU [11]	L/CU 11]	L/CU 11]
Other Categories						
Agriculture	L [16]	L [16]	L [16]	L [16]	L [16]	L [16]
Aviation And Surface Passenger Terminals	CU	CU	CU	CU	CU	CU
Detention Facilities	CU	CU	CU	CU	CU	CU
Mining	N	N	N	CU	CU	CU
Radio Frequency Transmission Facilities	L/CU [14]	L/CU [14]	L/CU [14]	L/CU [14]	L/CU 14]	L/CU 14]
Rail Lines And Utility Corridors	Y	Y	Y	Y	Y	Y

Y = Yes, Allowed
CU = Conditional Use Review Required
L = Allowed, But Special Limitations
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.140.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Commentary

Table 150-1 Campus Institutional Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in the campus institutional base zones.

Table 150-1 Campus Institutional Zone Primary Uses			
Use Categories	**CI1**	**CI2**	**IR**
Residential Categories			
Household Living	N	Y	Y
Group Living	N	Y	Y [9]
Commercial Categories			
Retail Sales And Service	CU [1]	Y	L/CU [10]
Office	N	Y	L/CU [10]
Quick Vehicle Servicing	N	N	N
Vehicle Repair	N	N	N
Commercial Parking	N	Y	N
Self-Service Storage	N	N	N
Commercial Outdoor Recreation	N	N	N
Major Event Entertainment	CU	CU	CU
Industrial Categories			
Manufacturing And Production	L [2]	L/CU [2]	N
Warehouse And Freight Movement	N	N	CU
Wholesale Sales	N	N	N
Industrial Service	L [2]	L/CU [2]	N
Bulk Fossil Fuel Terminal	N	N	N
Railroad Yards	N	N	CU
Waste-Related	N	N	N
Institutional Categories			
Basic Utilities	L/CU [3]	L/CU [3]	L/CU [3]
Community Service	CU [4]	Y	CU [4]
Parks And Open Areas	L/CU [5]	L/CU [5]	L/CU [5]
Schools	N	N	L/CU [11]
Colleges	Y/CU [6]	Y/CU [6]	L/CU [11]
Medical Centers	Y	Y	L/CU [11]
Religious Institutions	CU	CU	CU
Daycare	Y	Y	L/CU [12]
Other Categories			
Agriculture	L [7]	L [7]	L [7]
Aviation And Surface Passenger Terminals	N	N	N
Detention Facilities	N	N	N
Mining	N	N	N
Radio Frequency Transmission Facilities	L/CU [8]	L/CU [8]	L/CU [8]
Rail Lines And Utility Corridors	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.150.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Commentary

33.730 Quasi-Judicial Procedures

The following amendments correct a mistake that was made as part of the recently adopted Neighborhood Contact Update project. The Neighborhood Contact Update project simplified, clarified and made the existing neighborhood contact requirements more effective. The only existing neighborhood contact requirement in the EG and I zones is a requirement related to development of new fuel storage tanks on fossil fuel terminals. In keeping with the policy direction of the project (clarify the exisiting rules), the Neighborhood Contact Update project did not add neighborhood contact requirements for development other than fuel tanks in the EG or I zones. However, an exemption for development in EG and I zones was inadvertently left out of the code that details the neighborhood contact steps for a land use review. The following amendments add that exemption.

33.730 Quasi-Judicial Procedures

730

33.730.013 Expedited Land Division Procedure

The Expedited Land Division (ELD) procedure provides an alternative to the standard procedures for some land divisions. The applicant may choose to use the ELD process if the land division request meets all of the elements specified in ORS 197.360. The steps of this procedure are in ORS 197.365 through .375. The application requirements are listed in Section 33.730.060, below. Two additional steps are required for land division requests using the ELD Procedure:

A. Neighborhood contact.

1. When the ELD includes four to ten lots, the applicant is required to meet the neighborhood contact requirements specified in 33.705.020.A., Neighborhood contact I. If the proposed expedited land division is in an EG or I zone, it is exempt from the neighborhood contact requirements.

2. When the ELD includes eleven or more lots, the applicant is required to meet the neighborhood contact requirements specified in 33.705.020.B., Neighborhood contact II. If the proposed expedited land division is in the EG1, EG2, or an I zone, it is exempt from the neighborhood contact requirements.

B. Pre-application conference. A pre-application conference is required for all land division requests processed through the ELD procedure. See 33.730.050, Pre-Application Conference. The pre-application conference must be held before applying for an ELD review.

33.730.014 Type I Procedure

The Type I procedure is an administrative process with public notice but no hearing.

A. Pre-application conferences. A pre-application conference is not required.

B. Neighborhood contact.

1. When the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

2. When the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.725.020.B., Neighborhood contact II, are required. If the proposed development is in the EG1 , EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

C.-H.[No change]

33.730.015 Type Ix Procedure
The Type Ix procedure is an administrative process with public notice but no hearing.

A. Pre-application conferences. A pre-application conference is optional.

B. Neighborhood contact.

1. When the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

2. When the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.705.020.B., Neighborhood contact II, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

C.-H.[No change]

33.730.020 Type II Procedure
The Type II procedure is an administrative process, with the opportunity to appeal the Director of BDS's decision to another review body.

A. Pre-application conference. A pre-application conference is optional unless it is a specific requirement of a review. See 33.730.050, Pre-Application Conference.

B. Neighborhood contact.

1. When the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site and no portion of the site is in the Design overlay zone, the neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

2. When the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site and no portion of the site is in the Design overlay zone, the neighborhood contact steps of 33.705.020.B., Neighborhood contact II, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

3. When the proposed development associated with the land use review will result in the addition of more than 10,000 square feet of net building area to the site and the site is in the Design overlay zone, the neighborhood contact steps of 33.705.020.C, Neighborhood contact III, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

C.-J. [No change]

33.730.025 Type IIx Procedure
The Type IIx procedure is an administrative process, with the opportunity to appeal the Director of BDS's decision to another review body.

A. Pre-application conference. A pre-application conference is optional. See 33.730.050, Pre-Application Conference.

B. Neighborhood contact.

1. The neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required when:

   a. The application is for a land division that includes four to ten lots; or

   b. The application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

2. When the application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.705.020.B., Neighborhood contact II, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

C.-J. [No change]

33.730.030 Type III Procedure

A Type III procedure requires a public hearing before an assigned review body. Subsections A through E~~D~~ apply to all sites. If the site is within the City of Portland, Subsections F~~E~~ through I~~H~~ also apply. If the site is in the portion of unincorporated Multnomah County that is subject to City zoning, Subsection J~~I~~ also applies.

A. Pre-application conference. A pre-application conference is required for all requests processed through a Type III procedure. See 33.730.050, Pre-Application Conference.

B. Neighborhood contact.

1. The neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required when:
   a. The application is for a land division that includes four to ten lots and does not include an environmental review; or
   b. The application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site and no portion of the site is in the Design overlay zone. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.
2. The neighborhood contact steps of 33.705.020.B., Neighborhood contact II, are required when:
   a. The application is for a land division that includes eleven or more lots and does not include an environmental review; or
   b. The application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site and no portion of the site is in the Design overlay zone. If the proposed development is in the EG1, EG2, or an I zone, or it was subject to a building permit process, it is exempt from the neighborhood contact requirements.
3. The neighborhood contact steps of 33.705.020.C., Neighborhood contact III, are required when:
   a. The application is for a land division that includes an environmental review; or
   b. The application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of more than 10,000 square feet of net building area to the site and the site is in the Design overlay zone. If the proposed development is in the EG1, EG2, or an I zone it is exempt from the neighborhood contact requirements.

Commentary

33.910.030 Definitions

The definition of fossil fuels was added to clarify the land use category Bulk Fossil Fuel Terminals.

Petrochemicals that are used primarily for non-fuel products are excluded, such as asphalt, plastics, lubricants, fertilizer, roofing, and paints. However, methanol is an exception that is included as a fossil fuel, because large methanol storage and distribution facilities tend to have structural similarities to liquid natural gas (LNG) and liquid petroleum gas (LPG) terminals, including large-scale storage and gas pipeline access, and because they can have similar safety and climate impacts.

Some fossil fuels under this definition are also classified as "renewable fuels" in the federal Renewable Fuel Standard and "clean fuels" in Oregon's Clean Fuel Standard, such as liquid natural gas and liquid propane gas. These federal and state standards require transportation fuel sold within their jurisdiction to contain a minimum volume of renewable or clean fuels. Renewable or clean fuels with more than 5 percent fossil fuel volume are defined as fossil fuels.

Renewable fuels are those fuels derived from biomass (plant or animal material), such as recycled cooking oil, soybean oil, or animal fats. Renewable natural gas/biogas is fuel captured from the waste stream, such as methane from landfills, waste water treatment plants, and agricultural or food waste. It does not include methane and other hydrocarbons produced from fossil fuels. Renewable hydrogen is hydrogen produced using renewable energy derived from wind power sited in ecologically responsible ways, solar, existing and low-impact hydroelectric, geothermal, biogas (including biogas produced from biomass), and ocean/wave technology sources.

Fuels containing 5% or less fossil-fuel volume are not considered fossil fuels under this definition. For example, "pure" ethanol made from corn or other non-fossil source is required by the Alcohol and Tobacco Tax and Trade Bureau to be denatured in order to be transported to the site. Denatured ethanol typically contains up to 5% methanol, so that it is toxic and undrinkable.

33.910.030 Definitions
The definition of words with specific meaning in the zoning code are as follows:

Fossil Fuel. Fossil fuels are petroleum products (such as crude oil and gasoline), coal, methanol, and gaseous fuels (such as natural gas and propane) that are made from decayed plants and animals that lived millions of years ago and are used as a source of energy. Denatured ethanol and similar fuel additives with less than 5 percent fossil fuel content, biodiesel/renewable diesel with less than 5 percent fossil fuel content, and petroleum-based products used primarily for non-fuel uses (such as asphalt, plastics, lubricants, fertilizer, roofing, and paints) are not fossil fuels.

33.920 Descriptions of the Use Categories

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Sections:

Introduction to the Use Categories
- 33.920.010 Purpose
- 33.920.020 Category Titles
- 33.920.030 Classification of Uses

Residential Use Categories
- 33.920.100 Group Living
- 33.920.110 Household Living

Commercial Use Categories
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- 33.920.240 Office
- 33.920.250 Retail Sales And Service
- 33.920 260 Self-Service Storage
- 33.920.270 Vehicle Repair

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- 33.920.300 Bulk Fossil Fuel Terminal
- 33.920.310~~300~~ Industrial Service
- 33.920.320~~310~~ Manufacturing And Production
- 33.920.330~~320~~ Railroad Yards
- 33.920.340~~330~~ Warehouse And Freight Movement
- 33.920.350~~340~~ Waste-Related
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- 33.920.530 Mining
- 33.920.540 Radio Frequency Transmission Facilities
- 33.920.550 Rail Lines And Utility Corridors

Commentary

33.920.300 Bulk Fossil Fuel Terminal

Bulk Fossil Fuel Terminals are added as a new land use category to regulate their development in the Zoning Code. Regulation of Bulk Fossil Fuel Terminals implements policy direction in City of Portland Resolution 37168 and 2035 Comprehensive Plan Policies 4.79, 4.81, 4.82, 6.48, and 7.14 which address reducing natural hazard risks and fossil fuel distribution and storage facilities.

Bulk Fossil Fuel Terminals are characterized by having (1) marine, pipeline or railroad transport access and (2) either trans-loading facilities for transferring a shipment between transport modes (such as from rail to ship) or bulk storage facilities exceeding 2 million gallons of fossil fuels. The 2-million-gallon threshold is sized to include facilities that are large enough to unload unit trains. Functionally, these terminals tend to be regional gateway facilities, where fossil fuels enter and exit the region.

The use description is clarified with criteria that are intended to prevent the aggregation of new facilities smaller than 2 million gallons on adjacent sites into a larger terminal that could effectively circumvent the terminal storage capacity threshold.

Resolution 37168 lists a specific exception to not restrict service directly to end users. At a small scale, services to end users include retail gasoline filling stations, natural gas access lines in street right-of-way to residential and business customers, and heating oil tanks at home sites. Larger scale end users with fossil fuel storage and access infrastructure also include manufacturers, jet fuel facilities for PDX Airport, vessel fuel facilities on Portland Harbor, and others, where fossil fuels are used as an input.

33.920.300 Bulk Fossil Fuel Terminal

A. Characteristics. Bulk Fossil Fuel Terminals are establishments primarily engaged in the transport and bulk storage of fossil fuels. Terminal activities may also include fuel blending, regional distribution, and wholesaling. The firms rely on access by marine, railroad, or regional pipeline to transport fuels to or from the site, and either have transloading facilities for transferring a shipment between transport modes, or have storage capacity exceeding 2 million gallons for fossil fuels. There is minimal on-site sales activity with the customer present.

B. Accessory uses. Accessory uses may include retail sales of petroleum products, offices, food membership distribution, parking, storage, truck fleet parking and maintenance areas, rail spur or lead lines, and docks.

C. Examples. Examples include crude oil terminals, petroleum products terminals, natural gas terminals, propane terminals, and coal terminals.

D. Exceptions.

1. Truck or marine freight terminals that do not store, transport or distribute fossil fuels are classified as Warehouse And Freight Movement uses.
2. Truck or marine freight terminals that do not have transloading facilities and have storage capacity of 2 million gallons or less are classified as Warehouse And Freight Movement uses. However, multiple fossil fuel facilities, each with 2 million gallons of fossil fuel storage capacity or less but cumulatively having a fossil fuel storage capacity in excess of 2 million gallons, located on separate parcels of land will be classified as a Bulk Fossil Fuel Terminal when two or more of the following factors are present:
   a. The facilities are located or will be located on one or more adjacent parcels of land. Adjacent includes separated by a shared right-of-way;
   b. The facilities share or will share operating facilities such as driveways, parking, piping, or storage facilities; or
   c. The facilities are owned or operated by a single parent partnership or corporation.
3. Gasoline stations and other retail sales of fossil fuels are not Bulk Fossil Fuel Terminals.
4. Distributors and wholesalers that receive and deliver fossil fuels exclusively by truck are not Bulk Fossil Fuel Terminals.
5. Industrial, commercial, institutional, and agricultural firms that exclusively store fossil fuel for use as an input are not Bulk Fossil Fuel Terminals.
6. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.
7. The storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, drydock, ship or barge servicing facility, rail yard, or as part of a fleet vehicle servicing facility are not Bulk Fossil Fuel Terminals.
8. Uses that recover or reprocess used petroleum products are not Bulk Fossil Fuel Terminals.

33.920.310~~300~~ Industrial Service

33.920.320~~310~~ Manufacturing And Production

33.920.330~~320~~ Railroad Yards

33.920.340~~330~~ Warehouse And Freight Movement

A. Characteristics. Warehouse And Freight Movement firms are involved in the storage, or movement of goods for themselves or other firms. Goods are generally delivered to other firms or the final consumer, except for some will-call pickups. There is little on-site sales activity with the customer present.

B. Accessory uses. Accessory uses may include offices, food membership distribution, truck fleet parking and maintenance areas, rail spur or lead lines, docks, and repackaging of goods.

C. Examples. Examples include separate warehouses used by retail stores such as furniture and appliance stores; household moving and general freight storage; cold storage plants, including frozen food lockers; storage of weapons and ammunition; major wholesale distribution centers; truck, marine, or air freight terminals; bus barns and light rail barns; parcel services; major post offices; grain terminals; and the stockpiling of sand, gravel, or other aggregate materials.

D. Exceptions.

1. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.
2. Miniwarehouses are classified as Self-Service Storage uses.
3. Establishments that engage in the transfer or storage of fossil fuels, rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities or have storage capacity exceeding 2 million gallons for fossil fuels are classified as Bulk Fossil Fuel Terminal uses.

33.920.350~~340~~ Waste-Related

33.920.360~~350~~ Wholesale Sales

A. Characteristics. Wholesale Sales firms are involved in the sale, lease, or rent of products primarily intended for industrial, institutional, or commercial businesses. The uses emphasize on-site sales or order taking and often include display areas. Businesses may or may not be open to the general public, but sales to the general public are limited as a result of the way in which the firm operates. Products may be picked up on site or delivered to the customer.

B. Accessory uses. Accessory uses may include offices, food membership distribution, product repair, warehouses, parking, minor fabrication services, and repackaging of goods.

C. Examples. Examples include sale or rental of machinery, equipment, heavy trucks, building materials, special trade tools, welding supplies, machine parts, electrical supplies, janitorial supplies, restaurant equipment, and store fixtures; mail order houses; and wholesalers of food, clothing, auto parts, building hardware, and office supplies.

D. Exceptions.

1. Firms that engage primarily in sales to the general public are classified as Retail Sales And Service.
2. Firms that engage in sales on a membership basis are classified as either Retail Sales And Service or Wholesale Sales, based on a consideration of the characteristics of the use.
3. Firms that are primarily storing goods with little on-site business activity are classified as Warehouse And Freight Movement.
4. Establishments that engage in the regional wholesaling of fossil fuels, rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities or have storage capacity exceeding 2 million gallons for fossil fuels are classified as Bulk Fossil Fuel Terminal uses.

BEFORE THE LAND USE BOARD OF APPEALS

OF THE STATE OF OREGON

COLUMBIA PACIFIC BUILDING TRADES COUNCIL, PORTLAND BUSINESS ALLIANCE, WESTERN STATES PETROLEUM ASSOCIATION,

Petitioners,

WORKING WATERFRONT COALITION,

Intervenor- Petitioners

v.

CITY OF PORTLAND,

Respondent,

COLUMBIA RIVERKEEPER, OREGON PHYSICIANS FOR SOCIAL RESPONSIBILITY, PORTLAND AUDOBON SOCIETY, and CENTER FOR SUSTAINABLE ECONOMY,

Intervenors- Respondent

LUBA No. 2017-001

CITY COUNCIL ORDINANCE NO. 188142, AS AMENDED

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24. Legislative Notices of November 10, 2016, Council Hearing, with Mailing List, as required by Portland City Code, Chapter 33.740 (10/26/2016) 1247

25. Amended DLCD Notice of Council Hearing, submitted online by Tom Armstrong (10/24/2016) 1282

26. Draft of 2016 Mitigation Action Plan Agency Review Draft, prepared for Bureau of Emergency Management by Tetra Tech, submitted by Bureau of Planning and Sustainability (BPS) (10/19/2016) 1286

27. Fossil Fuel Terminal Zoning Amendments: Proposed Draft PowerPoint slides, presented at October 11, 2016, PSC Work Session (10/11/2016) 2095

28. Minutes from October 11, 2016, PSC Meeting (Other relevant documents found at links in minutes are located at Record item numbers 21, 27, and 30) (10/11/2016) 2108

29. Final Report on Task 3- Updated Compliance Scenarios Prepared for Oregon Department of Environmental Quality by ICF International, submitted by BPS (10/05/2016) 2122

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42. City Council Resolution No. 37168, As Amended, Opposing Expansion of Infrastructure Whose Primary Purpose is Transporting or Storing Fossil Fuels in or Through Portland or Adjacent Waterways (11/12/15) 3759

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	Item No.	**Description**
A.	3	Audio CD of December 14, 2016, City Council Meeting (12/14/2016)**
B.	8	Audio CD of November 16, 2016, City Council Meeting (11/16/2016)**

	Item No.	Description
C.	13	Audio CD of November 10, 2016, City Council Meeting (12/14/2016)**
D.	25	Flash Drive containing video of September 13, 2016, PSC Meeting (09/13/2016)**

Oregon
Kate Brown, Governor

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Salem, Oregon 97301-2540
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Fax: 503-378-5518
www.oregon.gov/LCD

NOTICE OF ADOPTED CHANGE TO A COMPREHENSIVE PLAN OR LAND USE REGULATION

Date: December 21, 2016
Jurisdiction: City of Portland
Local file no.: Fossil Fuel Terminal
DLCD file no.: 013-16

The Department of Land Conservation and Development (DLCD) received the attached notice of adopted amendment to a comprehensive plan or land use regulation on 12/20/2016. A copy of the adopted amendment is available for review at the DLCD office in Salem and the local government office.

Notice of the proposed amendment was submitted to DLCD 36 days prior to the first evidentiary hearing.

Appeal Procedures

Eligibility to appeal this amendment is governed by ORS 197.612, ORS 197.620, and ORS 197.830. Under ORS 197.830(9), a notice of intent to appeal a land use decision to LUBA must be filed no later than 21 days after the date the decision sought to be reviewed became final. If you have questions about the date the decision became final, please contact the jurisdiction that adopted the amendment.

A notice of intent to appeal must be served upon the local government and others who received written notice of the final decision from the local government. The notice of intent to appeal must be served and filed in the form and manner prescribed by LUBA, (OAR chapter 661, division 10).

If the amendment is not appealed, it will be deemed acknowledged as set forth in ORS 197.625(1)(a). Please call LUBA at 503-373-1265, if you have questions about appeal procedures.

DLCD Contact

If you have questions about this notice, please contact DLCD's Plan Amendment Specialist at 503-934-0017 or plan.amendments@state.or.us

ORDINANCE NO. 188142 As Amended

Restrict bulk fossil fuel terminals. (Ordinance; Amend Title 33, Planning and Zoning)

The City of Portland ordains:

Section 1. The Council finds:

General Findings

1. The rapid development of fossil fuel resources in the western U.S. and Canada has resulted in numerous facility and infrastructure projects proposed to transport coal, diluted bitumen, natural gas, propane or other fossil fuels through the West Coast.

2. Fossil fuels pose risks to safety, health, and livability, including mobility of people, other freight, and other commercial vehicles.

3. The Portland Bureau of Emergency Management's Mitigation Action Plan (MAP) identifies how natural hazard events like floods, landslides, and earthquakes might affect the City of Portland. The Portland area has experienced numerous earthquakes in the past, ranging from Magnitude 4.5 to 9.0. Portland is certain to experience seismic events in the future. Many of Portland's fossil fuel storage tanks were built before seismic design requirements in building codes were adopted.

4. Most of Portland's employment and industrial zones are located in areas with moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016). Fossil fuel infrastructure poses considerable risks in the event of a major earthquake.

5. The extraction and combustion of fossil fuels are significant sources of greenhouse gas emissions and major contributors to climate change and pollution.

6. Coal contains toxic heavy metals, including mercury, arsenic and lead, and exposure to these toxic heavy metals is linked to cancer, birth defects and other health problems.

7. A Union Pacific train carrying oil from North Dakota to Tacoma derailed in Mosier, Oregon on June 3, 2016, spilling 42,000 gallons of crude oil, igniting a fire, and leading to the evacuation of one-quarter of the town's residents.

8. Tribal communities in Oregon and Washington have expressed concerns about the safety risks of fossil fuel infrastructure and the related threats to human health, cultural heritage, and environmental quality.

9. The City's 2015 Climate Action Plan (adopted by Resolution 37135) identifies the need to establish a "fossil fuel export policy that considers lifecycle emissions, safety,

economics, neighborhood livability and environmental impacts" (Climate Action Plan, action 3G, page 69).

10. The City committed in its 2015 Climate Action Plan to advancing policy and programs to reduce local fossil fuel use both in the City's own operations and through community-wide initiatives.

11. In Resolutions 36959 and 36962 adopted in 2012, the Council expressed opposition to coal trains traveling through Portland until a programmatic, comprehensive and area-wide Environmental Impact Statement and comprehensive Health Impact Assessment are completed.

12. Resolution 37168, adopted November 12, 2015, expressed the City Council's opposition to the "expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." It also expressed the Council's intent not to restrict improvements in safety, efficiency, or seismic resilience; the provision of service directly to end users; or infrastructure that will accelerate the transition to non-fossil fuel energy sources.

13. The 2035 Comprehensive Plan sets policy direction (Policies 4.75 and 4.76) to encourage disaster-resilient development and specifically to reduce natural hazard risks to critical energy and transportation infrastructure in Portland Harbor. Most of Portland's employment and industrial zones are located in areas with moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016).

14. The zoning code currently allows Bulk Fossil Fuel Terminals as a Warehouse and Freight Movement use without any limits on the size of terminals, which does not implement the Council's policy actions described in Findings 9 – 13 above

15. As initial implementation of these policies, the proposed amendments create a new land use category and impose prohibitions and limits that restrict the level of development to less than what is allowed under the current standards. The amendments will prohibit new terminals and limit the expansion of existing terminals.

16. The amendments promote major benefits to human health and safety, environmental health and resilience, with minor impacts to economic prosperity and equity.

17. The amendments will restrict expansion at existing fuel terminals and prohibit new terminal development, potentially impacting associated job growth and tax revenue. At the same time, the code restrictions on fossil fuel terminal development will also limit potential financial risks from a major accident involving fossil fuel infrastructure.

18. The amendments will reduce the scale of low, but potentially catastrophic, safety risks associated with fossil fuel infrastructure, including explosive accidents at liquefied

natural gas (LNG) and liquefied petroleum gas (LPG) facilities, and seismic risks of tank farms.

19. The amendments will limit expansion at existing fuel terminals and prohibit new terminal development, which may negatively impact associated middle-wage, industrial job growth that disproportionately benefits workers of color.

20. The amendments will restrict development of fossil fuel terminals consistent with City and State objectives on climate change and public safety. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, substituting these fuels for higher-carbon fuels does not begin to approach the goal of an 80% reduction in carbon emissions by 2050 established in Portland's Climate Action Plan or the State's 75% goal.

21. The potential impacts of the code amendments on constraining the fossil fuel supply to meet regional demand is uncertain. Fossil fuel demand in this growing region has been relatively flat over the last 15 years. At best, the demand for fossil fuel may increase moderately, as indicated by trend-based forecasts, or may plateau and decline with a continued shift to other modes of transportation, more fuel efficient vehicles, electric vehicles, and other carbon reduction strategies.

22. In Resolution 37168, the City Council expressed support for accelerating the transition to non-fossil fuel energy sources. As part of that transition, the Oregon Department of Environmental Quality (ODEQ) is implementing the Oregon Clean Fuels Program, which requires a 10 percent reduction in average carbon intensity by 2025. Fuels that could be used to achieve the standards include ethanol, biodiesel, electricity, hydrogen, natural gas, propane, and biogas, which may require additional storage capacity. In order to facilitate implementation of the Clean Fuels Program, non-fossil fuel storage tanks are not subject to the capacity limits.

Findings on Statewide Planning Goals

23. State planning statutes require cities to adopt and amend comprehensive plans and land use regulations in compliance with state land use goals. Only the stated goals addressed below apply.

24. **Goal 1, Citizen Involvement**, requires provision of opportunities for citizens to be involved in all phases of the planning process. The preparation of these amendments has provided numerous opportunities for public involvement, including:
    a. The Bureau of Planning and Sustainability maintained and updated as needed a project web site that included basic project information, announcements of public events, project documents and staff contact information.
    b. On June 29, 2016, the Fossil Fuel Terminal Zoning Amendments Discussion Draft was published and posted on the Bureau website.
    c. On August 8, 2016, notice of the proposed action was mailed to the Department of Land Conservation and Development (DLCD) in compliance with the post-

acknowledgement review process required by OAR 660-18-020. DLCD received the notice later that day.

d. On August 12, 2016, the Fossil Fuel Terminal Zoning Amendments Proposed Draft was published and posted on the Bureau website.
e. On August 12, 2016, notice of the Planning and Sustainability Commission hearing on the Fossil Fuel Terminal Zoning Amendments was mailed to 367 people, including all neighborhood and business associations, and all those who had requested notice, as required by state law and administrative rules and the City's zoning code. The notice also announced the availability of the Fossil Fuel Terminal Zoning Amendments Proposed Draft.
f. On September 13, 2016, the Planning and Sustainability Commission held a hearing on the proposal. Staff from the Bureau of Planning and Sustainability presented the proposal, and public testimony was received.
g. On September 20, 2016, the City Council held a work session on the Fossil Fuel Terminal Zoning Amendments.
h. On October 11, 2016, the Planning and Sustainability Commission voted to recommend the Fossil Fuel Terminal Zoning Amendments to City Council, including PSC-recommended modifications to the Proposed Draft
i. On October 24, 2016, the Fossil Fuel Terminal Zoning Amendments Recommended Draft was published and posted on the Bureau website.
j. On October 25, 2016, notice of the City Council hearing on the Fossil Fuel Terminal Zoning Amendments was mailed to 1,123 people. The notice also announced the availability of the Fossil Fuel Terminal Zoning Amendments Recommended Draft.
k. On November 10, 2016, City Council held a hearing on the Planning and Sustainability Commission recommendation for the Fossil Fuel Terminal Zoning Amendments. Staff from the Bureau of Planning and Sustainability presented the proposal, and public testimony was received.
l. On November 16, 2016, City Council held a second hearing on the Fossil Fuel Terminal Zoning Amendments.
m. On December 8, 2016, voted to adopt the Zoning Code changes in the Fossil Fuel Terminal Zoning Amendments.

25. **Goal 2, Land Use Planning**, requires the development of a process and policy framework that acts as a basis for all land use decisions and assures that decisions and actions are based on an understanding of the facts relevant to the decision.
    a. The process for adopting the amendments followed the procedures required by Title 33.740, Legislative Procedures, OAR 660-018-0020, ORS 227.186 and ORS 197.610.
    b. The applicable approval criteria for zoning code text amendments (33.835 Goal, Policy, and Regulation Amendments) are satisfied for the reasons explained in the findings below.
    c. The amendments meet relevant goals and policies of the City's adopted Comprehensive Plan as described in the findings below for Portland's Comprehensive Plan Goals and Policies;

d. The amendments are based on an identification of issues and problems as described in the general findings and in the project report and supporting documents contained in Exhibit A.
e. The amendments support this goal because the code changes provide use limitations for Bulk Fossil Fuel Terminals consistent with the City's adopted Comprehensive Plan.
f. The amendments also support this goal because development of the changes followed established city procedures for legislative actions, while also improving the clarity and comprehensibility of the City's codes.

26. **Goal 7, Natural Hazards**, requires reducing risk to people and property from natural hazards. The amendments support this goal because help limit the risks of storing large volumes of hazardous materials in an area with moderate to high susceptibility to an earthquake.

27. **Goal 9, Economic Development**, requires provision of adequate opportunities for a variety of economic activities vital to public health, welfare, and prosperity. The amendments are consistent with this goal because these changes and restrictions only apply to a new land use category, Bulk Fossil Fuel Terminals, and do not have a significant effect on the other allowed uses in industrial and employment zones. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial areas of Portland.

28. **Goal 12, Transportation**, requires provision of a safe, convenient, and economic transportation system. Goal 12 is implemented by the Transportation Planning Rule (TPR), which requires certain findings if a proposed regulation will significantly affect an existing or planned transportation facility. Under OAR 660-012-0060(1), a land use regulation amendment significantly affects a transportation facility if it would:

    (a) Change the functional classification of an existing or planned transportation facility (exclusive of correction of map errors in an adopted plan);
    (b) Change standards implementing a functional classification system; or
    (c) As measured at the end of the planning period identified in the adopted transportation system plan:
        (A) Allow land uses or levels of development that would result in types or levels of travel or access that are inconsistent with the functional classification of an existing or planned transportation facility;
        (B) Reduce the performance of an existing or planned transportation facility below the minimum acceptable performance standard identified in the TSP or comprehensive plan; or
        (C) Worsen the performance of an existing or planned transportation facility that is otherwise projected to perform below the minimum acceptable performance standard identified in the TSP or comprehensive plan.

a. These amendments do not change the functional classification of an existing or planned transportation facility, nor change standards that implement a functional classification system.
b. These amendments create a new land use category, but impose prohibitions and limits that restrict the level of development to less than what is allowed under the current standards. The zoning code currently allows Bulk Fossil Fuel Terminals as a Warehouse and Freight Movement use without any limits on the size of terminals. The amendments will prohibit new terminals and limit the expansion of existing terminals.
c. Given the new prohibitions and limits on expansion, the amendments will not reduce or worsen the performance of an existing or planned transportation facility below the minimum acceptable performance standard identified in the TSP or comprehensive plan.
d. For the same reason, these changes will not have a significant effect on existing or planned transportation facilities because the proposed amendments are minor changes to the allowed uses in industrial uses, and will not increase development intensity in a manner that will be inconsistent with the function or classification of existing transportation facilities or increase automobile traffic.
e. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial areas of Portland.

29. **Goal 15, Willamette River Greenway**, requires protection of the natural, scenic, historical, agricultural, economic and recreational qualities of lands along the Willamette River. The amendments support this goal because they minimize risks to natural, scenic and historic qualities along the river by restricting the storage of large volumes of hazardous materials in liquefaction zones near the river. The amendments prohibit new fossil fuel terminals, which will minimize potential risk to people and the environment by requiring any new terminal to be located outside of the liquefaction zone away from the greenway.

Findings on Metro Urban Growth Management Functional Plan

30. **Title 4, Industrial and other Employment Areas**, seeks to provide and protect a supply of sites for employment by limiting the types and scale of non-industrial uses in Regionally Significant Industrial Areas (RSIAs), Industrial and Employment Areas. The amendments support Title 4 because they do not increase the type or scale of non-industrial uses allowed in RSIAs, Industrial or General Employment zones. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial and employment areas of Portland.

Findings on Portland's Comprehensive Plan Goals

31. Since the adopted 2035 Comprehensive Plan is not yet effective, the proposed amendments are evaluated below for consistency with the City's existing, effective, and acknowledged Comprehensive Plan. Only the Comprehensive Plan goals addressed below are relevant and apply.

32. **Goal 1, Metropolitan Coordination**, calls for the Comprehensive Plan to be coordinated with federal and state law and to support regional goals, objectives and plans. The amendments are consistent with this goal because notification of the proposals, and an opportunity to provide comment at a public hearing before the Planning and Sustainability Commission, was provided to the Oregon Department of Land Conservation and Development consistent with ORS 197.610, and to Metro, Tri-Met, the Port of Portland, and the Oregon Department of Transportation consistent with 33.740.020. Nothing within these amendments changes or affects the Urban Growth Boundary, Urban Planning Area Boundary, or Urban Services Boundary.

33. **Goal 2, Urban Development**, calls for maintaining Portland's role as the major regional employment and population center through public policies that encourage expanded opportunity for housing and jobs, while retaining the character of established residential neighborhoods and business centers. The zoning code amendments will have minimal impact on Portland as the region's major employment center because there are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial and employment areas of Portland.

34. **Policy 2.14, Industrial Sanctuaries**, calls for providing industrial sanctuaries and encouraging the growth of industrial activities by preserving industrial land primarily for manufacturing purposes. The amendments are consistent with this policy because these changes and restrictions only apply to a new land use category, Bulk Fossil Fuel Terminals, and do not significantly affect the other allowed uses in industrial and employment zones. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial areas of Portland.

35. **Goal 5, Economic Development**, calls for fostering a strong and diverse economy that provides a full range of employment and economic choices for individuals and families in all parts of the city. The amendments are consistent with this goal because these changes and restrictions only apply to a new land use category, Bulk Fossil Fuel Terminals, and do not have a significant effect on the other allowed uses in industrial and employment zones.

36. **Policy, 5.1, Urban Development and Revitalization**, encourages investment in the development, redevelopment, rehabilitation and adaptive reuse of urban land and buildings for employment and housing opportunities. Objectives A and C specifically call for ensuring a sufficient supply of commercially and industrially-zoned, buildable

land, and retaining industrial sanctuary zones and maximizing use of infrastructure and intermodal transportation linkages with and within these areas. The zoning code amendments support this policy and objectives and will not affect the City's supply of land for economic development and employment growth because there are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial areas of Portland.

37. **Goal 6, Transportation**, calls for developing a balanced, equitable, and efficient transportation system that provides a range of transportation choices; reinforces the livability of neighborhoods; supports a strong and diverse economy; reduces air, noise, and water pollution; and lessens reliance on the automobile while maintaining accessibility. These amendments support this goal for the following reasons:

    a. These changes will not have a significant effect on existing or planned transportation facilities because the proposed amendments are minor changes to the allowed uses in industrial zones, and will not increase development intensity in a manner that will be inconsistent with the function or classification of existing transportation facilities or increase automobile traffic.
    b. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial areas of Portland, so there is no impact to the city's transportation system.
    c. These amendments create a new land use category, but imposes prohibitions and limits that restrict the level of development to less than what is allowed under the current standards. The zoning code currently allows Bulk Fossil Fuel Terminals as a Warehouse and Freight Movement use without any limits on the size of terminals. The amendments will prohibit new terminals and limit the expansion of existing terminals.
    d. Given the new prohibitions and limits on expansion, the amendments will not reduce or worsen the performance of an existing or planned transportation facility below the minimum acceptable performance standard identified in the TSP or comprehensive plan.

38. **Policy 6.9, Freight Classification Descriptions**, calls for designating a system of truck streets, railroad lines, and intermodal freight facilities that support local, national, and international distribution of goods and services. The amendments do not change the designation of any element of the city's freight system.

39. **Policy 6.18, Adequacy of Transportation Facilities**, calls for ensuring that amendments to land use regulations that change allowed uses are consistent with the identified function and capacity of, and adopted performance measures for, affected transportation facilities. This ordinance amends the zoning code to create a new land use category, but imposes prohibitions and limits that restrict the level of development to less than what is allowed under the current standards. The zoning code currently allows Bulk Fossil Fuel Terminals as a Warehouse and Freight Movement use without any limits on the size of terminals. The amendments will prohibit new terminals and limit the expansion of

existing terminals. Therefore, consistency with the identified function and capacity of transportation facilities is not impacted.

40. **Policy 6.29, Multimodal Freight System**, calls for developing and maintaining a multimodal freight transportation system for the safe, reliable, and efficient movement of goods within and through the City. The amendments do not change the designation of any element of the city's freight system.

41. **Goal 7, Energy**, calls for promoting a sustainable energy future by increasing energy efficiency in all sectors of the city by ten percent by the year 2000. **Policy 7.8, Energy Supply**, calls for supporting environmentally acceptable, sustainable energy sources, especially renewable resources such as solar, wind, hydroelectric, geothermal, and biomass (wood, farm and municipal waste). These amendments support a transition to non-fossil fuel energy sources by not including non-fossil fuel storage tanks in the storage capacity limits.

42. **Goal 8, Environment,** calls for maintaining and improving the quality of Portland's air, water and land resources and protecting neighborhoods and business centers from detrimental noise pollution. **Policy 8.11, Special Areas, H. Willamette River Greenway** calls for the protection of the natural and economic qualities of lands along the Willamette River through the Willamette Greenway Plan. The amendments support this goal because they minimize or even reduce risks to natural and economic qualities along the river by restricting the storage of large volumes of hazardous materials in liquefaction zones near the river. The amendments prohibit new fossil fuel terminals, which will minimize potential risk to people and the environment by requiring any new terminal to be located outside of the liquefaction zone away from the greenway.

43. **Goal 10, Plan Review and Administration,** calls for the periodic review so that the Comprehensive Plan and implementing ordinances remain an up-to-date and workable framework for land use development. **Policy 10.6, Amendments to the Comprehensive Plan Goals, Policies, and Implementing Measures**, requires that all proposed amendments to implementing ordinances be reviewed by the Planning and Sustainability Commission prior to action by the City Council. These amendments support this policy. The Planning and Sustainability Commission reviewed these amendments at a public hearing on September 13, 2016 and made a recommendation on October 11, 2016, to action by the City Council.

44. **Policy 10.10, Amendments to the Zoning and Subdivision Regulations**, requires that amendments to the zoning and subdivision regulations be clear, concise, and applicable to the broad range of development situations faced by a growing urban city. The amendments are consistent with this policy and its objectives as follows:

    a. The amendments address a present land use and development situation. The zoning code currently allows Bulk Fossil Fuel Terminals as a Warehouse and Freight Movement use without any limits on the size of terminals and without consideration

of liquefaction hazards and public safety. These amendments create a new land use category and impose prohibitions and limits that restrict the level of development to less than what is allowed under the current standards. The amendments will prohibit new terminals and limit the expansion of existing terminals.

b. The amended regulation is simple and concise by using clear and objective standards and not requiring a discretionary land use review for the limited expansion of an existing terminal.

NOW THEREFORE, The Council directs:

a. Adopt Fossil Fuel Terminal Zoning Amendments, *Recommended Draft* dated October 24, 2016, attached as Exhibit A.

b. Adopt the commentary in Exhibit A, Fossil Fuel Terminal Zoning Amendments, *Recommended Draft*, dated October 24, 2016, as legislative intent and further findings.

c. Amend Title 33, Planning and Zoning, as shown in Exhibit A, Fossil Fuel Terminal Zoning Amendments, *Recommended Draft*, dated October 24, 2016.

d. The Bureau of Planning and Sustainability shall report to City Council no later than December 31, 2019 on the implementation of this ordinance, including:
   - the number and description of any requests by existing terminal operators to replace and expand their facilities;
   - the number and description of building permits issued for fossil fuel tanks between 200,000 and 2 million gallons;
   - the trends in fossil fuel energy use and non-fossil energy use in Oregon;
   - the status of local and state regulatory proceedings that may improve seismic resilience of fossil fuel storage infrastructure; and
   - information on compliance with the Oregon Clean Fuels Program.

e. City Bureaus, including BDS, PBEM and Fire, shall work with the State of Oregon to develop policy options to require seismic upgrades of storage tanks within a firm deadline for replacement of older, unsafe tanks.

Section 2. If any section, subsection, sentence, clause, phrase, diagram, designation, or drawing contained in this Ordinance, or the plan, map or code it adopts or amends, is held to be deficient, invalid or unconstitutional, that shall not affect the validity of the remaining portions. The Council declares that it would have adopted the plan, map, or code and each section, subsection, sentence, clause, phrase, diagram, designation, and drawing thereof, regardless of the fact that any one or more sections, subsections, sentences, clauses, phrases, diagrams, designations, or drawings contained in this Ordinance, may be found to be deficient, invalid or unconstitutional.

188142

Passed by the Council: DEC 14 2016

Mary Hull Caballero
Auditor of the City of Portland
By Susan Parsons
Deputy

Mayor Charles Hales

Prepared by: T. Armstrong and M. Armstrong
Date Prepared: October 24, 2016

~~1259~~ ~~1261~~ ~~1378~~

Agenda No. 1385

ORDINANCE NO. 188142 As Amended

Title

Restrict bulk fossil fuel terminals. (Ordinance; Amend Title 33, Planning and Zoning).

INTRODUCED BY Commissioner/Auditor: **Charlie Hales**	CLERK USE: DATE FILED NOV 01 2016
COMMISSIONER APPROVAL Mayor—Finance and Administration - Hales Position 1/Utilities - Fritz Position 2/Works - Fish Position 3/Affairs - Saltzman Position 4/Safety - Novick	Mary Hull Caballero Auditor of the City of Portland By: _____ Deputy
BUREAU APPROVAL Bureau: Planning and Sustainabiltiy Bureau Head: Susan Anderson Susan Anderson	**ACTION TAKEN:** NOV 09 2016 **CONTINUED TO** NOV 16 2016 9:30 A.M. NOV 16 2016 **PASSED TO SECOND READING** As Amended DEC 08 2016 2 P.M DEC 08 2016 Rescheduled to DEC 14 2016 10:15 am Time Certain
Prepared by: Tom Armstrong Date Prepared: 10/21/2016	
'mpact Statement Completed ☒ Amends Budget ☐	
Portland Policy Document If "Yes" requires City Policy paragraph stated in document. Yes ☐ No ☐	
City Auditor Office Approval: required for Code Ordinances	
City Attorney Approval: KS Beaumont required for contract, code, easement, franchise, comp plan, charter	
Council Meeting Date **11/10/2016**	

AGENDA
TIME CERTAIN ☒ **Start time: 2:00pm** **Total amount of time needed: 3 hours** **(for presentation, testimony and discussion)**
CONSENT ☐
REGULAR ☐ **Total amount of time needed: _____** **(for presentation, testimony and discussion)**

FOUR-FIFTHS AGENDA	COMMISSIONERS VOTED AS FOLLOWS:	YEAS	NAYS
1. Fritz	1. Fritz	✓	
2. Fish	2. Fish	✓	
3. Saltzman	3. Saltzman	✓	
4. Novick	4. Novick	✓	
Hales	Hales	✓	

~~1259~~ ~~1261~~ ~~1378~~

Agenda No. 1385

ORDINANCE NO. 188142 As Amended

Title

Restrict bulk fossil fuel terminals. (Ordinance; Amend Title 33, Planning and Zoning).

INTRODUCED BY Commissioner/Auditor: **Charlie Hales**	CLERK USE: DATE FILED NOV 01 2016
COMMISSIONER APPROVAL	Mary Hull Caballero Auditor of the City of Portland
Mayor—Finance and Administration - Hales	By: _____ Deputy
Position 1/Utilities - Fritz	**ACTION TAKEN:**
Position 2/Works - Fish	NOV ~~09~~ 10 2016 **CONTINUED TO** NOV 16 2016 9:30 A.M.
Position 3/Affairs - Saltzman	NOV 16 2016 **PASSED TO SECOND READING** As Amended DEC 08 2016 2 P.M
Position 4/Safety - Novick	DEC 08 2016 Rescheduled to DEC 14 2016 10:15 am Time Certain
BUREAU APPROVAL	
Bureau: Planning and Sustainabiltiy	
Bureau Head: Susan Anderson Susan Anderson	
Prepared by: Tom Armstrong	
Date Prepared: 10/21/2016	
'mpact Statement	
Completed ☒ Amends Budget ☐	
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Hales	Hales	✓	

ORDINANCE NO. 188142 As Amended

Restrict bulk fossil fuel terminals. (Ordinance; Amend Title 33, Planning and Zoning)

The City of Portland ordains:

Section 1. The Council finds:

General Findings

1. The rapid development of fossil fuel resources in the western U.S. and Canada has resulted in numerous facility and infrastructure projects proposed to transport coal, diluted bitumen, natural gas, propane or other fossil fuels through the West Coast.

2. Fossil fuels pose risks to safety, health, and livability, including mobility of people, other freight, and other commercial vehicles.

3. The Portland Bureau of Emergency Management's Mitigation Action Plan (MAP) identifies how natural hazard events like floods, landslides, and earthquakes might affect the City of Portland. The Portland area has experienced numerous earthquakes in the past, ranging from Magnitude 4.5 to 9.0. Portland is certain to experience seismic events in the future. Many of Portland's fossil fuel storage tanks were built before seismic design requirements in building codes were adopted.

4. Most of Portland's employment and industrial zones are located in areas with moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016). Fossil fuel infrastructure poses considerable risks in the event of a major earthquake.

5. The extraction and combustion of fossil fuels are significant sources of greenhouse gas emissions and major contributors to climate change and pollution.

6. Coal contains toxic heavy metals, including mercury, arsenic and lead, and exposure to these toxic heavy metals is linked to cancer, birth defects and other health problems.

7. A Union Pacific train carrying oil from North Dakota to Tacoma derailed in Mosier, Oregon on June 3, 2016, spilling 42,000 gallons of crude oil, igniting a fire, and leading to the evacuation of one-quarter of the town's residents.

8. Tribal communities in Oregon and Washington have expressed concerns about the safety risks of fossil fuel infrastructure and the related threats to human health, cultural heritage, and environmental quality.

9. The City's 2015 Climate Action Plan (adopted by Resolution 37135) identifies the need to establish a "fossil fuel export policy that considers lifecycle emissions, safety,

economics, neighborhood livability and environmental impacts" (Climate Action Plan, action 3G, page 69).

10. The City committed in its 2015 Climate Action Plan to advancing policy and programs to reduce local fossil fuel use both in the City's own operations and through community-wide initiatives.

11. In Resolutions 36959 and 36962 adopted in 2012, the Council expressed opposition to coal trains traveling through Portland until a programmatic, comprehensive and area-wide Environmental Impact Statement and comprehensive Health Impact Assessment are completed.

12. Resolution 37168, adopted November 12, 2015, expressed the City Council's opposition to the "expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." It also expressed the Council's intent not to restrict improvements in safety, efficiency, or seismic resilience; the provision of service directly to end users; or infrastructure that will accelerate the transition to non-fossil fuel energy sources.

13. The 2035 Comprehensive Plan sets policy direction (Policies 4.75 and 4.76) to encourage disaster-resilient development and specifically to reduce natural hazard risks to critical energy and transportation infrastructure in Portland Harbor. Most of Portland's employment and industrial zones are located in areas with moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016).

14. The zoning code currently allows Bulk Fossil Fuel Terminals as a Warehouse and Freight Movement use without any limits on the size of terminals, which does not implement the Council's policy actions described in Findings 9 – 13 above

15. As initial implementation of these policies, the proposed amendments create a new land use category and impose prohibitions and limits that restrict the level of development to less than what is allowed under the current standards. The amendments will prohibit new terminals and limit the expansion of existing terminals.

16. The amendments promote major benefits to human health and safety, environmental health and resilience, with minor impacts to economic prosperity and equity.

17. The amendments will restrict expansion at existing fuel terminals and prohibit new terminal development, potentially impacting associated job growth and tax revenue. At the same time, the code restrictions on fossil fuel terminal development will also limit potential financial risks from a major accident involving fossil fuel infrastructure.

18. The amendments will reduce the scale of low, but potentially catastrophic, safety risks associated with fossil fuel infrastructure, including explosive accidents at liquefied

natural gas (LNG) and liquefied petroleum gas (LPG) facilities, and seismic risks of tank farms.

19. The amendments will limit expansion at existing fuel terminals and prohibit new terminal development, which may negatively impact associated middle-wage, industrial job growth that disproportionately benefits workers of color.

20. The amendments will restrict development of fossil fuel terminals consistent with City and State objectives on climate change and public safety. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, substituting these fuels for higher-carbon fuels does not begin to approach the goal of an 80% reduction in carbon emissions by 2050 established in Portland's Climate Action Plan or the State's 75% goal.

21. The potential impacts of the code amendments on constraining the fossil fuel supply to meet regional demand is uncertain. Fossil fuel demand in this growing region has been relatively flat over the last 15 years. At best, the demand for fossil fuel may increase moderately, as indicated by trend-based forecasts, or may plateau and decline with a continued shift to other modes of transportation, more fuel efficient vehicles, electric vehicles, and other carbon reduction strategies.

22. In Resolution 37168, the City Council expressed support for accelerating the transition to non-fossil fuel energy sources. As part of that transition, the Oregon Department of Environmental Quality (ODEQ) is implementing the Oregon Clean Fuels Program, which requires a 10 percent reduction in average carbon intensity by 2025. Fuels that could be used to achieve the standards include ethanol, biodiesel, electricity, hydrogen, natural gas, propane, and biogas, which may require additional storage capacity. In order to facilitate implementation of the Clean Fuels Program, non-fossil fuel storage tanks are not subject to the capacity limits.

Findings on Statewide Planning Goals

23. State planning statutes require cities to adopt and amend comprehensive plans and land use regulations in compliance with state land use goals. Only the stated goals addressed below apply.

24. **Goal 1, Citizen Involvement**, requires provision of opportunities for citizens to be involved in all phases of the planning process. The preparation of these amendments has provided numerous opportunities for public involvement, including:
    a. The Bureau of Planning and Sustainability maintained and updated as needed a project web site that included basic project information, announcements of public events, project documents and staff contact information.
    b. On June 29, 2016, the Fossil Fuel Terminal Zoning Amendments Discussion Draft was published and posted on the Bureau website.
    c. On August 8, 2016, notice of the proposed action was mailed to the Department of Land Conservation and Development (DLCD) in compliance with the post-

acknowledgement review process required by OAR 660-18-020. DLCD received the notice later that day.

d. On August 12, 2016, the Fossil Fuel Terminal Zoning Amendments Proposed Draft was published and posted on the Bureau website.
e. On August 12, 2016, notice of the Planning and Sustainability Commission hearing on the Fossil Fuel Terminal Zoning Amendments was mailed to 367 people, including all neighborhood and business associations, and all those who had requested notice, as required by state law and administrative rules and the City's zoning code. The notice also announced the availability of the Fossil Fuel Terminal Zoning Amendments Proposed Draft.
f. On September 13, 2016, the Planning and Sustainability Commission held a hearing on the proposal. Staff from the Bureau of Planning and Sustainability presented the proposal, and public testimony was received.
g. On September 20, 2016, the City Council held a work session on the Fossil Fuel Terminal Zoning Amendments.
h. On October 11, 2016, the Planning and Sustainability Commission voted to recommend the Fossil Fuel Terminal Zoning Amendments to City Council, including PSC-recommended modifications to the Proposed Draft
i. On October 24, 2016, the Fossil Fuel Terminal Zoning Amendments Recommended Draft was published and posted on the Bureau website.
j. On October 25, 2016, notice of the City Council hearing on the Fossil Fuel Terminal Zoning Amendments was mailed to 1,123 people. The notice also announced the availability of the Fossil Fuel Terminal Zoning Amendments Recommended Draft.
k. On November 10, 2016, City Council held a hearing on the Planning and Sustainability Commission recommendation for the Fossil Fuel Terminal Zoning Amendments. Staff from the Bureau of Planning and Sustainability presented the proposal, and public testimony was received.
l. On November 16, 2016, City Council held a second hearing on the Fossil Fuel Terminal Zoning Amendments.
m. On December 8, 2016, voted to adopt the Zoning Code changes in the Fossil Fuel Terminal Zoning Amendments.

25. **Goal 2, Land Use Planning**, requires the development of a process and policy framework that acts as a basis for all land use decisions and assures that decisions and actions are based on an understanding of the facts relevant to the decision.
    a. The process for adopting the amendments followed the procedures required by Title 33.740, Legislative Procedures, OAR 660-018-0020, ORS 227.186 and ORS 197.610.
    b. The applicable approval criteria for zoning code text amendments (33.835 Goal, Policy, and Regulation Amendments) are satisfied for the reasons explained in the findings below.
    c. The amendments meet relevant goals and policies of the City's adopted Comprehensive Plan as described in the findings below for Portland's Comprehensive Plan Goals and Policies;

d. The amendments are based on an identification of issues and problems as described in the general findings and in the project report and supporting documents contained in Exhibit A.
e. The amendments support this goal because the code changes provide use limitations for Bulk Fossil Fuel Terminals consistent with the City's adopted Comprehensive Plan.
f. The amendments also support this goal because development of the changes followed established city procedures for legislative actions, while also improving the clarity and comprehensibility of the City's codes.

26. **Goal 7, Natural Hazards**, requires reducing risk to people and property from natural hazards. The amendments support this goal because help limit the risks of storing large volumes of hazardous materials in an area with moderate to high susceptibility to an earthquake.

27. **Goal 9, Economic Development**, requires provision of adequate opportunities for a variety of economic activities vital to public health, welfare, and prosperity. The amendments are consistent with this goal because these changes and restrictions only apply to a new land use category, Bulk Fossil Fuel Terminals, and do not have a significant effect on the other allowed uses in industrial and employment zones. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial areas of Portland.

28. **Goal 12, Transportation**, requires provision of a safe, convenient, and economic transportation system. Goal 12 is implemented by the Transportation Planning Rule (TPR), which requires certain findings if a proposed regulation will significantly affect an existing or planned transportation facility. Under OAR 660-012-0060(1), a land use regulation amendment significantly affects a transportation facility if it would:

    (a) Change the functional classification of an existing or planned transportation facility (exclusive of correction of map errors in an adopted plan);
    (b) Change standards implementing a functional classification system; or
    (c) As measured at the end of the planning period identified in the adopted transportation system plan:
        (A) Allow land uses or levels of development that would result in types or levels of travel or access that are inconsistent with the functional classification of an existing or planned transportation facility;
        (B) Reduce the performance of an existing or planned transportation facility below the minimum acceptable performance standard identified in the TSP or comprehensive plan; or
        (C) Worsen the performance of an existing or planned transportation facility that is otherwise projected to perform below the minimum acceptable performance standard identified in the TSP or comprehensive plan.

a. These amendments do not change the functional classification of an existing or planned transportation facility, nor change standards that implement a functional classification system.
b. These amendments create a new land use category, but impose prohibitions and limits that restrict the level of development to less than what is allowed under the current standards. The zoning code currently allows Bulk Fossil Fuel Terminals as a Warehouse and Freight Movement use without any limits on the size of terminals. The amendments will prohibit new terminals and limit the expansion of existing terminals.
c. Given the new prohibitions and limits on expansion, the amendments will not reduce or worsen the performance of an existing or planned transportation facility below the minimum acceptable performance standard identified in the TSP or comprehensive plan.
d. For the same reason, these changes will not have a significant effect on existing or planned transportation facilities because the proposed amendments are minor changes to the allowed uses in industrial uses, and will not increase development intensity in a manner that will be inconsistent with the function or classification of existing transportation facilities or increase automobile traffic.
e. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial areas of Portland.

29. **Goal 15, Willamette River Greenway**, requires protection of the natural, scenic, historical, agricultural, economic and recreational qualities of lands along the Willamette River. The amendments support this goal because they minimize risks to natural, scenic and historic qualities along the river by restricting the storage of large volumes of hazardous materials in liquefaction zones near the river. The amendments prohibit new fossil fuel terminals, which will minimize potential risk to people and the environment by requiring any new terminal to be located outside of the liquefaction zone away from the greenway.

Findings on Metro Urban Growth Management Functional Plan

30. **Title 4, Industrial and other Employment Areas**, seeks to provide and protect a supply of sites for employment by limiting the types and scale of non-industrial uses in Regionally Significant Industrial Areas (RSIAs), Industrial and Employment Areas. The amendments support Title 4 because they do not increase the type or scale of non-industrial uses allowed in RSIAs, Industrial or General Employment zones. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial and employment areas of Portland.

Findings on Portland's Comprehensive Plan Goals

31. Since the adopted 2035 Comprehensive Plan is not yet effective, the proposed amendments are evaluated below for consistency with the City's existing, effective, and acknowledged Comprehensive Plan. Only the Comprehensive Plan goals addressed below are relevant and apply.

32. **Goal 1, Metropolitan Coordination**, calls for the Comprehensive Plan to be coordinated with federal and state law and to support regional goals, objectives and plans. The amendments are consistent with this goal because notification of the proposals, and an opportunity to provide comment at a public hearing before the Planning and Sustainability Commission, was provided to the Oregon Department of Land Conservation and Development consistent with ORS 197.610, and to Metro, Tri-Met, the Port of Portland, and the Oregon Department of Transportation consistent with 33.740.020. Nothing within these amendments changes or affects the Urban Growth Boundary, Urban Planning Area Boundary, or Urban Services Boundary.

33. **Goal 2, Urban Development**, calls for maintaining Portland's role as the major regional employment and population center through public policies that encourage expanded opportunity for housing and jobs, while retaining the character of established residential neighborhoods and business centers. The zoning code amendments will have minimal impact on Portland as the region's major employment center because there are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial and employment areas of Portland.

34. **Policy 2.14, Industrial Sanctuaries**, calls for providing industrial sanctuaries and encouraging the growth of industrial activities by preserving industrial land primarily for manufacturing purposes. The amendments are consistent with this policy because these changes and restrictions only apply to a new land use category, Bulk Fossil Fuel Terminals, and do not significantly affect the other allowed uses in industrial and employment zones. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial areas of Portland.

35. **Goal 5, Economic Development**, calls for fostering a strong and diverse economy that provides a full range of employment and economic choices for individuals and families in all parts of the city. The amendments are consistent with this goal because these changes and restrictions only apply to a new land use category, Bulk Fossil Fuel Terminals, and do not have a significant effect on the other allowed uses in industrial and employment zones.

36. **Policy, 5.1, Urban Development and Revitalization**, encourages investment in the development, redevelopment, rehabilitation and adaptive reuse of urban land and buildings for employment and housing opportunities. Objectives A and C specifically call for ensuring a sufficient supply of commercially and industrially-zoned, buildable

land, and retaining industrial sanctuary zones and maximizing use of infrastructure and intermodal transportation linkages with and within these areas. The zoning code amendments support this policy and objectives and will not affect the City's supply of land for economic development and employment growth because there are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial areas of Portland.

37. **Goal 6, Transportation**, calls for developing a balanced, equitable, and efficient transportation system that provides a range of transportation choices; reinforces the livability of neighborhoods; supports a strong and diverse economy; reduces air, noise, and water pollution; and lessens reliance on the automobile while maintaining accessibility. These amendments support this goal for the following reasons:

    a. These changes will not have a significant effect on existing or planned transportation facilities because the proposed amendments are minor changes to the allowed uses in industrial zones, and will not increase development intensity in a manner that will be inconsistent with the function or classification of existing transportation facilities or increase automobile traffic.
    b. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial areas of Portland, so there is no impact to the city's transportation system.
    c. These amendments create a new land use category, but imposes prohibitions and limits that restrict the level of development to less than what is allowed under the current standards. The zoning code currently allows Bulk Fossil Fuel Terminals as a Warehouse and Freight Movement use without any limits on the size of terminals. The amendments will prohibit new terminals and limit the expansion of existing terminals.
    d. Given the new prohibitions and limits on expansion, the amendments will not reduce or worsen the performance of an existing or planned transportation facility below the minimum acceptable performance standard identified in the TSP or comprehensive plan.

38. **Policy 6.9, Freight Classification Descriptions**, calls for designating a system of truck streets, railroad lines, and intermodal freight facilities that support local, national, and international distribution of goods and services. The amendments do not change the designation of any element of the city's freight system.

39. **Policy 6.18, Adequacy of Transportation Facilities**, calls for ensuring that amendments to land use regulations that change allowed uses are consistent with the identified function and capacity of, and adopted performance measures for, affected transportation facilities. This ordinance amends the zoning code to create a new land use category, but imposes prohibitions and limits that restrict the level of development to less than what is allowed under the current standards. The zoning code currently allows Bulk Fossil Fuel Terminals as a Warehouse and Freight Movement use without any limits on the size of terminals. The amendments will prohibit new terminals and limit the expansion of

existing terminals. Therefore, consistency with the identified function and capacity of transportation facilities is not impacted.

40. **Policy 6.29, Multimodal Freight System**, calls for developing and maintaining a multimodal freight transportation system for the safe, reliable, and efficient movement of goods within and through the City. The amendments do not change the designation of any element of the city's freight system.

41. **Goal 7, Energy**, calls for promoting a sustainable energy future by increasing energy efficiency in all sectors of the city by ten percent by the year 2000. **Policy 7.8, Energy Supply**, calls for supporting environmentally acceptable, sustainable energy sources, especially renewable resources such as solar, wind, hydroelectric, geothermal, and biomass (wood, farm and municipal waste). These amendments support a transition to non-fossil fuel energy sources by not including non-fossil fuel storage tanks in the storage capacity limits.

42. **Goal 8, Environment,** calls for maintaining and improving the quality of Portland's air, water and land resources and protecting neighborhoods and business centers from detrimental noise pollution. **Policy 8.11, Special Areas, H. Willamette River Greenway** calls for the protection of the natural and economic qualities of lands along the Willamette River through the Willamette Greenway Plan. The amendments support this goal because they minimize or even reduce risks to natural and economic qualities along the river by restricting the storage of large volumes of hazardous materials in liquefaction zones near the river. The amendments prohibit new fossil fuel terminals, which will minimize potential risk to people and the environment by requiring any new terminal to be located outside of the liquefaction zone away from the greenway.

43. **Goal 10, Plan Review and Administration,** calls for the periodic review so that the Comprehensive Plan and implementing ordinances remain an up-to-date and workable framework for land use development. **Policy 10.6, Amendments to the Comprehensive Plan Goals, Policies, and Implementing Measures**, requires that all proposed amendments to implementing ordinances be reviewed by the Planning and Sustainability Commission prior to action by the City Council. These amendments support this policy. The Planning and Sustainability Commission reviewed these amendments at a public hearing on September 13, 2016 and made a recommendation on October 11, 2016, to action by the City Council.

44. **Policy 10.10, Amendments to the Zoning and Subdivision Regulations**, requires that amendments to the zoning and subdivision regulations be clear, concise, and applicable to the broad range of development situations faced by a growing urban city. The amendments are consistent with this policy and its objectives as follows:

    a. The amendments address a present land use and development situation. The zoning code currently allows Bulk Fossil Fuel Terminals as a Warehouse and Freight Movement use without any limits on the size of terminals and without consideration

of liquefaction hazards and public safety. These amendments create a new land use category and impose prohibitions and limits that restrict the level of development to less than what is allowed under the current standards. The amendments will prohibit new terminals and limit the expansion of existing terminals.

b. The amended regulation is simple and concise by using clear and objective standards and not requiring a discretionary land use review for the limited expansion of an existing terminal.

NOW THEREFORE, The Council directs:

a. Adopt Fossil Fuel Terminal Zoning Amendments, *Recommended Draft* dated October 24, 2016, attached as Exhibit A.

b. Adopt the commentary in Exhibit A, Fossil Fuel Terminal Zoning Amendments, *Recommended Draft*, dated October 24, 2016, as legislative intent and further findings.

c. Amend Title 33, Planning and Zoning, as shown in Exhibit A, Fossil Fuel Terminal Zoning Amendments, *Recommended Draft*, dated October 24, 2016.

d. The Bureau of Planning and Sustainability shall report to City Council no later than December 31, 2019 on the implementation of this ordinance, including:
   - the number and description of any requests by existing terminal operators to replace and expand their facilities;
   - the number and description of building permits issued for fossil fuel tanks between 200,000 and 2 million gallons;
   - the trends in fossil fuel energy use and non-fossil energy use in Oregon;
   - the status of local and state regulatory proceedings that may improve seismic resilience of fossil fuel storage infrastructure; and
   - information on compliance with the Oregon Clean Fuels Program.

e. City Bureaus, including BDS, PBEM and Fire, shall work with the State of Oregon to develop policy options to require seismic upgrades of storage tanks within a firm deadline for replacement of older, unsafe tanks.

Section 2. If any section, subsection, sentence, clause, phrase, diagram, designation, or drawing contained in this Ordinance, or the plan, map or code it adopts or amends, is held to be deficient, invalid or unconstitutional, that shall not affect the validity of the remaining portions. The Council declares that it would have adopted the plan, map, or code and each section, subsection, sentence, clause, phrase, diagram, designation, and drawing thereof, regardless of the fact that any one or more sections, subsections, sentences, clauses, phrases, diagrams, designations, or drawings contained in this Ordinance, may be found to be deficient, invalid or unconstitutional.

188142

Passed by the Council: DEC 14 2016

Mary Hull Caballero
Auditor of the City of Portland
By _____
Deputy

Mayor Charles Hales

Prepared by: T. Armstrong and M. Armstrong
Date Prepared: October 24, 2016

188142

Exhibit A











Fossil Fuel Terminal Zoning Amendments

As Adopted

City of Portland, Oregon
December 14, 2016
Ordinance No. 188142

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.
City of Portland, Oregon

188142

The Bureau of Planning and Sustainability is committed to providing equal access to information and hearings. If you need special accommodation, please call 503-823-7700, the City's TTY at 503-823-6868, or the Oregon Relay Service at 1-800-735-2900.

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Acknowledgments

This report was written by project staff from the City of Portland Bureau of Planning and Sustainability.

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1. Introduction

In recent years, the rapid development of fossil fuel resources in the Western United States and Canada has prompted many proposals in the Pacific Northwest for new large fuel terminals and infrastructure projects. In early 2015, Pembina Pipeline Corporation proposed a propane terminal in Portland that drew substantial public opposition. Mayor Charlie Hales withdrew a proposed zoning code amendment that the development needed to move forward, effectively blocking that proposal. In November 2015, Portland City Council adopted Resolution 37168 calling for opposition to expansion of fossil fuel infrastructure. In June 2016, City Council adopted the 2035 Comprehensive Plan, which included Policy 6.48 to limit fossil fuel distribution and storage facilities to those needed to serve the regional market. This code-change project begins to implement the policy direction in the resolution by restricting development and expansion of bulk fossil fuel terminals.

Project summary

The Fossil Fuel Terminal Zoning Amendments project would restrict the development and expansion of Bulk Fossil Fuel Terminals.

Adopted zoning code amendments:

- Identify "Bulk Fossil Fuel Terminals" as a regulated land use, characterized by (a) marine, railroad, or pipeline transport access and (b) either storage capacity exceeding 2 million gallons or transload facilities (such as rail-to-ship loading).
- Prohibit new Bulk Fossil Fuel Terminals in all base zones.
- Classify existing Bulk Fossil Fuel Terminals in industrial and general employment zones as "limited uses" that can continue to operate. Expansion of fossil fuel storage at these existing terminals would be prohibited.

Why is this important?

Fossil fuel distribution policy – New policy directions adopted by City Council in November 2015 and in the 2035 Comprehensive Plan would limit fossil fuel distribution and storage facilities to those serving the regional market. City Council adopted these policies after holding public hearings and hearing testimony from hundreds of Portlanders.

Climate action goals – Fossil fuels are major contributors to climate change and pollution. The rapid development of fossil fuel resources in the Western United States and Canada has prompted many recent proposals for new export terminals in the Pacific Northwest. The City's Climate Action Plan seeks to reduce greenhouse gas emissions with fossil fuels being the largest source of emissions.

Public safety and environmental protection – Several recent accidents involving fossil fuel distribution across the nation and in Oregon highlight public safety risks in cities and environmental risks along rivers. Most of Portland's industrial areas have moderate-to-high liquefaction susceptibility in a major earthquake.

Oregon's industrial and distribution center – Portland is Oregon's largest, most diverse distribution hub, and existing Portland petroleum terminals serve more than 90 percent of the statewide market. Adopted code changes would restrict the expansion of these facilities in Portland.

Project scope and timing

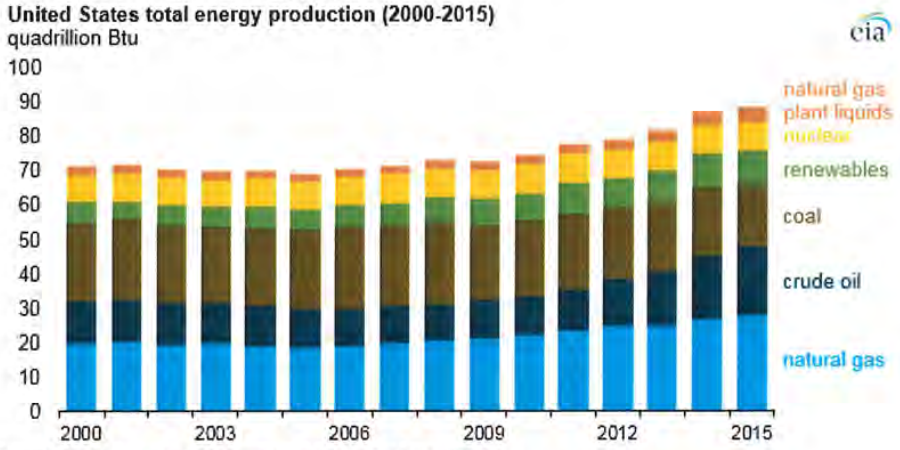
The energy distribution market in the Pacific Northwest is changing. Production of crude oil and natural gas, particularly from North Dakota, has substantially increased in the U.S. since 2009, as shown in Figure 1. In turn, several large new fuel distribution terminals have been proposed in the Pacific Northwest to access West Coast and export markets, as shown in Figure 2. Similar trends have occurred in Alberta and British Columbia.

This project is proposing a prompt, focused response to these market changes. The adopted code amendments will restrict development of new fossil fuel terminals and limit the expansion of existing terminals, consistent with City and State objectives on climate change and public safety.

Where are Portland's existing fossil fuel terminals?

Portland's industrial districts are Oregon's largest seaport, rail hub and truck distribution center. The Northwest Industrial District in Portland is also the end of the Olympic Pipeline, which supplies most of Oregon's petroleum fuels from Puget Sound refineries. The ten petroleum terminals located in Northwest Portland are the gateway distribution facilities serving Oregon and Southern Washington markets. Additionally, NW Natural's GasCo terminal provides peak-consumption storage of natural gas for much of the regional market. In Northwest Portland, these "tank farm" storage facilities have direct access to pipeline, deep-water port, railroad and truck route infrastructure. Several other smaller fossil fuel distribution facilities are also located in Portland.

Figure 1. Increasing U.S. energy production



Source: U.S. Energy Information Administration, 2016

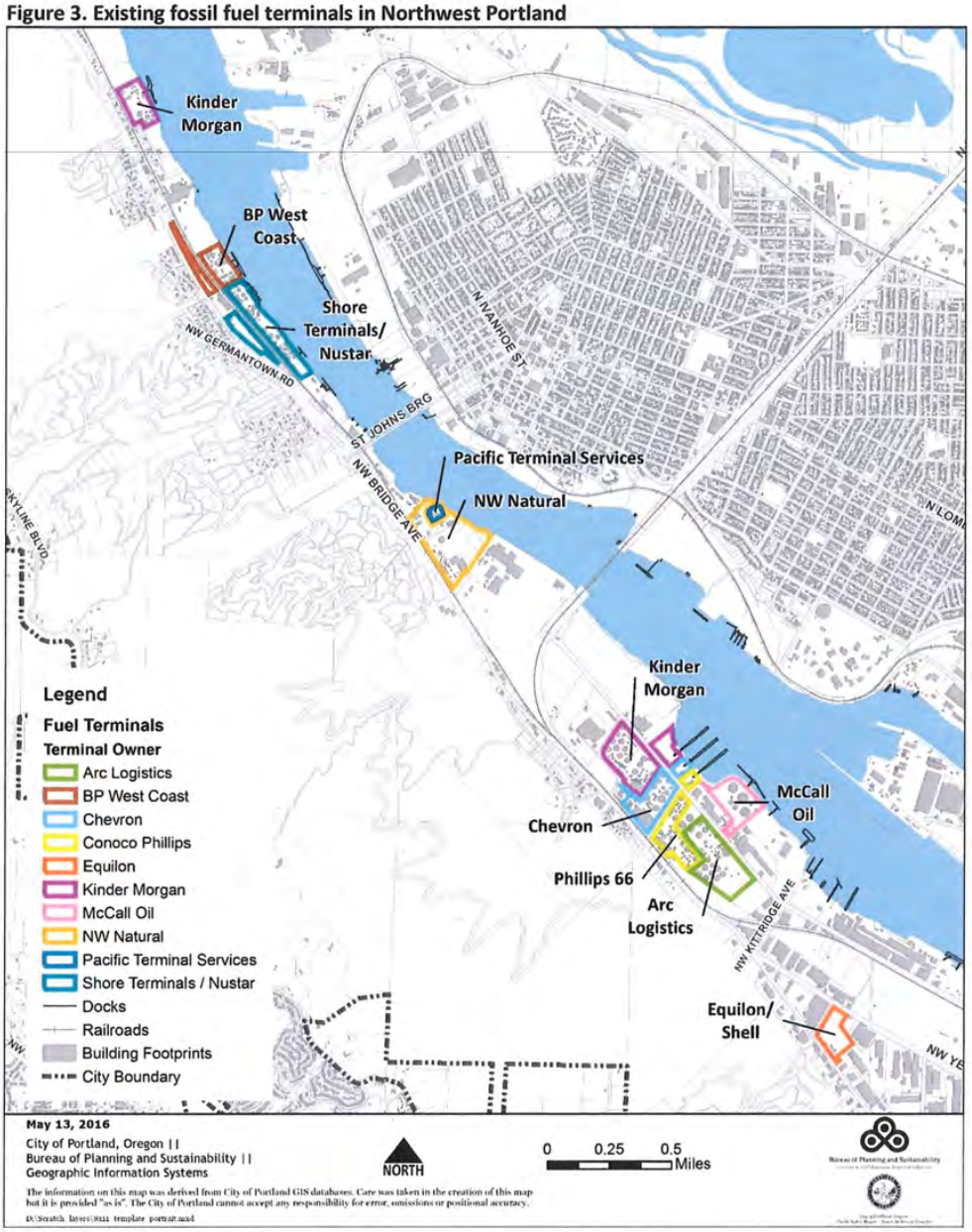
Figure 2. Examples of recent fossil terminal proposals in the Pacific Northwest

Operator	*Facility type*	*Location*	*Proposed new storage capacity*
Petroleum fuels			barrels
Vancouver Energy	Crude oil terminal	Vancouver WA	2,160,000
Imperium Renewables	Biofuels terminal	Grays Harbor WA	720,000
Gaseous fuels			gallons
Oregon LNG terminal	New LNG terminal	Warrenton OR	84,000,000
Jordan Cove LNG	New LNG terminal	Coos Bay OR	84,000,000
Pembina	Propane terminal	Portland	35,000,000
Haven Energy	Propane terminal	Longview WA	23,000,000
Coal			Stockpile acres
Millennium Bulk Terminal	Coal terminal	Longview WA	~20
Ambre Energy	Coal transload facility	St. Helens OR	no storage
Gateway Pacific Terminal	Coal terminal	Bellingham WA	80



Five petroleum terminals are located in the Willbridge area of NW Portland.

Figure 3. Existing fossil fuel terminals in Northwest Portland



City Council review and recommendations

The City Council held a public hearing on November 6, 2016, which was extended to November 13, 2016, and made the following seven changes to the Planning and Sustainability Commission's Recommended Draft in response to issues raised in testimony.

1. Technical correction to clarify that truck only terminals are not Bulk Fossil Fuels Terminals.
2. Changes to clarify that fuel storage for airports, marine servicing facilities and rail yards are not Bulk Fossil Fuel Terminals.
3. Clarification to the definition of Fossil Fuels by specifying that non-fuel petroleum-based products, such asphalt and lubricants, are not fossil fuels.
4. Amendments to the ordinance to provide additional direction for follow-up actions, including reporting back to City Council by 2019 on trends in terminal permitting, fuel consumption, seismic code changes, and Clean Fuels Program compliance.
5. Changes to the description of limited use to include references to storage "tank" capacity and to prohibit the storage of coal (outside of tanks).
6. Deletion of the allowance for up to 10% expansion of existing terminals with seismic-upgrade replacement of older storage tanks.
7. Amendments to the ordinance and findings based on these amendments.

The City Council considered and did not act on a draft amendment to allow 10% expansion of existing terminals for the exclusive storage of fuel that is blended to achieve compliance with the Clean Fuels Program.

Terminal storage capacity threshold – PSC review and recommendations

The Planning and Sustainability Commission (PSC) held a public hearing on September 13, 2016, and made three changes to the Proposed Draft in response to issues raised in testimony.

1. Terminal storage capacity threshold – The size threshold to distinguish Bulk Fossil Fuel Terminals was reduced from 5 million to 2 million gallons of storage, in order to include facilities that are large enough to unload unit trains. This change would also include and restrict smaller existing fuel distributors.
2. Ownership aggregation - Code language was added to prevent the aggregation of new facilities smaller than 2 million gallons into a larger terminal that could effectively circumvent the terminal storage capacity threshold.
3. Expansion of existing terminals - Existing terminals were reclassified from a "nonconforming use" to a "limited use," which accommodates seismic upgrades and limits expansion to (a) include replacement of existing tanks, (b) no more than 10 percent of the capacity of replaced tanks, and (c) no more than 10 percent of the total terminal capacity in 2016. A public notification requirement was also added for new tanks.

The PSC considered and did not act on NW Natural's request to exempt regulated utilities.

What's in this report?

This report describes the content, summary background information, and legislative process of the Fossil Fuel Terminal Zoning Amendments as adopted by the Portland City Council. This report consists of seven parts:

- **Section 1** introduces the code-change project.
- **Section 2** describes how the adopted code changes implement City policies in Resolution 37168 and the 2035 Comprehensive Plan.
- **Section 3** summarizes public and stakeholder involvement activities that have helped shape and inform this project.
- **Section 4** describes background conditions that inform the adopted zoning changes.
- **Section 5** describes the analysis of adopted zoning concepts, including related policy directions, implementation issues and rationale.
- **Section 6** specifies the draft code language, along with code commentary pages that clarify expected implementation.
- **Section 7** recommends future implementation directions for building code amendments to address seismic resilience and periodic monitoring for code effectiveness.

2. Policy direction

Section 2 describes how the adopted code changes implement relevant City policies in Resolution 37168 and the Comprehensive Plan.

City of Portland Fossil Fuel Resolution 37168

> BE IT RESOLVED, that the City Council will actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways; and

The adopted zoning code changes are a key implementation action of Resolution 37168, adopted in November of 2015. Addressing the overall direction of the resolution to oppose expansion of fossil fuel distribution and storage infrastructure, this project proposes to restrict development and expansion of bulk fossil fuel terminals.

> BE IT FURTHER RESOLVED, that this Resolution does not restrict:
> 1. improvements in the safety, or efficiency, seismic resilience, or operations of existing infrastructure;
> 2. the provision of service directly to end users;
> 3. development of emergency backup capacity;
> 4. infrastructure that enables recovery or re-processing of used petroleum products; or
> 5. infrastructure that will accelerate the transition to non-fossil fuel energy sources; and

The adopted code changes address exceptions 2 and 4 in the Resolution through specific exclusions of end-user facilities and recovery or re-processing of used petroleum products from the adopted new land use restrictions on Bulk Fossil Fuel Terminals. Also, storage capacity for non-fossil fuels, such as ethanol, is not subject to these restrictions, which could help with the transition to non-fossil fuel energy sources under the State of Oregon's Clean Fuels Program (exception 5). Responding to testimony and information presented in this project, City Council opted for a more restrictive approach than the exceptions for seismic resilience improvements (1) and development of emergency backup capacity (3) by prohibiting expansion of fossil fuel storage at existing fuel terminals.

> BE IT FURTHER RESOLVED, that City bureaus are directed to examine existing laws, including those related to public health, safety, building, electrical, nuisance, and fire codes, and develop recommendations to address fossil fuels that strengthen public health and safety; and

The resolution broadly addresses fossil fuel infrastructure. The zoning code regulates land use patterns and development of fossil fuel distribution facilities on parcels. Zoning does not regulate the quantity of products handled (throughput) on developed sites or their destination (such as exports). Additional amendments to building, fire and energy codes would need to be addressed in future projects.

> BE IT FURTHER RESOLVED, that the Bureau of Planning and Sustainability is directed to develop proposed code changes for Council consideration to advance the policies set forth in this Resolution; and

The project specifically implemented this provision of the resolution.

> BE IT FURTHER RESOLVED, that prior to any further Council action, the mayor shall schedule (1) a work session to review any proposed code changes and (2) an executive session to review the legal considerations of any proposed code changes; and

The project implemented this process requirement of the resolution.

> BE IT FURTHER RESOLVED, that the Bureau of Planning & Sustainability shall undertake an analysis of the economic impacts of any proposed Code changes to advance the policies set forth in this resolution, with a particular focus on potential impacts to local blue-collar jobs; and

This report includes summary analysis of economic impacts in Section 4, specifically addressing impacts on middle-wage blue collar jobs. Analysis to date is limited on the potential impacts on fuel supply to meet regional demand. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts, or may plateau and decline with implementation of climate resilience goals and strategies.

> BE IT FURTHER RESOLVED, that the City and applicable bureaus shall seek and identify opportunities to invest in Portland's 'human infrastructure' by supporting programs to retrain our workforce as the city transitions to a clean energy economy; and

This provision of the resolution is expected to be implemented as a future action.

> BE IT FURTHER RESOLVED, that the City shall consult with its Tribal Government Partners, the State of Oregon, local governments, and other key stakeholder including labor, business, environment, neighborhoods and communities of color in advancing this policy;

The Mayor's Office staff has sought input from the entities identified above to implement this process requirement of the resolution.

Guiding principles of the 2035 Comprehensive Plan

The Comprehensive Plan sets five Guiding Principles, which encourage balanced, integrated multi-disciplinary approaches that must comply with the Plan. This project is consistent with the Guiding Principles because it promotes major benefits to human health and safety, environmental health and resilience, and integrates considerations for economic prosperity and equity.

Economic prosperity

> *Guiding Principle: Support a low-carbon economy and foster employment growth, quality education and training, competitiveness, and equitably-distributed household prosperity.*

The adopted code changes will prohibit fossil fuel storage expansion at existing terminals and prohibit new terminal development, impacting associated job growth and tax revenue. The adopted code

restrictions on fossil fuel terminal development would also limit potential financial risks from a major accident involving fossil fuel infrastructure.

Human health

> *Guiding Principle:* Avoid or minimize negative health impacts and improve opportunities for Portlanders to lead healthy, active lives.

Major benefit – The adopted code changes will reduce the scale of low, but potentially catastrophic, safety risks associated with the growth of fossil fuel infrastructure, including oil train derailments, explosive accidents at liquefied natural gas (LNG) and liquefied petroleum gas (LPG) facilities, and seismic risks of tank farms. Fossil fuel emissions and coal dust are also significant sources of air pollution associated with respiratory disorders.

Environmental health

> *Guiding Principle: Weave nature into the city and foster a healthy environment that sustains people, neighborhoods, and wildlife. Recognize the intrinsic value of nature and sustain the ecosystem services of Portland's air, water, and land.*

Major benefit – The human health benefits described above also extend to environmental health. The adopted code changes will reduce the scale of environmental health risks associated with the growth of fossil fuel infrastructure, including oil train derailments along the Columbia River, LNG and LPG facilities in riparian areas, and seismic risks of tank farms along the Willamette River. Fossil fuel emissions are also a significant source of air pollution.

Equity

> *Guiding Principle: Promote equity and environmental justice by reducing disparities, minimizing burdens, extending community benefits, increasing the amount of affordable housing, affirmatively furthering fair housing, proactively fighting displacement, and improving socio-economic opportunities for under-served and under-represented populations. Intentionally engage under-served and under-represented populations in decisions that affect them. Specifically recognize, address, and prevent repetition of the injustices suffered by communities of color throughout Portland's history.*

The adopted code changes will prohibit expansion at existing fuel terminals and prohibit new terminal development, impacting associated middle-wage, industrial job growth that disproportionately benefits workers of color. Restricting potential increases in regional supply of fossil fuels could also have regressive impacts of increasing fuel costs, disproportionately affecting lower-income people.

Resilience

> *Guiding Principle: Reduce risk and improve the ability of individuals, communities, economic systems, and the natural and built environments to withstand, recover from, and adapt to changes from natural hazards, human-made disasters, climate change, and economic shifts.*

Major benefit – The adopted code changes will restrict development of fossil fuel terminals consistent with City and State objectives on climate change and public safety. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, substituting these fuels for higher-carbon fuels does not begin to approach the goal of an 80% reduction in carbon emissions by 2050 established in Portland's Climate Action Plan or the State's 75% goal.

2035 Comprehensive Plan policies specifically implemented in this project

The adopted zoning changes in the project are implementing the following specific policies.

Overall project direction: Fossil fuel distribution

> *Policy 6.48 Fossil fuel distribution. Limit fossil fuel distribution and storage facilities to those necessary to serve the regional market.*

The adopted code changes will implement Policy 6.48 by restricting development and expansion of fossil fuel distribution terminals. Analysis to date on the potential impacts of code amendments in constraining fossil fuel supply to meet regional demand is limited. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts reviewed in Section 4, or may plateau and decline with implementation of climate resilience goals and strategies. The adopted code changes will limit the capacity of Portland fossil fuel terminals to meet any increase in regional demand to new facilities that have less than 2 million gallons of storage capacity and to exempted end-user facilities (such as jet fuel storage for airport expansion).

Related policy directions

> *Policy 4.81 Disaster-resilient development. Encourage development and site-management approaches that reduce the risks and impacts of natural disasters or other major disturbances and that improve the ability of people, wildlife, natural systems, and property to withstand and recover from such events.*
>
> *Policy 4.82 Portland Harbor facilities. Reduce natural hazard risks to critical public and private energy and transportation facilities in the Portland Harbor.*

Policies 4.81 and 4.82 are partly met by prohibiting fuel terminal development in Portland's industrial areas that are predominantly in locations with high susceptibility to soil liquefaction (see Figure 7 in Section 4). Adopted code changes do not allow for incremental expansion at existing terminals, which is one pathway to providing financial returns to cover improvement costs for safety improvements. Instead, a future code-change project is recommended in Section 7 to develop building code amendments that improve seismic resilience and require seismic upgrades comparable to proposed requirements on unreinforced masonry buildings.

> *Policy 6.2 Diverse and expanding economy. Align plans and investments to maintain the diversity of Portland's economy and status as Oregon's largest job center with growth across all sectors (commercial, industrial, creative, and institutional) and across all parts of the city.*
>
> *Policy 6.5 Economic resilience. Improve Portland's economic resilience to impacts from climate change and natural disasters through a strong local economy and equitable opportunities for prosperity.*
>
> *Policy 6.6 Low-carbon and renewable energy economy. Align plans and investments with efforts to improve energy efficiency and reduce lifecycle carbon emissions from business operations. Promote employment opportunities associated with the production of renewable energy, energy*

efficiency projects, waste reduction, production of more durable goods, and recycling.

The adopted code changes are consistent overall with the range of direction in Policies 6.2, 6.5 and 6.6, prohibiting development and expansion of new fossil fuel terminals that conflict with resilience and climate action goals. The adopted code changes will limit the capacity of Portland fossil fuel terminals to meet any increase in regional demand to new facilities that have less than 2 million gallons of storage capacity and to exempted end-user facilities (such as jet fuel storage for airport expansion).

Existing Comprehensive Plan policies specifically implemented in this project

The 2035 Comprehensive Plan was adopted in June 2016 and is not expected to take effect until early 2018. In the meantime, the existing Comprehensive Plan is in effect.

Policy 7.6 Energy Efficient Transportation. Provide opportunities for non-auto transportation including alternative vehicles, buses, light rail, bikeways, and walkways. The City shall promote the reduction of gasoline and diesel use by conventional buses, autos and trucks by increasing fuel efficiency and by promoting the use of alternative fuels.

Policy 7.8 Energy Supply. The City shall promote conservation as the energy resource of first choice. The City shall also support environmentally acceptable, sustainable energy sources, especially renewable resources such as solar, wind, hydroelectric, geothermal, biomass (wood, farm and municipal waste), cogeneration, and district heating and cooling.

The adopted code changes are consistent with Policies 7.6 and 7.8, promoting the use of alternative energy sources by restricting development and expansion of fossil fuel terminals.

2015 Climate Action Plan

Goal: Reduce local carbon emissions 80 percent from 1990 levels by 2050, with an interim goal of 40 percent by 2030.

As described in Section 4, lower-carbon fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, but they do not approach the goal of an 80% reduction in carbon emissions by 2050 in Portland's Climate Action Plan or the State's 75% goal. Investments in major infrastructure typically take decades to recoup, and the transition to renewables needs to go much faster than that to stabilize global emissions. The adopted code changes are consistent with the 80% goal of the Climate Action Plan by restricting development of fossil fuel terminals.

3. Public and stakeholder involvement

Section 3 summarizes public and stakeholder involvement activities that have helped shape and inform this project. Stakeholder focus group results are further explained in Appendix A of this report.

What have we heard leading up to this project?

Public hearings at the Planning and Sustainability Commission and City Council on the Pembina terminal development proposal in 2014 and Resolution 37168 in 2015 drew testimony from hundreds of people. The overall theme of that testimony was strong objection to the Pembina project and support for the fossil fuel resolution. Primary reasons included the neighborhood safety and health risks and inconsistency with the City's climate action objectives. The Resolution also drew letters with strong opposition from state and regional business associations.

Following adoption of the Resolution in November 2015, City Council added the related Policy 6.48 on fossil fuel distribution to the 2035 Comprehensive Plan, reflecting the recently adopted policy direction in the Resolution. Public involvement in the Comprehensive Plan Update included public hearings in April 2016 on City Council amendments and thousands of comments on the 2035 Comprehensive Plan over the previous 8 years. The adopted code amendments are consistent with several sustainability-related policies in the Plan. Addressing issues with policy tradeoffs, the 2035 Comprehensive Plan calls for a balanced, integrated approach to implement multiple goals. As described in Section 2, the adopted code amendments provide major benefits toward implementing three of the Plan's five guiding principles and integrates consideration of the other two guiding principles.

Public involvement activities in this project

Extensive public comments were received on the Discussion Draft, Proposed Draft, and Recommended Draft, which influenced substantial changes between the adopted code changes and prior draft versions. Two overall themes of the public input include 1) extensive comments from residents, community groups and environmental advocates for a bold change in direction to oppose fossil fuel terminal development and 2) objections to the code changes by business, labor, and fuel industry representatives in order to accommodate regional growth, everyday fuel needs, and transition investments.

The City Council received emailed and verbal testimony from over 300 people who called generally for a "full ban" on new fossil fuel terminals and strengthened restrictions on expansion of existing terminals. Letters and verbal testimony were also provided by representatives of various organizations in support and opposition to the draft code changes, including environmental organizations, community groups, business groups, and fuel terminal operators. Testimony particularly focused on draft allowances for expansion of existing terminals.

The PSC also received emailed and verbal testimony from over 600 people generally calling for a full ban on new fossil fuel terminals and strengthened restrictions on expansion of existing terminals. While comments varied, predominant recommendations included removing the 5-million-gallon terminal size threshold and adding discretionary review criteria on expansion to address climate and safety impacts.

Similar testimony for more stringent restriction on fuel terminal development was submitted by 350PDX, Portland Audubon, Center for Sustainable Economy, Physicians for Social Responsibility, Columbia Riverkeeper, Columbia River Inter-Tribal Fish Commission, Sierra Club, Climate Solutions, League of Women Voters, and others. Additional themes of their comments and recommendations included support for a nonconforming use designation on fossil fuel terminals, new restrictions on ownership aggregation to prevent circumvention of the terminal size threshold, and support for additional building code requirements to improve seismic safety.

In contrast, testimony objecting to the draft restrictions on fuel terminal development were submitted by Portland Business Alliance, Port of Portland, Columbia Pacific Building and Construction Trades Council, NW Natural, Burlington Northern Santa Fe Railroad, Working Waterfront Coalition, Arc Terminals, Western States Petroleum Association, and others. Examples of their concerns included: inconsistency with the Resolution's direction for various exemptions and economic impacts analysis; substantial growth is expected in the use of some fossil fuels (e.g., jet fuel, natural gas, transition fuels); and a request for exemption of public utilities that are already regulated to serve regional end users.

Likewise, comments on the Discussion Draft included extensive emailed comments for a full ban on fossil fuel terminals. Contrasting comments from business and labor organizations included opposition to recommended code changes, requests for more time and analysis, and clarifications to address practical considerations. Letters were received from NW Natural, Port of Portland, Columbia Pacific Building and Construction Trades Council, Kinder Morgan, Arc Terminals, and Western States Petroleum Association (WSPA). Some examples of comments included that growth rates will change over time, that fuels meeting Oregon's Clean Fuel Standard should be excluded, inclusion of non-fuel methanol is inconsistent, and the economic analysis is cursory. WSPA submitted draft code language, including focusing terminal restrictions on extra-regional facilities beyond the West Coast (PADD V) region and a new Energy Corridor Overlay Zone that protects the historic energy cluster for infrastructure growth.

Public involvement in concept development for the project consisted primarily of four stakeholder focus groups, which were held in June 2016 to review preliminary code concepts and help identify and understand potential implementation issues. The focus groups highlighted the range of stakeholder perspectives and interests concerning recommended zoning changes. Figure 4 summarizes the themes of issues raised in the focus groups. Other outreach activities have included meetings with interagency partners, terminal operators, and other interested stakeholders. These activities and what we heard in them are further described in the appendix of this report.

Inter-governmental coordination

The Mayor's Office staff has sought input from Tribal Government Partners to shape and inform the draft code amendments. An In-House Draft Report was circulated to inter-bureau partners in June 2016. Their comments have helped to shape and inform the Discussion Draft and subsequent drafts, particularly addressing code administration and legal limitations.

Figure 4. Summary themes of stakeholder focus group comments

TOPIC	FUEL TERMINAL REPRESENTATIVES	ENVIRONMENTAL AND HEALTH ORGANIZATIONS	STATE AND REGIONAL BUSINESS ORGANIZATIONS	NEIGHBORHOOD AND EQUITY ORGANIZATIONS
Key issues	▸ We've operated safely for decades. We meet the federal/state low-carbon fuel standards. ▸ Difficult to participate: very quick process; emotionally driven; antitrust restrictions. ▸ Unintended impacts: harder to meet clean fuel standards; more trucks on road; costs to rest of the state.	▸ Looking for strong, model code. Expect community backlash if expectations not met. ▸ Safety needs to be integral with climate - Mosier oil train wreck; terminals in liquefaction soils. ▸ Include disaster risks in economic analysis. Bonding or insurance for worst case.	▸ Resolution requires more research on economic impacts, etc. ▸ How will the code hold up in 5 years? ▸ What is the goal? If climate or safety, zoning tool is not the right fit. ▸ Portland is not an economic island. Statewide impact. ▸ Big political decision. Don't rush it.	▸ Safety and pollution are our priority. Look closely at seismic and explosion risks. ▸ A reasonable expectation for growth is smart. ▸ This is aggressive. Without LNG, won't China burn more coal? ▸ Rail safety in the Gorge is also a key issue that this can't resolve.
New land use category	▸ If unclear, permit staff could be pressured - unpredictable results. ▸ Use federal West Coast PADD 5 "region."	▸ Regulate both existing and new facilities. ▸ New code must effectively implement the policy.	▸ Need clear definitions: region, export, end user. ▸ Do not make terminals non-conforming or an ambiguous limited use.	▸ Why allow it in IG2? ▸ A new export terminal in contaminated harbor is unlikely.
Definition of fossil fuels	▸ Natural gas considered a low carbon fuel by State, so why included here? ▸ Tomorrow's cleaner fuels won't meet today's definitions.	▸ Excluding methanol undermines policy. ▸ If end use is mostly fuel, then limit it. ▸ One new LNG tank is a big risk. So is coal.	▸ Federal and state are going a different direction, requiring cleaner fossil fuels. Why restrict cleaner fuels at cross purposes?	▸ Make way for bio-diesel as a cleaner fuel. ▸ Methanol not a fuel in Oregon - overreaching. ▸ Fuels are okay if they have no emissions.
Terminal development restrictions	▸ Some sites are already built-out. ▸ Our non-contiguous sites are connected by pipelines. ▸ Can't comment on size.	▸ Most prefer Option A. ▸ Caution about Commerce Clause. ▸ 1% annual growth metric is too high.	▸ Don't come at sideways. Unclear rationales will lead to appeals. ▸ Size limits would put region on "import diet." ▸ Dated, low forecast.	▸ Option C preferred. ▸ Allow for modest growth of LNG and oil; not coal. ▸ Review size limits every few years.

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4. Background conditions

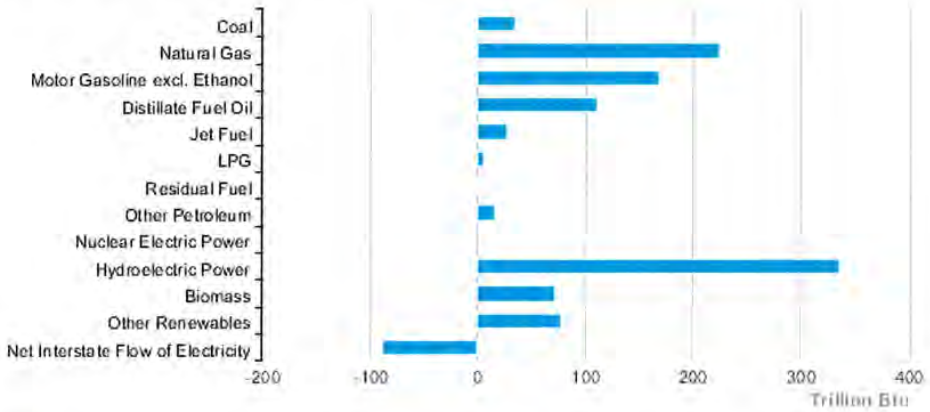
This section of the report describes background conditions that inform the adopted zoning changes. Topics include access to energy, impacts on the economy, climate change impacts, and health and safety impacts of draft zoning code changes. Background information on changing energy markets in the Pacific Northwest and Portland's existing fossil fuel terminals is included in the Section 1. Legal and policy background information is presented in Section 2.

Access to energy

Energy consumption in Oregon

Oregon residents and businesses rely on Portland's fossil fuel distribution and storage facilities as a wholesale distribution hub to meet their energy consumption needs. Estimated state energy consumption by fossil fuels and other sources are shown in Figure 5. Residents and businesses in much of Southern Washington also rely on Portland terminals for access to fuels.

Figure 5. Oregon energy consumption estimates, 2014



eia Source: Energy Information Administration, State Energy Data System

Four refineries in the Puget Sound area supply nearly all of the petroleum fuels consumed in Oregon, delivered primarily through the Olympic Pipeline that terminates at the cluster of 10 petroleum terminals in Northwest Portland. From there, petroleum products are delivered to Oregon and Southern Washington markets via truck, pipeline and barge. NW Natural supplies natural gas to its Western Oregon market area and operates peak-consumption storage terminals in Northwest Portland

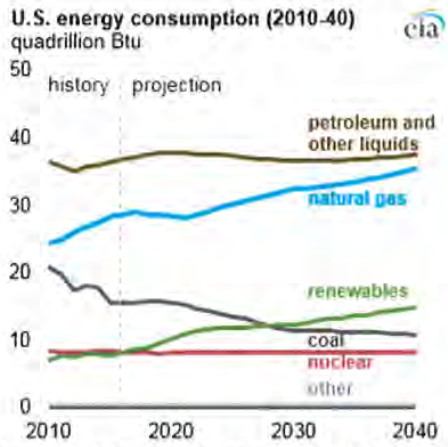
and Newport. Thus, fossil fuel terminals in Portland are a primary statewide distribution hub for transportation fuels and natural gas.

Energy consumption forecasts and the demand for additional storage capacity

Analysis to date is limited on the energy consumption forecasts and how the adopted code changes would impact the demand for additional fossil fuel storage capacity. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts, or may plateau and decline with implementation of climate resilience goals and strategies. National forecasts of energy consumption by the U.S. Energy Information Administration show varying growth trajectories by energy type, including a relatively flat outlook for petroleum fuels, decline for coal, and moderate growth for natural gas and renewables (see Figure 6).

Liquid bulk cargo in Portland Harbor is projected to expand at a range of 0.5% to 1.0% average annual growth (AAG) to 2040 (BST Associates, 2012), providing an estimate of potential market expansion needs for petroleum fuels, which could mean a need for an additional 10-20% increase in storage capacity. However, based on this forecast, ECONorthwest (2012) estimated that there was no additional land needed for new liquid bulk terminals in Portland. The 1.9% average annual growth forecast to 2034 (NW Natural 2014 Integrated Resource Plan) provides an estimate of market expansion needs for natural gas distribution facilities.

Figure 6. U.S. energy production and consumption projections to 2040



Source: US Energy Information Administration, Annual Energy Outlook 2016

Even if regional fossil fuel demand follows trend-based local forecasts, there is a wide margin between the size of recently proposed crude oil, coal, and LNG terminals in the Pacific Northwest and the scale of expected growth of existing Portland fuel terminals that generally serve the regional market area, as shown in Figure 7.

Contradictory stakeholder comments were received that local growth projections are too high, too low, and could change substantially with market innovations. To address this uncertainty, periodic monitoring for code effectiveness is recommended in Section 7 as a future implementation project,

Figure 7. Estimated storage capacity at existing and proposed fuel terminals

Operator	*Facility type*	*Location*	*Site acres*	*Storage capacity*	*New Storage capacity*
Petroleum fuels					
Existing Portland terminals				bbls	
Chevron	Petroleum terminal	NW Portland	21	1,600,000	
Kinder Morgan Willbridge	Petroleum terminal	NW Portland	33	1,551,000	
Arc Logistics	Asphalt/crude oil	NW Portland	39	1,518,200	
NuStar	Petroleum terminal	NW Portland	22	1,191,000	
McCall Oil	Petroleum terminal	NW Portland	19	930,000	
Conoco Phillips	Petroleum terminal	NW Portland	21	760,000	
BP West Coast	Petroleum terminal	NW Portland	18	601,500	
Kinder Morgan Linnton	Petroleum terminal	NW Portland	13	420,000	
Equilon/Shell	Petroleum terminal	NW Portland	13	400,000	
Pacific Terminal Services	Petroleum terminal	NW Portland	2	278,000	
Recently proposed new terminals or reinvestment in Pacific NW				bbls	Proposal
Vancouver Energy	Crude oil terminal	Vancouver WA	47	NA	2,160,000
Imperium Renewables	Biofuels terminal	Grays Harbor WA	11	NA	720,000
NuStar	Petroleum terminal	Vancouver WA	19	775,000	Reuse tanks
Gaseous fuels					
Existing Portland terminals				LNG gal	2035 forecast
NW Natural GasCo	LNG plant/terminal	NW Portland	41	7,500,000	3,428,000
Recently proposed natural gas terminals/storage in Pacific NW				LNG gal	Proposal
Oregon LNG terminal	New LNG terminal	Warrenton OR	96	NA	84,000,000
Jordan Cove LNG	New LNG terminal	Coos Bay OR	400	NA	84,000,000
NW Natural North Mist	Gas reservoir storage	Mist OR	2,644	NA	2.5 Bcf gas
Other recent proposals (now inactive) for gaseous fuel terminals				LPG gal	Proposal
Pembina	Propane terminal	Portland	38	NA	34,000,000
Haven Energy	Propane terminal	Longview WA	24	NA	23,000,000
NW Innovation	Methanol plant	Kalama WA	83	NA	67,000,000
Coal					
Existing Portland terminals					
None					
Recently proposed coal terminals in Pacific NW					Stockpile acres
Millennium Bulk Terminal	Coal terminal	Longview WA	100	NA	~20
Ambre Energy	Coal transload facility	St. Helens OR		NA	no storage
Gateway Pacific Terminal	Coal terminal	Bellingham WA	334	NA	80

Terminology: bbls = barrels, Dth = decatherms, LNG = liquified natural gas, LPG = liquified propane gas, Bcf = billion cubic feet, AAG = average annual growth.

Sources: Oregon DEQ for petroleum tank data. NW Natural 2014 Integrated Resource Plan for existing capacity and forecast at 1.9% AAG. BST, Portland Harbor Forecast (2012) for petroleum terminals at 1.0% AAG.

including monitoring for changes in regional fuel demand over time. The adopted code changes will limit the capacity of Portland fossil fuel terminals to meet any increase in regional demand to new facilities that have less than 2 million gallons of storage capacity and to exempted end-user facilities (such as jet fuel storage for airport expansion).

Impacts of draft code changes on the economy

Jobs and wages at Portland's fuel terminals

In 2014, the 11 existing fuel terminals in Portland shown in Figure 3 provided approximately 280 jobs at their sites and supported an estimated 720 total jobs in the metropolitan area. The annual payroll at those terminals was $23 million, which supported total personal income of about $92 million in the metropolitan area.

BPS calculated these supported employment and income estimates from the induced and indirect impacts from metropolitan area purchases by these firms and their employees. For example, the jobs of the Longshore Union workers who unload fuels from tankers at these fuel terminals are not counted as direct jobs at the terminal sites. The multipliers used for these calculations were estimated from the average employment and income effects of marine terminals in Portland (Martin Associates, 2012). The job and wage estimates were calculated from Quarterly Census of Employment and Wages (QCEW) data.

Portland's industrial area jobs also have an important urban equity role in that they consist primarily of middle-wage jobs that do not require 4-year college degrees, which the overall economy has been losing since 2000. In contrast, jobs in commercial districts are concentrated primarily in low- and high-wage quartiles (fourths) of overall city employment. Middle-wage job growth supports the "income self-sufficiency" objectives of the Portland Plan and 2035 Comprehensive Plan (Policy 6.28) to expand access to self-sufficient wage levels.

Long-term job growth to 2035 is estimated at 1.6% average annual growth in the warehousing, transportation and utilities sector in Portland's 2016 Economic Opportunities Analysis and Metro's 2014 Urban Growth Report. Applying this growth rate to Portland's existing fuel terminals, approximately 110 net new permanent jobs are expected between 2014 and 2035, which is the equivalent of about four new terminals at their current average size. The total metropolitan area job impact of this fuel terminal expansion would be approximately 290 new jobs by 2035. If fuel terminal job growth occurred at a slower 1.0% average annual rate, matching the forecast growth of liquid bulk cargo volumes in Portland Harbor, approximately 65 net new terminal jobs would be generated by 2035, supporting a total 170 new jobs in the metro area. Pembina's proposed propane terminal in 2014 was estimated to create 30 to 40 new permanent jobs and 600-800 temporary construction jobs.

The adopted code changes will limit the capacity of Portland fossil fuel terminals to meet any increase in regional demand to new facilities that have less than 2 million gallons of storage capacity and to exempted end-user facilities (such as jet fuel storage for airport expansion).

Tax revenues of new terminals

State and local revenues from income and property taxes vary widely by facility. For example, property taxes on the depreciated improvements value of existing fuel terminals are much lower than new construction. If fuel terminals added 110 net new direct jobs by 2035 and the resulting state and local

tax revenues is typical of businesses and developed facilities in Portland's Working Harbor (Martin Associates, 2016), the estimated new state and local tax revenues in fiscal year 2035 (in 2015 dollars) would be $1.6 million. In contrast, the proposed $500 million Pembina project was estimated to generate approximately $12 million in annual property tax revenue, reflecting the increased improvements value and property taxes of new construction.

The adopted code changes will limit the capacity of Portland fossil fuel terminals to meet any increase in regional demand to new facilities that have less than 2 million gallons of storage capacity and to exempted end-user facilities (such as jet fuel storage for airport expansion). Prohibiting large scale new terminals such as Pembina could result in similar levels of foregone property taxes. However, development of the limited land supply along Portland Harbor for new auto or grain terminals would also result in substantial local and state tax revenues, offsetting foregone taxes on new fossil fuel terminals.

Growth opportunities in fossil fuel distribution

The most recent cargo forecast for Portland Harbor in 2012 projected 1.0% AAG in liquid bulk tonnage to 2040 as a high scenario and 0.5% AAG as a low scenario (BST Associates, 2012). Based on this forecast, ECONorthwest (2012) estimated no additional land need for new liquid bulk terminals. Since 2012, several new fuel terminals have been proposed in the Pacific Northwest, as shown in Figure 2.

Updating the liquid bulk forecast at this point would be challenging for several reasons. Most of the recent fuel terminal proposals have since been abandoned or appear to be dormant. Policy and permitting uncertainty complicate the development feasibility of new terminals and transportation infrastructure. Crude oil prices have fallen sharply in 2015 and 2016, reducing the current market potential for major investments. Expanding global industrial product markets after the Great Recession slowed substantially in 2015. And energy distribution markets could change abruptly with continuing product innovations and location shifts in global production.

In the long term, Portland has competitive advantages for accommodating energy terminal development as a Pacific Rim gateway location to growing Asian markets, the Columbia River's low-gradient railroad access for heavy cargo through the Cascades, and Oregon's freight infrastructure hub. On the other hand, Portland's industrial land supply for continuing growth is limited, and expanding cargo markets for autos, grain and dry bulks are competing for current growth capacity.

Other economic impacts

Energy infrastructure and terminal investments appear to have low but potentially catastrophic risks of major accidents, as described below. Examples include seismic resilience of petroleum terminals in the event of a Cascadia Subduction Zone earthquake, oil train derailments, explosions at LNG (liquefied natural gas) and LPG (liquefied petroleum gas, such as propane) facilities, and others.

Clean Energy is a target industry in the City of Portland. An emerging cluster of Portland area business activity in solar and wind energy manufacturing, green building development, and other fields of sustainable urban innovation present long-term business growth opportunities. Substantial local investment in fossil fuel infrastructure and large new terminals could hinder local growth momentum in Clean Energy industries.

Climate change impacts of draft code changes

Climate impact of fossil fuels

Fossil fuels are major contributors to climate change and pollution, as described in Portland's 2015 Climate Action Plan. Greenhouse gas emissions from the burning of fossil fuels and land use changes, including deforestation, are primary causes of climate change. The Intergovernmental Panel on Climate Change's most recent report documents the overwhelming evidence that human activities have been the major driver of recent warming of the Earth's surface, and that climate change and its consequences will continue into the future (IPCC, 2013).

The magnitude of future climate impacts depends largely on the trajectory of future global greenhouse gas emissions. Greenhouse gas emissions from human activities have continued to rise in recent decades, reaching the highest rates in human history between 2000 and 2010 (IPCC, 2014). About half of all carbon dioxide emissions, the most prevalent greenhouse gas, between 1750 and 2010 occurred in the last 40 years. The energy, industry and transportation sectors have dominated these emissions increases. On the current trajectory, global transportation emissions will double by 2050.

Transition to "renewable" and "clean" fuels

The U.S. Environmental Protection Agency (USEPA) implements the federal Renewable Fuel Standard (RFS) that requires transportation fuel sold in the U.S. to contain a minimum volume of renewable fuels. The RFS originated with the Energy Policy Act of 2005 and was expanded and extended by the Energy Independence and Security Act of 2007 (EISA). Similarly, the Oregon Department of Environmental Quality (ODEQ)implements the Oregon Clean Fuel Program. ODEQ describes "clean fuel" as a fuel with a lower carbon intensity than that of the fuel it replaces.

Examples of "clean fuels" in Oregon's program include most types of ethanol, biodiesel, natural gas, biogas, electricity, propane and hydrogen. The Oregon Clean Fuel Standard sets 2015 as a baseline that represents 10 percent ethanol blended with gasoline and 5 percent biodiesel blended with diesel. The rule also requires a 10 percent reduction in average carbon intensity from 2015 levels by 2025.

Terminal representatives and business stakeholders urged that adopted zoning code changes not create a disincentive or barrier to compliance with these federal and state rules, which may require additional tank capacity to implement. Environmental and public health organization representatives pointed out that City Resolution 37168 addresses fossil fuels generally, including lower-carbon fossil fuels like natural gas and propane. The adopted code changes prohibit expansion of fossil fuel tank storage at existing terminals but allow for additional storage for non-fossil fuels (such as ethanol) that can support compliance with renewable and clean fuel requirements. The adopting ordinance also calls for future tracking of information on compliance with the Clean Fuels Program and reporting back to City Council by 2019, which could prompt code adjustments as needed to avoid hindering program compliance.

Velocity of transition to non-fossil fuel energy

Portland's Climate Action Plan sets a goal for an 80% reduction in greenhouse gas emissions by 2050. Oregon's climate action goals similarly call for 75% reduction by 2050. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, they don't begin to approach the 80% reduction that the City is striving for or the State's 75% goal. ODEQ estimates that the greenhouse gas emissions reduction from switching from gasoline to compressed natural gas, for example, is 18%; for propane, it is 15%. The lower-carbon fossil fuels do have appeal as a bridge to widespread use of renewable energy, but investments in major infrastructure typically take decades to recoup, and the transition to renewables needs to go much faster than that to stabilize global emissions.

During recent hearings and analysis on Resolution 37168 and the Pembina terminal proposal, the question of whether to differentiate between fossil fuels with different carbon content was widely discussed. In the lead up to the resolution, an option was proposed that would oppose new coal and oil infrastructure but allow for other fossil fuels that could show a likely net decrease in carbon emissions. City Council decided not to apply this option in the resolution.

Health, safety and environmental impacts of draft code changes

Seismic resilience and liquefaction soils

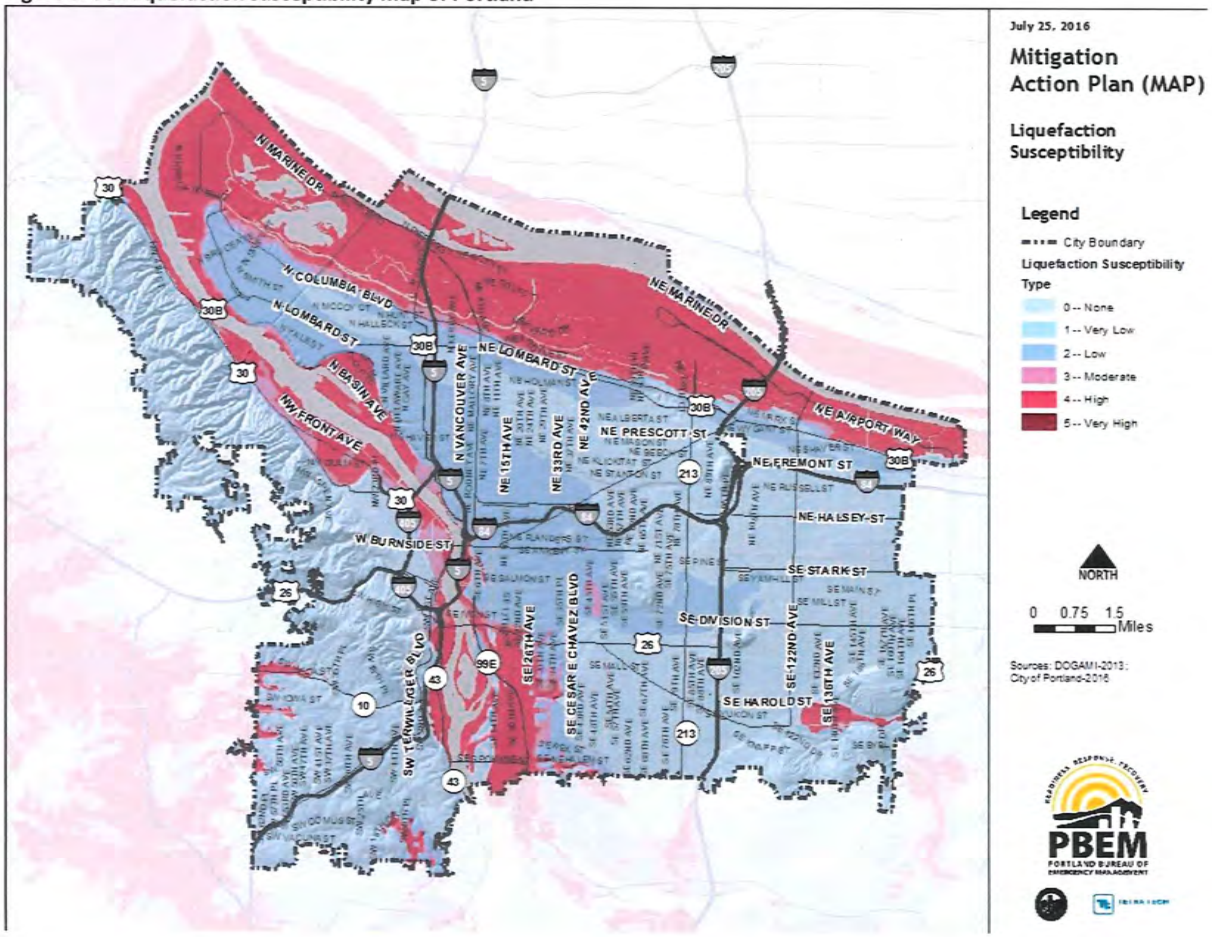
The 2035 Comprehensive Plan sets policy direction (4.75 and 4.76) to encourage disaster-resilient development and specifically to reduce natural hazard risks to critical energy and transportation infrastructure in Portland Harbor.

The 2016 Critical Energy Infrastructure Hub Study underway by the Portland Bureau of Emergency Management includes a literature review and modeled risks of structural damage to critical infrastructure from earthquakes, floods, landslides, volcanic activity, wildfire and other sources. Along with petroleum and natural gas infrastructure, the study is also assessing infrastructure risks to emergency services, transportation, electricity, potable water and waste water. The study area includes the Northwest and Linnton industrial areas. PBEM has identified significant seismic risks at the fuel terminals from a major Cascadia Subduction Zone earthquake because of their location in a filled riverfront plateau area with moderate- to high-susceptibility location for soil liquefaction.

As shown in Figure 7, the Oregon Department of Geology and Mineral Industries (DOGAMI) has mapped most of the riverfront plateau areas, which account for over 90 percent of Portland's industrial zoning, as having high susceptibility for soil liquefaction, along with areas along the Central City riverfront and much of the Brooklyn and Sellwood-Moreland neighborhoods. Most of the existing fuel terminals in the Willbridge area are mapped as having moderate susceptibility for soil liquefaction, and the others are mapped in the high susceptibility areas. The adopted code amendments will improve the seismic resilience of new bulk fossil fuel terminals by precluding their development in areas with high susceptibility to soil liquefaction.

City Council deleted a draft code allowance for up to 10% expansion of existing terminals for seismic replacement of storage tanks, following testimony by some terminal operators that a 10% limitation would not provide an adequate incentive to cover improvement costs of tank replacement. Instead, the City Council directed the Portland Bureau of Emergency Management and the Bureau of Development Services to study future amendments to building and fire codes to improve seismic safety of fossil fuel infrastructure.

Figure 8. Soil liquefaction susceptibility map of Portland



develop building code amendments to improve seismic resilience and require seismic upgrades comparable to proposed requirements on unreinforced masonry buildings.

Safety of liquefied gas terminals

Liquefied natural gas (LNG) and liquefied petroleum gas (LPG), such as propane, facilities pose safety risks from potential explosions and fire. The Pembina propane terminal, which was proposed in 2015 at the Port of Portland Terminal 6, is an apt case study. The Pembina terminal would have required environmental zoning code amendments that did not move forward.

The issue of safety risks was discussed extensively during review of the proposed Pembina terminal, and a quantitative risk assessment study was prepared to inform that review process (Det Norske Veritas (U.S.A.), Inc., 2015). The study estimated the risk from flammable releases, such as jet fires, pool fire, flash fire, vapor cloud explosions, fireball and Boiling Liquid Expanding Vapor Explosion (BLEVE).

The risk was presented as individual risk in the form of location-specific risk contours extending outward from the proposed facilities, and as societal risk in the form of potential loss of life and cumulative frequency of various accidents. The highest offsite risk level was found to be 1 fatality in 1,000 years in areas directly north and south of facility. The nearest residential zones are located beyond the risk level contour of 1 fatality in 100 million years. The cumulative societal risk was estimated at 1 statistical fatality every 38 years. The study also included various facility design and siting recommendations to mitigate identified risks.

Another risk assessment (Northwest Citizen Science Initiative, 2015) on the Pembina project was presented by environmental groups and neighbors including the Hayden Island Neighborhood Association. The analysis identifies additional sources of risk from BLEVE cascades, terrorist events and magnitude 9 earthquakes. The authors recommend not locating a propane terminal within 10 miles of the Portland/Vancouver urban area.

Public safety risks from a new LNG or LPG facility are estimated to be very low relative to other urban hazards, although possible impacts could be catastrophic. The adopted code amendments are expected to reduce public safety risks by prohibiting development of large new LNG or LPG facilities exceeding 2 million gallons of storage capacity.

Oil train accidents

On June 3, 2016 an oil train traveling through the Columbia River Gorge partially derailed in Mosier en route to Tacoma. The 16-car derailment resulted in a 1,000-barrel spill and fires that lasted nearly a day. Small amounts of oil reportedly reached the river, and nearby drinking water and wastewater facilities in Mosier were affected.

An Associated Press analysis of accident records found that 26 oil-train derailments or fires have occurred nationally in the last decade. The national geography of increasing oil extraction in the inland Great Plains states and refineries concentrated on the coasts is contributing to this trend. Risk of how often such derailments are likely to occur in the Columbia Gorge is disputed, with one estimate as high as one every 30 months.

Preliminary reporting on the cause of the Mosier derailment pointed to failed bolts in the track that are difficult to detect. Union Pacific reported that improvements are underway to replace bolts on 530

miles of curved track nationwide. Railroad safety is regulated at the federal level and monitored by the Federal Railroad Administration. A recent Government Accounting Office report has identified challenges and delays in implementing some federal rail safety regulations.

The adopted code amendments could incrementally reduce rail accident risks by restricting development and expansion of fossil fuel terminals in Portland as a West Coast rail hub location. However, restricting the location of new petroleum terminals in the city of Portland is not expected to substantially affect the volume of petroleum cargo transported by rail to Puget Sound refineries.

The Portland/Vancouver area is a rail hub location, where West Coast rail lines running north-south intersect the low gradient east-west rail corridor along both sides of the Columbia River. Roughly half of the east-west rail cargo destined for the Seattle-Tacoma area, in addition to Oregon-bound rail cargo, moves through the Portland metropolitan area. Derailment risk within Portland is reduced by the numerous siding destinations and congestion of the "Portland Triangle" area where UP and BNSF lines come together. However, derailment risks to natural resources, especially along rivers, and to rural communities appear to be significant.

5. Code concepts and analysis

This section of the report describes the adopted zoning change concepts by topic area, including the related policy directions, implementation issues, and rationale for the adopted zoning changes.

1. **Types of distribution and storage facilities to be regulated**

Policy direction:

- City Council Resolution 37168 (adopted November 2015) calls for opposing expansion of infrastructure for transportation and storage of fossil fuels, subject to various exceptions, including safety improvements, service to end users, and infrastructure that accelerates transition to non-fossil fuel energy.
- 2035 Comprehensive Plan Policy 6.48 Fossil Fuel Infrastructure (adopted June 2016, not effective until 2018) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Preliminary code concepts:

- Limit development of new Bulk Fossil Fuel Terminals as a regulated land use.
- Bulk Fossil Fuel Terminals are engaged in freight movement or wholesaling of fossil fuels at facilities that are characterized by having (1) marine, pipeline or railroad transport access and (2) either transloading facilities for transferring a shipment between transport modes (such as from rail to ship) or bulk storage facilities exceeding 2 million gallons of fossil fuels. Examples include petroleum terminals, liquid natural gas terminals, and coal terminals. Functionally, these terminals are typically regional gateway facilities, where fossil fuels enter and exit the region, but the use classification is intended to be clearly identifiable and not rely on a definition of region.
- Exceptions that are not Bulk Fossil Fuel Terminals:
    - Retail sales of fossil fuels, such as gasoline or propane filling stations;
    - Distributors, wholesalers, and industrial service uses that receive and deliver fossil fuels exclusively by truck;
    - End-user facilities that store fossil fuels for use as an input (including off-site storage), such as manufacturing, agriculture, and airports;
    - Uses that recover or reprocess used petroleum products;
    - Waste-related uses that transfer or store solid or liquid wastes, such as landfills.

Implementation issues:

- Definition of region – Portland is a regional distribution hub for energy and other products, and this zoning change is not intended to restrict energy access to the growing region. However, the regional market area of Bulk Fossil Fuel Terminals varies by product and is difficult to define. Portland's 10 petroleum terminals generally serve Oregon and Southern Washington. This market area substantially exceeds the Portland metropolitan area, which is often colloquially referred to as the region. Some terminal representatives pointed out that the federal government's 5-state West Coast PADD 5 region is generally their regional market area. Bureau

of Development Services (BDS) staff commented that zoning does not regulate the target market (destination) of wholesale products, and the zoning code does not define region. Business organization representatives commented that the energy markets and related market areas are likely to change over time. Therefore, the adopted land use incorporates the concept of a regional market into the size limits, and a zoning definition of region is not adopted here.

- Storage capacity size threshold - The Bulk Fossil Fuel Terminal use category is intended to apply to regional gateway facilities where fossil fuels are brought into the region. The 2-million-gallon capacity threshold is small compared to the existing petroleum terminals, which range from 11.6 million to 67 million gallons, with most facilities having more than 25 million gallons of storage capacity. In response to testimony, the PSC reduced the terminal size threshold from 5 million to 2 million gallons of storage, in order to include facilities that are large enough to unload unit trains. This change would apply to both new and existing terminal and would extend the terminal restrictions beyond the 11 largest fuel terminals in Willbridge and Linnton areas of NW Portland to also include smaller existing fuel distributors. Staff identified 24 additional petroleum, pipeline, and gaseous fuel distributors that may be affected.

- Site aggregation – A potential loophole to the terminal size threshold was identified in PSC testimony through site aggregation of smaller facilities. The reference to partnerships and corporations in the existing definition of "ownership" is an inclusive term, which includes subsidiaries of a larger corporation and would prevent a larger parent corporation from using different subsidiaries on contiguous lots. To further prevent potential circumvention of the terminal size threshold through site aggregation, the PSC recommended adding criteria in the use description to identify aggregated sites that each have storage smaller than 2 million gallons but effectively function as a larger terminal.

- End users – Resolution 37168 lists a specific exception to not restrict service directly to end users. At a small scale, services to end users include retail gasoline filling stations, natural gas access lines in street right-of-way to residential and business customers, and heating oil tanks at home sites. Larger scale end users with fossil fuel storage and access infrastructure also include manufacturers, jet fuel facilities serving PDX Airport, vessel fuel facilities on Portland Harbor, and others where fossil fuels are used as an input. The City Council added code amendments that exempt storage of aviation fuel serving regional airports and marine vessel fueling at Portland Harbor.

- Inclusion of regulated utilities - NW Natural, the natural gas utility that serves western Oregon and parts of southwest Washington, has recommended that its facilities should not be subject to new zoning restrictions because its distribution facilities provide service to end users, which are exempted in Resolution 37168. NW Natural's service to end users in Oregon is regulated by the Oregon Public Utility Commission. The company periodically prepares an Integrated Resources Plan (IRP) to document its forecast for natural gas use by its customers. The IRP also details how NW Natural proposes to meet changes in natural gas demand and is statutorily obligated to do so in ways that result in the "least cost" to customers, while managing risk and complying with all applicable environmental and workplace regulations. The PUC conducts a public review process of the IRP and ultimately either "acknowledges" the IRP or identifies shortcomings the

company must address in a revised IRP. The PSC considered and did not act on NW Natural's request to exempt regulated utilities. One commissioner expressed concern that a regulated utility could potentially sell fossil fuel from local storage facilities to customers who are not regional end users.

- Interpretation of use category – Terminal and business representatives commented that ambiguity in the use description could result in conflicting expectations, pressured interpretations, appeals, and inconsistent code implementation. While underlying policy accommodates regional access and exceptions that may be difficult to clearly define, the adopted land use designation is defined by clear and objective size thresholds and marine/railroad/pipeline access.

2. **Definition of fossil fuels**

Policy direction: City Council Resolution 37168 applies to fossil fuel infrastructure and storage generally, and does not distinguish among types or carbon intensity of fossil fuels.

Preliminary code concept:

- Definition of fossil fuels: petroleum products (such as crude oil and gasoline), coal, and gaseous fuels (such as natural gas and propane) that are made from decayed plants and animals that lived millions of years ago and are used primarily as a source of energy.
- Exclusion of non-fuel products – Petrochemicals that are used primarily for non-fuel products are excluded, such as asphalt, plastics, lubricants, fertilizer, roofing and paints.
- Methanol is included as a fossil fuel. Development of methanol storage and transportation facilities would be prohibited similarly to LNG and LPG terminals.
- Denatured ethanol and similar fuel additives and biodiesel/renewable diesel with less than 5% fossil fuel content are not fossil fuels.
- Biogas from wastewater treatment plants, anaerobic digesters, landfills and other sources is not a fossil fuel.

Implementation issues:

- Definition of fossil fuels – Definitions of fossil fuels vary by source. Here are some examples.
  - Oregon Department of Environmental Quality (ODEQ) – Fossil fuels: fuels such as oil, natural gas, and coal that are made from decayed plants and animals that lived millions of years ago. These fuels are made of hydrogen and carbon (hydrocarbons).
  - U.S. Environmental Protection Agency (USEPA), 40 C.F.R. § 60.41 - Fossil fuel means natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such materials for the purpose of creating useful heat.
  - Oregon Department of Energy Administrative Rule, OAR 345-001-0010 - "Fossil fuel" means natural gas, petroleum, coal and any form of solid, liquid or gaseous fuel derived from such materials that serves as useful energy.

- Renewable and clean fuel standards – As described in Section 4, USEPA implements the federal Renewable Fuel Standard (RFS) that requires transportation fuel sold in the U.S. to contain a minimum volume of renewable fuels. Similarly, ODEQ implements the Oregon Clean Fuel

Program. ODEQ identifies examples of "clean fuels" in Oregon as most types of ethanol, biodiesel, natural gas, biogas, electricity, propane and hydrogen. Terminal representatives and business stakeholders urged that adopted zoning code changes not create a disincentive or barrier to compliance with these federal and state rules, which may require additional tank capacity to implement. Environmental and public health organization representatives pointed out that City Resolution 37168 addresses fossil fuels generally, including clean fuels.

- *Methanol – Large methanol plants have recently been proposed in Tacoma, Kalama, and St. Helens. Methanol plants tend to have structural similarities to LNG and LPG terminals, including large-scale and gas pipeline access, and they can have similar safety and climate impacts. Stakeholder focus groups were asked whether any* special inclusions, such as methanol, should be considered. Most people commenting noted that methanol is primarily used in the production of plastics and other non-fuel uses. Views differed among environmental organizations commenting. Some noted that excluding it undermines the policy. The adopted code limits development of large methanol plants similarly to LNG or LPG terminals.

- *Denatured ethanol* – A terminal operator pointed out that "pure" ethanol made from corn or other non-fossil source is required by the Alcohol and Tobacco Tax and Trade Bureau to be denatured in order to be transported to the site. Denatured ethanol typically contains up to 5% methanol, so that it is toxic and undrinkable. Storage of denatured ethanol is exempted. In other words, denatured ethanol tanks would not be counted as part of the maximum storage capacity of fossil fuel terminals.

- Biogas products from landfills – Bureau of Environmental Services (BES) staff commented that biogas from landfills and other sources are not fossil fuels and should not be restricted by the adopted zoning changes. The adopted description of fossil fuel terminals specifically excludes waste-related uses, such as landfills, which are regulated as a separate land use in the zoning code. Also, the adopted definition of fossil fuels, described as being made from decayed plants and animals that lived millions of years ago, would not include biogas from a landfill.

3. **Prohibition of new bulk fossil fuel terminals**

Policy direction:

- City Council Resolution 37168 (adopted November 2015) calls for opposing expansion of infrastructure for transportation and storage of fossil fuels, subject to various exceptions, including safety improvements, service to end users, and infrastructure that accelerates transition to non-fossil fuel energy.
- 2035 Comprehensive Plan Policy 6.48 Fossil Fuel Infrastructure (adopted June 2016, not effective until 2018) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Preliminary code concept:

- Prohibit new Bulk Fossil Fuel Terminals in all base zones.

Implementation issues:

- Policy implementation – City Resolution 37168 reflected a major change in policy direction on fossil fuel distribution and storage facilities. Prohibition of new Bulk Fossil Fuel Terminals is intended as an unambiguous, assertive approach to implement this policy change, responding to increasingly evident safety risks of fossil fuel infrastructure, aggressive climate change goals, and changing energy markets in the Pacific Northwest.

- Community expectations – Several hundred people provided email and verbal testimony asking for a "full ban" on new and expanded fossil fuel terminals. Climate resilience advocates are widely represented in the Portland community and the Pacific Northwest. Public involvement in Resolution 37168 and this project reveal broad community expectations for a bold approach to restrict fossil fuel distribution facilities in Portland.

- Providing regional market access to fuels – Analysis to date is limited on the potential impacts of the prohibition on constraining regional fuel supply. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts, or may plateau and decline with implementation of climate resilience goals and strategies. The fossil fuels consumed in Oregon are generally not extracted or refined in the state. As a result, fossil fuel terminals provide multimodal transportation efficiency and price advantages for distributing fuels to the growing population of the regional market area.

- Option to set size limits on new fossil fuel terminals – The Discussion Draft proposed storage capacity size standards to limit new fossil fuel terminal development. Figure 7 in Section 4 indicates a wide margin between the size of recently proposed crude oil, coal and LNG terminals in the Pacific Northwest and the scale of expected growth by existing Portland fuel terminals that serve the regional market area. Recommended terminal size limitations within that margin would allow for expansion at existing terminals and moderately sized new terminal development to meet potential market area consumption needs. Instead, BPS's Proposed Draft and the PSC's Recommended Draft code changes would prohibit new Bulk Fossil Fuel Terminals, a more restrictive approach to more assertively implement the new policy directions and respond to extensive community comments on the draft code changes. As recommended by the PSC, existing terminals could expand storage facilities up to 10 percent through seismic upgrades that replace existing tanks, providing the opportunity to meet modest growth in potential market area consumption needs.

- Balanced, integrated policy approach – The adopted restrictions on fossil fuel distribution facilities entail tradeoffs among public goals for environmental protection, public health and safety, meeting energy needs, and economic prosperity, as described in Section 4. The Comprehensive Plan calls for a balanced, integrated approach in land use regulations to meet these public objectives, as described in Section 2. The adopted code changes provide for significant environmental and safety benefits in restricting development and expansion of fossil fuel terminals and provide for limited expansion of fossil fuel terminals to adequately meet regional energy needs and integrate economic prosperity and equity considerations.

4. "Limited use" classification of existing facilities

Policy direction:

- City Council Resolution 37168 includes various exemptions to not restrict safety or efficiency improvements, service to end users, emergency backup capacity, infrastructure for recovery or re-processing of used petroleum products, or infrastructure that will accelerate the transition to non-fossil fuel energy sources.
- 2035 Comprehensive Plan Policy 6.48 Fossil Fuel Infrastructure (adopted June 2016, not effective until 2018) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.
- 2035 Comprehensive Plan Policies 4.75 and 4.76 call for encouraging disaster-resilient development and reducing natural hazard risks to critical energy and transportation infrastructure in Portland Harbor.

Preliminary code concept:

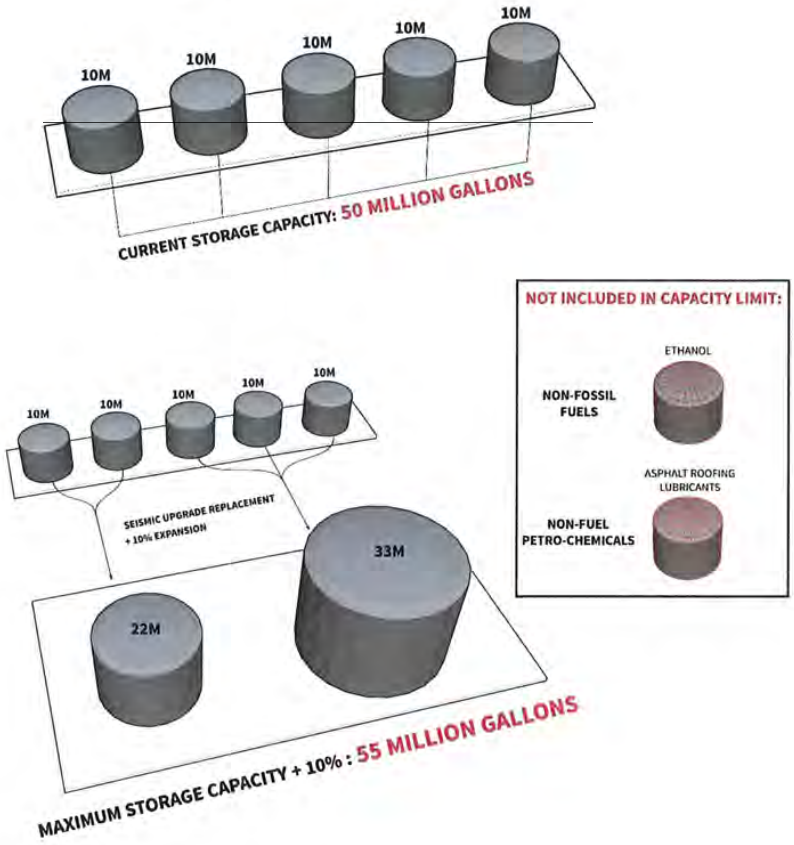
- Classify existing Bulk Fossil Fuel Terminals in industrial and general employment zones as "limited uses" that can continue to operate. Fossil fuel storage at existing terminals is limited to the existing capacity on the effective date of these regulations, and expansion is prohibited.

Implementation issues:

- Prohibition of expansion at existing terminals - City Council received extensive testimony to prohibit expansion at existing terminals and opted to do so. Similar to the prohibition of new Bulk Fossil Fuel Terminals, prohibition of terminal expansion demonstrates an unambiguous, assertive approach to implement bold policy change, emphasizing fuel infrastructure safety and climate resilience. These adopted code changes are generally more restrictive than the exceptions in the resolution that call for not restricting improvements at existing fuel terminals that improve safety, provide wholesale fuel supply to local or regional end users, add backup capacity, or add mixing tanks for clean/renewable fuels.

- Option to restrict expansion at existing terminals as a legal, non-conforming use – In the Proposed Draft, Bulk Fossil Fuel Terminals were classified as a prohibited use, under which existing terminals would become legal, non-conforming uses. The Proposed Draft assumed some opportunity to approve expansion of existing terminal storage capacity that would allow the existing terminals to add new fuel additive tanks to meet clean and renewable fuel standards, seismic upgrades of existing tanks, and emergency backup capacity, consistent with Resolution 37168. However, comments from BDS clarified that such expansion would be difficult to approve through a non-conforming situation review. BDS recommends considering an alternative approach to set limitations on expansion. In response, BPS and the PSC recommended classifying Bulk Fossil Fuel Terminals as a limited use with clear and objective standards that limit expansion of existing terminals.

Figure 9. Calculation of storage expansion limitations considered



- Option to allow 10% expansion at existing terminals – The PSC recommended code amendments to allow limited expansion of fossil fuel storage at these existing terminals that (a) include "seismic upgrades" which replace existing tanks, (b) add no more than 10 percent of the capacity of replaced tanks, and (c) result in no more than 10 percent cumulative expansion of the total terminal capacity on the effective date of these code changes. See Figure 9 above. City Council deleted this draft code allowance for up to 10% expansion with seismic upgrades of storage tanks, following testimony by some terminal operators that a 10% limitation would not provide an adequate incentive to cover improvement costs of tank replacement. Instead, a future code-change project is recommended in Section 7 to develop building code amendments that improve seismic resilience and require seismic upgrades comparable to proposed requirements on unreinforced masonry buildings.

- Option to restrict expansion at existing terminals as a conditional use – A large number of comments to PSC supported stronger restrictions on expansions at existing terminals through adding binding limits as well as criteria for safety and climate impacts. BDS staff have commented that they do not have staff expertise to implement discretionary land use review criteria addressing greenhouse gas emissions or safety impacts of hazardous material storage and transportation. If new conditional use criteria are added to limit or require no net increase of greenhouse gas emissions or safety impacts of hazardous material storage and transportation facilities, applicants would be required to hire specialized consultants to show compliance of the particular criterion, which would affect the complexity, predictability, and cost of land use reviews in new ways. This change would be inconsistent with 2035 Comprehensive Plan Policy 6.16 Regulatory Climate, which calls for improving development review processes and regulations to encourage predictability and support local and equitable employment growth and encourage business retention. Given the level of community scrutiny about fossil fuel terminal expansion, this discretionary public review process could add significantly to the cost and uncertainty of investments at fossil fuel terminals.

- Option to not restrict expansion at existing terminals - The Discussion Draft recommended code concepts (storage capacity size standards to limits new fossil fuel terminal development) that would not restrict development on existing terminals. This option was intended to be consistent with the exceptions in the resolution (as described in the previous point) and to accommodate potential growth in regional fuel demand. Instead, the Proposed Draft code changes applied a legal, non-conforming use status on existing Bulk Fossil Fuel Terminals, a more restrictive approach to more assertively implement the new policy directions and respond to extensive community comments on the recommended code changes.

- Divergent stakeholder views – Extensive comments on the Recommended Draft, Proposed Draft and Discussion Draft recommended tight limits on expansion of existing fuel terminals. In contrast, stakeholder focus group participants generally urged that existing fuel terminals should not be changed to a non-conforming use for reasons ranging from providing a critical product to not discouraging desired seismic and safety improvements on existing facilities. Stakeholder group comments from environmental and public health organizations generally supported restricting expansion of existing terminals, while some participants cautioned about political and legal tradeoffs of making the existing fuel terminals nonconforming.

6. Zoning code changes

This section of the report specifies the adopted code language, along with code commentary pages that clarify expected implementation. The section is formatted to facilitate readability, showing adopted code changes on the right-hand pages and related code commentary on the facing left-hand pages.

Commentary

Table 100-1 Open Space Zone Primary Uses

The amendments to this table reflect changes to prohibit new Bulk Fossil Fuel Terminals in all base zones.

33.100 Open Space Zone

Table 100-1 Open Space Zone Primary Uses	
Use Categories	**OS Zone**
Residential Categories	
Household Living	N
Group Living	N
Commercial Categories	
Retail Sales And Service	CU [1]
Office	N
Quick Vehicle Servicing	N
Vehicle Repair	N
Commercial Parking	N
Self-Service Storage	N
Commercial Outdoor Recreation	CU
Major Event Entertainment	N
Industrial Categories	
Manufacturing And Production	CU [6]
Warehouse And Freight Movement	N
Wholesale Sales	N
Industrial Service	N
Bulk Fossil Fuel Terminal	N
Railroad Yards	N
Waste-Related	N
Institutional Categories	
Basic Utilities	L/CU [5]
Community Service	CU [4]
Parks And Open Areas	L/CU [2]
Schools	CU
Colleges	N
Medical Centers	N
Religious Institutions	N
Daycare	CU
Other Categories	
Agriculture	L[7]
Aviation And Surface Passenger Terminals	N
Detention Facilities	N
Mining	CU
Radio Frequency Transmission Facilities	L/CU [3]
Rail Lines And Utility Corridors	CU

Y = Yes, Allowed L = Allowed, But Special Limitations CU = Conditional Use Review Required
N = No, Prohibited

Commentary

Table 110-1 Single-Dwelling Zone Primary Uses

The amendments to this table reflect changes to prohibit new Bulk Fossil Fuel Terminals in all base zones.

Table 110-1 Single-Dwelling Zone Primary Uses						
Use Categories	**RF**	**R20**	**R10**	**R7**	**R5**	**R2.5**
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	CU	CU	CU	CU	CU	CU
Commercial Categories						
Retail Sales And Service	N	N	N	N	N	N
Office	N	N	N	N	N	N
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	N	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	N
Industrial Categories						
Manufacturing And Production	CU [6]	N	N	N	N	N
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	N
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]
Community Service	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]
Parks And Open Areas	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]
Schools	CU	CU	CU	CU	CU	CU
Colleges	CU	CU	CU	CU	CU	CU
Medical Centers	CU	CU	CU	CU	CU	CU
Religious Institutions	CU	CU	CU	CU	CU	CU
Daycare	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]
Other Categories						
Agriculture	L [7]	L [7]	L/CU [8]	L/CU [8]	L [9]	L [9]
Aviation And Surface Passenger Terminals	CU	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	CU	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]
Railroad Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Commentary

Table 120-1 Multi-Dwelling Zone Primary Uses

The amendments to this table reflect changes to prohibit new Bulk Fossil Fuel Terminals in all base zones.

Table 120-1 Multi-Dwelling Zone Primary Uses						
Use Categories	**R3**	**R2**	**R1**	**RH**	**RX**	**IR**
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	Y [1]
Commercial Categories						
Retail Sales And Service	N	N	N	CU[2]	L/CU [3]	L/CU [10]
Office	N	N	N	CU[2]	L/CU [3]	L/CU [10]
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	CU [4]	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	CU
Industrial Categories						
Manufacturing And Production	N	N	N	N	N	CU
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	CU
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [13]	L/CU [13]	L/CU [13]	L/CU [13]	L/CU [13]	L/CU [13]
Community Service	CU [6]	CU [6]	CU [6]	L/CU [6]	L/CU [5, 6]	CU [6]
Parks And Open Areas	L/CU [7]	L/CU [7]	L/CU [7]	Y	Y	Y
Schools	CU	CU	CU	CU	L/CU [5]	L/CU [11]
Colleges	CU	CU	CU	CU	CU	L/CU [11]
Medical Centers	CU	CU	CU	CU	CU	L/CU [11]
Religious Institutions	CU	CU	CU	CU	CU	CU
Daycare	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	Y	L/CU [12]
Other Categories						
Agriculture	L [14]	L [14]	L [14]	L [14]	L [14]	L [14]
Aviation And Surface Passenger Terminals	N	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]
Rail Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Commentary

Table 130-1 Commercial Zone Primary Uses

The amendments to this table reflect changes to prohibit new Bulk Fossil Fuel Terminals in all base zones.

Table 130-1 Commercial Zone Primary Uses								
Use Categories	**CN1**	**CN2**	**CO1**	**CO2**	**CM**	**CS**	**CG**	**CX**
Residential Categories								
Household Living	Y	Y	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]
Commercial Categories								
Retail Sales And Service	L [2]	Y	N	L [3]	L [4]	Y	Y	Y
Office	L [2]	Y	Y	Y	L [4]	Y	Y	Y
Quick Vehicle Servicing	N	L [12]	N	N	N	N	Y	L [12]
Vehicle Repair	N	N	N	N	N	Y	Y	L [5]
Commercial Parking	N	N	N	N	N	Y	CU [11]	CU [11]
Self-Service Storage	N	N	N	N	N	N	L [6]	L [6]
Commercial Outdoor Recreation	N	N	N	N	Y	Y	Y	Y
Major Event Entertainment	N	N	N	N	N	CU	CU	Y
Industrial Categories								
Manufacturing And Production	L/CU [2]	L/CU [2]	N	N	L/CU [4, 5]	L/CU [5]	L/CU [5,7]	L/CU [5]
Warehouse And Freight Movement	N	N	N	N	N	N	CU [5,7]	N
Wholesale Sales	N	N	N	N	L [4, 5]	L [5]	L [5,7]	L [5]
Industrial Service	N	N	N	N	N	CU [5]	CU [5,7]	CU [5]
Bulk Fossil Fuel Terminal	N	N	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N	N	N
Institutional Categories								
Basic Utilities	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]
Community Service	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]
Parks And Open Areas	Y	Y	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	Y	Y	Y	Y	Y
Colleges	Y	Y	Y	Y	Y	Y	Y	Y
Medical Centers	Y	Y	Y	Y	Y	Y	Y	Y
Religious Institutions	Y	Y	Y	Y	Y	Y	Y	Y
Daycare	Y	Y	Y	Y	Y	Y	Y	Y

Commentary

Other Categories								
Agriculture	L [13]	L [13]	L [13]	L [13]	L [13]	L/CU [14]	L/CU [14]	L/CU [14]
Aviation And Surface Passenger Terminals	N	N	N	N	N	N	CU	CU
Detention Facilities	N	N	N	N	N	N	CU	CU
Mining	N	N	N	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]
Rail Lines And Utility Corridors	CU	CU	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Commentary

33.140.050 Neighborhood Contact

As an alternative to a land use review, a public notice and meeting requirement applies to development of fuel storage structure, such as a new tank, at a Bulk Fossil Fuel Terminal, similar to the requirement for multi-dwelling residential development. This notice and meeting would create public awareness about the project and serve to discuss a proposal in an informal basis.

33.140 Employment and Industrial Zones

140

Sections:

General
- 33.140.010 General Purpose of the Zones
- 33.140.020 List of the Employment and Industrial Zones
- 33.140.030 Characteristics of the Zones
- 33.140.040 Other Zoning Regulations

Use Regulations
- 33.140.100 Primary Uses
- 33.140.110 Accessory Uses
- 33.140.130 Nuisance-Related Impacts
- 33.140.140 On-Site Waste Disposal
- 33.140.150 Neighborhood Contact

Site Development Standards
- 33.140.200 Lot Size
- 33.140.205 Floor Area Ratio
- 33.140.210 Height
- 33.140.215 Setbacks
- 33.140.220 Building Coverage
- 33.140.225 Landscaped Areas
- 33.140.227 Trees
- 33.140.230 Ground Floor Windows in the EX Zones
- 33.140.235 Screening
- 33.140.240 Pedestrian Standards
- 33.140.242 Transit Street Main Entrance
- 33.140.245 Exterior Display, Storage, and Work Activities
- 33.140.250 Trucks and Equipment
- 33.140.255 Drive-Through Facilities
- 33.140.265 Residential Development
- 33.140.270 Detached Accessory Structures
- 33.140.275 Fences
- 33.140.280 Demolitions
- 33.140.290 Nonconforming Development
- 33.140.295 Parking and Loading
- 33.140.300 Signs
- 33.140.310 Superblock Requirements
- 33.140.315 Recycling Areas

33.140.050 Neighborhood Contact

A. **Purpose.** Neighborhood contact is required when a new storage structure for any type of fuel will be built on a Bulk Fossil Fuel Terminal because of the impacts that fuel projects can have on the surrounding community. The neighborhood contact requirement provides an opportunity for community input on the design of the project by providing a setting for the applicant and neighborhood residents to discuss a proposal in an informal manner. Sharing information and concerns early offers the opportunity to identify ways to improve a proposal and to resolve conflicts.

B. **Neighborhood contact requirement.** Proposals meeting the following conditions are subject to the neighborhood contact requirement as specified in Section 33.700.025, Neighborhood Contact. All of the steps in 33.700.025 must be completed before a building permit is requested.

1. The proposed development has not been subject to a land use review; and

2. The proposed development includes at least one new structure for the storage of any type of fuel.

Commentary

33.140.100 Primary Uses

The amendments to this section reflect changes to prohibit new Bulk Fossil Fuel Terminals in all base zones and reclassify existing terminals in industrial and general employment zones as limited uses. Regulation of Bulk Fossil Fuel Terminals implements policy direction in City of Portland Resolution 37168 (adopted November 2015) and 2035 Comprehensive Plan Policy 6.48 (adopted June 2016, expected to take effect in 2018), both of which address fossil fuel distribution and storage facilities.

The limited use designation would prohibit expansion of fossil fuel tank capacity at existing Bulk Fossil Fuel Terminals.

33.140.100 Primary Uses

A. No change

B. Limited uses. Uses allowed that are subject to limitations are listed in Table 140-1 with an "L". These uses are allowed if they comply with the limitations listed below and the development standards and other regulations of this Title. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters. The paragraphs listed below contain the limitations and correspond with the footnote numbers from Table 140-1.

1. – 16. No change

17. Bulk Fossil Fuel Terminals. This regulation applies to all parts of Table 140-1 that have a [17].

a. Existing Bulk Fossil Fuel Terminals. Bulk Fossil Fuel Terminals that existed on [insert effective date] are allowed, but the total amount of fossil fuel that can be stored on the site in storage tanks is limited to the fossil fuel storage tank capacity that existed on [insert effective date]. Total fossil fuel storage tank capacity on the site in excess of the capacity that existed on [insert effective date] is prohibited. Storing coal on the site is prohibited.

b. New Bulk Fossil Fuel Terminals are prohibited.

Commentary

Table 140-1 Employment and Industrial Zone Primary Uses
The amendments to this section reflect changes to prohibit new Bulk Fossil Fuel Terminals in all base zones and reclassify existing terminals in industrial and general employment zones as limited uses.

Table 140-1
Employment and Industrial Zone Primary Uses

Use Categories	EG1	EG2	EX	IG1	IG2	IH
Residential Categories						
Household Living	CU	CU	Y	CU [1]	CU [1]	CU [1]
Group Living	CU	CU	L/CU [2]	N	N	N
Commercial Categories						
Retail Sales And Service	L/CU [3]	L/CU [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Office	L [3]	L [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Quick Vehicle Servicing	Y	Y	N	Y	Y	Y
Vehicle Repair	Y	Y	Y	Y	Y	Y
Commercial Parking	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]
Self-Service Storage	Y	Y	L [7]	Y	Y	Y
Commercial Outdoor Recreation	Y	Y	Y	CU	CU	CU
Major Event Entertainment	CU	CU	CU	CU	CU	CU
Industrial Categories						
Manufacturing And Production	Y	Y	Y	Y	Y	Y
Warehouse And Freight Movement	Y	Y	Y	Y	Y	Y
Wholesale Sales	Y	Y	Y	Y	Y	Y
Industrial Service	Y	Y	Y	Y	Y	Y
Bulk Fossil Fuel Terminal	L [17]	L [17]	N	L [17]	L [17]	L [17]
Railroad Yards	N	N	N	Y	Y	Y
Waste-Related	N	N	N	L/CU [8]	L/CU [8]	L/CU [8]
Institutional Categories						
Basic Utilities	Y/CU [12]	Y/CU [12]	Y/CU [12]	Y/CU [13]	Y/CU [13]	Y/CU 13]
Community Service	L [9]	L [9]	L [10]	L/CU [11]	L/CU [11]	L/CU [11]
Parks And Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	N	N	N
Colleges	Y	Y	Y	N	N	N
Medical Centers	Y	Y	Y	N	N	N
Religious Institutions	Y	Y	Y	N	N	N
Daycare	Y	Y	Y	L/CU [11]	L/CU 11]	L/CU 11]
Other Categories						
Agriculture	L [16]	L [16]	L [16]	L [16]	L [16]	L [16]
Aviation And Surface Passenger Terminals	CU	CU	CU	CU	CU	CU
Detention Facilities	CU	CU	CU	CU	CU	CU
Mining	N	N	N	CU	CU	CU
Radio Frequency Transmission Facilities	L/CU [14]	L/CU [14]	L/CU [14]	L/CU [14]	L/CU 14]	L/CU 14]
Rail Lines And Utility Corridors	Y	Y	Y	Y	Y	Y

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Commentary

33.910.030 Definitions

The definition of fossil fuels was added to clarify the land use category Bulk Fossil Fuel Terminals.

Petrochemicals that are used primarily for non-fuel products are excluded, such as asphalt, plastics, lubricants, fertilizer, roofing, and paints. However, methanol is an exception that is included as a fossil fuel, because large methanol storage and distribution facilities tend to have structural similarities to liquid natural gas (LNG) and liquid petroleum gas (LPG) terminals, including large-scale storage and gas pipeline access, and because they can have similar safety and climate impacts.

Fuels containing 5% or less fossil-fuel volume are not considered fossil fuels under this definition. For example, "pure" ethanol made from corn or other non-fossil source is required by the Alcohol and Tobacco Tax and Trade Bureau to be denatured in order to be transported to the site. Denatured ethanol typically contains up to 5% methanol, so that it is toxic and undrinkable.

Some fossil fuels under this definition are also classified as "renewable fuels" in the federal Renewable Fuel Standard and "clean fuels" in Oregon's Clean Fuel Standard, such as liquid natural gas and liquid propane gas. These federal and state standards require transportation fuel sold within their jurisdiction to contain a minimum volume of renewable or clean fuels.

33.910.030 Definitions

The definition of words with specific meaning in the zoning code are as follows:

Fossil Fuel. Fossil fuels are petroleum products (such as crude oil and gasoline), coal, methanol, and gaseous fuels (such as natural gas and propane) that are made from decayed plants and animals that lived millions of years ago and are used as a source of energy. Denatured ethanol and similar fuel additives with less than 5 percent fossil fuel content, biodiesel/renewable diesel with less than 5 percent fossil fuel content, and petroleum-based products used primarily for non-fuel uses (such as asphalt, plastics, lubricants, fertilizer, roofing, and paints) are not fossil fuels.

Commentary

33.920 Descriptions of the Use Categories

920

Sections:

Introduction to the Use Categories
- 33.920.010 Purpose
- 33.920.020 Category Titles
- 33.920.030 Classification of Uses

Residential Use Categories
- 33.920.100 Group Living
- 33.920.110 Household Living

Commercial Use Categories
- 33.920.200 Commercial Outdoor Recreation
- 33.920.210 Commercial Parking
- 33.920.220 Quick Vehicle Servicing
- 33.920.230 Major Event Entertainment
- 33.920.240 Office
- 33.920.250 Retail Sales And Service
- 33.920 260 Self-Service Storage
- 33.920.270 Vehicle Repair

Industrial Use Categories
- 33.920.300 Bulk Fossil Fuel Terminal
- 33.920.310~~300~~ Industrial Service
- 33.920.320~~310~~ Manufacturing And Production
- 33.920.330~~320~~ Railroad Yards
- 33.920.340~~330~~ Warehouse And Freight Movement
- 33.920.350~~340~~ Waste-Related
- 33.920.360~~350~~ Wholesale Sales

Institutional Use Categories
- 33.920.400 Basic Utilities
- 33.920.410 Colleges
- 33.920.420 Community Service
- 33.920.430 Daycare
- 33.920.450 Medical Centers
- 33.920.460 Parks And Open Areas
- 33.920.470 Religious Institutions
- 33.920.480 Schools

Other Use Categories
- 33.920.500 Agriculture
- 33.920.510 Aviation And Surface Passenger Terminals
- 33.920.520 Detention Facilities
- 33.920.530 Mining
- 33.920.540 Radio Frequency Transmission Facilities
- 33.920.550 Rail Lines And Utility Corridors

Commentary

33.920.300 Bulk Fossil Fuel Terminal

Bulk Fossil Fuel Terminals are added as a new land use category to regulate their development in the Zoning Code. Regulation of Bulk Fossil Fuel Terminals implements policy direction in City of Portland Resolution 37168 (adopted November 2015) and 2035 Comprehensive Plan Policy 6.48 (adopted June 2016, expected to take effect in 2018), both of which address fossil fuel distribution and storage facilities.

Bulk Fossil Fuel Terminals are characterized by having (1) marine, pipeline or railroad transport access and (2) either trans-loading facilities for transferring a shipment between transport modes (such as from rail to ship) or bulk storage facilities exceeding 2 million gallons of fossil fuels. The 2-million-gallon threshold is sized to include facilities that are large enough to unload unit trains. Functionally, these terminals tend to be regional gateway facilities, where fossil fuels enter and exit the region. Additionally, Policy 6.48 calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market. However, the use classification is intended to be clearly identifiable by physical characteristics and not rely on a definition of region.

The regional market area of Bulk Fossil Fuel Terminals varies by product and is difficult to define. Portland's 10 petroleum terminals generally serve Oregon and Southern Washington. This market area substantially exceeds the Portland metropolitan area, which is often colloquially referred to as the region. Some terminal representatives pointed out that the federal government's 5-state West Coast PADD 5 region is generally their regional market area.

The use description is clarified with criteria that are intended to prevent the aggregation of new facilities smaller than 2 million gallons into a larger terminal that could effectively circumvent the terminal storage capacity threshold.

Resolution 37168 lists a specific exception to not restrict service directly to end users. At a small scale, services to end users include retail gasoline filling stations, natural gas access lines in street right-of-way to residential and business customers, and heating oil tanks at home sites. Larger scale end users with fossil fuel storage and access infrastructure also include manufacturers, jet fuel facilities for PDX Airport, vessel fuel facilities on Portland Harbor, and others, where fossil fuels are used as an input.

33.920.300 Bulk Fossil Fuel Terminal

A. Characteristics. Bulk Fossil Fuel Terminals are establishments primarily engaged in the transport and bulk storage of fossil fuels. Terminal activities may also include fuel blending, regional distribution, and wholesaling. The firms rely on access by marine, railroad, or regional pipeline to transport fuels to or from the site, and either have transloading facilities for transferring a shipment between transport modes, or have storage capacity exceeding 2 million gallons for fossil fuels. There is minimal on-site sales activity with the customer present.

B. Accessory uses. Accessory uses may include retail sales of petroleum products, offices, food membership distribution, parking, storage, truck fleet parking and maintenance areas, rail spur or lead lines, and docks.

C. Examples. Examples include crude oil terminals, petroleum products terminals, natural gas terminals, propane terminals, and coal terminals.

D. Exceptions.

1. Truck or marine freight terminals that do not store, transport or distribute fossil fuels are classified as Warehouse And Freight Movement uses.
2. Truck or marine freight terminals that do not have transloading facilities and have storage capacity of 2 million gallons or less are classified as Warehouse And Freight Movement uses. However, multiple fossil fuel facilities, each with 2 million gallons of fossil fuel storage capacity or less but cumulatively having a fossil fuel storage capacity in excess of 2 million gallons, located on separate parcels of land will be classified as a Bulk Fossil Fuel Terminal when two or more of the following factors are present:
   a. The facilities are located or will be located on one or more adjacent parcels of land. Adjacent includes separated by a shared right-of-way;
   b. The facilities share or will share operating facilities such as driveways, parking, piping, or storage facilities; or
   c. The facilities are owned or operated by a single parent partnership or corporation.
3. Gasoline stations and other retail sales of fossil fuels are not Bulk Fossil Fuel Terminals.
4. Distributors and wholesalers that receive and deliver fossil fuels exclusively by truck are not Bulk Fossil Fuel Terminals.
5. Industrial, commercial, institutional, and agricultural firms that exclusively store fossil fuel for use as an input are not Bulk Fossil Fuel Terminals.
6. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.
7. The storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, drydock, ship or barge servicing facility, rail yard, or as part of a fleet vehicle servicing facility are not Bulk Fossil Fuel Terminals.
8. Uses that recover or reprocess used petroleum products are not Bulk Fossil Fuel Terminals.

Commentary

33.920.310~~300~~ Industrial Service

33.920.320~~310~~ Manufacturing And Production

33.920.330~~320~~ Railroad Yards

33.920.340~~330~~ Warehouse And Freight Movement

A. **Characteristics.** Warehouse And Freight Movement firms are involved in the storage, or movement of goods for themselves or other firms. Goods are generally delivered to other firms or the final consumer, except for some will-call pickups. There is little on-site sales activity with the customer present.

B. **Accessory uses.** Accessory uses may include offices, food membership distribution, truck fleet parking and maintenance areas, rail spur or lead lines, docks, and repackaging of goods.

C. **Examples.** Examples include separate warehouses used by retail stores such as furniture and appliance stores; household moving and general freight storage; cold storage plants, including frozen food lockers; storage of weapons and ammunition; major wholesale distribution centers; truck, marine, or air freight terminals; bus barns and light rail barns; parcel services; major post offices; grain terminals; and the stockpiling of sand, gravel, or other aggregate materials.

D. **Exceptions.**

1. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.
2. Miniwarehouses are classified as Self-Service Storage uses.
3. Establishments that engage in the transfer or storage of fossil fuels, rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities or have storage capacity exceeding 2 million gallons for fossil fuels are classified as Bulk Fossil Fuel Terminal uses.

33.920.350~~340~~ Waste-Related

33.920.360~~350~~ Wholesale Sales

A. **Characteristics.** Wholesale Sales firms are involved in the sale, lease, or rent of products primarily intended for industrial, institutional, or commercial businesses. The uses emphasize on-site sales or order taking and often include display areas. Businesses may or may not be open to the general public, but sales to the general public are limited as a result of the way in which the firm operates. Products may be picked up on site or delivered to the customer.

B. **Accessory uses.** Accessory uses may include offices, food membership distribution, product repair, warehouses, parking, minor fabrication services, and repackaging of goods.

C. **Examples.** Examples include sale or rental of machinery, equipment, heavy trucks, building materials, special trade tools, welding supplies, machine parts, electrical supplies, janitorial supplies, restaurant equipment, and store fixtures; mail order houses; and wholesalers of food, clothing, auto parts, building hardware, and office supplies.

D. Exceptions.

1. Firms that engage primarily in sales to the general public are classified as Retail Sales And Service.
2. Firms that engage in sales on a membership basis are classified as either Retail Sales And Service or Wholesale Sales, based on a consideration of the characteristics of the use.
3. Firms that are primarily storing goods with little on-site business activity are classified as Warehouse And Freight Movement.
4. Establishments that engage in the regional wholesaling of fossil fuels, rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities or have storage capacity exceeding 2 million gallons for fossil fuels are classified as Bulk Fossil Fuel Terminal uses.

7. Other implementation recommendations

This section of the report recommends future implementation directions for building code amendments to address seismic resilience and periodic monitoring for code effectiveness.

Seismic resilience

The adopting ordinance sets direction to implement this future action:

1. Portland Bureau of Emergency Management (PBEM) and Portland Office of Government Relations are directed to develop proposals for State building code changes to improve seismic resilience and require seismic upgrades comparable to proposed requirements on unreinforced masonry buildings. City Bureaus, including the Bureau of Development Services, PBEM, and Fire Bureau, shall work with the State of Oregon to require seismic upgrades of storage tanks within a firm deadline for replacement of older, unsafe tanks.

Seismic resilience is one of the underlying rationales for fossil fuel distribution policies and the adopted code amendments. Seismic safety requirements of land development are addressed in building codes, which are adopted and amended at the state level.

Monitoring for code effectiveness

The adopting ordinance sets direction to implement this future action:

2. Portland Bureau of Planning and Sustainability (BPS) is directed to periodically monitor the effectiveness of these zoning code amendments to implement underlying policies and consider code adjustments in response to regional fuel demand and market changes, product innovation, safety and climate action considerations, and related regulatory changes. BPS shall report to City Council no later than December 31, 2019 on the implementation of this ordinance, including:

    a. the number and description of any requests by existing terminal operators to replace and expand their facilities;

    b. the number and description of building permits issued for fossil fuel tanks between 200,000 and 2 million gallons;

    c. the trends in fossil fuel energy use and non-fossil energy use in Oregon;

    d. the status of local and state regulatory proceedings that may improve seismic resilience of fossil fuel storage infrastructure; and

    e. information on compliance with the Oregon Clean Fuels Program.

A monitoring and adaptation approach would provide for ongoing code effectiveness within a context of changing energy markets, products, and associated regulations.

Appendix A: Stakeholder focus group results

Public involvement in the concept development for the Fossil Fuel Terminal Zoning Project consisted primarily of four stakeholder focus groups as well as meetings with fuel terminals and other individuals or organizations. The focus groups were held in June 2016. The purpose of the focus groups was to help identify and understand the issues that should help shape the preliminary zoning code being considered by this project. The focus groups also helped to expeditiously reach out to a broad range of stakeholders. While their perspectives and interests are shared on some topics, they diverge on other topics.

In addition to the stakeholder focus groups, BPS staff met with several fuel terminals to explain the proposal, answer questions, and discuss their individual concerns. This was needed because antitrust regulations constrained discussion about certain topics, for example supply chains, in the presence of representatives from other fuel terminals. Primarily, the terminal operators explained their operations and facilities, many of which differed substantially from other terminals.

Who participated?

Figure 9 lists the participants of the four focus groups conducted. Ten to twelve participants were invited to each meeting, although not everyone was able to attend. The first focus group consisted of fuel terminal representatives who have a direct stake in the recommended regulations. The second group was environmental and public health organizations, some of whom advocated for the resolution before City Council and have community safety and sustainability in mind. The third group were state and regional business and government organizations. Their interest was to protect the state economy by testing the proposal against economic realities. The fourth group was neighborhood and equity community organizations whose interests were to protect neighborhoods adjacent to the terminals and underserved communities who may rely on terminals for employment. Additionally, the Mayor's Office invited input from Native communities and tribal governments.

Preliminary code concepts discussed

- Identify "bulk fossil fuel terminals" as a regulated land use, characterized by inter-regional transport access and larger storage facilities.
- Either prohibit new terminals or set storage capacity limits high enough to accommodate regional growth.
- Allow existing terminals to expand for seismic upgrades, access to greener fuels and capacity for regional growth.

What discussion questions were asked?

The focus groups were provided background materials describing the preliminary code change concepts about two weeks before the focus group meetings. BPS staffed prompted the focus group across four topics:

Figure 10. Stakeholder Focus Group Participants, June 2016

STAKEHOLDER	DATE	ATTENDEES
Fuel terminal representatives	Thursday, June 02, 2016	Gilbert Betancourt, Phillips 66 Nick Giotta, Phillips 66 Stephanie Williams, Phillip 66 Andrew Holbrook, Kinder Morgan Shanna Brownstein, Northwest Natural Kevin Jones, McCall Oil Pamela Brady, BP West Coast Jerry Henderson, Chevron Kevin Buffum, Pacific Terminal Services Steve Kober, NuStar Will Rassmussen, WSPA Frank Holmes, WSPA Chris West, Pac/West and Arc Terminals Nathan Eggers, Arc Terminals Jerome Jackson, NuStar Rob Hill, NuStar
Environmental and health organizations	Tuesday, June 07, 2016	Zach Klonoski, Mayor's Office Regna Merritt, Ore. Physicians for Social Responsibility Trish Weber, Center for Sustainable Economy Meredith Connolly, Climate Solutions Kristen Sheeran, Climate Solutions Nick Caleb, 350PDX/CSE Bob Salinger, Audubon Society Dan Serren, Columbia Riverkeeper Adriana Voss-Andreae, 350PDX Micah Meskel, Portland Audobon
State and regional business organizations	Thursday, June 09, 2016	Jana Jarvis, Oregon Trucking Association Greg Theisen, Port of Portland Ellen Wax, Working Waterfront Jay Clemens, Associated Oregon Industries Mark Landauer, Oregon Public Ports Association Marion Haynes, Portland Business Alliance Corky Collier, Columbia Corridor Association Kelly Ross, NAIOP Shanna Brownstein, Northwest Natural Emerald Bogue, Port of Portland Susan Lahsene, Port of Portland Phil Grillo, Davis Wright Tremaine
Neighborhood and equity organizations	Tuesday, June 14, 2016	Jeff Geisler, Hayden Island Neighborhood Association John Bradley, Northwest District Association Travis Argue, UA Local 290 Willy Myers, Columbia Pacific Building Trades

1. Issues that should shape the project
2. Types of distribution and storage facilities to be regulated
3. Definition of fossil fuels
4. Zoning approach for limiting new storage facilities

In addition to specific questions within each topic, participants were invited to share any general and wrap-up comments during the focus group.

What we heard

For each topic area, the results of the focus groups are summarized in Figure 4 of Section 3. That table summarizes the main themes and concerns raised during the focus groups.

Key issues

Fuel terminal representatives objected to this policy direction in general. They discussed their safe operating history and commitment to implement the federal and state standards for renewable and clean fuels. There were challenges to participating in the conversation, but they agreed to work cooperatively on this project to get the code right. For example, anti-trust laws precluded the group from engaging in certain conversations because it would involve disclosing information about their supply chains and could be considered collusion in court of law. This group was concerned with the fast timeline and felt the policies should be discussed first.

They also felt the process was emotionally driven, not having considered the unintended consequences. For example, with renewable and clean fuel standards constantly in flux, they felt that zoning rules could make it more difficult to meet these standards. Restricting growth here in Portland at the end of the Olympic Pipeline could put more trucks on the road, instead of more efficient pipeline or rail transportation. The group asserted that there could also be significant economic impacts on the rest of the state, given that 95% of Oregon's fuel passes through Portland first. Lastly, fuel terminal representatives expressed concern for additional administrative burdens that a new land use category would bring. For example, what steps would be necessary for these firms to demonstrate that they were existing operations prior to the new zoning rules? Additionally, they warned that their site configuration may pose a challenge to effective zoning rules, as they are often non-contiguous operations connected by interconnected pipelines.

Environmental and public health organizations felt the policy direction was less aggressive toward fossil fuels than what the City Council resolution had proclaimed. They felt the resolution sought to outright prohibit new development and expansion on existing facilities. Because of this, they cautioned about community backlash if this proposal did not meet expectations. In this vein, they highlighted that Portland will be the first city to fully implement this type of policy, so the project could be an opportunity to set a strong precedent and model code for other cities. This group also felt that resident health and safety was also a top priority. They noted the seismic risks posed by fuel terminal tank farms that lie on liquefaction zones as well as the June 2016 oil train wreck in Mosier. For these reasons, they felt Portland Bureau of Emergency Management (PBEM) and other environmental justice groups should be involved in safety considerations. Lastly, the group felt the economic impact statement should include more than the impact on jobs. It should also consider the risks of economic and financial damages from a natural disaster. Members of this focus group offered to provide technical analysis on the impacts that the proposed options could have on the environment and public health and safety.

Some noted that risks should be accounted for through bonding or insurance requirements under worst-case scenarios.

State and regional business organizations felt that this undertaking requires more research. The resolution set required tasks, including an economic impact analysis and an examination of relevant laws, and they felt these tasks should be completed before laying the groundwork through code development. They felt the marine cargo forecast for liquid bulks of 1% growth is outdated and too low. (Note, an opposite reaction was expressed by environmental and health organization representatives who felt this figure was too high.) Similarly, they feared that the code may not hold up well in five years because of constantly changing energy markets. For example, in five years Portland could be shipping cleaner fuels to the Midwest. Some members expressed concern that the zoning code may not be the right tool to achieve some of the GHG (greenhouse gas) reduction and public safety goals that this resolution aimed to achieve. If the goal is public safety, then the City should require or create incentives for seismic upgrades. They stated that, if the goal is to reduce greenhouse gases, then prohibiting the export of cleaner-burning fuels, such as LNG (liquefied natural gas), may have the opposite intended effect. Lastly, the group asserted the important role that Portland's fuel terminal facilities play in rest of the state economy. They warned of political and economic repercussions that these decisions could have. They shared the view with fuel terminal representatives that this is a big political decision—the timeline is too short and the process should not be rushed.

Neighborhood and equity community organizations communicated that safety, pollution and accidental releases were their top priority when considering zoning for fuel terminals. They wanted a close examination of the seismic and explosion risks associated with fuel terminals. For example, which terminals are in liquefaction zones? Where are the storage tanks located in relation to neighborhoods? They sought honesty about the risks posed to the Linnton neighborhood specifically. Rail safety in the Columbia Gorge was also a key issue. The June 2016 incident in Mosier highlighted the risks. A potential solution they offered would be more pipelines, but they are difficult to get built. This group recognized the difficulty in managing competing values. They felt a reasonable expectation of growth is a smart idea. One participant described the proposal as aggressive, adding that by prohibiting LNG export terminals, global export destinations like China may end up burning dirtier fuels, such as coal. They felt this also meant Portland would forego export profits.

New land use category

Fuel terminal representatives were concerned for the clarity of the rules. They felt that the definition of "bulk terminal" is very important to be clear. If the definition was open to interpretation, then permit staff could be pressured. They warned that creating "bulk fuel terminal" as a specifically regulated use could lead to unpredictable results. This group was also concerned with the definition of "region." They were unsure if off-shore distribution was the issue, advocating for using the federally recognized West Coast region (PADD 5) as the definition of "regional market." PADD 5 includes Oregon, Washington, California, Nevada, Arizona, Alaska and Hawaii.

Environmental and public health organizations wanted to see the regulation go beyond new facilities and also look at limits on expansion at existing facilities. They felt the City Council resolution was clear and unambiguous about opposing expansion of fossil fuel infrastructure, which includes expansions at existing sites. They emphasized the importance for getting the right definition of "bulk terminal" and the associated size limit (or prohibition)—these must be correct in order to effectively implement the policy. Some members questioned whether seismic upgrades at existing facilities could be allowed but

expansions prohibited. This group also urged the inclusion of PBEM's work on hazards in liquefaction zones in this project.

State and regional business organizations echoed the concerns for clear and correct definitions that the fossil fuel representatives posed. "Region," "export," "end user," and "fossil fuel" are all important terms to get right. They also were strongly opposed to making existing facilities non-conforming uses, as well as making them limited uses with unclear exceptions. This would expose projects to discretionary land use actions, which is costly and unpredictable, and hence risky. It would likely make improvements that the community values, such as seismic upgrades, more difficult to attain.

Neighborhood and equity community organizations were skeptical that a new export terminal would be proposed in the Portland area in the wake of Pembina. They felt that Superfund sites were too expensive to acquire and build on. The group also wondered whether a new zone for fossil fuels ought to be created instead of a land use. They questioned why it ought to be allowed in IG2.

Definition of fossil fuels

Fuel terminal representatives were primarily concerned with the long-term applicability of the proposed rules. Energy markets and new technologies are constantly in flux, and it is difficult to know what the size requirements might be for newer—perhaps cleaner—fuels, particularly blended fuels. This group sought clarification for what "green fuels" meant. They noted that the proposed inclusion of LNG among city-regulated fossil fuels is inconsistent with the State of Oregon's inclusion of LNG as a "clean fuel." They called for periodic review of the rules when tomorrow's cleaner fuels become known, as they may not meet today's definitions. They cautioned about unintended consequences of placing restrictions on fossil fuel terminals, such as potentially putting more trucks on the road by restricting growth at facilities with pipeline, marine and rail access. This may result in considerably more GHG emissions. They also felt that methanol should not be included in the list of regulated fuels because it is used more as a value-added commodity than a fuel. They shared this last viewpoint with most other focus groups, except the environmental and health organizations.

Environmental and public health organizations looked to the intent of the City Council resolution and noted that it included propane, methanol, natural gas and other low-carbon fuels. At the same time, they agreed that code changes should provide flexibility to meet Oregon's low carbon fuel standard. They noted that methanol is currently being used as a fuel, so excluding it undermines the policy. The group sought clarification on how to address non-fuels. Some suggested that the GHG emissions of these input commodities should help ground their use. Others thought that the proportions (e.g., in blended fuels) should be considered—if the product is mostly used as a fossil fuel, then it should be regulated and restricted. Lastly, they highlighted how even one new LNG tank in Portland is a major safety issue. Although not explosive, coal also poses a significant risk, especially in transportation. Because of these risks, they believed that the resolution should be implemented through health and safety standards.

State and regional business organizations expressed frustration that while the federal and state government are going one direction requiring cleaner-burning fuels, the City of Portland appears to be choosing to restrict distribution of these cleaner fuels in another policy direction. Some members thought the City could try to incentivize a higher blend of renewables, and others warned of the disincentives that could discourage investment—disincentives should limit GHG emissions, not seismic upgrades.

Neighborhood and equity community organizations thought that restricting methanol exports would be an overreach. They said it is not being used as a fuel in the United States, and instead it is a value-added product used in manufacturing of plastics and other goods. Including methanol would negatively impact the manufacturing sector that requires it as an input, and it could open the door to regulating other non-fuel commodities, such as paints and asphalt. In general, they felt that if we can make certain fuels cleaner burning, then it poses minimal threat. They asserted that, since there is no clear transitional path away from our dependency on fossil fuels, we should make way for cleaner alternatives, such as blended bio-diesel.

Terminal development restrictions

Fuel terminal representatives were concerned with potential restrictions precluding development on certain site configurations, which have some peculiarities. For example, where two existing tank farms are non-contiguous (e.g., at Willbridge) and are connected by facility pipelines, they should be allowed an option for expansion. Additionally, some sites may already be built out and cannot accommodate the new growth that is expected. This group could not comment on facility size and anticipated growth, because of anti-trust laws, but they noted that it is critically important. For this reason, they could not provide feedback on the implementation options presented.

Environmental and public health organizations generally preferred Option A. However, some recognized the legal challenges posed by federal restrictions. They wondered if health and human safety risks may provide a defensible rationale. Some members also noted that while prohibiting all new facilities and making existing facilities non-conforming uses might be more legally defensible, it is much less politically feasible. Finally, some members of this group were skeptical of the 1% annual growth forecast for liquid bulks. They felt this was too high, which is contrary to what the state and regional business organization representatives stated.

State and regional business organizations criticized the approach to implementing the City Council resolution. They felt that zoning to regulate tank size approaches the problem sideways, and the unclear rationale could lead to appeals and legal challenges. One participant advocated to prohibit exports more directly, rather than a sideways approach. They cautioned that tank size limits could essentially put the region on an "import diet," even if the intent of the limit is to reduce throughput. They did not think this proposal accounted for these unintended impacts. Docked ships in the harbor may need an LNG tank to power their facilities and improve air quality, for example. They also noted that there are economic advantages and efficiency gains to being a bigger facility, and placing restrictions on size will have consequences that we don't want—lower wages for example. Lastly, they felt the 1% annual growth forecast for liquid bulks was outdated—an updated forecast would be higher. This was the opposite of what environmental and public health organizations stated.

Neighborhood and equity community organizations generally preferred Option C, calling it a realistic proposal that allows for some growth but doesn't restrict it too much. While the group was fairly resolute that coal is not a good alternative, they recognized that LNG is a cleaner-burning fuel. However, since the facilities in the region are already at capacity, Option C would allow for some wiggle room for the region's growth. They felt it would allow the "invisible hand" to guide the market more easily. They recommended that the City review the size limits every few years as the market changes.

188142
10-21-16
SP

IMPACT STATEMENT

Legislation title: Restrict bulk fossil fuel terminals. (Ordinance; Amend Title 33, Planning and Zoning)

Contact name: Tom Armstrong, Bureau of Planning and Sustainability
Contact phone: 503-823-3527
Presenter name: Tom Armstrong and Michael Armstrong

Purpose of proposed legislation and background information:

The zoning code currently allows Bulk Fossil Fuel Terminals as a Warehouse and Freight Movement use without any limits on the size of terminals. These amendments create a new land use category and impose prohibitions and limits that restrict the level of development to less than what is allowed under the current standards. The amendments will prohibit new terminals and limit the expansion of existing terminals to no more than 10 percent of the current storage capacity.

In 2012, the Council expressed opposition to coal trains traveling through Portland until a programmatic, comprehensive and area-wide Environmental Impact Statement and comprehensive Health Impact Assessment are completed (Resolutions 36959 and 36962). The 2015 Climate Action Plan commits the City to continue to advance policy and programs to reduce local fossil fuel use both in the City's own operations and through community-wide initiatives.

Resolution 37168, adopted November 12, 2015, expressed the City Council's opposition to the "expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways," and also expressing the intent not to restrict improvements in safety, efficiency, or seismic resilience; the provision of service directly to end users; or infrastructure that will accelerate the transition to non-fossil fuel energy sources.

The 2035 Comprehensive Plan sets policy direction (4.75 and 4.76) to encourage disaster-resilient development and specifically to reduce natural hazard risks to critical energy and transportation infrastructure in Portland Harbor. Most of Portland's employment and industrial zones are located in areas with moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016).

Financial and budgetary impacts:

The proposed zoning code amendments do not authorize additional spending on a new or existing City project, do not amend the City budget, and do not affect current or future staffing levels.

Community impacts and community involvement:
The amendments promote major benefits to human health and safety, environmental health and resilience, with minor impacts to economic prosperity and equity.

The amendments will restrict development of fossil fuel terminals consistent with City and State objectives on climate change and public safety. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, substituting these fuels for higher-carbon fuels does not begin to approach the goal of an 80% reduction in carbon emissions by 2050 established in Portland's Climate Action Plan or the State's 75% goal.

The amendments will reduce the scale of low, but potentially catastrophic, safety risks associated with the growth of fossil fuel infrastructure, including oil train derailments, explosive accidents at liquefied natural gas (LNG) and liquefied petroleum gas (LPG) facilities, and seismic risks of tank farms.

The amendments will restrict expansion at existing fuel terminals and prohibit new terminal development, potentially impacting associated job growth and tax revenue. However, in 2014, the 11 existing terminals in Portland only accounted for 280 jobs, out of more than 85,000 jobs in Portland's industrial areas. At the same time, the code restrictions on fossil fuel terminal development would also limit potential financial risks from a major accident involving fossil fuel infrastructure.

The potential impact of the code amendments on constraining the fossil fuel supply to meet regional demand is uncertain. Fossil fuel demand in this growing region has been relatively flat over the last 15 years. At best, the demand for fossil fuel may increase moderately, as indicated by forecasts based on long-term historic trends, or may plateau and decline with a continued shift to other modes of transportation, more fuel efficient vehicles, electric vehicles, and other carbon reduction strategies. Restricting potential increases in regional supply of fossil fuels could have a negative economic impact by increasing fuel costs. However, these potential impacts are mitigated by allowing the existing terminals to expand their storage capacity by 10 percent, which provides insurance against any uncertainty in the future demand for fossil fuels.

In Resolution 37168, the City Council expressed support for accelerating the transition to non-fossil fuel energy sources. As part of that transition, the Oregon Department of Environmental Quality (ODEQ) is implementing the Oregon Clean Fuels Program, which requires a 10 percent reduction in average carbon intensity by 2025. Fuels that could be used to achieve the standards include ethanol, biodiesel, electricity, hydrogen, natural gas, propane, and biogas, which may require additional storage capacity. In order to facilitate implementation of the Clean Fuels Program, non-fossil fuel storage tanks are not subject to the capacity limits.

Public involvement in concept development for the project consisted primarily of four stakeholder focus groups, which were held in June 2016 to review preliminary code concepts and help identify and understand potential implementation issues. The focus groups highlighted the range of stakeholder perspectives and interests concerning proposed zoning changes. Figure 4 summarizes the themes of issues raised in the focus groups. Other outreach activities have

included meetings with interagency partners, terminal operators, and other interested stakeholders.

Extensive public comments were received on the Discussion Draft and influenced substantial changes between the Discussion and Proposed Drafts. Over 700 people sent emails asking for a "full ban" on new and expanded fossil fuel terminals. Their comments included three generally consistent recommendations: a ban on new bulk fossil fuel terminals; tight limits on expansion at existing facilities; and provisions to improve the safety and resilience of existing terminals. Similar comments for further restrictions on terminal growth and seismic improvements were also made in letters from 350PDX, Portland Audubon, Center for Sustainable Economy, Columbia Riverkeeper, Oregon Sierra Club, Climate Solutions, members of a City Club seismic safety subcommittee, Linnton Neighborhood Association, League of Women Voters and other residents. Examples of other concerns raised in those letters include that code changes serve as a bold model for other jurisdictions; to partner with Portland Bureau of Emergency Management on seismic safety; and to clarify forecast growth methodologies relative to climate policies.

Themes of comments on the Discussion Draft from business and labor organizations included opposition to proposed code changes, requests for more time and analysis, and clarifications to address practical considerations. Letters were received from NW Natural, Port of Portland, Columbia Pacific Building and Construction Trades Council, Kinder Morgan, Arc Terminals, and Western States Petroleum Association (WSPA). Some examples of comments included that growth rates will change over time, that fuels meeting Oregon's Clean Fuel Standard should be excluded, inclusion of non-fuel methanol is inconsistent, and the economic analysis is cursory.

The PSC held a public hearing on September 13, 2016. Thirty-six people gave oral testimony and another 715 pieces of written and email testimony was submitted. While comments varied, predominant recommendations included removing the 5-million-gallon terminal size threshold; support for a nonconforming use designation on fossil fuel terminals and adding discretionary review criteria for expansions. Other comments focused on preventing ownership aggregation to prevent circumvention of the terminal size threshold, and support for additional building code requirements to improve seismic safety.

Figure 1. Summary themes of stakeholder focus group comments

TOPIC	FUEL TERMINAL REPRESENTATIVES	ENVIRONMENTAL AND HEALTH ORGANIZATIONS	STATE AND REGIONAL BUSINESS ORGANIZATIONS	NEIGHBORHOOD AND EQUITY ORGANIZATIONS
Key issues	▸ We've operated safely for decades. We meet the federal/state low-carbon fuel standards. ▸ Difficult to participate: very quick process; emotionally driven; antitrust restrictions. ▸ Unintended impacts: harder to meet clean fuel standards; more trucks on road; costs to rest of the state.	▸ Looking for strong, model code. Expect community backlash if expectations not met. ▸ Safety needs to be integral with climate - Mosier oil train wreck; terminals in liquefaction soils. ▸ Include disaster risks in economic analysis. Bonding or insurance for worst case.	▸ Resolution requires more research on economic impacts, etc. ▸ How will the code hold up in 5 years? ▸ What is the goal? If climate or safety, zoning tool is not the right fit. ▸ Portland is not an economic island. Statewide impact. ▸ Big political decision. Don't rush it.	▸ Safety and pollution are our priority. Look closely at seismic and explosion risks. ▸ A reasonable expectation for growth is smart. ▸ This is aggressive. Without LNG, won't China burn more coal? ▸ Rail safety in the Gorge is also a key issue that this can't resolve.
New land use category	▸ If unclear, permit staff could be pressured - unpredictable results. ▸ Use federal West Coast PADD 5 "region."	▸ Regulate both existing and new facilities. ▸ New code must effectively implement the policy.	▸ Need clear definitions: region, export, end user. ▸ Do not make terminals non-conforming or an ambiguous limited use.	▸ Why allow it in IG2? ▸ A new export terminal in contaminated harbor is unlikely.
Definition of fossil fuels	▸ Natural gas considered a low carbon fuel by State, so why included here? ▸ Tomorrow's cleaner fuels won't meet today's definitions.	▸ Excluding methanol undermines policy. ▸ If end use is mostly fuel, then limit it. ▸ One new LNG tank is a big risk. So is coal.	▸ Federal and state are going a different direction, requiring cleaner fossil fuels. Why restrict cleaner fuels at cross purposes?	▸ Make way for bio-diesel as a cleaner fuel. ▸ Methanol not a fuel in Oregon - overreaching. ▸ Fuels are okay if they have no emissions.
Terminal development restrictions	▸ Some sites are already built-out. ▸ Our non-contiguous sites are connected by pipelines. ▸ Can't comment on size.	▸ Most prefer Option A. ▸ Caution about Commerce Clause. ▸ 1% annual growth metric is too high.	▸ Don't come at sideways. Unclear rationales will lead to appeals. ▸ Size limits would put region on "import diet." ▸ Dated, low forecast.	▸ Option C preferred. ▸ Allow for modest growth of LNG and oil; not coal. ▸ Review size limits every few years.

1881422

Budgetary Impact Worksheet

Does this action change appropriations?

☐ **YES**: Please complete the information below.
☒ **NO**: Skip this section

Fund	Fund Center	Commitment Item	Functional Area	Funded Program	Grant	Sponsored Program	Amount

CITY OF

PORTLAND, OREGON

OFFICIAL MINUTES

[Excerpt Council Meeting December 13-15, 2016. Item 1385.]

A REGULAR MEETING OF THE COUNCIL OF THE CITY OF PORTLAND, OREGON WAS HELD THIS **14TH DAY OF DECEMBER, 2016** AT 9:30 A.M.

THOSE PRESENT WERE: Mayor Hales, Presiding; Commissioners Fish, Fritz, Novick and Saltzman, 5.

Commissioner Fritz arrived at 9:31 a.m.
Mayor Hales left at 11:55 a.m. and returned at 12:18 p.m.
Commissioner Saltzman left at 1:03 p.m.

OFFICERS IN ATTENDANCE: Karla Moore-Love, Clerk of the Council; Linly Rees, Senior Deputy City Attorney, and at 11:40 a.m., Lauren King, Deputy City Attorney; and Jason King and Mike Cohen, Sergeants at Arms.

On a Y-5 roll call, the Consent Agenda was adopted.

The meeting recessed at 11:32 a.m. and reconvened at 11:33 a.m.

		Disposition:
	COMMUNICATIONS	
1382-A	Request of Mike O'Callaghan to address Council regarding theft (Communication)	**PLACED ON FILE**
1382-B	Request of Matt Smith to address Council regarding declare support for Portland's Muslim community and censure Donald Trump (Communication)	**PLACED ON FILE**
	TIMES CERTAIN	
1383	**TIME CERTAIN: 9:45 AM –** Adopt the 2017 Portland Electric Vehicle Strategy to accelerate the transition to electric vehicles and increase deployment of public charging infrastructure (Resolution introduced by Mayor Hales) 30 minutes requested **Motion to add paragraph designating resolution as binding city policy:** Moved by Fritz and seconded by Hales. (Y-5) (Y-5)	**37255** **AS AMENDED**
1384	**TIME CERTAIN: 10:15 AM** – Accept the 2016 Annual Fire Prevention Report (Report introduced by Commissioner Saltzman) 30 minutes requested **Motion to accept report:** Moved by Saltzman and seconded by Novick. (Y-5)	**ACCEPTED**

1385	**TIME CERTAIN: 10:45 AM –** Restrict bulk fossil fuel terminals (Previous Agenda 1378; Ordinance introduced by Mayor Hales; amend Title 33, Planning and Zoning) 10 minutes requested (Y-5)	**188142** **AS AMENDED**
	CONSENT AGENDA – NO DISCUSSION	
1386	Appoint Thuy Tu and Daniel Newberry to the Urban Forestry Commission (Report introduced by Mayor Hales and Commissioner Fritz) (Y-5)	**CONFIRMED**
	Mayor Charlie Hales	
1387	Extend the terms of Jeff Bachrach, Michelle Rudd, Katherine Schultz, Chris Smith, Mike Houck, Gary Oxman and Maggie Tallmadge of the Planning and Sustainability Commission to expire April 1, 2017 (Report) (Y-5)	**CONFIRMED**
	Office of Management and Finance	
*1388	Ratify a Letter of Agreement between the City and Laborers' Local 483 regarding shift premium pay for certain Portland Bureau of Transportation employees (Ordinance) (Y-5)	**188134**
	Commissioner Steve Novick **Bureau of Transportation**	
*1389	Accept a grant from the Portland Development Commission in an amount of $1,453,956 for construction of Foster Transportation and Streetscape Project, SE 82nd Ave to 90th Ave (Ordinance) (Y-5)	**188135**
*1390	Authorize a contract with the lowest responsible bidder for the Foster Streetscape Project, Phase I (Ordinance) (Y-5)	**188136**
*1391	Amend contract with CH2M Engineers, Inc. for final payment for work completed for the Smart City Challenge grant project in the amount of $5,000 (Ordinance; amend Contract No. 31000660) (Y-5)	**188137**
	Commissioner Amanda Fritz **Portland Parks & Recreation**	
1392	Authorize a competitive solicitation and contract with the lowest responsive and responsible bidder for construction of the Argay Park Tennis Court Improvements Project for an estimated $500,000 (Second Reading Agenda 1352) (Y-5)	**188138**

1393	Authorize a competitive solicitation and contract with the lowest responsive and responsible bidder for construction of the Forest Park Trail Bridges Replacement Project for an estimated $640,000 (Second Reading Agenda 1353) (Y-5)	**188139**
1394	Authorize a competitive solicitation and contract with the lowest responsive and responsible bidder for construction of the Rieke Field Replacement Project for an estimated $968,808 (Second Reading Agenda 1354) (Y-5)	**188140**
1395	Authorize a competitive solicitation and contract with the lowest responsive and responsible bidder for construction of the Whitaker Ponds Entry Improvements Project for an estimated $606,000 (Second Reading Agenda 1355) (Y-5)	**188141**
	REGULAR AGENDA **Mayor Charlie Hales** **Bureau of Planning & Sustainability**	
1396	Require disclosure of energy performance ratings for residential single family buildings when listed for sale to promote transparency in housing costs and reduction in local carbon emissions (Second Reading Agenda 1358; add Code Chapter 17.108) (Y-5)	**188143** **AS AMENDED**
	Bureau of Police	
***1397**	Apply for and accept a grant in the amount of $15,000 and appropriate $10,000 for FY 2016-17 from the Oregon Department of Transportation Traffic Safety Division FY 2017 Speed Enforcement Grant program for sworn personnel overtime reimbursement (Ordinance) (Y-4; Hales absent)	**188144**
***1398**	Authorize an Intergovernmental Agreement with Washington County for sharing tactical team resources in mutual aid (Previous Agenda 1359) 10 minutes requested (Y-4; Hales absent)	**188145**
	City Budget Office	
***1399**	Authorize contract with the World Council on City Data for joining a global network of cities that are improving city services and quality of life with open data (Ordinance) 15 minutes requested (Y-4; Hales absent)	**188146**
	Office of Management and Finance	
1400	Accept bid of Streimer Sheet Metal Works, Inc. for the Mt Scott Community Center Heating, Ventilation and Air Condition Replacement and Direct Digital Control Upgrade Project for $828,585 (Procurement Report – Bid No. 00000428) **Motion to accept report:** Moved by Fish and seconded by Fritz. (Y-4; Hales absent)	**ACCEPTED** **PREPARE CONTRACT**

*1401	Authorize an amendment of the FY 2016-17 appropriation schedule in the amount of $19,255,033 for the Portland Building Reconstruction project (Ordinance) (Y-4; Hales absent)	**188147**
1402	Approve findings to authorize an exemption to the competitive bidding requirements and authorize the use of the alternative contracting method of Construction Manager/General Contractor all in connection with the Tryon Creek Wastewater Treatment Plant Headworks Project for an estimated amount of $54,000,000 (Ordinance) 10 minutes requested	**RESCHEDULED TO DECEMBER 21, 2017 AT 9:30 AM**
1403	Clarify definitions, administrative authority and make housekeeping changes to the Transient Lodgings Tax Code (Ordinance; amend Code Chapter 6.04) 30 minutes requested for items 1403-1404	**PASSED TO SECOND READING DECEMBER 21, 2016 AT 9:30 AM**
1404	Amend Tourism Improvement District code to update definitions and change the due dates and delinquency dates to match those in the Transient Lodging Tax code (Ordinance; amend Code Chapter 6.05)	**PASSED TO SECOND READING DECEMBER 21, 2016 AT 9:30 AM**
*1405	Authorize a lease extension with Oregon Pacific Investment & Development Company for the Bureau of Fire and Police Disability and Retirement office space at 1800 SW First Ave, Suite 450, commonly known as the Harrison Square Building through October 31, 2020 for approximately $205,000 annually (Previous Agenda 1365) (Y-4; Saltzman absent)	**188149**
*1406	Authorize financing not expected to exceed $51 million for an affordable housing project known as the Ellington Apartments (Previous Agenda 1364) 15 minutes requested for items 1406 and 1413 (Y-5)	**188150**
	Commissioner Steve Novick **Bureau of Transportation**	
1407	Authorize the Portland Bureau of Transportation to develop a Transportation System Development Charge methodology based upon the "Person Trip" model to more accurately reflect Portland's Transportation System (Resolution) 15 minutes requested (Y-5)	**37256**
1408	Accept findings of the South Portal Partnership Plan Project pertaining to proposed changes to roadway alignments of SW Bond Ave, SW Moody Ave, SW Hamilton St, SW Hamilton Ct, SW Lowell St, and SW Thomas St, and direct implementation of a plan to fund, design and construct remaining South Waterfront street connections (Previous Agenda 1369) 10 minutes requested **Motion to adopt amendments in staff memo dated December 14, 2016:** Moved by Novick and seconded by Fritz. (Y-5) (Y-5)	**37257** **AS AMENDED**
	Commissioner Amanda Fritz	

S-1409	Adopt the Open and Accountable Elections Policy (Second Reading S-1370; add Code Chapter 2.16) (Y-3 Hales, Fritz, Novick. N-2 Fish, Saltzman)	**SUBSTITUTE 188152**
	Portland Parks & Recreation	
1410	Create a local improvement district to construct park improvements in the Portland Open Space Sequence Local Improvement District in partnership with the Halprin Landscape Conservancy (Previous Agenda 1371; Hearing; Ordinance; C-10054) 10 minutes requested **Motion to adopt amendments in staff memo dated December 13, 2016 as updated December 14:** Moved by Hales and seconded by Fish. (Y-4; Saltzman absent) **Motion to add remaining property at 1700 SW Fourth Avenue:** Moved by Hales and seconded by Fish. (Y-4; Saltzman absent)	**PASSED TO SECOND READING AS AMENDED DECEMBER 21, 2016 AT 9:30 AM**
	Commissioner Nick Fish **Bureau of Environmental Services**	
***1411**	Authorize an application to Oregon Office of Emergency Management for a Hazard Mitigation Grant Program grant in the amount of up to $2,500,000 for Johnson Creek floodplain acquisition (Ordinance) (Y-4; Saltzman absent)	**188153**
	Water Bureau	
1412	Authorize a contract with the lowest responsible bidder for the construction of the Greenleaf Pump Station Project at an estimated cost of $1,275,000 (Second Reading Agenda 1374) (Y-5)	**188148**
	Commissioner Dan Saltzman **Portland Housing Bureau**	
***1413**	Authorize the purchase of certain real property located at 1610 NE 66th Ave at a price not to exceed $47,000,000 for affordable rental housing (Previous Agenda 1376) (Y-5)	**188151**

At 1:17 p.m., Council recessed.

MARY HULL CABALLERO
Auditor of the City of Portland

By Karla Moore-Love
Clerk of the Council

For a discussion of agenda items, please consult the following Closed Caption File.

Closed Caption File of Portland City Council Meeting
[Excerpt Item 1385.]

This file was produced through the closed captioning process for the televised City Council broadcast and should not be considered a verbatim transcript.
Key: ***** means unidentified speaker.

DECEMBER 14, 2016 9:30 AM session

11:28 a.m. Meeting continued.
Item 1385.
Hales: Council has done great work on this issue and so has the community nless there is further discussion. I believe we're ready to vote. Roll call.
Novick: Thank you, mayor, for your leadership on this issue. Really proud that Portland is adopting this policy. I do want to add a word of caution, which is that I think we have learned from the war on drugs that interrupting supply of an addictive substance is a strategy of limited usefulness so although this is an important step. We need to focus on strategies to reduce the demands for fossil fuels like transportation policies and investments that create a community where it's easier to bike and walk and take transit. So again, proud of this move. But we can't forget the demand side either. Aye.
Fritz: I'm very grateful for staff and community work on this and mayor hales' for your leadership in going for the most restrictive and careful policy possible so it's really a great honor. So some people may think I'm in festive clothing in fact I've got red for fossil fuels and green for the cannabis this afternoon aye.
Fish: I appreciate the public forums and the testimony and the work that's gone on to get to this day. There actually was a lot of drama that preceded this. Today it's drama free. We are united in taking a step and I think we got it right. Aye.
Saltzman: thank you, mayor, for your leadership on this and I think this is a good policy and I'm pleased to support it. Aye.
Hales: I want to thank the activists in our community that have called us to our conscience on this issue. Some of you are here today. You've worked long and hard to make us a leader. I'm proud that we're a leader. I'm wearing my c40 pin because I was at the conference to accept an award for having the best climate action plan in the world. I didn't expect to deliver the applause line of the conference and my ego didn't require it but I did. That's because as I was accepting that award I looked out over the crowd and pointed out my colleagues, rahm Emanuel from Chicago was there, Eric garcetti from Los Angeles, Ed Murray from Seattle, Greg Stanton from phoenix and Steve Adler from Austin. I said to the group of worried cities around the world who are partners in this work that regardless of what you're reading or hearing about the united states that the cities of our country that are climate action cities are still in this work, and are still committed. What you're doing here by pushing our city to keep adopting the kind of policy three of which we're taking action on today is making those words real, showing that we are climate leaders. Best of all, most of all this is how we're expressing our values about the place we live in. We live here together. We want this to be a sustainable, responsible community. You have helped us be just that. I'm very proud of this day. Aye. [cheers and applause] thank you all very much.
Fritz: Thank you for coming to share this moment with us. I really appreciate it you followed through every time.
Hales: Thank you.
[End of excerpt.]

From: Brian Conwell
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, December 09, 2016 9:49:07 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Brian Conwell
P.O. Box 283
Unalaska, AK 99685

From: Kountz, Steve
To: BPS Fossil Fuel Zoning
Subject: FW: Let"s Revive Portland"s Fossil Fuel Ban!
Date: Monday, December 12, 2016 10:44:11 AM

-----Original Message-----
From: Brian Conwell [mailto:bconwell828@gmail.com]
Sent: Friday, December 09, 2016 9:51 AM
To: Kountz, Steve <Steve.Kountz@portlandoregon.gov>
Subject: Let's Revive Portland's Fossil Fuel Ban!

Dear Mr. Kountz and Portland Bureau of Planning and Sustainability:

In its effort to develop code changes to implement the City's historic November 2015 Fossil Fuel Policy, I am encouraging the Bureau of Planning and Sustainability to return to the initial intent and plain language of the resolution. The resolution stated the City's intent to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

In short, I am asking the City to enact a ban of new fossil fuel infrastructure - in particular oil, gas, and coal terminals in Portland.

Unfortunately, the Fossil Fuel Terminal Zoning Amendments discussion draft falls far short of the 2015 Fossil Fuel Resolution that the City Council passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

Please revise proposed code changes to include:
- A ban on new bulk fossil fuel terminals
- Strong limits on expansions at existing facilities
- Provisions to improve the safety and resilience of existing terminals

Presently, the discussion draft allows new bulk terminals to be built, setting limits that would significantly increase fossil fuel projects in the City, including 21 million gallons of new crude oil storage and a new LNG tank the size of NW Natural's existing facility in NW Portland. New LNG tanks and petroleum storage (enough to hold 7 unit trains worth of oil) would double down on precisely the kind of fossil fuel projects that the City Council intended to ban in November 2015. Please revise the proposed code changes to ban new bulk fossil fuel terminals.

The proposed code changes would also allow existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Proposed code The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it! Please revise proposed code changes to set limits on existing bulk fossil fuel terminals, and add provisions to encourage existing facilities to improve their safety and resilience in a large seismic event.

As one of thousands who supported the City's Fossil Fuel Policy, I urge you to develop a new, strengthened draft before the Planning and Sustainability's Commission's hearing in September.

Sincerely,

Brian Conwell

188142

P.O. Box 283
Unalaska, AK 99685

CITY OF

PORTLAND, OREGON

OFFICIAL MINUTES

[Excerpt Council Meeting December 7-8, 2016. Item 1378.]

A RECESSED MEETING OF THE COUNCIL OF THE CITY OF PORTLAND, OREGON WAS CANCELED THIS **8TH DAY OF DECEMBER, 2016**.

THIS MEETING WAS CANCELED DUE TO INCLEMENT WEATHER

		Disposition:
1378	**TIME CERTAIN: 2:00 PM –** Restrict bulk fossil fuel terminals (Second Reading Agenda 1281; Ordinance introduced by Mayor Hales; amend Title 33, Planning and Zoning) 10 minutes requested	**RESCHEDULED TO DECEMBER 14, 2016 AT 10:45 AM TIME CERTAIN**
1379	**TIME CERTAIN: 2:10 PM –** Provide affordable housing through an Inclusionary Housing program (Ordinance introduced by Mayor Hales; amend Title 33, Planning and Zoning) 3 hours requested for items 1379 and 1380	**RESCHEDULED TO SPECIAL MEETING DECEMBER 13, 2016 AT 9:00 AM TIME CERTAIN**
1380	Provide affordable housing through an Inclusionary Housing Program and update the Multiple-Unit Limited Tax Exemption Program (Ordinance introduced by Commissioner Saltzman; add Code Section 30.01.120, amend Section 30.01.030 and Chapter 3.103)	**RESCHEDULED TO SPECIAL MEETING DECEMBER 13, 2016 AT 9:00 AM TIME CERTAIN**

MARY HULL CABALLERO
Auditor of the City of Portland

Susan Parsons

By Susan Parsons
Acting Clerk of the Council

From: Myrie, Trevaun
To: Council Clerk – Testimony
Subject: FW: Fossil Fuel Resolution
Date: Monday, December 05, 2016 8:58:56 AM

Trevaun Myrie
Admin Support Specialist
Office of Mayor Charlie Hales
1221 SW Fourth Avenue, Suite 340
(Office) (503) 823-4120
Trevaun.Myrie@portlandoregon.gov

From: Councillor Laura Dupont [mailto:Dupontl@portcoquitlam.ca]
Sent: Wednesday, November 30, 2016 4:19 PM
To: Hales, Mayor <mayorcharliehales@portlandoregon.gov>; Commissioner Fish <nick@portlandoregon.gov>; Commissioner Fritz <amanda@portlandoregon.gov>; steve@portlandoregon.gov; Commissioner Saltzman <dan@portlandoregon.gov>
Subject: Fossil Fuel Resolution

Dear Mayor Hales and Portland City Commissioners:

I am Councillor Laura Dupont from City of Port Coquitlam, BC . I am also a member of the Safe Energy Leadership Alliance (SELA), a coalition of more than 165 elected local, Tribal, and state leaders from the Pacific Northwest, Montana, Idaho, California, and British Columbia, advocating for full assessment of risks and costs of proposals to dramatically expand fossil fuel transport and export through our region. While we come from diverse communities, both rural and urban, SELA members share core interests of protecting public health and safety, Treaty rights and cultural resources, and the environment. Fossil fuel transport is a particular concern for my community because of climate change.

I want to commend you for your leadership in adopting Portland's Fossil Fuel Resolution in November 2015, which outlines risks and impacts from transport of fossil fuels on public health and safety, air and water quality, and economic development. These impacts are carried to communities across our region by rail and barge lines, and I share the City of Portland's concerns.

I want to thank you for your current efforts to develop and adopt policies and codes to implement the city's Fossil Fuel Resolution. Your action in Portland will benefit communities facing impacts from increased movement of coal and oil by rail and barge, and will stand as a model for other local governments considering policy and code updates to condition fossil fuel infrastructure.

Thank you for your leadership on this important issue.

Sincerely,

Councillor Laura Dupont
City of Port Coquitlam
2580 Shaughnessy Street
Tel. 604-927-5410
Cell. 604-328-8026
www.portcoquitlam.ca

188142

King County

Dow Constantine
King County Executive

401 Fifth Avenue, Suite 800
Seattle, WA 98104

206-296-9600 Fax 206-296-0194
TTY Relay: 711
www.kingcounty.gov

December 5, 2016

Mayor Charlie Hales
Commissioner Nick Fish
Commissioner Amanda Fritz
Commissioner Steve Novick
Commissioner Dan Saltzman
1221 SW 4th Ave., Room 340
Portland, OR 97204

Dear Mayor Hales and Portland City Commissioners:

I am writing to thank you for your leadership in developing local policies and regulations for development of fossil fuel infrastructure in the City of Portland.

I am the elected Executive for King County, Washington, home to more than 2 million residents.

I am also the chair of the Safe Energy Leadership Alliance (SELA), a coalition of more than 165 elected local, Tribal, and state leaders from the Pacific Northwest, Montana, Idaho, California, and British Columbia advocating for full assessment of risks and costs of proposals to dramatically expand fossil fuel transport and export through our region. While we come from diverse communities, both rural and urban, SELA members share core interests of protecting public health and safety, Treaty rights and cultural resources, and the environment. Fossil fuel transport is a particular concern for my community because oil trains come through the heart of King County and the Puget Sound region, bringing risks of spills and explosions to densely populated urban areas like downtown Seattle and to sensitive waterways, and salmon habitat.

I want to commend you for your leadership in adopting Portland's 2015 Fossil Fuel Resolution, which outlines risks and impacts from transport of fossil fuels on public health and safety, air and water quality, and economic development. These impacts are carried to communities across our region by rail and barge lines, and I share the City of Portland's concerns.

I want to thank you for your current efforts to develop and adopt policies and codes to implement the city's Fossil Fuel Resolution. Your action in Portland will benefit communities facing impacts from increased movement of coal and oil by rail and barge, and will stand as a model for other local governments considering policy and code updates to condition fossil fuel infrastructure.

Thank you for your leadership on this important issue.

Sincerely,

Dow Constantine

Dow Constantine
King County Executive

CITY OF

PORTLAND, OREGON

OFFICIAL MINUTES

[Excerpt Council Meeting November 16, 2016. Item 1281]

A REGULAR MEETING OF THE COUNCIL OF THE CITY OF PORTLAND, OREGON WAS HELD THIS **16TH DAY OF NOVEMBER, 2016** AT 9:30 A.M.

THOSE PRESENT WERE: Mayor Hales, Presiding; Commissioners Fritz and Novick, 3.

OFFICERS IN ATTENDANCE: Susan Parsons, Acting Clerk of the Council; Ben Walters, Chief Deputy City Attorney; and Jason King and Mike Cohen, Sergeants at Arms.

The Consent Agenda was rescheduled to November 17, 2016.

		Disposition:
	COMMUNICATIONS	
1260	Request of Chet Orloff to address Council regarding Forest Park (Communication)	**PLACED ON FILE**
1261	Request of Phyllis Reynolds to address Council regarding Forest Park (Communication)	**PLACED ON FILE**
1262	Request of George Milne to address Council regarding the liability of interfacing hikers and bicycles on the trails in Forest Park (Communication)	**PLACED ON FILE**
1263	Request of Barbara Dugan to address Council regarding dangers to senior citizens if single track cycling is allowed to occur on pedestrian only trails in Forest Park (Communication)	**PLACED ON FILE**
1264	Request of Alex Schay to address Council regarding dangers to people with disabilities if single track cycling is allowed to occur on pedestrian only trails in Forest Park (Communication)	**PLACED ON FILE**
	TIMES CERTAIN	
1265	**TIME CERTAIN: 9:45 AM –** Accept findings of the South Portal Partnership Plan Project pertaining to proposed changes to roadway alignments of SW Bond Ave, SW Moody Ave, SW Hamilton St, SW Hamilton Ct, SW Lowell St, and SW Thomas St, and direct implementation of a plan to fund, design and construct remaining South Waterfront street connections (Resolution introduced by Commissioner Novick) 1 hour requested	[Council Work Session to be held Nov 28 at 11am] **CONTINUED TO DECEMBER 7, 2016 At 9:30 AM**

	CONSENT AGENDA – NO DISCUSSION	
	Mayor Charlie Hales	
	Bureau of Police	
1266	Ratify an amendment to the collective bargaining agreement between the City and the Portland Police Commanding Officers Association to make PPCOA Labor Agreement Article 33 consistent with Human Resources Administrative Rule 8.03 (Ordinance) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM	**PASSED TO SECOND READING NOVEMBER 23, 2016 AT 9:30 AM**
***1267**	Authorize an Intergovernmental Agreement with the Multnomah County District Attorney to partially fund the cost of employing three full-time equivalent District Attorney investigators not to exceed $265,405 (Ordinance) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188087**
1268	Amend an Intergovernmental Agreement with Multnomah County for the Sex Buyers Accountability and Diversion Program (Second Reading 1233; amend Contract No. 30002122) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188088**
	Fire & Police Disability and Retirement	
***1269**	Amend the Fire and Police Disability, Retirement and Death Benefit Plan in order to comply with an arbitration decision regarding final pay calculation for members of Portland Firefighters Association and Portland Police Commanding Officers Association (Ordinance) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188089**
	Office of Management and Finance	
***1270**	Pay claim of Randall Cummings in the sum of $6,554 involving the Portland Police Bureau (Ordinance) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188090**
***1271**	Authorize leasing of commercial office space at non-City owned buildings to temporarily relocate business operations during the Portland Building Reconstruction project (Ordinance) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188098**
***1272**	Authorize a lease extension with Oregon Pacific Investment & Development Company for the Bureau of Fire and Police Disability and Retirement office space at 1800 SW First Ave, Suite 450, commonly known as the Harrison Square Building through October 31, 2020 for approximately $205,000 annually (Ordinance) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM	**CONTINUED TO DECEMBER 7, 2016 AT 9:30 AM**

1273	Extend term of a franchise granted to MCI Metro Access Transmission Services, Inc. to build and operate telecommunication facilities within City streets (Second Reading Agenda 1238; amend Ordinance No. 169230) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188091**
1274	Extend term of a franchise granted to Electric Lightwave, Inc. to build and operate telecommunication facilities within City streets (Second Reading Agenda 1239; amend Ordinance No. 170283) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188092**
1275	Extend term of a franchise granted to McLeodUSA Telecommunications Services, Inc. to build and operate telecommunication facilities within City streets (Second Reading 1240; amend Ordinance No. 175061) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188093**
1276	Extend term of a franchise granted to XO Communications Services, LLC to build and operate telecommunications facilities within City streets (Second Reading Agenda 1241; amend Ordinance No. 175062) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188094**
	Commissioner Steve Novick **Bureau of Transportation**	
***1277**	Authorize the Bureau of Transportation to execute a temporary easement with Oregon Health Science University as part of the SW Bond Avenue Project (Ordinance) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188095**
***1278**	Authorize an Intergovernmental Agreement between the Bureau of Transportation and TriMet for the review and inspection of proposed improvements at the SW Bond Ave and SW Porter St intersection (Ordinance) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188096**
	Commissioner Nick Fish **Bureau of Environmental Services**	
1279	Authorize the Bureau of Environmental Services to execute an easement with TriMet as part of the Portland to Milwaukie Light Rail: SE Powell Boulevard/16th Avenue Storm Sewer Project No. E10060 (Ordinance) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM	**PASSED TO SECOND READING NOVEMBER 23, 2016 AT 9:30 AM**

1280	Authorize an Intergovernmental Agreement with Home Forward to allow the Percent for Green Program to fund the construction of a green street facility as part of Home Forward's construction project at St. Francis Apartments at SE 11th Ave., SE 12th Ave,. SE Stark St. in the amount of $113,936 (Second Reading Agenda 1243) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188097**
	REGULAR AGENDA	
	Mayor Charlie Hales	
	Bureau of Planning & Sustainability	
1281	Restrict bulk fossil fuel terminals (Previous Agenda 1259; amend Title 33, Planning and Zoning) 1 hour requested **Motion to accept amendments 1-6, and 8 as prepared by City staff November 16, 2016 and modify paragraph a of amendment 6 to prohibit the storage of coal:** Moved by Hales and seconded by Novick. (Y-3)	**PASSED TO SECOND READING AS AMENDED DECEMBER 8, 2016 AT 2:00 PM**
	Commissioner Steve Novick	
	Bureau of Emergency Management	
***1282**	Authorize an Intergovernmental Agreement with eligible parties for the Sharing of Emergency Operations Center Personnel within the Greater Portland Metropolitan Region when personnel are unable to get to their normal reporting location (Ordinance) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188099**
	Bureau of Transportation	
1283	Authorize the Bureau of Transportation to allocate $500,000 to the Portland Parks Foundation for construction of the Footbridge Over Burnside (Ordinance)	**PASSED TO SECOND READING NOVEMBER 23, 2016 AT 9:30 AM**
1284	Make administrative changes to Motor Vehicle Fuel Tax Code for more efficient implementation of the Street Repair and Traffic Safety Program (Second Reading Agenda 1254; amend Code Chapter 17.105) (Y-3)	**188086**
	Commissioner Amanda Fritz	
	Portland Parks & Recreation	
1285	Amend provisions relating to possession of cannabis in parks to conform to State law (Ordinance; amend Code Section 20.12.040) 10 minutes requested **Motion to replace "marijuana" with "cannabis":** Moved by Fritz. Housekeeping motion. No vote taken.	**PASSED TO SECOND READING AS AMENDED NOVEMBER 23, 2016 AT 9:30 AM**

*1286	Authorize a competitive solicitation and contract with the lowest responsive and responsible bidder for construction of the Colonel Summers Park Splash Pad and Portland Loo Installation Project (Ordinance) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188100**
*1287	Amend contract with DAO Architecture, LLC in the amount of $3,500 to complete work on the Colonel Summers Park gate design (Ordinance; amend Contract No. 30004821) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188101**
*1288	Designate and assign the Mt. Tabor Annex from Portland Parks & Recreation to the Portland Housing Bureau for development of affordable housing and transfer $1,200,000 to Parks Memorial Fund (Ordinance) RESCHEDULED TO NOVEMBER 17, 2016 AT 2:00 PM (Y-4)	**188102**
	Commissioner Nick Fish **Water Bureau**	
1289	Authorize a contract and provide payment for the construction of the Sandy River Engineered Log Jam Placement Project at an estimated cost of $2,300,000 (Ordinance)	**PASSED TO SECOND READING NOVEMBER 23, 2016 AT 9:30 AM**

At 12:41 p.m., Council recessed.

MARY HULL CABALLERO
Auditor of the City of Portland

By Susan Parsons
Acting Clerk of the Council

For a discussion of agenda items, please consult the following Closed Caption File.

Closed Caption File of Portland City Council Meeting
Excerpt, Item 1281.

This file was produced through the closed captioning process for the televised City Council broadcast and should not be considered a verbatim transcript.
Key: ***** means unidentified speaker.

NOVEMBER 16, 2016 9:30 AM Session

11:15 a.m. Meeting continued:
Hales: We're going to get back to work here and move on to item 1281.
Item 1281.
Hales: Thank you so we had an excellent hearing on this proposal last week, we have people signed up that did not get to speak and we have a lot of interest in the room on continuing this discussion. Let me suggest a way we may move through this fairly quickly. I'm going to call staff up to walk through the amendments and we have a work sheet in front of the council that has those potential -- the amendments put on the table last week plus additional ones based on testimony and we'll identify those by number and content. Thank you.
Tom Armstrong, Bureau of Planning and Sustainability: Tom Armstrong with bps. As you said at last week's hearing there were four amendments put on the table that were corrections and clarifications as well as additional directions to staff for are follow-up in three years to see how things are going as well as following up on the seismic upgrades of storage tanks. Based on the testimony from last week's hearing council expressed an interest in looking at four additional amendments which we have before you today. The first one amendment number 5 was in response to testimony by the working waterfront coalition to add clarify the description of what we meant by storage capacity to make sure it's clear that it's storage tank capacity, so we have prepared a code amendment to make that clarification. Six and seven were sort of the conversation we got into around whether or not to allow for a 10% expansion with seismic replacement of storage tanks or if we did not do that would we want to consider allowing an expansion for fuel blending that is needed to comply with the state clean fuels program. So that's what amendment 6 and 7 are. Based on the outcome of 6 and 7 we have a revised ordinance in finding for you to adopt to support those amendments.
Hales: Want to make sure council questions about any of those but I'm prepared to make a motion to take a group of those as a package. See if we -- an agreement about that. If not, we can unbundle them.
Fritz: I appreciate that I need some clarification on amendment 5.
Armstrong: Yes.
Fritz: It looks like 33.114.100. b1 we're still adding the 10%'.
Armstrong: Yes. It's a sequence of amendments as you go through and so if you look at amendments 6 and 7 you will see the words tank has been included in there because we assume that was a straightforward amendment and would be made. You amended you recommended the draft in 5 to add tank. When you decide 6 and 7, that changes those will change depending on which outcome how the 10% is applied or taken away. So they build on each other.
Fritz: I don't see where we're saying it's not 10% more.
Hales: She's looking at 33.141.007.1 where there's still a mention of 10%.
Armstrong: Under amendment 6 or under amendment 7 --
Fritz: Under 7.
Armstrong: Right. There's two options under 7. One is to option 1 is allow 10% expansion

for seismic and fuel blending. Option 2, to allow it only for fuel blending.
Hales: But if we adopted amendment 6 those words would disappear from that subsection?
Armstrong: Well -- it depends on what you -- which outcome you want. If you want to allow no expansion, you adopt number 6 and reject number 7.
Hales: But then the words she's reading in that subsection, 10% --
Armstrong: Never comes up. You have not adopted amendment 7.
Fritz: So we're not giving any extra for blended we're just saying.
Armstrong: If you say no to amendment 7 there would be no extra expansion for that.
Fritz: That's where I'm confused. Usually when we have amendments I'm ready to say yes to everything so you're just directing me to which ones you want to say no to.
Hales: Here's what I --
Armstrong: At the top of the cheat sheet is which outcome you want.
Hales: This is what -- suppose we keep track of this so the public can I want to make a motion to adopt a package of amendments including the first four, that is amendment 1 that clarifies the truck only terminals are not bulk fossil fuel terminals. Number 2, clarifies that fuel storage for airports and marine servicing facilities and railyards, filling stations for trains, planes and ships are not fossil fuel terminals. 3 clarifies our definition that non fuel petroleum based products like asphalt and lubricants won't get burned and put into the atmosphere those are not fossil fuel, bulk fossil fuel facilities. The fourth, requiring some follow-up actions from council next year. Those have not changed and those are included in my package. Is also want to include amendment 5 that does this clarification about storage tank capacity. Amendment 6, which deletes the 10% expansion and I'm not going to include number 7. It includes number 8 which revises the findings. Here's my rationale. Let me see if there's a second.
Fritz: Second.
Hales: One, we heard very compelling testimony from the advocates for this policy that we should be totally clear that we're not interested in incremental expansion and we also heard testimony from the fossil fuel industry that the hopes for result of that provision which staff was trying to be practical about was not going to happen. That is, it's not a sufficient incentive of itself to cause people to make seismic improvements. We deem to deal with the issue of seismic improvements whether by changing the state building code or by some other means but we're not going to get it done with an incentive. So including an incentive is not a good bargain for anyone and I don't think we should take that approach. That's the rationale behind this approach. If we're comfortable with that we can act on it and then see if any folks are still interested in testifying or ready to go home or whatever they want to do.
Fritz: I think we hear testimony.
Hales: Let's give the people signed up last week a chance to do so then see if we can proceed.
Fritz: Be aware the amendments on the table so if your fine with them then just pass and that continues the vote.
Hales: If you still want to speak, if you think we still don't have it right, don't hold back.
Hales: Got your first three.
Bob Sallinger: Good morning, I'm bob Sallinger, conservation director for the Audubon society. I was going to testify this morning in taking the 10% off the table, keeping it off without any additional changes. I appreciate your comments already this morning. That's huge. It eliminates a real loophole and something you have talked about how you want this to be replicable in other places. It's great that's out of there. That is the kind of thing that gets replicated. It's also a thing that once it's in there becomes an entitlement, hard to get

back out. Congratulations on that decision already. This is truly an historic moment, exciting to Audubon in part because it restores the kinds of progressive visionary leadership which Portland is known for. Sometimes I feel like we have gotten preventing really bad things happening but not necessarily leading the way. This restores that kind of role so it's an exciting moment. I think it's that kind of visionary leadership Portland is known for nationwide. The only thing I'll say is I hope we go to Salem and pass legislation to make fossil fuel companies do the upgrades they should have done decades ago. It's absolutely reprehensible they have been sitting on a ticking time bomb for decades and they have known it. These are some of the most wealthy companies in the city, the state, the country and the world. They have the capacity of fixing these things with or without incentive and should have done it long ago. It's time to go down to Salem. I know a lot of folks would go with you to make sure it happens and happens soon. Thank you.
Marjorie Kirchner: Good morning. Marjorie kirchner from Oregon physicians for social responsibility has asked me to read her comments as she is unable to be here. Thank you, mayor and commissioners, for this opportunity to comment on groundbreaking zoning amendments that will protect our health and climate. Oregon physicians for social responsibility wholeheartedly supports amendment six and the mayors package. Thank you.
Hales: Thank you. Good morning.
Dan Serres: Dan serres, conservation director for Columbia river keeper. Thank you for your leadership on this. On the first issue bob has already said we agree with bob on 10%. Thank you for taking that up. On amendment 5 there's just two issues that lucked out. First is coal is not stored in tanks. So there's a potential problem there with adopting amendment 5, which is just something we might want to consider. Then the second piece of amendment 5 if it's meant to address pipe capacity in all likelihood because pipelines that aren't pertinent to a large fossil fuel facility if they are a big transmission pipeline they are likely already exempt because of federal preemption at least for natural gas pipelines so if that's a major concern amendment 5 may not be as necessary for addressing that piece if that's really where your focus is. So we strongly support amendment 6 and the amendments 1 through 4 as laid out. Thank you.
Hales: Thank you all very much. Others?
Hales: Good morning. We have three.
Hales: Micah, stand by. We'll get you next. Good morning.
Don Steinke: Good morning. I'm don Steinke from Vancouver, Washington. I'm not perfectly sure if all my concerns got addressed. Methane is a main component of natural gas. It has a very potent greenhouse effect. The epa has recently declared that methane concentrations in the air have gone up 30% and this increases coincided with leaks associated with fracking. We get most of our natural gas from frack wells in British Columbia, 12,000 of them. Maybe 100,000 in the Midwest. Fracking endangers the water and endangers our climate more. I believe natural gas is almost as bad as coal in terms of climate. Corporations are required to put shareholder value above the greater good. Once the pension funds and investment banks have built fossil fuel infrastructure they will demand return on investment for a life time. As of this month all gas stations in Russia are required to provide electric car charging stations at their own expense. The upper house in Germany has asked the European union to ban new cars that require diesel or gasoline by 2030 and Norway is planning to do that by 2025 and has already begun the transition with city vehicles, postal delivery trucks and school busses there is no fixed demand for anything. Demand is created by supply. The alternatives are here. The lease payments on my new electric car are only $130 a month. It won't use gasoline, biofuels, low carbon fuels. We don't need increased infrastructure for them or for blending. Keep your

ordinance strong. I support amendment 6. Come back in a month or two and consider having a new construction make charging outlets accessible to all occupants and new infrastructure thank you.
Hales: Good morning.
Paige Spence: Good morning, mayor hales and commissioners. I'm Paige Spence, the Oregon conservation network director at the Oregon league of conservation voters. Thank you for the opportunity to speak. I'm particularly grateful to city council for continuing to work on mitigating climate change in light of recent national elections which have us very fearful of environmental protection roll backs under the administration. Ocn is very grateful to the work that has gone into passing the resolution a year ago. First with regard to allowing for the 10% expansion we appreciate you looking at this to in order to limit the potential expansions and we support your proposed package of amendments mayor hales. Second I will ask that you eliminate the exemption for new facilities less than 10,000 gallons. We urge you not to include a blanket exception for facilities under 2 million gallons' fossil fuel demands should be declining as you all agree and we do not need and the amendments need not allow for new fossil fuel infrastructure. Third, please continue to reject northwest naturals efforts to be exempted. I'm exciting to see the positive results of this process and be a part of this transition away from fossil fuels. Thank you for all your work to make this possible. I want to thank outher groups. 350 Pdx, Portland Audubon, Columbia keeper, climate action coalition, friends of the Columbia gorge, Oregon physicians for social responsibility, the senate for sustainable economy, the Sierra club, oec and elcd. Tons of great work. Thank you.
Hales: Good morning.
Alona Steinke: My name is alona Steinke, a retired Rn from Vancouver I have asthma and I'm concerned that allowing any new terminals to be built would put more dangerous and polluting trains on the track. Increasing the number of unit trains not only would increase the likelihood of derailment, fire and explosion it also increases toxic and cancer causing air pollution from the four diesel locomotives that power each train. Senators Wyden and merkley and congressman Blumenauer have referred to Portland's air pollution as a public health emergency. In Vancouver in Clark county we have failed air quality standards and last year we came within one bad air day of being declared noncompliant. Our Columbia river is the second most endangered in the u.s. The haze in the gorge is the worst in the western united states. The city of Vancouver has an ordinance that only addresses oil. Now you're a real climate leader by adopting a more comprehensive ordinance. You have set an example for the cities of Vancouver, Hoquiam and Wattcom county. You have already captured international attention by your bold action. Canadian members of parliament Elizabeth may has also endorsed your resolution. Cities have to lead and you are leading us to a future where we have clean water and air that doesn't make us sick. A future safe for our children, our grandchildren and generations beyond. Thank you for supporting amendment 6.
Hales: Thank you all.
Hales: Good morning.
Micah Meskel: Thank you, council and mayor. My name is Micah Meskel I'm with the Audubon society of Portland, I was also a steering committee member for the natural hazard mitigation planning process and I looked at the terminals themselves. I appreciate the current set of amendments and would like to expand on pbems what the presentation last week that was given. I would like to make a couple of points. The vulnerability of the current infrastructure is a big deal. Most of that was put in place before building codes and it is a ticking time bomb. We think that bolsters argument to remove the 2-million-gallon threshold for new facilities. We think adding any new infrastructure to the cei hub is a big

mistake. Those new facilities are still vulnerable to explosions from the facilities that have not been upgraded. Because of the close proximity of that area and likelihood that it can all slosh into the river in the event of an earthquake. We think putting any new infrastructure there is only adding to that issue. Then one point jonna as a pbem staffer may have been reluctant to advocate on but I will as a committee member speak up to is the need for bds, fire and pbem to be adequately supported in the process of moving down to Salem to adjust the -- to look into proposals regarding building codes. They need proper staffing for that. They also need the political support of council. We think that's paramount in taking this process to actually looking at how we can really add safety to our community through requiring seismic upgrades.

Hales: Thank you very much. Good morning.

Mary Peveto: Thank you for this opportunity. My name is Mary Peveto and I'm here with neighbors for clean air to support mayor your package of amendments particularly 6 and 1 through 4 with also the consideration considerations for five already spoken to. In 2010 when we started to look at air toxicity it didn't take long to get to the tank farm on highway 30. There are seven companies, they operate eight terminals they include 586 storage tanks and have a total capacity of 300 million. They admit just the storage tanks sitting there emit 1394 tons annually of volatile debris and compounds. For us it's the embodiment of the disconnect between Portland ideals that have brought us to a 19% reduction in carbons emissions for 1990 standards and the state of our regulations which deal with the other 188 air pollutants which have only served to mimic federal regulations, antiquated federal regulations. This has put people in harm's way and are innovative and continue progressive residential infill in our cities and growth is just putting more people in harm's way. I have further testimony as the backdrop of obviously supporting I don't see any reason why we would be doing expansion. I think we have got to use every lever that we have to eliminate, to get rid of this dangerous juxtaposition. For its existing threat and for the future threat and catastrophic earthquake. I would also like this opportunity to put a plug into your group to empower your representatives on the cleaner air Oregon advisory committee Susan Anderson so that she can help us maximize the authority the state has through errors omissions regulatory jurisdiction to modernize, to do what they need to do, to meet the ideals of our 21st century sustainability Portland and growth goals.

Akash Singh: Good morning. I'm a student fellow at the institute of sustainable solutions and also in conjunction with neighbors for clean air. I am strongly in support of this entire proposal especially amendments 1 through 4 and number 6 in regards to coal and number 5. Last weekend an industry representative noted that he felt like he had been invited to a barbecue. It was darkly amusing that a man who is digging into the meat himself he imagined that he was part of the meet. Speaking as someone who is a part of that meat I cannot underscore for every individual who strives to make this world a more equitable place. A good chunk of that is in regards to environmental justice. It means protecting those around us from the effects of climate change we can protect everyone else. I believe today in part we can prove Portland has a reputation of being a liberal icon that is truly a beacon of leadership upon urban America. I choose to believe my elected city officials will stand with the basic scientific truth and existence of this planet for generations to come. I beseech you to listen to the voice of our communities. Our tribes list the critical danger that fossil fuels pose to their existence. We cannot afford to ignore their concerns. As was stated last week governor Barbara Walters is holding her 80th birthday this year. I hope you will make sure that we reduce or possibly eliminate our dependence on fossil fuels. Today I implore you to use your offices to protect the citizens that put you there, to protect the power bestowed upon you with their votes. I implore you to stand with the planet in its greatest time of need. Thank you.

Hales: Thank you all.
Peter Wilcox: Good morning. Thank you, mayor hales, other commissioners. Nice to see you. I'm captain peter Wilcox, president of the Columbia river keeper. I'm also a co-founder and owner of sequential biofuels which for 15 years has made certified biodiesel who for 15 years has made over 8 million gallons a year from recycled food processing oil. Fully reclaimed product. This is a clean and low carbon biodiesel which can turn even Volkswagen tdis into true green vehicles. We and Columbia river keeper and I can see no reasonable justification for the proposed 10% storage tank expansion and I'm glad to hear about amendment 6 and we're glad to support that amendment. Fossil fuel use has been flatter and declined for many years in Oregon and a central point of the policy we passed a while back was to make sure that continues and accelerates. The gradual market penetration of electric vehicles and increasing bio fuel mileage of newer vehicles will ensure this. Furthermore, there's a massive worldwide growth in the clean biofuels industry as well as a dirty biofuels industry that we have to be careful of including cost effective methods to make a biodiesel renewable diesel that can be used in absolutely any diesel engine seamlessly, without any blending. The blending issue is its on its way from technology standpoint and development in the field of bio based fuel and lubricants becoming less and less important as we move towards fuels that can be used without blending. That's already happening in diesel but it's going to happen in the gas arena as well. They are now making bio based fuels and lubricants around the world from cellulosic waste and the big prize is algae. Of course we have a global explosion of algae and a overproduction of algae around the world. Oceans because of warming will create an opportunity to make an awful lot of bio based fuels in the future. One of the most important aspects of the new fossil fuel policy is as the first example anywhere is that it will be utilized as you said as a template around your world, around the country for policy and so we want to make sure the policy is the best one possible. I think you're now on track to do that so I support that. Thank you for your time.
Hales: Thank you very much. Good morning.
*****:** I will defer to Ms. Weber.
Patricia Weber: Well, thank you. Good morning. I'm Patricia weber. I would like to thank you for allowing me to testify. I strongly support amendment 6 and urge you to adopt it. The reason is simple. Seismic upgrades of buildings and other facilities is not under the purview of land use code planning provisioning; they are regulated by building codes therefore it is not appropriate for the zoning code to be amended to incent seismic upgrades. My professional background includes working for over 20 years as a licensed professional engineer in Oregon as well as ten years in the land use planning profession. My experience is working as a private sector consultant though I have sat on both sides of the desk, so to speak. The purpose of land use planning is to develop vibrant and sustainable communities in a way that meets policies of the comprehensive plan. Beyond that regulations that apply are developed to promote capability between properties and their neighbors. Factors such as basic site design, impacts on traffic, parking, odors, so on are to be considered. Land use planning regulations traditionally stop at the exterior of the building or facility. Given the testimony that you received indicating that a 10% incentive would be ineffective testimony that jibes with everything in my professional experience and that the public testimony overwhelmingly rejects the 10% expansion, the appropriate mechanism by which to address seismic resiliency is through pbm and the state building codes division.
Ted Gleichman: Good morning. Ted Gleichman today representing the Oregon sierra club. I gave copies of my testimony to the council staff. Also in collaboration with Gregory Monahan, who spoke with you last week right after the amazing teenagers.

Hales: Tough act to follow.
Gleichman: Exactly. On the other hand, as grandparents, Gregory and I and a huge percentage of the membership of sierra club feel strongly about the opportunities for everybody's grandchildren going forward and we really appreciate all the work you've put in. So what I have provided you with is the three open letters that we prepared, one last week submitted as testimony in writing, then one today focusing on looking into 2017 and beyond. The continuous improvement challenge for these issues. We of course associate ourselves with all the comments you've heard so far. I knew that engineer weber would provide us with an excellent assessment of the fact that there's really no true connection between seismic upgrades and fossil fuels use. It's a difficult and complex issue but you are experts on what's coming with the earthquake. So I know that this is an issue that is going to go well into the future. Beyond the direct really first rate work that you're doing right now. So three quick points from today's proceedings it's standard for agencies, I worked in municipal government for a long time to see things in a policy framework. The word emergency is not used often enough in this situation because it's generally such a slow motion catastrophe in terms of climate change, the earthquake is an emergency the likes of which none of us has ever seen and won't see it until we see it, then the new one that I referenced in my testimony, 2017 federal energy policy which as we know and was commented on at length will be disastrous. I think as you're working with community stakeholders referencing this triple catastrophe set of emergencies is very helpful. Second, business as usual versus responsibility for just transition is very difficult for all of us. We're creatures of habit. I would urge you to think about that systematically going forward, especially with large enterprises and other stakeholders. Finally, bps and psc have done amazing work. I want to make life slightly more difficult for director Anderson by proposing as the third item, amendment 4, the three-year report back, I would suggest should be looked at as a milestone, not a solution. And there's no reason, for example, that every building permit pulled in relationship to fossil fuels could not be posted. In a notification structure I get notifications every time there's a crash on the sunset highway. Once in a great while that matters a great deal to me. Same sort of modern tool structure could be used to improve the basic communication practices. Thank you.
Hales: Good suggestions. Thank you.
Charles Johnson: I want to thank the city for -- for the record Charles Johnson, Oregonians for food and shelter sanity, a very different than organization than Oregonians for food and shelter. I think that we have talked about 10% incentive cap is not going to work. What we have before us is pretty good. If the amendment with the three-year report that passes we don't need to change it here but in general terms I'm addressing only one of you that's going to be here in two months let alone two years, but when we restrict other people we should also talk about doing our best. So we also need to know how well the city is moving from fossil fuel powered vehicles to zero emissions vehicles. So it won't be part of Charlie hales' legacy but the city should look to codify ways that we are working to wean ourselves off the poison is that fossil fuels. People talked about being able to lease an electric car, zero emissions vehicle, for under $140 a month. In Portland we want to make sure the state holds governor brown to the highest standards, better than in regard to nestle bottled water in the gorge that we move to the electricity that's powering these cars is the cleanest possible energy, not coal based. Some concern about hydro, grow wind and solar. When you pass amendment 4 and we report back I hope that everyone will keep in the discussion our own personal responsibility to match what we impose on that stinking fossil fuels industry.
Jonah Majure: I work on sauvie islands. Honestly, you three are going to be dead by the time climate change starts to impact my generation. Even with no new infrastructure even

with the Paris agreements we're still going to face an absolute climate catastrophe, especially in the global south. We'll see a lot of climate refugees coming here because of that. Unfortunately, clean fuels is something we're talking about today and that has actually made it easier for frack sources of fuel like gas and bachin oil to come into our city, our state, and I don't really think that's something we should even be talking about today. I don't really see why we're fooling ourselves about just a 10% expansion if Donald trump is going to be president we're going to see massive amounts of extraction even after the Obama administration has increased extraction across the country. He's president entirely because democrats and liberals weren't progressive enough, not standing up for social justice, for environmental justice. Honestly I'm seeing a pretty different response here today than we saw just a few weeks ago during the police contract vote. I think that really shows the kind of privileges that the environmental community is afforded. Who are the police unions going to listen to when the vast majority supported trump and many police officers supported trump? They have all the military gear built up by not only you all but the Obama administration. Now we're seeing them cracking down on protesters, instead of actually investigating hate crimes and systemic violence. What we need to be doing is focusing on our rights to protest, our rights to fight for a livable future for everybody. Since we're here because of the shell no protest that you all cracked down on a year ago it's really important to recognize there's always a time for protests. We need to be going to actually dismantle all the fossil fuel infrastructure we have as quickly as possible by creating a just transition for workers, for people in our communities who have been disenfranchised by the fossil fuel economy. Making sure they have unionized jobs, safe energy, safe transit and safe agriculture. Most importantly we need to make sure that we're continuing to listen to tribes. Those who are living here on unseeded lands we need to make sure we recognize all of the treaties and needs of the indigenous peoples of this area. I really don't think the city has been doing that. Now is the time for local and state governments to be using all the tools in the tool box whether it's eminent domain or mutual aid to make sure we're able to resist a trump presidency and increased extraction from the systems that created trump. Thanks.

Hales: Thank you. Good morning.

Lightning: Good morning. I'm lightning. I represent lightning watchdog pdx. If we continue to incentivize fossil fuel industry and they are going to continue to make a tremendous amount of profits they are going to continue to do what they are doing, we need to again focus on a carbon tax. We need to have an understanding that they have a hidden subsidy of about 5.3 trillion per year. The incentives to do fossil fuels is so great right now they are going to continue to do it. One of the issues I see along the riverfront we had the superfund cleanup there. We need to remove these storage tanks off the river. We need to understand they don't need to be there. They should have never been placed there. We need to work with these companies and consider somehow, some way to buy them out and get them out of there. We're not doing that. We know if there's a major earthquake we'll have serious problems. We already have a superfund cleanup that in my estimate will go over 10 billion. Everybody wants to talk 800 million. You're in fantasy land. The amount of money it will cost to clean this river is so great we need to remove those storage tanks from the rivers. Plain and simple, another issue that I have is that we need to keep understanding that we all talk about going electric vehicles. Well, elon musk is an intelligent individual. Very smart man, but the reality is he can tell you too it's going to take many, many, many years and he's building his battery storage facility one and he predicts to go out 10, 20, 30, 40 of those facilities. That's going to take many years before you go sustainable. The reality is we need to phase it in. The reality is we need to do a serious carbon tax. Reality is it's going to take tremendous amount of time but there should be

nothing on these rivers if we have a serious disaster that can flow contaminants into this river like we have done for the last 50-plus years that was allowed. We have to stop that now. Discontinue that now. Quit sitting there and going, well, we'll just keep you from expanding. That's not good enough for me. We need to talk to these companies and say what's it going to take for you to remove these tanks off the river? We already have a superfund cleanup in front of us. Now what are you going to do to us? As far as president-elect trump, get ready, Paris agreement, get ready, fracking. He's going to come in here in a whole different direction and you better get ready at this time.
Hales: Thank you all very much. I think that completes our signup sheet. We have a student here who we always make exceptions for students.
Hales: Yes. Come on up, please.
Hales: We began this hearing with students. It's appropriate you get the last word. Thanks for being here this morning.
Liel Voss: Dear mayor and commissioners. My name is liel. As more and more pipelines and trains and barges carry toxic coal, oil and gas to where it gets burned and animals and people are dying of the effects of global warming, you heard a lot of kids speak last time to stop adding more fossil fuels. I know you might think we are just kids who don't understand all the decisions and details that adults have to make, but think about who might be wiser here. Kids who have everything to lose in this world or the adults who got us in this mess in the first place. We waited too long already. We need to stop using fossil fuels as quickly as possible. Please vote for no building new tanks or pipelines or anything that carries fossil fuels for any reason. Please, please listen to us and vote for the strongest law you can. Thank you.
Hales: Thank you. We make exceptions -- [applause] before we take action on the amendments I do want to clarify the issue that came up about amendment 5. That is does it properly cover the potential for a coal terminal here which is obviously something we were trying to make sure we didn't have happen. I understand that existing language may do the job but let's get that on the record and clarify that.
Armstrong: So under the language and we looked at it in response to that testimony, it would be possible for an existing fossil fuel facility to store coal. You could not have a new one come in, but if an existing tank farm wanted to start to remove tanks and have piles of coal on it, they could. Those existing facilities are from two to 40 acres so much smaller in site size than what we see in terms of the proposals for coal terminals elsewhere. But it would be limited -- the opportunity there is limited to the existing terminal under the current language.
Hales: It's not our intent to allow conversion of oil facilities to coal facilities. I'm certain of that. So is the use of the word tank sufficient to ensure that, that won't happen or do we need to add language?
Armstrong: I would recommend that you actually look at amendment 6 which is where you were headed, and that to paragraph a, you just add a phrase at the end there, a new sentence that says storage of coal is prohibited.
Hales: So moved.
Fritz: Second.
Hales: We'll further amend 6 to include that provision.
Fritz: The concern about pipes and if you had a big enough pipe you could essentially be moving more oil through.
Armstrong: In terms of turnover.
Fritz: Yes.
Armstrong: You know, I think they brought up in testimony that the pipeline regulations tend to be more in the federal realm, and at least right now the city and bds, we don't really

regulate the amount of throughput. It's an issue we heard at the psc, and I guess it was beyond what we were looking at through this project in terms of is it a bigger pipe or how much turnover or throughput comes through these facilities. The pipe is -- it would represent a major investment to rebuild and expand the pipeline from Puget sound down to Portland and from Portland to Eugene. There would be a whole bunch of federal permitting involved as part of that process.
Hales: Again in term of there was some good testimony today about this is our zoning code, this is about that piece of land and that piece of land, so it's not the right tool to affect the pipeline issue. We may or may not have adequate state or federal regulation but it wouldn't be in this part of the law.
Fritz: So that's something we may want to look at again thinking of the Pembina proposal. I wouldn't like to just not storage it's just not a big enough pipe and loading stuff directly onto ships maybe we can consider that in our process. Thank you.
Hales: Other questions? Let's take a vote on the amendments package. Sorry as further amended by our last amendment about the coal issue. Sorry.
Novick: Appreciate all the testimony and the mayor's efforts. Aye.
Fritz: Once again I'm very proud of our community, I'm very proud to be one of your commissioners to do this partnership. Thank you for the bureau of planning and sustainability director Anderson and all the folks who worked very hard on this. We're not done. We have to continue looking for ways that we can support our planet, support our community, make sure things are safe and we move as quickly as possible to renewable energy. I was struck by the Leah talking about it's our generation that has passed on many of these big problems and I'm thinking back to where we stopped using hairspray and banned Styrofoam which was at the time thought to be avant-garde and do the trick. Obviously we know that's not the case let's make many more changes in our lifestyles, we expect many more changes in our lifestyles as well as our approaches. Thank you, mayor, for leading this. I'm very appreciative of the amount of time you have put into this work. Aye.
Hales: Let me start with some thank yous. Elected leadership matters and I'm proud of ours but having excellent public administrators and staff matters as well. If it weren't for Susan Anderson and Michael Armstrong and tom Armstrong we wouldn't be where Portland is today. Susan has been an author of many of our path-breaking policies and her team turned it into real work that then become law and shapers of our city. I commend you all. Zach Klonoski on my staff has been a fervent advocate for this and other environmental policies. I know this is a great day for you, Zach. Thank you for your work. Let me say a little bit about democracy and Portland's role. We sometimes have people come to this chamber and say, we don't have a voice. That bothers us because we believe people should. Then we have actions like this one where we put something on the table, we developed it to a point we think is right, then the community comes in and says here's how to make it better. That happens in this discussion last week and this week about the 10% threshold or allowance and it happened just today in this fine point about are we really sure we have outlawed coal facilities. I hope you feel affirmed. I always do when the community comes in and helps do it right. At a time when we're worried about democracy, it's still here in Portland. Thank you for being part of that. Thank you to 350 pdx, river keepers, Audubon, all the others who have brought people here as community members to make the case. Secondly, I'm very proud that in the last part of my work in this city I will go from having been a dark brown haired city commissioner adopting the first climate action plan to being the guy I am today doing this, but also that at a time when we're really worried about will cities still be able to lead we'll be able to show that cities do lead. In fact, I will get to carry the message of this action first to the c40 conference in Mexico City,

where I think our fellow city leaders from around the world are going to be wondering are united states cities still in this. We are still in it. United states cities that are climate action committees are still in this. We will continue and accelerate the work at the local and partnership level even if we don't have a responsible partner at the federal level and they need to hear that. All those cities, rio, sao Paolo, all the other 83 cities of the c40 network need to know that we're still in. We're still responsible, still moving forward. Those are nice words but this will prove that that's true. That's enormously helpful to the credibility of this movement. I started a tradition last year of having all the west coast mayors talk about a couple of issues at the time. We're going to get together in December. I hope mayor wheeler when he takes office continues this tradition. Obviously this issue is going to be on the table because we have cities up and down this coast that share our belief in the critical importance of climate action at the city level and the ability to work together. There has been a lot of talk about walls lately. I hope that those cities work together to build a green wall along this part of the united states' border that changes what we do and how we live but also changes the world. So thank you all. Proud day for Portland, for me personally. A proud day for all of us who advocate for doing the right thing. Aye. Thank you very much. [applause] thank you all very much.
Fritz: Let the record show that was a standing ovation.
Hales: We're going to take a recess. I want to thank this young lady here.
[end of excerpt]



Fossil Fuel Terminal Zoning Amendments

City Council Public Hearing
November 16, 2016

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.

Proposed zoning code amendments

- **Define** Bulk Fossil Fuel Terminals as a regulated land use.
- **Prohibit** Bulk Fossil Fuel Terminals in all base zones.
- Existing Bulk Fossil Fuel Terminals would become limited uses that can continue to operate.

Proposed Amendments

Amendment #1 – Technical Correction to Exception #4 to clarify that truck only terminals are not Bulk Fossil Fuels Terminals.

Amendment #2 – Clarification to Exception #7 that fuel storage for airports, marine servicing facilities and rail yards are not Bulk Fossil Fuel Terminals.

Amendment #3 – Clarification of the Fossil Fuel definition by specifying that non-fuel petroleum-based products, such asphalt and lubricants, are not fossil fuels.

Proposed Amendments

Amendment #4 – Additional directions

d. The Bureau of Planning and Sustainability shall report to City Council no later than December 31, 2019 on the implementation of this ordinance.

e. City Bureaus, including BDS, PBEM and Fire, shall work with the State of Oregon to develop policy options to require seismic upgrades of storage tanks within a firm deadline for replacement of older, unsafe tanks.

Proposed Amendments

Amendment #5 – Change description of limited use to include reference to storage tank capacity.

Amendment #6 – Delete provision that allows for up to 10% expansion for seismic replacement of storage tanks.

Amendment #7 – Add provision that allows for up to 10% expansion for the exclusive storage of fuel that is blended to achieve compliance with the Clean Fuels Program.

Amendment #8 – Adopt revised Ordinance and Findings based on amendments.

Defining fossil fuel

Fossil fuels are petroleum products (such as crude oil and gasoline), coal, methanol, and gaseous fuels (such as natural gas and propane) that are made from decayed plants and animals that lived millions of years ago and are used as a source of energy.

Exclusions: Denatured ethanol and similar fuel additives, biodiesel/renewable diesel with less than 5% fossil fuel content, and petroleum-based products used primarily for non-fuel uses such as asphalt, plastics, lubricants, fertilizer, roofing and paints.

New land use category:
Bulk Fossil Fuel Terminals

Bulk Fossil Fuel Terminals:

- Marine, railroad, or pipeline transport access; and
- Transloading facilities (such as train-to-ship) or storage capacity exceeding 2 million gallons.

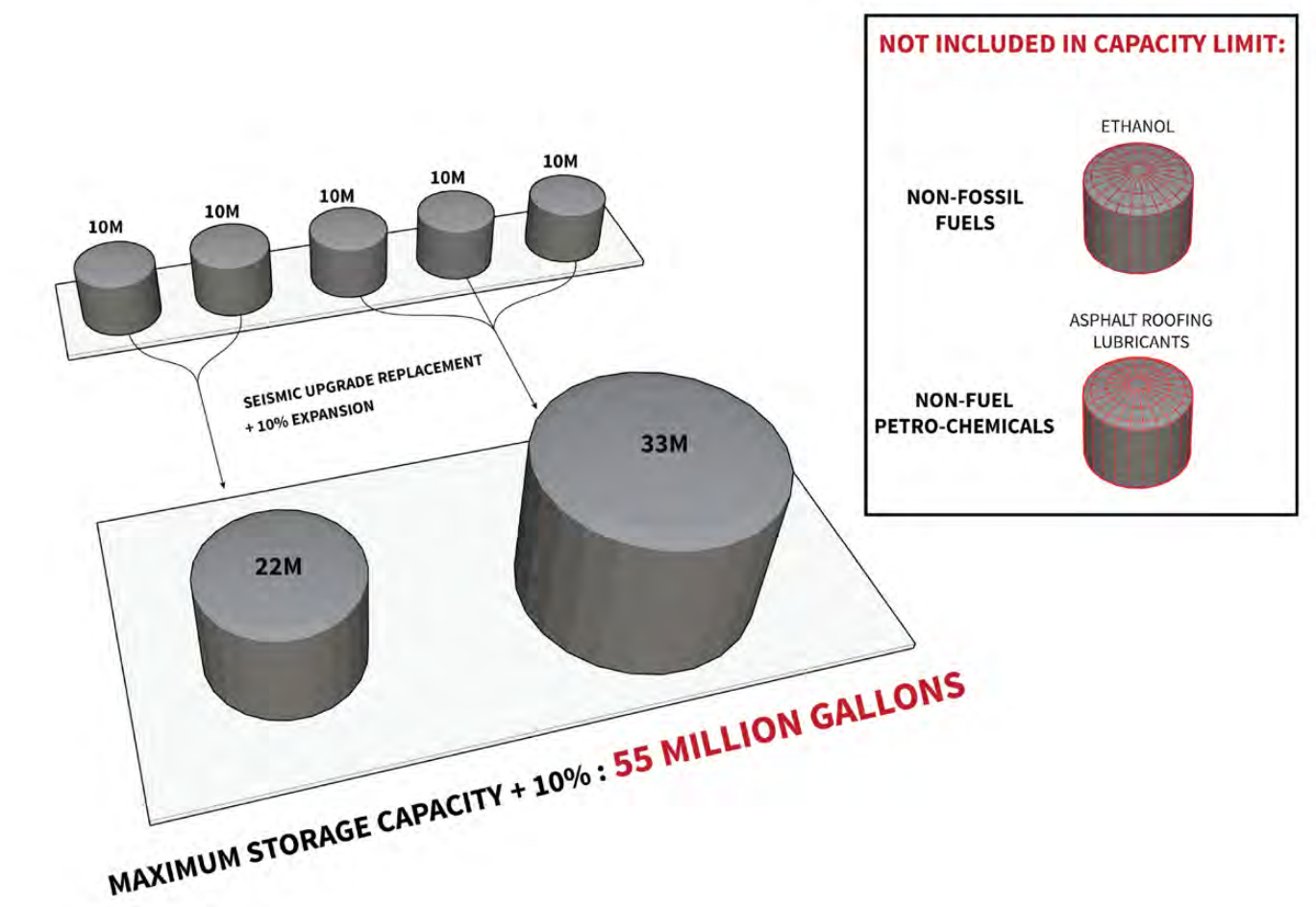
Exclusions:

- Distributors with access exclusively by truck;
- End-user facilities, including filling stations and firms that store fossil fuels for use as an input;
- Airports, marine and rail servicing facilities.

Regulating existing terminals

- Limited Use
- Storage capacity expansion limited to 10 percent of current capacity.
- Replacement of existing tanks for seismic upgrade needed to expand
- No land use review for expansion
- Public notice and meeting required

Regulating existing terminals



Future code changes on seismic resilience



PBEM's 2016 Critical Energy Infrastructure Hub Study future actions.

Seismic safety requirements are addressed in state building codes.

Advocate for state-level code changes to improve seismic resilience and require seismic upgrades.

Council Amendments 11/16/16

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AMENDMENTS TO FOSSIL FUEL ZONING CODE (Nov 16, 2016)

Four alternatives for existing terminal expansions:

1. Recommendation (no change) – allow 10 percent expansion for seismic upgrades (No on amendments #6 and 7)
2. No expansion of storage tank capacity. (Yes on #6, No on #7)
3. Expansion only for fuel blending (Yes on #6 and #7)
4. Expansion allowed for seismic upgrades and fuel blending (No on #6 and Yes on #7)

Amendments	**Yes/No**
Title 33 code changes (Nov 10)	
Amendment #1 – Technical Correction to Exception #4 to clarify that truck only terminals are not Bulk Fossil Fuels Terminals.	
Amendment #2 – Changes to Exception #7 to clarify that fuel storage for airports, marine servicing facilities and rail yards are not Bulk Fossil Fuel Terminals.	
Amendment #3 – Clarifies the definition of Fossil Fuels by specifying that non-fuel petroleum-based products, such asphalt and lubricants, are not fossil fuels.	
Amendment to Ordinance (Nov 10)	
Amendment #4 – Provide additional direction for follow-up actions.	
Title 33 code changes (new)	
Amendment #5 (new) – Change description of limited use to include reference to storage tank capacity.	
Amendment #6 (new) – Delete provision that allows for up to 10% expansion for seismic replacement of storage tanks. *As amended to prohibit the storage of coal.*	
~~Amendment #7 (new) – Add provision that allows for up to 10% expansion for the exclusive storage of fuel that is blended to achieve compliance with the Clean Fuels Program.~~	
Amendment to Ordinance (new)	
Amendment #8 (new) – Adopt revised ordinance and findings based on amendments.	

Amendments to Recommended Title 33 code changes

Amendment #1 – Technical Correction to Exception #4 to clarify that truck only terminals are not Bulk Fossil Fuels Terminals.

33.920.300 Bulk Fossil Fuel Terminal

D. Exceptions.

1. Truck or marine freight terminals that do not store, transport or distribute fossil fuels are classified as Warehouse And Freight Movement uses.
2. Truck or marine freight terminals that do not have transloading facilities and have storage capacity of 2 million gallons or less are classified as Warehouse And Freight Movement uses. However, multiple fossil fuel facilities, each with 2 million gallons of fossil fuel storage capacity or less but cumulatively having a fossil fuel storage capacity in excess of 2 million gallons, located on separate parcels of land will be classified as a Bulk Fossil Fuel Terminal when two or more of the following factors are present:
   a. The facilities are located or will be located on one or more adjacent parcels of land. Adjacent includes separated by a shared right-of-way;
   b. The facilities share or will share operating facilities such as driveways, parking, piping, or storage facilities; or
   c. The facilities are owned or operated by a single parent partnership or corporation.
3. Gasoline stations and other retail sales of fossil fuels are not Bulk Fossil Fuel Terminals.
4. Distributors and wholesalers that receive and deliver fossil fuels exclusively by truck are not Bulk Fossil Fuel Terminals.
5. Industrial, commercial, institutional, and agricultural firms that exclusively store fossil fuel for use as an input are not Bulk Fossil Fuel Terminals.
6. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.

Amendment #2 – Changes to Exception #7 to clarify that fuel storage for airports, marine servicing facilities and rail yards are not Bulk Fossil Fuel Terminals.

7. The storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, drydock, ship or barge servicing facility, rail yard, or as part of a fleet vehicle servicing facility are not Bulk Fossil Fuel Terminals.
8. Uses that recover or reprocess used petroleum products are not Bulk Fossil Fuel Terminals.

Amendment #3 – Clarifies the definition of Fossil Fuels by specifying that non-fuel petroleum-based products, such asphalt and lubricants, are not fossil fuels.

33.910.030 Definitions

The definition of words with specific meaning in the zoning code are as follows:

Fossil Fuel. Fossil fuels are petroleum products (such as crude oil and gasoline), coal, methanol, and gaseous fuels (such as natural gas and propane) that are made from decayed plants and animals that lived millions of years ago and are used as a source of energy. Denatured ethanol and similar fuel additives with less than 5 percent fossil fuel content, biodiesel/renewable diesel with less than 5 percent fossil fuel content, and petroleum-based products used primarily for non-fuel uses (such as asphalt, plastics, lubricants, fertilizer, roofing and paints) are not fossil fuels.

Amendment to Ordinance

Amendment #4 – Provide additional direction for follow-up actions.

d. The Bureau of Planning and Sustainability shall report to City Council no later than December 31, 2019 on the implementation of this ordinance, including:
   1. the number and description of any requests by existing terminal operators to replace and expand their facilities;
   2. the number and description of building permits issued for fossil fuel tanks between 200,000 and 2 million gallons;
   3. the trends in fossil fuel energy use and non-fossil energy use in Oregon;
   4. the status of local and state regulatory proceedings that may improve seismic resilience of fossil fuel storage infrastructure; and
   5. information on compliance with the Oregon Clean Fuels Program.

e. City Bureaus, including BDS, PBEM and Fire, shall work with the State of Oregon to develop policy options to require seismic upgrades of storage tanks within a firm deadline for replacement of older, unsafe tanks.

Title 33 code changes (new)

Amendment #5 – Change description of limited use to include reference to storage tank capacity.

33.140.100 Primary Uses

A. No change

B. Limited uses.

17. Bulk Fossil Fuel Terminals. This regulation applies to all parts of Table 140-1 that have a [17].

    a. Existing Bulk Fossil Fuel Terminals. The following use limitations apply to existing Bulk Fossil Fuel Terminals:

       (1) Bulk Fossil Fuel Terminals that existed on [insert effective date] are allowed, but the total amount of fossil fuel that can be stored on the site in storage tanks is limited to the fossil fuel storage tank capacity that existed on [insert effective date] plus 10 percent. Total fossil fuel storage tank capacity on the site in excess of the capacity that existed on [insert effective date] plus 10 percent is prohibited; and

(2) New fossil fuel storage tanks are prohibited unless a new fossil fuel storage tank is replacing an existing fossil fuel storage tank that does not meet current building code standards for seismic safety, and in that case, the capacity of the new fossil fuel storage tank is prohibited from being greater than the storage capacity of the existing tank that is being replaced plus 10 percent.

b. New Bulk Fossil Fuel Terminals are prohibited.

Amendment #6 – Delete provision that allows for up to 10% expansion for seismic replacement of storage tanks.

33.140.100 Primary Uses

A. No change

B. Limited uses.

17. Bulk Fossil Fuel Terminals. This regulation applies to all parts of Table 140-1 that have a [17].

a. Existing Bulk Fossil Fuel Terminals. Bulk Fossil Fuel Terminals that existed on [insert effective date] are allowed, but the total amount of fossil fuel that can be stored on the site in storage tanks is limited to the fossil fuel storage tank capacity that existed on [insert effective date]. Total fossil fuel storage tank capacity on the site in excess of the capacity that existed on [insert effective date] is prohibited. The storage of coal is prohibited.

b. New Bulk Fossil Fuel Terminals are prohibited.

~~**Amendment #7** – Add provision that allows for up to 10% expansion for the exclusive storage of fuel that is blended to achieve compliance with the Clean Fuels Program.~~
~~Option #1 – 10% expansion for seismic replacement and fuel blending.~~
~~Option #2 – 10% expansion only for fuel blending.~~

~~Option #1 – 10% expansion for seismic replacement and fuel blending.~~

~~**33.140.100 Primary Uses**~~

~~**A. No change**~~

~~**B. Limited uses.**~~

~~17. Bulk Fossil Fuel Terminals. This regulation applies to all parts of Table 140-1 that have a [17].~~

~~a. Existing Bulk Fossil Fuel Terminals. The following use limitations apply to existing Bulk Fossil Fuel Terminals:~~

~~(1) Bulk Fossil Fuel Terminals that existed on [insert effective date] are allowed, but the total amount of fossil fuel that can be stored on the site in storage tanks is limited to the fossil fuel storage tank capacity that existed on [insert effective date] plus 10 percent. Total fossil fuel storage tank capacity on the site in excess of the capacity that existed on [insert effective date] plus 10 percent is prohibited; and~~

~~(2) New fossil fuel storage tanks are prohibited unless:~~

- ~~The new fossil fuel storage tank is replacing an existing fossil fuel storage tank that does not meet current building code standards for seismic safety,~~

and in that case, the capacity of the new fossil fuel storage tank is prohibited from being greater than the storage capacity of the existing tank that is being replaced plus 10 percent; or

- The new fossil fuel storage tank is for the exclusive storage of fuel that is blended to achieve compliance with the Clean Fuels Program administered by the Oregon Department of Environmental Quality.

b. New Bulk Fossil Fuel Terminals are prohibited.

Option #2 – 10% expansion only for fuel blending.

33.140.100 Primary Uses

A. No change

B. Limited uses.

17. Bulk Fossil Fuel Terminals. This regulation applies to all parts of Table 140-1 that have a [17].

a. Bulk Fossil Fuel Terminals that existed on [insert effective date] are allowed, but the total amount of fossil fuel that can be stored on the site in storage tanks is limited to the fossil fuel storage tank capacity that existed on [insert effective date]. An additional 10 percent of the total fossil fuel storage tank capacity that existed on [insert effective date] is allowed for the exclusive storage of fuel that is blended to achieve compliance with the Clean Fuels Program administered by the Oregon Department of Environmental Quality. Total fossil fuel storage tank capacity on the site in excess of the capacity that existed on [insert effective date] plus 10 percent is prohibited.

b. New Bulk Fossil Fuel Terminals are prohibited.

Amendment #8 – Adopt revised ordinance and findings based on amendments.

Version 1 – PSC recommendation with no change to 10% for seismic and added Council direction.
Version 2 – no 10% expansion.
Version 3 – 10% expansion for clean fuel blending.
Version 4 – 10% expansion for seismic replacement and clean fuel blending.

188142

Agenda Item 1259 TESTIMONY 2:00 PM TIME CERTAIN

Support

RESTRICT FOSSIL FUEL TERMINALS CODE

IF YOU WISH TO **SPEAK** TO CITY COUNCIL, **PRINT** YOUR NAME.

Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
1 ✓	GREGORY MONAHAN	7225 SW 13TH AVE	gregorymonahan29 @gmail.com
2 ✓	MARILYNN SEWELL		
3 ✓	Mia Reback		
4 ✓	Nick Caleb		
5 ✓	Alan Smith		a23smith@yahoo
6 ✓	Dick Harmon	1023 SE Bidwell 97202	
7 ✓	~~Michael Hall~~ - Bonnie McKinney	16 Churchill Downs L.O. 97035	—
8 ✓	Jack Strobel		Jacksmonkey@gmail.com
9 ✓	Sophia Smith		Sophia89smith@gmail.com
10 ✓	Shannon Doyle		sed42304@gmail.com

Date 11-10-2016

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188142

Agenda Item 1259 TESTIMONY 2:00 PM TIME CERTAIN

Support

RESTRICT FOSSIL FUEL TERMINALS CODE

IF YOU WISH TO **SPEAK** TO CITY COUNCIL, **PRINT** YOUR NAME.

CALL TOGETHER

Call together

Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
11	✓ Olivia Magaret ✓ Lilly Mason	3067 SE ANKENY ST	
12	✓ Sarah Taylor		
13	✓ → Gaby Lemieux	~~4923~~	
14	✓ → Tyler Hann		
15	✓ → Tucker Holstun		
16	~~Eddie Rosen~~		
17	✓ Riah Sallee		
18	✓ Eleanor Wardlaw		
19	✓ Hannah Witscher		
20	Paul Spindel		

Date 11-10-2016

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Agenda Item 1259 TESTIMONY 2:00 PM TIME CERTAIN

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Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
21	✓ DARISE WELLER	9259 NW GERMANTOWN	dweller972@comcast.net
22	✓ Rob Lee		
23	✓ Eileen Fromer	8175 SW 71st Ave	
24	✓ Deborah Romerein	3512 N.E. 23rd #7 PDX	dromerein@gmail.com
25	✓ DR. Theodora Tsongas	7324 SE Madison St PDX 97215	
26	✓ Julie Chapman	League of Women Voters PDX	
27	✓ Mary Vogel	12208 SW 12th Ave	mary@plangreens.net
28	✓ Rose Christopherson MD PhD	14707 NW Cedar St - Portland	rose.christopherson@comcast.net
29	✓ Regna Merritt	260 NW Rettick D	regna@mypin
30	✓ Ann Turner MD	2007 NE Main	

Date 11-10-2016

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Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
31	✓ Patricia Bellamy	3214 NE Cesar E Chavez Blvd. PDX 97212	
32	✓ Diane Wiwn	1500 SW 11th Ave. PDX 97210	
33	✓ ANDY HARRIS	3969 N. OVERLOOK BLVD PDX 97227	
34	✓ MURTA AIRTER	350 PDX	
35	✓ Ryan Rittenhouse	Friends of the Columbia Gorge	ryan@gorgefriends.org
36	✓ MAYA JARRAD	97212	
37	Nancy Crumpacker		
38	David Chatfield	97206 Oregon P.S.R.	dchatfield@igc.org
39	✓ Peter Sallinger	4006 NE 9th PDX	—
40	✓ Bob Sallinger	5151 NW Cornell Rd PDX	—

Testified 11-16

Date 11-10-2016

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IF YOU WISH TO **SPEAK** TO CITY COUNCIL, **PRINT** YOUR NAME.

Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
41	Witey Barnett	220 NE Bridgeton Rd 97211	
42	Peter Wilcox		
43	Liel Voss		
44	Dan Serres Dan Serres	1125 SE Madison St PDX 97217 103A	
45	Marjorie Kircher	3023 SW Cascade Dr. PDX 97205	
46	Anna Todio	10700 SW 4th Ave Portland OR	
47	Byron Harmon	708 maplecrest CT SW PDX OR	
48	left Robert Grossman	3224 NE 17th Ave PDX 97212	
49	Paige Spence	1410 NE Schuyler St #26 97212	Paige@olcv.org
50	Don Steinke	Vancouver WA	crVanWash@gmail.com

Date 11-10-2016

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Agenda Item 1259 — TESTIMONY — 2:00 PM TIME CERTAIN

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Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
51	✓ Alona Steinke	P.O. Box 822393 Vancouver WA 98682	
52	✓ Mimi Rupert	1839 NW Pentland St. Portland, OR 97229	
53	✓ Haile Perez	5816 SW Gillcrest Ct. Portland 97221	
54	✓ Micah Meskel	5151 NW Cornell Rd	
55	✓ Mary Peveto		
56	✓ Akash Singh	1913 NE 73rd Ave #3	
57	✓ TED GLEICHMAN	8017 N. DANA AVE. PDX 97203	ted.gleichman@oregon.sierraclub.org
58	Peter Miller	1706 SE 70th Portland 97214	
59	Harriet Cooke need to leave at 2:50	3126 SW Carson St	sent in testimony this morning
60	✓ TRISH WEBER	2785 NW Marshall DR Corvallis OR 97330	trish.weber@gmail.com

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Agenda Item 1259 TESTIMONY 2:00 PM TIME CERTAIN

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IF YOU WISH TO **SPEAK** TO CITY COUNCIL, **PRINT** YOUR **NAME.**

Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
61	✓ Charles Bridgecrane JOHNSON		
62	✓ Jonah Majure		
63			
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70			

Date 11-10-2016

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Agenda Item 1259 TESTIMONY 2:00 PM TIME CERTAIN

CON

RESTRICT FOSSIL FUEL TERMINALS CODE

IF YOU WISH TO **SPEAK** TO CITY COUNCIL, **PRINT** YOUR NAME.

Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
✓ 1	ROB MATHERS	5880 NW ST HELENS RD PORTLAND, OR 97210	
✓ 2	ECLEN WAX	200 SW MARKET ST #190 PTLD. OR 97201	
✓ 3	David Kong	6305 NW Old Lower River Rd Vancouver, WA 98660	dave@tidewater.com
4	Lightning Watchdog PDX		
5	Adam Smith		
6			
7			
8			
9			
10			

Date 11-10-2016 Page 1 of 1

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Parsons, Susan BUREAU TESTIMONY RECAP

From: Kountz, Steve
Sent: Tuesday, November 15, 2016 1:20 PM
To: Armstrong, Tom; Armstrong, Michael; Klonoski, Zach; Parsons, Susan
Subject: Nov. 15 update on fossil fuel zoning testimony

Since the last update I sent before the hearing last week, City Council has received 30 additional testimony emails on the fossil fuel terminal zoning amendments, including the 3 attached letters received on Thursday afternoon. The other 27 new emails generally followed the form-letter formats described in the examples I attached last week, calling for a "full ban" on new fossil fuel terminals and strengthened restrictions on expansion of existing terminals. Altogether, City Council has received 315 testimony emails on these zoning amendments to date.


TBL 11 10 16.pdf


Port of Portland 110916.pdf


Tsongas_11101...

Attachments are also filed with testimony - Clerk 20.

Steve Kountz
Senior Economic Planner
Portland Bureau of Planning and Sustainability
1900 SW 4th Ave., Ste. 7100, Portland, OR 97201-5350
503-823-4551, steve.kountz@portlandoregon.gov

The Bureau of Planning and Sustainability is committed to providing meaningful access. For accommodations, modifications, translation, interpretation or other services, please contact 503-823-7700 or use City TTY 503-823-6868, or Oregon Relay Service 711.

503-823-7700: Traducción o interpretación | Chuyển Ngữ hoặc Phiên Dịch | 翻译或传译 | Traducere sau Interpretare | Письменный или устный перевод | Письмовий або усний переклад | Turjumida ama Fasiraadda | 翻訳または通訳 | ภาษาเขียนหรือภาษาอธิบาย | الترجمة التحريرية أو الشفهية | www.portlandoregon.gov/bps/71701

TIDEWATER
TRANSPORTATION & TERMINALS

188142

November 10, 2016

Portland City Council
c/o- Council Clerk
1221 SW Fourth Avenue, Room 130
Portland, Oregon 97204

RE: City of Portland - Bureau of Planning and Sustainability
Recommended Draft Fossil Fuel Terminal Zoning Amendments

Thank you for the opportunity for Tidewater Barge Lines ("Tidewater") to provide comments regarding the draft zoning amendments that would restrict development and expansion of bulk fossil fuel terminals.

Tidewater is a marine transportation and terminal company based in the Pacific Northwest that employs approximately 275 people. Tidewater has been in business since 1932 and is the largest inland marine transportation company west of the Mississippi River with 16 tugboats, 170 barges and five marine terminals. Tidewater's vessels help to move millions of tons of freight every year on Pacific Northwest waterways, reducing congestion on the state's highways and railroads while producing far fewer pollutants and carbon emissions than trucks and trains transporting equivalent tonnage. Likewise, our industry's incident statistics and safety record show that the towing industry in the Pacific Northwest has one of the best programs for moving commodities securely and safely in the nation.

We have reviewed the proposed zoning changes and are concerned that these amendments will restrict economic development in the Pacific Northwest. We feel that energy terminals can be built, expanded and operated safely in the City of Portland. Energy terminals have the ability to create a positive economic impact and support new and existing family wage jobs in our region.

In addition, we have concerns that the proposed zoning changes will have negative environmental consequences to the Pacific Northwest. The proposed zoning changes create uncertainty about the future of energy terminals. These terminals are key to a fuel distribution network that allows Tidewater to supply fuel by barge from Portland to Eastern Oregon and Washington in an efficient and environmentally friendly matter. As noted in the enclosed document, four barges pushed by a tugboat is the equivalent of 538.5 trucks or 140 railcars that travel on the highways and railroads in our region. If these terminals cease operations, fuel will have to be distributed in other modes of transportation such as truck and railcar. Therefore, if barging is no longer a viable option for transporting fuel, then every four barge tow would be potentially replaced with 538.5 trucks or 140 rail cars travelling on the highways and railroads in the Columbia River Gorge.

6600 NW Old Lower River Road, Vancouver, WA 98660 • 360.693.1491 • www.tidewater.com

188142

In conclusion, Tidewater is an advocate for environmental stewardship in the Pacific Northwest and hopes the City of Portland will consider having a constructive dialogue with Tidewater and the other stakeholders to generate an implementable fossil fuel distribution policy that addresses climate change goals, public safety and environmental protection without significantly adversely impacting the viability of Oregon's economy and its waterfront industry. Tidewater urges the Portland City Council not to adopt these proposed fossil fuel terminal zoning amendments.

Thank you for your consideration and the opportunity to comment on this important matter.

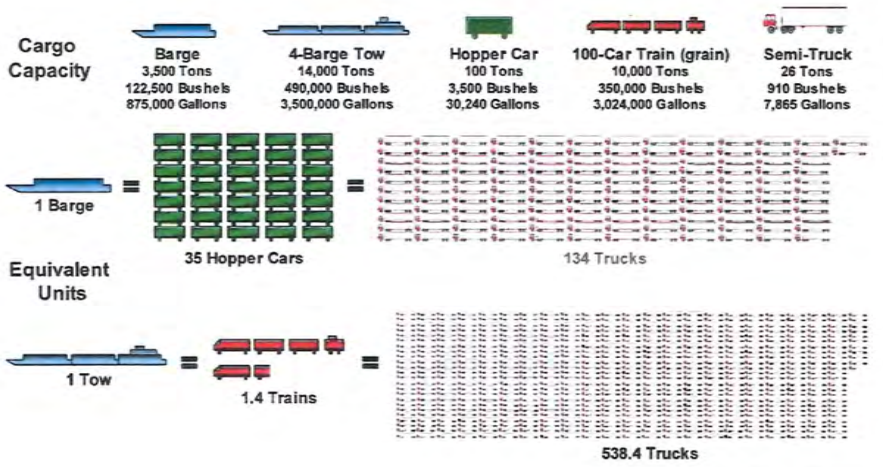
Sincerely,

Robert A. Curcio
President & CEO

Enclosure

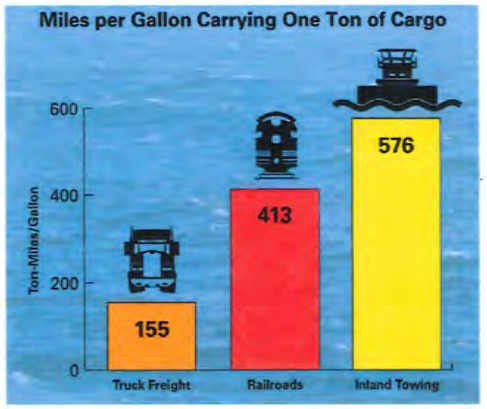
Environmental Advantages of Barging

Freight Comparison of Barges, Trains and Trucks



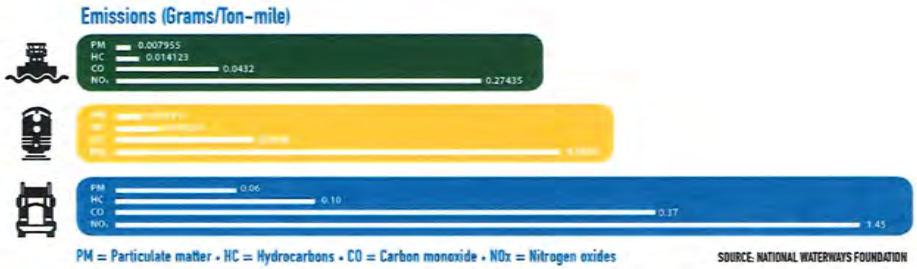
Source: U.S. Army Corps. of Engineers

Saving Energy



Source: Texas Transportation Institute

Ensuring Clean Air



188142

November 9, 2016

Portland City Council
1221 SW 4th Avenue
Portland, Oregon 97204

Dear Portland City Council:

Thank you for the opportunity to comment on the Fossil Fuel Terminal Zoning Amendments. Throughout this process, we have focused largely on how the City of Portland can move forward with this policy in a manner that avoids unintended consequences for our region and state. To that end, we appreciate that fuel storage for "end users", including Portland International Airport (PDX) and marine fuel suppliers, are specifically exempt from the provisions of the proposed amendments.

In the case of PDX, its important to note that aviation fuel isn't stored exclusively at PDX. Fuel farm facilities at PDX are owned and operated by the Portland Fueling Facilities Corporation (PFFC), a consortium of the airlines operating at PDX. PFFC tanks assume a three-day reserve. The distribution chain for aviation fuel is a long one – beginning at a refinery (where it becomes aviation fuel), then to a distributor (fuel farm in PDX), then to PFFC tanks, and finally to the air craft. Aviation fuel cannot be blended with other fuels, and is stored separate from other fuels handled by the distributor.

With growth in the aviation sector, fuel consumption is expected to increase by more than 50% by 2035 with a corresponding need for tank storage. The code amendments should make it clear that fuel storage for end users is exempt – regardless of where this fuel is stored within city limits. We understand this was the legislative intent, and appreciate Portland City Council considering an amendment that would make this clear for the sake of avoiding confusion in future scenarios.

Thank you again for this opportunity to comment on this clarifying amendment and build on our comments to date.

Sincerely,

Emerald Bogue
Regional Affairs Manager

Mission: To enhance the region's economy and quality of life by providing efficient cargo and air passenger access to national and global markets, and by promoting industrial development.

7200 NE Airport Way Portland OR 97218
Box 3529 Portland OR 97208
503 415 6000

188142

Comments to the Portland City Council on the Fossil Fuel Terminal Zoning Amendments Recommended by Portland Bureau of Planning and Sustainability - November 10, 2016

I am Dr. Theodora Tsongas, an environmental health scientist, and a member of the Environmental Health Working Group of Oregon Physicians for Social Responsibility and the Multnomah County Local Emergency Planning Committee. The Fossil Fuel Terminal Zoning code changes recommended by the Portland Bureau of Planning and Sustainability are well thought out. I commend PSC's restriction of aggregation of small fossil fuel terminals, and I commend PSC for rejecting a request by NW Natural to exempt its facilities from the fossil fuel code amendments.

But the recommended code changes still raise concerns about public safety and could pose a threat to our community and neighborhoods. We can do better to more fully reflect the city's Resolutions 37168 (the Fossil Fuel Policy Resolution), 37164 (the Oil Train Resolution), and the Climate Action Plan.

Please let me remind you of the fire that resulted from a collision of an oil tanker truck with an oil train. Unfortunately, the truck driver was killed. Fortunately, the train cars burned but did not explode. It was a very close call for nearby industries, workers and residents in NW Portland. In Mosier the derailed train cars burned for days and destroyed or disabled much of the town's water and sewer infrastructure, exposed residents and visitors to noxious smoke from the oil fires as well as causing major disruption in the life of the town. Accidents happen.

Let 's not increase the likelihood of an oil fire. We need to truly "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." This means actively discouraging increases in demand for fossil fuel unit trains in Portland.

If we look at the ten large oil facilities listed in Figure 7 of PSC's recommendation, and apply a 10% across- the-board increase in terminal capacity, that would result in additional storage of 39 million gallons of oil – a volume equivalent to roughly 13 unit trains of explosive Bakken crude oil.

Allowing a 10% increase in capacity will not discourage the development of fossil fuel infrastructure. We must allow for seismic and safety upgrades without increasing capacity, or we defeat the purpose of the resolutions and the Climate Action Plan.

Why take chances with our neighborhoods that are on the rail corridor? And let's not take a chance with the health and safety of our Linnton neighbors who live so close to the tanks.

And, let's truly take the lead in combating climate change by accelerating the decline of fossil fuel use and by redirecting our resources to the development and implementation of sustainable, clean energy sources. Let's continue the great work that you have begun!

Thank you for considering my comments.

Theodora Tsongas, PhD, MS
Portland, OR 97215

188142

From: jeremiah jenkins
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 16, 2016 1:00:30 PM

1. Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. We need NO new fossil fuel infrastructure.
2. Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
3. Prevent NW Natural from getting a carve out. NW Natural wants to be exempted from this policy and we need to make sure the City Council does not add a last minute amendment on NW Natural's behalf.

From: jeremiah jenkins
MIAH66@YAHOO.COM
3537 ne 81st ave
portland 97213

188142

TERRY PARKER
P.O. BOX 13503
PORTLAND, OREGON 97213-0503

Subject: Comments to the Portland City Council related to restricting the expansion of bulk fossil fuel terminals, November 16, 2016

The ordinance to restrict expansion of bulk fossil fuel terminals in Portland precisely parallels the logic as to why Donald Trump was elected the next President of the United States. The election was far less about drawing racial lines in the sand and far more of a referendum on the economy than progressives are willing to admit. The outcome of the election was a call for a change from status quo politics. The rallying cry came from blue collar workers and rural America against the dictatorial social engineering agenda by white majority elitists that are eliminating family wage industrial and related transportation jobs for people of all races - at the same time increasing taxes and the costs of living. It's no wonder why recent school graduates have trouble finding good paying jobs.

Nearly forty percent of Oregonians voted for Trump. Throwing rocks from within a glass house calling the other side's message one of hate when Portland policy itself proliferates the same tone with car hater policies imbedded in the Comprehensive Plan markedly demonstrates a lack of understanding of the City's own double standard bias.

Portland is a transportation hub for the region, including the Willamette Valley, and a gateway to Asia for Eastern Oregon. Should restricting the expansion of bulk fossil fuel terminals in Portland create a fuel/energy shortage along with the absence of potential blue collar job creation, the City has no leg to stand on or complain should the costs for food, housing and/or manufactured goods significantly increase. Any tax increases for any such ill advised self-induced deficiency that would be paid directly or indirectly by the working class and possibly subsidize even more costly social engineering must be considered as off the table.

Finally, predetermined conclusions by government funded science that take aim at humans as the culprit of climate change must start with a conversation about sustainability in managing human population growth as opposed to implementing social engineering edicts that eliminate employment opportunities, harm the economy and dictate costly downgrades to working class lifestyle choices.

Respectfully,

Terry Parker
Northeast Portland

Oregon Sierra Club

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188142

November 16, 2016

Looking Into 2017 & Beyond:
The Challenge of Continuous Improvement

"No New Fossil Fuels Infrastructure"
A Third Open Letter to the Portland City Council

Preamble Summary, Resolution 37168, November 12, 2015:
Oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways.

Again, thank you for your ongoing commitment to full implementation of this binding policy resolution. Your leadership is vital.

As you move toward completing these unprecedented and critically important zoning restrictions on new fossil fuel infrastructure (FFI), we wish to highlight three ongoing challenges and potential contradictions:

1) Policy vs. Emergency
2) Business As Usual vs. Responsibility for the Just Transition
3) Agency Reporting vs. Crowd-Sourced Creativity

1) Policy vs. Emergency

On these issues, the superb forensic and analytical work by the Bureau of Planning & Sustainability (BPS), the thoughtful and refined consideration by the Planning & Sustainability Commission (PSC), and the careful public impact assessment that the City Council has conducted all fit within a great Portland municipal tradition of public policy leadership.

However, a word that has not been used often enough is "emergency." In our November 10 second open letter to you, we focused on the agglomeration of the three catastrophes you must juggle in this effort: the climate crisis, our earthquake, and 2017-plus Federal energy policy.

It is very important that you continually emphasize to **all** stakeholders –especially the business community and the other large enterprises who have the most impact – that we are truly living through an ongoing emergency, and will be forever.

2) Business As Usual vs. Responsibility for the Just Transition

Change is hard for humans, and the mitigation and adaptation this Portland process represents is being applied across a spectrum ranging from grassroots enthusiasm to corporate fiscal horror. Too many enterprises see climate crisis and seismic mitigation and adaptation as annoying impositions, rather than core responsibilities.

You have the responsibility to help lead others to the comprehensive insights you yourselves have developed through years of study and hard work. This is especially important, again, for those in the business community and other large enterprises who must shoulder the lion's share – or perhaps the dinosaur's share – of the load in building the just transition.

In our July 13 first open letter to you, I outlined a simple four-part model that defines this complex challenge to our civilization:

1. **Keep It In the Ground**
2. **Do No More Harm**
3. **Reduce the Need**
4. **Build the Just Transition**

Your leadership actions on FFI reverberate across these four summary categories. The good news for those who must change the most is that there is a lot of building to do to build the just transition: there are thousands of jobs in Portland climate and seismic mitigation and adaptation.

3) Agency Reporting vs. Crowd-Sourced Creativity

Finally, in another paradigm shift, we suggest that it may no be longer adequate – in the face of this triple-catastrophe emergency and four-part effort to build the just transition – for you and us to rely simply on standardized agency reporting to keep us on track and help us evolve, no matter how high the competence level with which the agencies perform.

Next year, please consider enhanced public notification of each small and large step along these paths. Although we outside of government who work on these issues are not always a constant joy to policy implementers, there is a growing model of constructive social media outreach and crowd-sourced creativity that can potentially bolster over-stretched public resources.

This is not an easy needle to thread, but the thousands of constituents who have attended hearings and opined to you over the last two years include many people who would be happy to join in when they can make a difference. We should all seek to harness the opportunity there.

Thank you for your consideration – and **thanks again to you, the PSC, and BPS and other City staff** for these efforts! We respect and appreciate your work as our representatives.

Ted Gleichman, Policy Advisor, *Beyond Gas & Oil Team*, Oregon Sierra Club

Oregon Sierra Club

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Main: 503-238-0442 • Fax: 503-238-6281

November 10, 2016

Protecting Portland through the Triple Catastrophe: The Climate Crisis || Our Earthquake || Federal Energy Policy

"No New Fossil Fuels Infrastructure"

A Second Open Letter to the Portland City Council

Preamble Summary, Resolution 37168, November 12, 2015: Oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways.

Thank you for your ongoing commitment to full implementation of this binding policy resolution. Your leadership has never been more important to our city, state, region, nation, and the planet than it is today.

Our planned purpose was to join with our many colleagues here to continue to encourage your maximum attention to the complex double catastrophe of the climate crisis and the inevitable Cascadia subduction zone earthquake that will devastate our region. You are intimately familiar with both these unprecedented challenges (please see below for a few comments).

But today I must add **a fresh third catastrophe: imminent changes to Federal energy and climate policy**, which will destroy a huge percentage of the very limited progress made in moving Federal policy beyond the clear and present dangers of the fossil fuel era.

None of us expected that a climate denier would ever occupy the Oval Office. The most brutal components of the fossil fuels energy industry have been deeply engaged in transition planning for President-Elect Trump and are moving quickly to prepare for power. President Obama has taken several steps in recent years to elevate attention to the climate crisis and to move partially away from his prior "All of the Above" energy development strategy. The Trump Administration will maximize reversal of those actions.

With a unified National governmental power structure, the Republican leadership will move at warp speed. That is a procedural approach they have honed to perfection in unified State government control in recent years; Wisconsin is a prominent example, but it is now standard

operating procedure within their governmental playbook, implemented in many states. To be sure, there is the possibility of some limited checks and balances in the current Senate filibuster protocols, and redress of over-reach is sometimes available through the courts. Nonetheless, we must now be prepared to see the most vigorous moves for fossil fuel exploitation and monetization in our nation's history – and that is already a high bar.

For example, we are likely to see immediate concerted efforts to enact **Federal pre-emption** over State and Local efforts against fossil fuels – especially against transport, storage, and export efforts. This risk makes Portland's action *now* to protect your policy resolution – ***our City's*** policy resolution! – especially urgent.

Traditionally, it has been much easier politically to protect established law against reversal assaults than to fight for new efforts that contradict Federal (or State) pre-emption statutes. There is no guarantee that will apply in this arena, but we must proceed urgently to carve out as much local progress as we possibly can.

Simultaneously, the chemistry, physics, and geology of the intersecting catastrophes of our global climate crisis and the Cascadia subduction zone earthquake proceed apace. For the former, the agencies you manage are working to deal with it every day, with vitally important mitigation and adaptation strategies against the effects that we all see and feel now. Complete implementation of the policy resolution is critically important to that.

For the latter, a ticking time bomb in process for almost 317 years, it is the hardest kind of emergency to deal with: like a sudden life-threatening illness or catastrophic accident, it is completely irrelevant to daily life until the moment when it takes over everything one must do.

We now know that placing some 95% of our fossil fuel storage and baseline distribution infrastructure in the Cascadia seismic liquefaction destruction zone on the sands of the Willamette flood plain was the worst possible choice. You have all participated in many briefings and preparedness exercises around our inevitable impending earthquake; you know very well how deadly and destructive it will be, both at the time of fracture and in the multi-year aftermath. That is why it is imperative that the formal implementation of our City's binding policy resolution not permit **any** expansion of catastrophic risk in seismically unsafe zones, with seismically unsafe facilities.

Chemistry, physics, and geology ignore politics – and the new Federal politics just chosen through the ancient Electoral College structure will ignore chemistry, physics, and geology. This perfect storm of triple catastrophic risk requires that everyone recognize that now is not the time for misguided "split the baby" pseudo-compromise. You must resist that fallacy and temptation.

Thank you for your consideration.

Ted Gleichman, Policy Advisor, *Beyond Gas & Oil Team*, Oregon Sierra Club

188142

Oregon Sierra Club

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July 13, 2016

"No New Fossil Fuels Infrastructure": First, Do No More Harm

An Open Letter to the Portland City Council

Preamble Summary, Resolution 37168, November 12, 2015:
Oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways.

Portland is at imminent risk of squandering its prior leadership in dealing with the local response to our global climate crisis. The problem is serious bureaucratic back-sliding into a "business as usual" mentality in the implementation of Resolution 37168. Unless you deal promptly and firmly with signals of agency misunderstanding of both the letter and spirit of this resolution, this situation could too easily become a local crisis in its own right.

This binding policy resolution, which you approved unanimously on November 12, 2015, catapulted our city into the forefront of local, regional, national, and international efforts to confront one of the greatest sets of challenges our species has faced since the development of industrial technology.

It is vital that you remember the genesis of this effort, and re-commit to the specific – often difficult! – changes in municipal and stakeholder planning and behavior for your mission.

There is a straightforward but interlocking four-part schematic that outlines precisely where we are as a global and local political economy:

1. **Keep It in the Ground**
2. **Do No More Harm**
3. **Reduce the Need**
4. **Make the Just Transition**

1. Keep It in the Ground

We now know that our combustion of fossil fuels has moved our global atmosphere and temperature structure into such dangerous territory that civilization is genuinely at risk if we do not make radical reversals in behavior.

At least four-fifths of global fossil fuel reserves must be left completely intact, in the ground, and never exploited.

This requirement is completely contrary to modern corporate financial structure, because proven reserves constitute roughly half of the assets (and therefore a major component of share value) of the fossil fuels companies. This is one of the key reasons why business-as-usual policies and procedures are inevitably doomed to failure – for both corporate financial health and planetary social and environmental health. This has been one key factor in the current financial collapse of shareholder equity in coal corporations.

Acceptance of ***Keep It in the Ground*** is a mandatory first step for both the psychological and political economy revisions we must make for survival. This is the foundation for the other three intersecting components of this basic methodology. Resolution 37168 speaks eloquently to many of the issues inherent in our mandatory recognition of our new reality.

2. Do No More Harm

Understanding the compulsory physics and chemistry of ***Keep It in the Ground*** leads inevitably to this second principle: don't make things worse by continuing down the same destructive path. We must begin with our environmental version of the first line of the Hippocratic Oath: ***Do No More Harm.***

This is the required primary set of actions for directly confronting the climate crisis: to get out of this hole, first we have to stop digging. "No New Fossil Fuel Infrastructure" is the easiest way to proceed first. The core of Resolution 37168 – preventing new export and storage infrastructure – falls completely within this principle.

It is imperative that you maintain and defend your policy.

3. Reduce the Need

Simultaneously, demand reduction is vital to permit us to ***Do No More Harm***. Gradual complete elimination of coal for electrical production in Oregon is now state law. The same goal must be applied to oil and natural gas, urgently. As I noted in my testimony to you on November 12, there is no fossil fuel solution to the fossil fuels crisis.

You must align City procedures and economic governance with this need for both conservation and energy efficiency (which are overlapping but distinct sets of tools). Beyond direct City internal control and external economic governance, you must also push the Portland business communities – especially the fossil fuels companies – and the other governments that overlap with and impact your work to both ***Do No More Harm*** and ***Reduce the Need.***

4. Make the Just Transition

Finally, underpinning all these efforts must be the recognition that there is no substantive difference among environmental, economic, and social justice. We are engaged in a transition into a full-renewables energy economy, and that will be impossible unless it is done based on justice for all. The urgency of the effort means that coordination of ***Do No More Harm, Reduce the Need,*** and ***Make the Just Transition*** becomes the essence of this era.

Thank you for your consideration.

Ted Gleichman, on behalf of Oregon Sierra Club

188142

From: Rasmussen, William
To: BPS Fossil Fuel Zoning
Subject: WSPA Fossil Fuel Terminal Zoning Comment
Date: Wednesday, November 16, 2016 9:25:54 AM
Attachments: Final LETTER WSPA Portland Terminal 11 16 2016.docx

City Staff:

Please find the attached responses to questions posed by Mr. Kountz and please include this in the record for this zoning amendment matter.

William L. Rasmussen, P.C.
Partner

Miller Nash Graham & Dunn LLP
3400 U.S. Bancorp Tower | 111 S.W. Fifth Avenue | Portland, Oregon 97204
Direct: 503.205.2308 | Office: 503.224.5858 | Fax: 503.224.0155
william.rasmussen@millernash.com | www.millernash.com
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188142

WSPA
Western States Petroleum Association

Credible Solutions • Responsive Service • Since 1907

Catherine H. Reheis-Boyd

President

Via email fossilfuelzoning@portlandoregon.gov
and hand delivery at hearing:

November 16, 2016

Honorable Mayor Charlie Hales
and City Commissioners
City of Portland
1221 SW 4th Avenue, Room 130
Portland, OR 97204

Re: Response to City Questions Emailed to Terminal Operators

Dear City Council Members:

The Western States Petroleum Association (WSPA) appreciates the opportunity to provide comments on the proposed PSC Fossil Fuel Terminal Zoning Amendments. WSPA is a non-profit trade association representing companies that explore for, produce, refine, transport, and market petroleum and petroleum products in five western states including Oregon. WSPA members operate petroleum terminals in Portland. WSPA opposes the Planning and Sustainability Commission's recommended zoning amendments under Resolution No. 37168, Fossil Fuel Terminal Zoning Amendments.

This letter responds to two questions that were posed by City Senior Economic Planner Steve Kountz to terminal operators by email on Monday, November 14, 2016. A copy of Mr. Kountz' email is attached.

Mr. Kountz Question #1: Do you agree that allowing for a 10% expansion is not an adequate incentive that would prompt you to replace and upgrade your storage tanks?

Response: WSPA and other industry members never agreed that 10% expansion is an accurate representation of future demand. We do not know what the future will hold. A more appropriate expansion option is outlined in the Appendix to our November 10, 2016, letter that is in the record.

Mr. Kountz Question #2: Would allowing a 10% expansion for additional new storage tanks for fuel that is blended in compliance with the Clean Fuels Program address your future needs?

1415 L Street, Suite 600, Sacramento, California 95814
(916) 498-7752 • Fax: (916) 444-5745 • Cell: (916) 835-0450
cathy@wspa.org • www.wspa.org

Response: We do not know what the future will hold regarding future demand and future regulation. A more appropriate expansion option is outlined in the Appendix to our November 10, 2016, letter that is in the record.

Again, thank you for this opportunity to comment on the Fossil Fuel Terminal Zoning Amendments Proposed Draft. We hope the City reconsiders its push to pass regulations in this area and more narrowly tailors its rules to avoid unintended consequences.

Thank you for your consideration of WSPA's comments. We welcome any questions or comments you might have. Please contact me at this office or my staff, Jessica Spiegel at Jessica@wspa.org or 360-352-4512.

Sincerely,

cc: Jessica Spiegel, Western States Petroleum Association

1415 L Street, Suite 600, Sacramento, California 95814
(916) 498-7752 • Fax: (916) 444-5745 • Cell: (916) 835-0450
cathy@wspa.org • www.wspa.org

From: Kountz, Steve
To: BPS Fossil Fuel Zoning
Subject: FW: Fossil fuel terminal zoning amendments
Date: Tuesday, November 15, 2016 4:07:30 PM
Attachments: Arc Response.pdf

From: Nathan Eggers [mailto:eggers@arcterminals.com]
Sent: Tuesday, November 15, 2016 3:16 PM
To: Kountz, Steve <Steve.Kountz@portlandoregon.gov>
Subject: [Approved Sender] RE: Fossil fuel terminal zoning amendments

Steve,

Please see the attached response from Arc Terminals.

Regards,
Nate

Nathan Eggers
Terminal Manager
5501 N.W. Front Ave.
Portland, Oregon 97210
(O) 503-273-4705
(C) 503-816-0847
eggers@arcterminals.com

From: Kountz, Steve [mailto:Steve.Kountz@portlandoregon.gov]
Sent: Monday, November 14, 2016 1:34 PM
Subject: Fossil fuel terminal zoning amendments

At the City Council hearing last Thursday, there was testimony that the draft limit on fuel terminal expansion to no more than 10% of the capacity of replaced tanks was not an adequate incentive for replacing old tanks to comply with current seismic codes. The City Council wanted BPS to check-in with the terminal operators before they consider amendments at their hearing on Wednesday, Nov 16, at 10:45 am. Commissioners have asked to consider a new amendment that would limit additional storage capacity (up to 10% of the total existing terminal storage capacity) to fuels that comply with the State of Oregon Clean Fuel Standard only.

Please respond to the following questions:

Do you agree that allowing for a 10% expansion is not an adequate incentive that would prompt you to replace and upgrade your storage tanks?
Would allowing a 10% expansion for additional new storage tanks for fuel that is blended in compliance with the Clean Fuels Program address your future needs?

If possible, please send me an email or give me a call.

Thanks,
Steve

Steve Kountz
Senior Economic Planner
Portland Bureau of Planning and Sustainability
1900 SW 4th Ave., Ste. 7100, Portland, OR 97201-5350
503-823-4551, steve.kountz@portlandoregon.gov

The Bureau of Planning and Sustainability is committed to providing meaningful access. For accommodations, modifications, translation, interpretation or other services, please contact 503-823-7700 or use City TTY 503-823-6868, or Oregon Relay Service 711.
503-823-7700: Traducción o interpretación | Chuyển Ngữ hoặc Phiên Dịch | 翻译或传译 | Traducere sau Interpretare | Письменный или устный перевод | Письмовий або усний переклад | Turjumida ama Fasiraadda | 翻訳または通訳 | ภาษาเขียนหรือภาษาพูด | الترجمة التحريرية أو الشفهية | www.portlandoregon.gov/bps/71701

188142

Arc Terminals

November 15, 2016

Steve.Kountz@portlandoregon.gov

Steve,

Below is Arc Terminals response to the two questions you posed yesterday:

Do you agree that allowing for a 10% expansion is not an adequate incentive that would prompt you to replace and upgrade your storage tanks?

The ability to increase capacity by up to 10% would be an important incentive as Arc Terminals considers potential improvements to its Portland terminal that could also improve seismic resiliency. Eliminating this incentive would conflict with the City's policy of not restricting improvements in seismic resiliency at these terminals.

Would allowing a 10% expansion for additional new storage tanks for fuel that is blended in compliance with the Clean Fuels Program address your future needs?

The ability to develop new storage capacity for use in connection with the State of Oregon's Clean Fuels Program would be consistent with City policy and could help with the transition to non-fossil fuel energy sources. However, standing alone, such a limited expansion ability would conflict with the City's fossil fuel policy outlined in Resolution 37168 and does not reflect that these terminals serve regional needs (i.e., greater than Oregon).

Thank you for the opportunity to provide comments. If you have any questions, please contact me at (503) 273-4705.

Nathan Eggers
Terminal Manager
eggers@arcterminals.com

2001 NW Front Ave | Portland, Oregon | Phone (503) 273-4705

Parsons, Susan

From: Klonoski, Zach
Sent: Tuesday, November 15, 2016 4:19 PM
To: Parsons, Susan
Subject: FW: Comments re: Fossil Fuel Expansion

FYI

From: Peter Cornelison [mailto:Peter.Cornelison@cityofhoodriver.com]
Sent: Tuesday, November 15, 2016 1:25 PM
To: Klonoski, Zach <Zach.Klonoski@portlandoregon.gov>
Subject: FW: Comments re: Fossil Fuel Expansion

Misspelled your name on the first round...

From: Peter Cornelison
Sent: Tuesday, November 15, 2016 12:38 PM
To: zack.klonoski@portlandoregon.gov; claire.adamsick@portlandoregon.gov; amanda@portlandoregon.gov
Cc: arlenecburns@gmail.com; Paul Blackburn
Subject: Comments re: Fossil Fuel Expansion

Dear Mayor Hales and Commissioner Fritz,

Thank you for the opportunity to provide comments last Thursday before Council at your hearing on a Fossil Fuel ordinance. As I stated, thank you for your groundbreaking work on this issue. The rest of us in the Pacific Northwest and beyond look at cities like Portland as a beacon of hope and progress, especially needed given the new political reality in Washington D.C.

I am sorry I was unable to attend your entire meeting but Mayor Burns and I had to leave to attend a Wasco County Commission meeting on the proposed double track expansion by Union Pacific Railroad near Mosier, Oregon. You may be interested to know that the 3 member commission denied the application based on tribal treaty rights. This makes the third time (Boardman, OR coal terminal, Bellingham, WA coal terminal) that tribal treaty rights have prevailed, although its likely this decision will be appealed.

I appreciate that you asked for my thoughts about the proposed use of a 10% increase in capacity of bulk terminals to help secure needed seismic upgrades. I heard reports that, in later testimony, a Kinder Morgan representative was not interested in the 10%. I also heard that terminal operators are now asking that you specifically exclude pipes from the zoning amendments. On the basis of these reports, I'd recommend:

- Prohibition of expansions of existing fossil fuels terminals;
- Encouragement of seismic upgrades through state building codes without expansion of capacity;
- Elimination of the threshed for prohibiting new fossil fuel terminals;
- Inclusion of language to prevent "bait and switch maneuvers" that would allow dirty fossil fuels to be stored in tanks permitted for "Clean Fuels";
- Maintenance of language that does not exempt natural gas and methane from this code;

• No exclusion of pipes and pipe size in this document.

As I understand it, you can create an opportunity to revisit the pipe issue, demand issues, and seismic upgrades in one year.

These are my personal suggestions, as I've not had time to poll members of our Hood River City Council. But I think it likely that you would have their strong support.

In closing I want to share links to two coal news stories: Coal continuously discharged from rail cars and Coal clean water act lawsuit settlement.

Good luck in your deliberations.

Peter Cornelison
Hood River Council Member

• Maintenance of language that does not exempt natural gas and methane from this code;

• No exclusion of pipes and pipe size in this document.

As I understand it, you can create an opportunity to revisit the pipe issue, demand issues, and seismic upgrades in one year.

These are my personal suggestions, as I've not had time to poll members of our Hood River City Council. But I think it likely that you would have their strong support.

In closing I want to share links to two coal news stories: Coal continuously discharged from rail cars and Coal clean water act lawsuit settlement.

Good luck in your deliberations.

Peter Cornelison
Hood River Council Member

From: Kountz, Steve
To: BPS Fossil Fuel Zoning
Subject: FW: Fossil fuel terminal zoning amendments
Date: Wednesday, November 16, 2016 8:42:25 AM

From: Kevin Jones [mailto:kevin@mccalloil.com]
Sent: Tuesday, November 15, 2016 11:00 PM
To: Kountz, Steve <Steve.Kountz@portlandoregon.gov>
Subject: RE: Fossil fuel terminal zoning amendments

Dear Steve,
Sorry for the late last minute reply to the Cities inquiry.
Please find our comments below. I'm available Wednesday AM by cell phone if you require any clarification to our response and will be present at tomorrow's meeting at City Hall.

At the City Council hearing last Thursday, there was testimony that the draft limit on fuel terminal expansion to no more than 10% of the capacity of replaced tanks was not an adequate incentive for replacing old tanks to comply with current seismic codes. The City Council wanted BPS to check-in with the terminal operators before they consider amendments at their hearing on Wednesday, Nov 16, at 10:45 am. Commissioners have asked to consider a new amendment that would limit additional storage capacity (up to 10% of the total existing terminal storage capacity) to fuels that comply with the State of Oregon Clean Fuel Standard only.

Please respond to the following questions:
Do you agree that allowing for a 10% expansion is not an adequate incentive that would prompt you to replace and upgrade your storage tanks?

Yes. In order to economically justify the enormous level of private investment needed to comprehensively upgrade critical energy and transportation infrastructure at existing FFTs, existing FFT's must be allowed to grow and transition from fossil fuels by changing the configuration of their storage facilities. The PSC Recommendation does the opposite as it prohibits existing FFTs from growing, except in one very limited circumstance. The only circumstance an FFT can grow is if it replaces an existing tank with a seismically upgraded tank. However, even if an existing tank is replaced with a seismically upgraded tank, the incremental growth that

can occur is limited to 10 percent of the capacity of the tank being replaced, with an overall increase limited to 10 percent of the storage capacity of the FFT facility on the date the amendments are enacted. This severe limitation on expansion discourages disaster-resilient development because the small amount of growth that is allowed to occur will not justify the massive amount of private investment needed to replace all the existing tanks in Portland. Even if investment does occur, the PSC recommendation will only produce a seismic upgrade of 10 percent, because no additional growth can occur once the 10 percent limit is reached. Without growth, investment in seismic upgrades will simply not occur.

In short, the 10 percent rule creates an economic disincentive to disaster-resilient development and is
counterproductive to meaningful seismic upgrades over time. If the City is serious about bringing fuel storage tanks up to current seismic standards, both the City and industry must work together to create a private/public incentive that advocates for seismic-resiliency and the betterment of the region. One option would be to advocate for a tax credit from the state that would provide the financial incentive to fuel storage facilities to rebuild their tanks to current seismic standards. If the City truly wants to ensure that fuel storage tanks are seismically upgraded, it should not only partner with the industry to advocate for such a tax credit, it should take a leadership role in doing so.

Would allowing a 10% expansion for additional new storage tanks for fuel that is blended in compliance with the Clean Fuels Program address your future needs?

No. We believe limiting FFT expansion to accommodate any new blend stock, renewable or alternative fuel (non-fossil based fuels or additives) to 10% of an existing FFT's total capacity to be in direct conflict with the City's resolution and with the Oregon Clean Fuels program. We strongly recommend no restriction or limitation on the size or volume of newly constructed tanks for this purpose. It is important to note Federal and State Clean Fuel Programs are causing significant change in the industry and renewable and alternative fuels are being developed and introduced into the market that provide clean non-fossil alternatives to blended fossil fuels used today. The transition has begun as municipalities and commercial organizations such as the City of Portland maintenance division, EWEB, PGE, and UPS are using renewable diesel today that is transported into our market by vessel.

Segregation of these fuels is required and will increase tank storage demand while the industry, vehicles and consumers adjust and move away from fossil

fuel. There should be no limit on the expansion of a facility to accommodate these products as doing so would be counterproductive to the City's goal of reducing fossil fuels use. Therefore, we strongly urge the City not to restrict the storage capacity or expansion of a facility for handling alternative and renewable fuels and blend stocks that do not utilize fossil fuels.

I believe the combined efforts of the City and Industry to advocate for seismic upgrade incentives and to encourage growth to accommodate new non-fossil fuels is a better approach and a win/win for all.

Regards,

Kevin T. Jones
Chief Executive Officer
McCall Oil & Chemical Corporation
5480 NW Front Avenue
Portland, OR 97210
(503) 221-6400 Ext. 436 / (503) 219-0989 Direct
(503) 709-4259 Cell
Email: kevin@mccalloil.com
www.mccalloil.com

From: Kountz, Steve [mailto:Steve.Kountz@portlandoregon.gov]
Sent: Monday, November 14, 2016 1:34 PM
Subject: Fossil fuel terminal zoning amendments

At the City Council hearing last Thursday, there was testimony that the draft limit on fuel terminal expansion to no more than 10% of the capacity of replaced tanks was not an adequate incentive for replacing old tanks to comply with current seismic codes. The City Council wanted BPS to check-in with the terminal operators before they consider amendments at their hearing on Wednesday, Nov 16, at 10:45 am. Commissioners have asked to consider a new amendment that would limit additional storage capacity (up to 10% of the total existing terminal storage capacity) to fuels that comply with the State of Oregon Clean Fuel Standard only.

Please respond to the following questions:

1. Do you agree that allowing for a 10% expansion is not an adequate incentive that would prompt you to replace and upgrade your storage tanks?

Would allowing a 10% expansion for additional new storage tanks for fuel that is blended in compliance with the Clean Fuels Program address your future needs?

If possible, please send me an email or give me a call.

Thanks,
Steve

Steve Kountz
Senior Economic Planner
Portland Bureau of Planning and Sustainability
1900 SW 4th Ave., Ste. 7100, Portland, OR 97201-5350
503-823-4551, steve.kountz@portlandoregon.gov

The Bureau of Planning and Sustainability is committed to providing meaningful access. For accommodations, modifications, translation, interpretation or other services, please contact 503-823-7700 or use City TTY 503-823-6868, or Oregon Relay Service 711.
503-823-7700: Traducción o interpretación | Chuyển Ngữ hoặc Phiên Dịch | 翻译或传译 | Traducere sau Interpretare | Письменный или устный перевод | Письмовий або усний переклад | Turjumida ama Fasiraadda | 翻訳または通訳 | ภาษาเขียนหรือภาษาพูด | الترجمة التحريرية أو الشفهية | www.portlandoregon.gov/bps/71701

188142

From: Nora Stern
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 15, 2016 11:41:12 PM

I support a ban on new fossil fuel terminals in our region, a prohibition on expansion of existing terminals and required seismic upgrade of existing terminals. NW Natural Gas should not be exempted from this agreement!

From: Nora Stern
norastern1@gmail.com
4763 NE Going St
Portland 97218

From: Hannah Machiorlete
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 15, 2016 9:57:17 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Hannah Machiorlete

From: Hannah Machiorlete
hmachiorlete@lclark.edu
0615 SW Palatine Hill Rd, MSC 1097
Portland 97219

From: Christine Yun
To: RPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 14, 2016 8:05:06 PM

Christine Yun
1915 SE Alder St.
Portland, OR 97214

November 14, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Please do not allow existing terminals to expand.

Prohibit all new fossil fuel infrastructure.

Resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Christine Yun

From: Stephen Hochman
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Sunday, November 13, 2016 7:58:57 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

1. Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
2. Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
3. Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Stephen Hochman

From: Stephen Hochman
hochman9@gmail.com
2815 SW Montgomery Drive
Portland 97201

From: David Pollard
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Sunday, November 13, 2016 7:22:11 PM

I support this ban as a Portland resident. Thank you for your representation.

From: David Pollard
pollardld2@gmail.com
808 NW 19th Ave, apt 402
Portland 97209

From: Diane Jacobs
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Sunday, November 13, 2016 12:41:58 PM

Now more than ever we need to keep fossil fuel in the ground. I want you to enact a full ban on new terminals and prohibit expansions at existing terminals and require them to make upgrades fro Seismic Safety through State Building Codes. We must also not add a last minute amendment on NW Naturals behalf.

Thank you,
diane

From: Diane Jacobs
dianejacobs2@icloud.com
2828 NE 69th Ave.
Portland 97213

188142

From: Luke Anavi
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Friday, November 11, 2016 3:55:59 PM

Please vote to ban ALL new fossil fuel infrastructure within the city of Portland and prohibit ANY expansions of existing facilities in the future. It is very important that we as a city send the strongest possible message to our fellow cities of the World that climate change is an emergency that demands immediate and decisive action if we are to save the Earth for ourselves and all other living creatures.

From: Luke Anavi
lanavi@ymail.com
2431 N.E. Flanders St.
Portland 97232

From: Thomas Brown
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Friday, November 11, 2016 4:53:02 PM

It's time to leave it in the ground. The water that we depend on for our health and the air we breathe are priceless. Don't sell them cheaply.

Thomas Brown

From: Thomas Brown
tawb2007@hotmail.com
4750 Franklin Blvd
Eugene 97403

From: Yumi Ishihara
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Friday, November 11, 2016 8:09:03 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Yumi Ishihara

From: Yumi Ishihara
mrslauizm@gmail.com
9802 SE Nicholas Dr
Happy Valley 97086

188142

From: Noah Jenkins
To: BPS Fossil Fuel Zoning
Subject: Strengthen proposed ban on fossil fuel infrastructure
Date: Friday, November 11, 2016 2:31:51 PM

Dear Portland City Council Members:

Like so many Portlanders, I was thrilled to hear of your proposal to ban new fossil fuel facilities in the City of Portland; we need to be taking exactly these kinds of bold steps to address the greatest threat currently facing Earth's biosphere: climate change. I urge you to stay true to the original intent of the resolution passed last fall by:

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities.
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades; and
- Rejecting Northwest Natural's request to be exempted from these regulations.

Let us seize this opportunity to lead the nation toward a future free of fossil fuels and the damage they cause from extraction to transport to end use. The alternatives are already here; we need these kinds of strong measures to accelerate the transition to a clean energy future.

Thank you for your time and attention.

Sincerely yours,
Noah Jenkins
8025 SE 60th Ave
Portland OR 97206

From: Justin Seibert
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Friday, November 11, 2016 2:28:12 PM

Even before the reality of an anti-climate Trump presidency, it has been absolutely imperative for the people of our planet to do everything possible to reverse the effects of man-made climate change. Every day we have a responsibility to protect our only planet not just for ourselves but for future generations. Failure to do so will make our livelihoods ever more difficult and costly, perhaps even impossible.

Though I have not always lived in Oregon, I have always considered it my home. I am especially honored to live in Portland and be among people who cherish and respect our surrounding natural areas. We have a deep understanding of what is at stake for our planet and our wellbeing.

I believe Portland can and should be a leader for climate responsibility. We should not consider this an option anymore. Now is the time to invest wholeheartedly in our future. Fossil fuels must be our past.

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

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Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing

concern of our time.

Sincerely,
Justin Seibert

From: Justin Seibert
justinmseibert@gmail.com
6207 SE Carlton St.
Portland 97206

188142

Agenda Item 1259 TESTIMONY 2:00 PM TIME CERTAIN

Support

RESTRICT FOSSIL FUEL TERMINALS CODE

IF YOU WISH TO **SPEAK** TO CITY COUNCIL, **PRINT** YOUR NAME.

Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
1 ✓	GREGORY MONAHAN	7225 SW 13TH AVE	gregorymonahan29 @gmail.com
2 ✓	MARILYNN SEWELL		
3 ✓	Mia Reback		
4 ✓	Nick Caleb		
5 ✓	Alan Smith		a23smith@yahoo
6 ✓	Dick Harmon	1023 SE Bidwell 97202	
7 ✓	~~Michael Hall~~ - Bonnie McKinney	16 Churchill Downs L.O. 97035	—
8 ✓	Jack Strobel		Jackmstrobj@gmail.com
9 ✓	Sophia Smith		Sophia89smith@gmail.com
10 ✓	Shannon Doyle		sed42304@gmail.com

Date 11-10-2016

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188142

Agenda Item 1259 — TESTIMONY — 2:00 PM TIME CERTAIN

Support

RESTRICT FOSSIL FUEL TERMINALS CODE

IF YOU WISH TO **SPEAK** TO CITY COUNCIL, **PRINT** YOUR **NAME**.

Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
11	✓ Olivia Magaret ✓ Lilly Mason	3067 SE ANKENY ST	
12	✓ Sarah Taylor		
13	✓ Gaby Lemieux	~~[illegible]~~	
14	✓ Tyler Honn		
15	✓ Tucker Holstun		
16	~~Eddie Rosen~~		
17	✓ Riah Sallee		
18	✓ Eleanor Wardlaw		
19	✓ Hannah Witscher		
20	Paul Spindel		

(ALL TOGETHER)

(all together)

Date 11-10-2016

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LUBA No. 2020-009
Page 484

188142

Agenda Item 1259 TESTIMONY 2:00 PM TIME CERTAIN

Support

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IF YOU WISH TO **SPEAK** TO CITY COUNCIL, **PRINT** YOUR **NAME.**

Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
21 ✓	DARISE WELLER	9259 NW GERMANTOWN	dweller972@comcast.net
22 ✓	Rob Lee		
23 ✓	Eileen Fromer	8175 SE 71st Ave	
24 ✓	Deborah Romerein	3512 N.E. 23rd #1 PDX	dromerein@gmail.com
25 ✓	DR. Theodora Tsongas	7324 SE Madison St PDX 97215	
26 ✓	Julie Chapman	League of Women Voters PDX	
27 ✓	Mary Vogel	12208 W 12th Ave	mary@plangreen.net
28 ✓	Rose Christopherson MD PhD	14707 NW Cedarst - Portland	rose.christopherson@comcast.net
29 ✓	Regna Merritt	260 NW Rettie Dr	regnamerritt
30 ✓	Ann Turner MD	2007 NE Main	

Date 11-10-2016

188142

Agenda Item 1259 TESTIMONY 2:00 PM TIME CERTAIN

Support

RESTRICT FOSSIL FUEL TERMINALS CODE

IF YOU WISH TO **SPEAK** TO CITY COUNCIL, **PRINT** YOUR **NAME.**

Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
31	✓ Patricia Bellamy	3214 NE Cesar E Chavez Blvd. PDX 97212	
32	✓ Diane Wiwn	1500 SW 11th Ave. PDX 97210	
33	✓ ANDY HARRIS	3969 N. OVERLOOK BLVD PDX 97227	
34	✓ MURTA AIRTER	350 PDX	
35	✓ Ryan Rittenhouse	Friends of the Columbia Gorge	ryan@gorgefriends.org
36	✓ MAYA JARRAD	97212	
37	Nancy Crumpacker		
38	David Chatfield	97206 Oregon P.S.R.	dchatfield@igc.org
39	✓ Peter Sallinger	4006 NE 9th PDX	—
40	✓ Bob Sallinger	5151 NW Cornell Rd PDX	—

Testified 11-16

Date 11-10-2016

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188142

Agenda Item 1259 TESTIMONY 2:00 PM TIME CERTAIN

Support

RESTRICT FOSSIL FUEL TERMINALS CODE

IF YOU WISH TO **SPEAK** TO CITY COUNCIL, **PRINT** YOUR NAME.

Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
41	Witey Barnett	220 NE Bridgeton Rd 97211	
42	✓ Peter Wilcox		
43	✓ Liel Voss		
✓ 44	Dan Serres Dan Serres	1125 SE Madison St PDX 97217 103A	
✓ 45	Marjorie Kircher	3023 SW Cascade Dr. PDX 97205	
46	Anna Todio	10700 SW 4th Ave Portland OR	
47	Byron Harmon	708 maplecrest CT SW PDX OR	
48	left Robert Grossman	3224 NE 17th Ave PDX 97212	
49	✓ Paige Spence	1410 NE Schuyler St #26 97212	Paige@olcv.org
50	✓ Don Steinke	Vancouver WA	crVanWash@gmail.com

Date 11-10-2016

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188142

Agenda Item 1259 TESTIMONY 2:00 PM TIME CERTAIN

Support

RESTRICT FOSSIL FUEL TERMINALS CODE

IF YOU WISH TO **SPEAK** TO CITY COUNCIL, **PRINT** YOUR NAME.

Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
51	✓ Alona Steinke	P.O. Box 822393 Vanc WA 98682	
52	✓ Mimi Rupert	1839 NW Pentland St. Portland, OR 97229	
53	✓ Haile Peveto	5816 SW Gillcrest Ct. Portland 97221	
54	✓ Micah Meskel	5151 NW Cornell Rd	
55	✓ Mary Peveto		
56	✓ Akash Singh	1913 NE 73rd Ave #3	
57	✓ TED GLEICHMAN	8017 N. DANA AVE. PDX 97203	ted.gleichman@oregon.sierraclub.org
58	Peter Miller	1706 SE 70th Portland 97214	
59	Harriet Coolle need to leave at 2:50	3126 SW Carson St	sent in testimony this morning
60	✓ TRISH WEBER	2785 NW Marshall DR Corvallis OR 97330	trish.weber@gmail.com

Date 11-10-2016

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188142

Agenda Item 1259 TESTIMONY 2:00 PM TIME CERTAIN

Support

RESTRICT FOSSIL FUEL TERMINALS CODE

IF YOU WISH TO **SPEAK** TO CITY COUNCIL, **PRINT** YOUR **NAME.**

Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
61	✓ Charles Bridgecrane JOHNSON		
62	✓ Jonah Majure		
63			
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69			
70			

Date 11-10-2016

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188142

Agenda Item 1259 TESTIMONY 2:00 PM TIME CERTAIN

CON

RESTRICT FOSSIL FUEL TERMINALS CODE

IF YOU WISH TO **SPEAK** TO CITY COUNCIL, **PRINT** YOUR NAME.

Number	Name (please print)	Address & Zip Code (optional)	Email (optional)
✓ 1	ROB MATHERS	5880 NW ST HELENS RD PORTLAND, OR 97210	
✓ 2	ECLEN WAX	200 SW MARKET ST #190 PTLD. OR 97201	
✓ 3	David Kong	6305 NW Old Lower River Rd Vancouver, WA 98660	dave@tidewater.com
4	Lightning Watchdog PDX		
5	Adam Smith		
6			
7			
8			
9			
10			

Date 11-10-2016 Page 1 of 1

CITY OF

PORTLAND, OREGON

OFFICIAL MINUTES

[Excerpt Council Meetings November 9-10, 2016; Item 1259.]

A RECESSED MEETING OF THE COUNCIL OF THE CITY OF PORTLAND, OREGON WAS HELD THIS **10TH DAY OF NOVEMBER, 2016** AT 2:00 P.M.

THOSE PRESENT WERE: Mayor Hales, Presiding; Commissioners Fish, Fritz, Novick and Saltzman, 5.

Commissioner Novick left at 3:45 p.m. and returned at 4:50 p.m.

OFFICERS IN ATTENDANCE: Karla Moore-Love, Clerk of the Council; Lauren King, Deputy City Attorney and Jim Wood and Jason King, Sergeants at Arms.

		Disposition
1259	**TIME CERTAIN: 2:00 PM –** Restrict bulk fossil fuel terminals (Ordinance introduced by Mayor Hales; amend Title 33, Planning and Zoning) 3 hours requested	**CONTINUED TO NOVEMBER 16, 2016 AT 9:30 AM**

At 5:00 p.m., Council adjourned.

MARY HULL CABALLERO
Auditor of the City of Portland

By Karla Moore-Love
Clerk of the Council

For a discussion of agenda items, please consult the following Closed Caption File.

Closed Caption File of Portland City Council Meeting

This file was produced through the closed captioning process for the televised City Council broadcast and should not be considered a verbatim transcript.
Key: ***** means unidentified speaker.

NOVEMBER 10, 2016 2:00 PM

Hales: Good afternoon, everyone and welcome to the November 10th meeting of the Portland city council. Would you please call the roll?
[roll call]
Hales: welcome, everyone. We'll get the procedural stuff out of the way here in a moment and I'll ask our council clerk to read the item. And then why don't you go ahead and do that because we have a single item on the calendar this afternoon and I'll talk about rest.
Item 1259.
Hales: Thank you. Thank you all for being here today we are citizens of a good place and it is so good to see you all so thank you for being a part of the legitimate exercise of democracy and may that always be true in our city and elsewhere so thank you for coming. Some of you have probably testified at city council before. I'll go through the procedures quickly so we can hear from you. We are going to have a staff presentation and some invited testimony about this item, and then we'll open it up to public testimony. Hopefully, you've signed up. Because of the number of people here we're going to ask you to limit your comments to two minutes apiece because we want to hear from as many people as possible. If you already had your views expressed, you can feel free to say so or yield time to another. We have only a couple of ground rules here in terms of testimony. You need give only your name, you don't have to give us your address when you come up and speak. And if you agree with someone's point of view, feel free to give them a thumbs up or a wave of the hand or twirl something if you have it in your hand and if you disagree with someone, a polite hand gesture to the negative is okay. [laughter] but we ask always in this chamber that we not make demonstrations, applause and verbal displays in favor or against our fellow citizens' points of view so that everyone can be heard. We make exceptions for visiting dignitaries and students and so we might make that exception today because we have some student testimony today and I'm going to have them up early in the process. This isn't a school day, but there's still homework. That's it in terms of procedures. We have some amendments that we'll consider but let me open up with some remarks, and then set this in motion. The rapid development of fossil fuel resources in the western part of our country and Canada has put a lot of pressure on Portland and other cities and has sought to transport and move huge quantities of fossil fuels through and into our communities. As we all experienced with the pembina proposal last year, the zoning code actually allows fossil fuel terminals as a warehouse and freight movement use in our zoning code today without any limit on the size of these terminals. We, of course, passed a resolution saying we're going in a different direction and today is the proposal to put that into city law, into our code. The amendments in front of us as we'll have explained in greater detail by the bureau of planning and sustainability staff will prohibit all types of new fossil fuel terminals and impose limits on the expansions of existing ones. Through our climate action plan and council resolutions, this council has been on record for a long time to advance policies to reduce fossil fuel use and to oppose oil and coal trains traveling through our city. Last year, we took the step of passing that resolution that I mentioned that stated we would oppose the expansion of infrastructure whose primary purpose is transporting or storing fossil fuels. We are also putting a lot of time and effort into becoming disaster resistant or at least more so, to be more resilient as a city and many of

our employment and industrial zones including the critical energy and transportation infrastructure in Portland are located in areas with moderate to high risk of liquefaction so that's a public safety issue that we need to address as a city. Last month we adopted a natural hazard mitigation action plan that includes a critical infrastructure hub study that outlines the next steps in improving seismic safety for these fossil fuel terminals in the northwest industrial areas along highway 30 and in Linton. These amendments before us will prohibit all types of new fossil fuel terminals, 2 million gallons or larger, and impose limits on the expansion of existing ones to no more than 10% of their current storage capacity. The limited expansion has allowed only in conjunction with the replacement of old tanks so there's an improvement in that seismic safety if anybody actually is in the process of replacing a tank, something that is not happening very often now and in terms of that seismic resiliency needs to happen more quickly to avoid disaster. So before we hear from our staff, I want to introduce some amendments that clarify the language, that way you will get to testify on those amendments as well as having them explained. Amendments one through three deal with language in title 33 and amendment four amends the ordinance to provide some additional direction for follow-up actions. Amendment number one is a technical correction to exception number four, to clarify that truck-only terminals the kind of local terminals that we have are not bulk fossil fuel terminals. Amendment number two makes some changes to exception number seven to clarify that fuel storage for airports, marine servicing facilities and railyards are not bulk fossil fuel terminals. These are the filling stations for the airport, the railyards, and the ships, they exist here today. And the number three, amendment number three clarifies the definition of fossil fuels by specifying that nonfuel petroleum based products, such as asphalt are not fossil fuels. Actually, think about it with asphalt we take oil and mix it with gravel and put it on the street and it stays there for 100 years so it's not going into the atmosphere. It's a very different use of petroleum than burning it and releasing hydrocarbons and carbon dioxide. And number four provides additional direction for follow-up actions. I'm going to propose those amendments and see if there's a second and again, those are before us and you can testify on those as we proceed. So now, I want to call on our bureau staff, Susan Anderson, the director of bureau of planning and sustainability, Michael Armstrong and tom Armstrong to explain in greater detail what's in front of us. Good afternoon.

Susan Anderson, Director, Bureau of Planning and Sustainability: Good afternoon. So as the mayor mentioned, I'm Susan Anderson the director of the bureau of planning and sustainability and with me are Michael Armstrong and Tom Armstrong and no their not related, they are sometimes interchangeable. I just want to start off with a little bit of context for the discussion, and then I'll hand it over to Michael and tom. Cities all over the world are talking about climate change and some are making big broad statements and setting up their action plans, but here in Portland we're doing much more and we've been doing it for a long time and we're showing the rest of the world that cities can make a difference. Along with a dozen or so other cities internationally, Portland is seen as a leader on this issue. We've cut carbon emissions by 40% per capita since 1990 and we've cut total emissions by 21% even while our population increased by more than a third and jobs increased by more than 25% so we're headed in the right direction. You know, sometimes, the actions that cities take are broad and sweeping, like land use regulations that impact housing and transportation and environmental issues and other issues and sometimes, there's actions that are very specific and they're very measurable. They are measurable like actions you've taken in the past, things like clean energy works which resulted in energy and money savings for more than 5,000 homes or measurable like cutting city government energy bills which we've done by $6 million just for last year alone, saving more than $50 million in the past 10 years. We've invested in electric vehicles,

we're now buying 100% green power for all city facilities, something that we've been heading towards and are now at for several years, we're requiring energy scores for large commercial buildings which you did and enacted here 18 months ago so that future tenants can compare the energy prices in different spaces and owners can see what's possible and what their competitors are doing so that they can make smart investments and in just a couple of weeks we're going to ask you to do the same for houses so that home buyers will have the benefit of energy scores when they're looking to buy a house much like we have miles per gallon ratings for cars. We know that specific, measurable actions are essential if we're going to reduce the use of fossil fuels so why am I talking about energy efficiency when we're going to talk about fossil fuel storage? Well reducing our demand is essential if we want to meet our climate goals, but it's also essential if we want to limit the size of fossil fuel infrastructure in the future because demand needs to stay stable or go down if storage facilities are going to be limited, but we know we can do this and we've shown that we can do this over the past 20 years. It started back on city council two decades ago, Mike Lindbergh, earl Blumenauer were sitting -- they used to be over there on the other side of the building but you've been doing the right thing for a long time. Mayor hales, you were a part of that with our past record as our proof, we know we can show the rest of the world that this can be done. I encourage you all to keep pushing us in the right direction. We had several more projects and policies that will be coming to you quite soon. We have the residential energy score, we have a new electric vehicle strategy that will be coming out and community solar hopefully by next summer. All these things are going to make a difference and sadly given the election, now more than ever we need local action. We can't rely on the federal government. We can't rely on a future president who doesn't even believe that climate change is real. But we know the science is clear and clean energy costs are falling dramatically since 2008. Wind costs are down 40%. Photovoltaic costs are down 60%, l.e.d. Lighting costs are down 90%, so it's not just a smart move for the environment, it's a smart investment. So I look forward to hearing all the testimony this afternoon and I really, really encourage you to move this ordinance forward. Thank you.

Hales: Thank you, Susan. Okay gentlemen.

Michael Armstrong, Bureau of Planning and Sustainability: Mayor and commissioners, I'm Michael Armstrong with the bureau of planning and sustainability. The ordinance in front of you this afternoon results from several policies that council has adopted over the last months, going back to the resolution you adopted almost exactly a year ago, this fossil fuel infrastructure resolution which had two important pieces. One to actively oppose expansion of infrastructure whose primary purpose is to transport or store fossil fuels and at the same time, ensure that those restrictions don't get in the way of improvements to safety, efficiency, seismic resilience, the routine operations or to get in the way of service to end users. Later, you adopted a comprehensive plan that's generally around fossil fuel distribution to limit that distribution to the facilities necessary to serve the regional market. Those policies are based on considerations of a couple of different concerns, significantly public safety and environmental risks, both from fossil fuels being transported to Portland often by rail, sometimes by barge, by pipeline and also from where those fuels are stored. This map shows the soils that are susceptible to liquefaction with the darker colors being more susceptible the large fossil fuel tanks that this ordinance addresses are located primarily along the river in moderate to high risk of soil liquefaction. So we're trying to address public safety and environmental risks and respond to the mounting urgency of climate change. A lot of the work we have to do here locally to reduce emissions is around improving efficiency, installing renewables. At the same time, the globe is transitioning toward cleaner fuels, lower carbon and overall reductions of emissions. To keep that going in the right direction we need to keep fossil fuels in the ground and as mayor you pointed

out, there are a lot of fossil fuels that are currently coming out of the ground across the western u.s. for us to succeed on climate we can't let those be exported and burned. At the same time, we recognize that the transition away from fossil fuels will take some time. Portland has a key role geographically as the distribution hub that supplies 90% of the fossil fuels that serve the state. It's in southwest Washington, as well. And so we know that we need to accommodate existing infrastructure and we want to encourage it to move towards safer facilities. Portland's been adding population and jobs as Susan referred and at the same time, our fossil fuel use has stayed essentially flat or falling. This slide shows gasoline and diesel use in Oregon over the last 10 years and the trend is flat, slightly down. The next slide shows natural gas use. This is primarily supplied by pipeline. The trend is a little more uneven in part due to different winters. There are higher peaks in there as well and yet the overall trend is flat or falling, despite population growth, despite job growth. It's important to note that even this low to no growth scenario we may need some tanks in order to help the transition to cleaner fuels when we bring in biodiesel, when we bring in some of the other low carbon fuels, we need to be able to store those, to blend those and the ordinance attempts to address that so we've anticipated those needs. At a more global level, we are seeing big changes in global demand for fossil fuels. And so this chart showing, you know, the earlier 2003 global energy forecast, steady increase, that forecast has been moderated very substantially so the 2015 forecast is close to flat. Not a lot is clear about the future right now, I think it's pretty clear that other countries will accelerate their work to reduce carbon emissions so we can expect to see more of this in the future. I'm going to turn it over to tom to describe the amendments in detail.

Tom Armstrong, Bureau of Planning and Sustainability: Tom Armstrong with bps. The mayor in his opening remarks did a good job of providing an overview of what the zoning code amendments do to implement the policy direction in the resolution that you passed last year. Essentially what we're doing is defining a new type of use, a new category of use called bulk fossil fuel terminals and we're characterizing that use. We are essentially prohibiting that use in all of the base zones which primarily applies to the industrial zones, and then we're coming up with some standards to say once we've prohibited that use, what do we do with the existing terminals and the psc recommendation before you is to make them limited uses to allow them to continue to operate, make investments in seismic improvements and limit the expansion of their storage capacity to no more than 10% of what they have today. A couple of key things here, you know, how we define fossil fuels and what's a fuel versus another petroleum product was one of the challenges we had through this process, especially also, when we look at things like natural gas and biogas and how you tell the difference between the two and what that source comes from and so we've settled on a definition that refers to decayed plants and animals that lived millions of years ago and are used as a source of energy and as the mayor has said and proposed in his amendments, we have some exclusions in that definition to make it clear that non-fuels and other renewable fuels, such as ethanol or renewable diesel are not included in that definition so that we provide sort of the opportunity for that transition to the cleaner fuel. As I said we've defined what a bulk fossil fuel terminal is and it is what we call a gateway facility. It has access to a marine dock or railroad spur or a pipeline and it has a significant amount of storage capacity. The recommendation before you from the planning and sustainability commission lowered that threshold capacity from 5 million gallons to 2 million gallons, roughly equivalent to the amount of oil that can be stored in one-unit train. They thought that that was a good benchmark in terms of what represents a large facility that has sort of a wider impact. Based on your resolution last year we again have a number of exclusions or clarifications of who's not included, who doesn't get captured within this definition and as the mayor said, we had some technical amendments to make clear, especially with respect to airports and marine and rail servicing facilities that are

essentially the gas stations for those larger type uses are not included in this definition of what a bulk terminal is. As I said, you know, we have 10 of these petroleum based terminals out in the northwest industrial district and then one on northwest natural Lng facility. So a key thing was what to do with them and the planning and sustainability commission really sort of considered a range of options, whether to make them a nonconforming use or conditional use. In the end, they settled on a recommendation to make them what we call limited use, to limit their expansion of their storage capacity to 10%. And in order to unlock that 10% it has to be a replacement. It's not just new storage capacity, you've got to replace an old tank and that's where we get a bit of a seismic upgrade benefit because the new tanks have to comply with the current seismic codes. At the same time, they recommended that for those types of tank replacement that there should not be a land use review that introduces some uncertainty in the process and potential delays through appeals, that they wanted to provide a clear path to have those seismic replacements happen. In exchange for that, they required a public notice and meeting prior to the filing of a development permit for these tanks. This is similar to what we do with multi-family residential buildings, when a developer comes forward, he needs to notify the surrounding neighborhood, he needs to have a meeting to explain the proposal, and then the neighborhood is at least aware of what's going on, they can make their views known, but it does create some public awareness of what types of activities will be happening out on these existing terminals. Again just a little graphic of how that replacement and storage capacity work. If you have say a facility with 50 million gallons of current capacity, they can decide which combination of tanks they want to replace. They can replace it one for one. They could replace it with a larger one, but the idea is we're removing these older tanks that aren't up to current codes and replacing them with new tanks that are. I think you'll also hear from our bureau partners at pbem and fire about the seismic safety concerns and the slow pace of turnover in terms of the existing tanks that are out there. These zoning codes really address sort of that future growth and expansion. It doesn't really get at the issue of how to improve the safety of what's out there today, absent sort of flat or declining demand. Is there really going to be a need to expand capacity and that's going to require additional steps beyond what we address in these zoning code changes today. Just to reiterate what the mayor's put on the table in terms of the four amendments, there are three amendments to the zoning code to really clarify our intent as to what is a bulk or not a bulk fossil fuel terminal and what is not a fossil fuel in terms of those other products like asphalts and lubricants and an amendment to the ordinance to provide some additional direction to us and to our bureau partners to both report back to you on the effect of what these regulations have, especially as it relates to the issue of sort of the fuel supply for the region and the state in terms of how that fits with our growing economy and population, but also direction, continued direction to the city bureaus to work on this issue with the state of Oregon with respect to seismic upgrades of the existing tanks. And with that that is the end of my remarks. If there's any questions?
Hales: Questions at this point?
Saltzman: I want to clarify. So a 10% expansion of a terminal?
Tom Armstrong: Yes.
Saltzman: Discounts the storage space itself, not any associated piping or pumping that goes with it?
Tom Armstrong: Correct. Piping is the trans loading and the movement of product between the source and the individual tanks and to however it's being conveyed out of the facility and so storage, that's movement. Storage is the tanks themselves.
Saltzman: Okay thank you.
Fritz: So we're putting that 10% in to try to encourage the companies to change their tanks. So am I correct to say we're not allowed to say just do it?

Tom Armstrong: Currently under state law, the seismic upgrades are a building code issue, and it's similar to what we're struggling with, with the unreinforced masonry buildings. So absent a program similar to that urm program that inventories all the tanks out there and comes up with some sort of deadline, you have 10 years, 15 years to replace these, this is an incentive and a hedge. It's an incentive to provide some cost recovery to those seismic upgrade improvements. It's also a hedge against that demand curve that Michael showed, some uncertainty about how much additional storage capacity these facilities might need to comply with the state's clean fuel standards. Because those are going to come on board over the next 10 years, they need additional capacity for fuel additives like ethanol, they need additional blending to comply with those standards. The ethanol tanks themselves aren't subject to these regulations, but the blended fuel capacity would be and so this is a way of providing them a little bit of flexibility to also comply with those clean fuel regulations.
Fritz: And do we know what the life expectancy of a tank it?
Tom Armstrong: A very long time. There are tanks out there that are more than 50 years old.
Fritz: I'm thinking if the water bureau once in a while we have to replace those tanks. So do we think -- do we know how many tanks are going to reach the end of their useful life, anyway?
Tom Armstrong: Not with any precision, but we know there's over 300 tanks out there and we've seen 15 to 20 tank replacements or new tanks come in over the last 10 to 15 years so it's been a very slow replacement period and perhaps Nate takara the fire marshal when he gets up he's more familiar with what's out there today and those risks involved that he may be able to speak to that issue.
Fritz: Thank you.
Hales: Okay. These folks will be standing by for more questions, but let's go ahead and complete our staff presentation by asking Nate Takara our fire marshal and our bureau of emergency management to come up and tell us their perspective, please. I'll embarrass her on the way up to say she's also our northwest 23rd avenue recovery manager and she's doing a great job in helping the community get back on its feet so thank you.
Jonna Papaefthimiou, Portland Bureau of Emergency Management: Thank you mayor Hales, my name is Jonna Papaefthimiou I work for the city's bureau of emergency management and in there at the bureau I'm the lead on the city's natural hazard mitigation plan so we talked about that plan in council last month. As you mentioned in your introduction, natural hazards including flooding, drought, heat waves and severe storms are intensified by global warming so as emergency manager I see very clearly how important it is for the city to do its part to reduce climate impacts, and I think this proposal is very worthwhile for that reason alone. In terms of local vulnerabilities, the critical energy infrastructure hub the tank farms in Linton is an area of significant risk for the entire state of Oregon. The particular issue of earthquake risk in Linton has long been an area of focus for our bureau and as part of the update to that natural hazard plan which council adopted, pbem commissioned a focus study on the Linton area and what our consultants found that the majority of the facilities in the cei hub are constructed to no or low seismic standards and they're mostly located on soft liquefiable soils that are typically associated with increased seismic vulnerability. So the code changes that are proposed today limit the expansion of these facilities and that is another reason to support it. I think there's more work to be done in this regard with respect to building code and getting at the retrofits of existing facilities, but one more thing as you already alluded to, pbem as a small bureau so in addition to being the lead, I am the recovery manager for the northwest 23rd gas explosion. That explosion was incredibly dangerous and disruptive. It also involved a very tiny amount of fuel compared to what is stored in even one small industrial storage tank

and I think this incident reminds us even with a fuel like natural gas, which is generally very safe and a technology that's very well understood, nothing is fool proof so preventing new large terminals inside the city limits is the only approach that is 100% certain to protect residents of Oregon's largest city from a major accident so this is a third reason why the bureau of emergency management supports these changes. Thank you.
Hales: Thank you. Nate thank you for coming.
Nate Takara, Portland Fire and Rescue: Thank you, mayor and commissioners. I would like to thank director Anderson and her team for the work they've put together to get the fossil fuel zoning amendments brought to you this afternoon. I support the concept of finding ways to limit the growth of these facilities. I do have some concerns with the proposal because it primarily focuses on limiting the growth of these facilities. Unless there are additional steps that are being considered to complement this amendment the proposal alone will not make these facilities safer today. In recent years when these facilities constructed larger tanks, they were mandated to install these tanks to current fire life safety standards. The tanks are larger than the ones being replaced there are cumulative benefits with new tanks. When new tanks are installed to current requirements and from the fire life safety perspective, they are considered to be much safer than the ones being replaced. Just as important, during the installation, several key fire life safety components are evaluated, such as containment, spill control and fire safety equipment to ensure that they meet current code. Overall, this has a positive impact on the overall safety of these facilities. Moving forward I believe in order to make these facilities safer, we have to limit the size of these facilities and create initiatives for initiating development of new code requirements for mandatory structural and fire life safety upgrades for existing tanks to meet current code requirements.
Hales: Thank you very much. That's exactly what I want to make sure we report back because there's more work to be done besides a policy and the zoning code itself so thank you. Questions? Thank you, both very much. So we have a couple of panels to call. First involves policy makers that are affected by this. Thanks to our tribal liaison, we have made sure that we always are in good communication with tribal governments, we have the grand ronde here, mayor Arlene burns, the mayor of mosier. We're going to have the hood river city council member. And representative lew frederick from here in Portland and the district that contains all that liquefiable soil you just saw. Senator-elect: Thank you, lew frederick. So welcome, good afternoon, so good to have you all here.
Kathleen George: Thank you very much. Thank you very much. Thank you so much for inviting the grand ronde tribe to speak to this important issue before you today. Our relationship with the city of Portland is of critical importance to us and of great value and we always appreciate you including us when decisions are made that affect our precious Willamette river, upon which Portland depends and many, many Oregonians depend. The confederate tribes of Grande Ronde, of course maintain their relationship with their seated lands and with this river and we return to the river every year to fish and to celebrate our fisheries which travel right through downtown Portland up the Willamette river to the grand ronde reservation. Our salmon and our eels reside in the Willamette and are affected by it and, of course, the lives of our tribal members and all Portlanders are affected by the river and the pollutants that go into it. And, of course, the decision before you today does not occur in a vacuum and is not only considered in light of this particular fossil fuel terminal zoning decision. We know, of course, that our Willamette river is a super fund site and right now, the environmental protection agency, department of environmental quality and many organizations are considering how we can heal this deeply wounded river and so it is in this context that a consideration of expanded opportunities for pollution or safety concerns that could cause future pollution are of the utmost importance. The grand ronde tribe remains deeply committed to healing our fisheries that depend on this river and all the

people who depend on the river. Tribal people and other people who rely on fish to feed their families are at higher risks whenever pollutants are in our river and in our fish and just as Portland harbor has the potential and is affecting our fish and people, pollution from safety threats at fossil fuel terminal zoning issues and facilities have the potential to affect that, as well. Not only do we have the recent tragedy in Portland of the explosion, but we also remember the mosier train derailment of the last year where our rivers were polluted. And we need to remember that the best laid plans can go awry. While we appreciate the opportunity for increased safety measures and the replacement of old tanks, we do need to share our concerns are that continued fossil fuel terminals development or other opportunities for expansion would introduce additional risk of harm to an already damaged and degraded ecosystem and that any continued fossil fuel terminal development would be unacceptable to grand ronde because we feel that right now as a community of Oregonians, our focus needs to be on improving our safety, healing our river, our fisheries to protect our people and the potential benefit of fossil fuel development in our opinion has not been shown to be worth the cost to Oregon's priceless resources. I thank you for the opportunity to talk to you today.

Hales: Thank you very much for being here. Thank you. Mayor burns, welcome.

Arlene Burns: Thank you very much for the invitation and for all the hard work you are doing. I'm Arlene Burns the mayor of mosier. We need to proactively address the threats imposed by the fossil fuel development that will negatively affect not only the city of Portland, but all communities along the tracks. As everyone knows on June 3rd, the city of mosier experienced the derailment of a train of crude on its way to an existing terminal in Tacoma. It was going less than 30 miles an hour on a relatively straight piece of track, only because it was a rare windless day we did not lose our town. We are experiencing four or five of these trains per month, but if the Vancouver facility is built or expansion of existing facilities in Portland is allowed, this could increase to four or five unit trains a day or more. We are fighting for our lives in the Columbia river gorge as infrastructure development is being pushed even in front of mosier where the train derailed to facilitate the proposed terminals even despite the fact that ours is a national scenic area supposedly protected and protecting tribal rights. We need your help. After yesterday's national election, one thing is clear: It's up to us to be the innovators and the leaders in progressive city codes and resolutions to not only protect our future but to be a template for the rest of the country, especially in the light of seismic risks, we need to focus our efforts on industry development that will not increase the hazards during a seismic event. I'm thankful and probably never prouder to be an Oregonian and serve as an elected official because I believe that the future is in the hands of committed individuals who collectively can lead the way to a sustainable future. Mayor hales and this entire council have shown leadership by passing a landmark fossil fuel resolution, by adopting binding rules that take bold action, you will also be helping all of the towns along the tracks, daunted by the possibility of the Columbia river gorge becoming a super highway for fossil fuel transportation. I urge this council to take the strongest stand possible, not only to protect our future but to lead the way. Thank you.

Hales: Thank you very much. Appreciate you being here. Welcome.

Peter Cornelison: Thank you. Thank you, mayor hales and commissioners. My name is Peter Cornelison and I'm a council member from hood river, Oregon. And both the city of hood river and the county of hood river have passed resolutions unanimously opposing fossil fuel by rail in the Columbia river gorge. The oil train fire and spill that happened in mosier this summer was only seven miles away from our city of 7,000 people. So we're quite at risk. In the gorge, we live under the daily threat of another oil train explosion. This summer, when the derailment happened in mosier, i-84 was completely shut down, as well as Washington highway 14. And most local fire departments were responding to the

emergency in mosier. They weren't available for any local emergencies. We see your fossil fuel resolution as the best way for our communities to be protected. We know we can't stop rail traffic, but if the terminal capacity is not there, then they won't be coming through the gorge. We salute your leadership on this issue and the work you have done on a climate action plan. We in hood river look at that as an example as we try to craft our own. Thank you.
Hales: Thank you. Mr. Frederick welcome. Senator-elect frederick, you've got to get used to that new title. Thank you for being here. Push the button on the base of that microphone there.
Lew Fredrick: Thank you very much mayor hales and members of the city council. I'm lew Frederick, state representative from district 43, north and northeast Portland and senator-elect from a district of a larger area that has the same description. My senate district includes import and export facilities that serve the entire state. In fact, just about any goods coming to or leaving Oregon have to pass through the facilities in my district, that's the airport, railroads, Columbia river, Willamette river, it's the port of Portland east of the Willamette river basically. It's a pretty large-scale area. Looking forward to it. Now that represents substantial opportunities for those who live nearby, but it also represents substantial risk when we talk about the movement of fossil fuels. While a major incident would be catastrophic to the state, it could very well be unsurvivable in large areas of northeast Portland. And recovery to the extent even possible could last longer than the market for those fuels. It should also be known we get them back in the form of greenhouse gases and pollution on the prevailing winds. The picture of how unsustainable that is becomes terrifyingly clear every day. Portland's climate action plan sets a goal of 80% reduction in greenhouse gas emissions by 2050. We can't get there without moving faster than we are. This is a global problem. The repercussions, the human costs depend on what happens in china just as much as here. We can't at least in the short term count on effective action at the federal level. I believe Portland should exercise whatever authority it has to limit both local and global use of fossil fuels. This problem belongs to all of us. And after the events of this week, this is a time for us to show what stewardship of the environment and our neighborhood looks like. Maybe we can teach the rest of the nation what a future can be. Thank you for giving me this opportunity.
Hales: Thank you all.
Fritz: May I ask a question. Obviously, the big question here is should we allow the 10% expansion in order to encourage building of tanks that are earthquake safe. So I'm interested to hear your thoughts on that specific question. Is it worth giving a little bit of expansion in order to get some seismic upgrades? We're not allowed by the state yet to just say you must do it by then. So where do each of you come down on yes or no on the 10%?
Fredrick: I think the 10% acts as an incentive if we can get something done. We need to get something done quickly and that's the concern that I have. Not only something in terms of seismic issues, I'm very concerned about the seismic issues. The report that you just heard from your city sustainability person was saying very clearly there's zero to maybe a few percent of those tanks that are, in fact, safe enough in case of an earthquake and we're not talking about the huge earthquake, just an earthquake. And the fault line is right there. The liquefaction issues, I'm reminded of what took place in the world series quake in san Francisco. Where the downtown became jello if it becomes jello under those tanks, we lose north Portland.
Hales: Thank you. Other thoughts on that question?
Burns: I'm not sure exactly what the 10%, that ends up being quite a lot, but I agree that whatever one can do to upgrade the tanks to be more safe, for example, what's happening with the railroad right now, they have these other tanks for shipping crude, but they're not

going to be online for a long time and in the meantime, the ceo of union pacific told us that oh, we're charging them more per tank to use the old ones so the railroad is actually profiting more using the old tanks so they don't have much to get them online, either. I think it's a crucial issue and if that incentive could really manifest itself as a requirement, it seems worth it. But otherwise, it's bringing us a larger burden to the situation.
George: And I would have to agree on behalf of the tribe. Philosophically we would prefer to not have any expansion of capacity. And that being said we understand that as the situation is today there is really no other incentive to encourage that change and being as aware as we are of the seismic issues here on the Willamette river and in the heart of Portland, with our community all around us, it seems that, you know, safety has to be of paramount importance if this serves as that incentive, I think it's necessary at this time, although unfortunately, we really don't want to see more fuel there.
Hales: Thank you. Thank you very much. That helps. Thank you all. Okay a couple more people to call, and then we'll turn to the sign-up sheet. We have a representative of our planning and sustainability commission, the most overworked volunteers in Portland Gary Oxman. And Pam Neil the Portland development commission with an economic analysis.
Gary Oxman: I'm Gary Oxman of the planning and sustainability commission First of all, the commission was extremely enthusiastic in support. We see that as an integral part of the climate action plan and a very important step to be taken. We were also very concerned about safety and specifically the risk of an earthquake and large-scale earthquake. Basically, that kind of earthquake occurring in the high-risk soils where most of the fossil fuel infrastructure is located currently will produce a local and regional environmental catastrophe and will also produce a local human health catastrophe. Surviving without fuels in a post-earthquake environment is going to be a very, very bleak situation. So that imbued a lot of the commission's thinking. We also, while we did not take a formal position on other approaches to seismic improvement, we did have some rich conversation about that and particularly the desirability of a comprehensive approach to seismic stabilization. As has been outlined by others, other panels, basically the planning commission took four changes to what was originally proposed to us as a policy in the zoning code. It reduced the size allowed for new fossil fuel tanks from 5 million down to 2 million gallons and again that was thought that that produced adequate flexibility for people to continue their business and to blend environmentally sustainable fuels, but at the same time, attempting to discourage the use of large unit trains for oil transport. Secondly, we went with the decision to go with a limited use than other options, specifically what we heard from testimony is that the current providers and the current businesses that run fossil fuel need some degree of certainty about what the environment is going to be and so the limited use created a clear pathway to future seismic stabilization. Going along with that, the third recommendation was we decided not to require land use review and again, we wanted to clear a path and it wasn't clear what a land review would really add in terms of value to considering proposals for tank replacements or seismic upgrade and lastly, we added what we thought were some pretty good protections against aggregating multiple small businesses into a larger business that effectively overcomes the limit and so we tried to cut that off. So that was really basically the approach that the commission took. I would be happy to answer any questions.
Hales: Thank you very much. Appreciate your work on this and everything else we've put on your plate. Appreciate your work on this and everything else.
Oxman: On behalf of the commission we thank you.
Hales: Thank you. Welcome.
Pam Neil: Thank you. Hi, Mr. Mayor, commissioners. I'm pam Neil and I am the clean energy liaison for the Portland development commission. I am going to give you testimony about Portland's clean tech economy. Portland's 40 years of progressive policy around

climate and sustainable innovation has made the city's internationally renowned as a place that has found the balance between growth and the quality of life. In the past it's been difficult to quantify the size of our clean tech sector because of the federal government's industrial classification system not adapting to the industry. For example, an employee at Portland's indo windows would be classified under building materials rather than as a manufacturer of highly efficient window materials. Under the leadership of mayor hales, we recently did a pilot with the c-40 climate leadership group that sought to quantify what is called the low carbon economic goods and services sector. While the information hasn't been publicly released, we do have top line analysis to share that can finally demonstrate a link between Portland's climate leadership and the creation of the sizable industry in itself. The data shows that the low carbon economic goods and services sector is a $10 billion industry with an average of 5% growth since 2012. The sector has an employment of almost 47,000 and is composed of 2,450 companies. Portland has been in the position of being a net exporter of low carbon goods and services. This data includes Clackamas and Washington counties in addition to Multnomah, but we believe this is an accurate look at the local sector. Other analysis we've conducted shows that the sector is very rich in middle wage jobs defined as earning higher than 42,000 per year and requiring less than a bachelor's degree. Portland has never been afraid to prioritize sustainability and the health and wellbeing of its people. As we've demonstrated by removing a highway on our waterfront and making a park. We were the first city in the u.s. To have a green infrastructure and a green building policy. We were early to sign up for the Kyoto protocol and we signed onto the historic Paris climate agreement. We brought back the modern street car and last fall celebrated the completion of a multimodal bridge that excludes cars. We've created the thriving and equitable 21st century economy that sees vast potential for growth as the world looks for lowing carbon we've created a Portland brand around sustainability and innovation that recognized around the world, whether it's china, japan, or our sister city in Guadalajara, Mexico, which I recently visited with a team from Portland and the mayor's office. The trajectory of our climate policy has been working. We will continue to embrace the policies and the programs that have fostered a better city for job creation for Portland's residents.

Hales: Thank you very much. Appreciate your work. Questions? Thank you both very much. Okay we're going to turn to public testimony. We're going to give students a chance to come first, that's good news and bad news. It's good news because it's great to hear from students. It's bad news because they're a hard act to follow. If you're here as a student, come on up. Please. Welcome. Good afternoon.

*****: Good afternoon.

*****: Good afternoon.

Tyler Honn: My name is Tyler Honn.

Gaby Lemieux: I'm Gaby Lemieux.

Tucker Holstrum: Tucker Holstrum.

Honn: And we all attend Lincoln high school.

Honn: It is great to once again see the members of the city council after our visit last Thursday. During our time in school and in the first months of our environmental justice and sustainability class at Lincoln, we've learned about the issue of climate change. We've learned how without immediate action; the fate of the world will be imperiled within our lifetimes. The entire world was held hostage by the imminent threat of nuclear annihilation presented by the arms race between the Soviet Union and the united states. However, the issue of climate change is significantly more frightening. Unlike nuclear war if we do nothing and continue down the path we have followed for decades; climate change will wreak havoc on our world.

Lemieux: We have all lived in Portland our entire lives. We have visited other countries and states, but we always long to return to the rich green forests, the staggering snowcapped mountains, the broad powerful rivers and the open hearted people of the northwest. Many times we have driven through the gorge and thought aloud how lucky we are to live in a place of such unparalleled majesty. But now every time we witness the beauty of this corner of the world we cannot escape a certain lingering sorrow. We imagine that so many of the things that we love might soon be gone. We see the trees parched, the mountains defeated and unable to carry snow, the rivers choked and empty of salmon, all ravaged by climate change. And these worries are not just contained to the beautiful pacific northwest. Across the world, it is already happening.
Holstrum: We constantly hear our elders say they shouldn't have left us with such a mess. While these things are true we cannot afford for you to simply pass this issue on to us. We have to stop building new fossil fuel infrastructure now. Yet fossil fuel companies continue to operate unchallenged by the government and intend to extract five times as much carbon as we can safely utilize. We don't have time to wait around. We need to start an aggressive transition to renewable energy now.
Honn: In spite of the challenges ahead, we've found huge sources of inspiration in our own communities. The walkout at Lincoln was a turning point for us. We looked across the Hawthorne bridge. The line of students was so long as the protest spanned the entire bridge back to the west side. Over 1,000 students walked out on September 7th. When we saw that there were people willing to stand up for what they believe in, we knew we didn't have to wait around and hope for a better future. We knew that we could start shaping our own destiny. However, change cannot wait until our generation begins to run for public office and to write our own legislation. The change has to start with you. If we don't begin right now, by the time we are old enough to hold public office, it will already be too late.
Lemieux: We heartily appreciate the city council's support to stop the development of all new fossil fuel terminals and to limit the construction of petroleum storage tanks under 2 million gallons. However, we must stress the need for tighter restrictions. The city of Portland needs to do more than just banning holding tanks over 2 million gallons. We need a full ban on all new storage infrastructure. The 10% expansion would make the city liable for millions of gallons of additional fuel capacity it would increase our future contributions to climate change or devastate the river and surrounding waterfront in the event of a seismic disaster. So if a 10% volume expansion is truly the only way to ensure our safety in the event of a seismic disaster, then I simply express my frustration and hope deeply that the irony is understood by all of us and that our message will not be lost on fossil fuel companies.
Holstrum: We are done waiting. The initiatives already passed in the city should constitute the jumping off point for a better future for all, one that is healthy, just and sustainable. We need a fundamental change in the way that we address our priorities. We must follow an ideal similar to that which was outlined in the Iroquois confederacy. We must consider the impact of our decisions on the next seven generations. This would allow us to stop the acting as if short-term economic growth is more important than all else and favor a cooperation among people, governments and the earth for the greater good of all on this fragile planet. As nasa's voyager one spacecraft was flung out of the solar system at 11 miles per second the onboard cameras were pointed back towards the earth. Encapsulated in the sunlight was a tiny, pale blue dot, a world teeming with life against the back drop of near infinite and hospitable space. This is our world and we stand as a city on one small corner of it. While our world is in a cosmic sense fragile and small this only verifies that as the care takers of this world, we have the chance to begin an aggressive global transition away from fossil fuels right here right now in Portland. We believe that banning all expansion on fossil fuel storage facilities in the city of Portland is the only

logical next step. The only one that can result in a promising future for the city and the world. We need to write the history of the world and be on the leading edge of change. With questionable support for climate action from the federal government for at least the next four years the role of local governments in this movement will become much more important than it has already been. We urge you to do all you possibly can to confront this issue for it is the greatest one our species has ever known and your generation is the last that can put us on the right track in time.
Hales: We do make an exception and applaud for students here. [applause] thank you very much for being here. We do make that exception in part because some of the best moments of being on this council for us is when we do hear from students. We heard from students in our budget hearings about the importance of our parks programs, we hear from students about tough issues like bullying and we hear from students about this issue the most important of our time so it's really for us as policy makers, we get to listen to a lot of adults, but you're a special category and that's why we give you special treatment so welcome.
Mimi Rupert: Thank you. Good afternoon, my name is Mimi Rupert.
Haile Peveto: And I'm Haile Peveto
Rupert: We are a part of the inaugural environmental justice and sustainability class at Lincoln high school. Last week in preparation for this hearing our class marched down to city hall to speak with mayor Charlie hales and city commissioners nick Fish, Amanda Fritz, Steve Novick, and Dan Saltzman we demonstrated our upmost support for the ban on any new fossil fuel infrastructure through the strongest fossil fuel zoning codes up tp date. In return, we were praised for our student advocacy and direct action. When reflecting on the event later in the day, there was one word that seemed to perfectly sum up our morning: Empowering. As students who have been studying climate change in the classroom for two years, we were ecstatic when given the incredible opportunity to take direct action and fight for our future and the future of generations to come.
Peveto: There are a multitude of things you think about when you're young and considering your future. Your hopes, dreams and aspirations, your family and career and your happiness and for the most part, young -- and for most young people those fantasies are filled with optimism and excitement, but for my generation and the generations to follow, our futures are burdened with conditions, limitations and destruction. We can no longer separate our future from the devastating effects of climate change and so many people are already living this heart-breaking reality. We are lucky enough to live in a developed country with good infrastructure and desirable location, but many are shrouded in ignorance. As if this problem is so bad, but climate change doesn't wait for anyone and soon it will be our turn to face the devastation. Sadly, by the time our earth reaches its boiling point, I will be turning around, 46 years old. My potential children will be around my age now and their climate will be completely different than the one I grew up with. They will not have the luxury of experiencing everything our beautiful earth has to offer because it will no longer be the planet that we know now.
Rupert: This ban is more important now than ever with a leader who has no intention of addressing the severity of climate change and actually has the intention of setting us many steps back, it is imperative that Portland be at the forefront of this environmental movement and set an example for the rest of our nation. The city of Portland has already been such a pioneer in advocating for change. And this ban solidifies that by banning all future expansions on fossil fuel storage infrastructure. We are promoting morality, we are promoting justice and we are promoting a better future so please consider our lives as the next generation of leaders, the lives of those already suffering and those yet to be born when making pivotal decisions, such as the one to be made today. Thank you.
Hales: Welcome. [applause]

Peter Sallinger: I'm peter Sallinger, I go to grant high school. Tuesday, November 8th, 2016, we elected our next president. In doing so, we elected a man who believes among many other things that climate change is a hoax created by the Chinese. We elected Donald trump, a man who has refused and will continue to refuse to listen to the science that has been proven over and over again. And in a time like this, we have a tendency to panic, to say what have we come to and to walk away from everything we have been fighting for, but we cannot. For it is in these times that we must stand up and as Hillary Clinton said on Wednesday, never stop believing that fighting for what's right is worth it. We have a historic opportunity to do what's right and to walk the talk. We have the opportunity to show cities around the nation that we can make a difference and that we will continue to fight for our children and our children's children, no matter who stands in our way and that we will live up to the green image that people across our country conjure when they think of Portland. Today, we as Portlanders must take this huge step towards preserving our world for all those who will follow us. We will show everyone that Portland will not back down by leading from example and we are not afraid to make a difference. I hope that after today, we will be able to look back on what we have done and celebrate this as a historical accomplishment and one that shall not be forgotten. That being said I believe there are still things we can do to make this an even stronger victory. Let's fix any loopholes that allow for smaller facilities and take out anything allowing for facilities to get 10% larger in exchange for seismic upgrades. We here in Portland do not have to exchange bigger facilities for safer facilities. We need to lead by telling fossil fuel companies that keeping the people of Portland safe is an obligation, not just something they do merely for the sake of creating larger facilities. I hope that today, we can honor those who will come after us by showing the world who we are in Portland. I would like to thank the mayor as well as the rest of city council for leading the way and voting to ensure that Portland is safer and more environmentally friendly and we will continue to fight for what we know is right.
Hales: Thank you all. [applause] more students to come up? Yes, come on please.
Sophia Smith: My name is Sophia smith I'm 16 years old, I can't vote. I'm scared for my future because for the next two years I have little voice it in. I'm counting on this city council to protect my home and protect my generation and those after me. For we are the people who will have to live through the decisions we make today and in the future. Two days ago, our country elected a president who thinks climate change is a hoax. What does that mean for the future of this earth, as the u.s. is the second largest contributor of fossil fuels and carbon emissions. Having trump elected, I'm not only scared for the basic treatment of all Americans, but I am scared if I will even have a future where I can keep fighting for human equality. We have so much power in our country to shape the future. It starts with local governments who have the ability to take a strong position. We are fortunate in that in the pacific northwest, we don't see immediate extreme impacts of climate change, but by the time we experience the repercussions, it will be too late. We have to stop thinking about profit and think about all the people in this world who are affected by our actions. We are not asking for a lot, but we need to take a stand and stand firm and allow no expansion or creation of fossil fuel terminals. Our window for stopping global warming is slowly closing meaning why would we create this resolution if we are going to do less than we can? Instead of doing a second rate job, which we have done so many countless times in the past we need to do as much as we possibly can so all of us have a future I am proud to live in. All we have time for is to take action and to do it right. If we weaken this resolution, time will run out before we have a chance to fix our mistakes. When you were children, did you think about the health of this planet and worried if you were going to have a future? Did you have to stand in front of your government just so your life would be protected? That is what I have to do because my future is being put

below the wealth of companies. And endangering our planet. As a country we need to realize the only people we want to help with a decision like this is ourselves. That means we can't weaken our actions. We have to do all that is physically possible. Last year when the city council unanimously passed its resolution to create a stronger regulation for fossil fuel companies and no new fossil fuel infrastructure I was so proud to live in Portland and I began to feel hopeful for my future. I want to live in a world where I'm proud of the actions of my government and what they have taken so I can live a happy, healthy life. That can start here in Portland, Oregon, by standing firm on no new fossil fuel infrastructure or expansions. Thank you.
Hales: Thank you. Welcome. Who would like to be next?
Shannon Doyle: I'm Shannon Doyle I'm 12 years old and I'm here today because it is a human right to have clean air and water. I have grown up in this wonderful city, it's a beautiful masterpiece. The Columbia river gorge has in some ways made me who I am. It taught me how to hike, how to fall, it taught me what my place is in the world. And most importantly it taught me how to be myself. The Columbia gorge has shown me how I am connected to every living thing. That is why we must do everything we can to protect all life. I recently read an article published in the guardian about the estimated decrease in the animal population. It states that animal populations plummeted by 58% between 1970 and 2012 with losses on track to reach 67% by 2020. Researchers from world wildlife fund and the zoologic society of London compiled the report. In four years I will be 16 years old. In that time, if we do not decrease our fossil fuel consumption, more than half of our current animal populations will be gone, extinct. Portland, Oregon is leading the nation to clean energy. We have risen together to do so many amazing things. We have dangled from bridges and blockaded shell. We have a Portland climate action plan as well as a Portland public school climate literacy resolution. Last year, when you voted for no fossil fuel infrastructure, it gave me hope that we would soon meet our city's goal to achieve 40% reduction in carbon emissions by 2030. That means we must follow up and stay strong. We cannot be weak. We cannot have any more fossil fuel infrastructure built. We must not let companies make short-term profits and endanger the lives of the residents of Portland and our own blue dot, earth. Together, we can say yes to clean air, clean water and a healthy planet. Thank you for your time and opportunity to speak with you today.
Hales: Thank you. Welcome. [applause]
Jack Strobel: Hi I'm Jack Stroble, fossil fuels are not going to go away on their own. They're like a weed. We need to pull up its roots or it will never go away. We can't take our time and hope they'll leave it's about time that Portland became independent of fossil fuels. We have a golden opportunity and we need to use it to better our lives, to improve our city, to say no to new fossil fuel infrastructure. Ever been to Los Angeles? There's oil rigs everywhere, even in the city and worst of all, there's a giant smog cloud that covers the city from all the fossil fuel emissions. I don't want that to happen to our beautiful city of Portland. I don't want the Willamette river to be lined with fossil fuel infrastructure. We don't want oil pipelines snaking through forest park. And we can't risk it. Just one oil silo could break and flood into the Willamette, killing thousands of fish, and then it would flush into the Columbia, hurting the salmon and finally, flushing into the ocean, blackening our beaches. We don't need another oil spill epidemic. What we need is to say no. We can switch to renewable energy; we can improve our dams. We have to choose to fight. The people of Portland want this, the men, women and children of Portland want this. Together we can cut our fossil fuels. We can say no. Say no to all the fossil fuels. We are saying no and so can you.
Hales: Thank you all very much. [applause] okay any other students besides these? You may be batting cleanup for the student team. So welcome.

Eleanor Wardlaw: My name is Eleanor Wardlaw and I'm 14 years old. As young people in the country currently very divided on such an important topic we are at times voiceless. Without the ability to vote it is easy to be left out of the political process. That said, we are the generation that will be the most impacted by decisions like these. Prohibiting fossil fuel Expansion and standing up to the corporate greed that drives climate change deniers sets a vital precedent for the rest of the country. When many leaders refuse to acknowledge the effects people have on climate change, it's important to take action on this delicate issue. Thank you.
Hales: Thank you, welcome.
Hannah Witscher: My name is Hannah Witscher I'm 15 and a freshman at grant high school. The republican congress and the president elect made it very clear they do not view climate change as an important topic and the threat that it is to today's world. If they will not act, it is our duty to. If we can make a difference, we must. We should not value the life, health and safety of the people in our community as lower than the chance of a company to make a profit. We need to say that oil companies and fossil fuels are a bad thing and that they are a huge risk to our environment, both the actual oil and the carbon dioxide that they produce. Global warming is a huge issue if we can make a difference we must; we have to fight for our future before it is gone. Thank you.
Hales: [applause] good afternoon, and welcome.
Lilly Mason: Hi my name is Lilly Mason.
Olivia Magaret: And I'm Olivia Magaret. we are students from Sunnyside environmental school.
Mason: Last year, three of our fellow friends and students came here to testify against any future fossil fuel infrastructure development in the Portland area. The council unanimously approved this resolution and promised to enforce it. This felt like such a breakthrough and start of a healthier community, but now, we feel cheated. With these proposed rules, new infrastructure with under 2 million gallons of fuel would be accepted. This would allow more greenhouse gases to be emitted into our atmosphere, which is harmful to everyone everywhere and there is no way we can ignore that. We also know that any new fossil fuel infrastructure that would be built no matter what size would be here for 20 years or more and we don't have time for that. The fossil fuel industry has known for decades about global warming and we don't understand why they should be rewarded for destroying our planet.
Magaret: Right now, Portland has a chance to prohibit all new fossil fuel terminals and require existing facilities to make seismic safety improvements without expanding. As 13-year-olds, this really matters to us. Our planet is in serious trouble. Humans are killing the earth and each other. As you know all fossil fuels emit greenhouse gases and other harmful pollutants when burned. These emissions lead to serious, universal and irreversible consequences. We are already beginning to see the impacts climate change has on our way of life. Polar ice sheets and glaciers are melting, resulting in rising seas, temperatures are increasing and many species are at risk of extinction. It is our responsibility to do something to fix this. Building more fossil fuel facilities is not the answer and by-passes all progress our city has made to break free from fossil fuel dependence.
Mason/ Magaret: Our dream is that someday Portland will be able to run on almost all renewable energy. We can only accomplish this if we stand up for what we believe in and protect the place that we call home. Thank you.
Hales: Thank you. [applause] I told you they would be a hard act to follow. I cannot imagine more of a contrast between the disheartening insanity of this week and the hopeful leadership that we see from young people in this community. Let's hear it for our students. [applause]

Fritz: Before you go students, we learned that we're not allowed to just require the tanks to become seismically upgraded. We're going to need your help to go down to the legislature in the new year to get that changed. So in 10 days' time on December 1st we're going to be holding a legislative agenda advocacy training at the city and it's going to be tabors base on SE Belmont it's from 6-8 you would be very welcome to come so that we can help you prepare for making your case to the legislature because I hope you do just what you did now. Thank you very much.
Hales: Thank you.
Novick: The fight against climate change takes many forms and we here at the council are going to take up an issue soon which relates very much to what extent do we require new parking to be built with new residences and when we require new parking spots to be built, that continues to build society around the car, which encourages people to keep on driving and releasing carbon so I hope that you will turn out to encourage this council to reduce parking minimums as part of the effort against climate change.
Hales: All these opportunities for activism.
Fritz: Just one more thing, commissioner Novick calls it climate disruption, which is much clearer than climate change. Climate change is having a 70-degree day on November 10th here in Portland, Oregon. It's nice if you're outside, but it's not right. So we've got to all be very focused on the language that we use and the way that we use it so we're working together in the ways that we can. Thank you very much.
Hales: Thank you all. Okay. It's going to be a hard act to follow so we're going to move to the sign-up sheet and if you are here and you have a disability or if you have some childcare needs and want to get early in the queue, come to our council clerk and we'll scroll you in. Let's go to the sheet and folks can let you know.
Moore: I've got them off the list. I have a remaining 54 total testifiers.
Gregory Monahan: My name is Dr. Gregory Monahan I'm here in my capacity as the chair of the beyond gas and oil team for the Oregon chapter of the sierra club and I'm speaking on behalf of the sierra club. The Oregon chapter of the Sierra club supports an implementation of the fossil fuel policy which does not allow for any expansion of bulk fossil fuel terminals. It's clear to anyone who understands science or who is willing to look dispassionately at the evidence that climate change is real and that its effects are evident today. It is also clear that the consequences of ignoring greenhouse gas emissions will lead to a future in which the lives of our children and grandchildren will be very difficult. The results of the recent elections also make it clear that we cannot rely upon our national leaders to solve this problem for us. Leadership will have to come from the bottom up starting right here in our city. The united nations just released a report on the emissions gap, that is the difference between the amount of greenhouse gas emissions needed to keep the temperature of the world from rising beyond 1.5 degrees Celsius and the amount we are currently emitting. The news is not good. In short, we need to radically reduce the amount of fossil fuels we are using and we need to begin to doing so now. Additionally, the staff report of the planning and sustainability commission makes it clear that overall demand for fossil fuels is already flat. It is reasonable to expect a decline as more electric vehicles are put into service. There is absolutely no rational basis for expanding fossil fuel infrastructure. Nowhere in the language of the resolution that you passed about a year ago does it list exemptions which allow for the expansion of the described infrastructure. In light of what we know about our climate and our national policies, it is imperative that we do not continue to expand fossil fuel infrastructure. Therefore, the sierra club urges you to eliminate the 2 million-gallon minimum and to eliminate the allowed expansion for seismic upgrades.
Hales: Thank you. Good afternoon, welcome.

Marilynn Sewell: Thank you. My name is Marilynn Sewell I'm the minister of the first Unitarian church and I have to say that hearing those young people just broke my heart. This council led by mayor Charlie hales has passed the strongest land use code in the country, prohibiting all new infrastructure for fossil fuel export. Look at this picture. I think you will remember this incident.
Hales: Yes, we do.
Sewell: Tiny activists hanging from the St. John's bridge. They stopped shell's massive ice breaker for 48 hours and pictures like this went around the world, and then through our emissary, once more our witness went around the world to the pope, to president Obama. And now, again, the whole world is watching in light of this election, what will happen to the climate movement? Do not think that what happens in this city council today is unimportant and, of course, on November 17th, we are important to the larger world. We know that the rest of the country watches what Portland does in many arenas and certainly in regard to climate. And so we are here today not just to testify but to witness. I'm using religious language because this is truly the greatest moral issue of our day or one might say of any day. We will all be accountable as moral agents if we fail to keep fossil fuels in the ground, all of it. The temptation always, always is to accommodate to power. But rather we must speak truth to power. In the words of that spike lee movie, do the right thing, it's in your hands, do the right thing.
Hales: Thank you, you're wonderful. Speaking of some people that had something to do with that, welcome.
Mia Reback: Thank you for considering today's amendments to prohibit both fossil fuel terminals. My name is Mia Reback I'm one of the organizers with 350 pdx. Almost exactly a year ago, we came before the city council and when we passed the city's opposition to new fossil fuel infrastructure in our city or adjacent waterways. And when we did that we said no to the long-term investments that lock us into polluting carbon emissions for decades to come, preventing any hope of meeting our carbon goals and our climate goals. When talking about new fossil fuel infrastructure, we're not talking about the next few years of fuel use. We're talking about the next five decades and the long-term course we as a city and a planet will take. Now is our chance to turn that resolution into binding land use law by changing our city code, sending a signal around the world and to our fossil fuel industry here that we're protecting our people, our land, our water and climate. Just last week, the Paris climate agreement went into effect, stating that world leaders are committed to keeping global warming between 1.5 and two degrees Celsius. But a recent study by oil change international aptly titled the sky's limit found that the committed emissions of our existing fossil fuel infrastructure alone will blow us past two degrees Celsius. The principal finding of that study which I think to some is quite depressing to me is very hopeful. They found that in order to keep within these globally agreed upon limits we must build no new fossil fuel infrastructure, not some, none. No coal, no oil, no gas. And that governments who are prepared to move away from existing fossil fuels have to begin that managed decline immediately. Fossil fuels aren't going to go away overnight, but the actions we take today will dictate the future course of where they go. I encourage the city council to pass bolder versions of the fossil fuel terminal amendments. We should not be trading our safety for increased fossil fuel facilities. I encourage you to get rid of the allowance for 10% expansions and to look into further restrictions on small terminals in addition, prohibiting bulk fossil fuel facilities. Thank you.
Hales: Let's take the next three.
Rob Mathers: Good afternoon I am Rob Mathers and I am not a climate disruption denier. I feel like we've been invited to the barbecue and we're on the menu. We are opposed to the amendments and there's two principal reasons. I was going to go into the bottleneck reason first. You know, in order to use renewable fuels, they have to be blended with

conventional fuels, at least in the foreseeable future and if there's a bottleneck created and if volumes have to be trucked into the region or the state from outside the region or state, then that is just the opposite of where you want to go with limiting greenhouse gas emissions and carbon emissions. With respect to the seismic resiliency issue, we feel that this will lead to disinvestment in the bulk fossil fuel terminals which will result in no improvements to seismic resiliency. My company Kinder Morgan and I'm here representing the working waterfront coalition today and Kinder Morgan. Our core values are to operate safely and compliantly and reliable and we rebuilt a tank in Linton. We increased the capacity by 30%, but that's what it took to justify the investment. And in wheel bridge, we increased our capacity, our overall capacity by about 23%, which is seismically resilient now as is the tank in Linton, such that what it took 20% increase in the capacity to justify that investment. So we feel that Portland is not an island. And that instead of being visionary and exemplary, that these land use restrictions and zoning changes are actually short sighted and very self-centered. Thank you.
Fritz: Can I ask you a question? You saw the northwest natural gas explosion in northwest. So wouldn't your tanks that aren't seismically stable, if there was an earthquake, wouldn't they produce an explosion many times more than that?
Mathers: I don't know if there would be an explosion, I don't know if there would be release. It could possibly happen yes.
Fritz: So is your company not worried about liability in that instance?
Mathers: Yes. We are.
Hales: The reason for the -- and we'll talk about this some more, the reason for the 10% allowance was we would hope that people would basically try to take market share from somebody else within the existing capacity by building a seismically resistant tank, our hope would be that companies that are worried about liability or have old tanks could, in effect, take that capacity from their competitors by building a safe one and we're not sure if we calibrated that right. You weren't necessarily taking market share, maybe you were given the demand is flat. You're taking market share from somebody else.
Mathers: But there has been. Last year, gasoline rose 2%, natural gas demand countrywide rose 3%. There probably are going to be more vehicle miles traveled here.
Hales: We're actually going down here and we're happy about that.
Mathers: I don't know maybe we need to check the latest statistics on that.
Hales: Okay well appreciate that.
Fritz: So your saying that the 10% increase isn't going to foster any change?
Mathers: No, that is correct it's going to not foster change and it going to lead to disinvestment and it's going to lead to these facilities being stranded and if that's what your intention is then you will achieve that goal.
Fritz: So mayor I think you put that forward as an incentive, if it's not I think we should have a discussion on if we need it or not.
Mayor: Right thank you, welcome.
David Konz: Thank you mayor hales, commissioners thank you for having me and the opportunity to provide comments on these zoning amendments. My names David konz and I work for tide water barge lines we're a tug and barge company headquartered in the pacific northwest and employ approximately 275 people. Tide water has been in business since 1932 it's the largest inland marine transportation company west of the Mississippi river. With 16 tug boats 170 barges and 5 marine terminals, tide water's vessels help move millions of tons of freight every year on the pacific northwest water ways reducing congestion on the state's highways and railroads while producing far fewer pollutants and carbon emissions than trucks and trains transporting equivalent tonnage. Likewise, our industry statistics and safety record show that the towing industry in the pacific northwest has one of the best programs for moving commodities securely and safely in our region.

We have reviewed the proposed zoning and are concerned this will restrict economic development in the pacific northwest we feel energy terminals can be built expanded and operated safely in the city of Portland. These terminals have the ability to create positive economic impact and support new and existing family wage jobs in our region and the other thing we wanted to bring from our perspective as a water way user is that these may have unintended environmental consequences looking at the big picture. These changes would create uncertainty about these terminal existences and to robs points earlier about them stranded on an island, if they go away their key to the fuel supply network of our region and the sides the eastern sides of Oregon and Washington for example barging supplies about 50% of the fuel consumed in the tri cities area and barging also a for barge configuration is usually how their transported take about 538 trucks off the road and 140 railcars off the road. So if the terminals go away and the demand still is there even if its flatter slightly decreasing there still going to need their fuel and it's going to go through other methods so that's for every barge load that goes that's a potential of 538 trucks or 140 railcars traveling along the Columbia river gorge. So in conclusion tide waters an advocate for environmental stewardship and hopes to the city of Portland will consider a constructive dialogue with us and other stakeholders to generate an implemental fossil fuel distribution policy that addresses climate change. Public safety and environmental protection without significantly adversely impacting the viability of Oregon's economy and water front industry. Thank you for the consideration and the time to share out viewpoint.
Hales: Ellen Welcome.
Ellen Wax: Hi, Ellen Wax with the working waterfront coalition. The working waterfront coalition supports the intent for seismic safety and improvements in emission reduction. We do not believe this is a tool that will achieve the goal, we have concern about the unintended consequences per seismic upgrades resulting in disincentives. The working waterfront coalition has submitted a letter of testimony to the record and for the record the wwc thinks there is a – in the planning commission's recommendations specific to the storage structures definition it's not clear whether the limits on growth relate only to fossil fuel storage tanks or whether the limits on growth relate to pipes and other fossil fuel facilities associated with the existing terminals. It is our understanding during discussions with city staff that the city's intent is to limit growth related to the existing storage tank capacity and it does not intend to limit growth related to pipes and other fossil fuels facilities and infrastructure. We have submitted to the record clarifying amendments that address this issuer by specifically stating fossil fuel storage tanks in the language. Thank you.
Hales: Thank you very much. Ok let's take the next three.
Hales: Welcome.
Nick Caleb: Greetings. I dressed up for you today I think last year I was here in a red t-shirt. I got a new shirt since then that is red. My name is Nicolas Caleb the staff attorney for neighbors for clean air and a professor at Concordia university. Today I'm delivering testimony for the center for sustainable economy, and my boss Mary Peveto I think will give testimony for mca a little bit. Last November after a year of wild action and debate about our role in the regional and global climate action we passed the fossil fuel and infrastructure resolution it was a huge milestone. We did this because fossil fuels posed health and safety risks to Portlanders and pretty much everywhere across the site of extraction through transport and when we combust these fuels. Since this time as has been mentioned far more eloquently by youth today threats have become more severe both political and scientific. Not only have the threats become more severe, but the city of Portland has taken the fight outside its boundaries as well so we have become involved in regulatory processes with regard to oil trains we also submitted resolutions in support of the standing rock blockade of fossil fuel infrastructure so our cards are on the table we're

committed to this as a matter of policy and now it's just time to tie the bow on top of it. I think we can still improve the policy in front of us. I think the dialogue we just heard was very useful and understanding a key point of this whether allowing for a 10% increase and existing capacity will serve as a sweetener for investment representatives of an international fossil fuel company just told you that it won't so I think we shouldn't believe them, but the option isn't to allow 30% upgrades. We're not going to do that. I think what is in front of us, we knock down the cap on existing infrastructure we draw a strong line in the sand and we move forward from there into a renewable energy economy. Thank you very much.

Alan Smith: My name is Alan Smith and I'm a Portland resident natural gas is not a clean fuel saying its clean because burning it is less carbon intensive than the fuel it replaces is like saying smoking tobacco is healthy because it won't kill you as quickly as smoking opiates. Over a 20-year period methane is 84 times more powerful than co2 as a greenhouse gas and fugitive emissions have increased more than 30% above epa's estimate over the last decade. One scientist has said this is almost certainly due to fracking, according to the ipcc 40 to 70% of species would be doomed to extinction by global warming at 3.5 degrees Celsius. Climate change is estimated to kill 400,000 people per year already and the number is projected to exceed 600,000 by 2030. Billions of people migrating to avoid starvation from drought would cause chaos around the world to have a 66% chance of keeping global warming below 2 degrees Celsius 68% over two/thirds of the proven reserves must remain in the ground. The fuel terminal representatives claim these amendments are emotionally driven. This is a false argument and an arrogant one at that. It's also an example of attacking your opponent's character when you can't win a debate with rational arguments. It's true the dire warnings we hear from the scientific community stir emotion, especially when we hear the damage to life on earth is proceeding faster than predicted, but we should all remember that it's not just local jobs or lives that matter and there are no good jobs on a dead planet. I urge you to eliminate the allowance, 10% existing expansion of terminals and support the recommendation of pursuing seismic safety through billing code changes at the state level. Since the recommended draft was written, plans were announced for a $2 million facility --

Hales: Go ahead, finish, please.

Smith: -- in Jacksonville, Florida. The 2 million-gallon threshold should also be limited so that facilities like that can't be built in Portland.

Hales: Thank you. Welcome.

Dick Harmon: Good afternoon. I'm dick Harmon. I live in Portland, I'm 80. I'm here as father, grandfather and great grandfather. I support 350's position on the ordinance and I want to thank the council especially mayor hales for stepping firmly into our new reality. We have run out of time on climate so the small adjustments as incentives is offensive. It is deeply offensively. We don't have time for that kind of stuff. We have in my view just been threatened by disinvestment. My reaction to that is let them disinvest. Let them reinvest by making up for the increase in demand by changing their business plan to invest in renewables and keep conservation. The other question here at root in my view listening to this, we have a liquid fuels catastrophe coming at us, so the mobilization of the people and the institutions of Portland to electrify transportation is critical. It's stupid we're in this argument over the safety of these tanks. Cut the liquid and go to electrification of transportation. We will back you if you lead on this thing. It's going to take big money. We can raise that money as a community to invest in that kind of electricity. We can negotiate with Detroit to speed up the entry of electric vehicles. So we don't have to take this stuff that the fossil fuel guys are saying. The last thing, it's about the children. I can't say it any better than the kids did.

Hales: Thank you.

Bonnie McKinley: Bonnie McKinley. I go to garage sales I set upon my voyages as a garage sailor in the 1970's. One Saturday in that long past decade I was garage sailing through southeast Portland. One sale stood out for its remarkable treasure shelf of cheap, cool stuff. I asked the couple why they were selling their precious belongings for so little. They explained they were being forced to leave their neighborhood. They had to clear out fast. Holding this garage sale was a small piece of the larger preparations to leave their home of 50 years. Why? They had been cancelled out of their long-term neighborhood. Their home and hundreds of others lie in the path of eight lanes of vehicles, the proposed mt. hood freeway. The plan was to have east to west freeways roll out in the southeast powell/division neighborhood. To the north and south additional freeway would plow through Prescott and sellwood neighborhoods. Federal funds were in place. This thing was happening. Except, except, Portland still has those sweet tree blessed neighborhoods. The city of Portland changed course. It used its brain and heart and traded a foul smelling freeway for a planning prize that continues to impress the nation. Light rail our max lines. Things can change for good. Policies, city leadership, economic viabilities and public sentiment can change and make sense for the good of residents and for the environment. We can use our brains. We still have hearts. Let's use them when considering the perpetration perpetuation of fossil fuel infrastructure. No new climate bashing projects we will work for energy conservation and renewable energy and for all the employment they can bring to our city. The city of Portland, commissioners, people impress that nation Again. This time with a glorious robust, visionary fossil fuel infrastructure resolution.
Hales: Thank you so much.
Sarah Taylor: My name is Sarah Taylor. I'm here to talk about the past, current and future materials of fossil fuels on newborns and maternal health in particular to premature babies. I live in a Linton, a place of two rivers of lakes, of wetlands and forest park, I live in the historic Linton community that was annexed by the city of Portland in 1915 for what looks like the sole purpose of turning a river community into a fossil fuel and super fund site. In 1962, the state of Oregon bulldozed Linton to make way for more fossil fuel infrastructure our small community has asked for a river front piece of land so we can rebuild and year after year this city council has denied a small park, a small piece of the river so that the fossil fuel community can continue to take over that river community, but today I am here as a midwife in north Portland. I have delivered over 2,000 babies most of them in your city I am here to share that the impact of the fossil fuel industry on the unborn children in our community is devastating. Right now the united states is 36th in maternal and newborn health. This is largely because of environment factors African-American and Native-American babies are 2.5 times more likely to die in the first year of their life and it is increasingly obvious that this is because of fossil fuels. We live not just downstream, we live up and down a pipeline. I'm from Pennsylvania, where there is fracking john Hopkins university did a study. Babies born where there is fracking where our oil will come from are dying they are costing money they have huge medical bills; they have lifelong challenges that oil is coming through a pipeline at the expense of unborn babies. The fossil fuel fumes destroy women's estrogen read the science I will give you the studies. You are destroying a baby life before it's born, you are destroying its genetic makeup. You know the fish in that river are in trouble. The mothers on the banks of that river in my Portland community are in trouble. It is not because of poverty. It is not that our students in north Portland cannot learn. It's because we have polluted their rivers, their air, their soil, their mothers' uteruses, their wombs so that is down river in Pennsylvania where the fracking is happening. In north Portland, you know that you just failed to agree to clean up the super site, 16 of them and now you are saying that you are going to increase the hazard for north Portland children. I also worked in Haiti.
Hales: I'm going to wrap it up. This is a new point.

Taylor: I want to tell you down pipe, I've worked in Haiti for the last five years, I've watched hundreds of babies die. So what you do here impacts north Portland, the fracking babies and the babies on the other end and I ask you to think about the babies when you make that decision.
Hales: Thank you so much.
Riah Sallee: Thank you for giving us, all of us the opportunity to speak with you today.
Hales: give us your name.
Sallee: Sorry about that. I'm Riah Sallee. Thank you for giving us this opportunity. I support a full ban on all new fossil fuel terminals large and small and ask you to eliminate the projects below 2 million gallons. Additionally, I understand that there are other mechanisms to encourage seismic upgrades and to the extent that those can be employed. I support them over a 10% increase in capacity at existing terminal as is climate disruption was not enough derailments in mosier and elsewhere have given us a multitude of reasons to ask the city of Portland create policy that reduces oil train traffic through our precious Columbia river gorge not increase it. Climate change is the most pressing issue we face globally we cannot allow short-term corporate profit gain to trump the health of our people the safety of our communities and the environmental viability of this region. The city of Portland has the opportunity and I believe responsibility to continue to lead the way for other cities to follow.
Hales: Thank you. Welcome.
Darise Weller: My name is Darise Weller and I'm here as a very concerned citizen and a Linton resident. With our country about to be taken over by a man who vowed to reverse environmental laws and dismantle epa now's the time to stand up boldly to the fossil fuels industry's to stop cow-towing to big oil interests who are trying to make the city back down on this historic ordinance when actually there's a need to expand on this ordinance to insure safety. The Cascadia earthquake along with other fault lines make the locations where the tanks are located the worst possible place. Natural hazards are not only there is not the only problem that result in environmental catastrophes of epic proportions in the last few years we have had three near misses due to accidents that would have achieved the same disastrous results. Do not exempt northwest natural from fossil fuel amendments many small tanks can quickly added up to a large storage facility. Code seven of Oregon land use laws state cities should pass zoning laws where hazards cannot be mitigated circle law requires responsibility make sure the insurance or assurance bond coverage is enough to include not only the environment cost of destruction and cleanup, but also the loss of life and property. If industries will not or cannot acquire that assurance they should move to safer ground. Make the tank farms move if they will not upgrade seismically to the highest standards needed. Do not allow storage railroad cars filled with hazardous materials to be stored in this area sometimes for days on end this amounts to mobile storage of fossil fuels. The dangers are greatly increased by railroad switching that takes place in the Linton area and there are many uncontrolled railroad crossings with tanker trucks loaded with volatile fuels crossing over them. We should not have to bear the consequences of fossil fuel industries that favor profits over people. Don't back down on the original ordinance of no new expansion. Make a bold statement. Protect us.
Hales: Thank you. Thank you very much.
Eileen Fromer: My name is Eileen Fromer. Climate change and greenhouse gas emissions will not stop because president-elect Donald trump is coming to the white house. This city must remain committed to transitioning to clean energy and meet its 2050 carbon reduction goals every step we take as a community to keep fossils fuels in the ground and transition to sustainable energy is essentially to stop global warming and the catastrophes it brings to life on earth. Portland has the opportunity to be the example of how communities can come together and get it done do not accept the 10% expansion of

fossil fuel infrastructure tied to seismic upgrades. That is not necessary to achieve the seismic upgrade and is obviously a sneaky, backdoor way to allow expansion. Seismic resilience and upgrades are important and necessary to achieve as soon as possible for at risk fossil fuel storage tanks. However, there is no reason to tie this to the expansion of current fossil fuel facilities. Specifically, I encourage you to remove the words "plus 10%" from page 49 of the psc's recommendation.
Hales: Thank you, thank you so much.
Rob Lee: My names rob lee. When the gasoline tanker truck crashed into the rail tanks cars last summer just imagine how the first firefighters on the scene when they saw the numbers on the side of the cars indicated asphalt instead of oil or ethanol as it happened the gasoline fire burned it's self out after hours instead of having tank cars exploding right next to a giant liquefied gas tank in a chemical plant with its tanks of liquefied hydrogen. Imagine how city leaders would feel explaining how the city of Portland allows dangerous components to exist so close together and how we can only watch the ensuing catastrophic fire made its way along the river. Can't happen? Let me remind you this was one of recent tank fires in our area. Obviously adding any infrastructure to this dangerous situation is a fool's errand. It's time to start moving the tank farms to safer places, not adding to a situation that might explode even before the earthquake. Thank you.
Hales: Good afternoon.
Debra Romerein: Debra Romerein. Nope, it's not dead yet. Contrary to recent reports, Australia's great barrier reef has not been completely stuffed out, not yet. Only a quarter of the world's reef has been killed off this year and the rest is in mortal danger there have been three mass bleaching events reported on the reef since 1998. This year was unprecedented die off, the worst scientists have of seen. How many dead canaries does that equate to? I recently got back from Hawaii and it's happening there, too. The primary reason this is occurring is warming ocean attentions, the burning 'fossil fuels. Exxon mobile James black 40 years ago knew it, too. He said the likely manner mankind is influencing the global climate is through carbon dioxide side release from the burning of fossil fuels before all of us here know what we have to do. We have to reduce our dependence on all fossil fuel. We already know that you have done something so important, something that really counts when you voted unanimously last year for a full ban on any fossil fuel infrastructure expansion. You were clear, resolute. Now is no time for half measures, watered down inserted clause is, back pedaling concessions, strong arming forces. Now is the time to show what other leader looks like. Let's chart a course for other cities to follow. You make me so proud to be from Portland. I want to leave you with one question. When I do my seismic upgrade to my apartment building will I be allowed through a code or zoning change to build 30% more rentable space to recoup my seismic upgrade cost of course, not. But I still do the right thing. Thank you so much.
Hales: Thank you.
*****:** Yum.
Theodora Tsongas: Good afternoon. I'm dr. Theodora Tsongas I'm a member of the environmental working group of the physicians for social responsibility. And a member of the Multnomah county local emergency planning committee. The fossil fuel zoning code changes recommended by the Portland planning and sustainability commission are well thought out. I commend their restrictions of small fossil fuel terminals and their rejection of a request by northwest natural to exempt its facility's. The recommended code changes still raise concerns about public safety and pose a threat to our community and neighborhoods. You've been reminded of the fire that resulted from a collision of an oil tanker truck with an oil train, unfortunately the truck driver was killed fortunately the train cars burned, but did not explode it was a very close call for nearby industry's workers and residents in northwest Portland. In Mosier the derailed cars burned for days exposing

residents and visitors to smoke as well as causing major disruption in the life of the town. Accident do happen let's not increase the likely hood of an oil fire we need to truly actively oppose expansion of fossil fuel infrastructure this means actively discouraging increases in demand for fossil fuel unit trains in Portland. A 10% across the board increase for the 10 large oil facilities listed by psc would result in additional storage of 39 million gallons of oil, equivalent to roughly 13 trains of crude oil. We must find ways to require seismic and safety upgrades without increasing capacity or we defeat the purpose of council resolution 37168 and 37164 and the climate action plan. Let's truly take the lead in combating climate disruption thank you.

Julie Chapman: I'm Julie chapman with the league of women voters of Portland. Any increase in fossil fuel infrastructure is not consistent with the league of women voter's natural resources and climate change position. Having followed the process of code development I've observed that the recommendations have ranged from unlimited expansion to no increase in capacity in the existing terminals. Last month three of the seven planning and sustainability commissioners voted not to allow an increase. The petroleum industry has exactly rushed to upgrade their tanks even with no size restrictions allowing the 10% increasing in capacity for existing terminals is arbitrary. Any increase is not compatible with state climate goals nor with Portland's climate action plan these goals do not state the exception unless we have an increase in regional population in fact, regional population increases are assumed in the calculations. The goals are a reflection of the important task before us, to leave behind the business as usual paradigm and to adopt clean energy policy. Good news, the cost for developing alternative energy resources are coming down all the time. We live in a state without a petroleum extraction industry and with the wealth of water, sun and wind. If any region in the world is well suited to shift onto renewable energy, it's Portland and Oregon. We urge you to exercise foresight and to stick to the goals you've adopted in resolution 37168. If cities lead, we'd like to be headed in the right direction.

Hales: Thank you. Welcome.

Mary Vogel: Thank you. Nice to see you again today I'm Mary Vogel as you know I'm a planning consultant who usually focuses on central city planning. But today I want to support the general direction of these zoning amendments I do want to question however the need to allow the 10% expansion of tanks in the proposal. I know our planning director Susan Anderson knows that urban design and Urban forum are critical to reducing demands, but Susan didn't mention the residential infill project that we heard yesterday that will allow more people to live in walkable neighborhoods as well as make more neighborhoods walkable. By the way, you can still testify on that or send testimony until November 16. She didn't mention your upcoming hearing on parking reform that commissioner Novick mentioned and she didn't mention the central city 2035 plan that I'm hoping will make it more walkable and bikeable. There are so many other policies that will lead to a decrease in demand. As excellent as the report is, I certainly learned a lot from it. It does not make a good case for the need for the 10% capacity increase. I want to support with so many others and ask you to take the allowance for the 10% expansion out. I also want to support the invitations from commissioner Fritz and novick. Perhaps you could repeat the date, Amanda and the parking reform hearings as well.

Hales: Thank you so much. I want to make a suggestion in terms of process. I'd like to call the staff back up for a little bit of a work session on just some of the questions that have been raised because you and others have raised this 10% issue and we also heard from the industry about that so if that would suit the council, I know we're going to lose a quorum at five and we also had demonstrations that has the police bureau urging people to make travel plans a little differently. I'd like to take a little bit of a pause in testimony and just bear down on a couple of issues we've heard about, so certainly from my perspective,

I think it's the perspective of this council, and I know it is, and I really know it is as you as professionals, there is no one beholden to the fossil fuel industry. My only interest in any mitigating factors in our turning policy into code is to make it work as a practical matter, to avoid getting overturned by some other government, and those are probably the only reasons. If the 10% threshold, which we intended for the reasons of encouraging seismic upgrades apparently isn't going to do that. What's the case for it?
Anderson: Let me toss out something. I think you can recommend 0%, but there is an issue of blending that is very real, in terms of having tanks to be able to do that and whether you'd be able to monitor that is unlikely. I think adding on an amendment that directs my fellow bureau directors at bds, pbem and fire to pursue new codes, so that you can actually require a seismic upgrade is from my perspective something to do. It will take years, though. So whether or not you want to go to zero now, eventually you want to go to zero. If you want to do that after the new code is finally through the state and we get to adopt it or you want to do it now.
Fritz: Why does it take years to get a change at the state?
Anderson: In general building code changes follow practice and at least it's been like a two or three-year process to get a major change in the building code. So you can get Paul Scarlett in here to talk more about that, it's not an overnight thing.
Fritz: I would imagine lots of building code things are kind of inside a baseball or the committees that deal with that. This is obviously a bigger public purpose so surely if the legislature was to direct it that could happen faster right?
Hales: So yes I'm really struggling with not that your arguing for it, you tried to craft good policy and you also have a history of crafting visionary policy. If the 10% threshold and we just heard from Kinder Morgan isn't going to incent them to make the change, and if the rate of change from old dangerous tanks to new seismically resilient ones is glacial. It will take us 300 years at the current rate to have it all taken care of. So in other words, we're not solving the problem or even ameliorating the concern in the industry. I'm starting to wonder if there's any real upside to the 10% threshold.
Anderson: Maybe Michael can talk about blending and whether that's a real issue.
Hales: That I think I need to hear about.
Michael Armstrong: I think blending is the consideration so the state cleans fields programs first came into effective in January of this year. It ratchets up the percent of low carbon fuels that need to be blended in. So the recent new tanks that we've seen have been specifically for blending I thinks it believable that the current infrastructure will need some additional tanks in order to do that blending as the clean fuels.
Hales: Couldn't we specifically address that issue? If there's any exception or carve out here couldn't it be if it's only for that purpose as opposed to some sort of general wiggle room?
Michael Armstrong: I think we can try to define it that way.
Fritz: presumably any new blending process would have to involve new construction so if the companies are feeling like they are being told that they have to move to that they're going to be building new tanks anyways right? So why would they need a bigger tank then currently?
Michael Armstrong: I think that might be a good question for the terminal operators.
Hales: This is when we talked about it before, but based on what we heard from the community and the industry I think it needs work in the sense that we want to make sure we're really in concert with the state, we have a clean fuels policy that say use more and more clean fuels, we want the infrastructure of those fuels to be provided. Granted the fact we're going to be using less and less fossil fuel overall. Those are the scenario's we agree with state government on. We have to get these old dangerous tanks replaced with new ones. Sounds like, frankly, the only way to get to that is a mandate. I'm fine with that. It's

not going to happen with incentives. A few people have built new tanks, but again, we just heard that the 10% threshold isn't going to change their corporate decision making about that, so I'm struggling with what we're getting for the 10% allowance really given the testimony that we heard from the industries like, okay, it isn't going to work, we're not doing anyone any favors, not that we were trying to.
Fritz: Also mayor just thinking through the politics of it sometimes for instance on sick leave when Portland has a very strong ordinance, the legislation sometimes comes back and weakens it. I don't know why we wouldn't go for the strong ordinance in the first place.
Hales: The only reason I would pull my punches on this issue politically was if we had a significant fear that the legislation would overrule our ability to do what we're doing. It's happened. It has not happened lately the legislature been going in the right direction lately they gave us they set us free from a prohibition on inclusionary housing for example rather than tying us down with new ones. For the legislations step in on local zoning would be a pretty big overreach, but I guess They've done that before, too.
Fish: I think we've been pretty consistent in not legislating against the fear that someone will pull the rug out. They have the right, but they then have to make that case. As I listen to the discussion and the incentive plan, I appreciate that Kinder Morgan came in. I don't know who else might take advantage of the incentive and what is as the mayor said the benefit. If we can't mandate it and don't control the timeline towards that process, I'd like to see it. If we're not sure whether the incentive is going to work, a dormant incentive doesn't have much of an impact. If there is someone who might use the intensive to create a public good, I guess I'd like to know beyond just Kinder Morgan and who might take advantage of that and why before we say we're going to take this out and address the mayor's question about can it be tailored so it's adapted to real world situations where we get a clear public benefit and not an invitation to be used willie nilly. Does that make sense?
Anderson: In other issues like this we've done a do this until. So we'd set up an incentive until legislation gets passed at which time times can be regulatory and obviously it ends at the time.
Fritz: That would be a disincentive though to the industry to not oppose the legislation.
Fish: Let me continue this line. I don't want to extrapolate off of one person's testimony about what Kinder Morgan will or will not do and commissioner novick is not here. He would be leading the discussion about moving towards upgrading seismic standards. We don't know if the legislature will or will not take this up in a time manner. We got to get a handle on this because everything we do in the river can be undone if there's a seismic event and we have failure around these tanks. For me to make a decision I'd have to have a better sense about who is impacted, who might take advantage of it, because right now I feel like we're speculating, but it would have to be tailored so at either sunset or there was some clear oversight about how it was used and then we'll have some follow up decision making. I think the mayor hit the nail on the head I don't feel like I have enough information to evaluate whether it would be an incentive someone would take advantage of for the public benefit.
Anderson: One of the things, there's no -- we aren't setting this up right now. They could do it right now, and we're getting one a year maybe, and so whether or not there's no limit, they can go 30% over at this point and it's not an incentive to do it now. So I kind of believe --
Hales: I think making it clear, taking it out,
Fish: do you believe the mayor should withdraw his amendment?
Anderson: No.
Hales: It's already in the base proposal from the planning and sustainability commission. The 10%.
Anderson: The 10%. We put that in there because the planning sustainability commission

felt they thought an incentive would help to move the market. At the same time there were others making the case. They have that right now and it doesn't cause that.
Hales: Natural industrial zone today You can just build a tank.
Fish: You're saying they're playing Russian roulette without making any investment to make them seismically resilient and because you're not required to.
Anderson: There is another issue to, which is maybe they don't see the market expanding. If we're going to reach our 80% reduction in 2050, it's only going be falling so what would be the financial incentive for them to invest in this.
Fish: If we were doing the comp plan right now you would hand us a one pager at a bunch of options and a box we could check because it's getting late, we've been in lots of hearings a little bit, could you walk us through what you think are the options at this point?
Hales: Leave it in as 10%, that is one.
Anderson: You go to zero, you go to something in between. You should also proposal have an amendment that says maybe you've already put this together about having bds and pbem and fire put together the due code I think that's it.
Tom Armstrong: So I will say that --
Saltzman: Couldn't it also go up? -- [overlapping dialogue] -- maybe a 50% incentive is and what is the trade-off.
[Overlapping Dialogue]
Tom Armstrong: I will say the mayors fourth amendment has us reporting back to you for three years, what the fuel demand trends are, the tank replacement is. That's an opportunity to review what are the dynamics. I think, in addition the 10% is in there not only for an incentive for seismic upgrade, but the uncertainty around the fuel blending for the clean fuel standards that is in year one is going to ratchet up over the next 10 years. We don't know what the needs are going to be for a blended tank. We have said it's okay to have a tank of non-fossil fuel of ethanol that you need to blend, but part of that additional expansion capacity is for that fuel blending when you take the ethanol and petroleum and mix it together which happens on this end of the pipe not up in the pungent sound area.
Hales: We're going to lose a quorum in half an hour. I'll restate what I said earlier. There's three reasons I would in any way weaken what we've put in policy in the code. One would be practicalities, work in the present day. We're working towards a lower carbon pollution. That is our incentive, what we have stated in this city. Oil locked up in pavement is not a problem for the climate not as much as oil being burned. We do still need pavement, but I'm okay with that one. That's being practical. Second I want to be political that I don't want to set the city Portland to be overturned in court or at the legislature. And the third would be that we're -- that we're not creating a replicable model because I believe what other people said here is we're going to create a precedent for other cities to follow and I want them to be able to pick up this ordinance and cross out Portland and put in Eugene or Prineville or anywhere else and so that is a concern. Seems to me the 10% threshold isn't pivotal to those questions. Doesn't sound like it's needed in the practical world, but the blending thing might be. I'm going to ask that you prepare an amendment that removes the 10%, and adds a blending amendment. Bring that back to us as an option, because if there's a way to do that, there might be an interest in the council in going that direction. And I think commissioner Fish's question is good as well. How would a blending provision work? You get to build a new tank if you're doing it to follow the state's clean fuel guidelines, tell us how that would work. Seems to me that's a set of conversations that you ought to have with them as an industry and then we use to make adjustments to this code proposal. Is that helpful?
Fritz: I think we should check with government relations and our leaders in the legislature both with whom are Portland politicians so that's great. Could you explain the bit about the 2,000 vs 5,000 is it?

Hales: You mean the 2 million vs the 5 million gallons?
Tom Armstrong: In the amendment or the code?
Fish: While we're looking for that I think we should let the folks know that because of the demonstrations planned around this building we've been advised to give our staff the opportunity to leave early because they may not be able to get to cars. That is not to be alarmist. That is to tell people if they are required to pick up a child at school, get to a medical appointment, get home at a certain time it may be that the transportation system is impacted around this building. I'll say while we're going to continue this hearing if someone has that concern they should make their own judgment.
Hales: We're going to continue this hearing until five and we'll continue it, the hearing because we have people worked on amendments and we won't get to everyone who wants to speak today, so we'll do our best.
Fritz: Your right it was the 2 million in the definition of the capacity exceeding 2 million gallons. So could you explain it used to be 5 million gallons?
Tom Armstrong: When we started this process, we looked at the Pembina facility's which are 30 or 40 million gallons. Through the process, the discussion process and planning commission we got down before the planning commission who was 5 million-gallon. That covers pretty much all of the major distributors in the Portland harbor today. There was concern there would be both some small operators underneath there increasing of fossil fuel structure, so the planning commission recommended and before you to move that threshold down to 2 million gallons. That is roughly the equivalent of one oil train and experience, one-unit train carrying crude oil.
Fritz: What about the testimony we heard saying we should get rid of that? And I don't quite understand that.
Tom Armstrong: I think it has to do with how small do you get and do you when you a pull in the smaller operators does that become a burden on essential local distributors such as propane companies that bring in railcars and then distribute even the small bottles of propane around and do we want to regulate all of those people that may have 100,000 gallons.
Fritz: but it's a threshold. -- [overlapping dialogue] –
Hales: I haven't heard anything yet that would cause me to move it up or down. Certainly wouldn't want to move it up, but one of the things that ought to be in that follow-up plan is what's our intention here. No more bulk fossil fuel terminals in Portland. So we think we know what bulk looks like the planning commission says that's 2 million gallons, that may not be right, where we want to draw the line. It may be smaller than that, but that is something we might not figure out in the first version of the ordinance. So I'm less prepared to try to tinker with that than I am with the 10% provision. Which gives people the appearance that we're watering down the ordinance, but might not do any good. That seems to me the worst of both worlds.
Anderson: On the 2 million to weaken in the next week put together what kinds of companies, real examples of companies in the Portland area that would be affected by that so the propane companies and some of the smaller firms.
Hales: Any other requests for them? We'll continue the hearing until five.
Saltzman: I'd like to say some clarifying language that was suggested by the working waterfront coalition to define what is covered by the 10%, that it applies to tanks only and not to piping and pumps and things like that.
Hales: Thank you so much. Other questions for staff? All right, then let's return to the list and we'll keep going as long as we can.
Rose Christopherson: Hi. Thanks a lot for all the good work you guys are doing. I'm rose Christopherson. I'm going to testify as a representative of the care of creation ministry of Augustan Lutheran church. God gave us an incredibly rainbow Saturday morning, I don't

know if you saw it, but the thing I noticed was that the red is on the outside, the long. The violet is on the inside. What actually falls on the earth, of course, is we call it light because we see it but its electromagnetic radiation that continues into the invisible range of both sides. Heat is the side that goes beyond red, it's a lower wave length and that's infrared. And when we see something, say a red scarf, what's happening is the red is reflected and that's why you're seeing it and all the other wave lengths are absorbed. When you see something like a lump of coal you do see it, so something is being reflected. For the most part being absorbed, it's black. When you burn that coal and you get carbon dioxide and it goes up to the atmosphere, it gathers warmth because the infrared light that hits the earth and comes back out into the atmosphere is captured by that carbon dioxide. And so that is where the warming comes from. The fact it's above us is where they call it greenhouse gas. As we burn the fossil fuels carbon dioxide is released and it warms the earth. So when you see a rainbow again I think you'll notice the red on the outside and you'll remember the carbon dioxide absorbing the heat from the longer wave lengths.
Hales: Wow, thank you, that was a teachable moment.
Christopherson: If a doctor can explain it and a city council can understand it, it's actually simple physics.
Hales: We call that process. Thank you.
Christopherson: It's really simple.
Regna Merritt: Thank you. Today I'm testifying on behalf of power past coal coalition, a huge alliance of health, environmental, business, clean energy, faith and community groups working to stop coal experts off the west coast. We deeply support resolution 37681 and truly want to see full implementation of those protections. This city council has been well ahead of the curve on climate, fossil fuels, coal and oil. You have been awesome. After Tuesdays election this is a new world. President-elect trump is as volatile as bachin oil. Big oil and big coal have a big vision and very detailed plans for exporting fossil fuels from our west coast ports. They are in Bolden now, and becoming more empowered with each passing day. While we'd hope there's be an opportunity of protection it's more obvious to today than ever before that our local and state leadership must protect and sustain us for the next many years all local actions through zoning amendments must be taken to safe guard our lives, health a safety and they must be taken to protect our climate. We rely on you. So please modify this proposal to prohibit all expanse of existing fossil fuel terminals, encourage seismic upgrades to buildings without expansion of capacity eliminate the threshold and also prohibit bait and switch maneuvers that will allow 100% fossil fuels to be stored in tanks that were permitted for clean fuels. Please maintain the part of the proposal that does not exempt natural gas and its methane from this code. We have to stay in the game in this new world, this is where the rubber hits the road. We can protect our own backyard, those most vulnerable and the climate that sustains all earth inhabitants. We thank you and future generations will thank you for taking the right action on this.
Hales: Thank you. Welcome.
Anne Turner: I'm Dr. Anne Turner. I've spend my entire career working for underserved communities first with Multnomah county health department and for the last 20 years at Virginia Garcia memorial health center both as a clinician and as medical director. We all deeply appreciate your leadership on climate, coal trains, oil trains, as the recent fossil fuel resolution. Today I'm here to ask that you give strong consideration to the issue of environment justice as you review the proposed zoning amendments before you. It's important that we fully understand the broad and negative impacts that any increase in fossil fuel capacity in Portland may bring to low-income communities and communities of color. Air quality will be degraded by diesel emissions, emergency response times will be delayed and the loud startling train horns going off 24/7 will disrupt sleep, study and work

for those living in those neighborhoods. Serious health impacts from increased hospitalizations for asthma, heart attacks and cancer may be experienced by those in the neighbors as well expose to that environment pollution. So in order to meet the standards of equity and environmental justice and to protect public health for our most vulnerable please do not permit a 10% expansion in the fossil fuel terminals and find a solution now rather than later on and permit no new fossil fuel terminals of any size.
Hales: Good afternoon. I don't remember who was first, so go ahead, please.
Patricia Bellamy: Good afternoon mayor hale and council members. My name is Patricia bellamy. Thank you to offer support for your fully restricting development expansion of any and all bulk fossil fuel terminals and eliminating the 10% increase in expansion and to give you a nurse's perspective. I've been a Portland resident for 30 years and critical care nurse for over 40. I'm a member of the American nurse's associations ana which serves over 3,600,000 nurses and Oregon nurses Association Ona which represents over 10,000 Oregon Rn's. Ona has passed a resolution support of Oregon's position no to coal exports interested in that letter to Kate brown, I, quote, ona would continue to work opposing projects that would increase coal transportation in Oregon. As a front line member of our healthcare system nurses are concerned about the health and environment impacts caused by coal, end of quote. Nurses are also aware of the danger of climate disruption. Ana resolve that the American nurse's association recognizes and publicly acknowledges that the challenges we face as a result of global climate change are unprecedented in history. Its critical nurses speak out and advocate for the Health and safety hazards from coal, oil, natural gas or ethanol are far too many to list in this brief testimony. The science is clear. Thank you for your groundbreaking work.
Hales: Thank you so much. Welcome.
Diane Winn: Good afternoon. My name is Diane Winn. I'm a retired public health nurse and worked over 25 years conducting injury preventive research. I was here a year ago when you passed the fossil fuel resolution. What a proud moment it was. Today as you consider the zoning amendments I urge you to support the modification recommended by the power pass coal. With my background in public health I'm concerned about explosions and fires that can cause dramatic deaths. In the past couple of years at least 10 oil trains have experienced catastrophic derailments and explosions in north America. You all know about the derailment in Canada that was demolished a city and killed 47 people. One way is reducing the risk for fossil fuel transport. Even to increase the capacity 10% will increase in the number of trains. Oil and other fossil fuel storage tanks are also at risk for fires and explosions. A human error fire in Mississippi in 2006 killed three workers after fire traveled from one oil storage tank to another. Less than one-year ago today the potential hit too close to home a tractor trailer carrying fuel struck several train cars near the St. johns bridge and burst into flames this occurred 400 feet from the lng tanks. Finally, like others, I cannot conclude without mentioning the election results. We cannot expect the federal government to do anything to address climate disruption in fossil fuels. It will be up to cities and states. I ask you to take a very bold stand and take strong aggressive fossil fuel policy. Your leadership will stand as a beacon of hope for the rest of the country.
Hales: Good afternoon.
Andy Harris: Good afternoon. I'm Andy Harris, a resident of the overlook neighborhood of north Portland, my home is above the Union Pacific freight yard within the half mile blast and evacuation zone for oil train derailments. I work at OHSU, but I'm speaking on behalf of Oregon physicians for social responsibility. Portland does need to take bold and prudent action. Building additional fossil fuel terminals capacity, whether it's 10% or otherwise in a seismically active area is not prudent. Allowing more fossil fuel trains, oil and gas to pass through Portland is not prudent. Fossil fuel are inherently unsafe whether being transported or shift. From the Mosier experience in June we know firsthand about the fire

and explosions of bachin oil. Portland is made a commitment to reduce our impact on climate change or climate disruption and to transition to renewable energy to weaken the council's fossil fuel resolution by allowing additional fossil fuel capacity at 10% and/or adding new exemptions is unwise and dangerous. A case in point is natural gas or methane 25% more potent than carbon dioxide as greenhouse gas. It's extracted by fracking. As far as the impact on climate change, I'm glad that an exemption for natural gas has not been present in the current proposal and I would urge you not to create one. Just to conclude as a physician and grandfather I would urge the council to take bold and effective action by putting the health and safety of Portlanders first.
Hales: Welcome.
Mukta Akter: Good afternoon. My name is Mukta Akter and I'm a social and climate activist from Bangladesh. I'm working with 350 pdx as an international fellow on the climate issue. Bangladesh is one of the most climate vulnerable places in the world. Countries like yours are producing the largest amount of greenhouse gases, but contributing countries like Bangladesh are contributing no greenhouse gasses. Bangladesh is a low elevation country and the combination of sea level rise and increasingly powerful storms is already contaminating our freshwater. The effects are dramatic and devastating. It isn't having major impacts on agriculture, food security, and economic performance of Bangladesh. The scenery is almost the same for south Asia we can expect the sea level to rise by 2035 this mean the Bangladesh 35% cultural area will submerge under sea water 15 to 20 million people will turn into climate refugees. It's a huge challenge for our government now how we resettled in. The effects have already started in your country. For instance, the catastrophic flood in Texas and Louisiana last year and hurricane in Florida. Please think what is your contribution to greenhouse gasses, our future and the next generation is in great risk. Climate change is not an isolated issue. It is a global problem and to fight against the corporative approach the policy you are working to is a good start. Still much more needs to be done to secure it. Thank you.
Hales: Welcome.
Ryan Rittenhouse: My name is Ryan Rittenhouse. I work for friends of the Columbia Gorge. We're very much concerned of the fossil fuel in that area. As you heard from the mayor of Mosier there was the disaster earlier this summer where an oil train derailed. As far as oil train disasters would go that was about as good as you could hope for. If we have another oil train disaster in the Gorge, it's much less likely in Mosier. Takes a long time, this is not something that's being exaggerated. Any increase in fossil fuel infrastructure, fossil fuel storage, even 10% increase, maybe that limit on 2 million gallons is too much because it will mean more oil through the gorge and the likely another disaster of going in the gorge goes up. This incentive is more for them to make the upgrades themselves. If we're going to do an incentive let's come up with one that encourages it to make it for their own sake and that reinforces the spirit, which is reducing fossil fuel storage capacity in the city.
Hales: Thank you very much.
Maya Jarrad: My name is Maya Jarrad and I'm on staff with 350 pdx. Frankly, I'm thrilled to be addressing a governing body that is ready to take action on climate change. At this moment we cannot look at federal legislators to do that, so I am that much more appreciative right now of the way Portland has taken the bold and inevitable step to facilitate this transition and ban new bulk fossil fuel terminals. I want to talk about the potential for flat line demand and decrease of fuels in Oregon. The energy administration prediction for Oregon only a .7% increase in total crude oil and consumption by the year 2040. Though that growth is predicted after year 2030. And that's with low incentives for industrial efficiency and high/low prices. The biggest process growth for those fuel need in Oregon predicted by the eia. In other words, the most generous models for fuel expansion

other mode; scenarios predict a decline of .4% on the same timeline again, these increases are predicted after 2030. Given the current status of changes to the climate will fuel increase be called for after 2030? You may not be able to legally demand upgrades under current law for seismic safety. We in this room will demand upgrades of companies for seismic safety. We have made it politically possible for you as our governing body to pass strong climate action and I can assure you people in this room and watching you from all over Portland will demand the corporations to do just that. Thank you so much.
Hales: Thank you. Thank you all very much. So again, let's take a process check here. We appreciate you who testified again.
Fritz: Can I just ask, I'm very much appreciative of our guests from Bangladesh. Did you have people who came a long way to testify today?
Hales: I think not.
Rittenhouse: I believe there might be someone here from Haiti.
Jarrad: I'm not sure he wants to testify
Fritz: That's fine I just want to make sure if you come all that way.
Hales: That's very important. Yes. Thank you so much. It's our normal practice when we have more people than time to continue a hearing and we may want to do that. I know we're going to want to take you discussion of amendments at our next meeting. So what's our window of availability here in terms of upcoming council meetings?
Fish: The good thing is we have so little on our plate.
Hales: We have nothing else going on.
Moore-Love: I don't have a full council until December 7, when everybody is back.
Hales: Hang on a second. So you're saying -- well, what about next week, I'm sorry.
Moore-Love: It's already on the regular agenda on the 16th, but commissioner Fish is gone.
Hales: We might not be taking final action so we should go ahead and do that, but then the question is when do we have a third window for –
Fish: What's December 8th like Karla?
Moore-Love: That is inclusionary zoning for four hours.
Hales: If it's just a vote.
fish: We're all going to be celebrating the governor's Barbara Walters 80th Birthday that day.
Saltzman: It's not just the vote, it's the hearing.
Hales: We're saying I want to continue this hearing to next week because it's on the calendar for next week anyway. Susan you might help us out here if you have any process suggestions. This hearing is back on the council calendar next week, right?
Moore-Love: Yes. It's the first item on the regular agenda.
Hales: So we will discuss amendments, the ones that are in front of us and maybe others, because we've asked staff to prepare additional amendments, we'll take action on the amendments at the beginning of the session, take testimony, see if we got it right and adopt the amendments and then we'll set a date for the final vote. So the final vote could be -- not going to be the 23rd of November, right, because we don't have five of us here.
Fish: Should we do it on the eighth, just before inclusionary zoning?
Hales: We can do it then. All five of us here on the eighth?
Moore-Love: Everybody is here on the seventh if it's just a vote.
Fish: The seventh doesn't work for me, but we could do it just before the inclusionary. We're not cutting into his time we're just casting the vote.
Saltzman: If it's only the vote if there's additional testimony then I would object.
Hales: We'll continue this hearing next week at what time?
Moore-Love: It will the 16th at roughly 10:45.

Hales: If you signed up to speak today and didn't get a chance and want to speak next week you'll be first. What we'll do next week is we'll have a discussion on council amendments, take action on amendments and then let you testify and tell us whether we got it right or not and then the final action on the ordinance itself is on the 8th and that's how it works, that we don't do amendments and final votes on the same day when we're making legislation, because zoning code is around for a really, really long time, which is the whole idea here. Again, I want to thank you all for excellent testimony. Stay in touch with Zach Klonoski in my office for discussions about these issues. Come back next week if you are able. If you can't come back next week and still want to let us know your thoughts on this, obviously email each of our offices as you have been doing already, but I want to thank this community and the excellent testimony we got today. We have a chance in Portland to make a difference and you are why. Thank you so much and we are adjourned until next week. Thank you.

At 5:00 p.m. council adjourned.



Fossil Fuel Terminal Zoning Amendments: Recommended Draft

City Council Public Hearing
November 10, 2016

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.

New policy direction on fossil fuel infrastructure

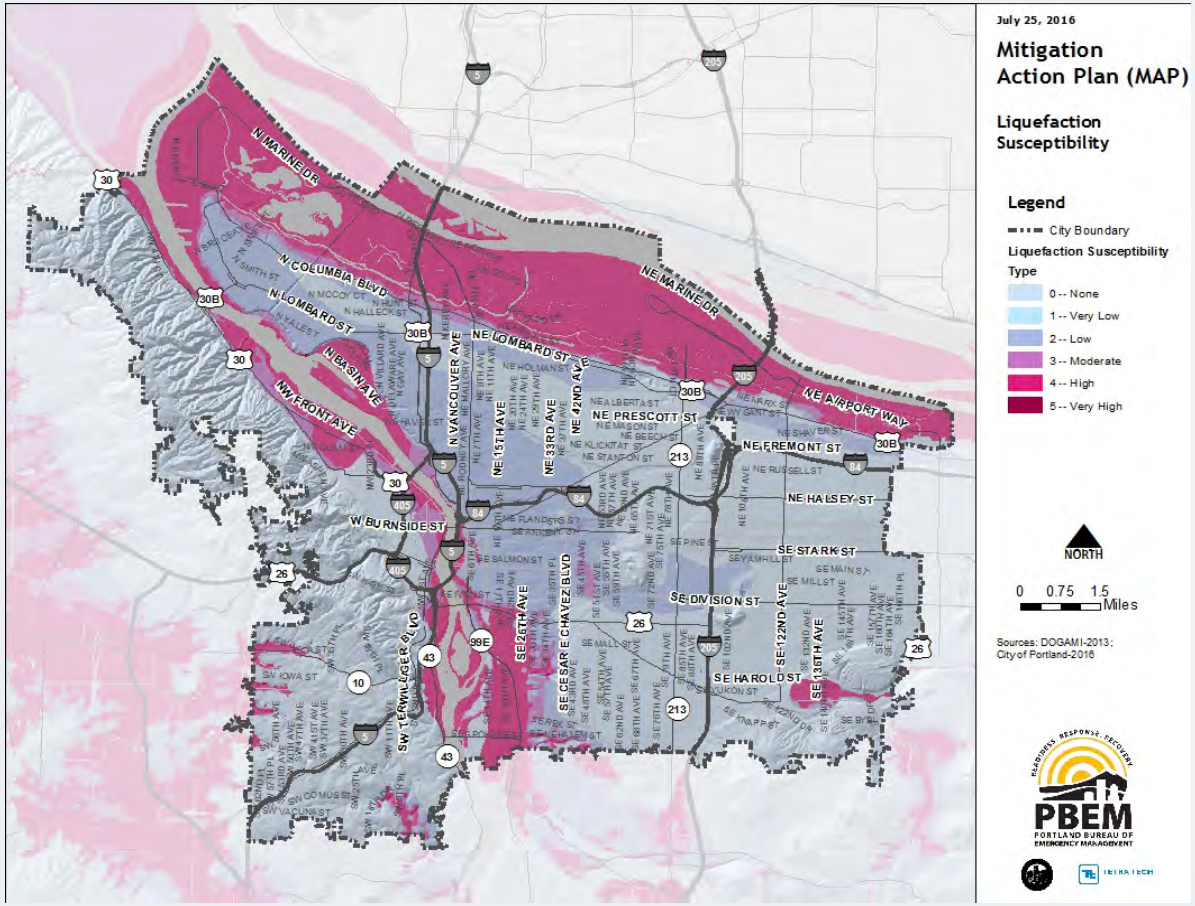
Fossil Fuel Infrastructure Resolution, November 2015:

1. Actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways.
2. But do not restrict. . .
   - improvements in the safety, efficiency, seismic resilience, or operations of existing infrastructure
   - service directly to end users
   - infrastructure that will accelerate the transition to non-fossil fuel energy sources

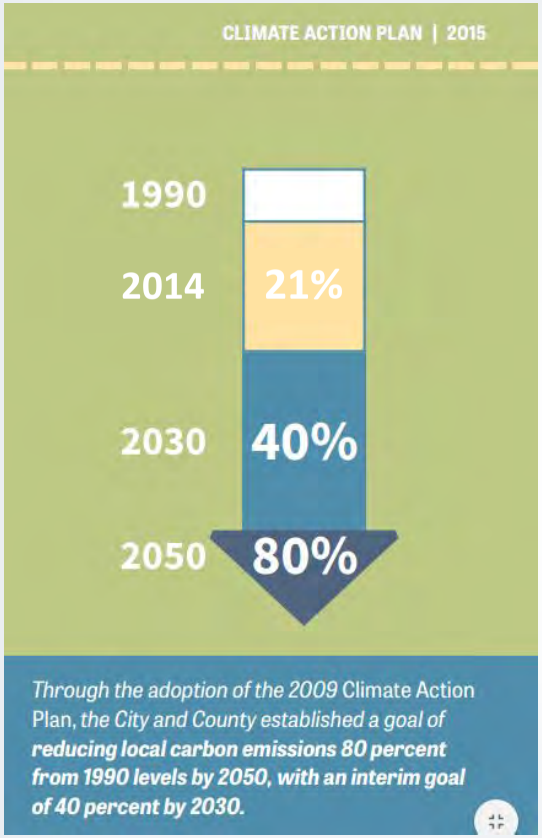
2035 Comprehensive Plan

Policy 6.48 Fossil fuel distribution. Limit fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Public safety and environmental risks



Climate Action Plan implementation



Portland's Climate Action Plan Goal: 80% reduction in greenhouse gas emissions by 2050.

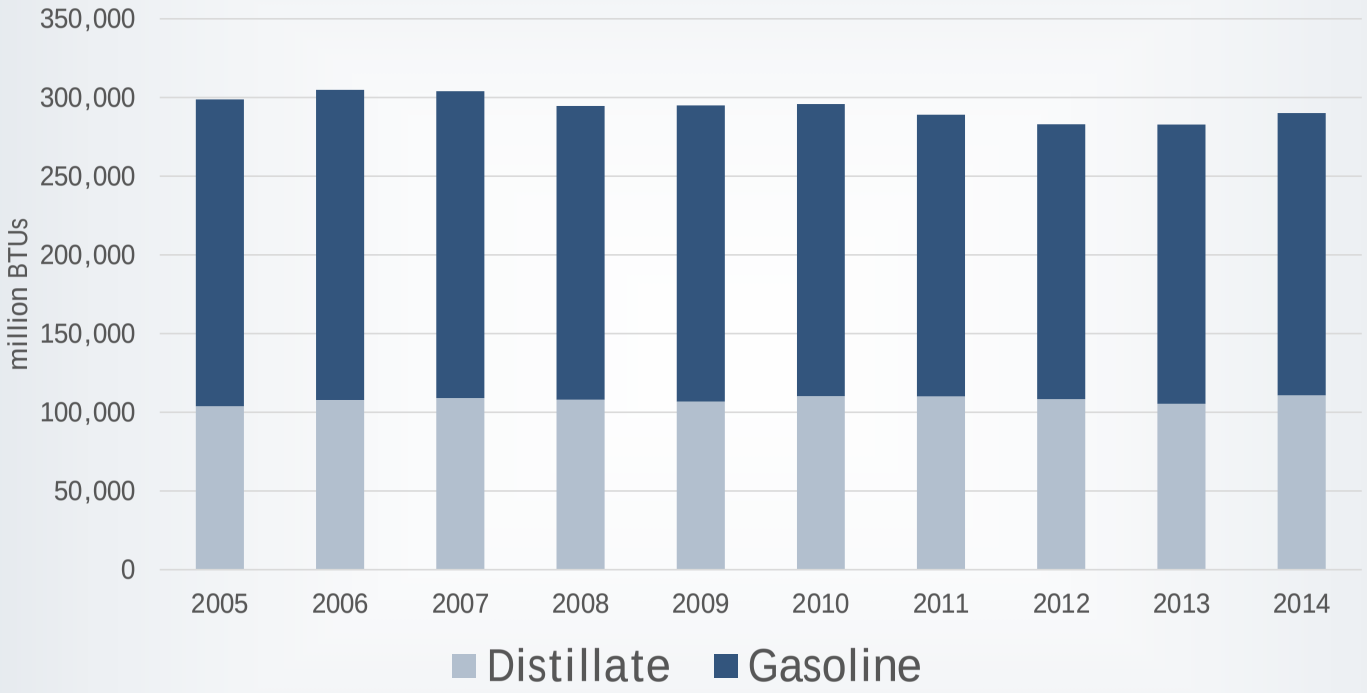
Oregon's climate action goal (HB 3543): 75% reduction in greenhouse gas emissions by 2050.

Statewide fuel distribution hub



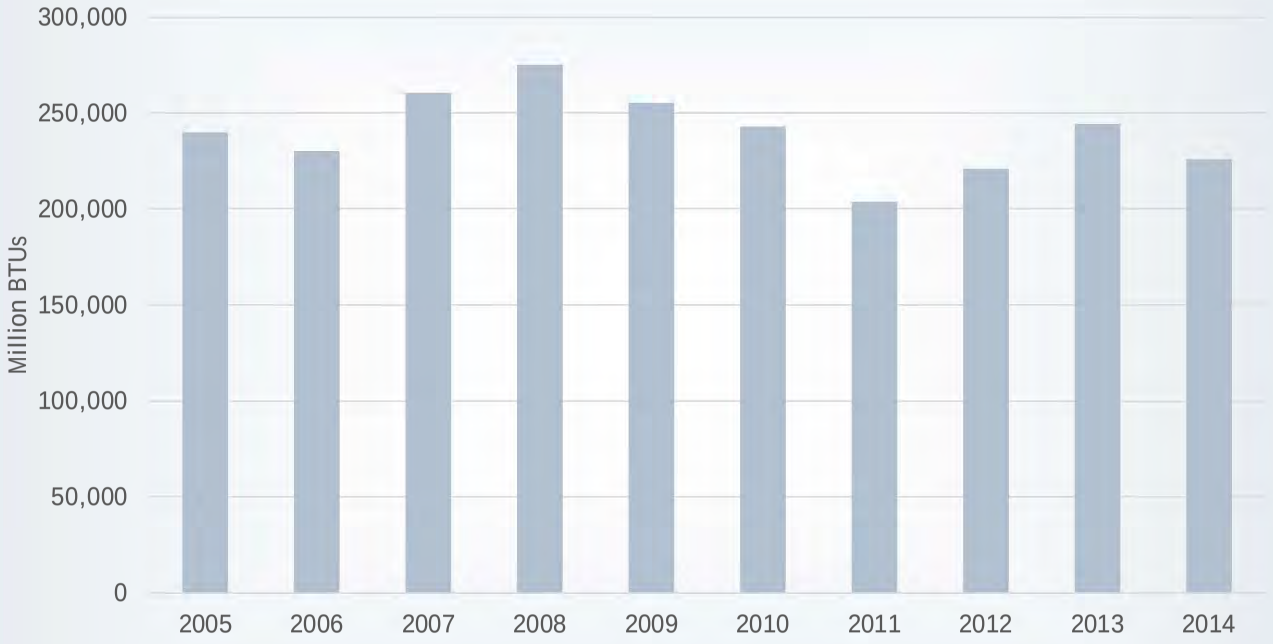
- Over 90% of petroleum sold in Oregon is handled at the 10 Portland terminals.
- Hub infrastructure: harbor, pipelines, railroads, truck routes.
- Natural gas storage for regional peak consumption.

Over the past 10 years gasoline and diesel use in Oregon has been flat or falling



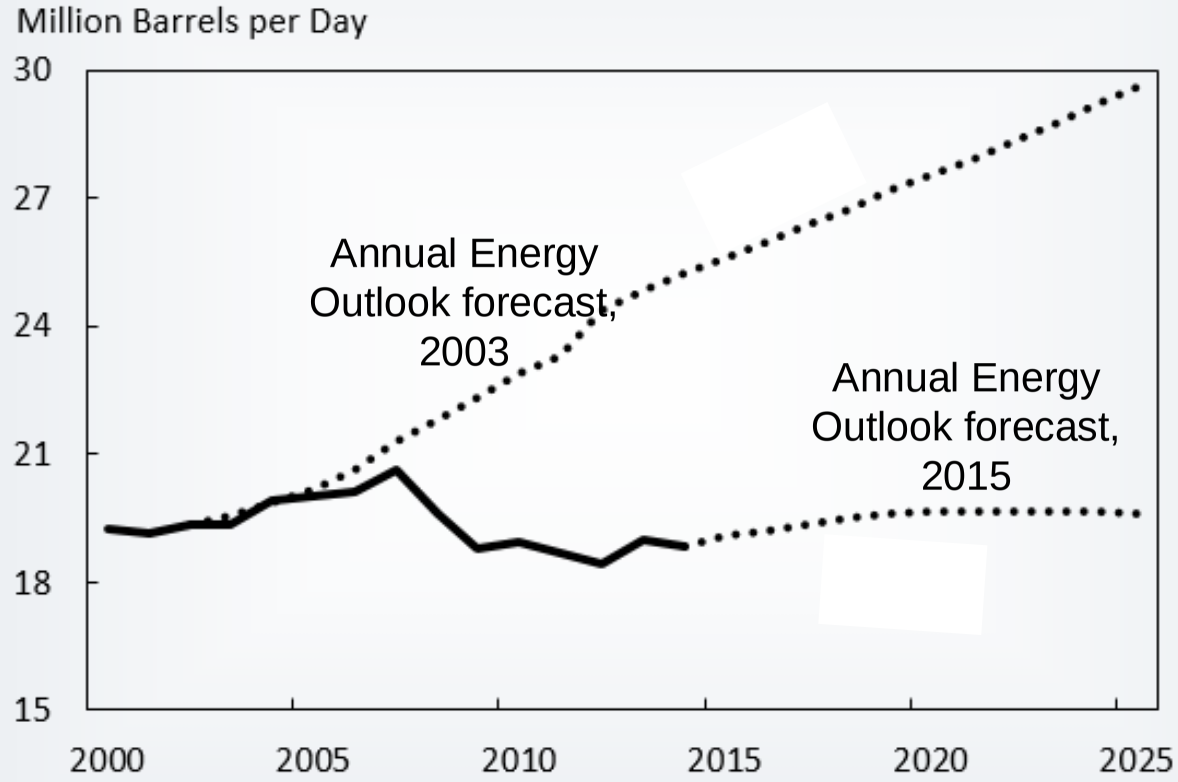
Source: U.S. Energy Information Administration, State Energy Data for Oregon
URL: http://www.eia.gov/state/seds/sep_use/total/pdf/use_OR.pdf

Total natural gas usage has also been flat over the past 10 years, though with higher peak needs



Source: U.S. Energy Information Administration, State Energy Data
URL: http://www.eia.gov/state/seds/sep_use/total/pdf/use_OR.pdf

U.S. Energy Information Administration forecasts of total oil use in the U.S. have moderated significantly



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Proposed zoning code amendments

- **Define** Bulk Fossil Fuel Terminals as a regulated land use.
- **Prohibit** Bulk Fossil Fuel Terminals in all base zones.
- Existing Bulk Fossil Fuel Terminals would become limited uses that can continue to operate.

Defining fossil fuel

Fossil fuels are petroleum products (such as crude oil and gasoline), coal, methanol, and gaseous fuels (such as natural gas and propane) that are made from decayed plants and animals that lived millions of years ago and are used as a source of energy.

Exclusions: Denatured ethanol and similar fuel additives, biodiesel/renewable diesel with less than 5% fossil fuel content, and petroleum-based products used primarily for non-fuel uses such as asphalt, plastics, lubricants, fertilizer, roofing and paints.

New land use category:
Bulk Fossil Fuel Terminals

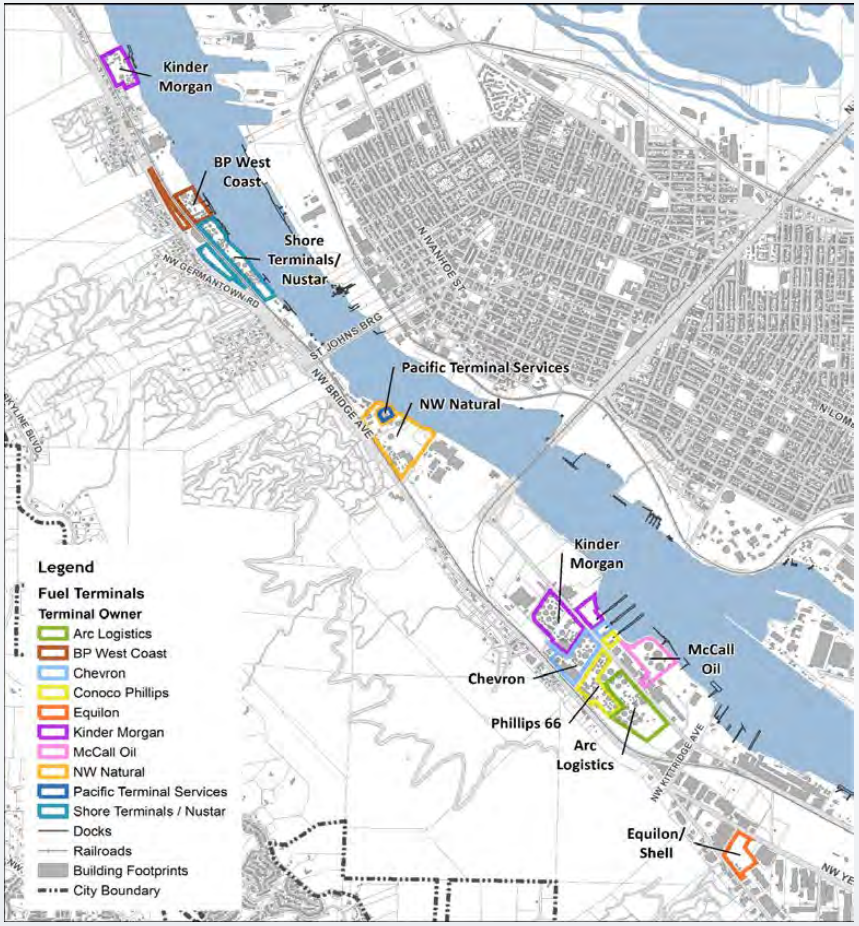
Bulk Fossil Fuel Terminals:

- Marine, railroad, or pipeline transport access; and
- Transloading facilities (such as train-to-ship) or storage capacity exceeding 2 million gallons.

Exclusions:

- Distributors with access exclusively by truck;
- End-user facilities, including filling stations and firms that store fossil fuels for use as an input;
- Airports, marine and rail servicing facilities.

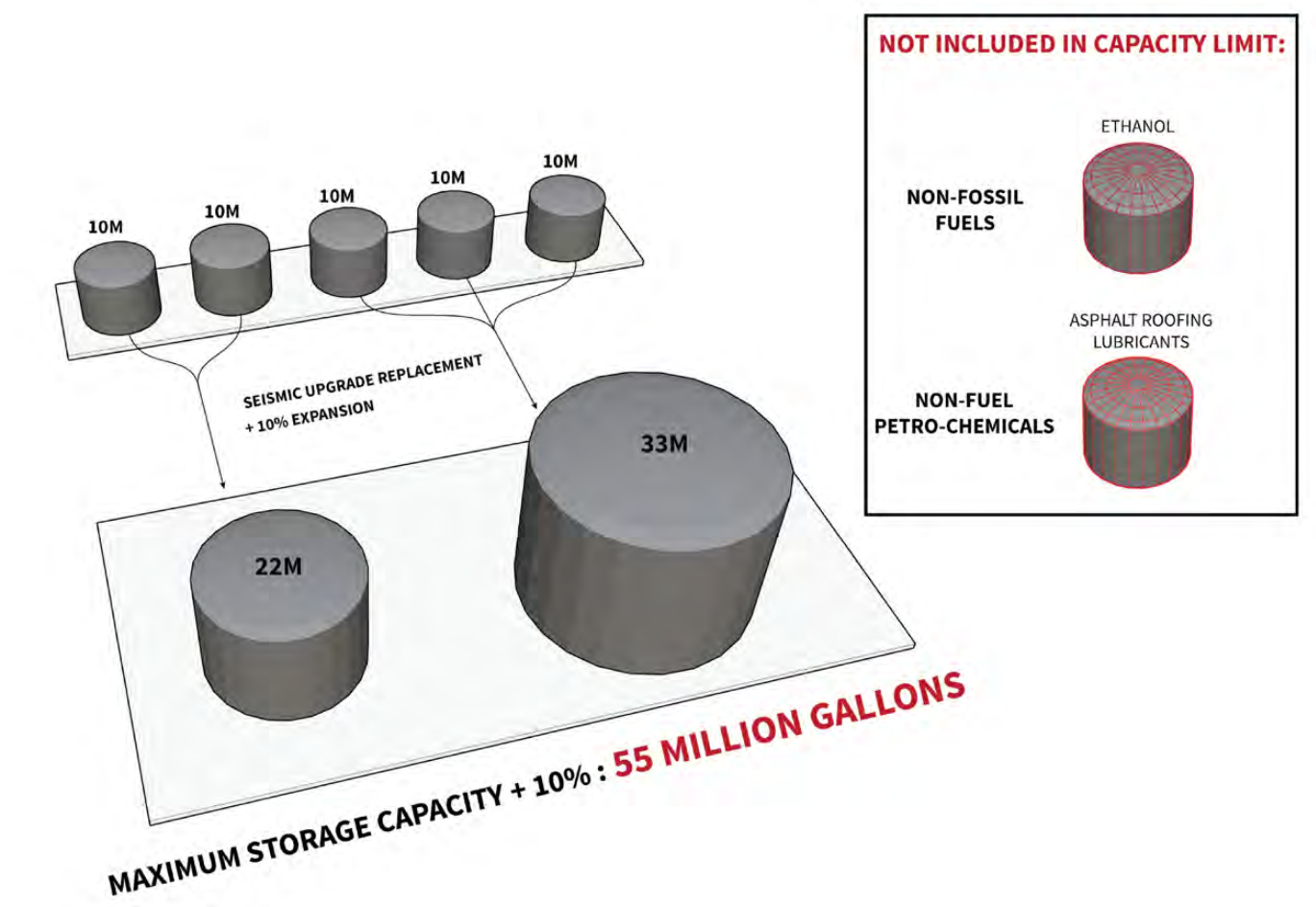
Status of existing terminals



Regulating existing terminals

- Limited Use
- Storage capacity expansion limited to 10 percent of current capacity.
- Replacement of existing tanks for seismic upgrade needed to expand
- No land use review for expansion
- Public notice and meeting required

Regulating existing terminals



Future code changes on seismic resilience



PBEM's 2016 Critical Energy Infrastructure Hub Study future actions.

Seismic safety requirements are addressed in state building codes.

Advocate for state-level code changes to improve seismic resilience and require seismic upgrades.

Proposed Amendments

Amendment #1 – Technical Correction to Exception #4 to clarify that truck only terminals are not Bulk Fossil Fuels Terminals.

Amendment #2 – Clarification to Exception #7 that fuel storage for airports, marine servicing facilities and rail yards are not Bulk Fossil Fuel Terminals.

Amendment #3 – Clarification of the Fossil Fuel definition by specifying that non-fuel petroleum-based products, such asphalt and lubricants, are not fossil fuels.

Proposed Amendments

Amendment #4 – Additional directions

d. The Bureau of Planning and Sustainability shall report to City Council no later than December 31, 2019 on the implementation of this ordinance.

e. City Bureaus, including BDS, PBEM and Fire, shall work with the State of Oregon to develop policy options to require seismic upgrades of storage tanks within a firm deadline for replacement of older, unsafe tanks.

Parsons, Susan BUREAU TESTIMONY RECAP 188142

From: Kountz, Steve
Sent: Thursday, November 10, 2016 11:08 AM
To: Armstrong, Michael; Armstrong, Tom; Klonoski, Zach; Parsons, Susan
Subject: FW: Update on fossil fuel zoning testimony

CNA_Fossil_Fuel... Cooke_111016.... Your Voice Needed to Ensur... Comments on Proposed Fossil ... PFC letter fossil fuel zoning ... WWC submittal City Council Re ... Wysham_11101...

Norgren_11101...

Attachments are also filed with Testimony. Clerk

As of 10:30 this morning, City Council has received emailed testimony from 285 parties. Among these emails, 8 additional letters are attached that were submitted in the last day, most coming from organizations. The other additional testimony in the last day has generally followed the form-letter format with themes described below.

From: Kountz, Steve
Sent: Tuesday, November 08, 2016 1:45 PM
To: Armstrong, Tom <Tom.Armstrong@portlandoregon.gov>; Armstrong, Michael <Michael.Armstrong@portlandoregon.gov>; Klonoski, Zach <Zach.Klonoski@portlandoregon.gov>; Parsons, Susan <Susan.Parsons@portlandoregon.gov>
Subject: Update on fossil fuel zoning testimony

As of noon today, City Council has received 232 testimony emails on the Fossil Fuel Terminal Zoning Amendments. All of this testimony generally reflects a common theme, calling for a "full ban" on new fossil fuel terminals and strengthened restrictions on expansion of existing terminals. These emails typically followed a form-letter format or a common header with brief individual comments, and I am attaching 5 examples that loosely represent the full range of what we have received so far. One letter was also submitted jointly by Columbia Riverkeeper, 350 PDX, and others, which is also attached.

Thanks,
Steve

Steve Kountz
Senior Economic Planner
Portland Bureau of Planning and Sustainability
1900 SW 4th Ave., Ste. 7100, Portland, OR 97201-5350
503-823-4551, steve.kountz@portlandoregon.gov

To help ensure equal access to City programs, services and activities, the City of Portland will provide translation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints, and additional information, contact me at 503-823-4551, City TTY 503-823-6868, or use Oregon Relay Service: 711.

188142

Parsons, Susan

From: linda.stone@loveable.com
Sent: Wednesday, November 09, 2016 10:25 PM
To: BPS Fossil Fuel Zoning
Subject: Your Voice Needed to Ensure Portland Enacts Historic Fossil Fuel Terminal Ban

This link is sent to you from http://audubonportland.org

You are receiving this mail because someone read a page at Audubon Society of Portland and thought it might interest you.

linda.stone@loveable.com thought that the page Your Voice Needed to Ensure Portland Enacts Historic Fossil Fuel Terminal Ban (at http://audubonportland.org/issues/take-action/your-voice-needed-to-ensure-portland-enacts-historic-fossil-fuel-terminal-ban) might interest you.

He/she says:
"Please enact the historic fossil fuel terminal ban"

--
Audubon Portland Staff

Type size - +

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Your Voice Needed to Ensure Portland Enacts Historic Fossil Fuel Terminal Ban



Last fall Portland City Council passed a historic resolution to ban new fossil fuel facilities in the city, putting Portland at the forefront of the climate justice movement. The resolution was the result of massive grassroots advocacy and the leadership of Mayor Hales and City Council. Now, one year later we need to hold the City to their word as they work to implement this resolution into binding city code. Overall, the proposed code is a strong step forward, but it could be made stronger.

Submit Comments and Attend the November 10 Hearing:

When: November 10, 2016 from 2 to 5 p.m.
Where: City Council Chambers - 1221 SW 4th Ave, Portland OR 97204

With the proposed draft, the City is taking steps towards making last year's fossil fuel ban a reality, but they need to hear from the community that we expect the proposal to completely follow through with enacting a full ban of fossil fuel expansion, as last fall's resolution explicitly called for.

Submit Comments:

Email your comments to Portland City Council at fossilfuelzoning@portlandoregon.gov and urge them to strengthen the code proposal by:

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities.
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Rejecting Northwest Naturals request to be exempted from these regulations.

Please act now to ensure Portland fulfills the promise to its historic fossil fuel resolution!

188142

Parsons, Susan

From: merrittregna@gmail.com on behalf of Regna Merritt <Regna@oregonpsr.org>
Sent: Wednesday, November 09, 2016 11:27 PM
To: BPS Fossil Fuel Zoning
Subject: Comments on Proposed Fossil Fuel Amendments

Kayla	Schneider-Smith		1502 SE 84th Ave	Portland	OR	97216
Adriana	Cvitkovic		1502 SE 84th Ave	Portland	OR	97216
Mike	Goren		3525 SE Taylor St	Portland	Or	97215
Sarah	Klatt-Dickerson		2135 NE 134th pl	Portland	Or	97230
Sean	Tenney		3414 NE 17th Avenue	Portland	OR	97212
Sarah	Collmer		704 W 20th St.	Vancouver	WA	98660
Alicia	Keys		10480 SW Eastridge #88	Portland	OR	97225
Helen	Hays		18553 S Ferguson Rd	Oregon City	OR	97045
Debra	Rehn		5130 SE 30th Ave Apt 9	Portland	OR	97202
Gisela	Ray		85 SE 16th Court	Gresham	Oregon	97080
Maria	Grumm		1815 SE 30th Ave	Portland	Oregon	97214
Francisco	Gadea		4110 SE Hawthorne Blvd #758	Portland	OR	97214
Maureen	O'Neal		9100 s.w. 80th ave	Portland	Or	97223
	McCuen	Mental Health	1825 Fairmount Ave s	Salem	Oregon	97302

Annie						
Sybil	Kohl	MSW	18103 NE 159th Ave	Brush Prairie	Washington	98606
Roger	Burt	MS	4035 NE Hazelfern	Portland	OR	97232
Sonia	Holdaway		5501 SE Flavel Drive	Portland	OR	97206
Benjamin	Sexton		1502 SE 84th Ave	Portland	OR	97216
Gretchen	Randolph Ph.D, PMHNP	Psychiatric Nurse Practitioner	13635 SW 115th Ave	Portland	Oregon	97223
Jack	Herbert		11935 SW Edgewood Street	Portland	OR	97225
Marilee	Dea	MSRN CPNP	4613 ne killingsworth #2	Portland	Oregon	97218
Susan	Katz	MD	726 NW 11th Ave. #306	Portland	OR	97209
Rose	Christopherson,	MD, PhD	14707 Nw Cedar St	Portland	OR	97231
Jesse	Kaminash		260 NW Pittock Dr	Portland	OR	97210
Becky	Bell-Greenstreet		1079 State St.	North Bend	Oregon	97459
Stephen	Couche		4718 SE 31st Ave.	Portland	Oregon	97202
Cheryl	Erb		1068 park ave NE	Salem	OR	97301
patricia	Carcasses		2741A Se 141 Ave	Portland	Oregon	97236
Brian	Beinlich		PO Box 1417	North Plains	OR	97133
Martha	Tocco	PhD	3180 SW Westwood Drive	Portland	Oregon	97225

Robert	Goldman, MD	Academic Physician and Surgeon	4015 SW 57th Ave	Portland	OR	97221
Frodo	Okulam	D.Min.	10019 NE Failing	Portland	OR	97220
Joseph	Snyder	4th generation Oregonian	5858 SW Riveridge Ln. #4	Portland	Oregon	97239
Tim	Swinehart	Teacher, Lincoln High School	4226 SE Pine St.	Portland	Oregon	97215
Mike	Ellison		4303 NE 14th Ave	Vancouver	WA	98663
Mary & John	Sievertsen	CPA	7705 SW Miner Way	Portland	Oregon	97225
Nicole	Staudinger		1815 NE Junior St	Portland	Oregon	97211
Thomas	Ward, MD		260 NW Pittock Dr	Portland		97210

Those listed above submit the comments below.

Dear Mayor Hales and Commissioners Fritz, Fish, Novick, and Saltzman:

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input into drafts of the Fossil Fuel Terminal Zoning Amendments. The current proposal is much improved, bringing it closer to the original intent of the 2015 Fossil Fuel Policy Resolution #37168. However, it still falls short of the resolution, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland."

Although this proposal prohibits new large bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new and expanded fossil fuel storage tanks.

I want the City of Portland to:

1) Prohibit any expansion of existing terminals. Instead, require upgrades for Seismic Safety through State building codes.

2) Enact a full ban on all new bulk fossil fuel terminals: 2 million gallon facilities are still too large. The language of the City's 2015 Resolution was "to actively oppose" any new fossil fuel infrastructure.

With a few simple improvements to the proposed Fossil Fuel Zoning Amendments, Portland can fully implement our historic resolution and once again be a beacon of light in addressing one of the most pressing concerns of our time.

188142

Thank you for consideration of these comments,

Regna Merritt

Regna Merritt, PA
Oregon Physicians for Social Responsibility
1020 SW Taylor St, Suite 275 Portland,OR 97205
C: 971.235.7643

188142

Concordia Neighborhood Association
P.O. Box 11194
Portland, OR 97211
landuse@concordiapdx.org

Re: Fossil Fuel Terminal Zoning Amendments

November 7th, 2016

Portland City Council
1221 SW 4th Avenue
Portland, OR 97204

Mayor Charlie Hales, mayorcharliehales@portlandoregon.gov
Commissioner Steve Novick, novick@portlandoregon.gov
Commissioner Amanda Fritz, amanda@portlandoregon.gov
Commissioner Nick Fish, nick@portlandoregon.gov
Commissioner Dan Saltzman, dan@portlandoregon.gov

Dear Council Members,

Following the Pembina fuel terminal proposal, we support the City's actions to impose predictable, understandable regulations that will prohibit new large fossil fuel terminals in our city, while supporting our transition to a clean energy economy, and not impede important renovations of existing facilities, including those required to make them safer, replace them as they age out, and seismically upgrade them.

We have reviewed the proposed zone change language, as well as the September 9th, 2016 memo from Tom Armstrong and Steve Kountz to the Planning and Sustainability Commission outlining the proposed Fossil Fuel Terminal Zoning Amendments. Our comments below are specifically in reference to that memo.

Regarding the Fossil Fuel Terminal size threshold, we support Option A: No change to the storage capacity threshold of 5 million gallons.

With regards to regulating existing terminal expansion, we support Option C, to prohibit new Bulk Fossil Fuel Terminals and allow expansion of existing terminals greater than 10% through a conditional use review process with special criteria for emergency backup capacity, seismic upgrades, and tanks for clean and renewable fuels. However, it is critical that these criteria are enforced via inspections, as we would not like to see additional storage capacity approved under the guise of renewable fuels, only to discover that the operator has had a change of heart and decided to store pure fossil fuels after the structure is approved and the final inspector has left the site. There needs to be a regulatory regime to ensure that any structure that is approved for renewable fuels, is actually only used for renewable fuels.

Concerning additional review criteria, we feel strongly that if existing BDS staff does not feel that they have the capacity or expertise to implement discretionary land use review criteria addressing greenhouse gas emissions or safety impacts of hazardous material storage and transportation, that they should acquire this capacity. This capacity could be acquired by hiring new staff, by forming strategic alliances with outside organizations, or by hiring consultants, but it is critical that BPS and BDS figure this out so that it can be properly regulated. This starts with being able to write clear and predictable criteria with which to judge new applications. There are many good options, such as cradle to grave analysis, well to wheel analysis, and other methodologies with which to measure the greenhouse gas emissions of any new proposal; the criteria used to pick a particular methodology should balance ease of regulation with effectiveness at meeting GHG emissions reduction goals. There are similar objective methodologies and criteria available with which to measure safety. We thus support Option B, to add conditional use criteria for expansion of existing terminals to mitigate adverse land use impacts on greenhouse gas emissions and safety impacts of hazardous materials storage and transportation.

These are certainly complicated issues, but we have within Portland some of the best and brightest in their respective fields, and we have access to national expertise as well. If the City needs to add to its capacity in order to regulate fossil fuel terminals in the manner that will be most effective at reducing GHG emissions and meeting our community goals for safety, than the City must acquire the necessary expertise. It's simply not acceptable to claim a lack of staff expertise as an excuse to not propose the most effective possible regulations. Expertise is something that can be acquired, and should be acquired when it is required.

We thank you for your close and careful examination of these critical issues, and for considering our comments as you make your decisions as to how the City will proceed.

Signed,

Isaac Quintero
Chair, Board of Directors

Concordia Neighborhood Association
P.O. Box 11194
Portland, OR 97211
landuse@concordiapdx.org

cc: Susan Anderson, susan.anderson@portlandoregon.gov, Steve Kountz, steve.kountz@portlandoregon.gov

188142

Fossil Fuel Terminal zoning testimony 11-10-2016
Harriet Cooke MD, MPH
3126 SW Carson St, Port. OR 97219
holisticooke@aol.com

I am writing in full support of restricting development and expansion of bulk fossil fuel terminals, such that NO new Bulk Fossil Fuel Terminals will be allowed. I further support improvement limitations on existing Bulk Fossil fuel terminals, such that only seismic upgrades are allowable which would add no more than 10% of the capacity of replaced tanks. However, I would prefer NO increase in capacity. We need to keep the flow of oil SLOW while we continue to build capacity for and integrate renewable energy systems.

As vital as this project has been to limiting the worst of climate catastrophe, it is ever more essential with a president who is planning to lift restrictions on the production of fossil fuel reserves, and lift federal roadblocks to moving and consuming more fossil fuels.

It is up to our states, cities, and counties to move us forward in creating a more sustainable, equitable, and compassionate world.

Thank you for all the work you do in moving us toward this direction.
Harriet

188142

PORTLAND FREIGHT COMMITTEE

November 8, 2016

The Honorable Mayor Charlie Hales and City Council
City Hall, 1221 SW Fourth Avenue
Portland, OR 97204

RE: Comments on the proposed Fossil Fuel Terminal Zoning Amendments

Dear Mayor Hales & City Commissioners,

On behalf of the Portland Freight Committee (PFC), thank you for the opportunity to comment on the proposed Fossil Fuel Terminal Zoning Amendments (FFTZA) recommended draft.

In general, the PFC supports the goals sought to be addressed by the proposed fossil fuel terminal zoning amendments including reducing carbon emissions and making seismic upgrades to infrastructure that serves our city and beyond. However, the proposed zoning code amendments are deeply flawed and not the appropriate solution. Restricting expansion at existing fuel terminals and prohibiting new terminal development may impact industrial job growth and middle-income jobs. It may also constrain the supply of fossil fuels to serve anticipated population and employment growth, which will lead to increasing fuel costs and disproportionately affect low-income households.

We are also concerned that the city of Portland is unilaterally imposing regulation that will compromise the supply of fuels to other communities throughout the state and Western U.S. Portland is a regional fossil fuel hub, located at the terminus of the Olympic pipeline. Over 90 percent of petroleum used in Oregon is handled through the Bulk Fossil Fuel Terminals in Portland. Fuels handled in and through the Portland Energy Cluster (Energy Hub) are also supplied to the state of Washington, western Idaho, and during fire-season, to locations as far away as Montana and California. The FFTZA will create a bottleneck in the distribution system. Consumers and businesses throughout this broad market area rely on the fuels that are supplied from the energy hub in Portland.

Additionally, limiting the supply of fuels to airports, the maritime industry, railroads and trucking firms, until a viable source of alternative fuels are readily available makes little or no sense. Supplying fuels by alternative means, likely by truck, from outside the city, region and state is the antithesis of smart climate action policy.

The proposed amendments may also have a negative impact on seismic resiliency improvement efforts at the bulk fossil fuel terminals in Portland. The 10 percent overall expansion cap on tank storage capacity is actually a disincentive to rebuilding tanks that meet modern-day seismic standards.

The PFC urges Portland City Council to pursue other ways to achieve climate action plan and seismic resiliency goals. For example, the city may allocate its' own resources for the purchase of electric powered or other low-carbon emitting vehicles for its' city fleet and to demonstrate its' commitment to curbing greenhouse gas emissions. Providing economic incentives and an expedited permitting process may be ways to hasten construction of new, more seismically-resilient storage tanks at the BFFTs.

We are not asking the city to be complacent about the need to address climate change or the risks associated with catastrophic seismic events; we're recommending that the city take actions that are more thoughtfully considered and which are undertaken in a more consistent and open process than that which has taken place. At a minimum, there should be more thought, consideration and analysis including of fuel supply and prices before the proposed amendments are implemented.

Thank you for your consideration of our comments.

Respectfully yours,

Pia Welch Raihana Ansary

Pia Welch
Chair

Raihana Ansary
Vice Chair

188142

Working Waterfront
COALITION

Mayor Charlie Hales and
Portland City Commissioners
Portland City Hall
1221 SW 4th Avenue
Portland, OR 97204

November 9, 2016

Re: Fossil Fuel Terminal Zoning Amendments (City Council Hearing, November 10, 2016, 2pm)

Dear Mayor Hales and City Commissioners,

I am writing on behalf of the Working Waterfront Coalition (WWC) in opposition to the Fossil Fuel Terminal Zoning Amendments (FFT Amendments) recommended by the Planning and Sustainability Commission, dated October 11, 2016. (PSC Recommendation). As you know, the WWC represents a wide range of waterfront businesses along the Portland Harbor including several fossil fuel terminals (FFT's).

Background and Position

The WWC has actively participated in the City's FFT amendment process and related efforts, including the enactment of Resolution 37168 and the adoption of the City's 2035 Comprehensive Plan. Throughout the FFT amendment process the WWC has opposed the City's effort to prohibit or limit the growth of multimodal terminals along the working waterfront. These multimodal fuel terminals have safely provided the City, the Region and the State with most of the liquid fuel supply for decades. The energy cluster in Linnton and Willbridge is by far Oregon's largest fuel distribution hub, providing more than 90 percent of the State's fuel supply. Because of the importance of these terminals the WWC has consistently objected to earlier versions of the City's FFT amendments, which sought to ban these multimodal terminals completely. Likewise, the WWC objects to the most recent version of the City's FFT amendments, which ban new multimodal fuel terminals and severely restrict the growth of existing FFTs.

Policy Analysis

From a policy standpoint, it may be helpful for the WWC to explain its' opposition to the PSC Recommendation relative to several of the City's recently enacted goals, including Resolution 37168 and the City's 2035 Comprehensive Plan. In that regard, City Council should reject the FFT amendments recommended by the Planning and Sustainability Commission because the PSC recommendation is inconsistent with several of the City's recently enacted goals:

1) As provided in Policy 4.81 and Policy 4.82 of the 2035 Comprehensive Plan, if the City's goal is to encourage disaster-resilient development and reduce natural-hazard risks to critical energy and transportation infrastructure, then City Council should reject the PSC Recommendation because it discourages firms from investing in disaster-resilient development.

Explanation: In order to economically justify the level of private investment needed to comprehensively upgrade critical energy and transportation infrastructure at existing FFTs, existing FFT's must be allowed to grow. The PSC Recommendation does the opposite. The PSC Recommendation prohibits existing FFTs from growing, except in one very limited circumstance. The only circumstance

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under which an existing FFT can grow is if it replaces an existing tank with a seismically upgraded tank. However, even if an existing tank is replaced with a seismically upgraded tank, the incremental growth that can occur when a tank is replaced is limited to 10 percent of the capacity of the tank being replaced, with an overall increase limited to 10 percent of the storage capacity of the FFT facility on the date the amendments are enacted. This severe limitation on expansion discourages disaster-resilient development because the small amount of growth that is allowed to occur will not justify the massive amount of private investment needed to replace existing tanks in Portland. Even if investment does occur, the PSC recommendation will only produce a seismic upgrade of 10 percent, because no additional growth can occur once the 10 percent limit is reached. Without growth, investment in seismic upgrades will not occur. In short, the 10 percent rule creates an economic disincentive to disaster-resilient development, is shortsighted, and will be counterproductive to meaningful seismic upgrades over time.

2) As provided in Policy 6.48 of the 2035 Comprehensive Plan, if the City's goal is to limit fossil-fuel distribution and storage facilities to those necessary to serve the regional market, then City Council should reject the PSC Recommendation because it restricts the ability of fossil fuel infrastructure that is necessary to serve the regional market.

Explanation: All of the existing FFT's located in Portland's energy cluster are needed to serve the regional market. The PSC recommendation wrongly targets existing FFTs that serve the regional market. The WSPA alternative provides a regulatory concept and draft code language that limits extra-regional FFT's, while protecting FFT's that serve the regional market. The WSPA alternative is consistent with Policy 6.48, but the PSC recommendation is not.

3) As provided in Resolution 37168, if the City's goal is not to restrict the expansion of fossil fuel infrastructure that improves the safety, efficiency and seismic resilience of existing infrastructure, then City Council should reject the PSC Recommendation because it discourages firms from making improvements that increase the safety, efficiency and seismic resilience of fossil fuel facilities that primarily serve the regional market.

Explanation: For the reasons described above, the PSC Recommendation will not improve seismic resilience of existing FFT infrastructure, because it creates a long term disincentive to invest in existing FFTs and any related seismic upgrades. The associated disinvestment in existing FFT facilities that will occur as a result of the PSC recommendation will create a less efficient and potentially less safe regional fossil fuel infrastructure in Portland, as firms focus future capital investments in markets where their return on investment is justified.

4) As provided in the Comprehensive Plan, if the City's goal is to reduce vehicle miles traveled, then City Council should reject the PSC Recommendation because limiting multimodal storage capacity to existing tank capacity will require more trucks to move more fossil fuel into and through Portland, in order to bypass supply constraints at existing fossil fuel facilities that serve the regional market.

Explanation: By prohibiting new FFTs and limiting the capacity of existing FFTs that serve the regional market the PSC Recommendation creates a significant supply constraint for fossil fuels used by customers within the region. Over time and in times of emergency, this supply constraint will create a significant fossil fuel bottleneck in Portland. When it becomes necessary to bypass this supply constraint,

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the only remaining option firms will have is to truck fossil fuels to and through Portland, in order to bypass the constraint. This constraint will therefore increase vehicle miles traveled and will require more fossil fuel to be transferred to and through Portland by truck.

5) As provided in Policy 6.5 of the 2035 Comprehensive Plan, if the City's goal is to create economic resilience, then City Council should reject the PSC recommendation because restrictions on existing fossil fuel facilities that primarily serve the regional market makes the City, the Region and the State more susceptible to impacts from climate change, natural disasters and unforeseen changes in the economy.

Explanation: The proposed ban on new FFTs that serve the regional market, along with a significant limit on growth for existing FFTs, will make the City, the Region and the State less economically resilient because the ban and its related limits creates a significant regulatory constraint that discourages firms from investing in needed infrastructure and technology that will make the Portland region less susceptible to impacts from climate change, natural disasters and unforeseen changes in the economy. For the foreseeable future, fossil fuels will continue to fill an important role in our energy economy. The Portland region and the state as a whole depends on the existing FFT's for roughly 90 percent of its petroleum supply. Even if the demand for fossil fuel in Oregon is only growing ½ percent to 1 percent annually, as estimated by the city, it is critically important for firms to continue to invest in fossil fuel facilities over the next several decades, as significant demand continues and risk of natural disasters and other unforeseen emergencies continues to exist. In short, Portland should not create significant disincentives for FFT's to invest in critical energy facilities that will continue to power Portland and the State of Oregon for decades to come.

Position, Alternative, and Clarifying Amendment

For all of the above reasons, the WWC opposes the PSC Recommendation and requests that it not be adopted by City Council.

The WWC notes that the FFT Amendment process was rushed. This fact is reflected in Appendix A of October 11, 2016, PSC Recommendation. Throughout this rushed process the WWC has supported a better alternative offered by WSPA in July, 2016, which is attached to this letter. The WSPA alternative is not mentioned in the PSC Recommendation, and was unfortunately ignored by the City throughout the rushed review process. The WWC continues to support the WSPA alternative.

If City Council is inclined to move forward with the PSC Recommendation, or something similar, the WWC requests that a significant ambiguity in the PSC recommendation be clarified. Specifically, it is not clear whether the limits on the growth relate only to fossil fuel storage tanks, or whether the limits on growth relate to pipes and other fossil fuel facilities associated with existing FFTs. It is our understanding from discussions with city staff that the City's intent is to limit growth related to existing storage tank capacity, and that it does not intend to limit growth related to pipes and other fossil fuel facilities and infrastructure. Accordingly, we offer the following clarifying amendments:

Section 33.140.100(B)(17)(a), as shown on page 49 of the October 11, 2016 PSC Recommendation, should be amended as follows:

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a. Existing Bulk Fossil Fuel Terminals. The following use limitations apply to existing Bulk Fossil Fuel Terminals:

(1) Bulk Fossil Fuel Terminals that existed on [insert effective date] are allowed, but the total amount of fossil fuel that can be stored on the site in fossil fuel storage tanks, is limited to the fossil fuel storage tank capacity that existed on [insert effective date] plus 10 percent. Total fossil fuel storage tank capacity on the site in excess of the fossil fuel storage tank capacity that existed on [insert effective date] plus 10 percent is prohibited.

(2) New fossil fuel storage tanks are prohibited unless a new fossil fuel storage tank is replacing an existing fossil fuel storage tank that does not meet current building code standards for seismic safety, and in that case, the capacity of the new fossil fuel storage tank is prohibited from being greater than the storage capacity of the existing fossil fuel storage tank that is being replaced, plus 10 percent.

(3) No other use limitations shall be imposed on existing Bulk Fossil Fuel Terminals other than those set forth above.

Section 33.910.030, as shown on page 53 of the October 11, 2016 PSC Recommendation, should be amended as follows:

Fossil Fuel Storage Tank A fossil fuel storage tank is a tank affixed to the ground, within the boundaries of an existing Bulk Fossil Fuel Terminal site, which is used exclusively for fossil fuel storage.

Conclusion

For all of the reasons stated above, the WWC urges City Council to reject the PSC recommendation and reconsider its proposed regulation of multimodal FFTs along the City's working waterfront. The existing concentration of multimodal fuel terminals located along the City's working waterfront handles more than 90 percent of the State's fuel supply, and will continue to do so for the foreseeable future. Given these realities, it is critically important that the City not create a fuel bottleneck that severely affects the entire State of Oregon. Unfortunately, that is precisely what the PSC recommendation does and will do.

Sincerely,

Ellen M. Wax
Executive Director

Established in 2005, the Working Waterfront Coalition, with its extensive knowledge of harbor industry needs and active industry participation, is dedicated to working with its partners to ensure an appropriate balance between environmental concerns and the needs of river-related, river-dependent employers. Portland's Harbor is a vital employment area: home to thousands of valuable high-wage, high-benefit jobs. In addition, WWC members are conscientious stewards of the environment, making significant investments in the harbor consistent with state and federal laws.

188142

WSPA
Western States Petroleum Association

Western States Petroleum Association
Credible Solutions • Responsive Service • Since 1907

Frank E. Holmes
Director Northwest Region

July 25, 2016

Mr. Steve Kountz
City of Portland
1900 SW 4th Ave, Suite 7100
Portland, OR 97201

via e-mail: steve.kountz@portlandoregon.gov

Re: WSPA Comments on the City of Portland Discussion Draft

Dear Mr. Steve Kountz:

The Western States Petroleum Association (WSPA) is a non-profit trade association representing companies that explore for, produce, refine, transport, and market petroleum, petroleum products in five western states including Oregon. WSPA appreciates the opportunity to provide comments on the City of Portland Bureau of Planning and Sustainability Fossil Fuel Terminal Zoning Amendments Discussion Draft.

As you know from our June 2, 2016, meeting, several WSPA members operate petroleum terminals in Portland. These members have responsibly operated in the energy corridor along Northwest St. Helens Road for decades. This corridor provides key energy and emergency infrastructure as recognized by various city, state, and federal documents. WSPA opposes the City's push to regulate fossil fuels under Resolution No. 37166, Fossil Fuel Terminal Zoning Amendments, or otherwise, but submits these comments in an attempt to mitigate some of the unintended consequences of the contemplated zoning amendments.

The proposed zoning amendments contradict and misalign with federal and state laws pertaining to energy infrastructure, including but not limited to Oregon's low carbon fuel standards, Oregon's Renewable Fuel Standards, federal Renewable Fuel Standards, and similar laws. The Discussion Draft further appears to not follow policy direction in Resolution No. 37166 and the City's Comprehensive Plan enabling energy infrastructure to serve the region as well as transition to non-fossil fuel sources. Of particular concern to WSPA, the proposed zoning amendments would create a number of substantial unintended consequences. Specifically:

- The Discussion Draft restricts infrastructure that serves the region, in contradiction of the new City Comprehensive Plan provision governing fossil fuel infrastructure;
- The Discussion Draft fails to clearly specify how existing infrastructure can expand on existing sites, to adjacent properties, and to nearby non-adjacent properties;

975 Carpenter Road, N.E., Suite 106, Lacey, Washington 98516
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fholmes@wspa.org • www.wspa.org

188142

- The Discussion Draft restricts infrastructure related to Oregon's low carbon fuel standards, Oregon's Renewable Fuel Standards, federal Renewable Fuel Standards, and similar laws;
- The Discussion Draft terminal size thresholds are too small to enable expansion to serve future energy needs;
- The Discussion Draft stymies potential future technologies that do not fit within the contemplated framework;
- The Discussion Draft provides too narrow of a geographic area (currently, the IH Zone) for siting new terminals;
- The Discussion Draft generally does not align with state and federal policy regarding siting energy infrastructure;
- The Discussion Draft encourages less efficient (and potentially less safe) transportation by truck over more efficient modes of transportation;
- The Discussion Draft fails to provide for the economic impact assessment called for by Resolution No. 37166; and
- The proposed timeline for implementing the Discussion Draft is too fast to allow for thoughtful discussion and tailoring addressing the above and other concerns.

We have enclosed proposed zoning code language that would address some of the issues raised in this comment. While the proposed language does not resolve all the problems with the contemplated amendments, it addresses some of them.

Again, thank you for this opportunity to comment on the Fossil Fuel Terminal Zoning Amendments Discussion Draft. We hope the City reconsiders its push to pass regulations in this area, and if does, that it will more narrowly tailor its rules to not contradict federal and state direction and avoid unintended consequences.

Thank you for your consideration of WSPA's comments. If you have any questions, please contact me at this office at fholmes@wspa.org and (360) 352-4506.

Sincerely,

Frank E Holmes

Frank E. Holmes
Director, Northwest Region
Western States Petroleum Association

Enclosure: Appendix 1, Proposed Portland Zoning Ordinance

975 Carpenter Road N.E., Suite 106, Lacey, Washington 98516
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188142

WSPA

Appendix 1- Proposed Portland Zoning Ordinance

This appendix contains draft zoning code language from WSPA for City of Portland consideration in effectuating the City's fossil fuels policy. WSPA continues its position that the City's effort to regulate fossil fuels is misplaced and opposes those efforts. These proposed code provisions are intended to avoid some of the unintended consequences of the City's proposal and do not indicate WSPA support for City efforts to regulate fossil fuels. WSPA's draft code language contains four components:

1. Three new definitions for Portland Zoning Ordinance Chapter 33.910 (Appendix 1, page 2),
2. A use characteristics description for Bulk Fossil Fuels Terminals in Zoning Ordinance Chapter 33.920 (Appendix 1, page 2),
3. A new Energy Corridor Overlay Zone to protect existing fuel terminals in proposed new Portland Zoning Ordinance Chapter 33.490 (Appendix 1, page 4), and
4. Modifications to base industrial zones in Portland Zoning Ordinance Chapter 33.140 to recognize Bulk Fossil Fuel Terminals as a limited use (Appendix 1, page 7).

[Proposed New Definitions for Portland Zoning Ordinance Chapter 33.910]

Extra-Regional Bulk Fossil Fuel Terminal. A fossil fuel terminal that primarily serves markets outside of the Petroleum Administration for Defense District (PADD) 5 region, an area that includes the western states of California, Arizona, Nevada, Oregon, Washington, Alaska, and Hawaii.

Fossil Fuels. Fossil fuels include coal, petroleum, crude oil, refined oil, natural gas, bitumen, kerosene, propane, and other fuels made from decayed plants and animals that lived millions of years ago and are primarily used as a source of energy. Blended fuels containing a mix of fossil fuels and other fuel sources designed to address Oregon's low carbon fuel standards in Oregon Administrative Rules Chapter 340, Division 253, federal Renewable Fuel Standards, state Renewable Fuel Standards, or similar state or federal laws designed to reduce the carbon footprint of fuels are not fossil fuels.

Regional Bulk Fossil Fuel Terminal. A fossil fuel terminal that primarily serves the Petroleum Administration for Defense District (PADD) 5 region, an area that includes the western states of California, Arizona, Nevada, Oregon, Washington, Alaska, and Hawaii.

ENERGY PROUD

[Proposed New Use Category For Bulk Fossil Fuel Terminals]

33.920.360 Bulk Fossil Fuel Terminal

A. Characteristics. Bulk Fossil Fuel Terminals are characterized by having all of the following (1) marine, pipeline or railroad transport access, (2) transloading facilities for transferring a shipment between transport modes (such as from rail to ship), and (3) storage facilities for fossil fuels exceeding a storage capacity of [ ] million barrels for petroleum, [ ] million gallons for liquefied natural gas (LNG), [ ] million gallons for other liquefied gas fuels.

B. Accessory Uses. Accessory uses may include offices, pipes, industrial processing, shipping terminals, parking, storage, rail spur or lead lines, and docks.

C. Examples. Extra-regional liquefied natural gas (LNG) export facilities, propane export facilities, or coal export facilities.

D. Exceptions.

1. Improvements in the safety, or efficiency, seismic resilience, or operations of existing energy infrastructure.
2. Terminals or firms that are end users of fossil fuels or sell directly to end users of fossil fuels such as airports, manufacturing, agricultural businesses, utilities, gas stations, and power plants.
3. Development of emergency backup capacity.
4. Infrastructure that enables recovery or re-processing of used petroleum products
5. Terminals or firms that are storing, transporting or processing fuels and blended fuels containing a mix of fossil fuels and other fuel sources designed to address Oregon's low carbon fuel standards in Oregon Administrative Rules Chapter 340, Division 253, federal Renewable Fuel Standards, state Renewable Fuel Standards, or similar state or federal laws designed to reduce the carbon footprint of fuels.

[Proposed New Chapter in Zoning Ordinance]

City of Portland Planning and Zoning Ordinance - Title 33, Planning and Zoning

Chapter 33.490 Energy Corridor Overlay Zone

Sections:

33.490.010 Purpose
33.490.020 Map Symbol
33.490.025 Relationship to Portland Zoning Code Chapter 33.140
33.490.030 No Size limits
33.490.040 Expansion of Energy Corridor Terminals

Map 490-1 Energy Corridor Overlay Zone Boundaries

33.490.010 Purpose

The Energy Corridor Overlay Zone recognizes the historic cluster of energy terminals, including fossil fuel terminals that have served as Portland's hub for energy transport for decades. The purpose of this overlay zone is to protect this area for future energy infrastructure growth, including but not limited to expansion of energy terminals.

33.490.020 Map Symbol

The Energy Corridor Overlay zone is shown on the Official Zoning Maps with a letter "m" map symbol.

33.490.025 Relationship to Portland Zoning Code Chapter 33.140

The Energy Corridor Overlay zone provides flexibility for the sites subject to this overlay in addition to what are allowed under Portland Zoning Code Chapter 33.140. If there is a conflict between what is allowed under this Chapter 33.490 and what would be allowed Chapter 33.140, this Chapter 33.490 controls.

33.490.030 No Size Limits

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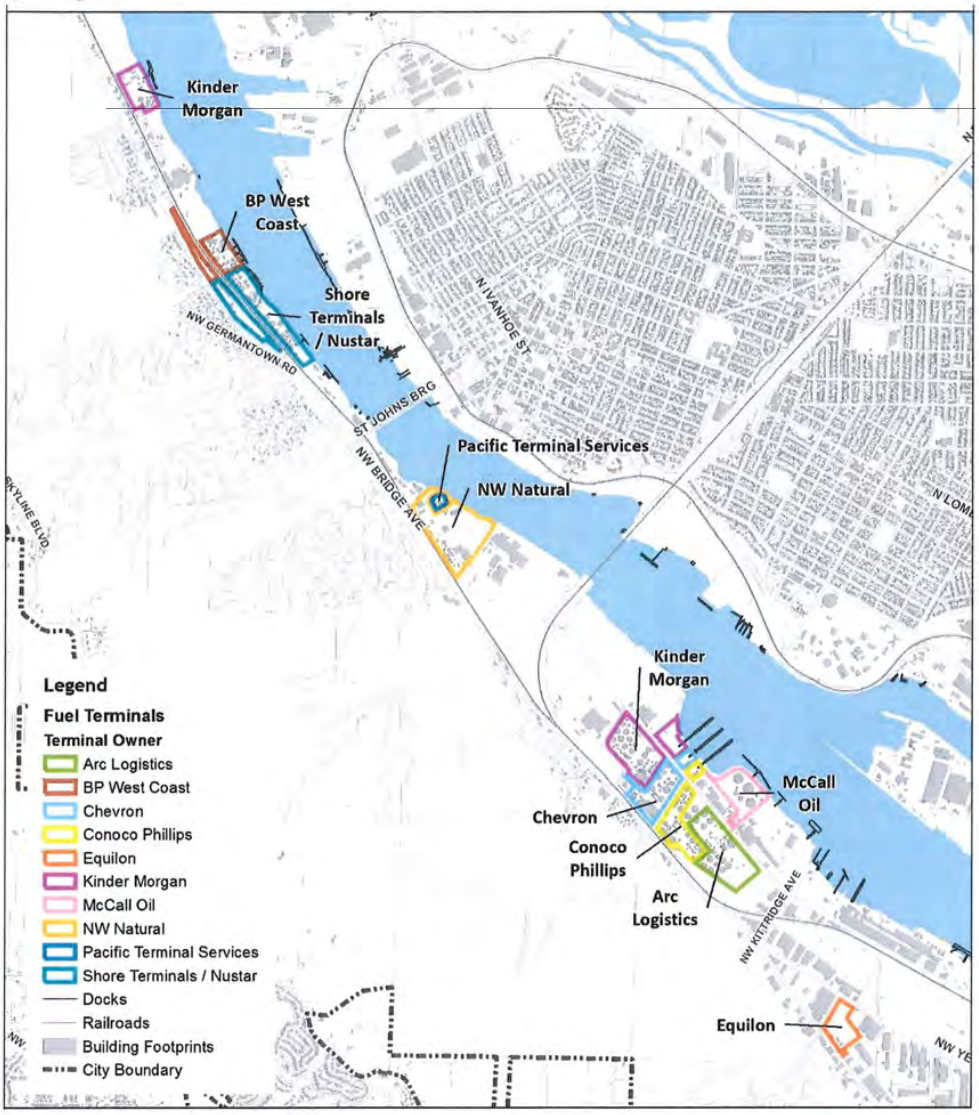
There is no storage or other size limits for Bulk Fossil Fuel Terminals or other energy facilities located in the Energy Corridor Overlay Zone.

33.490.040 Expansion of Energy Corridor Terminals

A Bulk Fossil Fuel Terminal in the Energy Corridor Overlay may expand to new lots and parcels outside of the Energy Corridor Overlay zone as provided in this Section 33.490.040. A Bulk Fossil Fuel Terminal may only expand onto parcels or lots that are all or partially within one half of a mile from a property line of the lot or parcel containing the Bulk Fossil Fuel Terminal. A Bulk Fossil Fuel Terminal that is expanded outside of the Energy Corridor Overlay will be treated as if it were entirely within the Energy Corridor Overlay for purposes of land use and all other city approvals. If an expansion of an energy facility to a new lot or parcel pursuant to this Section 33.490.040 includes proposed development that would qualify the combined energy facility as a Bulk fossil Fuel Terminal, the combined energy facility will be treated as if it were entirely within the Energy Corridor Overlay for purposes of land use and all other city approvals.

Map 490-1 Energy Corridor Overlay Zone Boundaries [*designate noted sites with "m" map symbol*]



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[Proposed Changes to Chapter 33.140 are shown in RED]

City of Portland Planning and Zoning Ordinance - Title 33, Planning and Zoning

Chapter 33.140 Employment and Industrial Zones

Sections:

General

33.140.010 General Purpose of the Zones
33.140.020 List of the Employment and Industrial Zones
33.140.030 Characteristics of the Zones
33.140.040 Other Zoning Regulations

Use Regulations

33.140.100 Primary Uses
33.140.110 Accessory Uses
33.140.130 Nuisance-Related Impacts
33.140.140 On-Site Waste Disposal

Site Development Standards

33.140.200 Lot Size
33.140.205 Floor Area Ratio
33.140.210 Height
33.140.215 Setbacks
33.140.220 Building Coverage
33.140.225 Landscaped Areas
33.140.227 Trees
33.140.230 Ground Floor Windows in the EX Zones
33.140.235 Screening
33.140.240 Pedestrian Standards
33.140.242 Transit Street Main Entrance
33.140.245 Exterior Display, Storage, and Work Activities
33.140.250 Trucks and Equipment
33.140.255 Drive-Through Facilities
33.140.265 Residential Development
33.140.270 Detached Accessory Structures
33.140.275 Fences
33.140.280 Demolitions

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33.140.290 Nonconforming Development
33.140.295 Parking and Loading
33.140.300 Signs
33.140.310 Superblock Requirements
33.140.315 Recycling Areas

General

33.140.010 General Purpose of the Zones

The employment and industrial zones are for areas of the City that are reserved for industrial uses and for areas that have a mix of uses with a strong industrial orientation. The zones reflect the diversity of industrial and business areas in the City. The zones differ in the mix of allowed uses, the allowed intensity of development, and the development standards. The regulations promote areas which consist of uses and developments which will support the economic viability of the specific zoning district and of the City. The regulations protect the health, safety and welfare of the public, address area character, and address environmental concerns. In addition, the regulations provide certainty to property owners, developers, and neighbors about the limits of what is allowed.

33.140.020 List of the Employment and Industrial Zones

The full and short names of the employment and industrial zones and their map symbols are listed below. When this Title refers to the employment or E zones it is referring to the first three listed. When this Title refers to the industrial or I zones, it is referring to the last three listed.

Full Name / Short Name	Map Symbol
General Employment 1	EG1
General Employment 2	EG2
Central Employment	EX
General Industrial 1	IG1
General Industrial 2	IG2
Heavy Industrial	IH

33.140.030 Characteristics of the Zones

A. General Employment. The General Employment zones implement the Mixed Employment map designation of the Comprehensive Plan. The zones allow a wide range of employment

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opportunities without potential conflicts from interspersed residential uses. The emphasis of the zones is on industrial and industrially-related uses. Other commercial uses are allowed to support a wide range of services and employment opportunities. The development standards for each zone are intended to allow new development which is similar in character to existing development. The intent is to promote viable and attractive industrial/commercial areas.

1. General Employment 1. EG1 areas generally have smaller lots and a grid block pattern. The area is mostly developed, with sites having high building coverages and buildings which are usually close to the street. EG1 zoned lands will tend to be on strips or small areas.

2. General Employment 2. EG2 areas have larger lots and an irregular or large block pattern. The area is less developed, with sites having medium and low building coverages and buildings which are usually set back from the street. EG2 zoned lands will generally be on larger areas than those zoned EG1.

B. Central Employment. This zone implements the Central Employment map designation of the Comprehensive Plan. The zone allows mixed-uses and is intended for areas in the center of the City that have predominantly industrial type development. The intent of the zone is to allow industrial and commercial uses which need a central location. Residential uses are allowed, but are not intended to predominate or set development standards for other uses in the area. The development standards are intended to allow new development which is similar in character to existing development.

C. General Industrial. The General Industrial zones are two of the three zones that implement the Industrial Sanctuary map designation of the Comprehensive Plan. The zones provide areas where most industrial uses may locate, while other uses are restricted to prevent potential conflicts and to preserve land for industry. The development standards for each zone are intended to allow new development which is similar in character to existing development. The intent is to promote viable and attractive industrial areas.

1. General Industrial 1. IG1 areas generally have smaller lots and a grid block pattern. The area is mostly developed, with sites having high building coverages and buildings which are usually close to the street. IG1 areas tend to be the City's older industrial areas.

2. General Industrial 2. IG2 areas generally have larger lots and an irregular or large block pattern. The area is less developed, with sites having medium and low building coverages and buildings which are usually set back from the street.

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D. Heavy Industrial. This zone is one of the three zones that implement the Industrial Sanctuary map designation of the Comprehensive Plan. The zone provides areas where all kinds of industries may locate including those not desirable in other zones due to their objectionable impacts or appearance. The development standards are the minimum necessary to assure safe, functional, efficient, and environmentally sound development.

33.140.040 Other Zoning Regulations

The regulations in this chapter state the allowed uses and the development standards for the base zones. Sites in overlay zones or plan districts and designated historical landmarks are subject to additional regulations which supersede those of this Chapter. The Official Zoning Maps indicated which sites are subject to the additional regulations. Specific uses or development types may also be subject to regulations in the 200s series of chapters.

Use Regulations

33.140.100 Primary Uses

A. Allowed uses. Uses allowed in the employment and industrial zones are listed in Table 140-1 with a "Y". These uses are allowed if they comply with the development standards and other regulations of this Title. Being listed as an allowed use does not mean that a proposed development will be granted an adjustment or other exception to the regulations of this Title. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters.

B. Limited uses. Uses allowed that are subject to limitations are listed in Table 140-1 with an "L". These uses are allowed if they comply with the limitations listed below and the development standards and other regulations of this Title. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters. The paragraphs listed below contain the limitations and correspond with the footnote numbers from Table 140-1.

1. Household Living uses in I zones. This regulation applies to all parts of Table 140-1 that have a [1]. Household Living in houseboats and houseboat moorages in I zones are regulated by Chapter 33.236, Floating Structures. Household Living in other structures is prohibited.

2. Group Living. This regulation applies to all parts of Table 140-1 that have a [2].

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a. General regulations. All Group Living uses except for alternative or post incarceration facilities, are allowed by right subject to the regulations of Chapter 33.239, Group Living.

b. Alternative or post incarceration facilities. Group Living uses which consist of alternative or post incarceration facilities are conditional uses. They are also subject to the regulations of Chapter 33.239, Group Living.

3. EG commercial limitation. This regulation applies to all parts of Table 140-1 that have a [3].

a. Limited uses.

(1) Office uses. Except for sites with historic landmarks, the net building area for Office uses is limited to the square footage of the site area. On sites with historic landmarks, the net building area for Office uses may be up to twice the total square footage of the site area. Exceptions to these size limits are prohibited.

(2) Retail Sales And Service uses. Except for sites with historic landmarks, the net building area plus any exterior display or storage area for Retail Sales And Service uses is limited to 60,000 square feet or the square footage of the site area, whichever is less. On sites with historic landmarks, the net building area plus any exterior display or storage area for Retail Sales And Service uses is limited to 60,000 square feet or twice the total square footage of the site area, whichever is less.

b. Conditional uses.

(1) Retail Sales And Service uses that exceed the area limits in 3.a(2) are a conditional use.

4. IG1 commercial limitation. This regulation applies to all parts of Table 140-1 that have a [4].

a. Limited uses. One Retail Sales And Service or Office use is allowed per site. The square footage of net building area plus the exterior display and storage area may be up to 3,000 square feet.

b. Conditional uses.

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(1) More than one Retail Sales And Service or Office Use on a site is a conditional use.

(2) Any Retail Sales And Service or Office Use where the net building area plus the exterior display and storage area is more than 3,000 square feet is a conditional use.

c. Prohibited uses.

(1) Except for sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 20,000 square feet or the square footage of the site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

(2) For sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 60,000 square feet or twice the square footage of the site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

5. IG2 commercial limitation. This regulation applies to all parts of Table 140-1 that have a [5].

a. Limited uses. Up to four Retail Sales And Service or Office uses are allowed per site. The square footage of the net building area plus the exterior display and storage area may be up to 3,000 square feet per use.

b. Conditional uses.

(1) More than four Retail Sales And Service or Office uses on a site is a conditional use.

(2) Any Retail Sales And Service or Office use where the net building area plus the exterior display and storage area is more than 3,000 square feet is a conditional use.

c. Prohibited uses.

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(1) Except for sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 20,000 square feet or the square footage of the site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

(2) For sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 60,000 square feet or twice the square footage of site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

6. IH commercial limitation. This regulation applies to all parts of Table 140-1 that have a [6].

a. Limited uses. Up to four Retail Sales And Service or Office uses are allowed per site. The square footage of the net building area plus the exterior display and storage area may be up to 3,000 square feet per use.

b. Conditional uses.

(1) More than four Retail Sales And Service or Office use on a site is a conditional use.

(2) Any Retail Sales And Service or Office use where the net building area plus the exterior display and storage area is more than 3,000 square feet is a conditional use.

c. Prohibited uses.

(1) Except for sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 12,000 square feet or the square footage of the site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

(2) For sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 25,000 square feet or twice the square footage of site area, whichever is less. Retail Sales And Service

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and Office uses that exceed these area limits are prohibited.

7. Self-Service Storage limitation. This regulation applies to all parts of Table 140-1 that have a [7]. The limitations are stated with the special regulations for these uses in Chapter 33.284, Self-Service Storage.

8. Waste-Related limitation. This regulation applies to all parts of Table 140-1 that have a [8]. All Waste-Related uses are conditional uses, unless they meet all of the following conditions in which case they are allowed by right.

a. The use must be approved by Metro under their authority as prescribed in ORS 268.317;

b. Metro's approval of the use must include a mitigation plan. The requirements for the mitigation plan must be approved by the City Council through an intergovernmental agreement with Metro, adopted prior to Metro's approval of the use; and

c. The location of the use must be in conformance with Metro's Regional Solid Waste Management Plan.

9. Community Service uses in EG zones. This regulation applies to all parts of Table 140-1 that have a [9]. Most Community Service uses are allowed by right. Short term housing may be allowed by right if it meets certain standards. See Chapter 33.285, Short Term Housing and Mass Shelters. Mass shelters are prohibited.

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Table 140-1
Employment and Industrial Zone Primary Uses

Use Categories	EG1	EG2	EX	IG1	IG2	IH
Residential Categories						
Household Living	CU	CU	Y	CU [1]	CU [1]	CU [1]
Group Living	CU	CU	L/CU [2]	N	N	N
Commercial Categories						
Retail Sales And Service	L/CU [3]	L/CU [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Office	L [3]	L [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Quick Vehicle Servicing	Y	Y	N	Y	Y	Y
Vehicle Repair	Y	Y	Y	Y	Y	Y
Commercial Parking	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]
Self-Service Storage	Y	Y	L [7]	Y	Y	Y
Commercial Outdoor Recreation	Y	Y	Y	CU	CU	CU
Major Event Entertainment	CU	CU	CU	CU	CU	CU
Industrial Categories						
Manufacturing And Production	Y	Y	Y	Y	Y	Y
Warehouse And Freight Movement	Y	Y	Y	Y	Y	Y
Wholesale Sales	Y	Y	Y	Y	Y	Y
Industrial Service	Y	Y	Y	Y	Y	Y
Railroad Yards	N	N	N	Y	Y	Y
Waste-Related	N	N	N	L/CU[8]	L/CU [8]	L/CU [8]
Bulk Fossil Fuels Terminal	L [17]	L [17]	L [17]	L [17]	L [17]	L [17]
Institutional Categories						
Basic Utilities	Y/CU [12]	Y/CU [12]	Y/CU [12]	Y/CU [13]	Y/CU [13]	Y/CU 13]
Community Service	L [9]	L [9]	L [10]	L/CU [11]	L/CU [11]	L/CU [11]
Parks And Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	N	N	N
Colleges	Y	Y	Y	N	N	N
Medical Centers	Y	Y	Y	N	N	N
Religious Institutions	Y	Y	Y	N	N	N
Daycare	Y	Y	Y	L/CU [11]	L/CU 11]	L/CU 11]
Other Categories						
Agriculture	L [16]	L [16]	L [16]	L [16]	L [16]	L [16]
Aviation And Passenger Terminals	CU	CU	CU	CU	CU	CU
Detention Facilities	CU	CU	CU	CU	CU	CU
Mining	N	N	N	CU	CU	CU
Radio Transmission Facilities	L/CU [14]	L/CU [14]	L/CU [14]	L/CU [14]	L/CU 14]	L/CU 14]
Rail Lines And Utility Corridors	Y	Y	Y	Y	Y	Y

Y = Yes, Allowed CU = Conditional Use Review Required

L = Allowed, But Special Limitations N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.140.100.B.

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• Specific uses and developments may also be subject to regulations in the 200s series of chapters.

10. Community Service in the EX zone. This regulation applies to all parts of Table 140-1 that have a [10]. Most Community Service uses are allowed by right. Short term housing and mass shelters may be allowed by right if they meet certain standards, or may be a conditional use. See Chapter 33.285, Short Term Housing and Mass Shelters.

11. Community Service and Daycare limitations in I zones. This regulation applies to all parts of Table 140-1 that have a [11]. Community Service uses or Daycare uses up to 3,000 square feet of net building area are allowed. Community Service uses or Daycare uses larger than 3,000 square feet of net building area are a conditional use. Short term housing and mass shelters of any size are prohibited.

12. Basic Utilities in E zones. This regulation applies to all parts of Table 140-1 that have a [12]. Public safety facilities that include Radio Frequency Transmission Facilities are subject to the regulations of Chapter 33.274. All other Basic Utilities are allowed.

13. Basic Utilities in I zones. This regulation applies to all parts of Table 140-1 that have a [13]. Public safety facilities that include Radio Frequency Transmission Facilities are subject to the regulations of Chapter 33.274. Public safety facilities which have more than 3,000 square feet of floor area are a conditional use. The approval criteria are in Section 33.815.223. All other Basic Utilities are allowed.

14. Radio Frequency Transmission Facilities. This regulation applies to all parts of Table 140-1 that have a [14]. Some Radio Frequency Transmission Facilities are allowed by right. See Chapter 33.274.

15. Commercial Parking. This regulation applies to all parts of Table 140-1 that have a [15]. Except where plan district provisions supersede these regulations, Commercial Parking is a conditional use in the E and I zones. Within plan districts, there may be special regulations.

16. Agriculture. This regulation applies to all parts of Table 140-1 that have a [16]. Agriculture is an allowed use. Where the use and site meet the regulations of Chapter 33.237, Food Production and Distribution, the applicant may choose whether it is allowed as a Market Garden.

17. Bulk Fossil Fuels Terminals. Regional Bulk Fossil Fuel Terminals of any size are allowed. Extra-Regional Bulk Fossil Fuel Terminals may not exceed a storage capacity of [____] million barrels for petroleum, [____] million gallons for liquefied natural gas

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(LNG), [____] million gallons for other liquefied gas fuels, except as may be allowed pursuant to the Portland Energy Corridor Overlay Zone. Coal terminals may not exceed a storage capacity of one ton of coal.

C. Conditional uses. Uses which are allowed if approved through the conditional use review process are listed in Table 140-1 with a "CU". These uses are allowed provided they comply with the conditional use approval criteria for that use, the development standards, and other regulations of this Title. Uses listed with a "CU" that also have a footnote number in the table are subject to the regulations cited in the footnote. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters. The conditional use review process and approval criteria are stated in Chapter 33.815, Conditional Uses.

D. Prohibited uses. Uses listed in Table 140-1 with an "N" are prohibited. Existing uses in categories listed as prohibited may be subject to the regulations of Chapter 33.258, Nonconforming Uses and Development.

33.140.110 Accessory Uses. Uses that are accessory to a primary use are allowed if they comply with specific regulations for the accessory uses and all development standards.

33.140.130 Nuisance-Related Impacts

A. Off-site impacts. All nonresidential uses including their accessory uses must comply with the standards of Chapter 33.262, Off-Site Impacts.

B. Other nuisances. Other nuisances are regulated by Title 29, Property and Maintenance Regulations.

33.140.140 On-Site Waste Disposal

On-site disposal of solid wastes generated by a use is subject to the same regulations as for uses in the Waste-Related use category. See Table 140-1.

Development Standards

[NO REVISIONS PROPOSED TO DEVELOPMENT STANDARDS]

188142

Dear City Commissioners,
I wrote the following op-ed which will get carried in papers around the country, urging other cities to follow our lead as the first city in the country to act on the Paris Agreement. I hope my op-ed helps support you in knowing that you are acting on behalf of all of us in Portland in passing the strongest possible ordinance, and, more importantly, future generations in other cities and states around the world. I will be taking the message of your groundbreaking work to COP22 in Marrakech, tomorrow. I hope you won't let us down.
Thank you for your leaderhsip!
Sincerely,
Daphne Wysham

Paris, Follow Portland
by Daphne Wysham

A few days before voters went to the polls in the U.S., the Eiffel Tower and Arc de Triomphe glowed green in Paris.

The reason? France was celebrating the Paris Climate Agreement, which came into force on November 4.

It was a remarkable achievement. Less than a year after 196 countries signed the climate agreement, over two-thirds of the world's countries — including the two biggest greenhouse gas emitters, the U.S. and China — ratified it, agreeing to an upper limit of 2 degrees Celsius in atmospheric warming.

But it might be a bit early to break out the champagne. For starters, the Paris Agreement is toothless.

There are no timetables for ratcheting down consumption of fossil fuels, and no sanctions for countries that fail to meet targets. The deal promises a small amount of assistance to developing countries fighting climate change, but most of that is merely repackaged development aid.

More frighteningly still, the world's existing fossil fuel infrastructure and proven wells and mines will sail us right past the 2 degree upper limit if they're all exploited.

Meanwhile, the clear-eyed citizens of Portland, Oregon, are pioneering a more proactive way forward. A year ago, Portland's city council unanimously voted to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Portland's city leaders took this step as much out of a desire to protect their own health and safety as out of a desire to act on climate change.

Much of Portland's fossil fuel infrastructure lies in an industrial zone that, should an earthquake come to pass, would rapidly turn to jello. And oil train derailments — like the one earlier this year in nearby Mosier, Oregon — can cause out-of-control blazes, bringing near fears to the fore.

Respect for indigenous communities is another factor. The Standing Rock Sioux's protest against the Dakota Access Pipeline encampment is a reminder that Native American treaty rights are routinely flouted by fossil fuel industries wanting to push their export projects on impoverished communities. It happens here in the Northwest, too.

But climate science is the central piece. A recent study found that if we are to maintain a mere 66 percent chance of avoiding surpassing 2 degrees Celsius of warming, no more new major fossil fuel infrastructure can be built.

In fact, we must actually leave many proven reserves untapped and begin to dismantle existing fossil fuel infrastructure.

President Obama did the right thing in signing the Paris Agreement. He also took a bold step in issuing guidelines for federal agencies to disclose greenhouse gas emissions associated with major infrastructure projects, like the Dakota Access Pipeline, and consider alternatives should the impact be significant.

But at this moment in time, neither the Paris Agreement nor Obama's proposed "climate test" is sufficient.

Portland Mayor Charlie Hales is showing the world what a first step toward meaningful action on the Paris Accords might look like. On November 17, Portland's city council will vote on what is likely the strongest land use code language in the country prohibiting all new fossil fuel export infrastructure.

Should it pass and become binding law, we'll know who the real world leaders are. Paris — and the rest of the Paris Agreement signatories — would do well to follow Portland's lead.

And if you do, back home in our evergreen city, we'll raise a glass of microbrew in your honor.

From: Daphne Wysham
daphne.wysham@gmail.com
1294 14th St
West Linn 97068

Hi, I'm Tim Norgren, member of Laborers' Local 737. I live in the Gorge and often work in Portland.

Our house is within sight of the railroad when the leaves thin out, which means we're squarely in the "blast zone" and if we should be as unfortunate as Mosier we would have to evacuate our house after being rocked by a cataclysmic explosion and inhaling vast quantities of carcinogens. Next we would have to see if the volunteer fire dept. (even closer to the tracks, near the Port office) was still standing and hope the equipment wasn't destroyed or the volunteers killed so that we'd have some help in stopping the house and forest fires that often accompany such events. There's a good chance the fracking chemicals and oil spilled would end up in rock creek, feeding into the Columbia, or if a train derailed across from the fairgrounds on the thin isthmus between the Columbia and Rock Cove, then it's likely it would end up on both sides, and perhaps claim the lives of those traveling alongside it on Hwy 14 as well. Our water treatment plant sits nestled between town and the fairgrounds and it's pretty much a given our water would be poisoned. So would our fish, otters, waterbirds, raccoons and the others.

Health effects just from the psychological trauma of such events can last for years, especially in children. There's now enough evidence for us to know that traumatic events during childhood often lead to a prolonged "fight, flight or freeze" reaction, affecting ALL of our biological systems and leading to health problems from heart and breathing issues, to digestive issues, to "unexplained" nerve pain. My partner endured a barn fire as a child and though she wasn't burned she was forced to watch helplessly and smell her animal friends being cooked alive while they screamed. To this day she is plagued by night terrors related to it in various ways. She also developed fibromyalgia, a debilitating nerve disease which is directly linked to childhood trauma and sometimes triggers later in life. Trauma can also linger for generations. It's rampant in places like Lac Megantic, and will surely linger with the residents and former residents of Mosier and the other "sacrifice zones" for years as well. I don't want to see more of this in our communities and we are standing at the threshold of an opportunity to turn back the tide on this type of tragedy.

That being said I encourage you to improve on the PSC's recommendation by sticking to the full intentions of the oil train resolution the council adopted last year. That resolution made it clear that no new infrastructure would be built to encourage an increase in oil train traffic through Portland and the Gorge. Allowing a 10% increase in volume to current fuel storage facilities would do just that. There are other ways to encourage seismic upgrades, including simply calling it as it is, a public safety issue, and making upgrades a requirement for staying in business here. If that isn't acceptable to them I guarantee that I and other workers in the building trades will be more than willing to do the demolition work and ready the space for a more sustainable business!

In line with the above I have no wish to build NEW structures either, no matter how "small" they are, which would increase fuel traffic through Portland, by train, truck, or pipeline. Again, we all live here in the area, and no one wants to see their community destroyed. Nor does any worker want to look at such a tragedy and know that we "built" it. Because the fact is we construction folks do tend to look back at projects a few years later and say "I built that". It's always preferable to have some pride in what you're saying, and increasingly the fossil fuel industry brings nothing but shame.

Finally, let there be no exemption for NW Natural. As we find we can meet our needs with sustainable energy there'll likely be LESS demand for fracked gas, (which from extraction to burning is often more carbon intensive than coal) in the Portland area, especially as we become more and more aware of the earthquakes and poIsoned water (including water used to irrigate crops..disgusting!) which are the additional consequence of fracking.

Please let there be no more tragedy and no more trauma caused by our actions or inactions. Let the will of the people be law!

Thanks. Sincerely,

Tim Norgren

Parsons, Susan Bureau testimony recap 188142

From: Parsons, Susan
Sent: Tuesday, November 08, 2016 2:06 PM
To: Commissioner Fish; Fritz, Amanda; Hales, Charlie; Novick, Steve; Saltzman, Dan; Brewster, Stacy; Broughal, Justine; Gleason, Megan; Quitugua, Betsy; Salazar, Goldann; Wiggins, Rachael
Cc: Kountz, Steve; Armstrong, Tom; Armstrong, Michael; Klonoski, Zach; Moore-Love, Karla
Subject: FW: 1259 Update on fossil fuel zoning testimony

Attachments are also filed with testimony. Clerk

Commissioners,
Please see email from BPS below.

Susan Parsons
Assistant Council Clerk
City of Portland
susan.parsons@portlandoregon.gov
503.823.4085

From: Kountz, Steve
Sent: Tuesday, November 08, 2016 1:46 PM
To: Armstrong, Tom <Tom.Armstrong@portlandoregon.gov>; Armstrong, Michael <Michael.Armstrong@portlandoregon.gov>; Klonoski, Zach <Zach.Klonoski@portlandoregon.gov>; Parsons, Susan <Susan.Parsons@portlandoregon.gov>
Subject: Update on fossil fuel zoning testimony

Fossil Fuels code | I support fossil fuel zoning a... | Let's Put Portland's Fossil... | Pass a full ban on new or expa... | please ban all new fossil fuel... | 2016.11.7 Columbia Riverk...

As of noon today, City Council has received 232 testimony emails on the Fossil Fuel Terminal Zoning Amendments. All of this testimony generally reflects a common theme, calling for a "full ban" on new fossil fuel terminals and strengthened restrictions on expansion of existing terminals. These emails typically followed a form-letter format or a common header with brief individual comments, and I am attaching 5 examples that loosely represent the full range of what we have received so far. One letter was also submitted jointly by Columbia Riverkeeper, 350 PDX, and others, which is also attached.

Thanks,
Steve

Steve Kountz
Senior Economic Planner
Portland Bureau of Planning and Sustainability
1900 SW 4th Ave., Ste. 7100, Portland, OR 97201-5350
503-823-4551, steve.kountz@portlandoregon.gov

To help ensure equal access to City programs, services and activities, the City of Portland will provide translation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints, and additional information, contact me at 503-823-4551, City TTY 503-823-6868, or use Oregon Relay Service: 711.

188142

Parsons, Susan

From: Liza Burney <lizaburney@yahoo.com>
Sent: Thursday, October 27, 2016 3:56 PM
To: BPS Fossil Fuel Zoning
Subject: Fossil Fuels code

I urge you to strengthen the code proposal by:

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Rejecting Northwest Naturals request to be exempted from these regulations

Liza

188142

Parsons, Susan

From: Mary Davis <cysliders@aol.com>
Sent: Monday, November 07, 2016 8:29 PM
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments

Mary Davis
8049 SE Ogden St
Portland, OR 97206

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Mary Davis

188142

Parsons, Susan

From: Dianne Ensign <roughskinnednewt@hotmail.com>
Sent: Tuesday, November 08, 2016 12:06 PM
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!

Dianne Ensign
11600 SW Lancaster Rd
Portland, OR 97219

November 8, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Dianne Ensign

188142

Parsons, Susan

From: Joseph Stenger MD <Joseph.stenger@gmail.com>
Sent: Tuesday, November 08, 2016 6:30 AM
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!

Thanks for the improved Fossil Fuel Terminal Zoning Amendments. But we need a full ban on new terminals of any size. It is not a matter of balancing financial interests and environmental interests. We must follow the 2015 resolution and actively oppose expansion in any form. This is crucial for the future for my children and grandchildren and for those of all of us!

Do not exempt smaller terminals.
Do not allow expansion of current facilities.
Do not make an exemption for NW Natural.

We must develop a new economy focusing on renewables. That is difficult, but climate chaos is worsening daily. This is our responsibility. Please do the right thing.

Thank you!

From: Joseph Stenger MD
Joseph.stenger@gmail.com
4420 NE 36th Ave
Portland 97211

188142

Parsons, Susan

From: Dena Turner <denaturn62@gmail.com>
Sent: Monday, November 07, 2016 7:30 AM
To: BPS Fossil Fuel Zoning
Subject: please ban all new fossil fuel terminals

To Portland City Councilors:

Last fall Portland City Council passed a historic resolution to ban new fossil fuel facilities in the city, putting Portland at the forefront of the climate justice movement. The resolution was the result of massive grassroots advocacy and the leadership of Mayor Hales and City Council. Now, one year later we need to hold the City to their word as they work to implement this resolution into binding city code.
Please make this a strong and binding portion of the city code by implementing the following:

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Rejecting Northwest Naturals request to be exempted from these regulations

Thank you

Dena Turner

1122 SE 60th Avenue

Portland, Oregon 97215

denaturn62@gmail.com

188142

November 7, 2016

Portland City Council
1221 SW Fourth Avenue, Room 130
Portland, Oregon 97204.

Sent via email to: fossilfuelzoning@portlandoregon.gov

Re: Comments in Support of Strong Fossil Fuel Zoning Code Amendments

Dear Mayor Hales and Portland City Council Commissioners,

Thank you for the opportunity to offer our comments on the recommended draft of the City of Portland's Fossil Fuel Terminal Zoning Amendments ("amendments"). We appreciate and support several of the revisions put forward by the Planning and Sustainability Commission (PSC). Still, the City must make further adjustments to the proposed code amendments in order to fully implement Portland's Fossil Fuel Policy Resolution #37168 ("resolution"). The resolution stated that the City would **"actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."** The bold intent and plain language of the resolution provide clear guidance to the City Council as it considers proposals to further strengthen – or further weaken – the City's proposed fossil fuel zoning code amendments.

The City Council made a landmark statement in November 2015, and it should honor this statement by ensuring existing fossil fuel terminals do not expand; prohibiting all new fossil fuel terminals; and, resisting pressure to exempt certain fossil fuel companies such as NW Natural.

On behalf of Columbia Riverkeeper, 350 PDX, Sierra Club, Friends of the Columbia Gorge, Center for Sustainable Economy, Oregon Physicians for Social Responsibility, Climate Action Coalition and Portland Audubon Society we offer the following suggestions to improve rather than weaken the proposed fossil fuel zoning code amendments.

I. Prohibit Expansion of Existing Fossil Fuel Terminals

Public testimony overwhelmingly supports prohibiting the expansion of existing fossil fuel terminals. In contrast, PSC recommends allowing for a 10 percent expansion of capacity for replaced tanks. The PSC recommendation was driven by a desire to streamline seismic upgrades. Notably, a revision to remove the "plus 10 percent"[1] allowable expansion in the recommended

[1] *See* Recommended Draft Fossil Fuel Zoning Code Amendments. October 2016. P. 49.

draft failed narrowly during the PSC's discussion. The PSC's recommendation conflicts with the City's fossil fuel resolution, and it conflicts with the City's oil train ordinance. We urge the City to improve the proposed fossil fuel code amendments.

- City Council should amend PSC's recommendation by removing the proposed allowance for a 10 percent expansion of existing fossil fuel terminals. City Council should simply remove the words "plus 10 percent" in Sections 33.140.100-B.17.a-(1)-(2), on page 49 of PSC's recommendation. This change would still allow seismic improvements of fossil fuel tanks to move forward in a streamlined fashion without a discretionary land use process.

- The following code concepts are slightly amended from the PSC's recommendation, and they could accomplish the City's goal of allowing seismic safety upgrades in fossil fuel terminals by allowing a straightforward limited review process for existing terminals, while not incentivizing new fossil fuel infrastructure:

    - Identify "Fossil Fuel Terminals" as a regulated land use, characterized by (a) marine, railroad, or pipeline transport access and (b) either transloading facilities for transferring a shipment between transport modes (such as from rail to ship) or facilities that store fossil fuels.

    - Prohibit Fossil Fuel Terminals in all base zones.

    - Classify existing Fossil Fuel Terminals in industrial and general employment zones as "limited uses" that can continue to operate. Expansion of fossil fuel storage at these existing terminals is prohibited.

    - The following use limitations apply to existing Fossil Fuel Terminals:

        1] Fossil Fuel Terminals that existed on [insert effective date] are allowed, but the total amount of fossil fuel that can be stored on the site is limited to the fossil fuel storage capacity that existed on [insert effective date]. Total fossil fuel storage capacity on the site in excess of the capacity that existed on [insert effective date] is prohibited; and

        2] New fossil fuel storage structures are prohibited unless a new fossil fuel storage structure is replacing an existing fossil fuel storage structure that does not meet current building codes standards for seismic safety, and in that case, the capacity of the

new fossil fuel storage structure is prohibited from being greater than the storage capacity of the existing structure that is being replaced.[2]

- Allowing expanded fossil fuel infrastructure could create more demand for unit trains in Portland, conflicting with the City's Oil Train Resolution # 37164. Unfortunately, PSC recommended allowing a 10 percent expansion of existing terminals as a limited use. For the ten facilities capable of handling oil that are listed on p. 17, Figure 7 of PSC's recommended draft, a 10 percent across-the-board increase in terminal capacity would result in additional storage of 38,848,740 gallons of oil – a volume equivalent to 13 unit trains of explosive Bakken crude oil.[3] The City Council should disallow expansions at existing facilities to bring the code language into alignment with the City's original fossil fuel policy and oil train resolution.

- For large terminals such as the Chevron, Kinder Morgan, and NuStar facilities, a 10 percent increase would exceed the volume of a single unit train, 2.5 to 3 million gallons of oil. Portland's Resolution # 37164 called for the City to oppose any project that would increase oil train traffic through Portland, a standard that conflicts with new 10 percent increases in oil terminals with large existing capacities.



Oil train derails, punctures, spills, and burns in Mosier on June 3, 2016.

- The PSC's recommendation is very likely to result in a 10 percent increase in fossil fuel storage in Portland because Portland is beginning a parallel process to increase seismic safety of its fossil fuel tanks. When coupled with a requirement for seismic upgrades, PSC's recommendation to allow a 10 percent increase is very likely to spur additional fossil fuel infrastructure in Portland. Specifically, if the City requires facilities to upgrade (as it should) for seismic safety and simultaneously allows for expansion, the City will likely see expanded fossil fuel infrastructure. As a result, the City Council should amend the resolution to remove the words "plus 10 percent," thereby not promoting over 38 million gallons of new crude oil storage infrastructure.

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[2] This second use limitation may be redundant, because replacement structures will automatically be required to meet new updated seismic standards. It's included for clarity to parallel the PSC's recommended draft.

[3] Assumes roughly 3 million gallons of oil per unit train. Unit trains typically carry 2.5 to 3 million gallons of crude oil, depending on the length of the train and size of the cars in the train.

- The PSC's recommended amendments correctly acknowledge that "derailment risks to natural resources, especially along rivers, and to rural communities appear to be significant." Oregonians learned first-hand during the June 3, 2016, derailment in Mosier that oil trains are dangerous, and the City Council should use its fossil fuel zoning code amendments to diminish their use rather than create space for many more. The City of Mosier is still dealing with groundwater and surface water pollution from the derailment, evidence that Portland's fossil fuel zoning code amendments should be sculpted to reduce oil train risks however possible.

- A proposal to expand rail traffic through the Columbia River Gorge shows that Portland should make its fossil fuel zoning code amendments as restrictive as possible on future oil or coal unit trains. The Port of Portland recently supported a proposal by Union Pacific to dramatically expand its rail capacity through the town of Mosier – the same location as the oil train derailment, spill, and fire on June 3rd, 2016. In supporting the Mosier rail expansion, the Port of Portland stated that the rail expansion could increase unit train delivery of bulk goods to Portland, which could include the bulk shipment of oil. In November, the Wasco County Commission voted to deny the rail expansion in large part because of the impacts of increased train traffic on treaty-protected tribal fishing resources, a decision that may be appealed by Union Pacific. The Mosier rail expansion controversy shows that the City of Portland should take clear steps to restrict any future developments that could increase oil train traffic through the Columbia River Gorge.

II. Prohibit New Fossil Fuel Facilities

The Planning Commission recommended prohibiting new bulk fossil fuel facilities, consistent with the resolution's direction to **"actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."** However, the PSC included an exception that would allow new fossil fuel facilities with a storage capacity of up to 2 million gallons. PSC opted for 2 million gallons as a lower threshold for defining a bulk fossil fuel terminal because it was less than the volume of a single unit train of oil. We urge City Council to eliminate or reduce any allowance for new fossil fuel terminals that may create increased use or shipment of polluting, dangerous fossil fuels through Portland.

- Staff explained that fossil fuel use may be flat or declining, negating the need for new or expanded fossil fuel terminals. The City's landmark resolution directs Portland to "actively oppose" fossil fuel expansion and thereby curb demand – not perpetuate it. Portland must accelerate the trend of declining fossil fuel use in order to meet its 2050

carbon reduction goals. Globally, climate science is clear that we must keep fossil fuels in the ground to avoid catastrophe.[4]

- City Council should eliminate or reduce the 2 million gallon threshold for a "bulk fossil fuel terminal." By defining a bulk fossil fuel terminal as a facility with storage capacity greater than 2 million gallons, the amendments leave open the possibility of facilities that can accept additional shipments of crude oil or other dangerous fuels.[5] The amendments should be improved by eliminating or lowering the 2 million gallon threshold and preventing additional risks for Portland and uprail residents.

- City Council should reject the idea that new or expanded fossil fuel infrastructure is necessary to protect the health and safety of Portland residents and downstream communities. In the Council's September 20th work session, BPS staff suggested that the City should offer the possibility of new or expanded infrastructure as a "sweetener" to encourage seismic and safety upgrades. The promise of expanded infrastructure, on its own, has not been adequate to induce the fossil fuel industry to improve the seismic readiness of tank infrastructure in the past. Looking forward, City Council should support other expected and recommended processes that will encourage seismic upgrades rather than weakening the City's proposed amendments.

Encouraging Seismic Safety

PSC's recommended draft works to address how the City of Portland can address seismic safety at existing fossil fuel terminals. We agree with staff that the City should explore options to require seismic safety upgrades through a program similar to the un-reinforced masonry buildings (URMs) program that is in process, or a property maintenance code. The City will more effectively enhance seismic safety through this Portland Bureau of Emergency Management (PBEM) process than through a clumsy, broad-brush incentive to build new fossil fuel infrastructure.

- The City should "develop proposals for State building code changes to improve seismic resilience and require seismic upgrades comparable to proposed requirements on unreinforced masonry buildings," as stated on page 62 of the PSC's recommendation.

- The Council should reject the idea that new or expanded fossil fuel infrastructure is necessary to protect the health and safety of Portland residents and downstream communities. As noted above, the historic availability of opportunities to expand or build

[4] "The Sky Is the Limit: Why the Paris Climate Goals Require a Managed Decline of Fossil Fuel Production." 2016. Oil Change International. http://priceofoil.org/content/uploads/2016/09/OCI_the_skys_limit_2016_FINAL_2.pdf.

[5] Unit trains typically carry 2.5 to 3 million gallons each and are usually 90 cars and 1 mile or more in length.

new fossil fuel infrastructure has not been an adequate inducement for establishing safe, seismically-ready facilities.

- City Council should support Portland Bureau of Emergency Management's (PBEM) expected and recommended process that will encourage seismic upgrades rather than weakening the City's proposed amendments.

III. Include Regulated Utilities and NW Natural in Portland's Fossil Fuel Policy

NW Natural has requested an exemption from Portland's fossil fuel amendments. BPS' October 5, 2016, memo offered potential language for this option, but it did not recommend for or against an exemption for NW Natural and other regulated utilities. Despite receiving additional testimony directly from NW Natural during its hearing in October, not a single member of the PSC recommended altering the fossil fuel zoning code amendments to exempt NW Natural. We urge City Council to adopt PSC's approach to regulated utilities and reject NW Natural's requested exemption.

- NW Natural should not receive special treatment. It is appropriate for large, potentially hazardous energy facilities to be regulated by multiple layers of government. The Planning Commission was comfortable with NW Natural receiving scrutiny from multiple layers of government. NW Natural's role as a public utility should not afford it a special status with respect to meeting the City's goal of prohibiting new fossil fuel infrastructure. Indeed, natural gas is specifically included as a carbon-intensive, dangerous fossil fuel in Portland's 2015 resolution. NW Natural must be included because natural gas - primarily methane - is a powerful greenhouse gas and its combustion releases significant carbon pollution.

- NW Natural already owns and operates adequate storage facilities in the Pacific Northwest to meet its Portland load growth needs.[6] At present, NW Natural is undergoing a seismic review of its existing Portland Gasco LNG facility. The City's proposed amendments would allow NW Natural to improve the seismic readiness of its existing storage through a limited use review.

- New LNG infrastructure could serve non-utility and utility purposes, complicating the impact of NW Natural's requested exemption. NW Natural seeks an exemption for facilities that fall within PUC-regulated operations. Staff's October 5 memo stated, "If

[6] See NW Natural Integrated Resource Plan. September 2016. See Section 7.2 - Gas storage relies on Mist, only new LNG storage considered is in Clark County. P. 3.35.

NW Natural established an unregulated subsidiary to supply wholesale LNG, for example, any infrastructure associated with these operations would still be subject to the Fossil Fuel Code." In reality, gas utilities often mix the utility and non-utility purposes of gas storage facilities. For instance, NW Natural's Mist Storage facility has undergone multiple site certificate changes, and now it is planned to operate both as storage for NW Natural's gas utility customers, as well as a source of firm supplies to PGE's gas-fired power plants at Port Westward.[7] Additionally, Puget Sound Energy proposes a new LNG facility in Tacoma that may be used both as storage for its regulated utility customers and as a fueling station for LNG ships and trucks. Hence, the exemption NW Natural seeks may allow facilities that engage in both PUC-regulated and non-PUC-regulated activities.

- NW Natural's Integrated Resource Plan (IRP) does not specify the need for new major LNG storage in Portland. In its long-range plans, NW Natural's IRP discusses the potential for possible LNG storage to meet load growth in Clark County – not Portland. As a result, NW Natural does not appear to need new LNG storage in Portland to meet its core utility needs, and so the exemption it seeks is unnecessary.

IV. Take Bold Action for a Clean, Safe Energy Economy and a Stable Climate

Portland's City Council will benefit Portland's clean energy economy by undertaking the proposed amendments with the suggestions we have outlined. Just as importantly, the City can make significant strides towards improving the safety of neighborhoods by using the right tools to mandate seismic improvements for fossil fuel storage tanks in highly liquefiable soils near the Willamette and Columbia Rivers. Furthermore, the City's fossil fuel code amendments need not impinge on the expansion of cleaner, non-fossil fuels: facilities handling 95% or greater non-fossil fuels are already exempted. And while the amendments should restrict fossil fuel terminals from expanding or building new facilities, they leave open the potential for Portland to continue to serve as a hub for fuels using existing infrastructure until the region moves further towards a managed decline of fossil fuel use.

Importantly, the PSC's recommendation offers City staff both direction and flexibility in implementing the fossil fuel zoning code amendments. Specifically, Portland Bureau of Planning and Sustainability is directed to periodically monitor the effectiveness of these zoning code amendments "to implement underlying policies and consider code adjustments in response to regional fuel demand and market changes, product innovation, safety and climate action considerations, and related regulatory changes." By directing BPS to evaluate the impacts of the

[7] See recent story from Argus Media highlighting new PGE-NW Natural gas storage collaboration. http://www.argusmedia.com/news/article/?id=1323500.

policy, BPS is given a pathway to recommend new fossil fuel infrastructure on an "as-needed" basis if unforeseen conflicts arise.

A 2016 study from the Labor Network for Sustainability provides more detail on how Portland and the region will benefit from a transition to clean energy.[8] Additionally, there is growing support for a renewable energy agenda in the City of Portland. Indeed, new fossil fuel infrastructure could be stranded assets in the foreseeable future.

Lastly, yet another new study from Oil Change International shows that time is of the essence to address climate change through reducing our use of fossil fuels.[9] The study shows that, if we are to avoid a temperature rise of 2 degrees Celsius, we can build no new fossil fuel infrastructure. Indeed, much of our currently proven oil, gas, and coal reserves must go untapped. The Pacific Northwest – with Portland as its guiding light – can begin a managed decline of fossil fuel use, even as the region continues to grow its economy. Portland earned national praise for its 2015 Fossil Fuel Resolution, and the rest of the world is counting on cities like Portland to show how a managed decline of fossil fuel use can respond to the urgent challenge of reducing our dependence on climate-changing fossil fuels.

We look forward to the City Council voting to establish a code that reflects the bold, practical steps outlined in Portland's landmark fossil fuel policy.

Sincerely,

Dan Serres
Conservation Director
Columbia Riverkeeper

Mia Reback
350 PDX

Also submitted on behalf of: Friends of the Columbia Gorge, Center for Sustainable Economy, Portland Audobon Society, Sierra Club, Oregon Physicians for Social Responsibility, Climate Action Coalition

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[8] The Economic Impact of Clean Energy Investments in the Pacific Northwest: Alternatives to Fossil Fuel Exports. 2016. Labor Network For Sustainability. Link to study: http://www.labor4sustainability.org/files/NorthPacific_final_03032016_.pdf

[9] "The Sky Is the Limit: Why the Paris Climate Goals Require a Managed Decline of Fossil Fuel Production." 2016. Oil Change International. http://priceofoil.org/content/uploads/2016/09/OCI_the_skys_limit_2016_FINAL_2.pdf.

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Teresa St Martin
Maggie Tallmadge

November 3, 2016

Mayor Hales
Commissioner Saltzman
Commissioner Fish
Commissioner Fritz
Commissioner Novick

RE: Restricting Bulk Fossil Fuel Terminals

Mayor Hales and City Commissioners:

The Portland Planning and Sustainability Commission (PSC) is pleased to forward our unanimous recommendation to amend the Zoning Code to restrict bulk fossil fuel terminals in the City of Portland. This recommendation is consistent with the policy direction in the 2015 Climate Action Plan, City Council Resolution 37168 and the 2035 Comprehensive Plan. As Portland, the state of Oregon, and other public agencies and private firms continue to work to reduce greenhouse gas emissions, we expect statewide demand for fossil fuels to decline. More generally, to stabilize the climate, we anticipate that nations around the world will shift away from fossil fuels.

The recommended amendments will prohibit new fossil fuel terminals and limit the expansion of the existing terminals. One of our primary concerns is the safety risk associated with these facilities because most of Portland's industrial areas are located in areas with moderate to high levels of liquefaction susceptibility.

In our deliberations, the PSC made four key changes to the BPS staff proposal:

1. The storage capacity threshold size for defining a bulk fossil fuel terminal was lowered to 2 million gallons. This level is slightly less than the volume of one unit-train, which is a good benchmark. We also are concerned about the throughput of a facility and the possibility that a relatively small amount of storage could move a large volume of fossil fuel through our community.

2. The PSC added language to prevent companies from using subsidiaries to aggregate or link smaller facilities as a means to circumvent the storage capacity threshold limits.

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3. Existing terminals are designated as a limited use. Future expansion is limited to 10 percent of the current terminal capacity and must be done in conjunction with the replacement of existing tanks in order to improve seismic safety. The 10 percent expansion is a way to incentivize seismic upgrades and to provide some flexibility with complying with the State of Oregon's Clean Fuel Standards.

4. In a related recommendation, the PSC decided to not require a land use review for the replacement tanks. We wanted to create a clear permitting path for the seismic upgrades. At the same time, we believe it is important that the public know what is going on with these facilities. Therefore, we added a neighborhood notice and meeting requirement that is to take place prior to submitting development permit applications.

While these bulk fossil fuel terminals provide 90 percent of the transportation fuel that supports our economy and mobility, these facilities represent a tremendous risk to community safety. We hope that these zoning code amendments are the first step in a process to replace the old storage tanks and improve our seismic resilience.

Sincerely,

Katherine Schultz
Chair

City of Portland, Oregon | Bureau of Planning and Sustainability | www.portlandoregon.gov/bps
1900 SW 4th Avenue, Suite 7100, Portland, OR 97201 | phone: 503-823-7700 | fax: 503-823-7800 | tty: 503-823-6868

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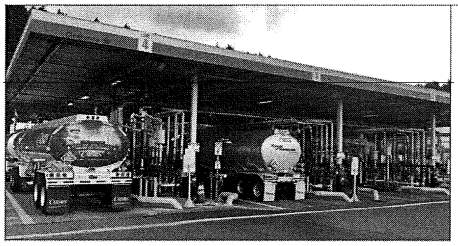
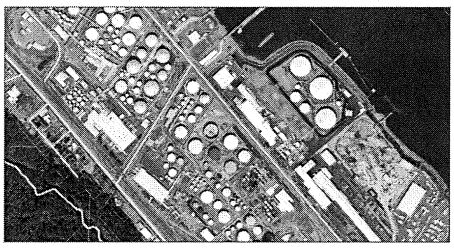
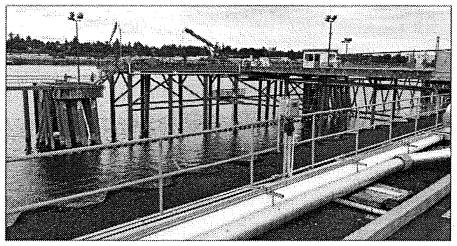
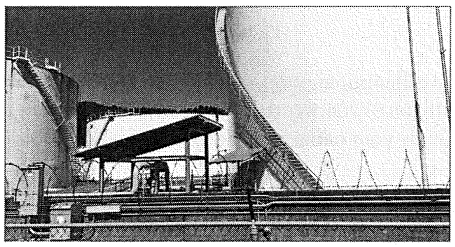
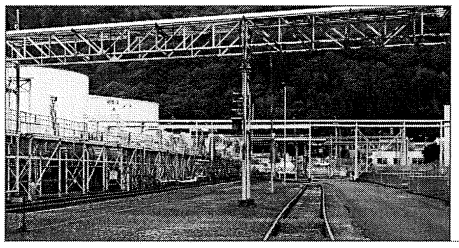
Exhibit A











Fossil Fuel Terminal Zoning Amendments

Recommended Draft

City of Portland, Oregon
October 11, 2016

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.
City of Portland, Oregon

The Bureau of Planning and Sustainability is committed to providing equal access to information and hearings. If you need special accommodation, please call 503-823-7700, the City's TTY at 503-823-6868, or the Oregon Relay Service at 1-800-735-2900.

How can I provide feedback to decision-makers?

The Fossil Fuel Terminal Zoning Amendments project would begin to implement new policy direction on fossil fuel distribution and storage facilities through changes to the Zoning Code. This proposal would restrict development and expansion of bulk fossil fuel terminals.

You may testify about recommended changes to the Portland City Council through November 10, 2016, in the following ways:

Testify in person at the City Council hearing.

The hearing, on November 10, 2016 at 2:00 P.M., will be in Council Chambers at City Hall, 1221 SW 4th Avenue. To confirm the date and time, please check the City Council calendar at www.portlandoregon.gov/auditor/26997

Write to City Council.

Email written testimony to the Council Clerk at fossilfuelzoning@portlandoregon.gov or send to 1221 SW Fourth Avenue, Room 130, Portland, Oregon 97204. Written testimony must be received by the time of the hearing and must include your name and address.

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Acknowledgments

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1. Introduction

In recent years, the rapid development of fossil fuel resources in the Western United States and Canada has prompted many proposals in the Pacific Northwest for new large fuel terminals and infrastructure projects. In early 2015, Pembina Pipeline Corporation proposed a propane terminal in Portland that drew substantial public opposition. Mayor Charlie Hales withdrew a proposed zoning code amendment that the development needed to move forward, effectively blocking that proposal. In November 2015, Portland City Council adopted Resolution 37168 calling for opposition to expansion of fossil fuel infrastructure. In June 2016, City Council adopted the 2035 Comprehensive Plan, which included Policy 6.48 to limit fossil fuel distribution and storage facilities to those needed to serve the regional market. This code-change project begins to implement the policy direction in the resolution by restricting development and expansion of bulk fossil fuel terminals.

Project summary

The Fossil Fuel Terminal Zoning Amendments project would restrict the development and expansion of Bulk Fossil Fuel Terminals.

Recommended zoning code amendments:

- Identify "Bulk Fossil Fuel Terminals" as a regulated land use, characterized by (a) marine, railroad, or pipeline transport access and (b) either storage capacity exceeding 2 million gallons or transload facilities (such as rail-to-ship loading).
- Prohibit new Bulk Fossil Fuel Terminals in all base zones.
- Classify existing Bulk Fossil Fuel Terminals in industrial and general employment zones as "limited uses" that can continue to operate. Expansion of fossil fuel storage at these existing terminals would be limited to improvements that (a) include "seismic upgrades" which replace existing tanks, (b) add no more than 10 percent of the capacity of replaced tanks, and (c) result in no more than 10 percent cumulative expansion of the total terminal capacity on the effective date of these code changes.

Why is this important?

Fossil fuel distribution policy – New policy directions adopted by City Council in November 2015 and in the 2035 Comprehensive Plan would limit fossil fuel distribution and storage facilities to those serving the regional market. City Council adopted these policies after holding public hearings and hearing testimony from hundreds of Portlanders.

Climate action goals – Fossil fuels are major contributors to climate change and pollution. The rapid development of fossil fuel resources in the Western United States and Canada has prompted many recent proposals for new export terminals in the Pacific Northwest. The City's Climate Action Plan seeks to reduce greenhouse gas emissions with fossil fuels being the largest source of emissions.

Public safety and environmental protection – Several recent accidents involving fossil fuel distribution across the nation and in Oregon highlight public safety risks in cities and environmental risks along rivers. Most of Portland's industrial areas have moderate-to-high liquefaction susceptibility in a major earthquake.

Oregon's industrial and distribution center – Portland is Oregon's largest, most diverse distribution hub, and existing Portland petroleum terminals serve more than 90 percent of the statewide market. Recommended code changes would restrict the expansion of these facilities in Portland.

Project scope and timing

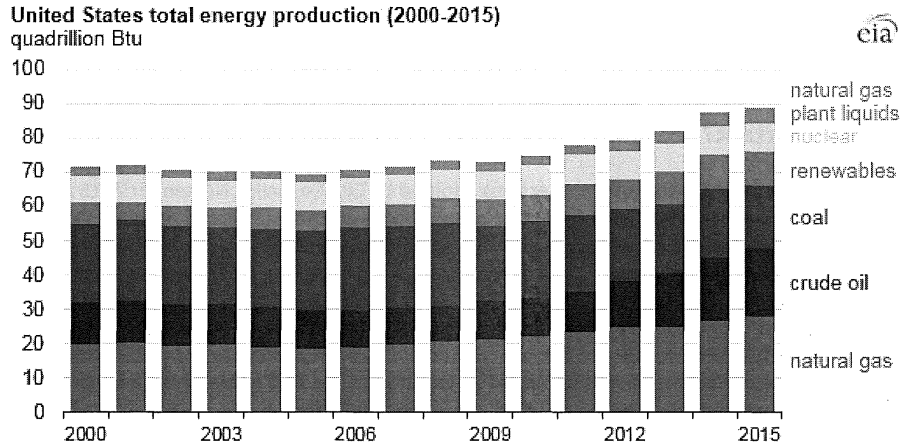
The energy distribution market in the Pacific Northwest is changing. Production of crude oil and natural gas, particularly from North Dakota, has substantially increased in the U.S. since 2009, as shown in Figure 1. In turn, several large new fuel distribution terminals have been proposed in the Pacific Northwest to access West Coast and export markets, as shown in Figure 2. Similar trends have occurred in Alberta and British Columbia.

This project is proposing a prompt, focused response to these market changes. The recommended code amendments will restrict development of new fossil fuel terminals and limit the expansion of existing terminals, consistent with City and State objectives on climate change and public safety.

Where are Portland's existing fossil fuel terminals?

Portland's industrial districts are Oregon's largest seaport, rail hub and truck distribution center. The Northwest Industrial District in Portland is also the end of the Olympic Pipeline, which supplies most of Oregon's petroleum fuels from Puget Sound refineries. The ten petroleum terminals located in Northwest Portland are the gateway distribution facilities serving Oregon and Southern Washington markets. Additionally, NW Natural's GasCo terminal provides peak-consumption storage of natural gas for much of the regional market. In Northwest Portland, these "tank farm" storage facilities have direct access to pipeline, deep-water port, railroad and truck route infrastructure. Several other smaller fossil fuel distribution facilities are also located in Portland.

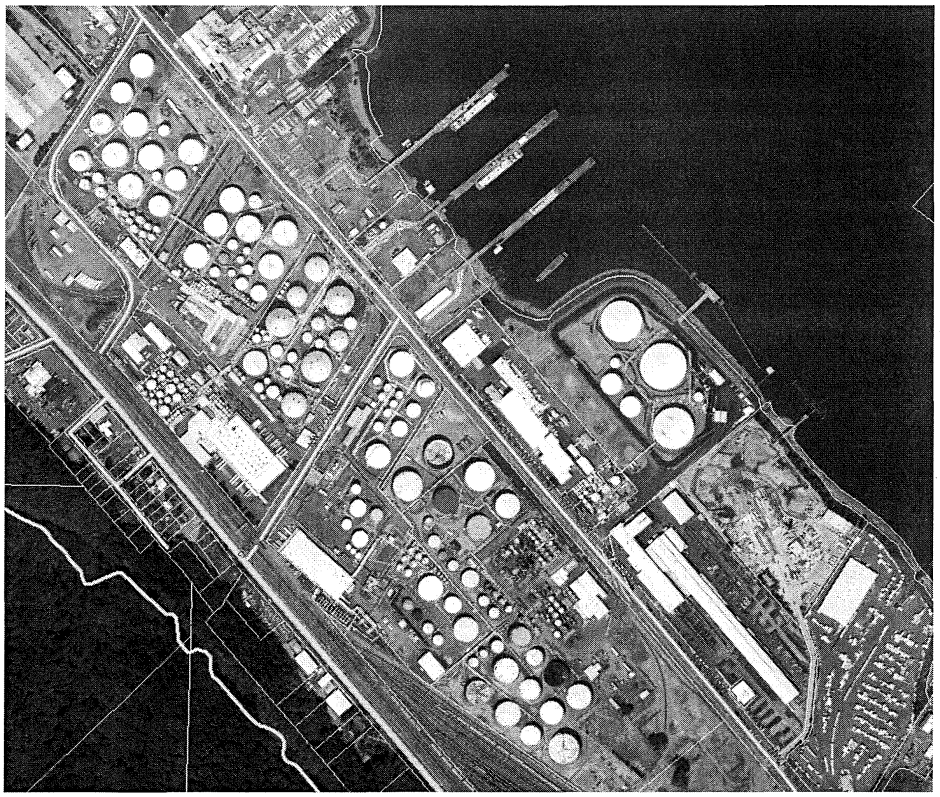
Figure 1. Increasing U.S. energy production



Source: U.S. Energy Information Administration, 2016

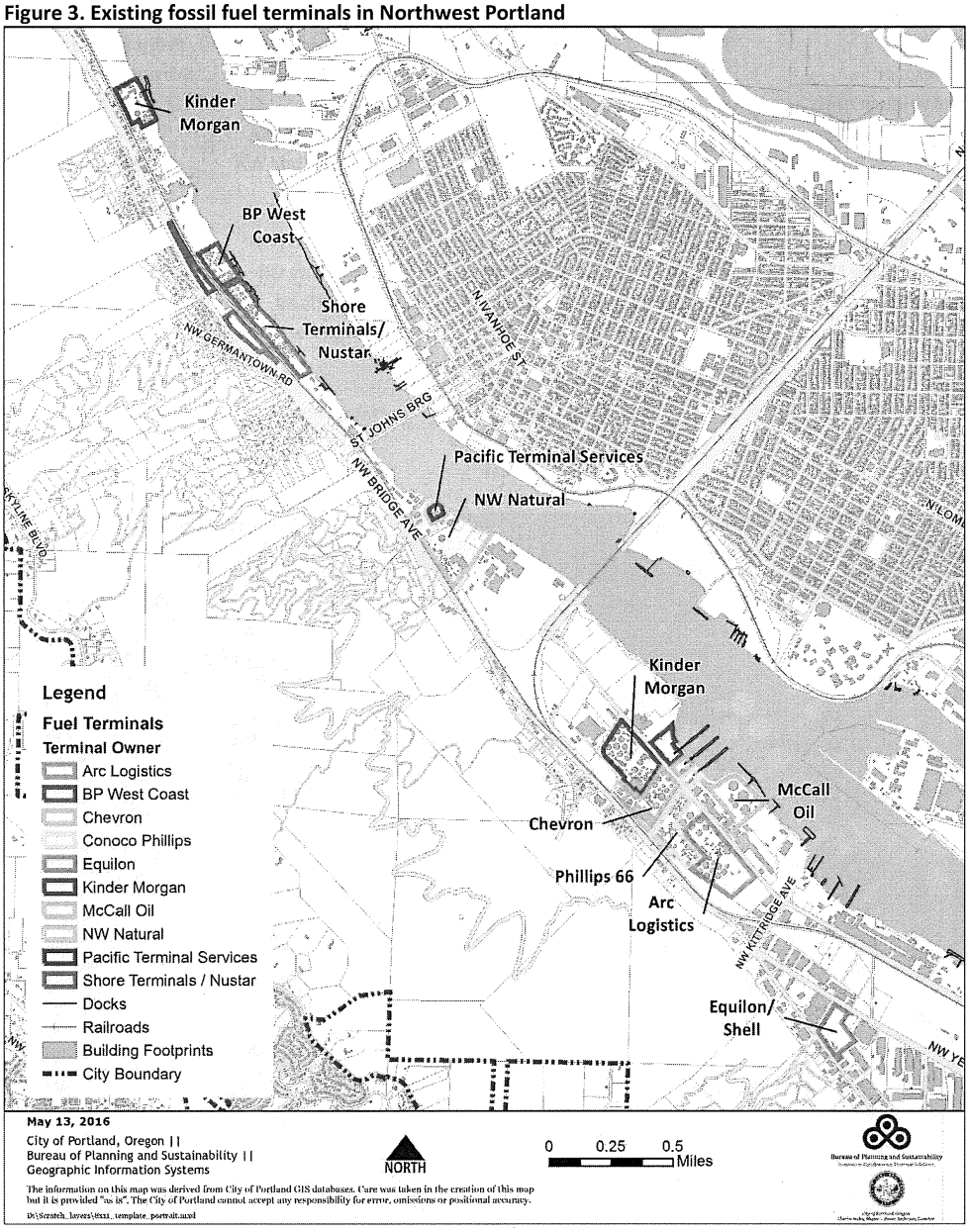
Figure 2. Examples of recent fossil terminal proposals in the Pacific Northwest

Operator	*Facility type*	*Location*	*Proposed new storage capacity*
Petroleum fuels			barrels
Vancouver Energy	Crude oil terminal	Vancouver WA	2,160,000
Imperium Renewables	Biofuels terminal	Grays Harbor WA	720,000
Gaseous fuels			gallons
Oregon LNG terminal	New LNG terminal	Warrenton OR	84,000,000
Jordan Cove LNG	New LNG terminal	Coos Bay OR	84,000,000
Pembina	Propane terminal	Portland	35,000,000
Haven Energy	Propane terminal	Longview WA	23,000,000
Coal			Stockpile acres
Millennium Bulk Terminal	Coal terminal	Longview WA	~20
Ambre Energy	Coal transload facility	St. Helens OR	no storage
Gateway Pacific Terminal	Coal terminal	Bellingham WA	80



Five petroleum terminals are located in the Willbridge area of NW Portland.

Figure 3. Existing fossil fuel terminals in Northwest Portland



PSC review and recommendations

The Planning and Sustainability Commission (PSC) held a public hearing on September 13, 2016, and made three changes to the Proposed Draft in response to issues raised in testimony.

1. Terminal storage capacity threshold – The size threshold to distinguish Bulk Fossil Fuel Terminals was reduced from 5 million to 2 million gallons of storage, in order to include facilities that are large enough to unload unit trains. This change would also include and restrict smaller existing fuel distributors.
2. Ownership aggregation - Code language was added to prevent the aggregation of new facilities smaller than 2 million gallons into a larger terminal that could effectively circumvent the terminal storage capacity threshold.
3. Expansion of existing terminals - Existing terminals were reclassified from a "nonconforming use" to a "limited use," which accommodates seismic upgrades and limits expansion to (a) include replacement of existing tanks, (b) no more than 10 percent of the capacity of replaced tanks, and (c) no more than 10 percent of the total terminal capacity in 2016. A public notification requirement was also added for new tanks.

The PSC considered and did not act on NW Natural's request to exempt regulated utilities.

What's in this report?

This *Recommended Draft* of Fossil Fuel Terminal Zoning Amendments is recommended by the Planning and Sustainability Commission for consideration by the Portland City Council. The audience is the City Council and the general public, including stakeholders, inter-governmental partners, implementers and other interested parties. Project stakeholders include property owners, businesses, employees, residents, neighbors, business district and neighborhood associations, underrepresented and underserved groups, environmental groups and other community groups. Implementers include the real estate industry, development review staff and others who use the zoning code.

Your feedback on the Recommended Draft should be directed to the City Council. You may testify about the recommended changes in person at the City Council hearing on November 10, 2016, or testify in writing before the hearing (see information about how to provide feedback on the inside cover of this report).

This report consists of seven parts:

- **Section 1** introduces the project.
- **Section 2** describes how the recommended code changes implement City policies in Resolution 37168 and the 2035 Comprehensive Plan.
- **Section 3** summarizes public and stakeholder involvement activities that have helped shape and inform this project.
- **Section 4** describes background conditions that inform the recommended zoning changes.
- **Section 5** describes the analysis of recommended zoning concepts, including related policy directions, implementation issues and rationale.
- **Section 6** specifies the draft code language, along with code commentary pages that clarify expected implementation.

- **Section 7** recommends future implementation directions for building code amendments to address seismic resilience and periodic monitoring for code effectiveness.

2. Policy direction

Section 2 describes how the recommended code changes implement relevant City policies in Resolution 37168 and the Comprehensive Plan.

City of Portland Fossil Fuel Resolution 37168

> BE IT RESOLVED, that the City Council will actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways; and

The recommended zoning code changes are a key implementation action of Resolution 37168, adopted in November of 2015. Addressing the overall direction of the resolution to oppose expansion of fossil fuel distribution and storage infrastructure, this project proposes to restrict development and expansion of bulk fossil fuel terminals.

> BE IT FURTHER RESOLVED, that this Resolution does not restrict:
> 1. improvements in the safety, or efficiency, seismic resilience, or operations of existing infrastructure;
> 2. the provision of service directly to end users;
> 3. development of emergency backup capacity;
> 4. infrastructure that enables recovery or re-processing of used petroleum products; or
> 5. infrastructure that will accelerate the transition to non-fossil fuel energy sources; and

The recommended code changes address exceptions 2 and 4 in the Resolution through specific exclusions of end-user facilities and recovery or re-processing of used petroleum products from the recommended new land use restrictions on Bulk Fossil Fuel Terminals. Also, storage capacity for non-fossil fuels, such as ethanol, is not subject to these restrictions, which could help with the transition to non-fossil fuel energy sources under the State of Oregon's Clean Fuels Program (5). Expansion of fossil fuel storage at existing fuel terminals is allowed, but limited and only in conjunction with safety/seismic replacement (1). Development of emergency backup capacity may be restricted, unless that capacity can fit within the 10 percent expansion limit.

> BE IT FURTHER RESOLVED, that City bureaus are directed to examine existing laws, including those related to public health, safety, building, electrical, nuisance, and fire codes, and develop recommendations to address fossil fuels that strengthen public health and safety; and

The resolution broadly addresses fossil fuel infrastructure. The zoning code regulates land use patterns and development of fossil fuel distribution facilities on parcels. Zoning does not regulate the quantity of products handled (throughput) on developed sites or their destination (such as exports). Additional amendments to building, fire and energy codes would need to be addressed in future projects.

> BE IT FURTHER RESOLVED, that the Bureau of Planning and Sustainability is directed to develop proposed code changes for Council consideration to advance the policies set forth in this Resolution; and

The project will specifically implement this provision of the resolution.

> BE IT FURTHER RESOLVED, that prior to any further Council action, the mayor shall schedule (1) a work session to review any proposed code changes and (2) an executive session to review the legal considerations of any proposed code changes; and

The proposed project will implement this process requirement of the resolution.

> BE IT FURTHER RESOLVED, that the Bureau of Planning & Sustainability shall undertake an analysis of the economic impacts of any proposed Code changes to advance the policies set forth in this resolution, with a particular focus on potential impacts to local blue-collar jobs; and

This report includes summary analysis of economic impacts in Section 4, specifically addressing impacts on middle-wage blue collar jobs. Analysis to date is limited on the potential impacts on fuel supply to meet regional demand. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts, or may plateau and decline with implementation of climate resilience goals and strategies.

> BE IT FURTHER RESOLVED, that the City and applicable bureaus shall seek and identify opportunities to invest in Portland's 'human infrastructure' by supporting programs to retrain our workforce as the city transitions to a clean energy economy; and

This provision of the resolution is expected to be implemented as a future action.

> BE IT FURTHER RESOLVED, that the City shall consult with its Tribal Government Partners, the State of Oregon, local governments, and other key stakeholder including labor, business, environment, neighborhoods and communities of color in advancing this policy;

The Mayor's Office staff has sought input from and will continue to reach out to the entities identified above to implement this process requirement of the resolution.

Guiding principles of the 2035 Comprehensive Plan

The Comprehensive Plan sets five Guiding Principles, which encourage balanced, integrated multi-disciplinary approaches that must comply with the Plan. This project is consistent with the Guiding Principles because it promotes major benefits to human health and safety, environmental health and resilience, and integrates considerations for economic prosperity and equity.

Economic prosperity

> *Guiding Principle: Support a low-carbon economy and foster employment growth, quality education and training, competitiveness, and equitably-distributed household prosperity.*

The recommended code changes would restrict expansion at existing fuel terminals and prohibit new terminal development, impacting associated job growth and tax revenue. The recommended code

restrictions on fossil fuel terminal development would also limit potential financial risks from a major accident involving fossil fuel infrastructure.

Human health

> *Guiding Principle:* Avoid or minimize negative health impacts and improve opportunities for Portlanders to lead healthy, active lives.

Major benefit – The recommended code changes would reduce the scale of low, but potentially catastrophic, safety risks associated with the growth of fossil fuel infrastructure, including oil train derailments, explosive accidents at liquefied natural gas (LNG) and liquefied petroleum gas (LPG) facilities, and seismic risks of tank farms. Fossil fuel emissions and coal dust are also significant sources of air pollution associated with respiratory disorders.

Environmental health

> *Guiding Principle: Weave nature into the city and foster a healthy environment that sustains people, neighborhoods, and wildlife. Recognize the intrinsic value of nature and sustain the ecosystem services of Portland's air, water, and land.*

Major benefit – The human health benefits described above also extend to environmental health. The recommended code changes would reduce the scale of environmental health risks associated with the growth of fossil fuel infrastructure, including oil train derailments along the Columbia River, LNG and LPG facilities in riparian areas, and seismic risks of tank farms along the Willamette River. Fossil fuel emissions are also a significant source of air pollution.

Equity

> *Guiding Principle: Promote equity and environmental justice by reducing disparities, minimizing burdens, extending community benefits, increasing the amount of affordable housing, affirmatively furthering fair housing, proactively fighting displacement, and improving socio-economic opportunities for under-served and under-represented populations. Intentionally engage under-served and under-represented populations in decisions that affect them. Specifically recognize, address, and prevent repetition of the injustices suffered by communities of color throughout Portland's history.*

The recommended code changes would restrict expansion at existing fuel terminals and prohibit new terminal development, impacting associated middle-wage, industrial job growth that disproportionately benefits workers of color. Restricting potential increases in regional supply of fossil fuels could also have regressive impacts of increasing fuel costs, disproportionately affecting lower-income people.

Resilience

> *Guiding Principle: Reduce risk and improve the ability of individuals, communities, economic systems, and the natural and built environments to withstand, recover from, and adapt to changes from natural hazards, human-made disasters, climate change, and economic shifts.*

Major benefit – The recommended code changes would restrict development of fossil fuel terminals consistent with City and State objectives on climate change and public safety. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, substituting these fuels for higher-carbon fuels does not begin to approach the goal of an 80% reduction in carbon emissions by 2050 established in Portland's Climate Action Plan or the State's 75% goal.

2035 Comprehensive Plan policies specifically implemented in this project

The recommended zoning changes in the project are implementing the following specific policies.

Overall project direction: Fossil fuel distribution

> *Policy 6.48 Fossil fuel distribution. Limit fossil fuel distribution and storage facilities to those necessary to serve the regional market.*

The recommended code changes would implement Policy 6.48 by restricting development and expansion of fossil fuel distribution terminals. Analysis to date on the potential impacts of code amendments in constraining fossil fuel supply to meet regional demand is limited. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts reviewed in Section 4, or may plateau and decline with implementation of climate resilience goals and strategies. As recommended, fuel terminal capacity in Portland to meet regional demand would be limited to expansion of existing terminals by no more than 10 percent.

Related policy directions

> *Policy 4.81 Disaster-resilient development. Encourage development and site-management approaches that reduce the risks and impacts of natural disasters or other major disturbances and that improve the ability of people, wildlife, natural systems, and property to withstand and recover from such events.*
>
> *Policy 4.82 Portland Harbor facilities. Reduce natural hazard risks to critical public and private energy and transportation facilities in the Portland Harbor.*

Policies 4.81 and 4.82 are partly met by prohibiting fuel terminal development in Portland's industrial areas that are predominantly in locations with high susceptibility to soil liquefaction (see Figure 7 in Section 4). Incremental expansion at existing terminals also provides a pathway for market-driven safety improvements, providing financial return to cover improvement costs.

> *Policy 6.2 Diverse and expanding economy. Align plans and investments to maintain the diversity of Portland's economy and status as Oregon's largest job center with growth across all sectors (commercial, industrial, creative, and institutional) and across all parts of the city.*
>
> *Policy 6.5 Economic resilience. Improve Portland's economic resilience to impacts from climate change and natural disasters through a strong local economy and equitable opportunities for prosperity.*
>
> *Policy 6.6 Low-carbon and renewable energy economy. Align plans and investments with efforts to improve energy efficiency and reduce lifecycle carbon emissions from business operations. Promote employment opportunities associated with the production of renewable energy, energy efficiency projects, waste reduction, production of more durable goods, and recycling.*

The recommended code changes are consistent overall with the range of direction in Policies 6.2, 6.5 and 6.6, providing for modest expansion of existing terminals as part of a diverse, expanding economy

and prohibiting development of new fossil fuel terminals that conflict with resilience and climate action goals.

Existing Comprehensive Plan policies specifically implemented in this project

The 2035 Comprehensive Plan was adopted in June 2016 and is not expected to take effect until early 2018. In the meantime, the existing Comprehensive Plan is in effect.

> *Policy 7.6 Energy Efficient Transportation. Provide opportunities for non-auto transportation including alternative vehicles, buses, light rail, bikeways, and walkways. The City shall promote the reduction of gasoline and diesel use by conventional buses, autos and trucks by increasing fuel efficiency and by promoting the use of alternative fuels.*
>
> *Policy 7.8 Energy Supply. The City shall promote conservation as the energy resource of first choice. The City shall also support environmentally acceptable, sustainable energy sources, especially renewable resources such as solar, wind, hydroelectric, geothermal, biomass (wood, farm and municipal waste), cogeneration, and district heating and cooling.*

The recommended code changes are consistent with Policies 7.6 and 7.8, promoting the use of alternative energy sources by restricting development and expansion of fossil fuel terminals.

2015 Climate Action Plan

> *Goal: Reduce local carbon emissions 80 percent from 1990 levels by 2050, with an interim goal of 40 percent by 2030.*

As described in Section 4, lower-carbon fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, but they do not approach the goal of an 80% reduction in carbon emissions by 2050 in Portland's Climate Action Plan or the State's 75% goal. Investments in major infrastructure typically take decades to recoup, and the transition to renewables needs to go much faster than that to stabilize global emissions. The recommended code changes are consistent with the 80% goal of the Climate Action Plan by restricting development of fossil fuel terminals.

3. Public and stakeholder involvement

Section 3 summarizes public and stakeholder involvement activities that have helped shape and inform this project. Stakeholder focus group results are further explained in Appendix A of this report.

What have we heard leading up to this project?

Public hearings at the Planning and Sustainability Commission and City Council on the Pembina terminal development proposal in 2014 and Resolution 37168 in 2015 drew testimony from hundreds of people. The overall theme of that testimony was strong objection to the Pembina project and support for the fossil fuel resolution. Primary reasons included the neighborhood safety and health risks and inconsistency with the City's climate action objectives. The Resolution also drew letters with strong opposition from state and regional business associations.

Following adoption of the Resolution in November 2015, City Council added the related Policy 6.48 on fossil fuel distribution to the 2035 Comprehensive Plan, reflecting the recently adopted policy direction in the Resolution. Public involvement in the Comprehensive Plan Update included public hearings in April 2016 on City Council amendments and thousands of comments on the 2035 Comprehensive Plan over the previous 8 years. The recommended code amendments are consistent with several sustainability-related policies in the Plan. Addressing issues with policy tradeoffs, the 2035 Comprehensive Plan calls for a balanced, integrated approach to implement multiple goals. As described in Section 2, the recommended code amendments provide major benefits toward implementing three of the Plan's five guiding principles and integrates consideration of the other two guiding principles.

Public involvement activities in this project

Extensive public comments were received on the Discussion Draft and Proposed Draft, which influenced substantial changes between the Recommended Draft and prior drafts. Two overall themes of the public input include 1) extensive comments from residents, community groups and environmental advocates for a bold change in direction to oppose fossil fuel terminal development and 2) objections to the draft code changes by business, labor, and fuel industry representatives in order to accommodate regional growth, everyday fuel needs, and transition investments.

The PSC received emailed testimony from about 600 people generally calling for a "full ban" on new fossil fuel terminals and strengthened restrictions on expansion of existing terminals. While comments varied, predominant recommendations included removing the 5-million-gallon terminal size threshold and adding discretionary review criteria on expansion to address climate and safety impacts. Similar testimony for more stringent restriction on fuel terminal development was submitted by 350PDX, Portland Audubon, Center for Sustainable Economy, Physicians for Social Responsibility, Columbia Riverkeeper, Columbia River Inter-Tribal Fish Commission, Sierra Club, Climate Solutions, League of Women Voters, and others. Additional themes of their comments and recommendations included support for a nonconforming use designation on fossil fuel terminals, new restrictions on ownership

aggregation to prevent circumvention of the terminal size threshold, and support for additional building code requirements to improve seismic safety.

In contrast, testimony objecting to the draft restrictions on fuel terminal development were submitted by Portland Business Alliance, Port of Portland, Columbia Pacific Building and Construction Trades Council, NW Natural, Burlington Northern Santa Fe Railroad, Working Waterfront Coalition, Arc Terminals, Western States Petroleum Association, and others. Examples of their concerns included: inconsistency with the Resolution's direction for various exemptions and economic impacts analysis; substantial growth is expected in the use of some fossil fuels (e.g., jet fuel, natural gas, transition fuels); and a request for exemption of public utilities that are already regulated to serve regional end users.

Themes of comments on the Discussion Draft from business and labor organizations included opposition to recommended code changes, requests for more time and analysis, and clarifications to address practical considerations. Letters were received from NW Natural, Port of Portland, Columbia Pacific Building and Construction Trades Council, Kinder Morgan, Arc Terminals, and Western States Petroleum Association (WSPA). Some examples of comments included that growth rates will change over time, that fuels meeting Oregon's Clean Fuel Standard should be excluded, inclusion of non-fuel methanol is inconsistent, and the economic analysis is cursory. WSPA submitted draft code language, including focusing terminal restrictions on extra-regional facilities beyond the West Coast (PADD V) region and a new Energy Corridor Overlay Zone that protects the historic energy cluster for infrastructure growth.

Public involvement in concept development for the project consisted primarily of four stakeholder focus groups, which were held in June 2016 to review preliminary code concepts and help identify and understand potential implementation issues. The focus groups highlighted the range of stakeholder perspectives and interests concerning recommended zoning changes. Figure 4 summarizes the themes of issues raised in the focus groups. Other outreach activities have included meetings with interagency partners, terminal operators, and other interested stakeholders. These activities and what we heard in them are further described in the appendix of this report.

Inter-governmental coordination

The Mayor's Office staff has sought input from and will continue to reach out to Tribal Government Partners to shape and inform the draft code amendments. An In-House Draft Report was circulated to inter-bureau partners in June 2016. Their comments have helped to shape and inform the Discussion Draft and subsequent drafts, particularly addressing code administration and legal limitations.

Figure 4. Summary themes of stakeholder focus group comments

TOPIC	FUEL TERMINAL REPRESENTATIVES	ENVIRONMENTAL AND HEALTH ORGANIZATIONS	STATE AND REGIONAL BUSINESS ORGANIZATIONS	NEIGHBORHOOD AND EQUITY ORGANIZATIONS
Key issues	▸ We've operated safely for decades. We meet the federal/state low-carbon fuel standards. ▸ Difficult to participate: very quick process; emotionally driven; antitrust restrictions. ▸ Unintended impacts: harder to meet clean fuel standards; more trucks on road; costs to rest of the state.	▸ Looking for strong, model code. Expect community backlash if expectations not met. ▸ Safety needs to be integral with climate - Mosier oil train wreck; terminals in liquefaction soils. ▸ Include disaster risks in economic analysis. Bonding or insurance for worst case.	▸ Resolution requires more research on economic impacts, etc. ▸ How will the code hold up in 5 years? ▸ What is the goal? If climate or safety, zoning tool is not the right fit. ▸ Portland is not an economic island. Statewide impact. ▸ Big political decision. Don't rush it.	▸ Safety and pollution are our priority. Look closely at seismic and explosion risks. ▸ A reasonable expectation for growth is smart. ▸ This is aggressive. Without LNG, won't China burn more coal? ▸ Rail safety in the Gorge is also a key issue that this can't resolve.
New land use category	▸ If unclear, permit staff could be pressured - unpredictable results. ▸ Use federal West Coast PADD 5 "region."	▸ Regulate both existing and new facilities. ▸ New code must effectively implement the policy.	▸ Need clear definitions: region, export, end user. ▸ Do not make terminals non-conforming or an ambiguous limited use.	▸ Why allow it in IG2? ▸ A new export terminal in contaminated harbor is unlikely.
Definition of fossil fuels	▸ Natural gas considered a low carbon fuel by State, so why included here? ▸ Tomorrow's cleaner fuels won't meet today's definitions.	▸ Excluding methanol undermines policy. ▸ If end use is mostly fuel, then limit it. ▸ One new LNG tank is a big risk. So is coal.	▸ Federal and state are going a different direction, requiring cleaner fossil fuels. Why restrict cleaner fuels at cross purposes?	▸ Make way for bio-diesel as a cleaner fuel. ▸ Methanol not a fuel in Oregon - overreaching. ▸ Fuels are okay if they have no emissions.
Terminal development restrictions	▸ Some sites are already built-out. ▸ Our non-contiguous sites are connected by pipelines. ▸ Can't comment on size.	▸ Most prefer Option A. ▸ Caution about Commerce Clause. ▸ 1% annual growth metric is too high.	▸ Don't come at sideways. Unclear rationales will lead to appeals. ▸ Size limits would put region on "import diet." ▸ Dated, low forecast.	▸ Option C preferred. ▸ Allow for modest growth of LNG and oil; not coal. ▸ Review size limits every few years.

4. Background conditions

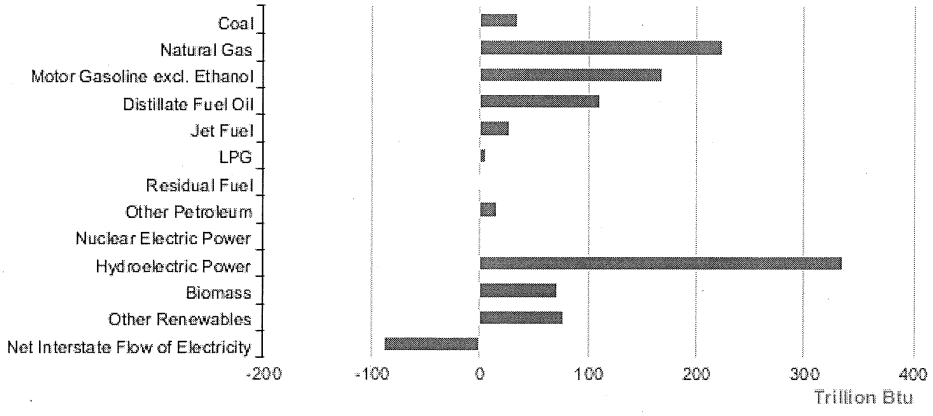
This section of the report describes background conditions that inform the recommended zoning changes. Topics include access to energy, impacts on the economy, climate change impacts, and health and safety impacts of draft zoning code changes. Background information on changing energy markets in the Pacific Northwest and Portland's existing fossil fuel terminals is included in the Section 1. Legal and policy background information is presented in Section 2.

Access to energy

Energy consumption in Oregon

Oregon residents and businesses rely on Portland's fossil fuel distribution and storage facilities as a wholesale distribution hub to meet their energy consumption needs. Estimated state energy consumption by fossil fuels and other sources are shown in Figure 5. Residents and businesses in much of Southern Washington also rely on Portland terminals for access to fuels.

Figure 5. Oregon energy consumption estimates, 2014



eia Source: Energy Information Administration, State Energy Data System

Four refineries in the Puget Sound area supply nearly all of the petroleum fuels consumed in Oregon, delivered primarily through the Olympic Pipeline that terminates at the cluster of 10 petroleum terminals in Northwest Portland. From there, petroleum products are delivered to Oregon and Southern Washington markets via truck, pipeline and barge. NW Natural supplies natural gas to its Western Oregon market area and operates peak-consumption storage terminals in Northwest Portland

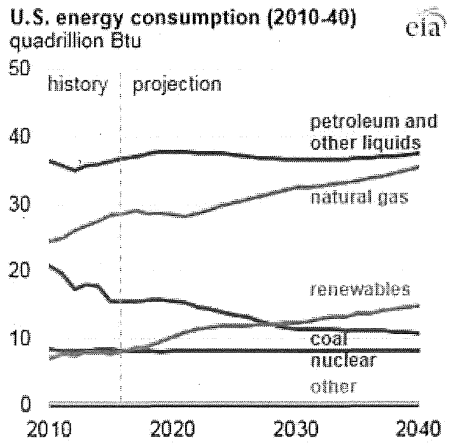
and Newport. Thus, fossil fuel terminals in Portland are a primary statewide distribution hub for transportation fuels and natural gas.

Energy consumption forecasts and the demand for additional storage capacity

Analysis to date is limited on the energy consumption forecasts and how the recommended code changes would impact the demand for additional fossil fuel storage capacity. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts, or may plateau and decline with implementation of climate resilience goals and strategies. National forecasts of energy consumption by the U.S. Energy Information Administration show varying growth trajectories by energy type, including a relatively flat outlook for petroleum fuels, decline for coal, and moderate growth for natural gas and renewables (see Figure 6).

Liquid bulk cargo in Portland Harbor is projected to expand at a range of 0.5% to 1.0% average annual growth (AAG) to 2040 (BST Associates, 2012), providing an estimate of potential market expansion needs for petroleum fuels, which could mean a need for an additional 10-20% increase in storage capacity. However, based on this forecast, ECONorthwest (2012) estimated that there was no additional land needed for new liquid bulk terminals in Portland. The 1.9% average annual growth forecast to 2034 (NW Natural 2014 Integrated Resource Plan) provides an estimate of market expansion needs for natural gas distribution facilities.

Figure 6. U.S. energy production and consumption projections to 2040



Source: US Energy Information Administration, Annual Energy Outlook 2016

Even if regional fossil fuel demand follows trend-based local forecasts, there is a wide margin between the size of recently proposed crude oil, coal, and LNG terminals in the Pacific Northwest and the scale of expected growth of existing Portland fuel terminals that generally serve the regional market area, as shown in Figure 7.

Contradictory stakeholder comments were received that local growth projections are too high, too low, and could change substantially with market innovations. To address this uncertainty, periodic monitoring for code effectiveness is recommended in Section 7 as a future implementation project,

including monitoring for changes in regional fuel demand over time. As recommended, fuel terminal capacity in Portland to meet regional demand would be limited to expansion of existing terminals by no more than 10 percent.

Figure 7. Estimated storage capacity at existing and proposed fuel terminals

Operator	*Facility type*	*Location*	*Site acres*	*Storage capacity*	*New Storage capacity*
Petroleum fuels					
Existing Portland terminals				bbls	
Chevron	Petroleum terminal	NW Portland	21	1,600,000	
Kinder Morgan Willbridge	Petroleum terminal	NW Portland	33	1,551,000	
Arc Logistics	Asphalt/crude oil	NW Portland	39	1,518,200	
NuStar	Petroleum terminal	NW Portland	22	1,191,000	
McCall Oil	Petroleum terminal	NW Portland	19	930,000	
Conoco Phillips	Petroleum terminal	NW Portland	21	760,000	
BP West Coast	Petroleum terminal	NW Portland	18	601,500	
Kinder Morgan Linnton	Petroleum terminal	NW Portland	13	420,000	
Equilon/Shell	Petroleum terminal	NW Portland	13	400,000	
Pacific Terminal Services	Petroleum terminal	NW Portland	2	278,000	
Recently proposed new terminals or reinvestment in Pacific NW				bbls	Proposal
Vancouver Energy	Crude oil terminal	Vancouver WA	47	NA	2,160,000
Imperium Renewables	Biofuels terminal	Grays Harbor WA	11	NA	720,000
NuStar	Petroleum terminal	Vancouver WA	19	775,000	Reuse tanks
Gaseous fuels					
Existing Portland terminals				LNG gal	2035 forecast
NW Natural GasCo	LNG plant/terminal	NW Portland	41	7,500,000	3,428,000
Recently proposed natural gas terminals/storage in Pacific NW				LNG gal	Proposal
Oregon LNG terminal	New LNG terminal	Warrenton OR	96	NA	84,000,000
Jordan Cove LNG	New LNG terminal	Coos Bay OR	400	NA	84,000,000
NW Natural North Mist	Gas reservoir storage	Mist OR	2,644	NA	2.5 Bcf gas
Other recent proposals (now inactive) for gaseous fuel terminals				LPG gal	Proposal
Pembina	Propane terminal	Portland	38	NA	34,000,000
Haven Energy	Propane terminal	Longview WA	24	NA	23,000,000
NW Innovation	Methanol plant	Kalama WA	83	NA	67,000,000
Coal					
Existing Portland terminals					
None					
Recently proposed coal terminals in Pacific NW					Stockpile acres
Millennium Bulk Terminal	Coal terminal	Longview WA	100	NA	~20
Ambre Energy	Coal transload facility	St. Helens OR		NA	no storage
Gateway Pacific Terminal	Coal terminal	Bellingham WA	334	NA	80

Terminology: bbls = barrels, Dth = decatherms, LNG = liquified natural gas, LPG = liquified propane gas, Bcf = billion cubic feet, AAG = average annual growth.

Sources: Oregon DEQ for petroleum tank data. NW Natural 2014 Integrated Resource Plan for existing capacity and forecast at 1.9% AAG. BST, Portland Harbor Forecast (2012) for petroleum terminals at 1.0% AAG.

Impacts of draft code changes on the economy

Jobs and wages at Portland's fuel terminals

In 2014, the 11 existing fuel terminals in Portland shown in Figure 3 provided approximately 280 jobs at their sites and supported an estimated 720 total jobs in the metropolitan area. The annual payroll at those terminals was $23 million, which supported total personal income of about $92 million in the metropolitan area.

BPS calculated these supported employment and income estimates from the induced and indirect impacts from metropolitan area purchases by these firms and their employees. For example, the jobs of the Longshore Union workers who unload fuels from tankers at these fuel terminals are not counted as direct jobs at the terminal sites. The multipliers used for these calculations were estimated from the average employment and income effects of marine terminals in Portland (Martin Associates, 2012). The job and wage estimates were calculated from Quarterly Census of Employment and Wages (QCEW) data.

Portland's industrial area jobs also have an important urban equity role in that they consist primarily of middle-wage jobs that do not require 4-year college degrees, which the overall economy has been losing since 2000. In contrast, jobs in commercial districts are concentrated primarily in low- and high-wage quartiles (fourths) of overall city employment. Middle-wage job growth supports the "income self-sufficiency" objectives of the Portland Plan and 2035 Comprehensive Plan (Policy 6.28) to expand access to self-sufficient wage levels.

Long-term job growth to 2035 is estimated at 1.6% average annual growth in the warehousing, transportation and utilities sector in Portland's 2016 Economic Opportunities Analysis and Metro's 2014 Urban Growth Report. Applying this growth rate to Portland's existing fuel terminals, approximately 110 net new permanent jobs are expected between 2014 and 2035, which is the equivalent of about four new terminals at their current average size. The total metropolitan area job impact of this fuel terminal expansion would be approximately 290 new jobs by 2035. If fuel terminal job growth occurred at a slower 1.0% average annual rate, matching the forecast growth of liquid bulk cargo volumes in Portland Harbor, approximately 65 net new terminal jobs would be generated by 2035, supporting a total 170 new jobs in the metro area. Pembina's proposed propane terminal in 2014 was estimated to create 30 to 40 new permanent jobs and 600-800 temporary construction jobs.

The recommended code changes would allow for limited expansion at existing terminals and new fuel distribution facilities smaller than 2 million gallons to accommodate potential increases in regional demand and resulting job growth.

Tax revenues of new terminals

State and local revenues from income and property taxes vary widely by facility. For example, property taxes on the depreciated improvements value of existing fuel terminals are much lower than new construction. If fuel terminals added 110 net new direct jobs by 2035 and the resulting state and local tax revenues is typical of businesses and developed facilities in Portland's Working Harbor (Martin Associates, 2016), the estimated new state and local tax revenues in fiscal year 2035 (in 2015 dollars) would be $1.6 million. In contrast, the proposed $500 million Pembina project was estimated to generate approximately $12 million in annual property tax revenue, reflecting the increased improvements value and property taxes of new construction.

The recommended code changes would allow for code-limited expansion at existing terminals and new fuel distribution facilities smaller than 5 million gallons and resulting state and local tax revenue. However, prohibiting large scale new terminals such as Pembina could result in similar levels of foregone property taxes. Development of the limited land supply along Portland Harbor for new auto or grain terminals would also result in substantial local and state tax revenues, offsetting foregone taxes on new fossil fuel terminals.

Growth opportunities in fossil fuel distribution

The most recent cargo forecast for Portland Harbor in 2012 projected 1.0% AAG in liquid bulk tonnage to 2040 as a high scenario and 0.5% AAG as a low scenario (BST Associates, 2012). Based on this forecast, ECONorthwest (2012) estimated no additional land need for new liquid bulk terminals. Since 2012, several new fuel terminals have been proposed in the Pacific Northwest, as shown in Figure 2.

Updating the liquid bulk forecast at this point would be challenging for several reasons. Most of the recent fuel terminal proposals have since been abandoned or appear to be dormant. Policy and permitting uncertainty complicate the development feasibility of new terminals and transportation infrastructure. Crude oil prices have fallen sharply in 2015 and 2016, reducing the current market potential for major investments. Expanding global industrial product markets after the Great Recession slowed substantially in 2015. And energy distribution markets could change abruptly with continuing product innovations and location shifts in global production.

In the long term, Portland has competitive advantages for accommodating energy terminal development as a Pacific Rim gateway location to growing Asian markets, the Columbia River's low-gradient railroad access for heavy cargo through the Cascades, and Oregon's freight infrastructure hub. On the other hand, Portland's industrial land supply for continuing growth is limited, and expanding cargo markets for autos, grain and dry bulks are competing for current growth capacity.

Other economic impacts

Energy infrastructure and terminal investments appear to have low but potentially catastrophic risks of major accidents, as described below. Examples include seismic resilience of petroleum terminals in the event of a Cascadia Subduction Zone earthquake, oil train derailments, explosions at LNG (liquefied natural gas) and LPG (liquefied petroleum gas, such as propane) facilities, and others.

Clean Energy is a target industry in the City of Portland. An emerging cluster of Portland area business activity in solar and wind energy manufacturing, green building development, and other fields of sustainable urban innovation present long-term business growth opportunities. Substantial local investment in fossil fuel infrastructure and large new terminals could hinder local growth momentum in Clean Energy industries.

Climate change impacts of draft code changes

Climate impact of fossil fuels

Fossil fuels are major contributors to climate change and pollution, as described in Portland's 2015 Climate Action Plan. Greenhouse gas emissions from the burning of fossil fuels and land use changes, including deforestation, are primary causes of climate change. The Intergovernmental Panel on Climate Change's most recent report documents the overwhelming evidence that human activities have been

the major driver of recent warming of the Earth's surface, and that climate change and its consequences will continue into the future (IPCC, 2013).

The magnitude of future climate impacts depends largely on the trajectory of future global greenhouse gas emissions. Greenhouse gas emissions from human activities have continued to rise in recent decades, reaching the highest rates in human history between 2000 and 2010 (IPCC, 2014). About half of all carbon dioxide emissions, the most prevalent greenhouse gas, between 1750 and 2010 occurred in the last 40 years. The energy, industry and transportation sectors have dominated these emissions increases. On the current trajectory, global transportation emissions will double by 2050.

Transition to "renewable" and "clean" fuels

The U.S. Environmental Protection Agency (USEPA) implements the federal Renewable Fuel Standard (RFS) that requires transportation fuel sold in the U.S. to contain a minimum volume of renewable fuels. The RFS originated with the Energy Policy Act of 2005 and was expanded and extended by the Energy Independence and Security Act of 2007 (EISA). Similarly, the Oregon Department of Environmental Quality (ODEQ)implements the Oregon Clean Fuel Program. ODEQ describes "clean fuel" as a fuel with a lower carbon intensity than that of the fuel it replaces.

Examples of "clean fuels" in Oregon's program include most types of ethanol, biodiesel, natural gas, biogas, electricity, propane and hydrogen. The Oregon Clean Fuel Standard sets 2015 as a baseline that represents 10 percent ethanol blended with gasoline and 5 percent biodiesel blended with diesel. The rule also requires a 10 percent reduction in average carbon intensity from 2015 levels by 2025.

Terminal representatives and business stakeholders urged that recommended zoning code changes not create a disincentive or barrier to compliance with these federal and state rules, which may require additional tank capacity to implement. Environmental and public health organization representatives pointed out that City Resolution 37168 addresses fossil fuels generally, including lower-carbon fossil fuels like natural gas and propane. The recommended code changes would allow for limited expansion at existing terminals and are not expected to hinder compliance with the renewable and clean fuel standards, as described in Section 5.

Velocity of transition to non-fossil fuel energy

Portland's Climate Action Plan sets a goal for an 80% reduction in greenhouse gas emissions by 2050. Oregon's climate action goals similarly call for 75% reduction by 2050. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, they don't begin to approach the 80% reduction that the City is striving for or the State's 75% goal. ODEQ estimates that the greenhouse gas emissions reduction from switching from gasoline to compressed natural gas, for example, is 18%; for propane, it is 15%. The lower-carbon fossil fuels do have appeal as a bridge to widespread use of renewable energy, but investments in major infrastructure typically take decades to recoup, and the transition to renewables needs to go much faster than that to stabilize global emissions.

During recent hearings and analysis on Resolution 37168 and the Pembina terminal proposal, the question of whether to differentiate between fossil fuels with different carbon content was widely discussed. In the lead up to the resolution, an option was proposed that would oppose new coal and oil

infrastructure but allow for other fossil fuels that could show a likely net decrease in carbon emissions. City Council decided not to apply this option in the resolution.

Health, safety and environmental impacts of draft code changes

Seismic resilience and liquefaction soils

The 2035 Comprehensive Plan sets policy direction (4.75 and 4.76) to encourage disaster-resilient development and specifically to reduce natural hazard risks to critical energy and transportation infrastructure in Portland Harbor.

The 2016 Critical Energy Infrastructure Hub Study underway by the Portland Bureau of Emergency Management includes a literature review and modeled risks of structural damage to critical infrastructure from earthquakes, floods, landslides, volcanic activity, wildfire and other sources. Along with petroleum and natural gas infrastructure, the study is also assessing infrastructure risks to emergency services, transportation, electricity, potable water and waste water. The study area includes the Northwest and Linnton industrial areas. PBEM has identified significant seismic risks at the fuel terminals from a major Cascadia Subduction Zone earthquake because of their location in a filled riverfront plateau area with moderate- to high-susceptibility location for soil liquefaction.

As shown in Figure 7, the Oregon Department of Geology and Mineral Industries (DOGAMI) has mapped most of the riverfront plateau areas, which account for over 90 percent of Portland's industrial zoning, as having high susceptibility for soil liquefaction, along with areas along the Central City riverfront and much of the Brooklyn and Sellwood-Moreland neighborhoods. Most of the existing fuel terminals in the Willbridge area are mapped as having moderate susceptibility for soil liquefaction, and the others are mapped in the high susceptibility areas. The recommended code amendments will improve the seismic resilience of new bulk fossil fuel terminals by precluding their development in areas with high susceptibility to soil liquefaction.

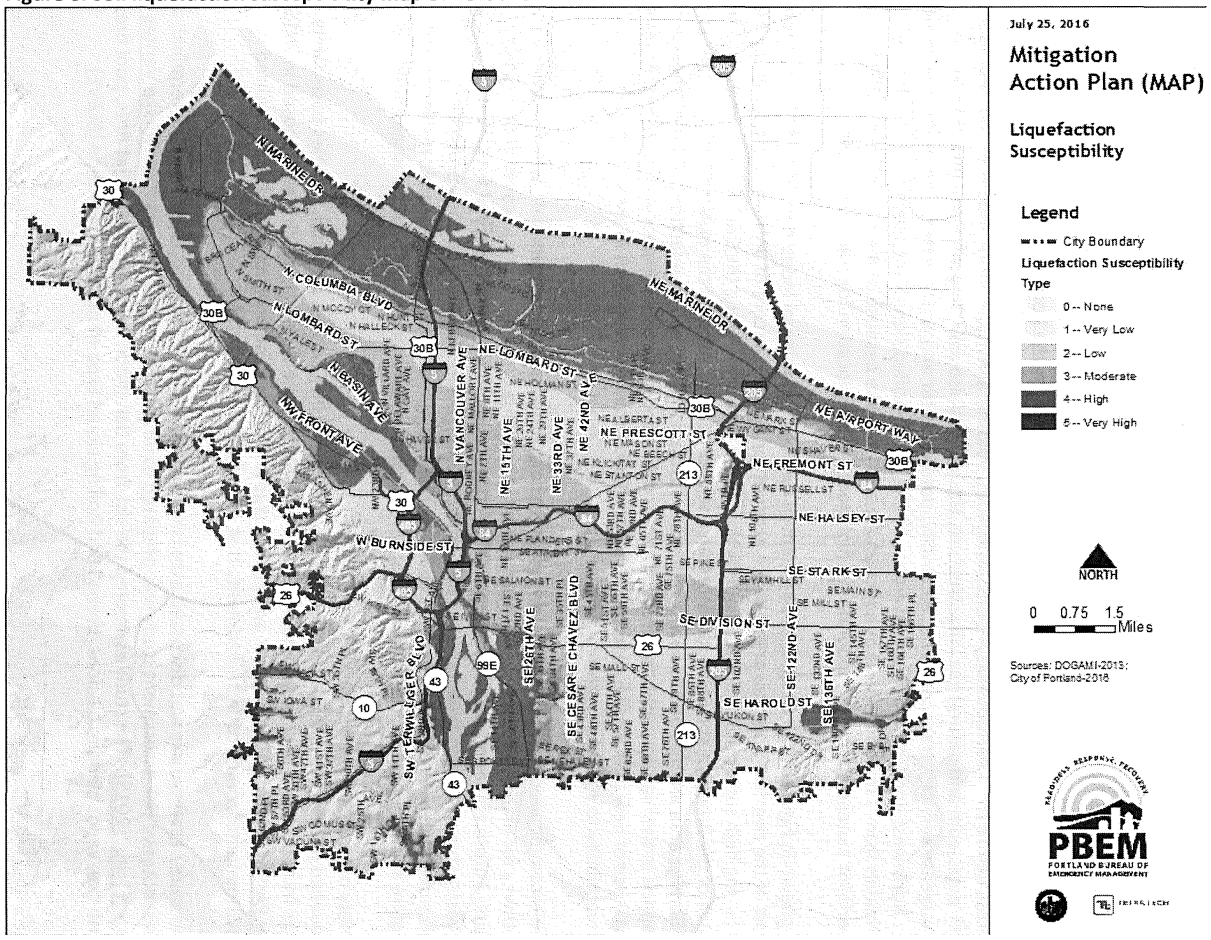
The recommended code changes allow for limited expansion at existing terminals, which provides a pathway for market-driven seismic improvements through a financial return to cover improvement costs. Future amendments to building and fire codes to improve seismic safety of fossil fuel infrastructure may also be adopted to implement Resolution 37168. A future code project is recommended in Section 7 to develop building code amendments to improve seismic resilience and require seismic upgrades comparable to proposed requirements on unreinforced masonry buildings.

Safety of liquefied gas terminals

Liquefied natural gas (LNG) and liquefied petroleum gas (LPG), such as propane, facilities pose safety risks from potential explosions and fire. The Pembina propane terminal, which was proposed in 2015 at the Port of Portland Terminal 6, is an apt case study. The Pembina terminal would have required environmental zoning code amendments that did not move forward.

The issue of safety risks was discussed extensively during review of the proposed Pembina terminal, and a quantitative risk assessment study was prepared to inform that review process (Det Norske Veritas (U.S.A.), Inc., 2015). The study estimated the risk from flammable releases, such as jet fires, pool fire, flash fire, vapor cloud explosions, fireball and Boiling Liquid Expanding Vapor Explosion (BLEVE).

Figure 8. Soil liquefaction susceptibility map of Portland



The risk was presented as individual risk in the form of location-specific risk contours extending outward from the proposed facilities, and as societal risk in the form of potential loss of life and cumulative frequency of various accidents. The highest offsite risk level was found to be 1 fatality in 1,000 years in areas directly north and south of facility. The nearest residential zones are located beyond the risk level contour of 1 fatality in 100 million years. The cumulative societal risk was estimated at 1 statistical fatality every 38 years. The study also included various facility design and siting recommendations to mitigate identified risks.

Another risk assessment (Northwest Citizen Science Initiative, 2015) on the Pembina project was presented by environmental groups and neighbors including the Hayden Island Neighborhood Association. The analysis identifies additional sources of risk from BLEVE cascades, terrorist events and magnitude 9 earthquakes. The authors recommend not locating a propane terminal within 10 miles of the Portland/Vancouver urban area.

Public safety risks from a new LNG or LPG facility are estimated to be very low relative to other urban hazards, although possible impacts could be catastrophic. The recommended code amendments are expected to reduce public safety risks by prohibiting development of large new LNG or LPG facilities exceeding 2 million gallons of storage capacity.

Oil train accidents

On June 3, 2016 an oil train traveling through the Columbia River Gorge partially derailed in Mosier en route to Tacoma. The 16-car derailment resulted in a 1,000-barrel spill and fires that lasted nearly a day. Small amounts of oil reportedly reached the river, and nearby drinking water and wastewater facilities in Mosier were affected.

An Associated Press analysis of accident records found that 26 oil-train derailments or fires have occurred nationally in the last decade. The national geography of increasing oil extraction in the inland Great Plains states and refineries concentrated on the coasts is contributing to this trend. Risk of how often such derailments are likely to occur in the Columbia Gorge is disputed, with one estimate as high as one every 30 months.

Preliminary reporting on the cause of the Mosier derailment pointed to failed bolts in the track that are difficult to detect. Union Pacific reported that improvements are underway to replace bolts on 530 miles of curved track nationwide. Railroad safety is regulated at the federal level and monitored by the Federal Railroad Administration. A recent Government Accounting Office report has identified challenges and delays in implementing some federal rail safety regulations.

The recommended code amendments could incrementally reduce rail accident risks by restricting development and expansion of fossil fuel terminals in Portland as a West Coast rail hub location. However, restricting the location of new petroleum terminals in the city of Portland is not expected to substantially affect the volume of petroleum cargo transported by rail to Puget Sound refineries.

The Portland/Vancouver area is a rail hub location, where West Coast rail lines running north-south intersect the low gradient east-west rail corridor along both sides of the Columbia River. Roughly half of the east-west rail cargo destined for the Seattle-Tacoma area, in addition to Oregon-bound rail cargo, moves through the Portland metropolitan area. Derailment risk within Portland is reduced by the numerous siding destinations and congestion of the "Portland Triangle" area where UP and BNSF lines

come together. However, derailment risks to natural resources, especially along rivers, and to rural communities appear to be significant.

5. Code concepts and analysis

This section of the report describes the recommended zoning change concepts by topic area, including the related policy directions, implementation issues, and rationale for the recommended zoning changes.

1. **Types of distribution and storage facilities to be regulated**

Policy direction:

- City Council Resolution 37168 (adopted November 2015) calls for opposing expansion of infrastructure for transportation and storage of fossil fuels, subject to various exceptions, including safety improvements, service to end users, and infrastructure that accelerates transition to non-fossil fuel energy.
- 2035 Comprehensive Plan Policy 6.48 Fossil Fuel Infrastructure (adopted June 2016, not effective until 2018) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Preliminary code concepts:

- Limit development of new Bulk Fossil Fuel Terminals as a regulated land use.
- Bulk Fossil Fuel Terminals are engaged in freight movement or wholesaling of fossil fuels at facilities that are characterized by having (1) marine, pipeline or railroad transport access and (2) either transloading facilities for transferring a shipment between transport modes (such as from rail to ship) or bulk storage facilities exceeding 2 million gallons of fossil fuels. Examples include petroleum terminals, liquid natural gas terminals, and coal terminals. Functionally, these terminals are typically regional gateway facilities, where fossil fuels enter and exit the region, but the use classification is intended to be clearly identifiable and not rely on a definition of region.
- Exceptions that are not Bulk Fossil Fuel Terminals:
    - Retail sales of fossil fuels, such as gasoline or propane filling stations;
    - Distributors, wholesalers, and industrial service uses that receive and deliver fossil fuels exclusively by truck;
    - End-user facilities that store fossil fuels for primary use at or near the site, such as manufacturing, agriculture, and airports;
    - Uses that recover or reprocess used petroleum products;
    - Waste-related uses that transfer or store solid or liquid wastes, such as landfills.

Implementation issues:

- Definition of region – Portland is a regional distribution hub for energy and other products, and this zoning change is not intended to restrict energy access to the growing region. However, the regional market area of Bulk Fossil Fuel Terminals varies by product and is difficult to define. Portland's 10 petroleum terminals generally serve Oregon and Southern Washington. This market area substantially exceeds the Portland metropolitan area, which is often colloquially referred to as the region. Some terminal representatives pointed out that the federal

government's 5-state West Coast PADD 5 region is generally their regional market area. Bureau of Development Services (BDS) staff commented that zoning does not regulate the target market (destination) of wholesale products, and the zoning code does not define region. Business organization representatives commented that the energy markets and related market areas are likely to change over time. Therefore, the recommended land use incorporates the concept of a regional market into the size limits, and a zoning definition of region is not recommended here.

- Storage capacity size threshold - The Bulk Fossil Fuel Terminal use category is intended to apply to regional gateway facilities where fossil fuels are brought into the region. The 2-million-gallon capacity threshold is small compared to the existing petroleum terminals, which range from 11.6 million to 67 million gallons, with most facilities having more than 25 million gallons of storage capacity. In response to testimony, the PSC reduced the terminal size threshold from 5 million to 2 million gallons of storage, in order to include facilities that are large enough to unload unit trains. This change would apply to both new and existing terminal and would extend the terminal restrictions beyond the 11 largest fuel terminals in Willbridge and Linnton areas of NW Portland to also include smaller existing fuel distributors. Staff identified 24 additional petroleum, pipeline, and gaseous fuel distributors that may be affected.

- Site aggregation – A potential loophole to the terminal size threshold was identified in PSC testimony through site aggregation of smaller facilities. The reference to partnerships and corporations in the existing definition of "ownership" is an inclusive term, which includes subsidiaries of a larger corporation and would prevent a larger parent corporation from using different subsidiaries on contiguous lots. To further prevent potential circumvention of the terminal size threshold through site aggregation, the PSC recommended adding criteria in the use description to identify aggregated sites that each have storage smaller than 2 million gallons but effectively function as a larger terminal.

- End users – Resolution 37168 lists a specific exception to not restrict service directly to end users. At a small scale, services to end users include retail gasoline filling stations, natural gas access lines in street right-of-way to residential and business customers, and heating oil tanks at home sites. Larger scale end users with fossil fuel storage and access infrastructure also include manufacturers, jet fuel facilities at the PDX Airport, vessel fuel facilities on Portland Harbor, and others where fossil fuels are used as an input. Again, the limits on new facilities are sized to apply only to larger distribution facilities.

- Inclusion of regulated utilities - NW Natural, the natural gas utility that serves western Oregon and parts of southwest Washington, has recommended that its facilities should not be subject to new zoning restrictions because its distribution facilities provide service to end users, which are exempted in Resolution 37168. NW Natural's service to end users in Oregon is regulated by the Oregon Public Utility Commission. The company periodically prepares an Integrated Resources Plan (IRP) to document its forecast for natural gas use by its customers. The IRP also details how NW Natural proposes to meet changes in natural gas demand and is statutorily obligated to do so in ways that result in the "least cost" to customers, while managing risk and complying with all applicable environmental and workplace regulations. The PUC conducts a public review

process of the IRP and ultimately either "acknowledges" the IRP or identifies shortcomings the company must address in a revised IRP. The PSC considered and did not act on NW Natural's request to exempt regulated utilities. One commissioner expressed concern that a regulated utility could potentially sell fossil fuel from local storage facilities to customers who are not regional end users.

- Interpretation of use category – Terminal and business representatives commented that ambiguity in the use description could result in conflicting expectations, pressured interpretations, appeals, and inconsistent code implementation. While underlying policy accommodates regional access and exceptions that may be difficult to clearly define, the land use designation is recommended to be defined by clear and objective size thresholds and marine/railroad/pipeline access.

2. **Definition of fossil fuels**

Policy direction: City Council Resolution 37168 applies to fossil fuel infrastructure and storage generally, and does not distinguish among types or carbon intensity of fossil fuels.

Preliminary code concept:

- Definition of fossil fuels: petroleum products (such as crude oil and gasoline), coal, and gaseous fuels (such as natural gas and propane) that are made from decayed plants and animals that lived millions of years ago and are used primarily as a source of energy.
- Exclusion of non-fuel products – Petrochemicals that are used primarily for non-fuel products are excluded, such as plastics, lubricants, fertilizer, roofing and paints.
- Methanol is included as a fossil fuel. Development of methanol storage and transportation facilities would be prohibited similarly to LNG and LPG terminals.
- Denatured ethanol and similar fuel additives and biodiesel/renewable diesel with less than 5% fossil fuel content are not fossil fuels.
- Biogas from wastewater treatment plants, anaerobic digesters, landfills and other sources is not a fossil fuel.

Implementation issues:

- Definition of fossil fuels – Definitions of fossil fuels vary by source. Here are some examples.
  - Oregon Department of Environmental Quality (ODEQ) – Fossil fuels: fuels such as oil, natural gas, and coal that are made from decayed plants and animals that lived millions of years ago. These fuels are made of hydrogen and carbon (hydrocarbons).
  - U.S. Environmental Protection Agency (USEPA), 40 C.F.R. § 60.41 - Fossil fuel means natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such materials for the purpose of creating useful heat.
  - Oregon Department of Energy Administrative Rule, OAR 345-001-0010 - "Fossil fuel" means natural gas, petroleum, coal and any form of solid, liquid or gaseous fuel derived from such materials that serves as useful energy.

- Renewable and clean fuel standards – As described in Section 4, USEPA implements the federal Renewable Fuel Standard (RFS) that requires transportation fuel sold in the U.S. to contain a

minimum volume of renewable fuels. Similarly, ODEQ implements the Oregon Clean Fuel Program. ODEQ identifies examples of "clean fuels" in Oregon as most types of ethanol, biodiesel, natural gas, biogas, electricity, propane and hydrogen. Terminal representatives and business stakeholders urged that recommended zoning code changes not create a disincentive or barrier to compliance with these federal and state rules, which may require additional tank capacity to implement. Environmental and public health organization representatives pointed out that City Resolution 37168 addresses fossil fuels generally, including clean fuels. The recommended allowance for code-limited expansion of existing terminals will allow enough supply to comply with the renewable and clean fuel standards.

- *Methanol – Large methanol plants have recently been proposed in Tacoma, Kalama, and St. Helens. Methanol plants tend to have structural similarities to LNG and LPG terminals, including large-scale and gas pipeline access, and they can have similar safety and climate impacts. Stakeholder focus groups were asked whether any* special inclusions, such as methanol, should be considered. Most people commenting noted that methanol is primarily used in the production of plastics and other non-fuel uses. Views differed among environmental organizations commenting. Some noted that excluding it undermines the policy. The recommended code limits development of large methanol plants similarly to LNG or LPG terminals.

- *Denatured ethanol* – A terminal operator pointed out that "pure" ethanol made from corn or other non-fossil source is required by the Alcohol and Tobacco Tax and Trade Bureau to be denatured in order to be transported to the site. Denatured ethanol typically contains up to 5% methanol, so that it is toxic and undrinkable. Storage of denatured ethanol is recommended to be exempted. In other words, denatured ethanol tanks would not be counted as part of the maximum storage capacity of fossil fuel terminals.

- Biogas products from landfills – Bureau of Environmental Services (BES) staff commented that biogas from landfills and other sources are not fossil fuels and should not be restricted by the recommended zoning changes. The recommended description of fossil fuel terminals specifically excludes waste-related uses, such as landfills, which are regulated as a separate land use in the zoning code. Also, the recommended definition of fossil fuels, described as being made from decayed plants and animals that lived millions of years ago, would not include biogas from a landfill.

3. **Prohibition of new bulk fossil fuel terminals**

   Policy direction:
   - City Council Resolution 37168 (adopted November 2015) calls for opposing expansion of infrastructure for transportation and storage of fossil fuels, subject to various exceptions, including safety improvements, service to end users, and infrastructure that accelerates transition to non-fossil fuel energy.

- 2035 Comprehensive Plan Policy 6.48 Fossil Fuel Infrastructure (adopted June 2016, not effective until 2018) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Preliminary code concept:

- Prohibit new Bulk Fossil Fuel Terminals in all base zones.

Implementation issues:

- Policy implementation – City Resolution 37168 reflected a major change in policy direction on fossil fuel distribution and storage facilities. Prohibition of new Bulk Fossil Fuel Terminals is recommended as an unambiguous, assertive approach to implement this policy change, responding to increasingly evident safety risks of fossil fuel infrastructure, aggressive climate change goals, and changing energy markets in the Pacific Northwest.

- Community expectations – About 600 people sent email testimony in response to the Proposed Draft asking for a "full ban" on new and expanded fossil fuel terminals. Climate resilience advocates are widely represented in the Portland community and the Pacific Northwest. Public involvement in Resolution 37168 and this project reveal broad community expectations for a bold approach to restrict fossil fuel distribution facilities in Portland.

- Providing regional market access to fuels – Analysis to date is limited on the potential impacts of the prohibition on constraining regional fuel supply. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts, or may plateau and decline with implementation of climate resilience goals and strategies. The fossil fuels consumed in Oregon are generally not extracted or refined in the state. As a result, fossil fuel terminals provide multimodal transportation efficiency and price advantages for distributing fuels to the growing population of the regional market area.

- Option to set size limits on new fossil fuel terminals – The Discussion Draft proposed storage capacity size standards to limit new fossil fuel terminal development. Figure 7 in Section 4 indicates a wide margin between the size of recently proposed crude oil, coal and LNG terminals in the Pacific Northwest and the scale of expected growth by existing Portland fuel terminals that serve the regional market area. Recommended terminal size limitations within that margin would allow for expansion at existing terminals and moderately sized new terminal development to meet potential market area consumption needs. Instead, BPS's Proposed Draft and the PSC's Recommended Draft code changes would prohibit new Bulk Fossil Fuel Terminals, a more restrictive approach to more assertively implement the new policy directions and respond to extensive community comments on the recommended code changes. As recommended, existing terminals can expand storage facilities up to 10 percent through seismic upgrades that replace existing tanks, providing the opportunity to meet modest growth in potential market area consumption needs.

- Balanced, integrated policy approach – The recommended restrictions on fossil fuel distribution facilities entail tradeoffs among public goals for environmental protection, public health and safety, meeting energy needs, and economic prosperity, as described in Section 4. The Comprehensive Plan calls for a balanced, integrated approach in land use regulations to meet these public objectives, as described in Section 2. The recommended code changes provide for significant environmental and safety benefits in restricting development and expansion of fossil fuel terminals and provide for limited expansion of fossil fuel terminals to adequately meet regional energy needs and integrate economic prosperity and equity considerations.

4. "Limited use" classification of existing facilities

Policy direction:

- City Council Resolution 37168 includes various exemptions to not restrict safety or efficiency improvements, service to end users, emergency backup capacity, infrastructure for recovery or re-processing of used petroleum products, or infrastructure that will accelerate the transition to non-fossil fuel energy sources.
- 2035 Comprehensive Plan Policy 6.48 Fossil Fuel Infrastructure (adopted June 2016, not effective until 2018) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.
- 2035 Comprehensive Plan Policies 4.75 and 4.76 call for encouraging disaster-resilient development and reducing natural hazard risks to critical energy and transportation infrastructure in Portland Harbor.

Preliminary code concept:

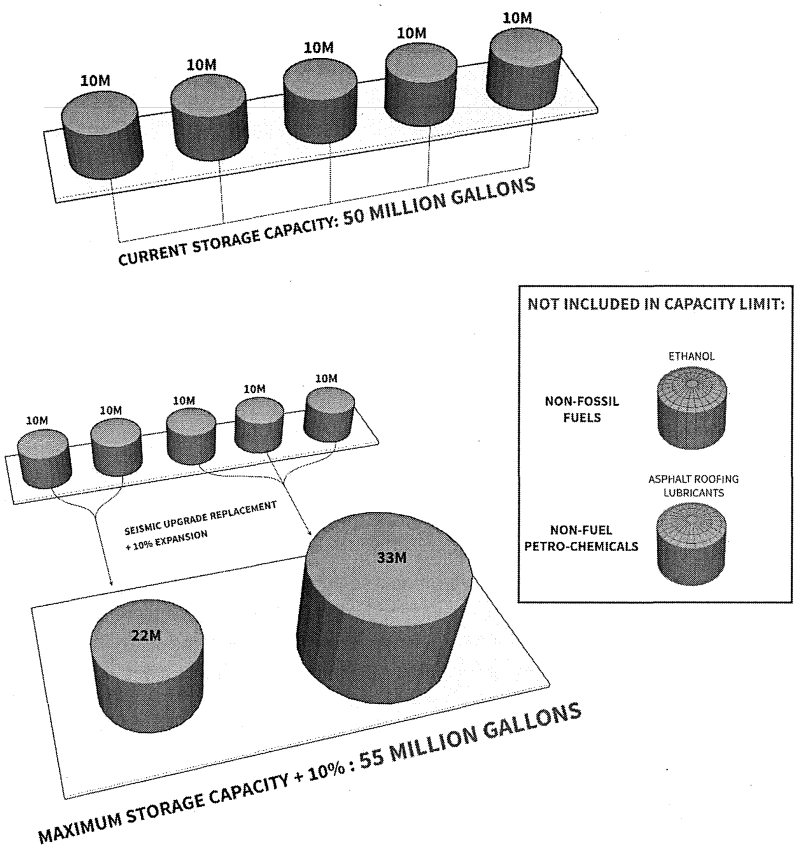
- Classify existing Bulk Fossil Fuel Terminals in industrial and general employment zones as "limited uses" that can continue to operate. Expansion of fossil fuel storage at these existing terminals would be limited to improvements that (a) include "seismic upgrades" which replace existing tanks, (b) add no more than 10 percent of the capacity of replaced tanks, and (c) result in no more than 10 percent cumulative expansion of the total terminal capacity on the effective date of these code changes. See Figure 9 below.

Implementation issues:

- Flexibility for limited expansion – As recommended, expansion of fossil fuel storage at existing terminals would be limited to "seismic upgrades" that replace existing tanks and would not exceed the current terminal capacity by more than 10 percent. Given these limitations, the draft code changes may be more restrictive than the exceptions in the resolution that call for not restricting improvements at existing fuel terminals that improve safety, provide wholesale fuel supply to local or regional end users, add backup capacity, or add tanks for clean/renewable fuels would require approval through a nonconforming situation review.

- Option to restrict expansion at existing terminals as a legal, non-conforming use – In the Proposed Draft, Bulk Fossil Fuel Terminals were classified as a prohibited use, under which existing terminals would become legal, non-conforming uses. The Proposed Draft assumed some opportunity to approve expansion of existing terminal storage capacity that would allow the existing terminals to add new fuel additive tanks to meet clean and renewable fuel standards, seismic upgrades of existing tanks, and emergency backup capacity, consistent with

Figure 9. Recommended calculation of storage expansion limitations



Resolution 37168. However, comments from BDS clarified that such expansion would be difficult to approve through a non-conforming situation review. BDS recommends considering an alternative approach to set limitations on expansion. In response, BPS and the PSC recommended classifying Bulk Fossil Fuel Terminals as a limited use with clear and objective standards that limit expansion of existing terminals.

- Option to restrict expansion at existing terminals as a conditional use – A large number of comments support stronger restrictions on expansions at existing terminals through adding binding limits as well as criteria for safety and climate impacts. BDS staff have commented that they do not have staff expertise to implement discretionary land use review criteria addressing greenhouse gas emissions or safety impacts of hazardous material storage and transportation. If new conditional use criteria are added to limit or require no net increase of greenhouse gas emissions or safety impacts of hazardous material storage and transportation facilities, applicants would be required to hire specialized consultants to show compliance of the

particular criterion, which would affect the complexity, predictability, and cost of land use reviews in new ways. This change would be inconsistent with 2035 Comprehensive Plan Policy 6.16 Regulatory Climate, which calls for improving development review processes and regulations to encourage predictability and support local and equitable employment growth and encourage business retention. Given the level of community scrutiny about fossil fuel terminal expansion, this discretionary public review process could add significantly to the cost and uncertainty of investments at fossil fuel terminals.

- Option to not restrict expansion at existing terminals - The Discussion Draft recommended code concepts (storage capacity size standards to limits new fossil fuel terminal development) that would not restrict development on existing terminals. This option was intended to be consistent with the exceptions in the resolution (as described in the previous point) and to accommodate potential growth in regional fuel demand. Instead, the Proposed Draft code changes would apply a legal, non-conforming use status on existing Bulk Fossil Fuel Terminals, a more restrictive approach to more assertively implement the new policy directions and respond to extensive community comments on the recommended code changes.

- Divergent stakeholder views – Extensive comments on the Proposed Draft and Discussion Draft recommended tight limits on expansion of existing fuel terminals. In contrast, stakeholder focus group participants generally urged that existing fuel terminals should not be changed to a non-conforming use for reasons ranging from providing a critical product to not discouraging desired seismic and safety improvements on existing facilities. Stakeholder group comments from environmental and public health organizations generally supported restricting expansion of existing terminals, while some participants cautioned about political and legal tradeoffs of making the existing fuel terminals nonconforming.

6. Zoning code changes

This section of the report specifies the draft code language, along with code commentary pages that clarify expected implementation. The section is formatted to facilitate readability, showing recommended code changes on the right-hand pages and related code commentary on the facing left-hand pages.

Commentary

Table 100-1 Open Space Zone Primary Uses

The amendments to this table reflect changes to prohibit new Bulk Fossil Fuel Terminals in all base zones.

Table 100-1 Open Space Zone Primary Uses	
Use Categories	**OS Zone**
Residential Categories	
Household Living	N
Group Living	N
Commercial Categories	
Retail Sales And Service	CU [1]
Office	N
Quick Vehicle Servicing	N
Vehicle Repair	N
Commercial Parking	N
Self-Service Storage	N
Commercial Outdoor Recreation	CU
Major Event Entertainment	N
Industrial Categories	
Manufacturing And Production	CU [6]
Warehouse And Freight Movement	N
Wholesale Sales	N
Industrial Service	N
Bulk Fossil Fuel Terminal	N
Railroad Yards	N
Waste-Related	N
Institutional Categories	
Basic Utilities	L/CU [5]
Community Service	CU [4]
Parks And Open Areas	L/CU [2]
Schools	CU
Colleges	N
Medical Centers	N
Religious Institutions	N
Daycare	CU
Other Categories	
Agriculture	L[7]
Aviation And Surface Passenger Terminals	N
Detention Facilities	N
Mining	CU
Radio Frequency Transmission Facilities	L/CU [3]
Rail Lines And Utility Corridors	CU

Y = Yes, Allowed L = Allowed, But Special Limitations CU = Conditional Use Review Required
N = No, Prohibited

Commentary

Table 110-1 Single-Dwelling Zone Primary Uses

The amendments to this table reflect changes to prohibit new Bulk Fossil Fuel Terminals in all base zones.

Table 110-1
Single-Dwelling Zone Primary Uses

Use Categories	RF	R20	R10	R7	R5	R2.5
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	CU	CU	CU	CU	CU	CU
Commercial Categories						
Retail Sales And Service	N	N	N	N	N	N
Office	N	N	N	N	N	N
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	N	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	N
Industrial Categories						
Manufacturing And Production	CU [6]	N	N	N	N	N
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	N
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]
Community Service	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]
Parks And Open Areas	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]
Schools	CU	CU	CU	CU	CU	CU
Colleges	CU	CU	CU	CU	CU	CU
Medical Centers	CU	CU	CU	CU	CU	CU
Religious Institutions	CU	CU	CU	CU	CU	CU
Daycare	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]
Other Categories						
Agriculture	L [7]	L [7]	L/CU [8]	L/CU [8]	L [9]	L [9]
Aviation And Surface Passenger Terminals	CU	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	CU	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]
Railroad Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Commentary

Table 120-1 Multi-Dwelling Zone Primary Uses

The amendments to this table reflect changes to prohibit new Bulk Fossil Fuel Terminals in all base zones.

Table 120-1
Multi-Dwelling Zone Primary Uses

Use Categories	R3	R2	R1	RH	RX	IR
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	Y [1]
Commercial Categories						
Retail Sales And Service	N	N	N	CU[2]	L/CU [3]	L/CU [10]
Office	N	N	N	CU[2]	L/CU [3]	L/CU [10]
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	CU [4]	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	CU
Industrial Categories						
Manufacturing And Production	N	N	N	N	N	CU
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	CU
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [13]	L/CU [13]	L/CU [13]	L/CU [13]	L/CU [13]	L/CU [13]
Community Service	CU [6]	CU [6]	CU [6]	L/CU [6]	L/CU [5, 6]	CU [6]
Parks And Open Areas	L/CU [7]	L/CU [7]	L/CU [7]	Y	Y	Y
Schools	CU	CU	CU	CU	L/CU [5]	L/CU [11]
Colleges	CU	CU	CU	CU	CU	L/CU [11]
Medical Centers	CU	CU	CU	CU	CU	L/CU [11]
Religious Institutions	CU	CU	CU	CU	CU	CU
Daycare	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	Y	L/CU [12]
Other Categories						
Agriculture	L [14]	L [14]	L [14]	L [14]	L [14]	L [14]
Aviation And Surface Passenger Terminals	N	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]
Rail Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Commentary

Table 130-1 Commercial Zone Primary Uses

The amendments to this table reflect changes to prohibit new Bulk Fossil Fuel Terminals in all base zones.

Table 130-1 Commercial Zone Primary Uses								
Use Categories	**CN1**	**CN2**	**CO1**	**CO2**	**CM**	**CS**	**CG**	**CX**
Residential Categories								
Household Living	Y	Y	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]
Commercial Categories								
Retail Sales And Service	L [2]	Y	N	L [3]	L [4]	Y	Y	Y
Office	L [2]	Y	Y	Y	L [4]	Y	Y	Y
Quick Vehicle Servicing	N	L [12]	N	N	N	N	Y	L [12]
Vehicle Repair	N	N	N	N	N	Y	Y	L [5]
Commercial Parking	N	N	N	N	N	Y	CU [11]	CU [11]
Self-Service Storage	N	N	N	N	N	N	L [6]	L [6]
Commercial Outdoor Recreation	N	N	N	N	Y	Y	Y	Y
Major Event Entertainment	N	N	N	N	N	CU	CU	Y
Industrial Categories								
Manufacturing And Production	L/CU [2]	L/CU [2]	N	N	L/CU [4, 5]	L/CU [5]	L/CU [5,7]	L/CU [5]
Warehouse And Freight Movement	N	N	N	N	N	N	CU [5,7]	N
Wholesale Sales	N	N	N	N	L [4, 5]	L [5]	L [5,7]	L [5]
Industrial Service	N	N	N	N	N	CU [5]	CU [5,7]	CU [5]
Bulk Fossil Fuel Terminal	N	N	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N	N	N
Institutional Categories								
Basic Utilities	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]
Community Service	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]
Parks And Open Areas	Y	Y	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	Y	Y	Y	Y	Y
Colleges	Y	Y	Y	Y	Y	Y	Y	Y
Medical Centers	Y	Y	Y	Y	Y	Y	Y	Y
Religious Institutions	Y	Y	Y	Y	Y	Y	Y	Y
Daycare	Y	Y	Y	Y	Y	Y	Y	Y

Commentary

Other Categories								
Agriculture	L [13]	L [13]	L [13]	L [13]	L [13]	L/CU [14]	L/CU [14]	L/CU [14]
Aviation And Surface Passenger Terminals	N	N	N	N	N	N	CU	CU
Detention Facilities	N	N	N	N	N	N	CU	CU
Mining	N	N	N	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]
Rail Lines And Utility Corridors	CU	CU	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Commentary

33.140.050 Neighborhood Contact

As an alternative to a land use review, a public notice and meeting requirement applies to development of fuel storage structure, such as a new tank, at a Bulk Fossil Fuel Terminal, similar to the requirement for multi-dwelling residential development. This notice and meeting would create public awareness about the project and serve to discuss a proposal in an informal basis.

33.140 Employment and Industrial Zones

140

Sections:

General
- 33.140.010 General Purpose of the Zones
- 33.140.020 List of the Employment and Industrial Zones
- 33.140.030 Characteristics of the Zones
- 33.140.040 Other Zoning Regulations

Use Regulations
- 33.140.100 Primary Uses
- 33.140.110 Accessory Uses
- 33.140.130 Nuisance-Related Impacts
- 33.140.140 On-Site Waste Disposal
- 33.140.150 Neighborhood Contact

Site Development Standards
- 33.140.200 Lot Size
- 33.140.205 Floor Area Ratio
- 33.140.210 Height
- 33.140.215 Setbacks
- 33.140.220 Building Coverage
- 33.140.225 Landscaped Areas
- 33.140.227 Trees
- 33.140.230 Ground Floor Windows in the EX Zones
- 33.140.235 Screening
- 33.140.240 Pedestrian Standards
- 33.140.242 Transit Street Main Entrance
- 33.140.245 Exterior Display, Storage, and Work Activities
- 33.140.250 Trucks and Equipment
- 33.140.255 Drive-Through Facilities
- 33.140.265 Residential Development
- 33.140.270 Detached Accessory Structures
- 33.140.275 Fences
- 33.140.280 Demolitions
- 33.140.290 Nonconforming Development
- 33.140.295 Parking and Loading
- 33.140.300 Signs
- 33.140.310 Superblock Requirements
- 33.140.315 Recycling Areas

Commentary

33.140.050 Neighborhood Contact

A. **Purpose.** Neighborhood contact is required when a new storage structure for any type of fuel will be built on a Bulk Fossil Fuel Terminal because of the impacts that fuel projects can have on the surrounding community. The neighborhood contact requirement provides an opportunity for community input on the design of the project by providing a setting for the applicant and neighborhood residents to discuss a proposal in an informal manner. Sharing information and concerns early offers the opportunity to identify ways to improve a proposal and to resolve conflicts.

B. **Neighborhood contact requirement.** Proposals meeting the following conditions are subject to the neighborhood contact requirement as specified in Section 33.700.025, Neighborhood Contact. All of the steps in 33.700.025 must be completed before a building permit is requested.

1. The proposed development has not been subject to a land use review; and

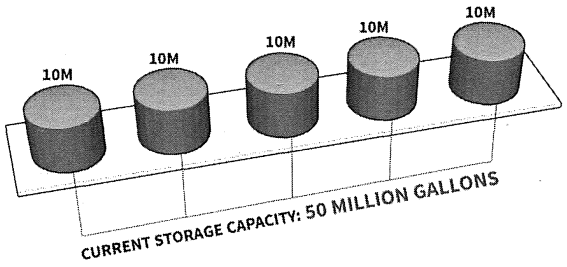
2. The proposed development includes at least one new structure for the storage of any type of fuel.

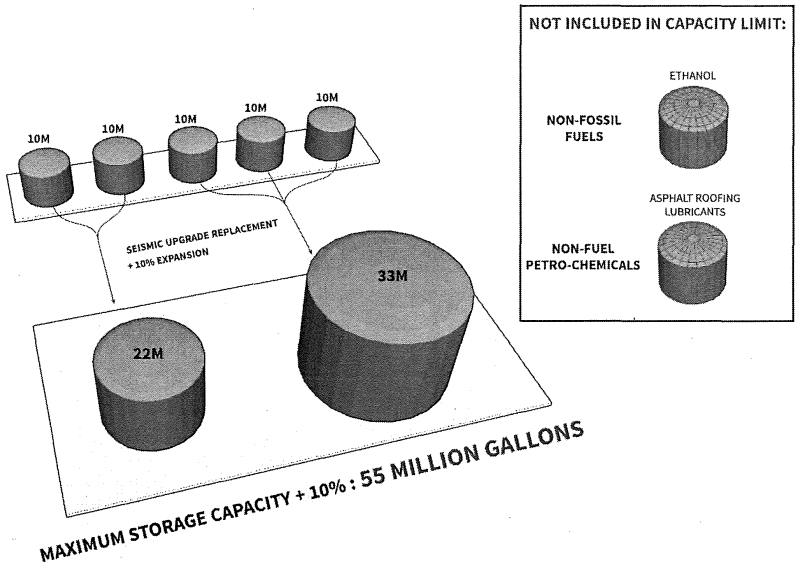
Commentary

33.140.100 Primary Uses

The amendments to this section reflect changes to prohibit new Bulk Fossil Fuel Terminals in all base zones and reclassify existing terminals in industrial and general employment zones as limited uses. Regulation of Bulk Fossil Fuel Terminals implements policy direction in City of Portland Resolution 37168 (adopted November 2015) and 2035 Comprehensive Plan Policy 6.48 (adopted June 2016, expected to take effect in 2018), both of which address fossil fuel distribution and storage facilities.

The limited use designation would accommodate seismic upgrades of existing tanks and would allow for limited expansion consistent with Resolution 37168. Expansion of "fossil fuel" storage at these existing terminals would be limited to improvements that (a) include "seismic upgrades" which replace existing tanks, (b) add no more than 10 percent of the capacity of replaced tanks, and (c) result in no more than 10 percent cumulative expansion of the total terminal capacity on the effective date of these code changes. See the graphics below on calculation of storage expansion limitations.





33.140.100 Primary Uses

A. No change

B. Limited uses. Uses allowed that are subject to limitations are listed in Table 140-1 with an "L". These uses are allowed if they comply with the limitations listed below and the development standards and other regulations of this Title. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters. The paragraphs listed below contain the limitations and correspond with the footnote numbers from Table 140-1.

1. – 16. No change

17. Bulk Fossil Fuel Terminals. This regulation applies to all parts of Table 140-1 that have a [17].

a. Existing Bulk Fossil Fuel Terminals. The following use limitations apply to existing Bulk Fossil Fuel Terminals:

(1) Bulk Fossil Fuel Terminals that existed on [insert effective date] are allowed, but the total amount of fossil fuel that can be stored on the site is limited to the fossil fuel storage capacity that existed on [insert effective date] plus 10 percent. Total fossil fuel storage capacity on the site in excess of the capacity that existed on [insert effective date] plus 10 percent is prohibited; and

(2) New fossil fuel storage structures are prohibited unless a new fossil fuel storage structure is replacing an existing fossil fuel storage structure that does not meet current building code standards for seismic safety, and in that case, the capacity of the new fossil fuel storage structure is prohibited from being greater than the storage capacity of the existing structure that is being replaced plus 10 percent.

b. New Bulk Fossil Fuel Terminals are prohibited.

Commentary

Table 140-1 Employment and Industrial Zone Primary Uses
The amendments to this section reflect changes to prohibit new Bulk Fossil Fuel Terminals in all base zones and reclassify existing terminals in industrial and general employment zones as limited uses.

Table 140-1 Employment and Industrial Zone Primary Uses						
Use Categories	**EG1**	**EG2**	**EX**	**IG1**	**IG2**	**IH**
Residential Categories						
Household Living	CU	CU	Y	CU [1]	CU [1]	CU [1]
Group Living	CU	CU	L/CU [2]	N	N	N
Commercial Categories						
Retail Sales And Service	L/CU [3]	L/CU [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Office	L [3]	L [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Quick Vehicle Servicing	Y	Y	N	Y	Y	Y
Vehicle Repair	Y	Y	Y	Y	Y	Y
Commercial Parking	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]
Self-Service Storage	Y	Y	L [7]	Y	Y	Y
Commercial Outdoor Recreation	Y	Y	Y	CU	CU	CU
Major Event Entertainment	CU	CU	CU	CU	CU	CU
Industrial Categories						
Manufacturing And Production	Y	Y	Y	Y	Y	Y
Warehouse And Freight Movement	Y	Y	Y	Y	Y	Y
Wholesale Sales	Y	Y	Y	Y	Y	Y
Industrial Service	Y	Y	Y	Y	Y	Y
Bulk Fossil Fuel Terminal	L [17]	L [17]	N	L [17]	L [17]	L [17]
Railroad Yards	N	N	N	Y	Y	Y
Waste-Related	N	N	N	L/CU [8]	L/CU [8]	L/CU [8]
Institutional Categories						
Basic Utilities	Y/CU [12]	Y/CU [12]	Y/CU [12]	Y/CU [13]	Y/CU [13]	Y/CU 13]
Community Service	L [9]	L [9]	L [10]	L/CU [11]	L/CU [11]	L/CU [11]
Parks And Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	N	N	N
Colleges	Y	Y	Y	N	N	N
Medical Centers	Y	Y	Y	N	N	N
Religious Institutions	Y	Y	Y	N	N	N
Daycare	Y	Y	Y	L/CU [11]	L/CU 11]	L/CU 11]
Other Categories						
Agriculture	L [16]	L [16]	L [16]	L [16]	L [16]	L [16]
Aviation And Surface Passenger Terminals	CU	CU	CU	CU	CU	CU
Detention Facilities	CU	CU	CU	CU	CU	CU
Mining	N	N	N	CU	CU	CU
Radio Frequency Transmission Facilities	L/CU [14]	L/CU [14]	L/CU [14]	L/CU [14]	L/CU 14]	L/CU 14]
Rail Lines And Utility Corridors	Y	Y	Y	Y	Y	Y

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Commentary

33.910.030 Definitions

The definition of fossil fuels was added to clarify the land use category Bulk Fossil Fuel Terminals.

Petrochemicals that are used primarily for non-fuel products are excluded, such as plastics, lubricants, fertilizer, roofing, and paints. However, methanol is an exception that is included as a fossil fuel, because large methanol storage and distribution facilities tend to have structural similarities to liquid natural gas (LNG) and liquid petroleum gas (LPG) terminals, including large-scale storage and gas pipeline access, and because they can have similar safety and climate impacts.

Fuels containing 5% or less fossil-fuel volume are not considered fossil fuels under this definition. For example, "pure" ethanol made from corn or other non-fossil source is required by the Alcohol and Tobacco Tax and Trade Bureau to be denatured in order to be transported to the site. Denatured ethanol typically contains up to 5% methanol, so that it is toxic and undrinkable.

Some fossil fuels under this definition are also classified as "renewable fuels" in the federal Renewable Fuel Standard and "clean fuels" in Oregon's Clean Fuel Standard, such as liquid natural gas and liquid propane gas. These federal and state standards require transportation fuel sold within their jurisdiction to contain a minimum volume of renewable or clean fuels.

33.910.030 Definitions

The definition of words with specific meaning in the zoning code are as follows:

Fossil Fuel. Fossil fuels are petroleum products (such as crude oil and gasoline), coal, methanol, and gaseous fuels (such as natural gas and propane) that are made from decayed plants and animals that lived millions of years ago and are used as a source of energy. Denatured ethanol and similar fuel additives, and biodiesel/renewable diesel with less than 5 percent fossil fuel content are not fossil fuels.

Commentary

Sections:

Introduction to the Use Categories
- 33.920.010 Purpose
- 33.920.020 Category Titles
- 33.920.030 Classification of Uses

Residential Use Categories
- 33.920.100 Group Living
- 33.920.110 Household Living

Commercial Use Categories
- 33.920.200 Commercial Outdoor Recreation
- 33.920.210 Commercial Parking
- 33.920.220 Quick Vehicle Servicing
- 33.920.230 Major Event Entertainment
- 33.920.240 Office
- 33.920.250 Retail Sales And Service
- 33.920 260 Self-Service Storage
- 33.920.270 Vehicle Repair

Industrial Use Categories
- 33.920.300 Bulk Fossil Fuel Terminal
- 33.920.310~~300~~ Industrial Service
- 33.920.320~~310~~ Manufacturing And Production
- 33.920.330~~320~~ Railroad Yards
- 33.920.340~~330~~ Warehouse And Freight Movement
- 33.920.350~~340~~ Waste-Related
- 33.920.360~~350~~ Wholesale Sales

Institutional Use Categories
- 33.920.400 Basic Utilities
- 33.920.410 Colleges
- 33.920.420 Community Service
- 33.920.430 Daycare
- 33.920.450 Medical Centers
- 33.920.460 Parks And Open Areas
- 33.920.470 Religious Institutions
- 33.920.480 Schools

Other Use Categories
- 33.920.500 Agriculture
- 33.920.510 Aviation And Surface Passenger Terminals
- 33.920.520 Detention Facilities
- 33.920.530 Mining
- 33.920.540 Radio Frequency Transmission Facilities
- 33.920.550 Rail Lines And Utility Corridors

Commentary

33.920.300 Bulk Fossil Fuel Terminal

Bulk Fossil Fuel Terminals are added as a new land use category to regulate their development in the Zoning Code. Regulation of Bulk Fossil Fuel Terminals implements policy direction in City of Portland Resolution 37168 (adopted November 2015) and 2035 Comprehensive Plan Policy 6.48 (adopted June 2016, expected to take effect in 2018), both of which address fossil fuel distribution and storage facilities.

Bulk Fossil Fuel Terminals are characterized by having (1) marine, pipeline or railroad transport access and (2) either trans-loading facilities for transferring a shipment between transport modes (such as from rail to ship) or bulk storage facilities exceeding 2 million gallons of fossil fuels. The 2-million-gallon threshold is sized to include facilities that are large enough to unload unit trains. Functionally, these terminals tend to be regional gateway facilities, where fossil fuels enter and exit the region. Additionally, Policy 6.48 calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market. However, the use classification is intended to be clearly identifiable by physical characteristics and not rely on a definition of region.

The regional market area of Bulk Fossil Fuel Ter+minals varies by product and is difficult to define. Portland's 10 petroleum terminals generally serve Oregon and Southern Washington. This market area substantially exceeds the Portland metropolitan area, which is often colloquially referred to as the region. Some terminal representatives pointed out that the federal government's 5-state West Coast PADD 5 region is generally their regional market area.

The use description is clarified with criteria that are intended to prevent the aggregation of new facilities smaller than 2 million gallons into a larger terminal that could effectively circumvent the terminal storage capacity threshold.

Resolution 37168 lists a specific exception to not restrict service directly to end users. At a small scale, services to end users include retail gasoline filling stations, natural gas access lines in street right-of-way to residential and business customers, and heating oil tanks at home sites. Larger scale end users with fossil fuel storage and access infrastructure also include manufacturers, jet fuel facilities at the PDX Airport, vessel fuel facilities on Portland Harbor, and others, where fossil fuels are used as an input.

33.920.300 Bulk Fossil Fuel Terminal

A. Characteristics. Bulk Fossil Fuel Terminals are establishments primarily engaged in the transport and bulk storage of fossil fuels. Terminal activities may also include fuel blending, regional distribution, and wholesaling. The firms rely on access by marine, railroad, or regional pipeline to transport fuels to or from the site, and either have transloading facilities for transferring a shipment between transport modes, or have storage capacity exceeding 2 million gallons for fossil fuels. There is minimal on-site sales activity with the customer present.

B. Accessory uses. Accessory uses may include retail sales of petroleum products, offices, food membership distribution, parking, storage, truck fleet parking and maintenance areas, rail spur or lead lines, and docks.

C. Examples. Examples include crude oil terminals, petroleum products terminals, natural gas terminals, propane terminals, and coal terminals.

D. Exceptions.

1. Truck or marine freight terminals that do not store, transport or distribute fossil fuels are classified as Warehouse And Freight Movement uses.
2. Truck or marine freight terminals that do not have transloading facilities and have storage capacity of 2 million gallons or less are classified as Warehouse And Freight Movement uses. However, multiple fossil fuel facilities, each with 2 million gallons of fossil fuel storage capacity or less but cumulatively having a fossil fuel storage capacity in excess of 2 million gallons, located on separate parcels of land will be classified as a Bulk Fossil Fuel Terminal when two or more of the following factors are present:
   a. The facilities are located or will be located on one or more adjacent parcels of land. Adjacent includes separated by a shared right-of-way;
   b. The facilities share or will share operating facilities such as driveways, parking, piping, or storage facilities; or
   c. The facilities are owned or operated by a single parent partnership or corporation.
3. Gasoline stations and other retail sales of fossil fuels are not Bulk Fossil Fuel Terminals.
4. Distributors and wholesalers that receive and deliver fossil fuels exclusively by truck are classified as Warehouse And Freight Movement uses.
5. Industrial, commercial, institutional, and agricultural firms that exclusively store fossil fuel for use as an input are not Bulk Fossil Fuel Terminals.
6. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.
7. The storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, rail yard, or as part of a fleet vehicle servicing facility are accessory to their use.
8. Uses that recover or reprocess used petroleum products are not Bulk Fossil Fuel Terminals.

Commentary

33.920.310~~300~~ Industrial Service

33.920.320~~310~~ Manufacturing And Production

33.920.330~~320~~ Railroad Yards

33.920.340~~330~~ Warehouse And Freight Movement

A. **Characteristics.** Warehouse And Freight Movement firms are involved in the storage, or movement of goods for themselves or other firms. Goods are generally delivered to other firms or the final consumer, except for some will-call pickups. There is little on-site sales activity with the customer present.

B. **Accessory uses.** Accessory uses may include offices, food membership distribution, truck fleet parking and maintenance areas, rail spur or lead lines, docks, and repackaging of goods.

C. **Examples.** Examples include separate warehouses used by retail stores such as furniture and appliance stores; household moving and general freight storage; cold storage plants, including frozen food lockers; storage of weapons and ammunition; major wholesale distribution centers; truck, marine, or air freight terminals; bus barns and light rail barns; parcel services; major post offices; grain terminals; and the stockpiling of sand, gravel, or other aggregate materials.

D. **Exceptions.**

1. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.

2. Miniwarehouses are classified as Self-Service Storage uses.

3. Establishments that engage in the transfer or storage of fossil fuels, rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities or have storage capacity exceeding 2 million gallons for fossil fuels are classified as Bulk Fossil Fuel Terminal uses.

33.920.350~~340~~ Waste-Related

33.920.360~~350~~ Wholesale Sales

A. **Characteristics.** Wholesale Sales firms are involved in the sale, lease, or rent of products primarily intended for industrial, institutional, or commercial businesses. The uses emphasize on-site sales or order taking and often include display areas. Businesses may or may not be open to the general public, but sales to the general public are limited as a result of the way in which the firm operates. Products may be picked up on site or delivered to the customer.

B. **Accessory uses.** Accessory uses may include offices, food membership distribution, product repair, warehouses, parking, minor fabrication services, and repackaging of goods.

C. **Examples.** Examples include sale or rental of machinery, equipment, heavy trucks, building materials, special trade tools, welding supplies, machine parts, electrical supplies, janitorial supplies, restaurant equipment, and store fixtures; mail order houses; and wholesalers of food, clothing, auto parts, building hardware, and office supplies.

Commentary

D. Exceptions.

1. Firms that engage primarily in sales to the general public are classified as Retail Sales And Service.
2. Firms that engage in sales on a membership basis are classified as either Retail Sales And Service or Wholesale Sales, based on a consideration of the characteristics of the use.
3. Firms that are primarily storing goods with little on-site business activity are classified as Warehouse And Freight Movement.
4. Establishments that engage in the regional wholesaling of fossil fuels, rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities or have storage capacity exceeding 2 million gallons for fossil fuels are classified as Bulk Fossil Fuel Terminal uses.

7. Other implementation recommendations

This section of the report recommends future implementation directions for building code amendments to address seismic resilience and periodic monitoring for code effectiveness.

Seismic resilience

Considering setting direction to implement this future action within the adopting ordinance:

- Portland Bureau of Emergency Management and Portland Office of Government Relations are directed to develop proposals for State building code changes to improve seismic resilience and require seismic upgrades comparable to proposed requirements on unreinforced masonry buildings.

Seismic resilience is one of the underlying rationales for fossil fuel distribution policies and the recommended code amendments. Seismic safety requirements of land development are addressed in building codes, which are adopted and amended at the state level.

Monitoring for code effectiveness

Considering setting direction to implement this future action within the adopting ordinance:

- Portland Bureau of Planning and Sustainability is directed to periodically monitor the effectiveness of these zoning code amendments to implement underlying policies and consider code adjustments in response to regional fuel demand and market changes, product innovation, safety and climate action considerations, and related regulatory changes.

A monitoring and adaptation approach would provide for ongoing code effectiveness within a context of changing energy markets, products, and associate regulations.

Appendix A: Stakeholder focus group results

Public involvement in the concept development for the Fossil Fuel Terminal Zoning Project consisted primarily of four stakeholder focus groups as well as meetings with fuel terminals and other individuals or organizations. The focus groups were held in June 2016. The purpose of the focus groups was to help identify and understand the issues that should help shape the preliminary zoning code being considered by this project. The focus groups also helped to expeditiously reach out to a broad range of stakeholders. While their perspectives and interests are shared on some topics, they diverge on other topics.

In addition to the stakeholder focus groups, BPS staff met with several fuel terminals to explain the proposal, answer questions, and discuss their individual concerns. This was needed because antitrust regulations constrained discussion about certain topics, for example supply chains, in the presence of representatives from other fuel terminals. Primarily, the terminal operators explained their operations and facilities, many of which differed substantially from other terminals.

Who participated?

Figure 9 lists the participants of the four focus groups conducted. Ten to twelve participants were invited to each meeting, although not everyone was able to attend. The first focus group consisted of fuel terminal representatives who have a direct stake in the recommended regulations. The second group was environmental and public health organizations, some of whom advocated for the resolution before City Council and have community safety and sustainability in mind. The third group were state and regional business and government organizations. Their interest was to protect the state economy by testing the proposal against economic realities. The fourth group was neighborhood and equity community organizations whose interests were to protect neighborhoods adjacent to the terminals and underserved communities who may rely on terminals for employment. Additionally, the Mayor's Office invited input from Native communities and tribal governments.

Preliminary code concepts discussed

- Identify "bulk fossil fuel terminals" as a regulated land use, characterized by inter-regional transport access and larger storage facilities.
- Either prohibit new terminals or set storage capacity limits high enough to accommodate regional growth.
- Allow existing terminals to expand for seismic upgrades, access to greener fuels and capacity for regional growth.

What discussion questions were asked?

The focus groups were provided background materials describing the preliminary code change concepts about two weeks before the focus group meetings. BPS staffed prompted the focus group across four topics:

Figure 10. Stakeholder Focus Group Participants, June 2016

STAKEHOLDER	DATE	ATTENDEES
Fuel terminal representatives	Thursday, June 02, 2016	Gilbert Betancourt, Phillips 66 Nick Giotta, Phillips 66 Stephanie Williams, Phillip 66 Andrew Holbrook, Kinder Morgan Shanna Brownstein, Northwest Natural Kevin Jones, McCall Oil Pamela Brady, BP West Coast Jerry Henderson, Chevron Kevin Buffum, Pacific Terminal Services Steve Kober, NuStar Will Rassmussen, WSPA Frank Holmes, WSPA Chris West, Pac/West and Arc Terminals Nathan Eggers, Arc Terminals Jerome Jackson, NuStar Rob Hill, NuStar
Environmental and health organizations	Tuesday, June 07, 2016	Zach Klonoski, Mayor's Office Regna Merritt, Ore. Physicians for Social Responsibility Trish Weber, Center for Sustainable Economy Meredith Connolly, Climate Solutions Kristen Sheeran, Climate Solutions Nick Caleb, 350PDX/CSE Bob Salinger, Audubon Society Dan Serren, Columbia Riverkeeper Adriana Voss-Andreae, 350PDX Micah Meskel, Portland Audobon
State and regional business organizations	Thursday, June 09, 2016	Jana Jarvis, Oregon Trucking Association Greg Theisen, Port of Portland Ellen Wax, Working Waterfront Jay Clemens, Associated Oregon Industries Mark Landauer, Oregon Public Ports Association Marion Haynes, Portland Business Alliance Corky Collier, Columbia Corridor Association Kelly Ross, NAIOP Shanna Brownstein, Northwest Natural Emerald Bogue, Port of Portland Susan Lahsene, Port of Portland Phil Grillo, Davis Wright Tremaine
Neighborhood and equity organizations	Tuesday, June 14, 2016	Jeff Geisler, Hayden Island Neighborhood Association John Bradley, Northwest District Association Travis Argue, UA Local 290 Willy Myers, Columbia Pacific Building Trades

1. Issues that should shape the project
2. Types of distribution and storage facilities to be regulated
3. Definition of fossil fuels
4. Zoning approach for limiting new storage facilities

In addition to specific questions within each topic, participants were invited to share any general and wrap-up comments during the focus group.

What we heard

For each topic area, the results of the focus groups are summarized in Figure 4 of Section 3. That table summarizes the main themes and concerns raised during the focus groups.

Key issues

Fuel terminal representatives objected to this policy direction in general. They discussed their safe operating history and commitment to implement the federal and state standards for renewable and clean fuels. There were challenges to participating in the conversation, but they agreed to work cooperatively on this project to get the code right. For example, anti-trust laws precluded the group from engaging in certain conversations because it would involve disclosing information about their supply chains and could be considered collusion in court of law. This group was concerned with the fast timeline and felt the policies should be discussed first.

They also felt the process was emotionally driven, not having considered the unintended consequences. For example, with renewable and clean fuel standards constantly in flux, they felt that zoning rules could make it more difficult to meet these standards. Restricting growth here in Portland at the end of the Olympic Pipeline could put more trucks on the road, instead of more efficient pipeline or rail transportation. The group asserted that there could also be significant economic impacts on the rest of the state, given that 95% of Oregon's fuel passes through Portland first. Lastly, fuel terminal representatives expressed concern for additional administrative burdens that a new land use category would bring. For example, what steps would be necessary for these firms to demonstrate that they were existing operations prior to the new zoning rules? Additionally, they warned that their site configuration may pose a challenge to effective zoning rules, as they are often non-contiguous operations connected by interconnected pipelines.

Environmental and public health organizations felt the policy direction was less aggressive toward fossil fuels than what the City Council resolution had proclaimed. They felt the resolution sought to outright prohibit new development and expansion on existing facilities. Because of this, they cautioned about community backlash if this proposal did not meet expectations. In this vein, they highlighted that Portland will be the first city to fully implement this type of policy, so the project could be an opportunity to set a strong precedent and model code for other cities. This group also felt that resident health and safety was also a top priority. They noted the seismic risks posed by fuel terminal tank farms that lie on liquefaction zones as well as the June 2016 oil train wreck in Mosier. For these reasons, they felt Portland Bureau of Emergency Management (PBEM) and other environmental justice groups should be involved in safety considerations. Lastly, the group felt the economic impact statement should include more than the impact on jobs. It should also consider the risks of economic and financial damages from a natural disaster. Members of this focus group offered to provide technical analysis on the impacts that the proposed options could have on the environment and public health and safety.

Some noted that risks should be accounted for through bonding or insurance requirements under worst-case scenarios.

State and regional business organizations felt that this undertaking requires more research. The resolution set required tasks, including an economic impact analysis and an examination of relevant laws, and they felt these tasks should be completed before laying the groundwork through code development. They felt the marine cargo forecast for liquid bulks of 1% growth is outdated and too low. (Note, an opposite reaction was expressed by environmental and health organization representatives who felt this figure was too high.) Similarly, they feared that the code may not hold up well in five years because of constantly changing energy markets. For example, in five years Portland could be shipping cleaner fuels to the Midwest. Some members expressed concern that the zoning code may not be the right tool to achieve some of the GHG (greenhouse gas) reduction and public safety goals that this resolution aimed to achieve. If the goal is public safety, then the City should require or create incentives for seismic upgrades. They stated that, if the goal is to reduce greenhouse gases, then prohibiting the export of cleaner-burning fuels, such as LNG (liquefied natural gas), may have the opposite intended effect. Lastly, the group asserted the important role that Portland's fuel terminal facilities play in rest of the state economy. They warned of political and economic repercussions that these decisions could have. They shared the view with fuel terminal representatives that this is a big political decision—the timeline is too short and the process should not be rushed.

Neighborhood and equity community organizations communicated that safety, pollution and accidental releases were their top priority when considering zoning for fuel terminals. They wanted a close examination of the seismic and explosion risks associated with fuel terminals. For example, which terminals are in liquefaction zones? Where are the storage tanks located in relation to neighborhoods? They sought honesty about the risks posed to the Linnton neighborhood specifically. Rail safety in the Columbia Gorge was also a key issue. The June 2016 incident in Mosier highlighted the risks. A potential solution they offered would be more pipelines, but they are difficult to get built. This group recognized the difficulty in managing competing values. They felt a reasonable expectation of growth is a smart idea. One participant described the proposal as aggressive, adding that by prohibiting LNG export terminals, global export destinations like China may end up burning dirtier fuels, such as coal. They felt this also meant Portland would forego export profits.

New land use category

Fuel terminal representatives were concerned for the clarity of the rules. They felt that the definition of "bulk terminal" is very important to be clear. If the definition was open to interpretation, then permit staff could be pressured. They warned that creating "bulk fuel terminal" as a specifically regulated use could lead to unpredictable results. This group was also concerned with the definition of "region." They were unsure if off-shore distribution was the issue, advocating for using the federally recognized West Coast region (PADD 5) as the definition of "regional market." PADD 5 includes Oregon, Washington, California, Nevada, Arizona, Alaska and Hawaii.

Environmental and public health organizations wanted to see the regulation go beyond new facilities and also look at limits on expansion at existing facilities. They felt the City Council resolution was clear and unambiguous about opposing expansion of fossil fuel infrastructure, which includes expansions at existing sites. They emphasized the importance for getting the right definition of "bulk terminal" and the associated size limit (or prohibition)—these must be correct in order to effectively implement the policy. Some members questioned whether seismic upgrades at existing facilities could be allowed but

expansions prohibited. This group also urged the inclusion of PBEM's work on hazards in liquefaction zones in this project.

State and regional business organizations echoed the concerns for clear and correct definitions that the fossil fuel representatives posed. "Region," "export," "end user," and "fossil fuel" are all important terms to get right. They also were strongly opposed to making existing facilities non-conforming uses, as well as making them limited uses with unclear exceptions. This would expose projects to discretionary land use actions, which is costly and unpredictable, and hence risky. It would likely make improvements that the community values, such as seismic upgrades, more difficult to attain.

Neighborhood and equity community organizations were skeptical that a new export terminal would be proposed in the Portland area in the wake of Pembina. They felt that Superfund sites were too expensive to acquire and build on. The group also wondered whether a new zone for fossil fuels ought to be created instead of a land use. They questioned why it ought to be allowed in IG2.

Definition of fossil fuels

Fuel terminal representatives were primarily concerned with the long-term applicability of the proposed rules. Energy markets and new technologies are constantly in flux, and it is difficult to know what the size requirements might be for newer—perhaps cleaner—fuels, particularly blended fuels. This group sought clarification for what "green fuels" meant. They noted that the proposed inclusion of LNG among city-regulated fossil fuels is inconsistent with the State of Oregon's inclusion of LNG as a "clean fuel." They called for periodic review of the rules when tomorrow's cleaner fuels become known, as they may not meet today's definitions. They cautioned about unintended consequences of placing restrictions on fossil fuel terminals, such as potentially putting more trucks on the road by restricting growth at facilities with pipeline, marine and rail access. This may result in considerably more GHG emissions. They also felt that methanol should not be included in the list of regulated fuels because it is used more as a value-added commodity than a fuel. They shared this last viewpoint with most other focus groups, except the environmental and health organizations.

Environmental and public health organizations looked to the intent of the City Council resolution and noted that it included propane, methanol, natural gas and other low-carbon fuels. At the same time, they agreed that code changes should provide flexibility to meet Oregon's low carbon fuel standard. They noted that methanol is currently being used as a fuel, so excluding it undermines the policy. The group sought clarification on how to address non-fuels. Some suggested that the GHG emissions of these input commodities should help ground their use. Others thought that the proportions (e.g., in blended fuels) should be considered—if the product is mostly used as a fossil fuel, then it should be regulated and restricted. Lastly, they highlighted how even one new LNG tank in Portland is a major safety issue. Although not explosive, coal also poses a significant risk, especially in transportation. Because of these risks, they believed that the resolution should be implemented through health and safety standards.

State and regional business organizations expressed frustration that while the federal and state government are going one direction requiring cleaner-burning fuels, the City of Portland appears to be choosing to restrict distribution of these cleaner fuels in another policy direction. Some members thought the City could try to incentivize a higher blend of renewables, and others warned of the disincentives that could discourage investment—disincentives should limit GHG emissions, not seismic upgrades.

Neighborhood and equity community organizations thought that restricting methanol exports would be an overreach. They said it is not being used as a fuel in the United States, and instead it is a value-added product used in manufacturing of plastics and other goods. Including methanol would negatively impact the manufacturing sector that requires it as an input, and it could open the door to regulating other non-fuel commodities, such as paints and asphalt. In general, they felt that if we can make certain fuels cleaner burning, then it poses minimal threat. They asserted that, since there is no clear transitional path away from our dependency on fossil fuels, we should make way for cleaner alternatives, such as blended bio-diesel.

Terminal development restrictions

Fuel terminal representatives were concerned with potential restrictions precluding development on certain site configurations, which have some peculiarities. For example, where two existing tank farms are non-contiguous (e.g., at Willbridge) and are connected by facility pipelines, they should be allowed an option for expansion. Additionally, some sites may already be built out and cannot accommodate the new growth that is expected. This group could not comment on facility size and anticipated growth, because of anti-trust laws, but they noted that it is critically important. For this reason, they could not provide feedback on the implementation options presented.

Environmental and public health organizations generally preferred Option A. However, some recognized the legal challenges posed by federal restrictions. They wondered if health and human safety risks may provide a defensible rationale. Some members also noted that while prohibiting all new facilities and making existing facilities non-conforming uses might be more legally defensible, it is much less politically feasible. Finally, some members of this group were skeptical of the 1% annual growth forecast for liquid bulks. They felt this was too high, which is contrary to what the state and regional business organization representatives stated.

State and regional business organizations criticized the approach to implementing the City Council resolution. They felt that zoning to regulate tank size approaches the problem sideways, and the unclear rationale could lead to appeals and legal challenges. One participant advocated to prohibit exports more directly, rather than a sideways approach. They cautioned that tank size limits could essentially put the region on an "import diet," even if the intent of the limit is to reduce throughput. They did not think this proposal accounted for these unintended impacts. Docked ships in the harbor may need an LNG tank to power their facilities and improve air quality, for example. They also noted that there are economic advantages and efficiency gains to being a bigger facility, and placing restrictions on size will have consequences that we don't want—lower wages for example. Lastly, they felt the 1% annual growth forecast for liquid bulks was outdated—an updated forecast would be higher. This was the opposite of what environmental and public health organizations stated.

Neighborhood and equity community organizations generally preferred Option C, calling it a realistic proposal that allows for some growth but doesn't restrict it too much. While the group was fairly resolute that coal is not a good alternative, they recognized that LNG is a cleaner-burning fuel. However, since the facilities in the region are already at capacity, Option C would allow for some wiggle room for the region's growth. They felt it would allow the "invisible hand" to guide the market more easily. They recommended that the City review the size limits every few years as the market changes.

188142
11/10/16

Hello everyone, Good Afternoon!

My name is Mukta Akter and I'm a social and climate activist from Bangladesh.

Bangladesh is one of the most climate vulnerable countries in the world. The developed countries like US are producing the largest amount of Green House Gases, but countries like Bangladesh who are contributing almost no GHG, are the ones paying a lot.

Bangladesh is mainly a low elevation country and the combination of sea level rise and increasingly powerful storms is already contaminating our fresh water with salinity. The effects are dramatic and devastating. Extreme weather events are having major impacts on the agriculture, food security and economic performance of Bangladesh. The scenario is almost the same for the entire South Asia.

According to the latest NOAA data, we can expect a 1 meter sea level rise by 2035. This means 35% of Bangladesh's coastal area will submerge under seawater and 15-20 million people will turn into climate refugees. It is a huge challenge for our government how to resettle them.

The effects have already started in your country. For instance, the catastrophic flood in Texas & Louisiana last year and the coastal erosion in Florida. Please think, what is the race for development, when it becomes risk for lives and livelihood? Due to your contribution to GHG, our future and the next generation is in great risk.

Climate change is not an isolated issue. It is a global problem and to fight against, it needs collaborative approach. The policy you are working towards - no new fossil fuel infrastructures is a good start, still much more needs to be done to secure our mother globe from the devastating climate calamities.

Mukta Akter
International Fellow From Bangladesh
Currently working with 350PDX
Email: mukta@350pdx.org

188142

From: Heidi Alford
To: BPS Fossil Fuel Zoning
Subject: final zoning code for Resolution #37168
Date: Thursday, November 10, 2016 10:09:43 AM

Dear City Council,

I am proud of the city of Portland for the November 2015 resolution #37168 regarding fossil fuels. Now it is time to create strong code to implement this vision.

Please close any loopholes in the final zoning code which would allow fuel companies to increase infrastructure development for oil and coal! It is especially important given the results of the national election. Let's show what Blue cities can accomplish!

Thank you,

Heidi J Alford
4032 SE Crystal Springs Blvd.
Portland, OR 97202

From: Ali Berman
To: BPS Fossil Fuel Zoning
Subject: Close the loopholes on Fossil Fuel Ban
Date: Thursday, November 10, 2016 4:25:04 PM

Dear City Council,

In light of the recent election, your decision today on banning fossil fuel infrastructure in Portland is more important than ever. Our new administration wants to cut all our national climate change work, making the choices we make locally critical in the fight against climate change. Cities MUST lead. I am urging you to do the following to ensure the ban is as powerful as possible. Let's do this, all the way, and make real change. **Close the loopholes.** Be the leaders our city and our world needs.

I ask that Portland:

Enacts a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
Eliminates the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities.
Directs Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
Rejects Northwest Naturals request to be exempted from these regulations.

Thank you! #CitiesLead

Ali Berman
1125 NW 9th Ave
Portland, OR 97209

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www.aliberman.com

188142

From: Mary Blankevoort
To: BPS Fossil Fuel Zoning
Subject: Opposition to expansion of Portland"s fossil fuel infrastructure
Date: Thursday, November 10, 2016 7:59:37 AM

Let's continue to lead the country in our protection of the environment, force the transition to sustainable energy sources that do not contribute to global climate change, and not let corporate interests sway these goals.

Please prohibit expansion of fossil fuel terminals, eliminate or reduce the thresholds for prohibiting new fossil fuel storage terminals, and use the right tools to make seismic upgrades. this does NOT mean expansion of existing terminals!

Sincerely,

Mary Blankevoort
Troutdale, Oregon

188142

From: Thomas Brown
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 10, 2016 11:32:51 AM

It's time to leave it in the ground. The water that we depend on for our health and the air we breathe are priceless. Don't sell them cheaply.

Thomas Brown

From: Thomas Brown
tawb2007@hotmail.com
4750 Franklin Blvd
Eugene 97403

From: Linda Cargill
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Thursday, November 10, 2016 12:22:03 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Linda Cargill
2020 NW Northrup St. Apt. 601
Portland, OR 97209

188142

From: Cathryn Chudy
To: BPS Fossil Fuel Zoning
Subject: re: fossil fuel infrastructure resolution
Date: Thursday, November 10, 2016 5:08:27 PM

Dear Portland City Council,

I live in Vancouver, WA but work in Portland.

I could not be at the City Council meeting today in person, but want you to know that I support the strongest land use code changes that are possible.

Sincerely,

Cathryn Chudy

1506 E. 29th St.

Vancouver, WA 98663

971-221-4180

From: holisticooke@aol.com
To: BPS Fossil Fuel Zoning
Subject: testimony for today"s hearing.
Date: Thursday, November 10, 2016 10:40:17 AM
Attachments: Fossil Fuel Terminal zoning 11-10-16 11.doc

Attached and below is my testimony for today's hearing. I plan to be there but need to leave early.
Thank you.

Fossil Fuel Terminal zoning testimony 11-10-2016
Harriet Cooke MD, MPH
3126 SW Carson St, Port. OR 97219
holisticooke@aol.com

I am writing in full support of restricting development and expansion of bulk fossil fuel terminals, such that NO new Bulk Fossil Fuel Terminals will be allowed. I further support improvement limitations on existing Bulk Fossil fuel terminals, such that only seismic upgrades are allowable which would add no more than 10% of the capacity of replaced tanks. However, I would prefer NO increase in capacity. We need to keep the flow of oil SLOW while we continue to build capacity for and integrate renewable energy systems.

As vital as this project has been to limiting the worst of climate catastrophe, it is ever more essential with a president who is planning to lift restrictions on the production of fossil fuel reserves, and lift federal roadblocks to moving and consuming more fossil fuels.

It is up to our states, cities, and counties to move us forward in creating a more sustainable, equitable, and compassionate world.

Thank you for all the work you do in moving us toward this direction.

Harriet

From: Deborah Garman
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 10, 2016 9:42:04 AM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland continue in a proactive way to:
Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.
Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Thank you in advance for bold leadership to protect Oregonians and our planet.

Sincerely,

Deborah Garman

From: Deborah Garman
debbygarman@gmail.com
175 NE 7th Ave
Hillsboro 97124

From: John Hahn-Francini
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 10, 2016 3:30:00 PM

I would like the ban on new fossil fuel facilities to include
•A full ban on new terminals, large or small. A 2 million gallon facility is still too large. We need NO new fossil fuel infrastructure.
•Prohibition of expansions at existing terminals and requiremen that they make upgrades for Seismic Safety through State Building Codes.
•The prohibition should prevent NW Natural from getting a carve out.

From: John Hahn-Francini
johnhf@hevanet.com
4617 NE Killingsworth St. Unit 9
Portland 97218

Testimony For Portland City Council

Fossil Fuel Facilities

November 10, 2016

Dick Harmon

—Text

—Notes

I'm Dick Harmon, I live in Portland, I'm 80, I'm here as father, grandfather and great grandfather.

I support 350's position on the ordinance, and I want to thank the Council Members, especially Mayor Hales, for stepping firmly into our new reality.

The fossil fuel industry is pushing back, so we're here to help you keep those firm steps in place, and advance them.

We're not here as protesters. Like the people at Standing Rock, and the people all around the country rising up on these questions, we are here to *protect* our children and their children, by protecting our— and their— air, water, soil, life and energy.

Regardless of what the national election results might lead some to think, we're in a climate emergency.

We've run out of time on climate. This decade is our final window to cut emissions deeply—that's all there is.

The fossil fuel industry—including the methane retailers— proffers the claim that the ordinance as proposed will curtail their ability to meet new demand, as new people move to Oregon.

Our response?

First a clear, firm NO.

Second, an alternative for the industry: meet that new demand with renewables and deep energy conservation.

Change your business plans toward the real-world future.

You say the fossil firms serving Portland cannot change their business plans?

We offer you a model: PG&E, in Northern California, deals in both natural gas and electricity. It is the largest investor-owned utility in the US.

In June, PG&E announced an agreement to *replace* the nuclear plant at San Diablo with renewables and deep efficiency, because they are cheaper than nuclear.

In our case, renewables and deep efficiency are cheaper than carbon and methane—especially when you include safety and human and non-human health risks.

To create the deal, PG&E *began* by inviting labor, community, and two major environmental organizations to the table.

They emerged with a trade-off: over nine years, shutting the nuke, and providing $350 million for transitioning 1,000 well-paid employees and $50 million for replacing lost property taxes to the county.

This model offers sticks *and* carrots; it can help us *realign interests*, and *incent conversion* to the clean Portland economy.

It's a way to say *yes* to community, labor, environment, and a converting industry.

It's a model for the other cities of America while Washington burns.

It's a way to say both no and yes: *no* to business as usual, *yes* to *protecting* our children, grand children, and great grandchildren.

Thank you.

Notes

1. Methane: "While methane doesn't linger as long n the atmosphere as carbon dioxide, it is initially {first 20 years} far more devastating to the climate because of how effectively it absorbs heat. In the first two decades after its release, methane is 84 times more potent than carbon dioxide. *Both* types of emissions must be addressed if we want to effectively reduce the impact of climate change. Steve Hamburg (EDF Chief Scientist), "Methane: the other important greenhouse gas." Environmental Defense Fund (www.edf.org.methane-othe-important-greenhouse-gase.)

2. PG&E Diablo Canyon agreement:

   —PG&E *News Release* June 21, 2016 (includes link to text of agreement.)

   —Tom Dalzell {Business Manager and Financial Secretary, International Brotherhood of Electrical Workers, Local 1245}, "Historic Agreement Paves Way for Alliance Between Labor and Environmentalists," www.huffingtonpost.com/tom-dalzell-hisoric-agreement, June 29, 1960.

   —Diane Caldwell, "California's Last Nuclear Power Plant Could Close," *New York Times* June 21, 2016.

3. Deep Energy Conservation in large commercial buildings: For a reliable, different set of incentives, see www.meetscoalition.com; especially the agreement between the owner of the Bullitt Building in Seattle, Seattle City Light, and MEETs. (Full disclosure: my son Rob Harmon is principal of MEETS.)

188142

From: Licia Hauss
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 10, 2016 2:29:06 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Licia Hauss
NE Portland

From: Licia Hauss
lhauss@gmail.com
3020 NE Glisan Apt. D
Portland 97232

188142

From: Wendy Hoffman
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 10, 2016 8:23:01 PM

I support reducing fossil fuel consumption through the following means. These are all a good first step to a sustainable future. Please, be a leader we can stand with and that shares our views. Thank you. (1) a full ban on new fossil fuel terminals. (2) prohibit expansions at existing terminals. (3) preventing any exceptions to the current proposal. For example, no exemptions for NW Naturals.

From: Wendy Hoffman
wendyhoffman21@gmail.com
4139 NE 62nd Ave.
Portland 97218

From: Jenny Holmes
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 10, 2016 9:09:11 AM

Thank you Portland City Council for passing the ban on new fossil infrastructure in November 2015 and to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. I testified in support of creating new zoning rules last year, but I know that the devil is in the details. Portland needs to have strong Fossil Fuel Zoning Amendments and those in the recommended draft are inadequate. Portland can play a an important leadership role and create an identify for sustainability through this policy that makes it an attractive place to live and do business.

The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution. Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Thank you for considering these comments. With a President-elect who does not believe that climate change exists, strong local policies are more important than ever.
Sincerely,

From: Jenny Holmes
jehrestore@gmail.com
2325 NE 44th Ave
Portland 97213

188142

The League of Women Voters of Portland
618 NW Glisan St., Suite 303, Portland, OR 97209
(503) 228-1675 • info@lwvpdx.org • www.lwvpdx.org

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DATE: November 10, 2016

TO: Mayor Hales, Commissioners Fish, Fritz, Novick, and Saltzman

FROM: League of Women Voters of Portland
Fran Dyke, President
Julie Chapman, Action Committee Member

RE: Fossil Fuel Terminal Zoning Amendments

Since the 1950s the League of Women Voters has worked at federal and state levels to protect air, land and water resources. More recently, the League has lobbied vigorously for comprehensive legislation to control global climate change. Any increase in fossil fuel infrastructure is not consistent with the current League of Women Voters natural resources and climate change positions, nor with Portland's Climate Action Plan.

We want to thank the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for their work to develop the zoning code recommendations for City Council Resolution 37168. Several drafts were submitted to industry stakeholders and to the community for feedback before the Commission recommendations were incorporated. The resulting draft now before the City Council is closer to the Resolution's intention to reduce fossil fuel use in our region.

We would like to discuss the proposed increased capacity in new and existing terminals, and the climate goals adopted by Oregon, Portland and Multnomah County.

The current zoning code recommendations allow for new terminals, with a maximum capacity of 2 million gallons, and restrict new tank construction in the existing 10 bulk petroleum terminals to a 10% increase above current capacity. This has been suggested as an incentive for the fossil fuel companies to replace old tanks with those complying with current seismic guidelines.[1]

Having followed the process of code development, we observe that the recommendation for allowing 10% increases in capacity for existing terminals is arbitrary. If you are looking for coherence in policy, we suggest that a 5% increase in capacity would be consistent with the maximum capacity of 2 million gallons allowed for new terminals.[2]

However, we find that any increase in fossil fuel terminal development is not compatible with the state climate goals, nor with Portland's Climate Action Plan. These goals do not state the exception "unless we have an increase in regional population." In fact, regional population increases are assumed in the calculations.[3] The goals are a reflection of the important task before us to leave behind the "business as usual" paradigm and to adopt a clean energy policy.

Climate impacts on Oregon's economy have been analyzed in many spheres: forest fires and timber loss, extreme weather events, public health, sea level rise and storm surge flooding, Pacific ocean acidification with severe impacts for the shellfish industry, and drought impacts on fisheries and agriculture. Remediation costs and loss of revenue for the state (and by extension, for Portlanders) will increase as weather extremes intensify and water resources become less predictable.

The good news is that costs for developing alternative energy resources are coming down all the time and in much of the world are actually lower than the costs for constructing new fossil fuel infrastructure.[4] We live in a state without a petroleum extraction industry, and with a wealth of water, sun and wind. If any region in the world is well-suited to shift to renewable energy, it is Portland and Oregon.

We urge you to exercise foresight and to stick to the goals you have adopted in Resolution 37168. If "cities lead," we'd like to head in the right direction.

1. Portland Planning and Sustainability Commission, October 11, 2016.
2. The total capacity for petroleum in the 10 existing terminals is 386 million gallons, giving an average capacity of 39 million gallons per terminal. A 5% increase in size would give each terminal an average increase of 1.95 million gallons, consistent with the 2 million gallon new terminals allowed.
3. 2015 Climate Action Plan, p. 20, www.portlandoregon.gov/bps/climate
4. http://www.bloomberg.com/news/articles/2016-04-06/wind-and-solar-are-crushing-fossil-fuels

From: Nina Macdonald
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 10, 2016 1:18:02 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Nina Macdonald

From: Nina Macdonald
ninamacdonald1@yahoo.com
5918 SE Milwaukie Ave
Portland 97202

From: Sarah McKenzie
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Thursday, November 10, 2016 8:00:22 AM

Sarah McKenzie
2309 SE 30
Portland, OR 97214

November 10, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Sarah McKenzie

From: Lynn
To: BPS Fossil Fuel Zoning
Subject: Pass a Full Ban on Fossil Fuel Terminals
Date: Thursday, November 10, 2016 9:24:02 AM

In the light of our national directions, we must stand strong as a city in our need to move away from fossil fuels. We have the unique opportunity for deep transformation. We can both meet and exceed our climate goals - as we must do now to avoid the loss of civilization as we know it.

We are ready for a new way. Not only do we have technologies like wind and solar within our reach, we also have the potential of net zero or passive housing which could deeply transform the amount of energy we need. Just as the economics of renewables have become attainable, so have both the economics and technology for passive house building. Look no further than Orenco Orchids for an example.

We don't need more gas. We need transformation. The time is right. Please do the right thing and help us get there.

Thank you,

Lynn Merrick
2216 SE 58th Ave.
Portland, OR
97215

188142

From: Lynn Merrick
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals! 1
Date: Thursday, November 10, 2016 9:07:09 AM

A huge thanks to all in our city who have worked to incorporate public good into the Fossil Fuel Terminal Zoning Amendments. In the light of our national direction, it is more important than ever that all cities and states take a stand on moving us away from fossil fuels and into the new age of renewable fuels and reductions in our emissions. Please be willing to take strong stand necessary to move us into the 21st Century. Please return to your strong and visionary resolution in the fall of 2015 prohibiting ALL new fossil fuel infrastructure.

From: Lynn Merrick
lynn@hevanet.com
2216 SE 58th Ave
Portland 97215

188142

From: Joseph Miller
To: Commissioner Fish; Commissioner Novick; Commissioner Saltzman; Commissioner Fritz; Hales, Mayor; Council Clerk – Testimony
Cc: BPS Fossil Fuel Zoning
Subject: Delete words "plus 10 percent" from p. 49 of PSC"s Draft Fossil Fuel Terminal Zoning Amendments
Date: Thursday, November 10, 2016 11:28:10 AM

Thank you for your efforts to promote equity, sustainability, and Portland's transition to a low carbon, clean energy future.

Please vote to delete the words "plus 10 percent" from page 49 of the Planning and Sustainability Commission's Draft Fossil Fuel Terminal Zoning Amendments. The PSC's draft amendments are excellent in almost every way, but the addition of "plus 10 percent" is totally unnecessary and counter to the intent of Portland's Fossil Fuel Policy Resolution #37168.

Thanks,

Joe Miller
1030 SW Jefferson Apt. 534
Portland 97210

From: Dana Mozer
To: BPS Fossil Fuel Zoning
Subject: fossil fuel ban
Date: Thursday, November 10, 2016 11:28:40 AM

Dear City Council

If there is one thing I am proud of today, it is of being a Portlander. Now more than ever, the revolution must begin at home. Please please please ensure that a STRONG fossil fuel ban is enacted in Portland, as an example to the rest of the country and the world. As the Audubon Society calls for, I urge you to work for the following points -

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities.
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities.
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades.
- Rejecting Northwest Naturals request to be exempted from these regulations.

Thank you

Dana Mozer

188142

From: Brian Ormiston
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 10, 2016 3:26:15 PM

Now with Trump heading to the oval office he promises to ditch any efforts to reduce fossil fuel burning in the atmosphere and return to business as usual. We need to take it upon ourselves now and be a progressive model for others to follow. I wholeheartedly support the issues put forth by 350PDX. I will reiterate those concerns below.

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. We need NO new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. NW Natural wants to be exempted from this policy and we need to make sure the City Council does not add a last minute amendment on NW Natural's behalf.

From: Brian Ormiston
brianormiston@yahoo.com
5210 SE 48th Ave.
Portland 97206

188142

From: Chris Petersen
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 10, 2016 1:16:13 PM

Portland should lead the nation in taking action on Climate change.

From: Chris Petersen
Audiofreq.llc@gmail.com
4128 SW Vesta Street
Portland 97219

From: Gary Ploski
To: BPS Fossil Fuel Zoning
Subject: Comments on the Fossil Fuel Terminal Ban
Date: Thursday, November 10, 2016 8:30:03 AM

Good day.

I will be unable to attend today's hearing and want to share some thoughts on why the current language need to be strengthened to protect the environment and the people of Portland.

Here are some of the improvements that I believe should be put in place before the language is finalized; especially due to the recent news that the leading anti-climate change voice will be appointed by the president elect. Portland needs to stand strong and protect that which provides for us. If we don't do it we cannot hope for protections from the federal government.

- Exceptions to the rule will not benefit Portland. Enact a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities.

- First, expansion should not be permitted. Secondly, seismic upgrades should be required, full stop. Eliminate the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities.

- If the big one comes it is imperative that we be ready. Direct Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades.

- No single entity should be able to be exempted. Reject Northwest Naturals request to be exempted from these regulations.

Thank you for your time and service.

Gary Ploski
1125 NW 9th Ave
Portland, OR 97209
—
http://reels.garyploski.com - Acting Reels & Short Clips
http://garyploski.com – Blog, Acting, Directing
Apple Certified Associate in Final Cut Pro X
Twitter – Facebook – YouTube – IMDb – LinkedIn
Rising Star the movie – Watch on Amazon.com

From: Rick Rappaport
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Thursday, November 10, 2016 7:54:08 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Rick Rappaport
2218 n.e. gile terrace
portland, OR 97212

Good afternoon. My name is Marilyn Sewell, and I am the Minister Emerita of the First Unitarian church.

This Council, led by Mayor Charlie Hales, has passed the strongest land use code in the country, prohibiting all new infrastructure for fossil fuel export. (*Hold up picture*.) Look at this picture—tiny kyaktivists and Greenpeace activists hanging from the St. John's bridge stopped Exxon's massive icebreaker for 48 hours, and pictures like this went around the world. Then through our emissary, Mayor Hales, once more our witness went around the world, to the Pope, to President Obama.

Now again, the whole world is watching—in light of this election, what will happen to the climate movement? Do not think what happens in this City Council today and on Nov. 17 is not important to the larger world—we know that the rest of the country watches what Portland does, in many arenas, and certainly in regard to climate. So we are here today not just to testify, but to witness. I'm using religious language because this is truly the greatest moral issue of our time. We will all be accountable as moral agents if we fail to keep fossil fuel in the ground.

The temptation, always, is to accommodate to power, but rather we must speak truth to power. In the words of that wonderful Spike Lee movie, "Do the right thing." It's in your hands. So do the right thing.

Oregon Sierra Club

SIERRA CLUB
FOUNDED 1892

1821 SE Ankeny St • Portland, Oregon 97214
Main: 503-238-0442 • Fax: 503-238-6281

November 10, 2016

Protecting Portland through the Triple Catastrophe: The Climate Crisis || Our Earthquake || Federal Energy Policy

"No New Fossil Fuels Infrastructure"

A Second Open Letter to the Portland City Council

Preamble Summary, Resolution 37168, November 12, 2015: Oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways.

Thank you for your ongoing commitment to full implementation of this binding policy resolution. Your leadership has never been more important to our city, state, region, nation, and the planet than it is today.

Our planned purpose was to join with our many colleagues here to continue to encourage your maximum attention to the complex double catastrophe of the climate crisis and the inevitable Cascadia subduction zone earthquake that will devastate our region. You are intimately familiar with both these unprecedented challenges (please see below for a few comments).

But today I must add **a fresh third catastrophe: imminent changes to Federal energy and climate policy**, which will destroy a huge percentage of the very limited progress made in moving Federal policy beyond the clear and present dangers of the fossil fuel era.

None of us expected that a climate denier would ever occupy the Oval Office. The most brutal components of the fossil fuels energy industry have been deeply engaged in transition planning for President-Elect Trump and are moving quickly to prepare for power. President Obama has taken several steps in recent years to elevate attention to the climate crisis and to move partially away from his prior "All of the Above" energy development strategy. The Trump Administration will maximize reversal of those actions.

With a unified National governmental power structure, the Republican leadership will move at warp speed. That is a procedural approach they have honed to perfection in unified State government control in recent years; Wisconsin is a prominent example, but it is now standard

operating procedure within their governmental playbook, implemented in many states. To be sure, there is the possibility of some limited checks and balances in the current Senate filibuster protocols, and redress of over-reach is sometimes available through the courts. Nonetheless, we must now be prepared to see the most vigorous moves for fossil fuel exploitation and monetization in our nation's history – and that is already a high bar.

For example, we are likely to see immediate concerted efforts to enact **Federal pre-emption** over State and Local efforts against fossil fuels – especially against transport, storage, and export efforts. This risk makes Portland's action *now* to protect your policy resolution – ***our City's*** policy resolution! – especially urgent.

Traditionally, it has been much easier politically to protect established law against reversal assaults than to fight for new efforts that contradict Federal (or State) pre-emption statutes. There is no guarantee that will apply in this arena, but we must proceed urgently to carve out as much local progress as we possibly can.

Simultaneously, the chemistry, physics, and geology of the intersecting catastrophes of our global climate crisis and the Cascadia subduction zone earthquake proceed apace. For the former, the agencies you manage are working to deal with it every day, with vitally important mitigation and adaptation strategies against the effects that we all see and feel now. Complete implementation of the policy resolution is critically important to that.

For the latter, a ticking time bomb in process for almost 317 years, it is the hardest kind of emergency to deal with: like a sudden life-threatening illness or catastrophic accident, it is completely irrelevant to daily life until the moment when it takes over everything one must do.

We now know that placing some 95% of our fossil fuel storage and baseline distribution infrastructure in the Cascadia seismic liquefaction destruction zone on the sands of the Willamette flood plain was the worst possible choice. You have all participated in many briefings and preparedness exercises around our inevitable impending earthquake; you know very well how deadly and destructive it will be, both at the time of fracture and in the multi-year aftermath. That is why it is imperative that the formal implementation of our City's binding policy resolution not permit **any** expansion of catastrophic risk in seismically unsafe zones, with seismically unsafe facilities.

Chemistry, physics, and geology ignore politics – and the new Federal politics just chosen through the ancient Electoral College structure will ignore chemistry, physics, and geology. This perfect storm of triple catastrophic risk requires that everyone recognize that now is not the time for misguided "split the baby" pseudo-compromise. You must resist that fallacy and temptation.

Thank you for your consideration.

Ted Gleichman, Policy Advisor, *Beyond Gas & Oil Team*, Oregon Sierra Club

188142

Oregon Sierra Club

SIERRA CLUB
FOUNDED 1892

1821 SE Ankeny St • Portland, Oregon 97214
Main: 503-238-0442 • Fax: 503-238-6281

July 13, 2016

"No New Fossil Fuels Infrastructure": First, Do No More Harm

An Open Letter to the Portland City Council

Preamble Summary, Resolution 37168, November 12, 2015:
Oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways.

Portland is at imminent risk of squandering its prior leadership in dealing with the local response to our global climate crisis. The problem is serious bureaucratic back-sliding into a "business as usual" mentality in the implementation of Resolution 37168. Unless you deal promptly and firmly with signals of agency misunderstanding of both the letter and spirit of this resolution, this situation could too easily become a local crisis in its own right.

This binding policy resolution, which you approved unanimously on November 12, 2015, catapulted our city into the forefront of local, regional, national, and international efforts to confront one of the greatest sets of challenges our species has faced since the development of industrial technology.

It is vital that you remember the genesis of this effort, and re-commit to the specific – often difficult! – changes in municipal and stakeholder planning and behavior for your mission.

There is a straightforward but interlocking four-part schematic that outlines precisely where we are as a global and local political economy:

1. **Keep It in the Ground**
2. **Do No More Harm**
3. **Reduce the Need**
4. **Make the Just Transition**

1. Keep It in the Ground

We now know that our combustion of fossil fuels has moved our global atmosphere and temperature structure into such dangerous territory that civilization is genuinely at risk if we do not make radical reversals in behavior.

At least four-fifths of global fossil fuel reserves must be left completely intact, in the ground, and never exploited.

This requirement is completely contrary to modern corporate financial structure, because proven reserves constitute roughly half of the assets (and therefore a major component of share value) of the fossil fuels companies. This is one of the key reasons why business-as-usual policies and procedures are inevitably doomed to failure – for both corporate financial health and planetary social and environmental health. This has been one key factor in the current financial collapse of shareholder equity in coal corporations.

Acceptance of ***Keep It in the Ground*** is a mandatory first step for both the psychological and political economy revisions we must make for survival. This is the foundation for the other three intersecting components of this basic methodology. Resolution 37168 speaks eloquently to many of the issues inherent in our mandatory recognition of our new reality.

2. Do No More Harm

Understanding the compulsory physics and chemistry of ***Keep It in the Ground*** leads inevitably to this second principle: don't make things worse by continuing down the same destructive path. We must begin with our environmental version of the first line of the Hippocratic Oath: ***Do No More Harm***.

This is the required primary set of actions for directly confronting the climate crisis: to get out of this hole, first we have to stop digging. "No New Fossil Fuel Infrastructure" is the easiest way to proceed first. The core of Resolution 37168 – preventing new export and storage infrastructure – falls completely within this principle.

It is imperative that you maintain and defend your policy.

3. Reduce the Need

Simultaneously, demand reduction is vital to permit us to ***Do No More Harm***. Gradual complete elimination of coal for electrical production in Oregon is now state law. The same goal must be applied to oil and natural gas, urgently. As I noted in my testimony to you on November 12, there is no fossil fuel solution to the fossil fuels crisis.

You must align City procedures and economic governance with this need for both conservation and energy efficiency (which are overlapping but distinct sets of tools). Beyond direct City internal control and external economic governance, you must also push the Portland business communities – especially the fossil fuels companies – and the other governments that overlap with and impact your work to both ***Do No More Harm*** and ***Reduce the Need.***

4. Make the Just Transition

Finally, underpinning all these efforts must be the recognition that there is no substantive difference among environmental, economic, and social justice. We are engaged in a transition into a full-renewables energy economy, and that will be impossible unless it is done based on justice for all. The urgency of the effort means that coordination of ***Do No More Harm, Reduce the Need,*** and ***Make the Just Transition*** becomes the essence of this era.

Thank you for your consideration.

Ted Gleichman, on behalf of Oregon Sierra Club

188142

SIERRA CLUB
OREGON CHAPTER

November 10, 2016

Mayor Hales
Commissioner Saltzman
Commissioner Fritz
Commissioner Fish
Commissioner Novick
Auditor Caballero

Re: Agenda Item 1259 for Portland City Council Meeting, November 10, 2015
Restrict bulk fossil fuel terminals (Ordinance introduced by Mayor Hales; amend Title 33, Planning and Zoning)

The Oregon Chapter of the Sierra Club supports an implementation of the Fossil Fuel Infrastructure Policy which does not allow for any expansion of Bulk Fossil Fuel Terminals.

It is clear to anyone who understands science or who is willing to look dispassionately at the evidence, that climate change is real and that its effects are evident today. It is also clear that the consequences of ignoring greenhouse gas emissions will lead to a future in which the lives of our children and grandchildren will be very difficult.

The results of the recent elections also make it clear that we cannot rely on our national leaders to solve this problem for us. Leadership will have to come from the bottom up, starting here in our city.

The United Nations just released a report on the emissions gap[1]: the difference between the amount of greenhouse gas emissions needed to keep the temperature of the world from rising beyond 1.5 degrees Celsius and the amount we are currently emitting. The news is not good. In short, we need to radically reduce the amount of fossil fuels we are using and we need to begin doing so now.

Additionally the staff report of the Planning and Sustainability Commission makes it clear that overall demand for fossil fuels is already flat. It is reasonable to expect a decline as more electric vehicles are put into service.

There is absolutely no rational basis for expanding fossil fuel infrastructure.

You, the members of Portland's City Council took a courageous, visionary action when you adopted the Fossil Fuel Infrastructure Policy on November 12, 2015, in which it states in part:

"NOW, THEREFORE, BE IT RESOLVED, that the City Council will actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuel in or through Portland or adjacent waterways ..."

---

[1] UNEP (2016). The Emissions Gap Report 2016. United Nations Environment Programme (UNEP), Nairobi, http://web.unep.org/emissionsgap/

Nowhere in the language of the resolution does it list exceptions which allow for the expansion of the described infrastructure. In light of what we know about our climate and our national politics, it is imperative that we do not continue to expand fossil fuel infrastructure.

Therefore, the Sierra Club urges you to modify the language of the proposed ordinance to eliminate:

1. The 2 million gallon minimum as part of the definition of "Bulk Fossil Fuel Terminals". and
2. The allowed expansion of Bulk Fossil Fuel Terminals when replacing existing facilities during a seismic upgrade.

No expansion of existing facilities should be allowed.

Gregory P. Monahan, PhD

Gregory Monahan, PhD
Chair, Beyond Gas & Oil Team
Oregon Sierra Club
7225 SW 13th Ave
Portland, OR 97219

TESTIMONY ON FOSSIL FUEL TERMINAL ZONING CODE AMMENDMENTS

My name is Alan Smith and I am a Portland resident.

Natural gas is not a clean fuel. Saying it's clean because burning it is less carbon intensive than the fuel it replaces is like saying smoking tobacco is healthy, because it won't kill you as quickly as smoking opiates.

Over a 20 year period methane is 84 times more powerful than CO2 as a greenhouse gas and fugitive emissions have increased more than 30% above the EPA's estimate over the last decade.[1] One scientist has said this is almost certainly due to fracking. There should be no exemption for NW Natural.

According to the IPCC 40-70% of species would be doomed to extinction by global warming of 3.5 degrees Celsius.[2]

Climate change is estimated to kill 400,000 people per year already, and the number is projected to exceed 600,000 by 2030.[3] Billions of people migrating to avoid starvation from drought would cause chaos around the world.

To have a 66% chance of keeping global warming below 2 degrees Celsius, 68% of the proven reserves must remain in the ground.[4]

The Fuel Terminal Representatives claim these amendments are emotionally driven. This is a false argument, and an arrogant one at that. It's also an example of attacking your opponent's character when you can't win the debate with rational arguments.

It's true the dire warnings we hear from the scientific community stir emotion, especially when we hear that the damage to life on earth is proceeding faster than predicted, but we should all remember that it's not just local jobs or lives that matter, and there are no good jobs on a dead planet.

---

[1] "A large increase in U.S. methane emissions over the past decade inferred from satellite data and surface observations" by A. J. Turner, et al., March 2016, *Geophysical Research Letters*

[2] "Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change", IPCC, Geneva, Switzerland, 2007

[3] "Obama Is Right: Climate Change Kills More People Than Terrorism", By Rebecca Leber, February 11, 2015, *New Republic*

[4] "The Sky's Limit: Why the Paris Climate Goals Require a Managed Decline of Fossil Fuel Production", by Greg Muttitt, September 22, 2016, Oil Change International

I urge you to eliminate the allowance of a 10% expansion of existing terminals, and support the recommendation of pursuing seismic safety thru building code changes at the state level.

Since the Recommended Draft was written, JAX LNG announced plans for a 2 million gallon facility in Jacksonville, Fla., intended to supply bunker barges for distribution on the east coast. The 2 million gallon threshold should also be eliminated, so such facilities will not be built in Portland.

Thank you for your attention to these comments.

Alan Smith

188142

From: Pamela Smith
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Thursday, November 10, 2016 8:10:19 AM

Pamela Smith
1822 SE 12 Ave
Portland, OR 97214

November 10, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Pamela smith

From: Stephanie Taylor
To: BPS Fossil Fuel Zoning
Subject: Enact a Full Ban on All New Fossil Fuel Terminals & Prohibit Expansions of Existing Terminals
Date: Thursday, November 10, 2016 11:26:02 AM

Dear Portland City Council,

The policy set by City Council advanced our transition away from dirty, dangerous fossil fuels, and the City received worldwide praise for its leadership. Portland must continue to take bold action for a clean energy economy. **On behalf of future Portland generations, please prohibit expansions of existing fossil fuel terminals.**

Please enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities. We learned first-hand during the June 3, 2016 derailment in Mosier that oil trains are dangerous, and the City should use its fossil fuel zoning code amendments to diminish their use rather than creating space for many more. Fossil fuel demand should be declining: the amendments need not allow for new fossil fuel infrastructure. Staff explained that fossil fuel use may be flat or declining, negating the need for new or expanded fossil fuel terminals.

City Council should allow existing terminals to operate or upgrade for seismic readiness, but not to expand. Allowing fossil fuel terminals to expand is a clumsy and unnecessary way to push seismic upgrades at dangerous fossil fuel storage tanks near rivers and neighborhoods. The City has other, more effective means of encouraging seismic upgrades than an imprecise, open-ended incentive to build more fossil fuel infrastructure. We agree that the City should "develop proposals for State building code changes to improve seismic resilience and require seismic upgrades comparable to proposed requirements on unreinforced masonry buildings," as stated on page 62 of the PSC's recommendation. Let's use the right tools to make seismic upgrades. We don't need to expand fossil fuel terminals in order to make them safer.

Climate science is clear that we must keep fossil fuels in the ground to avoid catastrophe. Additionally, there is growing support for renewable energy in the City of Portland. Portland must accelerate the trend of declining fossil fuel use in order to meet its 2050 carbon reduction goals.

Make Portland Proud!

Stephanie Taylor
1918 SE Ankeny
Portland, OR 97214

From: Kathie Nunn
To: BPS Fossil Fuel Zoning
Subject: City of Portland - Recommended Draft Fossil Fuel Terminal Zoning Amendments - Curcio Letter - Revised with Enclosure
Date: Thursday, November 10, 2016 2:08:52 PM
Attachments: TBL - Letter to Portland City Council RE Recommended Draft Fossil Fuel Terminal Zoning Amendments 11 10 16.pdf
Importance: High

The attached document is being sent to you on behalf of Bob Curcio, President and CEO of Tidewater Barge Lines. Thank you for the opportunity to provide comments regarding the draft fossil fuel terminal zoning amendments.

Warm regards,

Kathie Nunn
Executive Assistant

Tidewater Barge Lines, Inc.
6305 NW Old Lower River Road
Vancouver, WA 98660
Direct: 360/759-0335
Fax: 360/694-8981
kathie@tidewater.com

TIDEWATER
TRANSPORTATION & TERMINALS

November 10, 2016

Portland City Council
c/o- Council Clerk
1221 SW Fourth Avenue, Room 130
Portland, Oregon 97204

RE: City of Portland - Bureau of Planning and Sustainability
Recommended Draft Fossil Fuel Terminal Zoning Amendments

Thank you for the opportunity for Tidewater Barge Lines ("Tidewater") to provide comments regarding the draft zoning amendments that would restrict development and expansion of bulk fossil fuel terminals.

Tidewater is a marine transportation and terminal company based in the Pacific Northwest that employs approximately 275 people. Tidewater has been in business since 1932 and is the largest inland marine transportation company west of the Mississippi River with 16 tugboats, 170 barges and five marine terminals. Tidewater's vessels help to move millions of tons of freight every year on Pacific Northwest waterways, reducing congestion on the state's highways and railroads while producing far fewer pollutants and carbon emissions than trucks and trains transporting equivalent tonnage. Likewise, our industry's incident statistics and safety record show that the towing industry in the Pacific Northwest has one of the best programs for moving commodities securely and safely in the nation.

We have reviewed the proposed zoning changes and are concerned that these amendments will restrict economic development in the Pacific Northwest. We feel that energy terminals can be built, expanded and operated safely in the City of Portland. Energy terminals have the ability to create a positive economic impact and support new and existing family wage jobs in our region.

In addition, we have concerns that the proposed zoning changes will have negative environmental consequences to the Pacific Northwest. The proposed zoning changes create uncertainty about the future of energy terminals. These terminals are key to a fuel distribution network that allows Tidewater to supply fuel by barge from Portland to Eastern Oregon and Washington in an efficient and environmentally friendly matter. As noted in the enclosed document, four barges pushed by a tugboat is the equivalent of 538.5 trucks or 140 railcars that travel on the highways and railroads in our region. If these terminals cease operations, fuel will have to be distributed in other modes of transportation such as truck and railcar. Therefore, if barging is no longer a viable option for transporting fuel, then every four barge tow would be potentially replaced with 538.5 trucks or 140 rail cars travelling on the highways and railroads in the Columbia River Gorge.

6305 NW Old Lower River Road, Vancouver, WA 98660 • 360.693.1491 • www.tidewater.com

In conclusion, Tidewater is an advocate for environmental stewardship in the Pacific Northwest and hopes the City of Portland will consider having a constructive dialogue with Tidewater and the other stakeholders to generate an implementable fossil fuel distribution policy that addresses climate change goals, public safety and environmental protection without significantly adversely impacting the viability of Oregon's economy and its waterfront industry. Tidewater urges the Portland City Council not to adopt these proposed fossil fuel terminal zoning amendments.

Thank you for your consideration and the opportunity to comment on this important matter.

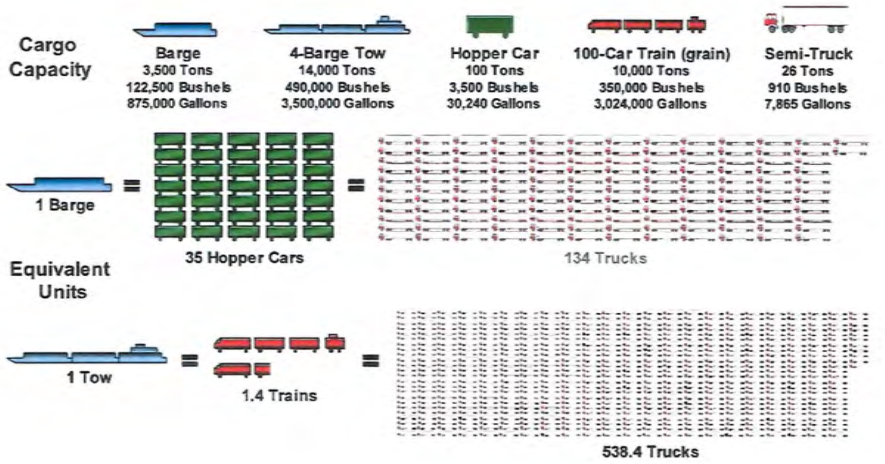
Sincerely,

Robert A. Curcio
President & CEO

Enclosure

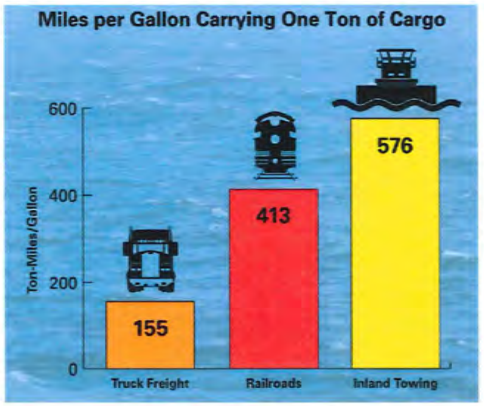
Environmental Advantages of Barging

Freight Comparison of Barges, Trains and Trucks



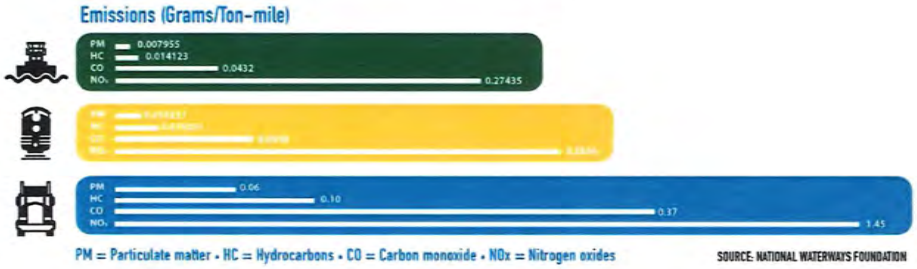
Source: U.S. Army Corps. of Engineers

Saving Energy



Source: Texas Transportation Institute

Ensuring Clean Air



188142

From: Theodora Tsongas
To: BPS Fossil Fuel Zoning
Subject: Comments to Portland City Council
Date: Thursday, November 10, 2016 11:21:39 AM
Attachments: Comments on the Fossil Fuel Terminal Zoning Recommended by Portland Bureau of Planning and Sustainability to the Portland City Council.docx

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Please find my comments attached.

Comments to the Portland City Council on the Fossil Fuel Terminal Zoning Amendments Recommended by Portland Bureau of Planning and Sustainability - November 10, 2016

I am Dr. Theodora Tsongas, an environmental health scientist, and a member of the Environmental Health Working Group of Oregon Physicians for Social Responsibility and the Multnomah County Local Emergency Planning Committee. The Fossil Fuel Terminal Zoning code changes recommended by the Portland Bureau of Planning and Sustainability are well thought out. I commend PSC's restriction of aggregation of small fossil fuel terminals, and I commend PSC for rejecting a request by NW Natural to exempt its facilities from the fossil fuel code amendments.

But the recommended code changes still raise concerns about public safety and could pose a threat to our community and neighborhoods. We can do better to more fully reflect the city's Resolutions 37168 (the Fossil Fuel Policy Resolution), 37164 (the Oil Train Resolution), and the Climate Action Plan.

Please let me remind you of the fire that resulted from a collision of an oil tanker truck with an oil train. Unfortunately, the truck driver was killed. Fortunately, the train cars burned but did not explode. It was a very close call for nearby industries, workers and residents in NW Portland. In Mosier the derailed train cars burned for days and destroyed or disabled much of the town's water and sewer infrastructure, exposed residents and visitors to noxious smoke from the oil fires as well as causing major disruption in the life of the town. Accidents happen.

Let 's not increase the likelihood of an oil fire. We need to truly "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." This means actively discouraging increases in demand for fossil fuel unit trains in Portland.

If we look at the ten large oil facilities listed in Figure 7 of PSC's recommendation, and apply a 10% across- the-board increase in terminal capacity, that would result in additional storage of 39 million gallons of oil – a volume equivalent to roughly 13 unit trains of explosive Bakken crude oil.

Allowing a 10% increase in capacity will not discourage the development of fossil fuel infrastructure. We must allow for seismic and safety upgrades without increasing capacity, or we defeat the purpose of the resolutions and the Climate Action Plan.
Why take chances with our neighborhoods that are on the rail corridor? And let's not take a chance with the health and safety of our Linnton neighbors who live so close to the tanks.
And, let's truly take the lead in combating climate change by accelerating the decline of fossil fuel use and by redirecting our resources to the development and implementation of sustainable, clean energy sources. Let's continue the great work that you have begun!

Thank you for considering my comments.

Theodora Tsongas, PhD, MS
Portland, OR 97215

188142

From: Anais Tuepker
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 10, 2016 12:22:14 PM

Dear City Council,

I have written to you in support of a strong fossil fuel infrastructure ban before, but today, in the aftermath of our presidential election, I write with an even greater sense of urgency than before. Like many Portlanders, I am deeply concerned for the direction of our country in the next four years.

But I also have hope that this election will serve as a wake-up call to all of us that we are the ones who must take decisive action on climate change. We, right here, must be the leaders in moving away from a fossil fuel economy, as quickly as is humanly possible.

That means, in precise and immediate terms, that we cannot allow any new terminals. The draft recommendations still allow for new terminals up to 2 million gallons. Any new terminal is s shortsighted investment and sends entirely the wrong message to businesses and other stakeholders that we will allow the norms of a fossil-fuel dependent economy to continue.

Similarly, expansions at existing terminals should not be allowed, nor should they be linked to calls for seismic safety upgrades. Safety upgrades are absolutely needed, and plans should be reviewed and recommended through the state's existing channels for improving seismic safety. But if facility owners see upgrades as linking to a one-time opportunity to expand facility capacity, they will take it, and that again sends the wrong message and goes against the spirit of the infrastructure ban that the Council passed last year. Allowing a 10% expansion of existing facilities could translate into 39 million gallons of additional oil being shipped, burned, and added to the already overstretched "budget" of fossil fuels we can burn before being guaranteed of disastrous rises in global temperatures.

I urge you to please make this a true ban on new fossil fuel infrastructure, with no exceptions. We are running out of time to protect so much of what we hold dear in our natural world; we are putting our social fabric in jeopardy. Portland needs to be brave and step up for a sustainable, inclusive, clean-energy future that works for all of us.

Sincerely,

Anais Tuepker, PhD MPH

From: Anais Tuepker
anaistuepker@gmail.com
1414 SE Lafayette St
Portland 97202

From: Tyler Wagner
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 10, 2016 5:14:07 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

As a young Catholic inspired by Pope Francis, I believe that we have a moral imperative to care for our planet in a way that protects all people, especially the poor and for the benefit of future generations. With that in mind, the current Fossil Fuel Zoning Amendments recommended draft falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Tyler Wagner

From: Tyler Wagner
thwagner213@gmail.com
3527 SE Madison St
Portland 97214

188142

From: Lynn Wallis
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 10, 2016 12:19:24 PM

With the election of Trump, it is even more vital to do whatever possible to protect our state's environment. This is one thing we can do, and I call upon you in the name of future generations to do it: continue to actively oppose new fossil fuel infrastructure in Portland.Ly

From: Lynn Wallis
plwallis3@msn.com
6404 SE 23rd Avenue. Apt. 406
Portland 97202

188142

From: Richard Weinhold
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 10, 2016 10:40:32 AM

Enact these protections now, before the Trump steamroller takes the reins and forces dangerous and anti-environmental practices upon us. We have the opportunity to have the first strike- so please do it! Protect the Columbia River and our communities.

From: Richard Weinhold
gr8trips@yahoo.com
2006 Hwy 101N, PMB 709
Florence 97439

Mayor Hales and Commissioners,

With our country about to be taken over by a man who has vowed to reverse environmental laws and dismantle EPA. Now is the time to stand up boldly to the fossil fuel industry, stop kowtowing to big oil interests who are trying to make the city back down on this historic ordinance. There is a need to expand on this ordinance to assure safety.

The Cascadia earthquake: It's not if it is going to happen,but when. If it doesn't happen in the next 50 years we have dodged an 85% chance that it will. Two other adjacent fault lines and one under the tank farms, along with liquefiable soils and lateral movement, make the location for these fossil fuel tanks the worse place possible to locate them.

Natural hazards are not the only problem that could result in an environmental catastrophe of epic proportions. In the last few years we have had 3 near misses due to accidents that could have achieved the same disastrous results.

Do not exempt NW Natural from fossil fuel code amendments. Storage of such fuels near the fuel storage tanks and Siltronics liquid hydrogen tank are extremely dangerous. Many small tanks can quickly add up to a large storage facility.

Goal 7 of Oregon Land Use Law states that cities should pass zoning laws where hazards cannot be mitigated.

Cercla law requires responsibility. Make sure insurance or assurance bond coverage is enough to include not only the environmental costs of destruction and cleanup, but also loss of life, property loss- private, industrial, and public. Which would include Linnton, St Johns, Industries, Forest Hills Park, the Willamette River and the Columbia River, wildlife and aquatic life adjacent to the fossil fuel industries. If Fossil Fuel industries will not or cannot acquire such insurance, than they should be required to move to safer ground.

Make the tanks move if they will not upgrade seismically to the highest standards needed.

Can you imagine the amount of carbon a fire from that area would create? You can't extinguish a fire particularly of that magnitude, millions and millions of gallons, you have to let it burn out.

Do not allow storage of RR tank cars filled with hazardous materials to be stored in this area, sometimes for days on end. That amounts to mobile storage of fossil fuels. Some stored as close as 25 feet from Linnton's Day Care Center. The dangers are greatly increased by RR switching that takes place in the Linnton/ Willbrige area. There are many uncontrolled railroad crossings in Linnton with tanker trucks loaded with volatile fuel crossing over them.

Kinder Morgan's leaking, legacy Columbia pipe line and Gasco's pipe line should not be adjacent and should be relocated or replaced.

Taxpayers, neighborhoods, families, the environment should not have to bear the consequences and costs of fossil fuel industries that favor profits over people.

For all your constituents don't back down on this ordinance, make a bold statement. PROTECT US.

Thank you for your time and consideration on this matter,

Darise Weller : Linnton resident and LNA board member, Portland Harbor Community Advisory Group member, North West Toxic Communities Coalition for EPA Region 10 board member, and very concerned citizen.

From: Rasmussen, William
To: BPS Fossil Fuel Zoning
Cc: Jessica Spiegel (jspiegel@wspa.org)
Subject: WSPA Written Testimony Regarding Proposed Fossil Fuel Terminal Zoning Amendments
Date: Thursday, November 10, 2016 10:48:40 AM
Attachments: Final LETTER WSPA Portland Terminal 11 10 2016.pdf
WSPA Appendix 1, Proposed Portland Zoning Ordinance.pdf

Dear Council and Planning Staff,

Please find the attached testimony from WSPA and include it in the record of the above referenced matter. We will also provide a physical copy of the testimony at the hearing today.

Thank you,

William L. Rasmussen, P.C.
Partner

Miller Nash Graham & Dunn LLP
3400 U.S. Bancorp Tower | 111 S.W. Fifth Avenue | Portland, Oregon 97204
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WSPA
Western States Petroleum Association

Credible Solutions • Responsive Service • Since 1907

Catherine H. Reheis-Boyd

President

Via Email and Hand Delivery at Hearing: fossilfuelzoning@portlandoregon.gov

November 10, 2016

Honorable Mayor Charlie Hales
and City Commissioners
City of Portland
1221 SW 4th Avenue, Room 130
Portland, OR 97204

Re: Western States Petroleum Association Comment for PSC Fossil Fuel Terminal Zoning Amendments

Dear City Council Members:

The Western States Petroleum Association (WSPA) appreciates the opportunity to provide comments on the proposed PSC Fossil Fuel Terminal Zoning Amendments. WSPA is a non-profit trade association representing companies that explore for, produce, refine, transport, and market petroleum and petroleum products in five western states including Oregon. WSPA members operate petroleum terminals in Portland. WSPA opposes the Planning and Sustainability Commission's recommended zoning amendments under Resolution No. 37168, Fossil Fuel Terminal Zoning Amendments.

WSPA members have operated in the energy corridor along Northwest St. Helens Road for decades. This corridor provides key energy and emergency infrastructure as recognized by various city, state, and federal documents. WSPA members have grown concerned that the amendments go beyond the original City Council adopted resolution No. 37168 to constrain existing operations and projects for current and near-future regional needs for energy.

The recommended zoning amendments would create a number of substantial unintended consequences. Specifically, the recommended amendments would:

- Prevent and discourage terminal upgrades, including tank seismic upgrades, due to the business impacts of capping capacity and operational sequencing for upgrading tanks, resulting in *fewer* upgraded tanks;

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- Prevent and discourage replacing equipment that has reached end of life;
- Prevent and discourage equipment upgrades necessary to meet market demand or comply with federal and state law;
- Prevent and discourage safety and efficiency upgrades;
- Restrict infrastructure that serves the region as described above, in contradiction of the new City Comprehensive Plan provision governing fossil fuel infrastructure in the City's adopted 2035 Comprehensive Plan Policy 6.48;
- Fail to clearly specify how existing infrastructure can expand on existing sites, to adjacent properties, and to nearby non-adjacent properties;
- Restrict new infrastructure related to Oregon's low carbon fuel standards, Oregon's Renewable Fuel Standards, federal Renewable Fuel Standards, and similar laws;
- Fail to provide for sufficient facilities to serve future energy needs;
- Stymy [that's quite the word! How about Thwart?] potential future technologies that do not fit within the contemplated framework;
- Attempt to exclude Portland from the national and regional energy market;
- Introduce a host of ambiguities and uncertainties to the marketplace that are necessary for a thriving economy;
- Not align with state and federal policy regarding siting energy infrastructure or transportation of fuels;
- Encourage less efficient (and potentially less safe) transportation by truck over more efficient modes of transportation;
- Fail to provide for the economic impact assessment called for by Resolution No. 37168;

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- Fail to adequately engage Oregon and Metro residents and businesses outside Portland that will be impacted by the bottleneck in energy distribution created by the proposal.

State and federal laws govern state and regional energy and transportation policy, including through the U.S. Constitution, federal law, and state land use law. The unintended consequences described in this letter would create a bottleneck in energy supply for the state and region through these zoning provisions that violate the above federal and state policies. The proposal is inconsistent with Oregon's coordinated land use planning system, Metro's regional plan, the City's Comprehensive plan, and the City's land use regulations. We respectfully ask that the City slow down and take the time to develop an approach that takes into account all of the local and regional laws and policies impacted by this proposed amendment.

The City serves as a distribution hub for the region and state. Terminals in the City serve more than 90 percent of the statewide market. The proposal may result in reduced energy options available in other jurisdictions in Metro, Oregon, and other nearby states, without appropriately coordinating with those jurisdictions. The policy decisions that the City is trying to force through affect the region and state, and seem to exclude impacted parties in smaller cities and rural areas of the state.

We have enclosed proposed zoning code language in Appendix 1 that would address some of the issues raised in this comment. While the proposed language does not resolve all the concerns with the contemplated amendments, it addresses some of them.

Again, thank you for this opportunity to comment on the Fossil Fuel Terminal Zoning Amendments Proposed Draft. We hope the City reconsiders its push to pass regulations in this area and more narrowly tailors its rules to avoid unintended consequences.

Thank you for your consideration of WSPA's comments. If you have any questions or comments please contact me or my staff, Jessica Spiegel at Jessica@wspa.org or 360-352-4512.

Thank you,

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Appendix 1- Proposed Portland Zoning Ordinance

This appendix contains draft zoning code language from WSPA for City of Portland consideration in effectuating the City's fossil fuels policy. WSPA continues its position that the City's effort to regulate fossil fuels is misplaced and opposes those efforts. These proposed code provisions are intended to avoid some of the unintended consequences of the City's proposal and do not indicate WSPA support for City efforts to regulate fossil fuels. WSPA's draft code language contains four components:

1. Three new definitions for Portland Zoning Ordinance Chapter 33.910 (Appendix 1, page 2),
2. A use characteristics description for Bulk Fossil Fuels Terminals in Zoning Ordinance Chapter 33.920 (Appendix 1, page 2),
3. A new Energy Corridor Overlay Zone to protect existing fuel terminals in proposed new Portland Zoning Ordinance Chapter 33.490 (Appendix 1, page 4), and
4. Modifications to base industrial zones in Portland Zoning Ordinance Chapter 33.140 to recognize Bulk Fossil Fuel Terminals as a limited use (Appendix 1, page 7).

[Proposed New Definitions for Portland Zoning Ordinance Chapter 33.910]

Extra-Regional Bulk Fossil Fuel Terminal. A fossil fuel terminal that primarily serves markets outside of the Petroleum Administration for Defense District (PADD) 5 region, an area that includes the western states of California, Arizona, Nevada, Oregon, Washington, Alaska, and Hawaii.

Fossil Fuels. Fossil fuels include coal, petroleum, crude oil, refined oil, natural gas, bitumen, kerosene, propane, and other fuels made from decayed plants and animals that lived millions of years ago and are primarily used as a source of energy. Blended fuels containing a mix of fossil fuels and other fuel sources designed to address Oregon's low carbon fuel standards in Oregon Administrative Rules Chapter 340, Division 253, federal Renewable Fuel Standards, state Renewable Fuel Standards, or similar state or federal laws designed to reduce the carbon footprint of fuels are not fossil fuels.

Regional Bulk Fossil Fuel Terminal. A fossil fuel terminal that primarily serves the Petroleum Administration for Defense District (PADD) 5 region, an area that includes the western states of California, Arizona, Nevada, Oregon, Washington, Alaska, and Hawaii.

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[Proposed New Use Category For Bulk Fossil Fuel Terminals]

33.920.360 Bulk Fossil Fuel Terminal

A. Characteristics. Bulk Fossil Fuel Terminals are characterized by having all of the following (1) marine, pipeline or railroad transport access, (2) transloading facilities for transferring a shipment between transport modes (such as from rail to ship), and (3) storage facilities for fossil fuels exceeding a storage capacity of [____] million barrels for petroleum, [____] million gallons for liquefied natural gas (LNG), [____] million gallons for other liquefied gas fuels.

B. Accessory Uses. Accessory uses may include offices, pipes, industrial processing, shipping terminals, parking, storage, rail spur or lead lines, and docks.

C. Examples. Extra-regional liquefied natural gas (LNG) export facilities, propane export facilities, or coal export facilities.

D. Exceptions.

1. Improvements in the safety, or efficiency, seismic resilience, or operations of existing energy infrastructure.
2. Terminals or firms that are end users of fossil fuels or sell directly to end users of fossil fuels such as airports, manufacturing, agricultural businesses, utilities, gas stations, and power plants.
3. Development of emergency backup capacity.
4. Infrastructure that enables recovery or re-processing of used petroleum products
5. Terminals or firms that are storing, transporting or processing fuels and blended fuels containing a mix of fossil fuels and other fuel sources designed to address Oregon's low carbon fuel standards in Oregon Administrative Rules Chapter 340, Division 253, federal Renewable Fuel Standards, state Renewable Fuel Standards, or similar state or federal laws designed to reduce the carbon footprint of fuels.

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[Proposed New Chapter in Zoning Ordinance]

City of Portland Planning and Zoning Ordinance - Title 33, Planning and Zoning

Chapter 33.490 Energy Corridor Overlay Zone

Sections:

33.490.010 Purpose
33.490.020 Map Symbol
33.490.025 Relationship to Portland Zoning Code Chapter 33.140
33.490.030 No Size limits
33.490.040 Expansion of Energy Corridor Terminals

Map 490-1 Energy Corridor Overlay Zone Boundaries

33.490.010 Purpose

The Energy Corridor Overlay Zone recognizes the historic cluster of energy terminals, including fossil fuel terminals that have served as Portland's hub for energy transport for decades. The purpose of this overlay zone is to protect this area for future energy infrastructure growth, including but not limited to expansion of energy terminals.

33.490.020 Map Symbol

The Energy Corridor Overlay zone is shown on the Official Zoning Maps with a letter "m" map symbol.

33.490.025 Relationship to Portland Zoning Code Chapter 33.140

The Energy Corridor Overlay zone provides flexibility for the sites subject to this overlay in addition to what are allowed under Portland Zoning Code Chapter 33.140. If there is a conflict between what is allowed under this Chapter 33.490 and what would be allowed Chapter 33.140, this Chapter 33.490 controls.

33.490.030 No Size Limits

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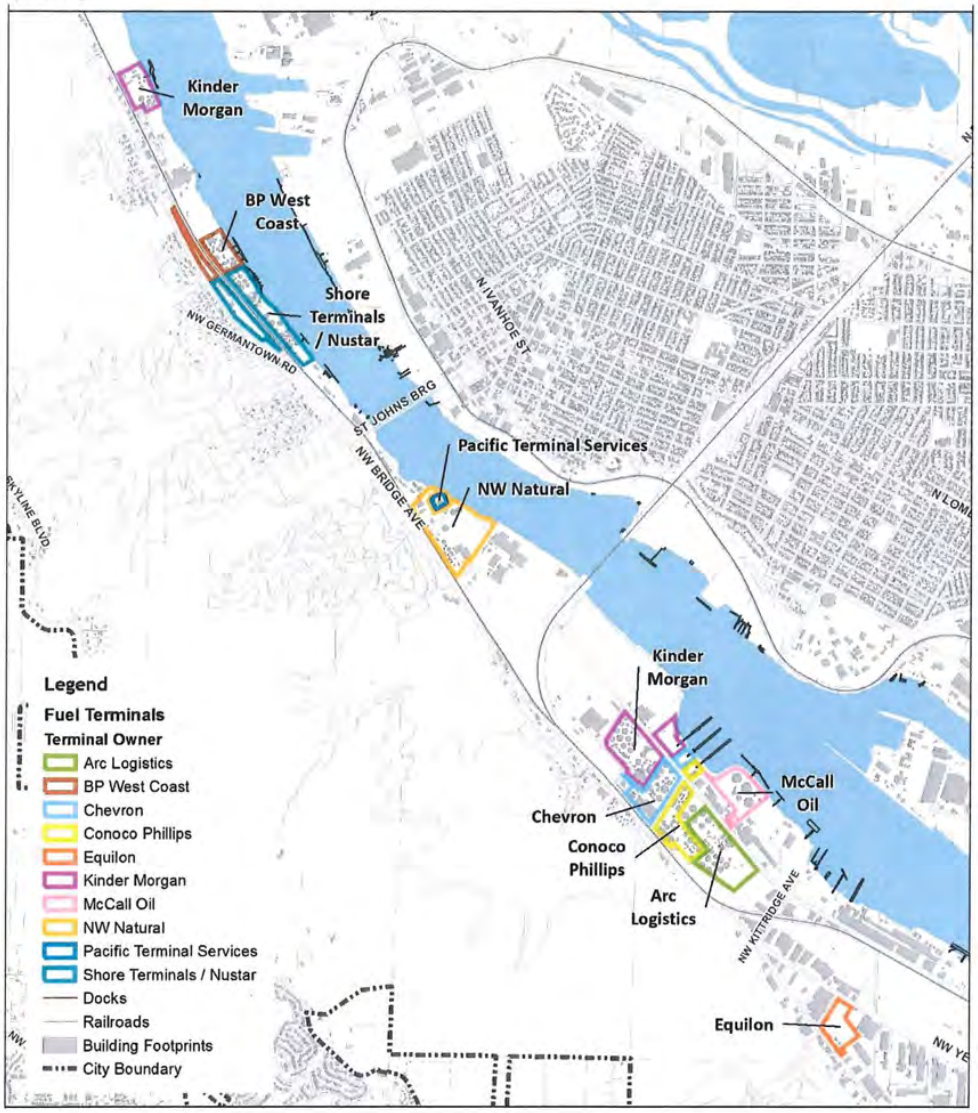
There is no storage or other size limits for Bulk Fossil Fuel Terminals or other energy facilities located in the Energy Corridor Overlay Zone.

33.490.040 Expansion of Energy Corridor Terminals

A Bulk Fossil Fuel Terminal in the Energy Corridor Overlay may expand to new lots and parcels outside of the Energy Corridor Overlay zone as provided in this Section 33.490.040. A Bulk Fossil Fuel Terminal may only expand onto parcels or lots that are all or partially within one half of a mile from a property line of the lot or parcel containing the Bulk Fossil Fuel Terminal. A Bulk Fossil Fuel Terminal that is expanded outside of the Energy Corridor Overlay will be treated as if it were entirely within the Energy Corridor Overlay for purposes of land use and all other city approvals. If an expansion of an energy facility to a new lot or parcel pursuant to this Section 33.490.040 includes proposed development that would qualify the combined energy facility as a Bulk fossil Fuel Terminal, the combined energy facility will be treated as if it were entirely within the Energy Corridor Overlay for purposes of land use and all other city approvals.

Map 490-1 Energy Corridor Overlay Zone Boundaries [*designate noted sites with "m" map symbol*]



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[Proposed Changes to Chapter 33.140 are shown in RED]

City of Portland Planning and Zoning Ordinance - Title 33, Planning and Zoning

Chapter 33.140 Employment and Industrial Zones

Sections:

General

33.140.010 General Purpose of the Zones
33.140.020 List of the Employment and Industrial Zones
33.140.030 Characteristics of the Zones
33.140.040 Other Zoning Regulations

Use Regulations

33.140.100 Primary Uses
33.140.110 Accessory Uses
33.140.130 Nuisance-Related Impacts
33.140.140 On-Site Waste Disposal

Site Development Standards

33.140.200 Lot Size
33.140.205 Floor Area Ratio
33.140.210 Height
33.140.215 Setbacks
33.140.220 Building Coverage
33.140.225 Landscaped Areas
33.140.227 Trees
33.140.230 Ground Floor Windows in the EX Zones
33.140.235 Screening
33.140.240 Pedestrian Standards
33.140.242 Transit Street Main Entrance
33.140.245 Exterior Display, Storage, and Work Activities
33.140.250 Trucks and Equipment
33.140.255 Drive-Through Facilities
33.140.265 Residential Development
33.140.270 Detached Accessory Structures
33.140.275 Fences
33.140.280 Demolitions

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33.140.290 Nonconforming Development
33.140.295 Parking and Loading
33.140.300 Signs
33.140.310 Superblock Requirements
33.140.315 Recycling Areas

General

33.140.010 General Purpose of the Zones

The employment and industrial zones are for areas of the City that are reserved for industrial uses and for areas that have a mix of uses with a strong industrial orientation. The zones reflect the diversity of industrial and business areas in the City. The zones differ in the mix of allowed uses, the allowed intensity of development, and the development standards. The regulations promote areas which consist of uses and developments which will support the economic viability of the specific zoning district and of the City. The regulations protect the health, safety and welfare of the public, address area character, and address environmental concerns. In addition, the regulations provide certainty to property owners, developers, and neighbors about the limits of what is allowed.

33.140.020 List of the Employment and Industrial Zones

The full and short names of the employment and industrial zones and their map symbols are listed below. When this Title refers to the employment or E zones it is referring to the first three listed. When this Title refers to the industrial or I zones, it is referring to the last three listed.

Full Name Short Name /	**Map Symbol**
General Employment 1	EG1
General Employment 2	EG2
Central Employment	EX
General Industrial 1	IG1
General Industrial 2	IG2
Heavy Industrial	IH

33.140.030 Characteristics of the Zones

A. General Employment. The General Employment zones implement the Mixed Employment map designation of the Comprehensive Plan. The zones allow a wide range of employment

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opportunities without potential conflicts from interspersed residential uses. The emphasis of the zones is on industrial and industrially-related uses. Other commercial uses are allowed to support a wide range of services and employment opportunities. The development standards for each zone are intended to allow new development which is similar in character to existing development. The intent is to promote viable and attractive industrial/commercial areas.

1. General Employment 1. EG1 areas generally have smaller lots and a grid block pattern. The area is mostly developed, with sites having high building coverages and buildings which are usually close to the street. EG1 zoned lands will tend to be on strips or small areas.

2. General Employment 2. EG2 areas have larger lots and an irregular or large block pattern. The area is less developed, with sites having medium and low building coverages and buildings which are usually set back from the street. EG2 zoned lands will generally be on larger areas than those zoned EG1.

B. Central Employment. This zone implements the Central Employment map designation of the Comprehensive Plan. The zone allows mixed-uses and is intended for areas in the center of the City that have predominantly industrial type development. The intent of the zone is to allow industrial and commercial uses which need a central location. Residential uses are allowed, but are not intended to predominate or set development standards for other uses in the area. The development standards are intended to allow new development which is similar in character to existing development.

C. General Industrial. The General Industrial zones are two of the three zones that implement the Industrial Sanctuary map designation of the Comprehensive Plan. The zones provide areas where most industrial uses may locate, while other uses are restricted to prevent potential conflicts and to preserve land for industry. The development standards for each zone are intended to allow new development which is similar in character to existing development. The intent is to promote viable and attractive industrial areas.

1. General Industrial 1. IG1 areas generally have smaller lots and a grid block pattern. The area is mostly developed, with sites having high building coverages and buildings which are usually close to the street. IG1 areas tend to be the City's older industrial areas.

2. General Industrial 2. IG2 areas generally have larger lots and an irregular or large block pattern. The area is less developed, with sites having medium and low building coverages and buildings which are usually set back from the street.

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D. Heavy Industrial. This zone is one of the three zones that implement the Industrial Sanctuary map designation of the Comprehensive Plan. The zone provides areas where all kinds of industries may locate including those not desirable in other zones due to their objectionable impacts or appearance. The development standards are the minimum necessary to assure safe, functional, efficient, and environmentally sound development.

33.140.040 Other Zoning Regulations

The regulations in this chapter state the allowed uses and the development standards for the base zones. Sites in overlay zones or plan districts and designated historical landmarks are subject to additional regulations which supersede those of this Chapter. The Official Zoning Maps indicated which sites are subject to the additional regulations. Specific uses or development types may also be subject to regulations in the 200s series of chapters.

Use Regulations

33.140.100 Primary Uses

A. Allowed uses. Uses allowed in the employment and industrial zones are listed in Table 140-1 with a "Y". These uses are allowed if they comply with the development standards and other regulations of this Title. Being listed as an allowed use does not mean that a proposed development will be granted an adjustment or other exception to the regulations of this Title. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters.

B. Limited uses. Uses allowed that are subject to limitations are listed in Table 140-1 with an "L". These uses are allowed if they comply with the limitations listed below and the development standards and other regulations of this Title. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters. The paragraphs listed below contain the limitations and correspond with the footnote numbers from Table 140-1.

1. Household Living uses in I zones. This regulation applies to all parts of Table 140-1 that have a [1]. Household Living in houseboats and houseboat moorages in I zones are regulated by Chapter 33.236, Floating Structures. Household Living in other structures is prohibited.

2. Group Living. This regulation applies to all parts of Table 140-1 that have a [2].

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a. General regulations. All Group Living uses except for alternative or post incarceration facilities, are allowed by right subject to the regulations of Chapter 33.239, Group Living.

b. Alternative or post incarceration facilities. Group Living uses which consist of alternative or post incarceration facilities are conditional uses. They are also subject to the regulations of Chapter 33.239, Group Living.

3. EG commercial limitation. This regulation applies to all parts of Table 140-1 that have a [3].

a. Limited uses.

(1) Office uses. Except for sites with historic landmarks, the net building area for Office uses is limited to the square footage of the site area. On sites with historic landmarks, the net building area for Office uses may be up to twice the total square footage of the site area. Exceptions to these size limits are prohibited.

(2) Retail Sales And Service uses. Except for sites with historic landmarks, the net building area plus any exterior display or storage area for Retail Sales And Service uses is limited to 60,000 square feet or the square footage of the site area, whichever is less. On sites with historic landmarks, the net building area plus any exterior display or storage area for Retail Sales And Service uses is limited to 60,000 square feet or twice the total square footage of the site area, whichever is less.

b. Conditional uses.

(1) Retail Sales And Service uses that exceed the area limits in 3.a(2) are a conditional use.

4. IG1 commercial limitation. This regulation applies to all parts of Table 140-1 that have a [4].

a. Limited uses. One Retail Sales And Service or Office use is allowed per site. The square footage of net building area plus the exterior display and storage area may be up to 3,000 square feet.

b. Conditional uses.

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(1) More than one Retail Sales And Service or Office Use on a site is a conditional use.

(2) Any Retail Sales And Service or Office Use where the net building area plus the exterior display and storage area is more than 3,000 square feet is a conditional use.

c. Prohibited uses.

(1) Except for sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 20,000 square feet or the square footage of the site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

(2) For sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 60,000 square feet or twice the square footage of the site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

5. IG2 commercial limitation. This regulation applies to all parts of Table 140-1 that have a [5].

a. Limited uses. Up to four Retail Sales And Service or Office uses are allowed per site. The square footage of the net building area plus the exterior display and storage area may be up to 3,000 square feet per use.

b. Conditional uses.

(1) More than four Retail Sales And Service or Office uses on a site is a conditional use.

(2) Any Retail Sales And Service or Office use where the net building area plus the exterior display and storage area is more than 3,000 square feet is a conditional use.

c. Prohibited uses.

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(1) Except for sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 20,000 square feet or the square footage of the site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

(2) For sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 60,000 square feet or twice the square footage of site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

6. IH commercial limitation. This regulation applies to all parts of Table 140-1 that have a [6].

a. Limited uses. Up to four Retail Sales And Service or Office uses are allowed per site. The square footage of the net building area plus the exterior display and storage area may be up to 3,000 square feet per use.

b. Conditional uses.

(1) More than four Retail Sales And Service or Office use on a site is a conditional use.

(2) Any Retail Sales And Service or Office use where the net building area plus the exterior display and storage area is more than 3,000 square feet is a conditional use.

c. Prohibited uses.

(1) Except for sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 12,000 square feet or the square footage of the site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

(2) For sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 25,000 square feet or twice the square footage of site area, whichever is less. Retail Sales And Service

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and Office uses that exceed these area limits are prohibited.

7. Self-Service Storage limitation. This regulation applies to all parts of Table 140-1 that have a [7]. The limitations are stated with the special regulations for these uses in Chapter 33.284, Self-Service Storage.

8. Waste-Related limitation. This regulation applies to all parts of Table 140-1 that have a [8]. All Waste-Related uses are conditional uses, unless they meet all of the following conditions in which case they are allowed by right.

a. The use must be approved by Metro under their authority as prescribed in ORS 268.317;

b. Metro's approval of the use must include a mitigation plan. The requirements for the mitigation plan must be approved by the City Council through an intergovernmental agreement with Metro, adopted prior to Metro's approval of the use; and

c. The location of the use must be in conformance with Metro's Regional Solid Waste Management Plan.

9. Community Service uses in EG zones. This regulation applies to all parts of Table 140-1 that have a [9]. Most Community Service uses are allowed by right. Short term housing may be allowed by right if it meets certain standards. See Chapter 33.285, Short Term Housing and Mass Shelters. Mass shelters are prohibited.

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Table 140-1
Employment and Industrial Zone Primary Uses

Use Categories	EG1	EG2	EX	IG1	IG2	IH
Residential Categories						
Household Living	CU	CU	Y	CU [1]	CU [1]	CU [1]
Group Living	CU	CU	L/CU [2]	N	N	N
Commercial Categories						
Retail Sales And Service	L/CU [3]	L/CU [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Office	L [3]	L [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Quick Vehicle Servicing	Y	Y	N	Y	Y	Y
Vehicle Repair	Y	Y	Y	Y	Y	Y
Commercial Parking	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]
Self-Service Storage	Y	Y	L [7]	Y	Y	Y
Commercial Outdoor Recreation	Y	Y	Y	CU	CU	CU
Major Event Entertainment	CU	CU	CU	CU	CU	CU
Industrial Categories						
Manufacturing And Production	Y	Y	Y	Y	Y	Y
Warehouse And Freight Movement	Y	Y	Y	Y	Y	Y
Wholesale Sales	Y	Y	Y	Y	Y	Y
Industrial Service	Y	Y	Y	Y	Y	Y
Railroad Yards	N	N	N	Y	Y	Y
Waste-Related	N	N	N	L/CU[8]	L/CU [8]	L/CU [8]
Bulk Fossil Fuels Terminal	L [17]	L [17]	L [17]	L [17]	L [17]	L [17]
Institutional Categories						
Basic Utilities	Y/CU [12]	Y/CU [12]	Y/CU [12]	Y/CU [13]	Y/CU [13]	Y/CU 13]
Community Service	L [9]	L [9]	L [10]	L/CU [11]	L/CU [11]	L/CU [11]
Parks And Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	N	N	N
Colleges	Y	Y	Y	N	N	N
Medical Centers	Y	Y	Y	N	N	N
Religious Institutions	Y	Y	Y	N	N	N
Daycare	Y	Y	Y	L/CU [11]	L/CU 11]	L/CU 11]
Other Categories						
Agriculture	L [16]	L [16]	L [16]	L [16]	L [16]	L [16]
Aviation And Passenger Terminals	CU	CU	CU	CU	CU	CU
Detention Facilities	CU	CU	CU	CU	CU	CU
Mining	N	N	N	CU	CU	CU
Radio Transmission Facilities	L/CU [14]	L/CU [14]	L/CU [14]	L/CU [14]	L/CU 14]	L/CU 14]
Rail Lines And Utility Corridors	Y	Y	Y	Y	Y	Y

Y = Yes, Allowed — CU = Conditional Use Review Required

L = Allowed, But Special Limitations — N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.140.100.B.

• Specific uses and developments may also be subject to regulations in the 200s series of chapters.

10. Community Service in the EX zone. This regulation applies to all parts of Table 140-1 that have a [10]. Most Community Service uses are allowed by right. Short term housing and mass shelters may be allowed by right if they meet certain standards, or may be a conditional use. See Chapter 33.285, Short Term Housing and Mass Shelters.

11. Community Service and Daycare limitations in I zones. This regulation applies to all parts of Table 140-1 that have a [11]. Community Service uses or Daycare uses up to 3,000 square feet of net building area are allowed. Community Service uses or Daycare uses larger than 3,000 square feet of net building area are a conditional use. Short term housing and mass shelters of any size are prohibited.

12. Basic Utilities in E zones. This regulation applies to all parts of Table 140-1 that have a [12]. Public safety facilities that include Radio Frequency Transmission Facilities are subject to the regulations of Chapter 33.274. All other Basic Utilities are allowed.

13. Basic Utilities in I zones. This regulation applies to all parts of Table 140-1 that have a [13]. Public safety facilities that include Radio Frequency Transmission Facilities are subject to the regulations of Chapter 33.274. Public safety facilities which have more than 3,000 square feet of floor area are a conditional use. The approval criteria are in Section 33.815.223. All other Basic Utilities are allowed.

14. Radio Frequency Transmission Facilities. This regulation applies to all parts of Table 140-1 that have a [14]. Some Radio Frequency Transmission Facilities are allowed by right. See Chapter 33.274.

15. Commercial Parking. This regulation applies to all parts of Table 140-1 that have a [15]. Except where plan district provisions supersede these regulations, Commercial Parking is a conditional use in the E and I zones. Within plan districts, there may be special regulations.

16. Agriculture. This regulation applies to all parts of Table 140-1 that have a [16]. Agriculture is an allowed use. Where the use and site meet the regulations of Chapter 33.237, Food Production and Distribution, the applicant may choose whether it is allowed as a Market Garden.

17. Bulk Fossil Fuels Terminals. Regional Bulk Fossil Fuel Terminals of any size are allowed. Extra-Regional Bulk Fossil Fuel Terminals may not exceed a storage capacity of [____] million barrels for petroleum, [____] million gallons for liquefied natural gas

ENERGY PROUD

(LNG), [____] million gallons for other liquefied gas fuels, except as may be allowed pursuant to the Portland Energy Corridor Overlay Zone. Coal terminals may not exceed a storage capacity of one ton of coal.

C. Conditional uses. Uses which are allowed if approved through the conditional use review process are listed in Table 140-1 with a "CU". These uses are allowed provided they comply with the conditional use approval criteria for that use, the development standards, and other regulations of this Title. Uses listed with a "CU" that also have a footnote number in the table are subject to the regulations cited in the footnote. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters. The conditional use review process and approval criteria are stated in Chapter 33.815, Conditional Uses.

D. Prohibited uses. Uses listed in Table 140-1 with an "N" are prohibited. Existing uses in categories listed as prohibited may be subject to the regulations of Chapter 33.258, Nonconforming Uses and Development.

33.140.110 Accessory Uses. Uses that are accessory to a primary use are allowed if they comply with specific regulations for the accessory uses and all development standards.

33.140.130 Nuisance-Related Impacts

A. Off-site impacts. All nonresidential uses including their accessory uses must comply with the standards of Chapter 33.262, Off-Site Impacts.

B. Other nuisances. Other nuisances are regulated by Title 29, Property and Maintenance Regulations.

33.140.140 On-Site Waste Disposal

On-site disposal of solid wastes generated by a use is subject to the same regulations as for uses in the Waste-Related use category. See Table 140-1.

Development Standards

[NO REVISIONS PROPOSED TO DEVELOPMENT STANDARDS]

ENERGY PROUD

My name is Diane Winn. I live at 1500 SW 11th Ave. I am a retired public health nurse and worked over 25 years conducting injury prevention research.

I was in these Chambers a year ago when you passed the Fossil Fuel resolution. What a proud moment it was. Our city leaders had taken an historic and bold step in addressing climate change! Portland was lauded throughout the country for approving the strongest fossil fuel ban in the US!!

Today, as you consider the zoning code amendments to implement the policy, I urge you to support the modifications recommended by PSR. With my background in public health, I am aware of the many threats to health and safety that fossil fuel transport and storage present. One relates to explosions and fires that can cause traumatic injuries and death and the release of toxins into the air.

An obvious fire risk is the transport of fossil fuels. In the past couple of years, at least 10 oil trains have experienced catastrophic derailments and explosions in North America. We all know about the derailment in Canada that demolished a city and killed 47 people. Thankfully Oregon escaped such a tragedy just 6 months ago when a train loaded with Bakken crude derailed and caught fire in Mosier. One way to reduce these risks is to reduce the need for fossil fuel transport. However, even a 10% increase in the capacity of one or all of our existing large fossil fuel terminals will result in more trains. This would conflict with the City's Oil Train Resolution.

Another major fire risk relates to storage. Oil and other fossil fuel storage tanks are at risk of fires and explosions from both man-made and natural causes. For example, a human-error fire in Mississippi in 2006 killed three workers after the fire traveled from one oil storage tank to another. Storage tanks located in liquefaction areas are at increased risk of spills, fires, and explosions during an earthquake.

Less than one year ago today, the potential for a fossil fuel tank fire hit too close to home. A tractor-trailer carrying fuel struck several train cars near the St. John's Bridge. Fuel from the big rig ignited, causing a fire with 70 foot flames. This occurred approximately 400 feet from a LNG storage tank.

Finally, I cannot conclude without mentioning the election results of two days ago. We **can not** expect the Federal government to do anything to address climate change and fossil fuels. It will be up to cities and states. I again ask you to take a very bold stand and pass a strong Fossil Fuel Policy that includes all fossil fuels and prohibits all new fossil fuel terminals and the expansion of existing terminals. Your leadership will serve as a beacon of hope to the rest of the country. I thank you for your service in making Portland a better place to live.

The mapping of fuels for the Clean Fuels Program would seem like the only reasonable way to allow a 10% increase in capacity.

188142

From: Rose Christopherson
To: BPS Fossil Fuel Zoning
Subject: Revise Coal Export DEIS to Protect Health, Safety, & Environment
Date: Wednesday, November 09, 2016 8:48:15 AM

Rose Christopherson
14707 Nw Cedar St
Portland, OR 97231

November 9, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Rose Christopherson

From: Austin Cory
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Wednesday, November 09, 2016 6:09:21 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Austin Cory
8739 SW Kelly Ave
Portland, OR 97239

From: Adrienne Dickinson
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 09, 2016 1:20:35 PM

Honorable Members of Portland City Council:

Portland is known as a Progressive city, and we are proud of that! "Keep Portland weird" is dear to hearts here, since it means we are not afraid to be different and bold, unique in good ways.

In view of this devastating Presidential election result, where a person has been elected President of the United States who does not believe in Climate Change, much less Climate Justice, we need to stand up and be loud and proud as we set a direction, a model, for other cities. Cities still have rights and responsibilities, and let's take this opportunity to use these to move our city, our country, our world in a direction of survival. It seems so obvious, but heads are down and minds are closed.

This would be a wake-up and an example. Not that this is an easy road, but there is science and will and know-how and ideas, so let's go for it.

Do the most, not the least.* Be strong and bold in the implementation of this measure, for which we have so heartily applauded you.

Thank you sincerely,

*Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. We need NO new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting "a carve out." NW Natural wants to be exempted from this policy and we need to make sure the City Council does not add a last minute amendment on NW Natural's behalf.

From: Adrienne Dickinson
dickinsonfam@hotmail.com
14900 SE Rupert Drive
Portland 97267

From: Barb Greene
To: BPS Fossil Fuel Zoning
Subject: fossil fuel code
Date: Wednesday, November 09, 2016 4:54:08 PM

Please strengthen the code proposal by:

Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities.

Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities.

Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades.

Rejecting Northwest Naturals request to be exempted from these regulations.

Please act now to ensure Portland fulfills the promise to its historic fossil fuel resolution.

Thank you!

Barb Greene

From: Jana Griffin
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 09, 2016 2:28:18 AM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Jana

From: Jana Griffin
janamgriffin@gmail.com
8424 N Peninsular Ave
Portland 97217

From: Ben Hamati
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 09, 2016 7:40:11 PM

First of all, a special thanks to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. Listening to many different interest groups in order to craft legislation is often a thankless and difficult task. The current draft is much improved, offering changes that bring it close to the original intent of the 2015 Resolution.

But, the current Fossil Fuel Zoning Amendments draft falls short of the bold and visionary resolution that Portland should striving to achieve. This draft will allow construction of new port facilities that can handle 2 million gallons per day and expand the existing terminal capacity by 10%.

Unlike most Republicans, I believe that climate change is real. However, this is not why I am writing to you. The recovery of, transportation of and consumption of fossil fuels create serious negative externalities that the market fails to price correctly. The ecological, human and carbon costs of a fossil fuel based economy seem excessive when compared to a 0 emission society.

I am commenting to ask that the city of Portland; enact a full ban on construction of new export terminals, require existing terminals and pipelines to meet the State's Seismic Safety guidelines and prevent NW Natural from receiving preferential treatment.

Sincerely yours,
Ben Hamati

From: Ben Hamati
benhamati@reed.edu
5614 se milwaukie ave
Portland 97202

188142

From: Lynn Herring
To: BPS Fossil Fuel Zoning
Subject: Fossil Fuel Ban Hearing
Date: Wednesday, November 09, 2016 3:56:43 PM

November 9, 2016

Dear Portland City Councilors,

Regarding last year's historic fossil fuel ban resolution for which you showed great leadership in passing,

I urge you to strengthen the code proposal and enact a full ban of fossil fuel expansion, as championed by the Audubon Society of Portland and other concerned organizations and community leaders.

Lynn Herring

Lake Oswego, OR

lynnhe@outlook.com

From: Michael Heumann
To: BPS Fossil Fuel Zoning
Subject: The City Council should approve the Portland Sustainability Commission"s Recommended Fossil Fuel Amendments
Date: Wednesday, November 09, 2016 9:37:09 AM

Dear Commissioners Fish, Fritz, Novick, Saltzman, and Mayor Hales;

I am writing to you all to urge each of you to approve the Portland Sustainability Commission's Recommended Fossil Fuel Amendments and stop any new fossil fuel facilities (including building new terminals and traveling on the rail lines and roadways) in our City by voting to actively oppose new fossil fuel infrastructure in Portland. It is critical that we move away from our dependence on fossil fuels as quickly as possible to stave off the worst impacts of climate chaos.

I can well imagine that you are receiving enormous pressure from fossil fuel companies to weaken the rules by allowing exceptions for new and expanded fossil fuel infrastructure. These big corporations want to expand fossil fuel terminals for their own continued profit, despite the risks to our climate and the dangers posed by oil, coal, and other fossil fuel trains that could travel through Portland neighborhoods and the Columbia River Gorge. There are thousands of people in Portland who live, work and worship within the blast zones along existing rail lines.

Fossil fuels are unsafe throughout their lifecycle from extraction through to combustion. In order to prevent catastrophic climate change, we need to prohibit ALL NEW FOSSIL FUEL PROJECTS and begin a rapid, managed transition to clean energy. I urge you to use your vote to make Portland a leader in standing up to the fossil fuel corporations and protecting the health and safety of our community--and that of people throughout the world. Please vote for the strongest prohibition possible on new fossil fuel infrastructure.

Thank you on behalf of all of the people of Portland, who will come after us. This is an important legacy to give to our future citizens and descendants.

Thank you,

Michael

Michael Heumann
HeumannHealth Consulting LLC
2402 NE 26th Ave.
Portland, OR 97212
heumannhealth@gmail.com
503-880-2226

188142

From: Emily Krafft
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 09, 2016 9:08:43 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015.

I urge you to reconcile remaining differences between this amendment and the original resolution which obligates the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland."

To do so, it is very important to enact a comprehensive ban on new terminals, regardless of size. Only a firm stance to abstain from new fossil fuel infrastructure will stop the hole from becoming deeper, and allow us to concentrate on lifting ourselves out of climate chaos.

Similarly, expansions at existing terminals should be prohibited and and required to make upgrades for Seismic Safety through State Building Codes.

These rules should apply to everyone without exception, including Northwest Natural, who seeks to portray their product as an environmental solution--but as we know, investing in new natural gas infrastructure leads us away from creating the renewable energy future we seek.

I was very proud to be a Portland resident at the passing of this historic resolution last year. Please demonstrate your commitment to confronting catastrophic climate change and ensuring public safety by honoring the original intent of this amendment.

Thank you for your consideration and leadership.

From: Emily Krafft
emily.krafft@gmail.com
1302 NE Mason St
Portland 97211

From: Monika Lapinski
To: BPS Fossil Fuel Zoning
Subject: fossil fuel terminal ban
Date: Wednesday, November 09, 2016 7:23:25 PM

To the members of the Portland City Council.
I grew up in PDX and love it, I will continue to love and live in (or at a minimum visit and hold it high as a standard for decent quality of life and a place that values the environment) for the rest of my life. As Portland grows, and as the nation moves forward with a very conservative federal government that neither understands nor appreciates the dangers of anthropologically caused climate change associated with fossil fuel dependence, I am asking you to fight for not only Portland values, but Portland (and global) resilience in the face of a changing world.
I understand that there are potential economic issues associated with a complete ban on fuel terminals in Portland, but at this point I don't care. Corporations and the general public can take a hit, and need to learn that there are consequences associated with the massive economic growth that has been come with industrialization. We can figure it out, treat people well and make things fair again all while paying more for luxury items like gas.
I stand with Portland Audubon in hoping that you will help Portland move the nation forward in clean energy and away from fossil fuel transportation/use, fracking is not a "bridge" and other fossil fuels need to be reduced and eliminated quickly. A complete ban would help fuel this movement.
Below are a list of things that a ban would support, which I am behind 100%
Best - Monika

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities.
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Rejecting Northwest Naturals request to be exempted from these regulations.

188142

From: deborah lev
To: BPS Fossil Fuel Zoning
Subject: support for fossil fuel infrastructure restrictions- opportunity to go further
Date: Wednesday, November 09, 2016 4:09:46 PM

Mayor Hales and Council members.

As we know, cities such as Portland have taken the lead on climate action in our country. In the wake of the recent elections, it is more important than ever for Portland to set an example for responsible transition to a clean energy future. So heartfelt thanks to you, the elected officials who took the initiative to pass the 2015 resolution outlawing additional fossil fuel infrastructure and a Climate Action Plan and Comprehensive Plan that call for a transition from fossil fuels. Thanks also to the staff and Planning and Sustainability Commission members whose efforts have turned this into implementable regulation.

I'm here today to urge the Council to pass the strongest possible restrictions on fossil fuel infrastructure. Clearly we cannot rely on federal action to ensure our future in the face of climate change; we need to again take the lead. Please consider amendments to restrict all new fossil fuel infrastructure in the City, in keeping with the Council's brave resolution

As there is currently no documented need for additional storage facilities to meet the regional need, allowing these additions does not meet the spirit of the resolution. Why allow new facilities of up to two million gallons? New facilities of any size will come with a need for more transport of dangerous cargoes along our streets, rails, and waterways. These expansions bring additional risk to Portlanders already disproportionately burdened. To meet climate goals, we will need to over time rely less on fossil fuels, not more. If it is necessary to contemplate a future need for expansion in spite of this need, a ban of all new facilities could contain provisions that allow for periodic review of the need.

Likewise, it seems unnecessary to allow for 10% expansion of capacity of existing facilities. Again, with no demonstrated need for additional capacity, allowing these expansions is not in keeping with the goal of holding the line on new fossil fuel infrastructure. Am I concerned about seismic stability of these facilities? I live in Northwest Portland; you bet I am. Let's figure out the best way to require and incentivize these upgrades or relocations, not assume that expansion is the real price of risk reduction.

In summary, I'd like to applaud the Council for your action so far on this important issue, and urge you to hold the line on no new fossil fuel infrastructure in Portland.

Deborah Lev
2845 NW Raleigh St

From: T L
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 09, 2016 9:06:53 AM

Dear Portland City Council,
I am a Washington resident and was at the first hearing regarding this zoning issue. I applaud your efforts and ask that you enact a full ban on new terminals large or small. Further, I would ask that the new policy prohibit expansion at existing terminals and require them to make upgrades for safety and environmental protection. Once upon a time, natural gas was promoted as just that, natural. However, it is just another dirty fossil fuel and a product of the fracking industry we are trying so hard to shut down. It is time to stop giving handouts to the fossil fuel industry and holding them to high standards of safety and environmental impacts.

Please pass a tough policy.

Your friend across the river,
Therese Livella

From: T L
harvestofpeace@yahoo.com
123 no thanks
La Center 98629

188142

From: Shawn Looney
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Wednesday, November 09, 2016 8:59:26 PM

Shawn Looney
12937 NW Newberry Road
Portland, OR 97231

November 9, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Shawn Looney

From: Alice McKee-Smith
To: BPS Fossil Fuel Zoning
Subject: Fossil Fuel Hearing
Date: Wednesday, November 09, 2016 2:50:08 PM

To the Portland City Council,
I commend you on passing the historic resolution to ban new fossil fuel facilities in the city last year. As you work to implement this resolution into binding city code, I expect you to completely follow through with enacting a full ban of fossil fuel expansion, as last fall's resolution explicitly called for.

I urge you to strengthen the code proposal by:

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities.
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades.
- Rejecting Northwest Natural's request to be exempted from these regulations.

Now more than ever our state, country, and world need strong leadership in combatting climate change. I urge you to step up and provide that leadership. The people of Portland support you and your efforts.

Thank you,
Alice McKee

From: Ketty Miller
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Wednesday, November 09, 2016 8:34:38 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Ketty Miller
14209 NE EUGENE CT
PORTLAND, OR 97230

From: Michael Moore
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 09, 2016 9:17:33 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Michael Patrick Moore

From: Michael Moore
Mpm259@cornell.edu
6395 SE 68th Ave
Portland 97206

From: t_norgren@nseup.net
To: BPS Fossil Fuel Zoning; Commissioner Fish; Commissioner Novick; Commissioner Saltzman; Commissioner Fritz; Hales, Mayor
Subject: attn: fossil fuel legislation-testimony toward Thursday"s hearing.
Date: Wednesday, November 09, 2016 3:44:21 PM
Attachments: Portland hearing.odt

Hi, I'm Tim Norgren, member of Laborers' Local 737. I live in the Gorge and often work in Portland.

Our house is within sight of the railroad when the leaves thin out, which means we're squarely in the "blast zone" and if we should be as unfortunate as Mosier we would have to evacuate our house after being rocked by a cataclysmic explosion and inhaling vast quantities of carcinogens. Next we would have to see if the volunteer fire dept. (even closer to the tracks, near the Port office) was still standing and hope the equipment wasn't destroyed or the volunteers killed so that we'd have some help in stopping the house and forest fires that often accompany such events. There's a good chance the fracking chemicals and oil spilled would end up in rock creek, feeding into the Columbia, or if a train derailed across from the fairgrounds on the thin isthmus between the Columbia and Rock Cove, then it's likely it would end up on both sides, and perhaps claim the lives of those traveling alongside it on Hwy 14 as well. Our water treatment plant sits nestled between town and the fairgrounds and it's pretty much a given our water would be poisoned. So would our fish, otters, waterbirds, raccoons and the others.

Health effects just from the psychological trauma of such events can last for years, especially in children. There's now enough evidence for us to know that traumatic events during childhood often lead to a prolonged "fight, flight or freeze" reaction, affecting ALL of our biological systems and leading to health problems from heart and breathing issues, to digestive issues, to "unexplained" nerve pain. My partner endured a barn fire as a child and though she wasn't burned she was forced to watch helplessly and smell her animal friends being cooked alive while they screamed. To this day she is plagued by night terrors related to it in various ways. She also developed fibromyalgia, a debilitating nerve disease which is directly linked to childhood trauma and sometimes triggers later in life. Trauma can also linger for generations. It's rampant in places like Lac Megantic, and will surely linger with the residents and former residents of Mosier and the other "sacrifice zones" for years as well. I don't want to see more of this in our communities and we are standing at the threshold of an opportunity to turn back the tide on this type of tragedy.

That being said I encourage you to improve on the PSC's recommendation by sticking to the full intentions of the oil train resolution the council adopted last year. That resolution made it clear that no new infrastructure would be built to encourage an increase in oil train traffic through Portland and the Gorge. Allowing a 10% increase in volume to current fuel storage facilities would do just that. There are other ways to encourage seismic upgrades, including simply calling it as it is, a public safety issue, and making upgrades a requirement for staying in business here. If that isn't acceptable to them I guarantee that I and other workers in the building trades will be more than willing to do the demolition work and ready the space for a more sustainable business!

In line with the above I have no wish to build NEW structures either,

no matter how "small" they are, which would increase fuel traffic through Portland, by train, truck, or pipeline. Again, we all live here in the area, and no one wants to see their community destroyed. Nor does any worker want to look at such a tragedy and know that we "built" it. Because the fact is we construction folks do tend to look back at projects a few years later and say "I built that". It's always preferable to have some pride in what you're saying, and increasingly the fossil fuel industry brings nothing but shame.

Finally, let there be no exemption for NW Natural. As we find we can meet our needs with sustainable energy there'll likely be LESS demand for fracked gas, (which from extraction to burning is often more carbon intensive than coal) in the Portland area, especially as we become more and more aware of the earthquakes and poIsoned water (including water used to irrigate crops..disgusting!) which are the additional consequence of fracking.

Please let there be no more tragedy and no more trauma caused by our actions or inactions. Let the will of the people be law!

Thanks. Sincerely,

Tim Norgren

Hi, I'm Tim Norgren, member of Laborers' Local 737. I live in the Gorge and often work in Portland.

Our house is within sight of the railroad when the leaves thin out, which means we're squarely in the "blast zone" and if we should be as unfortunate as Mosier we would have to evacuate our house after being rocked by a cataclysmic explosion and inhaling vast quantities of carcinogens. Next we would have to see if the volunteer fire dept. (even closer to the tracks, near the Port office) was still standing and hope the equipment wasn't destroyed or the volunteers killed so that we'd have some help in stopping the house and forest fires that often accompany such events. There's a good chance the fracking chemicals and oil spilled would end up in rock creek, feeding into the Columbia, or if a train derailed across from the fairgrounds on the thin isthmus between the Columbia and Rock Cove, then it's likely it would end up on both sides, and perhaps claim the lives of those traveling alongside it on Hwy 14 as well. Our water treatment plant sits nestled between town and the fairgrounds and it's pretty much a given our water would be poisoned. So would our fish, otters, waterbirds, raccoons and the others.

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Thanks. Sincerely,

Tim Norgren

188142

From: Rob Oberdorfer
To: BPS Fossil Fuel Zoning
Subject: Proposed fossil fuel terminal ban
Date: Wednesday, November 09, 2016 4:26:59 PM

Dear City Council:

I am writing to urge you to enact this historic ban on fossil fuel terminals, and would like to comment on some of the provisions:

-Please remove the exception for terminals under 2 million gallons. It is too late for piecemeal progress on this issue. Let's have Portland lead the way into a green energy future!

-Please reject Northwest Naturals request to be exempted. Allowing exemptions would degrade the ban to a symbolic gesture.

-Please eliminate the provision to allow existing fossil fuel terminals to grow in exchange for seismic upgrades. These upgrades should be required for public safety as a cost of doing dangerous business in our community, and can be addressed outside of the scope of this ban.

Thank you for your work on this important issue.

Sincerely,
Rob Oberdorfer

From: merrittregna@gmail.com on behalf of Regna Merritt
To: BPS Fossil Fuel Zoning
Subject: Comments on Proposed Fossil Fuel Amendments
Date: Wednesday, November 09, 2016 11:27:30 PM

Kayla	Schneider-Smith	1502 SE 84th Ave	Portland	OR	97216
Adriana	Cvitkovic	1502 SE 84th Ave	Portland	OR	97216
Mike	Goren	3525 SE Taylor St	Portland	Or	97215
Sarah	Klatt-Dickerson	2135 NE 134th pl	Portland	Or	97230
Sean	Tenney	3414 NE 17th Avenue	Portland	OR	97212
Sarah	Collmer	704 W 20th St.	Vancouver	WA	98660
Alicia	Keys	10480 SW Eastridge #88	Portland	OR	97225
Helen	Hays	18553 S Ferguson Rd	Oregon City	OR	97045
Debra	Rehn	5130 SE 30th Ave Apt 9	Portland	OR	97202
Gisela	Ray	85 SE 16th Court	Gresham	Oregon	97080
Maria	Grumm	1815 SE 30th Ave	Portland	Oregon	97214
Francisco	Gadea	4110 SE Hawthorne Blvd #758	Portland	OR	97214
Maureen	O'Neal	9100 s.w. 80th ave	Portland	Or	97223
		1825			

Annie	McCuen	Mental Health	Fairmount Ave s	Salem	Oregon	97302
Sybil	Kohl	MSW	18103 NE 159th Ave	Brush Prairie	Washington	98606
Roger	Burt	MS	4035 NE Hazelfern	Portland	OR	97232
Sonia	Holdaway		5501 SE Flavel Drive	Portland	OR	97206
Benjamin	Sexton		1502 SE 84th Ave	Portland	OR	97216
Gretchen	Randolph Ph.D, PMHNP	Psychiatric Nurse Practitioner	13635 SW 115th Ave	Portland	Oregon	97223
Jack	Herbert		11935 SW Edgewood Street	Portland	OR	97225
Marilee	Dea	MSRN CPNP	4613 ne killingsworth #2	Portland	Oregon	97218
Susan	Katz	MD	726 NW 11th Ave. #306	Portland	OR	97209
Rose	Christopherson,	MD, PhD	14707 Nw Cedar St	Portland	OR	97231
Jesse	Kaminash		260 NW Pittock Dr	Portland	OR	97210
Becky	Bell-Greenstreet		1079 State St.	North Bend	Oregon	97459
Stephen	Couche		4718 SE 31st Ave.	Portland	Oregon	97202
Cheryl	Erb		1068 park ave NE	Salem	OR	97301
patricia	Carcasses		2741A Se 141 Ave	Portland	Oregon	97236
Brian	Beinlich		PO Box 1417	North Plains	OR	97133

Martha	Tocco	PhD	3180 SW Westwood Drive	Portland	Oregon	97225
Robert	Goldman, MD	Academic Physician and Surgeon	4015 SW 57th Ave	Portland	OR	97221
Frodo	Okulam	D.Min.	10019 NE Failing	Portland	OR	97220
Joseph	Snyder	4th generation Oregonian	5858 SW Riveridge Ln. #4	Portland	Oregon	97239
Tim	Swinehart	Teacher, Lincoln High School	4226 SE Pine St.	Portland	Oregon	97215
Mike	Ellison		4303 NE 14th Ave	Vancouver	WA	98663
Mary & John	Sievertsen	CPA	7705 SW Miner Way	Portland	Oregon	97225
Nicole	Staudinger		1815 NE Junior St	Portland	Oregon	97211
Thomas	Ward, MD		260 NW Pittock Dr	Portland		97210

Those listed above submit the comments below.

Dear Mayor Hales and Commissioners Fritz, Fish, Novick, and Saltzman:

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input into drafts of the Fossil Fuel Terminal Zoning Amendments. The current proposal is much improved, bringing it closer to the original intent of the 2015 Fossil Fuel Policy Resolution #37168. However, it still falls short of the resolution, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland."

Although this proposal prohibits new large bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new and expanded fossil fuel storage tanks.

I want the City of Portland to:

1) Prohibit any expansion of existing terminals. Instead, require upgrades for Seismic Safety through

State building codes.

2) Enact a full ban on all new bulk fossil fuel terminals: 2 million gallon facilities are still too large. The language of the City's 2015 Resolution was "to actively oppose" any new fossil fuel infrastructure.

With a few simple improvements to the proposed Fossil Fuel Zoning Amendments, Portland can fully implement our historic resolution and once again be a beacon of light in addressing one of the most pressing concerns of our time.

Thank you for consideration of these comments,

Regna Merritt

Regna Merritt, PA
Oregon Physicians for Social Responsibility
1020 SW Taylor St, Suite 275 Portland,OR 97205
C: 971.235.7643

From: Kelly Pergande
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 09, 2016 6:08:07 PM

Dear City Council Members,
Please take a stand for our future and oppose: fossil fuel terminals- new or expanded, and oil trains screeching through our beautiful city. Portland has an opportunity to create policy that will set into motion a real change for green energy to take place if we can just say no to fossil fuel. Our future depends on this.

Kelly Pergande
Resident, North Portland

From: Kelly Pergande
Kelly.coffeebreak@yahoo.com
9737 N Smith St.
Portland 97203

From: Meaghan I Petix
To: BPS Fossil Fuel Zoning
Subject: Fossil Fuel Terminal Zoning
Date: Wednesday, November 09, 2016 5:34:43 PM

Dear Portland City Council,

I strongly urge you to strengthen the code proposal by:

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities.
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Rejecting Northwest Naturals request to be exempted from these regulations.

Thank you for your consideration!

Sincerely,

Meaghan Petix
118 NW Jackson Street
Apt. #309
Corvallis, OR 97330

From: Emily Platt
To: BPS Fossil Fuel Zoning
Subject: Portland's Fossil Fuel Policy Resolution
Date: Wednesday, November 09, 2016 7:00:10 PM

Dear Members of Portland City Council,

I am writing to express my strong support of a final fossil fuel code that limits the expansion of existing fossil fuel infrastructure, even potential facilities that handle relatively small amounts of fossil fuels -- all bulk fossil fuels facilities should be banned outright (as the City of Vancouver has done). In addition, any seismic upgrades should not be used as an excuse to expand existing fossil fuel infrastructure. Lastly, limitations in fossil fuel infrastructure should also apply to NW Natural with respect to methane and existing LNG terminals.

We are at critical juncture in the fight to combat fossil fuel driven global climate change. Our president-elect is an anti-environment global climate change denier. Thus, multiple local actions such as Portland's fossil fuel resolution will be key to limit and eventually end fossil fuel use. It is our duty as citizens of Portland and of the world to combat this existential threat with every tool we have.

Sincerely,

Emily Platt
2808 SE 18th Ave

188142

Moore-Love, Karla

From:	Bogue, Emerald <Emerald.Bogue@portofportland.com>
Sent:	Wednesday, November 09, 2016 12:32 PM
To:	Council Clerk – Testimony; Moore-Love, Karla; Hales, Mayor; Commissioner Fish; Commissioner Fritz; Commissioner Novick; Commissioner Saltzman
Cc:	Grumm, Matt; Schmanski, Sonia; Klonoski, Zach; Crail, Tim; katie.schriver@portlandoregon.gov; Armstrong, Tom
Subject:	Letter from Port of Portland re: fossil fuel terminal code amendments
Attachments:	Port of Portland to Portland City Council re FFT amendments 11.9.pdf

Please find the attached letter regarding fossil fuel terminal code amendments. This testimony is building on that submitted to date.

Please contact me anytime with questions, and thank you for this opportunity to weigh in.

Emerald Bogue
Regional Affairs Manager, Port of Portland
503.475.1409

188142

November 9, 2016

Portland City Council
1221 SW 4th Avenue
Portland, Oregon 97204

Dear Portland City Council:

Thank you for the opportunity to comment on the Fossil Fuel Terminal Zoning Amendments. Throughout this process, we have focused largely on how the City of Portland can move forward with this policy in a manner that avoids unintended consequences for our region and state. To that end, we appreciate that fuel storage for "end users", including Portland International Airport (PDX) and marine fuel suppliers, are specifically exempt from the provisions of the proposed amendments.

In the case of PDX, its important to note that aviation fuel isn't stored exclusively at PDX. Fuel farm facilities at PDX are owned and operated by the Portland Fueling Facilities Corporation (PFFC), a consortium of the airlines operating at PDX. PFFC tanks assume a three-day reserve. The distribution chain for aviation fuel is a long one – beginning at a refinery (where it becomes aviation fuel), then to a distributor (fuel farm in PDX), then to PFFC tanks, and finally to the air craft. Aviation fuel cannot be blended with other fuels, and is stored separate from other fuels handled by the distributor.

With growth in the aviation sector, fuel consumption is expected to increase by more than 50% by 2035 with a corresponding need for tank storage. The code amendments should make it clear that fuel storage for end users is exempt – regardless of where this fuel is stored within city limits. We understand this was the legislative intent, and appreciate Portland City Council considering an amendment that would make this clear for the sake of avoiding confusion in future scenarios.

Thank you again for this opportunity to comment on this clarifying amendment and build on our comments to date.

Sincerely,

Emerald Bogue
Regional Affairs Manager

7200 NE Airport Way Portland OR 97218
Box 3529 Portland OR 97208
503 415 6000

188142

From: Pia Welch
To: BPS Fossil Fuel Zoning
Cc: Ansary, Raihana; Kountz, Steve
Subject: Fossil Fuel Zoning Letter - PFC
Date: Wednesday, November 09, 2016 11:41:55 AM
Attachments: letter re fossil fuel zoning code amendments (clean version).docx

Hello,

Here is a letter regarding the Fossil Fuel Amendment.

Thanks,

Pia

Pia Welch
Portland Freight Committee
503 249 6414

188142

November 8, 2016

PORTLAND FREIGHT COMMITTEE

The Honorable Mayor Charlie Hales and City Council
City Hall, 1221 SW Fourth Avenue
Portland, OR 97204

RE: Comments on the proposed Fossil Fuel Terminal Zoning Amendments

Dear Mayor Hales & City Commissioners,

On behalf of the Portland Freight Committee (PFC), thank you for the opportunity to comment on the proposed Fossil Fuel Terminal Zoning Amendments (FFTZA) recommended draft.

In general, the PFC supports the goals sought to be addressed by the proposed fossil fuel terminal zoning amendments including reducing carbon emissions and making seismic upgrades to infrastructure that serves our city and beyond. However, the proposed zoning code amendments are deeply flawed and not the appropriate solution. Restricting expansion at existing fuel terminals and prohibiting new terminal development may impact industrial job growth and middle-income jobs. It may also constrain the supply of fossil fuels to serve anticipated population and employment growth, which will lead to increasing fuel costs and disproportionately affect low-income households.

We are also concerned that the city of Portland is unilaterally imposing regulation that will compromise the supply of fuels to other communities throughout the state and Western U.S. Portland is a regional fossil fuel hub, located at the terminus of the Olympic pipeline. Over 90 percent of petroleum used in Oregon is handled through the Bulk Fossil Fuel Terminals in Portland. Fuels handled in and through the Portland Energy Cluster (Energy Hub) are also supplied to the state of Washington, western Idaho, and during fire-season, to locations as far away as Montana and California. The FFTZA will create a bottleneck in the distribution system. Consumers and businesses throughout this broad market area rely on the fuels that are supplied from the energy hub in Portland.

Additionally, limiting the supply of fuels to airports, the maritime industry, railroads and trucking firms, until a viable source of alternative fuels are readily available makes little or no sense. Supplying fuels by alternative means, likely by truck, from outside the city, region and state is the antithesis of smart climate action policy.

The proposed amendments may also have a negative impact on seismic resiliency improvement efforts at the bulk fossil fuel terminals in Portland. The 10 percent overall expansion cap on tank storage capacity is actually a disincentive to rebuilding tanks that meet modern-day seismic standards.

The PFC urges Portland City Council to pursue other ways to achieve climate action plan and seismic resiliency goals. For example, the city may allocate its' own resources for the purchase of electric powered or other low-carbon emitting vehicles for its' city fleet and to demonstrate its' commitment to curbing greenhouse gas emissions. Providing economic incentives and an expedited permitting process may be ways to hasten construction of new, more seismically-resilient storage tanks at the BFFTs.

We are not asking the city to be complacent about the need to address climate change or the risks associated with catastrophic seismic events; we're recommending that the city take actions that are more thoughtfully considered and which are undertaken in a more consistent and open process than that which has taken place. At a minimum, there should be more thought, consideration and analysis including of fuel supply and prices before the proposed amendments are implemented.

Thank you for your consideration of our comments.

Respectfully yours,

Pia Welch — Chair

Raihana Ansary — Vice Chair

From: Danielle Replogle
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 09, 2016 1:02:33 PM

I am writing in regards to the Fossil Fuel Terminal Zoning Amendments.

It's more important now than ever that we act locally to do what's right. Barring extreme action on the national level, federal regulations on the fossil fuel industry have become unlikely. We must do what we can to show that there are still citizens of the U.S. that believe in facts and will fight to uphold the promises we made in at the UNFCCC in Paris. Portland has the chance to be a leader on this front. As a former educator, I'm begging for the future of my students. The world has already exceeded the levels of CO2 acceptable to prevent destructive climate change. We cannot keep exacerbating this problem. We need to enact a full ban on new fossil fuel infrastructure, with no exceptions. Current facilities need a ban on expansion and need to be made Seismic Safe through State Building Codes.

Please uphold promises to actively oppose new fossil fuel infrastructure by any means possible.
Sincerely,
Danielle Replogle
Lewis & Clark Law School Student

From: Danielle Replogle
drep18@Gmail.com
708 SW Maplecrest Ct.
Portland 97219

188142

From: CenturyLink Customer
To: BPS Fossil Fuel Zoning
Subject: [User Approved] Fossil Fuel Terminals
Date: Wednesday, November 09, 2016 9:24:31 AM

Dear City Council-I urge the following:
1. A full ban on all new fossil fuel terminals, without any exceptions.
2. Require all existing fossil fuel terminals to have seismic up-grade, without any financial incentive to do so.
3. All corporations, including Northwest Natural, need to be subject to the regulations.

Yours very truly,
Michael P. Ryan

From: Amalia Silverheart
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 09, 2016 8:32:14 AM

To the City of Portland,

I am too young to vote, too young to run for office, too young to drive. But I'm not too young to want to continue living on this planet, and I'm not too young to write letters. Do not condemn me and my peers to a future where earth is unlivable.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators

Thank you,

Amalia Silverheart

From: Amalia Silverheart
mollysilverheart@gmail.com
2017 SE 42nd Ave
Portland 97215

From: linda.stone@loveable.com
To: BPS Fossil Fuel Zoning
Subject: Your Voice Needed to Ensure Portland Enacts Historic Fossil Fuel Terminal Ban
Date: Wednesday, November 09, 2016 10:25:15 PM

This link is sent to you from http://audubonportland.org

You are receiving this mail because someone read a page at
Audubon Society of Portland
and thought it might interest you.

linda.stone@loveable.com thought that the page Your Voice Needed to Ensure Portland Enacts Historic Fossil Fuel Terminal Ban
(at http://audubonportland.org/issues/take-action/your-voice-needed-to-ensure-portland-enacts-historic-fossil-fuel-terminal-ban)
might interest you.

He/she says:
"Please enact the historic fossil fuel terminal ban"

--
Audubon Portland Staff

From: Lynn Washabaugh
To: BPS Fossil Fuel Zoning
Subject: Fossil fuel
Date: Wednesday, November 09, 2016 3:24:06 PM

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities.
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Rejecting Northwest Naturals request to be exempted from these regulations.

Sincerely,
Portland resident

From: Kountz, Steve
To: BPS Fossil Fuel Zoning
Subject: FW: Fossil Fuel Terminal Zoning Amendments
Date: Thursday, November 10, 2016 9:47:18 AM
Attachments: CNA_Fossil_Fuel_Letter_Nov_2016.pdf

From: Garlynn Woodsong [mailto:landuse@concordiapdx.org]
Sent: Wednesday, November 09, 2016 6:21 PM
To: Hales, Mayor <mayorcharliehales@portlandoregon.gov>; Commissioner Novick <novick@portlandoregon.gov>; Commissioner Fritz <amanda@portlandoregon.gov>; Commissioner Fish <nick@portlandoregon.gov>; Commissioner Saltzman <dan@portlandoregon.gov>
Cc: Anderson, Susan <Susan.Anderson@portlandoregon.gov>; Kountz, Steve <Steve.Kountz@portlandoregon.gov>
Subject: Fossil Fuel Terminal Zoning Amendments

Dear Council Members,

Following the Pembina fuel terminal proposal, we support the City's actions to impose predictable, understandable regulations that will prohibit new large fossil fuel terminals in our city, while supporting our transition to a clean energy economy, and not impede important renovations of existing facilities, including those required to make them safer, replace them as they age out, and seismically upgrade them.

We have reviewed the proposed zone change language, as well as the September 9th, 2016 memo from Tom Armstrong and Steve Kountz to the Planning and Sustainability Commission outlining the proposed Fossil Fuel Terminal Zoning Amendments. Our comments below are specifically in reference to that memo.

Regarding the Fossil Fuel Terminal size threshold, we support Option A: No change to the storage capacity threshold of 5 million gallons.

With regards to regulating existing terminal expansion, we support Option C, to prohibit new Bulk Fossil Fuel Terminals and allow expansion of existing terminals greater than 10% through a conditional use review process with special criteria for emergency backup capacity, seismic upgrades, and tanks for clean and renewable fuels. However, it is critical that these criteria are enforced via inspections, as we would not like to see additional storage capacity approved under the guise of renewable fuels, only to discover that the operator has had a change of heart and decided to store pure fossil fuels after the structure is approved and the final inspector has left the site. There needs to be a regulatory regime to ensure that any structure that is approved for renewable fuels, is actually only used for renewable fuels.

Concerning additional review criteria, we feel strongly that if existing BDS staff do not feel that they have the capacity or expertise to implement discretionary land use review criteria addressing greenhouse gas emissions or safety impacts of hazardous material storage and transportation, that they should acquire this capacity. This capacity could be acquired by hiring new staff, by forming strategic alliances with outside organizations, or by hiring consultants, but it is critical that BPS and BDS figure this out so that it can be properly regulated. This starts with being able to write clear and predictable criteria with which to judge new applications. There are many good options, such as cradle to grave analysis, well

to wheel analysis, and other methodologies with which to measure the greenhouse gas emissions of any new proposal; the criteria used to pick a particular methodology should balance ease of regulation with effectiveness at meeting GHG emissions reduction goals. There are similar objective methodologies and criteria available with which to measure safety. We thus support Option B, to add conditional use criteria for expansion of existing terminals to mitigate adverse land use impacts on greenhouse gas emissions and safety impacts of hazardous materials storage and transportation.

These are certainly complicated issues, but we have within Portland some of the best and brightest in their respective fields, and we have access to national expertise as well. If the City needs to add to its capacity in order to regulate fossil fuel terminals in the manner that will be most effective at reducing GHG emissions and meeting our community goals for safety, than the City must acquire the necessary expertise. It's simply not acceptable to claim a lack of staff expertise as an excuse to not propose the most effective possible regulations. Expertise is something that can be acquired, and should be acquired when it is required.

We thank you for your close and careful examination of these critical issues, and for considering our comments as you make your decisions as to how the City will proceed.

Signed,

(see attached)

Isaac Quintero
Chair, Board of Directors

Garlynn Woodsong
Chair, Land Use & Transportation Committee

Concordia Neighborhood Association
P.O. Box 11194
Portland, OR 97211
landuse@concordiapdx.org

188142

Concordia Neighborhood Association
P.O. Box 11194
Portland, OR 97211
landuse@concordiapdx.org

Re: Fossil Fuel Terminal Zoning Amendments

November 7th, 2016

Portland City Council
1221 SW 4th Avenue
Portland, OR 97204

Mayor Charlie Hales, mayorcharliehales@portlandoregon.gov
Commissioner Steve Novick, novick@portlandoregon.gov
Commissioner Amanda Fritz, amanda@portlandoregon.gov
Commissioner Nick Fish, nick@portlandoregon.gov
Commissioner Dan Saltzman, dan@portlandoregon.gov

Dear Council Members,

Following the Pembina fuel terminal proposal, we support the City's actions to impose predictable, understandable regulations that will prohibit new large fossil fuel terminals in our city, while supporting our transition to a clean energy economy, and not impede important renovations of existing facilities, including those required to make them safer, replace them as they age out, and seismically upgrade them.

We have reviewed the proposed zone change language, as well as the September 9th, 2016 memo from Tom Armstrong and Steve Kountz to the Planning and Sustainability Commission outlining the proposed Fossil Fuel Terminal Zoning Amendments. Our comments below are specifically in reference to that memo.

Regarding the Fossil Fuel Terminal size threshold, we support Option A: No change to the storage capacity threshold of 5 million gallons.

With regards to regulating existing terminal expansion, we support Option C, to prohibit new Bulk Fossil Fuel Terminals and allow expansion of existing terminals greater than 10% through a conditional use review process with special criteria for emergency backup capacity, seismic upgrades, and tanks for clean and renewable fuels. However, it is critical that these criteria are enforced via inspections, as we would not like to see additional storage capacity approved under the guise of renewable fuels, only to discover that the operator has had a change of heart and decided to store pure fossil fuels after the structure is approved and the final inspector has left the site. There needs to be a regulatory regime to ensure that any structure that is approved for renewable fuels, is actually only used for renewable fuels.

Concerning additional review criteria, we feel strongly that if existing BDS staff does not feel that they have the capacity or expertise to implement discretionary land use review criteria addressing greenhouse gas emissions or safety impacts of hazardous material storage and transportation, that they should acquire this capacity. This capacity could be acquired by hiring new staff, by forming strategic alliances with outside organizations, or by hiring consultants, but it is critical that BPS and BDS figure this out so that it can be properly regulated. This starts with being able to write clear and predictable criteria with which to judge new applications. There are many good options, such as cradle to grave analysis, well to wheel analysis, and other methodologies with which to measure the greenhouse gas emissions of any new proposal; the criteria used to pick a particular methodology should balance ease of regulation with effectiveness at meeting GHG emissions reduction goals. There are similar objective methodologies and criteria available with which to measure safety. We thus support Option B, to add conditional use criteria for expansion of existing terminals to mitigate adverse land use impacts on greenhouse gas emissions and safety impacts of hazardous materials storage and transportation.

These are certainly complicated issues, but we have within Portland some of the best and brightest in their respective fields, and we have access to national expertise as well. If the City needs to add to its capacity in order to regulate fossil fuel terminals in the manner that will be most effective at reducing GHG emissions and meeting our community goals for safety, than the City must acquire the necessary expertise. It's simply not acceptable to claim a lack of staff expertise as an excuse to not propose the most effective possible regulations. Expertise is something that can be acquired, and should be acquired when it is required.

We thank you for your close and careful examination of these critical issues, and for considering our comments as you make your decisions as to how the City will proceed.

Signed,

Isaac Quintero
Chair, Board of Directors

Concordia Neighborhood Association
P.O. Box 11194
Portland, OR 97211
landuse@concordiapdx.org

cc: Susan Anderson, susan.anderson@portlandoregon.gov, Steve Kountz, steve.kountz@portlandoregon.gov

188142

Moore-Love, Karla

From:	Ellen Wax <ellen.wax@workingwaterfrontportland.org>
Sent:	Wednesday, November 09, 2016 5:33 PM
To:	Moore-Love, Karla; Schmanski, Sonia; Dunphy, Jamie; Klonoski, Zach; Grumm, Matt; Shriver, Katie; Ender, Timur; BPS Fossil Fuel Zoning
Subject:	WWC submittal to City Council re: FFT zoning amendments
Attachments:	WWC submittal City Council Re FFT zoning amendments.pdf

Please see the attached Working Waterfront Coalition (WWC) letter of testimony submittal with requested clarifying amendments to the PSC's *Fossil Fuel Terminal Zoning Amendments: Recommended Draft* to be considered by City Council at the hearing scheduled for Thursday, November 10, 2016.

Please see Council Clerk's requested name and address for the Working Waterfront Coalition in the email signature below and for purposes of providing name and address as part of our written testimony please include this email as part of the submittal and record.

Thank you. Ellen

Ellen M. Wax
Executive Director
Working Waterfront Coalition

503.220.2064 | 503.295.3660 fax
200 SW Market Street, Suite 190
Portland, OR 97201
ellen.wax@workingwaterfrontportland.org
www.workingwaterfrontportland.org

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Mayor Charlie Hales and
Portland City Commissioners
Portland City Hall
1221 SW 4th Avenue
Portland, OR 97204

November 9, 2016

Re: Fossil Fuel Terminal Zoning Amendments (City Council Hearing, November 10, 2016, 2pm)

Dear Mayor Hales and City Commissioners,

I am writing on behalf of the Working Waterfront Coalition (WWC) in opposition to the Fossil Fuel Terminal Zoning Amendments (FFT Amendments) recommended by the Planning and Sustainability Commission, dated October 11, 2016. (PSC Recommendation). As you know, the WWC represents a wide range of waterfront businesses along the Portland Harbor including several fossil fuel terminals (FFT's).

Background and Position

The WWC has actively participated in the City's FFT amendment process and related efforts, including the enactment of Resolution 37168 and the adoption of the City's 2035 Comprehensive Plan. Throughout the FFT amendment process the WWC has opposed the City's effort to prohibit or limit the growth of multimodal terminals along the working waterfront. These multimodal fuel terminals have safely provided the City, the Region and the State with most of the liquid fuel supply for decades. The energy cluster in Linnton and Willbridge is by far Oregon's largest fuel distribution hub, providing more than 90 percent of the State's fuel supply. Because of the importance of these terminals the WWC has consistently objected to earlier versions of the City's FFT amendments, which sought to ban these multimodal terminals completely. Likewise, the WWC objects to the most recent version of the City's FFT amendments, which ban new multimodal fuel terminals and severely restrict the growth of existing FFTs.

Policy Analysis

From a policy standpoint, it may be helpful for the WWC to explain its' opposition to the PSC Recommendation relative to several of the City's recently enacted goals, including Resolution 37168 and the City's 2035 Comprehensive Plan. In that regard, City Council should reject the FFT amendments recommended by the Planning and Sustainability Commission because the PSC recommendation is inconsistent with several of the City's recently enacted goals:

1) As provided in Policy 4.81 and Policy 4.82 of the 2035 Comprehensive Plan, if the City's goal is to encourage disaster-resilient development and reduce natural-hazard risks to critical energy and transportation infrastructure, then City Council should reject the PSC Recommendation because it discourages firms from investing in disaster-resilient development.

Explanation: In order to economically justify the level of private investment needed to comprehensively upgrade critical energy and transportation infrastructure at existing FFTs, existing FFT's must be allowed to grow. The PSC Recommendation does the opposite. The PSC Recommendation prohibits existing FFTs from growing, except in one very limited circumstance. The only circumstance

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under which an existing FFT can grow is if it replaces an existing tank with a seismically upgraded tank. However, even if an existing tank is replaced with a seismically upgraded tank, the incremental growth that can occur when a tank is replaced is limited to 10 percent of the capacity of the tank being replaced, with an overall increase limited to 10 percent of the storage capacity of the FFT facility on the date the amendments are enacted. This severe limitation on expansion discourages disaster-resilient development because the small amount of growth that is allowed to occur will not justify the massive amount of private investment needed to replace existing tanks in Portland. Even if investment does occur, the PSC recommendation will only produce a seismic upgrade of 10 percent, because no additional growth can occur once the 10 percent limit is reached. Without growth, investment in seismic upgrades will not occur. In short, the 10 percent rule creates an economic disincentive to disaster-resilient development, is shortsighted, and will be counterproductive to meaningful seismic upgrades over time.

2) As provided in Policy 6.48 of the 2035 Comprehensive Plan, if the City's goal is to limit fossil-fuel distribution and storage facilities to those necessary to serve the regional market, then City Council should reject the PSC Recommendation because it restricts the ability of fossil fuel infrastructure that is necessary to serve the regional market.

Explanation: All of the existing FFT's located in Portland's energy cluster are needed to serve the regional market. The PSC recommendation wrongly targets existing FFTs that serve the regional market. The WSPA alternative provides a regulatory concept and draft code language that limits extra-regional FFT's, while protecting FFT's that serve the regional market. The WSPA alternative is consistent with Policy 6.48, but the PSC recommendation is not.

3) As provided in Resolution 37168, if the City's goal is not to restrict the expansion of fossil fuel infrastructure that improves the safety, efficiency and seismic resilience of existing infrastructure, then City Council should reject the PSC Recommendation because it discourages firms from making improvements that increase the safety, efficiency and seismic resilience of fossil fuel facilities that primarily serve the regional market.

Explanation: For the reasons described above, the PSC Recommendation will not improve seismic resilience of existing FFT infrastructure, because it creates a long term disincentive to invest in existing FFTs and any related seismic upgrades. The associated disinvestment in existing FFT facilities that will occur as a result of the PSC recommendation will create a less efficient and potentially less safe regional fossil fuel infrastructure in Portland, as firms focus future capital investments in markets where their return on investment is justified.

4) As provided in the Comprehensive Plan, if the City's goal is to reduce vehicle miles traveled, then City Council should reject the PSC Recommendation because limiting multimodal storage capacity to existing tank capacity will require more trucks to move more fossil fuel into and through Portland, in order to bypass supply constraints at existing fossil fuel facilities that serve the regional market.

Explanation: By prohibiting new FFTs and limiting the capacity of existing FFTs that serve the regional market the PSC Recommendation creates a significant supply constraint for fossil fuels used by customers within the region. Over time and in times of emergency, this supply constraint will create a significant fossil fuel bottleneck in Portland. When it becomes necessary to bypass this supply constraint,

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the only remaining option firms will have is to truck fossil fuels to and through Portland, in order to bypass the constraint. This constraint will therefore increase vehicle miles traveled and will require more fossil fuel to be transferred to and through Portland by truck.

5) As provided in Policy 6.5 of the 2035 Comprehensive Plan, if the City's goal is to create economic resilience, then City Council should reject the PSC recommendation because restrictions on existing fossil fuel facilities that primarily serve the regional market makes the City, the Region and the State more susceptible to impacts from climate change, natural disasters and unforeseen changes in the economy.

Explanation: The proposed ban on new FFTs that serve the regional market, along with a significant limit on growth for existing FFTs, will make the City, the Region and the State less economically resilient because the ban and its related limits creates a significant regulatory constraint that discourages firms from investing in needed infrastructure and technology that will make the Portland region less susceptible to impacts from climate change, natural disasters and unforeseen changes in the economy. For the foreseeable future, fossil fuels will continue to fill an important role in our energy economy. The Portland region and the state as a whole depends on the existing FFT's for roughly 90 percent of its petroleum supply. Even if the demand for fossil fuel in Oregon is only growing ½ percent to 1 percent annually, as estimated by the city, it is critically important for firms to continue to invest in fossil fuel facilities over the next several decades, as significant demand continues and risk of natural disasters and other unforeseen emergencies continues to exist. In short, Portland should not create significant disincentives for FFT's to invest in critical energy facilities that will continue to power Portland and the State of Oregon for decades to come.

Position, Alternative, and Clarifying Amendment

For all of the above reasons, the WWC opposes the PSC Recommendation and requests that it not be adopted by City Council.

The WWC notes that the FFT Amendment process was rushed. This fact is reflected in Appendix A of October 11, 2016, PSC Recommendation. Throughout this rushed process the WWC has supported a better alternative offered by WSPA in July, 2016, which is attached to this letter. The WSPA alternative is not mentioned in the PSC Recommendation, and was unfortunately ignored by the City throughout the rushed review process. The WWC continues to support the WSPA alternative.

If City Council is inclined to move forward with the PSC Recommendation, or something similar, the WWC requests that a significant ambiguity in the PSC recommendation be clarified. Specifically, it is not clear whether the limits on the growth relate only to fossil fuel storage tanks, or whether the limits on growth relate to pipes and other fossil fuel facilities associated with existing FFTs. It is our understanding from discussions with city staff that the City's intent is to limit growth related to existing storage tank capacity, and that it does not intend to limit growth related to pipes and other fossil fuel facilities and infrastructure. Accordingly, we offer the following clarifying amendments:

Section 33.140.100(B)(17)(a), as shown on page 49 of the October 11, 2016 PSC Recommendation, should be amended as follows:

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a. Existing Bulk Fossil Fuel Terminals. The following use limitations apply to existing Bulk Fossil Fuel Terminals:

(1) Bulk Fossil Fuel Terminals that existed on [insert effective date] are allowed, but the total amount of fossil fuel that can be stored on the site in fossil fuel storage tanks, is limited to the fossil fuel storage tank capacity that existed on [insert effective date] plus 10 percent. Total fossil fuel storage tank capacity on the site in excess of the fossil fuel storage tank capacity that existed on [insert effective date] plus 10 percent is prohibited.

(2) New fossil fuel storage tanks are prohibited unless a new fossil fuel storage tank is replacing an existing fossil fuel storage tank that does not meet current building code standards for seismic safety, and in that case, the capacity of the new fossil fuel storage tank is prohibited from being greater than the storage capacity of the existing fossil fuel storage tank that is being replaced, plus 10 percent.

(3) No other use limitations shall be imposed on existing Bulk Fossil Fuel Terminals other than those set forth above.

Section 33.910.030, as shown on page 53 of the October 11, 2016 PSC Recommendation, should be amended as follows:

Fossil Fuel Storage Tank A fossil fuel storage tank is a tank affixed to the ground, within the boundaries of an existing Bulk Fossil Fuel Terminal site, which is used exclusively for fossil fuel storage.

Conclusion

For all of the reasons stated above, the WWC urges City Council to reject the PSC recommendation and reconsider its proposed regulation of multimodal FFTs along the City's working waterfront. The existing concentration of multimodal fuel terminals located along the City's working waterfront handles more than 90 percent of the State's fuel supply, and will continue to do so for the foreseeable future. Given these realities, it is critically important that the City not create a fuel bottleneck that severely affects the entire State of Oregon. Unfortunately, that is precisely what the PSC recommendation does and will do.

Sincerely,

Ellen M. Wax
Executive Director

Established in 2005, the Working Waterfront Coalition, with its extensive knowledge of harbor industry needs and active industry participation, is dedicated to working with its partners to ensure an appropriate balance between environmental concerns and the needs of river-related, river-dependent employers. Portland's Harbor is a vital employment area: home to thousands of valuable high-wage, high-benefit jobs. In addition, WWC members are conscientious stewards of the environment, making significant investments in the harbor consistent with state and federal laws.

Moore-Love, Karla

From: Klonoski, Zach
Sent: Wednesday, November 09, 2016 2:59 PM
To: Parsons, Susan; Moore-Love, Karla
Subject: FW: WWC clarifying amendments to PSC Recommended Draft Fossil Fuel Terminal zoning amendments
Attachments: WSPA Comment on Discussion Draft City of Portland July 25 2016.pdf; WSPA Appendix 1, Proposed Portland Zoning Ordinance.pdf

Importance: High

Please add this to the record on the Fossil Fuel Terminal Zoning Amendments item scheduled for tomorrow.

Thanks!

ZK

From: Ellen Wax [mailto:ellen.wax@workingwaterfrontportland.org]
Sent: Wednesday, November 09, 2016 12:03 PM
To: Klonoski, Zach <Zach.Klonoski@portlandoregon.gov>
Subject: WWC clarifying amendments to PSC Recommended Draft Fossil Fuel Terminal zoning amendments
Importance: High

Dear Zach,

Below in this email are the WWC's requested clarifying amendments to the PSC's Fossil Fuel Terminal Zoning Amendments: Recommended Draft.

As we discussed in our recent meeting with you the WWC does not support the PSC Recommendation for fossil fuel terminals and requests that it is not adopted by City Council. However, if City Council members decide to support the PSC Recommendation then we respectfully request the clarifying amendments as outlined below.

The WWC notes that the FFT Amendment process was rushed. This fact is reflected in Appendix A of October 11, 2016, PSC Recommendation. Throughout this rushed process the WWC has supported a better alternative offered by WSPA in July, 2016, which is attached to this email (*WSPA Appendix 1. Proposed Portland Zoning Ordinance*). The WSPA alternative is not mentioned in the PSC Recommendation, and was unfortunately ignored by the City throughout the rushed review process. The WWC continues to support the WSPA alternative.

If City Council is inclined to move forward with the PSC Recommendation, or something similar, the WWC requests that a significant ambiguity in the PSC recommendation be clarified. Specifically, it is not clear whether the limits on the growth relate only to fossil fuel storage tanks, or whether the limits on growth relate to pipes and other fossil fuel facilities associated with existing FFTs. It is our understanding from discussions with city staff that the City's intent is to limit growth related to existing storage tank capacity, and that it does not intend to limit growth related to pipes and other fossil fuel facilities and infrastructure. Accordingly, we offer the following clarifying amendments:

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(2) New fossil fuel storage tanks are prohibited unless a new fossil fuel storage tank is replacing an existing fossil fuel storage tank that does not meet current building code standards for seismic safety, and in that case, the capacity of the new fossil fuel storage tank is prohibited from being greater than the storage capacity of the existing fossil fuel storage tank that is being replaced, plus 10 percent.

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Please call or email with any questions. Thank you. Ellen

Ellen M. Wax
Executive Director
Working Waterfront Coalition

503.220.2064 | 503.295.3660 fax
200 SW Market Street, Suite 190
Portland, OR 97201
ellen.wax@workingwaterfrontportland.org
www.workingwaterfrontportland.org

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Mayor Charlie Hales and
Portland City Commissioners
Portland City Hall
1221 SW 4th Avenue
Portland, OR 97204

November 9, 2016

Re: Fossil Fuel Terminal Zoning Amendments (City Council Hearing, November 10, 2016, 2pm)

Dear Mayor Hales and City Commissioners,

I am writing on behalf of the Working Waterfront Coalition (WWC) in opposition to the Fossil Fuel Terminal Zoning Amendments (FFT Amendments) recommended by the Planning and Sustainability Commission, dated October 11, 2016. (PSC Recommendation). As you know, the WWC represents a wide range of waterfront businesses along the Portland Harbor including several fossil fuel terminals (FFT's).

Background and Position

The WWC has actively participated in the City's FFT amendment process and related efforts, including the enactment of Resolution 37168 and the adoption of the City's 2035 Comprehensive Plan. Throughout the FFT amendment process the WWC has opposed the City's effort to prohibit or limit the growth of multimodal terminals along the working waterfront. These multimodal fuel terminals have safely provided the City, the Region and the State with most of the liquid fuel supply for decades. The energy cluster in Linnton and Willbridge is by far Oregon's largest fuel distribution hub, providing more than 90 percent of the State's fuel supply. Because of the importance of these terminals the WWC has consistently objected to earlier versions of the City's FFT amendments, which sought to ban these multimodal terminals completely. Likewise, the WWC objects to the most recent version of the City's FFT amendments, which ban new multimodal fuel terminals and severely restrict the growth of existing FFTs.

Policy Analysis

From a policy standpoint, it may be helpful for the WWC to explain its' opposition to the PSC Recommendation relative to several of the City's recently enacted goals, including Resolution 37168 and the City's 2035 Comprehensive Plan. In that regard, City Council should reject the FFT amendments recommended by the Planning and Sustainability Commission because the PSC recommendation is inconsistent with several of the City's recently enacted goals:

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Explanation: In order to economically justify the level of private investment needed to comprehensively upgrade critical energy and transportation infrastructure at existing FFTs, existing FFT's must be allowed to grow. The PSC Recommendation does the opposite. The PSC Recommendation prohibits existing FFTs from growing, except in one very limited circumstance. The only circumstance

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under which an existing FFT can grow is if it replaces an existing tank with a seismically upgraded tank. However, even if an existing tank is replaced with a seismically upgraded tank, the incremental growth that can occur when a tank is replaced is limited to 10 percent of the capacity of the tank being replaced, with an overall increase limited to 10 percent of the storage capacity of the FFT facility on the date the amendments are enacted. This severe limitation on expansion discourages disaster-resilient development because the small amount of growth that is allowed to occur will not justify the massive amount of private investment needed to replace existing tanks in Portland. Even if investment does occur, the PSC recommendation will only produce a seismic upgrade of 10 percent, because no additional growth can occur once the 10 percent limit is reached. Without growth, investment in seismic upgrades will not occur. In short, the 10 percent rule creates an economic disincentive to disaster-resilient development, is shortsighted, and will be counterproductive to meaningful seismic upgrades over time.

2) As provided in Policy 6.48 of the 2035 Comprehensive Plan, if the City's goal is to limit fossil-fuel distribution and storage facilities to those necessary to serve the regional market, then City Council should reject the PSC Recommendation because it restricts the ability of fossil fuel infrastructure that is necessary to serve the regional market.

Explanation: All of the existing FFT's located in Portland's energy cluster are needed to serve the regional market. The PSC recommendation wrongly targets existing FFTs that serve the regional market. The WSPA alternative provides a regulatory concept and draft code language that limits extra-regional FFT's, while protecting FFT's that serve the regional market. The WSPA alternative is consistent with Policy 6.48, but the PSC recommendation is not.

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Explanation: For the reasons described above, the PSC Recommendation will not improve seismic resilience of existing FFT infrastructure, because it creates a long term disincentive to invest in existing FFTs and any related seismic upgrades. The associated disinvestment in existing FFT facilities that will occur as a result of the PSC recommendation will create a less efficient and potentially less safe regional fossil fuel infrastructure in Portland, as firms focus future capital investments in markets where their return on investment is justified.

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Explanation: By prohibiting new FFTs and limiting the capacity of existing FFTs that serve the regional market the PSC Recommendation creates a significant supply constraint for fossil fuels used by customers within the region. Over time and in times of emergency, this supply constraint will create a significant fossil fuel bottleneck in Portland. When it becomes necessary to bypass this supply constraint,

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Explanation: The proposed ban on new FFTs that serve the regional market, along with a significant limit on growth for existing FFTs, will make the City, the Region and the State less economically resilient because the ban and its related limits creates a significant regulatory constraint that discourages firms from investing in needed infrastructure and technology that will make the Portland region less susceptible to impacts from climate change, natural disasters and unforeseen changes in the economy. For the foreseeable future, fossil fuels will continue to fill an important role in our energy economy. The Portland region and the state as a whole depends on the existing FFT's for roughly 90 percent of its petroleum supply. Even if the demand for fossil fuel in Oregon is only growing ½ percent to 1 percent annually, as estimated by the city, it is critically important for firms to continue to invest in fossil fuel facilities over the next several decades, as significant demand continues and risk of natural disasters and other unforeseen emergencies continues to exist. In short, Portland should not create significant disincentives for FFT's to invest in critical energy facilities that will continue to power Portland and the State of Oregon for decades to come.

Position, Alternative, and Clarifying Amendment

For all of the above reasons, the WWC opposes the PSC Recommendation and requests that it not be adopted by City Council.

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Working Waterfront
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Fossil Fuel Storage Tank A fossil fuel storage tank is a tank affixed to the ground, within the boundaries of an existing Bulk Fossil Fuel Terminal site, which is used exclusively for fossil fuel storage.

Conclusion

For all of the reasons stated above, the WWC urges City Council to reject the PSC recommendation and reconsider its proposed regulation of multimodal FFTs along the City's working waterfront. The existing concentration of multimodal fuel terminals located along the City's working waterfront handles more than 90 percent of the State's fuel supply, and will continue to do so for the foreseeable future. Given these realities, it is critically important that the City not create a fuel bottleneck that severely affects the entire State of Oregon. Unfortunately, that is precisely what the PSC recommendation does and will do.

Sincerely,

Ellen M. Wax
Executive Director

Established in 2005, the Working Waterfront Coalition, with its extensive knowledge of harbor industry needs and active industry participation, is dedicated to working with its partners to ensure an appropriate balance between environmental concerns and the needs of river-related, river-dependent employers. Portland's Harbor is a vital employment area: home to thousands of valuable high-wage, high-benefit jobs. In addition, WWC members are conscientious stewards of the environment, making significant investments in the harbor consistent with state and federal laws.

188142

Working Waterfront COALITION

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Western States Petroleum Association
Credible Solutions • Responsive Service • Since 1907

Frank E. Holmes
Director Northwest Region

July 25, 2016

Mr. Steve Kountz
City of Portland
1900 SW 4th Ave, Suite 7100
Portland, OR 97201

via e-mail: steve.kountz@portlandoregon.gov

Re: WSPA Comments on the City of Portland Discussion Draft

Dear Mr. Steve Kountz:

The Western States Petroleum Association (WSPA) is a non-profit trade association representing companies that explore for, produce, refine, transport, and market petroleum, petroleum products in five western states including Oregon. WSPA appreciates the opportunity to provide comments on the City of Portland Bureau of Planning and Sustainability Fossil Fuel Terminal Zoning Amendments Discussion Draft.

As you know from our June 2, 2016, meeting, several WSPA members operate petroleum terminals in Portland. These members have responsibly operated in the energy corridor along Northwest St. Helens Road for decades. This corridor provides key energy and emergency infrastructure as recognized by various city, state, and federal documents. WSPA opposes the City's push to regulate fossil fuels under Resolution No. 37166, Fossil Fuel Terminal Zoning Amendments, or otherwise, but submits these comments in an attempt to mitigate some of the unintended consequences of the contemplated zoning amendments.

The proposed zoning amendments contradict and misalign with federal and state laws pertaining to energy infrastructure, including but not limited to Oregon's low carbon fuel standards, Oregon's Renewable Fuel Standards, federal Renewable Fuel Standards, and similar laws. The Discussion Draft further appears to not follow policy direction in Resolution No. 37166 and the City's Comprehensive Plan enabling energy infrastructure to serve the region as well as transition to non-fossil fuel sources. Of particular concern to WSPA, the proposed zoning amendments would create a number of substantial unintended consequences. Specifically:

- The Discussion Draft restricts infrastructure that serves the region, in contradiction of the new City Comprehensive Plan provision governing fossil fuel infrastructure;
- The Discussion Draft fails to clearly specify how existing infrastructure can expand on existing sites, to adjacent properties, and to nearby non-adjacent properties;

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- The Discussion Draft restricts infrastructure related to Oregon's low carbon fuel standards, Oregon's Renewable Fuel Standards, federal Renewable Fuel Standards, and similar laws;
- The Discussion Draft terminal size thresholds are too small to enable expansion to serve future energy needs;
- The Discussion Draft stymies potential future technologies that do not fit within the contemplated framework;
- The Discussion Draft provides too narrow of a geographic area (currently, the IH Zone) for siting new terminals;
- The Discussion Draft generally does not align with state and federal policy regarding siting energy infrastructure;
- The Discussion Draft encourages less efficient (and potentially less safe) transportation by truck over more efficient modes of transportation;
- The Discussion Draft fails to provide for the economic impact assessment called for by Resolution No. 37166; and
- The proposed timeline for implementing the Discussion Draft is too fast to allow for thoughtful discussion and tailoring addressing the above and other concerns.

We have enclosed proposed zoning code language that would address some of the issues raised in this comment. While the proposed language does not resolve all the problems with the contemplated amendments, it addresses some of them.

Again, thank you for this opportunity to comment on the Fossil Fuel Terminal Zoning Amendments Discussion Draft. We hope the City reconsiders its push to pass regulations in this area, and if does, that it will more narrowly tailor its rules to not contradict federal and state direction and avoid unintended consequences.

Thank you for your consideration of WSPA's comments. If you have any questions, please contact me at this office at fholmes@wspa.org and (360) 352-4506.

Sincerely,

Frank E. Holmes

Frank E. Holmes
Director, Northwest Region
Western States Petroleum Association

Enclosure: Appendix 1, Proposed Portland Zoning Ordinance

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WSPA

Appendix 1- Proposed Portland Zoning Ordinance

This appendix contains draft zoning code language from WSPA for City of Portland consideration in effectuating the City's fossil fuels policy. WSPA continues its position that the City's effort to regulate fossil fuels is misplaced and opposes those efforts. These proposed code provisions are intended to avoid some of the unintended consequences of the City's proposal and do not indicate WSPA support for City efforts to regulate fossil fuels. WSPA's draft code language contains four components:

1. Three new definitions for Portland Zoning Ordinance Chapter 33.910 (Appendix 1, page 2),
2. A use characteristics description for Bulk Fossil Fuels Terminals in Zoning Ordinance Chapter 33.920 (Appendix 1, page 2),
3. A new Energy Corridor Overlay Zone to protect existing fuel terminals in proposed new Portland Zoning Ordinance Chapter 33.490 (Appendix 1, page 4), and
4. Modifications to base industrial zones in Portland Zoning Ordinance Chapter 33.140 to recognize Bulk Fossil Fuel Terminals as a limited use (Appendix 1, page 7).

Extra-Regional Bulk Fossil Fuel Terminal. A fossil fuel terminal that primarily serves markets outside of the Petroleum Administration for Defense District (PADD) 5 region, an area that includes the western states of California, Arizona, Nevada, Oregon, Washington, Alaska, and Hawaii.

Fossil Fuels. Fossil fuels include coal, petroleum, crude oil, refined oil, natural gas, bitumen, kerosene, propane, and other fuels made from decayed plants and animals that lived millions of years ago and are primarily used as a source of energy. Blended fuels containing a mix of fossil fuels and other fuel sources designed to address Oregon's low carbon fuel standards in Oregon Administrative Rules Chapter 340, Division 253, federal Renewable Fuel Standards, state Renewable Fuel Standards, or similar state or federal laws designed to reduce the carbon footprint of fuels are not fossil fuels.

Regional Bulk Fossil Fuel Terminal. A fossil fuel terminal that primarily serves the Petroleum Administration for Defense District (PADD) 5 region, an area that includes the western states of California, Arizona, Nevada, Oregon, Washington, Alaska, and Hawaii.

[Proposed New Use Category For Bulk Fossil Fuel Terminals]

33.920.360 Bulk Fossil Fuel Terminal

A. Characteristics. Bulk Fossil Fuel Terminals are characterized by having all of the following (1) marine, pipeline or railroad transport access, (2) transloading facilities for transferring a shipment between transport modes (such as from rail to ship), and (3) storage facilities for fossil fuels exceeding a storage capacity of [____] million barrels for petroleum, [____] million gallons for liquefied natural gas (LNG), [____] million gallons for other liquefied gas fuels.

B. Accessory Uses. Accessory uses may include offices, pipes, industrial processing, shipping terminals, parking, storage, rail spur or lead lines, and docks.

C. Examples. Extra-regional liquefied natural gas (LNG) export facilities, propane export facilities, or coal export facilities.

D. Exceptions.

1. Improvements in the safety, or efficiency, seismic resilience, or operations of existing energy infrastructure.
2. Terminals or firms that are end users of fossil fuels or sell directly to end users of fossil fuels such as airports, manufacturing, agricultural businesses, utilities, gas stations, and power plants.
3. Development of emergency backup capacity.
4. Infrastructure that enables recovery or re-processing of used petroleum products
5. Terminals or firms that are storing, transporting or processing fuels and blended fuels containing a mix of fossil fuels and other fuel sources designed to address Oregon's low carbon fuel standards in Oregon Administrative Rules Chapter 340, Division 253, federal Renewable Fuel Standards, state Renewable Fuel Standards, or similar state or federal laws designed to reduce the carbon footprint of fuels.

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[Proposed New Chapter in Zoning Ordinance]

City of Portland Planning and Zoning Ordinance - Title 33, Planning and Zoning

Chapter 33.490 Energy Corridor Overlay Zone

Sections:

33.490.010 Purpose
33.490.020 Map Symbol
33.490.025 Relationship to Portland Zoning Code Chapter 33.140
33.490.030 No Size limits
33.490.040 Expansion of Energy Corridor Terminals

Map 490-1 Energy Corridor Overlay Zone Boundaries

33.490.010 Purpose

The Energy Corridor Overlay Zone recognizes the historic cluster of energy terminals, including fossil fuel terminals that have served as Portland's hub for energy transport for decades. The purpose of this overlay zone is to protect this area for future energy infrastructure growth, including but not limited to expansion of energy terminals.

33.490.020 Map Symbol

The Energy Corridor Overlay zone is shown on the Official Zoning Maps with a letter "m" map symbol.

33.490.025 Relationship to Portland Zoning Code Chapter 33.140

The Energy Corridor Overlay zone provides flexibility for the sites subject to this overlay in addition to what are allowed under Portland Zoning Code Chapter 33.140. If there is a conflict between what is allowed under this Chapter 33.490 and what would be allowed Chapter 33.140, this Chapter 33.490 controls.

33.490.030 No Size Limits

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There is no storage or other size limits for Bulk Fossil Fuel Terminals or other energy facilities located in the Energy Corridor Overlay Zone.

33.490.040 Expansion of Energy Corridor Terminals

A Bulk Fossil Fuel Terminal in the Energy Corridor Overlay may expand to new lots and parcels outside of the Energy Corridor Overlay zone as provided in this Section 33.490.040. A Bulk Fossil Fuel Terminal may only expand onto parcels or lots that are all or partially within one half of a mile from a property line of the lot or parcel containing the Bulk Fossil Fuel Terminal. A Bulk Fossil Fuel Terminal that is expanded outside of the Energy Corridor Overlay will be treated as if it were entirely within the Energy Corridor Overlay for purposes of land use and all other city approvals. If an expansion of an energy facility to a new lot or parcel pursuant to this Section 33.490.040 includes proposed development that would qualify the combined energy facility as a Bulk fossil Fuel Terminal, the combined energy facility will be treated as if it were entirely within the Energy Corridor Overlay for purposes of land use and all other city approvals.

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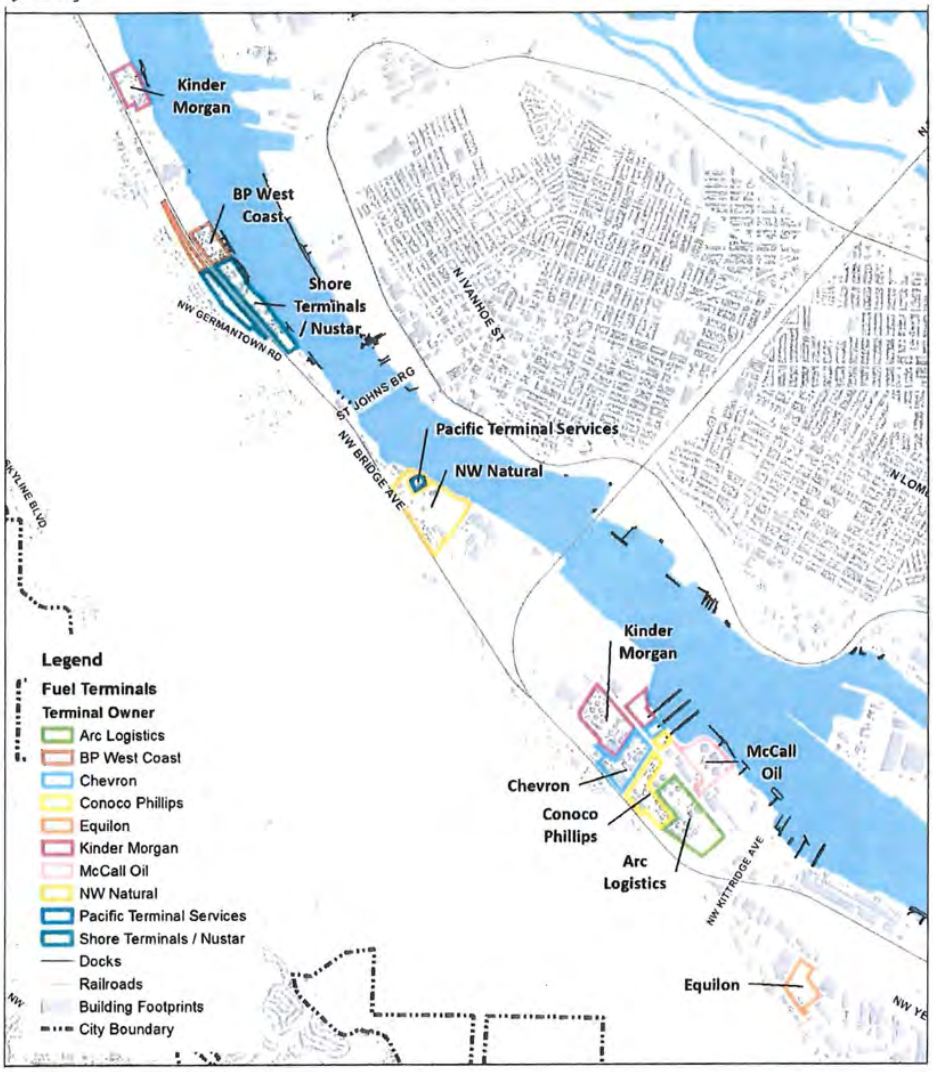
Map 490-1 Energy Corridor Overlay Zone Boundaries [*designate noted sites with "m" map symbol*]



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[Proposed Changes to Chapter 33.140 are shown in RED]

City of Portland Planning and Zoning Ordinance - Title 33, Planning and Zoning

Chapter 33.140 Employment and Industrial Zones

Sections:

General

33.140.010 General Purpose of the Zones
33.140.020 List of the Employment and Industrial Zones
33.140.030 Characteristics of the Zones
33.140.040 Other Zoning Regulations

Use Regulations

33.140.100 Primary Uses
33.140.110 Accessory Uses
33.140.130 Nuisance-Related Impacts
33.140.140 On-Site Waste Disposal

Site Development Standards

33.140.200 Lot Size
33.140.205 Floor Area Ratio
33.140.210 Height
33.140.215 Setbacks
33.140.220 Building Coverage
33.140.225 Landscaped Areas
33.140.227 Trees
33.140.230 Ground Floor Windows in the EX Zones
33.140.235 Screening
33.140.240 Pedestrian Standards
33.140.242 Transit Street Main Entrance
33.140.245 Exterior Display, Storage, and Work Activities
33.140.250 Trucks and Equipment
33.140.255 Drive-Through Facilities
33.140.265 Residential Development
33.140.270 Detached Accessory Structures
33.140.275 Fences
33.140.280 Demolitions

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33.140.290 Nonconforming Development
33.140.295 Parking and Loading
33.140.300 Signs
33.140.310 Superblock Requirements
33.140.315 Recycling Areas

General

33.140.010 General Purpose of the Zones

The employment and industrial zones are for areas of the City that are reserved for industrial uses and for areas that have a mix of uses with a strong industrial orientation. The zones reflect the diversity of industrial and business areas in the City. The zones differ in the mix of allowed uses, the allowed intensity of development, and the development standards. The regulations promote areas which consist of uses and developments which will support the economic viability of the specific zoning district and of the City. The regulations protect the health, safety and welfare of the public, address area character, and address environmental concerns. In addition, the regulations provide certainty to property owners, developers, and neighbors about the limits of what is allowed.

33.140.020 List of the Employment and Industrial Zones

The full and short names of the employment and industrial zones and their map symbols are listed below. When this Title refers to the employment or E zones it is referring to the first three listed. When this Title refers to the industrial or I zones, it is referring to the last three listed.

Full Name / Short Name	Map Symbol
General Employment 1	EG1
General Employment 2	EG2
Central Employment	EX
General Industrial 1	IG1
General Industrial 2	IG2
Heavy Industrial	IH

33.140.030 Characteristics of the Zones

A. General Employment. The General Employment zones implement the Mixed Employment map designation of the Comprehensive Plan. The zones allow a wide range of employment

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opportunities without potential conflicts from interspersed residential uses. The emphasis of the zones is on industrial and industrially-related uses. Other commercial uses are allowed to support a wide range of services and employment opportunities. The development standards for each zone are intended to allow new development which is similar in character to existing development. The intent is to promote viable and attractive industrial/commercial areas.

1. General Employment 1. EG1 areas generally have smaller lots and a grid block pattern. The area is mostly developed, with sites having high building coverages and buildings which are usually close to the street. EG1 zoned lands will tend to be on strips or small areas.

2. General Employment 2. EG2 areas have larger lots and an irregular or large block pattern. The area is less developed, with sites having medium and low building coverages and buildings which are usually set back from the street. EG2 zoned lands will generally be on larger areas than those zoned EG1.

B. Central Employment. This zone implements the Central Employment map designation of the Comprehensive Plan. The zone allows mixed-uses and is intended for areas in the center of the City that have predominantly industrial type development. The intent of the zone is to allow industrial and commercial uses which need a central location. Residential uses are allowed, but are not intended to predominate or set development standards for other uses in the area. The development standards are intended to allow new development which is similar in character to existing development.

C. General Industrial. The General Industrial zones are two of the three zones that implement the Industrial Sanctuary map designation of the Comprehensive Plan. The zones provide areas where most industrial uses may locate, while other uses are restricted to prevent potential conflicts and to preserve land for industry. The development standards for each zone are intended to allow new development which is similar in character to existing development. The intent is to promote viable and attractive industrial areas.

1. General Industrial 1. IG1 areas generally have smaller lots and a grid block pattern. The area is mostly developed, with sites having high building coverages and buildings which are usually close to the street. IG1 areas tend to be the City's older industrial areas.

2. General Industrial 2. IG2 areas generally have larger lots and an irregular or large block pattern. The area is less developed, with sites having medium and low building coverages and buildings which are usually set back from the street.

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D. Heavy Industrial. This zone is one of the three zones that implement the Industrial Sanctuary map designation of the Comprehensive Plan. The zone provides areas where all kinds of industries may locate including those not desirable in other zones due to their objectionable impacts or appearance. The development standards are the minimum necessary to assure safe, functional, efficient, and environmentally sound development.

33.140.040 Other Zoning Regulations

The regulations in this chapter state the allowed uses and the development standards for the base zones. Sites in overlay zones or plan districts and designated historical landmarks are subject to additional regulations which supersede those of this Chapter. The Official Zoning Maps indicated which sites are subject to the additional regulations. Specific uses or development types may also be subject to regulations in the 200s series of chapters.

Use Regulations

33.140.100 Primary Uses

A. Allowed uses. Uses allowed in the employment and industrial zones are listed in Table 140-1 with a "Y". These uses are allowed if they comply with the development standards and other regulations of this Title. Being listed as an allowed use does not mean that a proposed development will be granted an adjustment or other exception to the regulations of this Title. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters.

B. Limited uses. Uses allowed that are subject to limitations are listed in Table 140-1 with an "L". These uses are allowed if they comply with the limitations listed below and the development standards and other regulations of this Title. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters. The paragraphs listed below contain the limitations and correspond with the footnote numbers from Table 140-1.

1. Household Living uses in I zones. This regulation applies to all parts of Table 140-1 that have a [1]. Household Living in houseboats and houseboat moorages in I zones are regulated by Chapter 33.236, Floating Structures. Household Living in other structures is prohibited.

2. Group Living. This regulation applies to all parts of Table 140-1 that have a [2].

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a. General regulations. All Group Living uses except for alternative or post incarceration facilities, are allowed by right subject to the regulations of Chapter 33.239, Group Living.

b. Alternative or post incarceration facilities. Group Living uses which consist of alternative or post incarceration facilities are conditional uses. They are also subject to the regulations of Chapter 33.239, Group Living.

3. EG commercial limitation. This regulation applies to all parts of Table 140-1 that have a [3].

a. Limited uses.

(1) Office uses. Except for sites with historic landmarks, the net building area for Office uses is limited to the square footage of the site area. On sites with historic landmarks, the net building area for Office uses may be up to twice the total square footage of the site area. Exceptions to these size limits are prohibited.

(2) Retail Sales And Service uses. Except for sites with historic landmarks, the net building area plus any exterior display or storage area for Retail Sales And Service uses is limited to 60,000 square feet or the square footage of the site area, whichever is less. On sites with historic landmarks, the net building area plus any exterior display or storage area for Retail Sales And Service uses is limited to 60,000 square feet or twice the total square footage of the site area, whichever is less.

b. Conditional uses.

(1) Retail Sales And Service uses that exceed the area limits in 3.a(2) are a conditional use.

4. IG1 commercial limitation. This regulation applies to all parts of Table 140-1 that have a [4].

a. Limited uses. One Retail Sales And Service or Office use is allowed per site. The square footage of net building area plus the exterior display and storage area may be up to 3,000 square feet.

b. Conditional uses.

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(1) More than one Retail Sales And Service or Office Use on a site is a conditional use.

(2) Any Retail Sales And Service or Office Use where the net building area plus the exterior display and storage area is more than 3,000 square feet is a conditional use.

c. Prohibited uses.

(1) Except for sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 20,000 square feet or the square footage of the site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

(2) For sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 60,000 square feet or twice the square footage of the site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

5. IG2 commercial limitation. This regulation applies to all parts of Table 140-1 that have a [5].

a. Limited uses. Up to four Retail Sales And Service or Office uses are allowed per site. The square footage of the net building area plus the exterior display and storage area may be up to 3,000 square feet per use.

b. Conditional uses.

(1) More than four Retail Sales And Service or Office uses on a site is a conditional use.

(2) Any Retail Sales And Service or Office use where the net building area plus the exterior display and storage area is more than 3,000 square feet is a conditional use.

c. Prohibited uses.

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(1) Except for sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 20,000 square feet or the square footage of the site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

(2) For sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 60,000 square feet or twice the square footage of site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

6. IH commercial limitation. This regulation applies to all parts of Table 140-1 that have a [6].

a. Limited uses. Up to four Retail Sales And Service or Office uses are allowed per site. The square footage of the net building area plus the exterior display and storage area may be up to 3,000 square feet per use.

b. Conditional uses.

(1) More than four Retail Sales And Service or Office use on a site is a conditional use.

(2) Any Retail Sales And Service or Office use where the net building area plus the exterior display and storage area is more than 3,000 square feet is a conditional use.

c. Prohibited uses.

(1) Except for sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 12,000 square feet or the square footage of the site area, whichever is less. Retail Sales And Service and Office uses that exceed these area limits are prohibited.

(2) For sites with a historic landmark, the net building area of all the Retail Sales And Service and Office uses on a site plus the exterior display and storage area, taken together, may not exceed 25,000 square feet or twice the square footage of site area, whichever is less. Retail Sales And Service

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and Office uses that exceed these area limits are prohibited.

7. Self-Service Storage limitation. This regulation applies to all parts of Table 140-1 that have a [7]. The limitations are stated with the special regulations for these uses in Chapter 33.284, Self-Service Storage.

8. Waste-Related limitation. This regulation applies to all parts of Table 140-1 that have a [8]. All Waste-Related uses are conditional uses, unless they meet all of the following conditions in which case they are allowed by right.

a. The use must be approved by Metro under their authority as prescribed in ORS 268.317;

b. Metro's approval of the use must include a mitigation plan. The requirements for the mitigation plan must be approved by the City Council through an intergovernmental agreement with Metro, adopted prior to Metro's approval of the use; and

c. The location of the use must be in conformance with Metro's Regional Solid Waste Management Plan.

9. Community Service uses in EG zones. This regulation applies to all parts of Table 140-1 that have a [9]. Most Community Service uses are allowed by right. Short term housing may be allowed by right if it meets certain standards. See Chapter 33.285, Short Term Housing and Mass Shelters. Mass shelters are prohibited.

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Table 140-1
Employment and Industrial Zone Primary Uses

Use Categories	EG1	EG2	EX	IG1	IG2	IH
Residential Categories						
Household Living	CU	CU	Y	CU [1]	CU [1]	CU [1]
Group Living	CU	CU	L/CU [2]	N	N	N
Commercial Categories						
Retail Sales And Service	L/CU [3]	L/CU [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Office	L [3]	L [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Quick Vehicle Servicing	Y	Y	N	Y	Y	Y
Vehicle Repair	Y	Y	Y	Y	Y	Y
Commercial Parking	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]
Self-Service Storage	Y	Y	L [7]	Y	Y	Y
Commercial Outdoor Recreation	Y	Y	Y	CU	CU	CU
Major Event Entertainment	CU	CU	CU	CU	CU	CU
Industrial Categories						
Manufacturing And Production	Y	Y	Y	Y	Y	Y
Warehouse And Freight Movement	Y	Y	Y	Y	Y	Y
Wholesale Sales	Y	Y	Y	Y	Y	Y
Industrial Service	Y	Y	Y	Y	Y	Y
Railroad Yards	N	N	N	Y	Y	Y
Waste-Related	N	N	N	L/CU[8]	L/CU [8]	L/CU [8]
Bulk Fossil Fuels Terminal	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Institutional Categories						
Basic Utilities	Y/CU [12]	Y/CU [12]	Y/CU [12]	Y/CU [13]	Y/CU [13]	Y/CU 13]
Community Service	L [9]	L [9]	L [10]	L/CU [11]	L/CU [11]	L/CU [11]
Parks And Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	N	N	N
Colleges	Y	Y	Y	N	N	N
Medical Centers	Y	Y	Y	N	N	N
Religious Institutions	Y	Y	Y	N	N	N
Daycare	Y	Y	Y	L/CU [11]	L/CU 11]	L/CU 11]
Other Categories						
Agriculture	L [16]	L [16]	L [16]	L [16]	L [16]	L [16]
Aviation And Passenger Terminals	CU	CU	CU	CU	CU	CU
Detention Facilities	CU	CU	CU	CU	CU	CU
Mining	N	N	N	CU	CU	CU
Radio Transmission Facilities	L/CU [14]	L/CU [14]	L/CU [14]	L/CU [14]	L/CU 14]	L/CU 14]
Rail Lines And Utility Corridors	Y	Y	Y	Y	Y	Y

Y = Yes, Allowed — CU = Conditional Use Review Required

L = Allowed, But Special Limitations — N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.140.100.B.

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• Specific uses and developments may also be subject to regulations in the 200s series of chapters.

10. Community Service in the EX zone. This regulation applies to all parts of Table 140-1 that have a [10]. Most Community Service uses are allowed by right. Short term housing and mass shelters may be allowed by right if they meet certain standards, or may be a conditional use. See Chapter 33.285, Short Term Housing and Mass Shelters.

11. Community Service and Daycare limitations in I zones. This regulation applies to all parts of Table 140-1 that have a [11]. Community Service uses or Daycare uses up to 3,000 square feet of net building area are allowed. Community Service uses or Daycare uses larger than 3,000 square feet of net building area are a conditional use. Short term housing and mass shelters of any size are prohibited.

12. Basic Utilities in E zones. This regulation applies to all parts of Table 140-1 that have a [12]. Public safety facilities that include Radio Frequency Transmission Facilities are subject to the regulations of Chapter 33.274. All other Basic Utilities are allowed.

13. Basic Utilities in I zones. This regulation applies to all parts of Table 140-1 that have a [13]. Public safety facilities that include Radio Frequency Transmission Facilities are subject to the regulations of Chapter 33.274. Public safety facilities which have more than 3,000 square feet of floor area are a conditional use. The approval criteria are in Section 33.815.223. All other Basic Utilities are allowed.

14. Radio Frequency Transmission Facilities. This regulation applies to all parts of Table 140-1 that have a [14]. Some Radio Frequency Transmission Facilities are allowed by right. See Chapter 33.274.

15. Commercial Parking. This regulation applies to all parts of Table 140-1 that have a [15]. Except where plan district provisions supersede these regulations, Commercial Parking is a conditional use in the E and I zones. Within plan districts, there may be special regulations.

16. Agriculture. This regulation applies to all parts of Table 140-1 that have a [16]. Agriculture is an allowed use. Where the use and site meet the regulations of Chapter 33.237, Food Production and Distribution, the applicant may choose whether it is allowed as a Market Garden.

17. Bulk Fossil Fuels Terminals. Regional Bulk Fossil Fuel Terminals of any size are allowed. Extra-Regional Bulk Fossil Fuel Terminals may not exceed a storage capacity of [ ] million barrels for petroleum, [ ] million gallons for liquefied natural gas

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(LNG), [ ] million gallons for other liquefied gas fuels, except as may be allowed pursuant to the Portland Energy Corridor Overlay Zone. Coal terminals may not exceed a storage capacity of one ton of coal.

C. Conditional uses. Uses which are allowed if approved through the conditional use review process are listed in Table 140-1 with a "CU". These uses are allowed provided they comply with the conditional use approval criteria for that use, the development standards, and other regulations of this Title. Uses listed with a "CU" that also have a footnote number in the table are subject to the regulations cited in the footnote. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters. The conditional use review process and approval criteria are stated in Chapter 33.815, Conditional Uses.

D. Prohibited uses. Uses listed in Table 140-1 with an "N" are prohibited. Existing uses in categories listed as prohibited may be subject to the regulations of Chapter 33.258, Nonconforming Uses and Development.

33.140.110 Accessory Uses. Uses that are accessory to a primary use are allowed if they comply with specific regulations for the accessory uses and all development standards.

33.140.130 Nuisance-Related Impacts

A. Off-site impacts. All nonresidential uses including their accessory uses must comply with the standards of Chapter 33.262, Off-Site Impacts.

B. Other nuisances. Other nuisances are regulated by Title 29, Property and Maintenance Regulations.

33.140.140 On-Site Waste Disposal

On-site disposal of solid wastes generated by a use is subject to the same regulations as for uses in the Waste-Related use category. See Table 140-1.

Development Standards

[NO REVISIONS PROPOSED TO DEVELOPMENT STANDARDS]

ENERGY PROUD

From: Beata Alexander
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 7:52:19 AM

Dear City Council Members,

As a resident of this city and a supporter of 350PDX, I urge you to vote in favor of strict building codes enforcing a ban on fossil fuel and promoting green alternatives. We want clean air, water and soil. Take measures to curb climate change--have PDX lead the way. Do not allow loop holes to get around this issue.

We all have this responsibility--make it happen--we have the technology.

Sincerely,

Beata Alexander

From: Beata Alexander
Beata822@aol.com
4031 SE Hawthorne Blvd
Portland 97214

From: Faye Bennett
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Tuesday, November 08, 2016 2:16:47 PM

Faye Bennett
3965 SE Oak St
Portland, OR 97214

November 8, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
M. Faye Bennett

From: David Betts
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 6:21:28 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

1. Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
2. Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
3. Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time. Keep it in the ground!

Sincerely,

From: David Betts
pinnerb@hotmail.com
3317 South Shore Blvd
Lake Oswego 97034

From: Lyla Boyajian
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 5:32:22 PM

Honorable City Council Members,

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

1) Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
2)Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
3)) Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Lyla Boyajian

From: Lyla Boyajian
lylaboyajian@gmail.com
3203 SE Woodstock Blvd
Portland 97202

From: Andrew Butz
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 1:28:55 PM

Thanks to the Planning & Sustainability Commission and the Bureau of Planning & Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I ask the City of Portland to:
* Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
* Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
* Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

The City of Portland really has the opportunity to be a leader in the climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Andrew Butz
anbunz@yahoo.com
3735 SE 9th
Portland 97202

From: Rose Christopherson
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 6:29:02 AM

Thanks so much for helping us restrict new fossil fuel terminals. I agree with 350 PDX...
But haven't figured out how to cut & paste...
but i am especially worried about the huge tanks near Linton on ground that will liquify in a big earthquake. Please don't let them simply upgrade these tanks. They should be moved onto safer ground.
And don't make a special case for NW Natural, and don't let them make their upgrades larger than the ones they have.
Thanks!!

From: Rose Christopherson
rose.christopherson@comcast.net
14707 Nw Cedar St
Portland 97231

188142

From: Eliza Crockett
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 4:02:55 PM

Let's have Portland lead the way to future without fossil fuels! It has to start somewhere.

From: Eliza Crockett
e_crockett@comcast.net
1742 SE Clatsop St
Portland 97202

188142

From: marilee dea
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 7:10:18 AM

Please pass only a full ban on Fossil fuel Infrastructure just like you passed overwhelmingly last year. Do not let the Fossil Fuel industry control us. It is time to get off of FF and move to renewables.Let the city of Portland be the leader to begin the change we need in the world,
Marilee Dea RN PNP

From: marilee dea
marileedea@comcast.net
4613 NE Killingsworth
Portland 97218

188142

From: Dianne Ensign
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Tuesday, November 08, 2016 12:06:21 PM

Dianne Ensign
11600 SW Lancaster Rd
Portland, OR 97219

November 8, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Dianne Ensign

188142

From: Tracy Farwell
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Tuesday, November 08, 2016 4:27:13 PM

Tracy Farwell
PO Box 86449
Portland, OR 97286

November 8, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. CURIOUSLY, WE SEE DRAMATIC EXAMPLES OF PRICEY FOSSIL INFRASTRUCTURE INVESTMENTS THAT WILL BE REDUNDANT AND STRANDED IN JUST A FEW YEARS. SOON INDUSTRY PUSHBACK WILL DECLINE TO ZERO AS CLIMATE REALITY BECOMES CLEAR.

Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Tracy Farwell

188142

From: Martin Frazier
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 8:06:57 AM

We are at a turning point in human history.
We all live downstream from the corporate profit mongering polluters.
We must stop and look at what we can do to heal.
KEEP IT IN THE GROUND.
SAY, "NO" TO BIG OIL.

From: Martin Frazier
martinfrazier52@gmail.com
18th ave
Portland 97202

From: Laura Hanks
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 8:54:22 AM

Dear Portland City Council,
--Please enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. We need NO new fossil fuel infrastructure.
--Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
--Prevent NW Natural from getting a carve out. NW Natural wants to be exempted from this policy and we need to make sure the City Council does not add a last minute amendment on NW Natural's behalf.
Thank you for your attention to these important matters,
Laura Hanks

From: Laura Hanks
laura.hanks@comcast.net
6281 SE Deering Ct
Portland 97222

188142

From: Margie Hanrahan
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 8:56:14 AM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Margie Hanrahan

From: Margie Hanrahan
hanrahanmargie@gmail.com
520 SE 4th St.
Gresham 97080

188142

From: Sabolch Horvat
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 7:33:14 AM

I support reducing fossil fuel consumption through the following means. These are all a good first step to a sustainable future. Thank you. (1) a full ban on new fossil fuel terminals. (2) prohibit expansions at existing terminals. (3) preventing any exceptions to the current proposal. For example, no exemptions for NW Naturals.

From: Sabolch Horvat
sabolch.horvat@gmail.com
4139 NE 62nd Ave
Portland 97218

From: Jynx Houston
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 11:49:12 AM

I AM URGING YOU TO DO THE RIGHT THING & ADOPT A STRONGER FOSSIL FUEL CODE--ABSOLUTELY
NO NEW OR EXPANDED FOSSIL FUEL TERMINALS.

JYNX HOUSTON
7605 SE LINCOLN ST.
PORTLAND, OR 97215

From: Jynx Houston
jynxcdo@gmail.com
7605 SE Lincoln St.
Portland 97215

188142

From: Sharon Hunt
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 11:28:10 AM

This isn't about money and you should not be swayed by that. It is about our safety and the environment.
Please do the RIGHT thing !

From: Sharon Hunt
gvsahunt@comcast.net
17227 S W Loma Vista Street
Aloha 97007

188142

From: Tom Kane
To: BPS Fossil Fuel Zoning
Subject: Fossil fuel infrastructure
Date: Tuesday, November 08, 2016 1:24:36 PM

Dear Council Members,

I don't know if you are aware, but the latest science is clear--we must cease to develop new fossil fuel reserves. Current existing sources of fossil fuel, if used, will put us over the 2 degree threshold. Furthermore, the more information we get from scientists, the more we see that changes due to the warming of the planet are accelerating and coming sooner than expected. The reality is that we need to rapidly phase out the use of fossil fuels if we are to have a planet remotely like the one we have now.

New infrastructure is simply making long term investments in projects that we cannot allow to exist in the long term. I hope to see the city of Portland lead the way in stopping all new fossil fuel infrastructure. From there we can look forward to the state following your lead. Doing this puts us in a position of leadership. When the needed factories in renewable energy, we will have a good argument for locating them here as leaders in the movement away from fossil fuels.

Thanks for your work

Tom Kane

188142

From: Gordon Karpen
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 12:15:57 AM

Portland City Council, please:
Let's improve the Fossil Fuel Zoning Amendments in so that they are such as to make the matters of concern more manageable and more sustainable, without any more fossil fuel storage.

Have a wonderful day!
Thank You.

From: Gordon Karpen
gordonkarpen@yahoo.com
310 NW 6th Ave. #310
Portland 97209

188142

From: Harry Kershner
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 11:48:20 AM

NO new fossil fuel infrastructure. NO expansions of existing infrastructure. NO carve out.for NW Natural.

From: Harry Kershner
harrykershner@msn.com
9322 N Oswego Ave
Portland 97203

From: Jan MacWilliams
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 7:31:58 AM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Jan MacWilliams
janmacwill@gmail.com
2007 NE 65th Ave
Portland 97213

From: Linda Martin
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 12:13:56 AM

Keep it in the ground!!!!!!
A full ban on new or expanded fossil fuel terminals!
Don't exempt NW Natural!
Prohibit expansions an existing terminals and require them to make upgrades for seismic safety!

Listen to the people… We pay your salaries!… Remember?

From: Linda Martin
LDM593@yahoo.com
PO Box 80368
Portland 97280

188142

From: Sena McCarthy
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 2:50:56 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

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Sincerely,
Sena McCarthy

From: Sena McCarthy
Senabean@gmail.com
3908 SE Oak
POrtland 97214

188142

From: Teresa McFarland
To: BPS Fossil Fuel Zoning
Subject: Fossil Fuel Policy Resolution #37168
Date: Tuesday, November 08, 2016 7:55:36 AM

Dear City Council members,

On November 2015, you passed a resolution that stated that the City would

"actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Please stand firm and enshrine this decision in regulation.

I urge you to prohibit all expansions of existing fossil fuel terminals. It's unnecessary for the City to allow new terminals up to 2 million gallons. And we don't need to expand fossil fuel terminals in order to make them safer. Also, please reject NW Natural's request to be exempted from the proposed amendments.

Thank you,

Teresa McFarland

From: Bill Michtom
To: BPS Fossil Fuel Zoning
Subject: Fossil fuel terminal zoning
Date: Tuesday, November 08, 2016 3:10:46 PM

While the City Council has proposed a restriction on fossil fuel terminals, it is still contrary to what is required to combat the crisis conditions of climate change under which we live.

It still allows expansion of fossil fuel storage at existing terminals.

The only action necessary and sufficient to the global emergency of climate change is ending ALL fossil fuel use. Any expansion is too much.

I urge the council to amend the resolution so that it eliminates ALL expansion and starts reducing such facilities immediately.

There is no other safe option.

Thank you.

Bill Michtom
731 SW Salmon St, #505
Portland, OR, 97205
503-975-1529

188142

From: Amanda Morse
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Tuesday, November 08, 2016 5:54:20 AM

Amanda Morse
4928 se 73rd
Portland, OR 97206

November 8, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Amanda

From: Kerry movassagh
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 11:23:31 PM

Kerry movassagh
8560 n mohawk
portland, OR 97203

November 8, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Kerry movassagh

188142

From: Doris Nielsen
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 7:35:17 AM

Please!! No more infrastructure to support fossil fuels. Portland must be a leader in transitioning away from fossil fuels whose use is heating up our planet. Make us proud of our City Council for taking a stand on this important issue!

From: Doris Nielsen
wirtz.doris@gmail.com
3315 Cedar Ct.
Lake Oswego 97034

From: Lynne Oulman
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 4:07:42 PM

"Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.
I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators."

I also wish to add a closing thought. All governmental bodies have a fiduciary obligation to protect the "public trust." Your actions on this issue will be a benchmark for future generations, who will recognize that you acted for future generations rather than the monetary benefit of a very few. Thank you from a former PDX resident!

From: Lynne Oulman
lynne.oulman@gmail.com
816 14th St
Bellingham WA 98225 98225

From: JUDY PERRY
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 8:58:46 AM

I strongly recommend that the Council:
Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. We need NO new fossil fuel infrastructure.
Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
Prevent NW Natural from getting a carve out. NW Natural wants to be exempted from this policy and we need to make sure the City Council does not add a last minute amendment on NW Natural's behalf.

I want your decision to be a message to our citizens as well as to fossil fuel corporations: we see the climate heading toward more chaos, we know the heat -trapping gases already up in the atmosphere have set in motion harmful effects we have not seen yet, we know we need to curtail our use of carbon fuels in order to minimize increasing climate chaos. Your decision on fossil fuel infrastructure leads us toward a more liveable future. THANK YOU FOR YOUR EFFORTS.

From: JUDY PERRY
judy1of4perry@hotmail.com
2021 NE Clackamas St., #7
Portland 97232

188142

From: Amy Robbins
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 8:44:15 AM

We want a peaceful future with renewable energy and a stable climate so let's plan for it now. No new fossil fuel terminals of any size. No expansions of existing terminals. No exceptions for NW Natural or anyone else. Until we can dismantle our current terminals, they need to be made seismically safe. Please help Portland lead the way to a better future.
Sincerely,
Amy Robbins

From: Amy Robbins
arobbins1966@yahoo.com
9227 N Central St
Portland 97203

188142

From: Claudia
To: BPS Fossil Fuel Zoning
Subject: Fossil Fuel Zoning
Date: Tuesday, November 08, 2016 4:57:18 PM

"The City's intent was clear: to use the City's policy to hasten our transition away from dirty, dangerous fossil fuels. The City received worldwide praise for its leadership. Now it's time for to put the policy into binding code. The Planning and Sustainability Commission (PSC) made its recommendation in October. **On Nov. 10**, the City Council must resolve key issues to ensure that the final zoning code amendments reflect the ambitious goals of the Council's 2015 resolution."

Happy Trails
Claudia Sanzone

From: Barbara Scharff
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 4:54:39 PM

Dear City Council:
I am sending this message because Portland is poised to make history in the international climate justice movement. We can become a pioneer, a model city in the United States to enact a full ban on new fossil fuel terminals and infrastructure. Also, existing terminals should not be expanded, and they certainly need seismic upgrades. (I just saved enough money to seismically upgrade the foundation and connection to our old family home, and installed a gas shut-off valve.) Also, NW Natural should be included in all policies.

Please make the needed improvements to the Fossil Fuel Zoning Amendments. Our children and grandchildren depend on your forward thinking and will be thanking you.

Sincerely,
Barbara Scharff

From: Barbara Scharff
buscharff@msn.com
3025 NE Brazee Street
Portland 97212

From: Jane Stackhouse
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Tuesday, November 08, 2016 7:33:50 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Jane Stackhouse
2643 NE 43 Ave
Portland, OR 97213

From: Joseph Stenger MD
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 6:30:22 AM

Thanks for the improved Fossil Fuel Terminal Zoning Amendments. But we need a full ban on new terminals of any size. It is not a matter of balancing financial interests and environmental interests. We must follow the 2015 resolution and actively oppose expansion in any form. This is crucial for the future for my children and grandchildren and for those of all of us!

Do not exempt smaller terminals.
Do not allow expansion of current facilities.
Do not make an exemption for NW Natural.

We must develop a new economy focusing on renewables. That is difficult, but climate chaos is worsening daily. This is our responsibility. Please do the right thing.

Thank you!

From: Joseph Stenger MD
Joseph.stenger@gmail.com
4420 NE 36th Ave
Portland 97211

From: Gene Stubbs
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 9:22:56 AM

I want the City of Portland to:
1) Enact a full ban on new terminals, large and small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose' new fossil fuel infrastructure.

2) Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

3) Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S clmate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time meaning Climate Change.

Sincerely,

Gene Stubbs

From: Gene Stubbs
stubbsgene@comcast.net
7032 SW 3rd Avenue
Portland 97219

188142

From: Ja Vranka
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 11:18:32 AM

Please take a stand for no new fossil fuel terminals! No expansion of current fossil fuel terminals! And no special exemptions for NW Natural! This is the way it must go for the sake of our planet and for our children and grandchildren. Portland needs to be a leader in this struggle for all of our sakes!
Thank you for your consideration.

From: Ja Vranka
javranka@gmail.com
9103 SW 23rd Drive
Portland 97219

From: Daphne Wysham
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Tuesday, November 08, 2016 2:59:19 PM

Dear City Commissioners,
I wrote the following op-ed which will get carried in papers around the country, urging other cities to follow our lead as the first city in the country to act on the Paris Agreement. I hope my op-ed helps support you in knowing that you are acting on behalf of all of us in Portland in passing the strongest possible ordinance, and, more importantly, future generations in other cities and states around the world. I will be taking the message of your groundbreaking work to COP22 in Marrakech, tomorrow. I hope you won't let us down.
Thank you for your leaderhsip!
Sincerely,
Daphne Wysham

Paris, Follow Portland
by Daphne Wysham

A few days before voters went to the polls in the U.S., the Eiffel Tower and Arc de Triomphe glowed green in Paris.

The reason? France was celebrating the Paris Climate Agreement, which came into force on November 4.

It was a remarkable achievement. Less than a year after 196 countries signed the climate agreement, over two-thirds of the world's countries — including the two biggest greenhouse gas emitters, the U.S. and China — ratified it, agreeing to an upper limit of 2 degrees Celsius in atmospheric warming.

But it might be a bit early to break out the champagne. For starters, the Paris Agreement is toothless.

There are no timetables for ratcheting down consumption of fossil fuels, and no sanctions for countries that fail to meet targets. The deal promises a small amount of assistance to developing countries fighting climate change, but most of that is merely repackaged development aid.

More frighteningly still, the world's existing fossil fuel infrastructure and proven wells and mines will sail us right past the 2 degree upper limit if they're all exploited.

Meanwhile, the clear-eyed citizens of Portland, Oregon, are pioneering a more proactive way forward. A year ago, Portland's city council unanimously voted to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Portland's city leaders took this step as much out of a desire to protect their own health and safety as out of a desire to act on climate change.

Much of Portland's fossil fuel infrastructure lies in an industrial zone that, should an

earthquake come to pass, would rapidly turn to jello. And oil train derailments — like the one earlier this year in nearby Mosier, Oregon — can cause out-of-control blazes, bringing near fears to the fore.

Respect for indigenous communities is another factor. The Standing Rock Sioux's protest against the Dakota Access Pipeline encampment is a reminder that Native American treaty rights are routinely flouted by fossil fuel industries wanting to push their export projects on impoverished communities. It happens here in the Northwest, too.

But climate science is the central piece. A recent study found that if we are to maintain a mere 66 percent chance of avoiding surpassing 2 degrees Celsius of warming, no more new major fossil fuel infrastructure can be built.

In fact, we must actually leave many proven reserves untapped and begin to dismantle existing fossil fuel infrastructure.

President Obama did the right thing in signing the Paris Agreement. He also took a bold step in issuing guidelines for federal agencies to disclose greenhouse gas emissions associated with major infrastructure projects, like the Dakota Access Pipeline, and consider alternatives should the impact be significant.

But at this moment in time, neither the Paris Agreement nor Obama's proposed "climate test" is sufficient.

Portland Mayor Charlie Hales is showing the world what a first step toward meaningful action on the Paris Accords might look like. On November 17, Portland's city council will vote on what is likely the strongest land use code language in the country prohibiting all new fossil fuel export infrastructure.

Should it pass and become binding law, we'll know who the real world leaders are. Paris — and the rest of the Paris Agreement signatories — would do well to follow Portland's lead.

And if you do, back home in our evergreen city, we'll raise a glass of microbrew in your honor.

From: Daphne Wysham
daphne.wysham@gmail.com
1294 14th St
West Linn 97068

From: Claire Alexander
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 3:07:20 PM

Claire Alexander
4720 N Trenton St
Portland, OR 97203

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Claire Alexander

188142

From: Dale Allen
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 9:43:44 PM

Dear Commissioners,
Thank you for your strong opposition to fossil fuel infrastructure in Portland. I understand you are getting enormous pressure from energy companies to weaken rules that will protect our safety and livability.

It's clear that citizens of the region want less, not more, fossil fuel storage and transport in and through Portland. Will you have the courage to stand up to these giants and show the country and the world another way forward?

We don't need these fuels; we can't afford their climate and environmental costs. Enough is enough.
Please draw the line here on fossil fuel infrastructure.

Thank you,
Your neighbor and supporter,
Dale Allen

From: Dale Allen
Dmallen174@gmail.com
4771 NE Going
Portland 98218

188142

From: Susanna Askins
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 3:17:15 PM

Susanna Askins
14640 NE Russell Ct
Portland, OR 97230

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Susanna Askins

From: Fred Baisden
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 5:47:15 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Fred Baisden
4902 SW 1st Ave
Portland, OR 97239

From: John Barger
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 6:39:23 PM

John Barger
7752 SE 44th Ave
Portland, OR 97206

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
John Barger

From: Wendy Barner
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 2:26:53 PM

Wendy Barner
1020 NW 9th Ave Apt 1212
Portland, OR 97209

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Wendy Barner

188142

From: Duncan Baruch
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 5:49:00 PM

Duncan Baruch
8833 SW 30th Ave. #308
Portland, OR 97219-4067

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, recent site of a derailed oil train and fire.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Duncan Baruch

From: Ben Basin
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 4:07:17 PM

Ben Basin
515 SE 19th Ave.
Portland, OR 97214

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Ben Basin

From: Ric Bernat
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 2:36:47 PM

Ric Bernat
2207 NE 18th Ave.
Portland, OR 97212

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Ric

From: A Bigelow
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 1:56:55 PM

A Bigelow
2215 N Skidmore Ct
Portland, OR 97217

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

No Pembina style projects ever, please. No oil bomb trains ever, please. No fossil fuel based pollution ever, please.

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Thank you.

Thank you.
A Bigelow

From: Ethel Birnbach
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 2:46:57 PM

Ethel Birnbach
4703 C SW Caldew
Portland, OR 97219

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Ethel Birnbach

From: Trish Claffey
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 1:26:29 PM

Trish Claffey
2527 NE Clackamas St
Portland, OR 97232

November 7, 2016

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Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Sincerely,

Sincerely,
Trish Claffey

From: George Cummings
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 2:16:59 PM

George Cummings
3816 NE 17th Ave
Portland, OR 97212

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Sincerely,

Sincerely,
George Cummings

188142

From: Mary Davis
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 8:29:23 PM

Mary Davis
8049 SE Ogden St
Portland, OR 97206

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Mary Davis

From: Patricia de Garmo
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 3:27:24 PM

Patricia de Garmo
7410 SE Taylor
Portland, OR 97215

November 7, 2016

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Dear Mayor Hales, Members of the Council, and Staff:

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Patricia de Garmo

From: Kris Deelane
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 2:06:36 PM

Kris Deelane
5108 NE KILLINGSWORTH ST
PORTLAND, OR 97218

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Sincerely,

Sincerely,
Kris Deelane

188142

From: Sarah Deumling
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 5:29:33 PM

Portland Mayor and City Council:

We are so proud of your work to date to reduce our use of fossil fuels. Please remain strong and pass a ban or any new terminals, large or small, as well as any expansions - no exceptions for anyone. Someone must lead us out of this dangerous fossil fuel swamp and I think you - and Portland - are the ones. If we don't lave a livable planet for future generations (and us) all other issues don't matter. This is by far the most important issue for you to deal decisively with.

Thank you for courage, foresight and determination.
Sincerely,
Sarah Deumling

From: Sarah Deumling
sdeumling@gmail.com
2233 SE Main St.
Portland 97214

188142

From: kdickson5@frontier.com
To: BPS Fossil Fuel Zoning
Date: Monday, November 07, 2016 9:03:48 PM

It is vital Portland, Oregon follow up and absolutely pas the necessary type of law to prevent fossil fuels from entering our City of Roses. One can not imagine what horrible damage would result from an accident to our city. Please prevent any possibility of this transpiring by your authority. Donald and Carol Dickson Box 219028 Portland, Oregon

From: Nathan Ember
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 1:48:08 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Nathan Ember
designlovegiveadamn@gmail.com
12417 SE 27th Ave
Oak Grove 97222

188142

From: Barbara Erlich
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 5:48:55 PM

Barbara Erlich
7521 N. Edgewater Avenue
Portland, OR 97203

November 7, 2016

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Dear Mayor Hales, Members of the Council, and Staff:

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Barbara Erlich

From: Tim Giugni
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 8:33:16 AM

We are moving rapidly towards new technologies that will make the investment in this terminal obsolete in 5 years time.

I request that we move towards the future and invest there, rather than the past.

From: Tim Giugni
octorilla@yahoo.com
4773 NE Going St
Portland 97218

From: Matthew Glidden
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 2:17:04 PM

Matthew Glidden
2904 NE Knott St
Portland, OR 97212

November 7, 2016

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Sincerely,

Sincerely,
Matthew Glidden

188142

From: didier gohler
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 5:21:55 PM

For the sake of the world and future generations please wake up and move away from fossil fuels. You can do this...
thank you

From: didier gohler
dgohler@hotmail.com
2865 cheryl st
eugene 97408

From: Sheila Golden
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 10:40:07 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

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Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sheila Golden

From: Sheila Golden
goldensheila6@gmail.com
1411 NE 16th Ave.
Portland 97232

From: Helen Hays
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 5:37:16 PM

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From: Helen Hays
hlhays@ccgmail.net
18553 S Ferguson Rd
Oregon City 97045

From: Craig Heverly
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 7:06:42 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

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Sincerely,
Craig Heverly

From: Craig Heverly
hevanet@hevanet.com
3712 SE 9th Ave
Portland 97202

From: Craig Heverly
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 1:16:48 PM

Craig Heverly
3712 SE 9th Avenue
Portland, OR 97202

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Sincerely,

Sincerely,
Craig B Heverly

From: Robert Hodge
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 2:26:55 PM

Robert Hodge
3735 NE Cleveland Ave
Portland, OR 97212

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

We no need no stinkin Oil trains/infrastructure in our back yard/community!! Fossil Fuel Is Dead!

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Sincerely,

Sincerely,
Robert Hodge

From: Kathleen Holloway
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 8:48:07 PM

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Sincerely,
Kathleen Holloway

From: Kathleen Holloway
katholloway@mindspring.com
3132 SE 58th Ave
Portland 97206

From: Don Jacobson
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 1:16:31 PM

Don Jacobson
2545 SW Terwilliger Blvd Apt 314
Portland, OR 97201-6304

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Don Jacobson

From: Sandra Joos
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 4:17:47 PM

Sandra Joos
4259 SW Patrick Pl
Portland, OR 97239

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Sandra Joos

188142

From: Karen Keeney
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 9:09:25 PM

Karen Keeney
NE 16th Ave
Portland, OR 97211

November 8, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Karen Keeney

188142

From: John Keyser
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 3:37:09 PM

John Keyser
3227 SE 67
Portland, OR 97206

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Sincerely,

Sincerely,
John Keyser

From: jeff kipilman
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 2:08:41 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

jeff kipilman
3315 NE 41st Ave
Portland, OR 97212

From: Scott Kulhanek
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 1:56:43 PM

Scott Kulhanek
17858 SE Division St
Portland, OR 97236

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Scott Kulhanek

From: Jack Lenehan
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 3:22:15 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

1. Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2. Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

3. Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.
Sincerely,
Jack

From: Jack Lenehan
jack.lenehan@gmail.com
4216 N. Mississippi, 309
Portland 97217

From: Diane Luck
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 6:29:02 PM

Diane Luck
3204 NE 27th Avenue
Portland, OR 97212

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

I appreciate the new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." I now urge you to take the strongest stand possible for our climate and safety. Please do not allow existing terminals to expand. Please prohibit all new fossil fuel infrastructure. (The proposed zoning code already has an exception for fuels that contain non-fossil energy.) And please resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Thank you for being an example to other people in taking a strong stance on supporting CLEAN ENERGY, not dirty fossil fuel.

Sincerely,
Diane Luck

188142

From: Rose Madrone
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 4:51:03 PM

It is finally time to make this a commitment for Portland! I know it is apparent to you that so many of your city residents and constituents support this ban. Portland is so revered, in our country as well as around the world, for making smart, sustainable and inspiring choices, that lead others to voting for what is right, and not what the corporations are leaning towards. Please represent your children, and their children's children!

Vote for the Ban on New or Expanded Fossil Fuel Terminals!!!!!

Thank you
Rose Madrone

From: Rose Madrone
madrone@tidepool.com
2845 SE Ash St
Portland 97214

From: Mauria McClay
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 6:59:08 PM

Mauria McClay
8125 NE Wygant
Portland, OR 97218

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Mauria McClay

From: Mark McCormick
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 5:38:58 PM

Mark McCormick
801 Oak Street
Hood River, OR 97031

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Sincerely,

Sincerely,
Mark McCormick

From: Mark McLeod
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 5:48:00 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Mark McLeod
2602 SE 28th Place
Portland, OR 97202

From: Mark McLeod
SustainableMcLeod@gmail.com
2602 SE 28th Place
Portland 97202

From: Paulette Meyer
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 3:27:34 PM

Paulette Meyer
1615 SE 58th Av
Portland, OR 97215

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Dr. Paulette Meyer

From: meyer4842@comcast.net
To: BPS Fossil Fuel Zoning
Subject: Portland's Fossil Fuel Policy Resolution #37168
Date: Monday, November 07, 2016 3:19:59 PM

The Planning and Sustainability Commission (PSC) got it right in October when they: Restricted aggregation of small fossil fuel terminals. Rejected a request by NW Natural to exempt its facilities from the fossil fuel code amendments. The City should improve the PSC's Recommended Fossil Fuel Amendments. 1. Prohibit expansions of existing fossil fuel terminals. City Council should allow existing terminals to operate or upgrade for seismic readiness, but not to expand. We don't expect all terminals to go away overnight, but the City's 2015 vote clearly hoped to stop "new infrastructure." The Council should simply remove the words "plus 10 percent" from p. 49 of the PSC's recommendation. This simple fix will prevent unnecessary fossil fuel expansion. Adopting the PSC's recommendation could create more demand for unit trains in Portland, conflicting with the City's November 2015 Oil Train Resolution # 37164. For the ten large oil facilities listed on Figure 7 of PSC's recommendation, a 10% acrossthe-board increase in terminal capacity would result in additional storage of 39,124,920 gallons of oil – a volume equivalent to 13 or more unit trains of explosive Bakken crude oil.1 A single 10% increase in one of several large existing terminals would exceed the volume of a unit train, potentially encouraging new oil unit trains. Yet, Portland's Oil 1 Assumes roughly 3 million gallons of oil per unit train. Unit trains typically carry 2.5 to 3 million gallons of crude oil, depending on the length of the train and size of the cars in the train. Train Resolution # 37164 called for the City to oppose any project that would increase oil train traffic through Portland. The 10% increase would conflict with City policy. We learned first-hand during the June 3, 2016 derailment in Mosier that oil trains are dangerous, and the City should use its fossil fuel zoning code amendments to diminish their use rather than creating space for many more. Already, the Port of Portland has advocated for expanding train lines through Mosier that could increase oil trains. 2. City Council should eliminate or reduce the threshold for prohibiting new fossil fuel terminals. It's unnecessary for the City to allow new terminals up to 2 million gallons. The City of Vancouver banned bulk crude oil facilities outright. Fossil fuel demand should be declining: the amendments need not allow for new fossil fuel infrastructure. To mix renewable and fossil forms of diesel and oil, we should be using existing tank infrastructure. There is no need to expand fossil fuel tanks in order to reduce fossil fuel dependence. The code already exempts fuels that are 95 percent non-fossil. 3. Let's use the right tools to make seismic upgrades. We don't need to expand fossil fuel terminals in order to make them safer. We agree that the City should "develop proposals for State building code changes to improve seismic resilience and require seismic upgrades comparable to proposed requirements on unreinforced masonry buildings," as stated on page 62 of the PSC's recommendation.. The potential for expansion has existed for years, yet thus far it has not been an adequate inducement for establishing safe, seismically-ready facilities. PSC and Council should support Portland Bureau of Emergency Management's (PBEM) expected and recommended process that will encourage seismic upgrades rather than weakening the City's proposed amendments. Council shouldn't cave to NW Natural and exempt methane gas from Portland's fossil fuel

code. NW Natural has requested an exemption from Portland's fossil fuel amendments. We urge City Council to consider the following approach to regulated utilities: • Reject NW Natural's request to be exempted from the proposed amendments. Despite a direct plea from NW Natural, not a single PSC member recommended exempting NW Natural. One PSC member explained that it was normal for multiple layers of government to regulate industries. • Natural gas, primarily comprised of methane, is exactly the type of highly polluting fossil fuel that the City intended to address in its November 2015 resolution. Natural gas is specifically included as a carbon-intensive, dangerous fossil fuel in Portland's 2015 resolution. Portland must take bold action for a clean energy economy. Climate science is clear that we must keep fossil fuels in the ground to avoid catastrophe. And a 2016 study from the Labor Network For Sustainability provides more detail on how Portland and the region will benefit from a transition to clean energy. Additionally, there is growing support for renewable energy in the City of Portland. Portland must accelerate the trend of declining fossil fuel use in order to meet its 2050 carbon reduction goals.

From: Kathryn Midson
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 3:27:24 PM

Kathryn Midson
1911 NW 24TH PL
PORTLAND, OR 97210

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Kthryn Midson

From: Bonnie Mitchell
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 5:07:40 PM

Bonnie Mitchell
11908 NW McNamee Rd
Portland, OR 97231

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Sincerely,

Sincerely,
Bonnie Mitchell

From: Gregory Monahan
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 2:06:50 PM

Gregory Monahan
7225 SW 13th Ave
Portland, OR 97219

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Sincerely,

Sincerely,
Dr. Gregory Monahan

From: John Morris
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 4:38:07 PM

John Morris
6636 SW Burlingame Ave
Portland, OR 97239

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its up-rail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
John and Brenda Morris

From: Don Myers
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 10:02:40 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely, Don Myers

From: Don Myers
walkalot65@gmail.com
27875 Ridge view way
Nehalem 97131

188142

From: John Nettleton
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 4:58:05 PM

John Nettleton
4311 SE 37th Ave. #21
Portland, OR 97202

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
John Nettleton

From: David S. Nichols
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 2:16:28 PM

David S. Nichols
5107 NE Couch St.
Portland, OR 97213

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Sincerely,

Sincerely,
David S. Nichols

188142

From: Gregory Ojala
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 6:08:58 PM

Gregory Ojala
10941 NE Russell St.
Portland, OR 97220

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Gregory Ojala

188142

From: Joyce Peck
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 3:27:47 PM

Joyce Peck
6045 SE Carlton St
Portland, OR 97206

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Joyce Peck

From: Rich Peppers
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 5:36:22 PM

To All City Councillors:

I am writing to thank you for the visionary work on creating the fossil fuel infrastructure ban resolution that gives rise to the ordinance up for discussion and decision, on November 10th. Please keep that vision in mind as you work on the implementing ordinance. I join with hundreds of others in urging you to:

1. Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2. Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

3. Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Thank you -

Rich Peppers
821 NE 70th Ave
Portland, OR 97213

From: Rich Peppers
richpeppers@gmail.com
821 NE 70th Ave
Portland 97213

188142

From: Tobi Piatek
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 7:43:02 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Tobi Piatek
19463 SW Tualamere Ave
Lake Oswego, OR 97035

From: Sandy Polishuk
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 1:13:06 PM

We need the strongest possible code to stop new and expanded fossil fuel terminals. Please give the citizens of Portland what we thought we were getting when you passed the resolution: no new infrastructure, upgraded tanks that will withstand an earthquake, and no exemptions for NW Natural or anyone else.

Compromise isn't appropriate on this one. The earth doesn't compromise. Climate change doesn't compromise. We need to stand firm and do what is needed--all of it!

Thanks

From: Sandy Polishuk
sndybeech@gmail.com
1610 NE Tillamook St Apt. 3
Portland 97212

From: Nora Polk
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 1:46:31 PM

Nora Polk
6405 SE 62nd Ave
Portland, OR 97206

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Nora Polk

188142

From: Rick Ray
To: BPS Fossil Fuel Zoning
Subject: Support a Strong Ordinance to Ban New Fossil Fuel Infrastructure
Date: Monday, November 07, 2016 2:47:05 PM

Dear Portland City Council,

I endorse your policy to hasten our transition away from dirty, dangerous fossil fuels. Now it's time for to put the policy into binding code. The City Council must resolve key issues to ensure that the final zoning code amendments reflect the ambitious goals of the Council's 2015 resolution.

Thank you,

Rick Ray
408 NW 12th Ave #410
Portland OR 97209

From: Lin Reedijk
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 6:59:50 PM

I appreciate the work of the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

1. Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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3. Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Lin Reedijk

From: Lin Reedijk
greengirlpdx@yahoo.com
4673 SW Corbett Ave Uppr
Portland 97239

From: David Regan
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 7:33:30 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

David Regan
623 SW Park Ave #703
Portland, OR 97205

From: Toni Romei
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 3:07:03 PM

Toni Romei
11375 S. W. Erste Place
Tigard, OR 97223

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Toni Romei

188142

From: Christian Rusby
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 6:40:29 PM

Please support Fossil Fuel alternatives so that people can escape the guilt of destroying future generations Climate irreparably. Thank you for taking actions to represent our views and in turn, reduce our fears! Thank you.

Christian

From: Christian Rusby
crusby@gmail.com
4619 NE 30th Ave.
Portland 97211

From: Lee Schmidt
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 8:39:22 PM

Lee Schmidt
1926 SW Vermont St.
Portland, OR 97219

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

I endorse the folowing message and ask that you count me as a strong supporter of stringent regulations that will protect our community from fossil fuel expansion.

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Lee Schmidt

From: Jaylen Schmitt
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 4:38:11 PM

Jaylen Schmitt
2407 NE Mason
Portland, OR 97211

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Jaylen Schmitt

From: Kelly Scott
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 5:40:23 PM

Thank you for being courageous and forward-thinking in trying to protect our earth from further climate change. I urge you to be strong and resist weakening your initial resolution! Specifically:

1. Do not allow ANY new fossil fuel terminals.

2. Do not allow ANY expansions at existing facilities.

3. Do not allow an exception for NW Natural. I am one of their customers and realize this may lead to increased costs of natural gas. But given the effects of global climate change, it is worth it! And I would hope this would encourage them and other companies to invest more in renewable energy.

I am proud to live in such a beautiful and thinking city! Thank you for your leadership, and please make the hard but RIGHT decision to protect our world.

From: Kelly Scott
kellydoc1@comcast.net
3159 SW Hampshire St
Portland 97205

From: Dan Serres
To: BPS Fossil Fuel Zoning
Subject: Fossil Fuel Zoning Code Comments of Columbia Riverkeeper, 350, et al.
Date: Monday, November 07, 2016 7:56:23 AM
Attachments: 2016.11.7 Columbia Riverkeeper 350 et al comments Final.pdf

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Dear Mayor Hales, Portland City Council Commissioners, and Staff -

Please see the attached comments, submitted on behalf of Columbia Riverkeeper, 350 PDX, Sierra Club, Portland Audubon, Climate Action Coalition, Center for Sustainable Economy, Oregon Physicians for Social Responsibility, and Friends of the Columbia Gorge.

Sincerely,

Dan Serres
(503) 890-2441
1125 SE Madison St. Suite 103A
Portland, OR 97214

--
Dan Serres | Conservation Director
Columbia Riverkeeper | 1125 SE Madison Suite 103A Portland 97214
503.890.2441 | dan@columbiariverkeeper.org

November 7, 2016

Portland City Council
1221 SW Fourth Avenue, Room 130
Portland, Oregon 97204.

Sent via email to: fossilfuelzoning@portlandoregon.gov

Re: Comments in Support of Strong Fossil Fuel Zoning Code Amendments

Dear Mayor Hales and Portland City Council Commissioners,

Thank you for the opportunity to offer our comments on the recommended draft of the City of Portland's Fossil Fuel Terminal Zoning Amendments ("amendments"). We appreciate and support several of the revisions put forward by the Planning and Sustainability Commission (PSC). Still, the City must make further adjustments to the proposed code amendments in order to fully implement Portland's Fossil Fuel Policy Resolution #37168 ("resolution"). The resolution stated that the City would **"actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."** The bold intent and plain language of the resolution provide clear guidance to the City Council as it considers proposals to further strengthen – or further weaken – the City's proposed fossil fuel zoning code amendments.

The City Council made a landmark statement in November 2015, and it should honor this statement by ensuring existing fossil fuel terminals do not expand; prohibiting all new fossil fuel terminals; and, resisting pressure to exempt certain fossil fuel companies such as NW Natural.

On behalf of Columbia Riverkeeper, 350 PDX, Sierra Club, Friends of the Columbia Gorge, Center for Sustainable Economy, Oregon Physicians for Social Responsibility, Climate Action Coalition and Portland Audubon Society we offer the following suggestions to improve rather than weaken the proposed fossil fuel zoning code amendments.

I. Prohibit Expansion of Existing Fossil Fuel Terminals

Public testimony overwhelmingly supports prohibiting the expansion of existing fossil fuel terminals. In contrast, PSC recommends allowing for a 10 percent expansion of capacity for replaced tanks. The PSC recommendation was driven by a desire to streamline seismic upgrades. Notably, a revision to remove the "plus 10 percent"[1] allowable expansion in the recommended

[1] *See* Recommended Draft Fossil Fuel Zoning Code Amendments. October 2016. P. 49.

draft failed narrowly during the PSC's discussion. The PSC's recommendation conflicts with the City's fossil fuel resolution, and it conflicts with the City's oil train ordinance. We urge the City to improve the proposed fossil fuel code amendments.

- City Council should amend PSC's recommendation by removing the proposed allowance for a 10 percent expansion of existing fossil fuel terminals. City Council should simply remove the words "plus 10 percent" in Sections 33.140.100-B.17.a-(1)-(2), on page 49 of PSC's recommendation. This change would still allow seismic improvements of fossil fuel tanks to move forward in a streamlined fashion without a discretionary land use process.

- The following code concepts are slightly amended from the PSC's recommendation, and they could accomplish the City's goal of allowing seismic safety upgrades in fossil fuel terminals by allowing a straightforward limited review process for existing terminals, while not incentivizing new fossil fuel infrastructure:

    - Identify "Fossil Fuel Terminals" as a regulated land use, characterized by (a) marine, railroad, or pipeline transport access and (b) either transloading facilities for transferring a shipment between transport modes (such as from rail to ship) or facilities that store fossil fuels.

    - Prohibit Fossil Fuel Terminals in all base zones.

    - Classify existing Fossil Fuel Terminals in industrial and general employment zones as "limited uses" that can continue to operate. Expansion of fossil fuel storage at these existing terminals is prohibited.

    - The following use limitations apply to existing Fossil Fuel Terminals:

        1] Fossil Fuel Terminals that existed on [insert effective date] are allowed, but the total amount of fossil fuel that can be stored on the site is limited to the fossil fuel storage capacity that existed on [insert effective date]. Total fossil fuel storage capacity on the site in excess of the capacity that existed on [insert effective date] is prohibited; and

        2] New fossil fuel storage structures are prohibited unless a new fossil fuel storage structure is replacing an existing fossil fuel storage structure that does not meet current building codes standards for seismic safety, and in that case, the capacity of the

new fossil fuel storage structure is prohibited from being greater than the storage capacity of the existing structure that is being replaced.[2]

- Allowing expanded fossil fuel infrastructure could create more demand for unit trains in Portland, conflicting with the City's Oil Train Resolution # 37164. Unfortunately, PSC recommended allowing a 10 percent expansion of existing terminals as a limited use. For the ten facilities capable of handling oil that are listed on p. 17, Figure 7 of PSC's recommended draft, a 10 percent across-the-board increase in terminal capacity would result in additional storage of 38,848,740 gallons of oil – a volume equivalent to 13 unit trains of explosive Bakken crude oil.[3] The City Council should disallow expansions at existing facilities to bring the code language into alignment with the City's original fossil fuel policy and oil train resolution.

- For large terminals such as the Chevron, Kinder Morgan, and NuStar facilities, a 10 percent increase would exceed the volume of a single unit train, 2.5 to 3 million gallons of oil. Portland's Resolution # 37164 called for the City to oppose any project that would increase oil train traffic through Portland, a standard that conflicts with new 10 percent increases in oil terminals with large existing capacities.



Oil train derails, punctures, spills, and burns in Mosier on June 3, 2016.

- The PSC's recommendation is very likely to result in a 10 percent increase in fossil fuel storage in Portland because Portland is beginning a parallel process to increase seismic safety of its fossil fuel tanks. When coupled with a requirement for seismic upgrades, PSC's recommendation to allow a 10 percent increase is very likely to spur additional fossil fuel infrastructure in Portland. Specifically, if the City requires facilities to upgrade (as it should) for seismic safety and simultaneously allows for expansion, the City will likely see expanded fossil fuel infrastructure. As a result, the City Council should amend the resolution to remove the words "plus 10 percent," thereby not promoting over 38 million gallons of new crude oil storage infrastructure.

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[2] This second use limitation may be redundant, because replacement structures will automatically be required to meet new updated seismic standards. It's included for clarity to parallel the PSC's recommended draft.

[3] Assumes roughly 3 million gallons of oil per unit train. Unit trains typically carry 2.5 to 3 million gallons of crude oil, depending on the length of the train and size of the cars in the train.

- The PSC's recommended amendments correctly acknowledge that "derailment risks to natural resources, especially along rivers, and to rural communities appear to be significant." Oregonians learned first-hand during the June 3, 2016, derailment in Mosier that oil trains are dangerous, and the City Council should use its fossil fuel zoning code amendments to diminish their use rather than create space for many more. The City of Mosier is still dealing with groundwater and surface water pollution from the derailment, evidence that Portland's fossil fuel zoning code amendments should be sculpted to reduce oil train risks however possible.

- A proposal to expand rail traffic through the Columbia River Gorge shows that Portland should make its fossil fuel zoning code amendments as restrictive as possible on future oil or coal unit trains. The Port of Portland recently supported a proposal by Union Pacific to dramatically expand its rail capacity through the town of Mosier – the same location as the oil train derailment, spill, and fire on June 3rd, 2016. In supporting the Mosier rail expansion, the Port of Portland stated that the rail expansion could increase unit train delivery of bulk goods to Portland, which could include the bulk shipment of oil. In November, the Wasco County Commission voted to deny the rail expansion in large part because of the impacts of increased train traffic on treaty-protected tribal fishing resources, a decision that may be appealed by Union Pacific. The Mosier rail expansion controversy shows that the City of Portland should take clear steps to restrict any future developments that could increase oil train traffic through the Columbia River Gorge.

II. Prohibit New Fossil Fuel Facilities

The Planning Commission recommended prohibiting new bulk fossil fuel facilities, consistent with the resolution's direction to **"actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."** However, the PSC included an exception that would allow new fossil fuel facilities with a storage capacity of up to 2 million gallons. PSC opted for 2 million gallons as a lower threshold for defining a bulk fossil fuel terminal because it was less than the volume of a single unit train of oil. We urge City Council to eliminate or reduce any allowance for new fossil fuel terminals that may create increased use or shipment of polluting, dangerous fossil fuels through Portland.

- Staff explained that fossil fuel use may be flat or declining, negating the need for new or expanded fossil fuel terminals. The City's landmark resolution directs Portland to "actively oppose" fossil fuel expansion and thereby curb demand – not perpetuate it. Portland must accelerate the trend of declining fossil fuel use in order to meet its 2050

carbon reduction goals. Globally, climate science is clear that we must keep fossil fuels in the ground to avoid catastrophe.[4]

- City Council should eliminate or reduce the 2 million gallon threshold for a "bulk fossil fuel terminal." By defining a bulk fossil fuel terminal as a facility with storage capacity greater than 2 million gallons, the amendments leave open the possibility of facilities that can accept additional shipments of crude oil or other dangerous fuels.[5] The amendments should be improved by eliminating or lowering the 2 million gallon threshold and preventing additional risks for Portland and uprail residents.

- City Council should reject the idea that new or expanded fossil fuel infrastructure is necessary to protect the health and safety of Portland residents and downstream communities. In the Council's September 20th work session, BPS staff suggested that the City should offer the possibility of new or expanded infrastructure as a "sweetener" to encourage seismic and safety upgrades. The promise of expanded infrastructure, on its own, has not been adequate to induce the fossil fuel industry to improve the seismic readiness of tank infrastructure in the past. Looking forward, City Council should support other expected and recommended processes that will encourage seismic upgrades rather than weakening the City's proposed amendments.

Encouraging Seismic Safety

PSC's recommended draft works to address how the City of Portland can address seismic safety at existing fossil fuel terminals. We agree with staff that the City should explore options to require seismic safety upgrades through a program similar to the un-reinforced masonry buildings (URMs) program that is in process, or a property maintenance code. The City will more effectively enhance seismic safety through this Portland Bureau of Emergency Management (PBEM) process than through a clumsy, broad-brush incentive to build new fossil fuel infrastructure.

- The City should "develop proposals for State building code changes to improve seismic resilience and require seismic upgrades comparable to proposed requirements on unreinforced masonry buildings," as stated on page 62 of the PSC's recommendation.

- The Council should reject the idea that new or expanded fossil fuel infrastructure is necessary to protect the health and safety of Portland residents and downstream communities. As noted above, the historic availability of opportunities to expand or build

[4] "The Sky Is the Limit: Why the Paris Climate Goals Require a Managed Decline of Fossil Fuel Production." 2016. Oil Change International. http://priceofoil.org/content/uploads/2016/09/OCI_the_skys_limit_2016_FINAL_2.pdf.

[5] Unit trains typically carry 2.5 to 3 million gallons each and are usually 90 cars and 1 mile or more in length.

new fossil fuel infrastructure has not been an adequate inducement for establishing safe, seismically-ready facilities.

- City Council should support Portland Bureau of Emergency Management's (PBEM) expected and recommended process that will encourage seismic upgrades rather than weakening the City's proposed amendments.

III. Include Regulated Utilities and NW Natural in Portland's Fossil Fuel Policy

NW Natural has requested an exemption from Portland's fossil fuel amendments. BPS' October 5, 2016, memo offered potential language for this option, but it did not recommend for or against an exemption for NW Natural and other regulated utilities. Despite receiving additional testimony directly from NW Natural during its hearing in October, not a single member of the PSC recommended altering the fossil fuel zoning code amendments to exempt NW Natural. We urge City Council to adopt PSC's approach to regulated utilities and reject NW Natural's requested exemption.

- NW Natural should not receive special treatment. It is appropriate for large, potentially hazardous energy facilities to be regulated by multiple layers of government. The Planning Commission was comfortable with NW Natural receiving scrutiny from multiple layers of government. NW Natural's role as a public utility should not afford it a special status with respect to meeting the City's goal of prohibiting new fossil fuel infrastructure. Indeed, natural gas is specifically included as a carbon-intensive, dangerous fossil fuel in Portland's 2015 resolution. NW Natural must be included because natural gas - primarily methane - is a powerful greenhouse gas and its combustion releases significant carbon pollution.

- NW Natural already owns and operates adequate storage facilities in the Pacific Northwest to meet its Portland load growth needs.[6] At present, NW Natural is undergoing a seismic review of its existing Portland Gasco LNG facility. The City's proposed amendments would allow NW Natural to improve the seismic readiness of its existing storage through a limited use review.

- New LNG infrastructure could serve non-utility and utility purposes, complicating the impact of NW Natural's requested exemption. NW Natural seeks an exemption for facilities that fall within PUC-regulated operations. Staff's October 5 memo stated, "If

[6] See NW Natural Integrated Resource Plan. September 2016. See Section 7.2 - Gas storage relies on Mist, only new LNG storage considered is in Clark County. P. 3.35.

NW Natural established an unregulated subsidiary to supply wholesale LNG, for example, any infrastructure associated with these operations would still be subject to the Fossil Fuel Code." In reality, gas utilities often mix the utility and non-utility purposes of gas storage facilities. For instance, NW Natural's Mist Storage facility has undergone multiple site certificate changes, and now it is planned to operate both as storage for NW Natural's gas utility customers, as well as a source of firm supplies to PGE's gas-fired power plants at Port Westward.[7] Additionally, Puget Sound Energy proposes a new LNG facility in Tacoma that may be used both as storage for its regulated utility customers and as a fueling station for LNG ships and trucks. Hence, the exemption NW Natural seeks may allow facilities that engage in both PUC-regulated and non-PUC-regulated activities.

- NW Natural's Integrated Resource Plan (IRP) does not specify the need for new major LNG storage in Portland. In its long-range plans, NW Natural's IRP discusses the potential for possible LNG storage to meet load growth in Clark County – not Portland. As a result, NW Natural does not appear to need new LNG storage in Portland to meet its core utility needs, and so the exemption it seeks is unnecessary.

IV. Take Bold Action for a Clean, Safe Energy Economy and a Stable Climate

Portland's City Council will benefit Portland's clean energy economy by undertaking the proposed amendments with the suggestions we have outlined. Just as importantly, the City can make significant strides towards improving the safety of neighborhoods by using the right tools to mandate seismic improvements for fossil fuel storage tanks in highly liquefiable soils near the Willamette and Columbia Rivers. Furthermore, the City's fossil fuel code amendments need not impinge on the expansion of cleaner, non-fossil fuels: facilities handling 95% or greater non-fossil fuels are already exempted. And while the amendments should restrict fossil fuel terminals from expanding or building new facilities, they leave open the potential for Portland to continue to serve as a hub for fuels using existing infrastructure until the region moves further towards a managed decline of fossil fuel use.

Importantly, the PSC's recommendation offers City staff both direction and flexibility in implementing the fossil fuel zoning code amendments. Specifically, Portland Bureau of Planning and Sustainability is directed to periodically monitor the effectiveness of these zoning code amendments "to implement underlying policies and consider code adjustments in response to regional fuel demand and market changes, product innovation, safety and climate action considerations, and related regulatory changes." By directing BPS to evaluate the impacts of the

[7] See recent story from Argus Media highlighting new PGE-NW Natural gas storage collaboration. http://www.argusmedia.com/news/article/?id=1323500.

policy, BPS is given a pathway to recommend new fossil fuel infrastructure on an "as-needed" basis if unforeseen conflicts arise.

A 2016 study from the Labor Network for Sustainability provides more detail on how Portland and the region will benefit from a transition to clean energy.[8] Additionally, there is growing support for a renewable energy agenda in the City of Portland. Indeed, new fossil fuel infrastructure could be stranded assets in the foreseeable future.

Lastly, yet another new study from Oil Change International shows that time is of the essence to address climate change through reducing our use of fossil fuels.[9] The study shows that, if we are to avoid a temperature rise of 2 degrees Celsius, we can build no new fossil fuel infrastructure. Indeed, much of our currently proven oil, gas, and coal reserves must go untapped. The Pacific Northwest – with Portland as its guiding light – can begin a managed decline of fossil fuel use, even as the region continues to grow its economy. Portland earned national praise for its 2015 Fossil Fuel Resolution, and the rest of the world is counting on cities like Portland to show how a managed decline of fossil fuel use can respond to the urgent challenge of reducing our dependence on climate-changing fossil fuels.

We look forward to the City Council voting to establish a code that reflects the bold, practical steps outlined in Portland's landmark fossil fuel policy.

Sincerely,

Dan Serres
Conservation Director
Columbia Riverkeeper

Mia Reback
350 PDX

Also submitted on behalf of: Friends of the Columbia Gorge, Center for Sustainable Economy, Portland Audubon Society, Sierra Club, Oregon Physicians for Social Responsibility, Climate Action Coalition

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[8] The Economic Impact of Clean Energy Investments in the Pacific Northwest: Alternatives to Fossil Fuel Exports. 2016. Labor Network For Sustainability. Link to study: http://www.labor4sustainability.org/files/NorthPacific_final_03032016_.pdf

[9] "The Sky Is the Limit: Why the Paris Climate Goals Require a Managed Decline of Fossil Fuel Production." 2016. Oil Change International. http://priceofoil.org/content/uploads/2016/09/OCI_the_skys_limit_2016_FINAL_2.pdf.

From: Rio Shayne
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 2:56:45 PM

Rio Shayne
1230 NW 12th AVE
Portland, OR 97209

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Rio Shayne

From: Joyce Sherman
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 4:37:59 PM

Joyce Sherman
15938 Ne Fremont
Portland, OR 97230

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Joyce Sherman

From: jan and Larry Slobin
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 1:46:39 PM

---

jan and Larry Slobin
2340 NW Brewer Ln
Portland, OR 97229

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Janet J. Slobin

From: Eleanor Solomon
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 5:27:48 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Eleanor Solomon
eleanorjsolomon@gmail.com
8644 SW 42nd Ave
Portland 97219

From: kim stafford
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 5:13:32 PM

We are surrounded by cities, states, our nation and others who seem addicted to business as usual, while our planet deteriorates.

The great work we need to do as a world community begins with individual steps.

Portland has a chance to signal this beginning by passing a full ban--no limitations--on new or expanded fossil fuel terminals.

Our children will be glad we had the courage to take this step.

Thank you and be well,
Kim Stafford
SW Portland

From: kim stafford
krs@lclark.edu
8946 SW 8th Ave.
Portland 97219

188142

From: Chester Stark
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 6:39:04 PM

Chester Stark
3803 SE Grant Ct.
Portland, OR 97214

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Chester Porter Stark

From: Wade Stoddard
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 2:46:49 PM

Wade Stoddard
4105 N. Massachusetts Ave.
Portland, OR 97217

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Wade Stoddard

From: Renee Such
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 1:16:21 PM

Renee Such
3425 SE Stark St
Portlnd, OR 97214

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Renee Such

From: L Cam Taylor
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 7:50:18 PM

L Cam Taylor
705 SE 32ND AVE
Portland, OR 97214

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
L Cam Taylor

From: Kathy Tonegawa
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 7:50:02 PM

Kathy Tonegawa
7131 S. W. 5th Avenue
Portland, OR 97219

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Kathy Tonegawa

From: Charles Townsend
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 1:56:29 PM

Charles Townsend
623 NE Morris St.
Portland, OR 97212

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed, spilled, causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Charles Townsend

From: Dena Turner
To: BPS Fossil Fuel Zoning
Subject: please ban all new fossil fuel terminals
Date: Monday, November 07, 2016 7:30:35 AM

To Portland City Councilors:

Last fall Portland City Council passed a historic resolution to ban new fossil fuel facilities in the city, putting Portland at the forefront of the climate justice movement. The resolution was the result of massive grassroots advocacy and the leadership of Mayor Hales and City Council. Now, one year later we need to hold the City to their word as they work to implement this resolution into binding city code.
Please make this a strong and binding portion of the city code by implementing the following:

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Rejecting Northwest Naturals request to be exempted from these regulations

Thank you

Dena Turner

1122 SE 60th Avenue

Portland, Oregon 97215

denaturn62@gmail.com

From: John Wadsworth
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 2:57:15 PM

John Wadsworth
9271 SW 3rd Ave
Portland, OR 97219

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
John Wadsworth

From: Donna Wehrley
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 2:06:30 PM

Donna Wehrley
3601 SW River Pkwy STE 1904
Portland, OR 97239

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Donna Wehrley

From: Charlie Weiss
To: BPS Fossil Fuel Zoning
Subject: Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 9:33:26 PM

Charlie Weiss
543 SW Maplecrest Ct.
Portland, OR 97219

November 8, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Charlie Weiss

188142

From: Hans West
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Monday, November 07, 2016 6:33:15 PM

Honorable P&S Commission and Bureau of P&S members,
It makes no sense to build a larger, more expensive fossil fuel infrastructure in Portland. And it appears that much of this would be for the purpose of exporting fossil fuels. We know that we need to cut back on our use of carbon based fuels because of global warming.
In support of that the US just signed on to the Paris Climate Change Accords and committed the nation to lowering it's carbon footprint. So let's start with that premise and very carefully scrutinize and regulate any projects that will make our committment to do that less strong and less likely to happen.
Thank you for your hard work on this issue.

Hans West

From: Hans West
westh3@gmail.com
545 Waldo Ave SE
Salem 97302-3174

From: Mark Wheeler
To: BPS Fossil Fuel Zoning
Subject: Union Pacific's failure to adequately maintain its tracks
Date: Monday, November 07, 2016 3:27:25 PM

Mark Wheeler
628 SE 58th
Portland, OR 97215

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Mark Wheeler

From: Diane Winn
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Monday, November 07, 2016 1:57:06 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Diane Winn
1500 SW11th Ave
401
portland, OR 97201

188142

From: Jean Wyman
To: BPS Fossil Fuel Zoning
Subject: I support fossil fuel zoning amendments
Date: Monday, November 07, 2016 3:17:23 PM

Jean Wyman
3914 NE 75th
Portland, OR 97213

November 7, 2016

Dear Staff City of Portland,

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Sincerely,
Jean wyman

188142

From: Naomi Bishop
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Sunday, November 06, 2016 1:18:27 PM

I want the City of Portland to:

1) Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
2) Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
3) Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Please listen to the citizens of Portland who are thinking and acting for the future.

Thank you.
Naomi Bishop

From: Naomi Bishop
naomi.bishop@csun.edu
2825 SE Harrison Street
Portland 97214

From: Barbara Council
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Sunday, November 06, 2016 11:19:58 AM

We have know for over 40 years the damage that Fossil Fuels create. Many of us worked hard and made big effort to stop relying on fossil fuels and other continued to ignore the warnings. We are now witnessing the effect of the damage of Fossil Fuels and the date is not going to reverse until we stop the addictive and predatory use of fossil fuels. I want to have a clean future for our children and their children. Americans have brilliant minds and I know we can solve this issue. Lets invest in a better future by not using fossil fuels.
Thank you,
Barbara Council

From: Barbara Council
barbaracncl@yahoo.com
1430 SW 12th Ave #1112
Portland 97201

188142

From: Erika DAVIS
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Sunday, November 06, 2016 3:34:42 PM

Please enact a full ban on the construction of ANY new or expanded fossil fuel supporting infrastructure.
Any new such infrastructure allowed to move forward puts us that much further behind in the pursuit of clean, renewable energy and the infrastructure it requires to become viable.
NW Natural should NOT be granted exemption, and needs to be included in the policy of no new fossil fuel infrastructure.
We are already losing ground in the global race for leadership in clean renewables. I urge you to focus your attention and support on tightening that race, and helping bring America the greatness we all know it can achieve by becoming a leader in the efforts to keep our one and only planet livable. It will benefit everyone--economically, politically, and in the life and health of each and every living thing.

From: Erika DAVIS
ERIKA@CRESCENTIDESIGN.COM
236 ROSALIE RD
LOPEZ ISLAND 98261

188142

From: Nancy Hedrick
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Sunday, November 06, 2016 3:19:05 PM

Please do not allow new fossil fuel terminals or expansions of current ones. Seismic upgrades of current sites is crucial, as a major earthquake could lead to catastrophic fires and environmental pollution. Please do not grant a special exemption to NW Natural Gas.

Please act to protect the planet as well as our community.

From: Nancy Hedrick
nanhedrick2@hotmail.com
6902 N Villard Ave
Portland 97217

From: Judy Heumann
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Sunday, November 06, 2016 7:57:15 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Judy Heumann
2402 NE 26
Portland, OR 97212

From: trace` Hulette
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Sunday, November 06, 2016 12:24:00 AM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

t.a.Hulette

From: trace` Hulette
t.a.hulette@gmail.com
929 SW Salmon St.
Portland 97205

From: David Jaffe
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Sunday, November 06, 2016 12:51:35 PM

I am COMPLETELY against new or expanded fuel terminals. History will show adding or enlarging them at this point in time is grossly irresponsible, and I am irrevocably opposed.

Sincerely,
David Jaffe
604 SW Arboretum Circle
Portland, OR 97221

From: David Jaffe
david-jaffe@comcast.net
604 SW Arboretum Circle
Portland 97221

188142

From: Marjorie Kircher
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Sunday, November 06, 2016 4:44:36 PM

Dear Mayor Hales, Members of the Council, and Staff:

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Marjorie Kircher
3023 SW Cascade Dr
Portland, OR 97205

188142

From: Mark Kramer
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Sunday, November 06, 2016 9:55:38 PM

Portland needs to send a message about climate change to the state and the country by passing this ban.

From: Mark Kramer
mark@kramer-associates.com
2136 SE Madison
Portland 97214

188142

From: Ellen Mendoza
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Sunday, November 06, 2016 9:07:13 AM

For the birds and bees, the flowers and the trees, for the children and the old folks, and all of us,

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.
Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.
Sincerely,

Ellen Mendoza

From: Ellen Mendoza
ellenmendoza_lido@yahoo.com
2866 SE Harrison
Portland 97214

188142

From: david peter
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Sunday, November 06, 2016 8:30:53 PM

I am very concerned re public health as well as health of our local and global environment and want my city to take this bold move of not allowing any NEW fossil fuels infrastructure . Oil and coal cannot be transported or stored safely, especially increasingly volatile subtypes of these .

Please allow portland to lead the country on this historic move toward true sustainability that can be achieve only safely Without continued fossil fuel dependence.

thanks, David R. Peter, MD Legacy Family Physician and Conservation Landowner.

From: david peter
energyfarmoregon@gmail.com
25130 S. Highway 170
Canby 97013

From: Nora Polk
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Sunday, November 06, 2016 4:20:11 PM

Dear Mayor Hales, Members of the Council, and Staff:

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Nora Polk
6405 SE 62nd Ave
Portland, OR 97206

From: Scott & Heidi Trinkle
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Sunday, November 06, 2016 10:56:59 AM

Please Pass a FULL BAN on new and expanded fossil fuel terminals.

Many thanks to the Planning and Sustainability Commission and the Bureau of Planning & Sustainability for the work in incorporating public input on initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.
Unfortunately the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it continues to allow new terminals up to 2 million gallons storage and existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

We want the City of Portland to:
1.Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
2.Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
3.Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

The City of Portland has the opportunity to be a leader in the U.S. climate justice movement and with a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Scott & Heidi Trinkle
liggig@gmail.com
1205 SW Cardinell Dr.
Portland 97201

188142

From: Maurine Canarsky
To: BPS Fossil Fuel Zoning
Subject: Fossil Fuel Terminal Zoning
Date: Saturday, November 05, 2016 11:38:56 AM

To: City Council Members

I have read the report and offer the following testimony.

Page 5: Review and Recommendations, last sentence, "The PSC considered and did not act on NW Natural's request to exempt utilities." If that means you are NOT exempting them from these proposed regs., okay. I support REJECTING NW Natural's request to be exempted from these proposed regs.

Page 10: Overall Project Direction: Fossil fuel distribution policy 6.48
I support ELIMINATING the provision that allows expansion of existing terminals by 10%.

Page 10: Related Policy Directions: Policy 4.81, Disaster resilient development
I support REQUIRING upgrades rather than "encouraging" them. Develop proposals for state building code changes to require seismic upgrades.

Page 26: Storage Capacity Size Threshold
I support enacting a FULL BAN on all new fossil fuel terminals, whether 2-million-gallons or less. No new terminals.

Thank you for the work you have done so far to ban new fossil fuel facilities in Portland, and thank you for considering my testimony.

Sincerely yours,
Maurine Canarsky

1977 SE 22nd Ave.
Portland, OR 97214-4851
503-719-7332
canarskyyomo@gmail.com

188142

From: Ineke Deruyter
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 12:00:27 PM

I am advocating for NO new fossil fuel infrastructure and NO expansion of existing terminals. Make sure that Seismic Safety is up-to-date for existing structures. Also, please prevent NW natural from receiving a carve out. Let us in Portland be leaders in preventing climate change . Thank you,

From: Ineke Deruyter
ideruyter@hotmail.com
9322 N Oswego Ave
Portland 97203

From: Marilyn Dunham
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 11:36:40 PM

Fossil fuels are not only old carbon, they are also old technology.

The future clearly points to electric vehicles, with electricity from renewable sources like wind, solar, and even tidal energy.. Although these energy sources are till being developed, they represent an increased ability for localities, and families, to generate their own energy.

There is no safe way to extract, transport, refine, or burn fossil fuels. The petrochemicals pose health problems everywhere they are processed, and can have destructive impacts that last for decades, DECADES!, after a spill or fire. We are riding a tectonic plate here- how large will the firestorms be when "The Big One' happens? What will survive?

Ban any hew petrochemical infrastructure developments, whether they are new terminals or capacity upgrades.

From: Marilyn Dunham
the_dunhams@yahoo.com
9757 SW Arborcrest Way
Portland 97225

From: Camilla Echeverria
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 6:02:06 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Camilla Echeverria
cami.echeverria@icloud.com
1598 Villard St
Eugene 97403

From: Duane Fickeisen
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 3:17:10 PM

It's simple. We cannot abate climate change while we continue to expand the use of fossil fuels. We must aggressively pursue renewable resources for energy. One step in that direction is a full ban on new fossil fuel terminals and storage facilities. I urge you to prevent the expansion of infrastructure that supports continued use of fossil fuels through rigorous regulation, land use planning, zoning, building codes, and whatever other means are available.

This is not only an environmental issue due to climate change, but a public safety and community livability issue. The recent Mosier oil train wreck, explosion, spill, and fire was fortunately not much worse in impact (bad as it was), but imagine if that had happened within Portland. Every week there is news of another spill, pipeline explosion, or other disaster from the transport and distribution of fossil fuels. The apparent gas line displacement that resulted in the explosion last week on NW 24th is a wakeup call. If a piece of construction equipment can cause that much damage, imagine the effects of several minutes of severe ground shaking. The probability of a subduction earthquake with likely impacts on the fuel infrastructure as well as on the ability of first responders to get to and contain a major ensuing fire makes us especially vulnerable. The ongoing health impacts from exposure to combustion products and leaking hydrocarbons is unacceptable.

Keep it in the ground. Vote "no" on new fossil fuel infrastructure and provide strong incentives for renewable energy development and conservation. Let's take the City's Climate Action Plan seriously.

From: Duane Fickeisen
dfickeisen@gmail.com
2360 SE 58th Ave
Portland 97215

188142

From: Jan Fuegy
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 7:36:34 AM

KEEP IT IN THE GROUND!!!!
No new fossil fuel infrastructure.

From: Jan Fuegy
janfuegy@msn.com
20 SW Custer St.
Portland 97219

188142

From: Rose Gerstner
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 9:31:27 PM

No new fossil fuel infrastructure! I want a healthy world for my grandchildren!

From: Rose Gerstner
rosegerstner@gmail.cmo
5198 sterling creek rd
jacksonville 97530

188142

From: Anne Hamburg
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 1:49:20 PM

Please stand against all new fossil fuel infrastructure. No exemptions.

From: Anne Hamburg
akaseyh@yahoo.com
3231 SE 109th Ave.
Portland 97266

188142

From: Glenna Hayes
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 12:47:17 PM

I want to thank the Council and the PSC for the work that has been done to bring the Fossil Fuel Terminal Zoning Amendments draft closer to the original intent of the 2015.

My input on this current draft is as follows:
We should enact a full ban on new terminals, large or small. This was the plain language of the 2015 resolution.
Prohibit all expansions at existing terminals and require them to make upgrades for seismic safety through State building codes.
No exceptions for NW Natural! Storage of Liquid Natural Gas should be included in this policy just like any other fossil fuel terminal operators.

These improvements to the policy will position Portland to move forward to a clean energy future and provide the leadership needed so that Portland can once again be on the forefront addressing climate change, the most pressing issue of our time.

Sincerely,
Glenna Hayes
7245 SW 53rd Ave
Portland, OR 97219

From: Glenna Hayes
gahportland@yahoo.com
7254 Sw 53rd Ave
Portland 97219

From: Douglas Hayner
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 10:02:56 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Douglas Hayner
5825 NE Emerson St
Portland, OR 97218

From: Lorraine Heller
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 8:41:54 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Lorraine Heller
9601 NW Lealey Rd #301
Portland, OR 97229

From: Emily Herbert
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 9:40:04 AM

Dear Counselors,
First, let me say I deeply appreciate all you do and have done to move our city to sustainability and more than that, livability.
Surely you are aware that the perilous state of our climate on earth is threatening everything we stand for in community. Already the poor and marginalized are being pushed out of house and home because of migration to the North West. The thoughtful and monied are coming here for the same reason I did eight years ago, a better chance of a livable future than in many parts of the country. AND Portland can be a beacon in the darkness for moving to a livable future. You've made a courageous careful start banning Pembina and crafting this policy. Yet the profiteers are pounding at your doors, offering half-truths and promising riches if you only let them continue the fossil fuel path to destruction. Yet we must change, we have to for the children.
As a former smoker, I was heavily addicted, one of the best things I did to stop was to get all the cigarettes out of the house and swear off ever buying more. That is the step we red shirts urge you to take today as our planet is burning up. No new fossil fuel infrastructure, none nada, zip. Your courage to stand up to the powerful utilities and industries will be a beacon to the rest of the country. For the children please.

From: Emily Herbert
ewh1960@gmail.com
2120 Ne Halsey St. #29
Portland 97232

188142

From: Gayle Janzen
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 8:30:33 PM

Portland needs to be a leader in the PNW and the rest of the country and stop new fossil fuel terminals from being built and stop the expansion of the existing ones. We will never move forward in a meaningful way towards alternative energy, if we keep allowing the dirty energy industry to expand their ability to destroy our environment as they use the PNW to export their fracked gas, tar sands and oil. And don't allow NW Natural an exemption to these anti-expansion policies. Stopping expansion but yet allowing one company their very own loophole pretty much renders the regulations useless.

From: Gayle Janzen
cgjanzen@comcast.net
11232 Dayton Ave N
Seattle 98133

From: Linda Kelley
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 12:44:33 PM

Dear City Councilors;
I am an Oregon resident though not in Portland; however your decision is extremely important to all of us. Enacting a full ban on new terminals or expansions of any fossil fuel infrastructure must happen. If you feel that a citywide ban is too much a drop in the pan, please think again.
One city after another is now banning Crude Oil from passing through its area. When an example of what we need to do is available people see it can be done and will push forward.
We know we need to stop any more funds going towards the fossil fuel industry and create the mandate to grow the safe electric grid that is absolutely possible if we just decide to make it happen. The first step is to stop further fossil fuel infrastructure. Please for the sake of us all, pass this resolution.
Thank You,
Linda Kelley
1830 Arthur St.
Eugene, OR
97405

From: Linda Kelley
earthspirits@comcast.net
1830 Arthur St.
Portland 97405

188142

From: Christine Kosonen
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 9:38:26 PM

Only a full ban on new fossil fuel infrastructure will protect our city and natural region. We need to prepare for a healthier future and invest in renewable resources. To further protect our local interests, there should be no expansions of current facilities and current facililies should be required to make.seismic upgrades. No companies should.be given special privileges to avoid these policies. Thank you for considering our future!

From: Christine Kosonen
cealila@yahoo.com
3735 SE Yamhill.St
Portland 97214

188142

From: Avery Leinova
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 10:48:11 AM

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. We need NO new fossil fuel infrastructure. Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes. Prevent NW Natural from getting a carve out. NW Natural wants to be exempted from this policy and we need to make sure the City Council does not add a last minute amendment on NW Natural's behalf.

From: Avery Leinova
averyleinova@gmail.com
107 SE 30th Pl
Portland 97214

From: Ann Littlewood
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 9:46:17 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Ann Littlewood
2915 NE 21st Ave
Portland, OR 97212

From: Miriam Margulies
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 9:53:42 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Miriam Margulies
6428 SW 46th Place
Portland, OR 97221

188142

From: Kelly McConnell
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 12:26:13 PM

I fully support a COMPLETE ban on new or expanded fossil fuel terminals...ANYWHERE. We are killing our planet with oil, coal, LNG, pesticides, and GMOs. What the hell is wrong with those who put their PERSONAL profits above the viability of our planet? They need to GROW A BRAIN, you can't drink oil, you can't eat money, and you can't breathe car exhaust.

NO MORE FOSSIL FUELS - LEAVE IT IN THE GROUND

From: Kelly McConnell
prvt@2ezgroup.com
11375 SW Erste
Portland 97223

From: Vesta McGee
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 3:17:33 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Vesta

From: Vesta McGee
Vstmcgee@gmail.com
1631 sw Yamhill st #105
Portland 97205

From: Ashley McGraw
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 9:07:00 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Ashley McGraw
5104 NE 17th Ave
Portland, OR 97211

From: Alain Millar
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 10:03:22 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Alain Millar
3161 SE Balfour Street
Portland, OR 97222

From: Stephen Miller
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 9:06:46 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Stephen Miller
2005 NE 56th Ave
Portland, OR 97213

From: Patricia Mizutani
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 4:44:30 PM

For moral and ethical reasons, all efforts in our power to stop the accumulation of greenhouse gases in Earth's atmosphere must be taken. What is at stake if we do not?
-More severe and life threatening weather systems.
-Rising ocean levels with inundation of major population centers.
-Compromised and threatened food and water supplies.
-Northward spread of tropical and warm weather infectious diseases.
-Worsening health for those with heart disease and lung disease as temperatures rise.

And, of course, those who will suffer the most will be the poor, the very young and the very old, and the chronically ill.

The City Council of Portland has the power to do its part in the global fight against climate change. I ask you to vote for the following:
1. Ban all new fossil fuel terminals, whether large or small.
2. Prohibit the expansion of existing terminals though insure that they comply with upgrades for seismic safety per OR state building codes.
3. Do not exempt NW Natural Gas from the ban on new terminals. In addition, It should not be allowed to expand existing terminals during the seismic upgrades.

Respectfully submitted,
Patricia Mizutani, MD
2335 NE 24th Ave
Portland OR 97212

From: Patricia Mizutani
pmizutan@yahoo.com
2335 NE 24th Ave
Portland 97212

From: Christy Orlet
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 11:26:56 AM

Dear Mayor Hales, Members of the Council, and Staff:

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In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Christy Orlet
7330 SW 29th Ave
97219
Portland, OR 97219

188142

From: kastania rasmussen
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 9:18:16 AM

We need to enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large! I strongly believe that we need NO new fossil fuel infrastructure.

I strongly support prohibiting expansions at existing terminals and requiring them to make upgrades for Seismic Safety through State Building Codes.

Lastly, NW Natural should not get a carve out from this policy!

From: kastania rasmussen
k.g.rasmussen1@gmail.com
3114 se 19th ave
portland 97202

From: Zach Reuter
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 2:22:07 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Zach Reuter

From: Zach Reuter
zpreuter08@aim.com
7141 SE Mabel Ave.
Portland 97267

From: Susan Rhedmon
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 2:17:18 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Susan Rhedmon
7555 NE Stanton St
Portland, OR 97213

From: Diana Richardson
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 8:02:23 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Diana Richardson
1905 SW Sunset Blvd
Portland, OR 97239

From: Emma Ronai-Durning
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 5:53:41 AM

I would like to first say thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

That being said, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

-Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
-Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
-Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.
Sincerely,

From: Emma Ronai-Durning
eronaidurning@gmail.com
1911 SW River Dr
Portland 97201

188142

From: William Savery
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 11:12:23 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

William Savery
0841 SW Gaines St
Unit 1606
Portland, OR 97239

From: Suzie Schmick
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 9:30:53 AM

Dear Mayor Hales, Members of the Council, and Staff:

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In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Suzie Schmick
5337 SE Sierra Vista Dr.
Portland, OR 97267

From: Martha Shelley
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 10:45:58 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Martha Shelley
9026 N. Syracuse St.
Portland, OR 97203

188142

From: Katherine Sherman
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 3:13:07 PM

As an individual and a mom, trying to do the best for our region and my children's future, I encourage you to vote to ban any new fossil fuel infrastructure, and instead promote efficiency, conservation, and renewable energy. It will only happen if those in positions of influence, such as yourself, lead the way. Thank you in advance on behalf of my family.

From: Katherine Sherman
oaxacaguera@yahoo.com
12600 SE Kelly St.
Portland 97236

From: Kent Siebold
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 11:20:00 AM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Kent Siebold
211 NE Jessup St
Portland, OR 97211

188142

From: Glenn Silbersdorff
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 11:07:18 AM

I am writing because I cannot make the meeting. I am in full support of the band the fossil fuel terminals I hope you are too. This includes NW natural, they should not receive an exemption

From: Glenn Silbersdorff
Opdxglenn@gmail.com
8909 NE Webster st
Portland 97220

188142

From: Linda Stern
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 9:48:43 AM

We MUST stop the use of fossil fuel. To that end, I am strongly opposed to any new terminals and any expansion of existing terminals. In addition, NW Natural should NOT be exempted from this ban.

From: Linda Stern
lindamstern@comcast.net
6102 SE 22nd Ave.
Portland 97202

From: Anna Tadio
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 1:49:43 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for it's work on the 2015 resolution.

I have recently spent 5 months in varying parts of Asia including China, and have seen the destruction of air quality caused by fossil fuels. The World Health Organization has routinely declared states of emergency and told people to remain indoors when the level of particulate matter in the air has increased to levels unsafe to breath. The particulate matter released into the air is caused from burning coal. If we allow ports to be built in Oregon to export coal to Asia, the fossil fuels that are burned in Beijing and other mega cities across China will not only pollute the air there, but also here in the USA. Studies have shown that some of the air pollution the United States is exposed to, has blown across the ocean directly from Asia. It does not make sense to export dirty energy sources across the ocean where they will be burned and then travel back to the USA contributing to asthma and other respiratory illnesses.

Please enact a full ban on fossil fuel terminals in Oregon, so that we can continue to breath in fresh air on the west coast.

Best,
Anna Tadio
Lewis & Clark Law School

From: Anna Tadio
annatadio@gmail.com
10300 SW 4th Ave
Portland 97219

From: Meredith Vuylsteke
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 2:21:01 PM

Please, this is not about business anymore. This is about our world. We need to stand up and show the rest of the country that you can say no! Please do not let this pad unless we have a full ban on new terminals!

Thank you

From: Meredith Vuylsteke
Mercury1to1@gmail.com
370 NE 9TH PLACE
Hillsboro 97124

188142

From: Peggy Warren-Murphy
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Saturday, November 05, 2016 9:03:06 AM

Please consider the catastrophic repercussions of global warming...stand up for the future generations ! No to BIG OIL Corporations ! We demand clean air, water, and food! No fossil fuel terminals! Current ones need seismic updating along with other infrastructures as well.

Thank you for listening...

Peggy Warren-Murphy

From: Peggy Warren-Murphy
Peggy-murphy@comcast.net
2191 Ohio St
Eugene 97402-1023

From: Jan Zuckerman
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Saturday, November 05, 2016 11:21:16 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Jan Zuckerman
2914 NE 18th Ave
Portland, OR 97212

From: Charles Barr
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 1:26:52 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Charles Barr
2715 NE Cesar E Chavez Blvd
Portland, OR 97212

From: Mary G Barrow
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 10:41:17 PM

Dear Mayor Hales, Members of the Council, and Staff:

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Sincerely,

Mary G Barrow
1531 SW Harrison St Apt 18
Portland, OR 97201

From: Nancy Bechtol
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 5:56:57 PM

Dear Mayor Hales, Members of the Council, and Staff:

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Nancy Bechtol
9070 SW Garden Home Rd
Portland, OR 97223

From: Leland Block
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 1:24:51 PM

Dear Mayor Hales, Members of the Council, and Staff:

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Sincerely,

Leland Block
3565 NE Mathison Pl
Portland, OR 97212

188142

From: C Bradley
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Friday, November 04, 2016 9:49:44 PM

I want a full ban on new fossil fuel infrastructure projects.
Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. We need NO new fossil fuel infrastructure.
Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
Prevent NW Natural from getting a carve out. NW Natural wants to be exempted from this policy and we need to make sure the City Council does not add a last minute amendment on NW Natural's behalf.

From: C Bradley
hrcbradley@gmail.com
1383 Tucker Rd
Hood River 97031

From: Susan Daugherty
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 1:58:17 PM

Dear Mayor Hales, Members of the Council, and Staff:

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Susan Daugherty
6304 SE 17th Ave
Portland, OR 97202

From: Carolyn Eckel
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 1:38:56 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Carolyn Eckel
PO Box 33707
Portland, OR 97292

From: Craig Heverly
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 4:54:36 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Craig Heverly
3712 SE 9th Ave
Portland, OR 97202

From: Kristin Lee & Mike Duley
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 10:15:19 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Kristin Lee & Mike Duley
5803 SW Garden Home Rd
Portland, OR 97219

From: Joyce Leggatt
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 2:40:15 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Joyce Leggatt
173 NE Bridgeton Rd #6
Portland, OR 97211

From: Rose Lindsey
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 2:34:36 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,
Rosie Lindsey

Rose Lindsey
3265 SE Madison
Portland, OR 97214

From: Jim Lockhart
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 2:45:37 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Jim Lockhart
4528 ser 99th
portland, OR 97266

188142

From: Cass Martinez
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 8:36:02 PM

Dear Mayor Hales, Members of the Council, and Staff:

Imagining our future climate is hard, imagining improving that future is harder. I hope you all are willing to visualize the future and anticipate the big changes that have to happen, beginning with limiting fossil fuel storage in, and movement through, Portland.

I encourage you to draw the line on fossil fuel in Portland, without exemptions.

Sincerely,

Cass Martinez
8734 NW Wood
Portland, OR 97231

From: Kathy Masarie
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Friday, November 04, 2016 8:07:04 PM

Dear City Council
It is CRITICAL that we take every small action we can toward decreasing the levels of CO2 in our atmosphere. Stopping all NEW development off structures using fossil fuels is a powerful step forward.
Please ban this expansion/hew fossil fuel terminals.

Thanks
Kathy Masarie MD
Pediatrician
Founder of Family Empowerment Network

From: Kathy Masarie
kmasarie@comcast.net
7155 SW Newton Place
Portland 97225

From: Mauria McClay
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 9:14:45 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Mauria McClay
8125 NE Wygant
Portland, OR 97218

From: David Medford
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 3:31:38 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

David Medford
7020 Sw 82nd Ave
Portland, OR 97223

From: justin michelson
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Friday, November 04, 2016 11:46:38 PM

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

From: justin michelson
justin.michelson@gmail.com
81868 Lost Valley Ln
Dexter 97431

From: Amanda G Moore
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 3:05:15 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Amanda G Moore
7314 N Williams Avenue
Portland, OR 97217

From: Paige Osberg
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 1:27:36 PM

Dear Mayor Hales, Members of the Council, and Staff:

I want Portland to be a global leader in transitioning away from fossil fuels. We went a long way toward that goal in November 2015, when you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

I now ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Paige Osberg
12465 SW Foothill Dr
Portland, OR 97225

From: Robert Ranta
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 3:02:45 PM

Dear Mayor Hales, Members of the Council, and Staff:

(Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.)

The above statement is from Columbia Riverkeeper and covers the issues that concern us. What I'd like to know is why would anyone want to invest in expensive infrastructure that will be obsolete before it is paid for. Fossil fuels are/must be on their way out. We can't afford to invest in yesterday's technology but must instead invest in the coming sustainable energy future.

Sincerely,

Robert Ranta
7144 N. Boston
Portland, OR 97217

From: Jill Riebesehl
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 1:26:59 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

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Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Jill Riebesehl
3203 SE 24th Ave
Portland, OR 97202

From: Diane Rios
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 2:07:39 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Diane Rios
1634 SE 50TH
Portland, OR 97215

From: Mary Rose
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Friday, November 04, 2016 11:45:42 PM

In regards to the Fossil Fuel Zoning Amendments, I would like the City of Portland to:

-Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
-Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
-Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Let's be leaders in the movement to sustain life on this planet! Shifting our energy focus to renewables and away from fossil fuels could allow us to pass this land down to our children and grandchildren knowing we did our best to make it liveable! Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Mary Rose

From: Mary Rose
zambonirose@gmail.com
4334 NE 23rd Ave
Portland 97211

From: Rosalind Rosenow
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Friday, November 04, 2016 10:40:41 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Rosalind Rosenow

From: Rosalind Rosenow
desertroz62@hotmail.com
3737 SW 117th Ave Unit 44
Portland 97005

188142

From: Meg Ruby
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 11:33:12 PM

Dear Mayor Hales, Members of the Council, and Staff:

Rarely has or will a city council have the opportunity to take action with such global import.

Thank you for your guts, vision and and diligent hard work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. I was there in November 2015, when you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

Now it's time to translate this landmark resolution into binding city rule. You have a mandate to take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Rarely has or will a city council have the opportunity to take action with such global import. Thank you for your guts, vision, hard work, courage and willingness to take historic action. I look forward to living in a city and a region which seized the day, and acted to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Meg Ruby
3218 SE Tibbetts Street, Apt. A
Portland, OR 97202

From: David Rutiezer
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Friday, November 04, 2016 11:20:15 PM

Please pass a full ban, because the livability of this planet for our future generations depends on it.

From: David Rutiezer
david@creativedavid.com
14827 NE Sacramento St. #107
Portland 97230

From: Casey Sundermann
To: BPS Fossil Fuel Zoning
Subject: Fossil Fuel Zoning Amendments
Date: Friday, November 04, 2016 4:28:23 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

Please take the strongest stand possible for our climate and safety. Do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Have the courage to resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort. I want to live in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,
Casey Sundermann

Casey Sundermann
5847 NE 31st Ave
Portland, OR 97211

From: Deva Sunya
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Friday, November 04, 2016 7:27:52 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

1 - Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

3 - Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Deva Sunya

From: Deva Sunya
dragon@350pdx.org
3414 SE 21st Ave.
Portland 97202

From: Charles Townsend
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 1:54:46 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Charles Townsend
623 NE Morris
Portland, OR 97212

From: NIna Vaught
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 1:32:14 PM

Dear Mayor Hales, Members of the Council, and Staff:

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

NIna Vaught
11616 N Island Cove Lane
Portland, OR 97217

From: Gabriel Wihtol
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 2:31:54 PM

Dear Mayor Hales, Members of the Council, and Staff:

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Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Gabriel Wihtol
5000 n willamette blvd
Portland, OR 97203

From: Krysta Williams
To: BPS Fossil Fuel Zoning
Subject: Pleas completely ban new or expanded fossil fuel terminals!
Date: Friday, November 04, 2016 8:27:42 PM

I want to thank the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, there are additional changes we want to see to make sure our communities are safe, especially for our most vulnerable citizens. The current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:
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Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Krysta Williams

--
Krysta Williams
Community Engagement & Education Coordinator
Pronouns: She/her
Zenger Farm
www.zengerfarm.org
11741 SE Foster Road
Portland, OR 97266
503.282.4245, ext. 108

I only work part time, so thanks in advance for your patience. If you need a more immediate response, please contact our program director, David@zengerfarm.org or call 503. 282.4245

From: Angela Zehaya
To: BPS Fossil Fuel Zoning
Subject: Full Ban No Exemptions
Date: Friday, November 04, 2016 6:40:58 PM

Dear City Council Members:

I know that you know all about climate change already. And you know how devastating fracking is to our water supply. And you already know what transporting coal does to air quality. And we just had a huge explosion in our backyard. Fossil fuels are the past. We need to turn our faces toward the future.

I would like to see Portland become a national leader on this issue. I want us to make the news. I want cities worldwide to hear that we just banned all new fossil fuel terminals in our city and we are turning toward renewables. Because it's the right thing to do, and because we all have to. No exceptions, no exemptions.

NW Natural has had a good run, and they will have to deal with market pressures just like any other business that extracts maximum profit. They will have to plan for energy descent and diversify, plain and simple. We don't owe them anything. It's funny how corporations love to talk about the market when it is in their favor, how they must sell out the common good for profit, but when the market shifts away from them, all the sudden they want to dip from the common well. Nope. It doesn't work that way.

I know that you know all about climate change already. And you know how devastating fracking is to our water supply. And you already know what transporting coal does to air quality. And we just had a huge explosion in our backyard. Fossil fuels are the past. We need to turn our faces toward the future.

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From: Suzanne Zuniga
To: BPS Fossil Fuel Zoning
Subject: Re: Fossil Fuel Zoning Amendments – Let's Put Portland's Fossil Fuel Ban Into Practice!
Date: Friday, November 04, 2016 1:02:10 PM

Dear Mayor Hales, Members of the Council, and Staff:

Thank you for your diligent work in bringing forward a new set of land use rules that could establish Portland as a global leader in transitioning away from fossil fuels. In November 2015, you voted unanimously to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Portland's resolution was an important step towards reducing the climate, safety, and environmental risks of oil trains, coal trains, and fossil fuel storage.

In translating Portland's landmark resolution into binding city rules, I ask that you take the strongest stand possible for our climate and safety. First, I ask that you do not allow existing terminals to expand. Allowing a 10% or greater expansion at existing terminals could increase the number of dangerous oil and coal trains coming through Portland and its uprail neighbors like Mosier, OR, where an oil train derailed and spilled causing a dramatic fire in the Gorge.

Secondly, I ask that you prohibit all new fossil fuel infrastructure. The language of your resolution was clear: "to actively oppose new fossil fuel infrastructure." Terminals of two million gallons or less are an unnecessary give-away to the fossil fuel industry. The proposed zoning code already has an exception for fuels that contain non-fossil energy.

Third, I ask that you resist pressure from the fossil fuel industry to exempt any fossil fuels or to weaken the proposed code language. Portland is poised to lead on climate, but we need you to stand firm and make sure the final fossil fuel code reflects the intent of your November 2015 vote.

Thank you for your effort, and I look forward to living in a city and a region that is determined to reduce its reliance on dangerous, polluting fossil fuels like oil and coal.

Sincerely,

Suzanne Zuniga
301 NE 65th Ave
Portland, OR 97213

From: Jere Grimm
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 03, 2016 7:29:07 AM

To the Portland City Council"
Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.
However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.
Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.
Sincerely,

Comment*

Name*
Jere Grimm
jereray@spiritone.com

1734 NW Aspen
Portland OR 97210

From: Jere Grimm
jereray@spiritone.com
1734 NW Aspen
Portland 97210

188142

November 3, 2016

To whom it concerns,

AUDITOR 11/03/16 PM12:13

My name is Nic Hofmann. I am a student at Lincoln High School, an athlete, a brother, a son, an environmentalist, and many more things, but everything I am depends on the environment in which I live. The success of our future, and most importantly our kids', and our grandkids' future depends on the condition we leave our environment in. As our city approaches this monumental moment you have the opportunity to change the future for our city, our state, our country, and even the world. Your decision will decide the future of those yet to come. In the words of Joshua Lawrence Chamberlain, Commander of the 20th Maine Infantry, at the battle of Gettysburg:

"...In a momentous struggle such as this, it is character that tells. I do not mean simply bravery. What I mean is a seasoned substance of soul. I mean such qualities as intelligence, thoughtfulness, conscientiousness, right-mindedness, patience, fortitude, and unconquerable resolve....

We know not the future, and cannot plan for it. But we can hold our spirits and our bodies so pure and high, we may cherish such thoughts and ideals, and dream such dreams of lofty purpose, that we can determine what manner of men we will be whenever and wherever the hour strikes, that calls to noble action."

In this time, our city calls YOU to noble action, and we seek leadership. We ask of you to display the qualities that Chamberlain speaks of. Now more than ever your thoughtfulness, fortitude, and right-mindfulness will change the world should you choose to.

OUR city needs to:
1. Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large.

2. Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

3. Prevent NW Natural from getting an exemption. Allowing LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Intelligence, thoughtfulness, conscientiousness, right-mindedness, patience, fortitude, and unconquerable resolve, these qualities are what we ask of, these qualities are what will make history, these qualities are what will create a better world for those yet to come. These qualities will help you be for and of the people.

Sincerely,

Nic Hofmann

From: Mary McGaughey
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 03, 2016 12:20:47 AM

Spilled crude oil has poisoned land areas, our oceans. The world is moving forward to clean energy. We must divest from oil energy at a much greater rate than is happening now. New, expanded terminals to ship oil over our land and oceans is hardly working to phase out oil energy. Let us, the world, embrace the new clean energy technology already available. Let us implement this energy at a rate which addresses the environmental, atmospheric CRISIS facing our Earth. FAST & NOW, TODAY!

From: Mary McGaughey
marymcgaughey@yahoo.com
381 NE VIllage Squire Av Unit 2
Gresham 97030

188142

From: Daniela Molnar
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 03, 2016 3:16:32 PM

Portland should be putting funds into clean energy initiatives, not new fossil fuel infrastructure.

From: Daniela Molnar
dnmolnar@gmail.com
1845 SE Elliott Ave
Portland 97214

From: Letty Phillips
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Thursday, November 03, 2016 7:50:44 AM

Please live up to your own spin. DO Ban all new terminals. Prohibit expansions at existing terminals. No carve out for NW Natural Gas. In this moment, when the entire planet must turn away from the use of fossil fuels, there is no beneficial expansion of fossil fuel infrastructure. Increasing or expanding existing infrastructure are not neutral acts without consequence. Accidents will happen. and be horribly destructive and environmentally devastating. Increased use of fossil fuels, by anyone anywhere increases catastrophic climate change. Survival of the interdependent systems of the planet require that we now change attitude and behavior to live sustainably together. Please act responsibly.

From: Letty Phillips
mizletty@gmail.com
3911 SE Milwaukie Avenue, Apt 208
Portland 97202-3881

From: Danny Thiemann
To: BPS Fossil Fuel Zoning
Subject: Fossil fuel ban hearing testimony for Nov. 10
Date: Thursday, November 03, 2016 7:01:35 PM

Hi,

I work with Oregonians living below the poverty line, especially those who work in two of our states' big industries: Fishing and agriculture. I see how their lives are disproportionately impacted by rising temperatures associated with the burning of fossil fuels. These impacts include the following: Kidney damage from dehydration in hotter summers, heat stress on the body (risk of fainting, heart failure and death, as has happened in Washington this past year and California), more frequent falls from ladders as balance decreases with dehydration, more pesticides in the blood of children who live by farms as warmer winters kill less pests requiring more chemicals to be applied, and communities of color who have been displaced by this city's policy to build Legacy Emmanuel Hospital and push black residents out near I-205 where air quality from highways is poorer, then displace these communities again by failing to ensure funds from the Portland development commission go to minority residents to rebuild, a situation that combines the worst of environmental injustice with social injustice. In light of this city government's history of systematically placing poorer people more at risk by, for example, developing fossil fuel infrastructure in an earthquake zone right next to North Portlanders schools and homes without proper safety codes in the event of an earthquake, it is high time that this city government start addressing climate change because this is an issue affecting the immediate health and safety of residents every time they breathe or go to work, and the long term health of our communities' children.

The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:
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2. Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

3. Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Danny Thiemann

From: Anthony Albert
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 02, 2016 1:41:50 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

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Sincerely,

From: Anthony Albert
albert2910@msn.com
285 NW 35th St., Apt. 8
Corvallis 97330

188142

From: Robert Bresky
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 02, 2016 2:51:47 PM

I oppose any development on Portland's floodplain because due to climate change major flooding of the Willamette River now occurs every 20 years rather than 100 years. Which means we are for another doozy this winter. Most of the dams in the Pacific Northwest were not for flood control but rather for hydroelectric generation and irrigation. Up until recently, PGE's idea of flood control at Willamette Falls dam was hammering boards on top of its dam to hold back floodwaters. what that means is we cannot rely on the US Army Corps of Engineers to mitigate future extreme flooding events. So when a biblical flood comes, who is going to bail out the businesses and residential development that exists on Portland's floodplain? If you said the US Taxpayers, you are correct. The federal flood insurance program encourages foolish development on our valuable floodplain habitat. It is a massive subsidy to high risk private and commercial real estate developers. I pay enough taxes to Oregon and to Uncle Sam and I don't want my tax bill increased to support fossil fuel terminals or any other floodplain developments that the city of Portland is encouraging.

From: Robert Bresky
bobthenatureguy@gmail.com
PO Box 2733
Oregon City 97045

From: Kim Fortin
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 02, 2016 9:00:34 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

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Sincerely,

From: Kim Fortin
fortinkim@gmail.com
2023 SE Madison St., Apt. 2
Portland 97214

From: Anandi Gefroh
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 02, 2016 1:15:49 PM

I feel like we're at a crossroads where ordinary citizens are becoming more aware than ever about the effects of oil, gas and coal on the environment and are asking themselves what kind of world do they want to leave their children. The time is now. The Paris Agreement on Climate Change came into effect on Friday and every country should see the writing on the wall because changes to the climate are occurring even faster than climate scientists had predicted. Bernie Sanders is on the right side of history when he says that we should be making investments in clean energy technologies, retraining people who work in the energy sector, in order to prevent the worst impacts of climate change, especially given that we are the largest consumer of energy in the world. That is why the protest at Standing Rock is so extremely important - because we should not be building infrastructure for dirty, polluting energy sources. We must fight that at every turn. It is my belief that we actually already have the technologies for clean energy solutions at our fingertips but the power of polluters is so strong. It is particularly disturbing that journalists are being arrested and that our police are being used against us to support corporate interests. Their motto is privatize the profits, socialize the losses - for example, we paid $10 billion in hard earned tax dollars to clean up the massive Gulf spill. That's outrageous! And yet, the media and most of our representatives in government are silent. As Leo DiCaprio says in his great film "After The Flood," there is no more time for 10 year plans. We're running out of time to do the right thing for our children and for our beautiful planet. Let's make Portland a leader on this very important issue. PLEASE ENACT A FULL BAN ON NEW TERMINALS FOR FOSSIL FUELS. PLEASE PROHIBIT EXPANSIONS OF EXISTING TERMINALS AND REQUIRE SEISMIC UPGRADES. LET'S MAKE PORTLAND A LEADER ON THIS ALL IMPORTANT ISSUE.

From: Anandi Gefroh
anandi@anandi.com
2825 SE Hawthorne Blvd
Portland 97214

From: Marguerite Hall
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 02, 2016 8:03:15 PM

ank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

As a city, I want us to lead in the nation on putting sustainable energy policies in place.
I want the city of Portland to make it mandatory that all buildings constructed with PDC loans, matching programs and grants must include solar panels that saves on more than 50% energy costs. And I want any structures that have been built but need additional funding require energy saving solar panels. I want more programs offered to home owners to make it affordable to install solar panels and a new policy incentives for homeowners to convert to solar energy.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

From: Marguerite Hall
margueritehall1234@gmail.com
2745 NW Pettygrove
Portland 97210

From: Helen Hays
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 02, 2016 2:09:21 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:
*Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
*Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
*Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Helen Logan Hays

From: Helen Hays
hlhays@ccgmail.net
18553 S Ferguson Rd
Oregon City 97045

From: Craig Heverly
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 02, 2016 12:58:00 PM

Thank you to the Planning and Sustainability Commission and the Bureau of Planning and Sustainability for its work in incorporating public input on its initial drafts of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments recommended draft still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 2 million gallons and allows existing terminals to expand by 10%. In order to protect our immediate health and safety and play our part in stopping catastrophic climate change, we must pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate. NW Natural has no current plans for more LNG storage in Portland and should be included in this policy just like the other fossil fuel terminal operators.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Craig Heverly

From: Craig Heverly
heverlyjc@hevanet.com
3712 SE 9th Avenue
Portland Portland

From: Margaret Kirschner
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 02, 2016 1:10:49 PM

Please enact a full ban on any new or expanding terminals for fossil fuel.

Portland is a progressive city that can lead the way toward a cleaner, safeer environment.

Thank you for considering my viewpoint.

From: Margaret Kirschner
kirschie83@gmail.com
7339 N. Willamette Blvd,
Portland 97203

From: Laura M. Ohanian
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 02, 2016 1:55:24 PM

What happens in Portland will have ramifications for all of us in the rest of Oregon. Stop fossil fuel infrastructure NOW and start focusing on truly clean, renewable energy infrastructure.

From: Laura M. Ohanian
lmo@efn.org
P.O. Box 811
Eugene 97440

188142

From: Admin
To: BPS Fossil Fuel Zoning
Subject: Fossil Fuel Ban
Date: Wednesday, November 02, 2016 8:29:21 PM

Dear City Council Members:

Please incorporate the fossil fuel ban into Portland's City Code.

Thank you.

Diane Schauer

From: Katie Scott
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 02, 2016 6:03:32 PM

While Portland's impact may be small, we need local governments to make these types of changes to push action on climate change at a national level. Don't back down. Please take a strong stand on fossil fuels.

Enact a full ban on new terminals, large or small. A 2 million gallon facility is still too large. We need NO new fossil fuel infrastructure.

Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.

Prevent NW Natural from getting a carve out. NW Natural wants to be exempted from this policy and we need to make sure the City Council does not add a last minute amendment on NW Natural's behalf.

From: Katie Scott
Kljscott@gmail.com
111 ne 6th Ave
Portland 97232

From: Jeff Stookey
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 02, 2016 1:17:01 PM

We must keep fossil fuels in the ground.
We currently have all the scientific and technical knowledge and the physical resources to get all of the energy we need from renewables, according to Mark Z. Jacobson, Director of the Atmosphere/Energy Program and Professor of Civil and Environmental Engineering at Stanford University. Now add to that a new analysis, called "World Energy Revolution: A Sustainable World Energy Outlook 2015", produced by Greenpeace in collaboration with researchers from the German Aerospace Center, that says our world can make the switch to 100% renewable energy by 2050. Feed-in-tariffs--which have helped put Germany and Ontario, Canada at the forefront of the transition to green energy--are promoted by Oregonians for Renewable Energy Progress (OREP) as an important policy tool to incentivize this transition. Recent developments report that wind and solar is cheaper per kilawatt hour than other methods of power generation.
America's path to prosperity lies in a rapid switch-over to abundant, homegrown, renewable energy to power our homes, businesses, and vehicles--NOT in facilitating extracting and exporting of dirty, polluting coal, oil, and gas, which represents a retreat from the 21st Century economy. Renewable energy already employs 2.7 million workers (more than the fossil fuel industry) and studies have shown that green energy will continue to create far more jobs than the fossil fuel industries. [see: Sizing the Clean Economy, A National and Regional Green Jobs Assessment by the Metropolitan Policy Program at the Brookings Institute, 2011. Also, One Million Climate Jobs, 3rd Edition, 2014, edited by Jonathan Neale, published by the Campaign Against Climate Change] A U.S.-led, green, industrial revolution will move our economy forward, create millions of new jobs, and help ensure a livable planet for future generations.

From: Jeff Stookey
jstookey108@gmail.com
3656 NE Wasco St
Portland 97232

From: Adriana Voss-Andreae
To: BPS Fossil Fuel Zoning
Subject: Pass a full ban on new or expanded fossil fuel terminals!
Date: Wednesday, November 02, 2016 2:20:31 PM

Thank you Mayor Hales, Commissioner Frtiz, Commisioners Novick, Fish, Saltzman, for passing the bold Fossil Fuel Resolution last year making the commitment to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." You may remember that Portland communities showed up in full force- from neighborhood associations to youth, from local businesses to raging grannies, from frontline communities to environmentalists, from physicians to union plumbers- to show their full support for a complete ban on new fossil fuel infrastructure.

Because the grim reality is that there is nearly 3X as much fossil fuel in existing global reserves as we can burn and have even a 50/50 chance of staying below temperatures past which our planetary life systems become critically unstable. That's even without any new wells being drilled in reserves already owned or leased by fossil fuel companies.

As Bill McKibben said numerous times: the nation and world is watching us here in Portland to see if you will live up to this commitment and lead the way on climate change.

To live up to this commitment there are some significant changes to this draft that need to be made: it still allows new terminals up to 2 million gallons (which is completely unnecessary if we are going to be rapidly weaning off of fossil fuels as the Climate Action Plan proposes; tanks built to be used under the definition of clean fuels are exempt anyway); it allows existing terminals to expand by 10% (also unnecessary; we don't need to expand fossil fuel infrastructure in order to require/regulate seismic upgrades). I urge you to pass an ordinance that fully prohibits new fossil fuel storage tanks.

I want the City of Portland to:

Enact a full ban on new terminals, large or small.
Prohibit expansions at existing terminals and require them to make upgrades for Seismic Safety through State Building Codes.
Don't give NW Natural a carve out. Allowing new LNG storage in Portland is unnecessary and bad for our safety and climate.

With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.
Sincerely,

Dr. Adriana Voss-Andreae
Executive Director, 350PDX

From: Adriana Voss-Andreae
adriana@350pdx.org
1517 SE Holly St
Portland Portland

188142

AUDITOR 11/03/16 PM12:13

350 PDX

About the Comments Being Delivered

350PDX solicited public comments on the discussion draft and proposed draft of the fossil fuel terminal zoning code amendments. While some of the technical comments vary, the community's ask remains the same: reduce the storage threshold to zero and pass a full ban on new fossil fuel terminals, prohibit expansions at existing facilities, and require existing terminal operators to make much needed safety improvements. Below you will find 308 comments submitted to the Bureau of Planning and Sustainability on the discussion draft and 282 comments submitted to the Planning and Sustainability Commission on the proposed draft. Thank you for your careful consideration on the zoning code amendments and we encourage you to go bold and say no to all new fossil fuel infrastructure.

Building
The Climate
Movement

188142

Fossil Fuel Policy Code Comments: Proposed Draft

November 2, 2016 /

Name: Austin Rose
Email: arosepdx@gmail.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Teresa Reitinger
Email: t_reitinger@yahoo.com

Comment:

The times beg for a full ban for the possible future of the planet

and the health of its children. Now is the time to take this important step in the hope that other municipalities will follow suit in the name of sanity.

188142

Name: Kelly McConnell
Email: prvt@2ezgroup.com

Comment:

I want clean air and water and I'm damned tired of begging for them. I want a FULL ban on any and all new or expanded fossil fuel infrastructure. Since they insist on continuing to foul our air, land, and water they leave us no choice but to ban them.

Name: Anthony Albert
Email: albert2910@msn.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Jynx Houston
Email: jynxcdo@gmail.com

Comment:

PORTLAND NEEDS A FULL BAN ON ALL NEW FOSSIL FUEL TERMINALS & NO EXPANSIONS ON EXISTING TERMINALS & NO INCREASE IN FOSSIL FUEL INFRASTRUCTURE.

Name: James Rankin
Email: jim.rankin@oregonstate.edu

188142

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Todd Corbett
Email: htcorbett@hotmail.com

Comment:

Within the Portland area, please enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Also, please strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. And please prevent anything that leads to aggregate increase in fossil fuel infrastructure in Portland. Thanks

Name: Craig Heverly
Email: heverlyjc@hevanet.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much

improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

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However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments

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through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Craig Heverly

Name: Don Jacobson
Email: donjphoto@gmail.com

Comment:

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I want the City of Portland and the Planning and Sustainability

Commission to:

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1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Name: kathleen shelley
Email: kshelley@epud.net

Comment:

No more fossil fuel facilities in Portland. Eliminate those that now exist. The goal is to reduce our dependence on fossil fuels.

Name: Michael Garland
Email: mjgpdx36@gmail.com

Comment:

I support the call for a complete ban on further development of fossil fuel infrastructure in Portland.

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Name: Virginia Wiseman
Email: virginia.n.wiseman@gmail.com

Comment:

Dear PSC,

I really hope that you will honor the City Council's resolution and amend the draft rule to fully ban ALL new fossil fuel infrastructure – regardless of size. The time has come to make fossil fuels scarce so that we can make the transition to a clean energy economy that leaves our planet intact enough for us to live on it. Please.

Many thanks!

Name: Annoe McCuen
Email: mccuen7691@comcast.net

Comment:

Please do whatever is in your power to downsize the effect of fossil fuel on our environment. Thank you.

Name: David Bennett
Email: bapoo503@yahoo.com

Comment:

Please take any measures that reduce the presence of fossil fuels and attendant infrastructure in Portland. As everyone without a vested interest in the continuation of dependence on fossil fuels for energy knows, we need to dial down as fast as possible. If it's not too late, we're close to that time. If not in our city, where?

Name: Eric Schmall

Email: kahunalamaku@gmail.com

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Comment:

I'm requesting that you enact a full ban on all new fossil fuel terminals, regardless of size. There is no need for exceptions. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Please strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you.

Name: David Hermanns
Email: dhermann@earthlink.net

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not

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clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Name: Barbara Bartschi
Email: bartschi@imagina.com

Comment:

Ban new fossil fuel terminal.

The dangerous oil trains should also be ban. We know the terminals and trains are not safe for our environment, we need immediate solutions for clean energy.

188142

Name: kima garrison
Email: kimasuegarrison@gmail.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Victoria Cole
Email: cole.tori@gmail.com

Comment:

Please don't let the process water down what Portlanders spoke very, very clearly in favor of this year. Enact a full ban on fossil fuel terminals, no matter what size! We are in a crucial moment for the climate. This kind of precedent could change our future for the better. Please don't leave holes in our fossil fuel export policy. Furthermore, I believe Portland's leadership should strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. Last but not least, I'd like to see Portland lead the nation by preventing any aggregate increases in fossil fuel infrastructure in the city. It's unlikely to have more than a subtle impact on existing business here, but it can set a wonderful precedent, allowing Portland to be the true leader on climate change action that we purport to be. Thank you.

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Name: Alan Smith
Email: a23smith@yahoo.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small.
An exception for new facilities that are 5 million gallons or less is unnecessary.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Lisa Cohn
Email: lisaellencohn1@gmail.com

Comment:

Hi,

I'm writing to support your enacting a full ban on all new fossil fuel terminals, regardless of size. I don't like your proposed exception for new facilities that are 5 million gallons or less. We need a full ban!
In addition, please strengthen restrictions on expansions allowed at existing terminals by adding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
I also support the city preventing any aggregate increase in fossil fuel infrastructure in Portland.
Your proposal is almost there. Let's protect our climate and environment and enact a full ban!

Name: Amber Buhl
Email: ambie80b@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its

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work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

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While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

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Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

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4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Name: Dave King
Email: landd_2@q.com

Comment:

No new terminals of any size. And for that matter let's shut down existing terminals and make Portland 100% renewable with expanded transit like they have in Latin America. Solar & wind and massive weatherization by the city. Pay for it with our share of the money saved by cutting the 5.3 TRILLION per year subsidies to fossil fuel companies world wide.

Name: Gregg Kleiner
Email: kleinerg@comcast.net

Comment:

Given all the evidence of climate change taking place all around us (wildfires, flooding, rising sea levels, melting ice sheets), we simply cannot scrimp on enacting a FULL ban on all new fossil fuel terminals, no matter what the size. If we keep burning fossil fuels, the future is bleak. It's time to step up! Do NOT all ow an exception for new facilities that are five million gallons or less! That doesn't work.

At the same time, we MUST strengthen restrictions on expansions at existing terminals by adding binging limits and criteria for safety and impacts from climate change in the City's non-conforming use review process.

188142

The time is NOW. We don't have another option. Please prevent any increase in fossil fuel infrastructure in Portland. Our Planet can no longer tolerate our burning of fossil fuels. Thank you!

Name: Howard Shapiro
Email: howeird3@gmail.com

Comment:

If the pipeline is large enough to refill the 4,999,999 gallon storage tanks quickly the proposed limit is meaningless. there should be no new fossil fuel storage facilities allowed.

There should be no expansion of current facilities allowed.

If the PSC decided to recomment allowing any new construction I would like to see some kind of bonding language contained in the ordinance in the event of a spill.

If Portland is serious about keeping our city at the level of health and sustainability that we presently have, we cannot allow any loopholes in our codes and ordinances that high priced lawyers and planners can take advantage of because if they find them they will use them.

Name: Dean Sigler
Email: muchcatfur@comcast.net

Comment:

Let's not let loopholes allow the camel into the tent. We need to have a zero-tolerance policy toward new fossil fuel expansions.

Name: marjory bryan
Email: djinstigatah@gmail.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.

188142

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland

Thank you for all you do!!!

Name: Mary McGaughey
Email: marymcgaughey@yahoo.com

Comment:

Oregon passed the Clean Energy Act. We pledged to systematically divest from oil energy. The City Portland may not go against the will of all Oregonians. NO OIL TRANSPORT from Our Oregon!!!!

Name: Helen Hays
Email: hlhays@ccgmail.net

Comment:

Please enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. Additionally, strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impact in the City's non-conforming use review process. Finally, prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you for your consideration,
Helen Logan Hays

Name: Steve Rauworth
Email: steve.rauworth@gmail.com

Comment:

Fossil fuels, in particular ones whose transportation poses great

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danger to ecosystems and human communities, even though we are still dependent on them now, are already things of the past. Using them makes our planet a worse place to live.

The only sensible action to take in light of these facts is to ban any new terminals and minimize the use and impact of existing ones. We must adjust to this reality, which will involve some discomfort, but nothing compared to the grim alternative.

Name: Don E. Dumond
Email: ddumond@uoregon.edu

Comment:

My comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Respectfully submitted,

Name: Deborah Field
Email: deblyfield@gmail.com

Comment:

We are a city committed to reducing our fossil fuel usage and therefore, making changes to our storage of fossil fuels needs to reflect our commitment. I do not want any new fossil fuel terminals or expansion of existing terminals in Portland. Listen to the citizens in Portland and reflect their voices in your decisions.

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Name: Cynthia Enlow
Email: hienlow@msn.com

Comment:

City of Portland: I support amending the proposed draft to reflect the City's fossil fuel goals:
•Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.
•Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
•Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Gabrielle Karras
Email: gk2829@hotmail.com

Comment:

Hello,

I live in the Woodstock neighborhood and I am very, very concerned about global climate change and fossil fuel zoning. As a progressive city, I would like to see Portland enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. I would like to see strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. I would like to prevent any aggregate increase in fossil fuel infrastructure in Portland. We need to be a leader in this issue. We live in a beautiful place and fossil fuels are the enemy of beauty. We need to invest in alternative energy and not rely on a type of energy that is destroying the planet.....By continuing to invest in fossil fuels because the money is attractive is only to delay the coming catastrophe.....

Name: jody guth

Email: jodyguth@gmail.com

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Comment:

Why a partial ban? This is Portland. Home of enlightened thinkers who do what is right for the environment and people regardless of monied interests. (usually, mostly, hopefully....) Please, continue on the common sense path forward....a full ban with NO exceptions. Thank you.

Name: Neal Keefer
Email: nvkeefer@msn.com

Comment:

Dear City Council, I am writing to ask you to enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. In addition, I believe you should strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. Finally, please take steps to prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you for considering my comments.

Name: Joe Chasse
Email: joetruck@gmail.com

Comment:

WE HAVE ALREADY BEEN SHOWN by Union Pacific and other corporate collaborators that we can NOT trust them. Their ONLY MOTIVE is PROFITS for the shareholders, while OUR MOTIVES run deep throughout our communities and our region.

Name: Matthew Baird
Email: mbaird@climatetrust.org

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Comment:

Message is simple. Please enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
There's no reason to hedge in favor of fossil fuels now that we know the full cost of burning fossil fuels. Keep them out, so we can focus on moving forward with cleaner alternatives.

Name: John Rau
Email: jrau2@comcast.net

Comment:

As an environmental scientist I think Portland should certainly consider that shipping any fossil fuels to China is shipping fuels that our children may one day need away to fund the greed of the fossil fuel industry and in return gets us air pollution. The pollution China puts into the air eventually ends up here. If they don't have cheap fuels to use they will be motivated to develop renewable energy and that will help us all deal with global climate change. A full ban on fossil fuel export is the only strategy that makes long term sense.

Name: Janice Vranka
Email: javranka@gmail.com

Comment:

Please take a stand and put into place a FULL BAN on ALL new fossil fuel terminals. Period. No exceptions. As Portland residents and active members of our community we ask you to reject any expansions on exiting terminals AND increases in fossil fuel infrastructure. We want livable and safe communities now and in the future for the sake of our children and grandchildren.
Thank you for your consideration.

Name: Diane Jacobs

Email: dianejacobs2@icloud.com

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Comment:

We need to enact a full ban on all new fossil fuel terminals, strengthen restrictions on expansions allowed at existing terminals, and prevent any aggregate increase in fossil fuel infrastructure in Portland. We cannot go at this slowly anymore.

Name: Hal Anthony
Email: threepines@jeffnet.org

Comment:

Portland's approach to fossil fuels needs displaced with the factual realities off sustainability, which is two things: 1) A return of natural utilities and their priceless supplies of FREE, PREREQUISITE HUMAN-NEEDED MODALITIES W/O WHICH WE PERISH; and 2) We have no choice at this time; it is sink and human chaos on fossil fuel vs. possible survival with sustainability. There are no other alternatives, but Clinton will take you to nukes and war — you will see.

Name: Randall Webb
Email: lawrkw@comcast.net

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the

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terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Randall Webb

Name: Harry Kershner
Email: harrykershner@msn.com

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Comment:

1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: John Nettleton
Email: jpn5710@yahoo.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

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intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

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2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Name: karen christensen
Email: lesterladonna@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments.

I want the City of Portland and the Planning and Sustainability Commission to:

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1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Karen Christensen
Portland, OR 97212

Name: Linda Magnuson
Email: lmagnusonl@gmail.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small.
An exception for new facilities that are 5 million gallons or less is unnecessary.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for

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safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Vincent Alvarez
Email: vincent.alvarez@burroughs.com

Comment:

WE should enact a ban on future terminals, no matter the size. Until the fossil fuel industry can prove that spills or accidents are impossible.

Name: Lucy Wong
Email: lucymwong@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to

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the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Lucy Wong
NE Portland Resident

Name: Tara Hershberger
Email: tara.lyn.hershberger@gmail.com

Comment:

Hello! I am a teacher and artist living in Portland. I believe there is nothing more important for the city to do than to care for it's

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citizens and do what is safest and smartest for the people. Rejecting fossil fuel as a basis of our economy is vital to a livable future. Fully and effectively banning all new fossil fuel infrastructure is necessary to protect Portland and move us toward a more just and sustainable way of life.
I want you to enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Pipelines can leak or explode, oil trains derail, coal dust falls off trains and barges. We don't want these in our region, or anywhere.
I urge you also to strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Do what you can to prevent any increase in fossil fuel infrastructure in Portland. To thrive in a changing climate, we must adapt to sustainable, local technologies, live simpler, and end systemic violence and racism. It is an important action to ban new fossil fuel infrastructure and expansion!

Name: Darvel Lloyd
Email: darvlloyd@gmail.com

Comment:

Portland must send a strong message to the fossil fuel corporations and their transporters to PHASE OUT (not ramp up!) production, storage, and transportation of the stuff that is ruining our fragile mother Earth as we know and love it! If we have to find "greener" substitutes for oil, coal, and gas for everything from energy production to plastics, so be it. The City should do all it can to encourage production and distribution of these substitutes!

Name: Rachel Hampton
Email: hamptonrachel2002@outlook.com

Comment:

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Please improve the Fossil Fuel Zoning Amendments by:
-Enacting a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.
-Strengthening restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
-Preventing any aggregate increase in fossil fuel infrastructure in Portland.
Thank You.

Name: Robert Meder
Email: rdmeder@comcast.net

Comment:

Oregon GREEN!

Name: Karen Alexander-Brown
Email: kjalexander@hotmail.com

Comment:

Dear City of Portland,
Keep Portland the leader in combating climate change that we have always been by enacting the following:
1) Enact a full ban on all new fossil fuel terminals, large or small. An exception for
new facilities that are 5 million gallons or less is unnecessary.
2) The City's code changes should not allow more unit trains of dangerous fossil
fuels like Bakken crude oil.
3) Strengthen restrictions on expansions allowed at existing terminals through
adding binding limits as well as criteria for safety and climate impacts in the
City's non-conforming use review process.
4) Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Margaret Stephens
Email: mlstep@msn.com

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Comment:

I am writing to urge the City of Portland do the following:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

PS: what Portland does affects the entire State of Oregon; please set the best example for the rest of our state. Thank you.

Name: Diana Boom
Email: diana@dboom.net

Comment:

Just that – please ban all new fossil fuel terminals. Go Portland.

Name: Briar Schoon
Email: briar.dayne@gmail.com

Comment:

I want to thank the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. While the current draft is much improved, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland".

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I want the City of Portland and the Planning and Sustainability Commission to:
1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.
3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

We must transition away from fossil fuels immediately if we are to curb the worst impacts of climate change. The City of Portland has the opportunity to be a bold leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.
Sincerely,
Briar Schoon

Name: Lilian Kong
Email: lilian.kong@outlook.com

Comment:

Dear City of Portland,
While the latest draft of the fossil fuel terminal zoning code changes is greatly improved, I believe it is not enough. I believe we should:
1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

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2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Nathaniel Holder
Email: nathaniel@nholder.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015

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Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Name: Robert Heydenreich
Email: bobheyden@gmail.com

Comment:

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I want the City of Portland and the Planning and Sustainability Commission to:

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Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

I believe that we cannot put off any longer our efforts to stop global warming. It we don't start now, soon it will be too late and

the consequences will be devastating.

Sincerely, Robert Heydenreich

188142

Name: Breanna Lundvall
Email: breanna.lundvall@gmail.com

Comment:

Dear City of Portland,

As a Portlander, this ban is very important to me as well as my fellow friends and neighbors. We NEED a full ban. Any exceptions to a full ban are just plain wrong. In the world we live in today, we cannot afford to continue this behavior any longer. It is irresponsible. Please enact a full ban on ALL new fossil fuel terminals. Along with this is the need to place the strongest of restrictions of expanding existing terminals. Again, we cannot continue this behavior any longer. Let us be a leader for the rest of the country. It is what the people want!

Thank you

Name: satya vayu
Email: satyavayu@gmail.com

Comment:

We need to take our city's commitment to stopping climate change seriously! Please enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
In addition, please strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Finally, we must prevent any aggregate increase in fossil fuel infrastructure in Portland.
Thank you,

Satya Vayu

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Name: Jeffrey White
Email: rogue576@gmail.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: joana kirchhoff
Email: joanakirchhoff@gmail.com

Comment:

Dear City Council, Please prevent the increase of fossil fuel infrastructure in Portland. The resolution passed by the Council now comes to you for implementation – don't renege on the intent of that resolution. Now it the moment to stand for the climate!

Name: Jared Naimark
Email: jwnaimark@gmail.com

Comment:

In order to address the climate crisis and local pollution we need Portland to be a leader in moving us completely beyond fossil fuels and towards 100% renewable energy. I urge the city to enact a full ban on all new fossil fuel terminals, large or small.

Sincerely,

Jared Naimark

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Name: Katherine Anne Stansbury
Email: yttik1000@yahoo.com

Comment:

Amend the proposed draft to reflect the City's fossil fuel goals:*Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.
*Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
*Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Ben Basin
Email: ben_basin@yahoo.com

Comment:

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I want the City of Portland and the Planning and Sustainability Commission to:

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4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Name: Kelly O'Hanley
Email: kohanley@gmail.com

Comment:

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Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Andrew Butz
Email: anbunz@yahoo.com

Comment:

Dear Planning and Sustainability Commission:

Please enact a full ban on any new fossil fuel terminals, large or small. We don't need an exception for new facilities of 5 million gallons or less. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Moreover, we must strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
The bottom line is, we need to prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Bernadette Rodgers
Email: bernadetterodgers350@gmail.com

Comment:

Dear Mayor Hales & Portland City Council,

Portland made national and international headlines last year with the first-ever resolution calling for no new fossil fuel infrastructure projects in Portland. I was so proud of Portland that day! Now as you code that resolution into law, let's stay true to its intent and ensure that it is not watered down to allow

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projects that clearly violate the intent of the resolution. Specifically, this law should:
–Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
–Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
–Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thanks for all you do to serve and protect this great city, and to make sure Portland leads the way to a clean and just energy future!

Sincerely,
Dr. Bernadette Rodgers
PSU and PCC faculty
350PDX Board Chair

Name: Farrah Chaichi
Email: FNChaichi@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to

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another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Farrah

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Name: Jane Stackhouse
Email: jane@janestackhouse.com

Comment:

We are so close to putting Portland in the forefront of action against climate change. Please keep with your original vision and correct the proposed zoning rules.
1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.
2. Do not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
3. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The only infrastructure work that should be done is strengthening existing storage to withstand a major earthquake.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Allen Neuringer
Email: allen.neuringer@reed.edu

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland".
Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to

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another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Allen Neuringer

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Name: CatAshleigh Mead
Email: cat_list1@featherforge.com

Comment:

Please keep Portland safer from fuel spills, fires, and other contamination, and set an example of leadership for other cities by putting the brakes on the major cause of climate change through showing the industry it is unwelcome.

Please enact a FULL ban on all new fossil fuel terminals, with no exceptions, and no code changes to allow more trains of fossil fuels.

Please also strengthen restrictions on expansions at existing terminals and prevent any increase in fossil fuel infrastructure in Portland.

Thank you.

Name: Anthony Albert
Email: albert2910@msn.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Alan Smith
Email: a23smith@yahoo.com

Comment:

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Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

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4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Alan Smith

Name: Deborah Einbender
Email: pursona@teleport.com

Comment:

Aggressive, bold action is needed NOW. We should be leaders in the movement to make sure that a full ban on all new fossil fuel terminals of any size is immediately passed, with no exceptions for size. No increase in dangerous fossil fuels, like Bakken crude oil should be allowed. The city should act to strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Name: Alain Millar
Email: jakeshouseajm@comcast.net

Comment:

We need to lead the country (as we have before on environmental issues) and
1. enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. No more Mosiers.
2. strengthen restrictions on expansions allowed at existing

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terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Aaron Schalon
Email: aaron.schalon@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Aaron Schalon

Name: G. Gibson
Email: mistergibson@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland".
Although this draft prohibits new larger bulk terminals, it still

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allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

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G. Gibson
mistergibson@gmail.com
Citizen

Name: John Hahn-Francini
Email: johnhf@hevanet.com

Comment:

I would like to see a full ban on all new fossil fuel infrastructure in Portland. A full ban should not have exceptions for new facilities that are 5 million gallons or less. The code changes should not allow more unit trains of dangerous, highly combustible fossil fuels like Bakken crude oil. I would like to see the code strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. I would like to see the code prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Robert Spies
Email: rspiesr@netscape.net

Comment:

The US should not be exporting fossil fuels! We'll need them ourselves when the crunch comes. The US should be working on renewable energy, and phasing out fossil fuels. Therefore new fossil fuel terminals are unnecessary.

Name: Eve Heidtmann
Email: eveandden@gmail.com

Comment:

I am adding my voice in support of a ban on ALL new fossil fuel terminals and the strongest possible restrictions on the expansion at existing terminals. The age of fossil fuels is over. The sooner we put an end to fossil fuel use, the better for it will be for our children and all species.

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Name: Joshua Berger
Email: josh@plazm.com

Comment:

Please Please Please

Let's continue to be a leader in sustainability!

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Joanne Walters
Email: greengirlspdx@gmail.com

Comment:

Please ban all new fossil fuel anything. Keep it in the ground and out of the rails and ships!

Name: P Anna Johnson
Email: aj@mercedlake.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use

review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

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Name: Linda Magnuson
Email: lmagnusonl@gmail.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Cynthia Enlow
Email: hienlow@msn.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2.Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3.Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Eric Canon
Email: canonmetals@gmail.com

Comment:

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Ban fossil fuels terminals in Portland. No more. Turn the future toward sustainable alternatives. Do it now.

Name: P Horter
Email: lacengh@yahoo.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Gisela Ray
Email: giselaray@frontier.com

Comment:

We know that fossil fuels have to be phased out and soon. It would be utter folly then to spend precious resources on new infrastructure for those fuels. That money must instead be diverted to renewables. That's the future and the future needs to start now. Fossil fuel companies must not be allowed to bring new terminals and other new infrastructure to Portland or Oregon for that matter. If they do they will clamor to recoup their investment by recovering and selling ever more fossil fuels.

Name: Rachel Lewine
Email: rachel@lewine.net

Comment:

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Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

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4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Rachel Lewine

Name: Rachel Lewine
Email: rachel@lewine.net

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve

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safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

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2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Rachel Lewine

Name: Katherine Gibson
Email: ktdid3542@gmail.com

Comment:

What is it about NO that is not understood?!

Name: Susan Wechsler

Email: susanwechsler@comcast.net

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Comment:

Please enact a full ban on all new fossil fuel terminals, and prevent ANY aggregate increase in fossil fuel infrastructure in Portland.

We cannot afford to wait for others to act.

Name: Darrell Kay
Email: drcskay@gmail.com

Comment:

We the people do not want any new fossil fuel terminals in this region. Nor do we want expansions of any existing facilities. Conservation and conversion to renewable fuels should be promoted. We certainly DO NOT want to encourage more oil by rail in any way. We should actively decrease this disaster in the making before it strikes again!

Name: virginia feldman
Email: feldmanvi@gmail.com

Comment:

Dear Portland Sustainability Council:
As a physician, mother, & grandmother, I urge you to enact a full ban on fossil fuel terminals–large or small. Please remember the 2015 Resolution–to 'actively oppose' new fossil fuel infrastructure.
Similarly, please remove the exception for new facilities that are <5 million gallons.

Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

And I urge you to strengthen restrictions on expansions allowed at existing terminals, through adding binding limits and safety criteria in re climate impacts in the City's use review process.

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And finally, please make your language precise to prevent smaller related "terminals" from clustering and aggregating, thus increasing fossil fuel shipments through our city.

The City of Portland can be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could be at the forefront on the most pressing concern of our time.

Name: Barbara Krupnik-Goldman
Email: bkgold2@gmail.com

Comment:

Dear Commissioners,
The revised version of the fossil fuel proposal is much improved, however it still needs improvement in the following areas:

1) Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2) Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3) Prevent any aggregate increase in fossil fuel infrastructure in Portland.

In order to keep global warming under 2C and have a livable future, we need to immediately transition to clean, renewable energy sources. We can't allow new multi-decade investments in fossil fuels that lock us into a world of climate chaos. Instead, we must draw the line to stop the growth of the fossil fuel industry, protect the health and safety of our community, and transition to a 100% renewable energy economy now!
Thank-you,

Name: Anne Hamburg
Email: akaseyh@yahoo.com

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Comment:

New and expanded fossil fuel terminals are not a good idea for Portland. If this does end up happening, please ensure the fossil fuel industry has and can prove it has it's own spill and fire suppression crews on duty at all times and ready to respond within a few minutes...do not waste our fire bureau resources on it. Please increase renewable and/or safe energy sources.

Name: Shawn Looney
Email: looneys@involved.com

Comment:

Please enact a full ban on ALL new fossil fuel terminals, and strengthen restrictions on expansions allowed at existing terminals. Portland absolutely should not increase its fossil fuel infrastructure. Burning of fossil fuels is a huge contributor of global warming. We cannot afford to continue being part of the problem. Thank you.

Name: Martin Frazier
Email: martinfrazier52@gmail.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Nancy Pfeiler
Email: nancypfeiler6@gmail.com

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Comment:

I do not live in Portland. I live in Salem. We need you to continue to be the model for all cities in Oregon.
Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland".
Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

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3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Name: Kate Gessert
Email: katerg@igc.org

Comment:

Dear Sirs:
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.
Thank you! Best, Kate Gessert

Name: Annie McCuen
Email: mccuen7691@comcast.net

Comment:

Please do everything in your power to reduce the dangers

created by oil-fossil fuel-industries, terminals, trains, reduce, eliminate.

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Name: Jan Madill
Email: jan@janmadill.com

Comment:

Please ban all new fossil fuel terminals. Also strengthen restrictions on existing terminals and do NOT allow any overall increase in fossil fuel infrastructure in Portland. For future generations we need to move now to renewable energy.

Name: Christine Yun
Email: cpypdx@gmail.com

Comment:

I would like City Council to consider the following:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Jennifer Adkins
Email: azulclarojo@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original

intent of the 2015 Resolution.

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However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

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4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Name: Laura M. Ohanian
Email: lmo@efn.org

Comment:

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Sincerely,
Laura M. Ohanian

Name: Neal Keefer
Email: nvkeefer@msn.com

Comment:

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Please strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Please take steps to prevent any aggregate increase in fossil

fuel infrastructure in Portland.

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Name: Dave King
Email: landd_2@q.com

Comment:

The resolution gave me hope that there would be no infrastructure built and the existing facilities would be grandfathered but not added to. That's what I expect the ordinance to provide. Please don't cave.
Climate is changing now, please don't speed it up with new carbon.

Name: Joseph Meyers
Email: dearsmileyjoe@gmail.com

Comment:

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Sincerely,

Joe Meyers

Name: Barbara Bartschi
Email: bartschi@imagina.com

Comment:

Ban all fossil fuel terminals. We don't need any more pollution. We already are dealing with the mistakes of Hanford! We are running out of time – we need to think of our children's future.

Barbara Bartschi

188142

Name: marjory bryan
Email: djinstigatah@gmail.com

Comment:

Please, enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Angelica Pray
Email: angelicapray@yahoo.com

Comment:

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Sincerely,
Angelica Pray

Name: Tracy Ceravolo
Email: cyclwomn@yahoo.com

Comment:

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There is no reason to expand fossil fuel infrastructure. It is a dying, outdated industry which is ruining our environment all for greed. We must invest in renewable energy infrastructure like we are at war with Climate Change! This must happen, and the sooner we start, the less painful it will be. Portland must be a leader in this message to the country and the world. No more fossil fuel infrastructure AT ALL.

Name: Dolores Wood
Email: pgna_greening@yahoo.com

Comment:

Fossil fuels are proven harmful to our health and safety. I advocate for clean air, soil and water, and against increased transport of fossil fuel, and against new storage facilities for fossil fuels. I advocate for clean energy, and for restoration of polluted areas. I advocate for maintenance, and upgrading, but not expansion of existing fossil fuel facilities.

Name: Joy Mamoyac
Email: salmonberries@msn.com

Comment:

As a long time Oregonian who loves her state I an VERY concerned about fossil fuel terminals whether they are large or small infrastructures. There needs to be a ban in place, When you consider the fires, derailments, enviromental disasters and explosions that have happened as in Mosier it is very dangerous to all Oregonians on so many levels. We need this ban to prevent future loss of life and damage to our ecosystem. It's not a matter of "if " these dangerous events will happen but "when"! We need to give careful thought when considering any expansions to existing terminals. You have the responsibilty and DUE dilligence to protect The state of Oregon as a whole!

Name: Mary McGaughey
Email: marymcgaughey@yahoo.com

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Comment:

Oregon has just voted for Clean Energy. To move forward with sustainable, non-polluting energy. We, the whole world is working to divest from dirty oil. Many nations have signed on to the 2016 Paris Climate Agreement, even China! Building terminals to transport oil to Asia will 'fly in the face' of our commitment to eliminate oil as the major energy source of the world. Backward is not where We are going!

Name: Fraser Rasmussen
Email: rasmussenf43@gmail.com

Comment:

I am requesting that by regulation the city of Portland will remain free of any new fossil fuel terminals. That city will not accept any amount of crude oil shipments to be stored or processed within its boundaries.

Name: Elle West
Email: appleface25@yahoo.com

Comment:

fossil fuels are now unnecessary and unwanted. for a fuel company to make a decision based on profit that is projected is irresponsible and NOW life threatening. WE DO NOT WANT OIL, WE WANT A FUTURE.

Name: Steve Elliot
Email: secondselliot@peoplepc.com

Comment:

Climate change is real. Staying the course is obviously unacceptable as it will only hasten the pace of global warming, causing more catastrophic storms, and loss of plant and animal species. One of the greatest causes of global warming is from the use of fossil fuels in internal combustion engines.

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New infrastructure for fossil fuel extraction, transport, storage, and refining indicate a willingness to go forward to planet disaster. This is unacceptable. We must transition to other sources of energy if we are going to have a livable planet for our grandchildren's grandchildren.

Name: Paul Spindel
Email: pspindel@msn.com

Comment:

Hi.
I am writing you to ask that:
1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

We can do better. Be leaders.
Thank you

Name: Natalie Reich
Email: natmobile@comcast.net

Comment:

I know there is ample evidence that continuing to frack oil and harvest coal, transport and burn these fuels is a sure road to utter disaster and we may already be past the point of no return. I know there will be earth scientists and environmentalists presenting the numbers -temperatures, atmospheric ppm, methane, C02, etc. This is simply an emotional appeal that our city stay consistent with its stated commitment to ban ALL FOSSIL FUEL INFRASTRUCTURE AND
T RANSPORT WITH NO LOOPHOLES OR EXCEPTIONS.

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Name: Tony and Phyllis DeCristofaro
Email: pdecrist@yahoo.com

Comment:

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Sincerely,

Tony and Phyllis DeCristofaro

Name: Glenna Hayes
Email: gahportand@yahoo.com

Comment:

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Sincerely,
Glenna Hayes
7254 SW 53rd Av
Portland, OR. 97219

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Name: Monica Mueller
Email: monica.mueller@pdx.edu

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments.I encourage the City of Portland and the Planning and Sustainability Commission to:
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.
Thanks in advance for considering these changes.

Name: Dana Brown
Email: danaconsulting@comcast.net

Comment:

Dear Mayor and City Council Members –
This is your opportunity to leave an historic legacy for future Portlanders. Enact a full ban on all new fossil fuel terminals, strengthen restrictions on expansions at existing terminals and prevent any increase in fossil fuel infrastructure in Portland. There is only one way forward to a future that will be sustainable for humanity and all life on the planet. Be the leaders you hoped to be. Thank you!

Name: Emily Platt
Email: platte@ohsu.edu

Comment:

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Sincerely,

Name: Pennelloppe Allee
Email: pennelloppe99@yahoo.com

Comment:

I support a full ban on all new fossil fuel terminals, large or small. We should be urgently moving away from fossil fuel dependency, and the oil companies have the resources to do so and develop clean energy. The only thing preventing them from doing so is greed. If we make fossil fuel extraction and use less accessible and profitable, they will be forced to invest in the cleaner, safer alternatives. They will not do it willingly, therefore, it is up to us to force the redirection of effort and investment through our actions and legislation. The City of Portland has the power to change the energy/climate paradigm. Embrace this opportunity to be leaders and energy policy shapers for the betterment of our local and global environments.

Name: Carolyn Stuart
Email: touchmonk@yahoo.com

Comment:

I am n full agreement with all of these points!

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

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Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Colleen McNally-Murphy
Email: cmcnallymurphy@gmail.com

Comment:

To whom it may concern:

It is time for Portland to reclaim its role as a leader in green infrastructure and renewable energy. To that end, I write to urge you to:
1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
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3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you very much.

Name: Eileen Fromer
Email: efromer@msn.com

Comment:

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Sincerely,
Eileen Fromer

Name: Daniel Senic
Email: euromerican@msn.com

Comment:

I am writing to voice my opposition to any expansion of fossil fuel transport through my beloved city.

I moved to Portland in 2009 not because of job opportunities but because of Portland's reputation as a leader in all environmental issues. This is important to me because I am a person of faith and as such am called to environmental stewardship. Our miracle planet, it's vegetation, oceans, atmosphere, climate, humans and animals are all part of God's creation and are thus good and sacred.

Corporate greed for profit threatens all that is perfect in it's originally created state and our Rose City should not give into temptation and intimidation and thereby aid in the destruction of creation. This city, country, and world has more than enough acres of parking lots and rooftops for solar panels and plenty of wind to go around to spin countless wind turbines. Not to mention other renewables. I ask my city to stand on the side of righteousness and I want the following:

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Name: Ineke Deruyter
Email: ideruyter@hotmail.com

Comment:

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Thank you very much, Ineke Deruyter

Name: Sheila Golden
Email: goldensheila6@gmail.com

Comment:

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3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sheila Golden

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

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However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

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be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

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Sincerely,

Name: John Nettleton
Email: jpn5710@yahoo.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

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2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
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3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

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Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

John Nettleton

Name: Sharon Labreck
Email: sharonlabreck@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is

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transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

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Sincerely,

Sharon Labreck

Name: Jason Fiske
Email: jasondanielfiske@gmail.com

Comment:

Let Portland live up to its potential by taking this "risk" and pioneering the standards for other American cities.

Name: Stephen Bachhuber
Email: srbachhuber1@gmail.com

Comment:

To BPS,
In regard to the possible ban on fossil fuel terminals, keep it strong.
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Mona McNeil
Email: monarandy@monarandy.com

Comment:

Please protect our Oregon/Washington environment and people. Ban all new fossil fuel terminals.

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Name: Maya Jarrad
Email: maya@350pdx.org

Comment:

Congratulations to all of you at the Bureau of Planning and Sustainability for your work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution, and to truly protecting Portland and its residents from further health, safety, and climate risks.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is

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unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Name: Susan Millhauser
Email: susancm@spiretech.com

Comment:

Thank you for the hard work done to date to develop the draft Fossil Fuel Terminal Zoning Amendments. I am writing today to encourage the addition of further restrictions on size and expansion of existing terminals to better meet the intent of the original City Council resolution, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's

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intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I encourage the City and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small, as clearly stated in the 2015 resolution.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now is the time to tighten up these amendments to ensure Portland's people and the natural environment are protected from fossil fuel transport and the location and expansion of terminals within our community. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Thank you for your consideration!

Name: Judy Romano
Email: judy92809@gmail.com

Comment:

We want to:
Enact a full ban on all new fossil fuel terminals, large or small.

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An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Susan Haywood
Email: susansaphone2@yahoo.com

Comment:

We must have a full ban all new fossil fuel terminals of any size. There must be no exceptions; we must not allow any more trains fossil fuels, especially Bakken crude, through our city (and hopefully the state).
As it is now, trains dragging oil tanks run frighteningly close to Max tracks and our freeways. We cannot afford to increase the risk of explosions that would harm so many people.
In addition, we should prevent any aggregate increase in fossil fuel infrastructure in Portland. We are on the confluence of two rivers and risk pollution that can move far and wide via their waters. It was wise to pull out of the Pembina project last year. Let's shrink our risks and not allow ourselves to be used by big corporations to export their foul products.
We need to strengthen restrictions on any and all expansions at existing terminals by adding binding limits and criteria for safety and climate impacts in Portland's non-conforming use review process. In fact, it would be great to reduce terminals now in existence for our own safety.

Name: Mark Grossman
Email: grossman_mark@yahoo.com

Comment:

My family lived in Oregon for years and value its environmental

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health. We ask for a full ban on new fossil fuel terminals of an size. Existing terminals should not be expanded. Fossil fuels are destroying the atmosphere and the oceans – let's not contribute to this any further.

Name: satya vayu
Email: satyavayu@gmail.com

Comment:

I appreciate that the Bureau of Planning and Sustainability incorporated public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the strong resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I urge the City of Portland and the Planning and Sustainability Commission to enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure. The exception for new facilities that are 5 million gallons or less needs to be removed as it would allow more unit

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trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

Also, restrictions need to be strengthened on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. Finally, please add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Satya Vayu

Name: Barbara Manildi
Email: bmanildi@earthlink.net

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Denise Busch
Email: standleydm@involved.com

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Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Cecelia Hurley
Email: diablaella@gmail.com

Comment:

Dear City of Portland,
Please consider this ban. I am a tax payer and natime Portlander. Please
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

These are the things I would like you to cinsider while making these important and impact full decisions.

Kind Regards,
Cecelia Hurley
7465 N Huron
PORTLAND OR
97203

188142

Name: William Whitaker
Email: wwhitak@boisestate.edu

Comment:

I am an Oregon grandfather concerned about leaving a heritage of a habitable world for grandchildren everywhere. We must keep carbon in the ground.

I urge you to enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

It is essential to strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

We must prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: David Kreisman
Email: dkreisman@hotmail.com

Comment:

It is extremely important that Portland NOT weaken this precedent setting policy! For future generations and the livability our planet I strongly urge the Portland City Council to:

1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Sincerely
David Kreisman

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Name: Mary Rose
Email: zambonirose@gmail.com

Comment:

It is time for us to boldly step into the change that needs to happen now. Portland has a chance right now to lead the way in the transition toward renewable energy. We cannot do so if we don't take the leap of banning new oil infrastructure. Please refine the Fossil Fuel Zoning Amendments to make this change possible.

I stand with many other Portlanders who want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Sincerely,
Mary Rose

Name: Michael Mitton

Email: mmitton@nvbell.net

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Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

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3 – Strengthen restrictions on expansions allowed at existing

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terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Michael and Marilyn Mitton

Name: Therese L
Email: harvestofpeace@yahoo.com

Comment:

I am writing to urge a full ban on new fossil fuel infrastructure in Portland. While I actually live in Washington, I follow issues of fossil fuel infrastructure and transportation in our region very closely. Since moving to Washington 3 years ago, I have done nothing in my community but fight the greedy oil companies that want to destroy my neighborhood. I feel like I am just treading water, trying to keep the place I love from falling into the wrong hands. Meanwhile, other important issues such as unemployment, homelessness, habitat restoration etc. go unresolved. Please, put an end to these constant fossil fuel projects so we can get back to work on other important issues! Thank you.

Name: Devin Kelly
Email: devin.scott.kelly@gmail.com

Comment:

Portland does not need new fossil fuel terminals. The cycle must

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be broken by restricting the implementation of new terminals and expand renewable energy.

Name: Craig Heverly
Email: heverlyjc@hevanet.com

Comment:

"No" means "No". Make it clean. Make it simple. No fossil fuel infrastructure. Period.

Thank you for your work.

Name: Lynda Byers
Email: lebyers484@gmail.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Mirabai Peart
Email: mirabaipeart@gmail.com

Comment:

I want to say thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. I appreciate that the current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution. However, the current Fossil Fuel Zoning

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Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015.
More than anything, the city's responsibility is to ensure a liveable climate for our future generations. All signs and studies are showing that climate change is moving on us faster than we want to acknowledge. If Portland can pass a true strong resolution on this then we will be taking one step in the right direction as a city, towards a reasonable future, and towards taking full responsibility to help reduce the severity of this global crisis.

This visionary resolution of 2015 called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although the current draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

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2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing

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terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time. We really need to do this, for now, and for all future generations. Let's make a resolution that Portland can be proud of.

Sincerely,
Mirabai Peart

Name: Ryan Francesconi
Email: hello@are-f.com

Comment:

Hello!

Let's be a world example and get this right. Full ban on fossil Fuel transport!!

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing

terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

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4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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Name: Diana Richardson
Email: licketysplit777@gmail.com

Comment:

I will not take up time and space to delineate all the reasons for insisting upon a FULL BAN on all new fossil fuel, large and small, I insist upon removing any exceptions to proposed new facilities that are 5 million gallons or less.
You must strengthen restrictions on existing terminals through adding binding limits as well as safety measures and criteria for climate impacts.
Lastly, you need to add language to smaller, "related" terminals from clustering and aggregating to increase fossil fuel shipments through Portland.
I express these instructions as a Citizen Protector of the Earth and Water under my stewardship as a citizen of Cascadia and of the geopolitical territories in which I reside.

Name: Robin Vesey
Email: jack-robin@spiritone.com

Comment:

No new fossil fuel terminals should be allowed or built in Portland, nor in any part of Oregon. The city should enact laws to forbid the transport of fossil fuels via rail or roads here, due to

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their dangers and impacts on our climate.

Name: Rick Rappapor
Email: rick@rickrappaport.com

Comment:

Hello, I realize that most of this comment is part of a sample letter written by others who have put in much more time and energy researching the published staff report and recommendations. I know it sounds like rubber stamping someone else's thoughts but why not? It says what I want to say better and more knowledgeably than me fumbling around and making factual or quasi legal errors.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

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I want the City of Portland and the Planning and Sustainability Commission to:

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Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Name: Kim Fortin
Email: fortinkim@gmail.com

Comment:

It's time to...

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use

review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

188142

Name: Ruby Karen Annette Wilcox
Email: rubykwilcox@yahoo.com

Comment:

My name is Ruby Karen A Wilcox and I live in Portland. I support a full ban on all new fossil fuel terminals in my city. Please please protect our environment! Please protect our home. Our Planet suffers from our addiction to fossil fuels, which come at such a brutal cost to our water, our people, our future. Please support other means of generating energy and fuels. It is time!

Name: Mary Mandeville
Email: k9chiro@aol.com

Comment:

Thank you for incorporating public comments on the Fossil Fuel Terminal Zoning Amendment. I'd like to say that I am in support of a FULL BAN.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for

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safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Mary Mandeville

Name: mary lane
Email: ryla2015@gmail.com

Comment:

City of Portland leaders:
Portland needs a FULL BAN on ALL new fossil fuel terminals, large or SMALL!
Please do the job you were elected to do: keep our environment and people safe and
do what Portlanders want you to do!!!

Name: Nicole Martin
Email: PixiStyxNM@aol.com

Comment:

Tell the City of Portland we want to...

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use

review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

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Name: Terrie Burdette
Email: pdxterrie@gmail.com

Comment:

As an East St John's resident I live in view of a busy rail line and often think about the danger of oil transporting train cars moving through my neighborhood. Besides the potential for human injury or death is the threat of environmental damage to nearby Smith and Bybee Lakes. We are a PNW city and should be leading the way by example to fully ban ALL new fossil fuel terminals of ANY size.

Name: Elizabeth Graser-Lindsey
Email: egraserlindsey@gmail.com

Comment:

Let's leave our children with a future. Let's do the right thing and turn from fossil fuels.

Name: Eliot Cole
Email: eliot.cole1@Gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is

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transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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Sincerely,

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Name: Mikel Gisi
Email: loveofthewild@gmail.com

Comment:

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Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

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Sincerely,

Name: Fiona Yun
Email: fiona.yun00@gmail.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small.
An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland

---

Name: Marsha Hanchrow
Email: machiya@centurylink.net

Comment:

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It's not that I don't care about the price of gas, I do. I want its price to include to include all its costs. Those would be, among many others, the far more expensive processes necessary to get the remaining less accessible oil out of the ground, the money that should be reimbursed to FEMA for the cost of every "natural" disaster caused or exacerbated by drilling or oil transport, the cost of every improvement to stormwater systems needed because too much land is covered by impermeable roadway, the cost of almost every action/war in the Middle East, and more that I'm not up to arguing on a tiny phone.

I have a car; I drive it on occasion. It is not entitled to cheap gas, nor am I, nor is anyone.

Please do not allow any more oil terminals in Portland.

Name: Sandy Polishuk
Email: sandypolishuk@gmail.com

Comment:

I very much appreciate the opportunity to have input to your committee before you submit your report to City Council and I thank you for the improvements you have made to the initial draft. However, I think the current proposal still needs more improvement to be in accord with the original intent of the resolution passed last Fall.

The point was no expansion of fossil fuel infrastructure. This means no new terminals and no expansion of the current ones! Seems pretty clear and simple to me.

I also think it's very important that all the current fossil fuel storage be seismically improved. We all know the 'big one' is coming eventually, and it could be sooner rather than later. We must protect our city and river from fuel spills that will cause contamination and possible explosions and fires.

We need to be sure that there is no increase in trains carrying oil. Ideally, we should stop them all. They are a danger to our health and safety!

Name: Rebecca Parker
Email: beccasuzanne2020@gmail.com

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Comment:

I would like a full ban on all fossil fuel terminals- NO exceptions. And no expansions on existing terminals- add binding limits. NO increased infrastructure!
The money could be better spent for health care or schools.
We need criteria for safety and climate impacts. Lets stop the short sightedness.
For any existing terminals, I'd like to see taxes placed to help cover the expensive chronic health costs of the crude oil.

Name: Jody Bleyle
Email: bleyle@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

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safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Jody Bleyle

Name: Susan Buswell
Email: tamaracktales@aol.com

Comment:

It truly is time to start downsizing the fossil fuel industry until it no longer exists...not add to it. The dangers of contamination to our rather pristine environment in the Pacific Northwest are too great to list and you are already aware of them. Please stop the

expansion of terminals, downsize the existing ones with intent to close. Thank you for your interest in our environmental health.

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Name: Jerry Smith
Email: digjerrydig@gmail.com

Comment:

Fossil fuel companies profit from poisoning the planet. They must be stop. Their bomb trains and explosive pipelines are a severe danger and have to be stopped.

Name: Amanda Schueler
Email: amanda.schueler@gmail.com

Comment:

Dear Mayor and Commissioners,

I urge you to ban all fossil fuel infrastructure in Portland. Here are the specifics of my request:
1.Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

I want Portland to continue to be a leader in protecting our precious planet. Fossil fuels must stay in the ground if we hope to slow and reverse the cataclysmic effects of climate change. I urge you to be a Protector!

Name: Collin Murphy
Email: Bleuoiseau@comcast.net

Comment:

Please, NO, and I mean NO such facilities belong in Portland or anywhere, for that matter!

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Name: Linda Levin
Email: linvin@comcast.net

Comment:

As a resident of Portland I urge you to adhere to the visionary resolution that Portland supported in the fall of 2015. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Actively oppose new infrastructure by enacting a full ban on all new fossil fuel terminals, large or small.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals by adding binding limits and include criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

The City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few improvements to the Fossil Fuel Zoning Amendments, Portland could again be on the forefront addressing the most critical concern of our time.

Sincerely,

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Name: Scott and Heidi Trinkle
Email: dwerger@gmail.com

Comment:

It is time to enact a full ban on ALL new fossil fuel terminals in or around the city of Portland. An exception for facilities that allow five million or fewer gallons of dangerous fossil fuels such as the Bakken crude oil must never be allowed.
By using the City's non-conforming review process, it is time to strengthen restrictions on the expansion of existing terminals with binding limits as well as with the strongest safety and climate impacts criteria possible. We know the damage that the mining for and burning of fossil fuels creates to people, for our communities (especially the poorest in the direct impact zones) and for the planet as a whole. It is, therefore, a must that the fossil fuel infrastructure for the city of Portland be limited to what already exists with a future goal of downsizing it and then putting Portland (along with the state of Oregon) on a path to 100% renewables in the coming decades.
We chose to retire from the US Army in what we saw as the environmentally progressive city of Portland, OR. We hope the Planning and Sustainability Commission continues along this path of sanity and sustainability for every residents' well being and it begins with a full BAN on fossil fuel terminals.

Name: Kat Majors
Email: mouser1@gmail.com

Comment:

Please, put the people and our health before Corporate profits.

Name: Anne Halpin
Email: pnwsun13@gmail.com

Comment:

We all live downstream, and we say NO, NO, and NO to:
-Any new fossil fuel terminals!
-Expansions allowed at existing terminals!

-Additional fossil fuel infrastructure!
Even those of us who technically live upstream from Portland recognize that when it comes to the question of fossil fuels and their impact on the earth and on future generations, we all live downstream. Now is the time to shift away from fossil fuel dependence and toward more sustainable energy systems. Oregon can lead the way toward a more healthy and sustainable future! And the rest of Oregon looks to Portland to be at the forefront! Please say NO, NO, and NO when it comes to bringing more dirty and dangerous fossil fuels into Portland's ports! Thank you.

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Name: Beth Slikas
Email: bethslikas@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

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I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Beth Slikas

Name: Kyle Collins
Email: kalelcollins85@gmail.com

Comment:

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be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Name: Luke Anavi
Email: lanavi@ymail.com

Comment:

Please enact a full and binding ban on all new fossil fuel infrastructure projects anywhere in the city limits of Portland. This is important for both symbolic and practical reasons and will once again make Portland a leader in the movement to address the climate change crisis. Thank you for considering my comment.

Name: Ed Kaiel
Email: ekaiel@pcc.edu

Comment:

I agree with this analysis and requests from 350 PDX. Stand up for the common good of the planet and all it's inhabitants.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

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Sincerely,

Ed and Linda Kaiel

Name: Molly Brown
Email: mollyybrown@gmail.com

188142

Comment:

Thank you for your courageous stances and resolution on behalf of life and Earth. Please keep going, setting an example for the rest of the nation.

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Mary Lou Putman
Email: mlputman@gmail.com

Comment:

Remove land use exemptions for oil re-refiners and oil recyclers i.e. APES and ORRCO. It is far dirtier than crude oil refining and They should not be here! Washington wouldn't let them process– why does Oregon?

Name: Michael Jordan
Email: mikejord65@msn.com

Comment:

Dear City of Portland,
Please:
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more

unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

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Name: kima garrison
Email: kimasuegarrison@gmail.com

Comment:

It's time for Portland to take a bold stand against fossil fuel companies, and let them go the way of the dinosaur!

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Cass Martinez
Email: cass@zzz.com

Comment:

I will be in the audience on September 13, 2016 at 1900 SW 4th, to listen to the people of Portland insist on follow-through on the City's policy of no new fossil fuel storage or transport. Destructive change due to fossil fuel use is evident and on the rise. I am willing to do my part to use less, and I want city government to do its part also. i thank the mayor and commissioners for their earnest efforts with this policy.

Name: Toni Noll
Email: toninoll@yahoo.com

Comment:

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NO, to fossil fuels in Oregon! Stay Out!

Name: Patrick McCulley
Email: pmcculle@gmail.com

Comment:

I don't think that this should be a hard decision. The fossil fuel industry might provide a few jobs. But real investment in renewable energy could provide more and sustain more jobs. Favoring the fossil fuel industry, an industry that knowingly promotes ignorance of anthropogenic climate change, is tantamount to promoting destruction of the human species. Its not a hard decision. Divest from all fossil fuel infrastructure now so that our descendents can have a viable future.

Name: Kayleigh O'Hara
Email: kayleigh.marchand@gmail.com

Comment:

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Sincerely,

Name: Hyung Nam
Email: hyung_n@yahoo.com

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Comment:

I urge you to enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Willie Levenson
Email: willielevenson@outlook.com

Comment:

In regards to the above subject please:

1) Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2) Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Amy Robbins
Email: arobbins1966@yahoo.com

Comment:

City of Portland and the Planning and Sustainability Commission,
It is time for Portland look forward. We know fossil fuels are not part of a healthy future. The Fossil Fuel Zoning Amendments

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need to be strengthened. No more fossil fuel terminals of any size and no fossil fuel infrastructure of any kind should be built. The old should be phased out. There is no better town to lead the way to renewable energy than Portland. We can do this. What are we waiting for?
Sincerely,
Amy Robbins

Name: Mary Fifield
Email: strwrytr@yahoo.com

Comment:

It is imperative that commissioners set a standard for leadership on moving our economy off of fossil fuels as soon as possible. I urge you to ban all new fossil fuel terminals, regardless of size, strengthen restrictions on expansions of existing terminals to account for safety and climate hazards, and limit the aggregate fossil fuel structure to its current capacity. We cannot afford to be incentivizing this kind of energy activity at a time when we face such dire consequences from climate disruption. A decision to restrict fossil fuel infrastructure is a sound long-term business and public health decision.

Name: Esther Nelson
Email: ehnelson0620@yahoo.com

Comment:

Please pass with amendments. Would be so right, so Portland.

Name: Jan Zuckerman
Email: zuckerez@hotmail.com

Comment:

Thank you very much for the work you have done to to listen to the public and make changes to your original draft of the Fossil Fuel Terminal Zoning Amendments. There is still work to be done to "actively oppose" new fossil fuel infrastructure. A FULL

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ban on all new fossil fuel terminals, large or small does exactly that- opposes new fossil fuel infrastructure. Allowing facilities under 5 million gallons makes no sense, in fact, it waters down the resolution and sends a message to our children that we believe the fossil fuel industry still has a right to poison their atmosphere a little bit and that continuing on a path of relying on CO2 producing energy is good for their future. Also, any more infrastructure, no matter how small, will increase the oil transportation into our city, which right now, is at dangerous levels.
In addition, we must have binding limits on future expansion of existing terminals and make safety and climate impacts on our city a priority in the non-conforming use review process.
This is our opportunity, as a city, to set an example for the rest of the world, by being bold and brave. Please make the improvements to the Fossil Fuel Zoning Amendments that send the right message to our children that their lives are worth protecting and that we are ready and excited about moving in an energy direction that demonstrates this.
Thank you.

Name: marilee dea
Email: marileedea@comcast.net

Comment:

The Cully Association of Neighbors represents the most diverse neighborhood in Oregon, it is dedicated to working cooperatively to build a safe and livable neighborhood. The UP tracks run through Cully and are adjacent to schools parks and homes and business, recently UP increased the number of unit oil trains running through Cully, especially at night- we request an immediate moratorium on these potentially dangerous trains and terminals that support the shipment of more Fossil Fuels. The ban on all new fossil fuel infrastructure was applauded by Cully, changing the intention and to increase of facilities allowing 5,000,000 more gallons goes in opposition of what the city of Portland passed and what Cully Association of Neighbors desires and intended.

Name: James Anderson
Email: sweepingit@yahoo.com

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Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Wayne Lammers
Email: wplring1@mac.com

Comment:

The Fossil Fuel Terminal Zoning Amendments need to follow the original intent of the 2015 Resolution, which was to "actively oppose" new fossil fuel infrastructure. That means it should include a full ban on new fossil fuel terminals, without an exception for smaller terminals. Existing terminals must not be allowed to expand, and must be subject to review for safety and climate impacts. The Amendments should also include language that prevents existing fossil fuel facilities of any kind, whether officially designated as "terminals" or not, from being leveraged in any way to increase shipments through the Portland area. To "actively oppose" new fossil fuel infrastructure means all of these things. It does not mean to allow the infrastructure to grow in smaller increments or in previously unanticipated ways. The climate crises means that we must be putting the brakes on fossil fuel use as rapidly as we can, not further abetting or even accelerating it.

Name: Zach Reuter
Email: zpreuter08@aim.com

Comment:

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Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for

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safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Zach Reuter

Name: Anandi Gefroh
Email: anandi@anandi.com

Comment:

We need to break our addiction to fossil fuels. Portland citizens and it's council can and should lead the nation in groundbreaking policies that will help us to develop new and sustainable energy resources, not polluting and dangerous ones.

Name: Andrew Crosby
Email: andrewcrosby1@gmail.com

Comment:

Dear Members of the Portland City Council –

Last November, you adopted a Fossil Fuel resolution that placed Portland in the vanguard of leadership toward a future that is not dominated by carbon combustion. It was a bold and historic action. Such actions are essential if we are to have any livable future at all. It is appropriate that Portland, along with other nodes of leadership like Vermont and California, set the tone for the rest of the nation.

Now it is time for you to show integrity by adopting regulations

that fully implement the clear intent of your resolution. At this critical time in the fight against impending climate chaos, any waffling on your part is unacceptable.

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My testimony is simple. Please adopt strong regulations/ordinances WITHOUT loopholes and compromises.

Specifically –

(1) Enact a full ban on all new fossil fuel terminals, large or small with NO exception for smaller facilities (less than 5 million gallons).

(2) Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. Strong requirements for seismic upgrades should be required for any expansions and/or modifications of existing terminals.

(3) Prohibit any aggregate increase in fossil fuel infrastructure in Portland.

Thank you for considering my testimony.

Andrew Crosby

Name: Rachel Jesequel
Email: rachel_michelle@hotmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still

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allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Rachel Jesequel

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Name: Dena Turner
Email: denaturn62@gmail.com

Comment:

To City of Portland:
I would like to encourage the City of Portland to do the following in order to ban fossil fuel infrastructure and to protect our City and our planet earth from further degradation due to dirty energy and climate change:
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Tim Norgren
Email: t_norgren@riseup.net

Comment:

Hi folks,
MY name's Tim Norgren, and I'm a member of the building trades through Laborer's local 737. I know from a few YEARS of conversations with others in the trades that I speak for many other workers in the Laborers, Carpenters, iron workers, pipefitters, and operating engineers unions (as well as a few staffers) who are afraid (or too busy with kids, work, etc.) to testify openly, when I ask you to pursue nothing less than a complete ban on new or expanded fossil fuel infrastructure, regardless of the size or whether some infrastructure already exists! This should include LNG! Northwest Natural has no current plans to expand its storage capacity and if we're to

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transition away from a fuel that leaks so much methane it's effectively worse than coal, then there's no need to think they ever will.
I remember when earthquakes in Oklahoma were unheard of. Now thanks to fracking there are increasing levels of quakes including two this year which were over five on the richter scale! We want jobs we can feel good about; not jobs that insure more children and families like our own will be hurt in earthquakes, exposed to poisonous water, or fooled into eating crops irrigated by such water, as has been the case in California and elsewhere! To add to the risks any new or expanded infrastructure would increase volatile tanker traffic through the region as well, and that is clearly not something any of us want. Mosier was more than enough warning, and the city council has already banned such an increase.
Please insure that these bans will be tangibly effective by including binding limits and criteria for safety and climate impacts in the City's non-conforming use review process.
Thank you. Sincerely, Tim Norgren

Name: katy mcfadden
Email: katytmcfadden@gmail.com

Comment:

Let us help keep it in the ground. This means no major transport, no export terminals, no anything to do with continuing the fossil fuel industry. Our task is to dismantle fossil dependence and rebuild with renewables.

Name: Harlan Shober
Email: harlan_shober@msn.com

Comment:

It took political courage and cost political capital to get to this point. Don't go weak on us now. Finish the job.

Watch this: https://www.youtube.com/watch?v=Kxryv2XrnqM.

Imagine how foolish timid action taken now will look in 15 years.

I want the City of Portland and the Planning and Sustainability Commission to:

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1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Name: David Kennedy
Email: dkennedy@350pdx.org

Comment:

I was so proud of my city in the fall when city council passed the resolution banning all new fossil fuel infrastructure. I originally moved to Portland because it was known as a leader on climate issues, and it has mostly lived up to that. This resolution was a major step in the right direction, and showed the kind of environmental leadership that I've come to love about this city.

I appreciate the work that the Bureau of Planning and Sustainability has done during the process of shifting the resolution toward policy. The most current draft represents significant progress from the first version. That being said, I feel that there is still more work to be done:

1) There should NOT be an exception for facilities under 5 million gallons. First of all, that is still a huge amount of fossil

fuels. Secondly, The resolution originally stated that we would "actively oppose" fossil fuel infrastructure, not allow loopholes for more of those facilities to pop up, as long as they're smaller.

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2) There should be stronger language to prevent expansion of existing terminals. The lack of such language would represent another loophole by which fossil fuel infrastructure could grow within our city.

Portland has long been a leader in climate action. I love that about my city. Please continue to take bold action by making this policy binding and strong.

Thank you,
David Kennedy

Name: Charles Brod
Email: cubrod@gmail.com

Comment:

Please amend the draft resolution so that no construction of large or small fossil fuel facilities may be undertaken n Portland; restrict expansion of existing facilities; and prevent any aggregate increase in fossil fuel infrastructure in the city of Portland.

Name: Jordan Lewis
Email: jordan@allclassical.org

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in

Portland.

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Name: Becky Gardner
Email: gbeckyl@msn.com

Comment:

No new fossil fuel anything anywhere in Oregon! As a native Oregonian I feel our beautiful state should lead the way in eliminating all fossil fuel businesses and encourage other states to follow our example. Show the nation and the world that we care about the future of our children, grandchildren, and the future of the planet! Oregon rocks!!!

Name: E Reid
Email: exreid@gmail.com

Comment:

This is no time to hedge your bets; you can't be timid in the face of global crisis. Please just:
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Do this, and your great-grandchildren will thank you.

Name: Angela Zehava
Email: angela.zehava@stanfordalumni.org

Comment:

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Dear City of Portland:
Thank you for your attention to this very important matter. If you haven't read Naomi Klein's book, This Changes Everything, I want to tell you the most important statement in the entire book. She says that the energy companies who want to produce this dirty energy and send it to Asia are heavily leveraged, and meanwhile the Saudis are keeping energy prices low and China is turning toward solar and other renewables in a big way. What this means is that if we can hold the line on West Coast fossil fuel terminals for just two years, that business model will DIE. It will no longer be feasible, and the U.S. government will have no choice but to turn toward renewables. We CAN win this. We need you.

Name: Bethany Thomas
Email: 33bethany@gmail.com

Comment:

Dear Commissioners,

As you consider the proposed draft of the code changes, I ask that you choose to enact a full ban on all new fossil fuel terminals and infrastructure in Portland. The risks to both human and environmental health and safety are too high, too costly. Please position Portland as a continued leader in progressive environmental policies. We can lead the way! Thank you for your leadership.

Sincerely,
Bethany Shetterly Thomas

Name: Patricia Mizutani
Email: pmizutan@yahoo.com

Comment:

To: Portland Planning and Sustainability Commission
Re: Fossil Fuel Terminal Zoning Amendments

The City of Portland has the opportunity to take a historical stand

by enacting a full ban on new fossil fuel terminals.

Human use of fossil fuels is causing global climate change. Due to rising temperatures, there are more severe weather systems, infectious disease are spreading beyond their usual latitudes, and rising temperatures are threatening our water supplies and food production. For those of us with chronic conditions such as emphysema and heart disease, rising temperatures are compromising our well being and will make our day-to-day existence more and more intolerable. All of us want a world which is safe and secure for ourselves, our children, and generations far into the future. For this to happen, we must act now to stop the expansion of fossil fuel use.

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We as a city need to do our part in these ways:
-Enact a full ban on all new fossil fuel terminals, large or small. Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil. We do not need new LNG storage in Portland.
-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Thank you for allowing we the public to voice our concerns.

Respectfully submitted,
Patricia Mizutani, MD

Name: Dana Weintraub
Email: mrdanaweintraub@gmail.com

Comment:

I just have one comment I'd like to make:

KEEP IT IN THE GROUND!

Short, and to the point.

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Name: Danny Thiemann
Email: dgt211@gmail.com

Comment:

Hello, My name is Danny thiemann. I am a poverty law attorney in the Hillsboro area, but I live and vote in portland. My clients tell me that warmer summers cause them greater heat stress as they work outside, where temperatures in the sun can reach 15 degrees warmer than the temperature listed in the newspaper for that day. Warmer summers also cause parents who move around for work to pull their children out of school earlier than planned as unseasonably temperatures change job start dates that no longer coincide with the school year. These warmer summers are linked to Oregons warmer climate and I recommend you enact a fossil fuel infrastructure policy that is as strong as possible to reduce impact of climate change on poorest workers. Oregon, unlike California, does not have heat stress protections. Please strengthen restrictions on fossil fuel infrastructure.

Thank you!!

Name: Fiona Yun
Email: fiona.yun00@gmail.com

Comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland

Name: Sabolch Horvat
Email: sabolch.horvat@gmail.com

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Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

While this proposal is much needed, I believe that the standards could be even stronger. Climate change has impacted our habitat greatly already and to avoid further disruptions it would be best if no new fossil fuel terminals were allowed regardless of size.

Thank you for listening,
Sabolch

Name: G. Gibson
Email: mistergibson@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the

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size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

G. Gibson
mistergibson@gmail.com
Citizen

Name: Daniel Wasil

Email: wdan18@gmail.com

Comment:

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Please do not put my children at risk. Do what you know is the right thing: ban all new fossil fuel terminals.

Name: Jennifer Gerlach
Email: gerlachfamily@comcast.net

Comment:

I strongly urge the City of Portland to amend the proposed draft to reflect the City's fossil fuel goals:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland

Name: Mark Darienzo
Email: markdari@pacifier.com

Comment:

I want you to enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Lynn Youngbar
Email: lynn@lynnyoungbar.com

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Comment:

Dear Portland City Council Members,
Please fulfill the policy promise you made last year to not allow new fossil fuel infrastructure in Portland. It was a bold move that sent an important message to the entire country. You must honor that policy through the city code. We do not need an exception for facilities of 5 million gallons or less. Any expansions allowed at existing terminals must happen only for local demand and include criteria for safety and climate impacts in the non-conforming use review process.
Thank you, Lynn Youngbar

Name: Noah Linschoten
Email: 89nlinschoten@gmail.com

Comment:

We do not need another dead end, unsustainable fuel. Instead of finding where to put this, we need to find another sustainable option entirely.

Name: Sascha Krader
Email: hungrytiger@gmail.com

Comment:

Dear Planning and Sustainability Commission,

I was drawn into Portland City politics by the proposed Pembina terminal. I thought it seemed terribly short-sighted and anti-Portland-values to put a new fossil fuel terminal in the city. I still think that, and I believe the City Commissioners agree.

The code as currently written does not ban fossil fuel terminals, however. Please strengthen the code so it forbids all new fossil terminals, and forbids expansion of the current existing terminals.

I think that doing that will be in the spirit of what the commissioners voted for last year.

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Thank you,

Name: Craig Perry
Email: theangrytoy@hotmail.com

Comment:

I support the following measures.
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Eliza Lindsay
Email: guileless@gmail.com

Comment:

Dear City of Portland's Planning and Sustainability Commission,

Thank you for considering zoning code changes to address issues of fossil fuels. This is so very important.

Please adopt the following changes to the proposed fossil fuel policy code:

1 – Enact a full ban on all new fossil fuel terminals, large or small. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. To do this we need to ban all new fossil fuel terminals.

2 – Strengthen restrictions on expansions allowed at existing

terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

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3 – Prevent any aggregate increase in fossil fuel infrastructure in Portland.

The future health of Portland and the wold depends on the taking strong action now to address climate change. Let's join the global movement, step up, and step forward for all alive now and those to come.

Sincerely,

Eliza Lindsay

Name: Joseph Stenger
Email: joseph.stenger@gmail.com

Comment:

Please revise the Fossil Fuel Zoning Amendment to remove exceptions for facilities under 5 million gallons. At this time of huge earthquake risk, new facilities of any size are overly dangerous to public health. In addition, I urge inclusion of language to prevent clustering and aggregating smaller terminals to circumvent size restrictions.
Our City should set the example on this crucial issue.
On behalf of my grandchildren, thanks!

Name: Debby Garman
Email: debbygarman@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

And now I want the City of Portland and the Planning and

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Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

I encourage you to take these steps to be champion leaders in taking care of your responsibilities to protect current and future citizens of this region.

Sincerely,

Debby Garman

Name: Andrea LePain
Email: aclepain@gmail.com

Comment:

Please ban ALL new fossil fuel infrastructure.
Portland already has a large fossil fuel handling and storage area.
The city's reputation as "green" apparently doesn't take this in to account. (Perhaps this should be publicized more.)
Portland is not only contributing in a significant way to climate change but also endangering the lives of all citizens in North Portland, along with the health of two rivers, with the present

infrastructure.
Your time would be better spent making sure that the tank farms and tracks already in place are prepared for disasters (i.e. earthquake, fire, sabotage). From where I live and stand directly across from this storage area, and from Hwy 30, it's plain to see that we are woefully unprepared.
Please do the right thing, both for our city and the planet.

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Name: Rev. Mary Sue Evers
Email: pastor@chucc.org

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or

small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Rev. Mary Sue Evers
Cedar Hills United Church of Christ,
Portland, OR

Name: Daniel Yuhas
Email: daniel.yuhas@gmail.com

Comment:

I want to give my support to the following:

Enact a full ban on all new fossil fuel terminals, large or small.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

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best,

Name: Patricia Zoline
Email: ashlandmagic@gmail.com

Comment:

Dear PSC,

I applaud the creation of a fossil fuel ban and together with 350PDX would suggest the following amendments to the current draft code:

Enact a full ban on all new fossil fuel terminals, large or small.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

sincerely,

Name: Kathryn Behrendt
Email: kbehrendt@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is

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transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Name: Akash Singh
Email: sakash18@yahoo.com

Comment:

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Portland hails itself as a green leader in a fossil fuel dependent economy. It would be the height of fatalistic hypocrisy to allow new fossil fuel infrastructure to be built and further entrench our dependence on fossil fuels when the first thing we need to accomplish is to be able to move away from them. A full ban and further restrictions are the only options to decrease our fossil fuel dependency, give a boost to a green economy, and mitigate the disastrous effects of climate change.

Name: Mary Murphy
Email: mkatem4@yahoo.com

Comment:

As a forth generation Portlander and MPH student in Environmental Systems and Human health, I strongly support the city of Portland taking the following actions:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you for acting on behalf of us and future generations.

Name: Jordan Karr-Morse
Email: jordan@softboxfilms.com

Comment:

This is a great opportunity for Portland to take a bold stance on a

critical global issue. We need to enact a full ban on fossil fuel infrastructure. Let's make Brand Portland mean something!

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Name: Linda Hayden
Email: linda.hayden3@gmail.com

Comment:

Please, listen to the people, the people who have entrusted you with our health and safety which is intrinsically connected with the health and well being of our planet. Enact a FULL BAN on all new fossil fuel terminals, Large or Small....How can we move on to clean and green if we keep getting mixed up with the dirty stuff....NO MORE FOSSIL Fuel infrastructures please!

Name: Claudia Montagne
Email: claudia.montagne@gmail.com

Comment:

The impacts of climate change on not only Portland but the world, and their disproportionate impacts on countries and individuals least responsible for these negative impacts tell me that climate justice is the issue of our times. Use of fossil fuels is at the root of this crisis. Our future, and the futures of the next generations is at stake. I have been watching our climate change for over 15 years now; it is real, it is accelerating. Portland and Oregon can take a leading progressive role in the change that is needed. I urge the commission to do its part by adopting this new code and strengthening it by banning all new fossil fuel terminals.

Thank you for your thoughtful consideration. Claudia Montagne

Name: nia hansen
Email: niabhansen@gmail.com

Comment:

I believe we're beyond the tipping point to control climate

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change; we have existing terminals for fossil fuels...an argument can and has been made to reduce/curtail the use of this type of fuel that is so detrimental, even fatal to our children and our planet. The bigger issue is this...reduce, curtail the use of fossil fuels; short of that, we need to make it difficult to provide containment of these fuels. Please consider banning all terminals; ALL Terminal, large and small. At the very least, increase safety issues surrounding the terminals, and decrease climate control impacts.

Name: Robert Breaks
Email: bobthenatureguy@gmail.com

Comment:

I stand in solidarity with the Dakota and Navajo tribes in protesting the Dakota oil pipeline through four states in the midwest of America. In their spirit, I agree that the city of Portland needs to ban all new fossil fuel terminals and/or the expansion of existing ones. The city's code should not allow any unit trains of dangerous fossil fuels from passing through Portland. In addition, I favor no expansion of existing fossil fuel terminals or any increase in fossil fuel infrastructure in Portland.

Name: Robert Breaks
Email: bobthenatureguy@gmail.com

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Name: Susan Economon
Email: seconomon@gmail.com

Comment:

Please act to ensure our future as a community as well as a model for our global partners. Vote to ban all new fossil fuel terminals and restrict expansion at existing terminals.

Name: Joanne Delmonico
Email: joannedelmonico@gmail.com

Comment:

I want a full ban on transporting and storage of fossil fuels in and around Portland and adjacent waterways.
Please protect our environment including waterways, air, and soil and protect our residents! Do the right thing!!
No increase in fossil fuel infrastructure in Portland!!

Name: Tori Cole
Email: colet@seiu503.org

Comment:

My name is Tori Cole, and I am a union organizer for SEIU 503 and an

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environmental activist. Like others who have followed this process, I've seen

Portlanders demand meaningful action from their city on climate, and I hope that

their conviction—which drove City Council to pass this as a resolution—informs

the code changes made today. We need to reject the building of any new fossil fuel

infrastructure in our city. Our climate movement sorely needs local leadership, and

Portland should fulfill its rumored destiny as a climate leader today. Local action

does matter.

Taking this action today will be the first drop in the bucket, step one of what we

need to achieve a just transition away from fossil fuels and to 100% renewable

energy by 2050, as reports from Greenpeace and others tell us we must. It's time

for all of us to make deliberate choices in favor of our future. This year, SEIU

503's membership passed a resolution to prioritize acting against climate change,

and on Saturday the board voted unanimously to support solidarity with Standing

Rock Sioux Tribe in their fight against the Dakota Access Pipeline. The time for

us to stand together in this fight is long overdue.

Even those highest in the financial sector recognize that the era of fossil fuels is

coming to a close, and that investments in the oil and gas

industry are now risky

and ill advised. To realize a successful transition to renewables, governments from

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local to federal must commit to invest in renewable infrastructure, and to create

decent work opportunities and economic empowerment for workers who cannot be

left behind in the oncoming economic restructuring. We must not allow ourselves

to be divided into 'labor' and 'environmentalist' camps—the real choice is not

jobs or environment. It is both, or neither.

So I urge you to take bold action, and listen to what the people are asking for.

Vote in favor of our future, and reject any increase to fossil fuel infrastructure at

the city level. No exceptions. And let's talk about how we are going to work

together to ensure that the people who got the worst deal in the old economy will

be the first in line to benefit in the new economy.

Name: Harriet Cooke
Email: holisticooke@aol.com

Comment:

Urgent! no new fossil fuel terminals. We need to be brainstorming how to live more simply so that others and future generations can live. Until the CO2 numbers come down to livable and sustainable levels, No New terminals! No city code changes to allow more unit trains. We need to learn how to live with less oil and more local community. Prevent any aggregate increase in fossil fuel infrastructure. Lets be the inspiration for

the rest of the country!!!

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Name: Christine Kosonen
Email: cealila@yahoo.com

Comment:

Portland, Protecting our future, of our water and our children! Invest in clean energy infrastructure. Do not permit another piece of fossil fuel industry to be built in our city & region. I urge you to develop careful monitoring of existing fossil oil infrastructure and hold the vision that it will be disassembled piece by piece and replaced with technologies that do not damage our most precious and irreplaceable reaources= clean water, earth, and air!!!

Name: Marty Bankhead
Email: marty.b@comcast.net

Comment:

Ladies & Gentlemen;
Thank you for your initial active opposition to new fossil fuel terminals. I urge you to ban any and all fossil fuel terminals. Stand strong against commercial interests that would like to use Portland for short-term gain, regardless of consequence.
The proposed day of your final vote is Veteran's Day. WWI soldiers gave their lives for the vision of a better world, as have Veterans of every war since. Please stand strong for that vision. Please stand strong for the future, keeping Portland an inspirational model of sustainability. Ban all new fossil fuel terminals, large or small, and ban expansion of existing facilities.

Thank you from a family who moved to Portland 30 years ago to improve life for our children.

Name: Deva Sunya
Email: dragon@350pdx.org

Comment:

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Time is short for addressing climate change. A recent study by NOAA says that we may see a 3 meter sea level rise by 2050-2060. That is much sooner than the IPCC report which is now much out of date. This amount of sea level rise will create hundreds of millions of climate refugees. There is much other evidence indicating the severity of our collective circumstances. At this point, the situation is so severe, that concerns over a companies profits are of no meaning. It is like the point in a disaster movie when everyone finally realizes that catastrophe has struck. Business as usual then comes to an end. We are already at that point. The usual considerations must be set aside and extraordinary measures taken. This is exactly what the science is telling us.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Sincerely,
Deva
Deva

Name: Camilo Marquez

Email: camilomarquezmd@juno.com

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Comment:

More than the vitally important need to protect the Portland environment from the risk of a spill or other disaster is the necessity to by any means possible keep all remaining fossil fuel reserves in the ground if we are to keep global temperature from reaching the point of no return for habitability of the planet.

Name: Mary Ann Dougherty
Email: dougherty_86@msn.com

Comment:

Portland City Council,
Please end all new fossil fuel terminals in Portland. We can't afford more spills along the beautiful Columbia River. The time is critical to end our fossil fuel dependence.

Name: Anais Tuepker
Email: anaistuepker@yahoo.com

Comment:

Dear City Council,

I was so proud of our city when, last year, we showed our commitment to a clean energy future and passed the ban on new fossil fuel infrastructure. Portland is my home, and part of why I love it so much is because every day I see evidence that we are a community dedicated to social and environmental justice. We are willing to embrace the need to change our ways and move off of unsustainable fossil fuels.
Now the time has come to enact that ban, and our actions need to be as strong as our words. Every day we delay taking strong action, we create more difficult and complex climate challenges for all those who come after us. That is why I urge you to enact a full ban on all new fossil fuels. Allowing an exemption for smaller new facilities undermines the power of the ban both practically and symbolically. Similarly, if we do not strengthen limits on

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existing facilities, we will not only allow continued disastrous impacts on the climate, we send the message that solving this problem can be done slowly, step by step.

We are long past the time for slow and steady change. We need to be bold. Those of us living now are already seeing the impacts of climate change through more extreme weather, increased temperatures affecting crops and loss of biodiversity, and the many social effects of destabilized societies. All those who come after us will have to live with the results of the choices we make today. Let's make the strongest, bravest choices we can, to end fossil fuel dependence now, with no new fossil fuel terminals and no expansions to a dying industry.

Thank you for your leadership.

Name: Megan Horst
Email: horstmegana@gmail.com

Comment:

I am a concerned and active citizen in NE Portland, and climate change is in the top 3 issues of importance to me. Thank you to BPS for its work so far on the fossil fuel policy code.

BUT, we need stronger code changes, including:
1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Becky Hawkins
Email: hawkins.becky@gmail.com

Comment:

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Like many Portlanders, I moved here in order to participate in a progressive city, and be able to enjoy the spectacular nature nearby. When I return home to my native Pittsburgh, I drive past billboard after billboard advertising "clean oil," "clean coal," and "safe fracking." Then I check the news and see another spill, another leak, another community devastated by the fossil fuel industry. And every time, the oil and gas companies are full of excuses as to why it's not their fault. It was the soil, the weather, a pipe, a well. It's always billed as a surprise, an unforeseeable circumstance. But pollution is not a surprise; it's a consequence of the fossil fuel industry. Don't allow any legal loopholes to endanger Portland's wildlife or its citizens.

Name: Mason Hiatt
Email: masonhiatt@gmail.com

Comment:

Considering that Portland City Council has issued a statement against the DAPL in North Dakota, which I applaud, the exact same arguments apply to why it is important to ban new terminals here in Portland. Doing anything else would be hypocritical and work against any claims the city might have to being on the forefront of environmental justice.

Name: barbara brower
Email: browerb@pdx.edu

Comment:

We know now without a doubt that climate is warming and fossil fuels are to blame. Why would a city like Portland want to do anything other than stand its ground on this issue? How can we continue to be part of a process that dooms life on Earth as we know it? There are plenty of other options to keep the economy ticking over–and there are no jobs on a dead planet.

Name: Barbara and Frank Roberts
Email: bjroberts7@hotmail.com

Comment:

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Dear Commission Members,
I would like to suggest changes to your draft of the Fossil Fuel Terminal Zoning Amendments:
1. Do not make an exception for new storage facilities under 5 million gallons. The rules should apply to all terminals.
2. Existing terminals should become a non-conforming use and therefore any expansion of a terminal would have to go through a non-conforming use process.
3. The non-conforming use review process should be strengthened by adding climate impacts and safety criteria.
4. Total fossil fuel infrastructure increases should not be allowed. Don't allow the industry to build many small facilities that in total will be above the current infrastructure.

Name: Susan Braverman
Email: susan@susanbraverman.com

Comment:

Please, please don't lose this opportunity to ban an and all fossil fuel terminals and to prohibit oil trains from running through Portland. It is so important that we focus on other sources of energy instead of perpetuating the dangers of fossil fuels and the degradation of the earth as a result. As a resident of NW Portland, whose children and grandchildren also live here in NW, we are aware of the danger every day as we listen to the trains and drive past the storage facilities along Rt. 30. Knowing they are there, and being conscious about preparing for a possible Cascadia Fault major earthquake, I am pleading with you to not bring any more Bakken fuel or trains transporting it anywhere near Portland! Thank you!

Name: Sarah Burns
Email: scaryraisins@yahoo.com

Comment:

To the City of Portland we want to...

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Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.
Thank you!

Name: Mark Braverman
Email: markbraverman48@gmail.com

Comment:

I fully support Resolution No. 37168. It is absolutely and urgenty the right thing to do at the right time, for reasons of safety, public health, and the longterm sustainability of our communities, cities, and the planet as a whole. Let Portland take the lead!

Name: Barbara Quinn
Email: barbaraqnn718@gmail.com

Comment:

Place a ban on all new fossil fuel terminals and other infrastructure. More Unit trains carrying fossil fuels like Bakken crude should be prohibited in the new code.
Also ban expansion of existing terminals.

Name: Tyler Wagner
Email: twagner@sipdx.org

Comment:

As the St. Ignatius Fellow at St. Ignatius Church in Southeast Portland, I have been ignited by Pope Francis' call in his encyclical Laudato Si to care for creation and to understand that

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we have a moral obligation to protect our planet for all beings, including people on this planet today and in future generations. With that moral call, I call on the City of Portland to:
1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2.Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3.Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Name: Elizabeth Milner
Email: milnere22@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to

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the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Elizabeth Milner

Name: Turner Masland
Email: turner.masland@gmail.com

Comment:

Bakken crude oil may seem like a quick solution to our energy problems, but in reality they only create more dangerous consequences for our community and our planet in the long run.

Portland is known for being a city with sustainability at it's core. We need to strengthen our resolve to protecting this planet and all of the life forms found on it. We need to think about our future generations. We need to enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. We need to Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. We need to Prevent any aggregate increase in fossil fuel infrastructure in Portland.

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Name: Cecilia Youngs
Email: cecilia.youngs@gmail.com

Comment:

Please enact a full ban on all new fossil fuel terminals, with no exceptions. The code changes should not allow more unit trains or dangerous fossil fuels like Bakken crude oil.
Please strengthen restrictions on expansions allowed at existing terminals by adding binding limits and criteria for safety and climate impacts in Portland's non-conforming use review process.
Please prevent any aggregate increase in fossil fel infrastructure in Portland.

Name: Jacob Braverman
Email: jacobbraverman@gmail.com

Comment:

Thank you for considering what I have to say. As I'm sure PSC is coming to see, there is widespread popular opposition to continued investment in fossil fuel development, and this is because as an entire nation we are waking up to the reality of climate change, and we are afraid about the real possibility of not leaving a viable world for our children to inhabit. By 2050, when I am 63, the world's sea levels will have risen an average

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of no less than 9 ft above their current levels. Seeing the world respond to the current refugee crisis, I cannot imagine what will have transpired by the time many of the world's coastal cities are underwater. And we are already locked into this. The best we can hope for now is to mitigate even more catastrophic changes, and this is absolutely necessary, because it is entirely possible for us to raise the average global temperature well beyond what it has ever been while supporting life as we know it. This is what is at stake as you decide whether to set a bold and courageous precedent that will be felt around the country, and hence around the world. On the other side are people who act against not just my interest and yours, and your childrens', but inexplicably against their own. The time for accepting this has ended, by necessity, and you are in the rare and privileged position of actually playing a part in ending it. This is the moment of you to be heroic or cowardly; you have the heartfelt prayers of millions around the world behind you.

Thank you again.
Jacob Braverman

Name: Kathy Austen
Email: augsten@efn.org

Comment:

Dear Portland City Council,

I am another signer of this letter composed by 350PDX. Portland must fulfill the intent of our 2015 Resolution to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels."

— Kathy Austen

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal

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I want the City of Portland and the Planning and Sustainability Commission to:

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2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few

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more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Name: Deborah Wiley
Email: da.wiley1@gmail.com

Comment:

please – no more fossil fuel infrastructure in PDX! We can evolve into a community that says no to this and instead supports all the great alternatives available

Name: Sarah Iannarone
Email: ss.iannarone@gmail.com

Comment:

Dear Commissioner:
Portland is seen around the world as a "sustainable city" a leader in green building, green energy, and green transportation. Please, let's ensure perception and reality align.

Please enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Please strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Please prevent any aggregate increase in fossil fuel infrastructure in Portland.

Finally, let's shore up our vulnerable fuel infrastructure prior to undertaking an expensive clean-up of the Harbor Superfund Site.

Thank you for your dedicated service to our city.

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Name: Anne Corbett
Email: corbett.anne@gmail.com

Comment:

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However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

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Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG

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storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Annie Corbett

Name: Craig Heverly
Email: heverlyjc@hevanet.com

Comment:

In recent revelations of sexual misconduct on college campuses, a strong mantra has emerged: "No means no." Please apply that to the ban on fossil fuel infrastructure. When the City Council passed it's courageous, visionary, and historic ban, I don't think it meant a "little" hanky-panky is OK. Or that a slight pat on the butt is allowable. I think they meant what they said. "No means no." Period. Amen. Thank you for your hard and careful service.

Name: Helen Hays
Email: hlhays@ccgmail.net

Comment:

The City of Portland should enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like

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Bakken crude oil.
Portland should strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Finally, any aggregate increase in fossil fuel infrastructure in Portland should be prevented.

Name: Sandra Siegner
Email: ssiegner3@gmail.com

Comment:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 – Enact a full ban on all new fossil fuel terminals, large or

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small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 – Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 – Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 – Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Message *

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Council Clerk Note:
There is no page 177 in the original filing.

Building
The Climate
Movement

188142

Fossil Fuel Policy Code Comments: Discussion Draft

November 2, 2016 /

Name: Judith Lienhard
Email: lienjud@aol.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic; this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals,
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River. These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety.

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Transporting and storing fossil fuels are never safe. The risks range from oil train derailments, pipeline spills, storage tank explosions and earthquakes, which is why the City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. Presently, the discussion draft exempts existing facilities from regulation, which will only grow our carbon footprint past the point of being able to meet our carbon reduction goals. We need to shrink Fossil Fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the original resolution that myself and thousands of other Portlanders supported last year. The revised version of the proposal should create a true ban on new fossil fuel infrastructure, have regulations that make Portland a safe place to live, and be legislation that will be sustainable for the earth in the long term.

Sincerely,

Name: Brian Johnson
Email: nogmo55@centurylink.net

Comment:

Hey this is Brian Johnson a lifelong resident of Multnomah and Clackamas Counties, aside from my military experience after high school (saving for and attending some) college and earning GI bill credits. A family man with two kids and a wife I met in college. I attended the hearings for Ambre Energy Coal and Pembina, in Portland, and also Millennium Bulk, and Oil by rail, in Longview and Olympia because I live near the tracks and have a vested interest in the Pacific NW, the nation and the planet. I'm very proud the mayor of Pdx and Milwaukie have declared climate change a high priority with proposals for no new fossil fuel infrastructure, and now in disbelief that, at least in Portland, this isn't happening. When the mayor makes a proposal like that, to me it means no new infrastructure, whether that's expanding existing plants, pipes, mines, wells, refineries, storage tanks, tracks, roads, bridges, for express prurpose to support operations, etc. In fact, taken to the letter, it may also

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include roads, roofs, flooring, and anything else composed of petroleum, etc. But I get it, and Portland certainly has its share of necessary maintenance and repairs to sidewalks, highways and roads. And if provisions for upgrades to minimize seismic disasters aren't made, at least make sure all energy companies are held responsible for all damages, not nothing at all or pennies on the dollar. If not them, their underwriters. Before you write this bill, be sure to google Arch and Peabody Coal companies treatment of miners and retirees "guaranteed" health coverages and pensions. And how they simultaneously wrote their chiefs millions in bonuses, presumably for successful bankruptcies which provided amnesty from their previous agreements to cover environmental costs and clean ups around their closed and closing mines. Come on, Portland, don't be like that! Show us what you're made of!

Name: Adam Brunelle
Email: brunelleadam@gmail.com

Comment:

1. A full ban on new bulk fossil fuel terminals
2. Limitations on expansions at existing facilities
3. Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette & Columbia rivers.
4. Invest heavily in renewables with an urgency befitting the climate crisis, and in particular, in such a way that vulnerable communities are more resilient to the negative effects of climate change. Our strategy for confronting climate change should primarily focus on those communities most vulnerable, not corporate "bridge solutions" which are actually just death sentences.

Name: Daniela Molnar
Email: dnmolnar@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in and around Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

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We need:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Robert Scheelen
Email: scheelen@earthlink.net

Comment:

Pleas go ahead and enact a full ban on new bulk fossil fuel terminals;
limitations on expansions at existing facilities;

provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

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Name: virginia feldman
Email: feldmanvi@gmail.com

Comment:

Dear Portland Bureau of Planning and Sustainability,
As a Portland resident, I urge you to implement:

1. A full ban on new bulk fossil fuel terminals.
2. Limitations on expansions at existing facilities.
3. Make provisions that require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Thank you,
Dr. Virginia Feldman
11230 SW Collina Ave
Portland, Or. 97219

Name: Brenda Weber
Email: brendaweber@cavtel.net

Comment:

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes.
Please make these changes due to the urgent threat that fossil fuel terminals pose to both the environment and public safety:
A full ban on new bulk fossil fuel terminals
It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and

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thousands of other Portlanders supported last year.
Limitations on expansions at existing facilities
Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River
It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Name: John Nettleton
Email: jpn5710@yahoo.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to

shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

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Respectfully,

Name: Anthony Albert
Email: albert2910@msn.com

Comment:

A full ban on new bulk fossil fuel terminals

Limitations on expansions at existing facilities

Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Name: Eileen Fromer
Email: efromer@msn.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that

fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

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It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Eileen Fromer

Name: Nancy Pfeiler
Email: nancypfeiler6@gmail.com

Comment:

I want:
A full ban on new bulk fossil fuel terminals
Limitations on expansions at existing facilities
Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

This matters to all Oregonians.

Thank you.

Name: Judy Todd
Email: judy@yournatureconnect.com

Comment:

It seems like the message of earlier this year has goten truncated as it has passed through City Hall and planning for our

future.
Please re-initiate the full on, kep 'em in the ground intentions citizens want!
No NEW TERMINALS (We will keep working on other options for energy and employment, of course! Like renewables...)
NO EXPANSIONS at exisiting sites of fossil fuel processimg or distribution (I kow you cannot affect Hanford's nuke plans, darn it)
WATCHDOG VIGILANCE on existing infrstructure by any fossil fuel company to be certain they are complying fully.
Thank you for being a good citizen and a future thinker!

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Name: Joan Levine
Email: jlevinehummingbird@gmailc.om

Comment:

Dear Portland Planning Bureau Members,

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train

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derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Joanie Levine

Name: bruce bauer
Email: bbauer1942@yahoo.com

Comment:

Do not ban fossil fuels for us, but do ban fossil fuels for our children, grandchildren and all generations that come after us because fossil fuel damage our young people's lungs and is a major contributor to climate change. What are you going to tell your grandchildren in 20 years?

Name: Jeff Stookey
Email: jstookey108@gmail.com

Comment:

We must keep fossil fuels in the ground.
We currently have all the scientific and technical knowledge and the physical resources to get all of the energy we need from renewables, according to Mark Z. Jacobson, Director of the Atmosphere/Energy Program and Professor of Civil and Environmental Engineering at Stanford University. Now add to that a new analysis, called "World Energy Revolution: A Sustainable World Energy Outlook 2015", produced by Greenpeace in collaboration with researchers from the German Aerospace Center, that says our world can make the switch to 100% renewable energy by 2050. Feed-in-tariffs–which have helped put Germany and Ontario, Canada at the forefront of the

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transition to green energy–are promoted by Oregonians for Renewable Energy Progress (OREP) as an important policy tool to incentivize this transition.
America's path to prosperity lies in a rapid switch-over to abundant, homegrown, renewable energy to power our homes, businesses, and vehicles–NOT in facilitating extracting and exporting of dirty, polluting coal, oil, and gas, which represents a retreat from the 21st Century economy. Renewable energy already employs 2.7 million workers (more than the fossil fuel industry) and studies have shown that green energy will continue to create far more jobs than the fossil fuel industries. [see: Sizing the Clean Economy, A National and Regional Green Jobs Assessment by the Metropolitan Policy Program at the Brookings Institute, 2011. Also, One Million Climate Jobs, 3rd Edition, 2014, edited by Jonathan Neale, published by the Campaign Against Climate Change] A U.S.-led, green, industrial revolution will move our economy forward, create millions of new jobs, and help ensure a livable planet for future generations.

Name: Alex Johnson
Email: ajohnson0@gmail.com

Comment:

Dear Bureau of Planning and Sustainability,

Although I have been very excited by the passage of the ban on new fossil fuel terminals, I am now concerned that the actual bill does not go as far as I was led to believe it would. The world is at a critical turning point, and if we are lucky, we can stop this devastating climate change before it's too late. Please do what's inevitable and ban ALL new bulk fossil fuel terminals. If they aren't banned today, they will certainly be banned in 40 years once our air is toxic and our oceans are empty.

Name: Kenneth Deveney
Email: kenndev@yahoo.com

Comment:

The Fossil Fuel Terminal Zoning Amendments discussion draft

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has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. We need to shrink fossil fuel use, not grow it!

Name: Gabrielle Karras
Email: gk2829@hotmail.com

Comment:

I am a resident of Portland, Oregon. I live in the Woodstock neighborhood. I urge the city government to pass a full ban on new bulk fossil fuel terminals, set limitations on expansions at existing facilities, and require provisions that would upgrade existing fossil fuel terminals for seismic resilience to protect the health and safety of neighboring communities and the Willamette River. I have not forgotten what happened in Mosier. We need to ban fossil fuel not encourage its use. Our children will thank us for doing the right thing and not caving into the fossil fuel industry.

Name: Ruth Harmon
Email: Tashamail@comcast.net

Comment:

I am writing to urge to you adopt regulations that would result in a full ban of new fossil fuel infrastructure, in particular oil, gas,

and coal terminals in Portland.

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The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I am asking, specifically, that you include in those regulations:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. For the sake all of humanity, and many of the species with whom we share this world, we need to take responsible action to reduce our harmful impacts on climate. It's time to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Linny Stovall
Email: linnystovall@me.com

Comment:

I urge you to create strong fossil fuel regs: no new bulk fuel terminals, limit expansions at current facilities, and require seismic upgrades.

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Name: Ellen Yarnell
Email: yarnell3439@comcast.net

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland and I thought we had this settled with the 2015 Fossil Fuel Resolution that passed last year.

Whereas the resolution was bold, visionary, and historic, the current Fossil Fuel Terminal Zoning Amendments discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders. This is not acceptable!

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

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Name: Sheila Golden
Email: goldensheila6@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Sheila Golden

Name: James Rankin
Email: jim.rankin@oregonstate.edu

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Comment:

Please make sure Portland & the Columbia & Willamette Rivers are not thoroughfares for transportation of fossil fuels, & that no new fossil fuel terminals are built, nor should existing ones be expanded but instead phased out.

Name: Barbara Scharff
Email: buscharff@msn.com

Comment:

Dear City of Portland planners: I just finished reading "This Changes Everything" by Naomi Klein. We cannot keep making expanded growth and mechanistic views of our planet the core principles of our economic policy. Our Earth is in peril. Please strengthen the current draft of the fossil fuel code to honor the original resolution. We need to make Portland a resilient, life-giving place. Thank you, Barbara Scharff

Name: Karen Deora
Email: karendeora@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety

of neighboring communities and the Willamette River.

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These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Kate Miller
Email: millerjkate@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that

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fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Randall Webb
Email: lawrkw@comcast.net

Comment:

We need a comprehensive solution to the fossil fuel issue in Oregon and in Portland. At the least this solution should include:
1. A full ban on new bulk fossil fuel terminals
2. Limitations on expansions at existing facilities
3. Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Thank you for your consideration. Keep it in the ground!

Randall Webb

Name: Dean Sigler
Email: muchcatfur@comcast.net

Comment:

We already have oil terminals along the Willamette and Columbia Rivers, stupid locations in the first place. The storage

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and refinery areas near the Willamette are on literally shaky ground, with liquefaction a near sure thing with any significant earthquake. We should be dismantling and moving these to safer ground or decommissioning them entirely.

We must not expand any existing site, but put our efforts into replacing the fossil fuels with clean alternatives.

We cannot allow Big Oil to jeopardize our land and rivers for short-term gain. Our air, land, water and populace all stand to lose.

Name: Evan Heidtmann
Email: evan.heidtmann@gmail.com

Comment:

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

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Sincerely,

Name: Ben Poe
Email: benpoe17@hotmail.com

Comment:

I am writing to urge you to adhere to the spirit and principles of the November resolution and enforce a full ban on new bulk fossil fuel terminals and strict limits on any expansion of existing facilities.

Ben Poe
St Johns

Name: Adriana Voss-Andreae
Email: vossandreae@gmail.com

Comment:

The Fossil Fuel Terminal Zoning Amendments discussion draft falls far short of the 2015 Fossil Fuel Resolution that was passed unanimously by City Council last year. The resolution was bold and historic, while the discussion draft prioritizes the fossil fuel industry over the health and safety of Portlanders.

I urge you to include strong draft language that places:
– A full ban on new bulk terminals
– Stronger limitations on expansions at existing facilities
– Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

It is unacceptable that the current discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will only serve to increase our carbon footprint past the point of being able to meet our local and state carbon reduction goals and increases our City's risk for pipeline spills, storage

tank explosions and seismic tank destabilization.

It is critical that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that thousands of us supported last year.

188142

Sincerely,

Dr. Voss-Andreae

Name: Eric John Kaiser
Email: ericjohn@ericjohnkaiser.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

188142

Sincerely,

Name: John Simonsen
Email: john.simonsen.mail@gmail.com

Comment:

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders and all Oregonians.

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

Name: Michael Mitchell
Email: iceink1@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that

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It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Patricia and Michael Mitchell

Name: Michael Carter
Email: incandescent.dusk@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public

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It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Michael Carter

Name: Eliot Cole
Email: eliot.cole1@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
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These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals

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It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Craig Perry
Email: theangrytoy@hotmail.com

Comment:

Don't backtrack on what COULD be historic legislation on fossil fuel infrastructure. Make sure there is a full ban on new bulk fossil fuel terminals, limitations on expansions at existing facilities, and provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Name: Steven Schafer
Email: steven.schafer@gmail.com

Comment:

Come on City of Portland. We ask you to do the right thing and be an example to the rest of the world. No new or expanded fossil fuel terminals.

Name: Che Lowenstein
Email: ctlowenstein@comcast.net

Comment:

When you bait and switch, you lose trust and loyalty forever. Why would you want to do that? Just keep your promises. Is that too much to ask?

188142

Name: Duncan Baruch
Email: c25cle@gmail.com

Comment:

The initial draft of proposed code changes that would translate the City's sweeping resolution into binding land use rules is inadequate.

I ask you to fully resist the fossil fuel industries' attempts to water down the City's strong, far-sighted resolution.

– Ban all new fossil fuel terminals.
– No expansion of existing facilities.
– Require existing fossil fuel terminals to make upgrades for seismic resilience for the protection and health of neighboring communities and the Willamette River.

Stand fast. Yield nothing to the Industry.

Thank you.

Name: Maggie Mackenzie
Email: maggiemackenzie@gmail.com

Comment:

I want the a full ban on new bulk fossil fuel terminals. Limitations on expansions at existing facilities.
Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River. Do not weaken the original wording. Global warning threatens life on earth. Be bold. Resisted corporate pressure. Be an example.

Name: Arthur Bright
Email: arthurabright@gmail.com

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Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
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These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Tricia Zigrang
Email: tazigrang@yahoo.com

Comment:

We have to quit using fossil fuels if we want to avoid extinction. We need to do everything w can to discourage the consumption of fossil fuels. DO NOT ADD NEW BULK FOSSIL FUEL TERMINALS!!! DO NOT ALLOW EXPANSION AT EXISTING FACILITIES!!! REQUIRE SEISMIC UPGRADES OF EXISTING TERMINALS!!! Avoid being corrupted by the morally bankrupt fossil fuel industry.

188142

Name: Lin Reedijk
Email: greengirlpdx@yahoo.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Fossil fuel terminals pose a serious threat to the environment and to public safety. These changes to the policy are crucial to protect our communities and our natural surroundings. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety

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without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Lin Reedijk

Name: Betty and Edgard Abadia
Email: amarone3@gmail.com

Comment:

Let's clean up the old terminals and secure them against seismic damage as First Priority! The Columbia River Gorge accident is merely a taste of what could occur, and we should take it as a viable warning: No new oil terminals! Thank you.

Name: G. Gibson
Email: mistergibson@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
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It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Heather Davis
Email: heatherannedavis@hotmail.com

Comment:

Ban all fossil fuels coming or going from our ports and in the city

Name: Wendy Bartlett
Email: wendyvw74@yahoo.com

Comment:

Fossil fuels are dirty, unsafe and unhealthy when extracted, and fatally toxic upon transporting by rail. The record speaks for itself: Keep It In The Ground!

Name: Tom Lichatowich
Email: tjlich@yahoo.com

Comment:

Dear Mr Mayor and Council,

What is going on in the City? While the previous Mayor and Council were basking in the admiration of the public in finally passing a good sense, people oriented resolution, the corporate powers were obviously working behind the scenes to erode that move.

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If this move is a mark of the new Mayor and council to pander to corporate fossil fuel interests, he is in for a long term fight for every inch he expects to make in promulgating his nefarious agenda.

I want a full ban on fossil fuel terminals, strict people approved expansion to existing facilities and people monitored surveys of existing facilities with regard to adequate seismic preparedness as well as general protection of the environment from spills and other known health and safety related results of this industry.

Name: Kyle Collins
Email: kalelcollins85@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
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3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local

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and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Christine Yun
Email: cpypdx@gmail.com

Comment:

When City Council voted to oppose expansion of infrastructure used for the manufacture/transport/distribution of fossil fuels, I understood this to mean:
A full ban on new bulk fossil fuel terminals
Limitations on expansions at existing facilities
Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

It appears that the proposed draft code changes fall far short of the above goals. Please reconsider and be forward-thinking in promoting action that addresses the causes of climate change.

Name: Andrea LePain
Email: aclepain@gmail.com

Comment:

Hello.

Thank you for the opportunity to comment on this important issue.
In addition to asking for no further fossil fuel infrastructure to be

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built and of no expansion of existing infrastructure, I would also ask for the existing infrastructure to be upgraded asap.

I live directly across from the tank farms just north of the St John's bridge. It's obvious that there is a great risk, in fact an almost certain probability, that those tanks will be impacted by an earthquake.
What will happen to the river?
What will happen to this community?
What will happen to the railway and Hwy 30 if there are fires, explosions, and/or leaks?
Is any agency or company or lawmaker looking in to this issue?
Is there any substantive action on it?

Obviously if something happens (and it eventually will) it will be a very big deal even if everyone who can do something has, at this time, their heads somewhere besides between their shoulders.

Name: Lenny Dee
Email: ldeepdx@yahoo.com

Comment:

Portland needs to set an example for the rest of the country by banning new and expansion of old fossil fuel facilities

Name: Basey Klopp
Email: bklopp@gmail.com

Comment:

If Oregon is serious about its future, it must address climate change seriously beginning with: a full ban on new bulk fossil fuel terminals, limitations on expansions at exisiting facilities and provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health of safety of all Oregonians and our rivers.

Name: Randy Harrison
Email: ran6711@comcast.net

188142

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
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These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Cassie McDonald
Email: cassie.a.mcdonald@gmail.com

Comment:

To Whom it May Concern;

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I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I demand:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Cassie McDonald

Name: Avery Leinova
Email: averyleinova@gmail.com

Comment:

What we need to keep the city of Portland safe: A full ban on

new bulk fossil fuel terminals. Limitations on expansions at existing facilities.
Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

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Name: Robert Frost
Email: bobfrost34@gmail.com

Comment:

I want Portland's proposed ban on all new fossil fuel to be carried out as prommissed!

Name: Jonathan Strunin
Email: struninja@gmail.com

Comment:

Dear Commission Members

Thank you to you and your staff for working every day as best you can to promote the safe, equitable, and sustainable growth of our city. There is no doubt this is not an easy job, and I appreciate your efforts to balance the many needs of the City.

I'm writing in regards to Resolution 37168, which contains the mandate for City Council to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." This is clear and unequivocal language that sets a clear mandate for a ban on all new or expanded facilities related to fossil fuels (with exemptions acknowledged).

Yet the proposed Zoning Code Amendments clearly state the goals of the amendments as to "allow for new terminal development large enough to
accommodate forecast growth" and to "Allow existing terminals to expand, particularly to support seismic upgrades and access to greener fuels."

Simply put, limiting the size of new developments and creating a

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broad allowance for existing terminals to expand, even for safety reasons, does not match the intent of the Resolution. The direction is to "actively oppose" new or expanded infrastructure, not balance the needs of the regional market or allow for expansions. For this reason, there should be NO new infrastructure allowed.

Additionally, while the Resolution exempts expansion for safety reasons, the burden of proof for need of expansion should be on the national and multinational corporations who run these facilities, and a broad allowance for expansion should not be codified, rather it should be applied for on an individual basis. The motive for allowing for broadly allowing expansion to increase their revenue so they can cover safety costs is not a valid one, as oil and gas companies are the richest organizations in the world. Allowing them concessions to make more money so they can have safer facilities is an incredibly distorted way of viewing protecting the public, as it is these companies that are in fact endangering the public through their industry.

Most importantly, the scope of Zoning Changes completely misses the point of the Resolution and of the climate challenge we face. Simply put, according to most experts, emissions need to STOP by 2017 to avoid 2 degrees in warming, already nearly catastrophic levels. The impacts will be felt locally as climate refugees flock to the Pacific Northwest, causing severe stress on the city in every imaginable capacity. Already the Northwest is in the midst of a major drought, one that will only get worse as warming increases. This is the time for governments, including the City of Portland to step up and ACTIVELY OPPOSE any new fossil fuel infrastructure development, not to allow for limited growth or expansion.

Now is NOT time for a balanced approach, rather a clear moral and ethical stance. Think of it this way: What world do you want YOUR children to live in? If you knew they were at risk (which they are), what choice would you make? Allow more fossil fuels, or set clear laws that give us a chance for a better future, or at least a less worse one?

As a Portland resident I cannot understand why the City would justify allowing for expanded fossil fuel growth in our borders

when it has passed resolutions barring it from doing so and fully recognizes the impact that climate change will have locally, regionally and worldwide.

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Please ensure that the zoning code update clearly meets the intent of the resolution and ACTIVELY OPPOSES all new and expanded infrastructure development. As citizens, we will be sure to be present to ensure the City keeps its word.

Thank you very much,
Jonathan Strunin, Sabin Community Resident

Name: Barbara Bernstein
Email: mediapro@spiritone.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland, as was promised in the resolution voted on by the Portland City Council last fall.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and

tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

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It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Karen Alexander-Brown
Email: kjalexander@hotmail.com

Comment:

Our survival is at stake! There is no time to back paddle. Here is what Oregonians want:

1. A full ban on new bulk fossil fuel terminals
2. Limitations on expansions at existing facilities
3. Provisions that require existing fossil fuel terminals make upgrades for seismic
resilience to protect the health and safety of neighboring communities and the
Willamette River
Thank you,
Karen Alexander-Brown

Name: Anthony Bencivengo
Email: bencivea@reed.edu

Comment:

The current draft proposal for proposed code changes would fail miserably at making our city's historic anti-fossil fuels resolution a reality. The proposal must be changed to include:
1. A full ban on new bulk fossil fuel terminals
2. Limitations on expansions at existing facilities
3. Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety

of neighboring communities and the Willamette River

Our city has an opportunity to display unprecedented leadership in support of climate justice. If we take it, we can say we were phasing out fossil fuel transport infrastructure "before it was cool". Why would we ever pass up a chance to do that?

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Thank you for your time,

Name: Rachel Lileet-Foley
Email: lileet@spiritone.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – I actually want an absolute ban on expansion of current facilities. We must stop the use of fossil fuels in its tracks and we must do so NOW!
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to

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shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Sarah Prowell
Email: sprowell@ix.netcom.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

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It is vital that the city strengthen the current draft of the fossil fuel

code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

188142

Name: Alicia Cohen
Email: cohenalicia@gmail.com

Comment:

Recently, Portland passed a resolution to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

The elected representatives of Portland spoke on behalf of the majority of the city's residents in this historic vote. Mayor Hales said about the vote, "The reality is, while climate change could be even more catastrophic, it's not too late to do something about it. If we're aggressive about carbon reduction, we can, city by city, make a difference."

Now, City staff have offered an initial draft of proposed code changes that would translate the City's sweeping resolution into binding land use rules. Instead of a ban these rules would do the exact opposite: allow new bulk fossil fuel terminals to be built and allow already existing ones to expand.

As a citizen of Portland I call for the rules to be rewritten to reflect precisely the intents and commitments of our City, our mayor, and our citizens. We must have a Fossil Fuel Policy that does indeed "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways.".

Name: Phillip Norman
Email: pjnorman@gmail.com

Comment:

Ban new and expanded terminals. End all existing allowance of public facilities for export of fossil fuel, too. The greedy investors

must lose.

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Name: Rachel `Hampton
Email: hamptonrachel2002@outlook.com

Comment:

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.
I believe we should have:
-A full ban on new bulk fossil fuel terminals
– Limitations on expansions at existing facilities
-Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River
Sincerely,

Name: Nancy Newell
Email: ogec2@hotmail.com

Comment:

Animal species are disappearing massively by the week all over Earth.
Our spoiled habits have to shift off oil and coal as major climate change
sources and it is more doable than ever to start the shift now.

Name: Dean Loros
Email: autocrosser1@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the

fossil fuel industry over the health and safety of Portlanders.

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I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Jan MacWilliams
Email: janmacwill@gmail.com

Comment:

The people of this community want and need:
– A full ban on new bulk fossil fuel terminals because we need to leave fossil fuels in the ground! The transportation used to move fossil fues around is just too dangerous and dirty. And the effects of the continued and increased use of fossil fuels is too damaging to our environment.
– Limitations on expansions at existing facilities for all the reasons mentioned above and,
– Provisions that require existing fossil fuel terminals make

upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

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Name: Kathleen Hoffman
Email: kacky@dsl-only.net

Comment:

I want a full ban on all new fossil fuel infrastructure in Portlsnd.

Name: Molly Jackson-Nielsen
Email: m.l.j.nielsen@gmail.com

Comment:

To the Bureau of Planning and Sustainabililty,

The 2015 Fossil Fuel Resolution passed in the City of Portland gives us the opportunity to chart a path for the rest of the United States. The resolution is brave – exactly what we need to be as a city and as a nation, in order to have any significant reduction in fossil fuel development and usage. The Zoning Amendments discussion draft, on the other hand, is weak. It upholds the status quo, supports fossil fuel development, and prevents Portland from setting a historic path for our country.

Portland is a special city. We aren't perfect, and we fall behind others in the areas of affordable housing, racial equality, and more. We do, however, have a strong history of environmental planning and legislation. We are the city most prepared, out of all the cities in the United States, to enact necessary fossil fuel restrictions and transitions to green energy. If the bold and visionary intents of the resolution are not upheld, then we fail in our duty as an American city – and as Americans – to make our country the best that it can be.

To reiterate: It is our duty as an American city to enact legislation that raises the United States up as a leader of the free world. But our country cannot be a leader while we are dependent, and plan for dependence, upon fossil fuels. Portland must set an example of independence from fossil fuels for the rest of the

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country. As a city, we are brave, forward-thinking, and unique. If we do not leverage these qualities for fossil fuel independence, we fail.

Please do not let fear motivate your decisions. Rather, let your decisions be motivated by hope, solidarity, bravery, and a sense of responsibility. Thank you for your time.

Sincerely,
Molly Jackson-Nielsen

Name: Tim Holbert
Email: timholbert2002@yahoo.com

Comment:

To The Members of the Bureau of Planning and Sustainability,

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland! More than "I" want — our world needs it. We are in absolutely dire circumstances and Portland needs to lead the way, not traipse along with half-hearted measures a day late.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year.
We ALL need:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

sincerely,
Tim Holbert
Resident SE Portland 97215

Name: Dan Jaffee
Email: dsjaffee@gmail.com

Comment:

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Dear BPS Staff:

I was very happy last year when Mayor Hales directed BPS to develop a policy that would ban new fossil fuel facilities in Portland, gaining us major media coverage and bolstering Portland's reputation as a climate leader.

However, I was shocked to learn yesterday that instead, BPS has proposed a policy that dramatically *weakens* this directive, and would permit new and expanded fossil fuel facilities within the city of Portland. This is completely contrary to the will of the tens of thousands of citizens who commented, protested, and spoke at hearings on this issue.

I insist that this proposed policy be dramatically strengthened to include the following:

–A complete prohibition on new bulk fossil fuel terminals.
–Strict limitations on expansions of existing facilities
–A requirement that existing fossil fuel terminals (such as the NW Energy Hub) make upgrades for seismic resilience to protect the health and safety of Portland residents and the Willamette River.

Portland residents were told clearly in 2015 that Mayor Hales had committed to permitting NO new fossil fuel terminals in the city of Portland. Portland received international media attention for this decision. The proposed policy is Orwellian: the exact opposite of what it was intended to be. If you do not dramatically strengthen this proposal, you will be violating those promises, endangering local health and safety as well as the climate, and jeopardizing Portland's national leadership on this issue.

Thank you for your attention.

Name: Mona McNeil
Email: monarandy@monarandy.com

Comment:

Don't allow new fossil fuel terminals, or expansion of existing ones. We need to protect our environment and our people from the health and safety risks they create.

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Name: Lisa cohn
Email: cohnmerk@comcast.net

Comment:

Hi!
I'm very proud to live in the city of Portland because of it's green policies.
Let's keep it up with a full ban on new and expanded fossil fuel terminals, plus
limitations on expansions at existing facilities.
I also support provisions calling for existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.
Very important!

Thanks!
Lisa Cohn
www.LisaECohn.com

Name: Rose Christopherson
Email: rose.christopherson@comcast.net

Comment:

Please don't allow any new fossil fuel terminals, and please don't let existing terminals be expanded. They should be allowed to quietly die of old age. We need to keep all these fossil fuels in the ground.
Also, remember that we are in a quake zone, and that all fuel terminals should be made resilient to quakes.

Name: Kelly McConnell
Email: prvt@2ezgroup.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

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The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. This discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders and it is NOT what we want or what we already approved.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety.

The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

Name: John Kemmick
Email: jpkemmick@gmail.com

Comment:

I am writing in support of a full ban on fossil fuel terminals as well as no growth on existing terminals. If we are actually going to be leaders on combating climate change, this is the only option. Thank you.

Name: Michael Gaskill
Email: moneyglass@gmail.com

Comment:

The proposed fossil fuel infrastructure zoning amendments fall are antithetical to the spirit of the resolution that was passed last year. I Join with the community in demanding zoning amendments that reflect the actual intent of the 2015 Fossil Fuel

Resolution, including:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.
I no longer live in Portland, but while I did I attended several BPS open house sessions on Portland's long term climate plan, and I helped organize to pass the 2015 Fossil Fuel Resolution. Stop watering down and sabotaging the work of thousands of your community members, and enact real and meaningful zoning amendments

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Thank you

Name: Tom Kane
Email: tomkane13@gmail.com

Comment:

To the City of Portland's Bureau of Planning and Sustainability,

I am writing to express my dismay at the weak proposal being put forth on new fossil fuel infrastructure. In terms of the changing climate, the hour is late. There is no need for new fossil fuel infrastructure. More accurately we cannot afford to build any new fossil fuel infrastructure. We must not build any more fossil fuel infrastructure.

If it is jobs you want to create for the trades, there are jobs. Yes, green jobs for sure–retrofitting buildings for efficiency, wind turbines, solar water heaters and panels and more. And how about we look at our roads, our schools and crumbling bridges. Let's put people to work on these projects. We also have a seismic disaster coming our way and we can see how we need to upgrade our bridges, roads and our airport. These are jobs that are positive work for the long-term health of our communities.

If you must throw a bone to the fossil fuel companies, have them work on upgrading the seismic resilience of the terminals on the Willamette. This will protect the health and safety of the people

that live there. Furthermore, if they do the job well those facilities will be available for use after the big earthquake.

To conclude, fossil fuel infrastructure is hazardous to the immediate well being of people living near these projects and secondly, it is absolutely lethal to our future well being. No new fossil fuel infrastructure. No loop holes. No exceptions.

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Name: Colleen McNally-Murphy
Email: cmcnallymurphy@gmail.com

Comment:

Dear City of Portland,

I am proud to live in a city that is on the forefront of environmental progress, and that has a forward thinking vision of the best way to create a livable environment. Portland has been coasting on the environmental innovations of two decades ago, and it is time for the next generation of environmental leadership. In this time of changing climate, oil train derailments, environmental devastation from extractive industries, Portland's next steps are clear.

I write to encourage the full ban on new bulk fossil fuel terminals, limitations on expansions at existing facilities, and provisions that require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette and Columbia Rivers.

Sincerely,
Colleen McNally-Murphy

Name: Gene Stubbs
Email: stubbsgene@comcast.net

Comment:

1. I would request a full ban on new bulk fossil fuel terminals.
2. Also, limitations on expansions at existing facilities.
3. Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety

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of neighboring communities and the Willamette River.
4. We should be shifting away from fossil fuels toward renewal energy sources to protect our environment and protect us from climate change.

Name: Sharon Miller
Email: smilertoo@aol.com

Comment:

Dear Bureau Members,
I have reviewed the draft resolution and thank you for your time spent protecting Portlander's health and safety. I would, however, request that the following be added to the draft::
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Sharon Miller

Name: JoAnne Eggers

Email: ejo.eggers@gmail.com

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Comment:

I grew up in Portland tho I do not live there now.
However, Portland has this opportunity to be a leader while taking effective significant action on greenhouse gas emissions. Your methane and CO2 affect me and mine (in Ashland) affect you and the whole planet. Thus I am very interested and concerned.

Please institute the strongest possible ban on new fossil fuel facilities and require upgrades on existing facilities to protect the health and safety of us all. That also means no expansions.

Thank you.

Name: Rogue Robertson
Email: djwobli@gmail.com

Comment:

Yo, you know what to do Thanks

Name: Ed Momford
Email: edumom2012@gmail.com

Comment:

There needs to be a full ban on new bulk fossil fuel terminals in the Portland area, limitations on expansions at existing facilities and provisions that require existing fossil fuel terminals make seismic upgrades for resilience to protect the health and safety of neighboring communities and the Willamette River.

Name: lorraine foster
Email: lorraine@spiretech.com

Comment:

want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

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The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Philip Brunner
Email: pdbrunner@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and

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historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Philip Brunner

Name: Craig Heverly
Email: heverlyjc@hevanet.com

Comment:

Craig Heverly
3712 SE 9th Avenue
Portland, OR 97202

Name: Michael Litt
Email: littm10@comcast.net

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Comment:

The Portland city council already voted to ban new and expanded fossil fuel terminals that might be used for export of these materials. Yet I understand that the draft plan for fossil fuel terminal zoning would not do this.

Climate change is already happening much more rapidly than predicted just 5-10 years ago, leading to record high temperatures in many parts of the world, increasing frequency of severe, multi-billion dollar storms and forest fires. this is no time to be facilitating the use of fossil fuels. Please honor the letter and spirit of the City council's resolution limiting fossil fuel transport through Portland.

Also, i am very worried about the high susceptibility of Portland's existing fossil fuel storage facilities to damage from a severe earthquake that is certain to come one of these days. High priority must be given to retrofitting these facilities to strengthen them seismically so that fuels will be available after a mega-quake to aid in our recovery.

Name: Mary Rose
Email: zambonirose@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

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These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Mary Rose

Name: Rebecca Smith
Email: biankasmith95@gmail.com

Comment:

In order to honor the Fossil Fuel Resolution, I urge you to ban new fossil fuel terminals and make it more difficult to expand existing terminals in Portland, two things that the current Fossil Fuel Terminal Zoning Amendments do not support, but instead go against directly.

It is very important to combat climate change in this way by reducing our carbon footprint, as fossil fuels are extremely destructive and dangerous to transport. This danger was just seen in Mosier, a situation that could have been much worse, especially if the derailment had happened in the much-more populated Portland area. In addition, many of the fossil fuel terminals in the city are located in dangerous seismic zones that would make an inevitable earthquake much more of a dire situation than it otherwise would be.

By continuing the expansion of these terminals and the fossil fuel

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transportation such expansions would require, the city would putting in danger its citizens lives, the environment in the terminal and transportation blast zones, and the greater global community.

The Fossil Fuel Resolution was an unprecedented and radical step in the right direction when it comes to reducing and eventually eradicating fossil fuels in our city! Let's continue to be leaders in the climate justice movement by respecting the resolution through improvements to the Fossil Fuel Zoning Amendments!

Sincerely,
Rebecca Smith

Name: Dale Allen
Email: dmallen174@gmail.com

Comment:

I was so excited by the city council's vote to ban new fossil fuel infrastructure. Imagine my dismay when I learned that the zoning draft not only allows for expansion of existing facilities but construction of new ones! I'm want our water and our children to be safe from this kind of threat.
Please re-write the zoning codes to reflect Portland residents' need for safety. Please do your part to require earthquake-proofing of existing facilities and a permanent freeze on new ones.
Thank you,
Dale Allen

Name: Jynx Houston
Email: jynxcdo@gmail.com

Comment:

THE CITY OF PORTLAND NEEDS A FULL BAN ON FOSSIL FUEL TERMINALS.

Name: Jack Blashchishen
Email: jacktherussiann@gmail.com

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Comment:

It's important that in the future we do not expand the use of fossil fuels, but limit it and eventually make it obsolete. This legislation is a sneaky and dishonest way to go behind the backs of the people of Portland. Turn back, we know you can do what is right.

Name: sandy sanders
Email: sandyssanders@att.net

Comment:

Solar and wind is the future. Carbon and nukes are the deadly and consumptive past.

Name: Diane Jacobs
Email: dianejacobs2@icloud.com

Comment:

I want a full ban on new fossil fuel terminals and no expansions of existing facilities and provisions that require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette river. I don't want any trains transporting crude oil passing through our communities. Everything in our power must be done to curb climate change.

Name: Susan DeFreitas Timmons
Email: susan.defreitas@gmail.com

Comment:

The time for a few weak regulations has passed. We are in a climate crisis that's worsening every day, and Portland has the opportunity to lead the way.

The vast majority of Portland residents want a full ban on new

bulk fossil fuel terminals–as well as on expansions of existing fossil fuel terminals, which could easily be just as damaging, not only to the environment, but to our local quality of life.

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And while we're at it, let's address the looming threat to the health of our region and the ecosystems on which we depend by making those fossil fuel terminals we do have ready for the The Big One–because we know it's only a matter of time until a monster earthquake hits. Therefore, we want provisions in that require existing fossil fuel terminals to make upgrades for seismic resilience.

These are the baseline measures we need NOW to protect the health and safety of neighboring communities and the Willamette River.

Thank you for taking bold action now, on behalf of both current residents and future generations.

Best wishes,

Susan DeFreitas Timmons

Name: Ann Littlewood
Email: annlittlewood3@gmail.com

Comment:

The proposed code changes must be in accordance with the November city council resolution to ban fossil fuel infrastructure expansion. I don't understand why the draft doesn't follow this. The last thing we need is new fossil fuel bulk terminals, expanded terminals, or to have existing terminals remain unsafe. Please rewrite the code changes to accommodate these requirements.

Name: Eve Heidtmann
Email: eveandden@gmail.com

Comment:

Please put teeth into the City's fossil fuel ban! We want

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absolutely no new fossil fuel terminals and want existing ones made safe from earthquakes while preparing for an eventual shutdown. The Earth is telling us the age of fossil fuels is over. The sooner we get free of them, the better for our children and all species.

We are counting on you to move Portland into a sustainable future.
Thank you,
Eve Heidtmann

Name: Lyle Funderburk
Email: lyle.funderburk@gmail.com

Comment:

New bulk fossil fuel terminals must be banned. All existing terminals need to be upgraded to provide seismic resilience. Emphasis on energy needs to shift more strongly on conservation and wind and solar energy.

Name: Courtney Stanton
Email: courtney@superopinionated.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland!

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

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These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Courtney Stanton

Name: Helen Hays
Email: hlhays@ccgmail.net

Comment:

Please support a full ban on new bulk fossil fuel terminals. Oregonians coping with climate change cannot afford more carbon released when they have issues that need change. Expansions at existing facilities must also be eliminated. At the least, Portlanders require existing fossil fuel terminals make upgrades for seismic resilience for their safety.

Name: Benjamin Sibelman
Email: ben@bensibelman.info

Comment:

I was told that the city where I grew up had passed an ordnance that took a bold, exciting step toward meeting our state and national commitments to help stop runaway climate disruption. Please don't give up on that goal with an "implementation plan"

that effectively reverses the ban.

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Name: P Horter
Email: lacengh@yahoo.com

Comment:

Dear Bureau Members,

I want a full ban–just like we were promised. Why is the City administration ignoring the City Council's resolution to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways"?

We want and need:
1) A full ban on new bulk fossil fuel terminals.
2) No expansions at existing facilities.
3) Provisions that require existing fossil fuel terminals make upgrades for seismic resilience (to protect the health and safety of neighboring communities and the Willamette River) within 3 years.

Please carry out the will of the people–as passed by the City Council.

Thank you.

Name: satya vayu
Email: satyavayu@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. It is crucial that we keep to that original vision, as the climate crisis is arguably the most urgent issue in the world today.

I demand:

1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.
It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Satya Vayu

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Name: Danny Hull
Email: voterspetition@voterspetitions.com

Comment:

Dear City of Portland Bureau of Planning and Sustainability:

In and through Portland and Portland-adjacent waterways, I want:
1. A full ban on new bulk fossil fuel terminals,
2. Limitations on expansions at existing fossil fuel facilities,
3. Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Thank you for your help with this petition of my voting.

Respectfully yours,
Danny Hull, B.S. Biology, A.A.S. Environmental Health Technology

Name: Alison Charbonneau
Email: charbo5@comcast.net

Comment:

Please stay focused on an environmentally sustainable future. Let's make Portland the city that thought ahead, and found a creative and unique way to support our needs, if not always our wants. The nation looks to Portland for environmental solutions,

let's not become part of the status quo by supporting out dependency on fossil fuels which we can see are a limited resource and an unhealthy choice in the long run.

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Name: Emma Rosen
Email: emmarosen22@gmail.com

Comment:

This fossil fuel discussion draft, as I'm sure you're aware, is not what I was promised when the Fossil Fuel Policy resolution was passed. I came out to support a BAN on fossil fuels, not weak regulations that benefit large industries over the climate and the safety of the city. While I'm sure the blame for this discussion draft does not land solely on you, please hear my concerns during this comment period and MAKE CHANGES
I want:
1) A full ban on new bulk fossil fuel terminals
2) Limitations on expansions at existing facilities
3) Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Thank you so much for reading,

Name: Marian Carter
Email: carterwstcvn@aol.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals

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2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that I and thousands of other citizens supported last year.

Sincerely,

Name: David Kreisman
Email: dkreisman@hotmail.com

Comment:

I stand in solidarity with 350PDX in demanding that the No New Fossil Fuel Infrastructure bill passed by the Portland City Council be implemented AS INTENDED and NOT watered down. I want the regulations to enforce the following:

1) A full ban on new bulk fossil fuel terminals
2) Limitations on expansions at existing facilities
3) Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Name: Ellen Bridges

Email: ellenwondermom@gmail.com

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Comment:

1. A full ban on new bulk fossil fuel terminals
2. Limitations on expansions at existing facilities
3. Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Name: Mary McGaughey
Email: marymcgaughey@yahoo.com

Comment:

We embrace clean energy, we are divesting in oil energy. Why would we invest in transporting oil energy around the planet? Why are we going backward at 'warp' speed into the dirty energy past? We must get the politics out of oil.....and keep the oil in the ground. For the Health & Safety of all life & Our Earth!

Name: Tom Bender
Email: tbender@nehalemtel.net

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for new seismic resilience standards (R 9.5 – 3000 year quake) to protect the health and safety of neighboring communities and the Willamette River.

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These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Tom Bender

Name: Mikel Gisi
Email: loveofthewild@gmail.com

Comment:

All present focus and resources should be put toward transitioning this country into a new renewable-energy, and thus energy-independent state. New oil terminals do not serve that goal, but take time, forcus, and resources, away from what our nation would benefit most from.

Name: Burton Merrill
Email: burtonmerrill936@yahoo.com

Comment:

If it is not renewable it is not worth our time. Save the planet for your children!

Name: Ryan Callahan

Email: Orevo94@yahoo.com

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Comment:

If it is not renewable its not worth anyone's time or resources. Lets take a step into the future.

Name: Elizabeth Brenner
Email: lpbrenner@earthlink.net

Comment:

In addition to a full ban on new bulk fossil fuel terminals, Limitat expansions at existing facilities, and require that existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Name: Katy Wolf
Email: katyewolf@gmail.com

Comment:

Dear City of Portland Bureau of Planning Sustainability,
What the hell. Your "historic" draft resolution to ban fossil fuel terminals has somehow become one that would ALLOW new bulk fossil fuel terminals to be built and already-existing ones to EXPAND.
Portlanders want:
1. A full ban on new bulk fossil fuel terminals
2. Limitations on expansions at existing facilities
3. Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Name: martin frazier
Email: martinfrazier52@gmail.com

Comment:

A full ban on new bulk fossil fuel terminals

Limitations on expansions at existing facilities
Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

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Name: John Vareldzis
Email: john.vareldzis@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

John Vareldzis

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Name: Jo Durand
Email: jodurand1947@gmail.com

Comment:

Please honor the intention of the fossil fuel policy resolution City Council passed by creating strong regulations that actually will accomplish what the resolution calls for including banning new bulk fossil fuel terminals, limit the expansion of existing facilities and require upgrades to existing facilities to prevent fuel spills in the event of an earthquake. Anything less will not protect our ground and waterways.

Name: Bill Michtom
Email: wdmichtom@gmail.com

Comment:

Portland, and Oregon & Washington in general, needs a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The 2015 Fossil Fuel Resolution that was passed last year was bold, visionary, and historic. Unfortunately, the Fossil Fuel Terminal Zoning Amendments discussion draft is none of those things. Instead of focusing on protecting the area and committing to ending fossil fuel use, it protects the fossil fuel industry.

We urgently need:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because the discussion draft allows new bulk terminals to be built as well as allowing existing facilities to expand, growing our carbon footprint and preventing

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us from meeting our local and state carbon reduction goals. Furthermore, as was recently emphasized in Mosier, transporting and storing fossil fuels is never safe. We face serious risks from oil train derailments, pipeline spills, storage tank explosions, and tank destabilization from earthquakes.

The City of Portland needs to hold fossil fuel industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, period!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that I and thousands of other Portlanders supported last year.

Sincerely,

Name: John Nettleton
Email: jpn5710@yahoo.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and

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storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Peter Miller
Email: peteskitoo@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland. I understand that much of the current infrastructure is built on seismically unstable landfill that will be very dangerous after an earthquake.

2015 Fossil Fuel Resolution that was passed last year is not matched by the Fossil Fuel Terminal Zoning Amendments discussion draft which doesn't do enough. This discussion draft does not do enough and is not forward looking.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These fossil fuel terminals are a threat to the environment and public safety.
We simply must continue to lower our carbon footprint AND guard against infrastructure that will fail in an earthquake. It is also clear that the transporting of these fuels is not safe.

Please strengthen the draft of the fossil fuel code to reflect the original resolution.

Sincerely,

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Name: Diane Jacobs
Email: dianejacobs2@icloud.com

Comment:

I want a full ban on new bulk fossil fuel terminals. Limitations on expansions at existing facilities and provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River. We need to be proactive and make strong policies for the future generations.

Name: Susan Wechslr
Email: susanwechsler@comcast.net

Comment:

I support a full ban on new fossil fuel infrastructure, as well as limitations on expansions at existing facilities.

Additionally, existing terminals should be required to make the necessary seismic upgrades to withstand the inevitable Cascadia Subduction Quake, in order to protect the safety of the community, as well as the health of the Willamette River.

Name: Imogen Taylor
Email: imogen.taylor@gmail.com

Comment:

I write to express my strong support for a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

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I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Imogen Taylor

Name: Delia Tyrrell
Email: delialey@gmail.com

Comment:

Reading the Fossil Fuel Terminal Zoning Amendments discussion draft was incredibly disappointing. After Portland was applauded by various news sources and environmental groups around the country for the resolution against new fossil fuel infrastructure, this discussion draft feels like a slap in the face. It is clear that fossil fuel companies have been pushing back against this progressive resolution, but we can't let them take away our future. These corporations are in it for the profit, but citizens of Portland need the ban for their lives and the lives of

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their children.

There needs to be a full ban on all new fossil fuel infrastructure, and the only reason an existing fossil fuel terminal should be improved is for safety and seismic upgrades, not expansion.

Let's think about our planet and the safety of our friends, family, and all other human beings impacted by the dangerous extraction, transportation, and use of fossil fuels. Portland can be a leader in the fight for climate justice. Let's get this policy right.

Name: Ben Haney
Email: tirewrangler22@yahoo.com

Comment:

The city must embrace the future, and do all they can to leave fossil fuel dependency behind. Please shut down any and all attempts by the oil industry to poison our environment!

Name: Randall Nerwick
Email: rnerwick@gmail.com

Comment:

I support a full ban on new bulk fossil fuel terminals, plus limitations on expansions at existing facilities. I also support requiring existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Thanks for considering these points.

Name: Farrah Chaichi
Email: FNChaichi@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft

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has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Farrah

Name: Ineke Deruyter
Email: ideruyter@hotmail.com

Comment:

I am excited to participate in a new ban on fossil-fuel industries during this comment period. The regulations for this plan need to be STRONG, without loop-hole possibilities. They need to include:
FULL ban on new bulk fuel terminals.

STRONG limitations on expanding existing facilities.
Make seismic upgrades to protect existing facilities from earth quake damage, as well as neighboring communities and rivers. Let's keep endorsing to keep fossil fuels in the ground! Thank you, Ineke Deruyter

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Name: Lucy Wong
Email: lucymwong@gmail.com

Comment:

I am writing to say the Fossil Fuel Terminal Zoning Amendments are not strict enough. We need to put a full ban on new bulk terminals, limit expansions at existing facilities and require existing fossil fuel terminals to make upgrades for seismic resilience. These changes are the least Portland should enact. If we truly want to be a green city and start working towards our plans to reduce carbon, we should stop all transportation and storage of fossil fuels. It isn't safe and supporting its use rather than working for renewables is short-sighted.

Thank you,

Name: Darvel Lloyd
Email: darvlloyd@gmail.com

Comment:

Yes, I recall you made a resolution to ban new bulk fossil fuel terminals. Now, STAND BY your resolution and vote to ban them! Also, don't allow any expansion of existing fossil fuel facilities. They are going to be out of commission anyway in the next big subduction earthquake. And they won't be needed as wind and solar (and other renewable sources) energy facilities expand. WE MUST TRANSITION TO CLEANER ENERGY, AS THE EARTH IS RAPIDLY WARMING BECAUSE OF FOSSIL FUEL EMISSIONS! You know this as well as I do. So now is the time to do something about this crisis–the greatest ever faced my humankind!

Name: Jeff Stookey
Email: jstookey108@gmail.com

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Comment:

Portland and the Pacific Northwest needs a full ban on new bulk fossil fuel terminals, such as have been proposed at Clatskanie, OR, Vancouver and Kalama, WA, and elsewhere.
Portland and the Pacific Northwest needs limitations on expansions at existing fossil fuel facilities.
We need provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette and Columbia Rivers. The recent New Yorker article on "The Really Big One," July 20, 2015, by Kathryn Schulz, points out the dangers of existing tank farms located along the Willamette River north of Portland's downtown.
We must keep fossil fuels in the ground.
We currently have all the scientific and technical knowledge and the physical resources to get all of the energy we need from renewables, according to Mark Z. Jacobson, Director of the Atmosphere/Energy Program and Professor of Civil and Environmental Engineering at Stanford University. Now add to that a new analysis, called "World Energy Revolution: A Sustainable World Energy Outlook 2015", produced by Greenpeace in collaboration with researchers from the German Aerospace Center, that says our world can make the switch to 100% renewable energy by 2050. Feed-in-tariffs–which have helped put Germany and Ontario, Canada at the forefront of the transition to green energy–are promoted by Oregonians for Renewable Energy Progress (OREP) as an important policy tool to incentivize this transition.
America's path to prosperity lies in a rapid switch-over to abundant, homegrown, renewable energy to power our homes, businesses, and vehicles–NOT in facilitating extracting and exporting of dirty, polluting coal, oil, and gas, which represents a retreat from the 21st Century economy. Renewable energy already employs 2.7 million workers (more than the fossil fuel industry) and studies have shown that green energy will continue to create far more jobs than the fossil fuel industries. [see: Sizing the Clean Economy, A National and Regional Green Jobs

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Assessment by the Metropolitan Policy Program at the Brookings Institute, 2011. Also, One Million Climate Jobs, 3rd Edition, 2014, edited by Jonathan Neale, published by the Campaign Against Climate Change] A U.S.-led, green, industrial revolution will move our economy forward, create millions of new jobs, and help ensure a livable planet for future generations.

Name: Dawn Smallman
Email: dawnsmallman@gmail.com

Comment:

Dear Bureau of Planning and Sustainability,

I'm writing to urge you to enact a full ban on the building of any new fossil fuel infrastructure – to include, but not be limited to – oil, gas and coal terminals in the City of Portland.

The 2015 Fossil Fuel Resolution was supported by our community and a unanimous City Council vote – it offered the public a real promise of a future free of these terminals, and their associated and deadly health and safety risks. It promised the citizens of Portland a dramatic shift in City policy – away from fossil fuel consumption and towards renewable energy sources. As your bureau is charged with sustainability as a mission, I'm deeply disappointed that you all aren't working to uphold and further the 2015 resolution – a forward-thinking accomplishment created by a collaborative process between the City Council and members of the public.

Instead the Fossil Fuel Terminal Zoning Amendments discussion draft has weakened the advances that were contained in the 2015 Resolution. I object to the way that the draft favors industry profits over public health and safety. I object to you not honoring and upholding the work accomplished by City Council and the public. The City often asks for public input and engagement, and the 2015 Resolution was a great example of citizens and elected leaders collaborating on an outcome that was unanimous – both entities were pleased with the outcome. It was held up by the City as a successful example of these kinds of collaborations. Why would the Bureau of Planning and Sustainability want to

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undo that accomplishment? Actions like that only sour citizens on engaging with the City and make your bureau look like you feel "know better" and that you don't feel an obligation to properly represent the public and City Council in your work. It gives the impression that you really only represent industry and their deep pockets.

I'm writing to urge you to do the following things:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow.

If you are truly looking at sustainable energy solutions, you cannot be committing to expansion of fossil fuel use. If you are informed by science, you know that its far past the time for action to eliminate fossil fuel consumption, in order to address the very real current and future global peril induced by climate change.

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original 2015 resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Dawn Smallman
1148 SE 50th Ave.
Portland, OR 97215

Name: Suzan Ireland
Email: suzan_ireland@hotmail.com

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Comment:

I am writing to express my support for strengthening the current draft of the fossil fuel code. I want a full ban on new bulk terminals, stronger limitations on expansions at existing facilities and provisions to require fossil fuel terminals to make upgrades for seismic resiilence to protect the health and safety of neighboring communities.
Sincerely,

Name: Meg Ruby, M.S.
Email: megativity1@gmail.com

Comment:

Dear Members of the City of Portland's Bureau of Sustainability and Planning,

My name is Meg Ruby. I own and I live at 3218 SE. Tibbets Street, Apt. A, Portland, OR 97202.

I am writing today to urged the city to finalize into law the fossil fuel ban enacted by Portland city Council this last year.

To cut to the chase, the following constitute the essential next steps:

A full ban on new bulk fossil fuel terminals;
Limitations on expansions at existing facilities;
Provisions that require existing fossil fuel terminals make necessary upgrades for seismic resilience in order to protect the health and safety of neighboring communities and the Willamette River.

Thank you for your continued leadership and specifically for leading the city through the completion of the final actions needed to codify into law the ban on fossil fuel exports.

Sincerely,

Meg Ruby, M.S.

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Name: Andrew Butz
Email: anbunz@yahoo.com

Comment:

Please ban any new bulk fossil fuel terminals in Portland and limit expansions at existing facilities.
We also must require existing fossil fuel terminals to make seismic upgrades to protect the health & safety of neighboring communities as well as the Willamette River.

Name: Annie McCuen
Email: mccuen7691@comcast.net

Comment:

Please, do not allow permits for new oil, gas terminal. We must all thrive to go toward clean energy if we want to save the planet now and for future generations.
Thank you.

Name: Walt Mintkeski
Email: mintkeski@juno.com

Comment:

I am concerned that the Fossil Fuel Terminal Zoning Amendments discussion draft does not meet the intent of the 2015 Fossil Fuel Resolution that The Portland City Council passed in November, 2015. Where the resolution was bold, visionary, and historic, this discussion draft is insufficient and prioritizes the fossil fuel industry over the health and safety of Portlanders.

The improvements in the amendments which I request are as follows:

Prohibit new bulk fossil fuel terminals. Portland's resolution was clear in its intent to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or

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through Portland or adjacent waterways." The proposed code changes prohibit coal, and the amendments should do the same for other fossil fuels like oil, LNG, propane, and methanol.
Proposed code changes should restrict expansion of existing fossil fuel infrastructure as non conforming uses.
Non-conforming facilities (existing fossil fuel terminals) should be required to invest in seismic upgrades and to post fossil fuel risk bonds to protect public health and water quality. These requirements can be phased in over time to address the resolution's mandate to address the public safety risks of fossil fuels.
Rather than accept the fossil fuel companies' claim of increased demand, the code changes should plan for greener fuels and transition to100% Renewable Energy in Portland by 2050.
Involve the Portland Bureau of Emergency Management in addressing the risks of fossil fuel storage and transport at existing facilities in Portland's NW Industrial Area.
These changes are crucial because of the threats that fossil fuel terminals pose to both the environment and public safety. The discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels pose risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution which I and thousands of other Portlanders supported last year.

Thank you,

Name: Ben Basin
Email: ben_basin@yahoo.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil,

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gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Judy Arielle Fiestal
Email: judyarielle@gmail.com

Comment:

I was disappointed to see how far short of the hopes of the supporters for the ban on new and expanded fossil fuel terminals ended up being. The draft is allowing for new bulk terminals to be built as well as present terminals be expanded. These

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provisions go against the sentiment that our carbon reduction footprint be reduced, not expanded. I am asking for the policymakers to strengthen the fossil fuel code to truly reflect the sentiment that we need to look for a new direction in our energy policy and fossil fuel use needs to be reduced for the future of our environment. In addition the facilities that are already in place should be upgraded for seismic resilience.
Thank you-
Judy Arielle Fiestal

Name: Kim Finley
Email: kimfinli@gmail.com

Comment:

DON'T DILLUTE THE ORIGINAL POLICIES!
BAN ALL NEW FOSSIL FUEL TERMINALS!

I AM FOR LIMITATIONS ON EXPANSIONS AT ALL EXISTING FACILITIES!!

AND, PROVISIONS THAT REQUIRE EXISTING FOSSIL FUEL TERMINALS TO MAKE UPGRADES FOR SEISMIC RESILIENCE.

WE MUST PROTECT THE HEALTH AND SAFETY OF NEIGHBORING COMMUNITIES AND THE WILLAMETTE RIVER!!!

Name: Rich Peppers
Email: richpeppers@gmail.com

Comment:

Dear City Council and Mr Mayor –

As a Portland resident, I'm writing to express my concern over the draft of the fossil fuel code currently before you as an implementation tool for the resolution prohibiting any further fossil fuel infrastructure development in the City that you passed last year. By allowing an enormous expansion of some existing facilities and not rolling out plans to control fossil fuel

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infrastructure risks, the proposed code draft breaks faith with the resolution the Council passed last year. I urge you to amend it to severely limit any potential expansion of existing infrastructure, and to include steps to make the industry reduce their pollution levels and fire (and other) risks.

Moreover, as indicated in the original resolution, the implementing code draft is an opportunity to flesh out much further some concrete steps the City is willing to take to help ensure a Just Transition occurs as our area, and the whole country, shift more and more to a renewable-energy economy. This is a chance to reach out to communities of color and low-income people to train them for the green economy, and to expand the use of Community Benefits Agreements as piloted successfully in the City previously, working with unions to ensure their apprenticeship programs have opportunities to engage fully in a partnership with the City for a Just Transition. The draft code could and should spell out a City responsibility to develop these kinds of programs.

Thank you for your attention to these matters.

Name: MacKenzie Stout
Email: merlinsgarden@yahoo.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

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These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Thomas Brown
Email: tawb2007@hotmail.com

Comment:

Please do not allow the fosil fuel industry to build any more infrastructure which will contribute to the end of life on our planet.

Thank you, Thomas Brown

Name: Julia Cochrane
Email: willowtree@olypen.com

Comment:

Because I care about the next generation and those beyond, I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and

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historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Name: Craig Heverly
Email: heverlyjc@hevanet.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

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shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

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Sincerely,

Message *

Name: Diana Richardson
Email: licketysplit777@gmail.com

Comment:

As a responsible citizen of the bioregion known as Cascadia, the state of Oregon, the city of Portland, and my neighborhood of Hillsdale, I demand a total ban on new bulk fossil fuel terminals. This means BINDING legislation.
The stakeholders have been identified to include the fossil fuel mega businesses. This is an unconscionable bias: the stakeholders are We, The People who live here and who will be egregiously affected by disasters such as rolling bomb trains like the one which exploded in Mosier not long ago.
May you have the spine to stand up for what is right; not bow to pressure from the powerful and rich, nor succumb to other temptation which will result in your betrayal of the moral values with which you were raised.

Name: maria nazzaro
Email: marianazzaro@mail.com

Comment:

Ban new bulk fossil fuel terminals. Please limit expansion at existing facilities. Please include provisions that require existing terminals have seismic upgrades to protect our river and our communities.

Name: Nancy Shimeall

188142

Email: nshimeall@gmail.com

Comment:

I am deeply worried about climate change. The science is clear. The news of extreme heat, drought, hurricanes, rain, wildfires, and melting glaciers is the earth speaking to us. We must stop all new bulk fossil fuel terminals. We must stop expansion of existing terminals. And we must require upgrades to seismic resilience at existing terminals. Our great great grandchildren cannot speak. But in the future we want them to know that we acted with moral responsibility on their behalf. Please. Do the right thing to save our coming generations.

Name: Steve Rauworth
Email: steve.rauworth@gmail.com

Comment:

I just heard of your recommendations. How puzzling and disconcerting. You have heard of climate change, right? You do understand what the word sustainability in your title means, right? And you work for the city of Portland, and it's people, right?

If the answers to these questions are yes, then it's simple. Really, it is. Do the right thing. Without compromise, because however much compromise is touted as necessary in politics, in this case it translates to clearly foreseeable death and destruction.

We need a full ban on new bulk fossil fuel terminals. Expansions at existing facilities must be limited. And existing terminals must be required to make upgrades for seismic resilience.

Perhaps you were floating this joke just to see what the people would say. That's the only way I can understand your work. Ok, charade's over. Time to get real.

Name: Louise Shawkat
Email: louise40208@gmail.com

Comment:

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I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
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It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.
Lets get real think pf the
Childrens fiture

Name: Charlotte Stahl
Email: grandmacharlottes@yahoo.com

Comment:

I also want –

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Limitations on expansions at existing facilities
Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Name: Judy Sierra
Email: judysbooks@gmail.com

Comment:

I oppose expanded fossil fuel terminals in Portland. In the short-term, these pose a health risk to our community. No fossil fuel transportation is safe, and we, the taxpayers, will end up paying for the negligence (and profits) of the multinational fossil fuel corporations. I want a different future for Portland, for Oregon, and for the planet.

Name: Lori Benton
Email: loribtn30@yahoo.com

Comment:

Please ban new and expanded fossil fuel facilities and require that our current facilities be altered to withstand the impending earthquake. Our health and safety should be the priority. Thank you

Name: Ellen Mekjavich
Email: mekjavich@gmail.com

Comment:

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Sincerely,

Name: Carolyn Stuart
Email: carstu517@gmail.com

Comment:

I want-

A full ban on new bulk fossil fuel terminals
Limitations on expansions at existing facilities
Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Name: Janice Vranka
Email: javranka@gmail.com

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Comment:

I respectfully demand a full ban on new bulk fossil fuel terminals, limitations on expansions at existing facilities, as well as provisions requiring existing fossil fuel terminals protect the health and safety of neighboring communities.

Name: Heather Davis
Email: heatherannedavis@hotmail.com

Comment:

NO NO NO NO terminal we don't want it anywhere

Name: Marian Carter
Email: carterwstcvn@aol.com

Comment:

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Sincerely,

Name: Cheryl Trosper
Email: cherylt4235@gmail.com

Comment:

We want provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Name: Ronald Brown
Email: coolportlandtrees@gmail.com

Comment:

Get it right now...

A full ban on new bulk fossil fuel terminals
Limitations on expansions at existing facilities
Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Name: Kris Deelane
Email: youbigcat@aol.com

Comment:

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Sincerely,

Kris Deelane

Name: Jynx Houston
Email: jynxcdo@gmail.com

Comment:

NO EXPANSION OF EXISTING FOSSIL FUEL TERMINALS &
NO NEW FF TERMINALS IN
PORTLAND. THIS IS CRITICAL AS A PUBLIC HEALTH

MATTER.

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Name: Annie McCuen
Email: mccuen7691@comcast.net

Comment:

Please lean towards clean power, not towards dirty fuel terminal and transportation.
Thank you

Name: Matthew Kaminker
Email: jzmnk@yahoo.com

Comment:

I want the City of Portland to enact stronger regulations on fossil fuel terminals including:
A full ban on new bulk fossil fuel terminals
Limitations on expansions at existing facilities
Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Name: Alan Smith
Email: a23smith@yahoo.com

Comment:

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Sincerely,

Name: Cass Martinez
Email: cass@zzz.com

Comment:

I live near the Central Energy Hub that the City should decide is risky enough as it is. Oregon Public Broadcasting's Field Guide made a 55-minute program illustrating what the state is in for during an expected, overdue earthquake, with special reference to the risks to fossil fuel tanks in Portland on the Willamette River. http://www.opb.org/news/series/unprepared/

The City should prohibit new or enlarged fossil projects, and the City should mandate the processes that Japan uses to stabilize liquefy-able ground under existing fuel projects.

Name: dick harmon
Email: dickwisingup@hevanet.com

Comment:

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Dear Council Members: I support the 350PDX position. My family and I want the strongest possible restrictions on FF expansion and strong regs and incentives for steady, deep reductions in current use. Why? My grandson and great grandson live in this region. WE HAVE RUN OUT OF TIME ON CLIMATE. (See 7.21.16 NASA report.) Timidity in this case leads us to catastrophe for them. Restrict, divest, re-invest in renewabless and efficiency. Thank you. Dick Harmon

Name: Deborah Romerein
Email: romerein@gmail.com

Comment:

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Sincerely,
Deborah Romerein
Business Owner, Portland

Name: Kay Romerein
Email: romerein@gmail.com

Comment:

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Sincerely,
Kay Romerein
Retired Business Owner, Portland

Name: d goldsmith
Email: dell.goldsmith@gmail.com

Comment:

I strongly oppose new bulk fossil fuel terminals and a limit on expansion of the harmful facilities we already have. This is crucial. We are on our way to incredible damage from heat in the environment and climate damage. Can't you see this?

Existing terminals should be required to prepare and retrofit their facilities to withstand a 9 level earthquake that is predicted. Citizens and all living things need these actions that includes you.

Name: Patricia Hine
Email: zap_oregon@Msn.com

Comment:

Let's be responsible and do what's necessary to transition quickly to a fossil free energy infrastructure. We need to STOP building terminals for build fossil fuels, require existing fossil fuel terminals to make upgrades for seismic resilience. The science is clear. Rapid and just changes to current "business as usual" thinking is what we expect from our public officials. Please get going, quit stalling and do what is needed. Thank you.

Name: Jane Robson
Email: janerobsonphd@gmail.com

Comment:

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Sincerely,

Jane Robson, PhD

Name: Alan Locklear
Email: gardeneral@comcast.net

Comment:

Portland must implement its promised full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

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Best regards,

Name: Dr.Kathleen Shelley
Email: kshelley@epud.net

Comment:

Why, when we are trying to eliminate the use of fossil fuels, is it

reasonable to add to an/or expand existing facilities? No more should be allowed, and those in existence should be elimiated.

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Name: margaret Hartman
Email: mhartman1943@hotmail.com

Comment:

Please vote to ban new bulk fossil fuel terminals, to limit expansions of existing fossil fuel terminals, and to require safety measures against earthquakes on existing terminals. We must be prepared for the future which includes earthquakes and climate change. We are losing the battle to save our planet from destruction due to that climate change. Banning future fossil fuel terminals as well as safety for existing terminals and not expanding are things we can do to help to save our planet. Thank you.

Name: Jason Fiske
Email: jasondanielfiske@gmail.com

Comment:

If we do not make these kinds of sacrifices moving forward, then we are no different than these Oil Titans themselves.

We must be brave by Championing the Struggles and Hardships that come with the friction caused by living by Pioneer standards.

We must adjust and adapt as quickly as possible, because Our Only Resource is in danger. Earth.

Everyone reading this shares a home, it is time to force our systems & governments to acknowledge our cries.

We the people will not trust you any longer if you do not have the ability to react & change With Your Heart. Compassion for our own history is vital for moving forward.

Our energy usage and approach to living in harmony and unison is fundamentally flawed.

It is on us to progress without compromise. We cannot afford to

compromise. Our voices must be heard. We are in touch with a deeper reality by detaching ourselves from old ideas.

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It is safer for the Earth, Our Children, and Ourselves.

If you listen to the Needs of Your People, others will see. Your courage could inspire a Nation, a World even.

We are Oregon, We are America, We are Human, let us carve a path for the rest, for now it looks like risk, but history will show that this is an act of Heroism.

Name: Margaret Maloney
Email: meg4now97@gmail.com

Comment:

I have learned that strong public protest led to a meeting of mayors from several West Coast cities, who then took into consideration those protests and agreed to develop rules aimed at reducing fossil fuel infrastructure, and consumption. Now I have heard that a decision has been made to have public employees write their own rules instead. WHY?

Sabotaging the public will is not public service!

I want a full ban on new and expanded fossil fuel terminals! AND limitations on any expansion of existing such facilities!!!
Our nation and indeed the world desperately needs to cease use of fossil fuels and move toward cleaner, more sustainable energy sources in order to fight against climate change and the fragile ecosystem. Continuing to pour money into infrastructure supporting gas & oil use is totally counter to wise resource management.
I also want the existing terminals to immediately take action to ensure seismic resilience in the light of predicted earthquakes. Lessons must be learned from the recent derailing of fuel cargo along the Willamette valley. Our environment is precious and needs protection as does the human population.

Name: Beth Levin

Email: bethagl@yahoo.com

Comment:

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Ban fossil fuel terminal

Name: Laney Kibel
Email: laneykibel@hotmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
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Sincerely,

Laney Kibel

188142

Name: Desiree Tullos
Email: desiree.tullos@gmail.com

Comment:

I am writing to strong urge the City of Portland to immediately establish smart regulations to limit the use of fossil fuels, including:

– A full ban on new bulk fossil fuel terminals
– Limitations on expansions at existing facilities
– Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Thank you for the opportunity to provide comment on this critical issue.

Warm regards,
Desiree Tullos

Name: Tracy Farwell
Email: farwellt@msn.com

Comment:

Although I'm curious how you perverted the mandate you were given, I really don't want to know what you think you are paid to do. This is what I pay for:

1. A full ban on new bulk fossil fuel terminals.
2. Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.
3. No expansions at existing facilities, unless meeting same provisions required for existing fossil fuel terminals: upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

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Name: Merna Blagg
Email: nerb3sons@yahoo.com

Comment:

Please honor the plain language of the City's resolution and prohibit the expansion of fossil fuel terminals and infrastructure that would not directly serve the regional market.

Name: Douglas Kinnaird
Email: aquadoug@usa.net

Comment:

Bringing fossil fuels through the Columbia River Gorge and into our city of Portland is dangerous to our environment and human health and safety now, as well as contributing to the extreme and growing dangers it portends for future generations. Stop this! No new terminals, no expansion of existing facilities, and make the existing facilities safe against the major geologic shifts that scientists say could happen at any time in the near future.

Name: Susan Christenson
Email: sue2hawaii@gmail.som

Comment:

Dear Mayor and City of Portland Council,

The last time I attended your vote on fossil fuel terminals in your court, I was proud to see you in action taking the word of the people to heart, listening to what they had to say, and agreeing with the children for the need to ban fossil fuel terminals. I hope you have the same courage and insight to continue your determination to make this a safer place for Oregonians.

I would like to see...

A full ban on new bulk fossil fuel terminals

Limitations on expansions at existing facilities

Provisions that require existing fossil fuel terminals make

upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

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I have now completed my basic CERT (Community Emergency Response Team) training, am working on the plans for the September 17, 2016 West Coast Emergency Drill, and have complete confidence that you will support these restrictions to save the City of Portland and its people in the surrounding communities.

We are making plans to support you, and I have faith that you will continue to support us with the full ban on fossil fuel terminals that would completely destroy what Oregonians have built since the late 1800s.

Thank you for considering this support for us all.

Sincerely,

Susan Christenson
15655 SW 114 Court Unit 14
Tigard OR 97224
503 701-9657

PS I live 12 miles from the blast zone if this terminal is completed. According to Sierra Club materials, the blast zone goes out 14 miles!

Name: Kima Garrison
Email: kimasuegarrison@gmail.com

Comment:

This message is simple and to the point—I, as a native Portlander, want to see a full BAN on all new and expanded fossil fuel terminals....As a city, Portland usually leads the way on environmental issues, and this should be no exception!

Name: Stephen Couche
Email: steveco1948@comcast.net

Comment:

We need to be getting off our addiction to fossil fuels! Which if we commit to that means no more infrastructure for fossil fuels!

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Name: Larry Hon
Email: lhonharpster55@yahoo.com

Comment:

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Sincerely,

Larry Hon

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Name: John Nettleton
Email: jpn5710@yahoo.com

Comment:

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2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Sandra Hill
Email: sandhill-13@comcast.net

188142

Comment:

Please – we need a full ban on new and expanded fossil fuel terminals.
Did you not notice the response from the public on this????

Name: Hilary Thompson
Email: h.d42011@yahoo.com

Comment:

As a citizen of Portland, I demand our voices heard and respected. I vote for a Full ban on fossil fuel terminals, strict limits on expansion of existing plants, and a serious community protection act to make upgrades for seismic resilience.

Name: Amanda Yampolsky
Email: amandakateyampolsky@me.com

Comment:

I am learning about Vancouver,BC and their plans to have all their city infrastructure fossil fuel free. We can and should follow in these footsteps. Therefore expanding existings fossil fuel infrastructure is the wrong direction, but banning bulk storage facilities is the right direction. I am counting on you to recognize that now is the time to take actions to ban new fossil fuel infrastructure and limit the expansion of existing infrastructure. And finally it is time to maintain and upgrade the facilities that do already exist.
You can regulate wisely for a transformed energy system.
Amanda Yampolsky

Name: Duncan Baruch
Email: c25cle@gmail.com

Comment:

Do not retreat from or compromise the will of the people of Portland. We require:
A full ban on any new bulk fossil fuel terminals, limitations as most — better a ban — on expansions at existing facilities, and requiring that existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

188142

Name: Tina Kolpakowski
Email: tinaisis@gmail.com

Comment:

To the Bureau of Planning and Sustainability-
I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

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It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Tina Kolpakowski

Name: Janice Clark
Email: janicerclark@gmail.com

Comment:

We need a ban on new fossil fuel terminals and limits of expansion at existing facilities. Upgrading for earthquake safety is also necessary. Some facilities are in such risky places that they should be moved or be much better secured.
I am concerned that we still have such an emphasis on fossil fuels when we have other sustainable options. The threat to our environment of these fuels is real and becoming more and more obvious.

Name: Jill Riebesehl
Email: riebes@gmail.com

Comment:

The City Council passed a ban on new bulk fossil fuel terminals. That should be honored, as well as placing limitations on expansions at existing facilities.
Also, we need provisions that require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Name: Joy Jaquillard
Email: decker02@nwlink.com

Comment:

Portland should join the jurisdictions that are banning new or

expanded oil, gas, and coal terminals and other infrastructure. Fossil fuel terminals present the potential for great harm to the environment and our citizens. Allowing them here allows the owners and backers to profit at our expense. It's time to stop allowing corporate interests to externalize costs.

188142

The discussion draft does not live up to the 2015 Fossil Fuel Amendment. We need:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Name: John Thiemeyer
Email: jaythiemeyer@yahoo.com

Comment:

The bureau of planning and sustainability must represent the will and the best interests of the people of greater Portland. Saying one thing in November, then doing the opposite in July won't be tolerated. Though you are not elected, you will be held to account. Ultimately, you answer to the people. You are in the frontline to stop our dependency on fossil fuels and that industry's destruction of our planet.

Name: Mary McGaughey
Email: marymcgaughey@yahoo.com

Comment:

Oregon has voted to support clean energy during this 2016 legislative session. Sending oil energy around the world does nothing to support world wide clean energy initiative. We are doing this to even our terrible trade deficit. A polluted planet, beyond recovery, will definitely not support trade or life.....a dead planet is not a wise investment. Please divest from GREED before it is too late!

Name: Carleen Wuitschick
Email: cdwuitschick@hotmail.com

188142

Comment:

No oil or coal trains in Oregon or Washinton.

Name: Katherine Anne Stansbury
Email: kathycallaway@whiz.to

Comment:

I expect the Bureau of Planning and Sustainability to draft and implement:
1 – A full ban on new bulk fossil fuel terminals.
2 – Limitations on expansions at existing facilities.
3 – Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.
We are watching this issue closely and expect the rules to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."
Thank you for a better effort on this matter,
Katherine Stansbury, Portland

Name: Dolores Wood
Email: pgna_greening@yahoo.com

Comment:

The use of fossil fuel literally leads to a dead end. No new fossil fuel facilities should be built, and existing ones must be fazed out as soon as possible. For a viable future clean green energy must be made available to replace fossil fuels.
I advocate for a full ban on new fossil fuel facilities, and no expanded fossil fuel terminals.

Name: Diana Oxley
Email: dianaoxley@gmail.com

Comment:

188142

Dear BPS,
Regarding Portland's policy for transportation and storage of fossil fuels, I am writing to urge that plans make provision for the seismic resilience of all fossil fuel infrastructure.

Name: Christine Hart
Email: christine.el.hart@gmail.com

Comment:

A full ban on new bulk fossil fuel terminals
Limitations on expansions at existing facilities
Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Name: Rose Christopherson
Email: rose.christopherson@comcast.net

Comment:

Please, please, no more new bulk oil terminals. You know that these fuels need to be kept in the ground. It is our duty as a port city to keep them from being put on ships and sent overseas. No matter where they are burned, they will contribute CO2 to the atmosphere that will enhance warming of our beautiful planet.

Name: Rob Lee
Email: roblee43@gmail.com

Comment:

We need a full ban on bulk fossil fuel terminals in Portland, and serious limitations on expanding existing facilities, as well as seismic upgrades to current facilities. It's laughable public policy to have 90% of Oregon's petroleum supplies located in one earthquake prone place. Do you work for energy companies or the citizens of Portland?

188142

Name: Lynda Byers
Email: lebyers484@gmail.com

Comment:

City of Porland: As a citizen concerned about environment and health of our community, there must be a complete BAN on any new fossil fuel facilities and limitations on expansions of current ones. Think about earthquakes and global warming!

Name: James Newcomer
Email: jnewcomer@spiretech.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

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It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

188142

Sincerely,

James R Newcomer

Name: Anne Hamburg
Email: akaseyh@yahoo.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

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It is vital that the city strengthen the current draft of the fossil fuel

code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year. Let Portland be a leader and a healthy future for our country.

188142

Sincerely,

Name: Lynda Byers
Email: lebyers484@gmail.com

Comment:

City of Porland: As a citizen concerned about environment and health of our community, there must be a complete BAN on any new fossil fuel facilities and limitations on expansions of current ones. Think about earthquakes and global warming!

Name: Deborah Einbender
Email: pursona@teleport.com

Comment:

Nothing less than a full ban on fossil fuel terminals is acceptable including limitations on existing terminals. Seismic upgrades are essential. Do the right thing for our future generations.

Name: Richard Houle
Email: houle5@comcast.net

Comment:

As a community and a collection of responsible citizens, it is incumbent upon us to recognize that the decisions we make now regarding expansion of fossil fuels and its infrastructure will dramatically affect future generations not only in our immediate vicinity, but throughout the world. Citizens here in the Pacific Northwest, and myself included do not want to add to the problem of global warming and climate change. Supporting the fossil fuel industry over renewable energy does exactly that, and it's flat out bad policy. Therefore, I do not support any expansion of existing fossil fuel infrastructure and certainly see no

justification for building new terminals. Please do right by us.

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Name: Michael Mitchell
Email: iceink1@gmail.com

Comment:

In favor of a full ban on new bulk fossil fuel terminals with limitations on expansions at existing facilities along with provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Name: Jennifer Darling
Email: contrabandcuisine@frontier.com

Comment:

Having grown up in Portland, and now raising my kiddo here, the health of the air, water and soils are incredibly important to me. But now we live in an era where we also need to take into account global climate patterns and changes. The only rational course of action is to fully ban all building of fossil fuel infrastructure, both new and expanded terminals. There are so many immediate threats to human and ecological life as well as extended threats to dependence on the crumbling, antiquated fossil fuel industry. Resilience equals diversifying OUT of fossil fuels. Survival equals leaving fossil fuel dependence as soon as possible.

Name: Hal Anthony
Email: threepines@jeffnet.org

Comment:

Dear Portland, City of:

There are virtually zero safety measures required for oil depots for incidence like earthquakes. This needs to be addressed, ASAP, for existing plants, as we are quite overdue for a major

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NW seismic event, to mention one region.

Also, if future energy decisions, and all decisions by all people for that matter, are not made on the definitive side of "sustainable", then "adults" will continue to prove their hatred for children – period. Fact.

Think about it – all children are the most important beings on the planet. They MUST be protected sustainably and well so they can bail us out of our tragic and deadly human errors. "Sustainable" means "permanency", and it is the only path that can continue human viability.

Name: Pennelloppe Allee
Email: pennelloppe99@yahoo.com

Comment:

We should be urgently transitioning to clean energy sources and only investing in those. Expanding fossil fuel terminals is exactly the wrong course and an incredible waste of money. The sooner we wean ourselves from fossil fuel dependency, the better off we will be, environmentally and financially.

Name: Joe Chasse
Email: joetruck@gmail.com

Comment:

This is a great opportunity for Oregon and Washington to stand up to the coal and oil big shots. Citizens take all the risk. The corporations (they are not people) take all the profits. This is NOT a good scenario.

Name: Meredith Cocks
Email: meredithlcocks@gmail.com

Comment:

I was very disappointed to learn that the BPS's recent draft Fossil Fuel Terminal Zoning Amendments backtracked on the

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language passed by City Council in November. The City Council passed a resolution clearly outlining that no new fossil fuel infrastructure should exist in the city, nor should existing infrastructure be expanded. This was groundbreaking and the city rightly received accolades and national media attention. Was this just for show? Now that you have received the credit for taking a tough stance for clean air and climate justice, you are willing to contradict what the people and city leaders asked? This is not only upsetting to me as someone who has lived in the city for a decade and fought hard to make Oregon a more healthy place to live, it is dishonest on the part of the BPS and city leaders to go against their word.

Please do what you said you would do and put a full ban on new bulk fossil fuel terminals and limit expansions on existing facilities. Please require existing fossil fuel terminals to upgrade for seismic resilience to protect our community. In a world where business rules all these seem radical, but these are nothing more than common sense approaches to address the severity and reality of climate change. And here in the Northwest, the impact (35% chance in the next 50 years) of a devastating earthquake. Furthermore, given recent revelations about problems with air quality in Portland neighborhoods, including several I have lived in, and lead in PPS water, the city needs to start taking seriously the risk industry poses to our health, not just offer us lip service while poisoning our children.

Failing to create strong and meaningful regulations that ban new bulk fossil fuel infrastructure and limit expansion of existing would be a missed opportunity for the city to take real leadership and establish a true green legacy.

Thank you for considering my comments. I am sure you will do the right thing.

Name: Gar Tuyls
Email: garebear1946@gmail.com

Comment:

Please undertake a full ban of new fossil fuel infrastructure, in

188142

particular oil, gas, and coal terminals in Portland. The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.
These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!
It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

cheers, Gar

Name: Michael Linehan
Email: mikealin48@gmail.com

Comment:

The US does not need to export any raw materials, especially dirty energy sources. Exporting raw materials does not create jobs it destroys them. It turns us into a third world country. Transporting fossil fuels is dangerous and bad for the environment. The recent incident in Columbia Gorge should be a

lesson. We can create more jobs and have a better , healthier, and cleaner future by developing clean alternatives and eventually eliminating the use of fossil fuels. CLIMATE CHANGE IS REAL. It is killing the planet.

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Name: Jadene Fourman
Email: jmayla4@gmail.com

Comment:

I'm writing to support a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

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It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

188142

Name: Carol Gonzalez
Email: carolgonzalez@frontier.com

Comment:

First of all, thank you for your work and commitment to the City of Portland, its residents and the residents for generations to come, and for putting and keeping Portland on the national and international map as a beacon of forward-thinking planning, sustainability and principled actions.
I am adding my voice to reinforce the public demand for a full ban on any new bulk fossil fuel terminals, that there be severe limitations to expanding existing facilities,and that it be mandatory for the existing fossil fuel terminals to make seismic upgrades commensurate with the large-scale seismic activity predicted with 99% certainty to occur within the foreseeable future.
Thank you.

Name: Grace Weinstein
Email: graced4today@comcast.net

Comment:

You must keep the promise made in November to ban all new bulk fuel fossil fuel terminals. If your actions are weak, we will know the consequences — and there will surely be consequences–before long. The future is in your hands. Strong leadership and strong commitments will begin a process of restraining the collapse of our environment. Do not give in to the moneyed interests. We hold you responsible.

Name: Laura Gamse
Email: lauragamse@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil,

gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

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I support:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Laura

Name: Kelly McConnell
Email: prvt@2ezgroup.com

Comment:

I want CLEAN air and water and I'm damned tired of begging for them. Corporate profits DO NOT trump human health or the viability of our planet. STOP selling us out to the greedy fucking

rich!

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Name: Melanie Plaut
Email: melanie.plaut@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
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These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Melanie Plaut MD

Name: Sandy Polishuk
Email: sandypolishuk@gmail.com

Comment:

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Dear City Council,
When you passed the resolution last fall we truly believed you were committing to no expansion of fossil fuel infrastructure in our city. When I look at the draft, I see ideas that don't seem to be doing that.
We all know fossil fuels are on their way out so it makes no sense to be making investments in new infrastructure for it. That's why I thought it was so smart of you to pass the new policy. The investment in new infrastructure must be on clean energy, renewable energy. We must follow thru on the commitment to the new renewable economy. Please make sure the rules for implementing this resolution does this.
We need a complete ban on any new fossil fuel terminals.
We need limits on expansion of existing fossil fuel terminals.
And we very much need to feel safe in our city,that the fossil fuel storage at the existing terminals are seismically safe when the big one comes. Please make sure these terminals must seismically upgrade.
Thank you

Name: Peggy Ellis
Email: peggy.ellis1623@gmail.com

Comment:

The Fossil Fuel Terminal Zoning Amendments discussion draft is not what the original resolution
intended. In fact, the draft is just about opposite the original intention. Here's what it should include: 1) a full ban on new fossil fuel infrastructure
2) strong limits on expanding existing fossil fuel structures
3)requirements that existing fossil fuel facilities add seismic safety features to protect Portland citizens. It is extremely important that the city strengthen the draft to reflect the original intentions that I and thousands of other Portland citizens supported last year. Thank you, Peggy Ellis

Name: Shelley Baxter
Email: shelldolphin@gmail.com

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Comment:

We need to transition to safer cleaner fuels. I live in the gorge and live every day in dread as the oil trains rumble by.

Name: Jerry Smith, MSW
Email: digjerrydig@gmail.com

Comment:

No fossil fuel transport through Oregon. It is dangerous to Oregonians; and burning fossil fuels is the greatest danger to our planet.

Name: Marilyn Marcus
Email: shefa97405@yahoo.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
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2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow

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our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely

Name: Dave King
Email: landd_2@dog.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

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I want:
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2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

It is crucial to make the workers in these terminals whole by providing income and education preferably to work in new clean energy jobs as their old jobs disappear.

Name: Daniel L Brunner

Email: daniel.l.brunner@gmail.com

188142

Comment:

As someone who lives in the Kenton neighborhood of north Portland, and as an evangelical Christian committed to the care of the Earth, I am respectfully asking the City of Portland for:

1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Name: Rev. Mary Sue Evers
Email: pastor@chucc.org

Comment:

I'm writing to encourage you to implement the full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland that you previously committed to.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.1. A full ban on new bulk fossil fuel terminals
2. Limitations on expansions at existing facilities
3. Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

I was just up in eastern Washington and saw train after train after long train carrying coal and oil, destined for the gorge and after that, Portland and Vancouver. We skirted disaster in Morrow but we were very lucky. It is only a matter of time before our luck runs out. Further, all of this oil and coal contributes to the global load of climate change, and we have a wonderful opportunity to be on the front lines of keeping these fossil fuels out of the atmosphere.

I implore you to stand fast to the commitments you made in 2015.

188142

Name: Laura Stoops
Email: lstoops79@yahoo.com

Comment:

To be responsible citizens and politicians, We all need to come together and a say no to profits f from the fossil fuel industry. These fossil fuel terminals and trains endanger 96th lives and the beautiful city we live in and love. It's time to put all our focus into renewable and sustainable energy and stop supporting the fossil fuel industry. We need a full ban on new bill fossil fuel terminals and limitations on expansions.

Name: emmer holbrook
Email: maehah@comcast.net

Comment:

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. That resolution was bold, visionary, and historic; this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.
DON"T CAVE IN!!
We need:
1 – A full ban on new bulk terminals
2 – No expansions at existing facilities
3 – To require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of all METRO communities and the Willamette River.
The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!!
Portland must strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that tens of thousands of Portlanders supported last year.

188142

Name: Breanna Lundvall
Email: breanna.lundvall@gmail.com

Comment:

Hello fellow Portlanders! (who also love their home, right?)

Here is what I want, as well as many of my fellow neighbors:

A full ban on new bulk fossil fuel terminals, FULL. A limit on expansions of current structures. I would prefer NO expansions whatsoever.

This draft no where near honors the Fossil Fuel Resolution made last year. I attending that hearing. This does not make me feel safe, and it definitely does not honor Portlanders' health and safety.

Especially after the oil train explosion that somewhat recently happened in the Gorge, it is clearly urgent that we keep oil, coal, and gas out of here as quick as possible before more people and the environment are harmed.

Sincerely,

Breanna Lundvall

Name: Vesta McGee
Email: vstmcgee@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make

upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

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These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Vesta McGee

Name: Matt Phillips
Email: fireball.inferno@gmail.com

Comment:

Our city has made strong commitments in the past to reduce its reliance on fossil fuels and to help prevent catastrophic climate change.

It seems like current decision-making is trying to reverse decisions made in the last year to ban new fossil fuel terminals, which is unacceptable. Climate change is real and due in large part to actions we can control.

We need to reduce fossil fuel support, financing and use across the board. The City of Portland needs to support every possible path for this to happen. There will have to be compromises to our way of life if we want a planet worth living on for all the world's children.

Name: Harry Kershner
Email: harrykershner@msn.com

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Comment:

You must enact:
A full ban on new bulk fossil fuel terminals
Limitations on expansions at existing facilities
Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Name: Stuart Sandler
Email: s2wes@spiritone.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland

needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

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It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Stuart Sandler
Jeanne Bevis

Name: Jan Madill
Email: jan@janmadill.com

Comment:

Please, no new terminals or expansions of existing ones!

Name: Ellen Rubinstein
Email: ellen.rubinstein@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

Specifically, I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public

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safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Dayna Jones
Email: daynalouise2275@yahoo.com

Comment:

Any investment that is done in energy infrastructure in Portland needs to be an investment in renewable energy. We can't say we are adhering to a Climate Action Plan with integrity while simultaneously allowing for expansion of existing fossil fuel terminals. There are jobs in clean energy and Portland has the chance to be a leading city in modeling a just transition. The Pacific Northwest has already begun to feel the effects of climate change and it is inevitably only going to get worse. We must do our part, even more than our part when we can, to stop the unsustainable and toxic practice of fossil fuel reliance. Now is the time for the City of Portland to embrace the science of climate change and discontinue it's contributions toward it. The water, air, soil, and health of Portland's residents have all been placed in jeopardy due to a lack of industry regulation and it is the moral imperative of all decision makers to place people over industry profits.

Name: Lee Schmidt

Email: leeschmidt1938@gmail.com

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Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Name: Christy Kelley
Email: christyckelley@yahoo.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil,

gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

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I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Maya Jarrad
Email: maya@350pdx.org

Comment:

Dear Portland Bureau of Planning and Sustainability,

As an environmental economist and young adult, the project that most gives me hope for my future is Portland's Fossil Fuel

Resolution. The Resolution acknowledges the risks of investments in fossil fuel infrastructure to a greater extent than I have seen in any other policy document, and I am proud to live in Portland as a result of this.

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However, I feel that the draft zoning code amendments do not fully apply the Resolution. It is important to apply the Resolution as fully as possible by including language addressing these three points:
1. A full ban on new bulk fossil fuel terminals
2. Limitations on expansions at existing facilities
3. Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

It is vital that the suggested draft BPS submits to City Council address these three points in addition to the existing draft amendments.

Name: Paul Spindel
Email: pspindel@msn.com

Comment:

Live up to the commitments made earlier this year in City Hall.
No new fossil fuel terminals or expanded existing fossil fuel terminals.
Keep it in the ground

Name: Nancy Pfeiler
Email: nancypfeiler6@gmail.com

Comment:

I live in Salem. I need you to go forward in this issue as an example to the rest of us. Thank you for your efforts.
I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and

historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

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I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Cody Tucker
Email: cctucker5@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.
4 – Investment in sustainably sourced renewable energy like solar and wind

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These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. If the earthquake were to come tomorrow the entirety of the Willamette-Columbia delta will become a dead zone, an environmetal catastrophe. As a citizens of Portland we depend on the health of our environment.

The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year, not do the exact opposite.

Portland needs to remain the example of sustainable development in the United States. Expanding fossil fuel infrastructure will lead the city down a path much like every other American city. You need to do as the citizens asked, that is your job. We want a city that will lead not only Oregon, but America into a future that reallys on sustainable renewable energy sources that do not cause irreversible damage to future generations. Think of the future, the long term, not short term profits.

Sincerely,

Cody Tucker

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Name: Lynn Youngbar
Email: lynn@lynnyoungbar.com

Comment:

Dear City Council,
Last year when you passed the resolution ban on new fossil fuel facilities, I was in the audience supporting your audacious move. Now you need to complete what you started. I understand from 350PDX that your Zoning Amendment discussion draft falls far short of the resolution. Please don't let this happen. We need a full ban on new bulk terminals, good strong limitations on existing facilities and provisions for existing terminals to retrofit for seismic resilience to protect our communities.

In addition, any new regulations that can decrease our carbon footprint would be welcome.
Sincerely, Lynn Youngbar

Name: Turner Masland
Email: turner.masland@gmail.com

Comment:

For the sake of future generations and for the safety of our current community, we need a full ban on new and expanded fossil fuel terminals

Name: P Anna Johnson
Email: aj@mercedlake.com

Comment:

A full ban on new bulk fossil fuel terminals
Limitations on expansions at existing facilities
Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Name: Lynn Hager
Email: lhager@pdx.edu

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Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

IT WOULD BE NICE IF THE MAYOR WOULD UPHOLD AT LEAST SOME OF HIS PROMISES BEFORE HE LEAVES OFFICE!!

Sincerely,
Lynn Hager

Name: Christine Taylor
Email: litasberrypatch@gmail.com

Comment:

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I am writing to urge that you enact a full ban on new fossil fuel terminals and that you strengthen limitations on any expansions at existing facilities. In addition, I ask that you require existing fossil fuel terminals to make seismic upgrades.

I believe that it is essential that our city strengthen the present draft of the fossil fuel code to bring it into alignment with the intent of the original resolution that was so broadly supported by Portlanders last year.

As a retired Public Health Nurse and grandmother of children growing up here in Portland, I am deeply concerned about the health risks posed by fossil fuel transportation through and terminals in the communities where we live. I urge you to put public safety before financial gains / profits for fossil fuel companies.

Sincerely,
Christine Taylor

Name: Deva Sunya
Email: dragon@350pdx.org

Comment:

Climate change is happening faster even than the scientific communities worst case scenarios from just a few years ago. It is no exaggeration to say it is a planetary emergency. I find it really frustrating how city officials, planners, and business people all just keep acting as if climate change is not real. I'm sure the point will come when many people will be ashamed of their inaction. Will it be too late by then?

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was

passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

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Sincerely,
Deva

Name: tricia zigrang
Email: tazigrang@yahoo.com

Comment:

We should not be allowing infrastructure that supports fossil fuel. This will only slow our transition to clean energy. Please stand up to the fossil fuel industry and enforce a FULL BAN on new bulk fossil fuel terminals. We also want to see strict limitations of expansions at existing facilities. It is imperitive that existing terminals receive seismic upgrades.

Name: carolyn partridge
Email: carpart97405@yahoo.com

Comment:

What happened to the resolution passed last November? I want a full ban on new and expanded fossil fuel terminals. Oil is dirty and there are many chances for leaks and spills, especially considering our location in the Cascadia Subduction Zone. More importantly, we should be moving rapidly AWAY from fossil fuels due to global heating. Future lives matter. Thank you.

Name: mary lane
Email: ryla2015@gmail.com

Comment:

To whom this concerns:
As a citizen of Portland, I expect a full ban on new fossil fuel terminals.
I also expect no expansion on existing facilities. Further, I expect

seismic upgrades to all existing fossil fuel terminals.
Sincerely,
Mary T. Lane

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Name: Anais Tuepker
Email: anaistuepker@yahoo.com

Comment:

Dear Bureau of Planning and Sustainability,

Last fall, the Portland City Council took a strong and beautiful step towards a clean energy future when it voted to ban new fossil fuel terminals and set limits on expansions at existing facilities. Don't betray that moment, or the desires of the people of Portland, by implementing rules that will not enforce the strong intentions of the Council. Pleas ensure that implemented rules will enforce:
– A full ban on new bulk fossil fuel terminals;
– Limitations on expansions at existing facilities; and
– Required seismic safety upgrades for existing fossil fuel terminals.

We are truly at a moment where we cannot afford to delay a strong, rapid, transition off of fossil fuels. For the safety of our communities, and the health and well-being of our entire planetary ecosystem, please step up and do your part by crafting a strong and meaningful ban that means what the name implies: no new fossil fuel terminals. Thank you.

Name: Susan Watt
Email: susniam@gmail.com

Comment:

City of Portland Bureau of Planning & Sustainability,
Please honor the intent of the Fossil Fuel Policy adopted by the City of Portland. The amendment should require a full ban on new bulk fossil fuel terminals and impose limitations on expansions of existing facilities. You should also require existing fossil fuel terminals make upgrades for seismic resilience to

protect the health of the river and communities. Being a nearby Linnton resident, I am very concerned about the outcome of a major earthquake and the potential disaster from leaking and/or exploding tanks. Please honor the Fossil Fuel Ban!
Thanks, Susan Watt

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Name: Melba Dlugonski
Email: melbajde@hotmail.com

Comment:

Funny, I thought last year you guys were taking a stand I could be proud of. You were just teasing? Please, show us the leadership we hoped we could count on. New or expanded infrastructure is a vote for burning up the earth. Time is up.
Thank you.

Name: Theodora Tsongas
Email: ttsongas@gmail.com

Comment:

To the City of Portland Bureau of Planning and Sustainability
Re: Proposed draft Fossil Fuel Terminal Zoning Amendments

The discussion draft indicates that you apparently did not read the fossil fuel resolution passed by the city council. Your draft proposes the following: " The Fossil Fuel Terminal Zoning Amendments project would restrict the development of large new Bulk Fossil Fuel Terminals, while providing for expansion at existing terminals and moderately sized new terminal development to accommodate the fuel needs of the region's growing population." This is unnacceptable. You have managed to reverse the intent of the resolution to allow the expansion of fossil fuel infrastructure! This is unconscionable! You are ignoring the people of this city who have passed this resolution and who also are taxpayers who pay your salaries. You are not listening to the will of the people of this city. Go back and correct this mess.
We want a FULL BAN on new bulk fossil fuel terminals. We want NO expansion at existing facilities except for health and safety

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upgrades. We want requirements that existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River. We definitelty do NOT want expansion of existing fossil fuel facilities or any new facilities to "accomodate the regions' growing population". We must address these needs with expansion of sustainable clean sources of energy, not fossil fuels and not nuclear power. This is the point of the resolution: to address climate change NOW. Please read and remember all the whereas statements in the resolution so you will understand why this is necessary to the survival of our city, and the planet. You have an opportunity to be leaders. Please don't waste the chance to do something historical.
Sincerely,
Theodora Tsongas, PhD, MS

Name: Ellen Mendoza
Email: ellenmendoza_lido@yahoo.com

Comment:

Hi City of Portland,
You are my city, I have lived here for 30 years and I want to go living here. I don't want any new fossil fuel infrastructure and I want what is already here to be safe from earthquakes, and rising water levels. You should keep your pledge to have no more fuel terminals, storage, or refining of coal, oil, or gas.

Commit to 100% Renewable Energy in Portland by 2035. Do not give in to the Fossil Fuel Companies and the Railroads.
Thank you, ellen

Name: Mary Forst
Email: mcforst@igc.org

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was

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passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

I live on a houseboat on Sauvie Island, downstream from the Critical Infrastructure Hub where 90% of Oregon's fossil fuels are stored, in aging buildings built on fill land, which will not survive an earthquake. We are particularly aware of these dangers which should be mitigated.

Sincerely,
Mary Forst

Name: Bobbee Murr
Email: bobbeemurr@gmail.com

Comment:

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Keep the sustainability in your bureau's title real: No new facilities and no expansions of existing ones. Help break our addiction to all fossil fuels. We can do it.

Name: Bernadette Rodgers
Email: bernadetterodgers350@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland. This is what we fought for last year and what was approved unanimously by the City Council with the Fossil Fuel Infrastructure Ban Resolution in 2015.

It is disturbing that the Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the intent of that resolution! Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders. Exactly the OPPOSITE of the point of the resolution!!

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

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It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: BEVERLY BURKE
Email: bevburke@comcast.net

Comment:

When the earths resources are gone they are gone. Resource destruction is the result of overuse and lack of care and maintenance. The first is senselessness, or stupidity and the last is laziness and stupidity. Capital profits don't change these basic facts. Hoarding capital or helping the destructive corporations to do so is a short term strategy that kicks the problem into the future for generations, Please be a part of the solution, not the problem

Name: Helen Hays
Email: hlhays@ccgmail.net

Comment:

The City of Portland's Bureau of Planning and Sustainability should support a full ban of new bulk fossil fuel terminals. There should be limitations on expansions at existing facilities as well. Finally, provisions should be made that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Name: teresa mcgrath
Email: bone1953@msn.com

Comment:

renewables are the only logical action

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Name: Adriana Escobedo-Land
Email: landified@hotmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Adriana Escobedo-Land

Name: Ruth Gundle
Email: ruth.gundle@icloud.com

Comment:

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We want:
A full ban on new bulk fossil fuel terminals.
Limitations on expansions at existing facilities.
Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Name: Deena Grossman
Email: deenatgrossman@gmail.com

Comment:

Dear Portland Bureau of Planning and Sustainability Members,

Please implement a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

We need:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their

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safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely yours,
Deena T. Grossman, PPS Teacher

Name: Jeanne Alberts
Email: jeanne.alberts@gmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

I want:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

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Sincerely,

Jeanne Miller Alberts

Name: Kristin Gross
Email: hazypictures@gmail.com

Comment:

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Sincerely,

Kristin Gross

Name: Inga Fisher Williams
Email: iingafw@gmail.com

Comment:

July 27, 2016

Inga Fisher Williams
2824 NE Cesar Chavez Blvd.
Portland, Oregon 97212

COMMENTS to Bureau of Planning and Sustainability
re Fossil Fuel Terminal Zoning Amendments discussion draft, 2016

CC. Mayor Hales
Commissioners, Fish, Fritz, Saltzman, Novick

I> the following points are specific language changes / additions to the DRAFT

A. In section 1. INTRODUCTION on Climate Change include explicitly the language of the Nov ember 2015, Portland City Council adopted Resolution 37168 calling for opposition to expansion of fossil fuel infrastructure.
> ADD: exact language of resolution as policy direction.

B. In PROJECT SCOPE AND TIMING, what is the project that is referred to with this sentence: "This project is proposing a prompt, focused response to these market changes". Why limit the response to market changes?
>ADD : among factors show that public acceptance has changed [not merely market forces] as a result of climate change considerations post Paris. Numerous resolutions by Gorge communities opposing expansion of coal, oil propane delivering trains to feed export facilities [for inventory see Columbia River Keepers]

C. Make the project list in FIGURE 2 comprehensive to show WHEN these projects were proposed and their CURRENT STATUS. In addition, include also all those projects which are no longer being considered {withdrawn; not permitted; etc. as your reports states in other section , see 2nd sentence under GROWTH OPPORTUNITIES IN FOSSIL FUEL DISTRIBUTION] > MODIFY TABLE in Figure 2. Accordingly

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D. In section 3 PUBLIC AND STAKEHOLDER INVOLVEMENT, in paragraph What have we heard?
>ADD participation from multiple tribes in the Columbia River region.

E. Throughout the document the phrase "regional demand' is used.
>ADD definition to show that 'regional' means Portland, Oregon and SW Washington.

F. Members of the Oregon Congressional delegation have called for cessation of Baaken crude shipments till safety of the rail traffic is addressed.
>ADD to section 4 Oil Train Accidents the increasing public awareness re substantial risks {Spokane city tax proposal; Vancouver City Council resolution, etc.

II> The following points are broad policy criteria for structuring the draft to make it consistent with policy direction of resolution and change in public acceptance of expanded fossil fuel delivery means in view of shifts post PARIS on climate change actions by local jurisdictions:

The proposed draft should be so structured as to include:
1. A full ban on new bulk fossil fuel terminals
2. More conservative Limitations on expansions at existing facilities
3. Provisions that require [at any license review or permit request to City] from existing fossil fuel terminals to make upgrades for seismic resilience as a condition of approval in order to protect the health and safety of neighboring communities and the Willamette River,

Name: Robert Heydenreich
Email: bobheyden@gmail.com

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Comment:

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It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely, Robert Heydenreich

Name: JILL JAMES
Email: jillpdx747@gmail.com

Comment:

We have a chance to make a difference in our city and in our world – so find the courage to make it so!

188142

FULLY BAN any new fossil fuel terminals!
FULLY BAN expanding present fossil fuel terminals!
REQUIRE upgrades to existing fossil fuel terminals – including seismic resilience – and any other upgrades that will protect our people, our land, and our rivers!

Name: M. Andre
Email: andme@teleport.com

Comment:

want:
I am writing to express my strong opposition to the recently published Fossil Fuel Terminal Zoning Amendments discussion draft allowing for a new bulk fossil fuel terminal to be built and already existing ones to expand.

This is exactly what would be so detrimental to our community, and to the environment! I urge you to withdraw this proposal and instead use your leadership to insist on the following crucial moves to address these urgent threats to both the environment and to public safety" :

1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

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Sincerely,
M.E. Andre

Name: Sascha Krader

Email: hungrytiger@gmail.com

Comment:

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The fossil fuel infrastructure ban that was passed by the City Council was historic. It was a beautiful day and people were crying in City Hall. Now I hear that you have written the code so that the "ban" allows new fossil fuel terminals and allows the expansion of existing infrastructure. This is cynical and not in the spirit of the resolution that was passed.

Please, amend the code to make the ban real: no new terminals, no expansion of existing fossil fuel infrastructure, and upgrades for earthquake resilience.

Thank you.

Name: Daniel Yuhas
Email: daniel.yuhas@gmail.com

Comment:

I was upset to hear that the code of the fossil fuel infrastructure ban doesn't ban new terminals. Please, change the code to actually ban new terminals and expansions of existing terminals. It's the right thing to do. Thank you.

Name: Patricia Zoline
Email: patreezia@hotmail.com

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.
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Sincerely,

Name: Denise Jacobson
Email: dbjacobpdx@gmail.com

Comment:

I was deeply impressed by the Fossil Fuel Policy Resolution passed by the City Council last November. It seemed a definitive, and appropriate way to address a global climate crisis. It promised to "actively oppose expansion of infrastructure" for transporting and storing fossil fuels But now when it comes to drafting code changes to implement policy I see a failure of nerve. It appears that staff have allowed the fossil fuel industry to write the code to allow new crude oil facilities, new LNG facilities, and new gasified fuel tanks based on some estimate of future needs.
I say NO. We need a full ban on new bulk fossil fuel terminals. We need restrictions on the existing infrastructure aimed at

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increasing public health and safety of citizens and our environment–particularly our Willamette River. I should point out that while coal may be prohibited, we also need to assure that any existing oil, LNG, propane or methane facilities meet seismic safety standards. Any new infrastructure must be directed to these requirements, or to new clean fuels.

Name: Steven McGrath
Email: steve@solutions21st.com

Comment:

Please make sure the rules enacted look to the future, not the past. Don't let Mosier be a preview of a much larger disaster in Portland!

The Fossil Fuel Terminal Zoning Amendments discussion draft has fallen far short of the 2015 Fossil Fuel Resolution that was passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

We are asking for:
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Name: Betty and Edgard Abadia
Email: amarone3@gmail.com

Comment:

Fossil fuels corrupt and pollute our planet. The ONLY alternative is alternative fuels!

Name: John Stapp
Email: ethan2033@yahoo.com

Comment:

I support a complete ban on all fossil fuel terminals and limitations on existing ones. Furthermore it is imperative that existing terminals make the appropriate seismic upgrades to insure community safety. To do otherwise is to disincentive the development of alternative energy sources.

John Stapp

Name: Mike Horner
Email: hornervanzant@yahoo.com

Comment:

I am sorry to see that the BPS has drafted Zoning Amendments for Fossil Fuel Terminals that go explicitly against the will of the community and the sense and substance of the Resolution passed last year. It is apparent that the promoters of expanded Fossil Fuel Facilities have managed to influence the Bureau to gain an end run around the Resolution. Reducing these long term facilities is exactly what is needed now and the hardening of the existing ones against seismic damage is the only 'improvement' that should be allowed. The Bureau should reflect the will of the people and the council and remain faithful to the

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Resolutions' intent which was to institute:

*A comprehensive ban on new bulk terminals

*Forbid the expansion of existing facilities

*Harden the existing very vulnerable riverside tank farms and infrastructure against
seismic damage.

The time has come to get serious about reducing Fossil Fuel use and the resolution is a crucial first step on the path to a clean renewable energy future. The Bureau needs to adhere to that vision articulated by the council and the public.

Sincerely,

Mike Horner

Name: lynn merrick
Email: lynn@hevanet.com

Comment:

Even though the "slow cook" makes it hard to feel, the climate crisis is an emergency. It calls for the most far reaching, innovative thinking we can do. Because our country is moving at such a snail's pace, it is up to cities and states to take bold, aggressive action. We simply can not afford the delays. Portland, let's live up to your reputation and the promises you made just a few month's ago! Let's have a full ban on new bulk fossil fuel terminals, and all new infrastructure for oil, gas and coal terminals in Portland.

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I want:
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upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Thank you Portland for doing what's right for you citizens, and leading the way for our nation.

Best,
Lynn Merrick

Name: Joan Walker
Email: jmabwalker@verizon.net

Comment:

I want a full ban of new fossil fuel infrastructure, in particular oil, gas, and coal terminals in Portland.

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Sincerely,
Joan Walker

Name: Eric Johnson
Email: kurtcornell710@yahoo.com

Comment:

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Sincerely,

Name: Nancy Crumpacker
Email: nancycrumpacker@comcast.net

Comment:

I am appalled that the City's Planning and Sustainability Commission draft on land use code for the fossil fuel industry allows new crude facilities up to 21 million gallons, new liquefied natural gas storage up to 7 million gallons and new gas fuels (like propane) storage up to 7 million gallons. In other words, these code changes allow expansion of existing fossil fuel infrastructure.

If the proposed code prohibits coal storage facilities, it should do the same for all fossil fuels – crude, LNG, and propane and methanol.

Proposed code changes should require seismic upgrades and infrastructure for greener alternative fuels.

There is a significant risk of storing and transporting fossils fuels in our city to our public health such as long term heart and lung diseases in children and adults including cancer.

You should abide by the Reolution 37168 adopted Nov,12,2015:
NOW, THEREFORE, BE IT RESOLVED, that the City Council will actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways; and
BE IT FURTHER RESOLVED, that this Resolution does not restrict:
1. improvements in the safety, or efficiency, seismic resilience, or operations of existing infrastructure;

Please address these egregious errors in the code draft.

Thank you for your attention.

Name: Jack Lenehan
Email: jack.lenehan@gmail.com

188142

Comment:

Dear City of Portland,

I was disappointed and angered to learn that the Bureau of Planning and Sustainability recently proposed a zoning draft that allows for the creation and expansion of fossil fuel infrastructure, in direct contravention of the historic resolution passed just last November. This draft must not become law. It will undermine the city's role as a leader in clean energy and sustainability, and it will undermine the public's trust in the city's government. This draft must be replaced with one that provides the following:

1. A full ban on new bulk fossil fuel terminals
2. Limitations on expansions at existing facilities
3. Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

Do the right thing, stand on the right side of history, and scrap this draft.

Sincerely,
Jack

Name: Rev. Katherine Jesch
Email: kathjesch@earthlink.net

Comment:

It surprises me that Portland's Planning and Sustainability Commission proposal for City Code changes is so wimpy! The City's fossil fuel goals and the landmark November 2015 City Council Resolution to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways" is actively celebrated nationally and locally by almost every environmental and climate activist. Why would the PSC walk back from that commitment? Who is calling the shots here?

With regard to the proposed Code changes, I wish to make the following comments:

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1. The proposed Code changes prohibit new coal terminals, but the language must be expanded to include all other fossil fuel terminals as well.

2. Proposed Code changes for existing infrastructure should prohibit upgrades that will support expanded capacity, while they must allow and encourage safety and seismic upgrades. In fact, existing facilities should be required to upgrade for basic safety, though seismic upgrades (in light of what we now know about the Cascadia deep subduction fault) could be phased in over time.

3. Do not accept the fossil fuel companies' claims of increased demand. It is true that consumers will continue to use fossil fuels as long as we allow it. Regardless, we must make plans for a fossil fuel free future so, consistent with State and City policies, the Code should plan for 100 percent renewables by 2035.

4. Portland's Bureau of Emergency Management must be involved in addressing the risks of fossil fuel storage and transport at existing facilities in the North West Industrial Area. These companies cannot be allowed to make up their own plans without the expertise of the City's experts. There is just too much at stake!

I will be following the process for amending the PSC's proposal for the City code, and I plan to attend the public hearing on September 13, 2016. I do sincerely hope you will do the right thing here and revise your proposal to be more consistent with City policy, especially the City Council Resolution on fossil fuel infrastructure.

Name: Connor DeVane
Email: connor@hikethedivide.com

Comment:

So many people worked so hard for the fossil fuel resolution. I personally invested all my free time for weeks helping to spread

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awareness of the hearing, attended the hearing etc. I, as a member of the Portland community, see this as a humongous slap in the face. We are not interested in green wash nominal solutions so that we can Pat ourselves on the backs while we perpetuate the fossil fuel industry's crusade for capital that wrecks our planet, our economy and our health.

I want NO new terminals, as was demanded in the original resolution. I want NO expansion of existing facilities, or at the bare minimum strict limitations. I want existing facilities to upgrade their seismic resilience to help protect our city.

What happened to #citieslead ? Vancouver BC is going 100% renewable. Time to step up our game and put the well-being of Portland's citizens before all else.

Name: Brett Baylor
Email: baylorb@comcast.net

Comment:

The City of Portland, and especially our Bureau of Planning and Sustainability, need to now live up to the Fossil Fuel Resolution passed last fall as I and hundreds of other citizens watched and cheered. With such a short path to worldwide peril, my expectation is that the City of Portland will lead the way forward for other cities throughout the world to plan robust and comprehensive responses to global warming.

Somehow your draft changes in response to this resolution have devolved into something that could quite simply permit just the opposite of the intention of Council.

Please revise your draft to include:
1 – A full ban on new bulk terminals
2 – Stronger limitations on expansions at existing facilities
3 – Provisions to require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River.

Thank you for those changes.

Name: Kathryn Peterson
Email: kitkatmcla@hotmail.com

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Comment:

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It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,

Name: Diane Schauer
Email: schauerbj@comcast.net

188142

Comment:

The citizens of Portland deserve to live in a safe, healthy city. To reach that goal
new fossil fuel bulk terminals and expansions of existing terminals should be banned. Fossil fuels are dangerous under any conditions but particularly in our area, which is experiencing major growth and which is overdue for a significant earthquake.

Name: Tanika McGuire
Email: faie@ymail.com

Comment:

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Sincerely,
Tanika McGuire

Name: Philip Queeley
Email: pqueeley@gmail.com

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188142

Sincerely,
Philip Queeley

Name: Art Lewellan
Email: Lotilivo@gmail.com

Comment:

It seems to me the safest way to get Dakota Bakkan oil and gas to all our coasts and world markets is NOT through the Gorge. Instead, existing pipeline and rail corridors south through Oklahoma to Gulf refineries offers many safety advantages; should reduce demand for off-shore drilling in the Gulf, should build safety upgrades to existing petroleum facilities along the safer route.
It seems to me, Powder River coal CAN be left in the ground while the type of coal used to produce steel remain a vital industry necessary for national security.
It seems to me that electric vehicles (EVs) are safer cars and that plug-in hybrids (PHEVs) offer more potential to reduce CO2 emissions than all-battery (BEVs). PHEVs offer more economic incentives to drive less (reducing traffic), to walk and bike more and build communities to more conveniently use mass transit. It seems to me that the 4mpg standard 40' bus is obviously inappropriate for many routes and could be replaced with short wheelbase hybrid EVs based on new model paratransit vans. Seniors and disabled people need "Low-floor" entry and low-emission vans. It seems to me, municipalities should NOT continue to spend taxes on GM/Ford paratransit vans which are basic 1970's technology.

Name: Hal Glidden
Email: hglid@comcast.net

Comment:

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Sincerely,

Name: Paula Hood
Email: paula.e.hood@gmail.com

Comment:

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These changes are crucial because of the urgent threat that fossil fuel terminals pose to both the environment and public safety. Presently, the discussion draft allows new bulk terminals to be built and allows existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it!

It is vital that the city strengthen the current draft of the fossil fuel code to reflect the intent of the original resolution that myself and thousands of other Portlanders supported last year.

Sincerely,
Paula Hood

Name: Maria Gifford
Email: mariagarciajaguarwoman@yahoo.com

Comment:

1.A full ban on new bulk fossil fuel terminals
2.Limitations on expansions at existing facilities
3.Provisions that require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River

188142

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188142

11/1/16

Mayor Hales and City Commissioners of Portland,

My name is Elizabeth Gazeley. I am a senior at Lincoln High School and a student in the Environmental Justice and Sustainability class. I've been an Outdoor School student leader for the past three years. I've been a sustainability advocate since I could utter the words, "reduce, reuse, recycle." But the first step is to reduce.

I believe that the Fossil Fuel Terminal Zoning Amendments needs to *reduce* the two million gallon facility to zero. We need to reduce the 10% expansion allowance to 0%, because big companies like Chevron, NW Natural, Conoco Phillips, BP, Shell, and too many others will not back down from our beautiful river shores, if we don't force them to. If we give them the opportunity to expand, they will. What wealthy, powerful business wouldn't want to expand their fossil fuel reign? I believe that NW Natural should be no exception to this policy.

I was overjoyed at the prospect of Portland ending fossil fuel infrastructure, becoming a national leader in environmental policy. I have always been so proud and grateful for the Portland's environmental focus and dedication to the preservation of our state's natural resources. This amendment will become a pioneer of environmental policy. Other cities nationwide will look to Portland as a model of legislation. We need to put our feet down on fossil fuels now, before our carbon emissions shove us over 2℃ and we reach the point of no return. The burning of fossil fuels, not only puts the lives of millions of individuals in jeopardy, but the future of everyone at risk. We need to take control of our future now. When I come back home, after I get my degree in environmental science, I want to see the same inspirational, gorgeous, revolutionary, and green city still thriving, free of fossil fuels. I want my children to grow up with clean air, clean water, sustainable energy, and the same natural resources that I have been blessed with throughout my childhood. Thank you so much for you work on the current Fossil Fuel Terminal Zoning draft!

Elizabeth Gazeley

188142

From: Jan Polychronis
To: BPS Fossil Fuel Zoning
Subject: RE. Code Change Project restricting Bulk Fossil Fuel Terminals
Date: Tuesday, November 01, 2016 10:04:50 AM

I am writing to urge approval of City Resolution 37168 to implement new policy direction on fossil fuel distribution and storage. We need not only to prevent any new Bulk Fossil Fuel Terminals from being allowed, but also to restrict marine, railroad and pipeline transport access as well as restrict expansion of current bulk fuel terminals.

It is time to provide even greater support of the expansion of renewable energy and to prevent hazards to residents by restricting amounts of bulk fossil fuels to be transported into this state. This is most often for resale to other countries with specific businesses profiting from this sale. We also know of the hazards of burning fossil fuels. I pay slightly extra each month to have all of my energy provided from wind power and try to restrict my driving with a car that has higher mpg.

I was witness to the train derailment in Mosier earlier this summer. Ninety cars of crude oil were traveling on this track where only 4 years ago there were just a few cars on each train for local use per Union Pacific's own acknowledgement.

Please approve City Resolution 37168 as what Portland allows or prevents, affects us all.

Thank you,

Jan Polychronis
The Dalles, OR

From: M TL
To: BPS Fossil Fuel Zoning
Subject: ban Fossil Fuel terminal
Date: Tuesday, November 01, 2016 12:27:27 PM

I don't want more fossil fuel terminals when we have an earthquake bomb waiting to blow.

strengthen the code proposal by:

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities.
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Rejecting Northwest Naturals request to be exempted from these regulations.

Please act now to ensure Portland fulfills the promise to its historic fossil fuel resolution!

Marianne Terrell-Lavine
8619 SW 37th Ave
Portland OR 97219

November 1st, 2016

AUDITOR

Mayor Hales and City Commissioners of Portland,

I am a student in Lincoln High School's Environmental Justice and Sustainability class. My name is Emma Weightman, and I am a senior this year. I want to thank all of you for your support and understanding of the Fossil Fuel Terminal Zoning Amendment, and how powerful and important it is to the people of my generation, and those after me.

My introduction to climate justice was largely based off the fact that I wanted to take another elective class, and this one sounded interesting. I know that this seems unmotivated, but what happened after is something I never planned on happening. I found a love and appreciation for the beautiful community I have grown up in, through the fear that someday soon, all of it will be taken away. Luckily, I was able to cultivate this new passion through Environmental Justice class, thanks to the efforts of my school board and peers who fought to make sure this class could happen.

Portland is beautiful and unique, and without a doubt the best place to grow up. I am so thankful to be an hour or so drive from the coast, or the Gorge, and to be able to hike right around my backyard. Continuing the production of fossil fuels puts all of that at risk. Even worse, it puts our direct environment at risk. We are a city that is remarkably fortunate enough to be surrounded by rivers and hills. Those rivers are at extreme risk for pollution.

Being a senior and faced with the reality of leaving home, I would hate to come back and find it broken and destroyed. Thank you for your instrumental efforts for this fight, but the fight is far from finished. For my future, and the future of my friends, please continue your efforts to keep fossil fuel production to continue.

Sincerely,

188142

Emma Weightman

From: Jynx Houston
To: BPS Fossil Fuel Zoning
Subject: WRITTEN TESTIMONY
Date: Monday, October 31, 2016 1:42:39 PM

I strongly support the code change project to restrict development & expansion of Bulk Fossil Fuel Terminals.

Jynx Houston
7605 Se Lincoln St.
Portland, OR 97215

From: Ted Dreier
To: BPS Fossil Fuel Zoning
Subject: Fossil Fuel Terminal Zoning Amendments Recommended Draft
Date: Saturday, October 29, 2016 6:43:51 PM

Dear Portland City Council,
My only problem with the Fossil Fuel Terminal Zoning Amendments Draft is that it does not go far enough to restrict, limit, and reduce fossil fuel use in our city. But something is better than nothing: please pass this draft unanimously!
Sincerely,
Ted Dreier
7037 SW 54th Avenue
Portland, OR 97219
503 334 7817

188142

From: Kathryn Sheibley
To: BPS Fossil Fuel Zoning
Subject: Ban on Fossil Fuel
Date: Saturday, October 29, 2016 5:43:13 AM

i expect the City to follow through with its promise to enact a full ban of fossil fuel expansion with no exceptions and no exemptions.

Kathryn Sheibley

From: Tricia Knoll
To: BPS Fossil Fuel Zoning
Subject: Public Input on fossil fuel
Date: Friday, October 28, 2016 9:56:47 AM

Please follow through with stringent guidelines for the fossil fuel ban. The clock is ticking. We can't stand by.

Specifically I am ask you to

- Enact a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminate the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities
- Direct the Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Reject Northwest Naturals request to be exempted from these regulations

Tricia Knoll
8933 SW Lancelot Lane
Portland, Oregon 97219

Now available at Amazon.com from Aldrich Press, Ocean's Laughter -- a book of lyric and eco-poetry about Manzanita, Oregon. Reviews.
Urban Wild, a poetry chapbook now available from Finishing Line Press
website: triciaknoll.com
twitter:@ triciaknollwind

188142

From: judy@yournaturecontect.com
To: BPS Fossil Fuel Zoning
Cc: Judy Todd
Subject: Strengthen the no fossil fuel code proposal
Date: Friday, October 28, 2016 10:36:15 AM

To Portland City Council:

I request you forward the promised actions against any fossil fuels infrastructure, extraction, distribution or transporting in Portland. You can move this forward by strengthening the **no fossil fuel** code proposal in these ways:

1. Enact a full ban on all new fossil fuel terminals.

2. Remove the exception for terminals under 2 million gallons. Les is not an advantage and undermines the principle of the ban.

3. Eliminate the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. If upgrades are needed, require them without cutting expansion deals. This panders to the industry in ways that engages them in an endless loop of trying other avenues to advnace their agenda.

4. Reject Northwest Naturals request to be exempted from these regulations

Thank you for your service and for follow through on this vital code.

Judy Todd, concerned citizen and resident
503-260-4995

188142

From: Liza Burney
To: BPS Fossil Fuel Zoning
Subject: Fossil Fuels code
Date: Thursday, October 27, 2016 3:57:42 PM

I urge you to strengthen the code proposal by:

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Rejecting Northwest Naturals request to be exempted from these regulations

Liza

From: Avery Hurst
To: BPS Fossil Fuel Zoning
Subject: Please Strengthen your Code Proposal on Fossil Fuel Bans
Date: Thursday, October 27, 2016 4:47:10 PM

I would like to make comments to your Fossil Fuel Ban Code Proposal. As a resident of Portland, Oregon I would like to see the following accounted for:

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Rejecting Northwest Naturals request to be exempted from these regulations

Please consider my comments and those of other residents. The future is our responsibility. Thank you!
Avery

From: Sandy Joos
To: BPS Fossil Fuel Zoning
Subject: Enact a full fossil fuel ban
Date: Thursday, October 27, 2016 4:38:45 PM

Last fall the Portland City Council passed a resolution to ban new fossil fuel facilities in the city. Now the City needs to implement this resolution into binding city code. The proposed code is a strong step forward, but it could be made stronger. I am writing to urge the following specific steps:

1) Enact a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities.

2) Eliminate the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, period, and not provided in exchange for even bigger facilities.

3) Direct the Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades.

4) Reject Northwest Natural's request to be exempted from these regulations.

Please enact a full ban of fossil fuel expansion, as last fall's resolution called for.

From: Diana Lynn Kekule
To: BPS Fossil Fuel Zoning
Subject: THANK YOU
Date: Thursday, October 27, 2016 2:43:13 PM

Please act now to ensure Portland fulfills the promise to its historic fossil fuel resolution.
We urge you to strengthen the code proposal by:

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Rejecting Northwest Naturals request to be exempted from these regulations

Thank you for helping to raise the Consciousness of Humanity!

Kekule Bastron Family and Friends

From Heaven Sweet Nature Springs!

SHINE YOUR LOVELIGHT!

From: Walt Mintkeski
To: BPS Fossil Fuel Zoning
Subject: Comments on City of Portland Fossil Fuel Infrastructure Code
Date: Thursday, October 27, 2016 3:47:57 PM

I wish to thank the City of Portland for strengthening the draft Fossil Fuel Terminal Zoning Amendments.

However the final Code to be considered by City Council on November 10, 2016 needs to be strengthened by:

- Rejecting Northwest Natural's request to be exempted from these regulations
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons in capacity. The proposed 2 million gallon exception would still allow new fossil fuel facilities to be built in our communities

These changes are crucial because of the threats that fossil fuel terminals pose to both the environment and public safety. The proposed code allows new fossil fuel terminals under 2 million gallons to be built and existing facilities to expand by up to 10%, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Further, transporting and storing fossil fuels pose risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes. The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow.

It is vital that the city strengthen the proposed fossil fuel code to reflect the full intent of the original resolution which I and thousands of other Portlanders supported last year.

Thank you,

Walt Mintkeski
6815 SE 31st Ave
Portland, OR 97202
mintkeski@juno.com

From: Sarah Prowell
To: BPS Fossil Fuel Zoning
Subject: Comments on Draft Code Language for PDX"s Fossil Fuel Resolution
Date: Thursday, October 27, 2016 6:08:00 PM

To the Portland City Council,
Re: Comments on Draft Code Language for implementing Portland's historic Fossil Fuel Resolution
Dear Ms. And Sirs,
I urge the City Council to strengthen the current draft code to better adhere to the language and intent of the City's Fossil Fuel Resolution as a means to prevent fossil fuel infrastructure expansion to the fullest extent possible.
Atmospheric CO2 levels have already exceeded 400 ppm and the severe risks and implications of global warming are very real. For We The People and Our Planet, please revise the draft code with the following specific changes, as recommended by the Portland Audubon Society and to which I fully agree:

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Rejecting Northwest Naturals request to be exempted from these regulations

Sincerely,

Sarah Prowell
2216 SW Sunset Blvd
Portland, Oregon
503-452-0972

From: Lisa Sambora
To: BPS Fossil Fuel Zoning
Subject: Ban of New Fossil Fuel Facilities in Portland
Date: Thursday, October 27, 2016 3:54:31 PM

Dear City Council,

The resolution passed last fall to ban new fossil fuel facilities in the city was truly historic, placing Portland at the forefront of the climate justice movement. I strongly urge you to strengthen this code proposal by implementing the following:

- Enacting a full ban on all new fossil fuel terminals by removing the exception for terminals under 2 million gallons. The proposed 2-million-gallon exception would still allow new fossil fuel facilities to be built in our communities
- Eliminating the provision that allows existing fossil fuel terminals to grow by as much as 10% in exchange for seismic upgrades. These upgrades should be required, not provided in exchange for even bigger facilities
- Directing Portland Bureau of Emergency Management to develop proposals for State building code changes to require seismic upgrades
- Rejecting Northwest Naturals request to be exempted from these regulations

Thank you for receiving my comments.
Kindly,
Lisa S.
Portland, OR

Parsons, Susan

From: Washington, Mustafa
Sent: Tuesday, September 20, 2016 9:13 AM
To: Council Clerk – Testimony
Subject: FW: Audubon comments to Council on Bulk Fossil Fuel Facility Amendments
Attachments: 9-19-16 Audubon Comments to Council on Bulk Fossil Fuel Facility Amendments.pdf

Mustafa Washington
Constituent Services Specialist
Office Of Mayor Charlie Hales
P: 503-823-4120
mustafa.washington@portlandoregon.gov

From: Micah Meskel [mailto:mmeskel@audubonportland.org]
Sent: Monday, September 19, 2016 4:48 PM
To: Hales, Mayor <mayorcharliehales@portlandoregon.gov>; Commissioner Fritz <amanda@portlandoregon.gov>; Commissioner Fish <nick@portlandoregon.gov>; Commissioner Novick <novick@portlandoregon.gov>; Commissioner Saltzman <dan@portlandoregon.gov>
Subject: Audubon comments to Council on Bulk Fossil Fuel Facility Amendments

September 19, 2016

Dear Mayor Hales and members of the Portland City Council,

Audubon Society of Portland (Audubon) appreciates the opportunity to comment on the draft Fossil Fuel Terminal Zoning Code Amendments (Amendments). We urge you adopt amendments that are strong, clear and fully meet the objectives laid out in the historic Fossil Fuel Resolution (Resolution #37168) that was passed unanimously by the Portland City Council last November. While this was an historic statement on the importance of preventing further expansion of our existing bulk fossil fuel infrastructure, it ultimately will only be as effective as the amendments that are adopted to implement it.

Audubon strongly supports that approach taken by the City in the draft amendments which would make bulk fossil fuel terminals a prohibited use and require that existing fossil fuel terminals be treated as a non-conforming use subject to a Type II nonconforming use review. We believe that prohibiting bulk fossil fuel facilities on the basis of the risk that they present public health and safety is one which is clearly supported by the science and also one which is clearly within the City's purview to regulate through the land-use process. It

utilizes well established designations (prohibited uses and non-conforming uses) that are clear, familiar and well tested in our community. Finally, and most importantly, with limited modifications delineated below, it substantially achieves the goals that were strongly supported by the community and adopted by the Portland City Council. We appreciate the work that the City has done to date to develop these amendments.

We strongly urge the City not to back away from this approach as is being advocated by some Fossil Fuel interests. Specifically we urge the City not to eliminate the Type II process that would be required for expansion of local faculties to meet local demand and instead replace it by either allow existing facilities a blanket allowance to expand up to 10% beyond the existing capacity on the date of adoption of these amendments or allow existing facilities a blanket allowance to expand up to 10% beyond the existing capacity on the date adoption plus additional expansions through the conditional use permitting process (options 2B and 2C in the September 9, 2016 Memo from Staff). Neither of these approaches is consistent with the City Council Resolution which would only allow expansion in order to meet regional demand. Options 2B and 2C would functionally allow existing facilities to expand for any reason at all, regardless of whether or not it is tied to regional demand.

We believe that this situation represents a textbook case for why we have the non-conforming use process in the first place. The expansion of existing facilities represents a real and significant threat to our communities and the non-conforming use process is the mechanism that the city in place to ensure that prohibited uses do not expand unnecessarily and that the public has adequate opportunity to engage in these decisions.

We do not believe that non-conforming use process would lead to excessively onerous work for the Bureau of Development Services (BDS). First, there are relatively few existing bulk fossil fuel facilities in Portland (11) so the number of non-conforming use applications would be limited. Second, most applications would be non-controversial and would simply result in a staff review. Third, those applications that are controversial deserve the extra scrutiny that a Type II process offers---again, these facilities pose serious risks to our communities and it is specifically for these types of situations that we have a public review process in place. We urge you to retain the Type II review process for non-conforming uses to address proposed expansions of existing fossil fuel terminal facilities—it provides an existing, understood and effective pathway that will allow expansions consistent with the objectives of the resolution and amendments, but provide the public with recourse in the event that those objectives are not achieved.

Additionally, we would recommend the following improvements to the proposed amendments which we believe will allow it to better achieve the objectives of the resolution:

1) **Significantly reduce or eliminate the new fossil fuel facility threshold of 5,000,000 gallons**: This threshold is meant to allow expansion of existing facilities or development of new facilities to meet regional fuel needs. However, the City provides no rational for setting the threshold at 5,000,000 gallons beyond simply asserting that a 5,000,000-gallon facility is too small to serve as a bulk terminal. We disagree. 5 million gallons represents almost 120,000 barrels of oils which is enough to fill nearly two unit trains. We believe that the threshold is set far above what is necessary to achieve this objective and creates significant opportunity for fossil fuel providers to create infrastructure to serve much broader objectives which go beyond the intent of the fossil fuel resolution. It could also promote significant expansion in the number of hazardous oil trains passing

through Portland placing our communities real and direct risk. We recommend eliminating this threshold altogether and simply relying upon the non-conforming use process in order to determine whether a new facility or expansion of an existing facility should be allowed. Alternatively, if the city is unwilling to eliminate this loophole in its entirety, it should lower it to under 2,000,000 gallons, which is less than the capacity of a single unit train (50,000 barrels/ 2.1 million gallons). This would still allow facilities to meet regional need but minimize the likelihood of fossil fuel providers gaming the system and triggering significant increases in the number of oil trains passing through our communities.

2) Add additional review criteria to the non-conforming use review for existing facilities by including criteria that address public safety and climate change impacts. We support the amendments that have been submitted by 350PDX to address these concerns.

We urge you to move forward with the draft amendments including the two recommended changes in this letter.

Thank you for your consideration of these comments.

Respectfully,

Bob Sallinger

Bob Sallinger

Conservation Director

Audubon Society of Portland

Micah Meskel
Conservation Field Coordinator
Audubon Society of Portland
5151 NW Cornell Road
Portland, Oregon 97210
(971) 222-6128 | Direct
audubonportland.org

188142

(Email attachment)



September 19, 2016

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We urge you to move forward with the draft amendments including the two recommended changes in this letter.

Thank you for your consideration of these comments.

Respectfully,

Bob Sallinger

Bob Sallinger
Conservation Director
Audubon Society of Portland

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

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PORTLAND OR 97212

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Fossil Fuel Terminal Zoning

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NIXIE 970 FE 1 0011/18/16

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BC: 97201538075 *2489-08098-18-23

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City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Fossil Fuel Terminal Zoning

Presort First Class Mail ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[6]
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RETURN SERVICE REQUESTED

299/7100

ALLEGRA HEIDELINDE
2146 NW EVERETT
PORTLAND OR 97215

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NIXIE 970 SE 1260 0011/18/16

RETURN TO SENDER
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BC: 97201538075 *1229-05942-14-37

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Fossil Fuel Terminal Zoning

Presort First Class Mail ComBasPrice

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RETURN SERVICE REQUESTED

BC SHELBY
2505 N WILLIAMETTE

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NIXIE 970 DE 1260 0011/16/16

RETURN TO SENDER
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Fossil Fuel Terminal Zoning

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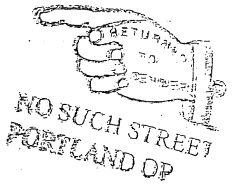
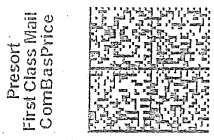
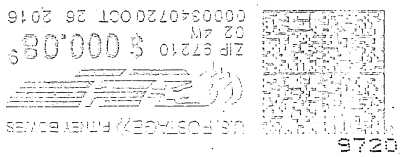




RETURN SERVICE REQUESTED

MAYA JARRAD
11232 DAYTON AVE
PORTLAND OR 97[redacted]



U.S. POSTAGE FITNEY BOWES
ZIP 97210 $ 000.08⁹
02 4W
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City of Portland, Oregon
Bureau of Planning and Sustainability
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Portland, Oregon 97201-5380 P514

Fossil Fuel Terminal Zoning

U.S. POSTAGE FITNEY BOWES
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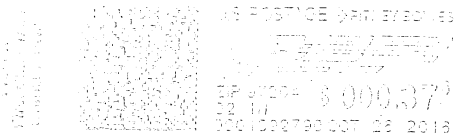

RETURN SERVICE REQUESTED

KAITLIN GRAMMER
3241 NE HOLMAN
PORTLAND OR 97213

wrong address

NIXIE 970 FE 1260 0011/10/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2489-05522-10-21

106 IRANNEI 97211
97201-5380

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ZIP 97204 $ 000.37⁶
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RETURN SERVICE REQUESTED

REBECCA PARKER
697 OAK KNOLL
PORTLAND OR 97205

U.S. POSTAGE FITNEY BOWES
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NIXIE 970 DE 1 0011/10/16

RETURN TO SENDER
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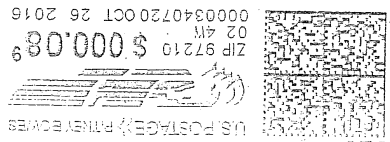
UNABLE TO FORWARD



NSN BC: 97201538075 *0229-01187-26-47

City of Portland, Oregon
Bureau of Planning and Sustainability
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Portland, Oregon 97201-5380 P514

Fossil Fuel Terminal Zoning

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U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37[6]
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RETURN SERVICE REQUESTED

PATRICK MULCAHEY
3339 SE CARUTHERS
STEVENSON WA 98648

NIXIE 970 DE 1 0011/08/16
RETURN TO SENDER
NO MAIL RECEPTACLE
UNABLE TO FORWARD

NMR
98648[illegible]5380

BC: 97201538075 *0229-01386-26-47

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RETURN SERVICE REQUESTED

GRETCHEN FREDA
18TH
PORTLAND OR 97202

NIXIE 970 DE 1 0011/08/16
RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

IA
97202[illegible]5380

BC: 97201538075 *0229-01131-26-47

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1900 SW 4th Avenue, Suite 7100
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ZIP 97204 $ 000.37[6]
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RETURN SERVICE REQUESTED

NSN

CHARLOTTE SAHNOW
1015 NE DEAN
EUGENE OR 97408

NIXIE 970 DE 1 0011/08/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 97201538075 *0229-01051-26-47

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Fossil Fuel Terminal Zoning

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ZIP 97204 $ 000.37⁶
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RETURN SERVICE REQUESTED

ELENA WOOD
621 NE SUMNER
PORTLAND OR 97212

NIXIE 970 FE 1260 0011/10/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2489-01075-03-17

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Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

ENDA KENNY
621 NE SUMMER
PORTLAND OR 97211

NIXIE 970 FE 1260 0011/10/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2979-05502-07-17

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ZIP 97204 $ 000.37⁶
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RETURN SERVICE REQUESTED

JOYCE LEGGATT
1128 NE EMERSON
PORTLAND OR 97211

NIXIE 970 FE 1260 0011/10/16

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UNABLE TO FORWARD

BC: 97201538075 *2489-05098-10-21

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RUBY WILCOX
173 NE BRIDGETON
PORTLAND OR 97232

NIXIE 970 FE 1260 0011/10/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BL: 97201538075 *2489-00088-10-24
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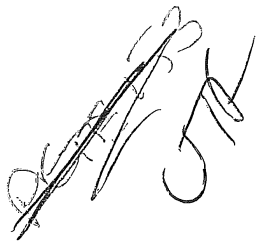
Fossil Fuel Terminal Zoning



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PETER FINLEY-FRY
COLUMBIA PACIFIC PLANNING
2153 SW MAIN ST

NIXIE 970 FE 1260 0011/10/16
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NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

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Fossil Fuel Terminal Zoning

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PATRICIA ZOLINE
1579 SE NEHALEM
PORTLAND OR 97213

Pls. return
Not at this

NIXIE 970 DE 1260 0011/09/16
RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

[illegible] BL: 97201538075 *2929-03686-02-13

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Fossil Fuel Terminal Zoning

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ZIP 97204 $ 000.37⁵
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RETURN SERVICE REQUESTED

JENNIFER LANIUS
~~5529 SE MORRISON~~ WRONG ST.
PORTLAND OR 97206

NIXIE 970 SE 1260 0011/09/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538805 *1429-00244-31-45

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Fossil Fuel Terminal Zoning

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ZIP 97204 $ 000.37⁵
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RETURN SERVICE REQUESTED

LYNN HERRING
9442 TIOGA
LAKE OSWEGO OR 97034

NIXIE 970 DE 1 0011/09/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

BC: 97201538805 *0229-01946-26-47

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ZIP 97204 $ 000.37⁵
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RETURN SERVICE REQUESTED

GARY GILARDI
1957 NW FLORENCE
LAKE OSWEGO OR 97031

NIXIE 970 DE 1 0011/09/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

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Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

JEFF HENKELMAN
NORTHWEST AWNING AND SIGN
4812 N INTERSTATE AVE

NIXIE 970 SC 1 0011/11/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *1279-00115-31-44

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1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

Delivered to wrong address (Portland)

WAYNE LAMMERS
7122 N OATMAN
TIGARD OR 97224

NIXIE 970 PE 1 0011/11/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *0279-01191-26-47

City of Portland, Oregon
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Fossil Fuel Terminal Zoning

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ZIP 97204 $ 000.37⁰
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Return addressee unknown

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WALTER MINTKESKI
4508 N WILLIAMS
PORTLAND OR 97202

NIXIE 970 PE 1260 0011/09/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

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Fossil Fuel Terminal Zoning

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U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392790 OCT 26 2016

RETURN SERVICE REQUESTED

Not at this address check zip

ASHLEIGH MEAD
4929 N COMMERCIAL
PORTLAND OR 97202

NIXIE 970 FE 1260 0011/09/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BC: 97201538075 *2929-00191-02-20

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Fossil Fuel Terminal Zoning

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U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37
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0001392790 OCT 26 2016

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RETURN SERVICE REQUESTED

REBECCA CLARKSON ← Not at this address
5203 SE 38TH
PORTLAND OR 97203

NIXIE 970 FE 1260 0011/09/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BC: 97201538075 *2489-07810-09-21

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Fossil Fuel Terminal Zoning

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Presort First Class Mail ComBasPrice

U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392790 OCT 26 2016

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Return to sender

LUCY WONG
5516 NE MALLORY
PORTLAND OR 97211

NIXIE 970 SE 1260 0011/10/16

RETURN TO SENDER
REFUSED
UNABLE TO FORWARD

BC: 97201538075 *1329-10434-31-47

City of Portland, Oregon
Bureau of Planning and Sustainability
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Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

CHESTER STARK
5519 SW MULTNOMAH
PORTLAND OR 97214

NIXIE 970 FE 1260 0011/09/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BC: 97201538075 *2489-02669-09-19
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Fossil Fuel Terminal Zoning

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U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392790 OCT 26 2016

RETURN SERVICE REQUESTED

CAMILO MARQUEZ
5606 SW RIVERSIDE
PORTLAND OR 97213

NIXIE 970 FE 1260 0011/09/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BC: 97201538075 *2489-07412-09-19
111 IRAN 95109-5389

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ZIP 97204 $ 000.37
02 1W
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MEGAN HORST
19698 SE COTTONWOOD
PORTLAND OR 97211

NIXIE 970 DE 1260 0011/08/16
RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD

FWD BC: 97201538075 *2929-06665-02-18

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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37⁶
02 1W
0001392790 OCT. 26

RETURN SERVICE REQUESTED

HYUNG NAM
1710 SW HARBOR
PORTLAND OR 97214

NIXIE 970 FE 1260 0011/08/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 972015380/5 *2929-04671-01-24

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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37⁶
02 1W
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RETURN SERVICE REQUESTED

BETHANY SILIKAS
18845 SW VISTA
PORTLAND OR 97225

NIXIE 970 DE 1 0011/08/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 972015380/5 *0229-01130-26-47

U.S. POSTAGE PITNEY BOWES
ZIP 97210 $ 000.08⁹
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ZIP 97204 $ 000.37⁶
02 1W
0001392790 OCT. 26 2016

RETURN SERVICE REQUESTED

PATRICIA MURPHY
3675 SE BYBEE
PORTLAND OR 972[redacted]

RTS

not here address

NIXIE 970 DE 1 0011/09/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 972015380/5 *2489-02469-09-28

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ZIP 97204 $ 000.37⁶
02 1W
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ANAIS TUEPKER
5919 SW SALMON
PORTLAND OR 97202

WRONG

MIXIE 970 DE 1260 0011/08/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2479-01745-29-44

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ZIP 97204 $ 000.37⁶
02 1W
0001392790 OCT. 26 2016

RETURN SERVICE REQUESTED

KATE GESSERT
2639 SE STEPHENS
EUGENE OR 97402

MIXIE 970 DE 1 0011/08/16

RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

BC: 97201538075 *2479-01156-29-47

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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37⁶
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ED KERNS
5812 NE 6TH
PORTLAND OR 97214

MIXIE 970 DE 1260 0011/10/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2489-03353-10-21

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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37⁰
02 1W
0001392790 OCT. 26 2016

RETURN SERVICE REQUESTED

GLEN STAMM
1207 SE 72ND
ASHLAND OR 97520

NIXIE 970 DE 1 0011/02/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD
BC: 97201538075 *0229-01152-26-47

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ZIP 97204 $ 000.37⁰
02 1W
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RETURN SERVICE REQUESTED

LEE ZUCKER
13140 MARINA
EUGENE OR 97403

NIXIE 970 DE 1 0011/02/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *0229-01087-26-47

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Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

JERRY SMITH
5908 SE 17TH
EUGENE OR 97405

NIXIE 970 DE 1 0011/02/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075

U.S. POSTAGE PITNEY BOWES
ZIP 97210 $ 000.08⁹
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THOMAS HOPKINS
2806 SE 15TH
MILWAUKIE OR 97267

NIXIE 970 FE 1 0011/02/16
RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD
ANK BC: 97201538075 *0229-01415-26-47

U.S. POSTAGE >> PITNEY BOWES
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ROBIN PATTEN
2607 HOPE

NIXIE 731 DE 1 0011/02/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD
NSN BC: 97201538075 *0229-01155-26-47
97201>5380

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SYBIL KOHL
940 SE ALEXANDER
SEATTLE WA 98115

NIXIE 980 DE 1 0011/03/16
RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD
TA BC: 97201538075 *1695-03073-03-26

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Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

JONATHAN BROOKS
317 W 4TH PLAIN
PORTLAND OR 97203

NIXIE 970 DE 1260 0011/02/16

RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

NSS BC: 97201538075 *2489-05395-02-29

102 IRANNE1 97203
97201>5380

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ZIP 97204 $ 000.37[6]
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RETURN SERVICE REQUESTED

DANA WEINTRAUB
1820 NE VINE
BEAVERTON OR 97003

NIXIE 970 DE 1 0011/03/16

RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

NSS BC: 97201538075 *0229-01127-26-47

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Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

RAYNE MACGEORGE
433 NE GRAHAM
PORTLAND OR 97214

NIXIE 970 DE 1260 0011/05/16

RETURN TO SENDER
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UNABLE TO FORWARD

TA BC: 97201538075 *2489-00487-01-25

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RETURN SERVICE REQUESTED

WILLIE LEVENSON
8936 N EDISON
PORTLAND OR 97212

NIXIE 970 DE 1260 0111/04/16

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BC: 97201538075 *2489-00412-04-28

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JAMES FULLER
8175 SW 71ST
TUCSON AZ 85741

NIXIE 850 DE 1 0011/04/16

RETURN TO SENDER
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UNABLE TO FORWARD

BC: 97201538075 *0229-01248-26-4

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BONNIE MCKINLAY
4110 SE HAWTHORNE
PORTLAND OR 97219

NIXIE 970 DE 1260 0011/04/16

RETURN TO SENDER
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UNABLE TO FORWARD

UTF BC: 97201538075 *2489-03659-04-19

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JAN MACWILLIAMS
4110 SE HAWTHORNE
PORTLAND OR 97213

UNDELIVERABLE. COMMERCIAL

NIXIE 970 9E 1260 0111/04/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BC: 97201538075 *2489-03556-04-19

112 IRANN 97201-5380

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PATI CALLAGHER
4110 SE HAWTHORNE
PORTLAND OR 97202

NIXIE 970 DE 1260 0011/04/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BC: 97201538075 *2489-03538-04-19

112 IRANN 97201-5380

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RETURN SERVICE REQUESTED

EMERALD GOLDMAN
1411 NE 16TH
PORTLAND OR 97215

NIXIE 970 DE 1260 0111/04/16

RETURN TO SENDER
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BC: 97201538075 *2489-00308-04-19

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RETURN SERVICE REQUESTED

STEVE MCCOY
11375 SW ERSTE
PORTLAND OR 97204

NOT A VALID ADDRESS

NIXIE 970 FE 1260 0011/03/16

RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD

ANK BC: 97201538075 *2489-05711-03-28

125 IRANNE 97201>5380

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RETURN SERVICE REQUESTED

MOLLY BROWN
2606 NE 30TH

NIXIE 957 DE 1 0011/02/16

RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

NSS BC: 97201538075 *0229-01154-26-47

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RETURN SERVICE REQUESTED

TARA HERSHBERGER
1090 CHANDLER
PORTLAND OR 97220

NIXIE 970 FE 1 0011/03/16

RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD

ANK BC: 97201538075 *0229-01056-26-47

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Not at this address

JOANNE HARMONY
374 SW HAMILTON
PORTLAND OR 97206

NIXIE 970 FE 1260 0011/03/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF
BC: 97201538075 *2489-01344-03-23

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RETURN SERVICE REQUESTED

NOAH LINSCHOTEN
3265 SE MADISON
VANCOUVER WA 98665

NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

N55
97201>5380
BC: 97201538075 *0229-01384-26-47

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Fossil Fuel Terminal Zoning

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02 1W
0001392790 OCT. 26. 2016

RETURN SERVICE REQUESTED

CHARLES TOWNSEND
1736 SE TAGGART
PORTLAND OR 97212

Not at this address.

NIXIE 970 DE 1260 0011/03/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BC: 97201538075 *2489-03561-03-27

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RETURN SERVICE REQUESTED

MARY LOU PUTMAN
8200 SE 36TH
PORTLAND OR 972

NSN

NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 972015380 75 *0229-01205-26-47

NSN
97201>5380

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RETURN SERVICE REQUESTED

DEAN SIGLER
7705 SW MINER
ALOHA OR 97003

NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

BC: 972015380 75 *0229-01198-26-47

NSS
97[illegible]5380

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RETURN SERVICE REQUESTED

MICHAEL HEVRON
3712 SE 9TH
BEAVERTON OR 97006

NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

BC: 972015380 75 *0229-01027-26-47

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RETURN SERVICE REQUESTED

JANIECE STATON
3803 SE GRANT
BEAVERTON OR 97006

NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
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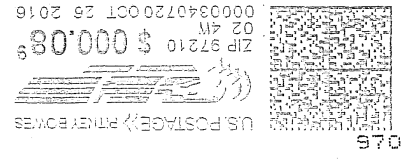
UNABLE TO FORWARD

BC: 97201538075 *0229-01028-26-47



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Fossil Fuel Terminal Zoning

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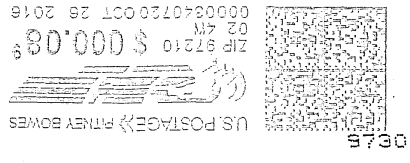
NANCY PFEILER
6201 NE 13TH
SALEM OR 97304

NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 97201538075 *0229-01206-26-47



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Fossil Fuel Terminal Zoning

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Not at this address

RETURN SERVICE REQUESTED

SATYA VAYU
4444 SE FRANCIS
PORTLAND OR 97206

NIXIE 970 FE 1260 0011/04/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BC: 97201538075 *2489-03930-04-19

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HELEN SPECTOR
2409 SE 51ST
PORTLAND OR 97229

NIXIE 970 DE 1260 0011/04/16
RETURN TO SENDER
NO SUCH NUMBER
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NSN
BC: 972015380?5 *0129-00757-28-22

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RETURN SERVICE REQUESTED

CRAIG MARBURGER
3525 RED CEDAR
PORTLAND OR 97239

NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 972015380?5 *0229-01387-26-47

U.S. POSTAGE FITNEY BOWES
ZIP 97210 $ 000.30
02 4W
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02 1W
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RETURN SERVICE REQUESTED

NSN

LEANNA BROOKS
7100 N COLUMBIA
VANCOUVER WA 98660

NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 972015380?5 *0229-01190-26-47

U.S. POSTAGE FITNEY BOWES
ZIP 97210 $ 000.30
02 4W
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ZIP 97204 $ 000.37⁶
02 1W
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N5N

MIKEL GISI
25525 S LAURA
VANCOUVER WA 98663

NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

ZIP 97210 $ 000.08⁹
02 4W
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RETURN SERVICE REQUESTED

CHRISTINE KOSONEN
2821 HURON
PORTLAND OR 97214

NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

ZIP 97210 $ 000.08⁹
02 4W
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N5N
97201>5380

BC: 97201538075 *0229-01378-26-47

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RETURN SERVICE REQUESTED

RAYNE MCGEORGE
381 NE VILLAGE SQUIRE
PORTLAND OR 97214

NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

ZIP 97210 $ 000.08⁹
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RETURN SERVICE REQUESTED

HARLAN SHOBER
46525 MCKENZIE
PORTLAND OR 97214

NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 972015380 75 *0229-01171-26-47

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RETURN SERVICE REQUESTED

MICHAEL GARLAND
38703 SCARVEL HILL
PORTLAND OR 97214

NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 972015380 75 *0229-01030-26-47

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FRANCISCO GADEA
3670 W BELLEWOOD
PORTLAND OR 97214

NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 972015380 75 *0229-01026-26-47

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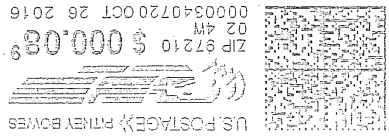
RETURN SERVICE REQUESTED

MARY MURPHY
571 SKAMANIA LANDING
PORTLAND OR 97232



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UNABLE TO FORWARD

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BC: 972015380?5 *0229-01184-26-47

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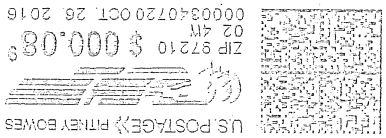
RETURN SERVICE REQUESTED

NEAL KEEFER
5356 NE NEPTUNE
PORTLAND OR 97232



NIXIE 970 DE 1 0011/03/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

NSN
97232[illegible]5380

BC: 972015380?5 *0229-01180-26-47

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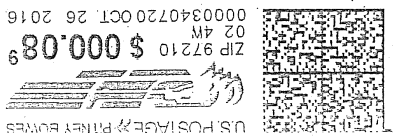
MARK GROSSMAN
524 SE 17TH



NIXIE 957 DE 1 0010/31/16
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BC: 972015380?5 *0229-01178-26-47

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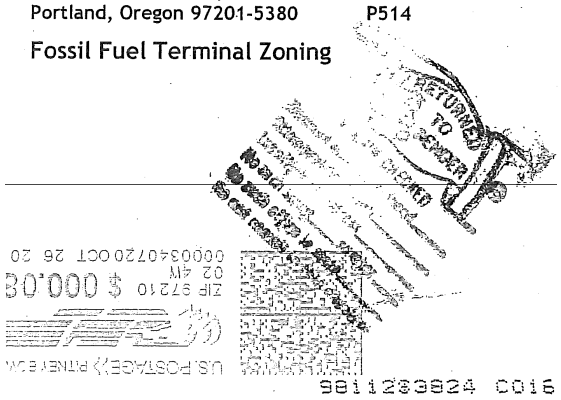
TAMMIE MURRAY
1516 SE 43RD
SEATTLE WA 98138



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JEFFREY OWEN AND HEATHER MCCAREY
1524 SW 18TH AVE
PORTLAND OR 97201

970 NFE 1260816C0811/02/16
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OWEN JEFF
4526 SE HARRISON ST
PORTLAND OR 97215-3172

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MATTHEW SMITH
5041 SAXON
PORTLAND OR 97220

NIXIE 970 DE 1 0811/02/16
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BC: 97201538075 *0779-01176-26-47

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PATRICK MCCULLEY
1825 FAIRMOUNT
PORTLAND OR 97213

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BC: 97201538075 *0229-01128-26-47

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CATHY SPOFFORD
1465 HOLLY
PORTLAND OR 97219

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NOAH DEVIENZO
1734 SW COLLINS
PORTLAND OR 97219

NIXIE 970 DE 1 0011/02/16
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BC: 97201538075 *0229-01121-26-47

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LILAH WALLACH
15200 SW CROWN
PORTLAND OR 97215

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TIFFANY MCCLEARY
8125 NE WYGANT
PORTLAND OR 97210

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UTF BC: 97201538075 *2489-02308-01-22
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MEREDITH LONG
6222 SW 36TH
VANCOUVER WA 98664

NIXIE 970 DE 1 0011/02/16
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NSN BC: 97201538075 *0229-01163-26-47

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JASON NOLIN
8125 NE WYGANT
PORTLAND OR 97218

NIXIE 970 FE 1260 0011/01/16
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UTF BC: 97201538075 *2489-02307-01-22
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ALICIA KEYS
1103 SE 21ST
PORTLAND OR 97[redacted]

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BC: 97201538075 *0229-01057-26-47

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JOSHUA ANDERSON
601 SW 2ND
PORTLAND OR 97239

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DANIEL SIMS
3515 SW 87TH
PORTLAND OR 97213

FWD

NIXIE 970 FE 1 0011/07/16

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MARY LANE
14960 SW 92ND
PORTLAND OR 97214

Not at this

NIXIE 970 DE 1260 0011/05/16

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HOWARD SHAPIRO
1125 NE MADISON
PORTLAND OR 97202

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HARRY KERSHNER
2335 SE PINE
PORTLAND OR 97203

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MARY SIEVERTSEN
2280 SE 34TH
PORTLAND OR 97225

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JEFF STOOKEY ?
5817 SE LAFAYETTE
PORTLAND OR 97232

NIXIE 970 7E 1260 0011/08/16

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BERNADETTE RODGERS
1518 SW UPPER
PORTLAND OR 97239

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FORREST MCALPINE NOT AT THIS ADDRESS
4638 NE FAILING
PORTLAND OR 97217

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BRAD NAHILL
7140 SE FRANKLIN
BEAVERTON OR 97007

NIXIE 970 DE 1 0011/01/16
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ANNE HALPIN
927 CLEARBROOK
CORVALLIS OR 97333

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
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AVERY LEINOVA
173 NE BRIDGETON
PORTLAND OR 97214

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DAVID NEZ
1015 NE DEAN
PORTLAND OR 97203

NIXIE 970 FE 1260 0011/01/16
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ALBYN JONES
6934 NE 13TH
PORTLAND OR 97202

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106 IRANN51 97211 97201>5380 BC: 97201538075 *2489-05334-01-29

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JULIE WALKER
3527 SE MADISON
PORTLAND OR 97224

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KRIS N
3535 SE 86TH
PORTLAND OR 97206

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CLYDE LOCKLEAT
54 SE 74TH
PORTLAND OR 97221

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PETER WILCOX
253 N BROADWAY
PORTLAND OR 97211

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UTF BC: 97201538075 *2489-00792-01-25
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DANIEL SENIC
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PORTLAND OR 97229

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BARBARA HILYER
2515 NE 9TH
PORTLAND OR 97239

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JORDAN MORSE
4210 SE BYBEE
PORTLAND OR 97202

NIXIE 970 FE 1260 0011/01/16

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UTF BC: 97201538075 *2489-09692-01-24
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ERINNE GOODELL
932 SE 12TH
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SUSAN MILLHAUSER
1030 SW JEFFERSTON
PORTLAND OR 97211

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THEODORA TSONGAS
1205 SW CARDINELL
PORTLAND OR 97215

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ANDREA LEPAIN
107 SE 30TH
PORTLAND OR 97283

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UTF BC: 97201538075 *2489-12831-01-23

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700 NE MULTNOMAH
PORTLAND OR 97212

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117 IRANN61 97232

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DANIEL SERRES
2329 SE MADISON
PORTLAND OR 97214

NIXIE 970 FE 1260 0011/01/16
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UTF BC: 97201538075 *2489-12819-01-23
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FRAN DYKE
618 NW GLISAN
PORTLAND OR 97209

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1502 SE 84TH
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8025 SE 60TH
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597 N DEKUM
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610 SW BROADWAY
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LIZ TERHAAR
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DEBBY GARMAN
2125 SE 35TH
HILLSBORO OR 97124

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3616 WIDGEON
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6512 SE DIVISION
PORTLAND OR 97230

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7200 SE WOODSTOCK
PORTLAND OR 97214

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KIMA GARRISON
175 NE 7TH
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VANCOUVER WA 98665

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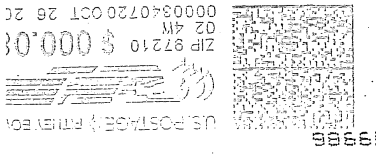

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2146 NW EVERETT
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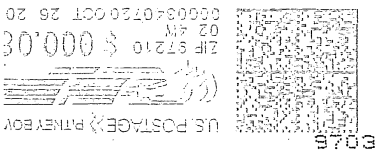

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2940 NE 35TH
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11439 SE MARKET ST
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SVEN ANDERSON
330 SE 75TH
PORTLAND OR 97204

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MATTHEW MCDELL
3816 NE 63RD
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NIXIE 970 FE 1260 0011/23/16

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BC: 97201538075 *2489-07397-23-21

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Fossil Fuel Terminal Zoning

PORTLAND
OR 970
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~~DEVIN KELLY~~ Not at this
4025 NE COUCH
PORTLAND OR 97215

NIXIE 970 5C 1 0011/26/16

RETURN TO SENDER
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UNABLE TO FORWARD

BC: 97201538075 *1629-07220-01-36

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NSW

MATTHEW BAIRD
904 NE 7TH
PORTLAND OR 97213

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
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BC: 97201538075 *0229-01042-26-47

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IA

KELLY O'HANLEY
111 NE 6TH
PORTLAND OR 97213

NIXIE 970 DE 1260 0011/01/16
RETURN TO SENDER
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UNABLE TO FORWARD

BC: 97201538075 *2489-01142-01-31

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REBEKAH CRESWELL
8338 N INTERSTATE
PORTLAND OR 97217

NIXIE 970 DE 1260 0011/01/16
RETURN TO SENDER
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UNABLE TO FORWARD

IA BC: 97201538075 *2489-00822-01-31

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Fossil Fuel Terminal Zoning

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SARAH PROWELL
2139 NE HALSEY
PORTLAND OR 97239

LONGER HERE

NIXIE 970 DE 1260 0011/01/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

9400922489306290 UTF BC: 97201538075 *2489-00694-01-31
117 IRANNE1 97232
97201>5380

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THOMAS WARD
7103 N MARYLAND
PORTLAND OR 97210

NIXIE 970 FE 1260 0011/01/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

9400922489306290 UTF BC: 97201538075 *2489-00344-01-31
118 IRANNE1 97217
97201>5380

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DANIEL JAFFEE
473 SE 46TH
PORTLAND OR 97211

NIXIE 970 DE 1 0010/31/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
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ZIP 97210 $ 000.03
02 4W
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1204

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RETURN SERVICE REQUESTED

JOSEPH STENGER
817 SW 171ST
PORTLAND OR 97211

NIXIE 970 DE 1 0010/31/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 972015380 75 *0229-01204-26-47

97201>5380 UTF

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DAVID HENDERSON
2454 OCCIDENTAL
PORTLAND OR 97211

NIXIE 970 DE 1 0010/31/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 972015380 75 *0229-01150-26-47

97201>5380 UTF

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RETURN SERVICE REQUESTED

MARY VORACHEK
7301 N WASHBURNE
SALEM OR 97301

NIXIE 970 DE 1 0010/31/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

U.S. POSTAGE PITNEY BOWES
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RETURN SERVICE REQUESTED

COLLIN KAEDER
19796 BELLEVUE WAY
PORTLAND OR 97225

NSN

NIXIE 970 DE 1 0010/31/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

NSN BC: 972015380 75 *0229-01247-26-47

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02 1W
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RETURN SERVICE REQUESTED

KAREN YORK
16869 SW 65TH
CAMAS WA 98607

NIXIE 970 DE 1 0010/31/16
RETURN TO SENDER
UNCLAIMED
UNABLE TO FORWARD

UNC BC: 972015380 75 *0229-01118-26-47

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02 1W
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RETURN SERVICE REQUESTED

CATHERINE STANSBURY
2133 NE BRAZEE
PORTLAND OR 97219

NIXIE 970 FE 1260 0010/31/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTC BC: 972015380 75 *2489-00062-31-30

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RETURN SERVICE REQUESTED

LARRY HON
975 CARPENTER RD
PORTLAND OR 97202

NIXIE 970 DE 1 0010/31/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
UTF BC: 97201538075 *0229-01246-26-47

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RETURN SERVICE REQUESTED

FRED INGRAM
5635 SE 63RD
PORTLAND OR 97206

NIXIE 97208 11/03/2016
RETURN TO SENDER
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UNABLE TO FORWARD
SORT IN MANUAL ONLY NO AUTOMATION
BC: 56998999955

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RETURN SERVICE REQUESTED

PATRICIA WEBER
2328 NW GLISAN
CORVALLIS OR 97330

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD
N55 BC: 97201538075 *0229-01149-26-47

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DAVID JACQUEMIN
2545 SW TERWILLIGER
GRESHAM OR 97080

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UNABLE TO FORWARD

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RETURN SERVICE REQUESTED

JOY MAMOYAC
10360 NE PACIFIC
CORVALLIS OR 97330

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
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UNABLE TO FORWARD

N55
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JUDITH BECK
245 SW LINCOLN
PORTLAND OR 97201

NIXIE 970 DE 1260 0011/01/16
RETURN TO SENDER
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UNABLE TO FORWARD

IA
BC: 97201538075 *2489-04871-01-24

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RETURN SERVICE REQUESTED

MICHAEL MITTON
3565 E FORK
PORTLAND OR 97209

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

N55 BC: 97201538075 *0229-01388-26-47
97201>5380

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RETURN SERVICE REQUESTED

SUSAN HAYWOOD
18553 S FERGUSON
PORTLAND OR 97210

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

N55 BC: 97201538075 *0229-01129-26-47
97210>5380

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RETURN SERVICE REQUESTED

DANNY THIEMANN
140 SE OAK
PORTLAND OR 97210

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

N55 BC: 97201538075 *0229-01090-26-47

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RETURN SERVICE REQUESTED

RICHARD RAY
85 SE 16TH
PORTLAND OR 97209

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 97201538075 *0229-01039-26-47



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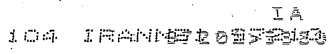
BETHANY THOMAS
31 NW 22ND
PORTLAND OR 97212

NIXIE 970 DE 1260 0011/01/16
RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

BC: 97201538075 *2489-03501-01-24



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GARY BAUER
220 NW SECOND
PORTLAND OR 97209

NIXIE 970 DE 1260 0011/01/16
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UNABLE TO FORWARD

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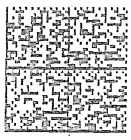

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ZIP 97204 $ 000.37[6]
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RETURN SERVICE REQUESTED

SHANNA BROWNSTEIN
220 NW 2ND
PORTLAND OR 97209

NIXIE 970 DE 1260 0011/01/16

RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

IA BC: 97201538075 *2489-03558-01-24
102 IRANN 97201-5380

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Portland, Oregon 97201-5380 P514

Fossil Fuel Terminal Zoning

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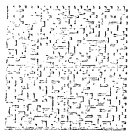

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ZIP 97204 $ 000.37[6]
02 1W
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SHANA BOUNSTEIN
220 NW 2ND
PORTLAND OR 97209

NIXIE 970 DE 1260 0011/01/16

RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

IA BC: 97201538075 *2489-03559-01-24
102 IRANN 97201-5380

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Fossil Fuel Terminal Zoning

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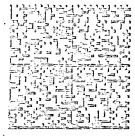

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ZIP 97204 $ 000.37[6]
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REINHARD PETROEUM
REINHARD PETROEUM
5885 NW SAINT HELENS RD
PORTLAND OR 97210-1145

NIXIE 970 FE 1260 0011/01/16

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UNABLE TO FORWARD

UTF BC: 97201538075 *2489-03738-01-24

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02 1W
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RETURN SERVICE REQUESTED

MICHAEL JORDAN
4259 SW PATRICK
LINN OR 97068

RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

BC: 97201538075 *0229-01035-26-47

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02 1W
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RETURN SERVICE REQUESTED

PAUL SPINDEL
9271 SE CLAY
WEST LINN OR 97068

RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

BC: 97201538075 *0229-01044-26-47

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02 1W
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RETURN SERVICE REQUESTED

MAUREEN O'NEAL
5904 SE KNIGHT
PORTLAND OR 97223

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2489-09759-01-24

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RETURN SERVICE REQUESTED

ANK
PAUL MARTINEZ
2934 NE 60TH
PORTLAND OR 97219

RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD

ANK BC: 97201538075 *2489-02176-01-22

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02 1W

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DAWN SMALLMAN
1913 NE 73RD
PORTLAND OR 97215

RETURN TO SENDER
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UNABLE TO FORWARD

ANK BC: 97201538075 *2489-02200-01-22

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02 1W
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RETURN SERVICE REQUESTED

NSN
HALEY KIRKPATRICK
1767 12TH
PORTLAND OR 97206

RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

ZIP 97210 $ 000.08⁹
02 4W
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U.S. POSTAGE PITNEY BOWES
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02 1W
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RETURN SERVICE REQUESTED

CHRISTINE TURNER
1414 SE LAFAYETTE
LONGVIEW WA 98632

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

N55 BC: 97201538075 *0229-01093-26-47

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U.S. POSTAGE PITNEY BOWES
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02 1W
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RETURN SERVICE REQUESTED

CHRIS TURNER
2007 NE MASON
LONGVIEW WA 98632

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

N55 BC: 97201538075 *0229-01134-26-47

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U.S. POSTAGE PITNEY BOWES
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02 1W
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RETURN SERVICE REQUESTED

CAROL VANCE
444 MUNN
PORTLAND OR 97206

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

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9615 GRAND RONDE
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MIRABAI PEART
4301 S BRYANT
PORTLAND OR 97206

NIXIE 970 DE 1 0011/01/16
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SANDRA MCDONOUGH
8410 SE FLAVEL
PORTLAND OR 97201

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ZACH REUTER
4407 SE YAMHILL
PORTLAND OR 97267

NIXIE 970 FE 1260 0011/01/16
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UTF BC: 97201538075 *2489-11120-01-24
114 IRANNS1 97215
97201>5380

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ANNIE MCCUEN
522 SW 5TH
SALEM OR 97302

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

NSS BC: 97201538075 *0229-01177-26-47
97302[illegible]
97201>5380

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DEBORAH FIELD
6732 NE ROSELEIGH
PORTLAND OR 97213

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
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TA BC: 97201538075 *0229-01207-26-47

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KAREN DEORA
2943 NE 8TH
PORTLAND OR 97212

NIXIE 970 DE 1 0011/01/16
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DANIELA MOLNAR
2335 NE 24TH
PORTLAND OR 97214

NIXIE 970 FE 1260 0011/01/16
RETURN TO SENDER
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BOB SALLINGER
2756 CHAD
PORTLAND OR 97212

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SARAH WIEBENSON
42852 SW DUDNEY
PORTLAND OR 9721[illegible]

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BRIAR SCHOON
16611 SE EAST
PORTLAND OR 97[illegible]

NIXIE 970 DE 1 0011/01/16
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BC: 97201538075 *0229-01117-26-47

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GEORGE WEISS AMANN
17124 SW MARTY
PORTLAND OR 97[illegible]

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
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BC: 97201538075 *0229-01119-26-47

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JAN ZUCKERMAN
1966 ORCHARDS
PORTLAND OR 97

NIXIE 970 DE 1 0011/01/16
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ANNE KOLLENDER
8001 SAND POINT
PORTLAND OR 97222

NIXIE 970 DE 1 0011/01/16
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NOT DELIVERABLE AS ADDRESSED
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DARRELL KAY
1215 NE IVON
LINCOLN CITY OR 97367

NIXIE 970 DE 1 0011/01/16
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UNABLE TO FORWARD

U.S. POSTAGE PITNEY BOWES
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STACIE HALL
16 CHURCHILL DOWNS
OREGON CITY OR 97045

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
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UNABLE TO FORWARD
BC: 97201538075 *0229-01115-26-47

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RETURN SERVICE REQUESTED

HELEN HAYS
5825 NE EMERSON
OREGON CITY OR 97045

NIXIE 970 FE 1 0011/01/16
RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD
BC: 97201538075 *0229-01211-26-47

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ANNE HAMBURG
320 SE ATWOOD
PORTLAND OR 97266

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
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UNABLE TO FORWARD

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MARTIN KILBOURNE
1103 SE 31ST
PORTLAND OR 97223

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
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BC: 97201538075 *0229-01058-26-47

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TED GLEICHMAN
2211 E 30TH
PORTLAND OR 97214

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JANICE VRANKA
680 16TH ST
PORTLAND OR 97219

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
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BC: 97201538075 *0229-01185-26-47

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TED LIGHT
7515 SE 23RD
PORTLAND OR 97215

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
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BC: 972015380 75 *0229-01197-26-47

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RETURN SERVICE REQUESTED

DAVID KENNEDY
5807 SE BELMONT
PORTLAND OR 97211

NIXIE 970 DE 1260 0011/01/16
RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

BC: 972015380 75 *2489-05059-01-23

IA
114 IRANN 97201>5380

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BRENT ROCKS
14071 CHATHAM
PORTLAND OR 97201

NIXIE 970 FE 1 0011/01/16
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DANIEL YUHAS
9725 SE 36TH
PORTLAND OR 97232

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD
NSN BC: 97201538075 *0229-01049-26-47

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MIKEL LITT
7317 NE HAZEL DELL
MILWAUKIE OR 97222

NIXIE 970 DE 1 0011/01/16
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NO SUCH STREET
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NSS BC: 97201538075 *0229-01195-26-47
97201>5380

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CHARLES PURVIS
2216 SW SUNSET
PORTLAND OR 97222

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD
NSS BC: 97201538075 *0229-01146-26-47

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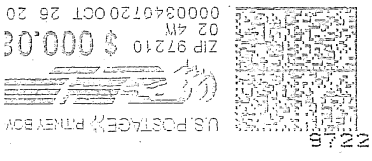
JACK WEST
3333 NE EVERTEE
MILWAUKIE OR 97222

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

BC: 97201538975 *0229-01385-26-47



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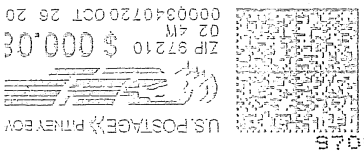
MICHELLE MINTMIER
6815 SE 31ST
BEAVERTON OR 97005

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538975 *0229-01186-26-47



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JACOB SEPULVEDA
330NW 116TH
PORTLAND OR 97214

NIXIE 970 DE 1260 0011/01/16
RETURN TO SENDER
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UNABLE TO FORWARD

IA BC: 97201538975 *2489-07869-01-18

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MARCIA DERNSON
71115 MORRIS
RAINIER OR 97048

NIXIE 970 DE 1260 0011/01/16
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UNABLE TO FORWARD

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RETURN SERVICE REQUESTED

BRIAN POSEWITZ
1605 E BURNSIDE
PORTLAND OR 97202

NIXIE 970 DE 1 0111/01/16
RETURN TO SENDER
NO SUCH NUMBER
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N5N BC: 97201538075 *0229-01116-26-47

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ROBERT HEYDENREICH
217 NW PRESCOTT
PORLTAND OR 97202

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

N5N BC: 97201538075 *0229-01144-26-47

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DEENA GROSSMAN
2063 BRYON
PORTLAND OR 97202

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 972015380 75 *0229-01135-26-47

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RETURN SERVICE REQUESTED

MARY MANDEVILLE
2988 NW ANGELICA
PORTLAND OR [redacted]

NIXIE 970 DC 1 0011/01/16
RETURN TO SENDER
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IA BC: 972015380 75 *0229-01381-26-47

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AMANDA SCHUELER
1516 NE HANCOCK
PORTLAND OR 97218

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JOSEPH MERRICK
4828 SE 30TH
PORTLAND OR 97215

NIXIE 970 FE 1260 0011/01/16

RETURN TO SENDER
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UNABLE TO FORWARD

UTF BL: 97201538075 *2489-01584-01-19
90 IRANN51 97202
97201>5380

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G GIBSON
2837 SE STEELE
PORTLAND OR 97202

NIXIE 970 DE 1260 0011/01/16

RETURN TO SENDER
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UNABLE TO FORWARD

UTF BL: 97201538075 *2489-01594-01-19
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97201>5380

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ZIP 97204 $ 000.37[6]
02 1W
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RETURN SERVICE REQUESTED

CHRISTINA PASILLAS
2132 W 14TH
KLAMATH FALLS OR 97603

NIXIE 970 DE 1 0011/01/16

RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

NSS BC: 97201538075 *0229-01139-26-47

ZIP 97210 $ 000.08[9]
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RETURN SERVICE REQUESTED

MONA MCNEIL
5406 NE EVERETTE
VANCOUVER WA 98686

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 97201538075 *0229-01181-26-47

NSN
97201>5380

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Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

MARY MCGAUGHEY
10740 SW 11TH
GRESHAM OR 97030

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

BC: 97201538075 *0229-01055-26-47

IA
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RETURN SERVICE REQUESTED

LINDA KAY WHEALIN
3914 SE LICYNTRA
GRESHMAN OR 97030

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
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UNABLE TO FORWARD

BC: 97201538075 *0229-01031-26-47

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KATHERINE GIBSON
86070 COUGAR
GRESHAM OR 97030

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
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BC: 97201538075 *0229-01040-26-47

IA
97080 97201 5380

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THOMAS KEYS
10480 SW EASTRIDGE
GRESHAM OR 97080

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD
BC: 97201538075 *0229-01054-26-47

IA
97080 97201 5380

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BARBARA PIKUS
6817 SE MORRISON
PORTLAND OR 97206

NIXIE 970 FE 1260 0011/01/16
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UNABLE TO FORWARD
BC: 97201538075 *7489-03220-01-29

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ROSE LINDSEY
1310 NE HOLMAN
PORTLAND OR 97214

NIXIE 970 FE 1260 0011/01/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BC: 97201538075 *2489-03382-01-29
108 IRANM

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BRIDGET WYATT
3946 NE 12TH
PORTLAND OR 97206

NIXIE 970 FE 1260 0011/01/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
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UTF BC: 97201538075 *2489-04858-01-29
108 IRANM

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BERKLEE ROBINS
3617 NE 10TH
LAKE OSWEGO OR 97035

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

NSN BC: 97201538075 *0229-01391-26-47

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FRASER RASMUSSEN
2218 NE GILE
LAKE OSWEGO OR 97035

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 97201538075 *0229-01147-26-47

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Fossil Fuel Terminal Zoning

RETURN SERVICE REQUESTED

MICHAEL HALL
4617 NE KILLINGSWORTH
LAKE OSWEGO OR 97035

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 97201538075 *0229-01169-26-47

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Fossil Fuel Terminal Zoning

RETURN SERVICE REQUESTED

BARBARA MANILDI
5746 NE GOING
LAKE OSWEGO OR 97035

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 97201538075 *0229-01208-26-47

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ALAIN MILLAR
731 SW SALMON
PORTLAND OR 97222

NIXIE 970 FE 1260 0011/01/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BC: 97201538075 *2489-07080-01-23
96 IRANNFF16D5805

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RETURN SERVICE REQUESTED

CECEILA HURLEY
25525 S LAURA
PORTLAND OR 97203

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

N55 BC: 97201538075 *0229-01152-26-47
97201>5380

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NO SUCH STREET

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MICHAEL KARNOSH
3587 NE STANTON
GRAND RONDE OR 97347

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

N55 BC: 97201538075 *0229-01389-26-47

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DIANA RICHARDSON
7141 SE MABEL
PORTLAND OR 97239

NIXIE 970 FE 1260 0011/01/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BC: 97201538075 *2489-00259-01-24
107 IRANN$10$75$$0

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WILLIAM WHITAKER
4501 WISTARIA
LA GRANDE OR 97850

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

NSS BC: 97201538075 *0229-01168-26-47
97850$$9999 97201>5380

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GREGG KLEINER
2135 NE 134TH
CORVALLIS OR 97330

NIXIE 970 DE 1 0011/01/16
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RETURN SERVICE REQUESTED

SARAH IANNARONE
39140 DEXTER
PORTLAND OR 97206

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

N5N BC: 972015380?5 *0229-01032-26-47

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RETURN SERVICE REQUESTED

JAMES RANKIN
7034 N CHARLESTON
CORVALLIS OR 97330

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

N55 BC: 972015380?5 *0229-01188-26-47
97201>5380

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RETURN SERVICE REQUESTED

DAPHNE WYSHAM
3082 NE REGENTS
LAKE OSWEGO OR 97035

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

N5N BC: 972015380?5 *0229-01382-26-47

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RETURN SERVICE REQUESTED

ESTHER NELSON
1803 SE WASHINGTON
LAKE OSWEGO OR 97035

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 97201538075 *0229-01125-26-47

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97201>5380

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RETURN SERVICE REQUESTED

ANGELA GUSA
1212 NE MASON
PORTLAND OR 97212

NIXIE 970 FE 1260 0011/01/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2489-05361-01-29

UTF
IRAN

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RETURN SERVICE REQUESTED

DEBORAH WILEY
430 NE 16TH
PORTLAND OR 97206

NIXIE 970 DE 1260 0011/01/16
RETURN TO SENDER
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UNABLE TO FORWARD

TA BC: 97201538075 *2489-01073-01-31

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RETURN SERVICE REQUESTED

DAVE RUUD
1503 N HAYDEN
PORTLAND OR 97231

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

BC: 97201538075 *0229-01038-26-47

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RETURN SERVICE REQUESTED

JONNEL MCNEILL
15704 NE 28TH
PORTLAND OR 97217

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

BC: 97201538075 *0229-01114-26-47

N55
97217>5380

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JANET STACKHOUSE
7325 N DENVER
PORTLAND OR 97212

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RETURN TO SENDER
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9400922489306290 UTF BC: 97201538075 *2489-00284-01-31

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ELLIE SEDOR
8325 SE 11TH
PORTLAND OR 97212

NOT AT THIS ADDRESS

NIXIE 970 DE 1260 0011/01/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BC: 97201538075 *2489-09784-01-23
90 IRANNE1 97202
97201>5380

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ASHLEY MCALLISTER
3386 SE WAVERLEIGH
PORTLAND OR 97213

NIXIE 970 DE 1260 0011/01/16
RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

IA BC: 97201538075 *2489-10235-01-23
90 IRANNE1 97202
97201>5380

NIXIE 970 DE 1260 0011/01/16
RETURN TO SENDER
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MARY TINKHAM
8312 SE 21ST
PORTLAND OR 97215

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RETURN SERVICE REQUESTED

DIANA REMPE
3724 SE 35TH
PORTLAND OR 97217

NIXIE 970 DE 1260 0011/01/16
RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

IA BC: 97201538075 *2489-10203-01-23
90 IRANNE1 97202
97201>5380

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DON MINNERLY
6413 SE 20TH
PORTLAND OR 97217

NIXIE 970 PE 1260 0011/01/16
RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD

ANK BC: 97201538075 *2489-10163-01-23
90 IRANNE1 97202
97201>5380

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RETURN SERVICE REQUESTED

MARK WHEELER
648 E 25TH
PORTLAND OR 97215

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
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UNABLE TO FORWARD

UTE BC: 97201538075 *0229-01210-26-47

ZIP 97210 $ 000.30
02 4W
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RETURN SERVICE REQUESTED

EILEEN RENCE
1742 DAYS CREEK
PORTLAND OR 97215

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *0229-01122-26-47

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97201>5380

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Fossil Fuel Terminal Zoning

JAMES ANDERSON
2752 SW WAKE ROBIN
PORTLAND OR 97215

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *0229-01157-26-47

UTF
97215>5380

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Fossil Fuel Terminal Zoning

DENA TURNER
8 CEDAR GATES
PORTLAND OR 97215

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *0229-01201-26-47

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DEAN PHILLIP
448 SUNWOOD
PORTLAND OR 97215

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF
97201>5380

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RETURN SERVICE REQUESTED

ELIZABETH LINDSEY
2104 NE 55TH
BEAVERCREEK OR 97004

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

NSS
97005>5380

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RETURN SERVICE REQUESTED

TOM HUSTON
7465 N HURON
DEXTER OR 97431

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

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BC: 97201538075 *0229-01196-26-47

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RETURN SERVICE REQUESTED

MONICA GILMAN
4626 SE CLINTON
ESTACADA OR 97023

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD
NSS BC: 97201538075 *0229-01170-26-47

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JAY HUMPHREY
2076 NW JOHNSON
ESTACADA OR 97023

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD
NSS BC: 97201538075 *0229-01136-26-47

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RETURN SERVICE REQUESTED

CHARLES JOHNSON
13160 SW TAPADERA
PORTLAND OR 97208

NIXIE 970 DE 1 0011/01/16
RETURN TO SENDER
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UTF BC: 97201538075 *0229-01088-26-47

U.S. POSTAGE PITNEY BOWES
ZIP 97210 $ 000.08⁶
02 4W
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Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

RACHEL HAMPTON
3231 SE 109TH
PORTLAND OR 97206

— Not this address
— Wrong zip code?

NIXIE 970 FE 1260 0011/01/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
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UTF BC: 97201538075 *2489-03944-01-21

109 IRANN 97201-5380

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Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

ELIZABETH LINDSAY
612 SE 48TH
PORTLAND OR 97218

NIXIE 970 DE 1260 0011/01/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BC: 97201538075 *2489-03905-01-21

114 IRANN 97201-5380

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RETURN SERVICE REQUESTED

RICHARD PASICHNYK
7706 SW BARNES
EUGENE OR 97402

NIXIE 970 DE 1 0011/01/16

RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

NSS BC: 97201538075 *0229-01199-26-47

U.S. POSTAGE >> PITNEY BOWES
ZIP 97210 $ 000.30
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Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

SHARON MILLER
1030 SW JEFFERSON
PORTLAND OR 97212

NIXIE 970 DE 1260 0011/01/16
RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

IA
BC: 97201538075 *2489-04358-01-24

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Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

Not at this address

LILLIAN KONG
3813 SE ROSWELL
PORTLAND OR 97206

NIXIE 970 FE 1260 0011/02/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF
BC: 97201538075 *2489-02773-02-27

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Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

BECKY GARDNER
152 SE SPOKANE
ALBANY OR 97322

NIXIE 970 DE 1 0011/02/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

ZIP 97210 $ 000.08⁹
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RETURN SERVICE REQUESTED

BRYAN TENANT
705 SE 32ND
PORTLAND OR 97217

NIXIE 970 DE 1260 0011/02/16
RETURN TO SENDER
REFUSED
UNABLE TO FORWARD

BC: 97201538075 *2489-08646-02-30

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Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

ANNA JOHNSON
650 NW IRVING
PORTLAND OR 97211

OCT 28 2016

NIXIE 970 FE 1260 0011/02/16
RETURN TO SENDER
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Fossil Fuel Terminal Zoning

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RETURN SERVICE REQUESTED

PATRICIA MIZUTANI
1260 NW NAITO
PORTLAND OR 97212

NIXIE 970 DE 1260 0011/02/16
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UNABLE TO FORWARD

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EDITH GILLIS
1133 NW 11TH
PORTLAND OR 97206

NIXIE 970 DE 1260 0011/02/16
RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

IA BC: 97201538075 *2489-02383-02-31
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Fossil Fuel Terminal Zoning

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ZIP 97204 $ 000.37⁶
02 1W
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RETURN SERVICE REQUESTED

RACHEL LEWINE
1330 SW 3RD

NIXIE 553 DE 1 0011/01/16
RETURN TO SENDER
NO SUCH STREET
UNABLE TO FORWARD

NSS BC: 97201538075 *0229-01089-26-47
97201>5380

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Fossil Fuel Terminal Zoning

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ZIP 97204 $ 000.37⁶
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RETURN SERVICE REQUESTED

FRANK HOLMES
1722 SE 58TH
LACEY WA 98516

NIXIE 980 DE 1 0011/02/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

NSN BC: 97201538075 *0229-01120-26-47

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Portland, Oregon 97201-5380 P514

Fossil Fuel Terminal Zoning

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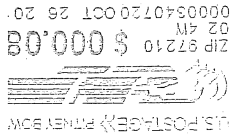
GAYLE JANZEN
4723 NE 14TH
SEATTLE WA 98133

NIXIE 980 DE 1 0011/02/16
RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD
BC: 97201538075 *0229-01172-26-47



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Fossil Fuel Terminal Zoning

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DARVEL LLOYD
13100 SE RIVER
PORTLAND OR 97215

NIXIE 970 FE 1260 0011/01/16
RETURN TO SENDER
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UNABLE TO FORWARD
BC: 97201538075 *2489-00429-01-24

UTF
127 IRANNE1 97222
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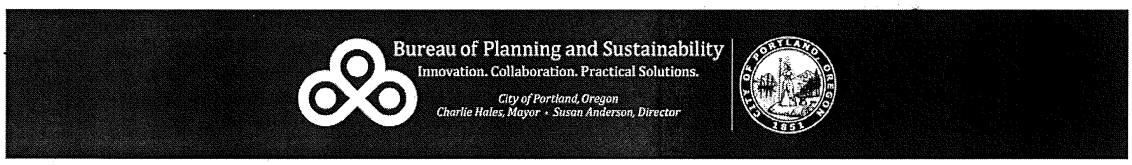
The Bureau of Planning and Sustainability is committed to providing equal access to information and hearings.

If you need special accommodation, please call 503-823-7700, the City's TTY at 503-823-6868, or the Oregon Relay Service at 711.

www.portlandoregon.gov/bps



City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Fossil Fuel Terminal Zoning

Fossil Fuel Terminal Zoning

Portland City Council Hearing
November 10, 2016 at 2:00 P.M.

Council Chambers, City Hall
1221 SW 4th Avenue, Portland, Oregon.

Watch City Council sessions live: www.portlandoregon.gov/article/230361

City Council Hearing on:
Fossil Fuel Terminal Zoning

Why am I receiving this notice?

You are receiving this notice because you responded in writing to the matter, testified at a previous related hearing, or have requested notice of this hearing.

What is this project about?

This code change project would restrict development and expansion of Bulk Fossil Fuel Terminals. These code changes would implement new policy direction on fossil fuel distribution and storage facilities in City Resolution 37168.

- Bulk Fossil Fuel Terminals would be characterized by (a) marine, railroad, or pipeline transport access and (b) either storage capacity exceeding 2 million gallons or transload facilities (such as rail-to-ship loading)

- Fossil fuels include petroleum products (such as crude oil and gasoline), coal, natural gas, and propane, and methanol, which is produced from natural gas.

- No new Bulk Fossil Fuel Terminals would be allowed.

- The existing Bulk Fossil Fuel Terminals in Industrial and General Employment zones would become "limited uses" that can continue to operate. Expansion of fossil fuel storage at these existing terminals would be limited to improvements that (a) include "seismic upgrades" which replace existing tanks, (b) add no more than 10 percent of the capacity of replaced tanks, and (c) result in no more than 10 percent cumulative expansion of the total terminal capacity on the effective date of these code changes.

The code changes will not apply to gas stations; distributors and wholesalers that receive and deliver fossil fuels exclusively by truck; industrial, commercial, institutional, and agricultural uses that store fossil fuels for use as an input; uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses. Fossil fuel storage facilities at airports, marine terminals, rail yards, and fleet vehicle fuel facilities are specifically exempted.

How can I review this proposal?

Get a copy of the report. The *Fossil Fuel Terminal Zoning Amendments Recommended Draft* will be available the week of October 24, 2016. You can pick up a copy at our office at 1900 SW 4th Avenue, 7th Floor. The Bureau receptionist will mail you a copy if you call 503-823-7700. The document will also be available on the Bureau of Planning and Sustainability website at www.portlandoregon.gov/bps/71118.

How can I comment on this proposal?

Testify at the City Council hearing. The hearing, on November 10, 2016 at 2:00 P.M., will be in Council Chambers at City Hall, 1221 SW 4th Avenue.

Write to City Council. Email written testimony to the Council Clerk at fossilfuelzoning@portlandoregon.govor send to 1221 SW Fourth Avenue, Room 130, Portland, Oregon 97204. Written testimony must be received by the time of the hearing and must include your name and address.

For more information

Contact Tom Armstrong, Supervising Planner, at the Bureau of Planning and Sustainability 503-823-3527 or tom.armstrong@PortlandOregon.gov or visit the Bureau of Planning and Sustainability's website: www.portlandoregon.gov/bps/71118.

FTZ Council Hrg Legisl Notice - Full Name	Organization Name	Address	City/State/Postal Code
Brad Fletcher		01537 SW COMUS ST	PORTLAND OR 97219-7842
Michael Dowd	Dowd Architecture Inc	0753 SW MILES ST	PORTLAND OR 97219-3060
Patricia Schechter and Nick Fish		1000 SW VISTA AVE APT 1112	PORTLAND OR 97205-1152
Howard Shapiro and Alice Shapiro , PSC Commissioner		1001 NW LOVEJOY ST APT 1210	PORTLAND OR 97209
Chris Girard	Plaid Pantry	10025 SW ALLEN BLVD	BEAVERTON OR 97005-4124
Angela Zehava		10046 N Oswego	Portland OR 97202
Jeremiah Jenkins		10055 NE Weidler	Portland OR 97213
Steve Janik	Ball Janik LLP	101 SW MAIN ST STE 1100	PORTLAND OR 97204-3228
Debbie Collard	Ball Janik LLP	101 SW MAIN ST STE 1100	PORTLAND OR 97204-3228
Mark Hardie	City of Maywood Park	10100 NE PRESCOTT ST STE 147	PORTLAND OR 97220
Charlotte Sahnow		1015 NE Dean	Eugene OR 97408
David Nez		1015 NE Dean	Portland OR 97203
Cathy Bledsoe		10151 SW Washington	Portland OR 97225
Chair/Land Use Chair Powellhurst-Gilbert NA	Powellhurst-Gilbert NA c/o EPNO	1017 NE 117th	Portland OR 97220
President/Chair EPNO	EPNO - East Portland Neighborhood Offic	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Lents NA	Lents NA c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Glenfair NA	Glenfair NA c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Parkrose NA	Parkrose NA c/o EPNP	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Centennial Community	Centennial Community Assn c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Hazelwood NA	Hazelwood NA c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Mill Park NA	Mill Park NA c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Parkrose Heights NA	Parkrose Heights Association of Neighbor	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Pleasant Valley NA	Pleasant Valley NA c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Russell NA	Russell NA	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Wilkes Community NA	Wilkes Community Group c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Woodland Park NA	Woodland Park NA c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Liz Terhaar		1020 SW Taylor	Hood River OR 97031
Kelly Campbell		1020 SW Taylor	Portland OR 97214
Pat Bowman		1021 NW Skyline	Portland OR 97229
Chair/Land Use Chair Linnton NA	Linnton NA (NWNW)	10250 NW 110th AVE	PORTLAND OR 97231
Kyle Collins		1026 Jackson	Eugene OR 97402

Mauria McClay			1029 N Winchell	Portland OR 97218
Sharon Miller			1030 SW Jefferson	Portland OR 97212
Susan Millhauser			1030 SW Jefferston	Portland OR 97211
Marjory Bryan			1032 SE 35th	Portland OR 97214
Joy Mamoyac			10360 NE Pacific	Corvallis OR 97330
Laurie Fisher			10414 SW Bonanza	Tigard OR 97224
Thomas Keys			10480 SW Eastridge	Gresham OR 97080
Gary Madson		CalPortland	1050 N RIVER ST	PORTLAND OR 97227-1719
Bob Short		CalPortland	1050 N RIVER ST	PORTLAND OR 97227-1719
Patricia Always			10511 W Kingswood	Sun City AZ 85351
Juliana Lukasik		@Large Films	10526 NE 13TH AVE	PORTLAND OR 97211-1560
David Bennett			1061 SE 57th	Portland OR 97215
Andrea LePain			107 SE 30th	Portland OR 97283
Daniel Brainich			1070 Hanover ST	Daly City CA 94014
Mary McGaughey			10740 SW 11th	Gresham OR 97030
Todd Corbett			10815 Hubbard Creek	Umpqua OR 97486
Tara Hershberger			1090 Chandler	Portland OR 97220
Jeffrey Stuhr		Holst Architecture	110 SE 8TH AVE	PORTLAND OR 97214
Alicia Keys			1103 SE 21st	Portland OR 97225
Martin Kilbourne			1103 SE 31st	Portland OR 97223
Jeffrey White			1108 G	Forest Grove OR 97116
Kelly O'Hanley			111 NE 6th	Portland OR 97213
Rick Rappaport			111 NW 11th	Portland OR 97212
Ken Pirie		Walker Macy	111 SW OAK ST STE 200	PORTLAND OR 97204-3406
Police Bureau - Bureau Director		C of P - Police Bureau	1111 SW 2ND AVE	PORTLAND OR 97204
Chair/President Gateway Area BA		Gateway Area Business Association	11124 NE HALSEY ST UNIT PMB 4	PORTLAND OR 97220-2021
Laura Berg			1115 SE Rex	Milwaukie OR 97222
Mark Whitlow		Perkins Coie	1120 NW COUCH ST FL 10	PORTLAND OR 97209-4114
Alan Beard		GBD Architects	1120 NW COUCH ST STE 300	PORTLAND OR 97209-4114
Katherine Schultz		GBD Architects	1120 NW COUCH ST STE 300	PORTLAND OR 97209-4114
Lee Underwood			1122 SE 60th	Hood River OR 97031
Joshua Berger			1123 SE 36TH AVE	PORTLAND OR 97214-4302

DR Virginia Feldman		11230 SW COLLINA AVE	PORTLAND OR 97219-7835
Maya Jarrad		11232 Dayton Ave	Portland OR 97212
Howard Shapiro		1125 NE Madison	Portland OR 97202
Chair/President Venture Portland BA	Venture Portland	1125 SE MADISON ST STE 112	PORTLAND OR 97214
Joyce Gibson		1128 NE 110TH AVE	PORTLAND OR 97220-3137
Joyce Leggatt		1128 NE Emerson	Portland OR 97211
John Gillette		1132 8th	Portland OR 97209
Edith Gillis		1133 NW 11th	Portland OR 97206
Nicholas Caces		1136 SE 50th	Portland OR 97215
Steve McCoy		11375 SW Erste	Portland OR 97204
Francesca Gambetti	Shiels Obletz Johnsen Inc	1140 SW 11TH AVE STE 500	PORTLAND OR 97205-2490
Randy Watson		11435 SE BOISE ST	PORTLAND OR 97266-2264
Glenna Hayes		11437 SE Pine	Portland OR 97219
Laura Kurtz		11439 SE Market	Portland OR 97203
Brian Smith		1148 SE 50th	Portland OR 97213
Walter Demaree		11535 N Force	Portland OR 97217
Dianne Ensign		11600 SW LANCASTER RD	PORTLAND OR 97219-7655
Mary Sue Evers		11675 SW Park	Portland OR 97225
David Hermanns		11935 SW Edgewood	Portland OR 97203
Jody Bleyle		120 SE 53rd	Portland OR 97215
Phillips 66		1201 K St, Ste 1930	Sacramento, CA 95814
Joyce Henstrand	Reynolds School District	1204 NE 201ST AVE	FAIRVIEW OR 97024
Theodora Tsongas		1205 SW Cardinell	Portland OR 97215
Heidi Trinkle and Scott Trinkle		1205 SW CARDINELL DR APT 603	PORTLAND OR 97201
Glen Stamm		1207 SE 72nd	Ashland OR 97520
Donald Krahmer	Schwab Williamson + Wyatt	1211 SW 5TH AVE STE 1900	PORTLAND OR 97204-3713
OCCUPANT	Riverdale Community Group	12112 SW BREYMAN AVE	PORTLAND OR 97219-8417
Angela Gusa		1212 NE Mason	Portland OR 97212
Marilyn Cohen		12145 SW 33rd	Portland OR 97219
Darrell Kay		1215 NE Ivon	Lincoln City OR 97367
Craig Perry		12222 NW Marina	Portland OR 97212
Susan Hanson	ODOT - Region 1	123 NW FLANDERS ST	PORTLAND OR 97209-4012

Farrah Chaichi		12320 SW CENTER ST APT 41	BEAVERTON OR 97005	
Nicholas Cutright		12345 Lake City	Seattle WA 98125	
A-L COMPRESSED GASES	A-L COMPRESSED GASES	12502 NE MARX ST	Portland ,OR 97230-1056	
Jack Brenneman		12532 SE OATFIELD RD	MILWAUKIE OR 97222-6958	
Patricia Mizutani		1260 NW Naito	Portland OR 97212	
Margaret Labadie		1260 NW NAITO PKWY UNIT 208	PORTLAND OR 97209	
Vincent Alvarez		12671 SE Where Else Ln	Milwaukie OR 97222	
Jocelyn Cox		12705 SE RIVER RD APT 306C	PORTLAND OR 97222	
Jeff Kellis		12910 SE CENTER ST	PORTLAND OR 97236-3619	
Shawn Looney		12937 NW Newberry	Portland OR 97231	
Babtist Lumley		12937 NW Newberry	Portland OR 97232	
Tobias Boyd		130 NE 72nd	Portland OR 97213	
Chair/Land Use Chair Sullivan's Gulch NA	Sullivan's Gulch NA c/o Holladay Park Pla	1300 NE 16TH AVE c/o Holladay F	PORTLAND OR 97232	
Phil Grillo		1300 SW 5th Ave, Ste 2400	Portland, OR 97201-5630	
Mike McCulloch	Michael McCulloch Architects	13000 NW OLD GERMANTOWN F	PORTLAND OR 97231-2773	
Brittain Brewer		1310 NE 24TH AVE	PORTLAND OR 97232-1625	
Rose lindsey		1310 NE Holman	Portland OR 97214	
Darvel Lloyd		13100 SE River	Portland OR 97215	
City of Tigard - Bureau Director	City of Tigard	13125 SW HALL BLVD	TIGARD OR 97223-8144	
Lee Zucker		13140 Marina	Eugene OR 97403	
AMERIGAS	AMERIGAS	1316 NE Lombard Pl	Portland ,OR 97211	
Charles Johnson		13160 SW Tapadera	Portland OR 97208	
Deborah Einbender		1326 SE Pine	Portland OR 97214	
Jason Miner	1000 Friends of Oregon	133 SW 2ND AVE STE 201	PORTLAND OR 97204-3534	
Rachel Lewine		1330 SW 3rd	Eagan MN 55123	
Chelsea Davis		1331 SW Hume	Portland OR 97219	
Alan Peters	Ambridge Event Center	1333 NE MARTIN LUTHER KING JI	PORTLAND OR 97232-1152	
City of Gresham - Bureau Director	City of Gresham	1333 NW EASTMAN PKWY	GRESHAM OR 97030-3825	
Debra Byers		13465 SW BRIGHTWOOD RD	BEAVERTON OR 97011	
Mary Griffiths		1347 NE 47th	Portland OR 97214	
Barbara Quinn		13817 SW Mistletoe	Portland OR 97203	
Danny Thiemann		140 SE Oak	Portland OR 97210	

Elizabeth Britt		1406 27th	Portland OR 97214
Brent Rocks		14071 Chatham	Portland OR 97201
Sharon Labreck		1408-1 SW Hall	Damascus OR 97089
Emerald Goldman		1411 NE 16th	Portland OR 97215
Rhonda Sabala		14139 NW Charlton	Portland OR 97211
Christine Turner		1414 SE Lafayette	Longview WA 98632
Jonnel Covault		1414 SE Redwood	Portland OR 97267
Noell Webb	Webb and Associates	1419 SW ALDER ST	PORTLAND OR 97205-1946
Cynthia Enlow		1460 NW Ashley	Albany OR 97321
Susanna Askins		14640 NE Russell	Portland OR 97230
Cathy Spofford		1465 Holly	Portland OR 97219
Rose Christopher		14707 NW Cedar	Portland OR 97231
Dennis Wilde	Gerding Edlen Development	1477 NW EVERETT ST	PORTLAND OR 97209
Kathi Futornick	Environmental Consulting Associcates	14800 NE BLUE BIRD HILL LN	DAYTON OR 97114-7005
Sara Dolph		149 SE 134th	Portland OR 97233
Adrienne Dickinson and Robert Dickinson		14900 SE RUPERT DR	PORTLAND OR 97267
Mary Lane		14960 SW 92nd	Portland OR 97214
Tom Lichatowich		15 NE 151st	Portland OR 97211
Director	Clackamas County - Transportation and D	150 BEAVER CREEK RD	OREGON CITY OR 97045-4143
Sustainability Team	Oregonian, The	1500 SW 1ST AVE STE 400	PORTLAND OR 97201
Adriana Cvitkovic		1502 NE 84th	Portland OR 97216
Monica Mueller		1502 SE 84th	Portland OR 97214
Damon Storey		1502 SE 84th	Portland OR 97216
Alastair Roxburgh		1503 N Hayden	Portland OR 97217
Dave Ruud		1503 N Hayden	Portland OR 97231
Steve Elliot		15036 Stagecoach	Swisshome OR 97480
Barbara Godlman		15066 SE Robinette	Portland OR 97216
Barbara Disciascio		15112 SE YAMHILL ST	PORTLAND OR 97233-2949
Tom Wright	Group Mackenzie	1515 SE WATER AVE STE 100	PORTLAND OR 97214-3349
Amanda Schueler		1516 NE Hancock	Portland OR 97218
Tammie Murray		1516 SE 43rd	Seattle WA 98138
Bernadette Rodgers		1518 SW Upper	Portland OR 97239

Becky Gardner		152 SE Spokane	Albany OR 97322
Lilah Wallach		15200 SW Crown	Portland OR 97215
Jeffrey Owen and Heather McCarey		1524 SW 18TH AVE	PORTLAND OR 97201
Scott Trinkle		1525 SE 139th	Portland OR 97201
Chuck Merrill	Merrill and Langberg	15253 SE LAURIE AVE	MILWAUKEE OR 97267-2531
Mary Barrow		1531 SW Harrison	Portland OR 97201
Jonnel McNeill		15704 NE 28th	Portland OR 97217
Erik Nielsen		15715 NW CENTRAL DR UNIT A51	PORTLAND OR 97229
Patricia Zoline		1579 SE Nehalem	Portland OR 97213
Stacie Hall		16 Churchill Downs	Oregon City OR 97045
Laraine Vonfeldt		16 SW Canby	Portland OR 97217
Brian Posewitz		1605 E Burnside	Portland OR 97202
Nora Polk		1610 NE Tillamook	Portland OR 97206
Jeff Perala	Perlo McCormack Pacific	16101 SW 72ND AVE STE 200	PORTLAND OR 97224
Diane Schneider	Safeway Inc	16300 SE EVELYN ST	CLACKAMAS OR 97015-9515
Chair/President Northeast Broadway BA	Northeast Broadway Business Association	1631 NE BROADWAY UNIT 449	PORTLAND OR 97232-1425
Eliot Cole		1635 NE Couch	Portland OR 97211
Tori Cole		1635 NE Couch	Portland OR 97232
Briar Schoon		16611 SE East	Portland OR 97212
Karen York		16869 SW 65th	Camas WA 98607
Hyung Nam		1710 SW Harbor	Portland OR 97214
George Weiss Amann		17124 SW Marty	Portland OR 97212
Pennelloppe Allee		17139 SW Berkeley	Beaverton OR 97003
Tracy Ceravolo		1721 NE 209th	Vancouver WA 98642
Chair/President Alberta Main Street BA	Alberta Main Street Business Association	1722 NE ALBERTA ST	PORTLAND OR 97211-5802
Frank Holmes		1722 SE 58th	Lacey WA 98516
Nancy Bishop		1725 N Alberta	Portland OR 97217
Avery Leinova		173 NE Bridgeton	Portland OR 97214
Ruby Wilcox		173 NE Bridgeton	Portland OR 97232
Sean Tenney		1732 N Blandena	Portland OR 97205
Noah Devienzo		1734 SW Collins	Portland OR 97219
Charles Townsend		1736 SE Taggart	Portland OR 97212

Eileen Rence		1742 Days Creek	Portland OR 97215
Don Dumond		1744 Moss	Eugene OR 97403
Diana Talcott		17469 SE Main	Portland OR 97202
Kima Garrison		175 NE 7th	Portland OR 97211
Susan Buswell		17628 SE Cook	Milwaukie OR 97267
Haley Kirkpatrick		1767 12th	Portland OR 97206
Marty Bankhead		17709 Hill	Lake Oswego OR 97035
Sabolch Horvat		17827 NW Sauvie	Portland OR 97212
Esther Nelson		1803 SE Washington	Lake Oswego OR 97035
Teresa Baldwin	Centennial School District	18135 SE BROOKLYN ST	PORTLAND OR 97236-1049
Eric Lambart		18141 SE Troge	Portland OR 97217
Mark Braverman		1815 NW 27th	Portland OR 97210
Jacob Braverman		1815 NW 27th	Portland OR 97210
Susan Braverman		1815 NW 27th	Portland OR 97210
Julio Forges		1820 NE 21st	Portland OR 97202
David Regan		1820 NE 21st	Portland OR 97205
Nick Caleb		1820 NE 21st	Portland OR 97212
Dana Weintraub		1820 NE Vine	Beaverton OR 97003
Jacqueline Glyde		1821 SE Ankeny	Portland OR 97252
Patrick McCulley		1825 Fairmount	Portland OR 97213
Linda Kay Stevens		1830 23rd St	Portland OR 97217
Gregory Monahan		1845 SE Elliott	Portland OR 97219
Sarah Ffitch		1850 SW HIGH ST	PORTLAND OR 97201-1740
Carmen Lohkamp		18531 SE TIBBETTS CT	GRESHAM OR 97030-6271
Susan Haywood		18553 S Ferguson	Portland OR 97210
Multnomah Drainage District - Bureau Direct	Multnomah Drainage District	1880 NE ELROD DR APT	PORTLAND OR 97211-1810
Jim Breithaup		1880 SW Edgewood	Portland OR 97201
Bethany Silikas		18845 SW Vista	Portland OR 97225
Sherry Patterson	Oregon Earthquake Preparation Network	18926 ARROWOOD AVE	LAKE OSWEGO OR 97035-8304
Gretchen Freda		18th	Portland OR 97202
City Auditor Hearing Office	City Auditor - Hearings Office	1900 SW 4TH AVE STE 3100	PORTLAND OR 97201-5350
Rachael Hawkey		1900 SW Sunset	Portland OR 97217

Amy Robbins			1905 SW Sunset	Portland OR 97203
Nia Hansen			1908 SE 35th	Portland OR 97239
Dawn Smallman			1913 NE 73rd	Portland OR 97215
Fiona Yun			1915 SE Alder	Portland OR 97203
Mary Ann Dougherty			19170 Bryant	Lake Oswego OR 97034
Philip Brunner			1920 N Schofield	Portland OR 97217
Eric Canon			1923 Elm	Forest Grove OR 97116
Seemin Qayum			1927 N Jantzen	Portland OR 97223
Mary Fiffield			1927 SE 35th	Portland OR 97214
Gary Gilardi			1957 NW Florence	Lake Oswego OR 97031
Jan Zuckerman			1966 Orchards	Portland OR 97212
Patrick Christopher			19695 Sun CIR	West Linn OR 97068-1913
Megan Horst			19698 SE Cottonwood	Portland OR 97211
Maurine Canarsky			1977 SE 22nd	Portland OR 97214
Collin Kaeder			19796 Bellevue Way	Portland OR 97225
Katy McFadden			200 SW Market	Portland OR 97219
Chair/President Downtown Retail Council	Downtown Retail Council c/o Portland Bu		200 SW MARKET ST STE 150	PORTLAND OR 97201-5715
Chair/Land Use Chair Beaumont-Wilshire NA	Beaumont-Wilshire NA c/o The Postal Sta		2000 NE 42ND AVE STE D - #394	PORTLAND OR 97213-1399
Chair/President Hollywood Boosters BA	Hollywood Boosters Business Association		2000 NE 42ND AVE UNIT PMB 38	PORTLAND OR 97213-1399
Julie Chapman			2005 SE Reedway	Portland OR 97202
Erin Madden			2007 NE 65th	Portland OR 97202
Chris Turner			2007 NE Mason	Longview WA 98632
Priscilla Lane			2009 SE Taylor	Portland OR 97215
Leslie Davis			2016 NE 25th	Portland OR 97212
Robert Fordham			2016 NE 25th	Portland OR 97212
Linda Cargill			2020 NW Northup	Portland OR 97209
Kim Fortin			2023 SE Madison	Portland OR 97214
Aaron Schalon			2032 NE Liberty	Portland OR 97232
Melissa Scherling			2033 NE Couch	Portland OR 97213
Peter Cornelison			205 Oak	Hood River OR 97031
Deborah Romereu			2058 SE Elliott	Portland OR 97212
Deena Grossman			2063 Bryon	Portland OR 97202

Jay Humphrey		2076 NW Johnson	Estacada OR 97023
Elizabeth Lindsey		2104 NE 55th	Beavercreek OR 97004
Joshua Bergeer		2124 NE 41st	Portland OR 97212
Debby Garman		2125 SE 35th	Hillsboro OR 97124
Jason Sheek , Marine Security		2126 SE 103RD DR	PORTLAND OR 97216-3021
Elle West		2132 NE 13th	Portland OR 97232
Christina Pasillas		2132 W 14th	Klamath Falls OR 97603
Catherine Stansbury		2133 NE Brazee	Portland OR 97219
Donna Murphy		2134 NE 37th	Portland OR 97212
Dawn Griffin		21341 S Ferguson	Portland OR 97213
Gregg Kleiner		2135 NE 134th	Corvallis OR 97330
Sarah Prowell		2139 NE Halsey	Portland OR 97239
John Kirkland		2146 NW Everett	Hood River OR 97031
Allegra Heidelinde		2146 NW Everett	Portland OR 97215
Natalie VanLeekwijck		2149 Cascade	Hazard NE 68844
Peter Finley-Fry	Columbia Pacific Planning	2153 SW MAIN ST	PORTLAND OR 97205-1124
Robert Heydenreich		217 NW Prescott	Porltand OR 97202
Lynda Byeers		2171 NE Schuyler	Portland OR 97212
Shana Bounstein		220 NW 2nd	Portland OR 97209
Shanna Brownstein		220 NW 2nd	Portland OR 97209
Northwest Natural		220 NW 2nd Ave	Portland, OR 97209
Gary Bauer		220 NW Second	Portland OR 97209
Chair/President Kenton BA	Kenton Business Association	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair Overlook NA	Overlook NA	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair Hayden Island NA	Hayden Island Neighborhood Network	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair Kenton NA	Kenton NA c/o NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair East Columbia NA	East Columbia NA	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair Portsmouth NA	Portsmouth NA	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair University Park NA	University Park NA c/o NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair Piedmont NA	Piedmont NA	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair Arbor Lodge NA	Arbor Lodge NA c/o NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair St Johns NA	St Johns NA	2209 N SCHOFIELD ST Box 441	PORTLAND OR 97217

President/Chair NPNS	NPNS - North Portland Neighborhood Ser	2209 N SCHOFIELD ST FL 2	PORTLAND OR 97217
Ted Gleichman		2211 E 30th	Portland OR 97214
Michelle Rudd , PSC Commissioner		2213 NW PINNACLE DR	PORTLAND OR 97229-9108
Regna Merritt		2216 SE 58th	Portland OR 97210
Charles Purvis		2216 SW Sunset	Portland OR 97222
Fraser Rasmussen		2218 NE Gile	Lake Oswego OR 97035
Joanne Jeni		2221 SW 1ST AVE APT 1921	PORTLAND OR 97201-5071
Maggie Tallmadge , PSC Commissioner		2225 NW HOYT ST	PORTLAND OR 97210-3216
Joe Chasse		22313 V	Ocean Park WA 98640
Leonard Nomeland		2234 N WILLAMETTE BLVD	PORTLAND OR 97217-4409
Alicia Cohen		2240 SE 24TH AVE	PORTLAND OR 97214-5506
James Clapp		22500 NE 113th	Vancouver WA 98682
President/Chair NWNW	NWNW - Neighbors West / Northwest	2257 NW RALEIGH ST	PORTLAND OR 97210
Chair/President Old Town Chinatown CA	Old Town Chinatown Community Associa	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Northwest Industrial NA	Northwest Industrial NA c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Goose Hollow NA	Goose Hollow Foothills League c/o NWN	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Northwest District Assn	Northwest District Assn c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Northwest Heights NA	Northwest Heights NA c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Pearl District NA	Pearl District NA c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Portland Downtown NA	Portland Downtown NA c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Sylvan-Highlands NA	Sylvan-Highlands NA c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Forest Park NA	Forest Park NA c/o Neighbors West/Nort	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Arlington Heights NA	Arlington Heights NA c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Hillside NA	Hillside NA c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Mary Sievertsen		2280 SE 34th	Portland OR 97225
Sharon Collver		2306 NE Siskiyou	Portland OR 97212
John Francini		2308 NE Rodney	Portland OR 97218
Cecilia Youngs		2317 NE 9th	Mercer Island WA 98040
FITZ ENTERPRISES, INC.	FITZ ENTERPRISES, INC.	232 NE MIDDLEFIELD RD	Portland ,OR 97211-1238
STAR OILCO	STAR OILCO	232 NE Middlefield Rd	Portland ,OR 97211
Patricia Weber		2328 NW Glisan	Corvallis OR 97330
Daniel Serres		2329 SE Madison	Portland OR 97214

James Nielson		2331 N Terry	Portland OR 97218
Chair/President Northwest Industrial NA	Northwest Industrial Business Association	2333 NW VAUGHN ST	PORTLAND OR 97210
Daniela Molnar		2335 NE 24th	Portland OR 97214
Harry Kershner		2335 SE Pine	Portland OR 97203
Chris Smith ,		2343 NW PETTYGROVE ST	PORTLAND OR 97210-2609
Paul Leistner		2350 SE 57TH AVE	PORTLAND OR 97215-4006
Nancy Crumpacker		2351 NW WESTOVER RD APT 701	PORTLAND OR 97210
Teresa McFarland		2357 NE 151st	Portland OR 97219
Helen Spector		2409 SE 51st	Portland OR 97229
Joan Andon		2411 NW Stimpson	Portland OR 97229
Ian Shelley		2414 SE 30th	Portland OR 97225
Thomasina Gabriele	Gabriele Development Services	2424 NW NORTHRUP ST STE LWF	PORTLAND OR 97210-2923
TYREE OIL, INC.	TYREE OIL, INC.	2429 N BORTHWICK AVE	Portland ,OR 97227-1704
Luke Anavi		2431 NE FLANDERS ST	PORTLAND OR 97232-3137
Mike Houck and Al Miller		2433 NW QUIMBY ST	PORTLAND OR 97210-2644
Emily Schelling		2435 NE 46TH AVE	PORTLAND OR 97213-1907
Judith Beck		245 SW Lincoln	Portland OR 97201
David Henderson		2454 Occidental	Portland OR 97211
Chair/President Nob Hill BA	Nob Hill Business Association	25 NW 23RD PL STE 6 - PMB 217	PORTLAND OR 97210
BC Shelby		2505 N Williamette	Portland OR 97214
Daniel Senic		2515 NE 9th	Portland OR 97229
Barbara Hilyer		2515 NE 9th	Portland OR 97239
Chair/President Alberta Street BA	Alberta Street Business Association	2529 NE ALBERTA ST	PORTLAND OR 9721
Peter Wilcox		253 N Broadway	Portland OR 97211
David Jacquemin		2545 SW Terwilliger	Gresham OR 97080
Ken Kailing	Ken Kailing, Planning Consultant	2548 31ST W AVE	SEATTLE WA 98199-3336
Greg Madden	Madden Fabrication	2550 NW 25TH PL	PORTLAND OR 97210-1843
Ceceila Hurley		25525 S Laura	Portland OR 97203
Mikel Gisi		25525 S Laura	Vancouver WA 98663
Lenny Dee		2580 NE 31st	Portland OR 97217
Carole Warner		260 NW Pittock	Portland OR 97202
Micah Meskel		260 NW Pittock	Portland OR 97211

CASCADE PETROLEUM TRANSPORTATION INC	CASCADE PETROLEUM TRANSPORTATION	2606 N NEWARK ST	Portland ,OR	97217-6969
Molly Brown		2606 NE 30th	Mt Shasta CA	96067
Robin Patten		2607 Hope	Oklahoma City OK	73115
Priscilla Carlson		2607 NE Mason	Portland OR	97211
Jamison Cavallaro		2614 SE 67th	Portland OR	97206
Jody Guth		2625 NE 41st	Portland OR	97212
Kathy Austen		2628 SE 109TH AVE	PORTLAND OR	97266
Kate Gessert		2639 SE Stephens	Eugene OR	97402
Jane Stackhouse		2643 NE 43rd	Portland OR	97213
Virginia Wiseman		2652 SE 48th	Portland OR	97211
Jason Fiske		2704 SE 47th	Portland OR	97206
Chair/President Burnside East BA	Burnside East Business Association	2705 E BURNSIDE ST UNIT 110	PORTLAND OR	97214-1763
Linda Magnumson		2717 NE 12th	Portland OR	97218
DON THOMAS PETROLEUM INC	DON THOMAS PETROLEUM INC	2727 NW SAINT HELENS RD	Portland ,OR	97210-2243
Mike Pederson	Rose City Awning	2728 NW NELA ST	PORTLAND OR	97210-1714
Charles Brod		2728 SE Tibbetts	portland OR	97202
Steve Cheseborough		2735 NE 37th	Portland OR	97212
Loren Waxman		2746 SE 26TH AVE	PORTLAND OR	97202-1227
James Anderson		2752 SW Wake Robin	Portland OR	97215
Paul Thompson		2755 NE 35th	Portland OR	97202
Bob Sallinger		2756 Chad	Portland OR	97212
Anne Davidson		2756 NW RALEIGH ST	PORTLAND OR	97210-2457
Susan Wechsler		2785 NW Marshall	Corvallis OR	97330
David Vanthof		2790 SW Carolina	Portland OR	97205
Linda Levin		2800 NE Edgehill	Portland OR	97201
Thomas Hopkins		2806 SE 15th	Milwaukie OR	97267
Cam Taylor		2806 SE 15th	Portland OR	97214
Jim Plunkett		2808 SE 18th	Portland OR	97219
Christine Kosonen		2821 Huron	Portland OR	97214
Alys Kennedy		2823 Birchwood	Bellingham WA	98225
Kelly McConnell		2823 NW Savier	Tigard OR	97223
Jennifer Gerlach		2825 SE Hawthorne	Portland OR	97214

George Jacobs		2828 NE 69th	Portland OR 97214
Maxine Schwartz		2833 NE 49th	Portland OR 97202
Greg Peden		2833 SE 45th	Portland OR 97201
Ryan Francesconi		2833 SE 45th	Portland OR 97206
G Gibson		2837 SE Steele	Portland OR 97202
Anthony Albert		285 NW 35th	Corvallis OR 97330
Barbara Brower		2889 NE Edgehill	Portland OR 97212
Tom Cloud		289D Cape labelle	Tonasket WA 98855
Leslie Centner and Kenneth Centner		2903 NW LURAY TER	PORTLAND OR 97210-2716
Chair/President East Burnside BA	East Burnside Business Association	2929 E BURNSIDE ST	PORTLAND OR 97214-1831
FUELMAN/FLEET 350	FUELMAN/FLEET 350	2929 NW 29TH AVE	Portland ,OR 97210-1705
WESTERN HYWAY OIL CO	WESTERN HYWAY OIL CO	2929 NW 29TH AVE	Portland ,OR 97210-1705
Paul Martinez		2934 NE 60th	Portland OR 97219
Barbara Goldman		2940 NE 35th	Portlan OR 97216
Karen Deora		2943 NE 8th	Portland OR 97212
Steve Rauworth		2944 SW 55th	Portland OR 97214
TARR ACQUISITION, LLC	TARR ACQUISITION, LLC	2946 NE COLUMBIA BLVD	Portland ,OR 97211-2062
Mary Mandeville		2988 NW Angelica	Portland OR 97218
Ted Sofianos	Mackins Auto Body	300 SE HEARTHWOOD	VANCOUVER WA 98684
Lloyd Lindley	Lloyd Lindley, ASLA	3005 NE 16TH AVE	PORTLAND OR 97212-3348
Teresa Penninger	ODOT - Region 5	3012 ISLAND AVE	LA GRANDE OR 97850-9497
Susan Arthur		3014 NE SCHUYLER ST	PORTLAND OR 97212-5127
Ray Ashmun		3018 NE 15th	Portland OR 97212
Joana Kirchhoff		3023 SW Cascade	Portland OR 97210
Geoff Granum		3039 SE 119TH AVE	PORTLAND OR 97266-1615
Betty Wollam	Swinerton Builders of Oregon	308 SW 2ND AVE STE 210	PORTLAND OR 97204
Daphne Wysham		3082 NE Regents	Lake Oswego OR 97035
Bethany Thomas		31 NW 22nd	Portland OR 97212
Anandi Gefroh		3100 SE 10th	Portland OR 97214
Don Jacobson		3104 SE Morrison	Porltand OR 97201
David Chatfield		3105 SE 51st	Portland OR 97206
Chair/Land Use Chair Alameda NA	Alameda NA c/o Gene Avery	3118 NE 32ND AVE	PORTLAND OR 97212-2623

John Barker		3124 SE TAYLOR ST	PORTLAND OR 97214-4037
BLUE FLAME	John H Barker Architect	3125 NW 35TH AVE	Portland ,OR 97210-1637
CARSON OIL CO., INC.	BLUE FLAME	3125 NW 35TH AVE	Portland ,OR 97210-1637
Sharon McDonald	CARSON OIL CO., INC.	3125 SE Yamhill	Portland OR 97266
Harriet Cooke		3126 SW CARSON ST	PORTLAND OR 97219-3700
Mary Ellen McFadden		313 S Maricara	Portland OR 97230
Jynx Houston		3137 NE 11th	Portland OR 97215
Lisa Cohn		3141 NW Greenbriar	Portland OR 97210
Joseph Miller		3161 SE Balfour	Portland OR 97201
Jonathan Brooks		317 W 4th Plain	Portland OR 97203
Anne Hamburg		320 SE Atwood	Portland OR 97266
Patricia Bellamy		3214 NE Cesar Chaves	Portland OR 97212
Kellen Ferguson		3220 NE Emerson	Portland OR 97211
Debra Poscharscky		3220 SE 43rd	Portland OR 97233
Chelsea Grubbs		3224 NE 17th	Portland OR 97211
Andrew Crosby		3225 SW View	Portland OR 97205
Rachel Hampton		3231 SE 109th	Portland OR 97206
Rebecca Brownlie		3236 Carrington	Bellingham WA 98226
Kaitlin Grammer		3241 NE Holman	Portland OR 97213
Paula Casner		3249 NE 81st	Portland OR 97213
Eric Schmall		3250 NE 73rd	Portland OR 97405
Noah Linschoten		3265 SE Madison	Vancouver WA 98665
Sven Anderson		330 SE 75th	Portland OR 97204
TA Anderson		330 SE 75th	Portland OR 97333
Andrew Jansky	Flowing Solutions	3305 SW 87TH AVE	PORTLAND OR 97225-2826
Jacob Sepulveda		330NW 116th	Portland OR 97214
Marjorie Kircher		3315 NE 41st	Portland OR 97205
Melissa Darby		3327 NE SIMPSON ST	PORTLAND OR 97211-7367
Andre Baugh	Baugh	333 SE 2ND AVE UNIT 200	PORTLAND OR 97214
Barbara Sestak		3330 NE KLICKITAT ST	PORTLAND OR 97212-2668
Jack West		3333 NE Evertee	Milwaukie OR 97222
SEQUENTIAL-PACIFIC BIODIESEL, LLC	SEQUENTIAL-PACIFIC BIODIESEL, LLC	3333 NW 35TH AVE STE C	Portland ,OR 97210-1642

Chris Davis		3335 NE 27TH AVE	PORTLAND OR 97212-2526
Patrick Mulcahey		3339 SE Caruthers	Stevenson WA 98648
Sarah Burns		3386 SE Waverleigh	Portland OR 97202
Ashley McAllister		3386 SE Waverleigh	Portland OR 97213
Jennifer Adkins		3414 SE 21st	Portland OR 97202
Mukta Akter		3414 SE 21st	Portland OR 97202
Maja Jarrad		3414 SE 21st	Portland OR 97202
Gregg Hayward		3414 SE 21st	Portland OR 97220
Earl Switzer		3414 SE 21st	Portland OR 97233
Shelley Holly		3425 NE 18TH AVE	PORTLAND OR 97212-2331
Rick Brown		3425 SW 12TH AVE	PORTLAND OR 97239-2970
Stephen Bachhuber		3428 SE 9th	Portland OR 97202
Gary Oxman		3431 NW RALEIGH ST	PORTLAND OR 97210-1932
Amirah Field		3437 NE 48th	Portland OR 97218
John Nettleton		3438 SE Mary	portland OR 97202
Richard Emery		3439 NE Sandy	Portland OR 97232
Gary Learning	ODOT - Region 3	3500 NW STEWART PKY	ROSEBURG OR 97470-1600
Jared Castle	ODOT - Region 3	3500 NW STEWART PKY	ROSEBURG OR 97470-1600
Tom Blackburn		3500 SE Concord	Portland OR 97267
Ralph Sanders		3504 NE DAVIS ST	PORTLAND OR 97232-3433
Mary Rose		3512 NE 23rd	Portland OR 97211
Daniel Sims		3515 SW 87th	Portland OR 97213
Chair/President Beaumont Ba	Beaumont Business Association	3519 NE 15TH AVE STE 540	PORTLAND OR 97212
Robert Meder		3520 SE 9th	Portland OR 97202
Craig Marburger		3525 Red Cedar	Portland OR 97239
Julie Walker		3527 SE Madison	Portland OR 97224
Chair/Land Use Chair Laurelhurst NA	Laurelhurst NA c/o SEUL	3534 SE MAIN	PORLAND OR 97214
Chair/Land Use Chair Creston-Kenilworth NA	Creston-Kenilworth NA c/o SEUL	3534 SE Main ST	PORTLAND OR 97214
Chair/President Belmont BA	Belmont Area Business Association	3534 SE MAIN ST	PORTLAND OR 97214-4263
Chair/President Division/Clinton BA	Division/Clinton Business Association	3534 SE MAIN ST	PORTLAND OR 97214-4263
President/Chair SEUL	SEUL - Southeast Uplift NA	3534 SE MAIN ST	PORTLAND OR 97214-4263
Chair/Land Use Chair Sunnyside NA	Sunnyside NA c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263

Chair/Land Use Chair Foster-Powell NA	Foster-Powell NA c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263	
Chair/Land Use Chair Reed NA	Reed NA	3534 SE MAIN ST	PORTLAND OR 97214-4263	
Chair/Land Use Chair Hosford-Abernethy NA	Hosford-Abernethy Neighborhood Devel	3534 SE MAIN ST	PORTLAND OR 97214-4263	
Chair/Land Use Chair Richmond NA	Richmond NA c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263	
Chair/Land Use Chair Woodstock NA	Woodstock NA c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263	
Chair/Land Use Chair North Tabor NA	North Tabor NA c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263	
Chair/Land Use Chair Ardenwald/Johnson Cre	Ardenwald / Johnson Creek NA c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263	
Chair/Land Use Chair Buckman Community A	Buckman Community Assn c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263	
Chair/Land Use Chair Montavilla NA	Montavilla NA c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263	
Chair/Land Use Chair Mt. Scott-Arleta NA	Mt Scott-Arleta NA	3534 SE MAIN ST	PORTLAND OR 97214-4263	
Kris N		3535 SE 86th	Portland OR 97206	
Willy Myers	Columbia Pacific	3535 SE 86TH AVE	PORTLAND OR 97266-2026	
Noah Jenkins		3537 NE 81st	Portland OR 97206	
Chair/President Multnomah Village BA	Multnomah Village Business Association	3540 SW CALIFORNIA ST	PORTLAND OR 97219-1679	
Scott Pratt		3545 SE ANKENY ST	PORTLAND OR 97214-2046	
Michael Mitton		3565 E Fork	Portland OR 97209	
Michael Karnosh		3587 NE Stanton	Grand Ronde OR 97347	
Jordan Lewis		3616 Widgeon	Portland OR 97230	
Berklee Robins		3617 NE 10th	Lake Oswego OR 97035	
Frank Roberts		3617 NE 10th	Portland OR 97212	
Rob Kebbon		3627 SW CORBETT AVE	PORTLAND OR 97239-4328	
Daniel Wasil		3633 SE 27th	Portland OR 97213	
Vivianne Clark		3655 SW 144th	Portland OR 97244	
Carolyn Stuart		3656 NE Wasco	Portland OR 97218	
Francisco Gadea		3670 W Bellewood	Portland OR 97214	
Patricia Murphy		3675 SE Bybee	Portland OR 97215	
Nancy Harrison		3707 SE 42nd	Portland OR 97239	
Michael Hevron		3712 SE 9th	Beaverton OR 97006	
Diana Rempe		3724 SE 35th	Portland OR 97217	
Andrew Butz		3735 SE 9th	Portland OR 97202	
Sascha Krader		3735 SE Yamill	Portland OR 97232	
Joanne Harmony		374 SW Hamilton	Portland OR 97206	

Janet Madill		3756 SE Lafayette	Portland OR 97212
Chair/President Midway BA	Midway Business Association	3758 SE 122ND AVE	PORTLAND OR 97236-3405
Janiece Staton		3803 SE Grant	Beaverton OR 97006
Rayne McGeorge		381 NE Village Squire	Portland OR 97214
Lillian Kong		3813 SE Roswell	Portland OR 97206
Matthew Mcdell		3816 NE 63rd	Portland OR 97214
HAJ, INC.	HAJ, INC.	3821 NW SAINT HELENS RD	Portland ,OR 97210-1434
Barbara Tombleson		3841 SE 51st	Portland OR 97219
CHRISTENSON OIL	CHRISTENSON OIL	3865 NW St. Helens Rd.	Portland ,OR 97296-0424
Michael Garland		38703 Scarvel Hill	Portland OR 97214
Chair/Land Use Chair Boise NA	Boise NA	3901 N MISSISSIPPI AVE	PORTLAND OR 97227-1162
Eileen Fromer		3911 SE Milwaukie	Portland OR 97223
Linda Kay Whealin		3914 SE Licyntra	Greshman OR 97030
Sarah Iannarone		39140 Dexter	Portland OR 97206
Kathryn Lavenne		3915 SE 103RD AVE	PORTLAND OR 97266-2407
Bridget Wyatt		3946 NE 12th	Portland OR 97206
Shoshana Cohen		3955 NE 8TH AVE	PORTLAND OR 97212-1206
Tom Sincic		3959 NE 42nd	Portland OR 97212
Faye Bennett		3965 SE Oak	Portland OR 97214
Akash Singh		3967 NE Ceasar Chavez	Portland OR 97213
Hal Anthony		3995 Russell	Grants Pass OR 97526
Randall Nerwick		4 Mountain	Portland OR 97222
Josh Chernoff		4008 SE Mall	Portland OR 97202
Neil McFarlane	TriMet	4012 SE 17TH AVE	PORTLAND OR 97202-3940
Gregg Everhart		4014 SE TAYLOR ST	PORTLAND OR 97214-4440
Naomi Berg		4017 SE Filbert	Portland OR 97202
Trine Beach		4023 SE LONG ST	PORTLAND OR 97202
Devin Kelly		4025 NE Couch	Portland OR 97215
Heidi Alford		4032 SE Crystal Springs	Portland OR 97202
Patrick Jones		4032 SE Crystal Springs	Portland OR 97229
Suzanne Jones		4033 SE GRANT ST	PORTLAND OR 97214-5934
Susan Gries		4034 NE 13TH AVE	PORTLAND OR 97212-1307

Jean Baker	Ada's Heir's	4039 SE GRANT CT	PORTLAND OR 97214-5942
Mia Reback		408 NW 12th	Portland OR 97212
Karen Stolzberg		4105 N Massachusetts	Portland OR 97219
Eloise Damrosch	RACC - Regional Arts and Culture Council	411 NW PARK AVE STE 101	PORTLAND OR 97209
Doug Zenn		411 SE 69TH AVE	PORTLAND OR 97215-1338
Pati Gallagher		4110 SE Hawthorne	Portland OR 97202
Jan MacWilliams		4110 SE Hawthorne	Portland OR 97213
Bonnie McKinlay		4110 SE Hawthorne	Portland OR 97219
Sara Crowley		4116 SE Stark	Portland OR 97214
Angelica Pray		4117 N Haight	Portland OR 97213
Elizabeth Clapp		4135 SE EVERGREEN ST	PORTLAND OR 97202-7761
Michael Newsom		4140 SE 37th	Portland OR 97211
Diana Bright		4146 SE Crystal Springs	Portland OR 97202
MERIT OIL & REFINING	MERIT OIL & REFINING	4150 N Suttle Rd	Portland ,OR 97217
Teresa Reitinger		4150 N Williams	Portland OR 97202
Turner Masland		417 Hume	Portland OR 97202
Chair/President Woodstock Community BA	Woodstock Community Business Associat	4207 SE WOODSTOCK BLVD UNIT	PORTLAND OR 97206
Michael Schumann		4210 NE Skidmore	Portland OR 97213
Jordan Morse		4210 SE Bybee	Portland OR 97202
Randall Webb		4221 NE Glisan	Portland OR 97210
Melanie McCandless		4240 SE STARK ST UNIT C	PORTLAND OR 97215-1644
Michael Jordan		4259 SW Patrick	Linn OR 97068
Chair/Land Use Chair Healy Heights NA	Healy Heights NA	4273 SW COUNCIL CREST DR	PORTLAND OR 97239-1530
Betsy White		42852 SW Dudney	Forest Grove OR 97116
Jeffrey Whte		42852 SW Dudney	Forest Grove OR 97116
Sarah Wiebenson		42852 SW Dudney	Portland OR 97227
Deborah Wiley		430 NE 16th	Portland OR 97206
Mirabai Peart		4301 S Bryant	Portland OR 97206
Kathryn Alexandra		4311 Ginnett	Anacortes WA 98221
Allen Neuringer		4311 SE 37th	Portland OR 97202
Rayne MacGeorge		433 NE Graham	Portland OR 97214
Janet Roxburgh		4334 NE 23rd	Portland OR 97217

Linda hayden		4344 SE Main	Portland OR 97216
Linda Magnuson		4346 NE Skidmore	Portland OR 97218
Kat Majors		4346 NE Skidmore	Portland OR 97220
Abigail Cermak		436 NE WYGANT ST	PORTLAND OR 97211-3360
PENNZOIL-QUAKER STATE COMPANY	PENNZOIL-QUAKER STATE COMPANY	440 N COLUMBIA BLVD	Portland ,OR 97217-1094
Glenda Goldwater		4406 SE Taylor	Portland OR 97214
Zach Reuter		4407 SE Yamhill	Portland OR 97267
Tom Archer	PBS Environmental	4412 SW CORBETT AVE	PORTLAND OR 97239-4207
Chair/Land Use Chair Sunderland NA	Sunderland NA	4415 NE 87TH AVE	PORTLAND OR 97220
Chair/Land Use Chair Cully Neighborhood NA	Cully Neighborhood Assn c/o CNN	4415 NE 87TH AVE	PORTLAND OR 97220
Chair/Land Use Chair Sumner NA	Sumner Association of Neighbors	4415 NE 87TH AVE	PORTLAND OR 97220
Chair/Land Use Chair Roseway NA	Roseway NA c/o CNN	4415 NE 87TH AVE	PORTLAND OR 97220
Chair/Land Use Chair Madison South NA	Madison South NA c/o CNN	4415 NE 87TH AVE	PORTLAND OR 97220
Chair/Land Use Chair Hollywood NA	Hollywood NA c/o CNN	4415 NE 87TH AVE	PORTLAND OR 97220
Chair/Land Use Chair Rose City Park NA	Rose City Park NA c/o CNN	4415 NE 87TH AVE	PORTLAND OR 97220
President/Chair Central NE Neighbors	CNN - Central Northeast Neighbors	4415 NE 87TH AVE	PORTLAND OR 97220-4901
Margaret Stephens		4420 NE 36th	Salem OR 97301
Carol Vance		444 Munn	Portland OR 97206
Satya Vayu		4444 SE Francis	Portland OR 97206
Merle Clifton		4457 NE CAMPAIGN ST	PORTLAND OR 97218-1724
Karen Christensen		446 NE Fargo	Portland OR 97212
Dean Phillip		448 Sunwood	Portland OR 97215
Celeste Lewis	Celeste Lewis, Architect	4486 SW WASHOUGA AVE	PORTLAND OR 97239-1393
John Rau		45 Eagle Crest	Portland OR 97221
William Whitaker		4501 Wistaria	La Grande OR 97850
Walter Mintkeski		4508 N Williams	Portland OR 97202
Kayleigh O'Hara		4523 NE Hoyt	Portland OR 97211
Kathy Bangertt		4540 SE Taylor	Portland OR 97215
Louis Torres	ODOT - Region 2	455 Airport RD BLDG B	SALEM OR 97301
Marilee Dea		4613 NE Killingsworth	Portland OR 97213
Marilee Dea and Mac McKinlay		4613 NE KILLINGSWORTH ST UNI	PORTLAND OR 97218-1932
Heather Carver		4613 NE KILLINGSWORTH ST UNI	PORTLAND OR 97218

Michael Hall		4617 NE Killingsworth	Lake Oswego OR 97035
P Horter		4619 NE 30th	Portland OR 97231
Walter Lichtenberg		4625 NE 38th	Portland OR 97202
Monica Gilman		4626 SE Clinton	Estacada OR 97023
Forrest McAlpine		4638 NE Failing	Portland OR 97217
Victoria Cole		4639 NE 30th	Portland OR 97232
Harlan Shober		46525 McKenzie	Portland OR 97214
Susan Economon		4655 NE Killingsworth	Portland OR 97218
Judith Eda		4655 NE Killingsworth	Portland OR 97218
Tony DeCristofaro		472 N Hayden Island	Portland OR 97217
Gayle Janzen		4723 NE 14th	Seattle WA 98133
Daniel Jaffee		473 SE 46th	Portland OR 97211
David Rasmussen		4764 SE MILWAUKIE AVE	PORTLAND OR 97202-4730
Ken Sandblast	Planning Resources	480 5TH ST	LAKE OSWEGO OR 97034
Craig Hopkins	Ray-Burt's Inc	4800 SE 26TH AVE	PORTLAND OR 97202-4602
Carl Benson	Ray-Burt's Inc	4800 SE 26TH AVE	PORTLAND OR 97202-4602
John Donnerberg	Real Property Consultants	4805 SW OLESON RD	PORTLAND OR 97225-1420
George Donnerberg	Real Property Consultants	4805 SW OLESON RD	PORTLAND OR 97225-1420
Chair/President Swan Island BA	Swan Island Business Association	4810 N LAGOON AVE STE 400	PORTLAND OR 97217
Jeff Henkelman	Northwest Awning and Sign	4812 N INTERSTATE AVE	PORTLAND OR 97217-3647
President/Chair NECN	NECN - Northeast Coalition of Neighbors	4815 NE 7TH AVE	PORTLAND OR 97211
Chair/Land Use Chair Vernon NA	Vernon NA c/o NECN	4815 NE 7TH AVE	PORTLAND OR 97211
Chair/Land Use Chair Humboldt NA	Humboldt NA c/o NECN	4815 NE 7TH AVE	PORTLAND OR 97211
Chair/Land Use Chair Sabin NA	Sabin Community Association c/o NENC	4815 NE 7TH AVE	PORTLAND OR 97211
Chair/Land Use Chair Eliot NA	Eliot NA	4815 NE 7TH AVE	PORTLAND OR 97211
Chair/Land Use Chair King Neighborhood NA	King NA	4815 NE 7th AVE	Portland OR 97211
Grady Preston		4822 NE Glisan	Portland OR 97232
Diane Jacobs		4822 SE 47th	Portland OR 97213
Joseph Merrick		4828 SE 30th	Portland OR 97215
Daniel Stillwaggon		4829 N Congress	Portland OR 97215
Dolores Wood and Ernest Wood		4834 SE 115TH AVE	PORTLAND OR 97266-3340
Becky Hawkins		4839 N Kerby	Portland OR 97215

Chair/President 42nd Avenue BA	42nd Avenue Business Associaiton	4920 NE 42ND AVE	PORTLAND OR 97218-1502
Casey Sundermann		4920 NE 55th	Portland OR 97211
Emily Meyer		4927 NE Rodney	Vancouver WA 98665
Ashleigh Mead		4929 N Commercial	Portland OR 97202
Kathleen Shelley		50 SW 97th	Vida OR 97488
Michael Dangelo		503 NE 29TH AVE	PORTLAND OR 97232-2411
Martin Donohoe		5031H Foothills	Lake Oswego OR 97034
Rebecca Clarke		5035 N DePaul	Portland OR 97203
Ann Clarkson		5035 N Depaux	Portland OR 97202
Bill Michtom		5035 NE 25th	Portland OR 97205
Chair/President North Portland BA	North Portland Business Association	5036 N LOMBARD ST	PORTLAND OR 97203-4402
Matthew Smith		5041 Saxon	Portland OR 97220
Monica Card		5104 SE Clinton	Portland OR 97206
Judy Romano		5105 SW Richardson	Portland OR 97214
David Nichols		5107 NE Couch	Portland OR 97213
John Nicol		5107 NE Couch	Portland OR 97217
Cale Christi		5109 N Oberlin	Portland OR 97203
Cyntha Gedes		5112 NE 28th	Portland OR 97202
Joanne Walters		5113 SE Taylor	Portland OR 97227
Barbara Bartschi		5117 SE Naef	Milwaukie OR 97267
Chair/Land Use Chair Mt. Tabor NA	Mt Tabor NA	5122 SE HAWTHORNE BLVD	PORTLAND OR 97215-3302
Lezlie Bugg		5124 SE 77TH AVE	PORTLAND OR 97206-4375
Natalie Reich		5130 SE 30th	Portland OR 97219
Ben Basin		515 SE 19th	Portland OR 97214
Sasha Samuels		5151 NW Cornell	Portland OR 97219
Lynn Youngbar		516 SE 200th	Portland OR 97212
Rebecca Clarkson		5203 SE 38th	Portland OR 97203
Pacific Terminal Services		5211 122nd St SE	Everett, WA 98208
Annie McCuen		522 SW 5th	Salem OR 97302
Mark Grossman		524 SE 17th	Palo Alto CA 94301
Jack Herbert		5262 NE 31st	Portland OR 97225
Patrick O'Herron		5318 NE 16th	Portland OR 97217

Gisela Ray		532 SE 15th	Gresham OR 97080
Nancy Anderson		5325 SW Dosch	Portland OR 97215
Sonya Bastendorff		5325 SW Dosch	Portland OR 97239
Mike Warwick		535 NE THOMPSON ST	PORTLAND OR 97212-3844
Neal Keefer		5356 NE Neptune	Portland OR 97232
Clyde Lockleat		54 SE 74th	Portland OR 97221
Mona McNeil		5406 NE Everette	Vancouver WA 98686
McCall Oil		5480 NW Front Ave	Portland, OR 97210
Chair/Land Use Chair Bridgeton NA	Bridgeton NA	55 NE BRIDGETON RD SLIP 3	PORTLAND OR 97211-1042
Nathaniel Eggers		5501 NW Front	Portland OR 97202
Lucy Wong		5516 NE Mallory	Portland OR 97211
Chester Stark		5519 SW Multnomah	Portland OR 97214
Amber Buhl		5521 SE 57th Ave	PORTLAND OR 97206
Robert Deering		5528 N Moore	Portland OR 97217
Jennifer Lanius		5529 SE Morrison	Portland OR 97206
Camilo Marquez		5606 SW Riverside	Portland OR 97213
Natalie Marburger		5606 SW Riverside	Portland OR 97239
Meryle Korn		5609 SE 54th	Bellingham WA 98226
Trisha Broeke		5609 SE 65th	Portland OR 97206
Ron Delp		5622 SE Raymond	Portland OR 97206
Fred Ingram		5635 SE 63rd	Portland OR 97206
Cass Martinez		5704 N Omaha	Portland OR 97231
Kellyn Bardeen		5709 SE Reedway	Portland OR 97206
Mary Murphy		571 Skamania Landing	Portland OR 97232
Tom Noll		5745 NE Church	Portland OR 97219
Barbara Manildi		5746 NE Going	Lake Oswego OR 97035
Ruba Leech		5803 SW Garden Home	Portland OR 97211
David Kennedy		5807 SE Belmont	Portland OR 97211
Ed Kerns		5812 NE 6th	Portland OR 97214
Andrew Stone		5817 SE Lafayette	Portland OR 97206
Jeff Stookey		5817 SE Lafayette	Portland OR 97232
Helen Hays		5825 NE Emerson	Oregon City OR 97045

Elizabeth Milner		5834 NE 23rd	Portland OR 97202
Deva Sunya		5847 NE 31st	Portland OR 97202
Kinder Morgan		5880 NW St Helens Rd	Portland, OR 97210
REINHARD PETROEUM	REINHARD PETROEUM	5885 NW SAINT HELENS RD	Portland ,OR 97210-1145
Maureen O'Neal		5904 SE Knight	Portland OR 97223
Jerry Smith		5908 SE 17th	Eugene OR 97405
Alan Smith		5908 SE 17th	Portland OR 97202
Anais Tuepker		5919 SW Salmon	Portland OR 97202
Gavin Everard		5944 N Kerby	Portland OR 97217
Steven Yett		5949 NE CULLY BLVD	PORTLAND OR 97218-3354
Jo Beall		597 N Dekum	Portland OR 97217
Tom Hughes	Metro Regional Council	600 NE GRAND AVE	PORTLAND OR 97232-2727
Shirley Caddick	Metro Regional Council	600 NE GRAND AVE	PORTLAND OR 97232-2727
Carlotta Collette	Metro Regional Council	600 NE GRAND AVE	PORTLAND OR 97232-2727
Craig Dirksen	Metro Regional Council	600 NE GRAND AVE	PORTLAND OR 97232-2727
Kathryn Harrington	Metro Regional Council	600 NE GRAND AVE	PORTLAND OR 97232-2727
Sam Chase	Metro Regional Council	600 NE GRAND AVE	PORTLAND OR 97232-2727
Bob Stacey	Metro Regional Council	600 NE GRAND AVE	PORTLAND OR 97232-2727
Joshua Anderson		601 SW 2nd	Portland OR 97239
Arlene Burns		606 3rd	Mosier OR 97040
Nathaniel Holder		610 SW Broadway	Portland OR 97215
City of Milwaukee - Bureau Director	City of Milwaukee	6101 SE JOHNSON CREEK BLVD	MILWAUKIE OR 97206-0641
E Reid		6109 NW Nevada	Portland OR 97217
Emily Platt		6109 SE Insley	Portland OR 97202
Karen Brown		6111 SW 33rd	Portland OR 97239
Elizabeth Lindsay		612 SE 48th	Portland OR 97218
Chair/Land Use Chair Eastmoreland NA	Eastmoreland NA	6123 SE REED COLLEGE PL	PORTLAND OR 97202-8125
Betsy Toll		6126 SE Grant	Portland OR 97206
Taylor St Clair		6130 SW Nevada	Portland OR 97217
Gail O'Hara		6134 NE Alameda	Portland OR 97213
Jason Chin		614 SW Nevada	Portland OR 97219
Duncan Brown	Land Use Planning & Research	61487 SW ELDER RIDGE ST	BEND OR 97702

Fran Dyke		618 NW Glisan	Portland OR 97209
Gerik Kransky	Bicycle Transportation Alliance (BTA)	618 NW GLISAN ST suite 401	PORTLAND OR 97209-3781
Debbie McDuffee		6192 SW CAPITOL HWY	PORTLAND OR 97239
Nancy Pfeiler		6201 NE 13th	Salem OR 97304
Mason Hiatt		6204 SE 40th	Portland OR 97212
Enda Kenny		621 NE Summer	Portland OR 97211
Elena Wood		621 NE Sumner	Portland OR 97212
Clyde Lockler		6222 SW 36th	Portland OR 97221
Meredith Long		6222 SW 36th	Vancouver WA 98664
Deborah Tramposh		623 NE Morris	Portland OR 97233
Debra Rehn		623 SW Park	Portland OR 97202
Theresa St Martin , PSC Commissioner		6234 SW ORCHID DR	PORTLAND OR 97219-4981
Steve Wheeler		628 SE 58th	Portland OR 97213
Collin Murphy		630 NE Lawrence	Portland OR 97202
Amy Pfeiffer	ODOT - Region 4	63085 N HIGHWAY 97 STE 107	BEND OR 97701-5765
Eric Kaiser		6311 N Commercial	Portland OR 97212
Daniel Dixon		6312 SW Capitol	Portland OR 97239
Chair/President Foster Area BA	Foster Area Business Association	6317 SE HOLGATE BLVD	PORTLAND OR 97206-3610
Sheelagh Oliveria		6356 N Wilbur	Portland OR 97206
Casey Remy		6356 N Wilbur	Portland OR 97429
Linda Engels		636 NE 61st	Portland OR 97213
Eric Wirfs		63820 CLAUSEN DR STE 100	BEND OR 97701-8063
Chair/Land Use Chair Woodlawn NA	Woodlawn NA c/o Luke Groser	6405 NE 7TH AVE	PORTLAND OR 97211-3603
Michael Pope		6405 SE 62nd	Portland OR 97206
FERRELLGAS, INC	FERRELLGAS, INC	641 NE Lombard St	Portland ,OR 97211
Don Minnerly		6413 SE 20th	Portland OR 97217
Marilyn Zornado		6415 NE Sacramento	Portland OR 97231
Deva Flemming		6420 NE 42nd	Portland OR 97218
Jules Elias		6435 NE Yamhill	Portland OR 97215
Renee Elias		6435 NE Yamhill	Portland OR 97215
Mark Wheeler		648 E 25th	Portland OR 97215
Anna Johnson		650 NW Irving	Portland OR 97211

Sarah Dickerson		6512 SE Division	Portland OR 97230
Dwyn Armstrong		6528 NW EARL AVE	SEATTLE WA 98117-5927
AIR LIQUIDE AMERICA SPECIALTY GASES	AIR LIQUIDE AMERICA SPECIALTY GASES	6529 NW Front Ave	Portland ,OR 97210
Blaine Ackley		655 NW 229th	Hillsboro OR 97214
SANTA FE PACIFIC	SANTA FE PACIFIC	6565 NW SAINT HELENS RD	Portland ,OR 97210-3638
Stephen Bartlett		659 N Tomahawk Island	Portland OR 97217
Terri Burdette		6603 N Bank	Portland OR 97203
Robin Vesey		6608 SE 81st	Portland OR 97219
Chair/President 82nd Ave Roses BA	82nd Avenue of Roses Business Associati	6631 SE 70TH AVE	PORTLAND OR 97206-7349
Kathryn Behrendt		6706 NE Rodney	Portland OR 97211
Deborah Field		6732 NE Roseleigh	Portland OR 97213
Melba Dlugonski		6735 SE 78TH AVE	PORTLAND OR 97206-7116
Wade Stoddard		68 57th	Portland OR 97217
Janice Vranka		680 16th St	Portland OR 97219
Michelle Mintmier		6815 SE 31st	Beaverton OR 97005
Barbara Pikus		6817 SE Morrison	Portland OR 97206
Heather Dennett		6835 N WALL AVE	PORTLAND OR 97203-5631
Annie Corbett		6844 Greeley	Portland OR 97217
Mark Darienzo		6923 NE MORRIS ST	PORTLAND OR 97213
Albyn Jones		6934 NE 13th	Portland OR 97202
Steven Kolberg	Petersen Kolberg & Assoc	6969 SW HAMPTON ST	PORTLAND OR 97223-8560
Rebecca Parker		697 Oak Knoll	Portland OR 97202
Breanna Lundvall		700 NE Multnomah	Portland OR 97212
Randy Painter		7017 NE ROSELAWN ST	PORTLAND OR 97218-3439
Kristi Schaefer		7025 SW 28th	Portland OR 97211
James Rankin		7034 N Charleston	Corvallis OR 97330
Ted Dreier		7037 SW 54th	Portland OR 97219
Bryan Tenant		705 SE 32nd	Portland OR 97217
Ellen Thayer		710 13th	White Salmon WA 98672
Leanna Brooks		7100 N Columbia	Vancouver WA 98660
Thomas Ward		7103 N Maryland	Portland OR 97210
Marcia Dernson		71115 Morris	Rainier OR 97048

Colleen McNally			7112 SW 53rd	Portnad OR 97213
Sandy Polishuk			7112 SW 53rd	Portland OR 97212
Wayne Lammers			7122 N Oatman	Tigard OR 97224
Christine Frey			7128 SE MALL ST	PORTLAND OR 97206-3472
Brad Nahill			7140 SE Franklin	Beaverton OR 97007
Diana Richardson			7141 SE Mabel	Portland OR 97239
Denise Busch			7160 SW Raleihgwood	Portland OR 97225
Lisa Faust		Pacific Continental Bank	717 NE GRAND AVE	PORTLAND OR 97232
Marsha Hanchrow			7200 SE Woodstock	Portland OR 97214
Chair/Land Use Chair Brentwood/Darlington		Brentwood-Darlington NA	7211 SE 62ND AVE	PORTLAND OR 97206-7564
Lisa Laakso			7217 N Lombard	Portland OR 97201
Chair/President Portland International BA		Portland Business Association	7218 NE SANDY BLVD UNIT 3	PORTLAND OR 97213-5741
Dana Brown			722 Meadow	Portland OR 97212
Amy Monahan			7225 SW 13th	Portland OR 97219
Claudia Montagne			7225 SW 13th	Portland OR 97219
Jared Naimark			7227 SW Linette	Portland OR 97201
Robert Grossman			7234 SE 17th	Portland OR 97212
Douglas Hayner			7254 SW 53rd	Portland OR 97218
Christine Yun			730 NE 31st	Portland OR 97214
David Kreisman			730 NE 31st	Portland OR 97267
Mary Vorachek			7301 N Washburne	Salem OR 97301
Alain Millar			731 SW Salmon	Portland OR 97222
Jean Wyman			7314 SE Division	Portland OR 97213
Mikel Litt			7317 NE Hazel Dell	Milwaukie OR 97222
Cody Tucker			7324 SE Madison	Portland OR 97221
Janet Stackhouse			7325 N Denver	Portland OR 97212
Bob LeFeber		Commercial Realty Advisors	733 SW 2ND AVE STE 200	PORTLAND OR 97204-3116
Angelina Marino		Marino Murals	7331 SW BARBUR BLVD	PORTLAND OR 97219-2807
Michael Streimer		Streimer Sheet Metal	740 N KNOTT ST	PORTLAND OR 97227-1613
Eve Heidtmann			7405 SE Market	Portland OR 97225
Carla Pacheco			7410 N Willamette	Portland OR 97219
Cliff Shaw			7426 SE 21st	Portland OR 97217

Tom Huston		7465 N Huron	Dexter OR 97431
Stephanie Christensen		7502 SW Miles	Portland OR 97219
R AND R PETROLEUM LLC	R AND R PETROLEUM LLC	7509 NE M L KING BLVD	Portland ,OR 97211-2829
Ted Light		7515 SE 23rd	Portland OR 97215
Barbara Erlich		7521 N Edgewater	Portland OR 97203
Julia Tomes		7526 SW Capitol Hill	Portland OR 97202
Amanda Hughes		7605 SE Lincoln	Portland OR 97209
Sierra Ansley		762 NW Harvest Moon	Portland OR 97124
Sharon Goldsworthy	EastRidge Park HOA	7646 SE 141ST AVE	PORTLAND OR 97236-5456
President/Chair SWNI	SWNI - Southwest Neighborhoods Inc	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair Collins View NA	Collins View NA c/o SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair Far Southwest NA	Far Southwest NA c/o SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair South Portland NA	South Portland NA c/o SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair Hillsdale NA	Hillsdale NA c/o SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair Arnold Creek NA	Arnold Creek NA	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair Ashcreek NA	Ashcreek NA	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair Bridlemile NA	Bridlemile NA c/o SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair Crestwood NA	Crestwood NA c/o Southwest Neighborh	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair Hayhurst NA	Hayhurst NA c/o SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair Homestead NA	Homestead NA c/o SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair Maplewood NA	Maplewood NA c/o SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair Markham NA	Markham NA c/o SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair Marshall Park NA	Marshall Park NA c/o SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair Multnomah NA	Multnomah NA c/o SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/Land Use Chair South Burlingame NA	South Burlingame NA c/o SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
Chair/President Hillsdale Main Street BA	Hillsdale Main Street BA c/o SWNI	7688 SW Capitol HWY	PORTLAND OR 97219-2692
Dean Sigler		7705 SW Miner	Aloha OR 97003
John Sievertsen		7705 SW Miner	Portland OR 97225
Richard Pasichnyk		7706 SW Barnes	Eugene OR 97402
April Christenson		777 NW 19th	Portland OR 97209
Lorraine Heller		7820 SW Walnut	Portland OR 97229
Chair/President St Johns Boosters BA	St Johns Business Boosters	7825 N LOMBARD ST	PORTLAND OR 97203

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Ann Turner			8 Cedar Gates	Portland OR 97211
Dena Turner			8 Cedar Gates	Portland OR 97215
Anne Kollender			8001 Sand Point	Portland OR 97222
Nancy Fleming			802 SW TERWILLIGER PL	PORTLAND OR 97239-2666
Rachel Jesequel			8025 SE 60th	Beaverton OR 97008
Tiffany McCleary			8125 NE Wygant	Portland OR 97210
Jason Nolin			8125 NE Wygant	Portland OR 97218
Dave Warrington			8131 SW 56TH AVE	PORTLAND OR 97219-3222
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Joseph Stenger			817 SW 171st	Portland OR 97211
James Fuller			8175 SW 71st	Tucson AZ 85741
Mary Lou Putman			8200 SE 36th	Portland OR 97217
Alissa Leavitt			8205 SE 45th	Portland OR 97231
Chair/Land Use Chair	Sellwood-Moreland NA	Sellwood-Moreland Improvement League	8210 SE 13TH AVE	PORTLAND OR 97202-6610
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Mary Tinkham			8312 SE 21st	Portland OR 97215
Ellie Sedor			8325 SE 11th	Portland OR 97212
Rebekah Creswell			8338 N Interstate	Portland OR 97217
Michael Harrison		Harrison Consulting	837 NW 25TH AVE	PORTLAND OR 97210-2827
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Michael Lilly		Michael J Lilly, Attorney at Law	8490 SW CECILIA TER	PORTLAND OR 97223
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David Powell			8508 SE 11th	Portland OR 97217
Kaley Frank			8523 N Curtis	Portland OR 97217
Maren Souders			8524 NE Thompson	Portland OR 97206
Katherine Gibson			86070 Cougar	Gresham OR 97030
Joseph Meyers			8608 NW Old Orchard	Portland OR 97211
Allison Milionis			8702 N DELAWARE AVE	PORTLAND OR 97217
Jeff Kipilman			8728 N Edison	Portland OR 97212

Nicole Martinez		8734 NW Wood	Portland OR 97217
Craig Heverly		8830 NE Hancock	Portland OR 97202
David King		8887 SW 67th	Portland OR 97203
Dee Packard		8935 SW Excalibur	Portland OR 97215
Willie Levenson		8936 N Edison	Portland OR 97212
Eric Martin	Stoel Rives Boley	900 SW 5TH AVE STE 2600	PORTLAND OR 97204-1235
Greer Kern		9029 N VAN HOUTEN AVE	PORTLAND OR 97203-2740
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Arlys Fones		9114 SW Trail	Portland OR 97219
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Tyler Wagner		9271 SW 3rd	Portland OR 97214
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Chair/President Historic Mississippi BA		Historic Mississippi Business Association	PO BOX 11106	PORTLAND OR 97211
Chair/Land Use Chair Concordia NA		Concordia NA	PO BOX 11194	PORTLAND OR 97211
Chair/President North Northeast BA		North Northeast Business Association	PO BOX 11565	PORTLAND OR 97211
Chair/Land Use Chair Irvington NA		Irvington Community Assn	PO BOX 12102	PORTLAND OR 97212
Chair/Land Use Chair Cathedral Park NA		Cathedral Park NA c/o NPNS	PO BOX 13102	PORTLAND OR 97217
Chair/Land Use Chair Grant Park NA		Grant Park NA	PO BOX 13102	portland OR 97213
Chair/Land Use Chair Kerns NA		Kerns NA	PO BOX 13350	PORTLAND OR 97213
Chair/President Central Eastside Industrial Co		Central Eastside Industrial Council	PO BOX 14251	PORTLAND OR 97293-0251
Chair/President Hawthorne Blvd BA		Hawthorne Blvd Business Association	PO BOX 15271	PORTLAND OR 97293
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City of Lake Oswego - Bureau Director	City of Lake Oswego	PO BOX 369	LAKE OSWEGO OR 97034-0369
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Chair/Land Use Chair Brooklyn Action Corps	Brooklyn Action Corps	PO BOX 42341	Portland OR 97242
Chair/President Greater Brooklyn BA	Greater Brooklyn Business Association	PO BOX 42411	Portland OR 97242
City of Beaverton - Bureau Director	City of Beaverton	PO BOX 4755	BEAVERTON OR 97076-4755
Chair/President Columbia Cooridor BA	Columbia Corridor Business Assn	PO BOX 55651	PORTLAND OR 97238
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Chair/President Lloyd District Community Ass	Lloyd District Community Association	PO BOX 6762	Portland OR 97228
Chair/Land Use Chair Lloyd District Communit	Lloyd District Community Association	PO BOX 6762	Portland OR 97228
Chair/President Pearl District NA	Pearl District Business Association	PO BOX 6767	Portland OR 97228
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Chair/President Sellwood-Westmoreland BA	Sellwood Westmoreland Business Associ	PO BOX 82103	PORTLAND OR 97282
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Alona Steinke		PO BOX 822393	Vancouver WA 98682
Don Steinke		PO BOX 822393	Vancouver WA 98682
Chair/Land Use Chair South Tabor NA	South Tabor NA	PO BOX 86836	Portland OR 97286
Chair/President Goose Hollow NA	Goose Hollow Business Association	PO BOX 915	PORTLAND OR 97207
BES - Bureau Director	BES - Bureau of Env Services	TO: 106/1000	
OMF - Bureau Director	OMF - Office of Management and Financ	TO: 106/1250	
Parks & Recreation - Bureau Director	C of P - Parks and Rec	TO: 106/1302	

Director Parks and Recreation	Parks & Rec	TO: 106/1302
BTS - Bureau Director	BTS - Tech Services	TO: 106/450
Cindy Dietz	C of P - Water Bureau	TO: 106/600
Lori Schumann	OMF - Risk Management	TO: 106/709
PBOT - Bureau Director	PBOT - Bureau of Transportation	TO: 106/800
POEM - Bureau Director	POEM - Portland Office of Emergency Ma	TO: 108/650
Revenue Bureau - Bureau Director	C of P - Revenue Bureau	TO: 122/600
Malu Wilkinson	Metro - Main	TO: 128/METRO
Randy Tucker	Metro - Main	TO: 128/METRO
Shirley Craddick	Metro - Main	TO: 128/METRO
PDC - Bureau Director	Portland Development Commission	TO: 129/PDC
PDC Portland Dev Commission	PDC - Portland Development Commission	TO: 129/PDC
City Auditor .	Office of the City Auditor	TO: 131/140
Susan Parsons	Office of the City Auditor	TO: 131/140
Margie Sollinger	Office of City Auditor - Ombudsman	TO: 131/140
Office of City Auditor Ombudsment	Office of City Auditor - Ombudsman	TO: 131/140
Steve Novick	Office of Commissioner Steve Novick	TO: 131/200
Chief of Staff Commissioner Novick	Office of Commissioner Steve Novick	TO: 131/200
Council Assistant Commissioner Novick	Office of Commissioner Steve Novick	TO: 131/200
Amanda Fritz	Office of Commissioner Amanda Fritz	TO: 131/220
Chief of Staff Commissioner Fritz	Office of Commissioner Amanda Fritz	TO: 131/220
Council Assistant Commissioner Fritz	Office of Commissioner Amanda Fritz	TO: 131/220
Dan Saltzman	Office of Commissioner Dan Saltzman	TO: 131/230
Chief of Staff Commissioner Saltzman	Office of Commissioner Dan Saltzman	TO: 131/230
Council Assistant Commissioner Saltzman	Office of Commissioner Dan Saltzman	TO: 131/230
Nick Fish	Office of Commissioner Nick Fish	TO: 131/240
BHCD - Bureau Director	BHCD - Housing and Comm Dev	TO: 131/240
Chief of Staff Commissioner Fish	Office of Commissioner Nick Fish	TO: 131/240
Council Assistant Commissioner Fish	Office of Commissioner Nick Fish	TO: 131/240
Mayor's Office	Office of the Mayor	TO: 131/340
Charlie Hales	Office of the Mayor	TO: 131/340
Chief of Staff Office of the Mayor	Office of the Mayor	TO: 131/340

Government Relations - Bureau Director	C of P - Government Relations	TO: 131/410
Housing Bureau - Bureau Director	C of P - Housing Bureau	TO: 157/11 BHCD
Mary Hull-Caballero	C of P - Auditor	TO: 224/PARC
Douglas Hardy	BDS - Bureau of Dev Services	TO: 299/5000
Kristin Cooper	BDS - Bureau of Dev Services	TO: 299/5000
Tim Heron	BDS - Bureau of Dev Services	TO: 299/5000
BDS - Bureau Director	BDS - Bureau of Dev Services	TO: 299/5000
Director BDS - Bureau Director	BDS - Bureau of Dev Services	TO: 299/5000
Steve Kountz	BPS - Bureau of Planning and Sustainabili	TO: 299/7100
Karen Lucchesi	BPS - Bureau of Planning and Sustainabili	TO: 299/7100
Nicholas Starin	BPS - Bureau of Planning and Sustainabili	TO: 299/7100
Deborah Stein	BPS - Bureau of Planning and Sustainabili	TO: 299/7100
Susan Anderson	BPS - Bureau of Planning and Sustainabili	TO: 299/7100
Mult Co - Land Use Planning - Bureau Directo	Mult Co - Land Use Planning	TO: 455/116/Land Use Planning

DLCD FORM 1

NOTICE OF A PROPOSED CHANGE TO A COMPREHENSIVE PLAN OR LAND USE REGULATION

FOR DLCD USE
File No.:
Received:

Local governments are required to send notice of a proposed change to a comprehensive plan or land use regulation **at least 35 days before the first evidentiary hearing**. (*See* OAR 660-018-0020 for a post-acknowledgment plan amendment and OAR 660-025-0080 for a periodic review task). The rules require that the notice include a completed copy of this form.

Jurisdiction: **City of Portland**

Local file no.: **Fossil Fuel Terminal Zoning Amendments**

Please check the type of change that best describes the proposal:

☐ **Urban growth boundary (UGB) amendment** including more than 50 acres, by a city with a population greater than 2,500 within the UGB

☐ **UGB amendment** over 100 acres by a metropolitan service district

☐ **Urban reserve designation,** or amendment including over 50 acres, by a city with a population greater than 2,500 within the UGB

☐ **Periodic review task** – Task no.:

☒ **Any other change** to a comp plan or land use regulation (*e.g.*, a post-acknowledgement plan amendment)

Local contact person (name and title): Tom Armstrong
Phone: 503-823-3527 E-mail: tom.armstrong@portlandoregon.gov
Street address: 1900 SW 4th Ave., Ste. 7100 City: Portland, OR Zip: 97201-

Briefly summarize the proposal in plain language. Please identify all chapters of the plan or code proposed for amendment (maximum 500 characters):

Amended from 8/08/16 notice to DLCD. Project would implement policy direction in City Resolution 37168 on fossil fuel distribution and storage, consistent with City and State objectives on climate change and public safety. Draft code changes would prohibit new Bulk Fossil Fuel Terminals in all base zones and would limit expansion at existing terminals. Zoning Code Sections that would be amended include 100, 110, 120, 130, and 140 on base zones (allowed uses) and 910 and 920 on general terms.

Date of first evidentiary hearing: 09/13/2016
Date of final hearing: 11/10/2016

☐ This is a revision to a previously submitted notice. Date of previous submittal:

Check all that apply:

☐ Comprehensive Plan text amendment(s)

☐ Comprehensive Plan map amendment(s) – Change from to
Change from to

☒ New or amended land use regulation

☐ Zoning map amendment(s) – Change from to
Change from to

☐ An exception to a statewide planning goal is proposed – goal(s) subject to exception:

☐ Acres affected by map amendment:

Location of property, if applicable (site address and T, R, Sec., TL):

List affected state or federal agencies, local governments and special districts: ODEQ, ODOT, DOGAMI, ODOE, Business Oregon, Oregon Building Codes Division, USEPA, USDOT, USDOE, Metro, Port of Portland

NOTICE OF A PROPOSED CHANGE – SUBMITTAL INSTRUCTIONS

1. Except under certain circumstances,[1] proposed amendments must be submitted to DLCD's Salem office at least 35 days before the first evidentiary hearing on the proposal. The 35 days begins the day of the postmark if mailed, or, if submitted by means other than US Postal Service, on the day DLCD receives the proposal in its Salem office. **DLCD will not confirm receipt of a Notice of a Proposed Change unless requested.**

2. A Notice of a Proposed Change must be submitted by a local government (city, county, or metropolitan service district). DLCD will not accept a Notice of a Proposed Change submitted by an individual or private firm or organization.

3. **Hard-copy submittal:** When submitting a Notice of a Proposed Change on paper, via the US Postal Service or hand-delivery, print a completed copy of this Form 1 on light green paper if available. Submit **one copy** of the proposed change, including this form and other required materials to:

Attention: Plan Amendment Specialist
Dept. of Land Conservation and Development
635 Capitol Street NE, Suite 150
Salem, OR 97301-2540

This form is available here:
http://www.oregon.gov/LCD/forms.shtml

4. **Electronic submittals** of up to 20MB may be sent via e-mail. Address e-mails to plan.amendments@state.or.us with the subject line "Notice of Proposed Amendment."

Submittals may also be uploaded to DLCD's FTP site at http://www.oregon.gov/LCD/Pages/papa_submittal.aspx.

E-mails with attachments that exceed 20MB will not be received, and therefore FTP must be used for these electronic submittals. **The FTP site must be used for all .zip files** regardless of size. The maximum file size for uploading via FTP is 150MB.

Include this Form 1 as the first pages of a combined file or as a separate file.

5. **File format:** When submitting a Notice of a Proposed Change via e-mail or FTP, or on a digital disc, attach all materials in one of the following formats: Adobe .pdf (preferred); Microsoft Office (for example, Word .doc or docx or Excel .xls or xlsx); or ESRI .mxd, .gdb, or .mpk. For other file formats, please contact the plan amendment specialist at 503-934-0017 or plan.amendments@state.or.us.

6. **Text:** Submittal of a Notice of a Proposed Change for a comprehensive plan or land use regulation text amendment must include the text of the amendment and any other information necessary to advise DLCD of the effect of the proposal. "Text" means the specific language proposed to be amended, added to, or deleted from the currently acknowledged plan or land use regulation. A general description of the proposal is not adequate. The notice may be deemed incomplete without this documentation.

7. **Staff report:** Attach any staff report on the proposed change or information that describes when the staff report will be available and how a copy may be obtained.

8. **Local hearing notice:** Attach the notice or a draft of the notice required under ORS 197.763 regarding a quasi-judicial land use hearing, if applicable.

9. **Maps:** Submittal of a proposed map amendment must include a map of the affected area showing existing and proposed plan and zone designations. A paper map must be legible if printed on 8½" x 11" paper. Include text regarding background, justification for the change, and the application if there was one accepted by the local government. A map by itself is not a complete notice.

10. **Goal exceptions:** Submittal of proposed amendments that involve a goal exception must include the proposed language of the exception.

[1] 660-018-0022 provides:
(1) When a local government determines that no goals, commission rules, or land use statutes apply to a particular proposed change, the notice of a proposed change is not required [a notice of adoption is still required, however]; and
(2) If a local government determines that emergency circumstances beyond the control of the local government require expedited review such that the local government cannot submit the proposed change consistent with the 35-day deadline, the local government may submit the proposed change to the department as soon as practicable. The submittal must include a description of the emergency circumstances.

If you have any questions or would like assistance, please contact your DLCD regional representative or the DLCD Salem office at 503-934-0017 or e-mail plan.amendments@state.or.us.

Notice checklist. Include all that apply:

☒ Completed Form 1

☒ The text of the amendment (e.g., plan or code text changes, exception findings, justification for change)

☒ Any staff report on the proposed change or information that describes when the staff report will be available and how a copy may be obtained

☐ A map of the affected area showing existing and proposed plan and zone designations

☒ A copy of the notice or a draft of the notice regarding a quasi-judicial land use hearing, if applicable

☐ Any other information necessary to advise DLCD of the effect of the proposal



2016

MITIGATION ACTION PLAN (THE MAP)



1286

The Mitigation Action Plan

The City of Portland's Path to Resilience

September 2016

PREPARED FOR

City of Portland
Bureau of Emergency Management
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Portland , Oregon 97266

PREPARED BY

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- Nickole Cheron, Disability Program, Portland Office of Neighborhood Involvement
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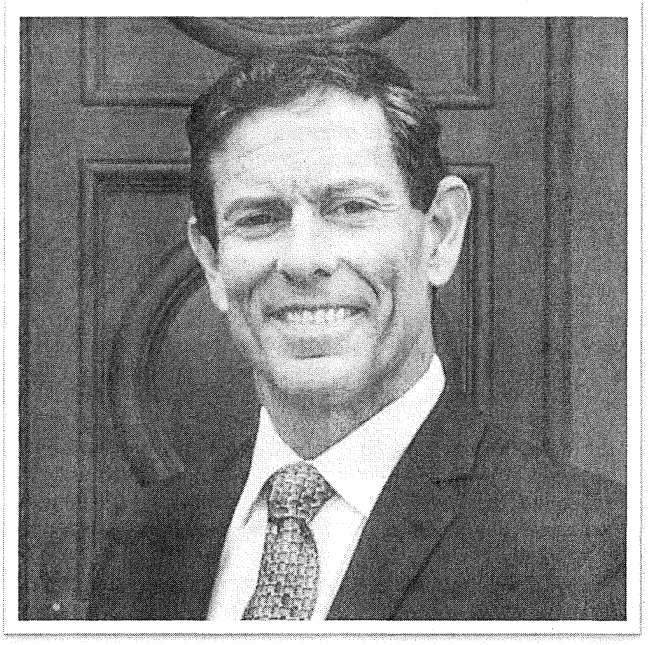
- Sherrie Forsloff, Oregon Health and Science University Emergency Management
- Simeon Mamaril, Filipino American Community
- Solamon Ibe (Co-Chairperson), Portland African American Leadership Forum
- Tom Milne, Goose Hollow Foothills League
- Vicente Harrison, Portland Parks & Recreation

Special Acknowledgments

The development of this plan would not have been possible without the dedication and commitment to this process by the Mitigation Action Plan Steering Committee. The dedication of this volunteer committee to allocate their time to this process is greatly appreciated. Also, the residents of the City of Portland are commended for their participation in the outreach strategy identified by the Steering Committee. This outreach success will set the course to the successful implementation of this plan during its next performance period. The planning team would also like to thank Portland Public Schools for the generous use of their facilities for steering committee meetings and trainings over the course of the planning process.

Dedication

This plan is dedicated to the memory of Glen Collins, who served as a member of the Mitigation Action Plan Steering Committee, and inspired us with his commitment to building resilience in the Portland metropolitan region.



Glen Collins, 1964 - 2016

EXECUTIVE SUMMARY

WHAT IS HAZARD MITIGATION?

Hazard mitigation is action that communities take before a disaster to reduce the potential for death, injury, and property damage. It is about acting to reduce potential impacts when such action is most effective: before a disaster strikes. *The Mitigation Action Plan* (MAP) identifies how natural hazard events like floods, landslides, and earthquakes might affect the City of Portland; it lists actions that City offices can take before a disaster to protect people, critical infrastructure, and natural resources, and ensure the continuation of services, livability, and economic stability for all Portlanders.

The MAP meets hazard mitigation planning requirements for funding eligibility under Federal Emergency Management Agency (FEMA) grant programs. It also meets the floodplain management planning requirements for FEMA's Community Rating System.

UPDATING THE CITY OF PORTLAND PLAN

The MAP is the second comprehensive update to the *City of Portland Natural Hazard Mitigation Plan* (NHMP), which was first developed in 2004. Since the development of the initial plan, the City has made significant progress in its mitigation programs and activities. A 5-year progress report conducted while developing the MAP determined that 75 percent of the 101 mitigation actions identified in the 2010 NHMP were initiated or completed during the plan's performance period. The MAP builds on those successes and enhances the 2010 NHMP in several ways:

- The public engagement strategy was significantly enhanced for development of the MAP, starting with a 32-member steering committee with broad representation from City bureaus, community groups, disability advocates, communities of color, subject-matter experts, and other stakeholders. The steering committee had 10 formal meetings and attended two equity trainings over the 18-month project.
- An equity lens was used throughout the planning process to ensure that the plan process and outcomes benefit people who are most likely to suffer from a natural hazard event.
- The vision, mission and goals were refined to reflect changes in community priorities and to enhance integration among community planning efforts. The vision is aligned with the City's Comprehensive Plan mission.
- The plan addresses eight main hazards of concern, an emerging hazard of concern, and several compounding factors relevant to adverse impacts from natural hazards.
- The risk and vulnerability assessments for all hazards of concern were updated using best available data and a more robust risk assessment platform.
- Significant revisions and enhancements were made to the action plan, including the identification of implementation parameters aimed at enhancing transparency and accountability.
- The updated strategy for implementing and maintaining the MAP includes a working group that will meet annually over the plan's performance period.

The MAP shows a commitment to regional collaboration and resilience by establishing a linkage procedure for special purpose districts in the City to formally link to the plan and establish their own eligibility for federal grant funds.

PLAN DEVELOPMENT APPROACH

Development of the MAP relied on broad participation from many stakeholders. The plan development strategy was designed to result in a plan that sets the stage for equitably reducing the adverse impacts of natural hazards in the City through actions embraced by both elected officials and the people of Portland. The process encompassed eight phases:

- Phase 1—Organize resources and review the prior plan
- Phase 2—Update the risk assessment
- Phase 3—Develop and implement a public engagement strategy
- Phase 4—Update goals, objectives and actions
- Phase 5—Review and update the plan maintenance strategy
- Phase 6—Assemble the updated plan
- Phase 7—Initiate and complete plan review and adoption
- Phase 8—Implement the approved, adopted plan.

Phases 2, 3, 4, 7 and 8 are described below; the MAP has information on all eight phases.

As the plan was developed, a simultaneous process assessed natural hazard risks for the City's Critical Energy Infrastructure Hub along the Willamette River. Results of this study are incorporated into the plan document as appropriate.

Update the Risk Assessment

Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards. The risk assessment was used to rank risk and to gauge the potential impacts of each hazard of concern on the City. Risks were assessed for nine geographic "reporting areas" to compare risk throughout the City. Based on the risk assessment, hazards of concern were ranked for the risk they pose to Portland, as shown in Table ES-1. The ranking is based on the probability of occurrence of a hazard and likely impacts in three categories: impacts on people, impacts on property, and impacts on the local economy. The sections below describe key components of the risk assessment for the MAP.

Table ES-1. Hazard Risk Ranking

Hazard Ranking	Hazard[a]	Risk Rating
1	Severe weather	High
2	Earthquake	High
3	Landslide	Medium
3	Wildfire	Medium
4	Flood	Medium
5	Volcanic Activity	Low
6	Dam Failure	Low
7	Drought	Low

a. Space weather was identified as an emerging hazard of concern but a full risk assessment was not conducted and, therefore, risk is not ranked. This will be revisited at the next plan update.

Hazard Identification and Profiling

Eight hazards of concern, and one emerging hazard of concern (space weather) were selected:

- Severe weather
- Earthquake
- Landslide
- Wildfire
- Flood
- Volcano
- Dam failure
- Drought.

Assessment of the Impact of Hazards on Physical, Social and Economic Assets

The following are key findings for the five highest ranked hazards (see Table ES-1):

- **Severe Weather**—Since 1950, Portland has experienced at least 150 severe weather events, including high winds, heavy snow and rain, and excessive heat. Climate change and El Niño weather patterns could change the severity and frequency of severe weather events. Older buildings and utilities like power lines are more susceptible to damage from severe weather. People who depend on electricity for life support or people without homes are likely to suffer most from severe weather events.
- **Earthquake**—The Portland area has experienced numerous earthquakes in the past, ranging from Magnitude 4.5 to 9.0. Portland is certain to experience seismic events in the future. Many of Portland's buildings were built before seismic design requirements were included in building codes, or before modern codes were adopted. Over 13,000 of Portland's buildings are in areas with high liquefaction susceptibility, and during a Cascadia Subduction Zone earthquake, nearly 6,000 people in Portland may be displaced from their homes.
- **Landslide**—Hundreds of landslides have occurred in Portland in the past 20 years, and the City can expect many more in the future. Landslides are most likely on steep slopes when the ground is saturated from rainfall or poor drainage. More than 89,000 people in Portland live in landslide hazard areas, along with over $20 billion worth of buildings and contents.
- **Wildfire**—Portland is a wildland-urban interface community, meaning that its structures are near or within natural areas than are prone to wildfire. Wildfire season is usually from June through October, although climate change, increasing fuel load (including from invasive species), and drought conditions may cause this to vary. In Portland, over 68,000 people are estimated to live in wildfire hazard areas, and over 19,000 buildings. Over 96 percent of these buildings are residential.
- **Flood**—Portland is at the confluence of two major rivers, and has many smaller creeks and streams that flow within the city limits. The city is susceptible to flooding from the rivers and streams, as well as urban flooding from overwhelmed or blocked storm drains and runoff from impervious surfaces. There are 2,925 structures in the 1-percent-annual-chance flood hazard area, and over 9,500 people who live in these areas. Only about half of the people who live in the 1-percent-annual-chance flood hazard area have flood insurance. FEMA flood maps do not take into account the residual risk for properties protected by a flood-control levee, so there may be a misperception that the flood risk in these areas is zero.

Vulnerability Identification

Vulnerability identification includes an assessment of social vulnerability using demographic indicators. Vulnerability to natural hazards is affected by a person's social and economic circumstances in everyday life. People who lack access to resources and information are likely to suffer most in a disaster. The key vulnerability factors for this plan include: people under 15, people over 65, renter-occupied housing, people of color, people with disabilities, and limited English-speaking households.

Estimates of the Cost of Potential Damage

Some of the most costly scenarios include the following:

- A 0.2-percent-annual-chance flood (commonly referred to as a 500-year flood) could cause over $19 billion in damage to structures and their contents.
- The Portland Hills Magnitude-6.5 Earthquake Scenario could cause $24 billion in damage to structures and their contents.

Develop and Implement a Public Engagement Strategy

The public engagement strategy was developed through discussion with the steering committee, review of best practices, interviews with community members, and input from experts contracted to assist with development of the equity lens. The implemented strategy promotes effective cooperation between City government and community organizations. It encouraged public participation during the MAP development process and will facilitate continued engagement with residents after adoption of the MAP. The following were key features of the strategy:

- An online platform for information sharing with the MAP steering committee and the public
- Stakeholder involvement through more than 50 in-person meetings or presentations and countless phone calls and emails
- A public survey that received almost 3,000 responses
- Nine community workshops, attended by more than 175 participants, to learn about the public's perception of risk and to identify existing efforts, possible partnerships, and recommended actions
- Five town hall events to answer questions and receive feedback on the draft plan during the 45-day public comment period.

Feedback received from the public engagement strategy was used throughout the plan process, especially in action item identification and selection.

Update Goals, Objectives and Actions

Vision, Mission, Goals, and Objectives

The steering committee reviewed and updated the vision, mission and goals from the 2010 NHMP and developed a set of objectives, as shown in Table ES-2. Goals were selected to support the vision and mission. Objectives were selected that meet multiple goals. Actions were selected and prioritized in part based the number of objectives each would help to accomplish.

Recommended Actions

The MAP's action plan presents 161 mitigation actions to reduce losses from natural hazards. City of Portland bureaus selected these actions from a variety of sources, including a mitigation best practices catalog supplemented with steering committee and other stakeholder recommendations, the results of the risk assessment and identified issues, public input, other plans and programs, the results of the capability assessment, and actions identified in the 2010 NHMP.

Table ES-2. Vision, Mission, Goals, and Objectives

Vision	***Our desired future state.***
Portland is a prosperous, healthy, equitable and resilient city where everyone has access to opportunity and is engaged in shaping decisions that affect their lives	
Mission	***What we do, who we do it for, and how.***
To equitably reduce risk and the adverse impacts of natural hazards by building community resilience through collaborative, cost-effective actions and strategies.	
Goals	***General guidelines that explain what we want to achieve with the plan.***
1. Protect life and reduce injuries. 2. Engage and build capacity for the whole community. 3. Minimize public and private property damage. 4. Protect, restore, and sustain natural systems. 5. Minimize the disruption of essential infrastructure and services. 6. Integrate mitigation strategies into existing plans and programs. 7. Prioritize multi-objective actions that reduce risk to vulnerable communities.	
Objectives	***Broader than actions, but more specific than goals, objectives are specific enough to help determine whether a proposed project or program would advance the values expressed in the mission and vision. Objectives may also be thought of as 'policies.' In the planning process, objectives are used to define and prioritize actions.***
• Strengthen development codes and update land use designations to facilitate effective disaster risk reduction • Prevent or reduce mitigation-related disparities affecting under-served and under-represented communities through plans, investments and engagement • Promote the use of natural systems to limit natural hazard related impacts • Increase the resilience of high-risk and critical infrastructure through monitoring, planning, maintenance, investment, adaptive technology, and continuity planning • Coordinate land use plans and public facility investments between City bureaus, other public and jurisdictional agencies, businesses, community partners, and other emergency response providers • Support community outreach activities that increase stakeholder awareness and understanding of hazard risk, mitigation options, and preparedness strategies • Identify and seek various funding opportunities for mitigation activities and look for ways to leverage existing funds • Seek opportunities in which hazard mitigation also benefits other community goals • Collect data to track progress on meeting mitigation goals. • Use the best available data, science and technologies to improve understanding of the location and potential impacts of natural hazards, the vulnerability of building types and community development patterns, and the measures needed to protect life safety. • Retrofit, purchase, or relocate structures in high hazard areas, especially those known to be repetitively damaged. • Promote, incentivize and support the mitigation of private property. • Improve systems that provide warning and emergency communications. • Promote mutual information exchange and incorporate existing community networks in the identification and implementation of mitigation actions. • Build City staff and community capacity to ensure effective implementation and equitable outcomes of mitigation action efforts • Develop plans to reduce immediate impacts of natural hazard events, and to facilitate rapid and effective social and economic recovery.	

Action Evaluation and Prioritization

Several steps were carried out to evaluate each action recommended in the MAP:

- An equity analysis screening was performed.
- Implementation information was identified, such as lead agency and timeline.
- A qualitative benefit/cost review was conducted.

Based on these analyses, multiple priority rankings were assigned to each action:

- Each action was rated high, medium or low for implementation, based on the benefit/cost ratio and funding availability
- Each action was rated high, medium or low for grant pursuit, based on grant eligibility and expected benefits
- Actions were assigned an "E" rating if the target audience/beneficiary identified for the action is one of the groups of focus for the assessment

Selected actions identified as high or medium implementation priority and supporting equity initiatives are identified in Table ES-3.

Table ES-3. High and Medium-Priority Actions from the Mitigation Action Plan Matrix

Action Number and Description	Implementation Priority
PBEM-10—Work with Office of Neighborhood Involvement Disability Program Coordinator to promote participation in the Additional Needs Registry through the Public Alerts system.	High-E
PBEM-11— Support Bureau of Development Services in implementing recommendations from the City's Unreinforced Masonry Seismic Retrofit Project, including promoting and supporting policies for mandatory retrofits of unreinforced masonry buildings. This action needs high-level support from City Council and Office of Government Relations.	Medium-E
PBEM-12—Audit PBEM's suite of plans to evaluate whether plans meet the needs of people with disabilities, people with language barriers, and other access and functional needs populations. Develop a transition plan to update all plans.	High-E
PBEM-23—Develop an emergency communications plan to distribute emergency messages to immigrant and refugee communities in language-appropriate and culturally appropriate ways.	High-E
BPS-1—Promote and fund energy independence projects in low-income neighborhoods and communities.	High-E
BPS-2—Plan for solar + battery storage systems, which can serve as mini power-supply stations or provide residents the ability to shelter in place after any electricity supply-disrupting event, at varying scales (project, neighborhood and district) and locations (critical City facilities, low-income housing, community gathering spots).	High-E
BPS-3—Encourage solar + battery storage demonstration projects at critical City facilities, in low-income neighborhoods and in other strategic locations.	High-E
BPS-7—Support *2015 Climate Action Plan* and *Climate Change Preparedness Strategy* actions that relate to adaptation planning and natural hazard mitigation actions.	High-E
BPS-10—Develop an emergency service plan for solid waste removal in multifamily properties after a disaster event.	High-E
OEHR-1 — Prior to and during implementation, review all actions for negative externalities and to ensure vulnerable populations are protected from displacement or other disproportionate burdens.	High-E

Note: PBEM = Portland Bureau of Emergency Management; BPS = Bureau of Planning and Sustainability; OEHR = Office of Equity and Human Rights

Initiate and Complete Plan Review and Adoption

The MAP was submitted to Oregon's Office of Emergency Management, FEMA Region X, and the Community Rating System contractor (Insurance Services Office, Inc.) for review and approval. The MAP will be presented to and adopted by the City of Portland City Council.

Implement the Approved, Adopted Plan

Plan implementation will occur over the next five years as the lead agencies begin to implement the actions identified in this plan. The Implementation and maintenance strategy developed by the steering committee will guide this phase. This phase will be dependent on the commitment of all City bureaus, elected officials and Portlanders to reducing risk from natural hazards.

PART 1—PLANNING PROCESS AND COMMUNITY PROFILE

1. Introduction to Hazard Mitigation Planning

1.1 About Hazard Mitigation

1.1.1 What Is It?

As the cost of disasters rises, communities must find ways to reduce hazard risks. The term "hazard mitigation" refers to actions that reduce or eliminate long-term risks caused by hazards such as earthquakes, floods, storms, and wildfires. It involves strategies such as planning, policy changes, programs, projects, and other activities that can mitigate the impacts of hazards. These advance actions reduce potential hazard effects or risk and are already in place at the time of impact. Without an investment in hazard mitigation, repeated disasters result in repeated damage and rebuilding. This recurrent reconstruction becomes more expensive as the years go by. Hazard mitigation breaks this costly cycle of damage and reconstruction by taking a long-term view of rebuilding and recovering from disasters.

DEFINITIONS

- **Mitigation**—Advance actions to reduce potential hazard effects or risk. Protections are already in place at the time a hazard event occurs.
- **Preparedness**—Advance actions that strengthen the capability of government, residents, and communities to respond to disasters.
- **Prevention**—Building capabilities to avoid, prevent or stop a threatened or actual act of terrorism.
- **Recovery**—A phase of emergency management in which activities are carried out to restore essential services and repair damage caused by a hazard event.
- **Resilience**—The capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment.
- **Response**—A phase of emergency management that consists of immediate actions to save lives, protect property and the environment and meet basic human needs.

1.1.2 When Does it Apply?

The federal Disaster Mitigation Act (DMA) of 2000 requires state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. The DMA emphasizes planning for disasters before they occur. However, hazard mitigation is also essential to post-disaster recovery. After disasters, repairs and reconstruction often just restore damaged property to pre-disaster conditions. The implementation of additional hazard mitigation actions leads to building smarter, safer, and more resilient communities that are better able to reduce future injuries and damage. *The Mitigation Action Plan* (MAP) is the City of Portland's natural hazard mitigation plan under the DMA.

1.1.3 Who Is Responsible?

The responsibility for hazard mitigation lies with private property owners, business and industry, and local, state and federal governments. The Federal Emergency Management Agency (FEMA) encourages multi-jurisdictional planning under its guidance for the DMA, urging state and local authorities to work together. The planning network called for by the DMA helps local governments articulate needs for mitigation, resulting in faster allocation of funds and more cost-effective risk reduction projects. When feasible, multi-jurisdictional planning presents opportunities in the ability to pool resources and eliminate redundant activities in a planning area that has uniform risk exposure.

Because of these factors, the City of Portland developed the MAP at two levels. The base plan addresses risk and vulnerability within city boundaries and identifies actions within the capabilities of the City. In addition, the City has developed a procedure by which special purpose districts in the City can formally link to the base plan—identifying risk and vulnerabilities to the assets they own and manage and selecting mitigation actions to reduce these risks. This linkage process (see Chapter 20) will ensure that all eligible local governments within the City have the opportunity to establish eligibility for grant funds while fostering collaboration among local governments and other local stakeholders.

1.1.4 How Is It Developed and Implemented?

The DMA promotes sustainability for disaster resistance. "Sustainable hazard mitigation" includes the sound management of natural resources and the recognition that hazards and mitigation must be understood in the largest possible social and economic context. Efforts to reduce risks should be compatible with other community goals, which may be related to equity, economic development, sustainability, public and environmental health, or other issues. As communities plan for new development and improvements to existing infrastructure, mitigation should be an important consideration.

1.1.5 How It Relates to Other Phases of Emergency Management

The main goal of hazard mitigation is to reduce the time that it takes to move through the emergency management cycle and to recover from natural hazard events (see Figure 1-1) because proactive measures have been put in place to reduce the amount of damage that occurs. As a result, planning for hazard mitigation impacts all phases of emergency management.

Because of this, hazard mitigation often gets confused with hazard preparedness. It is important to understand the difference between the two phases in order to understand the main focus of this plan, which is mitigation. Mitigation plans do identify strategies and actions that impact other aspects of the emergency management cycle. Increasing capabilities, for example, is a valid strategy for mitigation; the capabilities may be related to preparedness or response or recovery. Figure 1-2 provides an illustration of how mitigation and preparedness are different yet complementary.

1.2 HAZARD MITIGATION IN THE CITY OF PORTLAND

City of Portland bureaus manage city infrastructure, plan for long-term capital improvement and community-level investments, and administer a wide variety of programs. These activities play a role in the city's resilience to natural hazards. There are many things that bureaus can do now as part of their normal activities—or add to their portfolios when opportunities arise—to reduce Portland's risk from natural hazards over time and improve the City's ability to bounce back when natural hazard events do happen. These projects and programs together contribute to Portland's overall strategy for reducing its risk from natural hazards.

By investing in mitigation projects, the City decreases the risk and consequently the cost of disaster. In the event of a disaster, City response resources will be stretched. Through prior planning and implementation of mitigation projects, the City can decrease the amount of damage to its assets and be able to use resources for the greatest response and rebuilding needs. The intent of this plan is to identify what can be done prior to disaster that will protect the most people, the most essential and critical infrastructure and the most natural resources to enable the continuation of services, livability and economic stability for all Portlanders.

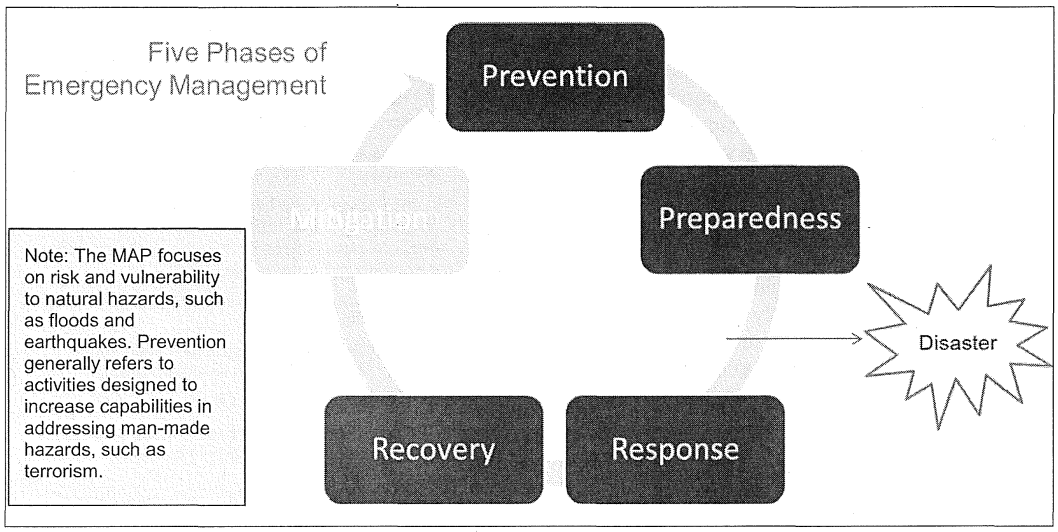


Figure 1-1. Five Phases of Emergency Management

Graphic by Danielle Butsick, PBEM

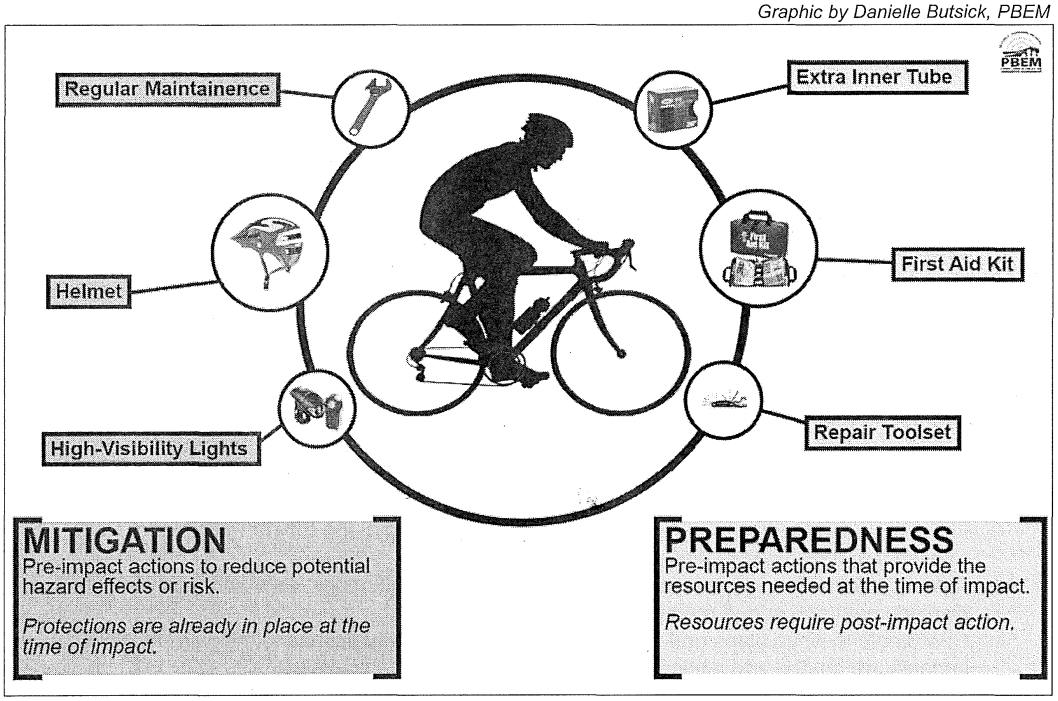


Figure 1-2. Mitigation and Preparedness Examples

The Mitigation Action Plan is the second comprehensive update to the *City of Portland Natural Hazard Mitigation Plan* (NHMP), which was first developed in 2004. This update identifies resources, information, and strategies for reducing risk from natural hazards. Elements and strategies in the plan were selected because they best meet the needs of Portland's bureaus and residents, and they also satisfy FEMA program requirements. The MAP will help guide and coordinate mitigation activities throughout the city. The main purpose of this planning effort was to identify risks posed by hazards and to develop strategies to reduce the impact of hazard events on people and property in the City of Portland; however, the plan was also developed to meet the following objectives:

- Incorporate Portland's equity goals into hazard mitigation planning to emphasize natural hazard risk reduction for Portland's most vulnerable residents.
- Involve people in Portland who represent communities of color, people with disabilities, senior citizens, and other groups who are potentially more vulnerable to natural hazards in the planning process, so that they have a say in the goals and actions selected and can communicate information about natural hazard risks within their communities.
- Develop a plan that reflects the priorities of Portland residents, bureaus, and offices while exceeding the requirements of the DMA.
- Meet the planning requirements of FEMA's Community Rating System (CRS), allowing the City to maintain or enhance its CRS classifications.
- Enable the City and all potential planning partners to use federal grant funding to reduce risk through mitigation.
- Set priorities for allocation of city funds and pursuit of federal and other grant funding opportunities to reduce risks from natural hazards.
- Improve understanding of risks and vulnerabilities specific to the City of Portland for Portland residents and decision-makers in City bureaus.
- Identify actions that will reduce the negative impacts of natural hazards and save lives, reduce displacement and speed recovery.
- Coordinate existing plans and programs so that high-priority actions to mitigate possible disaster impacts are funded and implemented.
- Foster collaboration between local government and residents.

REQUIRED CONTENT FOR LOCAL HAZARD MITIGATION PLANS (44 CFR 201.6(c))

- Documentation of the process used to develop the plan, including who was involved and how the public was involved.
- A risk assessment that provides the following information:

  A description of the type, location, and extent of all natural hazards that can affect the jurisdiction, previous occurrences of hazard events, and the probability of future hazard events.

  A description of the jurisdiction's vulnerability to the hazards in terms of:
  - Buildings, infrastructure and critical facilities located in hazard areas
  - Potential dollar losses
  - Development trends and the ability to consider mitigation in land use decisions.

  Assessment of each participating jurisdiction's risks where they vary from those of the entire planning area.
- A mitigation strategy for reducing potential losses identified in the risk assessment:
  - A description of mitigation goals.
  - A range of mitigation actions and projects to consider.
  - An action plan for each participating jurisdiction recommending and prioritizing specific mitigation actions.
- A plan maintenance process that includes:
  - A schedule for monitoring, evaluating, and updating the mitigation plan.
  - A process for incorporating the requirements of the mitigation plan into other local planning mechanisms.
  - A plan for ongoing public participation.
- Documentation that the plan has been formally adopted by the governing body of each jurisdiction requesting approval of the plan.

1.3 WHO WILL BENEFIT FROM THIS PLAN?

Effective hazard mitigation can provide the following benefits:

- Reduce the loss of life, property, essential services, and critical facilities; and reduce economic hardship.
- Reduce short-term and long-term recovery and reconstruction costs.
- Increase cooperation and communication in the community through the planning process.
- Increase potential for state and federal funding for pre- and post-disaster projects.

All residents, businesses, and visitors of the City of Portland are the ultimate beneficiaries of the MAP. However, the planning process to develop the MAP was performed through an equity lens, in order to focus the benefits of the plan on the people who are likely to suffer the greatest from a natural hazard event. The plan identifies strategies and actions that will reduce risk for those who live in, work in, and visit the City. It provides a viable planning framework for all foreseeable natural hazards that may impact Portland. Participation in the development of the plan by key stakeholders in the area helped ensure that outcomes will be mutually beneficial. The resources and background information in the plan are applicable citywide, and the plan's goals and recommendations can lay groundwork for the development and implementation of local mitigation activities and partnerships.

1.4 HOW TO READ THIS PLAN

In order to fulfill the requirements of the DMA and be eligible for federal disaster funding grant programs, a local hazard mitigation plan must contain a set of information as outlined in the Title 44 of the Code of Federal Regulations (44 CFR; see box at right). The MAP has been organized to provide all the required information. Notations are provided throughout the plan indicating specific requirements being addressed. The plan is divided into three parts:

- Part 1 includes the planning process and community profile.
- Part 2 includes the risk assessment.
- Part 3 includes the mitigation strategy and plan maintenance process.

The following appendices are also included to provide additional information or otherwise support the content outlined in the main document:

- Appendix A—5-year progress report (2010 through 2016)
- Appendix B—Steering Committee Ground Rules
- Appendix C—Public Engagement Materials
- Appendix D—Critical Energy Infrastructure Hub Study
- Appendix E—Reporting-Area-Scale Maps
- Appendix F—Data Sources and Methods used for Mapping
- Appendix G—Risk Assessment Data Gaps and Limitations
- Appendix H—Prior Plan Goals
- Appendix I—Mitigation Best Practices Catalog
- Appendix J—Expectations for Participating Bureaus
- Appendix K—Progress Report Template

The City's linkage strategy is outlined in Chapter 20 so that other eligible jurisdictions in Portland can use the information in this plan to ease their level of effort in meeting DMA requirements and becoming eligible for relevant grant programs.

2. PLAN UPDATE—WHAT HAS CHANGED

2.1 THE PREVIOUS PLANS

The City of Portland responded to the DMA by developing the initial *City of Portland Natural Hazard Mitigation Plan* (NHMP), which was approved on December 9, 2004. The NHMP underwent its initial 5-year update in conformance with DMA requirements and the update was approved on February 15, 2010. During the planning process for that first update, substantial revisions were made to all sections of the plan. Notably, four additional hazards of concern were added: severe weather, invasive plant species, erosion and volcanic activity. The original update process included the following (NHMP, 2010):

- **Preliminary Research**—Portland State University master degree program students in geology or urban studies researched plans, other city or county mitigation action items and the status of 2004 NHMP action items to provide background documents for the update.
- **Organize Resources**—The Portland Office of Emergency Management (now called Portland Bureau of Emergency Management) identified resources that could provide the technical expertise, historical information and research data to update the 2004 NHMP.
- **Update Hazard Profiles**—The planning team reviewed the hazards identified in the 2004 NHMP and assessed other hazards that have historically impacted the city. A hazard analysis was developed for eight hazards.
- **Update Risk Assessment**—The planning team reviewed the City's 2006 vulnerability analysis and used the results to develop a mitigation strategy.
- **Assess Capabilities**—The planning team reviewed the City's administrative, technical, legal, regulatory and fiscal capabilities and determined whether they adequately met existing requirements.
- **Update Mitigation Strategy**—The planning team reviewed the previous mitigation goals and actions to determine whether the goals still met the City's needs and whether the actions had been implemented, were in progress, or were no longer applicable. Based on the updated risk assessment, the planning team prioritized over 100 mitigation actions for implementation in a mitigation action plan.
- **Monitor Progress**—The planning team developed an implementation process for the mitigation action plan.

Changes to the 2004 plan were summarized in the 2010 update as shown in Table 2-1.

2.2 WHY UPDATE?

Portland's 2016 *Mitigation Action Plan* (MAP) is the next update to the City's natural hazard mitigation plan. Development of this new plan achieves a number of important goals, as described in the sections below.

Table 2-1. Summary of Changes in 2010 NHMP

2004 NHMP Section	Items Updated in 2010	2004 Items Deleted in 2010	Items Added in 2010
Planning Process	Planning process, planning team, list of sources, public outreach	N/A	N/A
Risk Assessment	Hazard profile history, asset inventory, vulnerability analysis & summaries	N/A	New hazards, repetitive Loss properties, National Flood Insurance Program requirements
Mitigation Strategy	Mitigation actions status, mitigation action implementation	Implemented & non-relevant mitigation actions	New mitigation actions, capability assessment
Plan Maintenance	Plan maintenance process	N/A	Appendix F

2.2.1 Federal Eligibility

Federal law (44 CFR) requires hazard mitigation plans to include a schedule for being monitored, evaluated and updated. This provides an opportunity to reevaluate recommendations, monitor the impacts of completed actions, and determine if there is a need to change the focus of mitigation strategies. A jurisdiction covered by a plan that has expired is not able to pursue elements of federal funding that require a current hazard mitigation plan.

2.2.2 Changes in Development

Hazard mitigation plan updates must be revised to reflect changes in development in Portland during the previous performance period of the plan (44 CFR Section 201.6(d)(3)). The plan must describe changes in development in hazard-prone areas that increased or decreased vulnerability since the last plan was approved. If no changes in development impacted overall vulnerability, plan updates may validate the information in the previously approved plan. The intent of this requirement is to ensure that the mitigation strategy continues to address the risk and vulnerability of existing and potential development and takes into consideration possible future conditions that could impact vulnerability.

Changes in risk due to development between the 2010 NHMP and the 2016 MAP are difficult to assess. The exposure and vulnerability assessment in the 2010 update was limited, and that update noted that the analysis should be updated and enhanced. No citywide tracking or assessment of exposure occurred during the performance period of the plan. The 2016 update includes a complete reassessment of risk and vulnerability in Portland, using more sophisticated data. It calculates replacement value from assessor records and uses a FEMA loss estimation model called Hazus-MH. More detailed information on the methodology used to assess risk is provided in Chapter 6. Now that the City is equipped with a baseline assessment of hazard vulnerability and a user-defined Hazus–MH model for Portland, a comparative analysis will be possible for future updates.

The MAP assumes that some new development triggered by an increase in population occurred in hazard areas. Because all such new development would have been regulated pursuant to local programs and codes, it is generally assumed that vulnerability did not increase even if exposure did. The City of Portland has a comprehensive plan that governs land-use decisions and policy-making (see Section 4.9.4), as well as a building code and specialty ordinances based on state and federal mandates.

2.2.3 Focus on Public Engagement and Equity

The 2010 NHMP met the federal requirements for community engagement and outreach. However, plan developers noted that the engagement strategy had fallen short of City of Portland standards and expectations. The 2016 planning process was developed to reinvigorate the dialogue between

residents, city government and other stakeholders and to use this dialogue to further existing equity goals. *The Portland Plan,* a strategic roadmap for the City, outlines the following vision for equity in the city (City of Portland, 2012):

- All Portlanders have access to a high-quality education, living wage jobs, safe neighborhoods, basic services, a healthy natural environment, efficient public transit, parks and greenspaces, decent housing and healthy food.
- The benefits of growth and change are equitably shared across communities. No one community is overly burdened by the region's growth.
- All Portlanders and communities fully participate in and influence public decision-making.
- Portland is a place where people's futures are not limited by race, gender, sexual orientation, disability, age, income, where they were born or where they live.
- Underrepresented communities are engaged partners in policy decisions.

Responsive to this vision, all City bureaus and offices are charged with promoting equity and reducing disparities. The MAP includes a strong emphasis on working to embrace equity in planning and to empower Portland's most vulnerable people to play a role in building the City's resilience. This is referred to as the application of an equity lens (see Figure 2-1). An equity lens is defined by the Portland Office of Equity and Human Rights (OEHR) as a critical thinking approach to undoing institutional and structural biases, which evaluates burdens, benefits and outcomes to underserved communities (OEHR, n.d. b). This equity lens was developed and applied throughout the planning process in all phases of the MAP's development and is discussed throughout the plan document.

Through this broad engagement and focus on equity, the City is working to reduce vulnerability from natural hazards for all communities so that the benefits of hazard mitigation, such as the following, can be shared by all Portlanders:

- A faster recovery and return to normal life for neighborhoods after a hazard event
- Reduced stress on responders and social services
- Workers' return to work more quickly after a hazard event, resulting in less economic disruption and fewer businesses closing
- Maintenance of the culture, diversity and distinct neighborhoods of the City of Portland.

2.3 THE 5-YEAR PROGRESS REPORT

The 2010 plan update included a plan maintenance protocol that called for annual review of mitigation actions. With the exception of monitoring the status of flood-related actions for the City's CRS program, organized annual progress reporting did not occur during the performance period of the 2010 plan. Therefore, a five-year progress report was completed as part of the 2016 plan update process. This progress report is included in Appendix A of this document and provides information on the following:

- Recent natural hazard events in Portland
- Mitigation success stories over the performance period of the plan
- A review of the action plan
- Recommendations for changes and enhancements.

The template used for the 5-year progress report was reviewed by City bureaus and the steering committee and was enhanced based on their feedback. The 2016 plan implementation and maintenance strategy outlines a reinvigorated approach for actively maintaining the plan and includes a progress report template updated to reflect the comments received during the planning process.

Graphic by Danielle Butsick, PBEM

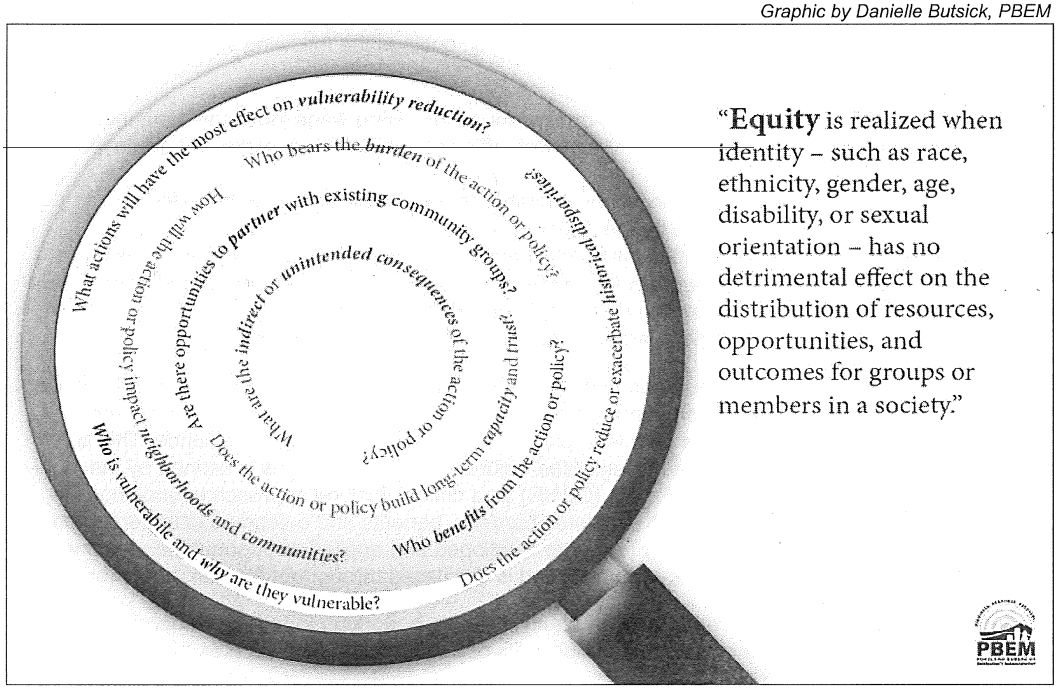


Figure 2-1. Mitigation Equity Lens

2.4 THE UPDATED PLAN—WHAT IS DIFFERENT?

The 2016 updated plan differs from the initial plan and the 2010 update in a variety of ways:

- The public engagement strategy used during the planning process was significantly enhanced, starting with a large number of non-governmental representatives serving on the plan steering committee.
- An equity lens was developed and applied throughout the planning process to assess in the evaluation of risk as well as the development of mitigation actions.
- The vision, mission and goals were revisited and refined to reflect changes in community priorities and to enhance integration among community planning efforts.
- The plan addressed eight main hazards of concern, an emerging hazard of concern, and several compounding factors relevant to adverse impacts from natural hazards.
- The risk and vulnerability assessments for all hazards of concern were updated using best available data and a more robust risk assessment platform.
- Significant revisions and enhancements were made to the action plan, including the identification of implementation parameters aimed at enhancing transparency and accountability.
- The plan implementation and maintenance strategy was revised and updated and includes a Mitigation Action Plan working group that will meet biannually over the plan's performance period.

Table 2-2 indicates the major changes between the 2010 and 2016 plans as they relate to 44 CFR planning requirements.

Table 2-2. Plan Changes Crosswalk

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval; (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.	The 2010 plan update was led by planning team members selected based on their program involvements, expertise and decision-making authority. Members of the public were involved in the planning process through intern assistance from the Portland State University Master's Program of Urban Planning and the Department of Geology; consultation with subject matter experts on hazard information; a website developed to provide information on the update process; a presentation to the City Council that was available for public viewing on the Cable Network; and presentations at citywide workshops. Technical difficulties prohibited the plan's public posting on the City website and the launch of a public survey.	The plan update was facilitated through a Steering Committee made up of stakeholders in Portland. The Steering Committee oversaw all phases of plan development including but not limited to the review and identification of goals and objectives, confirmation of a public involvement strategy, development of a plan implementation and maintenance strategy, and the recommendation of mitigation actions. All Steering Committee meetings were open to the public. Additional public input was received through public events early and late in the planning process and through a public survey. A 45-day public comment period was held before the draft plan was submitted for review. Agency coordination occurred through several avenues, including in-person and phone meetings with relevant agencies, monthly updates on plan progress and steering committee meetings distributed to a mailing list, attendance at steering committee meetings, the composition of the Steering Committee and the dissemination of the draft plan for public comment.
§201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.	The plan update included the identification, screening and profiling of eight hazards of concern. Five of these were also identified in the 2004 plan (earthquake, flood, landslide, severe weather and wildland urban interface fire). Three hazards were newly added (erosion, volcanic activity and invasive plant species).	A comprehensive risk assessment for Portland was developed that looked at eight natural hazards of concern: dam failure, drought, earthquake, flood, landslide, severe weather, volcanic activity, and wildfire. This assessment used the best available data and science with the Hazus-MH (version 2.2) risk assessment software and GIS analysis. In addition, the plan discussed impacts from an emerging hazard of concern and several compounding factors.
§201.6(c)(2)(i): [The risk assessment shall include a] description of the ... location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.	Each hazard of concern was profiled including the history, location and extent, and probability of future impacts.	Comprehensive risk assessments of each hazard of concern are presented in Chapters 7 through 14. Each chapter includes the following: • Hazard profile, including maps of extent and location, historical occurrences, frequency, severity and warning time • Compounding factors and secondary hazards • Exposure of people, property, critical facilities and natural environment • Vulnerability of people, property, critical facilities and natural environment • Future trends in development • Scenarios • Issues. Each hazard is compared to each other hazard via a risk ranking described in Chapter 16.

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i). This description shall include an overall summary of each hazard and its impact on the community	Vulnerability was described for each hazard of concern although information provided was not specific or detailed in many instances.	Vulnerability was assessed for all hazards of concern. The Hazus-MH computer model was used for the dam failure, earthquake, and flood hazards. These were Level-2 (user-defined) analyses using coordinating agency and local data. Critical facilities and assets were defined and inventoried using the Hazus Comprehensive Data Management System and other available datasets. Outputs were generated for other hazards by applying an estimated damage function to affected assets when available. The asset inventory was extracted from the Hazus-MH model. Best available data were used for all analyses.
§201.6(c)(2)(ii): [The risk assessment] must also address National Flood Insurance Program insured structures that have been repetitively damaged floods	Repetitive loss properties within the City are described.	A description of the National Flood Insurance Program (NFIP) and repetitive loss areas is included to meet DMA and CRS planning requirements. For repetitive loss properties, the type of structure was determined, likely causes of flooding were cited, and the information was reflected on maps. NFIP compliance is assessed.
§201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.	A generalized description of critical facilities and infrastructure in Portland is provided, as well as information on future critical facilities and infrastructure. Current and future exposure to the hazards of concern is discussed and Table 4-4-1a provides exposure estimates for Portland populations and buildings. Table 4-4-1b provides exposure estimates for City-owned critical facilities (erosion, invasive plant species and volcano hazards were undetermined).	A complete inventory of the numbers and types of buildings exposed was generated for each hazard of concern. The Steering Committee defined "critical facilities" for Portland, and these facilities were inventoried. Each hazard chapter provides a discussion of future development trends as they pertain to the hazard.
§201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) and a description of the methodology used to prepare the estimate.	Estimated losses from a 2004 Hazus-MH assessment were provided. Estimated losses were not provided for the invasive plant species and volcanic activity hazards.	Loss estimations were generated for all hazards of concern likely to impact property. These were generated by Hazus for the dam failure, earthquake, and flood hazards. For the other hazards, loss estimates were generated by applying a regionally relevant damage function to the exposed inventory. In all cases, a damage function was applied to an asset inventory. The asset inventory was the same for all hazards and was generated in the Hazus-MH model.
§201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.	Nine action areas of *The Portland Plan* that intersect with the NHMP are described. Additional detail was also provided on land use and development trends in Portland.	There is a discussion on future development trends as they pertain to each hazard of concern. This discussion looks predominantly at future land use designated in the recently updated comprehensive plan and the current regulatory environment that dictates this land use.

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.	The mitigation strategy was reviewed and updated from the 2004 plan. It includes a description of mitigation success stories over the 2004-2009 performance period.	The 2010 mitigation strategy underwent a comprehensive review including identified vision, mission and goals, existing capabilities, and previously identified actions. In addition, new mitigation actions were selected to meet the updated goals and objectives as well as to address the issues identified during the risk assessment and public engagement process.
§201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.	The 2010 plan included the same vision statement as the 2004 plan. In addition a mission statement was developed. The 2004 goals were reviewed, edited and updated. Seven goals were identified.	The vision, mission and goals identified in the 2010 plan were reviewed and updated. The plan includes an updated vision and mission statement as well as seven goals and 16 objectives. Goals were selected that support the vision and mission, objectives were selected that meet multiple goals, and actions were selected and prioritized based, in part, on meeting multiple objectives.
§201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.	Table 5-5-1a identifies 114 mitigation actions that were reviewed by the planning team for implementation over the five-year performance period. For each mitigation action, a brief assessment of benefits versus costs and technical feasibility was included.	A hazard mitigation best practices catalog was developed through an exercise that looked at strengths, weaknesses, obstacles and opportunities in Portland as well as previously identified best practices, and steering committee and other stakeholder input. This catalog identifies actions that manipulate the hazard, reduce exposure to the hazard, reduce vulnerability, or increase mitigation capability. The catalog segregates actions by scale of implementation. A table in the action plan section analyzes each action by mitigation type to illustrate the range of actions selected.
§201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program, and continued compliance with the program's requirements, as appropriate.	A brief discussion on the National Flood Insurance Program and Community Rating System was provided in the flood hazard profile. Appendix I includes a review of NFIP compliance. Actions that address NFIP compliance are called out in Table 5-6-1a.	The NFIP capability of the City is assessed and actions supporting continued compliance and good standing under the program have been identified,
§201.6(c)(3)(iii): [The mitigation strategy shall describe] how the actions identified in Section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.	The planning team evaluated criteria to identify the action that would have the greatest impact on the most hazards, meet the greatest number of goals, have the resources to implement current projects, and align with citywide and individual bureau priorities and goals. The selection of mitigation actions and their prioritization are described within the plan.	Each recommended action is prioritized using a qualitative methodology that looked at the objectives the project will meet, the timeline for completion, how the project will be funded, the benefits of the project and the costs of the project. In addition, actions with the potential for equity impacts are identified with an "E." This prioritization scheme is detailed in Chapter 19.

44 CFR Requirement	Previous Plan	Updated Plan
§201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.	The planning team and the Emergency Management Steering Committee were responsible for monitoring and evaluating the NHMP. An annual review meeting was to be held during the anniversary week of the FEMA approval date. An annual review questionnaire was to be completed. The plan maintenance strategy was not implemented during the performance period of the plan.	A detailed plan maintenance strategy is provided that includes the following: • Annual review and progress reporting • Formation of a working group • Development of an equity implementation guide • Plan update triggers • Plan incorporation guidelines • Strategy for continuing public involvement • Implementation coordination amongst the lead agencies identified.
§201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.	A discussion of how the actions of the NHMP intersect with *The Portland Plan* was included. A discussion is provided on how development and land use planning requirements use hazard information. Information on implementation of the mitigation actions through existing planning mechanisms was provided in the plan maintenance strategy.	This is included in the plan maintenance strategy and discussed in the capability assessment.
§201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.	Efforts for continued public involvement are described, including presentations to community organizations, maintenance of the website and contact information, the establishment of a schedule to implement public involvement, and the development of a citizen action plan. The level of continued public engagement specified was not maintained over the performance period of the plan.	This is included in the detailed plan maintenance strategy.
§201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commission, Tribal Council).	The Portland City Council adopted the 2010 NHMP update via resolution.	The Portland City Council will adopt the 2016 update via resolution.

3. PLAN UPDATE APPROACH

The Mitigation Action Plan was largely funded by a FEMA Pre-Disaster Mitigation grant received by the Portland Bureau of Emergency Management (PBEM) in 2015. It covered 69 percent of the cost for plan development. The balance was funded by City in-kind contributions.

3.1 PLAN UPDATE APPROACH

The approach to developing the 2016 MAP encouraged broad participation from many stakeholders. The plan development strategy was designed to result in the adoption and approval of a plan that sets the stage for equitably reducing the adverse impacts of natural hazards within the City through activities and strategies embraced by both elected officials and the people of Portland. The process encompassed eight key phases:

- Phase 1—Organize resources and review the prior plan
- Phase 2—Update the risk assessment
- Phase 3—Develop and implement a public involvement strategy
- Phase 4—Update goals, objectives and actions
- Phase 5—Review and update the plan maintenance strategy
- Phase 6—Assemble the updated plan
- Phase 7—Initiate and complete plan review and adoption
- Phase 8—Implement the approved, adopted plan.

Phases 1, 3 and 6 are described in Part 1 of this document. Phase 2 is described in Part 2. Phases 4, 5 and 8 are discussed in Part 3. In addition to these phases, a simultaneous process was pursued to assess natural hazard risks for the City's Critical Energy Infrastructure Hub along the Willamette River. Results of this study are incorporated into the plan document as appropriate and the full study is provided in Appendix D.

3.2 FORMATION OF THE PLANNING TEAM

The City of Portland hired Tetra Tech, Inc. to assist in preparation of the MAP. The Tetra Tech project manager and lead planner reported directly to the City of Portland project manager and project coordinator. The following planning team was formed to lead the planning effort:

- Danielle Butsick, Project Coordinator, PBEM
- Jonna Papaefthimiou, Project Manager, PBEM
- Paul Cone, GIS Support, City of Portland Corporate GIS
- Rob Flaner, Project Manager, Tetra Tech
- Kristen Gelino, Lead Planner, Tetra Tech
- Carol Baumann, Risk Assessment Lead, Tetra Tech.

The planning team facilitated the work of the steering committee, coordinated with other agencies, implemented the public engagement strategy, developed the plan document, and led the plan review and adoption process. The team met regularly throughout the planning process. As appropriate, other stakeholders and agency representatives were asked to participate in planning team calls.

3.3 DEFINING THE PLANNING AREA

The planning area was defined to consist of the entire area within the City of Portland city limits. Relevant Portland characteristics are described in Chapter 4.

3.4 PLAN KICKOFF

A kickoff event was held on June 22 (see Figure 3-1). The meeting was open to the public (see Figure 3-2) and had the following objectives:

- Introduce project goals
- Define mitigation and relevant laws
- Introduce the planning team and draft work plan
- Offer opportunities to be engaged.

At the meeting, local stakeholders were solicited to participate in the plan development. Stakeholders for this planning process were defined as persons and agencies that have a vested interest in the recommendations and implementation of the MAP. Stakeholders include residents, community groups, business owners, local, state and federal agencies, elected officials, visitors, and neighboring communities. Two stakeholder groups were identified at the kickoff meeting:

- Participatory stakeholders—Stakeholders who commit to being members of the Steering Committee overseeing the plan update process.
- Coordinating stakeholders—Stakeholders who cannot commit to the Steering Committee, but may attend meetings and want to be informed of plan progress.

Nineteen stakeholders signed up as participatory or coordinating stakeholders at the initial kickoff meeting.

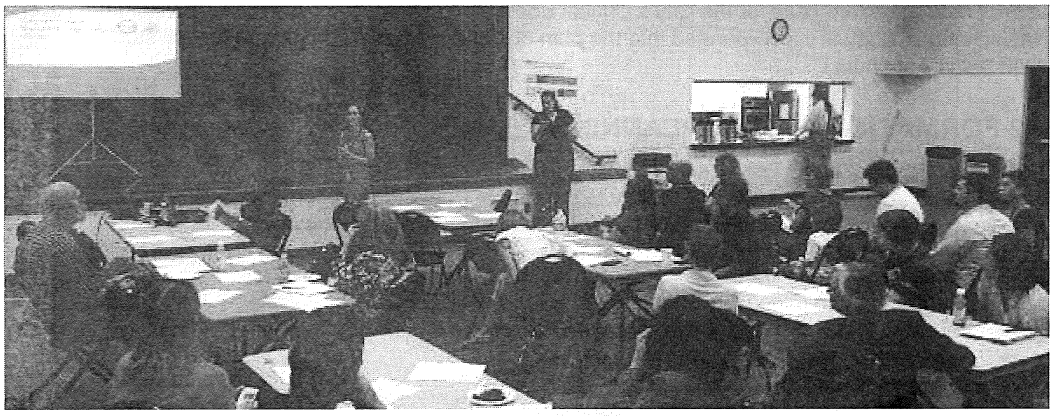


Figure 3-1. Plan Kickoff Meeting

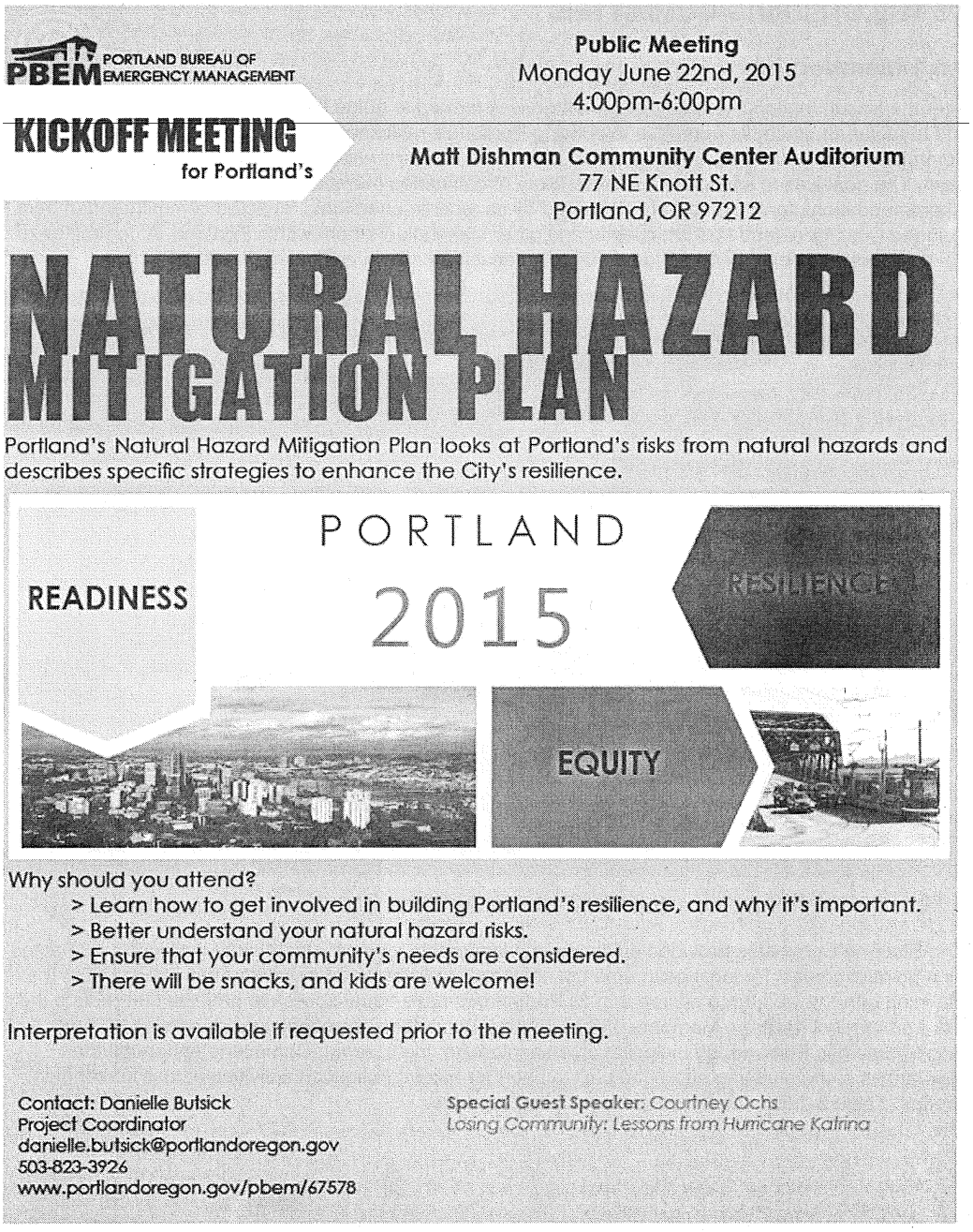


Figure 3-2. Kickoff Meeting Notice Poster

3.5 THE STEERING COMMITTEE

3.5.1 Membership

After the kickoff meeting, a steering committee was formed to guide the planning process for the update and to foster an equitable approach to building Portland's resilience to natural hazards. Steering Committee volunteers were solicited at the kickoff meeting and were also contacted by the planning team. The goal was to assemble a diverse array of committee members who could have recommendations for the plan or be impacted by its recommendations. Selected committee members included City of Portland staff, residents, and other stakeholders from within Portland. A committee of 32 members was confirmed to oversee the plan development process (see Figure 3-3).



Figure 3-3. Steering Committee

The Steering Committee provided guidance and leadership, oversaw the planning process, and acted as a point of contact for local governments, neighborhoods, and community groups interested in the planning effort. It worked to ensure that all Portlanders have equal access to projects that reduce their risk from natural hazards. Members of the Steering Committee represent a cross-section of views and interests across Portland. By including diverse interests, the Steering Committee enhanced the robustness of the planning effort and built support for hazard mitigation activities across stakeholder groups. Table 3-1 lists the Steering Committee members.

Table 3-1. Steering Committee Members

Representation[a]	Name	Title/Agency
Portland Government, Floodplain Management and Environmental Protection[c]		
Primary Member	Maggie Skenderian	Bureau of Environmental Services
Alternate Member	Kate Carone	Bureau of Environmental Services
Portland Government, Land Use and Comprehensive Planning[c]		
Primary Member	Kathryn Hartinger	Bureau of Planning and Sustainability
Alternate Member	Roberta Jortner / Sallie Edmunds	Bureau of Planning and Sustainability
Portland Government[c]		
Primary Member	Danielle Brooks	Office of Equity and Human Rights
Alternate Member	Judith Mowry	Office of Equity and Human Rights
Portland Government, Open Space Management		
Primary Member	Vicente Harrison	Parks & Recreation
Alternate Member	N/A	N/A
Portland Government, Public Safety[c]		
Primary Member	Laurent Picard	Fire and Rescue
Alternate Member	Leo Krick/Don Russ	Fire and Rescue
Stakeholder, Public Health[c]		
Primary Member	Jessica London (Co-Chairperson)	Oregon Health & Science University-Institute on Development and Disability/Oregon Office on Disability and Health
Alternate Member	Justin E. Ross	Oregon Health & Science University-Institute on Development and Disability/Oregon Office on Disability and Health
Stakeholder, Environmental Interests[c]		
Primary Member	Bob Sallinger	Audubon Society of Portland
Alternate Member	Micah Meskel	Audubon Society of Portland
Stakeholder, Community Health and Welfare		
Primary Member	Dean Alby	Oregon Food Bank
Alternate Member	N/A	N/A
Stakeholder, Community Organization		
Primary Member	Simeon Mamaril	Filipino American Community
Alternate Member	N/A	N/A
Stakeholder, Oregon Public Policy Committee[c]		
Primary Member	Jeff Soulages	Oregon Seismic Safety Policy Advisory Commission
Alternate Member	N/A	N/A
Stakeholder, Federal Agency		
Primary Member	Glen Collins	Department of Homeland Security
Alternate Member	N/A	N/A
Stakeholder, Community Organization/Committee[c]		
Primary Member	John Steup	Neighborhood Emergency Team/Amateur Radio Emergency Service/Local Emergency Planning Committee
Alternate Member	N/A	N/A
Stakeholder, Community Organization[c]		
Primary Member	Darlene Urban Garrett	Downtown Neighborhood Emergency Team /Neighbors West/Northwest Neighborhood Association
Alternate Member	N/A	N/A
Stakeholder, Community Organization[c]		
Primary Member	Solamon Ibe (Co-Chairperson)	Portland African American Leadership Forum
Alternate Member	N/A	N/A

Representation[a]	Name	Title/Agency
Stakeholder, Community Organization		
Primary Member	Karen Tam	Brummell Enterprises, Sellwood-Moreland Improvement League Member, Sellwood/Moreland
Alternate Member	Bob Burkholder	Brummell Enterprises, Sellwood-Moreland Improvement League Member, Sellwood/Moreland
Portland Government[c]		
Primary Member	Mary Ellen Collentine	Portland Water Bureau
Alternate Member	Mike Saling	Portland Water Bureau
Stakeholder, Business[c]		
Primary Member	Jim Mattison	Simpson Strong-Tie
Alternate Member	Shalini Prochazka, S.E.	Simpson Strong-Tie
Portland Government, Building and Code Enforcement[c]		
Primary Member	Kathy Roth	Bureau of Development Services
Alternate Member	Mark Fetters	Bureau of Development Services
Stakeholder, Community Organization[c]		
Primary Member	Jeremy O'Leary (Co-Chairperson)	East Portland Action Plan
Alternate Member	N/A	N/A
Portland Government and Community Organization		
Primary Member	Ronault (Polo) LS Catalani	Immigrant and Refugee Community Organization /Office of Neighborhood Involvement New Portlanders
Alternate Member	Lisha Shrestha	Immigrant and Refugee Community Organization /Office of Neighborhood Involvement New Portlanders
Stakeholder, Community Organization		
Primary Member	Jeff Geisler	Hayden Island Neighborhood Network
Alternate Member	Margaret Puckette	Hayden Island Neighborhood Network
Stakeholder, Community Organization[c]		
Primary Member	Rob Lee	Linnton Neighborhood Association
Alternate Member	N/A	N/A
Stakeholder, Community Organization		
Primary Member	Jennifer Levy	St. Johns Neighborhood Association
Alternate Member	Emilie Saks-Webb	St. Johns Neighborhood Association
Stakeholder, Local Government[c]		
Primary Member	Molly Emmons	Portland Public Schools
Alternate Member	N/A	N/A
Stakeholder, Community Organization		
Primary Member	Ranfis Giannettino Villatoro	MRG Foundation/Coalition of Communities of Color
Alternate Member	N/A	N/A
Portland Government, Emergency Management[c]		
Primary Member	Jonna Papaefthimiou	Bureau of Emergency Management
Alternate Member	Peter O'Farrell	Bureau of Emergency Management
Portland Government[c]		
Primary Member	Nickole Cheron	Disability Program, Office of Neighborhood Involvement[d]
Alternate Member	Brian Hoop	Office of Neighborhood Involvement
Stakeholder, Public Health		
Primary Member	Sherrie Forsloff	Oregon Health and Science University Emergency Management
Alternate Member	Mike Nurre	Oregon Health and Science University Emergency Management
Stakeholder, Community Organization[c]		
Primary Member	Casey Milne	Goose Hollow Foothills League
Alternate Member	Tom Milne	Goose Hollow Foothills League

Representation[a]	Name	Title/Agency
Stakeholder, Community Organization		
Primary Member	Dean Stearman	Volunteers of America
Alternate Member	N/A	N/A
Portland Government[c]		
Primary Member[b]	Rich Grant	Portland Bureau of Transportation
Alternate Member	N/A	N/A
Stakeholder, Community Organization[c]		
Primary Member[b]	Darise Weller	Portland Harbor Community Advisory Group
Alternate Member	N/A	N/A

a. Representatives from the Coalition of Communities of Color, Oregon School Boards Association and Rosewood Initiative were originally included on the committee roster, but needed to leave the committee due to a lack of resource, change of positions or other issue.
b. Steering Committee membership was approved by the committee at the fourth steering committee meeting.
c. Indicates that the steering committee member or his or her alternative missed three or fewer meetings over the course of the planning process.
d. Steering Committee member transitioned to representing the Disability Equity Program at the Office of Equity and Human Rights during the planning process.

3.5.2 Ground Rules

Leadership roles, ground rules (see Appendix B), and a charge statement were established at the first Steering Committee's meeting on July 28, 2015 and confirmed on August 19, 2015. The committee was charged with the following:

- Guide the planning process.
- Develop strategies for public involvement that foster mutual information exchange during plan development and implementation.
- Promote and advocate for equity in hazard mitigation.
- Support the development of mitigation strategies that promote a decrease in loss of life, property damage, and long-term impacts on social, environmental and economic systems from natural hazards.

The Steering Committee agreed to meet monthly as needed throughout the course of the plan's development. The planning team facilitated each Steering Committee meeting, which addressed a set of objectives based on the work plan established for the plan. The Steering Committee met 12 times from July 2015 through June 2016, including 10 steering committee meetings (see Figure 3-4) and two equity training sessions. All Steering Committee meetings were open to the public and agendas, handouts and meeting notes were posted to the hazard mitigation website. A summary of meeting objectives is included in the plan milestone table at the end of this chapter. Attendance logs are available for review upon request.

After leadership roles were confirmed at the August meeting, an executive steering committee meeting was held the week prior to each steering committee meeting. These meetings involved the steering committee co-chairs and members of the planning team. The agenda and meeting objectives were reviewed and discussed, as well as the forum in which each agenda item would be discussed (e.g. break out groups, full group discussion, etc.). Agendas were modified based on the executive committee feedback.

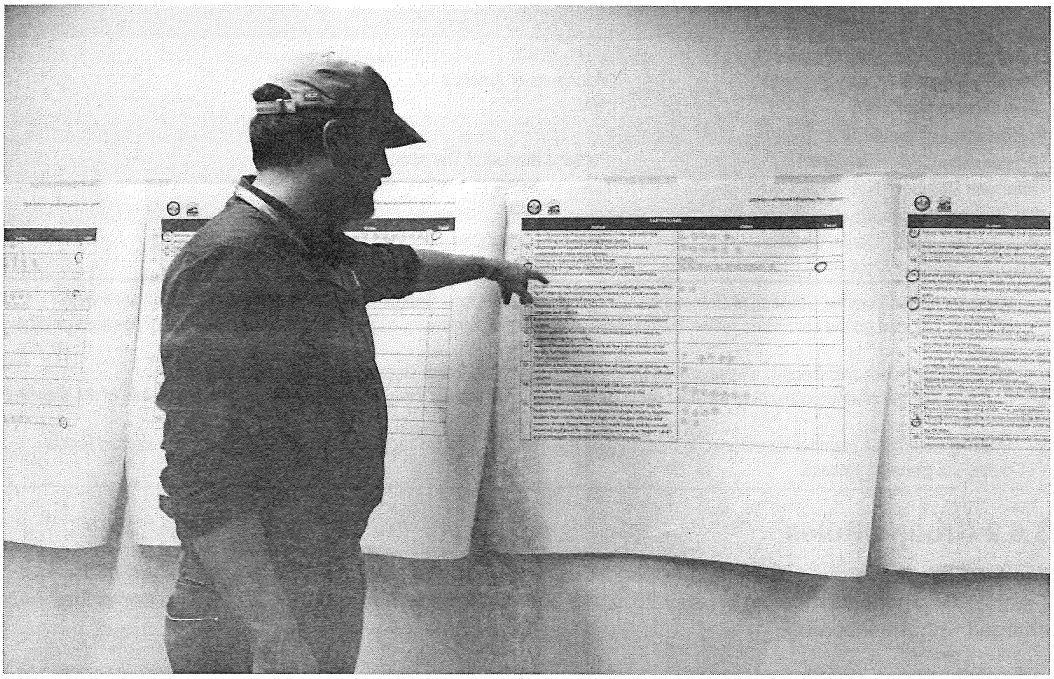


Figure 3-4. Discussion of Mitigation Actions at Steering Committee Meeting

3.5.3 Equity Trainings

In order to provide a baseline level of understanding of equity-related concerns in the City of Portland and in hazard mitigation planning in general, the planning team arranged for two equity training sessions for the steering committee. Interested members of the public and other stakeholders were also invited to attend these events. These trainings were used to inform and enhance the development of the equity lens applied throughout the planning process, including the public engagement strategy, the development of the risk assessment, the development of the mitigation strategy, and the plan implementation and maintenance strategy. City and contracted staff who provided this training also provided feedback and guidance on the development and application of the equity lens through the remainder of the plan development process.

City of Portland Office of Equity and Human Rights Training

On August 10, 2015, the Portland OEHR led a training to help participants recognize institutional and systemic barriers to just access to services and opportunities. Participants were asked to apply their skills to develop strategies that remove barriers in policies, programs, and practices, focusing on race and disability issues, and leading to the elimination of disparities and improved outcomes for all.

A conversational model was used to facilitate discussions, in order to create a supportive learning environment where people could express themselves without fear of judgment or recrimination. Activities at the training included brief presentations, short videos, small and large group conversations,

and practical exercises on real world scenarios. The training was designed to convey the following information:

- History of institutional/systemic racial biases and impacts today
- How implicit bias supports the status quo and disparities
- Why equality doesn't mean equity
- How to use equity questions to eliminate disparities and improve outcomes for all
- The City of Portland's commitment to equity as a value and mission.

A focus of the training was the distinction between an equity framework and an equality framework (see Figure 3-5). Equality implies equal treatment, while equity focuses on creating an equal opportunity for successful outcomes, which means that different groups and persons may need different allocations of resources. The working definition of equity applied during the training was as follows:

> Equity is realized when identity—such as race, ethnicity, gender, age, disability, or sexual orientation—has no detrimental effect on the distribution of resources, opportunities, and outcomes for groups or members in a society.

Source: OEHR

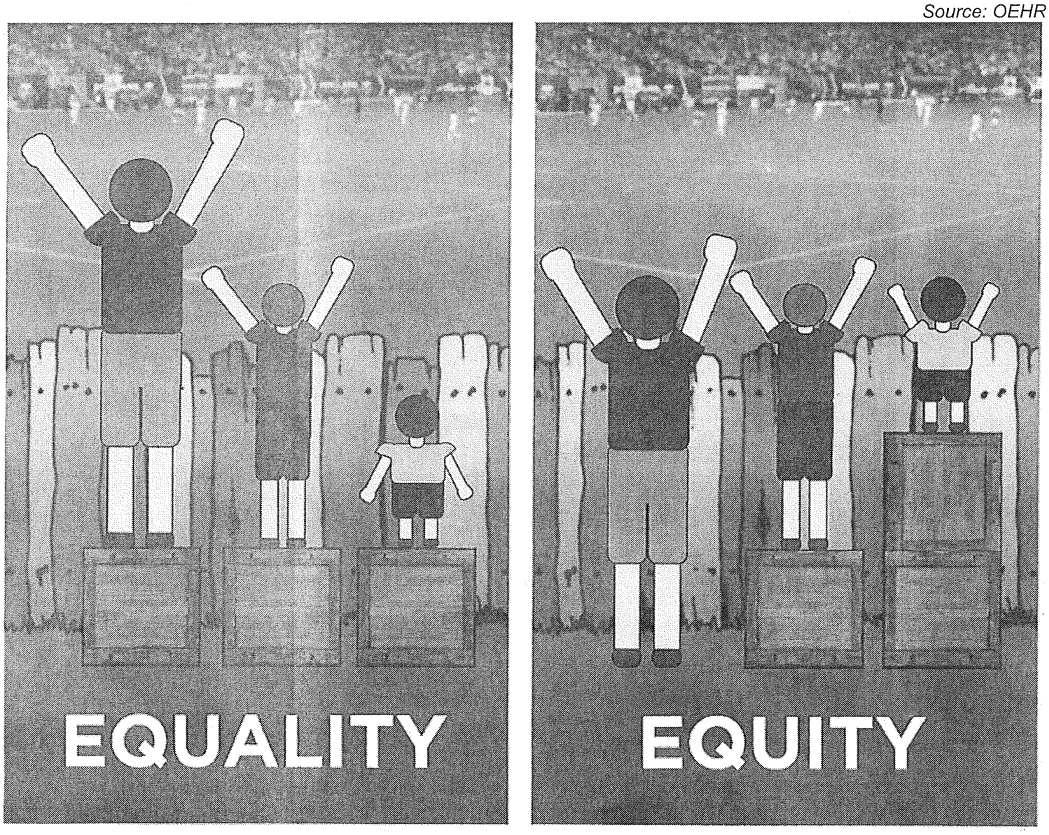


Figure 3-5. Equality versus Equity

Three scenarios were discussed in small groups by training attendees: the development of outreach strategies; communication mechanisms about a public health risk; and a willing-seller property acquisition program. Discussions considered the following:

- What assumptions serve as the basis for this policy, procedure or practice?
- How could this policy, procedure, or practice benefit communities of color or people with disabilities?
- How could this policy, procedure or practice burden communities of color or people with disabilities?
- What are some strategies for reducing negative impacts for communities of color or people with disabilities?

Natural Hazard Mitigation Focused Equity Training

On September 28, 2015 Dr. Himanshu Grover, assistant professor and co-director of the University of Washington's Institute for Hazard Mitigation and Planning, led a training to help participants to understand and recognize key equity issues in the planning and implementation of hazard mitigation policies (see Figure 3-6). The session was based on the "appreciative inquiry" approach to purposeful stakeholder interactions. This approach is useful for engaging with a broad range of stakeholders. It advocates collective inquiry into the development of a desired future state or policies that are compelling enough not to require the use of incentives, coercion or persuasion for implementation.

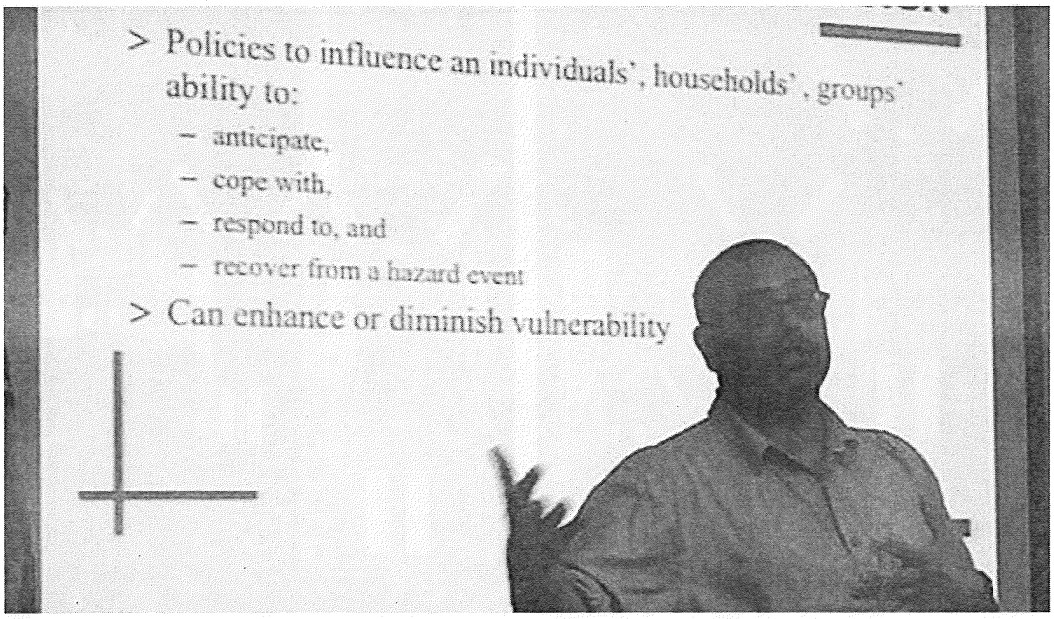


Figure 3-6. Natural Hazard Mitigation Focused Equity Training

This approach overcomes limitations of problem-solving by expanding human horizons and encouraging collective solutions. It assumes that communities are socially constructed phenomena and that problem-solving is limited only by human imagination and the agreements stakeholders make with

each other. The session was designed to stimulate a process of inquiry that results in better, more effective, sustainable and vital connections between stakeholders, toward the common objective of mitigating hazard risks to the community.

Participants were introduced to the role of hazard mitigation planning in reducing risks from hazard threats and were then asked to participate in a collaborative exercise to identify issues and challenges in the development and implementation of an effective hazard mitigation strategy for the City of Portland. Learning objectives for the training were as follows:

- Appreciate the role of the MAP in reducing risks and avoiding losses.
- Recognize key equity concerns in hazard mitigation planning.
- Actively participate in development of equity lens questions to eliminate disparities and improve outcomes for hazard mitigation policies and actions.
- Identify specific needs for targeted mitigation actions that can overcome traditional barriers and challenges to equity.
- Identify synergistic opportunities for implementing equitable hazard mitigation policies.

The training session focused on vulnerability and risk reduction in order to identify ways to achieve the following:

- Minimize the impacts of hazard events so that they do not become disasters.
- Provide a better quality of life to all groups and members of the community.
- Build trust and networks that can be relied upon for other developmental activity.
- Promote overall sustainability and resilience (enhance social equity).

Key factors identified for decreasing vulnerability and increasing social equity in hazard mitigation included the following:

- Access to resources (including information, knowledge, and technology)
- Social capital, including organizational trust, social networks and connections
- Beliefs and customs
- Age, gender, race
- Health and physical ability.

Common challenges in these processes include the following:

- **Framing**—Different stakeholders may have conflicting views of the issue.
- **Scope**—Who are those impacted and where are the impacts?
- **Transparency**—Trade-offs are not made explicit and hidden agendas seem to determine the outcome.
- **Inequity**—Decisions allot the risk and benefits unfairly.
- **Accountability**—Decision makers are isolated from the impact of their decision.
- **Alienation**—People or organizations are ignored: "authority knows best."
- **Trust**—Lack of trust in the process or the communication channel.
- **Paralysis by analysis**—Overly inclusive process that ultimately leads to a continuation of the status quo.

3.6 COORDINATION WITH OTHER AGENCIES

Opportunities for involvement in the planning process must be provided to neighboring communities, local and regional agencies involved in hazard mitigation, agencies with authority to regulate development, businesses, academia, and other private and nonprofit interests (44 CFR, Section 201.6(b)(2)). This task was accomplished by the planning team as follows:

- **Steering Committee Involvement**—Agency representatives were invited to participate on the Steering Committee. Many agencies contacted to participate as steering committee members ultimately elected to participate as coordinating stakeholders instead.
- **Stakeholder Notification**—The following agencies were invited to participate in the plan development process as coordinating stakeholders:

  - Centennial School District
  - City of Maywood Park
  - Clackamas County
  - Clark County
  - David Douglas School District
  - District Office of Congressman Earl Blumenauer, OR-3
  - Oregon Department of Geology and Mineral Industries (DOGAMI)
  - FEMA Region X
  - Marion County
  - Multnomah County Aging & Disability Services
  - Multnomah County Drainage District
  - Multnomah County Emergency Management
  - Multnomah County Health
  - Multnomah County Office of Citizen Involvement
  - Multnomah County Office of Diversity and Equity
  - Multnomah Youth Commission
  - Oregon Advocacy Commissions Office
  - Oregon Department of Environmental Quality
  - Oregon Department of Justice
  - Oregon Department of Land and Development
  - Oregon Department of Transportation (ODOT)
  - Oregon Emergency Management (OEM)
  - Oregon Health Authority (OHA)
  - Oregon Metro
  - Oregon Public Utility Commission
  - Port of Portland
  - Portland Public Schools
  - U.S. Coast Guard, Station Portland
  - Wasco County
  - Washington County

  These agencies received meeting announcements, meeting agendas, meeting handouts and meeting summaries by e-mail throughout the plan development process. Many supported the effort by attending meetings, providing feedback or comment, or providing data or studies. Distribution lists used for agency coordination are available upon request.

- **Pre-Adoption Review**—All the agencies listed above were provided an opportunity to review and comment on this plan, primarily through the City's hazard mitigation website (see Section 3.7.2). Each agency was sent an e-mail message informing them that the draft plan was available for review. In addition, the complete draft plan was sent to Oregon Office of Emergency Management, FEMA Region X, and the Insurance Services Office for a pre-adoption review to ensure program compliance.

3.7 PUBLIC ENGAGEMENT STRATEGY

Broad public participation in the planning process helps ensure that diverse points of view about local needs are considered and addressed. The public must have opportunities to comment on disaster mitigation plans during the drafting stages and prior to plan approval (44 CFR, Section 201.6(b)(1)). The Community Rating System expands on these requirements by making CRS credits available for optional public involvement activities.

- DEFINITIONS
- **Community**—All residents of the City of Portland and those who work and play here.
- **Engagement**—A two-way communication between local government and stakeholders.
- **Stakeholders**—Persons and agencies with a vested interest in the recommendations and implementation of the MAP. Stakeholders include residents, community groups, business owners, local, state and federal agencies, elected officials, visitors, and neighboring communities.

3.7.1 Strategy Development

Significant resources were invested in a public engagement strategy to ensure that the MAP development process benefited from a wide range of perspectives from all stakeholders. The City established the following goals for the public engagement strategy:

- Reach out to all stakeholders, specifically those living in higher risk areas.
- Create authentic opportunities for stakeholders to influence the planning process.
- Make use of existing community outreach capacities and networks.
- Partner with local organizations.
- Promote activities that meet the outreach requirements of the Disaster Mitigation Act and the Community Rating System.
- Propose activities that can be included and summarized in the plan.

The public engagement strategy was developed through discussion with the steering committee, review of best practices, interviews with community members, and input from technical support staff contracted to assist with development of the equity lens. Meetings held as part of this effort are summarized in Table 3-2.

Table 3-2. Equity and Outreach Strategy Development Meetings

Stakeholder	Meeting Date
Portland Office of Neighborhood Involvement	June 12, 2015
Portland Office of Equity and Human Rights	July 16, 2015
Portland Office of Neighborhood Involvement	September 18, 2015
Neighbors West/Northwest, Downtown Neighborhood Association	January 3, 2016
New Portlanders Program	March 14, 2016
Community Engagement Liaison Program	March 17, 2016

A recommended *Community Engagement Plan*, developed and reviewed by the steering committee and planning team, included the following recommended activities (see Appendix C):

- Online platform for information sharing
- Stakeholder identification and involvement
- Public hazard mitigation survey
- "Planning for Real" workshops
- Draft plan review and feedback (town hall meetings and public comment)

- Continued public engagement.

In addition to these activities recommended in the *Community Engagement Plan*, coordination was conducted with internal and external stakeholders as events were identified or information was requested. Although not all plan recommendations were implemented during the MAP development, the plan is a resource for continued public engagement during the performance period of the MAP, as well as a resource for the next hazard mitigation plan update. The following sections describe all public engagement activities carried out during development of the MAP.

The implemented strategy encouraged public participation during the MAP development process, will facilitate continued engagement with local residents after adoption of the MAP, and promotes effective cooperation between City government and civil society organizations within an integrated framework for community engagement. The strategy establishes public involvement that achieves the following:

- Results in City decisions that effectively respond to the needs and priorities of the community
- Makes community members and community resources part of the solution
- Involves the whole community, especially those who have not participated in the past
- Spreads knowledge of and support for public policies and programs
- Keeps government accountable.

3.7.2 Strategy Implementation and Results

Online Platform for Information Sharing

At the beginning of the plan development process, the PBEM hazard mitigation website was updated to provide information on the MAP development process and to serve as the information resource for mitigation within the city (see Figure 3-7): https://www.portlandoregon.gov/pbem/67578. The site includes the following:

- The 2010 NHMP
- Information on public engagement, including the survey, workshops and meetings
- The steering committee roster, ground rules, and meeting packets
- Links to equity resources
- Draft findings and reports
- Calendar of events
- Information on how to get involved in the planning process and where to submit comments and questions.

The site's address was publicized in all press releases, the survey and public engagement events. PBEM intends to keep a website active and up-to-date after the MAP's completion to keep the public informed about successful mitigation projects, progress on identified actions and future plan updates.



Figure 3-7. Sample Page from the Mitigation Action Plan Web Site

Stakeholder Identification and Involvement

The following activities were carried out in addition to formal public engagement meetings recommended in the Community Engagement Plan (meeting dates are listed in Table 3-3):

- **External Stakeholder Recruitment and Coordination—**Stakeholders were invited to join in the plan process as both participatory and coordinating stakeholders as described in Sections 3.5 and 3.6. Additionally, members of the planning team held several steering committee recruitment and stakeholder coordination meetings throughout the course of the planning process.
- **Internal Stakeholder Coordination—**Coordination with internal stakeholders occurred throughout the plan process through participatory and coordinating engagement. Several coordination meetings were held over the course of the MAP development process.
- **Identification of Barriers and Opportunities—**In-person and phone interviews were conducted with 41 representatives of neighborhood associations, community organizations and members of the public during the MAP development process to identify potential barriers to public engagement. City bureaus and offices and community organizations were surveyed to identify ongoing programs and initiatives, in order to leverage existing community linkages during development and implementation of the MAP. The results of these interviews and surveys are provided in Appendix C.
- **General Outreach and Presentations—**Additional outreach was conducted with internal and external stakeholders as events were identified or information was requested.

Table 3-3. Stakeholder Identification and Involvement Meetings

Stakeholder	Meeting Date
External Stakeholder Recruitment and Coordination Meetings	
U.S. Geological Society	May 26, 2015
U.S. Department of Homeland Security	June 11, 2015
Commission on People With Disabilities	June 12, 2015
Red Cross	June 18, 2015
Black Parent Initiative	June 30, 2015
Coalition of Communities of Color	July 2, 2015
Neighbors West/Northwest, Downtown Neighborhood Association	July 8, 2015
Metro	July 8, 2015
Portland Voz	July 14, 2015
Regional Mitigation Planners Meetup	July 28, 2015
Home Forward	August 11 2015
Sunday Parkways Laurelhurst Park	August 23, 2015
Regional Mitigation Planners Meetup	October 12, 2015
Regional Mitigation Planners Meetup	November 9, 2015
Regional Mitigation Planners Meetup	January 12, 2016
Goose Hollow Foothills League	January 12, 2016
Oregon Department of Geology and Mineral Industries	January 20, 2016
Portland State University	April 28, 2016
Oregon Department of Geology and Mineral Industries	May 11, 2016
Portland Public Schools	May 17, 2016
Latino Network	May 18, 2016
Regional Mitigation Planners Meetup	May 19, 2016
Red Cross	June 18, 2016
Black Parent Initiative	June 30, 2016
Coalition of Communities of Color	July 2, 2016
City Club Committee on Earthquake Resilience	July 19, 2016
Internal Stakeholder Coordination Meetings	
Climate Change Preparation Implementation Team	October 29, 2015
Portland Housing Bureau	November 19, 2015
Climate Change Preparation Implementation Team	February 18, 2016
Bureau of Planning and Sustainability	April 28, 2016
Office of Equity and Human Rights	May 4, 2016
Parks and Recreation	May 26, 2016
Bureau of Development Services	May 26, 2016
Portland Fire & Rescue	May 31, 2016
Bureau of Planning and Sustainability	June 15, 2016
Bureau of Planning and Sustainability	June 23, 2016
Office of Neighborhood Involvement	June 29, 2016
Bureau of Planning and Sustainability	July 20, 2016

Stakeholder	Meeting Date
General Outreach and Presentations	
Rosewood National Night Out	August 6, 2015
Oregon Emergency Management Association/Washington State Emergency Management Association Conference	September 23, 2015
Bureau of Development Services Emergency Preparedness Fair	September 30, 2015
Linnton Neighborhood Association Meeting	January 6, 2016
Marion County Emergency Management	February 10, 2016
Parents for Preparedness	March 8, 2016
Goose Hollow Foothills League	March 17, 2016
East Portland Action Plan	March 23, 2016
Eastmoreland Emergency Preparedness Committee	April 21, 2016
Bhutanese Community Workshop[a]	May 21, 2016
Vietnamese Community Workshop[a]	May 28, 2016
Somali Community Workshop[a]	May 29, 2016
Zomi Community Workshop[a]	June 6, 2016
Chinese Community Workshop	June 10, 2016
St. Johns Neighborhood Association Meeting	June 13, 2016
Catlin Gabel People Leading Across City Environments (PLACE) Program	June 28, 2016
Linnton Neighborhood Association Meeting	July 6, 2016

a. No member of the planning team was in attendance at this event. This outreach was conducted by community engagement liaisons and information was reported back to the planning team.

Public Hazard Mitigation Survey

A public survey was developed by the planning team with input from the steering committee. The survey was used to inform action item development and prioritization and to inform the planning team how best to communicate with the public about natural hazard risks and risk reduction. A survey distribution plan was developed (see Appendix C) to meet the goal of reaching a broad cross-section of the Portland population, with an emphasis on the populations most vulnerable to natural hazard risks: economically disadvantaged populations, communities of color, those with limited English proficiency, immigrants or refugees, and others who are historically underrepresented in government activities or experience greater likelihood of negative consequences from natural hazard events.

Survey Distribution

The public survey was launched February 5, 2016 (see Figure 3-8). It was distributed online in English, Spanish, Chinese, Russian, Ukrainian, and Vietnamese, through translation provided by Oregon Translation, LLC. It included questions to gather information about how Portlanders think about preparedness and reducing risk from natural hazards; questions to collect demographic information, such as income level, ethnic identification, household structure; and questions to identify the respondents' country of birth and language spoken at home. Data was also collected related to how the respondent learned about the survey and whether he or she would like to be contacted with additional related information. A sample page is shown on Figure 3-9. The complete survey and results can be found in Appendix C.



Figure 3-8. Flyer Used to Advertise the Public Survey

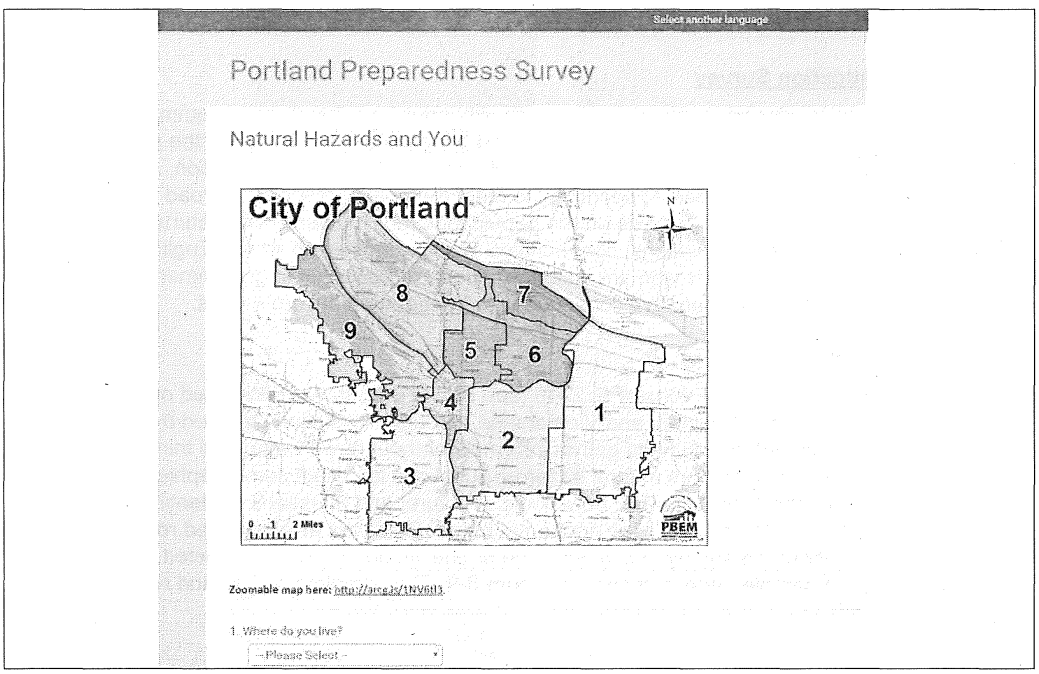


Figure 3-9. Sample Page from Survey Distributed to the Public

Survey Results

The survey remained open through the course of the MAP development; however, early results were compiled in May to inform action item development, plan content, and outreach strategies. There were 2,970 responses to the public survey through early April 2016. Key results are summarized below.

Geographic Representation and Residency Tenure

Survey responses were received from all risk reporting areas and from individuals who live outside of Portland; 75.5 percent of all respondents indicated that they live in Portland. When non-residents are excluded, the percent of responses from risk reporting areas is representative of the estimated population in some cases; however, there are some areas with under- and over-representation. Overrepresented areas included: Northeast, Southeast and Southwest. Under-represented areas include: Central City and East Portland. The remaining reporting areas were within 1 percent of the estimated population. See Table 3-4 for more information.

Table 3-4. Geographic Distribution of Survey Respondents

Reporting Area	Estimated City Population	Estimated % of City Populations	% of Survey Responses[a]	Difference
Airport	2,674	0.4%	0.2%	-0.2%
Central City	37,987	6.2%	3.6%	-2.6%
Central Northeast	47,644	7.8%	7.1%	-0.7%
East Portland	148,712	24.2%	9.6%	-14.6%
North Portland	68,047	11.1%	12.1%	+1.0%
Northeast	57,842	9.4%	15.9%	+6.5%
Southeast	153,952	25.1%	32.6%	+7.5%
Southwest	70,262	11.4%	13.8%	+2.4%
West/Northwest	26,875	4.4%	4.9%	+0.5%

a. Excluding respondents who indicated they reside outside of Portland.

The majority of respondents who live in Portland have lived in the City for 11 or more years (62 percent); 26 percent indicated that they have lived in the City for more than 25 years.

The top three areas where all survey respondents indicated that they and their families spend the most time are Central City (42 percent), Southeast (34 percent) and Southwest (25 percent). When non-Portland residents are excluded, the top areas are Central City (43 percent), Southeast (40 percent), Southwest and Northeast (about 25 percent each).

Demographics

Excluding non-Portland residents, 72 percent of respondents self-identified as middle income and 13 percent identified their household as low income. According to American Community Survey (ACS) estimates, approximately 12 percent of Portland families are surviving on incomes below the federal poverty line.

Excluding non-Portland residents, 99 percent of respondents indicated that they speak English at home. Only nine respondents indicated that they prefer languages other than English. The ACS estimates that limited English speaking households make up approximately 4 percent of Portland households.

Excluding non-Portland residents, 72 percent of respondents indicated that they own their home, and 27 percent indicated that they rent their home. The ACS estimates that 43 percent of the housing units in the City are renter-occupied.

Approximately 9 percent of respondents indicated that they have physical or mental disability. Thirteen respondents who indicated that they had a disability (about 7 percent) also indicated that they were 65 or older. According to U.S. census estimates, 9 percent of Portland residents under age 65 have a disability.

Respondents were able to enter their own racial identity rather than choosing from pre-determined options. The indicated racial identity was white/Caucasian or Anglo for 79 percent of respondents. According to ACS estimates, 78 percent of the Portland population is white.

Hazards of Concern

For Portland residents, the top three hazards of concern were earthquake (96 percent), severe weather (51 percent) and drought (34 percent). Dam failure (3.9 percent) and space weather (8 percent) were the least likely to be selected. The top three hazards remain the same when non-Portland residents are included. Of Portland residents, 53 percent indicated that they had experienced one of the hazards of concern.

Thoughts on Preparedness and Mitigation

Portlanders indicated that they have made efforts to reduce risk to their families. They clear storm drains (50 percent), have made non-structural retrofits, such as securing a water heaters (42 percent), and have planted drought-resistant plants (33 percent). Only 6 percent of Portlanders indicated that they have purchased flood insurance; 27 percent indicated that they have purchased earthquake insurance. Seventeen percent indicated that they had not done any of the options indicated. A large number of respondents indicated that they had not taken these measures because they rent or live in apartment buildings or condominiums.

The top three things Portlanders have done to prepare for a natural hazard event are obtaining emergency food and water (58 percent), having an emergency kit at home (54 percent) and registering for PublicAlerts (46 percent). Only 10 percent of respondents indicated that they had done nothing to prepare. When non-Portland residents are included, the results are similar.

Portlanders indicated the top three reasons for not preparing for emergencies as lack of money (40 percent), being too busy (34 percent) and preparing being too overwhelming (32 percent).

Portlanders indicated that power outage (67 percent), water system damage (65 percent) and bridge closures (43 percent) would impact them the most. Responses were similar when all survey respondents are included.

As the three most important things that the City of Portland government could do to reduce risk from natural hazards, Portlanders selected strengthening infrastructure such as bridges, sewer lines and water pipes (85 percent), strengthening public buildings (44 percent), and helping citizens reduce their individual natural hazard risks (36 percent). Strengthening schools was also commonly mentioned.

Planning for Real Workshops

Nine workshops were held in Portland between April 18 and May 14, 2016 using the "Planning for Real" workshop approach for community engagement:

- Seven of the workshops were open to the public and geographically focused.
- One workshop was held for the Coalition of Communities Color, Native American Youth and Family Center, Portland Voz, the Asian Pacific Network of Oregon (APANO), and the Latino Network
- One workshop was held for community engagement liaisons (CELs) representing Chinese, Zomi, Lao, Bhutanese, Somali, Latino, Iraqi, and Khmer immigrant and refugee communities (see Figure 3-10). CELs are leaders in their communities who are contracted with the City of Portland to act as a bridge between City government and immigrant and refugee communities. Following the CELs workshop, each participant was asked to schedule a meeting with at least 10 members of his or her community to share information about hazards in Portland and to provide any feedback received to the planning team

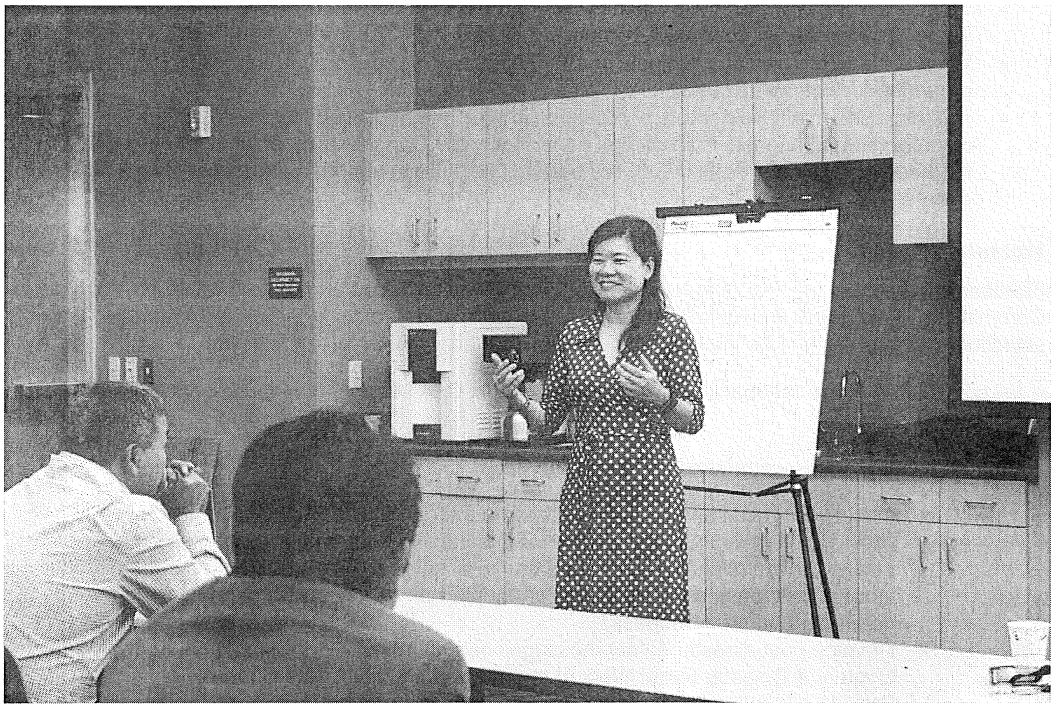


Figure 3-10. Community Engagement Liaisons (CELs) participate in "Planning for Real" Workshop

Workshop Content

The Planning for Real workshop process is described in the *Community Engagement Plan* provided in Appendix C. The content of each workshop varied based on lessons learned from previous workshops. Earlier workshops focused on the MAP development process and physical exposure to hazards of concern in the geographic area in which the workshop was held (primarily flood, earthquake, landslide, wildfire, and severe weather, with some discussion of drought, space weather, and volcano).

Later workshops were adapted based on feedback from early workshop attendees. The early workshop participants recommended less emphasis on the planning process and more information about projects

and programs the City is currently doing to reduce vulnerability, and ways for the City to partner with community organizations. Later workshops briefly covered natural hazard risks, then highlighted current city activities to reduce risk and vulnerability and potential collaborations between the city and community organizations.

For workshops with fewer attendees, discussions involved the whole group; workshops with larger groups were divided into discussion groups focused on specific hazards (wildfire, flood, earthquake, etc.). The following questions were discussed:

- Is your neighborhood in a hazard risk zone? Are there buildings or services you use on a daily basis that are in a hazard risk zone? What would the consequences be if they were impacted by a natural hazard?
- What are some ways that you could reduce the risk impacts and negative consequences at your home, at work, and in your neighborhood?
- What kinds of programs or projects can City offices do to support you and your neighbors in preparing for natural hazards?
- Are there potentially vulnerable populations in your neighborhood that could experience disproportionate impacts from natural hazard events? Can you think of ways to build capacity for these groups now, so that they are better positioned to absorb and recover from a hazard event?

Workshop Results

Feedback received at the Planning for Real workshops was compiled and shared with the Steering Committee, City bureaus and stakeholders. Bureaus were asked to consider this information in the selection of action items to be implemented over the performance period of the plan.

A full compilation of this feedback is included in Appendix C. A summary of key recommendations by topic follows:

- Planning process, communications and outreach:
    - Include full social and economic recovery after a disaster as a goal of the MAP.
    - Provide culturally and community-specific training for community leaders on home safety, hazard mitigation (e.g. non-structural seismic strengthening), food and supply storage, response considerations for people with special needs, and household and neighborhood preparedness.
    - Develop post-disaster safety messages based on the 2013 report Day Labor, Worker Centers & Disaster Relief Work in the Aftermath of Hurricane Sandy.
    - Provide education for rental property owners and property managers on hazard communication and mitigation actions.
    - Provide training on evacuation and sheltering for retirement home staff and all licensed nursing homes and assisted living care providers.
    - Increase PBEM's capacity to provide community trainings and partner with the Office of Neighborhood Involvement, Diversity in Civic Leadership program, and Community Engagement Liaisons program to connect underserved communities with training opportunities.
    - Expand the NET program (Neighborhood Emergency Team—volunteers trained by PBEM and Portland Fire & Rescue to provide emergency disaster assistance within their own neighborhoods) into every neighborhood in Portland and expand beyond the

neighborhood structure to non-geographic communities (e.g. immigrant and refugee communities).
- Update Portland Maps to be more user-friendly and visually map hazards.
- Culture- and language-appropriate webpage for new Portlanders to access emergency information, videos, and events in their preferred language.
- Postcard mailers to every household in Portland to share natural hazard risks and how to be prepared. Include this information in neighborhood newsletters.
- Hold a storytelling event to share disaster survivor stories and share information about hazards in an emotionally compelling way.
- Citywide preparedness tours to highlight exemplary projects.
- Do outreach for ATC-20 damage assessment trainings at neighborhood land use and transportation meetings. Provide ATC-20 training to NET members to support ATC-20 certified engineers and architects.

- All hazards:
  - Financial assistance and/or regulatory support for low-income residents and renters who are vulnerable to extreme heat or diminished air quality to install air conditioning systems.
  - Training and support for day laborers consistent with guidance in 2013 report *Day Labor, Worker Centers & Disaster Relief Work in the Aftermath of Hurricane Sandy*.
  - Funding for community organizations outside formal neighborhood structure whose projects focus on preparedness and community resilience.
  - Invest in and promote community gardens and local food production.
  - Invest in and promote rainwater collection systems in public, residential, and commercial properties.
  - Require new development to include onsite rainwater storage and/or emergency drinking water storage tanks. Include water storage solutions in seismic retrofit projects for schools and other public buildings.
  - Update city policies to include energy and water purification solutions promoted internationally by Green Empowerment.
  - Invest in and promote solar and other alternative energy in public, residential, and commercial properties.
  - Prioritize clearing bike paths so that non-automobile traffic can flow safely and develop plans to locate aid stations along these routes.
  - Prioritize road access to grocery stores, medical offices, and hospitals. Consider isolated communities in establishing road-clearing priorities.
  - Partner with community groups and critical social service organizations to ensure that they have continuity of operations plans.
  - Develop hazard-specific evacuation plans that consider likely impacts on bridges and other transportation infrastructure.
  - Develop a recovery plan to promote hazard-informed decision-making for post-disaster redevelopment and to take advantage of the opportunity to move critical assets to safer locations.
  - Provide neighborhood tool libraries for mitigation projects and post-disaster reconstruction. Partner with home improvement stores to build tool collections.
  - Require Portland's emergency responders to live within the city. Provide financial support to purchase or rent a home within the city limits.

- Landslide:
  - Financial support and education for property owners wishing to remediate their properties for erosion.
  - Emergency moratorium on all development in high landslide risk areas.
  - Enhanced communication with adjacent property owners and neighbors about how landslide risk is being minimized if development is permitted in landslide risk areas.
  - Erosion control projects using bio-swales and beneficial drainage systems.
  - Pre-established detour routes for access in and out of known landslide risk areas.
- Flood:
  - Replace unsafe or structurally compromised bridges and rebuild to more flood-resistant standards.
  - Identify high-traffic bridges and flood-prone routes and establish alternative routes to be used in case they are flooded.
  - Require construction of bio-swales for large construction projects where appropriate.
  - Promote the use of French drains and other on-site stormwater management systems.
- Earthquake:
  - Retrofit and/or move fuel infrastructure in Linnton. Maintain fuel reserves in safe locations for use in disaster recovery.
  - Strengthen levees to seismic standards.
  - Develop an inventory of and distribute information about which shelter facilities have been retrofitted.
  - Provide property owners with financial assistance for seismic strengthening, especially owners of multi-family and low-income housing.
  - Reinforce and fire-proof the Linnton Community Center as a place of refuge for residents who cannot evacuate.
  - Require automatic shutoff valves for gas lines in all new development.
  - Evaluate whether current seismic codes are sufficient for a 9.0 subduction zone earthquake. If not, adopt higher standards.
  - Assess seismic stability of large water towers throughout the city to determine whether they pose a risk or could be used as an emergency water source.
  - Communicate information about hazardous materials and potential plume areas prior to major event. Ensure firefighters and NET members know hazard types and response considerations.
  - Label unreinforced masonry buildings to notify occupants of their risks.
  - Require signage about risks and evacuation routes in hotels.
  - Retrofit and reinforce schools beyond life-safety standards so that they can be used as neighborhood shelters and storage locations for emergency supplies.
  - Stage emergency resources on the west side of the river in case bridges fail and east-west access is blocked.
  - Continually update water and sewer pipe systems, and continue with the project to build a seismically reinforced water pipe that crosses under the Willamette River
- Wildfire:
  - Require metal or composition roofing materials when replacing greater than 50 percent of a roof in a wildfire risk zone.

  - Provide NET members with training on fire response, especially how to use fire hydrants and hoses.
  - Provide clear information to the public on burn restrictions.

- Severe weather:
  - Primary concerns from workshop participants about severe weather were related to extreme heat and emergency shelters for all extreme weather conditions. All recommendations for severe weather are included under the all-hazards topic above.

- Drought:
  - Promote homeowners planting native and drought-resistant plants that require less water during drier months.
  - Provide water conservation education to kids in schools.

Press Releases, Media Coverage and Social Media

Press releases were distributed over the course of the MAP's development as key milestones were achieved and prior to each public meeting. Social media was also used to inform members of the public and other stakeholders on the status of the planning process. The planning effort received the following press coverage:

- Oregon Public Broadcasting, June 23, 2015: http://www.opb.org/news/article/portland-works-on-new-natural-hazard-mitigation-plan/
- Portland Tribune, June 22, 2015: http://portlandtribune.com/pt/9-news/264451-137767-city-event-kicks-off-natural-hazard-planning-
- Flash Alert Portland, June 22, 2015
- KOIN 6, July 28, 2015 http://koin.com/2015/07/28/linnton-most-dangerous-area-when-big-one-hits/
- Neighborhood Activist, Neighbors West-Northwest, July 2015
- Southwest Neighborhoods, October 2015, SW News
- Linnton Neighborhood Association Newsletter, March – April 2016
- Southwest Neighborhoods, Inc. August 2016 Newsletter
- KPAM, August 8, 2016, Get Ready

Draft Plan Review and Feedback

After a draft of the MAP was developed, it was presented to the public for review and comment. A 45-day public comment period was held from August 2, 2016 through September 15, 2016, with the following opportunities for comment:

- **Town Hall Events—**During the public review and comment period, five town hall events were held throughout Portland to give residents an opportunity to ask questions about and provide feedback on the draft MAP. Feedback requested from the public was specifically regarding action framing, opportunities to enhance benefits or diminish burdens, accessibility of the hazard maps, and clarification of items in the MAP that are confusing. Four of the meetings were open to the public and were informal open-house events held in city parks in each quadrant of the city. Participants were encouraged to review maps and interact with planning team and PBEM staff to learn about natural hazard risks in their area. The fifth meeting was held with members of the Coalition of Communities of Color, including Portland Voz, the Latino

Network, Native American Youth and Family, and APANO, to discuss the draft plan and how this group's comments from the Planning for Real workshop were included.

- **Other Public Comments—**Stakeholders were also invited to provide comments via email, postal mail, or phone.

In total, 56 comments were received on the draft MAP. These comments were addressed by the planning team in the draft plan as appropriate and/or forwarded to appropriate City bureaus as they were received. All comments were acknowledged by the planning team via email, phone or in person. A detailed list of all comments received is available upon request.

3.7.3 Critical Energy Infrastructure Hub Stakeholder Outreach

In addition to the outreach conducted as part of *The Mitigation Action Plan* development, focused outreach was carried out for a risk assessment of Portland's Critical Energy Infrastructure (CEI) Hub, which was conducted in conjunction with development of the MAP. Two formal stakeholder meetings were held on October 21, 2015 and February 25, 2016. Details on these meetings is provided in the CEI Hub Study (Appendix D). In addition to these formal meetings, additional outreach was conducted as shown in Table 3-5.

Table 3-5. CEI Hub Stakeholder Recruitment and Coordination

Stakeholder	Meeting Date
U.S. Department of Homeland Security	June 25, 2015
U.S. Department of Homeland Security	July 23, 2015
Multnomah County Local Emergency Planning Committee	August 14, 2015
Multnomah County Local Emergency Planning Committee	October 9, 2015
Multnomah County Local Emergency Planning Committee	November 13, 2015
U.S. Department of Homeland Security	December 2, 2015
Multnomah County Local Emergency Planning Committee	December 11, 2015
Oregon Public Health Division Emergency Operations	January 14, 2016
Audubon Society of Portland	April 1, 2016
Linnton Neighborhood Association	April 4, 2016
Hayden Island Neighborhood Association	April 6, 2016
Multnomah County Local Emergency Planning Committee	April 8, 2016

3.8 PLAN DEVELOPMENT CHRONOLOGY/MILESTONES

Table 3-6 summarizes the key milestones in the MAP development process.

Table 3-6. Mitigation Action Plan Development Chronology/Milestones

Date	Event	Description/Objectives	Attendance
2014			
7/08	Grant	PBEM received notice of the award of a Pre-Disaster Mitigation Grant to fund the hazard mitigation plan update.	N/A
2015			
1/26	Project staffing	• Hazard Mitigation Plan Project Coordinator Position Posted	N/A
1/05	Contractor solicitation	• PBEM advertised for contractor support for the plan update	N/A
3/12	Contractor selection	• PBEM selected Tetra Tech to facilitate plan development	N/A
5/4	Project staffing	• Hazard Mitigation Plan Project Coordinator Position filled	N/A
5/29	Internal Kickoff meeting	• Review project timeline • Form the planning team • Develop strategy for external kickoff • Develop strategy for CEI Hub task	4
6/22	External Kickoff meeting	• Introduce project goals • Define mitigation and relevant laws • Introduce the planning team and draft work plan • Offer opportunities to be engaged	37
7/28	1st Steering Committee Meeting	• Introduce the planning team and Steering Committee members • Introduce project goals, timeline and relevant laws • Develop Steering Committee ground rules • Introduce next steps and review action items	47
8/19	2nd Steering Committee Meeting	• Confirm chairpersons, meeting tools, and ground rules • Clarify the purpose of mitigation in emergency management • Review and briefly discuss the OEHR equity training • Perform a public involvement capability brainstorming session • Review plan review comments and discuss document outline • Identify hazards of concern • Introduce next steps and review action items	33
8/10	Equity Training	• OEHR Equity 101 Training	26
9/28	Equity Training	• Natural Hazard Mitigation Focused Equity Training	37
10/21	3rd Steering Committee Meeting	• Confirm steering committee role in planning process • Provide a brief review of equity training take home messages • Review the planning process and work plan • Present planning team recommendations for the risk assessment based on plan review survey • Confirm the hazards of concern • Confirm the hazard scenarios	27
10/21	1st CEI Hub Stakeholders Meeting	• Provide a natural hazard mitigation plan update overview • Describe CEI Hub component • Describe and discuss desired goals and outcomes • Describe stakeholder role in the planning process • Discuss any gaps in stakeholder representation • Describe information needs • Discuss data availability and possible sources • Identify and address data confidentiality and other concerns	22
11/18	4th Steering Committee Meeting	• Present the results of the vision, mission and goals homework survey • Discuss and confirm vision and mission statements • Discuss and confirm goal statements	28

Date	Event	Description/Objectives	Attendance
12/16	5th Steering Committee Meeting	• Present the planning team recommendation for risk reporting areas • Discuss and confirm risk reporting areas • Discuss and provide input on goals for the natural hazard mitigation public questionnaire including: what you would hope to find out, method of dissemination, method of advertisement, target audiences • Present the results of the critical facility homework survey • Discuss and confirm a critical facility definition • Discuss datasets being utilized for database development • Review the vision and mission • Discuss the results of the goals homework survey • Discuss and confirm goals • Introduce objectives development exercise	29
2016			
1/20	6th Steering Committee Meeting	• Present the Planning Team recommendation for objectives • Discuss and confirm objectives • Describe action plan development and introduce our next steps in moving towards action development • Present and discuss the 2010 Progress Report • Introduce and discuss plan implementation and maintenance	31
2/05	Public Engagement	• Natural Hazard Mitigation Survey opens	N/A
2/17	7th Steering Committee Meeting	• Present the general building stock loss estimate matrix • Describe mitigation best practices catalog development • Present and discuss the recommended public engagement plan	24
2/24	Webinar	• Discuss the results of the general building stock and answer questions pertaining to the risk assessment	6
2/25	2nd CEI Hub Stakeholders Meeting	• Review project objectives • Review results of Literature Review • Present Risk Assessment Model results • Identify possible actions for the City to consider for the Hazard Mitigation Plan	14
3/16	8th Steering Committee Meeting	• Present considerations and lessons learned from the Climate Action Plan for incorporating equity into mitigation planning • Set the stage for discussion about issues and action items • Reflect on issues and discuss capabilities that we have and those that we wish we had • Review mitigation best practices catalog • Small group action-storming	28
4/18	1st Planning for Real Workshop	• Northeast and Central Northeast Portland (joint workshop)	14
4/20	9th Steering Committee Meeting	• Present the recommendations from the CEI Hub report • Discuss the CEI Hub report recommendations and answer questions about the report • Present the planning team recommendation for the prioritization strategy • Discuss the strategy and provide recommendations for improvement • Small group action-voting and action-storming	28
4/23	2nd and 3rd Planning for Real Workshops	• Northeast Portland • North/Northwest Portland Central City (joint workshop)	7 and 29
4/24	4th Planning for Real Workshop	• Southeast Portland	42
4/30	5th Planning for Real Workshop	• North Portland	7
5/3	6th Planning for Real Workshop	• Southwest Portland	45

Date	Event	Description/Objectives	Attendance
5/7	7th Planning for Real Workshop	• Coalition of Communities of Color, Native American Youth and Family Center, and Latino Network	8
5/8	Public Engagement	• Survey Data Capture Date	2,970
5/10	8th Planning for Real Workshop	• East Portland	16
5/11	Bureau Action Selection Workshop	• Provide instruction and guidance on action selection	28
5/14	9th Planning for Real Workshop	• Community Engagement Liaisons (CELs) representing Chinese, Zomi, Lao, Bhutanese, Somali, Latino, Iraqi, and Khmer immigrant and refugee communities	12
6/15	10th Steering Committee Meeting	• Present the results of the MAP survey and the Planning for Real Meetings • Present the actions that have been selected by City bureaus and offices and any comments received to date • Receive additional comments on selected action items • Present the Plan Implementation and Maintenance Strategy • Review the next steps of the planning process • Receive feedback on steering committee's continued involvement • Discuss what worked in this planning process, did not work and ideas for improvement.	26
8/2	Start of the Public Comment Period	• Comment period opens and review draft posted online	N/A
8/9	1st Town Hall Meeting	• Coalition of Communities of Color	15
8/16	2nd Town Hall Meeting	• West/Northwest	15
8/17	3rd Town Hall Meeting	• North/Northeast	15
8/23	4th Town Hall Meeting	• East/Southeast	15
8/30	5th Town Hall Meeting	• Southwest	15
9/15	End of the Public Comment Period	• Comment period closes.	N/A
9/30	Plan Submitted to Review Agencies	• Plan submitted to Oregon Office of Emergency Management and FEMA Region X for concurrent review.	N/A
10/19	Plan Adoption	• Plan adopted by Portland City Council	N/A
X/X	Plan Submitted to Review Agencies	• Plan submitted to Insurance Services Office, Inc. for CRS assessment.	N/A
X/X	Final Plan Approval	• Final Plan Approval received by FEMA Region X	N/A

4. CITY OF PORTLAND PROFILE

The City of Portland is located primarily in Multnomah County in northwest Oregon, with small portions of the city extending into Washington and Clackamas counties (see Figure 4-1). The city covers 145 square miles centered on the Willamette River and its confluence with the Columbia River. Portland is the center of commerce, industry, transportation, finance and services for a metropolitan area of more than 2 million people. It is the largest city in Oregon, the seat of Multnomah County and the second largest city in the Pacific Northwest (after Seattle).

The Columbia River, which separates Oregon from Washington, is the city's northern boundary. Major jurisdictions adjacent to the city are Beaverton, Tigard and unincorporated Washington County to the west, Lake Oswego, Milwaukie, Happy Valley and unincorporated Clackamas County to the south, and Gresham, Fairview and unincorporated Multnomah County to the east. The small city of Maywood Park is an island within the Portland city limits, in the northeastern part of the city.

Major transportation routes through the city are Interstates 5, 84, 205 and 405, U.S. Highways 26 and 30, the Willamette and Columbia Rivers, and several major railroad lines. Portland International Airport is along the Columbia at the northern edge of the city. There are 10 vehicle bridges across the Willamette River in Portland, and two across the Columbia River. Willamette River crossings also include a railroad-only bridge and a new bridge serving only mass transit, bicycles and pedestrians. An aerial tram provides transportation from the South Waterfront area to the Marquam Hill neighborhood.

The city park system includes almost 12,000 acres in developed parks, natural areas, and built acreage (Portland Parks & Recreation, 2016). This includes Forest Park, the largest urban forest in the United States, at over 5,000 acres (Forest Park Conservancy, 2016).

4.1 HISTORICAL OVERVIEW

Portland was platted on the west bank of the Willamette River in 1845 on land that had been used until then by the Multnomah Chinooks. During the 1850s, Portland passed Oregon City to become the largest city in Oregon, a position it has held ever since. In its early decades, Portland depended on trade by water. The California Gold Rush created a market for Oregon wheat and lumber shipped to San Francisco by river and ocean, Willamette River steamboats delivered farm products from the state's agricultural areas, and Columbia River steamers connected to portage railroads to supply miners in Idaho and Montana (Oregon Historical Society, 2016).

Portland experienced further growth with the expansion of the regional railroad system from the 1880s to the 1910s. The Portland-centered rail network expanded with large and small lines opening the mountains in western Oregon and the Columbia Basin interior to logging, ranching, and agriculture. Flour mills, lumber mills, furniture factories, and shipyards lined the Willamette waterfront and major rail corridors. The first three bridges spanned the Willamette River between 1887 and 1891, and by 1906 the number of eastside residents surpassed the number of westside residents (Oregon Historical Society, 2016).

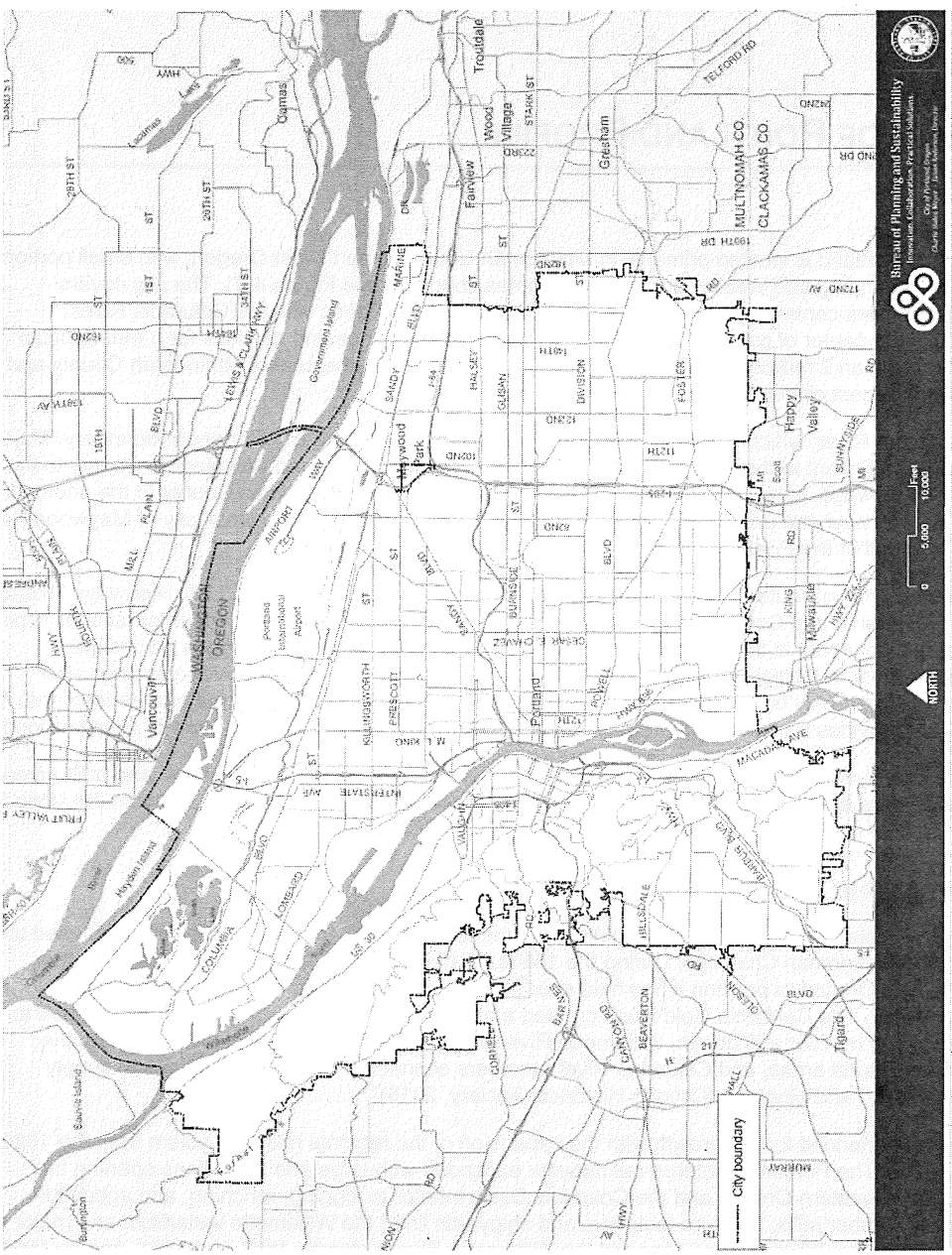


Figure 4-1. Main Features of Portland

Through a practice known as "red-lining" people of color were systematically excluded from living in most areas in Portland. In 1919, and continuing for decades, the Portland Realty Board's Code of Ethics banned members from selling property to people of color, in the interest of protecting property values. Red lines drawn on maps indicated where people of color could live, buy property, or obtain a mortgage. This ultimately concentrated Portland's population of people of color in a small, economically depressed district named Albina. During this time, it was widely known that employment opportunities for people of color were limited to domestic or railroad work. (Portland Housing Bureau, 2016). The effects of this practice can still be seen today, decades after it was declared illegal.

Shipbuilding became a significant local industry with the onset of World War II, with major shipyards on Swan Island and at St. Johns. Portland and Vancouver, Washington produced more than a thousand ocean-going combat and cargo ships from 1941 through 1945. The industry brought about a population boom, including many new African American residents in search of higher-paying jobs in the shipyards. Many newcomers settled in the City of Vanport, which was built in 1942–1943 adjacent to the Columbia River. That community was destroyed by flood in 1948, permanently displacing 18,000 residents, one quarter of whom were African American (Portland Housing Bureau, 2016; Oregon Historical Society, 2016). After the destruction from the flood, the land area making up the City of Vanport was annexed into the City of Portland.

In the late 1960s and 1970s, an expanding electronics industry and growing universities attracted new arrivals, and a new generation of civic activists became involved in city politics. Between 1968 and 1974, Portland leaders opted to replace a multi-lane expressway on the west shore of the Willamette River with what is now Tom McCall Waterfront Park. They also funded the city's first light-rail line, from downtown to Gresham. The Office of Neighborhood Associations was created during this period, and a landmark Downtown Plan was completed (Oregon Historical Society, 2016).

The City of Portland today is the center of a large integrated employment and market region. The U.S. Census Bureau has expanded its definition of the Portland metropolitan area from Multnomah, Washington, and Clackamas Counties in Oregon and Clark County in Washington to include Yamhill County, Columbia County, and Skamania County (Washington). Several public agencies, including Metro (an elected regional government), the Port of Portland, and the Tri-County Metropolitan Transportation District (TriMet) provide services for part or all of the greater Portland area (Oregon Historical Society, 2016).

4.2 PHYSICAL SETTING

4.2.1 Topography and Geology

Portland lies at the northern end of the Willamette River valley, at the Willamette's confluence with the Columbia River. The valley rises to the Coast Range of mountains on the west and to the Cascade Mountains on the east. The Willamette River begins in the Cascade Mountains almost 200 miles south of Portland. From Portland, the Columbia River Gorge flows northwest about 100 miles to the Pacific Ocean. Upstream to the east, the Columbia flows through the Columbia River Gorge, a break across the Cascade Mountains.

Elevations in the city range from about 20 feet above sea level along the Willamette River to over 1,000 feet in the Tualatin Mountains, which are more commonly called the West Hills (NHMP, 2010). The west side of the city is dominated by the West Hills, rising from a narrow terrace along the Willamette River. The east side is flat, with little elevation change except for a few volcanic buttes such as Mt. Tabor and Rocky Butte (Bureau of Environmental Services, 2006).

Soils on the west side of the Willamette River vary from clay loam with low permeability and relatively high erosion potential to gravelly loams, which are relatively well drained and moderately permeable. The flat areas along the west bank of the Willamette River are urban, with highly disturbed soil and unstable fill. On the east side of the Willamette River soils are highly variable, similar to the west side. Much of the area along the Columbia River has been filled with dredged sand, which drains very well. In undisturbed areas along the Columbia River, percolation (water flow through soil) rates are very slow. In the southeast areas of the city, soils vary from moderate to low permeability (NHMP, 2010).

4.2.2 Seismic and Volcanic Features

Most of the Pacific Northwest lies within the Cascadia Subduction Zone, where the Juan de Fuca and North American tectonic plates meet. The convergence of these plates puts most areas from western British Columbia to California at risk for a catastrophic earthquake with a potential magnitude of 9.0 or higher (Modified Mercalli Intensity Scale). Portland lies in this area of risk (NHMP, 2010).

Three major crustal fault lines run through Portland: the Portland fault, the East Bank fault and the Oatfield fault. Each is capable of generating moderately large (6.8) earthquakes (NHMP, 2010).

As a result of the subduction zone, there are active volcanoes nearby, including Mt. St. Helens, Mt. Hood, Mt. Adams and Mt. Jefferson. Major eruptions of these volcanoes may cause significant ash fall in the Portland area (NHMP, 2010).

Portland also lies atop the Boring Volcanic Field, a collection of cones and lava flows formed during one-time eruptive events. These include Mount Tabor, Rocky Butte and Powell Butte in east Portland. All existing Boring Volcanic centers are extinct, and the probability of an eruption in the Portland Metro area is very low (USGS, 2016a).

4.2.3 Surface Waters

The city of Portland lies within the watersheds of five primary surface waters, as described in the sections below.

Columbia Slough

The Columbia Slough Watershed drains an area of 51 square miles. The slough extends from Kelley Point Park on the west to Fairview Lake and Fairview Creek on the east. The watershed boundary includes portions of Portland, Troutdale, Fairview, Gresham, Maywood Park, Wood Village and unincorporated Multnomah County. Over the years, the watershed and waterway have been altered to accommodate industry and agriculture. Beginning in 1918, levees were built to provide flood protection. Wetlands and side channels were drained and filled to allow for development. Waterways were channelized, and dozens of streams were filled or diverted to underground pipes (PBES, 2006).

Today, the Columbia Slough includes an 18-mile main channel and 30 miles of secondary waterways, many ponds and lakes, including the Smith and Bybee Lakes complex near the Slough's confluence with the Willamette. The Upper and Middle Slough elevations and conveyance are managed by the Multnomah County Drainage District. The watershed's designation as an industrial area helps provide nearly 60,000 jobs. It is also the home to almost 160,000 people. Portland's Columbia South Shore Well Field, which supplies supplemental drinking water to a large portion of the region, is also in the Columbia Slough Watershed (PBES, 2006).

Johnson Creek

Johnson Creek originates in Clackamas County and flows west for 25 miles to its confluence with the Willamette River. The watershed covers 54 square miles and includes portions of the cities of Milwaukie, Portland, Gresham, Happy Valley and Multnomah and Clackamas Counties. Crystal Springs Creek and Kelley Creek are Johnson Creek's main tributaries and contribute the largest amount of flow to the main stem. Crystal Springs Creek is fed mostly by cold, clean groundwater from springs on the north side of Johnson Creek. Smaller tributary streams such as Mitchell, Errol, Deardorf, and Wahoo Creeks still flow, but about 38 percent of the watershed's historical tributaries are now piped or diverted to the combined sewer system. The northern watershed is characterized by large, flat floodplains, particularly in Lents neighborhood. The topography south of the main stem, where most of Johnson Creek's tributaries are located, is steep and varied (PBES, 2006).

One of the most significant changes in the watershed occurred in the 1930s when the Works Progress Administration attempted to control flooding by straightening, deepening and rock-lining the creek, creating a trapezoidal channel in 15 of the 25 stream miles. This work substantially altered the creek's ability to dissipate energy and absorb high winter flows. Because of these alterations, steady rainfall and surging stormwater runoff from hard surfaces overwhelm the confined stream channel. As a result, Johnson Creek has flooded 37 times since 1942, and at least seven floods caused major property damage in the last 35 years (PBES, 2006). The Johnson Creek floodplain has undergone substantial restoration in the last decade, after numerous properties in the floodplain were purchased by the City. Over 240 acre-feet of flood storage has been added through floodplain restoration, with a public investment of over $40 million.

Fanno Creek

Fanno Creek flows southwest for about 15 miles from its headwaters in Hillsdale to the Tualatin River near Durham. The Fanno Creek Watershed covers 32 square miles. About 4,529 acres are within the City of Portland. The remaining watershed area is mainly in Washington County. The Fanno Creek Watershed has steep slopes, steep stream gradients, and soils that are slow to infiltrate rain. These characteristics cause relatively high stormwater volumes and velocities, streambank instability and undercutting, erosion, instream sedimentation, and loss of streambank vegetation. More than 80 percent of the Fanno Creek Watershed in Portland is zoned for single-family residential use. The main stem Fanno Creek floodplain area has been cleared of vegetation and filled, reducing historical floodplain interactions and reducing habitat (PBES, 2006).

Tryon Creek

The Tryon Creek Watershed in southwest Portland covers about 6 square miles, about 21 percent of it outside the Portland city limits in Multnomah County, Clackamas County, and the City of Lake Oswego. The watershed is divided into three sub-watersheds: Tryon Creek, Arnold Creek, and Falling Creek. Arnold Creek and Falling Creek are Tryon Creek's main tributaries. Other smaller tributaries flow into Tryon Creek both within and outside Portland's city limits. The main stem of Tryon Creek is about 7 miles long from its headwaters near Multnomah Village (just north of Interstate 5 and Highway 99) to its confluence with the Willamette River in Lake Oswego at the Highway 43 crossing (PBES, 2006).

Significant residential development in the upper watershed above SW Boones Ferry Road has had negative effects on the condition of the watershed. Steep slopes and soils are slow to infiltrate water and increase surface runoff. These characteristics cause relatively high stormwater volumes and velocities, streambank instability and undercutting, erosion, instream sedimentation and loss of streambank vegetation. Residential development, impervious surfaces, and road crossings have severed the creek from its floodplain, decreased habitat and increased stream flow. Tryon Creek State

Natural Area is in the lower watershed, and the riparian area along Tryon Creek is largely intact, providing habitat diversity (PBES, 2006).

Willamette River

Portland's Willamette River Watershed covers about 69 square miles, about 0.5 percent of the river's total drainage basin. It is the most highly urbanized portion of the watershed and is a gateway for migrating salmon to the upper basin. It includes Forest Park, downtown's commercial core, industrial districts on both sides of the river and Portland's most densely populated residential neighborhoods (PBES, 2006).

The watershed is highly urbanized. Its east side is almost completely developed, and the small streams that once crossed the area have been diverted into the sewer system. The steeper slopes in the West Hills developed more slowly, and most of the watershed's remaining open stream channels are on the west side. Development, urban activities and structural changes throughout the watershed have diminished watershed functions and affected hydrology, physical habitat, water quality, and biological communities. Alterations to stream and riverbanks and channels has reduced floodplain functions and increased stream velocities (PBES, 2006).

The volume of water upstream of Portland and the presence there of dams and reservoirs severely constrain the City of Portland's ability to affect the hydrology of the Willamette River. Significant dredging, diking, and channeling of the main stem Willamette and its tributaries have altered habitat conditions. The main stem has been narrowed and deepened for flood control and navigation; off-channel habitat has been virtually eliminated, and the floodplain has been degraded. The river bank has been hardened with retaining walls and riprap, which prevents natural channel changes and minimizes the interaction between the river and riparian and floodplain vegetation (PBES, 2006).

4.2.4 Climate

Portland is in the marine west coast climate zone. The Coast Range helps to shield the Portland area from Pacific Ocean storms. The Cascades offer a steep slope over which moisture-laden westerly winds rise, resulting in moderate rainfall for the region. Precipitation falls mostly as rain, which varies across the Portland metropolitan area. The West Hills receive 60 inches of rain per year, but the airport receives only about 36 inches. The city averages 155 days of measurable precipitation a year. It is not uncommon to see relatively dry summers in Portland. Nearly 90 percent of Portland's annual rainfall occurs between mid-October and mid-May; only about 3 percent occurs in July and August (NOAA, 2016).

Winters can be mild to chilly and very moist, with January averaging 41.4 degrees Fahrenheit (°F). The Cascades generally block colder continental air masses from Canada, although cold air occasionally enters western Oregon through the Columbia River Gorge. Most temperatures during winter reach the 40s and lower 50s during the day and fall into the 30s at night. Temperatures below zero degrees are rare, occurring only six times since 1871. The city's lowest temperature was –3 °F in February 1950. Snow accumulations are not frequent. On average, only four days per year see measurable snow, and rarely more than 2 inches. Snow is most likely in areas above 500 feet or near the Columbia Gorge on Portland's east edge. The average winter snowfall total is 4.3 inches (NOAA, 2016b).

Spring is a transitional season. March and April are often damp and cool, with only a few warm dry days. May and June become drier, with warming weather. Generally, afternoon temperatures warm from the 60s or 70s in May to the 70s or lower 80s in June (NOAA, 2016b).

High pressure over the Pacific builds in the summer, with northwesterly winds prevailing in the afternoons and evenings. This high pressure prevents moisture from flowing into the area, so that summers often are dry and warm. August averages 69.5 °F. Afternoon highs in the 80s occur with regularity beginning in early July. Temperatures above 100 ºF are rare, usually occurring in July or August. The highest recorded temperature is 107 °F, most recently in August 1981 (NOAA, 2016b).

By early to mid- October, fall arrives with high temperatures back into the 60s. As nighttime hours increase, the valley cools more, allowing fog to form on clear nights. Fog can be dense during late night and early morning hours and can persist for several days (NOAA, 2016b).

Destructive storms are rare in Portland. Surface winds seldom exceed gale force (50 mph or greater) and have rarely exceeded 75 mph. Wind speeds average 7.5 mph over the course of a year. Thunderstorms can occur during any month, but are not common. Thunderstorms in winter and spring are weak, producing small hail and brief gusty winds. Those in summer can produce lightning, strong winds and large hail. Occasionally, thunderstorms will produce funnel clouds, but tornadoes are rare (NOAA, 2016b).

On average, the last occurrence of 32 ºF in the spring is March 30; the first of the fall occurs around November 8. First frost of fall is often around October 21, and the last frost of spring is typically near April 26. This makes for a long growing season (NOAA, 2016b).

Average climate conditions at two National Oceanic and Atmospheric Administration (NOAA) weather stations in Portland are shown in Table 4-1 and Table 4-2.

Table 4-1. Downtown Portland Normal Precipitation and Temperatures, 1981 – 2010

	Precipitation (inches)	Temperature (ºF)		
		Minimum	Average	Maximum
January	6.14	37.5	42.2	46.9
February	4.63	38.4	44.6	50.8
March	4.50	41.0	48.5	56.0
April	3.40	44.0	52.4	60.8
May	2.55	48.9	58.1	67.4
June	1.69	53.3	63.1	72.9
July	0.59	57.4	68.5	79.6
August	0.71	58.0	69.0	80.1
September	1.54	54.2	64.4	74.6
October	3.42	47.6	55.2	62.9
November	6.74	41.4	46.7	52.0
December	6.94	36.5	40.8	45.1
Annual	***42.85***	***46.6***	***54.5***	***62.5***

Source: NOAA, 2016.

Table 4-2. Portland International Airport Normal Precipitation and Temperatures, 1981 – 2010

	Precipitation (inches)	Temperature (°F)		
		Minimum	Average	Maximum
January	4.88	35.8	41.4	47.0
February	3.66	36.3	43.8	51.3
March	3.68	39.6	48.2	56.7
April	2.73	43.1	52.3	61.4
May	2.47	48.6	58.3	68.0
June	1.70	53.6	63.6	73.5
July	0.65	57.8	69.2	80.6
August	0.67	58.0	69.5	81.1
September	1.47	53.1	64.5	75.8
October	3.00	46.0	54.9	63.8
November	5.63	40.5	46.6	52.8
December	5.49	35.2	40.4	45.6
Annual	***36.03***	***45.6***	***54.4***	***63.1***

Source: NOAA, 2016b.

4.3 MAJOR PAST HAZARD EVENTS

Presidential disaster declarations are typically issued for hazard events that cause more damage than state and local governments can handle without assistance from the federal government. Although no specific dollar loss threshold has been established for these declarations, the availability of certain types of funding is limited by the ability to meet federally established damage thresholds. A presidential disaster declaration puts federal recovery programs into motion to help disaster victims, businesses and public entities. Some of the programs are matched by state programs.

FEMA reports presidential disaster declarations by county. Since 1964, 13 such declarations have applied to Multnomah, Washington or Clackamas County. These events are listed in Table 4-3.

Table 4-3. Presidential Disaster Declarations

Disaster Number	Declaration Date	Title	Declared County
DR-4258	2/17/2016	Severe winter storms, straight-line winds, flooding, landslides, and mudslides	Clackamas, Multnomah, Washington
DR-1956	2/17/2011	Severe winter storm, flooding, mudslides, landslides	Clackamas
DR-1824	3/2/2009	Severe winter storm, record and near record snow	Clackamas, Multnomah, Washington
DR-1733	12/8/2007	Severe storms, flooding, landslides, and mudslides	Washington
DR-1632	3/20/2006	Severe storms, flooding, landslides, and mudslides	Clackamas
EM-3228	9/7/2005	Hurricane Katrina evacuation (assistance for evacuees)	Clackamas, Multnomah, Washington
DR-1510	2/19/2004	Severe winter storms	Clackamas, Multnomah
DR-1107	3/19/1996	Severe storms and high winds	Washington
DR-1099	2/9/1996	High winds, severe storms and flooding	Clackamas, Multnomah, Washington
DR-985	4/26/1993	Earthquake	Clackamas, Washington
DR-413	1/25/1974	Severe storms, snowmelt & flooding	Clackamas, Washington
DR-319	1/21/1972	Severe storms & flooding	Clackamas, Multnomah, Washington
DR-184	12/24/1964	Heavy rains & flooding	Clackamas, Multnomah, Washington

Review of these events helps identify targets for risk reduction and ways to increase a community's capability to avoid large-scale events in the future. Still, many natural hazard events do not trigger federal disaster declaration protocol but have significant impacts on their communities. These events are also important to consider in establishing recurrence intervals for hazards of concern.

4.4 REPORTING AREAS

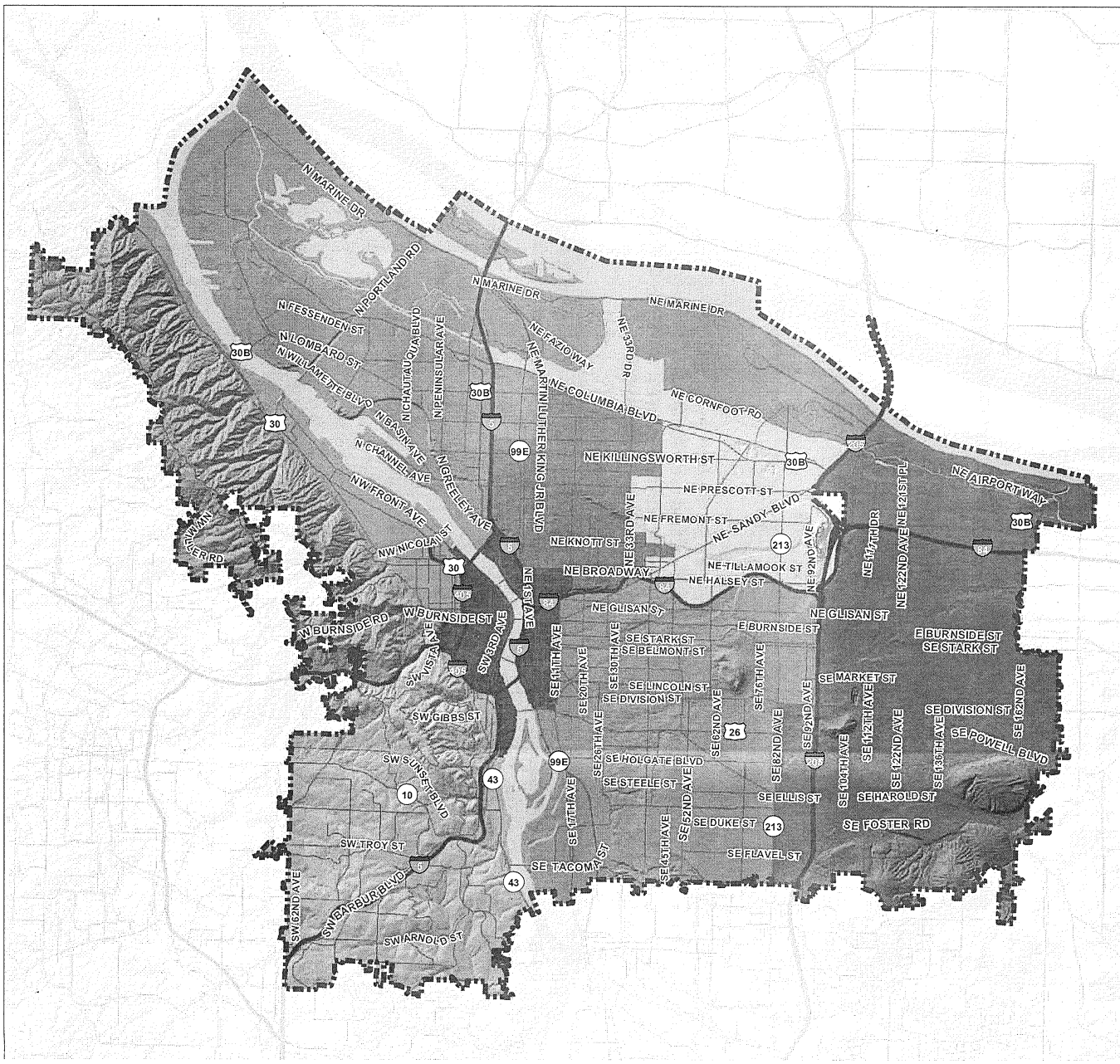
This plan assesses hazard risks for the City of Portland overall and for each of nine smaller areas that make up the city. The areas selected for risk assessment are those used in the City's budget mapping process, which roughly align with neighborhood coalition boundaries (although the central city is treated as a separate area). These risk reporting areas provide linkage to existing financial reporting areas, which is useful because mitigation actions often require financial expenditures. Budget reporting areas exclude the airport, so the airport was added as a separate reporting area for *The Mitigation Action Plan*. Table 4-4 provides summary descriptions of each area. A map of the areas is shown on Figure 4-2.

Table 4-4. Reporting Areas Used for Risk Assessment

Reporting Area	Corresponding Neighborhood Coalition Name	Population (2015)	Jobs (2014)	History	Current Conditions
Airport	None	N/A	N/A	• Mostly annexed 1960s–70s	• Predominantly commercial uses, some light industrial uses • Much of the area is devoted to the Portland International Airport. • There is one small residential area
Central City	Central City	36,087	134,883	• Annexed 1850–1900 • Oldest section of the City	• Smallest, and most densely populated • 34% of the City's jobs • Regional economic and transportation hub • Highest sidewalk coverage • Water and sewer infrastructure is old
Central Northeast	Central Northeast Neighborhood	46,535	27,072	• Annexed 1901–1990 • Largely incorporated by 1910 • Area from NE Prescott to NE Columbia Blvd incorporated after 1980	• Includes industrial lands north of Columbia and Sandy Boulevards • Cully neighborhood was annexed later than the rest of the area and has unimproved and substandard streets and lack of sidewalks.
East Portland	East Portland Neighborhood Office	150,822	48,722	• Mostly annexed in the mid-1980s • At the time of annexation many assets were below City standards	• Largest district in area, 29 square miles • Sewer system is relative new • 25% of the City's residents

Reporting Area	Corresponding Neighborhood Coalition Name	Population (2015)	Jobs (2014)	History	Current Conditions
North Portland	North Portland Neighborhood Services	65,661	38,488	• Annexed 1890–1990 • Inner neighborhoods mostly annexed 1890–1910 • St. Johns annexed by 1920	• Second largest district in area, 27 square miles • Land uses include large open spaces (Smith/Bybee Lakes and Kelly Point Park) and waterfront industrial (private and Port of Portland) • Street network generally meets City's connectivity standards • Water and sewer infrastructure is old
Northeast	Northeast Coalition Neighborhoods	59,723	23,513	• Annexed 1851–1900	• Second most dense district, with few large open spaces • Most inner neighborhoods have no walkable access to green space • Street network generally meets City's connectivity standards • Inner neighborhoods have some of the oldest water infrastructure in the City
Southeast	Southeast Uplift Neighborhood Coalition	153,937	49,487	• Annexed 1891–1990 • Incorporated by 1910, except some areas south of Woodstock Boulevard	• Water and sewer infrastructure is old • Street network generally meets the City's connectivity standards • 75 to 80% of streets have sidewalks • Most inner neighborhoods have no walkable access to green space • 25% of the City's residents
Southwest	Southwest Neighbors, Inc.	66,198	39,958	• Annexed 1891–1990 • Outer neighborhoods annexed in the 1980s	• Many streets are unimproved or unpaved • Most residential streets lack sidewalks • Major arterials follow hilly topography • Streets generally do not meet connectivity standards • Sewer system is relatively new and in good condition • Stormwater system has capacity deficiencies
West/ Northwest	Neighbors West/Northwest	26,815	32,161	• Annexed 1911–1990 • Close-in NW annexed by early 1900s.	• Least dense district, with only 27,000 residents • Forest Park is the largest single use • Home to significant industrial areas along the west bank of Willamette River

Source: Portland City Budget Office, 2016



September 12, 2016

Migitation Action Plan (MAP)

Figure 4-2. Risk Reporting Areas

Legend

City Boundary

Risk Reporting Areas

- Airport
- Central City
- Central Northeast
- East Portland
- West/Northwest
- North Portland
- Northeast
- Southeast
- Southwest

NORTH

0 0.75 1.5 Miles

Source: City of Portland-2016

PBEM

4.5 DEVELOPMENT PROFILE

4.5.1 Current Land Use and Zoning

Estimated Land Use

Portland has a total area of 145 square miles, of which 11.66 square miles is water. The City of Portland does not currently have a comprehensive inventory of existing land uses. Table 4-5 shows estimated current land use in the city derived from use descriptions provided in Multnomah County Assessor data. The distribution of land uses within the city will change over time.

Table 4-5. Current Land Use in Portland

Present Use Classification	Area (acres)[a]	% of total
Commercial	12,014	17.3%
Education	1,271	1.8%
Government	914	1.3%
Industrial	6,251	9.0%
Religious	639	0.9%
Residential	31,083	44.7%
Other—Vacant, Open Space, Unknown	17,379	25%
Total	**69,550**	**100%**

a. Area is based on tax lot boundaries and likely excludes public rights-of-way and water bodies.

Building Count

Because an accurate land use inventory is lacking, land use information is analyzed in this plan using building counts as a proxy. Table 4-6 shows the type and distribution of structures throughout Portland. This information is used for each hazard that has a defined spatial extent.

Table 4-6. Structure Type in Portland

	Number of Structures[a]						
	Residential	Commercial	Industrial	Religion	Government	Education	Total
Airport	257	105	170	0	111	0	**643**
Central City	857	1,587	79	45	64	17	**2,649**
Central Northeast	16,067	1,100	131	55	24	29	**17,406**
East Portland	41,422	1,886	97	158	81	111	**43,755**
North Portland	22,066	1,421	595	257	82	68	**24,489**
Northeast	19,751	706	22	111	24	66	**20,680**
Southeast	50,664	2,125	65	215	73	128	**53,270**
Southwest	22,297	617	21	72	41	76	**23,124**
West/Northwest	6,278	793	692	18	26	14	**7,821**
Total	**179,659**	**10,340**	**1,872**	**931**	**526**	**509**	**193,837**

a. Structure type assigned to best-fit present use classification, based on Multnomah County Assessor data. Where conflicting information was available, parcels were assumed to be improved.

4.5.2 Critical Facilities and Infrastructure

Definition and Categories

The 2007 *Critical Infrastructure Protection Plan, Portland/Vancouver Urban Area* presents the following regional definition of critical infrastructure (CH2M Hill, 2007):

> *Publicly and privately controlled systems and assets, including the built and natural environments and human resources, essential to the sustained functioning of the Portland/Vancouver metropolitan area including Clackamas, Columbia, Multnomah and Washington Counties in Oregon and Clark County in Washington. Such systems and assets specifically include those necessary to ensure continuity of security, safety, health and sanitation services, support the area's economy, and/or maintain public confidence. Incapacitation or destruction of any of these systems or assets would have a debilitating impact on the area either directly, through interdependencies, and/or through cascading effects.*

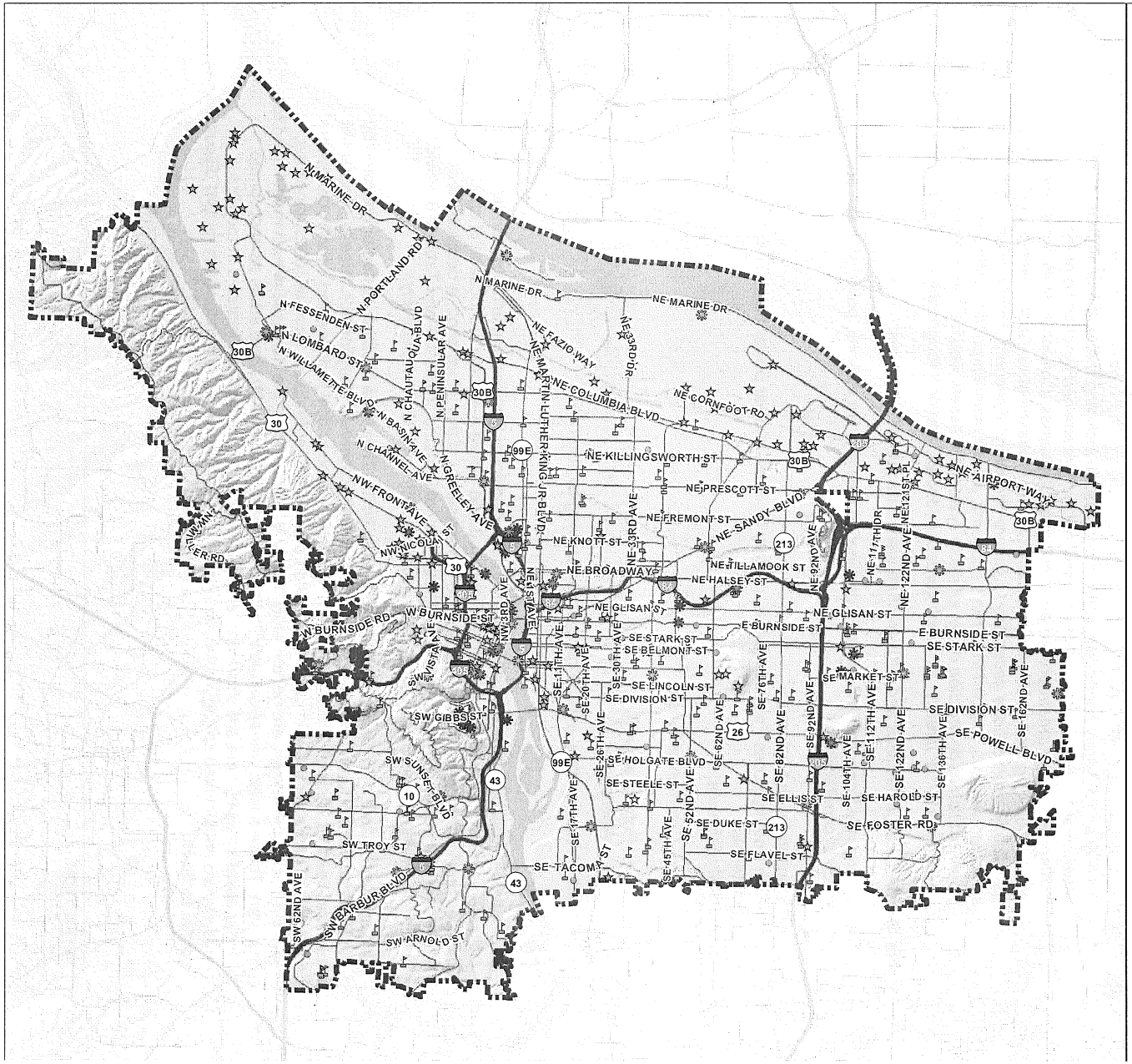
For the MAP, critical facilities and infrastructure were categorized as follows:

- Emergency Services (Emergency Coordination Centers, fire stations, police stations, and medical care facilities)
- Schools
- Transportation Systems
- High Potential Loss Facilities (dams, military facilities, nuclear power plants, hazardous materials)
- Utility Systems:
    - Communications
    - Power
    - Potable water
    - Wastewater
- Other Assets (zoos, jails, nursing/assisted living facilities)

Inventory

The database was built from the best available data. Additional facilities and infrastructure will be included as new data becomes available. Figure 4-3 and Figure 4-4 show the location of critical facilities and infrastructure in Portland. Due to the sensitivity of this information, a detailed list of facilities is not provided. The list is on file with the City of Portland. Table 4-7 and Table 4-8 provide summaries of the general types of critical facilities and infrastructure, respectively.

The analysis included 75 facilities outside of the city limits. These are facilities owned or operated by the Portland Water Bureau associated with the Bull Run Reservoir. They include three high potential loss facilities and 72 potable water facilities. All point-location critical facilities and infrastructure were analyzed to help rank risk and identify mitigation actions. Linear features, such as roads, pipelines, railroad tracks and levees, are not currently able to be analyzed by the risk assessment model used for this plan. These assets were overlaid with the extent and location of hazard areas as appropriate. Linear asset totals by type are shown in Table 4-9. The linear features not included in the Hazus analysis are not included on Figure 4-3 and Figure 4-4. The risk assessment for each hazard discusses critical facilities.



September 12, 2016

Mitigation Action Plan (MAP)

Figure 4-3. Critical Facilities

Legend

City Boundary

Emergency Services*

- Emergency Coordination Centers
- Fire Station Facilities
- Police Station Facilities
- Medical Care Facilities

High Potential Loss Facilities*

- Dams
- Military
- Nuclear Power Plants
- Hazardous Materials
- Schools
- Other Assets

Zoo, Jails, Nursing/Assisted Living Facilities

*Due to security reasons, some emergency services and high potential loss facilities have been left off of the map.

NORTH

0 0.75 1.5 Miles

Sources: WORD/NID-2015; OSFM-2015; City of Portland-2011, 2015, 2016

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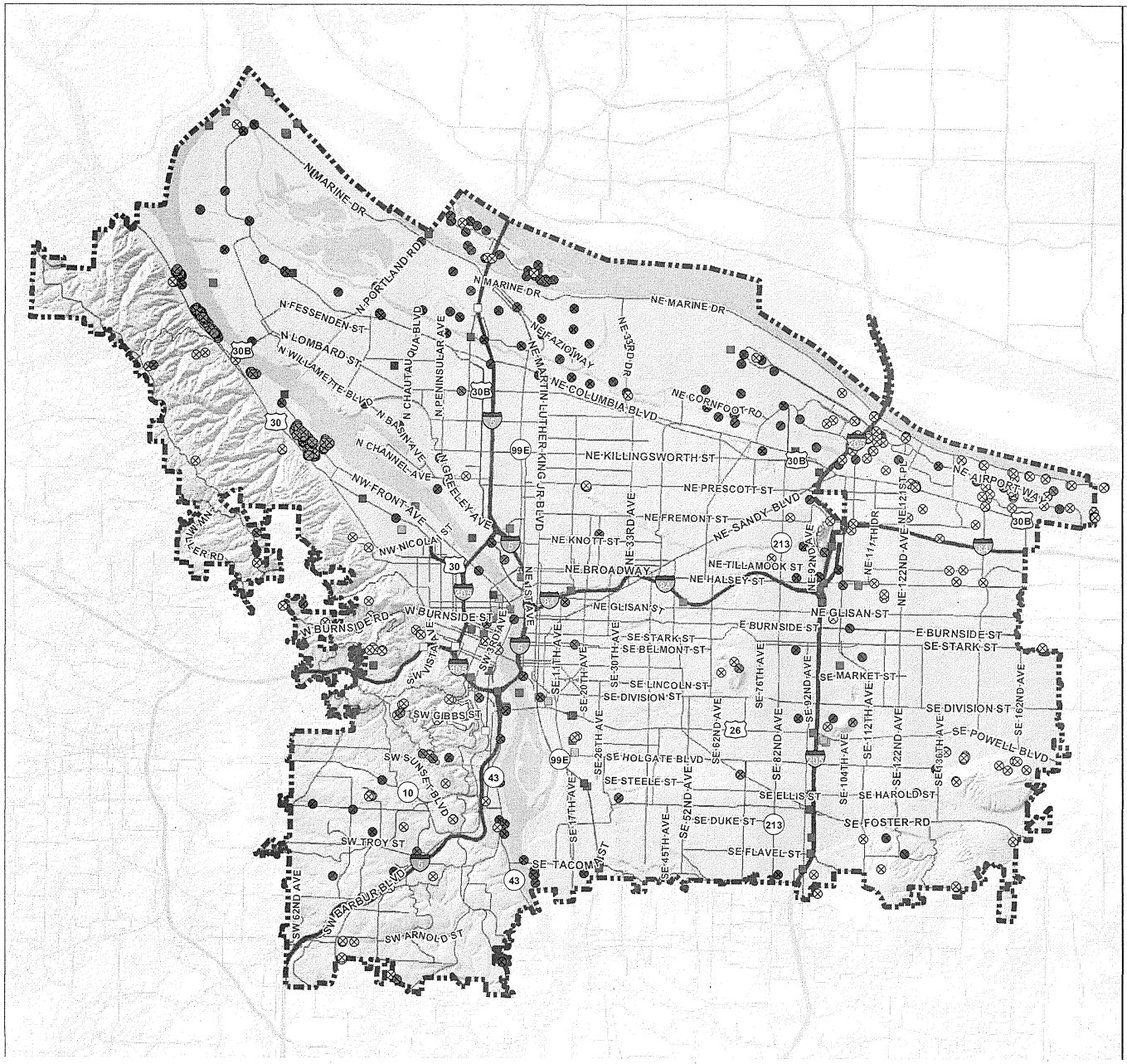


September 12, 2016

Mitigation Action Plan (MAP)

Figure 4-4. Critical Infrastructure

Legend

- City Boundary

Utility Systems*

- Electrical
- Natural Gas Facilities
- Communication Facilities
- Petroleum Facilities
- Potable Water Facilities
- Wastewater Facilities

Transportation Systems*

- Railway Tunnels, Bridges, and Facilities
- Light Rail Tunnels, Bridges, and Facilities
- Highway Tunnels and Bridges
- Bus Facilities
- Port and Airport Facilities

*Due to security reasons, some utility and transportation system components have been left off of the map.

NORTH

0 0.75 1.5 Miles

Sources: TriMet-2015; Port of Portland-2015; OPHS-2016; City of Portland-2011, 2015,2016; OPB-2016; PTS-2015; FEMA-2015; Kinder Morgan-2015

PBEM

Table 4-7. Portland Critical Facilities

Reporting Area	Number of Critical Facilities				
	Emergency Services	High Potential Loss Facilities	Schools	Other Assets	Total
Airport	2	9	0	0	**11**
Central City	15	31	29	7	**82**
Central Northeast	2	17	24	3	**46**
East Portland	12	26	73	21	**132**
West/Northwest	6	19	12	2	**39**
North Portland	7	46	27	5	**85**
Northeast	5	3	36	3	**47**
Southeast	8	14	77	18	**117**
Southwest	8	2	45	9	**64**
Outside City Boundary	0	3	0	0	**3**
Total	**65**	**170**	**323**	**68**	**626**

Table 4-8. Portland Critical Infrastructure

Reporting Area	Number of Critical Infrastructure Facilities					
		Utility Systems				
	Transportation Systems	Communications	Power	Potable Water	Wastewater	Total
Airport	2	0	5	19	10	**36**
Central City	28	2	11	1	9	**51**
Central Northeast	10	1	8	9	17	**45**
East Portland	11	5	8	173	17	**214**
West/Northwest	8	2	300	25	4	**339**
North Portland	15	3	7	6	63	**94**
Northeast	2	1	8	3	0	**14**
Southeast	11	5	8	2	8	**34**
Southwest	7	6	2	36	12	**63**
Outside City Boundary	0	0	0	72	0	**72**
Total	**94**	**25**	**357**	**346**	**140**	**962**

Table 4-9. Portland Linear Critical Infrastructure

	Infrastructure in Portland
Utility Systems	
Power Lines	476.87 miles
Gas Lines	83.38 miles
Potable Water System Back Bone	146.51 miles
Wastewater System Collection Pipes	2,643.05 miles
Transportation Systems	
Railroads	375.07 miles
Light Rail	52.80 miles
Flood Management Levees	
Levees	20.27 miles

Critical Energy Infrastructure Hub

The City of Portland is a major throughway for oil, gas and electric transmission lines connecting Oregon to California, Washington, and Canada. A significant portion of Portland's energy distribution infrastructure is along a 6-mile stretch of the Willamette River in Northwest Portland between the I-405 Fremont Bridge and Sauvie Island, an area referred to as the Critical Energy Infrastructure Hub (the CEI Hub). The importance of the infrastructure in this hub, as well as the potential risks associated with materials stored there, warrant particular attention for hazard mitigation planning. A separate study was conducted to assess this area's exposure and vulnerability to each of Portland's key hazards of concern. A report summarizing this study is provided in Appendix D. It identifies nine recommendations to improve resilience of the critical infrastructure in the CEI Hub. The recommendations have been incorporated as appropriate into the MAP action plan.

4.5.3 Future Trends in Development

The City of Portland limits new development in known hazard areas through codes and policies. City code outlines hazard-based restrictions on building and development under Title 24 (Building Regulations) and Title 33 (Planning and Zoning). The codes used to evaluate hazard resilience of properties to be developed will be assessed as the MAP is implemented, as will the alignment of mitigation actions in the various projects that address future development.

Portland's 2035 Comprehensive Plan (City of Portland, 2016) guides how and where land will be developed and infrastructure projects will be built to address future growth. The comprehensive plan's five guiding principles include "resilience," which it defines as reducing risk and improving the ability of individuals, communities, economic systems, and the natural and built environments to withstand, recover from, and adapt to changes from natural hazards, human-made disasters, climate change, and economic shifts. The risk assessment and action plan in the MAP, together with the resilience policies in the comprehensive plan, will help ensure that decisions guiding future development consider hazard risks and vulnerability. Future analysis of specific areas conducted during site review and permitting will include greater detail of the environment, demographics, buildings, infrastructure, and hazards. This will aid in a more definitive spatial analysis of buildable land. A study of buildable land inventory is a part of the Comprehensive Plan and hazards are integrated into the analysis.

Goal 7 of Oregon's *Statewide Planning Goals and Guidelines* is to protect people and property from natural hazards. It requires local governments to follow procedures, standards and definitions in statewide planning goals and commission rules to develop programs to achieve this goal. Natural hazards covered by this goal include floods, landslides, earthquakes and related hazards, tsunamis, coastal erosion and wildfires. The Portland Comprehensive Plan includes policies addressing risk related to landslide, wildfire, flooding and earthquake risks. The MAP provides actions that support this Statewide Planning Goal.

Risks to future development are analyzed in this plan for each identified hazard that has a defined spatial extent and location. For hazards that lack this spatial reference, Future land use information based on Comprehensive Plan land use designations is summarized in Table 4-10 by use category for Portland.

Table 4-10. Future Land Use Designations in Portland

Reporting Area	Total Acreage	Percent of total acres					
		Residential					
		Single-Dwelling	Multi-Dwelling	Commercial	Employment & Industrial	Mixed Use & Institutional	Open Space
Airport	5,309	2.6%	3.8%	0.0%	66.8%	5.0%	21.8%
Central City	2,975	0.0%	6.8%	42.9%	39.0%	0.0%	11.3%
Central Northeast	6,758	43.4%	6.0%	0.0%	31.0%	6.2%	13.4%
East Portland	18,604	50.1%	13.4%	1.2%	12.4%	7.4%	15.5%
North Portland	17,133	19.4%	5.2%	0.0%	44.6%	8.8%	22.1%
Northeast	4,427	65.8%	12.0%	0.0%	4.5%	13.7%	4.0%
Southeast	13,415	58.4%	12.3%	0.0%	4.3%	12.6%	12.4%
Southwest	11,519	65.9%	7.6%	0.0%	0.1%	9.2%	17.2%
West/Northwest	12,699	27.7%	2.8%	0.0%	21.8%	2.5%	45.2%
TOTAL	**92,838**	**40.5%**	**8.2%**	**1.6%**	**21.9%**	**7.8%**	**20.1%**

Source: Future land use categories are based on the proposed comprehensive plan designations as of February 2016.

4.6 POPULATION

Information about population is a critical part of planning because it directly relates to housing, industry, stores, public facilities and services, and transportation. The Population Research Center at Portland State University estimated Portland's population at 613,355 as of July 1, 2015.

4.6.1 Growth

Population changes are useful socio-economic indicators. A growing population generally indicates a growing economy, while a decreasing population signifies economic decline. Figure 4-5 shows the average annual population change from 1990 to 2015 for Portland and the State of Oregon. For both the city and the state, high growth rates in the 1990s dropped significantly in the 2000s and the first few years of the 2010s. Higher growth rates have since returned, and in Portland the 2014–2015 rate of 1.97 percent was greater than the 1.89-percent annual average of the 1990s. Table 4-11 shows the population in Portland since 1990 (PSU, 2016).

Source: PSU, 2016

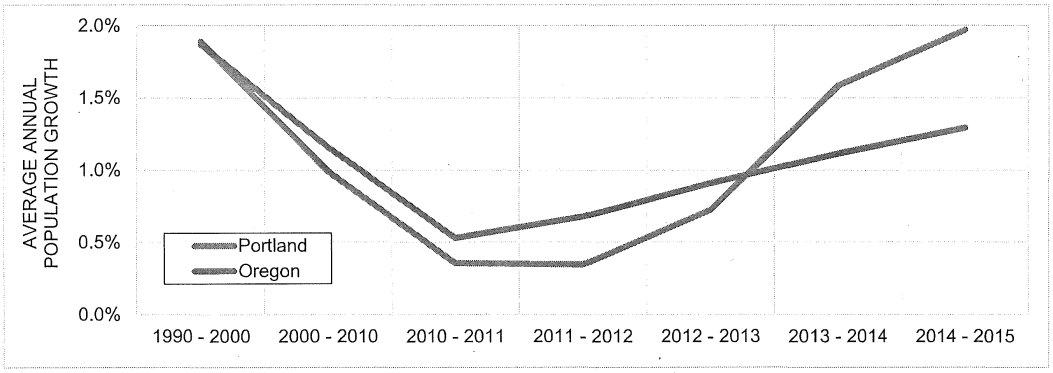


Figure 4-5. Oregon and City of Portland Population Growth

Table 4-11. Annual Population Data

Year	Population	Year	Population
1990	438,802	2012	587,865
2000	529,121	2013	592,120
2010	583,775	2014	601,510
2011	585,845	2015	613,355

Source: PSU, 2016

4.6.2 Age Distribution

The overall age distribution for Portland is illustrated in Figure 4-6. Based on U.S. Census data estimates, 11 percent of Portland's population is 65 or older, compared to the state average of 15 percent. According to U.S. Census data, 38.5 percent of the over-65 population has disabilities of some kind and 11.4 percent have incomes below the poverty line. Among children under 18 years old, 23.7 percent live below the poverty line. It is also estimated that 16 percent of the population is under 15 years old, compared to the state average of 18.2 percent.

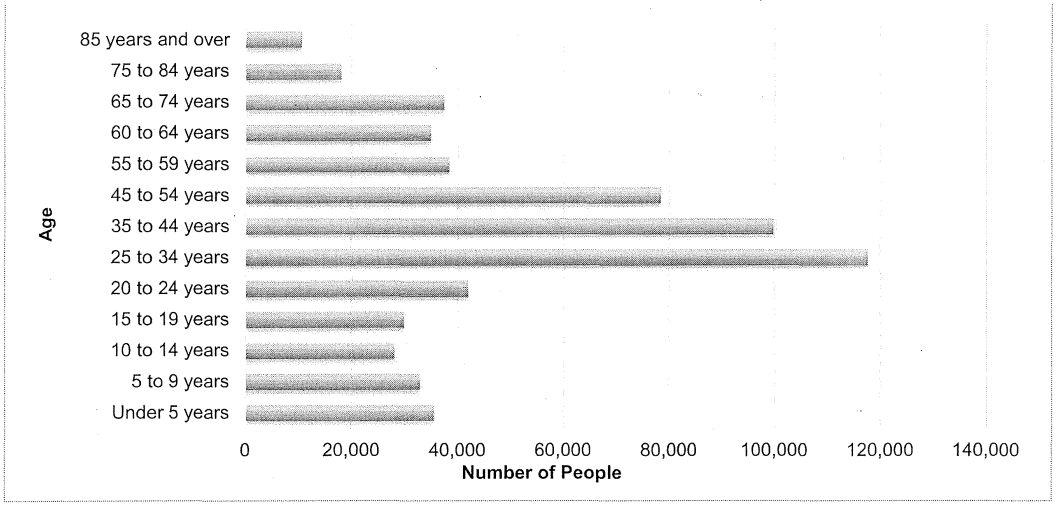


Figure 4-6. Portland Age Distribution

4.6.3 Race and Ethnicity

According to the U.S. Census, the racial composition of Portland is predominantly white, at about 77.3 percent. The largest minority populations are Asian at 7.5 percent and African American at 6.1 percent. Figure 4-7 shows the racial distribution in Portland.

Portland has a 14-percent foreign-born population. Other than English, the most commonly spoken language is Spanish. Portland has identified nine other "safe harbor" languages, defined as those that are spoken as a primary language by at least 1,000 people in Portland with limited English proficiency. They are Vietnamese, Chinese, Russian, Romanian, Ukrainian, Japanese, Somali, and Arabic, and Laotian (Lao communities are just under the 1,000-person threshold) (OEHR, n.d.a). The census estimates 8.9 percent of residents speak English "less than very well."

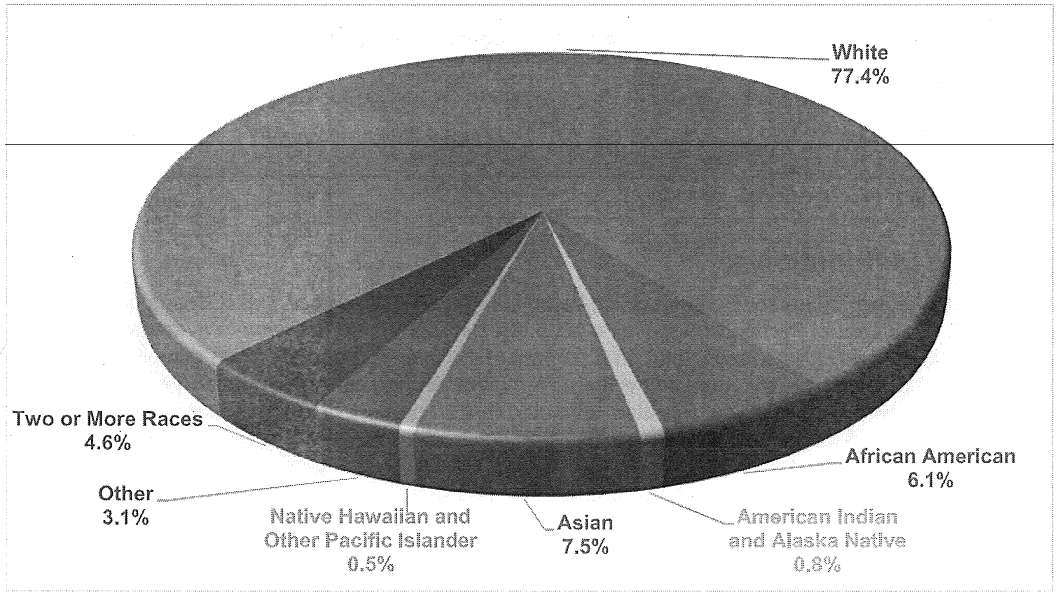


Figure 4-7. Portland Race Distribution

4.7 SOCIAL VULNERABILITY AND HAZARD MITIGATION

Hazard research has firmly established the importance of tailoring local hazard mitigation and emergency response policies to the needs of the community they serve. Vulnerability to natural hazard events arises out of the social and economic circumstances of everyday life (Morrow, 1999). Recent disasters such as Hurricane Katrina and Superstorm Sandy illustrated differences in impacts among different sections of the population, such as the poor, the elderly, immigrants, racial minorities, single-parent-headed households, and recent residents. These population groups are more vulnerable due to lack of material, economic, and political resources.

Identification and recognition of the spatial distribution of these groups is critical for formulating an effective hazard mitigation policy to build long-term community resilience. A social vulnerability lens is a valuable tool because it highlights where vulnerable groups are located within the community. This knowledge results in better hazard mitigation policies and improves the likelihood of achieving desired outcomes because many hazards of concern occur in defined locations.

4.7.1 Understanding Social Vulnerability

A number of broad contextual factors influence a person or household's vulnerability to a given hazard:

- Lack of material and financial resources to prepare for and recover from a hazard event
- Lack of access to information and knowledge required to respond to a hazard event
- Beliefs and norms
- Weak residential structures
- Poor access to infrastructure and lifelines.

Social vulnerability assessment is an innovative and useful way to identify spatial distribution of groups that are likely to suffer disproportionately in case of a hazard event, so that mitigation and capacity-building policies can be directed to these neighborhoods in order to minimize negative impacts of hazard events. Social vulnerability is defined as follows for hazard mitigation (Blaikie et al., 1994):

> "The characteristics of a person or group in terms of their capacity to anticipate, cope with, resist and recover from the impacts of a natural hazard. It involves a combination of factors that determine the degree to which someone's life and livelihood are put at risk."

Vulnerable groups are characterized by demographic and socio-economic conditions such as race, income or employment status (Blaikie et al., 1994; Hewitt, 1997; Tobin and Montz, 1997). Social vulnerability is an outcome of complex interactions between social factors that influence inequality, as well as elements of the built environment that contribute to vulnerability (houses, roads, utilities, etc.). Researchers have studied various dimensions of social vulnerability:

- Race/ethnicity:
  - Bolin 1986; Bolin and Bolton 1986
  - Perry and Mushkatel 1986
  - Peacock et al 1997
  - Bolin and Stanford 1998
  - Fothergill, Maestas, and Darlington 1999
  - Lindell and Perry 2004
- Economic status factors such as class, income, and poverty:
  - Peacock et al 1997
  - Dash et al 1997
  - Fothergill and Peek 2004
- The degree of urbanization and the quality of housing:
  - Cutter, Boruff and Shirley 2003
- Gender:
  - Enarson and Morrow 1997
  - Enarson and Morrow 1998
  - Fothergill 1999
- A host of other factors such as age, education, religion, etc.

Based on these studies, the following have been identified as key dimensions of social vulnerability:

- Income
- Gender
- Race, ethnicity
- Age
- Unemployment, dependence on social services
- Renting as opposed to owning a home
- Infrastructure lifelines
- Occupation/working conditions
- Family structures
- Educational attainment level
- Disabilities or access and functional needs.

While these factors have been identified with social vulnerability in general, demographic characteristics do not cause every person within a group to be more vulnerable to natural hazard events. Individuals with the identified demographic characteristics may have the resources needed to prepare for or respond to an emergency situation. The ability to avoid, withstand, cope with, respond to and recover from a disaster is an outcome of a host of internal and external characteristics, often shaped by circumstances beyond an individual's control. No group should be viewed as a victim group or a rescue group.

4.7.2 Demographic Indicators for Social Vulnerability Risk Assessment

Indicators are measures of abstract concepts, such as social vulnerability, that allow comparisons to be made across levels of assessment. To assess social vulnerability, it is common to use indicators from data that is collected during the decadal census and/or the U.S. Census Bureau's American Community Survey. For the social vulnerability component of the risk assessment for the MAP, the following indicators were selected:

- **Population Under 15 Years of Age**—Children, especially in the youngest age groups, often cannot protect themselves during a disaster because they lack the necessary resources, knowledge, or life experiences to effectively cope with the situation. Hazard mitigation planning needs to be tailored to ensure that the community is prepared to ensure that children are safe during disaster events, and that families with children have access to necessary information and tools.
- **Population Over 65 years of Age**—Persons aged 65 years and older are likely to require financial support, transportation, medical care, or assistance with ordinary daily activities, especially during disasters. Hazard mitigation activities need to account for such needs.
- **Renter Occupied Housing Units**—People who rent often do so because they do not have the financial resources for home ownership. They often lack access to information about financial aid during recovery. In the most extreme cases, renters lack sufficient shelter options when lodging becomes uninhabitable and limited supply causes housing costs to rise dramatically after a disaster. Renters commonly have limited opportunities for implementing mitigation measures at their home, and may not have insurance to cover their personal property. Additionally, renters may not be aware of hazard risks at the property. Hazard mitigation planning needs to explore ways to ensure that renters are aware of risks and opportunities available to them to mitigate known risks.
- **People of color**—Social and economic marginalization of certain racial and ethnic groups, including real estate discrimination, has resulted in greater vulnerability of these groups to all types of hazards. Based on data from a number of studies, African Americans, Native Americans, and populations of Asian, Pacific Islander, or Hispanic origin are likely to be more vulnerable than the broader community. These groups often have limited knowledge of local risks and modes of risk communication, have limited capacity to respond, and are likely to face major hurdles in navigating procedures to receive aid and assistance in a disaster event. Hazard mitigation plans need to identify the spatial distribution of these population groups and direct resources to reduce their vulnerability to hazards.
- **Families below the Poverty Level**—Economically disadvantaged families have limited ability to absorb losses due to hazard impacts. Wealth enables families to absorb and recover from losses more quickly, due to insurance and often the availability of low-cost credit. People with lower incomes tend not to have access to these resources. At the same time, poorer families are likely to inhabit poor quality housing and reside in locations that are most vulnerable to hazard events. Economically disadvantaged neighborhoods are also likely to have relatively

poor infrastructure and facilities, which exacerbate the disaster consequences for residents there.

- **Limited English Speaking Households**—Many households, specifically immigrants, are not fluent in English. For populations with limited English proficiency, disaster communication is difficult. This difficulty is especially true in communities whose first language is neither English nor Spanish and for whom translators and accurate translations of advisories may be scarce. Such households are likely to rely on relatives and local social networks (i.e., friends and neighbors) for information for preparing for a disaster event.
- **Persons with Disabilities**—Persons with disabilities or others with access and functional needs are more likely to have difficulty responding to a hazard event than the general population. Family, neighbors, and local government are the first level of response to assist these individuals, and coordination of efforts to meet their access and functional needs is paramount to life safety efforts. It is important for emergency managers to distinguish between functional and medical needs in order to plan for incidents that require evacuation and sheltering. Knowing the percentage of population with a disability allows emergency management personnel and first responders to understand and anticipate the services needed by those with access and functional needs.

These factors were selected based on factors likely to influence vulnerability, the equity priorities established by the City, and the availability of datasets at a small enough resolution to determine probable characteristics of populations within identified hazard areas. Table 4-12 summarizes the distribution of these social vulnerability indicators by risk-reporting area.

Table 4-12. Distribution of Social Vulnerability Indicators in Reporting Areas

Reporting Area	Percent of Total Population Included in the Indicator Group[a, b]							
	Population Under 15	Population Over 65	Renter Occupied Housing Units	People of Color	Families Below Poverty Level	Limited English Speaking Households	Persons with Disabilities[c]	
							Total Population	Population Under 65[d]
Airport	5.4%	5.1%	68.8%	31.8%	19.8%	20.6%	12.1%	9%
Central City	2.2%	10.1%	83.7%	20.9%	10.6%	3.9%	12.1%	9%
Central Northeast	18.1%	10.3%	35.1%	23.6%	11.7%	4.3%	12.1%	9%
East Portland	21.0%	12.7%	44.5%	30.4%	18.0%	10.2%	12.1%	9%
North Portland	17.1%	8.5%	39.4%	27.8%	14.9%	3.2%	12.1%	9%
Northeast	15.3%	9.1%	45.0%	24.2%	8.5%	0.9%	12.1%	9%
Southeast	14.0%	10.3%	47.4%	16.8%	9.9%	3.2%	12.1%	9%
Southwest	14.7%	14.0%	38.5%	12.6%	4.8%	1.3%	12.1%	9%
West/Northwest	11.4%	12.6%	53.0%	17.1%	4.6%	2.0%	12.1%	9%
Citywide	**16.2%**	**11.2%**	**45.8%**	**22.4%**	**11.7%**	**4.3%**	12.1%	9%

a. These estimates were made using the best available data (American Community Survey estimates), which does not correspond with hazard risk areas. It is expected that there is a degree of over- or under-estimation in these estimates, but they are adequate for planning purposes.
b. Red text fields indicate reporting area values at least 2 percent higher than the citywide average for that indicator.
c. The smallest level of unit for persons with disabilities is the census tract scale, which is not conducive to analysis by hazard extent and location; therefore, it is assumed that the population is evenly distributed in all reporting areas.
d. Percentage of persons with disabilities in the under-65 population is shown to distinguish this indicator from the over-65 indicator; much of the vulnerability of the over-65 population is associated with disabilities.

4.8 ECONOMY

4.8.1 Income

Other than in extreme circumstances, individual households in the United States prepare for, respond to and recover from disasters on their own. This means that households living in poverty are automatically disadvantaged when confronting hazards. Additionally, the poor typically occupy more poorly built and inadequately maintained housing. Mobile or modular homes, for example, are more susceptible to damage in earthquakes and floods than other types of housing. In urban areas, the poor often live in older houses and apartment complexes, which are more likely to be made of un-reinforced masonry, a building type that is particularly susceptible to damage during earthquakes. Furthermore, residents below the federal poverty level are less likely to have insurance to compensate for losses incurred from natural disasters. This means that residents below the poverty level have a great deal to lose during an event and are the least prepared to deal with potential losses. Personal household economics significantly impact people's decisions on evacuation. Individuals who cannot afford gas for their cars often decide not to evacuate. Table 4-13 summarizes recent income data from the U.S. Census Bureau for Portland and for the State of Oregon.

Table 4-13. 2014 Income Data for Portland and Oregon

	Portland	Oregon
2014 Per Capita Income	$32,438	$27,173
2014 Median Household Income	$52,230	$50,521
% of Households with Income of $100,000 or More	23%	20%
% of Households with Income Below $50,000	48%	49%
% of Residents with 2013-2014 Income Below the Poverty Level	18%	17%
% of Families with 2013-2014 Income Below the Poverty Level	12%	12%

Source: U.S. Census, 2016a

4.8.2 Industry, Businesses and Institutions

Portland's economy has slowly diversified over the past decades. Steady growth in nontraditional sectors, such as the manufacture of electrical equipment, instruments and related products, has helped Portland's economy adapt to national and global trends.

The Port of Portland, which is responsible for air and marine port facilities, offers opportunities for expanding export industries, investments, business and travel:

- Portland's location on the Columbia River gives it advantages for freight shipping. The Columbia River navigation channel begins at the Columbia River bar and continues 5 miles upriver at a depth of 55 feet and a width of 2,640 feet. From there, it maintains a depth of 43 feet and a width of 600 feet for 100 miles to the Portland Harbor (Port of Portland, 2016a)
- The Port also manages Portland International Airport, which is served by 19 passenger carriers and eight air-cargo carriers. In 2015, the airport provided 185,000 commercial flights and served nearly 17 million passengers (Port of Portland, 2016b).

The city's economy is strongly based in the educational services, health care, and social assistance industry (25.3 percent), followed by the professional-scientific-management industry (13.7 percent) and arts-entertainment-recreation (11.7 percent) Figure 4-8 shows the breakdown of industry types in Portland.

Source: U.S. Census, 2016a

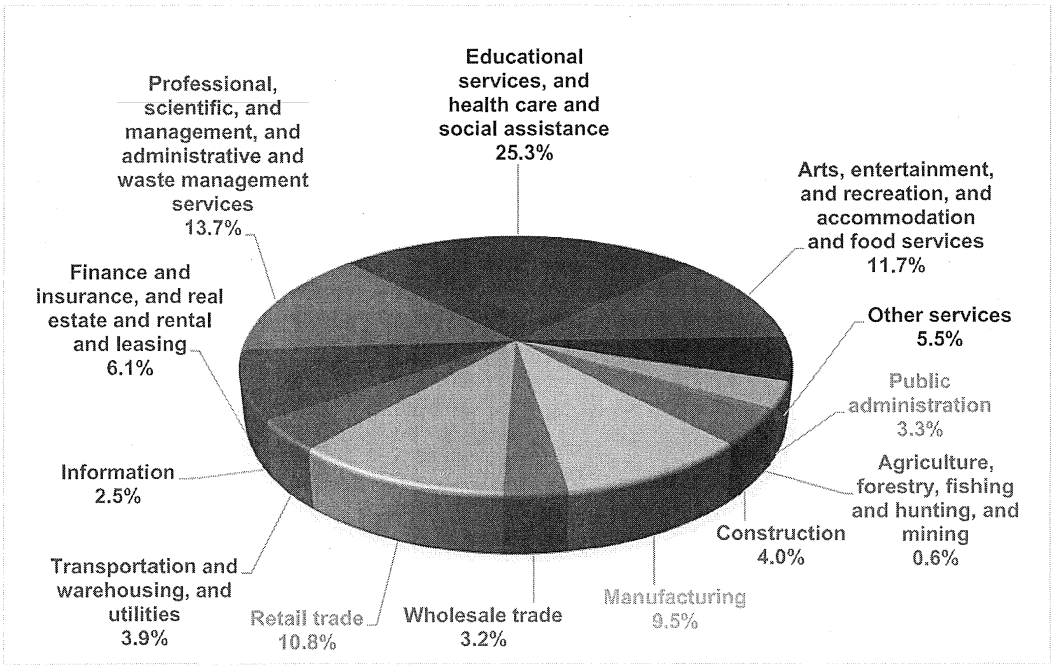


Figure 4-8. Industry in Portland

Semiconductor manufacturers, such as Intel and Siltronic, have established major facilities in the region. Other major private sector employers in the Portland metropolitan area include Tektronix, Nike, health systems Providence, Kaiser Permanente and Legacy, and retailers Safeway, Albertsons and Fred Meyer. Major public employers include Oregon Health and Science University (OHSU) and Portland State University (NHMP, 2010).

4.8.3 Employment Trends and Occupations

According to the American Community Survey, 69.4 percent of Portland's 16-and-older population is in the labor force—65.6 percent of women and 73.4 percent of men (U.S. Census, 2016a). Unemployment in the Portland-Vancouver-Hillsboro metropolitan area as estimated to be 4.4 percent in April 2016, a 0.8-percent decrease from one year earlier. That decrease ranked the area eighth nationally for year-over-year improvement in unemployment. Figure 4-9 compares Oregon's and the Multnomah County's unemployment trends from 2004 through 2014. The county's unemployment rate has generally been slightly below that of the state, though both have followed similar trends through the 2007–2009 recession and subsequent recovery (U.S. BLS, 2016).

Of the five occupation categories defined by the U.S. Census, the highest employment in Portland is in the management, business, science and arts occupation, and the lowest is in the natural resources, construction and maintenance occupation. As shown on Figure 4-10, employment since 2000 has been increasing in the management, business, science, and arts occupation and the service occupation, and decreasing in other occupation classes.

Source: BLS, 2016

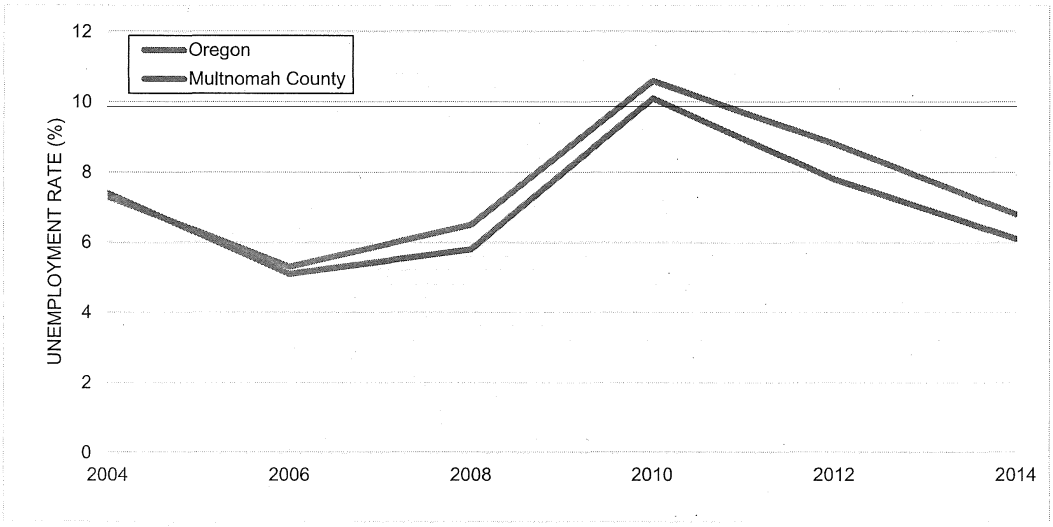


Figure 4-9. Oregon and Multnomah County Unemployment Rate

Sources: PBEM, 2010; U.S. Census Bureau, 2016a

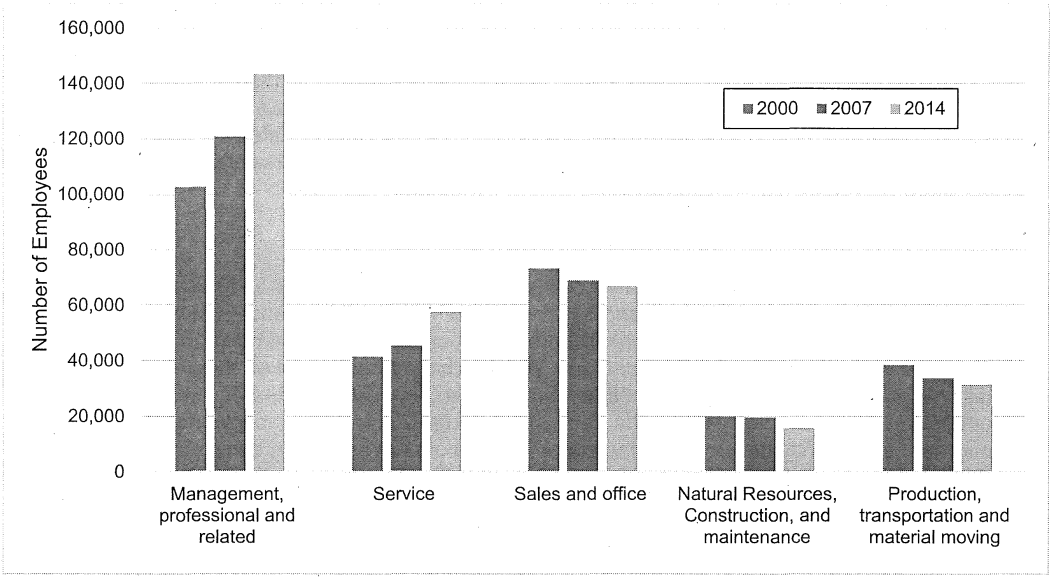


Figure 4-10. Occupations in Portland

The *City of Portland Economic Opportunities Analysis* summarizes key recent trends in city employment, including the following (E.D. Hovee & Company, LLC, 2016):

- In 2013, there were 393,742 jobs in Portland, 38 percent of all jobs in the seven-county metropolitan area.
- From 1980 to 2008, Multnomah County added 114,800 new jobs, a 1.1-percent average annual growth rate and 25 percent of the total metropolitan area job growth.
- From 2000 to 2008, Portland employment increased by 3,120 jobs—an annual average job growth of only 0.1 percent, and 5 percent of the total metropolitan area job growth.
- From 2008 to 2013, Portland had average annual job growth of 1.3 percent—23 percent of the total metropolitan area job growth.
- From 2000 to 2008, manufacturing jobs in the city declined by 3.3 percent per year. Retail jobs also declined. Employment in education and health care sectors increased at an average of 2.3 percent per year.
- Portland's geographic distribution of employment as of 2008 was as follows:
    - 27 percent in the Central City commercial areas
    - 5 percent in regional and town centers (or urban centers)
    - 18 percent in neighborhood commercial areas
    - 30 percent in industrial districts
    - 10 percent each in institutional and residential areas

The U.S. Census estimates that 58 percent of workers in Portland commute alone (by car, truck or van) to work, and mean travel time to work is 24.7 minutes (U.S. Census Bureau, 2016a).

4.9 LAWS, ORDINANCES AND PROGRAMS

Existing laws, ordinances, plans and programs at the federal, state, and local level can support or impact hazard mitigation actions identified in this plan. Hazard mitigation plans are required to include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information as part of the planning process (44 CFR, Section 201.6(b)(3)). Pertinent studies and reports are cited throughout *The Mitigation Action Plan*; federal, state, and local laws and programs are described below.

4.9.1 Federal

Disaster Mitigation Act

The DMA is the current federal legislation addressing hazard mitigation planning. It emphasizes planning for disasters before they occur, requiring plans to be in place before Hazard Mitigation Grant Program funds are available to communities. It specifically addresses planning at the local level. The MAP is designed to meet the requirements of DMA, improving eligibility for future hazard mitigation funds.

Americans with Disabilities Act

The Americans with Disabilities Act (ADA) seeks to prevent discrimination against people with disabilities in employment, transportation, public accommodation, communications, and government activities. Title II of the ADA deals with compliance with the Act in emergency management and disaster-related programs, services, and activities. It applies to state and local governments as well as third parties, including religious entities and private nonprofit organizations.

The ADA has implications for sheltering requirements and public notifications. During an emergency alert, officials must use a combination of warning methods to ensure that all residents have all necessary information. Those with hearing impairments may not hear radio, television, sirens, or other audible alerts, while those with visual impairments may not see flashing lights or other visual alerts. Two technical documents for shelter operators address physical accessibility needs of people with disabilities, as well as medical needs and service animals.

The ADA intersects with disaster preparedness programs in regards to transportation, social services, temporary housing, and rebuilding. Persons with disabilities may require additional assistance in evacuation and transit (e.g., vehicles with wheelchair lifts or paratransit buses). Evacuation and other response plans should address the unique needs of residents. Local governments may be interested in implementing a special-needs registry to identify the home addresses, contact information, and needs for residents who may require more assistance.

Clean Water Act

The federal Clean Water Act (CWA) employs regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's surface waters for the protection and propagation of fish, shellfish, wildlife and recreation in and on the water.

Evolution of CWA programs over the last decade has included a shift to holistic, watershed-based strategies. Under this approach, equal emphasis is placed on protecting healthy waters and restoring impaired ones. A full array of issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining water quality and other environmental goals is a hallmark of this approach.

The CWA is important to hazard mitigation in several ways. There are often permitting requirements for any construction within 200 feet of water of the United States, which may have implications for mitigation projects identified by a local jurisdiction. Additionally, CWA requirements apply to wetlands, which serve important functions related to preserving and protecting the natural and beneficial functions of floodplains and are linked with a community's floodplain management program. Finally, the National Pollutant Discharge Elimination System is part of the CWA and addresses local stormwater management programs. Stormwater management plays a critical role in hazard mitigation by addressing urban drainage or localized flooding issues within jurisdictions. In the State of Oregon, the Department of Environmental Quality (DEQ) develops and administers National Pollutant Discharge Elimination System municipal stormwater permits. The Portland Group permit was reissued on January 31, 2011. Both the Port of Portland and City of Portland have Stormwater Management Plans under this permit.

Community Development Block Grant Disaster Resilience Program

In response to disasters, Congress may appropriate additional funding for the U.S. Department of Housing and Urban Development Community Development Block Grant programs to be distributed as Disaster Recovery grants (CDBG-DR). These grants can be used to rebuild affected areas and provide seed money to start the recovery process. CDBG-DR assistance may fund a broad range of recovery activities, helping communities and neighborhoods that otherwise might not recover due to limited resources. CDBG-DR grants often supplement disaster programs of the Federal Emergency Management Agency, the Small Business Administration, and the U.S. Army Corps of Engineers. Housing and Urban Development generally awards noncompetitive, nonrecurring CDBG-DR grants by

a formula that considers disaster recovery needs unmet by other federal disaster assistance programs. To be eligible for CDBG-DR funds, projects must meet the following criteria:

- Address a disaster-related impact (direct or indirect) in a presidentially declared county for the covered disaster
- Be a CDBG-eligible activity (according to regulations and waivers)
- Meet a national objective.

Incorporating preparedness and mitigation into these actions is encouraged, as the goal is to rebuild in ways that are safer and stronger.

Emergency Watershed Program

The USDA Natural Resources Conservation Service (NRCS) administers the Emergency Watershed Protection (EWP) Program, which responds to emergencies created by natural disasters. Eligibility for assistance is not dependent on a national emergency declaration. The program is designed to help people and conserve natural resources by relieving imminent hazards to life and property caused by floods, fires, windstorms, and other natural occurrences. EWP is an emergency recovery program. Financial and technical assistance are available for the following activities (National Resources Conservation Service, 2016):

- Remove debris from stream channels, road culverts, and bridges
- Reshape and protect eroded banks
- Correct damaged drainage facilities
- Establish cover on critically eroding lands
- Repair levees and structures
- Repair conservation practices.

Endangered Species Act

The federal Endangered Species Act (ESA) was enacted in 1973 to conserve species facing depletion or extinction and the ecosystems that support them. The act sets forth a process for determining which species are threatened and endangered and requires the conservation of the critical habitat in which those species live. The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species and contains exceptions and exemptions. It is the enabling legislation in the United States for the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Criminal and civil penalties are provided for violations of the ESA and the Convention.

Federal agencies must seek to conserve endangered and threatened species and use their authorities in furtherance of the ESA's purposes. The ESA defines three fundamental terms:

- **Endangered** means that a species of fish, animal or plant is "in danger of extinction throughout all or a significant portion of its range." (For salmon and other vertebrate species, this may include subspecies and distinct population segments.)
- **Threatened** means that a species "is likely to become endangered within the foreseeable future." Regulations may be less restrictive for threatened species than for endangered species.
- **Critical habitat** means "specific geographical areas that are…essential for the conservation and management of a listed species, whether occupied by the species or not."

Five sections of the ESA are of critical importance to understanding it:

- **Section 4: Listing of a Species**—The National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries) is responsible for listing marine species; the U.S. Fish and Wildlife Service is responsible for listing terrestrial and freshwater aquatic species. The agencies may initiate reviews for listings, or citizens may petition for them. A listing must be made "solely on the basis of the best scientific and commercial data available." After a listing has been proposed, agencies receive comment and conduct further scientific reviews for 12 to 18 months, after which they must decide if the listing is warranted. Economic impacts cannot be considered in this decision, but it may include an evaluation of the adequacy of local and state protections. Critical habitat for the species may be designated at the time of listing.
- **Section 7: Consultation**—Federal agencies must ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed or proposed species or adversely modify its critical habitat. This includes private and public actions that require a federal permit. Once a final listing is made, non-federal actions are subject to the same review, termed a "consultation." If the listing agency finds that an action will "take" a species, it must propose mitigations or "reasonable and prudent" alternatives to the action; if the proponent rejects these, the action cannot proceed.
- **Section 9: Prohibition of Take—**It is unlawful to "take" an endangered species, including killing or injuring it or modifying its habitat in a way that interferes with essential behavioral patterns, including breeding, feeding or sheltering.
- **Section 10: Permitted Take**—Through voluntary agreements with the federal government that provide protections to an endangered species, a non-federal applicant may commit a take that would otherwise be prohibited as long as it is incidental to an otherwise lawful activity (such as developing land or building a road). These agreements often take the form of a "Habitat Conservation Plan."
- **Section 11: Citizen Lawsuits**—Civil actions initiated by any citizen can require the listing agency to enforce the ESA's prohibition of taking or to meet the requirements of the consultation process.

Federally funded projects, such as those for pre-disaster mitigation or flood mitigation, cannot jeopardize the continued existence of endangered or threatened species or adversely modify critical habitat (FEMA, 2015b). With the listing of salmon and trout species as threatened or endangered, the ESA has impacted most of the Pacific coast states. Some areas have been more impacted by the ESA than others due to the known presence of listed species, but the entire region is impacted by mandates, programs and policies based on the presumption of the presence of listed species. Most West Coast jurisdictions must now take into account the impact of their programs on habitat. The impacts may increase in the near future, resulting from recent court decisions and federal administrative actions involving the nexus between the ESA and the National Flood Insurance Program (NFIP) in the Puget Sound region of Washington (MSRC, 2016).

The Oregon Fish and Wildlife Commission (through the Oregon Department of Fish and Wildlife) maintains the threatened and endangered species list in the state of Oregon. The ESA program in the City of Portland is part of the Science, Fish and Wildlife Division of the Bureau of Environmental Services.

National Flood Insurance Program

The National Flood Insurance Program provides federally backed flood insurance in exchange for communities enacting floodplain regulations. Participation in the NFIP is voluntary; however, participation and good standing under NFIP are prerequisites to grant funding eligibility under the

Robert T. Stafford Act. The City of Portland participates in the NFIP and has adopted regulations that exceed the NFIP requirements. At the time of the preparation of this plan, the City of Portland was in good standing with NFIP requirements.

National Incident Management System

The National Incident Management System (NIMS) is a systematic approach for government, nongovernmental organizations, and the private sector to work together to manage incidents involving hazards. The NIMS provides a flexible but standardized set of incident management practices. Although participation is voluntary, federal departments and agencies are required to make adoption of NIMS by local and state jurisdictions a condition to receive federal preparedness grants and awards.

Presidential Executive Orders 11988 and 13690

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. It requires federal agencies to provide leadership and take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values of floodplains. The requirements apply to the following activities (FEMA, 2015a):

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing.

Executive Order 13690 expands Executive Order 11988 and acknowledges that the impacts of flooding are anticipated to increase over time due to the effects of climate change and other threats. It mandates a federal flood risk management standard to increase resilience against flooding and help preserve the natural values of floodplains. This standard expands management of flood issues from the current base flood level to a higher vertical elevation and corresponding horizontal floodplain. The goal is to address current and future flood risk and ensure that projects funded with taxpayer dollars last as long as intended (Office of the Press Secretary, 2015).

Presidential Executive Order 11990

Executive Order 11990 requires federal agencies to provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. The requirements apply to the following activities (National Archives, 2016):

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing.

Title VI of the Civil Rights Act of 1964

The Civil Rights Act of 1964 prohibits discrimination based on race, color, religion, sex or national origin and requires equal access to public places and employment. The act is relevant to emergency management and hazard mitigation in that it prohibits local governments from favoring the needs of one population group over another. Local government and emergency response must ensure the continued safety and well-being of all residents equally, to the extent possible.

4.9.2 State

The 2015 *Oregon Natural Hazards Mitigation Plan* has an exhaustive review of policies related to natural hazards in Oregon. Table 4-14 shows the identified polices relevant for the City of Portland. Detailed descriptions are provided in Section 3.4.1.2 of the state's NHMP (Oregon Department of Land Conservation and Development, 2015). Additional state programs and capabilities that are available as a resource to the City of Portland are described in Section 4.9.3.

Table 4-14. Policies Related to Specific Natural Hazards in Oregon

Hazard	Oregon Statewide Planning Goals[a] and Policies	Publications/Studies
Multi-Hazard	• Local Comprehensive Plans • Goal 2: Land use Planning • Goal 7: Natural Hazards • Oregon Building Codes	• Energy Assurance Plan • Natural Hazards Mitigation in Oregon: An Evaluation of Natural Hazards Mitigation Planning and Implementation in Oregon • Oregon Climate Adaptation Framework • Oregon Climate Assessment Report • Oregon Highway Plan • Oregon Resilience Plan • Oregon Transportation Plan • Planning for Natural hazards: Oregon Technical Resource Guide, 2000 • State Emergency Management Plan
Flood	• Goal 5: Natural Resources, Scenic and Historic Areas, and Open Space • Division of State Lands Fill and Removal Permit Program • The Oregon Plan for Salmon and Watersheds • Oregon's Wetlands Protection Program	• Department of Land Conservation and Development Water Quality Model Code and Guidebook
Landslide	• Goal 17: Coastal Shorelands • The Oregon Plan for Salmon and Watersheds • 1997 Senate Bill 12: Rapidly Moving Landslides	
Earthquake	• 2005 Senate Bill 2: Statewide seismic needs assessment for schools and emergency facilities • 2005 Senate Bill 3: Seismic earthquake rehabilitation grant program • 2005 Senate Bill 4 and 5: State bond authorization • 2001 Senate Bill 13: Seismic Event Preparation • 2001 Senate Bill 14: Seismic Surveys for School Buildings • 2001 Senate Bill 15: Seismic Surveys for Hospital Buildings • 1991 Senate Bill 96: Seismic Hazard Investigation	• Seismic Vulnerability of Oregon State Highway Bridges, Mitigation Strategies to Reduce Major Mobility Risks
Wildfire	• 1997 Senate Bill 360: Wildland-Urban Interface • Additional Criteria for Forestland Dwellings—ORS 215.730 • Urban Interface Fire Protection—ORS 477.015- 061	• Oregon's Communities at Risk Assessment • State Fire Services Mobilization Plan
Volcano		• Mount Hood Coordination Plan

a. Local comprehensive plans must address local concerns and issues raised by each of the state's 19 land use planning goals.
Source: Reproduced in part and enhanced from 2015 Oregon Natural Hazards Mitigation Plan

4.9.3 Local

The planning team performed an inventory and analysis of existing authorities and capabilities called a "capability assessment." A capability assessment creates an inventory of an agency's mission, programs and policies, and evaluates its capacity to carry them out. Goals, objectives, policies and actions identified in programs and plans identified were reviewed during the development of the MAP and used to inform the development of the mitigation strategy and assess opportunities for plan

integration. Actions that expand or fill gaps identified in existing capabilities were considered during the development of the mitigation strategy. An assessment of legal and regulatory capabilities is presented in Table 4-15.

Table 4-15. Legal and Regulatory Capability

	Local Authority	Other Jurisdiction Authority	State Mandated
Building Code (Bureau of Development Services (BDS))	Yes	No	Yes
Comment: *Portland City Code, Title 24: Building Regulations; last amended December 4, 2015*			
Zoning Code (Bureau of Planning and Sustainability (BPS))	Yes	No	Yes
Comment: *Portland City Code, Title 33: Planning and Zoning; effective January 1, 1991, last amended March 1, 2016* *E-Zones*			
Subdivisions (BDS, BPS)	Yes	No	Yes
Comment: *Portland City Code, Title 33 Section 600s: Land Divisions and Planned Developments; last amended March 1, 2016* *Johnson Creek Plan District*			
Stormwater Management (BDS (enforcement), BES (development and update))	Yes	No	Yes
Comment: *Portland City Code, Title 17 Sections 32 through 39: amendment anticipated July 2016*			
Post-Disaster Recovery Ordinance (PBEM)	No	No	No
Real Estate Disclosure	No	No	Yes
Comment: *Oregon Revised Statutes, Chapter 105 Section 464: Form of seller's property disclosure statement; disclosure is limited to information known by the seller*			
Growth Management (BPS)	Yes	Yes	Yes
Comment: *Metropolitan Service District: Urban Growth Boundary; last expanded in 2011*			
Site Plan Review (BDS/BES)	Yes	No	No
Comment: *Portland City Code, Title 33 Section 800s: Land Use Reviews; last amended July 24, 2015*			
Environmental Protection	Yes	Yes	Yes
Comment: *Portland City Code, Title 33 Chapter 440: Greenway Overlay Zones; last amended January 1, 2015* *Portland City Code, Title 33 Chapter 430 Environmental Zones; last amended July 24, 2015* *Streamlining Committee for Federal, State and Local Code and Regulatory Compliance on City Projects* *Lower Columbia River Salmon and Steelhead Recovery Plan (Title 24; Biological Opinion Compliance)*			
Flood Damage Prevention (BDS, BPS)	Yes	No	Yes
Comment: *Portland City Code, Title 24: Building Regulations–Flood Hazard Areas; last amended November 26, 2010* *Johnson Creek Basin Plan, Environmental Zones, Title 33 Chapter 430*			
Emergency Management (PBEM)	Yes	No	Yes
Comment: *Portland City Code, Title 15: Emergency Code; last amended October 7, 2015*			
Climate Change (BPS)	Yes	Yes	No
Comment: *Resolution 37121 Exhibit A: 2015 Sustainable City Principles and 2030 Environmental Performance Objectives* *ENN-5.04 Implementation by City Bureaus of Policies and Programs; adopted June 24, 2015;* *ENN-5.03 City of Portland and Multnomah County 2015 Climate Action Plan; adopted June 24, 2015*			
Other	Yes	No	No
Comment: *Portland City Code, Title 10: Erosion and Sediment Control Regulations* *Portland City Code, Title 11: Trees* *Portland City Code, Title 12: Air Pollution Emergency Response* *Portland City Code, Title 21: Water*			
Comprehensive Plan (BPS)	Yes	Yes	Yes
Is the plan equipped to provide linkage to this mitigation plan? Yes			
Comment: *The draft Comprehensive Plan includes policies related to hazard-resilient design*			

	Local Authority	Other Jurisdiction Authority	State Mandated
Capital Improvement Plan	Yes	No	Yes
What types of capital facilities does the plan address? Parks, sewer, transportation, water *How often is the plan updated?* Reviewed annually during budget process ***Comment**: Bureau of Development Services, Bureau of Environmental Services, Portland Fire & Rescue, Bureau of Fire & Police Disability & Retirement, Office of Management & Finance, Portland Parks & Recreation, Portland Bureau of Transportation, Portland Water Bureau—all have capital improvement plan summaries listed in the adopted budget*			
Floodplain or Watershed Plan	No	No	No
Stormwater Plan ***Comment**: Environmental Services Systems Plan (March 2012)*	Yes	No	Yes
Habitat Conservation Plan (Portland Water Bureau (PWB)) ***Comment**: Bull Run Water Supply Habitat Conservation Plan; last compliance report produced in 1995*	Yes	Yes	No
Economic Development Plan (Portland Development Commission) ***Comment**: Economic Development Strategy: A Five-Year Plan for Promoting Job Creation and Economic Growth; 3-year status report published July 2012*	Yes	No	No
Shoreline Management Plan	No	No	No
Community Wildfire Protection Plan ***Comment**: Multnomah County Community Wildfire Protection Plan*	Yes	Yes	No
Forest Management Plan (Portland Parks & Recreation) ***Comment**: Portland Urban Forestry Management Plan; 2004*	Yes	No	No
Climate Action Plan (BPS) ***Comment**: Climate Action Plan: Local Strategies to Address Climate Change; June 2015 (in conjunction with Multnomah County)*	Yes	Yes	No
Comprehensive Emergency Management Plan (PBEM) ***Comment**: City of Portland Basic Emergency Operations Plan; March 2013*	Yes	No	Yes
Threat & Hazard Identification & Risk Assessment ***Comment**: Portland Urban Area 2015 THIRA Update*	Yes	Yes	No
Post-Disaster Recovery Plan	No	No	No
Continuity of Operations Plan ***Comment**: All City bureaus have continuity of operations plans, except the Central Budget Office. Several are currently being updated. PBEM is in the process of hiring a planner to assist bureaus with updating their continuity of operations plans.*	Yes	No	No
Water System Master Plan ***Comment:** Infrastructure Master Plan: Supply System Plan; prepared in 2000, currently being updated Distribution System Plan; prepared in 2007*	Yes	No	Yes
Seismic Study ***Comment:** Water System Seismic Study Recommended by State Seismic Resilience Plan*	Yes	No	Yes
Water System Security and Vulnerability Assessment ***Comment:** Federally mandated; Completed in 2003 and 2001, respectively*	Yes	No	Yes
Bull Run Watershed Fire Management Plan	Yes	Yes	Yes
Headworks Facilities Plan ***Comment:** PWB report; completed in 2014*	Yes	No	No

	Local Authority	Other Jurisdiction Authority	State Mandated
Water Management & Conservation Plan ***Comment:*** *Completed in 2010; update underway*	Yes	No	Yes
Public Health Plan	No	Yes	No
Other ***Comment:*** *Transportation System Plan 2007—currently being updated* *Bull Run Roads Master Plan* *Wildfire Readiness Assessment & Gap Analysis 2009*	Yes	No	No

An assessment of fiscal capabilities is presented in Table 4-16. An assessment of administrative and technical capabilities is presented in Table 4-17. An assessment of education and outreach capabilities is presented in Table 4-18. Classifications under various community mitigation programs are presented in Table 4-19. The Steering Committee also identified the following additional local resources and capabilities:

- The MAP steering committee
- Potential legal authority identified through Unreinforced Masonry (URM) Workgroup to mandate seismic retrofits and other hazard mitigation related actions
- Strong personal and family preparedness for City employees
- Large membership of backyard habitat certified homes with strong natural science understanding; many of them are in landslide areas
- Strong communication system—Multnomah County Amateur Radio Emergency Service (ARES)
- Strong emergency preparedness education program for people with disabilities
- Robust education program for home retrofitting
- Strong network of community and marginalized groups.

Table 4-16. Fiscal Capability

Financial Resources	Accessible or Eligible to Use?
General Funds	Yes
Community Development Block Grants	Yes –Entitlement City
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes, with voter approval
User Fees for Water, Sewer, Gas or Electric Service	Yes—water, sewer, stormwater
Incur Debt through General Obligation Bonds	Yes, with voter approval
Incur Debt with Revenue Bonds	Yes, with voter approval
Incur Debt through Special Tax Bonds	Yes, with voter approval
Incur Debt through Private Activity Bonds	Yes, with voter approval or Board of County Commissioners Approval
Withhold Public Expenditures in Hazard-Prone Areas	No
State-Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes—System Development Charges
Other	• Possibly—National Fire Plan; Riparian Lands Tax Incentive; Fisheries Restoration and Enhancement Program

Table 4-17. Administrative and Technical Capability

Staff/Personnel Resources	Available?	Department/Agency/Position
Planners or engineers with knowledge of land development and land management practices	Yes	Bureau of Planning and Sustainability (BPS) - Planner
Engineers or professionals trained in building or infrastructure construction practices	Yes	BPS—Planner; Portland Bureau of Transportation (PBOT)—City Engineer, PWB – Chief Engineer, BES – Chief Engineer
Planners or engineers with an understanding of natural hazards	Yes	PBEM – Planner, PWB, PBOT & BES
Staff with training in benefit/cost analysis	Yes	Business Services/Watershed Services/Engineering Services, PWB – Engineering Planning
Surveyors (Not certified)	Yes	Watershed Services/Engineering Services, PWB – Engineering
Staff capable of making substantial damage estimates	Yes	BDS—ACT-20 Certified Engineers/Architects, PWB – Engineering
Personnel skilled or trained in GIS applications	Yes	CGIS; BPS; other bureaus with GIS experts
Scientist familiar with natural hazards in local area	Yes	DOGAMI; USGS; PSU Geology Department; NWS
Emergency manager	Yes	PBEM – Director, PWB Emergency Manager
Grant writers	Yes	PWB-Engineering; BES—Program Manager; PBEM—Planner; BPS - Planner
Other[a]	Yes	Building Codes Division (BCD) Post-Earthquake Inspection Program Cascadia Regional Earthquake Workgroup Community Rating System Users Group DEQ Emergency Response Program Drought Council Energy Facility Siting Council Hazard Mitigation Grant Review Board Oregon Board of Geologist Examiners Oregon Emergency Management Association Oregon Lidar Consortium Oregon Seismic Safety Policy Advisory Committee Pacific Northwest Seismograph Network Pacific Northwest Wildfire Coordinating Group State Interagency Hazard Mitigation Team Water Resources Dam Safety Program Metropolitan Services District Regional Emergency Management Group Multnomah County Emergency Management Multnomah County Drainage District

a. Many of these are state programs and resources that are described in detail in the *2015 Oregon Natural Hazards Mitigation Plan*. Others are regional agencies and resources connected to hazard mitigation planning.

Table 4-18. Education and Outreach

Criterion	Response
Do you have a Public Information Officer or Communications Office?	Yes – PBEM Public Information Officer and Senior Community Outreach & Information Representative
Do you have personnel skilled or trained in website development?	Yes- Bureau of Technology Services (BTS), Business Solutions/ eGovernment
Do you have hazard mitigation information available on your website?	Yes
If yes, please briefly describe:	Resources and links to hazard information Mitigation Action Plan website and related information
Do you utilize social media for hazard mitigation education and outreach?	Yes
If yes, please briefly describe:	PBEM uses Twitter, Facebook, and NextDoor to communicate with the public about hazard mitigation topics.
Do you have any citizen boards or commissions that address issues related to hazard mitigation?	Yes
If yes, please briefly specify:	Unreinforced Masonry Seismic Retrofit Project Mitigation Action Plan Working Group (forthcoming)
Do you have any other programs already in place that could be used to communicate hazard-related information?	Yes
If yes, please briefly describe:	Neighborhood Emergency Teams (NETs) Community Engagement Liaisons (CELs) Mutual Assistance Associations See also key stakeholders and networks in Appendix C
Do you have any established warning systems for hazard events?	Yes
If yes, please briefly describe:	Portland and Multnomah County PublicAlerts system

Table 4-19. Community Classifications

	Participating?	Classification	Date Classified
Community Rating System	Yes	6	May 1, 2016
Building Code Effectiveness Grading Schedule	Yes	2.2	December 2014
Public Protection	Yes	2	Last rating November 2015
Storm Ready	No	N/A	N/A
Firewise	No	N/A	N/A

PART 2—RISK ASSESSMENT

5. HAZARDS AND COMPOUNDING FACTORS

5.1 IDENTIFIED HAZARDS OF CONCERN

Hazard mitigation planning uses all available information to determine what types of disasters may affect a jurisdiction, how often they can occur, and their potential severity. For this plan, the Steering Committee considered the full range of natural hazards that could impact Portland and then identified hazards that present the greatest concern. The process incorporated review of state and local hazard planning documents, as well as information on the frequency, magnitude, and costs associated with hazards that have impacted or could impact Portland. Anecdotal information regarding natural hazards and the perceived vulnerability of Portland's assets to them was also used. Based on the review, this plan addresses the following hazards of concern:

- Severe weather
- Earthquake
- Landslide
- Wildfire
- Flood
- Volcanic activity
- Dam failure
- Drought

All hazards identified as impacting the region in which Portland is located (Region 2) in the Oregon Natural Hazards Mitigation Plan were included in the assessment. The steering committee elected to discuss windstorms and winter storms under the broader category of severe weather.

In addition the Steering Committee determined that information on space weather should be provided in the plan, although there was not enough information currently available for a full risk assessment. As a result, space weather is addressed as an emerging hazard of concern in this plan.

It is important to note that with the exception of dam failure, technological hazards (e.g., hazardous material incidents) and human-caused hazards (e.g., terrorist acts) are not addressed in this plan. Dam failure was selected for inclusion to enhance the Community Rating System (CRS) aspects of this plan, and because the dam failure hazard shares many similarities in modeling and risk assessment with other natural hazards of concern that other human or technological hazards do not.

In addition to the eight hazards of concern and one emerging hazard of concern, the Steering Committee considered including three additional hazards: air quality, erosion, and invasive species. Two of these hazards, erosion and invasive species, were assessed as hazards of concern in the 2010 natural hazard mitigation plan. After discussion and deliberation, the committee elected to discuss these hazards, along with climate change, as secondary hazards of concern or compounding factors. These hazards are discussed below and in the risk assessment profiles of each hazard of concern, as appropriate.

5.2 COMPOUNDING FACTORS AND SECONDARY HAZARDS

This section of the MAP looks at conditions that contribute to or result from hazard events:

- Compounding factors are characteristics of an area that can contribute to the likelihood or severity of a hazard event's occurrence.
- Secondary hazards are impacts that result from a hazard event in a more indirect way than the immediate hazard effects.

Some local conditions can both contribute to and result from a hazard. Table 5-1 shows how identified compounding factors and secondary hazards relate to the hazards of concern evaluated in this plan. The following sections provide further detail on each. The risk assessment for each hazard of concern addresses the compounding factors and secondary hazards specific to that hazard.

Table 5-1. Relationship Between Hazards, Compounding Factors, and Secondary Hazards

	Related Hazards of Concern	
	Compounding Factor	Secondary Hazard
Climate Change	Dam failure, drought, flood, landslide, severe weather, wildfire	Volcanic activity, wildfire
Air quality	Severe weather	Volcanic activity, wildfire
Erosion	Landslide	Dam failure, drought, flood, landslide, severe weather, wildfire
Invasive species	Flood, landslide, wildfire	

5.2.1 Climate Change

What is Climate Change?

Climate, consisting of patterns of temperature, precipitation, humidity, wind, and seasons, plays a fundamental role in shaping natural ecosystems and the human economies and cultures that depend on them. "Climate change" refers to changes in these patterns over a long period of time. Worldwide, average temperatures have increased 1.4°F since 1880 (NASA, 2015). Although this change may seem small, it can lead to large changes in climate and weather.

The warming trend and its related impacts are caused by increasing concentrations of carbon dioxide and other greenhouse gases in the earth's atmosphere. Greenhouse gases are gases that trap heat in the atmosphere, resulting in a warming effect. Carbon dioxide is the most commonly known greenhouse gas; however, methane, nitrous oxide and fluorinated gases also contribute to warming. Emissions of these gases come from a variety of sources, such as the combustion of fossil fuels, agricultural production, changes in land use, and volcanic eruptions. According to the U.S. Environmental Protection Agency (EPA), carbon dioxide concentrations measured about 280 parts per million (ppm) before the industrial era began in the late 1700s and have risen 43 percent since then, reaching 399 ppm in 2014 (see Figure 5-1). Furthermore, scientists are able to place this rise in carbon dioxide in a longer historical context through the measurement of carbon dioxide in ice cores. According to these records, carbon dioxide concentrations in the atmosphere are the highest that they have been in 650,000 years (NASA, 2016). According to NASA, this trend is of particular significance "because most of it is very likely human-induced and [it is] proceeding at a rate that is unprecedented in the past 1,300 years" (NASA, 2016). There is broad scientific consensus (97 percent of scientists) that climate-warming trends are very likely due to human activities (NASA, 2016). Unless emissions of greenhouse

gases are substantially reduced, this warming trend and its associated impacts are expected to continue.

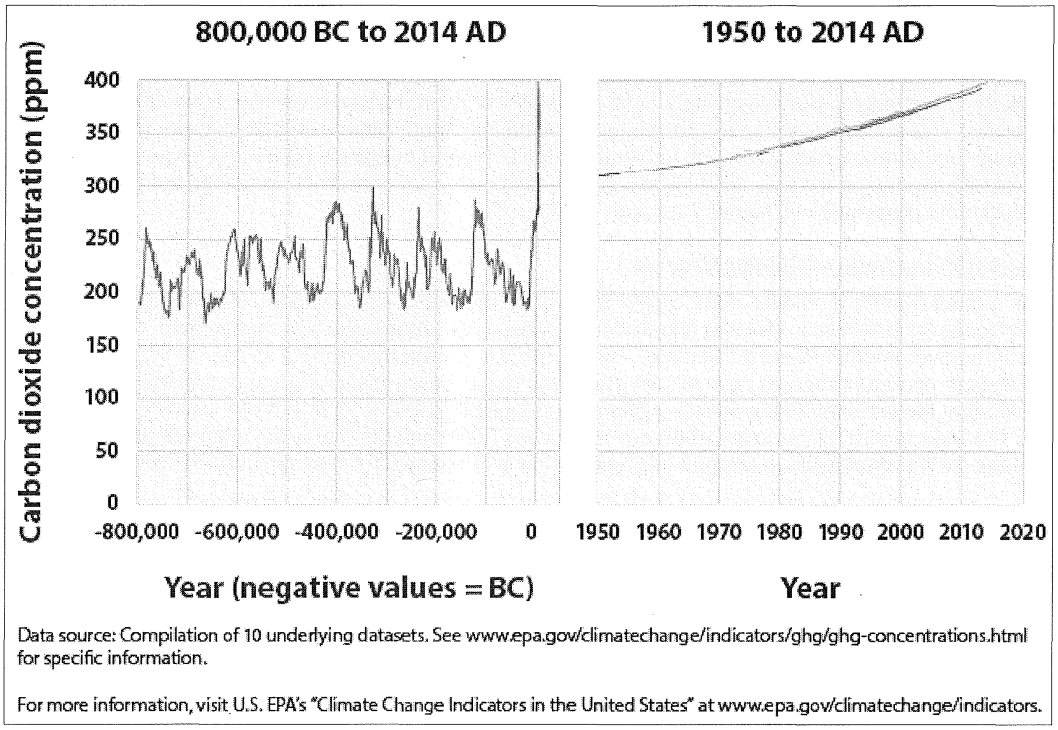


Figure 5-1. Global Carbon Dioxide Concentrations Over Time

Climate change will affect the people, property, economy and ecosystems of the City of Portland in a variety of ways. Climate change impacts are most frequently associated with negative consequences, such as increased flood vulnerability or increased heat-related illnesses/public health concerns; however, other changes may present opportunities. The most important effect for the development of this plan is that climate change will have a measurable impact on the occurrence and severity of natural hazards.

How Climate Change Affects Hazard Mitigation

An essential aspect of hazard mitigation is predicting the likelihood of hazard events in a planning area. Typically, predictions are based on statistical projections from records of past events. This approach assumes that the likelihood of hazard events remains essentially unchanged over time. Thus, averages based on the past frequencies of, for example, floods are used to estimate future frequencies: if a river has flooded an average of once every 5 years for the past 100 years, then it can be expected to continue to flood an average of once every 5 years.

For hazards that are affected by climate conditions, the assumption that future behavior will be equivalent to past behavior is not valid if climate conditions are changing. As flooding is generally

associated with precipitation frequency and quantity, for example, the frequency of flooding will not remain constant if broad precipitation patterns change over time. Specifically, as hydrology changes, storms currently considered to be a 1-percent-annual-chance event (100-year flood) might strike more often, leaving many communities at greater risk. The risks of drought, landslide, severe storms, extreme heat, and wildfire are all affected by climate patterns as well. For this reason, an understanding of climate change is pertinent to efforts to mitigate natural hazards. Information about how climate patterns are changing provides insight on the reliability of future hazard projections used in mitigation analysis. This section summarizes current understandings about climate change in order to provide a context for the recommendation and implementation of hazard mitigation measures. Expected impacts of climate change on the frequency or severity of each hazard of concern is assessed in the risk assessment presented in Chapter 7 through Chapter 10.

Current Indications of Climate Change

The major scientific agencies of the United States and the world—including the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA) and the Intergovernmental Panel on Climate Change (IPCC)—agree that climate change is occurring. Multiple temperature records from all over the world have shown a warming trend, and the IPCC has stated that the warming of the climate system is unequivocal (IPCC, 2014). Of the 10 warmest years in the 134-year record, all but one (1998) occurred since 2000, and 2015 was the warmest year on record (NASA, 2016). Worldwide, average temperatures have increased 1.4ºF since 1880 (NASA, 2016).

Rising global temperatures have been accompanied by other changes in weather and climate. Many places have experienced changes in rainfall resulting in more intense rain, as well as more frequent and severe heat waves (IPCC, 2014). The planet's oceans and glaciers have also experienced changes: oceans are warming and becoming more acidic, ice caps are melting, and sea levels are rising (NASA, 2016). Global sea level has risen approximately 6.7 inches, on average, in the last 100 years (NASA, 2016). This has already put some coastal homes, beaches, roads, bridges, and wildlife at risk (USGCRP, 2009).

NASA currently maintains information on the vital signs of the planet. At the time of the development of this plan, the following trends and status of these signs are as follows (NASA, 2016):

- Carbon Dioxide—Increasing trend, currently at 403.28 parts per million
- Global Temperature—Increasing trend,, increase of 1.4 degrees Fahrenheit since 1880
- Arctic Ice Minimum—Decreasing trend, 13.4 percent per decade
- Land Ice—Decreasing trend, 287.0 billion metric tons per year
- Sea Level—Increasing trend, 3.4 mm per year.

Projected Future Impacts

The Third National Climate Assessment Report for the United States indicates that impacts resulting from climate change will continue through the 21st century and beyond. Although not all changes are understood at this time and the impacts of those changes will depend on global emissions of greenhouse gases and sensitivity in human and natural systems, the following impacts are expected in the United States (NASA, 2016):

- Temperatures will continue to rise
- Growing seasons will lengthen
- Precipitation patterns will change
- Droughts and heat waves will increase

- Hurricanes will become stronger and more intense
- Sea level will rise 1-4 feet by 2100
- The Arctic may become ice free.

The 2015 Climate Action Plan states that the primary risks facing Multnomah County and the City of Portland (2015) include:

- Hotter, drier summer with more high-heat days
    - Increased temperatures (both day and night) and frequency of high heat days
    - Increased incidence of drought
    - Increased wildfire frequency and intensity
- Warmer winters with the potential for more intense rain events
    - Increased incidence and magnitude of damaging floods
    - Increased incidence of landslides.

Responses to Climate Change

Communities and governments worldwide are working to address, evaluate and prepare for climate changes that are likely to impact communities in coming decades. Generally, climate change discussions encompass two separate but inter-related considerations: mitigation and adaptation. The term "mitigation" can be confusing, because it's meaning changes across disciplines:

- Mitigation in restoration ecology and related fields generally refers to policies, programs or actions that are intended to reduce or to offset the negative impacts of human activities on natural systems. Generally, mitigation can be understood as avoiding, minimizing, rectifying, reducing or eliminating, or compensating for known impacts (CEQ, 1978).
- Mitigation in climate change discussions is defined as "efforts to reduce carbon emissions in order to slow climate change" (Multnomah County and the City of Portland, 2015). It includes strategies to reduce greenhouse gas sources and emissions and enhance greenhouse gas sinks.
- Mitigation in emergency management is typically defined as the effort to reduce loss of life and property by lessening the impact of disasters (FEMA, 2013).

In this section, mitigation is used as defined by the climate change community. In the other chapters of this plan, mitigation is primarily used in an emergency management context.

Adaptation is defined by the IPCC as "the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities, In some natural systems, human intervention may facilitate adjustment to expected climate and its effects" (IPCC, 2014).

Mitigation and adaptation are related, as the world's ability to reduce greenhouse gas emissions will affect the degree of adaptation that will be necessary. Some initiatives and actions can both reduce greenhouse gas emissions and support adaptation to likely future conditions. Portland and Multnomah County's *Climate Action Plan* includes actions to reduce carbon emissions as well as actions to prepare for impacts.

5.2.2 Air Quality

Air quality can be impacted by a variety of natural and non-natural sources. Air pollution can come from human-created stationary sources such as factories, human-created mobile sources such as planes and automobiles, and naturally occurring sources such as volcanic eruptions and dust storms. The EPA defines air pollution as "the presence of contaminants or pollutant substances in the air that interfere with our health or welfare, or produce other harmful environmental effects." The Oregon Department of Environmental Quality (DEQ) is the state administrative agency charged with preserving and enhancing Oregon's air quality to support healthy, clean air for all Oregonians (Oregon DEQ, 2016).

The natural dispersal of air pollutants in Portland is inhibited by interactions of topography and climate. Portland is in a valley with mountains on either side, which limits the ability of winds to disperse pollutants horizontally across areas as they might in a flatter landscape. This is particularly of concern during the summer when winds tend to be lighter and from the north. This lack of dispersal is intensified when the vertical mixing of air is inhibited by an inversion—when warm air is found at higher elevations than cool air. Inversions are common in all seasons In Portland and in western Oregon (Johnson, 1987). Figure 5-2 illustrates the relationship between inversions and air quality during winter, when inversions tend to be strongest (NWS, 2016).

According to DEQ, Portland's air meets all federal air quality health standards for the six principal pollutants regulated under the Clean Air Act: carbon monoxide, ozone, particulate matter, nitrogen oxides, sulfur oxides and lead (Oregon DEQ, 2016). DEQ notes that in recent years concerns have been raised regarding air toxics in Portland. Air toxics are defined as air pollutants known or suspected to cause cancer and come from a variety of sources (cars, consumer products, burning, etc.). No federal standards currently exist for these toxics. The air quality discussion in the MAP is not primarily concerned with controlling or eliminating sources of regulated or non-regulated air pollution. The discussion for this plan is limited to air pollution as a secondary hazard or compounding factor as it relates to natural hazard mitigation.

Air quality forecasts and current conditions can be viewed online at AirNow:

https://www.airnow.gov/index.cfm?action=airnow.local_city&cityid=160

5.2.3 Erosion

The 2010 NHMP assessed erosion as a hazard of concern; however, the plan states that the magnitude and severity of erosion in the City are 'negligible' and that erosion occurrences are typically secondary events that are directly linked to other hazard events. Because of this assessment, the 2016 Steering Committee elected to address erosion as a secondary hazard or compounding factor as appropriate in the MAP.

General Background

The city experiences annual rain and wind events that impact river shorelines combined with landslides and debris flows within the watersheds, loss of plant cover in riparian areas and river-traffic-induced erosion. During severe storm events riverine erosion is magnified due to increased volume and velocity of the water flow. Erosion is a problem in developed areas where the disappearing land threatens development and infrastructure.

Source: NWS, 2016

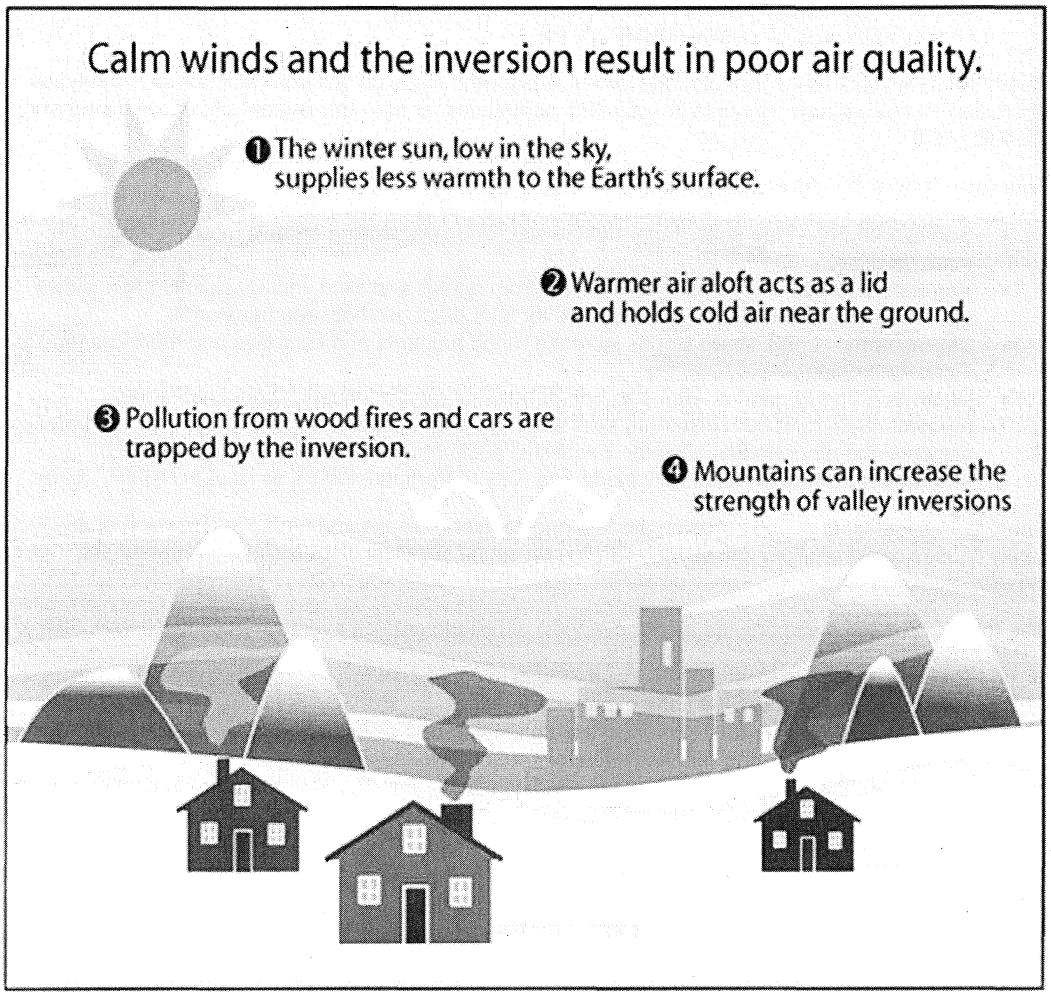


Figure 5-2. Impact of Inversion on Air Quality

There are two main types of erosion that affect human activity in Portland (NHMP, 2010).

- Riverine erosion results from the force of flowing water in and adjacent to river, creek, and tributary channels. This erosion affects the bed and banks of the channel and can alter or preclude any channel navigation or embankment development. In less stable braided channel reaches, erosion and material deposition are a constant issue. In more stable meandering channels, episodes of erosion may only occur occasionally.

- Wind erosion occurs when wind removes, moves and re-deposits soil. It can cause a loss of topsoil, hindering agricultural production. Blowing dust can also reduce visibility and have a negative effect on air quality (NHMP, 2010).

Runoff from rain cuts rills (channels) and gullies, while wind can strip soil from wide areas. Both types of erosion can move large amounts of sediment, sometimes far from the original site of soil disturbance (NHMP, 2010).

Four main factors influence erosion (NHMP, 2010):

- **Soil erodibility**—Fine soils, impermeable soils and soils lacking organic material tend to be more erodible.
- **Vegetative cover**—Vegetation shields soil from rainfall and wind, increases infiltration, slows runoff velocities, and retains soil moisture for later plant use between rainstorms.
- **Topography**—Long, steep slopes increase runoff amounts and velocities and therefore tend to increase erosion.
- **Weather**—The frequency, intensity, and duration of rainfall influence sediment release amounts. Sediment from disturbed soils can move into neighboring properties, streets, drainage systems and other bodies of water. Excessive sediment damages the functions of both stormwater sewers and natural watersheds (City of Portland, 2008b as cited in NHMP, 2010).

The City has identified riverine erosion areas along its rivers, creeks and tributaries. Erosion of any type rarely causes death or injury. However, erosion can cause significant destruction to property and infrastructure.

The following descriptions provide a brief overview of historic erosion events in the city (NHMP, 2010):

- Riverine erosion in local creeks occurred with minimal damage as culverts were filled and backed-up during the 1964 flood event.
- Wildfires in 2000 and 2001 removed vegetation that had stabilized hillsides. Subsequent erosion damage occurred during rain and snowmelt runoff events.
- Severe weather brings snow, rain and wind impacts to the city. Historical severe weather events surpassed the soil and the built environment's capacity to absorb or manage run-off, which results in erosion damage.

Location

Portland has many streams flowing down canyons in its hilly terrain. The intensity of the flow in the streams during the rainy season causes erosion to the banks. All rivers and creeks are subject to erosion. The city has two rivers and multiple streams and creeks. Some of those streams and rivers that are potentially threatened by erosion include: the Columbia and Willamette Rivers, Johnson, Tryon and Fanno Creeks; and the Columbia Slough. Hillside creeks are subject to erosion as a result of runoff caused by rain or melting snow pack (NHMP, 2010).

A variety of natural and human-induced factors influence the erosion process within the community. River orientation and proximity to upstream and downstream river bends can influence erosion rates. Embankment (earth or rock piled to keep back water or support a road) composition also influences erosion rates, (sand and silt will erode easily, whereas boulders or large rocks are more erosion resistant). Other factors that may influence riverine erosion include (NHMP, 2010):

- Geomorphology (land formations)
- Amount of encroachment in the high hazard zone

- Proximity to erosion-inducing structures
- Nature of the topography
- Density of development
- Structure types along the embankment
- Embankment elevation.

Erosion along the banks of the rivers and streams in the city is generally caused by a combination of factors; the natural process of a watercourse to find the path of least resistance; debris flows within the watershed; loss of riparian area plant cover; logging, wildfires, increased boat traffic close to the shoreline, and runoff from rainfall. While erosion has been identified as occurring within the city, few events have been reported that resulted in substantial damage.

Current Erosion Plan

The 2008 Erosion and Sediment Control Manual is a key reference for actions to be taken to mitigate erosion in development and maintenance situations. This plan describes vulnerability as not only in riverine areas, but any location where land is being moved and therefore impacts the natural areas.

Title 10 and this Erosion Control Manual apply to all ground-disturbing activities, whether or not a permit is required, unless such activities are otherwise exempted by Portland City Code.

Site planning and good site control are best practices that can be used to prevent discharges from a development site. The manual emphasizes careful planning and erosion prevention. Undisturbed groundcover must be retained whenever possible. This emphasis is particularly important in the Pacific Northwest immediately before and during the rainy season, when it is difficult to establish vegetation and the intense rains have high erosion potential.

5.2.4 Invasive Species

Invasive species was addressed as a hazard of concern in the 2010 natural hazard mitigation plan. It was the position of the 2016 Steering Committee that the hazard be assessed as a secondary hazard and compounding factor as appropriate in the MAP.

General Background

Invasive plants are those species that spread at such a rate that they cause harm to human health and the environment. In general, most invasive plants are non-native species, however, not all non-native plants are invasive (City of Portland, 2009 as cited in NHMP, 2010).

Invasive plants have been introduced into an environment in which they did not originate. They lack natural enemies, grow and reproduce quickly and are able to thrive in a wide variety of conditions. These characteristics allow plants to invade new habitats and out-compete natives, resulting in dense thickets of a single plant species. Dense thickets of invasive plants limit native plant diversity which in turn reduces food and shelter for wildlife. Invasive plants are the second leading cause of species extinction. Many invasive plants have shallow root systems that provide limited erosion control. Invasive plants also shade out native seedlings resulting in fewer trees. Less shade creates higher water temperatures, reducing oxygen for fish and other aquatic animals. Reduced tree cover also reduces storm water interception and absorption of $C0_2$ which interferes with the stabilization of the earth's temperature (NHMP, 2010). Invasive aquatic plants can decrease stormwater conveyance or cause debris blockages, increasing flood risk.

The City of Portland Bureau of Planning and Sustainability has developed lists of native, nuisance and prohibited plants. All of the species on the City's nuisance list and all of the species on its prohibited list are considered invasive plants. A native plant is a species that was likely found historically (prior to European settlement) in the Portland area. Nuisance plants are considered harmful to humans and plants and have a tendency to dominate plant communities (NHMP, 2010).

Arrival and Impacts

Most invasive plants arrived in Oregon through intentional introductions, however, in most cases, the uncontrolled spread was not anticipated. The number of new introductions has increased consistently with global trade and travel. Most invasive plant introduction pathways are human induced; the plants and their seeds travel on cars, trains, heavy equipment, boats, shoes and pets. The plants tend to become established along transportation corridors such as roads, utility easements, trails, parks and ports of entry. Humans also introduce new invasive plants through the nursery trade and gardening. Invasive plants are also transported through ecological pathways such as wind, wildlife, streams and other waterbodies. Land management practices such as mowing or constant soil disturbance also facilitate the establishment of and persistence of invasive plants (NHMP, 2010).

The following descriptions provide a brief overview of how invasive species have affected environmental health historically in the city (NHMP, 2010):

- **Water quality**—reduction in soil stability and of canopy diversity from invasive species results in increased stream temperatures and increased erosion.
- **Biodiversity**—rapid spread of invasive plant species creates monocultures by displacing native plants or by preventing their growth and establishment (which has affected water and air quality and stabilization of stream banks).
- **Habitat**—simplification of a plant community structure by an invasive plant monoculture reduces fish and wildlife habitat.
- **Tree Cover**—invasive cover in the shrub and groundcover layer prevents a natural forest regeneration processes.
- **Soil Health**—soils altered through allelopathy (the process of releasing chemicals that alter the soil chemistry and soil fungal processes thereby inhibiting the growth of neighboring plants, by another plant).
- **Wildfire**—some invasive plant species act as "fuel ladders" which facilitate the ability of a fire to travel into the tree canopy of conifers. Presence of invasive species makes the fire hotter, more difficult to control and more likely to continue to spread.
- **Stormwater**—forming monocultures, invasive species often preclude the establishment of native vegetation and tree canopy, altering vegetation cover types which can result in reduced stormwater interception by trees (City of Portland, 2008a as cited in NHMP, 2010).

Extensive infestations of invasive vines can also be implicated in multiple natural hazards. Trees overburdened with ivy or clematis vines are commonly found alongside several important traffic corridors in the city (Hwy. 26, Hwy. 30, Germantown Road). These overburdened trees are unstable and are often uprooted during rain or snow events and fall across power lines or roadways. When found on step unstable slopes these infested trees can be blown down and become involved in localized landslides (NHMP, 2010).

Fungal infestations can damage the health of native vegetation and contribute to increased wildfire risk. Swiss needle cast is a fungal disease affecting Douglas fir forests in Oregon, predominantly over the past 20 years. Although the fungus is native to Oregon, its detrimental impact may be increasing due to

rising spring and summer temperatures (Black et al., 2010) Douglas fir is one of the prominent tree species in Forest Park. A decline in the health of Forest Park's trees due to Swiss needle cast could contribute to increased fuel loads and combustibility, leading to greater risk and severity of wildfires in Portland. (Weiskittel et al., 2004).

For more information on invasive species in Portland, please visit the Bureau of Environmental Services Invasive Species Management website:

https://www.portlandoregon.gov/bes/45696

6. RISK ASSESSMENT METHODOLOGY

In hazard mitigation planning, risk is defined as the potential for damage, loss, or other impacts created by the interaction of natural hazards with community assets (see Figure 6-1).

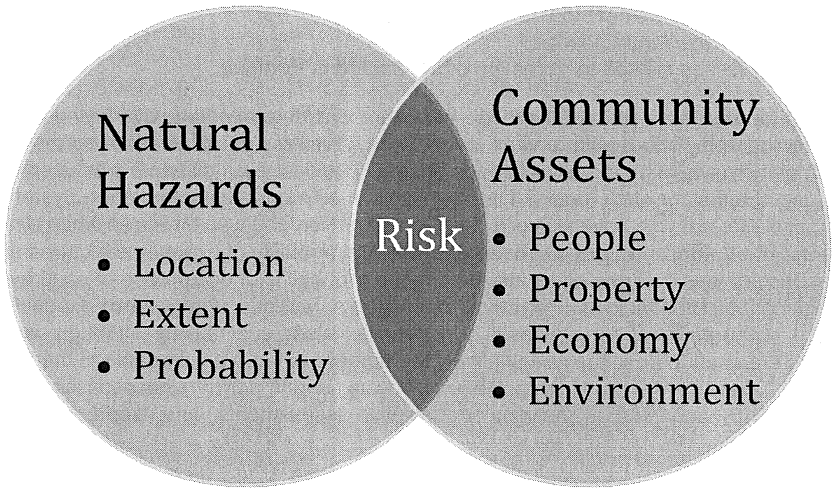


Figure 6-1. Risk in Hazard Mitigation

Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage that can result from natural hazards. It allows emergency management personnel to establish planning and response priorities by identifying potential hazards and vulnerable assets. The process focuses on the following elements:

- Vulnerability identification—Identify the people, property, environment, economic assets, and lands of Portland that could experience loss from natural hazard events.
- Cost evaluation—Estimate the cost of potential damage or the cost that could be avoided by taking steps to mitigate the risk.

6.1 OVERALL RISK ASSESSMENT METHODOLOGY

The risk assessments in Chapters 7 through 15 of this plan evaluate the risk of all identified hazards of concern prevalent in Portland. Each chapter describes the hazard, Portland's exposure and vulnerability, and probable event scenarios, meeting the requirements of the DMA (44 CFR, Section 201.6(c)(2)). The planning team reviewed existing studies, reports and technical information to determine the best available data to use in the risk assessment (44 CFR, Section 201.6(b)(3)). Information from these sources was incorporated into the hazard profiles and forms the basis of the

exposure and vulnerability assessment. The following steps were used to assess the risk of each hazard:

- **Profile each hazard**—The following information is given for each hazard:
  - Summary of past events
  - Geographic area most affected by the hazard
  - Event frequency estimates
  - A discussion of the severity of the hazard event
  - Warning time likely to be available for response
  - Secondary hazards or compounding factors associated with or resulting from the hazard of concern
  - Future development that may impact risk
  - Worst-case event scenario
  - Key issues related to mitigation of the hazard in Portland.
- **Determine exposure to each hazard**—Exposure was determined by overlaying hazard maps with demographic information and an inventory of structures, facilities and systems to determine which of them would be exposed to each hazard. The best available data was used to delineate the area of effect for each hazard. Data available in a Geographic Information System (GIS)-compatible format with coverage of the full extent of Portland was preferred when available.
- **Assess the vulnerability of exposed assets**—Vulnerability of exposed structures and infrastructure was determined by interpreting the probability of occurrence of each event and assessing the potential level of damage to structures, facilities, and systems exposed to each hazard. Vulnerability of populations is generally discussed qualitatively, although some model outputs are used to describe quantitatively the number of people vulnerable to the hazard event. FEMA's hazard-modeling program, Hazus-MH was used to perform this assessment for some hazards; GIS-based spatial analyses or qualitative assessments were used for others.

6.2 MAPPING

National, state and local spatial databases were reviewed for this planning effort. Maps were produced using GIS software to show the spatial extent of identified hazards when such data was available. These maps are included in the hazard profile chapters of this document. Maps at the reporting-area scale are included in Appendix E. Information on the data sources and methodologies used for hazard mapping is provided in Appendix F.

6.3 ASSESSING DAM FAILURE, EARTHQUAKE, FLOOD

6.3.1 Overview of FEMA's Hazus-MH Software

FEMA developed the Hazards U.S., or Hazus, model in 1997 to estimate losses caused by earthquakes. Hazus was later expanded into a multi-hazard methodology, Hazus-MH, with new models for estimating potential losses from hurricanes and floods. Hazus-MH is a GIS-based software program used to support risk assessments, mitigation planning, and emergency planning and response. The program maps and displays hazard data and the results of damage and economic loss estimates for buildings and infrastructure. The use of Hazus-MH for hazard mitigation planning offers numerous advantages:

- Provides a consistent methodology for assessing risk across geographic and political entities.

- Provides a way to save data so that it can readily be updated as population, inventory, and other factors change and as mitigation planning efforts evolve.
- Facilitates the review of mitigation plans because it helps to ensure that FEMA methodologies are incorporated.
- Supports grant applications by calculating benefits using FEMA definitions and terminology.
- Produces hazard data and loss estimates that can be used in communication with local stakeholders.
- Is administered by the local government and can be used to manage and update a hazard mitigation plan throughout its implementation.

6.3.2 Levels of Detail for Evaluation

Hazus-MH provides a wide range of inventory data, such as demographics, building stock, critical facilities, transportation and utility lifeline, and multiple models to estimate potential losses from natural disasters. The software's default data for inventory, vulnerability and hazards can be supplemented with local data to allow a more refined analysis. The model can carry out three levels of analysis, depending on the format and level of detail of information about Portland:

- **Level 1**—A Level 1 analysis estimates losses using only the software's default data. This data is derived from national databases and describes in general terms the characteristic parameters of a planning area.
- **Level 2**—A Level 2 analysis produces more accurate estimates of losses by supplementing the software's default data with detailed information in a GIS format about local geology, hydrology, hydraulics, building inventory, utilities and critical facilities.
- **Level 3**—This level of analysis generates the most accurate estimate of losses. It requires detailed engineering and geotechnical information to customize it for a local planning area.

6.3.3 Application for This Plan

The Hazus-MH model was used as follows for the hazards evaluated in this plan:

- **Flood**—A Level 2 analysis was performed for general building stock and for critical facilities and infrastructure. The effective Digital Flood Insurance Rate Map (DFIRM) for Portland was used to delineate flood hazard areas and estimate potential losses from the 10-, 100- and 500-year flood events. The effective DFIRM assumes the continued protection of FEMA-certified flood control levees and does not include residual exposure. Using the DFIRM floodplain boundaries and base flood elevation data and the City's 3-foot digital elevation model data, flood depth grids were generated and integrated into the Hazus-MH model. To estimate damage that would result from a flood, Hazus uses pre-defined relationships between flood depth at a structure and resulting damage, with damage given as a percent of total replacement value. Curves defining these relationships have been developed for damage to structures and for damage to typical contents within a structure. By inputting flood depth data and known property replacement cost values, dollar-value estimates of damage were generated.
- **Dam Failure**—The basis for this analysis was dam failure inundation mapping for Mt. Tabor Reservoirs 1, 5, and 6, and Washington Park Reservoirs 3 and 4. Inundation depth grids were created using inundation area boundaries and the City's 3-foot digital elevation model. The depth grids were imported into Hazus-MH and a Level 2 analysis was run using the flood methodology described above. Inundation area boundaries were not available for Portland's flood control levees at the time of this analysis.

- **Earthquake**—A Level 2 analysis was performed to assess earthquake risk and exposure. Earthquake shake maps and probabilistic data prepared by the U.S. Geological Survey (USGS) were used for the analysis of this hazard. National Earthquake Hazard Reduction Program (NEHRP) soils, liquefaction susceptibility and landslide susceptibility data were also integrated into the Hazus-MH model. Two scenario events and two probabilistic events were modeled:
  - The scenario events were a Magnitude-9.0 event on the Cascadia Subduction Zone and a Magnitude-6.5 event on the Portland Hills Fault.
  - The standard Hazus analysis was run for the 100- and 500-year probabilistic events.

6.4 ASSESSING LANDSLIDE, SEVERE WEATHER, VOLCANO, WILDFIRE

For landslide, severe weather, volcano and wildfire, historical data was not adequate to model future losses. However, areas and inventory susceptible to some of the hazards of concern were mapped by other means and exposure was evaluated. For other hazards, a qualitative analysis was conducted using the best available data and professional judgment.

6.5 ASSESSING DROUGHT

The risk assessment methodologies used for this plan focus on damage to structures. Because drought does not impact structures to the same degree as other hazards, the risk assessment for drought was more limited and qualitative than the assessment for the other hazards of concern.

6.6 ASSESSING SPACE WEATHER

Space weather is identified in this plan as an emerging hazard of concern; therefore, a detailed risk assessment of the hazard was not conducted. Additional information pertaining to risk from the space weather hazard will be monitored over the performance period of the plan; the potential for conducting a detailed risk assessment will be evaluated at the next plan update.

6.7 ASSESSING SOCIAL VULNERABILITY

Several demographic variables were extracted from the U.S. Census Bureau's American Community Survey database: total population, population under 15 years of age, population over 65 years of age, white population, people of color, total housing units, occupied housing units, owner-occupied housing units, renter-occupied housing units, total families, families below the poverty line, total households, and households speaking limited English. The number of people affected by a hazard in each demographic subset was first estimated for small areas called block groups, which are defined in the Census data:

- For each block group, the number of residential structures within the defined hazard zone was divided by the total number of residential structures in the block group.
- The resulting multiplier was applied to the population of each demographic subset in that block group to estimate the impacted number of people in each subset in each block group.
- The impacted populations of all block groups in a reporting area were totaled to get the impacted number of people in each subset in each reporting area.

6.8 DATA SOURCES, LIMITATIONS AND GAPS

6.8.1 Building Counts and Replacement Cost Value

The Hazus-MH modeling used GIS-based data on structure type, number and replacement cost. When available, an updated inventory was used in place of the Hazus-MH defaults for critical facilities and infrastructure. Replacement cost is the cost to replace an entire structure with one of equal quality and utility. It is based on industry-standard cost-estimation models published in *RS Means Square Foot Costs* (RS Means, 2015). Replacement cost of a structure is estimated based on its Hazus occupancy class (e.g., multi-family residential, commercial retail trade) and its square footage as indicated in the building data. For single-family residential, the construction class and number of stories also factor into the square foot costs.

6.8.2 Data Used for Spatial Analysis

Table 6-1 describes the data used for spatially based exposure and vulnerability assessments. If no database was available, it was noted as a gap (see Section 6.8.3).

6.8.3 Limitations and Data Gaps

General Limitations

Loss estimates, exposure assessments and vulnerability evaluations rely on the best available data and methodologies. However, results are subject to uncertainties associated with the following factors:

- Incomplete scientific knowledge about natural hazards and their effects on the built environment
- Approximations and simplifications necessary to conduct a study
- Incomplete or outdated structure, demographic or economic parameter data
- The variable nature, geographic extent and severity of each hazard
- Mitigation measures already employed
- The amount of advance notice residents have to prepare for a specific hazard event.

These factors can affect loss estimates by a factor of two or more. Therefore, potential exposure and loss estimates are approximate and should be used only to understand relative risk.

Despite their limitations, risk assessment techniques are able to indicate the possible extremes of hazard events. Their findings should be recognized as identification of potential hazard occurrences rather than as predictions of probable hazard events.

Identified Data Gaps and Specific Limitations

Hazus-MH currently represents the industry best management practice for assessing risk in support of hazard mitigation planning. However, Hazus and other models used for this risk assessment are limited by the availability of data to support their working components. Such models must use assumptions where firm data are not available. Assumptions are used, for example, to estimate ground deformation caused by liquefaction. These model limitations can lead to an understatement or overstatement of risk.

Table 6-1. Summary of Data Used for Spatial Analysis

Data	Source
Base Map Data	City boundaries, roads, water features, risk reporting areas provided by City of Portland.
General Building Stock Update	Building footprints and associated building information provided by City of Portland Bureau of Planning and Sustainability.
Critical Facility Database Update[a]	Emergency services (emergency operations centers, fire stations, medical care facilities, and police stations) provided by City of Portland and Regional Disaster Preparedness Organization.
	Schools provided by City of Portland.
	Transportation systems (airports, bus facilities, highway bridges, highway tunnels, railway bridges, rail facilities, and railway tunnels) provided by City of Portland and Regional Disaster Preparedness Organization
	Light rail bridges, facilities, and tunnels provided by TriMet.
	Port facilities provided by Port of Portland.
	Dams provided by Oregon Water Resources Department and the National Inventory of Dams.
	Hazardous materials facilities provided by the Oregon State Fire Marshall.
	Armories and nuclear reactor facilities provided by the City of Portland Bureau of Emergency Management.
	Military facilities provided by the Regional Disaster Preparedness Organization.
	Communications facilities provided by City of Portland and Hazus-MH default data.
	Electric power facilities provided by City of Portland, Regional Disaster Preparedness Organization, and Hazus-MH default data.
	Natural gas facilities provided by Oregon Public Health and Pacific Terminal Services.
	Petroleum facilities provided by Oregon Public Broadcasting, Regional Disaster Preparedness Organization, and Kinder Morgan.
	Potable water facilities provided by City of Portland Water Bureau.
	Wastewater facilities provided by City of Portland BES.
	Prisons provided by Regional Disaster Preparedness Organization.
	City-owned essential facilities, nursing homes and assisted living facilities provided by City of Portland.
Flood	Effective Digital Flood Insurance Rate Map downloaded from FEMA website.
	2014 3-foot resolution digital elevation model provided by City of Portland.
	Levee data provided by City of Portland.
	Repetitive loss data and active National Flood Insurance Program properties acquired from FEMA and geocoded by City of Portland.
Earthquake	Shake maps for Cascadia M-9.0 and Portland Hills M-6.5 downloaded from USGS website.
	Liquefaction susceptibility, landslide susceptibility, National Earthquake Hazard Reduction Program (NEHRP) soils, and active faults data provided by Oregon Department of Geology and Mineral Industries.
Landslide	Regulatory landslide hazard area and historical landslide deposits data provided by City of Portland.
Dam Failure	Mt Tabor Reservoirs 1, 5 and 6, and Washington Park Reservoirs 3 and 4 inundation areas data provided by City of Portland Water Bureau.
Wildfire	Wildfire fire hazard data provided by City of Portland.
Volcano	Mt. Hood Region volcano hazards data downloaded from USGS Cascade Volcano Observatory (CVO) website.
Demographics	2010-2014 American Community Survey 5-year Estimates (block group level) data downloaded from U.S. Census Bureau website.
Current and Future Land Use	Proposed comprehensive plan designations (future land use) data provided by City of Portland Bureau of Planning and Sustainability.

a. Not all requested data was received, so gaps in the database are present. Future planning efforts will work to address these gaps.

Appendix G presents findings from an evaluation of the data sources used for the risk assessment. It identifies gaps and potential impacts on the risk assessment results. The following are limitations specific to the datasets used in this planning process:

- City of Portland building data lacked certain detailed information, such as first floor elevation, so Hazus default building information was used. Detailed building information like this plays a major role in calculating replacement costs and evaluating how structures will behave during hazard events.
- Model data input requirements necessitate the conversion of building footprints into single-point features. Building locations are represented by single points at the centroid of the building footprint.
- Hazus does not currently have established depth-damage functions for estimating losses to houseboats during flood events.
- The current landslide data was produced at state-level scale. It is in the process of being updated at a county-level scale, which will be more appropriate for future exposure analyses for the City.
- The wildfire data is dated. This data will most likely be updated with LiDAR and new vegetation data that will improve the level of detail and accuracy.
- Not all critical facility data was available or complete. Appendix G outlines the specific gaps.
- Population estimates are generally based on where people are estimated to reside and do not take into account where individuals are likely to be at any given point in the day (e.g. school or work).
- Demographic data on persons with disabilities is aggregated at the tract level by the U.S. Census Bureau. This tract level data could not be used in a meaningful way for estimates for risk reporting areas.
- Potential exposure and vulnerability of linear critical infrastructure may overstate risk, as elevation and existing mitigation measures were not taken into consideration during the assessment.

7. SEVERE WEATHER



7.1 GENERAL BACKGROUND

Severe weather refers to any dangerous meteorological phenomena with the potential to cause damage, serious social disruption, or loss of human life. It includes thermal extremes, thunderstorms, tornadoes, windstorms, and winter storms.

The most common severe weather events that impact Portland are windstorms and winter storms, although extreme temperature events are becoming more common in recent years.

7.1.1 Thermal Extremes

Thermal extremes refer to relatively short-lived weather conditions that produce unusually hot or unusually cold conditions for an area. These events are deviations from normal or average seasonal temperatures and, thus, the threshold for an event varies based on average or typical conditions for a given locality. Normal temperatures for Portland are shown in Table 4-1 and Table 4-2.

Excessive Heat Events

Excessive heat events are defined by the U.S. EPA as "summertime weather that is substantially hotter and/or more humid than average for a location at that time of year" (U.S. EPA, 2006). Heat waves are excessive heat events that typically last two or more days. Because extreme heat is relative to the usual weather in a region, criteria that define an extreme heat event differ among jurisdictions and with the time of year. For Multnomah County, heat advisory protocols

DEFINITIONS

- **Freezing Rain**—The result of rain occurring when the temperature is below the freezing point. The rain freezes on impact, resulting in a layer of glaze ice up to an inch thick. In a severe ice storm, an evergreen tree 60 feet high and 30 feet wide can be burdened with up to six tons of ice, creating a threat to power and telephone lines and transportation routes.
- **Heavy Rain**—events during which the amount of rain experienced in a location substantially exceeds what is normal for the location and season.
- **Severe Local Storm**—Small atmospheric systems, including tornadoes, thunderstorms, windstorms, ice storms and snowstorms. Typically, major impacts from a severe storm are on transportation infrastructure and utilities. These storms may cause a great deal of destruction and even death, but their impact is generally confined to a small area.
- **Thunderstorm**—Typically 15 miles in diameter and lasting about 30 minutes, thunderstorms are underrated hazards. Lightning, which occurs with all thunderstorms, is a serious threat to human life. Heavy rains over a small area in a short time can lead to flash flooding. Strong winds, hail and tornadoes are also dangers associated with thunderstorms.
- **Tornado**—Tornadoes are funnel clouds of varying sizes that generate winds more than 300 miles per hour. A tornado is formed by the turbulent mixing of layers of air with contrasting temperature, moisture, density and wind flow. The mixing layers of air account for most of the tornadoes occurring in April, May and June, when cold, dry air meets warm, moister air moving up from the south. They can affect an area up to a mile wide, with a path of varying length. Tornadoes can come from lines of cumulonimbus clouds or from a single storm cloud. They are measured using the Fujita Scale ranging from F0 to F6.
- **Windstorm**—A storm featuring violent winds. Southwesterly winds are associated with strong storms moving onto the coast from the Pacific Ocean. Southern winds parallel to the coastal mountains are the strongest and most destructive winds. Windstorms tend to damage ridgelines that face into the winds.
- **Winter storm**—The National Weather Service defines a winter storm as having significant snowfall, ice, and/or freezing rain; the quantity of precipitation varies by elevation. Heavy snowfall is 4 inches or more in a 12-hour period, or 6 inches or more in a 24-hour period in non-mountainous areas; and 12 inches or more in a 12-hour period or 18 inches or more in a 24-hour period in mountainous areas.

are triggered by three consecutive days with an average maximum temperature above 95°F (City of Portland and Multnomah County, 2014).

Heat Index

Extreme heat events are often a result of ambient air temperature combined with other factors. Heat index tables (see Figure 7-1) provide information about how hot it feels based on meteorological conditions. Heat index values are for shady, light wind conditions; full sunshine can increase heat index values by up to 15°F. Strong winds with hot, dry air also can be hazardous (NWS, 2014a).

Source: National Weather Service/NOAA

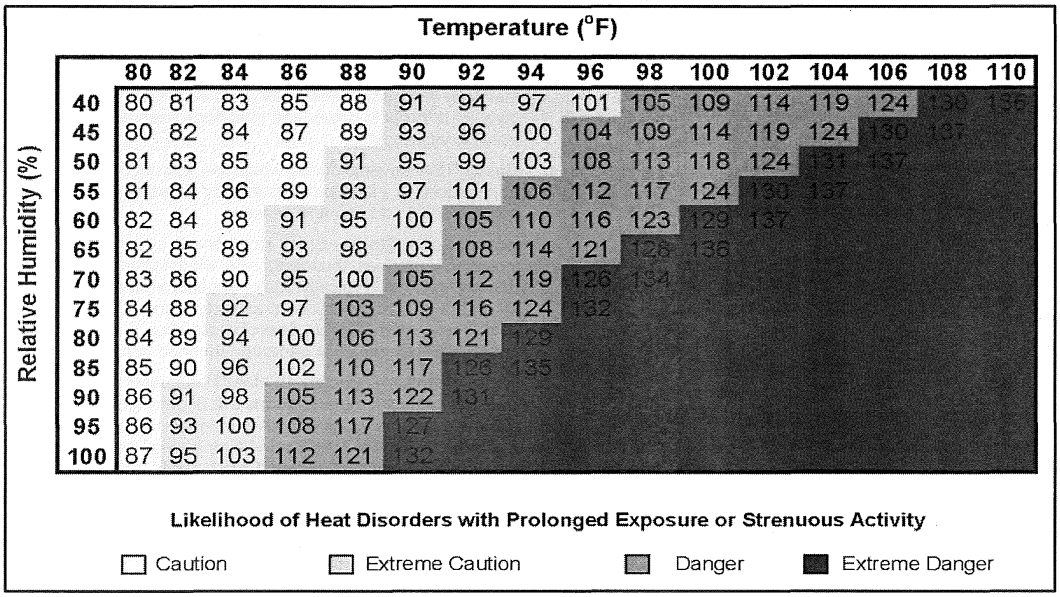
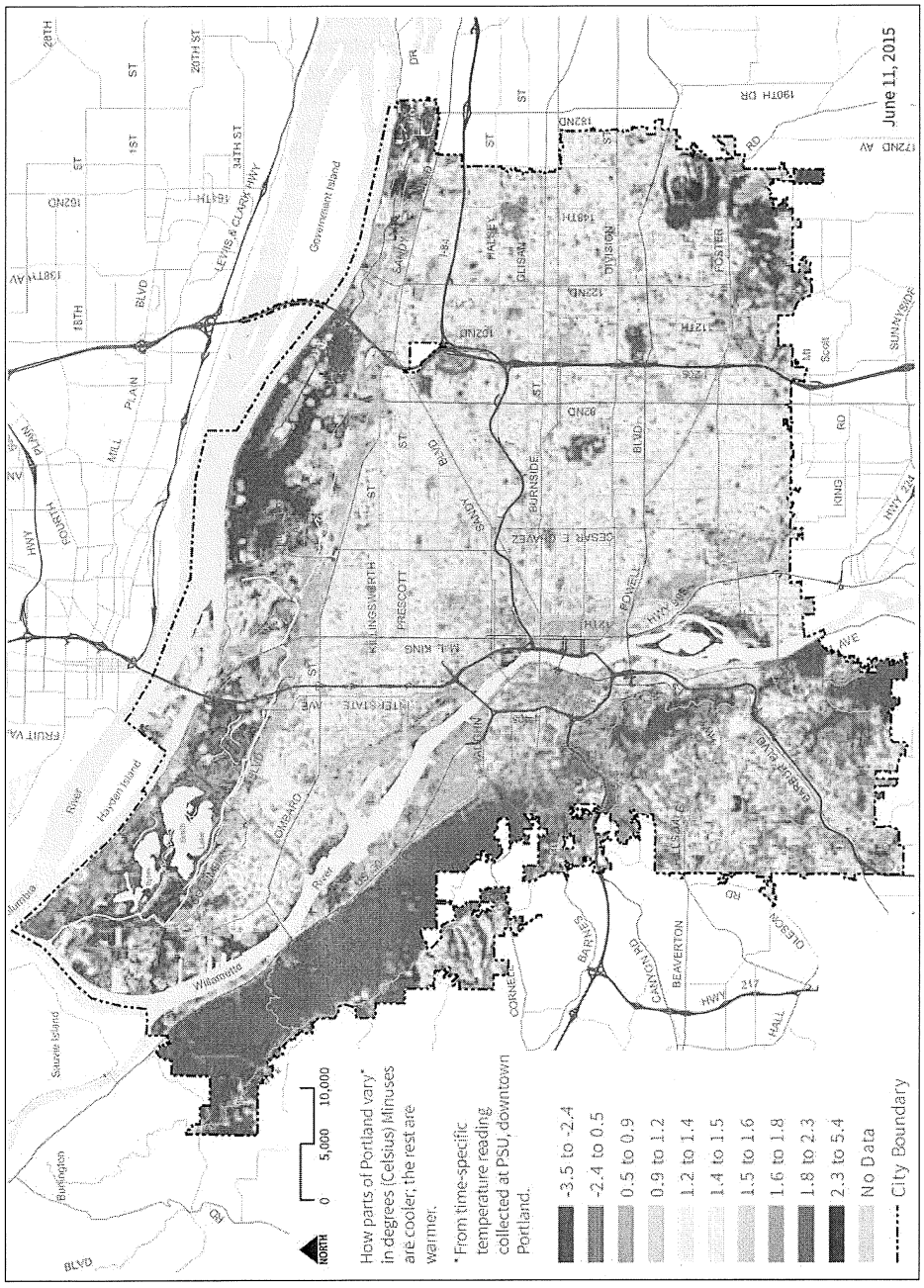


Figure 7-1. Heat Index Chart

Heat Islands

The *City of Portland and Multnomah County Climate Change Risk and Vulnerability Assessment* (2014) defines urban heat island effect as "the measureable increase in ambient urban air temperatures resulting primarily from the replacement of vegetation with buildings, roads, and other heat-absorbing infrastructure." Heat islands can increase peak summer energy demand, air pollution, greenhouse gas emissions, heat-related illness and death, and water quality degradation. Portland State University researchers studying of urban heat island effects (see Figure 7-2) have found differences up to 15ºF between paved and vegetated areas of the City.



Source: Image obtained from Profita, 2015 attributed as Courtesy of Portland State University

Figure 7-2. Portland's Urban Heat Islands

Extreme Cold and Wind Chill

Weather that constitutes extreme cold varies across different parts of the U.S. In regions relatively unaccustomed to winter weather, near freezing temperatures are considered extreme cold (CDC, 2014). Extreme cold can often accompany severe winter storms. Wind can exacerbate the effects of cold temperatures by carrying heat away from the body more quickly, thus making it feel colder than is indicated by the temperature. This phenomenon is known as wind chill. Wind chill is the temperature that your body feels based on the combination of air temperature and wind speed (CDC, 2014). Figure 7-3 shows the value of wind chill based on ambient temperature and wind speed.

Source: National Weather Service/NOAA

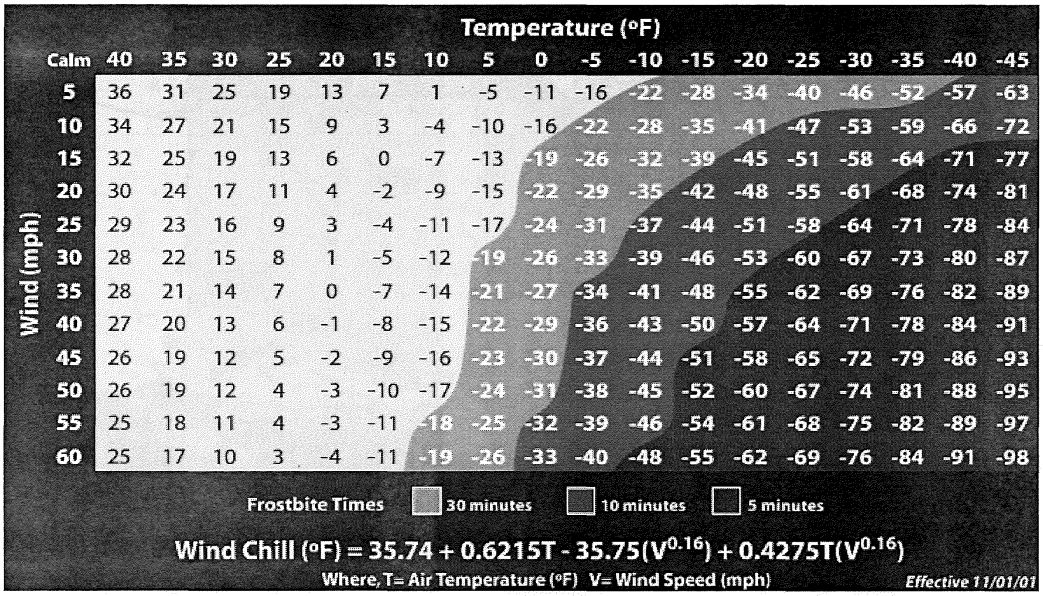


Figure 7-3. Wind Chill Chart

7.1.2 Thunderstorms

A thunderstorm is a rain event that includes thunder and lightning. Generally, the presence of three factors results in thunderstorm formation: moisture, rising unstable air, and a lifting mechanism. The lifecycle of a thunderstorm (see Figure 7-4) encompasses three stages (NSSL, 2016):

- Developing stage—A cumulus cloud is pushed upward, resembling a tower. Little to no rain is present, but occasional lightning may occur. This stage generally lasts for about 10 minutes.
- Mature stage—An updraft is still feeding the storm; however, precipitation begins to occur accompanied by a downdraft. A line of gusty winds is formed by this downdraft and rain-cooled air. This stage is the most likely time for hail, heavy rain, frequent lightning, strong winds, and tornadoes.
- Dissipating stage—After large amounts of precipitation, the downdraft becomes stronger than the updraft and the storm begins to dissipate. Precipitation generally decreases, but lightning may still be present.

Source: NOAA, 2015

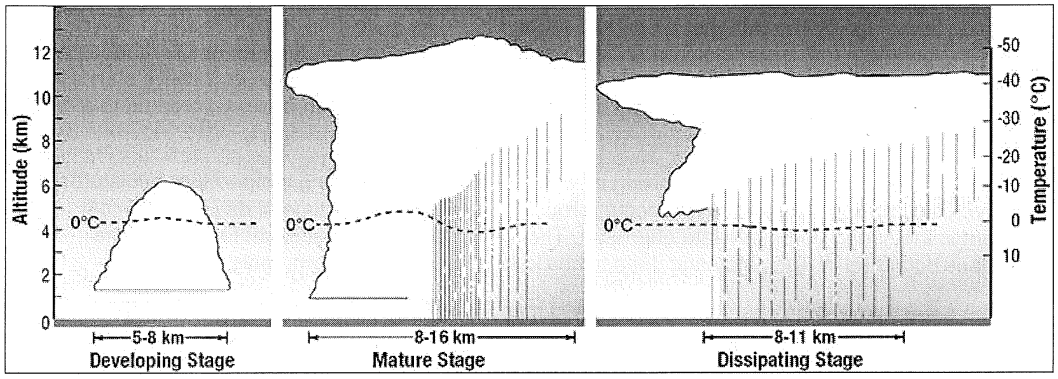


Figure 7-4. The Thunderstorm Life Cycle

A thunderstorm is classified as severe when it contains one or more of the following: hail with a diameter of 1 inch or greater, winds gusting in excess of 50 knots (57.5 mph), or tornado (NSSL, 2016).

Thunderstorms are usually short in duration (seldom more than 2 hours). Heavy rains associated with thunderstorms can lead to flash flooding during the wet or dry season. For more information on flooding see Chapter 11. Strong winds, hail and tornadoes are also dangers associated with thunderstorms.

Lightning

Lightning is an electrical discharge between positive and negative regions of a thunderstorm. A lightning flash is composed of a series of strokes, with an average of about four. The average duration of each stroke is about 30 microseconds (GHRC, 2016).

Lightning is one of the more dangerous weather hazards in the United States. Each year, lightning is responsible for deaths, injuries, and millions of dollars in property damage, including damage to buildings, communications systems, power lines, and electrical systems. Lightning also causes forest and brush fires and deaths and injuries to livestock and other animals. Property damage, increased operating costs, production delays, and lost revenue associated with lightning exceed $6 billion per year (NLSI, 2008). Impacts can be direct or indirect. People or objects can be directly struck, or damage can occur indirectly when current passes nearby.

Hail Storms

Hail is defined by the National Weather Service (2009) as "showery precipitation in the form of irregular pellets or balls of ice more than 5 millimeters in diameter, falling from a cumulonimbus cloud." Hail generally ranges from pea-size (0.25 inches) to softball size (4.5 inches) (NWS, 2009).

Hail occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice. Super-cooled water may accumulate on frozen particles near the back-side of a storm as they are pushed forward across and above the updraft by the prevailing winds near the top of the storm. Eventually, the hailstones encounter downdraft air and fall to the ground (U.S. Claim Expert, 2016).

7.1.3 Tornadoes

A tornado is defined by the National Weather Service (2009) as a violently rotating column of air, usually descending from a cumulonimbus cloud, with circulation reaching the ground. Tornadoes can come from lines of cumulonimbus clouds or from a single storm cloud. They nearly always start as funnel clouds and may be accompanied by a loud roaring noise. They can affect an area up to a mile wide, with a path of varying length.

A tornado is formed by the turbulent mixing of layers of air with contrasting temperature, moisture, density and wind flow. Tornadoes can occur throughout the year at any time of day but are most frequent in the spring during the late afternoon. The mixing layers of air account for most of the tornadoes occurring in April, May and June, when cold, dry air meets warm, moister air.

With the potential for wind speeds exceeding 300 mph, a tornado is the most destructive of all atmospheric phenomena on a local scale. Figure 7-5, adopted from FEMA, illustrates the potential impacts and damage from tornadoes of different magnitude. Oregon has a relatively low risk compared to states in the Midwestern and Southern U.S.

7.1.4 Windstorms

Wind is air flow that travels parallel to the Earth's topography. High winds are defined as those that last longer than one hour at 40 mph or greater or wind gusts of 58 mph or greater. Windstorms are generally short-duration events involving straight-line winds or gusts of over 50 mph, strong enough to cause property damage. Wind speeds vary with individual storms. Windstorms often accompany snow, ice and extreme cold temperature during winter months (Wilde, 2009 as cited in NHMP, 2010).

Windstorms are especially dangerous in areas with significant tree stands and areas with exposed property, poorly constructed buildings, mobile homes (manufactured housing units), major infrastructure, and above-ground utility lines. A windstorm can topple trees and power lines, cause damage to residential, commercial and critical facilities, and leave tons of debris in its wake. Windstorms tend to damage ridgelines that face into the winds.

According to the *Oregon Natural Hazard Mitigation Plan* (2015), the most frequent and strongest wind storms impacting the area originate in the Pacific Ocean and travel from the southwest. Eastern winds that travel through the Columbia River Gorge also have impacts in the area.

7.1.5 Winter Storms

Blizzards and Snowstorms

The National Weather Service defines a winter storm as having significant snowfall, ice and/or freezing rain; the quantity of precipitation varies by elevation. Heavy snowfall is 4 inches or more in a 12-hour period, or 6 inches or more in a 24-hour period in non-mountainous areas; and 12 inches or more in a 12-hour period or 18 inches or more in a 24-hour period in mountainous areas.

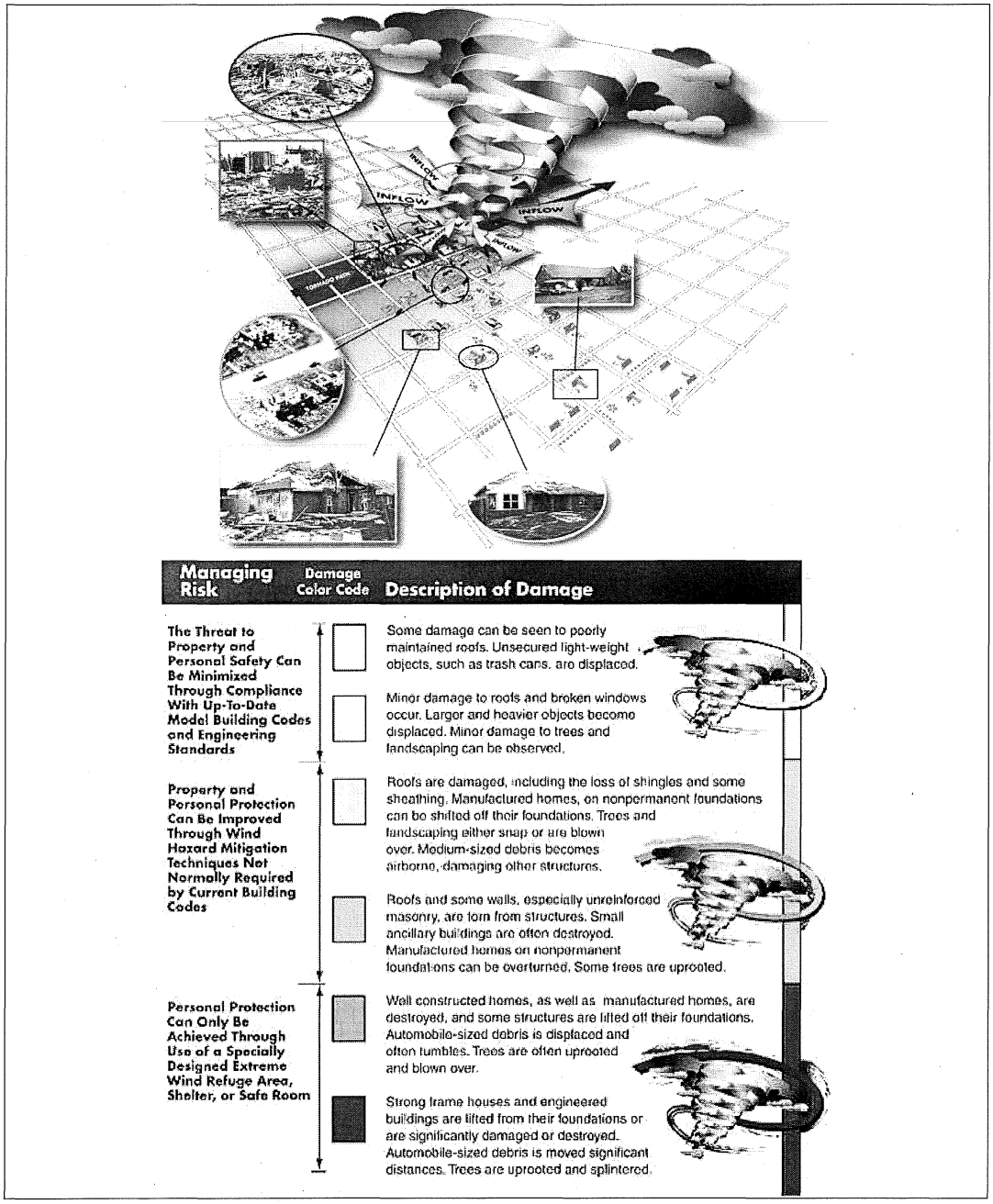


Figure 7-5. Potential Impact and Damage from a Tornado

There are three key ingredients to a severe winter storm:

- **Cold Air**—Below-freezing temperatures in the clouds and near the ground are necessary to make snow and/or ice.
- **Moisture**—Moisture is required in order to form clouds and precipitation. Air blowing across a body of water, such as a large lake or the ocean, is a typical source of moisture.
- **Lift**—Lift is required in order to raise the moist air to form the clouds and cause precipitation. An example of lift is warm air colliding with cold air and being forced to rise over the cold dome. The boundary between the warm and cold air masses is called a front. Another example of lift is air flowing up a mountain side.

While snow is relatively rare in the lower elevations of western Oregon, the Columbia Gorge provides a low-level passage through the mountains. Cold air, which lies east of the Cascades, often moves westward through the Gorge and into the Portland area. If a wet Pacific storm happens to reach the area at the same time, larger-than-average snow events may result (Taylor and Hannan, 1999 as cited in NHMP, 2010).

Ice Storms

The National Weather Service defines an ice storm as a storm that results in the accumulation of at least 0.25 inches of ice on exposed surfaces. Ice storms occur when rain falls from a warm, moist, layer of atmosphere into a below-freezing, drier layer near the ground. The rain freezes on contact with the cold ground and exposed surfaces, causing damage to trees, utility wires, and structures (see Figure 7-6).

Source: NWS, 2014b

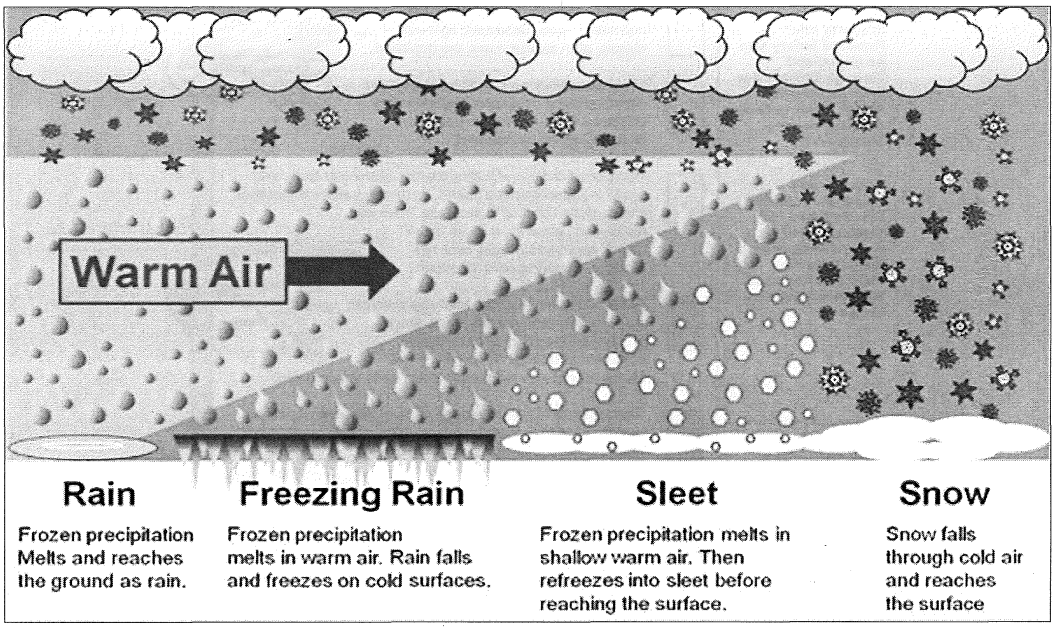


Figure 7-6. The Formation of Different Kinds of Precipitation

Ice accretion generally ranges from a trace to 1 inch. Accumulations between 1/4-inch and 1/2-inch can cause small branch and faulty limb breakage. Accumulations of 1/2-inch to 1 inch can cause significant breakage. Strong winds increase the potential for damage from ice accumulation.

7.2 HAZARD PROFILE

7.2.1 Past Events

Table 7-1 summarizes all severe weather events in and near Portland since 1950, as recorded by the National Oceanic and Atmospheric Administration (NOAA). Almost all of the disaster declarations impacting the City of Portland resulted to some extent from severe weather events. Table 7-2 provides detailed descriptions of severe weather events in Portland since 1991 that were reported to cause death, injuries or property damage.

Table 7-1. Summary of Severe Weather Event Impacts in Portland

Hazard Types Includes	# of Reported Events[a]	# of Events with Deaths, Injuries or Property Loss[a, b]
Strong Wind	15	15
High Wind	24	10
Excessive Heat	8	2
Extreme Cold/Wind Chill	0	0
Ice Storm	2	1
Heavy Snow	28	0
Winter Storm	8	2
Winter Weather	10	0
Lightning	5	3
Thunderstorm Wind	12	4
Hail	6	2
Funnel Cloud	3	0
Tornado	3	3
Heavy Rain	26	5
Total	**150**	**47**

a. Reported events since 1950 impacting Multnomah County and/or the Greater Portland Metro Area zone.
b. Only events that listed injuries and/or dollar amounts are included in these estimates. Some event descriptions include property damage that was not quantified.

Source: http://www.ncdc.noaa.gov/stormevents/

Table 7-2. Past Severe Weather Events Impacting Portland[a]

Date	Type	Deaths or Injuries	Property Damage
4/9/1991	Tornado	0	$250
Description: A thunderstorm produced a very small tornado and hail. A resident of a house which sustained minor damage recalled a steady progression of the wind effect. Initially, the neighbor's roof shingles lifted up, then their pool water was sucked out from underneath the poll cover, next, the first row of shingles on the witness' roof were turned up and small plants and a trellis were uprooted. Hail punctured a hole the size of a silver dollar in the garage screen door. At the same time this occurred, the U.S. Weather Service Office received a call from the same vicinity as the tornado reporting 0.5-inch hail and an unconfirmed report of 1-inch hail.			
11/12/1991	Tornado	0	$25,000
Description: A tornado occurred during a cold frontal passage. Eighty feet of fencing was damaged, part of a roof was torn off, an outbuilding was twisted and part of a wall was ripped out of a steel building.			
8/30/1999	Lightning	1	$0
Description: Lightning struck a boy from Gresham as he was bicycling near NE 230th Court in Wood Village at 1230 PDT. The lightning struck him in the head and exited through his groin. His companion at the time called 911 from a neighbor's house and paramedics arrived in about two minutes. The boy's heart had stopped, and he suffered a concussion and second degree burns on his face, chest, groin, and upper legs. He apparently did not receive the full force of the bolt directly, which spared his life. He was still on his bicycle with his hands on the handlebars when the paramedics arrived. He was revived in the ambulance en route to the hospital and he is expected to recover.			
12/18/2005	High Wind	0	$15,000
Description: A strong wind storm brought damaging winds to inland portions of northwest Oregon. The strongest wind gust reported was measured at 58 mph in the west hills of Portland. Many trees were reported downed by strong winds. Approximately 9,000 customers were reported without power in east Multnomah county. High winds also did damage to a few homes in the Gresham area, either by knocking down trees onto homes, or reported roof damage.			
1/1/2006	High Wind	0	$500,000
Description: A strong low pressure area off the Coast caused high winds in the Willamette Valley. McMinnville airport reported 44 mph sustained winds with a gust to 49 mph. Trees were reportedly blown down near Linfield College in Salem, including an 80 foot tall Cypress tree. A house in Aloha was destroyed by a falling tree. Nearly 22,000 customers were without power due to power lines downed by falling trees.			
2/3/2006	Strong Wind	0	$50,000
Description: A strong winter storm brought high winds to portions of northwest Oregon. Portland Airport reported 21 knots with gusts to 38 knots. Additionally, many residents experienced power outages due to trees blown down by strong winds.			
5/2/2007	Hail	0	$5,000
Description: During an afternoon under an unstable air mass, small thunderstorms moved across northwest Oregon. One storm produced a small hail storm, with enough hail accumulation to cover the ground. Hail covered the ground near the Gateway Transit Center, with biggest stones being half an inch in diameter.			
9/28/2007	Hail	0	$5,000
Description: In an unstable atmosphere, several thunderstorms moved over the forecast area. One such storm produced a short-lived tornado, that did considerable damage to a local farm. Dime size hail was also reported with the storm. Estimated half-inch hail fell near 162nd and Main.			
7/3/2008	Lightning	0	$2,000
Description: Lightning struck the Walt Morey Middle School in Troutdale, damaging some of the computer systems.			
12/20/2008	Winter Storm	0	$9 million property, $11.6 million crop
Description: The third in a series of an unusually cold storm systems brought heavy snow accumulations to northwest Oregon. The heavy snowfall created a significant impact to many communities across northwest Oregon. Fourteen to 24 inches of snow fell across the northern Willamette Valley. Some reports include 14 inches in Canby, 18 inches in Gladstone, 21 inches in Oregon City and 24 inches in Wilsonville. This storm was the most significant storm to hit the Portland Metro Area in the past 40 years. Freezing rain also occurred during this period with 1/4 to 3/4 inch of ice accumulation.			
12/24/2008	Winter Storm	0	$300,000
Description: Another cold storm system brought heavy snow accumulations to northwest Oregon. Four inches of snow fell over the Portland Metro area on Christmas eve. Freezing rain was also reported in the Portland and Troutdale areas. The snowfall combined with accumulations from the previous few days resulted in 4 roof collapses, 10 carports collapses and damage to 62 greenhouses.			

Date	Type	Deaths or Injuries	Property Damage
1/17/2009	High Wind	2	$30,000
Description: Strong winds caused some isolated power outages and downed a few trees in the Portland area.			
1/18/2009	High Wind	0	$25,000
Description: Strong east winds occurred across the Central Oregon Coast and through the Columbia River Gorge. A strong front produced strong winds that caused widespread power outages in Gresham, Troutdale and Multnomah Village. The high winds also downed several trees in southeast Portland, one of which fell on an automobile.			
6/4/2009	Thunderstorm Wind	0	$1,200
Description: A fairly vigorous upper level low pressure system had been blocked offshore and was finally allowed to progress onshore on June 4th. An upper level disturbance rotated around upper level low pressure system, enhancing divergence aloft and turning upper level flow easterly across much of western Oregon. This overall pattern resulted in enhanced vertical wind shear for the Willamette Valley, with southerly winds near the surface backing to easterly flow aloft. The June 4, 2009 was a significant thunderstorm outbreak by Northwestern Oregon standards, with several areas taking damage from strong thunderstorm wind gusts, minor urban area flooding, and rotation in a few storms resulted in one weak tornado. The top of a 70-foot tree was snapped off in downtown Portland at the intersection of SW Salmon Street and Park Avenue. A passer-by was nearly hit as it fell to the ground. Time of the event is estimated based nearby reports from the storm.			
11/16/2009	High Wind	0	$6,000
Description: Strong winds were estimated based on reports of damage to a downtown Portland residential home due to downed trees. Additionally, gusts of 43 – 48 knots were reported at the Portland home of a local television meteorologist. Power outages were reported across Clackamas county, with 1700 homes affected.			
9/22/2013	Strong Wind	0	$8 million
Description: A strong cold front resulted in high winds for the North and Central Oregon coast. This storm was the first storm of the Fall season, and also produced strong winds for the Northern Willamette Valley that resulted in structure damage and power outages for the Portland Metro area. Winds in the valley were 30 to 40 mph. These winds brought a tree down onto a house in SE Portland and left around 5000 people without power. Most of the power outages were in Washington County.			
9/28/2013	Strong Wind	0	$35,000
Description: A strong cold front resulted in strong winds across Northwest Oregon. Media reported via social media that a tree fell onto a mobile home near Hillsboro. Another social media report posted a picture of a tree that fell on two cars at the Fred Meyer in Oak Grove There were other reports of several large trees down around the Portland Metro Area. Portland General Electric reported over 25,000 customers were without power in Clackamas and Multnomah counties.			
11/7/2013	Strong Wind	0	$3,000
Description: A NWS Spotter estimated Winds of 55 mph, and reported several trees down along Highway 47 between Banks and Forest Grove. They reported power lines down and power outages in the area. A local media station KOIN stated that Pacific Power reported 12,500 customers without power in Northeast Portland for several hours. KOIN also said that Concordia University cancelled their morning classes. PGE reported that there were 2800 customers without power in Clackamas County.			
1/23/2014	Strong Wind	0	$7,000
Description: Strong east winds resulted in knocking two large trees over. One of these trees came down on an SUV in Milwaukie, and the other came down on an SUV in southwest Portland. There were also hundreds of people without power for at least an hour due to downed limbs on power lines.			
2/12/2014	Strong Wind	0	$1,000
Description: Strong winds downed a few trees and damaged a vehicle in Gresham.			
2/25/2014	Strong Wind	0	$7,000
Description: Strong and gusty east winds through the Columbia River Gorge resulted in impacts around the Portland Metro Area. Local media reported that a large tree fell onto a Max train and overhead wires in Gresham that closed that line for the rest of the day. Another downed tree crushed a SUV in Lake Oswego. A large tree took out power lines as it fell across Highway 43, disrupting power and closing the highway for a couple of hours. A Large tree branch fell and pierced through a window of a van that was driving on Highway 99 with luckily no injuries.			
3/6/2014	Strong Wind	0	$8,000

Date	Type	Deaths or Injuries	Property Damage
Description: Strong winds resulted in significant damage in the Portland Metro Area with area wind measurements between 30 and 48 mph. There were several reports of 12 to 24 inch diameter trees down. One landed on the Firestone Tire Building in downtown Portland, one closed a busy intersection at Hall and Bonita in Tigard, and another closed 'A' Avenue downtown Lake Oswego. There were numerous power outages, and tens of thousands of PGE customers were without power. Clackamas Community College cancelled all classes on March 6 due to the power outages.			
5/18/2014	Thunderstorm Wind	0	$11,000
Description: Winds from a thunderstorm resulted in a large oak tree falling on two parked cars in downtown Portland.			
10/25/2014	High Wind	0	$140,000
Description: Wind gusts up to 60 mph were reported throughout the Portland Metro Area. There were numerous trees downed by these winds with some landing on power lines. There were at least two homes that had major damage due to downed trees. Portland General Electric reported around 140,000 people without power by the end of the storm. One downed power line burned a hole in the road that it fell on. A NWS employee reported that a large gust blew doors open at a SW Portland restaurant, and ripped large paintings off the wall. Some of the downed trees blocked roads, and 2 lanes were blocked on Highway 30 for a couple of hours			
11/11/2014	High Wind	1	$32,000
Description: Strong winds resulted in downed trees throughout the Metro Area. Downed trees were responsible for the shut-down of several sections of the MAX line for several hours, and the closures of Cornelius Pass Road and Shattuck Road. One tree crashed the roof of a house in Oregon City and pinned the resident under a desk inside. A biker sustained serious injuries when a tree fell on him and a nearby car. A 54 mph easterly wind gust at the Portland Airport was the strongest east wind recorded since 1989.			
12/2/2014	Strong Wind	0	$15,000
Description: East winds blowing through the gorge were strong enough to knock over trees in the Portland Metro Area resulting in minor damage. One tree in Southwest Portland came down onto a house. Another tree knocked down near the Sellwood Bridge resulted in the closing of Highway 43 and caused major traffic delays. Several trees were knocked down in Gresham with at least one falling down on power lines and causing power outages. Another tree in Gresham fell onto a car.			
12/11/2014	High Wind	3	$80,000
Description: Gusty strong winds resulted in several downed trees for the Portland Metro Area. There were widespread road closures and power outages due to the downed trees. One fatality and one injury resulted from a tree falling onto a moving car. The Portland International Airport experienced re-routing and delays of aircraft, and the Portland Mass Transit, MAX system had system-wide delays due to power outages. In downtown Portland, loose material from a roof of a nearby building were lofted and blown against windows of the Standard Insurance Plaza damaging several windows on the fifteenth floor. A parapet of an apartment in NW Portland fell and caused major damage to the apartment building. At least one power pole was downed by the winds in Washington County. A large tree fell onto a moving car injuring a mother and killing her son.			
3/15/2015	Heavy Rain and High Wind	1	$118,000
Description: A series of storms along an atmospheric river of moisture produced a period of heavy rain from March 13 to March 15. Rainfall totals of 3 to 6 inches were measured for many areas of Northwest Oregon and a few local spots had over 7 inches of rain. The prolonged period of rain allowed the saturated soils to make large trees vulnerable to tip over if any winds developed (which did happen). No flooding was reported from this rain, but a mudslide did impact a residence in the west hills of Portland. *Around 50 trees were downed by strong winds in the afternoon on March 15 in the Portland Metro Area. A large tree fell onto a jeep and trapped an injured driver for several hours. Scaffolding was knocked off of a building downtown onto a few cars. A large tree even fell in the parking lot of the National Weather Service Forecast Office. Siding of a chimney in Southwest Portland was peeled off by the winds. Several roads were closed from trees and there were bus and train delays due to power outages. Four airplanes on route to Portland were diverted to other cities. A peak gust of 70 mph was measured at Chehalem Mountain, and a BPA weather station in Troutdale measured gusts of 63 mph.*			
6/7/2015	Heat	1	$0
Description: High Temperatures were in the low to mid 90s June 7 through June 9, which is around 22 degrees higher than the seasonal normal. The low temperatures were also unseasonably warm, and the low temperature on June 7 of 61 degrees at the Portland Airport tied the warmest low record that was previously set in 1948. There is one known indirect heat related fatality where a young man drowned while swimming in the Clackamas River near Gladstone. Multnomah County had 7 hospital visits for heat related illnesses.			
6/26/2015	Excessive Heat	1	$0

Date	Type	Deaths or Injuries	Property Damage
Description: Maximum temperatures were in the mid to upper 90s, which is 20 to 25 degrees above the seasonal normal. The low temperatures were in the mid 60s to low 70s. Several new daily temperature records were set for the warmest low temperatures. One man drowned after he fell off a jet ski in the Columbia River on June 27th. This accident occurred around 1 AM, but the warm nighttime temperatures likely contributed to him going into the river at night. The Multnomah County had 10 emergency room visits for heat related illnesses.			
8/29/2015	Strong Wind	0	$11,000
Description: Several locations measured wind gusts greater than 35 mph with the highest wind of 50 mph measured near the Oregon Zoo. There were several reports of downed trees and power lines that resulted in the loss of power for around 28,000 residents. Downed power lines closed Marine Drive, and a downed tree blocked a lane on US 30 on the Interstate 405 ramp at Thurman. A Twitter report showed a photo of downed tree damage to a couple of parked cars.			
10/31/2015	Heavy Rain	0	$150,000
Description: Heavy rain combined with clogged drains from leaves resulted in urban flooding. Portland Fire and Rescue received 32 calls in regards to street flooding, and assisted travelers in 5 cars from their stalled or trapped cars to dry land. Four roads were closed in the area for high water, and several Max lines were cancelled due to flooding under bridges. Thirteen Max trains were damaged by water and will be out of service for up to 2 weeks. One roof collapsed from the weight of rain water after the roof drains had been clogged, and several homes or businesses had flooded basements. A tree had fallen onto and damaged a parked car.			
12/1/2015	Ice Storm	0	$5,000
Description: A quarter to a half on an inch of ice was observed the eastern portions of the Portland Metro Area, mainly in Gresham and Troutdale. Tree limbs were broken by the ice and resulted in widespread power outages in eastern Multnomah County.			
12/7/2015	Heavy Rain and Strong Wind	0	$1.09 million
Description: Heavy rain resulted in urban flooding and small stream flooding throughout the Portland Metro Area. The rain was heavy enough to collapse a roof of a business in Gresham, Oregon, and cause a sink hole near Mt Hood College. High water flowing into Fairview Creek in Gresham snapped a sewage line. Several roads were closed due to high water and the TriMet Max operations were interrupted. Water crept into businesses and homes. There were at least two landslides in Portland; one on Corbett Hill, and the other on Cornell Road. *The media reported that strong winds resulted in tree damage near 5th and Jefferson in Oregon City. There was another report of a 1.5-foot diameter evergreen tree that fell onto a home in Clackamas and damaged the roof.*			
12/8/2015	Heavy Rain	0	$621,000
Description: Heavy rain resulted in urban flooding across the Portland Metro area. All Amtrak and freight trains were shut down between Portland and Vancouver due to flooding. A mobile home park in Gresham flooded. There were a couple of landslides on Highway 30 where debris covered the highway. One of these slides was near Germantown Road. The other slide was near the St John's Bridge, hit a car (with no injuries) as it happened, and covered all lanes of Highway 30.			
12/9/2015	Strong Wind	1	$107,000
Description: Strong winds combined with saturated soils from heavy rainfall resulted in property damage around the Portland Metro Area. A tree fell down and resulted in extensive damage to a home in Aloha. Another tree fell onto a home in Portland, killing a woman. Winds also damaged the Milwaukie Bridge. Broken tree limbs fell onto power lines that resulted in widespread power outages in Portland, Clackamas, and Beaverton.			
12/10/2015	Strong Wind	0	$60,000
Description: The media reported that a home in Aloha sustained significant damage as a tree downed by strong winds fell onto it.			
12/17/2015	Heavy Rain	0	$311,000
Description: Heavy rain resulted in new daily rainfall records for the Portland International Airport and downtown Portland. A new daily rainfall record of 1.87 inches at the airport broke the previous record of 1.02 inches from 1972. Downtown Portland measured 2.42 inches of rain, which broke the previous record of 2.26 inches from 1884. Standing water was reported on many roads in the area. The heavy rain caused a landslide on Highway 30 near the St Johns Bridge.			
12/21/2015	High Wind	0	$1.3 million
Description: High winds caused significant damage in the Portland Metro area as trees were downed onto homes and cars. Several roads were closed due to downed trees. Marine Drive was closed for several miles due to winds blowing a tractor trailer off of the road. One house caught on fire when a tree downed an electrical wire.			

Date	Type	Deaths or Injuries	Property Damage
3/1/2016	Strong Wind	1	$10,000
Description: Strong winds ahead of the front blew down a weak or dead tree onto a moving vehicle, killing the driver. Winds with the front downed several trees and branches near Beaverton resulting in power outages.			
3/13/2016	Strong Wind	0	$7,000
Description: Strong winds downed several trees in the Portland Metro Area. Some of these trees fell onto power lines and resulted in power outages, and others fell onto roadways and obstructed traffic. One tree fell onto a home in Portland with minor damage to the roof.			

a. Reported events since 1950 impacting Multnomah County and/or the Greater Portland Metro Area zone with reported injuries, fatalities, and/or property damage and event descriptions.

Source: http://www.ncdc.noaa.gov/stormevents/

7.2.2 Location

All areas of Portland are potentially exposed to severe weather events.

Thermal Extremes

Temperature extremes can occur throughout Portland. The Western Regional Climate Center notes several factors that have a significant impact on the local climate including terrain (such as the Cascade Range), the Pacific Ocean, and low pressure regions over the north Pacific Ocean. These climactic controls can cause significant climate differences in relatively short distances.

Thunderstorms

Thunderstorms affect relatively small localized areas, rather than large regions like winter storms and extreme temperature events. Thunderstorms can strike all regions of the United States, although they are most common in central and southern states. It is estimated that there are as many as 40,000 thunderstorms each day worldwide. The City of Portland can experience an average of 10 to 20 thunderstorm days each year (National Weather Service, 2010).

Tornadoes

Approximately 1,200 tornadoes occur in the United States each year, with the central portion of the country experiencing the most. The State of Oregon and the City of Portland have a lower risk for tornados than elsewhere in the country. Tornadoes are usually localized. Severe thunderstorms can result in conditions favorable to the formation of numerous or long-lived tornadoes.

Windstorms

All of the City of Portland is subject to high winds from thunderstorms and other severe weather events. According to FEMA, the City of Portland is located in Wind Zone I, where wind speeds can reach up to 130 mph. The City is also located in a special wind region along the west coast from Washington to Oregon. Figure 7-7 indicates how the frequency and strength of windstorms impacts the United States and the general location of the most wind activity. This is based on 40 years of tornado data and 100 years of hurricane data collected by FEMA.

Source: FEMA n.d.



Figure 7-7. Wind Zones in the United States

Winter Storms

Snow accumulation is most common at higher elevations, but can occur anywhere in Portland. Snow events occur if a wet Pacific storm reaches the area when a cold air mass is present. Cold air rarely travels west of the Cascade Range, as the mountains provide a natural barrier separating the Willamette Valley from the cold air to the east (NHMP, 2010). A natural break in the Cascade Mountains does occasionally allow cold air from the east to funnel through the Columbia Gorge into the Portland area, which can eventually settle south in the Willamette Valley and thus create snow and ice events (ONHW, 2004 as cited in NHMP, 2010). Ice events include freezing rain, sleet and hail.

7.2.3 Frequency

Portland can expect to experience exposure to some type of severe weather event at least annually. Many of the severe weather events for the City of Portland shown in Table 7-1 are related to high winds and severe winter weather. According to records, in 66 years, the city has experienced 150 severe weather events, an average of two to three events per year. Thunderstorms, windstorms and winter storms are likely to occur in the region annually. Not all storms produce damage.

The *2015 Oregon Natural Hazard Mitigation Plan*, identifies the following probabilities for winds of varying strength in Region 2, which includes Portland:

- A 25-year event for the region (4-percent annual probability) is 65 miles per hour.
- A 50-year event (2-percent annual probability) is 72 miles per hour.
- A 100-year event (1-percent annual probability) is 80 miles per hour.

Eight instances of thermal extreme events are listed for Portland between 1996 and 2015; however, this data likely underestimates the occurrence of such events. Extreme heat events can occur several times per year, especially in the summer.

There have been six reported funnel clouds or tornadoes in Portland since 1950. This amounts to about one such event every decade. Tornadoes can occur at any time of the year, with peak seasons at different times for different states (NSSL, 2015). In Oregon, tornadoes have been reported during all seasons; however, almost half of reported tornadoes have been reported in April, May and June (Storm events database, 2016). Based on historical records, tornadoes seem to be least likely in the state from January through March. Two of the tornadoes in or near Portland occurred in April and one occurred in November.

7.2.4 Severity

The most common problems associated with severe storms are immobility and loss of utilities. Fatalities are uncommon, but can occur. Roads may become impassable due to flooding, downed trees or a landslide. Power lines may be downed due to high winds or ice accumulation, and services such as water or phone may not be able to operate without power. Lightning can cause severe damage and injury. Physical damage to homes and facilities can be caused by wind, accumulation of snow or ice, and flooding resulting from heavy rain events. Even a small accumulation of snow can cause havoc on transportation systems.

Windstorms can be a frequent problem in Portland and have been known to cause damage to utilities. The predicted wind speed given in wind warnings issued by the National Weather Service is for a one-minute average; gusts may be 25 to 30 percent higher. Lower wind speeds typical in the lower valleys are still high enough to knock down trees and power lines and cause other property damage.

Ice storms accompanied by high winds can have especially destructive impacts, especially on trees, power lines, and utility services. While sleet and hail can create hazards for motorists when they accumulate, freezing rain can cause the most dangerous conditions in Portland. Ice buildup can bring down trees, communication towers and wires, creating hazards for property owners, motorists and pedestrians. Rain can fall on frozen streets, cars, and other sub-freezing surfaces, creating dangerous conditions.

The severity of an extreme heat event depends on how early the event occurs in the summer and the number of consecutive days it lasts (U.S. EPA, 2006). Urban heat island effect can exacerbate the severity of an extreme heat event. While the severity of an extreme heat event may vary, impacts include increased energy consumption, elevated emissions of air pollutants and greenhouse gases, compromised human health and comfort, and impaired water quality (U.S. EPA, 2015). Extreme heat can also impact infrastructure by warping bridges, causing roads to buckle, melting runways, and more.

Lightning severity is typically investigated for both property damage and life safety (injuries and fatalities). The number of reported injuries from lightning is likely to be low.

Tornadoes are potentially the most dangerous of local storms, but they are not common in Portland. If a major tornado were to strike within the populated areas of the city, damage could be widespread. Buildings could be damaged or destroyed. Businesses could be forced to close for an extended period or permanently, fatalities could be high, many people could be homeless for an extended period, and routine services such as telephone or power could be disrupted.

7.2.5 Warning Time

Meteorologists can often predict the likelihood of a severe storm. This can give several days of warning time. However, meteorologists cannot predict the exact time of onset or severity of the storm. Some storms may come on more quickly and have only a few hours of warning time.

7.2.6 Compounding Factors and Secondary Hazards

Secondary Hazards

The most significant secondary hazards associated with severe weather are floods, falling and downed trees, landslides and downed power lines. Rapidly melting snow combined with heavy rain can overwhelm both natural and man-made drainage systems, causing overflow and property destruction. Landslides occur when the soil on slopes becomes oversaturated and fails. Air quality issues can be exacerbated by severe weather events, particularly excessive heat. High temperatures can increase ground level ozone, a local air pollutant (City of Portland and Multnomah County, 2014).

Compounding Factors

El Niño-Southern Oscillation

The El Niño-Southern Oscillation (ENSO) climate pattern creates increased weather volatility such as hotter summers and colder winters, intense thunderstorms, lightning, hail, snow storms, freezing rain/ice storms, high winds and tornadoes. ENSO consists of two weather phenomena: El Niño and La Niña. While ENSO activities are not a hazard, they can lead to severe weather events and large-scale damage throughout Oregon, including Portland. Direct correlations were found linking ENSO events to severe weather across the Pacific Northwest, particularly drought, flooding and severe winter storms (Oregon, 2004 as cited in NHMP, 2010). Therefore, increased awareness and understanding of the impacts of ENSO events on regional weather are important (NHMP, 2010).

Climate Change

Several facets of climate change are likely to have impacts on the severe weather hazard that may increase the frequency of severe weather and result in those events becoming more extreme. Generally, these impacts are related to the following parameters (EPA, 2016):

- **Frequency**—Are events occurring more often than they did in the past?
- **Intensity**—Are events getting more severe, with the potential for more damaging effects?
- **Duration**—Are events lasting longer than "the norm"?
- **Timing**—Are events occurring earlier or later in the season or the year than they used to?

Figure 7-8 illustrates how the shift in climate normal can result in an increased frequency of extreme events.

Source: EPA, 2016

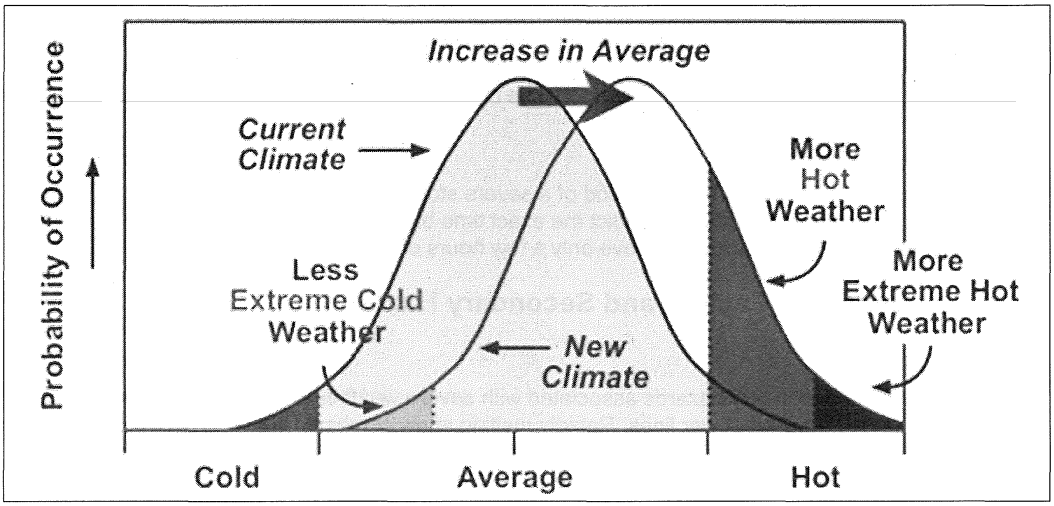


Figure 7-8. Impacts of Climate on Probability of Extreme Events

According to the *City of Portland and Multnomah County Climate Change Risk and Vulnerability Assessment* (2014), the following climate parameters related to severe weather are likely to have impacts for the City of Portland:

- Increase in average annual air temperature and likelihood of extreme heat events
- Changes in hydrology and water supply:
  - Reduced snowpack and water availability in some basins
  - Changes in water quality and timing of water availability (winter precipitation may be increasing)
- Increased incidence and magnitude of damaging floods and frequency of extreme precipitation events.

7.3 EXPOSURE

Portland's many micro-climates, hills and valleys, and the Columbia Gorge all contribute to weather variations. With major transportation routes that could be affected by ice and snow, bridges and hills to cross to get from one part of the city to the next and the economic impact of road closures, the exposure and vulnerability of the City to severe weather events is a reality every year (NHMP, 2010).

7.3.1 Population

All of Portland is exposed to some extent to severe weather. Some areas are more exposed due to geographic location and local weather patterns. People living at higher elevations with large stands of trees or power lines may be more susceptible to wind damage and lightning strikes. People in low-lying areas are at risk for possible flooding. People in densely populated urban areas without air conditioning, working outside, or in industrial corridors are likely to be more exposed to extreme heat events.

Economically disadvantaged households may be more exposed if heat and electricity are turned off during winter months. Residents who lack proper shelter are also more likely to be exposed to negative impacts from severe weather.

7.3.2 Property

According to the Multnomah County Assessor records used for this analysis, there are 193,837 structures in Portland. Most of these buildings are residential. All of these buildings are considered to be exposed to the severe weather hazard, but structures in poor condition or in particularly vulnerable locations (located on hilltops or exposed open areas) may risk the most damage. The frequency and degree of damage will depend on specific locations.

7.3.3 Critical Facilities and Infrastructure

All critical facilities exposed to flooding and landslide (see Chapters 10 and 11) are also likely exposed to severe weather. Additional facilities on higher ground may be exposed to damage from wind of falling trees. The most common problems associated with severe weather are loss of utilities. Downed power lines can cause blackouts, isolating large areas. Phone, water and sewer systems may not function. Roads may become impassable due to ice or snow or from secondary hazards such as landslides.

7.3.4 Environment

The environment is highly exposed to severe weather events. Natural habitats such as streams and trees are exposed to the elements during a severe storm and risk major damage and destruction. Prolonged rains can saturate soils and lead to slope failure. Flooding events caused by severe weather or snowmelt can produce river channel migration or damage riparian habitat.

7.4 VULNERABILITY

7.4.1 Population

Populations most vulnerable to severe weather events are those that are dependent on electricity for life support or that lack proper shelter. The elderly, young and persons with access and functional needs may be more vulnerable during extended power outages, especially if they are isolated. Population vulnerabilities to specific types of severe weather event are as follows:

- **Thermal Extremes**—Individuals with physical or mobility constraints, cognitive impairments, economic constraints, or social isolation are typically at greater risk to the adverse effects of excessive heat events. The average summertime mortality for excessive heat events is dependent upon the methodology used to derive such estimates. Certain medical conditions, such as heat stroke, can be directly attributable to excessive heat, while others may be exacerbated by excessive heat, resulting in medical emergencies. Individuals who lack shelter and heating are particularly vulnerable to extreme cold and wind chill.
- **Thunderstorms**—Nationally, lighting is one of the leading causes of weather-related fatalities (CDC, 2013). Lightning strikes are far more common in other areas of the country than they are in the Pacific Northwest. The majority of injuries and deaths associated with lighting strikes occur when people are outdoors; about one-third of lightning-related injuries occur indoors. Males are five times more likely than females to be struck by lighting and people between the ages of 15 and 34 account for 41 percent of all lightning strike victims (CDC, 2013).
- **Windstorms and Tornadoes**—Debris carried by extreme winds and trees felled by gusty conditions can contribute directly to loss of life and indirectly to the failure of buildings and other

structures that offer protection. Utility lines brought down by thunderstorms have also been known to cause fires, which start in dry roadside vegetation. Electric power lines falling down to the pavement create the possibility of lethal electric shock. Those with physical or mobility constraints may not be able to seek adequate shelter in the event of a tornado.

- **Winter Storms—**Many of the deaths that result from severe winter weather are indirectly related to the actual weather event, including deaths resulting from traffic accidents on icy roads and heart attacks while shoveling snow. Icy road conditions that lead to major traffic accidents can make it difficult for emergency personnel to travel. This may pose a secondary threat to life if police, fire, and medical personnel cannot respond to calls. Homeless populations that lack adequate shelter are also vulnerable to severe winter weather events.

Severe weather may have compounding impacts on socially vulnerable populations. For example, a severe winter storm that prompts school closures may result in the need for a parent to stay home from work to care for the children. Missing work could result in serious economic repercussions for economically disadvantaged households that spiral into much larger issues than a day of missed work.

7.4.2 Property

All property is vulnerable during severe weather events, but properties in poor condition or in particularly exposed locations may risk the most damage. Those in higher elevations and on ridges may be more prone to wind damage. Those that are located under or near overhead lines or near large trees may be vulnerable to falling ice or may be damaged in the event of a collapse. Table 7-3 shows the age of structures in Portland. Modern building code requirements regarding snow load came into effect in 2008. Structures built before 2008 may be more vulnerable to some severe weather events, such as heavy snow.

Table 7-3. Age of Structures in Portland

	Pre-2008[a]		2008-present[a]	
Reporting Area	Number of Structures	Percent	Number of Structures	Percent
Airport	594	92.4%	49	7.6%
Central City	2,575	97.2%	74	2.8%
Central Northeast	17,051	98.0%	355	2.0%
East Portland	42,463	97.0%	1,292	3.0%
North Portland	23,405	95.6%	1,084	4.4%
Northeast	19,932	96.4%	748	3.6%
Southeast	51,502	96.7%	1,768	3.3%
Southwest	22,539	97.5%	585	2.5%
West/Northwest	7,616	97.4%	205	2.6%
Total	**187,677**	**96.8%**	**6,160**	**3.2%**

a. Year built information was collected from Multnomah County Assessor data. When year built information was unavailable, it was estimated based on census block or county-wide average year built dates.

Loss estimations for the severe weather hazard are not based on damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent and 50 percent of the replacement value of exposed structures. This allows emergency managers to select a range of potential economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 7-4 lists the loss estimates.

Table 7-4. Loss Potential for Severe Weather

Reporting Area	Exposed Value	Potential Loss @ 1% Damage	@ 2.5% Damage	@ 5% Damage	@ 10% Damage	@ 50% Damage
Airport	$3,953,292,817	$39,532,928	$98,832,320	$1,976,646,409	$395,329,282	$1,976,646,408
Central City	$31,198,797,529	$311,987,975	$779,969,938	$15,599,398,765	$3,119,879,753	$15,599,398,765
Central Northeast	$10,886,322,033	$108,863,220	$272,158,051	$5,443,161,017	$1,088,632,203	$5,443,161,017
East Portland	$26,055,288,004	$260,552,880	$651,382,200	$13,027,644,002	$2,605,528,800	$13,027,644,002
North Portland	$23,502,220,863	$235,022,209	$587,555,522	$11,751,110,432	$2,350,222,086	$11,751,110,432
Northeast	$13,110,911,253	$131,109,113	$327,772,781	$6,555,455,627	$1,311,091,125	$6,555,455,626
Southeast	$30,396,480,542	$303,964,805	$759,912,014	$15,198,240,271	$3,039,648,054	$15,198,240,271
Southwest	$17,794,371,568	$177,943,716	$444,859,289	$8,897,185,784	$1,779,437,157	$8,897,185,784
West/Northwest	$13,908,090,256	$139,080,903	$347,702,256	$6,954,045,128	$1,390,809,026	$6,954,045,128
Total	$170,805,774,865	$1,708,057,749	$4,270,144,372	$85,402,887,433	$17,080,577,487	$85,402,887,433

7.4.3 Critical Facilities and Infrastructure

Incapacity and loss of roads are the primary transportation failures resulting from severe weather, mostly associated with secondary hazards. Landslides caused by heavy prolonged rains can block roads. High winds can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating population, and disrupting ingress and egress. Snowstorms in higher elevations can significantly impact the transportation system and the availability of public safety services. Of particular concern are roads providing access to isolated areas and to the elderly.

Severe windstorms, downed trees, and ice can create serious impacts on power and above-ground communication lines. Freezing of power and communication lines can cause them to break, disrupting electricity and communication. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance.

7.4.4 Environment

The vulnerability of the environment to severe weather is the same as the exposure.

7.4.5 Economic Impact

Prolonged obstruction of major routes due to landslides, snow, debris or floodwaters can disrupt the shipment of goods and other commerce. Large, prolonged storms can have negative economic impacts for an entire region.

7.5 FUTURE TRENDS IN DEVELOPMENT

All future development will be affected by severe storms. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The City of Portland has adopted the International Building Code. This code is equipped to deal with the impacts of severe weather events. Land use policies identified in the comprehensive plan also address many of the secondary impacts (flood and landslide) of the severe weather hazard. Additionally, the City of Portland has begun efforts to reduce severe weather impacts through low impact development and green infrastructure standards. With these tools, the City of Portland is well equipped to deal with future growth and the associated impacts of severe weather.

7.6 SCENARIO

A worst-case event would involve prolonged high winds during a snowstorm accompanied by freezing temperatures, followed by warmer weather and continued rain. Such an event would have both short-term and longer-term effects. Initially, schools and roads would be closed due to snow and downed tree obstructions. Power outages would be common. Later, as the weather warms and snow turns to rain, the sudden runoff could produce severe urban flooding in low-lying areas and landslides on steep slopes.

7.7 ISSUES

Important issues associated with a severe weather in Portland include the following:

- Redundancy of power supply throughout Portland must be evaluated to better understand which areas may be vulnerable.
- Many critical facilities in Portland may have limited or inadequate backup power generation, with only enough fuel on hand to run emergency generators for a short amount of time. This may result in loss of services, such as potable water, during extended power outages or may present risks to vulnerable populations such as those in hospitals or other care facilities.
- Debris management (downed trees, etc.) must be addressed, because debris can impact the severity of severe weather events, requires coordination efforts, and may require additional funding. A debris management plan is currently being developed.
- The effects of climate change may result in an increase in frequency of extreme heat events or more frequent, stronger storm systems.
- Older building stock in Portland is built to low code standards or none at all. These structures could be highly vulnerable to severe winter weather effects such as snow loads or high winds.
- Urban forest management programs should be evaluated to help reduce impacts from forest-related damage.
- Severe weather events cause or exacerbate many secondary hazard including power outages, poor air quality and landslides.
- Drainage systems and culverts in Forest Park and other areas throughout the City can and have been overwhelmed by heavy precipitation events, causing erosion and costly damage to fire access roads.

8. EARTHQUAKE



8.1 GENERAL BACKGROUND

8.1.1 How Earthquakes Happen

An earthquake is the vibration of the earth's surface following a release of energy in the earth's crust. This energy can be generated by a sudden dislocation of the crust or by a volcanic eruption. Most destructive quakes are caused by dislocations of the crust. The crust may first bend and then, when the stress exceeds the strength of the rocks, break and snap to a new position. In the process of breaking, vibrations called "seismic waves" are generated. These waves travel outward from the source of the earthquake at varying speeds. There are two main types of seismic waves (Michigan Technical University, 2007):

DEFINITIONS

- **Earthquake**—A sudden slip on a fault, volcanic or magmatic activity, and sudden stress changes in the earth that result in ground shaking and radiated seismic energy.
- **Liquefaction**—The complete failure of soils occurring when soils lose shear strength, flow horizontally, and behave like viscous fluids when liquefaction occurs.
- **Magnitude**—The measure of the strength of an earthquake, typically measured by the Richter scale. Each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number.

- Body waves travel through the earth's interior. They include P waves (primary waves) and S waves (secondary waves). P waves travel through solids and fluids, sending particles in the same direction that the wave is moving. Some animals, such as dogs, are able to hear P waves. S waves are the waves that are felt during an earthquake. These waves travel more slowly than P waves and are only transmitted through rock. S waves move particles up and down.
- Surface waves travel along the surface. They are lower frequency than body waves and arrive later. It is these waves that are primarily responsible for the destruction resulting from earthquakes. S waves also come in two types: Love waves and Rayleigh waves. Love waves travel exclusively on the surface of the earth and produce horizontal motion. Rayleigh waves travel like ocean waves, rolling the ground up and down. Most of the shaking felt during earthquakes is the result of these waves.

Earthquakes tend to reoccur along faults, which are zones of weakness in the crust. Even if a fault zone has recently experienced an earthquake, there is no guarantee that all the stress has been relieved. Another earthquake could still occur.

8.1.2 Types of Earthquakes

Four types of earthquakes affect the Portland area (see Figure 8-1):

- **Shallow Crustal earthquakes**—Shallow crustal earthquakes occur in the North America plate at depths of 20 miles or less (PNSN, n.d. a). These types of earthquakes occur frequently in the Pacific Northwest. Most are relatively small, but large, damaging events in the region have and will continue to occur. Generally, these earthquakes are expected to last from 20 to 60 seconds, with magnitudes less than 7.5. Aftershocks are likely (see #4 in Figure 8-1) (CREW, 2009).

Source: DOGAMI, 2010

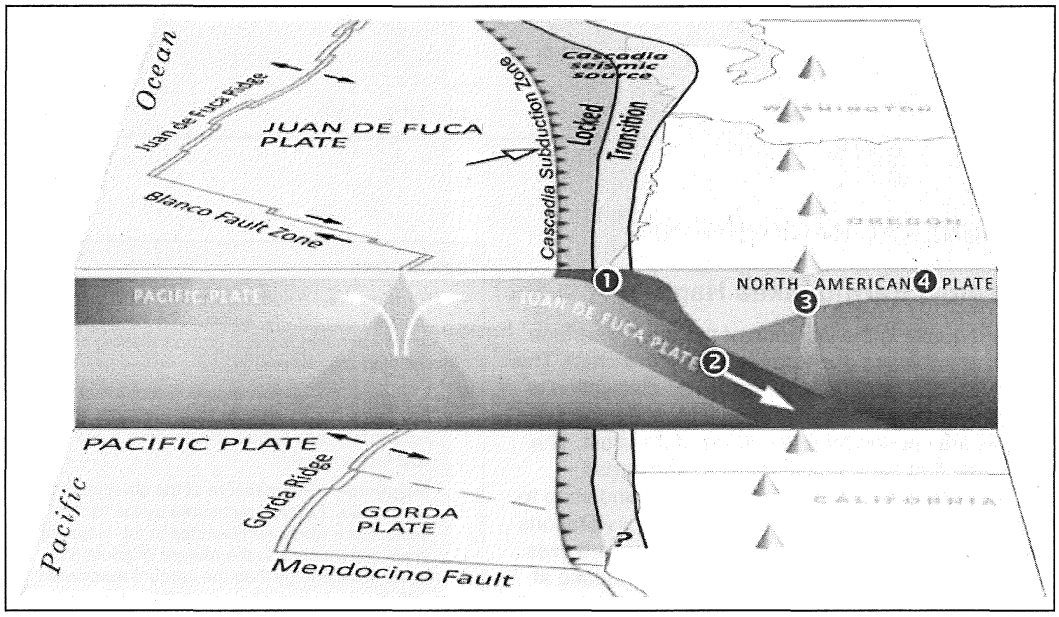


Figure 8-1. Earthquake Types in Oregon

- **Benioff Zone (Deep or Intraplate) Earthquakes**—Benioff Zone earthquakes occur in the Juan De Fuca plate as moves below the North American plate. They are deep earthquakes, 20 miles or more in depth (PNSN, n.d. b). Shaking from these earthquakes can last up to 60 seconds. Due to their depth, aftershocks are typically not felt. Generally, these earthquakes cause less damage than shallow earthquakes of similar magnitude but are felt over a wider area (CREW, 2009) (see #2 in Figure 8-1)
- **Subduction Zone Earthquakes**—Subduction Zone earthquakes occur at the interface between tectonic plates. A subduction zone earthquake affecting the City of Portland would be centered in the Cascadia Subduction Zone off the coast of Washington or Oregon. Such earthquakes typically have a minute or more of strong ground shaking, and are quickly followed by damaging tsunamis and numerous large aftershocks. The potential exists for large earthquakes along the Cascadia Subduction Zone, with a magnitude of 9 or more (CREW, 2009). This could produce a tsunami all along the fault line from British Columbia to Mendocino, California. The tsunami would not impact the City of Portland; however, lateral spreading and ground settlement would likely occur. Such an earthquake would produce catastrophic damage in the region (see #1 in Figure 8-1).
- **Volcanic activity** related seismic events, such as those occurring before an eruption of one of the volcanoes in the nearby Cascade Mountain Range, can also impact Portland. Such earthquakes can reach a magnitude of 5.5. The earthquake preceding the 1980 Mt. Saint Helens eruption was a magnitude 5.1 (see #3 in Figure 8-1) (Oregon Department of Land Conservation and Development, 2015).

8.1.3 Faults

Geologists classify faults by their relative hazards. Active faults, which represent the highest hazard, are those that have ruptured to the ground surface within the last 11,000 years. Potentially active faults are those that displaced layers of rock within the last 1.8 million years. Determining if a fault is active or potentially active depends on geologic evidence, which is not available for every fault. Additionally, earthquakes may occur on faults that have not been mapped and identified.

Faults are more likely to have earthquakes on them if they have more rapid rates of movement, have had recent earthquakes along them, experience greater total displacements, and are aligned so that movement can relieve accumulating tectonic stresses. A direct relationship exists between a fault's length and location and its ability to generate damaging ground motion at a given site. In some areas, smaller, local faults produce lower magnitude quakes, but ground shaking can be strong, and damage can be significant as a result of the fault's proximity to the area. In contrast, large regional faults can generate great magnitudes but, because of their distance and depth, may result in only moderate shaking in the area.

8.1.4 Earthquake Classifications

Earthquakes are typically classified in one of two ways: By the amount of energy released, measured as **magnitude**; or by the impact on people and structures, measured as **intensity**. Magnitude describes the size at the focus of an earthquake and intensity describes the overall felt severity of shaking during the event.

Magnitude

An earthquake's magnitude is a measure of the energy released at the source of the earthquake. It is expressed by ratings on the local magnitude scale (ML), commonly called the Richter scale, or the moment magnitude scale (M_w). Currently the most commonly used magnitude scale is the moment magnitude scale, with the follow classifications of magnitude:

- Great—$M_w \geq 8$
- Major—$M_w = 7.0 - 7.9$
- Strong—$M_w = 6.0 - 6.9$
- Moderate—$M_w = 5.0 - 5.9$
- Light—$M_w = 4.0 - 4.9$
- Minor—$M_w = 3.0 - 3.9$
- Micro—$M_w < 3$

One advantage of the moment magnitude scale is that, unlike other magnitude scales, it does not saturate at the upper end. That is, there is no value beyond which all large earthquakes have about the same magnitude. For this reason, moment magnitude is now the most often used estimate of large earthquake magnitudes. The magnitudes referenced in the scenario events used in the risk analysis are expressed in the moment magnitude scale.

Intensity

The intensity of an earthquake is based on the observed effects of ground shaking on people, buildings and natural features. Intensity of a given earthquake varies with location. The Modified Mercalli (MMI) scale expresses intensity of an earthquake and describes how strong a shock was felt at a particular location. Table 8-1 summarizes earthquake intensity as expressed by the Modified Mercalli scale.

Table 8-1. Mercalli Scale and Peak Ground Acceleration Comparison

Modified Mercalli Scale	Perceived Shaking	Potential Structure Damage		Estimated PGA[a] (%g)
		Resistant Buildings	Vulnerable Buildings	
I	Not Felt	None	None	<0.17%
II-III	Weak	None	None	0.17% - 1.4%
IV	Light	None	None	1.4% - 3.9%
V	Moderate	Very Light	Light	3.9% - 9.2%
VI	Strong	Light	Moderate	9.2% - 18%
VII	Very Strong	Moderate	Moderate/Heavy	18% - 34%
VIII	Severe	Moderate/Heavy	Heavy	34% - 65%
IX	Violent	Heavy	Very Heavy	65% - 124%
X – XII	Extreme	Very Heavy	Very Heavy	>124%

a. PGA measured in percent of g, where g is the acceleration of gravity
Sources: USGS, 2008a; USGS, 2010

8.1.5 Ground Motion

Earthquake hazard assessment is also based on expected ground motion. This involves determining the annual probability that certain ground motion accelerations will be exceeded, then summing the annual probabilities over the time period of interest. The most commonly mapped ground motion parameters are the horizontal and vertical peak ground accelerations (PGA) for a given soil or rock type. Instruments called accelerographs record levels of ground motion due to earthquakes at stations throughout a region. These readings are recorded by state and federal agencies that monitor and predict seismic activity.

Maps of PGA values form the basis of seismic zone maps that are included in building codes such as the International Building Code. Building codes that include seismic provisions specify the horizontal force due to lateral acceleration that a building should be able to withstand during an earthquake. PGA values are directly related to these lateral forces that could damage "short period structures" (e.g. single-family dwellings). Longer period response components determine the lateral forces that damage larger structures with longer natural periods (apartment buildings, factories, high-rises, bridges). Table 8-1 lists damage potential and perceived shaking by PGA factors, compared to the Mercalli scale.

8.1.6 Effect of Soil Types

The impact of an earthquake on structures and infrastructure is largely a function of ground shaking, distance from the source of the quake, and soil conditions and types. Liquefaction is a secondary effect of an earthquake in which soils lose their shear strength and flow or behave as liquid, thereby damaging structures that derive their support from the soil. Liquefaction generally occurs in soft sedimentary soils. A program called the National Earthquake Hazard Reduction Program (NEHRP) creates maps based on soil characteristics to help identify locations subject to liquefaction. Table 8-2 summarizes NEHRP soil classifications. NEHRP Soils B and C typically can sustain ground shaking without much effect, dependent on the earthquake magnitude. The areas that are commonly most affected by ground shaking have NEHRP Soils D, E and F. In general, these areas are also most susceptible to liquefaction.

Table 8-2. NEHRP Soil Classification System

NEHRP Soil Type	Description	Mean Shear Velocity to 30 meters
A	Hard Rock	1,500 meters/second
B	Firm to Hard Rock	760-1,500 meters/second
C	Dense Soil/Soft Rock	360-760 meters/second
D	Stiff Soil	180-360 meters/second
E	Soft Clays	< 180 meters/second
F	Special Study Soils (liquefiable soils, sensitive clays, organic soils, soft clays >36 m thick)	

8.2 HAZARD PROFILE

8.2.1 Past Events

Table 8-3 summarizes recorded historical earthquakes from before the current era (BCE) to the present that were believed to have been felt or to have caused damage in Portland. The largest recorded earthquake epicenter within 100 miles of Portland occurred in Scotts Mills on March 25, 1993. Its magnitude was 5.6 and it caused minor damage to some buildings. The shaking was intense enough to require damage assessment team deployments to perform bridge and key infrastructure inspections (NHMP, 2010). Federal disaster declaration DR-985, issued in response to this earthquake, applied to Clackamas and Washington Counties. There is geologic evidence that a magnitude 6.5 event may have occurred on the Portland Hills fault zone within the past 10,000 years; but, no events on that fault have been recorded in historic times (DOGAMI, 2001).

Table 8-3. Historical Earthquake Events in or Impacting Portland

Date	Location	Magnitude
February 2001[a]	Nisqually, Washington	6.8
March 25, 1993[b]	33.5 miles from Portland	5.6
1989[b]	82 miles from Portland	5.1
1981[b]	38 miles from Portland	5.5
1980[b]	60 miles from Portland	5.0
1980[b]	53 miles from Portland	5.0
March 27, 1964 [b]	Prince William Sound, Alaska	9.2
December 1963[a]	Portland area	4.5
November 1962[a]	Portland area	5.5
November 1961[a]	Portland area	5.0
December 1953[a]	Portland area	4.5
April 1949[a]	Olympia, Washington	7.1
December 1941[a]	Portland area	4.5
February 1892[a]	Portland area	5.0
October 1877[a]	Portland area	5.2
January 1700[a]	Cascadia Subduction Zone	About 9.0
1400 BCE, 1050 BCE, 600 BCE, 400 BCE, 400, 750, 900[a]	Cascadia Subduction Zone	Probably 8.0-9.0

a. Source: Oregon OEM, 2015
b. Source: NHMP, 2010

8.2.2 Location

Identifying the extent and location of an earthquake is not as simple as it is for other hazards such as flood, landslide or wildfire. The impact of an earthquake is a function of ground shaking, soil condition and type, and distance from the source (both horizontally and vertically). Mapping that shows the impacts of these components was used to assess the risk of earthquakes in Portland. While the impacts from each of these components can build upon each other during an earthquake event, the mapping looks at each component individually.

Identified Faults

The convergence of the Juan de Fuca and North American tectonic plates puts most areas of western Oregon, including the City of Portland, at risk for a catastrophic earthquake with a Magnitude 9 or higher. Figure 8-2 shows identified faults in and near the City of Portland. The City straddles three identified crustal faults (Oregon Department of Land Conservation and Development, 2015):

- The Oatfield fault, west of the northwest hills
- The East Bank fault, traversing the Willamette River into Oregon City
- The Portland Hills fault, running parallel to Forest Park into downtown Portland.

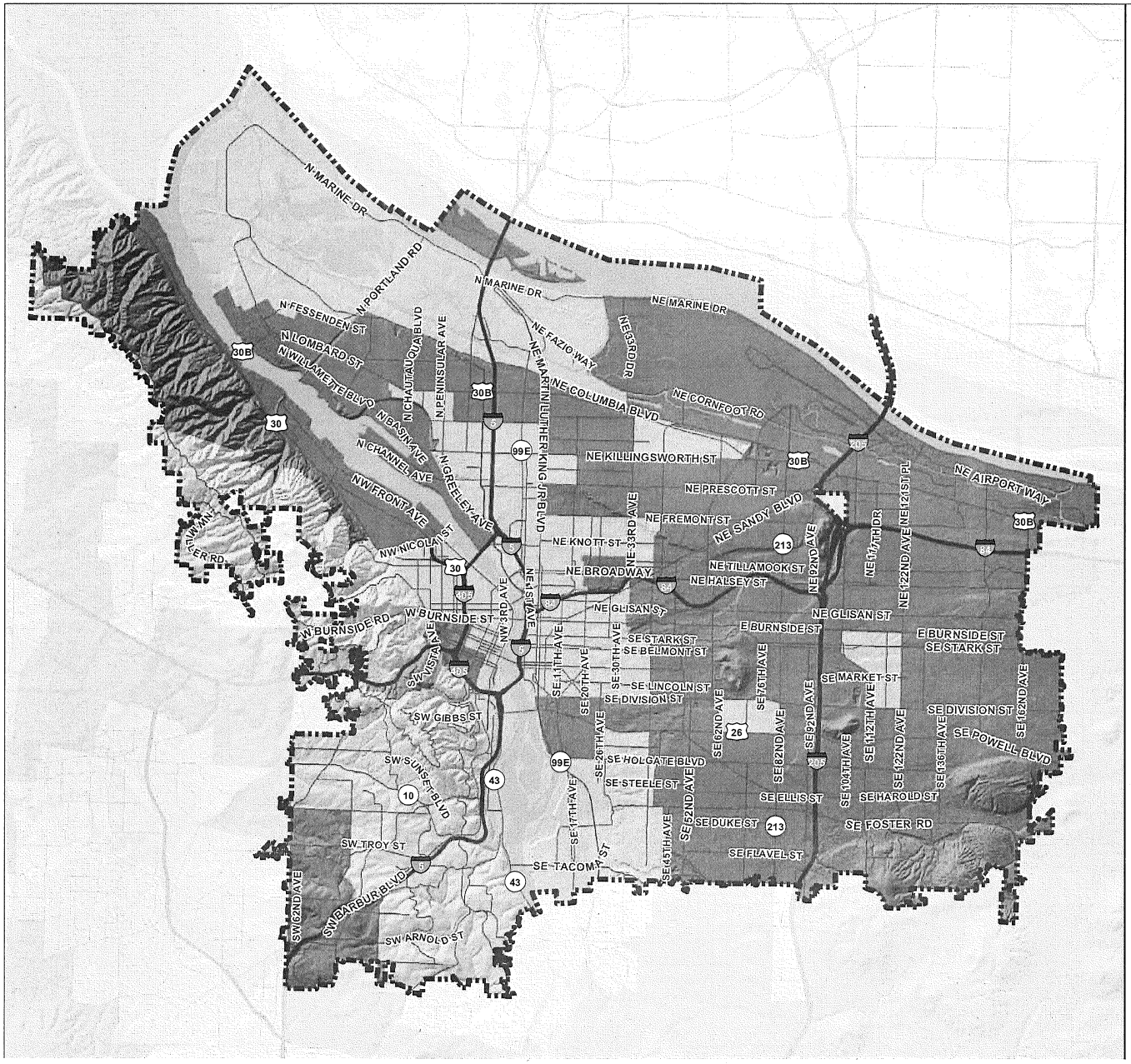
Shake Maps

A shake map is a representation of ground shaking produced by an earthquake. The information it presents is different from the earthquake magnitude and epicenter that are released after an earthquake because shake maps focus on the ground shaking resulting from the earthquake, rather than the parameters describing the earthquake source. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region, depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth's crust. A shake map shows the extent and variation of ground shaking in a region immediately following significant earthquakes.

Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and Modified Mercalli intensity. Two types of shake map are typically generated from the data:

- A probabilistic seismic hazard map shows the hazard from earthquakes that geologists and seismologists agree are statistically likely to occur in a given time period. Figure 8-3 and Figure 8-4 show the estimated ground motion for the 100-year and 500-year probabilistic earthquakes in Portland.
- Earthquake scenario maps describe the expected ground motions and effects of hypothetical large earthquakes for a region. Two scenarios were chosen for this plan:
    - Cascadia Subduction Zone Scenario—A Magnitude 9.0 event off the Pacific Coast. See Figure 8-5.
    - Portland Hills Fault Scenario—A Magnitude 6.5 event with the epicenter near the border of Washington and Oregon. See Figure 8-6.

September 12, 2016
Mitigation Action Plan (MAP)
Figure 8-2. Earthquake Fault Lines
Legend
City Boundary
Earthquake Fault Lines
Unnamed Fault
Beaverton Fault
East Bank Fault
Lake Oswego Fault
Marylhurst Fault
Oatfield Fault
Portland Hills Fault
River Forest Fault
Sylvania Fault
NORTH
0 0.75 1.5 Miles
Sources: DOGAMI-2011; City of Portland-2016
PBEM



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Mitigation Action Plan (MAP)

Figure 8-3.
100-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

City Boundary

100-year probabilistic earthquake PGA

Potential Damage - Perceived Shaking

V -- Very Light - Moderate

VI -- Light - Strong

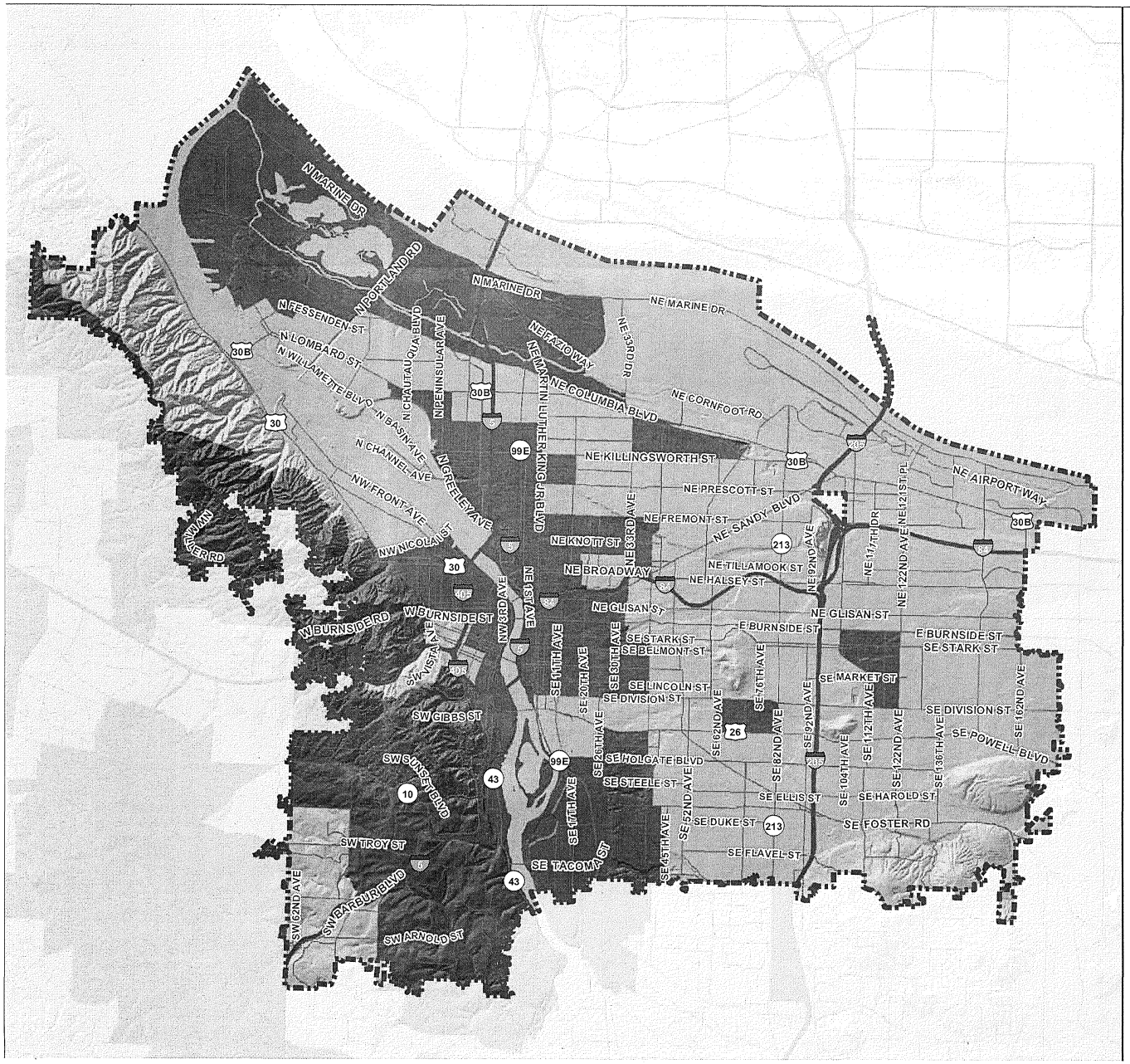
NORTH

0 0.75 1.5 Miles

Sources: FEMA-2014;
City of Portland-2016

CITY OF PORTLAND OREGON 1851

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Figure 8-4. 500-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

City Boundary

500-year probabilistic earthquake PGA

Potential Damage - Perceived Shaking

- VI -- Light - Strong
- VII -- Moderate - Very Strong
- VIII -- Moderate/Heavy - Severe

NORTH

0 0.75 1.5 Miles

Sources: FEMA-2015; City of Portland-2016

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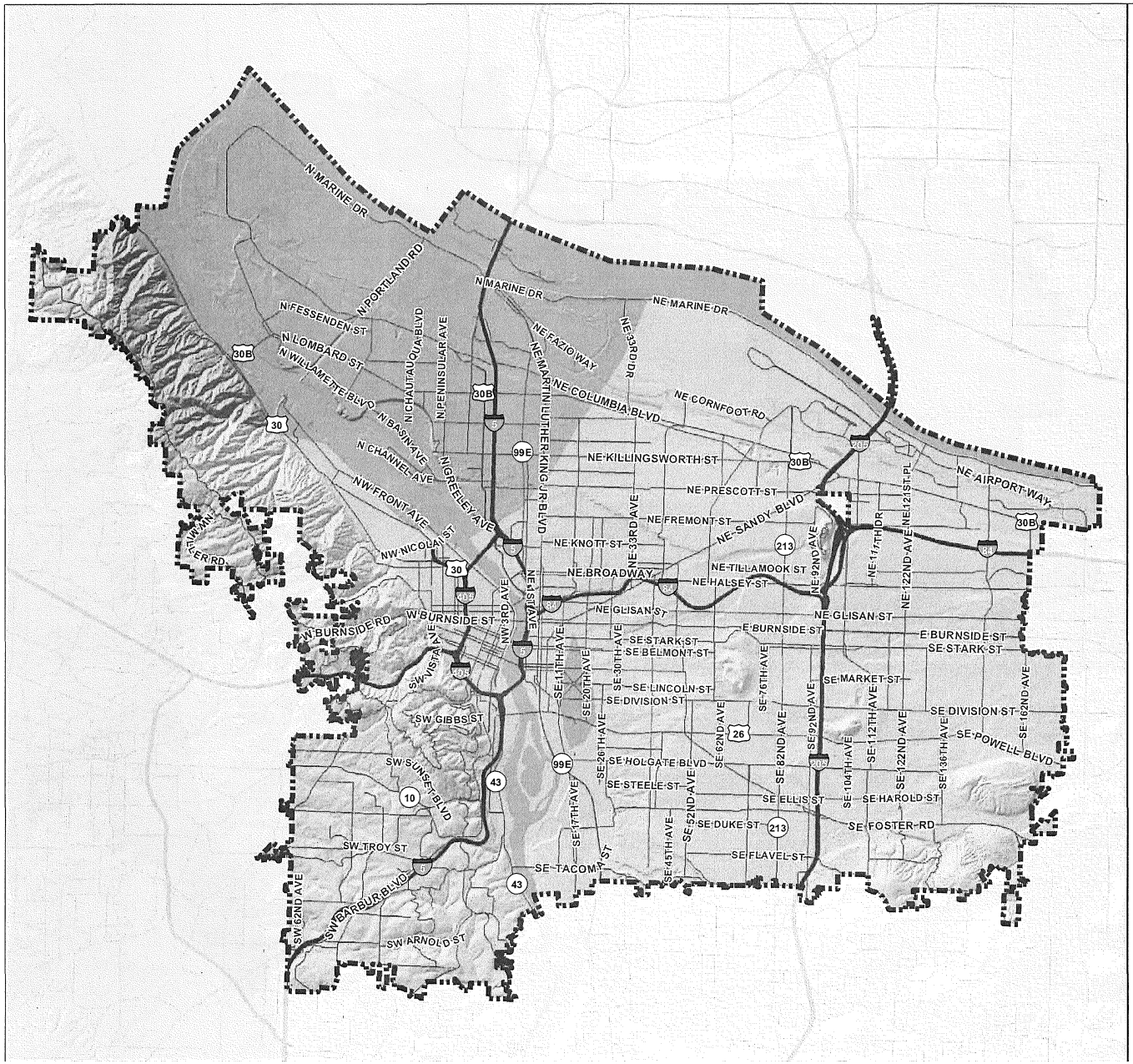


September 12, 2016

Mitigation Action Plan (MAP)

Figure 8-5.
Cascadia 9.0 Magnitude Earthquake--Peak Ground Acceleration

Legend

- City Boundary

Cascadia M9.0 earthquake PGA

Potential Damage - Perceived Shaking

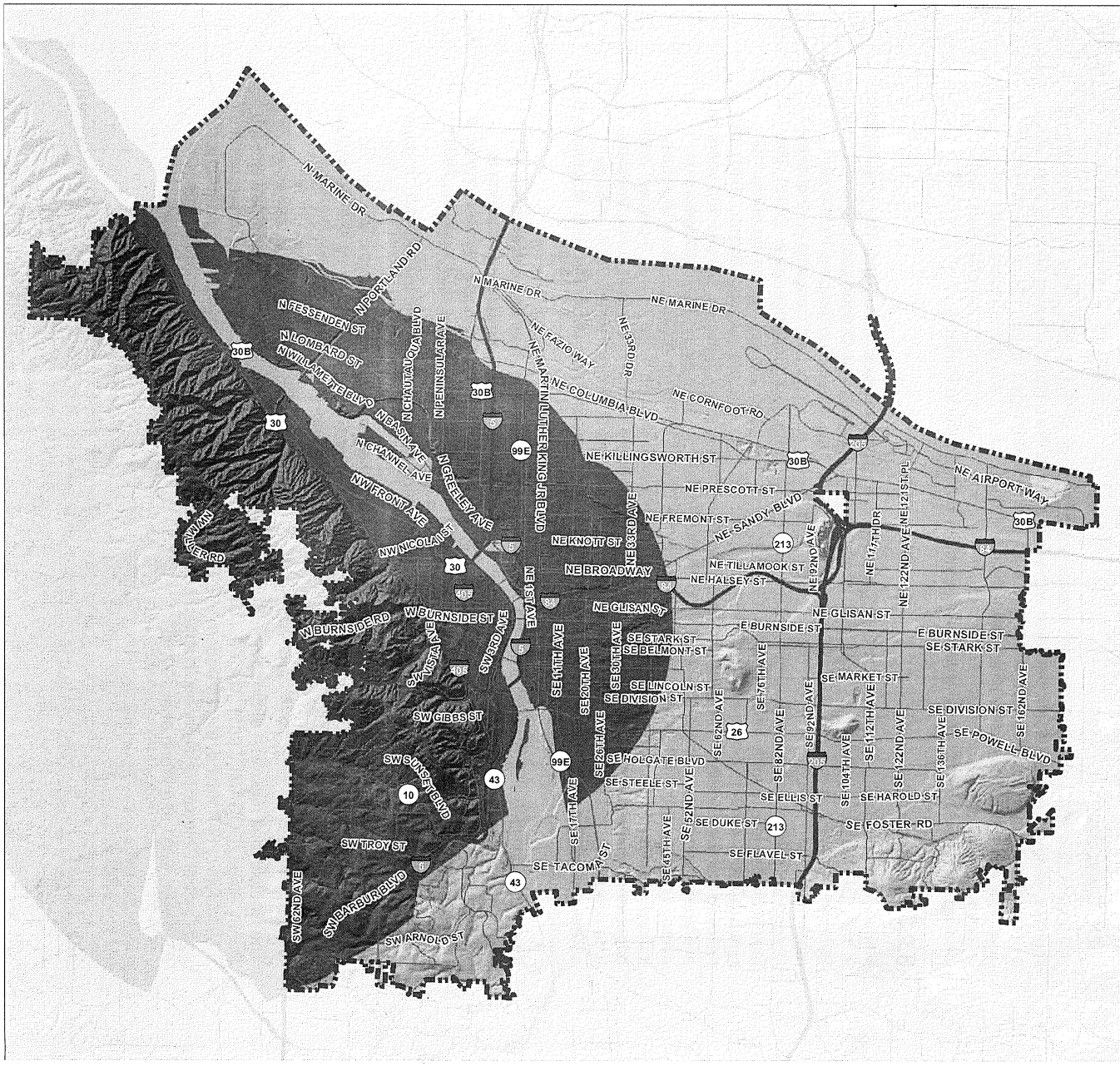
- V -- Very Light - Moderate
- VI -- Light - Strong
- VII -- Moderate - Very Strong
- VIII -- Moderate/Heavy - Severe

NORTH

0 0.75 1.5 Miles

Sources: USGS-2011; City of Portland-2016

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Figure 8-6. Portland Hills 6.5 Magnitude Earthquake-Peak Ground Acceleration

Legend

City Boundary

Portland Hills M6.5 earthquake PGA

Potential Damage - Perceived Shaking

- V -- Very Light - Moderate
- VI -- Light - Strong
- VII -- Moderate - Very Strong
- VIII -- Moderate/Heavy - Severe

NORTH

0 0.75 1.5 Miles

Sources: USGS-2009; City of Portland-2016

PBEM

NEHRP Soil Maps

NEHRP soil types define the locations that will be significantly impacted by an earthquake. NEHRP Soils B and C typically can sustain low-magnitude ground shaking without much effect. The areas that are most commonly affected by ground shaking have NEHRP Soils D, E and F. Figure 8-7 shows NEHRP soil classifications in Portland.

Liquefaction Maps

Soil liquefaction maps are useful tools to assess potential damage from earthquakes. When the ground liquefies, sandy or silty materials saturated with water behave like a liquid, causing pipes to leak, roads and airport runways to buckle, and building foundations to be damaged. In general, areas with NEHRP Soils D, E and F are also susceptible to liquefaction. If there is a dry soil crust, excess water will sometimes come to the surface through cracks in the confining layer, bringing liquefied sand with it, creating sand boils. Figure 8-8 shows the liquefaction susceptibility in Portland.

8.2.3 Frequency

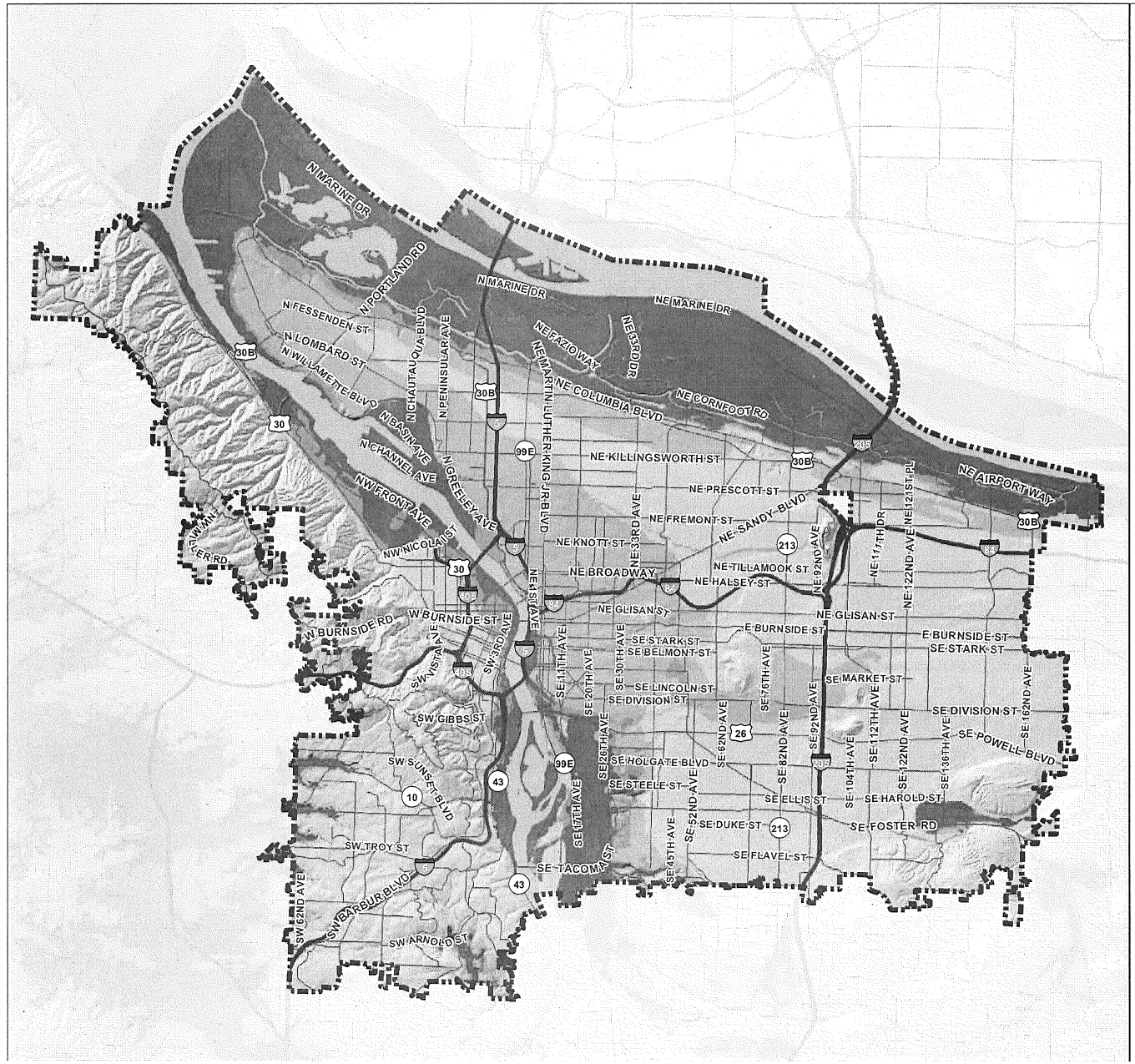
Many earthquake faults capable of producing damaging earthquakes exist in Portland. The greatest risk is from the Cascadia Subduction Zone fault, which lies just offshore of the Oregon coast. The Cascadia Subduction Zone has produced over 40 large magnitude earthquakes during the past 10,000 years, most recently on January 26, 1700. Based on the 10,000-year record of past Cascadia earthquakes, Oregon will certainly experience another Magnitude 8 to 9 earthquake (Goldfinger et al., 2012). The fault is divided into roughly four segments. Geologic records indicate that sometimes the entire fault ruptures at the same time and sometimes only some of the segments are involved (Stauth, 2016). It is believed that the southern portions of the fault rupture more frequently (between 220 and 380 years on average) and northern sections, most likely to impact Portland, rupture every 350 to 430 years on average (Stauth, 2016). Recent research conducted by Chris Goldfinger at Oregon State University indicates that a rupture of the segment off central and northern Oregon has a 15- to 20-percent chance of occurring in the next 50 years, while a rupture on the northern portion of the fault during the same time period has 10 to 17 percent chance of occurring in the next 50 years (Stauth, 2016). A large earthquake on this fault, which has the same type of subduction zone process as the 2011 Magnitude 9 earthquake in Japan, will be accompanied by a coastal tsunami.

The Portland Hills fault is located along the west bank of the Willamette River and can produce a Magnitude 7 earthquake (USGS, 2008a). The estimated likelihood of this earthquake occurring is 1 percent in the next 50 years (USGS, 2016d). The fault is 30 miles long and consists of a complex of fault zones, which include the Oatfield and East Bank faults (DOGAMI, 2001 and Wong et al., 2001).

The Portland Hills fault runs northwest to southeast through Portland. According to DOGAMI, "It starts roughly on the northern edge of Forest Park and runs along the foot of Portland's West Hills before turning east on West Burnside Street for a few blocks and then turning southeast again through the heart of downtown. The fault then crosses the Willamette River between the Marquam and Ross Island bridges to Milwaukie and ends about a mile south of the Clackamas River near Oregon City and Gladstone" (DOGAMI, 2001).

The Oatfield fault runs west of Northwest Skyline Road from Sylvan Hill to Germantown Road through Bonny Slope (DOGAMI, 2001). The East Bank fault on the east side of the Willamette River runs under the University of Portland, Mocks Bottom, the Oregon Convention Center, Lloyd Center and Benson and Central Catholic high schools. It appears to have been active within the last 11,000 years (DOGAMI, 2001 and Wong et al., 2001).

September 12, 2016
Mitigation Action Plan (MAP)
Figure 8-7.
National Earthquake Hazards Reduction Program (NEHRP) Soils
Legend
City Boundary
NEHRP Soils
Type
B
C
D
E
NORTH
0 0.75 1.5
Miles
Sources: DOGAMI-2012; City of Portland-2016
PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Figure 8-8. Liquefaction Susceptibility

Legend

- City Boundary

Liquefaction Susceptibility Type

- 0 -- None
- 1 -- Very Low
- 2 -- Low
- 3 -- Moderate
- 4 -- High
- 5 -- Very High

NORTH

0 0.75 1.5 Miles

Sources: DOGAMI-2013; City of Portland-2016

PBEM

8.2.4 Severity

The severity of an earthquake can be expressed in terms of intensity or magnitude. Intensity represents the observed effects of ground shaking on people, buildings, and natural features. The USGS has created ground motion maps based on current information about several fault zones. These maps show the PGA that has a certain probability (2 percent or 10 percent) of being exceeded in a 50-year period. This can also be understood as a 0.04 percent annual chance of occurrence (roughly a 2,500-year event) or a 0.2-percent annual chance (roughly a 500-year event), respectively. The PGA is measured in numbers of g's (the acceleration associated with gravity). Figure 8-9 shows the PGAs with a 2-percent exceedance chance in 50 years in the United States.

Magnitude is related to the amount of seismic energy released at the hypocenter of an earthquake. The hypocenter is the point in the earth where are earthquake rupture starts. It is determined by the amplitude of the earthquake waves recorded on instruments. Whereas intensity varies depending on location with respect to the earthquake epicenter, magnitude is represented by a single, instrumentally determined value for each earthquake event.

Earthquakes can last from a few seconds to over 5 minutes; they may also occur as a series of tremors over several days. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties generally result from falling objects and debris, because the shocks shake, damage or demolish buildings and other structures. Disruption of communications, electrical power supplies and gas, sewer and water lines should be expected. Earthquakes may trigger fires, landslides or releases of hazardous material, compounding their disastrous effects. Additionally, earthquakes may induce dam failures. After the 1999 Chi earthquake in Taiwan, the Shi-kang Dam failed after one side of the concrete structure was raised by 30 feet by ground deformation (RMS, 2000).

Small, local faults produce lower magnitude quakes, but ground shaking can be strong and damage can be significant in areas close to the fault. In contrast, large regional faults can generate earthquakes of great magnitudes but, because of their distance and depth, they may result in only moderate shaking in an area.

In simplistic terms, the severity of an earthquake event can be measured in the following terms:

- How hard did the ground shake?
- How did the ground move? (Horizontally or vertically)
- How stable was the soil?
- How susceptible is the built environment in the area of impact (for example, building codes used and presence of unreinforced masonry buildings)?

8.2.5 Warning Time

There is currently no reliable way to predict the day or month that an earthquake will occur at any given location. Research is being done with warning systems that use the low energy waves that precede major earthquakes. The USGS and university partners are developing and testing an early warning system called ShakeAlert for the West Coast of the United States. The potential warning ranges from a few seconds to tens of seconds notice that a major earthquake is about to occur (Earthquake Early Warning, 2016). The warning time is very short but it could allow enough time to stop vehicles from crossing bridges, turn on backup generators, open elevators doors, or slow trains.

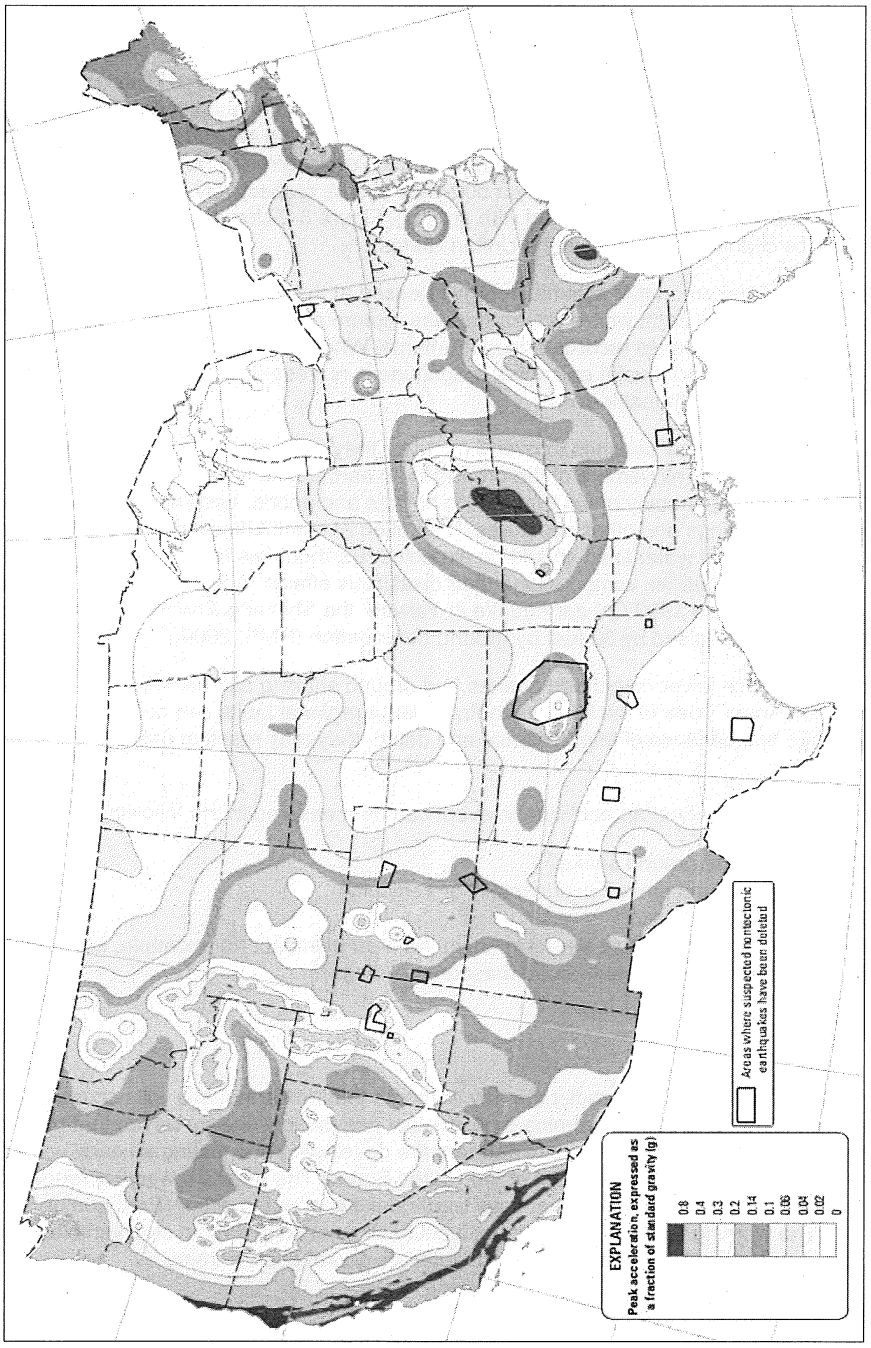


Figure 8-9. PGA with 2-Percent Probability of Exceedance in 50 Years

8.3 COMPOUNDING FACTORS AND SECONDARY HAZARDS

8.3.1 Overview

Earthquakes can cause large and sometimes disastrous landslides and mudslides. River valleys are vulnerable to slope failure, often as a result of loss of cohesion in clay-rich soils. Soil liquefaction occurs when water-saturated sands, silts or gravelly soils are shaken so violently that the individual grains lose contact with one another and float freely in the water, turning the ground into a pudding-like liquid. Building and road foundations lose load-bearing strength and may sink into what was previously solid ground. Unless properly secured, hazardous materials can be released, causing significant damage to the environment and people. Structure fires from broken gas lines also pose a significant hazard after earthquake events.

8.3.2 Climate Change

The impacts of global climate change on earthquake probability are unknown. Some scientists say that melting glaciers could induce tectonic activity. As ice melts and water runs off, tremendous amounts of weight are shifted on the earth's crust. As newly freed crust returns to its original, pre-glacier shape, it could cause seismic plates to slip and stimulate volcanic activity, according to research into prehistoric earthquakes and volcanic activity. NASA and USGS scientists found that retreating glaciers in southern Alaska may be opening the way for future earthquakes (NASA, 2004).

Secondary impacts of earthquakes could be magnified by climate change. Soils saturated by repetitive storms could experience liquefaction or an increased propensity for slides during seismic activity due to the increased saturation. Dams storing increased volumes of water due to changes in the hydrograph could fail during seismic events. There are currently no models available to estimate these impacts.

8.4 EXPOSURE

8.4.1 Population

The entire population of Portland is potentially exposed to direct and indirect impacts from earthquakes. The degree of exposure is dependent on many factors, including the age and construction type of the structures people live in, the soil type their homes are constructed on, their proximity to fault locations, etc. Whether directly impacted or indirectly impact, the entire population will have to deal with the consequences of earthquakes to some degree. Business interruption could keep people from working, road closures could isolate populations, and loss of functions of utilities could impact populations that suffered no direct damage from an event itself.

8.4.2 Property

According to Multnomah County Assessor records, there are 193,837 buildings in Portland, 92.7 percent of them residential, with a total replacement value of $170.8 billion. Since all structures in Portland are susceptible to earthquake impacts to varying degrees, this total represents the citywide property exposure to seismic events.

8.4.3 Critical Facilities and Infrastructure

All critical facilities in Portland are exposed to the earthquake hazard. Table 4-7 and Table 4-8 in Chapter 4 list the number of each type of facility by risk reporting area.

8.4.4 Environment

All environment in Portland is potentially exposed to the earthquake hazard. Habitat could be impacted by lateral spread, ground deformation or secondary impacts of earthquakes, such as landslides. Many of these changes would occur abruptly, such as a change in a stream direction, while others would occur more gradually, such as fallen trees allowing more light into an area and changing the composition of species.

8.5 VULNERABILITY

Earthquake vulnerability data was evaluated using a Level 2 Hazus-MH analysis. Once the location and size of a hypothetical earthquake are identified, Hazus-MH estimates the intensity of the ground shaking, the number of buildings damaged, the damage to critical facilities and infrastructure, the number of people displaced from their homes, and additional information that can be used to estimate the costs of repair and cleanup.

8.5.1 Population

Liquefaction Potential

There are estimated to be 35,966 people—5.6 percent of the total City population—residing in high liquefaction potential areas (see Table 8-4). The Southeast risk reporting area contains the largest share of this population, with an estimated 42 percent (15,111). This is followed by the Southwest risk reporting area with 24.1 percent (8,653), North Portland with 13.7 percent (4,920) and East Portland with 12.6 percent (4,540).

Table 8-4. Population Residing within High Liquefaction Potential Areas

	Population Residing within High Liquefaction Potential Areas [a, b]	
Reporting Area	Population Exposed	% of Exposure
Airport	784	2.2%
Central City	1,625	4.5%
Central Northeast	320	0.9%
East Portland	4,540	12.6%
North Portland	4,920	13.7%
Northeast	0	0.0%
Southeast	15,111	42.0%
Southwest	8,653	24.1%
West/Northwest	12	0.0%
Total	**35,966**	**100.0%**

a. Values based on an analysis of 2010-2014 American Community Survey 5-year estimates at the Census block group level.
b. Values calculated using block group statistics weighted by the number of residential structures in the hazard area as a percentage of the total residential structures in the block.

Table 8-5 shows social vulnerability indicators for the population residing in high liquefaction potential areas. Persons over 65 years of age and renters appear to be disproportionately residing in these areas. Elderly residents may have mobility issues that result in difficulty in moving to safe areas. Renters do not have the authority to make structural changes to their homes and, thus, are unable to pursue structural mitigation measures. They also may lack renters' insurance for their belongings.

Table 8-5. Distribution of Social Vulnerability Indicators in High Liquefaction Potential Areas

Reporting Area	Population Residing in High Liquefaction Potential Areas *a, b, c, d*					
	Percent Under 15 Years	Percent Over 65 Years	Percent of People of Color	Percent of Renter occupied Housing	Percent of Families Below Poverty Level	Percent of Limited English Speaking Households
Airport	5.4%	5.1%	31.8%	68.8%	19.8%	20.6%
Central City	2.6%	7.8%	12.9%	82.4%	13.8%	0.5%
Central Northeast	5.6%	5.2%	32.0%	66.5%	18.9%	19.7%
East Portland	17.6%	14.8%	26.3%	24.9%	10.7%	5.2%
North Portland	14.4%	17.7%	29.2%	22.1%	8.0%	3.8%
Northeast	-	-	-	-	-	-
Southeast	13.6%	12.0%	12.7%	58.4%	7.3%	2.2%
Southwest	12.1%	16.6%	13.8%	54.1%	4.9%	1.4%
West/Northwest	13.6%	13.3%	11.6%	22.3%	1.4%	0.0%
Total	**13.1%**	**13.8%**	**17.5%**	**50.4%**	**7.6%**	**2.5%**

a. Values based on an analysis of 2010-2014 American Community Survey 5-year estimates at the Census block group level.
b. Values calculated using block group statistics weighted by the number of residential structures in the hazard area as a percentage of the total residential structures in the block group.
c. Values in red indicate percentages are at least 2 percent greater than the Citywide average (see Section 4.7).
d. Persons with disabilities not shown because the available data, at a census tract scale, is not conducive to analysis by hazard extent and location.

Displaced Households and Short-Term Shelter Needs

Displaced households and short-term shelter needs in Portland were estimated for the 100-year and 500-year probabilistic earthquakes and the two scenario events. The 100-year event can also be expressed as a 39-percent chance of exceedance in 50 years; 500-year events are also described as having a 10-percent chance of exceedance in 50 years.

Displaced households are estimated based on a loss of habitability, calculated from damage to the residential building stock and anticipated loss of utilities such as water and power. Short-term shelter is estimated based on the assumptions that all households residing in damaged structures will seek alternative shelter; however, some households may stay with friends or relatives or make other accommodations. Studies from past earthquake events also indicate that some households that experienced no damage will also seek shelter, as will most individuals who lacked suitable shelter before the event. These estimates are based on damaged structures and economic data, such as income, that serve as indicators for the need for publicly provided shelters.Injury and Casualty Estimates

Injury and casualty estimates in Portland were estimated for the 100-year and 500-year earthquakes and the two scenario events. Results are broken down into four severity levels:

- Level 1—Injuries require medical attention but hospitalization is not needed.
- Level 2—Injuries require hospitalization but are not considered life-threatening
- Level 3—Injuries require hospitalization and can become life threatening if not promptly treated.
- Level 4—Victims are killed by the earthquake.

Table 8-6 and Table 8-7 summarize the results. In general, the analysis shows that the Central City risk reporting area would experience the greatest number of persons requiring short-term shelter.

Injury and Casualty Estimates

Injury and casualty estimates in Portland were estimated for the 100-year and 500-year earthquakes and the two scenario events. Results are broken down into four severity levels:

- Level 1—Injuries require medical attention but hospitalization is not needed.
- Level 2—Injuries require hospitalization but are not considered life-threatening
- Level 3—Injuries require hospitalization and can become life threatening if not promptly treated.
- Level 4—Victims are killed by the earthquake.

Table 8-6. Estimated Earthquake Impact on Persons and Households

	Displaced Households[a]		Persons Requiring Short-Term Shelter[a]			
	100-Year	500-Year	100-Year Earthquake		500-Year Earthquake	
Reporting Area	Earthquake	Earthquake	Number	% of Total Population	Number	% of Total Population
Airport	0	0	0	0.0%	1	Less than 0.1%
Central City	268	9,185	129	0.3%	4,505	11.9%
Central Northeast	4	204	2	Less than 0.1%	117	0.2%
East Portland	9	717	6	Less than 0.1%	510	0.3%
North Portland	12	724	7	Less than 0.1%	404	0.6%
Northeast	20	1,157	12	Less than 0.1%	676	1.2%
Southeast	48	2,563	24	Less than 0.1%	1,281	0.8%
Southwest	69	2,147	30	Less than 0.1%	935	1.3%
West/Northwest	82	3,029	33	Less than 0.1%	1,246	4.6%
Total	**513**	**19,726**	**243**	**Less than 0.1%**	**9,674**	**1.6%**

a. Calculated using a Census tract level, general building stock analysis in Hazus 2.2.
Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

Table 8-7. Estimated Earthquake Impact on Persons and Households

	Displaced Households[a]		Persons Requiring Short-Term Shelter[a]			
	Cascadia	Portland Hills	Cascadia M9.0		Portland Hills M6.5	
Reporting Area	M9.0	M6.5	Number	% of Total Population	Number	% of Total Population
Airport	0	0	0	0.0%	0	0.0%
Central City	2,886	13,762	1,417	3.7%	7,033	18.5%
Central Northeast	130	330	65	0.1%	166	0.3%
East Portland	309	195	233	0.2%	152	0.1%
North Portland	343	927	181	0.3%	547	0.8%
Northeast	278	1,165	161	0.3%	658	1.1%
Southeast	525	2,027	262	0.2%	1,006	0.7%
Southwest	542	1,920	233	0.3%	876	1.2%
West/Northwest	825	4,859	342	1.3%	2,000	7.4%
Total	**5,838**	**25,186**	**2,893**	**0.5%**	**12,437**	**2.0%**

a. Calculated using a Census tract level, general building stock analysis in Hazus 2.2.
Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

The estimates are provided for three times of day when community members are likely to be pursuing different activities and in different locations and types of buildings:

- 2:00 am—Community members are likely at home sleeping

- 2:00 pm—Community members are likely at school, work or other activities
- 5:00 pm—Peak commute time.

Table 8-8 summarizes the results. In general, the largest number of injuries and causalities are expected to occur during the day while persons are out in the community.

Table 8-8. Estimated Injury and Casualty Estimates from Earthquake Scenario Events

	Injury and Casualty County by Severity Level											
	2:00 AM				2:00 PM				5:00 PM			
	1	2	3	4	1	2	3	4	1	2	3	4
100-Year Earthquake	61	7	0	1	159	25	2	5	101	15	1	3
500-Year Earthquake	2,093	540	78	153	5,816	1,663	264	516	3,940	1,113	176	340
Cascadia Fault, M9.0 Scenario	378	56	4	8	1,370	246	27	53	918	164	18	35
Portland Hills Fault, M6.5 Scenario	2,591	670	97	190	5,032	1,310	196	381	3,599	941	141	271

Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

The following summarizes the results for each scenario for the 2:00 pm timeframe:

- 100-Year Earthquake—191 persons killed or injured as a result of the earthquake, less than 0.1 percent of the total population
- 500-Year Earthquake—8,259 persons killed or injured as a result of the earthquake, 1.3 percent of the total population
- Cascadia Fault, M9.0 Scenario—1,696 persons killed or injured as a result of the earthquake, 0.3 percent of the total population
- Portland Hills Fault, M6.5 Scenario—6,919 persons killed or injured as a result of the earthquake, 1.1 percent of the total population

8.5.2 Property

Building Age

Building age—along with factors such as the soil a building is located on, retrofits for seismic resistance, and construction materials and methods—is a predictor of how well a building is likely to perform during an earthquake. Oregon first adopted a statewide building code in 1974, and seismic standards were adopted in 1993. Buildings constructed before 1974 are most likely to be damaged in a large earthquake, while those constructed after 1993 are most likely to be able to withstand impacts. It should be noted, however, that some buildings may have been retrofitted since their construction to more fully comply with modern seismic codes. Table 8-9 shows year-built information provided in Multnomah County Assessor records.

Table 8-9. Age of Structures in Portland

	Pre-1974[a]		1974-1993 [a]		Post-1993 [a]		Total
Reporting Area	Number of Structures	Percent	Number of Structures	Percent	Number of Structures	Percent	Number of Structures
Airport	396	61.6%	109	17.0%	138	21.5%	643
Central City	2,020	76.3%	301	11.4%	328	12.4%	2,649
Central Northeast	15,335	88.1%	870	5.0%	1,201	6.9%	17,406
East Portland	28,675	65.5%	7,116	16.3%	7,964	18.2%	43,755
North Portland	18,899	77.2%	1,793	7.3%	3,797	15.5%	24,489
Northeast	18,521	89.6%	551	2.7%	1,608	7.8%	20,680
Southeast	45,960	86.3%	2,925	5.5%	4,385	8.2%	53,270

Reporting Area	Pre-1974[a] Number of Structures	Pre-1974[a] Percent	1974-1993 [a] Number of Structures	1974-1993 [a] Percent	Post-1993 [a] Number of Structures	Post-1993 [a] Percent	Total Number of Structures
Southwest	14,846	64.2%	5,727	24.8%	2,551	11.0%	23,124
West/Northwest	4,369	55.9%	1,142	14.6%	2,310	29.5%	7,821
Total	**149,021**	**76.9%**	**20,534**	**10.6%**	**24,282**	**12.5%**	**193,837**

a. Year built information was collected from Multnomah County tax assessor data. When year built information was unavailable, it was estimated based on census block or county-wide average year built dates.

The age of the building stock in Portland can be summarized as follows:

- 76.9 percent of buildings (149,021) in Portland were built before 1974.
- 10.6 percent of buildings (20,534) were built between 1974 and 1993.
- 12.5 percent of buildings (24,282) were built in 1993 or later.

More than half of the building stock was built before 1974 in all risk reporting areas. Numbers ranges from almost 56 percent in the West/Northwest to almost 90 percent in the Northeast.

Liquefaction Potential

Table 8-10 shows the estimated number and type of structures in high potential liquefaction areas. There are 13,191 structures or 6.8 percent of the total building stock; 36 percent of these buildings (4,774) are in the Southeast and 28 percent (3,777) are in North Portland. In addition, 6,090 structures (3.1 percent of total structures) are in moderate liquefaction susceptibility areas.

Table 8-10. Structures Located in High Liquefaction Potential Areas

Reporting Area	Number of Structures[a] Residential	Commercial	Industrial	Religion	Government	Education	Total
Airport	257	105	170	0	111	0	643
Central City	107	234	29	2	16	1	389
Central Northeast	105	274	81	1	9	0	470
East Portland	844	299	48	2	18	4	1,215
North Portland	2,331	757	465	176	42	6	3,777
Northeast	0	0	0	0	0	0	0
Southeast	4,352	350	44	17	6	5	4,774
Southwest	1,291	118	3	2	-	2	1,416
West/Northwest	6	140	355	3	3	-	507
Total	**9,293**	**2,277**	**1,195**	**203**	**205**	**18**	**13,191**

a. Structure type assigned to best fit Hazus occupancy classes based on present use classifications provided by Multnomah County assessor's data. Where conflicting information was present in the available data, parcels were assumed to be improved.

Loss Potential

Structural and Non-Structural Loss

Property losses were estimated through the Level 2 Hazus-MH analysis for the 100-year and 500-year earthquakes and the two scenario events. Table 8-11 through Table 8-14 show the results for two types of property loss: structural loss (damage to building structures); and non-structural loss (the value of lost contents). A summary of the property-related loss results is as follows:

- For a 100-year probabilistic earthquake, the estimated damage potential is $903.3 million, or 0.5 percent of the total replacement value for Portland.
- For a 500-year probabilistic earthquake, the estimated damage potential is $22 billion or 12.9 percent of the total replacement value for Portland.
- For a 9.0-magnitude Cascadia Fault event, the estimated damage potential is $7.3 billion, or 4.3 percent of the total replacement value for Portland.
- For a 6.5-magnitude Portland Hills Fault event, the estimated damage potential is $23.8 billion, or 14 percent of the total replacement value for Portland.

Table 8-11. Loss Estimates for the 100-Year Earthquake

Reporting Area	Estimated Loss			Estimated Loss as % of Total Replacement Value
	Structure	Contents	Total	
Airport	$6,806,171	$2,097,634	$8,903,805	0.2%
Central City	$212,643,110	$57,878,200	$270,521,310	0.9%
Central Northeast	$21,197,147	$6,219,927	$27,417,074	0.3%
East Portland	$39,255,492	$10,943,469	$50,198,962	0.2%
North Portland	$112,462,142	$37,989,016	$150,451,157	0.6%
Northeast	$53,576,499	$16,961,371	$70,537,870	0.5%
Southeast	$92,205,906	$27,212,453	$119,418,359	0.4%
Southwest	$91,131,036	$28,830,336	$119,961,373	0.7%
West/Northwest	$65,387,493	$20,503,299	$85,890,792	0.6%
Total	**$694,664,997**	**$208,635,705**	**$903,300,702**	**0.5%**

Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

Table 8-12. Loss Estimates for the 500-Year Earthquake

Reporting Area	Estimated Loss			Estimated Loss as % of Total Replacement Value
	Structure	Contents	Total	
Airport	$132,495,537	$43,060,449	$175,555,987	4.4%
Central City	$5,898,040,710	$1,521,890,941	$7,419,931,651	23.8%
Central Northeast	$442,348,156	$143,099,184	$585,447,340	5.4%
East Portland	$827,045,080	$248,014,229	$1,075,059,309	4.1%
North Portland	$2,836,072,122	$1,012,558,771	$3,848,630,893	16.4%
Northeast	$1,171,804,098	$362,788,692	$1,534,592,790	11.7%
Southeast	$1,932,240,974	$572,621,699	$2,504,862,672	8.2%
Southwest	$1,886,443,065	$627,857,122	$2,514,300,188	14.1%
West/Northwest	$1,823,131,817	$583,155,189	$2,406,287,006	17.3%
Total	**$16,949,621,559**	**$5,115,046,277**	**$22,064,667,836**	**12.9%**

Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

Table 8-13. Loss Estimates for the Cascadia M9.0 Scenario Earthquake

Reporting Area	Estimated Loss			Estimated Loss as % of Total Replacement Value
	Structure	Contents	Total	
Airport	$274,151,253	$63,821,977	$337,973,230	8.5%
Central City	$1,024,447,659	$160,011,908	$1,184,459,567	3.8%
Central Northeast	$346,048,842	$86,088,583	$432,137,424	4.0%
East Portland	$572,600,541	$144,209,337	$716,809,878	2.8%

Reporting Area	Estimated Loss			Estimated Loss as % of Total Replacement Value
	Structure	Contents	Total	
North Portland	$1,633,971,567	$445,062,992	$2,079,034,559	8.8%
Northeast	$271,997,167	$63,676,196	$335,673,363	2.6%
Southeast	$548,084,058	$139,071,846	$687,155,903	2.3%
Southwest	$310,914,118	$93,055,602	$403,969,720	2.3%
West/Northwest	$902,214,849	$313,611,205	$1,215,826,054	8.7%
Total	**$5,884,430,054**	**$1,508,609,644**	**$7,393,039,699**	**4.3%**

Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

Table 8-14. Loss Estimates for the Portland Hills M6.5 Scenario Earthquake

Reporting Area	Estimated Loss			Estimated Loss as % of Total Replacement Value
	Structure	Contents	Total	
Airport	$200,222,211	$48,948,351	$249,170,562	6.3%
Central City	$7,510,660,388	$1,938,611,406	$9,449,271,794	30.3%
Central Northeast	$459,914,232	$129,954,308	$589,868,540	5.4%
East Portland	$538,135,332	$173,625,581	$711,760,913	2.7%
North Portland	$2,870,971,346	$937,371,269	$3,808,342,615	16.2%
Northeast	$1,025,801,909	$298,072,759	$1,323,874,669	10.1%
Southeast	$1,648,783,858	$488,124,470	$2,136,908,329	7.0%
Southwest	$1,296,370,256	$445,431,042	$1,741,801,297	9.8%
West/Northwest	$2,907,879,064	$948,284,162	$3,856,163,226	27.7%
Total	**$18,458,738,597**	**$5,408,423,348**	**$23,867,161,945**	**14.0%**

Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

Building Damage

The Hazus-MH analysis estimated expected building damage by occupancy as follows:

- For a 100-year probabilistic earthquake, about 1.3 percent (2,543) of Portland buildings are expected to be at least moderately damaged. Less than 0.1 percent (31) are expected to be damaged beyond repair, including 17 residential structures.
- For a 500-year probabilistic earthquake, about 19.5 percent (37,739) of Portland buildings are expected to be at least moderately damaged. Approximately 1.8 percent (3,508) are expected to be damaged beyond repair, including 1,136 residential structures.
- For the Cascadia M9.0 scenario earthquake, about 7.1 percent (13,896) of Portland buildings are expected to be at least moderately damaged. Approximately 0.4 percent (848) are expected to be damaged beyond repair, including more than 306 residential structures.
- For the Portland Hills M6.5 scenario earthquake, about 21 percent (40,782) of Portland buildings are expected to be at least moderately damaged. Approximately 1.7 percent (3,225) are expected to be damaged beyond repair, including 1,239 residential structures.

Earthquake-Caused Debris

The Hazus-MH analysis estimated the amount of earthquake-caused debris for the 100-year and 500-year earthquakes and the two scenario events, as summarized in Table 8-15 and Table 8-16.

8.5.3 Critical Facilities and Infrastructure

Hazardous materials releases can occur during an earthquake from fixed facilities or transportation-related incidents. Transportation corridors can be disrupted during an earthquake, leading to the release of materials to the surrounding environment. Facilities holding hazardous materials are of particular concern because of possible isolation of neighborhoods surrounding them. During an earthquake, structures storing these materials could rupture and leak into the surrounding area or an adjacent waterway. This could have a disastrous effect on the environment and impede evacuations and access for emergency response.

Table 8-15. Estimated Earthquake-Caused Debris for Probabilistic Earthquake Events

	100-Year Earthquake		500-Year Earthquake	
Reporting Area	Debris to Be Removed (tons)[a]	Estimated Number of Truckloads [b]	Debris to Be Removed (tons)[a]	Estimated Number of Truckloads [b]
Airport	4,511	180	92,356	3,694
Central City	117,975	4,719	3,147,160	125,886
Central Northeast	9,989	400	227,137	9,085
East Portland	16,580	663	358,808	14,352
North Portland	58,669	2,347	1,708,414	68,337
Northeast	18,847	754	491,166	19,647
Southeast	34,696	1,388	836,790	33,472
Southwest	25,535	1,021	619,965	24,799
West/Northwest	30,614	1,225	969,597	38,784
Total	**317,416**	**12,697**	**8,451,394**	**338,056**

a. Debris generation estimates were based on updated general building stock dataset at a Census Tract analysis level.
b. Hazus-MH assumes 25 tons/trucks
Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations

Table 8-16. Estimated Earthquake-Caused Debris for Earthquake Scenario Events

	Cascadia Fault, M9.0 Scenario		Portland Hills Fault, M6.5 Scenario	
Reporting Area	Debris to Be Removed (tons)[a]	Estimated Number of Truckloads [b]	Debris to Be Removed (tons)[a]	Estimated Number of Truckloads [b]
Airport	229,138	9,166	162,131	6,485
Central City	714,776	28,591	4,065,742	162,630
Central Northeast	240,452	9,618	249,708	9,988
East Portland	350,800	14,032	243,030	9,721
North Portland	1,152,746	46,110	1,732,616	69,305
Northeast	139,606	5,584	448,702	17,948
Southeast	286,507	11,460	732,289	29,292
Southwest	99,454	3,978	356,395	14,256
West/Northwest	551,863	22,075	1,519,592	60,784
Total	**3,765,342**	**150,614**	**9,510,206**	**380,408**

a. Debris generation estimates were based on updated general building stock dataset at a Census Tract analysis level.
b. Hazus-MH assumes 25 tons/trucks
Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations

Fire can be a secondary hazard of earthquake- or landslide-induced release of hazardous materials. The proximity of Forest Park to this concentration of Portland's fuel infrastructure may increase the risk of landslides or seismic events, leading to wildfires, especially under dry conditions. Much of Portland's critical infrastructure, particularly its energy infrastructure, is concentrated in a small area in the northwest corner of the City, along the Willamette River. A separate study was conducted as part of this plan update to evaluate risks and identify recommendations for improving resilience in the City's Critical Energy Infrastructure (CEI) Hub. This study can be found in Appendix J.

Level of Damage

Hazus-MH classifies the vulnerability of critical facilities to earthquake damage by assigning probabilities of the likelihood of each facility experiencing one of five damage states: no damage, slight damage, moderate damage, extensive damage, or complete damage. The model was used to assign a vulnerability category to each critical facility in Portland based on the likelihood that the facility would meet or exceed these damage states. The analysis was performed for all scenario events. The results from the two Scenario Earthquake Events are shown in Table 8-17.

Table 8-17. Estimated Damage to Critical Facilities from Scenario Events

	Cascadia M9.0					Portland Hills M6.5				
Category[a, c]	None	Slight	Moderate	Extensive	Complete	None	Slight	Moderate	Extensive	Complete
Emergency Services	46	19	0	0	0	12	5	25	21	2
High Potential Loss Facilities[b]	0	70	89	1	0	0	6	50	60	44
Schools	323	0	0	0	0	83	200	40	0	0
Other Assets	0	57	11	0	0	0	1	27	23	17
Transportation Systems	54	40	0	0	0	40	27	26	1	0
Utility Systems										
Communications	0	25	0	0	0	0	9	13	3	0
Power	0	357	0	0	0	0	20	330	7	0
Potable Water	10	336	0	0	0	11	264	45	26	0
Wastewater	0	140	0	0	0	0	90	49	1	0
Total	**433**	**1,044**	**100**	**1**	**0**	**146**	**622**	**605**	**142**	**63**

a. Numbers indicate facilities that were assigned the damage state indicated based on probabilities of meeting or exceeding the criteria for the damage state. Damage states were assigned to the highest state exceeding 50 percent probability, meaning it is more likely than not that facilities in this category will receive at least the amount of damage described by the damage state.
b. Hazus does not calculate damage states for dams.
c. See Table 6-1 for a description of the facilities included in each category.

Time to Return to Functionality

Hazus-MH estimates the time to restore critical facilities to fully functional use. Results are presented as probability of being functional at specified time increments: 1, 3, 7, 14, 30 and 90 days after the event. For example, Hazus-MH may estimate that a facility has 5 percent chance of being fully functional at Day 3, and a 95-percent chance of being fully functional at Day 90. The analysis of critical facilities in Portland was performed for all scenario events. The results for the Cascadia M9.0 Scenario and the Portland Hills M6.5 scenario are summarized below Table 8-18 and Table 8-19.

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Liquefaction Potential

The potential for soil liquefaction was utilized in the Hazus model for the damage and functionality results for critical facility and point based features in the table above. Damage to linear based features, such as levees and roads, is not assessed by the Hazus model. Such facilities located on liquefiable soil may be particularly vulnerable to the earthquake hazards. The following describe critical infrastructure located in these areas:

Table 8-18. Functionality of Critical Facilities for Cascadia M9.0 Scenario Event

	# of Critical Facilities	Probability of Being Fully Functional (%)					
		at Day 1	at Day 3	at Day 7	at Day 14	at Day 30	at Day 90
Emergency Services	65	60	60	85	85	94	95
High Potential Loss Facilities[a]	170	3	5	49	49	75	89
Schools	323	82	83	98	98	99	99
Other Assets	68						
Transportation Systems	94	93	96	97	97	97	98
Utility Systems							
Communications	25	91	98	98	99	99	99
Power	357	68	89	95	98	99	99
Potable Water	346	78	95	98	99	99	99
Wastewater	140	54	88	97	97	98	99
Total/Average	**1,588**	**66**	**77**	**90**	**90**	**95**	**97**

a. Hazus does not calculate functionality for dams.

Table 8-19. Functionality of Critical Facilities for Portland Hill M6.5 Event

	# of Critical Facilities	Probability of Being Fully Functional (%)					
		at Day 1	at Day 3	at Day 7	at Day 14	at Day 30	at Day 90
Emergency Services	65	23	24	56	57	75	78
High Potential Loss Facilities[a]	170	1	2	21	21	41	60
Schools	323	34	35	74	75	89	90
Other Assets	68	1	2	22	22	44	66
Transportation Systems	94	76	83	85	86	87	91
Utility Systems							
Communications	25	64	83	87	93	96	99
Power	357	33	54	70	81	88	97
Potable Water	346	64	84	91	93	95	97
Wastewater	140	31	69	87	89	94	99
Total/Average	**1,588**	**36**	**48**	**66**	**69**	**79**	**86**

a. Hazus does not calculate functionality for dams.

Transportation Related Infrastructure

The following major roads in Portland pass through high liquefaction potential areas:

- N Hayden Island Dr.
- N Marine Dr., NE Marine Dr.
- N Martin Luther King Jr. Blvd., NE Martin Luther King Jr. Blvd.
- NE Airport Way
- NE Cascades Parkway
- NW Front Ave.
- NW Naito Parkway, SW Naito Parkway
- SE Bybee Blvd.
- SE Foster Rd.
- SE Grand Ave.
- SE Holgate Blvd.
- SE Johnson Creek Blvd.
- SE McLoughlin Blvd. (State Highway 99E)
- SE Milwaukie Ave.
- SE Powell Blvd.
- SE Water Ave.
- SW Beaverton Hillsdale Hwy
- SW Corbett Ave.
- SW Macadam Ave.
- SW Moody Ave.
- I-205
- I-5
- I-84
- SW Beaverton Hillsdale Hwy

In addition, 237.82 miles (63.4) of railroad lines are located in high potential liquefaction areas and an additional 79.33 miles (21.2 percent) are located in moderate liquefaction potential areas. The light rail lines may also be vulnerable with 12.05 miles (22.8 percent) located in high liquefaction areas and an additional 5.65 miles (10.7 percent) located in moderate liquefaction potential areas.

Utility Systems

Table 8-20 shows the mileage and percent of the citywide system located in high and moderate liquefaction potential areas. The Portland Water Bureau System is currently conducting a Water System Reliability Study to assess risk to the water system from seismic hazards.

Table 8-20. Utility Systems Within Liquefaction Potential Areas

	High Liquefaction Potential Areas		Moderate Liquefaction Potential Areas	
Infrastructure Type	Mileage	%	Mileage	%
Potable Water Backbone	27.49	18.8%	8.80	6.2%
Wastewater System Collection Pipes	406.47	15.4%	165.01	6.2%
Major Power Lines	112.17	23.5%	49.44	10.4%
Major Gas Lines	21.05	25.2%	15.58	18.7%

Levees

Almost all of the levees in Portland are located in high liquefaction potential areas (20.25 miles), with the remaining 0.2 miles in moderate liquefaction potential areas. An assessment of a small portion of the levee system conducted in 2001 determined that this portion of the system was safe for a 0.2-percent seismic risk (Magnitude 6.2 event) and 0.04-percent seismic risk (approximately magnitude 7.0 event). The study also concluded that it would be unlikely for a seismic event alone to cause flooding in areas protected by the levee. It was found that such flooding may occur if the earthquake occurred concurrently with a major flood, although the probability of such events occurring simultaneously was found to be low (USACE, 2001). However, other area levees may perform differently when exposed to the same parameters; further study is needed.

8.5.4 Environment

The environment vulnerable to earthquake hazard is the same as the environment exposed to the hazard. Groundwater supplies and adjacent water courses could be contaminated by spillage from storage tanks. Air quality could be significantly compromised by fires started due to secondary impacts from seismic events. Earthquake-induced landslides can significantly impact surrounding habitat. It is also possible for streams to be rerouted after an earthquake. This can change the water quality,

possibly damaging habitat and feeding areas. There is a possibility of streams fed by groundwater drying up because of changes in underlying geology.

8.5.5 Economic Impact

Economic impact will be largely associated with the disruption of services caused by an earthquake event. In general, significant events may cause damage to land, buildings, transportation infrastructure, and businesses. Estimates of functionality for critical facilities and infrastructure for the scenario events are shown in Table 8-18 and Table 8-19. Significant impacts may occur as a result of disruptions in the supply chain, a focus on expending resources to rebuild lost resources (especially for resources not covered by insurance), loss of wages, a downturn in tourism, and possibly a shortage in labor caused by residents relocating outside the damaged area. With an event of such significance, economic recovery could take years or decades, depending on available recovery funds.

8.6 FUTURE TRENDS IN DEVELOPMENT

Land use in Portland will be directed by the City's Comprehensive Plan. Development in Portland will be regulated through building standards and performance measures so that the degree of risk will be reduced. Hazard-resilient design is addressed in the City's Comprehensive Plan and it addresses geological hazards, including liquefaction potential, and the promotion of disaster resilient development. New development in Portland will likely be less vulnerable to earthquake hazards than older development due to higher regulatory standards for earthquake risk in modern building codes. In addition, the City has identified several actions that will seek to strengthen existing development codes and standards to the earthquake hazard.

New development in areas subject to liquefaction are of particular concern due to their increased vulnerability if proper structural measures are not taken. Although existing codes and ordinance should mitigate these risks, not all risk will be mitigated and critical infrastructure providing services to these areas may be negatively impacted. Table 8-21 and Table 8-22 show future land use designations in high and medium liquefaction potential areas, respectively. Citywide, the predominant land use in high potential areas is designated as employment and industrial (58.3 percent), followed by open space (24.9 percent).

8.7 SCENARIO

Any seismic activity of 6.0 or greater on faults in the general Portland region would have significant impacts throughout Portland. An earthquake in the Cascadia Subduction Zone would have disastrous consequences for the entire state and the region. Potential warning systems could give up to tens of seconds' notice that a major earthquake is about to occur.

Large magnitude earthquakes in the region could lead to massive structural failure of property on liquefiable soils. Structural failure may be intensified if the earthquake occurs during winter when soils are saturated. Heavy damage would also be expected in areas with substantial numbers of unreinforced masonry buildings or older building stock that has not been brought up to current seismic codes. Access to, from and around the City would be challenging, given the likelihood that bridges and major transportation routes may be impassable. These events could cause secondary hazards, including landslides and mudslides that would further damage structures. There is also a significant potential for major hazardous materials in the CEI Hub and other areas with large concentrations of hazardous materials on liquefiable soils.

8.8 ISSUES

The following issues have been identified over the course of the planning process:

- It is estimated that 76 percent of buildings (149,021) in Portland were built before 1974 when the first provisions for seismic criteria were implemented. (Note: Some buildings have been retrofitted, but data is not available to estimate the number and types of retrofits).
- It is estimated that an additional 10.5 percent of buildings (20,534) in Portland were built between 1974 and 1993 before modern seismic codes were in place.
- There are estimated to be 13,191 buildings located in high liquefaction susceptibility areas. This is about 7 percent of all buildings in Portland. 36 percent of these buildings (4,774) are located in the Southeast and 28 percent (3,777) are located in North Portland. An additional 6,090 buildings are located in moderate liquefaction susceptibility areas.

Table 8-21. Future Land Use Designations in Portland in High Potential Liquefaction Areas

		Percent of total acres					
		Residential					
Reporting Area	Total Acreage	Single-Dwelling	Multi-Dwelling	Commercial	Employment & Industrial	Mixed Use & Institutional	Open Space
Airport	5,307.9	2.6%	3.8%	0.0%	66.8%	5.0%	21.8%
Central City	1,055.9	0.0%	7.0%	27.4%	40.8%	0.0%	24.8%
Central Northeast	1,657.0	0.0%	0.0%	0.0%	79.0%	0.0%	21.0%
East Portland	2,329.7	15.7%	1.6%	0.0%	63.8%	0.2%	18.8%
North Portland	11,086.1	3.2%	1.4%	0.0%	58.3%	7.7%	29.4%
Northeast	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Southeast	2,402.7	29.3%	6.4%	0.0%	16.0%	9.8%	38.5%
Southwest	903.8	30.8%	22.0%	0.0%	0.0%	18.7%	28.5%
West/Northwest	2,076.9	0.1%	0.0%	0.0%	97.6%	0.4%	1.8%
TOTAL	**26,820.0**	**6.89%**	**3.1%**	**1.1%**	**58.3%**	**5.7%**	**24.9%**

Source: Future land use categories are based on the proposed comprehensive plan designations as of February 2016.

Table 8-22. Future Land Use Designations in Portland in Moderate Potential Liquefaction Areas

		Percent of total acres					
		Residential					
Reporting Area	Total Acreage	Single-Dwelling	Multi-Dwelling	Commercial	Employment & Industrial	Mixed Use & Institutional	Open Space
Airport	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0%
Central City	486.8	0.0%	2.7%	0.0%	40.0%	0.0%	4.6%
Central Northeast	151.5	0.0%	0.3%	0.0%	87.9%	2.3%	9.5%
East Portland	147.8	12.2%	0.6%	0.0%	77.8%	4.4%	5.0%
North Portland	843.1	1.9%	1.4%	0.0%	82.9%	7.3%	6.6%
Northeast	15.3	4.4%	0.0%	0.0%	95.5%	0.1%	0.0%
Southeast	697.9	69.5%	6.5%	0.0%	4.0%	14.5%	5.4%
Southwest	634.7	56.4%	7.5%	5.9%	0.3%	5.1%	30.6%
West/Northwest	1,366.0	18.6%	2.7%	0.0%	38.0%	3.5%	37.3%
TOTAL	**4,343.1**	**26.1%**	**3.6%**	**52.7%**	**39.3%**	**5.8%**	**19.4%**

Source: Future land use categories are based on the proposed comprehensive plan designations as of February 2016.

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- The following social-vulnerability-related issues have been identified for high liquefaction potential areas:
  - People over 65 years of age may disproportionately reside in these areas in North Portland (18 percent), Southwest (17 percent), and East Portland (15 percent).
  - People of color may disproportionately reside in these areas in the Central Northeast (32 percent), Airport (32 percent), North Portland (29 percent) and East Portland (26 percent).
  - Renters may disproportionally reside in these areas in the Central City (82 percent), Airport (69 percent), Central Northeast (67 percent), Southeast (58 percent) and Southwest (54 percent).
  - Families with incomes below the poverty level may disproportionately reside in these areas in the Airport (20 percent), Central Northeast (19 percent), and Central City (14 percent).
  - Households with limited English speaking abilities may disproportionally reside in these areas in the Airport (21 percent) and Central Northeast (20 percent).
- The following issues have been identified based on the 100-year probabilistic earthquake scenario:
  - All risk reporting areas would experience damage.
  - It is estimated that 513 households will be displaced from their homes after an event and 243 of these people will seek shelter in public shelters. More than half of these people are expected to reside in the Central City.
  - More than 317,000 tons of debris would be expected from the event, which will require approximately 12,680 truckloads to remove. Most debris (more than 30,000 tons) will be in the Central City, North Portland, Southeast, and West/Northwest.
  - All risk reporting areas have estimated damage of less than 1 percent of the total value and about 0.5 percent of the total value of Portland would likely be damaged.
  - It is expected that 346 buildings in Portland will be extensively or completely damaged. An additional 2,197 would be expected to be moderately damaged.
- The following issues have been identified based on the Cascadia M9.0 event earthquake scenario:
  - All risk reporting areas would experience damage.
  - It is estimated that 5,838 households will be displaced from their homes after an event and 2,893 of these people will seek shelter in public shelters. About half of these people are expected to reside in the Central City.
  - More than 3.7 million tons of debris would be expected from the event, which will require approximately 148,000 truckloads to remove. Most debris (more than 500,000 tons) will be in the Central City, West/Northwest, Southwest and Southeast.
  - All risk reporting areas have estimated damaged of more than 2 percent of the total value. The following risk reporting areas are expected to have damage of more than 8 percent of the total value: North Portland, West/Northwest and Airport. About 4.3 percent of the total value of Portland would likely be damaged.
  - It is expected that 5,587 buildings in Portland will be extensively or completely damaged. An additional 8,309 would be expected to be moderately damaged.
- The following issues have been identified based on the 500-year probabilistic earthquake scenario:

- All risk reporting areas would experience damage.
- It is estimated that 19,726 households will be displaced from their homes after an event and 9,674 of these people will seek shelter in public shelters. About half of these people are expected to reside in the Central City. Additionally, more than 1,200 people in the West/ Northwest and Southeast may require shelter.
- More than 8.4 million tons of debris would be expected from the event, which will require approximately 338,000 truckloads to remove. More than half of this debris will be in the Central City and North Portland reporting areas.
- All risk reporting areas have estimated damaged of more than 4 percent of the total value. The following risk reporting areas are expected to have damage of more than 10 percent of their total value: Central City, West/Northwest, Southwest, and Northeast. About 12.9 percent of the total value of Portland would likely be damaged. About one third of this damage would come from the Central City alone.
- It is expected that 12,871 buildings in Portland will be extensively or completely damaged. An additional 24,868 would be expected to be moderately damaged.

- The following issues have been identified based on the Portland Hills M6.5 event earthquake scenario:

  - All risk reporting areas would experience damage.
  - It is estimated that 25,186 households will be displaced from their homes after an event and 12,437 of these people will seek shelter in public shelters. More than half of these people are expected to reside in the Central City. Additionally, more than 1,000 people in the West/ Northwest and Southeast may require shelter.
  - More than 9.5 million tons of debris would be expected from the event, which will require approximately 380,400 truckloads to remove. More than 75 percent of this debris will be in the Central City, North Portland, and West/Northwest reporting areas.
  - All risk reporting areas have estimated damaged of more than 5 percent of the total value. The following risk reporting areas are expected to have damage of more than 10 percent of their total value: Central City, West/Northwest, North Portland and Northeast. The Central City and West/Northwest would be expected to have damage in excess of 25 percent of the total value of the areas. About 14 percent of the total value of Portland would likely be damaged.
  - It is expected that 12,948 buildings in Portland will be extensively or completely damaged. An additional 27,834 would be expected to be moderately damaged.

- Critical facility owners should be encouraged to create or enhance continuity of operations plans using the information on risk and vulnerability developed for this plan.
- Earthquakes could potentially trigger other natural hazard events such as dam failures, levee failures and landslides, which could severely impact Portland or regional critical facilities.
- There may be additional faults in or around the City of Portland that have not yet been discovered.
- After a major seismic event, the City of Portland is likely to experience disruptions in the flow of goods and services due to the destruction of major transportation infrastructure across the broader region.
- In many outreach programs residents are instructed to be self-sufficient up to three days following a major earthquake without government response agencies, utilities, private sector services and infrastructure components. It is likely that after a major event, supplies for 72 hours would not be sufficient. Residents should continue to be encouraged to start with three days and over time build up supplies for up to two or three weeks.

- Natural hazards have a devastating impact on businesses. Of all businesses that close following a disaster, more than 43 percent never reopen, and an additional 29 percent close for good within the next two years. The Institute of Business and Home Safety has developed "Open for Business," which is a disaster planning toolkit to help guide businesses in preparing for and dealing with the adverse effects of natural hazards. The kit integrates protection from natural disasters into companies' risk reduction measures to safeguard employees, customers, and the investment itself. The guide helps businesses secure human and physical resources during disasters, and helps to develop strategies to maintain business continuity before, during, and after a disaster occurs.
- An early warning system, ShakeAlert, is currently under development, but is not ready for public use.

9. LANDSLIDE



9.1 GENERAL BACKGROUND

Landslide is a general term for the dislodgment and fall of a mass of soil or rocks along a sloped surface. Landslides include mudflows, mudslides, debris flows, rock falls, debris avalanches, debris slides and earth flows. The susceptibility of hillside and mountainous areas to landslides depends on geology, topography, vegetation and weather. Landslides may be triggered or exacerbated by development of sloping ground or the creation of cut-and-fill slopes in areas of inadequately stable geologic conditions (NHMP, 2010).

DEFINITIONS

- **Landslide**—The movement of masses of loosened rock and soil down a hillside or slope. Slope failures occur when the strength of the soils forming the slope is exceeded by the pressure, such as weight or saturation, acting upon them.
- **Mass Movement**—A collective term for landslides, debris flows, falls and sinkholes.
- **Mudslide (or Mudflow or Debris Flow)**—A river of rock, earth, organic matter and other materials saturated with water. Mudslides develop in the soil overlying bedrock on sloping surfaces when water rapidly accumulates in the ground, such as during heavy rainfall or rapid snowmelt. Water pressure in the pore spaces of the material increases to the point that the internal strength of the soil is drastically weakened. The soil's reduced resistance can then easily be overcome by gravity, changing the earth into a flowing river of mud or "slurry."

9.1.1 Landslide Types

Failure Types

Landslides are commonly categorized by the type of initial ground failure. Figure 9-1 through Figure 9-4 show common types of slides (Washington Department of Ecology, 2014). The most common is the shallow colluvial slide, occurring particularly in response to intense, short-duration storms. Deep-seated slides are the largest and most destructive landslides, but they are less common than other types. The point of failure for deep landslides is typically within bedrock (generally more than 15 feet deep); the point of failure for shallow landslides is commonly between the thin soil mantle and the top of the bedrock. Deep landslides can occur in semi-consolidated sedimentary rocks in the Troutdale Formation around the Portland area (Oregon Department of Land Conservation and Development, 2015).

Material and Movement Type

The following landslide types are defined by material type and movement mechanism (see Figure 9-5):

- **Slides**—A slide is a mass movement of material at a discrete weakness area, sliding from stable underlying material. A *rotational slide* occurs when there is movement along a concave surface; a *translational slide* originates from movement along a non-curved surface.
- **Flows**—Flows include debris flows, debris avalanches, mudflows, creeps, earth flows, and lahars. Channelized debris flows are commonly mobilized by other types of landslides on slopes near a channel or by accelerated erosion in a channel during heavy rainfall or snow melt. Debris flows tend to initiate in the upper reaches of a drainage and pick up material as they move down. They can travel for several miles at speeds of more than 35 mph. At the mouth of the channel, the material fans out due to reduced slope and lack of confinement. (DOGAMI, 2013).

Source: Washington Department of Ecology

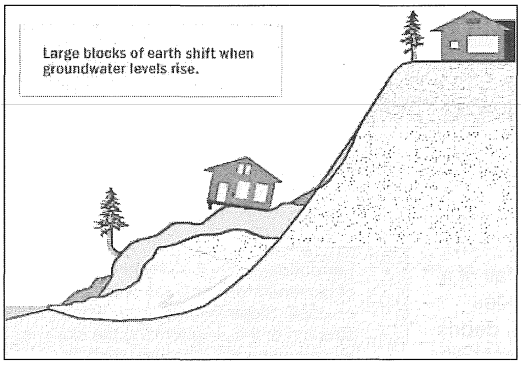


Figure 9-1. Deep Seated Slide

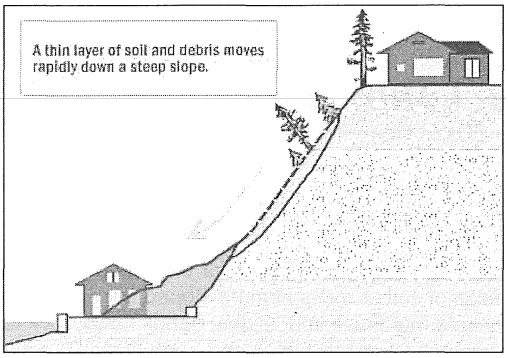


Figure 9-2. Shallow Colluvial Slide

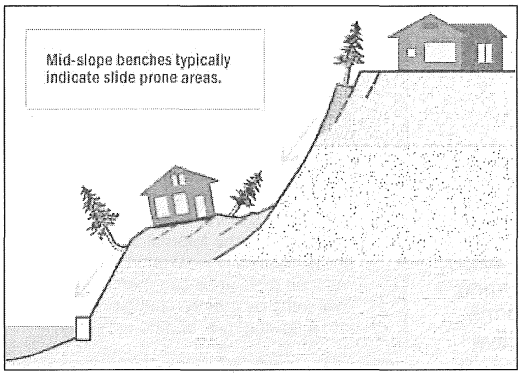


Figure 9-3. Bench Slide

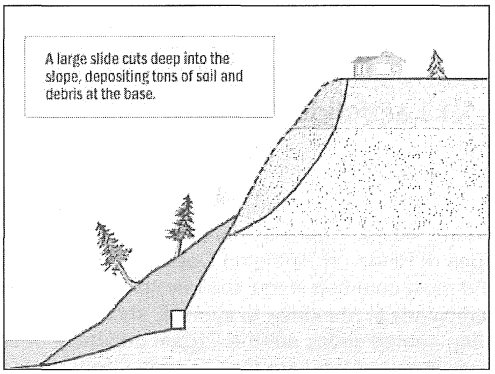


Figure 9-4. Large Slide

- **Spreads—**This type of landslide generally occurs on gentle slope or flat terrain. Lateral spreads are characterized by liquefaction of fine-grained soils. The event is typically triggered by an earthquake or human-caused rapid ground motion.
- **Falls—**Falls are the free-fall movement of rocks and boulders detached from steep slopes or cliffs.
- **Topples—**Topples are rocks and boulders that rotate forward and may become falls.
- **Complex—**Any combination of landslide types (USGS, 2004 and DOGAMI, 2008 as cited in NHMP, 2010).

9.1.2 Landslide Runout

In addition to the failure type, landslide risk assessment evaluates the post-failure movement of loosened material, called "runout." Runout is assessed for its travel distance and velocity. Mapping of landslide risk areas generally indicates the location of the potential failure, but mapping of areas that would be affected by the runout after the failure is not currently well-developed.

Source: DOGAMI Landslide Fact Sheet, 2008

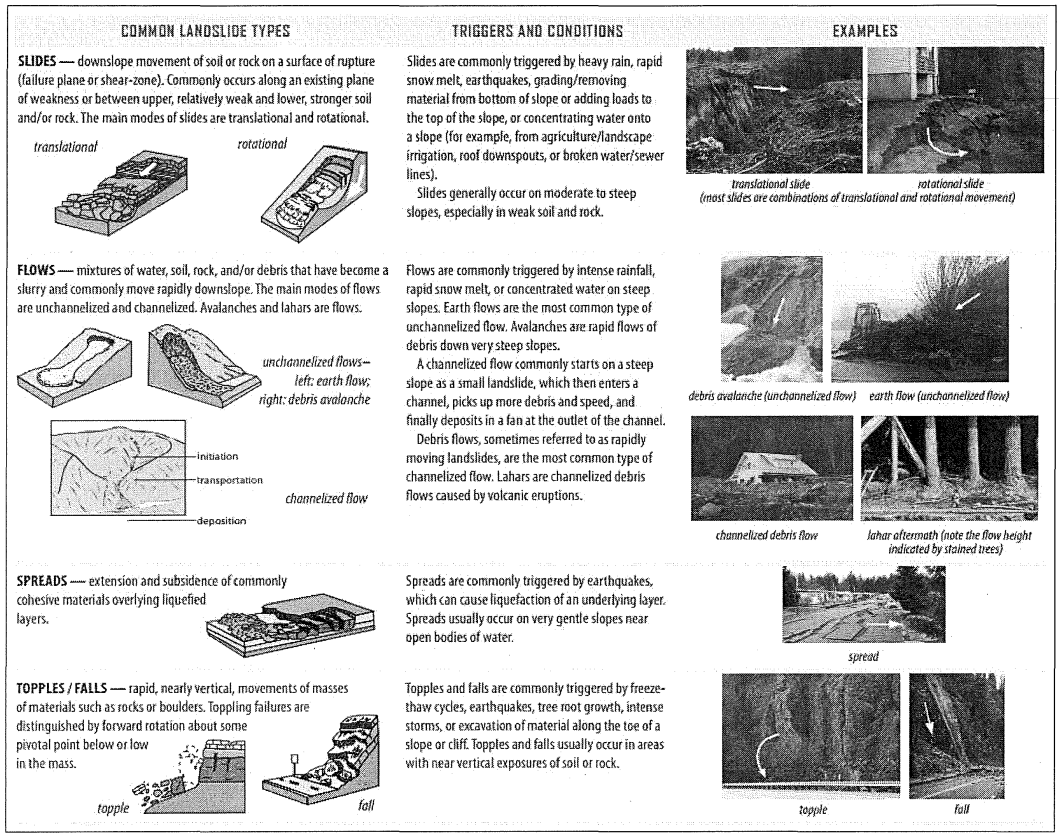


Figure 9-5. Common Landslide Types and Conditions

Recent events such as the Oso landslide in Washington in March 2014 have changed the thinking of the assessment of risk from landslide hazards. The Oso landslide was the deadliest single landslide event in U.S. history (43 fatalities, 49 homes destroyed, damage in excess of $10 million). The damage extended over 2.6 kilometers, although the failure location of the slide was less than a half-kilometer. Most of the area impacted was damaged by the slide runout. This indicates the importance of considering possible runout scenarios to accurately reflect the risk from landslide hazards.

9.1.3 Landslide Causes

Mass movements are caused by a combination of geological and climate conditions, as well as the encroaching influence of urbanization. Vulnerable natural conditions are affected by human residential, agricultural, commercial, and industrial development and the infrastructure that supports it.

Natural Conditions

Natural processes can cause landslides or re-activate historical landslide sites. Rainfall-initiated landslides tend to be smaller, while earthquake-induced landslides may be very large, but less frequent. Countless small slides each year result from the removal of supporting material along water bodies by currents and waves or undercutting during construction at the base of a slope. Seismic tremors can trigger landslides on slopes historically known to have landslide movement. Earthquakes can also cause lateral spreading on gentle slopes above steep stream and river banks. Landslides are particularly common along stream banks, reservoir shorelines, large lakes and seacoasts. Concave-shaped slopes with larger drainage areas appear to be more susceptible to landslides than other landforms. Landslides associated with volcanic eruptions can include volumes approaching a cubic mile of material. All soil types can be affected by natural landslide triggering conditions (Oregon Department of Land Conservation and Development, 2000).

Excavation and Grading

Slope excavation is common in the development of home sites or roads on sloping terrain. Grading can result in some slopes that are steeper than the pre-existing natural slopes. Since slope steepness is a major factor in landslides, these steeper slopes can be at an increased risk for landslides. The added weight of fill placed on slopes can also result in an increased landslide hazard. Small landslides can be fairly common along roads, in either the road cut or the road fill. Landslides occurring below new construction sites are indicators of the potential impacts stemming from excavation. In addition, historical landslide areas are more susceptible to construction-triggered sliding than are undisturbed slopes (Oregon Department of Land Conservation and Development, 2000).

A Portland State University study (Burns et al., 1998) found that changes to the slope through cutting or filling increased the risk of 76 percent of inventoried landslides in the Portland Metro region. The study documented 48 landslides that occurred in Oregon City in February 1996 and found that only about half the slides were considered natural. A Seattle landslide study found that human influence played some role in 84 percent of recorded slides (Winters, 2015).

Drainage and Groundwater Alterations

Water flowing through or above ground is often the trigger for landslides. Any activity that increases the amount of water flowing into landslide-prone slopes can increase landslide hazards. Broken or leaking water or sewer lines can be especially problematic, as can water retention facilities that direct water onto slopes. However, even lawn irrigation and minor alterations to small streams in landslide prone locations can result in damaging landslides. Ineffective stormwater management and excess runoff can also cause erosion and increase the risk of landslide hazards. Drainage can be affected naturally by the geology and topography of an area. Development that results in an increase in impervious surface impairs the ability of the land to absorb water and may redirect water to other areas. Channels, streams, flooding, and erosion on slopes all indicate potential slope problems. Road and driveway drains, gutters, downspouts, and other constructed drainage facilities can concentrate and accelerate flow. Ground saturation and concentrated flow are major causes of slope problems and may trigger landslides (Oregon Department of Land Conservation and Development, 2000).

Changes in Vegetation

Removing vegetation from very steep slopes can increase landslide hazards. A study by the Oregon Department of Forestry found that landslide hazards in three out of four steeply sloped areas were highest for roughly 10 years after timber harvesting (Oregon Department of Forestry, 1999). A more recent study of a heavy rain event on Vancouver Island, Canada found that low forest density,

indicating regrowth areas, and proximity to forest service roads were jointly associated with a 6- to 9-fold increase in the odds of a landslide (Goetz et al., 2015). Areas that have experienced wildfire and land clearing for development may have long periods of increased landslide hazard. In addition, woody debris in stream channels (both natural and man-made from logging) may cause the impacts of debris flows to be more severe (Oregon Department of Land Conservation and Development, 2000).

9.1.4 Indicators of Possible Landslide

The following are recognized indicators of a possible landslide (NHMP, 2010):

- Springs, seeps or wet ground that is not typically wet
- New cracks or bulges in the ground or pavement
- Soil subsiding from a foundation
- Secondary structures (decks, patios) tilting or moving away from main structures
- Broken water line or other underground utility
- Leaning structures that were previously straight
- Offset fence lines
- Sunken or dropped-down road beds
- Rapid increase in stream levels, sometimes with increased turbidity
- Rapid decrease in stream levels even though it is raining or recently stopped
- Sticking doors and windows, visible spaces indicating frames out of plumb.

9.1.5 Landslide Management

The largest landslides are often naturally occurring phenomena with little or no human contribution. The sites of large landslides are typically areas of previous landslide movement that are periodically reactivated by significant precipitation or seismic events. Such naturally occurring landslides can disrupt roadways and other infrastructure lifelines, destroy private property, and cause flooding, bank erosion and rapid channel migration. Landslides can create immediate, critical threats to public safety, and engineering solutions to protect structures from large active landslides are often prohibitively expensive.

In spite of their destructive potential, landslides can serve functions that are beneficial to the natural environment. They supply sediment and large wood to a stream network, contributing to complexity and dynamic channel behavior critical for aquatic and riparian ecological diversity. Effective landslide management should include the following elements:

- Continuing investigation to identify natural landslides, understand their mechanics, assess their risk to public health and welfare, and understand their role in ecological systems
- Regulation of development in or near existing landslides or areas of natural instability
- Preparation for emergency response to landslides to facilitate rapid, coordinated action among local government and state and federal agencies, and to provide emergency assistance to affected or at-risk residents
- Evaluation of options including landslide stabilization or structure relocation where landslides are identified that threaten critical public structures or infrastructure.

The State of Oregon has statewide planning goals that require comprehensive plans at the local level to reduce risk to people and property from natural hazards, which include geologically hazardous areas such as areas prone to landslide (Oregon Department of Land Conservation and Development, 2002). The City of Portland City Code 33.632 and Title 24 and the Oregon State Structural Specialty Code Section 1803 discourage development in landslide hazard areas; however, development may be allowed when certain requirements are met (Portland Bureau of Development Services, 2016). These

requirements include a mandatory landslide hazard study, to include the following (Portland Bureau of Development Services, 2014):

- Review of current landslide inventory and hazard maps, geologic literature, LiDAR, etc. for the site
- A visual reconnaissance of the site and surrounding area
- A description of current topography and observable geologic features and hazards
- Engineering recommendations for the layout and design of the land, including:
    - Identification of portions of the site that are suitable for development in a manner that reasonably limits the risk of landslide potential on the site and nearby properties
    - Recommendations for specific improvements, engineering requirements, or alternative development options to reasonably limit risks
    - Hazardous or no-build areas within the subdivision, if any, and/or building setback distances from slopes
    - Building locations and foundation designs
    - Driveway and/or street locations
    - Utility trench locations
    - Retaining walls, associated drainage and discharge systems, if any
    - Grading requirements for building sites, driveways or streets
    - Impact of tree removal on slope stability
    - Stormwater and groundwater disposal methods for new lots and evaluation of existing systems to remain, as well as evaluation of runoff and stormwater disposal from adjacent property that may impact the proposed development
    - Infiltration testing per the Bureau of Environmental Services Stormwater Management Manual, unless both the certified engineering geologist and professional engineer determine the site is not suitable for onsite infiltration
    - Subsurface exploration logs
    - Slope stability calculations.
- A statement of on-site slope stability after the proposed development is complete
- A statement of the estimated effect of the development on stormwater and groundwater runoff as it relates to slope stability and landslide hazard, and a proposed method of control.

9.2 HAZARD PROFILE

9.2.1 Past Events

Landslides are a major geologic hazard in Oregon and the impact of landslides on property and life safety for Oregonians will increase as population increases and development advances into more landslide-prone urban areas. In a typical year, an estimated $10 million is spent on landslide losses in Oregon (DOGAMI, 2008 as cited in NHMP, 2010). Since 2006, there have been seven Presidential Disaster Declarations in response to landslides in Oregon (FEMA, 2016b). Recent studies by DOGAMI have determined that 35 percent of Oregon is in high or very high landslide susceptibility zones (DOGAMI, 2016).

Landslides have created problems in and around Portland's hills. Landslides result in private property damage, and many impact transportation corridors, fuel and energy conduits and communication facilities. In October 2008, a devastating landslide destroyed two homes and severely compromised

another three. There were no casualties from this event, but it displaced the families from the destroyed homes and shut down a transportation route for an extended period of time (NHMP, 2010).

Much of the terrain in northwest Oregon is hilly and susceptible to slides; however, many slides take place in undeveloped areas and are unreported or even unnoticed. A statewide DOGAMI survey of winter storm landslides in 1996 and 1997 reported 9,582 documented slides (NHMP, 2010). This included 700 in the Portland Metropolitan region (Burns et al., 1998). In the City of Portland, 17 homes were completely destroyed and 64 were badly damaged. There were no serious injuries associated with the landslides in Portland or in other urban areas of Oregon during the 1996 storms (Oregon Department of Land Conservation and Development, 2015).

Historically, long periods of winter rain and heavy snowfall trigger landslides. These landslides may affect city roads and key emergency transportation routes. Wildfires have removed vegetation from hillsides and significantly increased runoff and landslide potential. On the steep-sloped Willamette Escarpment (Oaks Bottom and Mocks Crest Park natural areas) fires followed by repeated landslides have left many areas void of vegetation. Table 9-1 and Table 9-2 give an overview of the historical landslides and their impacts.

Table 9-1. Historical Landslides

Date	Approximate Location or Type	Number of Landslides
1895	Washington Park	1
1957	Children's Museum, World Forestry Center, Oregon Zoo	1
1972	I-5 near Portland	1
1996	Dodson, OR – Multnomah County	1
	February & December flood events. Portland Metro Area. Four main areas of concern: • West Hills • Steep slopes along Willamette River (i.e. Oaks Bottom, Swan Island) • SE Portland • Steep Areas along Columbia & north Willamette Rivers	700+
1996-2002	Portland (varied locations)	403
2005	Debris Flow – Mud Flow	1
	Earth Flow	2
	Mud Flow	1
	Slump – Debris Flow	1
	Slump – Earth Flow/Rock Fall	3
2006	Debris Slide	4
	Earth Flow	4
	Earth Flow – Debris Slide	2
	Earth Flow – Mud Flow	1
	Earth Flow – Rock Fall	1
	Rock Fall	1
	Slump – Debris Flow	1
	Slump – Earth Flow	1
	Slump – Earth Flow/Debris	1
	Type Unknown	1
2007	Debris Flow	3
	Debris Slide	3
	Earth Flow	4

Date	Approximate Location or Type	Number of Landslides
	Flow	1
	Rock Fall	5
	Rock Fall – Earth Flow	1
	Slump – Earth Flow	2
	Slump – Debris Flow/Earth	1
	Slump – Earth Flow/Debris	1
	Slump – Earth Flow/Rock Fall	1
2008	Debris Slide	3
	Debris Slide – Rock Fall	1
	Earth Flow	4
	Earth Flow – Debris Flow	3
	Earth Flow – Rock Fall	1
	Fault Scarp	1
	Potential Debris Flow	1
	Rock Fall	2
	Slump – Earth Flow	1
	Slump – Earth Flow/Rock Fall	3
	Type Unknown	2
2009	Debris Slide	4
	Debris Slide – Earth Flow	1
	Debris Slide – Mud Flow	2
	Earth Flow	2
	Earth Flow – Debris Flow	1
	Earth Flow – Mud Flow	1
	Earth Slide	1
	Possible Earth Flow	1
	Rock Fall	3
	Rock Fall – Mud Flow	1
	Slump – Debris Flow	1
	Slump – Earth Flow/Debris	1
	Slump – Earth Flow/Rock Fall	1
	Type Unknown	1
2010	Rock fall	4
	Earth Flow	2
	Debris Flow	1
	Rock Slide	1
	Rotational Earth	1
	Type Unknown	7
2012	Type Unknown	6
2014	Rock Slide	1
	Rock fall	1
TOTAL		**1,221+**

Source: NHMP, 2010 and SLIDO 3.2 last updated December 29, 2014

Table 9-2. Portland Landslide Events: Impacted Highways (2004-2014)

Highway	Year	Type
US 26	2004 – present	Rock Fall/Rock Slide
	2006	Rock Fall
	2007	Rock Fall/Rock Slide
US 30	2009	Debris Flow
	2010	Rock Fall
	2014	Rock Slide
US 30 Bypass (N. Bridge Ave-North)	2008	Rock Fall
US 99W	2005	Soil Cut-Slope Failure (construction)
	2007	Rock Fall
	2008	Rock Fall
	2009	Soil Cut-Slope Failure (construction)

Source: NHMP, 2010 and SLIDO 3.2, last updated December 29, 2014

9.2.2 Location

The best available predictor of where movement of landslides might occur is the location of past events. Past landslides can be recognized by their distinctive topographic shapes, which can remain in place for thousands of years. Most landslides recognizable in this fashion range from a few acres to several square miles. Most show no evidence of recent movement and are not currently active. A small proportion of them may become active in any given year, with movements concentrated within all or part of the landslide masses or around their edges.

In general, the probability of slope failure increases with an increase in slope incline. However, depending on factors such as soil type and water content, a slope having a relatively low incline could be at greater risk of failure than another slope having a relatively high incline. Other factors that influence susceptibility include rock type, water content, vegetative cover and type, slope aspect, permeability and rate of infiltration, proximity to seismic sources, and magnitude of seismic events. In addition, unconsolidated deposits of alluvial and glacial outwash materials are subject to accelerated stream bank erosion and landslides. The possibility of failure also increases in sloped areas where humans have disturbed the soil and vegetation such as cutback projects and timber reduction areas (NHMP, 2010).

Several data sets identify existing landslide areas for Oregon and Portland. These include DOGAMI SP-34 (landslide points from the 1996-1997 storms) and DOGAMI State Landslide Identification Database of Oregon (SLIDO), which was recently updated to version 3.2 in 2014 (landslide polygons from previous geologic and hazard mapping).

Recent studies have shown that the use of LiDAR to map landslides results in a significant improvement in the ability to locate historical landslides. DOGAMI has compared landslide mapping using existing techniques (time-series air photo survey and three other remote sensing types of data sets) to mapping with LiDAR in the Portland Hills. The LiDAR reveals many more slides and allows spatially accurate delineation of slide boundaries. Oregon City was the first city in the state to have a landslide map created by DOGAMI using the LiDAR technology (Burns and Madin, 2008 as cited in NHMP, 2010). Since then LiDAR maps of landslide hazards have become available for many counties and communities across Oregon (DOGAMI, 2016). The City of Portland has been working with DOGAMI to create such maps, which are now in the process of review (NHMP, 2010).

The most recent product by DOGAMI is a landslide susceptibility map for the entire state of Oregon. This map will provide landslide hazard information for regional planning and specifically identify areas where more detailed landslide mapping is needed (2016).

Two data sets were used for the risk assessment of the landslide hazard (see Figure 9-6):

- DOGAMI historical landslide deposits.
- City of Portland regulatory landslide hazard area—This dataset is currently used for permitting purposes and was created from three sources:
    - Areas identified and mapped by Metro as earthquake hazard areas
    - Areas delineated as zones of high landslide potential in a study conducted by Portland State University based on the mapping of 676 landslide events that occurred as a result of the February 1996 storms
    - All land within the City that has a slope of 15 percent or greater.

The Oregon Department of Forestry's *Storm Impacts and Landslides of 1996: Final Report* assesses the impacts of landslides for the 1996 winter storms. The study included eight study areas, but did not provide a detailed inventory of landslide prone areas outside the very small study area. This study concluded that the highest hazard for shallow rapid landslides in western Oregon occurs on slopes of over 70 percent to 80 percent, depending on landform and geology (NHMP, 2010).

The geographic extent of landslide events is essentially the same as slide location. The effects depend on what infrastructure is in the way of a slide, as well as the magnitude and force of the slide itself. The extent can be limited to one building or property or can be region-wide, as in the case of a major transportation disruption, slide-induced dam failure or utility outage (NHMP, 2010).

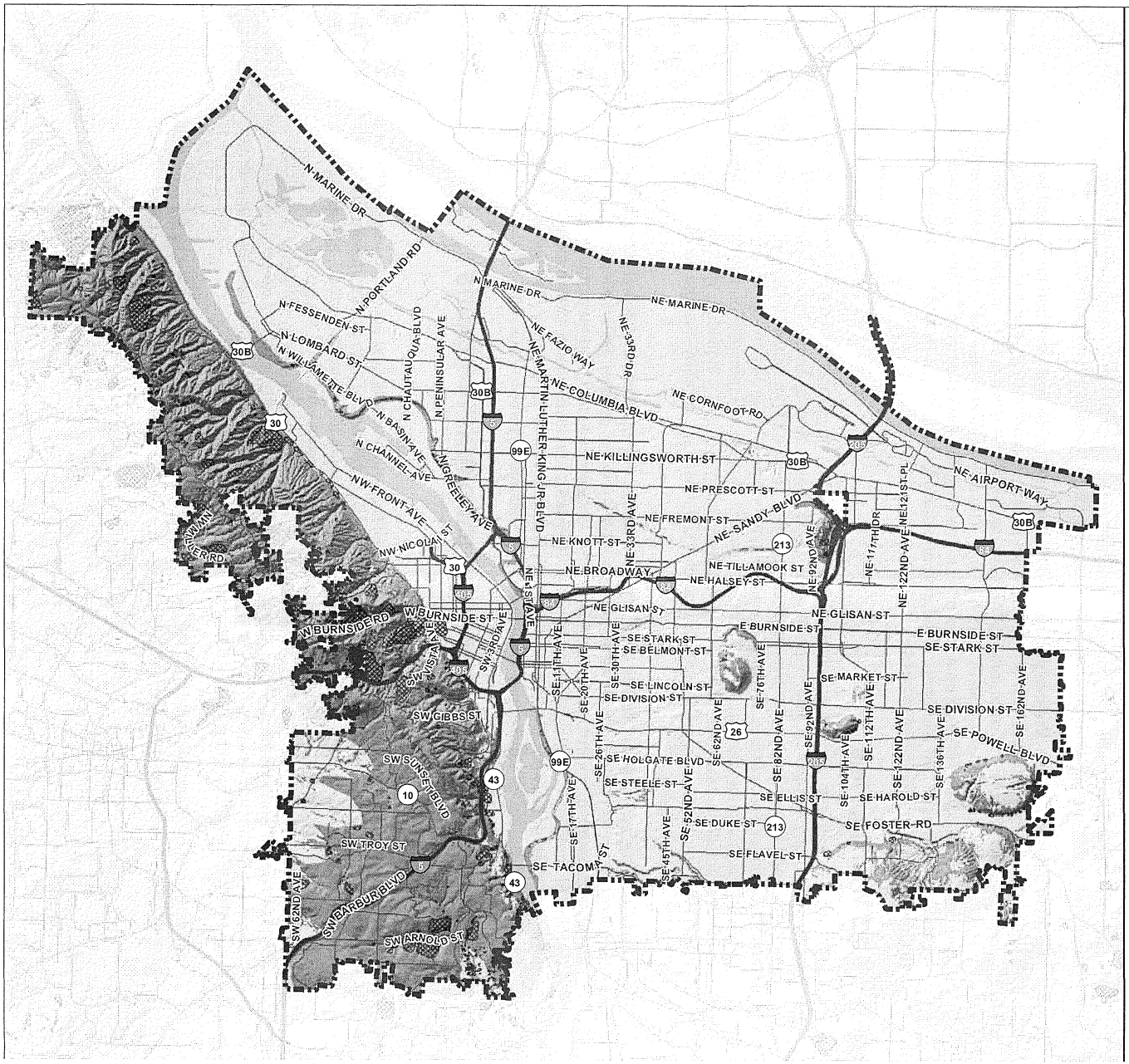
9.2.3 Frequency

Landslides are an annual occurrence in Oregon during the rainy months, October through May. They generally result from intense or prolonged rainfall, particularly during a rain on snow event. Slope alteration and shape can affect recurrence-interval. Recurrence intervals for steep terrain can range from 50 to 5,000 years, with some debris flow recurrence intervals of less than 10 years (Oregon, 2004 as cited in NHMP, 2010). Several steep-sloped natural areas are prone to yearly landslides: Forest Park, Terwilliger Wildlands, Marquam Nature Park and the Willamette Escarpment east of the Willamette River are notable (NHMP, 2010).

In general, landslides are most likely during periods of higher than average rainfall. The ground must be saturated prior to the onset of a major storm for significant landslides to occur. Most local landslides occur in January after the water table has risen during the wet months of November and December. Water is involved in nearly all cases; and human influence has been identified in more than 80 percent of reported slides.

9.2.4 Severity

Landslides destroy property and infrastructure and can take the lives of people. Slope failures in the United States result in an average of 25 lives lost per year and an annual cost to society of about $1.5 billion. According to NOAA, the 1997 and 2006 storms caused in excess of $20 million in property damage due to landslides. This was about half of all damage caused by the storm. The landslides caused by the storm also caused tens of millions of dollars of damage to road infrastructure.



September 12, 2016

Mitigation Action Plan (MAP)

Figure 9-6. Regulatory Landslide Hazard Area

Legend

- City Boundary
- Historic Landslide Deposits
- Landslide Hazard Area

NORTH

0 0.75 1.5 Miles

Sources: DOGAMI-2015; City of Portland-2015, 2016

PBEM

The potential impacts from landslides can be widespread. Landslides can impact transportation and rail routes, utility systems, and water and wastewater treatment infrastructure, along with public, private and business structures adjacent to steep slopes, along riverine embankments, or within alluvial fans or natural drainages. Utility disruptions are usually local and terrain-dependent. Damage may require reestablishing electrical, communications, and gas pipeline connections occurring from specific breakage points. Initial debris clearing from emergency routes and high traffic areas may be required. Water and wastewater utilities may need treatment to quickly improve water quality by reducing excessive water turbidity and reestablishing waste disposal capability (NHMP, 2010).

The 2014 landslide in Oso, Washington showed the devastating damage that can be caused by landslides. The slide traveled over 60 mph, covering over a square mile of land and depositing a thickness of 15 to 75 feet in some areas. The slide caused 43 fatalities and 12 injuries, destroyed 37 homes, and destroyed over a mile of state highway. The debris blocked the North Fork Stillaguamish River for over 24 hours, backing up a pool of water that flooded the valley about 2 miles upstream and reached approximately 20 feet deep, inundating an additional six homes. Total property damage was estimated at $60 million (NOAA, 2015).

9.2.5 Warning Time

Mass movements can occur suddenly or slowly. The velocity may range from a slow creep of inches per year to many feet per second, depending on slope angle, material and water content. Some methods used to monitor mass movements can provide an idea of the type of movement and the amount of time prior to failure. It is also possible to determine what areas are at risk during general time periods. Assessing the geology, vegetation and amount of predicted precipitation for an area can help in these predictions. However, there is no practical warning system for individual landslides. The current standard operating procedure is to monitor situations on a case-by-case basis, and respond after the event has occurred.

The USGS has an installation in the West Hills of Portland that monitors and detects changes in local conditions such as rainfall, groundwater pressure and soil water content. Data collection at this site supports research on hydrologic factors that control landslide initiation, and may provide advance warning of landslide conditions in the local area. Residents can also receive hazard alerts through National Weather Service advisories, through the federal Wireless Emergency Alert system, or through the Portland Bureau of Emergency Management's PublicAlerts website (DOGAMI, 2015).

9.3 COMPOUNDING FACTORS AND SECONDARY HAZARDS

9.3.1 Overview

Landslides can cause several types of secondary effects, such as blocking access to roads, which can isolate residents and businesses and delay commercial, public and private transportation. This could result in economic losses for businesses and prevent residents from accessing food, medicines, and other important supplies. Other potential problems resulting from landslides are power and communication failures. Vegetation or poles on slopes can be knocked over, resulting in possible losses to power and communication lines. Landslides also have the potential of destabilizing the foundation of structures, which may result in monetary loss for residents. They can damage rivers or streams, potentially harming water quality, fisheries and spawning habitat.

Landslides often occur with other natural hazards and human-caused activities, thereby exacerbating conditions, as described below (NHMP, 2010):

- Earthquake shaking can trigger events ranging from rock falls and topples to massive slides.
- Intense or prolonged precipitation can saturate slopes and cause failures leading to landslides.
- Landslides into a reservoir can indirectly compromise dam safety; a landslide can even affect the dam itself.
- Wildfires can remove vegetation from hillsides, significantly increasing runoff and landslide potential.
- Volcanic eruptions have been known to cause some of the largest landslides in the world.
- Development related activities such as increased runoff, excavation in hillsides, non-engineered fill and shocks and vibrations from construction can contribute to or trigger landslides. Construction projects accomplished without regard to geography, landslide toe locations, or historic slide events can increase landslide potential.
- Broken underground water mains can saturate soil and destabilize slopes, initiating slides.
- Blocked culverts can increase and alter water flow, thereby increasing the potential for a landslide event in an area with high natural risk.
- Natural weathering and decomposition of geologic material and alterations in flow of surface water or groundwater can further increase the potential for landslides (NHMP, 2010).

9.3.2 Invasive Species and Erosion

The presence of invasive species and erosion can impact the likelihood of a landslide occurring. Invasive species often have shorter root systems, providing less anchoring capabilities for slopes that may be likely to fail. Invasive fungal species that damage trees and other vegetation, such as Swiss needle cast disease infecting Douglas fir trees throughout Portland, can contribute to increased wildfire risk and lead to increased incidence of landslides. Landslides are impacted by erosion, especially if the erosion is occurring in areas undercutting steep slopes susceptible to slides.

9.3.3 Climate Change

Climate change may impact storm patterns, increasing the probability of more frequent, intense storms with varying duration. Warming temperatures also could increase the occurrence and duration of droughts and insect and fungal infestations, which would increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. All of these factors would increase the probability for landslide occurrences. The City of Portland and Multnomah County Climate Change Preparation Strategy (2014) indicates that an increased incidence of landslides due to climate change as a result of season precipitation patterns is likely.

9.4 EXPOSURE

9.4.1 Population

A population estimate for exposure to the landslide hazard was made by determining the percent of residential buildings in each risk reporting area located in mapped landslide areas and multiplying this percent by the total population for each area. This method may underestimate actual exposure to the landslide hazard area, as potential runout areas have not been identified and were not included in the assessment. Using this approach, the estimated population living in the landslide risk areas is 89,133 or 14.5 percent of the city-wide population. Table 9-3 shows the landslide hazard exposure by risk reporting area. The West/Northwest and Southwest area have substantial exposure to this hazard, with 78 percent and 82 percent of the population exposed, respectively. Table 9-4 shows the estimated percent of the population residing in landslide hazard areas by social vulnerability indicators. City-wide, the elderly population may be disproportionately residing in these hazard areas.

Table 9-3. Estimated Population Residing in Landslide Risk Areas

Reporting Area	Population Exposed[a]	% of Total Population
Airport	0	0.0%
Central City	3,723	9.8%
Central Northeast	454	1.0%
East Portland	3,597	2.4%
North Portland	1,200	1.8%
Northeast	255	0.4%
Southeast	1,574	1.0%
Southwest	57,440	81.8%
West/Northwest	20,890	77.7%
Total	**89,133**	**14.5%**

a. Value calculated as percent of residential buildings exposed multiplied by the estimated population.
Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

Table 9-4. Distribution of Social Vulnerability Indicators in Landslide Hazard Areas

	Population Residing in High Landslide Hazard Areas *a, b, c, d*					
Reporting Area	Percent Under 15 Years	Percent Over 65 Years	Percent of People of Color	Percent of Renter occupied Housing	Percent of Families Below Poverty Level	Percent of Limited English Speaking Households
Airport	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Central City	4.8%	13.5%	16.0%	75.0%	6.0%	0.3%
Central Northeast	11.4%	24.0%	21.8%	37.8%	13.1%	8.3%
East Portland	22.3%	11.4%	25.8%	22.5%	7.1%	7.2%
North Portland	12.8%	8.8%	17.4%	38.8%	9.5%	1.6%
Northeast	7.0%	21.2%	16.5%	68.3%	2.9%	0.1%
Southeast	12.0%	18.4%	12.2%	29.8%	3.7%	1.9%
Southwest	15.1%	13.1%	12.5%	35.5%	5.1%	1.3%
West/Northwest	14.4%	13.4%	16.9%	33.8%	3.5%	1.2%
Total	**15.0%**	**13.2%**	**14.4%**	**35.4%**	**4.8%**	**1.5%**

a. Values based on an analysis of 2010-2014 American Community Survey 5-year estimates at the Census block group level.
b. Values calculated using block group statistics weighted by the number of residential structures in the hazard area as a percentage of the total residential structures in the block group.
c. Values in red indicate percentages are at least 2 percent greater than the Citywide average (see Section 4.7).
d. Persons with disabilities not shown because the available data, at a census tract scale, is not conducive to analysis by hazard extent and location.

9.4.2 Property

Table 9-5 shows the number and replacement value of structures exposed to the landslide risk. There are more than 26,000 structures in the landslide risk areas, with an estimated value of $20.6 billion. Over 96 percent of the exposed structures are dwellings. Table 9-6 lists the type of structures exposed.

9.4.3 Critical Facilities and Infrastructure

Table 9-7 and Table 9-8 summarize the critical facilities and infrastructure exposed to the landslide hazard.

Table 9-5. Exposure and Value of Structures in Landslide Risk Areas

Reporting Area	Number of Buildings Exposed	Value Exposed			Exposed Value as % of Total Replacement Value
		Structure	Contents	Total	
Airport	0	$0	$0	$0	0.0%
Central City	136	$304,493,439	$228,473,839	$532,967,278	1.7%
Central Northeast	166	$83,602,166	$57,986,469	$141,588,635	1.3%
East Portland	1,021	$299,034,886	$155,669,463	$454,704,349	1.7%
North Portland	458	$446,697,999	$465,509,089	$912,207,088	3.9%
Northeast	97	$100,818,118	$78,368,497	$179,186,615	1.4%
Southeast	554	$356,360,397	$231,647,166	$588,007,563	1.9%
Southwest	18,778	$8,184,557,210	$5,913,498,269	$14,098,055,479	79.2%
West/Northwest	5,160	$2,403,388,313	$1,386,316,435	$3,789,704,748	27.2%
Total	**26,370**	**$12,178,952,528.18**	**$8,517,469,227.39**	**$20,696,421,756**	**12.1%**

Table 9-6. Structure Type Exposed in the Landslide Hazard Area

	Number of Structures[a]						
	Residential	Commercial	Industrial	Religion	Government	Education	Total
Airport	0	0	0	0	0	0	**0**
Central City	84	35	12	0	5	0	**136**
Central Northeast	153	4	0	8	1	0	**166**
East Portland	1,002	17	0	2	0	0	**1,021**
North Portland	389	36	12	1	5	15	**458**
Northeast	87	5	0	0	4	1	**97**
Southeast	518	23	6	0	0	7	**554**
Southwest	18,228	390	3	50	38	69	**18,778**
West/Northwest	4,880	232	28	1	11	8	**5,160**
Total	**25,341**	**742**	**61**	**62**	**64**	**100**	**26,370**

a. Structure type assigned to best fit Hazus occupancy classes based on present use classifications provided by Multnomah County assessor's data. Where conflicting information was present in the available data, parcels were assumed to be improved.

Table 9-7. Critical Facilities in Landslide Risk Areas[a]

Reporting Area	Number of Critical Facilities in Landslide Hazard Areas				
	Emergency Services	High Potential Loss Facilities	Schools	Other Assets	Total
Airport	0	0	0	0	**0**
Central City	0	0	0	0	**0**
Central Northeast	0	0	1	0	**1**
East Portland	0	0	0	0	**0**
West/Northwest	1	3	5	1	**10**
North Portland	0	2	0	0	**2**
Northeast	1	0	0	0	**1**
Southeast	0	0	0	0	**0**
Southwest	8	1	36	7	**52**
Outside City Boundary	0	0	0	0	**0**
Total	**10**	**6**	**42**	**8**	**66**

a. See Table 6-1 for a description of the facilities included in each category.

Table 9-8. Critical Infrastructure in Landslide Risk Areas[a]

	Number of Critical Infrastructure Facilities in Landslide Hazard Areas					
		Utility Systems				
Reporting Area	Transportation Systems	Communications	Power	Potable Water	Wastewater	Total
Airport	0	0	0	0	0	**0**
Central City	0	1	0	1	1	**3**
Central Northeast	2	1	0	2	0	**5**
East Portland	0	1	0	5	1	**7**
West/Northwest	4	2	2	25	1	**34**
North Portland	0	0	0	0	5	**5**
Northeast	1	0	0	0	0	**1**
Southeast	0	1	0	2	3	**6**
Southwest	7	5	1	34	6	**53**
Outside City Boundary	0	0	0	12	0	**12**
Total	**14**	**11**	**2**	**81**	**17**	**125**

a. See Table 6-1 for a description of the facilities included in each category.

The following linear infrastructure can be exposed to landslides:

- **Roads**—Access to major roads is crucial to life-safety after a disaster event and to response and recovery operations. Landslides can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems and delays for public and private transportation. This can result in economic losses for businesses. The following major roads in Portland cross through mapped landslide hazard areas:
  - I-205
  - I-5
  - I-84
  - I-405
  - N Interstate Ave.
  - N Willamette Blvd.
  - NW Cornell Rd.
  - NW Germantown Rd.
  - NW Skyline Blvd.
  - NW St Helens Rd (US Highway 30)
  - SE McLoughlin Blvd (State Highway 99E)
  - SW Barbur Blvd.
  - SW Beaverton-Hillsdale Highway
  - SW Boones Ferry Rd.
  - SW Capitol Highway
  - SW Macadam Ave.
  - SW Montgomery Dr.
  - SW Multnomah Blvd.
  - SW Naito Pkwy
  - SW Sunset Highway (US Highway 26)
  - SW Taylors Ferry Rd.
  - SW Terwilliger Blvd.
  - W Burnside Rd.
- **Bridges**—Landslides can significantly impact road bridges. They can knock out bridge abutments or significantly weaken the soil supporting them, making them hazardous for use.
- **Power Lines**—Power lines are generally elevated above steep slopes, but the towers supporting them can be subject to landslides. A landslide could trigger failure of the soil underneath a tower, causing it to collapse and ripping down the lines. Power and communication failures due to landslides can create problems for vulnerable populations and businesses. There are 87.61 miles (18.4 percent of the city-wide system) of power lines in mapped landslide hazard areas.
- **Gas Lines**—There are 12.43 miles of major gas lines in landslide hazard areas. Almost half of this exposure is in West/Northwest; another 43 percent is in Southwest.
- **Rail Lines**—25.51 miles (6.8 percent) of rail lines and 4.09 miles (7.7 percent) of light rail lines are in mapped landslide hazard areas.

9.4.4 Environment

Environmental problems as a result of mass movements can be numerous. Landslides that fall into streams may significantly impact fish and wildlife habitat, as well as affecting water quality. Hillsides that provide wildlife habitat can be lost for prolonged periods of time due to landslides. The Bull Run Watershed may be adversely impacted by landslides. Although no water supply related structures are located in known landslide hazard areas in the watershed, it is possible that large or numerous slides in the watershed could result in turbidity and the need to close the water source for a time.

9.5 VULNERABILITY

9.5.1 Population

In general, all of the estimated 89,133 persons exposed to the landslide hazard areas are considered to be vulnerable. Elderly and disabled residents and others with access and functional needs may have difficulty evacuating in the event of a quickly moving slide. Additionally, residents with mobility challenges may be less likely to notice the warning signs that typically proceed a slide event (see Section 9.1.4) if they are having challenges keeping up with house and yard maintenance activities.

If population and development on steep slopes or other potential landslide hazard areas increase, vulnerable populations may also increase. The City of Portland Bureau of Development Services regulates and reviews proposed development projects, including residential developments, located in known and potential landslide hazard areas.

9.5.2 Property

Loss estimations for the landslide hazard are not based on damage functions, because no damage functions have been generated. Instead, potential loss estimates were developed representing 10 percent, 30 percent and 50 percent of the replacement value of exposed structures. This allows emergency managers to select a range of economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 9-9 shows the general building stock loss potential in landslide risk areas.

Table 9-9. Loss Potential for Landslide

Reporting Area	Exposed Value	Potential Loss @ 10% Damage	Potential Loss @ 30% Damage	Potential Loss @ 50% Damage
Airport	$0	$0	$0	$0
Central City	$532,967,278	$53,296,728	$159,890,183	$266,483,639
Central Northeast	$141,588,635	$14,158,864	$42,476,591	$70,794,318
East Portland	$454,704,349	$45,470,435	$136,411,305	$227,352,175
North Portland	$912,207,088	$91,220,709	$273,662,126	$456,103,544
Northeast	$179,186,615	$17,918,662	$53,755,985	$89,593,308
Southeast	$588,007,563	$58,800,756	$176,402,269	$294,003,782
Southwest	$14,098,055,479	$1,409,805,548	$4,229,416,644	$7,049,027,740
West/Northwest	$3,789,704,748	$378,970,475	$1,136,911,424	$1,894,852,374
Total	$20,696,421,756	$2,069,642,176	$6,208,926,527	$10,348,210,878

9.5.3 Critical Facilities and Infrastructure

There are almost 200 critical facilities exposed to the landslide hazard to some degree. No loss estimation of these facilities was performed due to the lack of established damage functions for the landslide hazard. A more in-depth analysis of the mitigation measures taken by these facilities to prevent damage from mass movements should be done to determine if they could withstand impacts of a mass movement. At this time, all infrastructure and transportation corridors identified as exposed to the landslide hazard are considered vulnerable until more information becomes available.

9.5.4 Environment

The environment vulnerable to landslide hazard is the same as the environment exposed to the hazard.

9.6 FUTURE TRENDS IN DEVELOPMENT

The City of Portland is equipped to handle future growth within landslide hazard areas. Its comprehensive plan addresses landslide risk areas through goals and polices related to environmental health, directing growth away from high-risk areas through downzoning, designing with nature and the promotion of hazard resilient design. BDS regulates development in potential landslide hazard areas. A geotechnical report is required for commercial and residential permit applications on steep slopes, as well as recommendations for mitigating the risk from landslide. The City of Portland has committed to the continued integration of the Comprehensive Plan and the MAP. This enhances the opportunity for wise land use decisions as future growth impacts landslide hazard areas.

Table 9-10 shows the future land use designations for mapped landslide hazard area. The majority of the land area is designated as single-dwelling residential (50.3 percent), followed by open space (38.7 percent).

Table 9-10. Future Land Use Designations in Portland in Landslide Hazard Areas

		Percent of total acres					
	Total	Residential			Employment &	Mixed Use &	
Reporting Area	Acreage	Single-Dwelling	Multi-Dwelling	Commercial	Industrial	Institutional	Open Space
Airport	0.8	35.40%	5.70%	0.00%	0.00%	0.00%	58.90%
Central City	166.6	0.60%	12.80%	35.10%	46.70%	0.10%	4.60%
Central Northeast	236.7	37.10%	0.20%	0.00%	4.80%	7.40%	50.40%
East Portland	1,350.50	47.00%	2.00%	0.00%	1.40%	0.00%	49.50%
North Portland	552.7	21.00%	2.70%	0.00%	27.30%	25.10%	23.90%
Northeast	76.1	23.80%	6.50%	0.00%	40.90%	22.00%	6.80%
Southeast	508.2	32.60%	6.60%	0.00%	6.80%	12.00%	42.00%
Southwest	9,266.90	68.80%	5.80%	0.00%	0.10%	8.40%	17.00%
West/Northwest	9,499.50	36.70%	1.40%	0.00%	1.70%	0.50%	59.60%
TOTAL	**21,658.0**	**50.3%**	**3.6%**	**0.3%**	**2.3%**	**4.9%**	**38.7%**

Source: Future land use categories are based on the proposed comprehensive plan designations as of February 2016.

9.7 SCENARIO

Major landslides in Portland occur as a result of soils that have been affected by severe storms, groundwater or human development. The worst-case scenario would generally correspond to a severe storm that had heavy rain and caused flooding. Landslides are most likely during late winter when the

water table is high. After heavy rains from November to December, soils become saturated with water. As water seeps downward through upper soils that may consist of permeable sands and gravels and accumulates on impermeable silt, it will cause weakness and destabilization in the slope. A short, intense storm could cause saturated soil to move, resulting in landslides. As rains continue, the groundwater table rises, adding to the weakening of the slope.

Landslides are becoming more of a concern as development moves outside of city centers into areas with less infrastructure. Most landslide would be isolated events affecting specific areas. It is probable that private and public property, including infrastructure, would be affected. Landslides could affect bridges that pass over landslide-prone ravines and knock out rail service throughout Portland. Road obstructions caused by landslides would create isolation problems for residents and businesses in sparsely developed areas. Property owners exposed to steep slopes may suffer damage to property or structures. Landslides carrying vegetation such as shrubs and trees may cause a break in utility lines, cutting off power and communication access to residents.

Continued heavy rains and flooding will complicate the problem further. As emergency response resources are applied to problems with flooding, it is possible they will be unavailable to assist with landslides occurring all over Portland.

9.8 ISSUES

Important issues associated with landslides in Portland include the following:

- There are existing homes in landslide risk areas throughout Portland. The degree of vulnerability of these structures depends on the codes and standards the structures were constructed to. Information to this level of detail is not currently available.
- Future development could lead to more homes in landslide risk areas.
- The risk associated with the landslide hazard overlaps the risk associated with other hazards such as earthquake, flood and wildfire. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.
- All risk reporting areas aside from the Airport area have landslide exposure.
- It is estimated that more than 89,000 people reside in landslide hazard areas. More than half of this exposure is in the Southwest reporting area and an additional 25 percent is in the West/Northwest risk reporting area. Eighty-two percent and 77 percent of the total population in these areas are believed to be exposed to the landslide hazard.
- More than 26,370 buildings are estimated to be exposed to the landslide hazard. The risk reporting areas with more than 1,000 buildings exposed include Southwest, West/Northwest, and East Portland. More than 70 percent of the buildings exposed are in the Southwest reporting area.
- The total value of exposed contents and structures in Portland is estimated to be more than $20.6 billion, or 12.1 percent of the total value of Portland. About 68 percent of this exposure is in the Southwest reporting area.
- The vast majority of buildings exposed are residential (96 percent, 25,341). There are also 742 commercial buildings exposed, 64 government buildings, 62 religious services buildings, and 61 industrial buildings.
- The following social-vulnerability-related issues have been identified for landslide hazard areas:
    - Children under 15 years of age may disproportionately reside in landslide hazard areas in the East Portland (22 percent) risk reporting area.

- People over 65 years of age may disproportionately reside in landslide hazard areas in the Central Northeast (24 percent), Northeast (21 percent), Southeast (18 percent), Central City (14 percent), Southwest (13 percent) and West/Northwest (13 percent) risk reporting areas.
- People of color may disproportionately reside in landslide hazard areas in the East Portland risk reporting area (26 percent).
- Renters may disproportionately reside in landslide hazard areas in the Central City (75 percent) and Northeast (68 percent) risk reporting areas.
- Households with limited English speaking abilities may disproportionally reside in landslide hazard areas in the Central Northeast (8 percent) and East Portland (7 percent) risk reporting areas.

- There are 192 critical facilities in the landslide hazard area.
- Mapping and assessment of landslide hazards are constantly evolving. As new data and science become available, assessments of landslide risk should be reevaluated. This is especially true for runout modelling, which is not currently well understood.
- The impact of climate change on landslides is uncertain. Climate change impacts that alter vegetation patterns, increase the occurrence of wildfires or alter precipitation patterns may increase exposure to landslide risks.
- Landslides may cause negative environmental consequences, including water quality degradation.
- Areas with significant landslide risk should be monitored, to the extent possible, immediately following a possible triggering event.
- Facilities that contain hazardous materials located in landslide hazard areas may present additional risks for Portland.
- Currently available maps do not indicate runout (where a landslide might go). Current maps show the area that might be unstable, but do not offer a complete picture of areas at risk. New mapping is currently being developed by DOGAMI.

10. WILDFIRE



10.1 GENERAL BACKGROUND

DEFINITIONS

- **Wildland-Urban Interface (WUI) Area**—An area where structures are adjacent to or are intermingled with natural vegetative fuels which is prone to the occurrence of wildland fires (Oregon OEM, 2015).
- **Wildfire Hazard Zone**— the portion of a local government jurisdiction that has been determined to be at risk of a catastrophic wildfire (Oregon OEM, 2015).

A wildfire is any uncontrolled fire on undeveloped land that requires fire suppression. Wildfires can be ignited by lightning or by human activity such as smoking, campfires, equipment use, or arson. Oregon's Building Code encourages local governments to designate portions of their jurisdictions subject to catastrophic fire as Wildfire Hazard Zones. The purpose of these zones is to define areas where buildings need to be made more survivable from fires spreading through adjacent wildlands. Three factors vital to wildfire risk are included in the methodology for mapping these zones: weather, topography, and vegetative fuel factor.

10.1.1 Weather

Extreme weather leads to extreme fire events, and it is often a moderation of the weather that marks the end of a wildfire's growth. High temperatures and low humidity can produce vigorous fire activity. Winds may play a dominant role in directing the course of a fire. Strong, dry winds produce extreme fire conditions. The most damaging firestorms are usually marked by high winds.

10.1.2 Topography

The movement of air over the terrain tends to direct a fire's course. Gulches and canyons can funnel air and act as a chimney, intensifying fire behavior and inducing faster rates of spread. Saddles on ridge tops offer lower resistance to the passage of air and will draw fires. Solar heating of drier, south-facing slopes produces upslope thermal winds that can complicate fire behavior. On steep slopes, fuels on the uphill side of a fire are closer to the source of heat. Fire travels downslope much more slowly than it does upslope, and ridge tops often mark the end of wildfire's rapid spread.

10.1.3 Fuels

Fuels are classified by weight or volume and by type, including living and dead vegetation on the ground, brush and small trees on the surface, and tree canopies above the ground. Fuel loading, often expressed in tons per acre, indicates the amount of vegetative material available. Some fuels burn more easily or release more energy than others. Lighter fuels such as grasses, leaves and needles quickly expel moisture and burn rapidly, while heavier fuels such as tree branches, logs and trunks take longer to warm and ignite.

In Portland, wildfires burn fuels in large natural area parks and open spaces at the wildland urban interface and in the interior of the city. Wildfires can be categorized as occurring in the following locations (NHMP, 2010):

- **Wildland Urban Interface (WUI)**—Fires involving the wildland/urban interface occur in areas where urbanization and the presence of natural vegetation fuels allow a fire to spread rapidly from natural fuels to structures and vice versa. Especially in the early stage of such fires, structural fire suppression resources can be quickly overwhelmed, increasing the potential number of structures destroyed. Such fires are known for the large number of structures simultaneously exposed to fire. Nationally, wildland/urban interface fires commonly produce widespread losses.
- **Urban**—While these fires rarely spread out of control, due to proximity to fire resources and less fuel between buildings, urban conflagration is a hazard in densely populated areas. Many of the same factors that influence hazard in wildland/urban interface areas come into play in urban centers. Drought, high temperatures and fuel load are joined by factors such as flammable building materials, aging electrical wiring and closely packed structures to increase fire hazard.

10.2 HAZARD PROFILE

10.2.1 Past Events

All of Portland's natural ecosystems have been highly modified by humans. Historically, indigenous people purposely ignited large portions of the basin valley annually for agriculture, hunting, communication, warfare, visibility, safety and sanitation. Such systemic burning continued to shape the landscape to protect timber and property in the region (NHMP, 2010). When Anglo settlers arrived, they plowed native prairies and logged or cleared evergreen forests. Strategic seasonal burning ceased. As a result, woodlands grew denser and deciduous trees grew in among the evergreens. The mixed evergreen-deciduous forests we see today are much less fire prone than are pure evergreen forests. In part as a result of historic fires and logging, 70 percent of Forest Park is fairly fire resistant as is much of the forest that rings Powell Butte. But over several decades these forests will grow back to evergreens (NHMP, 2010).

The Multnomah County Community Wildfire Protection Plan (2011), lists the following dates and descriptions of fires that have impacted the City of Portland area:

- **1889**—Balch Creek Canyon Fire started with what is now known as the NW Industrial area burned westerly over Portland's West hills towards the Cascade Mountains in a roughly 2 mile by 7 mile swath, or approximately 9000 acres. Source: Portland Fire & Rescue
- **August 7, 1939**—The fire began in the Dutch Creek Canyon area near Scappoose, just west of Forest Park. The flames spread to Pisgah Mountain Home, an Asylum with about 60 elderly inmates. Despite the efforts of over 200 firefighters, 20 mile per hour winds fanned the fire to jump the canyon into a large timber stand. As the fire spread into Washington County, near North Plains, the Northwest Oregon Forest Protective Association deployed over 1500 men to fight the blaze. Although many farmers and timber operators lost homes and equipment, the most serious loss was to forested timberlands. Over 14,000 acres were lost. Investigators attributed the destruction to a carelessly tossed cigarette. Source: The Chronicle Area news Archives
- **1940**—The Bonny Slope Fire kindled in the southern portion of what is now known as Forest Park and burned westerly along the ridges then turned somewhat north as it crested the west hills towards the housing development now known as Forest Heights. It burned approximately an area approximately 1,000 acres. Source: Portland Fire & Rescue
- **August 19, 1951**—Burma Road Fire was a quick-moving urban wildfire started in Forest Park near Leif Erikson Road. The fire raced up and over view point ridge flames 50 feet high were recorded as the fire consumed over 100 acres in the span of one evening. Over 500 City of

Portland staff battled the blaze. Firefighters made a fire lane on Thompson Road on Skyline Ridge to carry equipment and personnel to the fire. The fire burned to the southwest broke over to Forest Heights. When the fire was finally extinguished 3,000 acres in the heart of forest park were burned. Source: Portland Fire & Rescue

- **August 8, 2001 and 2002**—Mocks Crest Fire caused Residents living on the Willamette Boulevard bluff near University of Portland nearly lost their homes and a large part of their community. In a dramatic team effort firefighters and citizens stopped the 5 Alarm wildland urban interface fire just before it overwhelmed the structures in its path. It burned approximately 38 acres. This area ignited again the following year, burning 10 acres. Source: Portland Fire & Rescue
- **August 2002 and September 2003**—Powell Butte had three relatively small wildland urban interface fires that totaled 54.75 acres. Source: Portland Fire & Rescue

The Oregon Natural Hazard Mitigation Plan records only one significant wildfire event impacting the region surrounding the City of Portland. The Columbia fire, which occurred in 1902 burned approximately 170,000 acres in Clackamas and Multnomah counties (Oregon Department of Land Conservation and Development, 2015). According to the FEMA Disaster Declarations database there have been no federally declared disasters involving fire in Portland (FEMA, 2016b).

10.2.2 Location

Designated Wildfire Hazard Zones

According to the Oregon Natural Hazard Mitigation Plan, the Portland metropolitan area is designated as a wildland-urban interface community (Oregon Department of Land Conservation and Development, 2015). The City of Portland, responsive to changes in Oregon Building code, designated areas of the City as vulnerable to wildfire hazards in 2002 (see Figure 10-1). The purpose of these zones is to define areas where buildings need to be made more survivable from fires spreading through nearby wildlands.

Much of the land area designated as at risk to wildfire in the city includes parks, open space and adjacent areas. The city's park natural areas designated as wildfire hazard areas include Powell Butte, the Willamette Bluffs or Escarpment, (Oaks Bottom and Mock's Crest) Marquam Nature Park, Terwilliger Wildlands, Kelly Butte, Rocky Butte and Mt. Tabor. The two largest areas are Forest Park and Powell Butte (NHMP, 2010). These natural areas have been identified as high risk by Oregon Department of Forestry and Portland Fire and Rescue because high-density commercial and residential development immediately surround the natural area parks and open spaces (NHMP, 2010).

Forest Park comprises the city's largest urban natural area which encompasses over 5,000 acres extending approximately eight miles along the northeast slope of the Tualatin Mountains. This area includes a diverse ecosystem with myriad bird, plant and animal species. Mixed deciduous (70 percent) and conifer (30 percent) growth reduce catastrophic fire potential in this location but could quickly change during intense dry seasons. Grasslands and large patches of flammable invasive species are at the edges of the park and in power line and utility corridors. These areas are often susceptible to fire (NHMP, 2010).

September 12, 2016
Mitigation Action Plan (MAP)
Figure 10-1.
Wildfire Hazard Area
Legend
City Boundary
Wildfire Hazard Area
NORTH
0 0.75 1.5
Miles
Sources: City of Portland-2002, 2016
PBEM

Powell Butte Nature Park, the adjacent Clatsop Butte Park natural area, and the treed Johnson Creek floodplain encompass over 1,000 acres of parks, dense tree canopy and urban interface development in Southeast Portland. Powell Butte is also the site of the Water Bureau's above and underground reservoir system. Powell Butte's vast meadowlands and interspersed forests are the focus of the wildfire threat in this area. The park's east side is at risk due to the close proximity of development to the meadow and the east winds of late summer and early autumn which, if ignited, could spread fires west to the forested area of the park. With the exception of some housing in close proximity to the meadow near the park entrance most development is downhill from the park, on the west slopes, sheltered from the dry winds (NHMP, 2010).

In Southwest and Northwest Portland the steep slopes of Forest Park, Marquam Nature Park and Terwilliger Wildlands, face into the strong, dry, east winds that funnel out of the Columbia Gorge most autumns. In Southeast Portland, Powell Butte, Mt. Tabor Park, Kelley Butte and Rocky Butte have a similar landscape position facing the east winds. Many of the developments that hug the west side of Forest Park or are at the top of the Willamette Escarpment were built without consideration of the path of historic fires (NHMP, 2010).

The Willamette Bluffs fires of 2000 and 2001 refocused the City's attention to reducing fuel loads through intergovernmental coordination. The Portland Wildfire Readiness Assessment and Gap Analysis Plan (City of Portland, 2009) funded through Pre-Disaster Mitigation Grant funds, suggested that work is needed to "reduce wildfire risks to homes and their neighborhoods closest to the city's heavily forested areas. The Plan recommended improving zoning codes that require or encourage fire-resistant building materials, reducing hazardous fuels within a few hundred feet of buildings and maintaining adequate emergency vehicle access (Portland 2009c)." (as cited in NHMP, 2010). According to a recent status report on the implementation of the Gap Analysis recommendations (see Attachment A of the 5-year progress report) such code changes have not yet been adopted and implemented by the City.

Community Wildfire Protection Plan Communities at Risk

In 2010 the Oregon Department of Forestry, Multnomah County Emergency Management, and the City of Portland's Wildfire Technical committee began work on the development of a community wildfire protection plan. Through this planning process local communities at risk were identified that were determined to be particularly vulnerable to wildfire. The results of this assessment are non-regulatory in nature and were intended to provide a starting point for "coordination and collaboration among agencies and the public in the County to identify and prioritize future wildfire projects and assists in meeting federal planning requirements and qualifying for assistance programs" (Multnomah County, 2011). It was noted in the plan that although the mapping produced for the assessment was more recent, the Portland Wildfire Zones provide greater detail (Multnomah County, 2011). Communities at risk within the areas covered by Portland Fire & Rescue and the Port of Portland Airport Fire Department are shown in Table 10-1.

10.2.3 Frequency

In Oregon, wildfire season normally begins in late June, peaks in August, and ends in October. However, a combination of above normal-temperatures and drought can increase the length of the typical fire season. Wildfire hazards would be highest during prolonged periods of drought, especially after periods of below normal rainfall, which would result in a combination of high fuel loads and unusually dry conditions (NHMP, 2010). Based on the historical record of seven fires impacting Portland in the past 127 years, the average recurrence interval for a fire is 18 years.

Table 10-1. Community Wildfire Protection Plan Communities at Risk

Priority Level	Communities at Risk	
	Portland Fire & Rescue	Port of Portland Airport
High	• Linnton • Forest Park/Skyline Road • Forest Heights • Willamette Bluffs Escarpment • Rocky Butte • Kelly Butte • Powell Butte • Johnson Creek Watershed • Oaks Bottom	• Elrose Road • Government Island
Medium	• Mount Tabor • Springwater and Flavel • Pittock Mansion Area • Tryon Creek • Terwilliger Creek • Zoo and Hoyt Arboretum	
Low	• Southwest Portland Cemetery • Sullivan's Gulch • Smith-Bybee Lake	

Source: Multnomah County Community Wildfire Protection Plan, 2011

10.2.4 Severity

Wildfires can range from isolated burns affecting a few acres to severe events that burn hundreds of thousands of acres. Large fires usually occur when groups of smaller fires merge. Property damage from wildfires can be severe and can significantly alter entire communities.

Potential losses from wildfire include human life, structures and other improvements, and natural resources. There are no recorded incidents of loss of life from wildfires in Portland.

10.2.5 Warning Time

Wildfires are often caused by humans, intentionally or accidentally. There is no way to predict when one might break out. Since fireworks often cause brush fires, extra diligence is warranted around the Fourth of July when the use of fireworks is highest. Dry seasons and droughts are factors that greatly increase fire likelihood. Dry lightning may trigger wildfires. Severe weather can be predicted, so special attention can be paid during weather events that may include lightning. Reliable National Weather Service lightning warnings are available on average 24 to 48 hours prior to a significant electrical storm.

If a fire does break out and spread rapidly, residents may need to evacuate within days or hours. A fire's peak burning period generally is between 1 p.m. and 6 p.m. Once a fire has started, fire alerting is reasonably rapid in most cases. The rapid spread of cellular and two-way radio communications in recent years has further contributed to a significant improvement in warning time.

10.3 COMPOUNDING FACTORS AND SECONDARY HAZARDS

10.3.1 Overview

Wildfires can generate a range of secondary effects, which in some cases may cause more widespread and prolonged damage than the fire itself. Fires can cause direct economic losses in the reduction of harvestable timber and indirect economic losses in reduced tourism. Wildfires can contaminate reservoirs, destroy transmission lines and contribute to flooding. They strip slopes of vegetation, exposing them to greater amounts of runoff and erosion. This can weaken soils and cause slope failures. Major landslides can occur several years after a wildfire. Wildfires can bake soils, especially those high in clay content, thus increasing the imperviousness of the ground. This increases the runoff generated by storm events, thus increasing the chance of flooding.

10.3.2 Air Quality

Wildfires across Oregon negatively impacted air quality in the Portland Metro region in August of 2015 causing County health departments to issue warnings. This is a common secondary hazard associated with wildfire and is discussed in more detail in the population vulnerability discussion of this profile.

10.3.3 Invasive Species

Invasive species can contribute to the fuel load in area, thus increasing the severity of fires. Since 2006, Portland Parks and Recreation and the Bureau of Environmental Services have begun work to reduce hazardous wildfire fuels by removing non-native and invasive vegetation in the most highly threatened natural area parks and adjacent open space areas (City of Portland, 2009 as cited in NHMP, 2010).In addition, invasive species can also present issues after a fire as non-native woody plant species frequently invade burned areas. When weeds become established, they can dominate the plant cover over broad landscapes, and become difficult and costly to control (NHMP, 2010).

Fungal infestations can damage the health of native vegetation and contribute to increased wildfire risk. Swiss needle cast is a fungal disease affecting Douglas fir forests in Oregon, predominantly over the past 20 years. Although the fungus is native to Oregon, its detrimental impact may be increasing due to rising spring and summer temperatures (Black et al., 2010) Douglas fir is one of the prominent tree species in Forest Park. A decline in the health of Forest Park's trees due to Swiss needle cast could contribute to increased fuel loads and combustibility, leading to greater risk and severity of wildfires in Portland (Weiskittel et al., 2004).

10.3.4 Climate Change

Climate change can affect multiple elements of the wildfire system: fire behavior, ignitions, fire management, and vegetation fuels. Hot dry spells create the highest fire risk. Increased temperatures may intensify wildfire danger by warming and drying out vegetation. Climate change also may increase winds that spread fires and thunderstorms producing lightning that ignites fires. Forest response to increased atmospheric carbon dioxide could contribute to more tree growth and thus more fuel for fires, although the effects of carbon dioxide on mature forests are still largely unknown. In turn, increased wildfires could release stores of carbon and further contribute to the buildup of greenhouse gases.

According to the City of Portland and Multnomah County Climate Change Preparation Strategy (2014) "in Oregon, the likelihood of increased frequency and intensity of wildfire is very high under the climatic changes expected in the coming decades (State of Oregon, 2010). In addition, an increasing pattern of hot, dry summers and earlier springs increases the likelihood of more and prolonged wildfires."

10.4 EXPOSURE

10.4.1 Population

Population estimates for those residing in wildfire hazard areas were calculated by multiplying the percent of residential structures within the hazard area for each risk reporting area by the total estimated population of that area. These estimates are shown in Table 10-2. Approximately 11 percent of the citywide population is believed to reside in these areas. Exposure as a percent of total population is most significant in the West/Northwest and Southwest reporting areas. Estimates for our social vulnerability indicators are shown in Table 10-3. Citywide estimates indicate that a disproportionate number of young and elderly residents may be residing within these areas. In addition, homeless or transient populations residing in City parks would have considerable exposure to the wildfire hazard.

Table 10-2. Population within Wildfire Hazard Areas

	Population Exposed[a]	% of Total Population
Airport	0	0.0%
Central City	2,925	7.7%
Central Northeast	691	1.5%
East Portland	11,808	7.9%
North Portland	836	1.2%
Northeast	0	0.0%
Southeast	0	0.0%
Southwest	31,550	44.9%
West/Northwest	20,205	75.2%
Total	**68,015**	**11.1%**

a. Value calculated as percent of residential buildings exposed multiplied by the estimated population.

Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

Table 10-3. Distribution of Social Vulnerability Indicators in Wildfire Hazard Areas

	Population Residing in High Wildfire Hazard Areas *a, b, c, d*					
Reporting Area	Percent Under 15 Years	Percent Over 65 Years	Percent of People of Color	Percent of Renter occupied Housing	Percent of Families Below Poverty Level	Percent of Limited English Speaking Households
Central City	8.6%	11.6%	15.6%	61.9%	4.5%	0.8%
Central Northeast	8.4%	28.6%	26.4%	44.6%	16.3%	10.0%
East Portland	23.0%	10.5%	25.9%	20.4%	5.9%	6.7%
North Portland	13.1%	9.5%	16.8%	29.9%	7.4%	1.6%
Southwest	14.6%	14.2%	12.8%	35.2%	4.1%	1.1%
West/Northwest	16.9%	13.1%	17.5%	30.2%	4.5%	2.4%
Total	15.5%	13.5%	16.9%	27.3%	3.3%	1.4%

a. Values based on an analysis of 2010-2014 American Community Survey 5-year estimates at the Census block group level.
b. Values calculated using block group statistics weighted by the number of residential structures in the hazard area as a percentage of the total residential structures in the block group.
c. Values in red indicate percentages are at least 2 percent greater than the Citywide average (see Section 4.7).
d. Persons with disabilities not shown because the available data, at a census tract scale, is not conducive to analysis by hazard extent and location.

The entire population of Portland would be exposed to air quality issues resulting from a wildfire, although the extent of exposure would depend on weather conditions. Populations without access to air conditioning or who work outdoors would increase their risk of exposure.

10.4.2 Property

Property damage from wildfires can be severe and can significantly alter entire communities. The number of structures in wildfire hazard areas within Portland and their estimated replacement values are listed in Table 10-4. Table 10-5 lists the structure types. The Southwest and West/Northwest reporting areas have the most exposure in the City, with 55 percent and 24 percent of total value exposed, respectively. Citywide, 9.5 percent of the total replacement value of Portland is believed to be exposed to the wildfire risk. Most of the exposed structures are residential (96.6 percent), followed by commercial (2.2 percent).

Table 10-4. Exposure and Value of Structures in Wildfire Hazard Areas

Reporting Area	Number of Buildings Exposed	Value Exposed			Exposed Value as % of Total Replacement Value
		Structure	Contents	Total	
Airport	0	$0	$0	$0	0.0%
Central City	79	$97,606,665	$60,662,292	$158,268,957	0.5%
Central Northeast	259	$162,630,647	$103,979,744	$266,610,391	2.4%
East Portland	3,328	$928,498,538	$484,931,548	$1,413,430,086	5.4%
North Portland	344	$543,255,169	$641,920,056	$1,185,175,224	5.0%
Northeast	0	$0	$0	$0	0.0%
Southeast	0	$0	$0	$0	0.0%
Southwest	10,277	$5,453,618,530	$4,337,521,920	$9,791,140,450	55.0%
West/Northwest	4,949	$2,161,912,229	$1,230,447,391	$3,392,359,620	24.4%
Total	**19,236**	**$9,347,521,776.57**	**$6,859,462,951.32**	**$16,206,984,728**	**9.5%**

Table 10-5. Structure Type Exposed in the Wildfire Hazard Area

Reporting Area	Number of Structures[a]						
	Residential	Commercial	Industrial	Religion	Government	Education	Total
Airport	0	0	0	0	0	0	0
Central City	66	8	2	2	1	0	79
Central Northeast	233	5	0	20	1	0	259
East Portland	3,289	35	0	4	0	0	3,328
North Portland	271	27	14	1	1	30	344
Northeast	0	0	0	0	0	0	0
Southeast	0	0	0	0	0	0	0
Southwest	10,012	150	21	28	12	54	10,277
West/Northwest	4,720	194	16	1	11	7	4,949
Total	**18,591**	**419**	**53**	**56**	**26**	**91**	**19,236**

a. Structure type assigned to best fit Hazus occupancy classes based on present use classifications provided by Multnomah County assessor's data. Where conflicting information was present in the available data, parcels were assumed to be improved.

10.4.3 Critical Facilities and Infrastructure

Critical facilities and infrastructure exposed to the wildfire hazard in Portland are listed in Table 10-6 and Table 10-7. 104 critical facilities and infrastructure are located in wildfire risk areas within the city (16.9 percent). In addition, it is likely that all Portland Water Bureau facilities located outside of the City boundaries are exposed to wildfire risk to some extent, although, the data used for this analysis did not provide information for these facilities. In addition linear features exposed to the wildfire hazard are shown in Table 10-8.

Table 10-6. Critical Facilities in Wildfire Hazard Area

	Number of Critical Facilities in Wildfire Hazard Areas[b]				
Reporting Area	Emergency Services	High Potential Loss Facilities[a]	Schools	Other Assets	Total
Airport	0	0	0	0	**0**
Central City	0	0	1	0	**1**
Central Northeast	0	0	2	1	**3**
East Portland	0	0	1	0	**1**
North Portland	0	2	1	0	**3**
Northeast	0	0	0	0	**0**
Southeast	0	0	0	0	**0**
Southwest	5	1	26	6	**38**
West/Northwest	1	3	4	1	**9**
Total	**6**	**6**	**35**	**8**	**55**

a. Includes 4 hazardous material facilities.
b. See Table 6-1 for a description of the facilities included in each category.

Table 10-7. Critical Infrastructure in Wildfire Hazard Area

	Number of Critical Infrastructure Facilities in Wildfire Hazard Areas[b]					
		Utility Systems				Total
Reporting Area	Transportation Systems	Communications	Power	Potable Water[a]	Wastewater	
Airport	0	0	0	0	0	**0**
Central City	0	0	0	0	0	**0**
Central Northeast	1	1	0	2	1	**5**
East Portland	0	1	1	18	1	**21**
West/Northwest	4	2	1	23	1	**31**
North Portland	0	0	0	1	5	**6**
Northeast	0	0	0	0	0	**0**
Southeast	0	0	0	0	0	**0**
Southwest	4	3	1	22	6	**36**
Total	**9**	**7**	**3**	**66**	**14**	**99**

a. It is likely that the 75 facilities located outside of the City boundaries are also exposed to the wildfire hazard.
b. See Table 6-1 for a description of the facilities included in each category.

Table 10-8. Linear Critical Facilities in Wildfire Hazard Area

	Facilities in Wildfire Hazard Area
Utility Systems	
Power Lines	60.74 miles, 12.7% of citywide total
Gas Lines	5.06 miles, 6.1% of citywide total
Transportation Systems	
Railroads	6.48 miles, 1.7% of citywide total
Light Rail	1.65 miles, 3.1% of citywide total
Major Roads	NW Cornell Rd, NW St Helens Rd (US Highway 30), SE Bybee Blvd, SW Bertha Blvd, SW Scholls Ferry Rd, SW Sunset Hwy (US Highway 26).

Note: The wildfire dataset used for this analysis does not include road right of ways in the hazard area.

10.4.4 Environment

Fire is a natural and critical ecosystem process in most terrestrial ecosystems, dictating in part the types, structure, and spatial extent of native vegetation. Portland natural areas and open spaces are fire-prone and fire-adapted ecosystems. The local forests, woodlands and grasslands evolved with fire over thousands of years. The moist western Oregon, natural plant communities burn less frequently, but when they do, the fires tend to be large and intense. Wildfires are part of the natural ecology and natural life cycles of wildlands. Fires create open spaces with different habitats for both plants and animals than existed previously. Fires also reduce fuel loads in areas, which in turn decreases the potential for large catastrophic fires (NHMP, 2010).

In addition to threatening humans, animals and infrastructure, wildfires in forested areas have a severe impact on natural resources. Wildfires strip the land of vegetation and destroy forest resources. Soil exposed to intense heat may lose its capability to absorb moisture and support life. Exposed soils erode quickly and enhance siltation of rivers and streams, thus increasing flood potential, harming aquatic life and degrading water quality. Lands stripped of vegetation are also subject to increased debris flow hazards (City of Portland, 2004a as cited in NHMP, 2010).

10.5 VULNERABILITY

Structures, above-ground infrastructure, critical facilities and natural environments are all vulnerable to the wildfire hazard. There is currently no validated damage function available to support wildfire mitigation planning. Except as discussed in this section, vulnerable populations, property, infrastructure and environment are assumed to be the same as described in the section on exposure.

10.5.1 Population

All population that is exposed to wildfire risk is vulnerable to wildfire risk. The most vulnerable individuals are those who are not able to evacuate risk areas quickly, such as older populations or those with access and functional needs. Generally, few people die in wildfires because warning time is sufficient to allow for evacuation.

Wildfires also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. Smoke and air pollution from wildfire can also be a severe health hazard for those living near or downwind from wildfires. This is especially true for sensitive populations, including children, the elderly and those with respiratory and cardiovascular diseases. Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals), gases (carbon

monoxide, carbon dioxide, nitrogen oxides), and toxics (formaldehyde, benzene). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility.

10.5.2 Property

Loss estimations for the wildfire hazard are not based on damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent and 50 percent of the replacement value of exposed structures. This allows emergency managers to select a range of economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 10-9 lists the loss estimates for each risk reporting area.

Table 10-9. Loss Potential for Wildfire

Reporting Area	Exposed Value	Potential Loss		
		@ 10% Damage	@ 30% Damage	@ 50% Damage
Airport	$0	$0	$0	$0
Central City	$158,268,957	$15,826,896	$47,480,687	$79,134,479
Central Northeast	$266,610,391	$26,661,039	$79,983,117	$133,305,196
East Portland	$1,413,430,086	$141,343,009	$424,029,026	$706,715,043
North Portland	$0	$0	$0	$0
Northeast	$0	$0	$0	$0
Southeast	$9,791,140,450	$979,114,045	$2,937,342,135	$4,895,570,225
Southwest	$3,392,359,620	$339,235,962	$1,017,707,886	$1,696,179,810
West/Northwest	$1,185,175,224	$118,517,522	$355,552,567	$592,587,612
Total	**$16,206,984,728**	**$1,620,698,473**	**$4,862,095,418**	**$8,103,492,364**

10.5.3 Critical Facilities and Infrastructure

Critical facilities of wood frame construction are especially vulnerable during wildfire events. In the event of wildfire, there would likely be little damage to most infrastructure. Most roads and railroads would be without damage except in the worst scenarios. Power lines are the most at risk from wildfire because most poles are made of wood and susceptible to burning. Fires can create conditions that block or prevent access and can isolate residents and emergency service providers. Wildfire typically does not have a major direct impact on bridges, but it can create conditions in which bridges are obstructed. Many bridges in areas of high to moderate fire risk are important because they provide the only ingress and egress to large areas and in some cases to isolated neighborhoods.

10.5.4 Environment

The vulnerability risks are the same as those described for exposure. In addition, there are four registered hazardous material containing structures in wildfire risk zones. During a wildfire event, these materials could rupture due to excessive heat and act as fuel for the fire, causing rapid spreading and escalating the fire to unmanageable levels. In addition they could leak into surrounding areas, saturating soils and seeping into surface waters, and have a disastrous effect on the environment.

10.5.5 Economic Impact

A large fire could have significant economic impacts for Portland, especially damage to utilities and the expense incurred fighting.

10.6 FUTURE TRENDS IN DEVELOPMENT

The City's Comprehensive Plan establishes goals, policies and projects for reducing wildfire risk, including through site design, designing with nature, promoting hazard resilient design, managing risk through plans and investments, and ensuring adequate resources and facilities for response. In addition, the City has identified actions that seek to strengthen fire-related development codes.

Table 10-10 shows future land use designations in mapped wildfire risk areas. Over half of the land area is designated as open space, which is a low risk use for landslide hazard areas. Approximately, 42.5 percent of the remaining area is designated as single-family dwelling.

Table 10-10. Future Land Use Designations in Portland

Reporting Area	Total Acreage	Percent of total acres					
		Residential					
		Single-Dwelling	Multi-Dwelling	Commercial	Employment & Industrial	Mixed Use & Institutional	Open Space
Airport	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Central City	23	4.0%	57.8%	35.7%	0.0%	0.0%	2.5%
Central Northeast	244	45.9%	3.9%	0.0%	0.0%	13.1%	37.1%
East Portland	2,949	49.1%	2.6%	0.0%	1.7%	0.2%	46.5%
North Portland	1,617	4.9%	0.2%	0.0%	14.4%	6.0%	74.4%
Northeast	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Southeast	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Southwest	5,761	61.4%	3.5%	0.0%	0.0%	7.5%	27.6%
West/Northwest	8,605	34.8%	1.1%	0.0%	1.4%	0.3%	62.5%
TOTAL	19,200	42.5%	2.1%	0.0%	2.1%	3.1%	50.2%

Source: Future land use categories are based on the proposed comprehensive plan designations as of February 2016.

10.7 SCENARIO

A major fire in Portland might begin with a wet spring, adding to fuels on the forest floor. Flashy fuels would build throughout the spring. The summer could see the onset of insect infestation. A dry summer could follow the wet spring, exacerbated by dry hot winds. Carelessness with combustible materials or a tossed lit cigarette, or a sudden lighting storm could trigger a multitude of small isolated fires. The embers from these smaller fires could be carried miles by hot, dry winds. The potential for large-scale destruction from such fires would be increased if there were an active fire season in the American west. This may lead to thinly spread resources being available to support local crews.

To further complicate the problem, heavy rains could follow the burns, causing flooding and landslides and releasing tons of sediment into rivers, permanently changing floodplains and damaging sensitive habitat and riparian areas. Such a fire followed by rain could release millions of cubic yards of sediment into streams for years, creating new floodplains and changing existing ones. With the forests removed from the watershed, stream flows could easily double. Floods that could be expected every 50 years may occur every couple of years. With the streambeds unable to carry the increased discharge because of increased sediment, the floodplains and floodplain elevations would increase.

10.8 ISSUES

The following issues were identified for the wildfire hazard:

- Wildfire hazard areas have been identified in all risk reporting areas aside from the following: Airport, Northeast and Southeast.
- 68,015 people are estimated to reside in wildfire hazard areas. This includes approximately 75 percent of the West/ Northwest population and nearly 45 percent of the Southwest population.
- There are estimated to be 19,236 buildings exposed to the wildfire hazard. More than half of these are in the Southwest reporting area. The majority of the remaining structures are in the West/Northwest and East Portland reporting areas.
- More than $16.2 billion is estimated to be exposed to the wildfire hazard. This is approximately 9.4 percent of the total value of Portland, more than 55 percent of the Southwest risk reporting area and almost 25 percent of the West/ Northwest area.
- More than 96 percent of the exposed buildings are thought to be residential structures. About 2 percent of the remaining buildings are commercial.
- The following social-vulnerability-related issues have been identified for wildfire hazard areas:
    - Children under 15 years of age may disproportionately reside in wildfire hazard areas in the East Portland risk reporting area (23 percent).
    - People over 65 years of age may disproportionately reside in wildfire hazard areas in the Central Northeast (29 percent) and West/Northwest (13 percent) risk reporting areas.
    - People of color may disproportionately reside in wildfire hazard areas in the Central Northeast (26 percent) and East Portland (26 percent) risk reporting areas.
    - Renters may disproportionately reside in wildfire hazard areas in the Central City (62 percent) risk reporting area.
    - Families with incomes below the poverty level may disproportionately reside in wildfire hazard areas in the Central Northeast risk reporting area (16 percent).
    - Households with limited English speaking abilities may disproportionally reside in wildfire hazard areas in the Central Northeast (10 percent) and East Portland (7 percent) risk reporting areas.
- There are 104 critical facilities located in the wildfire hazard area. The wildfire hazard presents a significant risk to the City's water supply.
- Portland's largest natural area and largest area exposed to wildfire risk—the 5,500 acre Forest Park—is surrounded on three sides by industrial and residential development (NHMP, 2010).
- The risk of loss to homes and businesses built at the wildland urban interface is significant and growing due to the buildup of hazardous wildfire fuels (including invasive species), longer dry seasons and changing weather patterns (NHMP, 2010).
- Public education and outreach to people living in or near the fire hazard zones should include information about and assistance with mitigation activities such as how to maintain defensible space, and advance identification of evacuation routes and safe zones.
- Area fire districts need to continue to train on wildland-urban interface events.
- Continued efforts at vegetation management activities are needed.
- Many of the actions identified in the 2009 Gap Analysis report and 2011 community wildfire protection plan still need to be implemented.
- Additional clarification and guidance is needed when discussing burn restrictions with the public.
- NET members could be trained to assist in fire-fighting when resources are stretched thin.

11. FLOOD



11.1 GENERAL BACKGROUND

11.1.1 What Is a Floodplain?

A floodplain is the area adjacent to a river, creek or lake that becomes inundated during a flood. Floodplains may be broad, as when a river crosses an extensive flat landscape, or narrow, as when a river is confined in a canyon.

DEFINITIONS

- **1-Percent Annual Chance Flood (100-Year Flood)**—The flood magnitude that has a 1-percent chance of being equaled or exceeded in any given year. On a statistical average over a long term, this magnitude can be expected to occur once every 100 years; in fact though, such a flood can occur multiple times in a few years, or even in a single year.
- **1-Percent Annual Chance Flood Hazard Area (100-Year Floodplain)**—The area that is inundated during a 1-percent annual chance (100-year) flood.
- **Flood**—The inundation of normally dry land resulting from the rising and overflowing of a body of water.
- **Floodplain**—The land area along the sides of a river that becomes inundated with water during a flood.
- **Riparian Area**—The area along the banks of a natural watercourse.

Floodplain Benefits

Floodplains are a natural component of the City of Portland environment. Understanding and protecting their natural functions can reduce flood damage and protect people and property. The benefits of preserving floodplains include the following:

- **Flood and erosion control**—Floodplains are like natural sponges, storing and slowly releasing floodwaters. This reduces the height of a flood and the speed of a river. When a river is cut off from its floodplain by levees and dikes, flood heights often increase and downstream damage can be greater.
- **Water quality improvement**—As water travels through floodplains, plants serve as natural filters, trapping sediments and capturing pollutants. Floodplains help to moderate temperature fluctuations that can harm aquatic life. They also help remove from the water soil and pollutants that can harm aquatic life.
- **Groundwater recharge**—Floodplains promote infiltration and recharge of underlying aquifers.
- **Fish and wildlife habitat**—Floodplains maintain biodiversity. They provide breeding and feeding grounds, create and enhance waterfowl areas, and protect habitat for rare and endangered species.

The natural processes of flooding add sediment and nutrients to floodplain areas. When floodwaters recede after a flood event, they leave behind layers of rock and mud. These gradually build up to create a new floor of the floodplain. Floodplains generally contain accumulations of sand, gravel, loam, silt or clay, often extending below the bed of the stream. These sediments provide a natural filtering system, with water percolating back into the ground and replenishing groundwater. These are often important aquifers, the water drawn from them being filtered compared to the water in the stream. Fertile, flat reclaimed floodplain lands are commonly used for agriculture, commerce and residential development.

Floodplains can support ecosystems that are rich in plant and animal species. A floodplain can contain 100 or even 1,000 times as many species as a river. Wetting of the floodplain soil releases an

immediate surge of nutrients: those left over from the last flood, and those that result from the rapid decomposition of organic matter that has accumulated since then. Microscopic organisms thrive and larger species enter a rapid breeding cycle. Opportunistic feeders (particularly birds) move in to take advantage. The production of nutrients peaks and falls away quickly, but the surge of new growth endures for some time. This makes floodplains valuable for agriculture. Species growing in floodplains are markedly different from those that grow outside floodplains. For instance, riparian trees (trees that grow in floodplains) tend to be very tolerant of root disturbance and very quick-growing compared to non-riparian trees.

A river and its floodplain together form a complex physical and biological system that supports a variety of natural resources and provides natural flood and erosion control. When a river is separated from its floodplain with levees and other flood control facilities, natural, built-in benefits can be lost, altered, or significantly reduced.

Effects of Human Activities

Because they border water bodies, floodplains have historically been popular sites to establish settlements. Human activities tend to concentrate in floodplains for a number of reasons: water is readily available; land is fertile and suitable for farming; transportation by water is easily accessible; and land is flatter and easier to develop. But human activity in floodplains frequently interferes with the natural function of floodplains. It can affect the distribution and timing of drainage, thereby increasing flood problems. Human development can create local flooding problems by altering or confining drainage channels. This increases flood potential in two ways: it reduces the stream's capacity to contain flows, and it increases flow rates or velocities downstream during all stages of a flood event. Additionally, human development typically results in increases in impervious surfaces, such as paved roadways and roofs. These areas increase stormwater runoff and flood risk, especially when the stormwater is contributing to a system designed for a lower level of flooding. Human activities can interface effectively with a floodplain as long as steps are taken to mitigate the activities' adverse impacts on floodplain functions.

11.1.2 Measuring Floods and Floodplains

The magnitude of floods is commonly rated based on the probability in any given year of the river discharge (flow) level reached during the flood being equaled or exceeded. Flood studies use historical records to determine the probability of occurrence or flood frequency for different discharge levels. The flood frequency equals 100 divided by the probability of occurrence. For example, the flow level with a 1-percent chance of being equaled or exceeded in any given year is referred to as the 100-year flood. These measurements reflect statistical averages only; it is possible for two or more floods with a 100-year or higher flood frequency to occur in a short time period. The same flood can have different flood frequency at different points on a river.

The 1-percent annual chance (100-year) flood is sometimes referred to as the base flood. Many communities have maps that show the extent and likely depth of flooding for the base flood. The inundated area shown on such maps is called the special flood hazard area (SFHA). Its boundary is used as a regulatory boundary as part of the National Flood Insurance Program (NFIP).

11.2 HAZARD PROFILE

11.2.1 Characteristics of Flooding in Portland

Portland is subject to flooding from river overflow from the Columbia, Willamette, Tualatin and Sandy Rivers, smaller rivers and lesser waterways, as well as flooding from local stormwater drainage. The city is susceptible to winter rain flooding between October and April, while between May and July snowmelt and runoff can create floods. Typically, the most severe floods are winter rainfall floods from December to February, when heavy or prolonged rain or snowmelt creates water flows that exceed the carrying capacity of river channels or other water courses and storage facilities. As storms from the Pacific move across the Oregon Coast Range, air rises and cools and heavy rainfall develops over high-elevation streams—as much as 4 to 6 inches of rain over a 24-hour period. Severe and prolonged storms can raise rivers and streams to their flood stages for three to four days or longer (NHMP, 2010). Three types of flooding are typical: riverine floods, urban flooding, and flash floods.

Riverine Flooding

Riverine flooding along channels of rivers and streams due to high water is the most common form of flooding in Portland. Flooding in large river systems typically results from large-scale weather systems that generate prolonged rainfall over a wide geographic area, causing floods in hundreds of smaller streams that drain into major rivers. Terrain helps determine the dynamics of riverine flooding. In relatively flat areas, shallow, slow-moving floodwater may cover the land for days or even weeks (NHMP, 2010).

Human development changes hydrologic systems in a watershed. As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb and then slowly release rainfall. Water moves to the ground and into streams at a much faster rate in urban areas, as heavy rainfall collects and flows faster on impervious concrete and asphalt surfaces. These changes can result in floodwaters that rise very rapidly and peak with violent force. The resulting high water volume and turbidity (suspended sediments in the water) both contribute to the erosion of stream banks (NHMP, 2010).

Shallow area flooding is a special type of riverine flooding. FEMA defines shallow flood hazards as areas that are inundated only 1 to 3 feet deep by the 1-percent annual chance flood. These areas are generally flooded by low-velocity sheet flows of water (NHMP, 2010).

Urban Flooding

Urban flooding can occur when the amount of rainfall and runoff exceeds the capacity of a stormwater system, such as a creek, ditch or storm drain, to remove it. A majority of land in Portland is urbanized and has a high concentration of impervious surfaces that either collect water or concentrate flow in unnatural channels. During periods of urban flooding, streets can become swift moving rivers and basements can fill with water. Storm drains and catch basins can back up with vegetative debris and trash and cause additional, localized flooding (NHMP, 2010).

Numerous areas are currently subject to urban flooding, and the number of at-risk areas could increase without proper infrastructure to guide water overflow. The continued increase of impervious surfaces related to development significantly contributes to Portland's future flood risk as increased runoff exceeds the capabilities of drainage infrastructure (NHMP, 2010).

Flash Floods

In hilly areas, a flood can begin only minutes after a heavy rain. Such flash floods provide little or no notice and can move so fast that they are particularly dangerous to people and property in their path.

11.2.2 Past Events

Significant historic flooding occurred in the Willamette and Columbia River basins in 1861, 1880, 1881, 1909, 1913, 1927, 1928, 1942, 1946, 1948, 1961, 1964/65, 1996 and 2007. (NHMP, 2010). Table 11-1 summarizes flood events for which federal disaster declarations have been issued. The sections below provided narrative descriptions of the most significant historical Portland floods.

Table 11-1. Portland Flood Events for Which Federal Disaster Declarations Were Issued

Disaster Number	Declaration Date	Title
DR-4258	2/17/2016	Severe winter storms, straight-line winds, flooding, landslides, and mudslides
DR-1956	2/17/2011	Severe winter storm, flooding, mudslides, landslides
DR-1733	12/8/2007	Severe storms, flooding, landslides, and mudslides
DR-1632	3/20/2006	Severe storms, flooding, landslides, and mudslides
DR-1099	2/9/1996	High winds, severe storms and flooding
DR-413	1/25/1974	Severe storms, snowmelt & flooding
DR-319	1/21/1972	Severe storms & flooding
DR-184	12/24/1964	Heavy rains & flooding

May 1948

Vanport was a residential community at a site that is now occupied by the Portland International Raceway and the Heron Lakes Golf Club. In 1944, it lay between the Portland city limits and the Columbia River and was completely encircled with a levee system and embankments. Its ground elevation was several feet below the Columbia River's normal water level. The community was built to house ship workers employed at Henry Kaiser's shipyards during World War II, and peaked in population in 1944 when it had approximately 42,000 residents and nearly 10,000 housing units (Abott, 2016). By 1948, as the war came to a close, the population of Vanport had declined substantially but it was still home to many of Portland's low-income and minority communities. On Memorial Day 1948, a railroad embankment was breached, resulting in a catastrophic flood. The community of 18,500 was flooded with debris-laden water 10 to 20 feet deep. Most of the buildings were substantially damaged or destroyed, and at least 15 people lost their lives. Many others were never found but were not officially recorded as fatalities. Others were permanently displaced, as the city ceased to exist (NHMP, 2010).

December 1964

Nearly every river in Oregon exceeded its flood stage in December 1964 as weather stations recorded new records for precipitation. Known as the Christmas Flood, the event triggered debris flows, bridge failures and flooding that caused thousands to evacuate and closed airports, railways and hundreds of miles of roads across the state. Ultimately, the event caused more than $157 million in damage and 20 people were killed (NHMP, 2010).

February 1996

One of the more severe flood years on record occurred in 1996, when many rivers and creeks throughout the Willamette River watershed rose to 100-year flood levels due to a combination of warm temperatures, heavy snow pack and four consecutive days of record-breaking rain. The floods caused five deaths statewide, forced thousands of people into shelters, and destroyed hundreds of homes. Portland was forced to erect makeshift barriers to prevent floodwaters from moving into the downtown area. On February 9, 1996, the Willamette River crested just inches away from overtopping the barriers. The Columbia River crested at 11 feet 2 inches above flood stage, testing the strength of

levees that protect Portland International Airport and areas north of Columbia Boulevard. Johnson Creek crested at 6 feet 5 inches above flood stage (NHMP, 2010).

Winter 1996-97

In November 1996, a tropical air mass swept across Oregon, again bringing record-breaking precipitation. The stormy weather continued into December and early January as 26 major rivers reached flood stage. Snowmelt and intense rain caused extensive flooding that led to widespread landslides, erosion, power outages, damaged homes and businesses, closed roads and eventually resulted in a Presidential Disaster Declaration (NHMP, 2010).

December 2007

Severe storms, winds, mudslides, landslides and flooding occurred between December 1 and 17, 2007 shutting down roads and highways including Interstate 5. Public infrastructure, homes and personal property were damaged. In Oregon, 73,000 residents were without power. A major disaster was declared for the State of Oregon on December 8, 2007 (NHMP, 2010).

January 2009

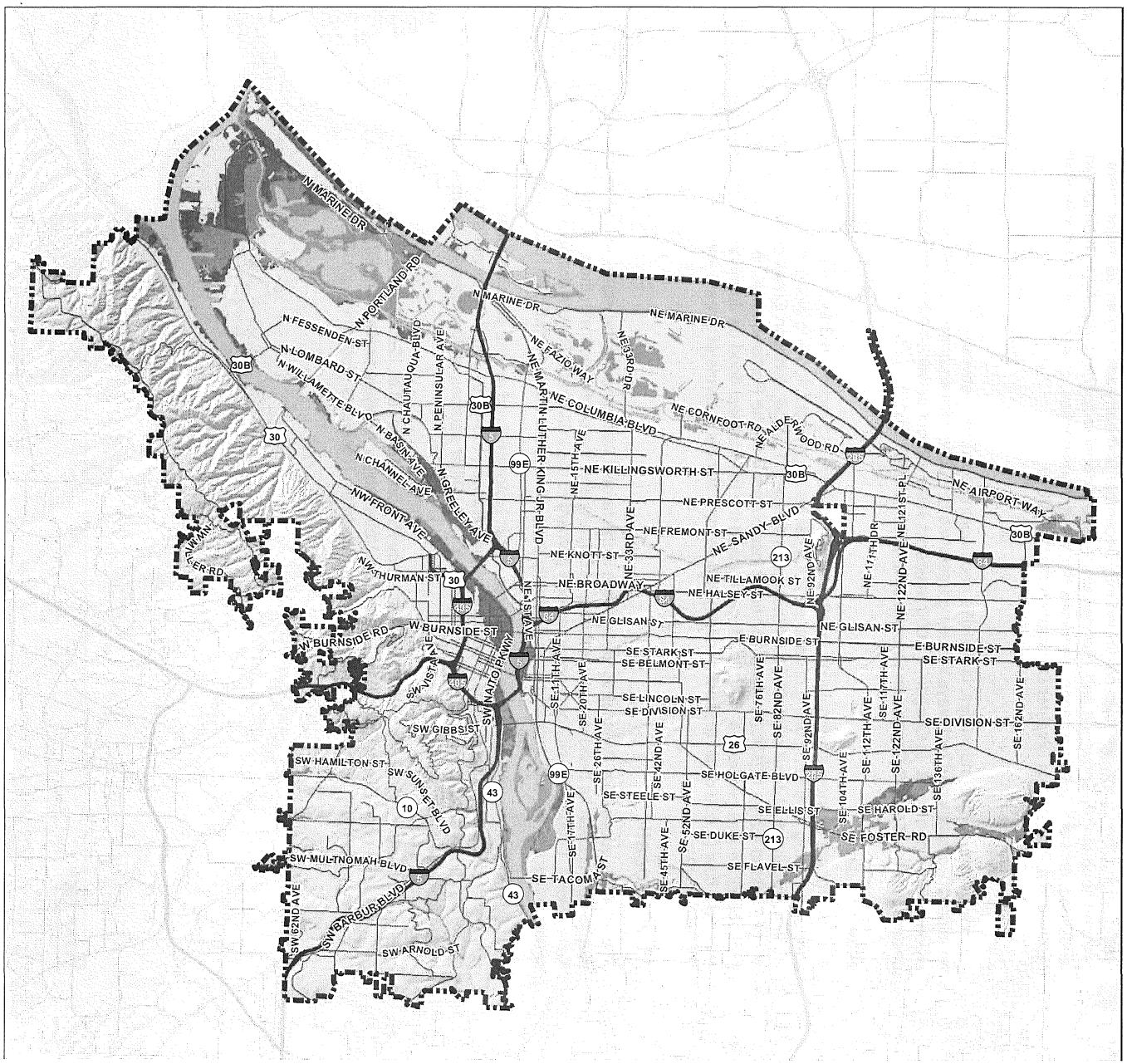
A great amount of snow accumulation in late December 2008 (15 inches to 3 foot drifts) and then a sudden warming at the beginning of January 2009 caused significant flooding along local streams. Portland received 24-hour rainfall of 3.04 inches on January 1, 2009. Johnson Creek crested at 3.7 feet above its flood stage. FEMA received 187 flood loss claims from the Portland area, six of which were from repetitive loss properties. This flood was ranked the third largest flood on Johnson Creek in terms of stream flow (2,430 cubic feet per second) and second highest in terms of stream level (14.69 feet) (NHMP, 2010).

11.2.3 Location

The 11,460-square-mile Willamette River Basin is the largest watershed in the state, with 13 major tributaries between its headwaters southeast of Eugene and the confluence with the Columbia River at Kelley Point. Though the city only occupies one percent of the Willamette River's drainage basin, its 17 square miles are the most urbanized and heavily used of all in the basin (NHMP, 2010).

FEMA Flood Insurance Rate Maps for the area depict historical flood extent, defining most of the flood-prone streams and delineating the 1-percent annual chance (100-year) and 0.2-percent annual chance (500-year) flood hazard areas, as shown in Figure 11-1. Other sources of flood location information can be found in the following:

- Lents Neighborhood Climate Resiliency Report (Berger et al., 2015)
- Johnson Creek Floodplain Residential Vulnerability Analysis (Judelman, 2015a)
- Summary Vulnerability of East Lents Floodplain Residents (Judelman, 2015b).



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Mitigation Action Plan (MAP)

Figure 11-1. Flood Hazard - 100-Year and 500-Year FEMA Flood Zone

Legend

- City Boundary
- 100-year FEMA flood zone
- 500-year FEMA flood zone
- Major Waterbodies

NORTH

0 0.75 1.5 Miles

Sources: FEMA-2014; City of Portland-2016

PBEM

11.2.4 Frequency

The following factors contribute to the frequency and severity of riverine flooding (NHMP, 2010):

- Rainfall intensity and duration
- Antecedent moisture conditions
- Watershed conditions, including steepness of terrain, soil types, amount and type of vegetation and density of development
- The existence of attenuating features in the watershed, including natural features such as wetlands and lakes and human-built features such as dams
- The existence of flood control features, such as levees and flood control channels
- Velocity of flow
- Tide heights and storm surge
- Availability of sediment for transport and the erodibility of the bed and banks of the watercourse.

These factors are evaluated using a hydrologic analysis to determine the probability that discharge of a certain size will occur and to determine the characteristics and depth of the flood resulting from that discharge. Portland typically experiences flooding after more than three days of heavy rainfall or when saturated conditions combine with significant rainfall or storms over short periods of time. Based on previous occurrences, it is probable that a flood has greater than a 33 percent likelihood of occurring in any given year (NHMP, 2010).

11.2.5 Severity

Nationwide, floods result in more deaths than any other natural hazard. Floods result in excessive expenditures for emergency response and generally disrupt the normal function of a community.

Typical flood damage can include the following (NHMP, 2010):

- Inundation of structures
- Erosion of stream banks, road embankments, foundations, footings for bridge piers and other features
- Impact damage from high-velocity flow and from debris
- Debris accumulation on bridge piers and in culverts, increasing loads on these features or causing overtopping or backwater damage
- Destruction of croplands
- Release or runoff of sewage and hazardous or toxic materials from damaged pipelines, tanks and facilities
- Economic loss (local facilities, utilities, communications, agriculture).

Problems related to flooding include sediment deposition and stream bank erosion. Deposition is the accumulation of soil, silt and other particles on a river bottom or delta. It leads to the destruction of fish habitat and presents a challenge for navigational purposes. It reduces channel capacity, resulting in increased flooding or bank erosion. Stream bank erosion is the removal of material from the stream bank. When bank erosion is excessive, it becomes a concern because it results in loss of streamside vegetation, loss of fish habitat and loss of land and property (NHMP, 2010). Erosion on a levee bank can also increase the risk of levee failure.

The principal factors affecting flood damage are flood depth and velocity. The deeper and faster flood flows become, the more damage they can cause. Shallow flooding with high velocities can cause as

much damage as deep flooding with slow velocity. Flood severity is often evaluated by examining peak discharges; Table 11-2 lists peak flows used by FEMA to map floodplains in Portland.

Table 11-2. Summary of Peak Discharges in Portland

Source/Location	Drainage Area (sq. mi.)	Discharge (cubic feet/second) 10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Johnson Creek[a]					
Downstream of confluence with Crystal Springs Creek	53	1,890	2,590	2,780	3,230
Upstream of confluence with Crystal Springs Creek	49	1,890	2,590	2,780	3,230
At 82nd Ave	46	1,830	2,660	2,970	3,640
At USGS Gauge 14-211500 (near RM 10.2	28	2,120	2,810	3,090	3,670
Fanno Creek					
At Beaverton-Hillsdale Highway	5.12	940	1,140	1,250	1,550
At extension of 65th Avenue	3.38	600	740	825	1,000
At extension of 59th Avenue	3.24	590	725	800	975
At Southwest 56th Avenue	2.53	470	620	670	800
At Southwest Shattuck Road	2.43	490	625	675	820
At Southwest 45th Avenue	1.71	350	460	490	590
Crystal Springs Creek[b]					
500 feet upstream of Southeast 28th Street	3.6	16	24	28	40
1,200 feet upstream of McLaughlin Street	n/a	22	70	92	169
Upstream of Railroad Bridge	n/a	44	100	126	212
Upstream of confluence with Johnson Creek	n/a	45	60	70	80

a. Decreasing discharge values caused by diversions to the Lents and Eastmoreland Golf Course areas
b. Decreasing discharge values caused by left overbank storage
n/a = data not available

11.2.6 Warning Time

Due to the sequential pattern of meteorological conditions needed to cause serious flooding, it is unusual for a flood to occur without warning. Warning times for floods can be between 24 and 48 hours. Flash flooding can be less predictable, but potential hazard areas can be warned in advanced of potential flash flooding danger.

The Portland Bureau of Emergency Management (PBEM) disseminates advisories relating to flooding. The Bureau of Environmental Services (BES) serves as technical expert to PBEM and other bureaus on local flooding and hydrology. Both PBEM and BES rely upon USGS real-time river gage data and the National Weather Service's (NWS) flood prediction service. Through this service, BES and other City staff receive severe weather and emergency email briefings in real-time. BES performs additional monitoring and analysis of USGS data and NWS predictions throughout the wet season (typically November 1 through March 31). Up to 10 BES staff each year are designated as emergency managers.

During periods of heavy precipitation or contiguous days of moderate precipitation, a subset of BES staff monitor real-time online USGS river gage data and NWS hydrograph predictions. USGS gages continuously collect discharge rates, water surface elevation, and temperature data and transmit that data every 15 minutes. Data is accessible online via USGS and NWS websites within an hour of collection. NWS predictive hydrologic models are run every 12 hours using the most current gage data and are also shared online. The following are the primary USGS gages monitored by the City of Portland:

- USGS 14144700, Columbia River, Vancouver, WA, under the I-5 Bridge
- USGS 14211820, Columbia Slough, Portland, OR, N Lombard St. & N Kelly Point Park Rd.
- USGS 14206900, Fanno Creek, Portland, OR, SW 56th & SW Seymour Ave.
- USGS 14211315, Tryon Creek, Portland, OR, G Ave. & Cumberland Pl.
- USGS 14211720, Willamette River, Portland, OR, under the Morrison Bridge
- USGS 14211550, Johnson Creek, Milwaukie, OR, SE Milport Rd. & SE McBrod Ave.
- USGS 14211500, Johnson Creek, in Portland, OR, SE 152nd Ave. & SE Foster Rd.
- USGS 14211499, Kelley Creek, Portland, OR, SE 159th Dr. & SE Foster Rd.
- USGS 14211400, Johnson Creek, Gresham, OR, SE Regner Rd. & SE Roberts Rd.

Portland's most frequent disruptive flooding occurs along Johnson Creek; as a result, much of the City's flood risk monitoring and response planning efforts are focused in this geographic area.

BES staff access hydrologic data multiple times per day once recorded water surface elevations are within 3 feet of bank-full levels and continue monitoring until the threat has passed. BES issues a Level 1 event advisory in Johnson Creek when the Sycamore Gage height reaches 10 feet (approximately 3 feet below bank-full). Coordinated monitoring intensifies at that point to include emergency conference calls, field checks of gages and river levels at locations most likely to flood, and interpretation of additional data. Technical staff review the hydrograph in depth and assess how quickly discharge rates are increasing at different points along the system; discuss predictions with NWS staff and request models be updated more frequently if conditions are rapidly evolving; review precipitation levels over preceding days; assess soil conditions (saturation, freezing levels, presence of snow, etc.) and likely impacts on river levels; compare current conditions against historic patterns and flood outcomes; and review flood inundation maps to ensure familiarity with modeled outcomes.

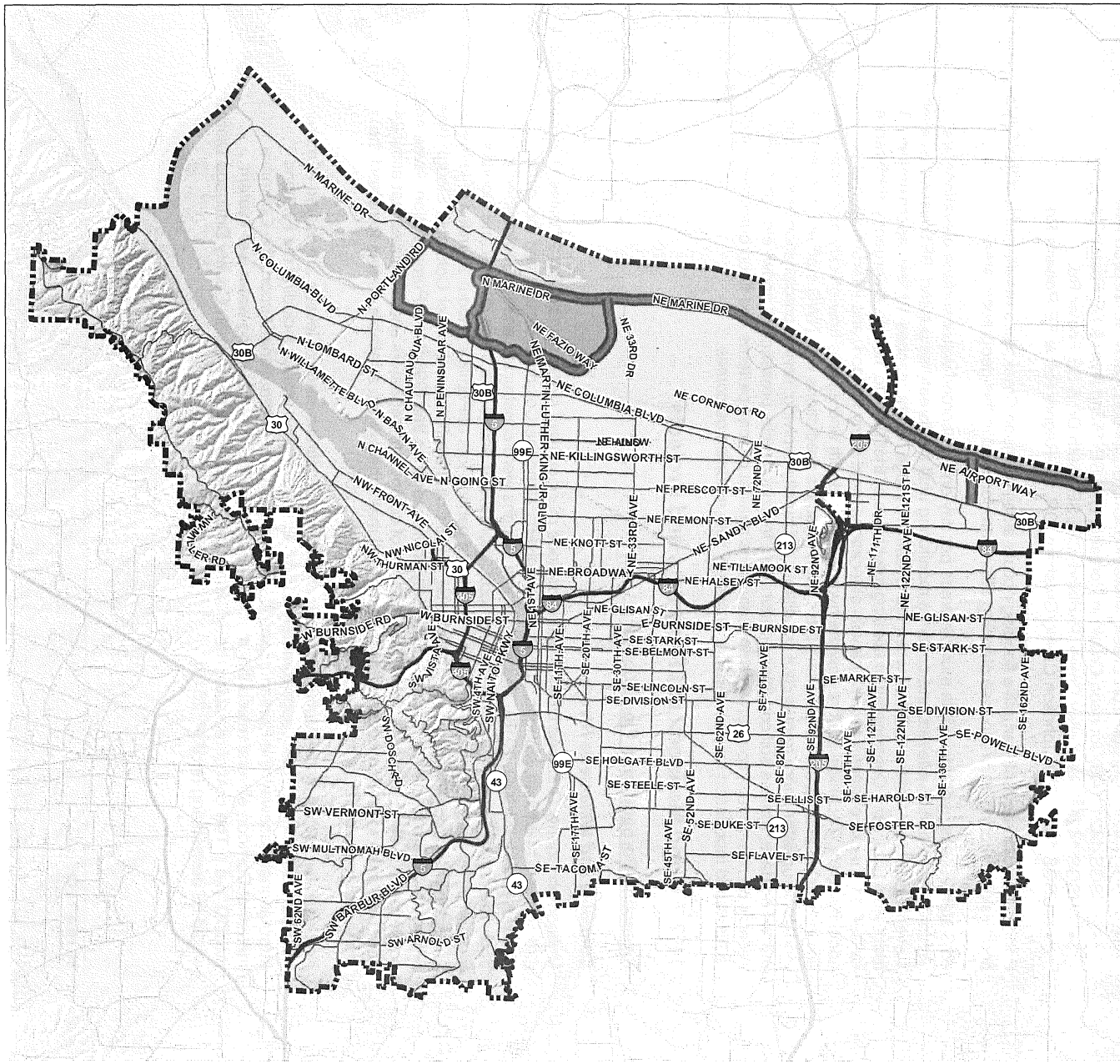
11.2.7 Flood Management Programs and Projects

Protecting Portland from Flood Losses

Columbia and Willamette Rivers

Multnomah County Drainage District maintains flood management systems including 27 miles of levees and 45 miles of ditches, sloughs, streams and culverts along the Columbia Slough and the lower Columbia River (MCDD, 2016). The ditches and sloughs were constructed and are maintained to accommodate a 1-percent annual chance flood. Stormwater enters into these ditches and sloughs through pipes that drain water from the streets and parking lots of Portland. About 20 miles of levees protect the city from flooding due to high water in the Columbia River and Lower Columbia Slough (see Figure 11-2). The system has been extensively improved since the 1996 flood. Pump station, levee and conveyance system upgrades, as well as a series of computers, repeaters and antennas that allow 24-hour real-time monitoring from remote locations, all make the system a reliable means to protect the managed floodplain from catastrophic flooding (NHMP, 2010).

Properties protected by the Multnomah County Drainage District system of levees are valued at more than $5.5 billion and protect approximately $16 billion in economic activity including the Portland International Raceway, the Portland Expo Center, the Portland International Airport, the Columbia Industrial Corridor, several residential neighborhoods, and the City's drinking water well system (MCDD, n.d.). The cost of replacing the infrastructure protected by Multnomah County Drainage District would be devastating (NHMP, 2010).



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Mitigation Action Plan (MAP)

Figure 11-2. Flood Management Levees

Legend

- City Boundary
- Flood Control Levees

District

- Multnomah County Drainage District
- Peninsula Drainage District #1
- Peninsula Drainage District #2

NORTH

0 0.75 1.5 Miles

Source: Multnomah County Drainage District

PBEM

Flood control storage reservoirs have substantially reduced flood potential along the Columbia River and other major waterways. Upstream of Multnomah County, the Columbia River has 22 major reservoirs and the Willamette River has 11. These reservoirs have reduced, but not eliminated flood potential (NHMP, 2010).

Johnson Creek

Public acquisition of homes and land in the Johnson Creek floodplain has significantly reduced the impacts of regular flooding. The area surrounding SE Foster Road flooded on average every other year until Portland invested over $40 million in floodplain restoration. Johnson Creek, which provides habitat to several native species of salmon, now floods approximately every 6 to 8 years.

Floodplain property purchases also contribute to the City's rating under the Community Rating System (CRS) program. Floodplain restoration projects along Johnson Creek have added over 240 acre-feet of flood storage to mitigate flood impacts. BES is currently developing a city-wide Stormwater System Plan that will complements the Johnson Creek Restoration Plan, which is focused on mitigating nuisance flooding. The Stormwater System Plan will identify a comprehensive set of actions focused on uplands, tributaries and drainage patterns to minimize the impacts of stormwater runoff on flooding. Implementation of such actions can help improve the City's CRS ranking with FEMA (NHMP, 2010).

Federal Flood Programs

National Flood Insurance Program

The National Flood Insurance Program (NFIP) makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. For most participating communities, FEMA has prepared a detailed Flood Insurance Study that presents water surface elevations for floods of various magnitudes, including the 1-percent annual chance flood and the 0.2-percent annual chance flood. Base flood elevations and the boundaries of the floodplains are shown on Flood Insurance Rate Maps (FIRMs), which are the principle tool for identifying the extent and location of the flood hazard. FIRMs are the most detailed and consistent data source available, and for many communities they represent the minimum area of oversight for the local floodplain management program.

Participants in the NFIP must, at a minimum, regulate development in floodplain areas in accordance with NFIP criteria. Before issuing a permit to build in a floodplain, participating jurisdictions must ensure that three criteria are met:

- New buildings and those undergoing substantial improvements must, at a minimum, be elevated to protect against damage by the 1-percent annual chance flood.
- New floodplain development must not worsen existing flood problems or damage to other properties.
- New floodplain development must exercise a reasonable and prudent effort to reduce its adverse impacts on threatened salmonid species.

Since the NFIP's inception, additional legislation has been enacted to strengthen the program, ensure its fiscal soundness and inform its mapping and insurance rate-setting through expert consultation, reports and studies. Most recently, the Biggert-Waters Flood Insurance Reform Act of 2012 (Public Law 141, Title II) and the Homeowner Flood Insurance Affordability Act of 2014 (Public Law 113-89) directed FEMA to make substantial changes to the NFIP by October 1, 2017. Administration, rating and application of key functional components of the NFIP could be directed by this legislation.

The Community Rating System

The CRS is a voluntary program within the NFIP that encourages floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions meeting the following three goals of the CRS:

- Reduce flood losses.
- Facilitate accurate insurance rating.
- Promote awareness of flood insurance.

For participating communities, flood insurance premium rates are discounted in increments of 5 percent. For example, a Class 1 community would receive a 45 percent premium discount, and a Class 9 community would receive a 5 percent discount. (Class 10 communities are those that do not participate in the CRS; they receive no discount.) The CRS classes for local communities are based on 18 creditable activities in the following categories:

- Public information
- Mapping and regulations
- Flood damage reduction
- Flood preparedness.

Figure 11-3 shows the nationwide number of CRS communities by class as of October 1, 2015, when there were 1,368 communities receiving flood insurance premium discounts under the CRS program. In Oregon there are 27 CRS communities (FEMA, 2016a). Although CRS communities represent only 6 percent of the over 22,000 communities participating in the NFIP, more than 70 percent of all flood insurance policies are written in CRS communities.

Source: FEMA, 2016a

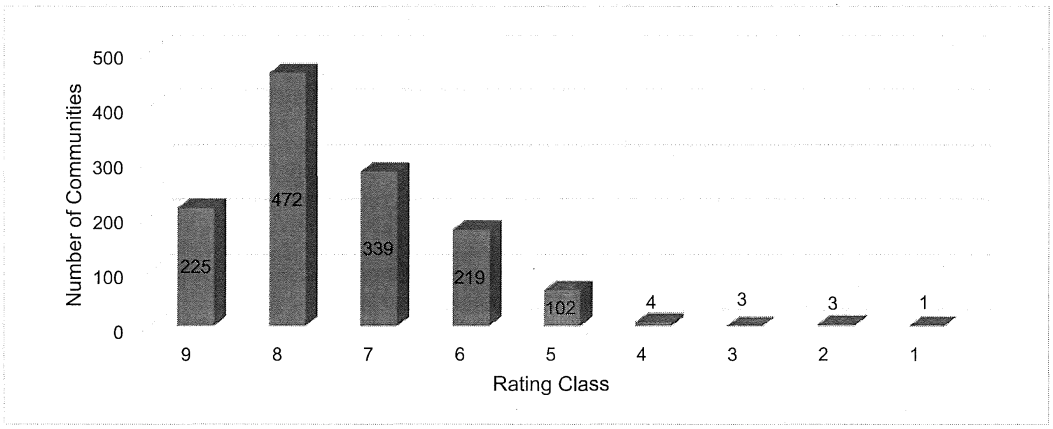

Figure 11-3. CRS Communities by Class Nationwide as of October 1, 2015

Portland Participation in NFIP and CRS

The City of Portland entered the NFIP on October 15, 1980. Currently, structures permitted or built in Portland before then are called "pre-FIRM" structures, and structures built afterwards are called "post-FIRM." However, the rating rules associated with this terminology may be subject to change due to

flood insurance reform discussed below. The insurance rate is different for the two types of structures. The effective date for the current FIRM is November 26, 2010. This map is a DFIRM (digital flood insurance rate map).

The City of Portland is currently in good standing with the provisions of the NFIP. Compliance is monitored by FEMA regional staff and by the Oregon Department of Land Conservation and Development (DLCD) under a contract with FEMA. Table 11-3 summarizes the City's current compliance with NFIP requirements. Maintaining compliance under the NFIP is an important component of flood risk reduction. The City of Portland has identified actions to maintain its compliance and good standing.

Table 11-3. National Flood Insurance Program Compliance

Criteria	Response
When did Portland enter the NFIP?	10/15/80
When did the current Flood Insurance Rate maps become effective?	11/26/10
What local department is responsible for floodplain management?	Bureau of Environmental Services
Who is the City's floodplain administrator? (department/position)	Bureau of Development Services
• **Is this a primary or auxiliary role?**	Primary
Are any certified floodplain managers on staff in Portland?	Yes
What is the date of adoption of the flood damage prevention ordinance?	Last amended in part on November 26, 2010
• **Does the floodplain management program meet or exceed minimum requirements?**	Yes
• **If so, in what ways?**	See CRS Classification status
When was the most recent Community Assistance Visit or Community Assistance Contact?	June 25, 2015
Does Portland have any outstanding NFIP compliance violations that need to be addressed?	No
Do the flood hazard maps adequately address the flood risk within the city?	No
• **If no, please state why.**	BES is constantly in the state of revision of the City's currently effective FIRM based on flood mitigation efforts being deployed by BES.
Does Portland's floodplain management staff need any assistance or training to support its floodplain management program?	Not at this time
• **If so, what type of assistance/training is needed?**	
Does Portland participate in the Community Rating System (CRS)?	Yes
• **Is Portland seeking to improve its CRS Classification?**	BES is always seeking ways to improve its CRS classification within the City's current capabilities and resources
• **How many Flood Insurance policies are in force in Portland?**	1,759
• **What is the insurance in force?**	$453,478,800 (04/30/2016)
• **What is the premium in force?**	$1,338,250 (04/30/2016
• **Average Premium**	$761 (04/30/2016)
• **% of Policies outside SFHA**	62.3% (04/0/2016)
• **How many total loss claims have been filed in Portland?**	224 (4/30/2016)
• **How many claims were closed without payment or are still open?**	70 (4/30/2016)
• **What were the total payments for losses?**	$2,829,285.23 (04/30/2016)
• **Average Claim Paid**	$12,868

The City of Portland is currently participating in the CRS program. Its CRS status is as follows:

- NFIP Community #—410183
- CRS Entry Date—10/1/2001
- Current CRS Classification—5
- % Premium Discount, SFHA/non-SFHA—25 percent/10 percent
- Total Annual Premium Savings—$234,329

Many of the mitigation actions identified in this plan are creditable activities under the CRS program. Therefore successful implementation of this plan offers the potential to enhance the CRS classification.

Natural Beneficial Functions

What Are Beneficial Floodplain Functions?

Flooding is a natural event, and floodplains provide many natural and beneficial functions. Riparian areas—the zones along the edge of a river or stream that are influenced by or are an influence upon the water body—generally have a greater diversity and structure of vegetation than upland areas. Shelter, space, food and water available in these areas determine the health of wildlife populations. Riparian communities are of special importance for many animals since water supply is a major limiting factor to the animals' population. Animals depend upon a supply of water for their existence.

CRS Credit for Protecting Natural Floodplain Functions

Wildlife and fisheries are impacted when plant communities are eliminated or fundamentally altered to reduce habitat. Human disturbance to riparian areas can limit wildlife's access to water, remove breeding or nesting sites, and eliminate suitable areas for rearing young. Changes in hydrologic conditions also can alter the plant community. FEMA's Community Rating System provides credits for adopting plans that protect one or more natural functions within a community's floodplain (Activity 510), such as the following (FEMA, 2013):

- A habitat conservation plan that explains and recommends actions to protect rare, threatened, or endangered aquatic or riparian species
- A habitat protection or restoration plan that identifies critical habitat within the floodplain, actions to protect remaining habitat, or actions to restore fully functioning habitat
- A green infrastructure plan that identifies open space corridors or connected networks of wetlands, woodlands, wildlife habitats, wilderness, and other areas that support native species, maintain natural ecological processes, or sustain air and water resources (the corridors or networks must include some floodplains)
- All or part of a comprehensive or other community plan that includes an inventory of the ecological attributes of a watershed or floodplain and recommends actions for protecting them through a mechanism such as a development regulation, development order, grant program, or capital improvement plan.

The credit requires that the following criteria be met:

- The plan may cover more than one community, but it must have an impact on natural floodplain functions within the community seeking credit.
- The plan must be adopted. If the plan is not a community plan adopted by the community's governing body, it must be adopted by an appropriate regional agency.

- The plan must be updated at least once every 10 years. The update must include a review of any changes to conditions as well as progress made since the original plan was prepared. Any changes to the adopted plan must be approved by the original adopting agency.
- The plan must include action items for protecting one or more identified species of interest and natural floodplain functions. The action items must describe who is responsible for implementing the action, how it will be funded, and when it will be done. General policy statements with no means of implementation are not considered action items.
- The plan must include a comprehensive inventory of the natural floodplain habitat within the community. It must identify areas that warrant protection or preservation in order to maintain fully functioning habitat for the species of interest. Where threatened or endangered species are present, each species must be addressed and a restoration plan must be included.
- A community can get credit for other plans that meet these credit criteria. These could be single-issue or single-species plans or plans that cover only one area of the community's floodplain.
- There is no credit under CRS Activity 510 for a plan that addresses water quality issues as a requirement for a permit under the National Pollution Discharge Elimination System (credit for such plans may be available under other CRS activities).

The following sections describe eight City of Portland documents that meet these requirements.

Balch Creek Watershed Protection Plan

The *Balch Creek Watershed Protection Plan* (Portland Bureau of Planning, 1991a), adopted by the City of Portland on February 8, 1991, protects the natural resources of the Balch Creek Watershed. The purpose for this plan was to identify and protect fish and wildlife habitat, ecologically and scientifically significant natural areas, open spaces, water bodies, wetlands and the functions and values of the watershed as a whole. This document is one of several natural resource plans completed by the City of Portland to comply with the State's Land Conservation and Development Commission (LCDC) Statewide Planning Goal 5, which requires all jurisdictions in Oregon to conserve open space and protect natural and scenic resources, using the following steps:

- Inventory—Identify, describe and evaluate the location, quality, and quantity of each natural resource within the City
- Analysis—Evaluate the economic, social, environmental and energy consequences of allowing, limiting and prohibiting uses that conflict with each identified resource
- Decision—Chose to protect or not to protect each identified resource.

The plan inventoried 15 sites, 13 of which were within the City of Portland. Resources identified within the watershed include: a full-year stream with associated floodplain, an isolated population of cutthroat trout and old conifer forest. The plan identifies protection and implementation measures for each of the 15 inventory areas. These protection and implementation measures are still being enforced today.

Columbia Corridor Industrial/Environmental Mapping Project

The Portland Bureau of Planning (now the Bureau of Planning and Sustainability) studied the Columbia River Corridor to make recommendations to the City of Portland Planning Commission for updating city Comprehensive Plan map designations and zones in the Columbia Corridor:

1. **Recommended Industrial and Annexation Rezoning for the Columbia Corridor (Portland Bureau of Planning, 1989a)**—This document contains the Planning Commission recommendations for converting old city industrial Comprehensive Plan map designations and

zones to new city industrial plan designations and zones and applying city plan designations and zones to certain annexed properties.

2. **Inventory and Analysis of Wetlands, Water Bodies and Wildlife Habitat Areas (Portland Bureau of Planning, 1989b)**—This document provides the inventory, analysis and proposal for protection of significant natural resources.
3. **Recommended Mapping for the Columbia Corridor (Portland Bureau of Planning, 1989c)**—This document provides detailed existing and recommended zoning for Phases 1 and 2. The zoning designations appear on the quarter section and full section Multnomah County Assessor's Maps.
4. **Appendix to the Inventory and Analysis of Wetlands, Waterbodies and Wildlife Habitat Areas (Portland Bureau of Planning, 1989d)**—This phase provided additional information that may be of benefit to more clearly understand the purpose and process of the natural resources portion of the project.

The findings and recommendations of this project are still valid and being implemented by the City.

East Buttes, Terraces and Wetlands Conservation Plan

The *East Buttes, Terraces and Wetlands Conservation Plan* (Portland Bureau of Planning, 1993) provides the inventory, analysis and recommendations for protection of significant East Portland natural, scenic, and open space resources. Portland is made up of 10 resource sites in East Portland: Mt. Tabor, Kelly Butte, Rocky Butte and seven additional upland sites. This plan complies with Statewide Planning Goal 5 and was adopted by the City on June 25, 1993. It identified four implementation measures that that are currently in effect:

- Amend the Portland Comprehensive Plan goals and policies to refer to the East Buttes, Terraces and Wetlands Conservation Plan.
- Adopt the East Buttes, Terraces and Wetlands Conservation Plan policies and objectives as the policy document for the area.
- Amend Title 33, Planning and Zoning to implement the conservation plan.
- Amend the official zoning maps to apply the "environmental zone" designation to identified resource areas, apply the open space (OS) zone to certain publicly owned lands and remove the Significant Environment Concern (SEC) zone from Rocky Butte.

Fanno Creek and Tributaries Conservation Plan

The *Fanno Creek and Tributaries Conservation Plan* (Portland Bureau of Planning, 1994a) provides the inventory, analysis and recommendations for protection of significant natural, scenic, and open space resources in the watershed of Fanno Creek and its tributaries. The planning effort identified the following objectives:

- Bring the City's comprehensive plan, zoning code and zoning maps into compliance with Oregon Statewide Planning Goal 5
- Reduce the threat to public health, safety and welfare from erosion, landslides, earthquakes and flooding
- Help the City comply with state and federal water quality regulations
- Facilitate development that maintains and enhances natural values provided by Fanno Creek and its tributaries.

The plan inventories and analyzes eight resource sites. Implementation measures were identified for each site. Each of these implementation measures are still in effect.

Johnson Creek Basin Protection Plan

The *Johnson Creek Basin Protection Plan* (Portland Bureau of Planning, 1991b) identifies, evaluates and protects significant fish and wildlife habitats, ecologically and scientifically significant natural areas, open spaces, water bodies, wetlands and the functions and values of the Johnson Creek basin as a whole. It adopts management recommendations on specific ways to retain and restore the natural habitat areas and values. The plan was designed to comply with Oregon Statewide Planning Goal 5. It identifies three natural resource protection measures that are still relevant and being implemented by the City:

- Limit housing density in areas that are difficult or hazardous to build on due to physical constraints such as floodways, steep slopes, floodplains or wetlands.
- Expand plan district requirements to include natural resource and neighborhood values.
- Protect or restore habitat within the resource area as an approval criterion for new development.

Northwest Hills Natural Areas Protection Plan

The *Northwest Hills Natural Areas Protection Plan* (Portland Bureau of Planning, 1991c) provides the inventory, analysis, and recommendations for protection of significant natural resources on the eastern slope of Portland's Northwest Hills. The study area covers 6,000 acres from NW St. Helens Road and the Willamette Greenway up to NW Skyline Boulevard, and from the Willamette Heights area to the Portland city limits near NW Newberry Road. This plan was written to comply with Statewide Planning Goal 5. It identified five implementation measures that that are currently in effect:

- Amend Portland's Comprehensive Plan goals and policies to refer to the protection plan.
- Adopt the protection plan policies and objectives as the policy document for the area.
- Amend Title 33, Planning and Zoning, and Title 34, Subdivisions and Partitioning Regulations, to implement the plan.
- Amend the Comprehensive Plan map designations and official zoning maps to apply the environmental zones, change base zones and correct open space mapping errors.
- Adopt an exception to Statewide Planning Goal 4, Forest Lands, to meet Federal Clean Water Act requirements and comply with Statewide Planning Goal 6, Air, Water and Land Resources Quality.

Skyline West Conservation Plan

The *Skyline West Conservation Plan* (Portland Bureau of Planning, 1994b) provides the inventory, analysis, and recommendations for protection of significant natural resources along the west slope of Tualatin Mountain ridge in northwest Portland. This plan was written to comply with Statewide Planning Goal 5. It inventories and analyzes three resource areas and identifies four implementation measures that that are currently in effect:

- Amend the Portland Comprehensive Plan goals and policies to refer to the conservation plan.
- Adoption of the conservation plan policies and objectives as the policy document for the area.
- Amend Title 33, Planning and Zoning, to implement the conservation plan.
- Amend the official zoning maps to apply the "environmental zone" designation to identified resource areas, apply the OS zone to certain public lands and remove the interim resource protection zone.

Southwest Hills Resource Protection Plan

The *Southwest Hills Resource Protection Plan* (Portland Bureau of Planning, 1992) provides the inventory, analysis and recommendations for protection of significant natural resources in southwest Portland. The study area covers 7,000 acres south of the Balch Creek basin and downtown Portland, including areas that drain directly into the Willamette River. This plan was written to comply with Statewide Planning Goal 5. The plan authorizes the following actions:

- Amend Portland's Comprehensive Plan goals and policies to refer to the protection plan.
- Adopt the protection plan policies and objectives as the policy document for the area.
- Amend Title 33, Planning and Zoning, to implement the protection plan.
- Amend the official zoning maps to apply the environmental zones to designated resources.
- Adopt a resolution directing the Bureau of Planning to study and prepare a recommendation on the concept of establishing a land bank for parks and natural areas acquisition.
- Repeal water features designations from the Southwest Hills Resource Protection Plan area.

Plan Integration

To ensure full integration of the above referenced natural beneficial functions plans, the City has identified mitigation actions that involve coordination of actions identified in the plans. There is a significant overlap in the goals and objectives of these plans, and coordinating their implementation will help ensure the success of all as well as the MAP. The maintenance strategy for the MAP will enhance the City's abilities to coordinate these plans. Each natural resource plan will be reviewed for its relevance to hazard mitigation and community resilience upon each future update to this plan.

11.3 COMPOUNDING FACTORS AND SECONDARY HAZARDS

11.3.1 Erosion

The most problematic secondary hazard for flooding is bank erosion, which in some cases can be more harmful than actual flooding. Riverine erosion results from the force of flowing water in and adjacent to river and creek channels. It affects the bed and banks of the channel and can alter or preclude any channel navigation or embankment development. During flood events, riverine erosion is magnified due to increased volume and velocity of the water flow. Flooding can generate high volume and velocity runoff that will concentrate in a river's lower drainages. When the stress applied by flood flows exceeds the resistance of the embankment material, erosion will occur. The erosion rate depends on the sediment supply and amount of runoff reaching the watercourse.

Erosion of any type rarely causes death or injury. However, erosion can cause significant destruction to property and infrastructure. Streams and rivers that are potentially threatened by erosion include the Columbia and Willamette Rivers; Johnson, Tryon and Fanno Creeks; and the Columbia Slough (NHMP, 2010).

11.3.2 Climate Change

Use of historical hydrologic data has long been the standard of practice for designing and operating water supply and flood protection projects. For example, historical data are used for flood forecasting models and to forecast snowmelt runoff for water supply. This method of forecasting assumes that the climate of the future will be similar to that of the period of historical record. However, the hydrologic record cannot be used to predict changes in frequency and severity of extreme climate events such as floods. Going forward, model calibration or statistical relation development must happen more

frequently, new forecast-based tools must be developed, and a standard of practice that explicitly considers climate change must be adopted. Climate change is already impacting water resources, and resource managers have observed the following:

- Historical hydrologic patterns can no longer be solely relied upon to forecast future conditions.
- Precipitation and runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management and ecosystem functions.
- Extreme climatic events will become more frequent, necessitating improvement in flood protection, drought preparedness and emergency response.

As hydrology changes, what is currently considered a 1-percent-annual-chance (100-year flood) may strike more often, leaving many communities at greater risk. Planners will need to factor a new level of safety into the design, operation, and regulation of flood protection facilities such as dams, bypass channels and levees, as well as the design of local sewers and storm drains.

According to the City of Portland and Multnomah County Climate Change Preparation Strategy (2014), floods in Portland are likely to increase, particularly in Portland's urbanized environment. These events will likely be the result of more intense rain events in mid-winter and will most likely take the form of urban nuisance flooding.

11.3.3 Other Secondary Hazards

Flooding is also responsible for hazards such as landslides when high flows over-saturate soils on steep slopes, causing them to fail. Hazardous materials spills and runoff are also a secondary hazard of flooding if storage tanks rupture and spill into streams, rivers or storm sewers.

11.4 EXPOSURE

The Level 2 (user-defined) Hazus-MH protocol was used to assess the risk and vulnerability to flooding in Portland. The model used census data at the block level and FEMA floodplain data, which has a level of accuracy acceptable for planning purposes. Where possible, the Hazus-MH default data was enhanced using local GIS data from county, state and federal sources.

11.4.1 Population

Population counts of those living in the floodplain in Portland were generated by estimating the percent of the total residential buildings in each risk reporting area within the 1-percent and 0.2-percent annual chance flood hazard areas and multiplying this percentage by the total population in the risk reporting area. Using this approach, it was estimated that the exposed population for the entire City is 9,590 persons within the 1-percent annual chance flood hazard area (1.6 percent of the total City population) and 18,333 within the 0.2-percent annual chance flood hazard area (3.0 percent of the total). Table 11-4 shows the population estimates by risk reporting area.

Table 11-5 and Table 11-6 show the estimated percent of the population believed to be residing in mapped floodplains for the social-vulnerability-related demographics of concern. Citywide there is a disproportionate number of elderly residents living in the 1-percent-annual-chance flood hazard area. Additionally, rental properties may make up a substantial portion of development in the 0.2-percent annual chance flood hazard area, particularly in the Airport, Central City, Central Northeast and Southwest.

Table 11-4. Population within Flood Hazard Areas[a]

Risk Reporting Area	1% Annual Chance Flood Hazard Area		0.2% Annual Chance Flood Hazard Area	
	Population Exposed[b]	% of Total Population	Population Exposed[a]	% of Total Population
Airport	2,528	94.6%	2,528	94.6%
Central City	798	2.1%	7,402	19.5%
East Portland	3,048	2.0%	4,893	3.3%
North Portland	2,310	3.4%	2,396	3.5%
Northeast	27	0.1%	27	0.1%
Northeast	0	0.0%	0	0.0%
Southeast	501	0.3%	529	0.3%
Southwest	378	0.5%	558	0.8%
West/Northwest	0	0.0%	0	0.0%
Total	**9,590**	**1.6%**	**18,333**	**3.0%**

a. Exposure estimates are not available for the 10-percent annual flood hazard.
b. Represents the percent of residential buildings that are exposed multiplied by the estimated 2010-2014 American Community Survey 5-year estimates.

Table 11-5. Distribution of Social Vulnerability Indicators in 1% Annual Chance Flood Hazard Area

Reporting Area	Population Residing in 1% Annual Chance Flood Hazard Areas *a, b, c, d*					
	Percent Under 15 Years	Percent Over 65 Years	Percent of People of Color	Percent of Renter occupied Housing	Percent of Families Below Poverty Level	Percent of Limited English Speaking Households
Airport	5.4%	5.1%	31.8%	68.8%	19.8%	20.6%
Central City	2.9%	9.7%	13.4%	79.4%	10.5%	0.7%
Central Northeast	5.4%	5.1%	31.8%	68.8%	19.8%	20.6%
East Portland	17.0%	14.0%	22.1%	26.9%	9.4%	4.1%
North Portland	12.2%	21.1%	23.0%	20.3%	7.2%	3.2%
Northeast	—	—	—	—	—	—
Southeast	10.7%	16.6%	8.1%	41.4%	2.3%	3.1%
Southwest	9.8%	17.2%	17.2%	60.1%	8.2%	1.3%
West/Northwest	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total	**13.7%**	**14.8%**	**21.9%**	**33.2%**	**8.8%**	**3.8%**

a. Values based on an analysis of 2010-2014 American Community Survey 5-year estimates at the Census block group level.
b. Values calculated using block group statistics weighted by the number of residential structures in the hazard area as a percentage of the total residential structures in the block group.
c. Values in red indicate percentages are at least 2 percent greater than the Citywide average (see Section 4.7).
d. Persons with disabilities not shown because the available data, at a census tract scale, is not conducive to analysis by hazard extent and location.

Table 11-6. Distribution of Social Vulnerability Indicators in 0.2% Annual Chance Flood Hazard Area

Reporting Area	Population Residing in 0.2% Annual Chance Flood Hazard Areas [a, b, c, d]					
	Percent Under 15 Years	Percent Over 65 Years	Percent of People of Color	Percent of Renter occupied Housing	Percent of Families Below Poverty Level	Percent of Limited English Speaking Households
Airport	5.4%	5.1%	31.8%	68.8%	19.8%	20.6%
Central City	1.5%	9.3%	13.5%	77.2%	10.1%	1.3%
Central Northeast	5.4%	5.1%	31.8%	68.8%	19.8%	20.6%
East Portland	18.6%	13.1%	22.9%	30.3%	11.7%	5.1%
North Portland	12.2%	21.1%	22.8%	20.1%	7.2%	3.2%
Northeast	—	—	—	—	—	—
Southeast	11.2%	16.2%	8.3%	41.5%	2.2%	3.3%
Southwest	8.7%	17.6%	16.3%	59.2%	6.1%	1.5%
West/Northwest	—	—	—	—	—	—
Total	**11.4%**	**13.0%**	**19.8%**	**51.2%**	**10.2%**	**3.2%**

a. Values based on an analysis of 2010-2014 American Community Survey 5-year estimates at the Census block group level.
b. Values calculated using block group statistics weighted by the number of residential structures in the hazard area as a percentage of the total residential structures in the block group.
c. Values in red indicate percentages are at least 2 percent greater than the Citywide average (see Section 4.7).
d. Persons with disabilities not shown because the available data, at a census tract scale, is not conducive to analysis by hazard extent and location.

11.4.2 Property

Structures in the Floodplain

Some land uses, such as single-family homes, are more vulnerable to flooding than others, such as agricultural land or parks. Table 11-7 and Table 11-8 summarize the total area and number of structures in the floodplain by risk reporting area and by structure type. Structure types were based on land use descriptions in Multnomah County assessor data. There are 2,925 structures within the 1-percent annual chance flood hazard area and 4,356 structures within the 0.2-percent annual chance flood hazard area. In the 1-percent annual chance flood hazard area, about 74 percent of these structures are in North Portland or East Portland (43 and 31 percent, respectively). Seventy-four percent (2,153) of the structures in the 1-percent annual chance flood hazard area are residential.

Table 11-7. Area and Number of Structures in the 1% Annual Chance Flood Hazard Area

Reporting Area	Area in Floodplain (acres)	Number of Structures in 1% Annual Chance Flood Hazard Area[a]							
		Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Airport	2,103.04	243	9	12	0	0	1	0	**265**
Central City	558.29	18	22	7	0	0	3	0	**50**
Central Northeast	432.37	9	30	19	0	0	3	0	**61**
East Portland	1,245.73	849	58	7	0	1	1	0	**916**
North Portland	5,243.72	749	183	135	0	173	4	0	**1,244**
Northeast	0.00	0	0	0	0	0	0	0	**0**
Southeast	978.04	165	51	7	0	0	0	0	**223**
Southwest	307.14	120	9	0	0	0	0	0	**129**
West/Northwest	914.42	0	5	32	0	0	0	0	**37**
Total	**11,782.76**	**2,153**	**367**	**219**	**0**	**174**	**12**	**0**	**2,925**

a. Values based on City of Portland building inventory data received October 2015.

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Table 11-8. Area and Number of Structures in the 0.2% Annual Chance Flood Hazard Area

Reporting Area	Area in Floodplain (acres)	Number of Structures in 0.2% Annual Chance Flood Hazard Area[a]							
		Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Airport	2,110.36	243	9	12	0	0	1	0	**265**
Central City	1,086.13	167	361	20	0	4	21	0	**573**
Central Northeast	438.34	9	30	19	0	0	3	0	**61**
East Portland	1,440.74	1,363	79	11	0	2	1	0	**1,456**
North Portland	7,016.02	777	349	253	0	173	15	0	**1,567**
Northeast	0.00	0	0	0	0	0	0	0	**0**
Southeast	1,056.23	174	53	7	0	0	0	0	**234**
Southwest	342.80	177	15	0	0	0	0	0	**192**
West/Northwest	1,167.48	0	29	158	0	0	1	0	**188**
Total	**14,658.10**	**2,910**	**925**	**480**	**0**	**179**	**42**	**0**	**4,536**

a. Values based on City of Portland building inventory data received October 2015.

Exposed Value

Table 11-9 and Table 11-10 summarize the estimated value of exposed buildings in Portland. This methodology estimated $6.7 billion worth of building-and-contents exposed to the 1-percent annual chance flood, representing 4.0 percent of the total replacement value of Portland, and $19.1 billion worth of building-and-contents exposed to the 0.2-percent annual chance flood, representing 11.2 percent of the total.

11.4.3 Critical Facilities and Infrastructure

Critical facilities and infrastructure in the floodplain are summarized in Table 11-11 through Table 11-14. Details are provided in the following sections. In addition linear features exposed to the flood hazard are shown in Table 11-15.

Table 11-9. Value of Structures in the 1% Annual Chance Flood Hazard Area

Reporting Area	Number of Buildings Exposed	Value Exposed			Exposed Value as % of Total Replacement Value
		Structure	Contents	Total	
Airport	265	$64,994,573	$36,784,946	$101,779,519	2.6%
Central City	50	$912,058,805	$622,430,862	$1,534,489,668	4.9%
Central Northeast	61	$142,697,040	$175,617,039	$318,314,079	2.9%
East Portland	916	$232,653,839	$145,518,166	$378,172,005	1.5%
North Portland	1,244	$1,670,002,621	$1,764,793,553	$3,434,796,173	14.6%
Northeast	0	$0	$0	$0	0.0%
Southeast	223	$320,045,992	$298,404,036	$618,450,028	2.0%
Southwest	129	$131,344,332	$79,503,463	$210,847,795	1.2%
West/Northwest	37	$77,139,870	$97,631,271	$174,771,142	1.3%
Total	**2,925**	**$3,550,937,073**	**$3,220,683,336**	**$6,771,620,408**	**4.0%**

Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

Table 11-10. Value of Structures in the 0.2% Annual Chance Flood Hazard Area

Reporting Area	Number of Buildings Exposed	Value Exposed			Exposed Value as % of Total Replacement Value
		Structure	Contents	Total	
Airport	265	$64,994,573	$36,784,946	$101,779,519	2.6%
Central City	573	$4,791,643,258	$3,644,727,618	$8,436,370,876	27.0%
Central Northeast	61	$142,697,040	$175,617,039	$318,314,079	2.9%
East Portland	1,456	$369,849,396	$229,502,548	$599,351,944	2.3%
North Portland	1,567	$3,382,875,378	$3,720,243,232	$7,103,118,610	30.2%
Northeast	0	$0	$0	$0	0.0%
Southeast	234	$346,489,138	$311,944,416	$658,433,553	2.2%
Southwest	192	$197,471,492	$128,636,188	$326,107,680	1.8%
West/Northwest	188	$707,179,543	$911,495,837	$1,618,675,381	11.6%
Total	**4,536**	**$10,003,199,819**	**$9,158,951,823**	**$19,162,151,642**	**11.2%**

Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

Table 11-11. Critical Facilities in the 1% Annual Chance Flood Hazard Area

Reporting Area	Number of Critical Facilities in the 1% Annual Chance Flood Hazard Area[a]				
	Emergency Services	High Potential Loss Facilities	Schools	Other Assets	Total
Airport	0	0	0	0	**0**
Central City	2	0	0	0	**2**
Central Northeast	0	2	0	0	**2**
East Portland	0	2	0	0	**2**
North Portland	0	8	0	0	**8**
Northeast	0	0	0	0	**0**
Southeast	0	2	0	0	**2**
Southwest	0	0	0	0	**0**
West/Northwest	1	0	0	0	**1**
Total	**3**	**14**	**0**	**0**	**17**

a. See Table 6-1 for a description of the facilities included in each category.

Table 11-12. Critical Facilities in the 0.2% Annual Chance Flood Hazard Area

Reporting Area	Number of Critical Facilities in the 0.2% Annual Chance Flood Hazard Area[a]				
	Emergency Services	High Potential Loss Facilities	Schools	Other Assets	Total
Airport	0	0	0	0	**0**
Central City	7	3	4	1	**15**
Central Northeast	0	2	0	0	**2**
East Portland	0	2	0	2	**4**
North Portland	0	22	0	0	**22**
Northeast	0	0	0	0	**0**
Southeast	0	2	0	0	**2**
Southwest	0	0	0	0	**0**
West/Northwest	2	0	0	0	**2**
Total	**9**	**31**	**4**	**3**	**47**

a. See Table 6-1 for a description of the facilities included in each category.

Table 11-13. Critical Infrastructure in the 1% Annual Chance Flood Hazard Area

Reporting Area	Number of Critical Infrastructure Facilities in the 1% Annual Chance Flood Hazard Area[a]					
		Utility Systems				
	Transportation Systems	Communications	Power	Potable Water	Wastewater	Total
Airport	1	0	0	0	0	**1**
Central City	12	0	0	0	0	**12**
Central Northeast	0	0	0	0	4	**4**
East Portland	1	1	1	1	1	**5**
North Portland	9	2	0	1	16	**28**
Northeast	0	0	0	0	0	**0**
Southeast	2	0	0	0	1	**3**
Southwest	0	0	0	0	2	**2**
West/Northwest	0	0	8	0	0	**8**
Total	**25**	**3**	**9**	**2**	**24**	**63**

a. See Table 6-1 for a description of the facilities included in each category.

Table 11-14. Critical Infrastructure in the 0.2% Annual Chance Flood Hazard Area

Reporting Area	Number of Critical Infrastructure Facilities in the 0.2% Annual Chance Flood Hazard Area[a]					
		Utility Systems				
	Transportation Systems	Communications	Power	Potable Water	Wastewater	Total
Airport	1	0	0	0	0	**1**
Central City	18	0	4	0	6	**28**
Central Northeast	0	0	0	0	4	**4**
East Portland	1	1	1	1	2	**6**
North Portland	10	2	3	1	24	**40**
Northeast	0	0	0	0	0	**0**
Southeast	2	0	0	0	1	**3**
Southwest	0	0	0	0	3	**3**
West/Northwest	1	0	52	0	0	**53**
Total	**33**	**3**	**60**	**2**	**40**	**138**

a. See Table 6-1 for a description of the facilities included in each category.

Table 11-15. Linear Critical Facilities in Flood Hazard Areas

	Facilities in Flood Hazard Areas	
	1% Annual Chance Flood Hazard Area	0.2% Annual Chance Flood Hazard Area
Utility Systems		
Power Lines	36.62 miles, 7.7% of citywide total	59.49 miles, 12.5% of citywide total
Gas Lines	1.99 miles, 2.4% of citywide total	10.87 miles, 13.0% of citywide total
Transportation Systems		
Railroads	26.43 miles, 7.0% of citywide total	100.92 miles, 26.9% of citywide total
Light Rail	2.10 miles, 4.0% of citywide total	6.31 miles, 12.0% of citywide total

Hazardous Material Facilities

Hazardous material facilities use or store materials that can harm the environment if damaged by a flood. One facility in the 10-percent annual chance flood hazard area, nine facilities in the 1-percent annual chance flood hazard area flood hazard area and 26 facilities in the 0.2-percent annual chance flood hazard area report having hazardous materials according to the Oregon State Fire Marshal. During a flood event, containers holding these materials can rupture and leak into the surrounding area, having a disastrous effect on the environment as well as residents.

Utilities and Infrastructure

Flood damage to infrastructure presents numerous risks. Roads or railroads that are blocked or damaged can isolate residents and can prevent access throughout the city, including for emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by floods or debris also can cause isolation. Floodwaters can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flood events, also causing localized urban flooding. Floodwaters can get into drinking water supplies, causing contamination. Sewer systems can be backed up, causing waste to spill into homes, neighborhoods, rivers and streams. Underground utilities can also be damaged. Dikes and levees can fail or be overtopped, inundating the land that they protect. The following sections describe impacts and exposure to these types of infrastructure.

Roads

The following major roads in Portland pass through the 1-percent annual chance flood hazard area flood hazard area and thus are exposed to flooding. Main highways that intersect the flood zone are all elevated above flood levels although it is possible that scour or debris carried by a flood could damage the support apparatus for elevated structures:

- N Marine Drive
- NE Marine Drive
- SE Foster Road
- SE Holgate Boulevard
- SE Johnson Creek Boulevard
- SE McLoughlin Boulevard
- SE 111th Ave.
- SE 122nd Ave.
- SE Harold St.
- SW Moody Ave.
- SW Shattuck Rd

Some of these roads are built above the flood level, and others function as levees to prevent flooding. Still, in severe flood events these roads can be blocked or damaged, preventing access to some areas.

Bridges

Flooding events can significantly impact road bridges. These are important because often they provide the only ingress and egress to some neighborhoods. An analysis showed that there are three light rail bridges, and four highway bridges that are in or cross over the 10-percent annual chance flood hazard area, three light rail bridges, and seven highway bridges in the 1-percent annual chance flood hazard area, and five light rail bridges and seven highway bridges in the 0.2-percent annual chance flood hazard area.

Rail Lines

Rail-based transportation systems can be negatively impacted by flood events. If rails are covered by flood waters trains may need to significantly slow their speed in order to pass or may not be able to pass at all. Flood waters can scour and undermine support systems and block lines with debris.

When a railroad embankment serves as a flood barrier during high water events, the risk of embankment failure is higher because the embankment was not engineered as a levee. In Portland, the railroad embankment that breached in 1948 would still serve as a flood barrier for Peninsula Drainage District #1, where Portland International Raceway and Blue Heron golf course are. This railroad embankment will be considered through Levee Ready Columbia.

Water and Sewer Infrastructure

Water and sewer systems can be affected by flooding. Floodwaters can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flood events, also causing localized urban flooding. Floodwaters can get into drinking water supplies, causing contamination. Sewer systems can be backed up, causing wastewater to spill into homes, neighborhoods, rivers and streams.

11.4.4 Environment

Flooding is a natural event, and floodplains provide many natural and beneficial functions. Nonetheless, flooding can impact the environment in negative ways. Migrating fish can wash into roads or over dikes into flooded fields, with no possibility of escape. Pollution from roads, such as oil, and hazardous materials can wash into rivers and streams. During floods, these can settle onto normally dry soils, polluting them for agricultural uses. During future rain or flood events, these contaminants can be re-mobilized into streams and rivers. Human development such as bridge abutments and levees, and logjams from timber harvesting can increase stream bank erosion, causing rivers and streams to migrate into non-natural courses.

Many species of mammals, birds, reptiles, amphibians and fish live in plant communities that are dependent upon streams, wetlands and floodplains. Changes in hydrologic conditions can result in a change in the plant community. Wildlife and fish are impacted when plant communities are eliminated or fundamentally altered to reduce habitat. Wildlife populations are limited by shelter, space, food, and water. Since water supply is a major limiting factor for many animals, riparian communities are of special importance.

Riparian areas are the zones along the edge of a river or stream that are influenced by or are an influence upon the water body. Human disturbance to riparian areas can limit wildlife's access to water, remove breeding or nesting sites, and eliminate suitable areas for rearing young. Wildlife rely on riparian areas and are associated with the flood hazard in the following ways:

- Mammals depend upon a supply of water for their existence. Riparian communities have a greater diversity and structure of vegetation than other upland areas. Beavers and muskrats are now recolonizing streams, wetlands and fallow farm fields, which are converted wetlands. As residences are built in rural areas, there is an increasing concern with beaver dams causing flooding of low-lying areas and abandoned farm ditches being filled in, which can lead to localized flooding.
- A great number of birds are associated with riparian areas. They swim, dive, feed along the shoreline, or snatch food from above. Rivers, lakes and wetlands are important feeding and resting areas for migratory and resident waterfowl. Other threatened or endangered species (such as the bald eagle or the peregrine falcon) eat prey from these riparian areas.
- Amphibians and reptiles are some of the least common forms of wildlife in riparian areas. However, some state threatened species, such as the western pond turtle and the spotted frog, are known to inhabit the waterways and wetlands.
- Fish habitat throughout Portland varies widely based on natural conditions and human influence. Many ditches were dug throughout the City to make low, wet ground better for

farming. As the water drained away and the wetlands were converted to farm fields, natural stream conditions were altered. Agriculture along many rivers extends to the water's edge and smaller side channels have been tilled to drain better. Within developing areas, small streams were placed in pipes and wetland was filled in to support urban development. While salmonids prefer clear, free-flowing streams, other species like the Olympic mud-minnow inhabit the calm, backwater areas of sloughs and wetlands.

11.5 VULNERABILITY

Many areas exposed to flooding may not actually experience serious flooding or flood damage. This section describes vulnerabilities in terms of population, property, infrastructure and environment.

11.5.1 Population

Generally, there is substantial warning time for flood events in Portland. Populations who may not understand or have access to available flood warning systems may be more vulnerable. In particular, many homeless people in Portland camp along floodplain areas, including along the Springwater Corridor Trail, which runs along Johnson Creek. These groups tend not to have access to technology and are unable to receive electronic evacuation notifications. Additionally, those who have difficulty evacuating, including the elderly and those with access and functional needs, may be more vulnerable if warning time is limited. Persons with limited incomes residing in the floodplain may not have flood insurance and may be more vulnerable to severe economic consequences in the event of a flood. The costs to evacuate during a flood event are also likely to disproportionately impact people with limited incomes. Persons driving or otherwise trying to cross flooded roadways are particularly at risk of physical harm.

Displaced Households and Persons Requiring Short Term Shelter

Impacts on persons and households in Portland were estimated for the 10-percent, 1-percent and 0.2-percent annual chance floods through the Level 2 Hazus-MH analysis. Table 11-16 summarizes the results.

Table 11-16. Estimated Flood Impact on Persons and Households

	Number of Displaced Persons[a]			Number of Persons Requiring Short-Term Shelter[a]		
Reporting Area	10% Annual Chance	1% Annual Chance	0.2% Annual Chance	10% Annual Chance	1% Annual Chance	0.2% Annual Chance
Airport	47	2,425	2,425	37	1,909	1,909
Central City	774	214	6,196	696	193	6,005
Central Northeast	4	6	6	0	3	3
East Portland	1,069	821	1,722	847	645	1,489
North Portland	1,461	848	1,118	1,372	781	1,037
Northeast	0	0	0	0	0	0
Southeast	459	139	168	343	109	133
Southwest	237	46	74	163	25	46
West/Northwest	1	0	0	0	0	0
Total	**4,052**	**4,499**	**11,709**	**3,458**	**3,664**	**10,622**

a. Calculated using a Census block level, general building stock analysis in Hazus, adjusted to reflect the estimated population.

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Public Health and Safety

Floods and their aftermath present numerous threats to public health and safety:

- **Unsafe food—**Floodwaters contain disease-causing bacteria, dirt, oil, human and animal waste, and farm and industrial chemicals. Their contact with food items, including food crops in agricultural lands, can make that food unsafe to eat. Refrigerated and frozen foods are affected during power outages caused by flooding. Foods in cardboard, plastic bags, jars, bottles, and paper packaging may be unhygienic with mold contamination.
- **Contaminated drinking and washing water and poor sanitation—**Flooding impairs clean water sources with pollutants. The pollutants also saturate into the groundwater. Flooded wastewater treatment plants can be overloaded, resulting in backflows of raw sewage. Private wells can be contaminated by floodwaters. Private sewage disposal systems can become a cause of infection if they or overflow.
- **Mosquitoes and animals—**Floods provide new breeding grounds for mosquitoes in wet areas and stagnant pools. The public should dispose of dead animals that can carry viruses and diseases only in accordance with guidelines issued by local animal control authorities. Leptospirosis—a bacterial disease associated predominantly with rats—often accompanies floods in developing countries, although the risk is low in industrialized regions unless cuts or wounds have direct contact with disease-contaminated floodwaters or animals.
- **Mold and mildew—**Excessive exposure to mold and mildew can cause flood victims—especially those with allergies and asthma—to contract upper respiratory diseases, triggering cold-like symptoms. Molds grow in as short a period as 24 to 48 hours in wet and damp areas of buildings and homes that have not been cleaned after flooding, such as water-infiltrated walls, floors, carpets, toilets and bathrooms. Very small mold spores can be easily inhaled by human bodies and, in large enough quantities, cause allergic reactions, asthma episodes, and other respiratory problems. Infants, children, elderly people and pregnant women are considered most vulnerable to mold-induced health problems.
- **Carbon monoxide poisoning—**In the event of power outages following floods, some people use alternative fuels for heating or cooking in enclosed or partly enclosed spaces, such as small gasoline engines, stoves, generators, lanterns, gas ranges, charcoal or wood. Built-up carbon monoxide from these sources can poison people and animals.
- **Hazards when reentering and cleaning flooded homes and buildings—**Flooded buildings can pose significant health hazards to people entering them. Electrical power systems can become hazardous. Gas leaks can trigger fire and explosion. Flood debris—such as broken bottles, wood, stones and walls—may cause injuries to those cleaning damaged buildings. Containers of hazardous chemicals may be buried under flood debris. Hazardous dust and mold can circulate through a building and be inhaled by those engaged in cleanup and restoration.
- **Mental stress and fatigue—**People who live through a devastating flood can experience long-term psychological impact. The expense and effort required to repair flood-damaged homes places severe financial and psychological burdens on the people affected. Post-flood recovery can cause, anxiety, anger, depression, lethargy, hyperactivity, and sleeplessness. There is also a long-term concern among the affected that their homes can be flooded again in the future.

Current loss estimation models such as Hazus are not equipped to measure public health impacts such as these. The best level of mitigation for these impacts is to be aware that they can occur, educate the public on prevention, and be prepared to deal with them in responding to flood events.

11.5.2 Property

Hazus-MH calculates losses to structures from flooding by looking at depth of flooding and type of structure. Using historical flood insurance claim data, Hazus-MH estimates the percentage of damage to structures and their contents by applying established damage functions to an inventory. For this analysis, local data on facilities was used instead of the default inventory data provided with Hazus-MH.

Building Age

Table 11-17 summarizes the age of buildings in the city relative to the initial FIRM date and the enactment of freeboard requirements.

Table 11-17. Pre-FIRM Buildings and Pre-Freeboard Requirement Buildings in 1% Annual Chance Flood Zone

	Pre-FIRM Buildings in Flood Zone[a]		Pre-Freeboard Buildings in Flood Zone[a]	
Reporting Area	Number	% of Total	Number	% of Total
Airport	257	96.6%	260	97.7%
Central City	7	35.0%	13	65.0%
Central Northeast	23	67.6%	24	70.6%
East Portland	684	83.1%	737	89.6%
North Portland	739	62.5%	1130	95.6%
Northeast	0	0.0%	0	0.0%
Southeast	166	91.7%	176	97.2%
Southwest	74	87.1%	81	95.3%
West/Northwest	17	65.4%	23	88.5%
Total	1,967	75.2%	2,444	93.4%

a. Indicates that building was built before the Flood Insurance Rate Maps became effective (before 1981).
b. Indicates that building was built before Freeboard requirements were in place (before 1996)

Estimated Losses Due to Flooding

Loss estimates for the 10-percent annual chance, 1-percent annual chance and 0.2-percent annual chance floods are presented in Table 11-18 through Table 11-20. It is estimated that there would be up to $369.2 million of flood loss from a 1-percent annual chance flood in Portland. This represents 0.2 percent of the total replacement value for Portland. It is estimated that there would be $1.9 billion of flood loss from a 0.2-percent annual chance flood, representing 1.1 percent of the total replacement value.

National Flood Insurance Program

The use of flood insurance in Portland is below the national average. Only 22.7 percent of insurable buildings in Portland are covered by flood insurance (see Table 11-21). According to an NFIP study, about 49 percent of single-family homes in special flood hazard areas are covered by flood insurance nationwide.

Table 11-18. Loss Estimates for 10% Annual Chance Flood

Reporting Area	*Structures* Impacted[a]	Estimated Loss Associated with 10% Annual Chance Flood			% of Total Replacement Value
		Structure	Contents	Total[a]	
Airport	N/A	$229,109	$616,420	$845,529	0.0%
Central City	N/A	$58,923,422	$68,904,478	$127,827,900	0.4%
Central Northeast	N/A	$0	$0	$0	0.0%
East Portland	N/A	$3,321,950	$1,920,660	$5,242,610	0.0%
North Portland	N/A	$88,691	$78,391	$167,082	0.0%
Northeast	N/A	$0	$0	$0	0.0%
Southeast	N/A	$259,384	$493,804	$753,188	0.0%
Southwest	N/A	$3,789,745	$2,531,660	$6,321,404	0.0%
West/Northwest	N/A	$12,067,394	$29,135,540	$41,202,934	0.3%
Total	**N/A**	**$78,679,694**	**$103,680,953**	**$182,360,647**	**0.1%**

a. Calculated using a user-defined analysis in Hazus

Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

Table 11-19. Loss Estimates for 1% Annual Chance Flood

Reporting Area	*Structures* Impacted[a]	Estimated Loss Associated with 1% Annual Chance Flood			% of Total Replacement Value
		Structure	Contents	Total[a]	
Airport	6	$451,242	$891,901	$1,343,143	0.0%
Central City	14	$87,274,869	$85,625,968	$172,900,837	0.6%
Central Northeast	35	$689,694	$2,146,062	$2,835,757	0.0%
East Portland	628	$31,144,067	$19,649,736	$50,793,804	0.2%
North Portland	154	$11,984,444	$23,350,117	$35,334,561	0.2%
Northeast	0	$0	$0	$0	0.0%
Southeast	56	$7,838,379	$29,672,642	$37,511,021	0.1%
Southwest	60	$7,601,119	$4,757,240	$12,358,359	0.1%
West/Northwest	19	$21,049,497	$35,117,159	$56,166,655	0.4%
Total	**972**	**$168,033,311**	**$201,210,825**	**$369,244,136**	**0.2%**

a. Calculated using a user-defined analysis in Hazus. Hazus is not currently able to calculate losses for houseboats, therefore, damage to these structures was not included in this assessment.

Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

Table 11-20. Loss Estimates for 0.2% Annual Chance Flood

Reporting Area	*Structures* Impacted[a]	Estimated Loss Associated with 0.2% Annual Chance Flood			% of Total Replacement Value
		Structure	Contents	Total[a]	
Airport	14	$635,412	$1,202,789	$1,838,201	0.0%
Central City	409	$330,668,030	$460,921,949	$791,589,978	2.5%
Central Northeast	35	$689,694	$2,146,062	$2,835,757	0.0%
East Portland	910	$47,639,098	$32,733,445	$80,372,543	0.3%
North Portland	569	$207,032,845	$599,086,809	$806,119,654	3.4%
Northeast	0	$0	$0	$0	0.0%
Southeast	74	$24,613,977	$52,138,088	$76,752,065	0.3%
Southwest	106	$19,444,699	$15,060,521	$34,505,220	0.2%
West/Northwest	144	$42,157,111	$80,473,217	$122,630,327	0.9%
Total	**2,261**	**$672,880,866**	**$1,243,762,880**	**$1,916,643,745**	**1.1%**

a. Calculated using a user-defined analysis in Hazus. Hazus is not currently able to calculate losses for houseboats, therefore, damage to these structures was not included in this assessment.

Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

Table 11-21. Percent of Buildings in Floodplain with Flood Insurance

Reporting Area	1% Annual Chance Flood		0.2% Annual Chance Flood	
	Total Buildings in Flood Zone	% of Buildings with Flood Insurance	Total Buildings in Flood Zone	% of Buildings with Flood Insurance
Airport	266	1.5%	266	1.5%
Central City	20	60.0%	517	14.5%
Central Northeast	34	5.9%	34	5.9%
East Portland	823	35.8%	1321	24.7%
North Portland	1182	16.5%	1473	16.6%
Northeast	0	0.0%	0	0.0%
Southeast	181	33.1%	195	33.3%
Southwest	85	41.2%	136	39.7%
West/Northwest	26	0.0%	171	0.6%
Total	**2617**	**23.0%**	**4113**	**18.8%**

The average claim paid in Portland represents about 3.1 percent of the 2015 average Replacement value of structures in the floodplain.

The percentage of policies and claims outside a mapped floodplain suggests that not all of the flood risk in Portland is reflected in current mapping. Based on information from the NFIP, 37.7 percent of policies in Portland are on structures within an identified SFHA, and 62.3 percent are for structures outside such areas. Of total claims paid, 23.8 percent were for properties outside an identified 1-percent annual chance flood hazard area. These claims are likely the result of urban flooding resulting from a lack of adequately sized stormwater conveyance systems.

Repetitive Loss

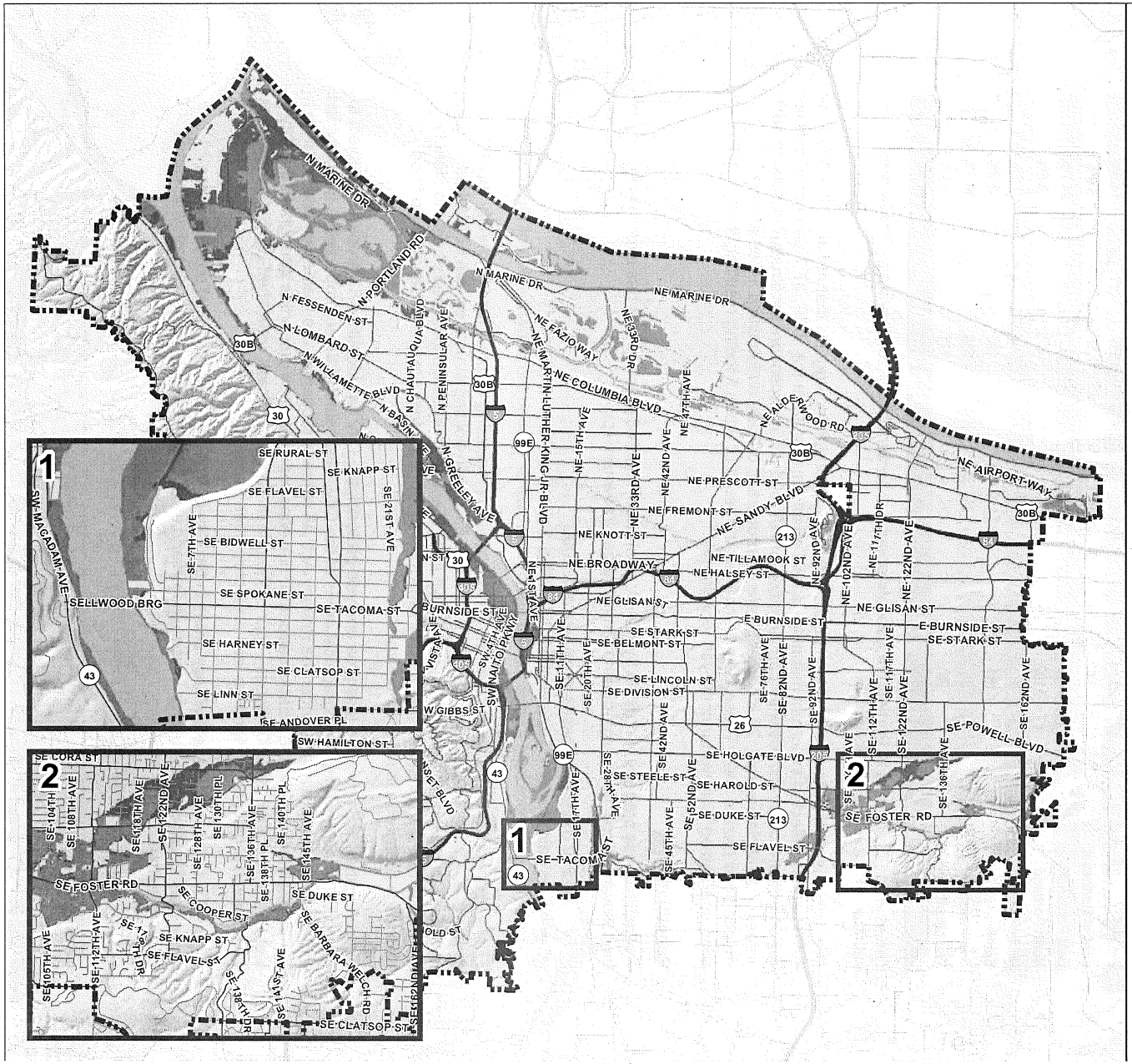
A repetitive loss property is defined by FEMA as an NFIP-insured property that has experienced any of the following since 1978, regardless of any changes in ownership:

- Four or more paid losses in excess of $1,000
- Two paid losses in excess of $1,000 within any rolling 10-year period
- Three or more paid losses that cumulatively equal or exceed the current value of the property.

FEMA-sponsored programs, such as the CRS, require participating communities to identify repetitive loss areas. A repetitive loss area is the portion of a floodplain holding structures that FEMA has identified as meeting the definition of repetitive loss. Identifying repetitive loss areas helps to identify structures that are at risk but are not on FEMA's list of repetitive loss structures because no flood insurance policy was in force at the time of loss.

Following the CRS repetitive loss area analysis protocol, the City has identified 83 properties subject to repetitive flooding within 7 geographical areas of the City. Disclosure of these properties is not provided in the plan due to protection under the Privacy Act. All of these properties are residential and are in or immediately adjacent to the FEMA-mapped SFHA. Nine repetitive loss properties throughout the City were identified after the 2009 floods—four of them in the Johnson Creek watershed. BES disseminates an outreach project to all repetitive loss area properties annually.

Figure 11-4 shows the repetitive loss areas in the City of Portland. FEMA's list of repetitive loss properties identifies nine such properties in Portland as of November 30, 2014, none of which have been mitigated.



September 12, 2016

Mitigation Action Plan (MAP)

Figure 11-4. Repetitive Loss Areas

Legend

- City Boundary
- Repetitive Loss Areas
- 100-year FEMA flood zone
- 500-year FEMA flood zone
- Major Waterbodies

NORTH

0 0.75 1.5 Miles

Sources: FEMA-2014; City of Portland-2016

PBEM

Repetitive loss properties make up only 1 to 2 percent of flood insurance policies in force nationally, yet they account for 40 percent of the nation's flood insurance claim payments. In 1998, FEMA reported that the NFIP's 75,000 repetitive loss structures have already cost $2.8 billion in flood insurance payments and that numerous other flood-prone structures remain in the floodplain at high risk. The government has instituted programs encouraging communities to identify and mitigate the causes of repetitive losses. A report on repetitive losses by the National Wildlife Federation (2006) found that 20 percent of these properties are outside any mapped 1-percent annual chance flood hazard area. The key identifiers for repetitive loss properties are the existence of flood insurance policies and claims paid by the policies.

11.5.3 Critical Facilities and Infrastructure

Hazus-MH was used to estimate the flood loss potential to critical facilities exposed to flood risk. Using depth/damage function curves to estimate the percent of damage to the building and contents of critical facilities, Hazus-MH correlates these estimates into an estimate of functional down-time (the estimated time it will take to restore a facility to 100 percent of its functionality). This helps to gauge how long Portland could have limited usage of facilities deemed critical to flood response and recovery. The Hazus critical facility results are as summarized in Table 11-22 through Table 11-24.

Table 11-22. Estimated Damage to Critical Facilities and Infrastructure from 10-Percent Annual Chance Flood

	Number of Facilities Affected	Average % of Total Value Damaged		Days to 100% Functionality
		Building	Content	
Emergency Services	2	56	100	640
Schools	0	--	--	--
Transportation Systems	10	21	--	N/A
High Potential Loss Facilities	1	1	--	N/A
Utility Systems				
Communications	1	16	--	N/A
Power	0	--	--	--
Potable Water	0	--	--	--
Wastewater	4	40	--	N/A
Other Assets	0	--	--	--
Total/Average	**18**	**27**	**100**	**640**

Table 11-23. Estimated Damage to Critical Facilities and Infrastructure from 1-Percent Annual Chance Flood

	Number of Facilities Affected	Average % of Total Value Damaged		Days to 100% Functionality
		Building	Content	
Emergency Services	2	84	100	900
Schools	0	--	--	--
Transportation Systems	14	18	--	N/A
High Potential Loss Facilities	9	7	--	N/A
Utility Systems				
Communications	3	16	--	N/A
Power	0	--	--	--
Potable Water	1	Less than 1	--	N/A
Wastewater	7	40	--	N/A
Other Assets	0	--	--	--
Total/Average	**36**	**26**	**100**	**900**

Table 11-24. Estimated Damage to Critical Facilities and Infrastructure from 0.2-Percent Annual Chance Flood

	Number of Facilities Affected	Average % of Total Value Damaged		Days to 100% Functionality
		Building	Content	
Emergency Services	7	39	71	669
Schools	4	4	20	480
Transportation Systems	21	17	--	N/A
High Potential Loss Facilities	25	9	--	N/A
Utility Systems				
Communications	3	21	--	N/A
Power	6	3	--	--
Potable Water	1	11	--	N/A
Wastewater	21	35	--	N/A
Other Assets	3	8	--	--
Total/Average	**91**	**16**	**46**	**575**

11.5.4 Environment

The environment vulnerable to flood hazard is the same as the environment exposed to the hazard. Loss estimation platforms such as Hazus-MH are not currently equipped to measure environmental impacts of flood hazards. The best gauge of vulnerability of the environment would be a review of damage from past flood events. Loss data that segregates damage to the environment was not available at the time of this plan. Capturing this data from future events could be beneficial in measuring the vulnerability of the environment for future updates.

11.6 FUTURE TRENDS IN DEVELOPMENT

Land use can exacerbate flood impacts. Development and fill in the floodplain can push floodwaters into areas that did not previously flood or worsen existing impacts. Development in the uplands can remove vegetation that absorbs and attenuates stormwater. Impervious surfaces shed stormwater toward flood-prone areas. Table 11-25 and Table 11-26 show the proposed distribution of future land uses within the 1-percent annual chance and 0.2-percent annual chance flood hazard areas.

Table 11-25. Future Land Use Designations in the 1% Annual Chance Flood Hazard Area

Reporting Area	Total Area (acres)	Percent of Total Area[a]					
		Residential		Commercial	Employment & Industrial	Mixed Use & Institutional	Open Space
		Single-Dwelling	Multi-Dwelling				
Airport	2,103	6.3%	8.1%	0.0%	23.9%	11.5%	50.3%
Central City	558	0.0%	8.8%	25.7%	28.1%	0.0%	37.4%
Central Northeast	432	0.0%	0.0%	0.0%	66.3%	0.0%	33.7%
East Portland	1,246	31.4%	2.0%	0.0%	20.3%	0.7%	45.7%
North Portland	5,244	3.2%	1.2%	0.0%	46.1%	9.3%	40.1%
Northeast	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Southeast	978	9.7%	4.6%	0.0%	6.1%	4.9%	74.7%
Southwest	307	8.9%	16.4%	0.0%	0.0%	16.0%	58.8%
West/Northwest	914	0.0%	0.0%	0.0%	95.7%	0.1%	4.2%
TOTAL	**11,783**	**6.9%**	**3.4%**	**1.2%**	**38.6%**	**7.1%**	**42.7%**

a. Future land use areas based on proposed comprehensive plan designations as of February 2016.

Table 11-26. Future Land Use Designations in the 0.2% Annual Chance Flood Hazard Area

Reporting Area	Total Area (acres)	Percent of Total Area					
		Residential					
		Single-Dwelling	Multi-Dwelling	Commercial	Employment & Industrial	Mixed Use & Institutional	Open Space
Airport	2,110	6.2%	8.1%	0.0%	23.8%	11.4%	50.5%
Central City	1,086	0.0%	7.5%	36.7%	32.2%	0.0%	23.6%
Central Northeast	438	0.0%	0.0%	0.0%	66.4%	0.0%	33.6%
East Portland	1,441	35.8%	3.5%	0.0%	18.7%	1.1%	40.8%
North Portland	7,016	2.4%	1.0%	0.0%	58.2%	7.6%	30.8%
Northeast	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Southeast	1,056	9.3%	4.4%	0.0%	5.8%	4.7%	75.8%
Southwest	343	11.2%	17.2%	0.0%	0.0%	16.3%	55.3%
West/Northwest	1,167	0.0%	0.0%	0.0%	96.2%	0.5%	3.3%
TOTAL	**14,658**	**6.5%**	**3.2%**	**2.7%**	**45.6%**	**6.1%**	**35.81%**

a. Future land use areas based on proposed comprehensive plan designations as of February 2016.

The City of Portland is equipped to handle future growth within flood hazard areas. Its comprehensive plan addresses frequently flooded areas through a variety of goals and polices pertaining to directing growth away from high-risk areas through downzoning; encouraging the preservation of open space and preserving and supporting natural and beneficial functions of floodplains; designing with nature; promoting hazard resilient design; protecting, restoring and preserving environment and watershed health; and ensuring comprehensive flood management. The City has committed to linking the comprehensive plan to the MAP. This creates an opportunity for wise land use decisions as future growth impacts flood hazard areas.

Additionally, the City of Portland participates in the NFIP and has adopted flood damage prevention ordinances in response to its requirements and has committed to maintaining its good standing under the NFIP through actions identified in this plan. The purpose of Chapter 24.50.010 of the Portland City Code is to protect the public health, safety, and welfare by restricting or prohibiting uses that are dangerous to health, safety, or property in times of flood or which cause increased flood heights or velocities and by requiring that uses and structures vulnerable to floods be protected from flood danger at the time of initial construction. The provisions of this chapter regulate development and construction in flood hazard areas.

11.7 SCENARIO

The primary water courses in Portland have the potential to flood at irregular intervals, generally in response to a succession of intense winter rainstorms. Storm patterns of warm, moist air usually occur between early November and late March. A series of such weather events can cause severe flooding in Portland. The worst-case scenario is a series of storms that flood numerous drainage basins in a short time. This could overwhelm the response and floodplain management capability in Portland. Major roads could be blocked, preventing critical access for many residents and critical functions. High in-channel flows could cause water courses to scour, possibly washing out roads and creating more isolation problems. In the case of multi-basin flooding, the City of Portland would not be able to make repairs quickly enough to restore critical facilities and infrastructure without significant disruption.

11.8 ISSUES

The following general issues related to the flood hazard were identified during the planning process:

- Not all structures located within the 1 percent annual chance flood hazard area have flood insurance. Flood insurance uptake is estimated to be 50 percent or less in all risk reporting areas, except in the Northeast where there is no mapped flood risk and the Central City where there is 60 percent uptake in flood insurance.
- Only about 18 percent of structures located in the 0.2 percent annual chance flood hazard area are thought to have flood insurance.
- There are a significant number of Pre-FIRM buildings in Portland. Approximately 75 percent of the buildings in the 1 percent annual chance flood hazard area are believed to have been built before 1981.
- Approximately 93 percent of the buildings in the floodplain were built before freeboard requirements were in place (1996).
- There are 9 repetitive loss properties in Portland that have structures on them. All of these properties are residential and are in or immediately adjacent to the FEMA-mapped SFHA.
- The Flood Insurance Study conducted by the Federal Emergency Management Agency (Flood Insurance Number 410183V000B) in January 2010, serves as the basis for Flood Insurance Rate Maps. This study does not include the impact of the 1996 flood nor the amount of construction which has occurred in the Portland area later than 1977. This is also the document that the buildable land inventory for the City is based on concerning property in floodplain areas.
- FEMA National Levee Accreditation Policies are currently under review and revision. These revisions are likely to impact accreditation of existing flood management systems.
- The risk associated with the flood hazard overlaps the risk associated with other hazards such as earthquake liquefaction. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.
- The potential future impacts of climate change on flood frequency and severity are not well understood. This lack of understanding creates challenges for predicting and planning for various flood scenarios.
- More information is needed on flood risk to support the concept of risk-based analysis of capital projects.
- Ongoing flood hazard mitigation will require funding from multiple sources.
- The concept of residual risk should be considered in the design of future capital flood control projects and should be communicated with residents living in the floodplain.
- Flood insurance should continue to be promoted as a means of protecting private property owners from the economic impacts of frequent flood events.
- A sustained effort should be made to gather historical damage data, such as high water marks on structures and damage reports. The collection of this information will assist with determining the cost-effectiveness of future mitigation projects and will provide more information on the nature of the hazard.
- Flood hazards do not recognize jurisdictional boundaries, and actions in jurisdictions can impact upstream or downstream neighbors. Coordination is necessary to ensure that these connections are understood and hazards are effectively mitigated.
- Floodplain residents need to continue to be educated about flood preparedness and the resources available before, during, and after floods. Flood preparedness can help residents reduce risk to property and lives. Resources that are made available after flood events can help residents make informed decisions that may mitigate future risk to lives and property.

- The location of hazardous materials within the floodplain could result in secondary hazards during or after a flood event.
- FEMA maps do not recognize residual risk outside the mapped area. Where levees are accredited, there may be a misperception that there is no flood risk. Public outreach and awareness efforts should, therefore, emphasize the residual risk behind levees.
- Existing floodplain-compatible uses such as agricultural and open space need to be maintained.

The following issues have been identified specific to the 10-percent annual chance (10-year) flood:

- Immediate impacts will be felt within all risk reporting areas except for the Northeast. However, the Central City and West/Northwest are expected to be most severely impacted.
- It is estimated that 4,052 people will be displaced from their homes after an event and 3,458 of these people will seek shelter in public shelters.
- 82 buildings are expected to be impacted by the flood event resulting in more than $182.3 million in damage. This is less than 1 percent of the total value of the risk reporting areas impacted and just about 0.1 percent of the total value of Portland.
- More than 16,255 tons of debris would be expected from the flood event, which will require approximately 650 truckloads to remove. Most debris will be in the North Portland area, Southeast area and the Central City.
- There are 20 critical facilities located in the flood hazard area.

The following issues have been identified specific to the 1-percent annual chance (100-year) flood:

- Immediate impacts will be felt within all risk reporting areas except for the Northeast. The risk reporting areas with the greatest number of buildings impacted (more than 100) will include East Portland and North Portland.
- It is estimated that 4,499 people will be displaced from their homes after an event and 3,664 of these people will seek shelter in public shelters.
- Of the 2,925 buildings exposed, 972 buildings are expected to be impacted by the flood event resulting in more than $369.2 million in damage. This is less than 1 percent of the total value of the risk reporting areas impacted and just about 0.22 percent of the total value of Portland.
- More than 39,639 tons of debris would be expected from the flood event, which will require approximately 1,585 truckloads to remove. Most debris (more than 5,000 tons) will be in the North Portland area, Southeast area, the Central City and the East Portland.
- There are 80 critical facilities located in the flood hazard area.
- For the social vulnerability demographics of concern, exposure to the 1-percent-annual-chance floodplain exceeds the citywide average by more than 2 percent in individual reporting areas as follows:
  - Population under 15 years of age—17 percent exposure in the East Portland area.
  - Population over 65 years of age—21 percent exposure in North Portland, 17 percent exposure in Southwest and Southeast, and 14 percent exposure in East Portland.
  - People of color—32 percent exposure in the Airport area and Central Northeast.
  - Renter-occupied housing—80 percent exposure in Central City, 69 percent exposure in the Airport area and Central Northeast, and 60 exposure percent in Southwest.
  - Families with incomes below the poverty level—20 percent exposure in the Airport area and Central Northeast

- Households with limited English speaking abilities—21 percent exposure in the Airport area and 20 percent exposure in Central Northeast.

The following issues have been identified specific to the 0.2-percent annual chance (500-year) flood:

- Immediate impacts will be felt within all risk reporting areas except for the Northeast. The risk reporting areas with the greatest number of buildings impacted will include North Portland (1,567 buildings), East Portland (1,456 buildings), and Central City (573 buildings).
- It is estimated that 11,709 people will be displaced from their homes after an event and 10,622 of these people will seek shelter in public shelters.
- Of the 4,536 buildings exposed, 2,261 buildings are expected to be impacted by the flood event, resulting in more than $1.9 billion in damage. This is more than 3.4 percent of the total value of the North Portland and more than 2.5 percent of the total value of the Central City risk reporting areas. In total damage would account for about 1.1 percent of the total value of Portland.
- More than 65,307 tons of debris would be expected from the flood event, which will require approximately 2,612 truckloads to remove. Most debris (more than 15,000 tons) will be in the Central City, North Portland area, and Southeast area
- There are 185 critical facilities located in the flood hazard area.
- For the social vulnerability demographics of concern, exposure to the 0.2-percent-annual-chance floodplain exceeds the citywide average by more than 2 percent in individual reporting areas as follows:
  - Population under 15 years of age—19 percent exposure in the East Portland area.
  - Population over 65 years of age—21 percent exposure in North Portland, 18 percent exposure in Southwest, and 16 percent exposure in Southeast.
  - People of color—32 percent exposure in the Airport area and Central Northeast.
  - Renter-occupied housing—77 percent exposure in Central City, 69 percent exposure in the Airport area and Central Northeast, and 59 exposure percent in Southwest.
  - Families with incomes below the poverty level—20 percent exposure in the Airport area and Central Northeast
  - Households with limited English speaking abilities—21 percent exposure in the Airport area and Central Northeast.

12. VOLCANIC ACTIVITY



12.1 GENERAL BACKGROUND

A volcano is a vent or opening in the earth's crust from which molten lava (magma), pyroclastic materials and volcanic gases are expelled onto the surface. Volcanoes can unleash destructive power greater than a nuclear bomb and pose a serious hazard if located near populated areas (NHMP, 2010).

There are four general types of volcanoes found within a short distance of the city (NHMP, 2010 and Allen, 1975):

- **Lava domes** are formed when lava erupts and accumulates near the vent, such as those found at the Boring Volcanic Field.
- **Cinder cones** are formed by accumulation of cinders, ash and other fragmented materials originating from an eruption. Mount Tabor and Powell Butte are local examples of cinder cone volcanoes.
- **Shield volcanoes** are broad, gently sloping volcanic cones of flat domical shape, usually several tens or hundreds of square miles in extent, built chiefly of overlapping and intertwined basaltic lava flows. Larch Mountain, Mount Sylvania and Highland Butte are local examples of shield volcanoes.
- **Composite or stratovolcanoes** are typically steep-sided, symmetrical cones of large dimensions built of alternating layers of lava flows, volcanic ash, cinders and blocks. Most composite volcanoes have a crater at the summit containing a central vent or clustered group of vents.

DEFINITIONS

- Lahar—A rapidly flowing mixture of water and rock debris that originates from a volcano. While lahars are most commonly associated with eruptions, heavy rains, and debris accumulation, earthquakes may also trigger them.
- Lava Flow—The least hazardous threat posed by volcanoes. Cascades volcanoes are normally associated with slow moving andesite or dacite lava.
- Stratovolcano—Typically steep-sided, symmetrical cones of large dimension built of alternating layers of lava flows, volcanic ash, and cinders, rising as much as 8,000 feet above their bases.
- Tephra—Ash and fragmented rock material ejected by a volcanic explosion
- Volcano—A vent in the planetary crust from which magma (molten or hot rock) and gas from the earth's core erupts.

12.1.1 Cascade Range Volcanoes

The City of Portland is near the Cascade Range, an 800-mile-long chain of volcanoes that extends from northern California to southern British Columbia (see Figure 12-1). There are 20 volcanoes in the Cascade Range, five of which have been active in historical times: Mount Baker, Glacier Peak, Mount Rainier, Mount St. Helens, Mount Adams and Mount Hood. Volcanoes can lie dormant for centuries between eruptions, and the risk they pose is not always apparent. All of the volcanoes in the Cascade Range are stratovolcanoes, which have seven different types of hazard associated with volcanic activity. Figure 12-2 presents a graphic overview of the geological hazards present during a volcanic event.

Source: USGS, 2013

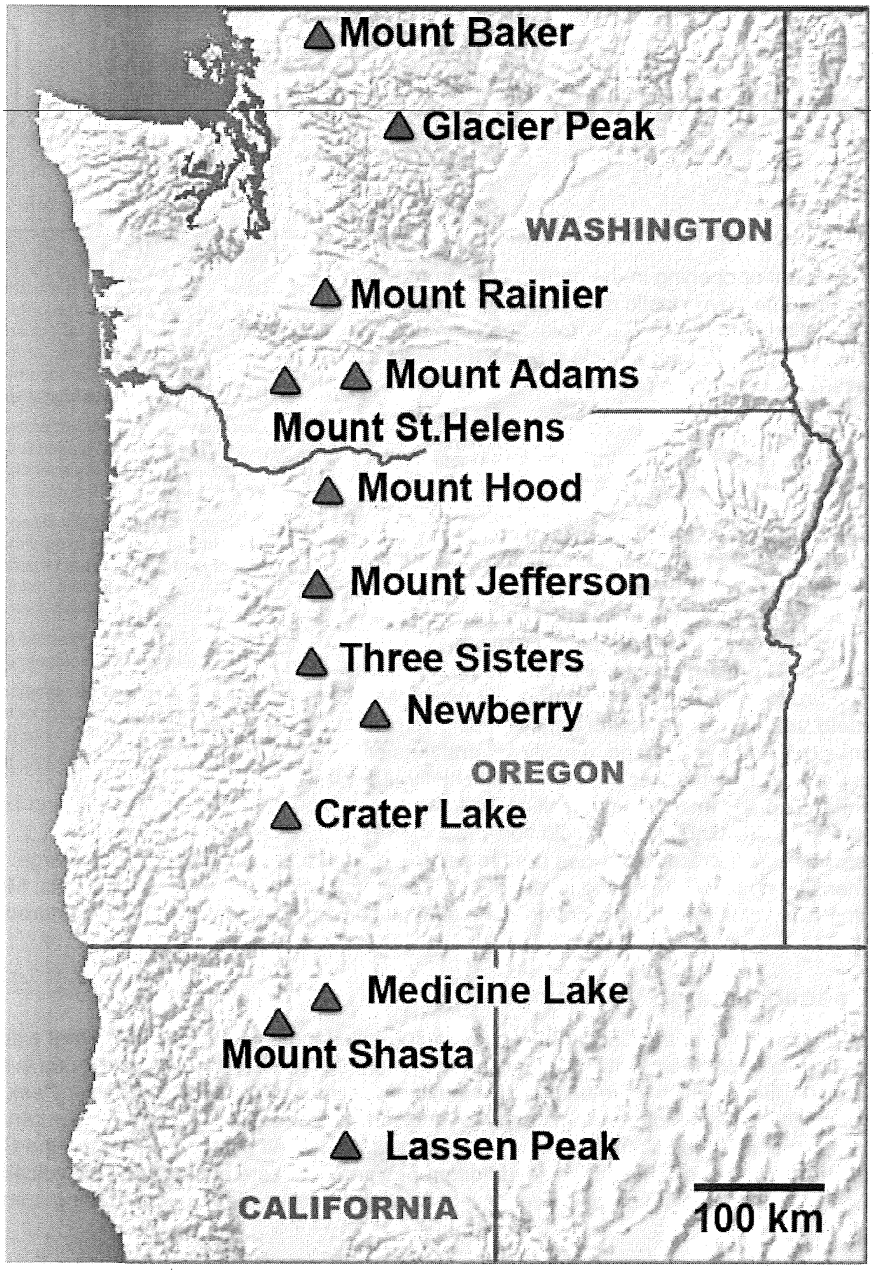


Figure 12-1. Cascade Range Volcanoes

Source: USGS, 2014c

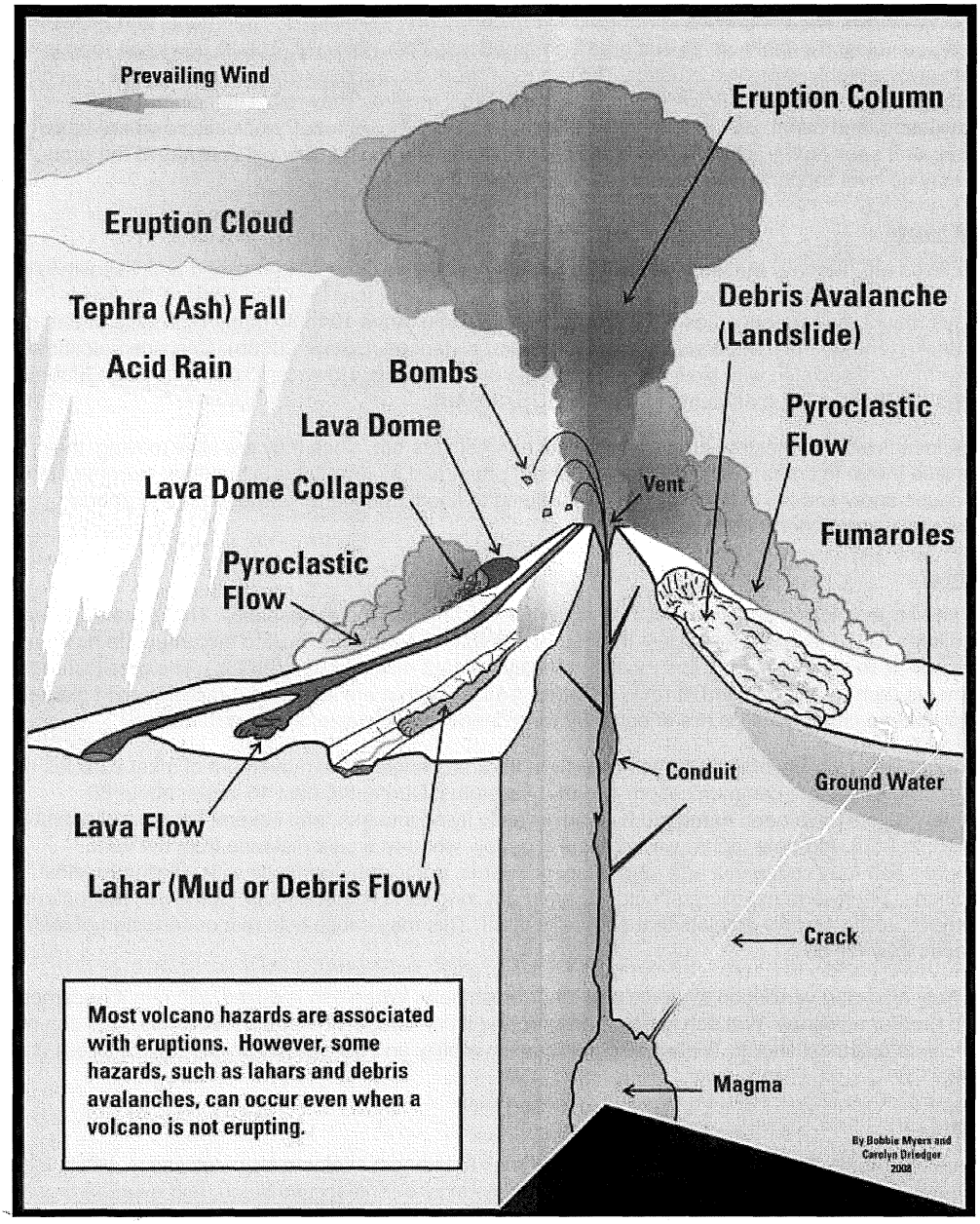


Figure 12-2. Geologic Hazards at Volcanoes

Pyroclastic Flows and Surges

Pyroclastic flows are avalanches of hot (200ºC to 700°C), dry, volcanic rock fragments and gases that descend a volcano's flanks at speeds greater than 50 miles per hour. Pyroclastic flows can form in three ways: a highly explosive eruption, "boiling over" from an eruptive vent, or collapse of a lava dome (USGS, 2016b). Pyroclastic flows and surges are a lethal hazard. They result in incineration, asphyxiation, and burial. Because of their speed they cannot be outrun. Pyroclastic flows are heavier than air and seek topographically low areas. Hot mixtures of gas and rock will flow above the ground and may go over topographical barriers such as ridges and hills.

Lava Flows

Lava flows are normally the least hazardous threat posed by volcanoes. The speed and viscosity of a lava flow are determined by the silica content of the lava. The higher the silica content, the more viscous (thick) the lava becomes. Low silica basalt lava can move 10 to 30 mph. High silica andesite and dacite tend to move more slowly and travel short distances (USGS, 2008b). Cascade volcanoes are normally associated with slow moving andesite or dacite lava. However, 3,000 years ago Mount St. Helens produced a large amount of basalt (USGS, 2014a).

Large lava flows may destroy property and cause forest fires but, since they are slow moving, they pose little threat to human life. The greater hazard presented by lava flows is that their extreme heat can cause snow and ice to melt very quickly, adding to flooding hazards or the lahar and debris avalanche hazards described below.

Tephra

Ash and large volcanic projectiles can erupt from a volcano into the atmosphere. These materials are sometimes called tephra. The largest fragments (bombs, >64 mm) fall back to the ground fairly near the vents, as close as a few yards and most commonly within 2 miles (USGS, 2008b). The smallest rock fragments (ash) are composed of rock, minerals, and glass that are less than 2 millimeters in diameter. Tephra plume characteristics are affected by wind speed, particle size, and precipitation.

Tephra poses a variety of threats. Ash only 1 cm thick can impede the movement of most vehicles and disrupt transportation, communication, and utility systems. During the past 15 years, about 80 commercial jets have been damaged by inadvertently flying into ash, and several have nearly crashed (USGS, 2008b). Airborne tephra will seldom kill people who are a safe distance from the vent. However, ash may cause eye and respiratory problems, particularly for those with existing medical conditions. Short-term exposure should not have any long-term health effects. Some ash fall materials may have acidic aerosol droplets that adhere to them. This may cause acid rain or corrosion of metal surfaces they fall on.

Ash may also clog ventilation systems and other machinery. When ash is mixed with rain it becomes a much greater nuisance. Wet ash is much heavier and it can cause structures to collapse. Wet ash may also cause electrical shorts. Tephra also decreases visibility and may cause psychological stress and panic.

Lahars

Lahars are rapidly flowing mixtures of water and rock debris that originate from volcanoes. While lahars are most commonly associated with eruptions, heavy rains, debris accumulation, and even earthquakes may also trigger them. They may also be termed debris or mud flows. Lahars can travel over 50 miles downstream, reaching speeds between 20 and 40 mph (USGS, 2008b). Beyond the flanks of a

volcano, lahars will normally be channeled into waterways. The threat from lahars comes from their speed and from the debris they carry. Abrasion from the heavy sediment and impacts from heavy debris can destroy forests as well as human-made structures, including bridges, dams, roads, pipelines, buildings, and farms. Lahars may also fill in channels, obstructing shipping lanes and impacting a channel's ability to handle large volumes of water.

Debris Avalanches

Debris avalanches occur when the flank of a volcano collapses and slides downslope. The avalanche may initially include rock, soil and snow, and incorporate additional materials, such as trees and buildings, as it moves toward the valley floor. If avalanches incorporate a significant amount of water as they rush down the volcano, they may transition to lahars. Avalanche scars are typically noticeable as horseshow shaped craters (USGS, 2015a).

Volcanic Gases

All active volcanoes emit gases. These gases may include steam (water vapor), carbon dioxide, sulfur dioxide, hydrogen sulfide, hydrogen, and fluorine. Sometimes, these chemicals can be absorbed by ash and impact groundwater, livestock, and metal objects. Even when a volcano is not erupting, gases can escape through small surface cracks. The greatest danger to people comes when large quantities of toxic gases are emitted from several sources or when there are topographic depressions that collect gases that are heavier than air. These gases can accumulate to the point where people or animals can suffocate (USGS, 2016c).

Lateral Blast

Lateral blasts are explosive events in which energy is directed horizontally instead of vertically from a volcano. They are gas-charged, hot mixtures of rock, gas and ash that are expelled at significantly high speeds. Lateral blasts vary in size, but large ones are fairly rare, with only a few historical examples worldwide. The most recent was the 1980 eruption of Mount St. Helens when almost everything within the blast zone (about 230 square miles) perished. The Mount St. Helens lateral blast is estimated to have reached a velocity of 670 mph, and there have been speculations that the velocity may have gone even higher, reaching a supersonic rate of 735+ mph for at least a few moments (USGS, 1997a).

12.2 HAZARD PROFILE

12.2.1 Past Events

Mt. St. Helens has been the most active volcano in the Cascade Range during the past 10,000 years. Early 19th century settlers in the region witnessed eruptions occurring along the north flank area of the mountain. In Oregon, awareness of the potential for volcanic eruptions has greatly increased since the May 18, 1980 eruption, which killed 57 people. The upper portion of the summit collapsed in a massive landslide triggered by volcanic tremors. That portion of the mountain is now a horseshoe-shaped crater partially filled by a lava dome (NHMP, 2010).

As a result of the 1980 Mt. St. Helens eruption and the far-reaching extent of the lateral blast, damage and reconstruction exceeded $1 billion. The coverage area was 230 square miles and reached 17 miles northwest of the crater. Impacts from pyroclastic flows covered six square miles and reached five miles north of the crater. Landslides covered 23 square miles. Lahars (mudflows) affected the North and South Forks of the Toutle River, the Green River and ultimately the Columbia River, as far as 70 miles from the volcano. Mt. St Helens' most recent eruption began in October of 2004, with initial steam and

ash eruptions giving away to slow-moving lava flows which ceased in January of 2008. In October of 2004 ash was pushed more than 10,000 feet into the air and lava flows continued until January 2008, after which activity ceased. The volcano has since been downgraded to inactive, although another eruption in the near future is likely (NHMP, 2010).

In 1781, Mount Hood erupted, which resulted in lahar flows that reached the Columbia River (USGS, 2013b). There were additional reports of eruptive activity in 1859 and 1865 from early settlers. Reports included sightings of fire, smoke, flying rock, and steaming (USGS, 2012). Two other minor eruption periods occurred during the last 500 years with some lava flow near the summit. The eruptions created pyroclastic flows and lahars with little ash fall. Other volcanoes throughout the Pacific Northwest have undergone similar formation and eruption cycles (MHFC, 2005 as cited in NHMP, 2010).

Table 12-1 and Figure 12-3 summarize past eruptions in the Cascades. Seven Cascade volcanoes have erupted since the beginning of the 18th century (USGS, 2013b).

Table 12-1. Past Eruptions near the City of Portland

Volcano	Number of Eruptions	Type of Eruptions
Mount Adams	3 in the last 10,000 years, most recent was 1,000 to 2,000 years ago	Andesite lava
Mount Hood	3 in the last 2000 years	Pyroclastic flows, lahars, steam explosions, tephra
Mount Jefferson	Last eruption approximately 15,000 years ago	Lava domes
Mount St Helens	19 eruptions in last 13,000 years	Pyroclastic flows, lahars, lava, and tephra

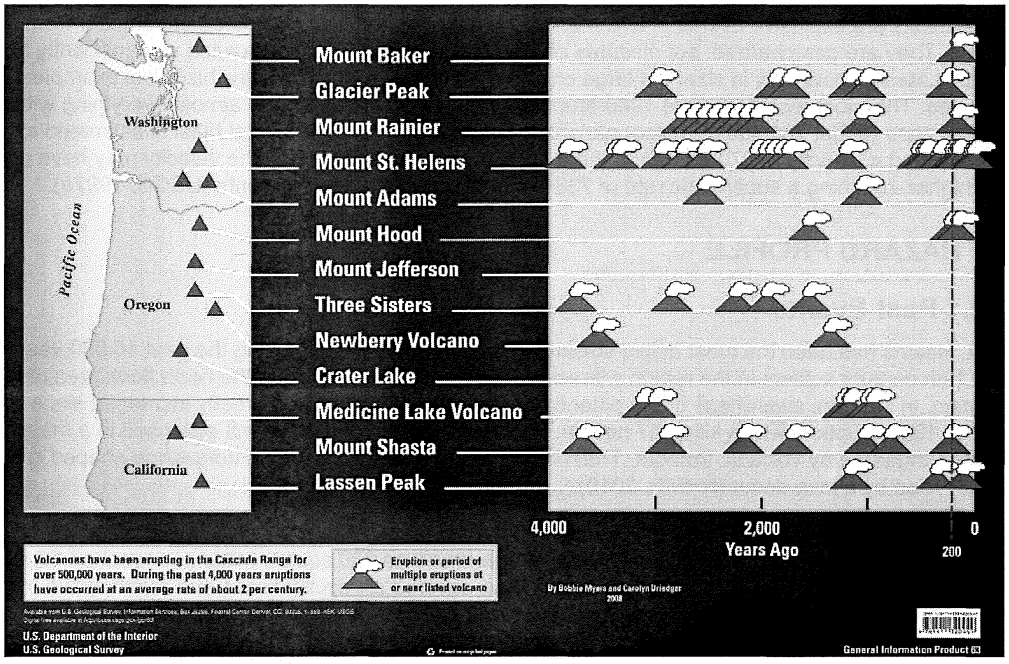


Figure 12-3. Cascade Range Eruptions in the Past 4,000 Years

12.2.2 Location

The extensive north-south chain of volcanoes in the Cascade Range was formed by earthquakes originating from the Cascadia Subduction Zone. As the Juan de Fuca Plate sinks beneath the North American Plate, it heats up and begins to melt, providing a vast reservoir of the heat and molten rock that create the magma chambers that become volcanoes (NHMP, 2010).

The USGS provides descriptions of the four closest volcanoes to the city, Mt. Adams, Mt. Hood, Mt. St. Helens and Mt. Jefferson, all located to the east of the city (USGS, 2009a as cited in NHMP, 2010):

- Mt. Adams stands approximately 31 miles due east of Mt. St. Helens. The towering stratovolcano (12,276 feet) is marked by a dozen glaciers, most of which are fed radially from its summit icecap. In the Cascades, Mt. Adams is second in eruptive volume only to Mt. Shasta and it far surpasses its loftier neighbor Mt. Rainier. Mt. Adams' main cone exceeds 124 cubic miles.
- Mt. Hood is located approximately 47 miles east-southeast of Portland and is the most accessible Oregon volcano. Access to the volcano is provided by US Highway 26 from the south and west and Oregon Highway 35 from the east. Other paved roads provide further access to this most often-climbed peak in the Pacific Northwest. In the winter, the mountain hosts winter sports. At 11,239 feet, Mt. Hood is the highest peak in the state and is part of the Mt. Hood National Forest (USGS, 2009a as cited in NHMP, 2010).
- Mt. Jefferson is located in the Mt. Jefferson Wilderness area and the Warm Springs Indian Reservation, approximately 70 miles from Portland. It is the second highest peak in Oregon at 10,497 feet. Access is provided by Highway 22 east of Salem and US Forest Service roads and trails that lead into the wilderness area (USGS, 2009 as cited in NHMP, 2010).
- Mt. St. Helens, a stratovolcano, is located approximately 50 miles northeast of Portland in Skamania County, Washington and has an elevation of 8,365 feet. Access is provided from the west in Cowlitz County by State Route 504. (USGS 2009a, as cited in NHMP, 2010).

Mt. St. Helens is believed to be the volcano with the greatest potential to have a near-term impact on the region because of its recent activity since the cataclysmic event in May 1980. A large eruption of Mt. St. Helens can eject tephra to altitudes of 12 to 20 miles and to deposit tephra over an area of 40,000 square miles or more. Wind direction and velocity, along with the vigor and duration of the eruption, will control the location, size and shape of the area affected by tephra fall (NHMP, 2010).

Due to proximity, the major hazard for the city would be impacts from ash or tephra. (i.e., minor ash falls from eruptions from Mt. St. Helens, or lesser ash falls from Mt. Hood or more distant volcanoes). Prevailing wind is a factor in how much ash is disbursed within the city. Volcanic eruptions may impact water bodies. River valleys are susceptible to debris flows, landslides and lahars that, under extreme conditions, may require dredging to maintain channel depths for navigation (NHMP, 2010). Figure 12-4 shows the potential area at risk of this hazard.

12.2.3 Frequency

Many Cascade volcanoes have erupted in the recent past and will be active again in the foreseeable future. Given an average rate of one or two eruptions per century during the past 12,000 years, these disasters are not part of our everyday experience; however, in the past hundred years, California's Lassen Peak and Washington's Mount St. Helens have erupted with terrifying results. The U.S. Geological Survey classifies Mount Hood, Mount Jefferson, Three Sisters, Newberry and Crater Lake as potentially active volcanoes in Oregon.

September 12, 2016

Mitigation Action Plan (MAP)

Figure 12-4.

Volcano Hazard Area

Legend

- City Boundary
- Volcano Hazard Area

NORTH

0 0.75 1.5 Miles

Sources: USGS-1997; City of Portland-2016

PBEM

Mt. St. Helens, in Washington State, is by far the most active volcano in the Cascades, with four major explosive eruptions in the last 515 years. Still, the probability of an eruption in any given year is extremely low. Figure 12-5 shows the annual probability of an ash fall accumulation of 4 inches or more (10 cm). The eastern portion of the City of Portland sits at the 0.02 percent range, or about once every 5,000 years. The rest of the City of Portland sits in the 0.01 percent range, or once every 10,000 years. However, frequencies of smaller accumulations in shorter timeframes are certainly possible.

Source: USGS, 2011

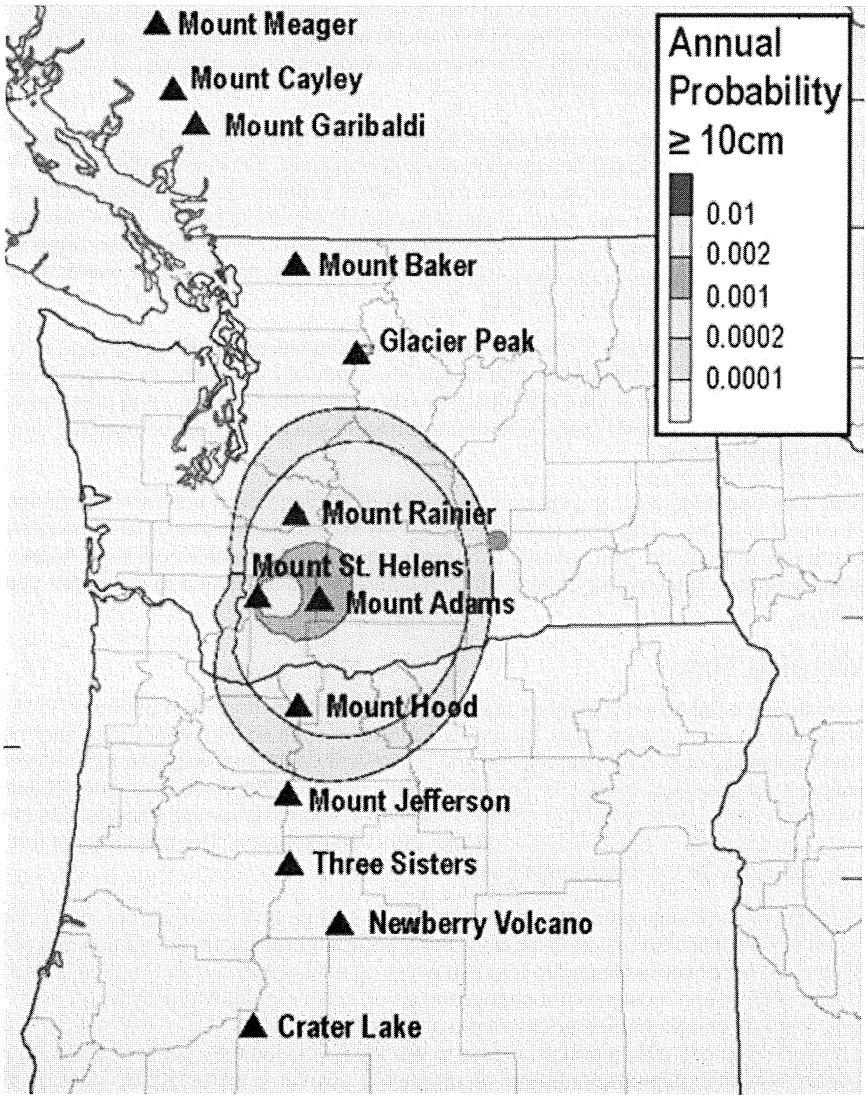


Figure 12-5. Probabilistic Hazard Map of Tephra Accumulation of 10 Centimeters or Greater

12.2.4 Severity

The most predominate threat to the city would occur from volcanic ash clouds, drifting downwind potentially landing several miles from the volcano. Events can vary from minor to heavy, with minor events reducing visibility and increasing respiratory and breathing difficulty. Driving can become potentially treacherous from reduced visibility and particulate ingested engine damage. Other problems common from air-entrained ash particles could include clogged and damaged sewage systems, mechanical equipment failure caused by the abrasive nature of volcanic ash and economic losses caused by business slowdowns and the cost of ash removal. Heavy tephra fall could affect humans and aquatic life as the ash accumulation increases the natural turbidity of waterbodies, causing increased treatment requirements. Heavier ash fall collects on all surfaces such as rooftops, decks and parking lots and requires removal. (NHMP, 2010).

A 1-inch deep layer of ash weighs an average of 10 pounds per square foot, causing danger of structural collapse. In addition to the concern for structural collapse, ash is corrosive and can be electrically conductive. This can lead to metallic roof surfaces experiencing increased deterioration. The abrasive and corrosive nature of ash not only causes potential minor but painful burns to humans, it can also damage computer and electronic systems. While volcanic ash is most often associated with structural instability, it can also cause issues with agriculture, health, power supply, water supply, transportation, and wastewater (USGS, 2015b).

Secondary impacts would be dust clouds generated by ash removal and surface damage from the scratchy nature of the tephra particulates. Ash clouds are especially damaging to jet aircraft as ash clouds can drift great distances at high altitudes. The city's international airport and other area airports are especially vulnerable and temporary flight restrictions and diversions may be required during active ash fall events (NHMP, 2010).

Although it is near both Mount St. Helens and Mount Hood, Portland does not have a large degree of exposure to direct impacts, aside from tephra. Figure 12-6 shows the severity of lahar hazards just to the east of the City of Portland. The severity of impacts from lahar hazards would likely depend on the severity of the eruption. The severity of impacts from tephra would be related to the extent of the accumulation.

12.2.5 Warning Time

Constant monitoring of all active volcanoes means that there will be more than adequate time for evacuation before an event. Since 1980, Mount St. Helens has settled into a pattern of intermittent, moderate and generally non-explosive activity, and the severity of tephra, explosions, and lava flows have diminished. All episodes, except for one very small event in 1984, have been successfully predicted several days to three weeks in advance. However, scientists remain uncertain as to whether the volcano's current cycle of explosivity ended with the 1980 explosion. The possibility of further large-scale events continues for the foreseeable future.

The best warning of a volcanic eruption is one that specifies when and where an eruption is likely and what type and size eruption should be expected. Such accurate predictions are sometimes possible but still rare. The most accurate warnings are those in which scientists indicate an eruption is probably only hours to days away, based on significant changes in a volcano's earthquake activity, ground deformation, and gas emissions. Experience from around the world has shown that most eruptions are preceded by such changes over a period of days to weeks. A volcano may begin to show signs of activity several months to a few years before an eruption. However, a warning that specifies months or years in advance when it might erupt are extremely rare.

Source: USGS, 2013a

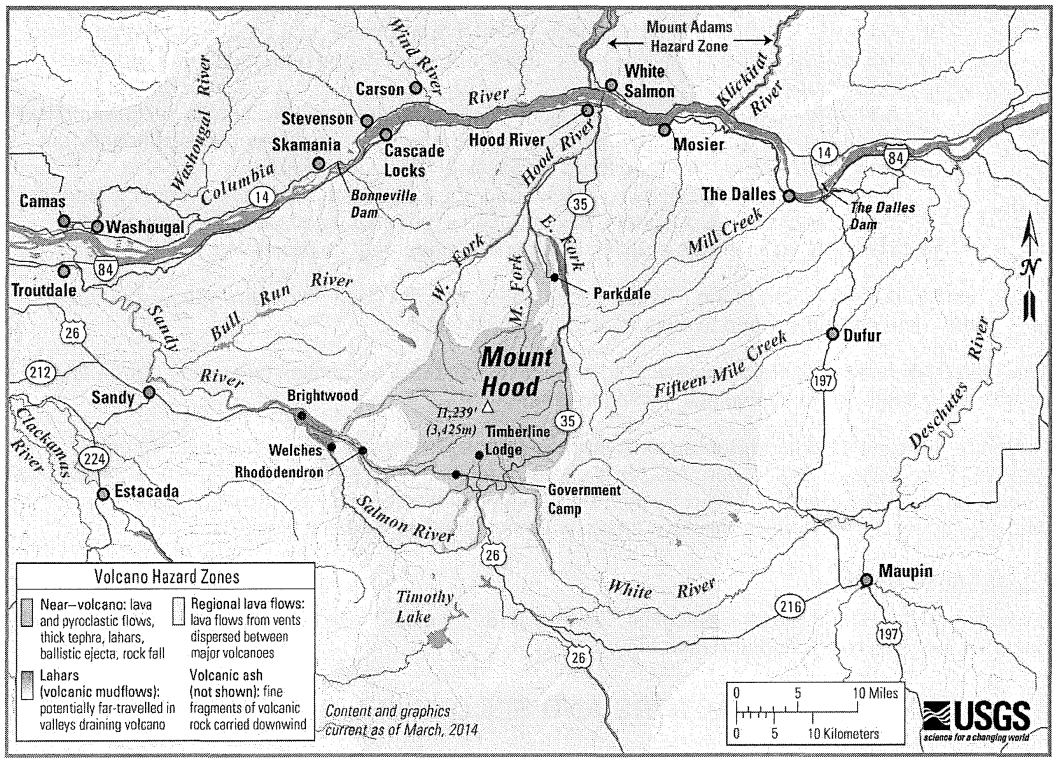


Figure 12-6. Potential Impact Area for Ground-Based Hazards during a Mount Hood Event

Monitoring Volcanic Activity

The USGS and the Pacific Northwest Seismograph Network conduct seismic monitoring of all Cascade volcanoes in Oregon and Washington. During the past decade, monitoring networks on Mount Hood and Mount St. Helens have been expanded (USGS, 2014b).

Volcanic Event Notification

Members of the public may sign up for the USGS Volcano Notification Service email subscription service on the USGS website. Notifications include several types: volcano activity notices; daily, weekly or monthly updates; status reports; volcano observatory notices for aviation; and information statements.

Volcano-alert notifications are based on analysis of data from monitoring networks, direct observations, and satellite sensors. They are issued for both increasing and decreasing volcanic activity and include text about the nature of the activity and about potential or current hazards. Scientists describe a volcano's status using alert levels and color codes and issue different types of notifications to address specific information needs. These alert levels consist of two parts (USGS, 2016e):

- Ranked terms to inform people on the ground about a volcano's status:
  - **Normal**—Volcano is in typical background, non-eruptive state or, after a change from a higher level, volcanic activity has ceased and volcano has returned to non-eruptive background state.
  - **Advisory**—Volcano is exhibiting signs of elevated unrest above known background level or, after a change from a higher level, volcanic activity has decreased significantly but continues to be closely monitored for possible renewed increase.
  - **Watch**—Volcano is exhibiting heightened or escalating unrest with increased potential of eruption, timeframe uncertain, OR, eruption is underway but poses limited hazards.
  - **Warning**—Hazardous eruption is imminent, underway, or suspected.
- Ranked colors to inform the aviation sector about airborne hazards (green, yellow, orange and red generally correspond to alert level term definitions).

This alert level ranking offers a framework that the public and civil authorities can use to gauge and coordinate a response to a developing volcano emergency.

Currently, the City of Portland Bureau of Emergency Management uses the federal system called Wireless Emergency Alerts to warn residents about impending risks posed from different hazards. Combined with the Emergency Alert System and Community Emergency Notification System, residents who sign up for these services will have ample warning about any volcanic hazards.

Lahar Travel Times

According to the United States Geological Survey (2013a), it would take more than 3.5 hours for distal hazard impacts to reach Portland (see Figure 12-7).

12.3 COMPOUNDING FACTORS AND SECONDARY HAZARDS

12.3.1 Overview

The secondary factors most commonly caused by volcanic eruptions are mud flows and landslides. Volcanic ash fall also contributes significantly to poor air quality as discussed in the population vulnerability section of this profile.

12.3.2 Climate Change

Climate change is not likely to affect the risk associated with volcanoes; however, volcanic activity can affect climate change. Volcanic clouds absorb terrestrial radiation and scatter a significant amount of incoming solar radiation. By reducing the amount of solar radiation reaching the Earth's surface, large-scale volcanic eruptions can lower temperatures in the lower atmosphere and change atmospheric circulation patterns. The massive outpouring of gases and ash can influence climate patterns for years following a volcanic eruption.

Source: USGS, 2013a

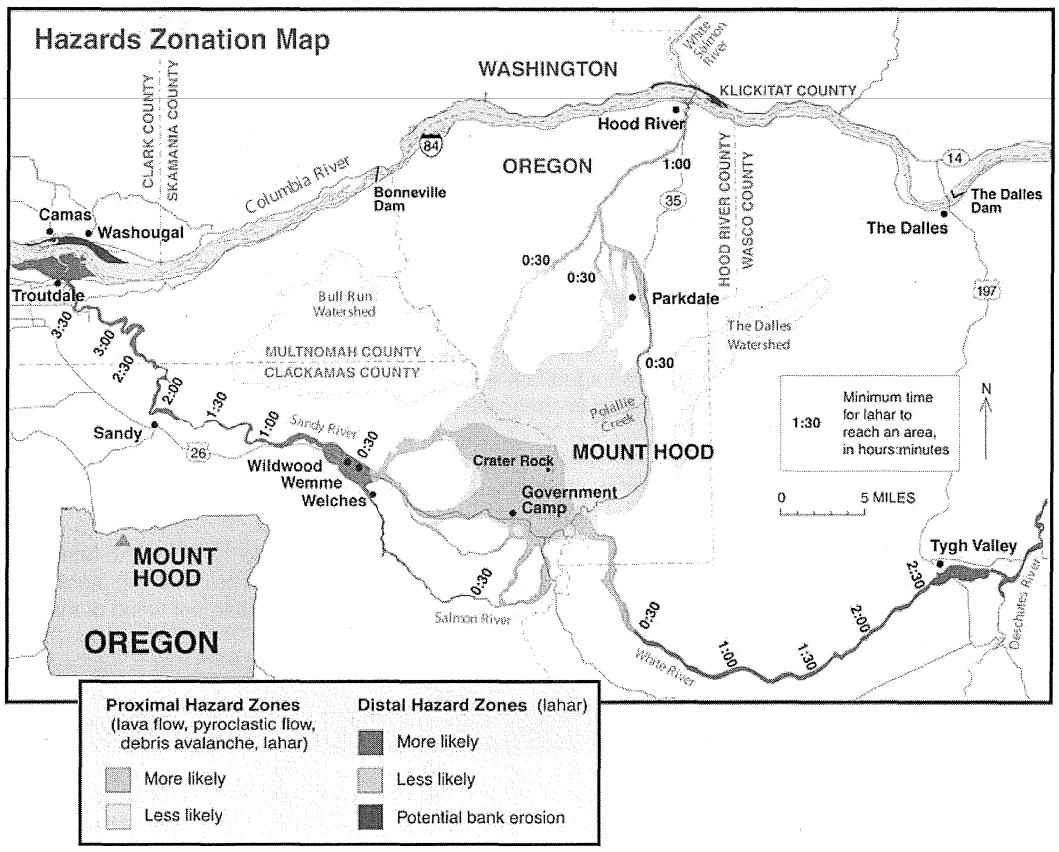


Figure 12-7. Mount Hood Hazard Zones and Lahar Travel Times

12.4 EXPOSURE

The City will likely experience damage only from volcanic eruption columns and clouds that contain volcanic gases, minerals and rock. The columns and clouds form rapidly and extend several miles above an eruption. Solid particles in the clouds present a serious aviation threat, can distribute acid rain (sulfur dioxide gas and water), can create risk of suffocation (carbon dioxide is heavier than air and collects in valleys and depressions) and pose a toxic threat from fluorine, which clings to ash particles, potentially poisoning grazing livestock and contaminating domestic water supplies (NHMP, 2010).

Buildings, streets and roads throughout the City would require minor cleanup with negligible impacts. Temporary utility interruptions are likely and minor cleanup may be required for electrical and other utility services. Water treatment facilities may be required to address highly turbid water. Columbia and Willamette River traffic could be impacted by sediment deposition from a large Mt. St. Helens or Mt. Hood eruption. Channel dredging to restore acceptable depths could be required after such an incident. Health complications associated with respiratory problems may also result (NHMP, 2010).

Portland is exposed to a Mt. Hood eruption that generates lahar and tephra. All that is in the path of the lahar is exposed to potential damage. Tephra exposure is assumed to apply to the entire city.

12.4.1 Population

The entire population of Portland is exposed to the effects of tephra. Populations residing in the northeast portion of the East Portland risk reporting area could be impacted by lahar hazards. Based on the percent of residential structures located in the lahar hazard areas it is estimated that approximately 25 people reside within the hazard area. The estimated social vulnerability indicators for those residing in this area is as follows:

- 7.7 percent under 15 years of age
- 23.8 percent over 65 years of age
- 8.8 percent people of color
- 6.9 percent renters
- 0 percent economically disadvantaged families
- 0 percent limited English speaking households.

12.4.2 Property

Lahar

All property in the lahar inundation areas would be exposed to lahar flows. Table 12-2 lists the total number of Portland structures in the lahar hazard zones and their values. All general building stock exposure is located in East Portland accounting for 1.8 percent of the total replacement value of the risk reporting area and less than 1 percent of the total replacement value of the city.

Table 12-2. Exposure and Value of Structures in Lahar Hazard Zone

Reporting Area	Number of Buildings Exposed	Value Exposed			Exposed Value as % of Total Replacement Value
		Structure	Contents	Total	
Airport	0	$0	$0	$0	0.0%
Central City	0	$0	$0	$0	0.0%
Central Northeast	0	$0	$0	$0	0.0%
East Portland	43	$233,499,088	$247,304,890	$480,803,978	1.8%
North Portland	0	$0	$0	$0	0.0%
Northeast	0	$0	$0	$0	0.0%
Southeast	0	$0	$0	$0	0.0%
Southwest	0	$0	$0	$0	0.0%
West/Northwest	0	$0	$0	$0	0.0%
Total	**43**	**$233,499,087.95**	**$247,304,890.38**	**$480,803,978**	**0.3%**

The 43 buildings located in the lahar hazard area are the following occupancy classes:

- Residential – 7 (16.3 percent)
- Commercial – 24 (55.8 percent)
- Industrial – 7 (16.3 percent)
- Education – 5 (11.6 percent).

Tephra

All property in Portland would be exposed to tephra accumulation from a volcanic eruption.

12.4.3 Critical Facilities

Lahar

Infrastructure exposed to lahar inundation includes highway bridges and a section of Union Pacific Railway that cross the Sandy River in the lahar zone, just outside Portland. Also outside Portland are 46 potable water facilities primarily operated by the Portland Water Bureau that are exposed to a lahar flow. These facilities are mostly wells and pumps in the Columbia South Shore Well Field. Table 12-3 and Table 12-4 summarize the exposed critical facilities in Portland.

Table 12-3. Critical Facilities in Lahar Inundation Zone

	Number of Critical Facilities in Lahar Hazard Areas[a]				
Reporting Area	Emergency Services	High Potential Loss Facilities	Schools	Other Assets	Total
Airport	0	0	0	0	0
Central City	0	0	0	0	0
Central Northeast	0	0	0	0	0
East Portland	0	4	0	0	4
North Portland	0	0	0	0	0
Northeast	0	0	0	0	0
Southeast	0	0	0	0	0
Southwest	0	0	0	0	0
West/Northwest	0	0	0	0	0
Outside City Boundary	0	0	0	0	0
Total	0	4	0	0	4

a. See Table 6-1 for a description of the facilities included in each category.

Table 12-4. Critical Infrastructure in Lahar Inundation Zone

	Number of Critical Infrastructure Facilities in Lahar Hazard Areas[a]					
		Utility Systems				
Reporting Area	Transportation Systems	Communications	Power	Potable Water	Wastewater	Total
Airport	0	0	0	0	0	0
Central City	0	0	0	0	0	0
Central Northeast	0	0	0	0	0	0
East Portland	0	1	1	35	1	38
West/Northwest	0	0	0	0	0	0
North Portland	0	0	0	0	0	0
Northeast	0	0	0	0	0	0
Southeast	0	0	0	0	0	0
Southwest	0	0	0	0	0	0
Outside City Boundary	3	0	0	46	0	49
Total	3	1	1	81	1	87

a. See Table 6-1 for a description of the facilities included in each category.

There are 1.34 miles of levees (6.6 percent of the total mileage in Portland) exposed to lahar flows in the distal hazard zone. Additionally, 2.60 miles of major power lines (0.6 percent of the total mileage in Portland) are also exposed.

Tephra

All transportation routes are exposed to tephra accumulation, which could create hazardous driving conditions on roads and highways and hinder evacuations and response.

12.4.4 Environment

The environment is highly exposed to the effects of a volcanic eruption. Even if ash fall from a volcanic eruption were to fall elsewhere, it could still be spread throughout Portland by surrounding rivers and streams. A volcanic blast would expose the local environment to many effects such as lower air quality, and many other elements that could harm local vegetation and water quality. Environment in the path of a lahar would be subject to additional impacts.

12.5 VULNERABILITY

12.5.1 Population

Lahar

Since there is generally adequate warning time before a volcanic event, the population vulnerable to distal hazards consists of those who choose not to evacuate or are unable to evacuate. The latter includes the elderly, the very young, those with access and functional needs, and those who may not have access to or be able to understand warnings.

Tephra

The entire population of Portland is vulnerable to the damaging effects of volcanic tephra, or ash fall, in the event of a volcanic eruption. The elderly, very young and those who experience ear, nose and throat problems are especially vulnerable to the tephra hazard. Ash is harsh, acidic, gritty, and smelly. Although the gases are usually too diluted to constitute danger to a person in normal health, the combination of acidic gas and ash may cause lung problems. Extremely heavy ash can clog breathing passages and cause death. When an ash cloud combines with rain, sulfur dioxide in the cloud combines with water to form diluted sulfuric acid that may cause minor, but painful burns to the skin, eyes, nose, and throat. Hydrochloric acid rains following eruptions have also been reported. Additionally, tephra decreases visibility and may cause psychological stress and panic.

12.5.2 Property

Lahar

There are currently no generally accepted damage functions for volcanic hazards in risk assessment platforms such as Hazus-MH. All properties listed in Table 12-5 are considered vulnerable to lahar hazards. The most vulnerable structures would be those that are located closest to the Columbia and Sandy River hazard areas, and those that are not structurally sound. Loss estimates for lahar hazards are shown in Table 12-5 representing 10, 30, and 50 percent of the exposed property value.

Table 12-5. Loss Estimates for Volcano Lahar Hazards

		Estimated Loss Potential from Lahar Hazards		
	Exposed Value	10% Damage	30% Damage	50% Damage
East Portland	$480,803,978	$48,080,398	$144,241,193	$240,401,989

Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8.3 for a discussion of data limitations.

Tephra

All of the property exposed to nature in Portland is exposed to the effects of tephra accumulation. Among these properties, the most vulnerable structures are those that are not as structurally sound and may collapse under the excessive weight of tephra and possible rainfall. There are no current regulations regarding the weight of tephra on roof structures, however current snow load requirements for new buildings built in Portland have been in effect since being adopted in 2008 by the Oregon Building Codes Division. Table 12-6 shows the percentage of properties in the City of Portland that were built before snow load codes went into effect. Pre-2008 properties are likely to be more vulnerable to potential roof collapse due to tephra accumulation. Additional vulnerable property includes equipment and machinery left out in the open whose parts can become clogged by the fine dust. Infrastructure, such as drainage systems, is potentially vulnerable to the effects of tephra, since the fine ash can clog pipes and culverts. This may be more of a problem if an eruption occurs during winter or early spring when precipitation is highest and floods are most likely.

To estimate the loss potential for this hazard, a qualitative approach was used, based on recommendations from FEMA guidelines on state and local mitigation planning. For this study, it was decided to use 0.1 percent as the loss ratio for the tephra hazard. Replacement valuations for all of Portland were the basis for these estimation, resulting in a loss estimate of $170,805,775.

Table 12-6. Age of Structures in Portland

	Pre-2008[a]		2008-present[a]	
Reporting Area	Number of Structures	Percent	Number of Structures	Percent
Airport	594	92.4%	49	7.6%
Central City	2,575	97.2%	74	2.8%
Central Northeast	17,051	98.0%	355	2.0%
East Portland	42,463	97.0%	1,292	3.0%
West/Northwest	7,616	97.4%	205	2.6%
North Portland	23,405	95.6%	1,084	4.4%
Northeast	19,932	96.4%	748	3.6%
Southeast	51,502	96.7%	1,768	3.3%
Southwest	22,539	97.5%	585	2.5%
Total	187,677	96.8%	6,160	3.2%

a. Year built information was collected from Multnomah County tax assessor data. When year built information was unavailable, it was estimated based on census block or county-wide average year built dates.

12.5.3 Critical Facilities

Lahar

Transportation routes that intersect with the lahar inundation zone are most vulnerable, especially depending on their structural stability. This would include roads, bridges and the Union Pacific Railway. The most vulnerable spots are those that directly intersect with a lahar outflow area and are not structurally sound. Utilities are vulnerable to damage from lahars due to the debris that may be carried. Most vulnerable are those that are located on or near parcels that intersect with the lahar outflow area or those that receive input from area streams and rivers that lahar flow through. Water treatment plants, potable water wells and wastewater treatment plants are vulnerable to contamination from debris that may be carried by a lahar.

Tephra

All transportation routes are exposed to tephra accumulation, which could create hazardous driving conditions on roads and highways and hinder evacuations and response. Machinery and equipment using these transportation routes would also be vulnerable. Water treatment plants and wastewater treatment plants are vulnerable to contamination from ash fall. Visibility in the short aftermath of an eruption would also be problematic.

12.5.4 Environment

The environment is very vulnerable to the effects of a volcanic eruption. A lahar could be very damaging to area rivers and streams and could redirect water flow and cause changes in water courses. Tephra accumulation would expose the local environment to lower air quality and other effects that could harm vegetation and water quality. This is particularly significant for the Bull Run watershed, where heavy ash fall could cause turbidity and water quality issues. The sulfuric acid contained in volcanic ash could be very damaging to area vegetation, water, wildlife, and air quality. Rivers and streams are also vulnerable to damage due to tephra.

12.5.5 Economic Impact

Volcanic eruptions can disrupt the normal flow of commerce and daily human activity without causing severe physical harm or damage. Ash that is a few inches thick can halt traffic, cause rapid wear of machinery, clog air filters, block drains, creeks and water intakes, and impact agriculture. Removal and disposal of large volumes of deposited ash can have significant impacts on government and business. The interconnectedness of the region's economy can be disturbed after a volcanic eruption. Roads, railroads and bridges can be damaged by lahars and mudflows. The Mount St. Helens May 1980 eruption demonstrated the negative effect on the tourism industry. Conventions, meetings, and social gatherings were canceled or postponed in cities and resorts throughout Oregon in areas not initially affected by the eruption. Columbia River shipping traffic was disrupted by mudflows that deposited more than 65 million cubic yards of sediment along the river bottom, reducing the depth of the navigational channel from 39 feet to less than 13 feet (USGS, 1997b). However, the eruption did lead to the creation of a thriving tourist industry for decades following the event.

The disruption of regional activity is further demonstrated by the 2010 eruption of Iceland's Eyjafjallajokull volcano, which led to European air travel being halted for several days. The movement of goods via major highways can also be halted due to tephra in the air. The Mount St. Helens event in May 1980 cost trade and commerce an estimated $50 million in only two days, as ships were unable to navigate the Columbia River. Clouds of ash often cause electrical storms that start fires, and damp ash can short-circuit electrical systems and disrupt radio communication. Volcanic activity can also lead to the closure of nearby recreation areas as a safety precaution long before the activity ever culminates in an eruption. Lloyd's City Risk Index estimates that a volcanic eruption from a nearby source could cause as much as $720 million of lost gross domestic product annually.

12.6 FUTURE TRENDS IN DEVELOPMENT

12.6.1 Lahar

Lahar zones are not identified as natural hazard areas under the Oregon Statewide Planning Goals or in the City's Comprehensive Plan. There are no known higher regulatory standards for development in these areas. The lahar inundation areas within the City are quite small (estimated to be less than 530 acres) and the likelihood of an eruption of the magnitude required to produce such lahars is quite low.

Future land use designations in the volcano distal hazard area in East Portland include:

- 66.0 percent Employment and Industrial
- 29.3 percent Open Space
- 4.7 percent Single-Dwelling Residential.

12.6.2 Tephra

All future development in Portland will be susceptible to the potential impacts from volcanic eruptions causing ash fall within the region. While this potential impact on the built environment is not considered to be significant, the economic impact on industries that rely on machinery and equipment such as agriculture or civil engineering projects could be significant. Since the extent and location of this hazard is difficult to gauge because it is dependent upon many variables, the ability to institute land use recommendations based on potential impacts of this hazard is limited. While the impacts of tephra are sufficient to warrant risk assessment for emergency management purposes, they are not sufficient to dictate land use decisions.

12.7 SCENARIO

12.7.1 Lahar

In the event of a volcanic eruption in Portland, there would probably not be any loss of life, due to adequate warnings. However, there could be great loss of property, especially in lahar inundation areas. The potential halting of Columbia River shipping traffic could severely impact the City of Portland's economy. There would also be the possibility of severe environmental impacts due to lahar flows in area rivers and streams.

12.7.2 Tephra

A large area could be affected by tephra accumulation. The most severe impacts would be on the environment. Any eruption of Mt. Hood would likely produce significant amounts of tephra in Portland. This impact is totally dependent upon the prevailing wind direction during and after the event. No one in Portland would likely be injured or killed by tephra, but businesses and non-essential government would be closed until the cloud passes. People and animals without shelter would be affected. Structures would be safe, but private property left out in the open might be damaged by the fine ash dust. Clean-up from such an event could be costly, depending upon the magnitude of the event.

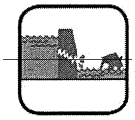
12.8 ISSUES

Since volcanic episodes have been fairly predictable in the recent past, there is probably not much concern about loss of life, but there is concern about loss of property, infrastructure and severe environmental impacts.

- All of Portland may be exposed to a tephra event.
- The East Portland risk reporting area is exposed to lahar hazards from a large magnitude event at Mount Hood.
- 25 people are estimated to reside in areas that may be impacted by lahar hazards.
- 43 buildings at an estimated replacement value of $480 million are exposed to the hazard. This represents about 1.9 percent of the risk reporting area and less than 1 percent of the total value of Portland.

- Buildings exposed are predominately commercial (24). There are also 7 residential, 7 industrial, and 5 educational buildings exposed.
- Residents who are 65 years or ago or older may be disproportionately exposed to the lahar hazard (24 percent).
- There are 91 critical facilities and critical infrastructure facilities located in the volcano hazard area.
- Tephra from volcanic eruptions can cause significant damage to heating and air conditioning systems and combustion systems.
- Tephra could cause turbidity and water quality issues in the Bull Run watershed.
- Tephra increases in weight significantly when wet and cleanup efforts can be extremely challenging.
- Lahars and mudflows could deposit large amounts of sediment into the Columbia River, significantly affecting shipping traffic and the local economy.
- Researchers continue to develop methods to predict volcanic eruptions accurately. Indications that an eruption may be imminent include swarms of small earthquakes as the magma rises up through the volcano, increases in gas emissions, and physical swelling or deformation of mountain slopes. Although warning time should be sufficient to prevent loss of life, the advent of these signs and the beginning of eruptive activity may be short.
- A regional Mount Hood Coordination plan has been developed to coordinate and plan for response activities in the event of an eruption. This plan should continue to be updated.

13. DAM FAILURE



13.1 GENERAL BACKGROUND

13.1.1 Causes of Dam Failure

Dam failures in the United States typically occur in one of four ways:

- Overtopping of the primary dam structure, which accounts for 34 percent of all dam failures, can occur due to inadequate spillway design, settlement of the dam crest, blockage of spillways, and other factors.
- Foundation defects due to differential settlement, slides, slope instability, uplift pressures, and foundation seepage can also cause dam failure. These account for 30 percent of all dam failures.
- Failure due to piping and seepage accounts for 20 percent of all failures. These are caused by internal erosion, erosion along hydraulic structures such as spillways, erosion due to animal burrows, and cracks in the dam structure.
- Failure due to problems with conduits and valves, typically caused by the piping of embankment material into conduits through joints or cracks, constitutes 10 percent of all failures.

The remaining 6 percent of U.S. dam failures are due to miscellaneous causes. Many dam failures in the United States have been secondary results of other disasters. The prominent causes are earthquakes, landslides, extreme storms, massive snowmelt, equipment malfunction, structural damage, foundation failures, and sabotage (ASDSO, 2016).

DEFINITIONS

- **Dam**—A hydraulic structure built above the natural ground grade line that is used to impound water. Dams include all appurtenant structures, and together are sometimes referred to as "the works." Dams include wastewater lagoons and other hydraulic structures that store water, attenuate floods, and divert water into canals (Oregon Administrative Rule, 2015)
- **Dam Failure**—An uncontrolled release of impounded water due to structural deficiencies in dam.
- **Emergency Action Plan**—A formal document that identifies potential emergency conditions at a dam and specifies actions to be followed to minimize property damage and loss of life. The plan specifies actions the dam owner should take to alleviate problems at a dam. It contains procedures and information to assist the dam owner in issuing early warning and notification messages to responsible downstream emergency management authorities of the emergency situation. It also contains inundation maps to show emergency management authorities the critical areas for action in case of an emergency. (FEMA 64)
- **High Hazard Dam**—Dams where failure or improper operation will probably cause loss of human life. (FEMA 333)
- **Significant Hazard Dam**—Dams where failure or improper operation will result in no probable loss of human life but can cause economic loss, environmental damage or disruption of lifeline facilities, or can impact other concerns. Significant hazard dams are often located in rural or agricultural areas but could be located in areas with population and significant infrastructure. (FEMA 333)

Poor construction, lack of maintenance and repair, and deficient operational procedures are preventable or correctable by a program of regular inspections. Terrorism and vandalism are serious concerns that all operators of public facilities must plan for; these threats are under continuous review by public safety agencies.

13.1.2 Regulatory Oversight

The dam failure risk assessment and mitigation strategies developed for this plan focus on impacts on people and property once a dam failure has occurred. The focus is not on dam operations to prevent dam failures from occurring, although a brief synopsis of regulatory programs impacting dam operations is included for reference.

National Dam Safety Act

The potential for catastrophic flooding due to dam failures led to passage of the National Dam Safety Act (Public Law 92-367). The National Dam Safety Program (NDSP) requires a periodic engineering analysis of every major dam in the country. The goal of this FEMA-monitored effort is to identify and mitigate the risk of dam failure so as to protect the lives and property of the public. The NDSP is a partnership between states, federal agencies, and other stakeholders that encourages individual and community responsibility for dam safety. State assistance funds have allowed participating states to improve their programs through increased inspections, emergency action planning, and the purchase of needed equipment. FEMA has also expanded existing and initiated new training programs. Grant assistance from FEMA provides support for improvement of dam safety programs that regulate most of the dams in the United States.

Oregon Dam Safety Guidelines

The Dam Safety Program of Oregon's Water Resources Department monitors dams at the state level. Reservoir storage permits are required for dams that are 10 feet or over in height and store at least 9.2 acre-feet of water (Oregon Water Resources Department, 2016b). The Department reviews design and specifications for dam construction and modification, conducts routine inspections and takes enforcement actions on dams that do not ensure the safety of life and property. Routine inspections for dams are conducted based on the hazard classification of the dam and range from annual inspections for high hazard dams to every six years for low hazard dams. (Oregon Administrative Rule, 2015).

U.S. Army Corps of Engineers Dam Safety Program

The U.S. Army Corps of Engineers is responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. The Corps has inventoried dams; surveyed each state and federal agency's capabilities, practices, and regulations regarding design, construction, operation and maintenance of the dams; and developed guidelines for inspection and evaluation of dam safety (U.S. Army Corps of Engineers, 2011).

Federal Energy Regulatory Commission Dam Safety Program

The Federal Energy Regulatory Commission (FERC) cooperates with a large number of federal and state agencies to ensure and promote dam safety. More than 3,000 dams are part of regulated hydroelectric projects in the FERC program. Two-thirds of these are more than 50 years old. As dams age, concern about their safety and integrity grows, so oversight and regular inspection are important. FERC inspects hydroelectric projects on an unscheduled basis to investigate the following:

- Potential dam safety problems
- Complaints about constructing and operating a project
- Safety concerns related to natural disasters
- Issues concerning compliance with the terms and conditions of a license.

Every five years, an independent FERC-approved engineer must inspect and evaluate projects with dams higher than 32.8 feet (10 meters), or with a total storage capacity of more than 2,000 acre-feet.

FERC monitors and evaluates seismic research and applies it in structural analyses of hydroelectric projects. FERC also evaluates the effects of potential and actual large floods on the safety of dams. During and following floods, FERC visits dams and licensed projects, determines the extent of damage, if any, and directs any necessary studies or remedial measures the licensee must undertake. The FERC publication *Engineering Guidelines for the Evaluation of Hydropower Projects* guides the FERC engineering staff and licensees in evaluating dam safety. The publication is frequently revised to reflect current information and methodologies.

FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans outline an early warning system if there is an actual or potential sudden release of water from a dam due to failure. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows, as well as procedures for notifying affected residents and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that everyone knows what to do in emergency situations (FERC, 2005).

13.2 HAZARD PROFILE

13.2.1 Past Events

Dam failures can occur suddenly and without warning. They may occur during normal operating conditions or during a large storm event. Significant rainfall can quickly inundate an area and cause floodwaters to overwhelm a reservoir. If the spillway of the dam cannot safely pass the resulting flows, water will begin flowing in areas not designed for such flows, and a failure may occur.

According to the Association of State Dam Safety Officials, there have been no recorded dam incidents in or near the City of Portland (ASDSO, 2016). Between 1953 and 2015, FEMA has not declared any major disasters or emergencies from dam failure events in Portland. The Oregon Natural Hazard Mitigation Plan notes that a major dam failure occurred near Hermiston in Umatilla County in 2005 and in Klamath Lake in 2006 (Oregon Department of Land Conservation and Development, 2015).

13.2.2 Location

There are seven dams located in Portland, three in the Bull Run Watershed, and one located upstream of the City on the Columbia River. The single dam on the main-stem of the Willamette River is a natural weir-type dam with hydroelectric generation, located at Willamette Falls, 10 miles upriver from downtown Portland. It also has a system of navigation locks, which are out of service as of 2011. The dam, owned by Portland General Electric (PGE), is a run-of-river dam and does not provide usable water storage or flood control (LIHI, 2016). There are also dams on tributaries of the Willamette that could impact Portland, but any such impacts would be expected to be minor. A review of the inundation mapping for these dams indicates that a failure of any of the dams located in the Bull Run Watershed would not be expected to impact the City of Portland. Impacts for the City of Portland from the Bonneville Dam on the Columbia River are not clearly understood at this time.

Information on dams located in or near Portland is listed in Table 13-1. Four are inspected by federal agencies, and the remainder are under the jurisdiction of the state.

Table 13-1. Dams in Portland

Name	*National ID #*	River	Height (feet)	Storage Capacity (acre-feet)	Last Inspection	Hazard Class
Bonneville Dam[c]	OR00001	Columbia	110.0	277,000	4/3/2008 (Federal)	High
Bull Run Lake Dam[b]	OR00300	Bull Run River	55.0	14,500	4/28/1995 (Federal)	Low
Bull Run Dam 1 (upper)[b]	OR00327	Bull Run River	194.0	33,760	6/12/2012 (Federal)	High
Bull Run Dam 2 (lower)[b]	OR00317	Bull Run River	125	21,000	6/12//2012 (Federal)	High
Mt. Tabor Reservoir #1[a]	OR00667	Bull Run River (off-stream)	30	37	11/12/2015	High
Mt. Tabor Reservoir #5[a]	OR00670	Bull Run River (off-stream)	55	153	11/12/2015	High
Mt. Tabor Reservoir #6[a]	OR00671	Bull Run River (off-stream)	28	230	11/12/2015	High
Washington Park Reservoir #3[a]	OR00668	Bull Run River (off-stream)	53	50	11/12/2015	High
Washington Park Reservoir #4[a]	OR00669	Bull Run River (off-stream)	60	54	11/12/2015	High
Portland International Airport De-icing Lagoon[a]	OR03822	N/A	20	67	03/15/2011	Low
Smith-Bybee Lakes[a]	OR00680	Columbia Slough	14	4,100	8/25/2010	Low
Willamette Falls[c]	OR00596	Willamette River	37	17,000	8/28/2012	High

a. Located in Portland.
b. Located in Bull Run Watershed
c. Located upstream of the City.
Source: Oregon Water Resources Department Dam Inventory Query, 2016a and U.S. Army Corps National Inventory of Dams, 2016

13.2.3 Frequency

Dam failure events are infrequent and usually coincide with events that cause them, such as earthquakes, landslides and excessive rainfall and snowmelt; however, dam failures can occur at any time. There is a residual risk associated with dams. Residual risk is the risk that remains after safeguards have been implemented. For dams, the residual risk is associated with events beyond those that the facility was designed to withstand. However, the probability of any type of dam failure is low in today's regulatory and dam safety oversight environment.

13.2.4 Severity

Dam failure can be catastrophic to all life and property downstream. The Oregon Dam Safety Program classifies dams and reservoirs in a three-tier hazard rating system primarily using the results of dam breach analyses. Dams are classified as high, medium or low based on the following criteria (Oregon Administrative Code, 2015):

a) An inundation depth of flowing water of at least two feet over the finished floors of dwellings, other frequently occupied buildings, or road surfaces where a vehicle is likely to be present establishes a "high hazard" rating.
b) Any inundation depth of water over the floorboards of structural buildings establishes a "significant hazard" rating.
c) For other roads and vulnerable utilities, an inundation depth of two feet or evidence of depth and velocity capable of creating damage establishes a "significant hazard" rating.
d) Wherever heavy recreational or other frequent use occurs downstream a "high hazard" rating shall be established to prevent probable loss of life. Such designation shall not depend on the presence of downstream infrastructure

e) For water depths close to those listed in the subsections (a) and (c), the Department may also consider water velocity in its determination of hazard rating.

The U.S. Army Corps of Engineers developed the classification system shown in Table 13-2 for the hazard potential of dam failures. The Oregon and Corps of Engineers hazard rating systems are both based only on the potential consequences of a dam failure; neither system takes into account the probability of such failures.

Table 13-2. Corps of Engineers Hazard Potential Classification

Hazard Category[a]	Direct Loss of Life[b]	Lifeline Losses[c]	Property Losses[d]	Environmental Losses[e]
Low	None (rural location, no permanent structures for human habitation)	No disruption of services (cosmetic or rapidly repairable damage)	Private agricultural lands, equipment, and isolated buildings	Minimal incremental damage
Significant	Rural location, only transient or day-use facilities	Disruption of essential facilities and access	Major public and private facilities	Major mitigation required
High	Certain (one or more) extensive residential, commercial, or industrial development	Disruption of essential facilities and access	Extensive public and private facilities	Extensive mitigation cost or impossible to mitigate

a. Categories are assigned to overall projects, not individual structures at a project.
b. Loss of life potential based on inundation mapping of area downstream of the project. Analyses of loss of life potential should take into account the population at risk, time of flood wave travel, and warning time.
c. Indirect threats to life caused by the interruption of lifeline services due to project failure or operational disruption; for example, loss of critical medical facilities or access to them.
d. Damage to project facilities and downstream property and indirect impact due to loss of project services, such as impact due to loss of a dam and navigation pool, or impact due to loss of water or power supply.
e. Environmental impact downstream caused by the incremental flood wave produced by the project failure, beyond what would normally be expected for the magnitude flood event under which the failure occurs.

Source: U.S. Army Corps of Engineers, 1995

13.2.5 Warning Time

Warning time for dam failure varies depending on the cause of the failure. In events of extreme precipitation or massive snowmelt, evacuations can be planned with sufficient time. In the event of a structural failure due to earthquake, there may be no warning time. A dam's structural type also affects warning time. Earthen dams do not tend to fail completely or instantaneously. Once a breach is initiated, discharging water erodes the breach until either the reservoir water is depleted or the breach resists further erosion. Concrete gravity dams also tend to have a partial breach as one or more monolith sections are forced apart by escaping water. The time of breach formation ranges from a few minutes to a few hours (U.S. Army Corps of Engineers, 1997).

The City of Portland has established protocols for flood warning and response to imminent dam failure in the flood warning portion of its adopted emergency operations plan. These protocols are tied to the emergency action plans created by the dam owners.

13.3 COMPOUNDING FACTORS AND SECONDARY HAZARDS

13.3.1 Overview

Dam failure can cause severe downstream flooding, depending on the magnitude of the failure. Other potential secondary hazards of dam failure are landslides around the reservoir perimeter, bank erosion on the rivers, and destruction of downstream habitat.

13.3.2 Climate Change

Dams are designed partly based on assumptions about a river's hydrograph. If changes in weather patterns have significant effects on hydrographs, the dam can lose some or all of its designed margin of safety, also known as freeboard. If freeboard is reduced, dam operators may be forced to release increased volumes earlier in a storm cycle in order to maintain required margins of safety. Such early releases can increase flood potential downstream. The dams assessed in this risk assessment are off-stream dams meaning that they are not located on a river course. This means that they are not as likely to experience changes in operations resulting from changes in the region's hydrograph.

13.4 EXPOSURE

The flood module of Hazus-MH was used for a Level 2 assessment of dam failure. Hazus-MH uses census data at the block level, which has a level of accuracy acceptable for planning purposes. Where possible, the Hazus-MH data was enhanced for this risk assessment using GIS data from local, state and federal sources. The exposure and vulnerability estimates provided below are based on failure events of Mount Tabor Reservoirs 1, 5, and 6, and Washington Park Reservoirs 3 and 4. Inundation maps and depth grids were prepared for this analysis, but are not included in the publicly available version of this plan due to security concerns. It should be noted that the inundation events used for this analysis were conducted before the recent plans to improve the Washington Park Reservoir and to decommission and make adjustments to the Mt. Tabor reservoirs. Risk and vulnerability to this hazard should be reassessed when improvements, adjustments and decommissioning activities are complete.

13.4.1 Population

All populations in an inundation zone would be exposed to the risk of a dam failure. The potential for loss of life is affected by the capacity and number of evacuation routes available to populations in areas of potential inundation as well as the amount of warning time before the event. The estimated population living in the mapped inundation areas in Portland is 15,277 or 2.5 percent of the city's population; however, there is some overlap between the Mount Tabor inundation areas, so total exposure of those residing in these areas may be overestimated. Table 13-3 summarizes the at-risk population in Portland by risk reporting area. Population exposure is concentrated in the Southeast area for the Mount Tabor reservoirs and in the Central City for the Washington Park reservoirs. Population exposure may increase depending on the time of day and whether or not residents are at home, work, school or commuting. Both Mount Tabor and Washington Park are used heavily by residents and tourists for recreation, so they may have significantly higher populations during pleasant weather conditions.

Table 13-4 shows the estimated percent of the population believed to be residing in mapped inundation areas for our social vulnerability indicators. Based on these estimates, a disproportionate number of limited English speaking households may be exposed to the Mount Tabor reservoir 1 inundation area, while a disproportionate number of renters and families living in poverty may be exposed to Washington Park inundation areas.

Table 13-3. Population within Dam Failure Areas

Reporting Area	Mount Tabor Reservoir 1		Mount Tabor Reservoirs 5 and 6		Washington Park Reservoirs 3 and 4	
	Population Exposed[a]	% of Total Population	Population Exposed[a]	% of Total Population	Population Exposed[b]	% of Total Population
Airport	0	0.0%	0	0.0%	0	0.0%
Central City	0	0.0%	0[b]	0.0%[b]	621	1.6%
Central Northeast	0	0.0%	0	0.0%	0	0.0%
East Portland	0	0.0%	0	0.0%	0	0.0%
North Portland	0	0.0%	0	0.0%	0	0.0%
Northeast	0	0.0%	0	0.0%	0	0.0%
Southeast	2,179	1.4%	12,477	8.1%	0	0.0%
Southwest	0	0.0%	0	0.0%	0 [b]	0.0% [b]
West/Northwest	0	0.0%	0	0.0%	0 [b]	0.0% [b]
Total	**2,179**	**0.4%**	**12,477**	**2.0%**	**621**	**0.1%**

a. Represents the percent of residential buildings that are exposed multiplied by the estimated 2010-2014 American Community Survey 5-year estimates.
b. It should be noted that there are structures exposed to the inundation areas; however, no structures are believed to be residential.

Table 13-4. Social Vulnerability Indicators Residing in Inundation Areas[a, b, c]

Reporting Area	Percent Under 15 Years	Percent Over 65 Years	Percent of People of Color	Percent of Renter occupied Housing	Percent of Families Below Poverty Level	Percent of Limited English Speaking Households
Mt Tabor Reservoir 1 Inundation Scenario						
Southeast	11.6%	9.4%	12.5%	45.4%	10.3%	5.6%
Mt Tabor Reservoirs 5 and 6 Inundation Scenario						
Southeast	15.4%	9.0%	12.5%	37.5%	6.5%	2.5%
Washington Park Reservoirs 3 and 4 Inundation Scenario						
Central City	2.1%	4.6%	19.3%	90.3%	27.1%	1.7%

a. Values based on an analysis of 2010-2014 American Community Survey 5-year estimates at the Census block group level.
b. Values calculated using block group statistics weighted by the number of residential structures in the hazard area as a percentage of the total residential structures in the block group.
c. Values in red indicate percentages are at least 2 percent greater than the Citywide average (see Section 4.7).

13.4.2 Property

Table 13-5 summarizes the value of Portland buildings in the mapped inundation areas. Less than 2 percent of the total replacement value of Portland is exposed to the dam failure hazard. Table 13-6 lists the structure type of buildings in the inundation areas. In the Mount Tabor inundation areas residential properties comprise much of the exposure. A majority of the structures impacted by the Washington Park Reservoirs are believed to be for commercial uses.

Table 13-5. Exposure and Value of Structures in Dam Failure Inundation Areas

Reporting Area	Value Exposed			Exposed Value	
	Structure	Contents	Total	as % of Area Total Replacement Value	as % of City Total Replacement Value
Mt Tabor Reservoir 1 Inundation Scenario					
Southeast	$291,832,348	$175,797,200	$467,629,548	1.5%	0.3%
Mt Tabor Reservoirs 5 and 6 Inundation Scenario					
Central City	$12,883,014	$12,739,561	$25,622,575	0.1%	--
Southeast	$1,406,503,787	$870,603,853	$2,277,107,640	7.5%	--
Total	***$1,419,386,801***	***$883,343,414***	***$2,302,730,215***	--	***1.3%***
Washington Park Reservoirs 3 and 4 Inundation Scenario					
Central City	$85,429,547	$58,155,084	$143,584,631	0.5%	--
Southwest	$334,390	$334,390	$668,780	0.0%	--
West/Northwest	$3,706,933	$3,706,933	$7,413,865	0.1%	--
Total	***$89,470,870***	***$62,196,406***	***$151,667,276***	--	***0.1%***

Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

Table 13-6. Area and Number of Structures in the Inundation Areas

Reporting Area	Inundation Area (acres)	Number of Structures in the Inundation Areas[a]						
		Residential	Commercial	Industrial	Religion	Government	Education	Total
Mt Tabor Reservoir 1 Inundation Scenario								
Southeast	179.8	717	12	0	1	0	9	739
Mt Tabor Reservoirs 5 and 6 Inundation Scenario								
Central City	37.9	0	9	0	0	3	0	12
Southeast	807.1	4,106	187	0	15	3	7	4,318
Total	***845.1***	***4,106***	***196***	***0***	***15***	***6***	***7***	***4,330***
Washington Park Reservoirs 3 and 4 Inundation Scenario								
Central City	34.4	14	21	5	0	0	0	40
Southwest	3.0	0	0	0	0	1	0	1
West/Northwest	5.4	0	11	0	0	0	0	11
Total	***42.7***	***14***	***32***	***5***	***0***	***1***	***0***	***52***

a. Values based off of City of Portland building inventory data received October 2015.

13.4.3 Critical Facilities

GIS analysis determined that there are critical facilities in the mapped inundation area as listed in Table 13-7 through Table 13-9.

13.4.4 Environment

In general, reservoirs held behind dams affect many ecological aspects of a river. River topography and dynamics depend on a wide range of flows, but rivers below dams often experience long periods of very stable flow conditions or saw-tooth flow patterns caused by releases followed by no releases. Water releases from dams usually contain very little suspended sediment; this can lead to scouring of river beds and banks. The dam failure inundation scenarios assessed for this assessment are located off-stream, so significant impacts on river ecosystems would not be expected. The environment would still be exposed to a number of risks in the event of dam failure.

Table 13-7. Critical Facilities in Inundation Areas

Reporting Area	Number of Critical Facilities in the Inundation Areas[b]				
	Emergency Services	High Potential Loss Facilities[a]	Schools	Other Assets	Total
Mt Tabor Reservoir 1 Inundation Scenario					
Southeast	0	0	1	1	2
Mt Tabor Reservoirs 5 and 6 Inundation Scenario					
Central City	0	1	0	0	1
Southeast	2	0	4	2	8
Total	***2***	***1***	***4***	***2***	***9***
Washington Park Reservoirs 3 and 4 Inundation Scenario					
Central City	0	0	0	0	0
Southwest	0	0	0	0	0
West/Northwest	0	0	0	0	0
Total	***0***	***0***	***0***	***0***	***0***

a. Includes one hazardous material containing facility.
b. See Table 6-1 for a description of the facilities included in each category.

Table 13-8. Critical Infrastructure in Inundation Areas

Reporting Area	Number of Critical Infrastructure Facilities in the Inundation Areas[b]					
	Transportation Systems	Utility Systems				Total
		Communications	Power	Potable Water[a]	Wastewater	
Mt Tabor Reservoir 1 Inundation Scenario						
Southeast	0	0	0	0	0	0
Mt Tabor Reservoirs 5 and 6 Inundation Scenario						
Central City	0	0	1	0	1	2
Southeast	0	0	2	1	0	3
Total	***0***	***0***	***3***	***1***	***1***	***5***
Washington Park Reservoirs 3 and 4 Inundation Scenario						
Central City	0	0	0	0	0	0
Southwest	0	0	0	0	0	0
West/Northwest	0	0	0	3	0	3
Total	***0***	***0***	***0***	***3***	***0***	***3***

a. In addition to the facilities outlined above, there are several potable water facilities exposed to dam failure inundation areas in the Bull Run Watershed. The mapped inundation areas for these dams are not expected to have impacts within the city boundaries.
b. See Table 6-1 for a description of the facilities included in each category.

Table 13-9. Linear Critical Facilities in Inundation Areas

	Facilities in Inundation Area		
	Mount Tabor Reservoir 1	Mount Tabor Reservoirs 5 and 6	Mount Tabor Reservoirs 3 and 4
Utility Systems			
Power Lines	0.43 miles, 0.1% of citywide total	2.39 miles, 0.5% of citywide total	4.69 miles, 1.0% of citywide total
Gas Lines	0.36 miles, 0.4% of citywide total	no exposure	1.58 miles or 1.9% of citywide total
Transportation Systems			
Railroads	No exposure	no exposure	1.19 miles, 0.3% of citywide total
Light Rail	No exposure	0.63 miles or 1.2% of the citywide system	0.76 miles, 1.4% of citywide total
Major Roads	SE Powell Blvd, SE Cesar E Chavez Blvd, SE Division St	SE Powell Blvd, SE Cesar E Chavez Blvd, SE Division St, SE Water Ave, SE Milwaukie Ave, SE Hawthorne Blvd	SW Jefferson St
Highways	Highways in Portland may be exposed to the dam inundation hazard, but they are likely to be elevated above potential inundation areas		

13.5 VULNERABILITY

13.5.1 Population

Vulnerable populations are all populations downstream from dam failures that are unlikely to escape the area within the allowable time frame. This includes the elderly, young or others with access and functional needs, who may be unable to get themselves out of the inundation area. Vulnerable populations also include those who would not have adequate warning from a cell phone, television or radio emergency warning system or are unable to understand warnings provided due to language barriers or other disabilities. It likely that many households living in the inundation areas are not aware that they reside in such areas, renters may be less likely to be so informed.

Estimates for the number of people who would be displaced and require short-term shelter were estimated for dam failure events through the Level 2 Hazus-MH analysis. Table 13-10 summarizes the results.

Table 13-10. Estimated Dam Failure Impact on Persons and Households

	Displaced Population[a]		Persons Requiring Short-Term Shelter[a]	
	Number	% of Population	Persons	% of Population
Mt Tabor Reservoir 1 Inundation Scenario				
Southeast	924	0.6%	754	0.5%
Mt Tabor Reservoirs 5 and 6 Inundation Scenario				
Central City	0	0%	0	0%
Southeast	7,662	5.0%	2,983	1.9%
Total	***7,662***	***1.2%***	***2,983***	***0.5%***
Washington Park Reservoirs 3 and 4 Inundation Scenario				
Central City	285	0.8%	275	0.7%
Southwest	0	0%	0	0%
West/Northwest	0	0%	0	0%
Total	***285***	***Less than 0.1%***	***275***	***Less than 0.1%***

a. Calculated using a Census block level, general building stock analysis in Hazus 2.2, and adjusted to reflect the estimated population.

13.5.2 Property

Vulnerable properties are those closest to the inundation areas. These properties would experience the largest, most destructive surge of water. Low-lying areas are also vulnerable since they are where the reservoir waters would collect.

A failure of the Mount Tabor Reservoirs 5 and 6 would be expected to lead to the most significant damage, with 2,990 structures impacted, resulting in more than $644 million in expected losses (about 0.4 percent of the total replacement value of Portland). Table 13-11 shows loss estimates for each scenario.

Table 13-11. Loss Estimates for Dam Failure

Reporting Area	Number of Structures Impacted	Estimated Loss			Estimated Loss as % of Replacement Value	
		Structure	Contents	Total	Area	City
Mt Tabor Reservoir 1 Inundation Scenario						
Southeast	572	$59,444,985	$35,989,157	$95,434,142	0.3%	0.1%
Mt Tabor Reservoirs 5 and 6 Inundation Scenario						
Central City	7	$43,999	$320,561	$364,561	Less than 0.1%	--
Southeast	2,983	$347,569,555	$296,128,894	$643,698,449	2.1%	--
Total	***2,990***	***$347,613,554***	***$296,449,455***	***$644,063,009***	**--**	***0.4%***
Washington Park Reservoirs 3 and 4 Inundation Scenario						
Central City	35	$27,788,472	$31,964,599	$59,753,072	0.2%	--
Southwest	1	$317,670	$334,390	$652,060	Less than 0.1%	--
West/Northwest	8	$2,240,150	$3,400,792	$5,640,942	Less than 0.1%	--
Total	***44***	***$30,346,293***	***$35,699,782***	***$66,046,074***	**--**	***Less than 0.1%***

Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

Table 13-12 shows the number of buildings in each hazard area that are believed to have active flood insurance policies. Flood insurance uptake in these areas is quite low with approximately 10 active policies in all three inundation areas combined.

Table 13-12. Percent of Buildings in Dam Inundation Areas with Flood Insurance

Reporting Area	Total Buildings in Inundation Area	Buildings with Flood Insurance	% of Buildings with Flood Insurance
Mt Tabor Reservoir 1 Inundation Scenario			
Southeast	739	1	0.1%
Mt Tabor Reservoirs 5 and 6 Inundation Scenario			
Central City	12	1	8.3%
Southeast	4,318	8	0.2%
Total	***4,330***	***9***	***0.2%***
Washington Park Reservoirs 3 and 4 Inundation Scenario			
Central City	40	0	0.0%
Southwest	1	0	0.0%
West/Northwest	11	0	0.0%
Total	***52***	***0***	***0.0%***

13.5.3 Critical Facilities

Estimated damage to critical facilities and infrastructure in the dam inundation areas is summarized in Table 13-13 through Table 13-15.

Transportation routes are vulnerable to dam inundation and have the potential to be wiped out, creating isolation issues. This includes all roads and railroads in the path of the dam inundation. Those that are most vulnerable are those that are already in poor condition and would not be able to withstand a large water surge. Utilities such as overhead power lines, cable and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues for the inundation areas. Facilities containing hazardous materials or the containers used to store them could be damaged during a dam failure event resulting in material releases that could be harmful to people, property and environment in the area.

Table 13-13. Estimated Critical Facilities and Infrastructure Damage—Mount Tabor Reservoir 1 Failure

	Number of Facilities Impacted	Average % of Total Value Damaged		Days to 100% Functionality
		Building	Content	
Emergency Services	0	--	--	--
Schools	1	0.7	4.0	480
Transportation Systems	0	--	--	--
High Potential Loss Facilities	0	--	--	--
Utility Systems				
Communications	--	--	--	--
Power	--	--	--	--
Potable Water	--	--	--	--
Wastewater	--	--	--	--
Other Assets	1	0.0	0.0	--
Total/Average	**2**	**0.7**	**4.0**	**480**

Table 13-14. Estimated Critical Facilities and Infrastructure Damage—Mount Tabor Reservoir 5 and 6 Failure

	Number of Facilities Impacted	Average % of Total Value Damaged		Days to 100% Functionality
		Building	Content	
Emergency Services	2	3.6	4.1	480
Schools	4	8.8	37.5	420
Transportation Systems	0	--	--	--
High Potential Loss Facilities	1	0.0	--	--
Utility Systems				
Communications	0	--	--	--
Power	3	0.13	--	--
Potable Water	1	--	--	--
Wastewater	1	--	--	--
Other Assets	2	--	--	--
Total/Average	**14**	**3.1**	**20.8**	**450**

Table 13-15. Estimated Critical Facilities and Infrastructure Damage—Washington Park Reservoir 3 and 4 Failure

	Number of Facilities Impacted	Average % of Total Value Damaged		Days to 100% Functionality
		Building	Content	
Emergency Services	0	--	--	--
Schools	0	--	--	--
Transportation Systems	0	--	--	--
High Potential Loss Facilities	0	--	--	--
Utility Systems				
Communications	0	--	--	--
Power	0	--	--	--
Potable Water	3	40.0	--	--
Wastewater	0	--	--	--
Other Assets	0	--	--	--
Total/Average	**3**	**40.0**	**--**	**--**

13.5.4 Environment

The extent of the vulnerability of the environment is the same as the exposure of the environment. As with any significant natural hazard event, large of amounts of debris generated from the damaged buildings and infrastructure could have significant environmental impacts. These impacts were estimated for the dam failure event through the Level 2 Hazus-MH analysis. Table 13-16 summarizes the results.

In addition, habitat of plants and animals would be detrimentally effected by the surge of water resulting from the failure. Hazardous materials could be released into the environment during the inundation. This release could have both immediate and long-term impacts to the natural environment as well as human health and safety.

Table 13-16. Estimated Dam Failure-Caused Debris

	Debris to Be Removed (tons) [a]	Estimated Number of Truckloads[b]
Mt Tabor Reservoir 1 Inundation Scenario		
Southeast	12,122	485
Mt Tabor Reservoirs 5 and 6 Inundation Scenario		
Central City	1	0
Southeast	59,740	2,390
Total	***59,741***	***2,390***
Washington Park Reservoirs 3 and 4 Inundation Scenario		
Central City	3,781	151
Southwest	267	11
West/Northwest	8	1
Total	***4,056***	***162***

a. Debris generation estimates were calculated using a census block level, general building stock analysis in Hazus 2.2
b. Hazus-MH assumes 25 tons/trucks
Note: Values shown are accurate only for comparison among results in this plan. See Section 6.8 for a discussion of data limitations.

13.5.5 Economic Impact

In general, dam failure presents the potential for significant disruption, including loss of life, massive property damage, and other long-term consequences. All of these are likely to impact the local economy, directly and indirectly. Economic losses can include the cost to rebuild structures and properties, the cost of response, and recovery, and long-term costs to repair environmental damage. It can also have a hidden impact, by reducing public morale and confidence, resulting in decreased spending in local stores and businesses near the event's occurrence. Such indirect and cascading impacts, however, are difficult to quantify, even though FEMA recognizes their significance and probability. FEMA provides resources to assist jurisdictions in estimating both direct and indirect economic consequences after a dam failure (Homeland Security, 2011)

13.6 FUTURE TRENDS IN DEVELOPMENT

Land use in Portland will be directed by the Portland Comprehensive Plan adopted under state law. The City has established comprehensive policies regarding sound land use in identified flood hazard areas; however, these policies and related regulations in the local municipal code are unlikely to impact land use and development decisions in dam inundation areas, because these areas are off stream and generally unconnected to floodplains.

Table 13-17 shows the future land use designations in the dam inundation areas. The majority of the land area in both the Mount Tabor 1 and 5 and 6 inundation scenarios is designated as single-family dwellings, while the dominant use in the Washington park inundation area is commercial.

Table 13-17. Future Land Use Designations in Dam Failure Inundation Areas

		Percent of total acres					
		Residential					
Reporting Area	Total Acreage	Single-Dwelling	Multi-Dwelling	Commercial	Employment & Industrial	Mixed Use & Institutional	Open Space
Mt. Tabor Reservoir 1							
Southeast	180	58.0%	18.9%	0.0%	0.3%	16.3%	**6.6%**
Total	***180***	***58.0%***	***18.9%***	***0.0%***	***0.3%***	***16.3%***	***6.6%***
Mt. Tabor Reservoirs 5 and 6							
Central City	38	0.0%	0.0%	0.0%	97.5%	0.0%	**2.5%**
Southeast	807	68.2%	13.1%	0.0%	2.4%	13.4%	**2.8%**
Total	***845***	***65.2%***	***12.5%***	***0.0%***	***6.7%***	***12.8%***	***2.8%***
Washington Park Reservoirs 3 and 4							
Central City	34	0.0%	4.9%	80.4%	0.0%	0.0%	**14.8%**
Southwest	3	40.5%	0.0%	0.0%	0.0%	59.5%	**0.0%**
West/Northwest	5	17.7%	0.6%	0.0%	0.0%	3.0%	**78.7%**
Total	***43***	***5.0%***	***4.0%***	***64.7%***	***0.0%***	***4.5%***	***21.8%***

Source: Future land use categories are based on the proposed comprehensive plan designations as of February 2016

13.7 SCENARIO

An earthquake in the region could lead to liquefaction or sliding of soils around a dam. This could occur without warning during any time of the day. Failure of a high hazard dam in the City would likely result

in the loss of life, roadways, structures and property and cause severe impacts on the local economy. While the possibility of failure is low, results of such an event would be devastating.

13.8 ISSUES

The most significant issue associated with dam failure involves the properties and populations in the inundation zones. Flooding as a result of a dam failure would significantly impact these areas. There is often limited warning time for dam failure. These events are frequently associated with other natural hazard events such as earthquakes, landslides or severe weather, which limits their predictability and compounds the hazard.

The following issues have been identified based on the Mt Tabor Reservoir 1 inundation scenario:

- Immediate impacts will be contained within the Southeast risk reporting area.
- More than 2,100 people are estimated to reside within the inundation areas. Of these, it is estimated that 924 people will be displaced from their homes after an event and 754 of these people will seek shelter in public shelters.
- Of the 739 buildings exposed, 572 are expected to be impacted by a dam failure event, resulting in more than $95.4 million in damage. This is less than 1 percent of the total value of the Southeast risk reporting area and less than 0.1 percent of the total value of Portland.
- The structures exposed to the hazard are predominantly residential (97 percent); however, there are also 9 structures identified as educational occupancy, 12 commercial structures and 1 religious structure in the exposure area.
- More than 12,120 tons of debris would be expected from the inundation event, which will require approximately 485 truckloads to remove.
- Only 1 building in the inundation area is believed to have flood insurance.
- There are 2 critical facilities located in the inundation area.
- Limited English speaking households may disproportionately reside in inundation areas in the Southeast risk reporting area (6 percent).

The following issues have been identified based on the Mt Tabor Reservoir 5 and 6 inundation scenario:

- Immediate impacts will be contained within the Central City and Southeast risk reporting areas. The vast majority of exposure is in the Southeast (96 percent of inundation area).
- 12,477 people are estimated to reside within the inundation areas. Of these, it is estimated that 7,662 people will be displaced from their homes after an event and 2,983 of these people will seek shelter in public shelters.
- There are 4,300 buildings estimated to be exposed to the dam inundation area.
- The vast majority of exposed structures in the Southeast reporting area are residential (95 percent).
- More than 59,741 tons of debris would be expected from the inundation event, which will require approximately 2,390 truckloads to remove.
- Of the 4,106 buildings exposed, 2,990 are expected to be impacted by a dam failure event, resulting in more than $2.3 billion in damage. This is 1.3 percent of the total value of the Southeast risk reporting area and less than 0.1 percent of the total value of Portland.
- Only 9 buildings in the inundation area are believed to have flood insurance.
- There are 14 critical facilities located in the inundation area.

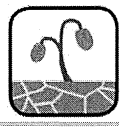
The following issues have been identified based on the Washington Park Reservoirs 3 and 4 inundation scenario:

- Immediate impacts will be contained predominantly within the Central City and the West/Northwest risk reporting area. There is one government building exposed in the Southwest.
- 621 people are estimated to reside within the inundation areas. Of these, it is estimated that 285 people will be displaced from their homes after an event and 275 of these people will seek shelter in public shelters.
- It is estimated that over 90 percent of the population exposed to the dam failure hazard reside in renter occupied housing and that more than 27 percent of families in the hazard area have incomes below the poverty level.
- Of the 52 buildings exposed, 44 are expected to be impacted by a dam failure event, resulting in more than $66 million in damage. This is less than 1 percent of the total value of the risk reporting areas impacted and less than 0.1 percent of the total value of Portland.
- All structures exposed within the West/Northwest area are commercial structures. Structures exposed in the Central City are mixed: 14 residential, 21 commercial, 5 industrial.
- More than 4,056 tons of debris would be expected from the inundation event, which will require approximately 162 truckloads to remove. Most debris will be in the Central City.
- No buildings in the inundation areas are believed to have flood insurance.
- There are 3 critical facilities located in the inundation area.
- Renters and families with incomes below the federal poverty level may disproportionately reside in the inundation areas in the Central City risk reporting area (90 percent and 27 percent, respectively).

The following general issues have been identified:

- It is unclear whether dam failure warning and notification strategies will be viable if dam failure occurs as a result of a significant earthquake that interrupts communication systems.
- Those with access and functional needs may not be able to evacuate if warning time for an event is limited.
- There is the potential for available warnings to be missed or misunderstood as a result of language or other cultural barriers.
- Downstream populations are often not aware that they are located in a dam failure inundation area and do not know the risks associated with probable dam failure.
- Balancing the need to address security concerns and the need to inform the public of the risk associated with dam failure is a challenge for public officials.
- The vast majority of structures located in the dam inundation areas do not have flood insurance.

14. DROUGHT



14.1 GENERAL BACKGROUND

Most regions experience drought conditions periodically. According to the National Drought Mitigation Center, drought originates from a deficiency of precipitation over an extended period of time, usually a season or more. This results in a shortage of water needed to support a specific activity, group, or environmental sector. Drought is the result of a significant decrease in water supply relative to what is "normal" in a given location. Unlike most disasters, droughts normally occur slowly but last a long time. There are four generally accepted operational definitions of drought (National Drought Mitigation Center, 2006):

DEFINITIONS

- **Drought**—The cumulative impacts of several dry years on water users. It can include deficiencies in surface and subsurface water supplies and generally impacts health, well-being, and quality of life.
- **Meteorological Drought**—An abnormally low level of precipitation over a period of time.
- **Agricultural Drought**—When there is not enough soil moisture to support crop needs at a particular time.
- **Hydrological Drought**—Deficiencies in surface and subsurface water supplies.
- **Socioeconomic Drought**—Drought impacts on a population's health, well-being and quality of life.

- **Meteorological drought** is an expression of precipitation's departure from normal over a period of time. Meteorological measurements are the first indicators of drought. Definitions are usually region-specific, and based on an understanding of regional climate. A definition of drought developed in one part of the world may not apply to another, given the wide range of meteorological definitions.
- **Agricultural drought** occurs when there is not enough soil moisture to meet the needs of a particular crop at a particular time. Agricultural drought happens after meteorological drought but before hydrological drought. Agriculture is usually the first economic sector to be affected by drought.
- **Hydrological drought** refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow and as lake, reservoir, and groundwater levels. There is a time lag between lack of rain and less water in streams, rivers, lakes and reservoirs, so hydrological measurements are not the earliest indicators of drought. After precipitation has been reduced or deficient over an extended period of time, this shortage is reflected in declining surface and subsurface water levels. Water supply is controlled not only by precipitation, but also by other factors, including evaporation (which is increased by higher than normal heat and winds), transpiration (the use of water by plants), and human use.
- **Socioeconomic drought** occurs when a physical water shortage starts to affect people, individually and collectively. Most socioeconomic definitions of drought associate it with the supply and demand of an economic good.

Defining when drought begins is a function of the impacts on water users, and includes consideration of the supplies available to local users as well as the stored water available in surface reservoirs or groundwater basins. Different water agencies have different criteria for defining drought. Some issue drought watch or drought warning announcements to their customers. Determinations of regional or

statewide drought conditions are usually based on a combination of hydrologic and water supply factors. The State of Oregon has a statutory definition of drought (Oregon Revised Statute §539.710), described as a potential state emergency when a lack of water resources threatens the availability of essential services and jeopardizes the peace, health, safety, and welfare of the people of Oregon.

14.2 HAZARD PROFILE

Droughts originate from a deficiency of precipitation resulting from an unusual weather pattern. If the weather pattern lasts a short time (a few weeks or a couple months), the drought is considered short-term. If the weather pattern becomes entrenched and the precipitation deficits last for several months or years, the drought is considered to be long-term. It is possible for a region to experience a long-term circulation pattern that produces drought, and to have short-term changes in this long-term pattern that result in short-term wet spells. Likewise, it is possible for a long-term wet circulation pattern to be interrupted by short-term weather spells that result in short-term drought. The El Niño Southern Oscillation (ENSO), a weather phenomenon that occurs every two to seven years in the Pacific Ocean, causes ocean currents and winds to shift while generating warmer water temperatures. During an ENSO phase, the Pacific Northwest can experience hotter winters that reduce snowpack, which leads to drought the following summer (National Drought Mitigation Center, 2016).

14.2.1 Past Events

In the past century, Oregon has experienced a number of droughts, some of the most severe occurring in 1976-77, 1992, and 2001-2002. The most recent droughts in the state occurred in 2005 and 2015 (Oregon Department of Land Conservation and Development, 2015 and Oregon Office of Emergency Management and Oregon Water Resources Department, 2016). NOAA's National Climatic Data Center does not list any drought events impacting the counties the City of Portland resides in (Multnomah, Washington and Clackamas) between 1950 and 2015.

Between 1954 and 2015, Oregon experienced one FEMA-declared drought-related emergency (EM-3039). This was the 1977 event, which has been identified as the worst drought in state history; however, the counties that the City of Portland resides in were not included in the declaration (FEMA, 2016b). The U.S. Secretary of Agriculture (USDA) is authorized to designate counties as disaster areas to make emergency loans to agricultural producers suffering losses due to drought. One-half to two-thirds of the counties in the U.S. have been designated as drought disaster areas in each of the past several years. Between 2012 and 2015, Oregon has been included in 307 USDA drought declarations. Multnomah, Washington and Clackamas counties have been included in seven of these declarations, all of them in 2015—June 10, 2015; July 22, 2015; August 5, 2015, August 12, 2015, August 19, 2015; and September 2, 2015, September 23, 2015 (USDA, 2016).

14.2.2 Location

Drought impacts could occur anywhere in Portland. NOAA has developed several indices to measure drought impacts and severity and to map their extent and locations. Values are reported in these indices by U.S. Climatological Divisions (NOAA, 2016c). These indices change regularly depending on local weather patterns and are snapshots of drought impacts at a specific point in time:

- The ***Palmer Crop Moisture Index*** measures short-term drought on a weekly scale and is used to quantify drought's impacts on agriculture during the growing season. Figure 14-1 shows this index for the week ending July 2, 2016.
- The ***Palmer Z Index*** measures short-term drought on a monthly scale. Figure 14-2 shows this index for June 2015.

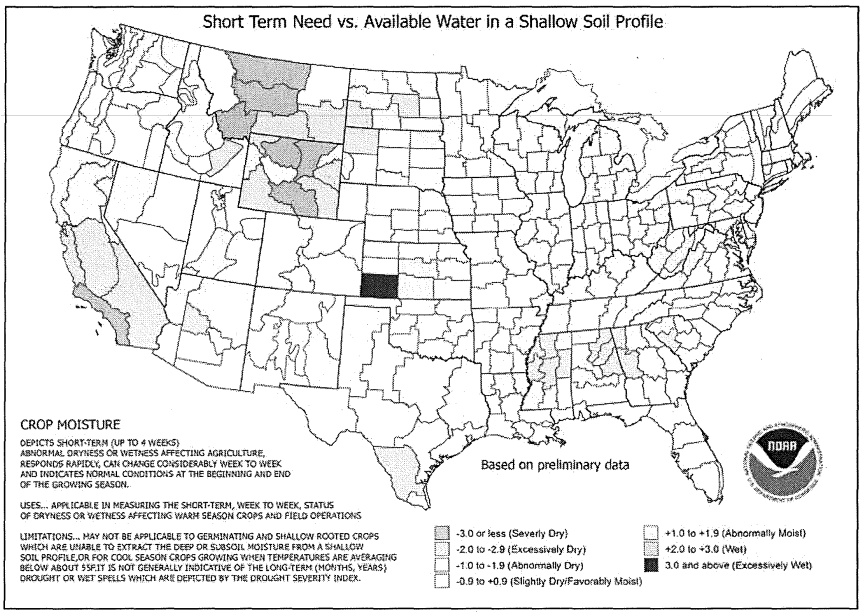


Figure 14-1. Crop Moisture Index for Week Ending July 2, 2016

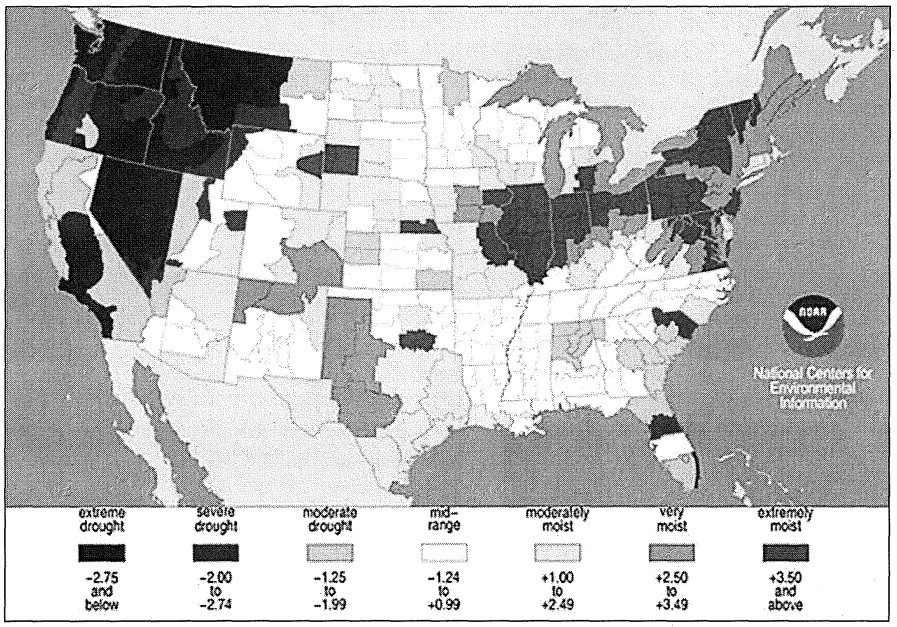


Figure 14-2. Palmer Z Index Short-Term Drought Conditions (June 2015)

- The ***Palmer Drought Index*** measures the duration and intensity of long-term drought-inducing circulation patterns. Long-term drought is cumulative, so the intensity of drought during a given month is dependent on the current weather patterns plus the cumulative patterns of previous months. Weather patterns can change quickly from a long-term drought pattern to a long-term wet pattern, and the Palmer Drought Index can respond fairly rapidly. Figure 14-3 shows this index for June 2015.
- The hydrological impacts of drought (e.g., reservoir levels, groundwater levels, etc.) take longer to develop and it takes longer to recover from them. The ***Palmer Hydrological Drought Index***, another long-term index, was developed to quantify hydrological effects. The Palmer Hydrological Drought Index responds more slowly to changing conditions than the Palmer Drought Index. Figure 14-4 shows this index for August 2015.

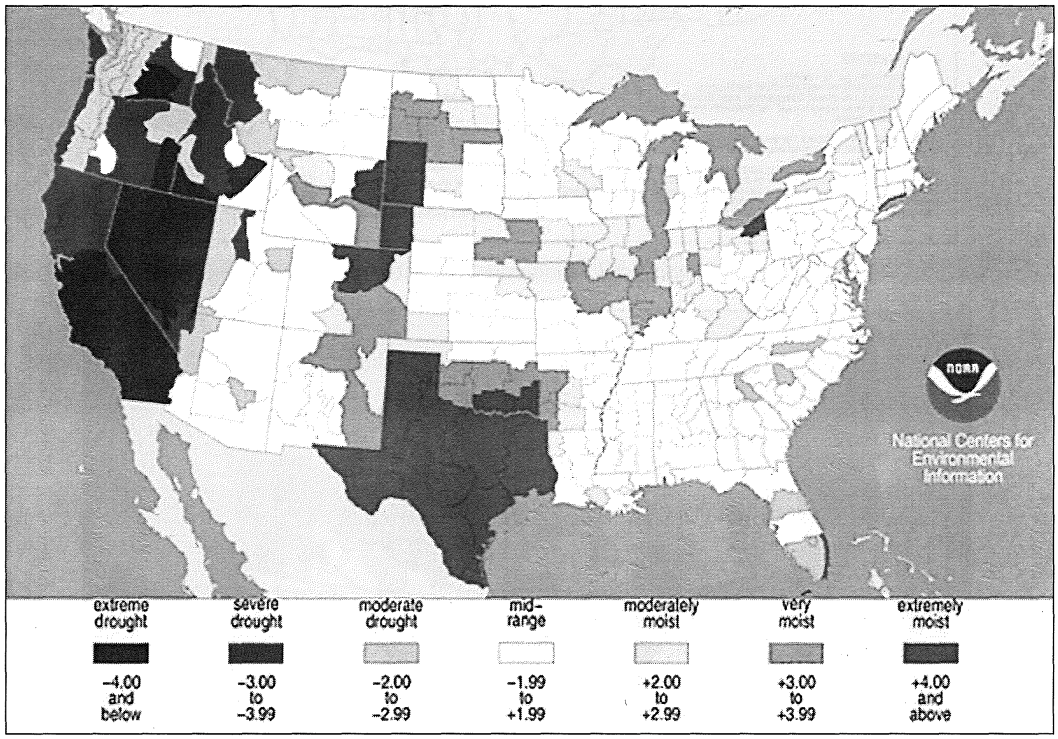


Figure 14-3. Palmer Drought Severity Index (June 2015)

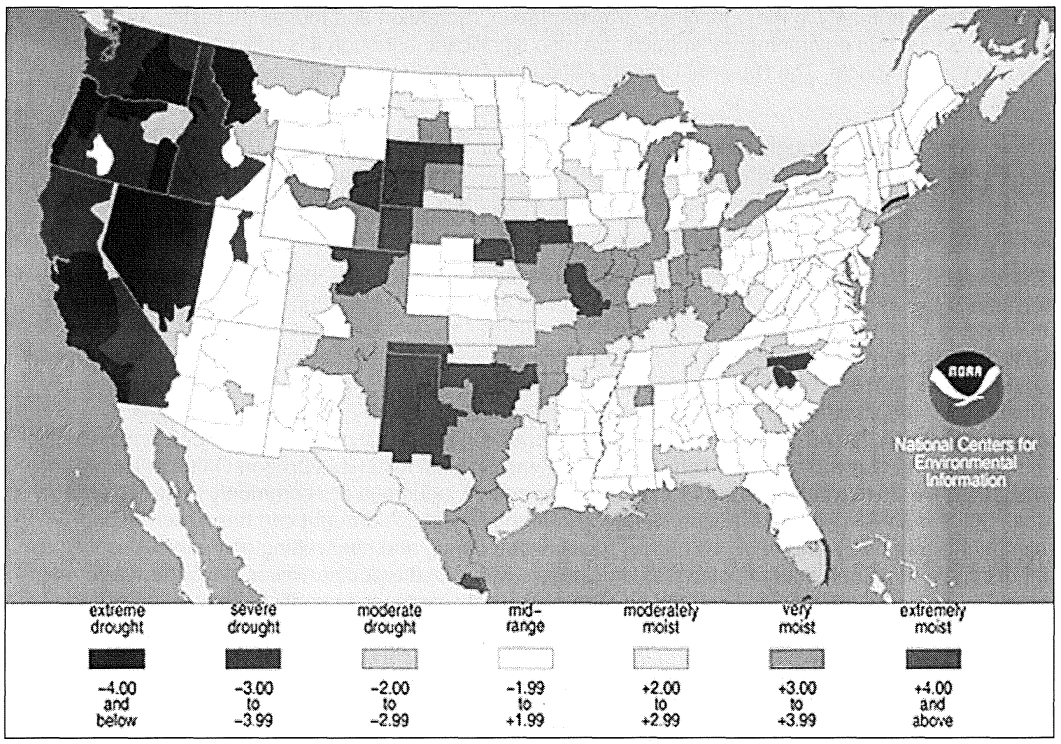


Figure 14-4. Palmer Hydrological Drought Index Long-Term Hydrologic Conditions (August 2015)

14.2.3 Frequency

Historical drought data for the region indicate there have been 7 significant droughts in the last 66 years. This equates to a drought every 9.4 years on average, or a 10.6 percent chance of a drought in any given year. However, severe droughts are uncommon in the Portland metropolitan area. Between 1992 and 2014, there were no Governor-declared droughts in the City of Portland or the surrounding counties (Oregon Department of Land Conservation and Development, 2015).

Drought is a normal, recurrent feature of climate, although many erroneously consider it a rare and random event. It is a temporary condition and differs from aridity because the latter is restricted to low rainfall regions and is a permanent feature of climate. It is rare for drought not to occur somewhere in North America each year. Despite impressive achievements in the science of climatology, estimating drought probability and frequency continues to be difficult. This is because of the many variables that contribute to weather behavior, climate change, and the absence of historic information. Climate change is expected to contribute to increasing drought risk in the future (Department of Land Conservation and Development, 2015).

14.2.4 Severity

Drought can have a widespread impact on the environment and the economy, although it typically does not result in loss of life or damage to property, as do other natural disasters. Nationwide, the impacts of

drought occur primarily in the agriculture, transportation, recreation and tourism, forestry, and energy sectors. Social and environmental impacts are also significant, although it is difficult to put a precise cost on these impacts. The National Drought Mitigation Center uses three categories to describe likely drought impacts:

- Agricultural—Drought threatens crops that rely on natural precipitation.
- Water supply—Drought threatens supplies of water for irrigated crops and for communities.
- Fire hazard—Drought increases the threat of wildfires from dry conditions in forest and rangelands.

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts. From 1980 to 2015 there have been 23 drought events in the United States with losses exceeding $1 billion. Of these 23 events, the State of Oregon was impacted by 11 (NOAA, 2016a). When measuring the severity of droughts, analysts typically look at economic impacts. All people could pay more for water if utilities increase their rates due to shortages. Agricultural impacts can result in loss of work for farm workers and those in related food processing jobs, as well as Native American Tribes which depend on local fisheries (Oregon Office of Emergency Management, 2015). Other water- or electricity-dependent industries are commonly forced to shut down all or a portion of their facilities, resulting in further layoffs. A drought can harm recreational companies that use water (e.g., swimming pools, water parks, and river rafting companies) as well as landscape and plant nursery businesses. In Oregon, where hydroelectric power plants generate nearly over 70 percent of the electricity produced, drought also threatens the supply of electricity, with the potential to affect the cost of power (U.S. Energy Information Administration, 2016).

Drought generally does not affect groundwater sources as quickly as surface water supplies, but groundwater supplies generally take longer to recover. Reduced precipitation during a drought means that groundwater supplies are not replenished at a normal rate. This can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. Shallow wells are more susceptible than deep wells. Reduced replenishment of groundwater affects streams. Much of the flow in streams comes from groundwater, especially during the summer when there is less precipitation and after snowmelt ends. Reduced groundwater levels mean that even less water will enter streams when stream flows are lowest.

14.2.5 Warning Time

Scientists at this time do not know how to predict drought more than a month in advance for most locations. Predicting drought depends on the ability to forecast precipitation and temperature. Anomalies of precipitation and temperature may last from several months to several decades. How long they last depends on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of weather systems on the global scale.

Because drought conditions in Oregon are often related to deficiencies in snowpack accumulation, some warning is available through monitoring snowpack accumulation through the winter. The U.S. Natural Resources Conservation Service's snow survey and water supply forecasting program conducts snow surveys to develop accurate and reliable water supply forecasts (USDA, 2014). The system, called SNOTEL (short for Snow Telemetry) provides information for local governments, water consumers and providers and the general public on snowpack conditions that may impact water resources in future months. When snowpack levels are below average, communities may make

changes to their water management programs and practices to reduce impacts from a possible future drought.

NOAA's National Integrated Drought Information System (NIDIS) launched a Drought Early Warning System (DEWS) for the Pacific Northwest in February of 2016. DEWS draws upon new and existing federal, tribal, state, local and academic partner networks to make climate and drought science readily available, easily understandable and usable for decision makers. The system improves stakeholders' abilities to monitor, forecast, plan for and cope with the impacts of drought (NIDIS, 2016).

14.3 COMPOUNDING FACTORS AND SECONDARY HAZARDS

14.3.1 Overview

The secondary hazard most commonly associated with drought is wildfire. A prolonged lack of precipitation dries out vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends. Millions of board feet of timber have been lost, and in many cases erosion occurred, which caused serious damage to aquatic life, irrigation, and power production by heavy silting of streams, reservoirs, and rivers.

Drought also is often accompanied by extreme heat, exposing people to the risk of sunstroke, heat cramps and heat exhaustion. Pets and livestock are also vulnerable to heat-related injuries. Crops can be vulnerable as well.

Environmental losses are the result of damage to plants, animals, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes, and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity.

14.3.2 Climate Change

Global water resources are already experiencing the following stresses without climate change:

- Growing populations
- Increased competition for available water
- Poor water quality
- Environmental claims
- Uncertain reserved water rights
- Groundwater overdraft
- Aging urban water infrastructure

With a warmer climate, droughts could become more frequent, more severe, and longer-lasting. According to the National Climate Assessment, "higher surface temperatures brought about by global warming increase the potential for drought. Evaporation and the rate at which plants lose moisture through their leaves both increase with temperature. Unless higher evapotranspiration rates are matched by increases in precipitation, environments will tend to dry, promoting drought conditions (Globalchange.gov, 2014).

Portland's drinking water supply is a rain-, rather than a snow-fed system. This means that increases in temperatures may have less of an impact on water supply in Portland than in other areas in the American west. By addressing current stresses on water supplies and by building a flexible, robust program, the City will be able to more adeptly respond to changing conditions and to survive dry years.

14.4 EXPOSURE

All people, property and environments in Portland would be exposed to some degree to the impacts of moderate to extreme drought conditions.

14.5 VULNERABILITY

Drought produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area experiencing physical drought. This complexity exists because water is integral to the ability to produce goods and provide services. Drought can affect a wide range of economic, environmental and social activities. The vulnerability of an activity to the effects of drought usually depends on its water demand, how the demand is met, and what water supplies are available to meet the demand.

The 2016 Drought Annex to the State of Oregon Emergency Operations Plan defines counties as being vulnerable to drought if a "severe and continuing drought" is in progress or likely to exist. This determination is made by the Water Supply Availability Committee, which is made up of several state and federal agencies, and evaluates drought status and vulnerability based on these indicators:

- Snowpack
- Precipitation
- Temperature Anomalies
- Long range temperature outlook
- Storage in key reservoirs
- Long range precipitation outlook
- Current stream flows and behavior
- Spring and summer streamflow forecasts
- Ocean surface temperature anomalies
- Soil and fuel moisture conditions
- NRCS Surface Water Supply Index.

This information is supplied to the Drought Readiness Council, which is an advisory body of state agencies involved with natural resources management, public health and emergency services. This council assesses how drought conditions may affect the vulnerability of various sectors across the state and makes recommendations to the Governor regarding the need for drought declarations (Oregon Office of Emergency Management and Oregon Water Resources Department, 2016).

The City of Portland and the counties it resides in, Multnomah, Washington and Clackamas, were not among the 25 counties that were in a state of drought declared by the Governor in 2015, one of the most recent severe droughts on record. Based on a review of Governor drought declarations since 1992, the City of Portland could be considered less vulnerable to drought impacts than many other parts of the state (Oregon Department of Land Conservation and Development, 2015).

14.5.1 Population

The City of Portland has the ability to minimize any impacts on residents and water consumers should several consecutive dry years occur. The nature of the Bull Run Watershed as a rain-fed source, as well as a supplemental aquifer-fed water source in the Columbia South Shore Wellfield, ensures that Portland residents will continue to have sufficient water even during dry years. No significant direct life or health impacts are anticipated as a result of drought in Portland.

14.5.2 Property

No structures will be directly affected by drought conditions, though some structures may become vulnerable to wildfires, which are more likely following years of drought. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners. However, these impacts are not considered critical in planning for impacts from the drought hazard.

14.5.3 Critical Facilities

Critical facilities as defined for this plan will continue to be operational during a drought. Critical facility elements such as landscaping may not be maintained due to limited resources, but the risk to Portland's critical facilities inventory will be largely aesthetic. For example, when water conservation measures are in place, landscaped areas will not be watered and may die. These aesthetic impacts are not considered significant.

14.5.4 Environment

Environmental losses from drought are associated with damage to plants, animals, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects.

14.5.5 Economic Impact

The economic impact of drought is largely associated with industries that use water or depend on water for their business. For example, landscaping businesses are affected as the demand for their service significantly declines because landscaping is not being watered. Livestock owners experience increased expenses for watering their herds. Agricultural industries are impacted if water usage is restricted for irrigation. Drought can lead to a reduction in power-generating capacity in hydroelectric-dominated systems, such as those found in Oregon. Reductions in capacity can lead to interruptions in the power supply that may have economic impacts in the region. Lloyd's City Risk Index estimates that a drought in the City of Portland could cause up to $540 million of lost gross domestic product annually.

14.6 FUTURE TRENDS IN DEVELOPMENT

The City of Portland has an established comprehensive plan that includes policies directing land use and dealing with issues of water supply and the protection of water resources. The plan works to

increase resilience and manage risk through a variety of policies including promoting the resilience of natural systems, including their ability to withstand drought, and through infrastructure investments that create redundancy in the water supply (City of Portland, 2016). This plan provides the capability at the local level to protect future development from the impacts of drought. Additionally, the City has identified an action to continue to address the potential drought related climate change impacts to the City's primary water supply, the Bull Run watershed.

14.7 SCENARIO

An extreme multiyear drought more intense than the 1977 drought could impact the region with little warning. Combinations of low precipitation and unusually high temperatures could occur over several consecutive years. Intensified by such conditions, extreme wildfires could break out in or near Portland, increasing the need for water. If such conditions persisted for several years, the economy of the City of Portland could experience setbacks, especially in water dependent industries.

14.8 ISSUES

The following drought-related issues have been identified in the course of the planning process:

- The need for the identification and development of alternative water supplies, especially in relation to the potential secondary impacts to water supply form drought-induced wildfire.
- There are no quantitative estimates for general building stock impacts for the drought hazard.
- Water resource management strategies have changed significantly over the last several decades. Managers must now consider the needs of communities, industries, power-generating facilities and the environment. Issues associated with meeting the needs of these competing demands with limited resources will likely increase as population growth continues and the impacts of climate change intensify.
- The use and promotion of water-saving and reclamation technologies even during non-drought periods may decrease the effects of drought in Portland.
- Promotion of native and drought-resistant landscaping should continue.
- Predicting droughts can be challenging, although warning systems are currently under development.
- Changes in the timing, frequency and duration of precipitation events may present challenges for current water storage and management practices in the region. Climate change may also increase the frequency and duration of meteorological drought conditions.

15. SPACE WEATHER

15.1 HAZARD PROFILE

Space weather is identified in this plan as an emerging hazard of concern; therefore, a detailed risk assessment of the hazard was not conducted. Additional information pertaining to risk from the space weather hazard will be monitored over the performance period of the plan; the potential for conducting a detailed risk assessment will be evaluated at the next plan update.

15.1.1 Background Information

According to NOAA's Space Weather Prediction Center, space weather refers to variations in the space environment between the sun and Earth. It includes phenomena that impact systems and technologies in orbit and on Earth. Figure 15-1 shows potential space weather related phenomena.

Source: NOAA and NWS Space Weather Prediction Center

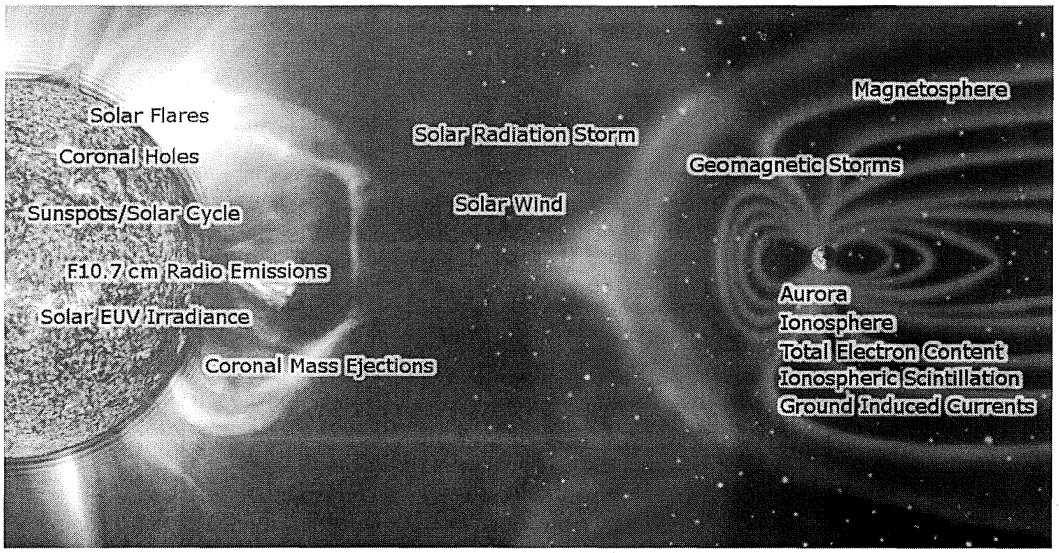


Figure 15-1. Space Weather Phenomena

Most space weather events start as bursts of plasma on the sun called coronal mass ejections. A coronal mass ejection event passes through the sun's corona and into the solar wind. When it reaches Earth, it energizes the magnetosphere and accelerates electrons and protons down to Earth's magnetic field lines, where they collide with the atmosphere and ionosphere, particularly at high latitudes. Different types of space weather can affect different technologies on Earth (NOAA, 2016d):

- During events known as radio blackout storms, solar flares can produce strong bursts of radiation that degrade or block high-frequency radio waves used for radio communication. Solar radiation from these flares also poses risks to passengers and crew of commercial aircraft flying in polar regions during the storm.
- Solar energetic particles can penetrate satellite electronics and cause electrical failure. These particles also block radio communications at high latitudes during solar radiation storms.
- Coronal mass ejections can cause geomagnetic storms on Earth and induce extra currents in the ground that can degrade power grid operations. Geomagnetic storms can also modify the signal from radio navigation systems, causing degraded accuracy.
- Induced current from geomagnetic storms can accelerate corrosion in long pipelines. Most pipelines have corrosion-control systems to prevent this, but not all.

15.1.2 Past Events

The strongest geomagnetic storm on record is the Carrington Event that occurred in September 1859. This storm caused telegraph lines to electrify, in some cases shocking technicians and setting telegraph paper on fire. The aurora generated by the magnetic effects could be seen as far south as Hawaii and Cuba (FEMA, 2016d).

More recent events include a space weather storm on March 13, 1989 that disrupted the hydroelectric power grid in Quebec, Canada. This system-wide outage lasted for 9 hours and left 6 million people without power. In October 2003, space weather cause a simultaneous shutdown of satellites and air traffic precision navigation for several hours. In early December of 2006, geomagnetic storms and solar flare activity disabled Global Positioning System (GPS) signal acquisition over the United States (SDR, 2010).

15.1.3 Warning Time

Space weather prediction services in the United States are provided primarily by the Space Weather Prediction Center and the U.S. Air Force's Weather Agency. The Space Weather Prediction Center draws on a variety of data sources, both space- and ground-based, to provide forecasts, watches, warnings, alerts, and summaries to civilian and commercial users (FEMA, 2016d).

15.2 EXPOSURE

There is no clearly defined extent of space weather exposure. All of Portland is potentially exposed to the direct and indirect impacts of space weather.

15.3 VULNERABILITY

15.3.1 Population

The potential impacts of space weather on human health on Earth are not well known. There are many theories about human health impacts from space weather associated with the disruption of electrical pulses within the body. There have not been enough significant occurrences of space weather events to confirm these theories. If they are accurate, then all populations in the City of Portland would be vulnerable to space weather events.

Power outages induced by space weather can be life-threatening to those dependent on electricity for life support.

15.3.2 Property

All property in the City of Portland would be vulnerable to indirect impacts associated with loss of power triggered by space weather events. The potential impacts from electromagnetic pulses from space weather events on power grids is generally accepted by experts in this field, but has not been widely studied, due to the infrequency of space weather events. Direct structural damage resulting from space weather is not likely.

15.3.3 Environment

Cosmic rays are high energy particles reaching Earth from sources outside our solar system. There is a theory that cosmic rays can create nucleation sites in the atmosphere, which seed cloud formation and create cloudier conditions. If this is true, then there would be a significant impact on climate. During the portion of the sun's 11-year solar cycle called "solar minimum," cosmic rays are at a maximum. Therefore, the duration of solar minimum may have an impact on Earth's climate. (NOAA, 2016d).

15.3.4 Economy

The economic consequences resulting from a citywide power outage caused by space weather would be severe and long-lasting. Without a stable electrical grid, every sector of Portland's economy would be impacted. Lloyd's City Risk Index estimates a solar storm could cause up to $250 million of lost gross domestic product annually (Lloyd's, 2015).

15.4 ISSUES

The October 2015 National Space Weather Action Plan developed by the National Science and Technology Council includes a goal of improving space-weather services by advancing understanding and forecasting. The objectives associated with this goal are as follows:

- Improve understanding of user needs for space-weather forecasting to establish lead-time and accuracy goals.
- Ensure that space-weather products are intelligible and actionable to inform decision-making.
- Establish and sustain a baseline observational capability for space-weather operations.
- Improve forecasting lead-time and accuracy.
- Enhance fundamental understanding of space weather and its drivers to develop and continually improve predictive models.
- Improve effectiveness and timeliness of the process that transitions research to operations.

It should be noted that these actions and challenges associated with space weather are for the most part, outside the control of the City of Portland and its leaders. The most important issue regarding space weather in Portland is the potential for disruption to the electrical systems resulting in cascading impacts on people and property. Additional issues include potential impacts on GPS systems, satellite operations and aviation.

16. RISK RANKING

A risk ranking was performed for the hazards of concern described in this plan for the City of Portland as a whole and for each risk reporting area. These risk rankings assess the probability of each hazard's occurrence as well as its likely impact on the people, property, and economy of Portland:

- The probability of occurrence of a hazard is indicated by a probability factor based on likelihood of annual occurrence.
- Hazard impacts were assessed in three categories: impacts on people, impacts on property and impacts on the local economy:
  - **People**—Values were assigned based on the percentage of the total ***population exposed*** to the hazard event.
  - **Property**—Values were assigned based on the percentage of the total ***property value vulnerable*** to the hazard event.
  - **Economy**—Values were assigned based on the percent of ***critical facilities exposed*** to a hazard in Portland.

The impacts of each hazard category were assigned a weighting factor to reflect the significance of the impact. These weighting factors are consistent with those typically used for measuring the benefits of hazard mitigation actions: impact on people was given a weighting factor of 3; impact on property was given a weighting factor of 2; and impact on the economy was given a weighting factor of 1. Table 16-1, Table 16-2 and Table 16-3 summarize the impacts for each hazard.

Table 16-1. Impact on People from Hazards

Hazard Event	Impact (high, medium, low)	Impact Factor	Multiplied by Weighting Factor (3)
Dam Failure[a]	Medium (2.0%)	2	2 x 3 = 6
Drought[b]	None (0%)	0	0 x 3 = 0
Earthquake	High (100%)	3	3 x 3 = 9
Flood[c]	Low (1.6%)	1	1 x 3 = 3
Landslide	Medium (14.5%)	2	2 x 3 = 6
Severe weather	High (100%)	3	3 x 3 = 9
Volcanic Activity[d]	Medium (estimated)	2	2 x 3 = 6
Wildfire	Medium (11.1%)	2	2 x 3 = 6

a. The Mt. Tabor Reservoirs 5 and 6 scenario is used for risk ranking.
b. The occurrence of a drought event rarely causes direct injury or death.
c. 1 percent annual chance flood event is used for risk ranking
d. Although the entire population is potentially exposed to ash fall, death or injury is unlikely unless an underlying condition is exasperated.

Table 16-2. Impact on Property from Hazards

Hazard Event	Impact (high, medium, low)	Impact Factor	Multiplied by Weighting Factor (2)
Dam Failure[a]	Low (less than 1%)	1	1 x 2 = 2
Drought[b]	Low (estimated)	1	1 x 2 = 2
Earthquake[c]	Medium (4.3%)	2	2 x 2 = 4
Flood[d]	Medium (less than 1%)	1	1 x 2 = 2
Landslide[e]	Low (estimated)	2	2 x 2 = 4
Severe weather[f]	Low (estimated)	1	1 x 2 = 2
Volcanic activity[g]	Low (estimated)	1	1 x 2 = 2
Wildfire	Low (estimated)	1	1 x 2 = 2

a. Mt. Tabor Reservoirs 5 and 6 scenario is used for risk ranking.
b. The occurrence of a drought event rarely causes structural damage.
c. Cascadia M9.0 scenario is used for risk ranking. Estimates were moved to medium due to an increase in severity resulting from more than 1 minute of shaking.
d. Impacts are assigned as medium due to unmapped urban drainage issues.
e. 12.1% of property is exposed, but landslides are unlikely to occur simultaneously as a standalone hazard.
f. Although all property is exposed, it is unlikely that more than 5 percent would be damaged.
g. 9.5% of property is exposed, but is unlikely that all property would be lost in any one event.

Table 16-3. Impact on Economy from Hazards

Hazard Event	Impact (high, medium, low)	Impact Factor	Multiplied by Weighting Factor (1)
Dam Failure[a]	Low (less than 1 percent)	1	1 x 1 = 1
Drought[b]	Low (estimated)	1	1 x 1 = 1
Earthquake[c]	High (100 percent)	3	3 x 1 = 3
Flood[d]	Low (5.0%)	1	1 x 1 = 1
Landslide[e]	Low (estimated)	1	1 x 1 = 1
Severe weather[f]	Medium (estimated)	2	2 x 1 = 2
Volcanic Activity[g]	Medium (5.6% + 100%)	2	2 x 1 = 2
Wildfire	Low (9.7%)	1	1 x 1 = 1

a. Mt. Tabor Reservoirs 5 and 6 scenario is used for risk ranking.
b. The occurrence of a drought event rarely causes large economic impacts in urbanized areas.
c. Cascadia M9.0 scenario is used for risk ranking
d. 1 percent annual chance flood event is used for risk ranking
e. 12% of facilities are exposed, but landslides are unlikely to occur simultaneously as a standalone hazard.
f. All facilities are exposed, but it is unlikely that more than 25 percent would be damaged. Economic impacts would occur as a result of transportation disruptions.
g. 9.7% of facilities are exposed, but is unlikely that all those exposed would impacted in any one event.

16.1 PROBABILITY OF OCCURRENCE

The probability of occurrence of a hazard is indicated by a probability factor based on likelihood of annual occurrence:

- High—Hazard event is likely to occur within 25 years (Probability Factor = 3)
- Medium—Hazard event is likely to occur within 100 years (Probability Factor =2)
- Low—Hazard event is not likely to occur within 100 years (Probability Factor =1)
- No exposure—There is no probability of occurrence (Probability Factor = 0)

The assessment of hazard frequency is generally based on past hazard events in the area, although the likelihood of future events has been taken into consideration in this assessment. Table 16-4 summarizes the probability assessment for each hazard of concern for this plan.

Table 16-4. Probability of Hazards

Hazard Event	Probability (high, medium, low)	Probability Factor
Dam Failure	Low	1
Drought	High	3
Earthquake[a]	Medium	2
Flood[b]	High	3
Landslide	High	3
Severe weather	High	3
Volcanic Activity	Low	1
Wildfire	High	3

a. Cascadia M9.0 scenario is used for risk ranking
b. 1 percent annual chance flood event is used for risk ranking

16.2 IMPACT

Hazard impacts were assessed in three categories: impacts on people, impacts on property and impacts on the local economy. Numerical impact factors were assigned as follows:

- **People**—Values were assigned based on the percentage of the total ***population exposed*** to the hazard event. Impact factors were assigned as follows:
  - High—25 percent or more of the population is exposed to a hazard (Impact Factor = 3)
  - Medium—10 percent to 25 percent of the population is exposed to a hazard (Impact Factor = 2)
  - Low—10 percent or less of the population is exposed to the hazard (Impact Factor = 1)
  - No impact—None of the population is exposed to a hazard (Impact Factor = 0)
- **Property**— Values were assigned based on the percentage of the total ***property value vulnerable*** to the hazard event. Impact factors were assigned as follows:
  - High—Estimated loss from the hazard is 10 percent or more of the total replacement value (Impact Factor = 3)
  - Medium—Estimated loss from the hazard is 5 percent to 10 percent of the total replacement value (Impact Factor = 2)
  - Low—Estimated loss from the hazard is 5 percent or less of the total replacement value (Impact Factor = 1)
  - No impact—No loss is estimated from the hazard (Impact Factor = 0)
- **Economy**—Values were assigned based on ***critical facility exposure*** for critical facilitates and infrastructure on Portland. Impact factors were assigned as follows:
  - High—25 percent or more of total facilities are exposed (Impact Factor = 3)
  - Medium—Between 10 and 25 percent of facilities are exposed (Impact Factor = 2)
  - Low—Less than 10 percent of facilities are exposed (Impact Factor = 1)
  - No Impact—No critical facilities are exposed to the hazard (Impact Factor = 0)

16.3 RISK RATING AND RANKING

The risk rating for each hazard was determined by multiplying the probability factor by the sum of the weighted impact factors for people, property and economy, as summarized in Table 16-5. Based on these ratings, a priority of high, medium or low was assigned to each hazard. City-wide the hazards ranked as being of highest concern are severe weather and earthquake. Hazards ranked as being of medium concern are flood, landslide and wildfire. The hazards ranked as being of lowest concern are volcanic activity, dam failure and drought. Table 16-6 shows the hazard risk ranking for the City of Portland. A similar ranking process was performed for each reporting area; the results from those efforts are summarized in Table 16-7 and Table 16-8.

Table 16-5. Hazard Risk Rating

Hazard Event	Probability Factor	Sum of Weighted Impact Factors	Total (Probability x Impact)
Dam Failure	1	6 +2+1 = 9	9
Drought	3	0+2+1 = 3	9
Earthquake	2	9+4+3 = 16	32
Flood	3	3+4+1 = 8	24
Landslide	3	6+2+1 = 9	27
Severe weather	3	9+2+2 = 13	39
Volcanic activity	1	6+2+2 = 10	10
Wildfire	3	6+2+1 = 9	27

Table 16-6. Hazard Risk Ranking

Hazard Ranking	Hazard Event	Category
1	Severe weather	High
2	Earthquake	High
3	Landslide	Medium
3	Wildfire	Medium
4	Flood	Medium
5	Volcanic activity	Low
6	Dam Failure	Low
7	Drought	Low

Table 16-7. Hazard Risk Rankings by Reporting Area

	Hazard Event								
Hazard Ranking	Airport	Central City	Central Northeast	East Portland	North Portland	Northeast	Southeast	Southwest	West/ Northwest
Dam Failure	None	Low	None	None	None	None	Low	Low	Low
Drought	Low	Low	Low	Low	Low	Low	Low	Low	Low
Earthquake	High	Medium	Medium	Medium	High	Medium	Medium	Medium	High
Flood	High	Medium	Medium	Medium	Medium	Low	Low	Medium	Low
Landslide	None	Medium	Medium	Medium	Medium	Medium	Medium	High	High
Severe weather	High	High	High	High	High	High	High	High	High
Volcanic activity	Low	Low	Low	Low	Low	Low	Low	Low	Low
Wildfire	Low	Medium	Medium	Medium	Medium	Low	Low	High	High

Table 16-8. Hazard Risk Ratings by Reporting Area

Hazard Ranking	Hazard Event								
	Airport	Central City	Central Northeast	East Portland	North Portland	Northeast	Southeast	Southwest	West/ Northwest
1	Severe weather	Severe weather	Severe weather	Severe weather	Severe weather	Severe weather	Severe weather	Wildfire	Landslide
2	Earthquake	Earthquake	Earthquake	Earthquake	Earthquake	Earthquake	Earthquake	Landslide	Wildfire
3	Flood	Landslide	Flood	Flood	Flood	Landslide	Landslide	Severe weather	Severe weather
4	Volcanic activity	Flood	Landslide	Landslide	Landslide	Wildfire	Flood	Earthquake	Earthquake
5	Wildfire	Wildfire	Wildfire	Wildfire	Wildfire	Volcanic activity	Volcanic activity	Flood	Volcanic activity
6	Drought	Volcanic activity	Volcanic activity	Volcanic activity	Volcanic activity	Flood	Wildfire	Volcanic activity	Flood
7	N/A	Dam failure	Drought	Drought	Drought	Drought	Dam failure	Dam failure	Dam failure
8	N/A	Drought	N/A	N/A	N/A	N/A	Drought	Drought	Drought

PART 3—MITIGATION STRATEGY

17. VISION, MISSION, GOALS AND OBJECTIVES

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards (44 CFR Section 201.6(c)(3)(i)). The Steering Committee established a vision, a mission, goals and objectives for this plan, based on a review of the 2010 NHMP goals, the State of Oregon Hazard Mitigation Plan goals, and other locally relevant community plans and programs, such as the Portland Comprehensive Plan. Following this review, the 2010 NHMP goals were updated to most accurately reflect current community needs and values and changing community priorities (see Appendix H for 2004 and 2010 goals).

A working draft of the vision, mission, goals and objectives was established through facilitated exercises and group discussion. Figure 17-1 shows the most commonly used terms in steering committee member comments on the vision and mission development process (words shown in larger fonts were mentioned more frequently).



Figure 17-1. Vision and Mission Development Word Cloud

The goals and objectives continued to be revised throughout the plant update process based on the results of the risk assessment and feedback received during the public engagement process. The vision, mission, goals and objectives selected for this plan and presented below, along with the actions

outlined in Chapter 19, all support each other. Goals were selected to support the vision and mission. Objectives were selected that meet multiple goals. Actions were prioritized based the number of objectives each would help to accomplish.

17.1 VISION

Vision is defined in this planning process as the City of Portland's desired future state. *The Mitigation Action Plan* was designed to support and inform the comprehensive plan, which is the implementing document for the Portland Plan. Therefore, it was determined that the vision for the MAP should align with the overall community vision for Portland, as follows:

> Portland is a prosperous, healthy, equitable and resilient city where everyone has access to opportunity and is engaged in shaping decisions that affect their lives (City of Portland 2035 Comprehensive Plan).

17.2 MISSION

The mission for the MAP defines what the plan aims to achieve and how:

> To equitably reduce risk and the adverse impacts of natural hazards by building community resilience through collaborative, cost-effective actions and strategies.

17.3 GOALS

The following goals were selected as general guidelines for the MAP that explain what the plan should achieve:

- Protect life and reduce injuries.
- Engage and build capacity for the whole community.
- Minimize public and private property damage.
- Protect, restore, and sustain natural systems.
- Minimize the disruption of essential infrastructure and services.
- Integrate mitigation strategies into existing plans and programs.
- Prioritize multi-objective actions that reduce risk to vulnerable communities.

17.4 OBJECTIVES

Objectives for this planning process are broader than actions but more specific than goals—specific enough to help determine whether a proposed project or program would advance the values expressed in the mission and vision. Objectives were used to define and prioritize actions. They also may be thought of as policies. Each objective meets multiple goals, serving as a stand-alone measurement of the effectiveness of a mitigation action, rather than as a subset of a goal.

Table 17-1 shows the objectives for the MAP and the goals that each objective supports. Some objectives were taken from or adapted from other local programs, and the source of those objectives is provided in parentheses after the description of the objective.

Table 17-1. 2016 Mitigation Action Plan Objectives

	Objective	Related Goals						
		Life	Whole Community	Property	Natural Systems	Infrastructure	Integrate	Prioritize
1	Strengthen development codes and update land use designations to facilitate effective disaster risk reduction (Adapted from Portland Comprehensive Plan 4.78)	✓		✓	✓		✓	
2	Prevent or reduce mitigation-related disparities affecting under-served and under-represented communities through plans, investments and engagement (Adapted from Portland Comprehensive Plan 7.2)	✓	✓	✓		✓	✓	✓
3	Promote the use of natural systems to limit natural hazard related impacts (Adapted from Portland Comprehensive Plan 7.4b)				✓		✓	
4	Increase the resilience of high-risk and critical infrastructure through monitoring, planning, maintenance, investment, adaptive technology, and continuity planning (Portland Comprehensive Plan 8.25)	✓		✓		✓	✓	
5	Coordinate land use plans and public facility investments between City bureaus, other public and jurisdictional agencies, businesses, community partners, and other emergency response providers (Adapted from Portland Comprehensive Plan 8.99)		✓	✓		✓	✓	
6	Support community outreach activities that increase stakeholder awareness and understanding of hazard risk, mitigation options, and preparedness strategies (Adapted from Multnomah County NHMP O1.2)	✓	✓	✓	✓			
7	Identify and seek various funding opportunities for mitigation activities and look for ways to leverage existing funds (Adapted from Multnomah County NHMP O1.5)	✓		✓		✓	✓	
8	Seek opportunities in which hazard mitigation also benefits other community goals (Adapted from Multnomah County NHMP O3.4)	✓	✓	✓	✓	✓	✓	✓
9	Collect data to track progress on meeting mitigation goals.	✓	✓	✓	✓	✓	✓	✓
10	Use the best available data, science and technologies to improve understanding of the location and potential impacts of natural hazards, the vulnerability of building types and community development patterns, and the measures needed to protect life safety.	✓		✓	✓			

Objective		Related Goals						
		Life	Whole Community	Property	Natural Systems	Infrastructure	Integrate	Prioritize
11	Retrofit, purchase, or relocate structures in high hazard areas, especially those known to be repetitively damaged.	✓		✓		✓		
12	Promote, incentivize and support the mitigation of private property.	✓	✓	✓				✓
13	Improve systems that provide warning and emergency communications.	✓	✓		✓	✓		
14	Promote mutual information exchange and incorporate existing community networks in the identification and implementation of mitigation actions.		✓				✓	
15	Build City staff and community capacity to ensure effective implementation and equitable outcomes of mitigation action efforts (Adapted from Portland 2015 Climate Action Plan)		✓				✓	
16	Develop plans to reduce immediate impacts of natural hazard events, and to facilitate rapid and effective social and economic recovery.	✓	✓	✓			✓	
TOTAL		12	11	12	7	8	11	4

Note: Objectives are numbered for reference, not to indicate priority.

18. MITIGATION ALTERNATIVES

Risk is a function of the hazard, the level of exposure, the level of vulnerability, and the available capability to respond to or prepare for hazard events. Risk can be mitigated by manipulating the hazard, reducing exposure to the hazard, reducing vulnerability, or increasing capability. Where mitigation is not yet possible, risk can be reduced through preparation, response or recovery.

Over the course of the MAP planning process, catalogs of mitigation alternatives were developed (in compliance with 44 CFR (Section 201.6(c)(3)(ii))) from best practices, steering committee recommendations, and stakeholder input. One catalog was developed for each hazard of concern, as well as a catalog for actions that would mitigate all hazards. The catalogs present alternatives that are categorized in two ways:

- By who would have responsibility for implementation:
    - Individuals (public scale)
    - Businesses (private scale)
    - Government (government scale).
- By what the alternative would do:
    - Manipulate the hazard
    - Reduce exposure to the hazard
    - Reduce vulnerability to the hazard
    - Increase the ability to respond to or be prepared for the hazard.

The steering committee brainstormed mitigation actions to be included in these catalogs, voted to identify top-rated actions, and then developed a list of recommended actions. The list of top-rated actions is available in Appendix I, along with the full list of mitigation actions for all hazards.

These catalogs are not exhaustive. Their purpose was to provide a list of what could be considered to reduce risk to hazards within Portland. The City of Portland, in collaboration with stakeholders, reviewed the catalogs to identify ways to apply the actions they contain for specific needs and situations. The catalogs provide a baseline of mitigation alternatives that are backed by a planning process, are consistent with the established goals and objectives, and are likely within the capabilities of the City of Portland to implement. Actions in the catalog that are not included in the City's action plan were not selected for one or more of the following reasons:

- The action is not currently feasible.
- The action is already being implemented.
- There is an apparently more cost-effective alternative.
- The action does not have public or political support.
- The action is not within the capabilities of the City.
- The potential for equitable impacts cannot be assessed at this time.

19. Action Plan and Implementation

19.1 Bureau Action Selection Workshop

On May 11, 2016 a workshop was held to provide guidance to City bureaus on selecting the mitigation actions to be included in *The Mitigation Action Plan*. This workshop was attended by 28 staff members from 11 City bureaus or offices. At the workshop, the planning team reviewed and discussed the following:

- The planning process
- The concept of mitigation
- The tool kit assembled by the planning team for use in action selection
- The instructions for completing relevant implementation information for each identified action.

Each bureau participating in development of the MAP was provided with a set of expectations (see Appendix J) and asked to do the following:

- Complete a letter of intent (provided with the set of expectations)
- Designate points of contact
- Attend bureau workshop
- Apply an equity lens to project selection, development and prioritization
- Pursue mitigation implementation opportunities
- Attend annual reporting and update meeting.

In addition, bureaus were encouraged to support the steering committee and the public involvement strategy. All bureaus identified as lead agencies in action items selected for implementation were asked to complete and sign this letter of intent. The following sections of this chapter outline the end result of this workshop and the internal work done within each bureau to reconcile previously identified actions and identify new actions for the MAP.

19.2 Status of Previous Plan Actions

The 2010 NHMP identified 101 mitigation actions for implementation. For the current update, these actions were reviewed by City bureaus and offices and other relevant agencies. For each action, it was determined whether the action had been completed, was in progress or had not been started. Incomplete actions were reviewed to determine if they should be carried over to the 2016 plan or removed from the plan due to a change in priorities, capabilities, or feasibility. In total, 75 (75 percent) of the identified actions have been started or completed, and 26 (25 percent) showed no progress. Of the 101 identified actions 39 (39 percent) were carried over to the 2016 plan. Each has a new action number assigned to it for the 2016 plan, and many were reworded to more clearly state their intent.

Table 19-1 summarizes the status of the recommended actions from the 2010 NHMP. More detailed information on many actions, especially those that were completed or are in progress, is provided in the 2016 Progress Report in Appendix A.

Table 19-1. Status of Actions Identified in the 2010 Natural Hazard Mitigation Plan

Action Item	Completed	Carry Over to MAP	Removed; No Longer Feasible
ST MH #1— Continue to involve the public in updating the Natural Hazard Mitigation Plan. (education & outreach)		✓	
***Comment**: Carried over, PBEM-15.*			
ST MH #2 — Form a committee to identify and coordinate critical transportation (street and highway) networks. (mapping, asset management)	✓		
***Comment**: There is no committee, but we have identified emergency transportation routes for key facilities. If new facilities are built, transportation routes would be re-evaluated.*			
ST MH #3 — Coordinate emergency standard operating procedures and plans between disaster responder organizations in the Portland metro region, to coordinate and expedite decision making during emergencies. (planning)	✓		
***Comment**: Regional Multi-Agency Coordination on operations. Internally de-conflicted the County Basic Emergency Operations Plan with the City Basic Emergency Operations Plan. PBEM reviews other bureaus' emergency procedures.*			
ST MH #4 — Develop a multiple-agency multi-hazard evacuation plan (earthquake, flood, fire and landslide at a minimum).	✓		
***Comment**: Evacuation Plan developed. Certain areas of highest risk have individualized plans (Linnton).*			
ST MH #5 — Acquire Light Detection and Ranging (LiDAR) images of the Portland Metro area to facilitate natural hazard area risk assessment and vulnerability analysis. (mapping) (NFIP Compliance)	✓		
***Comment**: Acquisition complete. Analysis in progress.*			
ST MH #6 — Use findings from Portland's Risk Assessment (HAZUS-MH) to enhance existing debris removal plan. HAZUS-MH will need to be updated. (existing GIS Mapping)	✓		
***Comment**: The 2003 HAZUS analysis was used to update Metro's debris removal plan from the 1990s in 2013. Debris modelling is being updated regionally. A new HAZUS analysis is being completed as part of the 2016 plan update.*			
ST MH #7 — Create a mitigation mapping committee to index and maintain GIS mapped inventory and develop prioritized list of critical facilities, residential and commercial buildings within known hazard areas such as earthquake, erosion, the 100-year and 500-year floodplains, invasive plant species, landslide and wildfire areas. (NFIP Compliance) Identify parameters and methods for new maps as needed to meet multi-hazard mitigation goals and to improve communication with the public.	✓		
***Comment**: CGIS maintains inventory in Portland Maps. No such committee exists. Much of this will be accomplished through the MAP update. Parks, BES data, PBOT erosion data, and others are included. PBEM also promotes the Map Your Neighborhood initiative.*			
ST MH #8 — Partner with utilities as they ensure continuity of service to the City and the Columbia South Shore Well field to provide for redundancy in case of primary power outage. (asset management)		✓	
***Comment**: Carried over, PWB-21.*			
ST MH #9 — Develop a city employee emergency response plan to assure that city employees know what is expected of them to continue City operations. (education, outreach)	✓		
***Comment**: All bureaus have submitted Continuity of Operations Plans (COOP) and recognize accountability requirements. PBEM is hiring a COOP planner. The mayor sends out emails informing employees what to do in an emergency.*			
ST MH #10 — Develop educational materials (television and print media) for residents that identify and define their risk to multi hazards: define and offer mitigation measures that residents can take home or share, determine method of distribution of the educational materials and coordinate with the media to reduce conveyance of misinformation. (education, outreach)	✓		
***Comment**: PBEM hired a comm. outreach representative, supports preparedness campaigns, promotes preparedness materials, and has offered seismic strengthening programs. Public Information Officer works with local news (KOIN) on post-disaster collaboration.*			

Action Item	Completed	Carry Over to MAP	Removed; No Longer Feasible
ST MH #11 [a] — Implement actions in the 2005 Portland watershed management Plan (planning) (NFIP Compliance)		✓	
***Comment**: Carried over, BES-1.*			
LT MH #1 [a] — Revise Portland's Comprehensive Plan to address and implement Citywide policies, land use improvements and mapping changes to natural hazards including, but not limited to, earthquakes, erosion, floods, invasive plants, landslides, volcano, severe weather and wildfires. (mapping, planning) (NFIP Compliance)		✓	
***Comment**: Carried over, BPS-5, BPS-6.*			
LT MH #3 — Increase the responsiveness of the emergency permitting procedures for post-hazard event periods through development of a procedural plan and the purchase of a mobile permitting van. (planning)		✓	
***Comment**: Carried over, BDS-1. Eliminated "purchase of a mobile permitting van" as this was determined to be cost-prohibitive.*			
LT MH #6 — Promote the development of TriMet communications and dispatch capability to immediately implement changes to transit routes and service due to disruption of streets, roads, bridges, rail transit tracks and the information technology that provides connectivity. (planning)	✓		
***Comment**: PBOT has encouraged TriMet to utilize WebEOC as the information sharing tool during severe weather events.*			
LT MH #8 [a] — Review and amend City Code and other compliance documentation to require that all facilities that store or handle hazardous materials (including large tanks) and which are located in the 500-year floodplain, landslide, or other hazard areas, develop a hazardous materials inventory statement. This statement will be made available for Fire Bureau review. Require that these storage tanks are either adequately protected or relocated outside of the 500 year floodplain, landslide, or other hazard areas. (asset management) (NFIP Compliance)		✓	
***Comment**: City Resolution 36156 (Water Bureau) requires businesses in the Columbia South Shore Well Field Wellhead Protection Area that meet hazmat thresholds to report a hazardous materials inventory every November 30. 2016 Critical Energy Infrastructure Hub Risk Assessment report includes recommendations to begin accomplishing this. Carry over, PBEM-19.*			
LT MH #9 — Identify and pursue funding opportunities from outside agencies to fund and implement identified mitigation projects and activities. (education, outreach)	✓		
***Comment**: FHA grant funding for PBEM/PBOT transportation planner. PDM 13 grant for MAP update, Hazard Mitigation Program grant for seismic retrofitting of private residences, PDM 15 grant application for seismic retrofit of private residences. PBEM annually applies for and receives Emergency Management Performance Grants, Urban Areas Security Initiative grants, and others on a regular basis. *Note: PBEM did not receive the Urban Areas Security Initiative grant in 2013.*			
LT MH #10 — Assess the stability of levees in the Columbia Corridor Area and develop appropriate emergency plans to address potential levee failure and associated hazards. (planning)		✓	
***Comment**: Carried over, PBEM-14, OMF-1.*			
LT MH #11 [a] — Support development of a multiple-agency plan for Marine Drive closure coordination. (planning)	✓		
***Comment**: PBOT is part of the Multnomah County Drainage District Flood Emergency Action Plan (2016) to install stop log closures along Marine Drive as necessary. Marine Drive closure is outlined in the City's evacuation plan for the Districts, which is an annex to the BEOP.*			
LT EQ #11 [a] — Work with local jurisdictions to assess the capacity of landfill to accommodate earthquake debris: develop coordination plans for disposal of debris in the aftermath of an earthquake. (planning)		✓	
***Comment**: Carried over, PBEM-4.*			

Action Item	Completed	Carry Over to MAP	Removed; No Longer Feasible
New MH #1 [a] — Cross reference and incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement and land use plans, to demonstrate multiple bureau benefits and strengthen eligibility from multiple funding sources. This action is also identified in LTFL#8, IS#94 & SW#117. (planning)	✓		
***Comment**: 2010 Natural Hazard Mitigation Plan components incorporated into Climate Action Plan and Comp. Plan update. PBEM regularly provides comments on citywide planning efforts and requests comments or participation from other bureaus on PBEM planning activities*			
New MH #2 — Identify and list repetitively flooded structures and infrastructures, analyze the threat to these facilities and prioritize mitigation actions to protect the threatened population. (NFIP Compliance)		✓	
***Comment**: Carried over, BES-4.*			
New Reworded MH — Acquire (buy-out), demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas. (planning) (NFIP Compliance)		✓	
***Comment**: Carried over, BES-4.*			
New MH #3 [a] — Develop and incorporate building ordinances commensurate with building codes to reflect survivability from all hazards to ensure occupant safety. (NFIP Compliance)		✓	
***Comment**: Carried over, BDS-2.*			
New MH #4 [a] — Update the Infrastructure Master Plan and System Vulnerability Assessment, Sewer Failure Response Plan. (asset management, planning)	✓		
***Comment**: The Infrastructure Master Plan was updated in 2014 and was renamed the Citywide Systems Plan. The Sewer Failure Response Plan was updated in 2012 to comply with National Pollutant Discharge Elimination System permit requirements, and named the Sewer Release Response Plan.*			
New MH #5 — Partner with agencies to develop a west side operations center to be used during an emergency if the east side Emergency Control Center and other City facilities become inoperable.		✓	
***Comment**: Carried over, OMF-2.*			
New MH #6 [a] — Promote 09 Climate Action Plan action items with similarities to adaptation planning and mitigation actions. (planning)		✓	
***Comment**: Carried over, BPS-7.*			
ST EQ #2 [a] — Assess existing earthquake related mitigation plans and vulnerability studies to identify areas of conflict, duplication or gaps between studies & secondary hazards of earthquake. (planning)			✓
***Comment**: Removed as it was determined that this is not a priority and not a productive use of staff time.*			
ST EQ #3 [a] — Update the vulnerability analysis of Columbia Boulevard Wastewater Treatment Plant Tryon Creek Wastewater Treatment Plant and wastewater pump stations. (Asset management, planning)		✓	
***Comment**: Carried over, BES-3.*			
ST EQ #4 — Prioritize the return of power to treatment plants (Tryon Creek and Columbia Boulevard) and pump stations.		✓	
***Comment**: Carried over, BES-2.*			
ST EQ #8 — Study the feasibility of mandatory or voluntary installation of seismic shutoff valves on natural gas meters at commercial and residential buildings.	✓		
***Comment**: PBEM pursued this, but it did not come to fruition. Valves are expensive, and take time and professional services to turn back on after being shut off. BPS and BDS have advocated for disclosure of seismic information upon sale of homes.*			
LT EQ #3 [a] — Develop a plan to strengthen sewer infrastructure in areas where street overlays and sewers have potential to collapse in a seismic event. (asset management)		✓	
***Comment**: Carried over, CAMG-1.*			

Action Item	Completed	Carry Over to MAP	Removed; No Longer Feasible
LT EQ #6 — Assess the vulnerability of the water distribution system to seismic events: work toward hardening the system.		✓	
***Comment**: Carried over, PWB-1.*			
LT EQ #8 [a] — Study development regulations and policies to ascertain if regulations can be made to limit development of high risk facilities in known areas of earthquake hazards.		✓	
***Comment**: Carried over, BPS-4, BPS-13, and BPS-15.*			
SW #2 — Acquire an additional facility for storage of anti-icing materials and expand anti-icing vehicle inventory.		✓	
***Comment**: PBOT acquired additional plows, sanders and anti-icing equipment. Storage for additional anti-icing material is planned for the Jerome Sears Westside facility once project is completed. Carried over, OMF-2.*			
ST SW #6 — Insulate residential buildings that house at risk populations.	✓		
***Comment**: This action is being accomplished through different means. BPS created Clean Energy Works, Oregon which is now a non-profit organization that conducts energy audits and provides homeowners with low-cost energy efficient upgrades.*			
ST SW #7 — Prioritize existing building stock for active review of Title 29 (Dangerous Building Code) This needs to be updated with intern information or information sent from individuals that are on the team.			✓
***Comment**: Removed because it is not feasible, not a productive use of staff time, and not directly related to hazards.*			
ST FL #1 — A covenant is recorded with the deed of new development in the floodplain to ensure that space below the base flood elevation is not converted to habitable space. This should be codified to improve compliance. (NFIP Compliance)		✓	
***Comment**: Carried over, BDS-3.*			
ST FL #2 — Continue to co-fund improvements to river and stream gauges in the Portland metropolitan area with the United Geological Survey.		✓	
***Comment**: Carried over, BES-7.*			
ST FL #4 — Secure the agreements necessary to design and implement the redevelopment of Freeway Land Company site. (within the Lents Urban Renewal Area)			✓
***Comment**: Removed. Determined to be overly specific. Incorporated into BES-18.*			
ST FL #5 — Acquire outside funding to hire a consultant to lead the application process to maintain a Class 5 rating when the City seeks Community Rating System re-certification.	✓		
***Comment**: Recently completed reverification. Portland is likely to be a Class 6 Community follow an extremely rigorous reverification process. New, more robust guidelines in the 2013 CRS Coordinators' Manual made it impossible to retain Class 5 status.*			
ST FL #6 [a] — Support Multnomah County Drainage District (MCDD) in the continued calibration and update of hydraulic models for conveyance and internal flood impacts to the four floodplains managed by MCDD #1.		✓	
***Comment**: BES-20*			
ST FL #8 — Identify funding for the design and construction of the Springwater Wetlands Complex, a 30-acre floodplain wetland restoration project in the Lents area of Johnson Creek.			✓
***Comment**: Removed. Determined to be overly specific. Incorporated into BES-18.*			
ST FL #9 — Secure funding to implement the passive flood management projects that are recommended in the Johnson Creek Restoration Plan & other watershed management plans. Coordinate with Portland Development Commission's urban renewal efforts in Lents and with other partners in other parts of the watershed.			✓
***Comment**: Removed. Determined to be overly specific. Incorporated into BES-18.*			
ST FL #10 — Improve definitions and refine standards for stormwater retention in the Storm water Management Manual.	✓		
***Comment**: New Stormwater Management guidelines have just been released, with clarifying definitions and standards.*			

Action Item	Completed	Carry Over to MAP	Removed; No Longer Feasible
LT FL #1 — Increase funding for the Johnson Creek Willing Seller Program; establish willing seller programs in other watersheds where flood hazard and priority restoration areas coexist. (NFIP Compliance)		✓	
***Comment**: Carried over, BES-6.*			
LT FL #3 [a] — Develop a plan for addressing flooding in the Holgate Lake area. (planning) (NFIP Compliance)			✓
***Comment**: Removed. Outside of scope of Johnson Creek Willing Seller area and not identified in Johnson Creek Restoration Plan. Not a current or future priority for BES.*			
LT FL #4 — Improve hydraulic bottleneck that prevents discharge of chlorinated effluent to the Willamette River during high river levels. (NFIP Compliance)			✓
***Comment**: Removed. Does not directly address risk from natural hazards.*			
LT FL #5 [a] — As Waterfront Park remodeling is designed, ensure that Portland's downtown property and critical facilities remain protected from floodwaters. (asset management)		✓	
***Comment**: Carried over, PP&R-1.*			
LT FL #6/#7 [a] — Partner with Army Corps of Engineers to conduct modeling of the Willamette River upstream of Portland to identify areas that, if acquired or restored, would contribute to mitigate of peak flows in Portland or result in significant reduction of flood damages. (NFIP Compliance)			✓
***Comment**: Removed. This is beyond the city's (specifically BES's) capabilities and responsibilities.*			
LT FL #8 [a] — Develop goals, policies and implementation measures to manage the amount of new impervious surface and remove existing impervious surfaces where appropriate. These goals, policies and measures may be at the citywide, watershed, or sub-watershed level. (planning) (NFIP Compliance)		✓	
***Comment**: Draft Comprehensive Plan contains goals and policies, and updated CAP and new Climate Change Preparation Strategy include objectives and actions to limit and reduce impervious area. BES would lead implementation measures to actually remove pavement. Carried over, BPS-17.*			
LT FL #9 — Upgrade trestles that carry the main conduits of the water delivery system. (Sandy River Crossing interties completed) (asset management)		✓	
***Comment**: Carried over, PWB-55.*			
FL #10 — Create redundancy in the water delivery system at the three Sandy River crossings by burying conduits under the river (in progress).		✓	
***Comment**: Carried over, PWB-56.*			
LT FL #11 — Provide funding for and participate in development of a flood inundation model for the managed floodplains and downtown sea wall. (mapping) (NFIP Compliance)			✓
***Comment:** Removed. Lead agency would be FEMA. New floodplain mapping requirements under the FEMA biological opinion will require FEMA to do this work with specific climate projections and mapping protocols.*			
LT FL #12 — Install a river gauge in the vicinity of the bridge over Johnson Creek at 108th. The gauge should be able to send data to remote monitoring sites.	✓		
***Comment**: The bridge was removed as part of the Foster Floodplain Natural Area construction, which created an additional 120 acre feet of flood storage along SE Foster Rd. We have installed a crest gage however to determine flood levels during over-bank events.*			
LT FL #13 — Install one-way valves on the outlet pipes of the storm inlets on SE Foster Road between 101st and 112th.	✓		
***Comment**: These outlets now go to a stormwater facility that is part of the Foster Floodplain Natural Area.*			
FL #1 [a] — Complete update to the Johnson Creek Restoration Plan. Develop individual plans for each sub-watershed to address the sources of excess stormwater runoff that exacerbates flooding. (NFIP Compliance)			✓
***Comment**: This action was determined to be redundant with ST MH #11*			

Action Item	Completed	Carry Over to MAP	Removed; No Longer Feasible
FL #2 [a] — Establish flood mitigation priorities for critical facilities and residential and commercial buildings located within the 100- year floodplain using survey elevation data. (NFIP Compliance)		✓	
***Comment**: Rolled over, CAMG-2.*			
ST-LS #1 [a] — Continue to maintain and Improve internal City communications to facilitate coordination of landslide mitigation activities. (education, outreach)		✓	
***Comment**: Carried over, PBOT-5.*			
ST-LS #3 — Mitigate Portland's water supply infrastructure from landslide hazards. (asset management)		✓	
***Comment**: Carried over, PWB-57.*			
ST-LS #4 — Initiate more operations and maintenance pilot projects along roads that inform about the development of standards for managing stormwater in ditches in landslide prone areas. (education, outreach)		✓	
***Comment**: Carried over, BES-11.*			
LT-LS #1 — Develop a comprehensive landslide map for the City of Portland to identify hazard areas and to improve communications with the public. (mapping)		✓	
***Comment**: Carried over, PBEM-9.*			
New LT LS #3 — Evaluate the role of drainage systems in the West Hills, including pipes, streams and drainage ways and options for protecting and improving their functions and increasing their resiliency. (planning)			✓
***Comment**: This action was determined to be redundant with ST MH #11*			
LT LS #4 [a] — Review the effectiveness of existing regulations related to development in landslide hazard areas. (planning)	✓		
***Comment**: Complete. Downzoning completed as part of Comprehensive Plan update.*			
LT-LS #6 — Employ alternative construction methods such as trenchless construction on City projects to reduce the impact that development can have in landslide prone areas	✓		
***Comment**: PBOT accomplishes this for sewer repair. City bureaus use a variety of practices depending on site and system conditions.*			
LT LS #7 — Continue development of standards for small pump stations as an alternative to gravity sewers in accessible or high risk areas.			✓
***Comment**: Removed. Not directly related to reducing risk from natural hazards.*			
ER #1 [a] — Develop recommendations for high and low ranking streamside plants that provide more erosion control, such as reducing erosion from high water and wave actions.		✓	
***Comment**: Carried over, BES-12.*			
ER #2 [a] — Implement projects that retain native vegetation, increase vegetation diversity and increase the complexity of the vegetation strata (having three vegetation strata: herbs, shrubs, trees).		✓	
***Comment**: Carried over, BES-13.*			
ER #3 [a] — Implement policies to increase the extent of coverage of the Greenway zones along the rivers and further limit proposed activities within these areas.	✓		
***Comment**: Complete. Expanded Greenway Zones included in 2035 Comprehensive Plan.*			
ER #4 [a] — Develop standards for soil backfill in vegetated areas, especially sloped areas. (planning)			✓
***Comment**: Removed. Not a priority action for City bureaus.*			
ER #5 [a] — Establish regulations that prevent installation of slopes steeper than 3:1 and prohibit development on slopes steeper than 3:1. (planning)			✓
***Comment**: Removed. Determined to be an ineffective strategy.*			
ER #6 — Implement projects that layback and/or regrade riverbank slopes and secure wetland sod mats composed of native emergent/grasses, etc.	✓		
***Comment**: Complete. Established practice for restoration projects.*			

Action Item	Completed	Carry Over to MAP	Removed; No Longer Feasible
ER #7 — Construct and install bio-engineered slope protective measures to reduce or eliminate erosion	✓		
***Comment**: Complete. Established practice for restoration projects.*			
ER #8 — Implement projects that increase large wood structures that act to soften the effect of wave action on shorelines as well as provide habitat for migrating salmonids.		✓	
***Comment**: Carried over, BES-14.*			
ER #9 — Secure large wood [boles w/ attached root wads] or log rafts to reduce high wave action that can result in erosion.			✓
***Comment**: Removed. Redundant with ER #8/BES-14.*			
ST WF #1 — Consolidate unassigned and/or unmanaged vegetated areas owned by the City under a single land management umbrella. (asset management)			✓
***Comment**: Removed. Not a priority and does not directly reduce risk from natural hazards. Intent is served by ST WF #2.*			
ST WF #2 — Procure funding for management of vegetated natural areas with high wildfire danger, including public and private properties.	✓		
***Comment**: Parks does not seek funding from outside sources, but this is a typical management practice and is integral to Parks SOPs and management/planning documents.*			
ST WF #4 — Provide wildfire management training to staff. (education, outreach)	✓		
***Comment**: Each year, Portland Fire & Rescue (PF&R) provides seasonal wildland training to all line personnel by reviewing and exercising procedures. In 2016, PF&R will conduct a spring Training Block that all line staff will complete, with basic state level hands-on wildland training.*			
ST WF #5 [a] — Amend the Portland Plant List and other related City plant lists and landscaping guides to include/identify fire resistant native plants and planting strategies that could be encouraged or required in local landscaping. (planning)	✓		
***Comment**: The Portland Plant List was updated to provide information about fire resistant native plants. Other landscaping and tree guides are maintained by BDS and Portland Parks & Recreation (PP&R).*			
ST WF #6 [a] — Integrate, as appropriate, fire prevention goals and provisions into City policies, plans and codes. Identify and address ambiguities or conflicts among city requirements. (planning)	✓		
***Comment**: The draft Comprehensive Plan includes policies and map changes to reduce future risks and impacts from natural hazards, including wildfire. The draft plan also includes new urban forest related policies that recognize the need to manage for wildfire.*			
ST WF #7 [a] — Identify conditions of approval and mitigation strategies that could be applied to new development or redevelopment in high risk areas.		✓	
***Comment**: Carried over, BPS-11.*			
ST WF #9 [a] — Improve the system for identifying new construction in areas subject to wildfires and communicating this information to the affected land owners. (planning)	✓		
***Comment**: It is not clear what exactly this strategy means. It seems to imply a new mapping tool or interface. BTS upgraded the online mapping platform at PortlandMaps.com, which shows fire risk by parcel.*			
ST WF #10 — Conduct systematic reviews of Portland's large, publicly owned, wildland tracts regarding fire safety and ecological health to ensure informed land management decisions. (asset management)	✓		
***Comment**: Complete. This is part of PP&R standard operating procedures and planning documents.*			
ST WF #11 — Adopt the national "Fire Danger Rating System" and install the signs at key points in the City.			
***Comment**: This is part of Parks' standard operating procedures and planning documents.*			

Action Item	Completed	Carry Over to MAP	Removed; No Longer Feasible
ST WF #12 — Implement a neighborhood wildland interface disaster planning program. (education, outreach)	✓		
Comment: *"Ready, Set, Go!" was developed and managed by the International Association of Fire Chiefs. We adopted the program last year, and have information on our website and handouts for citizens to learn how to protect themselves.*			
ST WF #13 [a] — Review and potentially refine City contract specifications for machinery operations during "Red Flag" weather conditions. (asset management)	✓		
Comment: *Complete. City of Portland's General Construction Safety Provisions for Owner Controlled Insurance Program document was updated by BES and PWB in January, 2011.*			
ST WF #14 [a] — Convene a standing wildland interface fire technical group. (planning)		✓	
Comment: *Carried over, PF&R-2.*			
ST WF #15 [a] — Index City wildfire mitigation plans and activities. (asset management)	✓		
Comment: *The 2011 Multnomah County Community Wildfire Protection Plan indexes recommendations from the 2010 NHMP, the 2009 Wildfire Readiness Assessment Gap Analysis Report, and the Forested and the 2005 Wildland Interface Areas Protection Annex recommendations into one comprehensive list.*			
WF [a] — Develop and implement protocol for defining and mapping Wildland Urban Interface Zones and develop recommended policies, regulations and landscape options for incorporation into City plans and programs. (planning)		✓	
Comment: *Carried over, PF&R-3.*			
ST WF #16 — Identify water grid engineering requirements for firefighting in wildfire areas. (asset management)	✓		
Comment: *Complete. PWB has extended the infrastructure or grid into some of these wildfire prone areas. There are City requirements for minimum fire flow standards in new developments throughout the WUI.*			
LT WF #2 [a] — Review the feasibility of adopting portions of nationally recognized wildfire interface codes to strengthen building standards in wildfire risk areas.	✓		
Comment: *Complete. The City of Portland has adopted the State of Oregon wildland urban inter-face requirements which are regulated by Bureau of Developmental Services.*			
LT WF #3 — Design and conduct a study to determine the effectiveness of maintenance agreements that are established when new land divisions are approved to manage vegetation in open space tracts.		✓	
Comment: *Carried over, BES-9.*			
LT WF #4 — Complete an assessment to characterize high priority wildfire risk areas and recommend specific mitigation strategies.			✓
Comment: *Removed. LiDAR data collected in 2014 may be processed with vegetation classifications to develop a wildfire risk zones dataset. This data is owned by the region, and this effort would be coordinated regionally.*			
LT WF #5 — Explore avenues for funding wildfire interface home construction upgrades to low income homeowners.			✓
Comment: *Removed. Not a priority - anecdotal cost-benefit analysis does not show this as being an efficient use of city resources.*			
WF [a] — Act upon all Mitigation Actions outlined in the Wildfire GAP Analysis Report		✓	
Comment: *Carried over, PF&R-3.*			
IS #1 — Update Invasive Species Plants List by consolidating nuisance and prohibited plant lists into one "Nuisance Plants List" and assigning priority ranks to the Nuisance Plants List.	✓		
Comment: *Completed in 2010*			
IS #2 [a] — Clarify zoning regulations to require removal of plants on the Nuisance Plants List in the Environmental, Greenway and Pleasant Valley Natural Resources Overlay Zones and the Columbia South Shore and Johnson Creek Basin Plan Districts.			✓
Comment: *There is no additional plan to require removal of all nuisance plants in the specific areas identified in the action.*			
IS #3 [a] — Initiate a process to ensure the Erosion Control Manual be made consistent with City goals to control and eradicate invasive plants. (planning)	✓		
Comment: *The Erosion Control Manual was updated in 2010. In this update, invasive species were called out as specifically prohibited.*			

Action Item	Completed	Carry Over to MAP	Removed; No Longer Feasible
IS #4 [a] — Initiate a process to ensure the Tree and Landscaping Manual, the Recommended Street Tree List and the Stormwater Management Manual be made consistent with City goals to control and eradicate invasive plants. (planning)			✓
***Comment**: Removed. Invasive species are considered in all documents as a general practice.*			
IS #5 [a] — Coordinate with the Portland Plan project to help ensure that invasive species are addressed in the Comprehensive Plan update and Portland Plan work plan. (planning)	✓		
***Comment**: The draft Comprehensive Plan contains policies to manage and prevent the spread of invasive plants.*			
IS #6 [a] — Research the feasibility of establishing a local noxious or invasive weed law.	✓		
***Comment**: Completed. Invasive Plant Policy Review and Regulatory Improvement Project completed in 2011.*			
LT V #1 [a] — Work with the state and other impacted jurisdictions to implement and update the various volcano Inter-Agency Coordination Plans.		✓	
***Comment**: Carried over, PBEM-7.*			
V [a] — Work with the state and other impacted jurisdictions to implement and update the various volcano Inter-Agency Coordination Plans.			✓
***Comment**: This action was determined to be redundant with LT V #1*			

a. Action was identified as a plan integration action by the planning team. See Section 19.5.5 for more information.

19.3 ACTIONS SELECTED FOR IMPLEMENTATION IN THE 2016 PLAN

City bureaus and offices were encouraged to review a wide variety of sources of actions for inclusion in the MAP:

- **Mitigation Best Practices Catalog**—A catalog that includes FEMA and other agency identified best practices, steering committee and other stakeholder recommendations, and recommendations from the Critical Energy Infrastructure Hub report.
- **Risk Assessment and Issues**—The results of the risk assessment information and issues identified during the planning process including the exposure and vulnerabilities of critical facilities that bureaus and offices may own or operate or upon which they depend.
- **Public Input**—The results of the public survey and summary notes from the Planning for Real workshops.
- **Other Plans and Programs**—Projects or actions that have been identified in other plans and programs such as the Climate Action Plan, Local Energy Assurance Plan, Capital Improvement Program, etc.
- **Capability Assessment**—Items listed in the capability assessment that the City does not currently have and would like to pursue.
- **2010 Natural Hazard Mitigation Plan**—Actions that were identified as "carry-over" actions from the 2010 plan.

Bureaus were asked to include a special emphasis on selecting actions that were identified by the steering committee and/or identified during the course of the broader public engagement efforts.

19.3.1 Equity Analysis Screening

After bureaus had performed a cursory review of potential actions and developed a working list for inclusion, an equity analysis screening for each action was performed using the following question matrix and review tool. Bureaus were encouraged to make revisions based on the review or to hold off on the pursuit of some actions until more information about equitable implementation could be identified.

A NOTE ON EQUITY:

The Portland Plan defines equity as follows:

- When everyone has access to the opportunities necessary to satisfy their essential needs, advance their well - being and achieve their full potential. We have a shared fate as individuals within a community and communities within society. All communities need the ability to shape their own present and future. Equity is both the means to healthy communities and an end that benefits us all.
- Equity concerns that are of particular importance in hazard mitigation include policies and programs that influence an individual's, household's, or group's ability to:
  - Anticipate
  - Cope with
  - Respond to, and
  - Recover from a hazard event.
  - Policies and programs can enhance or diminish vulnerability.

Review Tool

The equity screening review tool presented in Table 19-2 was developed by the Portland Bureau of Planning and Sustainability as part of the Climate Action Plan Equity Implementation Guide and adapted with guidance from the Portland Officer of Equity and Human Rights. Questions were reviewed and discussed by bureaus as appropriate during the equity analysis screening process.

Question Matrix

The question matrix (see Table 19-3) was designed as a conversation tool. Bureaus were asked to talk through these questions for each identified action and were encouraged to have a group discussion about actions so that multiple perspectives were brought into the screening process.

Table 19-2. Equity Screening Review Tool

	Procedural	Distributive	Structural
Programs/ Services	How was the target audience included in the design of the program? What actions will be taken to ensure that services and programs are physically and programmatically accessible and inclusive? What are the criteria for participation or receipt of benefits?	Is the program or service designed to meet the needs of underserved and underrepresented communities? If not what would need to be changed to ensure their equitable participation? How will program dollars be allocated to ensure inclusive and accessible service delivery? Does the cost structure of the program result in disparate use?/Does the fee structure of the service result in increased burdens for low-income communities?	Does this program/service create unintended consequences for communities that are underserved and underrepresented? How will they be mitigated? Is there an opportunity to extend additional benefits through this program/service that can help support the healing of past harms to communities? Does the program empower and build capacity of a community
Capital Investments	What are the criteria for prioritizing projects and investments? Does the data and information used consider the demographic, geographic and real-world experience of residents and businesses in the area? If data gaps exist, what are you using to guide decisions? What process will be used to get input from the community? How will you reach underserved populations?	Will the investment provide improved safety, health, access or opportunity for the communities who need it most? How will the underserved people who currently live and work in the area benefit from the investment?	What measures will be taken to mitigate the potential impacts of involuntary displacement in the project? How will business or employment opportunity created through the project be extended to communities of color, people with disabilities, and low-income people? How will community benefits be negotiated?
Regulation	Has analysis been done on the impacts to communities of color, people with disabilities, low-income populations, seniors, children, renters, and other historically underserved or excluded groups? How will impacted communities be able to learn about and understand changes with the regulation? How will the regulation be enforced?	Will the regulation provide improved safety, health, access or opportunity for the communities who need it most? How will the regulation alleviate any cost-burden for those who are already in a position where it is difficult to pay?	Does the regulation create or inhibit opportunity for communities of color, people with disabilities, and low-income populations? Will enforcement disproportionately negatively affect low-income communities or communities of color? How will this be mitigated?
Planning	How will impacted communities be involved in the planning process? What measures will be taken to ensure the process is fair and inclusive?	How does the plan prioritize and address the needs of the most impacted or vulnerable in the community? Does the plan improve safety, health, access or opportunity for the communities who need it most? How will resources shift to ensure equitable implementation of the plan?	What measures will be taken to mitigate the potential impacts of involuntary displacement? How will policies support community development? What support is needed to build the community's ownership and self-determination with the plan?

a. Procedural equity—ensuring that processes are fair and inclusive in the development and implementation of any program or policy
b. Distributive equity—ensuring that resources or benefits and burdens of a policy or program are distributed fairly, prioritizing those with highest need first.
c. Structural equity—a commitment and action to correct past harms and prevent future negative consequences by institutionalizing accountability and decision-making structures that aim to sustain positive outcomes

Source: BPS Presentation, Climate Action Plan and Equity: Connecting the Dots with the Community

Table 19-3. Equity Screening Question Matrix

Evaluation Question	Response
1. What issue/problem/risk is the action designed to address? And what are the expected benefits?	Issue: Benefits:
2. Who is the target audience/beneficiary for this action? Who is affected if no action is taken?	
3. How would you classify the mitigation action? (Programs/Service; Capital Investment; Regulation; Planning). *Refer to questions in table above based on your answer to this question.*	
4. Will any community groups be involved in the design/implementation of this action? (i.e. potential partners)	
5. Will this action reduce risk from natural hazards for the following groups? How?	
Communities of color	
Persons with disabilities and/or access and functional needs	
Households with limited English Proficiency	
Renters	
Economically disadvantaged families	
Seniors (age 65 or older)	
Children (under 15 years of age)	
6. How could this action benefit the following groups? Or How could this action be modified so that there are benefits?	
Communities of color	
Persons with disabilities and/or access and functional needs	
Households with limited English Proficiency	
Renters	
Economically disadvantaged families	
Seniors (age 65 or older)	
Children (under 15 years of age)	
7. How could this action burden/negatively impact/leave out the following groups, for example through communication, transportation, physical or programmatic barriers?	
Communities of color	
Persons with disabilities and/or access and functional needs	
Households with limited English Proficiency	
Renters	
Economically disadvantaged families	
Seniors (age 65 or older)	
Children (under 15 years of age)	
8. If you have identified burdens, barriers, or negative impacts, or opportunities for benefits please revisit the action to identify strategies to reduce or eliminate burdens or negative impacts; remove communication, transportation, physical or programmatic barriers; or enhance potential benefits.	
9. Have you identified a performance metric for evaluating progress on this action? How will you know when this action is complete? (please provide) Have you considered outcomes for communities of color, people with disabilities, low-income families, people with limited English proficiency, renters, seniors, and children?	

19.3.2 Selected Actions

Table 19-4 shows the 161 actions that were selected for implementation during the performance period of the MAP. Actions are named and numbered by the lead agency identified for implementation. This agency will be the primary contact for annual progress reports as discussed in the plan implementation and maintenance strategy described in Section 0. In addition to the action name and description, the following information is provided for each identified action:

- **Lead agency**—The lead agency in administering the project.
- **Potential partners**—Potential partners that may be able to assist with implementation.
- **Hazard addressed**— The specific hazard(s) the action will mitigate.
- **Action Source**—Where the action came from, for example Climate Action Plan or Steering Committee Recommendation.
- **Performance Metric**—How the lead agency will measure progress on this action.
- **New or existing assets**— Indicates whether the action mitigates hazards for new or existing assets or both.
- **Funding**—Funding sources identified for the action.
- **Timeframe**—Timeframe is listed as follows:
  - **Near-term** (plan adoption to May 2018)
  - **Mid-term** (June 2018 to December 2021)
  - **Long-term** (2022 or beyond)
  - **Existing/on-going** (currently underway or annual/semi-annual schedule)
  - **Uncertain** (depends on funding/other factors)
- **Objectives met**—The mitigation plan objectives identified by number that the action addresses (see Table 17-1).
- **In previous plan**—Indicates if the action was a carry-over action from the 2010 plan and the former action item number.

The actions selected are projects, programs, and policies that City of Portland bureaus and offices hope to implement over the next five years. It is important to note that this action plan includes only those actions that fall under the jurisdictional authorities of the City of Portland. Many other agencies, jurisdictions, districts, and organizations exist within the City of Portland, and have responsibilities outside of this plan.

Table 19-4. Actions Selected for Implementation

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PBEM-1 — Continue to engage and inform the public about hazards, including through a "disaster survivor" storytelling event and through postcard mailers sent to every household in Portland with easy-to-understand and graphic-heavy information about hazards and actionable instructions on how to be prepared. Include information about how to register for Public Alerts with all outreach efforts.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Office of Neighborhood Involvement (ONI), Immigrant and Refugee Community of Oregon (IRCO), Local media partners, Coalition of Communities of Color			
Action Source: Public Workshops		**Performance Metric:** # of postcard mailers sent; # of new Public Alerts registrants; # of attendees at events			
All Hazards	N/A	Staff Time/Budget Reallocation	Short-term	2, 6, 8, 10, 12, 15	No
PBEM-2 — Expand the Neighborhood Emergency Team (NET) program into every neighborhood in Portland and expand beyond the neighborhood structure to non-geographic and cultural communities (e.g. immigrant and refugee communities, disability community organizations), and work with Community Engagement Liaisons to provide trainings in languages other than English.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Community Engagement Liaisons (CELs) program; Office of Neighborhood Involvement (ONI); neighborhood associations			
Action Source: Public Workshops		**Performance Metric:** # of additional neighborhoods with established NETs; NET diversity reporting			
All Hazards	N/A	Staff Time/Budget Reallocation	Long-term	2, 6, 8, 14, 15	No
PBEM-3 — Expand PBEM's capacity to provide community trainings and partner with the Office of Neighborhood Involvement (ONI), Diversity in Civic Leadership (DCL) program, Community Engagement Liaisons, and Multnomah County programs, as well as Non-Governmental Organizations and community-based programs to connect under-resourced and underserved communities with disaster preparedness, home safety, emergency response, and other training opportunities.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Office of Neighborhood Involvement (ONI), Diversity in Civic Leadership (DCL) program, Community Engagement Liaisons (CELs) program, Multnomah County, Non-Governmental Organizations			
Action Source: Public Workshops		**Performance Metric:** # of additional trainings provided per year; # of trainings provided in underserved communities; geographic distribution of training			
All Hazards	N/A	Staff Time/Budget Reallocation	Long-term	2, 6, 12, 14, 15	No
PBEM-4 — Advocate in regional debris planning process for consideration of equity and environmental justice implications of temporary debris storage sites.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Metro			
Action Source: 2010 NHMP		**Performance Metric:** Equity and environmental justice promoted as a priority in identifying temporary debris storage sites.			
Earthquake	N/A	Staff Time	Long-term	2, 16	Yes (LT EQ #11)
PBEM-5 — Support Multnomah County in developing a robust, inclusive, and equitable sheltering plan.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Multnomah County			
Action Source: Steering Committee		**Performance Metric:** Participation in Multnomah County sheltering plan process.			
All Hazards	N/A	Staff Time	Mid-term	2, 6, 16	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PBEM-6— Support public school districts in developing a prioritization strategy for seismic strengthening of existing schools to facilitate rapid re-opening of schools.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** public school districts			
Action Source: Steering Committee		**Performance Metric:** Participation in prioritization process for seismic strengthening.			
Earthquake	Existing	Staff Time	Mid-term	4, 5, 11, 16	No
PBEM-7— Remain informed about inter-agency volcano coordination planning to communicate and understand agency roles and capabilities and potential sheltering needs for evacuees.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Portland Bureau of Transportation (PBOT), Mount Hood Facilitating Committee			
Action Source: 2010 NHMP		**Performance Metric:** City emergency managers aware of volcano coordination plans.			
Volcano	N/A	Staff Time	Long-term	6, 16	Yes (V #1)
PBEM-8— Coordinate with owners and operators of key communications infrastructure (i.e. internet and telecom) located in unreinforced masonry (URM) buildings or buildings not designed for the purpose of housing this infrastructure; assess risks to these assets, and develop a strategy that identifies alternatives and funding sources for implementing seismic strengthening projects.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Owners/operators of communications infrastructure			
Action Source: PBEM Strategic Plan		**Performance Metric:** Development of a strategy for funding and implementing seismic strengthening projects to protect key communications infrastructure.			
Earthquake	Existing	Staff Time	Long-term	4, 7, 10, 12, 13	No
PBEM-9— Update risk assessment information about landslides and develop new MAP action items based on updated 2017-2018 Department of Geology and Mineral Industries (DOGAMI) landslide data and recommendations.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Department of Geology and Mineral Industries (DOGAMI), BDS, MAP Working Group			
Action Source: Steering Committee		**Performance Metric:** MAP landslide chapters updated in 2017.			
Landslide	N/A	Staff Time	Short-term	10, 16	No
PBEM-10 — Work with Office of Neighborhood Involvement (ONI) Disability Program Coordinator to promote participation in the Additional Needs Registry through the Public Alerts system.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Office of Neighborhood Involvement (ONI), Portland Police Bureau (PPB), PF&R, Bureau of Emergency Communications (BOEC), Multnomah County, Elders in Action			
Action Source: PBEM Strategic Plan		**Performance Metric:** # of additional registrants for Additional Needs Registry;			
All Hazards	N/A	Staff Time/Budget Reallocation	Long-term	2, 6, 9, 13, 15	No
PBEM-11— Support Bureau of Development Services (BDS) in implementing recommendations from the City's Unreinforced Masonry (URM) Seismic Retrofit Project, including promoting and supporting policies for mandatory retrofits of URM buildings. This action needs high-level support from City Council and Office of Government Relations (OGR).					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** BDS, Portland Development Commission (PDC), Office of Government Relations (OGR), Portland Housing Bureau (PHB), City Council			
Action Source: PBEM Strategic Plan		**Performance Metric:** Adoption of mandatory retrofit codes; # of city buildings retrofitted; # of affordable housing units retrofitted			
Earthquake	Existing	Staff Time	Long-term	1, 4, 11	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PBEM-12 — Audit PBEM's suite of plans to evaluate whether plans meet the needs of people with disabilities, people with language barriers, and other access and functional needs populations. Develop a transition plan to update all plans.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Regional Disaster Preparedness Organization (RDPO), Office of Equity and Human Rights (OEHR), Office of Neighborhood Involvement (ONI)			
Action Source: PBEM Strategic Plan		**Performance Metric:** Completion of audit.			
All Hazards	N/A	Staff Time/Budget Reallocation	Short-term	2, 15, 16	No
PBEM-13 — Expand ATC-20 damage assessment trainings and certifications to non-city employees to increase pool of qualified post-earthquake building inspectors, including through advertisements to registered Minority, Women-Owned, and Emerging Small Business architecture and structural engineering firms.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Oregon Office of Emergency Management (OEM), University of Portland, Structural Engineers Association of Oregon (SEAO)			
Action Source: Steering Committee, PBEM Strategic Plan		**Performance Metric:** # of additional ATC-20 certifications issued			
All Hazards	N/A	Staff Time/Budget Reallocation	Long-term	6, 14, 15	No
PBEM-14— Support Multnomah County Drainage District (MCDD) and Levee Ready Columbia in risk assessment and flood response planning efforts.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** MCDD, Portland Water Bureau (PWB), BES, PBOT			
Action Source: Steering Committee, 2010 NHMP		**Performance Metric:** PBEM participation in Levee Ready Columbia meetings and planning projects.			
Flood	Existing	Staff Time	Long-term	4, 5, 6	Yes (LT MH #10)
PBEM-15 — Continue to involve the public in updating the MAP, including by establishing a standing committee with community representation to oversee progress reporting and implementation of MAP action items, and oversee annual updates to the MAP. Perform outreach consistent with the MAP Community Engagement Strategy, and ensure reports are written in plain, accessible language.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** BES, BPS, BDS, PP&R, PF&R, PWB, OEHR, MAP Steering Committee			
Action Source: Steering Committee		**Performance Metric:** Committee established, meets quarterly, and updates plan annually.			
All Hazards	N/A	Staff Time	Long-term	2, 5, 6, 9, 10, 16	Yes (ST MH #1)
PBEM-16 — Maintain and promote registration in Public Alerts system, including registration in languages other than English, and improve accessibility of the online interface for languages other than English. Integrate into other public outreach activities.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Multnomah County, Public Alerts Steering Committee			
Action Source: PBEM Strategic Plan		**Performance Metric:** # of new Public Alerts registrants; # of new Public Alerts registrants in languages other than English			
All Hazards	N/A	Staff Time/Budget Reallocation	Long-term	2, 6, 9, 13	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PBEM-17 — Hire a permanent planner to help City bureaus update continuity of operations plans and set aside a percentage of time to work with key social services organizations such as food banks and homeless shelters to develop continuity of operations plans.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Oregon Food Bank, local homeless shelters			
Action Source: Steering Committee		**Performance Metric:** Number of social service organizations with continuity of operations plans.			
All Hazards	N/A	Staff Time	Long-term	2, 6, 14, 15, 16	No
PBEM-18— Expand Neighborhood Emergency Team (NET) trainings to include teachers and principals and include information about non-structural retrofits in classrooms.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** BDS, public school districts			
Action Source: PBEM Strategic Plan, Steering Committee		**Performance Metric:** # of teachers and principals trained			
All Hazards	N/A	Staff Time	Long-term	2, 6, 14, 15	No
PBEM-19 — Advocate for implementation of Critical Energy Infrastructure (CEI) Hub Risk Assessment recommendations, including establishment of Critical Energy Infrastructure (CEI) Hub Disaster Resilience Workgroup.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Office of Government Relations, Regional Disaster Preparedness Organization (RDPO) Policy Committee, City Council			
Action Source: CEI Hub Stakeholders		**Performance Metric:** CEI Hub Disaster Resilience Workgroup established; CEI Hub recommendations implemented			
All Hazards	Both	Staff Time	Mid-term	4, 5, 10, 11	No
PBEM-20 — Develop a post-disaster recovery plan to guide post-disaster redevelopment that considers hazard exposure and relocation of critical infrastructure outside of high-hazard areas, prioritizes the restoration of natural systems to limit future hazard impacts, and includes whole-community recovery strategies to reduce the potential for involuntary displacement.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** BPS			
Action Source: Steering Committee, PBEM Strategic Plan		**Performance Metric:** Recovery plan developed.			
All Hazards	Both	Staff Time	Long-term	2, 3, 5, 8, 11, 16	No
PBEM-21 — Increase the City's capacity to establish post-earthquake communication nodes throughout the city after a major earthquake, including through expansion of training and additional communications equipment cache placements for the Basic Earthquake Emergency Communication Nodes (BEECN) program.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Office of Neighborhood Involvement (ONI), PF&R, Amateur Radio Emergency Service (ARES)			
Action Source: PBEM Strategic Plan		**Performance Metric:** BEECN program at full capacity of 444 trained BEECN volunteers; BEECN diversity reporting (age, gender, racial identity)			
All Hazards	N/A	Staff Time/Budget Reallocation	Long-term	2, 6, 13, 14, 15	No
PBEM-22 — Develop a Transportation Recovery Plan.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Portland State University (PSU)			
Action Source: Steering Committee, PBEM Strategic Plan		**Performance Metric:** Transportation Recovery Plan developed.			
All Hazards	Both	Budget Allocation	Near-term	4, 5, 10, 16	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PBEM-23 — Develop an emergency communications plan to distribute emergency messages to immigrant and refugee communities in language-appropriate and culturally appropriate ways.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Community Engagement Liaisons (CELs) program			
Action Source: PBEM Strategic Plan, Public Workshops		**Performance Metric:** communications plan developed			
All Hazards	N/A	Staff Time/Budget Reallocation	Long-term	2, 6, 14, 15, 16	No
PBEM-24 —Through a public process with key stakeholders, create an inventory of fossil fuel facilities and infrastructure in Portland that includes characteristics related to seismic safety such as date of construction, construction type, and whether seismic upgrades have been made. This action requires high-level support from City Council.					
Lead Agency: Portland Bureau of Emergency Management (PBEM)		**Partner Agencies:** Bureau of Development Services			
Action Source: Public Comments		**Performance Metric:** Final inventory of fossil fuel infrastructure and facilities.			
All Hazards	Existing	New budget allocation	Short-term	1, 4, 6, 9, 10, 12	No
PP&R-1 — Consider known natural hazards on Portland Parks & Recreation (PP&R) owned or managed properties when developing future plans for these properties, to ensure future plans do not adversely alter or modify these hazards.					
Lead Agency: Portland Parks & Recreation (PP&R)		**Partner Agencies:** various depending on site			
Action Source: PP&R Master Plans		**Performance Metric:** Future Park and Trail Master Plans with known natural hazards will include discussion of those hazards.			
All Hazards	Existing	Staff Time/GF/CIP/System Development Charge (SDC)	Long-term	3, 5, 6	Yes (LT FL #5)
PP&R-2 — Consistent with PP&R management practices and standard operating procedures, allocate funding for management of vegetated natural areas with high wildfire danger, including public and private properties.					
Lead Agency: Portland Parks & Recreation (PP&R)		**Partner Agencies:** various depending on site			
Action Source: 2010 NHMP		**Performance Metric:** Properties identified as high wildfire danger are actively managed.			
Wildfire	Existing	Staff Time/GF/CIP/System Development Charge (SDC)	Long-term	3, 5, 12	Yes (ST WF #2)
PP&R-3 — Conduct systematic reviews of Portland's large, publicly owned, wildland tracts regarding fire safety and ecological health to ensure informed land management decisions.					
Lead Agency: Portland Parks & Recreation (PP&R)		**Partner Agencies:** various depending on site			
Action Source: 2010 NHMP		**Performance Metric:** Systematic reviews performed per SOPs and Parks and Trails plans.			
Wildfire	Existing	Staff Time/GF/CIP/System Development Charge (SDC)	Long-term	3, 5, 6	Yes (ST WF #10)
PF&R-1 — Adopt the national "Fire Danger Rating System" and install the signs at key points in the City.					
Lead Agency: Portland Fire & Rescue (PF&R)		**Partner Agencies:** Parks and Recreation			
Action Source: 2010 NHMP		**Performance Metric:** Locations for signage identified and all necessary signage placed in these locations			
Wildfire	Existing	Existing PF&R FTEs	Mid-term	4, 6, 10, 13, 14,	Yes (WF #11)

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PF&R-2 — Convene a standing wildland interface fire technical group to plan for and address wildland urban interface (WUI) hazards.					
Lead Agency: Portland Fire & Rescue (PF&R)		**Partner Agencies:** PBEM, Parks and Recreation			
Action Source: 2010 NHMP		**Performance Metric:** Quarterly meeting of standing wildfire interface technical group to plan for and address WUI hazards of concern			
Wildfire	Existing	Existing PF&R FTEs	Near-term	1, 3, 4, 5, 6, 7, 9, 10, 13, 14	Yes (WF #14)
PF&R-3 — Act upon all Mitigation Actions outlined in the Wildfire Gap Analysis Report.					
Lead Agency: Portland Fire & Rescue (PF&R)		**Partner Agencies:** Parks, PBEM			
Action Source: 2010 NHMP		**Performance Metric:** All action items in Gap analysis completed			
Wildfire	Existing	Existing PF&R FTEs	Mid-term	1, 3, 4, 5, 6, 7, 9, 10, 12,13, 14	Yes (WF)
PF&R-4 — Inventory critical PF&R assets and review critical PF&R infrastructure vulnerability and identify a 50-year plan to strengthen, retrofit, relocate or otherwise increase resiliency.					
Lead Agency: Portland Fire & Rescue (PF&R)		**Partner Agencies:** None			
Action Source: Steering Committee		**Performance Metric:** Inventory and Review Completed			
Earthquake	New	Existing PF&R FTEs.	Mid-term	4, 5, 10, 11	No
PF&R-5 — Require defensible spaces and water turrets around structures in wildfire risk areas					
Lead Agency: Portland Fire & Rescue (PF&R)		**Partner Agencies:** BDS			
Action Source: Steering Committee		**Performance Metric:** N/A			
Wildfire	New	Existing PF&R FTEs.	Mid-term	1, 4, 5, 10, 12	No
PF&R-6 — Partner with the Forest Park Conservancy and individual land owners to develop a fire risk reduction plan for Forest Park.					
Lead Agency: Portland Fire & Rescue (PF&R)		**Partner Agencies:** Portland Parks & Recreation (PP&R)			
Action Source: Steering Committee		**Performance Metric:** Development of Forest Park fire risk reduction plan			
Wildfire	New	Existing PF&R FTEs.	Mid-term	6, 8, 12, 13, 14	No
PF&R-7 — Continue to engage and train Neighborhood Emergency Team (NET) volunteers to assists with mitigation, response and recovery efforts post disaster. Ensure training takes place in ADA-accessible fire stations, Neighborhood Emergency Teams (NETs) perform outreach activities to underrepresented groups.					
Lead Agency: Portland Fire & Rescue (PF&R)		**Partner Agencies:** PBEM			
Action Source: Steering Committee		**Performance Metric:** Bi-annual fire station-based training opportunities for s members.			
All Hazards	New	Existing PF&R FTEs.	Near-term	2, 6, 13, 14, 15	No
PF&R 8 — Ensure that Additional Needs Registry Data is appropriately utilized and ensure that emergency responders are aware of locations of disabled Portlanders.					
Lead Agency: Portland Fire & Rescue (PF&R)		**Partner Agencies:** Multnomah County, Bureau of Emergency Communications (BOEC), PBEM			
Action Source: : Steering Committee		**Performance Metric:** Ensure that BOEC's Computer Aided Dispatch (CAD) system is updated with most recent Additional Needs Registry Data.			
All Hazards	New	Existing PF&R FTEs.	Near-term	2, 6, 13	No
PF&R-9 — Perform non-structural assessments and mitigation activities (e.g. anchor bookcases to the wall).					
Lead Agency: Portland Fire & Rescue (PF&R)		**Partner Agencies:** None			
Action Source: : Steering Committee		**Performance Metric:** Prioritize mitigation activities at PF&R facilities and implement high priority mitigation action items.			
Earthquake	New	Existing PF&R FTEs.	Long-term	4, 10, 11	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
BPS-1 — Promote and fund energy independence projects in low-income neighborhoods and communities.					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** PBEM; Private sector; Bonneville Power Administration (BPA)			
Action Source: Public Workshops; BPS Strategic Plan		**Performance Metric:** Promotional materials / communications created; # projects begun or completed			
All Hazards / Earthquake	New	Staff time	Mid-term	2, 8, 12	No
BPS-2 — Plan for solar + battery storage systems, which can serve as mini power-supply stations or provide residents the ability to shelter in place after any electricity supply-disrupting event, at varying scales (project, neighborhood and district) and locations (critical City facilities, low-income housing, community gathering spots).					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** Private sector; Bonneville Power Administration (BPA)			
Action Source: Public Workshops; BPS Strategic Plan		**Performance Metric:** Progress made on complete plan.			
All Hazards / Earthquake	New	Staff time	Mid-term	2, 4, 8, 12	No
BPS-3 — Encourage solar + battery storage demonstration projects at critical City facilities, in low-income neighborhoods and in other strategic locations.					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** Private sector; Bonneville Power Administration (BPA)			
Action Source: Public Workshops; BPS Strategic Plan		**Performance Metric:** Successful formation of coalitions / partnerships; # projects begun or completed			
All hazards / Earthquake	New	Staff time	Mid-term	2, 4, 8, 12	No
BPS-4 — Explore ability to waive System Development Charge (SDC) for change of use if money will be spent on seismic retrofit.					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** PBEM			
Action Source: Steering Committee		**Performance Metric:** Completed studies; enactment of new fee waiver program			
Earthquake	New	Staff time	Near-term	1, 4, 8, 11, 12	No
BPS-5 — Adopt Portland's Comprehensive Plan to address Citywide policies, land use improvements and mapping changes related to natural hazards. This action needs high-level support from City Council.					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** City Council; all City bureaus			
Action Source: 2010 NHMP		**Performance Metric:** Progress made towards adoption of natural hazard elements in Comprehensive Plan			
All hazards	Both	Staff time	Near-term	1, 3, 8, 12, 15	Yes (LT MH #1)
BPS-6 — Support Comprehensive Plan policies and projects that relate to resilience, climate change and natural hazard mitigation, response, adaptation and recovery. This action needs high-level support from City Council.					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** All City bureaus; City Council			
Action Source: 2010 NHMP		**Performance Metric:** # Successful projects or implementation of policies related to resilience, climate change & natural hazard mitigation.			
All hazards	Existing	Staff time	Mid-term	1, 3, 8, 12, 15	Yes (LT MH #1)

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
BPS-7 — Support 2015 Climate Action Plan and Climate Change Preparedness Strategy actions that relate to adaptation planning and natural hazard mitigation actions.					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** City bureaus; County			
Action Source: 2010 NHMP		**Performance Metric:** # Successful projects or implementation of policies related to resilience, climate change & natural hazard mitigation.			
All hazards	Existing	Staff time	Mid-term	3, 8, 9, 15	Yes (New MH #6)
BPS-8 — Consider natural hazard mitigation in the development of the River Plan/North Reach.					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** BES, PP&R, private sector			
Action Source: BPS Strategic Plan		**Performance Metric:** # of natural hazard and resilience-related elements included in the River Plan/North Reach			
All hazards / Flood	Both	Staff time	Mid-term	3, 8, 12	No
BPS-9 — Develop an emergency resumption of service plan for solid waste removal after a disaster event.					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** PBEM, Portland Housing Authority (PHA)			
Action Source: BPS Strategic Plan		**Performance Metric:** Progress made towards development of plan.			
All hazards / Earthquake	Both	Staff time	Near-term	4, 5, 8, 12. 14. 15	No
BPS-10 — Develop an emergency service plan for solid waste removal in multifamily properties after a disaster event.					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** PBEM, Portland Housing Authority (PHA)			
Action Source: BPS Strategic Plan		**Performance Metric:** Progress made towards development of plan.			
All hazards / Earthquake	Both	Staff time	Mid-term	2, 4, 5, 8, 12. 14. 15	No
BPS-11 — Develop recommended policies, regulations and/or landscape options for areas at risk from wildfires.					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** PBEM, BDS, PF&R, BES, PP&R			
Action Source: 2010 NHMP		**Performance Metric:** Progress made towards development of policies, recommendations and/or regulations.			
Wildfire	New	Staff time	Mid-term	3, 4, 5, 9, 10, 12	Yes (ST WF#7)
BPS-12 — When possible, build mitigation and resiliency education into bureau public events and outreach (e.g., neighborhood meetings, Fix-it Fairs).					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** PBEM, Neighborhood Emergency Team (NET)			
Action Source: BPS Strategic Plan		**Performance Metric:** # of resilience / mitigation outreach events completed			
All hazards	Existing	Staff time	Near-term	2, 6, 8, 12	No
BPS-13 — Develop incentives and regulations that promote, encourage and/or require seismic retrofits of private property (such as multi-family, masonry structures). This action needs high-level support from City Council and Office of Government Relations (OGR).					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** Portland Development Commission (PDC), BDS, PBEM, City Council, Office of Government Relations (OGR)			
Action Source: 2010 NHMP		**Performance Metric:** Progress made towards the development and implementation of incentive program.			
Earthquake	New	Staff time	Near-term	1, 4, 11, 12	Yes (LT EQ #8)

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
BPS-14 — Identify ways to encourage, promote or require U.S. Resiliency Council Certification for new public buildings. This action needs high-level support from City Council and Office of Government Relations (OGR).					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** PBEM, City Council, Office of Government Relations (OGR)			
Action Source: 2010 NHMP		**Performance Metric:** # of public buildings certified under the U.S. Resiliency Council Certification program			
Earthquake	New	Staff time	Mid-term	1, 4, 5, 15	Yes (LT EQ #8)
BPS-15 — Prioritize retrofitting of structures along emergency transportation routes.					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** PBOT, Multnomah County, Oregon Department of Transportation (ODOT), PF&R, Portland Police Bureau (PPB)			
Action Source: 2010 NHMP		**Performance Metric:** # or % Buildings retrofitted			
Earthquake	New	Staff time	Long-term / Ongoing	5, 8, 11, 13	Yes (LT EQ #8)
BPS-16 — Use updated floodplain data and maps, including potential climate change scenarios, to inform City and County land use, transportation, and other infrastructure planning processes.					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** Multnomah County, BES, PBOT, PBEM, Federal Emergency Management Agency (FEMA), Multnomah County Drainage District (MCDD)			
Action Source: BPS Strategic Plan		**Performance Metric:** Progress made towards full incorporation of new floodplain data into land use planning databases.			
Flood, Severe Weather	Both	Staff time	Near-term	1, 2, 4, 5, 9, 10, 12	No
BPS-17 — Encourage or require private property owners and developers to limit or reduce impervious area at citywide, watershed, site-specific and district scales.					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** BES, PBOT			
Action Source: 2010 NHMP		**Performance Metric:** # of successful outreach and/or communication programs completed.			
Flood / Severe weather	New	Staff time	Mid-term	1, 3, 5, 8, 12	Yes (LT FL #8)
BPS-18 — Provide safety training for day laborers, protect workers' rights, and collaborate with Voz to provide a safe place to locate day laborer services to encourage employment of local day laborers for post-disaster reconstruction and recovery. This action needs high-level support from City Council.					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** Portland Development Commission (PDC), Voz, City Council			
Action Source: 2010 NHMP		**Performance Metric:** worker center established, # safety trainings or certifications provided			
All Hazards	N/A	Staff time	Mid-term	2, 6, 7, 8, 14, 15, 16	No
BPS-19 — Update the environmental overlay zone, codes and maps to reflect best available science and the location and extent of risks associated with natural hazards in Portland					
Lead Agency: Bureau of Planning and Sustainability (BPS)		**Partner Agencies:** BES, BDS, PP&R			
Action Source: New		**Performance Metric:** Acres of natural resources included in the overlay zone			
All Hazards	Existing	Staff time	Near-term	1, 3, 4, 5, 6, 8, 10, 14	No
PWB-1 — Continue to assess the vulnerability of the water system to seismic events and work toward hardening the backbone system.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: 2010 NHMP		**Performance Metric:** Seismic hardening reduces risk by percent of total risk factors			
Earthquake	Both	Capital Improvement Plan (CIP)	Existing/ Ongoing	4, 7, 9, 10	Yes

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PWB-2 — Install remote operating valves to isolate existing river crossings.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: Water System Seismic Study		**Performance Metric:** Valve isolation reduces risk of water loss following damage			
Earthquake	Both	Capital Improvement Plan (CIP)	Mid-Term	4, 11	No
PWB-3 — Install isolation valves where distribution system is tied in to backbone.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: Water System Seismic Study		**Performance Metric:** Valve isolation reduces risk of water loss following damage			
All Hazards	Both	Capital Improvement Plan (CIP)	Existing/ Ongoing	4, 11	No
PWB-4 — Seismically upgrade water pump stations.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: Water System Seismic Study		**Performance Metric:** Seismic upgrades reduce risk to water delivery system			
Earthquake	New	Capital Improvement Plan (CIP)	Existing/ Ongoing	4,10	No
PWB-5 — Continue to monitor dam safety at Mt. Tabor and Washington Park reservoirs.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** State Water Resources			
Action Source: Steering Committee		**Performance Metric:** Dam safety reduces flooding risk			
Dam Failure	Existing	Capital Improvement Plan (CIP)	Existing/ Ongoing	10, 9	No
PWB-6 — Seismically upgrade water storage tanks.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: Water System Seismic Study		**Performance Metric:** Seismic upgrades reduce vulnerability of water storage tanks			
Earthquake	New	Capital Improvement Plan (CIP)	Existing/ Ongoing	4, 11	No
PWB-7 — Plan, design and construct new Willamette River Crossing.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Division of State Lands, Portland Harbor Master			
Action Source: Portland Water Bureau (PWB) Operations Group		**Performance Metric:** Redundancy of water delivery routes across Willamette River ensures adequate water supply to West side			
Earthquake	New	Capital Improvement Plan (CIP)	Mid-Term	4, 11, 2	No
PWB-8 — Plan, design and construct second new Willamette River Crossing.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Division of State Lands, Portland Harbor Master			
Action Source: Water System Seismic Study		**Performance Metric:** Redundancy of water delivery routes across Willamette River ensures adequate water supply to West side			
Earthquake	New	Capital Improvement Plan (CIP)	Long-Term	4, 2	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PWB-9 — Plan, design and construct replacement for St. John's River Crossing.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Division of State Lands, Portland Harbor Master			
Action Source: Water System Seismic Study		**Performance Metric:** Redundancy of water delivery routes across Willamette River ensures adequate water supply to West side			
Earthquake	New	Capital Improvement Plan (CIP)	Long-Term	4, 11, 2	No
PWB-10 — Partner with University of Washington to participate in the testing of the Earthquake Early Warning System.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** University of WA			
Action Source: Portland Water Bureau (PWB) Engineering		**Performance Metric:** Enhancing early earthquake notification capability saves lives			
Earthquake	Both	Capital Improvement Plan (CIP)	Near-Term	6, 10, 13	No
PWB-11 — Coordinate with electrical utilities on tree fall mitigation measures to prevent impacts to Bull Run watershed supply.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Portland General Electric (PGE), Local Electrical Utilities			
Action Source: Portland Water Bureau (PWB) Operations Group		**Performance Metric:** Water distribution is protected from power outages			
Severe Weather	Both	Capital Improvement Plan (CIP)	Near-Term	10, 11	No
PWB-12 — Continue to work in a co-management role with the Oregon Department of Forestry, US Forest Service and local fire departments to respond to and recover from fires in and near the Bull Run watershed.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Oregon Department of Forestry, United States Forest Service (USFS), Local Fire Departments			
Action Source: Bull Run Watershed Group Recommendations		**Performance Metric:** Water supply and distribution is protected from wildfire damage			
Wildfire	Both	Capital Improvement Plan (CIP)	Existing/ Ongoing	10, 11	No
PWB-13 — Continue to assess the potential impacts of climate change on wildfire in the Bull Run watershed.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** National Oceanic and Atmospheric Administration (NOAA)			
Action Source: Bull Run Watershed Group Recommendations		**Performance Metric:** Ongoing assessment helps to address changes timely			
Wildfire	Both	Capital Improvement Plan (CIP)	Existing/ Ongoing	9, 10	No
PWB-14 — Continue to monitor forest health surveys completed by federal and state agency partners for the Bull Run watershed.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** United States Forest Service (USFS), Oregon Department of Forestry			
Action Source: Bull Run Watershed Group Recommendations		**Performance Metric:** Monitoring forest health surveys helps address issues timely			
Wildfire	Both	Capital Improvement Plan (CIP)	Existing/ Ongoing	9,10	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PWB-15 — Update the Bull Run wildfire evacuation plan.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** United States Forest Service (USFS), Oregon Department of Forestry, Sandy Fire, Clackamas County Communications, Clackamas Emergency Management			
Action Source: Bull Run Watershed Group Recommendations		**Performance Metric:** Evacuation planning protects people and property			
Wildfire	Existing	Capital Improvement Plan (CIP)	Existing/ Ongoing	4, 16	No
PWB-16 — Identify and prioritize culvert improvements in the Bull Run watershed to manage streamflow and stormwater runoff and reduce risks to water quality and infrastructure.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** United States Forest Service (USFS)			
Action Source: Bull Run Watershed Group Recommendations		**Performance Metric:** Culvert improvements protect water supply by reducing runoff			
Flood	Both	Capital Improvement Plan (CIP)	Existing/ Ongoing	4, 11	No
PWB-17 — Continue to assess the potential impacts of climate change on flooding in the Bull Run watershed.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** United States Forest Service (USFS), National Oceanic and Atmospheric Administration (NOAA)			
Action Source: Bull Run Watershed Group Recommendations		**Performance Metric:** Ongoing assessment of climate change impacts allows for adjustments to protect water supply and prevent flooding			
Flood	Both	Capital Improvement Plan (CIP)	Existing/ Ongoing	9, 10	No
PWB-18 — Continue to assess the potential impacts of climate change associated with drought in the Bull Run watershed.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** United States Forest Service (USFS), National Oceanic and Atmospheric Administration (NOAA), Oregon Water Resources Department			
Action Source: Portland Water Bureau (PWB) Engineering		**Performance Metric:** Ongoing assessment of climate change impacts allows for adjustments to protect water supply from drought impacts			
Drought	Both	Capital Improvement Plan (CIP)	Existing/ Ongoing	9, 10	No
PWB-19 — Perform seismic/dynamic analysis of Bull Run watershed bridges.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** United States Forest Service (USFS)			
Action Source: Water System Seismic Study		**Performance Metric:** Seismic analysis helps to plan improvements to prevent damage to critical transportation routes			
Earthquake	New	Capital Improvement Plan (CIP)	Mid-Term	9, 10	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PWB-20 — Continue to implement with the USFS the Portland Water Bureau (PWB) transportation system management plan for emergency and fire access in Bull Run Watershed.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** United States Forest Service (USFS)			
Action Source: Portland Water Bureau (PWB) Engineering		**Performance Metric:** Implementation of a management plan for emergency and fire access transportation routes protects water supply access			
Wildfire	Both	Capital Improvement Plan (CIP)	Existing/ Ongoing	5, 9, 11	No
PWB-21 — Continue to partner with electrical utilities to ensure continuity of electrical service to the City and the Columbia South Shore Well field during power outages					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Portland General Electric (PGE), Local Electrical Utilities, Pacific Power & Light			
Action Source: 2010 NHMP		**Performance Metric:** Partnership with electrical utilities to ensure power to the City and South Shore Well field during power outages ensures uninterrupted water supply			
All Hazards	Both	Capital Improvement Plan (CIP)	Existing/ Ongoing	4, 5, 11	Yes (ST MH #8)
PWB-22 — Collaborate with Multnomah County Drainage District and Port of Portland to assess flooding impacts from levee failure, quantify risks, and identify potential mitigation strategies.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Multnomah County Drainage District (MCDD), Port of Portland, Multnomah County Levee Ready Columbia, United States Army Corps of Engineers (USACE)			
Action Source: Steering Committee		**Performance Metric:** Prevent flood damage through assessment and mitigation planning			
Flood	Both	Capital Improvement Plan (CIP)	Mid-Term	4, 5	No
PWB-23 — Make seismic improvements to Columbia South Shore well field and groundwater pump station					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: Portland Water Bureau (PWB) Operations Group		**Performance Metric:** Seismic improvements protect water supply and distribution systems			
Earthquake	New	Capital Improvement Plan (CIP)	Existing/ Ongoing	4, 11	No
PWB-24 — Install backup transformer(s) at Groundwater Pump Stations to reduce vulnerability to power outage.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Portland General Electric (PGE)			
Action Source: Portland Water Bureau (PWB) Operations Group		**Performance Metric:** Redundancy of power supply system ensures uninterrupted water distribution			
All Hazards	New	Capital Improvement Plan (CIP)	Mid-Term	4, 11	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PWB-25 — Investigate well treatment options to increase existing well capacity.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: Portland Water Bureau (PWB) Operations Group		**Performance Metric:** Reducing well deposits increases well holding capacity			
All Hazards	Both	Capital Improvement Plan (CIP)	Long-Term	4, 10, 8	No
PWB-26 — Investigate hypochlorite generation at ground water pump station to reduce or eliminate the need for out of area deliveries.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: Portland Water Bureau (PWB) Operations Group		**Performance Metric:** Reducing dependence on out of area deliveries ensures uninterrupted water treatment when transportation network is damaged			
All Hazards	Both	Capital Improvement Plan (CIP)	Mid-Term	4, 8, 16	No
PWB-27 — Continue to research ways to balance the needs between fire flow requirements and water quality requirements.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Portland Fire & Rescue (PF&R)			
Action Source: Steering Committee		**Performance Metric:** Ensures that water quality is maintained			
Wildfire	Both	Capital Improvement Plan (CIP)	Long-term	9,10	No
PWB-28 — Coordinate with Fleet and PBOT Maintenance Operations to ensure adequate reserves of diesel fuel and gasoline to support extended operations.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Office of Management and Finance (OMF) - Fleet, PBOT Maintenance Operations			
Action Source: Portland Water Bureau (PWB) Operations Group		**Performance Metric:** Adequate fuel storage reserves ensures water distribution systems can continue to operate			
All Hazards	New	Capital Improvement Plan (CIP)	Near-Term	11, 16	No
PWB-29 — Work with other City bureaus to investigate potential for pre-disaster agreements to provide fuel, shelter, food, water, and sanitary facilities, materials, supplies, equipment, and specialty contractors for City response.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** City bureaus			
Action Source: Portland Water Bureau (PWB) Engineering		**Performance Metric:** Pre-disaster agreements to provide critical resources will allow for quicker emergency response in the event of a disaster			
All Hazards	Both	Capital Improvement Plan (CIP)	Near-Term	13, 14, 15	No
PWB-30 — Partner with Multnomah County, Metro, Portland Public Schools (PPS), adjacent school districts, and Portland Parks and Recreation (PP&R) to develop a sheltering plan for city responders and their families.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Multnomah County, Metro, PPS, local school districts, PP&R			
Action Source: Portland Water Bureau (PWB) Engineering		**Performance Metric:** Development of a plan and identification of shelter locations for responders and their families allows quicker response in disasters			
All Hazards	Both	Capital Improvement Plan (CIP)	Near-Term	13, 14, 15	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PWB-31 — Investigate availability, capacity, contracting and delivery of portable water treatment plants					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Federal Emergency Management Agency (FEMA), Army National Guard, Regional Water Providers Consortium			
Action Source: Water System Seismic Study		**Performance Metric:** Ensures availability of potable water after an event			
All Hazards	New	Capital Improvement Plan (CIP)	Mid-Term	10, 14	No
PWB-32 — Investigate availability and use of food-grade quality tank trucks for distribution of water following emergencies.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Federal Emergency Management Agency (FEMA)			
Action Source: Water System Seismic Study		**Performance Metric:** Benefit is potential for expanded water delivery system via tank trunks			
All Hazards	New	Capital Improvement Plan (CIP)	Mid-Term	14, 16	No
PWB-33 — Determine number, locations and types of Emergency Water Distribution Systems, and provide location information to the public.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Federal Emergency Management Agency (FEMA), Regional Water Providers Consortium			
Action Source: Water System Seismic Study		**Performance Metric:** Water distribution planning and publication of locations improves critical access to potable water following disasters			
All Hazards	New	Capital Improvement Plan (CIP)	Mid-Term	14, 16	No
PWB-34 — Investigate and implement use of Integrated Public Alert and Warning System (IPAWS) / Wireless Emergency Alerts (WEA) systems to send alerts from specific cell towers to cell phones for those in specific locations affected by an event.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** PBEM; Federal Emergency Management Agency (FEMA); Multnomah, Clackamas, and Washington Counties			
Action Source: Steering Committee		**Performance Metric:** Emergency notifications save lives			
All Hazards	Both	Capital Improvement Plan (CIP)	Near-Term	6, 13	No
PWB-35 — Develop measures to rapidly isolate damaged portions of the water conveyance system (most of Vernon 270, Washington Park 229 and Tabor 270) to minimize water loss and preserve storage					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Portland Fire & Rescue (PF&R)			
Action Source: Water System Seismic Study		**Performance Metric:** Minimizing water loss ensures adequate water supply			
All Hazards	New	Capital Improvement Plan (CIP)	Mid-Term	4, 16	No
PWB-36 — Further study the feasibility of seismic valve installation at strategic locations to protect water supply & storage.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Portland Fire & Rescue (PF&R)			
Action Source: Portland Water Bureau (PWB) Engineering		**Performance Metric:** Protection of water storage and minimizing seismic impacts protects water supply			
Earthquake	Both	Capital Improvement Plan (CIP)	Mid-Term	4,10	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PWB-37 — Participate with PBOT, Multnomah County, Oregon Department of Transportation (ODOT), Metro, Clackamas County and USFS in an in depth risk assessment of the bridges to develop and prioritize mitigation projects to ensure connectivity after an event.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** PBOT, Multnomah County, Oregon Department of Transportation (ODOT), Metro, Clackamas County, United States Forest Service (USFS)			
Action Source: Steering Committee		**Performance Metric:** Ensuring access to critical transportation, including bridges, ensures water delivery despite disaster damage			
Earthquake	Both	Capital Improvement Plan (CIP)	Mid-Term	4,10,14	No
PWB-38 — Coordinate with Multnomah County, Clackamas County, Metro, Oregon Department of Transportation (ODOT) and PBOT to ensure road system access to critical facilities including Interstate, Lusted Hill, Headworks, Sandy River Station, pump stations, and tank/reservoir sites.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** PBOT, Multnomah County, Oregon Department of Transportation (ODOT), Metro, Clackamas County, United States Forest Service (USFS)			
Action Source: Portland Water Bureau (PWB) Operations Group		**Performance Metric:** Access to critical facilities following disasters ensures water delivery			
All Hazards	Both	Capital Improvement Plan (CIP)	Near-Term	4,10,14	No
PWB-39 — Revise current emergency response plans based on recommendations from the Water Bureau Seismic Study.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** PBEM			
Action Source: Water System Seismic Study		**Performance Metric:** Including seismic risks in planning emergency response is critical to determine strategies to protect and provide water system maintenance, transportation, supply and delivery			
All Hazards	Existing	Capital Improvement Plan (CIP)	Near-Term	10, 13, 16	No
PWB-40 — Continue to support research of best available science and data for space weather and potential impacts to the City of Portland, and where possible take steps to increase resilience of city infrastructure to space weather events.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** National Oceanic and Atmospheric Administration (NOAA)			
Action Source: Steering Committee		**Performance Metric:** Consideration of potential impacts to communication and other systems protects water distribution			
Space Weather	Both	Capital Improvement Plan (CIP)	Existing/ Ongoing	10, 4	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PWB-41 — Develop main replacement program with earthquake resistant pipe (Kubota ERDIP or US-Pipe TR-EXTREME) in areas of high permanent ground deformation					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: Water System Seismic Study		**Performance Metric:** Seismic resiliency for at-risk locations prevents catastrophic failure			
Earthquake	Both	Capital Improvement Plan (CIP)	Mid-Term	4, 11	No
PWB-42 — Support the creation of a City of Portland Seismic Resiliency Officer position under PBEM to drive citywide resiliency efforts. This action needs high-level support from City Council.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** City Council, PBEM			
Action Source: Steering Committee		**Performance Metric:** Seismic resiliency officer position would assist resiliency efforts			
Earthquake	Both	Capital Improvement Plan (CIP)	Near-Term	7, 16	No
PWB-43 — Coordinate with Commissioner's Office and Office of Government Relations (OGR) to elevate seismic retrofit funding for water infrastructure to a high priority on the City's legislative agenda. This action needs high-level support from City Council and Office of Government Relations (OGR).					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Commissioner's Office, Office of Government Relations (OGR)			
Action Source: Portland Water Bureau (PWB) Engineering		**Performance Metric:** Provides a mechanism for requesting seismic improvement funding			
Earthquake	Both	Capital Improvement Plan (CIP)	Near-Term	4, 7	No
PWB-44 — Collaborate with other City bureaus to encourage and expand personal, family and business preparedness plans and programs.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** City bureaus, PBEM			
Action Source: Steering Committee		**Performance Metric:** Personal and family preparedness saves lives; business preparedness allows continuity. Responders are able to assist more readily if families are prepared.			
Earthquake	Both	Capital Improvement Plan (CIP)	Near-Term	6, 13	No
PWB-45 — Develop a West-side emergency operations and staging facility for field crews.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: Portland Water Bureau (PWB) Engineering		**Performance Metric:** Ensures access to materials and personnel to respond in emergencies.			
All Hazards	Both	Capital Improvement Plan (CIP)	Mid-Term	14, 15	No
PWB-46 — Develop a staging plan for stockpiling water system repair materials in strategic locations.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: Portland Water Bureau (PWB) Engineering		**Performance Metric:** Ensures repairs despite transportation system damage			
All Hazards	Both	Capital Improvement Plan (CIP)	Mid-Term	15, 16	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PWB-47 — Continue to conduct ongoing emergency response training for all Portland Water Bureau (PWB) employees.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** PBEM			
Action Source: Water System Seismic Study		**Performance Metric:** Ensures organized and effective response to disasters			
All Hazards	Both	Capital Improvement Plan (CIP)	Long-term	15, 16	No
PWB-48 — Purchase additional vacuum excavator to facilitate access to water system for maintenance and repairs.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: Water System Seismic Study		**Performance Metric:** Protects assets			
All Hazards	Both	Capital Improvement Plan (CIP)	Mid-Term	4, 16	No
PWB-49 — Establish relationships with out-of-state utilities for future Emergency Management Assistance Compact (EMAC) agreements.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** National WARN, out-of-state utilities			
Action Source: Water System Seismic Study		**Performance Metric:** Ensures power supply in catastrophic outages			
All Hazards	Both	Capital Improvement Plan (CIP)	Near-Term	14, 16	No
PWB-50 — Establish and document PWB reporting standards for both temporary protective measures and permanent repairs in compliance with Federal Emergency Management Agency (FEMA) guidelines.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Federal Emergency Management Agency (FEMA), PBEM, Oregon Emergency Management (OEM), Multnomah County			
Action Source: Water System Seismic Study		**Performance Metric:** Ensures FEMA reimbursement success			
All Hazards	Both	Capital Improvement Plan (CIP)	Near-Term	14, 16	No
PWB-51 — Train PWB responders to understand and follow protocols for Federal Emergency Management Agency (FEMA) reporting.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Federal Emergency Management Agency (FEMA), PBEM			
Action Source: Water System Seismic Study		**Performance Metric:** Ensures FEMA reimbursement success			
All Hazards	Both	Capital Improvement Plan (CIP)	Near-Term	14, 16	No
PWB-52 — Upgrade trestles that carry Conduits 2 and 3 of the water delivery system.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** United States Forest Service (USFS), Clackamas County			
Action Source: 2010 NHMP		**Performance Metric:** Upgrade mitigates loss			
All Hazards	Both	Capital Improvement Plan (CIP)	Mid-Term	4, 11	Yes

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PWB-53 — Create redundancy in the water delivery system by burying Conduit 3 under the Sandy River.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Division of State Lands, Clackamas County			
Action Source: 2010 NHMP		**Performance Metric:** Ensures water delivery			
All Hazards	Both	Capital Improvement Plan (CIP)	Long-Term	4, 11	Yes
PWB-54 — Continue to mitigate Portland's water supply infrastructure and the Bull Run Watershed from landslide hazards; incorporate landslide hazard reduction techniques into infrastructure projects.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: 2010 NHMP		**Performance Metric:** Mitigates loss due to landslide			
Landslide	Both	Capital Improvement Plan (CIP)	Existing/ Ongoing	4, 10, 11	Yes
PWB-55 — Seismically harden Groundwater Transmission Main.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** PBOT			
Action Source: Water System Seismic Study		**Performance Metric:** Critical location requiring seismic stability – Protects water delivery system			
Earthquake	Both	Capital Improvement Plan (CIP)	Long-Term	4, 11	No
PWB-56 — Seismically harden conduits from Headworks to Powell Butte.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** United States Forest Service (USFS)			
Action Source: Water System Seismic Study		**Performance Metric:** Seismic resiliency critical to water delivery			
Earthquake	Both	Capital Improvement Plan (CIP)	Long-Term	4, 11	No
PWB-57 — Mitigate landslide hazards for the conduits within the Bull Run watershed.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** United States Forest Service (USFS)			
Action Source: Water System Seismic Study		**Performance Metric:** Mitigate loss due to landslide			
Landslide	Both	Capital Improvement Plan (CIP)	Long-Term	4, 11	No
PWB-58 — Make seismic improvements at Headworks.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: Portland Water Bureau (PWB) Operations Group		**Performance Metric:** Mitigates loss			
Earthquake	Both	Capital Improvement Plan (CIP)	Long-Term	4, 11	No
PWB-59 — Make seismic improvements at Lusted Hill Treatment Facility.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Multnomah County			
Action Source: Portland Water Bureau (PWB) Operations Group		**Performance Metric:** Mitigates loss			
Earthquake	Both	Capital Improvement Plan (CIP)	Long-Term	4, 11	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
PWB-60 — Install remote monitoring sensors and alarms at Bull Run dams to provide an early detection of dam movement or change.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** United States Forest Service (USFS), Federal Energy Regulatory Commission (FERC)			
Action Source: Portland Water Bureau (PWB) Operations Group		**Performance Metric:** Mitigation and early warning would be possible with monitoring			
Dam Failure	Both	Capital Improvement Plan (CIP)	Mid-Term	4, 9, 13	No
PWB-61 — Continue to monitor Bull Run Dams 1 and 2 for seismic risk, floods and landslides					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** United States Forest Service (USFS), Federal Energy Regulatory Commission (FERC)			
Action Source: Portland Water Bureau (PWB) Engineering		**Performance Metric:** Monitoring allows for early warning and loss mitigation			
All Hazards	Both	Capital Improvement Plan (CIP)	Existing/ Ongoing	4, 9	No
PWB-62 — Replace Cast Iron piping with seismically resilient pipe material.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** N/A			
Action Source: Portland Water Bureau (PWB) Operations Group		**Performance Metric:** Seismic resilience reduces loss			
Earthquake	Both	Capital Improvement Plan (CIP)	Existing/ Ongoing	4, 11	No
PWB-63 — Establish a pre-disaster inter-bureau agreement with Office of Management and Finance (OMF) - Fleet and PBOT Maintenance Operations to assign personnel, equipment, and resources to work in coordination with Portland Water Bureau (PWB) response.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** OMF - Fleet, PBOT Maintenance Operations			
Action Source: Portland Water Bureau (PWB) Operations Group		**Performance Metric:** Continuity of operations is enhanced for all departments			
All Hazards	Both	Capital Improvement Plan (CIP)	Near-Term	6, 7, 13	No
PWB-64 — Coordinate with FEMA on results of updated flood-plain mapping on Willamette River for impacts to Portland Water Bureau (PWB) facilities.					
Lead Agency: Portland Water Bureau (PWB)		**Partner Agencies:** Federal Emergency Management Agency (FEMA), BES			
Action Source: Portland Water Bureau (PWB) Operations Group		**Performance Metric:** Flood plain mapping and planning for impacts to Portland Water Bureau (PWB) facilities would help with mitigation and alternative water delivery planning			
Flood	Both	Capital Improvement Plan (CIP)	Near-Term	6, 7, 13	No
OMF-1 — Participate in Oregon Solutions project to recertify Multnomah County Drainage District (MCDD) levees.					
Lead Agency: Office of Management and Finance (OMF)		**Partner Agencies:** BDS, Oregon Solutions			
Action Source: 2010 NHMP		**Performance Metric:** Staff time and funding for levee recertification.			
Flood	Existing	Staff Time/Budget Reallocation	Long-term	4, 5	Yes (LT MH #10)

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
OMF-2 — Partner with agencies to develop an emergency operations center on the west side of the Willamette River. This action needs high-level support from City Council.					
Lead Agency: Office of Management and Finance (OMF)		**Partner Agencies:** PBOT, City Budget Office (CBO), Bureau of Emergency Communications (BOEC), City Council			
Action Source: 2010 NHMP		**Performance Metric:** West side emergency operations center developed and operational.			
All Hazards	New	Staff Time/Budget Reallocation	Long-term	2, 4, 5, 15	Yes (New MH #5)
PBOT-1 — Perform risk assessment of bridges; use findings to develop and prioritize mitigation projects. Ensure equity tools are used in project prioritization.					
Lead Agency: PBOT		**Partner Agencies:** PWB			
Action Source: Steering Committee		**Performance Metric:** Risk assessment completed and Plan created. Project prioritization has equity criteria.			
Earthquake	New	Staff Time/ Hazard Mitigation Grant Program (HMGP) /Pre-Disaster Mitigation (PDM) grant	Long Term	4, 5, 7,10,11	No
PBOT-2 — Identify transportation routes likely to be impacted by landslides and identify potential alternate routes based on most likely scenarios. Communicate potential alternate routes with the public, highlighting the fact that routes may change during actual events. Ensure this information is available to those with limited English proficiency, as well as seniors and those with disabilities.					
Lead Agency: PBOT		**Partner Agencies:** PBEM, Oregon Department of Transportation (ODOT)			
Action Source: Steering Committee (Landslide 95)		**Performance Metric:** Routes identified, communication to disadvantaged communities.			
Landslide	New	Staff Time/ HMGP /PDM	Mid-term	4, 5, 6	No
PBOT-3 — Design and build facility for PBOT Maintenance Operations that can operate as a Bureau Incident Command Post following a large earthquake. Move existing road clearing equipment to a facility that is not subject to freeway ramp collapse. Engage local community groups, especially communities of color, in design phase and ensure Minority, Women Owned Emerging Small Business contracting meets or exceeds aspirational goals.					
Lead Agency: PBOT		**Partner Agencies:** Office of Management and Finance (OMF) – Fleet			
Action Source: Hazard Mitigation Catalog		**Performance Metric:** Facility designed, funded and built. Community engagement.			
Earthquake	New	Staff Time/ HMGP /PDM	Mid-term	4, 5, 11, 13	No
PBOT-4 — Perform drainage assessment and mitigate problem areas of right of way where frequent washouts occur during heavy rains.					
Lead Agency: PBOT		**Partner Agencies:** Parks, BES, Oregon Department of Transportation (ODOT)			
Action Source: Hazard Mitigation Catalog		**Performance Metric:** Assessment performed			
Severe weather	New	Staff Time/ HMGP/PDM	Mid-term	3, 4, 5, 7, 11	No
PBOT-5 — Continue to convene city landslide group after each major landslide occurrence (including large single landslides or multiple concurrent landslides) to evaluate the city's response and develop lessons learned.					
Lead Agency: PBOT		**Partner Agencies:** PBEM, BDS			
Action Source: 2010 NHMP		**Performance Metric:** Landslide group convenes after landslides.			
Landslide	N/A	Staff Time	Long-term	9, 14, 15	Yes (ST LS #1)
BES-1 — Continue to implement actions in the 2005 Portland Watershed Management Plan.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** N/A			
Action Source: 2010 NHMP		**Performance Metric:** # of green infrastructure projects completed			
Erosion, Landslide, Flood	N/A	Staff Time	Long-term	3, 4	Yes (ST MH #11)

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
BES-2 — Engage with the electric utilities to negotiate prioritizing the return of power to treatment plants (Tryon Creek and Columbia Boulevard), collection system active controls and pump stations.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** PBEM, Utilities			
Action Source: 2010 NHMP		**Performance Metric:** Agreement with electric utilities executed.			
Earthquake	N/A	Staff Time	Near-Term	4, 16	Yes (ST EQ #4)
BES-3 — Complete the BES Resiliency Plan to identify vulnerabilities in the sanitary and combined sewer collection system.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** N/A			
Action Source: 2010 NHMP		**Performance Metric:** Completion of BES Resiliency Plan.			
Earthquake	N/A	Staff Time	Near-Term	4, 16	Yes (ST EQ #3)
BES-4 — Continue BES' land acquisition program to protect or enhance water quality, hydrology and habitat. Consider the presence of floodplain and steep slopes in the program's criteria. When properties are purchased, remove structures and place deed restrictions to limit to open space uses, to protect them as natural resource areas or other green infrastructure in perpetuity.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** PP&R, Metro			
Action Source: 2010 NHMP		**Performance Metric:** # of acres acquired through the Watershed Land Acquisition Program.			
All Hazards	N/A	Staff Time, Budget Allocation	Long-term	11, 12	Yes (New Reworded MH)
BES-5 — Develop permitting and policy tools to offset impacts of floodplain development with mitigation on sites that increase flood storage and enhance ecological functions, consistent with new floodplain regulations.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** BDS, Portland Development Commission (PDC)			
Action Source: BES Strategic Plan		**Performance Metric:** Adoption of policies and new permitting requirements.			
Flood	N/A	Staff Time	Mid-term	3, 4, 5, 7, 8, 12	No
BES-6 — Continue to fund the Johnson Creek Willing Seller Program to reduce the risks of flooding, while improving natural floodplain conditions in the watershed.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** PP&R			
Action Source: 2010 NHMP		**Performance Metric:** # of acres acquired through the Johnson Creek Willing Seller Program.			
Flood	N/A	Staff Time, Budget Allocation	Long-term	3, 7, 11	Yes (LT FL #1)
BES-7 — Continue to partner with United States Geological Survey (USGS) to maintain and improve river and stream gauges in the Portland metropolitan area.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** PBEM, PBOT			
Action Source: 2010 NHMP		**Performance Metric:** N/A			
Flood	N/A	Staff Time	Long-term	9, 10	Yes (ST FL #2)
BES-8 — Continue to provide publicly accessible information on landscaping techniques that reduce water run-off.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** East Multnomah Soil and Water Conservation District, West Multnomah Soil and Water Conservation District, Watershed Councils			
Action Source: BES Strategic Plan		**Performance Metric:** N/A			
Flood	N/A	Staff Time	Long-term	3, 12	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
BES-9 — Design and conduct a study to determine the effectiveness of maintenance agreements that require homeowners associations to manage vegetation in open space tracts when new land divisions are approved.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** BDS			
Action Source: 2010 NHMP		**Performance Metric:** Completion of study.			
Wildfire	N/A	Staff Time	Near-Term	3, 12	Yes (LT WF #3)
BES-10 — Update the Stormwater Management Manual on a regular basis to incorporate best management practices, address development-related issues and work effectively with natural hydrologic conditions.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** BDS			
Action Source: 2010 NHMP		**Performance Metric:** Updates completed.			
Flood	N/A	Staff Time	Long-term	1, 3, 12	Yes (ST FL #10)
BES-11 — Investigate design approaches for effectively managing stormwater in landslide-prone areas.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** PBOT			
Action Source: 2010 NHMP		**Performance Metric:** Design approaches developed.			
Landslide	N/A	Staff Time	Long-term	3, 4, 5, 12	Yes (LT LS #4)
BES-12 — Continue the City's vegetation management, public education programs, and partnerships with watershed councils and the soil and water conservation districts to prevent erosion along streams and rivers.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** PP&R, Watershed Councils, Soil and Water Conservation Districts			
Action Source: 2010 NHMP		**Performance Metric:** # of projects completed.			
Flood, Landslide	N/A	Staff Time	Long-term	3, 6, 12	Yes (ER #1)
BES-13 — Continue to implement projects that retain native vegetation, increase vegetation diversity and increase the complexity of the vegetation strata (having at least three vegetation strata: herbs, shrubs, trees).					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** PP&R			
Action Source: 2010 NHMP		**Performance Metric:** Acres managed or restored.			
Flood, Landslide	N/A	Staff Time, Budget Allocation	Long-term	3, 8, 12	Yes (ER #2)
BES-14 — Continue to implement City restoration projects that increase large wood and root wads, which soften the effect of wave action on shorelines as well as provide habitat for migrating salmonids.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** N/A			
Action Source: 2010 NHMP		**Performance Metric:** River or stream miles restored with large wood.			
Flood	N/A	Staff Time, Budget Allocation, Hazard Mitigation Assistance (HMA) (Floodplain & Stream Restoration, Flood Diversion & Storage)	Long-term	3, 8	Yes (ER #8)
BES-15 — Support Early Detection and Rapid Response to control invasive plant and insect populations that threaten forest infrastructure.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** PP&R, United States Department of Agriculture (USDA), Oregon Department of Agriculture (ODA)			
Action Source: BES Strategic Plan		**Performance Metric:** N/A			
Landslide, Wildfire	N/A	Staff Time	Long-term	3, 12	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
BES-16 — Explore options to acquire rights of first refusal for properties that become non-conforming uses in the floodplain due to changing regulations. Right of first refusal would be exercised when properties are substantially damaged by a flood event. Consider establishing an acquisition fund for these properties that amortizes the cost of acquisition over decades.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** PP&R, Metro			
Action Source: BES Strategic Plan		**Performance Metric:** White paper completed documenting the anticipated effectiveness of this tool.			
Flood	N/A	Staff Time, HMA	Long-term	7, 11, 12	No
BES-17 — Complete the Stormwater System Plan, including strategies to reduce risks related to runoff in areas at risk of natural hazards.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** PP&R, PBOT			
Action Source: BES Strategic Plan		**Performance Metric:** Stormwater System Plan completed.			
Landslide, Flood	N/A	Staff Time	Near-Term	3, 4	No
BES-18 — Continue to implement green infrastructure projects and natural area restoration projects identified in BES' watershed management plans and system plans.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** PP&R, PBOT			
Action Source: BES Strategic Plan		**Performance Metric:** # and type of projects completed.			
Landslide, Flood	N/A	Staff Time, HMA (Floodplain & Stream Restoration, Flood Diversion & Storage)	Long-term	3, 4	No
BES-19 — Partner with community groups and residents to plant trees and revegetate natural areas and open spaces to improve local hydrology and stormwater management and to promote resiliency of and equitable benefits provided by the urban forest.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** PP&R, Watershed Councils, Friends of Trees			
Action Source: BES Strategic Plan		**Performance Metric:** # of trees planted; # of acres revegetated.			
Flood, Landslide	N/A	Staff Time	Long-term	2, 3, 15	No
BES-20 — Support Multnomah County Drainage District (MCDD) in their continued calibration and update of hydraulic models for conveyance and internal flood impacts to the four floodplains managed by MCDD #1.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** MCDD			
Action Source: 2010 NHMP		**Performance Metric:** N/A			
Flood	N/A	Staff Time	Long-term	5, 9, 10	Yes (ST FL #6)
BES-21 — Provide technical assistance to support Multnomah County Drainage District in conducting flooding impact studies from levee failure and develop a risk assessment using the updated general building stock, critical facility and demographic information developed for the mitigation action plan.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** BPS, MCDD			
Action Source: BES Strategic Plan		**Performance Metric:** N/A			
Flood, Dam Failure	N/A	Staff Time	Near-term	2, 4, 5, 10	No
BES-22 — Work with the Federal Emergency Management Agency (FEMA) to remap all City of Portland streams to identify changes in peak flows and flood extents due to climate change.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** Federal Emergency Management Agency (FEMA), United States Army Corps of Engineers (USACE)			
Action Source: BES Strategic Plan		**Performance Metric:** N/A			
Flood	N/A	Staff Time	Near-term	3, 9, 10	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
BES-23 — Where feasible, cost effective and supported both publicly and politically, restore the natural and beneficial floodplain functions of appropriate floodplains within the City. For this action, appropriate means a floodplain that has been identified through a master plan or study certified by a qualified agency.					
Lead Agency: Bureau of Environmental Services (BES)		**Partner Agencies:** PP&R, BDS			
Action Source: Community Rating System (CRS)		**Performance Metric:** # of acres of restored floodplain			
Flood	Both	Flood Mitigation Assistance (FMA) grant, PDM, HMGP, Land and Water Conservation Fund, Johnson Creek Willing Seller Program	Long-term	1, 2, 3, 4, 11	No
BDS-1 — Increase the responsiveness of the emergency permitting procedures for post-hazard event periods through development of procedural plan that considers equity implications.					
Lead Agency: Bureau of Development Services (BDS)		**Partner Agencies:** N/A			
Action Source: 2010 NHMP		**Performance Metric:** N/A			
All Hazards	N/A	Staff Time	Near-Term	2, 15, 16	Yes (LT MH #3)
BDS-2 — Enforce codes relating to wildfire, earthquake, flood, and landslide, including Portland City Code (PCC) 24.51 (fire-safe materials), PCC 24.85 (seismic upgrades), PCC 24.50 (local flood hazard mitigation), and develop a publicly accessible landslide code guide in plain language to assist developers in complying with landslide-related building codes.					
Lead Agency: Bureau of Development Services (BDS)		**Partner Agencies:** BPS			
Action Source: 2010 NHMP		**Performance Metric:** N/A			
Wildfire, Earthquake, Flood, Landslide	N/A	Staff Time	Long-term	1, 6, 12	Yes (New MH #3)
BDS-3 — Develop an ordinance requiring a covenant to be recorded on the deed for new development in the FEMA special flood hazard area to ensure that space below the base flood elevation is not converted to habitable space.					
Lead Agency: Bureau of Development Services (BDS)		**Partner Agencies:** N/A			
Action Source: 2010 NHMP		**Performance Metric:** N/A			
Flood	N/A	Staff Time	Mid-term	1, 12	Yes (ST FL #1)
BDS-4 — Encourage and expand personal, family, and business preparedness plans and programs.					
Lead Agency: Bureau of Development Services (BDS)		**Partner Agencies:** All City bureaus			
Action Source: Steering Committee		**Performance Metric:** Preparedness fairs; citywide preparedness surveys			
All Hazards	N/A	Staff Time	Long-term	1, 4, 12	No
BDS-5 — Make information about floodplain zones available to residents when applying for permits.					
Lead Agency: Bureau of Development Services (BDS)		**Partner Agencies:** N/A			
Action Source: Steering Committee		**Performance Metric:** N/A			
Flood	N/A	Staff Time	Mid-term	3, 6, 12, 15	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
BDS-6 — Implement recommendations from the City's Unreinforced Masonry (URM) Work Group.					
Lead Agency: Bureau of Development Services (BDS)		**Partner Agencies:** PBEM			
Action Source: Steering Committee		**Performance Metric:** New codes developed.			
Earthquake	Existing	Staff Time, Budget Allocation, HMA	Long-term	1, 2, 3, 6, 7, 11, 12	No
BDS-7 — Continue to coordinate with Multnomah County Drainage District (MCDD) to review permit applications for development near levees; if a permit is requested for development within the "levee review area", submit the application to MCDD to review and if necessary work with developer to revise plans to meet United States Army Corps of Engineers (USACE) requirements for development on or near federal levees.					
Lead Agency: Bureau of Development Services (BDS)		**Partner Agencies:** Multnomah County Drainage District (MCDD), BPS			
Action Source: Stakeholder Input		**Performance Metric:** N/A			
Dam Failure, Flood	Existing	Staff Time	Long-term	1, 4	No
BDS-8 — Maintain good standing under the National Flood Insurance Program by implementing programs that meet or exceed the minimum NFIP requirements. Such programs include enforcing an adopted flood damage prevention ordinance, participating in floodplain mapping updates, and providing public assistance and information on floodplain requirements and impacts.					
Lead Agency: Bureau of Development Services (BDS)		**Partner Agencies:** Bureau of Environmental Services			
Action Source: NFIP Compliance		**Performance Metric:** Continued good standing under the NFIP			
Flood	New and Existing	Staff Time	Ongoing	1, 9, 10, 12	No
CAMG-1 — Advocate for bureaus to consider seismic and landslide risk when developing capital improvement plans, including plans to replace water and sewer infrastructure.					
Lead Agency: City Asset Managers Group (CAMG)		**Partner Agencies:** PBEM, BES			
Action Source: 2010 NHMP		**Performance Metric:** Criteria established in Capital Improvement Plan (CIP) prioritization process regarding seismic and landslide hazards.			
Earthquake, Landslide	Both	Staff Time	Long-term	1, 4, 5	Yes (LT EQ #3)
CAMG-2 — Consider what the critical assets are in determining mitigation priorities for City assets, incorporating critical facilities risk assessment data from the MAP where relevant.					
Lead Agency: City Asset Managers Group (CAMG)		**Partner Agencies:** PBEM, BES			
Action Source: 2010 NHMP		**Performance Metric:** N/A			
All Hazards	Existing	Staff Time	Long-term	2, 5, 7, 11	Yes (FL #2)
CAMG-3 — Encourage every bureau to inventory critical assets and review critical infrastructure vulnerability, and identify a 50-year plan to strengthen, retrofit, relocate or otherwise increase resiliency. Consider ways to promote city-wide collaboration					
Lead Agency: City Asset Managers Group (CAMG)		**Partner Agencies:** City bureaus, PBEM			
Action Source: Steering Committee		**Performance Metric:** Entire city infrastructure planning is critical to disaster recovery			
Earthquake	Both	Capital Improvement Plan (CIP)	Long-term	5, 7	No

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
OEHR-1 — Prior to and during implementation, review all actions for negative externalities and to ensure vulnerable populations are protected from displacement or other disproportionate burdens.					
Lead Agency: Office of Equity and Human Rights (OEHR)		**Partner Agencies:** PBEM, BES, BPS, PBOT, PWB			
Action Source: Steering Committee		**Performance Metric:** All actions are reviewed for equity considerations during implementation planning.			
All Hazards	N/A	Staff Time	Long-term	2, 8, 14, 15	No

19.3.3 Action Plan Benefit-Cost Review

The action plan must be prioritized according to a benefit/cost analysis of the proposed actions (44 CFR, Section 201.6(c)(3)(iii)). The benefits of proposed projects were weighed against estimated costs as part of the project prioritization process. The benefit/cost analysis was not as detailed as required by FEMA for eligibility under the Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) grant program. A less formal approach was used because some projects may not be implemented for up to 10 years, and associated costs and benefits could change in that time. Therefore, a review of apparent benefits versus apparent cost was performed by assigning subjective ratings (high, medium, and low) to project costs and benefits.

Benefit ratings were defined as follows:

- **High:** Action will support compliance with a legal mandate or, once completed, will have an immediate impact on the reduction of risk exposure to life and property.
- **Medium:** Once completed, action will have a long-term impact on the reduction of risk exposure to life and property, has a substantial life safety component, or project will provide an immediate reduction in the risk exposure to property.
- **Low:** Long-term benefits of the action are difficult to quantify in the short term.

Cost impact ratings were defined as follows:

- **High:** Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.
- **Medium**: Could budget for under existing work-plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
- **Low:** Possible to fund under existing budget. Project is or can be part of an existing ongoing program or would not require substantial effort to initiate or appropriate funds.

Using this approach, projects with positive benefit versus cost ratios (such as high over high, high over medium, medium over low, etc.) are considered cost-beneficial and are prioritized accordingly.

For many of the strategies identified in this action plan, the City may seek financial assistance under the HMGP or PDM programs, both of which require detailed benefit/cost analyses. These analyses will be performed on projects at the time of application using the FEMA benefit-cost model. For projects not seeking financial assistance from grant programs that require detailed analysis, the City reserves the right to define "benefits" according to parameters that meet the goals and objectives of this plan.

19.3.4 Action Plan Prioritization

Using the results of the benefit-cost analysis as well as the other information identified in the action development process, all identified actions were prioritized in two categories: implementation and grant pursuit.

Implementation priority was defined as follows:

- **High Priority—**An action that meets multiple objectives, has benefits that exceed cost, has funding secured or is an ongoing project. High priority actions can be completed in the short-term or mid-term (1 to 5 years) or are projects that are long-term projects that can be initiated in the short-term and will have large positive impacts once completed. The key factors for high priority actions are that they have funding secured and can be completed or initiated in the short- or mid-term.
- **Medium Priority**—An action that meets multiple objectives, that has benefits that exceed costs, and for which funding has not yet been secured, but is eligible for funding. Actions can be completed in the short- or mid-term, once funding is secured, or are projects that are long-term projects that can be initiated in the short-term and will have large positive impacts once completed. Medium priority actions will become high priority actions once funding is secured. The key factors for medium priority actions are that they are eligible for funding, but do not yet have funding secured, and they can be completed or initiated within the short- or mid-term.
- **Low Priority**—An action that will mitigate the risk of a hazard, that has benefits that do not exceed the costs or are difficult to quantify, for which funding has not been secured, that is not eligible for grant funding, and for which the time line for completion is long-term or uncertain. Low priority actions may be eligible for grant funding from other programs that have not yet been identified. Low priority projects are generally "blue-sky" or "wish-list." projects. Financing is unknown, and they can be completed over the long term.

Grant pursuit priority was defined as follows:

- **High Priority**—An action that has been identified as meeting grant eligibility requirements, assessed to have high benefits, is listed as high or medium priority, and where local funding options are unavailable or where dedicated funds could be utilized for projects that are not eligible for grant funding.
- **Medium Priority**—An action that has been identified as meeting grant eligibility requirements, assessed to have medium or low benefits, is listed as medium or low priority, and where local funding options are unavailable.
- **Low Priority**—An action that has not been identified as meeting grant eligibility requirements, or has low benefits. Additionally, projects that are already being funded and are likely to continue to be funded are identified as low grant pursuit priority.

In addition, each action was reviewed to determine if the target audience/beneficiary identified for the action is one of the groups of focus for the assessment (e.g. people with disabilities, communities of color, etc.). If so, the priority was noted with an E (e.g. High-E). Results are summarized in Table 19-5.

Table 19-5. Prioritization of Mitigation Actions

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is project Grant Eligible?	Can Project be Funded under Existing Programs/ Budgets?	Implementation Priority (High, Med., Low)	Grant Pursuit Priority (High, Med., Low)
PBEM-1	6	Medium	Low	Yes	No	Yes	High	Low
PBEM-2	5	Medium	Medium	Yes	No	No	Medium – E	Low – E
PBEM-3	5	Medium	Medium	Yes	No	No	Medium – E	Low – E
PBEM-4 [a]	2	Low	Low	Yes	No	Yes	High	Low
PBEM-5 [a]	3	Medium	Low	Yes	No	Yes	High	Low
PBEM-6 [a]	4	Medium	Low	Yes	No	Yes	Medium	Low
PBEM-7 [a]	2	Low	Low	Yes	No	Yes	High	Low
PBEM-8 [a]	5	Medium	Medium	Yes	No	Yes	High	Low
PBEM-9 [a]	2	Low	Low	Yes	No	Yes	High	Low
PBEM-10	5	Medium	Low	Yes	No	Yes	High – E	Low – E
PBEM-11 [a]	3	High	High	Yes	Yes	No	Medium – E	High – E
PBEM-12 [a]	3	Medium	Low	Yes	No	Yes	High – E	Low – E
PBEM-13	3	Medium	Low	Yes	No	Yes	High	Low
PBEM-14 [a]	3	Low	Low	Yes	No	Yes	Medium	Low
PBEM-15 [a]	6	Medium	Low	Yes	No	Yes	High	Low
PBEM-16	4	Medium	Medium	Yes	No	No	Medium-E	Low-E
PBEM-17	5	Medium	Medium	Yes	No	No	Medium-E	Low-E
PBEM-18 [a]	4	Medium	Low	Yes	No	Yes	High-E	Low-E
PBEM-19	4	Medium	Medium	Yes	No	No	High	Low
PBEM-20 [a]	6	Medium	Medium	Yes	No	No	Medium-E	Low-E
PBEM-21	5	Medium	Medium	Yes	No	No	High	Low
PBEM-22 [a]	4	Low	Low	Yes	Yes	Yes	High	Low
PBEM-23 [a]	5	High	Medium	Yes	No	No	High-E	Low-E
PBEM-24	6	Medium	Medium	Yes	No	No	Medium	Low
PP&R-1 [a]	3	Low	Low	Yes	No	Yes	Medium	Low
PP&R-2	3	Medium	Low	Yes	No	Yes	High	Low
PP&R-3	3	Low	Low	Yes	No	Yes	High	Low
PF&R-1	5	Medium	Low	Yes	No	Yes	Medium	Low
PF&R-2 [a]	10	High	Low	Yes	No	Yes	High	Low
PF&R-3 [a]	11	Medium	Medium	Yes	Yes	Yes	Medium	Low
PF&R-4 [a]	4	High	High	Yes	Yes	No	Medium	Medium
PF&R-5 [a]	5	Medium	Medium	Yes	No	No	Low	Low
PF&R-6 [a]	5	Medium	Low	Yes	Yes	Yes	Medium/	Low
PF&R-7 [a]	5	Medium	Low	Yes	No	Yes	Low	Low
PF&R-8	3	Medium	Low	Yes	No	Yes	Medium	Low
PF&R-9	3	Medium	Medium	Yes	Yes	No	Medium	Medium
BPS-1	3	High	High	Yes	No	No	High –E	High-E
BPS-2	4	High	High	Yes	No	No	High-E	High-E
BPS-3	4	High	High	Yes	No	No	High-E	High-E
BPS-4	5	Medium	Low	Yes	No	No	Low	Low
BPS-5 [a]	5	High	Low	Yes	No	Yes	High	Low

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is project Grant Eligible?	Can Project be Funded under Existing Programs/ Budgets?	Implementation Priority (High, Med., Low)	Grant Pursuit Priority (High, Med., Low)
BPS-6 [a]	5	High	Low	Yes	No	Yes	High	Low
BPS-7 [a]	4	High	Low	Yes	No	Yes	High-E	Medium-E
BPS-8 [a]	3	Medium	Medium	Yes	No	No	Medium	Low
BPS-9 [a]	6	High	High	Yes	Yes (PDM)	No	High	High
BPS-10 [a]	7	High	High	Yes	Yes (PDM)	No	High-E	High-E
BPS-11 [a]	6	Medium	Medium	Yes	No	No	Low	Low
BPS-12 [a]	4	High	Low	Yes	No	Yes	Medium	Medium
BPS-13 [a]	4	High	High	Yes	No	No	High	Medium
BPS-14 [a]	4	Medium	Medium	Yes	No	No	Medium	Medium
BPS-15	4	High	Medium	Yes	No	No	High	High
BPS-16 [a]	7	High	Low	Yes	Yes (PDM, FMA)	Yes	High	Low
BPS-17 [a]	5	Medium	Medium	Yes	No	No	Low	Low
BPS-18	7	Medium	Medium	Yes	No	No	Medium-E	Low-E
BPS-19 [a]	8	High	Medium	Yes	Yes (PDM)	No	Medium	Medium
PWB-1 [a]	4	High	High	Yes	Yes	Yes	High	High
PWB-2	2	High	Medium	Yes	Yes	Yes	Medium	Medium
PWB-3	2	High	High	Yes	Yes	Yes	High	High
PWB-4	2	High	Medium	Yes	Yes	Yes	Medium	Medium
PWB-5	2	High	Low	Yes	Yes	Yes	High	High
PWB-6	2	High	Medium	Yes	Yes	Yes	Medium	Medium
PWB-7	3	High	High	Yes	Yes	Yes	High	High
PWB-8	2	High	High	Yes	Yes	Yes	Medium	Medium
PWB-9	3	High	High	Yes	Yes	Yes	Medium	Medium
PWB-10	3	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-11	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-12	2	High	Low	Yes	Yes	Yes	High	High
PWB-13	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-14	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-15 [a]	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-16	2	High	Medium	Yes	Yes	Yes	Medium	Medium
PWB-17	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-18	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-19	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-20 [a]	3	High	Low	Yes	Yes	Yes	High	High
PWB-21	3	High	Medium	Yes	Yes	Yes	Medium	Medium
PWB-22 [a]	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-23	2	High	High	Yes	Yes	Yes	High	High
PWB-24	2	High	High	Yes	Yes	Yes	Medium	Medium
PWB-25	3	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-26	3	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-27	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-28 [a]	2	High	Low	Yes	Yes	Yes	Medium	Medium

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is project Grant Eligible?	Can Project be Funded under Existing Programs/ Budgets?	Implementation Priority (High, Med., Low)	Grant Pursuit Priority (High, Med., Low)
PWB-29 [a]	3	High	Low	Yes	Yes	Yes	High	High
PWB-30 [a]	3	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-31	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-32	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-33	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-34	2	High	Medium	Yes	Yes	Yes	Medium	Medium
PWB-35	2	High	Medium	Yes	Yes	Yes	High	High
PWB-36	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-37 [a]	3	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-38 [a]	3	High	Low	Yes	Yes	Yes	High	High
PWB-39 [a]	3	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-40 [a]	2	High	Low	Yes	Yes	Yes	Low	Low
PWB-41 [a]	2	High	High	Yes	Yes	Yes	Medium	Medium
PWB-42 [a]	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-43 [a]	2	High	Low	Yes	Yes	Yes	High	High
PWB-44	2	High	Low	Yes	Yes	Yes	High	High
PWB-45	2	High	High	Yes	Yes	Yes	Medium	Medium
PWB-46 [a]	2	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-47	2	High	Low	Yes	Yes	Yes	High	High
PWB-48	2	High	Medium	Yes	Yes	Yes	Medium	Medium
PWB-49	2	High	Low	Yes	Yes	Yes	High	High
PWB-50	2	High	Low	Yes	Yes	Yes	High	High
PWB-51	2	High	Low	Yes	Yes	Yes	High	High
PWB-52	2	High	High	Yes	Yes	Yes	Medium	Medium
PWB-53	2	High	High	Yes	Yes	Yes	Medium	Medium
PWB-54 [a]	3	High	High	Yes	Yes	Yes	Medium	Medium
PWB-55	2	High	High	Yes	Yes	Yes	High	High
PWB-56	2	High	High	Yes	Yes	Yes	High	High
PWB-57	2	High	High	Yes	Yes	Yes	High	High
PWB-58	2	High	High	Yes	Yes	Yes	High	High
PWB-59	2	High	High	Yes	Yes	Yes	High	High
PWB-60	3	High	Medium	Yes	Yes	Yes	Medium	Medium
PWB-61	2	High	Low	Yes	Yes	Yes	High	High
PWB-62	2	High	High	Yes	Yes	Yes	Medium	Medium
PWB-63 [a]	3	High	Low	Yes	Yes	Yes	Medium	Medium
PWB-64 [a]	3	High	Low	Yes	Yes	Yes	Medium	Medium
OMF-1 [a]	2	Medium	Low	Yes	No	Yes	High	Low
OMF-2	4	Medium	Medium	Yes	No	Yes	High	Low
PBOT-1 [a]	5	Medium	Medium	Yes	Yes	Yes	High	Medium
PBOT-2	3	Medium	Low	Yes	Yes	Yes	High	Medium
PBOT-3	4	High	High	Yes	Yes	No	Medium	Medium
PBOT-4	5	Medium	Medium	Yes	Yes	Yes	Medium	Low
PBOT-5 [a]	3	Low	Low	Yes	No	Yes	High	Low

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is project Grant Eligible?	Can Project be Funded under Existing Programs/ Budgets?	Implementation Priority (High, Med., Low)	Grant Pursuit Priority (High, Med., Low)
BES-1 [a]	2	High	Low	Yes	No	Yes	High	Low
BES-2	2	High	Low	Yes	No	Yes	High	Low
BES-3 [a]	2	High	Medium	Yes	No	Yes	High	Low
BES-4	2	High	High	Yes	Yes	No	High	High
BES-5 [a]	6	High	Low	Yes	No	Yes	High	Low
BES-6	3	High	High	Yes	No	Yes	High	Low
BES-7	2	High	Low	Yes	No	Yes	High	Low
BES-8	2	Medium	Low	Yes	No	Yes	High	Low
BES-9	2	Medium	Low	Yes	No	No	Medium	Low
BES-10	3	High	Low	Yes	No	Yes	High	Low
BES-11	4	Medium	Low	Yes	No	Yes	High	Low
BES-12	3	High	Low	Yes	No	Yes	High	Low
BES-13	3	High	Low	Yes	No	Yes	High	Low
BES-14	2	Medium	Low	Yes	Yes	Yes	High	High
BES-15	2	Medium	Low	Yes	No	Yes	High	Low
BES-16	3	High	High	Yes	Yes	No	Medium	Medium
BES-17 [a]	2	High	Medium	Yes	No	Yes	High	Low
BES-18 [a]	2	High	Medium	Yes	Yes	Yes	High	High
BES-19	3	Medium	Low	Yes	No	Yes	High	Low
BES-20 [a]	3	Low	Low	Yes	No	Yes	High	Low
BES-21 [a]	4	Low	Low	Yes	No	Yes	High	Low
BES-22 [a]	3	Low	Low	Yes	No	Yes	High	Low
BES-23	5	High	Medium	Yes	Yes	No	Medium	High
BDS-1	3	Medium	Medium	Yes	No	No	Medium	Low
BDS-2 [a]	3	High	Low	Yes	No	Yes	High	Low
BDS-3 [a]	2	Medium	Low	Yes	No	Yes	High	Low
BDS-4	3	High	Low	Yes	No	Yes	High	Low
BDS-5	4	Medium	Low	Yes	No	Yes	High	Low
BDS-6 [a]	7	High	High	Yes	Yes	No	Medium	Medium
BDS-7 [a]	2	Medium	Low	Yes	No	Yes	High	Low
BDS-8 [a]	4	High	Low	Yes	No	Yes	High	Low
CAMG-1 [a]	3	Medium	Low	Yes	No	Yes	High	Low
CAMG-2 [a]	4	Medium	Low	Yes	No	Yes	High	Low
CAMG-3 [a]	2	High	Medium	Yes	Yes	Yes	High	High
OEHR-1	4	Medium	Medium	Yes	No	Yes	High-E	Low-E

a. Action was identified as a plan integration action by the planning team. See Section 19.5.5 for more information.

19.3.5 Analysis of Mitigation Actions

Mitigation Types

Each recommended action was classified based on the hazard it addresses and the type of mitigation it involves. Table 19-6 shows the classification based on this analysis. Mitigation types are defined as follows:

- **Prevention**—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and storm water management regulations.
- **Property Protection**—Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.
- **Public Education and Awareness**—Actions to inform citizens and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.
- **Natural Resource Protection**—Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- **Emergency Services**—Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.
- **Structural Projects**—Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.
- **Community Capacity Building**—Actions that identify, strengthen or link the community's tangible and intangible resources. Includes investing in food independence projects (ex. community gardens), promoting and supporting rain water collection systems, alternative energy sources (ex. solar power, wind power, micro-level hydro power), culturally appropriate community-level training for emergency and trauma response.

Objectives Met

Each recommended action also identifies the objectives that the action supports. Table 19-7 shows the recommended actions and the corresponding objectives.

Table 19-6. Analysis of Mitigation Actions by Mitigation Type

Hazard	Actions That Address the Hazard, by Mitigation Type						
	Prevention	Property Protection	Public Education and Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Community Capacity Building
All Hazards	• PBEM-12,19, 20, 22 • PP&R-1 • BPS-5, 6, 7, 8, 19 • PWB-21, 25, 26, 46, 49, 50, 51, 64 • BES-4 • BDS-1 • OEHR-1	• PBEM-19,12 • PWB-3, 24, 35, 38, 52, 53 • BES-4 • CAMG-2	• PBEM-1, 2, 3, 10, 15, 16, 18 • PF&R-7 • BPS-3, 12 • PWB-34 • BDS-4	• BES-4	• PBEM-2, 5, 10, 12, 16, 17, 18, 19, 23 • PF&R-7, 8 • BPS-2, 9, 10 • PWB-3, 21, 24, 28, 29, 30, 31, 32, 33, 35, 38, 39, 46, 47, 48, 49, 50, 51, 61, 63 • OMF-2 • BDS-4		• PBEM-2, 3, 15, 17, 18, 19, 23, 24 • PF&R-7 • BPS-1, 2, 18
Severe Weather	• BPS-16, 17 • PBOT-4	• PBOT-4		• BPS-17 PWB-11			
Earthquake	• PBEM-11 • PF&R-4, • BPS-4, 13, 14, 19 • PWB-36, 37, 42, 43, 44 • BES-2, 3 • BDS-2, 6 • CAMG-1	• PBEM-6, 8, • PF&R-4,9 • BPS-15 • PWB-1, 2, 3, 4, 6, 7, 8, 9, 19, 23, 36, 37, 41, 55, 56, 58, 59, 62 • PBOT-1, 3 • BDS-6 • CAMG-1, 3	• BPS-3, 44 • BDS-6		• PBEM-4, 8, • BPS-2, 9, 10 • PWB-2, 10, 44 • BES-2		• BPS-1, • PWB-42 • PBOT-3
Landslide	• PBEM-9 • PBOT-5 • BES-1, 11, 12, 17 • BDS-2 • CAMG-1	• PWB-54, 57 • BES-1 • CAMG-1	• PBOT-2 • BES-1, 12, 19 • BDS-2	• BES-1, 12, 13, 15, 18, 19	• PBOT-2	• BES-1	• BES-19
Wildfire	• PF&R-1, 3, 5, 6 • BPS-6, 11 • PWB-12, 13, 15, 27 • BES-9 • BDS-2		• PF&R-1, 3	• PP&R-2, 3, • PF&R-3 • PWB-14 • BES-9, 15	• PF&R-3 • PWB-12, 15, 20		• PF&R-2, 3, 6

Hazard	Actions That Address the Hazard, by Mitigation Type						
	Prevention	Property Protection	Public Education and Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Community Capacity Building
Flood	• PBEM-14 • BPS-8, 16, 17 • PWB-17, 22, 64 • BES-1, 5, BES-8, 10, 12, 16, 17, 20, 21, 22, • BDS-2, 3, 5, 7, 8	• BES-1, 6, 16 • BDS-3	• BES-1, 7, 8, 12, 19 • BDS-5	• PWB-17 • BES-1, 5, 6, 12, 13, 14, 18, 19, 23	• PBEM-14 • PWB-24 • BES-7, 21	• PWB-16 • OMF-1 • BES-1	• BES-19
Volcanic Activity	•				• PBEM-7		
Dam Failure	• PWB-5 • BDS-7				• PWB-60		
Drought	• PWB-18						
Space Weather	• PWB-40						

Table 19-7. Analysis of Mitigation Actions by Objectives Met

Action #	# of Objectives Met	Objective														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PBEM-1	6		✓				✓		✓		✓		✓			✓	
PBEM-2	5		✓				✓		✓						✓	✓	
PBEM-3	5		✓				✓						✓		✓	✓	
PBEM-4	2		✓														✓
PBEM-5	3		✓				✓										✓
PBEM-6	4				✓	✓						✓					✓
PBEM-7	2						✓										✓
PBEM-8	5				✓			✓			✓		✓		✓		
PBEM-9	2										✓						✓
PBEM-10	5		✓				✓			✓				✓		✓	
PBEM-11	3	✓			✓							✓					
PBEM-12	3		✓													✓	✓
PBEM-13	3						✓								✓	✓	
PBEM-14	3				✓	✓	✓										
PBEM-15	6		✓			✓	✓			✓	✓						✓
PBEM-16	4		✓				✓			✓				✓			
PBEM-17	5		✓				✓								✓	✓	✓
PBEM-18	4		✓				✓								✓	✓	
PBEM-19	4				✓	✓					✓	✓					
PBEM-20	6		✓	✓		✓			✓			✓					✓
PBEM-21	5		✓	✓										✓	✓	✓	
PBEM-22	4				✓	✓					✓						✓
PBEM-23	5		✓				✓								✓	✓	✓
PBEM-24	6	✓			✓		✓			✓	✓		✓				
PP&R-1	3			✓		✓	✓										
PP&R-2	3			✓		✓							✓				
PP&R-3	3			✓		✓	✓										
PF&R-1	5				✓		✓				✓			✓	✓		
PF&R-2	10	✓		✓	✓	✓	✓	✓		✓	✓			✓	✓		
PF&R-3	11	✓		✓	✓	✓	✓	✓		✓	✓		✓	✓	✓		
PF&R-4	4				✓	✓					✓	✓					
PF&R-5	5	✓			✓	✓					✓		✓				
PF&R-6	5						✓		✓				✓	✓	✓		
PF&R-7	5		✓				✓						✓	✓		✓	
PF&R-8	3		✓				✓							✓			
PF&R- 9	3				✓						✓	✓					
BPS-1	3		✓						✓				✓				
BPS-2	4		✓		✓				✓				✓				
BPS-3	4		✓		✓				✓				✓				
BPS-4	5	✓			✓				✓			✓	✓				
BPS-5	5	✓		✓					✓				✓			✓	
BPS-6	5	✓		✓					✓				✓			✓	
BPS-7	4			✓					✓	✓						✓	

Action #	# of Objectives Met	Objective 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
BPS-8	3			✓					✓				✓				
BPS-9	6				✓	✓			✓				✓		✓	✓	
BPS-10	7		✓		✓	✓			✓				✓		✓	✓	
BPS-11	6			✓	✓	✓				✓	✓		✓				
BPS-12	4		✓				✓		✓				✓				
BPS-13	4	✓			✓							✓	✓				
BPS-14	4	✓			✓	✓										✓	
BPS-15	4					✓			✓			✓		✓			
BPS-16	7	✓	✓		✓	✓				✓	✓		✓				
BPS-17	5	✓		✓		✓			✓				✓				
BPS-18	7		✓				✓	✓	✓						✓	✓	✓
BPS-19	8	✓		✓	✓	✓	✓		✓		✓				✓		
PWB-1	4				✓			✓		✓	✓						
PWB-2	1				✓												
PWB-3	1				✓												
PWB-4	2				✓						✓						
PWB-5	2									✓	✓						
PWB-6	2				✓							✓					
PWB-7	3		✓		✓							✓					
PWB-8	2		✓		✓												
PWB-9	3				✓							✓	✓				
PWB-10	3						✓				✓			✓			
PWB-11	2										✓	✓					
PWB-12	2										✓	✓					
PWB-13	2									✓	✓						
PWB-14	2									✓	✓						
PWB-15	2				✓												✓
PWB-16	2				✓							✓					
PWB-17	2									✓	✓						
PWB-18	2									✓	✓						
PWB-19	2									✓	✓						
PWB-20	3					✓				✓		✓					
PWB-21	3				✓	✓						✓					
PWB-22	2				✓	✓											
PWB-23	2				✓							✓					
PWB-24	2				✓							✓					
PWB-25	3				✓				✓		✓						
PWB-26	3				✓				✓								✓
PWB-27	2									✓	✓						
PWB-28	2											✓					✓
PWB-29	3													✓	✓	✓	
PWB-30	3													✓	✓	✓	
PWB-31	2										✓				✓		
PWB-32	2														✓		✓

Action #	# of Objectives Met	Objective 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PWB-33	2														✓		✓
PWB-34	2						✓							✓			
PWB-35	2				✓												✓
PWB-36	2				✓						✓						
PWB-37	3				✓						✓				✓		
PWB-38	3				✓						✓				✓		
PWB-39	3				✓						✓				✓		
PWB-40	3				✓						✓				✓		
PWB-41	2										✓			✓			
PWB-42	2							✓									✓
PWB-43	2						✓	✓						✓			
PWB-44	2						✓										
PWB-45	2							✓						✓			
PWB-46	2															✓	✓
PWB-47	2															✓	✓
PWB-48	2				✓												✓
PWB-49	2															✓	✓
PWB-50	2														✓		✓
PWB-51	2														✓		✓
PWB-52	2				✓							✓					
PWB-53	2				✓										✓		
PWB-54	3				✓						✓	✓					
PWB-55	2				✓										✓		
PWB-56	2				✓										✓		
PWB-57	2				✓							✓					
PWB-58	2				✓							✓					
PWB-59	2				✓							✓					
PWB-60	3				✓					✓				✓			
PWB-61	2				✓					✓							
PWB-62	2				✓							✓					
PWB-63	3						✓	✓						✓			
PWB-64	3						✓	✓						✓			
OMF-1	2				✓	✓											
OMF-2	4		✓		✓	✓										✓	
PBOT-1	5				✓	✓		✓			✓	✓					
PBOT-2	3				✓	✓	✓										
PBOT-3	4				✓	✓						✓		✓			
PBOT-4	5			✓	✓	✓		✓				✓					
PBOT-5	3									✓					✓	✓	
BES-1	2			✓	✓												
BES-2	2				✓												✓
BES-3	2				✓												✓
BES-4	2											✓	✓				
BES-5	6			✓	✓	✓		✓	✓				✓				

Action #	# of Objectives Met	Objective 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
BES-6	3			✓				✓				✓					
BES-7	2									✓	✓						
BES-8	2			✓									✓				
BES-9	2			✓									✓				
BES-10	3	✓		✓									✓				
BES-11	2				✓	✓											
BES-12	1			✓													
BES-13	13			✓					✓				✓				
BES-14	2			✓					✓								
BES-15	2			✓									✓				
BES-16	3							✓				✓	✓				
BES-17	2			✓	✓												
BES-18	2			✓	✓												
BES-19	3		✓	✓												✓	
BES-20	3					✓				✓	✓						
BES-21	4		✓		✓	✓					✓						
BES-22	3			✓						✓	✓						
BES-23	5	✓	✓	✓	✓							✓					
BDS-1	3		✓													✓	✓
BDS-2	3	✓					✓						✓				
BDS-3	2	✓											✓				
BDS-4	3	✓			✓								✓				
BDS-5	4			✓			✓						✓			✓	
BDS-6	7	✓	✓	✓			✓	✓				✓	✓				
BDS-7	2	✓			✓												
BDS-8	4	✓								✓	✓		✓				
CAMG-1	3	✓			✓	✓											
CAMG-2	4		✓			✓		✓				✓					
CAMG-3	2					✓		✓									
OEHR-1	4		✓						✓						✓	✓	
Total	529	22	33	32	75	37	35	18	25	25	43	35	38	21	32	29	28
% of actions		14%	21%	20%	47%	23%	22%	11%	16%	16%	27%	22%	24%	13%	20%	18%	18%

19.4 PLAN ADOPTION

A hazard mitigation plan must document that it has been formally adopted by the governing body of the jurisdiction requesting federal approval of the plan (44 CFR Section 201.6(c)(5)). DMA compliance and its benefits cannot be achieved until the plan is adopted. This plan will be submitted for a pre-adoption review to the Oregon Office of Emergency Management, FEMA Region X, and the Insurance Services Office, Inc. prior to adoption. Once pre-adoption approval has been provided, the City of Portland will formally adopt the plan. A copy of the resolution is provided in Figure 19-1.

Insert Adoption Resolution

Figure 19-1. Resolution Adopting The Mitigation Action Plan

19.5 PLAN IMPLEMENTATION AND MAINTENANCE STRATEGY

A hazard mitigation plan must present a plan maintenance process that includes the following (44 CFR Section 201.6(c)(4)):

- A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan over a 5-year cycle.
- A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate.
- A discussion on how the community will continue public participation in the plan maintenance process.

This section details the formal process that will ensure that *The Mitigation Action Plan* remains an active and relevant document and that the City maintains its eligibility for applicable funding sources. It includes the establishment of a Mitigation Action Plan Working Group and a schedule for monitoring and evaluating the plan annually and producing an updated plan every 5 years. The plan's format allows sections to be reviewed and updated when new data become available, resulting in a plan that will remain current and relevant.

19.5.1 Plan Implementation

The effectiveness of the MAP depends on its implementation and the incorporation of its actions into existing plans, policies and programs. Together, the action items in the plan provide a framework for activities that the City of Portland, with support from stakeholders, will work to implement over the next 5 years. The planning team and the steering committee have established a vision, a mission, goals and objectives and have prioritized mitigation actions that will be implemented through existing plans, policies, and programs. The plan will be evaluated based on how effectively the implementation of the mitigation actions have been at reducing risk in Portland and in meeting plan goals. Lead agencies for all selected mitigation actions have identified performance metrics to help evaluate the success of the MAP. The effectiveness of the MAP will also be assessed at the next update by the new working group through a review of the changes in risk that occurred over the performance period and by the degree to which mitigation goals and objectives were incorporated into existing plans, policies and programs.

The Portland Bureau of Emergency Management (PBEM) will have lead responsibility for coordinating and tracking the plan implementation and maintenance strategy. Plan implementation and evaluation will be a shared responsibility among all bureaus and offices identified as lead agencies in the mitigation action plan and all other jurisdictions that may link to this plan.

19.5.2 Mitigation Action Plan Working Group

The hazard mitigation steering committee was a volunteer body that oversaw this update of the plan. It was the steering committee's position that an oversight committee with representation similar to that of the steering committee should have an active role in the plan implementation and maintenance. Therefore, a Mitigation Action Plan Working Group will be formed to remain a viable body involved in key elements of the plan implementation and maintenance strategy. This working group should strive to include representation from stakeholders in Portland as well as Bureau representatives. The Mitigation Action Plan Working Group will work toward fulfilling the following responsibilities:

- Continuing to provide feedback and guidance on equity concerns;
- Coordinating action implementation;

- Providing feedback on possible avenues for continued public engagement;
- Coordinating with the Office of Governmental Relations annually to determine what hazard mitigation related items should be advocated for during their annual agenda setting;
- Reviewing and contributing to the annual progress report; and
- Providing input and recommendations on possible enhancements to be considered at the next plan update.

Future plan updates will be overseen by a steering committee similar to the one that participated in this update, so keeping an interim group intact will provide a head start on future updates. The Mitigation Action Plan Working Group will meet biannually to work toward the objectives outlined in this implementation and maintenance strategy. PBEM will coordinate the meetings, which likely will be held in March and September.

19.5.3 Equity Implementation Guide

The steering committee recommends that equity analysis and screening be carried forward as actions are implemented. The Mitigation Action Plan Working Group will provide suggestions, guidance and feedback in the development of a natural hazard mitigation equity implementation guide. It is expected that this guide will build upon or be adapted from previous best practices and recommendations such as those in the *Climate Action Plan Equity Implementation Guide* or the *East Portland Action Plan's Involuntary Displacement Prevention Recommendations for East Portland*. Special attention will be paid to best practices for collecting data, using information gathered to inform other processes and identifying and expanding accountability mechanisms.

19.5.4 Annual Progress Report

The lead agencies identified for action item implementation will participate in annual progress reporting, led by PBEM. This progress report will be presented to and reviewed by the Mitigation Action Plan Working Group. The intent of the progress report will be to evaluate the progress on the implementation of the action plan during a 12-month performance period. This review will include items such as the following:

- Summary of any hazard events that occurred during the performance period and the impact these events had on Portland;
- Review of the data utilized for this planning process as well as identified gaps and identification of any newly available or updated datasets;
- Listing of any newly published or updated reports or studies that should be incorporated into the next plan update process;
- Review of any upcoming local planning efforts that should be integrated with the MAP
- Review of any changes that would impact risk in Portland (e.g. decommissioning or reservoir or annexation)
- Review of mitigation success stories;
- Review of continuing public engagement;
- Brief discussion about why actions were not completed or have not been initiated;
- Reevaluation of the action plan to determine if the timeline for identified projects needs to be amended (such as changing a long-term project to a short-term project because of new funding);
- Review of data that was or should be collected for an equity identified actions (e.g. High-E)
- Changes in or potential for new funding options (grant opportunities);

- Review of the Steering Committee recommended actions (see Appendix I) and recommendations for new actions based on new or enhanced capabilities identified by lead agencies or next steps in actions identified in the 2016 action plan;
- Impacts of changes in other planning programs or projects that involve hazard mitigation; and
- Identification of training needs or additional guidance, such as benefit-cost analysis or E-grants training or additional equity guidance.

The planning team has created a template for preparing a progress report (see Appendix K). The Mitigation Action Plan Working Group and identified lead agencies will provide feedback to PBEM on items included in the template. PBEM staff will compile the information into a formal annual report on the progress of the plan, which will be presented to the mitigation action plan working group for their review and comment. This report will be disseminated as follows:

- Posted on the PBEM website dedicated to the MAP;
- Provided to the local media through a press release;
- Presented to the City of Portland City Council to inform them of the progress of mitigation actions implemented during the reporting period; and
- Provided as part of the CRS annual re-certification package.

The annual progress report should be compiled in August of each year, reviewed by the committee in September, and be finalized before October 1 each year.

19.5.5 Incorporation into Other Planning Mechanisms

The information on hazard, risk, vulnerability and mitigation contained in *The Mitigation Action Plan* and cited throughout is based on the best available science and technology. Plan integration is the incorporation of this information into other relevant planning mechanisms, such as general planning and capital facilities planning. It includes the integration of natural hazard information and mitigation policies, principles and actions into local planning mechanisms and vice versa, as well as the encouragement of collaborative planning and inter-agency coordination (FEMA, 2015c).

Plan Integration During the 2010 NHMP Performance Period

The 2010 NHMP identified three main activities to incorporate the NHMP requirements into other planning mechanisms as appropriate during the performance period of the plan (44 CFR Section 201.6(c)(4)(ii)):

- Conduct a review of community-specific regulatory tools to assess the integration of the mitigation strategy. These regulatory tools were identified in the capability assessment section.
- Track implemented mitigation actions to determine their success or failure, to determine road blocks to implementation, and identify potential corrective actions.
- Work with community members to increase awareness of the NHMP and provide assistance in integrating the mitigation strategy into relevant planning mechanisms. Implementation of these requirements may require updating or amending specific planning mechanisms.

Although the status of these specific activities was not tracked closely during the performance period, the City did make progress on integrating and incorporating the NHMP into locally relevant plans and programs. The planning team conducted a review of the 2010 NHMP mitigation actions and identified 51 actions that addressed integration into local planning mechanisms and/or collaborative planning. During the performance period of the plan, 19 (37 percent) of these actions were completed, 23 (45 percent) were carried over to the 2016 MAP, and 9 (18 percent) were removed due to a lack of

feasibility. More information on the status of these actions can be found in Table 19-1. The following plans and programs were specifically identified by participating bureaus to have integrated the goals, risk assessment or recommendations of the 2010 NHMP or vice versa:

- Portland Comprehensive Plan
- Climate Action Plan
- PBEM Strategic Plan
- Portland Parks & Recreation Master Plan
- BPS Strategic Plan
- BES Strategic Plan
- Portland Water Bureau (PWB) Water System Seismic Study
- Johnson Creek Restoration Plan
- Portland Watershed Management.

Plan Integration for the Mitigation Action Plan

Implementation of the MAP has and will continue to enhance and expand the integration efforts of the 2010 NHMP. During the update process, *The Portland Plan*, the draft *Comprehensive Plan*, *Capital Investment Plans*, the *Climate Action Plan,* and other plans were reviewed for relevant community goals, policies and actions. Inter-agency coordination occurred through involvement by local, regional, state and federal stakeholders involved in and consulted with during the planning process. This coordination is expected to continue through the Mitigation Action Plan working group activities, annual progress reporting, implementation coordination and the continued public engagement outlined below.

As the plan is implemented, all City bureaus will use information from this updated plan as the best available science and data on natural hazards impacting the City of Portland. Bureaus were asked to review the capability assessment and identify codes, plans and programs that provide opportunities for integration and include these as actions in the MAP. Seventy actions related to plan integration have been identified by the planning team and recommended for implementation in this plan. Progress will be reported annually through the progress reporting process described above. New opportunities for integration will be identified as part of the annual progress report.

19.5.6 Implementation Coordination

It is anticipated that upon completion of this plan, there will be interest among the lead agencies in pursuing grant funding under FEMA hazard mitigation grant programs and other relevant programs. In order to keep lead agencies informed of these opportunities and to coordinate grant pursuits, the PBEM staff person charged with coordinating the implementation of this plan will strive to:

- Coordinate with lead agencies and stakeholders through scheduling mitigation action plan working group meetings; and
- Monitor HMGP grant funding opportunities identified in this plan, maintain accountability of other lead agencies to monitor funding opportunities for their actions, and coordinate with other lead agencies to seek funding when such opportunities become available.

PBEM will strive to coordinate the working group sessions as needed and with enough lead time to plan for pursuing Hazard Mitigation Assistance funds, which typically open in March or April. At working group sessions, agenda topics will be devoted to the following:

- Identify and refine projects or actions that are recommendations of this plan so that eligible, well-planned, vetted projects can be submitted for consideration when funding opportunities arise;

- Identify and develop strategies for incorporating mitigation projects into existing budgets, schedules, and planning mechanisms;
- Identify additional opportunities for plan integration; and
- Provide input for the annual progress report.

Plan Update

The City of Portland intends to continue to update the MAP on a 5-year cycle from the date of final plan approval. This cycle may be accelerated to less than 5 years based on the following triggers:

- A federal disaster declaration that impacts Portland;
- A hazard event that causes loss of life; or
- A comprehensive update of the City's Comprehensive Plan.

It will not be the intent of future updates to develop a complete new natural hazard mitigation plan for Portland. The update will, at a minimum, include the following elements:

- The update process will be convened through a steering committee.
- The goals and objectives will be reviewed to evaluate the effectiveness of the plan.
- The hazard risk assessment will be reviewed and, if necessary, updated using best available information and technologies.
- The action plan will be reviewed and revised to account for any actions completed, dropped, or changed and to account for changes in the risk assessment or new policies identified under other planning mechanisms.
- The equity implementation strategy will be reviewed to see if adjustments are needed and if equity-flagged projects are meeting their equity objectives.
- The draft update will be sent to appropriate agencies and organizations for comment.
- The public will be given an opportunity to comment on the update prior to adoption.
- The City Council and governing boards of any planning partners will adopt the updated plan.

The plan update process will be led by the Portland Bureau of Emergency Management. All lead agencies and relevant stakeholders will be asked to participate in the plan update process.

19.5.7 Continued Public Engagement and Access

The public will continue to be apprised of the plan's progress through the hazard mitigation website and through the provision of copies of the annual progress reports to the media. The website will not only house the final plan, it will continue to be the one-stop shop for information regarding the plan and plan implementation. A mechanism for providing comments on the mitigation plan and on the implementation of actions will be available via the website. Additionally, PBEM will strive to include information on the website that clearly outlines available data on mitigation projects and hazard risk and mechanisms to evaluate progress.

Additional public engagement will be pursued as opportunities arise or as recommended by the Mitigation Action Plan Working Group. This may include activities such as utilizing existing networks and communication systems to distribute the annual progress report, speaking to groups upon request and as resources allow, and recorded webinars or other online engagement.

Upon initiation of future update processes, a new public engagement strategy will be initiated based on guidance from a new steering committee and the recommendations of the mitigation action plan

working group. This strategy will be based on the needs and capabilities of the City of Portland and any planning partners at the time of the update.

20. LINKAGE PROCEDURES

The federal Disaster Mitigation Act broadly defines local government to encompass more than city and county governments. The DMA's definition of local government also includes local jurisdictional authorities such as schools or special purpose districts. The benefits of the DMA extend to these governments if the planning requirements are met. Not all eligible local governments in the City of Portland are currently covered by approved, adopted local hazard mitigation plans. Some or all of these local governments may wish to develop and adopt DMA-compliant plans to gain eligibility for relevant grant programs.

In order to promote the wise use of resources, enhance communication and collaboration among local governments, and encourage regional consistency, the City of Portland has developed linkage procedures that define requirements for completing a DMA-compliant annex to this plan. This linkage procedure will substantially reduce the level of effort for linking jurisdictions in plan development, as many of the components of the MAP development process will be used to support annex development. No currently non-DMA compliant jurisdiction in Portland is obligated to link to this plan. These jurisdictions can choose to not seek compliance or to develop their own "complete" plan that addresses all required elements for such plans.

Eligible jurisdictions located in Portland may link to this plan at any point during the plan's performance period (5 years after final approval). Eligibility will be determined by the following factors:

- The linking jurisdiction is a local government as defined by the Disaster Mitigation Act.
- The boundaries or service area of the linking jurisdiction is completely contained within the boundaries of Portland established during the 2016 MAP development process.
- The linking jurisdiction's critical facilities were included in the critical facility and infrastructure risk assessment completed during the 2016 plan development process.

It is expected that linking jurisdictions will complete the following requirements and submit a completed annex to the lead agency (PBEM) for review within six months of submitting a letter of intent to link to the MAP:

- The eligible jurisdiction requests a "Linkage Package" by contacting the Point of Contact (POC) for the plan:

  Jonna Papaefthimiou
  Planning and Preparedness Manager, PBEM
  Phone: 503-823-3809
  Email: jonnap@portlandoregon.gov

- The POC will provide a linkage procedure package that includes linkage information and a linkage tool-kit:

  - Linkage Information

- Procedures for linking to the Mitigation Action Plan (MAP)
- Expectations for linking jurisdictions
- A sample "letter of intent" to link to the MAP
- A copy of Section 201.6 of 44 CFR, which defines the federal requirements for a local natural hazard mitigation plan.

➢ Linkage Tool-Kit

- Copy of the approved MAP
- A special purpose district template that will form the basis of the annex
- Instructions for completing the annex
- Facility-specific results of the critical facility risk assessment (for official use only)
- A catalog of mitigation best practices
- An annex review check-list
- A sample resolution for plan adoption
- ArcMap files and associated database for map production consistent with the MAP.

- The linking jurisdiction will be required to review the MAP, which includes the following key components:

  ➢ Vision, mission, goals and objectives
  ➢ Risk assessment
  ➢ Comprehensive review of alternatives
  ➢ Equity analysis screening process
  ➢ Action prioritization scheme
  ➢ Plan implementation and maintenance procedures.

  Once this review is complete, the linking jurisdiction will submit a letter of intent to link to the MAP and complete its annex using the template and instructions provided by the POC.

- The development of the new jurisdiction's annex must not be completed by one individual in isolation. The jurisdiction must develop, implement and describe a public engagement strategy and a methodology to identify and vet jurisdiction-specific actions. The original plan development involved extensive public outreach and engagement and is described in Part 1 of the MAP. Since linking jurisdictions were not explicitly covered by these strategies, they will have to initiate new strategies and describe them in their annex. Although linking jurisdictions will need to conduct their own public engagement, they are encouraged to use the results of the extensive public engagement conducted during development of the MAP to help inform their selection of actions (for example, the results of the public survey and Planning for Real Workshops). For consistency, linking jurisdictions are encouraged to develop and implement strategies similar to those described in this plan; however, the City of Portland recognizes that linking jurisdictions may have fewer staff and resources available to support such efforts. At a minimum, a linking jurisdiction must develop a strategy that meets the minimum requirements outlined in the DMA.
- The methodology to identify actions should include a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard and a description of the process by which chosen actions were identified. As part of this process, linking jurisdictions should coordinate the selection of actions amongst the jurisdiction's various departments.
- Once its public engagement strategy and template are completed, the new jurisdiction will submit the completed package to the POC for a pre-adoption review to ensure conformance with the plan format and linkage procedure requirements.

- The POC will review for the following:
  - Documentation of public engagement and action plan development strategies
  - Conformance of template entries with guidelines outlined in instructions
  - Chosen actions are consistent with vision, mission, goals, objectives and mitigation catalog of the MAP.
  - A designated point of contact
  - A completed FEMA plan review crosswalk.

- Plans will be reviewed by the POC and submitted to Oregon Office of Emergency Management (OEM) for review and approval.
- OEM will review plans for state compliance. Non-compliant plans are returned to the lead agency for correction. Compliant plans are forwarded to FEMA for review with annotation as to the adoption status.
- FEMA reviews the linking jurisdiction's plan in association with the approved plan to ensure DMA compliance. FEMA notifies the new jurisdiction of the results of review with copies to OEM and the approved plan lead agency.
- Linking jurisdiction corrects plan shortfalls (if necessary) and resubmits to OEM through the approved plan lead agency.
- For plans with no shortfalls from the FEMA review that have not been adopted, the new jurisdiction governing authority adopts the plan and forwards adoption resolution to FEMA with copies to lead agency and OEM.
- FEMA regional director notifies the new jurisdiction's governing authority of the plan's approval.

The new jurisdiction plan is then included with the City plan, and the linking jurisdiction is committed to participate in the ongoing plan implementation and maintenance strategies and should have at least one regularly attending representative on the Mitigation Action Plan working group.

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GLOSSARY

ACRONYMS

ACS—American Community Survey

ADA—Americans with Disabilities Act

APANO—Asian Pacific Network of Oregon

ARES—Amateur Radio Emergency Services

BCD—Building Codes Division

BCE—Before Current Era

BDS—City of Portland Bureau of Development Services

BEECN—Basic Earthquake Emergency Communication Nodes

BES—City of Portland Bureau of Environmental Services

BOEC—City of Portland Bureau of Emergency Communications

BPA—Bonneville Power Administration

BPS—City of Portland Bureau of Planning and Sustainability

BTS—City of Portland Bureau of Technology Services

CAD—Computer Aided Dispatch

CAMG—City of Portland Asset Managers Group

CBO—City of Portland Budget Office

CEI—Critical Energy Infrastructure

CEL—Community Engagement Liaison

CGIS—City of Portland Corporate GIS

CDBG-DR—Community Development Block Grant – Disaster Recovery

CFR—Code of Federal Regulations

CIP—Capital Improvement Plan

COOP—Continuity of Operations Plan

CRS—Community Rating System

CVO—Cascade Volcano Observatory

CWA—Clean Water Act

DCL—Diversity in Civic Leadership
DEQ—State of Oregon Department of Environmental Quality
DEWS—Drought Early Warning System
DFIRM—Digital Flood Insurance Rate Maps
DLCD—Oregon Department of Land Conservation and Development
DMA —Disaster Mitigation Act
DOGAMI—Oregon Department of Geology and Mineral Industries
E—Equity
EMAC—Emergency Management Assistance Compact
ENSO— El Niño-Southern Oscillation
EPA—U.S. Environmental Protection Agency
EQ—Earthquake
ESA—Endangered Species Act
EWP—Emergency Watershed Protection
FEMA—Federal Emergency Management Agency
FERC—Federal Energy Regulatory Commission
FIRM—Flood Insurance Rate Map
GIS—Geographic Information System
GPS—Global Positioning System
Hazus-MH—Hazards, United States-Multi Hazard
HMA—Hazard Mitigation Assistance
HMGP—Hazard Mitigation Grant Program
HVAC—Heating, Ventilation and Air Conditioning
IBC—International Building Code
IPAWS—Integrated Public Alert and Warning System
IPCC—Intergovernmental Panel on Climate Change
IRC—International Residential Code
IRCO—Immigrant and Refugee Community of Oregon
LiDAR—Light Detection and Ranging
MAP—Mitigation Action Plan – refers to City of Portland 2016 plan
MCDD—Multnomah County Drainage District
ML—Local Magnitude or Richter Scale
MMI—Modified Mercalli Scale
M_W—Magnitude

NASA—National Aeronautics and Space Administration
NEHRP—National Earthquake Hazards Reduction Program
NET—Neighborhood Emergency Team
NHMP—Natural Hazard Mitigation Plan – refers to City of Portland 2004 or 2010 plan
NIDIS—National Integrated Drought Information System
NIMS—National Incident Management System
NFIP—National Flood Insurance Program
NOAA—National Oceanic and Atmospheric Administration
NRCS—Natural Resources Conservation Services
NWS—National Weather Service
ODA—Oregon Department of Agriculture
ODOT—Oregon Department of Transportation
OEHR—City of Portland Office of Equity and Human Rights
OEM—Oregon Office of Emergency Management
OGDC—Oregon Geologic Data Compilation
OGR—City of Portland Office of Governmental Relations
OHA—Oregon Health Authority
OHSU—Oregon Health and Science University
OMF—City of Portland Office of Management and Finance
ONI—City of Portland Office of Neighborhood Involvement
OS—Open Space Zone
PBEM—City of Portland Bureau of Emergency Management
PBOT—City of Portland Bureau of Transportation
PCC—City of Portland City Code
PDC—Portland Development Commission
PDM—Pre-Disaster Mitigation Grant Program
PGA—Peak Ground Acceleration
PGE—Portland General Electric
PHA—Portland Housing Authority
PHB—City of Portland Housing Bureau
POC—Point of Contact
PPB—City of Portland Police Bureau
PP&R—Portland Parks and Recreation
ppm—Parts per million

PPS—Portland Public Schools

PSU—Portland State University

PWB—City of Portland Water Bureau

RDPO—Regional Disaster Preparedness Organization

SDC—System Development Charge

SEAO—Structural Engineers Association of Oregon

SEC—Significant Environment Zone

SFHA—Special Flood Hazard Area

SLIDO—State Landslide Database of Oregon

TriMET—Tri-County Metropolitan Transportation District

USACE—U.S. Army Corp of Engineers

USDA—U.S. Department of Agriculture

USFS—U.S. Forest Service

USGS—U.S. Geological Survey

URM—Unreinforced Masonry

WEA—Wireless Emergency Alerts

WUI—Wildland Urban Interface

DEFINITIONS

1-Percent Annual Chance Flood (100-Year Flood): The flood magnitude that has a 1 percent chance of being equaled or exceeded in any given year. On a statistical average over a long term, this magnitude can be expected to occur once every 100 years; in fact though, such a flood can occur multiple times in a few years, or even in a single year.

1-Percent Annual Chance Flood Hazard Area (100 Year Floodplain or Special Flood Hazard Area): The area that is inundated during a 1-percent annual chance (100-year) flood.

Acre-Foot: An acre-foot is the amount of water it takes to cover 1 acre to a depth of 1 foot. This measure is used to describe the quantity of storage in a water reservoir. An acre-foot is a unit of volume. One acre foot equals 7,758 barrels; 325,829 gallons; or 43,560 cubic feet. An average household of four will use approximately 1 acre-foot of water per year.

Adaptation: The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities, In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.

Agricultural Drought: When there is not enough soil moisture to support crop needs at a particular time.

Air Pollution: the presence of contaminants or pollutant substances in the air that interfere with health or welfare, or produce other harmful environmental effects.

Air Toxics: Air pollutants known or suspected to cause cancer and come from a variety of sources.

Asset: An asset is any man-made or natural feature that has value, including, but not limited to, people; buildings; infrastructure, such as bridges, roads, sewers, and water systems; lifelines, such as electricity and communication resources; and environmental, cultural, or recreational features such as parks, wetlands, and landmarks.

Base Flood: The flood having a 1% chance of being equaled or exceeded in any given year, also known as the "100-year" or "1% chance" flood. The base flood is a statistical concept used to ensure that all properties subject to the National Flood Insurance Program (NFIP) are protected to the same degree against flooding.

Benefit/Cost Analysis: A benefit/cost analysis is a systematic, quantitative method of comparing projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

Benefit: A benefit is a net project outcome and is usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of benefit-cost analysis of proposed mitigation measures, benefits are limited to specific, measurable, risk reduction factors, including reduction in expected property losses (buildings, contents, and functions) and protection of human life.

Benioff Zone (Deep) Earthquakes: Benioff Zone earthquakes occur in the Juan De Fuca plate as moves below the North American plate. They are deep earthquakes, 20 miles or more in depth. Shaking from these earthquakes can last up to 60 seconds. Due to their depth, aftershocks are typically not felt.

Body Wave: A type of seismic wave that travels through the earth's interior.

Capability Assessment: A capability assessment provides a description and analysis of a community's current capacity to address threats associated with hazards. The assessment includes two components: an inventory of an agency's mission, programs, and policies, and an analysis of its capacity to carry them out. A capability assessment is an integral part of the planning process in which a community's actions to reduce losses are identified, reviewed, and analyzed, and the framework for implementation is identified.

Community Capacity Building: Actions that identify, strengthen or link the community's tangible and intangible resources. Includes investing in food independence projects (ex. community gardens), promoting and supporting rain water collection systems, alternative energy sources (ex. solar power, wind power, micro-level hydro power), culturally appropriate community-level training for emergency and trauma response.

Community Rating System (CRS): The CRS is a voluntary program under the NFIP that rewards participating communities (provides incentives) for exceeding the minimum requirements of the NFIP and completing activities that reduce flood hazard risk by providing flood insurance premium discounts.

Community: All residents of the City of Portland and those who work and play here.

Compounding Factor: Characteristics of a planning area that can contribute to the likelihood or severity of a hazard event's occurrence.

Coordinating stakeholders: Stakeholders who could not commit to the Steering Committee, but may have attended meetings and wanted to be informed of plan progress.

Critical Facility and Infrastructure: Publicly and privately controlled systems and assets, including the built and natural environments and human resources, essential to the sustained functioning of the Portland/Vancouver metropolitan area including Clackamas, Columbia, Multnomah and Washington Counties in Oregon and Clark County in Washington. Such systems and assets specifically include those necessary to ensure continuity of security, safety, health and sanitation services, support the area's economy, and/or maintain public confidence. Incapacitation or destruction of any of these systems or assets would have a debilitating impact on the area either directly, through interdependencies, and/or through cascading effects. For the MAP, these facilities were categorized as emergency services, schools, transportation systems, high potential loss facilities, utility systems and other assets.

Critical Habitat: specific geographical areas that are essential for the conservation and management of a listed species, whether occupied by the species or not.

Dam Failure: An uncontrolled release of impounded water due to structural deficiencies in dam.

Dam: A hydraulic structure built above the natural ground grade line that is used to impound water. Dams include all appurtenant structures, and together are sometimes referred to as "the works." Dams include wastewater lagoons and other hydraulic structures that store water, attenuate floods, and divert water into canals

Disaster Mitigation Act of 2000 (DMA); The DMA is Public Law 106-390 and is the latest federal legislation enacted to encourage and promote proactive, pre-disaster planning as a condition of receiving financial assistance under the Robert T. Stafford Act. The DMA emphasizes planning for disasters before they occur. Under the DMA, a pre-disaster hazard mitigation program and new requirements for the national post-disaster hazard mitigation grant program (HMGP) were established.

Distributive Equity: Ensuring that resources or benefits and burdens of a policy or program are distributed fairly, prioritizing those with highest need first.

Drought: The cumulative impacts of several dry years on water users. It can include deficiencies in surface and subsurface water supplies and generally impacts health, well-being, and quality of life.

Earthquake: An earthquake is defined as a sudden slip on a fault, volcanic or magmatic activity, and sudden stress changes in the earth that result in ground shaking and radiated seismic energy. Earthquakes can last from a few seconds to over 5 minutes, and have been known to occur as a series of tremors over a period of several days. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties may result from falling objects and debris as shocks shake, damage, or demolish buildings and other structures.

Emergency Action Plan: A formal document that identifies potential emergency conditions at a dam and specifies actions to be followed to minimize property damage and loss of life. The plan specifies actions the dam owner should take to alleviate problems at a dam. It contains procedures and information to assist the dam owner in issuing early warning and notification messages to responsible downstream emergency management authorities of the emergency situation. It also contains inundation maps to show emergency management authorities the critical areas for action in case of an emergency.

Emergency Services: Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.

Endangered: a species of fish, animal or plant is "in danger of extinction throughout all or a significant portion of its range.

Engagement: A two-way communication between local government and stakeholders.

Equity Lens: A critical thinking approach to undoing institutional and structural biases, which evaluates burdens, benefits and outcomes to underserved communities.

Equity: When everyone has access to the opportunities necessary to satisfy their essential needs, advance their well-being and achieve their full potential. We have a shared fate as individuals within a community and communities within society. All communities need the ability to shape their own present and future. Equity is both the means to healthy communities and an end that benefits us all (The Portland Plan).

Excessive Heat Event: Summertime weather that is substantially hotter and/or more humid than average for a location at that time of year.

Exposure: Exposure is defined as the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.

Extent: The extent is the size of an area affected by a hazard.

Flash Flood: A flash flood occurs with little or no warning when water levels rise at an extremely fast rate

Flood Insurance Rate Map (FIRM): FIRMs are the official maps on which the Federal Emergency Management Agency (FEMA) has delineated the Special Flood Hazard Area (SFHA).

Flood Insurance Study: A report published by the Federal Insurance and Mitigation Administration for a community in conjunction with the community's Flood Insurance rate Map. The study contains such background data as the base flood discharges and water surface elevations that were used to prepare the FIRM. In most cases, a community FIRM with detailed mapping will have a corresponding flood insurance study.

Flood: The inundation of normally dry land resulting from the rising and overflowing of a body of water.

Floodplain: Any land area susceptible to being inundated by flood waters from any source. A flood insurance rate map identifies most, but not necessarily all, of a community's floodplain as the Special Flood Hazard Area (SFHA).

Floodplain: The land area along the sides of a river that becomes inundated with water during a flood.

Floodway Fringe: Floodway fringe areas are located in the floodplain but outside of the floodway. Some development is generally allowed in these areas, with a variety of restrictions. On maps that have identified and delineated a floodway, this would be the area beyond the floodway boundary that can be subject to different regulations.

Floodway: Floodways are areas within a floodplain that are reserved for the purpose of conveying flood discharge without increasing the base flood elevation more than 1 foot. Generally speaking, no development is allowed in floodways, as any structures located there would block the flow of floodwaters.

Freeboard: Freeboard is the margin of safety added to the base flood elevation.

Freezing Rain: The result of rain occurring when the temperature is below the freezing point. The rain freezes on impact, resulting in a layer of glaze ice up to an inch thick. In a severe ice storm, an evergreen tree 60 feet high and 30 feet wide can be burdened with up to six tons of ice, creating a threat to power and telephone lines and transportation routes.

Frequency: For the purposes of this plan, frequency refers to how often a hazard of specific magnitude, duration, and/or extent is expected to occur on average. Statistically, a hazard with a 100-year frequency is expected to occur about once every 100 years on average and has a 1 percent chance of occurring any given year. Frequency reliability varies depending on the type of hazard considered.

Fujita Scale of Tornado Intensity: Tornado wind speeds are sometimes estimated on the basis of wind speed and damage sustained using the Fujita Scale. The scale rates the intensity or severity of tornado events using numeric values from F0 to F5 based on tornado wind speed and damage. An F0 tornado (wind speed less than 73 miles per hour (mph)) indicates minimal damage (such as broken tree limbs), and an F5 tornado (wind speeds of 261 to 318 mph) indicates severe damage.

Geographic Information System (GIS): GIS is a computer software application that relates data regarding physical and other features on the earth to a database for mapping and analysis.

Goal: Explain what should be achieved.

Hail: showery precipitation in the form of irregular pellets or balls of ice more than 5 millimeters in diameter, falling from a cumulonimbus cloud.

Hazard Mitigation Grant Program (HMGP): Authorized under Section 202 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster

Hazard of Concern: Hazards that present the greatest concern for a planning area. These hazards are profiled and risk to the planning area is assessed.

Hazard: A hazard is a source of potential danger or adverse condition that could harm people and/or cause property damage.

Hazards U.S. Multi-Hazard (Hazus-MH) Loss Estimation Program: Hazus-MH is a GIS-based program used to support the development of risk assessments as required under the DMA. The Hazus-MH software program assesses risk in a quantitative manner to estimate damage and losses associated with natural hazards. Hazus-MH is FEMA's nationally applicable, standardized methodology and software program and contains modules for estimating potential losses from earthquakes, floods, and wind hazards. Hazus-MH has also been used to assess vulnerability (exposure) for other hazards.

Heat Wave: Excessive heat events that typically last two or more days.

High Hazard Dam: Dams where failure or improper operation will probably cause loss of human life.

High Wind: Those that last longer than one hour at 40 mph or greater or wind gusts of 58 mph or greater.

Hydraulics: Hydraulics is the branch of science or engineering that addresses fluids (especially water) in motion in rivers or canals, works and machinery for conducting or raising water, the use of water as a prime mover, and other fluid-related areas.

Hydrological Drought: Deficiencies in surface and subsurface water supplies.

Hydrology: Hydrology is the analysis of waters of the earth. For example, a flood discharge estimate is developed by conducting a hydrologic study.

Ice Storm: A storm that results in the accumulation of at least 0.25 inches of ice on exposed surfaces.

Intensity: For the purposes of this plan, intensity refers to the measure of the effects of a hazard.

Invasive Plants: those species that spread at such a rate that they cause harm to human health and the environment. In general, most invasive plants are non-native species, however, not all non-native plants are invasive.

Inventory: The assets identified in a study region comprise an inventory. Inventories include assets that could be lost when a disaster occurs and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

Lahar: A rapidly flowing mixture of water and rock debris that originates from a volcano. While lahars are most commonly associated with eruptions, heavy rains, and debris accumulation, earthquakes may also trigger them

Landslide: The movement of masses of loosened rock and soil down a hillside or slope. Slope failures occur when the strength of the soils forming the slope is exceeded by the pressure, such as weight or saturation, acting upon them.

Lava Flow: The least hazardous threat posed by volcanoes. Cascades volcanoes are normally associated with slow moving andesite or dacite lava.

Lightning: Lightning is an electrical discharge resulting from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a "bolt," usually within or between clouds and the ground.

Liquefaction: Liquefaction is the complete failure of soils, occurring when soils lose shear strength and flow horizontally. It is most likely to occur in fine grain sands and silts, which behave like viscous fluids when liquefaction occurs. This situation is extremely hazardous to development on the soils that liquefy, and generally results in extreme property damage and threats to life and safety.

Local Government: Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity.

Love Waves: A type of seismic surface wave that produces horizontal motion.

Magnitude: Magnitude is the measure of the strength of an earthquake, and is typically measured by the Richter scale. As an estimate of energy, each whole number step in the magnitude scale

corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.

Mass movement: A collective term for landslides, debris flows, falls and sinkholes.

Meteorological Drought: An abnormally low level of precipitation over a period of time.

Mission: What the is to be achieved and how.

Mitigation Actions: Mitigation actions are specific actions to achieve goals and objectives that minimize the effects from a disaster and reduce the loss of life and property.

Mitigation Strategy: The long-term blueprint for reducing the potential losses identified in the risk assessment.

Mitigation: Advance actions to reduce potential hazard effects or risk. Protections are already in place at the time a hazard event occurs.

Mudslide (or Mudflow or Debris Flow): A river of rock, earth, organic matter and other materials saturated with water. Mudslides develop in the soil overlying bedrock on sloping surfaces when water rapidly accumulates in the ground, such as during heavy rainfall or rapid snowmelt. Water pressure in the pore spaces of the material increases to the point that the internal strength of the soil is drastically weakened. The soil's reduced resistance can then easily be overcome by gravity, changing the earth into a flowing river of mud or "slurry."

Natural Resource Protection: Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

Objective: Broader than actions, but more specific than goals, objectives are specific enough to help determine whether a proposed project or program would advance the values expressed in the mission and vision. Objectives may also be thought of as 'policies.' In this planning process, objectives are used to define and prioritize actions.

Participatory Stakeholders: Stakeholders who committed to being members of the Steering Committee that oversaw the plan update process.

Peak Ground Acceleration: Peak Ground Acceleration (PGA) is a measure of the highest amplitude of ground shaking that accompanies an earthquake, based on a percentage of the force of gravity.

Planning Partners: City of Portland bureaus and offices which manage infrastructure and administer programs included or potentially included as part of the city's hazard mitigation strategy.

Planning Team: The Tetra Tech team and PBEM staff responsible for the facilitation of the planning process and the development of the plan document.

Preparedness: Advance actions that strengthen the capability of government, residents, and communities to respond to disasters.

Presidential Disaster Declaration: These declarations are typically made for events that cause more damage than state and local governments and resources can handle without federal government assistance. Generally, no specific dollar loss threshold has been established for such declarations. A

Presidential Disaster Declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, designed to help disaster victims, businesses, and public entities.

Prevention (emergency management): Building capabilities to avoid, prevent or stop a threatened or actual act of terrorism.

Prevention (mitigation typology): Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and storm water management regulations.

Primary waves (P waves): A type of seismic body wave that travels through both solids and fluids. These waves are the fastest travelling seismic waves.

Probability of Occurrence: The probability of occurrence is a statistical measure or estimate of the likelihood that a hazard will occur. This probability is generally based on past hazard events in the area and a forecast of events that could occur in the future.

Procedural Equity: Ensuring that processes are fair and inclusive in the development and implementation of any program or policy.

Property Protection: Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.

Public Education and Awareness: Actions to inform citizens and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.

Rayleigh Waves: A type of seismic surface wave that travels like ocean waves. Most of the shaking felt during an earthquake is the result of these waves.

Recovery: A phase of emergency management in which activities are carried out to restore essential services and repair damage caused by a hazard event.

Repetitive Loss Property: Any NFIP-insured property that, since 1978 and regardless of any changes of ownership during that period, has experienced:

- Four or more paid losses in excess of $1,000
- Two paid losses in excess of $1,000 within any rolling 10-year period
- Three or more paid losses that cumulatively equal or exceed the current value of the property.

Residual Risk: The risk that remains after safeguards have been implemented.

Resilience: The capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment.

Response: A phase of emergency management that consists of immediate actions to save lives, protect property and the environment and meet basic human needs.

Return Period (or Mean Return Period): This term refers to the average period of time in years between occurrences of a particular hazard (equal to the inverse of the annual frequency of occurrence).

Riparian Area: The area along the banks of a natural watercourse.

Risk Assessment: Risk assessment is the process of measuring potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process assesses the vulnerability of people, buildings, and infrastructure to hazards and focuses on (1) hazard identification; (2) impacts of hazards on physical, social, and economic assets; (3) vulnerability identification; and (4) estimates of the cost of damage or costs that could be avoided through mitigation.

Risk Ranking = Probability + Impact (people + property + economy)

Risk Ranking: This ranking serves two purposes, first to describe the probability that a hazard will occur, and second to describe the impact a hazard will have on people, property, and the economy. Risk estimates are based on the methodology used to prepare the risk assessment for this plan. The following equation shows the risk ranking calculation:

Risk: Risk is the estimated impact that a hazard would have on people, services, facilities, and structures in a community. Risk measures the likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Riverine: Of or produced by a river. Riverine floodplains have readily identifiable channels. Floodway maps can only be prepared for riverine floodplains.

Robert T. Stafford Act: The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-107, was signed into law on November 23, 1988. This law amended the Disaster Relief Act of 1974, Public Law 93-288. The Stafford Act is the statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs.

Safe Harbor Languages: Those that are spoken as a primary language by at least 1,000 people in Portland with limited English proficiency.

Secondary Hazard: Impacts that result from a hazard event in a more indirect way than the immediate hazard effects.

Secondary Waves (S waves): A type of seismic body wave that travel through rock.

Severe Local Storm: Small atmospheric systems, including tornadoes, thunderstorms, windstorms, ice storms and snowstorms. Typically, major impacts from a severe storm are on transportation infrastructure and utilities. These storms may cause a great deal of destruction and even death, but their impact is generally confined to a small area.

Shallow Crustal Earthquake: Shallow crustal earthquakes occur within the North America plate at depths of 20 miles or less. These types of earthquakes occur frequently in the Pacific Northwest. Most are relatively small, but large, damaging events in the region have and will continue to occur. Generally, these earthquakes are expected to last from 20 to 60 seconds, with magnitudes less than 7.5. Aftershocks are likely.

Shallow Flood Hazard Area: Areas that are inundated only 1 to 3 feet deep by the 1-percent annual chance flood.

Significant Hazard Dam: Dams where failure or improper operation will result in no probable loss of human life but can cause economic loss, environmental damage or disruption of lifeline facilities, or can impact other concerns. Significant hazard dams are often located in rural or agricultural areas but could be located in areas with population and significant infrastructure.

Social Vulnerability (for hazard mitigation): The characteristics of a person or group in terms of their capacity to anticipate, cope with, resist and recover from the impacts of a natural hazard. It involves a combination of factors that determine the degree to which someone's life and livelihood are put at risk (Blaikie et al., 1994).

Socioeconomic Drought: Drought impacts on a population's health, well-being and quality of life.

Special Flood Hazard Area: The base floodplain delineated on a Flood Insurance Rate Map. The SFHA is mapped as a Zone A in riverine situations and zone V in coastal situations. The SFHA may or may not encompass all of a community's flood problems

Stakeholder: Persons and agencies with a vested interest in the recommendations and implementation of the MAP. Stakeholders include residents, community groups, business owners, local, state and federal agencies, elected officials, visitors, and neighboring communities.

Steering Committee: Representative members from the community and city bureaus and offices that serve as the oversight body. They are responsible for many of the planning milestones and decisions prescribed for this process.

Stratovolcano: Typically steep-sided, symmetrical cones of large dimension built of alternating layers of lava flows, volcanic ash, and cinders, rising as much as 8,000 feet above their bases.

Stream Bank Erosion: Stream bank erosion is common along rivers, streams and drains where banks have been eroded, sloughed or undercut. However, it is important to remember that a stream is a dynamic and constantly changing system. It is natural for a stream to want to meander, so not all eroding banks are "bad" and in need of repair.

Structural equity: A commitment and action to correct past harms and prevent future negative consequences by institutionalizing accountability and decision-making structures that aim to sustain positive outcomes.

Structural Projects: Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.

Subduction Zone Earthquakes: Subduction Zone earthquakes occur at the interface between tectonic plates. Such earthquakes typically have a minute or more of strong ground shaking, and are quickly followed by damaging tsunamis and numerous large aftershocks.

Surface Waves: A type of seismic wave that travels along the earth's surface.

Sustainable Hazard Mitigation: This concept includes the sound management of natural resources, local economic and social resiliency, and the recognition that hazards and mitigation must be understood in the largest possible social and economic context.

- **Tephra:** Ash and fragmented rock material ejected by a volcanic explosion

Threatened: a species "is likely to become endangered within the foreseeable future.

Thunderstorm: Any rain event that includes thunder and lightning. A typical thunderstorm is about 15 miles in diameter and lasts about 30 minutes.

Tornado: Tornadoes are funnel clouds of varying sizes that touch ground. Tornadoes are measured using the Fujita Scale ranging from F0 to F6.

Urban Heat Island Effect: the measureable increase in ambient urban air temperatures resulting primarily from the replacement of vegetation with buildings, roads, and other heat-absorbing infrastructure. The heat island effect can result in significant temperature differences between rural and urban areas.

Vision: A desired future state.

Volcano: A vent in the planetary crust from which magma (molten or hot rock) and gas from the earth's core erupts.

Vulnerability: Vulnerability describes how exposed or susceptible an asset is to damage. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damage, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power. Flooding of an electric substation would affect not only the substation itself but businesses as well. Often, indirect effects can be much more widespread and damaging than direct effects.

Watershed: A watershed is an area that drains downgradient from areas of higher land to areas of lower land to the lowest point, a common drainage basin.

Wildfire Hazard Zone: The portion of a local government jurisdiction that has been determined to be at risk of a catastrophic wildfire

Wildfire: These terms refer to any uncontrolled fire occurring on undeveloped land that requires fire suppression. The potential for wildfire is influenced by three factors: the presence of fuel, topography, and air mass. Fuel can include living and dead vegetation on the ground, along the surface as brush and small trees, and in the air such as tree canopies. Topography includes both slope and elevation. Air mass includes temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount, duration, and the stability of the atmosphere at the time of the fire. Wildfires can be ignited by lightning and, most frequently, by human activity including smoking, campfires, equipment use, and arson.

Wildland-Urban Interface (WUI) Area: An area where structures are adjacent to or are intermingled with natural vegetative fuels which is prone to the occurrence of wildland fires

Windstorm: A storm featuring violent winds. Windstorms are generally short-duration events involving straight-line winds or gusts of over 50 mph, strong enough to cause property damage.

Winter Storm: The National Weather Service defines a winter storm as having significant snowfall, ice, and/or freezing rain; the quantity of precipitation varies by elevation. Heavy snowfall is 4 inches or more in a 12-hour period, or 6 inches or more in a 24-hour period in non-mountainous areas; and 12 inches or more in a 12-hour period or 18 inches or more in a 24-hour period in mountainous areas.

Zoning Ordinance: The zoning ordinance designates allowable land use and intensities for a local jurisdiction. Zoning ordinances consist of two components: a zoning text and a zoning map.

APPENDICES

The Mitigation Action Plan

Appendix A. 5-Year Progress Report

2010 City of Portland Natural Hazard Mitigation Plan

2016 Progress Report

REPORTING PERIOD

March 2010 through March 2016

BACKGROUND

The City of Portland has developed and maintained a hazard mitigation plan, most recently updated in 2010. The *City of Portland Natural Hazard Mitigation Plan* identifies resources, information, and strategies for reducing risk associated with natural hazards in the City. The plan was adopted in 2010 and approved by FEMA Region X on February 15, 2011.

By preparing the 2010 update, the City retained compliance with the federal Disaster Mitigation Act and remained eligible for hazard mitigation grant funding under the federal Robert T. Stafford Act. The plan and annexes are available to the public online at the following website:

https://www.portlandoregon.gov/pbem/53813

An update of the 2010 plan is underway. The new update will be adopted before the end of 2016.

Purpose

This progress report provides an update on implementation of the action plan identified in the 2010 *City of Portland Natural Hazard Mitigation Plan*. This report was prepared by the 2016 update planning team and reviewed by the 2016 update steering committee. The objective is to ensure that there is a continuous planning process that keeps the local hazard mitigation plan responsive to stakeholder needs and capabilities. The contents of this progress report are as follows:

- Summary overview of action plan progress
- Recent natural hazard events
- Changes in risk exposure in Portland
- Mitigation success stories
- Itemized review of the action plan
- Changes in capability in Portland that could impact plan implementation
- Recommendations for changes/enhancement.

The Steering Committee

The update steering committee plays an important role in plan development, and may remain involved during plan implementation. The steering committee has provided technical review and oversight on developing this implementation progress report. Table 1 lists steering committee membership as of March, 2016.

Table 1. 2015-2016 Steering Committee Members

	Agency	Primary Member	Alternate
1	Bureau of Environmental Services (BES)	Maggie Skenderian	Kate Carone
2	Bureau of Planning and Sustainability (BPS)	Kathryn Hartinger	Roberta Jortner / Sallie Edmunds
3	Office of Equity and Human Rights (OEHR)	Danielle Brooks	Judith Mowry
4	Parks & Recreation	Vicente Harrison	
5	Fire and Rescue (PF&R)	Laurent Picard	Leo Krick
6	OHSU Institute on Development and Disability/Oregon Office of Disability and Health	Jessica London	Justin E. Ross
7	Portland Audubon Society	Bob Sallinger	Micah Meskel
8	Oregon Food Bank	Dean Alby	
9	Filipino American Community	Simeon Mamaril	
10	Oregon Seismic Safety Policy Advisory Commission	Jeff Soulages	
11	Department of Homeland Security	Glen Collins	
12	NET/ARES/Local Emergency Planning Committee	John Steup	
13	Neighbors West/Northwest	Darlene Urban Garrett	
14	Portland African American Leadership Forum/Boy Scouts of America	Solamon Ibe	
15	Brummell Enterprises, SMILE Member, Sellwood/Moreland	Karen Tam	Bob Burkholder
16	Portland Water Bureau	Mary Ellen Collentine	Mike Saling
17	Simpson Strong-Tie	Jim Mattison	Shalini Prochazka, S.E.
18	Bureau of Development Services	Kathy Roth	Mark Fetters
19	East Portland Action Plan	Jeremy O'Leary	
20	Immigrant and Refugee Community Organization IRCO/ONI New Portlanders	Ronault (Polo) LS Catalani	Lisha Shrestha
21	Hayden Island Neighborhood Network	Jeff Geisler	Margaret Puckette
22	Linnton Neighborhood Association	Rob Lee	
23	St. Johns Neighborhood Association	Jennifer Levy	Emilie Saks-Webb
24	Portland Public Schools	Molly Emmons	
25	MRG/Coalition of Communities of Color	Ranfis Giannettino Villatoro	
26	Bureau of Emergency Management	Jonna Papaefthimiou	
27	Office of Neighborhood Involvement (ONI)	Brian Hoop	
28	OHSU Emergency Management	Sherrie Forsloff	Mike Nurre
29	Goose Hollow Foothills League	Casey Milne	
30	Volunteers of America	Dean Stearman	
31	Portland Bureau of Transportation (PBOT)	Rich Grant	
32	Portland Harbor Community Advisory Group	Darise Weller	

SUMMARY OVERVIEW OF ACTION PLAN PROGRESS

The 2010 *City of Portland Natural Hazard Mitigation Plan* includes an action plan that identifies specific mitigation actions and a performance period for implementation of those actions. Table 2 summarizes the actions and current progress as of the time of this progress report.

Table 2. Summary Overview of Action Plan Progress

Number of Mitigation Actions	**101**
Mitigation Actions Started or Completed	
Number of Actions	75
Percent of Total	75%
Mitigation Actions Not Started	
Number of Actions	26
Percent of Total	25%

RECENT NATURAL HAZARD EVENTS IN PORTLAND

- **January 2012 Winter Storm**—Heavy flooding, street closures.
- **July 2013 Government Island Wildfire**—Over 20 acres of wildlands on Government Island burned.
- February 2014 Winter Storm—Snow and freezing rain. City of Portland issued Emergency Alert advising residents to remain indoors due to ice.
- **July 2015 Excessive Heat**—County activated cooling centers.
- **August 2015 Smoke Event**—Wildfires across Oregon negatively impacted air quality in the Portland Metro region. County health departments issued warnings.
- **December 2015 Severe Weather**—Heavy flooding, landslides, and wind damage. State Disaster Declaration. Federal Disaster Declaration for December 6-23, 2015.
- **January 2016 Severe Weather**—Significant snow and ice throughout the City. Hazardous conditions due to icy roads and walkways. City offices closed and warming shelters opened.

CHANGES IN RISK EXPOSURE IN PORTLAND

Since 2010, there has been no tracking of risk exposure or changes to risk exposure in Portland.

MITIGATION SUCCESS STORIES

The City of Portland completed restoration on the Foster Floodplain Natural Area in 2012. The project began after a 15-year process to purchase the property from 60 willing sellers and move them out of the Johnson Creek 100-year floodplain. The project added 140 acre-feet of flood storage, which was put to the test in December 2015 during record floods on Johnson Creek. The additional flood storage created by removal of impervious surfaces, planting of native vegetation and wood debris substantially reduced the amount of flooding experienced at homes and businesses in the Foster area.

In 2014 the City of Portland conducted a pilot project for residential seismic strengthening, managed by Clean Energy Works, Inc. Using federal grant dollars from the hazard mitigation grant program (HMGP), the City of Portland helped to seismically strengthen 23 single-family homes in Portland. In 2015 the City of Portland applied for and received funding for a similar project under the pre-disaster mitigation (PDM) grant program to help 150 homeowners seismically strengthen their homes. Clean Energy Works, operating under the new name Enhabit, will be partnering with the City in the management of this project.

REVIEW OF THE ACTION PLAN

This section reviews the action plan and lists the status of each action from the hazard mitigation plan, grouped by the agency or department responsible for its completion. The action plan matrix in Table 3 provides the following information:

- Brief summary of action
- Lead agency responsible for implementation
- Indication of whether any action has been taken (Yes or No)
- Current timeline (Short Term or Long Term)
- Indication of whether the project priority has changed (Yes or No)
- Status (Complete, Ongoing or No Progress)
- Comments, including the following information:
  - Was any element of the action carried out during the reporting period?
  - If no action was completed, why?
  - Is the timeline for implementation for the action still appropriate?
  - If the action was completed, does it need to be changed or removed from the action plan?

PORTLAND CHANGES THAT MAY IMPACT PLAN IMPLEMENTATION

No changes that might impact plan implementation were reported since 2010.

RECOMMENDATIONS FOR CHANGES OR ENHANCEMENTS

Based on the review of this report by the steering committee, the recommendations described below will be noted for future updates or revisions to the plan. In future updates, identified action items should include a timeframe and should clearly indicate the bureau primarily responsible for implementation and progress reporting. Potential partners (community groups, other jurisdictions, etc.) should also be listed. Action items should be organized and prioritized by responsible bureau, and a statement should be included describing whether the action can be accomplished within existing budgets or if additional funds need to be pursued.

An online data-sharing method for tracking action item status should be explored (e.g. GoogleDocs, OneDrive, etc.), as should a method for tracking grants and funding opportunities to implement action items.

Public review notice: *The contents of this report are considered to be public knowledge and have been prepared for total public disclosure. Copies of the report have been provided to local media outlets. The report is also posted on the City of Portland Natural Hazard Mitigation Plan website. Any questions or comments regarding the contents of this report should be directed to:*

Natural Hazard Mitigation
Portland Bureau of Emergency Management
9911 SE Bush Street
Portland, OR 97266
503-823-4375
TheMAP@portlandoregon.gov

Table 3. Action Plan Matrix

Action Taken?	Timeline	Priority Changed?	Comment (Describe progress or changed priority)	Status
ST MH #1— Continue to involve the public in updating the Natural Hazard Mitigation Plan. (education & outreach)				
Lead Agency:				
Yes	Long Term	No	In progress. Outreach is recorded in Emergency Management Performance Grants grant reporting. PBEM does regular outreach and is supportive of MCDD's Levee Ready Columbia outreach efforts.	Ongoing
ST MH #2— Form a committee to identify and coordinate critical transportation (street and highway) networks. (mapping, asset management)				
Lead Agency:				
Yes	Long Term	Yes	There is no committee, but we have identified emergency transportation routes for key facilities. If new facilities are built, transportation routes would be re-evaluated.	Complete
ST MH #3— Coordinate emergency standard operating procedures and plans between disaster responder organizations in the Portland metro region, to coordinate and expedite decision making during emergencies. (planning)				
Lead Agency:				
Yes	Short Term	No	Regional Multi-Agency Coordination on operations. Internally de-conflicted the County Basic Emergency Operations Plan with the City Basic Emergency Operations Plan. PBEM reviews other bureaus' emergency procedures.	Complete
ST MH #4— Develop a multiple-agency multi-hazard evacuation plan (EQ, flood, fire and landslide at a minimum).				
Lead Agency:				
Yes	Short Term	No	Evacuation Plan developed. Certain areas of highest risk have individualized plans (Linnton).	Complete
ST MH #5— Acquire Light Detection and Ranging (LiDAR) images of the Portland Metro area to facilitate natural hazard area risk assessment and vulnerability analysis. (mapping) (NFIP Compliance)				
Lead Agency:				
Yes	Short Term	No	Acquisition complete. Analysis in progress.	Complete
ST MH #6— Use findings from Portland's Risk Assessment (HAZUS-MH) to enhance existing debris removal plan. HAZUS-MH will need to be updated. (existing GIS Mapping)				
Lead Agency:				
Yes	Short Term	No	The 2003 HAZUS analysis was used to update Metro's debris removal plan from the 1990's in 2013. Debris modeling is being updated regionally. A new HAZUS analysis is being completed as part of the 2016 plan update.	Complete
ST MH #7— Create a mitigation mapping committee to index and maintain GIS mapped inventory and develop prioritized list of critical facilities, residential and commercial buildings within known hazard areas such as earthquake, erosion, the 100-year and 500-year floodplains, invasive plant species, landslide and wildfire areas. (NFIP Compliance) Identify parameters and methods for new maps as needed to meet multi-hazard mitigation goals and to improve communication with the public.				
Lead Agency:				
Yes	Long Term	Yes	CGIS maintains inventory in Portland Maps. No such committee exists. Much of this will be accomplished through the MAP update. Parks, BES data, PBOT erosion data, and others are included. PBEM also promotes the Map Your Neighborhood initiative.	Complete
ST MH #8— Partner with utilities as they ensure continuity of service to the City and the Columbia South Shore Well field to provide for redundancy in case of primary power outage. (asset management)				
Lead Agency:				
Yes	Long Term	No	The Groundwater Electrical Improvements project, currently in design, will provide for upgrades and additional redundancy to the Groundwater Pump Station electrical system.	Ongoing

Action Taken?	Timeline	Priority Changed?	Comment (Describe progress or changed priority)	Status
ST MH #9— Develop a city employee emergency response plan to assure that city employees know what is expected of them to continue City operations. (education, outreach)				
Lead Agency:				
Yes	Short Term	No	All bureaus have submitted Continuity of Operations Plans (COOP), and recognize accountability requirements. PBEM is hiring a COOP planner. The mayor sends out emails informing employees what to do in an emergency.	Complete
ST MH #10— Develop educational materials (television and print media) for residents that identify and define their risk to multi hazards: define and offer mitigation measures that residents can take home or share, determine method of distribution of the educational materials and coordinate with the media to reduce conveyance of misinformation. (education, outreach)				
Lead Agency:				
Yes	Long Term	No	PBEM hired a communications outreach representative, supports preparedness campaigns, promotes preparedness materials, and has offered seismic strengthening programs. Public Information Officer works with local news (KOIN) on post-disaster collaboration.	Complete
ST MH #11— Implement actions in the 2005 Portland Watershed Management Plan (planning) (NFIP Compliance)				
Lead Agency:				
Yes	Short Term	No	Dozens of projects implemented since the Portland Watershed Management Plan was completed. BES is developing a Stormwater System Plan that will significantly increase our ability to address drainage and flooding problems. Analysis available Sept. 2016.	Ongoing
LT MH #1— Revise Portland's Comprehensive Plan to address and implement Citywide policies, land use improvements and mapping changes to natural hazards including, but not limited to, earthquakes, erosion, floods, invasive plants, landslides, volcano, severe weather and wildfires. (mapping, planning) (NFIP Compliance)				
Lead Agency:				
Yes	Long Term	No	The draft Comp. Plan includes policies to reduce natural hazard risks and impacts, proposes changes to reduce development in areas prone to natural hazards. City Council hearings started November 2015. Adoption and submittal in spring 2016.	Ongoing
LT MH #3— Increase the responsiveness of the emergency permitting procedures for post-hazard event periods through development of a procedural plan and the purchase of a mobile permitting van. (planning)				
Lead Agency:				
Yes	Short Term	Yes	BDS looked into purchasing a mobile permitting van, and learned that it was much more expensive than originally thought. There are not sufficient resources currently to implement this action.	Ongoing
LT MH #6— Promote the development of TriMet communications and dispatch capability to immediately implement changes to transit routes and service due to disruption of streets, roads, bridges, rail transit tracks and the information technology that provides connectivity. (planning)				
Lead Agency:				
No	Long Term	No	Not started, identified as a need.	No Progress
LT MH #8— Review and amend City Code and other compliance documentation to require that all facilities that store or handle hazardous materials (including large tanks) and which are located in the 500-year floodplain, landslide, or other hazard areas, develop a hazardous materials inventory statement. This statement will be made available for Fire Bureau review. Require that these storage tanks are either adequately protected or relocated outside of the 500 year floodplain, landslide, or other hazard areas. (asset management) (NFIP Compliance)				
Lead Agency:				
No	Long Term	No	City Resolution 36156 (Water Bureau) requires businesses in the Columbia South Shore Well Field Wellhead Protection Area that meet haz-mat thresholds to report a hazardous materials inventory every November 30. Not in Title 33, Title 24 or Fire Code.	No Progress

Action Taken?	Timeline	Priority Changed?	Comment (Describe progress or changed priority)	Status
LT MH #9— Identify and pursue funding opportunities from outside agencies to fund and implement identified mitigation projects and activities. (education, outreach)				
Lead Agency:				
Yes	Long Term	No	FHA grant funding for PBEM/PBOT transportation planner. PDM 13 grant for MAP update, Hazard Mitigation Program grant for seismic retrofitting of private residences, PDM 15 grant application for seismic retrofit of private residences. PBEM annually applies for and receives Emergency Management Performance Grants, Urban Areas Security Initiative grants, and others on a regular basis. *Note: PBEM did not receive the Urban Areas Security Initiative grant in 2013.	Complete
LT MH #10— Assess the stability of levees in the Columbia Corridor Area and develop appropriate emergency plans to address potential levee failure and associated hazards. (planning)				
Lead Agency:				
Yes	Long Term	No	Assessments are being conducted through the Levee Ready Columbia project, and some have already been completed. Emergency response plans have been and will be developed for specific areas of concern.	Ongoing
LT MH #11— Support development of a multiple-agency plan for Marine Drive closure coordination. (planning)				
Lead Agency:				
No	Short Term	No	No multi-agency plan exists between MCDD, Port of Portland, PBOT, and PPB. Plans are developed ad hoc or as needed basis. Associated with winter weather plan/annex.	No Progress
LT EQ #11— Work with local jurisdictions to assess the capacity of landfill to accommodate earthquake debris: develop coordination plans for disposal of debris in the aftermath of an earthquake. (planning)				
Lead Agency:				
Yes	Short Term	No	A debris management plan is under development. PBEM is working with Metro and the Regional Disaster Preparedness Organization.	Ongoing
New MH #1— Cross reference and incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement and land use plans, to demonstrate multiple bureau benefits and strengthen eligibility from multiple funding sources. This action is also identified in LTFL#8, IS#94 & SW#117. (planning)				
Lead Agency:				
Yes	Long Term	No	2010 Natural Hazard Mitigation Plan components incorporated into Climate Action Plan and Comp. Plan update. PBEM regularly provides comments on citywide planning efforts and requests comments or participation from other bureaus on PBEM planning activities	Complete
New MH #2— Identify and list repetitively flooded structures and infrastructures, analyze the threat to these facilities and prioritize mitigation actions to protect the threatened population. (NFIP Compliance)				
Lead Agency:				
Yes	Long Term	No	There are 11 repetitive loss properties throughout the city. Two of these no longer have structures on them.	Ongoing
New Reworded MH— Acquire (buy-out), demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas. (planning) (NFIP Compliance)				
Lead Agency:				
Yes	Long Term	No	1-2 properties on the Repetitive Loss Properties list are in target areas for acquisition.	Ongoing
New MH #3— Develop and incorporate building ordinances commensurate with building codes to reflect survivability from all hazards to ensure occupant safety. (NFIP Compliance)				
Lead Agency:				
Yes	Short Term	No	BDS is currently evaluating state seismic building codes adopted in 2014. BDS is also reviewing retrofit triggers for commercial buildings.	Ongoing

Action Taken?	Timeline	Priority Changed?	Comment (Describe progress or changed priority)	Status
New MH #4— Update the Infrastructure Master Plan and System Vulnerability Assessment, Sewer Failure Response Plan. (asset management, planning)				
Lead Agency: City Asset Managers Group (CAMG)				
Yes	Short Term	No	Infrastructure Master Plan was updated in 2014 and renamed the Citywide Systems Plan. The Sewer Failure Response Plan was updated in 2012 to comply with National Pollutant Discharge Elimination System permit requirements and named the Sewer Release Response Plan.	Complete
New MH #5— Partner with agencies to develop a west side operations center to be used during an emergency if the east side Emergency Control Center and other City facilities become inoperable.				
Lead Agency:				
Yes	Long Term	No	The Jerome Sears Center is currently being retrofitted to ADA accessibility to be temporary homeless shelter (6 months). Additional upgrades could be made over time to convert it to a west side operations center.	Ongoing
New MH #6— Promote 09 Climate Action Plan action items with similarities to adaptation planning and mitigation actions. (planning)				
Lead Agency:				
Yes	Long Term	No	This is a multi-bureau effort. A Climate Action Plan Implementation Team with representatives from key implementing bureaus meets regularly to monitor progress on 2015 CAP and 2014 Climate Change Preparation Strategy.	Ongoing
ST EQ #2— Assess existing earthquake related mitigation plans and vulnerability studies to identify areas of conflict, duplication or gaps between studies & secondary hazards of earthquake. (planning)				
Lead Agency:				
Yes	Short Term	No	This is being completed as part of the 2016 natural hazard mitigation plan update.	Ongoing
ST EQ #3— Update the vulnerability analysis of Columbia Boulevard Wastewater Treatment Plant Tryon Creek Wastewater Treatment Plant and wastewater pump stations. (asset management, planning)				
Lead Agency:				
Yes	Long Term	No	This was in the Capital Improvement Plan for 2013, but Bureau of Environmental Services determined at that time that more study was needed and we delayed it, but other related projects have been completed. A resiliency plan will be developed in FY16-18.	Ongoing
ST EQ #4—Prioritize the return of power to treatment plants (Tryon Creek and Columbia Boulevard) and pump stations.				
Lead Agency:				
Yes	Long Term	No	Bureau of Environmental Services has done several things under this umbrella and is otherwise required to have a high priority on power reliability by federal standard for critical assets.	Ongoing
ST EQ #8—Study the feasibility of mandatory or voluntary installation of seismic shutoff valves on natural gas meters at commercial and residential buildings.				
Lead Agency:				
Yes	Short Term	Yes	PBEM pursued this, but it did not come to fruition. Valves are expensive, and take time to turn back on after being shut off. It may be pursued at a state level. BPS and BDS have advocated for disclosure of seismic information upon sale of homes.	Complete
LT EQ #3—Develop a plan to strengthen sewer infrastructure in areas where street overlays and sewers have potential to collapse in a seismic event. (asset management)				
Lead Agency: City Asset Managers Group (CAMG)				
Yes	Short Term	No	City Asset Managers Group is working on this. MAP risk assessment could identify projects and key risk areas.	Ongoing

Action Taken?	Timeline	Priority Changed?	Comment (Describe progress or changed priority)	Status
LT EQ #6—Assess the vulnerability of the water distribution system to seismic events: work toward hardening the system.				
Lead Agency:				
Yes	Long Term	No	The Water Bureau has completed a number of seismic evaluations and upgrades over the last several years. A comprehensive evaluation of the entire water system is planned to be completed in the Fall of 2016.	Ongoing
LT EQ #8—Study development regulations and policies to ascertain if regulations can be made to limit development of high risk facilities in known areas of earthquake hazards.				
Lead Agency:				
No	Long Term	No	Not begun. BPS is leading the Comprehensive Plan and Central City 2035 planning process, which could establish the policy framework to update regulatiions. There are other options too, e.g., changes to fire code.	No Progress
SW #2—Acquire an additional facility for storage of anti-icing materials and expand anti-icing vehicle inventory.				
Lead Agency:				
Yes	Long Term	No	The city has acquired two new anti-icing vehicles. There is one storage location now. This is being addressed in conjunction with other needs at the Jerome Sears facility.	Ongoing
ST SW #6—Insulate residential buildings that house at risk populations.				
Lead Agency: Bureau of Planning and Sustainability				
Yes	Long Term	Yes	This action is being accomplished through different means. BPS created Clean Energy Works, Oregon which is now a non-profit organization that conducts energy audits and provides homeowners with low-cost energy efficient upgrades.	Complete
ST SW #7—Prioritize existing building stock for active review of Title 29 (Dangerous Building Code) This needs to be updated with intern information or information sent from individuals that are on the team.				
Lead Agency:				
No	Short Term	No	No progress at this time.	No Progress
ST FL #1— A covenant is recorded with the deed of new development in the floodplain to ensure that space below the base flood elevation is not converted to habitable space. This should be codified to improve compliance. (NFIP Compliance)				
Lead Agency:				
No	Long Term	No	No progress at this time. Team responsible for these types of codes is not clear on what this action means.	No Progress
ST FL #2—Continue to co-fund improvements to river and stream gauges in the Portland metropolitan area with the United Geological Survey.				
Lead Agency:				
Yes	Long Term	No	BES continues to allocate funding for these important sources of hydrologic (and in some cases, water quality) data.	Ongoing
ST FL #4—Secure the agreements necessary to design and implement the redevelopment of Freeway Land Company site. (within the Lents Urban Renewal Area)				
Lead Agency:				
Yes	Short Term	No	Potential with a current manufacturing company interested in the site. Should know by June if it is a viable project.	Ongoing
ST FL #5—Acquire outside funding to hire a consultant to lead the application process to maintain a Class 5 rating when the City seeks Community Rating System re-certification.				
Lead Agency:				
Yes	Short Term	No	Recently completed reverification. Portland is likely to be a Class 6 Community follow an extrmemely rigorous reverification process. New, more robust guidelines in the 2013 CRS Coordinators' Manual made it impossible to retain Class 5 status.	Complete

Action Taken?	Timeline	Priority Changed?	Comment (Describe progress or changed priority)	Status
ST FL #6—Support Multnomah County Drainage District (MCDD) in the continued calibration and update of hydraulic models for conveyance and internal flood impacts to the four floodplains managed by MCDD #1.				
Lead Agency:				
Yes	Short Term	No	Participated in information sharing for update of the internal drainage study. In addition, developed and calibrated model to predict stormwater volumes from BES stormwater system to the Multnomah County Drainage District #1.	Ongoing
ST FL #8—Identify funding for the design and construction of the Springwater Wetlands Complex, a 30-acre floodplain wetland restoration project in the Lents area of Johnson Creek.				
Lead Agency:				
Yes	Long Term	Yes	Grant funding was identified, but became cost-prohibitive. BES is pursuing a way to self-fund the project. Capital Improvement Plan advisory committee meeting in January to seek funding.	Ongoing
ST FL #9—Secure funding to implement the passive flood management projects that are recommended in the Johnson Creek Restoration Plan & other watershed management plans. Coordinate with Portland Development Commission's urban renewal efforts in Lents and with other partners in other parts of the watershed.				
Lead Agency:				
Yes	Short Term	No	BES is currently working with Housing, PDC, and Mayor's office to submit an application to Oregon Solutions to implement a robust set of projects that will help mitigate 100-year flood impacts to 300+ residential properties and numerous businesses.	Ongoing
ST FL #10—Improve definitions and refine standards for stormwater retention in the Storm water Management Manual.				
Lead Agency:				
Yes	Short Term	No	New Stormwater Management guidelines have just been released, with clarifying definitions and standards.	Complete
LT FL #1—Increase funding for the Johnson Creek Willing Seller Program; establish willing seller programs in other watersheds where flood hazard and priority restoration areas coexist. (NFIP Compliance)				
Lead Agency:				
Yes	Long Term	No	In addition to the Johnson Creek Willing Seller Program, a Watershed Land Acquisition Program is in place that prioritizes properties with significant hydrologic function and/or value. Over 450 acres have been acquired City-wide in partnership with Portland Parks (and in some cases, Metro) under the Watershed Program. Willing Seller funding is available to purchase the additional properties needed to implement the JC Restoration Plan. Over 20 acres acquired through the Willing Seller Program since 2010.	Ongoing
LT FL #3—Develop a plan for addressing flooding in the Holgate Lake area. (planning) (NFIP Compliance)				
Lead Agency:				
Yes	Long Term	No	No progress to date. Anticipate looking at this area as part of the larger Lents Floodplain/Oregon Solutions project.	No Progress
LT FL #4—Improve hydraulic bottleneck that prevents discharge of chlorinated effluent to the Willamette River during high river levels. (NFIP Compliance)				
Lead Agency:				
Yes	Long Term	No	The recent Facilities Plan update anticipates a future improvement of installing a high river bankside outfall to provide access to flow to the Willamette River during the conditions outlined.	Ongoing

Action Taken?	Timeline	Priority Changed?	Comment (Describe progress or changed priority)	Status
LT FL #5—As Waterfront Park remodeling is designed, ensure that Portland's downtown property and critical facilities remain protected from floodwaters. (asset management)				
Lead Agency:				
Yes	Long Term	No	This was considered during the Central City 2035 plan. BPS has contracted with PSU to evaluate flood changes from climate change in the Lower Willamette. The report will be completed by early 2017.	Ongoing
LT FL #6/#7—Partner with Army Corps of Engineers to conduct modeling of the Willamette River upstream of Portland to identify areas that, if acquired or restored, would contribute to mitigate of peak flows in Portland or result in significant reduction of flood damage. (NFIP Compliance)				
Lead Agency:				
Yes	Long Term	No	BPS contracted with PSU for work with the Army Corps to model the Willamette River flood extent through Portland under Climate Change scanarios. Following this, areas will be identifed that may be used to reduce peak flows. Analysis complete in 2018.	Ongoing
LT FL #8—Develop goals, policies and implementation measures to manage the amount of new impervious surface and remove existing impervious surfaces where appropriate. These goals, policies and measures may be at the citywide, watershed, or sub-watershed level. (planning) (NFIP Compliance)				
Lead Agency:				
Yes	Long Term	No	Draft Comprehensive Plan contains goals and policies, and updated CAP and new Climate Change Preparation Strategy include objectives and actions to limit and reduce impervious area. BES would lead implementation measures to actually remove pavement.	Complete
LT FL #9—Upgrade trestles that carry the main conduits of the water delivery system. (Sandy River Crossing interties completed) (asset management)				
Lead Agency:				
Yes	Long Term	No	Several conduit trestles have been eliminated or upgraded over the last several years. Eight more are recommended to be completed over the next five years.	Ongoing
FL #10—Create redundancy in the water delivery system at the three Sandy River crossings by burying conduits under the river (in progress).				
Lead Agency:				
Yes	Long Term	No	Two of these crossings have been replaced as part of a construction project completed in 2010. The Conduit 3 Crossing of the Sandy River is scheduled for completion within the Water Bureau's five year Capital Improvement Plan.	Ongoing
LT FL #11—Provide funding for and participate in development of a flood inundation model for the managed floodplains and downtown sea wall. (mapping) (NFIP Compliance)				
Lead Agency:				
Yes	Long Term	No	BPS contracted with PSU to assess changes to Willamette River floodplains resulting from climate change. Report completion date is in 2017. Levee Ready Columbia is contracting with USGS and Corps of Engineers to conduct an assessment for the Columbia.	Ongoing
LT FL #12—Install a river gauge in the vicinity of the bridge over Johnson Creek at 108th. The gauge should be able to send data to remote monitoring sites.				
Lead Agency:				
Yes	Short Term	Yes	The bridge was removed as part of the Foster Floodplain Natural Area construction, which created an additional 120 acre feet of flood storage along SE Foster Rd. We have installed a crest gage however to determine flood levels during over-bank events.	Complete

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Action Taken?	Timeline	Priority Changed?	Comment (Describe progress or changed priority)	Status
LT FL #13—Install one-way valves on the outlet pipes of the storm inlets on SE Foster Road between 101st and 112th.				
Lead Agency:				
Yes	Long Term	No	These outlets now go to a stormwater facility that is part of the Foster Floodplain Natural Area.	Complete
FL #1—Complete update to the Johnson Creek Restoration Plan. Develop individual plans for each subwatershed to address the sources of excess stormwater runoff that exacerbates flooding. (NFIP Compliance)				
Lead Agency:				
Yes	Short Term	No	This work falls under the Stormwater System Plan. See ST-MH #11.	Ongoing
FL #2—Establish flood mitigation priorities for critical facilities and residential and commercial buildings located within the 100-year floodplain using survey elevation data. (NFIP Compliance)				
Lead Agency:				
Yes	Short Term	Yes	The City Asset Managers Group is working to define critical facilities, rather than prioritize, which is the first step. This will also be furthered by the MAP risk assessment and action item update.	Ongoing
ST-LS #1—Continue to maintain and Improve internal City communications to facilitate coordination of landslide mitigation activities. (education, outreach)				
Lead Agency: Portland Bureau of Emergency Management				
Yes	Long Term	No	PBEM continues working to improve internal coordination and communication. It is unclear what this action refers to specifically in terms of landslide mitigation.	Ongoing
ST-LS #3—Mitigate Portland's water supply infrastructure from landslide hazards. (asset management)				
Lead Agency:				
Yes	Long Term	No	Evaluation work continues on PWB facilities considered vulnerable to landslides.	Ongoing
ST-LS #4—Initiate more operations and maintenance pilot projects along roads that inform about the development of standards for managing stormwater in ditches in landslide prone areas. (education, outreach)				
Lead Agency: Bureau of Environmental Services				
No	Short Term	Yes	No progress has been made on this project to date. Project description is vague and does not identify specific actions.	No Progress
LT-LS #1—Develop a comprehensive landslide map for the City of Portland to identify hazard areas and to improve communications with the public. (mapping)				
Lead Agency:				
Yes	Short Term	No	BPS is coordinating with DOGAMI on a project to improve landslide related maps and data. This is currently between Corporate GIS and DOGAMI. CGIS will update landslide data based on DOGAMI work.	Ongoing
New LT LS #3—Evaluate the role of drainage systems in the West Hills, including pipes, streams and drainage ways and options for protecting and improving their functions and increasing their resiliency. (planning)				
Lead Agency:				
Yes	Short Term	No	This work falls under the Stormwater System Plan. See ST-MH #11.	Ongoing
LT LS #4—Review the effectiveness of existing regulations related to development in landslide hazard areas. (planning)				
Lead Agency: Bureau of Planning and Sustainability				
No	Short Term	No	Not started but could be a good Comprehensive Plan implementation project. It could be coupled with project to address impervious area and use new landslide data from DOGAMI.	No Progress
LT-LS #6—Employ alternative construction methods such as trenchless construction on City projects to reduce the impact that development can have in landslide prone areas.				
Lead Agency: Bureau of Environmental Services				
No	Long Term	No	No progress on this project to date. Specific action items are unclear.	No Progress

Action Taken?	Timeline	Priority Changed?	Comment (Describe progress or changed priority)	Status
LT LS #7—Continue development of standards for small pump stations as an alternative to gravity sewers in accessible or high risk areas.				
Lead Agency:				
No	Short Term	No	BES recognizes this as a desirable project but has not begun work yet.	No Progress
ER #1—Develop recommendations for high and low ranking streamside plants that provide more erosion control, such as reducing erosion from high water and wave actions.				
Lead Agency:				
No	Short Term	Yes	No progress has been made on this project to date. Project description is vague and does not identify specific actions.	No Progress
ER #2—Implement projects that retain native vegetation, increase vegetation diversity and increase the complexity of the vegetation strata (having three vegetation strata: herbs, shrubs, trees).				
Lead Agency:				
Yes	Long Term	No	Robust invasive plant removal/native plant installation implementation over the last 5 years.	Ongoing
ER #3—Implement policies to increase the extent of coverage of the Greenway zones along the rivers and further limit proposed activities within these areas.				
Lead Agency:				
Yes	Long Term	No	In progress. Central City 2035 plan anticipates proposing expanded river setback, updated regulations, and riverbank enhancement targets.	Ongoing
ER #4—Develop standards for soil backfill in vegetated areas, especially sloped areas. (planning)				
Lead Agency:				
No	Short Term	Yes	No progress has been made on this project to date. Project description is vague and does not identify specific actions.	No Progress
ER #5—Establish regulations that prevent installation of slopes steeper than 3:1 and prohibit development on slopes steeper than 3:1. (planning)				
Lead Agency:	Bureau of Development Services/Bureau of Planning and Sustainability			
No	Short Term	No	No such proposal yet.	No Progress
ER #6—Implement projects that layback and/or regrade riverbank slopes and secure wetland sod mats composed of native emergent/grasses, etc.				
Lead Agency:				
Yes	Long Term	No	These practices are used routinely in our restoration projects. Six projects, 98 acres completed since 2010.	Ongoing
ER #7—Construct and install bio-engineered slope protective measures to reduce or eliminate erosion				
Lead Agency:				
No	Short Term	No	No progress on this project to date. Specific action items are unclear.	No Progress
ER #8—Implement projects that increase large wood structures that act to soften the effect of wave action on shorelines as well as provide habitat for migrating salmonids.				
Lead Agency:				
Yes	Long Term	No	These practices are used routinely in our restoration projects. Six projects, 98 acres completed since 2010.	Ongoing
ER #9—Secure large wood [boles w/ attached root wads] or log rafts to reduce high wave action that can result in erosion.				
Lead Agency:				
Yes	Short Term	No	Large wood has been installed in all major tributaries to the Willamette, including Columbia Slough, Johnson, Tryon, Fanno, and Stephens Creeks. Proposals in progress for mainstream Willamette projects at Powers Marine, Sellwood, and Kelly Point Parks.	Ongoing

Action Taken?	Timeline	Priority Changed?	Comment (Describe progress or changed priority)	Status
ST WF #1—Consolidate unassigned and/or unmanaged vegetated areas owned by the City under a single land management umbrella. (asset management)				
Lead Agency:				
No	Long Term	No	No progress has been made on this project to date.	No Progress
ST WF #2—Procure funding for management of vegetated natural areas with high wildfire danger, including public and private properties.				
Lead Agency:				
Yes	Long Term	No	Parks does not seek funding from outside sources, but this is a typical management practice and is integral to Parks SOPs and management/planning documents.	Complete
ST WF #4—Provide wildfire management training to staff. (education, outreach)				
Lead Agency:				
Yes	Short Term	No	Each year PF&R provides seasonal wildland training to all line personnel by reviewing and exercising procedures. In 2016, PF&R will conduct a spring Training Block that all line staff will complete, with basic state level hands-on wildland training.	Complete
ST WF #5—Amend the Portland Plant List and other related City plant lists and landscaping guides to include/identify fire resistant native plants and planting strategies that could be encouraged or required in local landscaping. (planning)				
Lead Agency:				
Yes	Short Term	No	The Portland Plant List was updated to provide information about fire resistant native plants. Other landscaping and tree guides are maintained by BDS and PP&R.	Complete
ST WF #6—Integrate, as appropriate, fire prevention goals and provisions into City policies, plans and codes. Identify and address ambiguities or conflicts among city requirements. (planning)				
Lead Agency:				
Yes	Short Term	No	The draft Comprehensive Plan includes policies and map changes to reduce future risks and impacts from natural hazards, including wildfire. The draft plan also includes new urban forest related policies that recognize the need to manage for wildfire.	Complete
ST WF #7—Identify conditions of approval and mitigation strategies that could be applied to new development or redevelopment in high risk areas.				
Lead Agency:				
Yes	Long Term	No	The Comprehensive Plan could set the stage to address this in future code amendments (e.g., ezones, land division).	Ongoing
ST WF #9—Improve the system for identifying new construction in areas subject to wildfires and communicating this information to the affected land owners. (planning)				
Lead Agency:				
Yes	Short Term	No	It is not clear what exactly this strategy means. It seems to imply a new mapping tool or interface. BTS upgraded the online mapping platform at PortlandMaps.com, which shows fire risk by parcel.	Complete
ST WF #10—Conduct systematic reviews of Portland's large, publicly owned, wildland tracts regarding fire safety and ecological health to ensure informed land management decisions. (asset management)				
Lead Agency:				
Yes	Short Term	No	This is part of Parks' standard operating procedures and planning documents.	Complete
ST WF #11—Adopt the national "Fire Danger Rating System" and install the signs at key points in the City.				
Lead Agency:				
No	Short Term	No	Portland does not currently have a "Fire Danger Rating System", but this is a system that would be useful and could be maintained by the Parks Bureau.	No Progress

Action Taken?	Timeline	Priority Changed?	Comment (Describe progress or changed priority)	Status
ST WF #12—Implement a neighborhood wildland interface disaster planning program. (education, outreach)				
Lead Agency: Portland Parks and Recreation				
Yes	Short Term	No	"Ready, Set, Go!" was developed and managed by the International Association of Fire Chiefs. We adopted the program last year, and have information on our website and handouts for citizens to learn how to protect themselves.	Complete
ST WF #13—Review and potentially refine City contract specifications for machinery operations during "Red Flag" weather conditions. (asset management)				
Lead Agency:				
No	Short Term	No	No equipment use restrictions exist during Red Flag Warnings other than an advisory generated by the Natural Weather Service. Parks does have contract language that restricts construction and other work during Red Flag days.	No Progress
ST WF #14—Convene a standing wildland interface fire technical group. (planning)				
Lead Agency:				
Yes	Short Term	Yes	A standing wildland interface technical group currently meets to discuss wildland issues but budgets have limited current activity.	Ongoing
ST WF #15—Index City wildfire mitigation plans and activities. (asset management)				
Lead Agency:				
Yes	Short Term	No	The 2011 Multnomah County Community Wildfire Protection Plan indexes recommendations from the 2010 NHMP, the 2009 Wildfire Readiness Assessment Gap Analysis Report, and the Forested and the 2005 Wildland Interface Areas Protection Annex recommendations into one comprehensive list.	Complete
WF—Develop and implement protocol for defining and mapping Wildland Urban Interface Zones and develop recommended policies, regulations and landscape options for incorporation into City plans and programs. (planning)				
Lead Agency: Bureau of Planning and Sustainability				
No	Long Term	No	Not started. This could be a good Comprehensive Plan implementation project. It should be co-led with Portland Fire & Rescue.	No Progress
ST WF #16—Identify water grid engineering requirements for firefighting in wildfire areas. (asset management)				
Lead Agency:				
No	Short Term	No	Have not started, but this could be coordinated between PF&R and the Water Bureau.	No Progress
LT WF #2—Review the feasibility of adopting portions of nationally recognized wildfire interface codes to strengthen building standards in wildfire risk areas.				
Lead Agency:				
Yes	Short Term	Yes	PF&R have worked toward adopting nationally recognized codes, but with little success. Portland does have requirements for new structures built in wildland areas, such as non-combustible siding and roofing.	Ongoing
LT WF #3—Design and conduct a study to determine the effectiveness of maintenance agreements that are established when new land divisions are approved to manage vegetation in open space tracts.				
Lead Agency:				
No	Short Term	No	Not started.	No Progress
LT WF #4—Complete an assessment to characterize high priority wildfire risk areas and recommend specific mitigation strategies.				
Lead Agency:				
No	Short Term	Yes	Metro procured LiDAR data in 2014, and vegetation classification analysis was performed by BPS and PSU. The vegetation data could be used to produce a wildfire risk assessment, but that analysis has not been done.	No Progress

Action Taken?	Timeline	Priority Changed?	Comment (Describe progress or changed priority)	Status
LT WF #5—Explore avenues for funding wildfire interface home construction upgrades to low income homeowners.				
Lead Agency:				
No	Short Term	No	PF&R has not explored this due to the lack of funding for a dedicated wildland position through the Fire Marshall's Office.	No Progress
WF—Act upon all Mitigation Actions outlined in the Wildfire GAP Analysis Report				
Lead Agency:				
Yes	Long Term	No	See Attachment A.	Ongoing
IS #1—Update Invasive Species Plants List by consolidating nuisance and prohibited plant lists into one "Nuisance Plants List" and assigning priority ranks to the Nuisance Plants List.				
Lead Agency:				
Yes	Short Term	No	Completed in 2010.	Complete
IS #2—Clarify zoning regulations to require removal of plants on the Nuisance Plants List in the Environmental, Greenway and Pleasant Valley Natural Resources Overlay Zones and the Columbia South Shore and Johnson Creek Basin Plan Districts.				
Lead Agency:				
No	Short Term	Yes	There is no additional plan to require removal of all nuisance plants in the specific areas identified in the action. DROP.	No Progress
IS #3—Initiate a process to ensure the Erosion Control Manual be made consistent with City goals to control and eradicate invasive plants. (planning)				
Lead Agency:				
Yes	Short Term	No	The Erosion Control Manual was updated in 2010. In this update, invasive species were called out as specifically prohibited.	Complete
IS #4—Initiate a process to ensure the Tree and Landscaping Manual, the Recommended Street Tree List and the Stormwater Management Manual be made consistent with City goals to control and eradicate invasive plants. (planning)				
Lead Agency:				
No	Long Term	Yes	There is no coordination committee in place. Tree and Landscaping Manual maintained by BDS, Recommended Street Tree List maintained by PP&R/Urban Forestry, SWMM maintained by BES. Any such project should be led by the BES Invasive Species Mgmt. Program.	No Progress
IS #5—Coordinate with the Portland Plan project to help ensure that invasive species are addressed in the Comprehensive Plan update and Portland Plan work plan. (planning)				
Lead Agency:				
Yes	Short Term	No	The draft Comprehensive Plan contains policies to manage and prevent the spread of invasvie plants.	Complete
IS #6—Research the feasibility of establishing a local noxious or invasive weed law.				
Lead Agency:				
No	Short Term	No	Not started.	No Progress
LT V #1—Work with the state and other impacted jurisdictions to implement and update the various volcano Inter-Agency Coordination Plans.				
Lead Agency: Portland Bureau of Emergency Management				
Yes	Long Term	No	PBEM attends meetings regarding interagency volcano plans for Mt. St. Helens, Mt. Adams, and Mt. Hood	Ongoing
V—Work with the state and other impacted jurisdictions to implement and update the various volcano Inter-Agency Coordination Plans.				
Lead Agency:				
CHOOSE	CHOOSE	CHOOSE	Redundant.	CHOOSE

ATTACHMENT A – WILDFIRE GAP ANALYSIS REPORT ACTION ITEM STATUS

5. Convene a standing City of Portland wildfire technical working group. *Done*
6. Identify and map the wildland urban interface area within the City. *Done*
7. Modify existing regulations to improve the permitting process and allow an increase of the defensible space around structures. *Not Started.*
8. Integrate fire prevention goals and provisions into policies, plans, and codes. *Not Started.*
9. Secure funding for continued, long term vegetation management projects that maintain safe fuel levels in key locations. *PF&R conducted some vegetation management when grants were available, up to 2012, at which point funding expired.*
10. Conduct a wildland firefighter training assessment. *Done.*
11. Reaffirm wildland firefighting standards for Portland Fire & Rescue. *Done*
12. Analyze and prioritize emergency vehicle access routes. *Not Started.*
13. Conduct a periodic tri-county wildfire coordination meeting. *Done. PF&R regularly attends Fire Defense Board Meetings.*
14. Revisit mutual aid agreements to ensure they are current and applicable. *Done. Most agreements are reviewed periodically, even though they are perpetual in nature and extend from year to year.*
15. Establish an agreed upon fire danger rating system and develop agency protocols. *Not Started.*
16. Continue conduct annual wildland firefighter training for Portland Fire personnel. *Done.*
17. Improve enforcement of park rules in natural areas and open space tracts on approved land divisions. *Not Started.*
18. Improve emergency radio communications between PP&R Nature field staff and City first responders. *Done. Communications between Rangers has improved, but no documented improvements with Nature Field Staff.*
19. Design and conduct an effectiveness study of maintenance agreements that are established when new land divisions are approved to manage vegetation in open space tracts. *Not Started.*
20. Conduct wildfire training for City wildfire response stakeholders. *Not Started.*
21. Develop a comprehensive, long term vegetation treatment program. *Done. Portland Parks is working on a 10-year Restore Forest Park Plan for continued maintenance and removal of non-native trees and vegetation and other ladder fuels.*
22. Educate landowners within the Wildfire Hazard Zone about wildfire hazards. *Done.*
23. Establish a fire information network in Forest Park and Powell Butte. *Not Started.*
24. Create incentives to encourage fuel reduction and defensible space. *Done. Currently Portland Parks works with landowners and participates in outreach with our partner organizations.*
25. Design and install one or more demonstration areas to showcase wildfire resistant plantings. *Done. Station 27 is currently a "work-in-progress" to demonstrate wildfire resistance strategies.*
26. Initiate and maintain training opportunities with regional and City incident management teams. *Done.*
27. Develop a cross-bureau plan for evacuation of citizens in high fire risk areas. *Not Started.*
28. Develop critical GIS map layers for fire response and planning in natural areas. *Done.*
29. Review and update the Forested and Wildland Interface Areas Fire Protection Plan. *Not Started.*
30. Re-Invigorate Neighborhood Emergency Teams with concrete projects. *Done.*
31. Improve the system for identifying new construction in areas subject to wildfires. *Not Started.*
32. Assess and communicate the capacity of the water infrastructure (e.g. pipes, hydrants, water reservoirs). *Not Started.*
33. Review the feasibility of adopting portions of state or nationally recognized wildfire interface codes. *Not Started.*
34. Identify conditions of approval and mitigation strategies for new development or redevelopment in high risk areas. *Not Started.*

Appendix B. Steering Committee Ground Rules

B. Steering Committee Ground Rules

PURPOSE OF THE STEERING COMMITTEE

The role of the Steering Committee is to guide the planning process for the City of Portland Mitigation Action Plan (MAP), and to foster an equitable approach to building Portland's resilience to natural hazards. The Steering Committee will provide guidance and leadership, oversee the planning process, and act as a point of contact for local governments, neighborhoods, and community groups interested in this planning effort, working to ensure that all Portlanders have equal access to projects that reduce their risk from natural hazards. Members of the Steering Committee represent a cross-section of views and interests across Portland. Through this inclusion of diverse interests, the Steering Committee hopes to enhance the robustness of the planning effort and to build support for hazard mitigation activities across stakeholder groups. A successful planning effort will result in the adoption and approval of a plan that sets the stage for equitably reducing the adverse impacts of natural hazards within the City through activities and strategies embraced by both elected officials and the people of Portland.

DEFINITION OF STAKEHOLDER

Stakeholders for this planning process are persons and agencies that have a vested interest in the recommendations and implementation of the MAP. Stakeholders include residents; community groups; business owners; local, state and federal agencies; elected officials; visitors; neighboring communities; and others.

CHARGE STATEMENT

During the course of developing the MAP, the Steering Committee will:

- guide the planning process,
- develop strategies for public involvement that foster mutual information exchange during plan development and implementation,
- promote and advocate for equity in hazard mitigation, and
- support the develop of mitigation strategies that promote a decrease in loss of life, property damage, and long-term impacts to social, environmental and economic systems from natural hazards.

CHAIRPERSON AND VICE CHAIRPERSON

Solamon Ibe, Jessica London, and Jeremy O'Leary have been selected as the co-chairpersons of the Steering Committee. The Co-chairpersons will rotate acting Chairperson and Chairperson Support roles. The role of the acting Chairperson for each meeting is to:

- lead meetings so that agendas are followed and meetings adjourn on-time;

- allow all members to be heard during discussions;
- moderate discussions between members with differing points of view; and
- be a sounding board for staff in the preparation of agendas and on how to best involve the full Committee in work plan tasks.

The role of the Chairperson Support person will be to assist in timekeeping and to assist in tracking the order in which members have indicated they would like to comment, particularly when agenda items are contentious.

QUORUM

A quorum for the Steering Committee will be 17 members. When less than 17 members are present at a meeting, items listed on the agenda may still be reviewed and discussed; however, any committee action as to those items will be postponed until a quorum is present.

ALTERNATES

Committee members were selected for the Steering Committee based on their specific backgrounds and perspectives on matters related to hazard mitigation. Regular attendance by members is needed to understand the issues presented, identify and reflect on various stakeholder perspectives, and reach agreements on plan recommendations. However, there may be circumstances when regular members cannot attend. To address these circumstances, alternates may be designated for each Steering Committee member. An alternate attending on behalf of a Steering Committee member shall have the same rights and responsibilities as the Steering Committee member during that meeting. Alternates will be included on all Steering Committee emails and should remain apprised of the business of the Steering Committee.

DECISION-MAKING

The Steering Committee will strive for consensus in its decision-making process. If consensus cannot be reached as to a particular item or issue, the Steering Committee's decision will be determined by a majority vote of the Committee members in attendance at the meeting, and the meeting summary will reflect the number of votes in favor, opposed, and in abstention. Any Steering Committee member may request that dissenting opinions be included in the meeting summary.

In the event that an issue brought to a vote results in a tie, 20 additional minutes of discussion time will be allotted for the topic. A re-vote will be conducted at the end of the allotted time. If the vote still results in a tie, decision-making authority will be handed over to the lead agency, Portland Bureau of Emergency Management (PBEM). PBEM may choose to decide on the issue, extend the time allotted for discussion or carry the item over to the next agenda.

RECOMMENDATIONS

The Committee's recommendations will be recorded in the meeting summaries and reflected in the MAP, as appropriate. The Committee may also be asked to assist in public outreach efforts and public presentations of the MAP and its recommendations.

STAFFING

The Planning Team for this project includes appropriate personnel from the City of Portland Department of Emergency Management, along with contract consultant assistance provided by Tetra Tech, Inc. The Planning Team will schedule meetings, distribute agendas, prepare information/presentations for Committee meetings, write meeting summaries, and generally seek to facilitate the Committee's activities.

A City designated Public Information Officer, **Dan Douthit 503-823-3928**, will be the designated spokesperson for this planning effort.

MEETING DATES

Meetings generally will be conducted on the third Wednesday of each month from 4:00 PM to 6:30 PM at the Wyeast Conference Room, Level L1, 501 N Dixon St. Portland, OR 97227. A teleconference number will also be provided for those wishing to join the meeting, but who are unable to attend in person. The planning team requests that steering committee members be given first priority for spaces on the conference line in the event those who choose to utilize the call-in option exceeds the line capacity. Meetings that conflict with religious, state or federal holidays will be rescheduled at the Steering Committee's discretion. Such scheduling changes will be noted on the hazard mitigation website. Meetings will be open to the public and will be advertised as such.

ATTENDANCE

Participation of all Committee members in meetings is important and members should make every effort to attend each meeting. If Committee members and their designated alternates are unable to attend a meeting, they should provide as much advance notice as reasonably possible to the Planning Team before the meeting is conducted. If neither a Steering Committee member nor his or her alternate attends 2 consecutive meetings or 3 cumulative meetings, the Steering Committee chairperson will reach out to the member to determine if participation will still be possible. The Steering Committee will strive to maintain the Steering Committee membership at 33 members with a representative makeup similar to the initial committee makeup.

PUBLIC INVOLVEMENT

All Steering Committee meetings will be open to the public. Members of the public wishing to address the Steering Committee at a meeting may do so based on the following protocol:

- While the agenda is reviewed at the beginning of each Steering Committee meeting, the chairperson will ask if anyone wishes to be heard. Anyone wishing to speak will be given three minutes and Steering Committee members may then ask questions. This allotted time cannot be aggregated or passed on to another individual.
- The time allocation for public comment at each meeting will be determined by the chairperson.
- When many people are expected to testify, sign-up lists will be provided. Written materials may also be submitted to the Steering Committee for distribution to members either prior to or at the meeting. Written material for distribution to members may also be submitted by those unable to attend in person.
- Those wishing to make video or PowerPoint presentations should check with the Planning Team prior to the meeting (danielle.butsick@portlandoregon.gov).

- All comments must have relevance to the MAP and Portland. Relevance will be determined by the chairperson.

A member of the public may request clarification from the Steering Committee by raising his or her hand during the normal course of the meeting; permission to speak will be granted at the discretion of the chairperson.

The meeting agendas for all Steering Committee meetings will be posted on the hazard mitigation website a minimum of 72 hours prior to all scheduled meetings (https://www.portlandoregon.gov/pbem/67578).

COURTESY

Committee members will treat each other with respect, listen to each other, work cooperatively, and allow all members to voice their opinions.

STEERING COMMITTEE MEMBERSHIP

Agency	Primary Member	Alternate
Bureau of Environmental Services (BES)	Maggie Skenderian	Kate Carone
Bureau of Planning and Sustainability (BPS)	Kevin Martin	
Bureau of Planning and Sustainability (BPS)	Sallie Edmunds	Roberta Jortner
Office of Equity and Human Rights (OEHR)	Danielle Brooks	
Parks & Recreation	Vicente Harrison	
Fire and Rescue (PF&R)	Leo Krick	Laurent Picard
Bureau of Technology Services	Paul Cone	
OHSU Institute on Development and Disability/Oregon Office of Disability and Health	Justin Ross	Jessica London
Portland Audubon Society	Bob Sallinger	Micah Meskel
Oregon Food Bank	Dean Alby	
Rosewood Initiative	Tony Lamb	
Filipino American Community	Simeon Mamaril	
Intel	Jeff Soulages	
Department of Homeland Security	Glen Collins	
NET/ARES/Local Emergency Planning Committee	John Steup	
Downtown NET/Northwest NET	Darlene Urban Garrett	
Portland African American Leadership Forum, Groundwork Portland	Solamon Ibe	
Brummell Enterprises, SMILE Member, Sellwood/Moreland	Karen Tam	Bob Burkholder
Portland Water Bureau	Mary Ellen Collentine	Mike Saling
Simpson Strong-Tie	Shalini Prochazka, S.E.	David Gilroy
Bureau of Development Services	Kathy Roth	Mark Fetters
East Portland Action Plan	Jeremy O'Leary	
Immigrant and Refugee Community Organization IRCO	Ronault (Polo) LS Catalani	
Coalition of Communities of Color	Maggie Tallmadge	
Hayden Island Neighborhood Network	Jeff Geisler	
Linnton Neighborhood Association	Rob Lee	Darise Weller
St. Johns Neighborhood Association	Jennifer Levy	Emilie Saks-Webb
Portland Public Schools	Molly Emmons	
Portland Voz	Ranfis Giannettino Villatoro	

Bureau of Emergency Management	Jonna Papaefthimiou	
Office of Neighborhood Involvement (ONI)	Nickole Cheron	
Oregon School Boards Association	Siobhan Burke	
OHSU Emergency Management	Sherrie Forsloff	Mike Nurre

GROUND RULES ATTACHMENT A: MEETING FACILITATION

Committee Co-Chairs

- Solamon Ibe – Portland African American Leadership Forum
- Jessica London – Oregon Health and Science University/Oregon Office of Disability and Health
- Jeremy O'Leary – East Portland Action Plan

One Chair and one Vice-Chair will serve at each steering committee meeting. Each Co-Chair will be off-duty approximately once every three months, depending upon scheduling needs. The Co-Chairs will determine scheduling in advance of each meeting. If a substitute is needed, Co-Chairs will work with the other Co-Chairs and the Planning Team to designate an alternate.

Responsibilities

Chair

The Chair will be responsible for facilitating discussion during meetings. During normal discussion, the Chair will manage committee comments and questions, calling on members in the order they requested to speak. The Chair will also receive comments and questions from non-committee members at her or his discretion. If the topic becomes contentious or several members wish to provide comment, the Chair may request assistance from the Vice-Chair.

Vice-Chair

The Vice-Chair will manage committee and public comments when requested by the Chair, or when the topic becomes contentious or several members wish to provide comment. While managing comments, the Vice-Chair may also call on members of the public at her or his discretion. The Vice-Chair will track time spent on agenda items and will alert the Chair when time allotted to an agenda topic is nearing or have been reached.

Self-Representation

While acting as Chair or Vice-Chair, the Co-Chairs may represent their own interests, thoughts, and opinions so long as they do not use their position to overstep others. Comments from the acting Chair or Vice-Chair will be received in the same manner as comments from other members.

Meeting Management

Seating

Whenever possible, the meeting room will have a U-shaped conference table large enough for the entire steering committee. To facilitate accurate consensus and voting representation, conference table seating will be reserved for voting steering committee members and planning team members. In situations where a bureau or organization has both a primary member and a designated alternate present, only the primary member will be seated at the conference table. Additional seating for non-voting stakeholders and members of the public will be provided. The bottom of the U-shape (head of

the table) will be reserved for the Co-Chairs and Planning Team members. Committee members are free to choose any other seat at the table that will meet their needs.

Comment/Question Queue

At the discretion of the Chair and Vice-Chair, a whiteboard may be used to keep a running list of names of committee members and members of the public who wish to provide comments or questions. The Vice-Chair is responsible for managing the queue and ensuring committee members are called upon for comment. Members of the public may be added to the list at the Vice-Chair's discretion. Normal conversation is preferred, and this method will be employed only when deemed necessary by the Chair and/or Vice-Chair.

Voting Cards

Each steering committee member will be provided with a set of three colored cards to be used in committee discussions or voting activities. Committee members will use these colored cards to indicate their needs or voting preferences during discussion.

- **Red** indicates a "no" answer during a vote. During discussion, a red card indicates that a committee member wishes to express a dissenting opinion or is uncomfortable with the present discussion. Red cards will be addressed in the order they are received.
- **Yellow** indicates an "undecided" or "abstaining" vote. During discussion, a yellow card indicates that a committee member requires clarification before the conversation can continue. For example, a member might use a yellow card to request a definition when an acronym is used. Yellow cards will be addressed immediately, and should be used judiciously.
- **Green** indicates a "yes" answer during a vote. During discussion, a green card indicates that a member has a supporting comment or question. Green cards will be addressed in the order they are received.

A set of cards will be provided for each committee member at every meeting. Each card will have its color name printed in text, and will include the above definition for its purpose. Cards will be collected from committee members after each meeting.

Handouts

All handouts will be printed and provided for committee members at each meeting.

Committee Membership

The Planning Team will maintain a roster for the steering committee. Committee members are free to designate alternates at their discretion. New voting members will be added at the committee's discretion. If a stakeholder or member of the public wishes to join the committee as a new voting member, she or he will be presented to the committee for confirmation.

Appendix C. Public Engagement Materials

PUBLIC ENGAGEMENT STRATEGY

PBEM

The Mitigation Action Plan

Community Engagement Plan

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Attachments

Attachment 1. Copy of Survey Responses
Attachment 2. Key Stakeholders & Networks

EXECUTIVE SUMMARY

This community engagement plan outlines the Community Engagement Strategy for the City of Portland's 2016 Mitigation Action Plan (MAP) development process. The City has invested significant resources in facilitating public participation to ensure that the MAP reflects the relevant needs of the community. This document proposes a number of activities to be undertaken over the next few months as part of the MAP development process. A number of recommendations are also made to ensure continued community engagement following the adoption of the MAP. These recommendations include creation of an E-portal and an online risk atlas, multi-lingual support for planning documents and surveys, hazard mitigation exhibits, increased coordination with other bureaus and civic organizations, and the hazard mitigation ambassador program.

1. INTRODUCTION

This community engagement plan provides a framework for public participation in the 2016 Mitigation Action Plan (MAP) development process. The City of Portland believes in the importance of public participation, and has invested significant resources to ensure that this process benefits from a wide range of perspectives from all stakeholders.

BOX–1: COMMUNITY ENGAGEMENT STRATEGY GOALS

1. Reach out to all stakeholders, specifically those that live in higher risk areas.
2. Create authentic opportunities for stakeholders to influence the planning process
3. Make use of existing community outreach capacities and networks.
4. Partner with local organizations
5. Promote activities that meet the Disaster Mitigation Act (DMA) and Community Rating System (CRS) outreach requirements;
6. Propose activities that can be included in the MAP

2. PUBLIC INVOLVEMENT PRINCIPLES

BOX–2: NEED FOR PUBLIC PARTICIPATION

Effective public involvement in local planning and policy development:

1. Results in City decisions that effectively respond to the needs and priorities of the community.
2. Makes community members and community resources as part of the solution.
3. Involves the whole community – especially those that have not participated in the past.
4. Spreads knowledge of and support for public policies and programs.
5. Keeps government accountable.

The City of Portland has a history of promoting community engagement and participation in all areas of local policy making. It is one of the handful of cities in the United States that have intentionally adopted a programs to consult and partner with communities in all aspects of local policy making. The Office of Equity and Human Rights was established within the City Government "to promote equity and reduce disparities based on race and disability within City Government." Also, a number of other departments and agencies have developed numerous programs to promote stakeholder engagement.

All city departments and local agencies in Portland strive to incorporate the Portland City Council's 2010 Public Involvement Principals in their policy making efforts.

3. Stakeholder Involvement in Hazard Mitigation Planning Process

The Planning team listed and prioritized key stakeholders at the beginning of the planning process. The Portland Bureau of Emergency Management reached out to each of these stakeholders through emails and phone calls with invitation to participate as a steering committee member.

BOX–3: KEY TERMS

Community, refers to all residents of the City of Portland or those who work and play here.

Stakeholders, refer to people, groups, or businesses with an interest in findings and projects in the MAP. Stakeholders include residents; community groups; business owners; local, state and federal agencies; elected officials; visitors; neighboring communities; and others.

Engagement, is any two-way communication between the local government and stakeholders.

The Steering Committee guides the planning process for the MAP and promotes equity in building Portland's resilience to natural hazards. Members of the Steering Committee represent a cross-section of views and interests across Portland. By including diverse interests, the Steering Committee hopes to strengthen the planning effort and to build support for hazard mitigation activities across stakeholder groups. The Steering Committee provides guidance and leadership, oversees the planning process, and is the point of contact for local governments, neighborhoods, and community groups interested in the plan update. The Steering Committee members work with the planning team and other city officials to ensure that all Portlanders have equal access to projects that reduce their risk from natural hazards.

The Portland Bureau of Emergency Management coordinated two equity training sessions for the members of the Steering Committee and other stakeholders during the beginning of the plan update process. These sessions introduced attendees to key issues of equity in local policy making, especially in hazard mitigation planning.

4. CHALLENGES TO EFFECTIVE STAKEHOLDER INVOLVEMENT

To identify challenges to community engagement in the MAP process, the planning team conducted in person and phone interviews with 41 stakeholders. Ten members of Portland Neighborhood Associations were interviewed, 22 people representing community groups, and random visitors to local cafes in the city. Information about interviewees is kept private. It is not shared with city staff or in this report. The planning team conducted semi-structured interviews with a few questions, which allowed for free flow of conversation. Comments were recorded and grouped to show patterns. These interviews happened before the December 2015 floods in Portland. The floods may have changed some responses.

BOX–4: INTERVIEW QUESTIONS

1. How involved is the organization in the hazard mitigation planning process?
2. What do they think a Hazard Mitigation Plan is?
3. What groups do they think should be involved and why?
4. What constituency/ groups can they speak about or know about?
5. Do they think these groups are aware of the hazard risks they face?
6. What are the major concerns of these groups?
7. How do they think, we can involve these groups?
8. What are existing social network mechanisms are they aware of?
9. What role can their organization, or groups they know of, play?
10. Are you involved in any other community outreach program of the city? If so, which ones?

Interview responses were recorded and analyzed for patterns. The results are summarized below:

- Some communities of color and immigrant groups distrust the government.
- Respondents expressed the need to have multilingual notifications and other public outreach material. Interviewees want notifications and outreach materials in multiple languages. Many community members do not understand English very well and do not receive notifications in time. This results in more confusion and distrust.
- Most interviewees from community groups said they were burnt out on participation in city programs. Over the past few years, time commitment to local government public outreach programs has increased significantly for community groups. Each of the respondents said they participated in at least two ongoing outreach programs or committees.
- Members of the neighborhood associations wanted to participate in the MAP process, but were unsure how much influence they could have. They felt the process of hazard mitigation planning required technical expertise beyond their skills. They worried that getting involved in this process would take away time from other initiatives that they had already committed to.
- Most respondents from café interviews said they appreciated that the city started community engagement programs to promote public participation.
- Most respondents felt that there were other important issues that needed to be addressed, and hazard mitigation was low in their order of priority.
- Most respondents see earthquakes as the greatest risk, and said they do not feel prepared. They would like the City to provide more information and resources to help residents prepare for an earthquake.

5. RECOMMENDATIONS

Community engagement and outreach strategies in this section are designed to achieve the following three objectives:

1. Encourage public participation during the MAP development process (Section 5.1).
2. Facilitate continued engagement with local residents after adoption of the MAP (Section 5.2).
3. Promote effective cooperation and coordination between the local government and civil society organizations to promote an integrated framework for community engagement (Section 5.3).

5.1 COMMUNITY ENGAGEMENT AND OUTREACH ACTIVITIES

Community Engagement and Outreach Activity – 1: Stakeholder Participation Review	
Suggested Timeframe:	February 2016
Format:	Self-Evaluation by the Planning Team
Duration:	2 hrs.
Rationale:	After a few months of involvement in the same way (steering committee in this case), the stakeholder interest can start to wane. Attendance at the meetings decreases, and discussions tend to divert without contributing to the MAP development process. By doing a mid-course self-check, the planning team may re-activate participation, and if needed, reach out to more stakeholders who have yet not been involved.
Description of the Activity:	Planning team reassess participation in the steering committee and identify any stakeholders that may have dropped out or not yet participated in the update process.
Outcomes:	This activity will reveal the gaps in stakeholder representation that may cause problems or delay in formal adoption of the plan.
Follow-up Activities:	The project coordinator to reach out to the unrepresented stakeholders and encourage them to participate in the steering committee meetings.
Measures of Performance:	Number of unrepresented stakeholders contacted.

Community Engagement and Outreach Activity – 2: Community Hazard Mitigation Survey	
Suggested Timeframe:	February- April 2016
Format:	Mailed, Online, and Targeted
Duration:	3 months
Rationale:	The planning team should create opportunities for general public to be involved in the planning process. While many members of the public may not be technical experts, they can be a useful resource in identifying critical assets, problem areas, describe past events and provide ideas for continued community engagement. A Natural Hazard Mitigation Survey can help share information about the plan update and assess public awareness of risks.
Description of the Activity:	A Public Hazard Mitigation Survey should be conducted by the planning team. The survey should seek to collect information on how informed the public is about local hazard risks, their perception of their own risks, and how important they think hazard mitigation is. This survey should be multilingual and widely distributed in the community. Suggestions for survey distribution include: • Permanent online link to be displayed on local government website, and partner community organization web pages. • Paper surveys and collection boxes at neighborhood coalition office, and important local government offices. • Distribution of survey at local community events. • Survey kiosks at local popular grocery stores, and cafes.
Outcomes:	This activity will increase transparency of the planning process, build trust, and provide information about public preferences and attitudes towards hazard mitigation.
Follow-up Activities:	The collected data should be formatted and organized in an easily usable format (spreadsheets). Planning team should analyze data to find level of public awareness about local hazards, suggestions for public engagement, perceived risk from natural hazards, and their experiences with hazards. This dataset should be maintained by the local government to be a baseline for later surveys.
Measures of Performance:	Number of surveys conducted.

Community Engagement and Outreach Activity – 3: Planning for Real – Risk Assessment & Policy Development Focus Groups	
Suggested Timeframe:	Mar-April 2016
Format:	Focus Groups (10, in 8 neighborhood coalitions, and 2 special interest groups)
Duration:	3-4 hrs. for each event depending on participation and venue availability (Open House)
Rationale:	The planning team should risk assessment findings and encourage the community to help develop hazard mitigation policies that match community priorities.
Description of the Activity:	Planning for real is a hands-on focus group method that allows for participation by all attendees. Large format maps depicting risk areas are mounted on a horizontal table. The map station shows participants the extent and degree of hazard risks the community faces. The planning team introduces the risk assessment, and provides a brief overview of possible hazard mitigation activities (often based on FEMA and CRS guidance documents). Participants are then asked to place suggestions for the community on cards or flags placed on the map. Each exercise can have 5- 15 people per map station. Hazard risk computer workstations manned by local technical experts can be used instead of maps. The planning team should partner with the Portland's neighborhood coalitions to implement these exercises. Partnering with the neighborhood coalitions will add legitimacy to the process, build trust, and strengthen existing networks between the local government and the community. The Planning team should also partner with local community organizations to do similar workshops with two special interest groups – immigrant and refugee community or coalition of communities of color. The planning team may explore options for partnering with IRCO (Immigrant and Refugee Community Organization) and Communities of Color for implementation of these exercises.
Outcomes:	This activity will help communicate hazards risks to the community and increase public awareness of risk. It will also help collect information on community preferences for specific hazard mitigation actions to be included in the MAP.
Follow-up Activities:	The planning team should use the information collected from these workshops for updating risk analysis and generating hazard mitigation priorities.
Measures of Performance:	Number of attendees in each 'Planning for Real' activity.

Community Engagement and Outreach Activity – 4: Draft MAP Review & Feedback	
Suggested Timeframe:	Jul 2016
Format:	Online Public Brochures (distributed through local government agencies, partner organizations, and neighborhood associations) Hazard Mitigation Displays (at City Hall, and Neighborhood Coalition Centers) MAP Town Hall Meetings (5 Town Hall Meetings)
Duration:	30 days (based on FEMA guidelines)
Rationale:	The preceding engagement and outreach activities will significantly contribute to plan development, there should also be a way for the public to give feedback on the whole draft plan document. This will help identify omissions or inappropriate policies that may place disproportionate burden on specific community groups or neighborhoods.
Description of the Activity:	The planning team should collect feedback from communities on the draft plan. These four types of activities should be conducted during the 30-day comment period. • Online: The City should post the full draft report, an executive summary, and a slide deck of key points online for reviewing and download. There should be a place on the website for comments. • Public Brochures: These should include a summary of outcomes of local risk assessments, summary of public engagement activities, and key hazard mitigation polices in the plan. The brochure should also refers to the webpage where the plan documents are available, and give a location where people can submit and comment on the draft plan. These could be distributed through government agencies, neighborhood associations, and local community organizations. • Hazard Mitigation Displays: The planning team should create Hazard Mitigation displays at key places in the community. The displays could be placed at the City Hall and at the neighborhood coalition offices. The displays could be in form of free standing 3D displays showing hazard risks through photos and text. They should show the benefits of the proposed hazard mitigation policies. • MAP Town Hall Meetings: It is proposed that the City officials and the planning team should partner with Neighborhood coalitions and community organizations to host hazard mitigation town hall meetings where local residents can ask questions about the MAP. This forum gives residents a chance for direct responses to their questions. Venues should match "Planning for Real" sites if possible. There should be 5 town hall meetings
Outcomes:	This activity will help collect feedback on the draft MAP and give residents a chance to influence the final plan.
Follow-up Activities:	The planning team should collect the feedback and respond to the comments as quickly as possible.
Measures of Performance:	Number of activities completed. Number of attendees. Quality of feedback received.

Community Engagement and Outreach Activity – 5: Draft MAP Review & Feedback	
Suggested Timeframe:	Post Adoption Plan Rollout. Annual Review thereafter.
Format:	Online (continuous) Hazard Mitigation Annual Review Town Hall Meeting (in partnership with Neighborhood Coalitions, and communities)
Duration:	60-90 mins each.
Rationale:	Community engagement and outreach activities should continue after the plan is adopted to keep the public informed about hazards risks, continue to build support for implementation of mitigation projects, and prepare for the next plan update. These activities will also help build on the good will and public interest created the planning phase.
Description of the Activity:	These activities should be continued after the plan adoptions. • Online: Maintain a permanent webpage that hosts the digital copy of the MAP and document future planning activities. The webpage should also provide contact information for local agencies and departments involved in implementation of hazard mitigation activities. • Hazard Mitigation Annual Review Town Hall Meeting: City staff should partner with local neighborhood coalitions and civic organizations to host annual plan review town hall meetings. Rollout event should be planned within a month of formal plan adoption. At least one annual event should be planned in the following years. In these meeting the planning team should discuss the following: o Update historical events record with any events in the past year. o Review community profile and individual community assessments for each hazard and note any major changes or mitigation projects that have changed vulnerability. o Note accomplishments and current mitigation projects. o Record status of all action items in the MAP as projects are completed and as new needs or issues are identified. o Address updated Comprehensive Plans and other city plans - how can the two plans be coordinated to make them work for each other? o Incorporate additional hazard risk assessments as funding allows.
Outcomes:	This activity improves transparency in the MAP implementation process. It will also help maintain interest for engagement and outreach in the next update.
Follow-up Activities:	The planning team should prepare annual progress reports and make them available on the permanent website.
Measures of Performance:	Number of activities completed. Number of attendees.



Figure 1. Community Engagement and Outreach Strategy

5.2 COORDINATED AND COOPERATIVE ENGAGEMENT

The city of Portland has an established history of effective community engagement and stakeholder participation in local policy making through its bureaus, and offices. Each of these administrative units continually undertakes programs and outreach activities. At the same time, Portland is home to a large number of civic organizations that have taken on the leadership role in advancing interests of their stakeholders in local policy making. A list of these stakeholders as identified through stakeholder mapping exercise is included in Attachment 1.

The MAP development process can take advantage of these partnerships by directly engaging with these stakeholder networks in the plan making process. Specifically, it is recommended that existing groups and networks be engaged to solicit their views on the following:

- Identification of specific vulnerable groups within the community.
- Assessment of risk awareness among the various communities.
- Identification of preferred means of capacity building and outreach to enhance risk awareness and participation in the planning process.
- Identification and prioritization of hazard mitigation activities to be included in the MAP.
- Identification and training of Hazard Mitigation Ambassadors

In order to leverage existing community linkages and partnerships during the MAP development process, a brief survey of local bureaus and community organizations was conducted to identify ongoing programs and initiatives. The original survey responses are included in Attachment 1. Table 1 summarizes the various programs/activities/evens identified by respondents as possible avenues for outreach as well as continued engagement following the adoption of the MAP.

Table 1. Opportunities for Community Engagement and Outreach

#	Program/ Activity/ Event	Contact Person	Email
1	Small Business Sustainability Workshop for Local Entrepreneurs	City of Portland	danielle.butsick@portlandoregon.gov
2	Residential Education and Engagement Master Recycler Program Community Collection Events	Lauren Norris	lauren.norris@portlandoregon.gov
3	Sustainability at Work	Megan Shuler	megan.shuler@portlandoregon.gov
4	Recycling and Composting Program Multifamily Waste Reduction Program	Jill Kolek	jill.kolek@portlandoregon.gov
5	Green Team	Greg Supriano	greg.supriano@portlandoregon.gov
6	BPS Community Involvement for Comp Plan	Sara Wright	sara.wright@portlandoregon.gov
7	BPS District Liaisons, Central City, and River Plan	Deborah Stein - Manager	deborah.stein@portlandoregon.gov
8	PF&R (Portland Fire & Rescue) All-Hazards Large Incident and Disaster Response Plan	Don Russ - PF&R	don.russ@portlandoregon.gov
9	East Portland Action Plan	Lore Wintergreen	lore.wintergreen@portlandoregon.gov
10	NAMCO, National Association of Minority Contractors	Nate McCoy	nate@namc-oregon.org
11	Urban League of Portland	Nkenge Johnson	NHJ@ulpdx.org
12	SEI (Self Enhancement Inc.)	Tony Hopson	tonyh@selfenhancement.org
13	NAYA (Native American Youth and Family Center)	Loretta Kelly	lorettak@nayapdx.org
14	Wisdom of the Elders	Rose High Bear	raven@wisdomoftheelders.org
15	APANO (Asian Pacific Network of Oregon)	Joseph Santos-Lyons	joseph@apano.org
16	CCC Community and Economic Development Committee (including climate and environmental justice)	Maggie Tallmadge	maggie@coalitioncommunitiescolor.org
17	Climate Justice Collaborative	Cary Watters	cary@coalitioncommunitiescolor.org
18	PAALF (Portland African American Leadership Forum) Environmental Justice Workgroup	Solamon Ibe	s.ibe@hotmail.com
19	Sunday Parkways Summer events on the Columbia Slough Multnomah Days at Multnomah Village Portland Farmer's Market	Megan Callahan	Megan.Callahan@portlandoregon.gov

5.3 BROADER COMMUNITY ENGAGEMENT AND OUTREACH

Community engagement is a continuous process, and requires multiple means of facilitating two-way communication with the citizens. This section highlights a number of important ways to facilitate meaningful community engagements.

5.3.1 E-engagement: Online Risk Atlas & E-Portal

It is recommended that an online spatial risk atlas be hosted on the hazard mitigation website. The atlas will contain socio-economic data along with risk overlays to inform public about the likely hazard risks they face in their neighborhoods. Additional resources for specific mitigation actions, and opportunities for participation in the planning process can also be made available through this website. The interactive web based platform should also an interactive annotation tool for users to post flags, highlight and comment on specific locations on the map. This mapping interface can be developed in partnership with existing low cost mapping initiative underway in the other departments/bureaus at the

city. A screenshot of a similar application developed by Institute for Hazard Mitigation and Planning at University of Washington in partnership with Texas A &M University, Galveston is shown in Figure 2.



Figure 2. Screenshot of Sample Online Mapping Interface

Presently, the city does have a number of online mapping platforms to share spatial and census data. These include:

- MetroMap (https://gis.oregonmetro.gov/ metromap/)
- Racial equity atlas (http://regionalequityatlas.org/ programs/regional-equity-atlas/equity-atlas-20-mapping-tool)
- Portland Maps (https://www.portlandmaps.com).

While each of these online interface does provide significant data, the ability for users to download and analyze spatial datasets is very limited. Further, none of the online mapping platform accessed at the time of the writing of this report provided hazard risk information at the neighborhood level or linked to possible hazard mitigation information. It is therefore recommended that additional hazard mitigation related information and data be made available either through existing or a new online mapping interface.

The E-portal that will host the online risk atlas can also be designed to include hazard mitigation, and other hazard risk awareness resources for the local stakeholders. Presently, there are a number of hazard mitigation, risk awareness, and disaster preparation documents available online from the city website as well as federal website such as ready.gov. Given the diversity of stakeholders (and associated languages) in Portland, it is recommended that the city actively consider making these resources available online in multi-lingual format.

In addition to the online atlas there a number of other opportunities for engaging with the community using online platforms. The following updates are recommended to the existing Portland Bureau of Emergency Management hazard mitigation homepage:

- To provide updated information about all meetings and events proposed to be conducted as part of the planning process.
- Online questionnaires and surveys can be posted on this website to allow users to access and responds.
- Live Chat Events can be scheduled on this website to allow stakeholders who are unable to participate in steering committee meeting to interact with the planning team to provide feedback and comments.
- A feedback and comments tool can be created specifically to allow people to respond to the issues and concerns specifically for hazard mitigation planning.
- Facebook, twitter and other social media outlets can be utilized to connect with people and stakeholders.

5.3.2 Multilingual Support for Planning Documents and Surveys

A number of participants in the surveys conducted during the preparation of this engaging strategy indicated that a significant number of the residents did not understand English that well. It is therefore recommended that the planning team partner with local civic organizations that represent these minority groups and seek their assistance in conversion of planning documents and surveys into other formats. This will enable a boarder range of stakeholders to access, understand and participate in the planning process. Past experiences reveal that multi-language support is critical in diverse communities that are undergoing significant demographic changes. Lack of access to understandable documents and other outreach material is likely to further alienate communities that have traditionally been excluded from earlier public consultation process.

5.3.3 Hazard Mitigation Exhibits

Exhibits and displays are an effective way of making relevant information accessible to the public at a relatively lower cost. These locations can also serve as the nodes for further distribution of documents, surveys and materials. Over time stakeholders start to visit these locations regularly to seek out specific information regarding new projects and outreach activities. It is therefore strongly recommended that the planning team and the city consider installation of such displays at prominent locations such as the city hall and the neighborhood coalition offices. These displays can be used to provide regular updates on the hazard mitigation planning process, planned activities, and can also serve as nodes for conducting smaller public meetings events as needed. These displays will be particularly useful for public review of the draft plan, and continued engagement following the plan adoption.

5.3.4 Increased participation of Other Bureaus and Offices in Stakeholder Meetings

As highlighted earlier it is often not possible for the stakeholders to distinguish between hazard mitigation priorities and general development concerns. Stakeholders often tend to bring up a variety of concerns (often not necessarily connected to hazard mitigation planning) during steering committee meetings and the other events. It is possible that if these concerns are ignored citing lack of direct connection with hazard mitigation planning, it is likely to result in increased community distrust. It is therefore recommended that representatives from other bureaus, specifically Development services, Environmental services, Office of Equity and Human rights, Planning and Sustainability, and Housing Bureau be invited to these meetings and be allowed to respond to concerns related to their department. At a minimum, a procedure for recording all concerns be established, and forwarded to relevant bureaus for response. These responses could then be shared through email or directly with the stakeholders.

5.3.5 Hazard Mitigation Ambassador Program

The city of Portland is home to a large number of diverse stakeholder civil society organizations that are actively involved and embedded within their respective communities. These existing networks provide an effective means for the continued engagement with the local stakeholders not only during the MAP development process but also after the adoption of the plan. It is therefore recommended that the city consider establishment of a Hazard Mitigation Ambassador program. The primary goal of this program will be to identify and train individuals from diverse community groups about risk awareness, and minimization through effective mitigation actions. These individuals can also be trained to assist community members in preparation of household level emergency response plans, and other disaster mitigation activities, as well as resources to help community members become prepared for other hazard threats. These hazard mitigation ambassadors would serve as the vital link between the city and the community in case of any hazard event, and assist citizens in undertaking appropriate response actions as advocated by the city. Overtime it is expected that the role of these community ambassadors can be diversified to include organization and coordination of other community outreach activities in their community.

Community Engagement Plan

Attachment 1. Copy of Survey Responses

Survey of City Bureaus and Offices

Dear Respondent,

As you may know, Portland Bureau of Emergency Management is in the process of updating the city's Natural Hazard Mitigation Plan (NHMP). The plan outlines a strategy for reducing Portland's risk from natural hazards. Having a FEMA-approved plan also makes the City of Portland eligible for federal grants that can help strengthen city assets and improve community resilience before and after a disaster. Information about the project can be found at the project website here:

https://www.portlandoregon.gov/pbem/naturalhazard

We are asking for information about programs and outreach activities at your bureau or office to find opportunities for resource sharing and collaborative community engagement. We think it's important to team up whenever possible, and we want to find ways we can support each other in our outreach efforts. By working together, we think we can reach more people in more meaningful ways.

Feel free to share this with your colleagues who may also be able to provide relevant information.

Question 1: Which city bureau or office are you associated with?

BPS- Sustainability Education and Assistance

Question 2: Prior to receiving this survey, had you heard about the Natural Hazard Mitigation Plan (NHMP) update process?

○ Yes ◉ No

Question 3: Would you like to receive more information about the NHMP plan update?

○ Yes ◉ No

Please provide your contact information:

Preferred Email:

Telephone:

Question 4: Please list any community outreach and engagement programs at your bureau or office that we might be able to work together on. If known, please provide the contact information of the key person to contact for each of these programs.

#	Name of the program/activity/event	Contact Person	Email	Tel.
1	Example: Small Business Sustainability Workshop for local entrepreneurs to share sustainable practices May 15, 2016	Danielle Butsick, City of Portland	danielle.butsick@portlandoregon.gov	503-823-3926
2	Residential Education and Engagement: • Outreach for the curbside collection system to encourage composting, recycling and proper disposal of hazardous material	Lauren Norris	lauren.norris@portlandoregon.gov	
3	Sustainability at Work: * Assist 1,000 businesses annually to improve sustainability practices; certify 50 businesses annually through Sustainability at Work certification	Megan Shuler	megan.shuler@portlandoregon.gov	
4	Event Recycling and Composting Program Assist and provide equipment to 30 large and 100+ small- to medium-sized events to increase waste diversion at	Jill Kolek	jill.kolek@portlandoregon.gov	
5	Master Recycler Program: * Train 90 community volunteers on waste reduction and prevention, communications and behavior change * Manage 1,400 Master Recycler	Lauren Norris	lauren.norris@portlandoregon.gov	
6	Community Collection Events Partner with Neighborhood Coalitions, Metro and community organizations to host 45+ collection events annually.	Lauren Norris	lauren.norris@portlandoregon.gov	
7	Multifamily Waste Reduction Program: *Provides assistance to 50,000 MF units and 175 property managers, owners and companies annually. * Develops infrastructure policies that	Jill Kolek	jill.kolek@portlandoregon.gov	
8				
9				

Survey of City Bureaus and Offices

Dear Respondent,

As you may know, Portland Bureau of Emergency Management is in the process of updating the city's Natural Hazard Mitigation Plan (NHMP). The plan outlines a strategy for reducing Portland's risk from natural hazards. Having a FEMA-approved plan also makes the City of Portland eligible for federal grants that can help strengthen city assets and improve community resilience before and after a disaster. Information about the project can be found at the project website here:

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Feel free to share this with your colleagues who may also be able to provide relevant information.

Question 1: Which city bureau or office are you associated with?

Portland Housing Bureau

Question 2: Prior to receiving this survey, had you heard about the Natural Hazard Mitigation Plan (NHMP) update process?

(•) Yes ( ) No

Question 3: Would you like to receive more information about the NHMP plan update?

(•) Yes ( ) No

Please provide your contact information:

Preferred Email: michelle.depass@portlandoregon.gov

Telephone: 503 823-6291 or (503) 823-3606

Question 4: Please list any community outreach and engagement programs at your bureau or office that we might be able to work together on. If known, please provide the contact information of the key person to contact for each of these programs.

#	Name of the program/activity/event	Contact Person	Email	Tel.
1	Example: Small Business Sustainability Workshop for local entrepreneurs to share sustainable practices May 15, 2016	Danielle Butsick, City of Portland	danielle.butsick@portlandoregon.gov	503-823-3926
2	East Portland Action Plan	lore wintergreen	lore.wintergreen@portlandoregon.gov	503 823-4035
3	NAMCO, National Association of Minority Contractors	Nate McCoy	nate@namc-oregon.org	
4	Urban League of Portland	Nkenge Johnson, President and CEO	Nkenge Harmon Johnson <NHJ@ulpdx.org>	503 280-2600
5	SEI, Self Enhancement Inc.	Tony Hopson, President	tonyh@selfenhancement.org	503 249-1721
6	Self Enhancement Inc. Housing Programs	Libra Forde	libraf@selfenhancement.org	503 972-3687 office, or 808 372-9240 cell
7	NAYA Native American Youth and Family Center	Loretta Kelly	lorettak@nayapdx.org	503 288-8177
8	Wisdom of the Elders	Rose High Bear	raven@wisdomoftheelders.org	503 775-4014
9	APANO Asian Pacific Network of Oregon	Joseph Santos-Lyons Exec. Dir. or Duncan Hwang Associate Director	joseph@apano.org or duncan@apano.org	971 340-4861

Survey of City Bureaus and Offices

Dear Respondent,

As you may know, Portland Bureau of Emergency Management is in the process of updating the city's Natural Hazard Mitigation Plan (NHMP). The plan outlines a strategy for reducing Portland's risk from natural hazards. Having a FEMA-approved plan also makes the City of Portland eligible for federal grants that can help strengthen city assets and improve community resilience before and after a disaster. Information about the project can be found at the project website here:

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Feel free to share this with your colleagues who may also be able to provide relevant information.

Question 1: Which city bureau or office are you associated with?

BDS

Question 2: Prior to receiving this survey, had you heard about the Natural Hazard Mitigation Plan (NHMP) update process?

(●) Yes ( ) No

Question 3: Would you like to receive more information about the NHMP plan update?

( ) Yes (●) No

Please provide your contact information:

Preferred Email:

Telephone:

Question 4: Please list any community outreach and engagement programs at your bureau or office that we might be able to work together on. If known, please provide the contact information of the key person to contact for each of these programs.

#	Name of the program/activity/event	Contact Person	Email	Tel.
1	Example: Small Business Sustainability Workshop for local entrepreneurs to share sustainable practices May 15, 2016	Danielle Butsick, City of Portland	danielle.butsick@portlandoregon.gov	503-823-3926
2	Green Team	Greg Supriano	greg.supriano@portlandoregon.gov	503-823-7351
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Survey of City Bureaus and Offices

Dear Respondent,

As you may know, Portland Bureau of Emergency Management is in the process of updating the city's Natural Hazard Mitigation Plan (NHMP). The plan outlines a strategy for reducing Portland's risk from natural hazards. Having a FEMA-approved plan also makes the City of Portland eligible for federal grants that can help strengthen city assets and improve community resilience before and after a disaster. Information about the project can be found at the project website here:

https://www.portlandoregon.gov/pbem/naturalhazard

We are asking for information about programs and outreach activities at your bureau or office to find opportunities for resource sharing and collaborative community engagement. We think it's important to team up whenever possible, and we want to find ways we can support each other in our outreach efforts. By working together, we think we can reach more people in more meaningful ways.

Feel free to share this with your colleagues who may also be able to provide relevant information.

Question 1: Which city bureau or office are you associated with?

Question 2: Prior to receiving this survey, had you heard about the Natural Hazard Mitigation Plan (NHMP) update process?

(●) Yes ( ) No

Question 3: Would you like to receive more information about the NHMP plan update?

(●) Yes ( ) No

Please provide your contact information:

Preferred Email: leslie.lum@portlandoregon.gov

Telephone: 503-823-7896

Question 4: Please list any community outreach and engagement programs at your bureau or office that we might be able to work together on. If known, please provide the contact information of the key person to contact for each of these programs.

#	Name of the program/activity/event	Contact Person	Email	Tel.
1	Example: Small Business Sustainability Workshop for local entrepreneurs to share sustainable practices May 15, 2016	Danielle Butsick, City of Portland	danielle.butsick@portlandoregon.gov	503-823-3926
2	BPS Community Involvement for Comp Plan	Sara Wright	sara.wright@portlandoregon.gov	503-823-7728
3	BPS District Liaisons, Central City, and River Plan	Deborah Stein - Manager	deborah.stein@portlandoregon.gov	823-6991
4		Leslie Lum - North Portland	leslie.lum@portlandoregon.gov	503-823-7896
5		Nan Stark - Northeast Portland	nan.stark@portlandoregon.gov	503-823-3986
6		Marty Stockton - Southeast Portland	marty.stockton@portlandoregon.gov	503-823-2041
7		Joan Frederiksen - West Portland	joan.frederiksen@portlandoregon.gov	503-823-3111
8		Troy Doss - Central City	troy.doss@portlandoregon.gov	503-823-5857
9		Sallie Edmunds - River Team	sallie.edmunds@portlandoregon.gov	503-823-6950

Survey of City Bureaus and Offices

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Feel free to share this with your colleagues who may also be able to provide relevant information.

Question 1: Which city bureau or office are you associated with?

Portland Fire & Rescue

Question 2: Prior to receiving this survey, had you heard about the Natural Hazard Mitigation Plan (NHMP) update process?

○ Yes ◉ No

Question 3: Would you like to receive more information about the NHMP plan update?

◉ Yes ○ No

Please provide your contact information:

Preferred Email: don.russ@portlandoregon.gov

Telephone: 503 816-5590

Question 4: Please list any community outreach and engagement programs at your bureau or office that we might be able to work together on. If known, please provide the contact information of the key person to contact for each of these programs.

#	Name of the program/activity/event	Contact Person	Email	Tel.
1	Example: Small Business Sustainability Workshop for local entrepreneurs to share sustainable practices May 15, 2016	Danielle Butsick, City of Portland	danielle.butsick@portlandoregon.gov	503-823-3926
2	PF&R All-Hazards Large Incident and Disaster Response Plan	Don Russ - PF&R	don.russ@portlandoregon.gov	503 816-5590
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Survey of Community Organizations

Dear Respondent,

As you may know, Portland Bureau of Emergency Management is in the process of updating the city's Natural Hazard Mitigation Plan (NHMP). The plan outlines a strategy for reducing Portland's risk from natural hazards. Having a FEMA-approved plan also makes the City of Portland eligible for federal grants that can help strengthen city assets and improve community resilience before and after a disaster. Information about the project can be found at the project website here:

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We are asking for information about programs and outreach activities at your organization to find opportunities for resource sharing and collaborative community engagement. We think it's important to team up whenever possible, and we want to find ways we can support each other in our outreach efforts. By working together, we think we can reach more people in more meaningful ways.

Feel free to share this with your colleagues who may also be able to provide relevant information.

Question 1: Which organization/s are you associated with?

Coalition of Communities of Color

Question 2: Prior to receiving this survey, had you heard about the Natural Hazard Mitigation Plan (NHMP) update process?

(●) Yes ( ) No

Question 3: Would you like to receive more information about the NHMP plan update?

( ) Yes ( ) No

Please provide your contact information:

Preferred Email: Maggie@coalitioncommunitiescolor.org

Telephone: 781-697-0021

Question 4: Please list any community outreach and engagement programs at your organization that we might be able to work together on. If known, please provide the contact information of the key person to contact for each of these programs. (Add rows as required.)

#	Name of the program/activity/event	Contact Person	Email	Tel.
1	Example: Youth Environmental Justice Program, ongoing monthly meetings every third Wednesday	Danielle Butsick	danielle.butsick@portlandoregon.gov	503-823-3926
2	CCC Community and Economic Development Committee (including climate and EJ) - First Thursday of each month	Maggie Tallmadge	maggie@coalitioncommunitiescolor.org	781-697-0021
3	Climate Justice Collaborative meeting with policy leads - First Thursday of each month	Cary Watters	cary@coalitioncommunitiescolor.org	
4	PAALF EJ Workgroup - Third Friday of each month	Solamon Ibe	s.ibe@hotmail.com	
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Survey of Community Organizations

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We are asking for information about programs and outreach activities at your organization to find opportunities for resource sharing and collaborative community engagement. We think it's important to team up whenever possible, and we want to find ways we can support each other in our outreach efforts. By working together, we think we can reach more people in more meaningful ways.

Feel free to share this with your colleagues who may also be able to provide relevant information.

Question 1: Which organization/s are you associated with?

East Portland Neighborhood Office

Question 2: Prior to receiving this survey, had you heard about the Natural Hazard Mitigation Plan (NHMP) update process?

(●) Yes ( ) No

Question 3: Would you like to receive more information about the NHMP plan update?

(●) Yes ( ) No

Please provide your contact information:

Preferred Email: eliza.lindsay@portlandoregon.gov

Telephone: 971-340-6435

Question 4: Please list any community outreach and engagement programs at your organization that we might be able to work together on. If known, please provide the contact information of the key person to contact for each of these programs. (Add rows as required.)

#	Name of the program/activity/event	Contact Person	Email	Tel.
1	Example: Youth Environmental Justice Program, ongoing monthly meetings every third Wednesday	Danielle Butsick	danielle.butsick@portlandoregon.gov	503-823-3926
2	"Taste of Parkrose" event	Historic Parkrose		
3	Festival of Nations	Division Midway Alliance		
4	Rosewood Initiative Events	Rosewood Initiative		
5	The Slavic Festival in Ventura Park	Galina Nekrova		
6	82nd Ave. of the Roses Parade, end of April			
7	Cambodian Lao Thai Burmese New Years' Festival at Glenhaven Park, end of April			
8	National Night Out Community Fairs/Movie in the Park	Barb Klinger, The Rovers		
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Survey of City Bureaus and Offices

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Feel free to share this with your colleagues who may also be able to provide relevant information.

Question 1: Which city bureau or office are you associated with?

Bureau of Environmental Services (BES)

Question 2: Prior to receiving this survey, had you heard about the Natural Hazard Mitigation Plan (NHMP) update process?

(●) Yes ( ) No

Question 3: Would you like to receive more information about the NHMP plan update?

( ) Yes (●) No

Please provide your contact information:

Preferred Email:

Telephone:

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#	Name of the program/activity/event	Contact Person	Email	Tel.
1	Example: Small Business Sustainability Workshop for local entrepreneurs to share sustainable practices May 15, 2016	Danielle Butsick, City of Portland	danielle.butsick@portlandoregon.gov	503-823-3926
2	Sunday Parkways: East Portland (May 15) Southeast (Aug 21) Sellwood-Milwaukie (Oct 2)	Megan Callahan, Public Affairs Manager	Megan.Callahan@portlandoregon.gov	503-823-4759
3	Summer events on the Columbia Slough: Regatta (Aug 7) Explorando (June 11) Aquifer (Sept 17)	Megan Callahan, Public Affairs Manager	Megan.Callahan@portlandoregon.gov	503-823-4759
4	Multnomah Days at Multnomah Village (Aug 20)	Megan Callahan, Public Affairs Manager	Megan.Callahan@portlandoregon.gov	503-823-4759
5	Arbor Day at the Portland Farmer's Market (April 30)	Megan Callahan, Public Affairs Manager	Megan.Callahan@portlandoregon.gov	503-823-4759
6	"Life in the Floodplain", Oct. 8th at Zenger Farm	Kate Carone, BES	kate.carone@portlandoregon.gov	503-823-5569
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Community Engagement Plan

Attachment 2. Key Stakeholders & Networks

KEY STAKEHOLDERS & NETWORKS

Within the City of Portland, there are service (non-profit) organizations affiliated with different ethnic, racial, economic and other sub-populations that have historically lacked a voice in development and implementation of government policy and programs. Many of these organizations have experience conducting public engagement with their constituencies to develop and implement their own programs. There likely are opportunities for the PBEM to collaborate with and learn from these organizations for how best to engage their constituents. The following information identifies organizations that may provide collaboration and describes each organizations mission, constituency and organization partners. We also identify program areas that may lend themselves to collaboration with PBEM hazard mitigation planning.

Organization: African American Chamber of Commerce of Oregon[1]

Mission: To enhance, educate and empower the African American business and professional community in the Oregon and Southwestern Washington district. To identify and provide avenues for mentoring, professional growth and business development for small business owners and entrepreneurs. To develop and enhance outreach and assistance programs to youth in the areas of business, law, and personal responsibility.

Community Served: The African American Chamber serves the African American business and professional community in the Oregon and Southwestern Washington district.

Programs: The Chamber offers assistance, mentoring and referrals, through a vast network of associates and members, to assistance interested parties in starting, developing or expanding businesses. The Chamber also provides education scholarships, job postings and contract bid postings.

Partners: The Chamber's members are involved and committed volunteers who serve on a diverse range of commissions, boards, and committees connecting all socio-economic levels and racial communities. Whether it is business, education, legal, economic development, arts, social justice, housing, or health issue.

Potential Opportunities for Collaboration: Potential opportunity for communication with the African American business community. Hazard mitigation themes of community and business resilience may be of interest to members of the organization.

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[1] African American Chamber, 2015. Web site accessed Dec. 7, 2015. http://blackchamber.info/.

Organization: African American Health Coalition, Inc. [2]

Mission: To promote health and improve wellness among Oregon's African American community through health education, advocacy and research.

Community Served: Oregon's African American community

Programs: Chronic Disease Self-Management Program elderly 60+ years of age, National Diabetes Prevention Program for high risk individuals, Educational Program to Increase Colorectal Cancer Screening, Cover Oregon Insurance Enrollment Assistance, Diabetes Self-Management Program, Racial and Ethnic Approaches to Health, Spice it Up Healthy Eating Program and the Wellness within Reach that is focused on physical activity.

Partners: The African American Health Coalition, Inc. is sponsored by Moda Health, United Way, new Seasons Market, Providence Health & Services, Spirit Mountain Casino, Legacy Health, Family Care Health Plans, Novo Nordisk, M.J.M. Murdock Charitable Trust, Oregon Health & Science University, Safeway, Fred Meyer, the Collins Foundation, Multnomah County Health Department and MacDonalds.

Potential Opportunities for Collaboration: Potential opportunity to communicate with African American adults. The hazard mitigation theme of safety may be of interest to members of the organization.

Organization: Asian Pacific American Network of Oregon (APANO) [3]

Mission: The Asian Pacific American Network of Oregon is a statewide, grassroots organization, uniting Asians and Pacific Islanders to achieve social justice. We use our collective strengths to advance equity through empowering, organizing and advocating with our communities.

Community Served: Asians and Pacific Islanders

Programs: APANO program work is focused on community organizing, leadership development and training, policy advocacy, Civic Engagement, cultural Work and the jade district.

Partners: Partners of APANO in Oregon include The Asian Council of Eugene & Springfield, Chinese American Citizens Alliance, Chinese Consolidated Benevolent Association, COFA Alliance National Network, DisOrient Film Festival, Korean American Coalition of Oregon, Living Islands, Micronesian Islander Community, Mien Professionals Network, Oregon Marshallese Community, Philippine American Chamber of Commerce and Zomi Association of US.

Potential Opportunities for Collaboration: Potential opportunity to collaborate on outreach to Asian and Pacific Islander communities (Primarily younger adult population). Civic engagement, resilience, leadership development/training are APANO work areas that may have synergy with hazard mitigation.

[2] African American Health Coalition, Inc., 2015. Website accessed Dec. 7, 2015. http://aahc-portland.org/.
[3] APANO, 2015. Web site accessed Dec. 3, 2015. http://www.apano.org/.

Organization: Asian Health & Service Center[4]

Mission: To be the bridge between Asian and American cultures and build a harmonious community. Vision: To reduce health inequity and improve health care quality for all Asians.

Community Served: Asian Americans (demographic dominant client base 40 to 80 years of age)

Programs: Arts and cultural community engagement, health education and support, healthcare services, research and studies related to health in Asian American community and Chinese immersion preschool.

Partners: American Association of Retired Persons, American Cancer Society, Avon Breast Health Outreach Program, City of Beaverton, Coalition of Community Health Clinics, Children's Community Clinic, Gilead Sciences, Mercy & Wisdom Healing Center, Multnomah County Health Department, National College of Natural Medicine (NCNM), Native American Rehabilitation Association of the Northwest (NARA), North By Northeast Clinic, National Institutes of Health (NIH), Northwest Health Foundation, Novartis Pharmaceuticals, OHSU Richmond Clinic, Old Town Clinic: with Central City Concern Health Services, Orange County Asian and Pacific Islander Community Alliance, Oregon Health Authority (OHA), Oregon Health & Science University (OHSU), OHSU Family Center at Richmond, Outside In Medical Clinic, PACS Family Health Center, Portland State University, Providence Health & Services, Rosewood Family Health Center, Susan G. Komen for the Cure, SW Community Health Center, The Wallace Medical Concern, United Way of the Columbia-Willamette, Washington County Health & Human Services and West Burnside Chiropractic Clinic.

Potential Opportunities for Collaboration: Potential opportunity to reach older Asian American population. The hazard mitigation theme of safety may be of interest to members of the organization.

Organization: Audubon, Portland[5]

Mission: Audubon Society of Portland promotes the understanding, enjoyment, and protection of native birds, other wildlife, and their habitats.

Community Served: Local environmental community and the Pacific Northwest

Programs: Birding publications and information, education classes and camps, Wildlife Care Center, sanctuaries, and habitat and species conservation and restoration.

Potential Opportunities for Collaboration: Could potentially collaborate with outreach to environmental community. Members may be interested in impact mitigation strategies may have on wildlife or mitigation strategies that could also benefit wildlife and environmental education.

Organization: Black Parent Initiative[6]

Mission: The Black Parent Initiative (BPI) educates and mobilizes the parents and caregivers of Black and multi-ethnic children to ensure they achieve success.

Community Served: Families of Black and multi-ethnic children

[4] Asian Health & Service Center, 2015. Web site accessed Dec. 4, 2015. http://www.ahscpdx.org/.
[5] Audubon Portland, 2015. Web site accessed Dec. 4, 2015. http://audubonportland.org/.
[6] BPI, 2015. Web site accessed Dec. 4, 2015. http://thebpi.org/.

Programs: Parent University focuses on:

- Literacy: home-based support for improved child reading and comprehension
- Culturally Specific Parenting: home-based discipline; home based/school advocacy
- Advocacy: cultivating parent advocates
- And, the Together We Can program provides:
- Intensive Home Visiting: relationship-based; focus on safety, stability, and personal growth
- Group Services: personal growth, consciousness, and connection

Potential Opportunities for Collaboration: Potential opportunity for outreach to African American and mixed race families with children. The hazard mitigation theme of safety may be of interest to members of the organization.

Organization: Center for Intercultural Organizing[7]

Mission: The Center for Intercultural Organizing is a diverse, grassroots organization working to build a multi-racial, multicultural movement for immigrant and refugee rights.

Community Served: Multi-racial, multicultural immigrants and refugees

Programs: The Center for Intercultural Organizing has four focus areas.

Community Education-The Center educates immigrants, refugees and U.S.-born allies on pressing community issues and strengthens and supports existing efforts to bring visibility to immigrant and refugee struggles.

Civic Engagement and Policy Advocacy-Our civic engagement program provides a pathway for immigrants and refugees to participate in democratic processes through training programs, hands-on projects and collective action that produce concrete improvements in their lives.

Organizing and Mobilization-CIO assists immigrant and refugee community members in building the organizing skills necessary to impact policies that affect them and to work collaboratively, mobilizing diverse constituencies.

Intergenerational Leadership Development-CIO develops new leaders through a signature yearlong leadership development program, through strategic trainings, and through on-the-ground leadership positions within our campaigns.

Potential Opportunities for Collaboration: Potential opportunity to collaborate with Community Engagement and Civic Engagement programs.

Organization: Coalition of Communities of Color[8]

Mission: The Coalition of Communities of Color (CCC) addresses the socioeconomic disparities, institutional racism and inequity of services experienced by our families, children and communities; and to organize our communities for collective action resulting in social change to obtain self-determination, wellness, justice and prosperity.

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[7] CIO, 2015. Web site accessed Dec. 4, 2015. http://www.interculturalorganizing.org/.
[8] CCC, 2015. Web site accessed Dec. 4, 2015. http://www.coalitioncommunitiescolor.org/.

Community Served: Coalition of Communities of Color (CCC) is an alliance of culturally-specific community based organizations with representation from the following communities of color: African, African American, Asian, Latino, Native American, Pacific Islander, and Slavic.

Programs: The CCC implements culturally-responsive data and research projects to build an important knowledge base from which to educate and to advocate. Bridges is a leadership development initiative with houses six culturally-specific leadership development programs led by CCC member organizations. Bridges' programs provide ongoing support through leadership placements, mentorship and community networking. The CCC also conducts policy analysis and advocacy to advance policies in Oregon that have the best potential to improve outcomes for communities of color. This program area includes the Education Justice Initiative that creates better outcomes for all students by removing barriers facing students of color, and Community & Economic Development work that focuses on anti-displacement and environmental justice.

Partners: IRCO Africa House, IRCO Asian Family Center, Asian and Pacific American Network of Oregon, Center for Intercultural Organizing, El Centro Milagro, Hacienda Community Development Corporation, Immigrant and Refugee Community Organization (IRCO), Latino Network, KairosPDX, Native American Youth and Family Center (NAYA Family Center), Portland African American Leadership Forum, Portland Community Reinvestment Initiatives, Inc., Portland Youth and Elders Council, Self Enhancement, Inc., Slavic Community Center, Slavic Network of Oregon, Urban League of Portland, Verde and VOZ Workers' Rights Education Project.

Potential Opportunities for Collaboration: The staff could provide insight on how best coordinate with partner organizations.

Organization: Disability Rights Oregon[9]

Disability Rights Oregon (DRO) is a non-profit law office that provides advocacy and legal services to people with disabilities who have an issue related to their disability and that falls within DRO's goals and priorities.

Mission: To promote and defend the rights of individuals with disabilities.

Community Served: People with disabilities who have an issue related to their disability and that falls within DRO's goals and priorities.

- Goals:
  - Stopping Abuse and Neglect,
  - Providing Full Access to Community Participation,
  - Removing significant access barriers in public places with emphasis on barriers in education, transportation and the courts
  - Monitoring the increase in the supply of accessible housing through policy work
  - Providing information about reasonable accommodations for tenants to prevent homelessness and isolation.
  - Enforcing anti-discrimination laws
  - Working to achieve full participation in the electoral process including registering to vote and casting a ballot
  - Getting and Maintaining Quality Community Support Services

[9] Disability Rights Oregon, 2015. Web site accessed Dec. 4, 2015. https://droregon.org/.

- Getting a Free & Appropriate Education for Children
- Other Very Important Issues That Promote the Mission of DRO & That Are Approved by the Executive Director

Potential Opportunities for Collaboration: DRO may be able to provide insight on how best engage individuals with disabilities in HMP update process. They may also be able to provide inputs in development of appropriate hazard mitigation strategies

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Organization: East Portland Neighborhood Office (East Portland Action Plan)[10]

The East Portland Neighborhood Office (EPNO) is part of the City of Portland's Office of Neighborhood Involvement.

EPNO acts as a hub for these independent organizations in their work; providing organizing assistance, support in navigating the city's processes, funding opportunities, material resources (meeting space, event equipment, copies, etc), and more.

The East Portland Action Plan (EPAP), a group affiliated with the EPNO, was convened for the specific task of providing leadership and guidance to public agencies and other entities on how to strategically address community-identified issues and allocate resources to improve livability and prevent displacement in East Portland. East Portland is defined by the East Portland Neighborhood Office (EPNO) coalition area.

Goals: To enhance community involvement in efforts to improve neighborhood livability, a sense of community, public safety, organizational and self-empowerment at the neighborhood level, and to implement the goals of The Five Year Plan to Strengthen Community Involvement in Portland.

Community Served: EPNO serves about 25% of the City's population, spread across about 20% of the City's landmass. EPNO exists to support community organizations, community members, and the thirteen neighborhood associations of East Portland as they strengthen their communities and work with local government and other organizations.

Programs: The EPAP has identified strategies and action items for each of the following subject areas:

Housing and Development Policies, Commercial and Mixed Use, Transportation, Public Infrastructure and Utilities, Parks and Open Space. Natural Areas and Environment, Economic Development and Workforce Training, Education Infrastructure and Programs, Public Safety, Housing Assistance and Safety-net Services, Community Building, and Equity. There are working committees staffed by volunteers for several of these subject areas.

Potential Opportunities for Collaboration: With PEMB resource/staff support, EPAP/EPNO staff could provide guidance for effectively engaging community members. In addition, may be able to partner with EPAP members to engage the community through EPAP's monthly general meetings and through digital and print media. Other Portland District Coalitions may be able to provide similar access to their communities.

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[10] EPNO, 2015. Web site accessed Dec. 3, 2015. http://eastportland.org/.

Organization: Ecumenical Ministries of Oregon's Russian Oregon Social Services[11]

Mission: To successfully integrate Russian-speaking immigrants and refugees into Oregon and southwest Washington communities by providing services that increase independence, enable economic self-sufficiency, and improve mental and physical well-being.

Community Served: Russian Oregon Social Services (ROSS) was established by Ecumenical Ministries of Oregon (EMO) in 1994 to serve the needs of Russian-speaking refugees and immigrants. More than 100,000 Russian-speaking refugees and immigrants from the former Soviet Union currently reside in the Portland metro area, and the numbers are expected to increase.

Programs: ROSS provides the following services:

- 24-hour crisis response.
- Individual and family crisis counseling.
- One-on-one advocacy, crisis intervention, support safety planning.
- Assistance obtaining stalking orders and restraining orders and filing out other forms and documents.
- Accompaniment to hospitals for forensic medical exams (for clients).
- Accompaniment to court and assistance communicating with police and District Attorney's Office.
- Assistance accessing immigration legal services.
- Domestic violence and sexual assault victims' support groups.
- Assistance applying for crime victims compensation.
- Assistance applying for public benefits.
- Assistance with temporary and transitional housing.
- Mentorship program for survivors of domestic violence and sexual assault.
- Information and referrals.
- Community orientation.
- Assistance obtaining dental services.
- Translation and interpretation services (for clients).
- Cross-cultural education (for other service providers).

Potential Opportunities for Collaboration: May be able to provide guidance on how to effectively conduct outreach to the Russian speaking population, recommendations on translation services and access to the community network.

Organization: El Programa Hispano-Catholic Charities[12]

Mission: El Programa Hispano's mission is threefold: to increase self-sufficiency within the Latino community, to empower individuals to achieve a better quality of life and to promote mutual understanding and respect among cultures.

Community Served: low-income Latinos in the Portland metro area

[11] ROSS, 2015. Web site accessed Dec. 3, 2015. http://www.emoregon.org/ross.php.
[12] El Programa Hispanico, 2015. Web site accessed Dec. 3, 2015. http://www.catholiccharitiesoregon.org/services_latino_services.asp.

Programs: El Programa Hispano offers a wide variety of services for low-income Latino families, including a low-income taxpayer clinic, food stamp assistance, anti-poverty services, skill building classes and outreach to the elderly. Project UNICA assists Spanish-speaking women, men and adolescents affected by domestic violence and sexual assault. El Programa Hispano also offers case management, educational activities, and support groups to Latino parents with children ages birth to five years. El Programa Hispano provides academic support, advocacy, skill building, mentoring, tutoring and recreation to Latino students; as well as family engagement services to Latino parents in Multnomah County school districts.

Potential Opportunities for Collaboration: May be able to provide guidance for outreach to the low income Latino community and access to their network. Safety

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Organization: Hacienda Community Development Corporation (CDC) [13]

Mission: Hacienda CDC is a Latino Community Development Corporation that strengthens families by providing affordable housing, homeownership support, economic advancement and educational opportunities.

Community Served: Low income Latino community

Programs: The Community Economic Development Department provides culturally-specific education and skill-building programs for adult Latinos. Through a variety of programs, including micro-enterprise development, small business training, adult financial education, and workforce development programs, the department makes a long-term impact by increasing the income and assets of Hacienda residents and the broader Latino community.

The Asset Management department seeks to strengthen the performance of the organization's existing housing assets, strengthen the health of our communities through robust on-site services for residents and anticipate and plan for the asset management needs of existing and future properties.

The Housing Development department oversees the construction of new housing, office and commercial space.

Hacienda CDC serves approximately 300 members of the youth resident population through three major **Programs:** Portland Niños, Expresiones, and Avanzamos. The programs offer a variety of important academic and social support services to children from birth to 9th Grade. Hacienda CDC also provides home ownership counseling through its Homeownership Support Program. Services are provided to families and individuals buying their first homes as well as to those who are at risk of losing their homes to foreclosure.

Potential Opportunities for Collaboration: Hacienda CDC may be able to provide guidance on outreach to the Latino community and access to it network. The organization may also be interested as a stakeholder of housing infrastructure in the community.

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[13] Hacienda CDC, 2015. Web site accessed Dec. 3, 2015. http://www.haciendacdc.org/.

Organization: Home Forward[14]

Home Forward promotes, operates and develops affordable housing that engenders stability, self-sufficiency, self-respect and pride in its residents and represents a long-term community asset. Home Forward strives to be a community leader to create public commitment, policy and funding to preserve and develop affordable housing.

Mission: The mission of Home Forward is to assure that the people of the community are sheltered, with a special responsibility to those who encounter barriers to housing because of income, disability or special need.

Community Served: those who encounter barriers to housing because of income, disability or special need. Home Forward is a public corporation serving all of Multnomah County, including the cities of Gresham, Fairview, Portland, and Troutdale, and other East County communities.

Programs: Home Forward programs are divided into three major areas: apartment communities, rent assistance and support services. As the largest provider of affordable housing in Oregon, Home Forward offers a variety of housing options to low-income individuals and families: more than 6,000 apartments to rent, including approximately 1,980 units of public housing, and approximately 9,390 Section 8 rent assistance vouchers. Home Forward services include the GOALS (Greater Opportunities to Advance, Learn and Succeed) program that provides Home Forward participants with ways to set and reach their goal of becoming self-sufficient through five years of dynamic supportive services, and partners with programs such as the Portland YouthBuilders where low income youth aged 17-24 are paid to finish school, learn a trade, and plan for their future and the NAYA Family Center offers services relating to health, housing, nutrition, education, transportation and other services.

Partners: Home Forward partners with more than 100 community agencies in the public, nonprofit and private sectors. The services provided by our community partners include financial services, education, substance abuse and youth programs, job training and life skills.

Potential Opportunities for Collaboration: Home Forward could provide guidance and or assistance with outreach to low-income residents of Portland. In addition, as a manager of facilities in the area, the organization may be interested in direct engagement as a stakeholder in the HMP update process.

Organization: Immigrant & Refugee Community Organization (IRCO) [15]

Mission: IRCO's mission is to promote the integration of refugees, immigrants and the community at large into a self-sufficient, healthy and inclusive multi-ethnic society.

Community Served: Immigrant and refugee communities

Programs: IRCO focuses on removing barriers to self-sufficiency and helping individuals and families thrive, by providing more than 100 culturally and linguistically specific social services, from employment, vocational training and English language learning, to community development, early childhood and parenting education, youth academic support and gang prevention. To better provide these services IRCO established the IRCO Asian Family Center in 1994 and the IRCO Africa House in 2006.

[14] Home Forward, 2015. Web site accessed Dec. 4, 2015. http://www.homeforward.org/.
[15] IRCO, 2015. Web page accessed Dec. 4, 2015. http://www.irco.org/.

Potential Opportunities for Collaboration: IRCO could provide guidance and or collaborate with outreach to refugee and immigrant communities. There may be an opportunity to conduct community engagement activities at or collaborate with their established community centers.

Organization: Impact NW -Southeast Multicultural Services Center[16]

Impact NW's Seniors and Adults with Disabilities services and Energy Assistance program are offered through its Southeast Multicultural Services Center.

Mission: Impact NW's mission is to help people prosper through a community of support.

Community Served: Annually, more than 1,500 individuals are supported by Impact NW's Seniors and Adults with Disabilities Services programs.

Programs: Impact NW's Seniors & Adults with Disabilities Services program gives clients the tools and support they need to be healthy, happy, and active, and to live at home safely. Programs include connecting community volunteers to isolated seniors, in-home care coordination, transportation to shopping and medical appointments, money management and legal services, and on-site meal services. The Southeast Multicultural Senior Center provides an activity hub where seniors gather for meals, games, celebrations and friendship.

Potential Opportunities for Collaboration: Impact NW could provide outreach guidance and potentially could collaborate with outreach to seniors through the Southeast Multicultural Services Center.

Organization: JOIN[17]

Mission: JOIN exists to support the efforts of homeless individuals and families to transition out of homelessness into permanent housing.

Community Served: JOIN efforts are directed at individuals sleeping outside or in their car in the Portland Metro area. Service provision is not dependent on age, gender, ethnicity, sexual identity, specific diagnosis or identifiable issues.

Programs: JOIN's outreach program engages homeless individuals to identify and overcome their barriers to housing. The retentions program works with newly placed households to get the support they need to succeed in their housing long-term. The JOIN Day Center provides critical basic day services such as hygiene facilities, laundromat vouchers, referral information, clothing, conversation and a refuge from the weather. And the Immersion program helps people for the greater community learn about homelessness.

Potential Opportunities for Collaboration: JOIN could provide could provide insight on how to serve the homeless during and after a disaster.

[16] Impact NW, 2015. Web page accessed Dec. 4, 2015. http://impactnw.org/.
[17] JOIN, 2015. Web page accessed on December 7, 2015. http://joinpdx.org/.

Organization: Latino Network[18]

Mission: Latino Network provides transformative opportunities, services, and advocacy for the education, leadership and civic engagement of our youth, families and communities.

Community Served: Latino children and families

Programs: The Latino Network focus on early childhood education, family and youth engagement, transformative youth opportunities and civic leadership.

Potential Opportunities for Collaboration: The Latino Network could provide guidance for outreach to the Latino community. Also, there may be opportunities for collaborative public engagement.

Organization: Native American Youth & Family Center (NAYA) [19]

Mission: To enhance the diverse strengths of our youth and families in partnership with the community through cultural identity and education.

Community Served: Self-identified Native Americans, infant to Elder, from across the Portland, Oregon, metropolitan area

Programs: NAYA provide educational services, cultural arts programming, and direct support to reduce poverty to the Portland Metropolitan Area Native American community. In addition, NAYA supports civic engagement and advocacy by convening the Portland Indian Leaders Roundtable, fostering leadership through the Oregon LEAD cohort, hosting the Portland Youth and Elders Council and holding forums to engage the community and gather input on programming. NAYA also registers voters and educates their community about the importance of being civically engaged.

Partners: Member of the Coalition of Communities of Color

Potential Opportunities for Collaboration: NAYA could provide guidance for conducting outreach to Portland's Native American population. And, they may be willing to collaborate with community engagement.

Organization: Oregon Food Bank[20]

Mission: Oregon Food Bank works to eliminate hunger and its root causes.

Community Served: People in Oregon lacking the resources to reliably secure food for a healthy life.

Programs: OFB works with a cooperative, statewide network of partner agencies to distribute emergency food to hungry families. We fight hunger's root causes through public policy advocacy, nutrition and garden education and work to strengthen community food systems.

Partners: 953 partner organizations in Oregon and SW Washington

Potential Opportunities for Collaboration: The Oregon Food Bank may be able to provide guidance for working with partner organizations and outreach to the low income population. They may also be

[18] Latino Network, 2015. Web page accessed on December 7, 2015. http://www.latnet.org/.
[19] NAYA, 2015. Web page accessed on December 6, 2015. http://www.oregonfoodbank.org.
[20] Oregon Food Bank, 2015. Web page accessed on December 6, 2015. http://www.oregonfoodbank.org.

willing to provide access to their network. The Oregon Food Bank likely is interested in risks to food supply and access, and mitigation actions that help secure food supply and access.

Organization: Oregon Health and Science University, Oregon Office of Disability and Health (OODH) [21]

Mission: To prevent secondary conditions and improve the health and quality of life of Oregonians with disabilities through improved access to health care facilities, public health programs, and effective health promotion and wellness programs.

Community Served: Oregonians with disabilities

Programs: OODH provides healthy lifestyle, breast cancer awareness, emergency preparedness and health care access education and outreach to people with disabilities and service providers. In addition, OOHD conducts research on the health, wellbeing and risk factors of adolescents and adults with disabilities in Oregon.

Potential Opportunities for Collaboration: OODH can provide guidance on how to make public engagement accessible to people with disabilities, and may be willing to collaborate with outreach to these individuals. OODH likely is also interested in potential risks from natural hazards to people with disabilities and mitigation action items that would reduce these risks.

Organization: Portland African American Leadership Forum[22]

Mission: The Portland African American Leadership Forum (PAALF) leverages the power of our community's combined resources to advance the vision of a connected thriving, resilient Black Community.

Community Served: African Americans

Programs: PAALF convenes African American leaders around a public policy agenda that impacts the community in the areas of housing & economic development, education, health, and civic engagement/leadership.

Potential Opportunities for Collaboration: PAALF could provide guidance for outreach to the African American community and may be willing to collaborate with public engagement.

Organization: Portland Community Reinvestment Initiatives (PCRI) [23]

Mission: Preserve, expand and manage affordable housing in the City of Portland and provide access to, and advocacy for, services for residents.

Community Served: Low income families and adults

[21] OODH, 2015. Web page accessed on December 6, 2015. http://www.ohsu.edu/xd/research/centers-institutes/institute-on-development-and-disability/public-health-programs/oodh/oodh.cfm.
[22] Portland African American Leadership Forum, 2015. Web page accessed December 10, 2015. http://aalfnw.org/portland/
[23] PCRI, 2015. Web page accessed December 10, 2015. http://www.pcrihome.org/

Programs: PCRI focuses on preserving and managing affordable, high quality, scattered site, single family homes; expanding and managing their portfolio of small multiplexes; and acquiring/developing multi-family housing to preserve affordable housing choices in the community.

Potential Opportunities for Collaboration: PCRI could provide guidance and or assistance with outreach to low-income residents of Portland. In addition, as a manager of facilities in the area, the organization may be interested in direct engagement as a stakeholder in the HMP update process.

Organization: REACH CDC[24]

REACH is a nonprofit affordable housing development and property management company

Mission: REACH's mission is to provide quality, affordable housing for individuals, families and communities to thrive.

Community Served: Low income community.

Programs: REACH owns and manages a portfolio of 2,073 units of affordable housing located across the metropolitan region, including properties in Multnomah, Washington, and Clark Counties (state of Washington). The portfolio includes new and renovated plexes, apartment buildings and mixed-use developments.

REACH provide a range of programs focused on housing success and financial stability such as eviction prevention, financial education, employment and career support, and access to emergency food and clothing. In addition, REACH's Community Builders Program provides free volunteer-powered home repairs for low income elderly and disabled homeowners, as well as families with children living in the home experiencing some type of home health hazard (i.e. lead poisoning, radon, mold, etc.).

Potential Opportunities for Collaboration: REACH could provide guidance and or assistance with outreach to low-income residents of Portland. In addition, as a manager of facilities in the area, the organization may be interested in direct engagement as a stakeholder in the HMP update process.

Organization: Slavic Community Center of NW[25] (information in Russian on Web site)

Community Served: Slavic community in Portland

Potential Opportunities for Collaboration: The Slavic Community Center of NW could provide guidance and or collaborate with outreach to Slavic community in Portland.

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[24] REACH CDC, 2015. Web page accessed December 10, 2015. http://reachcdc.org/
[25] Slavic Community Center of NW, 2015. Web page accessed December 9, 2015. http://slavicfamily.org/

Organization: Urban League of Portland[26]

Mission: The Urban League of Portland's mission is to empower African Americans and others to achieve equality in education, employment, health, economic security and quality of life.

Community Served: African Americans and other people of color in the region.

Programs: The Urban League of Portland's programs include a distinctive blend of direct services, organizing, outreach, and advocacy. They offer workforce services, community health services, summer youth programming, senior services, meaningful civic engagement opportunities, and powerful advocacy.

Potential Opportunities for Collaboration: The Urban League Portland could provide guidance on outreach to African Americans and communities of color. In addition, there may be the opportunity to collaborate with their Diversity and Civic Leadership V.O.I.C.E. (Voice Our Importance through Community Engagement) Project, which is a series of forums to provide information, raise awareness and to provide the community with a voice on issues and decision-making in the city and region.

Organization: Verde[27]

Mission: Verde serves communities by building environmental wealth through social enterprise, outreach and advocacy.

Community Served: Low income communities of Portland

Programs: Verde's Social Enterprise work employs and trains low-income adults, creates contracting opportunities for minority-owned and woman-owned businesses and brings environmental assets to low-income neighborhoods.

Verde Outreach works to address the divide that exists between sustainability and low-income communities. Verde and partners bring new environmental investments to the Cully Neighborhood by creating an EcoDistrict. Through Policy Advocacy, Verde and partners create a policy framework that empowers low-income people and people of color to drive environmental resources into their neighborhoods, in response to existing community needs. Other policy focused work includes Clean Energy Works Oregon and Portland Bike Share.

Partners: Hacienda CDC and NAYA

Potential Opportunities for Collaboration: Verde will likely be interested in the potential impacts of natural hazards in the communities that they work and interested in how their projects could help build resilient communities.

[26] Urban League of Portland, 2015. Web page accessed December 9, 2015. http://www.ulpdx.org/.
[27] Verde NW, 2015. Web page accessed December 9, 2015. http://www.verdenw.org/.

PUBLIC SURVEY

Portland Natural Hazard Mitigation Plan (NHMP)

Survey Distribution Plan

Introduction and Purpose

As part of Portland's 2016 Natural Hazard Mitigation Plan update, a public survey will be used to inform action item development and prioritization, as well as inform the planning team how best to communicate with the public about natural hazard risks and risk reduction. The survey will help meet FEMA requirements for public involvement, earn points for the National Flood Insurance Program (NFIP) Community Rating System (CRS), as well as advance the City of Portland's equity objectives. It will reach a broad cross-section of the Portland population, with an emphasis on the populations most vulnerable to natural hazard risks – economically disadvantaged populations, communities of color, those with limited English proficiency, immigrants or refugees, and others who are historically underrepresented in government activities or experience greater likelihood of negative consequences from natural hazard events.

The NHMP survey will be launched Monday February 1st, 2016 and will remain open at a minimum through the close of the 2016 NHMP plan update. Initial results will be compiled April 3rd, 2016 to inform action item development, plan content, and outreach strategies. It will be distributed online in English, Spanish, Chinese, Russian, Ukrainian, and Vietnamese, through translation provided by Oregon Translation, LLC. It includes questions intended to gather information about how Portlanders think about preparedness and reducing risk from natural hazards; questions to collect demographic information, such as income level, ethnic identification, household structure; and questions to identify the respondents' country of birth and language spoken at home. Data is also collected related to how the respondent learned about the survey and whether he or she would like to be contacted with additional related information.

Web Survey

The web survey will be provided through Survey Gizmo at the following link.

http://sgiz.mobi/s3/Portland-Preparedness-Survey

The QR Code below will also be used to direct people to the survey.

The public will be directed to PBEM's website at http://www.portlandoregon.gov/pbem through a variety of outreach methods, to be discussed below. PBEM's main webpage will host the link to the web survey.

Social Media –

The web survey will be distributed via a variety of online social media. PBEM's social media networks to be used include:

- Facebook
- Twitter
- NextDoor

PBEM will also request that its bureau partners share the survey link through their social media networks as well. PBEM will work with Public Information Officers at Portland Fire & Rescue, Portland Police, Portland Water Bureau, and Portland Parks and Recreation.

Survey Cards –

The following will be printed on quarter-sheet postcards to be distributed in strategic locations throughout Portland.



Cards will be placed at computer terminals in all Multnomah County libraries in Portland. Libraries at which the survey cards will be distributed include:

- St. Johns Library
- Kenton Library
- North Portland Library
- Capitol Hill Library
- Northwest Library
- Albina Library
- Central Library
- Hillsdale Library
- Sellwood-Moreland Library
- Woodstock Library
- Belmont Library
- Hollywood Library

- Gregory Heights Library
- Holgate Library
- Rockwood Library
- Midland Library

Cards will also be placed at computer terminals in Portland State University Library and Portland Community College Library.

Other locations throughout Portland to distribute survey cards will be identified as time and resources allow. Possible locations include schools, grocery stores, and the Lloyd Center Mall. If practical and cost-effective, cards may be distributed in water bills through coordination with the Portland Water Bureau.

Flyers –

Flyers with information about the survey will be displayed at strategic locations, where survey cards are not cost-effective or practical. Locations where flyers may be displayed include schools, grocery stores, and major employers in Portland. See flyer in Appendix A.

Email Distribution –

A link to access the survey via PBEM's website will be distributed via email to the following groups:

- NHMP steering committee
- NHMP stakeholders distribution list
- NET distribution list
- All Neighborhood Coalition Offices

Along with the survey link, a flyer in PDF format will be attached to emails for printing and distribution. Steering committee members, NHMP stakeholders, NETs, and Neighborhood Coalition Offices will be asked to share the survey within their networks. If possible, the link and flyer will also be emailed out via the Portland Parks survey distribution list.

Newsletters and Print Media –

To the extent publication deadlines align with the timing of the NHMP Preparedness Survey, notices will be published in the Northwest Examiner and Southwest News via Portland's Crime Prevention Communications Program.

Notices may be placed in city newsletters including the Portland Water Bureau newsletter and Office of Equity and Human Rights newsletters, as possible.

News Media –

During the week of February 1st, 2016 through February 5th, 2016, local news stations will be contacted regarding the survey through a brief press release. Interviews and information will be provided to support news coverage of the survey. The public will be encouraged to participate and will be offered the opportunity to be entered in a prize drawing for preparedness kits and emergency gear. Possible networks include:

- KBOO
- KOIN
- OPB
- Univision/Spanish Radio
- Slavic Family Media

In-Person Outreach –

NHMP Steering Committee members will be encouraged to hold focus groups to discuss the NHMP survey, in order to give an opportunity for constituents to ask questions and provide real-time feedback. PBEM staff will be available to support these efforts as scheduling and resources allow.

PBEM staff will promote the survey at meetings and events, including Parents for Preparedness, Public Involvement Advisory Committee (PIAC), and other community events as possible.

PBEM staff will participate as a vendor at the Portland Fix-It-Fair on February 20th, 2016. Three to five PBEM iPads will be available at the PBEM booth, with which attendees will be encouraged to take the survey. At least 50 paper copies of the survey will be printed and made available at the event. Paper copies will have the information links written out.

Paper Survey

Paper surveys will be printed in English and in all five translated languages. The number of printed copies will depend on opportunities to distribute. Printed surveys will include PBEM contact information in a highly visible place so that participants know who to call with questions or to arrange for the completed survey to be collected. Paper surveys will be distributed at the events/groups below, as well as others as opportunities allow.

- East Portland Action Plan (EPAP) General Meeting – March 23rd, 2016 6:30pm – 8:30pm
  (Spanish)
- Portland Fix-it-Fair – February 20th, 2016 (All Day)
  (All languages available)
- APANO
  (Vietnamese, Chinese)
- IRCO Russian/Slavic Coalition – Civic Engagement Steering Committee every 3rd Monday from 7:00pm-9:00pm. March 15th, 2016. Contact: Oleg Kubrakov, olegk@mail.irco.org
  (Russian, Ukrainian)
- IRCO Asian Family Services
  (Vietnamese, Chinese)
- Fubonn Supermarket, SE 82nd Avenue (Monday – Sunday 9am to 8pm), Contact: 503-517-8899
- Slavic Church Emmanuel
  (Russian, Ukrainian)
- St. John the Baptist Ukrainian Orthodox Church
  (Russian, Ukrainian)
- Vietnamese Community of Oregon

(Vietnamese)

Where paper surveys are left on site to be distributed over a period of time, a locking drop box placarded with PBEM contact information will be provided for returned surveys. During events or meetings where PBEM staff remain on site, paper surveys will be collected real-time if possible. Participants who do not complete their survey at the time of distribution will be encouraged to make arrangements with PBEM staff via phone or email to have the completed survey collected at a public location.

PBEM staff will manually input data received via paper survey into the web-based survey. If comments are received in languages other than English, Oregon Translation Services, LLC will be contracted to translate the surveys. Intervals at which surveys are translated will depend upon the number of surveys requiring translation.

Appendix A – Survey Flyer



How do you prepare?

Help us make Portland ready. Win prizes. Tell us how you prepare here:

www.portlandoregon.gov/pbem

By taking 10 minutes to complete the Portland Preparedness Survey, you'll help City of Portland offices prioritize projects aimed at reducing our risk from natural hazards. You can also be entered to win prizes, including a $150 emergency kit, and other cool preparedness gear!

русский Tiếng Việt Español український 中文

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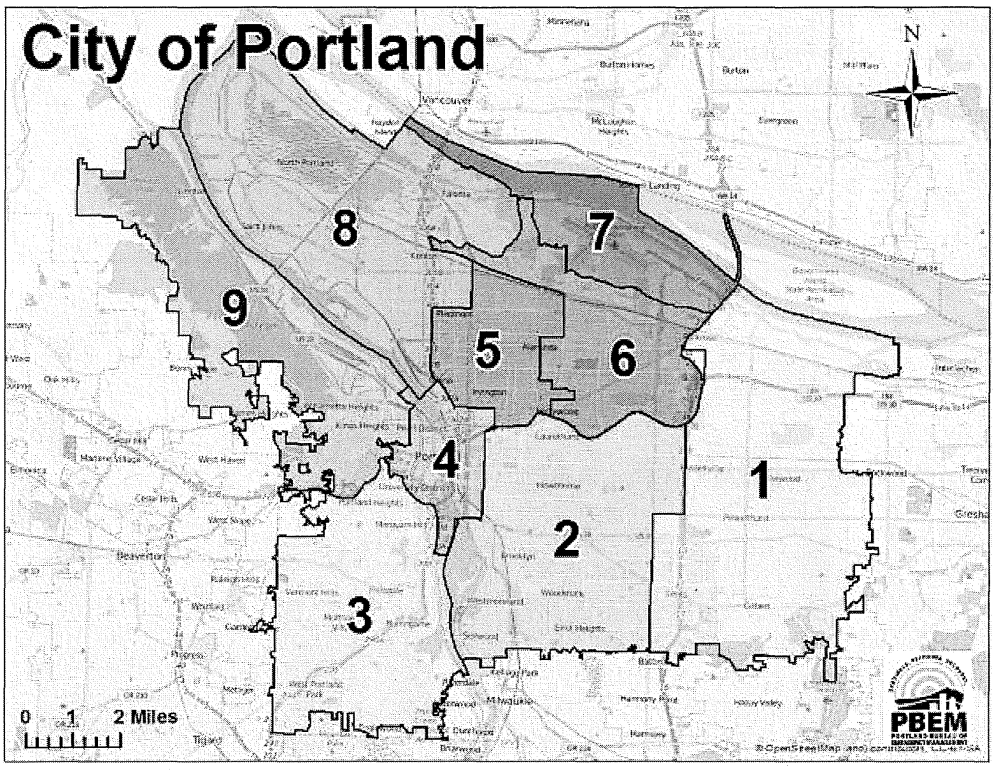
Portland Preparedness Survey

Natural Hazards and You



Zoomable map here: http://arcg.is/1NV6tl3.

1. Where do you live?

- Area 1 - East Portland
- Area 2 - Southeast
- Area 3 - Southwest
- Area 4 - Central City/Downtown
- Area 5 - Northeast
- Area 6 - Central Northeast
- Area 7 - Airport
- Area 8 - North Portland
- Area 9 - West/Northwest
- Outside of Portland

Where outside of Portland do you live?

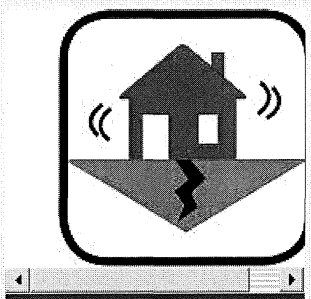
How long have you lived in Portland?

- 0-5 Years
- 6-10 Years
- 11-20 Years
- 21-25 Years
- >25 Years

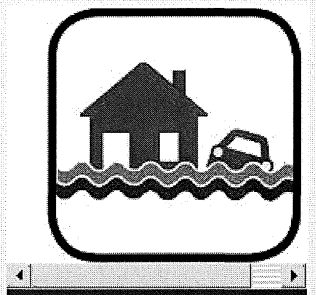
2. Where in Portland do you and your family spend most of your time (school or work)? *Select all that apply.*

- ☐ Area 1 - East Portland
- ☐ Area 2 - Southeast
- ☐ Area 3 - Southwest
- ☐ Area 4 - Central City/Downtown
- ☐ Area 5 - Northeast
- ☐ Area 6 - Central Northeast
- ☐ Area 7 - Airport
- ☐ Area 8 - North Portland
- ☐ Area 9 - West/Northwest
- ☐ Other

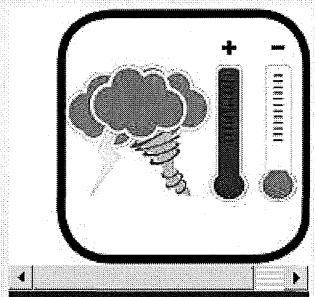
3. Select the three (3) natural hazards you worry about most.
To follow links for more information, right click link and select "open in new tab".



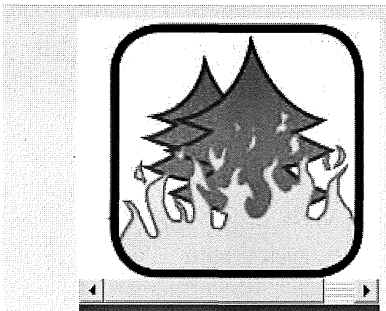
Earthquake
Click here for more information about earthquakes.



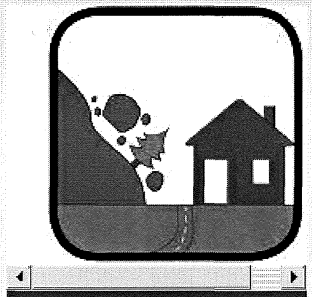
Flood
Click here for more information about floods.



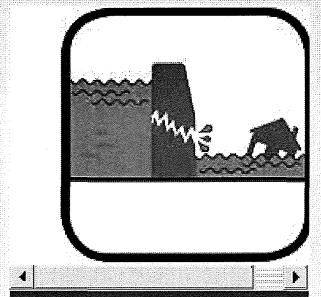
Severe Weather
Click here for more information about severe weather.



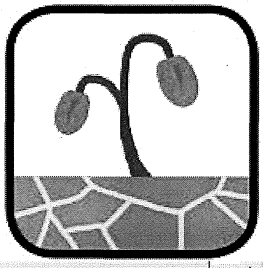
Wildfire
Click here for more information about wildfire.



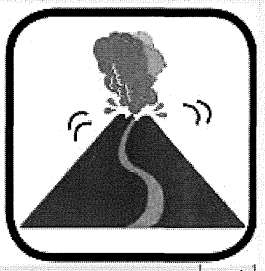
Landslide
Click here for more information about landslides.



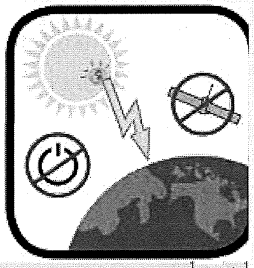
Dam Failure
Click here for more information about dam failure.



Drought
Click here for more information about drought.



Volcano
Click here for more information about volcanos.



Space Weather
Click here for more information about space weather.



Other

4. What other natural hazards do you worry about?

5. Have you experienced any of the hazards above?

- Yes
- No

6. Can you tell us about your experience?

7. Have you done any of these things to make you and your family safer?
To follow links for more information, right click link and select "open in new tab".

- ☐ I buy flood insurance for my home. *More information here.*
- ☐ I buy earthquake insurance for my home. *More information here.*
- ☐ I strengthened my home against earthquakes. *More information here.*
- ☐ I clear debris from my storm drains. *More information here.*
- ☐ I plant drought-resistant plants. *More information here.*
- ☐ I secure my water heater, book cases, or other objects that could fall in an earthquake. *More information here.*
- ☐ I maintain a "defensible space" clear of vegetation and flammable material. *More information here.*
- ☐ I elevated my home or utilities above potential flood levels. *More information here.*
- ☐ I make decisions about where to live based on natural hazard risks. *More information here.*
- ☐ I use fire-resistant landscaping around my home. *More information here.*
- ☐ I regularly trim trees near my house or near power lines. *More information here.*
- ☐ I haven't done any of these.
- ☐ Other

1778

8. Have you done any of these things to be prepared for an emergency? *To follow links for more information, right click link and select "open in new tab".*

- ☐ I work with my neighbors on emergency preparedness. More information here.
- ☐ I have registered for Public Alerts in my preferred language. *Go to PublicAlerts.org to register.*
- ☐ I know where my neighborhood BEECN is. *Find your neighborhood BEECN here.*
- ☐ I have an emergency kit at home. *More information here.*
- ☐ I have an emergency kit in my car. *More information here.*
- ☐ My household has an emergency plan. *More information here.*
- ☐ I have an emergency plan for my pets. *More information here.*
- ☐ I have received emergency training. *More information here.*
- ☐ I have an emergency source of power. *More information here.*
- ☐ I have emergency food and water. *More information here.*
- ☐ I have an emergency contact outside of the area. *More information here.*
- ☐ I know where I would go in an emergency. *More information here.*
- ☐ I have money saved for emergency use. *More information here.*
- ☐ I haven't done any of these.
- ☐ Other

9. Do any of these things make it hard for you to prepare your family for emergencies?

- [ ] I don't have the money.
- [ ] I have more important things to worry about.
- [ ] Thinking about preparedness is just too overwhelming.
- [ ] I'm too busy.
- [ ] I don't know what I need to do.
- [ ] I'm not sure what my risks are.
- [ ] Other

1780

10. Natural hazards can cause damage that makes it hard to carry out our daily lives. Select three (3) things that would impact you most.

- [ ] Bridge closure
- [ ] Loss of public transportation
- [ ] Internet outage
- [ ] Power outage
- [ ] Telephone outage
- [ ] Grocery store closure
- [ ] Water system damage
- [ ] Sewer system damage
- [ ] Road closure
- [ ] Damage to fuel and natural gas infrastructure
- [ ] Hospital or clinic closure
- [ ] Local business closure
- [ ] School or daycare closure
- [ ] Government office closure
- [ ] Other

Natural Hazards and the City of Portland

11. What are the three (3) most important things the City of Portland government offices should do to reduce the risk from natural hazards?

- [ ] Provide more information to the public about natural hazards.
- [ ] Strengthen public buildings.
- [ ] Reduce development in known hazardous areas.
- [ ] Restore natural floodplains and open space.
- [ ] Build or improve man-made protections (levees for example).
- [ ] Strengthen infrastructure such as bridges, sewer lines, and water pipes.
- [ ] Increase safety requirements for building permits.
- [ ] Collect more data and information about hazard areas.
- [ ] Help citizens reduce their individual natural hazard risks.
- [ ] Other

About You

12. How many people are in your household?

13. Do you own or rent your home?

- ○ Own
- ○ Rent
- ○ Other

14. Were you born in another country?

Yes
No

15. Where were you born?

16. Do you speak English at home?

- Yes
- No

17. What language do you prefer?

- Spanish
- Vietnamese
- Russian
- Chinese
- Romanian
- Ukrainian
- Japanese
- Somali
- Arabic
- Laotian
- Other

18. What is your age?

19. Do you have a physical or mental disability?

- No
- Yes

20. How many people in your home work to provide for the family?

21. Would you consider your household income low, middle, or high?

- Low
- Middle
- High

22. How do you identify yourself by race or ethnicity?

23. Are you a trained Community Emergency Response Team/Neighborhood Emergency Team member?

- Yes
- No

24. How did you find out about this survey?

- Library
- Social Media (Facebook, Twitter, NextDoor)
- Neighborhood Association
- City Website
- Radio/News Coverage
- Friend, Family Member, or Colleague
- Email
- Other

Prizes!

25. What is your email address or phone number?
This survey is completely anonymous, but if you want to be entered in our prize drawing to win free preparedness kits and emergency gear, we need to be able to contact you. The raffle drawing will be held on April 11, 2016.

26. Would you like us to contact you with related information and training opportunities?

- Yes
- No

Thank You!

Thank you for telling us about how you think about preparedness! The information you provided will help us prioritize projects, and lets us know how best to share information with you. *Visit our website here: www.portlandoregon.gov/pbem for more information.*

Report for Portland Preparedness Survey

There were 2,970 responses to the public survey between February and April of 2016. Key results are summarized below.

Geographic Representation and Residency Tenure

Survey responses were received from all risk reporting areas and from individuals who live outside of Portland. 75.5 percent of all respondents indicated that they live within Portland.

When non-residents are excluded, the percent of responses from risk reporting areas is representative of the estimated population in some cases; however, there are some areas with under- and over-representation. Over-represented areas included: Northeast, Southeast and Southwest. Under-represented areas include: Central City/Downtown and East Portland. The remaining reporting areas were within 1 percent of the estimated population. See the table below for more information.

Risk Reporting Area	Estimated Population	Estimated Percent of Population	Percent of Survey Responses (excluding outside of Portland)
Airport	2,674	0.4%	0.2%
Central City/Downtown	37,987	**6.2%**	**3.6%**
Central Northeast	47,644	7.8%	7.1%
East Portland	148,712	**24.2%**	**9.6%**
West/Northwest	26,875	4.4%	4.9%
North Portland	68,047	11.1%	12.1%
Northeast	57,842	**9.4%**	**15.9%**
Southeast	153,952	**25.1%**	**32.6%**
Southwest	70,262	**11.4%**	**13.8%**

The majority of respondents who live in Portland have lived in the City for 11 or more years (62 percent). 26 percent of respondents indicated that they have lived in the City for more than 25 years.

The top three areas where all survey respondents indicated that they and their families spend the most time include: Central City/Downtown (42 percent), Southeast (34 percent) and Southwest (25 percent). When non-Portland residents are excluded the top three areas indicated include Central City/Downtown (43 percent), Southeast (40 percent), Southwest and Northeast (about 25 percent each).

Demographics

72 percent of Portland resident respondents self-identified as middle income and 13 percent identified their household as low income. According to American Community Survey (ACS) estimates, approximately 12 percent of Portland families are surviving on incomes below the federal poverty line.

When non-Portland residents are excluded 99 percent of respondents indicated that they speak English at home. Only 9 respondents indicated that they preferred languages other than English. The ACS estimates that limited English speaking households make up approximately 4 percent of Portland households.

72 percent of Portland respondents indicated that they own their home, while 27 percent indicated that they rent their home. The ACS estimates that 43 percent of the housing units in the City are renter occupied.

Approximately 9 percent of respondents indicated that they have physical or mental disability. According to U.S census estimates 8.5 percent of Portland residents under age 65 have a disability. 13 (about 7 percent) of respondents indicating that they had a disability also indicated that they were 65 years of age or older.

Respondents were able to enter their own racial identity rather than choosing from pre-determined options. Approximately 79 percent of respondents indicated that they identified as white/Caucasian or Anglo. According to ACS estimates, 78 percent of the Portland population is white.

Hazards of Concern

For Portland residents, the top three hazard of concern selected were: earthquake (96 percent), severe weather (51 percent) and drought (34 percent). Dam failure (3.9 percent) and space weather (8 percent) were the least likely to be selected. The top three hazards remain the same when non-Portland residents are included.

53 percent of Portlanders indicated that they had experienced one of the hazard of concern.

Thoughts on Preparedness and Mitigation

Portlanders indicated that they have made efforts to reduce risk to their families. Portlanders clear storm drains (50 percent), have made non-structural retrofits, such as securing a water heaters (42 percent), and have planted drought-resistant plants (33 percent). Only 6 percent of Portlanders indicated that they have purchased flood insurance, while 27 percent indicated that they have purchased earthquake insurance. 17 percent of Portlanders indicated that they had not done any of the options indicated. There were a large number of respondents who indicated that they had not taken these measures because they rent or live in apartment buildings or condominiums.

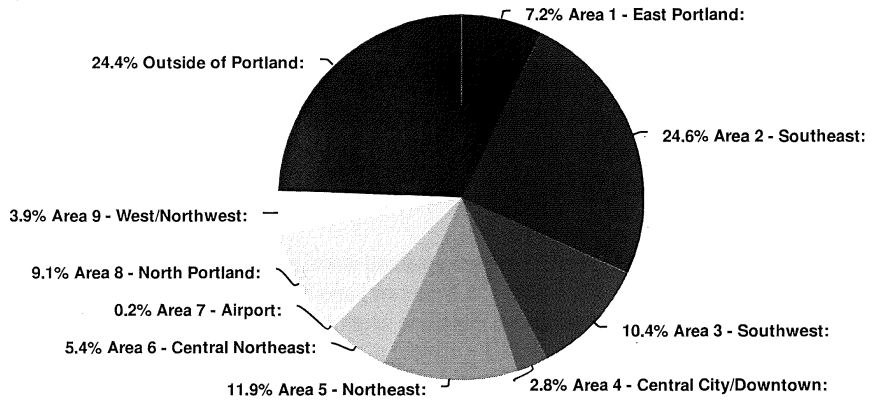
The top three things Portlanders have done to prepare for a natural hazard event include: obtained emergency food and water (58 percent), have an emergency kit at home (54 percent) and registered for public alerts (46 percent). Only 10 percent of respondents indicated that they had done nothing to prepare. When non-Portland residents are included, the results are similar.

Portlanders indicated the top three reasons for not preparing for emergencies included: lack of money (40 percent), being too busy (34 percent) and preparing being too overwhelming (32 percent).

Portlanders indicated that power outage (67 percent), water system damage (65 percent) and bridge closures (43 percent) would impact them the most. Responses were similar when all survey respondents are included.

Portlanders selected strengthen infrastructure such as bridges, sewer lines and water pipes (85 percent), strengthen public buildings (44 percent), and help citizens reduce their individual natural hazard risks (36 percent) as the three most important things that the City of Portland government could do to reduce risk from natural hazards. Strengthening schools was also commonly mentioned.

1. Where do you live?



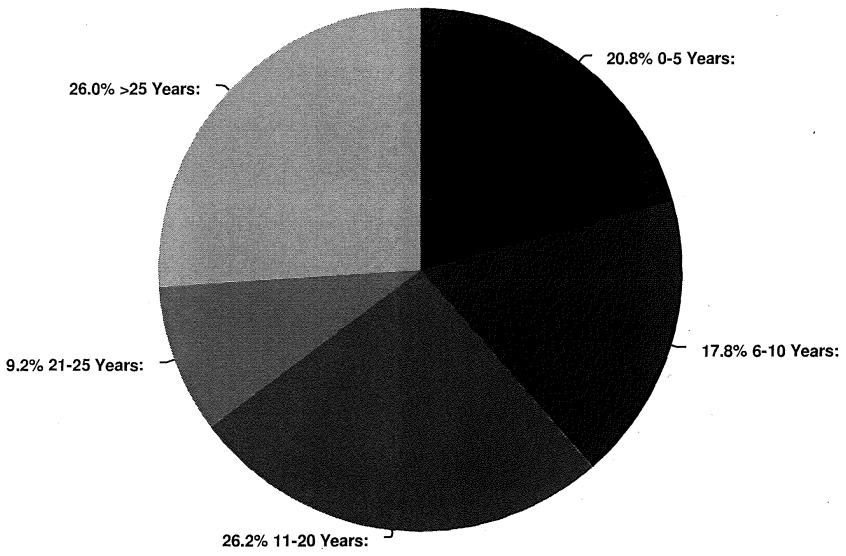
Value	Percent	Count
Area 1 - East Portland	7.2%	215
Area 2 - Southeast	24.6%	730
Area 3 - Southwest	10.4%	309
Area 4 - Central City/Downtown	2.8%	83
Area 5 - Northeast	11.9%	354
Area 6 - Central Northeast	5.4%	161
Area 7 - Airport	0.2%	5
Area 8 - North Portland	9.1%	270
Area 9 - West/Northwest	3.9%	116
Outside of Portland	24.4%	723
	Total	**2,966**

2. Where outside of Portland do you live?

Areas outside of Portland commonly mentioned include:

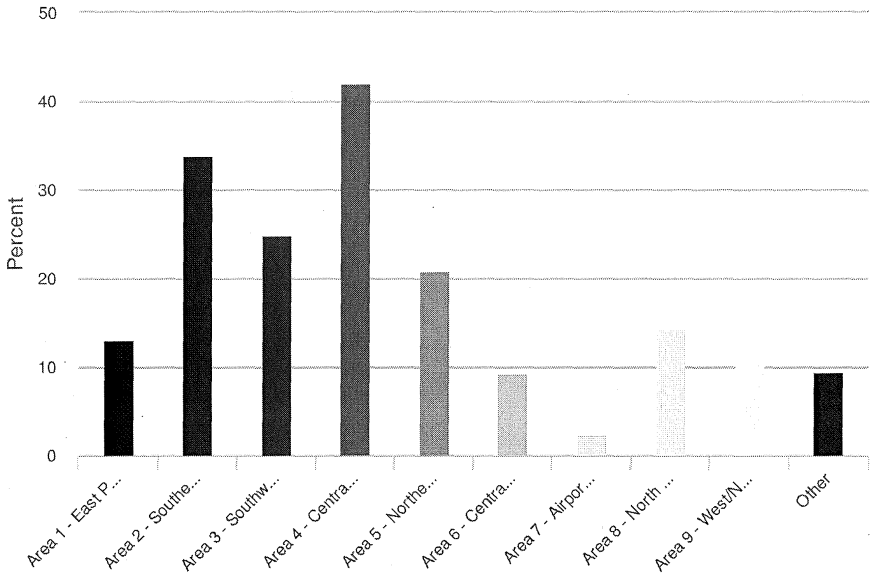
- Beaverton,
- Hillsboro,
- Tigard,
- Gresham,
- Milwaukie,
- Vancouver,
- Oregon City,
- Happy Valley,
- Lake Oswego,
- West Linn,
- Aloha,
- Tualatin,
- Sherwood,
- Troutdale,
- Fairview,
- Clackamas County,
- Gladstone,
- Newberg,
- Washington County,
- Camas,
- Cedar Hills,
- Forest Grove,
- Sandy, and
- Wilsonville.

3. How long have you lived in Portland?



Value	Percent	Count
0-5 Years	20.8%	436
6-10 Years	17.8%	374
11-20 Years	26.2%	550
21-25 Years	9.2%	192
>25 Years	26.0%	544
	Total	**2,096**

4. Where in Portland do you and your family spend most of your time (school or work)? Select all that apply.

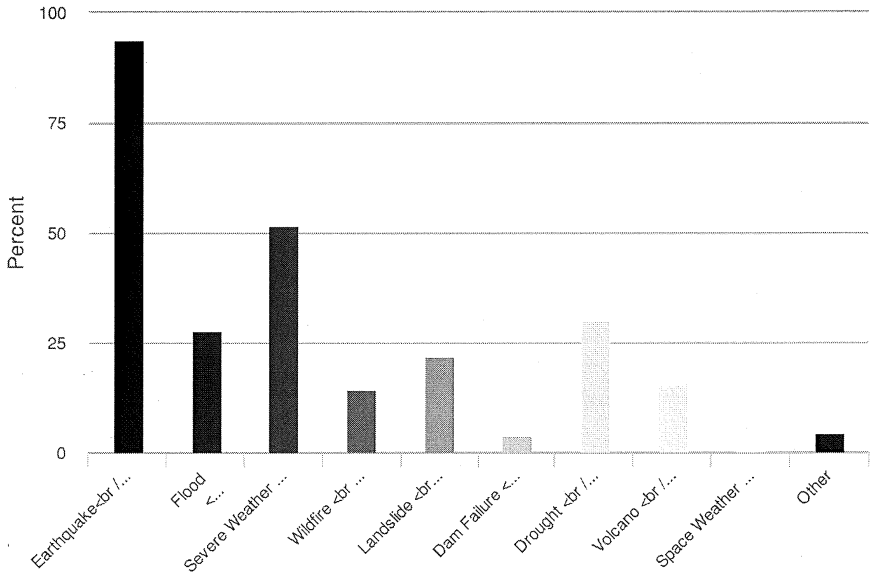


Value	Percent	Count
Area 1 - East Portland	13.1%	404
Area 2 - Southeast	33.9%	1,044
Area 3 - Southwest	25.0%	769
Area 4 - Central City/Downtown	42.0%	1,294
Area 5 - Northeast	20.8%	639
Area 6 - Central Northeast	9.3%	286
Area 7 - Airport	2.4%	75
Area 8 - North Portland	14.4%	442
Area 9 - West/Northwest	10.3%	317
Other	9.5%	291

Other areas commonly mentioned include:

- Beaverton,
- Vancouver,
- Hillsboro,
- Tigard,
- Milwaukie,
- Gresham,
- Oregon City,
- Lake Oswego,
- Hillsboro, and
- Clackamas County.

5. Select the three (3) natural hazards you worry about most.


100
75
50
25
0
Percent
Earthquake
...
Flood
<...
Severe Weather ...
Wildfire <br ...
Landslide <br ...
Dam Failure <...
Drought <br />...
Volcano <br />...
Space Weather ...
Other

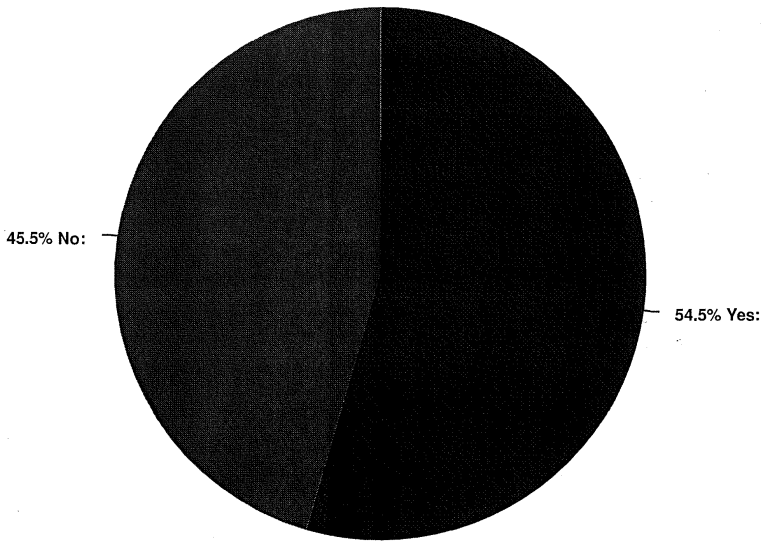
Value	Percent	Count
Earthquake *Click here for more information about earthquakes.*	94.0%	2,862
Flood *Click here for more information about floods.*	27.6%	839
Severe Weather *Click here for more information about severe weather.*	51.7%	1,575
Wildfire *Click here for more information about wildfire.*	14.3%	434
Landslide *Click here for more information about landslides.*	21.9%	666
Dam Failure *Click here for more information about dam failure.*	3.6%	110
Drought *Click here for more information about drought.*	30.2%	919
Volcano *Click here for more information about volcanos.*	15.6%	474
Space Weather *Click here for more information about space weather.*	8.0%	243
Other	4.6%	141

6. What other natural hazards do you worry about?

Other hazards commonly mentioned include:

- climate change,
- tsunami,
- falling trees,
- hazardous material spill/industrial accident,
- loss of electricity,
- economic collapse,
- pandemics,
- radon,
- sinkholes,
- poor air quality, and
- man-made disasters.

7. Have you experienced any of the hazards above?



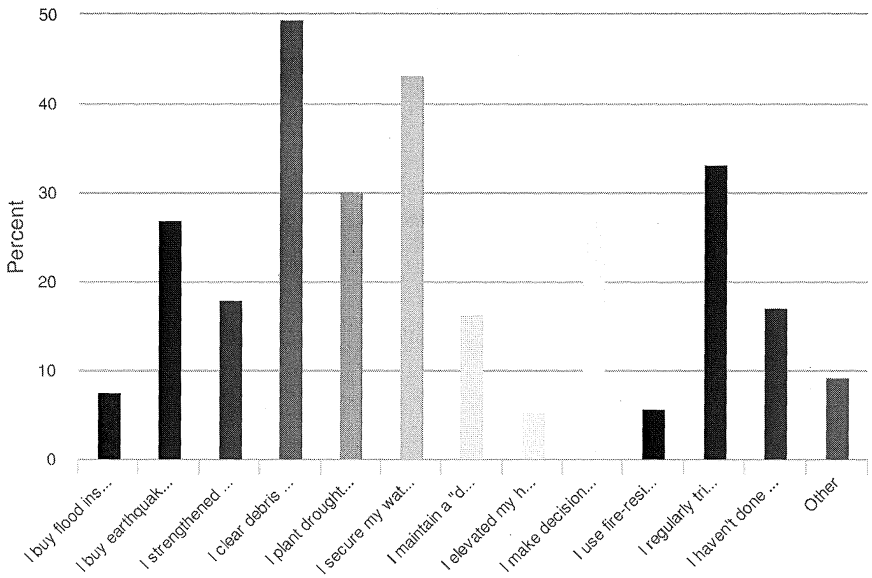
Value	Percent	Count
Yes	54.5%	1,660
No	45.5%	1,386
	Total	**3,046**

8. Can you tell us about your experience?

The vast majority of responses included hazards experienced living, working or vacationing elsewhere. For Portland experienced hazards, respondents most commonly referenced severe weather, earthquakes and flooding. Power outages, difficulty driving/commuting in severe weather, basement flooding and falling trees were commonly mentioned impacts. Many respondents mentioned the following:

- Earthquakes in California or elsewhere
- Portland "Spring Break Quake"
- Minor earthquakes in Portland
- 1996 Floods in Portland
- Eruption of Mt. St. Helens
- Ice storms
- Basement flooding due to severe weather/storms
- Columbus Day storms
- Small-scale nuisance flooding
- Water use restrictions from drought
- Power outages from severe weather/winter weather
- Difficulty driving/commuting in winter weather
- Landslides during the 1996 flood
- Tornadoes, mostly experienced elsewhere
- Hurricanes in other locations
- Wildfire, mostly experienced elsewhere
- Extreme temperatures (heat)
- Downed trees
- High winds
- Flooding in general or experienced elsewhere
- Small landslides in Portland
- Flooding in Johnson Creek, and
- Extreme cold.

9. Have you done any of these things to make you and your family safer?To follow links for more information, right click link and select "open in new tab".


50
40
30
20
10
0
Percent
I buy flood ins...
I buy earthquak...
I strengthened ...
I clear debris ...
I plant drought...
I secure my wat...
I maintain a "d...
I elevated my h...
I make decision...
I use fire-resi...
I regularly tri...
I haven't done ...
Other

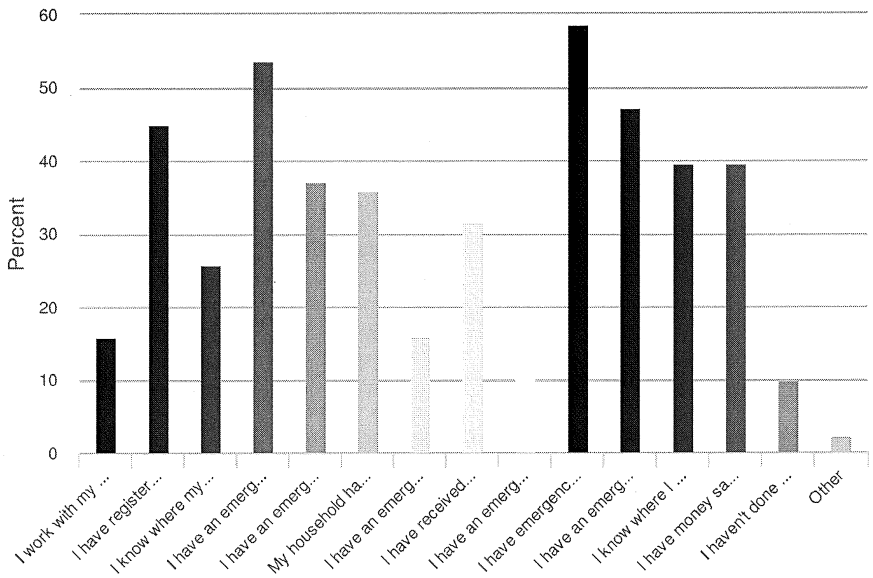
Value	Percent	Count
I buy flood insurance for my home. *More information here.*	7.6%	232
I buy earthquake insurance for my home. *More information here.*	27.0%	825
I strengthened my home against earthquakes. *More information here.*	18.0%	551
I clear debris from my storm drains. *More information here.*	49.5%	1,514
I plant drought-resistant plants. *More information here.*	30.2%	924
I secure my water heater, book cases, or other objects that could fall in an earthquake. *More information here.*	43.3%	1,323
I maintain a "defensible space" clear of vegetation and flammable material. *More information here.*	16.2%	496
I elevated my home or utilities above potential flood levels. *More information here.*	5.5%	168
I make decisions about where to live based on natural hazard risks. *More information here.*	27.3%	835
I use fire-resistant landscaping around my home. *More information here.*	5.8%	178
I regularly trim trees near my house or near power lines. *More information here.*	33.2%	1,016
I haven't done any of these.	17.1%	523
Other	9.4%	286

The vast majority of the comments related to living in an apartment, being a renter or preparing an emergency kit (addressed in the subsequent question). Common responses included:

- I live in an apartment/condo or rent
- Water capture systems, such as rain barrels
- Improved drainage around home, and
- Located/modified gas shutoff valves.

10. Have you done any of these things to be prepared for an emergency?To follow links for more information, right click link and select "open in new tab".

1800


60
50
40
30
20
10
0
Percent
I work with my ...
I have register...
I know where my...
I have an emerg...
I have an emerg...
My household ha...
I have an emerg...
I have received...
I have an emerg...
I have emergenc...
I have an emerg...
I know where I ...
I have money sa...
I haven't done ...
Other

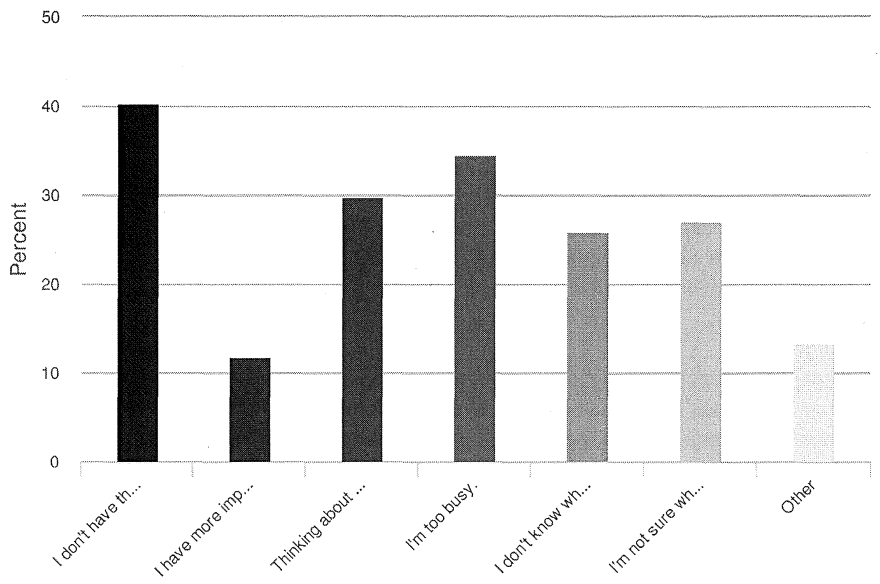
Value	Percent	Count
I work with my neighbors on emergency preparedness. More information here.	15.9%	488
I have registered for Public Alerts in my preferred language. *Go to PublicAlerts.org to register.*	45.0%	1,381
I know where my neighborhood BEECN is. *Find your neighborhood BEECN here.*	25.7%	788
I have an emergency kit at home. *More information here.*	53.6%	1,642
I have an emergency kit in my car. *More information here.*	37.2%	1,141
My household has an emergency plan. *More information here.*	35.9%	1,101
I have an emergency plan for my pets. *More information here.*	15.9%	489
I have received emergency training. *More information here.*	31.6%	969
I have an emergency source of power. *More information here.*	14.9%	457
I have emergency food and water. *More information here.*	58.6%	1,797
I have an emergency contact outside of the area. *More information here.*	47.2%	1,448
I know where I would go in an emergency. *More information here.*	39.5%	1,212
I have money saved for emergency use. *More information here.*	39.6%	1,213
I haven't done any of these.	10.0%	306
Other	2.3%	71

Other common responses included:

- Emergency kit at work
- NET/CERT volunteer
- Emergency communication system (e.g. ham radio), and
- Participate in drills.

11. Do any of these things make it hard for you to prepare your family for emergencies?

1802

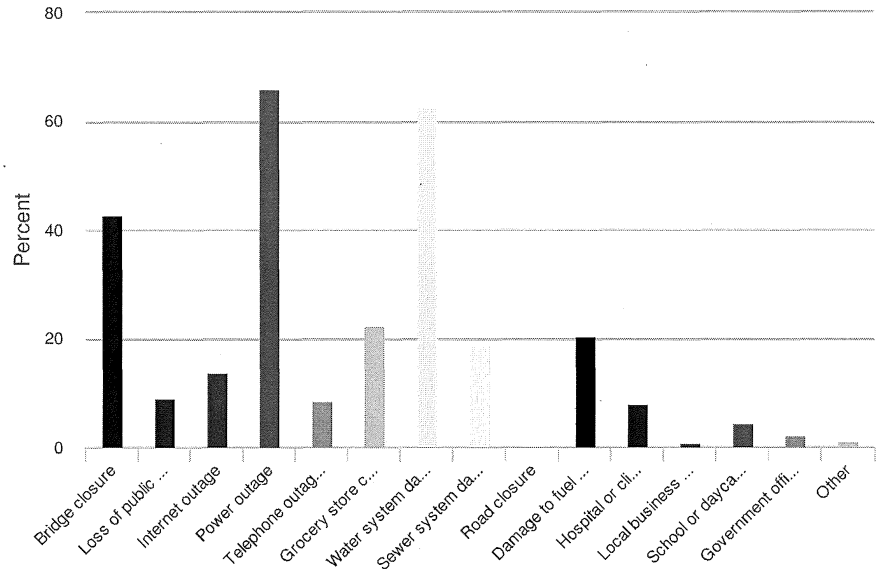


Value	Percent	Count
I don't have the money.	40.3%	997
I have more important things to worry about.	11.8%	293
Thinking about preparedness is just too overwhelming.	29.8%	739
I'm too busy.	34.6%	857
I don't know what I need to do.	25.9%	641
I'm not sure what my risks are.	27.2%	674
Other	13.4%	332

Other common responses included:

- Procrastination
- Laziness
- Denial
- Disability/elderly
- Don't have room or a secure place to store items
- Don't own home or live in an apartment building
- Difficulty retrofitting older homes
- Lack of people taking it seriously (friends/family/neighbors)
- Have started preparations, but have not completed them
- Have not prioritized it
- Lack of urgency
- Issues regarding rotation of food/medicine/water etc.
- Unsure how to address some issues related to planning/preparing
- Issues regarding preparations for pets
- Uncertainty/unknowns

12. Natural hazards can cause damage that makes it hard to carry out our daily lives. Select three (3) things that would impact you most.

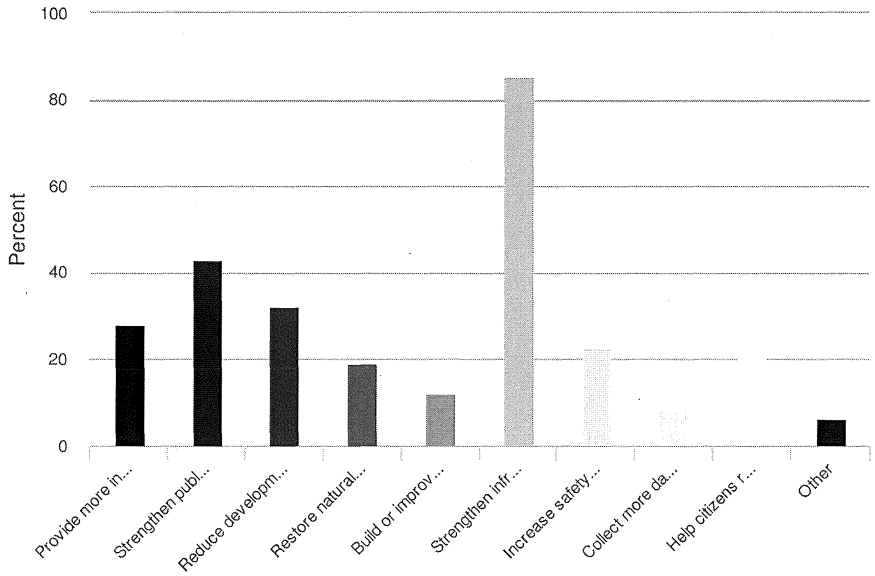


Value	Percent	Count
Bridge closure	42.8%	1,321
Loss of public transportation	9.1%	281
Internet outage	13.7%	423
Power outage	66.0%	2,036
Telephone outage	8.5%	261
Grocery store closure	22.3%	688
Water system damage	62.5%	1,929
Sewer system damage	19.1%	588
Road closure	15.7%	483
Damage to fuel and natural gas infrastructure	20.4%	630
Hospital or clinic closure	7.9%	244
Local business closure	0.7%	21
School or daycare closure	4.5%	138
Government office closure	2.3%	71
Other	1.2%	36

Other common responses included:

- Getting medicine
- Damage to home
- All options listed
- Damage to public schools, and
- Cell phone outages.

13. What are the three (3) most important things the City of Portland government offices should do to reduce the risk from natural hazards?

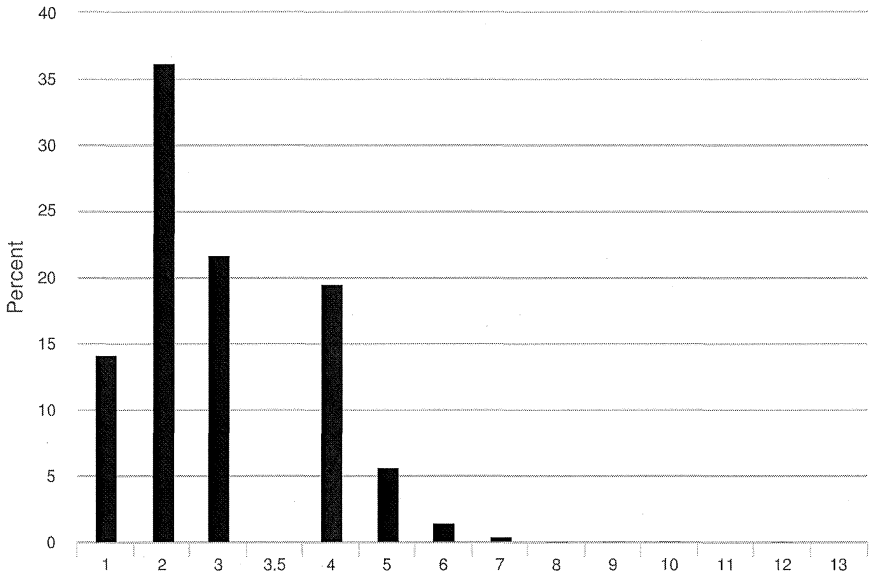


Value	Percent	Count
Provide more information to the public about natural hazards.	28.1%	847
Strengthen public buildings.	43.2%	1,302
Reduce development in known hazardous areas.	32.3%	974
Restore natural floodplains and open space.	19.0%	573
Build or improve man-made protections (levees for example).	12.1%	363
Strengthen infrastructure such as bridges, sewer lines, and water pipes.	85.4%	2,572
Increase safety requirements for building permits.	22.4%	675
Collect more data and information about hazard areas.	8.2%	246
Help citizens reduce their individual natural hazard risks.	35.3%	1,062
Other	6.4%	194

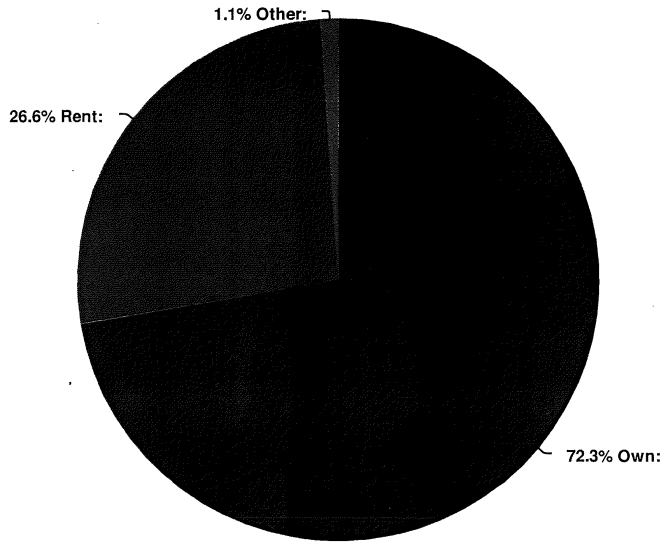
Other common responses included:

- Strengthen schools
- Road infrastructure improvement/address traffic issues
- Subsidize retrofits/preparedness
- Underground utilities
- Tax breaks
- Increase funding/wise use of public resources
- Address oil/gas infrastructure and shutoffs
- Strengthen bridges
- Require upgrades/retrofits
- Provide more information/guidance on planning and preparedness
- Offer more training/classes
- Help make it easier for residents to prepare, especially vulnerable populations.

14. How many people are in your household?

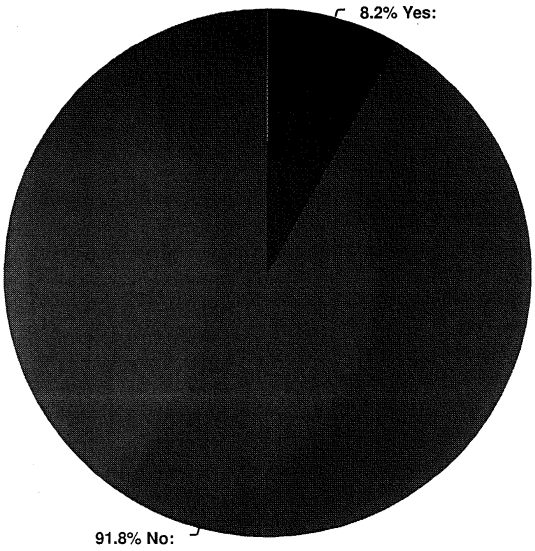


15. Do you own or rent your home?



Value	Percent	Count
Own	72.3%	2,141
Rent	26.6%	789
Other	1.1%	32
	Total	**2,962**

16. Were you born in another country?



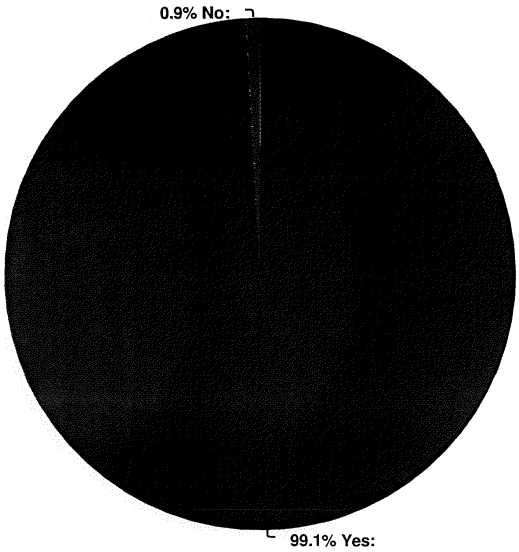
Value	Percent	Count
Yes	8.2%	233
No	91.8%	2,625
	Total	**2,858**

17. Where were you born?

Other common responses included:

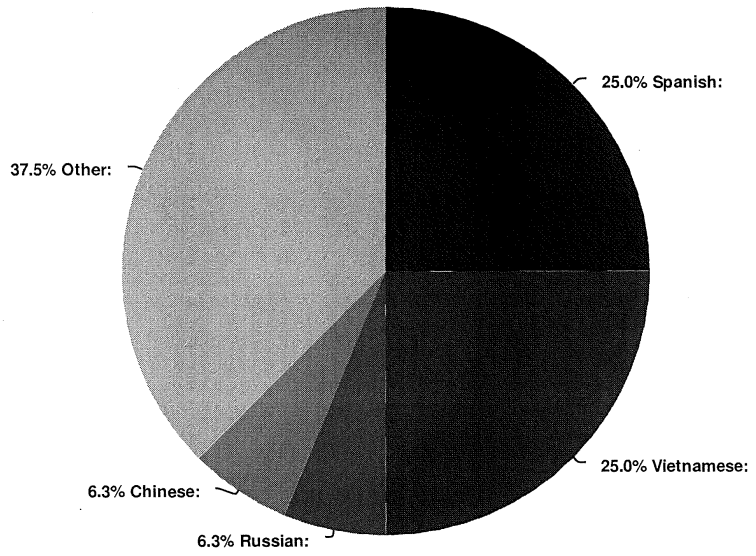
- Germany
- Canada
- Japan
- Philippines
- England
- Mexico
- Ukraine
- Vietnam

18. Do you speak English at home?



Value	Percent	Count
Yes	99.1%	2,941
No	0.9%	27
	Total	**2,968**

19. What language do you prefer?

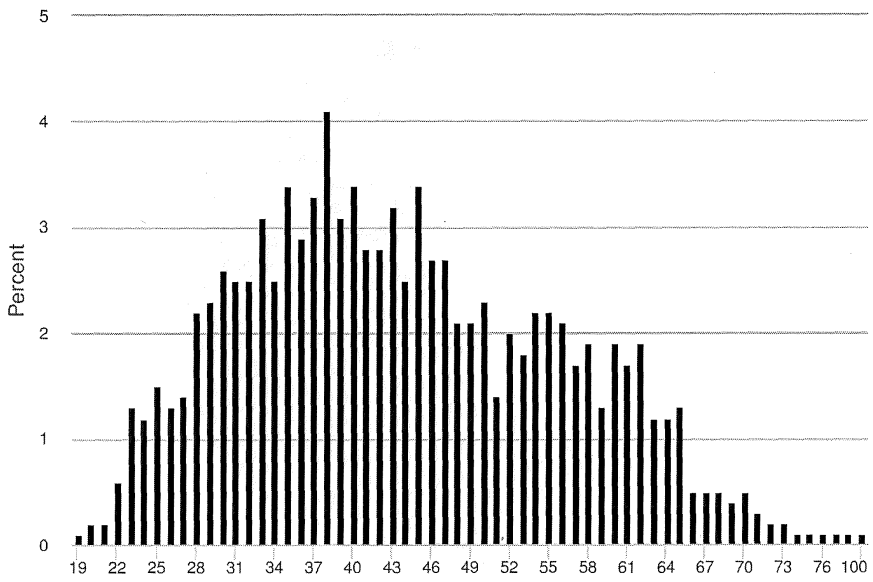


Value	Percent	Count
Spanish	25.0%	4
Vietnamese	25.0%	4
Russian	6.3%	1
Chinese	6.3%	1
Other	37.5%	6
	Total	**16**

Other responses included:

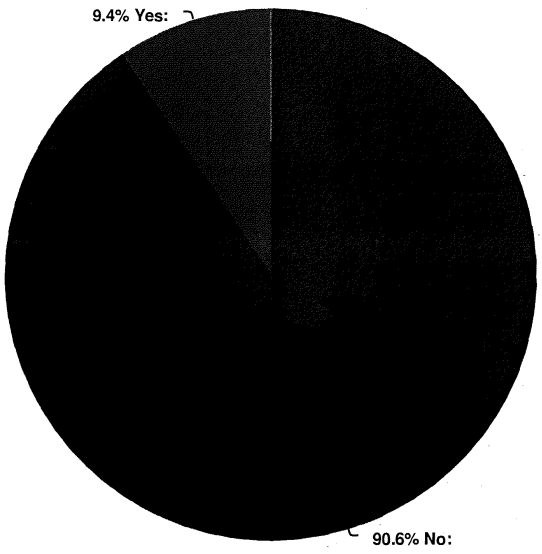
- English
- Hindi
- Nepali
- Persian

20. What is your age?



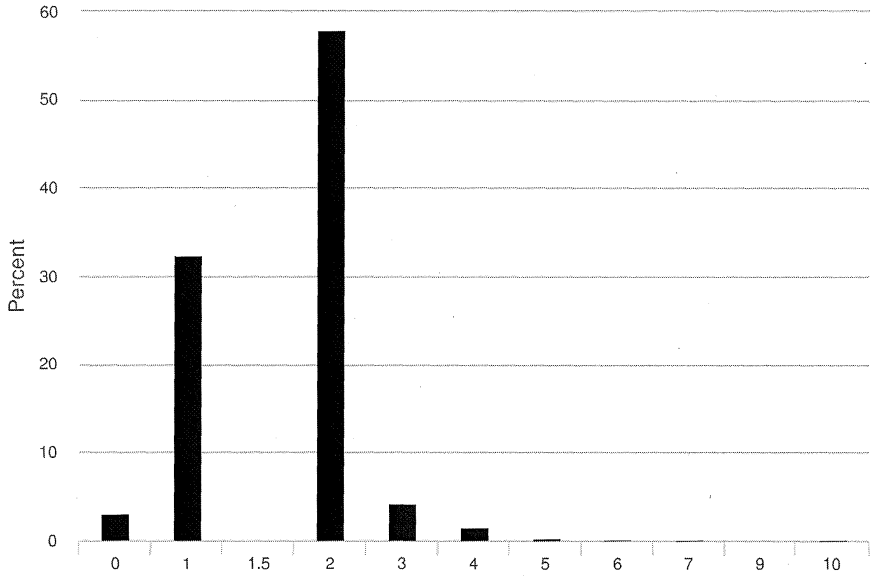
Average age is 43.5 years

21. Do you have a physical or mental disability?



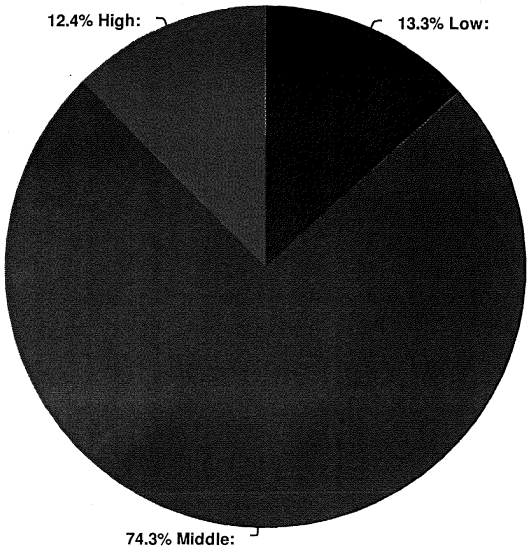
Value	Percent	Count
No	90.6%	1,834
Yes	9.4%	191
	Total	**2,025**

22. How many people in your home work to provide for the family?



Average is 1.7 people.

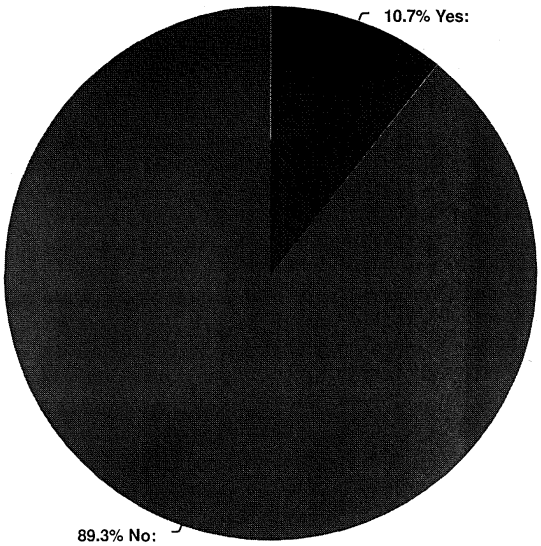
23. Would you consider your household income low, middle, or high?



Value	Percent	Count
Low	13.3%	393
Middle	74.3%	2,197
High	12.4%	366
	Total	**2,956**

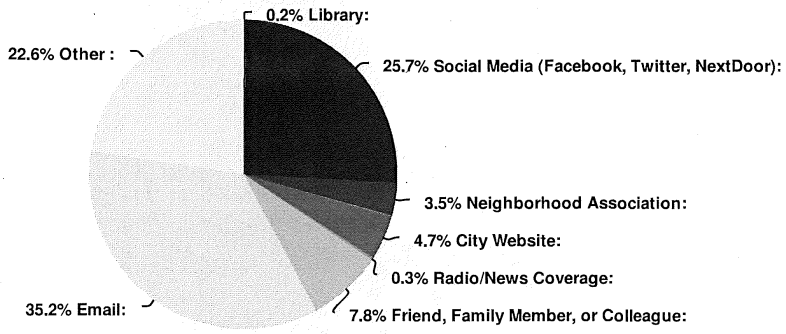
24. How do you identify yourself by race or ethnicity?

25. Are you a trained Community Emergency Response Team/Neighborhood Emergency Team member?



Value	Percent	Count
Yes	10.7%	314
No	89.3%	2,629
	Total	**2,943**

26. How did you find out about this survey?

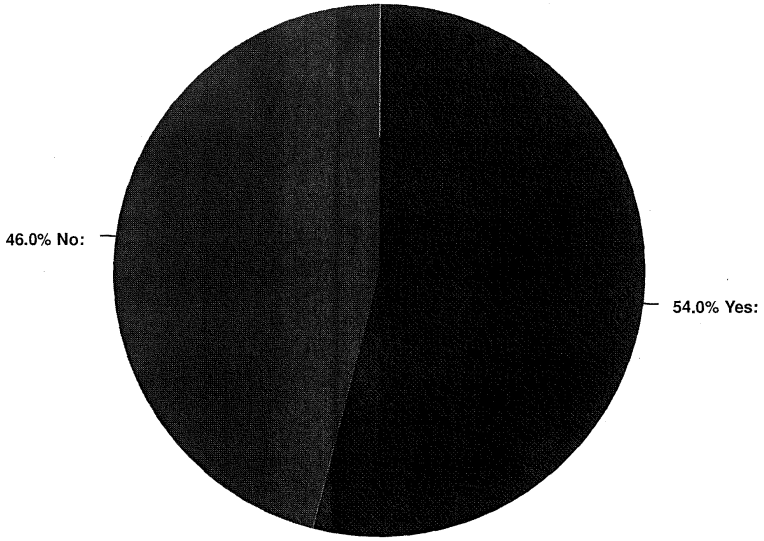


Value	Percent	Count
Library	0.2%	5
Social Media (Facebook, Twitter, NextDoor)	25.7%	761
Neighborhood Association	3.5%	103
City Website	4.7%	140
Radio/News Coverage	0.3%	10
Friend, Family Member, or Colleague	7.8%	231
Email	35.2%	1,040
Other	22.6%	668
	Total	**2,958**

Other common responses included:

- Work/employer
- OHSU
- ARES
- Ozone
- School
- Flash alert

27. Would you like us to contact you with related information and training opportunities?



Value	Percent	Count
Yes	54.0%	1,561
No	46.0%	1,330
	Total	**2,891**

PLANNING FOR REAL WORKSHOPS

Planning for Real Workshop Report

INTRODUCTION

This report summarizes the public feedback gathered in support of Portland's 2016 update to its natural hazard mitigation plan (NHMP). It is intended to be used by city bureaus and offices to identify and prioritize action items to be included in the NHMP.

As part of the planning process, the planning team, with guidance from the steering committee, developed a public engagement strategy to outline the ways in which the planning team would engage the public in the development of the plan. The public engagement strategy recommended that the planning team hold 10 "Planning for Real" workshops throughout Portland. Eight of these workshops would be open to the public and focused geographically in eight of the nine risk reporting areas used for the plan. The risk reporting areas are roughly aligned with Portland's neighborhood coalitions with the addition of a Central City area. The remaining two workshops would be held with community organizations that work with Portland's communities of color and immigrant and refugee communities.

The NHMP planning team ultimately held 7 geographically-based workshops in the following locations:

- Northeast and Central Northeast Portland (joint workshop), April 18th, 2016
- Northeast Portland, April 23rd, 2016
- North Portland, April 30th, 2016
- Southeast Portland, April 24th, 2016
- Southwest Portland, May 3rd, 2016
- North/Northwest Portland and Central City (joint workshop), April 23rd, 2016
- East Portland, May 10th, 2016

The workshops were promoted through and organized with the support of the following neighborhood coalitions and groups:

- Northeast Coalition of Neighbors
- Central Northeast Neighbors
- North Portland Neighborhood Services
- Southeast Uplift
- Southwest Neighborhoods, Inc.
- Neighbors North/Northwest
- East Portland Action Plan

Two workshops were held with community organizations with the following groups:

- Coalition of Communities of Color, Native American Youth and Family Center, Portland Voz, Asian Pacific American Network of Oregon (APANO) and Latino Network, May 7th, 2016
- Community Engagement Liaisons (CELs) representing Chinese, Zomi, Lao, Butanese, Somali, Latino, Iraqi, and Khmer immigrant and refugee communities, May 14th, 2016

Individuals in the Community Engagement Liaisons group are leaders in their communities and are contracted with the City of Portland to act as a bridge between city government and immigrant and refugee communities. Following the CELs workshop, each participant was asked to schedule a meeting with at least 10 members of his or her community to share information about hazards in Portland and to provide any feedback received to the planning team by June 15th. This work is still in progress.

WORKSHOP CONTENT

The content of each workshop varied based on lessons learned from previous workshops. The planning team recognized that this was an entirely new process and was open to adapting the workshop content to community needs throughout the process. Earlier workshops focused on the NHMP planning process and the local physical exposure to hazards of concern (primarily flood, earthquake, landslide, wildfire, and severe weather, with some discussion of drought, space weather, and volcano) in the geographic area in which the workshop was held.

Based on feedback received during the process (detailed below), the content of later workshops was adapted to align with the PBEM's long-term outreach goals and to establish partnerships with local community groups in building resilience and community capacity. Workshop participants urged the planning team to deemphasize the planning process itself, and provide more information about what projects and programs the city is currently doing to reduce vulnerability, and how the city might partner with community organizations to enhance social and economic benefits to the community. Later workshops took this feedback into account. These workshops were broader in focus, briefly covering natural hazard risks, highlighting current citywide activities to reduce risk and vulnerability, and working to identify potential partnerships and collaborations between the city and community organizations.

For workshops with fewer attendees, discussion sessions involved the whole group, while larger groups were divided into discussion groups focused on specific hazards (wildfire, flood, earthquake, etc.). The following are questions discussed during the discussion sessions:

1) Is your neighborhood in a hazard risk zone? Are there buildings or services you use on a daily basis that are in a hazard risk zone? What would the consequences be if they were impacted by a natural hazard?
2) What are some ways that you could reduce the risk impacts and negative consequences at your home, at work, and in your neighborhood?
3) What kinds of programs or projects can city offices do to support you and your neighbors in preparing for natural hazards?
4) Are there potentially vulnerable populations in your neighborhood that could experience disproportionate impacts from natural hazard events? Can you think of ways to build capacity for these groups now, so that they are better positioned to absorb and recover from a hazard event?

COMMUNITY FEEDBACK

This section describes the feedback received from the Planning for Real workshops, summarized by topic. Topics include planning process, communications, and outreach; all-hazards; landslide; flood; earthquake; wildfire; severe weather; and drought.

Planning Process, Communications, and Outreach

This topic is the broadest in scope and includes feedback related to how the NHMP planning process is implemented, how to communicate messages about natural hazards and other emergencies, and how education and outreach efforts are managed across the city. This topic was the one most frequently discussed during workshops, indicating that activities that fall within this category are high priority for workshop participants.

Participants were generally in support of using the Neighborhood Emergency Team (NET) program to connect neighbors and prepare as a community. Many neighborhoods lack NETs, and the need to expand the program was highlighted. Several outreach tools were also mentioned, including using NextDoor (social media website) to promote preparedness messages, and City of Seattle's Structured Neighborhood Assessment Program (SNAP) was mentioned as an example model for community organizing.
Emergency messaging was also a prevalent topic, particularly communication of emergency messages using a variety of media and in languages other than English. A cohort of Portland residents with hearing impairments attended the East Portland workshop, and emphasized the need to communicate emergency messages using visual means including signs and graphics or flashing lights as emergency signals. Communication through graphics would also help to reach children, people who are unable to read, and people with limited English proficiency. Participants advocated for a registry of addresses with people with special needs that could be shared with emergency responders.

There was a strong emphasis on culturally appropriate and multi-language outreach and preparedness training, as well as safety training for post-disaster reconstruction and recovery. Nearly all of the workshops included a discussion of the need for additional training and education opportunities at the community level. In terms of outreach, workshop participants expressed that outreach about the plan should focus on information about social and economic benefits and investing in community capacity through partnerships. Community members are not likely to emotionally engage with specific plans; they see all of PBEM's work, and often the whole city, as one effort. To the community, there is no difference between each of PBEM's plans and the plans developed by other bureaus; the city's outreach efforts should align with one another rather than operating in "silos". Community members care most about how the city's work will directly impact them.

Some key recommendations in this category were:

- Include full social and economic recovery after a disaster as a goal of the plan.
- Provide culturally and community-specific training for community leaders on home safety, hazard mitigation (e.g. non-structural seismic strengthening), food and supply storage, response considerations for people with special needs, and household and neighborhood preparedness.
- Develop post-disaster safety messages based on 2013 "Day Labor, Worker Centers & Disaster Relief Work in the Aftermath of Hurricane Sandy" report.
- Provide education for rental property owners and property managers on hazard communication and mitigation actions.
- Provide training on evacuation and sheltering for retirement home staff and all licensed nursing homes and assisted living care providers.
- Increase PBEM's capacity to provide community trainings and partner with the Office of Neighborhood Involvement, Diversity in Civic Leadership program, and Community Engagement Liaisons program to connect underserved communities with training opportunities.

- Expand the NET program into every neighborhood in Portland and expand beyond the neighborhood structure to non-geographic communities (e.g. immigrant and refugee communities).
- Update Portland Maps to be more user-friendly and visually map hazards.
- Cultural and language-appropriate webpage for New Portlanders to access emergency information, videos, and events in their preferred language.
- Postcard mailers to every household in Portland to share natural hazard risks and how to be prepared. Include this information in neighborhood newsletters.
- Hold a storytelling event to share disaster survivor stories and share information about hazards in an emotionally compelling way.
- Citywide "Preparedness Tours" to highlight exemplary projects.
- Do outreach for ATC-20 damage assessment trainings at neighborhood land use and transportation meetings. Provide ATC-20 training to NET members to support ATC-20 certified engineers and architects.

All-Hazards

Much of the feedback received during the workshops relates to reducing overall vulnerability and can be applied across multiple hazards. This category includes ideas that address multiple hazards but are not directly related to the hazard mitigation planning process or communication and outreach.

There was widespread interest among workshop participants in identifying a funding mechanism for assisting low-income families, particularly those with elderly or very young members, in the purchase and installation of air conditioners to address the risks posed by severe heat, as well as the diminished air quality during wildfire season and during a potential volcanic eruption. Participants were concerned about the rising summer temperatures over the past few years, and felt that the city should provide assistance for potentially vulnerable residents who don't have access to air conditioning. Participants recognized that most areas in the city are not at direct risk from volcanic lava or debris flows, but there was concern that ashfall after an eruption would pose a significant risk to the elderly and those who suffer from asthma and other respiratory problems. Another option discussed by workshop participants was to place permit requirements on new multi-family and rental housing to include air conditioning systems.

Food, water, and energy independence was another common thread in many workshop discussions. Workshop participants expressed concern about access to food and water in the case of any major natural hazard event in Portland; power outages and fuel shortages were also major concerns. Investments in community gardens and local food production, rainwater collection systems, and solar power systems were suggested as important steps to improving community resilience while simultaneously contributing to the city's sustainability and climate change adaptation goals.

Recognizing the important role day laborers can have in disaster response and recovery, as well as their increased risk of suffering negative consequences after a disaster, workshop participants expressed the desire to see the city take an active role in protecting this group's safety during post-disaster response, reconstruction, and recovery, and preventing post-disaster displacement. Guidelines were developed based on lessons learned from Hurricane Sandy (*Day Labor, Worker Centers & Disaster Relief Work in the Aftermath of Hurricane Sandy*, by Cordero-Guzman et al., 2013) to include these groups in planning activities, protecting workers' rights during reconstruction, provide preparedness and safety trainings,

provide access to personal protective equipment, and allocate funds for day labor centers to be established as community resources prior to a major natural hazard event.

Many community-based projects would rely on partnerships with community organizations for implementation. Participants expressed interest in finding ways for the city to financially support community organizations that promote activities related to preparedness and increasing community resilience.

Some key recommendations in this category were:

- Financial assistance and/or regulatory support for low-income residents and renters who are vulnerable to extreme heat or diminished air quality to install air conditioning systems.
- Training and support for day laborers consistent with guidance in "Day Labor, Worker Centers & Disaster Relief Work in the Aftermath of Hurricane Sandy" report from 2013.
- Funding for community organizations outside of formal neighborhood structure whose projects focus on preparedness and community resilience.
- Invest in and promote community gardens and local food production.
- Invest in and promote rainwater collection systems in public, residential, and commercial properties.
- Require new development to include onsite rainwater storage and/or emergency drinking water storage tanks. Include water storage solutions in seismic retrofit projects for schools and other public buildings.
- Update city policies to include energy and water purification solutions promoted internationally by Green Empowerment.
- Invest in and promote solar and other alternative energy in public, residential, and commercial properties.
- Prioritize clearing bike paths so that non-automobile traffic can flow safely and develop plans to locate aid stations along these routes.
- Prioritize road access to grocery stores, medical offices, and hospitals. Consider isolated communities in establishing road-clearing priorities.
- Partner with community groups and critical social service organizations to ensure that they have continuity of operations plans.
- Develop hazard-specific evacuation plans that consider likely impacts to bridges and other transportation infrastructure.
- Develop a recovery plan to promote hazard-informed decision-making for post-disaster redevelopment and to take advantage of the opportunity to move critical assets to safer locations.
- Provide neighborhood tool libraries for mitigation projects and post-disaster reconstruction. Partner with home improvement stores to build tool collections.
- Require Portland's emergency responders to live within the city. Provide financial support to purchase or rent a home within the city limits.

Landslide

Landslides were a major concern for many workshop participants, especially those who live in or near the West Hills in Portland; many were worried about the closure of key access roads and life safety hazards from collapse of bridges and tunnels. Participants were also worried about the dramatic increase in infill development over the past few years and the addition of large multi-family developments in known

landslide hazard areas. There was strong interest in preventing any additional development within the city's regulatory landslide hazard zone.
Some key recommendations in this category were:

- Financial support and education for property owners wishing to remediate their properties for erosion.
- Emergency moratorium on all development in high landslide risk areas.
- Enhanced communication with adjacent property owners and neighbors about how landslide risk is being minimized if development is permitted in landslide risk areas.
- Erosion control projects using bio-swales and beneficial drainage systems.
- Pre-established detour routes for access in and out of known landslide risk areas.

Flood

Flood risks were of particular concern to workshop participants who live in East Portland. Clear communication about safe alternative routes through highly flood-prone areas emerged as a top priority.
Some key recommendations in this category were:

- Replace unsafe or structurally compromised bridges and rebuild to more flood-resistant standards.
- Identify high-traffic bridges and flood-prone routes and establish alternative routes to be used in case they are flooded.
- Require construction of bio-swales for large construction projects where appropriate.
- Promote the use of French drains and other on-site stormwater management systems.

Earthquake

Because of the potential for long-term citywide and regional impact, earthquake is the "model hazard" for many participants in the Planning for Real workshops. Many of the recommendations in the all-hazards category above were discussed in the context of earthquake hazards, but were described in this report as all-hazards recommendations because of their broader applicability to other hazards of concern. It is also important to note that earthquakes may cause or contribute to incidences of other hazard events such as landslides or floods. For that reason, many concerns and recommendations from workshop participants that fall under other categories discussed in this report would also be applicable to earthquake hazards.
The need for enhanced communication about seismic risks and the seismic stability of structures throughout the city was highlighted as a priority during workshop discussions. Participants expressed the need for information about whether public buildings such as schools or office buildings have been seismically strengthened. It was also important to workshop participants that unreinforced masonry buildings be clearly marked so that people who live and work in these buildings are aware of the risks they face.
Participants were also generally unsure about whether current seismic codes were sufficient for a Cascadia Subduction Zone earthquake, and many strongly advocated for higher seismic standards for new buildings and infrastructure. Failure of bridges and overpasses, disrupted communications, and damage to key energy infrastructure and potential hazardous materials in liquefaction zones were major concerns for workshop participants. Many were also concerned about fires caused by broken gas lines and other ignition sources during and after an earthquake.

Some key recommendations in this category were:

- Retrofit and/or move fuel infrastructure in Linnton. Maintain fuel reserves in safe locations for use in disaster recovery.
- Strengthen levees to seismic standards.
- Develop an inventory of and distribute information about which shelter facilities have been retrofitted.
- Provide property owners with financial assistance for seismic strengthening, especially owners of multi-family and low-income housing.
- Reinforce and fire-proof the Linnton Community Center as a place of refuge for residents who cannot evacuate.
- Require automatic shutoff valves for gas lines in all new development.
- Evaluate whether current seismic codes are sufficient for a 9.0 subduction zone earthquake. If not, adopt higher standards.
- Assess seismic stability of large water towers throughout the city to determine whether they pose a risk or could be used as an emergency water source.
- Communicate information about hazardous materials and potential plume areas prior to major event. Ensure firefighters and NET members know hazard types and response considerations.
- Label unreinforced masonry buildings to notify occupants of their risks.
- Require signage about risks and evacuation routes in hotels.
- Retrofit and reinforce schools beyond life-safety standards so that they can be used as neighborhood shelters and storage locations for emergency supplies.
- Stage emergency resources on the west side of the river in case bridges fail and east-west access is blocked.
- Continually update water and sewer pipe systems, and continue with the project to build a seismically reinforced water pipe that crosses under the Willamette River.

Wildfire

Wildfire was primarily a concern for workshop participants who live in or near the West Hills, although participants from other areas in the city recognized the air quality risks associated with wildfire outside of their immediate neighborhoods. Recommendations to address air quality issues are discussed in the all-hazards topic above.

Many participants expressed concerns about hotter, drier summers leading to increased wildfire risk. There was also some concern about invasive or non-native species contributing to wildfire risk, as well as certain diseases affecting trees that can cause massive tree die-outs including Swiss-Cass Needle Disease, which is currently affecting Portland's Douglas Fir tree population.

Workshop participants provided a number of zoning and building code solutions to reduce fire risk in urban-wildland interface zones, such as requiring non-combustible roofing materials in wildfire risk zones. There was also interest in the city providing training to community members and NET members to use firefighting equipment and hoses.

Some key recommendations in this category were:

- Require metal or composition roofing materials when replacing greater than 50% of a roof in a wildfire risk zone.
- Provide NET members with training on fire response, especially how to use fire hydrants and hoses.
- Provide clear information to the public on burn restrictions.

Severe Weather

Primary concerns from workshop participants about severe weather were related to extreme heat and emergency shelters for all extreme weather conditions. All recommendations for severe weather are included under the all-hazards topic above.

Drought

Although drought was not a major concern for most workshop participants, some did provide recommendations for reducing Portland's drought risk. These recommendations were primarily focused on water conservation and planting native and drought-resistant plants that require less water.
Some key recommendations in this category were:

- Promote homeowners planting native and drought-resistant plants that require less water during drier months.
- Provide water conservation education to kids in schools.

NEXT STEPS - INSTRUCTIONS GIVEN TO BUREAUS

This report is intended to inform the development and prioritization of action items for the NHMP. City bureaus and offices should use this feedback from community members to supplement the list of recommended action items from other sources in this planning process. Bureaus and offices should consider which of the recommendations might fit under their portfolios. Those actions that are selected should be included in the final list of actions submitted to the NHMP planning team. They should also be refined using the equity screening process and prioritized using the prioritization tables provided in the bureau toolkit.

Questions? Contact Danielle Butsick at 503-823-3926 or danielle.butsick@portlandoregon.gov.

TOWN HALL MEETINGS

TOWN HALL MEETING SUMMARY

During the public review and comment period, five town hall events were held throughout Portland to give residents an opportunity to ask questions about and provide feedback on the draft Mitigation Action Plan (MAP) (See Table 1). These events were advertised as Summer Socials (See Figure 1). At the Summer Socials, the public was invited to come and view the maps, review the draft plan, and ask questions of city staff and neighborhood emergency team volunteers. Approximately 60 people attended the events, some even came to multiple events. Attendees learned about liquefaction, talked about natural hazard risks and how to get prepared. The Summer Socials led to several individuals being interested in becoming trained Neighborhood Emergency Team members, and several people registered for PublicAlerts after talking to staff about the voluntary registration program. Planning team staff shared information about city bureau projects currently underway to reduce risks from natural hazards, as well as those listed in the plan that bureaus hope to implement over the next five years.

Table 1. Meeting Dates, Description and Attendance

Date	Town Hall Meeting	Description/Geographic Area	Estimated Attendance
8/9	1st Town Hall Meeting	• Coalition of Communities of Color	15
8/16	2nd Town Hall Meeting	• West/Northwest	15
8/17	3rd Town Hall Meeting	• North/Northeast	15
8/23	4th Town Hall Meeting	• East/Southeast	15
8/30	5th Town Hall Meeting	• Southwest	15



Figure 1. Flyer Announcing Town Hall Events

Source: PBEM



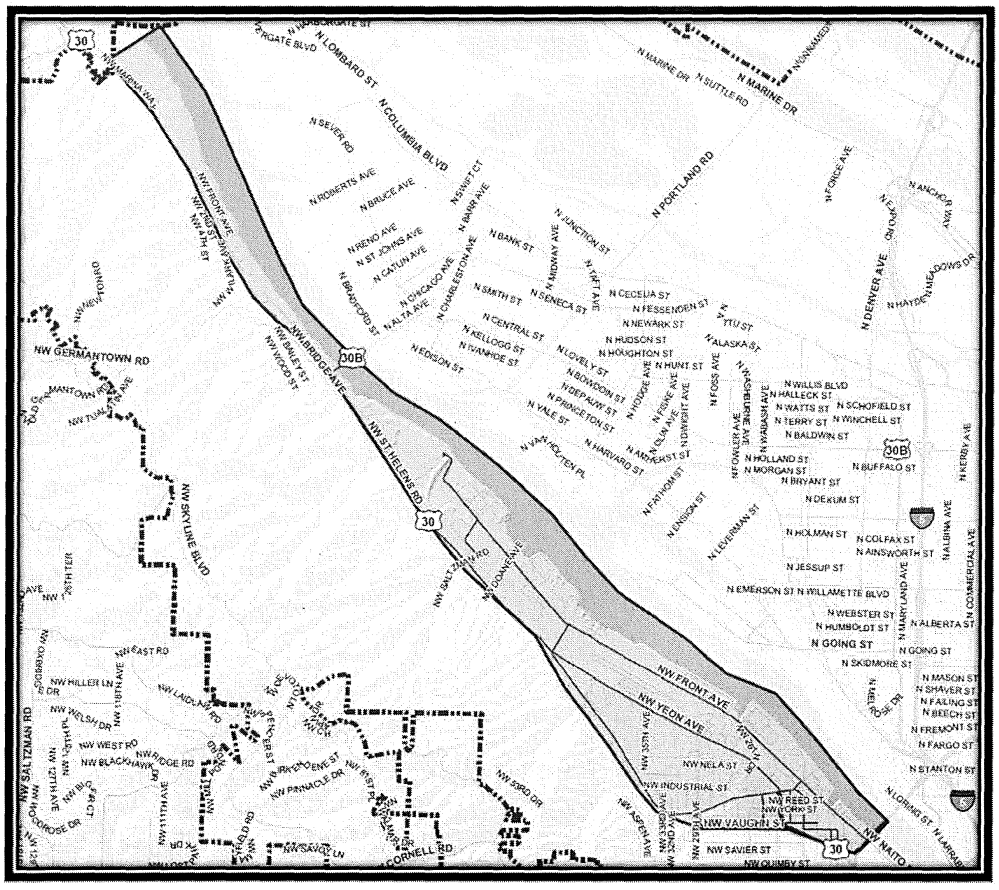
Figure 2. Residents Attending Summer Social Events

Appendix D. Critical Energy Infrastructure Hub Study

PBEM

Portland Bureau of Emergency Management

2016 Critical Energy Infrastructure Hub Study



TETRA TECH

June 2016

2016 Critical Energy Infrastructure Hub Study

June 2016

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GLOSSARY

BES—Bureau of Environmental Services (Portland)

CDMS—Comprehensive Data Management System

CEI—Critical Energy Infrastructure

CFR—Code of Federal Regulations

CSZ—Cascadia Subduction Zone

DOGAMI—Oregon Department of Geology and Mineral Industries

FEMA—Federal Emergency Management Agency

GIS—Geographic Information System

Hazus-MH—Hazards, United States-Multi Hazard

LEAP—City of Portland Local Energy Assurance Plan

LNG—Liquid natural gas

NEHRP—National Earthquake Hazards Reduction Program

PBEM—Portland of Bureau of Emergency Management

PUC—Public Utility Commission of Oregon

USGS—U.S. Geological Survey

EXECUTIVE SUMMARY

The stability and reliability of local energy importation systems are of paramount importance to the City of Portland and the surrounding region. A significant portion of the energy distribution infrastructure is located along a 6-mile stretch of the lower Willamette River in Northwest Portland, between the I-405 Fremont Bridge and Sauvie Island, commonly referred to as the Critical Energy Infrastructure Hub (the CEI Hub). The energy sector facilities in the CEI Hub receive and distribute 90% of the fuel that powers the State of Oregon (PBEM, 2012). The CEI Hub includes the following types of facilities:

- All of Oregon's major liquid fuel port terminals
- Liquid fuel transmission pipelines and transfer stations
- Natural gas transmission pipelines
- Liquefied natural gas storage facility
- High-voltage electric substations and transmission lines
- Electrical substations for local distribution.

The CEI Hub is strategically located to provide access to navigable waters, rail infrastructure, petroleum pipelines, and highways, all important for both the supply and the distribution of energy products. While the location is vital for its functions, it is also a significant source of risk for the CEI Hub assets and personnel as well as residents who live adjacent to the CEI Hub. The CEI Hub area is especially susceptible to earthquake, flood, landslide, severe weather, volcanic ash fall, and wildfire.

This CEI Hub study was conducted by the Portland Bureau of Emergency Management in coordination with the 2016 update of the City of Portland Hazard Mitigation Plan. The purpose of the study was to develop a stand-alone report that includes a risk assessment and a list of key recommendations, and to incorporate the findings into the update of the city's hazard mitigation plan.

The study also included a comprehensive literature review on five previous studies related to the CEI Hub to pull together key findings and recommendations.

STAKEHOLDER ENGAGEMENT

Stakeholders for this study are local, state and federal agencies, as well as owners and operators of CEI Hub facilities, local residents, and environmental groups, all of whom have a stake in the disaster resiliency of the CEI Hub. In all, over 135 stakeholders were invited to participate in this study. Fewer than 10 percent of the stakeholders invited to participate in this study actually participated. This low level of participation was not surprising, as it tracks with the level of participation in other studies reviewed for this project; but it does have a direct effect on the quality of the risk assessment results.

RISK ASSESSMENT

A comprehensive risk assessment was performed on the CEI Hub facilities using the same tools that are being used to update the City's hazard mitigation plan. Risk assessment software was used to model potential impacts

from earthquake and flood. Comprehensive Data Management System software was used to capture property-specific attributes of 323 user-defined facilities.

The CEI Hub risk assessment for each hazard of concern includes an overview of the hazard, an analysis of people, property and environment exposed to the hazard, an analysis of the vulnerability of exposed people, property and environment, and a summary of key findings. The 2016 update to the City of Portland Hazard Mitigation Plan includes a more detailed profile for each hazard of concern for the entire city.

SELECTED KEY FINDINGS

- It is assumed that the modeling results of this analysis are understated due to incomplete data sets. There is a heavy reliance on default level data in the modeling for this study in lieu of the data that was not available from CEI Hub stakeholders. The accuracy of the modeling would be significantly enhanced if key data attributes that help estimate damage in the Hazus-MH models could be provided. Further, the Hazus-MH model employed a "lower bound" analysis, intended to demonstrate cost-effectiveness at the lowest level of expected impact.
- The vast majority of the facilities in the study area are constructed on soft, liquefiable soils that are typically associated with increased seismic vulnerability. The soils and liquefaction data provided by DOGAMI significantly enhanced the results of this study.
- The facilities and infrastructure within the study area range from over 100 years old to new or recent construction. The new construction has been built to heightened code standards, while the older construction was built to little or no code standards. The majority of the facilities were constructed to low, or no code standards. Code construction standards are an important parameter in the modeling of seismic events.
- Models of the Cascadia Subduction Zone event show less damage than the Portland Hills Fault event due to proximity to the source. The CSZ event has an epicenter 67 miles west of the study area, while the Portland Hills fault scenario has an epicenter less than 5 miles west of the study area. The CSZ event would be considered the true worst-case scenario due to its higher probability of occurrence and likelihood of regional impact. USGS has assigned a 15 percent probability in 50 years for a CSZ event, versus a 1 percent probability in 50 years for the Portland Hills event. Additionally, seismologists estimate a CSZ event to last longer than 3 minutes, while estimates for a Portland Hills event are 60 seconds or less. Event duration can play a significant role in the amount of damage associated with seismic events.

RECOMMENDATIONS

This study includes nine recommendations:

- Recommendation 1: CEI Hub Disaster Resiliency Workgroup —Form a workgroup made up of CEI Hub stakeholders that would be recognized by federal, state and local agencies as an authoritative body with a vested interest in the resiliency of the CEI Hub. This workgroup would help guide policy, initiate dialogue, and have some level of funding capability to seed resilience initiatives in the study area.
- Recommendation 2: Update/Enhance CEI Hub Risk Assessment—Address data gaps in the risk assessment performed for this study and update the risk assessment as new data and science become available.
- Recommendation 3: Fossil Fuel Resolution—Apply Fossil Fuel Resolution #37168 to allow expansion of existing infrastructure or installation of new infrastructure only after adjacent infrastructure on the same facility have been retrofitted to address seismic risks, including liquefaction.

- Recommendation 4: Emergency Response/Recovery Regulatory Waivers—Pursue a process for allowing waivers from federal and state regulatory agencies in order to make disaster response and recovery in the CEI Hub more efficient, for example allowing gravity-fed transfers that bypass electricity-dependent overfill alarms during an electrical outage.
- Recommendation 5: Planning—The CEI Hub Disaster Resiliency Workgroup would establish a planning curriculum by assessing the level of planning that currently exists and establishing procedures to improve coordination on planning efforts.
- Recommendation 6: Backup Power—Identify and prioritize backup power needs following local energy assurance planning protocols, and consider the use of microgrids or other alternative energy sources.
- Recommendation 7: Training and Exercise—Commit to periodic, scenario-based City trainings and exercises in the CEI Hub, coordinating between CEI Hub stakeholders and local responders.
- Recommendation 8: Facility retrofits—Via a comprehensive, site-specific risk assessment, identify and prioritize for retrofit or replacement all vulnerable CEI Hub facilities.
- Recommendation 9: Land Use Repurposing—Create regionally acceptable means to repurpose land use within an identified buffer area adjacent to the CEI Hub.

1. PURPOSE OF THIS STUDY

1.1 BACKGROUND

1.1.1 Local and Regional Energy Resources

The City of Portland, like all jurisdictions in Oregon, relies on the importation of energy resources from adjacent states (DOGAMI, 2013). The stability and reliability of local energy importation systems are of paramount importance to the City and to the entire region. A significant portion of the local, regional and state energy distribution infrastructure is located along a 6-mile stretch of the lower Willamette River in Northwest Portland, between the I-405 Fremont Bridge and Sauvie Island (see Figure 1-1). This area is commonly referred to as the Critical Energy Infrastructure Hub (the CEI Hub).

The CEI Hub lies on soils that are highly susceptible to the impacts of earthquakes and other hazards. The importance of the CEI Hub to the people and economy of the City of Portland and the State of Oregon warrant a detailed look at the exposure and vulnerability of facilities in the CEI Hub to natural hazards. The 2016 Critical Energy Infrastructure Hub Study was conducted as part of the 2016 update to the *City of Portland Hazard Mitigation Plan*. This report of the study's findings is a companion document to that updated plan.

1.1.2 Hazard Mitigation Planning

Hazard mitigation is defined as any action taken to reduce or alleviate the loss of life, personal injury, and property damage that can result from a disaster. It involves long- and short-term actions implemented before, during and after disasters. Hazard mitigation activities include planning efforts, policy changes, programs, studies, improvement projects, and other steps to reduce the impacts of hazards. The federal Disaster Mitigation Act (Public Law 106 390) emphasizes planning for disasters before they occur by requiring state and local governments to develop hazard mitigation plans as a condition for some federal disaster grant assistance.

The study recommendations presented in Chapter 5 of this report were presented for review and comment at the April 2016 meeting of the City of Portland Hazard Mitigation Plan Steering Committee. Final study recommendations will be included as actions in the updated 2016 Hazard Mitigation Plan.

1.2 OBJECTIVES

The mission of the Portland Bureau of Emergency Management (PBEM) is to build a resilient City through coordinated planning, mitigation, response and recovery. PBEM's objectives for this study are as follows:

- Conduct a study in conjunction with the update to the City's hazard mitigation plan.
- Perform a risk assessment for the CEI Hub.
- Identify CEI Hub mitigation strategies for the City of Portland and possible funding mechanisms.
- Provide the findings in a stand-alone, companion document.
- Deliver a public presentation on the study for the City Council.
- Incorporate the CEI Hub mitigation recommendations into the final, updated Hazard Mitigation Plan.

September 12, 2016

Mitigation Action Plan (MAP)

Critical Energy Infrastructure Hub Study

Figure 1-1.
Critical Energy Infrastructure (CEI) Hub

Legend

City Boundary

Critical Energy Infrastructure (CEI) Hub Boundary

NORTH

0 0.5 1 Miles

Source: City of Portland-2016

1.3 STUDY SCOPE OF WORK

PBEM selected Tetra Tech, Inc. to facilitate the update to the City's Hazard Mitigation Plan, including the development of the CEI Hub study. A planning team composed of PBEM and Tetra Tech staff guided and facilitated the CEI Hub study. The scope of work for the CEI Hub study included the following tasks:

- **Task A: CEI Stakeholder Engagement**—CEI Hub stakeholders were identified and engaged by the planning team to support the development of the study. These stakeholders included owners/operators of CEI Hub facilities; state and federal agencies with relevant data, studies or plans about the facilities; residents of the surrounding Linnton neighborhood; members of the Hazard Mitigation Plan Steering Committee; and relevant staff from City of Portland bureaus. Stakeholders were invited to participate in two meetings:
  - At the first meeting, the planning team explained the purpose of the study, sought committed participation from stakeholders and requested relevant data.
  - At the second meeting, the planning team presented the findings of the risk assessment and identified recommendations for actions to be considered in the City's updated Hazard Mitigation Plan.
- **Task B: CEI Data Analysis**:
  - The planning team reviewed relevant plans, studies and programs to identify data that would augment the a risk assessment for the CEI Hub.
  - Following the literature review, a risk assessment was performed using the Federal Emergency Management Agency's (FEMA's) Hazus-MH risk assessment platform (Version 2.1). The risk assessment was conducted solely on facilities for which information was provided by participating stakeholders identified under Task A. Risk assessment results were generated by facility and by hazard type. Direct damage, indirect damage, and loss-of-function estimates were derived from the Hazus-MH platform.
- **Task C: CEI Facility Report**—The planning team prepared this CEI Hub study report, which provides an overview of the risk and vulnerability of the CEI Hub for each hazard of concern, identifies possible mitigation actions, and identifies possible sources of funding for recommendations that require an alternative source of funding. The report is a companion document to the 2016 update to the City's Hazard Mitigation Plan.
- **Task D: Final CEI Report to City Council**—The planning team will present the findings and recommendations of this report to the Portland City Council.

1.4 STUDY AREA DEFINED

The study area for this assessment was defined as a 6-mile-long area centered on US Highway 30 along the lower Willamette River between the south tip of Sauvie Island and the I-405 Fremont Bridge. Figure 1-1 shows the study area. A significant portion of Oregon's electricity, natural gas, and fuel oil infrastructure is concentrated in this area. The energy sector facilities in the CEI Hub include the following:

- All of Oregon's major liquid fuel port terminals
- Liquid fuel transmission pipelines and transfer terminals
- Natural gas transmission and distribution pipelines
- Liquefied natural gas (LNG) storage facility
- High-voltage electric substations and transmission lines
- Electrical substations for local distribution.

2. STAKEHOLDER ENGAGEMENT

This chapter summarizes the outreach and engagement efforts to CEI Hub stakeholders that the planning team undertook to gather the best available data for this study.

2.1 IDENTIFIED CEI HUB STAKEHOLDERS

A stakeholder is any person or group with an investment, share, or vested interest in something. For this study, stakeholders are all persons and agencies with a vested interest in the disaster resiliency of the CEI Hub, including, but not limited to facility owners and operators, environmental groups, adjacent property owners or residents, and major regional energy customers such as PDX airport. The planning team assembled a list of two key types of stakeholders to engage in the effort:

- Owners, operators and other data providers, such as state regulatory agencies
- Communities or interests that would likely be indirectly impacted by a major hazard event at the CEI Hub, such as neighborhoods adjacent to the CEI Hub and groups representing environmental interests.

Over 135 stakeholders representing these interests were contacted and invited to participate in the development of this study.

2.2 CEI HUB STAKEHOLDER OUTREACH

2.2.1 CEI Hub Stakeholder Meeting #1

A study kickoff meeting was held on October 21, 2015 at the Clean Rivers Cooperative Training Center, located in the study area. Seventeen CEI Hub stakeholders attended, along with five members of the planning team. Stakeholder interests that were represented included: CEI Hub owner/operators, representatives from the Linnton Neighborhood Association, the Oregon Department of Geology and Mineral Industries (DOGAMI), the Federal Emergency Management Agency (FEMA), and the Oregon Department of Environmental Quality. The meeting began with a presentation to introduce the planning team, project goals and expected outcomes as well as the following meeting objectives:

- Ensure that relevant stakeholders have been identified and are participating
- Determine information needs, data availability, and possible sources
- Identify and address data confidentiality and other concerns
- Outline the project timeline
- Determine next steps in the process.

After the presentation, there was discussion among the planning team and stakeholders on project understanding, concerns, information security and data capture and transmission. Most stakeholders in attendance indicated that they were likely to participate in the study.

2.2.2 Data Solicitation

On November 9, 2015 the planning team sent a data capture form to all identified CEI Hub owner and operator stakeholders, along with a set of instructions on how to complete the form. The form was designed to capture necessary information for each facility for input to the Comprehensive Data Management System (CDMS), an extension to FEMA's Hazus-MH risk assessment software (see Chapter 4). CDMS captures facility-specific attributes to establish curves for estimating damage to facilities. Completion of the CDMS form, which was voluntary, indicated each stakeholder's support for the study. Stakeholders were asked to submit completed forms by December 18, 2015.

2.2.3 CEI Hub Stakeholder Meeting #2

A second CEI stakeholder meeting was held at the Clean Rivers Cooperative Training Center on February 25, 2016 to present the results of the risk assessment and to identify recommendations for action. This meeting was attended by 11 CEI Hub stakeholders and three members of the planning team. The agenda was as follows:

- Welcome and introductions
  - Round-table introductions
- Project review
  - Project overview
  - Project status
  - Summary of the literature review
  - Next steps
- Model results
  - Description of the computer model
  - Hazard scenarios analyzed
  - Outputs defined
  - Review of the results
- Alternatives analysis
  - Strengths
  - Weaknesses
  - Obstacles
  - Opportunities to use strengths to address weaknesses and obstacles
  - Possible actions.

Evaluation of Strengths, Weaknesses, Obstacles and Opportunities

Recommended actions for possible inclusion in the City's Hazard Mitigation Plan were identified through consideration of the study area's hazard-related strengths, weaknesses, obstacles and opportunities. Key points discussed included the following:

- Strengths
  - Practical experience—CEI Hub owner/operators have not had to respond to a major disaster, but they do have practical experience in dealing with business interruption from impacts outside the CEI Hub.

- Established relationships—There are strong relationships among CEI Hub owner/operations that have been expanded to other stakeholders, such as the City of Portland, DOGAMI and the Oregon Department of Environmental Quality.
- The City of Portland Local Energy Assurance Plan (LEAP)—The LEAP, developed by the City in coordination with CEI Hub owner/operators, has helped to establish a dialogue among CEI Hub stakeholders on energy resilience that could be applied to disaster resilience.
- Product distribution alternatives—Petroleum/gas stakeholders have the ability to deliver product without power. This is not the ideal method, but it is an option that could be deployed to support continuity of operations.
- Example for disaster resilience—Portland General Electric, the principle energy supplier to the study area, has incorporated disaster resilience into its business plan and is proactively mitigating its vulnerable facilities. This provides a practical example for all CEI Hub stakeholders on embracing disaster resilience.

- Weaknesses
  - Access—The study area has the potential to be isolated in a disaster scenario due to limited points of ingress and egress.
  - Plan awareness—Numerous plans and studies have conducted in-depth assessments of the CEI Hub and its facilities. There is a lack of awareness by CEI Hub owner/operators about these plans.
  - Planning coordination—There is a lack of coordination of all the relevant planning efforts currently underway. This lack of coordination leads to a lack of consistency in data analyzed and plan findings and conclusions.
  - Lack of data—There seems to be a good understanding about potential hazard events and their impacts; however, understanding of how CEI Hub facilities might perform in these events is lacking due to information gaps for the CEI Hub facilities. Needed information probably exists, but is not readily available.
  - Understanding of functional downtime—CEI Hub stakeholders do not have a good understanding of how long after a hazard event their facilities would be unable to operate at their normal level.

- Obstacles
  - Environmental restrictions/regulations and safety restrictions/regulations—CEI Hub stakeholders indicated that existing environmental and safety regulations may impede response and recovery efforts at the CEI Hub after a major disaster.
  - Local regulations—The City of Portland recently adopted regulations that would restrict the expansion of petroleum facilities within the study area (Resolution No. 37168). This could be an obstacle to any incentive to retrofit vulnerable facilities in the CEI Hub. It would also be an obstacle for petroleum facilities to keep up with State of Oregon growth demand.
  - Security—The need for security of sensitive data can create an obstacle to sharing data and requires steps to ensure sure that shared data is secure.

- Opportunities
  - Continuity of operations planning—Determine if all CEI Hub owners and operators have prepared continuity of operations plans and whether existing plans address post-disaster operations and provide consistency in strategies.
  - State of Oregon Energy Plan update—Update the State Energy Plan and incorporate existing data, studies, and plans on the CEI Hub.
  - Work group—Build on the momentum from this study and others by creating a work group for data sharing, analysis, security and policy-making related to the overall resilience of the CEI Hub.

- Regulatory waiver—Consider a waiver to City Resolution No. 37168 that would allow a CEI Hub owner/operator to expand a petroleum facility if it is done as a retrofit to an identified vulnerable facility.
- Legislative strategies—Pursue state legislative strategies to address environmental and safety restrictions related to achieving disaster resilience through preparedness, response or mitigation actions by CEI Hub stakeholders.
- Backup generators—Ensure that all CEI Hub owner/operators own or have access to backup generators. Further analysis is necessary to determine how many generators are needed, the type, capacity, switching capabilities, etc.
- Training and exercises—Build on existing successes, such as LEAP, to provide disaster scenario training that includes and involves CEI Hub stakeholders.
- Ongoing risk assessment updates and enhancements—Continue to update and enhance the risk assessment for the CEI Hub using the best facility data and best available science as they become available.
- Planning—Make a concerted effort among public and private-sector CEI Hub stakeholders to identify existing plans related to CEI Hub disaster resiliency, the level of consistency among them, and needs for additional planning.

Review of Risk Assessment Results

Following the evaluation of strengths, weaknesses, obstacles and opportunities, stakeholders engaged in additional discussion on the risk assessment results. There was a general consensus that the model results were likely understating risk, especially in regard to earthquake risk. Stakeholders suggested several methods by which the data and models could be refined to more accurately portray risk, including greater participation from owners/operators at the CEI Hub and accounting for an increase in severity resulting from shaking duration lasting longer than one minute. Although risk may be understated in this study, the risk assessment results represent a valuable starting point toward understanding the vulnerabilities of the CEI Hub.

2.3 CEI HUB STAKEHOLDER PARTICIPATION

All stakeholder participation was valuable for this study, and participation from owners and operators of CEI Hub facilities was of particular importance. Because all CEI Hub facilities are privately owned, a detailed assessment of the CEI Hub could not be conducted without the participation of facility owners and operators. The risk and vulnerability assessment (described in Chapter 4) was built upon FEMA's Hazus-MH modeling program, which requires detailed, accurate data about existing conditions. The accuracy and reliability of the results depend upon the quality of the input data. When current, detailed data is not provided, the model supplements missing data with default entries and assumptions.

Modeled results presented in this report (see Chapter 4) are based only on the facilities for which data was provided. The total number of owners and operators of facilities in the CEI Hub has not been established, but is substantially more than those who provided full participation. Full participation in this study—defined as attending meetings and providing data to be used in the study—was given by the following stakeholders:

- Kinder Morgan
- Pacific Terminal Services
- Port of Portland
- DOGAMI
- Department of Homeland Security, Region X
- Portland Bureau of Emergency Management
- Portland Bureau of Environmental Services
- Oregon Department of Environmental Quality

- Oregon Public Broadcasting
- Concerned citizen from Sauvie Island
- Public representatives from the 2016 City of Portland Hazard Mitigation Plan Update Steering Committee, including those representing the Linnton Neighborhood Association, the Audubon Society and the Local Emergency Planning Committee.

This rate of participation is consistent with what was observed in the review of previous studies and plans (see Chapter 3). Many of the stakeholders who participated in other plans and studies also participated in this study, and stakeholders who did not participate in this study have generally not participated in other efforts. Early in the process, the planning team determined that success would be defined as any level of participation from CEI Hub stakeholders, because this study marks the beginning of the City's engagement of CEI Hub stakeholders in planning for disaster resiliency. The dialogue and engagement initiated through this study provides a metric on which to improve.

Participation from stakeholders subject to indirect impacts from a hazard event at the CEI Hub also was critical to the findings and recommendations of this study. Representatives from the Linnton Neighborhood Association, Sauvie Island and the Audubon Society all provided insights that had a direct impact on the recommendations of this study. Their engagement and commitment to understanding the risks expanded the perspectives of the study, thus enhancing the creditability of the final report.

3. LITERATURE REVIEW

The importance of the CEI Hub to Portland, the state of Oregon and the Pacific Northwest region has prompted numerous, detailed studies of the area by local, state and federal agencies. Many of these studies have focused on the CEI Hub's exposure and vulnerability to earthquake hazards. The planning team identified five key documents that examined the vulnerability of the CEI Hub to a Cascadia Subduction Zone (CSZ) earthquake or to prolonged loss of power:

- Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub (DOGAMI, 2013)
- Protected Critical Infrastructure Information, Columbia Basin Resiliency Assessment (U.S. Department of Homeland Security, 2015)
- City of Portland Local Energy Assurance Plan (PBEM, 2012)
- The Energy Cluster in Linnton (Grillo, 2005)
- Port of Portland, Corporate Seismic Risk Assessment Study (Berger ABAM, 2015).

This chapter provides extracts of these documents, providing a brief synopsis of each, along with a summary of key findings and recommendations.

3.1 EARTHQUAKE RISK STUDY FOR OREGON'S CRITICAL ENERGY INFRASTRUCTURE HUB

3.1.1 Synopsis

The Oregon Department of Geology and Mineral Industries conducted an earthquake risk study of the CEI Hub as part of a larger Energy Assurance Project by the Oregon Department of Energy, Public Utility Commission of Oregon (PUC) and DOGAMI (funded by the U.S. Department of Energy). The purpose of this study was to provide a better understanding of the vulnerabilities of the energy sector when confronted with a magnitude 8 or larger Cascadia earthquake. Study goals were as follows:

- Characterize Oregon's natural hazards using qualitative risk scores to estimate the scale of potential disasters.
- Better understand CEI Hub facility operations and learn about site conditions, structures, components, systems and interdependencies.
- Describe potential critical seismic vulnerabilities in the energy sector, and offer recommendations to improve energy sector resiliency to minimize earthquake impacts.

This study did not entail site-specific vulnerability and risk studies and provided only estimates of seismic vulnerability based on visual reconnaissance inspections, site-independent analyses and studies and existing site specific information provided by CEI Hub facilities.

3.1.2 Key Findings

The following are the key findings of the DOGAMI report that are relevant for this study:

- Some infrastructure in the CEI Hub was built 100 years ago, to very antiquated standards. Other infrastructure is new and built to current standards. Because of the wide range of ages and construction practices, the seismic vulnerability of the facilities also spans a wide range.
- Energy companies have operational interdependencies with the transportation and telecommunication sectors. The three energy sources—electricity, natural gas, and liquid fuel—depend upon each other; if one system is inoperable, it impacts another. For example, all sources rely on electricity to operate their systems. Electricity is needed to power the control rooms for natural gas and liquid fuel transmission.
- There are few regulations that require existing structures to be upgraded to today's seismic standards.
- Older building codes and practices did not adequately address many non-building structures that exist in the CEI Hub, such as tanks, pipes, and piers.
- Each energy source has a different level of redundancy in its transmission system. Redundancy influences the level of seismic resilience, with more redundant systems providing higher resilience.
- The following findings were made regarding liquid fuel facilities:

  - **Liquid fuel pipeline**—CEI Hub petroleum facilities receive liquid fuel from a liquid fuel transmission pipeline and from marine vessels. The liquid fuel pipeline was largely constructed in the 1960s when construction techniques had no seismic standards. The pipeline design did not consider ground movements from lateral spreading at river crossings or stresses induced by earthquakes that may cause pipe breaks. A pipe break would have a significant impact on all petrochemical facilities in the CEI Hub and could result in a statewide fuel shortage.
  - **Shipping channel**—Marine vessels use the navigation channel from the Columbia River mouth to the lower Willamette River to transport fuel. A preliminary investigation found that the shipping channel would likely be closed for river navigation after an earthquake until it is cleared for use by the U.S. Coast Guard. Closure of the shipping channel would prevent marine vessels from delivering liquid fuel and limit transport of emergency recovery equipment.
  - **Marine terminals**—Port facilities in the CEI Hub have significant seismic risks. Some older piers constructed without any seismic design may be damaged even in a moderate earthquake. If oil products are released and contaminate the navigable waterway, the waterway may be closed to river traffic, impeding emergency response and the supply chain. Local capacity to fight fires and clean hazardous material spills is limited.
  - **Fuel Tank Farms**—All fuel tank farms in the CEI Hub have significant seismic risk due to unmitigated liquefaction hazards. Most tanks were constructed on potentially liquefiable soils, with little or no seismic design criteria.
  - **Fuel supply**—Fuel terminals in the CEI Hub have a three- to five-day average supply of regular unleaded gasoline and diesel fuel. Premium gasoline is subject to daily delivery. If the supply chain is disrupted, fuel would quickly become scarce. Airlines operating at Portland International Airport receive 100 percent of their liquid fuels from a terminal in the CEI Hub. There is limited on-site fuel supply at the airport. If the transmission pipe between the CEI Hub and the airport fails, then the airport would likely experience a shortfall and operations would be impacted.

- The following findings were made regarding natural gas facilities:

  - **Natural gas pipelines**—Oregon's largest natural gas service provider receives most of its natural gas from pipelines that cross under the Columbia River. Most of these pipelines are 1960s vintage and were constructed without seismic design provisions. The soils at major river crossings are subject to liquefaction and lateral spreading. Pipe breaks could lead to a natural gas shortfall in the state as well as explosions or fires.
  - **LNG storage facility**—The LNG storage facility in the CEI Hub was constructed in the late 1960s on what is suspected to be highly liquefiable soils. As of February 2012, the natural gas operator with facilities in the CEI Hub had not performed seismic vulnerability assessments.

3.1.3 Recommendations

The most critical conclusion from this report is that energy sector companies must pro-actively integrate seismic mitigation into their business practices for Oregon's energy sector to adequately recover from a Magnitude 8.5 to 9 Cascadia earthquake in a reasonable time period. DOGAMI made these recommendations to private and public energy sector stakeholders:

- Energy sector companies should work with local, state tribal and federal government agencies and stakeholders to conduct seismic vulnerability assessments on all systems or facilities.
- Energy sector companies should work with local, state, tribal and federal government agencies and stakeholders to institutionalize long-term seismic mitigation programs to ensure facility resilience and operational reliability.
- The State of Oregon's Homeland Security Council should review the vulnerability and resilience of the energy sector to earthquakes and other natural disasters. This could involve the Energy Assurance Project partners (Oregon Department of Energy, PUC, and DOGAMI) as well as the Oregon Department of Transportation, Building Codes Division, and the Oregon Seismic Safety Policy Advisory Commission. Under Oregon Revised Statute (ORS) 401.109, no outside individual or group has previously been involved in the Homeland Security Council's roles and responsibilities.
- Energy sector companies and the State of Oregon should build Oregon's seismic resilience to a Cascadia earthquake. Adopting pro-active practices and a risk management approach will help achieve seismic resilience. A culture of awareness and preparedness about energy sector seismic vulnerability should be encouraged, including long-range energy planning. Emergency batteries, generators and communication devices should be braced or anchored to withstand a Cascadia earthquake.
- The length of time to resume services after a Cascadia earthquake should be evaluated by each energy company to establish a baseline understanding, and improvements should be made to achieve a satisfactory service level.

3.2 COLUMBIA BASIN REGIONAL RESILIENCY ASSESSMENT PROGRAM

3.2.1 Synopsis

The Regional Resiliency Assessment Program is a cooperative, non-regulatory, assessment of critical infrastructure, led by the federal Office of Infrastructure Protection. The program focuses on infrastructure systems within designated geographic areas, addressing hazards that could have regionally and nationally significant consequences. The goal is to mitigate the risk of loss of life and physical and economic damage from natural and manmade hazards.

The Columbia Basin Regional Resiliency Assessment Program established a working relationship between the Department of Homeland Security and key partners in Washington, Oregon, and Idaho. These included the Washington Military Department, the Oregon Military Department, and the Idaho Bureau of Homeland Security. Other public and private sector organizations contributed to the assessment of hazards and vulnerabilities associated with Columbia Basin transportation, agriculture, and energy infrastructure, and regional infrastructure systems that depend on the river transport system.

Data were gathered from public and private sector organizations to determine the hazards, vulnerabilities, and interdependencies among transportation, energy, and agriculture infrastructure along the Columbia, Willamette, and Snake Rivers. The Office of Infrastructure Protection conducted site assistance visits and enhanced critical infrastructure protection security surveys in all three states. The study included a detailed look at the CEI Hub because of its importance to the assessment area.

Because the document contains protected critical infrastructure information, it is exempt from release under the Freedom of Information Act (5 United States Code 552) and similar state and local disclosure laws (in accordance with Title 6 Code of Federal Regulations (CFR) Part 29). It is to be safeguarded and disseminated in accordance with the Critical Infrastructure Information Act of 2002 (6 United States Code §§ 131 et seq.), the implementing regulation (6 CFR Part 29), and protected critical infrastructure information program requirements.

3.2.2 Key Findings

The following are the key findings of the Columbia Basin Resiliency Assessment that are relevant for this study:

- **Finding # 1**—Planning related to the reopening of river navigation after a CSZ earthquake is insufficient. After a CSZ earthquake, sections of the lower Columbia and Willamette Rivers are likely to be closed to shipping. Reopening of navigation channels will be important to support critical functions in the immediate post-disaster situation, and to reduce economic impacts on the region over the long term.
- **Finding # 2**—Regional, state, local, and private sector disaster plans do not reflect the impacts on and integration necessary for recovery of petroleum infrastructure from a CSZ earthquake.
- **Finding # 5**—Most refined petroleum products destined for the Columbia Basin are received via the Olympic Pipeline and/or Columbia and Willamette River transportation systems, all of which would be significantly disrupted by a CSZ earthquake. East-to-west routes for refined petroleum products from Salt Lake City refineries and other sources may be necessary. Rail could play a pivotal role in emergency transportation. The ability to ship grain and petroleum fuels via rail would be critical until Columbia Basin river transportation systems are restored. It is assumed that rail traffic east of the Interstate 5 (I-5) corridor could be reestablished or rerouted fairly rapidly, providing transportation options. However, greater planning and preparation are needed to allow rail to play this role.
- **Finding # 6**—Reliability and rapid recovery of electricity are critical to recovery of petroleum fuel supply and grain export operations. The electrical grid serving Oregon, Washington, and Idaho is part of a highly interconnected system that will experience short- and long-term outages throughout the Pacific Northwest following a CSZ earthquake.

3.2.3 Recommendations

Finding-Specific Recommendations

The Columbia Basin Resiliency Assessment identified "resiliency options" for each of the identified key findings. The resiliency options for the key findings associated with the CEI Hub are as follows:

- Finding # 1 Resilience Options:
  - Emergency agencies should incorporate information about types and volumes of river commerce into existing recovery planning as an appendix to existing state recovery plans for Oregon and Washington.
  - Washington and Oregon State agencies should work with the U.S. Army Corps of Engineers and the Coast Guard to identify federal, state, local, and private sector resources to assist with waterway recovery (dredging, salvage, and transport vessels).
  - Restoration of channel navigation may be gradual and initially not sufficient to support all demands for passage. The Coast Guard and private industry should institute a study to develop specific guides for priority of service.
  - Mitigation measures such as seismic reinforcement of bridges and soil stabilization at port facilities might prevent CSZ earthquake damage that would otherwise take a long time to repair. Federal, state, and local agencies should build mitigation priorities into long-range planning, budgeting, and funding

requests. These agencies can encourage private terminal owners to install mitigation measures by providing information, scientific analysis, and grants or tax incentives.

- Finding # 2 Resilience Options
  - Emergency management and energy agencies should coordinate with industry associations to assist private sector owners and operators of petroleum and transportation assets to incorporate industry-specific resilience guidance and analysis into business continuity plans.
  - Government emergency planners in Idaho, Oregon, and Washington should use existing cross-jurisdictional planning coalitions, such as the Cascadia Region Earthquake Workgroup, in developing regional CSZ earthquake response plans that address petroleum fuel supply.
  - State energy planning agencies should facilitate collaboration between private petroleum supply chain components and regional, state, and local agencies to help facility owners understand the need for seismic vulnerability assessments and amend their contingency plans to address both infrastructure hardening and alternate supply chain pathways.
  - Emergency management, energy, and regulatory agencies should coordinate with federal authorities and private sector petroleum and transportation infrastructure owners and operators to develop a comprehensive listing of waivers from regulatory requirements that may be necessary so that private sector fuel supply contingency plans can be implemented successfully. Agencies should develop a process to facilitate securing the waivers.
  - State emergency management agencies, FEMA, and the private sector should investigate mitigation actions for regional petroleum supply chain choke points, including identifying alternative transportation modes and paths and alternate storage and dispensing facilities. Potential impacts related to those alternate supply chain strategies should be assessed, including alternative energy supplies and communication modes.

- Finding # 5 Resilience Options
  - The Great Northern Corridor Coalition promotes regional cooperation, planning, and shared project implementation for moving freight in a multistate rail and road freight corridor. Idaho, Oregon and Washington emergency management agencies should join the coalition to help ensure that emergency planning for a CSZ earthquake is considered for improvements being proposed.
  - The Transportation Security Administration, the Federal Railroad Administration, the Association of American Railroads, and the American Short Line and Regional Railroad Association should investigate the availability of railcars, including confirming the number of covered hoppers and tank cars that could be made available from major carriers and smaller railroads.
  - State rail programs could incorporate the impacts of congestion and resilience into future infrastructure planning for a CSZ earthquake.

- Finding #6 Resilience Option
  - State public utility agencies and electric providers need to coordinate restoration of electricity in less earthquake-damaged areas where otherwise unaffected infrastructure critical to alternative transportation options for fuel and grain products have been identified.
  - State public utility agencies and energy planners should collaborate with electric utilities to determine how established best practices could strengthen the regional grid to help mitigate the impacts of a CSZ earthquake. State energy planners should consider changes to response and recovery plans that can facilitate a utility's recovery and review energy assurance plans and emergency operation plans to ensure they address wide-scale electric outages and actions to mitigate impacts and restore the grid.
  - State public utility agencies, electric providers work and the Western Electricity Coordinating Council should study how to gauge recovery and restoration needs after a CSZ earthquake and

develop a regional strategy that inventories electric infrastructure resilience and hardening mitigation projects for all at-risk electrical equipment.

Overall Recommendations

The following overall resilience options are recommended:

- Community infrastructure improvement planning—Resilience measures can be incorporated into community land use or transportation planning.
- Structured approach to risk management—Effective risk management employs approaches to prevent or mitigate the effects of hazards that are likely to cause harm. Many government and industry partners use risk management models that can be applied to critical infrastructure.
- Emergency preparedness plans and exercises—The inclusion of infrastructure restoration activities in plans and exercises can enhance infrastructure resilience.
- Vulnerability identification—Analyzing the vulnerabilities of critical infrastructure enables critical infrastructure partners to take action to mitigate risks.

3.3 CITY OF PORTLAND LOCAL ENERGY ASSURANCE PLAN

3.3.1 Synopsis

The City of Portland Local Energy Assurance Plan was developed to prepare for energy disruptions. Participating stakeholders looked at Portland's reliance on energy and the vulnerability of the energy supply, and developed recommendations to address future energy disruptions. The Portland LEAP links to the Oregon State Energy Assurance Plan, Portland's Hazard Mitigation Plan, the Portland Urban Area's Critical Infrastructure Protection Plan, the city's Climate Action Plan and the recommendations of the Portland Peak Oil Task Force. Two documents were produced:

- An energy emergency plan for the City of Portland (the Energy Annex) describing the roles of emergency response agencies, energy providers and distributors, and the community. The Energy Annex provides a framework to guide the City's response during an energy disruption. The City's response priorities are life safety, incident stabilization, environmental protection and property conservation. Priority is given to provide emergency assistance to vulnerable populations. When the energy supply is disrupted, the City will work collaboratively with critical infrastructure owners and operators to help get facilities back online as quickly as possible. The City's efforts may include helping utilities access and secure their sites, facilitating damage assessments, debris removal, and reopening roads.
- An improvement plan with recommendations to guide next steps.

The Portland LEAP used the following earthquake scenario for planning purposes:

- **What**: Cascadia Subduction Zone earthquake with a magnitude of 8.0 in Portland.
- **Where:** The earthquake occurs 90 miles west of Portland.
- **When**: Noon on a Wednesday in November 2011.
- **Timeline:** 72 hours after the earthquake it is now Saturday.

3.3.2 Key Findings

The following are the key findings of the Portland LEAP process that are relevant for this study:

- **The importance of coordination between the public and private sectors**—Coordination between the City of Portland, energy utilities and industries will be paramount during an energy emergency. During a

major energy disruption, utilities will need help from emergency responders to gain access to their sites. Site access, transportation and debris removal for utility crews and emergency response workers will be critical to restoring power in a timely manner.

- **Coordination between local jurisdictions and state agencies can be improved**—There is little understanding in the Portland area of the Oregon Department of Energy's Oregon Petroleum Contingency Plan and minimal awareness of the Fuel Allocation Program. Priority groups identified in the Oregon Department of Energy's plan may not correspond to local government, business and industry priorities.

3.3.3 Recommendations

Recommendations were identified to help the region better prepare for a major energy disruption and build a resilient community. The following are most relevant to the CEI Hub study:

- **Formalize the relationship between the public and private sectors**—A formal public and private sector partnership of energy providers, distributors, energy users and state agencies, including the Public Utility Commission, is needed to strengthen preparations for a major energy disruption. This could better define roles, responsibilities, priorities, technology and protocols for communication between the City of Portland, energy utilities and industries in Portland's Northwest Industrial Area.

  - **Objective**—Work with the PUC and private sector energy providers to formalize a liaison position to the City's Emergency Coordination Center by December 2013.

- **Ensure that the energy assurance plan is used in development of bureau-specific and citywide continuity of operations plans and utility asset management plans**—Align findings from the energy assurance plan with energy profiles of essential facilities to ensure they are adequate to meet emergency needs.

  - **Objective**— By December 2014, ensure that all city bureaus have updated their continuity of operations plans to take into account their energy profile, internal and external interdependencies, necessary service restoration resources, and contingency plans. Work with private sector utilities to evaluate expected lengths of time to resume utility service after a Cascadia earthquake.

- **Certify more damage assessment teams**—The City should work with utilities to coordinate and train more post-earthquake damage assessment teams. This will give utilities the ability to assess their own facilities without relying on city damage assessment teams.

  - **Objective**—Conduct at least two Applied Technology Council post-earthquake damage assessment trainings (ATC-20) for 80 structural engineers, architects and inspectors to serve on damage assessment teams by September 2013.

- **Improve the process for emergency notifications**—Continue to improve the communication process between utilities, government and emergency response agencies and the public.

  - **Objective**—Work with utilities to formalize a process to communicate the impacts of planned and unanticipated outages and restoration actions with potentially affected customers, government and emergency response agencies and the public via a centralized website, by June 2013.

- **Conduct drills**—A regional practice drill should be performed with public and private partners. The exercise should focus on several possible disruptions to the energy system and demonstrate the need for energy resource options (i.e. renewable, petroleum, natural gas and electricity).

  - ➢ **Objective**—Plan a series of table top and functional exercises that test elements of the Energy Annex by September 2014 and use lessons learned to update the Energy Annex.

- **Recommend changes to the Oregon Department of Energy's Fuel Allocation Program**—When the Oregon Department of Energy implements its Fuel Allocation Program, end users are prioritized into three tiers. Tier 1 includes emergency services sectors (law enforcement, fire, EMS) and Tier 2 includes essential services (public works, transit, telecommunications, utilities). Because emergency vehicles cannot use roads heavily strewn with debris, debris removal operations should be performed early.

  - ➢ **Objective**—Work with the Oregon Department of Energy to consider accommodating certain essential functions, including debris management, as part of the Tier 1 Fuel Allocation Program.

3.4 THE ENERGY CLUSTER IN LINNTON

3.4.1 Synopsis

This 2005 report investigated the importance of the CEI Hub (referred to in the report as the Linnton Energy Cluster) to the Northwest region as a whole. It evaluated conditions that contribute to a healthy climate for the energy cluster and how potential land use changes could negatively impact those conditions. The report was prepared by Phillip E. Grillo of Miller Nash LLP for the Olympic Pipeline Company, BP West Coast Products LLC, and Kinder-Morgan Energy Partners, L.P. A principle source document was the City of Portland 2004 Industrial District Atlas.

3.4.2 Key Findings

The following are the key findings of the Linnton Energy Cluster report that are relevant for this study:

- Three property owners own 78.5 percent of the 69.3-acre study area.
- The convergence of freight infrastructure and all the logistical investments that support it have led to a highly efficient and highly regulated petroleum transportation and distribution network.
- The area has the characteristics of an "industry cluster"—a group of firms that are geographically close and share common markets and technologies and draw on similar worker skills and facilities. These clusters can draw competitive advantages from the investment of labor, facilities and other assets that accumulate in certain places, forming a concentration of employees, facilities and service. This can create strong buyer-supplier relationships.
- The zoning in the study area as of 2004 was ideally suited for energy cluster use.
- As a matter of policy, the study area has been preserved for all kinds of industry, especially heavy industries that cannot be located in other portions of the City.
- Protection of the study area for conflicting uses is important to Oregon's economy.
- The study area is subject to earthquakes, landslides, flooding and wildfire.
- There is only one way in and out of the study area—Highway 30—and there is a lack of alternate access.
- Increasing the population in the study area could lead to increased security concerns within the cluster.
- The potential impacts from a tank fire are significant. Studies estimate significant injury would be experienced within 60 seconds at a distance of 695 feet from the fire source.

3.4.3 Conclusions

The report concluded that the energy cluster is vital to the economy of the state and the region and should not be compromised by placing new residential uses nearby. It found that, over time, industries came to be located in the energy cluster because of the convergence of freight infrastructure and other favorable site conditions. The

introduction of new residential uses in the area would make it significantly more difficult and risky for the energy cluster to operate and would make it virtually impossible for the cluster to grow.

3.5 PORT OF PORTLAND CORPORATE SEISMIC RISK ASSESSMENT

3.5.1 Synopsis

The Port of Portland conducted a seismic risk assessment of high-value Port assets with the following goals:

- Evaluate the performance of the assets under the effects of an earthquake.
- Identify improvements that would enhance the ability to avoid damage from an earthquake.
- Estimate benefits of such improvements in comparison to cost of implementation.

The seismic risk assessment included the following elements:

- Identify a list of key Port aviation and marine assets to consider.
- Assess the seismic fragility of the identified assets, considering several earthquake magnitudes.
- Estimate duration of service loss or downtime.
- Estimate costs of repair or replacement.
- Estimate economic losses to the Port and to the region resulting from business interruptions.
- Identify potential mitigation actions for selected assets.
- Develop order-of-magnitude estimates of cost for the actions.
- Conduct benefit-cost analyses of potential mitigation actions.
- Identify specific mitigation projects for further study and analysis, potentially leading to incorporation into the Port's capital improvement program.

The only Port facility assessed in this report within the CEI Hub was Marine Terminal # 4, the Kinder-Morgan Berths 410 and 411. The following discussion pertains only to facilities within the CEI Hub.

3.5.2 Key Findings

The following are the key findings of the Port of Portland report that are relevant for this study:

- Berth 410 was constructed in 1962; Berth 411 was constructed in 1959.
- Design capacity for the lateral systems is approximately 30 percent of current code design forces.
- Berth 410 is constructed primarily of timber elements, and Berth 411 is constructed of concrete elements. However, the performance of the two berths is expected to be similar.
- The structures would likely survive a 72-year return period seismic event with repairable damage.
- A 475-year return period seismic event would induce significant soil liquefaction, causing large lateral soil displacements that would result in excessive forces on structural elements. The facilities would not survive the 475-year event.

3.5.3 Recommendations

Benefit-cost ratios for mitigation actions are shown in Table 3-1. The benefit-cost analysis for the potential retrofit mitigation actions at all of the marine facilities evaluated, except Terminal 4 (Berths 410/411), shows benefit-cost ratios greater than 1 considering Port and regional economic impacts.

Table 3-1. Terminal Mitigation Action Benefit/Cost Ratios

Marine Terminal#	Estimated Cost of Mitigation	Benefit/Cost Ratio
#4 (Berths 410 and 411)	$42 million	0.77
#5 (Berth 501)	$20 million	3.47
#5 (Berth 503)	$13 million	1.77
#6 (Berth 601)	$5 million	2.85
#6 (Berths 604/605)	$15 million	2.24

For Terminal 4 (Berths 410/411), the cost of facility replacement and the time out of service take the benefit/cost ratio of retrofit mitigation below 1. The report concluded that, given the age of these facilities and the cost of improvements that would be needed to achieve survivability for the 475-year earthquake, the only mitigation action that would be economically feasible is to replace the berths with a modern facility. It is expected that replacing the two berths with a single combined facility would be the preferred approach. The report's order-of-magnitude estimate of cost for a combined replacement facility was $42 million.

The following are additional general recommendations from the report:

- Evaluate the benefit of designing each new project for greater seismic resilience than required by building code. Considering that code requirements for seismic design forces are based on life safety and collapse prevention, not on property preservation or operational continuity, structures designed to code cannot be expected to maintain uninterrupted functionality after a major earthquake.
- Identify and evaluate mitigations for other key Port assets. This study identified and evaluated potential mitigation actions for only a limited number of the Port's key assets. A similar effort should be undertaken for other assets considered critical for the Port's functions.
- Broaden future seismic risk assessment efforts to include non-Port critical assets and lifelines, in coordination with other agencies and with utility owners.
- Confirm the plan for Port emergency operations and recovery. Immediate occupancy after a significant ground motion should not be expected for any Port facility, as it currently exists. The Port should assess the current emergency response plan to ensure there is an allowance for the probable temporary unavailability of existing Port facilities.

4. RISK ASSESSMENT

Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards. It allows emergency management personnel to establish response priorities by identifying potential hazards and vulnerable assets. The process focuses on the following elements:

- Vulnerability identification—Determine the impact of natural hazard events on the people, property, environment, economy and lands of the region.
- Cost evaluation—Estimate the cost of potential damage or cost that can be avoided by mitigation.

4.1 HAZARDS OF CONCERN

For this study, the study area was assessed for the hazards of concern identified by the oversight Steering Committee for the update of the City of Portland Hazard Mitigation Plan. The following hazards of concern are relevant in particular to the CEI Hub:

- Earthquake
- Flood
- Landslide
- Severe weather
- Volcanic activity
- Wildfire.

Detailed citywide assessments of all of these hazards of concern, as well as the dam failure hazard, which is not relevant for the CEI Hub, can be found in the 2016 City of Portland Hazard Mitigation Plan.

4.2 RISK ASSESSMENT METHODOLOGY

Risk assessments generally include exposure and vulnerability information for people, property, the environment and the economy. These factors are addressed in more detail for each hazard of concern in the 2016 City of Portland Hazard Mitigation Plan. For this study, the focus is on property; specifically, the facilities operating in the CEI Hub. The exposure and vulnerability of people, the environment and the economy are discussed only if impacts on CEI Hub facilities would result in secondary impacts on people, the environment or the economy. This is a high-level study based on the best available data, technology and industry best management practices available at the time of the study.

Sections 4.3 to 4.10 of this report provide summaries of each hazard, the scenarios assessed, and exposure and vulnerability evaluations for all CEI Hub facilities for which data was available. Not all CEI Hub stakeholders participated in this study. For facilities for which data was not available, the planning team made modeling assumptions that may understate the risk.

4.2.1 Mapping

A review of national, state and local databases was performed to locate spatially based data relevant to this planning effort. Maps were produced using geographic information system (GIS) software to show the extent and location of identified hazards when such data was available.

4.2.2 Earthquake and Flood—Hazus-MH

Overview

In 1997, FEMA developed the Hazards U.S., or Hazus, model to estimate losses caused by earthquakes. Hazus was later expanded into a multi-hazard model, Hazus-MH, able to estimate potential losses from hurricanes and floods. Hazus-MH is a GIS-based program used to support risk assessments, mitigation planning, and emergency planning and response. It provides a wide range of inventory data, such as demographics, building stock, and transportation and utility facilities. The program maps and displays hazard data and estimates damage and economic loss for buildings and infrastructure. Its advantages include the following:

- It provides a consistent methodology for assessing risk across geographic and political entities.
- It provides a way to save data so that it can readily be updated as population, inventory, and other factors change and as mitigation-planning efforts evolve.
- It facilitates the review of mitigation plans because it incorporates FEMA methodologies.
- It supports grant applications by calculating benefits using FEMA definitions and terminology.
- It produces hazard data and loss estimates that can be used in communication with local stakeholders.
- It is administered by the local government and can be used to manage and update a hazard mitigation plan throughout its implementation.

Levels of Detail for Evaluation

Hazus-MH provides default data for building and infrastructure inventory, vulnerability and hazards; this default data can be supplemented with local data to provide a more refined analysis. The model can carry out three levels of analysis, depending on the format and level of detail of information about the study area:

- **Level 1**—All of the information needed to produce an estimate of losses is included in the software's default data. This data is derived from national databases and describes in general terms the characteristic parameters of the study area.
- **Level 2**—More accurate estimates of losses require more detailed information about the study area. To produce Level 2 estimates of losses, detailed information is required about local geology, hydrology, hydraulics and building inventory, as well as data about utilities and critical facilities. This information is needed in a GIS format.
- **Level 3**—This level of analysis generates the most accurate estimate of losses. It requires detailed engineering and geotechnical information to customize it for the study area.

Comprehensive Data Management System

The Comprehensive Data Management System is a complementary tool to Hazus-MH that provides users with the ability to update and manage statewide datasets, which are currently used to support analysis in Hazus-MH. Currently, Hazus-MH users are required to undertake a large amount of manual effort to incorporate new data into the statewide datasets according to their pre-defined formats. To reduce this effort, CDMS streamlines and automates raw data processing, the conversion of external data sources into Hazus-MH compliant data and the transfer of data into and out of the statewide datasets.

Application for This Study

Hazus-MH (Version 2.1) was used to assess risk for the earthquake and flood hazards for this study. The following methods were used:

- **CDMS essential facility update**—The CDMS extension to Hazus-MH was used to update the inventory of assets analyzed for this study. Data provided by the participating CEI Hub stakeholders was formatted for importation into the CDMS platform for analysis. The planning team developed a CDMS data-capture form and accompanying instructions that were distributed to all participating stakeholders. The data-capture form was set up to collect up to 24 attributes on each facility in the CEI Hub to support the earthquake and flood analyses. For attributes not provided by CEI Hub stakeholders, Hazus default values were used. Each facility inventoried was assigned one of eight Hazus occupancy class designations, defined as shown in Table-4-1.
- **Earthquake**—A Level 2 analysis was conducted. Earthquake shake maps and probabilistic data prepared by the U.S. Geological Survey (USGS) were used for the analysis of this hazard. This data was augmented by National Earthquake Hazard Reduction Program soils, liquefaction susceptibility, and landslide susceptibility data provided by DOGAMI. An updated inventory of essential facilities, transportation and utility features was used in place of the Hazus-MH defaults.
- **Flood**—A Level 2 analysis was conducted. An updated inventory was used in place of the Hazus-MH defaults for essential facilities, transportation and utilities. Current study area digital Flood Insurance Rate Map information from FEMA was used to delineate flood hazard areas and estimate potential losses from the 10-year, 100-year, and 500-year flood events. Using the FEMA floodplain boundaries and the City of Portland 3-foot digital elevation model, flood depth grids were generated and integrated into the Hazus model.

Table-4-1. Hazus Occupancy Class Definitions

Facility Categories	Facility Types
Emergency Services	Emergency operation centers, fire, police, medical
Transportation Systems	Ports, airports, bridges, tunnels, rail, bus
High Potential Loss Facilities	Dams, hazardous materials, military, nuclear
Electric Power Facilities	Sub-stations, major power lines
Natural Gas Facilities	Major gas lines
Petroleum Facilities	Tank farms
Potable Water	Pump stations, wells, tanks, reservoirs, essential pipelines
Wastewater	Pump stations, treatment plants, pipelines

4.2.3 Landslide, Severe Weather, Volcanic Activity and Wildfire

For landslide, severe weather, volcano and wildfire, historical data was not adequate to model future losses. However, geospatial analysis can be used to map hazard areas and calculate exposures if geographic information is available on the locations of the hazards and inventory data. Areas and inventory susceptible to some of the hazards of concern were mapped and exposure was evaluated. For other hazards, a qualitative analysis was conducted using the best available data and professional judgment. Locally relevant information was gathered from a variety of sources. The primary data source was the City of Portland GIS database, augmented with state and federal data sets. Additional data sources for specific hazards were as follows:

- **Landslide**—Two data sets were used to support the landslide risk assessment:
  - City of Portland regulatory landslide hazard areas—This dataset was created from three sources: Areas mapped as earthquake hazard areas by Metro, areas delineated as zones of high landslide

potential by Portland State University based on study of hundreds of landslides during storms in February 1996, and areas in the City with slopes of 15 percent or greater.
  - DOGAMI historical landslide deposits.

- **Volcano**—Volcanic hazard data was obtained from the USGS Cascade Volcano Observatory.
- **Wildfire**—Wildland fire hazard data was provided by the City of Portland.

4.2.4 Sources of Data Used in Hazus Modeling

Table-4-2 summarizes the Hazus-MH model data sources for this study.

4.2.5 Limitations

Uncertainties are inherent in loss estimation, partly due to incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties for this study also result from the following:

- Approximations and simplifications necessary to conduct a study.
- Incomplete or outdated inventory, demographic or economic parameter data.
- The unique nature, geographic extent and severity of each hazard. For example, in the current Hazus-MH model, the maximum duration of shaking during an earthquake event is 1 minute. It is anticipated that shaking may last for 3 minutes or longer during a Magnitude-9.0 Cascadia event.
- Mitigation measures already employed.
- The amount of advance notice residents have to prepare for a specific hazard event.
- The fact that not all hazards of concern have readily available modeling platforms.

These factors can affect loss estimates by a factor of two or more. Therefore, potential exposure and loss estimates are approximate and should be used only to understand relative risk.

Hazus-MH currently represents the industry best management practice for assessing risk in support of hazard mitigation planning. However, Hazus and other models used for this risk assessment are limited by the availability of data to support their working components. Such models must make assumptions where firm data are not available. Assumptions are used, for example, to estimate ground deformation caused by liquefaction. These model limitations can lead to an understatement or overstatement of risk. Further, the Hazus-MH model employs a "lower bound" analysis, intended to demonstrate cost-effectiveness at the lowest level of expected impact.

Despite their limitations, risk assessment techniques are able to indicate the possible extremes of hazard events. Their findings should be recognized as identification of potential hazard occurrences rather than as predictions of probable hazard events.

Table-4-2. Hazus Model Data Documentation

Data	Source	Date	Format
Flood hazard data	FEMA	12/2014	Digital (GIS) format
Digital elevation model	City of Portland Bureau of Planning and Sustainability	2014	Digital (GIS) format
Shake maps (Cascadia M9.0 and Portland Hills M6.5)	U.S. Geological Survey	2011 and 2009	Digital (GIS) format
National Earthquake Hazards Reduction Program soils	Oregon Department of Geology and Mineral Industries	2013	Digital (GIS) format
Liquefaction susceptibility	Oregon Department of Geology and Mineral Industries	2013	Digital (GIS) format
Landslide susceptibility	Oregon Department of Geology and Mineral Industries	2013	Digital (GIS) format
Regulatory landslide hazard area	City of Portland	Provided in 2015	Digital (GIS) format
Historical landslide deposits	Oregon Department of Geology and Mineral Industries	Provided in 2015	Digital (GIS) format
Wildland fire hazard	City of Portland	2002	Digital (GIS) format
Mt. Hood volcanic hazards	U.S. Geological Survey Cascades Volcano Observatory (CVO)	1997	Digital (GIS) format
CEI Hub Facilities			
Emergency operation centers, armories, nuclear reactors, helipads	City of Portland Bureau of Emergency Management	2015	Digital (GIS) format
Fire stations, hospitals, Police Bureau facilities, schools, airports, transit centers, highway bridges, highway tunnels, railway bridges, rail facilities, rail tunnels, 800 MHz transmitters, CenturyLink offices, City-owned essential facilities, Oregon Zoo, nursing homes/assisted living facilities	City of Portland	various dates	Digital (GIS) format
Well sites, reservoirs, pump stations, potable water facilities	City of Portland Water Bureau	Provided in 2015	Digital (GIS) format
Wastewater facilities	City of Portland Bureau of Environmental Services	Provided in 2015	Digital (GIS) format
Fireboat facilities, law enforcement facilities, military installations, highway bridges, highway tunnels, electric substations, petroleum facilities, prisons	City of Portland Regional Disaster Preparedness Organization	2011	Digital (GIS) format
Bus facilities, light rail bridges, light rail facilities, light rail tunnels, railway bridges	TriMet	Provided in 2015	Digital (GIS) format
Airports, port facilities	Port of Portland	Provided in 2015	Digital (MS Excel) format
Hazardous material facilities	Oregon State Fire Marshal	Provided in 2015	Digital (GIS) format
IRIS data (natural gas facilities)	Oregon Public Health	Provided in 2016	Digital (GIS) format
Petrol tank farms	Oregon Public Broadcasting	Provided in 2016	Digital (GIS) format
Natural gas facilities	Pacific Terminal Services	Provided in 2015	Digital (MS Excel) format
Petroleum facilities	Kinder Morgan	Provided in 2015	Digital (MS Excel) format
Communications facilities, electric facilities	FEMA-Hazus-MH version 2.2 default Comprehensive Data Management System	2015	Digital (GIS) format

4.3 EARTHQUAKE RISK ASSESSMENT

4.3.1 Hazard Profile

This report provides a summary profile of the earthquake hazard in the City of Portland. The 2016 City of Portland Hazard Mitigation Plan and the following additional resources provide discussions that are more detailed:

- Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub (DOGAMI, 2013)
- Cascadia Subduction Zone Earthquakes: A Magnitude 9.0 Earthquake Scenario (Cascadia Region Earthquake Workgroup, 2013).

Faults Affecting the Study Area

Many earthquake faults capable of producing damaging earthquakes exist in the area of the CEI Hub. The most threatening fault is the Cascadia Subduction Zone fault, which lies just offshore of the Oregon coast. The CSZ fault has produced over 40 large magnitude earthquakes during the past 10,000 years, most recently on January 26, 1700. Based on the 10,000-year record of past Cascadia earthquakes, Oregon will certainly experience another Magnitude 8 – 9 earthquake (Goldfinger et al. 2012). A Magnitude 9 CSZ earthquake has a likelihood as high as 14 percent in the next 50 years (USGS, 2008), although probabilities are likely higher for smaller segments along the fault to break (Goldfinger et al. 2012). A large earthquake on this fault, which has the same type of subduction zone process as the 2011 Magnitude 9 earthquake in Japan, will be accompanied by a coastal tsunami.

The Portland Hills fault is located in the CEI Hub area and can produce a Magnitude 7 earthquake (USGS, 2008). The likelihood of this earthquake occurring is approximately 1 percent in the next 50 years (USGS, 2016).

Earthquake Damage

Earthquakes can last from a few seconds to over 5 minutes. They may occur as a single event or a series of tremors over several days. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties generally result from falling objects and debris because the shocks damage or demolish structures. Disruption of communications, electrical power supplies and gas, sewer and water lines should be expected. Earthquakes may trigger fires, landslides or releases of hazardous material, compounding their disastrous effects. Hazardous materials releases can occur during an earthquake from fixed facilities or transportation-related incidents. During an earthquake, structures storing these materials could rupture and leak into the surrounding area or an adjacent waterway, having a disastrous effect on the environment.

The following are the primary seismic characteristics that would impact the CEI Hub area:

- Ground shaking
- Liquefaction (soil behavior phenomenon in which a saturated sand softens and loses strength during strong earthquake ground shaking)
- Lateral spreading (where surficial soil permanently moves laterally due to earthquake shaking)
- Landslides
- Co-seismic settlement (where the ground surface is permanently lowered due to seismic shaking)
- Bearing capacity failures (when the foundation soil cannot support the structure it is intended to support).

Liquefaction and lateral spreading hazards are of primary concern to the waterfront fuel supply facilities. The impact of an earthquake is based on its magnitude as well as its distance from a community. Local faults can produce lower magnitude quakes that result in strong ground shaking and extensive damage because they are nearby. In contrast, large regional faults can generate earthquakes of great magnitudes that, because of their distance and depth, may result in only moderate shaking in an area.

Seismic Mapping

Shake Maps

A shake map is a map of ground shaking produced by an earthquake. The information it presents is different from the earthquake magnitude and epicenter that are released after an earthquake; shake maps focus on the ground shaking resulting from the earthquake, rather than the parameters describing the earthquake source. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region, depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth's crust. A shake map shows the extent and variation of ground shaking immediately after significant earthquakes.

Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on estimated amplitudes where data are lacking, and site amplification corrections. Two types of shake map are typically generated from the data:

- A probabilistic seismic hazard map shows the hazard from earthquakes that geologists and seismologists agree could occur. The maps are expressed in terms of probability of exceeding a certain ground motion, such as the 10-percent probability of exceedance in 50 years. This level of ground shaking has been used for designing buildings in high seismic areas. The standard Hazus analysis for the 100- and 500-year probabilistic events were modeled for this study.
- Earthquake scenario maps describe the expected ground motions and effects of hypothetical large earthquakes for a region. Two scenarios were chosen for this plan:
  - Scenario Earthquake 1—A Magnitude-9.0 event on the Cascadia Subduction Zone Fault with an epicenter at 45.7329° N, 125.125° W (67 miles west of Tillamook) and a focal depth of 20 km.
  - Scenario Earthquake 2—A Magnitude-6.5 event on the Portland Hills Fault with an epicenter at 45.5544° N, 122.798° W (Forest Park, Portland, OR) and a focal depth of 0 km.

National Earthquake Hazards Reduction Program Soil Maps

Soil classifications under the National Earthquake Hazards Reduction Program (NEHRP) help to identify locations that will be significantly impacted by an earthquake. NEHRP Soils B and C typically can sustain low-magnitude ground shaking without much effect. The areas that are most commonly affected by ground shaking have NEHRP Soils D, E and F. Mapped NEHRP Soils in the CEI Hub Study Area are shown on Figure 4-1.

Liquefaction

Figure 4-2 shows the mapped liquefaction hazard areas within the study area.

4.3.2 Exposure

Population

The entire population of the study area is exposed to direct and indirect impacts from earthquakes. This includes people who live in Linnton Neighborhood within the CEI Hub study area and people who work in the CEI Hub.

Property

All facilities in the study area are exposed to the earthquake hazard.

Environment

Secondary hazards associated with earthquakes will likely have impacts on the environment in the study area.

30B
30
NW 61ST AVE
NW FRONT AVE
NW ST HELENS RD
NW FRONT AVE
NW NICOLAI ST
NW WILSON ST
30
30B
5
5
NW 61ST AVE
NW FRONT AVE
NW ST HELENS RD
NW FRONT AVE
NW NICOLAI ST
NW WILSON ST
30
30B
5
5
September 12, 2016
Mitigation Action Plan (MAP)
Critical Energy Infrastructure Hub Study
Figure 4-1.
National Earthquake Hazards Reduction Program Soils
Legend
City Boundary
Critical Energy Infrastructure (CEI) Hub Boundary
NEHRP Soils
Type
B
C
D
E
NORTH
0
0.5
1
Miles
Sources: DOGAMI-2012; City of Portland-2016
CITY OF PORTLAND OREGON
PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Critical Energy Infrastructure Hub Study

Figure 4-2.
Liquefaction Susceptibility

Legend

City Boundary

Critical Energy Infrastructure (CEI) Hub Boundary

Liquefaction Susceptibility

0 -- None
1 -- Very Low
2 -- Low
3 -- Moderate
4 -- High
5 -- Very High

NORTH

0 0.5 1 Miles

Sources: DOGAMI-2013; City of Portland-2016

PBEM

4.3.3 Vulnerability

Population

The vulnerability of people in the study area depends on factors such as the age and construction type of the structures people live and work in, the soil type these facilities are constructed on, their proximity to the fault, etc. Whether directly impacted or indirectly impact, the entire population will have to deal with the consequences of earthquakes to some degree. Business interruption could keep people from working, road closures could isolate populations, and loss of functions of utilities could impact populations that suffered no direct damage from an event itself. These impacts would not be unique to the CEI Hub, but would be felt city-wide.

It is logical to assume, but difficult to model, secondary impacts from the CEI Hub facilities on population centers in the City after a major earthquake. The secondary impacts could include but are not limited to: reduction in air quality from fires and fume emissions from CEI Hub containment facilities that experience failures from seismic activity, environmental impacts from product entering the Willamette River, and isolation due to road and bridge failure. These impacts could be significant and would tax the response capability of the City.

Property

Level of Damage

Hazus-MH classifies the vulnerability of critical facilities to earthquake damage in five categories: no damage, slight damage, moderate damage, extensive damage, or complete damage. The definitions for each of these damage categories varies based upon the occupancy class of the facility, as shown in Table-4-3. The model was used to assign a vulnerability category to each defined facility in the study area.

The damage analysis was performed for the 100- and 500-year probabilistic events, the Magnitude 9.0 Cascadia Subduction Zone scenario event, and the Magnitude 6.5 Portland Hills fault scenario event. The results are summarized in Table-4-4 through Table-4-7.

Time to Return to Functionality

Hazus-MH estimates the time to restore critical facilities to fully functional use. Results are presented as probability of being functional at specified time increments: 1, 3, 7, 14, 30 and 90 days after the event. For example, Hazus-MH may estimate that a facility has 5 percent chance of being fully functional at Day 3, and a 95-percent chance of being fully functional at Day 90. In this methodology, loss of function is defined as the time that a facility is not capable of conducting business. This, in general, will be shorter than repair time, because businesses will rent alternative space while repairs and construction are being completed.

The functionality analysis of CEI Hub facilities was performed for the 100- and 500-year probabilistic events, the Magnitude 9.0 Cascadia Subduction Zone scenario event, and the Magnitude 6.5 Portland Hills fault scenario event. The results are summarized in Table-4-8 through Table-4-11.

Environment

The environment vulnerable to earthquake hazard is the same as the environment exposed to the hazard. Groundwater supplies and adjacent water courses could be contaminated by spillage from storage tanks. Air quality could be significantly compromised by fires started due to secondary impacts from seismic events. Earthquake-induced landslides can significantly impact surrounding habitat. It is also possible for streams to be rerouted after an earthquake. This can change the water quality, possibly damaging habitat and feeding areas. There is a possibility of streams fed by groundwater drying up because of changes in underlying geology.

Table-4-3. Damage State Definitions by Occupancy Class

Classification	Description
Emergency Services and High Potential Loss	
Slight	Small cracks at corners of door and window openings and wall-ceiling intersections; small cracks on stucco and plaster walls. Some slippage may be observed at bolted connections.
Moderate	Larger cracks at corners of door and window openings; small diagonal cracks across shear wall panels exhibited by cracks in stucco and gypsum wall panels; minor slack (less than 1/8" extension) in diagonal rod bracing requiring re-tightening; minor lateral set at store fronts and other large openings; small cracks or wood splitting may be observed at bolted connections.
Extensive	Large diagonal cracks across shear wall panels; large slack in diagonal rod braces and/or broken braces; permanent lateral movement of floors and roof; cracks in foundations; splitting of wood sill plates and/or slippage of structure over foundations; partial collapse of "soft-story" configurations; bolt slippage and wood splitting at bolted connections.
Complete	Structure may have large permanent lateral displacement, may collapse or be in imminent danger of collapse due to failed shear walls, broken brace rods or failed framing connections; it may fall its foundations; large cracks in the foundations. Approximately 3% of the total area of W2 buildings with complete damage is expected to be collapsed.
Transportation Systems	
Slight	Slight settlement (few inches) or offset of the ground. Minor cracking and spalling.
Moderate	Moderate settlement (several inches) or offset of the ground. Support features experiencing moderate (shear cracks) cracking and spalling (column structurally still sound), moderate movement of the abutment (<2"), extensive cracking and spalling of shear keys, any connection having cracked shear keys or bent bolts, keeper bar failure without unseating, rocker bearing failure or moderate settlement of the approach.
Extensive	Major settlement of the ground (few feet). Support features degrading without collapse—shear failure - (column structurally unsafe), significant residual movement at connections, or major settlement approach, vertical offset of the abutment, differential settlement at connections, shear key failure at abutments.
Complete	Major settlement of the ground. Support features collapsing and connection losing all bearing support, which may lead to imminent deck collapse, tilting of substructure due to foundation failure.
Electric Power	
Slight	Failure of 5% of the disconnect switches (i.e., misalignment), or the failure of 5 % of the circuit breakers (i.e., circuit breaker phase sliding off its pad, circuit breaker tipping over, or interrupter-head falling to the ground), or by the building being in minor damage state. Turbine tripping, or light damage to diesel generator, or by the building being in minor damage state.
Moderate	Failure of 40% of disconnect switches (e.g., misalignment), or 40% of circuit breakers (e.g., circuit breaker phase sliding off its pad, circuit breaker tipping over, or interrupter-head falling to the ground), or failure of 40% of current transformers (e.g., oil leaking from transformers, porcelain cracked), or by the building being in moderate damage state. chattering of instrument panels and racks, considerable damage to boilers and pressure vessels, or by the building being in moderate damage state
Extensive	Failure of 70% of disconnect switches (e.g., misalignment), 70% of circuit breakers, 70% of current transformers (e.g., oil leaking from transformers, porcelain cracked), or by failure of 70% of transformers (e.g., leakage of transformer radiators), or by the building being in extensive damage state. Considerable damage to motor driven pumps, or considerable damage to large vertical pumps, or by the building being in extensive damage state.
Complete	Failure of all disconnect switches, all circuit breakers, all transformers, or all current transformers, or by the building being in complete damage state. Extensive damage to large horizontal vessels beyond repair, extensive damage to large motor operated valves, or by the building being in complete damage state.
Natural Gas	
Slight	Slight damage to building.
Moderate	Considerable damage to mechanical and electrical equipment, or considerable damage to building
Extensive	Building being extensively damaged, or the pumps badly damaged beyond repair.
Complete	Building in complete damage state.
Petroleum	
Slight	Malfunction of plant for a short time (less than three days) due to loss of backup power or light damage to tanks.
Moderate	Malfunction of tank farm for a week or so due to loss of backup power, extensive damage to various equipment, or considerable damage to tanks.

Classification	Description
Extensive	Tanks extensively damaged, or extensive damage to elevated pipes.
Complete	Complete failure of all elevated pipes, or collapse of tanks.
Potable Water	
Slight	Malfunction of facility for a short time (less than three days) due to loss of electric power and backup power if any, considerable damage to various equipment, light damage to sedimentation basins, light damage to chlorination tanks, or light damage to chemical tanks. Loss of water quality may occur. Tanks suffering minor damage without loss of its contents or functionality. Minor damage to the tank roof due to water sloshing,
Moderate	Malfunction of facility for about a week due to loss of electric power and backup power if any, extensive damage to various equipment, considerable damage to sedimentation basins, considerable damage to chlorination tanks with no loss of contents, or considerable damage to chemical tanks. Loss of water quality is imminent. Storage tanks being considerably damaged, but only minor loss of content. Elephant foot buckling for steel tanks without loss of content, or moderate cracking of concrete tanks with minor loss of contents.
Extensive	Damage will likely result in the shutdown of the facility. Buildings extensively damaged, or the pumps being badly damaged beyond repair. Storage tanks being severely damaged and going out of service. Elephant foot buckling for steel tanks with loss of content, stretching of bars for wood tanks, or shearing of wall for concrete tanks fits the description of this damage state.
Complete	Complete failure of all piping, or extensive damage to the filter gallery. Total building collapse. Storage tanks collapsing and losing all of its content.
Wastewater	
Slight	Malfunction of facility for a short time (less than three days) due to loss of electric power and backup power if any, considerable damage to various equipment, light damage to sedimentation basins, light damage to chemical tanks. Loss of water quality may occur.
Moderate	Malfunction of facility for about a week due to loss of electric power and backup power if any, extensive damage to various equipment, considerable damage to sedimentation basins, considerable damage to chemical tanks with no loss of contents. Loss of water quality is imminent.
Extensive	Damage will likely result in the shutdown of the facility. Buildings extensively damaged, or the pumps being badly damaged beyond repair.
Complete	Complete failure of all piping's, or extensive damage to the filter gallery. Total building collapse.

Data Source: Multi-Hazard Loss Estimation Methodology, Earthquake Model, Hazus-MH 2.1, Technical Manual

Table-4-4. Estimated Damage to CEI Hub Facilities from 100-Year Earthquake

		Probability (%)														
	#	No Damage			Slight Damage			Moderate Damage			Extensive Damage			Complete Damage		
Category	Facilities	Avg.	High	Low	Avg.	High	Low	Avg.	High	Low	Avg.	High	Low	Avg.	High	Low
Emergency Services	3	96.64	97.22	95.47	2.99	4.00	2.49	0.33	0.48	0.25	0.02	0.03	0.02	0.00	0.00	0.00
Transportation	3	73.15	73.15	73.15	26.36	26.36	26.36	0.43	0.43	0.43	0.04	0.04	0.04	0.00	0.00	0.00
High Potential Loss	14	23.29	44.82	15.31	64.05	67.76	51.94	9.84	12.97	2.80	2.40	3.37	0.37	0.40	0.58	0.04
Electric Power	5	78.40	91.94	64.27	18.40	29.30	7.51	3.01	6.03	0.51	0.16	0.35	0.02	0.01	0.02	0.00
Natural Gas	1	64.27	64.37	64.37	29.30	29.30	29.30	6.03	6.03	6.03	0.35	0.35	0.35	0.02	0.02	0.02
Petroleum	293	68.74	92.04	64.27	25.94	29.30	7.42	5.00	6.03	0.05	0.28	0.35	0.02	0.02	0.02	0.00
Potable Water	1	64.27	64.27	64.27	29.30	29.30	29.30	6.03	6.03	6.03	0.35	0.35	0.35	0.02	0.02	0.02
Wastewater	3	64.81	65.05	64.59	28.94	29.09	28.78	5.87	5.93	5.80	0.34	0.34	0.33	0.02	0.02	0.02
All Facilities	**323**	**66.70**	**74.11**	**63.21**	**28.15**	**30.55**	**22.89**	**4.57**	**5.49**	**2.74**	**0.49**	**5.18**	**0.65**	**0.06**	**0.09**	**0.01**

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Table-4-5. Estimated Damage to CEI Hub Facilities from 500-Year Earthquake

Category	# Facilities	Probability (%)														
		No Damage			Slight Damage			Moderate Damage			Extensive Damage			Complete Damage		
		Avg.	High	Low	Avg.	High	Low	Avg.	High	Low	Avg.	High	Low	Avg.	High	Low
Emergency Services	3	55.14	60.87	43.77	22.11	26.34	19.99	7.32	10.01	5.98	1.03	1.78	0.66	14.37	18.07	12.52
Transportation	3	13.87	13.87	13.87	67.23	67.23	67.23	13.91	13.91	13.91	3.78	3.78	3.78	1.18	1.18	1.18
High Potential Loss	14	0.78	2.59	0.18	24.29	13.93	23.64	23.64	29.17	19.63	19.95	25.25	12.13	31.32	46.04	13.37
Electric Power	5	16.16	27.59	7.39	37.68	43.41	30.34	33.55	41.37	24.22	9.80	16.08	3.92	2.78	6.60	0.70
Natural Gas	1	7.62	7.62	7.62	31.26	31.26	31.26	41.32	41.32	41.32	16.01	16.01	16.01	3.77	3.77	3.77
Petroleum	293	9.67	27.72	7.32	32.84	43.20	30.20	39.07	41.34	24.13	14.22	16.06	3.89	4.17	6.72	0.82
Potable Water	1	7.70	7.70	7.70	31.59	31.59	31.59	41.75	41.75	41.75	16.18	16.18	16.18	2.75	2.75	2.75
Wastewater	3	7.41	7.57	7.32	30.55	31.19	30.20	40.52	41.35	40.09	15.76	16.07	15.58	5.73	6.72	3.79
All Facilities	**323**	**14.79**	**19.44**	**11.90**	**34.69**	**36.02**	**33.06**	**30.14**	**32.53**	**26.38**	**12.09**	**13.90**	**9.02**	**8.26**	**11.48**	**4.86**

Table-4-6. Estimated Damage to CEI Hub Facilities from M 9.0 Cascadia Subduction Zone Earthquake

Category	# Facilities	Probability (%)														
		No Damage			Slight Damage			Moderate Damage			Extensive Damage			Complete Damage		
		Avg.	High	Low	Avg.	High	Low	Avg.	High	Low	Avg.	High	Low	Avg.	High	Low
Emergency Services	3	72.22	75.88	70.39	15.79	16.59	15.39	0.72	0.76	0.70	0.00	0.01	0.00	11.24	13.49	6.73
Transportation	3	21.94	25.01	15.79	65.57	66.44	65.13	9.22	22.18	7.74	2.05	3.08	1.54	1.19	2.48	0.55
High Potential Loss	14	2.63	2.73	2.55	47.78	49.58	46.23	27.11	28.11	24.32	13.91	14.42	13.41	8.55	17.98	5.18
Electric Power	5	34.03	45.71	30.96	42.15	43.45	39.53	19.69	21.59	13.35	2.71	3.11	1.30	1.39	2.20	0.08
Natural Gas	1	31.52	31.52	31.52	43.37	43.37	43.37	21.55	21.55	21.55	3.10	3.10	3.10	0.43	0.43	0.43
Petroleum	293	39.04	45.71	30.96	41.04	43.37	39.39	16.98	21.55	13.31	2.11	3.10	1.29	0.81	2.20	0.08
Potable Water	1	31.58	31.58	31.58	43.45	43.45	43.45	21.59	21.59	21.59	3.11	3.11	3.11	0.25	0.25	0.25
Wastewater	3	35.88	45.71	30.96	41.57	42.59	30.96	18.56	21.17	13.35	2.47	3.05	1.30	1.49	2.20	0.08
All Facilities	**323**	**33.61**	**37.98**	**30.59**	**42.59**	**43.61**	**40.43**	**16.93**	**19.81**	**14.49**	**3.68**	**4.12**	**3.13**	**3.17**	**5.15**	**1.67**

Table-4-7. Estimated Damage to CEI Hub Facilities from M 6.5 Portland Hills Fault Earthquake

Category	# Facilities	Probability (%)														
		No Damage			Slight Damage			Moderate Damage			Extensive Damage			Complete Damage		
		Avg.	High	Low	Avg.	High	Low	Avg.	High	Low	Avg.	High	Low	Avg.	High	Low
Emergency Services	3	25.91	21.00	28.37	34.70	37.04	33.53	7.81	9.92	6.75	1.59	1.97	0.83	29.97	31.18	29.36
Transportation	3	2.93	3.27	2.25	48.96	51.03	44.82	26.43	27.11	26.09	12.44	14.47	12.44	8.54	11.33	7.14
High Potential Loss	14	0.14	0.27	0.00	11.44	17.89	1.82	17.99	22.75	7.51	21.24	21.28	18.17	49.16	72.48	37.78
Electric Power	5	4.38	7.02	1.85	23.02	29.91	15.51	40.98	40.95	40.07	22.97	22.87	16.44	8.64	12.91	5.66
Natural Gas	1	5.05	5.05	5.05	26.14	26.14	26.14	42.92	42.92	42.92	20.71	20.71	20.71	5.15	5.15	5.15
Petroleum	293	5.03	7.17	1.25	25.51	30.57	12.01	41.80	41.85	35.27	20.58	30.76	16.44	7.05	20.68	3.58
Potable Water	1	1.89	1.89	1.89	15.81	15.81	15.81	40.85	40.85	40.85	31.24	31.24	31.24	10.19	10.19	10.19
Wastewater	3	5.30	7.17	1.71	24.94	30.57	14.34	39.95	41.85	37.06	20.53	28.34	16.44	9.26	18.51	3.58
All Facilities	**323**	**6.33**	**6.61**	**5.30**	**26.32**	**29.87**	**20.50**	**32.34**	**33.53**	**29.57**	**18.91**	**21.46**	**16.59**	**16.0**	**22.80**	**12.81**

Table-4-8. Functionality of CEI Hub Facilities for 100-Year Earthquake

Category	# Facilities	Average % Functionality After Event					
		1 Day	3 Days	7 Days	14 Days	30 Days	90 Days
Emergency Services	3	96.60	96.63	99.50	99.60	99.90	99.90
Transportation	3	99.60	99.80	99.90	99.90	99.90	99.90
High Potential Loss	14	23.27	26.31	87.11	87.29	97.16	99.56
Electric Power	5	87.82	98.26	99.82	99.90	99.90	99.90
Natural Gas	1	84	96.5	99.2	99.7	99.9	99.9
Petroleum	293	84.77	96.12	97.22	98.95	99.81	99.90
Potable Water	1	84	96.5	99.2	99.7	99.9	99.9
Wastewater	3	75.00	96.43	99.60	99.70	99.80	99.90
All Facilities	**323**	**79.38**	**88.32**	**97.69**	**98.09**	**99.53**	**99.86**

Table-4-9. Functionality of CEI Hub Facilities for 500-Year Earthquake

Category	# Facilities	Average % Functionality After Event					
		1 Day	3 Days	7 Days	14 Days	30 Days	90 Days
Emergency Services	3	55.10	55.57	76.70	77.23	84.57	85.07
Transportation	3	86.90	93.50	95.80	96.00	96.40	98.30
High Potential Loss	14	0.74	1.90	24.94	25.03	48.67	68.61
Electric Power	5	38.50	71.90	92.28	97.32	98.54	99.90
Natural Gas	1	38.1	61.4	81.4	88.9	96.8	99.9
Petroleum	293	38.87	56.42	65.47	80.15	90.06	98.29
Potable Water	1	38.5	62	82.2	89.7	97.4	99.9
Wastewater	3	22.07	59.03	80.27	82.93	91.07	99.03
All Facilities	**323**	**39.85**	**57.72**	**74.88**	**79.66**	**87.94**	**93.63**

Table-4-10. Functionality of CEI Hub Facilities for M 9.0 Cascadia Subduction Zone Earthquake

Category	# Facilities	Average % Functionality After Event					
		1 Day	3 Days	7 Days	14 Days	30 Days	90 Days
Emergency Services	3	72.13	72.53	87.60	87.93	88.67	88.67
Transportation	3	91.37	95.67	97.20	97.33	97.53	98.67
High Potential Loss	14	2.60	4.87	50.21	50.36	77.48	91.40
Electric Power	5	57.00	86.34	97.16	98.68	99.22	99.90
Natural Gas	1	63.9	85.8	95.6	98.1	99.5	99.9
Petroleum	293	66.49	85.29	89.04	95.04	98.29	99.62
Potable Water	1	64	85.9	95.8	98.2	99.6	99.9
Wastewater	3	51.53	86.53	96.20	96.70	98.00	99.70
All Facilities	**323**	**58.63**	**75.37**	**88.60**	**90.29**	**94.79**	**97.22**

Table-4-11. Functionality of CEI Hub Facilities for M 6.5 Portland Hills Fault Earthquake

Category	# Facilities	Average % Functionality After Event					
		1 Day	3 Days	7 Days	14 Days	30 Days	90 Days
Emergency Services	3	25.87	26.67	59.77	60.60	68.37	69.17
Transportation	3	64.67	77.27	81.83	82.47	84.17	91.20
High Potential Loss	14	0.09	0.61	11.51	11.53	29.54	50.76
Electric Power	5	20.80	51.06	80.16	91.98	95.62	99.90
Natural Gas	1	33.2	55.2	76.5	85.5	95.8	99.9
Petroleum	293	31.76	46.62	56.60	72.84	84.82	97.21
Potable Water	1	24.3	42.4	64.1	76	92.2	99.9
Wastewater	3	18.27	51.37	72.60	76.07	86.77	98.47
All Facilities	**323**	**27.37**	**43.9**	**62.88**	**69.62**	**79.66**	**88.31**

4.3.4 Key Findings

Important findings associated with an earthquake include to the following:

- It is assumed that the modeling results of this analysis are understated due to incomplete data sets. There is a heavy reliance on default level data in the modeling for this study in lieu of the data that was not available from CEI Hub stakeholders. The accuracy of the modeling would be significantly enhanced if key data attributes that help estimate damage in the Hazus-MH models could be provided. Further, the Hazus-MH model employed a "lower bound" analysis, intended to demonstrate cost-effectiveness at the lowest level of expected impact.
- The vast majority of the facilities in the study area are constructed on soft, liquefiable soils that are typically associated with increased seismic vulnerability. The soils and liquefaction data provided by DOGAMI significantly enhanced the results of this study.
- The facilities and infrastructure within the study area range from over 100 years old to new or recent construction. The new construction has been built to heightened code standards, while the older construction was built to little or no code standards. The majority of the facilities were constructed to low, or no code standards. Code construction standards are an important parameter in the modeling of seismic events.
- Models of the Cascadia Subduction Zone event show less damage than the Portland Hills Fault event due to proximity to the source. The CSZ event has an epicenter 67 miles west of the study area, while the Portland Hills fault scenario had an epicenter less than 5 miles west of the study area. The CSZ event would be considered the true worst-case scenario due to its higher probability of occurrence and likelihood of regional impact. For the model, USGS has assigned a 15 percent probability in 50 years for a CSZ event, versus a 1 percent probability in 50 years for the Portland Hills event. Additionally, seismologists estimate a CSZ event to last longer than 3 minutes, while estimates for a Portland Hills event are 60 seconds or less. Event duration can play a significant role in the amount of damage associated with seismic events.
- For a CSZ event, the Hazus-MH model estimated that a 42.6 percent chance that all facilities analyzed would experience "slight" damage. For a Portland Hills event, there is a 32.3 percent chance that all facilities would experience "moderate" damage. Both scenario events approximate at least a 500-year probabilistic event, based on a comparison of the Hazus-MH results.
- For the CSZ event, the Hazus-MH model estimated that the facilities analyzed would be 88.6-percent functional at Day 7 following the event, and that it would take more than 90 days to restore 100-percent functionality. For a Portland Hills Fault scenario, facilities would be 62.89-percent functional at Day 7, and only 88.3-percent functional at Day 90. These results correlate with the 500-year probabilistic model results.

- The focus of the Hazus-MH modeling for this study was the direct impact on facilities in the study area. The modeling does not take into account significant secondary impacts from a CSZ event, such as the loss of use of port facilities due to the impacts from a likely tsunami on the Columbia River, or the loss of transportation corridor access due to road and bridge failures outside the study area. These secondary impacts could be substantial, considering the reliance of the CEI Hub on port access for receipt of its inventory, and the road and bridge network. These are key points identified in other studies reviewed for this study.

4.4 FLOOD RISK ASSESSMENT

4.4.1 Hazard Profile

A floodplain is the area adjacent to a river, creek or lake that becomes inundated during a flood. Floodplains may be broad, as when a river crosses an extensive flat landscape, or narrow, as when a river is confined in a canyon. These areas form a complex physical and biological system that not only supports a variety of natural resources but also provides natural flood and erosion control. When a river is separated from its floodplain with levees and other flood control facilities, natural benefits can be lost, altered or significantly reduced.

The principle flooding sources for the study area are the Willamette River and any localized flooding associated with a lack of drainage infrastructure. The Willamette River drains 11,200 square miles in northwestern Oregon upstream of Portland. Intensive commercial and industrial development borders the Willamette River in Portland, with some residential development near the upstream corporate limits. Major facilities within the 100-year floodplain include terminal and warehouse facilities on the west bank downstream of the Broadway Bridge (including the CEI Hub), portions of the Union Pacific Railroad at the Albina Yard, and industries on the west bank near Ross Island Bridge.

The Willamette River typically floods during the spring, primarily as the result of backwater from the Columbia River. FEMA has established the following flood depths on the Willamette River at the Morrison Bridge:

- 25.5 feet (North American Vertical Datum) for the 10-year flood
- 30.2 feet for the 50-year flood
- 32.3 feet for the 100-year flood
- 37.2 feet for the 500-year flood event.

The peak recorded discharge on the Willamette River at USGS Gage # 14211720 was 283,000 cubic feet per second on January 18, 1974.

A detailed flood hazard profile for all of the City of Portland is provided in the 2016 City of Portland Hazard Mitigation Plan. While there are FEMA-mapped floodplains within the study area, they do not significantly impact the CEI Hub facilities.

4.4.2 Exposure

Property

Facilities in the Floodplain

Table-4-12 shows the number of facilities in the 10-, 100- and 500-year floodplains. All these facilities are in the emergency services, transportation, petroleum or electric power occupancy category. This analysis does not reflect the total exposure within the study area; it only reflects the exposure of facilities for which information was provided to the planning team by participating CEI Hub stakeholders.

Table-4-12. CEI Hub Facilities in the Floodplain

Category	Number of Facilities Exposed		
	10-Year Flood	100-Year Flood	500-Year Flood
Emergency Services	1	1	1
Transportation	0	0	1
High Potential Loss	0	0	0
Electric Power	0	0	1
Natural Gas	0	0	0
Petroleum	2	2	40
Potable Water	0	0	0
Wastewater	0	0	0
Total	**3**	**3**	**43**

Land Use in the Floodplain

All land in the study area is zoned for industrial uses under the City of Portland Comprehensive Plan and zoning ordinance. While residential land uses exist adjacent to the study area, there are no residential land uses within the study area or the identified floodplains. There are no identified open space uses within the identified floodplains of the study area. While industrial occupancy is not an ideal land use for floodplains because of the potential secondary hazard of hazardous material releases, industrial facilities tend to be less vulnerable due to typical industrial construction classes. For example, petroleum storage tanks are typically constructed of steel or concrete that is flood resistant. Based on the available information, it does not appear that any of the exposed facilities are subject to regulations under the City's Flood Damage Prevention Ordinance (Section 24.50.050 of the Portland Municipal Code) because they were constructed prior to adoption of that ordinance.

Environment

Flooding is a natural event, and floodplains provide many natural and beneficial functions. Nonetheless, flooding can impact the environment in negative ways. At the CEI Hub, secondary hazards include the risk of oil or gas entering floodwaters due to spilling or leakage. Any flooding in the study area could result in surface water or groundwater contamination due to the liquid nature of the products handled in the CEI Hub.

4.4.3 Vulnerability

Property

Hazus-MH calculates losses to structures from flooding by looking at depth of flooding and type of structure and using historical flood insurance claim data to estimate the resulting percentage of damage to structures and their contents. For this analysis, local data on facilities was used instead of the Hazus-MH default inventory data. Modeling results are summarized in Table 4-13 for the 10-, 100- and 500-year flood events.

Environment

Loss estimation platforms such as Hazus-MH are not currently equipped to measure environmental impacts of flood hazards. The environment vulnerable to flood hazard is the same as the environment exposed to the hazard. The best gauge of vulnerability of the environment would be a review of damage from past flood events. Loss data that segregates damage to the environment was not available at the time of this plan. Capturing this data from future events could be beneficial in measuring the vulnerability of the environment for future updates.

Table 4-13. Flood Damage Estimates for Flood Scenario Events

	10-Year			100-Year			500-Year		
	# Facilities	% Damage		# Facilities	% Damage		# Facilities	% Damage	
Category	Impacted	Structure	Contents	Impacted	Structure	Contents	Impacted	Structure	Contents
Emergency Services	1	58.2	100	1	84.86	100	1	88	100
Transportation	0	0	0	0	0	0	1	14	0
High Potential Loss	0	0	0	0	0	0	0	0	0
Electric Power	0	0	0	0	0	0	1	0.66	0
Natural Gas	0	0	0	0	0	0	0	0	0
Petroleum	2	0	0	2	0	0	41	0	0
Potable Water	0	0	0	0	0	0	0	0	0
Wastewater	0	0	0	0	0	0	0	0	0

4.4.4 Key Findings

Important findings associated with the flood hazard in the study area include the following:

- It is assumed that the modeling results of this analysis are understated due to incomplete data sets. There is a heavy reliance on default level data in the modeling for this study in lieu of the data that was not available from CEI Hub stakeholders. The accuracy of the modeling would be significantly enhanced if key data attributes that help estimate damage in the Hazus-MH models could be provided. Further, the Hazus-MH model employed a "lower bound" analysis, intended to demonstrate cost-effectiveness at the lowest level of expected impact. It is evident from review of aerial photography of the study area that the net exposure and possible vulnerability are greater than reflected in these model results.
- Due to construction classes and operations of CEI Hub facilities, floods are more likely to have an indirect impact on these facilities than a direct impact. Issues such as road closures and power interruptions associated with flooding would impact the functions of the CEI Hub.
- Future development or re-development within the floodplains of the study area would trigger regulation under the City's Flood Damage Prevention Ordinance.
- There is a high probability that a flood in the study area would have significant environmental impact due to effects on water quality.

4.5 LANDSLIDE RISK ASSESSMENT

4.5.1 Hazard Profile

A landslide is a mass of rock, earth or debris moving down a slope. Landslides may be small or large, and can move slow or fast. They can be initiated by storms, earthquakes, fires, volcanic eruptions or human modification of the land. Mudslides develop in the soil overlying bedrock on sloping surfaces when water rapidly accumulates in the ground, such as during heavy rainfall or rapid snowmelt. Water pressure in the pore spaces of the material increases to the point that the internal strength of the soil is drastically weakened. The soil's reduced resistance can then easily be overcome by gravity, changing the earth into a flowing river of mud. A mudflow can move rapidly down slopes or through channels and can strike with little or no warning. The material can travel miles from its source, growing as it descends, picking up trees, boulders, cars and anything else in its path.

The site where landslide material initially breaks free is called the failure location; the movement of material away from the failure location to locations downslope is called runout. With these two components, landslides pose a serious hazard to properties on and below hillsides. When landslides deform and tilt the ground surface,

they can destroy building foundations, offset roads or break underground pipes at the failure location, and the runout can override downslope properties and structures.

Recent events such as the Oso landslide in Washington in March 2014 have changed the thinking of the assessment of risk from landslide hazards. The Oso landslide was the deadliest single landslide event in U.S. history (43 fatalities, 49 homes destroyed, damage in excess of $10 million). The damage extended over 2.6 kilometers, although the failure location of the slide was less than a half-kilometer. Most of the area impacted was damaged by the slide runout. This indicates the importance of considering possible runout scenarios to accurately reflect the risk from landslide hazards. The science and technology to do this is evolving. Runout studies are costly, and the science to do them is still to be validated. The driver to doing these types of studies is typically historical occurrence.

In general, landslide hazard areas are where the land has characteristics that contribute to the risk of the downhill movement of material, such as the following:

- Steep slopes
- A history of landslide activity or movement
- Stream or wave activity, which has caused erosion, undercut a bank or cut into a bank to cause the surrounding land to be unstable
- The presence of an alluvial fan, indicating vulnerability to the flow of debris or sediments
- The presence of impermeable soils, such as silt or clay, which are mixed with granular soils such as sand and gravel

Two data sets were used for the risk assessment of the landslide hazard:

- DOGAMI historical landslide deposits.
- City of Portland regulatory landslide hazard area—This dataset is currently used for permitting purposes and was created from three sources:
  - Areas identified and mapped by Metro as earthquake hazard areas
  - Areas delineated as zones of high landslide potential in a study conducted by Portland State University based on the mapping of 676 landslide events that occurred as a result of the February 1996 storms
  - All land within the City that has a slope of 15 percent or greater.

A detailed landslide hazard profile for all of the City of Portland is provided in the 2016 City of Portland Hazard Mitigation Plan. While there are landslide susceptible areas identified in the CEI Hub study area, they do not significantly impact the CEI Hub facilities.

4.5.2 Exposure

Table-4-14 summarizes the CEI Hub facilities exposed to the landslide hazard. This analysis does not reflect the total exposure within the study area; it only reflects the exposure of facilities for which information was provided to the planning team by participating CEI Hub stakeholders.

Any landslide exposure for the study area lies in the hillsides to the west. The direct exposure to landslide failure locations on steep slopes with soft soils is very low (on 2 out of 323 facilities analyzed). However, what is not known is the exposure of the study area to landslide runout, as landslide materials move downhill from the initial failure location. Runout maps currently do not exist for the study area. If an event like the Oso slide were to happen in the hillside to the west of the study area, most of the facilities in the CEI Hub would be impacted by runout.

Table-4-14. CEI Hub Facilities in Landslide Risk Areas

Category	Number of Exposed CEI Hub Facilities in Risk Area
Emergency Services	0
Transportation	0
High Potential Loss	0
Electric Power	0
Natural Gas	0
Petroleum	1
Potable Water	1
Wastewater	0
Total	**2**

The following infrastructure components also can be exposed to mass movements:

- **Roads**—Landslides can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems and delays for public and private transportation. This can result in economic losses for businesses.
- **Bridges**—Landslides can knock out bridge abutments or significantly weaken the soil supporting them, making them hazardous for use.
- **Power Lines**—Landslides can trigger failure of the soil underneath a power line tower, causing it to collapse and ripping down the lines.

4.5.3 Vulnerability

Currently, there are no nationally accepted formulas for modeling the damage resulting from landslides in applications such as Hazus-MH. At this time, all CEI Hub facilities, infrastructure and transportation corridors identified as exposed to the landslide hazard are considered vulnerable until more information becomes available.

4.5.4 Key Findings

Important findings associated with the landslide hazard in the study area include the following:

- It is assumed that the modeling results of this analysis are understated due to incomplete data sets. There is a heavy reliance on default level data in the modeling for this study in lieu of the data that was not available from CEI Hub stakeholders. The accuracy of the modeling would be significantly enhanced if key data attributes that help estimate damage in the Hazus-MH models could be provided. Further, the Hazus-MH model employed a "lower bound" analysis, intended to demonstrate cost-effectiveness at the lowest level of expected impact.
- As the science and technology for landslide risk analysis continues to evolve, risk managers within the study area should consider revisiting the risk assessment for this hazard, especially with the development risk assessment tools that can account for landslide runout.
- The risk associated with the landslide hazard overlaps the risk associated with other hazards such as earthquake, flood and wildfire. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.

4.6 SEVERE WEATHER RISK ASSESSMENT

4.6.1 Hazard Profile

Severe weather refers to any dangerous meteorological phenomena with the potential to cause damage, serious social disruption, or loss of human life. It includes thunderstorms, hail storms, damaging winds, tornadoes, excessive heat, snowstorms, ice storms, blizzards, and extreme cold. The most common severe weather events that impact the study area are winter weather and windstorms.

Severe weather events have the potential to happen anywhere in the study area. Low-lying areas adjacent to the Willamette River are more susceptible to flooding. Wind events are most damaging to areas that rely on elevated utilities such as above-ground power lines.

4.6.2 Exposure

Population

The entire population of the study area is exposed to direct and indirect impacts from severe weather. This includes people who live in the Linnton District and people who work in the CEI Hub.

Property

All 323 facilities for analyzed in this study are considered to be exposed to the severe weather hazard. This reflects only the exposure of facilities for which information was provided to the planning team.

4.6.3 Vulnerability

Population

The degree of vulnerability of population in the study area is dependent on many factors, including the age and construction type of the structures/facilities people live and work in. Whether directly or indirectly impacted, the entire population will have to deal with the consequences of severe weather to some degree. Business interruption could keep people from working, road closures could isolate populations, and loss of functions of utilities could impact populations that suffer no direct damage from an event itself.

Property

The range and diversity of severe weather hazards makes it difficult to establish standard estimates of damage to support risk assessment modeling for severe weather. Therefore, severe weather vulnerability assessments are typically qualitative in nature.

All facilities are vulnerable to a degree during severe weather events, but facilities in poor condition or in vulnerable locations may risk the most damage. Those in higher elevations and on ridges may be more prone to wind damage. Those that are located under or near overhead lines or near large trees may be vulnerable to falling ice or may be damaged in the event of a collapse.

Incapacity and loss of roads are the primary transportation failures resulting from severe weather, mostly associated with secondary hazards such as landslides or debris or power lines knocked down by high winds. Large storms can have negative economic impacts for an entire region as prolonged obstruction of major routes can disrupt the shipment of goods and other commerce.

Severe windstorms, downed trees, and ice can create serious impacts on power and above-ground communication lines. Freezing of power and communication lines can cause them to break, disrupting electricity and

communication. Loss of electricity and phone connection can leave populations isolated if residents are unable to call for assistance.

The biggest impact to the CEI Hub from severe weather events would be the prolonged loss of power. Power is a vital commodity for the CEI Hub for both the receipt and distribution of product, mostly through electricity-powered pumping. While it would be possible for product to be distributed via gravity methods, it is significantly less efficient and requires different operating procedures that would require some down time for conversion. While backup power is available, it is not consistent through all facilities in the CEI Hub.

4.6.4 Key Findings

Important findings associated with severe weather in the study area include the following:

- It is assumed that the modeling results of this analysis are understated due to incomplete data sets. There is a heavy reliance on default level data in the modeling for this study in lieu of the data that was not available from CEI Hub stakeholders. The accuracy of the modeling would be significantly enhanced if key data attributes that help estimate damage in the Hazus-MH models could be provided. Further, the Hazus-MH model employed a "lower bound" analysis, intended to demonstrate cost-effectiveness at the lowest level of expected impact.
- Coordinated continuity of operations planning between CEI Hub stakeholders would significantly aid the operations of CEI Hub facilities during and after severe weather events.

4.7 VOLCANIC ACTIVITY RISK ASSESSMENT

4.7.1 Hazard Profile

A volcano is a vent in the earth's crust through which magma, rock fragments, gases, and ash are ejected from the earth's interior. There are 20 volcanoes in the Cascade Range, five of which have been active in historical times: Mount Baker, Glacier Peak, Mount Rainier, Mount St. Helens, Mount Adams and Mount Hood.

Volcanoes can lie dormant for centuries between eruptions, and the risk they pose is not always apparent. When Cascade volcanoes erupt, high-speed avalanches of hot ash and rock called pyroclastic flows, lava flows, and landslides can devastate areas 10 or more miles away. Huge mudflows of volcanic ash and debris called lahars can inundate valleys more than 50 miles downstream. Falling ash from explosive eruptions can disrupt human activities hundreds of miles downwind, and drifting clouds of fine ash can cause severe damage to the engines of jet aircraft hundreds or thousands of miles away.

Any impacts on the study area from the volcano hazard would be considered to be secondary, indirect impacts associated mainly with ash fall from volcanic activity outside the study area. A detailed volcano hazard profile for all of the City of Portland is provided in the 2016 City of Portland Hazard Mitigation Plan.

Location

Based on currently best available data, there is no lahar exposure to the study area from volcanic activity. There could be ash fall exposure from volcanic activity at any of the Cascade Range volcanos near the study area. As a point of reference to this assertion; during the 9 hours of vigorous eruptive activity of Mt. St. Helens in 1980, about 540 million tons of ash fell over an area of more than 22,000 square miles. Total volume of the ash before its compaction by rainfall was about 0.3 cubic miles (USGS, 2016a). Much of this ash fall affected the City of Portland and the study area. Impacts from volcanic ash fall are dependent on prevailing wind directions at the time of the eruption. Figure 4-3 shows the annual probability of ash fall accumulation across the Pacific Northwest as projected by USGS Cascade Volcano Observatory. The study area is highlighted in the graphic.

Source: Hoblitt and Scott 2011

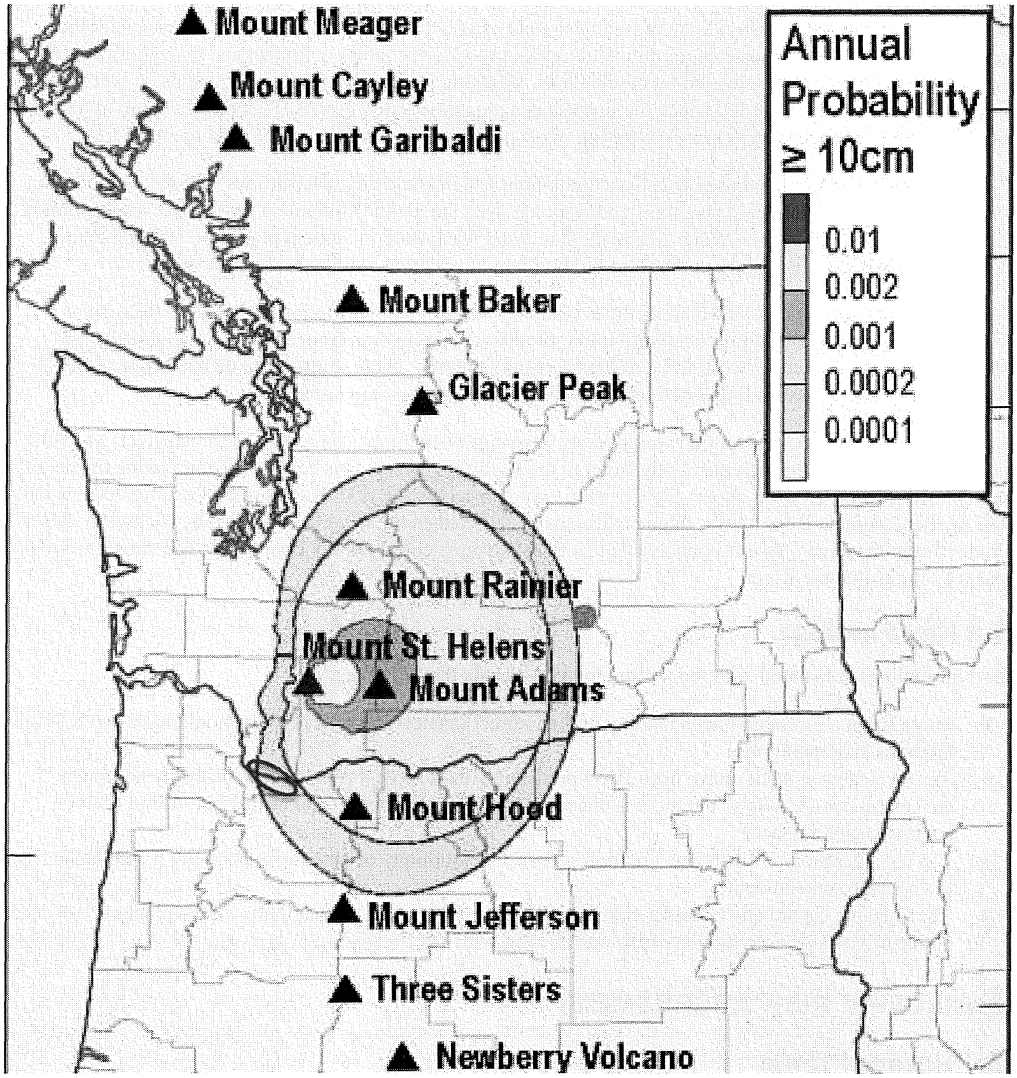

Figure 4-3. Probability of Ash Fall Accumulation in Pacific Northwest

4.7.2 Exposure

The entire study area would be exposed to ash fall accumulation from any of the nearby Cascade Range volcanoes.

4.7.3 Vulnerability

Facilities most vulnerable to ash fall are those that are not as structurally sound and may collapse under the excessive weight of ash and possible rainfall. Vulnerable property includes equipment and machinery out in the open whose parts can become clogged by the fine dust. Infrastructure, such as drainage systems, is potentially vulnerable to the effects of ash fall, since the fine ash can clog pipes and culverts. This may be more of a problem if an eruption occurs during winter or early spring when precipitation is highest and floods are most likely.

All transportation routes are exposed to ash accumulation, which could create hazardous driving conditions on roads and highways and hinder evacuations and response. Machinery and equipment using these transportation routes would also be vulnerable. Water treatment plants and wastewater treatment plants are vulnerable to contamination from ash. Visibility in the short aftermath of an eruption would also be problematic.

Indirect/secondary impacts on CEI Hub facilities could include power interruption, transportation corridor interruption that would impact product distribution, product contamination from ash fall, and public health concerns that could impact the work force of the CEI Hub facilities. These impacts are difficult to quantify by modeling, but could be assessed qualitatively by looking at relevant past occurrences.

Lahar flows from a Mt. Hood eruption would likely have significant impacts on the Columbia River. Mt. Hood lahars are likely to flow through the Sandy River to the Columbia River. This could interrupt marine traffic on the Columbia River, which would impact the CEI Hub, which receives and distributes some of its products via barge traffic up the Columbia River. Also, flood conditions on the Willamette River are dictated by backwater effects from the Columbia River. So it is conceivable that the study area could see flooding on the Willamette from lahar impacts on the Columbia River.

4.7.4 Key Findings

Important findings associated with the volcano hazard include the following:

- There is not a thorough understanding of the indirect impacts volcanic activity would have on CEI Hub facilities and operations.
- Since volcanic episodes have been fairly predictable in the recent past, there is probably not much concern about life safety, but there is concern about loss of property and infrastructure and severe environmental impacts.
- The consideration of a volcanic eruption scenario in continuity of operations planning would be beneficial to CEI Hub stakeholders.
- The volcanic hazard can be underestimated based on the perception that there will be plenty of advance notice of volcanic activity, like there was in 1980 with Mt. St. Helens.

4.8 WILDFIRE RISK ASSESSMENT

4.8.1 Hazard Profile

A wildfire is any uncontrolled fire on undeveloped land that requires fire suppression. Wildfires can be ignited by lightning or by human activity such as smoking, campfires, equipment use, or arson. Oregon's Building Code encourages local governments to designate portions of their jurisdictions subject to catastrophic fire as Wildfire Hazard Zones. The purpose of these zones is to define areas where buildings need to be made more survivable from fires spreading through adjacent wildlands. Three factors vital to wildfire risk are included in the methodology for mapping these zones: weather, topography, and vegetative fuel factor. Fire hazard maps used for this risk assessment were provided by the City of Portland. While there are wildfire severity zones within the

study area, they do not significantly impact the CEI Hub facilities. A detailed wildfire hazard profile for all of the City of Portland is provided in the 2016 City of Portland Hazard Mitigation Plan.

Fuels

Fuels are classified by weight or volume and by type, including living and dead vegetation on the ground, brush and small trees on the surface, and tree canopies above the ground. Fuel loading, often expressed in tons per acre, indicates the amount of vegetative material available. Some fuels burn more easily or release more energy than others. Lighter fuels such as grasses, leaves and needles quickly expel moisture and burn rapidly, while heavier fuels such as tree branches, logs and trunks take longer to warm and ignite.

Topography

The movement of air over the terrain tends to direct a fire's course. Gulches and canyons can funnel air and act as a chimney, intensifying fire behavior and inducing faster rates of spread. Saddles on ridge tops offer lower resistance to the passage of air and will draw fires. Solar heating of drier, south-facing slopes produces upslope thermal winds that can complicate fire behavior. On steep slopes, fuels on the uphill side of a fire are closer to the source of heat. Fire travels downslope much more slowly than it does upslope, and ridge tops often mark the end of wildfire's rapid spread.

Weather

Extreme weather leads to extreme fire events, and it is often a moderation of the weather that marks the end of a wildfire's growth. High temperatures and low humidity can produce vigorous fire activity. Winds may play a dominant role in directing the course of a fire. Strong, dry winds produce extreme fire conditions. The most damaging firestorms are usually marked by high winds.

4.8.2 Exposure

Any wildfire exposure for the study area lies in the hillsides to the west. Table 4-15 summarizes the CEI Hub facilities exposed to the wildfire hazard. This analysis does not reflect the total exposure within the study area; it only reflects the exposure of facilities for which information was provided to the planning team by participating CEI Hub stakeholders.

Table 4-15. CEI Hub Facilities in Wildfire Risk Areas

Category	Number of Exposed CEI Hub Facilities in Risk Area
Emergency Services	0
Transportation	0
High Potential Loss	0
Electric Power	1
Natural Gas	0
Petroleum	0
Potable Water	0
Wastewater	0
Total	**1**

4.8.3 Vulnerability

Structures, above-ground infrastructure, critical facilities and natural environments are all vulnerable to the wildfire hazard. Currently, there are no nationally accepted formulas for modeling the damage resulting from wildfire in applications such as Hazus-MH. Therefore, the vulnerability assessment for this hazard is qualitative.

CEI Hub facilities of wood frame construction are especially vulnerable during wildfire events. Power lines are at risk to wildfire if their support poles are made of wood and susceptible to burning.

The combustible nature of the materials on hand within the CEI Hub could increase the degree of risk within the study area. In the event of a wildfire, pipelines could provide a source of fuel and lead to a catastrophic explosion. However, the fact that most if not all of these materials are contained within fire resistant containers, and that there is a fairly significant fire break (Highway 30) between the risk area and those containers, significantly reduces that risk.

In the event of wildfire, there would likely be little damage to the majority of infrastructure in the study area. Most road and railroads would be without damage except in the worst scenarios. Fires can create conditions that block or prevent access and can isolate residents and emergency service providers. Wildfire typically does not have a major direct impact on bridges, but it can create conditions in which bridges are obstructed. Many bridges in areas of high to moderate fire risk are important because they provide the only ingress and egress to large areas and in some cases to isolated neighborhoods.

Most measurable impacts from the wildfire hazard would be indirect/secondary impacts. These impacts would be predominantly business interruption impacts associated with power loss and transportation corridor closures due to the response to wildfire events outside the study area.

4.8.4 Key Findings

Important findings associated with the wildfire hazard in the study area include the following:

- It is assumed that the modeling results of this analysis are understated due to incomplete data sets. There is a heavy reliance on default level data in the modeling for this study in lieu of the data that was not available from CEI Hub stakeholders. The accuracy of the modeling would be significantly enhanced if key data attributes that help estimate damage in the Hazus-MH models could be provided. Further, the Hazus-MH model employed a "lower bound" analysis, intended to demonstrate cost-effectiveness at the lowest level of expected impact.
- Coordinated continuity of operations planning between CEI Hub stakeholders would significantly aid the operations of CEI Hub facilities during and after wildfire events.

5. DISASTER RESILIENCE RECOMMENDATIONS

This chapter presents disaster resilience recommendations that will be considered for inclusion as actions in the 2016 update to the City of Portland Hazard Mitigation Plan. These recommendations are specific to the CEI Hub and were identified through a facilitated process that involved the identification and engagement of stakeholders, collection of data, assessment of risk, and identification of recommendations based on the study area's strengths, weaknesses, obstacles and opportunities (see Chapter 4 for more information on the risk assessment).

5.1 RECOMMENDATION 1—CEI HUB DISASTER RESILIENCY WORKGROUP

The CEI Hub is of paramount importance to the City of Portland, the State of Oregon and the larger region. The literature review and stakeholder engagement undertaken as part of this study highlighted the need for continued and enhanced focus on the development of disaster resilience for the CEI Hub to protect this critical resource and the surrounding areas. This study represents a high-level starting point for a collaborative approach to building resilience in the CEI Hub. To continue this work, it is recommended that a CEI Hub Disaster Resiliency Workgroup be formed and be officially recognized by all CEI Hub stakeholders. The success of the workgroup will depend on the following:

- Support from all CEI Hub stakeholders that were identified for this study
- Recognition by federal, state, local and private-sector entities as a body that can initiate change
- Public support garnered by the authentic involvement of public stakeholders, such as the Linnton Neighborhood Association.

The issues identified by this study and those that preceded it cross multiple public and private sectors and go beyond questions of hazard intensity and the resilience of facilities. The importance of the CEI Hub to the Pacific Northwest warrants a workgroup with strong commitment and recognition from all stakeholders. Because this workgroup would be recognized across multiple sectors, it would become the voice of disaster resilience for the CEI Hub. Goals for the workgroup would include the following:

- Meet regularly to work toward an established mission, vision, goals and objectives, and possible strategic plan.
- Build upon the strong buyer-supplier relationships established by the industry cluster (Grillo, 2005).
- Have dedicated resources to support disaster resilient initiatives for the CEI Hub.
- Provide recommendations on policy, best management practices, interagency coordination, public outreach and education, preparedness, response and recovery—all with regard to disaster resilience for the CEI Hub.

The Cascadia Region Earthquake Workgroup provides an example of the effectiveness of this level of focus on a regionally important subject. That workgroup is a coalition of private and public representatives, funded with a grant through the NEHRP, working together to improve the ability of Cascadia region communities, businesses and homeowners to proactively reduce impacts from earthquakes.

It is assumed that the CEI Hub Disaster Resiliency Workgroup would be established as a private non-profit entity similar to the Cascadia Region Earthquake Workgroup. The workgroup would need access to funding to be effective. Potential funding sources may include the following:

- Federal grants from the NEHRP, similar to those used by the Cascadia Region Earthquake Workgroup
- Sponsorship fees from supporting stakeholders such as the City of Portland, the State of Oregon, FEMA, and CEI Hub owner/operators

The importance of this recommendation to the overall resilience of the CEI Hub is indicated by the fact that all of the following recommendations incorporate a role for this workgroup. Implementation of the recommendations below is not contingent upon this recommendation, but their effectiveness will be enhanced by the existence of a CEI Hub Disaster Resiliency Workgroup.

5.2 RECOMMENDATION 2—UPDATE/ENHANCE CEI HUB RISK ASSESSMENT

The Hazus-MH model that was constructed to support this study and the update of the larger mitigation plan is a tool that can be used to support the implementation of hazard mitigation actions. The ability to look at risk associated with natural hazards at a property-specific level can be leveraged to support all phases of emergency management (preparedness, response, recovery and mitigation); however, model results are only as accurate as the data on which they rely.

As noted several times in this report, the results of the risk assessment for this study are likely to be understated in part due to the incomplete facility data resulting from less than full participation by all CEI Hub owner/operators and limitations of the Hazus model. The magnitude and severity of the hazard events that may impact the CEI Hub are believed to be well understood; however, the fragility of facilities at risk during these hazard events is less clear. This recommendation aims to improve model results and close this data gap by continuing to work with relevant stakeholders to gather data and update the model as new information becomes available from stakeholders as well as new data on event intensity, severity and magnitude of hazard events.

The groundwork for this recommendation was established during the course of this study. Hazard scenarios were identified, mapped and quantified, models were constructed, data capture tools and instructions were created, and data were captured for 323 facilities. The success of this recommendation will require a greater rate of participation by CEI Hub stakeholders than was achieved for this study. The formation of a CEI Hub Disaster Resiliency Workgroup (Recommendation 1) would contribute to the success of this recommendation because of the increased buy-in from CEI Hub stakeholders.

5.3 RECOMMENDATION 3—REGULATORY AMENDMENT

The City of Portland City Council Resolution No. 37168, passed on November 12, 2015, adopted a policy opposing projects that would increase the amount of crude oil being transported by rail through the City of Portland as well as expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways. Through the stakeholder engagement process for this study, CEI Hub owner/operators stated that this resolution provides no incentive for retrofitting vulnerable facilities and may provide a disincentive. For example, an owner/operator may be more likely to retrofit a vulnerable tank if capacity could be expanded at the same time that retrofitting occurred.

It is recommended that the City consider amending this resolution to allow for the expansion of an existing facility that has been identified as vulnerable to an identified hazard of concern and targeted for retrofit. The facility would have to have be identified as vulnerable based on the risk assessment model (Recommendation 2),

and the owner would have to include the retrofit in a resilience-related plan (Recommendation 4). The degree of allowable expansion would be capped (e.g. no more than 20 percent of current capacity). Proposals for retrofits/expansions would be screened by the CEI Hub Disaster Resiliency Workgroup (Recommendation 1). Implementation protocol for the amendment would need to be clearly vetted by stakeholder groups.

5.4 RECOMMENDATION 4—EMERGENCY RESPONSE/RECOVERY REGULATORY WAIVERS

CEI Hub stakeholders participating in this study stressed that federal and state environmental regulations regarding obtaining and transferring fuel are obstacles to effective disaster resilience, especially in disaster response and recovery. This recommendation proposes that parameters or best management practices be identified for waivers from federal and state regulatory agencies to improve ease of response and recovery efforts, with adequate assurances for environmental protection. The CEI Hub Resilience Workgroup would facilitate the development of these waivers and provide approval prior to submittal to the regulatory agency. Although this recommendation calls for waivers, a well-established protocol may achieve the same objective as a waiver under certain circumstances. The principle objective of this recommendation is to increase efficiency in disaster response and recovery by whatever means is most effective. This recommendation is specific to disaster response and recovery. It is not the intent of the recommendation to circumvent effective regulation outside of a disaster response and recovery scenario.

5.5 RECOMMENDATION 5—PLANNING

The current level of disaster-resilience planning by CEI Hub owner/operators is not well known. Some plans may exist, but their scope and degree of consistency have not been evaluated. Therefore, it is recommended that the CEI Hub Disaster Resiliency Workgroup (Recommendation 1) establish a suite of best management practices for a range of resilience-related planning efforts, such as continuity of operations plans, response plans, recovery plans, facility vulnerability assessments, etc. The first step in this process would be to assess existing planning efforts and establish minimum baselines for the promotion of disaster resilience. The assessment and development of the guidelines would seek answers to questions such as the following:

- Does each facility owner/ operator have a continuity of operations plan? A response plan? A recovery plan? A capital facility plan?
- Do these plans acknowledge or address disaster resilience?
- What should a continuity of operations plan for the CEI Hub include?

The establishment of these baselines and best management practices would help to promote consistency within the CEI Hub and promote the wise use of resources through the provision of templates and/or best practices that were vetted through a forum of peers who understand the importance and operations of the CEI Hub. The success of this recommendation would be predicated on stakeholder buy-in on the benefits of the planning curriculum and commitment in the use of the curriculum to develop plans. This would be facilitated through the CEI Hub Disaster Resiliency Workgroup.

5.6 RECOMMENDATION 6—BACKUP POWER

Power is mission-critical for the CEI Hub. Maintaining power supply to the CEI Hub will have a large impact on the region's ability to recover from a disaster. The Portland General Electric (power supplier for the CEI Hub) has built disaster resilience into its business plan, but maintaining consistent power during and after major disaster events cannot be guaranteed. As a result, backup power capability is a necessity for the CEI Hub. Needs should be identified through a systematic look at all facilities that determines the following:

- The current level of backup power capability at the CEI Hub
- How long that capability can be sustained
- The reliability of the capability
- Anticipated functional downtimes of facilities following hazard events
- The size and types of backup power systems that would meet the facility's needs, possibly including solar microgrids and other alternative energy sources.

FEMA has revised its policy on funding emergency generators through hazard mitigation grant programs. By including this recommendation in the Hazard Mitigation Plan, funding for these projects may be able to be secured through these grant programs.

5.7 RECOMMENDATION 7—TRAINING AND EXERCISE

Preparedness is a key element of disaster resilience. This includes training and exercises on multiple scenarios of likely events, so that when a hazard occurs, participants have already practiced responses and improved them based on lessons learned from the practices. Led by PBEM, the City of Portland has a well-established training and exercise program for disaster preparedness and response. This program is bolstered by multiple tabletop and full-scale exercises that examine disaster scenarios likely to occur in the City of Portland.

Through the implementation of this recommendation, the City would commit to periodic, scenario-based trainings and exercises within the CEI Hub, coordinated with CEI Hub stakeholders. This recommendation seeks to build on the existing PBEM training and exercise program. It assumes that implementation of Recommendations 1, 2 and 4 will provide the information and coordination to enhance the program for the CEI Hub. Under this recommendation, PBEM would make a commitment to a CEI Hub-specific training or exercise on a periodic basis (e.g. every 2 years). This recommendation would be coordinated through the CEI Hub Resiliency Workgroup.

5.8 RECOMMENDATION 8—FACILITY RETROFITS

Vulnerable facilities in the CEI Hub should be identified and retrofitted. A comprehensive, site-specific risk assessment should be conducted to identify and prioritize facilities for retrofit and/or replacement. Completion of this recommendation is dependent on the development of a facility vulnerability assessment protocol established by the CEI Hub Resiliency Workgroup. Once facilities have been identified, funding options (capital improvement plans, grants, etc.) and a timeline for completion would be identified for each facility. Additionally, facility retrofit projects potentially impacted by Portland City Council Resolution No. 37168 (Recommendation 3) would be identified.

This recommendation assumes that vulnerability assessment best practices would be performed by the CEI Hub facility owner/operator following the best management practices established in Recommendation 4. The identification of funding alternatives would be a coordinated effort between the facility owner/operator and the CEI Hub Resiliency Workgroup. If facilities are identified as potentially eligible for grant funding, the owner/operator would inform PBEM for incorporation as an action into the City's hazard mitigation plan through the plan implementation and maintenance protocol included in the plan document.

5.9 RECOMMENDATION 9—LAND USE REPURPOSING

Accessibility to the CEI Hub by land and water is necessary for both supply and distribution. The effectiveness of its location to marine, highway, petroleum pipeline, and rail access is a principle reason the CEI Hub is so important to the Pacific Northwest region. Relocating the CEI Hub to mitigate its natural hazard risks would negate the advantages of its current location. Given that it is not feasible to relocate the CEI Hub facilities, the City of Portland needs to consider whether it should continue to support residential land uses in this area, which is

likely to experience severe direct and indirect consequences from natural hazard events. The City recognizes the personal connection and long-term investment that Linnton residents have in their community. However, due to increasing evidence of substantial risk, the City has begun taking steps to slow the growth of residential use in the area (City of Portland, 2016). This recommendation for land use repurposing includes the development of regionally acceptable means to repurpose land within an identified buffer area, or hazard zone, adjacent to the CEI Hub.

The first step would be to identify an appropriate buffer zone for which land use repurposing would take place. The CEI Hub Resilience Workgroup should engage all stakeholders who would be directly impacted by land repurposing in a two-step facilitated process: 1) determine factors for consideration in establishing a buffer; 2) use those factors to define the size of buffer needed to ensure safety in the event of a hazard event affecting the CEI Hub.

Once the hazard zone buffer has been established, options for repurposing land use within that region would be identified. These options could include, but would not be limited to, further down-zoning (decreasing allowed density for new development) in addition to zoning changes in the city's 2035 Comprehensive Plan, or a voluntary buy-out program to convert existing properties to open space. These, and other land-use repurposing alternatives should be thoroughly evaluated by the CEI Hub Resilience Workgroup and members of the surrounding community.

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The Mitigation Action Plan

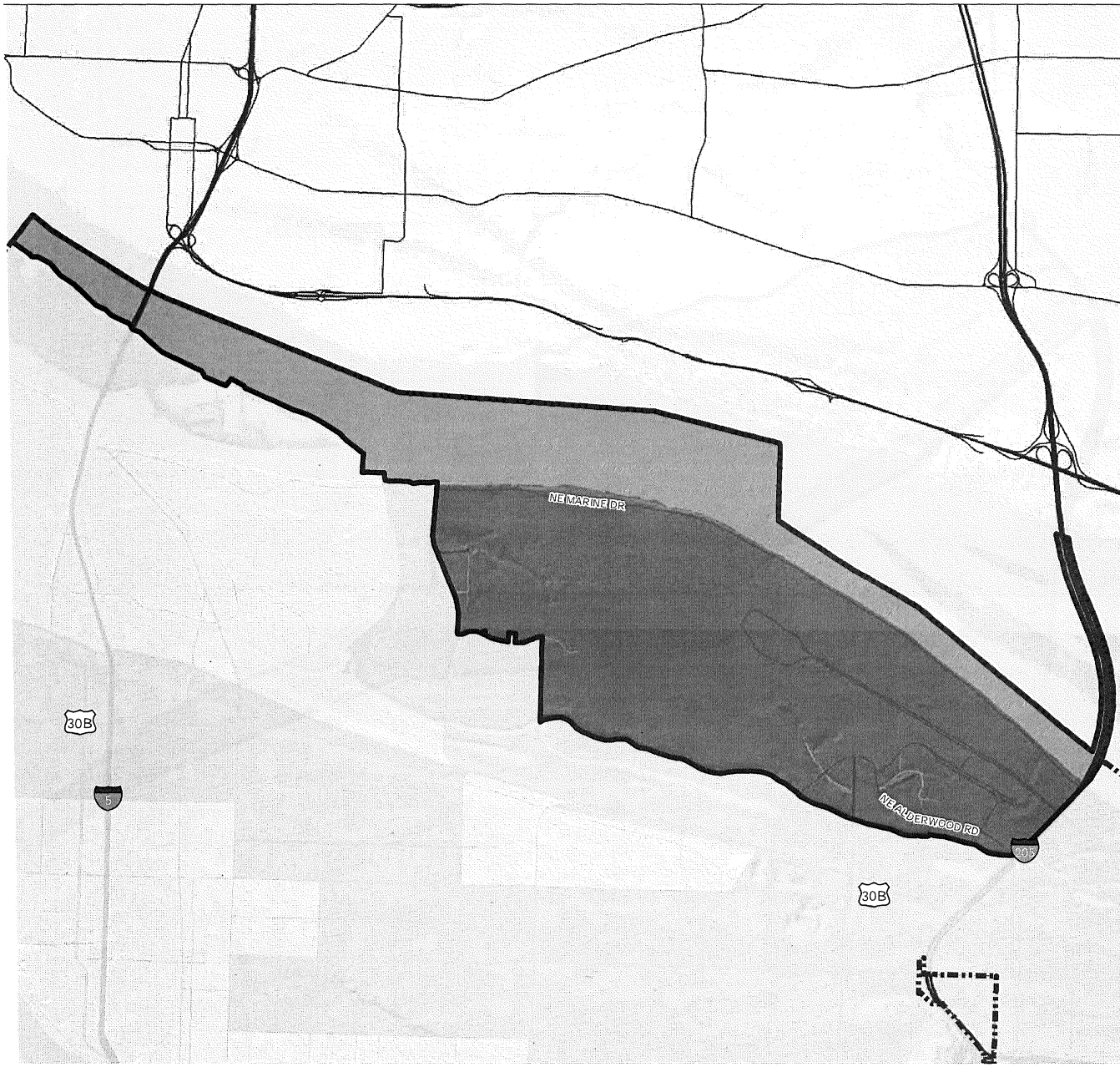
Appendix E. Reporting-Area-Scale Maps

E. Reporting-Area-Scale Maps

Risk assessment maps developed for *The Mitigation Action Plan* are provided by reporting area on the following pages.

AIRPORT

September 12, 2016
Mitigation Action Plan (MAP)
Flood hazard - 100-yr and 500-yr FEMA flood zone
Legend
City Boundary
100-year FEMA flood zone
500-year FEMA flood zone
Risk Reporting Area
Airport
NORTH
0 0.35 0.7
Miles
Sources: FEMA-2014; City of Portland-2016
PBEM
NE MARINE DR
NE ALDERWOOD RD
30B
30B



September 12, 2016

Mitigation Action Plan (MAP)

100-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

City Boundary

100-year probabilistic earthquake PGA

Potential Damage - Perceived Shaking

V -- Very Light - Moderate

VI -- Light - Strong

Risk Reporting Area Airport

NORTH

0 0.35 0.7 Miles

Sources: FEMA-2015; City of Portland-2016

PBEM

NE MARINE DR
NE ALDERWOOD RD
30B
5
September 12, 2016
Mitigation Action Plan (MAP)
Flood Hazard - 100-yr Flood Depth Grid
Legend
City Boundary
100-year flood depth grid
0.1' - 4.5'
4.6' - 11.5'
11.6' - 19.5'
19.6' - 25.9'
26' - 33.2'
Risk Reporting Area
Airport
NORTH
0 0.35 0.7
Miles
Sources: Tetra Tech-2016; City of Portland-2016
PBEM

September 12, 2016
Mitigation Action Plan (MAP)
500-year Probabilistic Earthquake--Peak Ground Acceleration
Legend
City Boundary
500-year probabilistic earthquake PGA
Potential Damage - Perceived Shaking
VI -- Light - Strong
VII -- Moderate - Very Strong
VIII – Moderate/Heavy - Severe
Risk Reporting Area
Airport
NORTH
0 0.375 0.75
Miles
Sources: FEMA-2015; City of Portland-2016
NE MARINE DR
NE ALDERWOOD RD
30B
PBEM

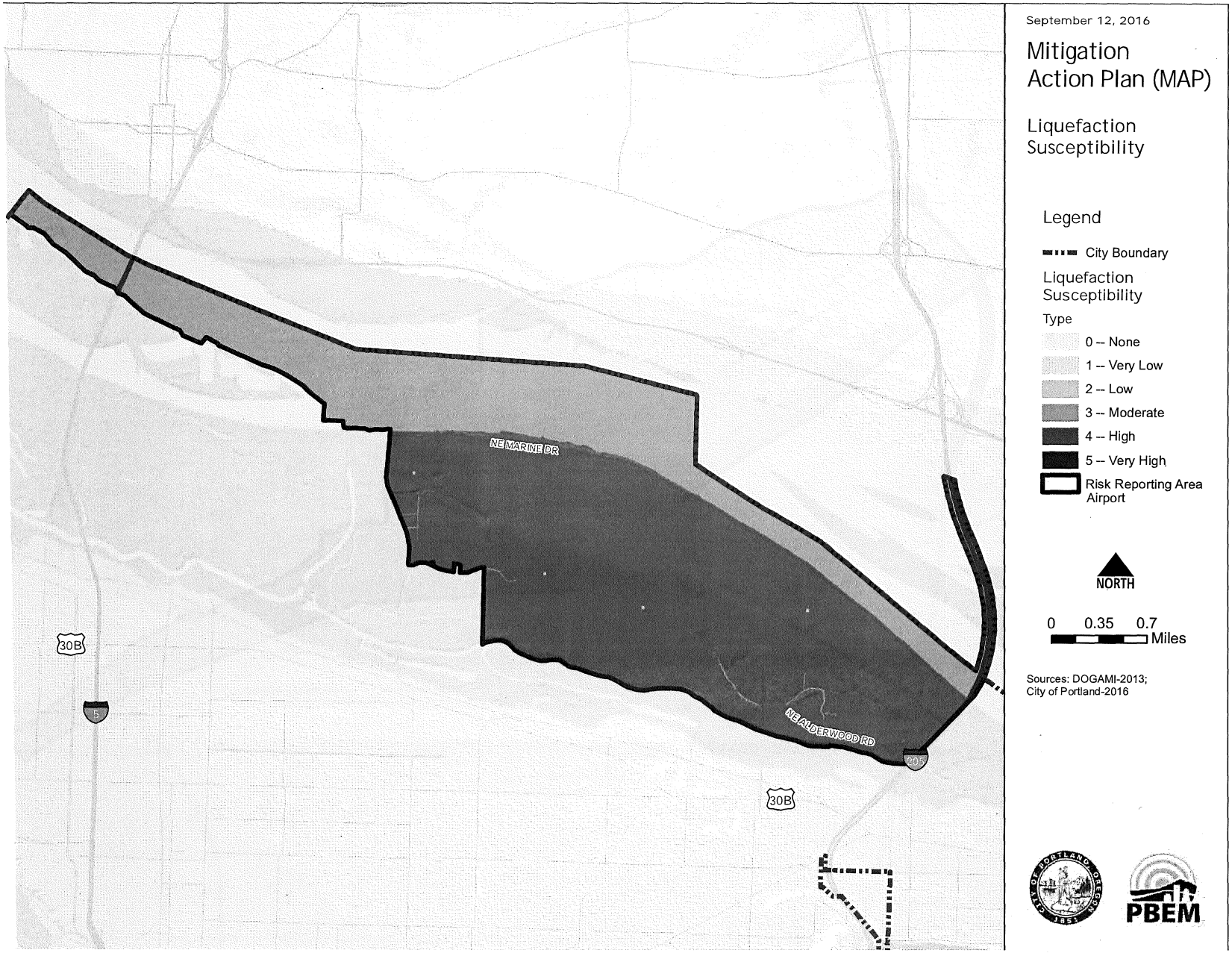
September 12, 2016
Mitigation Action Plan (MAP)
Flood Hazard - 500-yr Flood Depth Grid
Legend
City Boundary
500-year flood depth grid
0' - 4.6'
4.7' - 12.9'
13' - 22.6'
22.7' - 28.8'
28.9' - 36.7'
Risk Reporting Area
Airport
NORTH
0 0.4 0.8 Miles
Sources: Tetra Tech-2016; City of Portland-2016
PBEM
30B
NE MARINE DR
NE ALDERWOOD RD

September 12, 2016
Mitigation Action Plan (MAP)
Cascadia 9.0 Magnitude Earthquake--Peak Ground Acceleration
Legend
City Boundary
Cascadia M9.0 earthquake PGA
Potential Damage - Perceived Shaking
V – Very Light - Moderate
VI – Light - Strong
VII – Moderate - Very Strong
VIII – Moderate/Heavy - Severe
Risk Reporting Area
Airport
NORTH
0 0.35 0.7 Miles
Sources: USGS-2011; City of Portland-2016
PBEM
NE MARINE DR
NE ALDERWOOD RD
30B
5
205

September 12, 2016
Mitigation Action Plan (MAP)
Critical Facilities
Legend
City Boundary
Risk Reporting Area
Airport
Emergency Services*
Emergency Coordination Centers
Fire Station Facilities
Police Station Facilities
Medical Care Facilities
High Potential Loss Facilities*
Dams
Military
Nuclear Power Plants
Hazardous Materials
Schools
Other Assets
Zoo, Jails, Nursing/Assisted Living Facilities
*Due to security reasons, some emergency services and high potential loss facilities have been left off of the map.
NORTH
0 0.35 0.7 Miles
Sources: WORD/NID-2015; OSFM-2015; City of Portland-2011, 2015, 2016
PBEM
NE MARINE DR
NE ALDERWOOD RD
30B
30B
I-5

September 12, 2016
Mitigation Action Plan (MAP)
Critical Infrastructure
Legend
City Boundary
Risk Reporting Area
Airport
Utility Systems*
Electrical
Natural Gas Facilities
Communication Facilities
Petroleum Facilities
Potable Water Facilities
Wastewater Facilities
Transportation Systems*
Railway Tunnels, Bridges, and Facilities
Light Rail Tunnels, Bridges, and Facilities
Highway Tunnels and Bridges
Bus Facilities
Port and Airport Facilities
*Due to security reasons, some utility and transportation system components have been left off of the map.
NORTH
0 0.35 0.7
Miles
Sources: TriMet-2015; Port of Portland-2015; OPHS-2016; City of Portland-2011; 2015,2016; OPB-2016; PTS-2015; FEMA-2015; Kinder Morgan-2015
PBEM
NE MARINE DR
NE ALDERWOOD RD
30B
5

September 12, 2016
Mitigation Action Plan (MAP)
Regulatory Landslide Hazard Area
Legend
City Boundary
Historic Landslide Deposits
Landslide Hazard Area
Risk Reporting Area
Airport
NORTH
0 0.35 0.7
Miles
Sources: DOGAMI-2015; City of Portland-2015, 2016
PBEM
NE MARINE DR
NE ALDERWOOD RD
30B
30B



September 12, 2016

Mitigation Action Plan (MAP)

Liquefaction Susceptibility

Legend

- City Boundary

Liquefaction Susceptibility

Type

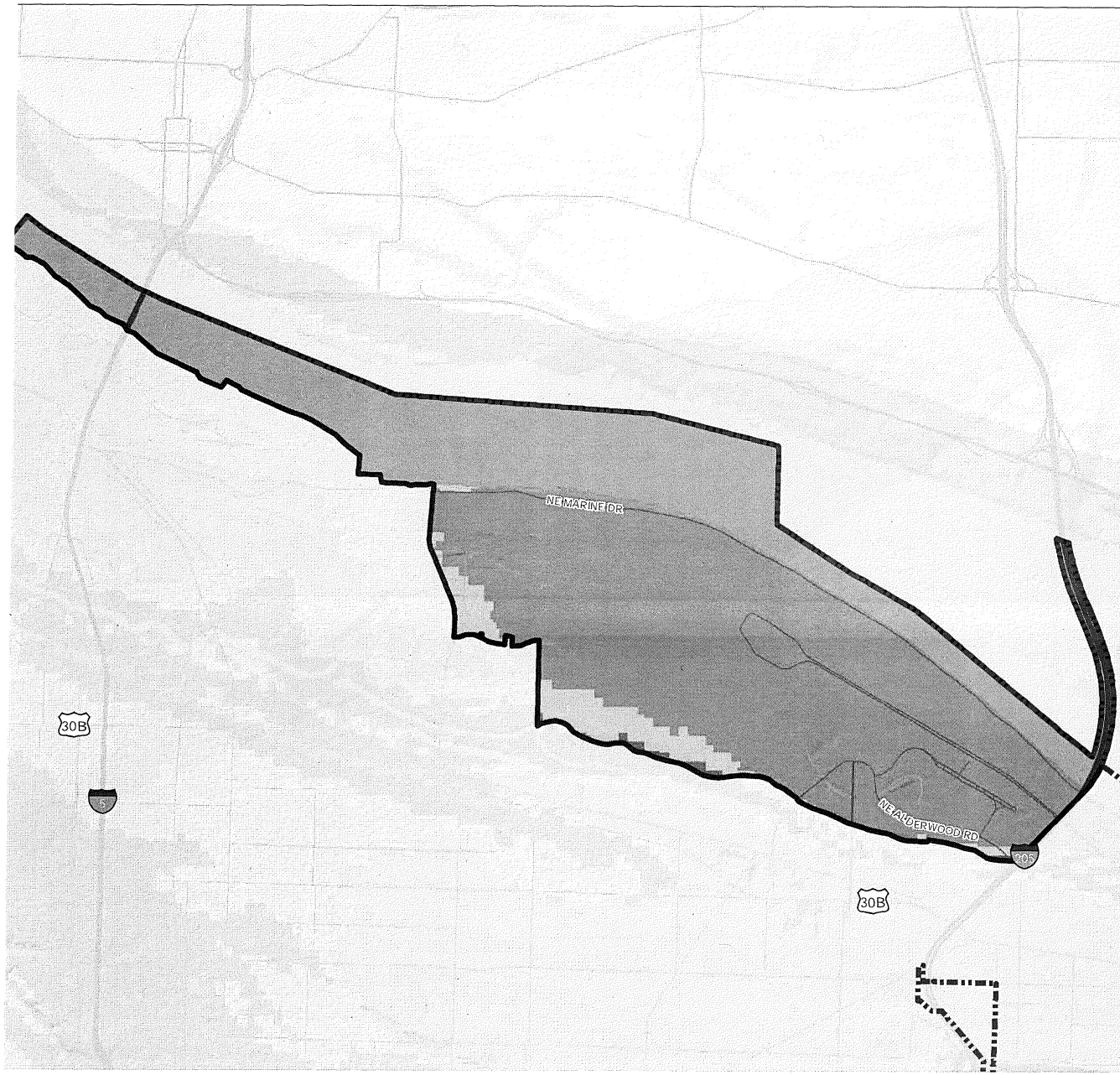
- 0 -- None
- 1 -- Very Low
- 2 -- Low
- 3 -- Moderate
- 4 -- High
- 5 -- Very High
- Risk Reporting Area
- Airport

NORTH

0 0.35 0.7 Miles

Sources: DOGAMI-2013; City of Portland-2016

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

National Earthquake Hazards Reduction Program Soils

Legend

City Boundary

NEHRP Soils

Type

B

C

D

E

Risk Reporting Area Airport

NORTH

0 0.35 0.7 Miles

Sources: DOGAMI-2012; City of Portland-2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Portland Hills 6.5 Magnitude Earthquake-Peak Ground Acceleration

Legend

- City Boundary
- Portland Hills M6.5 earthquake PGA
- Potential Damage - Perceived Shaking
  - V -- Very Light - Moderate
  - VI -- Light - Strong
  - VII -- Moderate - Very Strong
  - VIII -- Moderate/Heavy - Severe
- Risk Reporting Area
- Airport

NORTH

0 0.35 0.7 Miles

Sources: USGS-2009; City of Portland-2016

CITY OF PORTLAND OREGON

PBEM

NE MARINE DR
NE ALDERWOOD RD
September 12, 2016
Mitigation Action Plan (MAP)
Volcano Hazard Area
Legend
City Boundary
Volcano Hazard Area
Risk Reporting Area
Airport
NORTH
0 0.35 0.7
Miles
Sources: USGS-1997; City of Portland-2016
PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Wildfire Hazard Area

Legend

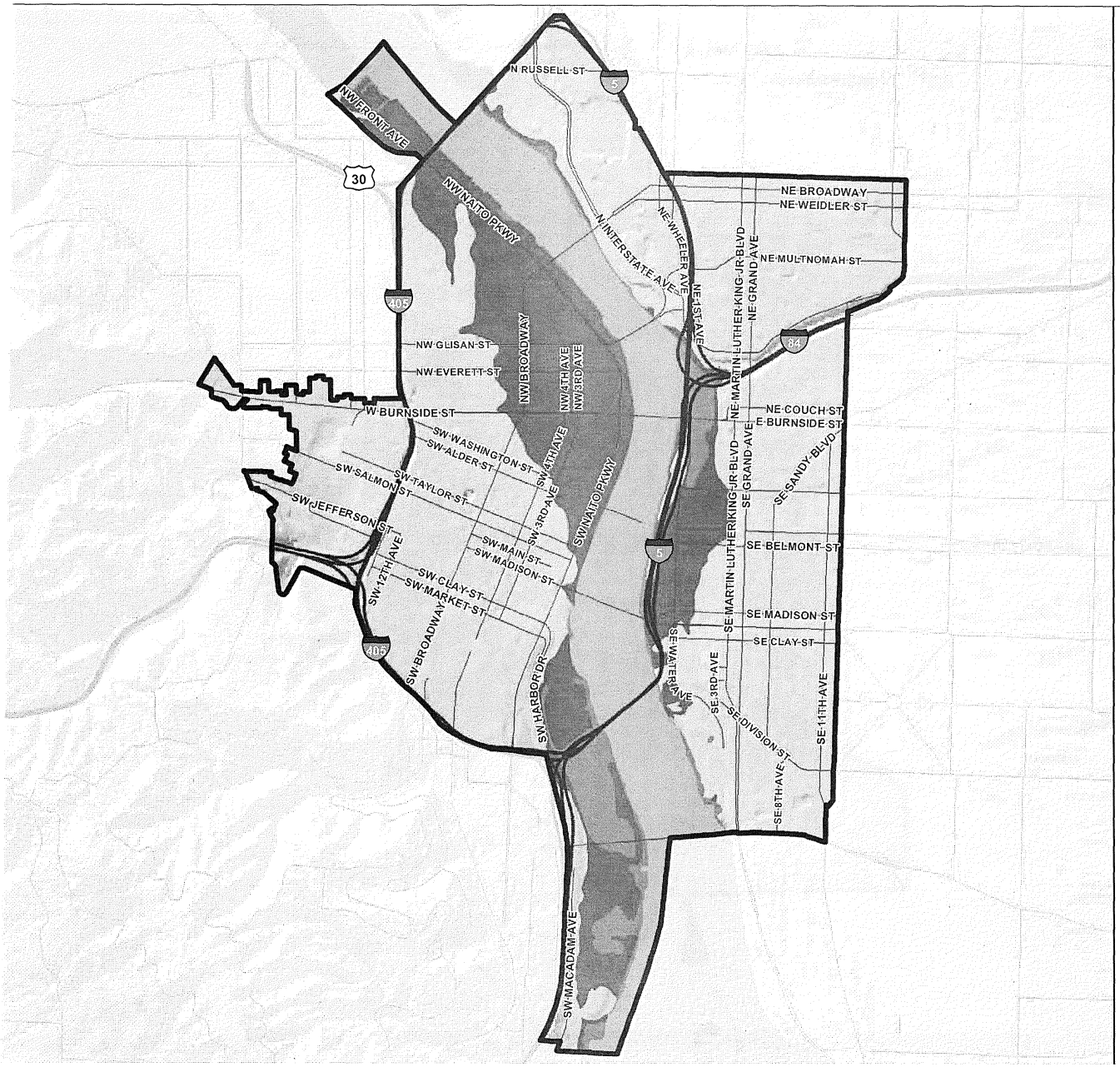
- City Boundary
- Wildfire Hazard Area
- Risk Reporting Area
- Airport

NORTH

0 0.35 0.7 Miles

Sources: City of Portland-2002, 2016

CENTRAL CITY



September 12, 2016

Mitigation Action Plan (MAP)

Flood hazard - 100-yr and 500-yr FEMA flood zone

Legend

- City Boundary
- 100-year FEMA flood zone
- 500-year FEMA flood zone
- Risk Reporting Area Central City

NORTH

0 0.175 0.35 Miles

Sources: FEMA-2014; City of Portland-2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

100-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

City Boundary

100-year probabilistic earthquake PGA

Potential Damage - Perceived Shaking

V -- Very Light - Moderate

VI -- Light - Strong

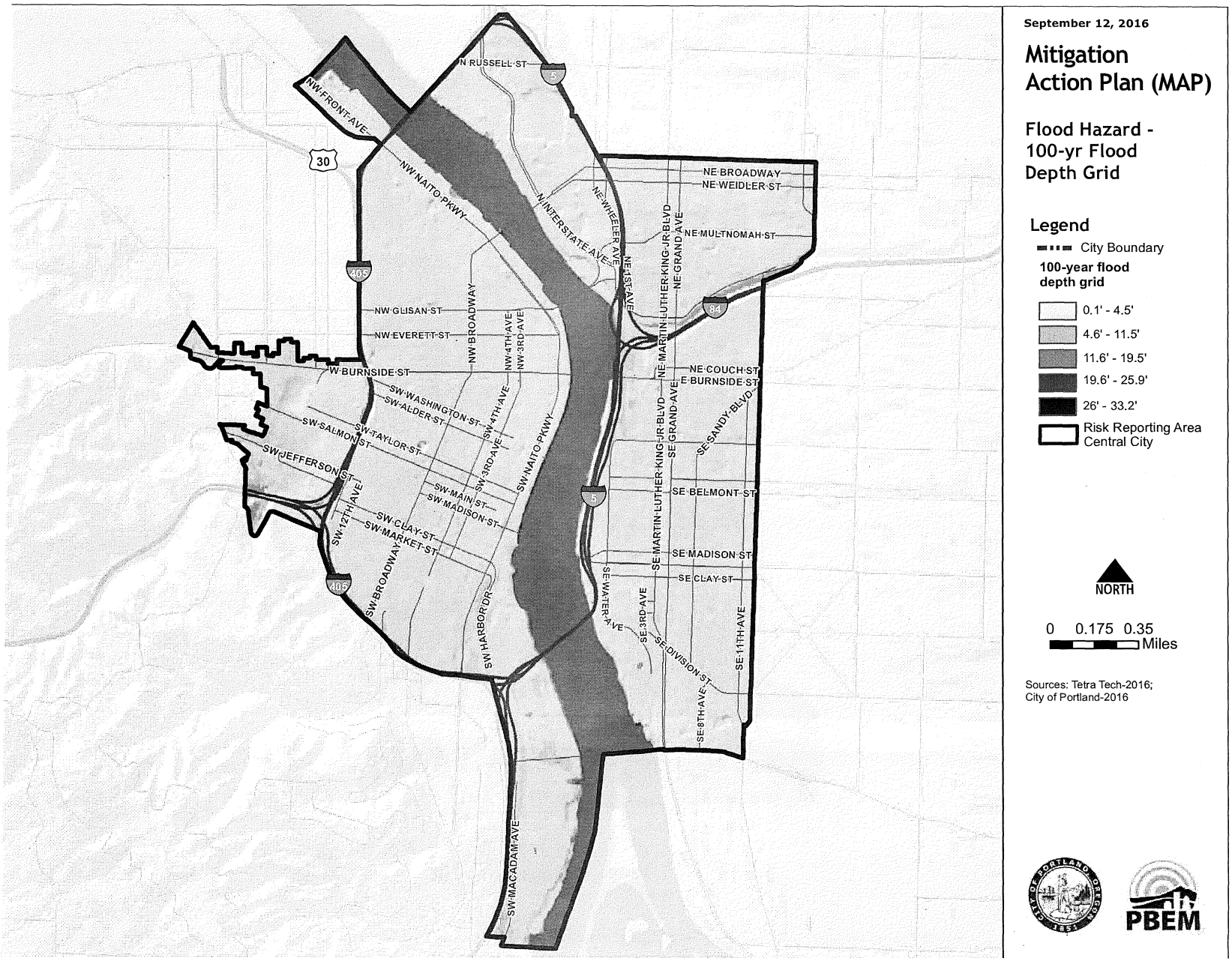
Risk Reporting Area
Central City

NORTH

0 0.175 0.35 Miles

Sources: FEMA-2015; City of Portland-2016

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Flood Hazard - 100-yr Flood Depth Grid

Legend

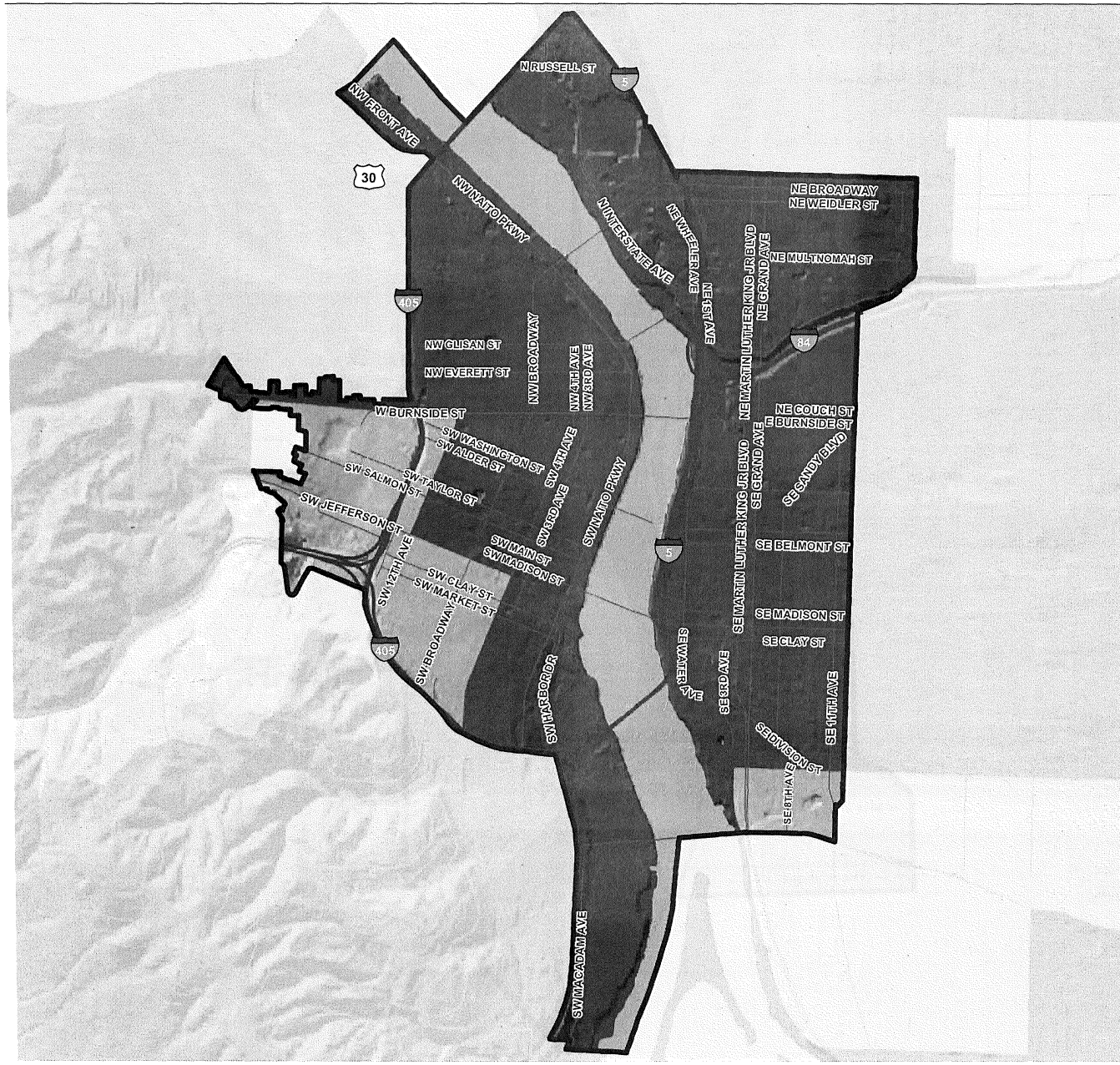
- City Boundary
- **100-year flood depth grid**
  - 0.1' - 4.5'
  - 4.6' - 11.5'
  - 11.6' - 19.5'
  - 19.6' - 25.9'
  - 26' - 33.2'
- Risk Reporting Area Central City

NORTH

0 0.175 0.35 Miles

Sources: Tetra Tech-2016; City of Portland-2016

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

500-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

City Boundary

500-year probabilistic earthquake PGA

Potential Damage - Perceived Shaking

VI -- Light - Strong

VII -- Moderate - Very Strong

VIII -- Moderate/Heavy - Severe

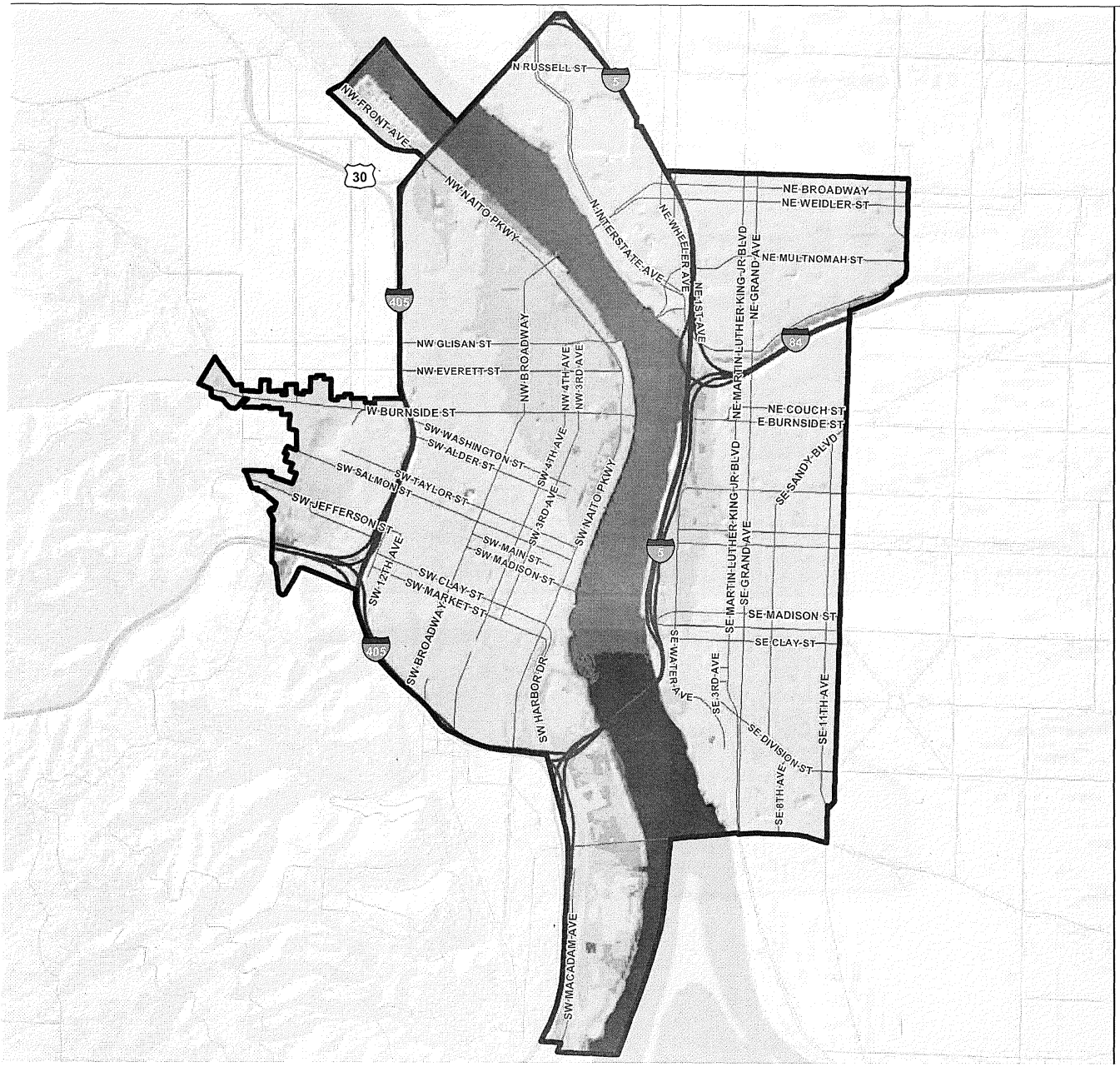
Risk Reporting Area Central City

NORTH

0 0.2 0.4 Miles

Sources: FEMA-2015; City of Portland-2016

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Flood Hazard - 500-yr Flood Depth Grid

Legend

- City Boundary

500-year flood depth grid

- 0' - 4.6'
- 4.7' - 12.9'
- 13' - 22.6'
- 22.7' - 28.8'
- 28.9' - 36.7'
- Risk Reporting Area Central City

NORTH

0 0.225 0.45 Miles

Sources: Tetra Tech-2016; City of Portland-2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Cascadia 9.0 Magnitude Earthquake--Peak Ground Acceleration

Legend

City Boundary

Cascadia M9.0 earthquake PGA

Potential Damage - Perceived Shaking

- V – Very Light - Moderate
- VI -- Light - Strong
- VII – Moderate - Very Strong
- VIII -- Moderate/Heavy - Severe

Risk Reporting Area
Central City

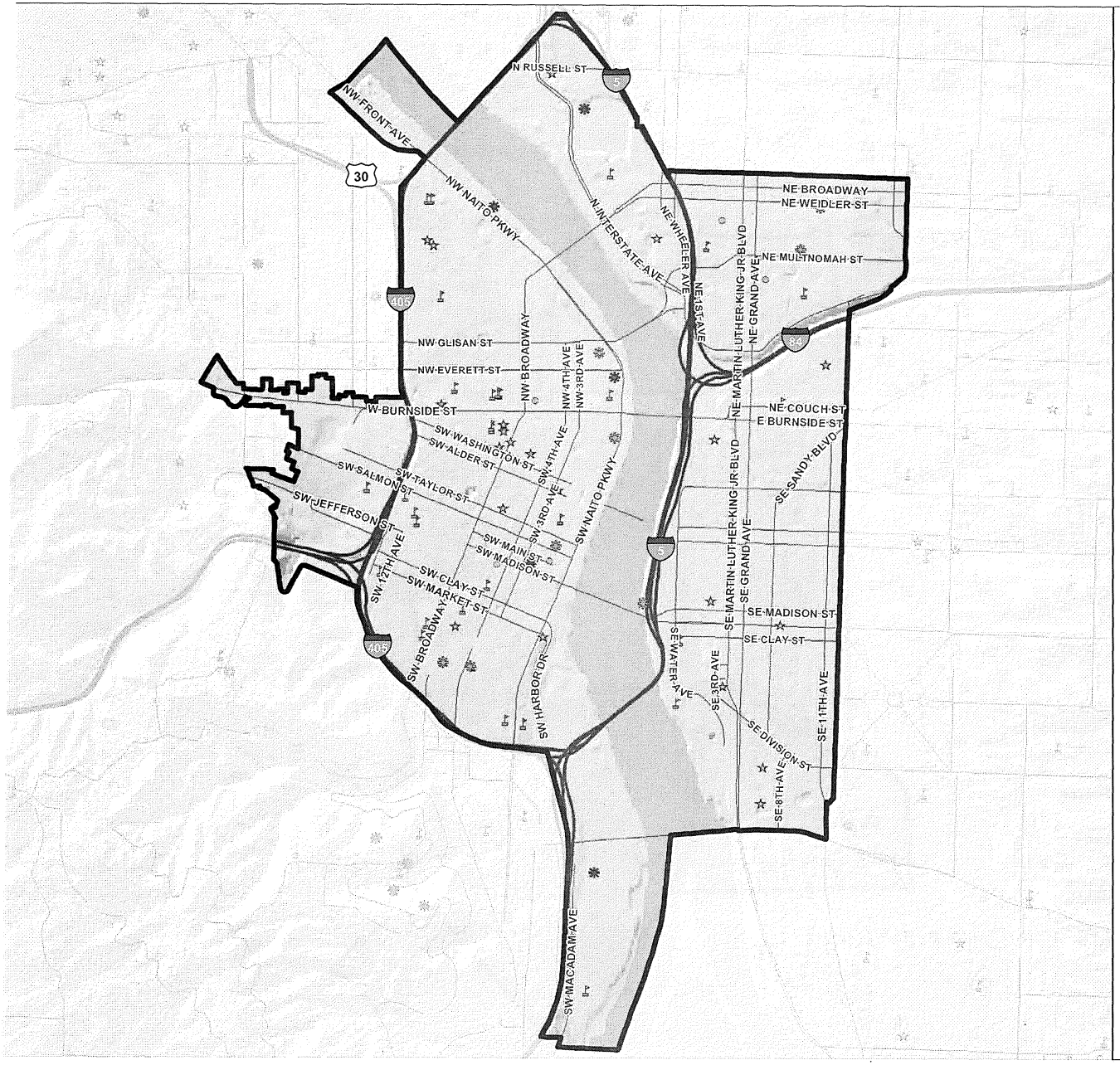
NORTH

0 0.175 0.35 Miles

Sources: USGS-2011; City of Portland-2016

CITY OF PORTLAND OREGON

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Critical Facilities

Legend

- City Boundary
- Risk Reporting Area Central City

Emergency Services*

- Emergency Coordination Centers
- Fire Station Facilities
- Police Station Facilities
- Medical Care Facilities

High Potential Loss Facilities*

- Dams
- Military
- Nuclear Power Plants
- Hazardous Materials
- Schools
- Other Assets

  Zoo, Jails, Nursing/Assisted Living Facilities

*Due to security reasons, some emergency services and high potential loss facilities have been left off of the map.

NORTH

0 0.175 0.35 Miles

Sources: WORD/NID-2015; OSFM-2015; City of Portland-2011, 2015, 2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Critical Infrastructure

Legend

- City Boundary
- Risk Reporting Area
- Central City

Utility Systems*

- Electrical
- Natural Gas Facilities
- Communication Facilities
- Petroleum Facilities
- Potable Water Facilities
- Wastewater Facilities

Transportation Systems*

- Railway Tunnels, Bridges, and Facilities
- Light Rail Tunnels, Bridges, and Facilities
- Highway Tunnels and Bridges
- Bus Facilities
- Port and Airport Facilities

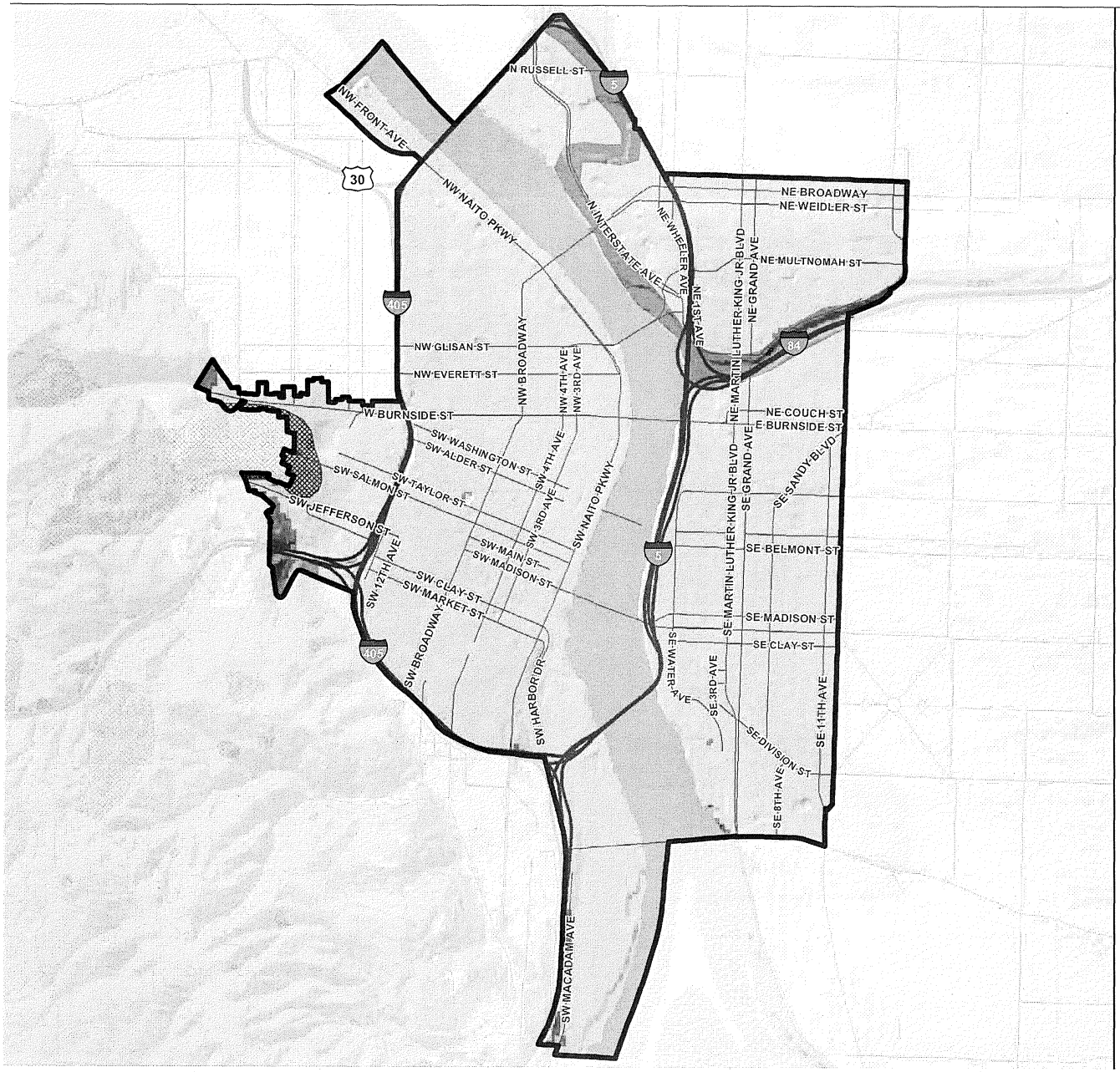
*Due to security reasons, some utility and transportation system components have been left off of the map.

NORTH

0 0.175 0.35 Miles

Sources: TriMet-2015; Port of Portland-2015; OPHS-2016; City of Portland-2011; 2015;2016; OPB-2016; PTS-2015; FEMA-2015; Kinder Morgan-2015

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Regulatory Landslide Hazard Area

Legend

- City Boundary
- Historic Landslide Deposits
- Landslide Hazard Area
- Risk Reporting Area Central City

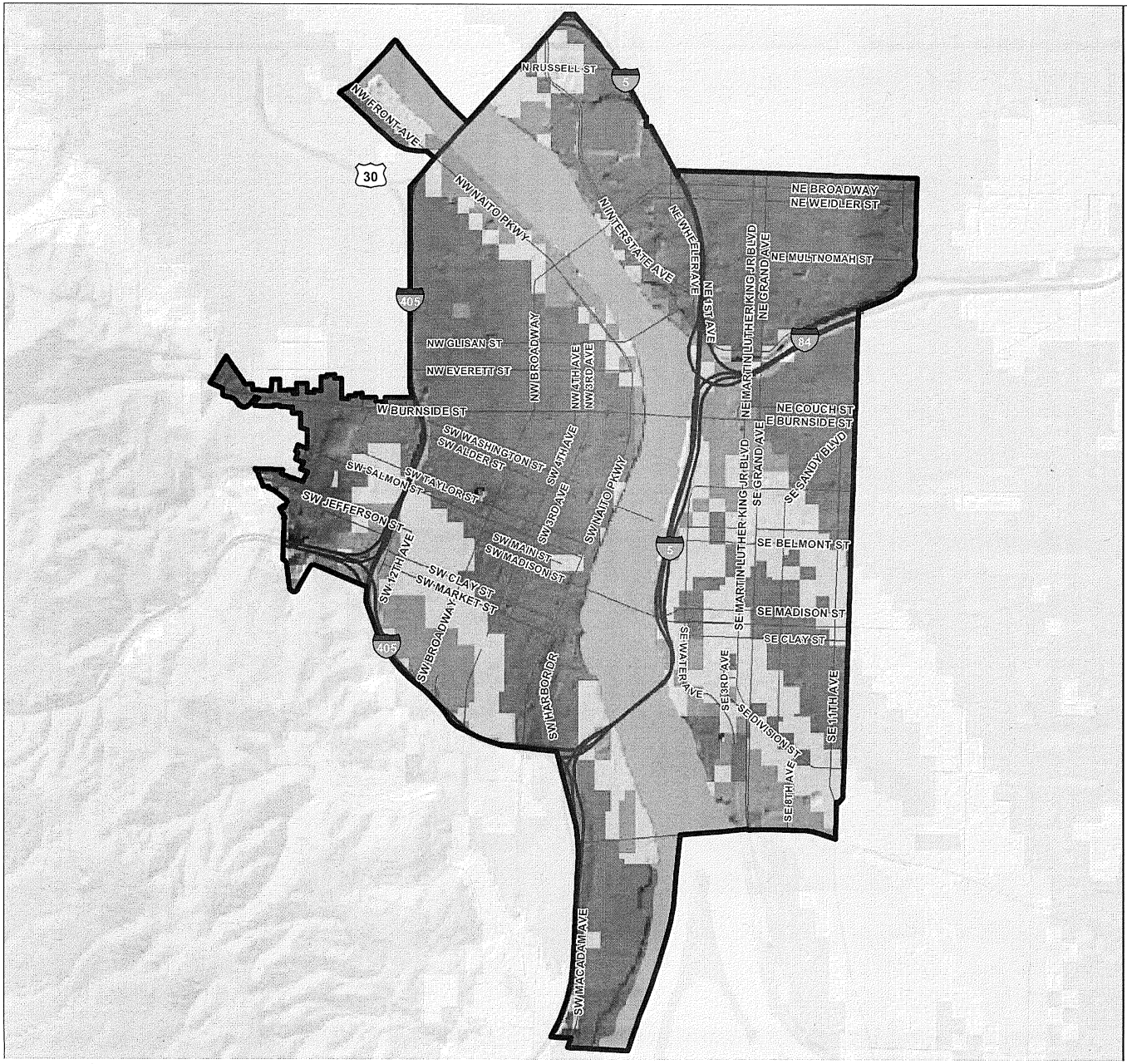
NORTH

0 0.175 0.35 Miles

Sources: DOGAMI-2015; City of Portland-2015, 2016

PBEM

September 12, 2016
Mitigation Action Plan (MAP)
Liquefaction Susceptibility
Legend
City Boundary
Liquefaction Susceptibility
Type
0 -- None
1 -- Very Low
2 -- Low
3 -- Moderate
4 -- High
5 -- Very High
Risk Reporting Area
Central City
NORTH
0 0.175 0.35
Miles
Sources: DOGAMI-2013; City of Portland-2016
PBEM
30
NW FRONT AVE
NW NAITO PKWY
N RUSSELL ST
NW BROADWAY
NW 4TH AVE
NW 3RD AVE
NW EVERETT ST
NW GLISAN ST
SW BURNSIDE ST
SW ASHINGTON ST
SW ALDER ST
SW TAYLOR ST
SW SALMON ST
SW JEFFERSON ST
SW 12TH AVE
SW BROADWAY
SW MARKET ST
SW CLAY ST
SW MADISON ST
SW MAIN ST
SW 3RD AVE
SW 4TH AVE
SW HARBOR DR
SW MACADAM AVE
SW NAITO PKWY
N INTERSTATE AVE
NE WHEELER AVE
NE 1ST AVE
NE MARTIN LUTHER KING JR BLVD
NE GRAND AVE
NE MULTNOMAH ST
NE BROADWAY
NE WEIDLER ST
NE COUCH ST
E BURNSIDE ST
SE MARTIN LUTHER KING JR BLVD
SE GRAND AVE
SE SANDY BLVD
SE BELMONT ST
SE MADISON ST
SE CLAY ST
SE 3RD AVE
SE WATER AVE
SE DIVISION ST
SE 6TH AVE
SE 11TH AVE



September 12, 2016

Mitigation Action Plan (MAP)

National Earthquake Hazards Reduction Program Soils

Legend

- City Boundary

NEHRP Soils

Type

- B
- C
- D
- E
- Risk Reporting Area
- Central City

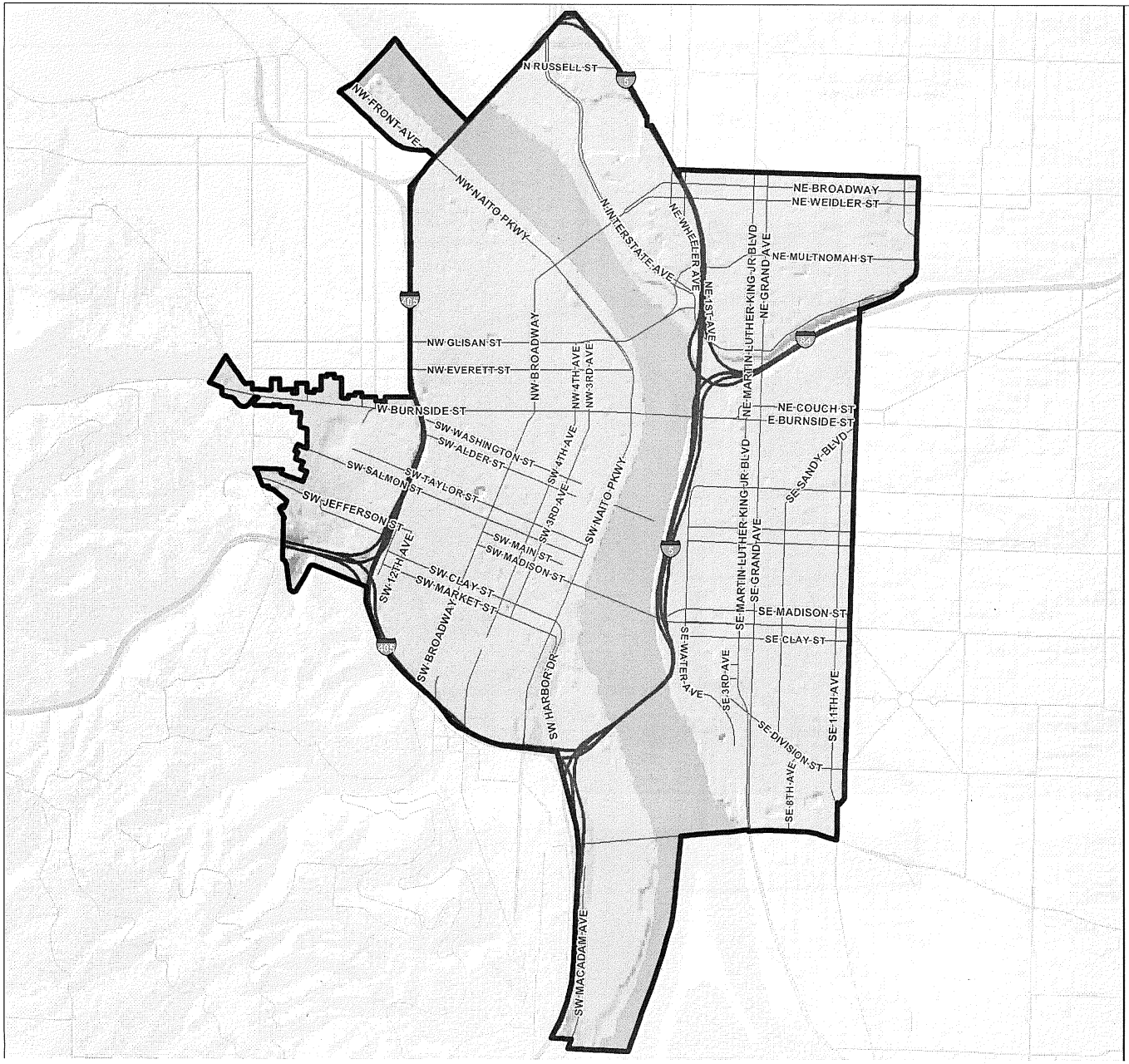
NORTH

0 0.175 0.35 Miles

Sources: DOGAMI-2012;
City of Portland-2016

PBEM

September 12, 2016
Mitigation Action Plan (MAP)
Portland Hills 6.5 Magnitude Earthquake-Peak Ground Acceleration
Legend
City Boundary
Portland Hills M6.5 earthquake PGA
Potential Damage - Perceived Shaking
V -- Very Light - Moderate
VI -- Light - Strong
VII -- Moderate - Very Strong
VIII -- Moderate/Heavy - Severe
Risk Reporting Area Central City
NORTH
0 0.175 0.35 Miles
Sources: USGS-2009; City of Portland-2016
PBEM
NW FRONT AVE
N RUSSELL ST
NW NAITO PKWY
NW BROADWAY
NW EVERETT ST
NW GLISAN ST
W BURNSIDE ST
SW JEFFERSON ST
SW SALMON ST
SW TAYLOR ST
SW ASH ST
SW MARKET ST
SW CLAY ST
SW BROADWAY
SW 12TH AVE
SW MADISON ST
SW JACKSON ST
SW WASHINGTON ST
SW ALDER ST
SW 3RD AVE
SW 4TH AVE
NW 4TH AVE
NW 3RD AVE
SW HARBOR DR
SW MACADAM AVE
SW NAITO PKWY
NE INTERSTATE AVE
NE WHEELER AVE
NE 1ST AVE
SE WATER AVE
SE 3RD AVE
SE MARTIN LUTHER KING JR BLVD
SE GRAND AVE
NE MARTIN LUTHER KING JR BLVD
NE GRAND AVE
SE DIVISION ST
SE 6TH AVE
SE CLAY ST
SE MADISON ST
SE BELMONT ST
SE SANDY BLVD
NE COUCH ST
E BURNSIDE ST
NE MULTNOMAH ST
NE BROADWAY
NE WEIDLER ST
SE 11TH AVE
30
405
5
84



September 12, 2016

Mitigation Action Plan (MAP)

Volcano Hazard Area

Legend

- City Boundary
- Volcano Hazard Area
- Risk Reporting Area Central City

NORTH

0 0.175 0.35 Miles

Sources: USGS-1997; City of Portland-2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Wildfire Hazard Area

Legend

- City Boundary
- Wildfire Hazard Area
- Risk Reporting Area Central City

NORTH

0 0.175 0.35 Miles

Sources: City of Portland-2002, 2016

CITY OF PORTLAND OREGON

PBEM

CENTRAL NORTHEAST

NE 33RD DR
NE 47TH AVE
NE 42ND AVE
NE 47TH AVE
NE HALSEY ST
NE SANDY BLVD
NE PRESCOTT ST
NE KILLINGSWORTH ST
NE COLUMBIA BLVD
NE PORTLAND HWY
NE 57TH AVE
NE 60TH AVE
NE CULLY BLVD
NE FREMONT ST
NE TILLAMOOK ST
NE 72ND AVE
213
NE 82ND AVE
30B
NE HALSEY ST
NE 92ND AVE
NE 91ST AVE
NE ROCKY BUTTE RD
September 12, 2016
Mitigation Action Plan (MAP)
Flood hazard - 100-yr and 500-yr FEMA flood zone
Legend
City Boundary
100-year FEMA flood zone
500-year FEMA flood zone
Risk Reporting Area Central Northeast
NORTH
0 0.275 0.55 Miles
Sources: FEMA-2014; City of Portland-2016
PBEM

September 12, 2016

Mitigation Action Plan (MAP)

100-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

- City Boundary
- **100-year probabilistic earthquake PGA**
- **Potential Damage - Perceived Shaking**
  - V -- Very Light - Moderate
  - VI -- Light - Strong
- Risk Reporting Area Central Northeast

NORTH

0 0.275 0.55 Miles

Sources: FEMA-2015; City of Portland-2016

PBEM

NE 33RD DR
NE 47TH AVE
NE 41ST AVE
NE 42ND AVE
NE 47TH AVE
NE HALSEY ST
NE SANDY BLVD
NE PRESCOTT ST
NE KILLINGSWORTH ST
NE PORTLAND HWY
NE COLUMBIA BLVD
NE 57TH AVE
NE 60TH AVE
NE CULLY BLVD
NE TILLAMOOK ST
NE FREMONT ST
NE 72ND AVE
NE 82ND AVE
NE HALSEY ST
NE 92ND AVE
NE 91ST AVE
NE ROCKY BUTTE RD
213
30B
84
5
205
September 12, 2016
Mitigation Action Plan (MAP)
Flood Hazard - 100-yr Flood Depth Grid
Legend
City Boundary
100-year flood depth grid
0.1' - 4.5'
4.6' - 11.5'
11.6' - 19.5'
19.6' - 25.9'
26' - 33.2'
Risk Reporting Area
Central Northeast
NORTH
0 0.275 0.55 Miles
Sources: Tetra Tech-2016; City of Portland-2016
PBEM

September 12, 2016

Mitigation Action Plan (MAP)

500-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

- City Boundary
- **500-year probabilistic earthquake PGA**
- **Potential Damage - Perceived Shaking**
  - VI -- Light - Strong
  - VII -- Moderate - Very Strong
  - VIII -- Moderate/Heavy - Severe
- Risk Reporting Area Central Northeast

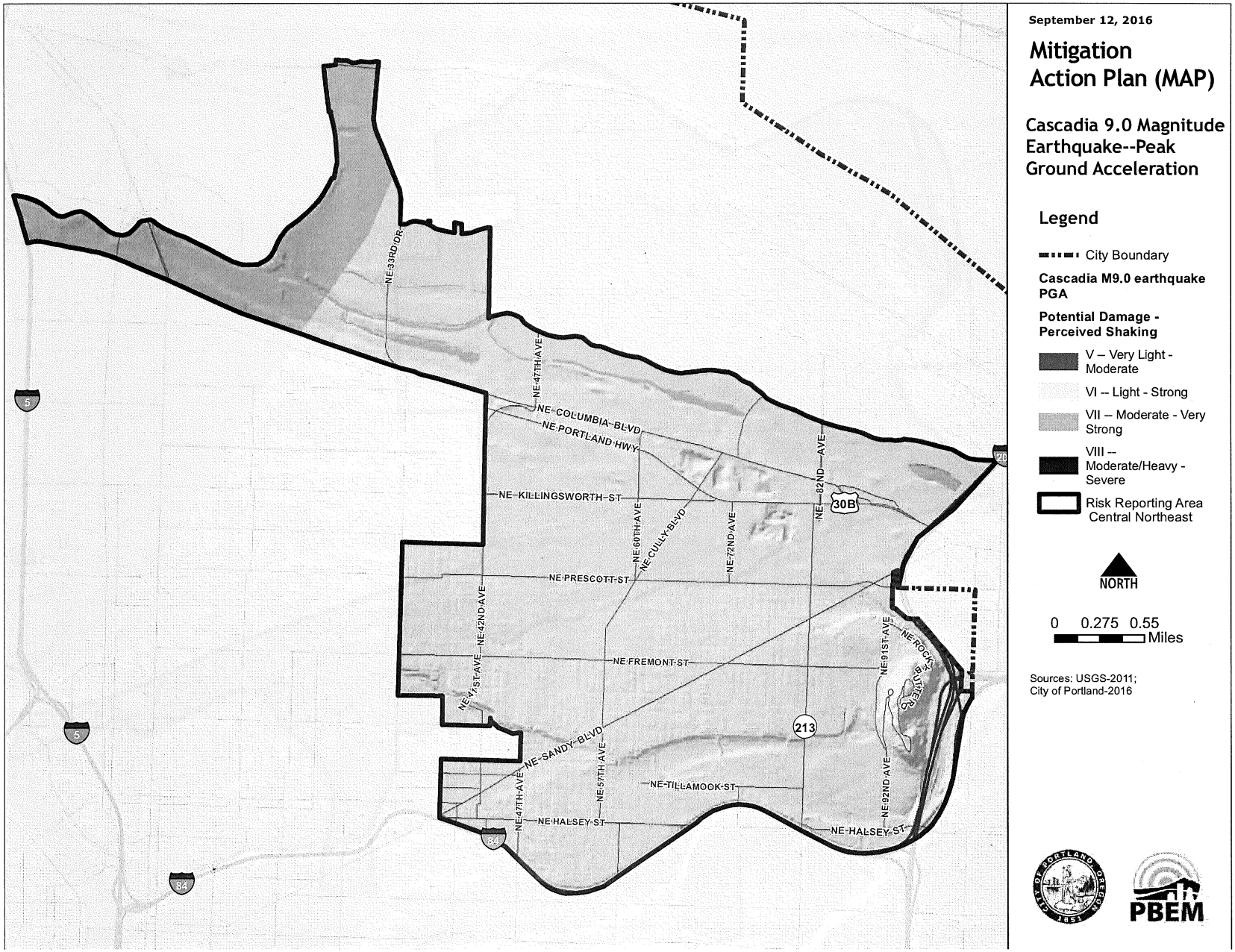
NORTH

0 0.325 0.65 Miles

Sources: FEMA-2015; City of Portland-2016

PBEM

NE 33RD DR
NE 47TH AVE
NE 41ST AVE
NE 42ND AVE
NE 47TH AVE
NE SANDY BLVD
NE HALSEY ST
NE 57TH AVE
NE PRESCOTT ST
NE KILLINGSWORTH ST
NE PORTLAND HWY
NE COLUMBIA BLVD
NE 47TH AVE
NE CULLY BLVD
NE 60TH AVE
NE FREMONT ST
NE TILLAMOOK ST
NE 72ND AVE
213
NE 82ND AVE
30B
NE HALSEY ST
NE 92ND AVE
NE 91ST AVE
NE ROCKY BUTTE RD
September 12, 2016
Mitigation Action Plan (MAP)
Flood Hazard - 500-yr Flood Depth Grid
Legend
City Boundary
500-year flood depth grid
0' - 4.6'
4.7' - 12.9'
13' - 22.6'
22.7' - 28.8'
28.9' - 36.7'
Risk Reporting Area
Central Northeast
NORTH
0
0.35
0.7
Miles
Sources: Tetra Tech-2016; City of Portland-2016
PBEM


NE 33RD DR
NE 47TH AVE
NE COLUMBIA BLVD
NE PORTLAND HWY
NE KILLINGSWORTH ST
NE 60TH AVE
NE CULLY BLVD
NE 72ND AVE
NE 82ND AVE
30B
NE PRESCOTT ST
NE 42ND AVE
NE 47TH AVE
NE FREMONT ST
NE 91ST AVE
NE ROCKWOOD PKWY
213
NE SANDY BLVD
NE 57TH AVE
NE TILLAMOOK ST
NE 92ND AVE
NE HALSEY ST
5
84
September 12, 2016
Mitigation Action Plan (MAP)
Cascadia 9.0 Magnitude Earthquake--Peak Ground Acceleration
Legend
City Boundary
Cascadia M9.0 earthquake PGA
Potential Damage - Perceived Shaking
V – Very Light - Moderate
VI -- Light - Strong
VII – Moderate - Very Strong
VIII -- Moderate/Heavy - Severe
Risk Reporting Area Central Northeast
NORTH
0 0.275 0.55
Miles
Sources: USGS-2011; City of Portland-2016
PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Critical Facilities

Legend

- City Boundary
- Risk Reporting Area Central Northeast

Emergency Services*

- Emergency Coordination Centers
- Fire Station Facilities
- Police Station Facilities
- Medical Care Facilities

High Potential Loss Facilities*

- Dams
- Military
- Nuclear Power Plants
- Hazardous Materials
- Schools
- Other Assets
  Zoo, Jails, Nursing/Assisted Living Facilities

*Due to security reasons, some emergency services and high potential loss facilities have been left off of the map.

NORTH

0 0.275 0.55 Miles

Sources: WORD/NID-2015; OSFM-2015; City of Portland-2011, 2015, 2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Critical Infrastructure

Legend

- City Boundary
- Risk Reporting Area
- Central Northeast

Utility Systems*

- Electrical
- Natural Gas Facilities
- Communication Facilities
- Petroleum Facilities
- Potable Water Facilities
- Wastewater Facilities

Transportation Systems*

- Railway Tunnels, Bridges, and Facilities
- Light Rail Tunnels, Bridges, and Facilities
- Highway Tunnels and Bridges
- Bus Facilities
- Port and Airport Facilities

*Due to security reasons, some utility and transportation system components have been left off of the map.

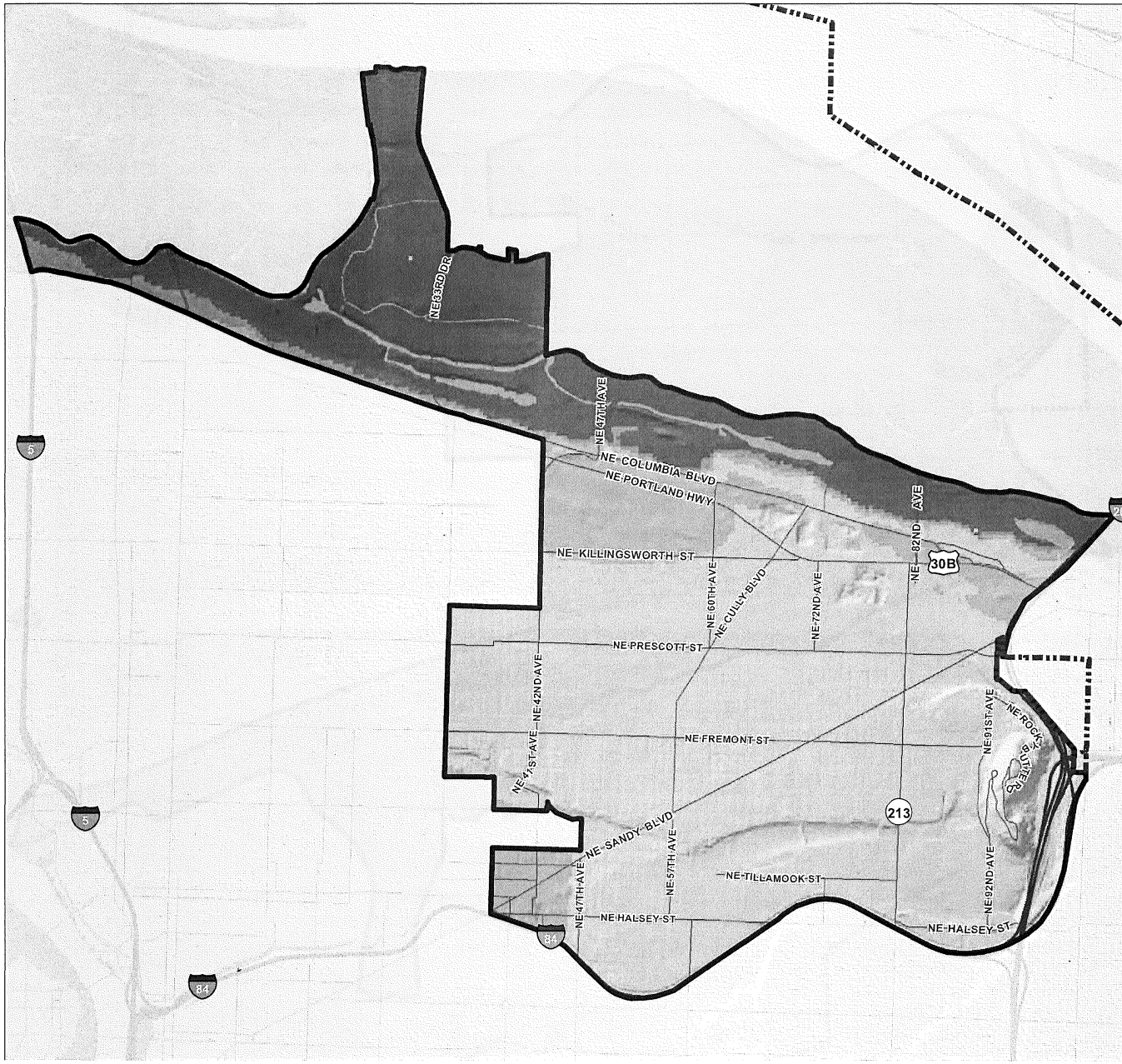
NORTH

0 0.275 0.55 Miles

Sources: TriMet-2015; Port of Portland-2015; OPHS-2016; City of Portland-2011, 2015,2016; OPB-2016; PTS-2015; FEMA-2015; Kinder Morgan-2015

PBEM

NE 33RD DR
NE 47TH AVE
NE 42ND AVE
NE 47TH AVE
NE SANDY BLVD
NE HALSEY ST
NE 57TH AVE
NE PRESCOTT ST
NE FREMONT ST
NE KILLINGSWORTH ST
NE PORTLAND HWY
NE COLUMBIA BLVD
NE 47TH AVE
NE CULLY BLVD
NE 60TH AVE
NE TILLAMOOK ST
NE 72ND AVE
NE 82ND AVE
NE HALSEY ST
NE 92ND AVE
NE 91ST AVE
NE ROCKY BUTTE RD
213
30B
NORTH
0 0.275 0.55
Miles
Sources: DOGAMI-2015; City of Portland-2015, 2016
PBEM
Legend
City Boundary
Historic Landslide Deposits
Landslide Hazard Area
Risk Reporting Area Central Northeast
September 12, 2016
Mitigation Action Plan (MAP)
Regulatory Landslide Hazard Area



September 12, 2016

Mitigation Action Plan (MAP)

Liquefaction Susceptibility

Legend

City Boundary

Liquefaction Susceptibility

Type

- 0 -- None
- 1 -- Very Low
- 2 -- Low
- 3 -- Moderate
- 4 -- High
- 5 -- Very High

Risk Reporting Area Central Northeast

NORTH

0 0.275 0.55 Miles

Sources: DOGAMI-2013; City of Portland-2016

PBEM

NE 33RD DR
NE 47TH AVE
NE 42ND AVE
NE 47TH AVE
NE SANDY BLVD
NE HALSEY ST
NE 57TH AVE
NE PRESCOTT ST
NE KILLINGSWORTH ST
NE PORTLAND HWY
NE COLUMBIA BLVD
NE 47TH AVE
NE 60TH AVE
NE CULLY BLVD
NE FREMONT ST
NE TILLAMOOK ST
NE 72ND AVE
213
NE 82ND AVE
30B
NE HALSEY ST
NE 92ND AVE
NE 91ST AVE
NE ROCKY BUTTE RD
September 12, 2016
Mitigation Action Plan (MAP)
National Earthquake Hazards Reduction Program Soils
Legend
City Boundary
NEHRP Soils
Type
B
C
D
E
Risk Reporting Area
Central Northeast
NORTH
0 0.275 0.55 Miles
Sources: DOGAMI-2012; City of Portland-2016
PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Portland Hills 6.5 Magnitude Earthquake-Peak Ground Acceleration

Legend

City Boundary

Portland Hills M6.5 earthquake PGA

Potential Damage - Perceived Shaking

- V -- Very Light - Moderate
- VI -- Light - Strong
- VII -- Moderate - Very Strong
- VIII -- Moderate/Heavy - Severe

Risk Reporting Area
Central Northeast

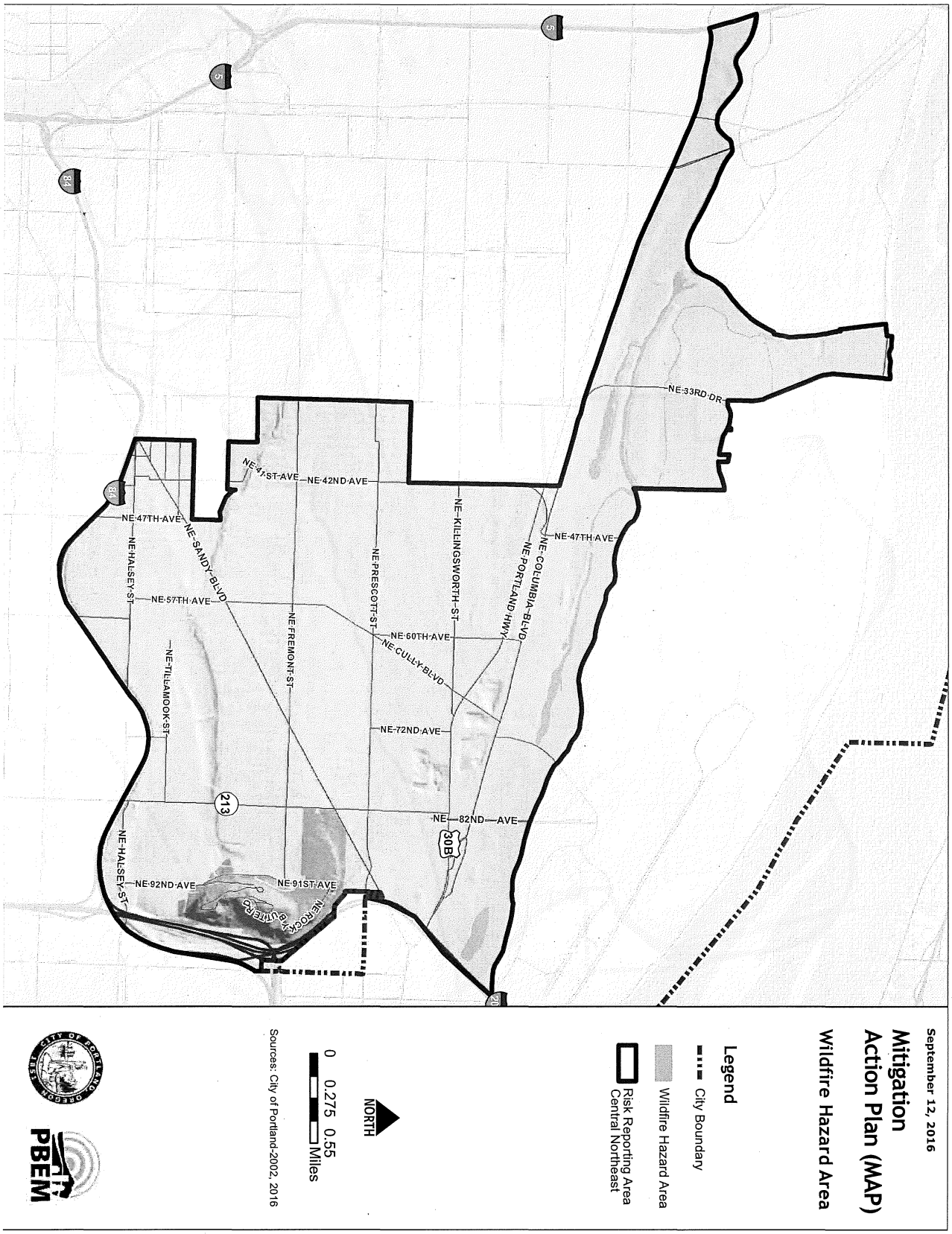
NORTH

0 0.275 0.55 Miles

Sources: USGS-2009; City of Portland-2016

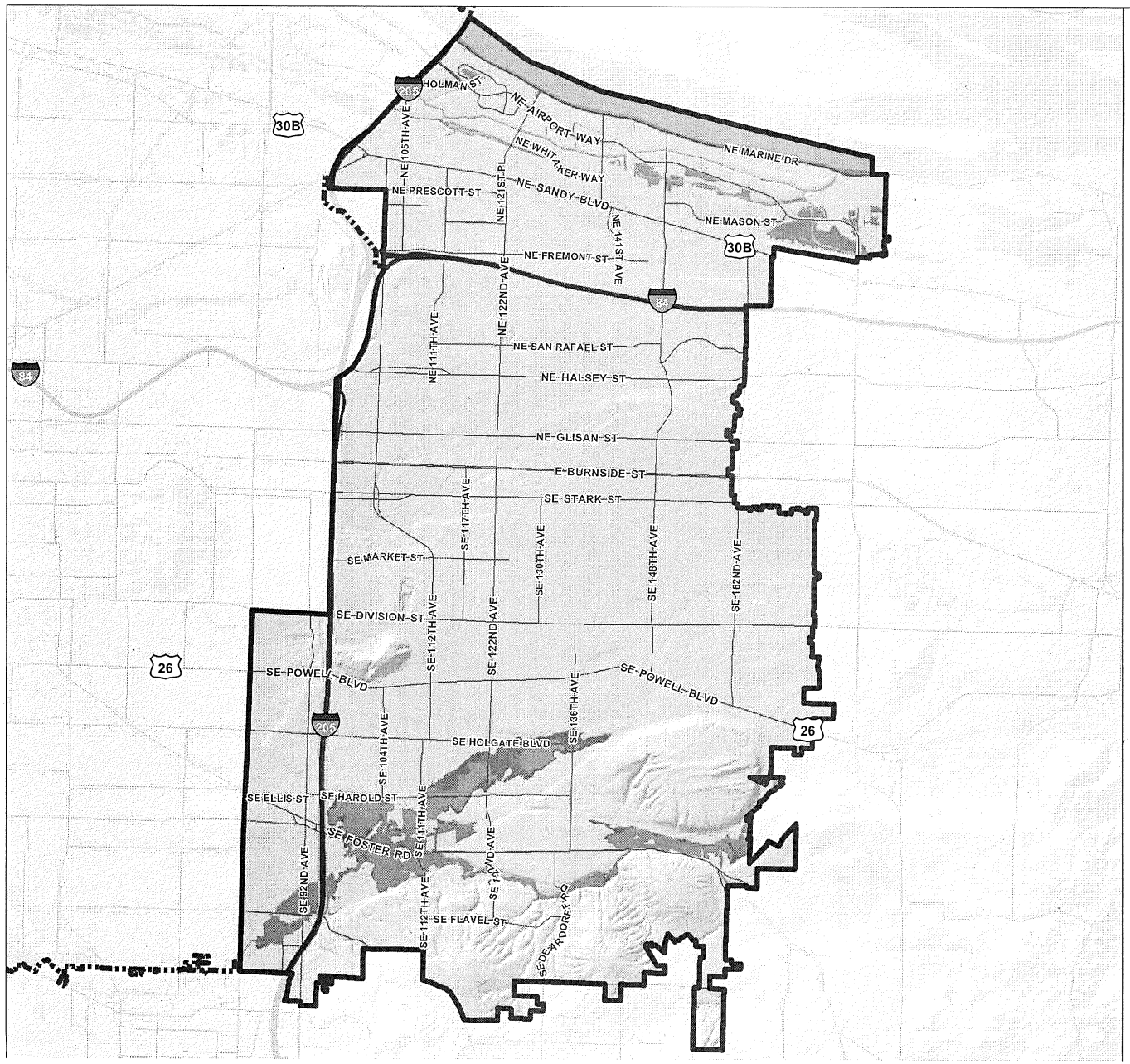
PBEM

NE 33RD DR
NE 47TH AVE
NE 41ST AVE
NE 42ND AVE
NE 47TH AVE
NE SANDY BLVD
NE HALSEY ST
NE 57TH AVE
NE PRESCOTT ST
NE KILLINGSWORTH ST
NE PORTLAND HWY
NE COLUMBIA BLVD
NE 60TH AVE
NE CULLY BLVD
NE FREMONT ST
NE TILLAMOOK ST
NE 72ND AVE
213
NE 82ND AVE
205
NE HALSEY ST
NE 92ND AVE
NE 91ST AVE
NE ROCKY BUTTE RD
September 12, 2016
Mitigation Action Plan (MAP)
Volcano Hazard Area
Legend
City Boundary
Volcano Hazard Area
Risk Reporting Area
Central Northeast
NORTH
0 0.275 0.55
Miles
Sources: USGS-1997;
City of Portland-2016
PBEM


September 12, 2016
Mitigation Action Plan (MAP)
Wildfire Hazard Area
Legend
City Boundary
Wildfire Hazard Area
Risk Reporting Area Central Northeast
NORTH
0 0.275 0.55 Miles
Sources: City of Portland-2002, 2016
PBEM
NE 33RD DR
NE 41ST AVE
NE 42ND AVE
NE 47TH AVE
NE 47TH AVE
NE SANDY BLVD
NE HALSEY ST
NE 57TH AVE
NE FREMONT ST
NE PRESCOTT ST
NE KILLINGSWORTH ST
NE PORTLAND HWY
NE COLUMBIA BLVD
NE 60TH AVE
NE CULLY BLVD
NE TILLAMOOK ST
NE 72ND AVE
NE 82ND AVE
NE HALSEY ST
NE 92ND AVE
NE 91ST AVE
NE ROCKY BUTTE RD
213
30B
84
5

1937

EAST PORTLAND



September 12, 2016

Mitigation Action Plan (MAP)

Flood hazard - 100-yr and 500-yr FEMA flood zone

Legend

- City Boundary
- 100-year FEMA flood zone
- 500-year FEMA flood zone
- Risk Reporting Area East Portland

NORTH

0 0.425 0.85 Miles

Sources: FEMA-2014; City of Portland-2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

100-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

- City Boundary
- **100-year probabilistic earthquake PGA**
- **Potential Damage - Perceived Shaking**
  - V – Very Light - Moderate
  - VI – Light - Strong
- Risk Reporting Area East Portland

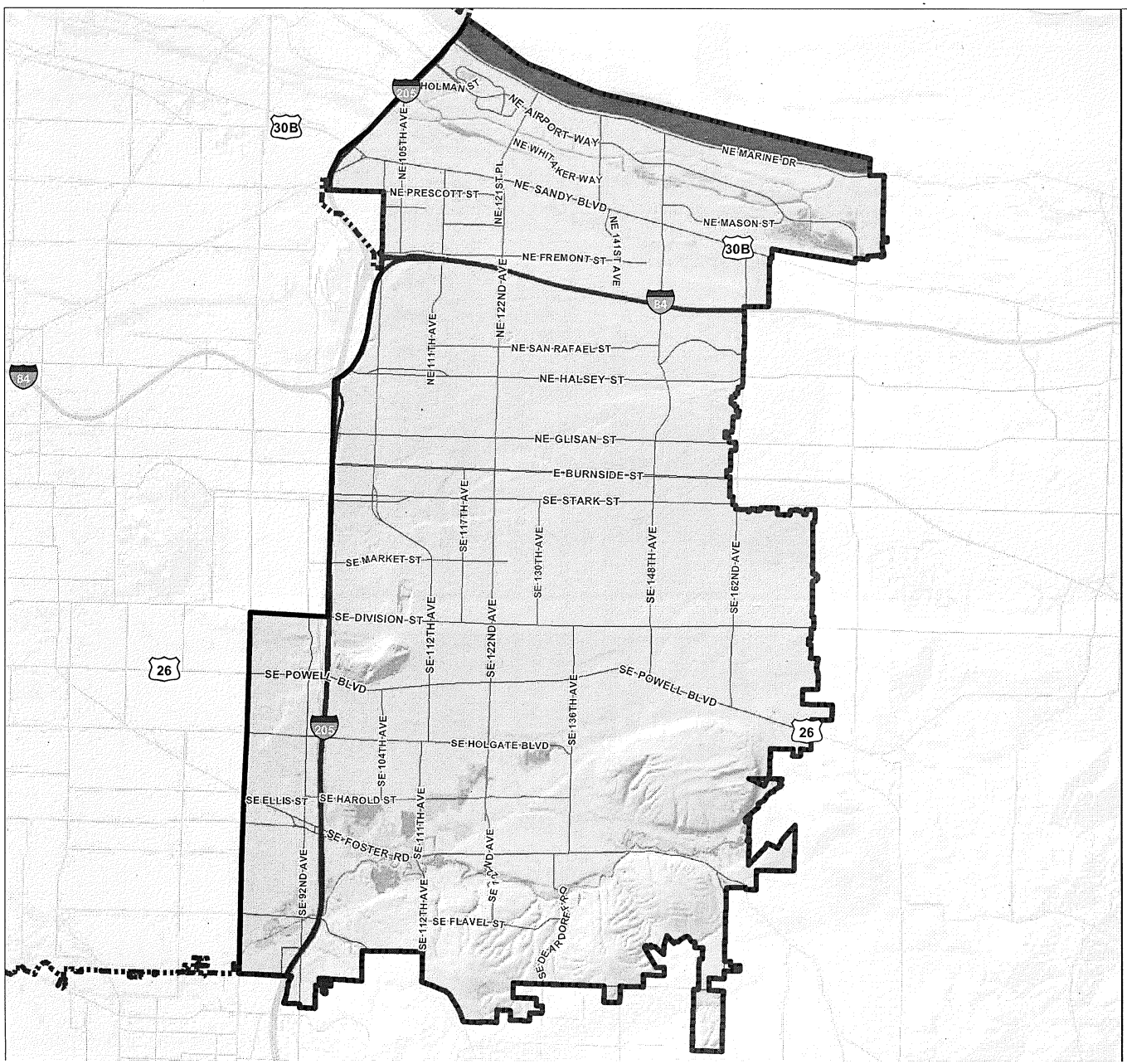
NORTH

0 0.425 0.85 Miles

Sources: FEMA-2015; City of Portland-2016

CITY OF PORTLAND OREGON

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Flood Hazard - 100-yr Flood Depth Grid

Legend

- City Boundary
- **100-year flood depth grid**
  - 0.1' - 4.5'
  - 4.6' - 11.5'
  - 11.6' - 19.5'
  - 19.6' - 25.9'
  - 26' - 33.2'
- Risk Reporting Area East Portland

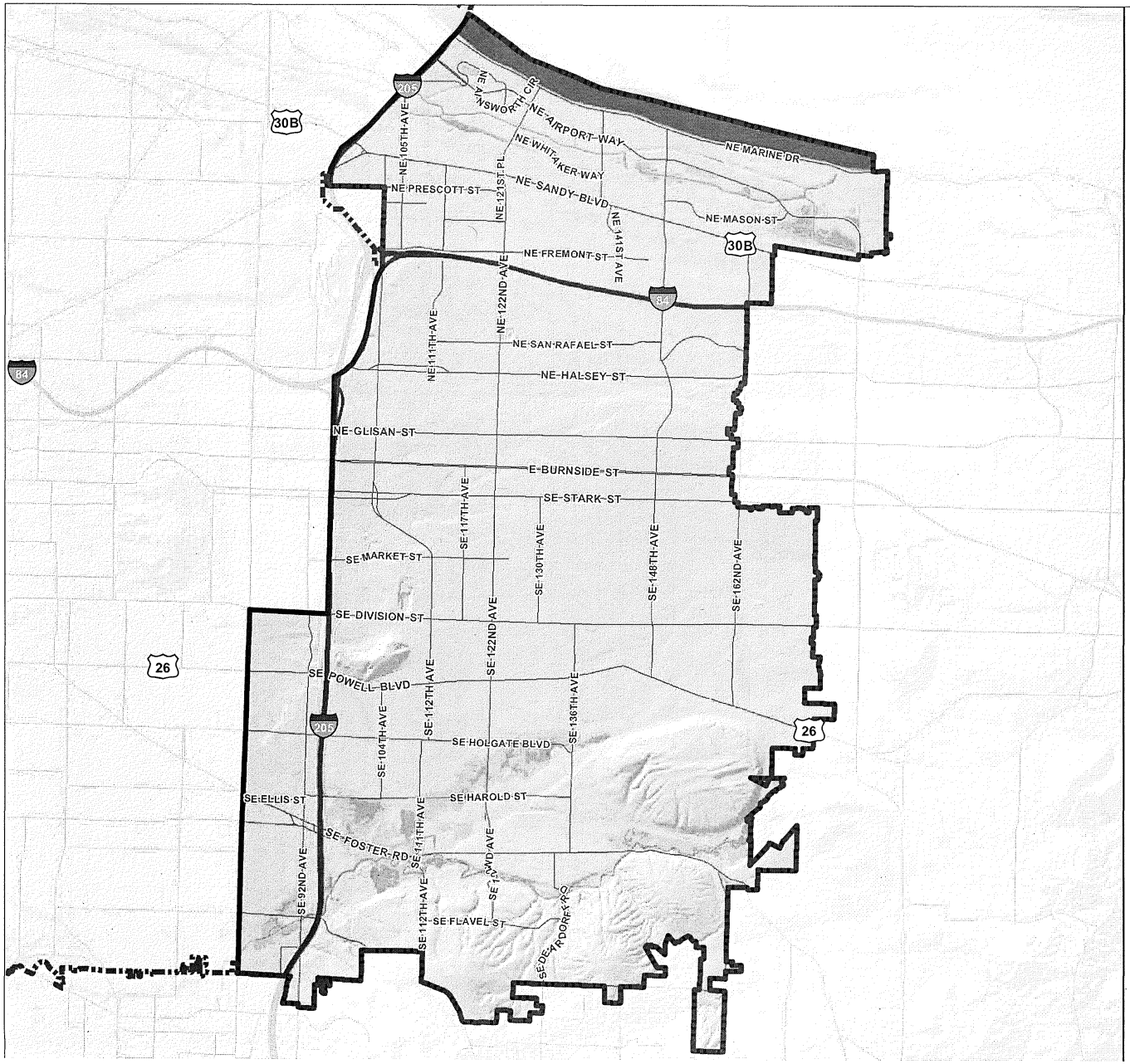
NORTH

0 0.425 0.85 Miles

Sources: Tetra Tech-2016; City of Portland-2016

PBEM

September 12, 2016
Mitigation Action Plan (MAP)
500-year Probabilistic Earthquake--Peak Ground Acceleration
Legend
City Boundary
500-year probabilistic earthquake PGA
Potential Damage - Perceived Shaking
VI -- Light - Strong
VII -- Moderate - Very Strong
VIII -- Moderate/Heavy - Severe
Risk Reporting Area East Portland
NORTH
0 0.475 0.95 Miles
Sources: FEMA-2015; City of Portland-2016
PBEM
SE 92ND AVE
SE 104TH AVE
SE 111TH AVE
SE 112TH AVE
SE 117TH AVE
SE 122ND AVE
SE 130TH AVE
SE 136TH AVE
SE 148TH AVE
SE 162ND AVE
SE ELLIS ST
SE HAROLD ST
SE FOSTER RD
SE FLAVEL ST
SE HOLGATE BLVD
SE DEARDORFF RD
SE POWELL BLVD
SE DIVISION ST
SE MARKET ST
SE STARK ST
NE GLISAN ST
NE HALSEY ST
NE SAN RAFAEL ST
E BURNSIDE ST
NE 105TH AVE
NE 111TH AVE
NE 122ND AVE
NE PRESCOTT ST
NE FREMONT ST
NE 141ST AVE
NE 121ST PL
NE HALSEY WAY
NE AIRPORT WAY
NE HOLMAN ST
NE SANDY BLVD
NE MASON ST
NE MARINE DR
26
30B
205
84



September 12, 2016

Mitigation Action Plan (MAP)

Flood Hazard - 500-yr Flood Depth Grid

Legend

- City Boundary

500-year flood depth grid

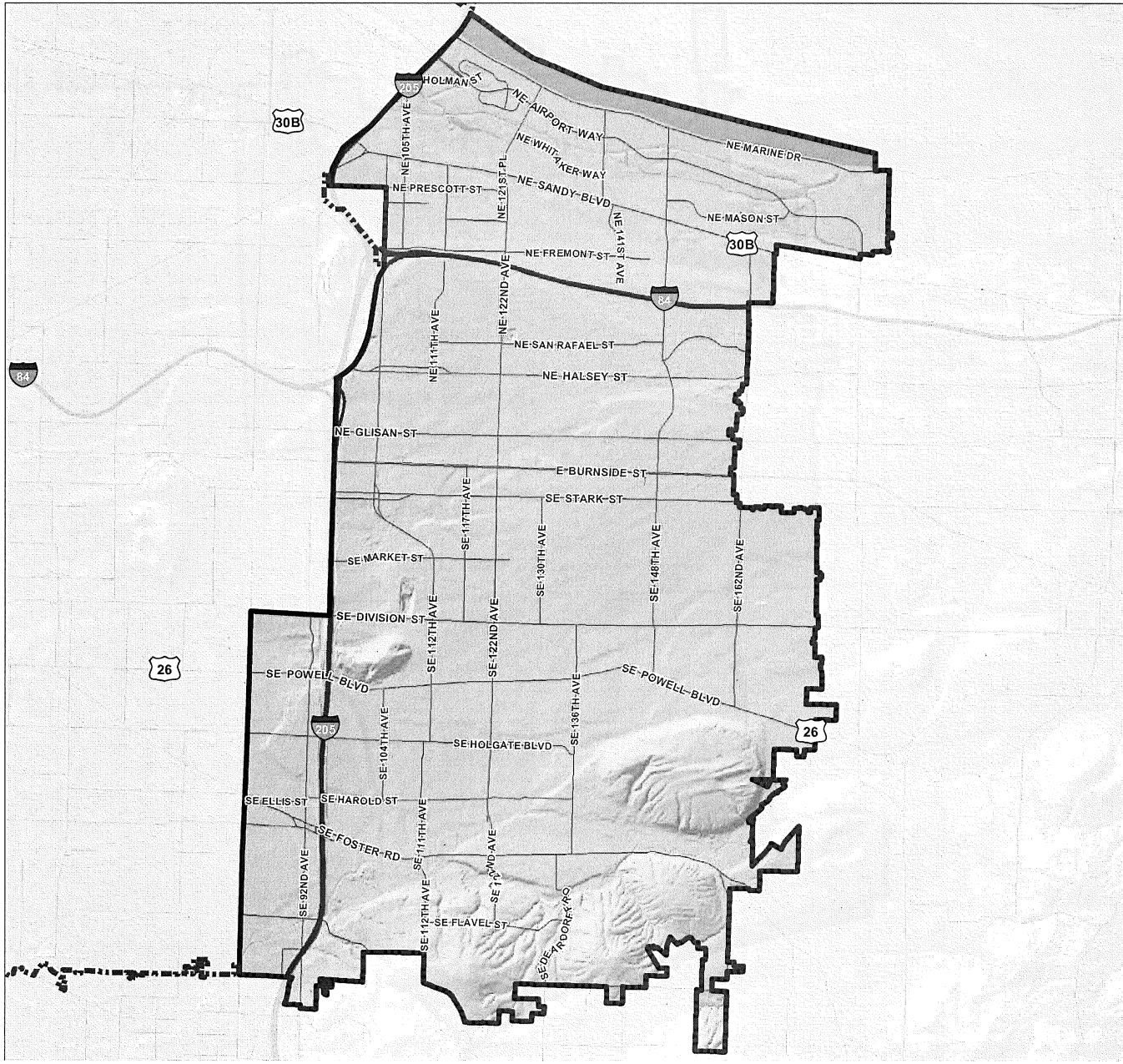
- 0' - 4.6'
- 4.7' - 12.9'
- 13' - 22.6'
- 22.7' - 28.8'
- 28.9' - 36.7'
- Risk Reporting Area East Portland

NORTH

0 0.5 1 Miles

Sources: Tetra Tech-2016; City of Portland-2016

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Cascadia 9.0 Magnitude Earthquake--Peak Ground Acceleration

Legend

City Boundary

Cascadia M9.0 earthquake PGA

Potential Damage - Perceived Shaking

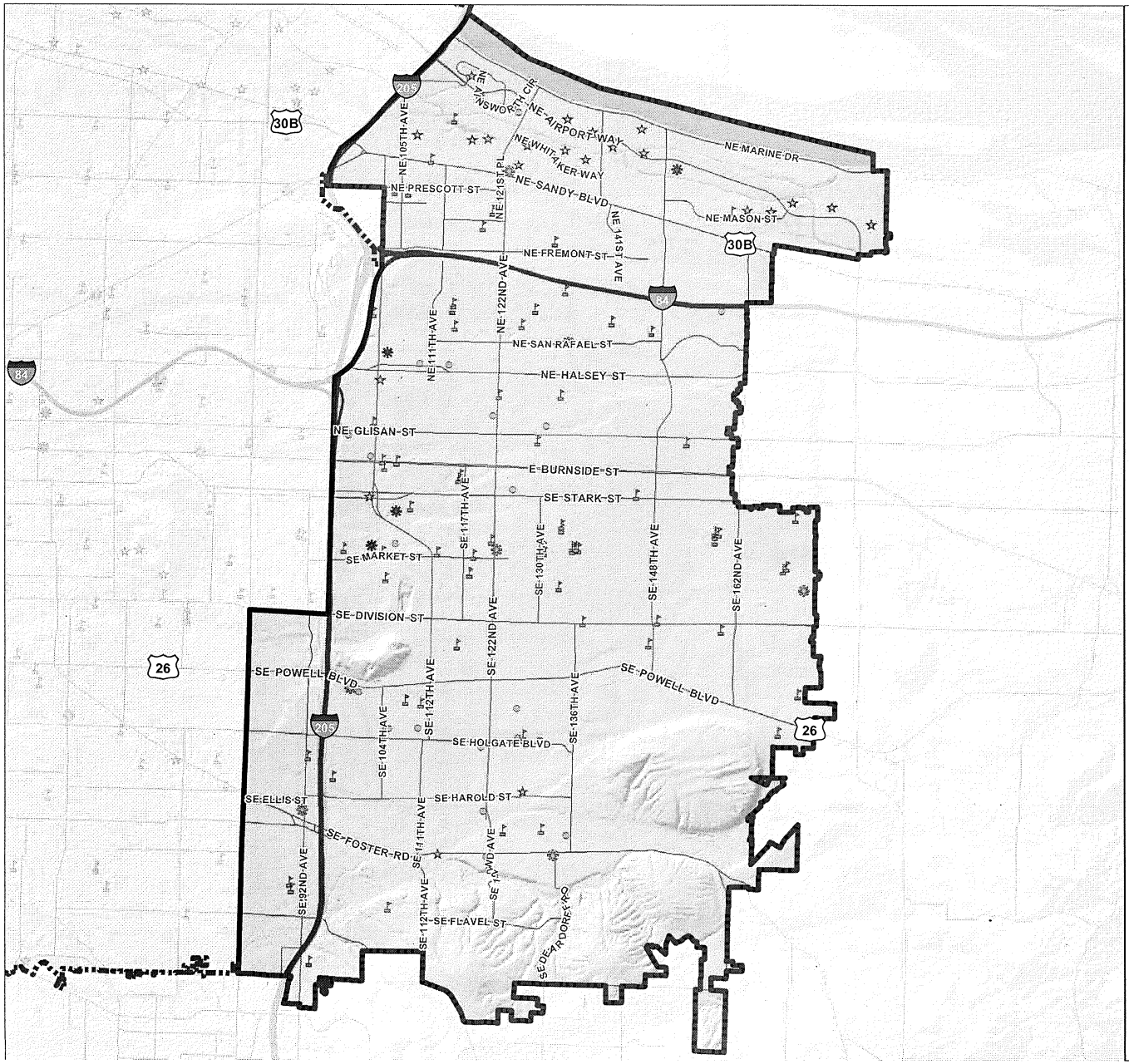
- V -- Very Light - Moderate
- VI -- Light - Strong
- VII -- Moderate - Very Strong
- VIII -- Moderate/Heavy - Severe
- Risk Reporting Area East Portland

NORTH

0 0.425 0.85 Miles

Sources: USGS-2011; City of Portland-2016

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Critical Facilities

Legend

- City Boundary
- Risk Reporting Area East Portland

Emergency Services*

- Emergency Coordination Centers
- Fire Station Facilities
- Police Station Facilities
- Medical Care Facilities

High Potential Loss Facilities*

- Dams
- Military
- Nuclear Power Plants
- Hazardous Materials
- Schools
- Other Assets

  Zoo, Jails, Nursing/Assisted Living Facilities

*Due to security reasons, some emergency services and high potential loss facilities have been left off of the map.

NORTH

0 0.425 0.85 Miles

Sources: WORD/NID-2015; OSFM-2015; City of Portland-2011, 2015, 2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Critical Infrastructure

Legend

- City Boundary
- Risk Reporting Area East Portland

Utility Systems*

- Electrical
- Natural Gas Facilities
- Communication Facilities
- Petroleum Facilities
- Potable Water Facilities
- Wastewater Facilities

Transportation Systems*

- Railway Tunnels, Bridges, and Facilities
- Light Rail Tunnels, Bridges, and Facilities
- Highway Tunnels and Bridges
- Bus Facilities
- Port and Airport Facilities

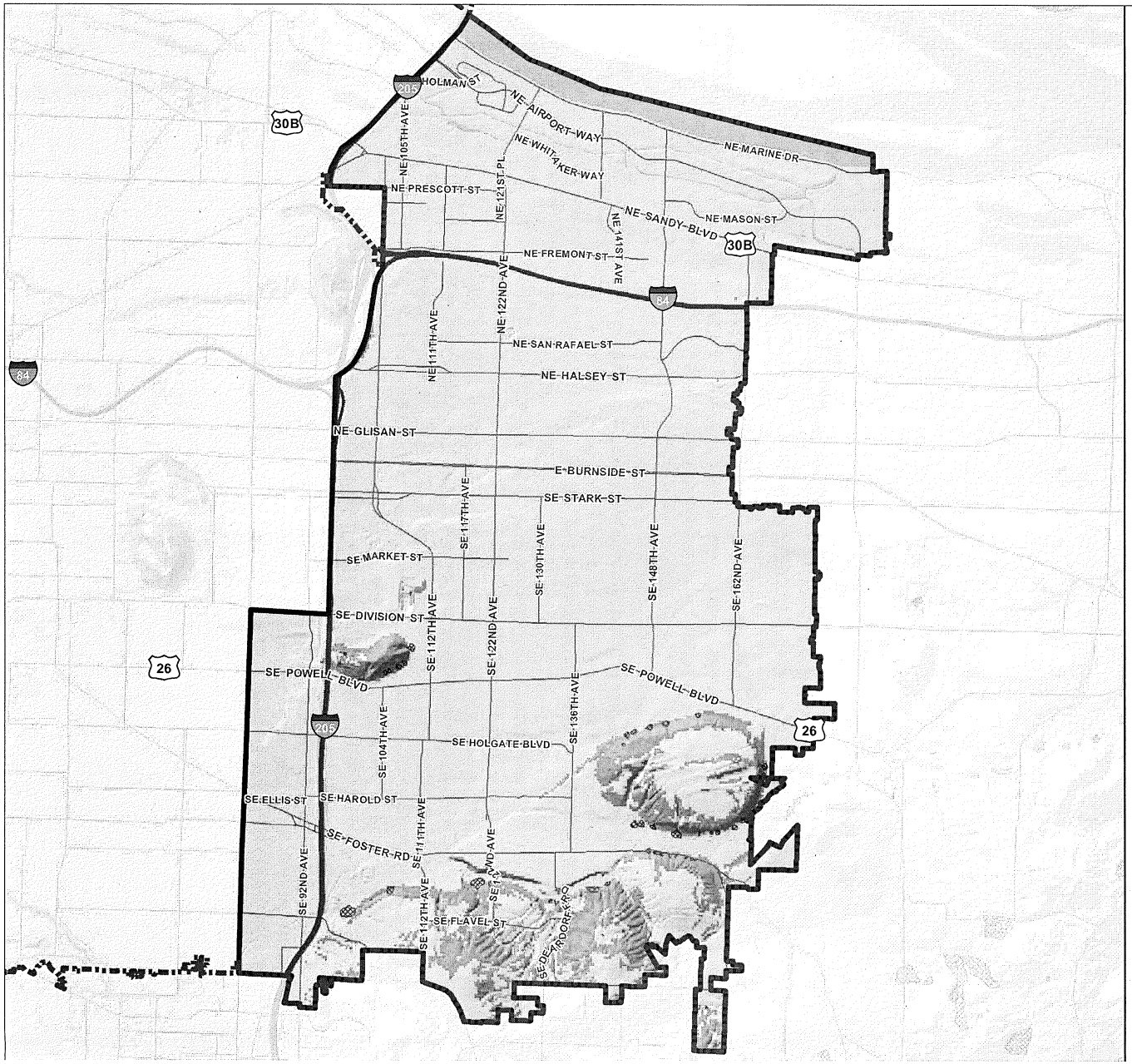
*Due to security reasons, some utility and transportation system components have been left off of the map.

NORTH

0 0.425 0.85 Miles

Sources: TriMet-2015; Port of Portland-2015; OPHS-2016; City of Portland-2011, 2015,2016; OPB-2016; PTS-2015; FEMA-2015; Kinder Morgan-2015

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Regulatory Landslide Hazard Area

Legend

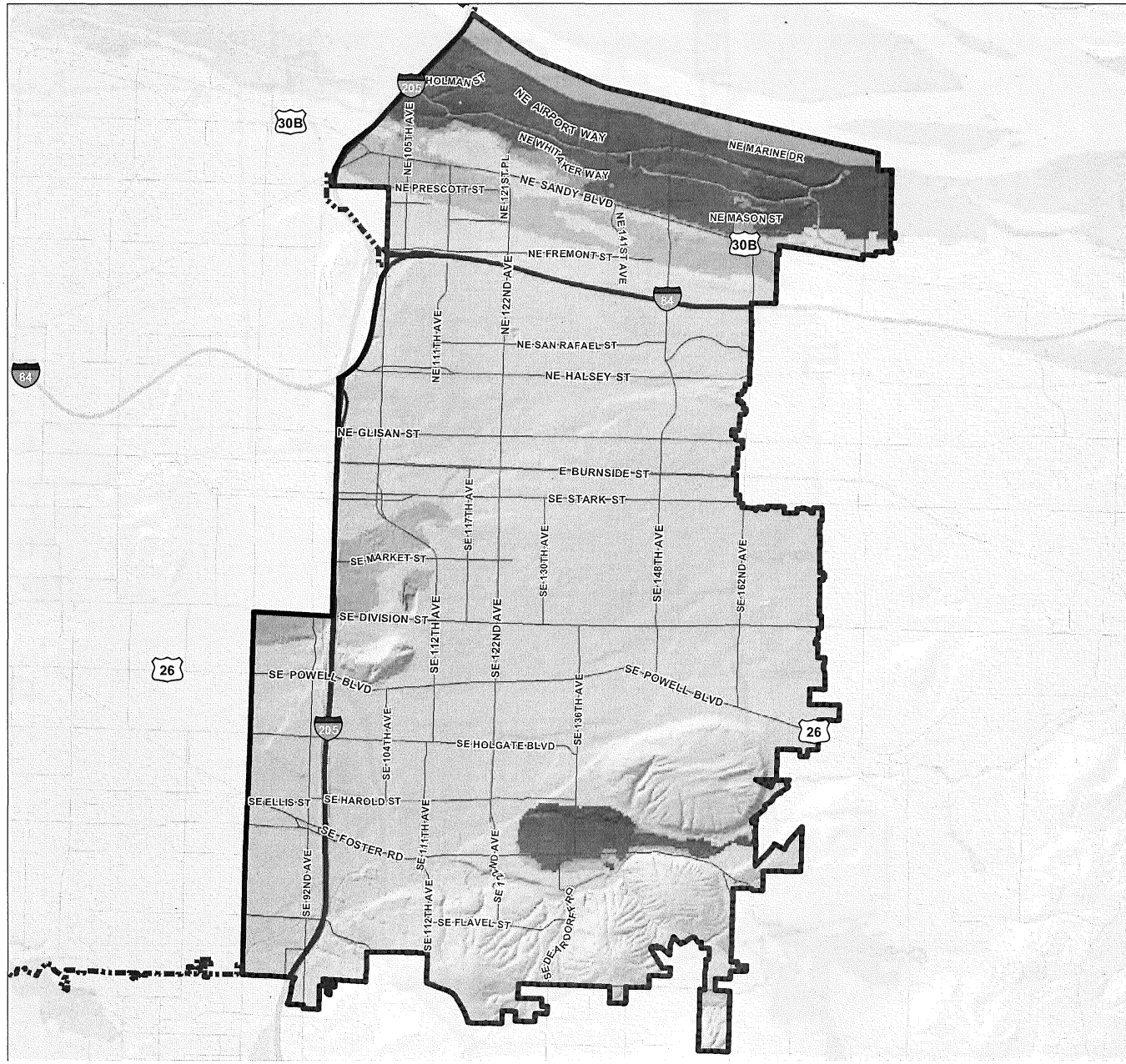
- City Boundary
- Historic Landslide Deposits
- Landslide Hazard Area
- Risk Reporting Area East Portland

NORTH

0 0.425 0.85 Miles

Sources: DOGAMI-2015; City of Portland-2015, 2016

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Liquefaction Susceptibility

Legend

City Boundary

Liquefaction Susceptibility

Type

- 0 -- None
- 1 -- Very Low
- 2 -- Low
- 3 -- Moderate
- 4 -- High
- 5 -- Very High

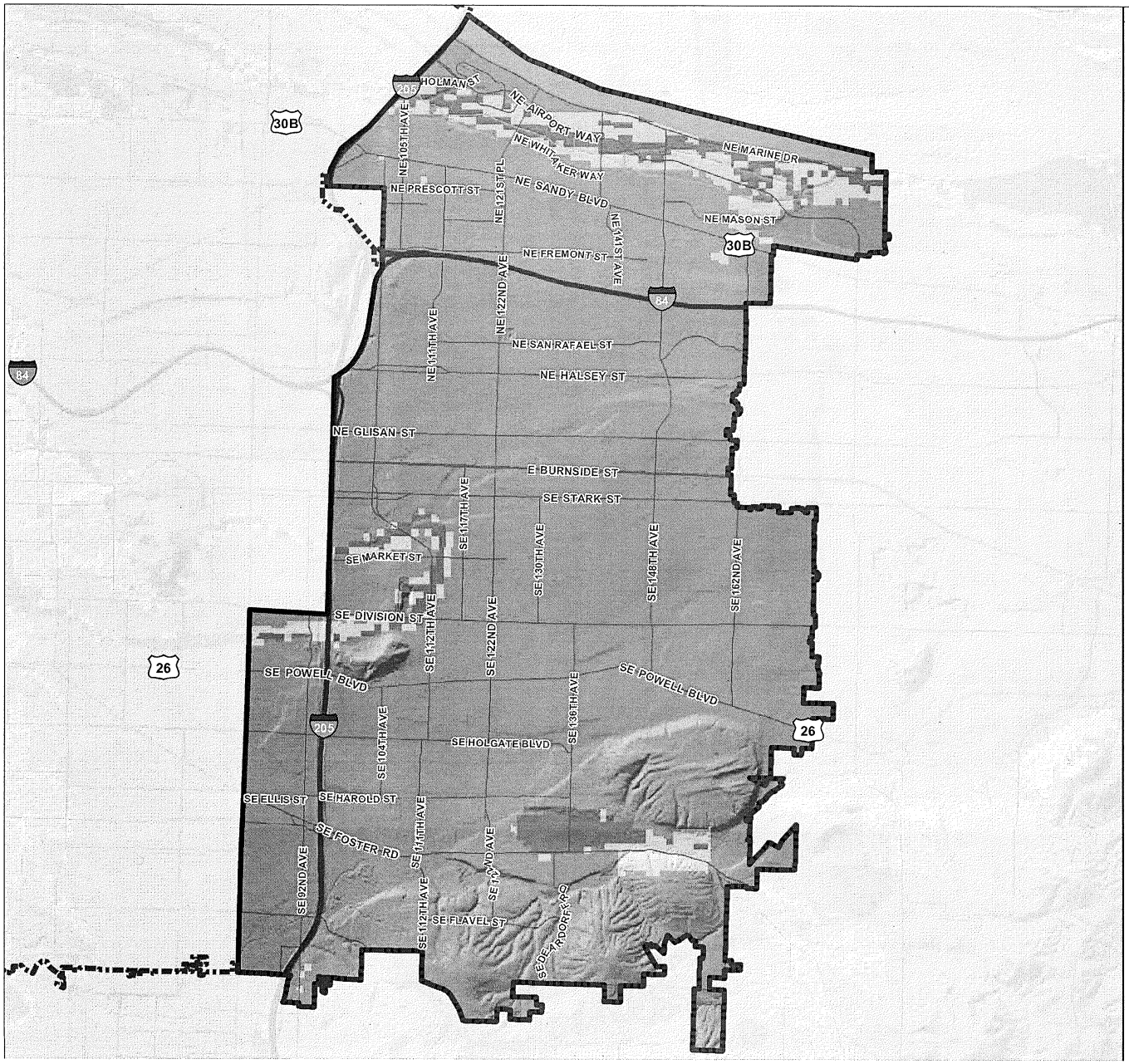
Risk Reporting Area East Portland

NORTH

0 0.425 0.85 Miles

Sources: DOGAMI-2013; City of Portland-2016

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

National Earthquake Hazards Reduction Program Soils

Legend

City Boundary

NEHRP Soils

Type

- B
- C
- D
- E

Risk Reporting Area
East Portland

NORTH

0 0.425 0.85 Miles

Sources: DOGAMI-2012;
City of Portland-2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Portland Hills 6.5 Magnitude Earthquake-Peak Ground Acceleration

Legend

City Boundary

Portland Hills M6.5 earthquake PGA

Potential Damage - Perceived Shaking

- V -- Very Light - Moderate
- VI -- Light - Strong
- VII -- Moderate - Very Strong
- VIII -- Moderate/Heavy - Severe

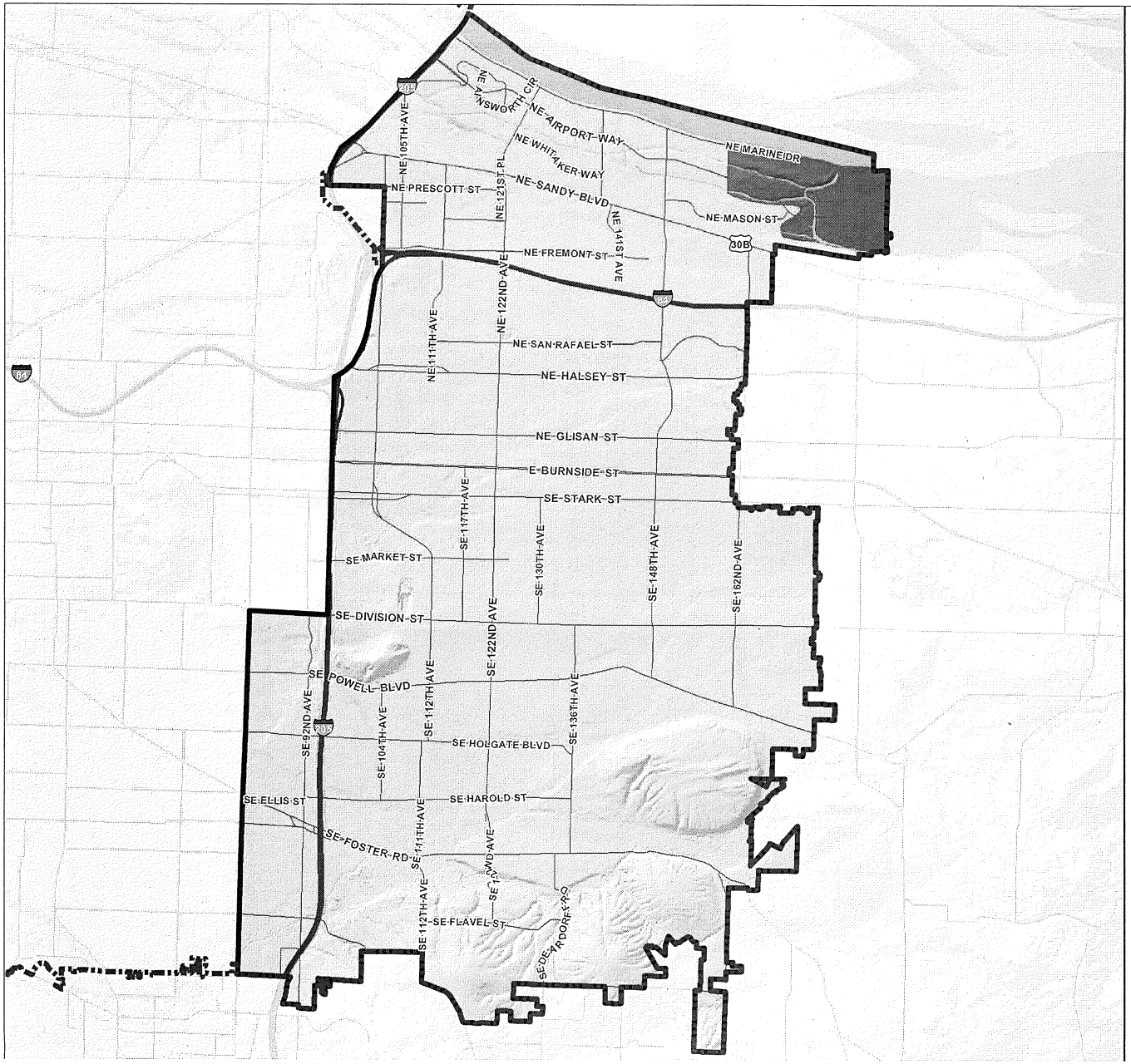
Risk Reporting Area East Portland

NORTH

0 0.425 0.85 Miles

Sources: USGS-2009; City of Portland-2016

PBEM


NE AINSWORTH CIR
NE AIRPORT WAY
NE MARINE DR
NE WHITAKER WAY
NE PRESCOTT ST
NE SANDY BLVD
NE MASON ST
NE FREMONT ST
NE SAN RAFAEL ST
NE HALSEY ST
NE GLISAN ST
E BURNSIDE ST
SE STARK ST
SE MARKET ST
SE DIVISION ST
SE POWELL BLVD
SE HOLGATE BLVD
SE HAROLD ST
SE FOSTER RD
SE FLAVEL ST
NE 105TH AVE
NE 121ST PL
NE 141ST AVE
NE 111TH AVE
NE 122ND AVE
SE 117TH AVE
SE 130TH AVE
SE 148TH AVE
SE 162ND AVE
SE 92ND AVE
SE 104TH AVE
SE 112TH AVE
SE 122ND AVE
SE 136TH AVE
SE ELLIS ST
SE 111TH AVE
SE 122ND AVE
SE 112TH AVE
SE DEARDORFF ST
205
84
30B
September 12, 2016
Mitigation Action Plan (MAP)
Volcano Hazard Area
Legend
City Boundary
Volcano Hazard Area
Risk Reporting Area
East Portland
NORTH
0 0.425 0.85
Miles
Sources: USGS-1997;
City of Portland-2016
PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Wildfire Hazard Area

Legend

- City Boundary
- Wildfire Hazard Area
- Risk Reporting Area East Portland

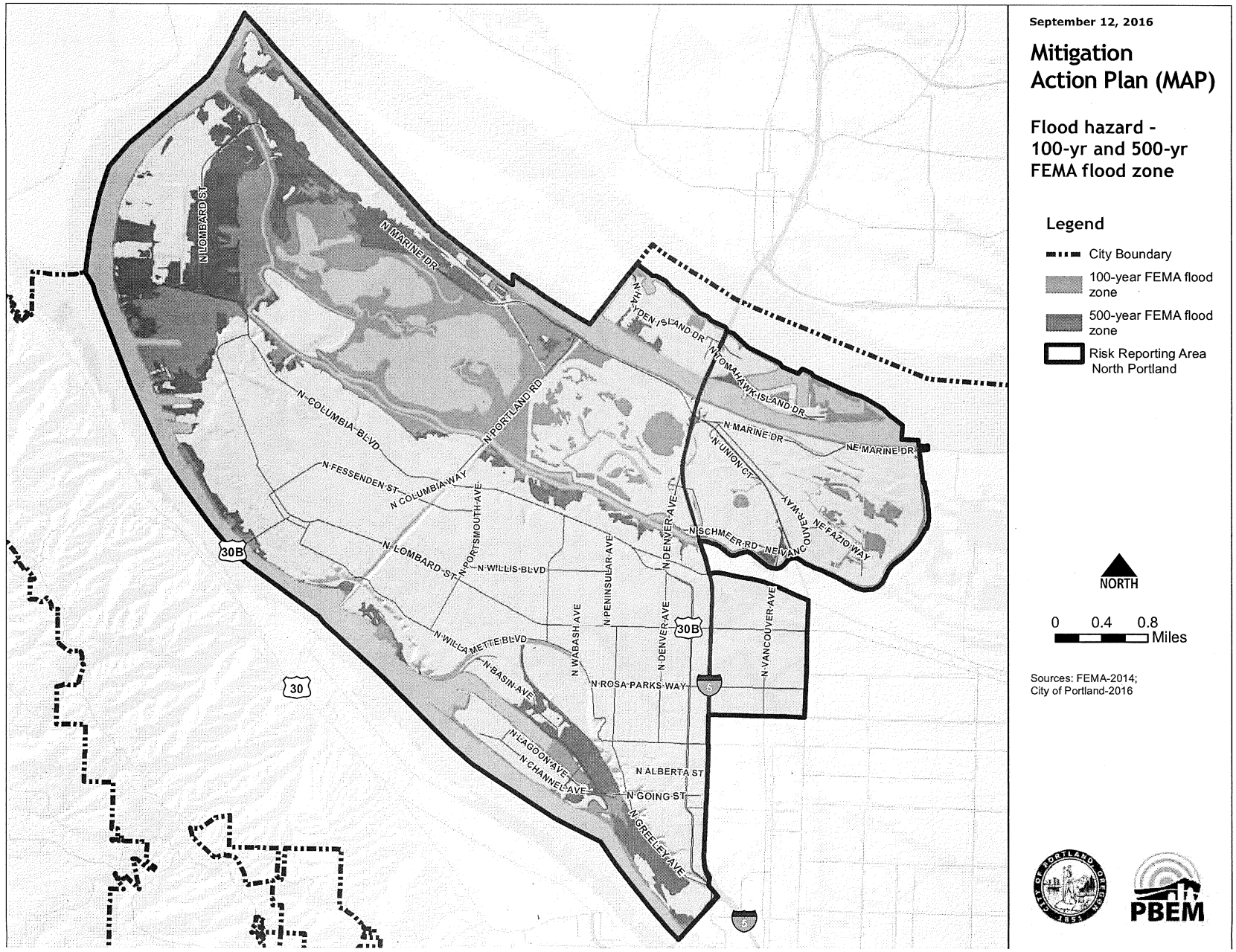
NORTH

0 0.425 0.85 Miles

Sources: City of Portland-2002, 2016

PBEM

NORTH PORTLAND


September 12, 2016
Mitigation Action Plan (MAP)
Flood hazard - 100-yr and 500-yr FEMA flood zone
Legend
City Boundary
100-year FEMA flood zone
500-year FEMA flood zone
Risk Reporting Area North Portland
NORTH
0 0.4 0.8 Miles
Sources: FEMA-2014; City of Portland-2016
PBEM
N LOMBARD ST
N MARINE DR
N HAYDEN ISLAND DR
N TOMAHAWK ISLAND DR
N COLUMBIA BLVD
N PORTLAND RD
N MARINE DR
NE MARINE DR
N FESSENDEN ST
N COLUMBIA WAY
N UNION CT
NE FAZIO WAY
N SCHMEER RD
NE VANC
N LOMBARD ST
N PORTSMOUTH AVE
N WILLIS BLVD
N PENINSULAR AVE
N DENVER AVE
N VANCOUVER AVE
30B
N WILLAMETTE BLVD
N WABASH AVE
N BASIN AVE
N ROSA PARKS WAY
30
N LAGOON AVE
N CHANNEL AVE
N ALBERTA ST
N GOING ST
N GREELEY AVE

September 12, 2016

Mitigation Action Plan (MAP)

100-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

- City Boundary

100-year probabilistic earthquake PGA

Potential Damage - Perceived Shaking

- V -- Very Light - Moderate
- VI -- Light - Strong

Risk Reporting Area
North Portland

NORTH

0 0.4 0.8 Miles

Sources: FEMA-2015; City of Portland-2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Flood Hazard - 100-yr Flood Depth Grid

Legend

City Boundary

100-year flood depth grid

- 0.1' - 4.5'
- 4.6' - 11.5'
- 11.6' - 19.5'
- 19.6' - 25.9'
- 26' - 33.2'

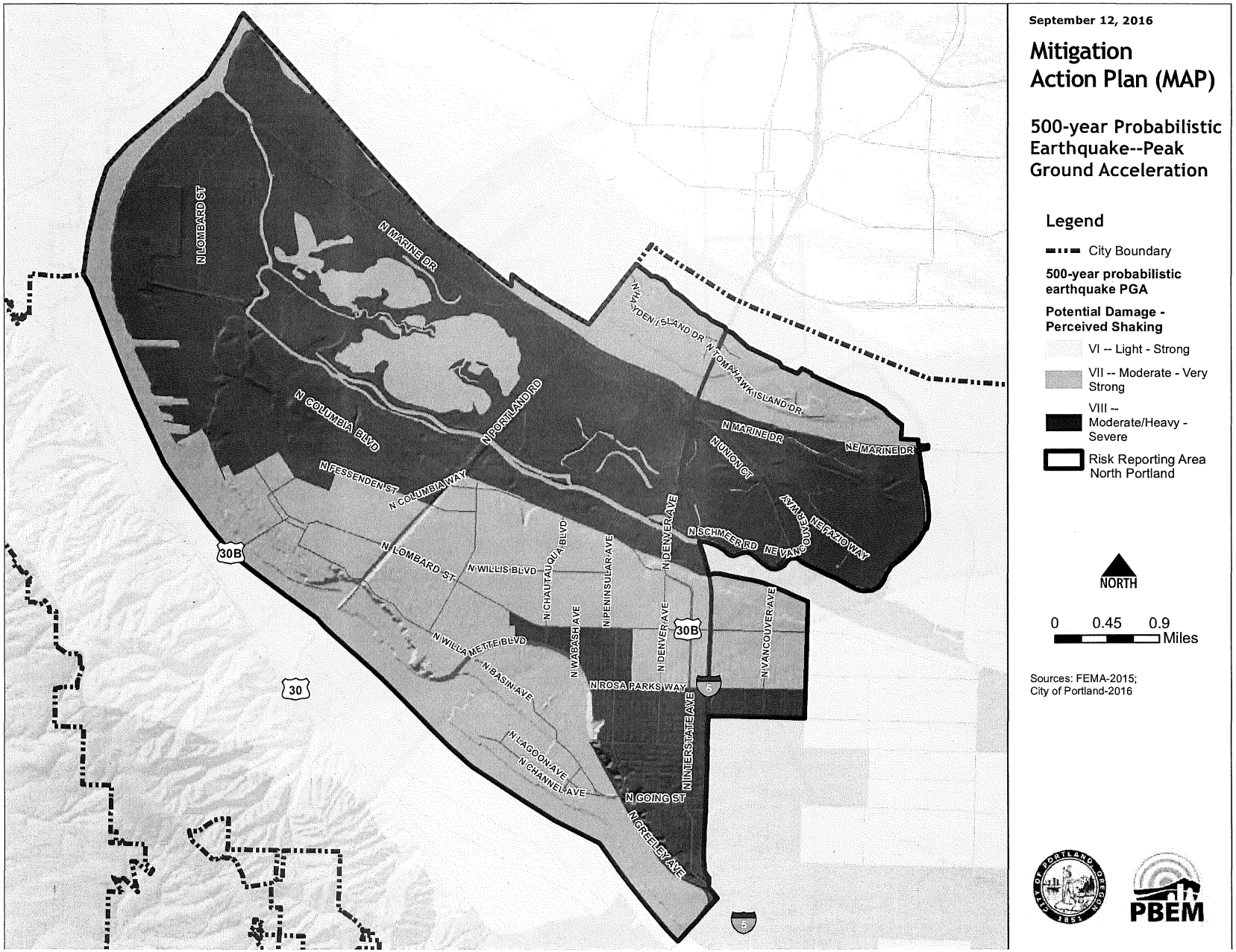
Risk Reporting Area North Portland

NORTH

0 0.4 0.8 Miles

Sources: Tetra Tech-2016; City of Portland-2016

PBEM


September 12, 2016
Mitigation Action Plan (MAP)
500-year Probabilistic Earthquake--Peak Ground Acceleration
Legend
City Boundary
500-year probabilistic earthquake PGA
Potential Damage - Perceived Shaking
VI -- Light - Strong
VII -- Moderate - Very Strong
VIII -- Moderate/Heavy - Severe
Risk Reporting Area North Portland
NORTH
0 0.45 0.9 Miles
Sources: FEMA-2015; City of Portland-2016
PBEM
N LOMBARD ST
N MARINE DR
N HAYDEN ISLAND DR
N TOMAHAWK ISLAND DR
N COLUMBIA BLVD
N PORTLAND RD
N MARINE DR
NE MARINE DR
N UNION CT
N FESSENDEN ST
N COLUMBIA WAY
NE VANCOUVER WAY
NE FAZIO WAY
N SCHMEER RD
30B
N LOMBARD ST
N WILLIS BLVD
N CHAUTAUQUA BLVD
N PENINSULAR AVE
N DENVER AVE
N WABASH AVE
N VANCOUVER AVE
N WILLAMETTE BLVD
N BASIN AVE
N ROSA PARKS WAY
N INTERSTATE AVE
N LAGOON AVE
N CHANNEL AVE
N GOING ST
N GREELEY AVE
30
5

September 12, 2016

Mitigation Action Plan (MAP)

Flood Hazard - 500-yr Flood Depth Grid

Legend

- City Boundary
- 500-year flood depth grid
  - 0' - 4.6'
  - 4.7' - 12.9'
  - 13' - 22.6'
  - 22.7' - 28.8'
  - 28.9' - 36.7'
- Risk Reporting Area North Portland

NORTH

0 0.5 1 Miles

Sources: Tetra Tech-2016; City of Portland-2016

CITY OF PORTLAND OREGON

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Cascadia 9.0 Magnitude Earthquake--Peak Ground Acceleration

Legend

- City Boundary
- **Cascadia M9.0 earthquake PGA**
- **Potential Damage - Perceived Shaking**
  - V – Very Light - Moderate
  - VI – Light - Strong
  - VII – Moderate - Very Strong
  - VIII -- Moderate/Heavy - Severe
- Risk Reporting Area North Portland

NORTH

0 0.4 0.8 Miles

Sources: USGS-2011; City of Portland-2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Critical Facilities

Legend

- City Boundary
- Risk Reporting Area North Portland

Emergency Services*

- Emergency Coordination Centers
- Fire Station Facilities
- Police Station Facilities
- Medical Care Facilities

High Potential Loss Facilities*

- Dams
- Military
- Nuclear Power Plants
- Hazardous Materials
- Schools
- Other Assets
  Zoo, Jails, Nursing/Assisted Living Facilities

*Due to security reasons, some emergency services and high potential loss facilities have been left off of the map.

NORTH

0 0.4 0.8 Miles

Sources: WORD/NID-2015; OSFM-2015; City of Portland-2011, 2015, 2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Critical Infrastructure

Legend

- City Boundary
- Risk Reporting Area North Portland

Utility Systems*

- Electrical
- Natural Gas Facilities
- Communication Facilities
- Petroleum Facilities
- Potable Water Facilities
- Wastewater Facilities

Transportation Systems*

- Railway Tunnels, Bridges, and Facilities
- Light Rail Tunnels, Bridges, and Facilities
- Highway Tunnels and Bridges
- Bus Facilities
- Port and Airport Facilities

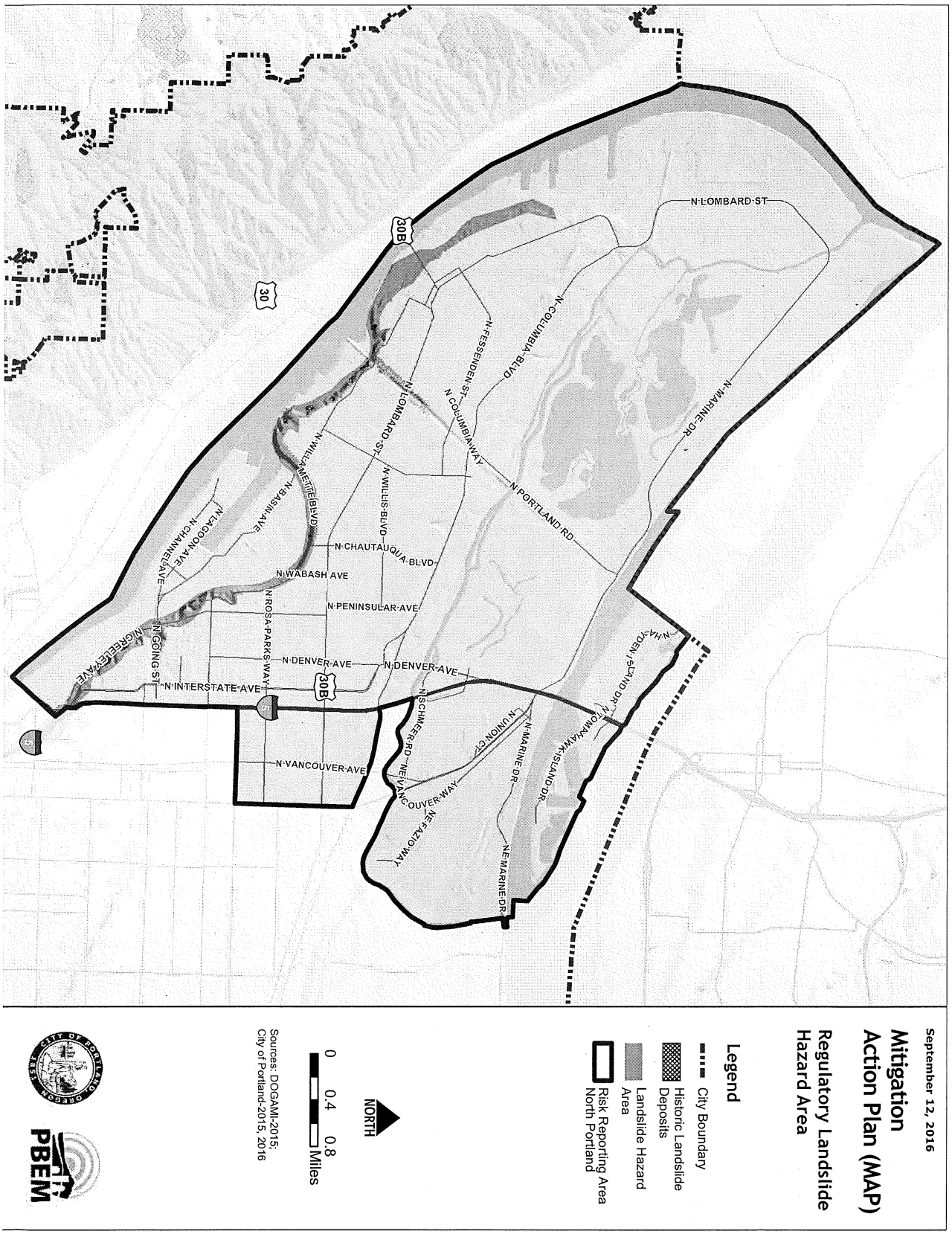
*Due to security reasons, some utility and transportation system components have been left off of the map.

NORTH

0 0.4 0.8 Miles

Sources: TriMet-2015; Port of Portland-2015; OPHS-2016; City of Portland-2011, 2015,2016; OPB-2016; PTS-2015; FEMA-2015; Kinder Morgan-2015

PBEM


September 12, 2016
Mitigation Action Plan (MAP)
Regulatory Landslide Hazard Area
Legend
City Boundary
Historic Landslide Deposits
Landslide Hazard Area
Risk Reporting Area North Portland
NORTH
0 0.4 0.8 Miles
Sources: DOGAMI-2015; City of Portland-2015, 2016
PBEM
N LOMBARD ST
N MARINE DR
N COLUMBIA BLVD
N FESSENDEN ST
N COLUMBIA WAY
N PORTLAND RD
N LOMBARD ST
N WILLIS BLVD
N WILLAMETTE BLVD
N BASIN AVE
N LAGOON AVE
N CHANNEL AVE
N CHAUTAUQUA BLVD
N WABASH AVE
N PENINSULAR AVE
N ROSA PARKS WAY
N GREELEY AVE
N GOING ST
N DENVER AVE
N INTERSTATE AVE
N VANCOUVER AVE
N SCHMEER RD
N UNION CT
N MARINE DR
N HAYDEN ISLAND DR
N TOMAHAWK ISLAND DR
NE VANCOUVER WAY
NE FAZIO WAY
NE MARINE DR
30B
30

1962



September 12, 2016

Mitigation Action Plan (MAP)

Liquefaction Susceptibility

Legend

City Boundary

Liquefaction Susceptibility

Type

- 0 -- None
- 1 -- Very Low
- 2 -- Low
- 3 -- Moderate
- 4 -- High
- 5 -- Very High

Risk Reporting Area North Portland

NORTH

0 0.4 0.8 Miles

Sources: DOGAMI-2013; City of Portland-2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

National Earthquake Hazards Reduction Program Soils

Legend

City Boundary

NEHRP Soils Type

B
C
D
E

Risk Reporting Area North Portland

September 12, 2016

Mitigation Action Plan (MAP)

Portland Hills 6.5 Magnitude Earthquake-Peak Ground Acceleration

Legend

City Boundary

Portland Hills M6.5 earthquake PGA

Potential Damage - Perceived Shaking

- V -- Very Light - Moderate
- VI -- Light - Strong
- VII -- Moderate - Very Strong
- VIII -- Moderate/Heavy - Severe

Risk Reporting Area North Portland

NORTH

0 0.4 0.8 Miles

Sources: USGS-2009; City of Portland-2016

CITY OF PORTLAND OREGON

PBEM

N LOMBARD ST
N MARINE DR
N COLUMBIA BLVD
N FESSENDEN ST
N COLUMBIA WAY
N PORTLAND RD
N WILLAMETTE BLVD
N BASIN AVE
N CHANNEL AVE
N LAGOON AVE
N GOING ST
N GREELEY AVE
N WABASH AVE
N CHAUTAUQUA BLVD
N PENINSULAR AVE
N DENVER AVE
N INTERSTATE AVE
I-5
N VANCOUVER AVE
N HAYDEN ISLAND DR
N TOMAHAWK ISLAND DR
N CHIMES RD
NE VANCOUVER WAY
NE FAZIO WAY
N UNION CT
N MARINE DR
NE MARINE DR
September 12, 2016
Mitigation Action Plan (MAP)
Volcano Hazard Area
Legend
City Boundary
Volcano Hazard Area
Risk Reporting Area North Portland
NORTH
0 0.4 0.8 Miles
Sources: USGS-1997; City of Portland-2016
PBEM

1966

September 12, 2016

Mitigation Action Plan (MAP)

Wildfire Hazard Area

Legend

- City Boundary
- Wildfire Hazard Area
- Risk Reporting Area North Portland

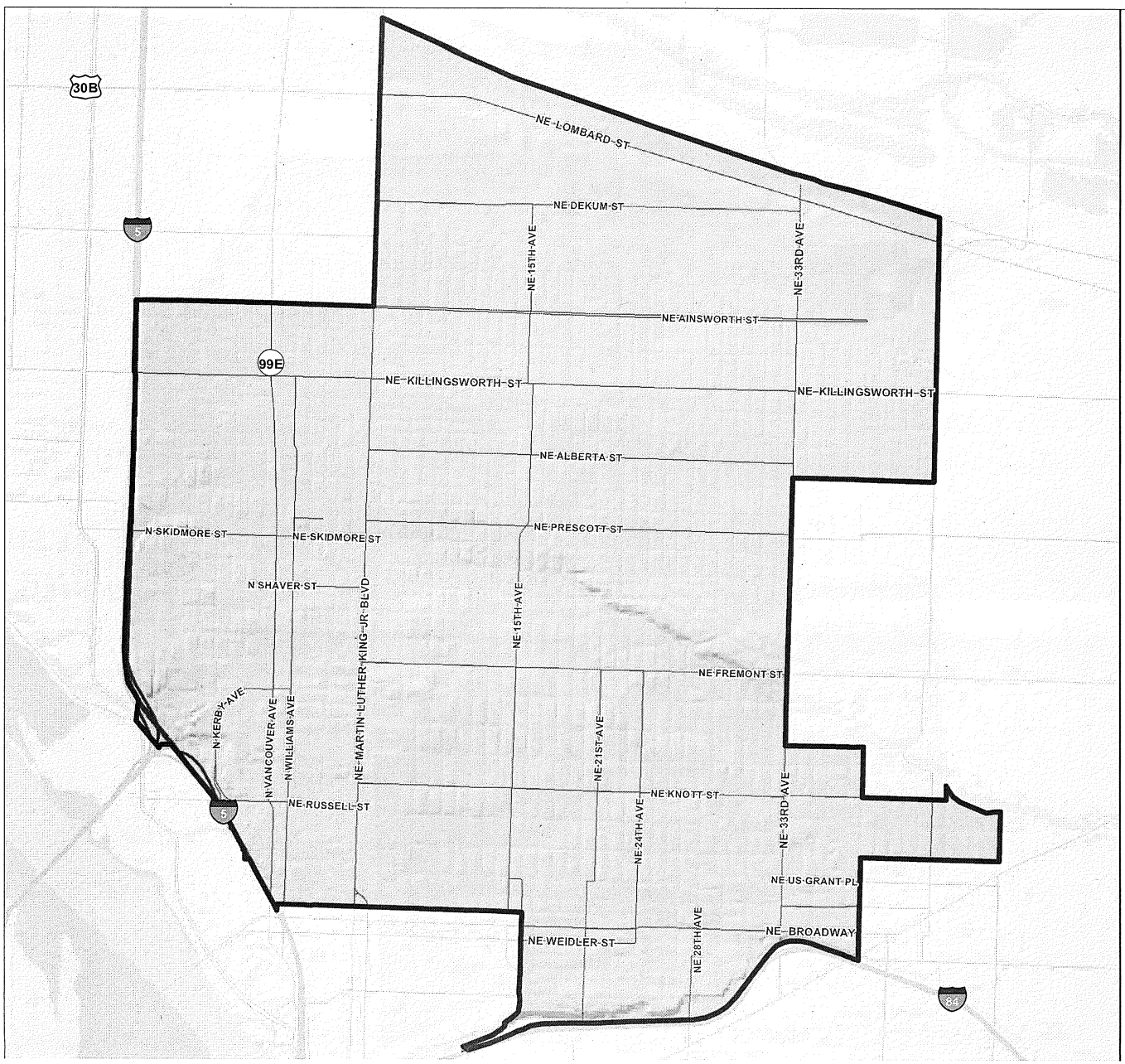
NORTH

0 0.4 0.8 Miles

Sources: City of Portland-2002, 2016

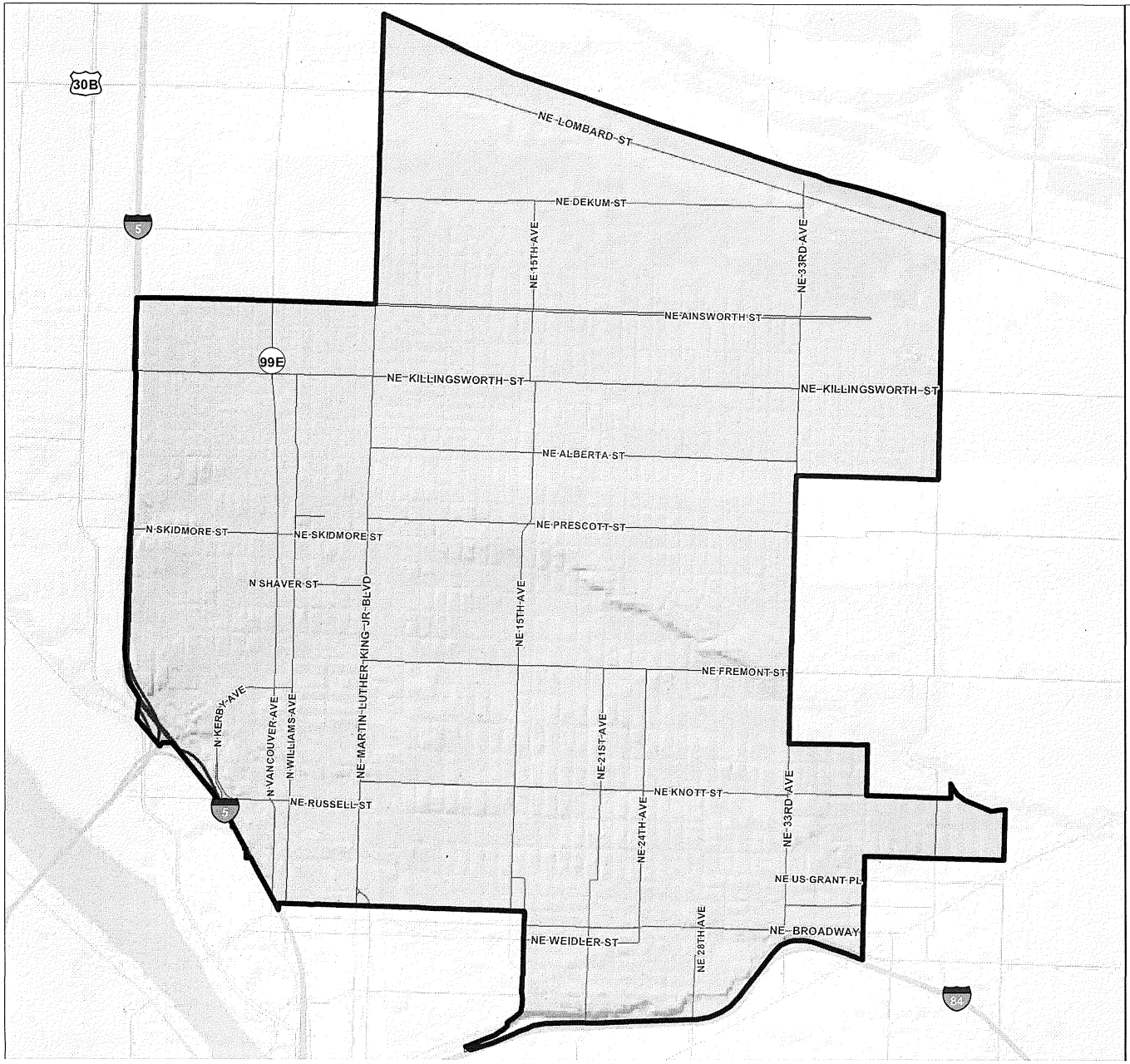
PBEM

NORTHEAST


30B
99E
NE LOMBARD ST
NE DEKUM ST
NE 15TH AVE
NE 33RD AVE
NE AINSWORTH ST
NE KILLINGSWORTH ST
NE KILLINGSWORTH ST
NE ALBERTA ST
N SKIDMORE ST
NE SKIDMORE ST
NE PRESCOTT ST
N SHAVER ST
NE MARTIN LUTHER KING JR BLVD
NE 15TH AVE
NE FREMONT ST
N KERBY AVE
N VANCOUVER AVE
N WILLIAMS AVE
NE 21ST AVE
NE KNOTT ST
NE RUSSELL ST
NE 24TH AVE
NE 33RD AVE
NE US GRANT PL
NE WEIDLER ST
NE 28TH AVE
NE BROADWAY
September 12, 2016
Mitigation Action Plan (MAP)
Flood hazard - 100-yr and 500-yr FEMA flood zone
Legend
City Boundary
100-year FEMA flood zone
500-year FEMA flood zone
Risk Reporting Area Northeast
NORTH
0 0.175 0.35 Miles
Sources: FEMA-2014; City of Portland-2016
PBEM

30B
99E
N KERBY AVE
N VANCOUVER AVE
N WILLIAMS AVE
N SKIDMORE ST
N SHAVER ST
NE RUSSELL ST
NE MARTIN LUTHER KING JR BLVD
NE KILLINGSWORTH ST
NE 15TH AVE
NE PRESCOTT ST
NE ALBERTA ST
NE DEKUM ST
NE LOMBARD ST
NE AINSWORTH ST
NE WEIDLER ST
NE 21ST AVE
NE 24TH AVE
NE KNOTT ST
NE 28TH AVE
NE FREMONT ST
NE 33RD AVE
NE BROADWAY
NE US GRANT PL
September 12, 2016
Mitigation Action Plan (MAP)
100-year Probabilistic Earthquake--Peak Ground Acceleration
Legend
City Boundary
100-year probabilistic earthquake PGA
Potential Damage - Perceived Shaking
V -- Very Light - Moderate
VI -- Light - Strong
Risk Reporting Area
Northeast
NORTH
0 0.175 0.35
Miles
Sources: FEMA-2015; City of Portland-2016
CITY OF PORTLAND OREGON
PBEM

1970



September 12, 2016

Mitigation Action Plan (MAP)

Flood Hazard - 100-yr Flood Depth Grid

Legend

- City Boundary
- **100-year flood depth grid**
  - 0.1' - 4.5'
  - 4.6' - 11.5'
  - 11.6' - 19.5'
  - 19.6' - 25.9'
  - 26' - 33.2'
- Risk Reporting Area Northeast

NORTH

0 0.175 0.35 Miles

Sources: Tetra Tech-2016; City of Portland-2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

500-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

City Boundary

500-year probabilistic earthquake PGA

Potential Damage - Perceived Shaking

VI – Light - Strong

VII -- Moderate - Very Strong

VIII – Moderate/Heavy - Severe

Risk Reporting Area Northeast

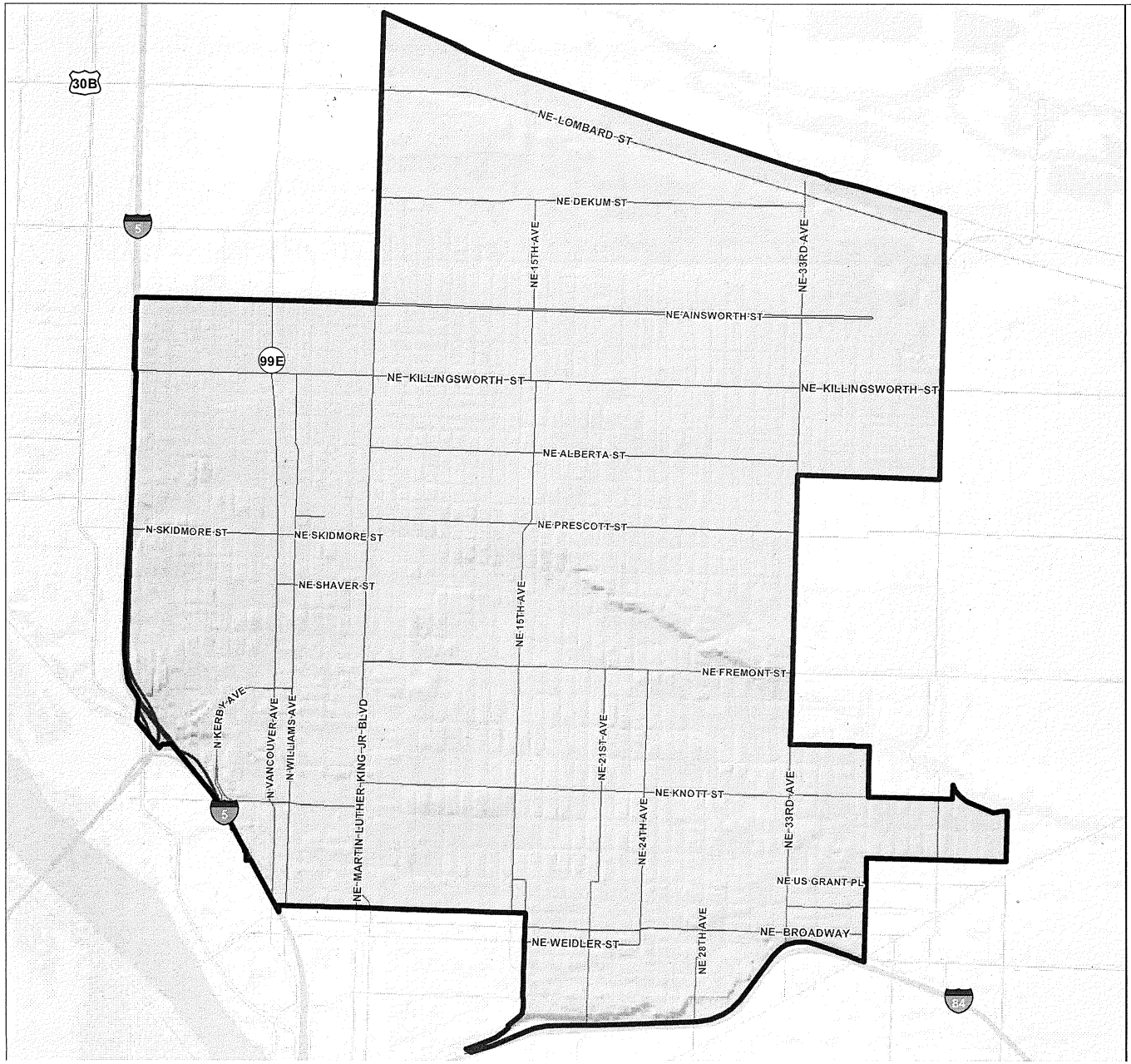
NORTH

0 0.2 0.4 Miles

Sources: FEMA-2015; City of Portland-2016

CITY OF PORTLAND OREGON

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Flood Hazard - 500-yr Flood Depth Grid

Legend

City Boundary

500-year flood depth grid

- 0' - 4.6'
- 4.7' - 12.9'
- 13' - 22.6'
- 22.7' - 28.8'
- 28.9' - 36.7'

Risk Reporting Area Northeast

NORTH

0 0.225 0.45 Miles

Sources: Tetra Tech-2016; City of Portland-2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Cascadia 9.0 Magnitude Earthquake--Peak Ground Acceleration

Legend

- City Boundary
- **Cascadia M9.0 earthquake PGA**
- **Potential Damage - Perceived Shaking**
  - V – Very Light - Moderate
  - VI – Light - Strong
  - VII – Moderate - Very Strong
  - VIII -- Moderate/Heavy - Severe
- Risk Reporting Area Northeast

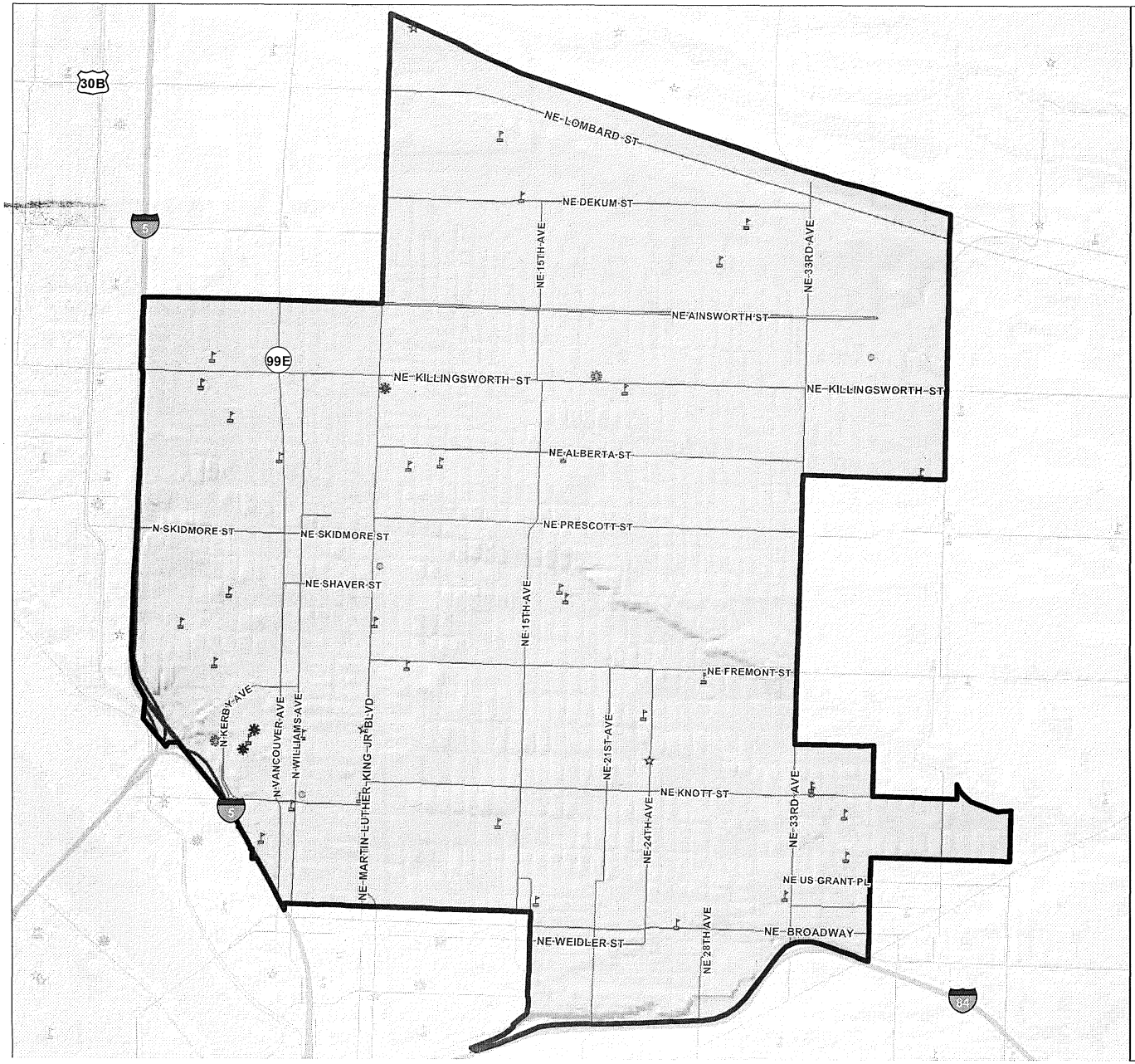
NORTH

0 0.175 0.35 Miles

Sources: USGS-2011; City of Portland-2016

PBEM

1974



September 12, 2016

Mitigation Action Plan (MAP)

Critical Facilities

Legend

- City Boundary
- Risk Reporting Area Northeast

Emergency Services*

- Emergency Coordination Centers
- Fire Station Facilities
- Police Station Facilities
- Medical Care Facilities

High Potential Loss Facilities*

- Dams
- Military
- Nuclear Power Plants
- Hazardous Materials
- Schools
- Other Assets
  Zoo, Jails, Nursing/Assisted Living Facilities

*Due to security reasons, some emergency services and high potential loss facilities have been left off of the map.

NORTH

0 0.175 0.35 Miles

Sources: WORD/NID-2015; OSFM-2015; City of Portland-2011, 2015, 2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Critical Infrastructure

Legend

- City Boundary
- Risk Reporting Area Northeast

Utility Systems*

- Electrical
- Natural Gas Facilities
- Communication Facilities
- Petroleum Facilities
- Potable Water Facilities
- Wastewater Facilities

Transportation Systems*

- Railway Tunnels, Bridges, and Facilities
- Light Rail Tunnels, Bridges, and Facilities
- Highway Tunnels and Bridges
- Bus Facilities
- Port and Airport Facilities

*Due to security reasons, some utility and transportation system components have been left off of the map.

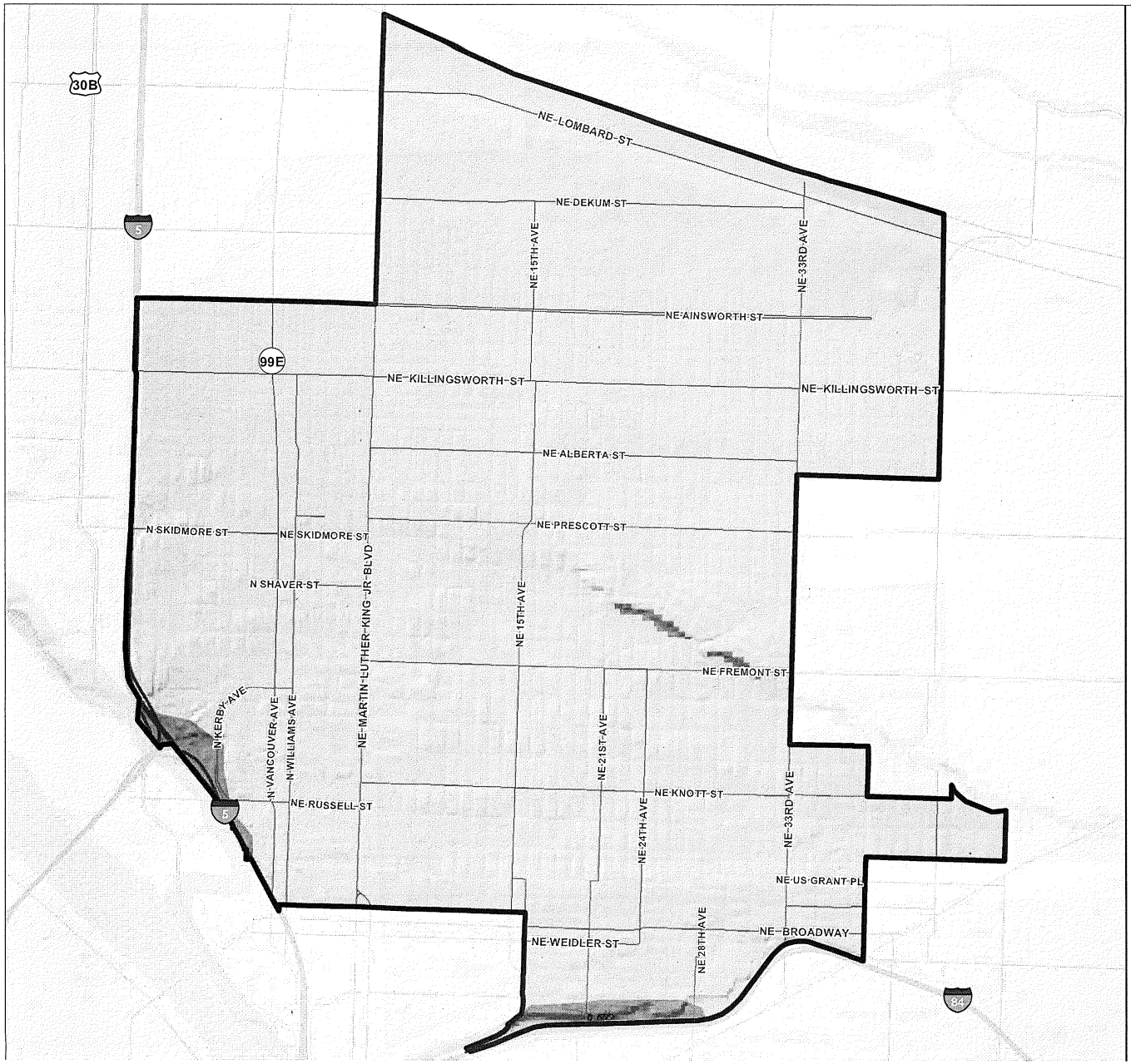
NORTH

0 0.175 0.35 Miles

Sources: TriMet-2015; Port of Portland-2015; OPHS-2016; City of Portland-2011, 2015,2016; OPB-2016; PTS-2015; FEMA-2015; Kinder Morgan-2015

CITY OF PORTLAND OREGON

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Regulatory Landslide Hazard Area

Legend

- City Boundary
- Historic Landslide Deposits
- Landslide Hazard Area
- Risk Reporting Area Northeast

NORTH

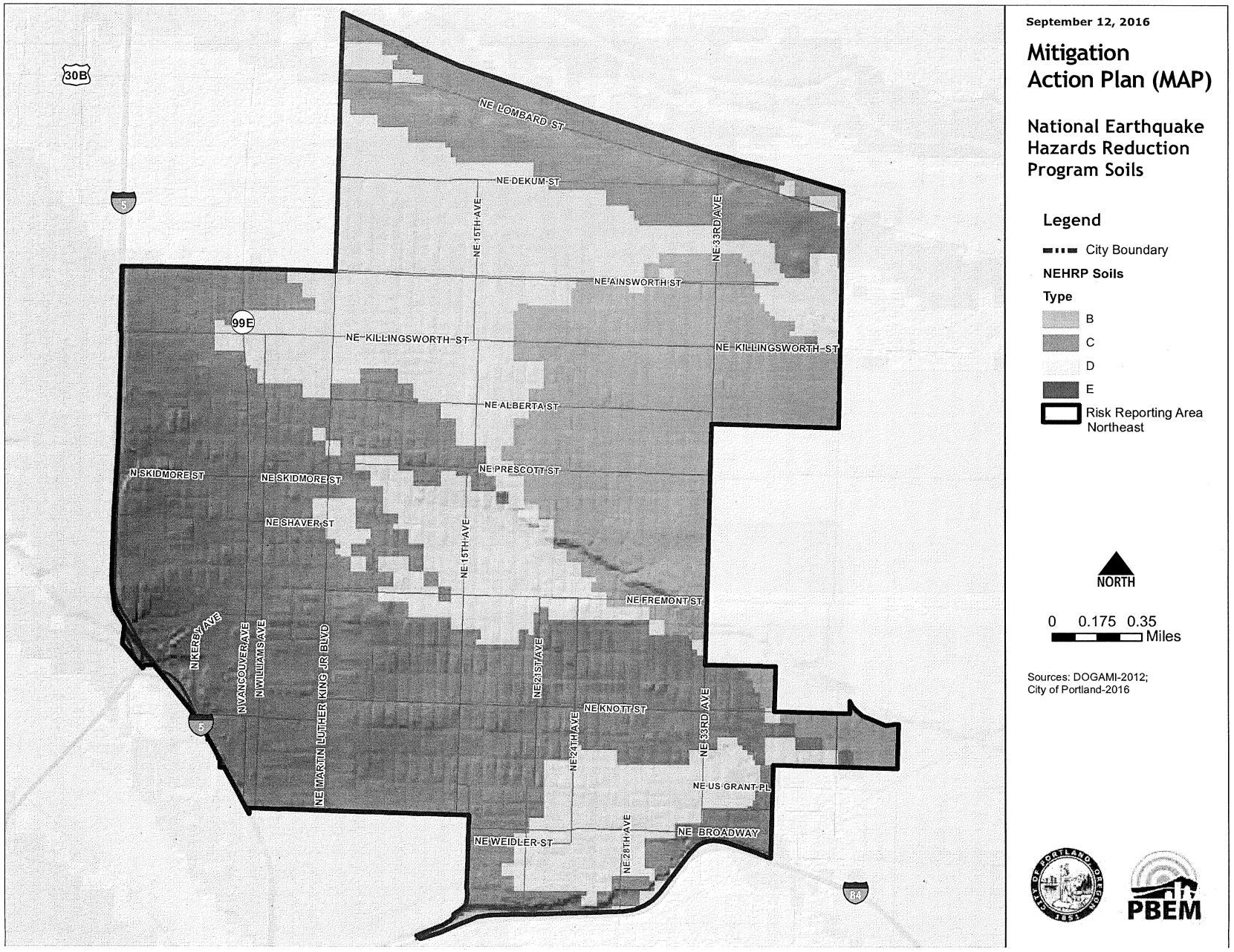
0 0.175 0.35 Miles

Sources: DOGAMI-2015;
City of Portland-2015, 2016

PBEM

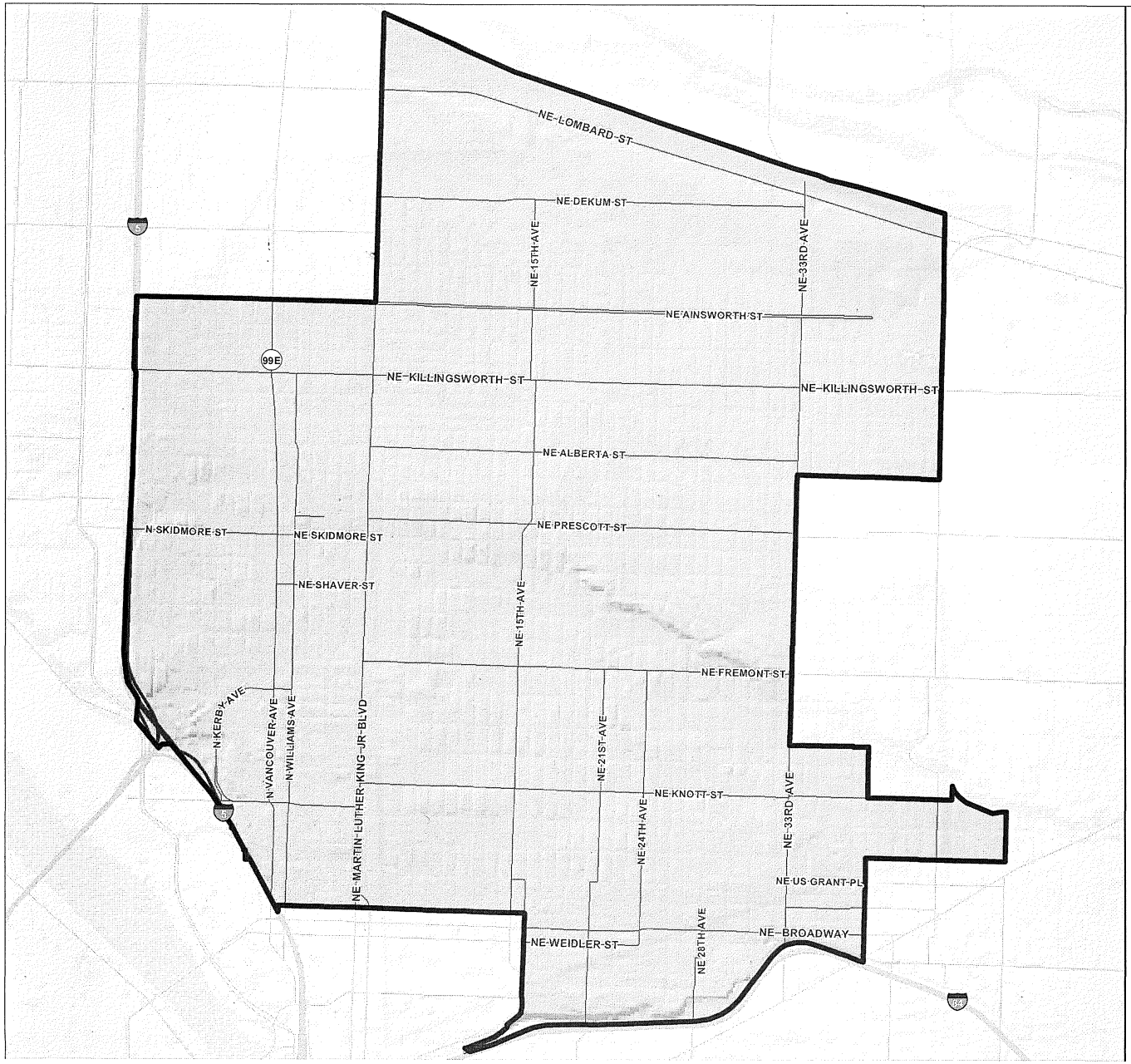
30B
99E
N KERBY AVE
N VANCOUVER AVE
N WILLIAMS AVE
N SKIDMORE ST
NE SHAVER ST
NE SKIDMORE ST
NE MARTIN LUTHER KING JR BLVD
NE KILLINGSWORTH ST
NE 15TH AVE
NE PRESCOTT ST
NE ALBERTA ST
NE DEKUM ST
NE LOMBARD ST
NE WEIDLER ST
NE 21ST AVE
NE 24TH AVE
NE KNOTT ST
NE 28TH AVE
NE FREMONT ST
NE AINSWORTH ST
NE 33RD AVE
NE BROADWAY
NE US GRANT PL
September 12, 2016
Mitigation Action Plan (MAP)
Liquefaction Susceptibility
Legend
City Boundary
Liquefaction Susceptibility
Type
0 -- None
1 -- Very Low
2 -- Low
3 -- Moderate
4 -- High
5 -- Very High
Risk Reporting Area
Northeast
NORTH
0 0.175 0.35
Miles
Sources: DOGAMI-2013; City of Portland-2016
PBEM

1978


30B
NE LOMBARD ST
NE DEKUM ST
NE 15TH AVE
NE 33RD AVE
NE AINSWORTH ST
99E
NE KILLINGSWORTH ST
NE KILLINGSWORTH ST
NE ALBERTA ST
N SKIDMORE ST
NE SKIDMORE ST
NE PRESCOTT ST
NE SHAVER ST
NE 15TH AVE
NE FREMONT ST
N KERBY AVE
N VANCOUVER AVE
N WILLIAMS AVE
NE MARTIN LUTHER KING JR BLVD
NE 21ST AVE
NE KNOTT ST
NE 24TH AVE
NE 33RD AVE
NE US GRANT PL
NE BROADWAY
NE WEIDLER ST
NE 28TH AVE
84
September 12, 2016
Mitigation Action Plan (MAP)
National Earthquake Hazards Reduction Program Soils
Legend
City Boundary
NEHRP Soils
Type
B
C
D
E
Risk Reporting Area Northeast
NORTH
0 0.175 0.35
Miles
Sources: DOGAMI-2012; City of Portland-2016
PBEM

30B
99E
N KERBY AVE
N VANCOUVER AVE
N WILLIAMS AVE
N SKIDMORE ST
NE SHAVER ST
NE SKIDMORE ST
NE MARTIN LUTHER KING JR BLVD
NE KILLINGSWORTH ST
NE 15TH AVE
NE 15TH AVE
NE LOMBARD ST
NE DEKUM ST
NE AINSWORTH ST
NE KILLINGSWORTH ST
NE ALBERTA ST
NE PRESCOTT ST
NE 21ST AVE
NE WEIDLER ST
NE 24TH AVE
NE KNOTT ST
NE 28TH AVE
NE FREMONT ST
NE 33RD AVE
NE 33RD AVE
NE BROADWAY
NE US GRANT PL
September 12, 2016
Mitigation Action Plan (MAP)
Portland Hills 6.5 Magnitude Earthquake-Peak Ground Acceleration
Legend
City Boundary
Portland Hills M6.5 earthquake PGA
Potential Damage - Perceived Shaking
V -- Very Light - Moderate
VI -- Light - Strong
VII -- Moderate - Very Strong
VIII -- Moderate/Heavy - Severe
Risk Reporting Area Northeast
NORTH
0 0.175 0.35 Miles
Sources: USGS-2009; City of Portland-2016
PBEM

1980



September 12, 2016

Mitigation Action Plan (MAP)

Volcano Hazard Area

Legend

- City Boundary
- Volcano Hazard Area
- Risk Reporting Area Northeast

NORTH

0 0.175 0.35 Miles

Sources: USGS-1997; City of Portland-2016

PBEM

LUBA No. 2020-009
Page 2267
1981

September 12, 2016

Mitigation Action Plan (MAP)

Wildfire Hazard Area

Legend

- City Boundary
- Wildfire Hazard Area
- Risk Reporting Area Northeast

Sources: City of Portland-2002, 2016

PBEM

1982

SOUTHEAST



September 12, 2016

Mitigation Action Plan (MAP)

Flood hazard - 100-yr and 500-yr FEMA flood zone

Legend

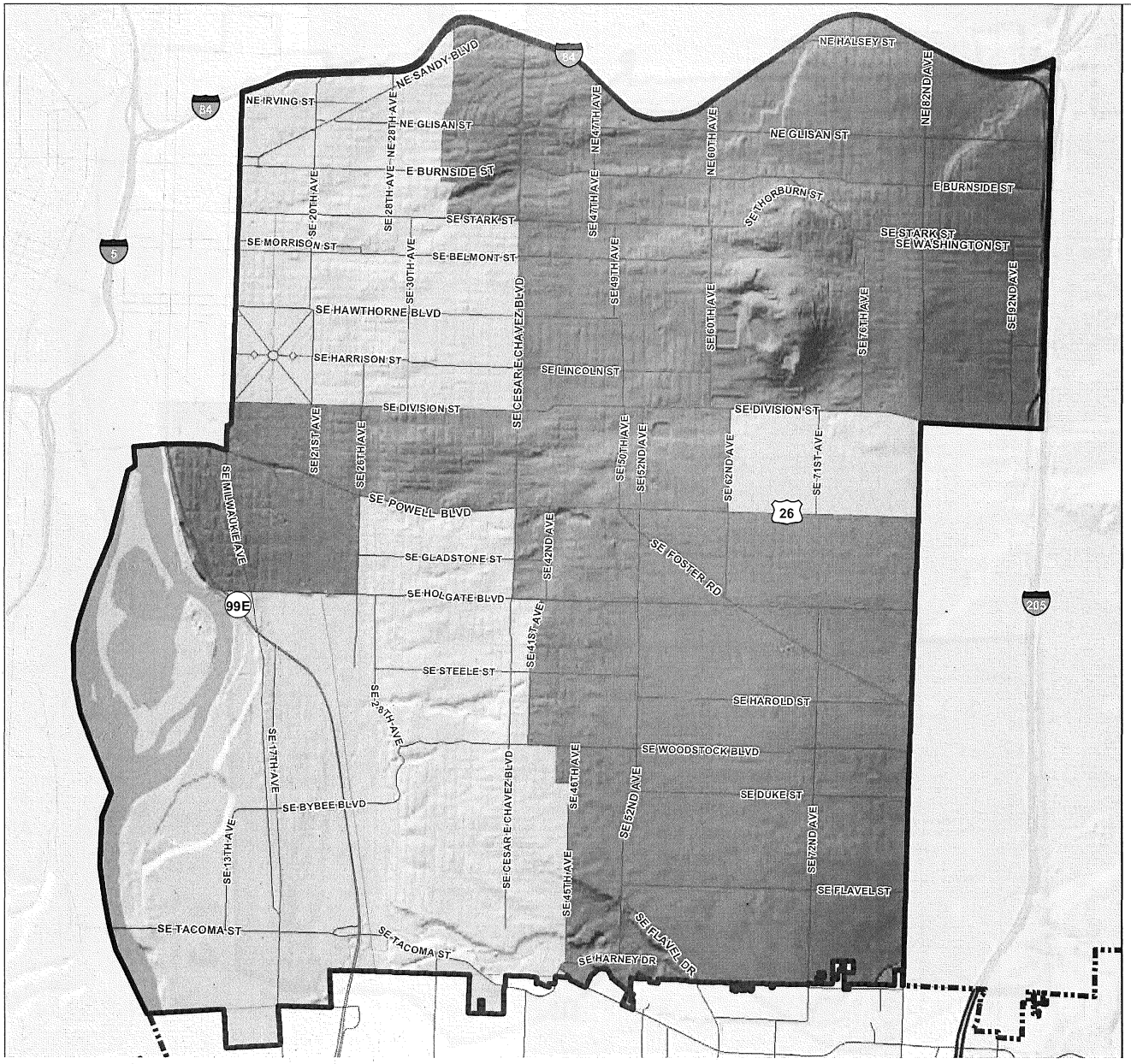
- City Boundary
- 100-year FEMA flood zone
- 500-year FEMA flood zone
- Risk Reporting Area Southeast

NORTH

0 0.275 0.55 Miles

Sources: FEMA-2014; City of Portland-2016

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

100-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

- City Boundary

100-year probabilistic earthquake PGA

Potential Damage - Perceived Shaking

- V -- Very Light - Moderate
- VI -- Light - Strong
- Risk Reporting Area Southeast

NORTH

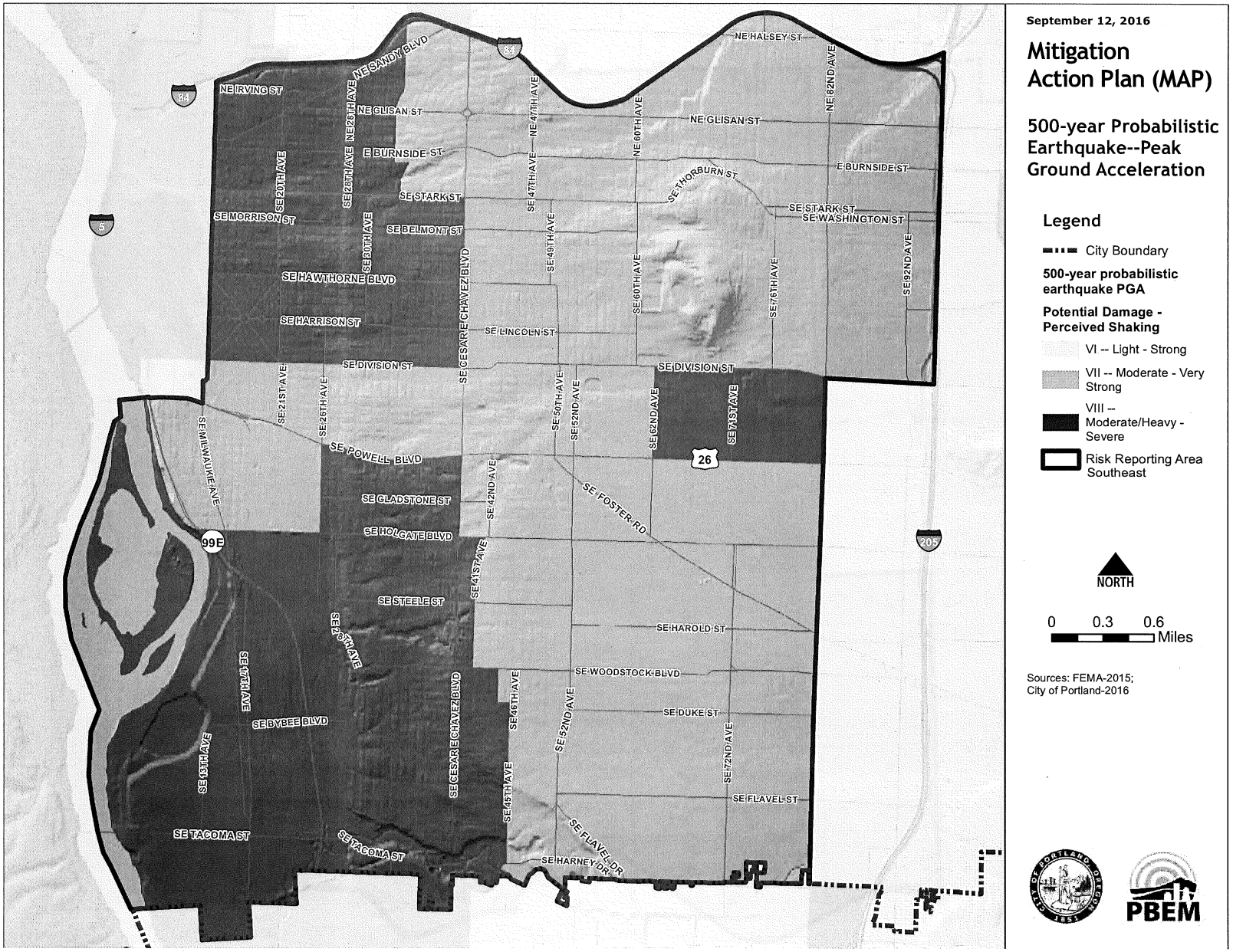
0 0.275 0.55 Miles

Sources: FEMA-2015; City of Portland-2016

PBEM


September 12, 2016
Mitigation Action Plan (MAP)
Flood Hazard - 100-yr Flood Depth Grid
Legend
City Boundary
100-year flood depth grid
0.1' - 4.5'
4.6' - 11.5'
11.6' - 19.5'
19.6' - 25.9'
26' - 33.2'
Risk Reporting Area Southeast
NORTH
0 0.275 0.55 Miles
Sources: Tetra Tech-2016; City of Portland-2016
PBEM
NE HALSEY ST
NE SANDY BLVD
NE IRVING ST
NE GLISAN ST
E BURNSIDE ST
SE STARK ST
SE MORRISON ST
SE BELMONT ST
SE HAWTHORNE BLVD
SE HARRISON ST
SE LINCOLN ST
SE DIVISION ST
SE POWELL BLVD
SE GLADSTONE ST
SE HOLGATE BLVD
SE STEELE ST
SE HAROLD ST
SE WOODSTOCK BLVD
SE DUKE ST
SE FLAVEL ST
SE TACOMA ST
SE HARNEY DR
SE THORBURN ST
SE WASHINGTON ST
SE FOSTER RD
SE FLAVEL DR
SE MILWAUKIE AVE
SE CESAR E CHAVEZ BLVD
NE 20TH AVE
NE 28TH AVE
SE 30TH AVE
NE 47TH AVE
SE 49TH AVE
NE 60TH AVE
SE 60TH AVE
NE 82ND AVE
SE 92ND AVE
SE 76TH AVE
SE 71ST AVE
SE 62ND AVE
SE 52ND AVE
SE 50TH AVE
SE 42ND AVE
SE 41ST AVE
SE 26TH AVE
SE 21ST AVE
SE 17TH AVE
SE 13TH AVE
SE 28TH AVE
SE 46TH AVE
SE 45TH AVE
SE 72ND AVE
84
5
26
99E
205

1986



September 12, 2016

Mitigation Action Plan (MAP)

500-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

- City Boundary

500-year probabilistic earthquake PGA

Potential Damage - Perceived Shaking

- VI -- Light - Strong
- VII -- Moderate - Very Strong
- VIII -- Moderate/Heavy - Severe
- Risk Reporting Area Southeast

NORTH

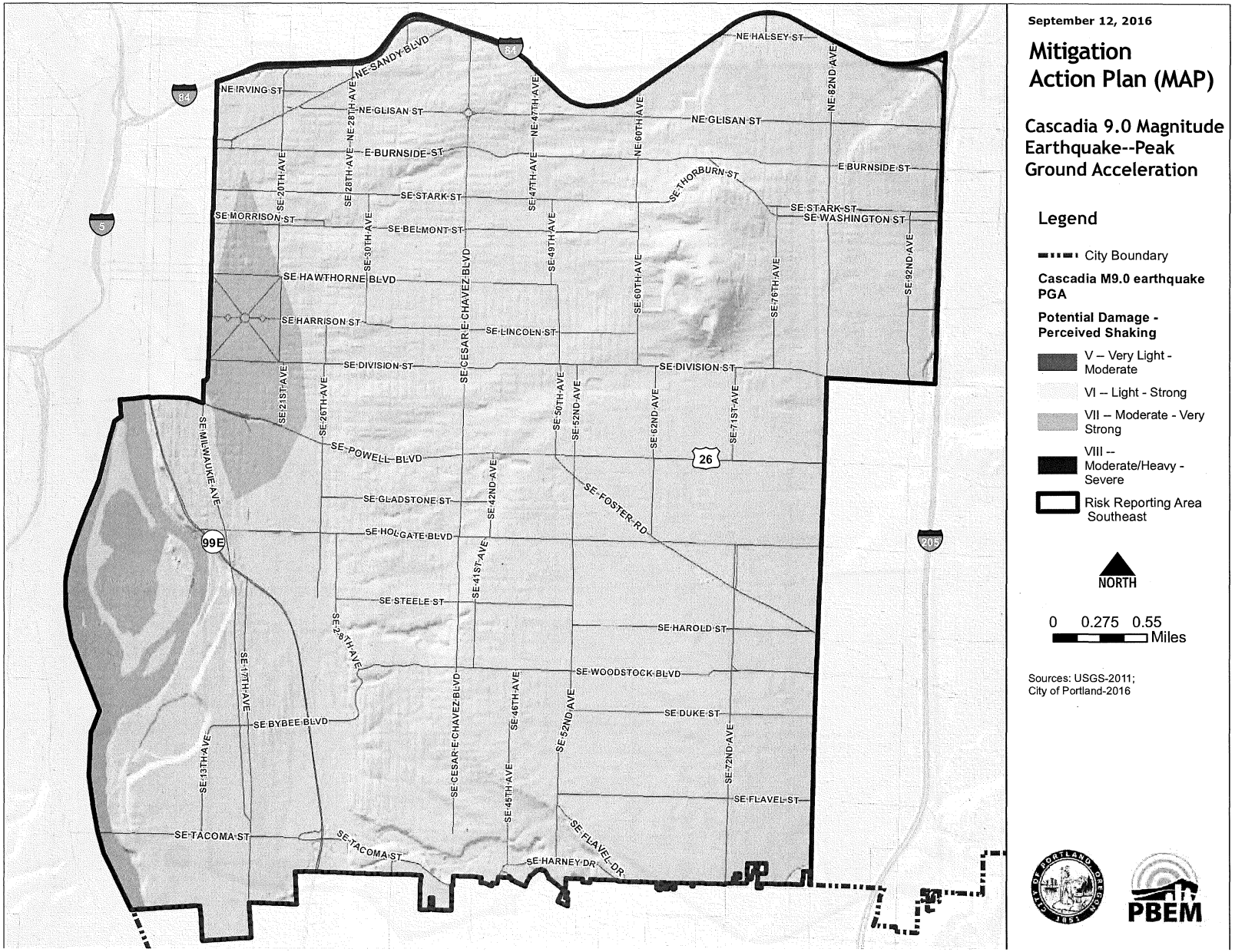
0 0.3 0.6 Miles

Sources: FEMA-2015; City of Portland-2016

PBEM


September 12, 2016
Mitigation Action Plan (MAP)
Flood Hazard - 500-yr Flood Depth Grid
Legend
City Boundary
500-year flood depth grid
0' - 4.6'
4.7' - 12.9'
13' - 22.6'
22.7' - 28.8'
28.9' - 36.7'
Risk Reporting Area Southeast
NORTH
0 0.325 0.65 Miles
Sources: Tetra Tech-2016; City of Portland-2016
PBEM
NE SANDY BLVD
NE IRVING ST
NE GLISAN ST
NE HALSEY ST
E BURNSIDE ST
SE STARK ST
SE MORRISON ST
SE BELMONT ST
SE HAWTHORNE BLVD
SE HARRISON ST
SE LINCOLN ST
SE DIVISION ST
SE POWELL BLVD
SE GLADSTONE ST
SE HOLGATE BLVD
SE STEELE ST
SE HAROLD ST
SE WOODSTOCK BLVD
SE DUKE ST
SE FLAVEL ST
SE TACOMA ST
SE HARNEY DR
SE FLAVEL DR
SE THORBURN ST
SE WASHINGTON ST
SE FOSTER RD
SE MILWAUKIE AVE
SE CESAR E CHAVEZ BLVD
SE 20TH AVE
SE 21ST AVE
SE 26TH AVE
SE 28TH AVE
SE 30TH AVE
SE 41ST AVE
SE 42ND AVE
SE 45TH AVE
SE 46TH AVE
SE 47TH AVE
SE 49TH AVE
SE 50TH AVE
SE 52ND AVE
SE 60TH AVE
SE 62ND AVE
SE 71ST AVE
SE 72ND AVE
SE 76TH AVE
NE 82ND AVE
SE 92ND AVE
SE 13TH AVE
SE 17TH AVE
SE 28TH AVE
NE 47TH AVE
NE 60TH AVE
84
5
26
99E
205

1988



September 12, 2016

Mitigation Action Plan (MAP)

Cascadia 9.0 Magnitude Earthquake--Peak Ground Acceleration

Legend

- City Boundary

Cascadia M9.0 earthquake PGA

Potential Damage - Perceived Shaking

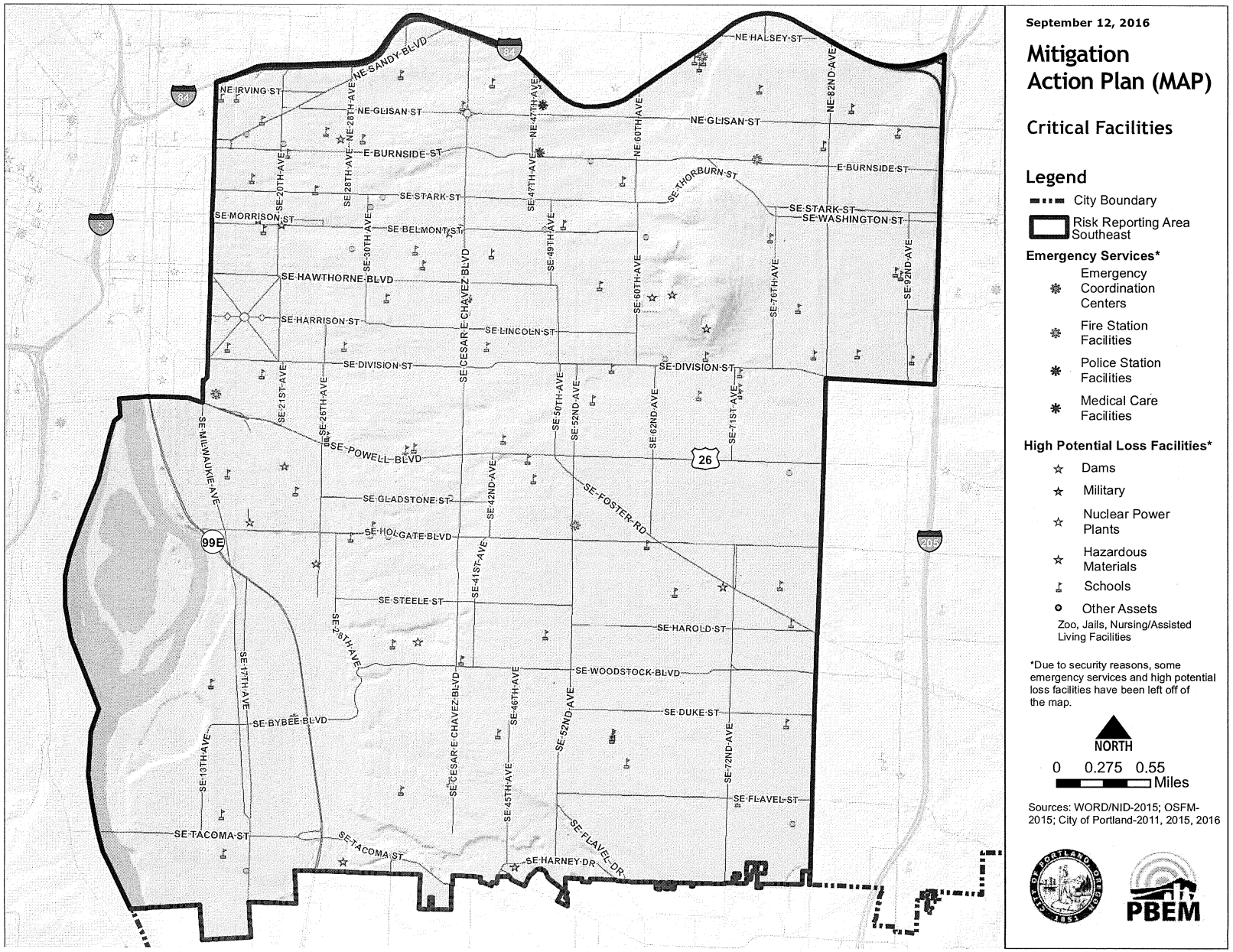
- V – Very Light - Moderate
- VI – Light - Strong
- VII – Moderate - Very Strong
- VIII – Moderate/Heavy - Severe
- Risk Reporting Area Southeast

NORTH

0 0.275 0.55 Miles

Sources: USGS-2011; City of Portland-2016

PBEM



September 12, 2016

Mitigation Action Plan (MAP)

Critical Facilities

Legend

- City Boundary
- Risk Reporting Area Southeast

Emergency Services*

- Emergency Coordination Centers
- Fire Station Facilities
- Police Station Facilities
- Medical Care Facilities

High Potential Loss Facilities*

- Dams
- Military
- Nuclear Power Plants
- Hazardous Materials
- Schools
- Other Assets
  Zoo, Jails, Nursing/Assisted Living Facilities

*Due to security reasons, some emergency services and high potential loss facilities have been left off of the map.

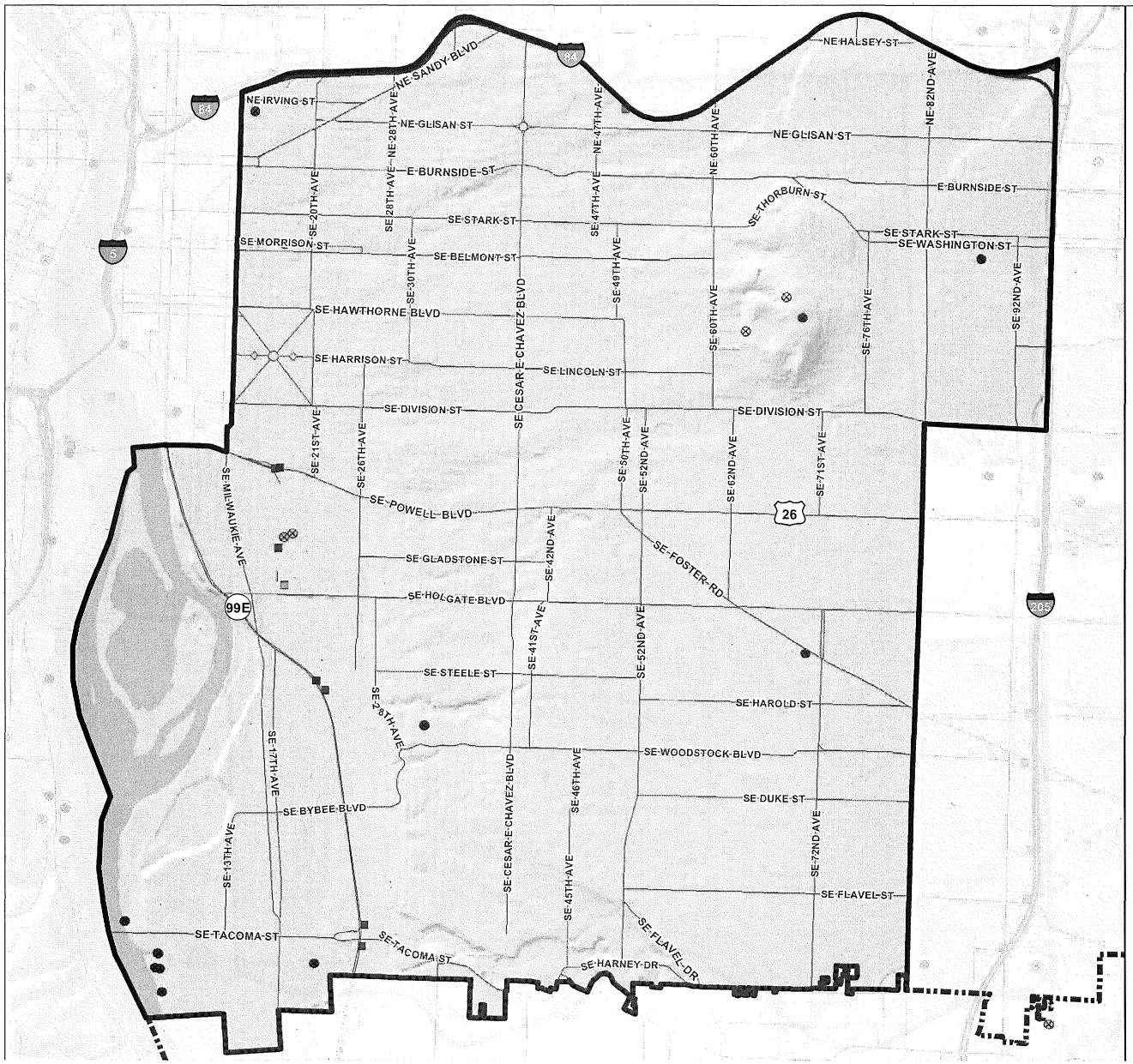
NORTH

0 0.275 0.55 Miles

Sources: WORD/NID-2015; OSFM-2015; City of Portland-2011, 2015, 2016

PBEM

1990



September 12, 2016

Mitigation Action Plan (MAP)

Critical Infrastructure

Legend

- City Boundary
- Risk Reporting Area Southeast

Utility Systems*

- Electrical
- Natural Gas Facilities
- Communication Facilities
- Petroleum Facilities
- Potable Water Facilities
- Wastewater Facilities

Transportation Systems*

- Railway Tunnels, Bridges, and Facilities
- Light Rail Tunnels, Bridges, and Facilities
- Highway Tunnels and Bridges
- Bus Facilities
- Port and Airport Facilities

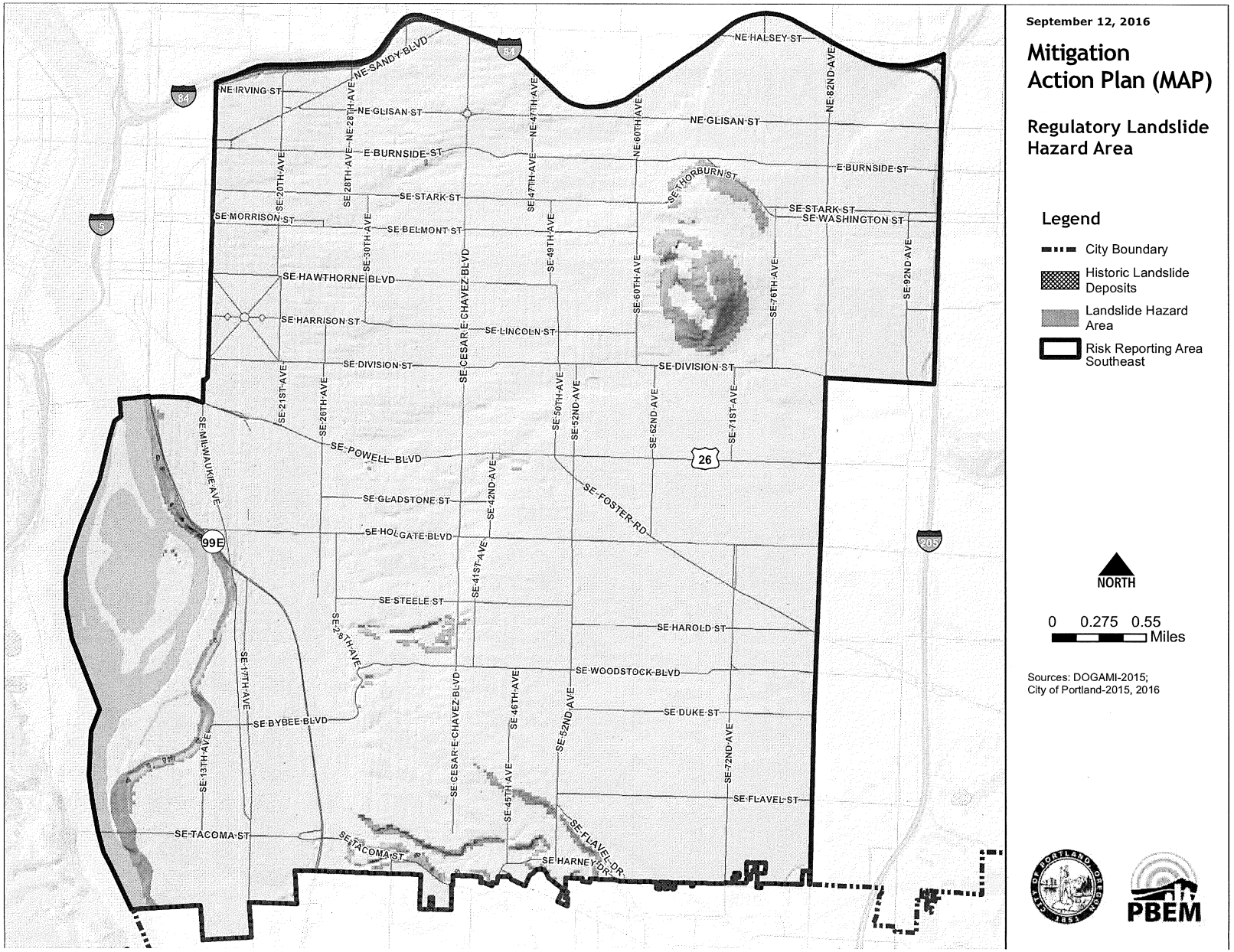
*Due to security reasons, some utility and transportation system components have been left off of the map.

NORTH

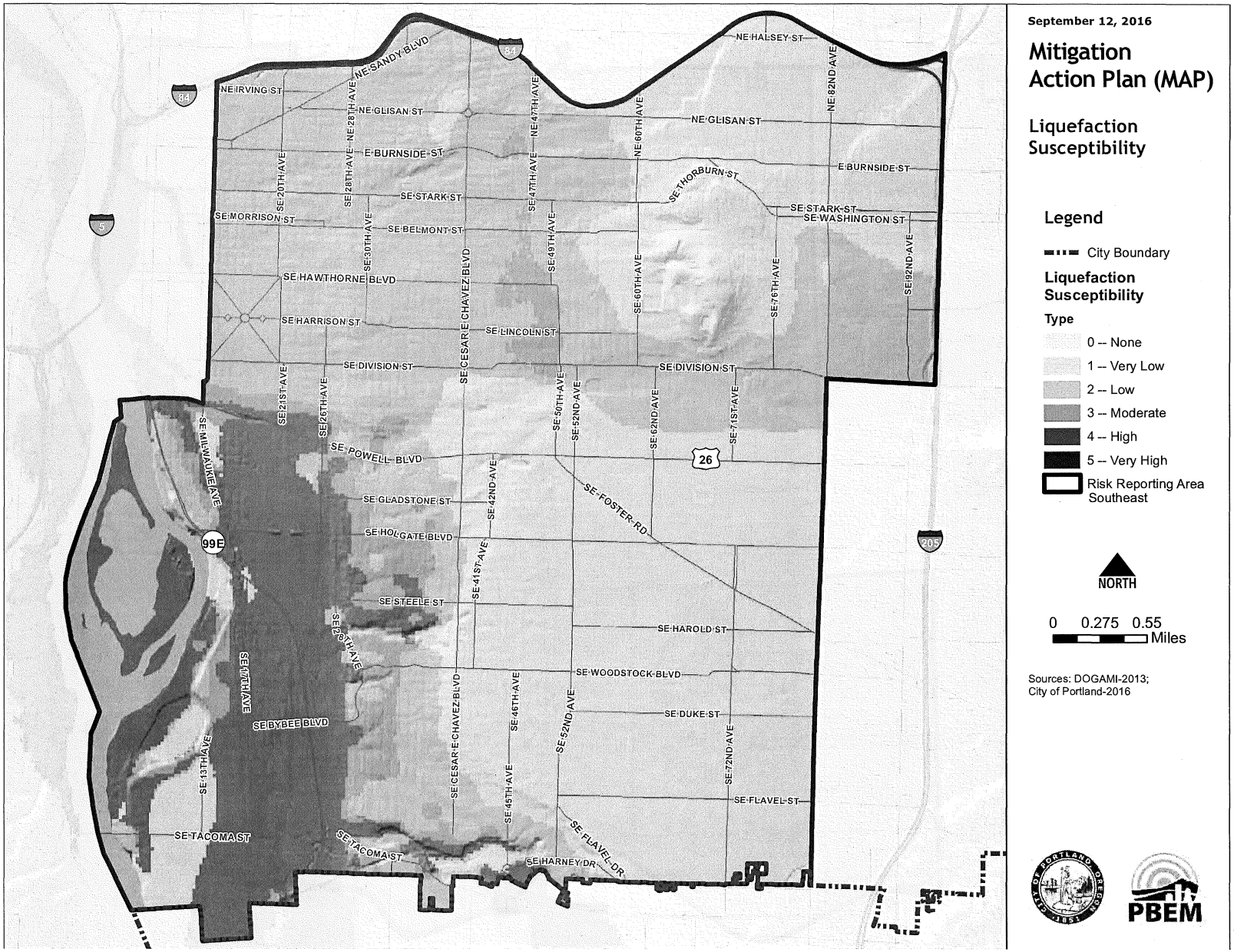
0 0.275 0.55 Miles

Sources: TriMet-2015; Port of Portland-2015; OPHS-2016; City of Portland-2011, 2015,2016; OPB-2016; PTS-2015; FEMA-2015; Kinder Morgan-2015

PBEM


September 12, 2016
Mitigation Action Plan (MAP)
Regulatory Landslide Hazard Area
Legend
City Boundary
Historic Landslide Deposits
Landslide Hazard Area
Risk Reporting Area Southeast
NORTH
0 0.275 0.55 Miles
Sources: DOGAMI-2015; City of Portland-2015, 2016
PBEM
NE SANDY BLVD
NE HALSEY ST
NE IRVING ST
NE GLISAN ST
E BURNSIDE ST
SE STARK ST
SE MORRISON ST
SE BELMONT ST
SE HAWTHORNE BLVD
SE HARRISON ST
SE LINCOLN ST
SE DIVISION ST
SE POWELL BLVD
SE GLADSTONE ST
SE HOLGATE BLVD
SE STEELE ST
SE HAROLD ST
SE WOODSTOCK BLVD
SE DUKE ST
SE FLAVEL ST
SE TACOMA ST
SE HARNEY DR
SE THORBURN ST
SE WASHINGTON ST
SE FOSTER RD
SE MILWAUKIE AVE
SE CESAR E CHAVEZ BLVD
SE BYBEE BLVD
SE 20TH AVE
SE 21ST AVE
SE 26TH AVE
SE 28TH AVE
SE 30TH AVE
SE 41ST AVE
SE 42ND AVE
SE 45TH AVE
SE 46TH AVE
SE 47TH AVE
SE 49TH AVE
SE 50TH AVE
SE 52ND AVE
SE 60TH AVE
SE 62ND AVE
SE 71ST AVE
SE 72ND AVE
SE 76TH AVE
NE 82ND AVE
SE 92ND AVE
NE 28TH AVE
NE 47TH AVE
NE 60TH AVE
SE 17TH AVE
SE 13TH AVE
84
5
26
99E
205

1992



September 12, 2016

Mitigation Action Plan (MAP)

Liquefaction Susceptibility

Legend

City Boundary

Liquefaction Susceptibility

Type

- 0 -- None
- 1 -- Very Low
- 2 -- Low
- 3 -- Moderate
- 4 -- High
- 5 -- Very High

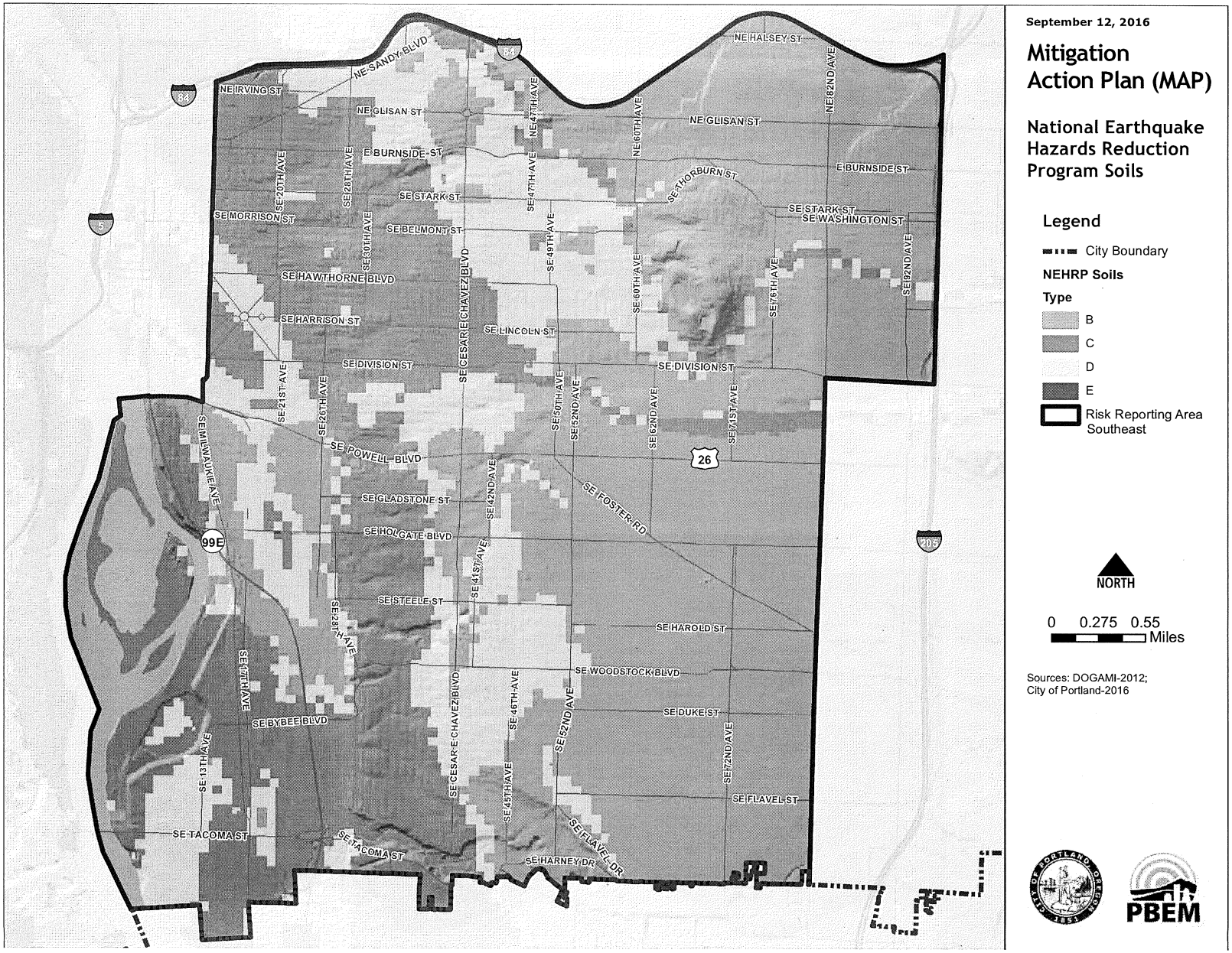
Risk Reporting Area Southeast

NORTH

0 0.275 0.55 Miles

Sources: DOGAMI-2013; City of Portland-2016

PBEM


September 12, 2016
Mitigation Action Plan (MAP)
National Earthquake Hazards Reduction Program Soils
Legend
City Boundary
NEHRP Soils
Type
B
C
D
E
Risk Reporting Area Southeast
NORTH
0 0.275 0.55 Miles
Sources: DOGAMI-2012; City of Portland-2016
PBEM
NE SANDY BLVD
NE IRVING ST
NE GLISAN ST
E BURNSIDE ST
SE STARK ST
SE MORRISON ST
SE BELMONT ST
SE HAWTHORNE BLVD
SE HARRISON ST
SE DIVISION ST
SE POWELL BLVD
SE GLADSTONE ST
SE HOLGATE BLVD
SE STEELE ST
SE HAROLD ST
SE WOODSTOCK BLVD
SE DUKE ST
SE FLAVEL ST
SE TACOMA ST
SE HARNEY DR
SE FOSTER RD
SE THORBURN ST
SE WASHINGTON ST
NE HALSEY ST
SE BYBEE BLVD
SE CESAR E CHAVEZ BLVD
SE MILWAUKIE AVE
NE 20TH AVE
SE 20TH AVE
NE 28TH AVE
SE 28TH AVE
NE 47TH AVE
SE 47TH AVE
NE 60TH AVE
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NE 82ND AVE
SE 82ND AVE
SE 30TH AVE
SE 49TH AVE
SE 76TH AVE
SE 21ST AVE
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SE 52ND AVE
SE 62ND AVE
SE 71ST AVE
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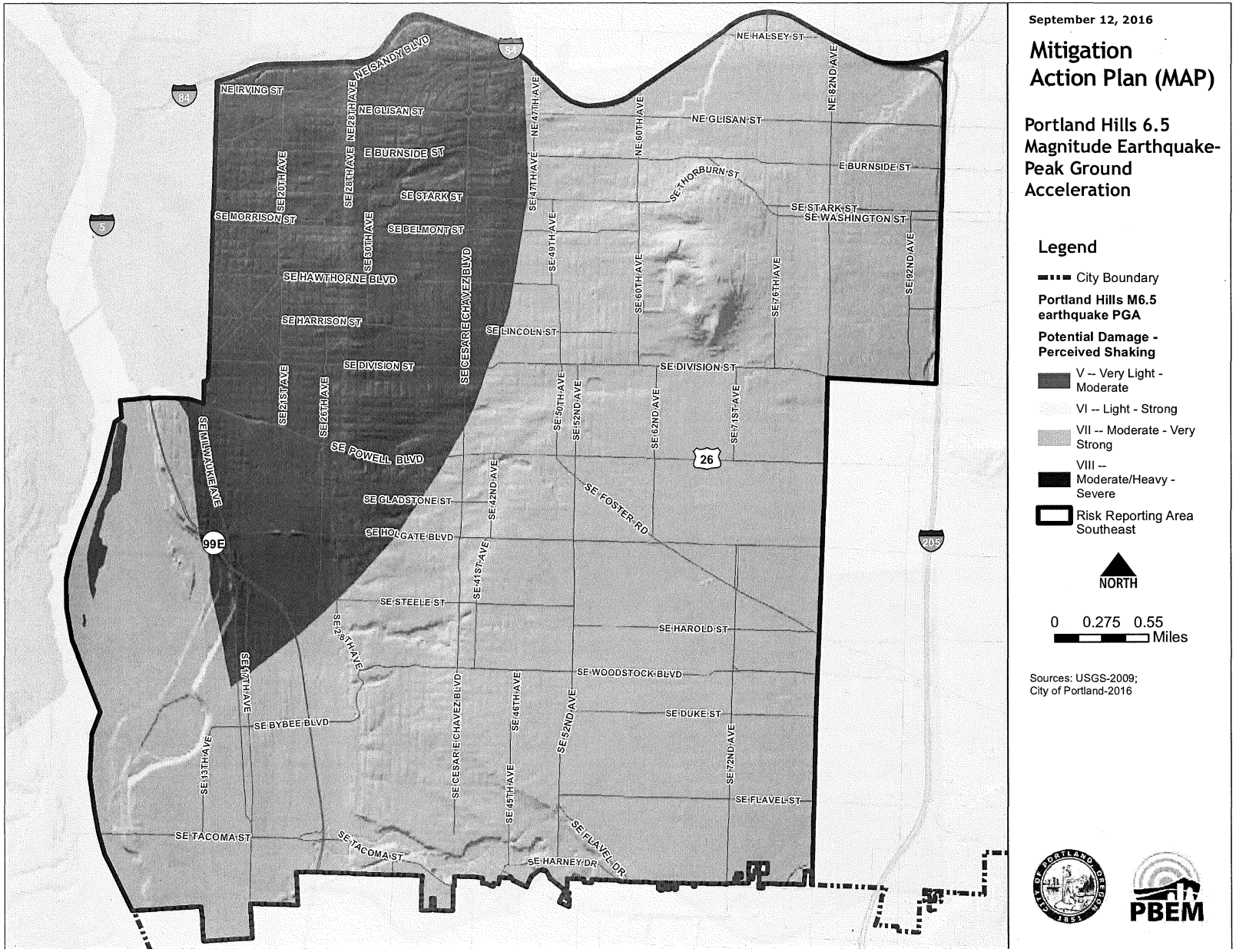
SE 45TH AVE
SE 72ND AVE
5
84
26
99E
205

1994



September 12, 2016

Mitigation Action Plan (MAP)

Portland Hills 6.5 Magnitude Earthquake-Peak Ground Acceleration

Legend

- City Boundary
- **Portland Hills M6.5 earthquake PGA**
- **Potential Damage - Perceived Shaking**
  - V -- Very Light - Moderate
  - VI -- Light - Strong
  - VII -- Moderate - Very Strong
  - VIII -- Moderate/Heavy - Severe
- Risk Reporting Area Southeast

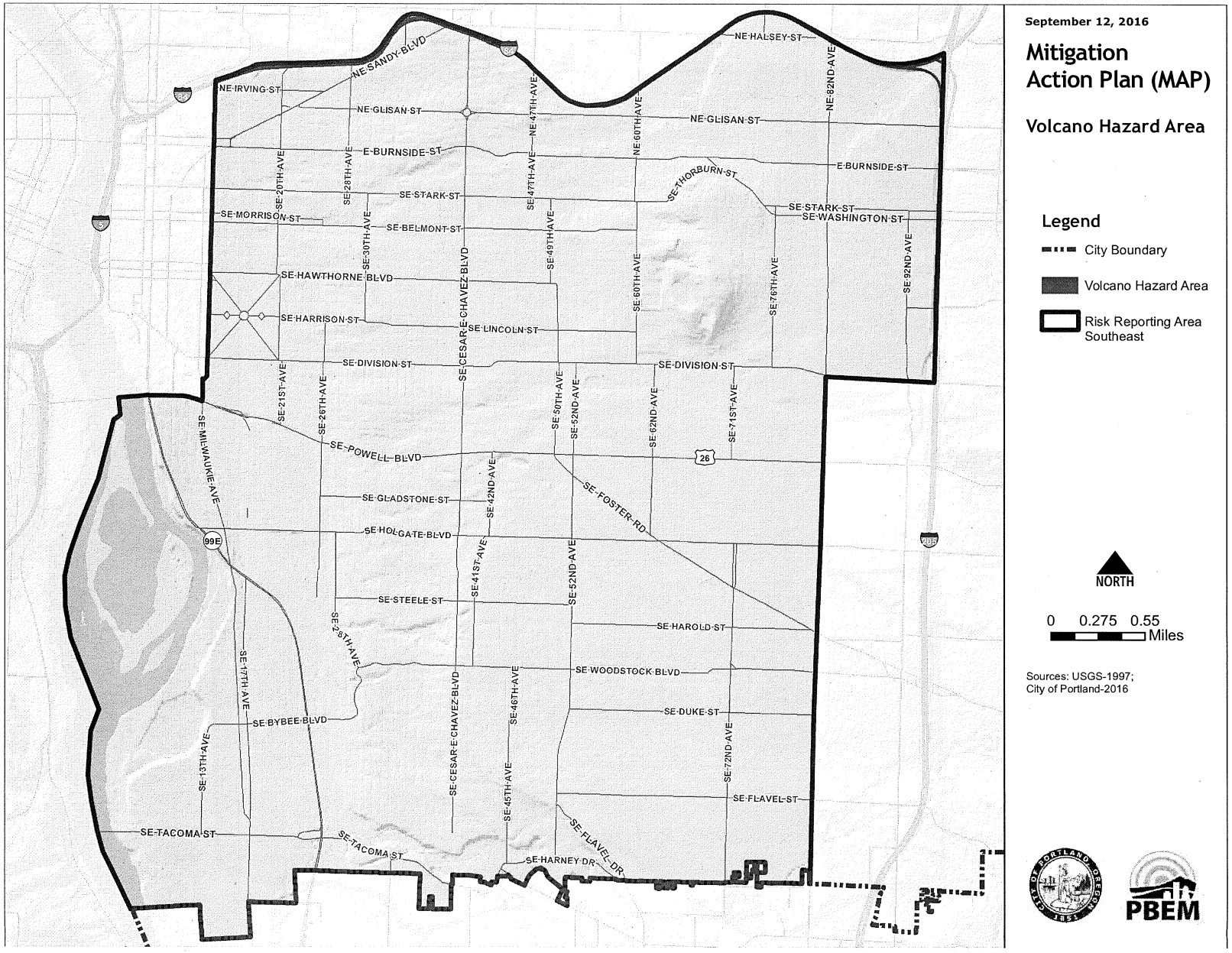
NORTH

0 0.275 0.55 Miles

Sources: USGS-2009; City of Portland-2016

PBEM

1995



September 12, 2016

Mitigation Action Plan (MAP)

Volcano Hazard Area

Legend

- City Boundary
- Volcano Hazard Area
- Risk Reporting Area Southeast

NORTH

0 0.275 0.55 Miles

Sources: USGS-1997; City of Portland-2016

PBEM

1996

September 12, 2016

Mitigation Action Plan (MAP)

Wildfire Hazard Area

Legend

- City Boundary
- Wildfire Hazard Area
- Risk Reporting Area Southeast

NORTH

0 0.275 0.55 Miles

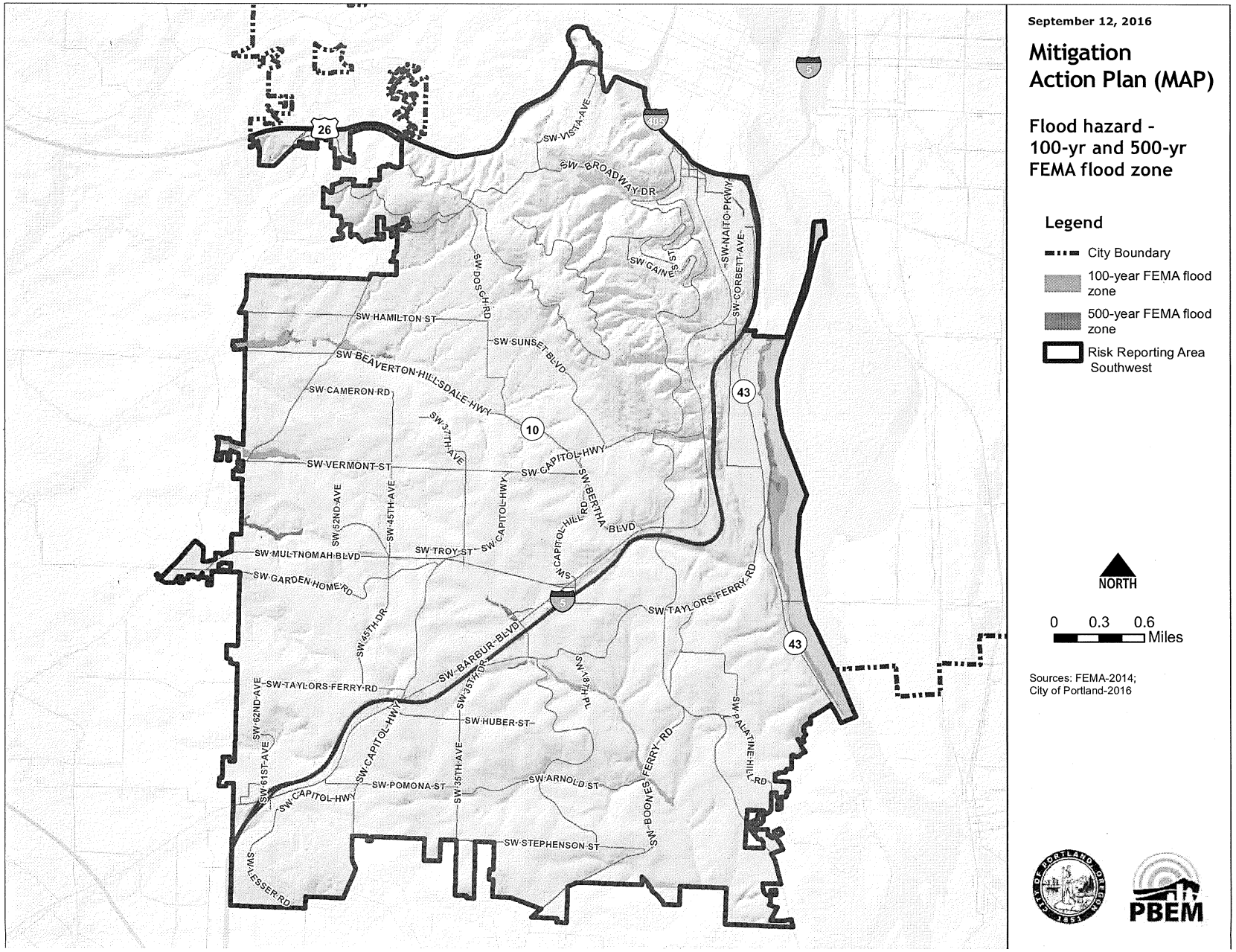
Sources: City of Portland-2002, 2016

PBEM

1997

SOUTHWEST

1998


September 12, 2016
Mitigation Action Plan (MAP)
Flood hazard - 100-yr and 500-yr FEMA flood zone
Legend
City Boundary
100-year FEMA flood zone
500-year FEMA flood zone
Risk Reporting Area Southwest
NORTH
0 0.3 0.6 Miles
Sources: FEMA-2014; City of Portland-2016
PBEM
SW VISTA AVE
SW BROADWAY DR
SW GAINES ST
SW NAITO PKWY
SW CORBETT AVE
SW DOSCH RD
SW HAMILTON ST
SW SUNSET BLVD
SW BEAVERTON-HILLSDALE HWY
SW CAMERON RD
SW 37TH AVE
SW VERMONT ST
SW CAPITOL HWY
SW BERTHA BLVD
SW CAPITOL HILL RD
SW 52ND AVE
SW 45TH AVE
SW MULTNOMAH BLVD
SW TROY ST
SW GARDEN HOME RD
SW 45TH DR
SW TAYLORS FERRY RD
SW BARBUR BLVD
SW 35TH DR
SW 18TH PL
SW HUBER ST
SW 61ST AVE
SW POMONA ST
SW 35TH AVE
SW ARNOLD ST
SW BOONES FERRY RD
SW PALATINE HILL RD
SW STEPHENSON ST
SW LESSER RD
26
10
43
5
205

September 12, 2016

Mitigation Action Plan (MAP)

100-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

- City Boundary
- **100-year probabilistic earthquake PGA**
- **Potential Damage - Perceived Shaking**
  - V -- Very Light - Moderate
  - VI -- Light - Strong
- Risk Reporting Area Southwest

NORTH

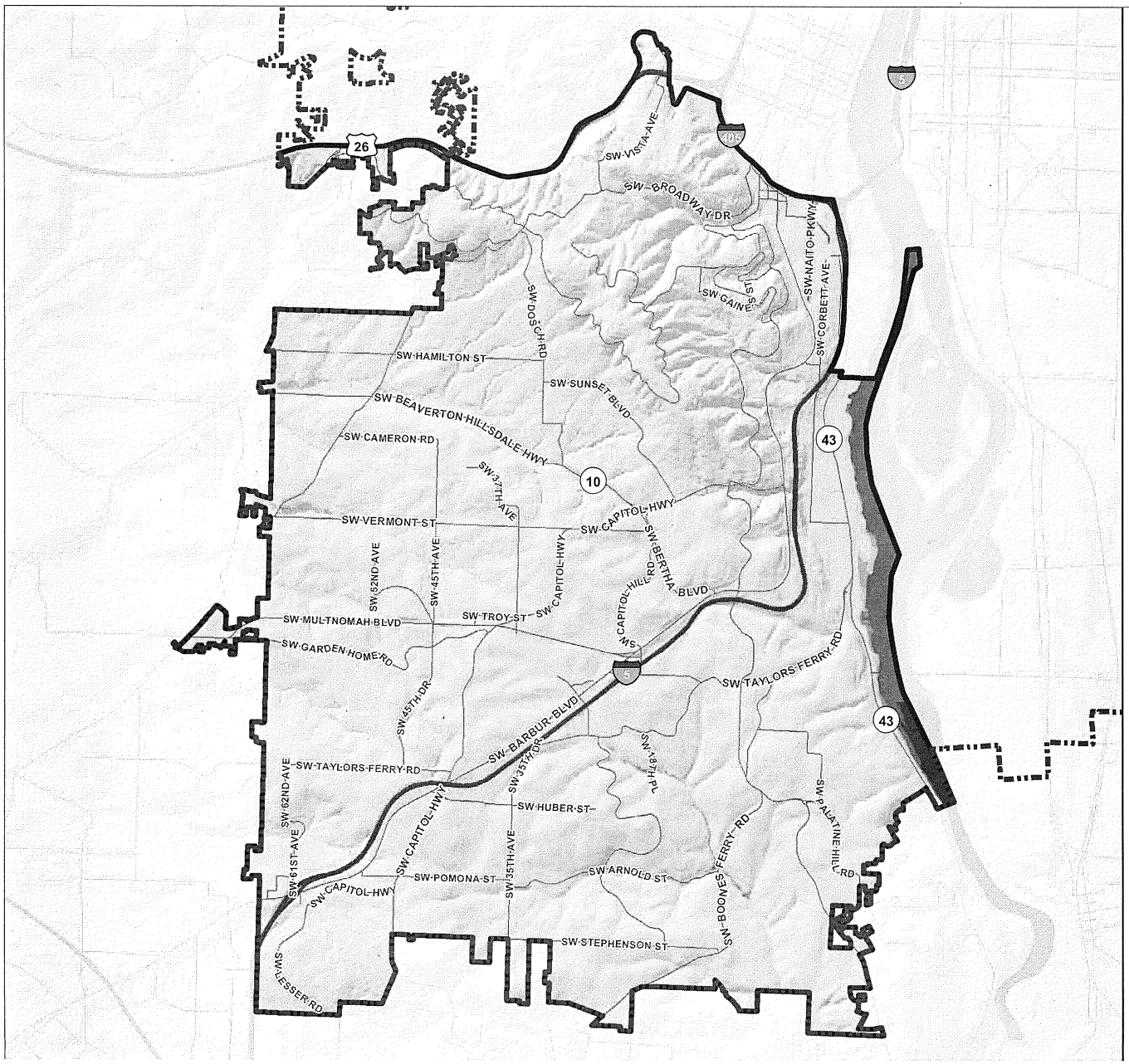
0 0.3 0.6 Miles

Sources: FEMA-2015; City of Portland-2016

CITY OF PORTLAND OREGON

PBEM

2000



September 12, 2016

Mitigation Action Plan (MAP)

Flood Hazard - 100-yr Flood Depth Grid

Legend

- City Boundary
- **100-year flood depth grid**
  - 0.1' - 4.5'
  - 4.6' - 11.5'
  - 11.6' - 19.5'
  - 19.6' - 25.9'
  - 26' - 33.2'
- Risk Reporting Area Southwest

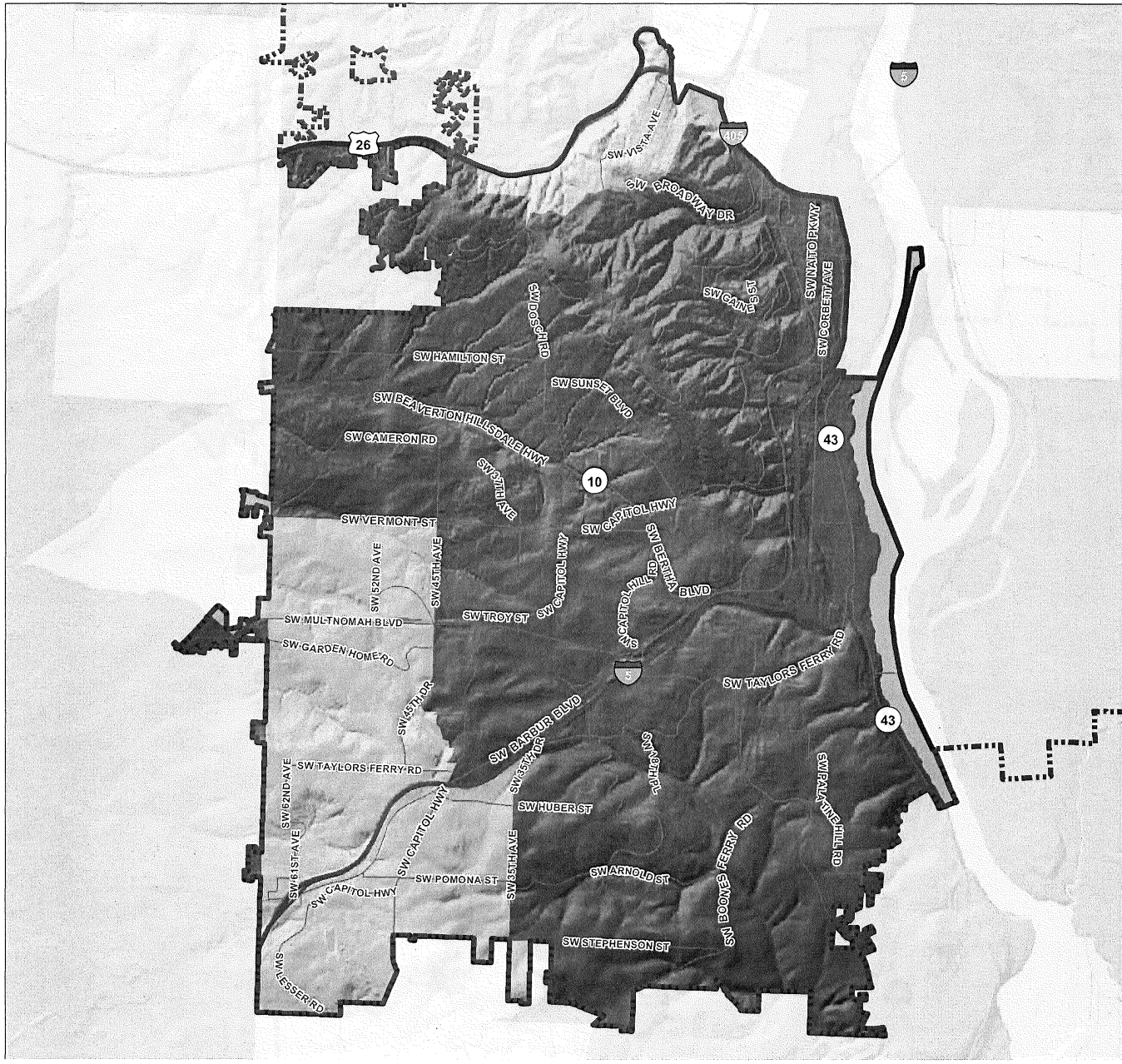
NORTH

0 0.3 0.6 Miles

Sources: Tetra Tech-2016; City of Portland-2016

PBEM

2001
LUBA No. 2020-009
Page 2287



September 12, 2016

Mitigation Action Plan (MAP)

500-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

City Boundary

500-year probabilistic earthquake PGA

Potential Damage - Perceived Shaking

VI -- Light - Strong

VII -- Moderate - Very Strong

VIII -- Moderate/Heavy - Severe

Risk Reporting Area Southwest

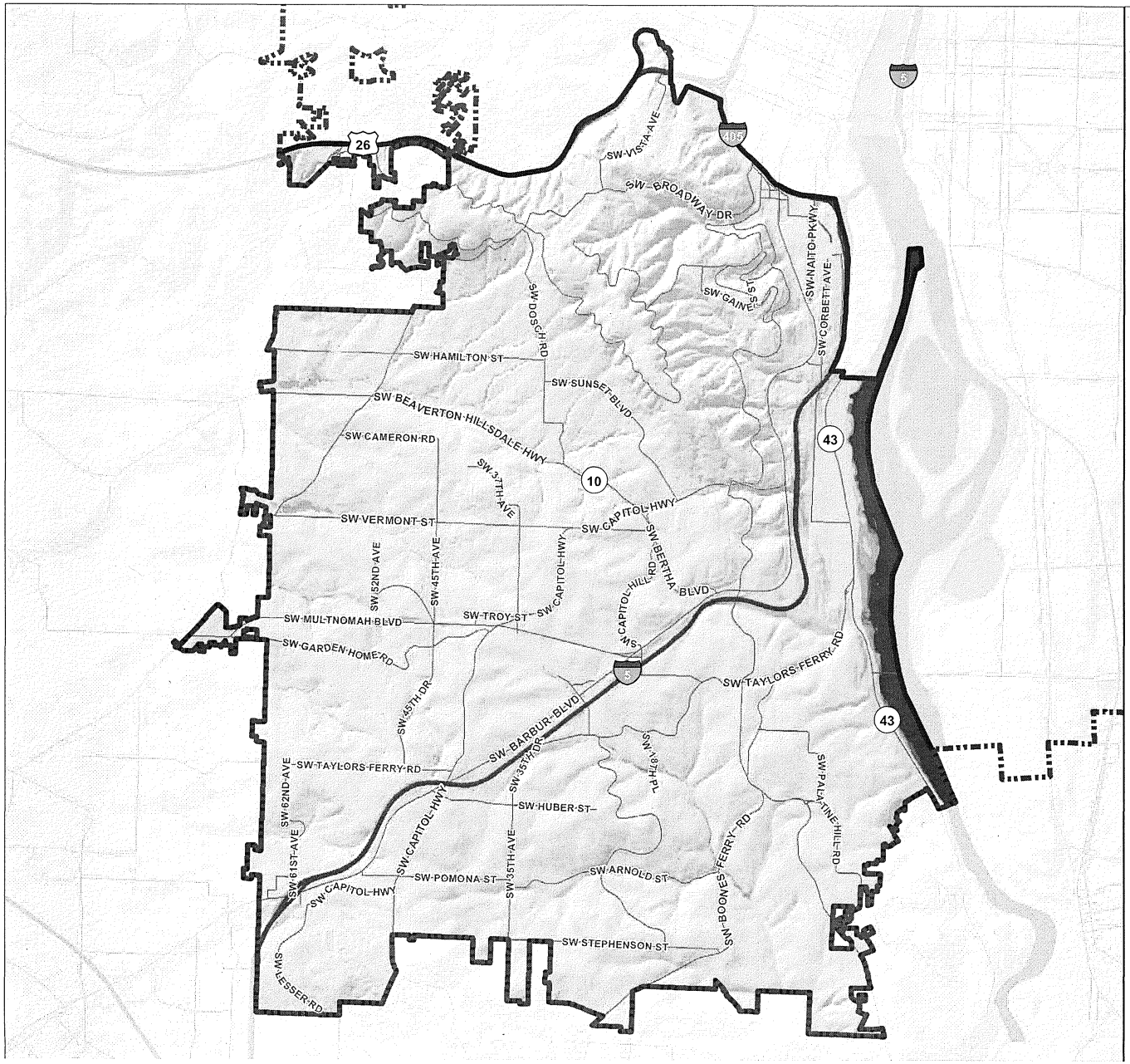
NORTH

0 0.35 0.7 Miles

Sources: FEMA-2015; City of Portland-2016

PBEM

2002



September 12, 2016

Mitigation Action Plan (MAP)

Flood Hazard - 500-yr Flood Depth Grid

Legend

- City Boundary

500-year flood depth grid

- 0' - 4.6'
- 4.7' - 12.9'
- 13' - 22.6'
- 22.7' - 28.8'
- 28.9' - 36.7'
- Risk Reporting Area Southwest

NORTH

0 0.375 0.75 Miles

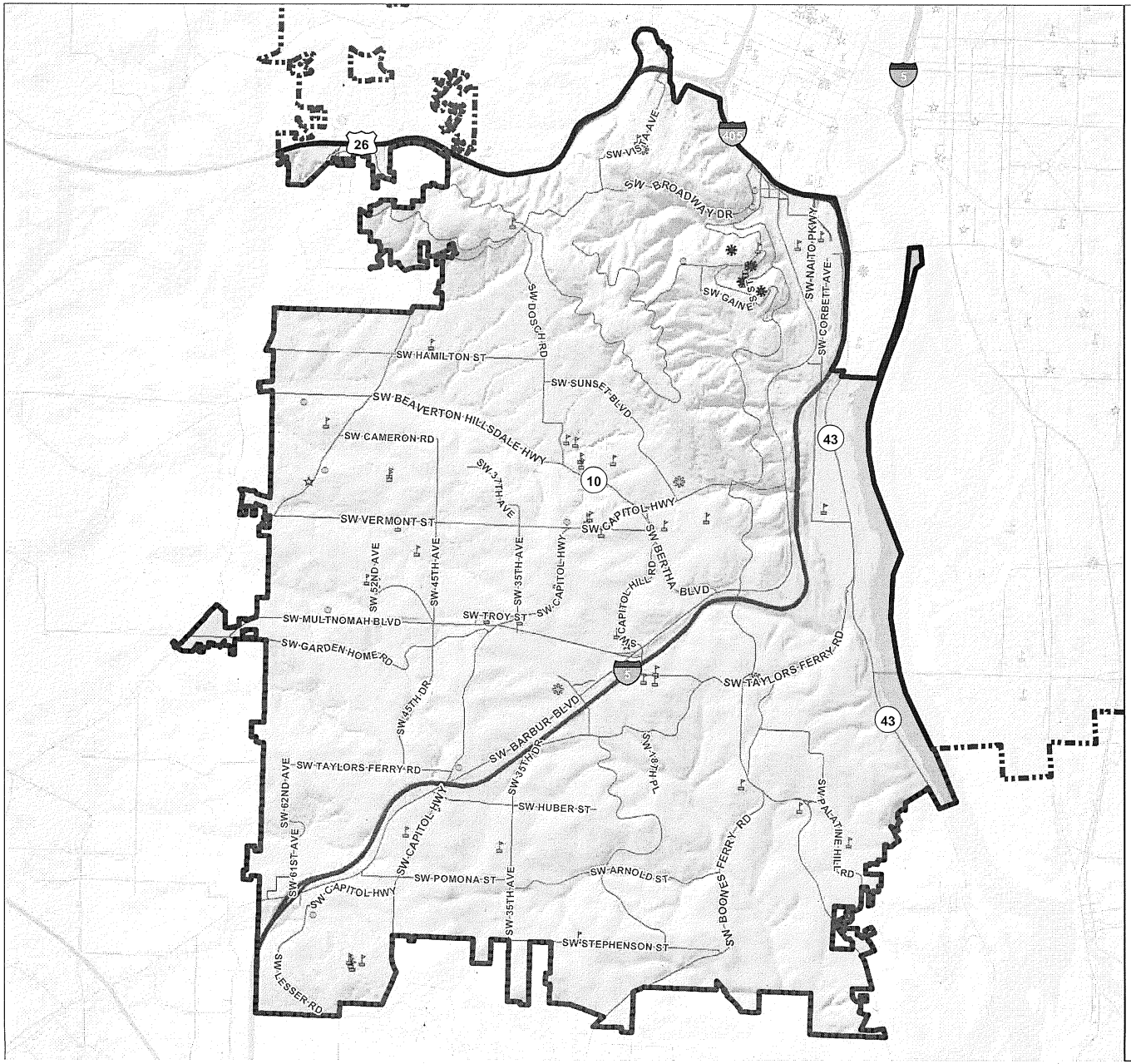
Sources: Tetra Tech-2016; City of Portland-2016

PBEM

2003
LUBA No. 2020-009
Page 2289

SW 62ND AVE
SW 61ST AVE
SW LESSER RD
SW CAPITOL HWY
SW TAYLORS FERRY RD
SW MULTNOMAH BLVD
SW GARDEN HOME RD
SW 52ND AVE
SW VERMONT ST
SW CAMERON RD
SW BEAVERTON HILLSDALE HWY
SW HAMILTON ST
SW 45TH DR
SW 45TH AVE
SW 37TH AVE
SW DOSCH RD
SW POMONA ST
SW 35TH AVE
SW 35TH DR
SW BARBUR BLVD
SW TROY ST
SW CAPITOL HWY
SW SUNSET BLVD
SW VISTA AVE
SW BROADWAY DR
SW HUBER ST
SW STEPHENSON ST
SW ARNOLD ST
SW 87TH PL
SW CAPITOL HILL RD
SW BERTHA BLVD
SW CANYON CT
SW NAITO PKWY
SW CORBETT AVE
SW BOONES FERRY RD
SW TAYLORS FERRY RD
SW PALATINE HILL RD
26
10
43
43
September 12, 2016
Mitigation Action Plan (MAP)
Cascadia 9.0 Magnitude Earthquake--Peak Ground Acceleration
City Boundary
Cascadia M9.0 earthquake PGA
Potential Damage - Perceived Shaking
V – Very Light - Moderate
VI – Light - Strong
VII – Moderate - Very Strong
VIII -- Moderate/Heavy - Severe
Risk Reporting Southwest
NORTH
0 0.3 0.6 Miles
Sources: USGS-2011; City of Portland-2016
PBEM

2004



September 12, 2016

Mitigation Action Plan (MAP)

Critical Facilities

Legend

- City Boundary
- Risk Reporting Area Southwest

Emergency Services*

- Emergency Coordination Centers
- Fire Station Facilities
- Police Station Facilities
- Medical Care Facilities

High Potential Loss Facilities*

- Dams
- Military
- Nuclear Power Plants
- Hazardous Materials
- Schools
- Other Assets

  Zoo, Jails, Nursing/Assisted Living Facilities

*Due to security reasons, some emergency services and high potential loss facilities have been left off of the map.

NORTH

0 0.3 0.6 Miles

Sources: WORD/NID-2015; OSFM-2015; City of Portland-2011, 2015, 2016

PBEM

2005
LUBA No. 2020-009
Page 2291

September 12, 2016

Mitigation Action Plan (MAP)

Critical Infrastructure

Legend

- City Boundary
- Risk Reporting Area Southwest

Utility Systems*

- Electrical
- Natural Gas Facilities
- Communication Facilities
- Petroleum Facilities
- Potable Water Facilities
- Wastewater Facilities

Transportation Systems*

- Railway Tunnels, Bridges, and Facilities
- Light Rail Tunnels, Bridges, and Facilities
- Highway Tunnels and Bridges
- Bus Facilities
- Port and Airport Facilities

*Due to security reasons, some utility and transportation system components have been left off of the map.

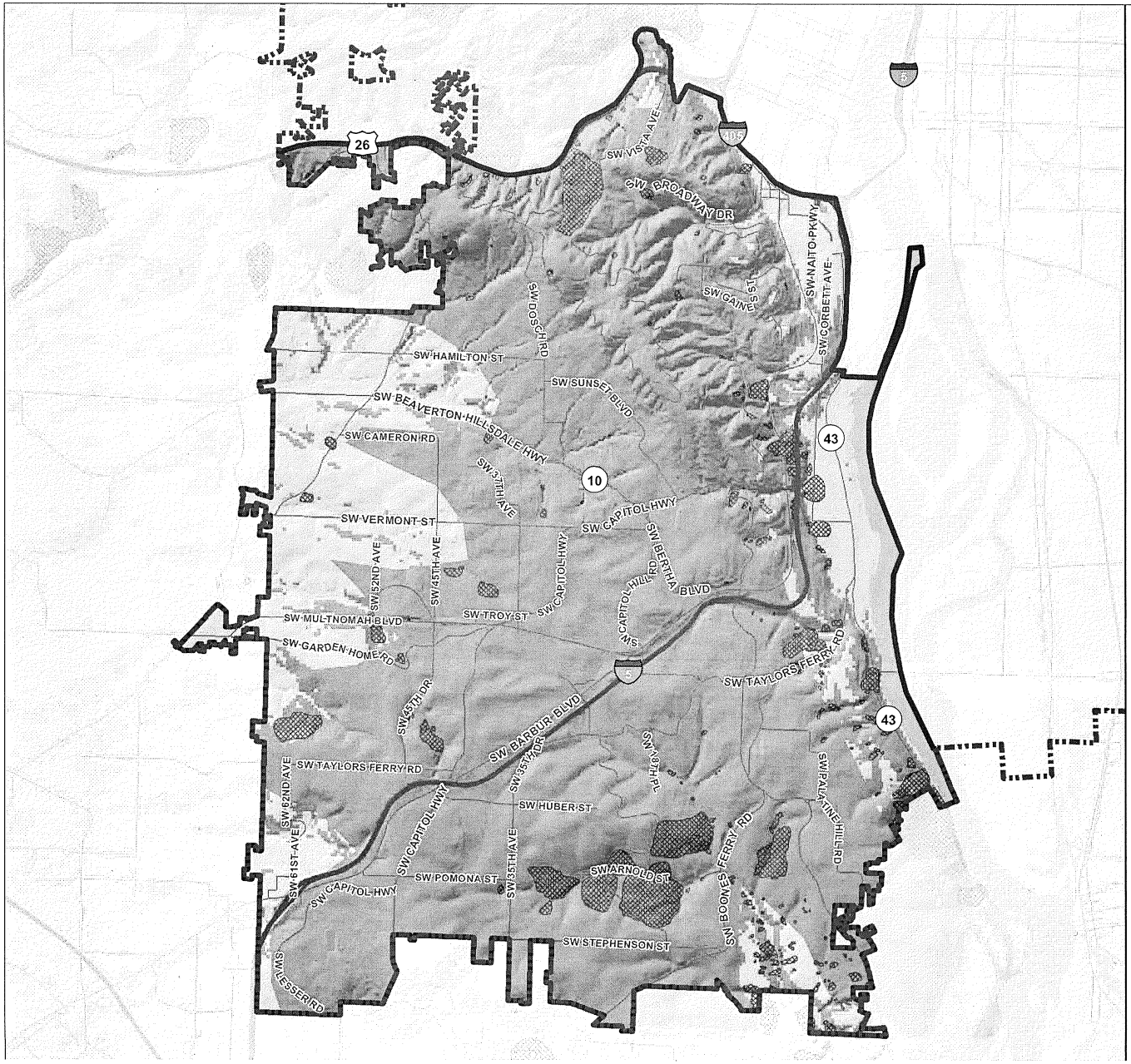
NORTH

0 0.3 0.6 Miles

Sources: TriMet-2015; Port of Portland-2015; OPHS-2016; City of Portland-2011, 2015,2016; OPB-2016; PTS-2015; FEMA-2015; Kinder Morgan-2015

PBEM

2006



September 12, 2016

Mitigation Action Plan (MAP)

Regulatory Landslide Hazard Area

Legend

- City Boundary
- Historic Landslide Deposits
- Landslide Hazard Area
- Risk Reporting Area Southwest

NORTH

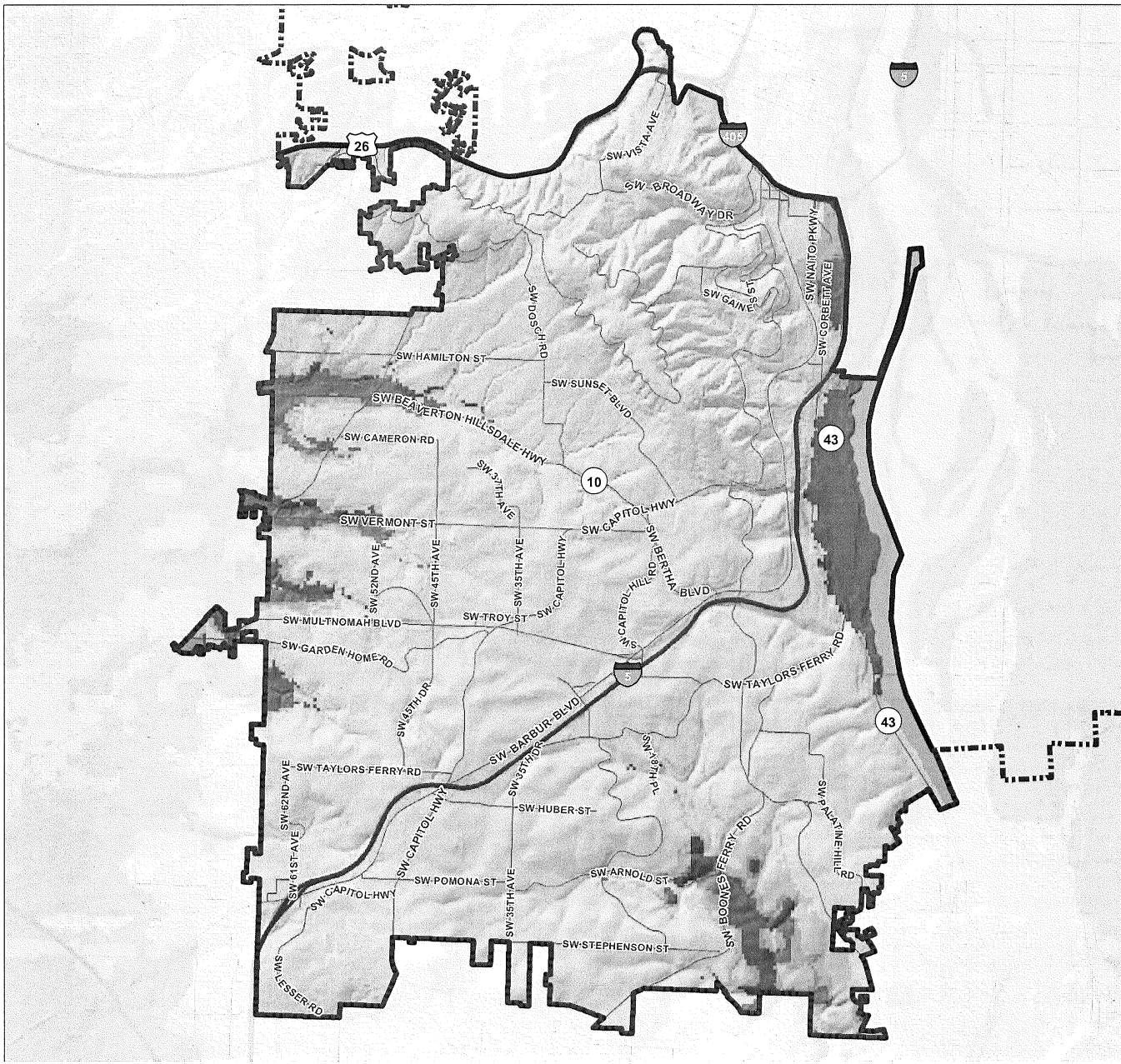
0 0.3 0.6 Miles

Sources: DOGAMI-2015; City of Portland-2015, 2016

PBEM

2007

LUBA No. 2020-009
Page 2293



September 12, 2016

Mitigation Action Plan (MAP)

Liquefaction Susceptibility

Legend

City Boundary

Liquefaction Susceptibility

Type

- 0 -- None
- 1 -- Very Low
- 2 -- Low
- 3 -- Moderate
- 4 -- High
- 5 -- Very High

Risk Reporting Area Southwest

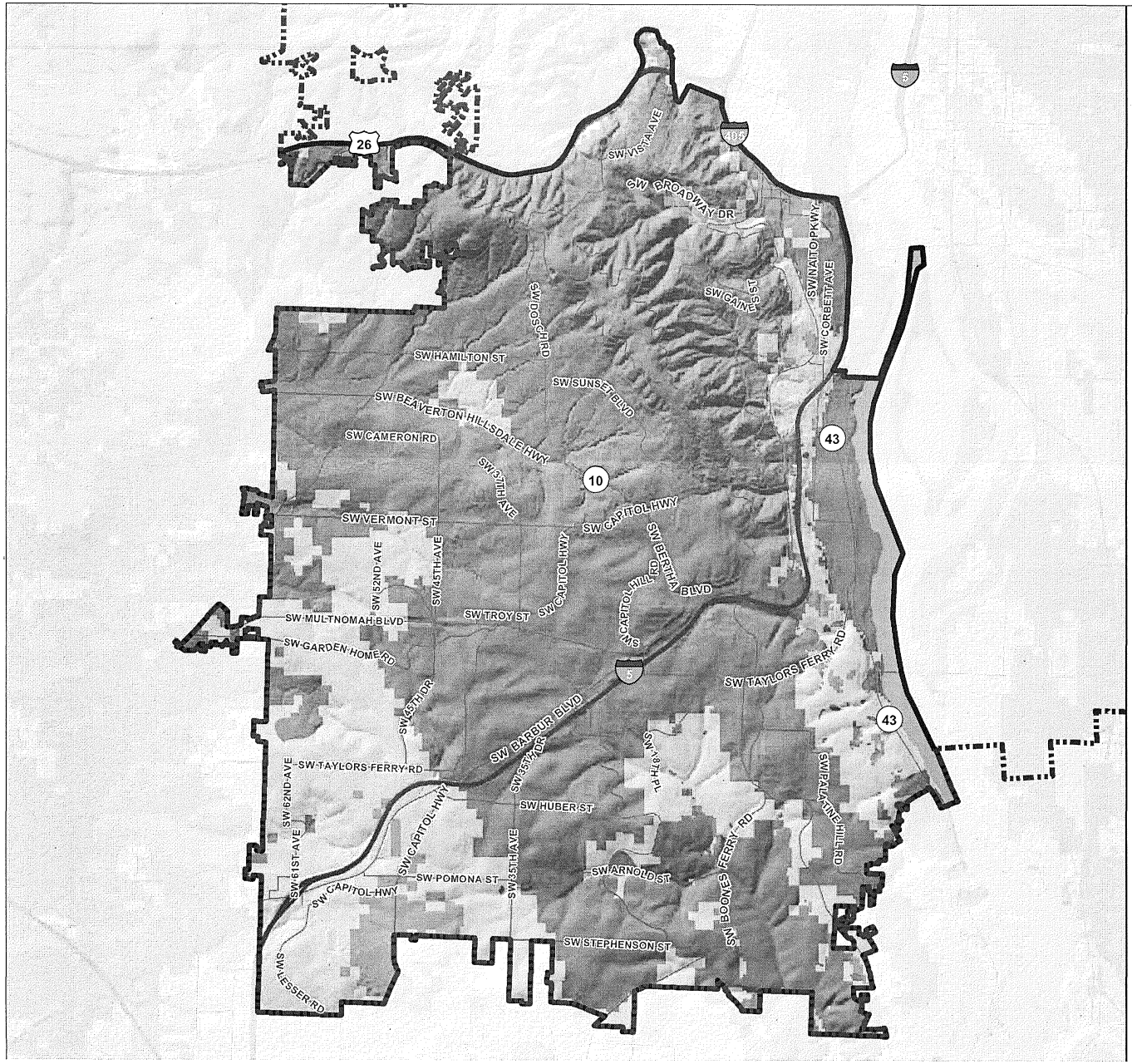
NORTH

0 0.3 0.6 Miles

Sources: DOGAMI-2013; City of Portland-2016

PBEM

2008



September 12, 2016

Mitigation Action Plan (MAP)

National Earthquake Hazards Reduction Program Soils

Legend

- City Boundary

NEHRP Soils

Type

- B
- C
- D
- E
- Risk Reporting Area Southwest

NORTH

0 0.3 0.6 Miles

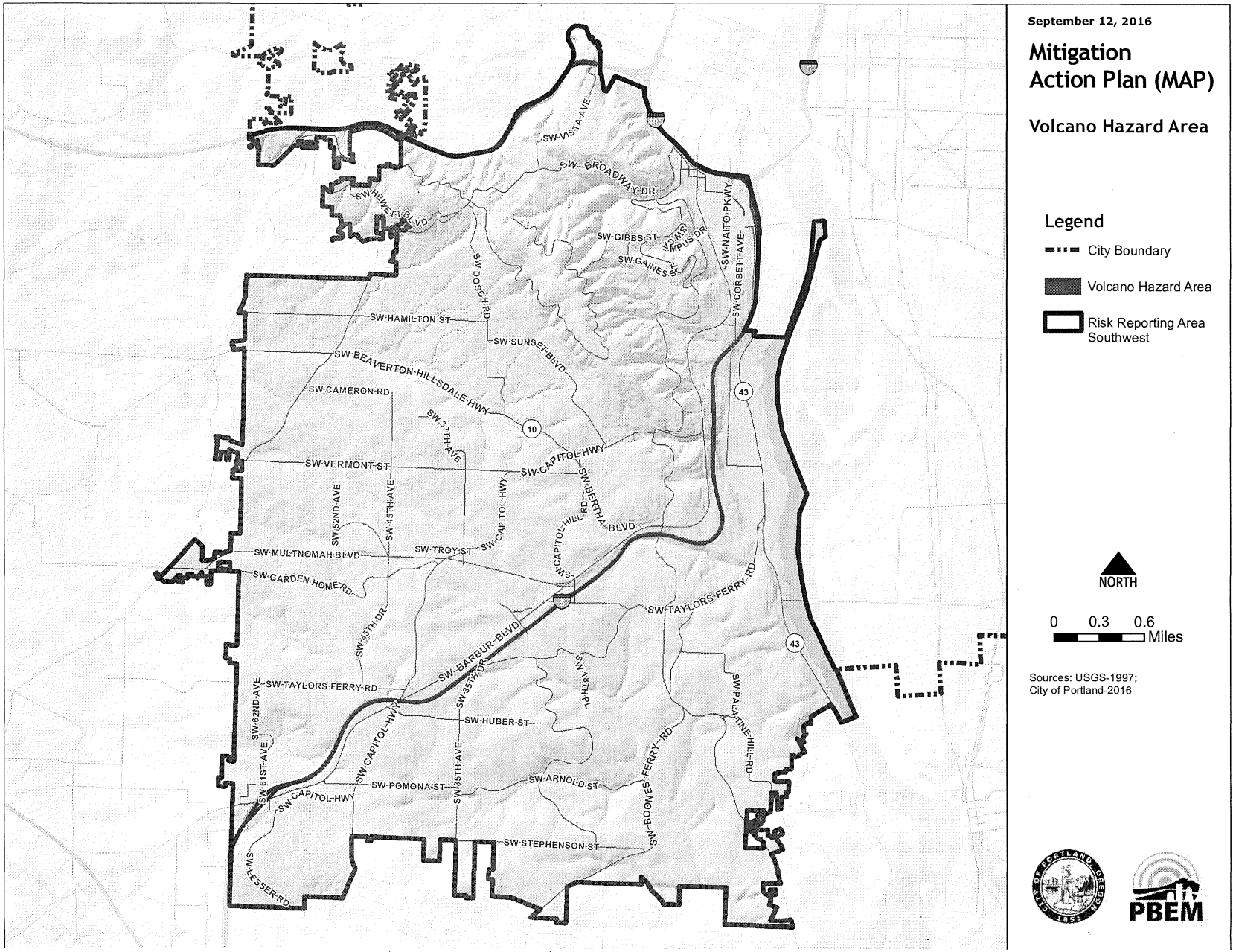
Sources: DOGAMI-2012; City of Portland-2016

PBEM

2009

September 12, 2016
Mitigation Action Plan (MAP)
Portland Hills 6.5 Magnitude Earthquake-Peak Ground Acceleration
Legend
City Boundary
Portland Hills M6.5 earthquake PGA
Potential Damage - Perceived Shaking
V -- Very Light - Moderate
VI -- Light - Strong
VII -- Moderate - Very Strong
VIII -- Moderate/Heavy - Severe
Risk Reporting Area Southwest
NORTH
0 0.3 0.6 Miles
Sources: USGS-2009; City of Portland-2016
PBEM
SW 61ST AVE
SW 62ND AVE
SW TAYLORS FERRY RD
SW CAPITOL HWY
SW POMONA ST
SW 45TH DR
SW GARDEN HOME RD
SW MULTNOMAH BLVD
SW 52ND AVE
SW VERMONT ST
SW 45TH AVE
SW TROY ST
SW 35TH AVE
SW 35TH DR
SW BARBUR BLVD
SW HUBER ST
SW STEPHENSON ST
SW ARNOLD ST
SW 37TH PL
SW BOONES FERRY RD
SW PALATINE HILL RD
SW CAMERON RD
SW RESERVOIR HILLSDALE HWY
SW 37TH AVE
SW CAPITOL HWY
SW CAPITOL HILL RD
SW IDAHA ST
SW CAPITOL HWY
SW HAMILTON ST
SW SUNSET BLVD
SW DOSCH RD
SW 5TH AVE
SW BROADWAY DR
SW MAIN ST
SW NAITO PKWY
SW CORBETT AVE
26
10
5
43
43

2010



September 12, 2016

Mitigation Action Plan (MAP)

Volcano Hazard Area

Legend

- City Boundary
- Volcano Hazard Area
- Risk Reporting Area Southwest

NORTH

0 0.3 0.6 Miles

Sources: USGS-1997; City of Portland-2016

PBEM

2011

LUBA No. 2020-009
Page 2297

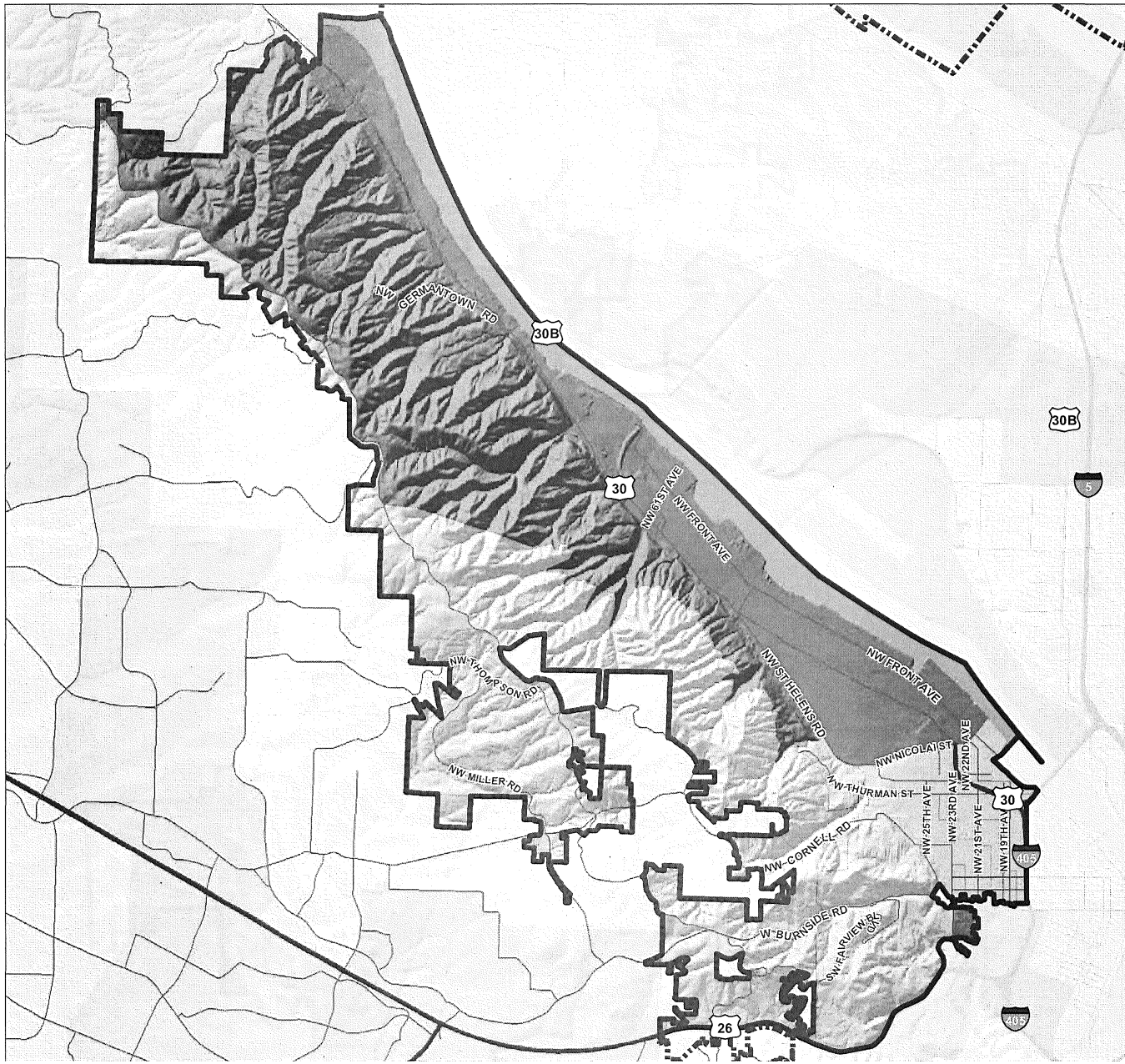
SW 61ST AVE
SW 62ND AVE
SW TAYLORS FERRY RD
SW GARDEN HOME RD
SW MULTNOMAH BLVD
SW 52ND AVE
SW VERMONT ST
SW CAMERON RD
SW BEAVERTON HILLSDALE HWY
SW HAMILTON ST
SW CAPITOL HWY
SW 45TH DR
SW 45TH AVE
SW 37TH AVE
SW TROY ST
SW DOSCH RD
SW SUNSET BLVD
SW VISTA AVE
SW BROADWAY DR
SW GAINES ST
SW NAITO PKWY
SW CORBETT AVE
SW POMONA ST
SW 35TH AVE
SW 35TH DR
SW BARBUR BLVD
SW HUBER ST
SW CAPITOL HILL RD
SW BERTHA BLVD
SW 87TH PL
SW ARNOLD ST
SW STEPHENSON ST
SW BOONES FERRY RD
SW PALATINE HILL RD
SW LESSER RD
26
10
43
NORTH
0 0.3 0.6
Miles
Sources: City of Portland-2002, 2016
Legend
City Boundary
Wildfire Hazard
Risk Reporting Area Southwest
Wildfire Hazard Area
Mitigation Action Plan (MAP)
September 12, 2016
PBEM

2012

WEST/NORTHWEST

NW GERMANTOWN RD
NW MILLER RD
NW THORNBURN RD
NW 61ST AVE
NW FRONT AVE
NW ST HELENS RD
NW FRONT AVE
NW NICOLAI ST
N W THURMAN ST
NW CORNELL RD
W BURNSIDE RD
SW FAIRVIEW BLVD
NW 25TH AVE
NW 23RD AVE
NW 22ND AVE
NW 21ST AVE
NW 19TH AVE
30B
30
26
5
September 12, 2016
Mitigation Action Plan (MAP)
Flood hazard - 100-yr and 500-yr FEMA flood zone
Legend
City Boundary
100-year FEMA flood zone
500-year FEMA flood zone
Risk Reporting Area West/Northwest
NORTH
0 0.4 0.8 Miles
Sources: FEMA-2014; City of Portland-2016
PBEM

2014



September 12, 2016

Mitigation Action Plan (MAP)

100-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

City Boundary

100-year probabilistic earthquake PGA

Potential Damage - Perceived Shaking

V -- Very Light - Moderate

VI -- Light - Strong

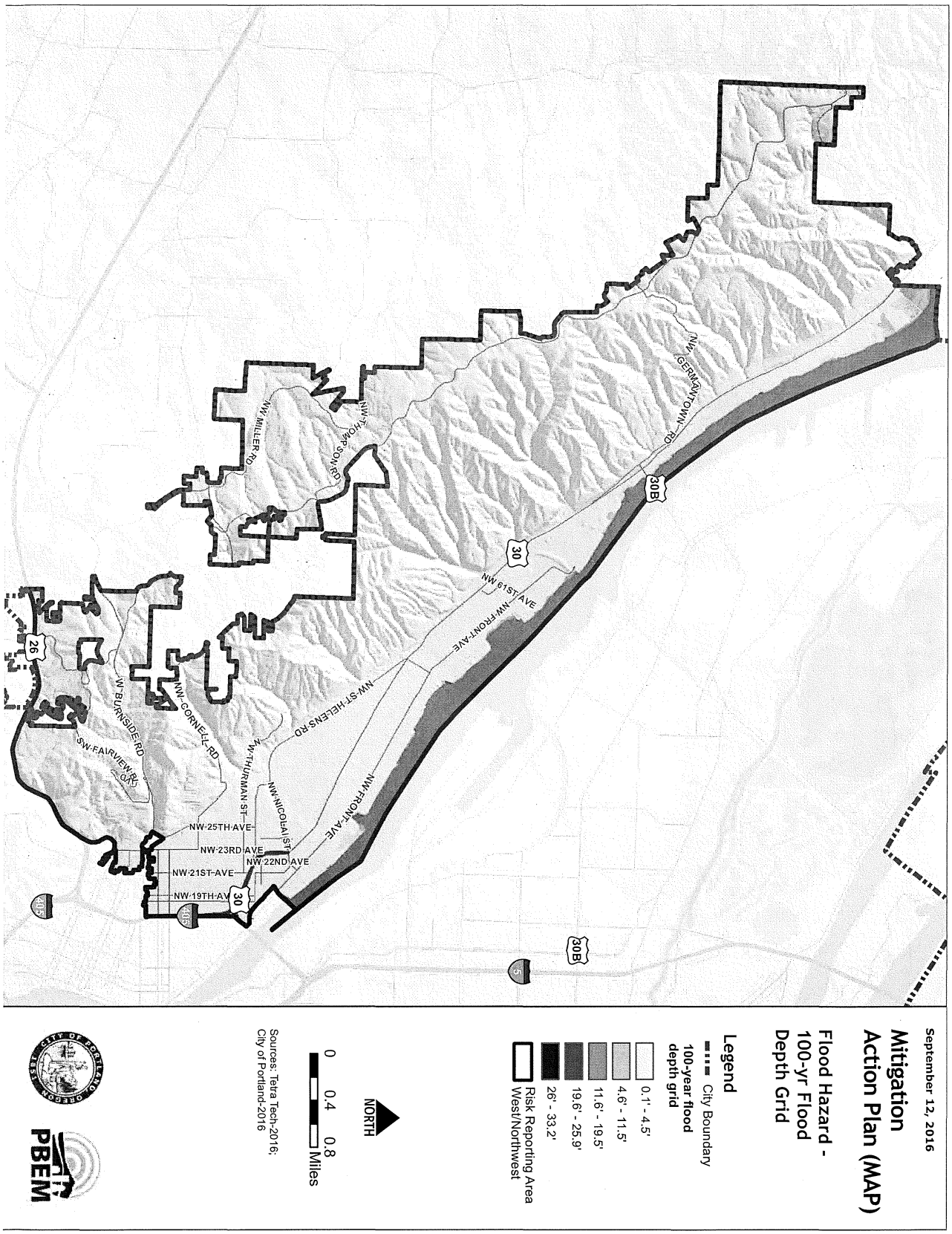
Risk Reporting Area West/Northwest

NORTH

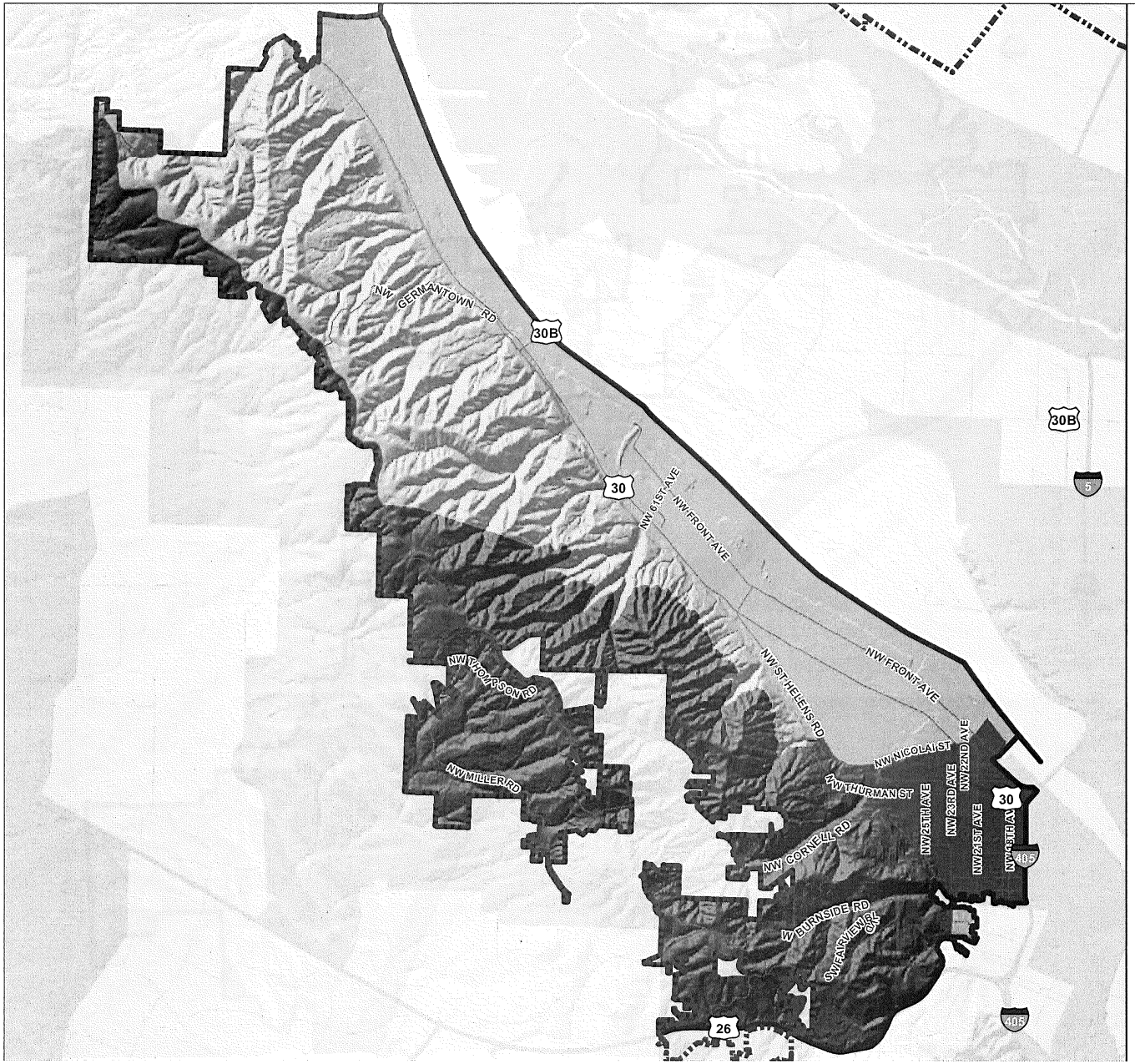
0 0.4 0.8 Miles

Sources: FEMA-2015; City of Portland-2016

PBEM


September 12, 2016
Mitigation Action Plan (MAP)
Flood Hazard - 100-yr Flood Depth Grid
Legend
City Boundary
100-year flood depth grid
0.1' - 4.5'
4.6' - 11.5'
11.6' - 19.5'
19.6' - 25.9'
26' - 33.2'
Risk Reporting Area West/Northwest
NORTH
0 0.4 0.8 Miles
Sources: Tetra Tech-2016; City of Portland-2016
PBEM
NW GERMANTOWN RD
NW THOMPSON RD
NW MILLER RD
NW 61ST AVE
NW FRONT AVE
NW ST HELENS RD
NW CORNELL RD
W BURNSIDE RD
SW FAIRVIEW BLVD
NW THURMAN ST
NW NICOLAI ST
NW 25TH AVE
NW 23RD AVE
NW 22ND AVE
NW 21ST AVE
NW 19TH AV
30
30B
26
5

2016



September 12, 2016

Mitigation Action Plan (MAP)

500-year Probabilistic Earthquake--Peak Ground Acceleration

Legend

- City Boundary
- **500-year probabilistic earthquake PGA**
- **Potential Damage - Perceived Shaking**
- VI -- Light - Strong
- VII -- Moderate - Very Strong
- VIII -- Moderate/Heavy - Severe
- Risk Reporting Area West/Northwest

NORTH

0 0.45 0.9 Miles

Sources: FEMA-2015; City of Portland-2016

PBEM

2017

September 12, 2016
Mitigation Action Plan (MAP)
Flood Hazard - 500-yr Flood Depth Grid
Legend
City Boundary
500-year flood depth grid
0' - 4.6'
4.7' - 12.9'
13' - 22.6'
22.7' - 28.8'
28.9' - 36.7'
Risk Reporting Area West/Northwest
NORTH
0 0.475 0.95 Miles
Sources: Tetra Tech-2016; City of Portland-2016
PBEM
NW GERMANTOWN RD
NW MILLER RD
NW THOMPSON RD
NW 61ST AVE
NW FRONT AVE
NW ST HELENS RD
NW CORNELL RD
W BURNSIDE RD
NW THURMAN ST
NW NICOLAI ST
NW 25TH AVE
NW 23RD AVE
NW 22ND AVE
NW 21ST AVE
NW 19TH AVE
30B
30
26
5

2018

NW GERMANTOWN RD
30B
30
NW 61ST AVE
NW FRONT AVE
NW ST HELENS RD
NW FRONT AVE
NW MILLER RD
NW THOMPSON RD
NW CORNELL RD
W BURNSIDE RD
SW FAIRVIEW BLVD
NW THURMAN ST
NW NICOLAI ST
NW 25TH AVE
NW 23RD AVE
NW 22ND AVE
NW 21ST AVE
NW 19TH AV
26
30B
September 12, 2016
Mitigation Action Plan (MAP)
Cascadia 9.0 Magnitude Earthquake--Peak Ground Acceleration
Legend
City Boundary
Cascadia M9.0 earthquake PGA
Potential Damage - Perceived Shaking
V – Very Light - Moderate
VI – Light - Strong
VII – Moderate - Very Strong
VIII – Moderate/Heavy - Severe
Risk Reporting Area West/Northwest
NORTH
0 0.4 0.8 Miles
Sources: USGS-2011; City of Portland-2016
PBEM

2019

September 12, 2016
Mitigation Action Plan (MAP)
Critical Facilities
Legend
City Boundary
Risk Reporting Area West/Northwest
Emergency Services*
Emergency Coordination Centers
Fire Station Facilities
Police Station Facilities
Medical Care Facilities
High Potential Loss Facilities*
Dams
Military
Nuclear Power Plants
Hazardous Materials
Schools
Other Assets
Zoo, Jails, Nursing/Assisted Living Facilities
*Due to security reasons some emergency services and high potential loss facilities have been left off of the map.
NORTH
0 0.4 0.8 Miles
Sources: WORD/NID-2015; OSFM-2015; City of Portland-2011, 2015, 2016
PBEM
NW SKYLINE BLVD
NW GERMANTOWN RD
NW MILLER RD
NW THOMPSON RD
NW 61ST AVE
NW FRONT AVE
NW ST HELENS RD
NW CORNELL RD
NW BURNSIDE RD
NW THURMAN ST
NW NICOLAI ST
NW 25TH AVE
NW 23RD AVE
NW 22ND AVE
NW 21ST AVE
NW 19TH AVE
30B
30
26
5

2020

September 12, 2016

Mitigation Action Plan (MAP)

Critical Infrastructure

Legend

City Boundary

Risk Reporting Area West/Northwest

Utility Systems*

- Electrical
- Natural Gas Facilities
- Communication Facilities
- Petroleum Facilities
- Potable Water Facilities
- Wastewater Facilities

Transportation Systems*

- Railway Tunnels, Bridges, and Facilities
- Light Rail Tunnels, Bridges, and Facilities
- Highway Tunnels and Bridges
- Bus Facilities
- Port and Airport Facilities

*Due to security reasons, some utility and transportation system components have been left off of the map.

NORTH

0 0.4 0.8 Miles

Sources: TriMet-2015; Port of Portland-2015; OPHS-2016; City of Portland-2011, 2015;2016; OPB-2016; PTS-2015; FEMA-2015; Kinder Morgan-2015

PBEM

2021

September 12, 2016
Mitigation Action Plan (MAP)
Regulatory Landslide Hazard Area
Legend
City Boundary
Historic Landslide Deposits
Landslide Hazard Area
Risk Reporting Area West/Northwest
NORTH
0 0.4 0.8 Miles
Sources: DOGAMI-2015; City of Portland-2015, 2016
PBEM
NW GERMANTOWN RD
NW MILLER RD
NW THOMPSON RD
NW 61ST AVE
NW FRONT AVE
NW ST HELENS RD
NW THURMAN ST
NW NICOLAI ST
NW 25TH AVE
NW 23RD AVE
NW 22ND AVE
NW 21ST AVE
NW 18TH AVE
NW CORNELL RD
W BURNSIDE RD
SW FAIRVIEW BLVD
30B
30
26
405

2022

September 12, 2016

Mitigation Action Plan (MAP)

Liquefaction Susceptibility

Legend

City Boundary

Liquefaction Susceptibility

Type

- 0 -- None
- 1 -- Very Low
- 2 -- Low
- 3 -- Moderate
- 4 -- High
- 5 -- Very High

Risk Reporting Area West/Northwest

NORTH

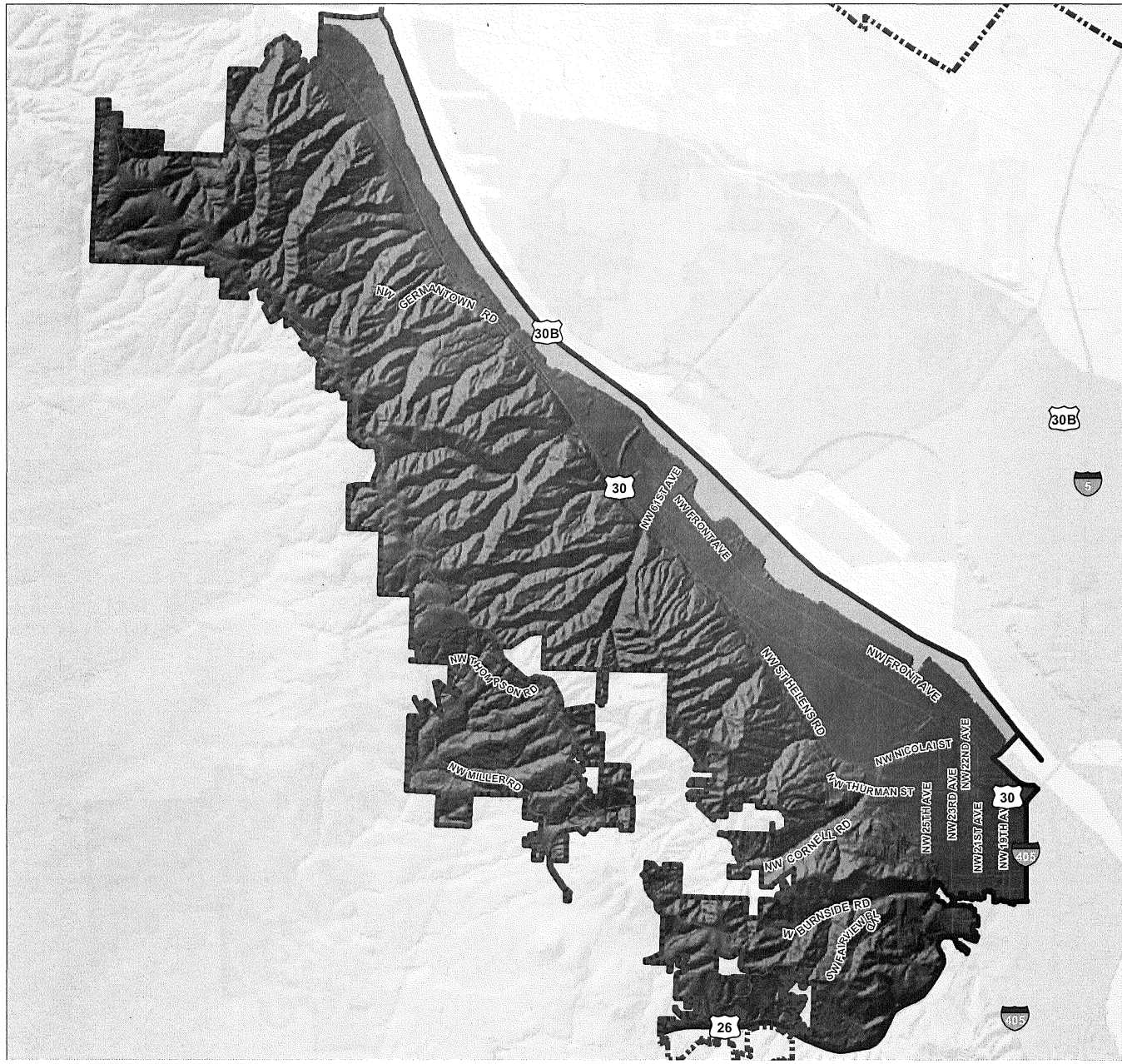
0 0.4 0.8 Miles

Sources: DOGAMI-2013; City of Portland-2016

PBEM

September 12, 2016
Mitigation Action Plan (MAP)
National Earthquake Hazards Reduction Program Soils
Legend
City Boundary
NEHRP Soils
Type
B
C
D
E
Risk Reporting Area West/Northwest
NORTH
0 0.4 0.8
Miles
Sources: DOGAMI-2012; City of Portland-2016
PBEM
NW GERMANTOWN RD
30B
30
NW 61ST AVE
NW FRONT AVE
NW STHELENS RD
NW THURMAN ST
NW NICOLAI ST
NW 25TH AVE
NW 23RD AVE
NW 22ND AVE
NW 21ST AVE
NW 19TH AV
26
W BURNSIDE RD
SW FAIRVIEW BLVD
NW CORNELL RD
NW THOMPSON RD
NW MILLER RD

2024



September 12, 2016

Mitigation Action Plan (MAP)

Portland Hills 6.5 Magnitude Earthquake-Peak Ground Acceleration

Legend

City Boundary

Portland Hills M6.5 earthquake PGA

Potential Damage - Perceived Shaking

- V -- Very Light - Moderate
- VI -- Light - Strong
- VII -- Moderate - Very Strong
- VIII -- Moderate/Heavy - Severe

Risk Reporting Area West/Northwest

NORTH

0 0.4 0.8 Miles

Sources: USGS-2009; City of Portland-2016

PBEM

September 12, 2016

Mitigation Action Plan (MAP)

Volcano Hazard Area

Legend

- City Boundary
- Volcano Hazard Area
- Risk Reporting Area West/Northwest

NORTH

0 0.4 0.8 Miles

Sources: USGS-1997; City of Portland-2016

PBEM

2026

NW GERMANTOWN RD
NW THOMPSON RD
NW MILLER RD
NW 61ST AVE
NW FRONT AVE
NW ST HELENS RD
NW CORNELL RD
W BURNSIDE RD
SW FAIRVIEW BLVD
NW THURMAN ST
NW NICOLAI ST
NW 25TH AVE
NW 23RD AVE
NW 22ND AVE
NW 21ST AVE
NW 19TH AVE
30B
30
26
September 12, 2016
Mitigation Action Plan (MAP)
Wildfire Hazard Area
Legend
City Boundary
Wildfire Hazard Area
Risk Reporting Area West/Northwest
NORTH
0 0.4 0.8 Miles
Sources: City of Portland-2002, 2016
PBEM

2027

The Mitigation Action Plan

Appendix F. Data Sources and Methods Used for Mapping

2028

F. Data Sources and Methods Used for Mapping

EARTHQUAKE MAPPING

Liquefaction Susceptibility

Liquefaction data was provided by the Oregon Department of Geology and Mineral Industries (DOGAMI). This database accompanies DOGAMI Open-File Report O-13-06 (Madin and Burns, 2013). The liquefaction mapping uses the methods of Hazus-MH MR4 to create new liquefaction susceptibility data for Oregon. Hazus assigns susceptibility classes based on geology. For this map, the geology was primarily taken from the Oregon Geologic Data Compilation (OGDC 5) and Statewide Landslide Information Layer for Oregon (SLIDO-2), with some coming from published liquefaction studies. The methods and data used to make this map are described in detail in Madin and Burns, 2013.

National Earthquake Hazard Reduction Program Soils

National Earthquake Hazard Reduction Program (NEHRP) site class data was provided by DOGAMI. This database accompanies DOGAMI Open-File Report O-13-06 (Madin and Burns, 2013). The NEHRP soils mapping uses measured shear wave velocity data, estimated shear wave velocity data from the literature, and geologic data primarily taken from OGDC 5 and SLIDO-2, with some coming from published earthquake hazard studies. The methods and data used to make this map are described in detail in Madin and Burns, 2013.

Landslide Susceptibility

Landslide susceptibility data was provided by DOGAMI. This database accompanies DOGAMI Open-File Report O-13-06 (Madin and Burns, 2013). This map uses the methods of Hazus-MH MR4 to create a new landslide susceptibility map for Oregon. Hazus assigns susceptibility classes based on the combination of three geologic material classes and six slope classes. The geologic material classes were derived from the OGDC 5, SLIDO-2, and several other published geologic maps. Slope data was derived from a mosaic of all Oregon Lidar Consortium Lidar topography available at the time and the USGS 30-meter digital elevation model. The methods and data used to make this map are described in detail in Madin and Burns, 2013.

Probabilistic Peak Ground Acceleration Maps

Probabilistic peak ground acceleration data are generated by Hazus-MH 2.2. In Hazus' probabilistic analysis procedure, the ground shaking demand is characterized by spectral contour maps developed by the U.S. Geological Survey (USGS) as part of a 2008 update of the National Seismic Hazard Maps. USGS probabilistic seismic hazard maps are revised about every six years to reflect newly published or thoroughly reviewed earthquake science and to keep pace with regular updates of the building code. Hazus includes maps for eight probabilistic hazard levels: ranging from ground shaking with a 39-percent probability of being exceeded in 50 years (100-year return period) to the ground shaking

with a 2-percent probability of being exceeded in 50 years (2,500-year return period). Earthquake mapping for this plan used the 100-year and 500-year probabilistic events.

Shake Maps

A shake map is designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes. Ground motion and intensity maps are derived from peak ground motion amplitudes recorded on seismic sensors (accelerometers), with interpolation based on estimated amplitudes where data are lacking, and site amplification corrections. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and Modified Mercalli intensity. For this plan, shake maps were prepared for two earthquake scenarios:

- An earthquake on the Cascadia Subduction Zone with the following characteristics:
  - Magnitude: 9.0
  - Epicenter: N 45.73 W 125.13
  - Depth: 20 km
- An earthquake on the Portland Hills Fault with the following characteristics:
  - Magnitude: 6.5
  - Epicenter: N 45.55 W 122.8
  - Depth: 0 km

FLOOD MAPPING

Flood hazard areas are mapped as depicted on effective FEMA Digital Flood Insurance Rate Maps dated December 2014. Repetitive flood loss and active NFIP policy data was provided by FEMA as of November 30, 2014. Property addresses were geocoded and then mapped at a citywide scale.

LANDSLIDE MAPPING

The landslide hazard exposure analysis used combination of areas drawn from two sources: regulatory landslide hazard area and historical landslide deposits.

Landslide Hazard Area

Landslide hazard area data was provided by the City of Portland. The regulatory landslide hazard area map was created from three sources:

- Areas identified and mapped by Oregon Metro as earthquake hazard areas
- Areas delineated as zones of high landslide potential in a study conducted by Portland State University based on the mapping of more than 676 landslide events that occurred as a result of the February 1996 storms
- All land within the City that has a slope of 15 percent or greater.

Historical Landslide Deposits

Historical landslide deposit data was provided by the City of Portland and created by DOGAMI as part of the SLIDO Release 3.2 (December 29, 2014). The database is an inventory of existing landslides

and includes supplemental photos taken by staff geologists while performing landslide related field work.

The landslide inventory is one of the essential data layers used to delineate regional landslide susceptibility. This inventory is not regulatory, and revisions can happen when new information regarding landslides is found or when future new landslides occur. Therefore, it is possible that landslides within the mapped area were not identified or occurred after the data was prepared.

This data was prepared by following the *Protocol for Inventory Mapping of Landslide Deposits from Light Detection and Ranging (Lidar) Imagery* developed by Burns and Madin (DOGAMI Special Paper 42, 2009). The three primary tasks include compilation of previously mapped landslides, Lidar-based morphologic mapping of landslide features, and review of aerial photographs. Landslides identified by these methods are digitally compiled into this database at varying scales. The recommended map/use scale for these data is 1:8,000.

Each landslide is also attributed with classifications for activity, depth of failure, movement type, and confidence of interpretation. The landslide inventory is intended to provide users with basic information regarding landslides. The geologic, terrain, and climatic conditions that led to landslides in the past may provide clues to the locations and conditions of future landslides, and it is intended that this data will provide useful information to develop regional landslide susceptibility maps, to guide site-specific investigations for future developments, and to assist in regional planning and mitigation of existing landslides.

WILDFIRE MAPPING

Wildfire hazard data created in 2002 by Metro Data Resource Center was provided by the City of Portland. ORS 93.270(4) changed the Oregon Building Code to encourage local governments to voluntarily designate portions of their jurisdictions subject to catastrophic fire as wildfire hazard zones. The purpose of these zones is to define areas where buildings need to be made more survivable from fires spreading through adjacent wildlands. This analysis and map identify wildfire hazard zones within the City of Portland. The methodology used to identify wildfire hazard zones data is described in detail on the Wildfire Hazard Zone Map created by the Metro Data Resource Center for Portland Fire & Rescue, dated October 11, 2002.

DAM FAILURE MAPPING

Inundation area data for Mt. Tabor Reservoirs Nos. 1, 5 and 6 and Washington Park Reservoirs Nos. 3 and 4, provided by the City of Portland Water Bureau, identifies areas where warnings or evacuations may be required due to a failure of the reservoirs. The original inundation area maps were created for the reservoirs' Emergency Action Plans. The DAMBRK model for the Mt. Tabor reservoirs was created and run in March 1999 to develop the original data, using a peak flow of 5,630 cubic feet per second from Reservoir No. 1, 25,400 cubic feet per second from Reservoir No 5, and 23,940 cubic feet per second from Reservoir No. 6.

VOLCANO HAZARD MAPPING

Digital Data for Volcano Hazards in the Mount Hood Region, Oregon was downloaded from the USGS Cascades Volcano Observatory (CVO) website. Scientists at the CVO created the volcanic hazards data to delineate proximal and distal hazard zones that could be affected by lahars in the event of an eruption. This dataset was generated with a combination of computer modeling and geologic evidence

of past events at Mt. Hood as recorded in deposits. These volcanic hazard zones are intended for use by public and private agencies to view, overlay with other GIS datasets, and make maps of volcanic hazards from potential future eruptions of Mount Hood.

The hazard zones delineated in this data set portray volcanic events believed most likely from future activity at Mount Hood. Areas outside the hazard zones, especially those having low relief, should not be regarded as hazard-free. Too many uncertainties exist in source, size, and mobility of future events to locate boundaries of zero-hazard zones with confidence. The degree of hazard does not change abruptly at the hazard zone boundaries. Rather, a volcanic hazard decreases gradually with increased distance from the volcano and above the valley floor. Volcanic hazards also span a range of size and recurrence.

REFERENCES

Burns, William J. and Kate Mickelson. Oregon Department of Geology & Mineral Resources.

Costa, John E., 1997, Hydraulic modeling for lahar hazards at Cascade volcanoes: Environmental & Engineering Geoscience, V. 3, No. 1, pp. 21-30.

Madin, I.P., and Burns, W.J., 2013, Ground motion, ground deformation, tsunami inundation, coseismic subsidence, and damage potential maps for the 2012 Oregon Resilience Plan for Cascadia Subduction Zone Earthquakes; Oregon Department of Geology and Mineral Industries Open-File Report O-13-06.

Schilling, Steve P. and Iverson, Richard M., 1997, Automated, reproducible delineation of zones at risk from inundation by large volcanic debris flows: in Chen, C. (editor), Hazards mitigation: mechanics, prediction, and assessment, Proceedings of first international conference, American Society of Civil Engineers, pp 176-186.

Scott, W.E., Pierson, T.C., Schilling, S.P., Costa, J.E., Gardner, C.A., Vallance, J.W., and Major, J.J., 1997, Volcano hazards in the Mount Hood Region, Oregon: U.S. Geological Survey, Open-file Report 97-89, 14 p.

Appendix G. Risk Assessment Data Gaps and Limitations

G. Risk Assessment Data Gaps and Limitations

HAZARD DATA GAPS

Data Layer	Data Gaps	Effect on Risk Assessment
Flood		
Finished floor elevations	This information is only available as individual elevation certificates. In order to incorporate this information into the Hazus analysis, the elevation values would need to be extracted from the certificates into a database that can be linked to the buildings data.	The first floor elevation, in conjunction with the flood depth grid value, is used to determine the depth of flooding at a particular building. The extent of damage to the building and its contents is then estimated from the depth of flooding by the application of a depth-damage curve associated with the Hazus occupancy class for the building. If the building-specific finish floor elevation is not available, a default value is used. This default value is based on the year the structure was built and the foundation type. Using default first floor elevation values results in less accurate damage estimates.
Earthquake		
Liquefaction susceptibility	Portland Water Bureau recently completed a liquefaction susceptibility dataset. This dataset will need to be vetted by other City bureaus. The next MAP update should incorporate this data in the earthquake analysis.	The current DOGAMI data has been produced at a state-level scale. The new Water Bureau data should be at a scale more appropriate for a city-level analysis.
Landslide susceptibility	DOGAMI is currently working on a new landslide susceptibility dataset that will be completed by the end of 2016. The next MAP update should incorporate this data in the earthquake analysis.	The current DOGAMI data has been produced at a state-level scale. The new DOGAMI data is being produced at a county-level scale and should provide more detail for a city-level analysis. The new DOGAMI data is also being produced using LiDAR data and the latest methodology.
Landslide		
Regulatory landslide hazard area	DOGAMI is currently working on a new landslide susceptibility dataset that will be completed by the end of 2016. The next MAP update should incorporate this data in the landslide analysis.	The current DOGAMI data has been produced at a state-level scale. The new DOGAMI data is being produced at a county-level scale and should provide more detail for a city-level analysis. The new DOGAMI data is also being produced using LiDAR data and the latest methodology.
Historic landslide deposits	DOGAMI is currently working on a new landslide susceptibility dataset that will be completed by the end of 2016. The next MAP update should incorporate this data in the landslide analysis.	The current DOGAMI data has been produced at a state-level scale. The new DOGAMI data is being produced at a county-level scale and should provide more detail for a city-level analysis. The new DOGAMI data is also being produced using LiDAR data and the latest methodology.
Wildfire		
Wildfire hazard	This dataset was created in 2002, the City may update this data. The next MAP update should incorporate the updated data in the wildfire analysis.	An updated version of this data will most likely be created from current LiDAR data and include updated vegetation data. Any increase in the level of accuracy and level of detail will improve the exposure analysis.
Climate Change		
N/A	No data available for scenario-based future modeling.	

BUILDING DATA GAPS

Data Layer	Data Gaps	Effect on Risk Assessment
Building footprints with added tax assessor data	The use description attribute was incomplete. Secondary descriptions and zoning attributes were used when the primary use description was not available.	The use description information is critical to assigning the correct Hazus occupancy classes to the buildings. The occupancy class is used in a number of ways including determining replacement costs and assigning damage curves for the flood and earthquake analyses.
	For residential buildings with both finished and unfinished basement square footage there was not information on how the square footage was divided between finished and unfinished. In this situation, it was assumed that the square footage was divided 50/50 between finished and unfinished.	Finished and unfinished square footage are used in the replacement cost calculation. Accurate square footage values result in more accurate replacement cost values.
	Attached garage square footage was not included so only detached garage information was used in the replacement cost calculation.	Garage square footage is used in the replacement cost calculation. Attached garage square footage values would result in more accurate replacement cost values.
	Construction class information (economy, average, luxury) was not available. This information is stored in the permitting system, but it is not possible to extract and associate it with the building data.	Construction class information for single-family residential buildings is used to determine the appropriate cost per square foot values used in the replacement cost calculation. For this risk assessment, all buildings were considered to have an average construction class. Using the actual construction class would result in more accurate replacement cost values.
	Construction material information was not available except for unreinforced masonry buildings.	Construction material information is used to assign damage curves for the earthquake analysis. For this risk assessment, default construction material values based on the Hazus occupancy class and year built were assigned. Using the actual construction material would result in the use of the most appropriate damage curves and more accurate damage estimates.
	Foundation type information was incomplete.	Foundation type information is used to assign damage curves for the flood analysis. For this risk assessment, default foundation type values based on the Hazus occupancy class were assigned when actual values were not available. Using the actual foundation type would result in the use of the most appropriate damage curves and more accurate damage estimates.
Low income URM buildings	Data not available.	

CRITICAL FACILITIES DATA GAPS

Data Layer	Data Gaps	Effect on Risk Assessment
Emergency Operation Centers		
Emergency Operation Centers	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Fire Stations		
Fire stations	Owner and replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Fireboat facilities	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Medical Care Facilities		
Hospitals	An attribute with the numbers of beds would have been useful when assigning the Hazus analysis class. Replacement cost values not available.	Using the correct Hazus analysis class provides the most accurate estimate of damage. Damage estimates in dollars not available when ranking risk and determining mitigation actions.

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Data Layer	Data Gaps	Effect on Risk Assessment
Police Stations		
Police Bureau facilities	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Non-Police Bureau facilities	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Schools		
Schools	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Dams		
Dams	Construction information was incomplete, this information is useful for assigning Hazus analysis class. Replacement cost values not available.	Using the correct Hazus analysis class provides the most accurate estimate of damage. Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Hazardous Materials		
Hazardous material facilities	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Military Facilities		
Armories	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Military installations	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Nuclear Power Plants		
Nuclear reactors	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Air Transportation Facilities		
Airports	Hazus has analysis classes for many of the individual buildings/terminals at an airport. The available data did not have this level of detail.	Building-level information could help refine any mitigation actions specific to the airport.
Helipads	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Bus Facilities		
Transit centers	Information that distinguishes between transit centers that are enclosed structures versus park and ride lots would have been useful when assigning the Hazus analysis class. Replacement cost values not available.	Using the correct Hazus analysis class provides the most accurate estimate of damage. Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Bus facilities	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Highway Facilities		
Highway bridges	City of Portland data provided spatial locations of bridges and HITRAC data provided descriptive information, including the Hazus analysis class, scour index and replacement cost. Unknown if replacement cost values are accurate.	Damage estimates in dollars may not be accurate.
Highway tunnels	Information on type of tunnel - bored or cut and cover - would have been useful when assigning Hazus analysis class. Replacement cost values not available.	Using the correct Hazus analysis class provides the most accurate estimate of damage. Damage estimates in dollars not available when ranking risk and determining mitigation actions.

Data Layer	Data Gaps	Effect on Risk Assessment
Light Rail Facilities		
Light rail bridges	Information about the bridge construction would have been useful when assigning Hazus analysis class. Replacement cost values not available.	Using the correct Hazus analysis class provides the most accurate estimate of damage. Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Light rail facilities	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Light rail tunnel	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Port Facilities		
Port facilities	Data was not provided in a GIS format. Used information in Seismic Risk Assessment report and orthoimagery to locate facilities.	Increased level of effort to analyze these facilities.
Rail Facilities		
Rail bridges	City of Portland data provided spatial locations of bridges and HITRAC data provided descriptive information, including the Hazus analysis class, scour index and replacement cost. Unknown if replacement cost values are accurate.	Damage estimates in dollars may not be accurate.
Rail facilities	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Rail tunnel	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Communications Facilities		
Transmitters 800MHz	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
CenturyLink offices	This data only includes CenturyLink offices, offices for other companies are not included. Replacement cost values not available.	Potentially missing facilities that could affect the determination of mitigation actions. Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Communication facilities	Default data is likely out of date and doesn't cover all radio and TV broadcasting facilities in the City. Replacement cost values are not available.	Potentially missing facilities that could affect the determination of mitigation actions. Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Other communications facilities	Data is not available for other internet facilities or switching hubs.	Potentially missing facilities that could affect the determination of mitigation actions.
Electric Power Facilities		
Electric substations	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Electric facilities	Default data is likely out of date and doesn't cover all radio and TV broadcasting facilities in the City. Replacement cost values are not available.	Potentially missing facilities that could affect the determination of mitigation actions. Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Natural Gas Facilities		
Natural gas facilities	This data may be missing natural gas compressor sites. Replacement cost values are not available.	Potentially missing facilities that could affect the determination of mitigation actions. Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Petroleum Facilities		
Petrol tank farms	Data is missing for several tank farms but majority are included. Replacement cost values are not available.	Potentially missing facilities that could affect the determination of mitigation actions. Damage estimates in dollars not available when ranking risk and determining mitigation actions.

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Data Layer	Data Gaps	Effect on Risk Assessment
Potable Water Facilities		
Well sites	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Reservoirs	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Pump stations	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Potable water facilities	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Wastewater Facilities		
Wastewater facilities	Pump/lift station data did not include capacity information, which would have been useful when assigning Hazus analysis class. Replacement cost values not available.	Using the correct Hazus analysis class provides the most accurate estimate of damage. Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Other Facilities		
Prisons	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
City-owned essential facilities	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Oregon Zoo	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.
Nursing homes/ assisted living facilities	Replacement cost values not available.	Damage estimates in dollars not available when ranking risk and determining mitigation actions.

Appendix H. Prior Plan Goals

H. Prior Plan Goals

For the 2004 NHMP, the Planning Team used the exposure analysis results as a basis for developing the mitigation goals and actions. The City selected the five goals in 2004 to reduce or avoid long-term vulnerabilities to the identified hazards for the five-year planning period.

- Identify risk level and evaluate Portland's vulnerability to natural hazards
- Implement activities to protect human life, property and natural systems
- Promote public awareness, engage public participation and enhance partnerships through education, outreach and coordination of a diverse and representative group of the City's population
- Establish a disaster resilient economy
- Build and support the capacity and commitment to continuously become less vulnerable to hazards

For the 2010 NHMP update, the Planning Team evaluated the 2004 NHMP's goals and determined they needed to modify them to better meet the city's changing needs. The City determined the seven goals to more clearly focus their long-term efforts to reducing risk and vulnerabilities to the identified hazards.

- Update the Risk Assessment and Vulnerability Analysis every five years
- Implement actions to prepare, protect, preserve and restore life, property and natural systems
- Promote public outreach to a variety of City populations
- Improve City of Portland's economic resilience through inclusion of the private sector into mitigation action implementation
- Commit to continuously reducing the City's natural hazards vulnerability
- Maximize mitigation effectiveness by taking a comprehensive approach to natural resource management via city plans, codes and programs that increase mitigation efforts
- Coordinate mitigation activities with regional communities and agencies

Appendix I. Mitigation Best Practices Catalog

I. MITIGATION BEST PRACTICES CATALOG

BACKGROUND INFORMATION

Risk is defined as being a function of the:

- Hazard
- Exposure
- Vulnerability
- Capability.

Risk can be reduced through mitigation by manipulating the hazard, reducing exposure to the hazard, reducing the vulnerability and/or increasing capability. And, where mitigation is not yet possible, the risk can be reduced through preparation, response or/and recovery.

Over the course of developing *The Mitigation Action Plan* (MAP), the following catalogs were developed from best practices, steering committee recommendations and stakeholder input. These catalogs are not meant to be exhaustive, but to inspire thought. It is expected that the City of Portland, in collaboration with stakeholders, will take these ideas and concepts and look for specific ways to apply them for their own particular needs/situation. These actions should be refined to add additional specificity and clarity as needed.

The City of Portland, its residents and its businesses are already engaged in many of these activities. In addition to identifying new actions, Bureaus may want to select actions that continue existing plans and programs. In general in selecting actions, the City of Portland and its stakeholders should capitalize on strengths and look for opportunities to overcome obstacles and weaknesses.

STEERING COMMITTEE TOP-RATED ACTIONS AND CEI HUB REPORT RECOMMENDATIONS

The following actions were selected as top-rated actions by the steering committee and/or were recommendations developed from the Critical Energy Infrastructure (CEI) Hub report.

Hazard (source)	Refined Action	Total Votes
All Hazards (SC-1)	For each hazard of concern, develop a simple report card that identifies the risk in each category and the progress made on identified performance metrics. Include a sheet with "plain talk" language explaining any references to government reports and emergency codes. Include this information in the annual progress report. Share the results annually in several very public ways (e.g. press release, community group networks, posted on website). Develop a system to ensure that members of the public have received the information.	11
All Hazards (SC-3)	Fund disability community-based organization to build resiliency skills and capacity of people with disabilities to be engaged as a part of a resilient community response	5
All Hazards (SC-4)	Develop an inventory of critical facilities that includes those facilities critical to underserved populations and other community groups. Once developed, keep this inventory up to date.	5
All Hazards (SC-210)	Prior to and during implementation, review all actions for negative externalities and to ensure vulnerable populations are protected from displacement or other disproportionate burdens.	Note – not included in voting
Dam Failure (SC-5)	Collaborate with Multnomah County Drainage District to get flooding impact studies from levy failure and develop a risk assessment using the updated general building stock, critical facility and demographic information developed for the mitigation action plan.	4
Dam Failure (SC-8)	Continue to monitor risk from Mt. Tabor reservoirs. Re-evaluate the proposal to retain 85% capacity, and consider reflecting pools instead.	3
Dam Failure (SC-10)	Collaborate with Clackamas County to get dam inundation areas from upstream dams that might affect Portland and develop a risk assessment using the updated general building stock, critical facility and demographic information developed for the mitigation action plan.	2
Drought (SC-12)	Promote drought-resistant landscaping and planting that supports native fauna including pollinator insects and migratory birds.	5
Earthquake (SC-13)	Expand ATC-20 trainings and certifications to increase pool of damage assessment team members.	6
Earthquake (SC-14)	Lobby for increased funding for seismic retrofits and the creation of a statewide committee on CEI hub partial or complete relocation. (Office of Government Relations)	16
Earthquake (SC-16)	Ensure that every Bureau has inventoried critical assets and reviewed critical infrastructure vulnerability and has identified a 50-year plan to strengthen, retrofit, relocate or otherwise increase resiliency. Consider ways to promote citywide collaboration and prioritization of resiliency efforts.	16
Earthquake (SC-18)	Collaborate with PSU to identify buildings (public and other institutions) that exceed life safety standards and are likely to be useable for government functions and other purposes after various earthquake events.	6
Earthquake (SC-23)	Appoint and fund a City of Portland Seismic Resiliency Officer	9
Earthquake (SC-24)	Develop incentives and regulations that promote, encourage and/or require seismic retrofits of private property (such as multi-family, masonry structures). Potential partner: Home Depot	16
Earthquake (SC-27)	Perform an in depth risk assessment of the transportation network to develop and prioritize mitigation projects to ensure connectivity after an event. Potential partners: PBOT, TSA, Tri-Met and Boat owners/organizations	16
Earthquake (SC-35)	Develop a program with a steady source of funding to provide grants for home retrofits. Devote a certain percentage of available funding to low income homeowners.	6
Earthquake (SC-40)	Encourage and expand personal, family and business preparedness plans and programs.	6

Hazard (source)	Refined Action	Total Votes
Earthquake (SC-42)	Retrofit the water conveyance system.	11
Earthquake (SC-49)	Increase taxes on businesses in high risk areas (Linnton) that are not working to reduce the risk to neighbors and the environment.	7
Earthquake (SC-50)	Appoint a CEI Hub Disaster Resiliency Workgroup to include citizens, business leaders that contribute to the high risk, elected officials and experts. White Paper Report to be made public and to include timelines and plans for change that goes into the "Report Card" and is managed, measured and reported annually.	6
Earthquake (SC-51)	Adopt higher standards for all buildings and reduce height limits.	7
Earthquake (SC-54)	Review alternatives to increase the resilience of the CEI hub and other energy infrastructure. Alternatives may include an update of zoning or building codes, relocation of tank farms out of vulnerable areas, seismic strengthening requirements etc.	12
Earthquake (SC-55)	Develop a study to evaluate how capped sediments behave in major earthquakes and whether there is the potential for toxic sediments below to be released. If such potential exists, promote full removal of sediments.	10
Earthquake (SC-62)	Require seismic upgrading of emergency operations center, fire, police stations by XX date.	7
Earthquake (SC-64)	Incorporate the recommendations of the Unreinforced Masonry Work Group into the mitigation action plan. Ensure work group recommendations are screened using the equity review tool.	12
Earthquake (SC-66)	Require seismic upgrading of public and private soft first story buildings by XX date.	6
Earthquake (SC-67)	Review construction plans for all bridges to determine their susceptibility to collapse and retrofit problem bridges. Work with bridge owners to secure funding and prioritize retrofits/upgrades. Potential Partners: PBOT, ODOT, County	11
Earthquake (SC-71)	Require all new schools and other government buildings to meet OC IV so they can be used as an earthquake emergency shelter. Require strategic strengthening of portions of existing schools. Develop a prioritization strategy for these improvements using an equity assessment.	18
Earthquake (SC-79)	Identify ways to encourage, promote or require U.S. Resiliency Council Certification (e.g. tax incentives, minimum standards, requirement for new public buildings).	7
Flood (SC-81)	Make information available about floodplains (10, 25, 50 and 500) when applying for permits (BDS and BES partnership).	4
Flood (SC-85)	Develop and implement a flood emergency warning text alert system that sends notice to cell phones in identified flood evacuation areas.	4
Flood (SC-87)	Clarify rules and responsibilities within Bureaus during a flood and partner with all Portland Bureaus to identify nonessential staff that can be trained to become dispatch operators so that essential "boots on the ground" personnel can be free to perform recovery actions. (Strengthen cross-training programs)	6
Flood (SC-91)	Expand holistic stormwater management program requiring green infrastructure such as eco-roofs where needed to improve hydraulic system capacity.	12
Landslide (SC-95)	Identify transportation routes likely to be impacted by landslides and identify alternate routes. Communicate this information to the public. Lead Agencies: PBOT, BES and PBEM	7
Landslide (SC-99)	Update landslide chapter in 2017 when new DOGAMI data can be included.	3
Landslide (SC-100)	Provide notice to property owners and other residents, including renters and transient populations) of location in high landslide risk areas. Consider mandatory renter disclosure. Consider posting signage. Potential Partners: DOGAMI and PSU	3
Landslide (SC-102)	Encourage property owners and developers to actively manage hillsides and landslide hazard areas to reduce risk from landslides. Develop a brochure describing risk and potential mitigation techniques. Incorporate landslide risk into invasive species management plans. Lead Agencies: BDS and BES	7
Landslide (SC-103)	Perform an assessment of drainage and erosion conditions in identified risk areas.	3

Hazard (source)	Refined Action	Total Votes
Landslide (SC-105)	Examine zoning and building codes and provide recommendations for increasing or decreasing permeable surfaces in landslide risk areas.	4
Landslide (SC-106)	Investigate the feasibility of expanding requirements for eco-roofs to include high landslide risk areas.	6
Landslide (SC-107)	Incorporate the retrofitting of existing infrastructure into the stormwater management plan.	3
Landslide (SC-112)	Adopt higher regulatory standards or rezone for new development within unstable slope areas.	5
Landslide (SC-123)	Consider adding a liability or risk clause to agreements with developers that develop in high risk areas and areas that would be impacted by landslides. Ensure that any actions are reviewed for equity considerations.	8
Severe Weather (SC-126)	Improve public warning and information systems for severe weather events. Ensure that communication is easy to understand, gives clear direction, timely, is available in multiple languages and reaches all populations. Potential Partners: County, disabled population, families and organizations that serve them.	7
Severe Weather (SC-127)	Coordinate and clarify pre- and post-severe weather event responsibilities within and among the Bureaus.	2
Severe Weather (SC-130)	Support redundant public transit systems that are reliable and prepared for severe weather.	2
Severe Weather (SC-134)	Overlay tree database with soils that area likely to saturate. Inform property owners/residents of risk and warning signs and provide information on possible mitigation measures.	3
Severe Weather (SC-137)	Identify ways to increase ice storm/snow response capabilities.	3
Severe Weather (SC-141)	Continue to fund and utilize the LENST text based warning system for severe weather notifications.	2
Severe Weather (SC-147)	Partner with Multnomah County to develop a more robust sheltering plan. Develop an established protocol for partnering with schools that includes a reunification plan. Provide more public outreach and information on cooling and heating shelters and when they are open. Ensure plans and program meet the needs for all populations. Potential Partners: County, disabled population, families and organizations that serve them	8
Space Weather (SC-151)	Continue to research best available science and data for space weather and potential impacts to the City of Portland.	2
Volcanic Hazards (SC-154)	Develop a partnership to use Wireless Emergency Alerts, Emergency Alert System or Community Emergency Notification System on volcano/ash fall alerts and awareness of evacuation procedures (PBEM and OEM)	1
Wildfire (SC-160)	Identify facilities with volatile/hazardous materials from high risk wildfire areas (e.g., hazardous chemicals that can spread the fire, cause additional serious health and environment concerns, trigger a chain reaction with other facilities due to the spread of the chemicals and/or the spreading fire resulting from the chemical release) and consider transfer, relocation or other mitigation efforts.	8
Wildfire (SC-161)	Identify invasive species that are fire hazards (e.g., scotch broom). Educate the public on these species and work to eradicate/greatly reduce them, especially in high risk areas	4
Wildfire (SC-163)	Require defensible spaces and water turrets around structures in wildfire risk areas.	6
Wildfire (SC-165)	Identify and publish a list of plants that are severe fire hazards.	3
Wildfire (SC-173)	Increase funding for Rangers outreach, surveys, patrols in general to let people know about smoking/campfire risk (especially in forest park)	6
Wildfire (SC-180)	Continue to research ways to balance the needs between fire safety flow requirements and water quality requirements.	3
Wildfire (SC-181)	Strengthen site and building design standards in wildfire risk areas.	6
Wildfire (SC-191)	Partner with the Forest Park Conservancy and individual land owners to develop a fire risk reduction plan for Forest Park.	3
Wildfire (SC-206)	Provide funding to better maintain fire access roads in Forest Park for response and evacuation needs as well as increased daily access for disabled/mobility challenged populations	4

Hazard (source)	Refined Action	Total Votes
All Hazards (CEI Hub-1)	CEI Hub Disaster Resiliency Workgroup – see report for more details	N/A
All Hazards (CEI Hub-2)	Update/enhance CEI Hub Risk Assessment – see report for more details	N/A
All Hazards (CEI Hub-3)	Regulatory Amendment – see report for more details	N/A
All Hazards (CEI Hub-4)	Emergency Response/Recovery Regulatory Waivers – see report for more details	N/A
All Hazards (CEI Hub-5)	Planning – see report for more details	N/A
All Hazards (CEI Hub-6)	Back-up power – see report for more details	N/A
All Hazards (CEI Hub-7)	Training and exercises – see report for more details	N/A
All Hazards (CEI Hub-8)	Facility retrofits– see report for more details	N/A
All Hazards (CEI Hub-9)	Land use repurposing – see report for more details	N/A

BEST PRACTICES AND PLANNING PROCESS ACTIONS

The following actions were developed from best practices and other stakeholder input. Actions shown include general mitigation best practices as well as actions identified through the steering committee planning process.

All Hazards

General Mitigation Best Practice—All Hazards			
Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Public (Individual) Scale			
• None	• None	• Apply for permits as required and follow established building codes • Perform a vulnerability check on personal property	• Educate yourself on risk reductions methods • Educate yourself on early warning procedures • Purchase insurance for your home and valuables • Volunteer on community mitigation projects. • Develop household mitigation plan, such as creating a retrofit savings account, communication capability with outside, 2 week self-sufficiency during an event • Prepare a family post-disaster action plan • Get to know your neighbors • Participate in perishable data capture programs
Private (Business) Scale			
• None	• None	• Establish/participate in a business-to-business mitigation mentoring program. • Perform a vulnerability check on property	• Educate your employees on the probable impacts from hazard events • Develop a Continuity of Operations Plan • Participate in perishable data capture programs

General Mitigation Best Practice—All Hazards			
Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Government Scale			
• None	• Relocate critical facilities out of known hazard areas • Prohibit or limit public expenditures for capital improvements in known hazard areas • Acquire safe sites for public facilities (e.g., schools, police/fire stations, etc.) • Prohibit new facilities for persons with special needs/mobility concerns in hazard areas. • Prohibit animal shelters in known hazard areas	• Retrofit critical facilities within known hazard areas. • Organize a managed retreat from very high-risk areas. • Promote open space uses in identified high hazard areas via techniques such as: PUD's, easements, setbacks, greenways, sensitive area tracks • Acquire property in high hazard areas for use as open space • Offer expanded development rights to developers/businesses for performing mitigation retrofits • Incorporate mitigation retrofits for public facilities into the annual capital improvements program. • Installing quick-connect emergency generator hook-ups for critical facilities	• Develop an all hazards public education campaign and resource center • Promote the purchase of insurance in known hazard areas • Designate high-risk zones as special assessment districts (to fund necessary hazard mitigation projects) • Incorporate a stand-alone element for hazard mitigation into the local comprehensive (land use) plan. • Develop a post-disaster reconstruction plan to facilitate decision making following a hazard event. • Involve citizens in comprehensive planning activities that identify and mitigate hazards • Adopt a post-disaster recovery ordinance based on a plan to regulate repair activity, generally depending on property location. • Adopt the International Building Code (IBC) and International Residential Code (IRC) • Increase the local Building Code Effectiveness Grading Schedule classification through higher building code standards and enforcement practices. • Identify a funding mechanism for a local match to Federal funds that can fund private mitigation practices. • Identify and strengthen facilities so that they can function as public shelters • Provide hazard vulnerability checklists for homeowners to conduct their own inspections • Establish a technical assistance program for residents to access data or resources for mitigation purposes • Develop mutual aid agreements with other local governments/organizations • Warehouse critical infrastructure components such as pipe, power line, and road repair material • Develop a Continuity of Government Plan • Provide technical information and guidance during permitting and development process • Form a citizen plan implementation steering committee to monitor progress of local mitigation actions. Include a mix of representatives from neighborhoods, local businesses, and local government.

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Actions Identified by Steering Committee—All Hazards	
Reduce Vulnerability	Increase Capability
Government Scale	
• Continue mitigation programs started by some bureaus (water/BES) and incorporate those programs into the mitigation action plan • Replicate mitigation best practices developed by some bureaus in bureaus that do not have a strategy for incorporating mitigation into standard operating procedures • Follow through with new/stronger Comprehensive Plan policies that set the stage for updating regulations and enhancing investments (implement these policies) • Continue to develop and institutionalize an asset management approach to budgeting and prioritizing infrastructure upgrades • Incorporate all hazard risk information into codes and policies and ensure that permits meet regulations for risk aversion and update as needed (especially environmental overlay zones)	• Continue to collect and update data on population, building stock, etc. and look for opportunities to capture and incorporate missing hazard-related data • Continue to utilize subject matter expertise (e.g. keep certified floodplain managers on staff, partner with Cascade Volcano Observatory) in order to inform residents, businesses and other city staff of hazard risk and mitigation opportunities and gaps • Continue to work on engaging the public in hazard mitigation. Capitalize on civic, city and neighborhood pride. Use this messaging in framing mitigation. • Continue to seek/develop unique funding opportunities for mitigation projects and to seek grant opportunities whenever they are available. • Partner with creative industries that excel at education and marketing ideas and concepts to the general public • Continue to retain and hire City staff that is competent and cares about mitigation • Establish a program to systematically review and update regulations that address hazard risk • Establish a process to coordinate/ partner with local, state and federal agencies to maintain up-to-date hazard data, maps, and assessments. • Continue to build on strong community engagement standards • Continue to develop and expand the NET program and engage NET volunteers • Integrate the mitigation action plan with existing plans and programs such as CRS, climate action plan, Comprehensive Plan etc.) • Develop a bureau-wide mitigation working group for greater collaboration and information sharing • Develop and implement successful, effective, institutionalized systems, especially for equitable mitigation • Continue to seek ways to meaningfully engage non-English speaking and other underserved populations • Seek ways to promote the mitigation of private property. • Incorporate mitigation priorities into goals/missions of applicable bureaus • Seek novel ways to influence traditional processes • Maintain existing hazard databases and establish a program for collection of perishable data after hazard events • Seek opportunities to incorporate psychological preparedness and education into preparedness and mitigation related programs • Emphasize the need for endurance in post-disaster planning (e.g. more than 72 hours preparation) • Develop strategy to overcome risk from existing development patterns and seek opportunities to incentivize mitigation of private property • Utilize the natural features and resources of Portland in planning for and mitigation from natural hazards • Focus on developing strategies that capture opportunities associated with the growing population and growth in the region • Perform an extensive literature and internal review of mitigation processes and practices that have provided beneficial results. Look to other communities such as LA, New Zealand, Japan. • Develop a bumper stick that says "keep" Portland Prepared • Ensure each action is measureable, tracked and shared publicly • Utilize informed, local media to increase publicity about mitigation • Engage local celebrities in sharing the mitigation message (Portlandia's Fred Armisen and Carrie Brownstein, actors from Grimm, the Blazers, the Timbers!) • Establish equitable criteria for action development and prioritization of actions. • Give the City the "right of refusal" after a major event • Develop games/fun activities about preparing ahead and surviving a disasters • Develop a recovery plan for the City of Portland. • Develop one "elevator speech" item per bureau. One action item that cannot be accomplished without additional resources • Ensure all actions have an estimated timeframe for completion that is reviewed and updated during the progress reporting process

Actions Identified by Steering Committee—All Hazards	
Reduce Vulnerability	Increase Capability
• Continue to support, incorporate and participate in projects that increase regional and local understanding of climate change and its impacts • Seek input from emergency responders on land use and development codes and regulation • Ensure that relocation programs are implemented equitably.	• Institute a climate change education program for the public that discusses how climate change will impact risk and vulnerability to hazard events • Work with CIRC to educate bureaus and create standard assumptions and models, internal consistency in application of data • Develop a phone tree with local community organizations, such as IRCO. • Identify a list of pre-approved Minority, Women-Owned, and Emerging Small Business contractors for response/recovery efforts • Align budgeting cycle with hazard mitigation priorities – when new funding is requested, require review of MAP priorities • Provide authority for use of the Resilience Bond Model • Build resiliency of city/county information to bounce back/respond to increased customer service demands such as staffing and increased call/email volume. • Fund vulnerable immigrant/refugee organizations • Incorporation of making all action items accessible for safe harbor languages and disability community. • Search and rescue specific for disability community. • Shelter program specifically meeting needs of disability • Convene a working group to provide recommendations on a citywide requirement for full disclosure of known natural hazard risk at time of property sale or transfer. Ensure the committee reviews and provides recommendations on unintended consequences such as lowering of property values in high risk areas and displacement of low income residents to these areas. • Provide notice to property owners and residents in identified dam inundation areas. • Develop an earthquake scenario and perform a risk assessment that assumes dam failure as a secondary hazard.

Dam Failure

General Mitigation Best Practice—Dam Failure			
Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Public (Individual) Scale			
• **None**	• Relocate out of Dam Failure Inundation areas.	• Elevate your home to appropriate levels • Flood-proof your home to appropriate levels	• Learn the evacuation routes for a dam failure event • Educate yourself on early warning procedures. • Purchase flood insurance
Private (Business) Scale			
• **Remove privately owned Dams** • **Strengthen privately owned Dams**	• Replace earthen dams with hardened structures	• Flood proof facilities within Dam Failure Inundation areas • Continue/ensure regularly scheduled engineering assessments of privately owned dams	• Develop and update Emergency Action Plans • Educate employees on dam failure evacuation routes • Educate employees on early warning procedures
Government Scale			
• **Remove government owned Dams** • **Strengthen government owned Dams**	• Replace earthen dams with hardened structures	• Adopt higher regulatory floodplain standards in mapped Dam Failure/Inundation areas. • Consider low density land uses within identified Dam Failure/Inundation areas. • Continue/ensure regularly scheduled engineering assessments • Create easements in impoundment and downstream inundation areas • Study and evaluate impacts from climate change on dam operations	• Enhance Emergency Operations Plan to include a dam failure component. • Institute monthly communications checks with dam operators. Maintain up to date communications list. • Inform the public on risk reduction techniques and develop a communication plan • Adopt real-estate disclosure requirements for the re-sale of property located within Dam Inundation areas. • Establish early warning systems downstream of high hazard dams. • Update evacuation routes and educate the public on those routes • Promote the purchase of flood insurance in inundation areas

Actions Identified by Steering Committee—Dam Failure
Increase Capability
Government Scale
• Update scenario based Dam Failure/Inundation area maps.
• Develop an earthquake scenario and perform a risk assessment that assumes dam failure as a secondary hazard.
• Provide notice to property owners and residents in identified dam inundation areas.

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Drought

General Mitigation Best Practice—Drought			
Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Public (Individual) Scale			
• **None**	• Install stored water/captured water techniques, such as rain barrels or down spout gardens • Use permeable paving techniques whenever feasible	• Plant drought resistant landscapes • Reduce water system losses (e.g. fix drips) • Modify plumbing systems, i.e. water saving kits or grey water systems	• Practice active water conservation techniques
Private (Business) Scale			
• **None**	• Install stored water/captured water techniques, such as rain barrels or down spout gardens • Use permeable paving techniques whenever feasible.	• Plant drought resistant landscapes • Reduce private water system losses • Identify alternate water supply sources • Plant drought-resistant crop varieties • Develop and implement grey water systems	• Practice active water conservation techniques • Develop a water conservation plan
Government Scale			
• **Promote groundwater recharge through stormwater management** • **Implement cloud seeding techniques during dry season**	• Identify and create ground water back up sources • Create/identify new impounded water supply points • Use permeable paving techniques whenever feasible	• Plant drought resistant landscapes on community owned facilities • Distribute water saving kits to community members • Implement storm water retention in regions ideally suited for groundwater recharges • Reduce water system losses through regular maintenance • Design water delivery systems to accommodate drought events	• Identify alternative water supplies for time of drought • Develop a drought contingency plan • Develop criteria triggers for drought related actions • Improve accuracy of water supply forecasts • Modify rate structures to influence active water conservation techniques • Consider providing incentives to property owners that utilize drought resistant landscapes in the design of their home • Develop/Implement drought education/notification systems and communication plan • Emphasize droughts relationship to other hazards in hazard awareness messaging • Increase capability to enforce water restrictions when such restrictions are in place.

Actions Identified by Steering Committee—Drought	
Reduce Vulnerability	Increase Capability
Government Scale	
• **Integrate water conservation and green infrastructure into all applicable regulations/programs**	• Update/establish requirements on impervious surfaces • Expand green stormwater infrastructure program and integrate water conservation into messaging – partner with Willamette Week Hydro Hogs lists to increase awareness.

Earthquake

General Mitigation Best Practice—Earthquake			
Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Public (Individual) Scale			
• **None**	• Locate outside of hazard area (off soft soils and other seismically induced ground failure areas)	• Retrofit structure (e.g. anchor house structure to foundation) • Secure household items that can cause injury or damage such as water heaters, bookcases, and other appliances • Build to higher design standards	• Practice "drop, cover and hold" • Participate in drills such as the Great Shakeout • Purchase earthquake insurance
Private (Business) Scale			
• **None**	• Locate/relocate mission critical functions outside hazard area where possible (off soft soils and other seismically induced ground failure areas)	• Build redundancy for critical functions/facilities • Retrofit critical buildings/areas housing mission critical functions • Perform non-structural assessments and mitigation activities (e.g. anchor bookcases to the wall) • Anchor rooftop-mounted equipment (i.e., HVAC units, satellite dishes, etc.).	• Adopt higher standard for new construction -- Consider "performance based design' when building new structures • Increase capability by having cash reserves for reconstruction • Inform your employees on the possible impacts of earthquake and how to deal with them at your work facility • Participate in drills such as the Great Shakeout

General Mitigation Best Practice—Earthquake			
Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Government Scale			
• **None**	• Locate critical facilities or functions outside of hazard area where possible (off soft soils and other seismically induced ground failure areas)	• Harden infrastructure • Provide redundancy for critical functions • Encourage mitigation of private property • Perform non-structural assessments and mitigation activities (e.g. anchor bookcases to the wall) • Require bracing of generators, elevators, and other vital equipment in hospitals. • Use flexible piping (earthquake resistant) when extending water, sewer, or natural gas service. • Install shutoff valves and emergency connector hoses where water mains cross fault lines. • Anchor rooftop-mounted equipment (i.e., HVAC units, satellite dishes, etc.). • Include retrofitting/replacement of critical system elements in Capital Improvements Plan (CIP)	• Produce more accurate hazard maps (e.g. liquefaction and soils maps) • Further enhance seismic risk assessment to target high hazard buildings for mitigation opportunities (e.g. older structures, unreinforced masonry) • Develop a debris management plan • Participate in drills such as the Great Shakeout • Communicate earthquake secondary hazards to public (e.g. landslides, dam failure, fires, hazardous material spills) • Assess emergency response routes and determine back-up options in case of damage or disruption • Educate K-12, residents, developers and businesses on earthquake safety and building codes. • Require/encourage rapid damage assessment training for City staff • Develop and distribute guidelines or pass ordinances that require developers and building owners to locate lifelines, buildings, critical facilities, and hazardous materials out of areas subject to significant seismic hazards. • Support financial incentives, such as low interest loans or tax breaks, for home and business owners who seismically retrofit their structures. • Use Hazus to quantitatively estimate potential losses from an earthquake • Establish a school survey procedure and guidance document to inventory structural and non-structural hazards in and around school buildings • Use rapid visual screening to quickly inspect a building and identify disaster damage or potential seismic structural and non-structural weaknesses to prioritize retrofit efforts, inventory high-risk structures and critical facilities, or assess post-disaster risk to determine if buildings are safe to re-occupy • Develop a technical assistance information program for homeowners. • Create a seismic safety committee to provide policy recommendations, evaluate and recommend changes in seismic safety standards, and give an annual assessment of local and statewide implementation of seismic safety improvements • Develop an inventory of public and commercial buildings that may be particularly vulnerable to earthquake damage.

Actions Identified by Steering Committee—Earthquake		
Reduce Exposure	Reduce Vulnerability	Increase Capability
Public (Individual) Scale		
• Remove buildings and do not build new buildings within 100 yards of an active fault (slip rate > 2 mm a year).	• Install automatic earthquake gas shutoffs	• None
Private (Business) Scale		
• Remove buildings and do not build new buildings within 100 yards of an active fault (slip rate > 2 mm a year). • Do not build critical facilities (Occupancy Class III and IV) on soft soil sites (SE and SF sites). • Do not build critical facilities (Occupancy Class III and IV) on sites with potential for seismic induced ground failure (lateral spreading, liquefaction, landslide).	• Install automatic earthquake gas shutoffs • Retrofit older office buildings to at least life-safety standards • Perform non-structural assessments of building contents • Pursue other non-structural mitigation including ceilings, troffer light fixtures, partition bracing, elevator rails, brick veneer, hollow clay tile around stairwells, etc.	• Purchase earthquake insurance
Government Scale		
• Remove buildings and do not build new buildings within 100 yards of an active fault (slip rate > 2 mm a year). • Do not build critical facilities (Occupancy Class III and IV) on soft soil sites (SE and SF sites) or on sites with potential for seismic induced ground failure (lateral spreading, liquefaction, landslide).	• Review construction plans for all bridges to determine their susceptibility to collapse and retrofit problem bridges. Work with bridge owners to secure funding and prioritize retrofits/upgrades. • Ensure that best available data and science is used in the siting and development of City buildings. • Require all newly built City buildings to exceed life safety standards. • Incentivize or require retrofitting of infrastructure in the CEI hub until complete or partial relocation can be obtained. • Partner with identified high potential loss facilities to encourage individual assessments of seismic risk. Identify and share risk with nearby residential communities. • Update residential building code so that it includes higher seismic standards for new or substantially improved buildings. • Perform non-structural assessments of building contents. Pursue other non-structural mitigation including ceilings, troffer light fixtures, partition bracing, elevator rails, brick veneer, hollow clay tile around stairwells, etc. • Develop a non-structural, technical assistance information program and tool kit.	• Research, develop and implement innovative approaches to implement the recent fossil fuel legislation using established jurisdictional authority (e.g. zoning) • Incorporate the updated liquefaction, lateral spreading and landslide data developed by the Portland Water Bureau into BDS development and design standards. • Develop and maintain a rapid damage assessment program that creates a tiered system of certification so that there can be two trained but uncertified assistants for each certified staff member. • Expand the BDS tie down training program and include information/training on other retrofit activities. • Develop and implement a plan for a system of fuel hubs and stockpiles. Involve public and private stakeholders that provide essential services in this planning process. • Research and develop a plan to ensure adequate sanitation if sewer systems are knocked offline by an event. • Develop a post-event communication plan. • Develop a post-disaster recovery plan based on a seismic event. • Develop method for communities to report mitigation priorities directly to the City. • Ensure that response plans have identified adequate food resources. Partner with food producers and distributors to develop memorandums of understanding and/or responsibilities. • Develop a phased sheltering plan. • Provide resources for businesses to help them identify ways to mitigate for natural hazards.

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Actions Identified by Steering Committee—Earthquake		
Reduce Exposure	Reduce Vulnerability	Increase Capability
	• Support financial incentives, such as low interest loans or tax breaks, for home and business owners who seismically retrofit their structures. • Install automatic earthquake gas shutoffs in public buildings and require automatic shutoffs in public buildings. • Retrofit older office buildings to at least life-safety standards • Require seismic upgrading of hospitals including phased nonstructural mitigation by XX date. • Require seismic upgrading of school buildings by XX date. • Require seismic upgrading of public and private non-ductile concrete buildings by XX date. • Seismically retrofit housing bureau buildings on the Unreinforced Masonry (URM) list or constructed prior to 1994 • Update residential building code so that it includes higher seismic standards for new or substantially improved buildings. Initiate triggers guiding improvements such as: < 50% substantial damage/improvements or passive trigger programs for mandatory seismic strengthening • Require higher standards for new construction of Occupancy Category II (and certain I?) buildings. • Perform a sediment seismic stability analysis for Hayden Island and develop appropriate mitigation items	• Assess opportunities for "alternative" evacuation routes, e.g. foot and bicycle paths, helicopter pads • Identify post-earthquake evacuation routes and prioritize retrofitting of structures along those routes. • Develop a response plan for fire boats. • Explore utilizing the waterways as a post event transportation system. • Assess potential fire risks from Cascadia quake if it were to happen during dry months. • Establish a basic needs check-list for all households and survey residents to determine the percent of households with sufficient supplies. • Adopt the mitigation plan and seek pledges from elected officials to implement and provide funding for identified actions. • Develop an instructional video for non-structural mitigation. • Explore capability to have portable temporary bridge to cross Willamette. • Perform geotechnical assessment of subsurface • Capitalize on recent publicity regarding earthquake risk in the Pacific Northwest • Determine a practical method to track buildings that are brought up to current seismic codes due to retrofit or permit requirement • Institute legislation that allows for rent controls after a certain percentage of housing stock is lost (e.g. post disaster) • Appoint an earthquake administrator – similar to a flood administrator • Institute bridge tolls to fund seismic retrofits

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Flood

General Mitigation Best Practice—Flood			
Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Public (Individual) Scale			
• **Clear stormwater drains and culverts**	• Locate outside of hazard area • Elevate utilities above base flood elevation • Institute low impact development techniques on property	• Retrofit structure (elevate house above base flood elevation) • Elevate items within house above base flood elevation • Build new homes above base flood elevation • Floodproof non-residential structures	• Comply with National Flood Insurance Program (NFIP) • Purchase flood insurance
Private (Business) Scale			
• **Clear stormwater drains and culverts**	• Locate business critical facilities or functions outside hazard area • Institute low impact development techniques on property	• Build redundancy for critical functions/ retrofit critical buildings • Provide flood-proofing measures when new critical infrastructure must be located in floodplains	• Increase capability by having cash reserves for reconstruction • Support and implement hazard disclosure for the sale/re-sale of property in identified risk zones • Solicit 'cost-sharing" through partnerships with public sector stake holders on projects with multiple benefits
Government Scale			
• **Develop an adopt a "storm drain" program** • **Dredge, construct levees, provide retention areas** • **Invest in structural flood control: levees, dams, channelization, revetments** • **Construct regional stormwater control facilities** • **Harden areas with significant erosion concerns** • **Promote/retain natural vegetation in areas with significant erosion concerns**	• Acquire or relocate identified repetitive loss properties • Adopt land development techniques such as density transfers or clustering • Institute low impact development techniques on property • Adopt sediment and erosion control regulations • Adopt zoning and erosion overlay districts • Prohibit any fill in floodplain areas • Encourage the use of porous pavement, vegetative buffers, and islands in large parking areas. • Use stream restoration to ensure adequate drainage and diversion of stormwater.	• Adopt appropriate regulatory standards such as cumulative substantial improvement/damage, freeboard, lower substantial damage threshold, compensatory storage • Develop and implement stormwater management regulations and master planning • Adopt "no-adverse impact" floodplain management policies that strive to not increase the flood risk on down-stream communities • Perform regular inspections/assessments of locally owned or maintained flood control infrastructure • Replace undersized culverts • Provide permanent protection for pump stations at risk of flooding • Identify/mitigate drainage issues resulting in ponding • Enhance road drainage programs or elevate/relocate roads subject to frequent flooding • Ensure permitting process is consistent with the adopted floodplain management ordinance • Develop an erosion protection program for high hazard areas • Construct open foundation systems on buildings to minimize scour	• Join Community Rating System (CRS) program or maintain/improve class • Provide training for staff and decision-makers in floodplain management (e.g. maintain certified floodplain managers on staff) • Create a building and elevation inventory of structures in the floodplain • Develop a Flood Task Force • Pre-stage flood response equipment before events • Integrate floodplain management policies into other planning mechanisms within Portland • Develop framework/continue efforts for cooperation between agencies/districts in flood mitigation activities (e.g. sand and sand bag deployment) • Retain good standing in National Flood Insurance Program • Participate in information sharing with other agencies (e.g. U.S. Army Corps of Engineers, NWS) • Identify and mitigate sources of nuisance flooding • Review and update floodplain damage prevention ordinances • Identify debris collection sites

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General Mitigation Best Practice—Flood			
Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
		• Construct deep foundations in erosion hazard areas • Establish a green infrastructure program • Use subdivision design standards to require elevation data collection during platting and to have buildable space on lots above the base flood elevation • Require tie downs of propane tanks • Require a drainage study with new development • Design a "natural runoff" or "zero discharge" policy for stormwater in subdivision design • Require and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains • Extend the freeboard requirement past the mapped floodplain to include an equivalent land elevation • Include requirements in the local floodplain ordinance for homeowners to sign non-conversion agreements for areas below base flood elevation. • Offer incentives for building above the required freeboard minimum (code plus). • Inspect bridges and identify if any repairs or retrofits are needed to prevent scour • Floodproof critical facilities and infrastructure located in flood hazard areas • Require all critical facilities to meet requirements of Executive Order 11988 and be built 1 foot above the 500-year flood elevation	• Require/encourage rapid damage assessment training for staff • Map locations of storm drains, catch basins and dry wells so that they may be located and cleared • Identify and map erosion hazard areas • Develop a tracking program for erosion hazards and their impacts on the community • Pass and enforce an ordinance that regulates dumping in streams and ditches • Develop a stormwater committee • Form a regional watershed council • Incorporate digital floodplain and topographic data into GIS systems, in conjunction with Hazus, to assess risk • Conduct NFIP community workshops to provide information and incentives for property owners to acquire flood insurance. • Increase drainage or absorption capacities with detention and retention basins, relief drains, spillways, drain widening/dredging or rerouting, logjam and debris removal, extra culverts, bridge modification, dike setbacks, flood gates and pumps, or channel redirection

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Actions Identified by Steering Committee—Flood		
Reduce Exposure	Reduce Vulnerability	Increase Capability
Government Scale		
• Relocate (through willing seller) existing development in floodplain	• Continue to improve and expand floodplain development regulations to meet higher standards • Develop maps that include information on climate change risk • Designate flood storage/conveyance areas • Expand the willing-seller program to a citywide program • Consider implementing/providing information on flood-resilient building design (allowing and designing for first floors to flood) • Promote and provide publicly accessible information on landscaping techniques that reduce water run-off. • Continue to develop and implement a public education campaign regarding low impact development. Reach out to community leaders and faith based organizations (possibly as pilot projects, signage about projects etc.) • Continue to improve and publicize the stormwater retention program. • Improve effectiveness of development restrictions in the floodplain • Fix Foster Rd flooding problem	• Produce more accurate flood hazard maps or identify areas for further study. Incorporate updated information from FEMA when available. • Convert hard copy first finished floor elevations for structures located in the floodplain into a digital database • Identify potential risk from flooding/channel migration downstream on Johnson Creek toward city boundary • Review and revise current approach to fill relocation projects to include an area specific "mitigation bank" so that the area is expanded beyond the tax lot (BDS and BES partnership) • Develop a system to communicate safe areas for traffic during a flood, and set up easy systems for citizens to report areas of standing water and dangerous roads (BES, PBEM and PBOT partnership) • Develop standard operating procedures that increase communication between PBOT and other agencies to report on flooded road status. • Develop a system to warn underground garages when a flood event is likely so that cars can be moved. Work with owners and operators to identify flood proofing strategies to reduce contaminated runoff from flooded garages. • Implement flood training exercises for pertinent Bureaus. Include exercises for high frequency, low impact events, such as the 10 year flood. • Enhance the flood risk assessment by incorporating waterfront planning exercises and climate change models (BES and BPS) • Reevaluate the willing seller program using an equity lens. Ensure that the program benefits both homeowners and renters.

Landslide

General Mitigation Best Practice—Landslide			
Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Public (Individual) Scale			
• **Stabilize slope (de-water, armor toe)** • **Reduce weight on top of slope** • **Minimize vegetation removal and the addition** • **Install rip rap boulders of geotextile fabric** • **Using bioengineered bank stabilization techniques.** • **Use a rock splash pad to direct run off and minimize the potential for erosion**	• Locate structures outside of hazard area (off unstable land and away from slide-run out area)	• Retrofit homes on steep slopes	• Sign up for warning systems • Learn the warning signs that indicate a landslide may occur • Educate yourself on risk reduction techniques for landslide hazards
Private (Business) Scale			
• **Stabilize slope (de-water, armor toe)** • **Reduce weight on top of slope** • **Minimize vegetation removal and the addition of impervious surfaces** • **Using bioengineered bank stabilization techniques.** • **Use a rock splash pad to direct run off and minimize the potential fort erosion**	• Locate structures outside of hazard area (off unstable land and away from slide-run out area)	• Retrofit at risk facilities	• Sign up for warning system and develop evacuation plan • Increase capability by having cash reserves for reconstruction • Educate your employees on the potential exposure to landslide hazards and your emergency response protocol
Government Scale			
• **Monitor/review accumulated effects from piecemeal development on steep slopes** • **Implement post-fire vegetation management plans** • **Coordinate with resource management agencies to identify potential issues from resource extraction activities** • **Using bioengineered bank stabilization techniques.** • **Use a rock splash pad to direct run off an minimize the potential fort erosion**	• Acquire properties located in high risk landslide areas • Adopt land use policies that prohibit the placement of habitable structures in high risk landslide areas • Adopt land use policies that limit accumulated effects in landslide risk areas	• Adopt higher regulatory standards for new development within unstable slope areas • Armor/retrofit critical infrastructure from the impact of landslides • Post signage in landslide hazard areas • Prohibit removal of natural vegetation from slopes • Assess vegetation in wildfire-prone areas to prevent landslides after fires (e.g., encourage plants with strong root systems).	• Produce landslide hazard risk maps • Enact tools to help manage development in hazard areas: better land controls, tax incentives, information, limit new impervious/pervious surfaces • Collect and compile landslide event history database • Develop plan/strategy for communicating risk to property owners/communities recently affected by wildfires • Increase regulatory authority for post-fire mitigation enforcement • Establish and communicate post-event repair responsibilities (e.g. roads that are impacted) • Conduct geological/engineering studies of potential slide areas • Notify property owners in high-risk areas • Develop a brochure describing risk and potential mitigation techniques

Actions Identified by Steering Committee—Landslide	
Reduce Vulnerability	Increase Capability
Government Scale	
• Prohibit onsite infiltration of collected stormwater (offsite drainage) in landslide hazard areas • Require geotechnical study for building/grading in landslide hazard area • Incorporate landslide risk areas in comprehensive plan and increase regulations for risk reduction (see above) • Evaluate disconnect downspouts program/stormwater disconnect program. Do not promote in landside areas. • Develop new stormwater systems to redirect drainage away from landslide hazard. • Utilize landslide data in maintenance plans – roads, utilities, etc., For example, you can build a trench as a drain if used correctly – add as a standard evaluation. • Revisit density, vegetation, stormwater control in zoning. • Establish post-landslide disaster protocol. Geoengineers on retainer for immediate assessment/safety evaluation. Determine level of hazard – 1, 2, 3? Is it time to evacuate? • Develop regulations regarding building and excavation in landslide hazard areas. • Create acquisition program for land/property in high risk areas	• Perform geotechnical assessment of subsurface • Update/establish requirements on impervious surfaces • Re-run HAZUS with new landslide areas (after DOGAMI study is completed) • Appoint a landslide administrator – similar to a flood administrator • Update landslide chapter in 2017 when new DOGAMI data can be included • Correlate historical data on rainfall and landslide events to develop landslide warning thresholds. • Develop an evacuation plan for the Linnton neighborhood that takes landslide risk into consideration. • Explore the feasibility of providing a disaster response facility (not sure if this means police/fire) in Linnton. • Explore the development of post-slide ordinances that regulate redevelopment. • Strengthen land use regulations on landslide risk areas. • Charge an additional permitting fee for construction in high risk areas and set aside these monies for an acquisition program. • Expand the landslide related policies in the St. Johns neighborhood to be applicable citywide. • Compile and update a landslide event history database. • Partner with DOGAMI to ensure city regulations have incorporated the best available data and science. • Perform an in-depth social vulnerability analysis of landslide risk. • Develop and implement a public outreach campaign that educates property owners about landslide risk and possible mitigation measures. • Modify the City Storm Water Manual to include specific guidance based on localized risks (e.g. reporting districts). • Assess fees or taxes for new development in known high-risk areas to offset costs of additional safety and response-oriented infrastructure. • Develop a landslide risk resource center. • Require landslide risk and history in property disclosure forms, transfer of deeds, and renters agreements • Seek funding to assist homeowners in mitigating risk from landslides. Develop quantitative risk ranking system to prioritize projects and report progress. • Implement tax breaks for land owners that implement mitigation strategies in areas at risk for landslides. • Send a letter to each property owner identified on the water hog list to fix leaky water systems.

Severe Weather

General Mitigation Best Practice—Severe Weather			
Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Public (Individual) Scale			
• **Increase tree plantings around buildings to shade parking lots and along public rights-of-way**	• None	• Insulate house • Provide redundant heat and power • Plant appropriate trees near home and power lines ("Right tree, right place" National Arbor Day Foundation Program) • Incorporate passive ventilation in the site design. • Secure loose items (i.e., patio furniture)	• Trim or remove trees that could affect power lines • Obtain a NOAA weather radio • Obtain an emergency generator • Identify locations of emergency shelters • Participate in amateur radio groups • Sign up for reverse 911 systems/other notification options • Post address so as to be visible to first responders • Teach school children about the dangers of lightning and how to take safety precautions.
Private (Business) Scale			
• **Increase tree plantings around buildings to shade parking lots and along public rights-of-way.**	• None	• Relocate critical infrastructure, such as power lines, underground • Install tree wire • Install lightning protection devices and methods, such as lightning rods and grounding, on communications infrastructure and other critical facilities • Install and maintain surge protection on critical electronic equipment. • Avoid placing flag poles or antennas near buildings	• Trim or remove trees that could affect power lines • Create redundancy in critical systems • Equip facilities with a NOAA weather radio • Equip vital facilities with emergency power sources

General Mitigation Best Practice—Severe Weather			
Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Government Scale			
• **Increase tree plantings around buildings to shade parking lots and along public rights-of-way.**	• None	• Trim trees back from power lines • Designate snow routes and strengthen critical road sections and bridges • Continue/expand participation in Storm Ready programs • Continue to support/maintain/improve notification and warning systems • Support/continue/formalize shelter agreements • Ensure critical facilities have back-up power generation capabilities • Install lightning protection devices on critical facilities and communications equipment • Inspect/ensure facilities can withstand high winds • Encourage construction of guard rails where appropriate • Ensure critical facilities/shelters can easily transition to generator produced power • Stockpile response/preparedness supplies • Install and maintain surge protection on critical electronic equipment • Review building codes and structural policies to ensure they are adequate to protect older structures from wind damage • Use natural environmental features as wind buffers in site design • Incorporate inspection and management of hazardous trees into the drainage system maintenance process. • Preemptively test power line holes to determine if they are rotting • Use designed-failure mode for power line design to allow lines to fall or fail in small sections rather than as a complete system to enable faster restoration • Avoid placing flag poles or antennas near buildings • Convert traffic lights to mast arms	• Support/continue programs such as "Tree Watch" that proactively manage problem areas by use of selective removal of hazardous trees, tree replacement, etc. • Establish and enforce building codes that require all roofs to withstand snow loads and wind speeds • Improve communication alternatives/redundancy • Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines • Provide NOAA weather radios to the public • Encourage coordination with amateur radio groups • Identify/ear mark funding opportunities for generator purchases • Develop evacuation/ emergency road plans and prioritize roads for response efforts • Encourage residents to sign-up for reverse 911 services or other notification services • Encourage/require residents to post addresses where they are visible to first responders • Include safety strategies for severe weather in driver education classes and materials. • Organize outreach to vulnerable populations, including establishing and promoting accessible heating centers in the community

Actions Identified by Steering Committee—Severe Weather Increase Capability
Government Scale
• Develop and implement land use codes and policies to reduce the creation of and impacts from urban heat island effect
• Update/establish requirements on impervious surfaces
• Use current enthusiasm for earthquake preparedness to also encourage preparedness for severe weather.
• Support transit providers by quickly communicating schedule changes and cancellations to the public.
• Support and promote the development of continuity of operations plans for community groups. Include information on scaling based on the incident and certify those businesses meeting certain requirements.
• Develop a resource center for severe weather information and tools.
• Identify mechanisms to fund/administer tree maintenance programs.
• Partner with appropriate agencies to identify mitigation strategies for Route 30.
• Identify ways to address areas of the community where freezing fog and ice are more likely.
• Develop on-call contracts for road and sidewalk sanding support.
• Develop standard operating procedures to increase communication between schools and city emergency management, especially as it pertains to school closures.
• Develop standard operating procedures for coordinating warning and response activities for severe weather events (e.g. moving transient populations away from floodplains and simultaneously opening shelters).
• Enhance outreach to populations more likely to be vulnerable to heat events. Provide information on locally available tools and resources.
• Continue to research new technologies for urban heat island abatement (e.g. glazing).
• Consider implementing/providing information on flood-resilient building design (allowing and designing for first floors to flood)
• Develop a public outreach campaign focused on the nexus between heat waves, wildfires, stagnant air and poor air quality. Provide resources for mitigation.
• Establish a certification program for shelter leaders and managers.
• Partner with local businesses to explore opportunities for increasing access to air conditioned spaces during extreme heat or poor air quality events (e.g. free movie theatre admission).
• Identify suitable locations for cooling shelters that can also be used in the event of poor air quality.
• Partner with neighborhood organizations to improve Community Emergency Response Team (or equivalent program) awareness and membership in all languages and underserved areas.

Space Weather

General Mitigation Best Practice—Space Weather			
Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Public (Individual) Scale			
• **None**	• None	• None	• Sign up for early warning systems and notifications
Private (Business) Scale			
• **None**	• None	• None	• Educate employees on impacts and emergency plans
Government Scale			
• **None**	• None	• None	• None

Actions Identified by Steering Committee—Space Weather
Increase Capability
Government Scale
• Provide links and information to NOAA space weather warning system.
• Develop system to alert businesses with vulnerable communications infrastructure.

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Volcanic Hazards

General Mitigation Best Practice—Volcano			
Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Public (Individual) Scale			
• **None**	• Identify equipment/resources that may be negatively impacted by ash fall and develop plan to move indoors/protect	• None	• Sign up for early warning systems and notifications
Private (Business) Scale			
• **None**	• Identify equipment/resources that may be negatively impacted by ash fall and develop plan to move indoors/protect	• Build redundancy for critical facilities and functions	• Educate employees on impacts and emergency plans
Government Scale			
• **None**	• Identify equipment/resources that may be negatively impacted by ash fall and develop plan to move indoors/protect	• Retrofit older building stock to be able to support accumulated ash fall loads	• Develop post-event cleanup plan

Actions Identified by Steering Committee—Volcano
Increase Capability
Government Scale
• Identify innovative ways to seek funding for private air conditioners.
• Continue to participate in and support updates of regional ash management plan.
• Research and develop lessons learned from Mt. St. Helens ash management response.

Wildfire

General Mitigation Best Practice—Wildfire			
Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Public (Individual) Scale			
• **Clear potential fuels on property: dry, overgrown underbrush, diseased trees**	• Create and maintain defensible space around structures • Reduce exposure -- Locate outside of hazard area • Mow regularly • Stay clear of hazard areas during a wildfire event	• Create and maintain defensible space around structures, provide water on site. • Use fire-retardant building materials • Create defensible spaces around your home	• Employ "Firewise" techniques to safeguard your home • Identify alternative water supplies for fire fighting • Install/replace roofing material with non-combustible roofing materials • Ensure that all fuel-burning equipment should be vented to the outside • Install carbon monoxide monitors and alarms.
Private (Business) Scale			
• **Clear potential fuels on property: dry underbrush, diseased trees**	• Create and maintain defensible space around structures and infrastructure • Reduce exposure -- Locate outside of hazard area	• Create and maintain defensible space around structures and infrastructure, provide water on site • Use fire-retardant building materials	• Support "Firewise" community initiatives • Create /establish stored water supplies to be utilized for fire fighting
Government Scale			
• **Clear fuels (dry underbrush, diseased trees) on land that can trigger and maintain wildfires** • **Implement "Best Management Practices" on public lands** • **Partner with local communities to create fire breaks**	• Create and maintain defensible space around structures and infrastructure • Enhance building code to include use of fire resistant materials in high hazard areas • Reduce exposure -- Locate outside of hazard area	• Create and maintain defensible space around structures and infrastructure • Use fire-retardant building materials • Develop/implement higher regulatory standards in wildfire hazard areas • Develop/support biomass reclamation initiatives • Increase regulatory requirements/code enforcement for fire risk reduction or incentivize higher standards • Develop fire smart building code regulations • Implement road side vegetation management best practices • Conduct pre-construction building inspections that include fire prevention requirements and provide emphasis on a fire resistant structure • Develop programs to identify/install wildland fire water supply systems such as cisterns, ponds and dry hydrants • Involve fire protection agencies in determining guidelines and standards and in development and site plan review procedures • Enclose the foundations of homes and other buildings in wildfire-prone areas, rather than leaving them open and potentially exposing undersides to blown embers or other materials. • Prohibit wooden shingles/wood shake roofs on any new development in areas prone to wildfires. • Routinely inspect the functionality of fire hydrants • Use prescribed burning to reduce fuel loads that threaten public safety and property.	• Seek alternative water supplies in urban wildland interface areas • Become a "Firewise" community • Utilize academia to study impacts/solutions to wildfire risk • Create/implement/update wildfire protection plans • Develop evacuation/ emergency road plans and prioritize roads for response efforts • Provide public outreach to increase understanding of forest management practices • Enhance/provide redundant communication infrastructure • Require/encourage rapid damage assessment training • Pre-plan responses to wildland urban interface areas • Use zoning and/or a special wildfire overlay district to designate high-risk areas and specify the conditions for the use and development of specific areas • Develop a vegetation management plan • Work with insurance companies, utility providers, and others to include wildfire safety information in materials provided to area residents

Actions Identified by Steering Committee—Wildfire	
Reduce Vulnerability	Increase Capability
Government Scale	
• Develop and implement invasive species management plans. Research best management practices and partner with local, regional organizations (e.g. colleges, fire districts, State) • Take advantage of allowances for City-specific building codes that restrict building materials (more stringent than State) • Partner with regional stakeholders to identify critical facilities that are in hazard risk areas. Review and prioritize mitigation activities, such as the creation of defensible space. • Develop guidelines regarding the construction of critical facilities in wildfire risk areas (disclose the risk, educate the company interested, regulate the land) • Analyze and identify wildfire evacuation routes in different neighborhoods and areas. Take into account bridges, transportation routes and disability access. • Retrofit fire and police stations in order to strengthen their current capabilities and ensure the safety of these emergency responders during a disaster. Where possible, strengthen facilities to higher than life safety standards. • Promote drought tolerant, fire resistant plants and the backyard habitat program.	• Develop regulations that specifically address urban wildfire interface zones • Update hazard maps using the newly developed LiDAR and vegetation class data • Plan for integration of defensible space and natural resource habitat management • Educate the public on wildfire risk and promote wildfire risk reduction measures. • Expand and improve public education and information programs about fire prevention, especially fireworks. • Educate the public and disseminate information about the evacuation routes. • Create wildfire evacuation route signs • Analyze and identify the locations of fire stations/boats and response times of firefighters in communities. See where there are major gaps and lack of fire support-take in to account the use of bridges and other transit routes that may be compromised. • Explore the feasibility of establishing a fire station and/or hazmat response team in or near Linnton. • Identify ways to enhance fire prevention and incorporate forest health (e.g. prescribed burns). • Promote and support the FireWise program in appropriate neighborhoods. • Continue increased patrols in watersheds and continue to help fund water towers. • Continue to identify and seek solutions for problem areas along the Pacifica Crest Trail. • Continue to require water bureau staff in the watershed to carry small fire fighting capabilities when risk level is at 3 or above. • Develop a secondary improved access from Lolo Pass for wildfire fighting Bull Run Watershed. • Develop a protocol for the use of in town reservoir water for emergency water supplies in the event of an urban fire. • Evaluate urban and wildfire risk from Cascadia Subduction Zone event and develop strategy to reduce risks. • Use Mt. Tabor reservoir for firefighting after earthquake • Fill Mt. Tabor reservoir with petroleum

The Mitigation Action Plan

Appendix J. Expectations for Participating Bureaus

J. EXPECTATIONS FOR PARTICIPATING BUREAUS

PLANNING PARTNER EXPECTATIONS

ACHIEVING CITYWIDE RESILIENCE TO NATURAL HAZARDS

City of Portland bureaus manage city infrastructure, plan for long-term capital improvement and community-level investments, and administer a wide variety of programs. These activities play a role in the city's resilience to natural hazards. There are many things that bureaus can do now as part of their normal activities – or add to their portfolios when opportunities arise – to reduce Portland's risk from natural hazards over time and improve the city's ability to bounce back when natural hazard events do happen. These projects and programs together contribute to Portland's *Mitigation Action Plan* (MAP), the city's overall strategy for reducing its risk from natural hazards. They also help achieve compliance with the Disaster Mitigation Act of 2000 (DMA 2000), a federal law that requires local jurisdictions to have a federally-approved hazard mitigation plan to ensure eligibility for pre- and post-disaster grant funding. As stewards of the city's assets and services, bureaus share responsibility for mitigating natural hazard risks and maintaining the city's compliance with DMA 2000. Portland Bureau of Emergency Management (PBEM) oversees the update process for the MAP, but the MAP is not "PBEM's plan". It belongs to the City of Portland as a whole, and each bureau has a stake in the development of the plan and implementation of mitigation actions.

GROUPS INVOLVED IN THE PLANNING PROCESS

Because of Portland's commission form of government, bureaus operate relatively independently of one another. This independence has led the MAP planning team to adopt the approach typically used for multi-jurisdictional plans. One of the goals of the multi-jurisdictional approach to hazard mitigation planning is to efficiently achieve compliance with the Disaster Mitigation Act (DMA) for all participating members in the planning effort, citywide compliance in this case. There are several groups who will be involved in this process at different levels, which include:

- **Planning Team—**the Tetra Tech team and PBEM staff responsible for the facilitation of the planning process and the development of the plan document.
- **Steering Committee—**representative members from the community and city bureaus and offices that serve as the oversight body. They are responsible for many of the planning milestones and decisions prescribed for this process.
- **Planning Partners—**City of Portland bureaus and offices which manage infrastructure and administer programs included or potentially included as part of the city's hazard mitigation strategy
- **Planning Stakeholders—**the individuals, groups, businesses, academia, etc., from which the planning team gains information to support the various elements of the plan. This group may also be referred to as coordinating stakeholders.

ESTIMATED TIME COMMITMENT

The total time required of planning partners is dependent upon the number of mitigation action items each bureau commits to implementing or pursuing funding to implement. At a minimum, bureau representatives should expect to participate in an all-bureau workshop in mid-May, 2016 and an annual reporting and update meeting.

DEFINITION OF PARTICIPATION

For this planning process, planning partners must meet the following participation requirements:

- **Complete a letter of intent.** Provide a "Letter of Intent to participate" (see exhibit A).
- **Designate points of contact.** Designate a primary and secondary point of contact for this effort. These designees will be listed as the hazard mitigation points of contact for your bureau in the plan. Points of contact will be responsible for gathering progress reporting information for the planning team.
- **Attend bureau workshop.** In mid-May, the planning team will hold a workshop for all City of Portland bureaus and offices that manage city assets or administer programs that are included or potentially included in the hazard mitigation strategy. All such bureaus and offices should plan to attend this workshop. At the workshop, bureau representatives will be expected to provide information on existing programs and capabilities, review the 2010 mitigation strategy and recommend actions to roll over, and pledge support for the final mitigation recommendations that fall under their portfolio. Each approved action item must have commitment from one bureau to act as lead implementing bureau.
- **Apply an equity lens to project selection, development, and prioritization.** An equity worksheet has been provided for bureaus to be used in action item selection, development, and prioritization. Bureau representatives have a deep understanding of the work they do and the communities that are affected by their work. Bureaus should use this knowledge to work through the prioritization worksheet provided by the planning team to select action items that provide the most benefit possible to underserved and potentially vulnerable populations, while minimizing any disproportionate burden or adverse effects on these groups. Project implementation should also be carried out with these considerations.
- **Pursue mitigation implementation opportunities.** When opportunities arise to implement actions identified as priorities in the hazard mitigation plan, bureaus should pursue these opportunities to the extent they are able. This may include pursing grant funding, reallocating available resources to mitigation actions, or incorporating mitigation actions into existing or planned projects or programs.
- **Attend annual reporting and update meeting.** Over the five-year implementation period, bureaus will meet on an annual basis to report progress and make updates to the MAP as necessary.

If possible, bureau representatives are also encouraged to:

- **Support the steering committee.** A steering committee is already in place for this planning process, with representation from PBOT, PBEM, OEHR, ONI, BES, BPS, BDS, BPS, PF&R, and PP&R. The committee is tasked with overseeing the development of the plan and will become an oversight body throughout implementation. Steering committee meetings are not mandatory meetings for all planning partners, but all bureaus and offices are encouraged to remain engaged with this process and attend meetings as possible.

- **Support the public involvement strategy.** The planning team will also request support from bureau partners during the implementation of the public involvement strategy developed by the steering committee. Support could be in the form of providing venues for public meetings, attending these meetings as meeting participants, providing technical support, providing access to mailing lists, providing existing public information materials, etc.

EXHIBIT A

Example Letter of Intent to Participate

City of Portland Hazard Mitigation Planning Team
C/O PBEM
9911 SE Bush Street
Portland, OR 97266

Via email at: TheMAP@portlandoregon.gov

City of Portland Mitigation Action Plan Planning Team,

Please be advised that the _____ (***insert bureau or office name***) is committed to participating in the development and implementation of the City of Portland Natural Hazard Mitigation Plan. As the _____ (title, e.g., Chief Administrative Official) for this bureau/office, I certify that I will commit all necessary resources in order to meet expectations as outlined in the "Planning Partners expectations" document provided by the planning team, in order to obtain citywide Disaster Mitigation Act (DMA) compliance and meet citywide equity goals outlined in the 2012 Portland Plan and this hazard mitigation plan process.

Mr./Ms. _____ will be our bureau/office's primary point of contact for this process and they can be reached at ***(insert: address, phone number and e-mail address)***. Mr./Ms. _____ will be our bureau/office's secondary point of contact for this process and they can be reached at ***(insert: address, phone number and e-mail address)***.

Sincerely,

_____

Appendix K. Progress Report Template

The Mitigation Action Plan

20XX Progress Report

REPORTING PERIOD

MONTH 20XX through MONTH 20XX

BACKGROUND

The City of Portland has developed and maintained a natural hazard mitigation plan, most recently updated in 2016. *The Mitigation Action Plan* (MAP) identifies resources, information, and strategies for reducing risk associated with natural hazards in the city. The plan was adopted in 2016 and approved by FEMA Region X on __DATE__.

By preparing the 2016 update, the City maintained compliance with the federal Disaster Mitigation Act (DMA) and retained eligibility for hazard mitigation grant funding under the federal Robert T. Stafford Act. The plan is available to the public online at the following website:

https://www.portlandoregon.gov/pbem/53813

As part of the 2016 plan update process, a linkage procedure was established whereby eligible special purpose districts and other local governments within Portland could link to the base plan by creating jurisdictional annexes that assess risk to jurisdiction-specific facilities and develop mitigation actions to reduce these risks. During the reporting period X jurisdictions submitted a letter of intent to follow the linkage procedure and gain DMA compliance. *Provide a status update of any linked jurisdictions (e.g. in plan development, submitted to the state for review, etc.). If any eligible jurisdictions have completed linkage, the status their actions should also be included in the progress report.*

Purpose

This progress report provides an update on implementation of the MAP. It was prepared by the MAP planning team and reviewed by the 20XX mitigation action plan working group. The objective is to ensure that there is a continuous planning process that keeps the MAP plan responsive to stakeholder needs and capabilities. This progress reports includes the following:

- Summary overview of action plan progress
- Summary of any hazard events that occurred during the reporting period and the impact these events had on Portland;
- Review of the data utilized for this planning process as well as identified gaps and identification of any newly available or updated datasets;

- Listing of any newly published or updated reports or studies that should be incorporated into the next plan update process;
- Review of mitigation success stories;
- Review of continuing public engagement;
- Brief discussion about why actions were not completed or have not been initiated;
- Reevaluation of the action plan to determine if the timeline for identified projects needs to be amended (such as changing a long-term project to a short-term project because of new funding);
- Review of data that was or should be collected for any equity identified actions (e.g. High-E).
- Review of the Steering Committee recommended actions (see Appendix I of the MAP) and recommendations for new actions based on new or enhanced capabilities identified by lead agencies or next steps in actions identified in the 2016 action plan;
- Changes in or potential for new funding options (grant opportunities);
- Impacts of changes in other planning programs or projects that involve hazard mitigation; and
- Identification of training needs or additional guidance, such as benefit-cost analysis or E-grants training or additional equity guidance.

The Natural Hazard Mitigation Plan Working Group

The natural hazard mitigation plan working group holds an evolving role in plan implementation, based on the hazard mitigation needs of the City. The working group meets on a quarterly basis to discuss issues related to the MAP implementation. There were X meetings held during the reporting period. Issues discussed by the committee included:

- Date—Agenda items, issues or objectives
- Date—Agenda items, issues or objectives
- Date—Agenda items, issues or objectives

Table 1 lists current Mitigation Action Plan Working Group membership.

Table 1. 20XX Steering Committee Members

Name	Title	Bureau or Agency

SUMMARY OVERVIEW OF ACTION PLAN PROGRESS

The MAP includes an action plan that identifies specific mitigation actions and a performance period for implementation of those actions. Table 2 summarizes the actions and current progress as of the time of this progress report.

Table 2. Summary Overview of Action Plan Progress

Number of Mitigation Actions Identified	**XX**
Mitigation Actions Started or Completed	
Number of Actions	XX
Percent of Total	XX%
Mitigation Actions Not Started	
Number of Actions	XX
Percent of Total	XX%

RECENT NATURAL HAZARD EVENTS IN PORTLAND

To Be Completed

REVIEW AND DATA AND IDENTIFIED GAPS

To be Completed

NEWLY PUBLISHED REPORTS

To be Completed

NEWLY IDENTIFIED OPPORTUNITIES FOR PLAN INTEGRATION

To Be Completed

CHANGES IN RISK EXPOSURE IN PORTLAND

To Be Completed

MITIGATION SUCCESS STORIES

To Be Completed

CONTINUED PUBLIC ENGAGEMENT

To Be Completed

REVIEW OF THE ACTION PLAN

This section reviews the action plan and lists the status of each action from the MAP, grouped by the bureau or jurisdiction responsible for its completion. The action plan matrix in Table 4 provides the following information:

- Brief summary of action
- Indication of whether any action has been taken
- Current timeline
- Indication of whether the project priority has changed
- Status (complete, ongoing or no progress)
- Comments, including the following information:
  - Was any element of the action carried out during the reporting period?
  - If no action was completed, why?
  - Is the timeline for implementation for the action still appropriate?
  - Has a new funding source been identified?
  - If the action was completed, does it need to be changed or removed from the action plan or should the action be revised to reflect the next step in action implementation?
  - If the action was identified as an equity action, what data is or should be collected to assess performance?

PORTLAND CHANGES THAT MAY IMPACT PLAN IMPLEMENTATION

To Be Completed

With these changes in mind, lead agencies have reviewed the steering committee recommended actions developed during the 2016 plan update. Because of newly acquired capabilities (e.g. staff, funding, technical assistance, etc.) the following actions shown in Table 4 will be added to the action plan as they are now feasible.

Table-4. Newly Selected Actions for Implementation

Hazards Addressed	New or Existing Assets	Funding Options	Timeframe	Objectives Met	In Previous Plan? (# from previous plan)
Action# —Action description					
Lead Agency:		**Partner Agencies:**			
Action Source:		**Performance Metric:**			
Action# —Action description					
Lead Agency:		**Partner Agencies:**			
Action Source:		**Performance Metric:**			
Action# —Action description					
Lead Agency:		**Partner Agencies:**			
Action Source:		**Performance Metric:**			
Action# —Action description					
Lead Agency:		**Partner Agencies:**			
Action Source:		**Performance Metric:**			
Action# —Action description					
Lead Agency:		**Partner Agencies:**			
Action Source:		**Performance Metric:**			
Action# —Action description					
Lead Agency:		**Partner Agencies:**			
Action Source:		**Performance Metric:**			
Action# —Action description					
Lead Agency:		**Partner Agencies:**			
Action Source:		**Performance Metric:**			
Action# —Action description					
Lead Agency:		**Partner Agencies:**			
Action Source:		**Performance Metric:**			
Action# —Action description					
Lead Agency:		**Partner Agencies:**			
Action Source:		**Performance Metric:**			
Action# —Action description					
Lead Agency:		**Partner Agencies:**			
Action Source:		**Performance Metric:**			

TRAINING NEEDS OR ADDITIONAL GUIDANCE

To be Completed.

RECOMMENDATIONS FOR CHANGES OR ENHANCEMENTS

Based on the review of this report by the Mitigation Action Plan Working Group, the recommendations described in the preceding sections will be noted for future updates or revisions to the plan.

Public review notice: *The contents of this report are considered to be public knowledge and have been prepared for total public disclosure. Copies of the report have been provided to local media*

outlets. The report is also posted on the City of Portland hazard mitigation website. Any questions or comments regarding the contents of this report should be directed to:

Name
Address
City, ST Zip
Phone
email

Table 4. Action Plan Matrix

Action Taken?	Timeline	Priority Changed?	Comment	Status
Action #—Description				
CHOOSE	CHOOSE	CHOOSE		CHOOSE
Action #—Description				
CHOOSE	CHOOSE	CHOOSE		CHOOSE
Action #—Description				
CHOOSE	CHOOSE	CHOOSE		CHOOSE
Action #—Description				
CHOOSE	CHOOSE	CHOOSE		CHOOSE
Action #—Description				
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Action #—Description				
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Action #—Description				
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CHOOSE	CHOOSE	CHOOSE		CHOOSE
Action #—Description				
CHOOSE	CHOOSE	CHOOSE		CHOOSE
Action #—Description				
CHOOSE	CHOOSE	CHOOSE		CHOOSE

Action Taken?	Timeline	Priority Changed?	Comment	Status
Action #—Description				
CHOOSE	CHOOSE	CHOOSE		CHOOSE
Action #—Description				
CHOOSE	CHOOSE	CHOOSE		CHOOSE
Action #—Description				
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Action #—Description				
CHOOSE	CHOOSE	CHOOSE		CHOOSE
Action #—Description				
CHOOSE	CHOOSE	CHOOSE		CHOOSE

Appendix L. FEMA Local Mitigation Plan Review Tool

L. FEMA Local Mitigation Plan Review Tool

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: **Portland, Oregon**	**Title of Plan:** **The Mitigation Action Plan: The City of Portland's Path to Resilience**	**Date of Plan:** **September 2016**
Local Point of Contact: **Jonna Papaefthimiou**	**Address:** **9911 SE Bush Street** **Portland, OR 97266**	
Title: **Planning and Preparedness Manager**		
Agency: **Portland Bureau of Emergency Management (PBEM)**		
Phone Number: **503-823-3809**	**E-Mail:** **Jonnap@portlandoregon.gov**	

State Reviewer:	**Title:**	**Date:**

FEMA Reviewer:	**Title:**	**Date:**
Date Received in FEMA Region *(insert #)*		
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved		

SECTION 1:

REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan** (section and/or page number)	**Met**	**Not Met**
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Part 1, Chapter 3 (Plan Update Approach) and Section 3.8 (Plan Development Chronology/Milestones) and Section 3.2 (Formation of the Planning Team) and Section 3.5 (the Steering Committee) and Section 3.6 (Coordination with Other Agencies) Part 1, Chapter 2 (Plan Update – What Has Changed)		
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Part 1, Chapter 3, Section 3.4 (Plan Kick-off); Section 3.5 (The Steering Committee); Section 3.6 (Coordination with Other Agencies); Section 3.7.3 (Critical Energy Infrastructure Hub Stakeholder Outreach)		
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Part 1, Chapter 3, Section 3.7 (Public Engagement Strategy) and Appendix C (Public Engagement Materials)		

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Part 1, Chapter 4, Section 4.9 (Laws, Ordinances and Programs) Part 2, Chapter 6, Section 6.1 (Overall Risk Assessment Methodology); Table 6-1 (Summary of Data Used for Spatial analysis); Section 6.8 (Data sources, limitations and gaps) Part 3, Chapter 17 (Vision, Mission, Goals and Objectives) Part 3, Chapter 19, Section 19.3 (Actions Selected for Implementation in the 2016 Plan) and Section 19.5.5, Subsection (Plan Integration for the Mitigation Action Plan) References cited throughout (see References section)		
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Part 3, Chapter 19, Section 19.5.7 (Continued Public Engagement and Access)		
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Part 3, Chapter 19, Section 19.5.4 (Annual Progress Report); Section 19.5.6, Subsection (Plan Update); Section 19.5.1 Plan Implementation		
ELEMENT A: REQUIRED REVISIONS			
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Part 2, Chapter 5 (Hazards and Compounding Factors) Part 2, Chapters 7 through 14, Section X.1 General Background, Section X.2 (Hazard Profile) and X.4 (Exposure)		
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Part 2, Chapters 7 through 14, Section X.2.1 (Past Events); X.2.4 (Frequency) Part 2, Chapter 16, Section 16.1 (Probability of Occurrence)		

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Part 2, Chapter 7 through 14, Section X.4 (Exposure) and X.5 (Vulnerability); , Sections X.8 (Issues) Part 2, Chapter 16 (Risk Ranking)		
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Part 2, Chapter 11, Section 11.5.2, Sub-section (Repetitive Loss)		
ELEMENT B: REQUIRED REVISIONS			
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Part 1, Chapter 4, Section 4.9.3 (Local)		
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Part 2, Chapter 11, Section 11.2.7 (Flood Management Programs and Projects)		
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Part 3, chapter 17 (Vision, Mission, Goals and Objectives)		
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Part 3, Chapter 18 (Mitigation Alternatives) Appendix I Mitigation Best Practices Catalog Chapter 19, Section 19.3 (Actions Selected for Implementation in the 2016 Plan); Section 19.3.2 (Selected Actions)		
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Part 3, Chapter 19, Section 19.3.4 (Action Plan Prioritization); Section 19.3.3 (Action Plan Benefit-Cost Review); Section 19.3.2 (Selected Actions); and Table 19-4 (Actions Selected for Implementation)		

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Part 3, Chapter 19, Section 19.5.5, Subsection (Plan Integration for the Mitigation Action Plan) Part 1, Chapter 4, Section 4.9.3 (Local); Part 3, Chapter 19, Section 19.3.2, Table 19-4 (Actions Selected for Implementation); and Section 19.3.4, Table 19-5 (Prioritization of Mitigation Actions) Part 3, Chapter 19, Section 19.5.5, Subsection (Plan Integration During the 2010 NHMP Performance Period)		
ELEMENT C: REQUIRED REVISIONS			
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Part 1, Chapter 2, Section 2.2.2 (Changes in Development) Chapters 7 through 14, Sections X.5 (Future Trends in Development)		
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Part 3, Chapter 19, Section 19.2 (Status of Previous Plan Actions)		
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	This plan update utilized a different prioritization scheme from original plan. Therefore, all actions were reprioritized. In general, Portland has increased its focus and attention on public engagement and equity and the entire plan and planning process was revised to address this shift in priorities. Part 1, Chapter 2, Section 2.2.3 (Focus on Public Engagement and Equity) Part 3, Chapter 19, Section 19.3.1 (Equity Analysis Screening) and Section 19.3.4 (Action Plan Prioritization)		
ELEMENT D: REQUIRED REVISIONS			

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	Pre-adoption review request – Adoption scheduled for October 19		
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	N/A		
ELEMENT E: REQUIRED REVISIONS			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1.			
F2.			
ELEMENT F: REQUIRED REVISIONS			

SECTION 2:

PLAN ASSESSMENT

INSTRUCTIONS: The purpose of the Plan Assessment is to offer the local community more comprehensive feedback to the community on the quality and utility of the plan in a narrative format. The audience for the Plan Assessment is not only the plan developer/local community planner, but also elected officials, local departments and agencies, and others involved in implementing the Local Mitigation Plan. The Plan Assessment must be completed by FEMA. The Assessment is an opportunity for FEMA to provide feedback and information to the community on: 1) suggested improvements to the Plan; 2) specific sections in the Plan where the community has gone above and beyond minimum requirements; 3) recommendations for plan implementation; and 4) ongoing partnership(s) and information on other FEMA programs, specifically RiskMAP and Hazard Mitigation Assistance programs. The Plan Assessment is divided into two sections:

1. Plan Strengths and Opportunities for Improvement
2. Resources for Implementing Your Approved Plan

Plan Strengths and Opportunities for Improvement is organized according to the plan Elements listed in the Regulation Checklist. Each Element includes a series of italicized bulleted items that are suggested topics for consideration while evaluating plans, but it is not intended to be a comprehensive list. FEMA Mitigation Planners are not required to answer each bullet item, and should use them as a guide to paraphrase their own written assessment (2-3 sentences) of each Element.

The Plan Assessment must not reiterate the required revisions from the Regulation Checklist or be regulatory in nature, and should be open-ended and to provide the community with suggestions for improvements or recommended revisions. The recommended revisions are suggestions for improvement and are not required to be made for the Plan to meet Federal regulatory requirements. The italicized text should be deleted once FEMA has added comments regarding strengths of the plan and potential improvements for future plan revisions. It is recommended that the Plan Assessment be a short synopsis of the overall strengths and weaknesses of the Plan (no longer than two pages), rather than a complete recap section by section.

Resources for Implementing Your Approved Plan provides a place for FEMA to offer information, data sources and general suggestions on the overall plan implementation and maintenance process. Information on other possible sources of assistance including, but not limited to, existing publications, grant funding or training opportunities, can be provided. States may add state and local resources, if available.

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

How does the Plan go above and beyond minimum requirements to document the planning process with respect to:

- *Involvement of stakeholders (elected officials/decision makers, plan implementers, business owners, academic institutions, utility companies, water/sanitation districts, etc.);*
- *Involvement of Planning, Emergency Management, Public Works Departments or other planning agencies (i.e., regional planning councils);*
- *Diverse methods of participation (meetings, surveys, online, etc.); and*
- *Reflective of an open and inclusive public involvement process.*

Element B: Hazard Identification and Risk Assessment

In addition to the requirements listed in the Regulation Checklist, 44 CFR 201.6 Local Mitigation Plans identifies additional elements that should be included as part of a plan's risk assessment. The plan should describe vulnerability in terms of:

1) *A general description of land uses and future development trends within the community so that mitigation options can be considered in future land use decisions;*
2) *The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; and*
3) *A description of potential dollar losses to vulnerable structures, and a description of the methodology used to prepare the estimate.*

How does the Plan go above and beyond minimum requirements to document the Hazard Identification and Risk Assessment with respect to:

- *Use of best available data (flood maps, HAZUS, flood studies) to describe significant hazards;*
- *Communication of risk on people, property, and infrastructure to the public (through tables, charts, maps, photos, etc.);*
- *Incorporation of techniques and methodologies to estimate dollar losses to vulnerable structures;*
- *Incorporation of Risk MAP products (i.e., depth grids, Flood Risk Report, Changes Since Last FIRM, Areas of Mitigation Interest, etc.); and*
- *Identification of any data gaps that can be filled as new data became available.*

Element C: Mitigation Strategy

How does the Plan go above and beyond minimum requirements to document the Mitigation Strategy with respect to:

- *Key problems identified in, and linkages to, the vulnerability assessment;*
- *Serving as a blueprint for reducing potential losses identified in the Hazard Identification and Risk Assessment;*
- *Plan content flow from the risk assessment (problem identification) to goal setting to mitigation action development;*
- *An understanding of mitigation principles (diversity of actions that include structural projects, preventative measures, outreach activities, property protection measures, post-disaster actions, etc.);*
- *Specific mitigation actions for each participating jurisdictions that reflects their unique risks and capabilities;*
- *Integration of mitigation actions with existing local authorities, policies, programs, and resources; and*
- *Discussion of existing programs (including the NFIP), plans, and policies that could be used to implement mitigation, as well as document past projects.*

Element D: Plan Update, Evaluation, and Implementation (*Plan Updates Only*)

How does the Plan go above and beyond minimum requirements to document the 5-year Evaluation and Implementation measures with respect to:

- *Status of previously recommended mitigation actions;*
- *Identification of barriers or obstacles to successful implementation or completion of mitigation actions, along with possible solutions for overcoming risk;*
- *Documentation of annual reviews and committee involvement;*
- *Identification of a lead person to take ownership of, and champion the Plan;*
- *Reducing risks from natural hazards and serving as a guide for decisions makers as they commit resources to reducing the effects of natural hazards;*
- *An approach to evaluating future conditions (i.e. socio-economic, environmental, demographic, change in built environment etc.);*
- *Discussion of how changing conditions and opportunities could impact community resilience in the long term; and*
- *Discussion of how the mitigation goals and actions support the long-term community vision for increased resilience.*

B. Resources for Implementing Your Approved Plan

Ideas may be offered on moving the mitigation plan forward and continuing the relationship with key mitigation stakeholders such as the following:

- *What FEMA assistance (funding) programs are available (for example, Hazard Mitigation Assistance (HMA)) to the jurisdiction(s) to assist with implementing the mitigation actions?*
- *What other Federal programs (National Flood Insurance Program (NFIP), Community Rating System (CRS), Risk MAP, etc.) may provide assistance for mitigation activities?*
- *What publications, technical guidance or other resources are available to the jurisdiction(s) relevant to the identified mitigation actions?*
- *Are there upcoming trainings/workshops (Benefit-Cost Analysis (BCA), HMA, etc.) to assist the jurisdictions(s)?*
- *What mitigation actions can be funded by other Federal agencies (for example, U.S. Forest Service, National Oceanic and Atmospheric Administration (NOAA), Environmental Protection Agency (EPA) Smart Growth, Housing and Urban Development (HUD) Sustainable Communities, etc.) and/or state and local agencies?*

SECTION 3:

MULTI-JURISDICTION SUMMARY SHEET (OPTIONAL)

INSTRUCTIONS: For multi-jurisdictional plans, a Multi-jurisdiction Summary Spreadsheet may be completed by listing each participating jurisdiction, which required Elements for each jurisdiction were 'Met' or 'Not Met,' and when the adoption resolutions were received. This Summary Sheet does not imply that a mini-plan be developed for each jurisdiction; it should be used as an optional worksheet to ensure that each jurisdiction participating in the Plan has been documented and has met the requirements for those Elements (A through E).

MULTI-JURISDICTION SUMMARY SHEET													
							Requirements Met (Y/N)						
#	Jurisdiction Name	Jurisdiction Type (city/ borough/ township/ village, etc.)	Plan POC	Mailing Address	Email	Phone	A. Planning Process	B. Hazard Identification & Risk Assessment	C. Mitigation Strategy	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Require-ments



Fossil Fuel Terminal Zoning Amendments: Proposed Draft

PSC Work Session
October 11, 2016

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.

New policy direction on fossil fuel infrastructure

Fossil Fuel Infrastructure Resolution, November 2015:

1. Actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways.
2. But do not restrict. . .
   - improvements in the safety, efficiency, seismic resilience, or operations of existing infrastructure
   - service directly to end users
   - infrastructure that will accelerate the transition to non-fossil fuel energy sources

2035 Comprehensive Plan

Policy 6.48 Fossil fuel distribution. Limit fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Proposed zoning code amendments

- **Define** Bulk Fossil Fuel Terminals as a regulated land use.
- **Prohibit** Bulk Fossil Fuel Terminals in all base zones.
- Existing Bulk Fossil Fuel Terminals would become legal, non-conforming uses that can continue to operate.

Code Issues

- Storage capacity threshold and aggregation of small facilities
- Regulating existing terminals
- Exemption for regulated utilities
- Other issues

New land use category:
Bulk Fossil Fuel Terminals

Bulk Fossil Fuel Terminals:

- Marine, railroad, or pipeline transport access; and
- Transloading facilities (such as train-to-ship) or storage capacity exceeding 5 million gallons.

Exclusions:

- Distributors with access exclusively by truck;
- End-user facilities, including filling stations and firms that store fossil fuels for use as an input;
- Recovery or reprocessing used petroleum

Storage Capacity Threshold

- Proposed draft: threshold is 5 million gallons
- Possible amendments:
  1. Reduce threshold
  2. Add language to prevent aggregation of small facilities
  3. Add language to clarify status of rail yards and pipelines

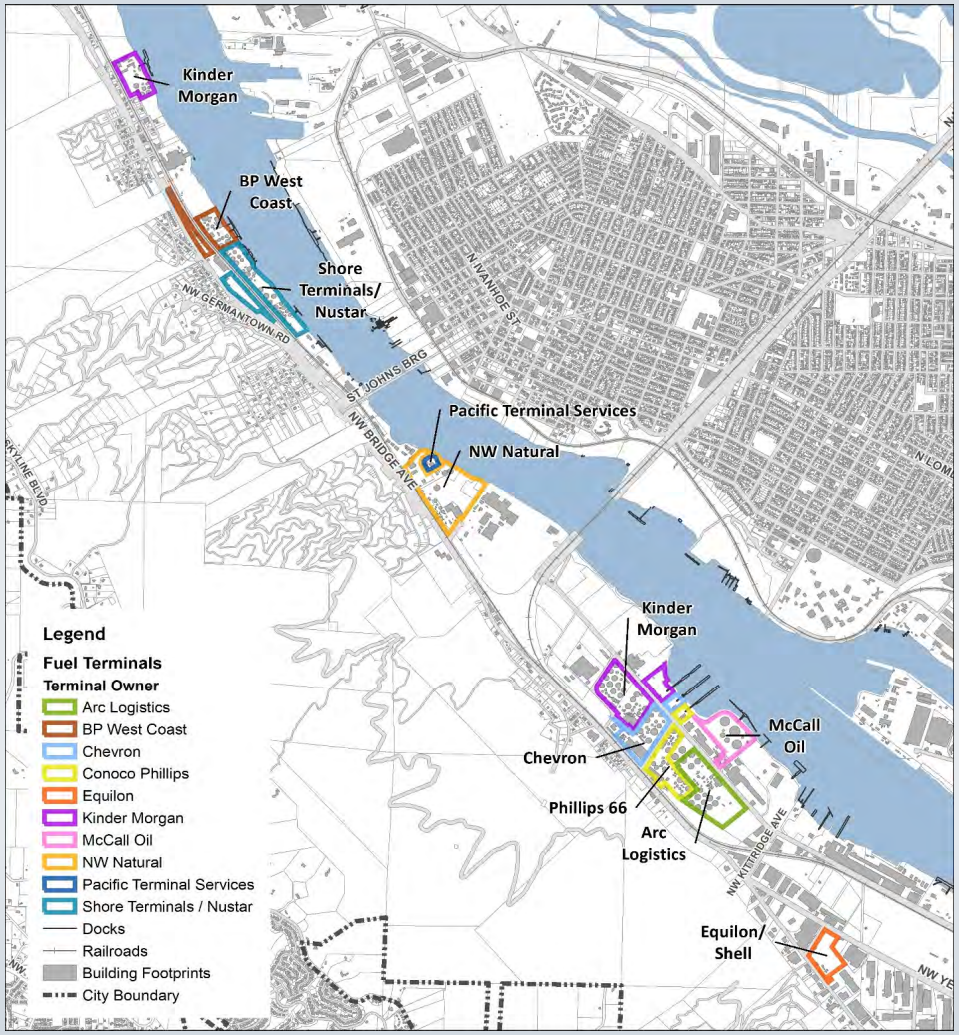
Aggregation of Small Facilities

- Zoning Code (33.910.030) definition of "ownership":

  An ownership is one or more contiguous lots that are owned by the same person, partnership, association, or corporation. Ownership also includes lots that are in common ownership but are separated by a shared right-of-way.

- Possible amendment: aggregation of separate parcels will be classified as a Bulk Fossil Fuel Terminal when two or more factors are present:
  a. Located on adjacent parcels, including separated by a right-of-way;
  b. Facilities share or will share operating facilities such as driveways, parking, piping, or storage tanks; or
  c. Facilities are owned or operated by a single parent partnership or corporation.

Status of existing terminals



Regulating Existing Terminals

- Proposed draft: Non-conforming use.
- Limited use:
  - No discretionary land use review.
  - Replacement or expansion for seismic upgrades or clean fuel standards allowed up to 10% increase in storage capacity.
- Conditional use:
  - Discretionary land use review for seismic upgrades or clean fuel standards allowed up to 10% increase.

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Exemption for regulated utilities

- Exceptions to Bulk Fossil Fuel Terminals:
- Possible amendment:

  Facilities operated by a public utility and regulated by the Oregon Public Utility Commission under ORS Chapters 756 and 757 for the purposes of ensuring fuel reliability to direct users through an interconnected system are not Bulk Fossil Fuel Terminals.

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Other Issues

- Regulating throughput
- Seismic upgrades

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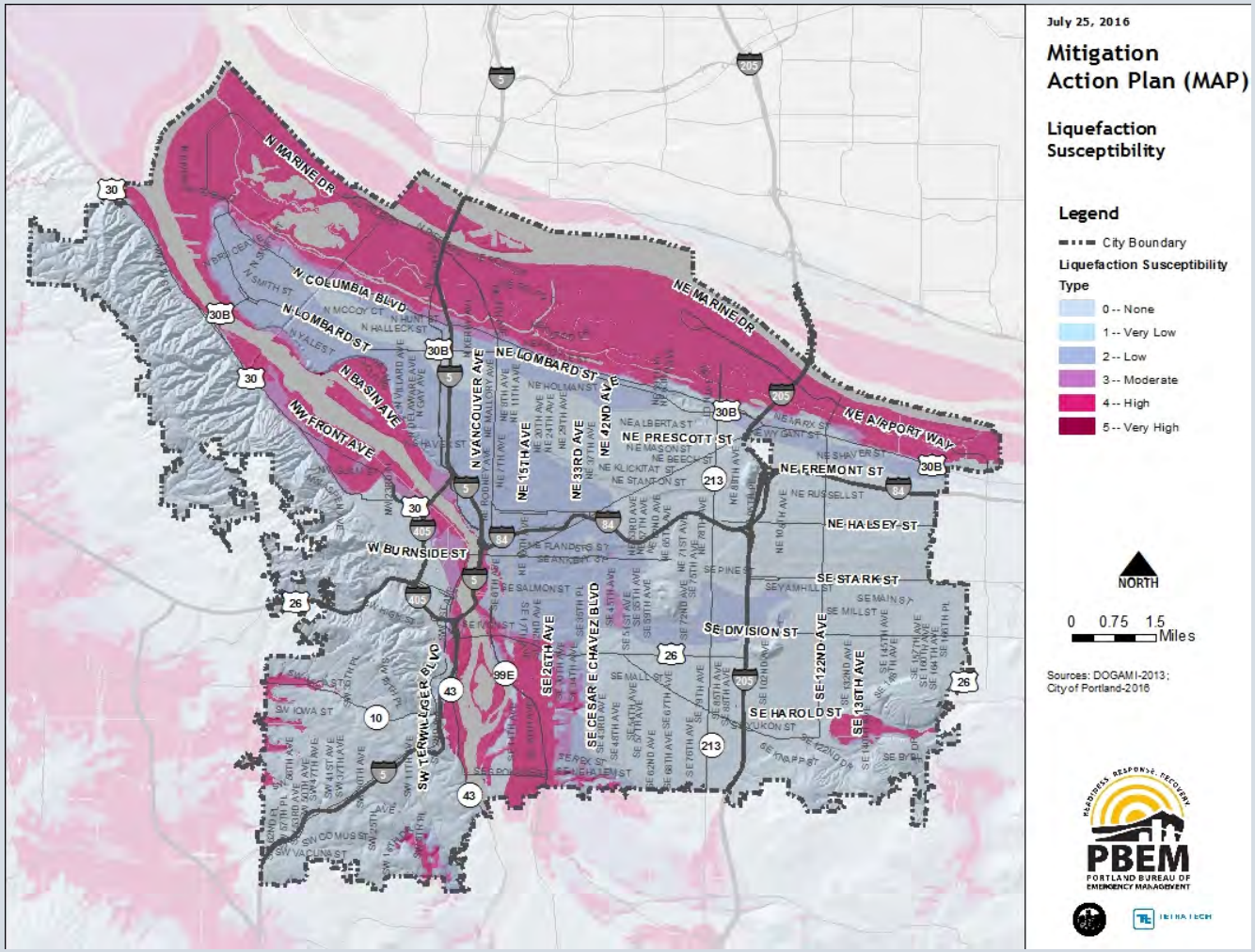
Defining fossil fuel

Fossil fuels are petroleum products (such as crude oil and gasoline), coal, and gaseous fuels (such as natural gas, methanol, and propane) that are made from decayed plants and animals that lived millions of years ago and are used as a source of energy.

Exclusions: Denatured ethanol and similar fuel additives and biodiesel/renewable diesel with less than 5% fossil fuel content are not fossil fuels.

Public safety and environmental risks



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Portland Planning and Sustainability Commission
October 11, 2016
12:30 p.m.
Meeting Minutes

Commissioners Present: Jeff Bachrach, Katie Larsell, Gary Oxman, Michelle Rudd, Katherine Schultz, Chris Smith, Eli Spevak, Teresa St Martin, Maggie Tallmadge (left at 3:15 p.m.)

Commissioners Absent: Andre' Baugh, Mike Houck

City Staff Presenting: Joe Zehnder, Michael Armstrong, Andria Jacob, Kyle Diesner, Tyler Bump, Matt Tschabold, Tom Armstrong

Other Presenters: Lorelei Juntunen (ECONorthwest)

Chair Schultz called the meeting to order at 12:30 p.m. and gave an overview of the agenda.

Documents and Presentations for today's meeting

Items of Interest from Commissioners

- *Commissioner Smith* and *Commissioner Spevak* attended Strong Towns, hosted by 1,000 Friends, an urban policy fiscal meeting, last week.

Director's Report

Joe Zehnder

- Residential Infill Project — BPS' recommendation to Council on the concepts are being published on October 17. The PSC's next meeting (October 25) will include a briefing on staff's recommendations.
- The first Task 5 Comp Plan hearing at Council was last Thursday; this Thursday is the continuation. Big topics people raised (pretty balanced testimony on both sides of these issues) included parking minimums, drive-throughs, the 4:1 versus 2:1 FAR issue in northwest, the Hayden Island bike path and individual property requests.

Consent Agenda

- RWA #7940: SW Moody south of the Ross Island Bridge
- Consideration of Minutes from the September 27, 2016 PSC meeting

Chair Schultz (at the request of *Commissioner Baugh*) pulled the Street Vacation RWA #7940 off the Consent Agenda. This item will return to the PSC for a hearing in the upcoming months.

Commissioner Smith moved to approve the Consent Agenda. *Commissioner Oxman* seconded.

The Consent Agenda was approved with an aye vote.
(Y9 — Bachrach, Larsell, Oxman, Rudd, Schultz, Smith, Spevak, St Martin, Tallmadge)

Home Energy Scoring

Briefing: Michael Armstrong, Andria Jacob, Kyle Diesner

Michael introduced the policy proposal. City Council will likely have their hearing on this at the end of November.

The intent of the policy is to reduce carbon emissions and respond to the urgency of climate change. Some people think this policy goes too far too fast, but staff feels the proposed policy is an appropriate

step to address climate change. The policy is also intended to make it easier for prospective homebuyers to see the full cost of home-ownership.

This action is part of the 2015 Climate Action Plan (CAP) to reduce energy use in existing buildings and was first proposed in the 2009 CAP. Action 1B in the 2015 CAP reads: "Require energy performance ratings for all homes so that owners, tenants and prospective buyers can make informed decisions about energy costs and carbon emissions." Residential buildings make up about 20 percent of carbon emissions. About three-quarters of existing houses were built before energy codes were in place and have not been retrofit.

It's also important for a prospective buyer to know their potential energy costs for housing they're considering to buy. Over time, a more efficient home can save a homeowner on the order of $10,000 over 10 years.

Benefits of the policy to Portlanders

- Better insight into the full costs of owning a home.
- Ability to compare energy costs and performance between homes.
- Knowledge of home improvements in advance of purchase.
- Access to specialized mortgage products
- Long-term operational savings from purchase of an energy-efficient home.

Staff is proposing that sellers of single-family homes obtain a home energy performance report, which includes:

- A home energy score and explanation of the score,
- An estimate of the total annual energy used in the home, by fuel type
- An estimate of the total monthly (or annual) cost of energy purchased for use in the home, in dollars by fuel type.
- The current average annual utility retail energy price by fuel type.

Staff have worked closely with the Oregon Department of Energy to stay aligned with existing statute and rules around home energy scoring systems and practices. The home energy score is based on how a home is built, not how the home is used. This type of score is called an asset rating and is considered best practice in the field because it allows buyers to compare homes on an apples-to-apples basis, which is not possible when you are just looking at past occupants' utility bills. This is similar to a MPG rating on cars, which enables comparison between vehicles even though actual mileage may vary. Asset ratings are based on a relatively brief inspection of the home by a certified home energy assessor.

Under the proposed policy, a seller must disclose the information from this report to the City of Portland and to prospective buyers who visit the home while it is on the market.
The requirement would apply to sellers or, in the case of newly constructed homes, homebuilders. However, sellers may have a designated representative, like a real estate professional, disclose the report and the score on their behalf.

Staff are proposing to use the US Department of Energy's Home Energy Score rating tool. The reports are customizable to make it consumer-friendly. The report also provides a roadmap for either the seller or the buyer about what to do to get that higher score.

As a result of stakeholder engagement and public comments, staff identified a number of exemptions that would be necessary. Since the policy is triggered by the public listing of a home for sale, the proposal exempts those transactions that never hit the market or that present examples of hardship, like foreclosures and short sales.

The proposed policy also recognizes that the new construction market is different than the existing homes market. Currently, other scoring products are in use in new construction, and stakeholders

indicated a need for time to transition to the new scoring tool. For that reason, staff propose to provide a waiver for new homes that are using other scoring products.

Also in response to public comment about equity concerns and potential harm to vulnerable residents, staff have proposed a new element to the policy, a deferral for "Low Income Qualified Sellers" — household income at or below 60 percent of median household income. Sellers would be able to qualify for this exemption by showing participation in one of a number of income-qualified services or who can demonstrate hardship.

Commissioner TaIlmadge suggested we may want to up this to include households at the 80 percent MFI threshold.

Rental homes are not included in the current proposal. However, staff noted that there are important equity benefits for renters since energy costs can burden lower-income households. However, equity stakeholder discussions suggested that though those equity benefits are understood, now is not the right time for this policy. Staff are therefore proposing to study this market, establish metrics to monitor that will identify when conditions are more favorable for a policy like this. BPS may recommend that Council establish a stakeholder committee to work on this, and staff welcome your thoughts on this piece.

Commissioner Spevak asked if this would apply to any single-home being sold.

- Any house that is sold, regardless of how it's being used. But when houses are leased, we are not proposing to require disclosure to the tenant.

Staff heard a number of comments from the public in their outreach:

- Equity: how does the policy affect low-income and vulnerable people (e.g., elders on fixed incomes?)
- Housing: concern that this will increase cost of homes, and worsen the housing crisis. Staff share concerns about affordability and believe that the proposed policy will enable homebuyers to understand the full cost of homeownership, including energy bills, which will improve affordability in the long run.
- Voluntary: Commenters suggested that a requirement was too aggressive and preferred a voluntary program. Staff noted that a voluntary approach has been in in place since 2009. Incentives for energy efficiency come from the utility sector, offered and promoted by Energy Trust of Oregon. These too are in effect. However, less than 2 percent of homes have gotten a score in Portland over the last 7 years.
- Many Portlanders recognize that home energy scores make the full cost of owning a home transparent in a way that they are not currently. Some argue that consumers (in this case, homebuyers) can find out what past occupants have paid for their utility bills and that it's obvious if a house has insulation or bad windows.
- Support for consumer protection and climate protection benefits.

Discussion
For PSC consideration:

1. What is the appropriate frequency for renewing the score?
2. Should Council establish a committee to identify appropriate market conditions for a policy addressing single-family rental housing?

This is tentatively scheduled to be at Council on November 23, which is a public hearing. This is an ordinance, so the second reading, likely December 7, is when Council will discuss and vote.
Commissioner Smith noted his experience is that you get what you measure. I understand the impetus for this, and I did read the letters with objections: there would be pressure on the assessors to give false-positive scores; economic burden to lower-income homeowners; and the idea that a bad score could reduce the marketability for a home, which could be a detriment particularly for low-income sellers.

- If a house gets a relatively low score and people can't invest in improvements, we have been talking to Enhabit about a customized loan product to meet the need. There are a number of home equity lines of credit opportunities as well. The flip side is: is it better to know or not to know?
- The "bad actors" questions: would home energy assessors have an incentive to rate homes poorly in order to generate business for energy-retrofit providers? Assessors must be certified, and there is QC for this if there are systematically biased results. The US Department of Energy requires entities that use the Home Energy Score tool to have an evaluation process in place. Currently, the Oregon Department of Energy is positioned to provide this role statewide; the City will also have to have someone to fill this QC role. Staff acknowledged the concern about assessors having a motivation to score houses low but also noted a countervailing pressure to score houses high in order to be view favorably for future assessments. For both reasons, quality control is essential.

Commissioner TaIlmadge: What are the concerns about expanding to the rental market?

- There is a fear of cost of the assessment being pushed onto renters. This is part of a larger conversation, not that it's a bad idea.

Commissioner Oxman: The commercial building program… does it cover any residential homes?

- Only commercial buildings 20,000 square feet and larger. No residential properties are included.
- Attached single-family homes are included in this proposal, but not stacked condos.

What's encompassed by being a green-certified home?

- The green building ratings (e.g., Earth Advantage and LEED for homes) include energy scoring but also other criteria, such as indoor air quality, water efficiency, and waste. Energy use is one component of these other ratings.

On effectiveness, how much of a decrease in energy consumption could we expect via this program?

- In Austin, this program has been going for 7 years. Of the houses that went through the process, about 6 percent followed through with improvements. So this is an essential first step in a market transformation effort, but this alone won't get to our carbon-reduction goals.

What's the turn-over rate for housing in Portland? How long will it take us to report on a number of houses?

- There were 11,000 homes transacted last year. We expect this over time, likely in the 20-year range.

Commissioner Rudd: Did we provide incentives with the voluntary program? What level of publicity was included in the voluntary program?

- There were incentives initially but not anymore.

Commissioner Bachrach: Is this going to apply to new homes?

- Yes. In the spirit of level playing field, we want those homes to get a score. Scores do vary with size as well as type of construction.

There are lots of energy-oriented programs. Utility customers already fund the Energy Trust of Oregon. It doesn't take long as a home owner to know what your utility bills are. So I don't know how much more incentive it will be to score versus when the homeowner gets a few bills. The point is to encourage retrofitting, correct? How will we measure the success of getting retrofits? What should we expect for people to act on having this information?

- We work closely with other participants in the energy field. We would evaluate impacts of this on understanding how the residential retrofit

Commissioner Spevak noted this is a good proposal. Information disclosure prompts people to address energy efficiency issues through the real estate sale process, and the City has an interest in this. Did the other cities have voluntary programs before requiring disclosure? I think one of the things that's important is that we're providing buyers information before they make their decisions.

- Some jurisdictions had voluntary, and some had mandatory retrofit requirements initially but then changed from required upgrades to a required score.

Commissioner St Martin: I support energy efficiency improvements. What are the costs of implementation for the City?

- We expect we would reassign existing City staff to work on this. We may need to pull from our larger green building and climate team.

This is a mandatory program with no penalties, so isn't that really voluntary?

- The BPS Director is proposed to have the authority to issue a penalty for non-compliance.

I get a report and it gives me options of how I can save and things to do. If the things to do cost lots more than my ownership time (energy use) will cost, why would I choose invest in upgrades? The timing may make the scoring less effective. There are obvious things you can see in older houses we can point out. It's the things you can't see that becomes important. If someone gets a score and makes improvements, their house still has the old score attached.

- They could redo the score audit.
- We are proposing to make the information available in the home for prospective buyers, so it's beneficial for either the buyer or seller.

Commissioner Larsell is also interested in experiences from other cities. I was noticing the exceptions, and I don't know how many that would include. Has there been thought about having the banks cover the cost of the assessment? This is the first part of a market transformation program; what happens next? And is this public, and is there history of contractors getting this information that in turn they make pitches to homeowners about?

- On the number of expected annual exceptions: we can follow up.
- Market transformation: information is a start, but will be much more effective when paired with a program to actually get someone and motivated to invest. Training, education and new tools can help, so that's why we're considering the score a first step to increase the changes for a new programmatic effort to succeed.
- Scores will be public. So someone who is looking at houses can see them, and others will have access to them as well.

Chair Schultz: In terms of frequency for renewing the score, my gut reaction is that a study on the metrics would be important so we could evaluate it at that time. I would completely support this scoring for the rental market would be good, too. If you're giving an exemption to sellers at a certain financial threshold, but what about on the buyer end?

Chair Schultz asked about having the PSC write a letter to Council.

Commissioner St Martin thinks the use of a mandate without a sure impact is something we should be careful about. I'm only questioning if this is the right first step.

Commissioner Spevak recommends supporting this because we already have a voluntary program. *Commissioner Smith* seconded.

Commissioner Rudd has some concern because we have a big turnout of people in the audience concerned about the proposal, but we don't have a hearing scheduled here. I understand we have CAP goals, but I'm not comfortable at this point to send a letter. I also know the voluntary program was not very successful at reaching lower-income people to assist with retrofits though there was some job creation.

- *Commissioner Bachrach* seconds this idea that it's inappropriate to give a recommendation to Council and we have outstanding questions on the Commission.

Commissioner St Martin asked for a pilot to pay for the work and see what people would do and if behaviors would change.

Commissioner Oxman has mixed feelings as well. The program may not make big changes in terms of the number of properties that will actually do change.

Commissioner Larsell asked if we note how many people showed up today against the proposal, and this is a first step to more work, if that would be a valuable letter to Council.

Chair Schultz noted we may not have support for a letter. I am personally supportive of the proposal and the work.

Michael clarified the question about a pilot: ETO has run repeated pilots over the past 7 years. The results are that voluntary programs have resulted in fewer than 2 percent of homes in Portland have energy scores.

Commissioner Smith asked to call the vote.

(Y5 — Larsell, Schultz, Smith, Spevak, Tallmadge; N4 — Bachrach, Oxman, Rudd, St Martin)

Staff will work with Commission officers to draft a letter for PSC to share with Council.

Inclusionary Housing
Briefing: Tyler Bump, Matt Tschabold; Lorelei Juntunen (ECONorthwest)

Tyler introduced the project and today's briefing. He acknowledged Shannon Buono's great work on the code (Title 33) component of the proposal. The state passed the bill last March that allows inclusionary housing. Since then, the Portland Housing Bureau (PHB) has led a process including a panel of experts to see how we can make inclusionary housing work in Portland. Portland is not unique; there are many other cites having similar conversations at this time.

Lorelei discussed The Economics of Inclusionary Development report. The numbers are not Portland-specific since this is a national report. The increase in one-bedroom rents have risen much higher than incomes. The challenge is that average rents can be only barely feasible even for people making 100 percent MFI.

Most cities with inclusionary housing programs target affordability at 60-80 percent MFI. The percentage of units in a development to be affordable range from very low up to 20 percent.

The new state legislation allows cities to have a mandatory program. Opt outs are required in the policy (e.g. fee-in-lieu). And there are lots of incentives to consider.

The policy can only work in places where development is occurring because it applies only to new buildings.

Market feasibility when sufficient rent income can cover costs. Another factor is capital is mobile. These are things builders don't have much control over. The only place there is "squish" is on the land value. If a policy reduces the residual land value below expectations, then development will no longer move forward.

With higher-density development, there is higher per-square-foot costs to the developer. Assuming the land value is zero and no policy in place, we see lots of growth only in the Central City.

With IH without incentives, at a 20 percent set aside, 80% of MFI and assumed $0 land price, big portions of the Central City are still feasible. We see a reduction in density in other areas because the rent that's achievable is not sufficient to support the higher construction costs in the higher-density development.

The Portland policy proposed does have incentives included. Incentives are necessary to make sure development is financially feasible and moves forward.

Ultimately:

- Well-calibrated IH programs can result in mixed income buildings in areas where new development is occurring.
- Poorly-calibrated IH programs create market disruptions and reduce development outcomes.
- Flexible programs are better:
    - Incentives
    - One size fits all vs. sub-market approach
    - Revisiting policy as market changes
    - Opt-out or fee-in-lieu

Commissioner St Martin: On the opt-out strategy, are incentives still provided?

- This changes from jurisdiction to jurisdiction

Commissioner Spevak: Do you see areas where IH have increased or decreased land value?

- Since every policy is different and many other variables, a pre/post assessment is almost impossible. Over time, you see land values going down, but since land owners have their own ideas of their property value, this doesn't always happen.

Commissioner Bachrach: The incentive package has been a big conversation with the work group. What difference does it make if we don't calibrate it right?

- A developer doesn't always know how much they'll be making. Returns are speculative and may not be known at the time the deal is financed, so if you can't show you can cover expenses, the project won't get financed, so it won't move forward.

In order to have a well-calibrated program, is it essential to have 100 percent incentive to compensate for the land value?

- There is a policy trade-off embedded here. Trade-offs and time periods are key.

Commissioner Smith: There is a calibration around not reducing multi-development. What about public dollars used in incentives versus using those dollars being used in other ways? You've described how there are different levels of returns… banks, then bank/developers, then everyone. has anyone crafted a public policy program that grabs from where everyone is making money versus just going for the lower tranches?

Chair Schultz: On the importance of calibration… is there a rule of thumb that says when calibration needs to happen?

- No, it ties into market situations. Ideally you would do this project-by-project, but that's not practical.

You talked about inclusionary policies work when the housing market is building units. With the incentive packages, would these affect the market as offered today?

- We helped to develop the policies at the early stages but haven't been involved with the policies, which are still evolving.
- We expect lots of people to testify about this question.

Matthew walked through the program recommendations. Citywide, 20 percent of units are affordable at 80 percent MFI. Or only 10 percent at 60 percent MFI, which is the voluntary option. Requirements and incentives vary:

- Mixed Use zones
- Central city
- Zones with base FAR above 5.0
- Build off-site options
    - Build new units off-site
    - Off-site dedication of existing units
- Fee-in-lieu calibration is a two-step process

- Calculate maximum justifiable fee-in-lieu
- Calculate Portland fee-in-lieu recommendation (slide 10)

Tyler highlighted the 2035 Comp Plan policies that are applicable to the discussion and issues about IZ. He shared the proposed amendments to Title 33 (Zoning Code) and Title 30 (Housing Code) and Administrative Rules. (slide 12)

February 1, 2017 is the target date for this to be implemented, so we need to update the existing zoning code as well as the new codes for mixed use zones and the Central City. Base zones' density bonuses are a key first part.

In 2010-2035 we are looking at 123,000 new housing units. About 30,000 units in Central City and 50,000 in Mixed Use Zones, all of which would be subject to the IH policies.
Timeline

- October 25: PSC Hearing
- November 8: PSC Work Session & Recommendation
- December TBD: City Council
- Anticipated Effective Date: Feb 1, 2017

Commissioner Smith: If we calibrate right, then we should be holding feasibility the same before and after the program.

- In the calibration, it was not a dollar-for-dollar off-set. The market will change, but just the inclusionary requirement is what we looked at. In some cases we are marginally below, some slightly above. Effectively we are mitigating as much as possible.
- Public dollars going to incentives are being used as efficiently as possible.

Parking minimums: We have minimums in the mixed-use zones, but we are suggesting waiving for affordable units. What about getting rid of parking minimums altogether?

- Regarding waiving minimums, the increased cost of parking hurts the IH program so we'd have to provide much higher levels of subsidy.

Commissioner Oxman noted the current City subsidy for $100,000 for each developed unit.

- This is a direct financial subsidy from PHB. It's sourced from Federal, URA or direct City general funds.

For the off-site development, I saw the criteria, which I assume are used to maintain equity. Was there discussion about if this is sufficient to maintain family support and integration with other average-income families?

- There was a question about the ½-mile. This aligns nicely with the radius around mass transit (light-rail), which can take advantage of comparable indicators.

In terms of the City's cost to build, the Willamette Week article showed that the City's costs were substantially higher.

- There may have been errors in that article, and I can look into that.

Commissioner Rudd: When we say "marginally" above and below, or "negligible", what's the scale?

- Depends on measure of analysis. We will look more closely at the numbers. We looked at various analyses, and we can make this work for our existing return requirements.
- We'll summarize the findings prior to the PSC work session.

Receiving sites have to be under construction or have a certificate of occupancy. If we can't work out the deal, what happens? Is there a risk to funding the projects with greater affordability if there is that time delay?

- We are looking into loosening this requirement that they are under construction and having some flexibility in having the units come online in a specific time.

With the transfer of affordability, do we think City sites will be receiving sites?

- Potentially. But a parameter of the off-site is that the City is not secondarily subsidizing the receiving site. So we'd have a rental development team to look at if the supplemental units aren't also receiving financing.

Commissioner Bachrach has been sitting in on some of the Task Force meetings. It's complicated, and staff has done a great job wading through everything. As the PSC, I think it's important not to risk our planning goals. We are designing the program for 80,000 units over the next 20 years in the Central City and MUZ. We should be protective of this and meeting our housing goals. If we err in the early years and we do lose housing, it's a detriment for many more years into the future. We heard that as we do this calibration, it's not quite working in MUZ. So we already have a program where the calibration analysis isn't quite working yet. So I'd have a concern signing off on this at this point. Will see that back again?

- There are concerns in the MUZ, but that second look will be complete before your October 25 hearing.

Are we spending the money effectively in the IZ program versus elsewhere? We've calculated the in-lieu fee based on a $100,000 subsidy to non-profit developers. All the incentives we give to non-profits building affordable units and the $100k direct subsidy, but the private developers with the same incentives don't get the financial bonus. What about subsidizing the private developers some amount as well? We would get a more cost-effective unit.

- It's not apples-to-apples. PHB is often financing 80-100 percent units being affordable. The financial structure is very different.
- If you look at the incentive packages, for those that only have an affordable property tax exemption, there is $2000-3000 per unit. The full property tax exemption $11,000-12,000 per unit.

There was discussion at the task force about needing to move this project quickly. Is there consideration of a phased approach?

- Commissioner Saltzman has requested to bring the full program to Council on December 8.

Commissioner Spevak: There is a big difference on property tax exemptions if they apply to all units or just the affordable units. The current proposal makes property tax abatements on all units available at the higher densities (generally in the Central City), but only for the affordable units in the mixed use zones. Is there anything magical about a 10-year tax abatement period (e.g. could it be tuned to a different number of years to create incentive bundles that achieve geographic parity between Central City and mixed use zone areas?

- We'll look into that.

Commissioner St Martin: When we talk about off-site units and dedicating existing, have you calibrated these choices to be neutral?

- We have calibrated so that should you choose a new construction off-site we will have more 60 percent MFI units off-site than we would on-site. This is equal with the 60-30 percent MFI as well.
- IH programs tend to be focused at 60-80 percent MFI. But knowing a build off-site option can build to 30 percent, so we wanted to be sure that's a good option.

Is the fee-in-lieu is structured so that's the last resort?

- Yes.

Commissioner Larsell: What's the variability in terms of your ability to predict and calibrate initially?

- We've had many people review and analyze our recommendations. With a full tax exemption program, we see this could work. We are again looking at the mixed use zones as we noted.

Chair Schultz: For the effective date of February 1, 2017… can you say it won't happen prior to that?

- We can't predict what Council will do, but functionally it will be very difficult to implement prior to then. I am fairly confident of this date. We don't know if Council would back-date this.

Prior to the work session, I'd like to understand the analysis of the effect of family housing units. What about a voucher program? I've met with Locust as well, and I've heard a slightly different take. "Negligible" is a question as *Commissioner Rudd* highlighted. As is defining parody.

Commissioner Smith asked about the MUZ bonuses. So for the existing Zoning Code, residential FAR is uncapped in zones. How do you calibrate based on uncapped?

- We are bringing those code changes forward in order to start counting residential floor space in the overall FAR limits.

Fossil Fuel Infrastructure Code Changes

Work Session / Recommendation: Tom Armstrong, Michael Armstrong

Commissioner Rudd recused herself from this topic.

Tom commented on balancing the direction of the fossil fuel infrastructure resolution about opposing expansion yet at the same time encouraging safety and transition to non-fossil fuels.

There are three components to the amendments we're discussing:

- Define Bulk Fossil Fuel Terminals as a regulated land use.
- Prohibit Bulk Fossil Fuel Terminals in all base zones.
- Existing Bulk Fossil Fuel Terminals would become legal, non-conforming uses that can continue to operate.

In the staff memo, there are four big issues for the PSC's consideration:

- Storage capacity threshold and aggregation of small facilities
- Regulating existing terminals
- Exemption for regulated utilities
- Other issues

Defining Bulk Fossil Fuel Terminal:

- Marine, railroad, or pipeline transport access; and
- Transloading facilities (such as train-to-ship) or storage capacity exceeding 5 million gallons.

Exclusions:

- Distributors with access exclusively by truck.
- End-user facilities, including filling stations and firms that store fossil fuels for use as an input.
- Recovery or reprocessing used petroleum.

Commissioner Smith asked if it's transloading OR 5 million gallons or AND 5 million gallons?

- It's an "or". So any facility with transloading is prohibited.

Storage Capacity Threshold

Proposed draft: Threshold of 5 million gallons

Possible amendments:

1. Reduce the threshold
2. Add language to prevent aggregation of small facilities
3. Add language to clarify status of rail yards and pipelines

BPS Recommendation: Retain the 5-million-gallon threshold.

Commissioner Oxman: Could someone permit a new transfer facility (e.g. coal from a train)? Or does this block that option?

- This would be blocked in Portland.

Commissioner Tallmadge: We're looking at the threshold for new facilities, yes?

- We're talking about 5 million gallons for existing and new facilities and if they'd fall under the fossil fuel terminal. The lower the 5-million-gallon threshold goes, if you say it's 0 (any amount of storage capacity), if you have a firm that has both fossil and bio tanks, they can no longer have the fossil tanks, so that has implications for their ability to blend fuels like biodiesel.

Can we lower the threshold for fuels we consider cleaner?

- We'd have to go back and redefine what a fossil fuel is in terms of the content. We are probably at a time where it would be difficult to come up with a new definition to set the mark. It could be something in your letter to Council to look at this in the future.

Commissioner Oxman: It seems like the primary policy focus is to limit expansion of fossil fuels going through the community. When we look at the other 24 listed, do we have a sense of what the aggregate volume of these is?

- We don't have data on what each individual business' capacity is. If we went with the 5-million-gallon threshold, we know they could expand up to that level, so the 24 businesses on the list could represent up to 125 million gallons of storage capacity. For comparison the 11 large facilities on our list have about 400 million gallons of storage capacity.

Commissioner Smith noted it seemed we had "OR" in some places and "AND" elsewhere.

- The intent is that they are regional facilities. Either they have large-scale storage or they could be a transload facility.

I am assuming the 5 million number is still relevant. So the logic was proposed that 5 million gallons is two unit trains. So if we lower the threshold to 2 million, that would prohibit any unit trains, so I'd suggest that to get to the intent of the policy.

Commissioner Spevak noted that at Port of Tacoma, there is a proposal for 87 million gallons of throughput at a proposed 8-million-gallon facility. It is possible that a relatively small tank can have lots of throughput. Let's decrease the size of allowable tanks. I concur with *Commissioner Smith*'s proposal.

Chair Schultz noted that *Commissioner Tallmadge* is in favor of reducing the 5-million-gallon threshold. Tom noted this is something we don't know: how much some of the biodiesel and other firms have and the impact that would be.

Commissioner Smith: I move to reduce the threshold from 5 to 2 million gallons. *St Martin* seconded.

(Y6 — Larsell, Oxman, Schultz, Smith, Spevak, St Martin; N1 — Bachrach)

Aggregation of Small Facilities

Aggregating a bunch of 2 million gallon facilities would require them to do a land division and other provisions.

Zoning Code (33.910.030) definition of "ownership":
An ownership is one or more contiguous lots that are owned by the same person, partnership, association, or corporation. Ownership also includes lots that are in common ownership but are separated by a shared right-of-way.

Commissioner Spevak moved to add the proposed language concerning aggregation of separate parcels will be classified as a Bulk Fossil Fuel Terminal when two or more factors are present:

a. Located on adjacent parcels, including separated by a right-of-way;
b. Facilities share or will share operating facilities such as driveways, parking, piping, or storage tanks; or
c. Facilities are owned or operated by a single parent partnership or corporation.

Commissioner Smith seconded.

(Y6 — Larsell, Oxman, Schultz, Smith, Spevak, St Martin; Abstain 1 — Bachrach)

Exemption for Regulated Utilities
During the comment process NW Natural suggested that almost by definition its services are direct-service to end users, which is identified in the November 2015 City Council resolution as one of the exceptions. Their argument is that their services are already regulated to serve customers. So it would be redundant and potentially conflicting if they had to satisfy both the PUC integrated resources plan process and this new regulation.

Commissioner Smith: We want to close off what you could do outside the intent of Council's resolution. Could someone load a truck with LNG from NW Natural's storage tank and deliver it to another utility or large user?

Shawna Brownstein, NWN: You can back a truck up and fill it with LNG to take it to places where we have low pressure on certain high-demand days. This facility is for peaking purposes, and the PUC wouldn't let us put this into rates if it were serving another purpose. We'd have to get PUC approval to use the facility to sell to others. The volume of the tank is part of our resource plan. We can't expand the facility unless it's to directly meet the demands of our customers and the growth of the region.

Commissioner Spevak: Lots of people don't use natural gas. PUC regulation doesn't cover everything (e.g. the plants themselves).

Commissioner Oxman supports the exemption. BDS has already told us they have concerns about assessing and regulating fossil fuels. The PUC is already an existing body, and it sounds like there are restrictions built in.

Chair Schultz noted *Commissioner Tallmadge*'s comment to not exempt for regulated utilities.

Commissioner Spevak moved to not provide an exception for regulated utilities. *Commissioner Smith* noted inaction is sufficient in this case. Without a motion to adopt new language to exempt a public utility, the code will stay as-is.

Regulating Existing Terminals
Proposed draft: Any facility with more than a 2-million-gallon capacity would be considered a non-conforming use.

Alternatives to consider:

- Limited use
    - No discretionary land use review.
    - Replacement or expansion for seismic upgrades or clean fuel standards allowed up to 10 percent increase in storage capacity.
- Conditional use
    - Discretionary land use review for seismic upgrades or clean fuel standards allowed up to 10 percent increase.

Staff proposes the Limited Use option: you can only expand if you're doing a seismic upgrade when you're adding a tank. They have to state in the development application what the purposed/use of the tank is to reduce the risk of bait-and-switch, which may be difficult to enforce going forward.

Commissioner St Martin asked about seismic upgrades. Are there specific upgrades to the tanks that are useful to upgrade their safety?

- The major benefit is replacing the tank. We've mainly seen companies demolish the existing tank, upgrade the foundation and then put the new tank in to replace the old one… not a retrofit.

Commissioner Smith: We have direction to stop being a fossil fuel export location. We have a Comp Plan seismic policy. But clean fuels is a state-level issue. Does the Council resolution include a clean fuels statement?

- It referenced not restricting infrastructure that accelerates transition to non-fossil fuel energy source, and we're suggesting these are a transitional fuel.

I'd come down on the conditional use option with clear criteria. I understand the current non-conforming use probably locks us into bad infrastructure.

Commissioner Oxman asked if there are requirements to meet seismic upgrades required in both the limited use and conditional use options.

- It depends on if you want to allow an expansion of fossil fuel capacity that will result in a seismic upgrade with a larger fossil fuel tank. It goes back to the AND versus OR question *Commissioner Spevak* raised.

What is the potential added value for using conditional use?

- There is a public review process and an opportunity to comment. BDS cautions what the discretionary judgement is: how will they determine the facility meets clean fuel standards or what's contained in the tank. The seismic upgrade and safety benefit from doing that is more straight-forward.

Commissioner Smith: What's the process difference for BDS between limited use versus conditional?

- Limited would be similar to a mixed-use building coming in… clear and objective standards. A company would come in with their demo plan, replacement plans, and if we want to go to the 10 percent increase, they would document where they are today in terms of capacity and what their next 10 percent would be.
- The staff memo includes code language in the back of the memo – code option #2.

And versus or: I would be ok with a seismic-only improvement if you're rehabbing a tank to do clean fuels.

Commissioner Spevak asked if under current regulations tanks are getting replaced to get them up to seismic.

- In theory, yes. But it's been very slow-going despite the fact that they can increase capacity.

I thought the expansion option was to sweeten the deal.

- It's part of the uncertainty of what the demand for what type of fuel we'll have in the future. depending on how we phrase this, whether or not a clean fuel tank is included in a bulk fossil fuel terminal or not, and then if you need an incentive to do a seismic upgrade, is the question.

I am unconvinced allowing a 10 percent increase in capacity will motivate tank replacements with seismic upgrades since they haven't been doing these under current regulations that allow major increases in capacity.

Commissioner St Martin: If you had ten 5-million gallon tanks, could you wipe them and increase to one big 55-gallon tank?

- If we have the 10 percent included, yes. It would be marginally better because of the required seismic upgrade.

Commissioner Oxman: In limited use language, it talks about at least one fossil fuel tank. Would you be allowed the 10 percent increase if you take down the small tank versus the larger one?

- 10 percent is a cap for the full site, not individual tanks on the site, as it is currently written.

Chair Schultz shared *Commissioner Tallmadge*'s option: non-conforming use is her first option. But if we opt for conditional use, certain safety criteria should be included.

Chair Schultz asked about the 10 percent addition: Do we know if economically this makes a dent in the cost of the required upgrade?

- We based this on the metric of the clean fuels standard and moving to 15 percent bio/ethanol fuel.

I am supportive of leaving this as a limited use because if we're not seismically upgrading now, I don't think we will in the future without encouraging the upgrade.

Commissioner Smith moved to adopt Option 2 (on page 11 in the staff report): Current facilities are limited use and an allowed 10 percent size upgrade. *Commissioner Larsell* seconded with the addition of notification requirement.

Commissioner Oxman proposed to include language about up to the amount specified in Table 140-8 to replace comparable capacity by 10 percent.

Commissioner Spevak suggested the limited use option but no not allow expansion of volume. This makes for a swift development process without increasing capacity. *Commissioner St Martin* seconded.

Commissioner Smith withdrew his motion. *Commissioner Larsell* withdrew her second.
Commissioner Smith Moved Option 2 as stated. *Commissioner Larsell* seconded.

Commissioner Oxman re-proposed to include language about the expansion would be up to 10 percent of a specific unit/tank on the site. *Commissioner Smith* seconded.

- (Y6 — Larsell, Oxman, Schultz, Smith, Spevak, St Martin; N1 — Bachrach)

Commissioner Larsell moved to include notification in the limited use proposal. *Commissioner Smith* seconded.

- (Y4 — Larsell, Oxman, Smith, Spevak; N3 — Bachrach, St Martin, Schultz)

Commissioner Spevak proposed an amendment to say the current facilities are limited use but expansion is prohibited. *St Martin* seconded.

- (Y3 — Smith, Spevak, St Martin; N4 — Bachrach, Larsell, Oxman, Schultz)

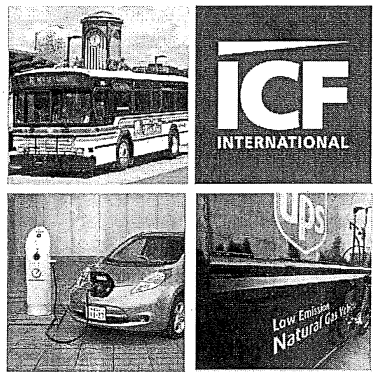
The Commission voted on the overall proposal: Existing terminals are designated as a limited use. There is no discretionary land use review. Expansions are allowed up to 10 percent capacity for a tank/unit that is being seismically upgraded. And a notification to stakeholders is required.

(Y7 — Bachrach, Larsell, Oxman, Schultz, Smith, Spevak, St Martin)

Adjourn

Chair Schultz adjourned the meeting at 4:34 p.m.

Submitted by Julie Ocken



Task 3 – Updated Compliance Scenarios

Final Report

August 2014

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ICF conducted this work under contract with the Oregon Department of Environmental Quality. The fuel volumes presented in this document are meant to be illustrative of compliance with a proposed Clean Fuels Program in Oregon. ICF developed the compliance scenarios in a manner consistent with our scope of work with Oregon DEQ, and as we do in all of our work, we strive to provide information and projections consistent with standard practices in a professional manner. These compliance scenarios, however, should not be confused with ICF market forecasts. These compliance scenarios reflect the fuel volumes that could be delivered to Oregon to comply with a Clean Fuels Program based on our understanding of transportation fuel availability today and projected transportation fuel availability. ICF makes no warranties express or implied (including without limitation any warranties or merchantability or fitness for a particular purpose), as to this material. Specifically but without limitation, ICF makes no warranty or guarantee regarding the accuracy of these scenarios or that such work products will be accepted by any legal or regulatory body.

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Abbreviations and Acronyms

AEO	Department of Energy Annual Energy Outlook
B2	2% by volume blend of biodiesel with diesel
B5	5% by volume blend of biodiesel with diesel
B10	10% by volume blend of biodiesel with diesel
BAU	Business As Usual
BD	Biodiesel
BEV	Battery Electric Vehicle
CAFE	Corporate average fuel economy
CARB	California Air Resources Board
CFP	Clean Fuels Program
CNG	Compressed Natural Gas
DGE	Diesel Gallon Equivalent
E85	85% by volume ethanol blend with gasoline
E10	10% by volume ethanol blend with gasoline
EIA	Energy Information Administration
EPA	US Environmental Protection Agency
FCV	Fuel cell vehicle
FFV	Flex-fuel vehicle
GGE	Gasoline Gallon Equivalent
HEV	Hybrid Electric Vehicle
HDV	Heavy-duty vehicle
ICE	Internal combustion engine
ILUC	Indirect Land Use Change
LCFS	Low Carbon Fuel Standard
LDV	Light-duty vehicle
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
MDV	Medium-duty vehicle
NGV	Natural gas vehicle
MGPY	Millions of Gallons Per Year
ODOT	Oregon Depart of Transportation
PEV	Plug-In Electric Vehicles
PHEV	Plug-In Hybrid Electric Vehicles
PHEV10	PHEV with 10 miles equivalent all electric range
PHEV40	PHEV with 40 miles equivalent all electric range
RD	Renewable Diesel
US DOE	United States Department of Energy
VMT	Vehicle Miles Traveled
ZEV	Zero Emission Vehicle

Executive Summary

The clean fuel standard in Oregon, implemented by the Clean Fuels Program, requires a 10% reduction in carbon intensity from the gasoline and diesel baselines over a ten year period. In addition to carbon intensity reduction, the Clean Fuels Program helps Oregon reduce its consumption of traditional petroleum fuels. Potential fuels that could be used to achieve the standard are ethanol, biodiesel, hydrogen, electricity, natural gas, propane, and biogas. The Clean Fuels Program is designed as a performance-based standard using flexible market-based mechanisms that allow regulated parties to select the most cost-effective pathways to achieve compliance. In general, fuels that have a lower carbon intensity than gasoline or diesel generate credits. Regulated parties, such as refiners, have the option of producing or blending low carbon fuels, or purchasing credits from other fuel providers, including, but not limited to biofuel producers, natural gas infrastructure providers, electric utilities, and hydrogen producers.

As part of Oregon Department of Environmental Quality's (DEQ) original rulemaking and advisory committee process in 2010, technical analysis was performed by TIAX LLC to develop an Oregon specific business-as-usual (BAU) and compliance scenarios for a Clean Fuels Standard. As part of the previous analysis, assumptions were made around the composition of the vehicle fleet, carbon intensities, and availability of low carbon fuels for compliance both in Oregon and out-of-state. Four years later there is a greater understanding of the vehicles and fuels that could be available and new regulations and developments that will affect Oregon's fleet composition and fuel consumption.

This report is the final phase of the process to update the Clean Fuels Program compliance scenarios. The previous report detailed the updated BAU case and this report describes in detail the methodology used to develop the four compliance scenarios, available fuels and technologies and the resulting compliance scenarios. Compliance scenarios for the Clean Fuels Standard are compared against the updated BAU to determine incremental fuels required to achieve the scenarios.

ICF, in consultation with Oregon DEQ, developed four compliance scenarios based on two fuel scenarios (alternative vehicle technologies vs biofuel blending) and two different diesel baselines (B2 vs B5). Table 1 below shows the compliance scenario matrix.

Table 1. Compliance Scenarios

Compliance Scenarios	Scenario 1 – Advanced Vehicle Technology	Scenario 2 – Higher Biofuel Blending
B2 Diesel Baseline (2010)	1 – B2	2 – B2
B5 Diesel Baseline (2015)	1 – B5	2 – B5

The key highlights of the CFP compliance scenarios include:

- **Over-compliance in the early years of the program (2016-2021) is critical.** Credits can be banked and traded later and do not lose their value. Banking credits when the standard is lower reduces compliance costs and eases compliance in later years.
- **The Clean Fuels Standard can be achieved through a diverse fuel supply.** All of the scenarios required a combination of ethanol, biodiesel and renewable diesel from various feedstocks, electricity, natural gas, renewable natural gas, and propane for compliance. In addition, none of the analyzed compliance scenarios required the use of cellulosic ethanol.
- **Eight (8) years of overlap between the post-2017 Zero Emission Vehicle (ZEV) Program eases the burden of compliance.** The ZEV Program generates almost 15% of the cumulative credits needed over the compliance period. California only overlaps three (3) years with the post-2017 ZEV Program which limits the contribution electric and fuel cell vehicles can have towards compliance in their LCFS.
- **A B5 baseline compared to a B2 baseline results in greater greenhouse gas (GHG) emission reductions.** The B5 baseline scenarios generate more deficits than the B2 baseline scenarios and therefore require more credits for compliance. This results in an increased consumption of biodiesel and renewable diesel and lower cumulative GHG emissions over the compliance period.
- **Renewable natural gas is a key fuel for Clean Fuels Standard compliance.** In the advanced technology scenarios, renewable natural gas generated just as many credits as electricity and about one-third the amount credits generated from ethanol or biodiesel. In addition, Oregon has significant in-state potential for renewable natural gas production.
- **Renewable Diesel, even only in small volumes, is needed for compliance.** Renewable diesel does not require additional distribution or refueling infrastructure and there are no blend limitations.

1 Introduction

The clean fuel standard in Oregon, implemented by the Clean Fuels Program (CFP), requires a 10% reduction in carbon intensity from the gasoline and diesel baselines over a ten year period. In addition to carbon intensity reduction, the Clean Fuels Program helps Oregon reduce its consumption of traditional petroleum fuels. Potential fuels that could be used to achieve the standards are ethanol, biodiesel, hydrogen, electricity, natural gas, propane, and biogas. Task 3 developed updated compliance scenarios. Compliance scenarios for the Clean Fuels Standard are being compared against the updated BAU to determine incremental fuels required to achieve the scenarios.

As part of Oregon DEQ's original rulemaking and advisory committee process in 2010, technical analysis was performed by TIAX LLC to develop an Oregon specific BAU and compliance scenarios for a Clean Fuels Standard. The VISION model was used to quantify the amount of fuels, infrastructure, and investment required for the BAU scenario. VISION is a fleet sales and turnover model developed by Argonne National Laboratory that can be used to quantify future energy consumption and GHG emissions based on overall fleet characteristics and composition. It is important to understand the fleet composition when considering alternative fuel consumption. Many alternative fuels including E85 (blended ethanol and gasoline with 85% by volume ethanol), electricity and natural gas require new vehicles to be purchased or converted and maximum consumption of these fuels is constrained by the population of these vehicles within the fleet.

As part of the previous analysis, assumptions were made around the composition of the vehicle fleet, carbon intensities, and availability of low carbon fuels for compliance both in Oregon and out-of-state. Four years later there is a greater understanding of the vehicles and fuels that could be available and new regulations and developments that will affect Oregon's fleet composition and fuel consumption. The latest available version of the VISION model, "VISION 2013 AEO Base Case,"[1] was used to develop the updated BAU scenario and the compliance scenarios. After completing BAU case, ICF and DEQ agreed on the assumptions to update the compliance scenarios. The following document details the methodology for developing the compliance scenarios.

[1] http://www.transportation.anl.gov/modeling_simulation/VISION/

2 Methodology: Scenario Development

ICF developed four (4) Clean Fuels Program compliance scenarios based upon input and discussion with Oregon DEQ. The following subsections review the methodology for developing the compliance scenarios and compliance schedules.

2.1 Compliance Scenarios and Clean Fuels Compliance Schedules

Compliance Scenarios

From a broad perspective, there are two ways to deploy alternative fuels that will help comply with a Clean Fuels Program. Firstly, biofuels can be blended into conventional gasoline or diesel for consumption in the existing vehicle fleet. Secondly, advanced vehicle technologies can be deployed, which consume alternative fuels such as natural gas, electricity, or hydrogen. Compliance with a Clean Fuels Program will require a diverse mix of all of these alternative fuels. Due to constraints on how quickly the vehicle fleet can be turned over, biofuel blending will likely be a major form of compliance until advanced vehicle technologies are deployed in significant numbers.

ICF developed two fuel scenarios – Scenario 1 and Scenario 2 – to capture the potential market responses to achieve compliance with a Clean Fuels Program. Scenario 1 reflects a market that is more dependent on advanced vehicle technologies than Scenario 2 and puts less pressure on advanced biofuels and biofuel blending for compliance. ICF will account for a variety of market developments in the compliance scenarios including the immediate availability of lower carbon biofuels such as biodiesel from waste greases, and animal fats; renewable diesel from tallow; and ethanol from sorghum and lower carbon intensity corn. Although cellulosic biofuels have been produced at a slower-than-expected rate, these lower carbon biofuels are available to California in significant quantities today and supply is forecasted to increase dramatically over the next several years.

Apart from biofuels, increasing natural gas supplies and lower fuel pricing than diesel have renewed interest in natural gas in the transportation sector. The use of low carbon biomethane (also referred to biogas and renewable natural gas) from waste sources including landfills and wastewater treatment plants in natural gas vehicles is projected to be a major compliance pathway. Biomethane is currently consumed in large volumes in California for LCFS compliance and EPA has qualified biomethane from landfills and other sources to generate cellulosic renewable identification numbers (RINs).

The Oregon Renewable Fuel Standard biodiesel blend mandate was 2% by volume (B2) in 2010 and increased to 5% (B5) in April 2011. The previous Clean Fuels Program analysis included a B2 diesel baseline. ICF will analyze the effects of compliance with a B2 compared to a B5 diesel baseline for both Scenarios as shown in the table below. Before DEQ selects a baseline and compliance schedule for the regulation, it is important to understand the implications. A B2 diesel is consistent with when the regulation was conceived in 2009 and analysis was performed in 2010 and allows for built-in credit generation from the B2 to B5 blend levels that are currently mandated. A B5 diesel baseline is consistent with the regulatory landscape in 2015 when the compliance schedule would begin in 2016.

Table 2. Compliance Scenarios

Compliance Scenarios	Scenario 1 – Advanced Vehicle Technology	Scenario 2 – Higher Biofuel Blending
B2 Diesel Baseline (2010)	1 – B2	2 – B2
B5 Diesel Baseline (2015)	1 – B5	2 – B5

Development of Compliance Schedules

The Oregon Clean Fuels Program is proposing using a similar percent reduction compliance schedule for the 10 year period as the California LCFS. To develop the actual numerical compliance schedule carbon intensities, ICF needed to develop baseline carbon intensity values for gasoline containing 10% by volume ethanol (E10), B2 and B5. Table 3 below shows the development of the baseline carbon intensities for E10, B2 and B5. Table 4 and Figure 1 show the compliance schedule for E10, B2 and B5 using the baseline carbon intensities in Table 3.

Table 3. Baseline Carbon Intensity Calculation

Baseline Fuels	Carbon Intensities (gCO2e/MJ)	Biofuel by Volume (%)	Biofuel by Energy (%)	Baseline Carbon Intensity (gCO2e/MJ)
Gasoline Pool – E10	Gasoline Blendstock – 89.40 Midwest Corn Ethanol – 88.02	10%	6.7%	89.31
Diesel Pool – B2	ULSD – 89.00 Biodiesel – 47.70[2]	2.27%	2.1%	88.13
Diesel Pool – B5	ULSD – 89.00 Biodiesel – 47.70[2]	5%	4.6%	87.09

[2] Weighted average of soybean, canola and used oil biodiesel based on individual carbon intensities of 50.19, 68.91 and 10.28 gCO2e/MJ and 2013 reported consumption volumes for the first six months of 13.66 million gallons, 4.37 million gallons and 3.39 million gallons for soybean, canola and used oil biodiesel, respectively.

Table 4. Gasoline and Diesel Compliance Schedules

Compliance Year	Percent Reductions	Gasoline Compliance Schedule	B2 Baseline Diesel Compliance Schedule	B5 Baseline Diesel Compliance Schedule
2015	-	89.31	88.13	87.09
2016	0.25%	89.08	87.91	86.87
2017	0.50%	88.86	87.69	86.65
2018	1.0%	88.41	87.25	86.22
2019	1.50%	87.97	86.81	85.78
2020	2.50%	87.08	85.93	84.91
2021	3.50%	86.18	85.05	84.04
2022	5.00%	84.84	83.73	82.73
2023	6.50%	83.50	82.40	81.43
2024	8.0%	82.16	81.08	80.12
2025	10.0%	80.38	79.32	78.38

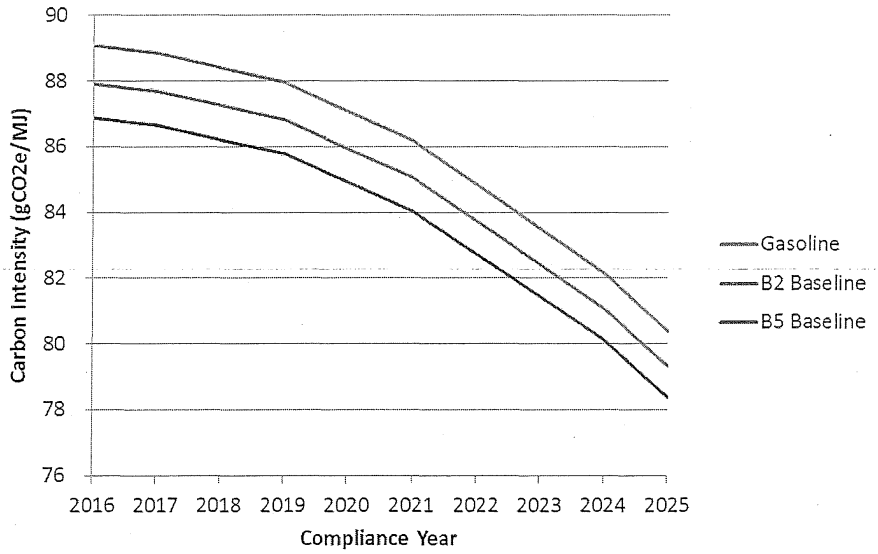

Figure 1. Gasoline and Diesel Compliance Schedules

2.2 Compliance Options Considered

ICF considered a variety of low carbon fuels to develop representative CFP compliance scenarios. Furthermore, to determine the balance of deficits and credits in each compliance scenario, ICF made various assumptions regarding how vehicles and fuels will be used in the near-term future towards CFP compliance. These are distinguished between fuels that substitute for gasoline (the gasoline pool) and fuels that substitute for diesel (the diesel pool).

Fuels that Substitute for Gasoline

ICF assumed that ethanol would continue to be blended into gasoline at a rate of 10 percent by volume, consistent with today's reformulated gasoline requirements. ICF limited the blending of ethanol with gasoline at a maximum of 15 percent by volume based on EPA's recently issued waiver for E15 in vehicle model years (MY) 2001 or newer. In addition, ICF included the potential of E85 consumption in flex-fuel vehicles (FFVs) if significant low carbon ethanol consumption is required for compliance. Although there is no E15 consumed in Oregon today – and very little generally in the United States – E15 could be consumed in meaningful quantities in Oregon as a result of drivers such as LCFS and the RFS2.

ICF considered the following pathways for ethanol production:

- **Corn, MW**: Corn from conventional processes is typically sourced from the Midwest. Corn has been and continues to be the most common feedstock for ethanol consumed in Oregon. Nearly 200 million gallons of corn ethanol are currently consumed in Oregon to meet the state's E10 requirement.
- **Corn, Boardman, OR**: The Boardman, OR ethanol facility currently produces 26 million gallons of corn ethanol per year. We assumed the same pathway carbon intensity from the 2010 plus the proposed CARB indirect land use change (ILUC) values.
- **Corn, low carbon intensity**: There is significant potential to lower the carbon intensity of corn ethanol through a variety of measures. For the purposes of this report, ICF assumed a lower limit of 46 g/MJ for what we term low carbon intensity corn ethanol (not including ILUC). There has already been a shift towards more efficient corn ethanol production as a result of the California LCFS, with many new lower carbon pathways submitted to and approved by CARB. The MW corn carbon intensity will exceed the gasoline standard in 2019 and ICF assumes by 2019 only ethanol meeting the standard will be consumed within Oregon with low carbon intensity corn will make up the balance of ethanol consumed in Oregon to meet the state's E10 requirement.
- **Corn, Sorghum**: There is a shift occurring towards lower carbon intensity feedstocks for ethanol production including grain and sweet sorghum as a result of the California LCFS. Based on the volumes of current applications submitted to CARB, ICF assumes that upwards of 100 million gallons per year of sorghum or other low carbon intensity feedstock ethanol will be available to Oregon by 2019 when the MW corn carbon intensity exceeds the gasoline standard.
- **Sugarcane**: Most sugarcane ethanol is produced in Brazil and shipped via tanker to the United States. In some cases, hydrous ethanol is shipped to a country in the Caribbean Basin Initiative (CBI); the excess water is subsequently removed and the anhydrous ethanol is shipped to the US. This step was more common when the US had a tariff on sugarcane ethanol imported directly from Brazil; the interim step allowed importers to avoid paying the tariff. For the sake of reference, the United

States imported 500 million gallons of sugarcane ethanol in 2012. ICF assumes that up to 50 million gallons per year of sugarcane ethanol could be consumed in Oregon.

- **Cellulosic**: Cellulosic ethanol refers generally to ethanol produced from wood, grasses, or other lignocelluosic materials.

Although ethanol from various feedstocks is the primary substitute for gasoline today, ICF also considered the following fuels that substitute for gasoline:

- **Electricity** used in plug -in electric vehicles (PEVs), including plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs), stands to play an important role towards compliance, particularly in later years of the regulation as the Zero Emission Vehicle (ZEV) Program takes full effect. In each of the compliance scenarios, a minimum number of PEVs was deployed to be consistent with business as usual case. For Scenario 1, ICF also considered the potential for all PHEVs in the BAU to be PHEV40s and not a split between PHEV10 and PHEV40.
- **Natural gas** has significant potential to displace gasoline consumption in medium-duty and light heavy-duty vehicles.
- **Biogas** has the potential to displace natural gas consumption and create significant reductions in carbon intensity. It is assumed that up to 47 million diesel gallon equivalents of biogas, comparable to Oregon in-state feedstock potential, could be consumed.

The table below shows the carbon intensity values used for fuels that substitute for gasoline. Unless otherwise noted, the carbon intensity values were taken directly from 2010 analysis with updates for CARB proposed ILUC values tables.

Table 5. Carbon Intensity Values for Fuels that Substitute for Gasoline

Fuel / Feedstock	Pathway Carbon Intensity (gCO2e/MJ)	ILUC (gCO2e/MJ)[a]	Updated CI (gCO2e/MJ)
Ethanol, MW Corn	64.82	23.20	88.02
Ethanol, Boardman	56.99	23.20	80.19
Ethanol, Low CI Corn	46.00	23.20	69.20
Ethanol, Sorghum	46.00	23.20	69.20
Ethanol, Sugarcane	26.44	26.50	52.94
Ethanol, Cellulosic[b]	18.22	2.5	20.72
Natural Gas (CNG/LNG) and Propane[c]	71.41	-	71.41
Biogas, multiple sources[d]	25.00	-	25.00
Electricity, marginal [e]	45.58	-	45.58

[a] ILUC values are proposed CARB values presented on March 11, 2014

[b] The average of previous Oregon pathways for ethanol from farmed trees and wheatstraw

[c] Assumes propane is mainly from natural gas liquids

[d] Representative of California LCFS applications for biogas used as CNG or LNG

[e] Includes the energy economy ratio (EER) of 3.4 for electric vehicles

Fuels that Substitute for Diesel

The fuel volumes in the compliance scenarios represent a combination of ICF research and previous project experience which includes input provided by the National Biodiesel Board (NBB). In the development of the compliance scenarios, we considered the following feedstocks for biodiesel:

- **Soybean oil**: Soybean oil is the largest single feedstock for biodiesel production in the United States. It is a well-established crop with a robust commodity market. While most soybeans are grown in the Midwest and a significant amount of biodiesel production capacity exists in the Midwest, Oregon biodiesel capacity can also utilize soybean oil. Soybean oil biodiesel is used as the balance biodiesel to make up necessary volumes to achieve desired blend levels.
- **Waste Grease/Used Oil**: Waste grease is a significant feedstock at Oregon production facilities. As a waste feedstock, waste grease has a low carbon intensity. The production process for biodiesel from waste grease is generally more energy intensive than for vegetable oils because there is generally a higher free fatty acid content. This requires an additional acid-catalyzed esterification reaction, thereby increasing the energy inputs. For the compliance scenarios, waste grease is assumed to remain constant at 15.8% of all biodiesel consumed based on the first 6 months of data from 2013.
- **Canola oil**: Canola oil is similar to soybean oil as a feedstock; it is more prominent feedstock in the European Union (referred to there as rapeseed). In North America, canola production historically exists primarily in Canada and northern states of the US and is a significant feedstock for Oregon

based biodiesel production. For the compliance scenarios, canola oil is assumed to remain constant at 20.4% of all biodiesel consumed based on the first 6 months of data from 2013.

- **Corn oil**: Corn oil is a byproduct of corn ethanol production and generally requires retrofitting an ethanol plant. It is a feedstock with significant growth potential for the biodiesel industry. Corn oil extraction is a relatively new commodity for the majority of ethanol production facilities, but represents another high-value co-product. Anecdotal evidence indicates that the majority of corn ethanol facilities in the US will have installed equipment to extract corn oil by the end of 2013. Corn oil biodiesel will be used as needed for the compliance scenarios.

ICF also considered the following alternative fuels:

- **Renewable diesel**: Like biodiesel, there are multiple feedstocks that can be used to produce renewable diesel, including palm oil, canola (or rapeseed) oil, jatropha oil, camelina oil, soy oil, waste greases, and animal fats (i.e., tallow). ICF considered renewable diesel produced from tallow and waste oil; this pathway is largely based on the availability of renewable diesel produced by Neste Oil in its Singapore production plant using its renewable diesel production process. A conservative assumption was made that maximum renewable diesel would be an average statewide 2% blend with a maximum of 10 million gallons per year from tallow and the balance from waste oil.
- **Natural gas**: ICF considered the potential for natural gas – compressed, liquefied, and biogas – in heavy-duty applications such as short-, medium-, and long-haul trucks, refuse haulers, and transit buses. It is assumed that up to 47 million diesel gallon equivalents of biogas, comparable to Oregon in-state feedstock potential, could be consumed. For Scenario 1, it is assumed that medium and heavy duty CNG vehicle sales increase to the point where 10% of diesel pool fuel consumption in 2025 is a combination of natural gas, biogas and LPG.
- **Propane** has potential to displace diesel consumption in medium-duty and light heavy-duty vehicles in niche applications. It is assumed that propane consumption will reach a maximum of 1% of total natural gas consumption. Since it is assumed that fossil fuel natural gas and propane have the same carbon intensity, the quantities of each fuel summing to the total are fungible.
- **Hybrid-Electric Vehicles (HEVs)**: HEVs do not consume alternative fuels; they do reduce the quantity of diesel consumed. In Scenario 1, the assumption is made that HEVs achieve 10% sales penetration in the medium- and heavy-duty markets. The BAU case and Scenario 2 do not included medium- and heavy-duty HEVs.

The table below includes the carbon intensity values used to determine the balance of deficits and credits in each scenario. Unless otherwise noted, the carbon intensity values were taken directly from 2010 analysis with updates for CARB proposed ILUC values tables.

Table 6. Carbon Intensity Values for Fuels that Substitute for Diesel

Fuel / Feedstock	Pathway Carbon Intensity (gCO_2e/MJ)	ILUC (gCO_2e/MJ)[a]	Updated CI (gCO_2e/MJ)
Biodiesel, soy oil	19.99	30.20	50.19
Biodiesel, waste grease	10.28	-	10.28
Biodiesel, corn oil	4.00	-	4.00
Biodiesel, canola oil	27.31	41.60	68.91
Renewable diesel, tallow	16.85	-	16.85
Renewable diesel, waste oil	10.28	-	10.28
Natural Gas and Propane [b]	79.34	-	79.34
Biogas, landfill [c]	27.78	-	27.78

[a] ILUC values are proposed CARB values presented on March 11, 2014

[b] Assumes propane is mainly from natural gas liquids; includes the EER of 0.9 for spark ignition CNG vehicles

[c] Representative of California LCFS applications for biogas used as CNG or LNG; includes the EER of 0.9 for spark ignition CNG vehicles

3 Overview of Compliance Scenarios

Based on the alternative fuels available for each compliance scenario and two diesel baselines described in Section 2, ICF developed four (4) different scenarios that achieve compliance with the Clean Fuels Program by balancing the cumulative deficits and credits over the 10 year compliance period.

Table 7. Overview of Clean Fuels Program Compliance Scenarios

Scenario	Ethanol	Biodiesel (BD) / Renewable Diesel (RD)	Natural Gas	Advanced Vehicles (PEVs / MD-HD HEVs)
Scenario 1-B2	Maintained E10 blend rate 50 million gallons per year (MGPY) of sugarcane ethanol for all years 100 MGPY of sorghum and balance ethanol required from low CI corn in 2019 when MW corn greater than standard	Maintained BD blend at 5% and canola/soy/used oil ratios RD at 1% in 2021 and increases to 2% by 2025; between 5-10 MGPY from tallow, balance waste oil	Natural gas vehicle market share increased till 10% diesel pool consumption is natural gas (18% market share in 2025) By 2019, 50% of natural gas from biogas (46 MGPY in 2025)	All PHEVs are PHEV40 MD-HD HEV sales increased to 10% market share by 2025
Scenario 1-B5	Same as Scenario 1-B2	BD blend to 6% in 2023 and 7% in 2025; maintained canola/soy/used oil RD 2% from 2016-2025 with 10 MGPY from tallow and balance waste oil	Same as Scenario 1-B2	Same as Scenario 1-B2
Scenario 2-B2	Same as Scenario 1-B2	Biodiesel blend to 6% in 2021 up to 8.9% in 2025; maintained canola/soy/used oil RD 2% from 2016-2025 with 10 MGPY from tallow and balance waste oil	By 2019, 100% of natural gas from biogas (12 MGPY in 2025)	Same as BAU
Scenario 2-B5	Same as Scenario 1-B2	BD blend to 6% in 2019 up to 10% in 2021; maintained canola/soy/used oil till 2020, capped canola at 10 MGPY and (2020) and waste oil at 30 MGPY (2023) RD 2% from 2016-2025 with 10 MGPY from tallow and balance waste oil	Same as Scenario 2-B2	Same as BAU
Assumptions for All Scenarios	Maximum ethanol blend is E15 FFVs 85% of miles on E85 Maximums for ethanol: Sorghum-100 MGPY; Low CI Corn-150 MGPY; Sugarcane- 50 MGPY			Achieves ZEV compliance BAU vehicle populations: 90,000 BEVs in 2025; 61,000 PHEV10 in 2025; 62,000 PHEV40 in 2025

3.1 Compliance Scenarios 1-B2 and 1-B5

Summary Overview of Compliance Scenarios 1-B2 and 1-B5

Figure 2 and Figure 3 on the following page show the annual credits and deficits generated for Scenarios 1-B2 and 1-B5. Each colored stacked bar represents credits generated from low carbon fuels; the blue line represents the deficits from forecasted gasoline blendstock and ultra-low sulfur diesel (ULSD) consumption. When the bars in years 2016-2021 exceed the blue line, annual credits exceed annual deficits and banked credits are generated for future compliance. When the bars fall short of the blue line in years 2022-2025, banked credits are required to meet annual compliance. The stacked bars are grouped by biofuels for blending at the bottom and advanced vehicle technologies at the top. Table 8 and Table 9 below show the annual deficits and credits generated and cumulative (banked) credits.

Table 8. Credits and Deficits: Banking in Scenario 1-B2

Fuel		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Deficits (Millions)	Gasoline	-0.05	-0.08	-0.14	-0.20	-0.32	-0.43	-0.59	-0.75	-0.89	-1.08
	Diesel	-0.11	-0.13	-0.18	-0.22	-0.31	-0.40	-0.53	-0.65	-0.78	-0.93
Credits (Millions)	Gasoline Subs	0.22	0.23	0.25	0.57	0.60	0.63	0.64	0.66	0.68	0.68
	Diesel Subs	0.21	0.22	0.24	0.29	0.32	0.41	0.43	0.48	0.49	0.53
Balance		0.28	0.24	0.17	0.44	0.28	0.20	-0.05	-0.26	-0.49	-0.79
Banked (Net)		0.28	0.51	0.68	1.12	1.40	1.60	1.55	1.29	0.80	0.00

Table 9. Credits and Deficits: Banking in Scenario 1-B5

Fuel		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Deficits (Millions)	Gasoline	-0.05	-0.08	-0.14	-0.20	-0.32	-0.43	-0.59	-0.75	-0.89	-1.08
	Diesel	-0.21	-0.23	-0.28	-0.32	-0.41	-0.50	-0.62	-0.74	-0.85	-1.00
Credits (Millions)	Gasoline Subs	0.22	0.23	0.25	0.57	0.60	0.63	0.64	0.66	0.68	0.68
	Diesel Subs	0.33	0.34	0.36	0.42	0.44	0.46	0.49	0.54	0.56	0.59
Balance		0.30	0.26	0.19	0.46	0.31	0.16	-0.09	-0.29	-0.50	-0.81
Banked (Net)		0.30	0.56	0.75	1.22	1.53	1.69	1.60	1.31	0.81	0.00

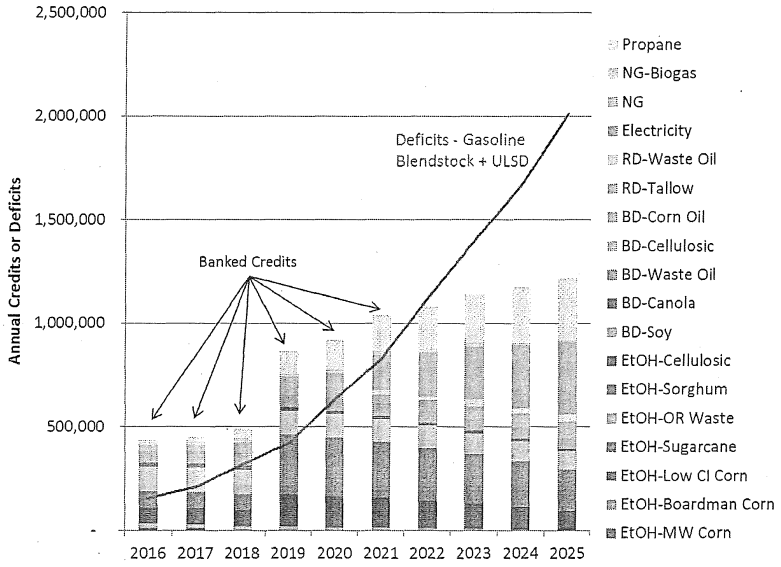

Figure 2. Balance of Credits and Deficits in Scenario 1-B2

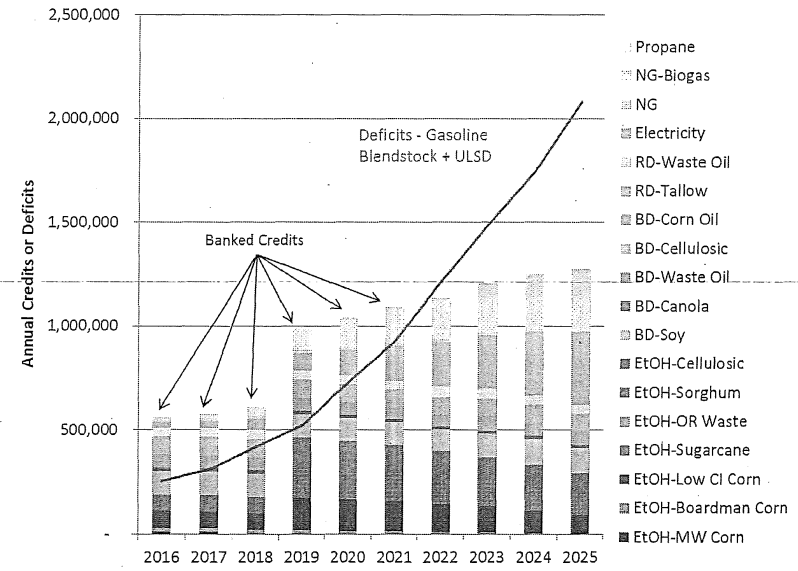

Figure 3. Balance of Credits and Deficits in Scenario 1-B5

In Scenario 1-B2, gasoline and diesel generate a similar number of deficits while in Scenario 1-B5 diesel generates almost 1 million more deficits than gasoline.

Fleet Changes from the BAU

Two fleet changes occurred between the BAU and Scenario 1 (both 1-B2 and 1-B5). In the light-duty fleet, all PHEVs are PHEV40s compare to the 50/50 split between PHEV10 and PHEV40 in the BAU. Figure 4 below shows the Scenario 1 light-duty vehicle fleet.

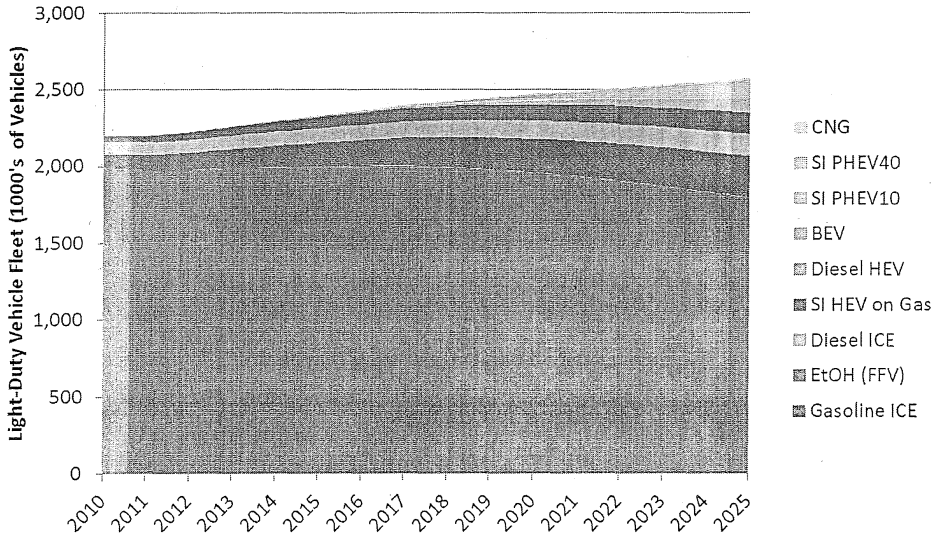

Figure 4. Scenario 1 Light-Duty Vehicle Fleet

The medium- and heavy-duty market shares for HEVs and natural gas/LPG vehicles were increased in Scenario 1 over the BAU case. The natural gas vehicle market shares were increased to achieve 10% diesel pool fuel consumption from natural gas/LPG. This assumption resulted in 18% market share of natural gas/LPG vehicles in 2025. The medium- and heavy-duty market shares for HEVs were increased to 10% by 2025. Figure 5 below shows the resulting Scenario 1 medium- and heavy-duty vehicle fleet.

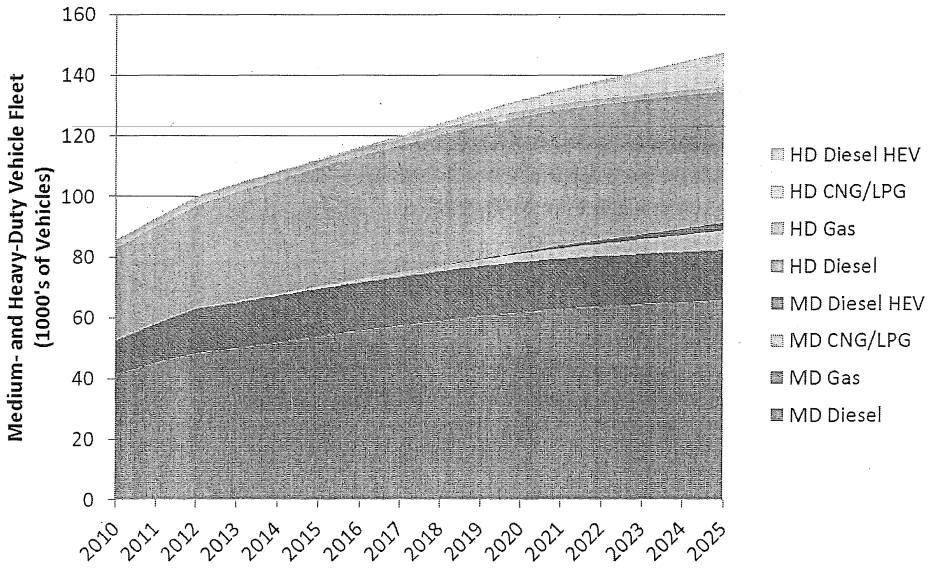

Figure 5. Scenario 1 Medium- and Heavy-Duty Fleet

Ethanol and Biofuels that Substitute for Gasoline

Table 10 below identifies the volumes of ethanol, broken down by feedstock, for both Scenarios 1-B2 and 1-B5. The ethanol volumes and feedstocks between 1-B2 and 1-B5 are identical.

Table 10. Ethanol Volumes (in million gallons) in Scenario 1

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Corn, MW	135.14	142.19	147.62	0	0	0	0	0	0	0
Corn, Boardman	26	26	26	26	26	26	26	26	26	26
Low CI Corn	50	50	50	102.18	104.72	106.05	106.86	106.38	104.56	102.26
Sugarcane	0	0	0	50	50	50	50	50	50	50
Sorghum	50	50	50	100	100	100	100	100	100	100
Total	261.14	268.19	273.62	278.18	280.72	282.05	282.86	282.38	280.56	278.26
% EtOH in Gasoline	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

Scenarios 1-B2 and 1-B5 consume very similar volumes of ethanol to the BAU case since all cases maintain a 10% ethanol blend. Scenarios 1-B2 and 1-B5 cease to consume MW corn ethanol by 2019 since the carbon intensity of MW Corn exceeds the standard in that year and every subsequent year.

Biodiesel

Table 11 and Table 12 below show the volumes of biodiesel, by feedstock, consumed in Scenarios 1-B2 and 1-B5.

Table 11. Biodiesel Volumes (in million gallons) in Scenario 1-B2

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Soy	24.48	24.77	24.98	25.09	25.05	24.98	24.91	24.71	24.42	24.13
Canola	7.83	7.93	7.99	8.02	8.01	7.99	7.97	7.90	7.81	7.72
Waste Oil	6.07	6.14	6.20	6.22	6.21	6.20	6.18	6.13	6.06	5.98
Total	38.38	38.84	39.17	39.33	39.27	39.16	39.06	38.74	38.28	37.83
% BD in ULSD	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%

Table 12. Biodiesel Volumes (in million gallons) in Scenario 1-B5

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Soy	24.50	24.80	25.01	25.12	25.08	24.99	24.92	29.68	31.79	33.83
Canola	7.84	7.93	8.00	8.03	8.02	8.00	7.97	9.49	10.17	10.82
Waste Oil	6.08	6.15	6.20	6.23	6.22	6.20	6.18	7.36	7.88	8.39
Total	38.42	38.89	39.21	39.38	39.32	39.19	39.08	46.54	49.84	53.04
% BD in ULSD	5%	5%	5%	5%	5%	5%	5%	6%	6.5%	7%

Scenario 1-B5 requires an increase from statewide average B5 to 6% biodiesel in 2023 and up to 7% in 2020. This results in a cumulative increase of over 35 million gallons of biodiesel between 2023 and 2025.

Renewable Diesel

Table 13 and Table 14 below show the volumes of renewable diesel, by feedstock, consumed in Scenarios 1-B2 and 1-B5.

Table 13. Renewable Diesel Volumes (in million gallons) in Scenario 1-B2

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Tallow	0	0	0	0	0	5	6	7	8	10
Waste Oil	0	0	0	0	0	2.19	1.89	3.67	2.54	3.89
Total	0	0	0	0	0	7.19	7.89	10.67	10.54	13.89
% RD in ULSD	0%	0%	0%	0%	0%	1%	1.1%	1.5%	1.5%	2%

Table 14. Renewable Diesel Volumes (in million gallons) in Scenario 1-B5

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Tallow	10	10	10	10	10	10	10	10	10	10
Waste Oil	4.11	4.28	4.40	4.46	4.44	4.39	5.48	5.36	5.18	5.01
Total	14.11	14.28	14.40	14.46	14.44	14.39	15.48	15.36	15.18	15.01
% RD in ULSD	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%

Scenario 1-B5 requires an increase to 2% renewable diesel throughout the program while Scenario 1-B2 only requires small volumes in the later years. This results in a cumulative increase of almost 100 million gallons of renewable diesel during the 10 year compliance period of the program.

Natural Gas/LPG

Table 15 below shows the natural gas/LPG and biogas consumption in million DGE where market share was increased to achieve 10% diesel pool consumption of natural gas/LPG/biogas in 2025. The vehicle penetrations and assumptions were the same for natural gas/LPG/biogas in Scenarios 1-B2 and 1-B5.

Table 15. Natural Gas/LGP Consumption (in million DGE) in Scenarios 1-B2 and 1-B5

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Natural Gas/LPG	8.11	11.79	15.25	14.11	18.52	23.26	28.28	33.80	39.94	46.62
Biogas	0.90	2.08	5.08	14.11	18.52	23.26	28.28	33.80	39.94	46.62
Total	9.01	13.87	20.34	28.22	37.04	46.53	56.55	67.61	79.87	93.24

Electricity

Table 16 below shows the electricity consumption from BEVs and PHEVs in million GGE.

Table 16. Electricity Consumption (in million GGE) in Scenarios 1-B2 and 1-B5

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total	1.51	1.85	3.17	4.99	7.39	10.24	13.40	16.87	20.76	25.12

3.2 Compliance Scenarios 2-B2 and 2-B5

Summary Overview of Compliance Scenarios 2-B2 and 2-B5

Figure 6 and Figure 7 on the following page show the annual credits and deficits generated for Scenarios 2-B2 and 2-B5. Each colored stacked bar represents credits generated from low carbon fuels; the blue line represents the deficits from forecasted gasoline blendstock and ultra-low sulfur diesel (ULSD) consumption. When the bars in years 2016-2021 exceed the blue line, annual credits exceed annual deficits and banked credits are generated for future compliance. When the bars fall short of the blue line in years 2022-2025, banked credits are required to meet annual compliance. The stacked bars are grouped by biofuels for blending at the bottom and advanced vehicle technologies at the top. Table 17 and Table 18 below show the annual deficits and credits generated and cumulative (banked) credits.

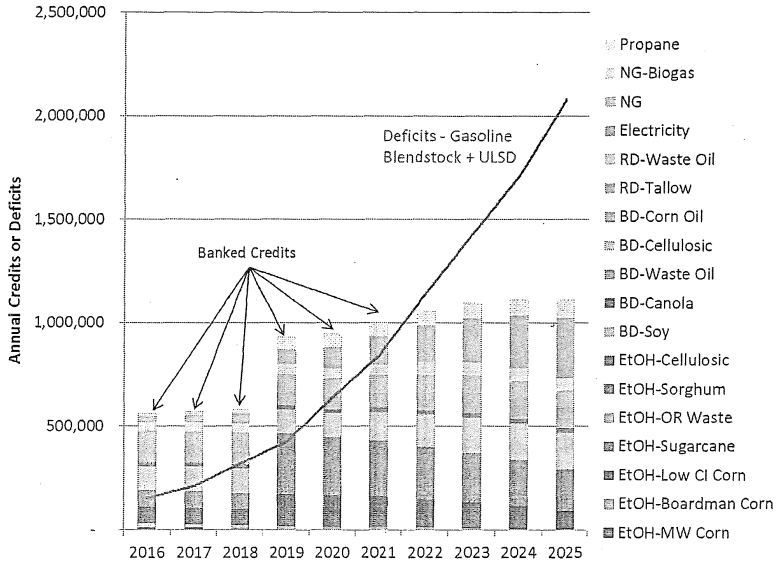

Figure 6. Balance of Credits and Deficits in Scenario 2-B2

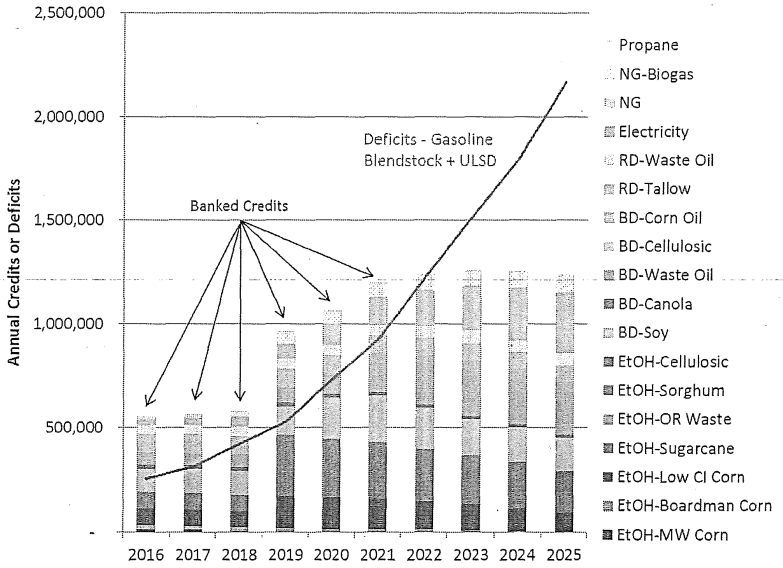

Figure 7. Balance of Credits and Deficits in Scenario 2-B5

Table 17. Credits and Deficits: Banking in Scenario 2-B2

Fuel		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Deficits (Millions)	Gasoline	-0.05	-0.08	-0.14	-0.20	-0.32	-0.43	-0.60	-0.75	-0.90	-1.09
	Diesel	-0.11	-0.13	-0.18	-0.23	-0.32	-0.41	-0.54	-0.68	-0.81	-0.99
Credits (Millions)	Gasoline Subs	0.22	0.23	0.24	0.56	0.58	0.60	0.61	0.62	0.63	0.63
	Diesel Subs	0.33	0.34	0.34	0.36	0.36	0.40	0.44	0.47	0.48	0.49
Balance		0.40	0.36	0.26	0.50	0.31	0.16	-0.09	-0.34	-0.60	-0.97
Banked (Net)		0.40	0.76	1.03	1.53	1.83	1.99	1.91	1.57	0.97	0.00

Table 18. Credits and Deficits: Banking in Scenario 2-B5

Fuel		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Deficits (Millions)	Gasoline	-0.05	-0.08	-0.14	-0.20	-0.32	-0.43	-0.60	-0.75	-0.90	-1.09
	Diesel	-0.21	-0.24	-0.28	-0.33	-0.41	-0.49	-0.63	-0.76	-0.90	-1.08
Credits (Millions)	Gasoline Subs	0.22	0.23	0.24	0.56	0.58	0.60	0.61	0.62	0.63	0.63
	Diesel Subs	0.33	0.33	0.34	0.39	0.48	0.59	0.62	0.63	0.62	0.61
Balance		0.29	0.25	0.15	0.43	0.33	0.27	0.01	-0.26	-0.54	-0.93
Banked (Net)		0.29	0.54	0.69	1.12	1.45	1.72	1.73	1.47	0.93	0.00

In Scenario 2-B2, gasoline and diesel generate similar numbers of deficits while in Scenario 2-B5, diesel generates almost 1 million more deficits than gasoline.

Fleet Changes from the BAU

There are no fleet changes between Scenarios 2-B2 and 2-B5 and the BAU.

Ethanol and Biofuels that Substitute for Gasoline

Table 19 below identifies the volumes of ethanol, broken down by feedstock, for both Scenarios 2-B2 and 2-B5. The ethanol volumes and feedstocks between 2-B2 and 2-B5 are identical.

Table 19. Ethanol Volumes (in million gallons) in Scenario 2

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Corn, MW	135.15	142.21	147.72	0	0	0	0	0	0	0
Corn, Boardman	26	26	26	26	26	26	26	26	26	26
Low CI Corn	50	50	50	102.36	104.99	106.44	107.36	107.02	105.34	103.18
Sugarcane	0	0	0	50	50	50	50	50	50	50
Sorghum	50	50	50	100	100	100	100	100	100	100
Total	261.15	268.21	273.72	278.36	280.99	282.44	283.36	283.02	281.34	279.18
% EtOH in Gasoline	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

Scenarios 2-B2 and 2-B5 consume the same volumes of ethanol to the BAU case since all cases maintain a 10% ethanol blend. Scenarios 2-B2 and 2-B5 cease to consume MW corn ethanol by 2019 since the carbon intensity of MW Corn exceeds the compliance in that year and every subsequent year. By 2025, there is a slight increase in ethanol consumption over Scenarios 1-B2 and 1-B5 since they include only PHEV40s and not PHEV10s which results in a slight increase in E10 consumption.

Biodiesel

Table 20 and Table 21 below show the volumes of biodiesel, by feedstock, consumed in Scenarios 2-B2 and 2-B5.

Table 20. Biodiesel Volumes (in million gallons) in Scenario 2-B2

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Soy	24.64	25.06	25.43	25.75	25.96	31.41	37.01	42.55	45.39	48.30
Canola	7.88	8.01	8.13	8.24	8.30	10.05	11.84	13.61	14.52	15.45
Waste Oil	6.11	6.21	6.31	6.39	6.44	7.79	9.18	10.55	11.26	11.98
Total	38.63	39.28	39.87	40.37	40.70	49.25	58.02	66.71	71.17	75.73
% BD in ULSD	5%	5%	5%	5%	5%	6%	7%	8%	8.5%	9%

Table 21. Biodiesel Volumes (in million gallons) in Scenario 2-B5

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Soy	24.64	25.06	25.43	30.92	44.94	52.33	47.47	43.51	43.83	44.21
Canola	7.88	8.01	8.13	9.89	10	10	10	10	10	10
Waste Oil	6.11	6.21	6.31	7.67	10.32	20	25.6	30	30	30
Total	38.63	39.28	39.87	48.48	65.27	82.33	83.07	83.51	83.83	84.21
% BD in ULSD	5%	5%	5%	6%	8%	10%	10%	10%	10%	10%

Scenario 2-B2 requires an increase from statewide average B5 to 6% biodiesel in 2021 and up to 9% in 2020 and Scenario 2-B5 requires an increase from B5 to B6 in 2019 and up to 10% in 2021. This results in a cumulative increase of almost 130 million gallons of biodiesel between Scenarios 2-B5 and 2-B2.

Renewable Diesel

Table 22 below shows the volumes of renewable diesel, by feedstock, consumed in Scenarios 2-B2 and 2-B5.

Table 22. Renewable Diesel Volumes (in million gallons) in Scenario 2-B2 and 2-B5

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Tallow	10	10	10	10	10	10	10	10	10	10
Waste Oil	4.18	4.42	4.64	4.82	4.94	5.07	6.41	6.51	6.58	6.66
Total	14.18	14.42	14.64	14.82	14.94	15.07	16.41	16.51	16.58	16.66
% RD in ULSD	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%

Scenarios 2-B2 and 2-B5 increase to 2% renewable diesel throughout the program resulting in 154 million gallons of renewable diesel consumption throughout the program.

Natural Gas/LPG

Table 23 below shows the natural gas/LPG and biogas consumption in million DGE where market share was increased to achieve 10% diesel pool consumption of natural gas/LPG/biogas in 2025. The vehicle penetrations and assumptions were the same for natural gas/LPG/biogas in Scenarios 2-B2 and 2-B5.

Table 23. Natural Gas/LGP Consumption (in million DGE) in Scenarios 2-B2 and 2-B5

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Natural Gas/LPG	4.51	5.38	6.20	6.99	7.77	8.52	9.36	10.13	10.94	12.22
Biogas	4.06	4.57	4.65	0.07	0.08	0.09	0.09	0.10	0.11	0.12
Total	0.45	0.81	1.55	6.92	7.70	8.43	9.27	10.03	10.83	12.10

Electricity

Table 24 below shows the electricity consumption from BEVs and PHEVs in million GGE.

Table 24. Electricity Consumption (in million GGE) in Scenarios 2-B2 and 2-B5

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total	1.51	1.85	2.80	4.20	6.12	8.44	11.07	13.97	17.24	20.93

The fleet change between Scenario 1 and 2 where all PHEVs are PEHV40 resulted in 4.2 million GGE of increased electricity consumption in 2025 in Scenario 1.

3.3 Greenhouse Gas Reductions

Table 25 shows the annual GHG emissions in million metric tons from transportation fuels from 2015 to 2025. Table 26 shows the percent GHG reductions annually from 2016 to 2025 and cumulatively over the compliance period from 2016 to 2025.

Table 25. Annual GHG Emissions (million metric tons)

Scenario	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
BAU	23.93	24.12	24.22	24.24	24.22	24.10	23.96	23.81	23.62	23.39	23.19
1-B2	23.92	23.95	24.04	24.03	23.64	23.48	23.21	23.00	22.71	22.41	22.09
1-B5	23.92	23.82	23.90	23.90	23.50	23.34	23.14	22.94	22.63	22.32	22.01
2-B2	23.92	23.83	23.92	23.94	23.58	23.45	23.26	23.06	22.81	22.56	22.32
2-B5	23.92	23.83	23.92	23.94	23.53	23.31	23.03	22.85	22.62	22.39	22.18

Table 26. GHG Emissions Reductions from the BAU (Percent)

Scenario	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2015
1-B2	0.7%	0.7%	0.9%	2.4%	2.6%	3.1%	3.4%	3.8%	4.2%	4.7%	**2.6%**
1-B5	1.3%	1.3%	1.4%	2.9%	3.2%	3.4%	3.7%	4.2%	4.6%	5.1%	**3.1%**
2-B2	1.2%	1.2%	1.3%	2.6%	2.7%	2.9%	3.2%	3.4%	3.6%	3.7%	**2.6%**
2-B5	1.2%	1.2%	1.3%	2.8%	3.3%	3.9%	4.1%	4.2%	4.3%	4.4%	**3.0%**

The reductions in Table 26 are compared to the BAU (which includes the ZEV Program and increased light-duty fuel economy standards) and only represent those reductions that would be directly attributed to the Clean Fuels Program. As expected, the scenarios with the B5 baseline achieved more cumulative reductions than the B2 scenarios. Additionally, both of the B2 baseline scenarios and the B5 baseline scenarios achieved similar cumulative reductions which were expected since the compliance period was looking to achieve the same carbon intensity reductions. The advanced vehicle technology scenarios are reducing more emissions annually at the end of the program compared to the blending scenarios due to displacing diesel with natural gas and biogas and reducing consumption of diesel from medium- and heavy-duty hybrids.

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MEMO

DATE: October 5, 2016

TO: Planning and Sustainability Commission

FROM: Tom Armstrong, Steve Kountz, Shannon Buono

CC: Michael Armstrong, Susan Anderson, Zach Klonoski

SUBJECT: Fossil Fuel Terminal Zoning Amendments

This memo is a response to major issues raised at the September 13, 2016 PSC public hearing and includes possible amendments to the Proposed Draft for consideration at the October 11 PSC work session.

Summary of issues:

- Storage capacity size threshold and aggregation of small facilities. The 5-million-gallon terminal size threshold determines which facilities will be subject to these restrictions. Public testimony raised concern that companies would use subsidiaries to aggregate or link smaller facilities as a means to circumvent the threshold limits.
- Regulating existing terminals. Designating existing terminals as non-conforming, limited or conditional uses has different implications for replacement of existing tanks, including seismic upgrades.
- Exemption for regulated utilities. NW Natural has requested that facilities required to serve end users be exempt from the regulations.
- Regulating throughput. Public testimony raised concerns that terminals would increase activity as a response to limited capacity and that the amount of product moving through a facility should be regulated.
- Seismic safety as a building code issue.

Balancing Competing Goals

The Portland Fossil Fuel Resolution (#37168) provides direction to actively oppose expansion of fossil fuel infrastructure, but do not restrict improvements in the safety, efficiency, seismic resilience, or operations of existing infrastructure and infrastructure that will accelerate the transition to non-fossil fuel energy sources.

BPS staff recommendations are based on three major points:

1. Even though these existing terminals are located in a moderate to high liquefaction susceptibility zone; it is impratical to assume that these facilities will move to another location in the region or Oregon. The focus should be on improving seismic resilience, which requires reinvestment and replacement of old tanks.

2. If the regulations are too restrictive, then the existing fossil fuel terminals will not make the necessary improvements to improve seismic safety. If there is a future program that requires replacement of old tanks through the building code, the zoning code should provide a clear path, without a discretionary land use review, to making these improvements.

3. Compliance with the State of Oregon's Clean Fuel Standards may generate the need for additional storage capacity for fuel additives such as ethanol. The zoning code should have a clear path, without a discretionary land use review, to provide flexibility for limited expansions to comply with the Clean Fuel Standards,

Zoning Code Options

1. Storage capacity size threshold and aggregation of sites

The Bulk Fossil Fuel Terminal use category is intended to apply to large regional gateway facilities where fossil fuels are brought into the region. The 5-million gallon capacity threshold is small compared to the existing petroleum terminals, which range from 11.6 million to 67.2 million gallons, with most facilities having more than 25 million gallons of storage capacity. Also, the recent proposals for export terminals in the Pacific Northwest are many times larger than the proposed 5-million gallon threshold. For example, the recent crude oil terminal proposal in Vancouver (Washington) was for 91 million gallons of storage capacity and the Pembina propane terminal proposal in Portland was for 34 million gallons of storage capacity.

The size threshold would apply to both new and existing terminals. BPS has identified 11 existing facilities that fit the description of a Bulk Fossil Fuel Terminal use. BPS involved representatives of these 11 terminals in early outreach activities for this project since May 2016, along with environmental organizations, neighborhood and equity organizations, and state and regional business associations. Smaller fossil fuel distributors that could be affected by these proposed regulations have not been involved in this process. Preliminary research to identify potential fossil fuel distributors based on NAIC codes has identified an additional 24 businesses that could be affected if the threshold is reduced below 5 million gallons (see table below).

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Company Name	NAIC Code	NAIC Category
Bulk Fossil Fuel Terminals		
1. ARC LOGISTICS	493190	Other warehousing and storage
2. BP PRODUCTS NORTH AMERICA INC	424710	Petroleum Bulk Stations and Terminals
3. CHEVRON USA INC	424720	Petroleum Products Wholesalers
4. PHILLIPS 66	424720	Petroleum Products Wholesalers
5. EQUILON ENTERPRISES (Shell)	486910	Petroleum Pipeline Transportation
6. KINDER MORGAN INC	486210	Petroleum Pipeline Transportation
7. MCCALL OIL AND CHEMICAL CORP	424720	Petroleum Products Wholesalers
8. NW NATURAL GAS STORAGE LLC	486210	Petroleum Pipeline Transportation
9. PACIFIC TERMINAL SERVICES INC	424710	Petroleum Bulk Stations and Terminals
10. SHORE TERMINALS (ExxonMobil)	424710	Petroleum Bulk Stations and Terminals
Other Businesses		
1. AIR LIQUIDE AMERICA SPECIALTY GASES	424720	Petroleum Products Wholesalers
2. AMERIGAS	454310	Fuel Dealers
3. BLUE FLAME	424720	Petroleum Products Wholesalers
4. BORING PETROLEUM INC	424720	Petroleum Products Wholesalers
5. CARSON OIL CO., INC.	424720	Petroleum Products Wholesalers
6. CASCADE PETROLEUM TRANSPORTATION INC	486910	Petroleum Pipeline Transportation
7. CHRISTENSON OIL	424720	Petroleum Products Wholesalers
8. DON THOMAS PETROLEUM INC	424720	Petroleum Products Wholesalers
9. FERRELLGAS, INC.	454310	Fuel Dealers
10. FITZ ENTERPRISES, INC.	424720	Petroleum Products Wholesalers
11. FUELMAN/FLEET 350	424720	Petroleum Products Wholesalers
12. HAJ, INC.	424720	Petroleum Products Wholesalers
13. HOUSEWARMERS OIL CO INC	424720	Petroleum Products Wholesalers
14. MERIT OIL & REFINING	424720	Petroleum Products Wholesalers
15. PENNZOIL-QUAKER STATE COMPANY	424720	Petroleum Products Wholesalers
16. POWELL DISTRIBUTING COMPANY INC	424710	Petroleum Bulk Stations and Terminals
17. R AND R PETROLEUM LLC	424720	Petroleum Products Wholesalers
18. REINHARD PETROEUM	424720	Petroleum Products Wholesalers
19. SANTA FE PACIFIC	486110	Crude Oil Pipeline Transportation
20. SEQUENTIAL-PACIFIC BIODIESEL, LLC	424720	Petroleum Products Wholesalers
21. STAR OILCO	424720	Petroleum Products Wholesalers
22. TARR ACQUISITION, LLC	424710	Petroleum Bulk Stations and Terminals
23. TYREE OIL, INC.	424720	Petroleum Products Wholesalers
24. WESTERN HYWAY OIL CO	424720	Petroleum Products Wholesalers

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A change to effectively eliminate the bulk fossil fuel storage aspect of the use description may also inadvertently expand the use category to include general freight transportation facilities, such as rail yards and barge lines that handle fossil fuels and other commodities. A clarification in the use description should be added to clarify that railroad yards and pipelines without transloading or storage facilities are not Bulk Fossil Fuel Terminals.

The September 16 written testimony from 350PDX, prepared by Mia Reback and Nick Caleb, indicates that the 5-million gallon threshold *probably* will be adequately restrictive on all new fossil fuel terminals, but are concerned about the potential for small terminal aggregation. Their concern is a larger parent corporation would set up different subsidiaries, each having a small lot with 5-million gallons of storage capacity, on contiguous lots as a way to circumvent the 5-million gallon limit on new facilities.

The Zoning Code (33.910.030) defines "ownership"as:

> An ownership is one or more contiguous lots that are owned by the same person, partnership, association, or corporation. Ownership also includes lots that are in common ownership but are separated by a shared right-of-way.

The reference to partnerships and corporations is an inclusive term that includes subsidiaries of a larger corporation, which would prevent a larger parent corporation from using different subsidiaries on contiguous lots.

A possible amendment to the definition of Bulk Fossil Fuel Terminals could clarify that multiple fossil fuel facilities, each with less than 5 million gallons of fossil fuel storage capacity located on separate parcels of land will be classified as a Bulk Fossil Fuel Terminal when two or more of the following factors are present:

a. The facilities are located or will be located on one or more adjacent parcels of land. Adjacent includes separated by a shared right-of-way;

b. The facilities share or will share operating facilities such as driveways, parking, piping, or storage tanks; or

c. The facilities are owned or operated by a single parent partnership or corporation.

Options:

A. No change. Retain the storage capacity threshold at 5 million gallons.

B. Reduce the storage capacity threshold.

C. Add language to clarify common ownership includes subsidiaries of corporations.

D. Add language to clarify the use status of railroad yards and pipelines.

- Regional gas and oil pipelines are classified as Rail Line and Utility Corridor uses.

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- Railroad yards are classified as Railroad Yard uses.

BPS Recommendation: Retain the 5-million gallon threshold. Add clarifying language to prevent aggregation of small facilities. Add clarifying language for railyards and pipelines.

2. Regulating existing terminal expansion

To be consistent with Resolution 37168, there should be an opportunity for replacement and limited expansion of existing terminal storage capacity to allow for new tanks to meet clean fuel standards and seismic safety improvements through the replacement of existing tanks.

The Proposed Draft establishes the existing terminals as legal non-conforming uses that will require all improvements to go through a non-conforming situation review. Comments from BDS clarify that even one-for-one replacement of existing tanks (without expansion) would be difficult to approve through a non-conforming situation review. In addition, the terminal operators raised concerns about being designated as a non-conforming use in terms of financing improvements and the uncertainty created by the land use review process. At the same time, 350PDX and many others expressed support for designating terminals as a non-conforming use and requiring improvements to go through a land use review.

Other options are to make the existing terminals a limited use or conditional use with land use review approval criteria to ensure that the expanded capacity will improve safety (replace old tanks) and is need for compliance with clean renewable fuel standards (reduce GHG emissions).

BDS recommends designating the existing terminals as a limited use with a limit on expansions to be no more than 10 percent of the existing total storage capacity on the site. Alterations, replacement of existing tanks, and expansions within the limit would be allowed without a land use review. Expansion of storage capacity would need to be done in conjunction with the seismic upgrade of at least one existing tank, so that there is an increase in the overall seismic safety of the terminal. New or replacement tanks would automatically be required to meet current building code standards for seismic safety.

Another approach would be to allow for expansion up to the 10 percent limit through a conditional use review. Approval criteria could to ensure that the added capacity will improve safety (replace old tanks) and is needed for compliance with clean renewable fuel standards (reduce GHG emissions). Alterations to the terminal that do not increase the fossil fuel storage capacity would not be subject to a conditional use review.

There was a lot of public testimony on whether or not to require a discretionary land use review as part of a limited expansion. Land use reviews require public notice and opportunities for public comment and appeals. Land use reviews also introduce an element of uncertainty and time delay that could be a deterrent to undertaking an improvement project that would otherwise help meet seismic resilience or clean fuel goals. BDS has expressed concerns that they do not have the expertise to implement discretionary land use

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review criteria addressing greenhouse gas emissions or safety impacts of hazardous material storage and transportation. If new conditional use criteria are added to limit or require no net increase of greenhouse gas emissions or safety impacts of hazardous material storage and transportation facilities, applicants would be required to hire specialized consultants to show compliance of the particular criterion, which would affect the complexity, predictability, and cost of land use reviews in new ways.

An alternative to a land use review is a public notice and meeting requirement, similar to the requirement for multi-dwelling residential development. The terminal operators would be required to send notice to the adjacent neighborhood association and hold a public meeting to explain the elements of the project prior to filing a development permit application. This notice and meeting would create public awareness about the project and serve to discuss a proposal in an informal basis.

BPS recommends designating the existing terminals as a limited use, capping the amount of expansion to 10 percent of the current storage capacity in order to provide flexibility to comply with clean fuel standards and as an incentive to make seismic upgrades. With a strict cap a land use review would not be necessary because all new improvements are required to comply with current building codes, so by their nature will be safer than the existing facilities. Also, given the past trends of flat gasoline consumption and other policy initiatives (increasing fuel efficiency standards, electric vehicles) that are expected to reduce the demand for fossil fuels, the most likely need for additional storage capacity is to comply with the clean fuel standards, which further helps reduce our GHG emissions.

Options:

A. No change. Existing terminals become non-conforming uses and any expansion must go through a non-conforming situation review. Variation: create review criteria that is specific to Bulk Fossil Fuel Terminals that addresses the need to comply with Clean Fuel Program and seismic safety standards.

B. Limited use. Existing terminals are designated as a limited use and expansion of storage capacity is not to exceed 10 percent of the current terminal capacity. No land use review required. Variation: require a public meeting prior to filing development application.

C. Conditional use. Replacement of storage tanks is allowed. Expansion of storage capacity is allowed (up to a 10 percent limit) through a conditional use review process with approval criteria for seismic upgrades and compliance with clean fuel standard.

BPS recommendation: Option B – a clear and simple approach.

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3. Exemption for regulated utilities.

NW Natural, the natural gas utility that serves western Oregon and parts of southwest Washington, has suggested that its facilities should not be subject to new zoning restrictions because its distribution facilities provide service to end users. The November 2015 City Council resolution included a provision that the resolution "does not restrict. . .the provision of service directly to end users."

NW Natural's service to end users in Oregon is regulated by the Oregon Public Utility Commission. The company periodically prepares an integrated resources plan (IRP) to document its forecast for natural gas use by its customers that takes into consideration changes in number of customers, gas usage per customer, and anticipated economic trends. The IRP also details how NW Natural proposes to meet changes in natural gas demand and is statutorily obligated to do so in ways that result in the "least cost" to customers, while managing risk and complying with all applicable environmental and workplace regulations. The PUC conducts a public review process of the IRP and ultimately either "acknowledges" the IRP or identifies shortcomings the company must address in a revised IRP.

NW Natural has suggested that, because of the regulatory authority of the PUC and existing review process, any proposed facilities would be thoroughly vetted as necessary to meet the needs of end users.

This approach would apply only to facilities NW Natural constructs that fall within its PUC-regulated operations. If NW Natural established an unregulated subsidiary to supply wholesale liquefied natural gas (LNG), for example, any infrastructure associated with these operations would still be subject to the Fossil Fuel Code.

Option: Add the following under "Exceptions that are not Bulk Fossil Fuel Terminals."

Proposed Language	*Facility operated by a public utility and regulated by the Oregon Public Utility Commission under ORS Chapters 756 and 757 for the purposes of ensuring fuel reliability to direct users through an interconnected system are not Bulk Fossil Fuel Terminals.*

5. Regulating throughput.

Public testimony raised concerns that terminals would ramp up activity as a response to limited capacity and that the amount of product moving through a facility should be regulated.

Regulating throughput of a specific use is not something that the City of Portland does, especially through the Zoning Code. This type of regulation represents a new direction with a set of issues regarding reporting, monitoring, enforcement, and staffing that are beyond the scope of this project.

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6. Seismic safety as a building code issue.

Improving seismic safety is a major issue. It also is a building code issue that is beyond the scope of the zoning code. As a future step, the City of Portland should explore options to require seismic safety upgrades through a program similar to un-reinforced masonry buildings (URMs) program that is in process or a property maintenance code.

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1. Draft code for regulating existing terminals as a limited use (2 options—no expansion; 10% expansion):

33.140.100 Primary Uses

A. No change

B. Limited uses. Uses allowed that are subject to limitations are listed in Table 140-1 with an "L". These uses are allowed if they comply with the limitations listed below and the development standards and other regulations of this Title. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters. The paragraphs listed below contain the limitations and correspond with the footnote numbers from Table 140-1.

1. – 16. No change

17. Bulk Fossil Fuel Terminals. This regulation applies to all parts of Table 140-1 that have a [17].

a. Bulk Fossil Fuel Terminals that existed on [*insert effective date*] and are shown on Map 140-1 are allowed but the total amount of fossil fuel that can be stored within the boundaries of each terminal is limited to the amount shown in Table 140-7. Fossil fuel storage capacity in excess of the amount specified in Table 140-7 is prohibited.;

b. New Bulk Fossil Fuel Terminals are prohibited.

Table 140-7 for Option 1—Base (company names will not appear in the Zoning Code)

Table 140-7
Total Allowed Fossil Fuel Storage Capacity

Terminal	Total allowed fossil fuel storage capacity
Terminal #1 *(Kinder Morgan Linnton)*	17,640,000 gallons
Terminal #2 *(BP West Coast)*	25,263,000 gallons
Terminal #3 *(Shore Terminals/Nustar)*	50,022,000 gallons
Terminal #4 *(Pacific Terminal Services)*	11,678,000 gallons
Terminal #5 *(NW Natural)*	7,500,000 gallons
Terminal #6 *(Kinder Morgan Willbridge)*	65,142,000 gallons
Terminal #7 *(Chevron)*	67,200,000 gallons
Terminal #8 *(Phillips 66)*	31,920,000 gallons
Terminal #9 *(Arc Terminals)*	66,524,200 gallons
Terminal #10 *(McCall Oil)*	39,060,000 gallons
Terminal #11 *(Equilion Shell)*	16,800,000 gallons

Table 140-7 for Option 2—Base plus 10% (company names will not appear in the Zoning Code)

Table 140-8
Total Allowed Fossil Fuel Storage Capacity

Terminal	Total allowed fossil fuel storage capacity
Terminal #1 *(Kinder Morgan Linnton)*	19,404,000 gallons
Terminal #2 *(BP West Coast)*	27,789,300 gallons
Terminal #3 *(Shore Terminals/Nustar)*	55,024,200 gallons
Terminal #4 *(Pacific Terminal Services)*	12,845,800 gallons
Terminal #5 *(NW Natural)*	8,250,000 gallons

Terminal #6 *(Kinder Morgan Willbridge)*	71,656,200 gallons
Terminal #7 *(Chevron)*	73,920,000 gallons
Terminal #8 *(Phillips 66)*	35,112,000 gallons
Terminal #9 *(Arc Logistics)*	73,176,600 gallons
Terminal #10 *(McCall Oil)*	42,966,000 gallons
Terminal #11 *(Equilion Shell)*	18,480,000 gallons

Table 140-1
Employment and Industrial Zone Primary Uses

Industrial Categories	**EG1**	**EG2**	**EX**	**IG1**	**IG2**	**IH**
Manufacturing And Production	Y	Y	Y	Y	Y	Y
Warehouse And Freight Movement	Y	Y	Y	Y	Y	Y
Wholesale Sales	Y	Y	Y	Y	Y	Y
Industrial Service	Y	Y	Y	Y	Y	Y
Bulk Fossil Fuel Terminal	N	N	N	N	N	L [17]
Railroad Yards	N	N	N	Y	Y	Y
Waste-Related	N	N	N	L/CU [8]	L/CU [8]	L/CU [8]

2. Draft code for regulating existing terminal expansion (up to 10%) as a limited use in exchange for upgrading one existing tank:

17. Bulk Fossil Fuel Terminals. This regulation applies to all parts of Table 140-1 that have a [17].

a. Existing Bulk Fossil Fuel Terminals. Bulk Fossil Fuel Terminals that existed on [*insert effective date*] and are shown on Map 140-1 are allowed but the total amount of fossil fuel that can be stored within the boundaries of each terminal is limited to the amount shown in Table 140-7. Additional fossil fuel storage capacity can be added within the terminal boundaries up to the amount specified in Table 140-8 if at least one fossil fuel storage facility that existed on the terminal site on [insert effective date] is brought into conformance with current seismic standards. Fossil fuel storage capacity in excess of the combined amounts specified in Tables 140-7 and 140-8 is prohibited.

b. New Bulk Fossil Fuel Terminals are prohibited.

Table 140-7
Total Allowed Fossil Fuel Storage Capacity

Terminal	Total allowed fossil fuel storage capacity
Terminal #1	67,200,000 gallons
Terminal #2	65,142,000 gallons
etc…	

Table 140-8
Additional Fossil Fuel Storage Capacity

Terminal	Additional fossil fuel storage capacity
Terminal #1	6,720,000 gallons
Terminal #2	6,514,200 gallons
etc…	

Table 140-1
Employment and Industrial Zone Primary Uses

Industrial Categories	EG1	EG2	EX	IG1	IG2	IH
Manufacturing And Production	Y	Y	Y	Y	Y	Y
Warehouse And Freight Movement	Y	Y	Y	Y	Y	Y
Wholesale Sales	Y	Y	Y	Y	Y	Y
Industrial Service	Y	Y	Y	Y	Y	Y
Bulk Fossil Fuel Terminal	N	N	N	N	N	L [17]
Railroad Yards	N	N	N	Y	Y	Y
Waste-Related	N	N	N	L/CU [8]	L/CU [8]	L/CU [8]

3. Draft code for regulating existing terminal expansion (up to 10%) as a CU:

33.140.100 Primary Uses

A. No change

B. Limited uses. Uses allowed that are subject to limitations are listed in Table 140-1 with an "L". These uses are allowed if they comply with the limitations listed below and the development standards and other regulations of this Title. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters. The paragraphs listed below contain the limitations and correspond with the footnote numbers from Table 140-1.

1. – 16. No change

17. Bulk Fossil Fuel Terminals. This regulation applies to all parts of Table 140-1 that have a [17].

a. Existing Bulk Fossil Fuel Terminals. Bulk Fossil Fuel Terminals that existed on [insert effective date] and are shown on Map 140-1 are allowed but the total amount of fossil fuel that can be stored within the boundaries of each terminal is limited to the amount shown in Table 140-7. Adding additional fossil fuel storage capacity up to the amount shown in Table 140-8 can be allowed through a conditional use review. Alterations to the terminal that do not increase the fossil fuel storage capacity are not subject to a conditional use review. Fossil fuel storage capacity in excess of the combined amounts specified in Tables 140-7 and 140-8 is prohibited.

b. New Bulk Fossil Fuel Terminals are prohibited.

Table 140-7
Fossil Fuel Storage Capacity

Terminal	Total allowed fossil fuel storage capacity
Terminal #1	67,200,000 gallons
Terminal #2	65,142,000 gallons
etc…	

Table 140-8
Additional Fossil Fuel Storage Capacity

Terminal	Additional fossil fuel storage capacity allowed as a conditional use
Terminal #1	6,720,000 gallons
Terminal #2	6,514,200 gallons
etc…	

Table 140-1
Employment and Industrial Zone Primary Uses

Industrial Categories	EG1	EG2	EX	IG1	IG2	IH
Manufacturing And Production	Y	Y	Y	Y	Y	Y
Warehouse And Freight Movement	Y	Y	Y	Y	Y	Y
Wholesale Sales	Y	Y	Y	Y	Y	Y
Industrial Service	Y	Y	Y	Y	Y	Y

Bulk Fossil Fuel Terminal	N	N	N	N	N	L/CU/N [17]
Railroad Yards	N	N	N	Y	Y	Y
Waste-Related	N	N	N	L/CU [8]	L/CU [8]	L/CU [8]

33.815.320 Bulk Fossil Fuel Terminals.

These approval criteria apply to Bulk Fossil Fuel Terminals. The approval criteria are:

A. The proposed development meets all *applicable seismic standards*; and

B. The proposed development is necessary to comply with *the clean fuel standards*.

4. Draft code for adding Neighborhood Contact:

33.140.050 Neighborhood Contact

A. Purpose. Neighborhood contact is required for changes to the storage capacity of Bulk Fossil Fuel Terminals in the IH zone because of the impacts that fossil fuel projects can have on the surrounding community. The neighborhood contact requirement provides an opportunity for community input on the design of the project by providing a setting for the applicant and neighborhood residents to discuss a proposal in an informal manner. By sharing information and concerns early, all involved have the opportunity to identify ways to improve a proposal and to resolve conflicts.

B. Neighborhood contact requirement. Proposals meeting the following conditions are subject to the neighborhood contact requirement as specified in Section 33.700.025, Neighborhood Contact. All of the steps in 33.700.025 must be completed before a building permit is requested.

1. The proposed development has not been subject to a land use review; and

2. Development for the storage of fossil fuels is proposed.

5. Draft Code to Ensure that the Olympic Pipeline and Rail Yards are not considered a Bulk Fossil Fuel Terminal, and ensure that the NW Natural LNG site is not a Bulk Fossil Fuel Terminal, plus a few changes for clarity purposes:

33.920.300 Bulk Fossil Fuel Terminal

A. Characteristics. Bulk Fossil Fuel Terminals are establishments primarily engaged in the transport and bulk storage of fossil fuels. Terminal activities may also include fuel blending, regional distribution, and wholesaling. The firms rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities for transferring fossil fuel between transport modes, or have fossil fuel storage capacity on the site exceeding 5 million gallons. There is minimal on-site sales activity with the customer present.

B. Accessory uses. Accessory uses may include retail sales of petroleum products, offices, food membership distribution, parking, storage, truck fleet parking and maintenance areas, rail spur or lead lines, and docks.

C. Examples. Examples include crude oil terminals, petroleum products terminals, natural gas terminals, propane terminals, and coal terminals.

D. Exceptions.

1. Truck or marine freight terminals that do not store, transport or distribute fossil fuels are classified as Warehouse and Freight Movement uses.
2. Truck or marine freight terminals that do not have fossil fuel transloading facilities and do not have fossil fuel storage capacity in excess of 5 million gallons are classified as Warehouse and Freight Movement uses.
3. Gasoline stations and other retail sales of fossil fuels are not Bulk Fossil Fuel Terminals.
4. Distributors and wholesalers that receive and deliver fossil fuels exclusively by truck are classified as Warehouse and Freight Movement uses.
5. Industrial, commercial, institutional, and agricultural firms that exclusively store fossil fuels for use as an input are not Bulk Fossil Fuel Terminals.
6. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.
7. The storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, rail yard, or as part of a fleet vehicle servicing facility are accessory to their use.
8. Uses that recover or reprocess used petroleum products are not Bulk Fossil Fuel Terminals.
9. Regional gas and oil pipelines are classified as Rail Line and Utility Corridor uses.
10 Railroad yards are classified as Railroad Yard uses.
11. Facilities operated by a public utility and regulated by the Oregon Public Utility Commission under ORS Chapter 756 and 757 for the purposes of ensuring fuel reliability to direct users through an interconnected system are not Bulk Fossil Fuel Terminals.

6. Additional code language to address the potential for small site aggregation:

33.920.300 Bulk Fossil Fuel Terminal

A. Characteristics. Bulk Fossil Fuel Terminals are establishments primarily engaged in the transport and bulk storage of fossil fuels. Terminal activities may also include fuel blending, regional distribution, and wholesaling. The firms rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities for transferring fossil fuel between transport modes, or have fossil fuel storage capacity on the site exceeding 5 million gallons (or equivalent volume). There is minimal on-site sales activity with the customer present.

B. Accessory uses. Accessory uses may include retail sales of petroleum products, offices, food membership distribution, parking, storage, truck fleet parking and maintenance areas, rail spur or lead lines, and docks.

C. Examples. Examples include crude oil terminals, petroleum products terminals, natural gas terminals, propane terminals, and coal terminals.

D. Exceptions.

1. Truck or marine freight terminals that do not store, transport or distribute fossil fuels are classified as Warehouse and Freight Movement uses.

2. Truck or marine freight terminals that do not have fossil fuel transloading facilities and do not have fossil fuel storage capacity in excess of 5 million gallons are classified as Warehouse and Freight Movement uses. However, multiple fossil fuel facilities, each with less than 5 million gallons of fossil fuel storage capacity but cumulatively having a fossil fuel storage capacity in excess of 5 million gallons, located on separate parcels of land will be classified as a Bulk Fossil Fuel Terminal when two or more of the following factors are present:

   a. The facilities are located or will be located on one or more adjacent parcels of land. Adjacent includes separated by a shared right-of-way;

   b. The facilities share or will share operating facilities such as driveways, parking, piping, or storage tanks; or

   c. The facilities are owned or operated by a single parent partnership or corporation.

3. Gasoline stations and other retail sales of fossil fuels are not Bulk Fossil Fuel Terminals.

4. Distributors and wholesalers that receive and deliver fossil fuels exclusively by truck are classified as Warehouse and Freight Movement uses.

5. Industrial, commercial, institutional, and agricultural firms that exclusively store fossil fuels for use as an input are not Bulk Fossil Fuel Terminals.

6. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.

7. The storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, rail yard, or as part of a fleet vehicle servicing facility are accessory to their use.

8. Uses that recover or reprocess used petroleum products are not Bulk Fossil Fuel Terminals.

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Friday, September 16, 2016 3:35:31 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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-----Original Message-----
From: rmacgeorge@everyactioncustom.com [mailto:rmacgeorge@everyactioncustom.com]
Sent: Friday, September 16, 2016 10:19 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Rayne MacGeorge
4110 SE Hawthorne Blvd # 321
Portland, OR 97214-5246

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Friday, September 16, 2016 3:35:10 PM
Attachments: image001.png

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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From: Greg Peden [mailto:GregP@gallatinpa.com]
Sent: Friday, September 16, 2016 3:32 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Cc: Armstrong, Tom <Tom.Armstrong@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Dear Planning and Sustainability Commissioners:

Knife River Corporation provides construction materials and contracting services in Portland and around the northwest. They own property within the city of Portland and operate an asphalt terminal on that property. As such, we have concerns regarding the proposed Fossil Fuels ordinance. Specifically we have the following concerns that we are hoping we can work with you to address.

1. Under proposed section 33.920.030 and the attached commentary regarding the definition of fossil fuels, there is reference to products that are excluded from the definition of fossil fuels. However, those exclusions are not specifically in the proposed language of the code. We request that these exclusions be specifically stated in the code and that "asphalt" be included as one of those exemptions. It is unclear to us what legal authority the "commentary" has and as such request this language be placed into the code. We think this is the simplest way to address our concerns and align them with what we believe to be the city's intent relating to fossil fuels.
2. Proposed section 33.920.300 (D) states "industrial, commercial, institutional and agricultural firms that *exclusively* store fossil fuels for use as an input are not Bulk Fossil Fuel Terminals." Assuming fuel used in asphalt is an "input", we read the word "exclusive" as preventing Knife River from selling asphalt to a third party. We request the term "exclusive" be changed to "primarily".

3. Additionally, we believe proposed section 33.920.300 (A) entitled "Characteristics" is vague and confusing. If asphalt was somehow determined to be deemed a "fuel" it appears that Knife River could only "store" up to 5 million gallons. However, we would not be allowed to "trans-load" the asphalt at all. Knife River does not manufacture the asphalt, so by definition we assume we would be considered to "trans-load" the asphalt and as such be in violation of the proposed code. Again we assume that is not the city's intent and as such believe our first recommendation is the best alternative.

Thank you very much for your consideration.

Sincerely,

Greg Peden on Behalf of Knife River Corp.



Greg Peden
503.220.0780 Office | 503.522.6016 Mobile | gallatinpa.com | gsquaredwins.com

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From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Friday, September 16, 2016 3:35:47 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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-----Original Message-----
From: powell440@everyactioncustom.com [mailto:powell440@everyactioncustom.com]
Sent: Friday, September 16, 2016 12:34 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
David Powell
4117 N Haight Ave
Portland, OR 97217-2919

City of Portland Planning and Sustainability Commission
1900 SW 4th Ave, Portland, OR 97201

Sent via email to: psc@portlandoregon.gov on September 16th, 2016.

Re: PSC Fossil Fuel Zoning Testimony

350PDX comments on the Fossil Fuel Code Changes Discussion Draft & recommended changes to the proposed draft submitted by BPS Staff to the Planning and Sustainability Commission on September 9th.

Prepared by Mia Reback and Nick Caleb.

Esteemed Members of the Portland Planning and Sustainability Commission,

Thank you for taking the time for in-depth consideration of this important issue. 350PDX believes the fossil fuel terminal zoning code changes should implement the clear language of Resolution #37168 which states that the City of Portland will "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways," and prohibit all new fossil fuel terminals and expansions and existing facilities.

Below, please find our feedback on several amendments currently under consideration.

Fossil Fuel Terminal Size Threshold:

350PDX supports Resolution #37168 being implemented in the clearest way possible to fully prohibit new fossil fuel terminals and terminals expansions. 350PDX encourages the Planning and Sustainability Commission to amend proposed proposed zoning code changes by reducing or eliminating the storage capacity threshold, with preference for eliminating the threshold and prohibiting all new fossil fuel terminals.

With this in mind, we understand and appreciate BPS's strategy in creating the 5 million gallon threshold and believe that this approach in combination with the transloading restriction *probably* will be adequately restrictive on all new fossil fuel terminals in line with the Resolution, but are concerned about the potential for small terminal aggregation that would create a fossil fuel footprint well above what now seems like an aggressive limit (see below). Adding a terminal aggregation restriction will make the 5 million gallon threshold far more palatable to our members.

In the event that PSC decides upon a terminal threshold of 5 million gallons or less, we will strongly urge BPS to conduct a follow up review and plan for these facilities in the near future, and at the latest, in the 2020 Climate Action Plan.

Appendix A and B present two alternative code changes prepared in consultation with Trish Weber, Land Use Consultant for the Center for Sustainable Economy.

Regulating Existing Terminal Expansion:

350PDX supports existing Bulk Fossil Fuel Facilities being designated as legal, non-conforming uses and requiring any expansion go through a Type II review process. Any costs associated with the review process should be borne by the applicant. This is consistent with the spirit and plain language of the Resolution, our new Comprehensive Plan, and Portland's commitments to the health and safety of its residents

350PDX supports no change to the current proposal that designates existing terminals as a non-conforming use and requires any expansion to go through a legal non-conforming situation review.

Additional Review Criteria for Terminal Expansions:

350PDX supports the PSC amending the proposed draft to strengthen restrictions on expansion allowed at existing terminals and add additional review criteria to the the non-conforming use process for Bulk Fossil Fuel Terminals to to include the criteria that are the basis for prohibiting new bulk fossil fuel terminals in the first place - health, safety, and climate.

At the hearing, there was a discussion around the potential for re-locating the capacity of an existing storage tank out of liquefaction zone for the purposes of increasing safety, and whether this would be prohibited by strict review criteria for terminal expansions. We believe this concern to be a moot point as we are unaware of any industrial land suitable for such a re-location that isn't in a liquefaction zone. Additionally, even if it were possible, new infrastructure would be unacceptable because it would lock us into dirty fuels and their carbon emissions for decades to come and contravene the plain language and intent of the Resolution.

We also ask the PSC to take a close look at the history of seismic upgrades in the NW Industrial Area when considering the argument that new regulations would disincentivize future seismic upgrades. Put plainly, facilities in the NW Industrial area have not been investing in seismic upgrades without restrictions on expansion so this argument seems particularly disingenuous. Rather than disincentivizing seismic upgrades, we believe that the non-conforming use designation will inspire even more conversation about how to incentivize or require existing facilities to invest in seismic upgrades. We are communicating several strategies to city staff and expect future reform efforts in line with BPS's recommendation for further Resolution implementation and seismic safety policy.

Appendix C presents a potential code change to support these additional criteria, prepared by Trish Weber, Land Use Consultant for the Center for Sustainable Economy.

Small Terminal Aggregation:

350PDX is concerned about the trend of terminal aggregation in fossil fuel projects, of which we have some examples in the Pacific Northwest. In British Columbia, where nearly two-dozen liquefied natural gas (LNG) export projects are in the proposal stage, the annual production of several LNG proposals would be three to four times larger than the annual production of the largest existing LNG terminal in the world. The way in which the projects would achieve these production volumes is through the aggregation of several terminals of equal size, each with its own liquefaction equipment, storage and other structures. The terminals would be geographic neighbors. Through the benefits of the project umbrella they would be greenlit under the same permits with respect to land use, pipelines, etc. Examples include ExxonMobil's WCC LNG project at Prince Rupert, BC (which would consist of five aggregated facilities), Woodside Energy Holdings Party's Grassy Point LNG project, and Petronas' Pacific Northwest LNG project at Port Edward.

These proposals are a part of a trend to be aware of when limiting bulk fossil fuel terminals. What we have traditionally defined as a "terminal" may in the near future be commonly treated a part of a larger "project" or "network", and the definition of the word terminal may change as the distinction between terminals dissolves and a terminal is no longer a distinct entity.

To prevent this loophole, code language should be added to limit "projects" or "networks" whose aggregate volume is greater than or equal to a Bulk Fossil Fuel Terminal.

Through amendments in the zoning code, the City of Portland can prevent the fossil fuel industry from using subsidiaries and partnerships to build small terminals that in aggregate function like a Bulk Fossil Fuel Terminal.

Appendix D presents potential code language to address terminal aggregation, prepared by Trish Weber, Land Use Consultant for the Center for Sustainable Economy.

Stakeholder & Public Involvement - The Role of Industry

In addition to our feedback on the above amendments, we question the role the fossil fuel industry (terminal operators and utilities) has had in this process. As recent Pulitzer Prize-winning articles have revealed, the fossil fuel industry has been a master of denial of climate change, and delay of action on the science. The fossil fuel industry has known since the 1960s that we must shift away from our reliance on fossil fuels if we are to avoid the dangers of runaway climate change. In the face of this evidence, the City of Portland should analyze its stakeholder involvement with a view to whether the fossil fuel industry -- especially national and

international corporations -- should be given the same ethical and legal weight of "stakeholder input" as local environmental, health, neighborhood and equity organizations when it comes to providing comments that shape the future of their industry.

In the original stakeholder process, it is our understanding that 30 organizations represented Port and industry interests while only 10 represented community, public health, or environmental interests. This distorted engagement by the industry that we are trying to constrain, combined with a reliance on industry-friendly forecasts -- without consideration of our City's climate commitments, the state of the renewable energy industry as a whole, and the prospects for clean energy in our city and immediate region -- is deeply troubling.

In particular, we are concerned with the role industry played in forecasting future demand for fossil fuels - which was instrumental in setting the 5,000,000 gallon terminal size threshold.

Final Comments

The plain language and spirit of the Resolution clearly recognize that fossil fuels are inherently dangerous throughout their entire life cycle and that Portland's seismic instability creates abnormally high risks for infrastructure that is already demonstrably dangerous. Fossil fuel terminal zoning code changes need to reflect the scientific realities of climate change and lower the exposure of Portland residents to the unacceptably high risks inherent in dangerous fossil fuel infrastructure.

Last November, at the end of a year of enormous community participation in local policymaking, the Portland City Council voted 5-0 to say no to new fossil fuel infrastructure because of the inherent dangers it poses to the health and safety of Portland residents. Community organizations overwhelmingly supported the measure over a the objections of a small and vocal group of industry representatives. Since November, the Comprehensive Plan update has clarified Portland's long-term policy goals for climate and seismic safety. Specifically, the plan encourages us to limit fossil fuel infrastructure in line with "regional demand" (Policy 6.48) -- which is currently stagnant and must continually decrease if we are to meet our binding climate commitments and goals -- and contains general proscriptions to regulate industrial areas to protect public health (Policy 6.38c) and ensure seismic safety (Policies 4.14, 4.62, 4.79, 4.80, 4.81, and 4.82). A strong fossil fuel terminal zoning code implementation also follows the city's and state's carbon reduction goals as stated in the 2015 Portland Climate Action Plan and Oregon House Bill 3543. Furthermore, Mayor-elect Ted Wheeler has promised to facilitate the design and implementation of a 100% renewable energy Portland strategy. We have collectively set a path forward and it is up to the Planning and Sustainability Commission to make sure our stated policy becomes law so we can protect the health and safety of Portland residents and begin the just transition to a clean and renewable economy.

Fossil fuels are inherently unsafe when we extract them, transport them, store them, and ultimately burn them. For Portlanders who hadn't previously taken notice of the issue, the recent oil train derailment in Mosier, OR brought full attention to the risks posed to our community every day. There have been too many small spills and close calls in Portland and the surrounding areas. Given the risk of a 9.0 earthquake in the next 30-50 years, Portland must address the current risks from our existing infrastructure in a scientifically sound manner, while simultaneously disallowing new fossil fuel facilities to be built or expanded upon.

Since the Resolution was passed in November 2015, global understanding of the severity of climate change has only increased. We now know that in order to meet the goal of limiting global warming to 1.5C, as laid out in the Paris Climate Agreement, we must begin an immediate transition away from fossil fuels to 100% renewable energy, with greenhouse gas emissions declining to zero far more rapidly than previously thought. We also now have the technology to transition off of fossil fuels to an economy based on energy efficiency and 100% renewable energy[1]. And we now have studies that show that, for the same amount of investment, an investment in energy efficiency and renewable energy will result in far more jobs. In July 2016, the Labor Network for Sustainability released a report called "THE ECONOMIC IMPACT OF CLEAN ENERGY INVESTMENTS IN THE PACIFIC NORTHWEST: ALTERNATIVES TO FOSSIL FUEL EXPORTS" which concluded that "investments in the Pacific Northwest in renewable energy and energy efficiency can generate more jobs in construction, transportation, supply chains, and operations and maintenance than a similar dollar investment in oil, coal, and natural gas infrastructure[2]." This and similar studies are extremely important to consider as we create a "just transition" policy framework that will both provide jobs for people in our community and more safely address our energy future. Given the availability of alternatives to fossil fuels, Portland should prohibit new infrastructure projects whose multi-decade investments would lock us into the fossil fuel economy for another 40 years instead of facilitating the transition to safer alternatives.

We don't need new fossil fuel infrastructure in Portland and industry's own projections confirm it. As city staff accurately pointed out in the Sept. 13 hearing, demand for petroleum and gas in the State of Oregon and natural gas use in the City of Portland has been constant or decreasing consistently. Even Northwest Natural's 2014 Integrated Resource Plan (IRP) does not indicate that Northwest Natural anticipates any increase in storage demand at its Portland LNG facility. On the contrary, NW Natural's projections show capacity remaining constant at its Portland LNG facility throughout the planning period for the report. The City of Portland should not facilitate expansions that aren't needed to meet local demand and not even predicted by the industry. Any short term increases in local demand as we transition to a renewable energy economy can be met by small increases in throughput at existing facilities.

[1] http://web.stanford.edu/group/efmh/jacobson/Articles/I/USStatesWWS.pdf
[2] http://www.labor4sustainability.org/files/NorthPacific_final_03032016_.pdf

Further, other jurisdictions on the west coast are following Portland's work and are beginning to pass related bans on fossil fuel terminals, including Vancouver, WA (Oil Terminal Ban[3]), Hoquiam, WA (Oil Terminal Ban) and Oakland, CA (Coal Terminal Ban). A straight prohibition of new fossil fuel terminals will be consistent with other jurisdictions that are passing full bans, not size restrictions.

There is no negotiating with the physics of climate change. If we don't say "no" to fossil fuels and immediately begin our justice-based transition to a green energy economy, we'll quickly be cooked.

The City of Portland should stay true to the intent and intended impact of the Resolution and comprehensively prohibit new fossil fuel terminals and terminal expansions of any fuel type, of any size, anywhere in Portland.

[3]http://www.cityofvancouver.us/sites/default/files/fileattachments/city_council/page/20031/08_sr099-16_prohibition_of_crude_oil_facilities.pdf

Appendix A: Fossil Fuel Terminal

Industrial Use Categories

33.920.300 Fossil Fuel Terminal*

A. Characteristics. Fossil Fuel Terminals are establishments engaged in the transport and storage of fossil fuels. Terminal activities may also include fuel blending, regional distribution, and wholesaling. The firms rely on access by marine, railroad or regional pipeline to transport fuels to or from the site. There is minimal on-site sales activity with the customer present.

B. Accessory uses. Accessory uses may include retail sales of petroleum products, offices, food membership distribution, parking, storage, truck fleet parking and maintenance areas, rail spur or lead lines, and docks.

C. Examples. Examples include crude oil terminals, petroleum products terminals, natural gas terminals, propane terminals, and coal terminals.

D. Exceptions.

1. Truck or marine freight terminals that do not store, transport or distribute fossil fuels are classified as Warehouse and Freight Movement uses.

2. Gasoline stations and other retail sales of fossil fuels are not Fossil Fuel Terminals.

3. Distributors and wholesalers that receive and deliver fossil fuels exclusively by truck are classified as Warehouse and Freight Movement uses.

4. Industrial, commercial, institutional, and agricultural firms that exclusively store fossil fuels for use as an input are not Fossil Fuel Terminals.

5. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste- Related uses.

6. The storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, rail yard, or as part of a fleet vehicle servicing facility are accessory to their use.

7. Uses that recover or reprocess used petroleum products are not Fossil Fuel Terminals.

** Additional locations in proposed amendment where "Bulk Fossil Fuel Terminal" would be revised to "Fossil Fuel Terminal" are not shown here. It is assumed that if this revision is adopted the necessary updates to other Code sections would be included as well.*

Appendix B: Bulk Fossil Fuel Terminal

Industrial Use Categories

33.920.300 Bulk Fossil Fuel Terminal

A. Characteristics. Bulk Fossil Fuel Terminals are establishments engaged in the transport and bulk storage of fossil fuels. Terminal activities may also include fuel blending, regional distribution, and wholesaling. The firms rely on access by marine, railroad or regional pipeline to transport fuels to or from the site and either have transloading facilities for transferring a shipment between transport modes, or have storage capacity exceeding 2 million gallons (or equivalent volume) of fossil fuels. There is minimal on-site sales activity with the customer present.

B. Accessory uses. Accessory uses may include retail sales of petroleum products, offices, food membership distribution, parking, storage, truck fleet parking and maintenance areas, rail spur or lead lines, and docks.

C. Examples. Examples include crude oil terminals, petroleum products terminals, natural gas terminals, propane terminals, and coal terminals.

D. Exceptions.

1. Truck or marine freight terminals that do not store, transport or distribute fossil fuels are classified as Warehouse and Freight Movement uses.

2. Truck or marine freight terminals that do not have transloading facilities and have storage capacity of less than 2 million gallons are classified as Warehouse and Freight Movement uses.

3. Gasoline stations and other retail sales of fossil fuels are not Bulk Fossil Fuel Terminals.

4. Distributors and wholesalers that receive and deliver fossil fuels exclusively by truck are classified as Warehouse and Freight Movement uses.

5. Industrial, commercial, institutional, and agricultural firms that exclusively store fossil fuels for use as an input are not Bulk Fossil Fuel Terminals.

6. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste- Related uses.

7. The storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, rail yard, or as part of a fleet vehicle servicing facility are accessory to their use.

8. Uses that recover or reprocess used petroleum products are not Bulk Fossil Fuel Terminals.

Appendix C: Nonconforming Situation Review

33.258.80 Nonconforming Situation Review

A. Procedure. A nonconforming situation review is processed through a Type II procedure.

B. Approval criteria. The request will be approved if the review body finds that the applicant has shown that all of the following approval criteria are met:

1. All requests must comply with the following review criteria:

~~1.~~ a. With mitigation measures, there will be no net increase in overall detrimental impacts (over the impacts of the last legal use or development) on the surrounding area taking into account factors such as:

~~a.~~ (1) The hours of operation;

~~b.~~ (2) Vehicle trips to the site and impact on surrounding on-street parking;

~~c.~~ (3) Noise, vibration, dust, odor, fumes, glare, and smoke;

~~d.~~ (4) Potential for increased litter; and

~~e.~~ (5) The amount, location, and nature of any outside displays, storage, or activities; and

~~2.~~ b. If the nonconforming use is in an OS or R zone, and if any changes are proposed to the site, the appearance of the new use or development will not lessen the residential character of the OS or R zoned area. This is based on taking into account factors such as:

~~a.~~ (1) Building scale, placement, and facade;

~~b.~~ (2) Parking area placement;

~~c.~~ (3) Buffering and the potential loss of privacy to abutting residential uses; and Lighting and signs; and

~~d.~~ (4) Lighting and signs; and

~~3.~~ c. If the nonconforming use is in a C, E, or I zone, and if any changes are proposed to the site, the appearance of the new use or development will not detract from the desired function and character of the zone~~.~~; and

2. Because fossil fuels pose risks to safety, health, and livability, including mobility of people, other freight, and other commercial vehicles, because the extraction and combustion of fossil fuels are significant sources of greenhouse gas emissions and major contributors to climate change and pollution, and given the record of crude oil and coal or other fossil fuel transport accidents, Bulk Fossil Fuel Terminal are subject to these additional review criteria. With mitigation measures, there will be no net increase in overall detrimental impacts (over the impacts of the last legal use or development) on the surrounding area based on the following factors:

a. The effects of greenhouse gas (GHG) emissions and climate change, where:

(1) GHG is defined as the following:

- carbon dioxide,
- methane,
- nitrous oxide,
- hydrofluorocarbons,
- perfluorocarbons,
- nitrogen trifluoride,
- and sulfur hexafluoride,

(2) Both direct and indirect GHG emissions are to be considered, where

- Direct GHG emissions are emissions from the Bulk Fossil Fuel Terminal Use site, and
- Indirect GHG emissions are emissions that are a consequence of the activities of the Bulk Fossil Fuel Terminal Use site, but occur at sources located elsewhere, and

(3) Quantification tools and methodology employed is to be per the White House Council on Environmental Quality's publication *"2012 Guidance for Accounting and Reporting,"* as amended over time.

As the totality of climate change impacts is not attributable to any single action, but are exacerbated by a series of actions, a statement that emissions from a request involving a Bulk Fossil Fuel Terminal represent only a small fraction of global emissions is essentially a statement about the nature of the climate change challenge, and is not an appropriate basis for deciding the impact of climate change impacts on the surrounding area. Moreover, these comparisons are also not an appropriate method for characterizing the potential impacts associated with a request, because this approach does not reveal anything beyond the nature of the climate change challenge itself: the fact that diverse individual sources of emissions each make a relatively small addition to global atmospheric GHG concentrations that collectively have a large impact.

(b) The effects of a fire and/or explosion at either the Bulk Fossil Fuel Terminal Site or transportation equipment or infrastructure used to convey fossil fuels to or from the Bulk Fossil Fuel Terminal, and

(c)The effects of a breach and release of fossil fuels from either the Bulk Fossil Fuel Terminal Site or transportation equipment or infrastructure used to convey fossil fuels to or from the Bulk Fossil Fuel Terminal, into the Columbia River and/or contributory waterways.

(d) When considering the effects of (b), and (c), above, the likelihood of an event occurring should be evaluated in the context of the scale and severity of the deleterious impact on the surrounding area.

Appendix D: Small Terminal Aggregation

To prevent this loophole, code language should be added to limit "projects" whose aggregate volume is greater than or equal to a Bulk Fossil Fuel Terminal.

Under the City's current definitions of "Development," "Site," and "Ownership", if there is a proposal to build things like storage facilities or loading equipment that contribute to the function of the Bulk Fossil Fuel Terminal that are on contiguous lots owned by the same corporation, that is all one Bulk Fossil Fuel Terminal and therefore the maximum quantitative limits apply. However, there is a concern that subsidiary companies will be used to circumvent the proposed size restrictions on new fossil fuel terminals.

Proposal: add the following language to Section 33.910.030 Definitions under "Ownership":

> *"Contiguous lots that are owned by multiple corporations that are subsidiaries of a single corporation are considered to be a single ownership."*

Commentary:
This will prevent them from setting up a number (e.g. five) different subsidiaries, having each subsidiary own one lot of a set of five that are all contiguous, and submitting five different applications, each for 5M gallons, saying that they are five different site because each site is owned by a different entity. This change will say, basically, "No, this is not five different terminals with five different applications because they are on five different sites, because all five sites are owned by the same parent corporation and therefore comprise one site, so it is one development application and thus subject to the maximum limits.

PROPOSED CHANGES

33.910.030 Definitions

Development. All improvements on a site, including buildings, other structures, parking and loading areas, landscaping, paved or graveled areas, and areas devoted to exterior display, storage, or activities. Development includes improved open areas such as plazas and walkways, but does not include natural geologic forms or unimproved land. See also Exterior Improvements.

Site. <...> the site is an ownership except as follows:
• If a proposed development includes more than one ownership, then all the ownerships are included as the site.

• If a proposed development includes only a portion of an ownership, and the balance of the ownership is vacant, then the applicant may choose to define the site as the portion of the ownership that is proposed for development.
• If a proposed development includes only a portion of an ownership, and there is other development on the ownership, then the applicant may choose to define the site as the portion of the ownership that is currently developed plus the portion proposed for development.

Ownership. An ownership is one or more contiguous lots that are owned by the same person, partnership, association, or corporation. Ownership also includes lots that are in common ownership but are separated by a shared right-of-way. *Contiguous lots that are owned by multiple corporations that are subsidiaries of a single corporation are considered to be a single ownership.*

<...>

September 16, 2016

RE: PSC Fossil Fuel Zoning Testimony

Dear Members of the Planning and Sustainability Commission,

Please accept the comments of 40 individuals listed below. Thank you in advance for your efforts to implement Portland's historic November 2015 Fossil Fuel Policy.

Thank you to the Bureau of Planning and Sustainability (BPS) for its work to incorporate public input after releasing the initial draft of the Fossil Fuel Terminal Zoning Amendments.

However, the current Fossil Fuel Zoning Amendments proposal falls short of the bold resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while **this proposal should mark any bulk terminal as 'non-conforming'**, it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make City policy reflect the intent of the historic City Council Resolution, I request that the City of Portland and the Planning and Sustainability Commission do the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- Remove the exception for new facilities that are 5 million gallons or less. That exception could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With improvements to the Fossil Fuel Zoning Amendments, Portland can once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sean	Tenney		1020 SW Taylor Street, Suite 275	Portland	OR	97205
Robert B.	Kaplan		PO BOX 577	Port Angeles	WA	98362
Natalie	Van Leekwijck		444 Munn Street	Hazard	NE	68844
Gary	Gilardi		1132 8th Street	Hood River	OR	97031
Glen	Paris-Stamm		697 Oak Knoll Drive	Ashland	OR	97520
Francisco	Gadea		4110 SE Hawthorne Blvd	Portland	OR	97214
Martin	Donohoe	MD	5031H foothills rd	lake oswego	OR	97034

Kathryn	Alexandra	RN	4311 ginnett rd	anacortes	WA	98221
Monica	Gilman	MA	25525 S Laura Ln	Estacada	Oregon	97023
Jay	Humphrey	Mr	25525 S Laura Ln	Estacada	Oregon	97023
Christina	Pasillas		2607 Hope St.	Klamath Falls	Oregon	97603
A.	Todd		PO Box 41783	Eugene	Oregon	97404
Annie	McCuen		1825 Fairmount ave S	Salem	Oregon	97302
Richard	Pasichnyk		2132 W 14th Ct	Eugene	OR	97402
Regna	Merritt	PA	260 NW Pittock Drive	Portland	Oregon	97210
Thomas	Ward	MD	260 NW Pittock Drive	Portland	Oregon	97210
Sybil	Kohl	MSW	8001 Sand Point Way NE	Seattle	WA	98115

Ron	Delp	MPA	5622 SE Raymond St.	Portland	OR	97206
Mary	Sievertsen		7705 SW Miner Way	Portland	Oregon	97225
John	Sievertsen		7705 SW Miner Way	Portland	Oregon	97225
Barbara	Tombleson		7526 SW Capitol Hill Road	Portland	Oregon	97219
Vivianne	Misca-Clark	Mrs.	3565 E. fork Rd.	Williams	OR.	97544
Dave	Ruud		14139 NW Charlton Rd	Portland	OR	97231
Kelly	Campbell		2319 SE 41st	Portland	OR	97214
Theodora	Tsongas	PhD, MS	7324 SE Madison St	Portland	OR	97215
Damon	Motz-Storey		1502 SE 84th Avenue	Portland	Oregon	97216
Ann	Turner	MD	2007 NE Mason St.	Portland	Oregon	97211
Sarah	Klatt-Dickerson		2135 NE 134th Pl	Portland	OR	97230

Rebekah	Creswell	Registered Nurse	8338 N Interstate Ave APT 205	Portland	OR	97217
Kellyn	Bardeen		5709 SE Reedway St.	Portland	Oregon	97206
Adriana	Cvitkovic		1502 NE 84th Ave	Portland	OR	97216
Joseph	Miller	PhD	1030 SW Jefferson St., Apt 534	Portland	Oregon	97201
Patricia	Murphy	N.D.	1516 SE 43rd Ave.	Portland	OR	97215
John	Gillette	M.D.	1133 N.W. 11th Ave., #405	Portland	OR	97209
Sharon	Miller	MSW	3214 NE Cesar Chavez Blvd	Portland	OR	97212
David	Chatfield		3105 S.E. 51st Avenue	Portland	Oregon	97206
Marjorie	Kircher	MS OTR	3023 SW Cascade Dr.	Portland	OR	97205
Casey Jo	Remy		1742 Days Creek Rd	Days Creek	OR	97429
Nancy	Crumpacker	MD	2351 NW Westover Road, #701	Portland	OR	97210
Charlotte	Sahnow	Dr.	2756 Chad Drive	Eugene OR		97408

Kountz, Steve

From: Trish Weber <trish.weber@gmail.com>
Sent: Friday, September 16, 2016 11:50 AM
To: Armstrong, Tom; Kountz, Steve
Subject: Fossil Fuel Terminal - Nonconforming Use Review additional criteria
Attachments: 258-ncu_PROPOSED AMENDMENT.pdf

Hi Tom, Hi Steve,

I wanted to double check and make sure you received a copy of the language that I brought to the meeting on 8/31. Please see attached, for your use. FYI, I also submitted this to the PSC as part of my comments.

Thanks, let me know if you have any questions or concerns!

-Trish Weber

--
"Screw your courage to the sticking-place. And we'll not fail." -- Macbeth, Act I Scene 7

APPENDIX "A"

NONCONFORMING SITUATION REVIEW – ADDITIONAL CRITERIA LANGUAGE

33.258.80 Nonconforming Situation Review

A. Procedure. A nonconforming situation review is processed through a Type II procedure.

B. Approval criteria. The request will be approved if the review body finds that the applicant has shown that all of the following approval criteria are met:

1. All requests must comply with the following review criteria:

~~1.~~ a. With mitigation measures, there will be no net increase in overall detrimental impacts (over the impacts of the last legal use or development) on the surrounding area taking into account factors such as:

~~a.~~ (1) The hours of operation;

~~b.~~ (2) Vehicle trips to the site and impact on surrounding on-street parking;

~~c.~~ (3) Noise, vibration, dust, odor, fumes, glare, and smoke;

~~d.~~ (4) Potential for increased litter; and

~~e.~~ (5) The amount, location, and nature of any outside displays, storage, or activities; and

~~2.~~ b. If the nonconforming use is in an OS or R zone, and if any changes are proposed to the site, the appearance of the new use or development will not lessen the residential character of the OS or R zoned area. This is based on taking into account factors such as:

~~a.~~ (1) Building scale, placement, and facade;

~~b.~~ (2) Parking area placement;

~~c.~~ (3) Buffering and the potential loss of privacy to abutting residential uses; and Lighting and signs; and

~~d.~~ (4) Lighting and signs; and

~~3.~~ c. If the nonconforming use is in a C, E, or I zone, and if any changes are proposed to the site, the appearance of the new use or development will not detract from the desired function and character of the zone.~~;~~ and

2. Because fossil fuels pose risks to safety, health, and livability, including mobility of people, other freight, and other commercial vehicles, because the extraction and combustion of fossil fuels are significant sources of greenhouse gas emissions and major contributors to climate change and pollution, and given the record of crude oil and coal or other fossil fuel transport accidents, Bulk Fossil Fuel Terminal are subject to these additional review criteria. With mitigation measures, there will be no net increase in overall detrimental impacts (over the impacts of the last legal use or development) on the surrounding area based on the following factors:

a. The effects of greenhouse gas (GHG) emissions and climate change, where:

(1) GHG is defined as the following:

- carbon dioxide,
- methane,
- nitrous oxide,
- hydrofluorocarbons,
- perfluorocarbons,
- nitrogen trifluoride,
- and sulfur hexafluoride,

(2) Both direct and indirect GHG emissions are to be considered, where

- Direct GHG emissions are emissions from the Bulk Fossil Fuel Terminal Use site, and
- Indirect GHG emissions are emissions that are a consequence of the activities of the Bulk Fossil Fuel Terminal Use site, but occur at sources located elsewhere, and

(3) Quantification tools and methodology employed is to be per the White House Council on Environmental Quality's publication *"2012 Guidance for Accounting and Reporting,"* as amended over time.

As the totality of climate change impacts is not attributable to any single action, but are exacerbated by a series of actions, a statement that emissions from a request involving a Bulk Fossil Fuel Terminal represent only a small fraction of global emissions is essentially a statement about the nature of the climate change challenge, and is not an appropriate basis for deciding the impact of climate change impacts on the surrounding area. Moreover, these comparisons are also not an appropriate method for characterizing the potential impacts associated with a request, because this approach does not reveal anything beyond the nature of the climate change challenge itself: the fact that diverse individual sources of emissions each make a relatively small addition to global atmospheric GHG concentrations that collectively have a large impact.

(b) The effects of a fire and/or explosion at either the Bulk Fossil Fuel Terminal Site or transportation equipment or infrastructure used to convey fossil fuels to or from the Bulk Fossil Fuel Terminal, and

(c) The effects of a breach and release of fossil fuels from either the Bulk Fossil Fuel Terminal Site or transportation equipment or infrastructure used to convey fossil fuels to or from the Bulk Fossil Fuel Terminal, into the Columbia River and/or tributary waterways.

(d) When considering the effects of (b), and (c), above, the likelihood of an event occurring should be evaluated in the context of the scale and severity of the deleterious impact on the surrounding area.

Date: 16 September 2016

To: City of Portland Planning & Sustainability Commission

Subject: Bulk Fossil Fuel Terminal Zoning Amendments – Additional Testimony

Esteemed Commissioners:

Thank you for the opportunity to submit testimony on the proposed Zoning Code amendments covering Bulk Fossil Fuel Terminal (BFFT) Zoning amendments submitted by the City of Portland Bureau of Planning and Sustainability (BPS) on 12 August 2016, with suggested revisions per Memorandum dated 9 September 2016.

This testimony is an addition to the testimony I submitted on 12 September, and is in response to concerns raised by several of you at the public hearing held on 13 September.

- **BPS's recommendation that the original Zoning amendment proposal be revised to "*allow limited expansion of existing terminals to not exceed 10 percent of the total terminal capacity*" should be rejected because it gives preferential treatment to a single class of Uses – Bulk Fossil Fuel Terminals.**

This assertion was part of my original testimony on the 12th, and is repeated for emphasis. The 10 percent expansion threshold is completely arbitrary on the part of the City and has no basis in any other legally adopted standard; it is based solely on the reluctance of BDS to see an increase in work load. Adoption of this revision could expose the City to a LUBA challenge.

- **Additional review criteria for BFFTs would incentivize seismic upgrades for existing facilities**

Included with my testimony on the 12th were suggested additional review criteria to which BFFT expansion applications should be subjected. These criteria include evaluations of climate change impacts, impacts of potential fire and/or explosion, and impacts of potential release of fossil fuels into the Columbia River. It is clear that the City of Portland takes very seriously the hazard posed by the existing location of fossil fuel storage facilities on liquefaction soils.

One way to address this existing risk is by the establishment of the proposed additional review criteria. Risk of fire and explosion and also risk of release of fossil fuels into the Columbia River could both be ameliorated by upgrading the facilities to higher seismic construction standards. If an Owner of a BFFT desires to expand a facility, under the additional criteria there would be a strong incentive to reduce these risks in order to compensate for the negative impacts on climate change by the increased GHG emissions. Approval of expansion proposals could be predicated upon reducing the risk of catastrophic fires, explosions, and spills that could occur in the event of a large earthquake. Under the existing review criteria, approval does not depend on decreasing these risks and thus there would be no incentive for the applicant to propose the additional work of seismic upgrades.

This concludes my written testimony. Please feel free to contact me with any questions or concerns. Thank you for your attention to this issue.

Cordially

Patricia J Weber
2785 NW Marshall Drive
Corvallis OR 97330
541-829-0887
trish.weber@gmail.com

Date: 12 September 2016

To: City of Portland Planning & Sustainability Commission

Subject: Bulk Fossil Fuel Terminal Zoning Amendments

Esteemed Commissioners:

Thank you for the opportunity to submit testimony on the proposed Zoning Code amendments covering Bulk Fossil Fuel Terminal (BFFT) Zoning amendments submitted by the City of Portland Bureau of Planning and Sustainability (BPS) on 12 August 2016, with suggested revisions per Memorandum dated 9 September 2016.

This testimony addresses Sections 2 and 3 of the 9 September 16 Memorandum which involve "Regulating existing terminal expansion" and "Additional review criteria" respectively. It also addresses the serious issue of terminal aggregation, wherein the fossil fuel industry submits a number of connected small facility proposals that individually meet size limitations but in aggregate exceed them.

- **Regulating existing terminal expansion**

The City of Portland Building and Development Services (BDS) Department reports that requiring expansion of existing terminals to undergo Non-conforming Situation Type II "would be difficult to approve." As a result of this feedback, BPS is recommending that the original Zoning amendment proposal be revised to *"allow limited expansion of existing terminals to not exceed 10 percent of the total terminal capacity"*.

This revision to the original zoning amendment should be rejected for two reasons:

1. **Expansion of existing fossil fuel infrastructure <u>should</u> be difficult to approve.** The City's Resolution #37618 was adopted for the express purpose to *"Oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."* The recommendation to classify BFFT as Non-conforming Uses is a correct and appropriate method of achieving the goal stated in Resolution #37618. Any revisions to the Code which would facilitate - rather than inhibit -expansion of existing fossil fuel infrastructure would stand in direct contradiction to the City Resolution. Allowing limited expansion of facilities up to 10 percent of capacity without land use review would facilitate expansions and thus should not be adopted. Funding for any additional staff and/or consultant time required by BDS to process fossil fuel expansion applications should be borne solely by the applicant.

2. **Proposed revision gives BFFT preferential treatment.** No other Use category in Nonconforming Situations is allowed to expand up to 10 percent of existing capacity without Land Use Review. The proposed revision gives unwarranted preferential treatment to a category of Uses, specifically BFFT. Furthermore, the 10 percent expansion threshold is completely arbitrary on the part of the City and has no basis in any other legally adopted

standard; it is based solely on the reluctance of BDS to see an increase in work load. Adoption of this revision could expose the City to a LUBA challenge.

- **Additional review criteria**

The review criteria for Nonconforming Situation Review included in the current version of the Zoning Code were developed to evaluate primarily changes to Residential and/or Commercial Nonconforming Uses, especially Commercial Uses in Residential Zones. As a result they address the types of compatibility issues typically presented by these types of Uses, e.g. noise and traffic. Given the severity of impact that BFFT pose to surrounding properties, the current review criteria alone are inadequate to address the serious threats presented by BFFT. Resolution #37168 includes the following findings:

- *Fossil fuels pose risks to safety, health, and livability, including mobility of people, other freight, and other commercial vehicles;*
- *Fossil fuel infrastructure poses considerable risks in the event of a major earthquake;*
- *The extraction and combustion of fossil fuels are significant sources of greenhouse gas emissions and major contributors to climate change and pollution;*
- *Crude oil, including oil derived from the Bakken shale reservoir, is known to be volatile, highly flammable and to contain elevated levels of benzene, a potent carcinogen; and*
- *Given the record of crude oil and coal or other fossil fuel transport accidents, such as Lac Megantic in 2013, the 1999 Bellingham pipeline leak or a coal train derailment, an event could have catastrophic effects if it occurred in any of Oregon's populated areas.*

Thus it is not only appropriate and necessary, but legally justified to impose stricter review criteria on applications to expand the Nonconforming Situation review criteria only for BFFT. The additional review criteria that need to be taken into consideration are: (1) impact of increase in greenhouse gas (GHG) emissions and climate change, (2) impact of potential fire and/or explosion, and (3) impact of potential release of fossil fuels into the Columbia River and/or any tributary waterways.

The addition of these review criteria for BFFT would allow for proposed expansions that involve either facilities used for mixing of clean fuels and/or seismic upgrades to existing facilities, as net decreases in either GHG emissions and/or risk of explosion and fire in the event of an earthquake could justify approval of the request.

Lastly, BDS asserts that if additional review criteria are adopted, because "they do not have staff expertise to implement discretionary land use review criteria addressing greenhouse gas emissions or safety impacts of hazardous material storage and transportation," BFFT "applicants would be required to hire specialized consultants to show compliance of the particular criterion." This is both necessary and appropriate, as justified by the above listed findings from Resolution #37168. Furthermore, BDS notes that this would be inconsistent with Comprehensive Plan Policy 6.16 Regulatory Climate. The additional criteria would, however, be in compliance with the recently adopted Comprehensive Plan Policy on Fossil Fuel Distribution which *"Limit fossil fuels distribution and storage facilities to those necessary to serve the regional market."* Given the severity of the

impacts noted above in the City's resolution, adopting Zoning code language for BFFT that aligns with the applicable Comprehensive Plan Policy for fossil fuel distribution is of greater importance than reducing the regulatory burden on the fossil fuel industry.

Proposed language to enact these additional criteria is attached as Appendix "A".

- **Terminal Aggregation**

It is important to note a trend of terminal aggregation in fossil fuel projects, of which we have some examples in the Pacific Northwest. In BC, where nearly two dozen liquefied natural gas (LNG) export projects are in the proposal stage, the annual production of several LNG proposals would be three to four times larger than the annual production of the largest existing LNG terminal in the world. The way in which the projects would achieve these production volumes is through the aggregation of several terminals of equal size, each with its own liquefaction equipment, storage and other structures. The terminals would be geographic neighbors. Through the benefits of the project umbrella they would be greenlit under the same permits with respect to land use, pipelines, etc.

While the existing Zoning code definitions for "site", "ownership", and "development" do an excellent job of precluding this practice of small facility aggregation, there does exist opportunities for the fossil fuel industry to sidestep Zoning code prohibtions. One way would be by submitting separate applications for multiple projects, each owned by an entity that is a subsidiary of a single corporation. Another would be to separate contiguous lots by a lot or lots under different Ownership, but to connect facilities on the non-contiguous lots by easements containing pipelines, access roads, &c.

The existing Zoning code definition for "Ownership" should be revised to include the following language:

> *Contiguous lots that are owned by multiple entities that are subsidiaries of a single corporation are considered to be a single ownership. Non-contiguous lots that are Owned by the same entity and connected via an easement granted by the Owner(s) of the lot(s) located between the non-contiguous lots are considered to be a single ownership.*

This concludes my written testimony. Please feel free to contact me with any questions or concerns. Thank you for your attention to this issue.

Cordially

Patricia J Weber
2785 NW Marshall Drive
Corvallis OR
97330
541-829-0887
trish.weber@gmail.com

APPENDIX "A"

NONCONFORMING SITUATION REVIEW – ADDITIONAL CRITERIA LANGUAGE

33.258.80 Nonconforming Situation Review

A. Procedure. A nonconforming situation review is processed through a Type II procedure.

B. Approval criteria. The request will be approved if the review body finds that the applicant has shown that all of the following approval criteria are met:

1. All requests must comply with the following review criteria:

~~1.~~ a. With mitigation measures, there will be no net increase in overall detrimental impacts (over the impacts of the last legal use or development) on the surrounding area taking into account factors such as:

~~a.~~ (1) The hours of operation;

~~b.~~ (2) Vehicle trips to the site and impact on surrounding on-street parking;

~~c.~~ (3) Noise, vibration, dust, odor, fumes, glare, and smoke;

~~d.~~ (4) Potential for increased litter; and

~~e.~~ (5) The amount, location, and nature of any outside displays, storage, or activities; and

~~2.~~ b. If the nonconforming use is in an OS or R zone, and if any changes are proposed to the site, the appearance of the new use or development will not lessen the residential character of the OS or R zoned area. This is based on taking into account factors such as:

~~a.~~ (1) Building scale, placement, and facade;

~~b.~~ (2) Parking area placement;

~~c.~~ (3) Buffering and the potential loss of privacy to abutting residential uses; and Lighting and signs; and

~~d.~~ (4) Lighting and signs; and

~~3.~~ c. If the nonconforming use is in a C, E, or I zone, and if any changes are proposed to the site, the appearance of the new use or development will not detract from the desired function and character of the zone~~.~~; and

2. Because fossil fuels pose risks to safety, health, and livability, including mobility of people, other freight, and other commercial vehicles, because the extraction and combustion of fossil fuels are significant sources of greenhouse gas emissions and major contributors to climate change and pollution, and given the record of crude oil and coal or other fossil fuel transport accidents, Bulk Fossil Fuel Terminal are subject to these additional review criteria. With mitigation measures, there will be no net increase in overall detrimental impacts (over the impacts of the last legal use or development) on the surrounding area based on the following factors:

a. The effects of greenhouse gas (GHG) emissions and climate change, where:

(1) GHG is defined as the following:

- carbon dioxide,
- methane,
- nitrous oxide,
- hydrofluorocarbons,
- perfluorocarbons,
- nitrogen trifluoride,
- and sulfur hexafluoride,

(2) Both direct and indirect GHG emissions are to be considered, where

- Direct GHG emissions are emissions from the Bulk Fossil Fuel Terminal Use site, and
- Indirect GHG emissions are emissions that are a consequence of the activities of the Bulk Fossil Fuel Terminal Use site, but occur at sources located elsewhere, and

(3) Quantification tools and methodology employed is to be per the White House Council on Environmental Quality's publication *"2012 Guidance for Accounting and Reporting,"* as amended over time.

As the totality of climate change impacts is not attributable to any single action, but are exacerbated by a series of actions, a statement that emissions from a request involving a Bulk Fossil Fuel Terminal represent only a small fraction of global emissions is essentially a statement about the nature of the climate change challenge, and is not an appropriate basis for deciding the impact of climate change impacts on the surrounding area. Moreover, these comparisons are also not an appropriate method for characterizing the potential impacts associated with a request, because this approach does not reveal anything beyond the nature of the climate change challenge itself: the fact that diverse individual sources of emissions each make a relatively small addition to global atmospheric GHG concentrations that collectively have a large impact.

(b) The effects of a fire and/or explosion at either the Bulk Fossil Fuel Terminal Site or transportation equipment or infrastructure used to convey fossil fuels to or from the Bulk Fossil Fuel Terminal, and

(c) The effects of a breach and release of fossil fuels from either the Bulk Fossil Fuel Terminal Site or transportation equipment or infrastructure used to convey fossil fuels to or from the Bulk Fossil Fuel Terminal, into the Columbia River and/or tributary waterways.

(d) When considering the effects of (b), and (c), above, the likelihood of an event occurring should be evaluated in the context of the scale and severity of the deleterious impact on the surrounding area.

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: Comments on Portland"s Fossil Fuel Export Policy submitted to the Bureau of Planning and Sustainability
Date:	Friday, September 16, 2016 3:41:39 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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www.portlandoregon.gov/bps

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From: Daphne Wysham [mailto:daphne.wysham@gmail.com]
Sent: Friday, September 16, 2016 3:40 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Comments on Portland's Fossil Fuel Export Policy submitted to the Bureau of Planning and Sustainability

Comments on Portland's Fossil Fuel Export Policy submitted to the Bureau of Planning and Sustainability
On behalf of Center for Sustainable Economy
September 16, 2016

Fossil fuels pose risks at every stage of their life cycle--from extraction, to transport, to storage to combustion. One risk that is of particular concern to the City of Portland is the risk of a catastrophic explosion in the event of a 9.0 magnitude earthquake. The entire industrial area of Portland, including the entire region where oil, gas and other chemicals are stored, is in a liquefaction zone. Should a quake hit, this region is particularly vulnerable to a catastrophic explosion, one that could set much of the city and the Willamette River on fire.

Northwest Natural and other fossil fuel industry representatives have submitted that the only way they will seismically upgrade their facilities is by way of expansion. The latest BPS code draft suggests a 10 percent increase of existing infrastructure may be acceptable. However, an expansion of existing facilities poses an additional and unacceptable risk to the Portland metropolitan area. Though we appreciate the concern of PSC over the possibility of disallowing seismic upgrades, we don't share the belief that the only way to incentivize upgrades is through allowing the expansion of fossil fuel infrastructure. In fact, this issue is more fit for subsequent city processes that should originate outside of the land use context. To this end, we are pleased to learn from BPS that they will recommend subsequent process of review of fossil fuel infrastructure policy and that additional studies and hearings will address the issues of seismic safety. We propose that, at the point in the review process when seismic safety is addressed, the City explore the option of imposing

fossil fuel, or more generally, dangerous infrastructure risk bonds. We are attaching, for your information, an outline of the concept of a fossil fuel risk bond. There is no reason that the City should accept that the only way we can protect health and safety by reducing catastrophic risk to the public is by allowing more of a dangerous activity.

--

Director, Climate and Energy Program
Center for Sustainable Economy
202-510-3541 (cell)
Skype: daphne.wysham
Twitter: daphnewysham

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Thursday, September 15, 2016 1:04:51 PM

Julie Ocken
City of Portland
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-----Original Message-----
From: sierra.ansley@everyactioncustom.com [mailto:sierra.ansley@everyactioncustom.com]
Sent: Thursday, September 15, 2016 12:39 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Sierra Ansley
762 NW Harvest Moon Dr
Hillsboro, OR 97124-2473

Kountz, Steve

From: Planning and Sustainability Commission
Sent: Friday, September 16, 2016 3:29 PM
To: Brownstein, Shanna
Cc: Kountz, Steve
Subject: RE: NW Natural's Regulatory Construct

Thank you, Shanna. I'll include this as part of the NWN testimony and will share with PSC members.

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Brownstein, Shanna [mailto:shanna.brownstein@nwnatural.com]
Sent: Thursday, September 15, 2016 4:26 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: NW Natural's Regulatory Construct

Members of the Planning & Sustainability Commission,

During my testimony, you asked a few specific questions regarding our integrated resource planning and rate-making for which I promised more thorough answers. I've tried to address your questions below.

- Our IRP is publicly available on our website here. I want to highlight a few pertinent points:
  - Assumptions for customer growth and demand were developed over many months and reviewed during an 8 hour technical working group meeting held on January 13, 2016.
    - The meeting was attended by staff from Oregon and Washington utility regulator offices, customer advocacy groups, members of industry, and energy efficiency advocates. They added their input and expertise that informed our growth projections.
    - These assumptions are at the very foundation of our IRP. Therefore, it is crucial they be robust and unassailable.
    - Appendix 10A.1 contains the sign-in sheet for participants at the January 13th meeting.
  - Chapter 2 contains our Gas Requirements Forecast. Table 2.3 (page 56) summarizes a Base, High and Low customer growth forecast, looking out to 2035.
    - I've included a screenshot of that page below for your convenience.
    - You'll see there is modest growth even in the low growth scenario. Even with this modest growth, there is no need to expand capacity at the LNG facility in Portland, nor are there any plans to do so at this time.
- Any investments made to the Company's distribution system facilities that are used to provide regulated utility service must meet a used -and-useful requirement in order to be recovered in a rate case. That is, in the case of our LNG facility, there must be sufficient demand to warrant investment in expansion; otherwise, the company will not be able to recover its investment.

- This requirement can be found in Chapter 757 of the Oregon Revised Statutes. It says:
    - *"757.355 Costs of property not presently providing utility service excluded from rate base; exception. (1) Except as provided in subsection (2) of this section, a public utility may not, directly or indirectly, by any device, charge, demand, collect or receive from any customer rates that include the costs of construction, building, installation or real or personal property not presently used for providing utility service to the customer."*

My hope is that this existing regulatory construct and transparent stakeholder involvement will give the PSC sufficient reason to exclude NW Natural's LNG facility from being designated a non-conforming use. Indeed, the Portland community already participates in our regulatory processes, expanding the LNG tank would only be based on proven regional demand, and the designation would create problems for seismic upgrades.

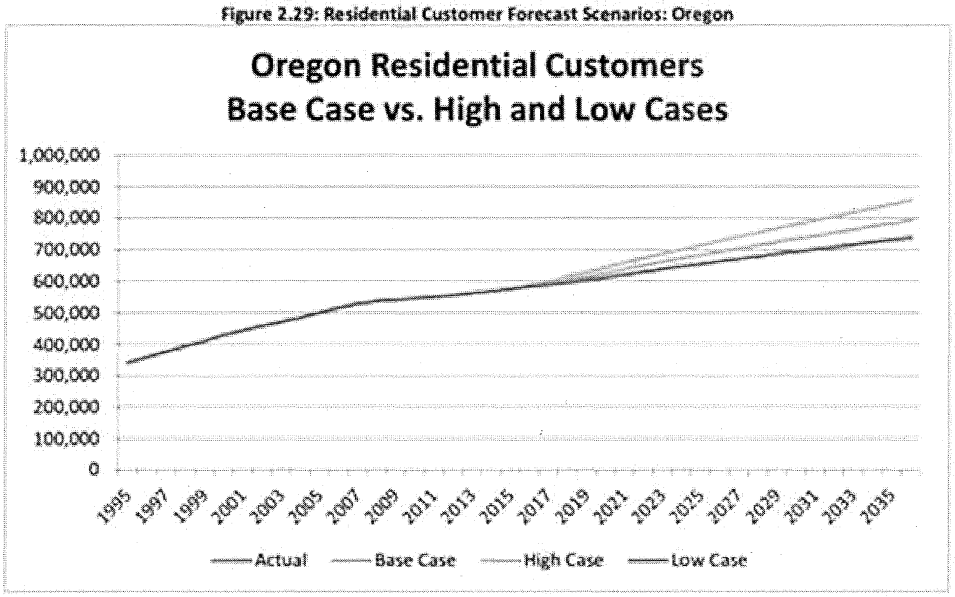
Of course, do not hesitate to contact me with any additional comments or concerns.

Best,
Shanna

Table 2.3: Average Annual Rates of Residential and Commercial Customer Growth 2016 – 2035

		Base Case	High Growth	Low Growth
Residential				
	Oregon	1.6%	1.9%	1.2%
	Washington	2.6%	3.4%	2.0%
	System	1.7%	2.1%	1.3%
Commercial				
	Oregon	0.9%	1.5%	0.2%
	Washington	1.8%	2.8%	0.7%
	System	1.0%	1.7%	0.3%
Residential plus Commercial				
	Oregon	1.5%	1.9%	1.1%
	Washington	2.6%	3.3%	1.9%
	System	1.6%	2.1%	1.2%

Figure 2.29: Residential Customer Forecast Scenarios: Oregon



Shanna Brownstein
Manager, Government & Community Affairs
NW Natural | 220 NW 2nd Avenue | Portland, OR 97209
p. 503-226-4211 x. 3560

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: Written testimony regarding Planning and Sustainability Commission Meeting, Tuesday, September 13, 2016, Agenda item: Mass Shelters and Housing Zoning Code Update Hearing / Recommendation
Date:	Friday, September 16, 2016 3:29:49 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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From: Ryan DEIBERT [mailto:ryan.deibert@multco.us]
Sent: Thursday, September 15, 2016 5:16 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Written testimony regarding Planning and Sustainability Commission Meeting, Tuesday, September 13, 2016, Agenda item: Mass Shelters and Housing Zoning Code Update Hearing / Recommendation

I understand that the Planning and Sustainability Commission elected to leave open the record for further written testimony regarding its September 13, 2016, meeting and the agenda items therein. I am submitting this written testimony to reiterate and further clarify my invited oral testimony during the meeting.

The Joint Office of Homeless Services (JOHS) was formed through intergovernmental agreement between the City of Portland and Multnomah County in order to more directly coordinate the budgeting, contracting, and policy development roles of each government related to ending homelessness. Staff from the JOHS also coordinate A Home for Everyone, the community-wide effort to house people experiencing homelessness throughout Multnomah County by making smart investments in the areas of housing, income, survival, emergency services, health, access to services and systems coordination.

JOHS staff have worked closely with staff from the Bureau of Planning and Sustainability to describe the scope of challenges siting mass shelters within the City of Portland and to identify potential improvements to zoning code to address those challenges. The proposed draft Mass Shelters and Housing Zoning Code Update addresses the vast majority of the identified challenges and will make a significant difference in the ability of publicly funded nonprofit and volunteer-led shelter providers (including those hosted or operated by religious institutions) to site shelters effectively and efficiently. We genuinely appreciate the work of staff in developing the

proposed draft, particularly their outreach to various A Home for Everyone partners, as well as neighborhood coalitions and other community groups.

We recommend only one change to the current draft proposal:

1. Our nonprofit publicly-funded shelter providers are routinely able to successfully operate mass shelters with 75-100 beds, and are able to do so more efficiently and cost effectively than when they operate smaller facilities. In commercial zones where existing structures and/or allowable floor area ratios offer square footage sufficient to accommodate these larger shelters, we recommend that they be an allowed use. Specifically, we recommend that the Maximum Number of Shelter Beds for Mass Shelters as an allowed use (as described at 33.285.050.B.2 and related Table 285-1) in Storefront Commercial (CS), Mixed Commercial/Residential (CM), and Office Commercial 2 (CO2) zones be set at 100 beds, rather than at 50 beds as in the current proposed draft.

Please contact me with any questions.

Ryan.

Ryan Deibert, MPH
Joint Office of Homeless Services
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(P) 503.988.2523
Ryan.Deibert@multco.us

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Thursday, September 15, 2016 1:05:13 PM

Julie Ocken
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-----Original Message-----
From: gdemocrat@everyactioncustom.com [mailto:gdemocrat@everyactioncustom.com]
Sent: Thursday, September 15, 2016 12:34 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

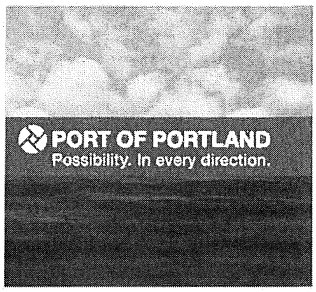
-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Glenda Goldwater
932 SE 12th Ave
Portland, OR 97214-2560



September 15, 2016

Katherine Schultz, Chair
Portland Planning & Sustainability Commission
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201

Re: Fossil Fuel Terminal Zoning Amendments – August 2016 Proposed Draft

Dear Chair Schultz:

Thank you for the opportunity to comment on the Fossil Fuel Terminal Zoning Amendments – August 2016 Proposed Draft. Throughout this process, we have focused largely on how the City of Portland can move forward with this policy in a manner that avoids unintended consequences and strikes the right balance for where our region is in the evolution beyond fossil fuels.

Port of Portland (Port) facilities play a critical role in the economic vitality of Portland and our region as a whole. From Portland International Airport to our four marine terminals – the functions of these facilities, by their very nature, depend on a predictable supply of fuel. Therefore, our comments remain focused on ensuring that existing Port facilities and operations, as well those of tenants, are not unduly negatively impacted by the proposed zoning amendments.

Building on written comments provided to the Mayor's staff on May 12, 2016, as well as written comments provided to Bureau of Planning and Sustainability staff on July 27, 2016, (both attached for your reference) we offer the following perspective from the Port.

Supporting exemptions:

We appreciate that fuel storage for "end users", including Portland International Airport (PDX) and marine fuel suppliers, are specifically exempt from the provisions of the August 2016 Proposed Draft. We also appreciate that fossil fuels, as used for inputs into products at commercial and industrial facilities, are also exempt.

The code amendments in the August 2016 Proposed Draft could adversely affect the reliability of fuel delivery to PDX into the future as well as the supply of clean and sustainable aviation, marine and fleet vehicle fuels.

In the short term, fuel supply to PDX is probably not a concern. However, in the medium to long term, we are concerned about impacts to the PDX fuel supply. Fuel farm facilities at PDX are owned and operated by the Portland Fueling Facilities Corporation (PFFC), a consortium of the airlines operating at PDX. With growth in the aviation sector, fuel consumption is expected to increase by more than 50% by 2035 with a corresponding need for tank storage. PFFC has a system of three tanks, two at 840,000 gallon capacity and one at 1.68 million gallon capacity. In addition, PFFC is in discussions to construct one additional tank. Current operating requirements assume a three-day reserve supply for redundancy purposes. Any regulatory change that would adversely affect the reliability of fuel supply from NW Portland to PDX would likely increase the reserve supply requirement, dramatically increasing the need for tank storage.

Mission: To enhance the region's economy and quality of life by providing efficient cargo and air passenger access to national and global markets, and by promoting industrial development.

7200 NE Airport Way Portland OR 97218
Box 3529 Portland OR 97208
503 415 6000

Printed on 100% recycled stock

Looking beyond supply and into the transition to clean and sustainable fuels – the issue really is capacity. Both the aviation and the marine industry are putting resources behind new fuel sources, the implementation of which we want to support. Fuels for facilities and operations defined as "end users" come from bulk facilities – now proposed to be non-conforming uses, with new facilities prohibited. Because existing bulk fuel facilities are the most likely location to store clean and sustainable fuels, we are concerned that these new fuels will inadvertently be "crowded out" due to limits on expansion imposed through these code amendments.

Code amendments should be cognizant of these efforts and support the infrastructure needed for this transition. Prohibiting bulk fuel facilities in the City of Portland and establishing such facilities as non-conforming uses will make it difficult or impossible for existing fuel terminal operators to modernize, upgrade and add capacity in order to serve the needs into the future.

Recommendations:

We encourage the city to take a different approach to review and designation of fuel terminals. In preparing the initial discussion draft (July 2016) of these amendments, bureau staff recognized that a Type II review would create uncertainty and a disincentive for needed investments. Further, bureau staff understood that the designation of a non-conforming use would significantly limit future investment. This position was consistent with Resolution 37168 in a way the current draft is not. It is incumbent on the Planning and Sustainability Commission and Portland City Council to tie code amendments back to the original legislative intent.

We encourage the City to take the time necessary to get this right. The implications of the proposed code amendments are far reaching with consequences that should be fully understood, balanced and appropriately vetted.

We look forward to being part of the ongoing discussion.

Sincerely,

Susie Lahsene
Director, Policy and Planning

enclosures

PORT OF PORTLAND

Memo

To: Josh Alpert, Chief of Staff, Office of Mayor Hales

From: Emerald Bogue, Regional Affairs Manager, Port of Portland

CC: Michael Armstrong, Tom Armstrong, Tom Bouillon, Susie Lahsene, Phil Ralston

Date: May 12, 2016

Re: Feedback on Fossil Fuel Policy Development

The Port of Portland appreciates the opportunity to provide information and feedback on the anticipated code amendments related to Resolution 37168. We hope this can be an ongoing conversation, and that we can be seen as a resource on issues pertaining to our public mission, and partner on areas where our missions align. The Portland waterfront serves a critical role in the delivery and transshipment of fuels used in the city, state, and wider region. This fact should not be overlooked as the City moves forward with a fossil fuel policy that is intended, in whole or in part, to achieve goals that extend beyond its borders.

We trust that the City will develop fossil fuel-related code amendments that that will reflect balance in community priorities – environmental, social and economic. Our feedback in this memorandum is mostly about avoiding unintended consequences and making sure the code amendments carefully consider the real world impacts to industry and the people who rely on it, as well as various environmental initiatives. In particular, we urge the City to take a careful approach to the scope of the fossil fuel definition and the concept of export versus local consumption.

Specifically:

Code amendments should not create disincentives for companies making needed investments in safety and seismic resiliency.

As noted in the 2012 DOGAMI study "Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub", oil terminals in Northwest Portland have significant seismic vulnerabilities and limited redundancy. (<http://www.oregongeology.org/sub/earthquakes/cei-hub-report.pdf>). Strictly limiting tank sizes individually or in aggregate may have the unintended consequence making it more difficult to replace multiple obsolete tanks with a single larger but modern tank that meets current seismic and environmental standards, as well making it more difficult to provide additional redundancy recommended in the report.

Code amendments should not create a disincentive for companies to take steps toward more environmentally friendly practices and commodities.

As such, regulated commodities should not include alternative fuels such as biodiesel or inputs to manufacture biodiesel, such as methanol. Nor should they include products derived from fossil fuels such as fertilizer, chemicals and steel. In addition, strict limitation of tank size may have an unintended consequence of limiting liquid bulk commodities that *are not* fuels, such as food-grade vegetable oil, as well as biofuels manufacturing and storage.

The following fuels are defined as alternative fuels by the Federal Energy Policy Act (EPAct) of 1992: pure methanol, ethanol, and other alcohols; blends of 85% or more of alcohol with gasoline; natural gas and liquid fuels domestically produced from natural gas; liquefied petroleum gas (propane); coal-derived liquid fuels; hydrogen; electricity; pure biodiesel (B100); fuels, other than alcohol, derived from biological materials; and P-Series fuels.

Code amendments should be consistent with the goals and definitions of the Oregon Clean Fuel Program.

The Clean Fuels Program [OAR 340-253-0000] is a critical component of Oregon's plan to reduce greenhouse gases in the transportation sector such as creating cleaner cars, using cleaner fuels and reducing the amount that Oregonians drive. In addition to reducing greenhouse gases, the program has many co-benefits including reductions in other air pollutants, improvements to public health and increased energy security.

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- This calls on the city to not just inform, but also engage representatives from these groups in the policy development.
- The feedback from these groups should be considered equally to those of other stakeholders whose opinions have been solicited to date.

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- This study should seek to understand the impact of these code amendments not only on local jobs, but on the broader needs of our region. Given that over 90% of Oregon's liquid fuels move through Portland, its import to ensure that infrastructure to serve this regional market is not adversely impacted.

PORT OF PORTLAND

Memo

To: Steve Kountz, Bureau of Planning and Sustainability

From: Tom Bouillion, Port of Portland

Date: July 27, 2016

Re: Port of Portland Comments on the Fossil Fuel Terminal Zoning Amendments Discussion Draft

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Thank you for the opportunity to comment on the Fossil Fuel Terminal Zoning Amendments Discussion Draft June 2016 (the draft document).

In addition to our previous comments provided in a memo dated May 12, 2016, we would like to emphasize our main areas of interest related to this topic.

Primarily, we want to ensure that existing Port facilities and operations are not unduly or unintentionally negatively impacted by any regulations that may stem from this initiative. Examples include the Aircraft Fuel Farm and the CNG powered vehicle fleet at Portland International Airport (PDX).

Secondarily, we want to ensure that current and future Port tenants are also not unduly or unintentionally impacted by any regulations that may stem from this initiative. Given these two primary areas of concern, we have a number of specific questions and comments:

Bulk Fossil Fuels Terminal Definition

> Bulk fossil fuel terminals are not well defined relative to other liquid bulk storage facilities. We believe that an existing liquid bulk storage facility that has handled in the past and/or has the capability of handling fossil fuels proposed to be regulated in this draft document should be considered an existing bulk fossil fuel terminal.

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- Marine vessel fuel facilities (rather than "vessel fuel facilities on Portland Harbor")
- Fleet vehicle fuel facilities
- Railroad fuel facilities
- Industrial and commercial uses (rather than simply "manufacturers")

We also remain concerned that "end user" is not well defined, leaving the potential for confusion and misunderstanding in the future. "End user" should also acknowledge the regional fuel market served by Portland, extending well beyond the metropolitan area and Oregon.

Site Definition

The draft document on page 23 suggests that off-site (non-contiguous) expansion of an existing terminal would be subject to limitations as if it were a new bulk fossil fuel terminal. Yet, the immediately following point notes that some existing bulk fossil fuel terminals are separated by public street rights-of-way and should be recognized as a single facility. These two contradictory statements need to be reconciled and clarified. In addition, the document should clarify that existing bulk fossil fuels terminals within an existing ground lease are allowed to expand their ground lease boundary and associated facility improvements.

Definition of Fossil Fuels

While we agree that petrochemicals used primarily for non-fuel products should be excluded from this code concept, we believe it is inconsistent that methanol would be regulated as a fossil fuel even when used as a petrochemical in a manufacturing process (such as refining biodiesel), as is proposed on page 21 of the draft document.

We are also concerned that the definition of regulated fossil fuels also includes some fuels defined under the Oregon Clean Fuel Program, including CNG and propane. Since these fuels are used extensively for vehicle fleets by the Port of Portland and many other government and commercial entities in Portland, we believe the draft document may unduly limit access to these important fuels.

Regulation of Tanks Suitable for Multiple Purposes

It is unclear if and how the tank size threshold described on page 24 of the draft document will be calculated for new liquid bulk storage facilities, when those tanks could be used to store a fossil fuel proposed for regulation, a non-regulated biofuel or other non-regulated liquid bulk commodity (such as vegetable oil) .

Ambiguity in how new tanks are regulated could undermine efforts of the Sustainable Aviation Fuels Northwest Project, described in more detail in our May 12, 2016 memo, as well as other efforts to meet the goals contained in the Oregon Clean Fuel Program.

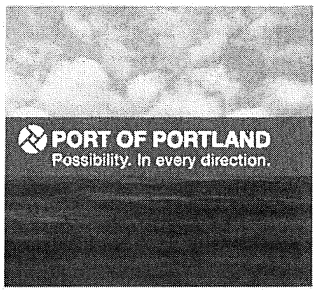
Analysis concerns:

The analysis of economic impact only looks at jobs, rather than what the impact would be to the entire region if access to fuels is limited. The analysis does not take into account the forecasted demand for low carbon fuels – thereby undermining transition requirements. Also, the forecast of need is based on old data that was used to predict export driven growth specific to marine terminals, not overall demand.

The proposed size limits for new Bulk Fossil Fuel Facilities described on page 24 of the draft document seem unsubstantiated, and the size limit is confusing depending on the specific commodity. "Barrel" is typically only used as a volume measure for crude oil, whereas refined petroleum products are defined in gallons or liters. As an example, refining a barrel of crude oil may result in 20 gallons of gasoline, 4 gallons of jet fuel, or any number of other volume ratios depending on the refined petroleum product in question. (<http://aoghs.org/news/history-of-the-42-gallon-barrel/>)

Given that tanks may be used for a variety of fossil fuels (or other non-regulated liquid bulk commodities), expressing limits in barrels is confusing and may be unduly limiting depending on the commodity. As an example, we are concerned about limits this may place on the wholesale supply of jet and other aviation fuels to Port of Portland operated airports in Portland and the metropolitan region.

Thank you for the opportunity to comment on the discussion draft and we look forward to further discussion of this concept.



September 15, 2016

Katherine Schultz, Chair
Portland Planning & Sustainability Commission
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201

Re: Fossil Fuel Terminal Zoning Amendments – August 2016 Proposed Draft

Dear Chair Schultz:

Thank you for the opportunity to comment on the Fossil Fuel Terminal Zoning Amendments – August 2016 Proposed Draft. Throughout this process, we have focused largely on how the City of Portland can move forward with this policy in a manner that avoids unintended consequences and strikes the right balance for where our region is in the evolution beyond fossil fuels.

Port of Portland (Port) facilities play a critical role in the economic vitality of Portland and our region as a whole. From Portland International Airport to our four marine terminals – the functions of these facilities, by their very nature, depend on a predictable supply of fuel. Therefore, our comments remain focused on ensuring that existing Port facilities and operations, as well those of tenants, are not unduly negatively impacted by the proposed zoning amendments.

Building on written comments provided to the Mayor's staff on May 12, 2016, as well as written comments provided to Bureau of Planning and Sustainability staff on July 27, 2016, (both attached for your reference) we offer the following perspective from the Port.

Supporting exemptions:

We appreciate that fuel storage for "end users", including Portland International Airport (PDX) and marine fuel suppliers, are specifically exempt from the provisions of the August 2016 Proposed Draft. We also appreciate that fossil fuels, as used for inputs into products at commercial and industrial facilities, are also exempt.

The code amendments in the August 2016 Proposed Draft could adversely affect the reliability of fuel delivery to PDX into the future as well as the supply of clean and sustainable aviation, marine and fleet vehicle fuels.

In the short term, fuel supply to PDX is probably not a concern. However, in the medium to long term, we are concerned about impacts to the PDX fuel supply. Fuel farm facilities at PDX are owned and operated by the Portland Fueling Facilities Corporation (PFFC), a consortium of the airlines operating at PDX. With growth in the aviation sector, fuel consumption is expected to increase by more than 50% by 2035 with a corresponding need for tank storage. PFFC has a system of three tanks, two at 840,000 gallon capacity and one at 1.68 million gallon capacity. In addition, PFFC is in discussions to construct one additional tank. Current operating requirements assume a three-day reserve supply for redundancy purposes. Any regulatory change that would adversely affect the reliability of fuel supply from NW Portland to PDX would likely increase the reserve supply requirement, dramatically increasing the need for tank storage.

Looking beyond supply and into the transition to clean and sustainable fuels – the issue really is capacity. Both the aviation and the marine industry are putting resources behind new fuel sources, the implementation of which we want to support. Fuels for facilities and operations defined as "end users" come from bulk facilities – now proposed to be non-conforming uses, with new facilities prohibited. Because existing bulk fuel facilities are the most likely location to store clean and sustainable fuels, we are concerned that these new fuels will inadvertently be "crowded out" due to limits on expansion imposed through these code amendments.

Code amendments should be cognizant of these efforts and support the infrastructure needed for this transition. Prohibiting bulk fuel facilities in the City of Portland and establishing such facilities as non-conforming uses will make it difficult or impossible for existing fuel terminal operators to modernize, upgrade and add capacity in order to serve the needs into the future.

Recommendations:

We encourage the city to take a different approach to review and designation of fuel terminals. In preparing the initial discussion draft (July 2016) of these amendments, bureau staff recognized that a Type II review would create uncertainty and a disincentive for needed investments. Further, bureau staff understood that the designation of a non-conforming use would significantly limit future investment. This position was consistent with Resolution 37168 in a way the current draft is not. It is incumbent on the Planning and Sustainability Commission and Portland City Council to tie code amendments back to the original legislative intent.

We encourage the City to take the time necessary to get this right. The implications of the proposed code amendments are far reaching with consequences that should be fully understood, balanced and appropriately vetted.

We look forward to being part of the ongoing discussion.

Sincerely,

Susie Lahsene
Director, Policy and Planning

enclosures

PORT OF PORTLAND

Memo

To: Josh Alpert, Chief of Staff, Office of Mayor Hales

From: Emerald Bogue, Regional Affairs Manager, Port of Portland

CC: Michael Armstrong, Tom Armstrong, Tom Bouillon, Susie Lahsene, Phil Ralston

Date: May 12, 2016

Re: Feedback on Fossil Fuel Policy Development

The Port of Portland appreciates the opportunity to provide information and feedback on the anticipated code amendments related to Resolution 37168. We hope this can be an ongoing conversation, and that we can be seen as a resource on issues pertaining to our public mission, and partner on areas where our missions align. The Portland waterfront serves a critical role in the delivery and transshipment of fuels used in the city, state, and wider region. This fact should not be overlooked as the City moves forward with a fossil fuel policy that is intended, in whole or in part, to achieve goals that extend beyond its borders.

We trust that the City will develop fossil fuel-related code amendments that that will reflect balance in community priorities – environmental, social and economic. Our feedback in this memorandum is mostly about avoiding unintended consequences and making sure the code amendments carefully consider the real world impacts to industry and the people who rely on it, as well as various environmental initiatives. In particular, we urge the City to take a careful approach to the scope of the fossil fuel definition and the concept of export versus local consumption.

Specifically:

Code amendments should not create disincentives for companies making needed investments in safety and seismic resiliency.

As noted in the 2012 DOGAMI study "Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub", oil terminals in Northwest Portland have significant seismic vulnerabilities and limited redundancy. (<http://www.oregongeology.org/sub/earthquakes/cei-hub-report.pdf>). Strictly limiting tank sizes individually or in aggregate may have the unintended consequence making it more difficult to replace multiple obsolete tanks with a single larger but modern tank that meets current seismic and environmental standards, as well making it more difficult to provide additional redundancy recommended in the report.

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PORT OF PORTLAND

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To: Steve Kountz, Bureau of Planning and Sustainability

From: Tom Bouillion, Port of Portland

Date: July 27, 2016

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Thank you for the opportunity to comment on the discussion draft and we look forward to further discussion of this concept.

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Thursday, September 15, 2016 11:05:31 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

-----Original Message-----
From: dnmolnar@everyactioncustom.com [mailto:dnmolnar@everyactioncustom.com]
Sent: Thursday, September 15, 2016 10:55 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Daniela Molnar
1845 SE Elliott Ave
Portland, OR 97214-4813

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] Re: Fossil Fuels
Date: Thursday, September 15, 2016 11:04:57 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

From: Charles Purvis [mailto:chasprvs@gmail.com]
Sent: Thursday, September 15, 2016 10:36 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] Re: Fossil Fuels

8200 SE 36th Ave
Portland, Or
97222

:)

http://www.charlespurvisphoto.com/

971-901-7200

On Tue, Sep 13, 2016 at 6:09 PM, Planning and Sustainability Commission <psc@portlandoregon.gov> wrote:

> Hello Charles,
>
> Thank you for your comments to the Planning and Sustainability Commission. For your testimony to be officially part of the public record, it does need to include your mailing address (including house or PO number). Without this information, the City is not able to send you notification of Council hearing dates or the Council's final decision, and you may not be able to appeal the Council's final

decision.

So that I may include your comments in the record and forward them to PSC members, can you please email me your mailing address?

Thanks,
julie

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Charles Purvis [mailto:chasprvs@gmail.com]
Sent: Tuesday, September 13, 2016 3:34 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Fossil Fuels

I say YES! to banning fossil fuel terminals from Portland altogether.

If we can't wean ourselves off the fossil fuel addiction, it will quite literally be our downfall.

It's simple. We must choose between Life or easy profit.

I say LIFE!

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: Public comment fossil fuel bulk terminal amendment
Date:	Friday, September 16, 2016 3:30:29 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Chris Turner [mailto:caturner458@gmail.com]
Sent: Thursday, September 15, 2016 7:48 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Public comment fossil fuel bulk terminal amendment

After looking at the 3 options, the non-conforming should still stand. If safety, unstable ground, fossil fuels are the issues, this will prevent any expansion. No increased storage of hazardous fuels should be allowed that includes bio diesel or other blended fuels. Companies that need to upgrade (seismic or otherwise) should do so to protect their investment not to gather incentives. Current trend is to combine small terminals. Therefore, allowing small terminals will lead to aggregation. Also, policy needs to be brought forward to eliminate the possibility of a company changing type of products, change import to export etc. Different products, different safety procedures, loading concerns, storage requirements, pollution controls. New permits and full evaluation need to be done for every change of products especially for bulk terminals. Chris turner 8 cedar gates rd longview wa 98632 360 270 2914

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Thursday, September 15, 2016 1:05:36 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: petillante@everyactioncustom.com [mailto:petillante@everyactioncustom.com]
Sent: Thursday, September 15, 2016 12:07 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Sarah Wiebenson
253 N Broadway Apt 304
Portland, OR 97227-1837

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Wednesday, September 14, 2016 9:42:08 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Kathy Austen [mailto:augsten@efn.org]
Sent: Wednesday, September 14, 2016 2:19 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear Portland City Council,

I am another signer of this letter composed by 350PDX. Portland must fulfill the intent of our 2015 Resolution to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels."

-- Kathy Austen

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the

use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Kathy Austen
Email: augsten@efn.org
Address: 2628 SE 109th Ave., Portland, Oregon, 97266

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Thursday, September 15, 2016 9:12:48 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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-----Original Message-----
From: steph.e.chris@everyactioncustom.com [mailto:steph.e.chris@everyactioncustom.com]
Sent: Wednesday, September 14, 2016 8:41 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Please keep Portland, and our shared waterways , protected from the threat of fossil fuel accidents - and use our resources to promote instead clean, renewable energy projects.

Sincerely,
Stephanie Christensen
7502 SW Miles Pl
Portland, OR 97219-3030

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Wednesday, September 14, 2016 10:04:26 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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www.portlandoregon.gov/bps

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-----Original Message-----
From: sharon.collver@everyactioncustom.com [mailto:sharon.collver@everyactioncustom.com]
Sent: Wednesday, September 14, 2016 9:30 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Sharon Collver
2306 NE Siskiyou St
Portland, OR 97212-2471

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Thursday, September 15, 2016 9:11:40 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Anne Corbett [mailto:corbett.anne@gmail.com]
Sent: Wednesday, September 14, 2016 6:30 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would

allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Annie Corbett

From: Anne Corbett
Email: corbett.anne@gmail.com
Address: 6844 N. Greeley Ave., Portland, Oregon, 97217

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Thursday, September 15, 2016 9:12:22 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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www.portlandoregon.gov/bps

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-----Original Message-----
From: bennett.sara@everyactioncustom.com [mailto:bennett.sara@everyactioncustom.com]
Sent: Wednesday, September 14, 2016 8:09 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Sara Crowley
4116 SE Stark St
Portland, OR 97214-3245

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: Comment regarding fossil fuel codes to implement City Council Resolution
Date:	Wednesday, September 14, 2016 3:45:26 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Adrienne and Robert Dickinson [mailto:dickinsonfam@hotmail.com]
Sent: Wednesday, September 14, 2016 3:44 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Comment regarding fossil fuel codes to implement City Council Resolution

Esteemed Portland Planning and Sustainability Commission:

Thank you for showing such interest in Portland's present and future as to serve on this commission. Thank you for listening to public comment on the code implementation of Portland City Council's measure to ban any new infrastructure whose purpose is to store or transport fossil fuels in or through Portland or its adjacent waterways. This ban is waiting on the laws necessary to enforce it.

We were present at the very-well attended meetings leading up to this City Council ordinance in November, very exciting!

We attended your commission meeting yesterday (up until 3:30). The proposal regarding codes before your commission neither fits the ordinance nor does it justice. These codes allow new infrastructure through expansion, and that is not the intent of the ordinance at all. The codes cannot change the intent of the ordinance, bending to suit others' purposes.

The time is now to move into the future. "Time and tide wait for no man'" and our future cannot wait for terminals that want to expand in Portland or for those of us who can't see exactly how life can work for us beyond fossil fuels. We as a nation are moving and must move with full intention toward a fossil fuel-free, sustainable energy future. San Diego, CA, a sprawling city, the country's eighth most populace at 1.4 million people, has set a goal to be

100 percent clean energy, and "its climate action plan is legally binding, not just a vaguely worded proclamation." ("Tomorrowland, Today; The Clean Energy Future is Here;" Gunther, Marc; *Sierra Magazine*, May/June 2016, 36-40)

Here in the Northwest, a consortium of cities, labor, environmentalists, firefighters and others have been working diligently for years to protect our area from fossil fuel contamination and threat --environmental devastation; threat to human, plant, and animal life; and devastating climate change that is on a trajectory to make Earth uninhabitable for our human species. We used to think we needed to move to fossil fuels because they are limited and running out, and we had ideas of using it all up, and then moving on somehow, but now we know we have to leave fossil fuels in the ground if we are even going to survive as a species. This is imperative, this ordinance by City Council, and we need codes that do in fact totally ban future fossil fuel infrastructure, as written.

Our city is not alone, though we lead in this area as a city. Other local jurisdictions have also voted against proposed oil, gas, and coal terminals, including Vancouver, Washougal, Hood River, The Dalles, Mosier, and Stevenson, but the Portland resolutions (including the one on trains) go much further, and we are proud of our city!

Be bold and be strong in requesting better, stricter codes that fully implement this ordinance banning new fossil fuel infrastructure. Why could a code not state that no expansion of existing (nonconforming) terminals and facilities is allowed, and no increase in capacity is allowed, though upgrades to meet seismic safety are encouraged? (And work with the state to get ordinances about seismic safety passed, if more are needed.)

The fossil fuel industry can move to clean, green energy, and leave fossil fuels --dirty, expensive, wasteful, and toxic --in the ground. More jobs, more creativity, and more responsibility are in this future of green and clean energy. We have loved our natural gas fires and cars with gasoline, but the time is over now, and we have new adventures ahead of us, long into the future, but only if we can stop climate change and that means drastic changes and courage right now. Life on Earth is worth it. We individuals need our cities to help us in this transition, and our cities need us. Working together, we will figure it out.

Thank you for listening.

Sincerely,
Adrienne Dickinson

14900 SE Rupert Drive
Portland, OR 97267

September 14, 2016

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Wednesday, September 14, 2016 9:42:29 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: barbara_erlich@everyactioncustom.com [mailto:barbara_erlich@everyactioncustom.com]
Sent: Wednesday, September 14, 2016 6:13 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Barbara Erlich
7521 N Edgewater Ave
Portland, OR 97203-5081

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Thursday, September 15, 2016 9:11:18 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Craig Heverly [mailto:heverlyjc@hevanet.com]
Sent: Wednesday, September 14, 2016 9:46 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

In recent revelations of sexual misconduct on college campuses, a strong mantra has emerged: "No means no." Please apply that to the ban on fossil fuel infrastructure. When the City Council passed it's courageous, visionary, and historic ban, I don't think it meant a "little" hanky-panky is OK. Or that a slight pat on the butt is allowable. I think they meant what they said. "No means no." Period. Amen. Thank you for your hard and careful service.

From: Craig Heverly
Email: heverlyjc@hevanet.com
Address: 3712 SE 9th Avenue, Portland, Oregon, 97202

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Wednesday, September 14, 2016 1:44:27 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Sarah Iannarone [mailto:ss.iannarone@gmail.com]
Sent: Wednesday, September 14, 2016 1:36 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear Commissioner:
Portland is seen around the world as a "sustainable city" a leader in green building, green energy, and green transportation. Please, let's ensure perception and reality align.

Please enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Please strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Please prevent any aggregate increase in fossil fuel infrastructure in Portland.

Finally, let's shore up our vulnerable fuel infrastructure prior to undertaking an expensive clean-up of the Harbor Superfund Site.

Thank you for your dedicated service to our city.

From: Sarah Iannarone
Email: ss.iannarone@gmail.com
Address: 5636 SE 63rd AVE, Portland, Oregon, 97206

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Thursday, September 15, 2016 9:10:50 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: tiffmccleary@everyactioncustom.com [mailto:tiffmccleary@everyactioncustom.com]
Sent: Wednesday, September 14, 2016 9:02 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Tiffany McCleary
2823 NW Savier St
Portland, OR 97210-2417

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Wednesday, September 14, 2016 10:04:11 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

-----Original Message-----
From: nora.mattek@everyactioncustom.com [mailto:nora.mattek@everyactioncustom.com]
Sent: Wednesday, September 14, 2016 9:32 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Nora Polk
6405 SE 62nd Ave
Portland, OR 97206-6605

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Wednesday, September 14, 2016 9:38:00 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Deborah Wiley [mailto:da.wiley1@gmail.com]
Sent: Wednesday, September 14, 2016 7:54 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

please - no more fossil fuel infrastructure in PDX! We can evolve into a community that says no to this and instead supports all the great alternatives available

From: Deborah Wiley
Email: da.wiley1@gmail.com
Address: 2652 se 48th ave, Portland, Oregon, 97206

Hi, I'm Mukta Akter. Please forgive my speaking as English is not my first language. I am from Bangladesh which is one of the most climate vulnerable countries in the world.

The changing climate, driven by accumulating greenhouse gases, has in just 40 years doubled the number of category 4 & 5 storms in South Asia. The destructive force of storms striking my country has increased 50%. Bangladesh is mainly a low elevation country and the combination of sea level rise and powerful storms is already contaminating our drinking water with salinity. The affects are devastating.

Bangladesh has contributed less than 0.03% of global greenhouse gases. It is your country that has contributed the most yet you are taking only small actions while still adding a lot of carbon to the atmosphere. Though we produce almost no carbon emissions, climate change has the biggest impact in my country which directly hits the agriculture, environment & water sector and has become a severe threat to food security and livelihood. Climate disruption is not something coming in the future. It is already here.

A recent NOAA study estimates a potential sea level rise of 1 meter in the next 20 years which will displace 15-20 million people in Bangladesh. It has become a huge challenge for us how to resettle our climate refugees. Even though the policy you are working towards to ban new fossil fuel terminals is a good thing, much more needs to be done to secure the globe from the devastating climate calamities.

***

I work in my country on water and climate issues. I'm currently in the US on an exchange program through the U.S. government and working with 350pdx. If you want to know more about Bangladesh, our severe the climate impacts or would like links to the studies quoted above, please feel free to contact me.

Mukta Akter
Bangladesh Water Partnership
bwp@dhaka.net

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Tuesday, September 13, 2016 6:00:17 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Heidi Alford [mailto:sierrahja@gmail.com]
Sent: Tuesday, September 13, 2016 2:08 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Dear Planning and Sustainability Commission,

As a citizen of Portland and as a human being on planet earth I think it is extremely important to do everything possible to reduce fossil fuel consumption. With that in mind I strongly urge you to do the following:

Eliminate the Fossil Fuel Terminal Size Threshold
Regulate Expansion of Existing Terminals
Prevent Increase in Fossil Fuel Infrastructure
Strengthen Restrictions on Expansions at Existing Terminals

Thank you,

Heidi Alford
4032 SE Crystal Springs Blvd.
Portland , OR 97202

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:24:58 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: nkanderson5@everyactioncustom.com [mailto:nkanderson5@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 8:33 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Nancy Anderson
330 SE 75th Ave
Portland, OR 97215-1458

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 5:55:50 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Marty Bankhead [mailto:marty.b@comcast.net]
Sent: Tuesday, September 13, 2016 12:53 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Ladies & Gentlemen;
Thank you for your initial active opposition to new fossil fuel terminals. I urge you to ban any and all fossil fuel terminals. Stand strong against commercial interests that would like to use Portland for short-term gain, regardless of consequence.
The proposed day of your final vote is Veteran's Day. WWI soldiers gave their lives for the vision of a better world, as have Veterans of every war since. Please stand strong for that vision. Please stand strong for the future, keeping Portland an inspirational model of sustainability. Ban all new fossil fuel terminals, large or small, and ban expansion of existing facilities.

Thank you from a family who moved to Portland 30 years ago to improve life for our children.

From: Marty Bankhead
Email: marty.b@comcast.net
Address: 17709 Hill Way, Lake Oswego, Oregon, 97035

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 10:39:29 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Kathryn Behrendt [mailto:kbehrendt@gmail.com]
Sent: Tuesday, September 13, 2016 10:38 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would

allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

From: Kathryn Behrendt
Email: kbehrendt@gmail.com
Address: 6706 NE Rodney Ave, Portland, Oregon, 97211

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Fossil Fuel Zoning Testimony: Full Ban needed!
Date: Tuesday, September 13, 2016 6:05:23 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Laura Berg [mailto:laurakim7@gmail.com]
Sent: Tuesday, September 13, 2016 3:34 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Fossil Fuel Zoning Testimony: Full Ban needed!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the

regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Laura Berg
4017 SE Filbert
Milwaukie, OR 97222

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 5:58:42 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: tiggerdean@everyactioncustom.com [mailto:tiggerdean@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 1:32 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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addressing the most pressing concern of our time.

Sincerely,
Tom Blackburn
3500 SE Concord Rd Unit 38
Portland, OR 97267-4652

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 5:58:56 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: tobias.boyd@everyactioncustom.com [mailto:tobias.boyd@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 11:55 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Tobias Boyd
130 NE 72nd Ave
Portland, OR 97213-5638

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 6:06:56 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Jacob Braverman [mailto:jacobbraverman@gmail.com]
Sent: Tuesday, September 13, 2016 5:01 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you for considering what I have to say. As I'm sure PSC is coming to see, there is widespread popular opposition to continued investment in fossil fuel development, and this is because as an entire nation we are waking up to the reality of climate change, and we are afraid about the real possibility of not leaving a viable world for our children to inhabit. By 2050, when I am 63, the world's sea levels will have risen an average of no less than 9 ft above their current levels. Seeing the world respond to the current refugee crisis, I cannot imagine what will have transpired by the time many of the world's coastal cities are underwater. And we are already locked into this. The best we can hope for now is to mitigate even more catastrophic changes, and this is absolutely necessary, because it is entirely possible for us to raise the average global temperature well beyond what it has ever been while supporting life as we know it. This is what is at stake as you decide whether to set a bold and courageous precedent that will be felt around the country, and hence around the world. On the other side are people who act against not just my interest and yours, and your childrens', but inexplicably against their own. The time for accepting this has ended, by necessity, and you are in the rare and privileged position of actually playing a part in ending it. This is the moment of you to be heroic or cowardly; you have the heartfelt prayers of millions around the world behind you.

Thank you again.
Jacob Braverman

From: Jacob Braverman
Email: jacobbraverman@gmail.com
Address: 1815 NW 27th Ave., Portland, Oregon, 97210

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 6:02:02 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Mark Braverman [mailto:markbraverman48@gmail.com]
Sent: Tuesday, September 13, 2016 2:40 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I fully support Resolution No. 37168. It is absolutely and urgenty the right thing to do at the right time, for reasons of safety, public health, and the longterm sustainability of our communities, cities, and the planet as a whole. Let Portland take the lead!

From: Mark Braverman
Email: markbraverman48@gmail.com
Address: 1815 NW 27th Ave., Portland, Oregon, 97210

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 6:01:09 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Susan Braverman [mailto:susan@susanbraverman.com]
Sent: Tuesday, September 13, 2016 2:22 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please, please don't lose this opportunity to ban an and all fossil fuel terminals and to prohibit oil trains from running through Portland. It is so important that we focus on other sources of energy instead of perpetuating the dangers of fossil fuels and the degradation of the earth as a result. As a resident of NW Portland, whose children and grandchildren also live here in NW, we are aware of the danger every day as we listen to the trains and drive past the storage facilities along Rt. 30. Knowing they are there, and being conscious about preparing for a possible Cascadia Fault major earthquake, I am pleading with you to not bring any more Bakken fuel or trains transporting it anywhere near Portland! Thank you!

From: Susan Braverman
Email: susan@susanbraverman.com
Address: 1815 NW 27th Ave., Portland, Oregon, 97210

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 5:53:00 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Robert Breaks [mailto:bobthenatureguy@gmail.com]
Sent: Tuesday, September 13, 2016 12:18 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I stand in solidarity with the Dakota and Navajo tribes in protesting the Dakota oil pipeline through four states in the midwest of America. In their spirit, I agree that the city of Portland needs to ban all new fossil fuel terminals and/or the expansion of existing ones. The city's code should not allow any unit trains of dangerous fossil fuels from passing through Portland. In addition, I favor no expansion of existing fossil fuel terminals or any increase in fossil fuel infrastructure in Portland.

From: Robert Breaks
Email: bobthenatureguy@gmail.com
Address: PO Box 2733, Oregon City, Oregon, 97045

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Tuesday, September 13, 2016 6:02:17 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

-----Original Message-----
From: Jonathan Brooks [mailto:remedygardens@gmail.com]
Sent: Tuesday, September 13, 2016 2:40 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Jonathan Brooks
7100 N Columbia Way
Portland, OR 97203

September 13, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely,
Jonathan Brooks

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 5:59:36 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: barbara brower [mailto:browerb@pdx.edu]
Sent: Tuesday, September 13, 2016 1:59 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

We know now without a doubt that climate is warming and fossil fuels are to blame. Why would a city like Portland want to do anything other than stand its ground on this issue? How can we continue to be part of a process that dooms life on Earth as we know it? There are plenty of other options to keep the economy ticking over--and there are no jobs on a dead planet.

From: barbara brower
Email: browerb@pdx.edu
Address: 2889 NE Edgehill Pl, Portland, Oregon, 97212

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 5:59:09 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: pdbrunner@everyactioncustom.com [mailto:pdbrunner@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 11:30 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
philip brunner
1920 N Schofield St
Portland, OR 97217-6663

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 6:01:24 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Sarah Burns [mailto:wordpress@350pdx.org]
Sent: Tuesday, September 13, 2016 2:39 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

To the City of Portland we want to...

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.
Thank you!

From: Sarah Burns
Email: scaryraisins@yahoo.com
Address: 3386 se Waverleigh Blvd, #7, Portland, Oregon, 97202

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 11:16:17 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Linda Cargill [mailto:lindacargill@ymail.com]
Sent: Tuesday, September 13, 2016 10:48 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Re: PSC Fossil Fuel Zoning Testimony: Create a full ban!

Dear PSC Commission members,
I'm writing you because I am extremely concerned about the connection between fossil fuels and the imminent danger posed to ALL people on our planet by Climate Change.
The Bureau of Planning and Sustainability did a great job of including public input in its initial draft of the Fossil Fuel Terminal Zoning Amendments. But the draft falls short in some important ways in reflecting the city's fossil fuel goals.
So I'm pleading with you to add language to the proposed draft to create a full ban on new fossil fuel infrastructure. Please hold the City to a high standard. It's up to you to protect us all!
I support amending the proposed draft so that it creates a full ban on all new fossil fuel terminals. I also don't think that new facilities that are 5 million gallons or less should be given an exception! So NO exceptions!
Also, please don't let the City make any code changes that would let more unit trains of fossil fuels -- like Bakken crude oil -- pass through our beautiful and vulnerable area.
In addition, please strengthen restrictions on expansions allowed at existing terminals, by making sure those expansions don't increase climate pollution or public safety risks.
Also, please add language to prevent terminals from building multiple small terminals together, allow them to avoid the 5 million gallon threshold.
Finally, please no new liquefied natural gas (LNG) or gaseous fuel storage near schools or neighborhoods. Too dangerous! Our current tank farms and LNG facility are enough.

Thank you,
Linda Cargill
2020 NW Northrup St., Apt. 601

Portland, Oregon 97209
Lindacargill@ymail.com

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 10:37:01 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: pbc@everyactioncustom.com [mailto:pbc@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 9:15 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Priscilla Carlson
2607 NE Mason St
Portland, OR 97211-6543

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:24:13 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: jamisoncav@everyactioncustom.com [mailto:jamisoncav@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 8:56 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for natural hazard safeguards to protect public health, safety, and welfare in the City's non-conforming use review process. The City should use this process to ensure that seismic upgrades, 500-year base flood elevation "critical facilities" building code standards, and other safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With

just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of addressing the most pressing concern of our time.

Sincerely,
Jamison Cavallaro
2614 SE 67th Ave
Portland, OR 97206-1219

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 10:36:16 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Chernoff, Josh [mailto:JChernoff@crowdcompass.com]
Sent: Tuesday, September 13, 2016 9:55 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] Re: PSC Fossil Fuel Zoning Testimony

Thanks Julie,
I will amend my first email here found a few typos too. :(

Hello my name is Josh Chernoff.

I was born at OHSU October 25th 1981. I was raised in Portland and I have raised my children in this city.
In hopes that my children are offered the same opportunities to raise their children in this city we must stop the destruction of our air, land and water.
I beg you to stop all new fossil fuel infrastructure development in and around our city.

Remember how clear you used to be able to see Mt. Hood from downtown?

- Josh Chernoff - 971-533-7446 - 4008 SE Mall St. Portland Oregon, 97202

> On Sep 13, 2016, at 9:49 AM, Planning and Sustainability Commission <psc@portlandoregon.gov> wrote:
>
> Hi Josh,
>
> Thank you for your comments to the Planning and Sustainability Commission. For your testimony to be officially part of the public record, it does need to include your mailing address (including house or PO number). Without this information, the City is not able to send you notification of Council hearing dates or the Council's final decision, and you may not be able to appeal the Council's final decision.
>

> So that I may include your comments in the record and forward them to PSC members, can you please email me your mailing address?
>
> Thanks,
> julie
>
>
> Julie Ocken
> City of Portland
> Bureau of Planning and Sustainability
> 1900 SW 4th Ave, Suite 7100
> Portland, OR 97201
> 503-823-6041
> www.portlandoregon.gov/bps
>
> ----------
> To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.
> ----------
>
>
> -----Original Message-----
> From: Chernoff, Josh [mailto:JChernoff@crowdcompass.com]
> Sent: Tuesday, September 13, 2016 9:45 AM
> To: Planning and Sustainability Commission <psc@portlandoregon.gov>
> Subject: PSC Fossil Fuel Zoning Testimony
>
> Hello my name is Josh Chernoff.
>
> I was born at OHSU October 25th 1981. I was raised in Portland and I have raised my children in this city.
> In hopes that my children are offered the same opportunities to raise their children in this city we much stop the destruction of our air, land and water.
> I beg you to stop all new fossil fuel infrastructure development in or around our city.
>
> Remember how clear you used to be able to see Mt. Hood from downtown?
>
> - Josh Chernoff
> 971-533-7446

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Wednesday, September 14, 2016 9:41:38 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Steve Cheseborough [mailto:chezztone@gmail.com]
Sent: Tuesday, September 13, 2016 9:07 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Please enact a full ban on all fossil-fuel terminals of any size. Thank you.

Steve Cheseborough
2735 NE 37th Ave
Portland, OR 97212

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Wednesday, September 14, 2016 9:42:45 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: jerekko@everyactioncustom.com [mailto:jerekko@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 6:14 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Jason Chin
614 SW Nevada St
Portland, OR 97219-3070

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Please enact bold, binding language for PSC Fossil Fuel Zoning
Date: Tuesday, September 13, 2016 6:01:42 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Rebecca Clark [mailto:bjclark@siderial.com]
Sent: Tuesday, September 13, 2016 2:40 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Please enact bold, binding language for PSC Fossil Fuel Zoning

Rebecca Clark
5035 N Depauw St
Portland, OR 97203

September 13, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

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Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

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-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely,
Rebecca Clark

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 5:55:02 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Tori Cole [mailto:colet@seiu503.org]
Sent: Tuesday, September 13, 2016 12:35 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

My name is Tori Cole, and I am a union organizer for SEIU 503 and an environmental activist. Like others who have followed this process, I've seen Portlanders demand meaningful action from their city on climate, and I hope that their conviction—which drove City Council to pass this as a resolution—informs the code changes made today. We need to reject the building of any new fossil fuel infrastructure in our city. Our climate movement sorely needs local leadership, and Portland should fulfill its rumored destiny as a climate leader today. Local action does matter.

Taking this action today will be the first drop in the bucket, step one of what we need to achieve a just transition away from fossil fuels and to 100% renewable energy by 2050, as reports from Greenpeace and others tell us we must. It's time for all of us to make deliberate choices in favor of our future. This year, SEIU 503's membership passed a resolution to prioritize acting against climate change,

and on Saturday the board voted unanimously to support solidarity with Standing Rock Sioux Tribe in their fight against the Dakota Access Pipeline. The time for us to stand together in this fight is long overdue.

Even those highest in the financial sector recognize that the era of fossil fuels is coming to a close, and that investments in the oil and gas industry are now risky and ill advised. To realize a successful transition to renewables, governments from local to federal must commit to invest in renewable infrastructure, and to create decent work opportunities and economic empowerment for workers who cannot be left behind in the oncoming economic restructuring. We must not allow ourselves to be divided into 'labor' and 'environmentalist' camps—the real choice is not jobs or environment. It is both, or neither.

So I urge you to take bold action, and listen to what the people are asking for. Vote in favor of our future, and reject any increase to fossil fuel infrastructure at the city level. No exceptions. And let's talk about how we are going to work together to ensure that the people who got the worst deal in the old economy will be the first in line to benefit in the new economy.

From: Tori Cole
Email: colet@seiu503.org
Address: 1635 NE Couch St., Portland, Oregon, 97232

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 5:55:18 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Harriet Cooke [mailto:holisticooke@aol.com]
Sent: Tuesday, September 13, 2016 12:43 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Urgent! no new fossil fuel terminals. We need to be brainstorming how to live more simply so that others and future generations can live. Until the CO2 numbers come down to livable and sustainable levels, No New terminals! No city code changes to allow more unit trains. We need to learn how to live with less oil and more local community. Prevent any aggregate increase in fossil fuel infrastructure. Lets be the inspiration for the rest of the country!!!

From: Harriet Cooke
Email: holisticooke@aol.com
Address: 3126 SW Carson St, Portland, Oregon, 97219

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:26:16 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: chelsea.davis@everyactioncustom.com [mailto:chelsea.davis@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 12:04 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
chelsea davis
1331 SW Hume Ct
Portland, OR 97219-4354

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 5:54:27 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Joanne Delmonico [mailto:joannedelmonico@gmail.com]
Sent: Tuesday, September 13, 2016 12:32 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I want a full ban on transporting and storage of fossil fuels in and around Portland and adjacent waterways.
Please protect our environment including waterways, air, and soil and protect our residents!
Do the right thing!!
No increase in fossil fuel infrastructure in Portland!!

From: Joanne Delmonico
Email: joannedelmonico@gmail.com
Address: 9601 NW Leahy Road, # 305, Portland, Oregon, 97229

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 11:17:45 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Walt Demaree [mailto:walt.demaree@ecoluberecovery.com]
Sent: Tuesday, September 13, 2016 11:01 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Cc: wd@windingopartners.com; Joe Stanaway <joe.stanaway@ecoluberecovery.com>; Flanagan, Brien J. <BFlanagan@SCHWABE.com>
Subject: PSC Fossil Fuel Zoning Testimony

Portland Planning and Sustainability Commission-

Clear Lube Re-Refining requests that the City maintain the exclusion of re-refining and recycled oil from Resolution 31168. The City has long had a policy of supporting recycling and using recycled oil. In particular, the City's purchasing code, **PCC 5.33.080 "Environmentally Preferable Procurement"** encourages the purchase of recycled oil. Clear Lube Oil Re-Refining requests that the City maintain the following provision from Resolution 31168 Amended in its current form:

BE IT FURTHER RESOLVED, that this Resolution does not restrict:
1. improvements in the safety, or efficiency, seismic resilience, or operations of existing infrastructure;
2. the provision of service directly to end users;
3. development of emergency backup capacity;
4. infrastructure that enables recovery or re-processing of used petroleum products; or
5. infrastructure that will accelerate the transition to non-fossil fuel energy sources;

Sincerely,

Walter Demaree
EcoLube Recovery
A ClearLube Re-Refining Company, LLC
Portland Address
11535 N Force Ave
Portland, OR 97217

Cell (425) 466-7244 | Office (425) 646-7873
walt.demaree@ecoluberecovery.com
wd@windingopartners.com

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 5:56:47 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Mary Ann Dougherty [mailto:dougherty_86@msn.com]
Sent: Tuesday, September 13, 2016 1:13 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Portland City Council,
Please end all new fossil fuel terminals in Portland. We can't afford more spills along the beautiful Columbia River. The time is critical to end our fossil fuel dependence.

From: Mary Ann Dougherty
Email: dougherty_86@msn.com
Address: 19170 Bryant Rd, Lake Oswego, Oregon, 97034

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 5:53:27 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Susan Economon [mailto:seconomon@gmail.com]
Sent: Tuesday, September 13, 2016 12:25 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please act to ensure our future as a community as well as a model for our global partners. Vote to ban all new fossil fuel terminals and restrict expansion at existing terminals.

From: Susan Economon
Email: seconomon@gmail.com
Address: 4655 NE Killingsworth St., Unit 30, Portland, Oregon, 97218

Arc Terminals

September 13, 2016

Planning and Sustainability Commission
PSC Fossil Fuel Zoning Testimony
1900 SW 4th Ave., Ste. 7100
Portland, OR 97201
Sent via email to: psc@portlandoregon.gov

RE: PSC Fossil Fuel Zoning Testimony

Dear Commissioners,

Please accept these comments from Arc Terminals on the proposed Fossil Fuel Terminal Zoning Amendments under your consideration. Arc Terminals leases and operates a terminal, located at 5501 NW Front Avenue in Portland, that serves as a critical link between supply and demand for petroleum and petroleum products, including asphalt, aviation gas, and distillates. Businesses and individuals throughout Oregon and the region benefit from, and depend upon, the services provided by the existing terminals in Portland, including Arc's facility.

This facility has a long history of operating in the City of Portland since 1947. Arc was disappointed when the City Council decided to regulate fossil fuels under Resolution No. 37168 because of the uncertainty and unintended consequences the resolution places on the terminal investments and operating plans.

We have participated in several stakeholder meetings with the Bureau of Planning and Sustainability staff, including a site visit to our terminal during the development of the draft currently before the Commission. We also provided comments on the staff discussion draft released on June 30th. We were shocked and disappointed at the dramatic policy changes between that staff discussion draft and the current draft before the Commission. Specifically, the latest draft makes Arc's facility and other terminals a non-conforming use, an alternative which the staff discussion draft expressly rejected to avoid creating a "disincentive for seismic, efficiency, and clean fuel investments on existing facilities, consistent with policy direction in Resolution 37168 and the Comprehensive Plan" (Page 23).

Yesterday staff released a memorandum summarizing potential "major changes" to the current draft before the Commission. Of particular note, the Bureau of Development Services has concluded that "expansions of existing terminals may not be possible through a non-conforming situation review." This is further evidence that the current draft unavoidably conflicts with the policies set forth in Resolution No. 37168.

5501 NW Front Ave | Portland, Oregon | Phone: (503) 273-4705

Arc Terminals

Arc offers the following comments to identify both the intended and unintended consequences of the proposed zoning amendments:

- Prevents and discourages replacing infrastructure and equipment that has reached end of life;
- Prevents and discourages upgrades necessary to meet national and regional market demand, Arc customer needs or complies with federal and state law;
- Prevents and discourages safety and efficiency upgrades;
- Restricts infrastructure that serves the rest of Oregon and the region;
- Creates a highly discretionary and uncertain process for altering terminal facilities and/or expanding on-site to meet demand, comply with federal and state law, and improve safety, efficiency, seismic resilience and operations;
- Introduces ambiguities and uncertainties to Arc and our customers business plans;
- Fails to adequately engage Oregon and Metro residents and business outside Portland who will be impacted by the bottleneck in energy distribution created by the proposal.
- The proposal fails to provide for the economic assessment called for by the resolution, including the potential impacts to blue-collar jobs; and
- The timeline for implementing the proposed amendments is too aggressive and does not allow for thoughtful discussion to address the many concerns.

Thank you for the opportunity to comment on the Fossil Fuel Terminal Zoning Amendments Draft. We sincerely hope the Commission seriously reconsiders these proposed amendments to the zoning code that single out a narrow but important business sector.

Thank you for considering these comments from Arc Terminals. If you have any questions, please contact me at (503) 273-4705.

Sincerely yours,

Nathan Eggers
Terminal Manager
eggers@arcterminals.com

5501 NW Front Ave | Portland, Oregon | Phone: (503) 273-4705

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 6:06:19 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: lindaengels51@everyactioncustom.com [mailto:lindaengels51@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 2:40 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of addressing the most pressing concern of our time.

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy but more needs to done to ensure our city's example in fighting climate change.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel

shipments through Portland.

Sincerely,
Linda Engels
636 NE 61st Ave
Portland, OR 97213-4308

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 10:33:20 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Rev. Mary Sue Evers [mailto:pastor@chucc.org]
Sent: Tuesday, September 13, 2016 10:08 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would

allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Rev. Mary Sue Evers
Cedar Hills United Church of Christ,
Portland, OR

From: Rev. Mary Sue Evers
Email: pastor@chucc.org
Address: 11695 SW Park Wa, Portland, Oregon, 97225

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 9:23:13 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Debby Garman [mailto:debbygarman@gmail.com]
Sent: Tuesday, September 13, 2016 8:30 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

And now I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

I encourage you to take these steps to be champion leaders in taking care of your responsibilities to protect current and future citizens of this region.

Sincerely,

Debby Garman

From: Debby Garman
Email: debbygarman@gmail.com
Address: 175 NE 7th Ave, Hillsboro, Oregon, 97124

Oregon Sierra Club

SIERRA CLUB
FOUNDED 1892

1821 SE Ankeny St • Portland, Oregon 97214
Main: 503-238-0442 • Fax: 503-238-6281

TESTIMONY to the PORTLAND PLANNING & SUSTAINABILITY COMMISSION:

ZONING PROPOSALS FOR FOSSIL FUEL EXPORT & STORAGE INFRASTRUCTURE

Implementation of City Council Resolution No. 37168

September 13, 2016

To the Members of the Planning & Sustainability Commission:

Thank you for this public hearing, and for your volunteer service to our city. Thank you also for two important aspects of the lead-up to this hearing:

- The staff work by the expert team at the Bureau of Planning & Sustainability (BPS) has been remarkable in its depth and thoroughness. We appreciate it.
- The decision by the Planning & Sustainability Commission (PSC) to delay until October 11 the public discussion of the options and recommendations that you may choose to forward to the City Council is very wise.

  This change allows time for deeper review and consideration of the oral and written testimony received in this process by everyone concerned about this massive set of proposals, including comprehensive staff evaluation by multiple agencies.

  This process was revised in response to the fallacy of receiving testimony and making decisions without due consideration, which occurred with your final hearing on the Pembina propane export terminal zoning amendment proposal, and which Oregon Sierra Club called out publicly as a flaw at the conclusion of that hearing. We appreciate that process correction.

However, regarding process, we are obligated to express our concerns about the continuing problem of slow and/or partial transparency in the City's consideration.

As a specific example, the new proposals promoted through the Bureau of Development Services (BDS), which we comment on below, were completed Friday and yet not released until Monday (yesterday), only one day before this hearing.

For organizations like ours working to respond in healthy ways to complex issues quickly, even a weekend delay makes our work more difficult. Going forward, quick distribution to all stakeholders of plans and proposals should be incorporated into Portland's municipal DNA.

As a specific process recommendation, therefore, **we request that the comment deadline for these zoning proposals be extended beyond the close of business today**, for additional input to you and BPS.

For the substantive issues embodied in the BPS and BDS staff work, and the proposals before you now, we have three major concerns to share today, and a new proposal:

1. The Fallacy of "Business as Almost Usual"
2. The Intersection of the Two Crises, Climate & Seismic
3. The Critical Importance of "Non-Conforming Uses" for Economic & Safety Transition

Proposal: Consider an Additional Plan to Support First-Responders & the Public

1. The Fallacy of "Business as Almost Usual"

As part of the coalition testifying to the City Council last November, we vigorously supported the ground-breaking binding policies in Resolution No. 37168.

Unfortunately, the initial BPS zoning proposal Discussion Draft, despite some virtues, had a "split the baby" flavor (please see our July 27 comments, and the text of our August 8 blog post, both attached and incorporated herein by reference). The final proposal showed significant improvement, but still included dangerous loopholes (please see the text of our September 7 blog post, also attached and incorporated herein).

The core fallacy to this process is that we cannot:

- on the one hand, fulfill the policy goals of the Resolution with carbon mitigation and adaptation strategies implemented by law, and
- on the other hand, continue to allow the fossil fuel industries to assert their control and to change behavior only on the margins.

We spoke to this fundamental contradiction in our July 13 Open Letter to the City Council (also attached and incorporated herein). The four components of this challenge are:

Keep It In the Ground
Do No More Harm
Reduce the Need
Build the Just Transition

Please be sure to read this two-page Open Letter. This framework is important for breaking the box of business-as-usual.

It is also important for you to understand that the fossil fuel industries are <u>not</u> climate deniers. They understand the science and they know that they cannot fight chemistry and physics. Instead of choosing to mitigate, however, they have chosen to compete more intensely with each other.

This is especially destructive in the export arena: those companies know that the projects that will be stopped first as the climate crisis grows are those that have not yet started construction. Hence the massive effort to push through the Pacific Northwest with every possible fossil fuel.

Because roughly half the stock value for the major multi-tiered fossil fuel companies is based on proven reserves, the call to keep at least four-fifths of existing reserves in the ground is equivalent to defining that part of their reserves as stranded assets, and accepting a deep slash in their share price. This understanding has been a key part of the recent financial collapse of coal companies, but it is coming to the oil and gas arena too.

For the distribution and retail companies (including the majors), changing behavior in this emergency is very difficult, and unacceptable to senior management in no small part because of this inherent financial hit. It is for that reason that these companies must be forced into the new realities of the climate crisis by force of law.

<u>It is not possible to please both sides:</u>

To oversimplify, **we cannot both save the climate and destroy the climate.**

That is the fallacy of the BPS and BDS attempts to provide the industry with opportunities for growth within limits.

We must have massive, urgent decline in fossil fuel use. Our infrastructure planning must reflect that. However, the climate crisis is not the only one we face.

2. The Intersection of the Two Crises, Climate & Seismic

Every jurisdiction on the planet is dealing with the climate crisis – many explicitly, through the beginnings of new public policy, and many (especially in the United States) only through the traumas of extreme weather, insect impact, sea-level rise, and the other ills of the growing heat load of the earth. But we all know it is here, now.

We do not need to repeat specifics; many commenters will detail those, and you all understand. ("Sustainability" is already in your name.) The key point for these zoning proposals, though, is the unique intersection with our impending earthquake.

Unlike the universality of the climate crisis, there is nothing 'daily' about the seismic crisis we face with the inevitable next rupture of the Cascadia subduction zone.

It could be another 316 years before the catastrophic rupture of 1700 repeats itself (although the odds are against so long a gap), or it could be Saturday. The average for this massive fracture is about 250 years, but the intervals vary widely.

When it happens, though, it will be the greatest catastrophe since the formation of the United States.

As you know, Portland shares this inevitable disaster with the larger cities of Seattle and Vancouver, B.C. The three major cities and all the smaller jurisdictions from Northern California through British Columbia share many challenges in preparing for this pending emergency. So we are not alone, but every locale has specific unique challenges.

One of ours is the insanity of having virtually all of our fossil fuel resources in archaic tanks on dredged soils in the Northwest Portland industrial zones on the Willamette River. These soils will inevitably liquefy when the earthquake strikes. (The chemical and other hazardous material tanks share the same problem.)

The overwhelming majority of the hundreds of tanks will sink and rupture; many will burn; many will explode; the destruction, toxic fumes, poisonous fluids, and fireballs will be carried downstream on the Willamette and Columbia rivers.

For practical purposes, there is no way to make our current tank farms seismically safe and usable, no matter how much is spent per ancient tank. The transportation fractures and bridge falls that will occur simultaneously will be especially damaging to any effort to use the rare tank that survives. The only solution is to eliminate the problem, as soon as possible.

Fossil fuel and poisonous chemical tanks must be removed from the Northwest seismic liquefaction zone, urgently.

At the same time, however, we must have fossil fuels available for the short- and medium-term – especially because of the intersection of these two crises. This is a difficult balance.

As you know, Sierra Club is a leader in Oregon and nationally in promoting the model laid out in our Open Letter, from **Keep It In the Ground** through **Build the Just Transition**. We fight for these values and the policies to implement them constantly.

But the Oregon Sierra Club leadership is clear that this transition is neither simple nor overnight. It

not possible to ban fossil fuel use tomorrow, but it is imperative to eliminate it urgently.

This contradictory challenge is exacerbated by our dual crises. When the earthquake hits, transportation and other resources that are currently available only with major inputs of fossil fuels will instantly become matters of life and death (just as the climate crisis already is during extreme weather catastrophes like floods, heat waves, and droughts).

As the tank farms disintegrate, First Responders and the general public will almost instantly be left with only the resources on hand. Those using fossil fuels will quickly deplete them, and be unable to get more. Day One of the earthquake will be horrific, but the next few months could well be even more deadly.

No matter how quickly we build the just transition, it is going to be a long time before we have fire trucks that are not dependent on fossil fuels.

It is imperative that Portland plan properly to protect the populace from this crisis intersection. That is not easy, but we have tools available.

3. The Critical Importance of "Non-Conforming Uses" for Economic & Safety Transition

We of course support the proposed ban on new Bulk Fossil Fuel Terminals, but we are also deeply concerned about leaving loopholes for expansion of existing tanks and tank farms, in our two-crisis situation.

The zoning code is an imperfect medium for dealing with these challenges, but it does offer important opportunities. One vital one is the Non-Conforming Use category.

We strongly support defining all the fossil fuel (and other hazardous materials) tanks in the seismic liquefaction zones as non-conforming, with the maximum feasible disincentive for expansion or same-site replacement.

There is no better possible example of a 'Titanic deck-chair' approach to ducking a problem than approve a building permit for an unstable tank that would make it less unstable but still unable to withstand the Cascadia rupture.

Frankly, that is exactly the kind of governmental failure in the face of bad corporate decision-making that has alienated so many voters for so long.

We understand that BDS has stated that they do not have the resources to properly consider non-conforming evaluation for tank farm expansions and replacements. There are simple answers to this concern, although they of course include difficulties in implementation:

First, there must be an acceptance that any expansion or replacement in the Northwest seismic zones is an impermissible mistake.

Second, BDS must work with the Council and the general public to increase the costs to industry for their evaluation and rejection of any proposals for expansion and replacement in these zones. Industry – especially the fossil fuels industries – must be forced to recognize legally and financially that business as usual is unacceptable.

We urge you to work diligently toward a structure that prohibits both new Bulk Fossil Fuel Terminals and eliminates the dangerous and obsolete tank farms on the Willamette with all deliberate speed.

It is imperative that you recommend that the Council define these tank farms as non-conforming uses.

You and the Council should in fact look at any other available options, in other parts of the

municipal code as well, to prohibit them more effectively than the non-conforming designation currently can.

At the same time, we urge you to ensure that the coming seismic disaster is properly incorporated into implementation of the Resolution.

We therefore request that you direct BPS staff (and ask that staff from other agencies) to engage in a new planning process that looks at more alternatives, after the current discussions are resolved and voted on.

Proposal: Consider an Additional Plan to Support First-Responders & the Public

After the determination is made on your current recommendations to the City Council, we request that you consider advocating for a broad stakeholder engagement effort, beginning early next year, to examine the full complexity of the fossil fuel infrastructure in the Portland metropolitan area.

Such an effort should have four major components.

First, it must recognize that fossil fuel use needs to be eliminated as quickly as possible. The climate crisis requires nothing less.

Second, it must recognize that industry can no longer use the Northwest industrial zones. These seismic, toxic, and flammable dangers must be eliminated.

Third, it must automatically incorporate quickly-scaled transition strategies to reduce fossil fuel use, urgently. This is an area where public policy must become much more assertive.

For example, there are many ways that electrical-use conversion to renewables and transportation-use conversion to electrical power can be strengthened and speeded up (in addition, of course, to pedestrian and bicycle improvements for the general public).

Smart-grid expansion is imperative for robust emergency response as well.

There are many other issues where the options are well-developed. The Portland-Multnomah County Climate Action Plan is an important leadership document, but it is not keeping up with the acceleration of the climate crisis, and it has not been adequately incorporated into municipal and public behavior. We must be much stronger on this.

Finally, it must include plans for new distributed fossil fuel infrastructure to support First Responders and the public. We need these new distributed fossil fuel reserves in smaller, seismically-immune facilities throughout the metropolitan area, planned specifically for life-safety support – and to be ultimately phased out as well, of course.

The building projects necessary to provide fossil fuels where they are extremely difficult to eliminate (again, think fire trucks – and, currently, most police vehicles) will raise fuel costs but would provide good jobs and make a dramatic difference in public protection over time.

Thank you for your consideration.

Prepared by Ted Gleichman
Policy advisor, *Beyond Gas & Oil Team*
Oregon Sierra Club

Oregon Sierra Club

SIERRA CLUB
FOUNDED 1892

1821 SE Ankeny St • Portland, Oregon 97214
Main: 503-238-0442 • Fax: 503-238-6281

July 13, 2016

"No New Fossil Fuels Infrastructure": First, Do No More Harm

An Open Letter to the Portland City Council

Preamble Summary, Resolution 37168, November 12, 2015:
Oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways.

Portland is at imminent risk of squandering its prior leadership in dealing with the local response to our global climate crisis. The problem is serious bureaucratic back-sliding into a "business as usual" mentality in the implementation of Resolution 37168. Unless you deal promptly and firmly with signals of agency misunderstanding of both the letter and spirit of this resolution, this situation could too easily become a local crisis in its own right.

This binding policy resolution, which you approved unanimously on November 12, 2015, catapulted our city into the forefront of local, regional, national, and international efforts to confront one of the greatest sets of challenges our species has faced since the development of industrial technology.

It is vital that you remember the genesis of this effort, and re-commit to the specific – often difficult! – changes in municipal and stakeholder planning and behavior for your mission.

There is a straightforward but interlocking four-part schematic that outlines precisely where we are as a global and local political economy:

1. **Keep It in the Ground**
2. **Do No More Harm**
3. **Reduce the Need**
4. **Make the Just Transition**

1. Keep It in the Ground

We now know that our combustion of fossil fuels has moved our global atmosphere and temperature structure into such dangerous territory that civilization is genuinely at risk if we do not make radical reversals in behavior.

At least four-fifths of global fossil fuel reserves must be left completely intact, in the ground, and never exploited.

This requirement is completely contrary to modern corporate financial structure, because proven reserves constitute roughly half of the assets (and therefore a major component of share value) of the fossil fuels companies. This is one of the key reasons why business-as-usual policies and procedures are inevitably doomed to failure – for both corporate financial health and planetary social and environmental health. This has been one key factor in the current financial collapse of shareholder equity in coal corporations.

Acceptance of ***Keep It in the Ground*** is a mandatory first step for both the psychological and political economy revisions we must make for survival. This is the foundation for the other three intersecting components of this basic methodology. Resolution 37168 speaks eloquently to many of the issues inherent in our mandatory recognition of our new reality.

2. Do No More Harm

Understanding the compulsory physics and chemistry of ***Keep It in the Ground*** leads inevitably to this second principle: don't make things worse by continuing down the same destructive path. We must begin with our environmental version of the first line of the Hippocratic Oath: ***Do No More Harm***.

This is the required primary set of actions for directly confronting the climate crisis: to get out of this hole, first we have to stop digging. "No New Fossil Fuel Infrastructure" is the easiest way to proceed first. The core of Resolution 37168 – preventing new export and storage infrastructure – falls completely within this principle.

It is imperative that you maintain and defend your policy.

3. Reduce the Need

Simultaneously, demand reduction is vital to permit us to ***Do No More Harm***. Gradual complete elimination of coal for electrical production in Oregon is now state law. The same goal must be applied to oil and natural gas, urgently. As I noted in my testimony to you on November 12, there is no fossil fuel solution to the fossil fuels crisis.

You must align City procedures and economic governance with this need for both conservation and energy efficiency (which are overlapping but distinct sets of tools). Beyond direct City internal control and external economic governance, you must also push the Portland business communities – especially the fossil fuels companies – and the other governments that overlap with and impact your work to both ***Do No More Harm*** and ***Reduce the Need.***

4. Make the Just Transition

Finally, underpinning all these efforts must be the recognition that there is no substantive difference among environmental, economic, and social justice. We are engaged in a transition into a full-renewables energy economy, and that will be impossible unless it is done based on justice for all. The urgency of the effort means that coordination of ***Do No More Harm, Reduce the Need,*** and ***Make the Just Transition*** becomes the essence of this era.

Thank you for your consideration.

Ted Gleichman, on behalf of Oregon Sierra Club

Oregon Sierra Club

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Main: 503-238-0442 • Fax: 503-238-6281

July 27, 2016

City of Portland
Bureau of Planning and Sustainability (BPS)
Attn: Steve Kountz
1900 SW 4th Ave, Suite 7100, Portland, OR 97201
Email delivery: steve.kountz@portlandoregon.gov

Comments: Fossil Fuel Terminal Zoning Amendments – Discussion Draft

Dear Mr. Kountz:

To begin with, please accept our thanks to you and your colleagues at BPS for this thorough and useful Discussion Draft on this component of the implementation of Council Resolution No. 37168 and *2035 Comprehensive Plan* Policy 6.48. We see many virtues to the work your project team has done, and this document (and the follow-up and additional documents to come) will be useful not just to the policy makers, stakeholders, and populace of Portland, but also to many people working on these issues across the United States and around the world. We appreciate your efforts.

However, we request that you take a fresh look at three core aspects to the principles and major definitions underlying these draft zoning amendments. Here are areas where we believe that you have significant misunderstandings, apparently trying to:

- avoid the universality of the public intent, as defined by the Council approvals;
- add inappropriate definitions of applicable terminal size ("large"), which distorts Council intent; and
- most importantly, ignore the deep implications of the baseline policy framework necessary to avoid a "business as usual" approach to the most unexpected and most significant environmental, economic, and social crisis our planet has ever faced: the climate crisis – the fundamental reason for all of this work.

First, we spoke to the baseline policy framework in an open letter delivered to the City Council on July 13, entitled **"No New Fossil Fuels Infrastructure": First, Do No More Harm** (copy attached, and incorporated into these comments by reference). This letter speaks to a straightforward but interlocking four-part schematic that outlines precisely where we are as a global and local political economy: **Keep It in the Ground, Do No More Harm, Reduce the Need, Make the Just Transition.** Here are the outlines of these four components, as provided to the Council:

"1. Keep It in the Ground

We now know that our combustion of fossil fuels has moved our global atmosphere and temperature structure into such dangerous territory that civilization is genuinely at risk if we do not make radical reversals in behavior. At least four-fifths of global fossil fuel reserves must be left completely intact, in the ground, and never exploited.

This requirement is completely contrary to modern corporate financial structure, because proven reserves constitute roughly half of the assets (and therefore a major component of share value) of the fossil fuels companies. This is one of the key reasons why business-as-usual policies and procedures are inevitably doomed to failure – for both corporate financial health and planetary social and environmental

health. This has been one key factor in the current financial collapse of shareholder equity in coal corporations.

Acceptance of ***Keep It in the Ground*** is a mandatory first step for both the psychological and political economy revisions we must make for survival. This is the foundation for the other three intersecting components of this basic methodology. Resolution 37168 speaks eloquently to many of the issues inherent in our mandatory recognition of our new reality.

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Understanding the compulsory physics and chemistry of ***Keep It in the Ground*** leads inevitably to this second principle: don't make things worse by continuing down the same destructive path. We must begin with our environmental version of the first line of the Hippocratic Oath: ***Do No More Harm***.

This is the required primary set of actions for directly confronting the climate crisis: to get out of this hole, first we have to stop digging. "No New Fossil Fuel Infrastructure" is the easiest way to proceed first. The core of Resolution 37168 – preventing new export and storage infrastructure – falls completely within this principle.

It is imperative that you maintain and defend your policy.

"3. Reduce the Need

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You must align City procedures and economic governance with this need for both conservation and energy efficiency (which are overlapping but distinct sets of tools). Beyond direct City internal control and external economic governance, you must also push the Portland business communities – especially the fossil fuels companies – and the other governments that overlap with and impact your work to both ***Do No More Harm*** and ***Reduce the Need.***

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Finally, underpinning all these efforts must be the recognition that there is no substantive difference among environmental, economic, and social justice. We are engaged in a transition into a full-renewables energy economy, and that will be impossible unless it is done based on justice for all. The urgency of the effort means that coordination of ***Do No More Harm, Reduce the Need,*** and ***Make the Just Transition*** becomes the essence of this era."

Second, we believe your project team has been persuaded to misread the plain language in both Council Resolution 37168 and *2035 Comprehensive Plan* Policy 6.48. These legally-binding components of Portland's overall legal framework were, we believe, intentionally crafted by the Council to be as broad as possible – while quite appropriately simultaneously allowing for adequate flexibility in implementation, so as to make implementation feasible.

This is clearly evident in the sensible balance within the first two *Be It Resolved* sections of Council Resolution 37168, and in the elegant simplicity of Policy 6.48:

> BE IT RESOLVED, that the City Council will actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways; and
>
> BE IT FURTHER RESOLVED, that this Resolution does not restrict:
> 1. improvements in the safety, or efficiency, seismic resilience, or operations of existing infrastructure;

2. the provision of service directly to end users;
3. development of emergency backup capacity;
4. infrastructure that enables recovery or re-processing of used petroleum products; or
5. infrastructure that will accelerate the transition to non-fossil fuel energy sources;

Policy 6.48 Fossil fuel distribution. Limit fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Nowhere in these provisions does it say explicitly that any expansion of fossil fuels infrastructure is contemplated, encouraged, or desired. And it is clear from the entirety of Resolution 37168, including the carefully defined *Whereas* clauses in this binding policy resolution, that the Council did not in any way support or encourage any expansion of fossil fuel use in its unanimous approval.

Unfortunately, your draft language redefines "service directly to end users" and "necessary to serve the regional market" in ways that completely undercut the clear intent of the Council. This must be reconsidered and reversed for these zoning amendments to reflect the will of the people of Portland, expressed through the Council.

Finally, as a specific key example of the failure of the draft amendments to follow the universality implicit in both Resolution 37168 or Policy 6.48, your project team has consistently violated both the letter and spirit of our new Portland legal and policy framework by adding a term found nowhere in either: "large."

See, for example, this paragraph from Discussion Draft page 6 that attempts to explain these proposed amendments in the context of the first Be It Resolved section:

> The proposed zoning code changes are a key implementation action of Resolution 37168, adopted November 2015. Addressing the overall direction of the resolution to oppose expansion of fossil fuel distribution and storage infrastructure, this project proposes size standards that restrict development of **large** [emphasis added] new fossil fuel terminals.

This wholly-new concept, "large," appears nowhere in either the resolution or the policy. We presume that it has been added to the Discussion Draft at the behest of stakeholders who are not interested in the difficult, expensive, and vital work of actually moving Portland out of a "business as usual" model for fossil fuels use, so that we can properly work through our part of the climate crisis.

"Large," of course, is in the eye of the beholder. It is deceptively simple; a multitude of sins can be contained within it; and – in this crisis – exactly the sort of distortion that we must work to prevent.

The Council's wisdom in laying down clear guidelines, in great detail, was, we believe, intended to avoid exactly this sort of distortion of the ordinance changes we need.

Overall, therefore, we urge you to reconsider the Discussion Draft based on the three principles outlined above:

- incorporating the universality of the public intent;
- preventing distortion of the Council intent; and
- fully recognizing the core fallacy of a "business as usual" implementation.

Thank you for your consideration.

Ted Gleichman, on behalf of Oregon Sierra Club

Will Portland Abandon its Pledge Against New Fossil Fuel Infrastructure?

August 8, 2016

By Ted Gleichman, policy advisor, Oregon Sierra Club *Beyond Gas & Oil Team*

Last November, the Portland City Council voted unanimously for a binding policy resolution to stop any fossil fuel exports through Portland and to ban new fossil fuel infrastructure for exports or storage. This unprecedented measure put Portland on a state-of-the-art path for regional, national, and global leadership in fighting the climate crisis. Oregon Sierra Club was one of many leading groups* that worked hard for this. Together, we flooded the Council hearings with more than 500 people, helping to motivate our City Council for this bold action.

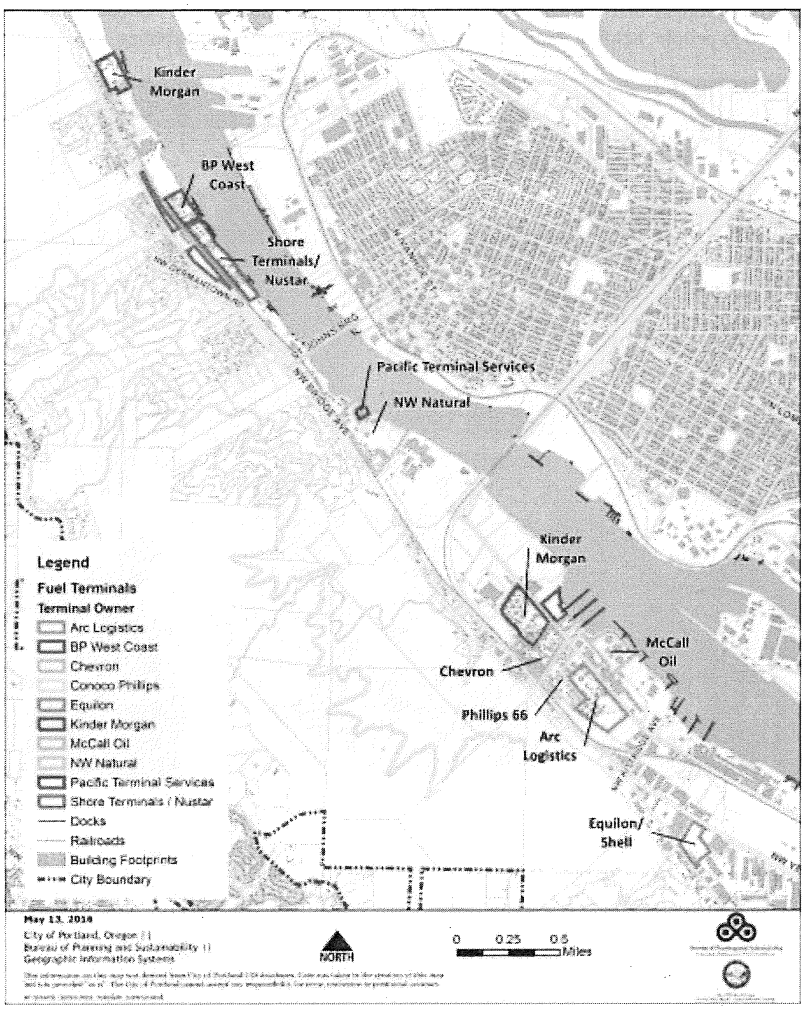


Activists pack City Hall in Portland

With leadership from Mayor Charlie Hales and Commissioner Amanda Fritz, the other Councilmembers – Commissioners Nick Fish, Dan Saltzman, and Steve Novick – joined in to make it unanimous. Next time you see any of them, **be sure to thank them! This fall, they will need to take this on again.**

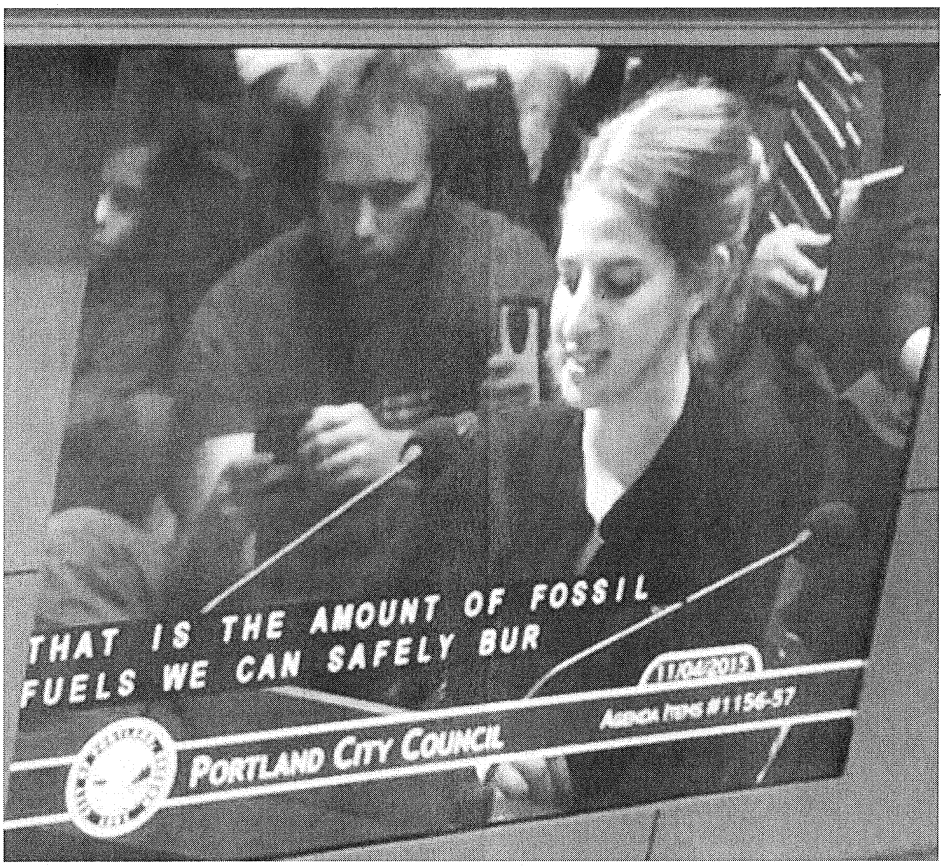
The Council resolution directed city agencies to develop ordinance and regulatory changes to implement this unprecedented plan. First up to bat is the Bureau of Planning and Sustainability (BPS), and they are on the verge of fouling out. Fortunately, the Planning and Sustainability Commission (PSC) serves as the umpire on BPS work, with a public hearing set for **Tuesday, September 13: save the date** (time and place TBD). We fans are going to pack the stands to root for the home team: Planet Earth!

OK, I've beaten that seasonal metaphor into infield dust. But make no mistake: this is no game. The current BPS zoning ordinance plan completely guts the clear intent of the pioneering Council resolution by giving the fossil fuels industry all-but-unlimited opportunity for growth.



When I testified to the Council last November, this was my key point: "There is no fossil fuels solution to the fossil fuels crisis." The audacious Portland resolution is a great reflection of that shared understanding, and we can't let the City abandon it.

Two leading organizers, Mia Reback of 350PDX and attorney Nicholas Caleb, presented summaries of the BPS problem to the City Council on July 13, and Oregon Sierra Club joined in with an Open Letter to the Council.



350PDX lead organizer Mia Reback testifying to Portland City Council last November, while attorney Nicholas Caleb tweets

Please take a few minutes to read our two-page Open Letter. To support the Council resolution, we start with big picture, ***Keep It in the Ground***, and move through the next three steps: ***Do No More Harm***, ***Reduce the Need***, and ***Make the Just Transition.***

For more information, please see the formal comments we submitted to BPS on July 27. Great comments also went in from our regular allies 350PDX, Audubon Society of

Portland, Center for Sustainable Economy (CSE), and Columbia Riverkeeper, among others.

We are in this for the long haul, and Portland's leadership is vital to our metropolitan area, Oregon, the Pacific Northwest, the United States, and our long-suffering overheated earth.

If you want to help, please send me a note or give me a call; see below. We will update you regularly as this evolves through the rest of this year.

Thanks for all you do!

Ted Gleichman ted.gleichman@oregon.sierraclub.org 503-781-2498

* Great work for Oregon Sierra Club was done last year by *Beyond Gas & Oil Team* chair Gregory Monahan (who also testified, along with then Chapter Director Andy Maggi) and long-time ace National *Beyond Coal* organizer Laura Stevens.

Other key organizations included 350PDX, Audubon Society of Portland, Columbia Riverkeeper, Sustainable Energy & Economy Network (a project of CSE), Raging Grannies, Climate Action Coalition, Physicians for Social Responsibility, Friends of the Columbia Gorge, EcoFaith Recovery & Beyond Fossil Fuels, Climate Solutions, Oregon League of Conservation Voters, and others. It was a terrific team effort!

UPDATE: Portland Fossil Fuel Policy Work Moves from F to B-Minus

By Ted Gleichman, policy advisor, Oregon Sierra Club *Beyond Gas & Oil Team*

September 7, 2016

Portland's Bureau of Planning & Sustainability (BPS) has proposed zoning amendments for review by the Planning & Sustainability Commission (PSC) that are substantially less destructive than the agency's original plan. But "less bad" does not equal "good."



BPS was charged with implementing parts of the ban on new fossil fuel infrastructure for export and storage that the City Council approved unanimously last November. Their original draft zoning amendments were filled with loopholes, and basically gave the industry an open door to unlimited expansion.

BPS was flooded with more than 700 comments to the draft plan, the vast majority calling for a true ban on new fossil fuel infrastructure.

To their credit, agency staff reworked their zoning ordinance proposals with very thorough and diligent staff work. BPS has now proposed to narrow the opportunities for industry expansion in four important ways:

1. The new zoning would define "Bulk Fossil Fuel Terminal" as a tank with more than five million gallons of capacity – a tad smaller than the current 300+ tanks in Portland, but still huge.
2. New Bulk Fossil Fuel Terminals would be banned, but new tanks under five million gallons could still be built so long as they do not include the infrastructure necessary to transload the fuels for export.
3. Existing Bulk Fossil Fuel Terminals would be defined as "non-conforming uses" – a zoning designation that means 'they are already here but we don't want to let them in again.'
4. Changes and expansions to the non-conforming current Bulk Fossil Fuel Terminals would require approval by a hearings officer after a public hearing. Any approvals could be challenged in court under land use law (which does not include, for example, increased climate destruction). Almost all of these tanks are in the earthquake

liquefaction zones, on dredged soils along the Willamette River north of downtown Portland – a truly insane place to build or expand anything, but especially not dangerous flammable explosive fossil fuel infrastructure.

The basic problem now is that important parts of these proposals do not yet reflect the clear understanding in the City Council's binding policy in Resolution No. 37168 to move beyond fossil fuels as quickly as possible.



Activists pack City Hall in Portland

The new formal proposal will be reviewed by the Planning & Sustainability Commission on Tuesday, September 13, in an open public hearing at 1900 SW 4th Ave., scheduled to run from 12:30-4:30 pm. **You do not need to be a Portland resident to participate in this critically-important hearing!**

The PSC will then decide in early October, after an open meeting without additional testimony, whether to forward any zoning amendments to the City Council for review, possible amendment, and approval. If they do, the Council itself will hold public hearings and vote in late November or early December.

For more information, or to join in as part of the Oregon Sierra Club team in the September 13 PSC hearing, please contact Ted Gleichman, ted.gleichman@oregon.sierraclub.org, 503-781-2498. ***And please stay tuned!***

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:25:45 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: glydenews@everyactioncustom.com [mailto:glydenews@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 1:30 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
JACQUELINE GLYDE
9455 NE Alderwood Rd
Portland, OR 97252-1777

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Tuesday, September 13, 2016 9:48:46 AM
Importance:	High

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Mary [mailto:mary@sock-dreams.com]
Sent: Tuesday, September 13, 2016 9:45 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony
Importance: High

Dear City Portland,
It is important that you amend the proposed draft to reflect the city's fossil fuel goals:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Sincerely,
Mary Griffiths
524 SE 17th Ave.
Portland, OR 97214

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 5:52:44 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: nia hansen [mailto:niabhansen@gmail.com]
Sent: Tuesday, September 13, 2016 12:17 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I believe we're beyond the tipping point to control climate change; we have existing terminals for fossil fuels...an argument can and has been made to reduce/curtail the use of this type of fuel that is so detrimental, even fatal to our children and our planet. The bigger issue is this...reduce, curtail the use of fossil fuels; short of that, we need to make it difficult to provide containment of these fuels. Please consider banning all terminals; ALL Terminal, large and small. At the very least, increase safety issues surrounding the terminals, and decrease climate control impacts.

From: nia hansen
Email: niabhansen@gmail.com
Address: 374 sw hamilton ct, Portland, Oregon, 97239

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 10:36:46 AM

Julie Ocken
City of Portland
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Portland, OR 97201
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-----Original Message-----
From: jharmony13@everyactioncustom.com [mailto:jharmony13@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 9:32 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Joan Harmony
3707 SE 42nd Ave
Portland, OR 97206-3200

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 5:57:32 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Becky Hawkins [mailto:hawkins.becky@gmail.com]
Sent: Tuesday, September 13, 2016 1:25 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Like many Portlanders, I moved here in order to participate in a progressive city, and be able to enjoy the spectacular nature nearby. When I return home to my native Pittsburgh, I drive past billboard after billboard advertising "clean oil," "clean coal," and "safe fracking." Then I check the news and see another spill, another leak, another community devastated by the fossil fuel industry. And every time, the oil and gas companies are full of excuses as to why it's not their fault. It was the soil, the weather, a pipe, a well. It's always billed as a surprise, an unforeseeable circumstance. But pollution is not a surprise; it's a consequence of the fossil fuel industry. Don't allow any legal loopholes to endanger Portland's wildlife or its citizens.

From: Becky Hawkins
Email: hawkins.becky@gmail.com
Address: 4344 SE Main St, Portland, Oregon, 97215

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 5:52:13 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Linda Hayden [mailto:linda.hayden3@gmail.com]
Sent: Tuesday, September 13, 2016 12:08 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please, listen to the people, the people who have entrusted you with our health and safety which is intrinsically connected with the health and well being of our planet. Enact a FULL BAN on all new fossil fuel terminals, Large or Small....How can we move on to clean and green if we keep getting mixed up with the dirty stuff....NO MORE FOSSIL Fuel infrastructures please!

From: Linda Hayden
Email: linda.hayden3@gmail.com
Address: 11437 SE Pine Ct, Portland, Oregon, 97216

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 10:36:33 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: allegra.heidelinde@everyactioncustom.com [mailto:allegra.heidelinde@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 9:26 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Allegra Heidelinde
7405 SE Market St
Portland, OR 97215-3538

Johan Hellman
Regional Assistant Vice President
State Government Affairs

BNSF Railway Company
2454 Occidental Ave. South, Bldg. 1A
Seattle, WA 98134
tel 206.625.6135
fax 206.625.6125
johan.hellman@bnsf.com

September 13, 2016

Planning and Sustainability Commission
City of Portland
1900 SW 4th Ave., Suite 7100
Portland, OR 97201

Sent electronically to: psc@portlandoregon.gov

Dear Commissioners:

The following comments regard the Portland Planning and Sustainability Commission's (the "Commission's") proposal to adopt city policies restricting the development of terminal infrastructure that would support trade opportunities for new energy resources.

As you may know, freight rail is critical to economic activity and a high quality of life in the state of Oregon, around the Pacific Northwest, and across the nation. Today, in Oregon, freight railroads employ more than 2,000 citizens who receive an average annual compensation of more than $108,000 per year. When political leaders speak of attracting and retaining good-paying, family-wage jobs, these are the kinds of jobs they describe. Furthermore, freight rail is critical to supporting and expanding opportunities in numerous related industries including agriculture, manufacturing, forest products, and international shipping.

Freight rail is also critical to achieving the region's environmental goals. It is the most efficient method of moving freight over land. As an example, BNSF can move 1 ton of freight, 500 miles, on a single gallon of fuel. Moving cargo by rail is 4 times more efficient and 16 times safer than moving it by truck. Every unit train displaces several hundred trucks from Oregon's roads and highways. As a result, the state's citizens enjoy improved air quality, safer highways, reduced greenhouse gas emissions, and reduced gridlock.

Since freight rail infrastructure is built and maintained almost entirely using private funds, taxpayers in Portland and other communities receive all of these benefits without paying any additional taxes. In fact, since freight rail eases congestion and wear-and-tear on publically-funded roads and

highways by eliminating truck traffic, freight rail infrastructure actually eases tax pressures that would otherwise be paid by local citizens.

Regarding the measure currently before the Commission, we are specifically concerned with the chilling effect these arbitrary regulatory requirements could have on the development of new trade infrastructure in general. Consistent with federally mandated common carrier requirements, BNSF has a federal obligation to move all forms of hazardous materials, including energy resources. In discussing hazardous materials, it is important to understand that these include a wide variety of substances common to everyday life in cities such as Portland.

Specifically, the range of common materials deemed hazardous includes the following: chemicals used to purify municipal drinking water; substances used in industrial and manufacturing processes, such as the development of technical fabrics used by outdoor clothing manufacturers; fertilizers, commonly used by farmers to produce more robust, sustainable and verdant crops. In short, these materials include a vast array of substances and products used every day by citizens throughout Portland and across the region. They also include materials used in the development of products that sustain thousands of good-paying, family-wage jobs in the Pacific Northwest.

The energy products the Commission seeks to limit through zoning changes are perfectly legal. In fact, these products are used every day by millions of people in Portland and other communities across the region and around the world. Therefore, it seems arbitrary to enact new zoning requirements in this way. It also begs the question of whether other zoning restrictions – either in Portland, or other communities along the supply chain – might be initiated to limit substances deemed politically undesirable which are, nevertheless, perfectly legal and universally used every day by millions of citizens locally, regionally, and globally. These might include materials used to make running shoes, sports equipment, building materials, or agricultural products. The result of this kind of decision making could be extremely disruptive to local communities as well as national and international commerce.

Finally, the instability created by this approach to policy making would send a powerful message to companies and organizations responsible for developing large infrastructure such as transportation networks, shipping terminals, manufacturing operations, and other cornerstones of the trade economy. This kind of infrastructure tends to be very capital intensive, so regulatory certainty is critical. Arbitrary

measures that create regulatory unpredictability undermine investment and cast a chilling effect across multiple sectors of the trade economy. For these reasons, we urge you to not adopt the zoning restrictions on bulk energy projects currently before the Commission.

Thank you for your consideration.

Sincerely,

Johan Hellman

Portland Planning and Sustainability Commissioner Public Hearing

Date: 9/13/16

Name: Jack Herbert (Please print legibly)

Authorized Spokesperson representing: _____ (if applicable)

Address: 11935 SW Edgewood St

City: Portland Zip: 97225 Phone: 971 205 2254

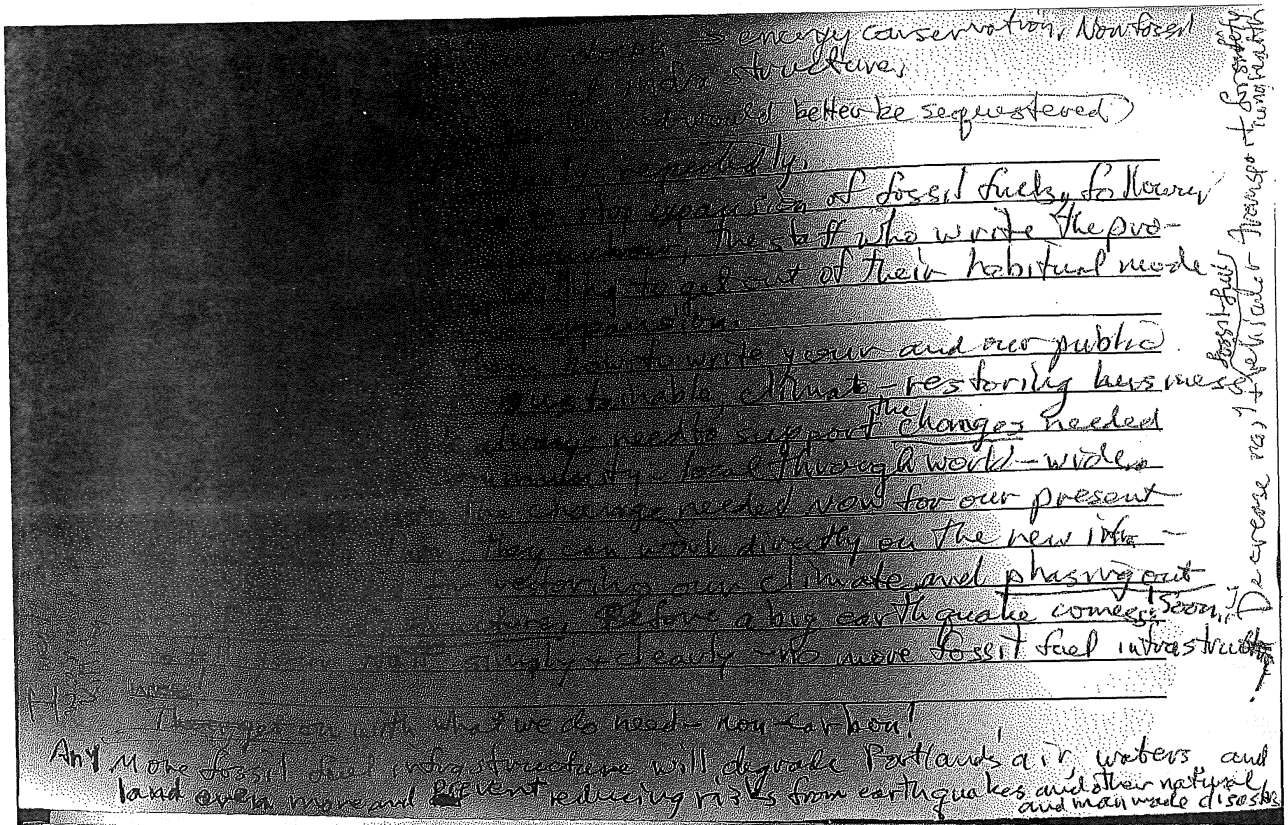
Email Address and/or Fax No.: jharlanherb@gmail.com

What agenda item do you wish to comment on? Fossil Fuel Infrastructure Code Update

Site Address, if different from above: _____

☑ (check if written comments are included on back)

2340



Any more fossil fuel infrastructure will degrade Portland's air, waters and land even more and prevent reducing risks from earthquakes and other natural and man made disasters

Drive fossil fuel need and demand down → energy conservation, Non fossil fuel economy. Not fossil fuel infrastructure,
(non-carbon because any carbon burned would better be sequestered)
Others have said it clearly repeatedly.
The City Council voted to stop expansion of fossil fuels, following the public will heave. Somehow, the staff who write the proposals have not been willing to get out of their habitual mode of supporting conventional business expansion.
You must show them how to write your and our public intention - support sustainable, climate-restoring business infrastructure. We always need to support the changes needed for our healthy community - local through work - wide. Get your staff into the change needed now for our present and future. Then, they can work directly on the new infrastructure needed for restoring our climate and phasing out fossil fuel infrastructure. Before a big earthquake comes soon! So tell your staff simply + clearly - no more fossil fuel infrastructure!
Then get on with what we do need - non-carbon!
Any more fossil fuel infrastructure will degrade Portland's air, waters and land even more and prevent reducing risks from earthquakes and other natural and man made disasters

I weatherize, keep my thermostat low, wear warm clothing. Much better than killing my descendants and nature I love

Decrease rail + vehicular transport for safety (unhealth) fossil fuel

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 5:57:45 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Mason Hiatt [mailto:masonhiatt@gmail.com]
Sent: Tuesday, September 13, 2016 1:31 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Considering that Portland City Council has issued a statement against the DAPL in North Dakota, which I applaud, the exact same arguments apply to why it is important to ban new terminals here in Portland. Doing anything else would be hypocritical and work against any claims the city might have to being on the forefront of environmental justice.

From: Mason Hiatt
Email: masonhiatt@gmail.com
Address: 2515 NE 9th Ave #12, Portland, Oregon, 97212

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 5:57:16 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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www.portlandoregon.gov/bps

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From: Megan Horst [mailto:horstmegana@gmail.com]
Sent: Tuesday, September 13, 2016 1:21 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I am a concerned and active citizen in NE Portland, and climate change is in the top 3 issues of importance to me. Thank you to BPS for its work so far on the fossil fuel policy code.

BUT, we need stronger code changes, including:
1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Megan Horst
Email: horstmegana@gmail.com
Address: 4619 NE 30th Ave, Portland, Oregon, 97211

Dear Commissioners of the Portland Planning and Sustainability Commission,
Sept 13th, 2016

My name is Maya Jarrad, a staff Organizer with 350PDX, with a BA in Environmental Studies - Economics

Today I want to highlight the problem of allowing large expansions of fuel storage or transport through adding multiple small terminals -- which is called *terminal aggregation*, a trend happening here in the Pacific Northwest.

Take British Columbia, for example, where nearly two dozen Liquid Nat Gas export projects are in the proposal stage. The annual production of LNG added across these proposals would be 3-4 times larger than that of the largest existing LNG terminal in the world.

Large production volumes are achieved through the *aggregation of several "small" terminals*, each with its own liquefaction equipment, storage and other structures. Being geographic neighbors, these small terminals create a large project which the proposed zoning amendments here *hope* to prevent, but which would be allowed by this draft.

Examples in British Columbia include 5 ExxonMobil LNG facilities, Woodside Energy Holdings Party LNG facilities, and Petronas LNG facilities, to name a few.

To close this loophole, code language should be added to limit "projects" whose aggregate volume is greater than or equal to a Bulk Fossil Fuel Terminal per the amendments' definition.

Specifically, add to the definition of "Ownership":

"Contiguous lots that are owned by multiple corporations that are subsidiaries of a single corporation are considered to be a single ownership."

This will help prevent the situation we are observing in British Columbia and thus succeed the resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is storing or transporting fuels".

Thank you.

Maya Jarrad

350PDX Community Organizer and Volunteer Coordinator
1820 NE 21st Ave
Portland, OR 97212

3414 SE 21st Ave
Portland, OR 97202

maya@350pdx.org

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Tuesday, September 13, 2016 6:05:39 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Albyn Jones [mailto:jones@reed.edu]
Sent: Tuesday, September 13, 2016 3:46 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Dear Planning and Sustainability Commission

I am writing in regard to the proposed code changes relating to fossil fuel terminals. First let me state that there are three important issues that inform my opinions about fossil fuel terminals: risk of rail and other transport accidents in the Columbia River Gorge and in Portland, risk of damage to Portland and our local habitat in the event of a major earthquake, and finally climate consequences of encouraging consumption of fossil fuels.

First: The recent rail accident in Mosier is evidence that rail transport of fossil fuels is not without risk, indeed the risk appears substantial. We were simply lucky that many people did not die. In addition to the fire and visible oil spill, we now know there was serious groundwater contamination (see http://www.opb.org/news/series/oil-trains/mosier-groundwater-contaminated-oil-train-derailment/).
Increasing the number of trains transporting oil through the gorge can only increase the risk. Now imagine a similar derailment occuring within Portland...

Second: Existing oil terminals in Portland pose a major risk of spillage and fire in the event of a major earthquake. Since we are located in the vicinity of the Cascadia Subduction Zone, such an earthquake WILL occur at some point, maybe tomorrow, maybe in 50 years. Adding more terminals and more oil moving through Portland

simply magnifies the probable damage that will occur as a result.

Finally: Adding capacity to ship fossil fuels, and hence facilitating consumption of same, flies in the face of the evidence about global warming. Short term economic gain for a few is simply not worth the long term consequences for all. Those consequences include more frequent extreme weather events, sea level rise, reduced snowpack in the Cascades leading to drought, etc.

In light of these issues, I ask you to act to prevent the expansion of transport into and storage of fossil fuels in Portland: ban all new fossil fuel terminals, regardless of capacity; restrict expansion of existing terminals; and establish criteria for safety of existing facilities and fuels transport.

Thank you for your attention,

Albyn Jones
4032 SE Crystal Springs Blvd
Portland 97202

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 6:00:35 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Michael Karnosh [mailto:Michael.Karnosh@grandronde.org]
Sent: Tuesday, September 13, 2016 2:14 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Full Name: Michael Karnosh, Ceded Lands Program Manager, Confederated Tribes of Grand Ronde
Mail Address: 9615 Grand Ronde Road
Grand Ronde, OR 97347

Dear Planning and Sustainability Commission,

On behalf of the Confederated Tribes of the Grand Ronde Community of Oregon ("Grand Ronde" or "Tribe"), thank you for this opportunity to comment on the City of Portland's Proposed Fossil Fuel Terminal Zoning Amendments ("Amendments"). Grand Ronde is made up of over 27 different antecedent tribes and bands, including the Multnomah, Clackamas and Cascades bands of Chinook people who originally inhabited the Portland area from time immemorial and signed the Willamette Valley Treaty of January 22, 1855, ceding their lands to the U.S. in exchange for certain rights and benefits. These antecedent tribes and bands were removed to the Grand Ronde Indian Reservation and later became the Confederated Tribes of Grand Ronde.

The lower Willamette River, which these Amendments affect, is an area of important Tribal cultural, natural, and treaty resources. Tribal members still fish for salmon and lamprey for cultural purposes in this section of the river. Grand Ronde still conducts traditional Tribal ceremonies here.

This reach of the Willamette River is plagued by water quality issues; much of it has been designated a Superfund site. One of the main contaminants of concern in the Superfund site is polycyclic aromatic hydrocarbons (PAHs), of which fossil fuels are a major source. The Tribe has been involved

as a government partner and Trustee at the Superfund site since its listing in 2000, and has consistently advocated for a cleanup that will be protective of human health and the environment. The Tribe's vision is for cleanup and source control such that Tribal members and the public may eat fish from the river without fear of contamination, and without the need for limits imposed by fish advisories.

In addition to its concerns over human health, the Tribe has concerns that the aquatic resources of the lower Willamette River will continue to suffer without a sufficiently protective remedy in place. PAHs in the water column and river sediments are known to have negative effects on Tribally important species such as Chinook salmon, Pacific lamprey, and other aquatic species with populations that have declined over the years.

Whether or not the Superfund remedy proves to be sufficiently protective of human health and the environment, additional development of fossil fuel terminals in the area introduces greater risk of contaminant discharge into the Willamette River, whether the discharge is intentional, neglectful, or the result of a natural disaster (e.g. subduction zone earthquake) or accident (e.g. oil train derailment). This equates to greater risk of harm to human health and the environment than currently exists, an outcome unacceptable to Grand Ronde.

Improvements to existing fossil fuel terminals that result in a higher degree of public safety and/or efficiency, and are not for the primary purpose of expansion, are exceptions that should be allowed, but in general fossil fuel terminal development in the Portland area should not be allowed to further jeopardize human health and the river's critical ecosystem. Again, thank you for this opportunity to be heard.

Sincerely,

Michael Karnosh
Ceded Lands Program Manager
Tribal Lands Department
Confederated Tribes of Grand Ronde

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 11:18:35 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Jordan Karr-Morse [mailto:jordan@softboxfilms.com]
Sent: Tuesday, September 13, 2016 11:18 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

This is a great opportunity for Portland to take a bold stance on a critical global issue. We need to enact a full ban on fossil fuel infrastructure. Let's make Brand Portland mean something!

From: Jordan Karr-Morse
Email: jordan@softboxfilms.com
Address: 1215 SE Ivon St, Portland, Oregon, 97202

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 5:55:35 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Christine Kosonen [mailto:wordpress@350pdx.org]
Sent: Tuesday, September 13, 2016 12:44 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Portland, Protecting our future, of our water and our children! Invest in clean energy infrastructure. Do not permit another piece of fossil fuel industry to be built in our city & region. I urge you to develop careful monitoring of existing fossil oil infrastructure and hold the vision that it will be disassembled piece by piece and replaced with technologies that do not damage our most precious and irreplaceable reaources= clean water, earth, and air!!!

From: Christine Kosonen
Email: cealila@yahoo.com
Address: 3735 SE Yamhill.St , Portland, Oregon, 97214

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 9:20:08 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Sascha Krader [mailto:hungrytiger@gmail.com]
Sent: Tuesday, September 13, 2016 1:04 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear Planning and Sustainability Commission,

I was drawn into Portland City politics by the proposed Pembina terminal. I thought it seemed terribly short-sighted and anti-Portland-values to put a new fossil fuel terminal in the city. I still think that, and I believe the City Commissioners agree.

The code as currently written does not ban fossil fuel terminals, however. Please strengthen the code so it forbids all new fossil terminals, and forbids expansion of the current existing terminals.

I think that doing that will be in the spirit of what the commissioners voted for last year.

Thank you,

From: Sascha Krader
Email: hungrytiger@gmail.com
Address: 730 NE 31st Avenue, Portland, Oregon, 97232

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:24:44 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: dkreisman@everyactioncustom.com [mailto:dkreisman@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 8:06 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
David Kreisman
15066 SE Robinette Ct
Portland, OR 97267-3209

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] Re: PSC Fossil Fuel Zoning Testimony: Requesting FULL BAN
Date: Tuesday, September 13, 2016 6:08:37 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

From: priscilla lane [mailto:lanekappes@comcast.net]
Sent: Tuesday, September 13, 2016 4:29 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] Re: PSC Fossil Fuel Zoning Testimony: Requesting FULL BAN

Thank you.

Priscilla Lane
5529 SE Morrison
Portland OR 97215

On Sep 13, 2016, at 9:23 AM, Planning and Sustainability Commission <psc@portlandoregon.gov> wrote:

Hello Priscilla,

Thank you for your comments to the Planning and Sustainability Commission. For your testimony to be officially part of the public record, it does need to include your mailing address (including house or PO number). Without this information, the City is not able to send you notification of Council hearing dates or the Council's final decision, and you may not be able to appeal the Council's final decision.

So that I may include your comments in the record and forward them to PSC members, can you please email me your mailing address?

Thanks,
julie

Julie Ocken
City of Portland
Bureau of Planning and Sustainability

1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: priscilla lane [mailto:lanekappes@comcast.net]
Sent: Tuesday, September 13, 2016 8:58 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: Requesting FULL BAN

Dear Members of the Planning and Sustainability Commission,

I am proud to see Portland City leaders pursuing a goal of opposing expansion of terminals supporting the fossil fuel industry. The leaders have shown themselves to be environmentally responsible and also open to citizen response.

Future expansion of terminals should be driven by public safety and seismic upgrades.
Portland should prohibit any new fossil fuel terminals of any size (eliminate exception for projects of 5 mil gallons or less), including LNG storage.
Oil train traffic should be reduced; no new crude oil unit train traffic.

Portland needs to continue to be at the front of the Climate Justice Movement.

Thank you,
Priscilla Lane,
Portland resident

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 5:58:29 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: jenn.lanius@everyactioncustom.com [mailto:jenn.lanius@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 1:35 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Jennifer Lanius
8205 SE 45th Ave
Portland, OR 97206-0931

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 10:32:14 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Andrea LePain [mailto:aclepain@gmail.com]
Sent: Tuesday, September 13, 2016 9:55 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please ban ALL new fossil fuel infrastructure.
Portland already has a large fossil fuel handling and storage area.
The city's reputation as "green" apparently doesn't take this in to account. (Perhaps this should be publicized more.)
Portland is not only contributing in a significant way to climate change but also endangering the lives of all citizens in North Portland, along with the health of two rivers, with the present infrastructure.
Your time would be better spent making sure that the tank farms and tracks already in place are prepared for disasters (i.e. earthquake, fire, sabotage). From where I live and stand directly across from this storage area, and from Hwy 30, it's plain to see that we are woefully unprepared.
Please do the right thing, both for our city and the planet.

From: Andrea LePain
Email: aclepain@gmail.com
Address: POB 83102 (mailing), 8936 N Edison, Portland, Oregon, 97283

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 6:06:33 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: lighttb@everyactioncustom.com [mailto:lighttb@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 3:40 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Ted Light
612 SE 48th Ave
Portland, OR 97215-1721

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 9:21:32 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Eliza Lindsay [mailto:guileless@gmail.com]
Sent: Tuesday, September 13, 2016 6:23 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear City of Portland's Planning and Sustainability Commission,

Thank you for considering zoning code changes to address issues of fossil fuels. This is so very important.

Please adopt the following changes to the proposed fossil fuel policy code:

1 - Enact a full ban on all new fossil fuel terminals, large or small. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. To do this we need to ban all new fossil fuel terminals.

2 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

3 - Prevent any aggregate increase in fossil fuel infrastructure in Portland.

The future health of Portland and the wold depends on the taking strong action now to address climate change. Let's join the global movement, step up, and step forward for all alive now and those to come.

Sincerely,

Eliza Lindsay

From: Eliza Lindsay
Email: guileless@gmail.com
Address: 4310 NE Holman Street, Portland, Oregon, 97218

Portland Planning and Sustainability Commission Public Hearing

Date: 9/13/2016

Name: Mike Litt (Please print legibly)

Authorized Spokesperson representing: _____ (if applicable)

Address: 13100 SE River Rd

City: Milwaukie Zip: 97222 Phone: 503-353-2787

Email Address and/or Fax No.: littm1@comcast.net

What agenda item do you wish to comment on? 5 million gallon limit on Fossil Fuel Facilities

Site Address, if different from above: _____

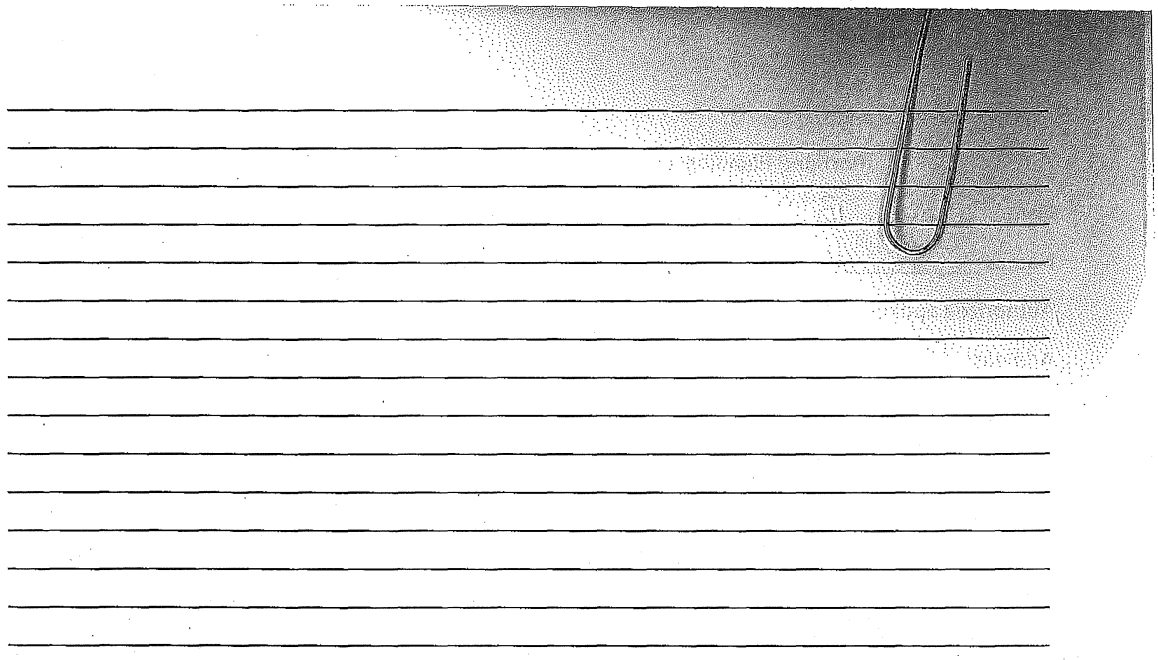
☒ (check if written comments are included on back)

2364

I have two reasons for opposing the 5 million gallon exemption proposed by the PJSC.

1) Allowing 5 million gallon oil infrastructure to be built would assist oil companies in increasing the number of oil trains passing through the Columbia Gorge. As the Mosier derailment and other oil-train derailments show, this would impose an unacceptable risk on the communities through which these trains pass.

2) Climate change, fueled by consumption of fossil fuels, poses ~~an~~ a terrifying threat to global civilization and to the very survival of the human species. Already, we are seeing the hottest year ever recorded and unprecedented increases in the number & intensity of severe weather events. We must transition to renewables (& possibly nuclear) as soon as possible. Discourage and development of fossil fuel infrastructure.



From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 6:06:05 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: gardeneral@everyactioncustom.com [mailto:gardeneral@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 4:00 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

I appreciate the hard work and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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addressing the most pressing concern of our time.

Sincerely,
Clyde Alan Locklear
6222 SW 36th Ave
Portland, OR 97221-3307

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

700 NE Multnomah Street, Suite 1200
Portland, Oregon 97232

(503) 238-0667
F (503) 235-4228
www.critfc.org

September 13, 2016

Portland Planning and Sustainability Commission
1900 SW 4th Avenue, Suite 7100
Portland, OR 97201

RE: Fossil Fuel Zoning Testimony

To the Portland Planning and Sustainability Commission:

The Columbia River Inter-Tribal Fish Commission (CRITFC) appreciates the City of Portland taking the responsible step to adopt Resolution 37168, opposing the expansion of fossil fuel transport projects, and taking the additional step in adopting 2035 Comprehensive Plan Policy section 6.48, limiting fossil fuel distribution and storage facilities. These are policies that move in the right direction to protecting our natural resources and preparing our region for an era of sustainable energy.

To continue that forward progression, zoning changes are appropriate. We agree with the definition of a "Bulk Fossil Fuel Terminal" and we urge the City to adopt the Zoning Amendments with these considerations:

- Maintain an appropriate definition of the terms: "region" and "regional" when referring to the "regional market" under § 6.48, such that this term is defined to be Oregon and Southwest Washington. Industrial stakeholders may prefer that you to consider defining "regional" as the entire PADD 5, which includes California, Hawaii and Alaska. However, Portland has not historically served the fossil fuel needs of California and these other areas. Notably, California consumes over two-thirds of the petroleum (roughly 80%) consumed in PADD V, while the entire states of Oregon and Washington consume less than 10%.

- Adopt building code recommendations related to seismic safety due to the dangerous location of many of these facilities. Currently, these projects are sited on a high-risk liquefaction zone and most are not built to appropriate seismic standards. The fuels stored in these facilities are upstream from the Columbia River estuary. The National Marine Fisheries Service's Recovery Planning Module for the Columbia River estuary emphasizes that protecting the estuary from hazardous chemicals is an important part of ESA-listed salmon recovery throughout the Columbia Basin.

We reviewed your Commission report and noticed that Figure 7 is incomplete. The figure does not account for additional proposed and operating crude by rail terminals, including two more in Grays Harbor and Columbia Pacific Bio-refinery operated by Global Partners. We realize that

each of these projects are in various stages of operation, but their applications are still "live". We are attaching a table to this letter with updated information.

Thank you for this opportunity to provide comments. Please feel free to contact us if you have any questions.

Sincerely,

Babtist Paul Lumley
Executive Director

Attachment

CRITFC – Pacific Northwest Fossil Fuel Transport Terminals – Rail/Ship Capacity Table

Type	Project	Crude Capacity (Barrels per day)	Coal Capacity (Million metric tons per annum)	Trains Per Week (1 way thru CR Gorge)	Vessels Round trips per week	Notes
Coal	Coyote Island Terminals (Port of Morrow, OR)	x	8.8 mmta	8-11	48 barge 10 ships	**Proposed, permit denied.** Trains to Port of Morrow, coal stored on site, transferred to barges. Barges down Columbia River to Port Westward, transfer directly to Panamax-sized ships. In legal proceedings.
Coal	Gateway Pacific (Cherry Pt, WA)	x	53 mmta	55-60	45+	**Proposed, permit denied.** Largest coal export terminal in U.S. All full trains travel through the CR Gorge, empty trains via interior WA state. Corps has denied permit based on treaty rights, probably will face appeal.
Coal	Millenium Bulk Terminals (Port of Longview, WA)	x	44 mmta	50-55	**30-35**	**Proposed.** In environmental review; DEIS released in April 2016.
Crude	Arc Terminals, Arc Logistics Partners (Portland, OR)	≤16,000 bpd	x	**≥2**	4	**Operating**. Former asphalt receiving terminal, receiving CBR and ethanol. Storage capacity 1,466,000.
Crude	Columbia Pacific Bio-Refinery/Global Partners (Port Westward, OR)	28,600 bpd (increase to 120,000)	x	**≤3-5** (increase to 10-12)	6	**Operating, financial problems.** Permitted to accept 24 – 50 trains/month, pending appeals and infrastructure upgrades. Rail line through Rainier needs major improvements. Ship dock condition extremely poor, received upgrade permit from Corps July 2015. Company in poor financial position, is currently accepting ethanol only. TBD.
Crude	Grays Harbor Rail Terminal U.S. Develop. (Grays Harbor, WA)	50,000 bpd	x	5	8	**Proposed.** Vacant industrial lot, lease was not renewed. Application is still active and project under environmental review.
Crude	Imperium Renewables (Grays Harbor, WA)	70,000 bpd	x	7-8	8	**Proposed Expansion**. DEIS released 2015, public comments filed Nov 2015. Company announced it will not accept crude on January 2016, but application not withdrawn.
Crude	NuStar Energy, L.P. (Port of Vancouver, WA)	50,000 bpd	x	2-4	**6**	**Proposed Conversion**. Former asphalt-receiving terminal with shipping capabilities. Under environmental review by City of Vancouver.
Crude	Targa Sound Terminals (Port of Tacoma)	30,000 bpd	x	2-3	4	**Proposed.** Capable of receiving CBR, ethanol, biodiesel.
Crude	Tesoro-Savage, Vancouver Energy (Port of Vancouver, WA)	360,000bpd	x	28	**14**	**Proposed.** Largest CBR terminal proposal in the U.S. Currently in EFSEC legal proceeding and environmental review. DEIS released 2015.
Crude	Westway Terminals (Grays Harbor, WA)	26,300-48,700 bpd	x	5	7	**Proposed Conversion.** Current storage-only, will be expanded to receive CBR. Application notes shipping by ships and barges. DEIS released 2015, public comments filed Nov 2015
Refinery	BP (Ferndale, WA)	*70,000 bpd	x	**6-7**	7-8	**Operating**. Largest refinery, receives crude by ships and CBR.
Refinery	Phillips 66 (Ferndale, WA)	(*35,000 bpd)	x	2-3	4	**Operating**. Receiving ships, but permits for CBR are pending
Refinery	Shell (Port of Anacortes)	(*60,000 bpd)	x	5-6	6	**Operating**. Receiving ships. Capacity reflects CBR **potential**. Currently in environmental review, strong opposition.
Refinery	Tesoro (Port of Anacortes)	*50,000 bpd	x	**5-6**	6	**Operating**. Receives by ship and CBR. Capacity reflects CBR only. Trains through Swinomish reservation challenged by tribe.
Refinery	U.S. Oil (Port of Tacoma)	*35,000 bpd	x	**3-4**	4	**Operating**. Refinery primarily receives by ship with limited CBR.
Propane/ LPG	Petrogas Ferndale LPG (Ferndale, WA)	30,000 (LPG)	x	1-2	2-3	**Operational.** Capability to handle exports & imports with rail, truck and pipeline; connected to 2 crude refineries

1x100 unit crude train = 2,900,000 gallons of crude ~ 42 gallons of crude = 1 barrel ~ CBR = "Crude by Rail" ~ Vessels – Panamax & Cape Class, barges in Gray's Harbor
All vessels in **RED** indicate vessels in the Lower Columbia River Estuary, all others through Puget Sound ~ All trains in **BLUE** reflect current rail traffic (one direction)in the Columbia River Gorge
*Refinery volume = amount of crude to receive by rail (CBR). Most refineries receive larger volume by ship delivery.

©CRITFC – September 8, 2016

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 6:08:10 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: janmacwill@everyactioncustom.com [mailto:janmacwill@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 4:23 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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addressing the most pressing concern of our time.

Sincerely,
Jan MacWilliams
2007 NE 65th Ave
Portland, OR 97213-4812

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 5:56:20 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Camilo Marquez [mailto:camilomarquezmd@juno.com]
Sent: Tuesday, September 13, 2016 1:00 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

More than the vitally important need to protect the Portland environment from the risk of a spill or other disaster is the necessity to by any means possible keep all remaining fossil fuel reserves in the ground if we are to keep global temperature from reaching the point of no return for habitability of the planet.

From: Camilo Marquez
Email: camilomarquezmd@juno.com
Address: 2934 NE 60th Ave, Portland, Oregon, 97213

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 6:05:09 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Turner Masland [mailto:turner.masland@gmail.com]
Sent: Tuesday, September 13, 2016 3:35 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Bakken crude oil may seem like a quick solution to our energy problems, but in reality they only create more dangerous consequences for our community and our planet in the long run. Portland is known for being a city with sustainability at it's core. We need to strengthen our resolve to protecting this planet and all of the life forms found on it. We need to think about our future generations. We need to enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. We need to Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. We need to Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Turner Masland
Email: turner.masland@gmail.com
Address: 3386 SE Waverleigh Blvd, Apt. 1, Portland, Oregon, 97202

PORTLAND
BUSINESS ALLIANCE
Commerce · Community · Prosperity

September 13, 2016

Katherine Schultz, Chair
Portland Planning and Sustainability Commission
1900 SW 4th Avenue, Suite 1700
Portland, Oregon 97201

Re: Fossil Fuel Zoning Testimony

Dear Chair Schultz and Commission Members:

The Portland Business Alliance (Alliance) represents more than 1,850 member companies, small, medium and large, throughout the Portland metro region. The Alliance's mission is to promote and foster an environment in the Portland region that attracts, supports and retains private-sector jobs and spurs economic vitality.

From the outset, the Alliance opposed the city's resolution to restrict expansion of fossil fuel infrastructure. At the same time, we appreciated the amendments to Resolution 37168, adopted by City Council, making it clear the resolution does not restrict 1) improvements in the safety, or efficiency, seismic resilience, or operations of existing infrastructure, 2) provision of service directly to end users, 3) development of emergency backup capacity, 4) infrastructure that enables recovery or reprocessing of used petroleum products, or 5) infrastructure that accelerates the transition to non-fossil fuel energy sources.

Portland is a regional fossil fuel hub, located at the terminus of the Olympic pipeline. Fuels stored and distributed from northwest Portland serve the entire state of Oregon and parts of southwest Washington. Consumers and businesses throughout this broad market area rely on the fuels that are supplied from the energy hub in Portland. While we support the goal of reducing greenhouse gas emissions and improving public safety and resiliency, we are concerned with the approach taken in the Fossil Fuel Terminal Zoning Amendments Proposed Draft.

The resolution passed by City Council makes it clear that it **does not restrict** the exemptions noted above. Yet, that is exactly what the proposed draft contemplates by its very language because it prohibits development of new fossil fuel terminals and restricts the expansion of existing terminals, as well as makes the existing uses nonconforming. The report notes that the proposed code changes may be more restrictive than the exemptions in the resolution direct.

Furthermore, restricting expansion at existing fuel terminals and prohibiting new terminal development may impact industrial job growth and middle-income jobs. It may also constrain the supply of fossil fuels to serve anticipated population and employment growth, leading upward pressure on fuel costs which disproportionately affects lower-income households.

Greater Portland's Chamber of Commerce
200 SW Market Street, Ste. 150 | Portland, OR 97201 | 503-224-8684 | FAX 503-323-9186 | www.portlandalliance.com

The resolution adopted by City Council directs the Bureau of Planning & Sustainability to undertake an economic impact analysis of any proposed code changes yet no analysis has been undertaken and the proposed draft acknowledges that information is limited. Though the report does acknowledge that there may be impacts to job growth, tax revenue, and fuel costs, there is no quantitative analysis about those impacts. We urge that the proposed code changes not be implemented until a thorough economic analysis has been conducted to determine to what extent the proposed constraints will impact fuel supply or prices for users throughout Oregon and southwest Washington, which depend on the fuels in Portland's northwest energy hub.

Under the federal Renewable Fuel Standard and Oregon Clean Fuel Program, transportation fuels are required to contain renewable fuels. Fuels that are considered "clean fuels" by the state, such as natural gas and propane, are subject to restriction under these proposed changes. If companies are required to blend ever greater amounts of cleaner fuels into fossil fuels, but the proposed limits do not allow them adequate expansion opportunities to do so, there will be conflicts. It does not make sense for the city to potentially interfere with key policies of the federal and state government that seek to reduce greenhouse gas emissions in the transportation sector. The proposed draft also includes methanol, which under any definition is not a fossil fuel.

We appreciate the challenge staff faced in trying to develop code language to implement City Council's resolution. The fact is, at this point in time, consumers and businesses rely on fossil fuels to meet their everyday needs. That reliance is becoming less so as alternative energy sources are developed and cleaner fuels are used and/or blended into fossil fuels to reduce greenhouse gas emissions. The city should exercise extreme caution in adopting proposed code changes that unnecessarily restrict or drive up the supply of fuels, particularly when some of the very fuels the infrastructure limitations impact are needed to comply with existing laws designed to further environmental goals.

Thank you for the opportunity to comment.

Sincerely,

Sandra McDonough

Sandra McDonough
President & CEO

cc: Portland City Council
Susan Anderson, Bureau of Planning and Sustainability

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: Comment-FossilFuelResolution
Date:	Tuesday, September 13, 2016 9:47:06 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Bonnie McKinlay [mailto:goto350pdx@gmail.com]
Sent: Tuesday, September 13, 2016 9:30 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Comment-FossilFuelResolution

Bonnie McKinlay
7112 SW 53rd Avenue
Portland 97219

Thank you for your meticulous work on evaluating and supplementing the City of Portland's Fossil Fuels Infrastructure Resolution.

Close to 50 years ago, on my 18th birthday, I left my parent's home to come to Portland. This is where I wanted to be---then---and now.

Our City Council took a historic move in unanimously passing the Resolution last fall. I fully support it.
I encourage you to withdraw the amendments that would allow terminals with five million gallon storage capacity, new liquefied natural gas storage facilities, and the construction of "mini terminal" clusters.

Please maintain the original intent of the resolution to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 6:04:54 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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From: Elizabeth Milner [mailto:milnere22@gmail.com]
Sent: Tuesday, September 13, 2016 3:30 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would

allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Elizabeth Milner

From: Elizabeth Milner
Email: milnere22@gmail.com
Address: 6413 se 20th, Portland, Oregon, 97202

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 5:52:27 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Claudia Montagne [mailto:claudia.montagne@gmail.com]
Sent: Tuesday, September 13, 2016 12:08 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

The impacts of climate change on not only Portland but the world, and their disproportionate impacts on countries and individuals least responsible for these negative impacts tell me that climate justice is the issue of our times. Use of fossil fuels is at the root of this crisis. Our future, and the futures of the next generations is at stake. I have been watching our climate change for over 15 years now; it is real, it is accelerating. Portland and Oregon can take a leading progressive role in the change that is needed. I urge the commission to do its part by adopting this new code and strengthening it by banning all new fossil fuel terminals.

Thank you for your thoughtful consideration. Claudia Montagne

From: Claudia Montagne
Email: claudia.montagne@gmail.com
Address: 9136 SW 8th Ave, Portland, Oregon, 97219

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 11:18:08 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
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From: Mary Murphy [mailto:wordpress@350pdx.org]
Sent: Tuesday, September 13, 2016 11:07 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

As a forth generation Portlander and MPH student in Environmental Systems and Human health, I strongly support the city of Portland taking the following actions:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you for acting on behalf of us and future generations.

From: Mary Murphy
Email: mkatem4@yahoo.com
Address: 630 NE Lawrence, Portland, Oregon, 97232

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:27:03 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: jpn5710@everyactioncustom.com [mailto:jpn5710@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 12:03 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
John Nettleton
4311 SE 37th Ave Apt 21
Portland, OR 97202-3265

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 10:34:20 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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-----Original Message-----
From: dnez@everyactioncustom.com [mailto:dnez@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 10:01 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
David Nez
8951 N Van Houten Ave
Portland, OR 97203-6081

OREGON PSR PHYSICIANS FOR SOCIAL RESPONSIBILITY

September 13, 2016

City of Portland Bureau of Planning and Sustainability Planning and Sustainability Commission□

1900 SW 4th Ave, Suite 7100□Portland, OR 97201

Sent via email to: psc@portlandoregon.gov

Re: Fossil Fuel Zoning Testimony

Dear Members of the Planning and Sustainability Commission,

Thank you for the opportunity to comment on the proposed draft of the City of Portland's Fossil Fuel Terminal Zoning Amendments. Recognizing that the amendments are still in draft form, we appreciate any and all the revisions that you support through this process that will reconcile the proposed code changes with the City's November 2015 Fossil Fuel Policy Resolution 37168. We want policy and code to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Along with Columbia Riverkeeper (CRK) and Friends of the Columbia Gorge, whose comments we in part incorporate by reference and repeat here, Oregon PSR supports the prohibition of bulk fossil fuel terminals and assigning existing fossil fuel terminals the status of a legal, nonconforming use. Portland's fossil fuel terminals should use a non-conforming use Type II process if code is to reflect the intention of the City's resolution.

The current proposal as reflected in the September 9, 2016 memo to the PSC does not achieve the City Council's intention to prohibit new major fossil fuel infrastructure, and we urge Planning and Sustainability Commission (PSC) members to make necessary changes to the proposed amendments.

I. The amendments should prohibit new bulk fossil fuel terminals.

Oregon PSR supports the proposed prohibition of bulk fossil fuel terminals. However, the language of the proposed zoning code carves out an exception for potential new terminals by allowing projects up to 5 million gallons of new storage. This volume represents almost 120,000 barrels of crude oil – approximately enough for two unit trains of oil. As noted by CRK, the City's proposed amendments would potentially allow new crude-by-rail deliveries to the Portland area, with each unit train of oil carrying 2.5 to 3 million gallons of crude oil. The City should eliminate the 5 million gallon threshold and prohibit new crude oil facilities, as the cities of Vancouver, Aberdeen, and Hoquiam have done already. To bring the amendments back into alignment with the resolution, the draft should also be revised to prohibit new LNG storage altogether.

II. The Amendments Should Limit Existing Fossil Fuel Facilities and Prevent Aggregation of Projects

Oregon PSR supports the City's proposal to identify existing fossil fuel facilities as legal nonconforming use facilities. By assigning existing facilities this status, the City preserves the ability for these facilities to address safety, seismic, and local market response issues while preserving the City's ability to achieve the larger goal of reducing reliance on fossil fuels.

We ask that the City add to the nonconforming use review the following factors:

- Expansion of existing terminals must be limited to allow operations only with those fuels described in the application. A letter describing those fuels must be submitted each year to the Director of BPS and the Mayor for review.
- Expansion shall not increase greenhouse gas emissions and climate change impacts;
- Expansion shall not increase the risk of fire and/or explosion at either the Bulk Fossil □Fuel Terminal Site, or the transportation route used to convey fossil fuels to or from the □Bulk Fossil Fuel Terminal, and
- Expansion shall not increase the risk of the release of fossil fuels from either the Bulk □Fossil Fuel Terminal Site or transportation equipment or infrastructure used to convey fossil fuels to or from the Bulk Fossil Fuel Terminal, into the environment, the Columbia River or other waterways.

□ Additionally, we ask that the City add language that prohibits the aggregation of smaller projects in order to avoid the 5 million gallon threshold that defines a "bulk fossil fuel terminal." By limiting aggregation and adding more stringent criteria to its nonconforming use review, consistent with the City's resolution, the proposed code changes would not inhibit □ improvements at these existing facilities that address seismic upgrades, safety improvements, or accelerate the transition to non-fossil energy.

III. Focus on Public Safety, Seismic Upgrades and Reducing Risks at Existing Facilities

We urge BPS staff to work with Portland's Bureau of Emergency Management to develop amendments or future code changes that protect the health and safety of Portland residents, consistent with the direction of the resolution.

Attached is a Position Statement from concerned health professionals that reminds us of the threats that oil-by-rail presents

to those who live, work and play in our great city. Please remember that crude oil is but one of many dangerous fossil fuels that threaten our community and our climate.

Thank you for the opportunity to comment on Portland's proposed draft of zoning code amendments to implement Portland's Fossil Fuel Policy Resolution 37168.

Sincerely,

Dr. Patrick O'Herron

President, Oregon Physicians for Social Responsibility

Kelly Campbell

Executive Director,

Oregon Physicians for Social Responsibility

Kelly@Oregonpsr.org

Regna Merritt, PA

Healthy Climate Program Director

Oregon Physicians for Social Responsibility

Regna@Oregonpsr.org

Oregon Physicians for Social Responsibility
1020 SW Taylor Street, Suite 275
Portland, Oregon 97205

Briefing: Oil-by-Rail Cargo Movement in Multnomah County

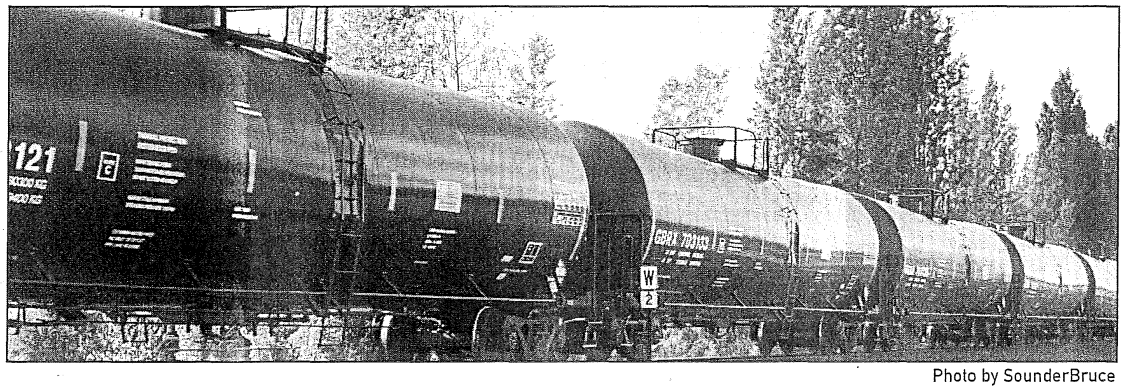


Photo by SounderBruce

PURPOSE

The purpose of this study is to:

1) Assess the potential negative impact of an accident involving train car(s) carrying crude oil traveling through populated areas in Multnomah County, and

2) Estimate whether the potential negative impact of an accident involving train car(s) carrying crude oil would be disproportionately experienced by environmental justice communities.

BASIS FOR ASSESSMENT

Oil-by-rail poses risks to the public because of the following factors:

- Transport by rail of hazardous materials such as crude oil and natural gas have increased 340 percent since 2012.[1]
- Most oil is currently carried in outdated tank cars prone to puncture, spills, and fires in train accidents.[2]
- Bakken crude is more volatile and flammable than most other crude oil.[3]
- Nine significant train derailments have occurred in North America since July 2013, one of which resulted in multiple fatalities and injuries.
- Impact from a major incident involving an oil train will extend beyond the immediately impacted area due to a toxic smoke plume, and stress and trauma to the population.
- The rapid increase of oil by rail has eclipsed the response capabilities of the local emergency responders and funding for those capabilities has not kept pace.[4]

Multnomah County
Office of Sustainability

Contact
Tim Lynch, Senior Policy Analyst
Office of Sustainability
tim.j.lynch@multco.us

January 2016

BACKGROUND

With the rapid development of the Bakken oil fields in North Dakota and Canada, and ongoing development of Canadian oil sands, shipments of crude oil-by-rail (OBR) have increased dramatically in the Northwest since 2012.[5] Due to this oil boom Oregon has become a throughway for crude oil traveling by rail destined for transfer terminals or refineries in Oregon, California, and Washington States. The total volume of OBR shipments transiting through the County is unknown. An emergency order issued by the U.S. Department of Transportation, however, requires that the carriers with a train containing more than 1,000,000 gallons of Bakken crude report to the State Emergency Response Commission. Currently, BNSF Railway and Portland and Western Railways both meet the criteria for Multnomah County. BNSF has 0 - 9 trains per week meeting the threshold while Portland and Western has 0 - 3 trains per week meeting the threshold.

Expansion of oil transfer and distribution terminals, if approved, will increase OBR shipments through Multnomah County. Currently, Port Westward, near Clatskanie, Oregon, is receiving 120,000 barrels of crude each day for reloading onto ocean going vessels. The proposed Vancouver Energy oil terminal at the Port of Vancouver, WA would ship up to 360,000 barrels of crude oil each day. If all of the 13 proposed or expanded oil facilities are built in Oregon and Washington, over one million barrels of oil will be shipped daily over Northwest rails lines.[6]

The dramatic increase in OBR shipments present safety concerns. Although overall incidents of rail cargo accidents is low, since 2010 there have been 11 fires, 6 explosions, and 9 evacuations in North America due to incidents involving ORB (Table 1 details several high profile OBR accidents). The number of reported OBR related incidents in the United States rose to 144 in 2014 from just one in 2009.[7] Several high profile derailments, spills, and explosions have raised widespread concern about the risks of moving crude by rail. An accident in Lac-Mégantic, a small town in Quebec, killed 47 people in the summer of 2013.[8] New federal rules, which take full effect in 2018, will require enhanced safety for rail cars carrying crude oil, including replacement or retrofit of outdated tanker cars, but those rules will not be fully implemented until May 1, 2025[9] and would not fully obviate the low probability but high impact potential of an accident.

DATE & LOCATION	DESCRIPTION
7/5/13 Lac-Mégantic, Quebec, Canada	An unattended freight train transporting petroleum crude oil rolled down a descending grade and subsequently 63 cars derailed. The subsequent fires, along with other effects of the accident, resulted in the confirmed deaths of 47 individuals. Extensive damage to the town center and the evacuation of approximately 2,000 people.
10/19/13 Gainford, Alberta, Canada	9 tank cars of propane and 4 tank cars of crude oil derailed. About 100 residents were evacuated. 3 propane cars burned, but the oil cars pushed away and did not burn.
11/7/13 Aliceville, Alabama	26 cars derailed, resulting in 11 cars impinged by a crude oil pool fire. An undetermined amount of petroleum crude oil escaped from derailed cars and found its way into wetlands area nearby the derailment site.
12/30/13 Castleton, North Dakota	A separation derailment resulted in the derailment of 21 cars of petroleum crude oil. 18 cars ruptured, and an estimated 400,000 gallons of petroleum crude oil was released. The ruptured tank cars ignited, causing a significant fire. Approxi mately 1,400 people were evacuated.
1/7/14 Plaster Rock, New Brunswick, Canada	17 cars of a mixed train hauling crude oil, propane, and other goods derailed. 5 cars carrying crude oil caught fire and exploded. 45 homes were evacuated but no injuries were reported.
4/30/14 Lynchburg, VA	105 tank cars loaded with petroleum crude oil derailed. Seventeen cars derailed, and one breached. A fire ensued. 350 evacuated from immediate area. Three cars came to rest in James River, spilling up to 30,000 gallons of oil into river.

Table 1: Recent oil train incidents in the United States and Canada[10]

Risks posed to Multnomah County residents from OBR include the potential for oil train explosions or spills as a result of derailment or rupture; increased particulate emissions from locomotive exhaust; congestion and collision along roadways and rail lines; and associated health impacts including injury and death.

Fires involving crude oil and/or fuel oil have several challenging aspects worth noting. Oil fires must be suppressed using specialized foam, and also release a noxious plume of toxic smoke. Only 10% of fire agencies in the State of Oregon are trained and equipped to respond with foam for an oil fire and 81% do not have the proper equipment to respond to a crude oil incident.[11] In addition, and depending on wind speed and direction, the plum from an oil train fire can greatly increase the area impacted by such an incident. For example, the Casselton, ND explosion and ensuing toxic cloud led to a five mile evacuation zone to the south and east of the incident.[12]

Concern about safety is also heightened because of population proximity to rail lines. A Multnomah County Health Department analysis (The Human Health Effects of Rail Transport of Coal Through Multnomah County, Oregon, February 2013) found that a large portion of the County's population lives near rail lines. The demographics of this study also suggested that people of color make up a larger portion of the population in areas near rail lines than they do in the County as a whole, raising environmental justice concerns with ORB transport.

Because of the novelty and rapid increase of OBR shipments in Multnomah County, combined with the proximity of rail lines to population centers and the risk to public safety, the Multnomah County Office of Sustainability undertook this assessment. The Multnomah County Office of Emergency Management and Multnomah County Health Department also provided important data and review. In addition, Oregon Physicians for Social Responsibility raised concerns to Multnomah County on the potential risk posed by oil trains to the public.

FINDINGS

Accidents involving rail cargo are relatively rare given the total volume of cargo shipped by rail. Accidents do occur, however. During the last decade, overall rail accidents have declined, along with accidents involving the transport of hazardous materials. According to the Federal Railroad Administration, the number of derailments on long-haul tracks in the United States has declined by around 21 percent since 2009 (to 2014). Of that decline in overall derailments, however, the number of accidents related to fire or violent rupture nearly doubled from 20 in 2009 to 38 in 2014.[13]

Since 2012 there have been 27 rail accidents in Multnomah County representing 34% of all rail accidents statewide during the same period. Statewide, derailments account for 85% of total accidents, while side collisions and fire/violent-rupture account for 5% of total accidents (see appendix A for more details).[14] The severity of an incident involving OBR depends on a complex mix of factors. These factors include the type of accident (derailment, spill, fire and/or explosion), the number of rail cars involved, the location of the incident, and the time of day and weather conditions when the incident occurs. The likelihood of a major accident from an oil train derailment, fire, and/or explosion is small, but the impact from such an incident would be high.

Additive factors combine to raise the overall level of concern for OBR shipments through Multnomah County. These factors include the especially volatile nature of the crude being transported, lagging federal safety rules for rail cars, the insufficient local emergency response capability, and the proximity of OBR shipments to heavily populated areas.

The Oregon Office of the State Fire Marshal recommends that in the event of a large oil train incident/spill, initial downwind evacuation should be at least 1,000 feet (300 meters). Further, if the tank or car is involved in a fire, officials should isolate and consider evacuation for 0.5-mile (800 meters) in all directions.[15] The impacts of the incident are likely to be felt over a much wider area, however, with toxic smoke from the plume impacting downwind communities.

An analysis of 2010 Census data showed that 26% of residents in Multnomah County live within a half-mile of rail lines that carries OBR. The same analysis revealed that 108 schools are also located within a half-mile of OBR rail lines, as well as 100 child care facilities within the evacuation zone.

Not only does OBR pose a threat to public health and safety generally, increased transport of crude is an environmental justice issue in Multnomah County. A demographic analysis of the 0.5-mile evacuation zone shows that Black/ African Americans in Multnomah County are 1.8 times more likely to live in the evacuation zone as compared to Whites. Pacific Islanders in Multnomah County are 1.48 times more likely to live in the evacuation zone as compared to Whites. In addition, there is a significantly higher proportion of Multnomah County's Pacific Islander population located in the evacuation zone as compared to Whites. Conversely, Asians are significantly underrepresented in the evacuation zones, and no meaningful difference between Latinos and Whites. Overall, people of color represent a greater percentage people in the evacuation zone (26.2%) versus general population (23.5%).

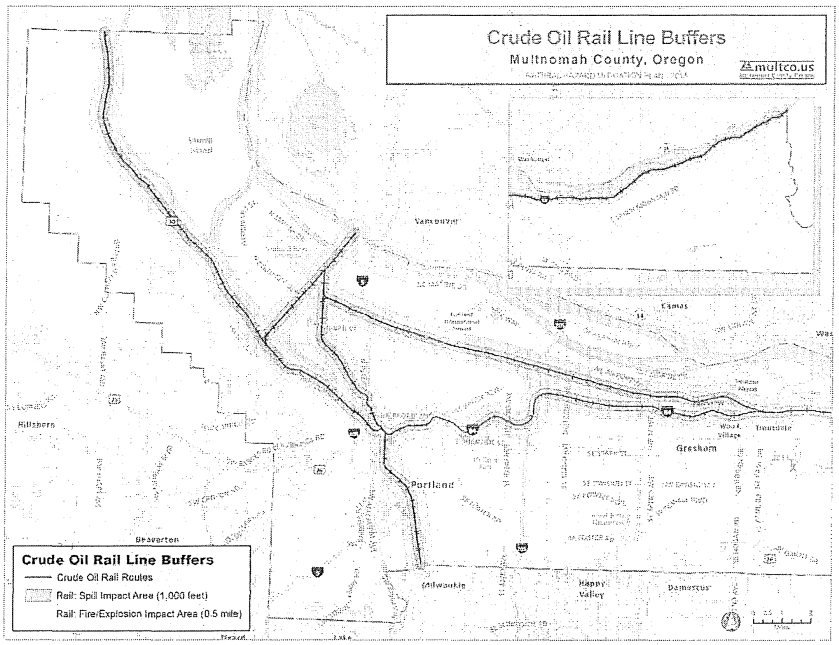


Figure 1: Oil-By-Rail Line Impact Buffers in Multnomah County

In addition to the human health impacts of OBR incidents, significant physical assets are also located with the evacuation zone. An analysis conducted by the Multnomah County Office of Emergency Management found that over $25 billion dollars in infrastructure is located within a half-mile of OBR tracks.

Table 2 on the following page shows the approximate number of parcels/buildings and improved value.

SUMMARY OF FINDINGS

- Up to 12 trains a week carry 1,000,000 gallons of crude oil through Multnomah County.
- Smaller shipments of crude oil are not reported on, but do pass through Multnomah County regularly.
- More than a quarter of the Multnomah County population lives within the half-mile "evacuation zone" around the oil transport route.
- 108 schools and a 100 child care facilities are within the evacuation zone.
- People of color are more likely to live within a half-mile of a rail line.
- Over $25 billion dollars of improved property is within a half-mile of rail lines in Multnomah County.
- The potential negative impacts of an oil train accident are heightened due to the volatility of the oil and the special equipment needed to extinguish it.
- Proposed new or expanded oil facilities in the NW will increase volumes of OBR transiting through Multnomah County.
- The lifting of the US oil export ban in 2015 is likely to increase pressure for new or expanded oil facilities in the Northwest.
- Emergency responders do not have adequate equipment to respond to a large scale OBR event.
- New safety requirements for rail cars carrying crude oil won't be fully implemented until 2025.

This briefing is not intended as a comprehensive analysis of all potential risks posed by OBR. Nor does this briefing capture potential benefit from increased OBR activity, for example new jobs. Further study and analysis is needed to create a comprehensive assessment. It is the finding of this briefing, however, that potential for serious and grave injury to life and property in Multnomah County warrants additional public scrutiny up to and including public policy that will protect public health and safety.

LOCATION			
Fairview	2,118	2,360	$392,328,560
Gresham	630	1,088	$727,378,680
Lake Oswego	0	0	$0
Maywood Park	272	318	$45,656,950
Portland	65,068	62,035	$22,319,588,560
Troutdale	968	880	$264,319,340
Wood Village	605	2,622	$105,731,230
Unincorporated Area	1,607	811	$1,937,644,260
MULTNOMAH COUNTY TOTAL	71,268	70,114	$25,792,647,580

Table 2: Exposure of Improved Property to Crude Oil Rail Hazardous Materials Spill

APPENDIX A

Impact Buffer Selection

Oregon Department of Transportation (ODOT) maintains records on which rail lines are used to carry crude oil by rail throughout Oregon. This study used the data provided by ODOT to examine these rail lines in Multnomah County using ArcGIS. A buffer analysis was used to estimate which populations were most likely to be impacted in case of an accident involving rail cars that are carrying crude oil. A buffer of 0.5-miles was used to analyze the area most likely to be impacted in the event of an accident involving crude by rail.

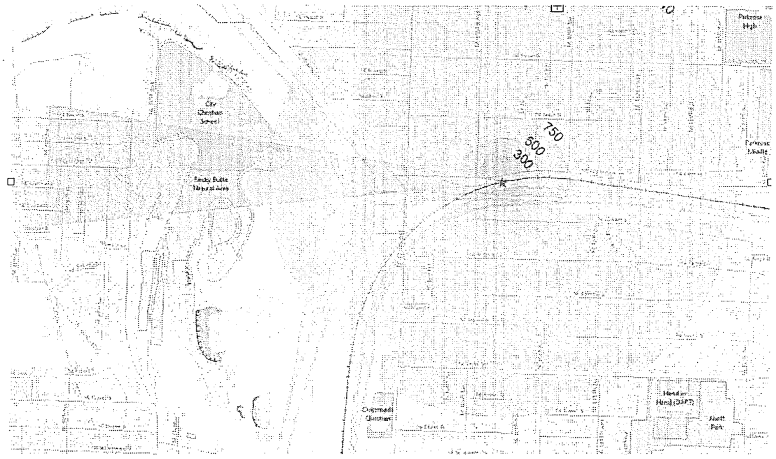


Figure 2: I-84 Crash Zone with plume (PBEM Desktop Exercise - OBR fire)

Various agencies including the federal Department of Transportation's Pipeline and Hazardous Materials Safety Administration have issued initial response guidelines codified in the Emergency Response Guidebook. For an incident involving a single oil tank car (whether truck or train), the primary set of responses is codified under response protocol 128 for petroleum crude oil, or UN hazmat code 1267. That guideline recommends initial evacuation range of 800 meters (approximately 0.5-miles) for a single burning car.[17] The Oregon Office of the State Fire Marshal also recommends that in the event of a large oil train incident/spill, initial down-wind evacuation should be at least 1,000 feet (300 meters). Further, if the tank or car is involved in a fire, officials should isolate and consider evacuation for 0.5-mile (800 meters) in all directions.[18] Therefore, the buffer area that was selected for this analysis is 0.5-mile (fire/explosion area) as the most likely area of impact in case of an emergency and is referred to in this report as the evacuation zone.

The 0.5-miles evacuation zone is a simplified version of what in practice is a highly complex set of potential responses by first responders and other safety personnel. Fire officials have the ability to model the plume based on the actual situation, similar to Figure 2. In practice, the evacuation zones may be much smaller (a single tipped car with no puncture in Seattle led to no evacuation) or much larger.

Appendix B

Rail Accident Data Multnomah County / State of Oregon

ACCIDENTS IN DESCENDING FREQUENCY BY TYPE

Selections: Railroad Group - ALL RAILROADS SELECTED, State - Oregon, County - MULTNOMAH All Regions
All Causes / All Types of Accidents / All Track Types
January through September 2015

	Accs	Pct of Total	2012	2013	2014	2014	2015			
GRAND TOTAL	27	100.0	5	9	10	6	3	100	11.1	-50
01 Derailments	24	88.9	5	6	10	6	3	100	66.7	-50
12 Other Impacts	2	7.4	.	2	.	.	.	.	.	.
09 Obstruction Impact	1	3.7	.	1	.	.	.	.	.	.

Selections: Railroad Group - ALL RAILROADS SELECTED, State - Oregon, County - All Counties, All Regions
All Causes / All Types of Accidents / All Track Types
January through September 2015

	Accs	Pct of Total	2012	2013	2014	2014	2015			
GRAND TOTAL	79	100.0	16	24	24	16	15	50	.	-6.3
01 Derailments	67	84.8	10	20	23	15	14	130	15	-6.7
12 Other Impacts	4	5.1	2	2	.	.	.	.	.	.
09 Obstruction Impact	3	3.8	1	1	.	.	1	.	.	.
04 Side Collision	2	2.5	1	1	.	.	.	.	.	.
11 Fire/Violent Rupture	2	2.5	1	.	1	1	.	.	.	.
13 Other Events	1	1.3	1	.	.	.	.	.	.	.

Appendix C

Estimated Population Within Evacuation Zone of Rail Lines Transporting Crude Oil In Multnomah County and Environmental Justice Analysis

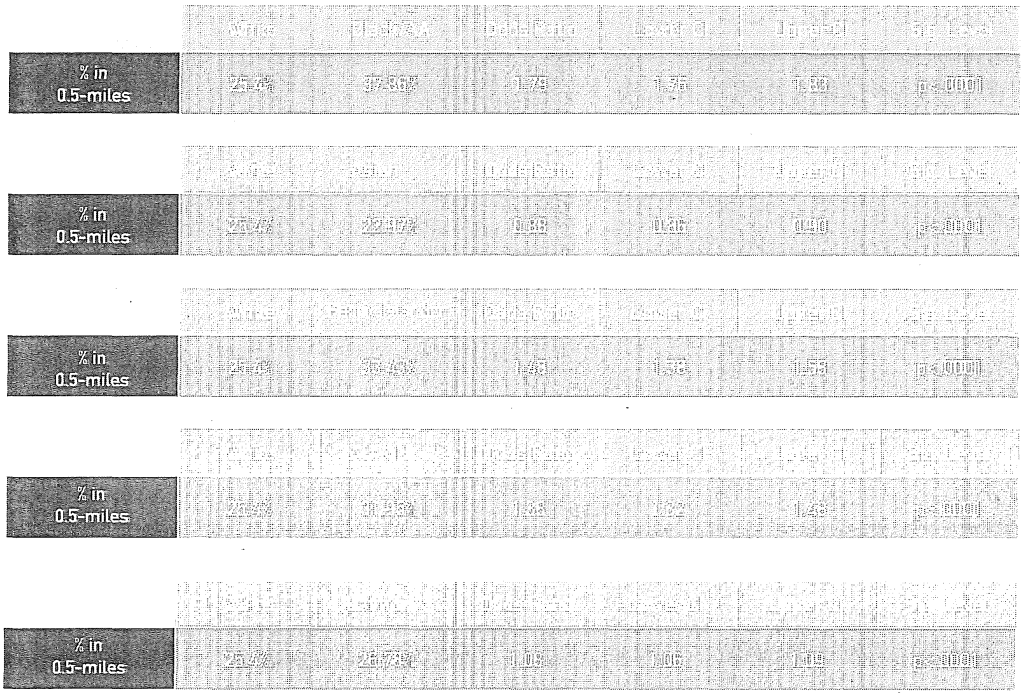
Population Group	Multnomah County	% of Total Population	Evacuation Zone (0.5-mile from railway)	% of Total Population in Evacuation Zone
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Age				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Race				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ethnicity				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Source: 2010 U.S. Census

Analysis Note: Census blocks were selected that intersect a half-mile buffer around rail lines that are identified by Oregon Emergency Management as transporting crude oil. Some of the Census blocks selected have areas that extend further than a half-mile from the rail line so this analysis may over-estimate the number of persons within the evacuation zone.

Environmental Justice Analysis, Statistical Test for Significance

Method:
Statistical tests - 2 x 2 Chi-Square tests (White, including Latinos compared to each racial group)



Note: Though the test is statistically significant, Whites and Latinos are about equally likely to be located in the evacuation zone.

FOOTNOTES

[1] Borrud, Hillary. "ODOT Says Oil Train Shipments on the Rise." Portland Tribune 14 November 2015

[2] New York State. Transporting Crude Oil in New York State: A Review of Incident Prevention and Response Capacity. Albany New York, 30 April 2014.

[3] New York State. Transporting Crude Oil in New York State: A Review of Incident Prevention and Response Capacity. Albany New York, 30 April 2014.

[4] Oregon State Police, Office of State Fire Marshal. Survey Findings and Recommendations on Crude Oil. Salem Oregon, 5 March 2015.

[5] Port of Portland. Port of Portland Statement Regarding Crude Oil by Rail. Portland, Oregon. 2014.

[6] Place, Eric De. The Northwest's Pipeline on Rails. Sightline Institute. July 2015.

[7] Mackrael, Kim. "Gaps in the System: Is Rail Safety on the Right Track?" The Globe and Mail 4 June 2015. Print.

[8] Place, Eric De. The Northwest's Pipeline on Rails. Sightline Institute. July 2015.

[9] United States. U.S. Department of Transportation. DOT Announces Final Rule to Strengthen Safe Transportation of Flammable Liquids by Rail. Washington, 1 May 2015.

[10] Bakken Crude Oil Pamphlet distributed by the NW Area Committee, February 2015

[11] Oregon State Police, Office of State Fire Marshal. Survey Findings and Recommendations on Crude Oil. Salem Oregon, 5 March 2015.

[12] Forest Ethics. Crude Injustice on Rails: Race and the Disparate Risk from Oil Trains in California. June 2015.

[13] Russell Gold and Paul Vieira. Wrecks Hit Tougher Oil Railcars. The Wall Street Journal. March 9, 2015.

[14] United States Department of Transportation. Federal Railroad Administration Office of Safety Analysis: http://safetydata.fra.dot.gov/. Washington, D.C., 2015.

[15] Office of State Fire Marshal Survey Findings and Recommendations on Crude Oil, January 8, 2015

[16] Improved value is estimated based on the building value associated with parcels that have been identified as being located in the 0.5-mile buffer, since building footprints were not associated with dollar value data.

[17] Forest Ethics. Crude Injustice on Rails: Race and the Disparate Risk from Oil Trains in California. June 2015.

[18] Office of State Fire Marshal Survey Findings and Recommendations on Crude Oil, January 8, 2015

Position Statement on Crude Oil Transport and Storage

To Governors of Washington & Oregon

From Concerned Washington & Oregon Health Care Professionals*

Energy companies have proposed increases in oil-by-rail transport and storage in the states of Washington and Oregon with subsequent ocean shipments from Pacific Northwest ports. While there was no movement of oil-by-rail in Washington three years ago, dramatic increases in oil extraction from the Bakken fields in North Dakota and Montana and from Canadian oil/tar sands have occurred with significant increases in oil-by-rail traffic. If current proposals are allowed to proceed, the volume of oil-by-rail coming into Washington would increase from the current 19 trains per week to as many as 137 trains per week, each about 1.5 miles long. Each would carry approximately 2.9 million gallons of volatile crude to be stored, in some cases refined, and then exported to other states. This is a larger daily volume than would flow through the proposed Keystone XL pipeline. Trains also carry Bakken oil through Oregon to California, and barges carry it from Oregon ports on the Columbia River to Washington and California refineries via the Pacific Ocean. If the federal crude oil export ban were lifted, the number of crude-by-rail trains and barges traveling through Washington and Oregon could increase significantly more than currently projected.

The known risks associated with oil-by-rail transport, oil tank storage, and oil export by vessel pose an unacceptable threat to human health and safety. As concerned Washington and Oregon health care professionals, we are deeply troubled by the public health and safety impacts of these proposals.

A thorough review of data published in peer-reviewed medical journals and other reliable sources is summarized below, and the findings are discussed in greater detail in Appendices A-F.

* Statement prepared by Washington & Oregon Physicians for Social Responsibility, released February 2015

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Summary of Major Risks
Major health risks of the proposed oil-by-rail transport, storage, and vessel export in Washington and Oregon include:

1) Delay of emergency vehicles (See Appendix A, Appendix B)
- Proposed routes in WA could cause emergency services delays in up to 93 towns and cities;[114] and
- In Oregon, 88 communities currently have at-grade crossings over which unit oil trains operate.[77]

2) Oil rail car fires, spills, explosions and derailments (See Appendix A)
- Bakken crude is more volatile and flammable than most other crude oil;[88]
- Most is carried in hazardous tank cars (DOT-111s) prone to puncture, spills and fires in train accidents;[23, 73]
- Nine significant train derailments have occurred in North America since July 2013,[114] one of which resulted in multiple fatalities and injuries;
- Between June 2011 and December 2013, train derailments occurred on average every 3.5 days in the Northwest;[27]
- Three million Washington residents and more than half a million Oregon residents live within a recommended evacuation zone as defined by the US Department of Transportation;[108, 114] and
- Rescue and cleanup crews face risks of toxic exposures, in addition to risks of fires. (See number 5 below)

3) Adverse health impacts of train noise (see Appendix A)
- Train noise in populated areas is associated with significant sleep disturbance;[1]
- Increased cardiovascular events including myocardial infarction and arrhythmia are associated with nighttime noise and noise exposure greater than 90 decibels (in the range of train horns);[95,100] and
- Adverse cognitive performance and increased psychiatric illness have been observed in children exposed to noise.[45]

4) Oil storage tank spills, fires and explosions (See Appendix B)
- Major fires and explosions of petroleum products have occurred at storage terminals within the past 10 years (e.g., Hertfordshire, England, 2005; Raleigh, Mississippi, 2006);
- Should a fire or explosive event occur at proposed sites located in close proximity to schools and residential areas, injuries and deaths would likely occur; and
- Several proposed storage tank sites would be located in an earthquake and tsunami zone, [37] increasing the risk of spills, fires and explosions.

5) Oil spills during loading and vessel transport (See Appendix C, Appendix D)
- Crude oil exposure during spill and cleanup increases the risk of neurotoxicity, cancer, lung disease, loss of cognitive function, and endocrine disruption in humans;[13, 21, 63]
- Dispersant chemicals used in cleanup are also highly toxic and associated with increased risks of cancer, lung and endocrine diseases.[66, 103]

6) **Increased air pollution**, including diesel particulate matter (See Appendix A)

- Accounts for the majority of air-toxic cancer risks in the Puget Sound area;[33, 90]
- Increased risks of cancers, particularly lung and breast cancer;[6, 9, 18, 26, 29, 32, 98, 117]
- Lower infant birth weight and increased risk of respiratory death in first year of life;[22, 75, 121]
- Impaired pulmonary development and increased risk of lung disease in infants,[55] children,[16, 36, 123] and adolescents;[36]
- Increased risk of neurodevelopmental and behavioral disorders in children;[8, 15, 74, 82, 83, 93, 111, 112]
- Increased risk of asthma diagnosis, exacerbation of symptoms, and asthma-related hospitalizations;[11, 16, 25, 41, 46, 81, 98, 99, 104]
- Increased risks of acute cardiovascular and cerebrovascular events;[10, 14, 30, 65, 69, 70, 84, 85, 87, 92, 97, 118, 119]
- Enhanced reactions to airborne allergens and immune system impairment;[38, 47, 67] and
- Increased risks of acute and chronic obstructive lung disease,[46] systemic inflammation, and overall risk of disease and mortality.[6, 29, 30, 61, 70, 87, 89]

7) **Increased water pollution** (See Appendix E)

- Cancer, digestive, and reproductive health risks associated with oil-contaminated drinking water sources;[3, 4, 105]
- Reduced short- and long-term viability of food sources, including salmon and shellfish;[51, 94, 114] and
- Pollution of tribal fishing resources.[20, 39, 80, 114]

8) **Contributions to climate change-induced injury and disease** (See Appendix F)

- Increased heat related illness and health care costs;[54, 57, 68]
- Increased extreme weather events with associated injuries and deaths;[5, 52, 54, 72]
- Food supply disruption;[64]
- Spread of infectious diseases;[64] and
- Disproportionate adverse effects on low income and communities of color.[52]

As Washington and Oregon health care professionals, we oppose the transport by rail and the storage and shipment of crude oil within our states on the basis of very serious, credible threats to the health of our residents. Further, we call upon the Governors of Washington and Oregon, as well as agencies in both states, to deny permits that facilitate the transport, storage and handling of crude oil by rail and/or barge.

Appendices:

Appendix A: Summary of Health Risks for Crude-by-Rail Transport
Appendix B: Summary of Health Risks for Oil Tank Storage
Appendix C: Summary of Health Risks for Oil Export by Marine Vessels
Appendix D: Washington & Oregon Oil Transport Routes & Oil Spill Response Plans
Appendix E: Overview of Water Pollution Risks & Sources
Appendix F: Summary of Health Risks from Climate Change
Appendix G: References

Appendix A:
Summary of Health Risks for Crude-by-Rail Transport

1. Delay of Emergency Vehicles:

- A total of 93 cities and towns and approximately 3 million Washington residents live on or near the crude-by-rail train routes. Crude-by-rail train routes pass through 38 heavily populated cities and towns in Washington, delaying traffic and emergency vehicle routes.
- In Oregon, 88 communities, including the state's largest, have at-grade crossings over which unit trains now operate. Mile-long oil trains can potentially operate over 403 crossings (ODOT, 2015).
- Emergency vehicle delay at railroad crossings could result in increased fatalities. Five to ten minute delays in emergency medical service (EMS) can critically alter chances for survival, particularly in the case of cardiovascular and respiratory emergencies as well as trauma. The additional blocked traffic at train crossings could make the difference between life and death.
- Example: Individual commercial streets in Aberdeen would be blocked for 17 minutes per train, given their length and mandated 5 mph speed within the city. A projected increase of 6-10 trains per day, multiplied by 17 minutes each, means a total blockage time of 12-20 hours per week.

2. Rail Car Fires and Explosions:

- The Pipeline and Hazardous Materials Safety Administration has concluded that crude oil from the Bakken Shale region of North Dakota is more flammable and more dangerous to ship than crude oil from other regions (2014).

  Train Derailment Statistics & Bakken Explosion Events
  - Trains carrying crude oil on major US railroads have increased from 9,500 carloads in 2008 to 415,000 carloads in 2013 (US DOT, 2014).
  - In 2013 the US Department of Transportation reported 154 rail car "failures" and 116 "episodes" involving tank cars carrying crude oil (US DOT, 2014).
  - The Sightline Institute has tracked derailments in the Northwest from June 2011 through December 2013. Their calculations map 276 reported derailments over a 31-month period – an average of 8.9 derailments per month, or one every three-and-a-half days (de Place & Abbotts, 2014).
  - The heads and shells of DOT-111 tank cars, which carry much of the nation's crude-by-rail, can almost always be expected to breach in derailments that involve pileups or multiple car-to-car impacts (NTSB, 2012).
  - Severe accidents involving oil train derailments have increased significantly in recent years, resulting in explosions, fires, and multiple deaths. Recent incidents include:
    - July 2013: a 79-car train carrying Bakken crude oil derailed in Lac-Mégantic, Quebec, killing 47 people.
    - December 2013: several explosions sent flames and mushroom clouds into the air when a 106-car train derailed in Casselton, North Dakota.
    - April 2014: a train derailed into the James River in Lynchburg, Virginia, sending burning volatile compounds into the water.

3. Increased Air and Diesel Particulate Matter (DPM) Pollution:

- Diesel exhaust from train engines is made up of a number of substances with gaseous and soot (particulate) components. Gaseous components include carbon monoxide, nitric oxide, nitrogen dioxide, sulfur oxides, and polycyclic aromatic hydrocarbons (PAHs). Diesel exhaust particulate is comprised of carbon particles, organic components (including PAHs), and trace metals. Individuals living in proximity to trains are vulnerable to inhalation of diesel gases and particulate matter.
- The World Health Organization's (WHO) International Agency for Research on Cancer (IARC) specifically classifies diesel engine exhaust as "carcinogenic to humans" (Simon, 2013).
- Fine particulate matter, categorized as less than 2.5 microns ($PM_{2.5}$), is especially harmful to humans because of its potential to deeply penetrate the alveoli of the lungs, resulting in lung inflammation. Additionally, exposure to particulate matter and gaseous pollutants such as benzene and PAHs is linked to systemic inflammation, increasing risk of disease and mortality (Avogbe et al., 2004; Dominici et al., 2006; Mustafic et al., 2012; Pieters et al., 2012).
- The US Environmental Protection Agency (EPA) placed the Puget Sound area in the top 5% nationally for potential cancer risk from air toxics (1996).
- DPM poses the largest potential cancer risk of all air toxics in the Puget Sound area (PSCAA, 2011).
- Fetuses, infants, children, the elderly, and those with preexisting disease or impaired immune systems are particularly vulnerable to health impacts from DPM air pollution.
- Even low levels of DPM below current federal standards have been linked to adverse health effects in children, the elderly, and other vulnerable populations (EPA, 2009).

Given this information, it is not surprising that many studies have demonstrated adverse health impacts associated with exposure to ambient air pollution in general and to diesel particulate matter specifically, including:

Cancer

- Increased cancer rates, particularly lung and breast (Beeson et al., 1998; Crouse et al., 2010; Demetriou et al., 2012; Dockery et al., 1992; Wei et al., 2012)
- DPM contributes 78% of the risk for cancer from airborne toxics in the Puget Sound area (PSCAA, 2015)
- Increased biological markers associated with risk of lung cancer (Demetriou et al., 2012)
- Increased oxidative DNA damage predictive of cancer risk (Avogbe et al., 2004)

Cardiovascular Diseases

- Higher rates of heart attack and stroke (Chen et al., 2013; Dominici et al., 2006; Lue et al., 2013; Mustafic et al., 2012; Qian et al., 2013; Wellenius et al., 2012; Shaw et al., 2013; Brook et al., 2010)
- Increased cardiovascular disease, overall mortality and morbidity for short- and long-term $PM_{2.5}$ exposure (Brook et al., 2010)
- Increased hospitalization for cardiac arrhythmias (Peters et al., 2000)

- Increased probability of hospitalization for acute myocardial infarction (Mustafic et al., 2012; Peters et al., 2001)
- Increased ischemic heart disease, arrhythmias, congestive heart failure (Dominici et al., 2006) and biomarkers (HRV) associated with cardiac morbidity and mortality (Pieters et al., 2012)

Cerebrovascular Diseases

- Increase in hospital admissions for strokes (Dominici et al., 2006; Lue et al., 2013; Wellenius et al., 2005)
- Significant increase in stroke mortality (Chen et al., 2013; Qian et al., 2013)
- Increased risk of stroke associated with increased exposure to fine particulate matter ($PM_{2.5}$), black carbon, and nitrogen dioxide (Wellenius et al., 2012)
- Increased risk of stroke and death from stroke for postmenopausal women (Miller et al., 2007)

Neurodevelopmental Disorders

- Higher rates of neurodevelopmental disorders in children (prenatally exposed) such as autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), lowered IQ, and adverse behaviors (Becerra et al., 2013; Chiu et al., 2013; Newman et al., 2013; Perera et al., 2013; Perera et al., 2009; Roberts et al., 2013 Volk et al., 2013; Volk et al., 2011).
- Increased behavioral symptoms such as anxiety, depression, social problems, rule breaking, and aggression in children (Perera et al., 2013)

Pulmonary Diseases and Disorders

- Respiratory deaths in infants during first year of life and lower infant birth weights (Woodruff et al., 2006; Dadvand et al., 2012; Olsson et al., 2013)
- Impaired lung development in children (Gauderman et al., 2004; WHO, 2005)
- Impaired pulmonary development in adolescents and measurable airway inflammation (Gauderman et al., 2004)
- A 6% higher risk of infant bronchiolitis (Karr et al., 2009) and significantly increased risk of asthma diagnosis with early life exposure to traffic-related air pollution (Clark et al., 2010)
- Increased frequency and severity of asthma attacks in children (Slaughter et al., 2003)
- Overall decreased lung function (WHO, 2003)
- Increased asthma rates and exacerbation of preexisting asthma and chronic obstructive pulmonary disease (COPD) (Carlsten et al., 2011; Gowers et al., 2012; Delamater et al., 2012; HEI Panel, 2010; Trasande & Thurston, 2005; Simon, 2013)
- Worsening asthma symptoms and increased hospitalization (Delameter et al., 2012; Gowers et al., 2012; HEI Panel, 2010; Pandya et al., 2002)

Reproductive and Developmental Disorders

- Reduced sperm quality in men exposed to air pollution, particularly diesel exhaust (De Rosa et al., 2003)

- Disruption of normal sexual differentiation during fetal development, including 2.42% higher odds of male cryptorchidism (undescended testes) amongst babies of fathers exposed to diesel exhaust before conception (Kurahashi et al., 2005)
- Increased congenital heart, lung, and immune system anomalies in children (Gauderman et al., 2004; Vrijheid et al., 2011)
- A 10 microgram increase in DPM (2.5) is associated with a 3.4% increase risk in daily mortality (Laden et al., 2000)
- In 2005 the World Health Organization published a summary of the health risks of air pollution on childhood health and concluded that "sound evidence already exists for a causal link between air pollution and children's health" (WHO, 2005, p.7)
- In the same document the WHO recommended that policy makers take measures to reduce childhood exposure to air pollution (WHO, 2005)

Multi-System and Overall Mortality

- Increased cardiovascular, pulmonary, and overall mortality (Dockery et al., 1993; Pope et al., 2002)
- Long-term exposure linked to decreased life expectancy from cardiopulmonary mortality (Krishnan et al., 2012; WHO, 2014)

4. Adverse Health Impacts of Train Noise and Vibration:

- Environmental noise pollution is a growing concern, and several studies have documented negative health consequences of chronic noise including sleep disturbance, cognitive impairment, cardiovascular disease and psychiatric disorder (Goines & Hagler, 2007; Babisch, 2005).
- Noise and vibrational effects from rail traffic vary from idling, screeching, and horn sounding. Horn sounding poses the most significant to risk to human health.
- The U.S. Department of Transportation's "Train Horn Rule" (49 CFR Part 222) requires engineers to sound train horns at 96 to 110 decibels (dB) fifteen to twenty seconds in advance of all public grade crossings (US DOT, 2005).
- The World Health Organization's "Guidelines on Community Noise" (1999) states that sleep disturbances and risk of adverse health effects of noise have been observed at 45 dB or less, recommending that noise events exceeding 45 dB be "limited if possible" (p. 8).

Despite public safety mitigation in some urban areas where quiet zones have been established, a growing body of research demonstrates that continuous noise, as well as intermittent nocturnal noise and vibrations, result in sleep disturbances and can cause impaired cognitive function and cardiovascular effects.

Sleep Disturbance

- Studies have demonstrated that outside nocturnal noise >50 decibels (dB) is associated with sleep disturbance, that railway noise has greater impacts than road noise, that intermittent noise is more sleep-disruptive than continuous noise, and that even one railway noise event during sleep significantly decreases rapid eye movement (REM) sleep (Aasvang et al., 2011; Carter, 1996).
- A recent case-control experimental study found that train transportation noise and subsequent vibrations led to a significant acceleration of heart rate of at least 3 beats

per minutes in 79% of sleeping participants after experiencing high-vibration periods produced from trains passing. These nocturnal heart rate accelerations are believed to potentially affect long-term cardiovascular health for populations living in close proximity to railroads with frequent rail traffic (Croy et al, 2013).

- Millions of people living along these rail lines will be at risk for disrupted sleep and associated health risks from proposed rail traffic volume (Kim et al., 2012; Hume et al., 2012).

Cardiovascular Effects

- New epidemiological studies support previous evidence that night-time noise and noise in excess of 90 decibels are associated with cardiovascular disease including risk of acute coronary events, myocardial infarction, arrhythmia, accelerated hypertension, and stroke (Hume et al., 2012),
- More specifically, the elevation of stress hormones such as epinephrine and cortisol resulting from high decibel noise exposure increases endogenous risk factors of heart disease from both short-term and chronic exposures (Ising & Kruppa, 2004; Selander et al., 2009; Sørensen et al., 2011; Sørensen et al., 2012).

Impaired Cognitive Function and Mental Health Effects

- Another less well appreciated risk of high decibel rail noise and vibration exposure is the impact on mental health and cognitive function.
- Sleep disturbance resulting in fatigue increases risk of hypertension, arrhythmia, and risk of accidental injury.
- Elevated noise is associated with cognitive impairment in children, as well as exacerbation of mental health disorders including depression and anxiety (Lercher, et al. 2003; Haines et al., 2001; Hygge et al., 2002).
- The health implications of chronic and nocturnal noise from increased rail traffic are highly likely and will impact human health in multiple areas and all age ranges (Goines & Hagler, 2007; Babisch, 2005).

Appendix B:
Summary of Health Risks for Oil Tank Storage

5. Oil Storage Tank Spills, Fires and Explosions:

- Three companies have plans to build facilities to receive, transfer, store and ship crude oil from Hoquiam, WA. US Development Group has detailed plans for a 42,000,000-gallon tank farm; their proposal has received initial approval by the WA Department of Ecology. Imperium proposes a 30,240,000-gallon tank farm, and Westway Group proposes a 42,000,000-gallon tank farm. The US Development proposal would site eight 5,250,000-gallon tanks within about 1,900 feet of the Hoquiam High School and only slightly farther away from both the middle and elementary schools. The two other tank farms are just south of the city commercial center but adjacent to each other. The proposed Imperium project would locate nine 3,360,000-gallon tanks immediately adjacent to an existing biodiesel production facility and its tank farm. Adjacent to the biodiesel site would be the proposed Westway project with five 8,400,000 gallon tanks. Existing storage tanks on the Westway site already include four tanks utilized for other liquid products including ethanol.
- Tesoro-Savage Petroleum Terminal (Tesoro-Savage) proposes to construct a facility in Vancouver, WA, to receive crude oil by rail and transfer it to vessels on the Columbia River. The "Vancouver Energy Distribution Terminal" would include six crude oil storage tanks. Annual throughput for each of the tanks would be 868,700,000 gallons per year, for a total facility throughput of over 5.2 billion gallons per year (Tesoro-Savage Application, 2013). The Tesoro-Savage tank farm and related rail traffic would be located near Vancouver's Fruit Valley neighborhood and a proposed waterfront development to include permanent housing. This would be the largest oil-by-rail facility in the nation (Florip, 2014).
- In Anacortes, WA, Shell Puget Sound Refinery proposes to expand access to its existing refinery for crude-by-rail to augment decreasing supplies coming by tanker from Alaska. The crude oil unloading facility would be served by a railroad extension from the existing BNSF rail line. Shell anticipates it would receive one unit train per day, with each unit train hauling 102 rail cars, or 612 incoming fully loaded cars per week. This unloading facility would be served by a 15-mile spur from the BNSF line near Mount Vernon and Burlington, running through heavily populated residential areas in proximity to the rail line.
- In Oregon, Global Partners, which was operating in 2014 with two 3,800,000-gallon tanks, has received a permit which allows expansion to include four 4,500,000-gallon tanks and the handling of over 1.8 billion gallons of crude oil annually. This facility is located on the Columbia River (OR DEQ, 2014).
- Oil storage tanks of varying sizes are at risk of fires and explosions from both man-made and natural causes. Man-made fires and explosions have resulted from maintenance errors (Smith County, MS, 6/5/2006; Baton Rouge, LA, 5/28/14) and inadequate venting of combustible vapors. Natural causes have included lightning-induced explosions (Baytown, TX, 9/14/14) and spontaneous explosions (Meadville, PA, 8/19/13).

There are at least two categories of potential causes of fires and related explosions at oil storage terminals: A) man-made causes including equipment failure, and B) natural causes including earthquake and tsunami.

A. Tank Fires from Equipment Failure or Other Man-Made Causes

There is an inherent risk of fire when handling, transporting, and refining crude oil. Further, Bakken crude has a large component of light hydrocarbons, making it highly volatile (Pipeline and Hazardous Materials Safety Administration, 2014).

Fires and explosions in tanks holding petroleum products are quite common and well documented throughout the industry. While many have been caused by human error, some have occurred because of inherent risks from equipment, technology, and the highly combustible nature of these fossil fuels. This is why oil storage tanks are most commonly sited away from population centers.

> Case Study #1: Hertfordshire, England, December 11, 2005
> The Hertfordshire Oil Storage Terminal (a.k.a. Buncefield Oil Depot) was the fifth largest oil-products storage facility in the United Kingdom. One of the gasoline storage tanks over-filled. A switch should have detected that the tank was full and shut off the supply, but it failed to operate properly. The switch failure should have triggered an alarm, but it also failed. Hundreds of gallons of gasoline spilled through the roof vent, down the side of the tank and onto the ground. The overflow resulted in the rapid formation of a rich fuel and air vapor cloud, triggering a so-called fuel-air explosion. The explosion was presumed to have been ignited by an electric generator or the depot's fire pumping system (COMAH, 2011). The resulting fires burned for 5 days. As a result of the event, 240 people visited accident and emergency departments. Of these 187 were emergency services workers, 17 were oil depot workers, and 40 were members of the public. Sixty-six had respiratory complaints, and 38 injuries were recorded (Hoek et al., 2007). The Buncefield Depot was located far from a residential area. Had this event occurred within a town, presumably many more injuries and even deaths would have been reported.

> Case Study #2: Raleigh, Mississippi, June 5, 2006
> The Partridge-Raleigh oilfield is located in rural Smith County, Mississippi. Three workers died and a fourth was injured in a fire caused by human error. Welders were attempting to connect oil tanks via pipes, when the welding torch sparked vapors escaping from one of the tanks. The fire traveled from one tank to another through connecting pipes. The explosion threw the workers from the top of the tanks. The US Chemical Safety and Hazard Investigation Board determined that a number of errors were made, including unsafe work practices such as utilizing a lit torch to determine the presence of flammable vapor instead of testing with a gas detector. Other hazards that contributed to the fire included neglecting to remove residual oil in the tanks prior to welding in the area (US CSB, 2007).

B. Natural Causes, Including Earthquake and Tsunami

For terminals at Washington and Oregon ports, earthquakes and subsequent tsunamis pose the risk of dislodging crude oil storage tanks from their foundations.

The Port of Grays Harbor resides within the potential zone of impact from a tsunami. While the US Development Group engineering study addresses the structural requirements for its eight

proposed tanks to withstand an earthquake (Shannon & Wilson, 2013), it does not address the structural requirements to withstand a subsequent tsunami.

The USGS Professional Paper 1661-B, Local Tsunami Hazards in the Pacific Northwest from Cascadia Subduction Zone Earthquakes, reports the following: "Comparing the results in this study at specific sites where previous inundation models have been formulated, the range in tsunami amplitude offshore Grays Harbor, WA, 2 to 7 meters, is slightly lower compared to the offshore amplitudes predicted by Preuss and Hebenstreit (7-8 meters)" (Geist, 2005).

Considering that the US Development's engineering study (Shannon & Wilson, 2013) showed that soils in the tank farm area up to depths of 150 feet or more consist of "outwash from alpine glaciation", meaning unstable sand, gravel, silt, etc. – and the recommended depth for pilings as support foundations would extend only a few feet into the "dense to very dense" alluvium (not bedrock) – one could argue that the foundation structures for the storage tanks would be very unlikely to withstand a tsunami wave of up to 24 feet. Structural integrity could be further compromised by the fact that the groundwater depth begins at only 17 feet below the surface.

Oil tank dislodgement from a massive tsunami increases the likelihood of subsequent fire and related explosions involving multiple tanks, discharging massive quantities of highly flammable crude oil into the area and the ocean.

Appendix C:
Summary of Health Risks for Oil Export by Marine Vessels

6. Oil Spills during Vessel Loading and Transport:

- A total of eight or more Panamax-sized ships, each carrying 16 million gallons of oil, are proposed to make 16 or more crossings per month transporting petroleum products out of Bellingham, Anacortes, Grays Harbor, and offshore from the mouth of the Columbia River between Washington and Oregon.
- Washington has a history of major oil spills including a 239,000-gallon tanker spill at Port Angeles in 1985; a 231,000-gallon barge spill in Grays Harbor in 1988; a 130,000-gallon refinery spill in Anacortes in 1991; and a 600,000-gallon refinery spill in Tacoma in 1991.

Health Impacts of Crude Oil Exposure

- Crude oil is a complex mixture of thousands of chemical compounds, many of them harmful to human health and the environment. These include but are not limited to: benzene, cadmium, toluene, ethylbenzene, xylene, and polycyclic aromatic hydrocarbons (PAHs). Some oil contains other hazardous chemicals such as the bioaccumulative neurotoxin mercury. Many of these chemicals have potential to damage organ systems through a variety of mechanisms including endocrine disruption and fetal mutations. They potentiate a number of diseases including cancer and can cause multi-generational birth defects (CDC, 1999).
- Volatile organic compounds (VOCs) found in unrefined petroleum, including benzene and toluene, readily enter the atmosphere, where they can be easily inhaled. Once they enter the body, they can be stored in fat, dissolve into cell membranes, and reside on mitochondria in the cell nucleus. This "change in viscosity" of the cell nucleus affects DNA transcription and replication and therefore has the potential to cause malignancy in any organ.
- Health implications of human exposure to crude oil constituents vary from individual to individual based upon multiple factors: time and duration of oil exposure, route of exposure, interaction with dispersant cleanup chemicals, use of personal protective equipment, wave action, heat, previous exposure to crude oil chemicals, medications used at the time of exposure, and pre-existing medical conditions.
- Exposure can occur directly through inhalation of contaminated air or dermally via skin contact with contaminated air or water. It can also occur indirectly via consumption of seafood or water.

A recent review summarized research of acute and long-term adverse health effects from exposure to eight major oil spills prior to 2010 (Levy and Nassetta, 2011).

Acute health effects among cleanup workers and community residents included:

- Respiratory symptoms (throat irritation, cough, shortness of breath)
- Eye symptoms (irritation and sore, itchy and/or reddened eyes)
- Headache
- Skin symptoms (irritation, itching, rashes, skin lesions)
- Nausea
- Dizziness
- Tiredness and fatigue

Chronic health effects included:

- Psychological disorders (generalized anxiety disorder, post-traumatic stress disorder (PTSD), lack of energy, and depression)
- Respiratory damage (impaired lung function; reductions in forced vital capacity, forced expiratory volume, forced expiratory flow, and maximum voluntary ventilation)
- Endocrine biomarkers (significant decrease in plasma cortisol concentrations in all groups and significant decrease in prolactin concentrations of workers performing high pressure cleaning)

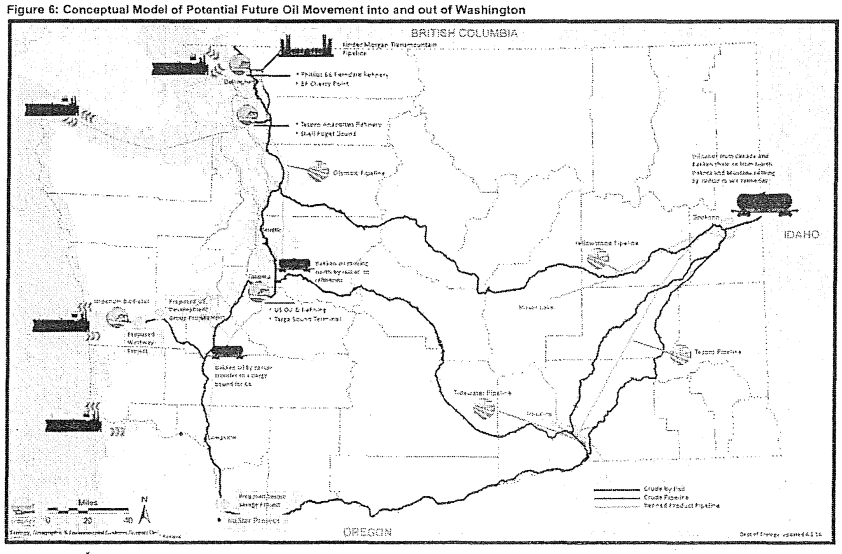
Toxicity of Oil Spill Cleanup Chemicals

- Clean-up response to the 2010 Deepwater Horizon explosion and resulting oil spill in the Gulf of Mexico involved the application of an unprecedented 1.84 million gallons of a chemical dispersant known as Corexit to subsea and surface waters. Little was known about Corexit toxicity or its environmental impacts prior to the spill.
- Collectively, the 57 ingredients in oil dispersant products listed by the EPA as appropriate for oil spill response at the time of the Deepwater Horizon incident were shown to be a myriad of known or suspected toxins with capacity to impact every organ system of the human body: 5 are linked to cancer; 33 are potential, suspected, or known skin irritants and toxins; 33 are eye irritants; 11 are respiratory toxins; 10 are kidney toxins; 8 are reproductive toxins; 7 are liver toxins; 6 are neurotoxins; 5 are toxic to the immune system; 4 are blood toxins; 3 are associated with asthma; and 1 is toxic to the endocrine system (Toxipedia Consulting Services, 2011).
- A recent study of 247 BP Gulf oil spill clean-up workers published in the *American Journal of Medicine* found the workers were at an increased risk of developing cancer, leukemia and other illnesses; also, "clean-up workers exposed to the oil spill and dispersant experienced significantly altered blood profiles, liver enzymes, and somatic symptoms" (D'Andrea & Reddy, 2013).
- The use of Corexit 9500A dispersant during the BP cleanup increased the toxicity of exposure by up to 52 times over crude oil alone (Martinez et al., 2013).

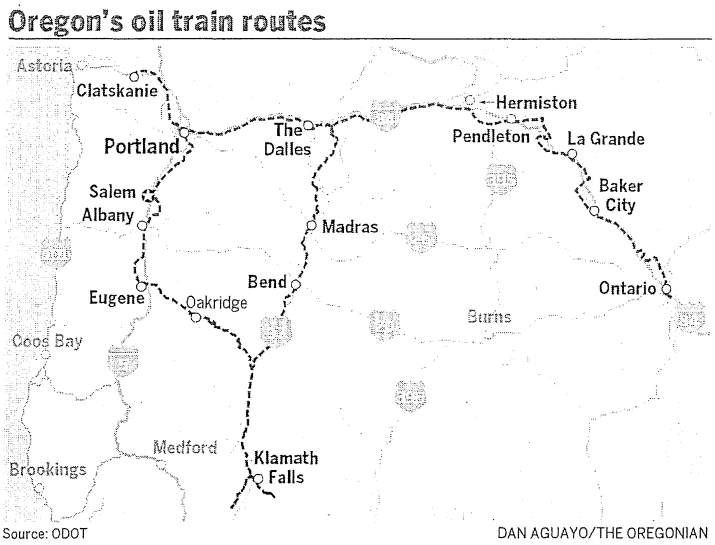
Appendix D:
Washington & Oregon Oil Transport Routes & Oil Spill Response Plans

Conceptual Model of Potential Future Oil Movement in and out of Washington:

Figure 6: Conceptual Model of Potential Future Oil Movement into and out of Washington



Rail Routes in Oregon:



Overview of Routes in Washington and Oregon

- Primary routes and proposals include transporting tar sands oil from Canada and Bakken shale oil from North Dakota and Montana, entering Washington near Spokane. The crude-by-rail would then continue on multiple routes across the state, passing through heavily populated cities and towns and along the entire I-5 Washington corridor. The trains will travel along dozens of rivers and streams including the Columbia River and past resource-rich areas including farmland, forests and the Columbia Gorge before storage near uniquely sensitive areas including city centers and a wildlife refuge, before export to refineries via marine vessels along the Pacific coast.
- Final refinery and/or export destinations in Washington include Bellingham (Phillips 66 Ferndale Refinery and BP Cherry Point), Anacortes (Tesoro Refinery and Shell Puget Sound), Tacoma (US Oil & Refining and Targa Sound Terminal), Grays Harbor (Imperium Biodiesel, proposed Westway and US Development facilities), and Vancouver (proposed Tesoro Savage Project and proposed NuStar Energy terminal conversion). Crude oil tank storage facilities are proposed for Grays Harbor and Vancouver.
- In Oregon, facilities in Clatskanie (Global Partners LP) and Portland (Arc Logistics Partners LP) handle and/or store crude oil. Crude oil is not refined in Oregon. Trains carry Bakken crude oil from Washington into Oregon, then through Portland to Global Partners in Clatskanie, where it is stored and later loaded onto barges that travel down the Columbia River to the Pacific Ocean and on to Washington and California refineries. Trains carrying Utah crude oil enter eastern Oregon bound for Arc Logistics Partners LP in Portland. Trains carry Bakken oil along the Columbia River, south along Deschutes River to Bend, and then continue south to California. Oil trains travel through Portland, Salem and Eugene en route to Klamath Falls and California.
- The Washington State Department of Ecology (WA DOE) *Marine & Rail Oil Transportation Study* shows crude-by-rail train routes passing 38 heavily populated Washington cities and towns (over 3,000 people per square mile) and at least a dozen other towns with population densities of 2,500 to 3,000. A total of 93 Washington communities and at least 3 million residents live in close proximity to crude-by-rail routes (WA DOE, 2014).
- In Oregon, 88 communities, including the state's largest, have at-grade crossings over which unit oil trains operate. Nearly half a million Oregon residents reside within a half mile of these tracks. Four hundred and twenty-six at-grade crossings currently have the potential for mile-long trains to operate over them (ODOT, 2015).
- Each unit train may have 100-125 railcars, be up to 1.5 miles long and hold approximately 2.9 million gallons of crude.
- Currently there is no legal limit to the number of oil trains that can travel through Washington or Oregon in a specific timeframe, and there have been limits on public disclosure (Davis, 2014).

Responding to an Oil Spill in Washington State

- A Department of Ecology study in 2004 found that a major oil spill could cost Washington's economy $10.8 billion and impact 165,000 jobs (DOE, 2011).
- The Department of Ecology currently lists 30 Oil Spill Contingency Plans for Washington State for Facilities, Pipelines, Refineries, and Vessels. Many of these will need to be updated and adapted to incorporate new oil storage and export proposals: www.ecy.wa.gov/programs/spills/preparedness/cplan/cpmanagers.htm
- Preliminary findings of the *Marine and Rail Oil Transportation Study* reflect an overall lack

of adequate training, resources, design and regulatory oversight to properly respond to an oil spill given current proposals (WA DOE, 2014). Findings and recommendations included:

- The Facility Oil Handling Regulation, Chapter 173-180 WAC, has not been updated for spill prevention standards since 1994. Ecology should update these standards to reflect modern spill prevention procedures based on handling volume (p. 64).
- "[N]one of the current crude by rail trains are subject to requirements for comprehensive response plans." And, "[r]ailroad spills are not currently covered by state approved oil spill contingency plans…" (p. 67).
- "Equipment necessary for oil spill containment, responder health and safety monitoring and fire suppression during a crude oil emergency response are insufficient in much across much [sic] of Washington" (p. 70).
- In a survey of the state's 278 fire districts near crude by rail routes, 62% "believe that their departments are not sufficiently trained or do not have the resources to respond to a train derailment accompanied by fire" (p. 70).
- An overwhelming majority of first responders surveyed "are not aware of the response strategies or resources in place by the railroads should an incident take place" (p. 71).
- Because crude by rail transport is fairly new to the US and Canada, there are few, if any, studies analyzing the risk of accidents and spills from crude-by-rail (p. 81).

Responding to an Oil Spill in Oregon

- Oregon has not initiated a study or investigation of the state's response preparedness for potential derailments and spills at the scale of Washington, which recently published preliminary findings of the *Marine and Rail Oil Transportation Study* (WA DOE, 2014).
- A "Hazardous Material By Rail Rulemaking Advisory Committee" began meeting in August 2014 to deal with notification issues for emergency responders.
- The Chief of the Eugene-Springfield Fire Department, Randall Groves, stated that three major criteria should factor into any future rule making related to crude-by-rail: prevention and mitigation accidents, response to a derailment or fire, and recovery and clean-up after an accident. Groves' memorandum suggested that a new, uniform response plan for Oregon is anticipated but not yet available (Groves, 2014).

Furthermore, research and technology for cleaning up oil spills is still lagging despite lessons learned from recent events, as stated in the 2011 National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling report:

> *"The technology available for cleaning up oil spills has improved only incrementally since 1990. Federal research and development programs in this area are underfunded. In fact, Congress has never appropriated even half the full amount authorized by the Oil Pollution Act of 1990 for oil spill research and development. In addition, the major oil companies have committed minimal resources to in-house research and development related to spill response technology."* (p. 269)

Additional Washington and Oregon oil spill response resources may be found on the Region 10 Regional Response Team and the Northwest Area Committee website:
http://www.rrt10nwac.com/NWACP/Default.aspx

Appendix E:
Overview of Water Pollution Risks & Sources

7. Water Pollution from Oil Contamination:

Crude and diluted bitumen oil spills resulting from train derailments, oil-loading accidents, and storage leaks pose a serious public health risk to downstream drinking water systems as well as primary Washington and Oregon food sources, including salmon and shellfish. The health risks of contamination by Bakken crude versus diluted bitumen from tar sands oil vary due to differences in toxic components as well as their environmental persistence and adherence properties. Nevertheless, significant risks to drinking water and food security are associated for any type of oil spill. Primary water pollution health risks include: A) drinking water contamination, B) damage to and loss of food sources, and C) pollution of subsistence and tribal fishing resources.

A. Drinking Water Contamination

Drinking water intake sources along the Columbia River exist in Kennewick, Longview, Pasco, and Richland. These, in addition to several inland wells and aquifers, are at risk of oil spill contamination due to the proposed transport of oil-by-rail across Washington State to the proposed Tesoro storage and loading facility in Vancouver (WA DOE, 2014).

In Oregon, residents of St. Helens and Boardman rely on the Columbia River as their primary drinking water source (OHA, 2015). A nearby oil spill could degrade their drinking water.

The US Environmental Protection Agency defines a principal or sole source aquifer as one supplying at least 50% of drinking water consumed in the area overlying the aquifer. "These areas may have no alternative drinking water source(s) that could physically, legally and economically supply all those who depend on the aquifer for drinking water" (EPA, 2012). One sole-source aquifer is located in the Spokane area (DOE, 2014), where all trains enter WA State. Environmental monitoring of drinking water safety in the face of potential oil spills should include current baseline data and levels of concern for oil and oil byproducts.

Contamination of drinking water by oil and its byproducts has the potential to persist for years and poses numerous risks to human health. Research on the health impacts of oil contamination has been largely limited to areas outside the US where significant oil spills have polluted primary drinking water sources. In Nigeria, Africa's largest oil producer and most populated nation, oil spill responses have been erratic and minimal. The United Nations Environment Programme found that families have been drinking from oil contaminated groundwater wells with carcinogenic benzene levels 900 times over the World Health Organization guidelines. They estimate clean up will take at least 30 years (UNEP, 2011).

Oil spills in Ecuador, the Niger Delta, and Kuwait have resulted in thousands of miles of land contaminated with crude oil and byproducts. Researchers found that oil ingested in these countries either directly through drinking water contamination or indirectly through consumption of oil-contaminated livestock increased the incidence of cancer and digestive problems across populations (Armstrong et al., 2001). Pregnant women who ingested oil-contaminated water in Ecuador were also found to have spontaneous abortion rates 2.34 times higher than a nearby

control group (Armstrong et al., 2002).

B. Damage to and Loss of Food Sources

Numerous communities rely on fish and shellfish from inland waterways, the Columbia River, and marine waters along Washington and Oregon's coastlines. Oil contamination from a spill during transport, storage and transfer – whether it be an inland or an ocean spill – would be extremely detrimental to the public health and economic viability of coastal wetlands, marine ecosystems, and critical food sources in our states. Immediate effects may be toxic to fish and other marine life, resulting in mass mortality. Other effects will manifest long-term, poisoning the organic substrate, interrupting food chains, and reducing the reproductive capacity of fish and shellfish exposed to oil pollution. The viability of salmon along these waterways is a specific concern.

When oil is spilled into water, the type of oil, its relative density and composition determine the rate and volume of spread into the water. An oil slick may be formed on the surface of the water, or it may be dissolved or dispersed into the water dependent upon wave currents and vessel traffic, temperature, wind force, and cleanup interventions such as the use of dispersant products. Oil containing volatile organic compounds will partially evaporate, becoming denser and more viscous, and increasing flow resistance. Eventually the oil will emulsify with particulate matter and sink, the remainder forming sticky tar balls, which then decompose from light exposure (photo-oxidation) and biodegrade via microorganisms at the bottom of the food chain. The biodegradation rate varies based on temperature as well as nutrient and oxygen availability.

The physical and chemical properties of diluted bitumen, such as tar sands oil from Canada, in the case of a spill include greater probability of sinking or submerging into water, increasing in the presence of sediment and turbulence. This makes diluted bitumen spill risk of greater concern in rivers such as the Columbia due to larger sediment volumes, shallower depths, and higher currents. Polycyclic aromatic hydrocarbons (PAHs) from diluted bitumen that reaches streams and rivers could have a significant adverse effect on spawning fish (WA DOE, 2014). When considering the safety of fish and seafood in the event of an oil spill, ongoing contamination in the Gulf of Mexico from the BP spill offers evidence of oil's detrimental health effects on fish and marine life, for which BP has been fined federal penalties up to $13.7 billion under the Clean Water Act (Guardian, 2015).

Another public health concern regarding ocean spills and food safety is current federal risk assessment levels for seafood contamination. A 2012 evaluation examined the Food and Drug Administration's (FDA) risk criteria for accumulated polycyclic aromatic hydrocarbons (PAHs) in seafood after the BP spill. As stated previously, PAHs accumulate in the food chain and are known carcinogens and developmental toxicants. The evaluation found that PAH levels of concern set by the FDA for Gulf shrimp after the BP spill were 53% higher than recommended for vulnerable populations such as pregnant women and children (Rotkin-Ellman et al., 2012).

C. Pollution of Subsistence and Tribal Fishing Resources

Current oil transport proposals present potentially significant public health implications for tribal lands and fishery habitats. Fisheries associated with tribes' Usual and Accustomed Areas (U&A) are at significant risk. The 2014 preliminary findings from the Washington State Marine & Rail Oil Transportation Study stated, "Nearly all of the 29 tribes of Washington State and several bordering tribes have the potential for impacts related to either rail and/or marine incidents associated with the crude marine and rail transportation and associated facilities in their traditional use areas, ceded lands, or treaty U&As" (WA DOE, 2014, p. 37).

Long-term health impacts after the 1989 Exxon Valdez oil spill to the Alaskan fishing community of Cordova, Alaska, where 50% of the economy was comprised of commercial fishing, included significantly higher levels of social disruption and psychological stress as a result of the disturbance in their food source and livelihood (Curry et al., 1992; Gill & Pico, 1996). Post traumatic stress disorder (PTSD) was also found to be higher in native Alaskan families who had subsisted on natural resources and land contaminated by the spill (Palinkas et al., 2004). Many of the tribal nations living in Washington and Oregon near proposed oil transport and storage sites are renewable resource communities similar to native communities in Alaska, for whom fishing is not only an income source but also a primary food source and a major component of cultural identity.

Appendix F:
Summary of Health Risks from Climate Change

8. Climate Change-related Injury and Disease:

Beyond the more apparent hazards of oil transport, storage and export, there is an undeniable connection between increased fossil fuel usage and its impact on climate change and health. The science is clear that the earth is warming and that people, through the burning of massive quantities of fossil fuels, are the main cause of this rapid increase in global temperatures. Heat trapping and warming temperatures are a result of increases in atmospheric greenhouse gases, which efficiently absorb heat from the earth's surface and prevent outgoing thermal energy from radiating back into space. The crude oil carried by trains into WA and OR, when eventually burned, will significantly add to an already dangerous burden of greenhouse gases being emitted into the atmosphere.

Numerous studies, reported in leading scientific and medical journals, show that ongoing changes to our climate are correlated with: changes in rainfall patterns; worsening heat waves; an increased frequency and magnitude of extreme weather events, droughts, and fires; a rise in sea levels; increased potency of allergens; and the spread of infectious diseases – all of which pose a real and serious threat to human health. Unless global carbon emissions start to fall within the next decade, we can expect to see further and more drastic changes in our climate, and related adverse health impacts all over the world.

Populations that could be most vulnerable to health impacts of climate change include those with:

- Demographic vulnerability: People with existing illnesses, people with disabilities, older adults, mothers, infants, children, people with low socioeconomic status, linguistically or socially-isolated populations, immigrants and refugees, communities of color, and American Indians
- Occupational vulnerability: Wildland firefighters, outdoor workers, growers, ranchers and farmworkers, emergency responders and health care workers
- Geographic vulnerability: Urban and suburban areas, coasts, steep slopes, and private water systems (Haggerty et al., 2014)

Health Impacts of Increased Ground Level Ozone

- Ground level ozone increases with hot weather, vehicle and diesel exhaust, gasoline vapors, and other outdoor air pollutants. Ground level ozone is known to irritate the respiratory tract, cause premature aging of the lungs, and has been linked to the development of asthma and exacerbation of existing asthma cases. In fact, people who spend more time being active in the outdoors working or playing are at greater risk for adverse health effects from ozone exposure than those who spend more time inside or are sedentary (McConnell et al., 2002; Gent et al., 2003).
- Asthma currently affects over 9% of Washington adults (ages 18 and older), and over 110,000 youth in Washington suffer from asthma. The Centers for Disease Control ranks asthma prevalence in Washington State residents as higher than the national average. In 2010, $73 million was spent on hospitalization costs for asthma-related illness in Washington. Asthma is the primary cause of school-age absenteeism nationally and is

associated with reduced quality of life, depression, and suicidal ideation (WA DOH, 2013).

- In Oregon, an estimated 10.8% of adults and 7.8% of children have asthma. Oregon has a higher burden of asthma than the overall US and was among the top six states with the highest percentage of adults with asthma in 2011. Children 0-4 years and females have the highest rates of asthma hospitalizations. In 2011, the total cost of asthma hospitalizations was more than $28 million, with an average of over $14,000 per hospitalization (Garland-Forshee & Gedman, 2013).
- The University of Washington's Climate Impacts Group has estimated that ozone levels will rise due to climate change and increases in train, auto, bus, and truck transportation in the state. Ozone levels are expected to increase by 16% in Spokane County and 28% in King County by midcentury (2045-2054) from 1997-2006, increasing the risk for deaths by cardiovascular disease, asthma, and lung cancer. They also estimate an increase in ozone-related deaths by 17% in Spokane County and 27% in King County during the same time period (Jackson et al., 2010).
- Health related costs of current ozone air pollution nationally were an estimated $6.5 billion in 2008 and will continue to rise without change in regulatory controls (Knowlton et al., 2011).

Health Impacts of Increased Extreme Weather Events and Wildfire

- Extreme weather events with associated injuries are already being witnessed globally. Precipitation extremes including heavy rainfall, flooding, and droughts are projected to increase in all regions of the US (IPCC, 2012).
- Floods account for approximately 98 deaths per year in the US and are the second deadliest of all weather-related hazards (Ashley & Ashley, 2008; NOAA, 2012).
- Steep slopes and intense rainfall can trigger landslides that result in injury and death.
- Smoke from wildfires is associated with cardiopulmonary disease, ischemic heart disease, asthma, bronchitis, pneumonia, cancer and motor vehicle crash injury (Haggerty et al., 2014).

Health Impacts of Shifting Disease Ranges

- Climate change is associated with the spread of vector- and water-borne disease and illness. Vectors such as fleas, ticks, and mosquitoes transmit pathogens that cause diseases including Lyme, dengue fever, West Nile virus, and Rocky Mountain spotted fever.
- Large-scale weather shifts in temperature, precipitation, and humidity can result in vector adaptation or geographic expansion, increasing the number of people at risk for acquiring vector-borne diseases.
- Water-borne illnesses such as pediatric gastrointestinal infections have also been associated with extreme weather events, large-scale flooding, and water source contamination (Luber et al., 2014).

Food Security and Vulnerable Populations

- An anticipated decline in crop yields, livestock, and fish production from extreme weather, changes in rainfall patterns, and ocean acidification is predicted to raise global food prices, resulting in food shortages.
- Elevated atmospheric carbon dioxide is also associated with decreased plant nitrogen concentration, resulting in decreased protein content of existing plants.
- Mental health disorders and anxiety around climate-related disease and illnesses are an additional concern for health care providers (Luber et al., 2014).
- Air pollution and climate change will continue to disproportionately affect minorities and lower socio-economic populations both in the US and worldwide. Those least responsible for the atmospheric content of carbon and other pollutants are positioned to bear the most significant brunt of their ill effects, including increased respiratory and infectious illness, extreme weather events and food shortages.

Medical Approach to Climate Change: The Precautionary Principle

The Intergovernmental Panel on Climate Change unequivocally states that a substantial and ongoing reduction in greenhouse gas emissions is necessary to prevent further imbalances in earth's climate and subsequent climate-related disease and illnesses (McCoy & Hoskins, 2014). As medical doctors and healthcare providers, we firmly invoke The Precautionary Principle in consideration of proposed substantial expansion of crude oil transport and storage projects. The Precautionary Principle – a substantial component of public and environmental health practice – states: "should an activity raise threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relations are not fully established scientifically" (Wingspread Conference, 1998).

The proposed increases in oil-by-rail transport and storage projects in Washington and Oregon externalize massive long-term threats to human, environmental, and economic health in our states in favor of short-term financial incentives. The reality of these projects in their totality pose significant risks to the health and livelihood of future generations and the viability of our planet.

Appendix G:
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From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 10:37:17 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: shee0106@everyactioncustom.com [mailto:shee0106@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 9:06 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Sheelagh Oliveria
5904 SE Knight St
Portland, OR 97206-6030

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Wednesday, September 14, 2016 9:43:02 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
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-----Original Message-----
From: helen.madsen.ost@everyactioncustom.com [mailto:helen.madsen.ost@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 9:44 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

What a relief that you voted for the November 2015 Fossil Fuel Policy. It makes me feel safer, and more in line with what we need to do to combat climate change.

Then I found out you are looking at making some exceptions. No, that makes no sense.

Large or small, a new fossil fuel terminal is a new fossil fuel terminal. You voted to actively oppose new fossil fuel infrastructure.

A new fossil fuel terminal, even a small one, or a multitude of small ones would allow the more fossil fuel trains, with the resulting dangers like what happened in the Gorge.

Since NW natural has no plans now, when you make this exception, it sounds like you are encouraging them to make plans for more LNG storage - but that is against the 2015 Fossil Fuel Policy. Allowing smaller ones would allow them to have multiple ones that would be the same as a big one. Making the exception for small size makes no sense.

What would help is to encourage more safety improvements at the current bulk fossil fuel terminals, especially if they enlarge. That makes sense.

It is a relief to be a citizen of the City of Portland, a leader in addressing the important fuel issues here in Portland. Stick to the original purposes and ideals that you made with the 2015 Fossil Fuel Policy. Stay a leader. Do not let that leadership drain away by allowing exceptions for small terminals that add to the danger to us as citizens.

Sincerely,
Helen Ost
7410 N Willamette Blvd
Portland, OR 97203-5080

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Testimony on fossil fuels for today"s September 13, 2016 hearing.
Date: Tuesday, September 13, 2016 6:00:04 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
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From: Terry Parker [mailto:parkert2012@gmail.com]
Sent: Tuesday, September 13, 2016 2:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Testimony on fossil fuels for today's September 13, 2016 hearing.

Welcome to the Socialist Republic of Portland: A city where there is a code change being put forward to outlaw the opportunity for good paying jobs in the energy industry; where in an industry that supports nearly ten percent of the jobs nationwide, automobile ownership and usage is being overtaxed to subsidize costly alternative transport mode infrastructure for freeloaders; and where homelessness is on the rise because the increasing costs of housing and the bloating of government through ever increasing taxation is out pacing the incomes of the working class.

If the social engineering policy makers truly want to reduce the use of fossil fuel, they need start by city government setting the example. This must include eliminating the entire city fleet of automobiles - most of which are utilized in single occupancy service by our public servants, and restricting air travel, or better yet even banning air travel by public and elected city officials.

Individual airline miles traveled - one seat on an airliner has a similar carbon footprint to driving a modern car the same distance. Two round trips to Washington, DC or one round trip to Europe have about the same carbon footprint as an average motorist who drives ten to twelve thousand miles per year. Therefore it is hypocritical to campaign against the use of fossil fuels and then simply jump on an airplane and fly across the country or overseas. Maybe the flights in and out of PDX should be capped with the airport placed on a diet.

And don't forget about the protesters that bring media attention to themselves with their disruptive antics and civil disobedience. They hang from bridges using nylon ropes flying nylon flags, paddle around in the water using plastic kayaks and canoes, and pedal their bicycles on asphalt all of which are made of petroleum and fossil fuel products. They often arrive at those protests in their petroleum fueled Escalades and

trucks hauling their bicycles and plastic flotillas.

The city is continually running out of other people's money to spend and wanting to increase taxes even more just to keep the mounting costs of existing social engineering programs on track. Given the increasing amount of homelessness coupled with lack of good paying jobs that are both directly related to an unfriendly business climate, the day of unsustainable social engineering policy making is just around the corner if not already here.

The simple fact is that we need fossil fuels today and in the near term foreseeable future to keep the economy moving forward. It is shortsighted and pretentious to create city codes that will be detrimental to and have a negative impact on both jobs and the economic health of the region.

Respectfully submitted,

Terry Parker
Northeast Portland

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 10:32:44 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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From: Jennifer Parks [mailto:jenniferparks@hevanet.com]
Sent: Tuesday, September 13, 2016 10:01 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

To the City of Portland:

Please, I urge you to amend the proposed draft to based on the fossil fuel goals that were in the resolution last fall. This plan enacts a full ban on all new fossil fuel terminals, large or small with an exception for new facilities that are 5 million gallons or less unnecessary. The plan strengthens restrictions on expansions allowed at existing facilities through adding binding limits in the City's non-conforming use review process. It also includes the prevention of any aggregate increase in fossil fuel infrastructure in Portland.

The City of Portland needs to fulfill their promise of its historic fossil fuel resolution to keep our environment healthy and green. Backing down from this crucial promise means the death of our vision for Portland's fossil fuel goals. Please do not let this happen.

Sincerely,

Jennifer Parks, 7706 SW Barnes Rd., Unit C, Portland, OR 97225

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 9:20:24 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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www.portlandoregon.gov/bps

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From: Craig Perry [mailto:theangrytoy@hotmail.com]
Sent: Tuesday, September 13, 2016 1:23 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I support the following measures.
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Craig Perry
Email: theangrytoy@hotmail.com
Address: 6201 NE 13th Ave unit A, PDX, Oregon, 97212

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Fossil Fuel Infrastructure
Date: Tuesday, September 13, 2016 9:47:46 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: James Plunkett [mailto:jimplunkett66@hotmail.com]
Sent: Tuesday, September 13, 2016 9:37 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Fossil Fuel Infrastructure

To the Planning and Sustainability Commission:
I support a ban on new fossil fuel terminals. I hope that it can be written with clarity and conviction so that the intent is maintained against the relentless probing of the dying petroleum industry. No loop holes.
I'm proud of my city for taking this courageous political position. It will soon be obvious to everyone that stopping our investment in this doomed technology will help protect us from loss.

with respect,

Jim Plunkett
7112 SW 53rd Ave, Portland
971 266-9994

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Tuesday, September 13, 2016 9:47:27 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
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-----Original Message-----
From: Jim Plunkett [mailto:jimplunkett66@hotmail.com]
Sent: Tuesday, September 13, 2016 9:31 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the

regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Jim Plunkett
7112 SW53rd
Portland, OR 97219

Chair Schultz and Commissioners,

Thank you for the opportunity to speak to you today. My name is Sandy Polishuk. I'm the Divestment/Reinvestment Team Coordinator at 350PDX.

The City has placed the Carbon Tracker 200 on their do-not-buy list. The Carbon 200 is the list of 200 public companies holding the vast majority of listed coal, oil and gas reserves, reserves which must be 'kept in the ground' if we are to have a livable climate for our children and grandchildren.

Under the Paris Accord world governments agreed to set limits on carbon emissions which will mean that 80% of the world's current reserves remain untapped and underground forever, becoming stranded assets. So it turns out the City's decision is also an excellent act of fiduciary responsibility.

The resolution before you today also recognizes the critical nature of the climate crisis. It makes perfect sense that if Portland is no longer invest its cash in fossil fuel, it will also cease investment in fossil fuel infrastructure. Any new or expanded infrastructure will also become a stranded asset as we will need to abandon it as we move into the renewable energy world of the future.

I urge you to propose a full ban on **all** new fossil fuel terminals, with no exceptions, and to strengthen restrictions on expansions allowed at existing terminals with binding limits as well as criteria for safety and climate impacts. Please help us prevent any aggregate increase in fossil fuel infrastructure in Portland. It's what best for our health, our safety and our pocketbooks.

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:26:42 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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www.portlandoregon.gov/bps

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-----Original Message-----
From: sqayum@everyactioncustom.com [mailto:sqayum@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 5:10 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Seemin Qayum
13817 SW Mistletoe Dr
Portland, OR 97223-5662

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 6:03:46 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
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From: Barbara Quinn [mailto:barbaraqnn718@gmail.com]
Sent: Tuesday, September 13, 2016 2:50 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Place a ban on all new fossil fuel terminals and other infrastructure. More Unit trains carrying fossil fuels like Bakken crude should be prohibited in the new code.
Also ban expansion of existing terminals.

From: Barbara Quinn
Email: barbaraqnn718@gmail.com
Address: 7034 N Charleston, Portland, Oregon, 97203

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: enact a full fossil fuel ban
Date: Tuesday, September 13, 2016 9:22:07 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Diana Rempe [mailto:dianarempe@gmail.com]
Sent: Tuesday, September 13, 2016 7:01 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: enact a full fossil fuel ban

Members of the Planning and Sustainability Commission,

Thank you for your hard work on our city's fossil fuel policy. The draft is a good beginning. However, it falls far short of the bold intention of the 2015 resolution when it allows new construction of terminals up to 5 million gallons. 5 million gallons of LNG or Bakken Crude would require transport through our cities and rural areas--an exceedingly dangerous process the City of Portland sought to alleviate via this ban. For examples of this, there is no need to look in the past to the horrific spill in Mosier or the the explosion in north Portland that killed the oil transport worker and launched a massive fire. Just this week there have been two pipeline spills--one in Texas and one in Arkansas--and yet another train derailment and spill, this time in Canada. We cannot risk another accident here in Portland--not only for the damage to the natural beauty of our area and the potential contamination of our water--but also for the longterm health risks to the workers doing the clean-up and containment and the communities adjacent to the transport lines and facilities, most of whom are the most vulnerable in Portland--poor and people of color.

Additionally, storage of these fuels--especially in the expanded terminals allowed for in this draft--does not fulfill the intention of the ban, which sought to improve safety and seismic durability.

It is time to make a real transition away from fossil fuels and Portland is poised to lead the country in this process. Please ban ALL new fossil fuel terminals. And, at existing terminals, please focus work on safety--worker safety at the terminal, and safety for all citizens, through reviewing climate impacts and strengthening seismic durability.

Please follow the true intention of the 2015 fossil fuel ban, by strengthening the fossil fuel

zoning amendments.

Thank you so much,

Diana Rempe, PhD
North Portland

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 5:59:49 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Barbara and Frank Roberts [mailto:bjroberts7@hotmail.com]
Sent: Tuesday, September 13, 2016 2:03 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear Commission Members,
I would like to suggest changes to your draft of the Fossil Fuel Terminal Zoning Amendments:
1. Do not make an exception for new storage facilities under 5 million gallons. The rules should apply to all terminals.
2. Existing terminals should become a non-conforming use and therefore any expansion of a terminal would have to go through a non-conforming use process.
3. The non-conforming use review process should be strengthened by adding climate impacts and safety criteria.
4. Total fossil fuel infrastructure increases should not be allowed. Don't allow the industry to build many small facilities that in total will be above the current infrastructure.

From: Barbara and Frank Roberts
Email: bjroberts7@hotmail.com
Address: 3617 NE 10th Avenue, Portland, Oregon, 97212

September 13, 2016

Dear Members of the Planning and Sustainability Committee,

Audubon Society of Portland (Audubon) appreciates the opportunity to comment on the draft Fossil Fuel Terminal Zoning Code Amendments (Amendments). We urge you adopt amendments that are strong, clear and fully meet the objectives laid out in the historic Fossil Fuel Resolution (Resolution #37168) that was passed unanimously by the Portland City Council last November. While this was an historic statement on the importance of preventing further expansion of our existing bulk fossil fuel infrastructure, it ultimately will only be as effective as the amendments that are adopted to implement it.

Audubon strongly supports that approach taken by the City in the draft amendments which would make bulk fossil fuel terminals a prohibited use and require that existing fossil fuel terminals be treated as a non-conforming use subject to a Type II nonconforming use review. We believe that prohibiting bulk fossil fuel facilities on the basis of the risk that they present public health and safety is one which is clearly supported by the science and also one which is clearly within the City's purview to regulate through the land-use process. It utilizes well established designations (prohibited uses and non-conforming uses) that are clear, familiar and well tested in our community. Finally, and most importantly, with limited modifications delineated below, it substantially achieves the goals that were strongly supported by the community and adopted by the Portland City Council. We appreciate the work that the City has done to date to develop these amendments.

We strongly urge the City not to back away from this approach as is being advocated by some Fossil Fuel interests. Specifically we urge the City not to eliminate the Type II process that would be required for expansion of local faculties for expansion to meet local demand and instead replace it with either allow existing facilities a blanket allowance to expand up to 10% beyond the existing capacity on the date of adoption of these amendments or allow existing facilities a blanket allowance to expand up to 10% beyond the existing capacity on the date adoption plus allow additional expansions through the conditional use permitting process (options 2B and 2C in the September 9, 2016 Memo from Staff). Neither of these approaches in consistent with the City Council Resolution which would only allow expansion in order to meet regional demand. Options 2B and 2C would functionally allow existing facilities to expand for any reason at all, regardless of whether or not it is tied to regional demand.

We reject arguments that the non-conforming review process would result in too much work for city staff. Quite, the contrary, we believe that this situation represents a textbook case for why we have the non-conforming use process in the first place. The expansion of existing facilities represents a real and significant threat to our communities and the non-conforming use process is the mechanism that the city in place to ensure that prohibited uses do not expand unnecessarily and that the public has adequate opportunity to engage in these decisions.

We do not believe that non-conforming use process would lead to excessively onerous work for the Bureau of Development Services (BDS). First, there are relatively few existing bulk fossil fuel facilities in Portland (11) so the number of non-conforming use applications would be limited. Second, most applications would be non-controversial and would simply result in a staff review. Third, those applications that are controversial deserve the extra scrutiny that a Type II process offers---again, these facilities pose serious risks to our communities and it is specifically for these types of situations that we have a public review process in place. We urge you to retain the Type II review process for non-conforming uses to address proposed expansions of existing fossil fuel terminal facilities—it provides an existing, understood and effective pathway that will allow expansions consistent with the objectives of the resolution and amendments, but provide the public with recourse in the event that those objectives are not achieved.

Additionally we would recommend the following improvements to the proposed amendments which we believe will allow it to better achieve the objectives of the resolution:

1) Significantly reduce the new fossil fuel facility threshold of 5,000,000 gallons: This threshold is meant to allow expansion or new facilities to meet regional fuel needs. However, the City provides no rational for setting the threshold at 5,000,000 gallons beyond simply asserting that a 5,000,000 gallon facility is too small to serve as a bulk terminal. We disagree. 5 million gallons represents almost 120,000 barrels of oils which is enough to fill nearly two unit trains. We believe that the threshold is set far above what is necessary to achieve this objective and creates significant opportunity for fossil fuel providers to create infrastructure to serve much broader objectives which go beyond the intent of the fossil fuel resolution. It could also promote significant expansion in the number of dangerous oil trains passing through Portland placing our communities real and direct risk. We recommend substantially lowering this threshold to less the 2,000,000 gallons, which is less that the capacity of a single unit train (50,000 barrels/ 2.1 million gallons). This would still allow facilities to meet regional need but minimize the likelihood of fossil fuel providers gaming the system and triggering significant increases in the number of oil trains passing through our communities.
2) Add additional review criteria to the non-conforming use review for existing facilities by including criteria that address public safety and climate change impacts. We support the amendments that have been submitted by 350PDX to address these concerns.

We urge you to move forward with the draft amendments including the two recommended changes in this letter.

Thank you for your consideration of these comments.

Respectfully,

Bob Sallinger

Bob Sallinger
Conservation Director

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:25:31 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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-----Original Message-----
From: sashasamuels@everyactioncustom.com [mailto:sashasamuels@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 7:42 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Let's go for it! And be a model to the rest of the country and the world.

Sincerely,
Sasha Samuels
7025 SW 28th Ave
Portland, OR 97219-1902

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:25:57 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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www.portlandoregon.gov/bps

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-----Original Message-----
From: ellie.luetmer@everyactioncustom.com [mailto:ellie.luetmer@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 7:40 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
ellie sedor
2515 NE 9th Ave Apt 11
Portland, OR 97212-4114

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:24:28 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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-----Original Message-----
From: grinstead.jake@everyactioncustom.com [mailto:grinstead.jake@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 8:16 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Jacob sepulveda
2329 SE Madison St
Portland, OR 97214-3929

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 11:16:44 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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www.portlandoregon.gov/bps

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From: Akash Singh [mailto:wordpress@350pdx.org]
Sent: Tuesday, September 13, 2016 10:54 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Portland hails itself as a green leader in a fossil fuel dependent economy. It would be the height of fatalistic hypocrisy to allow new fossil fuel infrastructure to be built and further entrench our dependence on fossil fuels when the first thing we need to accomplish is to be able to move away from them. A full ban and further restrictions are the only options to decrease our fossil fuel dependency, give a boost to a green economy, and mitigate the disastrous effects of climate change.

From: Akash Singh
Email: sakash18@yahoo.com
Address: 1913 NE 73rd Ave 3, Portland, Oregon, 97213

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: submitting comments on Fossil Fuel Infrastructure Code Changes
Date: Tuesday, September 13, 2016 6:07:29 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Dawn Smallman [mailto:dawnsmallman@gmail.com]
Sent: Tuesday, September 13, 2016 5:06 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: submitting comments on Fossil Fuel Infrastructure Code Changes

Dear PSC,

Please accept my comments below on the Fossil Fuel Infrastructure Code Changes hearing:

Please hold true to City Council's wise vision that was voted for unanimously last year in regards to the building of fossil fuel infrastructure in Portland: a full ban on the building of new fossil fuel terminals in our city!

Please keep their historic and visionary decision and vote INTACT. From the turnout at City Council discussions and votes - and from seeing the public turnout here today, its clear:

Portlanders don't want these dangerous shipments to and from these facilities moving through our community, nearby communities, the Columbia Gorge, along our rivers - and we don't want these dangerous and hazardous fuels stored within our community either.

Please regulate all fossil fuel terminals in the city as non-conforming use and make all changes or expansions at terminals in all city zones undergo non-conforming use review processes.

Please modify codes to require all storage terminals to make seismic upgrades that will keep our community safe.

Please require all city reviews of how terminals operate to include strict criteria for considering:
- public safety/risk
- seismic safety/risk
- potential risk to waterways and public safety while the products these terminal will hold are

being transported to and from terminals
- climate change impacts both to our community and to the global community caused by the use of these fossil fuels

Please substantially reduce the storage capacity threshold of 5 million gallons for ALL current or future fossil fuel terminals in our city. I oppose allowing existing facilities to increase their storage capacity by 10%.

Please prevent fossil fuel companies and their subsidiaries from being able to build, modify or aggregate a number of smaller terminals.

I urge you to listen to our community and our City Council who have made our desire clear to leave these dirty and dangerous fossil fuel products behind – and ban the building of new fossil fuel infrastructure.

Our community- and the global community - are counting on the wisdom of groups such as this one - to move us forward towards a more positive approach to energy sources. We need decision-makers to be brave, bold and innovative – we (including you!) are the people we have been waiting for to build a wiser, cleaner, healthier future.

Thank you,
Dawn Smallman
1148 SE 50th Ave.
Portland, OR 97215

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:27:16 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
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-----Original Message-----
From: marensouders@everyactioncustom.com [mailto:marensouders@everyactioncustom.com]
Sent: Monday, September 12, 2016 11:27 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
E Maren Souders
2409 SE 51st Ave Apt 5
Portland, OR 97206-1482

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: Fossil Fuel Infrastructure
Date:	Tuesday, September 13, 2016 6:00:50 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Cathy Spofford [mailto:cspof1@gmail.com]
Sent: Tuesday, September 13, 2016 2:19 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Fossil Fuel Infrastructure

Dear PCS members,

I am writing to encourage you to strengthen not water down restrictions to new fossil fuel infrastructure in Portland. Please ban all new terminals no matter the size, and prevent an increase in oil trains through the Portland area. We need to protect our community and water ways and focus on safe, sustainable energy sources.

Cathy Spofford
6130 SW Nevada Ct
Portland, OR 97219
Cspof1@gmail.com

Sent from my iPhone
Sent from my iPhone

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Tuesday, September 13, 2016 10:32:30 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Jane Stackhouse [mailto:jane@janestackhouse.com]
Sent: Tuesday, September 13, 2016 10:01 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the

regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Jane Stackhouse
2643 NE 43rd Ave
Portland, OR 97213

I'm Don Steinke from Vancouver.

Therefore They are bringing

The fossil fuel industry sees our local ports as the shortest pathway to Asia. ~~We currently have~~ 16 oil trains per week ~~traveling~~ through the Columbia Gorge. One year ago, the Los Angeles City Council voted unanimously to oppose 5 oil trains per week.

voted to place

A month ago the Spokane City Council ~~placed~~ a measure on the ballot banning oil trains and uncovered coal trains. Immediately BNSF took out a full page ad condemning the action. The Council removed the proposal from the ballot but some council members are considering a plan B.

BNSF

They wrote a letter cosigned by councilmembers from Mosier, and Edmonds WA. It appeared in the Seattle Times a week ago. It said:

We applaud those jurisdictions with control over oil-terminal expansions that have passed ordinances that don't allow crude oil terminals, such as the cities of Hoquiam, Aberdeen and Vancouver.

And we greatly appreciate the work of Whatcom County to implement a moratorium on any new permit applications as it considers a more permanent solution.

In contrast to this, your proposed zoning laws could allow more crude oil trains to come through Mosier and Portland.

You should not enable more fossil fuel trains to come through the Columbia Gorge to a terminal in Portland. In Vancouver we are fighting NuStar which proposed to handle 1 million gallons of crude oil per day, and you ~~seem willing~~ proposal would to allow storage of 5 million gallons.

The treaty tribes of the Columbia Gorge are adamantly opposed to coal and oil trains through the Gorge. Many of their councilmembers are right now in North Dakota blocking a pipeline to protect the water.

Don't accept any more fossil fuel project applications unless the treaty tribes have first approved the project.

You don't want ethanol terminals either. The NTSB says that ethanol trains are just as dangerous as crude oil trains. Your own Fire Department was maxed out on May 4, 2011, when a log fell off another train and caused an ethanol train to puncture and catch fire.

Russia's Prime Minister Medvedev has ordered all gas stations to install charging stations at their own expense, by November of this year.

Don't allow any expansion of the fossil fuel industry in Portland. We cannot transition off of fossil fuels if we invest more in fossil fuel infrastructure.

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 9:21:47 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Joseph Stenger [mailto:joseph.stenger@gmail.com]
Sent: Tuesday, September 13, 2016 6:51 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please revise the Fossil Fuel Zoning Amendment to remove exceptions for facilities under 5 million gallons. At this time of huge earthquake risk, new facilities of any size are overly dangerous to public health. In addition, I urge inclusion of language to prevent clustering and aggregating smaller terminals to circumvent size restrictions.
Our City should set the example on this crucial issue.
On behalf of my grandchildren, thanks!

From: Joseph Stenger
Email: joseph.stenger@gmail.com
Address: 4420 NE 36th Ave, Portland, Oregon, 97211

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 5:56:09 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

From: Deva Sunya [mailto:dragon@350pdx.org]
Sent: Tuesday, September 13, 2016 12:59 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Time is short for addressing climate change. A recent study by NOAA says that we may see a 3 meter sea level rise by 2050-2060. That is much sooner than the IPCC report which is now much out of date. This amount of sea level rise will create hundreds of millions of climate refugees. There is much other evidence indicating the severity of our collective circumstances. At this point, the situation is so severe, that concerns over a companies profits are of no meaning. It is like the point in a disaster movie when everyone finally realizes that catastrophe has struck. Business as usual then comes to an end. We are already at that point. The usual considerations must be set aside and extraordinary measures taken. This is exactly what the science is telling us.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to

increase fossil fuel shipments through Portland.

Sincerely,
Deva
Deva

From: Deva Sunya
Email: dragon@350pdx.org
Address: 3414 SE 21st Ave., Portland, Oregon, 97202

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Wednesday, September 14, 2016 9:41:06 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: mtinkham@everyactioncustom.com [mailto:mtinkham@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 5:10 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Mary Tinkham
6126 SE Grant St
Portland, OR 97215-4055

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 5:57:02 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Anais Tuepker [mailto:wordpress@350pdx.org]
Sent: Tuesday, September 13, 2016 1:16 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear City Council,

I was so proud of our city when, last year, we showed our commitment to a clean energy future and passed the ban on new fossil fuel infrastructure. Portland is my home, and part of why I love it so much is because every day I see evidence that we are a community dedicated to social and environmental justice. We are willing to embrace the need to change our ways and move off of unsustainable fossil fuels.

Now the time has come to enact that ban, and our actions need to be as strong as our words. Every day we delay taking strong action, we create more difficult and complex climate challenges for all those who come after us. That is why I urge you to enact a full ban on all new fossil fuels. Allowing an exemption for smaller new facilities undermines the power of the ban both practically and symbolically. Similarly, if we do not strengthen limits on existing facilities, we will not only allow continued disastrous impacts on the climate, we send the message that solving this problem can be done slowly, step by step.

We are long past the time for slow and steady change. We need to be bold. Those of us living now are already seeing the impacts of climate change through more extreme weather, increased temperatures affecting crops and loss of biodiversity, and the many social effects of destabilized societies. All those who come after us will have to live with the results of the choices we make today. Let's make the strongest, bravest choices we can, to end fossil fuel dependence now, with no new fossil fuel terminals and no expansions to a dying industry.

Thank you for your leadership.

From: Anais Tuepker
Email: anaistuepker@yahoo.com
Address: 1414 SE Lafayette Street, Portland, Oregon, 97202

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:25:13 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: aturner@everyactioncustom.com [mailto:aturner@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 6:36 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Ann Turner
2007 NE Mason St
Portland, OR 97211-5770

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:27:31 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: carol.v.600@everyactioncustom.com [mailto:carol.v.600@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 12:47 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

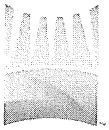
-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Carol Vance
4444 SE Francis St
Portland, OR 97206-3258



Climate Solutions
PRACTICAL SOLUTIONS TO GLOBAL WARMING

September 13, 2016

Portland Planning and Sustainability Commission
1900 SW 4th Ave. Suite 7100
Portland, OR 97201

RE: Draft Rule for Fossil Fuel Terminal Zoning Amendments

Dear Commission Members,

We write in **strong support of moving forward with the Draft Rules with proposed modifications as detailed below.** Climate Solutions is a regional non-profit working to accelerate practical and profitable solutions to global warming. For more than 15 years, Climate Solutions has been working to implement energy efficiency, renewable energy, and carbon reduction policies that demonstrate that clean energy and broadly shared economic prosperity go hand-in-hand. The City of Portland has long reflected the bold leadership and thoughtful attention to fair and effective climate solutions that we support. We are excited that the City is taking this important step to align its investments with its values and its commitments to climate action.

While the Draft Rules are a strong attempt to act on the City Council resolution, the following would improve the strength and impact of the rules in a way that furthers the City Council intent. Please consider including these modifications to the Draft Rules:

1. **We support the alternative proposed by staff to prohibit new bulk terminals.** We also support the staff alternative that existing terminals may not exceed 10 percent of the total terminal capacity. In the event that that the Commission should disagree with those approaches and prefer to have a permitting pathway for new bulk terminals, we propose that the threshold for such new terminals be limited to 2 million gallons and not 5 million gallons. That smaller amount would allow for some flexibility while minimizing potential gaming of the system or the chance for multiple 5 million gallon facilities being built going forward.
2. Condition any permit approval for a new or expanded facility with the following:
    a. Include a condition that the permit holder may only operate the facility as described in the application. For instance, if an applicant claims they will store and export ethanol only, then clearly state it would be a violation of the permit to switch to storage and export of a fossil fuel. This would help prevent the bait and switch that increasingly is occurring around the country. It also is consistent with other siting/permitting regulations such as the Oregon Energy Facility Siting Council which requires a site certificate holder to go through the amendment process if they alter the operations from what was described in their site certificate application.

ClimateSolutions.org

Seattle
1402 Third Avenue, Ste 1305
Seattle, WA 98101
tel 206.443.9570
fax 206.624.2022

Olympia
219 Legion Way SW, Ste 201
Olympia, WA 98501
tel 360.352.1763
fax 360.943.4977

Portland
610 SW Broadway, Ste 306
Portland, OR 97205
tel 503.206.4837

b. Include a condition that the permit holder submit annually to the City of Portland a letter describing the operations and what is stored in tanks and any difference between the current operations and what was described in their permit application.
c. Include a condition that the City may inspect the facility at any time to ensure that the tanks are being used to store the same fuel described in the permit application.

Thank you for your leadership,

David Van't Hof

David Van't Hof, Acting Oregon Director

ClimateSolutions.org

Seattle
1402 Third Avenue, Ste 1305
Seattle, WA 98101
tel 206.443.9570
fax 206.624.2022

Olympia
219 Legion Way SW, Ste 201
Olympia, WA 98501
tel 360.352.1763
fax 360.943.4977

Portland
610 SW Broadway, Ste 306
Portland, OR 97205
tel 503.206.4837

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 5:59:21 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: ravinspaw@everyactioncustom.com [mailto:ravinspaw@everyactioncustom.com]
Sent: Tuesday, September 13, 2016 11:17 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Laraine Vonfeldt
7301 N Washburne Ave
Portland, OR 97217-5859

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 6:04:00 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Tyler Wagner [mailto:twagner@sipdx.org]
Sent: Tuesday, September 13, 2016 2:51 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

As the St. Ignatius Fellow at St. Ignatius Church in Southeast Portland, I have been ignited by Pope Francis' call in his encyclical Laudato Si to care for creation and to understand that we have a moral obligation to protect our planet for all beings, including people on this planet today and in future generations.

With that moral call, I call on the City of Portland to:

1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Tyler Wagner
Email: twagner@sipdx.org
Address: 3527 SE Madison St, Portland, Oregon, 97214

Working Waterfront
COALITION

September 13, 2016

Portland Planning and Sustainability Commission
City of Portland
1900 SW 4th Avenue, Suite 7100
Portland, OR 97210

Subject: Proposed Draft of Fossil Fuel Terminal Zoning Amendments

Dear Portland Planning Commissioners,

The Working Waterfront Coalition (WWC) opposes the proposed Fossil Fuel Terminal Zoning Amendments, (draft dated August 12, 2016). The WWC and several of its members have repeatedly met with City of Portland representatives as these amendments moved from concept to draft code language. The WWC continues to oppose any zoning code amendment that would make existing multimodal fuel terminals nonconforming uses, or that would in any way limit these critically important energy facilities from serving as a distribution hub for the region, the state and for other states in the Pacific Northwest.

We further agree with the comments contained in the September 7, 2016 letter from Frank Holmes, Director of the Northwest Region of the Western States Petroleum Association (WSPA) to the Portland Planning and Sustainability Commission (PSC), and adopt his comments as our own.

We note that we are in receipt of an email from Steve Kountz dated September 12, 2016 transmitting a memo from Steve Kountz and Tom Armstrong dated September 9, 2016 to the PSC, indicating that Bureau of Development Services (BDS) has confirmed what the WWC has been saying for several months, namely that "expansions of existing terminals may not be possible through a nonconforming situation review." In response to this fundamental flaw, Mr. Kountz mentions two concepts, which he refers to as the "Limited Use" alternative and the "Conditional Use" alternative. These alternatives are not discussed in any detail in the related memo, nor is any specific code language proposed in support of these alternative. In essence these "alternatives" are mere concepts. Accordingly, we have nothing of substance to review in that regard. If the PCS is interested in exploring these alternatives proposed by the Bureau of Planning and Sustainability (BPS), the WWC requests that this hearing be continued for a period of at least 30 days to allow staff to prepare proposed code language to support these alternatives and for stakeholders to have a meaningful opportunity to review and comment on the resulting code language. Thank you for your continued attention to this important matter.

Sincerely,

Ellen Wax

Ellen Wax, Executive Director
Working Waterfront Coalition

Established in 2005, the Working Waterfront Coalition, with its extensive knowledge of harbor industry needs and active industry participation, is dedicated to working with its partners to ensure an appropriate balance between environmental concerns and the needs of river-related, river-dependent employers. Portland's Harbor is a vital employment area: home to thousands of valuable high-wage, high-benefit jobs. In addition, WWC members are conscientious stewards of the environment, making significant investments in the harbor consistent with state and federal laws.

Denise Weller

Portland Planning Commission,

The proposed plan for fossil fuel terminal zoning as written allows expansion on existing facilities, allows facilities to add new tankage and infrastructure as long as it is within their current facilities footprint.

This does not conform with resolution 37168 which opposes expansion of infrastructure whose primary purpose is transporting or **STORING** fossil fuels in or through Portland or adjacent waterways.

Nor does it address PBEMS recommendations for seismic risks.

Resolution 37168 states "Whereas:

- tribal communities in Ore. and Wash .have expressed concerns about the safety risks of fossil fuel infrastructure and the related threats to human health, cultural heritage, and environmental quality
- economic opportunities presented by expanding fossil fuel infrastructure are modest, with few jobs and little added value when compared to the related environmental costs
- the 2015 Climate Action Plan commits the city to continue to advance policy and programs to reduce fossil fuel use both in the city's own operations and through community-wide initiatives
- oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways
- fossil fuel infrastructure poses considerable risks in the event of a major earthquake

Therefore, be it resolved that the city of Portland will actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or throughout Portland or adjacent waterways.
Be it further resolved, this resolution is binding City policy."

The proposed fossil fuel zoning plan advocates expansion of fossil fuels facilities.Expansion through height or within footprint boundaries of existing fuel storage facilities does not comply with this resolution

[Type text]

Besides the impending Cascadia Subduction Zone Earthquake, there are three other earthquake fault lines that run under and adjacent to the tank farms.

According to DOGAMI the area of Linnton / Willbridge tank farms are on liquefiable soils.

In the event of an earthquake the tank farms are at great risk for sliding into the adjacent waterways. Thereby contaminating the Willamette River and the Columbia River

There are fire risks. In the event of an earthquake the shaking of the tanks particularity the floating lidded gasoline tanks and the very evacuation of the fuel from the tanks create sparks that will ignite the fuel, cause explosions. Linnton is the most at risk neighborhood for wildfires according to the Portland Fire Bureau, with Forest Park and the residential areas and the St Johns Bridge adjacent to the tank farms, the risk in dollars and lives would be substantial and catastrophic. Also fire risks from accidents such as the RR car accident a few years back where a traveling train slightly derailed and tore a fuel RR tanker stored on the tracks causing a huge fire. This was only minutes from happening in Linnton where the tanks are located and explosive chemicals are continually stored some as close as 25 feet from Linnton's daycare center. The recent tanker truck accident next to the LNG tank at Gasco, is another example of dodging a bullet for a catastrophic event. If there had been a more volatile chemical in the RR tanks the LNG tank would have exploded causing a quarter mile blast area, that means a quarter mile hole and everything within that quarter mile disintegrated, including the tank farms causing a domino effect of ignition, the St Johns bridge, Linnton, Forest Hills Park, and the Liquid hydrogen tank stored at Siltronics which has its own blast area that would severely affect St Johns. As it turns out even though the RR tanks did not catch on fire the instruments were affected that control the super low temps that the LNG needs to be kept at, a good reason to not allow expansion of the LNG tank. Numerous other accidents associated with the tank farms over the years have put residents at risk.

The tank farms are located in an insanely hazardous location, way too close to the river, extremely susceptible to homeland security issues, on liquefiable soils, are an eventual environmental catastrophe, and have health and safety risks for the residential neighborhoods of Linnton and St. Johns and NW Portland.

[Type text]

Community Advisory Group, Board Member Northwest Toxic Communities Coalition for Region 10.

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] Re: PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 10:34:50 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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-----Original Message-----
From: LCW [mailto:lcwhealin@gmail.com]
Sent: Tuesday, September 13, 2016 9:57 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] Re: PSC Fossil Fuel Zoning Testimony

648 N. E. 25th St., Gresham, OR 97030

Thanks Julie.

Take care, Linda

> On Sep 13, 2016, at 9:22 AM, Planning and Sustainability Commission <psc@portlandoregon.gov> wrote:
>
> Hello Linda,
>
> Thank you for your comments to the Planning and Sustainability Commission. For your testimony to be officially part of the public record, it does need to include your mailing address (including house or PO number). Without this information, the City is not able to send you notification of Council hearing dates or the Council's final decision, and you may not be able to appeal the Council's final decision.
>
> So that I may include your comments in the record and forward them to PSC members, can you please email me your mailing address?
>
> Thanks,
> julie
>
>
> Julie Ocken
> City of Portland
> Bureau of Planning and Sustainability

> 1900 SW 4th Ave, Suite 7100
> Portland, OR 97201
> 503-823-6041
> www.portlandoregon.gov/bps
>
> ----------
> To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.
> ----------
>
>
> -----Original Message-----
> From: Linda Whealin [mailto:lcwhealin@gmail.com]
> Sent: Tuesday, September 13, 2016 7:26 AM
> To: Planning and Sustainability Commission <psc@portlandoregon.gov>
> Subject: PSC Fossil Fuel Zoning Testimony
>
> Dear Planning & Sustainability Commission,
>
> Thank you for your efforts in keeping Oregon and Portland a place I am proud to live. I spent 13 years living in Houston Texas and am well aware of the damage that the oil industry can do. Waking up on a clear blue sky morning, one steps outside and inhales the smell of oil. LA and Houston have the top cancer rates in the country. While implementing a program to build a new fossil terminal may not have those immediate affects, the thought of changing the city code to allow more unit trains of dangerous, highly ignitable fuels, like the Bakken crude oil, into the environment that you have successfully protected to this point, is unthinkable.
>
> Please strengthen restrictions on expansions to protect and sustain our environment.
>
> Thank you for continuing to protect your city and state, Linda Whealin
>
>

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] RE: PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 10:35:43 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: The Yorks [mailto:happyyorks@comcast.net]
Sent: Tuesday, September 13, 2016 9:52 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] RE: PSC Fossil Fuel Zoning Testimony

You bet.
Karen York
516 SE 200th Place
Camas, WA 98607

I also own property in Lake Oswego incase anyone thinks that just because I live across the river I shouldn't have
a vested interest in what goes on in Portland.

From: Planning and Sustainability Commission [mailto:psc@portlandoregon.gov]
Sent: Tuesday, September 13, 2016 9:48 AM
To: The Yorks
Subject: RE: PSC Fossil Fuel Zoning Testimony

Hello,

Thank you for your comments to the Planning and Sustainability Commission. For your testimony to be officially part of the public record, it does need to include your mailing address (including house or PO number). Without this information, the City is not able to send you notification of Council hearing dates or the Council's final decision, and you may not be

able to appeal the Council's final decision.

So that I may include your comments in the record and forward them to PSC members, can you please email me your mailing address?

Thanks,

julie

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

From: The Yorks [mailto:happyyorks@comcast.net]
Sent: Tuesday, September 13, 2016 9:44 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

I am commenting today to remind all – all those whose job it is to oversee the planning and progress of Portland - This City, this Land, this Planet – I am here to remind you that we are stewards of this Earth. A steward is someone who has the job to protect and manage. It is the duty, then, to figure out what is best for the individuals, the town, and even the land itself and to use that knowledge to make plans and policies that will sustain those things. Like a 3 legged stool, all three must solidly exist. One not being more important than another.

Take the work of a farmer. A farmer knows that the goals of achieving a plentiful crop require care of the land. A crop that is planted might grow wonderfully the first year – but if the seeds are not saved, or if the soil is not cared for properly, successive years of abuse or neglect yield diminishing crops to an exponential degree.

Take the fisherman or the hunter. Those who hunt and fish know that

a catch that empties the waters or clears the lands of the animals, is not sustainable. There is no future in hunting to extinction. Leaving enough wildlife behind ensures the future of the animal – but moreover – the ability to continue to hunt and fish in the years to come.

It is the responsibility of these people, who already intimately know the delicate balances they live around and among, to maintain that balance. They do it because they already know that to not do so, is disastrous. City folk, who have spent much time removed from nature, often forget there is a delicate balance. They live in a contrived world where it is easy to believe they are the masters of all resources – that there is an endless supply of whatever they should want. But it simply is not so.

Fossil Fuels have had their time. When the science was new, we did not know the ramifications of using this finite resource. We only saw the benefits of our new crop. But we are older and wiser, now. It is important to the health of our world, that we stop using fossil fuels. It is important to this city, that we make planning choices that protect our city, and moreover, our planet. So when big business comes knocking, looking for a place to set up their business where money is paramount to environmental ethics, please give them a loud "no" for an answer. Our health depends on it. Thank you.

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 6:05:52 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Cecilia Youngs [mailto:cecilia.youngs@gmail.com]
Sent: Tuesday, September 13, 2016 3:52 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please enact a full ban on all new fossil fuel terminals, with no exceptions. The code changes should not allow more unit trains or dangerous fossil fuels like Bakken crude oil.
Please strengthen restrictions on expansions allowed at existing terminals by adding binding limits and criteria for safety and climate impacts in Portland's non-conforming use review process.
Please prevent any aggregate increase in fossil fel infrastructure in Portland.

From: Cecilia Youngs
Email: cecilia.youngs@gmail.com
Address: 9725 SE 36th St., Ste. 404, Mercer Island, Washington, 98040

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 10:33:35 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Daniel Yuhas [mailto:daniel.yuhas@gmail.com]
Sent: Tuesday, September 13, 2016 10:26 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I want to give my support to the following:

Enact a full ban on all new fossil fuel terminals, large or small.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

best,

From: Daniel Yuhas
Email: daniel.yuhas@gmail.com
Address: 730 NE 31st Avenue, Portland, Oregon, 97232

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 10:33:47 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Patricia Zoline [mailto:ashlandmagic@gmail.com]
Sent: Tuesday, September 13, 2016 10:30 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear PSC,

I applaud the creation of a fossil fuel ban and together with 350PDX would suggest the following amendments to the current draft code:

Enact a full ban on all new fossil fuel terminals, large or small.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

sincerely,

From: Patricia Zoline
Email: ashlandmagic@gmail.com
Address: 6415 NE Sacramento, Portland, Oregon, 97213

WRITTEN TESTIMONY ONLY

Portland Planning and Sustainability Commission Public Hearing

DO NOT CALL

Date: 13 Sept 2016

Name: Marilyn Zornado (Please print legibly)

Authorized Spokesperson representing: (if applicable)

Address: Marina Way Moorage, 13140 NW Marina Way

City: Portland Zip: 97231 Phone: 503-807-9825

Email Address and/or Fax No.: ZORNADO@gmail.com

What agenda item do you wish to comment on? Fossil Fuel Infrastructure

Site Address, if different from above:

☑ (check if written comments are included on back)

Marilyn ZORNADO

I live on a houseboat DOWNSTREAM from the "Tank Farms" on Hwy 30.

Portland needs to phase out ALL storage of fossil fuels on the banks of the Willamette. Currently the tanks are located on soil predicted to "Liquify" in an earthquake, spilling a toxic cocktail of fossil fuels into the river, endangering humans and wildlife. Start now to move fossil fuels OFF the River!

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:34:05 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: annaa52@everyactioncustom.com [mailto:annaa52@everyactioncustom.com]
Sent: Monday, September 12, 2016 6:19 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
T A Anderson
2752 SW Wake Robin Pl
Corvallis, OR 97333-1607

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:46:17 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: sa222@everyactioncustom.com [mailto:sa222@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:01 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Sven Andersson
601 SW 2nd Ave
Portland, OR 97204-3229

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:06:46 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: joan_andon@everyactioncustom.com [mailto:joan_andon@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:45 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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addressing the most pressing concern of our time.

Sincerely,
Joan Andon
2411 NW Stimpson Ln
Portland, OR 97229-8564

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:05:10 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: susanarthur57@everyactioncustom.com [mailto:susanarthur57@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:48 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Susan Arthur
3014 NE Schuyler St
Portland, OR 97212-5127

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] Re: PSC Fossil Fuel Zoning Testimony.
Date: Monday, September 12, 2016 11:05:02 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Ray Ashmun [mailto:rayashmun@gmail.com]
Sent: Monday, September 12, 2016 10:43 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] Re: PSC Fossil Fuel Zoning Testimony.

Ray Ashmun 3018 NE 15th Ave, Ptd, OR 97212

On Mon, Sep 12, 2016 at 10:31 AM, Planning and Sustainability Commission <psc@portlandoregon.gov> wrote:

> Hello,
>
> Thank you for your comments to the Planning and Sustainability Commission. For your testimony to be officially part of the public record, it does need to include your mailing address (including house or PO number). Without this information, the City is not able to send you notification of Council hearing dates or the Council's final decision, and you may not be able to appeal the Council's final decision.
>
> So that I may include your comments in the record and forward them to PSC members, can you please email me your mailing address?
>
> Thanks,
> julie
>
> Julie Ocken
> City of Portland
> Bureau of Planning and Sustainability
> 1900 SW 4th Ave, Suite 7100
> Portland, OR 97201
> 503-823-6041
> www.portlandoregon.gov/bps
>
> ---
> To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative

formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

From: Ray Ashmun [mailto:rayashmun@gmail.com]
Sent: Saturday, September 10, 2016 9:25 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony.

Absolutely no ban on fuel movement, and lessen other restrictions.
The City should be working in every way to promote commerce, especially since the Port of Portland shipping business is evaporating.
Pipelines should be built to move oil and other petrochemicals with the resulting commercial growth.

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:36:13 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: marygbarrow@everyactioncustom.com [mailto:marygbarrow@everyactioncustom.com]
Sent: Monday, September 12, 2016 6:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Mary G Barrow
1531 SW Harrison St Apt 18
Portland, OR 97201-2536

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:40:21 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: steve.bartlett.gdad@everyactioncustom.com [mailto:steve.bartlett.gdad@everyactioncustom.com]
Sent: Monday, September 12, 2016 5:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Last year, when our Portland City Council voted to dedicate our city to a new fossil fuel infrastructure policy, I was very proud to be a citizen of a city that can serve all other cities in this nation as a model of what we must do to leave to our grandchildren a livable world. Now I am writing to urge the City of Portland live up to the high standards set forth in its November 2015 Fossil Fuel Policy. We must not back away in the smallest detail from those standards. And, as I read the current proposal, we are in danger of backing away from a major intent of the 2015 policy statement.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel

shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of addressing the most pressing concern of our time.

Sincerely,
Stephen Bartlett
659 N Tomahawk Island Dr
Portland, OR 97217-7968

NW Natural®

Planning and Sustainability Commission
1900 SW 4th Avenue, Suite 7100
Portland, OR 97201

September 12, 2009

Members of the Planning and Sustainability Commission,

NW Natural appreciates the opportunity to provide comments on the BPS Zoning amendments. NW Natural has been operating in Oregon since 1859 and now provides natural gas to over 700,000 customers in the region; 167,000 of these customers are located in Portland.

We hope the comments below help the PSC better understand the regulatory process under which NW Natural operates, and the inherent limits this process places on the Company's LNG facility in Portland. We hope that a more granular understanding of the regulatory process will assuage any concerns you have about LNG infrastructure expansion, and request that you consider excluding the property from classification as a bulk fossil fuel terminal.

Background: According to the Fossil Fuel Terminal Zoning Amendments Proposed Draft, the City Council adopted Resolution 37168 in November 2015, which opposes expansion of fossil fuel infrastructure, except for safety improvements, service to end users, and infrastructure that accelerates transition to non-fossil fuel energy. The 2035 Comprehensive Plan (Policy 6.48) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.[1]

NW Natural's Business: NW Natural is a local distribution company (LDC) that provides natural gas directly to end users in Oregon and Washington. Throughout the region, the Company owns pipelines that carry gas to homes and businesses for water and space heating, cooking, and industrial processes.

NW Natural Environmental Values: NW Natural takes climate action very seriously. Pipeline replacement is the number one strategy for reducing greenhouse gas emissions from the LDC system: the Company took early action and, with the completion of our pipeline replacement program in 2015, we can now claim one of the tightest local distribution systems in the country. Additionally, Smart Energy was one of the first voluntary emission reduction programs offered by an LDC. The Company also joined the U.S. EPA Natural Gas Star Methane Challenge in March 2016 as a founding member. Under this program, companies adopt best practices and report reductions to the EPA annually.

How NW Natural is Regulated: NW Natural operates by a fairly unique set of rules because we are a state-regulated monopoly that provides a necessary service. The Oregon Public Utility Commission (OPUC) carefully monitors and regulates the Company's actions to protect ratepayers through rate

[1] Fossil Fuel Terminal Zoning Amendments Proposed Draft, August 12, 2016. Page 23. www.portlandoregon.gov/bps/article/586612

proceedings, audits, and the Integrated Resource Plan (IRP) process[2], a complex modeling exercise NW Natural is required to produce every 2 years to demonstrate how the Company plans to meet customer demand. The Citizens' Utility Board (CUB), a residential customer advocacy organization, the NW Industrial Gas Users Association, and environmental advocates actively engage in the regulatory processes at the OPUC, in order to ensure customers are protected and to monitor NW Natural's actions with respect to climate and efficiency goals.

The regulatory process is multifaceted; as such, there are requirements on the Company to provide reliable service, as well as rules that guide how NW Natural infrastructure can be used today and in the future. Our LNG tank exists at the intersection of these regulations: the facility ensures that NW Natural can provide reliable service to its customers. NW Natural's planning processes demonstrate that the fuel is needed to meet customers' peak demands in instances where the region may experience high loads, during events such as cold weather. This purpose and function of the tank is a central part of NW Natural's portfolio of resources, and is a topic of its Integrated Resource Planning.

It is important to note that any changed use or expansion of the facility would be vetted through processes at the OPUC. These processes are open to the public, and closely monitored and followed by a variety of outside groups – including those mentioned above – and the OPUC's professional staff.

Issues with Non-Conforming Use Designation: The designation of the facility as a non-conforming use creates consequences not intended by the original resolutions, which specifically exempt service to end users and storage facilities to those necessary to serve the regional market. Facilities designated as a nonconforming use can find it difficult to attract investment or credit to make alterations or upgrades, including safety upgrades, particularly when they are subject to discretionary review processes.

For instance, any upgrades to the facility – seismic, safety, or otherwise – will be considered more risky because they might trigger a Type II Discretionary Land Use Review. This kind of review is highly subjective and may make it more difficult and expensive to invest in the kinds of upgrades the city seeks to incent. Additionally, there are state policies in place that incent the use of LNG in river barges and heavy duty fleets in order to displace more carbon-intensive fuels like diesel. Even if NW Natural received approval for such a project from the OPUC, the non-conforming use designation would create additional cost and uncertainty, and might prohibit NW Natural from providing LNG to those end users.

Preferred Language: Since NW Natural is regulated by the OPUC through transparent processes that include stakeholder engagement opportunities, and since the intent of the original resolutions sought to exempt service to end users and service to the regional market, we request the code avoid classifying the facility as a "bulk fossil fuel terminal." We have included language below to this effect that would fit on page 23 under *"Exceptions that are not Bulk Fossil Fuel Terminals."* Such a carve-out would impact only NW Natural and would not create a loop-hole for other terminal owners and operators.

<u>Proposed Language</u>	*Any facility operated by a public utility and regulated by the Oregon Public Utility Commission under ORS Chapter 757 for the purpose of ensuring fuel reliability to direct users through an interconnected system.*

[2] Oregon Administrative Rules 860-027-0400. "... "Integrated Resource Plan" or "IRP" means the energy utility's written plan satisfying the requirements of Commission Order Nos. 07-002, 07-047 and 08-339, detailing its determination of future long-term resource needs, its analysis of the expected costs and associated risks of the alternatives to meet those needs, and its action plan to select the best portfolio of resources to meet those needs."

Secondary Approach: If the PSC is unable to exempt our facility, we ask that an additional section be added to the zoning code that deals specifically with bulk fossil fuel terminals as a non-conforming use. To ensure fairness, a separate code section should be drafted because the existing code does not implement the intent for a fair process, as professed in the staff report, and the staff report relies too much on the Council Resolution, which is not codified, and is not part of the zoning code.

We do not have sample language at this time, but as an example, the PSC should consider the following:

- If a change in law would impose technical or engineering requirements that would curtail capacity and ability to serve customers, modifications to maintain capacity and service should be allowed outright as a matter of regulatory entitlement.
- For repair and maintenance, the code should explicitly prohibit the City from using such measures as an opportunity to curtail or impose costly upgrades.
- Changes in related or supporting facilities or accessory uses should be allowed upon a showing of no increased public safety risk.
- Changes in intensity of uses – through efficiency and upgrades – that allow greater throughput also should be allowed upon demonstrating no increased risk to public safety.

Again, we appreciate the opportunity to offer comments on this proposed draft. We are happy to answer any questions you may have.

Sincerely,



Gary Bauer
Director, Government Affairs

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:38:21 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

-----Original Message-----
From: trinebeach@everyactioncustom.com [mailto:trinebeach@everyactioncustom.com]
Sent: Monday, September 12, 2016 5:11 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Trine Beach
4023 SE Long St
Portland, OR 97202-4044

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:35:44 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: beallster@everyactioncustom.com [mailto:beallster@everyactioncustom.com]
Sent: Monday, September 12, 2016 5:23 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

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addressing the most pressing concern of our time.

Sincerely,
Jo Beall
597 N Dekum St Apt 129
Portland, OR 97217-1962

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:33:06 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: mfayebennett@everyactioncustom.com [mailto:mfayebennett@everyactioncustom.com]
Sent: Monday, September 12, 2016 6:59 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

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addressing the most pressing concern of our time.

Sincerely,
Faye Bennett
3965 SE Oak St
Portland, OR 97214-2027

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:43:17 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: npbishop@everyactioncustom.com [mailto:npbishop@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:27 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Nancy Bishop
1725 N Alberta St
Portland, OR 97217-3535

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:44:01 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: clbledsoe@everyactioncustom.com [mailto:clbledsoe@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:17 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

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addressing the most pressing concern of our time.

Sincerely,
Cathy Bledsoe
10151 SW Washington St
Portland, OR 97225-6947

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:30:03 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: pat.bowman@everyactioncustom.com [mailto:pat.bowman@everyactioncustom.com]
Sent: Monday, September 12, 2016 9:13 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

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addressing the most pressing concern of our time.

Sincerely,
Pat Bowman
1021 NW Skyline Blvd
Portland, OR 97229-6820

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:07:46 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: dianaisbright@everyactioncustom.com [mailto:dianaisbright@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:44 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

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To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

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Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
DIANA BRIGHT
4146 SE Crystal Springs Blvd
Portland, OR 97202-7917

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:35:28 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: ebritt1406@everyactioncustom.com [mailto:ebritt1406@everyactioncustom.com]
Sent: Monday, September 12, 2016 5:36 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

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addressing the most pressing concern of our time.

Sincerely,
Elizabeth Britt
1406 SE 27th Ave Apt 6
Portland, OR 97214-2972

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 11:02:38 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Charles Brod [mailto:cubrod@gmail.com]
Sent: Monday, September 12, 2016 10:30 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please amend the draft resolution so that no construction of large or small fossil fuel facilities may be undertaken n Portland; restrict expansion of existing facilities; and prevent any aggregate increase in fossil fuel infrastructure in the city of Portland.

From: Charles Brod
Email: cubrod@gmail.com
Address: 2728 SE Tibbetts St, Portland, Oregon, 97202

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:38:56 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: ttenbroeke@everyactioncustom.com [mailto:ttenbroeke@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:29 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

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Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Trisha ten Broeke
5609 SE 65th Ave
Portland, OR 97206-5426

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:10:56 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: mcard@everyactioncustom.com [mailto:mcard@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:38 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

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addressing the most pressing concern of our time.

Sincerely,
Monica Card
5104 SE Clinton St Apt A
Portland, OR 97206-1400

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:11:32 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: paularcasner@everyactioncustom.com [mailto:paularcasner@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:00 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

We could even become more progressive and put solar panels on every city building, and require all new construction in this city to have solar panels on the roof. We could offer discounted services for solar panels being installed on the rest of the rooms on this town, make it a work program for people who are unemployed to teach them skills, and make this is solar city. There are so many things we can model for the rest of this country and make such a large difference in our environment. We can sponsor living trees as the preference for Holiday trees and plant them all over the city. We can do a lot to make a difference here and Portland has the means to put the legislation in place locally to be an example for the whole country. And we have the will of the people here on our side. Thank you for listening. Thank you for going forward with these ideas as well.

Sincerely,
Paula Casner
3249 NE 81st Ave
Portland, OR 97213-6539

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:11:13 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

-----Original Message-----
From: april@everyactioncustom.com [mailto:april@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:29 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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addressing the most pressing concern of our time.

Sincerely,
April Christenson
777 NW 19th Ave Apt 212
Portland, OR 97209-1392

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:15:12 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Merle [mailto:merle_c_2000@yahoo.com]
Sent: Monday, September 12, 2016 4:40 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

I am writing to ask that the City of Portland amend the proposed draft to reflect the city's fossil fuel goals:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

I, like many Portlanders, live very close to train tracks that carry fossil fuels now. It is a question of when, not if, our neigborhoods will be dealing with a disaster like our friends in Mosier just endured. They were so very lucky that the Gorge winds were still that day...a real miracle. They blow hard in Northeast Portland too. We should not expect the miracles to happen every time.

Thank you.
Sincerely,

Merle R Clifton
4457 NE Campaign St.

Portland, OR 97218

2542

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:32:47 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: cohenalicia@everyactioncustom.com [mailto:cohenalicia@everyactioncustom.com]
Sent: Monday, September 12, 2016 6:35 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Alicia Cohen
2240 SE 24th Ave
Portland, OR 97214-5506

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:28:50 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: mlc12145@everyactioncustom.com [mailto:mlc12145@everyactioncustom.com]
Sent: Monday, September 12, 2016 10:24 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Marilyn Cohen
12145 SW 33rd Ave
Portland, OR 97219-8255

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 9:19:11 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Mark Darienzo [mailto:markdari@pacifier.com]
Sent: Monday, September 12, 2016 9:26 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I want you to enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Mark Darienzo
Email: markdari@pacifier.com
Address: 6923 NE Morris Street, Portland, Oregon, 97213

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:46:00 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: maehkasew@everyactioncustom.com [mailto:maehkasew@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Daniel Dixon
6312 SW Capitol Hwy Ste 248
Portland, OR 97239-1938

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:10:32 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: drasticdreamer@everyactioncustom.com [mailto:drasticdreamer@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:38 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

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Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Sara Dolph
149 SE 134th Pl
Portland, OR 97233-1811

The League of Women Voters of Portland
618 NW Glisan St., Suite 303, Portland, OR 97209
(503) 228-1675 • info@lwvpdx.org • www.lwvpdx.org

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Debbie Kaye
1st VP
Peggy Bengry
2nd VP
Margaret Noel
3rd VP
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Corinne Paulson
Endowment
Linda Robolt
Voter Registration
Kris Hudson
Budget
Minda Seibert
Social Media

DATE: September 12, 2016

TO: Planning and Sustainability Commission

FROM: Fran Dyke, President
Margaret Noel, Vice President
Julie Chapman, Action Committee member
Ann Dudley, Action Committee member

RE: **Fossil Fuel Terminal Zoning Amendments, Proposed Draft**

Since the 1950's the League of Women Voters has worked at federal and state levels to protect air, land and water resources. More recently, the League has lobbied vigorously for comprehensive legislation to control global climate change. Any increase in fossil fuel infrastructure is not consistent with the current League of Women Voters natural resources and climate change positions, or with Portland's Climate Action Plan.

The Proposed Draft allows for the expansion of capacity in existing terminals within their current sites and for the construction of an unlimited number of 5 million gallon fossil fuel facilities. And, although the 2035 Comprehensive Plan would *limit* fossil fuel distribution and storage facilities to those serving the regional market, the plan does not *require* that we continue to rely on fossil fuels for anticipated future growth.

Your own Proposed Draft document acknowledges the velocity with which we must transition from fossil fuels on p.19: "The lower-carbon fossil fuels do have appeal as a bridge to widespread use of renewable energy, but investments in major infrastructure typically take decades to recoup, and the transition to renewables needs to go much faster than that to stabilize global emissions."

90% of Portland's industrial areas have moderate-to-high liquefaction susceptibility in a major earthquake. There is almost no safe, seismically stable industrial land on which to site further growth of fossil fuel terminals and facilities in the city of Portland.

We echo the concerns expressed in the Proposed Draft, that "Substantial local investment in fossil fuel infrastructure and large new terminals could hinder local growth mo-

mentum in Clean Energy industries."

Family wage jobs can be grown in the emerging renewable energy sectors.

Burning fossil fuels for energy to supply the needs of an increasing regional population is counterproductive in its adverse impacts on climate and increasing mitigation costs on local, national and global scales. When governments in the United States are spending billions to respond to disasters intensified or directly caused by climate change (wild fires, extreme heat "events," drought, sea level rise contributing to storm and tidal surges), a commitment to the rapid transition to non-fossil fuel energy sources is crucial.

In light of this, the League of Women Voters of Portland believes that increasing capacity for fossil fuels in the city of Portland is contrary to our long-range goal of combating climate change. We must invest in energy sources that don't emit greenhouse gases and in the grid capacity to utilize them efficiently.

If "Cities Lead," we want to head in the right direction!

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:38:39 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: verdilovers@everyactioncustom.com [mailto:verdilovers@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:38 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

It is time for our leadership to face the reality of what fossil fuel has done to change our climate and the need to do whatever is neccesary to improve the situation.

Sincerely,
Jules and Renee Elias6
6435 SE Yamhill St
Portland, OR 97215-2027

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:09:54 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: wax.delerium@everyactioncustom.com [mailto:wax.delerium@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:39 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

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addressing the most pressing concern of our time.

Sincerely,
Gavin Everard
5944 N Kerby Ave
Portland, OR 97217-2008

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:38:00 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: NFLEMINGRN@everyactioncustom.com [mailto:NFLEMINGRN@everyactioncustom.com]
Sent: Monday, September 12, 2016 5:16 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Nancy Fleming
802 SW Terwilliger Pl
Portland, OR 97239-2666

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:29:15 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: arlysfones@everyactioncustom.com [mailto:arlysfones@everyactioncustom.com]
Sent: Monday, September 12, 2016 10:01 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Please make the City's policy as strong as it can by:

-Enacting a full ban on all new fossil fuel terminals, large or small because this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is not in keeping with the Council's resolution and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of addressing the most pressing concern of our time. We are counting on you to make the code as strong as the resolution. This is the will of the people.

Sincerely,
Arlys Fones
9114 SW Trail Ct
Portland, OR 97219-4369

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony!
Date: Monday, September 12, 2016 4:05:27 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

-----Original Message-----
From: kaleyfrank@everyactioncustom.com [mailto:kaleyfrank@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:46 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony!

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Kaley Frank
8523 N Curtis Ave
Portland, OR 97217-6153

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:43:02 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: ghfreda@everyactioncustom.com [mailto:ghfreda@everyactioncustom.com]
Sent: Monday, September 12, 2016 5:02 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Gretchen Freda
3911 SE Milwaukie Ave Apt 203
Portland, OR 97202-3881

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:04:00 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: patigallagher@everyactioncustom.com [mailto:patigallagher@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:57 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Pati Gallagher
152 SE Spokane St Ste 6
Portland, OR 97202-6476

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Monday, September 12, 2016 12:20:12 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Becky Gardner [mailto:gbeckyl@msn.com]
Sent: Monday, September 12, 2016 12:12 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

No new fossil fuel anything anywhere in Oregon! As a native Oregonian I feel our beautiful state should lead the way in eliminating all fossil fuel businesses and encourage other states to follow our example. Show the nation and the world that we care about the future of our children, grandchildren, and the future of the planet! Oregon rocks!!!

From: Becky Gardner
Email: gbeckyl@msn.com
Address: 38703 Scravel Hill Rd NE, Albany, Oregon, 97322

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:45:21 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: cgerdes@everyactioncustom.com [mailto:cgerdes@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:15 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Cynthia Gerdes
3100 SE 10th Ave
Portland, OR 97202-2520

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 9:18:53 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Jennifer Gerlach [mailto:gerlachfamily@comcast.net]
Sent: Monday, September 12, 2016 9:23 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I strongly urge the City of Portland to amend the proposed draft to reflect the City's fossil fuel goals:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland

From: Jennifer Gerlach
Email: gerlachfamily@comcast.net
Address: 2639 SE Stephens St., Portland, Oregon, 97214

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 9:16:50 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

From: G. Gibson [mailto:mistergibson@gmail.com]
Sent: Monday, September 12, 2016 6:02 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would

allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

G. Gibson
mistergibson@gmail.com
Citizen

From: G. Gibson
Email: mistergibson@gmail.com
Address: 2837 S.E. Steele, #2, Portland, Oregon, 97202-4530

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:07:14 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: littlerose5555@everyactioncustom.com [mailto:littlerose5555@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:44 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Please enact a full, not a partial ban and include all the provisions suggested in this letter.

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of addressing the most pressing concern of our time.

Sincerely,
Emerald Goldman
4406 SE Taylor St
Portland, OR 97215-2456

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:45:04 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: chelseagrubbs44@everyactioncustom.com [mailto:chelseagrubbs44@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:33 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Chelsea Grubbs
1212 NE Mason St
Portland, OR 97211-4658

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:28:02 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: hawkins.becky@everyactioncustom.com [mailto:hawkins.becky@everyactioncustom.com]
Sent: Monday, September 12, 2016 9:51 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Becky Hawkins
4344 SE Main St
Portland, OR 97215-2437

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:28:17 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: williamsonofhender@everyactioncustom.com [mailto:williamsonofhender@everyactioncustom.com]
Sent: Monday, September 12, 2016 11:19 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
David Henderson
5262 NE 31st Ave
Portland, OR 97211-6912

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 9:16:34 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Sabolch Horvat [mailto:sabolch.horvat@gmail.com]
Sent: Monday, September 12, 2016 5:49 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

While this proposal is much needed, I believe that the standards could be even stronger. Climate change has impacted our habitat greatly already and to avoid further disruptions it would be best if no new fossil fuel terminals were allowed regardless of size.

Thank you for listening,
Sabolch

From: Sabolch Horvat
Email: sabolch.horvat@gmail.com
Address: 3137 NE 11th Ave #A, Portland, Oregon, 97212

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:34:57 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: amlynhughes@everyactioncustom.com [mailto:amlynhughes@everyactioncustom.com]
Sent: Monday, September 12, 2016 5:50 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Amanda Hughes
2076 NW Johnson St
Portland, OR 97209-1345

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:44:49 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: donjphoto@everyactioncustom.com [mailto:donjphoto@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:30 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Don Jacobson
2545 SW Terwilliger Blvd
Portland, OR 97201-6302

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:31:06 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

-----Original Message-----
From: gregghayward@everyactioncustom.com [mailto:gregghayward@everyactioncustom.com]
Sent: Monday, September 12, 2016 7:50 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

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addressing the most pressing concern of our time.

Sincerely,
Gregg Jazuk-Hayward
10055 NE Weidler St
Portland, OR 97220-3864

September 12,2016
Testimony Portland Planning Sustainability Commission regarding bulk fossil fuel facilities

Presenter: Patrick Jones Vice-president Northwest Heigths Neighborhood Association speaking as an individual

Members of the Commission:

Most large Metro areas have at least two gas, oil, petrol terminals. Almost all of Portland's storage/distribution resources are located on sand fill between the railroad bridge and the St Johns bridge. In the subduction zone quake the geologic base will fail as the base liquifies causing destruction of the tank farm and as a rep from Wacker Siltronics stated - we will see a massive and toxic fireball and that will completely destroy the infrastructure and us. So when the first responders, hospitals, gas stations run out of fuel for vehicles and generators, well....that's it.

So a responsible city governance would mitigate risk by creating a redundancy which means new hardened storage and distribution facilities
This proposed city action seems to a) preclude construction of new hardened facilities b) give the major multinational distributors every excuse to not make the essential improvements required so that after quake the rebuild of the whole region can take place. This proposed action is an expansion in scope of the efforts to block the construction of major coal and fracking oil terminals which I completely support. I do not support the careless expansion of scope which may put all of our futures at risk.

The availability to have access to fuel after the quake is also a regional concern, and development of redundant or replacement facilities should be carried by a regional entity such as Metro, the Port of Portland or the State. I urge the commission to look at unintended consequences which in this case could be drastic. There is no guarantee that Portland would be able to recapture its vitality if the resources needed to rebuild have not been secured.

Patrick Jones
9527 NW Marvin Ln
Portland Oregon 97229
(503) 810-0556
pandsjones@comcast.net

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:08:25 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: collin.kaeder@everyactioncustom.com [mailto:collin.kaeder@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:41 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

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addressing the most pressing concern of our time.

Sincerely,
collin kaeder
8265 SW Ernst Rd
Portland, OR 97225-3851

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:09:07 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: karenk@everyactioncustom.com [mailto:karenk@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:41 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

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addressing the most pressing concern of our time.

Sincerely,
Karen Keeney
NE 16TH Ave
Portland, OR 97211

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Monday, September 12, 2016 11:02:00 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: David Kennedy [mailto:dkennedy@350pdx.org]
Sent: Monday, September 12, 2016 8:51 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I was so proud of my city in the fall when city council passed the resolution banning all new fossil fuel infrastructure. I originally moved to Portland because it was known as a leader on climate issues, and it has mostly lived up to that. This resolution was a major step in the right direction, and showed the kind of environmental leadership that I've come to love about this city.

I appreciate the work that the Bureau of Planning and Sustainability has done during the process of shifting the resolution toward policy. The most current draft represents significant progress from the first version. That being said, I feel that there is still more work to be done:

1) There should NOT be an exception for facilities under 5 million gallons. First of all, that is still a huge amount of fossil fuels. Secondly, The resolution originally stated that we would "actively oppose" fossil fuel infrastructure, not allow loopholes for more of those facilities to pop up, as long as they're smaller.

2) There should be stronger language to prevent expansion of existing terminals. The lack of such language would represent another loophole by which fossil fuel infrastructure could grow within our city.

Portland has long been a leader in climate action. I love that about my city. Please continue to take bold action by making this policy binding and strong.

Thank you,
David Kennedy

From: David Kennedy
Email: dkennedy@350pdx.org
Address: 621 NE Sumner St, Portland, Oregon, 97211

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:37:45 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: kennedy.eileen7@everyactioncustom.com [mailto:kennedy.eileen7@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:40 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

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Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Enda Kenny
5812 NE 6th Ave
Portland, OR 97211-3167

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:43:48 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: raenadinerose@everyactioncustom.com [mailto:raenadinerose@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:21 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

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addressing the most pressing concern of our time.

Sincerely,
Alicia Keys
10480 SW Eastridge St Apt 88
Portland, OR 97225-5047

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:05:47 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: kilboy1@everyactioncustom.com [mailto:kilboy1@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:45 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

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Sincerely,
Martin Kilbourne
8887 SW 67th Pl
Portland, OR 97223-2242

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:06:04 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: haley.k.kirkpatrick@everyactioncustom.com [mailto:haley.k.kirkpatrick@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:50 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

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Sincerely,
Haley Kirkpatrick
6512 SE Division St Apt 1
Portland, OR 97206-1279

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:30:34 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: akollender@everyactioncustom.com [mailto:akollender@everyactioncustom.com]
Sent: Monday, September 12, 2016 8:20 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

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addressing the most pressing concern of our time.

Climate change is now. Will we be up to meeting the challenge of addressing it? I think so! Portland can lead the way for other cities.

Sincerely,
Anne Kollender
3813 SE Roswell St
Portland, OR 97222-5649

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:31:18 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: laurakurtz83@everyactioncustom.com [mailto:laurakurtz83@everyactioncustom.com]
Sent: Monday, September 12, 2016 7:22 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

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addressing the most pressing concern of our time.

Sincerely,
Laura Kurtz
7217 N Lombard St
Portland, OR 97203-3207

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:37:29 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: lisallaakso@everyactioncustom.com [mailto:lisallaakso@everyactioncustom.com]
Sent: Monday, September 12, 2016 5:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

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addressing the most pressing concern of our time.

Sincerely,
Lisa Laakso
1408 -1 SW Hall St
Portland, OR 97201-7612

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:10:15 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: democrats@everyactioncustom.com [mailto:democrats@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:39 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Eric Lambart
7122 N Oatman Ave
Portland, OR 97217-5834

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:29:01 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

-----Original Message-----
From: averyleinova@everyactioncustom.com [mailto:averyleinova@everyactioncustom.com]
Sent: Monday, September 12, 2016 9:23 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

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addressing the most pressing concern of our time.

Sincerely,
Avery Leinova
107 SE 30th Pl
Portland, OR 97214-2081

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Monday, September 12, 2016 11:03:59 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Jordan Lewis [mailto:jordan@allclassical.org]
Sent: Monday, September 12, 2016 10:57 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Jordan Lewis
Email: jordan@allclassical.org
Address: 15 NE 151st Ave, Portland, Oregon, 97230-4804

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:04:29 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: walter_lichtenberg@everyactioncustom.com [mailto:walter_lichtenberg@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:55 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

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-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Walter Lichtenberg
7515 SE 23RD Ave
Portland, OR 97202

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 9:19:40 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Noah Linschoten [mailto:89nlinschoten@gmail.com]
Sent: Monday, September 12, 2016 10:18 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

We do not need another dead end, unsustainable fuel. Instead of finding where to put this, we need to find another sustainable option entirely.

From: Noah Linschoten
Email: 89nlinschoten@gmail.com
Address: 7317 N.E. Hazel Dell Ave Apt 8, Vancouver, Washington, 98665

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] RE: PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:37:10 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: merrylongg [mailto:merrylongg@gmail.com]
Sent: Monday, September 12, 2016 5:22 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] RE: PSC Fossil Fuel Zoning Testimony

Meredith Long
8521 NE 15th St.
Vancouver, WA 98664

Thank you.

Sent from my T-Mobile 4G LTE Device

-------- Original message --------
From: Planning and Sustainability Commission
Date:09/12/2016 11:15 AM (GMT-07:00)
To: merrylongg
Subject: RE: PSC Fossil Fuel Zoning Testimony

Hello,

Thank you for your comments to the Planning and Sustainability Commission. For your testimony to be officially part of the public record, it does need to include your mailing address (including house or PO number). Without this information, the City is not able to send you notification of Council hearing dates or the Council's final decision, and you may not be able to appeal the Council's final decision.

So that I may include your comments in the record and forward them to PSC members, can you please email me your mailing address?

Thanks,
julie

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: merrylongg [mailto:merrylongg@gmail.com]
Sent: Friday, September 09, 2016 7:30 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

I am writing to ask that you enact a ban on any new fossil fuel terminals in Portland, regardless of size. I also ask that you prohibit any further development of fossil fuel infrastructure. More infrastructure or expansion of existing infrastructure will lead to more oil trains going through the Columbia River
Gorge National Scenic Area.
We have seen what happened with the oil train derailment in Mosier. We can't ever let this happen again!
Thank you.

Sent from my T-Mobile 4G LTE Device

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] Re: PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:39:51 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

-----Original Message-----
From: Shawn & Dave Looney [mailto:looneys@involved.com]
Sent: Monday, September 12, 2016 5:12 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] Re: PSC Fossil Fuel Zoning Testimony

Thanks for adding my mailing address, as follows:

12937 NW Newberry Road

Portland, Oregon 97231

Shawn Looney

On 9/12/16 10:15 AM, Planning and Sustainability Commission wrote:
> Hi Shawn,
>
> Thank you for your comments to the Planning and Sustainability Commission. For your testimony to be officially part of the public record, it does need to include your mailing address (including house or PO number). Without this information, the City is not able to send you notification of Council hearing dates or the Council's final decision, and you may not be able to appeal the Council's final decision.
>
> So that I may include your comments in the record and forward them to PSC members, can you please email me your mailing address?
>
> Thanks,
> julie
>
>

> Julie Ocken
> City of Portland
> Bureau of Planning and Sustainability
> 1900 SW 4th Ave, Suite 7100
> Portland, OR 97201
> 503-823-6041
> www.portlandoregon.gov/bps
>
> ----------
> To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.
> ----------
>
>
> -----Original Message-----
> From: Shawn & Dave Looney [mailto:looneys@involved.com]
> Sent: Friday, September 09, 2016 6:51 PM
> To: Planning and Sustainability Commission <psc@portlandoregon.gov>
> Subject: PSC Fossil Fuel Zoning Testimony
>
> The City of Portland stated it, "will actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or throughout Portland or adjacent waterways," yet the proposed fossil fuel zoning plan advocates expansion of fossil fuels facilities within Portland.
>
> Further, Goal 7 of Oregon Land Use Goals and Guidelines prohibits the siting of hazardous facilities in identified hazard areas where risk to the public safety cannot be mitigated.
>
> The vast majority of fuel tanks (95% of the region's supply) are located in the community of Linnton where hundreds of citizens reside. Linnton has multiple earthquake fault lines running under and adjacent to those tank farms. The tanks are located on liquifiable soils very near the Willamette River. In the event of an earthquake, the fuels will likely slide into the river, contaminating water all the way to the Pacific
> Ocean. In addition, there will be no fuel available for rescue or
> rebuilding.
>
> Considering all the potential devastating risks associated with the fuel tanks located within the Linnton area, the tank farms should not be allowed to expand. Rather, the tanks should be moved out of the area and relocated to areas that pose considerably fewer risks.
>
> Thank you,
> Shawn Looney, Linnton resident
>
>

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:36:30 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: cnclm1@everyactioncustom.com [mailto:cnclm1@everyactioncustom.com]
Sent: Monday, September 12, 2016 5:50 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

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To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

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-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Craig and Natalie Marburger
5606 SW Riverside Ln Apt 5
Portland, OR 97239-5959

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:30:19 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: pmartin@everyactioncustom.com [mailto:pmartin@everyactioncustom.com]
Sent: Monday, September 12, 2016 8:58 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

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addressing the most pressing concern of our time.

Sincerely,
Paul Martin
417 HUME
Portland, OR 97219

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:42:47 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: ashley.mcallister@everyactioncustom.com [mailto:ashley.mcallister@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:22 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

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addressing the most pressing concern of our time.

Sincerely,
Ashley McAllister
4638 NE Failing St
Portland, OR 97213-1060

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:07:06 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: quinnmcalpine@everyactioncustom.com [mailto:quinnmcalpine@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:48 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

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addressing the most pressing concern of our time.

Sincerely,
Forrest McAlpine
1029 N Winchell St
Portland, OR 97217-1145

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:29:35 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: mauria_rhys@everyactioncustom.com [mailto:mauria_rhys@everyactioncustom.com]
Sent: Monday, September 12, 2016 9:53 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

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addressing the most pressing concern of our time.

Sincerely,
Mauria McClay
8125 NE Wygant St
Portland, OR 97218-4153

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:28:34 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: drminnerly@everyactioncustom.com [mailto:drminnerly@everyactioncustom.com]
Sent: Monday, September 12, 2016 9:32 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

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addressing the most pressing concern of our time.

Sincerely,
Don Minnerly
4508 N Williams Ave
Portland, OR 97217-2956

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Monday, September 12, 2016 4:28:44 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Patricia Mizutani [mailto:wordpress@350pdx.org]
Sent: Monday, September 12, 2016 4:22 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

To: Portland Planning and Sustainability Commission
Re: Fossil Fuel Terminal Zoning Amendments

The City of Portland has the opportunity to take a historical stand by enacting a full ban on new fossil fuel terminals.

Human use of fossil fuels is causing global climate change. Due to rising temperatures, there are more severe weather systems, infectious disease are spreading beyond their usual latitudes, and rising temperatures are threatening our water supplies and food production. For those of us with chronic conditions such as emphysema and heart disease, rising temperatures are compromising our well being and will make our day-to-day existence more and more intolerable. All of us want a world which is safe and secure for ourselves, our children, and generations far into the future. For this to happen, we must act now to stop the expansion of fossil fuel use.

We as a city need to do our part in these ways:
-Enact a full ban on all new fossil fuel terminals, large or small.
Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil. We do not need new LNG storage in Portland.
-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
-Add language to prevent smaller related "terminals" from clustering and aggregating to

increase fossil fuel shipments through Portland.

Thank you for allowing we the public to voice our concerns.

Respectfully submitted,
Patricia Mizutani, MD

From: Patricia Mizutani
Email: pmizutan@yahoo.com
Address: 2335 NE 24th Ave, Portland, Oregon, 97212

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:33:22 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: murph1949@everyactioncustom.com [mailto:murph1949@everyactioncustom.com]
Sent: Monday, September 12, 2016 6:42 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Please, let's not backslide from our November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of addressing the most pressing concern of our time.

Sincerely,
Donna Murphy
2134 NE 37th Ave
Portland, OR 97212-5250

September 12, 2016

Planning and Sustainability Commission
City of Portland
1900 SW 4th Ave., Ste. 7100
Portland, OR 97201

RE: Comments for PSC Fossil Fuel Terminal Zoning Amendments Hearing

Dear Commissioners,

Please accept these comments from the Columbia Pacific Building Trades Council (CPBTC) regarding the Planning and Sustainability Commission's Fossil Fuel Terminal Zoning Amendments Draft. CPBTC is an organization that represents 25 different crafts, including: heat and frost insulators, boilermakers, brick and stone masons, cement masons, electricians, elevator constructors, glaziers, ironworkers, laborers, linoleum and carpet layers, operating engineers, painters & tapers, plasterers, plumbers, pipe fitters and steamfitters, roofers, sheet metal workers, sprinkler fitters and teamsters.

Last fall, CPBTC testified in opposition to the City Council's anti-fossil fuels Resolution No. 37 166 because of the unintended consequences of blocking any new fossil fuel infrastructure and the impact that will have on the men and women of the CPBTC and the region's economy as a whole. This past July, we also submitted comments on the Bureau of Planning and Sustainability staff discussion draft. We are extremely disappointed with the current draft because it totally ignored CPBTC's input and double downs the impact to the existing fossil fuel infrastructure by designating them nonconforming uses.

Fossil fuels are a lot more than the gas we pump into our cars. They fuel the jets we fly, the farms that grow our food and the trucks that deliver everyday products. They fuel industrial processes and heat our homes, businesses, schools and hospitals. Our entire economy and way of life depend directly on reliable and cost-effective fuel sources. Even as we pursue alternative energy strategies, fossil fuels will remain crucially important for decades to come.

Allowing existing fossil fuel infrastructure to enhance capacity would increase our energy independence by reducing reliance on fossil fuels from potentially unstable foreign sources, including Iraq, Russia, Venezuela and other countries. Beyond enhanced energy independence, these projects would generate thousands of new jobs, millions in economic activity and additional tax revenue to fund education, health care, transportation and other valuable public services here in the region.

It's also important for the future of our region to at the fossil fuel terminals be allowed and encouraged to update and modernize their facilities to improve safety, efficiencies, and environmental impacts. These projects create family-wage jobs, generate new revenue for public services and support important public policy goals, such as lowering carbon emissions and

seismic resiliency. The proposed zoning changes will also impede the region's ability to pursue economic development projects.

Additionally, based on our review of the Commission's draft, we strongly believe that the proposal does not align with regional (Metro), state and federal policy. The draft fails to provide for the economic assessment called for by Resolution. Finally, the timeline for implementing the proposed amendments is too aggressive and does not allow for thoughtful discussion to address the many concerns.

Thank you for the opportunity to comment on the Fossil Fuel Terminal Zoning Amendments Draft. If you have any questions, please contact me at 503-318-7691.

Sincerely yours,

Willy Myers
Executive Secretary-Treasurer
Columbia Pacific Building Trades Council

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:30:49 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: prin@everyactioncustom.com [mailto:prin@everyactioncustom.com]
Sent: Monday, September 12, 2016 8:45 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Kris N.
7140 SE Franklin St
Portland, OR 97206-2506

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:27:46 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: rnerwick@everyactioncustom.com [mailto:rnerwick@everyactioncustom.com]
Sent: Monday, September 12, 2016 10:39 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Randall Nerwick
3438 SE Mary Ct
Portland, OR 97222-5540

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:09:36 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Davemult@everyactioncustom.com [mailto:Davemult@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:40 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
David S. Nichols
5107 NE Couch St
Portland, OR 97213-3021

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Please enact bold, binding language for PSC Fossil Fuel Zoning
Date: Monday, September 12, 2016 11:00:54 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Manly Norris [mailto:manly.norris@airbnb.com]
Sent: Monday, September 12, 2016 7:32 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Please enact bold, binding language for PSC Fossil Fuel Zoning

Manly Norris
111 NE 6th Ave #209
Portland, OR 97232

September 12, 2016

Dear Planning & Sustainability Commission,

Go Big or Go Home.

Manly Norris
Manly Norris

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:35:12 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: cja610@everyactioncustom.com [mailto:cja610@everyactioncustom.com]
Sent: Monday, September 12, 2016 6:14 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Carla Pacheco
8935 SW Excalibur Pl
Portland, OR 97219-4997

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:35:59 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: deepackard66@everyactioncustom.com [mailto:deepackard66@everyactioncustom.com]
Sent: Monday, September 12, 2016 5:59 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Your diligent effort and transparency in pursuing implementation of its November 2015 Fossil Fuel Policy is so hopeful. What is needed is absolute integrity in the drafting of the actual policy and implementation of it so that the spirit and the body of it reflect the historic stand that this city took in late 2015. Keep in mind that the age of fossil fuel is over. It is killing us! Doesn't that simplify what you must do to protect this city's citizens?

Anything less is prevarications, replicating the Congress we have in Washington.

Please me resolute that the following safeguards and limitations are met:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of addressing the most pressing concern of our time.

Sincerely,
Dee Packard
1207 SE 72nd Ave
Portland, OR 97215-2909

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:42:30 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: dmphilipp42@everyactioncustom.com [mailto:dmphilipp42@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:36 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Dean Philipp
6817 SE Morrison St
Portland, OR 97215-2145

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Tuesday, September 13, 2016 9:18:18 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Barbara Pikus [mailto:basha@involved.com]
Sent: Monday, September 12, 2016 7:50 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

I absolutely want to see NO transporting or storing of fossil fuels in or through Portland or adjacent waterways. One spill in the Columbia River, one underground water source poisoned, one explosion that reaches a town, or schools, etc. is too horrendous to contemplate. Fossil Fuels = poison. They MUST be phased out, not further developed.

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy

was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Barbara Pikus
6109 SE Insley Street
Portland, OR 97206

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Monday, September 12, 2016 11:40:09 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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-----Original Message-----
From: Nora Polk [mailto:nora.mattek@gmail.com]
Sent: Monday, September 12, 2016 11:33 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Nora Polk
6405 SE 62nd Ave
Portland, OR 97206

September 12, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Nora Polk
Nora Polk

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [Approved Sender] Re: PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 12:54:30 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

From: Jan Polychronis [mailto:jp04sail@yahoo.com]
Sent: Monday, September 12, 2016 12:21 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [Approved Sender] Re: PSC Fossil Fuel Zoning Testimony

Po box 639, the dalles, or 97058

Sent from my iPhone

On Sep 12, 2016, at 10:31 AM, Planning and Sustainability Commission <psc@portlandoregon.gov> wrote:

> Hello Jan,
>
> Thank you for your comments to the Planning and Sustainability Commission. For your testimony to be officially part of the public record, it does need to include your mailing address (including house or PO number). Without this information, the City is not able to send you notification of Council hearing dates or the Council's final decision, and you may not be able to appeal the Council's final decision.
>
> So that I may include your comments in the record and forward them to PSC members, can you please email me your mailing address?
>
> Thanks,
> julie
>
> Julie Ocken
> City of Portland
> Bureau of Planning and Sustainability
> 1900 SW 4th Ave, Suite 7100
> Portland, OR 97201
> 503-823-6041
> www.portlandoregon.gov/bps

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From: Jan Polychronis [mailto:jp04sail@yahoo.com]
Sent: Sunday, September 11, 2016 7:31 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Please amend the proposed fossil fuel draft to reflect the city's fossil fuel goals:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

I live in the Columbmia River Gorge in The Dalles. I witnessed the explosion of oil trains in Mosier earlier this summer. I do not want fossil fuels traveling through this beautiful and protected area as well as exposing residents and visitors to this terrible hazard. We need to rely more on renewable resources and I have recently seen large windmill blades traveling by train to the interior as we have for many years. Let's get solar going too and other methods. Stop supporting dangerous fossil fuels which are polluting out earth! My power is 100% wind. Thank you. Jan Polychronis

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:06:24 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: frpopesj@everyactioncustom.com [mailto:frpopesj@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:47 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
L. Michael Pope, S.J.
3220 SE 43rd Ave
Portland, OR 97206-3104

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:08:46 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: al3xtec@everyactioncustom.com [mailto:al3xtec@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:42 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Grady Preston II
2139 NE Halsey St
Portland, OR 97232-1522

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:04:54 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: rick@everyactioncustom.com [mailto:rick@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:53 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

I know the rest of this is one of those "canned" letters from an environmental activist group but it's as heartfelt as what I'm about to say first. I was there during the passage of that moments and seminal measure. I watched as Michael _____ promised to implement this measure into legalese that fit the gravity of the vote and the importance of the issue. Well, sort of thank you Michael but your job was not to be the judge and jury of what should and should not be part of prohibited activities. Your job was to make a City Code provision that echoed the sentiment and the words each councillor and mayor spoke as they all cast YEA votes. What you have presented almost end runs their entire effort and a smart guy like you should have known better.

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to

ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of addressing the most pressing concern of our time.

Sincerely,
rick rappaport
2218 NE Gile Ter
Portland, OR 97212-1527

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:44:17 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: bibleeogirl@everyactioncustom.com [mailto:bibleeogirl@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:54 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Debra Rehn
5130 SE 30th Ave Apt 9
Portland, OR 97202-4557

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Monday, September 12, 2016 1:20:34 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: E Reid [mailto:exreid@gmail.com]
Sent: Monday, September 12, 2016 1:13 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

This is no time to hedge your bets; you can't be timid in the face of global crisis. Please just: Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Do this, and your great-grandchildren will thank you.

From: E Reid
Email: exreid@gmail.com
Address: 4150 N. Williams Ave., Portland, Oregon, 97217

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Tuesday, September 13, 2016 9:18:39 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Alastair Roxburgh [mailto:aroxbur@ieee.org]
Sent: Monday, September 12, 2016 8:31 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Planning and Sustainability Commissioners,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy.

The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

I wish to thank the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland City Council supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although the PCC draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (e.g., rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

* Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

* Create an exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

* Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

* Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Alastair Roxburgh

Alastair Roxburgh
1503 N Hayden Island Drive
Apt 860
PORTLAND, OR 97217

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 4:07:56 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: bewell1122@everyactioncustom.com [mailto:bewell1122@everyactioncustom.com]
Sent: Monday, September 12, 2016 3:42 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Catherine Salveson
NE 16TH Ave
Portland, OR 97211

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:32:17 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: clifford.shaw@everyactioncustom.com [mailto:clifford.shaw@everyactioncustom.com]
Sent: Monday, September 12, 2016 7:59 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Cliff Shaw
2505 N Willamette Blvd
Portland, OR 97217-4115

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:29:48 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: bcshelby@everyactioncustom.com [mailto:bcshelby@everyactioncustom.com]
Sent: Monday, September 12, 2016 8:43 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
BC Shelby
2414 SE 30th Ave
Portland, OR 97214-5621

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 11:00:20 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Harlan Shober [mailto:harlan_shober@msn.com]
Sent: Monday, September 12, 2016 4:27 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

It took political courage and cost political capital to get to this point. Don't go weak on us now. Finish the job.

Watch this: https://www.youtube.com/watch?v=Kxryv2XrnqM.

Imagine how foolish timid action taken now will look in 15 years.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

From: Harlan Shober

Email: harlan_shober@msn.com
Address: 2280 SE 34th Ave., Portland, Oregon, 97214

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:44:31 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

-----Original Message-----
From: desims@everyactioncustom.com [mailto:desims@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:48 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Daniel Sims
3959 NE 42nd Ave
Portland, OR 97213-1009

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:34:40 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: rspiesr@everyactioncustom.com [mailto:rspiesr@everyactioncustom.com]
Sent: Monday, September 12, 2016 5:49 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

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addressing the most pressing concern of our time.

Just today, September 12, 2016 there was a train of tanker cars several miles long on the track that parallels NE Lombard. Unless they are empty and on the way out, they should not be there. I thought oil trains had been stopped after the derail and spill east of Mt Hood town. This is why I was surprised to see a train of tankers.

Sincerely,
Robert Spies
9271 SE Clay St
Portland, OR 97216-2201

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Tuesday, September 13, 2016 9:19:55 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Daniel Stillwaggon [mailto:dstillwa@gmail.com]
Sent: Monday, September 12, 2016 11:26 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the

regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Daniel Stillwaggon
68 SE 57th Ave
Portland, OR 97215

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:31:33 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: andymstone@everyactioncustom.com [mailto:andymstone@everyactioncustom.com]
Sent: Monday, September 12, 2016 6:56 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

I am a systems ecologist, teacher and I vote.

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of addressing the most pressing concern of our time.

Sincerely,
Andrew Stone
5817 SE Lafayette St
Portland, OR 97206-2847

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:36:45 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: adp2525@everyactioncustom.com [mailto:adp2525@everyactioncustom.com]
Sent: Monday, September 12, 2016 5:48 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

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addressing the most pressing concern of our time.

Sincerely,
L Cam Taylor
705 SE 32nd Ave
Portland, OR 97214-3103

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Monday, September 12, 2016 11:03:04 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Liz Terhaar [mailto:liz@columbiariverkeeper.org]
Sent: Monday, September 12, 2016 10:39 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the

regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

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Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Liz Terhaar
710 13th Street
Hood River, OR 97031

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Tuesday, September 13, 2016 9:16:07 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Danny Thiemann [mailto:dgt211@gmail.com]
Sent: Monday, September 12, 2016 5:37 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Hello, My name is Danny thiemann. I am a poverty law attorney in the Hillsboro area, but I live and vote in portland. My clients tell me that warmer summers cause them greater heat stress as they work outside, where temperatures in the sun can reach 15 degrees warmer than the temperature listed in the newspaper for that day. Warmer summers also cause parents who move around for work to pull their children out of school earlier than planned as unseasonably temperatures change job start dates that no longer coincide with the school year. These warmer summers are linked to Oregons warmer climate and I recommend you enact a fossil fuel infrastructure policy that is as strong as possible to reduce impact of climate change on poorest workers. Oregon, unlike California, does not have heat stress protections. Please strengthen restrictions on fossil fuel infrastructure.

Thank you!!

From: Danny Thiemann
Email: dgt211@gmail.com
Address: 31 nw 22nd Pl Apt 22, Portland, Oregon, 97210

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 3:00:57 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Bethany Thomas [mailto:33bethany@gmail.com]
Sent: Monday, September 12, 2016 2:59 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear Commissioners,

As you consider the proposed draft of the code changes, I ask that you choose to enact a full ban on all new fossil fuel terminals and infrastructure in Portland. The risks to both human and environmental health and safety are too high, too costly. Please position Portland as a continued leader in progressive environmental policies. We can lead the way! Thank you for your leadership.

Sincerely,
Bethany Shetterly Thomas

From: Bethany Thomas
Email: 33bethany@gmail.com
Address: 2755 NE 35th Ave, Portland, Oregon, 97212

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:32:00 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: pt3.email2@everyactioncustom.com [mailto:pt3.email2@everyactioncustom.com]
Sent: Monday, September 12, 2016 8:05 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

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addressing the most pressing concern of our time.

Sincerely,
Paul Thompson
8312 SE 21st Ave Apt B
Portland, OR 97202-7474

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Monday, September 12, 2016 11:01:18 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Charles Townsend [mailto:charlesntownsend@gmail.com]
Sent: Monday, September 12, 2016 7:42 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Charles Townsend
623 NE Morris St.
Portland, OR 97212

September 12, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

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-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Charles Townsend
Charles Townsend

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:33:47 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: dtramposh@everyactioncustom.com [mailto:dtramposh@everyactioncustom.com]
Sent: Monday, September 12, 2016 6:29 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

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Sincerely,
Debora Tramposh
1525 SE 139th Ave
Portland, OR 97233-2306

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Please enact bold, binding language for PSC Fossil Fuel Zoning
Date: Tuesday, September 13, 2016 9:15:52 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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-----Original Message-----
From: Satya Vayu [mailto:satyavayu@gmail.com]
Sent: Monday, September 12, 2016 5:23 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Please enact bold, binding language for PSC Fossil Fuel Zoning

Satya Vayu
6608 SE 81st Ave
Portland, OR 97206

September 12, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely, Satya Vayu
Satya Vayu

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:32:30 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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www.portlandoregon.gov/bps

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-----Original Message-----
From: juliedwin@everyactioncustom.com [mailto:juliedwin@everyactioncustom.com]
Sent: Monday, September 12, 2016 6:35 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Julie Walker
15200 SW Crown Dr Unit 3
Portland, OR 97224-2675

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:45:38 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: lilahwallach@everyactioncustom.com [mailto:lilahwallach@everyactioncustom.com]
Sent: Monday, September 12, 2016 4:13 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Lilah Wallach
5113 SE Taylor St
Portland, OR 97215-2626

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 9:18:02 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Daniel Wasil [mailto:wdan18@gmail.com]
Sent: Monday, September 12, 2016 6:39 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please do not put my children at risk. Do what you know is the right thing: ban all new fossil fuel terminals.

From: Daniel Wasil
Email: wdan18@gmail.com
Address: 4221 NE Glisan Street, Portland, Oregon, 97213

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:43:33 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: lawrkw@everyactioncustom.com [mailto:lawrkw@everyactioncustom.com]
Sent: Monday, September 12, 2016 5:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Randall Webb
2328 NW Glisan St Apt 10
Portland, OR 97210-3490

Date: 12 September 2016

To: City of Portland Planning & Sustainability Commission

Subject: Bulk Fossil Fuel Terminal Zoning Amendments

Esteemed Commissioners:

Thank you for the opportunity to submit testimony on the proposed Zoning Code amendments covering Bulk Fossil Fuel Terminal (BFFT) Zoning amendments submitted by the City of Portland Bureau of Planning and Sustainability (BPS) on 12 August 2016, with suggested revisions per Memorandum dated 9 September 2016.

This testimony addresses Sections 2 and 3 of the 9 September 16 Memorandum which involve "Regulating existing terminal expansion" and "Additional review criteria" respectively. It also addresses the serious issue of terminal aggregation, wherein the fossil fuel industry submits a number of connected small facility proposals that individually meet size limitations but in aggregate exceed them.

- **Regulating existing terminal expansion**

The City of Portland Building and Development Services (BDS) Department reports that requiring expansion of existing terminals to undergo Non-conforming Situation Type II "would be difficult to approve." As a result of this feedback, BPS is recommending that the original Zoning amendment proposal be revised to *"allow limited expansion of existing terminals to not exceed 10 percent of the total terminal capacity"*.

This revision to the original zoning amendment should be rejected for two reasons:

1. **Expansion of existing fossil fuel infrastructure <u>should</u> be difficult to approve.** The City's Resolution #37618 was adopted for the express purpose to *"Oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."* The recommendation to classify BFFT as Non-conforming Uses is a correct and appropriate method of achieving the goal stated in Resolution #37618. Any revisions to the Code which would facilitate - rather than inhibit -expansion of existing fossil fuel infrastructure would stand in direct contradiction to the City Resolution. Allowing limited expansion of facilities up to 10 percent of capacity without land use review would facilitate expansions and thus should not be adopted. Funding for any additional staff and/or consultant time required by BDS to process fossil fuel expansion applications should be borne solely by the applicant.

2. **Proposed revision gives BFFT preferential treatment.** No other Use category in Nonconforming Situations is allowed to expand up to 10 percent of existing capacity without Land Use Review. The proposed revision gives unwarranted preferential treatment to a category of Uses, specifically BFFT. Furthermore, the 10 percent expansion threshold is completely arbitrary on the part of the City and has no basis in any other legally adopted

standard; it is based solely on the reluctance of BDS to see an increase in work load. Adoption of this revision could expose the City to a LUBA challenge.

- **Additional review criteria**

The review criteria for Nonconforming Situation Review included in the current version of the Zoning Code were developed to evaluate primarily changes to Residential and/or Commercial Nonconforming Uses, especially Commercial Uses in Residential Zones. As a result they address the types of compatibility issues typically presented by these types of Uses, e.g. noise and traffic. Given the severity of impact that BFFT pose to surrounding properties, the current review criteria alone are inadequate to address the serious threats presented by BFFT. Resolution #37168 includes the following findings:

  - *Fossil fuels pose risks to safety, health, and livability, including mobility of people, other freight, and other commercial vehicles;*
  - *Fossil fuel infrastructure poses considerable risks in the event of a major earthquake;*
  - *The extraction and combustion of fossil fuels are significant sources of greenhouse gas emissions and major contributors to climate change and pollution;*
  - *Crude oil, including oil derived from the Bakken shale reservoir, is known to be volatile, highly flammable and to contain elevated levels of benzene, a potent carcinogen; and*
  - *Given the record of crude oil and coal or other fossil fuel transport accidents, such as Lac Megantic in 2013, the 1999 Bellingham pipeline leak or a coal train derailment, an event could have catastrophic effects if it occurred in any of Oregon's populated areas.*

Thus it is not only appropriate and necessary, but legally justified to impose stricter review criteria on applications to expand the Nonconforming Situation review criteria only for BFFT. The additional review criteria that need to be taken into consideration are: (1) impact of increase in greenhouse gas (GHG) emissions and climate change, (2) impact of potential fire and/or explosion, and (3) impact of potential release of fossil fuels into the Columbia River and/or any tributary waterways.

The addition of these review criteria for BFFT would allow for proposed expansions that involve either facilities used for mixing of clean fuels and/or seismic upgrades to existing facilities, as net decreases in either GHG emissions and/or risk of explosion and fire in the event of an earthquake could justify approval of the request.

Lastly, BDS asserts that if additional review criteria are adopted, because "they do not have staff expertise to implement discretionary land use review criteria addressing greenhouse gas emissions or safety impacts of hazardous material storage and transportation," BFFT "applicants would be required to hire specialized consultants to show compliance of the particular criterion." This is both necessary and appropriate, as justified by the above listed findings from Resolution #37168. Furthermore, BDS notes that this would be inconsistent with Comprehensive Plan Policy 6.16 Regulatory Climate. The additional criteria would, however, be in compliance with the recently adopted Comprehensive Plan Policy on Fossil Fuel Distribution which *"Limit fossil fuels distribution and storage facilities to those necessary to serve the regional market."* Given the severity of the

impacts noted above in the City's resolution, adopting Zoning code language for BFFT that aligns with the applicable Comprehensive Plan Policy for fossil fuel distribution is of greater importance than reducing the regulatory burden on the fossil fuel industry.

Proposed language to enact these additional criteria is attached as Appendix "A".

- **Terminal Aggregation**

It is important to note a trend of terminal aggregation in fossil fuel projects, of which we have some examples in the Pacific Northwest. In BC, where nearly two dozen liquefied natural gas (LNG) export projects are in the proposal stage, the annual production of several LNG proposals would be three to four times larger than the annual production of the largest existing LNG terminal in the world. The way in which the projects would achieve these production volumes is through the aggregation of several terminals of equal size, each with its own liquefaction equipment, storage and other structures. The terminals would be geographic neighbors. Through the benefits of the project umbrella they would be greenlit under the same permits with respect to land use, pipelines, etc.

While the existing Zoning code definitions for "site", "ownership", and "development" do an excellent job of precluding this practice of small facility aggregation, there does exist opportunities for the fossil fuel industry to sidestep Zoning code prohibtions. One way would be by submitting separate applications for multiple projects, each owned by an entity that is a subsidiary of a single corporation. Another would be to separate contiguous lots by a lot or lots under different Ownership, but to connect facilities on the non-contiguous lots by easements containing pipelines, access roads, &c.

The existing Zoning code definition for "Ownership" should be revised to include the following language:

> *Contiguous lots that are owned by multiple entities that are subsidiaries of a single corporation are considered to be a single ownership. Non-contiguous lots that are Owned by the same entity and connected via an easement granted by the Owner(s) of the lot(s) located between the non-contiguous lots are considered to be a single ownership.*

This concludes my written testimony. Please feel free to contact me with any questions or concerns. Thank you for your attention to this issue.

Cordially

Patricia J Weber
2785 NW Marshall Drive
Corvallis OR
97330
541-829-0887
trish.weber@gmail.com

APPENDIX "A"

NONCONFORMING SITUATION REVIEW – ADDITIONAL CRITERIA LANGUAGE

33.258.80 Nonconforming Situation Review

A. Procedure. A nonconforming situation review is processed through a Type II procedure.

B. Approval criteria. The request will be approved if the review body finds that the applicant has shown that all of the following approval criteria are met:

1. All requests must comply with the following review criteria:

~~1.~~ a. With mitigation measures, there will be no net increase in overall detrimental impacts (over the impacts of the last legal use or development) on the surrounding area taking into account factors such as:

~~a.~~ (1) The hours of operation;

~~b.~~ (2) Vehicle trips to the site and impact on surrounding on-street parking;

~~c.~~ (3) Noise, vibration, dust, odor, fumes, glare, and smoke;

~~d.~~ (4) Potential for increased litter; and

~~e.~~ (5) The amount, location, and nature of any outside displays, storage, or activities; and

~~2.~~ b. If the nonconforming use is in an OS or R zone, and if any changes are proposed to the site, the appearance of the new use or development will not lessen the residential character of the OS or R zoned area. This is based on taking into account factors such as:

~~a.~~ (1) Building scale, placement, and facade;

~~b.~~ (2) Parking area placement;

~~c.~~ (3) Buffering and the potential loss of privacy to abutting residential uses; and Lighting and signs; and

~~d.~~ (4) Lighting and signs; and

~~3.~~ c. If the nonconforming use is in a C, E, or I zone, and if any changes are proposed to the site, the appearance of the new use or development will not detract from the desired function and character of the zone~~.~~; and

2. Because fossil fuels pose risks to safety, health, and livability, including mobility of people, other freight, and other commercial vehicles, because the extraction and combustion of fossil fuels are significant sources of greenhouse gas emissions and major contributors to climate change and pollution, and given the record of crude oil and coal or other fossil fuel transport accidents, Bulk Fossil Fuel Terminal are subject to these additional review criteria. With mitigation measures, there will be no net increase in overall detrimental impacts (over the impacts of the last legal use or development) on the surrounding area based on the following factors:

a. The effects of greenhouse gas (GHG) emissions and climate change, where:

(1) GHG is defined as the following:

- carbon dioxide,
- methane,
- nitrous oxide,
- hydrofluorocarbons,
- perfluorocarbons,
- nitrogen trifluoride,
- and sulfur hexafluoride,

(2) Both direct and indirect GHG emissions are to be considered, where

- Direct GHG emissions are emissions from the Bulk Fossil Fuel Terminal Use site, and
- Indirect GHG emissions are emissions that are a consequence of the activities of the Bulk Fossil Fuel Terminal Use site, but occur at sources located elsewhere, and

(3) Quantification tools and methodology employed is to be per the White House Council on Environmental Quality's publication *"2012 Guidance for Accounting and Reporting,"* as amended over time.

As the totality of climate change impacts is not attributable to any single action, but are exacerbated by a series of actions, a statement that emissions from a request involving a Bulk Fossil Fuel Terminal represent only a small fraction of global emissions is essentially a statement about the nature of the climate change challenge, and is not an appropriate basis for deciding the impact of climate change impacts on the surrounding area. Moreover, these comparisons are also not an appropriate method for characterizing the potential impacts associated with a request, because this approach does not reveal anything beyond the nature of the climate change challenge itself: the fact that diverse individual sources of emissions each make a relatively small addition to global atmospheric GHG concentrations that collectively have a large impact.

(b) The effects of a fire and/or explosion at either the Bulk Fossil Fuel Terminal Site or transportation equipment or infrastructure used to convey fossil fuels to or from the Bulk Fossil Fuel Terminal, and

(c) The effects of a breach and release of fossil fuels from either the Bulk Fossil Fuel Terminal Site or transportation equipment or infrastructure used to convey fossil fuels to or from the Bulk Fossil Fuel Terminal, into the Columbia River and/or tributary waterways.

(d) When considering the effects of (b), and (c), above, the likelihood of an event occurring should be evaluated in the context of the scale and severity of the deleterious impact on the surrounding area.

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 9:15:27 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Dana Weintraub [mailto:mrdanaweintraub@gmail.com]
Sent: Monday, September 12, 2016 4:51 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I just have one comment I'd like to make:

KEEP IT IN THE GROUND!

Short, and to the point.

From: Dana Weintraub
Email: mrdanaweintraub@gmail.com
Address: 17124 S.W. Marty Lane, Beaverton, Oregon, 97003

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: Good work
Date: Monday, September 12, 2016 11:01:37 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Steve Wheeler [mailto:swwheeler@arris.com]
Sent: Monday, September 12, 2016 8:42 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: Good work

Steve Wheeler
4501 NE Wistaria Dr.
Portland, OR 97213

September 12, 2016

Dear Planning & Sustainability Commission,

Dear Planning and Sustainability Commissioners,

Thank you for the diligence and transparency in pursuing the City's implementation of its 11/15 Fossil Fuel Policy. The City's draft makes real progress towards the goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved. The proposed changes are much closer to the original intent of the 2015 Resolution. It's great to see the city making decisions that are both environmentally responsible, and responsive to citizen input.

However, I'm concerned that the current Fossil Fuel Zoning Amendments proposal still falls short. It will allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, but is undermined by new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil.

We still need to strengthen the regulations when it comes to expanding pre-existing terminals. It is unclear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

Let's make the City's policy as strong as it can be by doing the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- Get rid of the exception for new facilities that are 5 million gallons or less. WHAT LOBBYIST WROTE THAT? Allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

- Let's build in strong restrictions on allowable expansions of existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland. That's a loop hole that allows end-runs. Please!

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate change awareness movement. With these important improvements to the Fossil Fuel Zoning Amendments, Portland will once again be on the forefront addressing a critical threat to humankind of our time.

Sincerely,

Sincerely,
Steve Wheeler

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:31:47 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: lena.moon@everyactioncustom.com [mailto:lena.moon@everyactioncustom.com]
Sent: Monday, September 12, 2016 7:54 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Elena Wood
3946 NE 12th Ave
Portland, OR 97212-1244

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Tuesday, September 13, 2016 9:34:25 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: bridgetmichelle07@everyactioncustom.com [mailto:bridgetmichelle07@everyactioncustom.com]
Sent: Monday, September 12, 2016 6:33 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Dear Portland PSC Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing implementation of its November 2015 Fossil Fuel Policy.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

-Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

-An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the fight against climate change. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland can remain at the forefront of

addressing the most pressing concern of our time.

Sincerely,
Bridget Wyatt
7314 SE Division St
Portland, OR 97206-1104

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 9:19:25 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Lynn Youngbar [mailto:lynn@lynnyoungbar.com]
Sent: Monday, September 12, 2016 10:14 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear Portland City Council Members,
Please fulfill the policy promise you made last year to not allow new fossil fuel infrastructure in Portland. It was a bold move that sent an important message to the entire country. You must honor that policy through the city code. We do not need an exception for facilities of 5 million gallons or less. Any expansions allowed at existing terminals must happen only for local demand and include criteria for safety and climate impacts in the non-conforming use review process.
Thank you, Lynn Youngbar

From: Lynn Youngbar
Email: lynn@lynnyoungbar.com
Address: 2317 NE 9th Ave., Portland, Oregon, 97212

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Tuesday, September 13, 2016 9:16:19 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Fiona Yun [mailto:fiona.yun00@gmail.com]
Sent: Monday, September 12, 2016 5:47 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland

From: Fiona Yun
Email: fiona.yun00@gmail.com
Address: 10046 N Oswego, Portland, Oregon, 97203

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 2:56:13 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Angela Zehava [mailto:angela.zehava@stanfordalumni.org]
Sent: Monday, September 12, 2016 2:52 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear City of Portland:
Thank you for your attention to this very important matter. If you haven't read Naomi Klein's book, This Changes Everything, I want to tell you the most important statement in the entire book. She says that the energy companies who want to produce this dirty energy and send it to Asia are heavily leveraged, and meanwhile the Saudis are keeping energy prices low and China is turning toward solar and other renewables in a big way. What this means is that if we can hold the line on West Coast fossil fuel terminals for just two years, that business model will DIE. It will no longer be feasible, and the U.S. government will have no choice but to turn toward renewables. We CAN win this. We need you.

From: Angela Zehava
Email: angela.zehava@stanfordalumni.org
Address: 1579 SE Nehalem St., Portland, Oregon, 97202

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Monday, September 12, 2016 10:33:00 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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www.portlandoregon.gov/bps

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From: James Anderson [mailto:wordpress@350pdx.org]
Sent: Sunday, September 11, 2016 8:30 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: James Anderson
Email: sweepingit@yahoo.com
Address: 7306 SE Main St., Portland, Oregon, 97215

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: Fossil Fuel Terminal Zoning Amendments
Date:	Monday, September 12, 2016 10:35:10 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Tom Cloud [mailto:tomclouddancer@yahoo.com]
Sent: Sunday, September 11, 2016 1:52 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Fossil Fuel Terminal Zoning Amendments

Dear Planning and Sustainability Commission,

Please adopt changes to Fossil Fuel Terminal Zoning Amendments to:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Protect our waterways.

Best Wishes,
Tom Cloud
Cloud Dancer Farm
298D Cape Labelle Rd
Tonasket WA 98855 509 486 2333

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Monday, September 12, 2016 10:35:40 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Andrew Crosby [mailto:andrewcrosby1@gmail.com]
Sent: Sunday, September 11, 2016 2:09 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear Members of the Portland City Council -

Last November, you adopted a Fossil Fuel resolution that placed Portland in the vanguard of leadership toward a future that is not dominated by carbon combustion. It was a bold and historic action. Such actions are essential if we are to have any livable future at all. It is appropriate that Portland, along with other nodes of leadership like Vermont and California, set the tone for the rest of the nation.

Now it is time for you to show integrity by adopting regulations that fully implement the clear intent of your resolution. At this critical time in the fight against impending climate chaos, any waffling on your part is unacceptable.

My testimony is simple. Please adopt strong regulations/ordinances WITHOUT loopholes and compromises.

Specifically -

(1) Enact a full ban on all new fossil fuel terminals, large or small with NO exception for smaller facilities (less than 5 million gallons).

(2) Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. Strong requirements for seismic upgrades should be required for any expansions and/or modifications of existing terminals.

(3) Prohibit any aggregate increase in fossil fuel infrastructure in Portland.

Thank you for considering my testimony.

Andrew Crosby

From: Andrew Crosby
Email: andrewcrosby1@gmail.com
Address: 3225 SW View Place, Portland, Oregon, 97205

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 10:32:42 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: marilee dea [mailto:marileedea@comcast.net]
Sent: Sunday, September 11, 2016 8:24 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

The Cully Association of Neighbors represents the most diverse neighborhood in Oregon, it is dedicated to working cooperatively to build a safe and livable neighborhood. The UP tracks run through Cully and are adjacent to schools parks and homes and business, recently UP increased the number of unit oil trains running through Cully, especially at night- we request an immediate moratorium on these potentially dangerous trains and terminals that support the shipment of more Fossil Fuels. The ban on all new fossil fuel infrastructure was applauded by Cully, changing the intention and to increase of facilities allowing 5,000,000 more gallons goes in opposition of what the city of Portland passed and what Cully Association of Neighbors desires and intended.

From: marilee dea
Email: marileedea@comcast.net
Address: 4613 NE Killingsworth #2, portland , Oregon, 97218

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Please enact bold, binding language for PSC Fossil Fuel Zoning
Date: Monday, September 12, 2016 10:59:10 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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-----Original Message-----
From: Ted Dreier [mailto:teddreier@gmail.com]
Sent: Sunday, September 11, 2016 8:51 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Please enact bold, binding language for PSC Fossil Fuel Zoning

Ted Dreier
7037 SW 54th Avenue
Portland, OR 97219

September 11, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely,
Ted Dreier

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Monday, September 12, 2016 10:34:42 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Anandi Gefroh [mailto:anandi@anandi.com]
Sent: Sunday, September 11, 2016 12:23 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

We need to break our addiction to fossil fuels. Portland citizens and it's council can and should lead the nation in groundbreaking policies that will help us to develop new and sustainable energy resources, not polluting and dangerous ones.

From: Anandi Gefroh
Email: anandi@anandi.com
Address: 2825 SE Hawthorne Blvd, Portland, Oregon, 97214

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 10:57:27 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Rachel Jesequel [mailto:rachel_michelle@hotmail.com]
Sent: Sunday, September 11, 2016 3:31 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would

allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Rachel Jesequel

From: Rachel Jesequel
Email: rachel_michelle@hotmail.com
Address: 13160 SW Tapadera St., Beaverton , Oregon, 97008

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 10:33:38 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Wayne Lammers [mailto:wplring1@mac.com]
Sent: Sunday, September 11, 2016 8:47 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

The Fossil Fuel Terminal Zoning Amendments need to follow the original intent of the 2015 Resolution, which was to "actively oppose" new fossil fuel infrastructure. That means it should include a full ban on new fossil fuel terminals, without an exception for smaller terminals. Existing terminals must not be allowed to expand, and must be subject to review for safety and climate impacts. The Amendments should also include language that prevents existing fossil fuel facilities of any kind, whether officially designated as "terminals" or not, from being leveraged in any way to increase shipments through the Portland area. To "actively oppose" new fossil fuel infrastructure means all of these things. It does not mean to allow the infrastructure to grow in smaller increments or in previously unanticipated ways. The climate crises means that we must be putting the brakes on fossil fuel use as rapidly as we can, not further abetting or even accelerating it.

From: Wayne Lammers
Email: wplring1@mac.com
Address: 14960 SW 92nd Ave., Tigard, Oregon, 97224

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 10:59:50 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
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From: katy mcfadden [mailto:katytmcfadden@gmail.com]
Sent: Sunday, September 11, 2016 9:49 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Let us help keep it in the ground. This means no major transport, no export terminals, no anything to do with continuing the fossil fuel industry. Our task is to dismantle fossil dependence and rebuild with renewables.

From: katy mcfadden
Email: katytmcfadden@gmail.com
Address: 313 s.w maricara, portland, Oregon, 97219

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Monday, September 12, 2016 10:58:52 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
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From: Emily Meyer [mailto:emeyer1935@comcast.net]
Sent: Sunday, September 11, 2016 7:27 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Please amend the proposed draft to reflect the city's fossil fuel goals:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

While I am currently a Vancouver, WA resident I lived in Portland for at least 25 years and consider the gorge a part of my life.

Thank You.

Emily Meyer
8608 NW Old Orchard Drive
Vancouver, WA 98665

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Former Oil Industry Worker.
Date: Monday, September 12, 2016 10:34:00 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: James Nielson [mailto:james@changemachine.org]
Sent: Sunday, September 11, 2016 9:11 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Former Oil Industry Worker.

James Nielson
8125 NE Wygant St
Portland, OR 97218

September 11, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely,
James Nielson

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Monday, September 12, 2016 10:58:22 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

To help ensure equal access to City programs, services and activities, the City of Portland will provide transportation, reasonably modify policies/procedures and provide auxiliary aids/services/alternative formats to persons with disabilities. For accommodations, translations, complaints and additional information, contact me, City TTY 503-823-6868, or use Oregon Relay Service: 711.

From: Tim Norgren [mailto:t_norgren@riseup.net]
Sent: Sunday, September 11, 2016 5:44 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Hi folks,
MY name's Tim Norgren, and I'm a member of the building trades through Laborer's local 737. I know from a few YEARS of conversations with others in the trades that I speak for many other workers in the Laborers, Carpenters, iron workers, pipefitters, and operating engineers unions (as well as a few staffers) who are afraid (or too busy with kids, work, etc.) to testify openly, when I ask you to pursue nothing less than a complete ban on new or expanded fossil fuel infrastructure, regardless of the size or whether some infrastructure already exists! This should include LNG! Northwest Natural has no current plans to expand its storage capacity and if we're to transition away from a fuel that leaks so much methane it's effectively worse than coal, then there's no need to think they ever will.
I remember when earthquakes in Oklahoma were unheard of. Now thanks to fracking there are increasing levels of quakes including two this year which were over five on the richter scale! We want jobs we can feel good about; not jobs that insure more children and families like our own will be hurt in earthquakes, exposed to poisonous water, or fooled into eating crops irrigated by such water, as has been the case in California and elsewhere! To add to the risks any new or expanded infrastructure would increase volatile tanker traffic through the region as well, and that is clearly not something any of us want. Mosier was more than enough warning, and the city council has already banned such an increase.
Please insure that these bans will be tangibly effective by including binding limits and criteria for safety and climate impacts in the City's non-conforming use review process.
Thank you. Sincerely, Tim Norgren

From: Tim Norgren
Email: t_norgren@riseup.net

Address: PO Box 297, Stevenson, Washington, 98648

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Monday, September 12, 2016 10:33:20 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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-----Original Message-----
From: Sharon Palumbo Meyer [mailto:sharon.palumbo@gmail.com]
Sent: Sunday, September 11, 2016 8:31 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Sharon Palumbo Meyer
5250 SW Landing Sq #5A
Portland, OR 97239

September 11, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely,
Sharon Palumbo Meyer

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Monday, September 12, 2016 10:31:33 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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-----Original Message-----
From: debra poscharscky [mailto:debforevers@gmail.com]
Sent: Saturday, September 10, 2016 9:20 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

debra poscharscky
16005 east burnside street
portland, OR 97233

September 11, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely,
debra poscharscky

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Monday, September 12, 2016 10:34:22 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Zach Reuter [mailto:zpreuter08@aim.com]
Sent: Sunday, September 11, 2016 9:23 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would

allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Zach Reuter

From: Zach Reuter
Email: zpreuter08@aim.com
Address: 7141 SE Mabel Ave, Portland, Oregon, 97267

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Monday, September 12, 2016 10:57:45 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Dena Turner [mailto:denaturn62@gmail.com]
Sent: Sunday, September 11, 2016 5:01 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

To City of Portland:
I would like to encourage the City of Portland to do the following in order to ban fossil fuel infrastructure and to protect our City and our planet earth from further degradation due to dirty energy and climate change:
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Dena Turner
Email: denaturn62@gmail.com
Address: 1122 SE 60th Avenue, Portland, Oregon, 97215

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 10:32:26 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Jan Zuckerman [mailto:zuckerez@hotmail.com]
Sent: Sunday, September 11, 2016 7:39 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you very much for the work you have done to to listen to the public and make changes to your original draft of the Fossil Fuel Terminal Zoning Amendments. There is still work to be done to "actively oppose" new fossil fuel infrastructure. A FULL ban on all new fossil fuel terminals, large or small does exactly that- opposes new fossil fuel infrastructure. Allowing facilities under 5 million gallons makes no sense, in fact, it waters down the resolution and sends a message to our children that we believe the fossil fuel industry still has a right to poison their atmosphere a little bit and that continuing on a path of relying on CO2 producing energy is good for their future. Also, any more infrastructure, no matter how small, will increase the oil transportation into our city, which right now, is at dangerous levels.
In addition, we must have binding limits on future expansion of existing terminals and make safety and climate impacts on our city a priority in the non-conforming use review process.
This is our opportunity, as a city, to set an example for the rest of the world, by being bold and brave. Please make the improvements to the Fossil Fuel Zoning Amendments that send the right message to our children that their lives are worth protecting and that we are ready and excited about moving in an energy direction that demonstrates this.
Thank you.

From: Jan Zuckerman
Email: zuckerez@hotmail.com
Address: 2914 NE 18th Ave., Portland, Oregon, 97212

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Monday, September 12, 2016 10:27:21 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Comcast [mailto:brownlies@comcast.net]
Sent: Saturday, September 10, 2016 4:42 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

I am writing to ask the city of Portland to amend the proposed draft re: PSC Fossil Fuel Zoning so that it reflects Portland"s fossil fuel goals.

There should be a ban on all new fossil fuel terminals without exception. Restrictions should be strengthened on expansions of existing terminals by adding binding limits as well as criteria for safety and climate impacts in Portland's non-conforming use review process. And, any aggregate increase in fossil fuel infrastructure in Portland should be prevented.

Portland is a model that many other communities in the US look up to. Please lead the way to a brighter future for our children and for our country by taking a stand against fossil fuel proliferation and by doing so, taking a stand for a better America.

With the greatest respect,

Rebecca Brownlie
3236 Carrington Way
Bellingham, Wa.
98226

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Please enact bold, binding language for PSC Fossil Fuel Zoning
Date: Monday, September 12, 2016 10:24:14 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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-----Original Message-----
From: Maurine Canarsky [mailto:canarskyyomo@gmail.com]
Sent: Saturday, September 10, 2016 12:29 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Please enact bold, binding language for PSC Fossil Fuel Zoning

Maurine Canarsky
1977 SE 22nd Ave.
Portland, OR 97214-4851

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely,
Maurine Canarsky

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 10:30:51 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: jim clapp [mailto:jimclapp@hotmail.com]
Sent: Saturday, September 10, 2016 8:54 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Dear Sir:

Thank you for passing a historic resolution to "actively oppose expansion of infrastructure whose primary purpose is transporting fossil fuels in or through Portland or adjacent waterways".

Please amend your proposed draft to reflect the city's fossil fuel goals and remain steadfast in your commitment to prohibit dirty fossil fuel projects:

1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criterial for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

The proposed expansion would negatively impact Portland, the Columbia River, the Columbia River Gorge National Scenic Area, and four National Wildlife Refuges (Steigerwald Lake, Franz Lake, Pierce, and Ridgefield), of which I was on the management team for over 25 years.

Please assist in stopping the development of those fossil fuel infrastructures that would

negatively impact these extremely valuable and non-replaceable resources.

Thank you for your consideration of my comments.

James R. Clapp
22500 NE 113th Street
Vancouver, WA 98682

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Monday, September 12, 2016 10:27:39 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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-----Original Message-----
From: Ann Clarkson [mailto:abcphdpdx@spiritone.com]
Sent: Saturday, September 10, 2016 5:00 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Ann Clarkson
5203 SE 38th
Portland, OR 97202

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

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Sincerely,

Sincerely,
Ann B Clarkson

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Please enact bold, binding language for PSC Fossil Fuel Zoning
Date: Monday, September 12, 2016 10:30:30 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Ineke Deruyter [mailto:ideruyter@hotmail.com]
Sent: Saturday, September 10, 2016 8:40 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Please enact bold, binding language for PSC Fossil Fuel Zoning

Ineke Deruyter
9322 N Oswego Ave
Portland, OR 97203

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

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Sincerely,

Sincerely,
Ineke Deruyter

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Please enact bold, binding language for PSC Fossil Fuel Zoning
Date: Sunday, September 11, 2016 5:08:31 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Kellen Ferguson [mailto:kellenf99@gmail.com]
Sent: Saturday, September 10, 2016 7:19 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Please enact bold, binding language for PSC Fossil Fuel Zoning

Kellen Ferguson
3220 NE Emerson st
Portland, OR 97211

September 10, 2016

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-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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Sincerely,

Sincerely,
Kellen Ferguson

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 10:28:55 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Mary Fifield [mailto:wordpress@350pdx.org]
Sent: Saturday, September 10, 2016 6:45 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

It is imperative that commissioners set a standard for leadership on moving our economy off of fossil fuels as soon as possible. I urge you to ban all new fossil fuel terminals, regardless of size, strengthen restrictions on expansions of existing terminals to account for safety and climate hazards, and limit the aggregate fossil fuel structure to its current capacity. We cannot afford to be incentivizing this kind of energy activity at a time when we face such dire consequences from climate disruption. A decision to restrict fossil fuel infrastructure is a sound long-term business and public health decision.

From: Mary Fifield
Email: strwrytr@yahoo.com
Address: 1927 SE 35th Pl, Portland, Oregon, 97214

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: No more oil trains through the Columbia Gorge
Date: Monday, September 12, 2016 10:24:54 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Laurie Fisher [mailto:lauriefisher55@gmail.com]
Sent: Saturday, September 10, 2016 12:59 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: No more oil trains through the Columbia Gorge

Laurie Fisher
10414 SW Bonanza Way
Tigard, OR 97224

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

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Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

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- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely,
Laurie Fisher

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 10:18:59 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: kima garrison [mailto:kimasuegarrison@gmail.com]
Sent: Saturday, September 10, 2016 9:43 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

It's time for Portland to take a bold stand against fossil fuel companies, and let them go the way of the dinosaur!

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: kima garrison
Email: kimasuegarrison@gmail.com
Address: 5112 ne 28th, portland, Oregon, 97211

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Monday, September 12, 2016 10:17:33 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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-----Original Message-----
From: kima garrison [mailto:kimasuegarrison@gmail.com]
Sent: Saturday, September 10, 2016 8:59 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

kima garrison
5112 ne. 28th
portland, OR 97211

September 10, 2016

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Sincerely,

Sincerely,
kima garrison

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: No Union Pacific rail expansion for oil trains
Date: Monday, September 12, 2016 10:26:05 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Fred Ingram [mailto:car54@spiritone.com]
Sent: Saturday, September 10, 2016 3:00 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: No Union Pacific rail expansion for oil trains

Fred Ingram
4822 SE 47th Avenue
Portland, OR 97206

September 10, 2016

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Sincerely,

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From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Please enact bold, binding language for PSC Fossil Fuel Zoning
Date: Sunday, September 11, 2016 5:09:07 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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-----Original Message-----
From: Don Jacobson [mailto:donjphoto@gmail.com]
Sent: Saturday, September 10, 2016 8:39 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Please enact bold, binding language for PSC Fossil Fuel Zoning

Don Jacobson
2545 SW Terwilliger Blvd Apt 314
Portland, OR 97201-6304

September 10, 2016

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Sincerely,

Sincerely,
Don Jacobson

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 10:17:51 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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www.portlandoregon.gov/bps

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From: Michael Jordan [mailto:mikejord65@msn.com]
Sent: Saturday, September 10, 2016 9:38 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear City of Portland,
Please:
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Michael Jordan
Email: mikejord65@msn.com
Address: 19796 Bellevue Way, W. Linn, Oregon, 97068

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Monday, September 12, 2016 10:18:17 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Alys Kennedy [mailto:akhawke@comcast.net]
Sent: Saturday, September 10, 2016 9:41 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Planning and Sustainability Commission:

I am writing to request that you stop all fossil fuel transport coming into and/or through Portland. If the humans, and all other life on the planet, are to survive into the future, it is imperative that we keep all fossil fuels in the ground where they belong. The extraction, transport and use of any and all fossil fuels, including Bakken crude oil creates pollution, toxicity, and direct danger to human and other life.

Oil by rail threatens not only our communities and the health and safety of the City of Portland, it poses a dire and direct threat to the Columbia River and the Columbia River Gorge National Scenic Area. This risk was made very clear with the June 2016 derailment disaster in Mosier. Every train delivering oil to a facility in Portland would have to move through the Gorge, putting scenic, natural, cultural, and recreational resources at risk and endangering and/or eliminating the lives of humans and wild and aquatic life. In addition, it puts all life any where along the rail line at risk - and it adds to the already precarious climate crisis world wide!

As noted by Portland's Mayor, Charlie Hales, "If we are aggressive about carbon reduction, we can, city by city, make a difference."

Therefore, I am asking that you **amend the proposed draft to reflect the city's fossil fuel goals:**

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for

new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you kindly for your consideration,

Alys Kennedy
2823 Birchwood Avenue
Bellingham, WA 98225

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSCFossil Fuel Zoning Testimony
Date:	Monday, September 12, 2016 10:18:37 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: jlkirkland3@comcast.net [mailto:jlkirkland3@comcast.net]
Sent: Saturday, September 10, 2016 9:43 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSCFossil Fuel Zoning Testimony

My wife and I live in Hood River and recently witnessed the train disaster occurring in Mosier. We are totally against oil trains passing through the Columbia Gorge in view of the high risks associated with this type of transfer. We encourage you to deny the railroad companies the opportunities to completely ruin one of the most beautiful parts of the US and an asset for Oregon.

(We lived in Houston, Texas for many years. For those who don't believe in the damages to the environment by oil transport, they should visit the Galveston Bay area. Oh, if you do visit that area, make certain you purchase chemicals to remove the oil globs from between your toes and on your clothes.)

John L. Kirkland
Rebecca T. Kirkland

PO Box 1767
1767 12th Street
Hood River, OR
97031

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Monday, September 12, 2016 10:16:55 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: joyce@ [mailto:harbor joyce@harbor-properties.com]
Sent: Saturday, September 10, 2016 8:49 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Please amend the proposed draft to reflect the city's fossil fuel goals.
Thank you,
Joyce Leggatt
173 NE Bridgeton Slip 6
Portland, OR 97211

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 10:28:17 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Willie Levenson [mailto:willielevenson@outlook.com]
Sent: Saturday, September 10, 2016 5:06 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

In regards to the above subject please:

1) Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2) Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Willie Levenson
Email: willielevenson@outlook.com
Address: 2800 NE Edgehill Place, Portland, Oregon, 97212

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Fossil Fuel Zoning Testimony: A Good Start but needs to be stronger
Date: Monday, September 12, 2016 10:24:34 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Clyde Alan Lockleat [mailto:gardeneral@comcast.net]
Sent: Saturday, September 10, 2016 12:49 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Fossil Fuel Zoning Testimony: A Good Start but needs to be stronger

Clyde Alan Lockleat
6222 SW 36th Ave
Portland, OR 97221-3307

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

I appreciate the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Regards
Clyde Alan Locklear

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Monday, September 12, 2016 10:19:36 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Cass Martinez [mailto:cass@zzz.com]
Sent: Saturday, September 10, 2016 10:15 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I will be in the audience on September 13, 2016 at 1900 SW 4th, to listen to the people of Portland insist on follow-through on the City's policy of no new fossil fuel storage or transport. Destructive change due to fossil fuel use is evident and on the rise. I am willing to do my part to use less, and I want city government to do its part also. i thank the mayor and commissioners for their earnest efforts with this policy.

From: Cass Martinez
Email: cass@zzz.com
Address: 8734 NW Wood, Portland, Oregon, 97231

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 10:25:24 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Patrick McCulley [mailto:pmcculle@gmail.com]
Sent: Saturday, September 10, 2016 1:49 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I don't think that this should be a hard decision. The fossil fuel industry might provide a few jobs. But real investment in renewable energy could provide more and sustain more jobs. Favoring the fossil fuel industry, an industry that knowingly promotes ignorance of anthropogenic climate change, is tantamount to promoting destruction of the human species. Its not a hard decision. Divest from all fossil fuel infrastructure now so that our descendents can have a viable future.

From: Patrick McCulley
Email: pmcculle@gmail.com
Address: 3816 ne 63rd ave., Portland, Oregon, 97213

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Monday, September 12, 2016 10:29:38 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Sharon McDonald [mailto:MsTick1@aol.com]
Sent: Saturday, September 10, 2016 7:10 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Sharon McDonald
8410 SE Flavel Street
Portland, OR 97266

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

I advocate for the environment because of my kids, grandkids, and great-grandkids. For me, those successive generations are not theoretical; they're already here. And I hope to leave behind a habitable planet for them, one that will sustain and support them. I know that you want the same for your loved ones. I know you want to do all you can to ensure that they are able to live in comfort on planet Earth. But in order to provide a sustainable planet, we must all make changes and must act quickly.

I'm so proud of my chosen city of residence and the leaders here who recognize the need and took action. They used the power of their position for the good of all. My wish is that all those in similar positions (across the nation and around the world) will recognize the wisdom shown by those here and follow their lead.

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make

Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely,
Sharon McDonald

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Testimony re Proposed Fossil Fuel Infrastructure Code Changes
Date: Monday, September 12, 2016 10:20:20 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Joseph Miller [mailto:jmiller@saintmarys.edu]
Sent: Saturday, September 10, 2016 11:15 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Testimony re Proposed Fossil Fuel Infrastructure Code Changes

Planning and Sustainability Commission
1900 SW 4th Avenue, Suite 7100
Portland,Oregon 97201

Dear Members of the PSC,

Thanks for your July and August draft proposed code changes to implement Portland's landmark fossil fuel policy to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

While I applaud and support the changes you have proposed, I join with many groups (Oregon Physicians for Social Responsibility, Columbia Riverkeeper, 350PDX, Audubon Society of Portland, Portland Rising Tide, etc.) in requesting that additional changes be made to:

-- eliminate the exception for new projects that are 5 million gallons or less,
-- ban all new fossil fuel terminals, including those designed for liquefied natural gas (LNG) or gaseous fuel storage.

Sincerely,

Joseph Miller PhD
1030 SW Jefferson St., Apt. 534
Portland, Oregon 97201

Member, Environmental Health Working Group, Oregon Physicians for Social Responsibility
Former Member, Board of Directors, Oregon Physicians for Social Responsibility

Member (representing Oregon PSR), Oregon DEQ Conversion Technology Rulemaking Advisory Committee (2012)

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Please enact bold, binding language for PSC Fossil Fuel Zoning
Date: Monday, September 12, 2016 10:29:55 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Gregory Monahan [mailto:gregorymonahan29@gmail.com]
Sent: Saturday, September 10, 2016 7:30 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Please enact bold, binding language for PSC Fossil Fuel Zoning

Gregory Monahan
7225 SW 13th Avenue
Portland, OR 97219

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely,
Gregory Monahan

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 10:27:58 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Hyung Nam [mailto:wordpress@350pdx.org]
Sent: Saturday, September 10, 2016 5:03 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I urge you to enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Hyung Nam
Email: hyung_n@yahoo.com
Address: 1803 SE Washington St #2, Portland, Oregon, 97214

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 10:31:11 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Esther Nelson [mailto:wordpress@350pdx.org]
Sent: Saturday, September 10, 2016 9:01 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please pass with amendments. Would be so right, so Portland.

From: Esther Nelson
Email: ehnelson0620@yahoo.com
Address: 4 Mountain Circle, Lake Osweg, Oregon, 97035

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Monday, September 12, 2016 10:26:20 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: John Nettleton [mailto:jpn5710@yahoo.com]
Sent: Saturday, September 10, 2016 3:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

John Nettleton
4311 SE 37th Ave. #21
Portland, OR 97202
971.207.1142

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Monday, September 12, 2016 10:19:55 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
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503-823-6041
www.portlandoregon.gov/bps

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From: Toni Noll [mailto:wordpress@350pdx.org]
Sent: Saturday, September 10, 2016 10:55 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

NO, to fossil fuels in Oregon! Stay Out!

From: Toni Noll
Email: toninoll@yahoo.com
Address: 9723 SW QUAIL POST ROAD, Portland, Oregon, 97219

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Monday, September 12, 2016 10:26:54 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Kayleigh O'Hara [mailto:kayleigh.marchand@gmail.com]
Sent: Saturday, September 10, 2016 3:34 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would

allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Kayleigh O'Hara
Email: kayleigh.marchand@gmail.com
Address: 5318 NE 16th Ave, Portland, Oregon, 97211

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Monday, September 12, 2016 10:26:37 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Sarah Prowell [mailto:sprowel@ix.netcom.com]
Sent: Saturday, September 10, 2016 3:20 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Sarah Prowell
2216 SW Sunset Blvd
Portland, OR 97239

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely,
Sarah Prowell

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Monday, September 12, 2016 10:28:36 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Amy Robbins [mailto:wordpress@350pdx.org]
Sent: Saturday, September 10, 2016 6:12 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

City of Portland and the Planning and Sustainability Commission,
It is time for Portland look forward. We know fossil fuels are not part of a healthy future. The Fossil Fuel Zoning Amendments need to be strengthened. No more fossil fuel terminals of any size and no fossil fuel infrastructure of any kind should be built. The old should be phased out. There is no better town to lead the way to renewable energy than Portland. We can do this. What are we waiting for?
Sincerely,
Amy Robbins

From: Amy Robbins
Email: arobbins1966@yahoo.com
Address: 9227 N Central St., Portland , Oregon, 97203

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Monday, September 12, 2016 10:22:04 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Maxine Schwartz [mailto:blackkatz@comcast.net]
Sent: Saturday, September 10, 2016 11:29 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Maxine Schwartz
8325 SE 11 th Ave
Portland, OR 97202

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely,
Maxine Schwartz

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Sunday, September 11, 2016 5:07:10 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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-----Original Message-----
From: Ian Shelley [mailto:ianjs@comcast.net]
Sent: Saturday, September 10, 2016 7:09 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Ian Shelley
50 SW 97th Ave
Portland, OR 97225

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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Sincerely,

Ian Shelley
Ian Shelley

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Please enact bold, binding language for PSC Fossil Fuel Zoning
Date: Monday, September 12, 2016 10:30:16 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Chester Stark [mailto:billandcorrine@comcast.net]
Sent: Saturday, September 10, 2016 7:40 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Please enact bold, binding language for PSC Fossil Fuel Zoning

Chester Stark
3803 SE Grant Ct.
Portland, OR 97214

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely
Chester Porter Stark

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Please enact bold, binding language for PSC Fossil Fuel Zoning
Date: Monday, September 12, 2016 10:23:42 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: linda kay stevens [mailto:lindakaystevens@gmail.com]
Sent: Saturday, September 10, 2016 12:19 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Please enact bold, binding language for PSC Fossil Fuel Zoning

linda kay stevens
4829 N. Congress
Portland, OR 97217

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

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Sincerely,

thank you.
Linda Kay Stevens

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Please enact bold, binding language for PSC Fossil Fuel Zoning
Date: Monday, September 12, 2016 10:19:18 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Andrew Stone [mailto:andymstone@gmail.com]
Sent: Saturday, September 10, 2016 9:49 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Please enact bold, binding language for PSC Fossil Fuel Zoning

Andrew Stone
5817 SE Lafayette
Portland, OR 97206

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

I am a systems ecologist, teacher, and I vote.

State and Federal officials will not act. Change only occurs with pressure from us. We can and will contribute to this movement.

Multnomah county acknowledged marriage equality early. Even though this was overturned it contributed to the national effort to normalize a human rights discussion.

Likewise it is important for future generations that Portland RIGHT NOW takes steps to move forward he conversation and legislation / regulation of fossil fuels.

The eyes of the nation are on Portland (albeit for different reasons.) We are going to do this - with or without you.

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its

November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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Sincerely,

Sincerely,
Andrew Stone

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Sunday, September 11, 2016 5:06:34 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Diana Talcott [mailto:diana.talcott@gmail.com]
Sent: Saturday, September 10, 2016 6:59 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Diana Talcott
2806 SE 15th Ave
Portland, OR 97202

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sincerely,
Diana Talcott

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!
Date: Monday, September 12, 2016 10:25:43 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: L Cam Taylor [mailto:adp2525@gmail.com]
Sent: Saturday, September 10, 2016 2:00 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

L Cam Taylor
705 SE 32nd Ave
Portland, OR 97214

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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Sincerely,

L Cam Taylor
L Cam Taylor

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Please enact bold, binding language for PSC Fossil Fuel Zoning
Date: Monday, September 12, 2016 10:22:55 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: John Wadsworth [mailto:johnsonwadsworth@msn.com]
Sent: Saturday, September 10, 2016 11:49 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Please enact bold, binding language for PSC Fossil Fuel Zoning

John Wadsworth
9271 SW 3rd Ave
Portland, OR 97219

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

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Sincerely,

John Wadsworth
John Wadsworth

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: Please enact bold, binding language for PSC Fossil Fuel Zoning
Date: Monday, September 12, 2016 10:23:23 AM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Jean Wyman [mailto:jwyman62@hotmail.com]
Sent: Saturday, September 10, 2016 11:59 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Please enact bold, binding language for PSC Fossil Fuel Zoning

Jean Wyman
3914 NE 75th
Portland, OR 97213

September 10, 2016

Dear Planning & Sustainability Commission,

Dear Member of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

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- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time. PLEASE CONTINUE TO BE AN IMPRESSIVE CITY COUNCIL, LEADING THE WAY ON CLIMATE CHANGE!

Sincerely,

Sincerely,
Jean Wyman

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Sunday, September 11, 2016 4:51:04 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Blaine Ackley [mailto:blaineackley@gmail.com]
Sent: Friday, September 09, 2016 1:45 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Dear Commission Members<
My name is Blaine Ackley and I reside at 655 NW 229th Ave. Hillsboro, OR 97124.
I urge you to ban all future fossil fuel development within the city of Portland. Also, please make any expansion of existing facilities rigorous and conscious of public safety.
My point to you is that all you have to do is look at what happened at Mosier, Oregon minor train derailment to see what horrendous disaster could happen here.
I urge you to consider the health, safety and welfare of your children and grandchildren in making this decision.
Sincerely yours,
:)Blaine Ackley

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:54:48 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Luke Anavi [mailto:lanavi@ymail.com]
Sent: Friday, September 09, 2016 3:18 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please enact a full and binding ban on all new fossil fuel infrastructure projects anywhere in the city limits of Portland. This is important for both symbolic and practical reasons and will once again make Portland a leader in the movement to address the climate change crisis. Thank you for considering my comment.

From: Luke Anavi
Email: lanavi@ymail.com
Address: 2431 N.E. Flanders St., Portland, Oregon, 97232

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Sunday, September 11, 2016 4:57:41 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Judith Beck [mailto:judith82340@gmail.com]
Sent: Friday, September 09, 2016 6:39 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

I am a citizen of Portland, OR very concerned for the health and safety of all of us here!
I wholeheartedly support the resolution passed by the Portland City Council opposing the building of new oil pipelines, terminals and any other infrastructure used by the fossil fuel industry. NO Exemptions for small Ones! Any size in totally unacceptable!
We must keep fossil fuels in the ground and get going on renewable energies! No time to waste if we are going to survive on this planet!
Thank you!
Judith Beck
245 SW Lincoln St., 2216
Portland, OR 97201

Sent from my iPad

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:46:49 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Jody Bleyle [mailto:bleyle@gmail.com]
Sent: Friday, September 09, 2016 9:15 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would

allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Jody Bleyle

From: Jody Bleyle
Email: bleyle@gmail.com
Address: 120 SE 53rd Ave., Portland, Oregon, 97215

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:59:01 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Molly Brown [mailto:mollyybrown@gmail.com]
Sent: Friday, September 09, 2016 8:31 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you for your courageous stances and resolution on behalf of life and Earth. Please keep going, setting an example for the rest of the nation.

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Molly Brown
Email: mollyybrown@gmail.com
Address: 722 Meadow Avenue, Mount Shasta, California, 96067

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:47:06 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Susan Buswell [mailto:tamaracktales@aol.com]
Sent: Friday, September 09, 2016 9:34 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

It truly is time to start downsizing the fossil fuel industry until it no longer exists...not add to it. The dangers of contamination to our rather pristine environment in the Pacific Northwest are too great to list and you are already aware of them. Please stop the expansion of terminals, downsize the existing ones with intent to close. Thank you for your interest in our environmental health.

From: Susan Buswell
Email: tamaracktales@aol.com
Address: 17628 SE Cook St., Milwaukie, Oregon, 97267

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:53:26 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
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From: Kyle Collins [mailto:kalelcollins85@gmail.com]
Sent: Friday, September 09, 2016 2:55 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

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Sincerely,

From: Kyle Collins
Email: kalelcollins85@gmail.com
Address: 1026 Jackson St, Eugene, Oregon, 97402

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Sunday, September 11, 2016 5:00:06 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Deena Grossman [mailto:deena@moonbridge.com]
Sent: Friday, September 09, 2016 9:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Dear Portland City Council and Mayor Hales:
Please amend the proposed draft to reflect the city's fossil fuel goals:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

This is essential to protect the citizens of Portland and the environment, our land, rivers and wildlife! Thank you for listening and acting for people who care, not for fossil fuel industry profit.

Sincerely yours,

Deena T. Grossman, voter and PPS teacher
7234 SE 17th Ave.
Portland, OR 97202
deenatgrossman@gmail.com

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:49:21 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Anne Halpin [mailto:pnwsun13@gmail.com]
Sent: Friday, September 09, 2016 12:30 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

We all live downstream, and we say NO, NO, and NO to:
-Any new fossil fuel terminals!
-Expansions allowed at existing terminals!
-Additional fossil fuel infrastructure!
Even those of us who technically live upstream from Portland recognize that when it comes to the question of fossil fuels and their impact on the earth and on future generations, we all live downstream. Now is the time to shift away from fossil fuel dependence and toward more sustainable energy systems. Oregon can lead the way toward a more healthy and sustainable future! And the rest of Oregon looks to Portland to be at the forefront! Please say NO, NO, and NO when it comes to bringing more dirty and dangerous fossil fuels into Portland's ports! Thank you.

From: Anne Halpin
Email: pnwsun13@gmail.com
Address: 320 SE Atwood Ave., Corvallis , Oregon, 97333

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Sunday, September 11, 2016 4:52:46 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Lorraine Heller [mailto:lorraineheller32@yahoo.com]
Sent: Friday, September 09, 2016 2:42 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

To whom it may concern:

The proposed draft should be amended to reflect the city of Portland's goals on fossil fuel. That is to enact a full ban on all new fossil fuel terminals large or small. We want no more train units carrying fossil fuel going through the Columbia River Gorge.
We must protect this sensitive natural area.

sincerely yours ,
Lorraine Heller
9601 NW Leahy Rd. Unit 301
Portland, Oregon 97229

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Sunday, September 11, 2016 4:55:07 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Tom Huston [mailto:thuston@uoregon.edu]
Sent: Friday, September 09, 2016 4:12 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Please consider amending the proposed draft to reflect the city's fossil fuel goals:

1) Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2) Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3) Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank You

Tom Huston
39140 Dexter Road
Dexter, Oregon 97431

University of Oregon
Physical Education & Recreation Dept.
Facilities Coordinator
541-346-8127

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date: Sunday, September 11, 2016 4:56:04 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Don Jacobson [mailto:deejay@donjacobsonphoto.com]
Sent: Friday, September 09, 2016 3:19 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

To: Planning and Sustainability Commission

Please consider the following points:

Enact a full ban on all new fossil fuel terminals, large or small.

An exception for new facilities that are 5 million gallons or less is unnecessary.

The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you,
Don Jacobson

~*~

"There is nothing more useless than a sharp photograph of a fuzzy concept" - Ansel Adams

~*~

Don Jacobson Photography
2545 SW Terwilliger Blvd. #314
Portland, OR 97201
503.808.7525

donjphoto@gmail.com
www.donjacobsonphoto.com
~*~

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Sunday, September 11, 2016 5:00:33 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: cgjanzen@comcast.net [mailto:cgjanzen@comcast.net]
Sent: Friday, September 09, 2016 9:56 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Dear Planning and Sustainability Commission:

It seems that original proposal to not allow new fossil fuel infrastructure in Portland was revised to allow more terminals afterall, and then revised with modifications that still favor the dirty energy's agenda to expand their terminals. We need be moving forward with alternative energy, not constantly kowtowing to the dirty energy industry as they recklessly destroy our planet for bigger and bigger profits.

Therefore I urge the City of Portland to amend the proposed draft to reflect the city's fossil fuel goals:
Enact a FULL ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Please stick to your original proposal and make Portland a leader in alternative energy and put the dirty energy industry on notice that they are not welcome there.

Sincerely,
Gayle Janzen
11232 Dayton Ave N
Seattle, WA 98133

Sent from my iPad

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Sunday, September 11, 2016 4:50:02 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: jeremiah jenkins [mailto:miah66@yahoo.com]
Sent: Friday, September 09, 2016 1:13 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

I am writing to ask the City of Portland to amend the proposed draft to reflect the city's fossil fuel goals:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you.

Jeremiah Jenkins
3537 NE 81st ave
Portland, OR 97213

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:55:25 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Ed Kaiel [mailto:ekaiel@pcc.edu]
Sent: Friday, September 09, 2016 4:55 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I agree with this analysis and requests from 350 PDX. Stand up for the common good of the planet and all it's inhabitants.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain

language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Ed and Linda Kaiel

From: Ed Kaiel
Email: ekaiel@pcc.edu
Address: 6311 N. Commercial Ave., Portland, Oregon, 97217

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Sunday, September 11, 2016 4:51:42 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Thomas Keys [mailto:tkeyshike@msn.com]
Sent: Friday, September 09, 2016 2:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Dear City of Portland,

In regard to the PSC Fossil Fuel Zoning Testimony, please

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

I understand I have copy & pasted from Ryan Rittenhouse's email. I did that to echo the sentiment to please stay true to our commitments to the environment. The constant expansion of fossil fuel infrastructure has just got to stop, especially with out any regulation or oversight going unchecked in relation to this industry. It's been said countless times. Fossil fuel use has NO MORE PLACE in this country or any other. It has had it's time & no doubt, a use for the growth the world has enjoyed. This is our very earth at stake now. Please go full bore & enact the strongest & strictest ban on ANY fossil fuel infrastructure permitting.

Respectfully,
Thomas J. Keys
1103 SE 21st Ct
Gresham, OR 97080
503-432-3882-cell
Prevent any aggregate increase in fossil fuel infrastructure in Portland
Sent from Mail for Windows 10

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Sunday, September 11, 2016 4:50:39 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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-----Original Message-----
From: Meryle Korn [mailto:meryle.korn@gmail.com]
Sent: Friday, September 09, 2016 1:29 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

As a native Portlander currently living in Washington state, I am troubled by the oil industry's continued push to open new fuel terminals of ANY size in the greater Portland area.

Oil is a filthy fossil fuel whose use has driven pollution levels to the point that our entire planet's climate has been disrupted in ways that threaten not just human life, but most life on earth. Fossil fuel profiteers must not be enabled by the building of new production facilities. And Bakken crude oil is even more dirty and explosively dangerous than other "natural" oils.

The recent film carried the meme, "If you build it, they will come." Its opposite should be put in effect here (anywhere in the Pacific Northwest) and now: If you DON'T build it, they CAN'T come!

Please prevent any increase, whether new or "upgraded" facilities, to increase fossil fuel infrastructure in Portland.

Thank you for your consideration.

Sincerely,

(Ms.) Meryle A. Korn
2821 Huron St.
Bellingham, WA 98226

(Born in Portland, OR in 1943; resident of Portland area for all but seven years of my life. Portland is my heart's home; please do not despoil it and further despoil our only planet for the sake of dirty fossil fuels.)

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:48:21 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Linda Levin [mailto:linvin@comcast.net]
Sent: Friday, September 09, 2016 10:51 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

As a resident of Portland I urge you to adhere to the visionary resolution that Portland supported in the fall of 2015. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Actively oppose new infrastructure by enacting a full ban on all new fossil fuel terminals, large or small.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals by adding binding limits and include criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

The City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few improvements to the Fossil Fuel Zoning Amendments, Portland could again be on the forefront addressing the most critical concern of our time.

Sincerely,

From: Linda Levin
Email: linvin@comcast.net
Address: 1330 SW 3rd Ave Apt 1202, Portland, Oregon, 97201

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Sunday, September 11, 2016 4:50:20 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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www.portlandoregon.gov/bps

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From: Linda Magnuson [mailto:lmagnusonl@gmail.com]
Sent: Friday, September 09, 2016 1:27 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Please

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Linda Magnuson
4346 NE Skidmore
Portland, OR 97218

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:48:58 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Kat Majors [mailto:mouser1@gmail.com]
Sent: Friday, September 09, 2016 11:46 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please, put the people and our health before Corporate profits.

From: Kat Majors
Email: mouser1@gmail.com
Address: 10360 ne pacific street, portland, Oregon, 97220

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date:	Sunday, September 11, 2016 4:56:23 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Patrick Mulcahey [mailto:renilep@me.com]
Sent: Friday, September 09, 2016 5:01 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Please stand by your city's resolution to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways" and amend the proposed draft to reflect the city's fossil fuel goals:

1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you,

patrick mulcahey
571 Skamania Landing Road
Stevenson, WA 98648

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:48:02 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Collin Murphy [mailto:Bleuoiseau@comcast.net]
Sent: Friday, September 09, 2016 10:48 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please, NO, and I mean NO such facilities belong in Portland or anywhere, for that matter!

From: Collin Murphy
Email: Bleuoiseau@comcast.net
Address: 3675 SE Bybee Blvd., Portland, Oregon, 97202

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Sunday, September 11, 2016 4:57:13 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Tammie Murray [mailto:jdmstm@hotmail.com]
Sent: Friday, September 09, 2016 6:27 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Dear Planning and Sustainability Commission:

RE: "PSC Fossil Fuel Zoning Testimony."

Please amend the proposed draft to reflect the city's fossil fuel goals:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

- Prevent any aggregate increase in fossil fuel infrastructure in Portland

Sincerely,
Tammie L Murray
82270 Red Bluff Road

Seaside, OR 97138-5037

2840

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Sunday, September 11, 2016 5:01:47 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Patricia Orlinski [mailto:bikerpat@mindspring.com]
Sent: Friday, September 09, 2016 11:07 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Dear Commissioners,

My name is Patricia Always. I live at 10511 W. Kingswood Circle in Sun City, AZ, 85351. I moved from Portland to spend time near my aging parents in AZ. I am writing to ask you to enact code changes to support the fossil fuel policy that was passed by Portland's City Council. Amend the proposed draft to reflect the city's fossil fuel goals: namely to

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.
- Thank you for your attention.

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:46:24 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Rebecca Parker [mailto:beccasuzanne2020@gmail.com]
Sent: Friday, September 09, 2016 8:18 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I would like a full ban on all fossil fuel terminals- NO exceptions.
And no expansions on existing terminals- add binding limits. NO increased infrastructure!
The money could be better spent for health care or schools.
We need criteria for safety and climate impacts. Lets stop the short sightedness.
For any existing terminals, I'd like to see taxes placed to help cover the expensive chronic health costs of the crude oil.

From: Rebecca Parker
Email: beccasuzanne2020@gmail.com
Address: 941 SE Bidwell St, Portland, Oregon, 97202-6319

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:59:42 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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From: Mary Lou Putman [mailto:mlputman@gmail.com]
Sent: Friday, September 09, 2016 9:00 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Remove land use exemptions for oil re-refiners and oil recyclers i.e. APES and ORRCO. It is far dirtier than crude oil refining and They should not be here! Washington wouldn't let them process-- why does Oregon?

From: Mary Lou Putman
Email: mlputman@gmail.com
Address: 1927 n Jantzen , Portland , Oregon, 97217

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:47:44 PM

Julie Ocken
City of Portland
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From: Amanda Schueler [mailto:amanda.schueler@gmail.com]
Sent: Friday, September 09, 2016 10:46 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear Mayor and Commissioners,

I urge you to ban all fossil fuel infrastructure in Portland. Here are the specifics of my request:
1.Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

I want Portland to continue to be a leader in protecting our precious planet. Fossil fuels must stay in the ground if we hope to slow and reverse the cataclysmic effects of climate change. I urge you to be a Protector!

From: Amanda Schueler
Email: amanda.schueler@gmail.com
Address: 4210 NE Skidmore St., Portland, Oregon, 97218

COLUMBIA RIVERKEEPER®

Columbia Riverkeeper
111 Third Street
Hood River, OR 97031
phone 541.387.3030
www.columbiariverkeeper.org

September 9, 2016

City of Portland Bureau of Planning and Sustainability
Planning and Sustainability Commission
1900 SW 4th Ave, Suite 7100
Portland, OR 97201

Sent via email to: psc@portlandoregon.gov

Re: Fossil Fuel Zoning Testimony

Dear Members of the Planning and Sustainability Commission,

Thank you for the opportunity to offer our comments on the proposed draft of the City of Portland's Fossil Fuel Terminal Zoning Amendments ("amendments"). We offer these comments on behalf of Columbia Riverkeeper and Friends of the Columbia Gorge. Riverkeeper and Friends of the Columbia Gorge recognize that the amendments are still in draft form, and we appreciate and support the revisions the Bureau of Planning and Sustainability (BPS) staff made between the discussion draft and the current proposed draft. As discussed below, we offer further suggested changes that will more fully reconcile the proposed code changes with the City's November 2015 Fossil Fuel Policy Resolution, Resolution # 37168. Riverkeeper and Friends of the Columbia Gorge support the concept of prohibiting bulk fossil fuel terminals and assigning existing fossil fuel terminals the status of a legal, nonconforming use. The proposed zoning code changes offer the flexibility to improve the safety and reliability of Portland's fossil fuel terminals through a non-conforming use Type II process, and they properly reflect the intention of the City's original resolution to limit to the greatest extent possible fossil fuel infrastructure in the City of Portland.

We urge the City to amend the draft zoning code changes to further align the proposed amendments with the original intent of Portland's landmark Fossil Fuel Policy Resolution, Resolution # 37168. Portland's Fossil Fuel Policy Resolution ("resolution") stated that the City would "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." The draft amendments come much closer to accomplishing this impressive goal than the previous discussion draft, but gaps remain in the code language that could allow unintended fossil fuel projects – including dangerous oil train terminals – to establish or expand in Portland. For this reason, the proposed amendments do no fully achieve the City Council's intention to prohibit new major fossil fuel infrastructure, and we urge Planning and Sustainability Commission (PSC) members to make modest changes to the proposed amendments that bolster the fossil fuel zoning code proposal.

We appreciate the effort of staff and the PSC to solicit input on zoning amendments that would implement the City's new fossil fuel policy. Columbia Riverkeeper and Friends of the

Columbia Gorge submit the following brief comments to explain the need for stronger language in the amendments that would prohibit new fossil fuel infrastructure in the City of Portland.

I. The amendments should prohibit new bulk fossil fuel terminals.

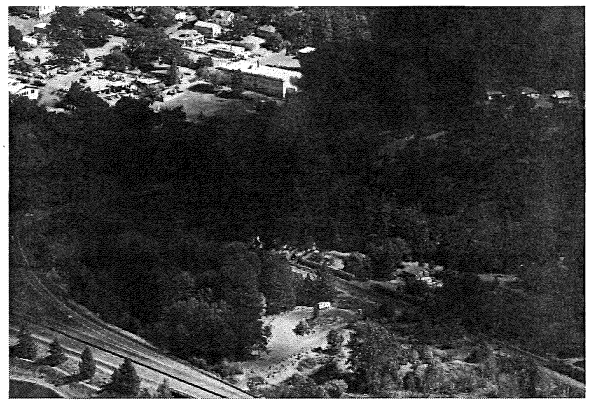
Riverkeeper and Friends of the Columbia Gorge support the proposed amendments' prohibition of bulk fossil fuel terminals. The amendments correctly identify bulk fossil fuel terminals as having the ability to transload fossil fuels and wisely prohibit new facilities with this capability. Proposed fossil fuel code changes Section 33.920.300, "Bulk Fossil Fuel Terminal," states,

> Bulk Fossil Fuel Terminals are establishments primarily engaged in the transport and bulk storage of fossil fuels. Terminal activities may also include fuel blending, regional distribution, and wholesaling. The firms rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities for transferring a shipment between transport modes, or have storage capacity exceeding 5 million gallons (or equivalent volume) of fossil fuels. There is minimal on-site sales activity with the customer present.[1]

This language is a huge improvement from the discussion draft, and we strongly support the intent to prohibit bulk fossil fuel terminals. However, we remain concerned that the language of the proposed zoning code changes carves out too large an exception for potential new terminals by allowing projects up to 5 million gallons of new storage. Staff considers facilities below 5 million gallons too small to be considered "bulk fossil fuel terminals," but this volume represents almost 120,000 barrels of crude oil – approximately enough for two unit trains of oil.

Portland's resolution was meant to steer Portland away from increased fossil fuel use rather than simply accommodating forecast fossil use by relying on estimates from the fossil fuel industry. Portland's landmark policy can be strengthened by reducing or eliminating the 5 million gallon exception for new fossil fuel storage.

As Northwest residents recently learned first-hand during an oil train derailment, spill, and fire in Mosier, Oregon on June 3rd, 2016, oil trains pose an acute safety risk. The derailment occurred as a result of oil shipments to the U.S. Oil facility in Tacoma, which receives one oil train per week, on average. The City's proposed amendments would potentially allow new crude-by-rail deliveries to the Portland area, with each unit train of oil carrying 2.5 to 3 million gallons of crude oil. The City



Oil Train derails, spills, and burns in Mosier, OR on June 3, 2016.

[1] Fossil Fuel Terminal Zoning Amendments Draft. Page 47.

should eliminate or reduce the 5 million gallon threshold because it is still high enough to accommodate oil trains.

Furthermore, the draft amendments fall short of aligning with Portland's Resolution # 37164 in opposition to crude-by-rail, passed unanimously by City Council on November 4, 2015, which called for the City to oppose any project that would increase oil train traffic through Portland. As currently written, the proposed amendments could facilitate an increase in crude-by-rail traffic through the City of Portland. The City's draft amendments acknowledge that "derailment risks to natural resources, especially along rivers, and to rural communities appear to be significant."[2] The City should address these risks by prohibiting new crude oil facilities, as the cities of Vancouver, Aberdeen, and Hoquiam have done already. In the alternative, the City should consider lowering the limit for crude oil facilities to below the volume of one unit train, 50,000 barrels[3] (2.1 million gallons) or less.

The City of Vancouver passed a new ordinance on July 18, 2016 that prohibits oil storage and handling facilities, oil refineries, and prohibits expansion at existing crude oil facilities. Vancouver's ordinance states that "development of new crude petroleum facilities, petroleum refineries, and expansion of existing crude petroleum facilities is contrary to the health, safety, and welfare of its citizens and business community," and prohibits the expansion of existing crude oil facilities in Vancouver.[4] Portland should consider a similar approach with respect to new and existing petroleum terminals by either lowering the threshold of what constitutes a "bulk fossil fuel terminal" or prohibiting them altogether.

We also urge the City to eliminate the 5 million gallon exception because it is unnecessary for liquid gas storage, particularly methane ("natural gas"). We urge the City to prohibit new liquefied natural gas (LNG) or gaseous fuel bulk terminals outright in the same manner that the proposed amendments would prohibit bulk coal terminals. The draft amendments indicate that the existing NW Natural Gas LNG plant/terminal has existing storage capacity of 7,000,000 gallons. As noted in our previous comments, neither NW Natural's 2014 Integrated Resource Plan (IRP) nor its 2016 Draft IRP indicate that NW Natural anticipates any increase in storage demand at its Portland LNG Gasco facility. On the contrary, NW Natural's projections show capacity remaining constant at its Portland LNG facility throughout the planning period for the report. Further, NW Natural's Draft 2016 IRP indicates that seismic investigations are ongoing at its Portland facility, a major issue of concern for highly volatile LNG storage:

> One additional matter is that **studies are just beginning for each LNG plant** in regard to Oregon's seismic initiative. It is too soon to know what actions may arise from these studies, but recommendations will be directed to reducing the consequences at each plant from a major Cascadia earthquake/tsunami event, such as minimizing tank leakage. There is no intention of making major changes to the plants, so the cost impact is expected to be modest.[5]

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[2] Fossil Fuel Terminal Zoning Amendments Draft. Page 22.
[3] Unit trains of oil are typically 90 cars or more in length, often carrying in excess of 60,000 barrels of oil.
[4] See details in City of Vancouver's Staff Report: http://www.cityofvancouver.us/sites/default/files/fileattachments/city_council/page/20031/08_sr099-16_prohibition_of_crude_oil_facilities.pdf
[5] NW Natural Draft IRP. 2016. P. 3.24

Where Portland's fossil fuel resolution called for the City to oppose new fossil fuel infrastructure, BPS' proposed amendments seem to grant unplanned-for expansions of new LNG storage in Portland. To bring the amendments back into alignment with the resolution, the discussion draft should be revised to prohibit new LNG storage altogether.

Lastly, we encourage the Planning and Sustainability Commission to clarify that facilities approved for one purpose – say, the storage of biofuels – may be limited to that purpose. City permits can carry conditions, and it will be reasonable for the City to condition new or expanded facilities to ensure that liquid bulk storage facilities are not transitioned to use for crude oil or other fossil fuels. The City can accomplish this goal by requiring that new applications for new or expanded facilities be limited by a condition of approval to the purpose for which they are authorized in their applications. In this way, the City's proposed ban on new fossil fuel bulk terminals fossil can preclude proposals that would circumvent the City's policy.

II. The Amendments Should Limit Existing Fossil Fuel Facilities and Prevent Aggregation of Projects

Riverkeeper and Friends of the Columbia Gorge support the City's proposal to identify existing fossil fuel facilities as legal nonconforming use facilities. By assigning existing facilities this status, the City preserves the ability for these facilities to address safety, seismic, and local market response issues while still preserving the City's ability to achieve the larger goal of reducing reliance on fossil fuels. The City summarizes its approach to existing facilities as follows:

> Existing Bulk Fossil Fuel Terminals would become legal, non-conforming uses, which may continue to operate. Expansion would require approval through a nonconforming situation review, which is a Type II discretionary land use review. The Type II procedure is an administrative process with the opportunity for public notice and comment.[6]

Portland's Climate Action Plan sets forth goals for the City to curb its emissions, and limiting fossil fuel infrastructure will be critical to achieve an 80% reduction in greenhouse gas emissions by 2050 for the City of Portland. The staff's report regarding the proposed amendments acknowledges that the continued use and expansion of any fossil fuels would hinder the City's ability to meet this goal, stating, "While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, substituting these fuels for higher-carbon fuels does not begin to approach the goal of an 80% reduction in carbon emissions by 2050 established in Portland's Climate Action Plan or the State's 75% goal."[7] Accordingly, we support the City's proposal to require expansion of existing terminals to go through a Type II non-conforming use process to limit fossil fuel infrastructure at existing facilities.

The City is likely to allow bulk fossil fuel terminals that are already operating to continue to do so at their current capacity, but the City may act to limit expansion at existing facilities by adding specific review criteria for nonconforming use review. We ask that the City add to the nonconforming use review the following factors:

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[6] Fossil Fuel Terminal Zoning Amendments Draft. Page 27.
[7] Fossil Fuel Terminal Zoning Amendments Draft. Page 8.

- Expansion shall not increase greenhouse gas emissions and climate change impacts;
- Expansion shall not increase the risk of fire and/or explosion at either the Bulk Fossil Fuel Terminal Site, or the transportation route used to convey fossil fuels to or from the Bulk Fossil Fuel Terminal, and
- Expansion shall not increase the risk of the release of fossil fuels from either the Bulk Fossil Fuel Terminal Site or transportation equipment or infrastructure used to convey fossil fuels to or from the Bulk Fossil Fuel Terminal, into the environment, the Columbia River or other waterways;

Additionally, we ask that the City consider adding language that prohibits the aggregation of smaller projects in order to avoid the 5 million gallon threshold that defines a "bulk fossil fuel terminal." By limiting aggregation and adding more stringent criteria to its nonconforming use review, consistent with the City's resolution, the proposed code changes would not inhibit improvements at these existing facilities that address seismic upgrades, safety improvements, or accelerate the transition to non-fossil energy.[8]

III. Focus on Public Safety, Seismic Upgrades and Reducing Risks at Existing Facilities

The City's fossil fuel resolution contains clear direction that "City bureaus are directed to examine existing laws, including those related to public health, safety, building, electrical, nuisance, and fire codes, and develop recommendations to address fossil fuels that strengthen public health and safety." According to the City's resolution, bulk fossil fuel terminals "pose risks to safety, health, and livability, including mobility of people, other freight, and other commercial vehicles," and "pose considerable risks in the event of a major earthquake."[9] Furthermore, NW Natural has indicated that their own LNG storage is undergoing new seismic reviews. We urge the City to revise its draft amendments to require or incent seismic upgrades at existing fossil fuel terminals.

We urge BPS staff to work with Portland's Bureau of Emergency Management to develop amendments or future code changes that protect Portland residents, consistent with the direction of the resolution and the comprehensive plan update.

IV. Conclusion

Thank you for the opportunity to comment on Portland's proposed draft of zoning code amendments to implement Portland's Fossil Fuel Policy Resolution 37168. Columbia Riverkeeper and Friends of the Columbia Gorge are pleased to support much of the language included in the proposed amendments. With a few modest changes, the City can attain the goals set forth in the original resolution - to prohibit new fossil fuel bulk terminals, limit existing fossil fuel terminals, and strengthen public safety and seismic protections at the City's existing terminals.

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[8] Fossil Fuel Terminal Zoning Amendments Draft. Page 6.
[9] Portland Fossil Fuel Policy, Resolution 37168.

Sincerely,

Daniel R. Serres
Conservation Director
Columbia Riverkeeper
1125 SE Madison St. Suite 103A.
Portland, OR 97214

Steve McCoy
Staff Attorney
Friends of the Columbia Gorge
522 SW Fifth Ave., Suite 720
Portland, OR 97204

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:53:05 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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From: Beth Slikas [mailto:bethslikas@gmail.com]
Sent: Friday, September 09, 2016 2:54 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would

allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Beth Slikas

From: Beth Slikas
Email: bethslikas@gmail.com
Address: 3515 SW 87th Ave, APT 24, Portland, Oregon, 97225

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:47:24 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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From: Jerry Smith [mailto:digjerrydig@gmail.com]
Sent: Friday, September 09, 2016 10:04 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Fossil fuel companies profit from poisoning the planet. They must be stop. Their bomb trains and explosive pipelines are a severe danger and have to be stopped.

From: Jerry Smith
Email: digjerrydig@gmail.com
Address: 5041 Saxon Way, Eugene, Oregon, 97405-3596

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Sunday, September 11, 2016 4:49:44 PM

Julie Ocken
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From: Helen Spector [mailto:helen94611@gmail.com]
Sent: Friday, September 09, 2016 1:12 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

City of Portland: PLEASE amend the proposed draft to reflect the city's fossil fuel goals:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Helen Spector
9601 NW Leahy Rd #309
Portland OR 97229
503-296-7248

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: Comment & Sustainability Commission
Date:	Sunday, September 11, 2016 5:00:52 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
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From: Earl Switzer [mailto:eswitzer27@gmail.com]
Sent: Friday, September 09, 2016 9:55 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Comment & Sustainability Commission

City of Portland

Dear Sir:

Please amend the proposed draft to reflect the city's fossil fuels goals. I would like Portland to enact a ban on all new fossil fuel terminals, large or small. The city's code changes should not allow more trains of explosive fossil fuels, such as Bakken oil.

We saw how dangerous Bakken oil can be if one remembers the oil train disaster last June in Mosier, Oregon.

Sincerely,

Earl C. Switzer
17469 SE Main St.
Portland, OR 97233

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony
Date: Sunday, September 11, 2016 4:52:08 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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From: Ellen Thayer [mailto:squeekerlynx@yahoo.com]
Sent: Friday, September 09, 2016 2:10 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

To whom this does concern:

I am writing to urge you to amend the proposed draft to reflect the city's fossil fuel goals which include:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you,

Ellen M Thayer
PO Box 710
140 SE Oak Street
White Salmon WA 98672

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:48:38 PM

Julie Ocken
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From: Scott and Heidi Trinkle [mailto:dwerger@gmail.com]
Sent: Friday, September 09, 2016 11:32 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

It is time to enact a full ban on ALL new fossil fuel terminals in or around the city of Portland. An exception for facilities that allow five million or fewer gallons of dangerous fossil fuels such as the Bakken crude oil must never be allowed.

By using the City's non-conforming review process, it is time to strengthen restrictions on the expansion of existing terminals with binding limits as well as with the strongest safety and climate impacts criteria possible. We know the damage that the mining for and burning of fossil fuels creates to people, for our communities (especially the poorest in the direct impact zones) and for the planet as a whole. It is, therefore, a must that the fossil fuel infrastructure for the city of Portland be limited to what already exists with a future goal of downsizing it and then putting Portland (along with the state of Oregon) on a path to 100% renewables in the coming decades.

We chose to retire from the US Army in what we saw as the environmentally progressive city of Portland, OR. We hope the Planning and Sustainability Commission continues along this path of sanity and sustainability for every residents' well being and it begins with a full BAN on fossil fuel terminals.

From: Scott and Heidi Trinkle
Email: dwerger@gmail.com
Address: 1205 SW Cardinell Dr. unit 603, Portland, Oregon, 97201

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Sunday, September 11, 2016 4:52:26 PM

Julie Ocken
City of Portland
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From: Lee Underwood [mailto:lee@cstarz.com]
Sent: Friday, September 09, 2016 2:11 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Dear City of Portland,

The recent oil train derailment and massive fire in Mosier has reinforced what we all have known for a long time—these trains going to and from Portland are moving BOMBS! Please amend the proposed draft to reflect the city's fossil fuel goals:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Please do not let us down!

Kind regards,

Lee Underwood
2149 Cascade Avenue
Hood River, OR
97031

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Terminal Zoning Amendments
Date: Sunday, September 11, 2016 4:54:22 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Jeff White [mailto:rogue576@gmail.com]
Sent: Friday, September 09, 2016 3:14 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Terminal Zoning Amendments

Please amend the proposed draft to reflect the city's fossil fuel goals:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you, Jeffrey A. and Betsy L. White, 42852 SW Dudney Avenue, Forest Grove, OR. 97116

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony
Date:	Sunday, September 11, 2016 4:53:46 PM

Julie Ocken
City of Portland
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From: lee zucker [mailto:lee.m.zucker@gmail.com]
Sent: Friday, September 09, 2016 2:54 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Please: For the sake of Portlanders, Oregonians in general, other residents and creatures of this planet

1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous
   fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals by adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you.

Lee Zucker for the Zucker family
1966 Orchard St.
Eugene, OR 97403

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:42:02 PM

Julie Ocken
City of Portland
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From: Terrie Burdette [mailto:pdxterrie@gmail.com]
Sent: Thursday, September 08, 2016 6:35 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

As an East St John's resident I live in view of a busy rail line and often think about the danger of oil transporting train cars moving through my neighborhood. Besides the potential for human injury or death is the threat of environmental damage to nearby Smith and Bybee Lakes. We are a PNW city and should be leading the way by example to fully ban ALL new fossil fuel terminals of ANY size.

From: Terrie Burdette
Email: pdxterrie@gmail.com
Address: 6603 N Bank St, Portland, Oregon, 97203

From: Lynda Byers [mailto:lebyers484@gmail.com]
Sent: Thursday, September 08, 2016 2:38 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Lynda Byers
Email: lebyers484@gmail.com
Address: 2171 NE Schuyler St Apt 4, Portland, Oregon, 97212

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:42:47 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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Portland, OR 97201
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From: Eliot Cole [mailto:eliot.cole1@Gmail.com]
Sent: Thursday, September 08, 2016 7:05 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would

allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Eliot Cole
Email: eliot.cole1@Gmail.com
Address: 4639 NE 30th, Portland, Oregon, 97211

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: [User Approved] PSC Fossil Fuel Zoning Testimony
Date:	Sunday, September 11, 2016 4:56:52 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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From: RICHARD EMERY [mailto:rsemery1@me.com]
Sent: Thursday, September 08, 2016 9:17 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: [User Approved] PSC Fossil Fuel Zoning Testimony

Please amend the proposed draft to better reflect the city's fossil fuel goals laid out in the resolution last fall:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing facilities through adding binding limits in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Please ensure that Portland fulfills the promise of its historic fossil fuel resolution.

Thank you!

Richard Emery
3439 NE Sandy Blvd. #205
Portland, OR 97232

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:39:40 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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From: Kim Fortin [mailto:fortinkim@gmail.com]
Sent: Thursday, September 08, 2016 5:38 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

It's time to...

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Kim Fortin
Email: fortinkim@gmail.com
Address: 2023 SE Madison St., Apt. 2, Portland, Oregon, 97214

From: Ryan Francesconi [mailto:hello@are-f.com]
Sent: Thursday, September 08, 2016 4:01 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Hello!

Let's be a world example and get this right. Full ban on fossil Fuel transport!!

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

From: Ryan Francesconi
Email: hello@are-f.com
Address: 2833 SE 45th Ave., Portland, Oregon, 97206

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:43:08 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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From: Mikel Gisi [mailto:loveofthewild@gmail.com]
Sent: Thursday, September 08, 2016 8:59 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would

allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Mikel Gisi
Email: loveofthewild@gmail.com
Address: 2211 E 30th St, APT B, Vancouver, Washington, 98663

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:42:26 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Elizabeth Graser-Lindsey [mailto:egraserlindsey@gmail.com]
Sent: Thursday, September 08, 2016 6:54 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Let's leave our children with a future. Let's do the right thing and turn from fossil fuels.

From: Elizabeth Graser-Lindsey
Email: egraserlindsey@gmail.com
Address: 21341 S. Ferguson Rd., Beavercreek, Oregon, 97004

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:43:57 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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From: Marsha Hanchrow [mailto:machiya@centurylink.net]
Sent: Thursday, September 08, 2016 9:06 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

It's not that I don't care about the price of gas, I do. I want its price to include to include all its costs. Those would be, among many others, the far more expensive processes necessary to get the remaining less accessible oil out of the ground, the money that should be reimbursed to FEMA for the cost of every "natural" disaster caused or exacerbated by drilling or oil transport, the cost of every improvement to stormwater systems needed because too much land is covered by impermeable roadway, the cost of almost every action/war in the Middle East, and more that I'm not up to arguing on a tiny phone.

I have a car; I drive it on occasion. It is not entitled to cheap gas, nor am I, nor is anyone.

Please do not allow any more oil terminals in Portland.

From: Marsha Hanchrow
Email: machiya@centurylink.net
Address: 1908 SE 35th Place, Portland, Oregon, 97214

From: Lynn Herring [mailto:lynnhe@outlook.com]
Sent: Thursday, September 08, 2016 4:01 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

To the Planning and Sustainability Commission, City of Portland,

Regarding Fossil Fuel Zoning, I encourage the City of Portland to amend the proposed draft to better reflect the city's fossil fuel goals laid out in the resolution last fall.

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing facilities through adding binding limits in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Take action now to ensure Portland fulfills the promise of its historic fossil fuel resolution.

Sincerely,

Lynn Herring

1090 Chandler Road

Lake Oswego, OR 97034

From: Craig Heverly [mailto:heverlyjc@hevanet.com]
Sent: Thursday, September 08, 2016 11:39 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

"No" means "No". Make it clean. Make it simple. No fossil fuel infrastructure. Period.

Thank you for your work.

From: Craig Heverly
Email: heverlyjc@hevanet.com
Address: 3712 SE 9th Ave, Portland, Oregon, 97202

From: Devin Kelly [mailto:devin.scott.kelly@gmail.com]
Sent: Thursday, September 08, 2016 10:37 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Portland does not need new fossil fuel terminals. The cycle must be broken by restricting the implementation of new terminals and expand renewable energy.

From: Devin Kelly
Email: devin.scott.kelly@gmail.com
Address: 5807 SE Belmont , 2, Portland, Oregon, 97215

From: jeff kipilman [mailto:jbkip@comcast.net]
Sent: Thursday, September 08, 2016 2:43 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

jeff kipilman
3315 NE 41st Ave
Portland, OR 97212

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:41:13 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: mary lane [mailto:ryla2015@gmail.com]
Sent: Thursday, September 08, 2016 6:21 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

City of Portland leaders:
Portland needs a FULL BAN on ALL new fossil fuel terminals, large or SMALL!
Please do the job you were elected to do: keep our environment and people safe and do what Portlanders want you to do!!!

From: mary lane
Email: ryla2015@gmail.com
Address: 2009 se taylor st., portland, Oregon, 97214

City of Portland, Oregon
Bureau of Development Services
Land Use Services
FROM CONCEPT TO CONSTRUCTION

Dan Saltzman, Commissioner
Paul L. Scarlett, Director
Phone: (503) 823-7300
Fax: (503) 823-5630
TTY: (503) 823-6868
www.portlandoregon.gov/bds

MEMO

Date: September 8, 2016

To: Steve Kountz

From: Laura Lehman
Bureau of Development Services

Cc: Rebecca Esau, BDS Land Use Services Supervisors

Re: BDS Comments on Fossil Fuel Terminal Proposed Draft

Thank you for the opportunity to review and comment on the proposed code language for the Fossil Fuel Terminal Zoning project. This project will help implement new policy direction for fossil fuel distribution and storage facilities through changes to the zoning code.

The comments below highlight our primary areas of concern and provide comments on the proposal. We look forward to working with BPS staff to address our concerns and to providing additional feedback as the project develops.

Primary Areas of Concern

1. **Nonconforming Situation Review**
   The proposed code is intended to implement policy direction to allow development of emergency backup capacity, infrastructure that will accelerate transition to non-fossil fuels, safety and efficiency improvements, service to end users, and infrastructure for processing of used petroleum products at existing Bulk Fossil Fuel Terminals. The proposed code prohibits Bulk Fossil Fuel Terminals and existing facilities would become non-conforming uses. As noted in the code analysis, expansions of nonconforming uses require a Type II Nonconforming Situation Review. The approval criteria for Nonconforming Situation Review in an I zone are as follows:

   With mitigation measures, there will be no net increase in overall detrimental impacts (over the impacts of the last legal use or development) on the surrounding area taking into account factors such as:
   a. The hours of operation;
   b. Vehicle trips to the site and impact on surrounding on-street parking;
   c. Noise, vibration, dust, odor, fumes, glare, and smoke;
   d. Potential for increased litter; and
   e. The amount, location, and nature of any outside displays, storage, or activities.

Approval of expansions of existing terminals consistent with the stated policy direction will be problematic and may not be possible – it will be difficult to show that expansion of tanks or addition of capacity would not increase fumes or odors per criterion (c). Expansions that result in additional vehicle trips, either due to movement of goods or additional staff on-site, would not be approvable per criterion (b). Lastly, new storage tanks would be considered additional exterior storage, and would likely be unable to satisfy criterion (e).

BDS suggests an approach similar to that used for Drive-Through facilities in the Hollywood Plan District (33.563.210.D). In the zones where fossil fuel terminals currently exist, this approach would be to prohibit Bulk Fossil Fuel Terminals unless there was a legal terminal on the site on a specific date, and then to provide limits for expansions of terminals that were existing as of that date. The limits on expansion could include that expansions be for seismic or safety upgrades, that they be for non-fossil fuels, or that they be infrastructure for re-processing of used fossil fuels. If including limits related to infrastructure, the proposed Code would need to be specific about what this includes. (Note that it will be difficult to ensure that infrastructure is used only for non-fossil fuels or used fuels, as BDS regulates the development of processing infrastructure but does not regulate the type of fuels processed). The limitations could include a cap on the volume of storage that could be permitted, to ensure that the expansions permitted would be appropriate for emergency backup or for service to end users.

An alternative approach would be to designate Bulk Fossil Fuel Terminals as a Conditional Use, subject to the approval criteria of 33.815.125 for Specified Uses in Industrial Zones. Expansions beyond the limitations of 33.815.040.B would require conditional use review. In order to prohibit new Bulk Fossil Fuel Terminals but allow expansions through the conditional use process, the use could have a footnote in the Allowed Uses table for the I zones, stating that new Bulk Fossil Fuel Terminals are prohibited, but that those that were legally in place on a specified date are a conditional use.

2. **Description of the Proposed "Bulk Fossil Fuel Terminals" Use Category**
The code concept includes a new land use category – Bulk Fossil Fuel Terminals. The use description includes an exception for industrial, commercial, institutional, and agricultural firms that exclusively store fossil fuels for use as an input. If these facilities otherwise meet the use characteristics (have marine or railroad access to transport fuels, or have storage capacities exceeding 5 million gallons), it will be difficult for BDS to determine whether the fossil fuels are being used exclusively as an input. If such a facility did begin shipping fuels that were being stored on site, that would constitute a change in operations rather than a change of use, and could occur without notice to BDS.

The use characteristics described in 33.920.300.A refer to firms that rely on access by marine services, railroad, or regional pipelines. The reference to firms could be confusing – the characteristics refer to the use and the facility, not necessarily to the firm that is conducting the use.

3. **Size Limits in General**
   The code should make it clear whether the storage capacity limits in the proposed Bulk Fossil Fuel Terminals use category apply to sites, or to operators, of which there could be more than one on a site. BDS will need guidance about how best to verify the capacity of existing and/or proposed fossil fuel storage on a site or per operator – through information shown on a site plan, or through manufacturer or other specifications. Storage capacity is not something that BDS will easily be able to inspect or enforce.

4. **Methanol**
   Fossil fuels will be defined as part of this project. The analysis on page 24 of the proposed draft document states that methanol is intended to be included in this definition, and that the proposed code is intended to limit large methanol plants. The analysis also states, however, that biogas is intended to be excluded and that the proposed definition specifies that fossil fuels are made from decayed plants and animals that lived millions of years ago, in order to exclude biogas. Methanol produced from natural gas appears to meet the proposed definition, but methanol produced from other sources such as biomass does not appear to meet this definition. It also appears that a facility producing methanol would fit the manufacturing and production use category, regardless of the input, and therefore would not be limited by the proposed code language.

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:40:48 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Mary Mandeville [mailto:k9chiro@aol.com]
Sent: Thursday, September 08, 2016 6:03 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you for incorporating public comments on the Fossil Fuel Terminal Zoning Amendment. I'd like to say that I am in support of a FULL BAN.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Mary Mandeville

From: Mary Mandeville
Email: k9chiro@aol.com
Address: 5746 NE Going Street, Portland, Oregon, 97218

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:41:37 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
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www.portlandoregon.gov/bps

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From: Nicole Martin [mailto:PixiStyxNM@aol.com]
Sent: Thursday, September 08, 2016 6:34 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Tell the City of Portland we want to...

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Nicole Martin
Email: PixiStyxNM@aol.com
Address: 5704 N Omaha Ave., Portland, Oregon, 97217

From: Michael Mitton [mailto:mmitton@nvbell.net]
Sent: Thursday, September 08, 2016 5:46 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Michael and Marilyn Mitton

From: Michael Mitton
Email: mmitton@nvbell.net
Address: 1260 NW Naito Pkwy #801, Portland, Oregon, 97209

From: Mirabai Peart [mailto:mirabaipeart@gmail.com]
Sent: Thursday, September 08, 2016 3:20 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I want to say thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. I appreciate that the current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution. However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015.
More than anything, the city's responsibility is to ensure a liveable climate for our future generations. All signs and studies are showing that climate change is moving on us faster than we want to acknowledge. If Portland can pass a true strong resolution on this then we will be taking one step in the right direction as a city, towards a reasonable future, and towards taking full responsibility to help reduce the severity of this global crisis.

This visionary resolution of 2015 called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although the current draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time. We really need to do this, for now, and for all future generations. Let's make a resolution that Portland can be proud of.

Sincerely,
Mirabai Peart

From: Mirabai Peart
Email: mirabaipeart@gmail.com
Address: 2833 SE 45th Ave, Portland, Oregon, 97206

From: Planning and Sustainability Commission
To: Kountz, Steve
Subject: FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date: Sunday, September 11, 2016 4:46:02 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Sandy Polishuk [mailto:sandypolishuk@gmail.com]
Sent: Thursday, September 08, 2016 10:25 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I very much appreciate the opportunity to have input to your committee before you submit your report to City Council and I thank you for the improvements you have made to the initial draft. However, I think the current proposal still needs more improvement to be in accord with the original intent of the resolution passed last Fall.

The point was no expansion of fossil fuel infrastructure. This means no new terminals and no expansion of the current ones! Seems pretty clear and simple to me.

I also think it's very important that all the current fossil fuel storage be seismically improved. We all know the 'big one' is coming eventually, and it could be sooner rather than later. We must protect our city and river from fuel spills that will cause contamination and possible explosions and fires.

We need to be sure that there is no increase in trains carrying oil. Ideally, we should stop them all. They are a danger to our health and safety!

From: Sandy Polishuk
Email: sandypolishuk@gmail.com
Address: 1610 NE Tillamook St Apt. 3, Portland, Oregon, 97212

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:39:19 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
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From: Rick Rappapor [mailto:rick@rickrappaport.com]
Sent: Thursday, September 08, 2016 5:09 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Hello, I realize that most of this comment is part of a sample letter written by others who have put in much more time and energy researching the published staff report and recommendations. I know it sounds like rubber stamping someone else's thoughts but why not? It says what I want to say better and more knowledgeably than me fumbling around and making factual or quasi legal errors.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Rick Rappapor
Email: rick@rickrappaport.com
Address: 2218 N.E. Gile Terrac, Portland, Oregon, 97212

From: Janet Roxburgh [mailto:hummingbirdzoo@yahoo.com]
Sent: Thursday, September 08, 2016 3:56 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is wonderful to observe the city making decisions that are environmentally responsible and responsive to citizen input.

Sadly, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." This draft still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary and undesirable: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Janet Roxburgh
1503 N Hayden Island Drive, 860
#860
Portland, OR 97217

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:38:50 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Robin Vesey [mailto:jack-robin@spiritone.com]
Sent: Thursday, September 08, 2016 5:08 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

No new fossil fuel terminals should be allowed or built in Portland, nor in any part of Oregon. The city should enact laws to forbid the transport of fossil fuels via rail or roads here, due to their dangers and impacts on our climate.

From: Robin Vesey
Email: jack-robin@spiritone.com
Address: 16 SW Canby St, Portland, Oregon, 97219-4661

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:38:24 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:40:15 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
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From: Ruby Karen Annette Wilcox [mailto:wordpress@350pdx.org]
Sent: Thursday, September 08, 2016 5:44 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

My name is Ruby Karen A Wilcox and I live in Portland. I support a full ban on all new fossil fuel terminals in my city. Please please protect our environment! Please protect our home. Our Planet suffers from our addiction to fossil fuels, which come at such a brutal cost to our water, our people, our future. Please support other means of generating energy and fuels. It is time!

From: Ruby Karen Annette Wilcox
Email: rubykwilcox@yahoo.com
Address: 430 NE 16TH Avenue #433, Portland, Oregon, 97232

From:	Planning and Sustainability Commission
To:	Kountz, Steve
Subject:	FW: PSC Fossil Fuel Zoning Testimony: I want a full ban!
Date:	Sunday, September 11, 2016 4:43:30 PM

Julie Ocken
City of Portland
Bureau of Planning and Sustainability
1900 SW 4th Ave, Suite 7100
Portland, OR 97201
503-823-6041
www.portlandoregon.gov/bps

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From: Fiona Yun [mailto:fiona.yun00@gmail.com]
Sent: Thursday, September 08, 2016 9:05 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland

From: Fiona Yun
Email: fiona.yun00@gmail.com
Address: 10046 N Oswego, Portland, Oregon, 97203

From: Pennelloppe Allee [mailto:wordpress@350pdx.org]
Sent: Wednesday, September 07, 2016 9:41 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I support a full ban on all new fossil fuel terminals, large or small. We should be urgently moving away from fossil fuel dependency, and the oil companies have the resources to do so and develop clean energy. The only thing preventing them from doing so is greed. If we make fossil fuel extraction and use less accessible and profitable, they will be forced to invest in the cleaner, safer alternatives. They will not do it willingly, therefore, it is up to us to force the redirection of effort and investment through our actions and legislation. The City of Portland has the power to change the energy/climate paradigm. Embrace this opportunity to be leaders and energy policy shapers for the betterment of our local and global environments.

From: Pennelloppe Allee
Email: pennelloppe99@yahoo.com
Address: 17139 SW Berkeley Ln, Beaverton , Oregon, 97003

From: Stephen Bachhuber [mailto:srbachhuber1@gmail.com]
Sent: Wednesday, September 07, 2016 2:08 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

To BPS,
In regard to the possible ban on fossil fuel terminals, keep it strong.
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Stephen Bachhuber
Email: srbachhuber1@gmail.com
Address: 3428 SE 9th Ave., Portland, Oregon, 97202

From: Dana Brown [mailto:danaconsulting@comcast.net]
Sent: Wednesday, September 07, 2016 8:51 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear Mayor and City Council Members -
This is your opportunity to leave an historic legacy for future Portlanders. Enact a full ban on all new fossil fuel terminals, strengthen restrictions on expansions at existing terminals and prevent any increase in fossil fuel infrastructure in Portland. There is only one way forward to a future that will be sustainable for humanity and all life on the planet. Be the leaders you hoped to be. Thank you!

From: Dana Brown
Email: danaconsulting@comcast.net
Address: 2606 NE 30th Ave, Portland, Oregon, 97212

From: Denise Busch [mailto:standleydm@involved.com]
Sent: Wednesday, September 07, 2016 8:37 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Denise Busch
Email: standleydm@involved.com
Address: 7160 SW Raleihgwood lane, Portland, Oregon, 97225

From: Tony and Phyllis DeCristofaro [mailto:wordpress@350pdx.org]
Sent: Wednesday, September 07, 2016 8:22 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Tony and Phyllis DeCristofaro

From: Tony and Phyllis DeCristofaro
Email: pdecrist@yahoo.com
Address: 472 N Hayden Is Dr, Portland, Oregon, 97217

Sent: Wednesday, September 07, 2016 11:40 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you for the opportunity to comment. Please consider the following:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you very much, Ineke Deruyter

From: Ineke Deruyter
Email: ideruyter@hotmail.com
Address: 9322 N Oswego Ave, Portland, Oregon, 97203

From: Steve Elliot [mailto:secondselliot@peoplepc.com]
Sent: Wednesday, September 07, 2016 7:57 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Climate change is real. Staying the course is obviously unacceptable as it will only hasten the pace of global warming, causing more catastrophic storms, and loss of plant and animal species. One of the greatest causes of global warming is from the use of fossil fuels in internal combustion engines.

New infrastructure for fossil fuel extraction, transport, storage, and refining indicate a willingness to go forward to planet disaster. This is unacceptable. We must transition to other sources of energy if we are going to have a livable planet for our grandchildren's grandchildren.

From: Steve Elliot
Email: secondselliot@peoplepc.com
Address: 15036 Stagecoach, Swisshome, Oregon, 97480

From: Jason Fiske [mailto:jasondanielfiske@gmail.com]
Sent: Wednesday, September 07, 2016 1:08 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Let Portland live up to its potential by taking this "risk" and pioneering the standards for other American cities.

From: Jason Fiske
Email: jasondanielfiske@gmail.com
Address: 2704 SE 47th Ave, Portland, Oregon, 97206

From: Eileen Fromer [mailto:efromer@msn.com]
Sent: Wednesday, September 07, 2016 10:47 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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Sincerely,
Eileen Fromer

From: Eileen Fromer
Email: efromer@msn.com
Address: 8175 SW 71st Ave., Portland, Oregon, 97223

From: Sheila Golden [mailto:goldensheila6@gmail.com]
Sent: Wednesday, September 07, 2016 12:09 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

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Sincerely,

Sheila Golden

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

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Sincerely,

From: Sheila Golden
Email: goldensheila6@gmail.com
Address: 1411 NE 16th Ave., Portland, Oregon, 97232

2910

From: Mark Grossman [mailto:wordpress@350pdx.org]
Sent: Wednesday, September 07, 2016 4:48 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

My family lived in Oregon for years and value its environmental health. We ask for a full ban on new fossil fuel terminals of an size. Existing terminals should not be expanded. Fossil fuels are destroying the atmosphere and the oceans - let's not contribute to this any further.

From: Mark Grossman
Email: grossman_mark@yahoo.com
Address: 2063 Byron St, Palo Alto, California, 94301

From: Glenna Hayes [mailto:wordpress@350pdx.org]
Sent: Wednesday, September 07, 2016 8:37 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

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I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Glenna Hayes
7254 SW 53rd Av
Portland, OR. 97219

From: Glenna Hayes
Email: gahportand@yahoo.com
Address: 7254 SW 53rd Ave, Portland, Oregon, 97219

From: Susan Haywood [mailto:wordpress@350pdx.org]
Sent: Wednesday, September 07, 2016 3:59 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

We must have a full ban all new fossil fuel terminals of any size. There must be no exceptions; we must not allow any more trains fossil fuels, especially Bakken crude, through our city (and hopefully the state).
As it is now, trains dragging oil tanks run frighteningly close to Max tracks and our freeways. We cannot afford to increase the risk of explosions that would harm so many people.
In addition, we should prevent any aggregate increase in fossil fuel infrastructure in Portland. We are on the confluence of two rivers and risk pollution that can move far and wide via their waters. It was wise to pull out of the Pembina project last year. Let's shrink our risks and not allow ourselves to be used by big corporations to export their foul products.
We need to strengthen restrictions on any and all expansions at existing terminals by adding binding limits and criteria for safety and climate impacts in Portland's non-conforming use review process. In fact, it would be great to reduce terminals now in existence for our own safety.

From: Susan Haywood
Email: susansaphone2@yahoo.com
Address: 2146 NW Everett St, Portland, Oregon, 97210

Western States Petroleum Association
Credible Solutions • Responsive Service • Since 1907

Frank E. Holmes
Director, Northwest Region

Sent via Email and US Mail:
psc@portlandoregon.gov

September 7, 2016

Planning and Sustainability Commission
City of Portland
1900 SW 4th Avenue, Suite 7100
Portland, OR 97201

Re: WSPA Comment for PSC Fossil Fuel Terminal Zoning Amendments Public Hearing

Dear Commissioners:

The Western States Petroleum Association (WSPA) is a non-profit trade association representing companies that explore for, produce, refine, transport, and market petroleum, petroleum products in five western states including Oregon. WSPA appreciates the opportunity to provide comments on the City of Portland's Bureau of Planning and Sustainability Fossil Fuel Terminal Zoning Amendments Proposed Draft, but is highly concerned about the proposal's disregard regard for federal, state, regional policy, and resulting unintended consequences.

Several WSPA members operate petroleum terminals in Portland. These members have responsibly operated in the energy corridor along Northwest St. Helens Road for decades. This corridor provides key energy and emergency infrastructure as recognized by various city, state, and federal documents. WSPA opposes the City's push to regulate fossil fuels under Resolution No. 37 166, Fossil Fuel Terminal Zoning Amendments, or otherwise, but submits these comments in an attempt to mitigate some of the unintended consequences of the contemplated zoning amendments.

The draft amendments explicitly propose to control state and regional energy and transportation policy, and exclude Metro and the State from their proper role in this issue. The proposal acknowledges the City's unique position in energy distribution and attempts to make a bottleneck in Portland, and thereby reduce the energy options available in all other jurisdictions in Metro, Oregon, and other states. As discussed in the Proposed Draft, the City serves as a distribution hub for the region and state. Terminals in the City serve more than 90 percent of the statewide market. The policy decisions that the City is trying to force on the region and state belong at the regional

975 Carpenter Road N.E., Suite 106, Lacey, Washington 98516
360 352-4506 • 360 352-4507 • 360 789-1435 Cell

and state level and wrongfully exclude impacted parties in smaller cities and rural areas of the state.

The proposed zoning amendments contradict and misalign with federal and state laws pertaining to energy infrastructure and transportation, including but not limited to Oregon's low carbon fuel standards, Oregon's Renewable Fuel Standards, federal Renewable Fuel Standards, and similar laws. The Proposed Draft further contradicts policy direction in Resolution No. 37166 and the City's Comprehensive Plan enabling energy infrastructure to serve the region as well as transition to non-fossil fuel sources.

Of particular concern to WSPA, the proposed zoning amendments would create a number of substantial unintended consequences. Specifically, the Proposed Draft:

- Introduces a host of ambiguities and uncertainties to marketplace necessary for a thriving economy;
- Prevents and discourages replacing equipment that has reached end of life;
- Prevents and discourages equipment upgrades necessary to meet market demand or comply with federal and state law;
- Prevents and discourages safety and efficiency upgrades;
- Restricts infrastructure that serves the region, in contradiction of the new City Comprehensive Plan provision governing fossil fuel infrastructure;
- Fails to clearly specify how existing infrastructure can expand on existing sites, to adjacent properties, and to nearby non-adjacent properties;
- Restricts infrastructure related to Oregon's low carbon fuel standards, Oregon's Renewable Fuel Standards, federal Renewable Fuel Standards, and similar laws;
- Fails to provide for sufficient facilities to serve future energy needs;
- Stymies potential future technologies that do not fit within the contemplated framework;
- Attempts to exclude Portland from the national and regional energy market;
- Bases decisions on whether to allow energy infrastructure expansion on impacts to the surrounding area (Nonconforming Situation Review) instead of the energy and transportation needs of the City, region, and state;
- Generally does not align with state and federal policy regarding siting energy infrastructure or transportation of fuels;

- Encourages less efficient (and potentially less safe) transportation by truck over more efficient modes of transportation;
- Fails to provide for the economic impact assessment called for by Resolution No. 37166;
- Pushes for an adoption timeline that is too fast to allow for thoughtful discussion and tailoring addressing the above and other concerns; and
- Fails to adequately engage Oregon and Metro residents and business outside Portland who will be impacted by the bottleneck in energy distribution created by the proposal.

We have enclosed proposed zoning code language in Appendix 1 that would address some of the issues raised in this comment. While the proposed language does not resolve all the problems with the contemplated amendments, it addresses some of them.

Again, thank you for this opportunity to comment on the Fossil Fuel Terminal Zoning Amendments Proposed Draft. We hope the City reconsiders its push to pass regulations in this area, and if does, that it will more narrowly tailor its rules to not contradict federal and state direction and avoid unintended consequences.

Thank you for your consideration of WSPA's comments. If you have any questions, please contact me at this office at fholmes@wspa.org and (360) 352-4506.

Sincerely,

Frank E Holmes

Frank E. Holmes
Director, Northwest Region

From: Cecelia Hurley [mailto:diablaella@gmail.com]
Sent: Wednesday, September 07, 2016 9:41 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear City of Portland,
Please consider this ban. I am a tax payer and natime Portlander. Please
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

These are the things I would like you to cinsider while making these important and impact full decisions.

Kind Regards,
Cecelia Hurley
7465 N Huron
PORTLAND OR
97203

From: Cecelia Hurley
Email: diablaella@gmail.com
Address: 7465 N Huron, PORTLAND, Oregon, 97203

From: Maya Jarrad [mailto:maya@350pdx.org]
Sent: Wednesday, September 07, 2016 3:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Congratulations to all of you at the Bureau of Planning and Sustainability for your work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution, and to truly protecting Portland and its residents from further health, safety, and climate risks.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

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2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

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4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Maya Jarrad
Email: maya@350pdx.org
Address: 3414 SE 21st Ave, Portland, Oregon, 97202

From: David Kreisman [mailto:dkreisman@hotmail.com]
Sent: Wednesday, September 07, 2016 10:50 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

It is extremely important that Portland NOT weaken this precedent setting policy! For future generations and the livability our planet I strongly urge the Portland City Council to:

1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Sincerely
David Kreisman

From: David Kreisman
Email: dkreisman@hotmail.com
Address: 15066 SE Robinette Ct, Portland, Oregon, 97267

From: Sharon Labreck [mailto:sharonlabreck@gmail.com]
Sent: Wednesday, September 07, 2016 1:01 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

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Sincerely,

Sharon Labreck

From: Sharon Labreck
Email: sharonlabreck@gmail.com
Address: 18141 SE Troge Rd, Damascus, Oregon, 97089

From: Joy Mamoyac [mailto:salmonberries@msn.com]
Sent: Wednesday, September 07, 2016 1:38 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

As a long time Oregonian who loves her state I an VERY concerned about fossil fuel terminals whether they are large or small infrastructures. There needs to be a ban in place, When you consider the fires, derailments, enviromental disasters and explosions that have happened as in Mosier it is very dangerous to all Oregonians on so many levels. We need this ban to prevent future loss of life and damage to our ecosystem. It's not a matter of "if " these dangerous events will happen but "when"! We need to give careful thought when considering any expansions to existing terminals. You have the responsibilty and DUE dilligence to protect The state of Oregon as a whole!

From: Joy Mamoyac
Email: salmonberries@msn.com
Address: 2988 NW Angelica Dr., Corvallis, Oregon, 97330

From: Barbara Manildi [mailto:bmanildi@earthlink.net]
Sent: Wednesday, September 07, 2016 8:28 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Barbara Manildi
Email: bmanildi@earthlink.net
Address: 3525 Red Cedar Way, Lake Oswego, Oregon, 97035

From: Mary McGaughey [mailto:wordpress@350pdx.org]
Sent: Wednesday, September 07, 2016 2:37 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Oregon has just voted for Clean Energy. To move forward with sustainable, non-polluting energy. We, the whole world is working to divest from dirty oil. Many nations have signed on to the 2016 Paris Climate Agreement, even China! Building terminals to transport oil to Asia will 'fly in the face' of our commitment to eliminate oil as the major energy source of the world. Backward is not where We are going!

From: Mary McGaughey
Email: marymcgaughey@yahoo.com
Address: 381 NE Village Squire Av Unit 2, Gresham, Oregon, 97030

From: Colleen McNally-Murphy [mailto:cmcnallymurphy@gmail.com]
Sent: Wednesday, September 07, 2016 10:40 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

To whom it may concern:

It is time for Portland to reclaim its role as a leader in green infrastructure and renewable energy. To that end, I write to urge you to:
1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you very much.

From: Colleen McNally-Murphy
Email: cmcnallymurphy@gmail.com
Address: 5406 NE Everett St, Portland, Oregon, 97213

From: Mona McNeil [mailto:monarandy@monarandy.com]
Sent: Wednesday, September 07, 2016 2:55 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please protect our Oregon/Washington environment and people. Ban all new fossil fuel terminals.

From: Mona McNeil
Email: monarandy@monarandy.com
Address: 15704 NE 28th Court, Vancouver, Washington, 98686

From: Susan Millhauser [mailto:susancm@spiretech.com]
Sent: Wednesday, September 07, 2016 3:50 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you for the hard work done to date to develop the draft Fossil Fuel Terminal Zoning Amendments. I am writing today to encourage the addition of further restrictions on size and expansion of existing terminals to better meet the intent of the original City Council resolution, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I encourage the City and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small, as clearly stated in the 2015 resolution.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now is the time to tighten up these amendments to ensure Portland's people and the natural environment are protected from fossil fuel transport and the location and expansion of terminals within our community. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Thank you for your consideration!

From: Susan Millhauser
Email: susancm@spiretech.com
Address: 5834 NE 23rd Ave, Portland, Oregon, 97211

From: Monica Mueller [mailto:monica.mueller@pdx.edu]
Sent: Wednesday, September 07, 2016 8:45 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments.I encourage the City of Portland and the Planning and Sustainability Commission to:
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.
Thanks in advance for considering these changes.

From: Monica Mueller
Email: monica.mueller@pdx.edu
Address: 3339 SE Caruthers St, Portland, Oregon, 97214

From: Emily Platt [mailto:platte@ohsu.edu]
Sent: Wednesday, September 07, 2016 9:18 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Emily Platt
Email: platte@ohsu.edu
Address: 2808 SE 18th Ave, Portland, Oregon, 97202

From: Fraser Rasmussen [mailto:rasmussenf43@gmail.com]
Sent: Wednesday, September 07, 2016 6:30 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I am requesting that by regulation the city of Portland will remain free of any new fossil fuel terminals. That city will not accept any amount of crude oil shipments to be stored or processed within its boundaries.

From: Fraser Rasmussen
Email: rasmussenf43@gmail.com
Address: 45 Eagle Crest Dr., Apt 300, Lake Oswego, Oregon, 97035

From: Natalie Reich [mailto:natmobile@comcast.net]
Sent: Wednesday, September 07, 2016 8:21 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I know there is ample evidence that continuing to frack oil and harvest coal, transport and burn these fuels is a sure road to utter disaster and we may already be past the point of no return. I know there will be earth scientists and environmentalists presenting the numbers -temperatures, atmospheric ppm, methane, C02, etc. This is simply an emotional appeal that our city stay consistent with its stated commitment to ban ALL FOSSIL FUEL INFRASTRUCTURE AND T RANSPORT WITH NO LOOPHOLES OR EXCEPTIONS.

From: Natalie Reich
Email: natmobile@comcast.net
Address: 6109 SW Nevada Court, Portland, Oregon, 97219

From: Judy Romano [mailto:judy92809@gmail.com]
Sent: Wednesday, September 07, 2016 3:55 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

We want to:
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Judy Romano
Email: judy92809@gmail.com
Address: 2058 SE Elliott, Portland, Oregon, 97214

From: Mary Rose [mailto:zambonirose@gmail.com]
Sent: Wednesday, September 07, 2016 11:05 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

It is time for us to boldly step into the change that needs to happen now. Portland has a chance right now to lead the way in the transition toward renewable energy. We cannot do so if we don't take the leap of banning new oil infrastructure. Please refine the Fossil Fuel Zoning Amendments to make this change possible.

I stand with many other Portlanders who want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Sincerely,
Mary Rose

From: Mary Rose
Email: zambonirose@gmail.com
Address: 4334 NE 23rd Ave, Portland, Oregon, 97211

From: Daniel Senic [mailto:euromerican@msn.com]
Sent: Wednesday, September 07, 2016 11:00 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I am writing to voice my opposition to any expansion of fossil fuel transport through my beloved city.

I moved to Portland in 2009 not because of job opportunities but because of Portland's reputation as a leader in all environmental issues. This is important to me because I am a person of faith and as such am called to environmental stewardship. Our miracle planet, it's vegetation, oceans, atmosphere, climate, humans and animals are all part of God's creation and are thus good and sacred.

Corporate greed for profit threatens all that is perfect in it's originally created state and our Rose City should not give into temptation and intimidation and thereby aid in the destruction of creation. This city, country, and world has more than enough acres of parking lots and rooftops for solar panels and plenty of wind to go around to spin countless wind turbines. Not to mention other renewables. I ask my city to stand on the side of righteousness and I want the following:

1.Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2.Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3.Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Daniel Senic
Email: euromerican@msn.com
Address: 330 NW 116th Ave , Portland, Oregon, 97229

From: Paul Spindel [mailto:pspindel@msn.com]
Sent: Wednesday, September 07, 2016 8:10 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Hi.
I am writing you to ask that:
1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

We can do better. Be leaders.
Thank you

From: Paul Spindel
Email: pspindel@msn.com
Address: 1465 HOLLY ST, WEST LINN, Oregon, 97068

Sent: Wednesday, September 07, 2016 9:30 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

The fossil fuel industry sees the region downstream from the I-5 Bridge over the Columbia as the shortest path for getting our natural resources on to a marine vessel.

You do not want to allow propane trains, oil trains, LPG trains or coal trains to come through the Columbia Gorge to a terminal in Portland.

In Vancouver we are fighting NuStar which proposed to handle 1 million gallons of crude oil per day, and you seem willing to allow storage of 5 million gallons.

One year ago, the Los Angeles City Council voted 15-0 to oppose a project that would have generated 5 oil trains per week of oil train traffic. Based on safety considerations, they would have opposed 1 oil train per week because their fire department cannot handle an oil train fire. One train holds approximately 1 million gallons.

The treaty tribes of the Columbia Gorge are adamantly opposed to coal and oil trains through the Gorge. Many of their councilmembers are right now in North Dakota blocking a pipeline and fending off attack dogs.

Twice within the last five years there has been a major pipeline leak into the Missouri. The Tribes are blocking a pipeline that would go under the Missouri and jeopardize the water. Back in the early 40s, Woody Guthrie wrote a song sayng, "If I was president Roosevelt . . . I'd shoot the first big oil man that killed the fishing creek."

You don't want ethanol terminals either. The NTSB says that ethanol trains are just as dangerous as crude oil trains. You own Fire Department was maxed out on May 4, 2011, when a log fell off another train and caused an ethanol train to puncture and catch fire. This happened on Hiway 30 near Cornelius Pass Road.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Don Steinke
POB 822393
Vancouver, WA 98682

From: Carolyn Stuart [mailto:wordpress@350pdx.org]
Sent: Wednesday, September 07, 2016 10:27 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I am n full agreement with all of these points!

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Carolyn Stuart
Email: touchmonk@yahoo.com
Address: 4920 NE 55th, Portland, Oregon, 97218

From: satya vayu [mailto:satyavayu@gmail.com]
Sent: Wednesday, September 07, 2016 6:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I appreciate that the Bureau of Planning and Sustainability incorporated public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the strong resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I urge the City of Portland and the Planning and Sustainability Commission to enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure. The exception for new facilities that are 5 million gallons or less needs to be removed as it would allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

Also, restrictions need to be strengthened on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. Finally, please add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Satya Vayu

From: satya vayu
Email: satyavayu@gmail.com
Address: 6608 SE 81st Ave, Portland, Oregon, 97206

From: Elle West [mailto:wordpress@350pdx.org]
Sent: Wednesday, September 07, 2016 6:41 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

fossil fuels are now unnecessary and unwanted. for a fuel company to make a decision based on profit that is projected is irresponsible and NOW life threatening. WE DO NOT WANT OIL, WE WANT A FUTURE.

From: Elle West
Email: appleface25@yahoo.com
Address: 3333 ne evertee, Portland, Oregon, 97232

From: William Whitaker [mailto:wwhitak@boisestate.edu]
Sent: Wednesday, September 07, 2016 10:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I am an Oregon grandfather concerned about leaving a heritage of a habitable world for grandchildren everywhere. We must keep carbon in the ground.

I urge you to enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

It is essential to strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

We must prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: William Whitaker
Email: wwhitak@boisestate.edu
Address: 1108 G Ave., La Grande, Oregon, 97850

From: Dolores Wood [mailto:wordpress@350pdx.org]
Sent: Wednesday, September 07, 2016 12:26 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Fossil fuels are proven harmful to our health and safety. I advocate for clean air, soil and water, and against increased transport of fossil fuel, and against new storage facilities for fossil fuels. I advocate for clean energy, and for restoration of polluted areas. I advocate for maintenance, and upgrading, but not expansion of existing fossil fuel facilities.

From: Dolores Wood
Email: pgna_greening@yahoo.com
Address: 4834 SE 115 Ave, Portland, Oregon, 97266

From: Jennifer Adkins [mailto:azulclarojo@gmail.com]
Sent: Tuesday, September 06, 2016 9:23 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Jennifer Adkins
Email: azulclarojo@gmail.com
Address: 3414 SE 21st Ave, Portland, Oregon, 97202

From: Anthony Albert [mailto:albert2910@msn.com]
Sent: Tuesday, September 06, 2016 5:29 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Anthony Albert
Email: albert2910@msn.com
Address: Apt. 8, Corvallis, Oregon, 97330

From: Kathy Bangertt [mailto:kbangert@comcast.net]
Sent: Tuesday, September 06, 2016 1:12 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Kathy Bangertt
4540 SE Taylor St
Portland, OR 97215

From: Barbara Bartschi [mailto:bartschi@imagina.com]
Sent: Tuesday, September 06, 2016 10:08 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Ban all fossil fuel terminals. We don't need any more pollution. We already are dealing with the mistakes of Hanford! We are running out of time - we need to think of our children's future.

Barbara Bartschi

From: Barbara Bartschi
Email: bartschi@imagina.com
Address: 5117 Se Naef Rd, Milwaukie, Oregon, 97267

From: Joshua Berger [mailto:josh@plazm.com]
Sent: Tuesday, September 06, 2016 5:56 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please Please Please

Let's continue to be a leader in sustainability!

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Joshua Berger
Email: josh@plazm.com
Address: 1123 SE 36th Ave, Portland, Oregon, 97214

From: marjory bryan [mailto:djinstigatah@gmail.com]
Sent: Tuesday, September 06, 2016 10:09 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please, enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: marjory bryan
Email: djinstigatah@gmail.com
Address: 1032 SE 35th Ave , Portland , Oregon, 97214

From: Andrew Butz [mailto:wordpress@350pdx.org]
Sent: Tuesday, September 06, 2016 12:09 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear Planning and Sustainability Commission:

Please enact a full ban on any new fossil fuel terminals, large or small. We don't need an exception for new facilities of 5 million gallons or less. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Moreover, we must strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
The bottom line is, we need to prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Andrew Butz
Email: anbunz@yahoo.com
Address: 3735 SE 9th, Portland, Oregon, 97202

From: Eric Canon [mailto:canonmetals@gmail.com]
Sent: Tuesday, September 06, 2016 6:32 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Ban fossil fuels terminals in Portland. No more. Turn the future toward sustainable alternatives. Do it now.

From: Eric Canon
Email: canonmetals@gmail.com
Address: 1923 Elm Street, Forest Grove, Oregon, 97116

From: Tracy Ceravolo [mailto:wordpress@350pdx.org]
Sent: Tuesday, September 06, 2016 10:29 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

There is no reason to expand fossil fuel infrastructure. It is a dying, outdated industry which is ruining our environment all for greed. We must invest in renewable energy infrastructure like we are at war with Climate Change! This must happen, and the sooner we start, the less painful it will be. Portland must be a leader in this message to the country and the world. No more fossil fuel infrastructure AT ALL.

From: Tracy Ceravolo
Email: cyclwomn@yahoo.com
Address: 1721 NE 209th, Vancouver, Washington, 98642

From: Farrah Chaichi [mailto:FNChaichi@gmail.com]
Sent: Tuesday, September 06, 2016 1:56 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Farrah

From: Farrah Chaichi
Email: FNChaichi@gmail.com
Address: 12320 SW Center St #41, Beaverton, Oregon, 97005

From: Judith Eda [mailto:judyeda@gmail.com]
Sent: Tuesday, September 06, 2016 5:30 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: enact a Full Ban!

Dear Members of the Planning and Sustainability Commission,

As a Portland resident, I am concerned that the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Judith Eda
4655 NE Killingsworth St
Portland, OR 97218

From: Deborah Einbender [mailto:pursona@teleport.com]
Sent: Tuesday, September 06, 2016 5:32 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Aggressive, bold action is needed NOW. We should be leaders in the movement to make sure that a full ban on all new fossil fuel terminals of any size is immediately passed, with no exceptions for size. No increase in dangerous fossil fuels, like Bakken crude oil should be allowed. The city should act to strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

From: Deborah Einbender
Email: pursona@teleport.com
Address: 1326 SE Pine St, Portland, Oregon, 97214

From: Cynthia Enlow [mailto:hienlow@msn.com]
Sent: Tuesday, September 06, 2016 6:29 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2.Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3.Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Cynthia Enlow
Email: hienlow@msn.com
Address: 1460 NW Ashley Dr, Albany, Oregon, 97321-1176

From: virginia feldman [mailto:feldmanvi@gmail.com]
Sent: Tuesday, September 06, 2016 7:20 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear Portland Sustainability Council:
As a physician, mother, & grandmother, I urge you to enact a full ban on fossil fuel terminals--large or small. Please remember the 2015 Resolution--to 'actively oppose' new fossil fuel infrastructure.
Similarly, please remove the exception for new facilities that are <5 million gallons.

Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

And I urge you to strengthen restrictions on expansions allowed at existing terminals, through adding binding limits and safety criteria in re climate impacts in the City's use review process.

And finally, please make your language precise to prevent smaller related "terminals" from clustering and aggregating, thus increasing fossil fuel shipments through our city.

The City of Portland can be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could be at the forefront on the most pressing concern of our time.

From: virginia feldman
Email: feldmanvi@gmail.com
Address: 11230 sw collina ave., portland, Oregon, 97219

From: Martin Frazier [mailto:martinfrazier52@gmail.com]
Sent: Tuesday, September 06, 2016 8:08 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Martin Frazier
Email: martinfrazier52@gmail.com
Address: 18th Avenue, Portland, Oregon, 97202

From: Kate Gessert [mailto:katerg@igc.org]
Sent: Tuesday, September 06, 2016 8:27 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear Sirs:
Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.
Thank you! Best, Kate Gessert

From: Kate Gessert
Email: katerg@igc.org
Address: 86070 Cougar Lane, Eugene, Oregon, 97402

From: G. Gibson [mailto:mistergibson@gmail.com]
Sent: Tuesday, September 06, 2016 5:44 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

G. Gibson
mistergibson@gmail.com
Citizen

From: G. Gibson
Email: mistergibson@gmail.com
Address: 2837 S.E. Steele, #2, Portland, Oregon, 97202-4530

From: Katherine Gibson [mailto:ktdid3542@gmail.com]
Sent: Tuesday, September 06, 2016 7:11 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

What is it about NO that is not understood?!

From: Katherine Gibson
Email: ktdid3542@gmail.com
Address: 1957 NW Florence Avenue #325, Gresham, Oregon, 97030

From: John Hahn-Francini [mailto:johnhf@hevanet.com]
Sent: Tuesday, September 06, 2016 5:46 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I would like to see a full ban on all new fossil fuel infrastructure in Portland. A full ban should not have exceptions for new facilities that are 5 million gallons or less. The code changes should not allow more unit trains of dangerous, highly combustible fossil fuels like Bakken crude oil. I would like to see the code strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. I would like to see the code prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: John Hahn-Francini
Email: johnhf@hevanet.com
Address: 4617 NE Killingsworth St. Unit 9, Portland, Oregon, 97218

From: Anne Hamburg [mailto:wordpress@350pdx.org]
Sent: Tuesday, September 06, 2016 7:34 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

New and expanded fossil fuel terminals are not a good idea for Portland. If this does end up happening, please ensure the fossil fuel industry has and can prove it has it's own spill and fire suppression crews on duty at all times and ready to respond within a few minutes...do not waste our fire bureau resources on it. Please increase renewable and/or safe energy sources.

From: Anne Hamburg
Email: akaseyh@yahoo.com
Address: 3231 SE 109th Ave, Portland, Oregon, 97266

From: Eve Heidtmann [mailto:eveandden@gmail.com]
Sent: Tuesday, September 06, 2016 5:54 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I am adding my voice in support of a ban on ALL new fossil fuel terminals and the strongest possible restrictions on the expansion at existing terminals. The age of fossil fuels is over. The sooner we put an end to fossil fuel use, the better for it will be for our children and all species.

From: Eve Heidtmann
Email: eveandden@gmail.com
Address: 7820 SW Walnut Lane, Portland, Oregon, 97225

From: P Horter [mailto:wordpress@350pdx.org]
Sent: Tuesday, September 06, 2016 6:50 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: P Horter
Email: lacengh@yahoo.com
Address: 17827 NW Sauvie Is.Rd., Portland, Oregon, 97231

From: P Anna Johnson [mailto:aj@mercedlake.com]
Sent: Tuesday, September 06, 2016 6:11 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: P Anna Johnson
Email: aj@mercedlake.com
Address: 6934 NE 13th Avenue, Portland, Oregon, 97211

From: Darrell Kay [mailto:drcskay@gmail.com]
Sent: Tuesday, September 06, 2016 7:20 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

We the people do not want any new fossil fuel terminals in this region. Nor do we want expansions of any existing facilities. Conservation and conversion to renewable fuels should be promoted. We certainly DO NOT want to encourage more oil by rail in any way. We should actively decrease this disaster in the making before it strikes again!

From: Darrell Kay
Email: drcskay@gmail.com
Address: 5356 NE Neptune Ln, Lincoln City, Oregon, 97367

From: Neal Keefer [mailto:nvkeefer@msn.com]
Sent: Tuesday, September 06, 2016 9:30 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Please strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Please take steps to prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Neal Keefer
Email: nvkeefer@msn.com
Address: 4025 NE Couch St, Portland, Oregon, 97232

From: Dave King [mailto:landd_2@q.com]
Sent: Tuesday, September 06, 2016 9:57 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

The resolution gave me hope that there would be no infrastructure built and the existing facilities would be grandfathered but not added to. That's what I expect the ordinance to provide. Please don't cave.
Climate is changing now, please don't speed it up with new carbon.

From: Dave King
Email: landd_2@q.com
Address: 8728 N Edison, Portland, Oregon, 97203

From: Barbara Krupnik-Goldman [mailto:bkgold2@gmail.com]
Sent: Tuesday, September 06, 2016 7:26 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear Commissioners,
The revised version of the fossil fuel proposal is much improved, however it still needs improvement in the following areas:

1) Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2) Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3) Prevent any aggregate increase in fossil fuel infrastructure in Portland.

In order to keep global warming under 2C and have a livable future, we need to immediately transition to clean, renewable energy sources. We can't allow new multi-decade investments in fossil fuels that lock us into a world of climate chaos. Instead, we must draw the line to stop the growth of the fossil fuel industry, protect the health and safety of our community, and transition to a 100% renewable energy economy now!
Thank-you,

From: Barbara Krupnik-Goldman
Email: bkgold2@gmail.com
Address: 11439 SE Market Street, Portland, Oregon, 97216

From: Alissa Leavitt (Green) [mailto:green.alissa@gmail.com]
Sent: Tuesday, September 06, 2016 3:09 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Fwd: Opposition to Planning Bureau proposal to allow existing tank farms to expand

I am writing to oppose the expansion of tank farms. This is against the City Council resolution to limit carbon based fuels. As you know having nearly all of Oregon's energy infrastructure in one place is careless, and presents an extreme hazard for the City in the event of accidents or natural disasters.

There are many safety issues raised by having volatile, dangerous chemicals near busy highways and communities.

Thank you,

Alissa Leavitt
9437 NW Germantown Road
Portland, Oregon 97231

--
Alissa Gabrielle Leavitt, MPH, MCHES
green.alissa@gmail.com
503-358-2331

From: Rachel Lewine [mailto:rachel@lewine.net]
Sent: Tuesday, September 06, 2016 7:01 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Rachel Lewine

From: Rachel Lewine
Email: rachel@lewine.net
Address: 3616 Widgeon Way, Eagan, Minnesota, 55123



Linnton Neighborhood Association
c/o Neighbors West Northwest
2257 NW Raleigh St.
Portland, OR 97210

September 6, 2016

Members of the Planning and Sustainability Commission

The Linnton Neighborhood Association passed the following motion at their July 6, 2016 general membership meeting with 31 people present regarding the Bureau of Planning and Sustainability's discussion draft Fossil Fuel Terminal Zoning project.

The proposed zoning code changes do not address the city's resolution 37168 - opposing expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through the city of Portland or adjacent waterways.

Nor do the changes address PBEMS recommendations for seismic risks.

Linnton Neighborhood Association's position is no new or expanding (including height) of the tank farm facilities, rather the tanks farms need to move to safer, non-liquifiable soil areas.

Sincerely,

Shawn Looney
Chair, Linnton Neighborhood Association

cc: Portland City Council members

From: Shawn Looney [mailto:looneys@involved.com]
Sent: Tuesday, September 06, 2016 7:58 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please enact a full ban on ALL new fossil fuel terminals, and strengthen restrictions on expansions allowed at existing terminals. Portland absolutely should not increase its fossil fuel infrastructure. Burning of fossil fuels is a huge contributor of global warming. We cannot afford to continue being part of the problem. Thank you.

From: Shawn Looney
Email: looneys@involved.com
Address: 12937 NW Newberry Rd, Portland, Oregon, 97231

From: Jan Madill [mailto:jan@janmadill.com]
Sent: Tuesday, September 06, 2016 8:55 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please ban all new fossil fuel terminals. Also strengthen restrictions on existing terminals and do NOT allow any overall increase in fossil fuel infrastructure in Portland. For future generations we need to move now to renewable energy.

From: Jan Madill
Email: jan@janmadill.com
Address: 2717 NE 12th Ave. , Portland, Oregon, 97212

From: Linda Magnuson [mailto:lmagnusonl@gmail.com]
Sent: Tuesday, September 06, 2016 6:16 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Linda Magnuson
Email: lmagnusonl@gmail.com
Address: 4346 NE SKidmore, Portland, Oregon, 97218

From: Annie McCuen [mailto:mccuen7691@comcast.net]
Sent: Tuesday, September 06, 2016 8:31 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please do everything in your power to reduce the dangers created by oil-fossil fuel-industries, terminals, trains, reduce, eliminate.

From: Annie McCuen
Email: mccuen7691@comcast.net
Address: 1825 Fairmount ave s, Salem, Oregon, 97302

From: CatAshleigh Mead [mailto:cat_list1@featherforge.com]
Sent: Tuesday, September 06, 2016 5:25 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please keep Portland safer from fuel spills, fires, and other contamination, and set an example of leadership for other cities by putting the brakes on the major cause of climate change through showing the industry it is unwelcome.

Please enact a FULL ban on all new fossil fuel terminals, with no exceptions, and no code changes to allow more trains of fossil fuels.

Please also strengthen restrictions on expansions at existing terminals and prevent any increase in fossil fuel infrastructure in Portland.

Thank you.

From: CatAshleigh Mead
Email: cat_list1@featherforge.com
Address: 3520 SE 9th Ave, Portland, Oregon, 97202

From: Joseph Meyers [mailto:dearsmileyjoe@gmail.com]
Sent: Tuesday, September 06, 2016 10:02 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

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While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Joe Meyers

From: Joseph Meyers
Email: dearsmileyjoe@gmail.com
Address: 5035 NE 25th Ave, Portland, Oregon, 97211

From: Alain Millar [mailto:jakeshouseajm@comcast.net]
Sent: Tuesday, September 06, 2016 5:41 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

We need to lead the country (as we have before on environmental issues) and
1. enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. No more Mosiers.
2. strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Alain Millar
Email: jakeshouseajm@comcast.net
Address: 3161 SE Balfour, Portland, Oregon, 97222

From: John Nettleton [mailto:jpn5710@yahoo.com]
Sent: Tuesday, September 06, 2016 12:27 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.
- Strengthen restrictions on expansions allowed at existing terminals through adding binding limits in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

- Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now, more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate

justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

John Nettleton
4311 SE 37th Ave. #21
Portland, OR
97202 971.207.1142

From: Allen Neuringer [mailto:allen.neuringer@reed.edu]
Sent: Tuesday, September 06, 2016 5:20 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Allen Neuringer

From: Allen Neuringer
Email: allen.neuringer@reed.edu
Address: 4140 SE 37th Ave., Apt. 9, Portland, Oregon, 97202

From: Laura M. Ohanian [mailto:lmo@efn.org]
Sent: Tuesday, September 06, 2016 9:30 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I want to thank the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the City to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland." Although this draft prohibits new larger bulk terminals, it still allows new terminals up to five million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e., rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming,' it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 -- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 -- Remove the exception for new facilities that are five million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 -- Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 -- Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now, more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Laura M. Ohanian

From: Laura M. Ohanian
Email: lmo@efn.org
Address: P.O. Box 811, Eugene, Oregon, 97440

From: Kelly O'Hanley [mailto:kohanley@gmail.com]
Sent: Tuesday, September 06, 2016 8:17 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Kelly O'Hanley
Email: kohanley@gmail.com
Address: 6134 NE Alameda St, Portland, Oregon, 97213

From: Nancy Pfeiler [mailto:nancypfeiler6@gmail.com]
Sent: Tuesday, September 06, 2016 8:26 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I do not live in Portland. I live in Salem. We need you to continue to be the model for all cities in Oregon.
Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Nancy Pfeiler
Email: nancypfeiler6@gmail.com
Address: 448 Sunwood Dr NW, Salem, Oregon, 97304

From: Angelica Pray [mailto:wordpress@350pdx.org]
Sent: Tuesday, September 06, 2016 10:09 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Angelica Pray

From: Angelica Pray
Email: angelicapray@yahoo.com
Address: 4822 Ne Glisan St, Portland, Oregon, 97213

From: Gisela Ray [mailto:giselaray@frontier.com]
Sent: Tuesday, September 06, 2016 6:55 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

We know that fossil fuels have to be phased out and soon. It would be utter folly then to spend precious resources on new infrastructure for those fuels. That money must instead be diverted to renewables. That's the future and the future needs to start now. Fossil fuel companies must not be allowed to bring new terminals and other new infrastructure to Portland or Oregon for that matter. If they do they will clamor to recoup their investment by recovering and selling ever more fossil fuels.

From: Gisela Ray
Email: giselaray@frontier.com
Address: 85 SE 16th Court, Gresham, Oregon, 97080

From: Bernadette Rodgers [mailto:bernadetterodgers350@gmail.com]
Sent: Tuesday, September 06, 2016 12:35 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear Mayor Hales & Portland City Council,

Portland made national and international headlines last year with the first-ever resolution calling for no new fossil fuel infrastructure projects in Portland. I was so proud of Portland that day! Now as you code that resolution into law, let's stay true to its intent and ensure that it is not watered down to allow projects that clearly violate the intent of the resolution. Specifically, this law should:
--Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
--Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
--Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thanks for all you do to serve and protect this great city, and to make sure Portland leads the way to a clean and just energy future!

Sincerely,
Dr. Bernadette Rodgers
PSU and PCC faculty
350PDX Board Chair

From: Bernadette Rodgers
Email: bernadetterodgers350@gmail.com
Address: 5105 SW Richardson Dr, Portland, Oregon, 97239

From: Aaron Schalon [mailto:aaron.schalon@gmail.com]
Sent: Tuesday, September 06, 2016 5:42 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Aaron Schalon

From: Aaron Schalon
Email: aaron.schalon@gmail.com
Address: 2033 ne couch street, Portland, Oregon, 97232

From: Alan Smith [mailto:wordpress@350pdx.org]
Sent: Tuesday, September 06, 2016 5:29 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Alan Smith

From: Alan Smith
Email: a23smith@yahoo.com
Address: 5908 SE 17th Avenue, Portland, Oregon, 97202

From: Robert Spies [mailto:rspiesr@netscape.net]
Sent: Tuesday, September 06, 2016 5:47 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

The US should not be exporting fossil fuels! We'll need them ourselves when the crunch comes. The US should be working on renewable energy, and phasing out fossil fuels. Therefore new fossil fuel terminals are unnecessary.

From: Robert Spies
Email: rspiesr@netscape.net
Address: 9271 SE Clay St, Portland, Oregon, 97216

From: Jane Stackhouse [mailto:jane@janestackhouse.com]
Sent: Tuesday, September 06, 2016 4:13 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

We are so close to putting Portland in the forefront of action against climate change. Please keep with your original vision and correct the proposed zoning rules.
1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.
2. Do not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
3. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The only infrastructure work that should be done is strengthening existing storage to withstand a major earthquake.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Jane Stackhouse
Email: jane@janestackhouse.com
Address: 2133 NE Brazee Street, Portland, Oregon, 97212

From: Joanne Walters [mailto:greengirlspdx@gmail.com]
Sent: Tuesday, September 06, 2016 6:09 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please ban all new fossil fuel anything. Keep it in the ground and out of the rails and ships!

From: Joanne Walters
Email: greengirlspdx@gmail.com
Address: 7103 N. Maryland, Portland, Oregon, 97227

From: Susan Wechsler [mailto:susanwechsler@comcast.net]
Sent: Tuesday, September 06, 2016 7:18 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please enact a full ban on all new fossil fuel terminals, and prevent ANY aggregate increase in fossil fuel infrastructure in Portland.

We cannot afford to wait for others to act.

From: Susan Wechsler
Email: susanwechsler@comcast.net
Address: 1820 NE Vine Ave, Corvallis, Oregon, 97330

From: Christine Yun [mailto:cpypdx@gmail.com]
Sent: Tuesday, September 06, 2016 9:12 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I would like City Council to consider the following:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Christine Yun
Email: cpypdx@gmail.com
Address: 1915 SE Alder St., Portland, Oregon, 97214

From: Ben Basin [mailto:wordpress@350pdx.org]
Sent: Monday, September 05, 2016 8:00 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

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Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Ben Basin
Email: ben_basin@yahoo.com
Address: 515 SE 19th Ave., Portland, Oregon, 97214

From: Jared Naimark [mailto:jwnaimark@gmail.com]
Sent: Monday, September 05, 2016 11:57 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

In order to address the climate crisis and local pollution we need Portland to be a leader in moving us completely beyond fossil fuels and towards 100% renewable energy. I urge the city to enact a full ban on all new fossil fuel terminals, large or small.

Sincerely,
Jared Naimark

From: Jared Naimark
Email: jwnaimark@gmail.com
Address: 1710 SW Harbor Way #205, Portland, Oregon, 97201

From: Katherine Anne Stansbury [mailto:yttik1000@yahoo.com]
Sent: Monday, September 05, 2016 3:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Katherine Anne Stansbury
5519 SW Multnomah Blvd.
Portland, OR 97219

From: Katherine Anne Stansbury [mailto:wordpress@350pdx.org]
Sent: Monday, September 05, 2016 2:59 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Amend the proposed draft to reflect the City's fossil fuel goals:*Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.
*Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
*Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Katherine Anne Stansbury
Email: yttik1000@yahoo.com
Address: 5519 SW Multnomah Blvd., Portland, Oregon, 97219

From: joana kirchhoff [mailto:joanakirchhoff@gmail.com]
Sent: Sunday, September 04, 2016 2:28 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear City Council, Please prevent the increase of fossil fuel infrastructure in Portland. The resolution passed by the Council now comes to you for implementation - don't renege on the intent of that resolution. Now it the moment to stand for the climate!

From: joana kirchhoff
Email: joanakirchhoff@gmail.com
Address: 3414 NE 73rd, Portland, Oregon, 97213

From: Walt Mintkeski [mailto:mintkeski@juno.com]
Sent: Sunday, September 04, 2016 3:44 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Members of the Portland Planning and Sustainability Commission,

As a Portland resident, I am pleased by the diligent effort and transparency with which the City is pursuing the implementation of its November, 2015 Fossil Fuel Policy. The City's draft policy makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." I thank the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution.
However, I think that the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in November, 2015. Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's Resolution.

While this proposal will designate any bulk terminal as 'non-conforming', it still needs to strengthen regulations with respect to expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as possible, I ask the City of Portland and the Planning and Sustainability Commission to:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.
- Strengthen restrictions on expansions allowed at existing terminals through adding binding limits in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.
- Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Thank you for considering my comments,
Walter Mintkeski
6815 SE 31st Ave, Portland, OR 97202

From: Brad Nahill [mailto:turtleactivist@hotmail.com]
Sent: Sunday, September 04, 2016 8:08 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Brad Nahill
7227 SW Linette Way
Beaverton, OR 97007

From: Jeffrey White [mailto:rogue576@gmail.com]
Sent: Sunday, September 04, 2016 10:14 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Jeffrey White
Email: rogue576@gmail.com
Address: 42852 SW Dudney Avenue, Forest Grove, Oregon, 97116-8523

From: Nicholas Curtright [mailto:Nicsmind@yahoo.com]
Sent: Saturday, September 03, 2016 7:31 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Nicholas Curtright
12345 lake city way #399
Seattle, WA 98125

From: Melba Dlugonski [mailto:melbajade@hotmail.com]
Sent: Friday, September 02, 2016 7:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Melba Dlugonski
6735 SE 78th
Portland, OR 97206

From: Robert Heydenreich [mailto:bobheyden@gmail.com]
Sent: Friday, September 02, 2016 10:40 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

I believe that we cannot put off any longer our efforts to stop global warming. It we don't start now, soon it will be too late and the consequences will be devastating.

Sincerely, Robert Heydenreich

From: Robert Heydenreich
Email: bobheyden@gmail.com
Address: 6204 SE 40th Avenue, Portland, Oregon, 97202

From: Nathaniel Holder [mailto:nathaniel@nholder.com]
Sent: Friday, September 02, 2016 7:16 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Nathaniel Holder
Email: nathaniel@nholder.com
Address: 1722 SE 58th Avenue, Portland, Oregon, 97215

From: Lilian Kong [mailto:lilian.kong@outlook.com]
Sent: Friday, September 02, 2016 6:02 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear City of Portland,
While the latest draft of the fossil fuel terminal zoning code changes is greatly improved, I believe it is not enough. I believe we should:
1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Lilian Kong
Email: lilian.kong@outlook.com
Address: 5609 SE 54th Ave, Portland, Oregon, 97206

From: Breanna Lundvall [mailto:breanna.lundvall@gmail.com]
Sent: Friday, September 02, 2016 4:31 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear City of Portland,

As a Portlander, this ban is very important to me as well as my fellow friends and neighbors. We NEED a full ban. Any exceptions to a full ban are just plain wrong. In the world we live in today, we cannot afford to continue this behavior any longer. It is irresponsible. Please enact a full ban on ALL new fossil fuel terminals. Along with this is the need to place the strongest of restrictions of expanding existing terminals. Again, we cannot continue this behavior any longer. Let us be a leader for the rest of the country. It is what the people want!

Thank you

From: Breanna Lundvall
Email: breanna.lundvall@gmail.com
Address: 433 NE Graham St. Apt. 4, Portland, Oregon, 97212

From: Eileen Rence [mailto:eileenesther@hotmail.com]
Sent: Friday, September 02, 2016 9:09 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Eileen Rence
4407 SE Yamhill St.
Portland, OR 97215

From: Karen Stolzberg [mailto:kstolzberg@juno.com]
Sent: Friday, September 02, 2016 10:52 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Re: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

I'm very excited about your efforts implementing the new Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." This is something I have been thinking about and working towards for many years.

The current draft from the Bureau of Planning and Sustainability regarding the Fossil Fuel Terminal Zoning Amendments is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is encouraging that the city is responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported. It called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear. New fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels undermines the promise of the City's 2015 Resolution.

I would also recommend that the regulations regarding the expansion of pre-existing terminals make it clear that there are definitive limits to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

- Eliminate an exception for new facilities that are 5 million gallons or less. This is unnecessary and could allow more unit trains of dangerous fossil fuels. Allowing new LNG storage in Portland is unnecessary: NW Natural has no plans for more LNG storage in Portland.
- Strengthen restrictions on expansions allowed at existing terminals through adding binding limits in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.
- Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

We can be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront of addressing the most pressing concern of our time.

Karen Stolzberg
9315 SW 37th Av.
Portland, OR 97219
503-244-7960

From: Casey Sundermann [mailto:csund5@msn.com]
Sent: Friday, September 02, 2016 9:03 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Casey Sundermann
5847 NE 31st Ave
Portland, OR 97211

From: satya vayu [mailto:satyavayu@gmail.com]
Sent: Friday, September 02, 2016 5:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

We need to take our city's commitment to stopping climate change seriously! Please enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
In addition, please strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Finally, we must prevent any aggregate increase in fossil fuel infrastructure in Portland.
Thank you,
Satya Vayu

From: satya vayu
Email: satyavayu@gmail.com
Address: 6608 SE 81st Ave, Portland, Oregon, 97206

From: Karen Alexander-Brown [mailto:kjalexander@hotmail.com]
Sent: Thursday, September 01, 2016 2:32 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear City of Portland,
Keep Portland the leader in combating climate change that we have always been by enacting the following:
1) Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.
2) The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
3) Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
4) Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Karen Alexander-Brown
Email: kjalexander@hotmail.com
Address: 6111 SW 33rd Place, Portland, Oregon, 97239

From: Diana Boom [mailto:diana@dboom.net]
Sent: Thursday, September 01, 2016 7:55 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Just that - please ban all new fossil fuel terminals. Go Portland.

From: Diana Boom
Email: diana@dboom.net
Address: PO Box 328, Lake Oswego, Oregon, 97034

From: Rebecca Clarke [mailto:bjclark@siderial.com]
Sent: Thursday, September 01, 2016 1:07 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Rebecca Clarke
5035 N DePauw St
Portland, OR 97203

From: Robert Grossman [mailto:rbgrossman@gmail.com]
Sent: Thursday, September 01, 2016 5:40 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Robert Grossman
3224 NE 17th Ave
Portland 97212

I do not support a ban on fossil fuel terminals that still allows new facilities to store as much as 5 million gallons of fuel. It is not necessary to allow such a terminal in the city since the facts are overwhelmingly clear that such terminals are a grave risk to the health and well being of Portland residents. I question the rationale behind such a proposal and know that when I voted for each member of the city council, no one ran on a platform that included such proposals.

Portland needs to strengthen restrictions on expansions at existing terminals through binding limits as well as criteria for safety and climate impacts as part of the city's non-conforming use review process. Climate change is real and our city needs to do more to reduce carbon emissions. Tighter limits would be a step in the right direction.

Finally, the city needs to prevent any aggregate increase in fossil fuel infrastructure in Portland. Renewables are the future and it makes no sense to bring on more capacity for an energy source that is destroying our climate and that we need to phase out.

Thanks, Bob Grossman

From: Rachel Hampton [mailto:hamptonrachel2002@outlook.com]
Sent: Thursday, September 01, 2016 7:09 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please improve the Fossil Fuel Zoning Amendments by:
-Enacting a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.
-Strengthening restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
-Preventing any aggregate increase in fossil fuel infrastructure in Portland.
Thank You.

From: Rachel Hampton
Email: hamptonrachel2002@outlook.com
Address: 7200 SE Woodstock Blvd. #28, Portland, Oregon, 97206

From: Robert Meder [mailto:rdmeder@comcast.net]
Sent: Thursday, September 01, 2016 1:27 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Oregon GREEN!

From: Robert Meder
Email: rdmeder@comcast.net
Address: 4828 se 30th Ave., #141, Portland, Oregon, 97202

From: Joseph Merrick [mailto:jwmherbert@gmail.com]
Sent: Thursday, September 01, 2016 2:57 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Fossil Fuel Zoning Testimony: please ban 100% of new infrastructure

To the esteemed members of the Planning and Sustainability Commission:

Thank you for your dedicated efforts and transparency with you are pursuing the implementation of November 2015 Fossil Fuel Policy.

The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

As a resident of Portland since 1986, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you also to the Bureau of Planning and Sustainability for your work in incorporating public input on the initial draft of the Fossil Fuel Terminal Zoning Amendments.
... The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the City making decisions that are not only environmentally responsible, but also responsive to its citizens' input.

This being said:
I am of the firm conviction that the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

... Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons (provided that the terminal cannot shift fossil fuels from one transportation mode to another, e.g. rail to marine).

The City's policy was clear...

... and I am of the firm conviction that new fossil fuel facilities -- which can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil -- undermine the promise and impact of the City's 2015 Resolution.

Furthermore:
While this proposal will mark any bulk terminal as 'non-conforming', it still needs to:
* strengthen regulations around ///expansion of pre-existing terminals.///

It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals.

The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

* Enact a full, unconditional ban on all new fossil fuel terminals -- large or small....
... especially given that this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

* An exception for new facilities that are 5 million gallons or less is unnecessary...
... and could allow more unit trains of dangerous fossil fuels like Bakken crude oil.
... Additionally, allowing new LNG storage in Portland is unnecessary:
NW Natural has no current plans for more LNG storage in Portland.

* Strengthen restrictions on expansions allowed at existing terminals, by adding:
** binding limits; as well as
** criteria for safety and climate impacts...
... in the City's non-conforming use review process.
The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

* Add language to prevent smaller related "terminals" from clustering and aggregating that would increase fossil fuel shipments through Portland.

Now more than ever, Portland has the opportunity to be a leader in the U.S. climate justice movement.
By a very simple, few more improvements to the Fossil Fuel Zoning Amendments, Portland can continue to be on the forefront addressing the most pressing concern of our time.

Thank you for your time.

Respectfully,

Joseph Merrick
2216 SE 58th Ave
Portland, OR 97215

From: John Nettleton [mailto:jpn5710@yahoo.com]
Sent: Thursday, September 01, 2016 8:03 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

John Nettleton
4311 SE 37th Ave #21
Portland, OR 97202

From: Briar Schoon [mailto:briar.dayne@gmail.com]
Sent: Thursday, September 01, 2016 10:12 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I want to thank the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. While the current draft is much improved, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland".

I want the City of Portland and the Planning and Sustainability Commission to:
1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.
3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

We must transition away from fossil fuels immediately if we are to curb the worst impacts of climate change. The City of Portland has the opportunity to be a bold leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.
Sincerely,
Briar Schoon

From: Briar Schoon
Email: briar.dayne@gmail.com
Address: 1516 NE Hancock St. Unit 104, Portland , Oregon, 97212

From: Margaret Stephens [mailto:mlstep@msn.com]
Sent: Thursday, September 01, 2016 7:44 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I am writing to urge the City of Portland do the following:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

PS: what Portland does affects the entire State of Oregon; please set the best example for the rest of our state. Thank you.

From: Margaret Stephens
Email: mlstep@msn.com
Address: 1830 23rd St NE, Salem, Oregon, 97301

From: Vincent Alvarez [mailto:vincent.alvarez@burroughs.com]
Sent: Wednesday, August 31, 2016 4:32 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

WE should enact a ban on future terminals, no matter the size. Until the fossil fuel industry can prove that spills or accidents are impossible.

From: Vincent Alvarez
Email: vincent.alvarez@burroughs.com
Address: 12671 SE Where Else Ln., Milwaukie, Oregon, 97222

From: Luke Anavi [mailto:lanavi@ymail.com]
Sent: Wednesday, August 31, 2016 4:26 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Luke Anavi
2431 N.E. Flanders St.
Portland, OR 97232

From: Hal Anthony [mailto:threepines@jeffnet.org]
Sent: Wednesday, August 31, 2016 11:32 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Portland's approach to fossil fuels needs displaced with the factual realities off sustainability, which is two things: 1) A return of natural utilities and their priceless supplies of FREE, PREREQUISITE HUMAN-NEEDED MODALITIES W/O WHICH WE PERISH; and 2) We have no choice at this time; it is sink and human chaos on fossil fuel vs. possible survival with sustainability. There are no other alternatives, but Clinton will take you to nukes and war -- you will see.

From: Hal Anthony
Email: threepines@jeffnet.org
Address: 3995 Russell Rd., Grants Pass, Oregon, 97526

From: Matthew Baird [mailto:mbaird@climatetrust.org]
Sent: Wednesday, August 31, 2016 9:55 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Message is simple. Please enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
There's no reason to hedge in favor of fossil fuels now that we know the full cost of burning fossil fuels. Keep them out, so we can focus on moving forward with cleaner alternatives.

From: Matthew Baird
Email: mbaird@climatetrust.org
Address: 904 NE 76th Ave, Portland, Oregon, 97213

From: Naomi Berg [mailto:naomboam@yahoo.com]
Sent: Wednesday, August 31, 2016 12:42 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Naomi Berg
1115 SE Rex St
Portland, OR 97202

3060

From: karen christensen [mailto:lesterladonna@gmail.com]
Sent: Wednesday, August 31, 2016 1:12 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Karen Christensen
Portland, OR 97212

From: karen christensen
Email: lesterladonna@gmail.com
Address: 446 NE Fargo st, Portland, Oregon, 97212

From: Teresa DeLorenzo [mailto:tde@teleport.com]
Sent: Wednesday, August 31, 2016 2:39 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Teresa DeLorenzo
Knappa Dock Road
Astoria, OR 97103

From: Don E. Dumond [mailto:ddumond@uoregon.edu]
Sent: Wednesday, August 31, 2016 7:34 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

My comment:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Respectfully submitted,

From: Don E. Dumond
Email: ddumond@uoregon.edu
Address: 1744 Moss St., Eugene, Oregon, 97403

From: Cynthia Enlow [mailto:hienlow@msn.com]
Sent: Wednesday, August 31, 2016 7:47 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

City of Portland: I support amending the proposed draft to reflect the City's fossil fuel goals:
•Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.
•Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
•Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Cynthia Enlow
Email: hienlow@msn.com
Address: 1460 NW Ashley Dr, Albany, Oregon, 97321-1176

From: Deborah Field [mailto:deblyfield@gmail.com]
Sent: Wednesday, August 31, 2016 7:41 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

We are a city committed to reducing our fossil fuel usage and therefore, making changes to our storage of fossil fuels needs to reflect our commitment. I do not want any new fossil fuel terminals or expansion of existing terminals in Portland. Listen to the citizens in Portland and reflect their voices in your decisions.

From: Deborah Field
Email: deblyfield@gmail.com
Address: 3437 NE 48th, Portland, Oregon, 97213

From: James Fuller [mailto:thornking@live.com]
Sent: Wednesday, August 31, 2016 11:32 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

James Fuller
3670 W Bellewood Pl
Tucson, AZ 85741

From: jody guth [mailto:jodyguth@gmail.com]
Sent: Wednesday, August 31, 2016 8:54 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Why a partial ban? This is Portland. Home of enlightened thinkers who do what is right for the environment and people regardless of monied interests. (usually, mostly, hopefully....) Please, continue on the common sense path forward....a full ban with NO exceptions. Thank you.

From: jody guth
Email: jodyguth@gmail.com
Address: 2308 ne rodney ave, portland, Oregon, 97212

From: Helen Hays [mailto:hlhays@ccgmail.net]
Sent: Wednesday, August 31, 2016 6:22 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. Additionally, strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impact in the City's non-conforming use review process. Finally, prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you for your consideration,
Helen Logan Hays

From: Helen Hays
Email: hlhays@ccgmail.net
Address: 18553 S Ferguson Rd, Oregon City, Oregon, 97045

From: Tara Hershberger [mailto:tara.lyn.hershberger@gmail.com]
Sent: Wednesday, August 31, 2016 5:07 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Hello! I am a teacher and artist living in Portland. I believe there is nothing more important for the city to do than to care for it's citizens and do what is safest and smartest for the people. Rejecting fossil fuel as a basis of our economy is vital to a livable future. Fully and effectively banning all new fossil fuel infrastructure is necessary to protect Portland and move us toward a more just and sustainable way of life.
I want you to enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Pipelines can leak or explode, oil trains derail, coal dust falls off trains and barges. We don't want these in our region, or anywhere.
I urge you also to strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Do what you can to prevent any increase in fossil fuel infrastructure in Portland. To thrive in a changing climate, we must adapt to sustainable, local technologies, live simpler, and end systemic violence and racism. It is an important action to ban new fossil fuel infrastructure and expansion!

From: Tara Hershberger
Email: tara.lyn.hershberger@gmail.com
Address: 8830 NE Hancock St., Portland, Oregon, 97220

From: Diane Jacobs [mailto:dianejacobs2@icloud.com]
Sent: Wednesday, August 31, 2016 11:24 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

We need to enact a full ban on all new fossil fuel terminals, strengthen restrictions on expansions allowed at existing terminals, and prevent any aggregate increase in fossil fuel infrastructure in Portland. We cannot go at this slowly anymore.

From: Diane Jacobs
Email: dianejacobs2@icloud.com
Address: 2828 NE 69th Ave., Portland, Oregon, 97213

From: Gabrielle Karras [mailto:gk2829@hotmail.com]
Sent: Wednesday, August 31, 2016 8:10 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Hello,

I live in the Woodstock neighborhood and I am very, very concerned about global climate change and fossil fuel zoning. As a progressive city, I would like to see Portland enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. I would like to see strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. I would like to prevent any aggregate increase in fossil fuel infrastructure in Portland. We need to be a leader in this issue. We live in a beautiful place and fossil fuels are the enemy of beauty. We need to invest in alternative energy and not rely on a type of energy that is destroying the planet.....By continuing to invest in fossil fuels because the money is attractive is only to delay the coming catastrophe.....

From: Gabrielle Karras
Email: gk2829@hotmail.com
Address: 4210 SE Bybee Blvd, Portland, Oregon, 97206

From: Neal Keefer [mailto:nvkeefer@msn.com]
Sent: Wednesday, August 31, 2016 9:13 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear City Council, I am writing to ask you to enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. In addition, I believe you should strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. Finally, please take steps to prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you for considering my comments.

From: Neal Keefer
Email: nvkeefer@msn.com
Address: 4025 NE Couch St, Portland, Oregon, 97232

From: Harry Kershner [mailto:harrykershner@msn.com]
Sent: Wednesday, August 31, 2016 12:13 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Harry Kershner
Email: harrykershner@msn.com
Address: 9322 N Oswego Ave, Portland, Oregon, 97203

From: Darvel Lloyd [mailto:darvlloyd@gmail.com]
Sent: Wednesday, August 31, 2016 6:03 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Portland must send a strong message to the fossil fuel corporations and their transporters to PHASE OUT (not ramp up!) production, storage, and transportation of the stuff that is ruining our fragile mother Earth as we know and love it! If we have to find "greener" substitutes for oil, coal, and gas for everything from energy production to plastics, so be it. The City should do all it can to encourage production and distribution of these substitutes!

From: Darvel Lloyd
Email: darvlloyd@gmail.com
Address: 54 SE 74th Ave., Portland, Oregon, 97215

From: Linda Magnuson [mailto:lmagnusonl@gmail.com]
Sent: Wednesday, August 31, 2016 3:15 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Linda Magnuson
Email: lmagnusonl@gmail.com
Address: 4346 NE Skidmore, Portland, Oregon, 97218

From: Teresa McFarland [mailto:terefarlan@gmail.com]
Sent: Wednesday, August 31, 2016 1:37 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Teresa McFarland
10740 SW 11th Dr
Portland, OR 97219

From: Mary McGaughey [mailto:wordpress@350pdx.org]
Sent: Wednesday, August 31, 2016 2:12 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Oregon passed the Clean Energy Act. We pledged to systematically divest from oil energy. The City Portland may not go against the will of all Oregonians. NO OIL TRANSPORT from Our Oregon!!!!

From: Mary McGaughey
Email: marymcgaughey@yahoo.com
Address: 381 NE Village Squire Av Unit 2, Gresham, Oregon, 97030

From: Jon McNeill [mailto:jon.mcneill@gmail.com]
Sent: Wednesday, August 31, 2016 12:08 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

To Whom It May Concern at the City of Portland,

Thank you for what you've already done in the fossil fuel zoning debate. Portland City Council has already passed a resolution with the stronger language that I support, and I urge you to strengthen the proposal to **enact a full ban on all new fossil fuel terminals, large or small**. No exceptions. Additionally, please **strengthen the restrictions on expansions for existing terminals** through binding limits during the use review process. Finally, please **prevent any aggregate increase in fossil fuel infrastructure in Portland**.

We can lead by example in this situation and help keep Portland a leader in the US climate justice movement.

Thank you for reading and listening!

Sincerely,
Jon McNeill
4929 N Commercial Ave
Portland, OR 97217

From: Amanda G Moore [mailto:thingus4@yahoo.com]
Sent: Wednesday, August 31, 2016 6:50 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Amanda G Moore
7314 N Williams Avenue
Portland, OR 97217

From: John Nettleton [mailto:wordpress@350pdx.org]
Sent: Wednesday, August 31, 2016 12:28 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: John Nettleton
Email: jpn5710@yahoo.com
Address: 4311 SE 37th Ave. #21, Portland, Oregon, 97202

From: Robin Patten [mailto:aweeble25@netscape.net]
Sent: Wednesday, August 31, 2016 5:14 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Robin Patten
4301 S Bryant Ave #131
Oklahoma City, OK 73115

From: John Rau [mailto:jrau2@comcast.net]
Sent: Wednesday, August 31, 2016 9:57 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

As an environmental scientist I think Portland should certainly consider that shipping any fossil fuels to China is shipping fuels that our children may one day need away to fund the greed of the fossil fuel industry and in return gets us air pollution. The pollution China puts into the air eventually ends up here. If they don't have cheap fuels to use they will be motivated to develop renewable energy and that will help us all deal with global climate change. A full ban on fossil fuel export is the only strategy that makes long term sense.

From: John Rau
Email: jrau2@comcast.net
Address: 2944 SW 55th Drive, Portland, Oregon, 97221

From: Steve Rauworth [mailto:steve.rauworth@gmail.com]
Sent: Wednesday, August 31, 2016 7:11 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Fossil fuels, in particular ones whose transportation poses great danger to ecosystems and human communities, even though we are still dependent on them now, are already things of the past. Using them makes our planet a worse place to live.

The only sensible action to take in light of these facts is to ban any new terminals and minimize the use and impact of existing ones. We must adjust to this reality, which will involve some discomfort, but nothing compared to the grim alternative.

From: Steve Rauworth
Email: steve.rauworth@gmail.com
Address: 532 SE 15th Ave., Portland, Oregon, 97214

From: Janice Vranka [mailto:javranka@gmail.com]
Sent: Wednesday, August 31, 2016 10:50 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please take a stand and put into place a FULL BAN on ALL new fossil fuel terminals. Period. No exceptions. As Portland residents and active members of our community we ask you to reject any expansions on exiting terminals AND increases in fossil fuel infrastructure. We want livable and safe communities now and in the future for the sake of our children and grandchildren. Thank you for your consideration.

From: Janice Vranka
Email: javranka@gmail.com
Address: 9103 SW 23rd Drive, Portland, Oregon, 97219

From: Randall Webb [mailto:lawrkw@comcast.net]
Sent: Wednesday, August 31, 2016 11:53 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Randall Webb

From: Randall Webb
Email: lawrkw@comcast.net
Address: 2328 NW Glisan St. , Portland, Oregon, 97210

From: Lucy Wong [mailto:lucymwong@gmail.com]
Sent: Wednesday, August 31, 2016 5:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Lucy Wong
NE Portland Resident

From: Lucy Wong
Email: lucymwong@gmail.com
Address: 621 NE Sumner St., Portland, Oregon, 97211

From: Anthony Albert [mailto:albert2910@msn.com]
Sent: Tuesday, August 30, 2016 6:15 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Anthony Albert
Email: albert2910@msn.com
Address: 285 NW 35th St, Apt. 8, Corvallis, Oregon, 97330

From: Nancy Anderson [mailto:nkanderson5@comcast.net]
Sent: Tuesday, August 30, 2016 6:49 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Nancy Anderson
330 SE 75th Ave
Portland, OR 97215

From: Stephen & Irene Bachhuber [mailto:srbachhuber1@gmail.com]
Sent: Tuesday, August 30, 2016 10:33 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

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- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Stephen & Irene Bachhuber
3428 SE 9th Ave
Portland, OR 97202

From: Barbara Bartschi [mailto:bartschi@imagina.com]
Sent: Tuesday, August 30, 2016 8:55 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Ban new fossil fuel terminal.

The dangerous oil trains should also be ban. We know the terminals and trains are not safe for our environment, we need immediate solutions for clean energy.

From: Barbara Bartschi
Email: bartschi@imagina.com
Address: 5117 SE Naef Rd, Milwaukie, Oregon, 97267

From: Sonya Bastendorff & Joshua Anderson [mailto:sonya.bastendorff@gmail.com]
Sent: Tuesday, August 30, 2016 9:21 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sonya Bastendorff & Joshua Anderson
5325 SW Dosch Rd
Portland, OR 97239

From: David Bennett [mailto:wordpress@350pdx.org]
Sent: Tuesday, August 30, 2016 8:15 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please take any measures that reduce the presence of fossil fuels and attendant infrastructure in Portland. As everyone without a vested interest in the continuation of dependence on fossil fuels for energy knows, we need to dial down as fast as possible. If it's not too late, we're close to that time. If not in our city, where?

From: David Bennett
Email: bapoo503@yahoo.com
Address: 1061 SE 57th Avenue, Portland, Oregon, 97215

From: marjory bryan [mailto:djinstigatah@gmail.com]
Sent: Tuesday, August 30, 2016 10:55 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland

Thank you for all you do!!!

From: marjory bryan
Email: djinstigatah@gmail.com
Address: 2232 SE Pine Street , Portland, Oregon, 97214

From: Amber Buhl [mailto:ambie80b@gmail.com]
Sent: Tuesday, August 30, 2016 9:35 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

4 - Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

From: Amber Buhl
Email: ambie80b@gmail.com
Address: 5521 se 57th ave, Portland, Oregon, 97206

From: Lisa Cohn [mailto:lisaellencohn1@gmail.com]
Sent: Tuesday, August 30, 2016 9:25 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Hi,

I'm writing to support your enacting a full ban on all new fossil fuel terminals, regardless of size. I don't like your proposed exception for new facilities that are 5 million gallons or less. We need a full ban!
In addition, please strengthen restrictions on expansions allowed at existing terminals by adding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
I also support the city preventing any aggregate increase in fossil fuel infrastructure in Portland. Your proposal is almost there. Let's protect our climate and environment and enact a full ban!

From: Lisa Cohn
Email: lisaellencohn1@gmail.com
Address: 3141 NW Greenbriar Terr, Portland, Oregon, 97210

From: Victoria Cole [mailto:cole.tori@gmail.com]
Sent: Tuesday, August 30, 2016 9:17 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please don't let the process water down what Portlanders spoke very, very clearly in favor of this year. Enact a full ban on fossil fuel terminals, no matter what size! We are in a crucial moment for the climate. This kind of precedent could change our future for the better. Please don't leave holes in our fossil fuel export policy. Furthermore, I believe Portland's leadership should strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. Last but not least, I'd like to see Portland lead the nation by preventing any aggregate increases in fossil fuel infrastructure in the city. It's unlikely to have more than a subtle impact on existing business here, but it can set a wonderful precedent, allowing Portland to be the true leader on climate change action that we purport to be. Thank you.

From: Victoria Cole
Email: cole.tori@gmail.com
Address: 1635 NE Couch St., Portland, Oregon, 97232

From: Todd Corbett [mailto:htcorbett@hotmail.com]
Sent: Tuesday, August 30, 2016 6:33 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Within the Portland area, please enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil. Also, please strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. And please prevent anything that leads to aggregate increase in fossil fuel infrastructure in Portland. Thanks

From: Todd Corbett
Email: htcorbett@hotmail.com
Address: 10815 Hubbard Creek Rd, Umpqua, Oregon, 97486

From: Dianne Ensign [mailto:roughskinnednewt@hotmail.com]
Sent: Tuesday, August 30, 2016 11:44 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Dianne Ensign
11600 SW Lancaster Rd
Portland, OR 97219

From: Deva Fleming [mailto:Msdeva@gmail.com]
Sent: Tuesday, August 30, 2016 5:51 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

We must stand together to protect our future!

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Deva Fleming
6420 NE 42nd Ave
Portland, OR 97218

From: Michael Garland [mailto:mjgpdx36@gmail.com]
Sent: Tuesday, August 30, 2016 8:08 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I support the call for a complete ban on further development of fossil fuel infrastructure in Portland.

From: Michael Garland
Email: mjgpdx36@gmail.com
Address: 2125 SE 35th Place, Portland, Oregon, 97214

From: kima garrison [mailto:kimasuegarrison@gmail.com]
Sent: Tuesday, August 30, 2016 9:13 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: kima garrison
Email: kimasuegarrison@gmail.com
Address: 5112 ne 28th, portland, Oregon, 97211

From: Erinne Goodell [mailto:erinne.larissa@gmail.com]
Sent: Tuesday, August 30, 2016 2:24 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

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-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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Sincerely,

Erinne Goodell
3241 NE Holman St
Portland, OR 97211

From: Angela Gusa [mailto:agusa@comcast.net]
Sent: Tuesday, August 30, 2016 6:29 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Angela Gusa
2625 NE 41st Ave
Portland, OR 97212

From: Hall, Stacie [mailto:stacie.hall@intel.com]
Sent: Tuesday, August 30, 2016 7:31 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Members of the Planning and Sustainability Commission:

I am writing to request that you amend the proposed PSC Fossil Fuel Zoning draft to better reflect the city's fossil fuel goals laid out in the resolution from last fall. I recommend that the City of Portland amend the proposal to reflect the city's fossil fuel goes laid out in the resolution for the following 3 points:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing facilities through adding binding limits in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Sincerely,
Stacie Hall
927 Clearbrook Dr.
Oregon City, OR 97045
503-557-1697

From: Douglas Hayner [mailto:pdxdoug@q.com]
Sent: Tuesday, August 30, 2016 9:02 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Douglas Hayner
5825 NE Emerson St
Portland, OR 97218

From: David Hermanns [mailto:dhermann@earthlink.net]
Sent: Tuesday, August 30, 2016 8:51 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland". Although this draft prohibits new larger bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine).

While this proposal will mark any bulk terminals as 'non-conforming', it still needs to strengthen the regulations on the size and type of expansion to pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

I want the City of Portland and the Planning and Sustainability Commission to:

1 - Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.

2 - Remove the exception for new facilities that are 5 million gallons or less which would allow more unit trains of dangerous fossil fuels like Bakken crude oil.
Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

3 - Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

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Sincerely,

From: David Hermanns
Email: dhermann@earthlink.net
Address: 9442 N Tioga Ave, Portland, Oregon, 97203

From: Craig Heverly [mailto:heverlyjc@hevanet.com]
Sent: Tuesday, August 30, 2016 6:55 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

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Sincerely,

Craig Heverly

From: Craig Heverly
Email: heverlyjc@hevanet.com
Address: 3712 SE 9th Avenue, Portland, Oregon, 97202

From: Jynx Houston [mailto:jynxcdo@gmail.com]
Sent: Tuesday, August 30, 2016 6:19 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

PORTLAND NEEDS A FULL BAN ON ALL NEW FOSSIL FUEL TERMINALS & NO EXPANSIONS ON EXISTING TERMINALS & NO INCREASE IN FOSSIL FUEL INFRASTRUCTURE.

From: Jynx Houston
Email: jynxcdo@gmail.com
Address: 7605 SE Lincoln St., Portland, Oregon, 97215

From: Don Jacobson [mailto:donjphoto@gmail.com]
Sent: Tuesday, August 30, 2016 7:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes closer to the original intent of the 2015 Resolution.

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Sincerely,

From: Don Jacobson
Email: donjphoto@gmail.com
Address: 2545 SW Terwilliger Blvd Apt 314, Portland, Oregon, 97201-6304

From: Dave King [mailto:landd_2@q.com]
Sent: Tuesday, August 30, 2016 9:39 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

No new terminals of any size. And for that matter let's shut down existing terminals and make Portland 100% renewable with expanded transit like they have in Latin America. Solar & wind and massive weatherization by the city. Pay for it with our share of the money saved by cutting the 5.3 TRILLION per year subsidies to fossil fuel companies world wide.

From: Dave King
Email: landd_2@q.com
Address: 8728 N Edison, Portland, Oregon, 97203

From: Amanda Jones [mailto:amjones@esassoc.com]
Sent: Tuesday, August 30, 2016 7:29 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Amanda Jones
SE Morrison St
Portland, OR 97206

From: Eric Kaiser [mailto:ericjohnkaiser@gmail.com]
Sent: Tuesday, August 30, 2016 7:21 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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Sincerely,

Eric Kaiser
3587 NE Stanton St
Portland, OR 97212

From: Ed Kerns [mailto:edkerns@aracnet.com]
Sent: Tuesday, August 30, 2016 10:51 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Ed Kerns
2335 SE Pine St
Portland, OR 97214

From: Gregg Kleiner [mailto:kleinerg@comcast.net]
Sent: Tuesday, August 30, 2016 10:04 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Given all the evidence of climate change taking place all around us (wildfires, flooding, rising sea levels, melting ice sheets), we simply cannot scrimp on enacting a FULL ban on all new fossil fuel terminals, no matter what the size. If we keep burning fossil fuels, the future is bleak. It's time to step up! Do NOT all ow an exception for new facilities that are five million gallons or less! That doesn't work.

At the same time, we MUST strengthen restrictions on expansions at existing terminals by adding binging limits and criteria for safety and impacts from climate change in the City's non-conforming use review process.

The time is NOW. We don't have another option. Please prevent any increase in fossil fuel infrastructure in Portland. Our Planet can no longer tolerate our burning of fossil fuels. Thank you!

From: Gregg Kleiner
Email: kleinerg@comcast.net
Address: 940 SE Alexander Avenue, Corvallis, Oregon, 97333

From: Rose Lindsey [mailto:lyleandrosie@spiritone.com]
Sent: Tuesday, August 30, 2016 7:49 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,
Rose Lindsey

Rose Lindsey
3265 SE Madison
Portland, OR 97214

From: Kelly McConnell [mailto:prvt@2ezgroup.com]
Sent: Tuesday, August 30, 2016 6:05 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I want clean air and water and I'm damned tired of begging for them. I want a FULL ban on any and all new or expanded fossil fuel infrastructure. Since they insist on continuing to foul our air, land, and water they leave us no choice but to ban them.

From: Kelly McConnell
Email: prvt@2ezgroup.com
Address: 11375 SW Erste, Tigard, Oregon, 97223

From: Annoe McCuen [mailto:mccuen7691@comcast.net]
Sent: Tuesday, August 30, 2016 8:14 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Please do whatever is in your power to downsize the effect of fossil fuel on our environment. Thank you.

From: Annoe McCuen
Email: mccuen7691@comcast.net
Address: 1825 Fairmount Ave S, Salem, Oregon, 97302

From: Bill Michtom [mailto:wdmichtom@gmail.com]
Sent: Tuesday, August 30, 2016 11:43 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

While the new draft has important improvements, it still misses the most important change: Ending ***all*** use of fossil fuels.

Our world is already at extreme risk of irreversible climate change. Thus we must do more than limit the size of new fossil fuel terminals. Having an exception for new facilities that are five million gallons or less pretends that there is room for compromise. There isn't!

Please change the draft to recognize the emergency conditions we are in.

Thank you.

--

"The real activity of power is not making people conform to what they don't want, the real activity of power is making them want it."

Bill Michtom
731 SW Salmon St, #505
Portland, OR, 97205

From: Michelle Mintmier [mailto:mmintmier@yahoo.com]
Sent: Tuesday, August 30, 2016 5:24 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Planning and Sustainability Commission,

Please amend the proposed draft for fossil fuel zoning to better reflect the city's goals laid out in the resolution last fall. Here in the Pacific Northwest, we take pride in our nationwide leadership on environmental issues. Fossil fuel zoning is part of a larger legacy we can write.

We want the ban to be as strong as possible. I am a member and highly active volunteer at Portland Audubon and echo their sentiments to make the ban better via these three aspects:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing facilities through adding binding limits in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

I look forward to all of us making this ban a success.
Thank you in advance,

Michelle Mintmier
3655 SW 144th Ave
Beaverton, OR 97005

From: Jason Nolin [mailto:jason.nolin@gmail.com]
Sent: Tuesday, August 30, 2016 2:34 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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Sincerely,

Jason Nolin
5745 NE Church St
Portland, OR 97218

From: Sarah Prowell [mailto:sprowell@ix.netcom.com]
Sent: Tuesday, August 30, 2016 11:24 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Sarah Prowell
2216 SW Sunset Blvd
Portland, OR 97239

From: James Rankin [mailto:jim.rankin@oregonstate.edu]
Sent: Tuesday, August 30, 2016 6:26 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: James Rankin
Email: jim.rankin@oregonstate.edu
Address: 111 NW 11th, Corvallis, Oregon, 97330

From: Teresa Reitinger [mailto:wordpress@350pdx.org]
Sent: Tuesday, August 30, 2016 5:51 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

The times beg for a full ban for the possible future of the planet and the health of its children. Now is the time to take this important step in the hope that other municipalities will follow suit in the name of sanity.

From: Teresa Reitinger
Email: t_reitinger@yahoo.com
Address: 3724 SE 35th Pl Apt F, Portland , Oregon, 97202

From: Rhonda Sabala & Michael Newsom [mailto:manewsom@comcast.net]
Sent: Tuesday, August 30, 2016 8:25 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Dear Members of the Planning and Sustainability Commission,

Thank you for pursuing the implementation of its November 2015 Fossil Fuel Policy. As a resident of Portland, I ask the City to enact a full ban on all new fossil fuel terminals, large or small.

Sincerely,

Rhonda Sabala & Michael Newsom
1015 NE Dean St
Portland, OR 97211

From: Kristi Schaefer [mailto:wondersmooch@gmail.com]
Sent: Tuesday, August 30, 2016 11:19 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Kristi Schaefer
2032 NE Liberty St
Portland, OR 97211

From: Melissa Scherling [mailto:indiethos@yahoo.com]
Sent: Tuesday, August 30, 2016 8:57 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Melissa Scherling
3250 NE 73rd Ave
Portland, OR 97213

From: Eric Schmall [mailto:kahunalamaku@gmail.com]
Sent: Tuesday, August 30, 2016 8:44 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

I'm requesting that you enact a full ban on all new fossil fuel terminals, regardless of size. There is no need for exceptions. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

Please strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you.

From: Eric Schmall
Email: kahunalamaku@gmail.com
Address: 16611 SE East View Ct, Portland, Oregon, 97405

From: Howard Shapiro [mailto:howeird3@gmail.com]
Sent: Tuesday, August 30, 2016 10:38 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

If the pipeline is large enough to refill the 4,999,999 gallon storage tanks quickly the proposed limit is meaningless. there should be no new fossil fuel storage facilities allowed.

There should be no expansion of current facilities allowed.

If the PSC decided to recomment allowing any new construction I would like to see some kind of bonding language contained in the ordinance in the event of a spill.

If Portland is serious about keeping our city at the level of health and sustainability that we presently have, we cannot allow any loopholes in our codes and ordinances that high priced lawyers and planners can take advantage of because if they find them they will use them.

From: Howard Shapiro
Email: howeird3@gmail.com
Address: 7426 SE 21st Ave., Portland, Oregon, 97202

From: kathleen shelley [mailto:kshelley@epud.net]
Sent: Tuesday, August 30, 2016 7:59 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

No more fossil fuel facilities in Portland. Eliminate those that now exist. The goal is to reduce our dependence on fossil fuels.

From: kathleen shelley
Email: kshelley@epud.net
Address: 46525 McKenzie Hwy, Vida , Oregon, 97488

From: Dean Sigler [mailto:muchcatfur@comcast.net]
Sent: Tuesday, August 30, 2016 10:43 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Let's not let loopholes allow the camel into the tent. We need to have a zero-tolerance policy toward new fossil fuel expansions.

From: Dean Sigler
Email: muchcatfur@comcast.net
Address: 18845, Southwest Vista Street, Aloha, Oregon, 97003-2907

From: Alan Smith [mailto:wordpress@350pdx.org]
Sent: Tuesday, August 30, 2016 9:21 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.
Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
Prevent any aggregate increase in fossil fuel infrastructure in Portland.

From: Alan Smith
Email: a23smith@yahoo.com
Address: 5908 SE 17th Street, Portland, Oregon, 97202

From: Matthew Smith [mailto:matthew.smith.c@gmail.com]
Sent: Tuesday, August 30, 2016 9:21 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Because of my deep love for our children and the Earth, I thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Matthew Smith
8524 NE Thompson St
Portland, OR 97220

From: Janiece Staton [mailto:ms.jdstaton@frontier.com]
Sent: Tuesday, August 30, 2016 4:32 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Janiece Staton
817 SW 171st Avenue
Beaverton, OR 97006

From: Diana Talcott [mailto:diana.talcott@gmail.com]
Sent: Tuesday, August 30, 2016 7:25 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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Sincerely,

Diana Talcott
2806 SE 15th Ave
Portland, OR 97202

From: Charles Townsend [mailto:charlesntownsend@gmail.com]
Sent: Tuesday, August 30, 2016 8:04 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Charles Townsend
623 NE Morris
Portland, OR 97212

From: Mary; Vorachek [mailto:maryvorachek@gmail.com]
Sent: Tuesday, August 30, 2016 6:09 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Amend the proposed draft to reflect fossil fuel goals that close all loopholes and enacts a full ban on all new fossil fuel terminals:

1. Enact a full ban on all new fossil fuel terminals without exceptions of any size.
2. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.
3. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Mary A. Vorachek

680 16th St. NE

Salem OR 97301

From: Jack West [mailto:jpwest@teleport.com]
Sent: Tuesday, August 30, 2016 6:19 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Jack West
3914 SE Licyntra Ln
Milwaukie, OR 97222

From: Virginia Wiseman [mailto:virginia.n.wiseman@gmail.com]
Sent: Tuesday, August 30, 2016 8:09 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

Dear PSC,

I really hope that you will honor the City Council's resolution and amend the draft rule to fully ban ALL new fossil fuel infrastructure - regardless of size. The time has come to make fossil fuels scarce so that we can make the transition to a clean energy economy that leaves our planet intact enough for us to live on it. Please.

Many thanks!

From: Virginia Wiseman
Email: virginia.n.wiseman@gmail.com
Address: 5516 NE Mallory Ave, Portland, Oregon, 97211

From: Susanna Askins [mailto:tlknkr@gmail.com]
Sent: Monday, August 29, 2016 11:30 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Susanna Askins
14640 NE Russell Ct
Portland, OR 97230

From: Joshua Berger [mailto:josh@plazm.com]
Sent: Monday, August 29, 2016 9:32 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Hi friends at the sustainability commission.

I stood in citty hall multiple times when the fossil fuel policy was being debated and voted on. As a longtime Portland resident and someone who has worked on sustainability issues for many years, I felt a deep sense of pride.

Now it is time to follow through on the high standards we set.

Please amend the proposed draft to reflect the city's fossil fuel goals:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals through adding binding limits in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you for your dedication and work on this issue. Let's continue to lead the nation in sustainabiity.

Best regards

Joshua Berger
2124 NE 41st ave
Portland OR, 97212

From: Jim Breithaupt [mailto:jlbfellow@comcast.net]
Sent: Monday, August 29, 2016 5:43 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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Sincerely,

Jim Breithaupt
1880 SW Edgewood Rd
Portland, OR 97201

From: Leanna Brooks [mailto:sketch3d@gmail.com]
Sent: Monday, August 29, 2016 5:20 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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Sincerely,

Leanna Brooks
317 w 4th Plain Blvd
Vancouver, WA 98660

From: Heather Carver [mailto:tierrabodhi@gmail.com]
Sent: Monday, August 29, 2016 7:13 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Re: PSC Fossil Fuel Zoning Testimony: Don't settle for less!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. And thank you to the Bureau of Planning and Sustainability for incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft brings the proposed changes much closer to the original intent of the 2015 Resolution.

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- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.
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Thank you!
Heather Carver
4613 NE Killingsworth St, Portland, OR 97218

From: Joe Chasse [mailto:joetruck@gmail.com]
Sent: Wednesday, August 31, 2016 9:45 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a full ban!

Testimony:

WE HAVE ALREADY BEEN SHOWN by Union Pacific and other corporate collaborators that we can NOT trust them. Their ONLY MOTIVE is PROFITS for the shareholders, while OUR MOTIVES run deep throughout our communities and our region.

From: Joe Chasse
Email: joetruck@gmail.com
Address: 22313 V St., Ocean Park, Washington, 98640

From: Cale Christi [mailto:cale.austin@gmail.com]
Sent: Monday, August 29, 2016 6:08 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Cale Christi
5109 N Oberlin St
Portland, OR 97203

From: Jonnel Covault [mailto:jonnelcovault@gmail.com]
Sent: Monday, August 29, 2016 10:59 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

I am very concerned that the Beautiful and Historic Columbia River Gorge is becoming a dirty fossil fuel Export corridor. Local residents bear the costs for toxic air and water when there are spills and coal dust. It is time to invest in Renewables. There are no toxic spills with wind or solar energy! Please help us leave a livable planet for our grandchildren.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Jonnel Covault
14114 SE Redwood Ave
Portland, OR 97267

From: Leslie Davis & Robert Fordham [mailto:boblespdx@comcast.net]
Sent: Monday, August 29, 2016 8:14 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Full ban, PSC Fossil Fuel Zoning Testimony

Dear Members of the Planning and Sustainability Commission,

I am a voter in the City of Portland and support your pursuing the implementation of the November 2015 Fossil Fuel Policy.

City leaders have made a good start in making Portland an example that other cities can follow. However, allowing new fossil fuel facilities that can store 5 million gallons of fossil fuels is a mistake.

I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. A

-Strengthen restrictions on expansions allowed at existing terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Leslie Davis & Robert Fordham
2016 NE 25th Ave
Portland, OR 97212

From: Tony and Phyllis DeCristofaro [mailto:pdecrist@yahoo.com]
Sent: Monday, August 29, 2016 5:14 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Tony and Phyllis DeCristofaro
472 N Hayden Is Dr
Portland, OR 97217

-----Original Message-----
From: Lenny Dee [mailto:ldeepdx@yahoo.com]
Sent: Monday, August 29, 2016 7:51 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Hi,

Please enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude . Strengthen restrictions on expansions allowed at existing terminals through adding binding limits in the City's non-conforming use review process. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Kind Regards,

Lenny Dee
2580 NE 31 Ave.

From: Robert Deering [mailto:robert.deering@comcast.net]
Sent: Monday, August 29, 2016 8:56 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Robert Deering
5528 N Moore Ave
Portland, OR 97217

From: Heather Dennett [mailto:heathervanhoof@hotmail.com]
Sent: Monday, August 29, 2016 5:48 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Heather Dennett
6835 N Wall Ave
Portland, OR 97203

From: Karen Deora [mailto:karendeora@gmail.com]
Sent: Monday, August 29, 2016 5:37 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Karen Deora
2943 NE 9th Ave
Portland, OR 97212

From: Carolyn Eckel [mailto:tlew4002@earthlink.net]
Sent: Monday, August 29, 2016 9:00 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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Sincerely,

Carolyn Eckel
PO Box 33707
Portland, OR 97292

From: Shannon Ferguson [mailto:shannonmferguson@msn.com]
Sent: Monday, August 29, 2016 10:21 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Shannon Ferguson
7910 N Fiske Ave
Portland, OR 97203

From: Kima Garrison [mailto:kimasuegarrison@gmail.com]
Sent: Monday, August 29, 2016 8:01 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Kima Garrison
5112 NE 28th Ave
Portland, OR 97211

From: Kaitlin Grammer [mailto:grammerk@comcast.net]
Sent: Monday, August 29, 2016 7:39 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Kaitlin Grammer
2104 NE 55th Ave
Portland, OR 97213

From: Dawn Griffin [mailto:dm_griffin@yahoo.com]
Sent: Monday, August 29, 2016 6:19 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Dawn Griffin
1347 NE 47th Ave
Portland, OR 97213

From: Michael & Deborah Hall [mailto:micahall1@yahoo.com]
Sent: Monday, August 29, 2016 5:14 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Michael & Deborah Hall
16 Churchill Downs
Lake Oswego, OR 97035

From: Rachael Hawkey [mailto:ranchrachael@yahoo.com]
Sent: Monday, August 29, 2016 5:23 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Rachael Hawkey
4839 N Kerby Ave
Portland, OR 97217

From: Craig Heverly [mailto:heverlyjc@hevanet.com]
Sent: Monday, August 29, 2016 8:54 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Craig Heverly
3712 SE 9th Ave
Portland, OR 97202

From: Michael Hevron [mailto:maehah@comcast.net]
Sent: Monday, August 29, 2016 6:38 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Ban fossil fuel terminals

Dear Members of the Planning and Sustainability Commission,

Thank you for the transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. Your actively opposing expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways is just what we need.

The Bureau of Planning and Sustainability has incorporated public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments, though not completely in line with the original intent of the 2015 Resolution.

But the Fossil Fuel Zoning Amendments proposal is still less than the resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

The current draft still allows new terminals up to 5 million gallons. The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil underminethe City's 2015 Resolution.

Also, this proposal still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals.

The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

* Ban ALL new fossil fuel terminals.

- Do NOT except "small" facilities under 5 million gallons. Do NOT allow new LNG storage in NW Natural didn't ask for it and expansion would be in a sensitive area.

-Add binding limits and safety and climate criteria on expansions allowed at existing terminals . The Be sure that seismic and safety improvements are included in any changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Michael Hevron
217 NW Prescott Pl
Beaverton, OR 97006

From: Barbara Hilyer [mailto:s.barbara.hilyer@gmail.com]
Sent: Monday, August 29, 2016 8:16 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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Sincerely,

Barbara Hilyer
2790 SW Carolina St
Portland, OR 97239

From: Tom Hopkins [mailto:appgol@gmail.com]
Sent: Monday, August 29, 2016 11:17 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony.

I thinks it is important that Portland take a leading role in limiting fossil fule extraction, transportation and consumption. I urge the PSC to follow the City recommendation and
1. Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary.

2. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.

3. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits in the City's non-conforming use review process.

4. Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Thank you

Thomas Hopkins
19698 SE Cottonwood St.
Milwaukie, Oregon 97267

appgol@gmail.com

From: P Horter [mailto:lacengh@yahoo.com]
Sent: Monday, August 29, 2016 6:21 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

I am writing to you about a subject that I think is very important: enacting a full ban on all fossil fuel terminals and infrastructure, and completely outlawing the expansion of all existing fossil fuel facilities.

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

P Horter
17827 NW Sauvie Is.Rd.
Portland, OR 97231

From: George Jacobs [mailto:aranobilis@earthlink.net]
Sent: Monday, August 29, 2016 8:27 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: Full Ban!

Dear Members of the Planning and Sustainability Commission,

While I would be inclined to thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy...I remember all too well your ridiculous vote on the Pembina Terminal when public testimony at several hearings ran 80%-20% AGAINST such a facility.

So, given that City Hall has already taken the brunt of the political flack on this one....it would be not only appreciated, but appropriate...for the Commission to follow suit.

Given the fact that the Federal government makes no secret of its desire to tunr the greater Portland Area, as well as the Columbia River Basin...into a fossil fuel export hub, the citiznes of Oregon as well as Washington must rely on their Local and Municipal Leaders and Councils to stand up and protect our Health, Safety, and Welfare.

The Portland Metro area is too large a population zone, and too important an ecosystem....to risk for the sake of some Corporations which will not really be providing a large number of permanent jobs for Oregonians.

Regards,

George Jacobs
Portland

George Jacobs
3104 SE Morrison St
Portland, OR 97214

From: Dan Jaffee [mailto:dsjaffee@gmail.com]
Sent: Monday, August 29, 2016 9:24 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: Support a Total Ban on new Fossil Fuel Terminals

Dear Portland Planning and Sustainability Commission,

The City's draft of the Fossil Fuel Policy makes progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." While the current draft is much improved, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

Although this new draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). New fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil will undermine the promise and impact of the City's 2015 Resolution.

While this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations regarding the expansion of pre-existing terminals. It is not clear whether there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I urge that the City of Portland and the Planning and Sustainability Commission do the following:

1. Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
2. An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing dangerous new LNG storage in Portland is unnecessary, because NW Natural has no current plans for more LNG storage in Portland.

3. Strengthen restrictions on expansions allowed at existing terminals through adding binding limits in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.
4. Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

The City of Portland has a rare opportunity to be recognized as a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be in the forefront of addressing the most pressing concern of our time.

Thank you very much for your attention.

Sincerely,

Daniel Jaffee
4723 NE 14th Ave.
Portland, OR 97211

From: David Jacquemin [mailto:dave.jacquemin@gmail.com]
Sent: Monday, August 29, 2016 6:23 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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Sincerely,

David Jacquemin
473 SE 46TH DRIVE
Gresham, OR 97080

From: Noah Jenkins [mailto:njohnj@yahoo.com]
Sent: Monday, August 29, 2016 5:16 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Noah Jenkins
8025 SE 60th Ave
Portland, OR 97206

From: Sandy Joos [mailto:joosgalefamily@comcast.net]
Sent: Monday, August 29, 2016 10:14 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

I first want to thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

I also want to thank the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
- Remove the exception for new facilities that are 5 million gallons or less. This is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary; NW Natural has no current plans for more LNG storage in Portland.
- Strengthen restrictions on expansions allowed at existing terminals through adding binding limits in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.
- Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now, more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Thank you for your efforts on this urgent matter.

Sandra Joos
4259 SW Patrick Pl
Portland, OR 97239
503-274-8803

From: Thomas Keys [mailto:tkeyshike@msn.com]
Sent: Monday, August 29, 2016 5:13 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

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- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

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Sincerely,

Thomas Keys
1103 SE 21st Ct
Gresham, OR 97080

From: David Kreisman [mailto:dkreisman@hotmail.com]
Sent: Monday, August 29, 2016 9:37 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban Now!

Dear Members of the Planning and Sustainability Commission,

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Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

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- Strengthen restrictions on expansions allowed at existing terminals through adding binding limits in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

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Regards

David Kreisman

15066 SE Robinette Ct
Portland, OR 97267

From: Barbara Krupnik-Goldman [mailto:bkgold2@gmail.com]
Sent: Monday, August 29, 2016 6:45 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Barbara Krupnik-Goldman

Barbara Krupnik-Goldman
2940 NE 35th Ave
Portland, OR 97216

From: Kristin Lee [mailto:Kplee@centurylink.net]
Sent: Monday, August 29, 2016 5:22 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Kristin Lee
5803 SW garden home rd
Portland, OR 97219

From: Tom Lichatowich [mailto:tjlichat@gmail.com]
Sent: Monday, August 29, 2016 7:41 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Tom Lichatowich
4625 NE 38th Ave
Portland, OR 97211

From: Erin Madden [mailto:erin.madden@gmail.com]
Sent: Monday, August 29, 2016 8:30 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Erin Madden
3756 SE Lafayette Ct
Portland, OR 97202

From: Matt Mcdell [mailto:mattmcdell@live.com]
Sent: Monday, August 29, 2016 10:27 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Matt Mcdell
3125 SE Yamhill St
Portland, OR 97214

From: Mary Ellen McFadden [mailto:ellenmcf@pacifier.com]
Sent: Monday, August 29, 2016 8:39 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Mary Ellen McFadden
2357 N.E. 151st Ave.
Portland, OR 97230

From: Teresa McFarland [mailto:terefarlan@gmail.com]
Sent: Monday, August 29, 2016 5:12 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Teresa McFarland
10740 SW 11th Dr
Portland, OR 97219

From: David Nichols [mailto:Davemult@aol.com]
Sent: Monday, August 29, 2016 5:53 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

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Sincerely,

David Nichols
5107 NE Couch Street
Portland, OR 97213

From: John Nicol [mailto:jnicolpdx@yahoo.com]
Sent: Monday, August 29, 2016 11:34 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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Sincerely,

John Nicol
2331 North Terry Street
Portland, OR 97217

From: gail ohara [mailto:gail@chickfactor.com]
Sent: Monday, August 29, 2016 6:36 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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Sincerely,

gail ohara
4523 NE Hoyt Street
Portland OR 97213

From: Maureen O'Neal [mailto:momoneal77@gmail.com]
Sent: Monday, August 29, 2016 8:31 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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Sincerely,

Maureen O'Neal
9100 s.w. 80th ave.
portland, OR 97223

From: Nora Polk [mailto:nora.mattek@gmail.com]
Sent: Monday, August 29, 2016 6:03 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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Sincerely,

Nora Polk
6405 SE 62nd Ave
Portland, OR 97206

From: Brian Posewitz [mailto:brianposewitz@comcast.net]
Sent: Monday, August 29, 2016 4:43 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

Dear PSC,

I support the general concept of the proposed new fossil fuel infrastructure policy: make it more difficult, expensive or impossible to build new fossil fuel facilities. Climate change is a crisis. We need to take bold, decisive action, even if it seems severe. Along with other things (including reduction in the food we get from animal agriculture), we need to stop enabling the production and use of fossil fuels. The proposed new policy seems like a step in the right direction.

Thank you for considering my comments.

Regards,

Brian Posewitz
8508 SE 11th Ave.
Portland, OR 97202
503-432-8249
brianposewitz@comcast.net

From: David Powell [mailto:powell440@gmail.com]
Sent: Monday, August 29, 2016 8:07 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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Sincerely,

David Powell
4117 N Haight Ave
Portland, OR 97217

From: Gisela Ray [mailto:giselaray@frontier.com]
Sent: Monday, August 29, 2016 7:26 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

As we know that fossil fuels have to be phased out it seems terribly counterproductive to add any new infrastructure for them. Let's use any new investment on renewables instead and help our planet fight climate change!

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Sincerely,

Gisela Ray
85 SE 16th Court
Gresham, OR 97080

From: Rick Ray [mailto:tribalromp@gmail.com]
Sent: Monday, August 29, 2016 9:56 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

RE: PSC Fossil Fuel Zoning

Please amend the proposed draft to reflect the city's fossil fuel goals:

- Enact a full ban on all new fossil fuel terminals, large or small. An exception for new facilities that are 5 million gallons or less is unnecessary. The City's code changes should not allow more unit trains of dangerous fossil fuels like Bakken crude oil.
- Strengthen restrictions on expansions allowed at existing terminals through adding binding limits in the City's non-conforming use review process.
- Prevent any aggregate increase in fossil fuel infrastructure in Portland.

Richard Ray
408 NW 12th Ave. #410
Portland OR 97209

From: David Regan [mailto:dregan02@msn.com]
Sent: Monday, August 29, 2016 5:41 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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Sincerely,

David Regan
623 SW Park Ave #703
Portland, OR 97205

From: Diana Richardson [mailto:licketysplit777@gmail.com]
Sent: Monday, August 29, 2016 6:12 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

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To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Diana Richardson
1905 SW Sunset Blvd
Portland, OR 97239

From: Berklee Robins [mailto:berkrobins@gmail.com]
Sent: Monday, August 29, 2016 5:12 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Berklee Robins
14071 Chatham Court
Lake Oswego, OR 97035

From: Brent Rocks [mailto:brent_rocks@comcast.net]
Sent: Monday, August 29, 2016 5:31 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Brent Rocks
1518 SW Upper Hall st
Portland, OR 97201

From: Michael Schumann [mailto:mikethemouthpiece@gmail.com]
Sent: Monday, August 29, 2016 5:11 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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Sincerely,

Michael Schumann
2833 NE 49th Ave
Portland, OR 97213

From: Alan Smith [mailto:a23smith@yahoo.com]
Sent: Monday, August 29, 2016 9:47 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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Sincerely,

Alan Smith
5908 SE 17th Ave
Portland, OR 97202

From: Taylor St Clair [mailto:thstclair@yahoo.com]
Sent: Monday, August 29, 2016 6:37 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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Sincerely,

Taylor St Clair
7325 N Denver Ave
Portland, OR 97217

From: Wade Stoddard [mailto:wadestoddard@yahoo.com]
Sent: Monday, August 29, 2016 5:11 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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Sincerely,

Wade Stoddard
4105 N Massachusetts Ave
Portland, OR 97217

From: Jeff Stookey [mailto:jstookey108@gmail.com]
Sent: Monday, August 29, 2016 6:11 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

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Sincerely,

Jeff Stookey
3656 NE Wasco St
Portland, OR 97232

From: Liz Terhaar [mailto:liz@columbiariverkeeper.org]
Sent: Monday, August 29, 2016 4:29 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Member of the Planning and Sustainability Commission,

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Sincerely,

Liz Terhaar
111 3rd St
Hood River, OR 97031

From: Betsy Toll [mailto:betsy.toll@gmail.com]
Sent: Monday, August 29, 2016 5:22 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

As a resident of Portland, I am proud and relieved that the City is committed to doing the right thing for current and future generations.

The current draft of the Fossil Fuel Terminal Zoning Amendments is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution.

Still, the current proposal falls short of the bold and inspired resolution that Portland supported in the fall of 2015. The most recent draft allows new terminals up to 5 million gallons, provided the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The idea if allowing new facilities that can store 5 million gallons of liquefied natural gas (LNG) and crude oil flatly undermines the intention and impact of the City's 2015 Resolution.

To make the City's policy as strong as it can be, I urge you to consider the following:

- Enact a full ban on all new fossil fuel terminals, large or small - "to actively oppose" new fossil fuel infrastructure, as the City promised.

- The exception for new facilities 5 million gallons or less has to go.

- Another Mosier, or Lac Megantic, in the heart of Portland would be catastrophic.

-Strengthen restrictions on expansions at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process.

- Add strong language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

The City of Portland has the opportunity to be a leader in the U.S. climate justice movement. NOW is the time!

With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could reclaim its place at the forefront of addressing the most pressing concern of our time.

Sincerely,

Betsy Toll
3841 SE 51 Ave.
Portland, OR 97206

From: Julia Tomes [mailto:julia.tomes@gmail.com] **On Behalf Of** Julia Tomes
Sent: Monday, August 29, 2016 9:44 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Re: PSC Fossil Fuel Zoning Testimony

Dear Members of the Planning and Sustainability Commission,

I want to thank you for the continued effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a parent of two children and a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

However, the current Fossil Fuel Zoning Amendments proposal still falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.

Additionally, while this proposal will mark any bulk terminal as 'non-conforming', it still needs to strengthen the regulations when it comes to the expansion of pre-existing terminals. It is not clear from the draft if there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, I ask the City of Portland and the Planning and Sustainability Commission to:

- Enact a full ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution, "to actively oppose" new fossil fuel infrastructure.
- An exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.
- Strengthen restrictions on expansions allowed at existing terminals through adding binding limits in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.
- Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now, more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Julia Tomes

1736 SE Taggart St.
Portland, Or 97202

From: Dr. Carole Warner [mailto:carewarner@yahoo.com]
Sent: Monday, August 29, 2016 7:18 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: We must have a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy.

However, the current Fossil Fuel Zoning Amendments proposal falls short of the bold and visionary resolution that Portland supported in the fall of 2015, which called for the city to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Although this draft prohibits new bulk terminals, it still allows new terminals up to 5 million gallons, provided that the terminal cannot shift fossil fuels from one transportation mode to another (i.e. rail to marine). The City's policy was clear, and new fossil fuel facilities that can store 5 million gallons of dangerous fossil fuels such as liquefied natural gas (LNG) or crude oil undermine the promise and impact of the City's 2015 Resolution.
We need to strengthen the regulations with regard to the expansion of pre-existing terminals. It is unclear from the draft whether there is any binding limit to potential expansion at existing bulk fossil fuel terminals. The City's intention with its 2015 Resolution was to ensure that changes to the City's fossil fuel infrastructure would be used to improve safety, seismic resiliency, and the use of lower-carbon fuels.

To make the City's policy as strong as it can be, we ask the City of Portland and the Planning and Sustainability Commission to consider the following:

First, enact a FULL ban on all new fossil fuel terminals, large or small. After all, this was the plain language of the City's 2015 Resolution - "to actively oppose" new fossil fuel infrastructure.

Second, an exception for new facilities that are 5 million gallons or less is unnecessary and could allow more unit trains of dangerous fossil fuels like Bakken crude oil. Additionally, allowing new LNG storage in Portland is unnecessary: NW Natural has no current plans for more LNG storage in Portland.

Third, you must strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

Finally, we must add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

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Sincerely,
Osiel Bonfim, PhD
Carole Warner, ND, LAc.

Dr. Carole Warner
3633 SE 27th Ave
Portland, OR 97202

From: Dr. George Weiss Amann [mailto:georgeweis@aol.com]
Sent: Monday, August 29, 2016 5:13 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

Thank you for the diligent effort and transparency with which the City is pursuing the implementation of its November 2015 Fossil Fuel Policy. The City's draft makes real progress towards the 2015 Resolution's goal to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." As a resident of Portland, I am proud to see City leaders working to make Portland an example that other cities can follow.

Thank you to the Bureau of Planning and Sustainability for its work in incorporating public input on its initial draft of the Fossil Fuel Terminal Zoning Amendments. The current draft is much improved, bringing the proposed changes much closer to the original intent of the 2015 Resolution. It is good to see the city making decisions that are not only environmentally responsible, but also responsive to citizen input.

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

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Sincerely,

Dr. George Weiss Amann
2132 NE 13th Ave
Portland, OR 97212

From: Mark Wheeler [mailto:mark@rootsrealty.com]
Sent: Monday, August 29, 2016 5:18 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony: I want a Full Ban!

Dear Members of the Planning and Sustainability Commission,

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-Strengthen restrictions on expansions allowed at existing terminals through adding binding limits as well as criteria for safety and climate impacts in the City's non-conforming use review process. The City should use this process to ensure that seismic and safety improvements are the basis for any new changes to Portland's existing bulk fossil fuel terminals.

-Add language to prevent smaller related "terminals" from clustering and aggregating to increase fossil fuel shipments through Portland.

Now more than ever, the City of Portland has the opportunity to be a leader in the U.S. climate justice movement. With just a few more improvements to the Fossil Fuel Zoning Amendments, Portland could once again be on the forefront addressing the most pressing concern of our time.

Sincerely,

Mark Wheeler
628 SE 58th
Portland, OR 97215

-----Original Message-----
From: Larry Hon [mailto:larryhon55@gmail.com]
Sent: Thursday, August 25, 2016 8:20 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: Fossil fuel terminal zoning amendments

I agree with the zoning amendment to prohibit bulk fossil fuel terminals in all zones and the full wording of the amendment.

Larry Hon
2806 SE 15th Ave
Portland, Oregon 97202
970-618-0129

From: Ruba Leech [mailto:ruba_t@hotmail.com]
Sent: Wednesday, August 24, 2016 3:10 PM
To: Kountz, Steve <Steve.Kountz@portlandoregon.gov>
Subject: Let's Revive Portland's Fossil Fuel Ban!

Dear Mr. Kountz and Portland Bureau of Planning and Sustainability:

In its effort to develop code changes to implement the City's historic November 2015 Fossil Fuel Policy, I am encouraging the Bureau of Planning and Sustainability to return to the initial intent and plain language of the resolution. The resolution stated the City's intent to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways."

In short, I am asking the City to enact a ban of new fossil fuel infrastructure - in particular oil, gas, and coal terminals in Portland.

Unfortunately, the Fossil Fuel Terminal Zoning Amendments discussion draft falls far short of the 2015 Fossil Fuel Resolution that the City Council passed last year. Where the resolution was bold, visionary, and historic, this discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders.

Please revise proposed code changes to include:
- A ban on new bulk fossil fuel terminals
- Strong limits on expansions at existing facilities
- Provisions to improve the safety and resilience of existing terminals

Presently, the discussion draft allows new bulk terminals to be built, setting limits that would significantly increase fossil fuel projects in the City, including 21 million gallons of new crude oil storage and a new LNG tank the size of NW Natural's existing facility in NW Portland. New LNG tanks and petroleum storage (enough to hold 7 unit trains worth of oil) would double down on precisely the kind of fossil fuel projects that the City Council intended to ban in November 2015. Please revise the proposed code changes to ban new bulk fossil fuel terminals.

The proposed code changes would also allow existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals. Proposed code The City of Portland needs to hold these industries accountable for improving their safety without promising them more room to grow. We need to shrink fossil fuel use, not grow it! Please revise proposed code changes to set limits on existing bulk fossil fuel terminals, and add provisions to encourage existing facilities to improve their safety and resilience in a large seismic event.

As one of thousands who supported the City's Fossil Fuel Policy, I urge you to develop a new, strengthened draft before the Planning and Sustainability's Commission's hearing in September.

Sincerely,

Ruba Leech
1128 NE Emerson St
Portland, OR 97211

From: Michael Andersen [mailto:mike.andersen@gmail.com]
Sent: Friday, August 19, 2016 1:44 AM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: support of restrictive fossil fuel zoning proposal

Portland's economy is dangerously overinvested in fossil fuels. A carbon cap or tax is on the way sooner or later, very possibly approved by state voters within several elections; permitting further local investment in the fossil fuel economy will only embed various parts of the local economy more deeply in business relationships, loans and business plans that will and must become inviable as the carbon price ratchets upward.

Every further investment in fossil fuels digs this future economic hole deeper. Portland should stop digging -- no new bulk fossil fuel terminals, no new gas stations, and no city interference with people who use direct action to block fossil fuel trade.

Failing that, the proposed regulations are an acceptable half measure.

Fossil fuel money is stupid money. We don't need it and we don't want it.

Michael Andersen
924 NE 65th Ave Unit B
Portland, OR 97213

-----Original Message-----
From: Brian K. Smith [mailto:brian.k.smith@gmail.com]
Sent: Thursday, August 18, 2016 11:20 PM
To: Planning and Sustainability Commission <psc@portlandoregon.gov>
Subject: PSC Fossil Fuel Zoning Testimony

The proposed limitations are a good first step.

Let's go even farther!

No new bulk fossil fuel terminals of any capacity.
No new gas stations.
City police stop enforcing trespassing laws against protestors interfering with fossil fuel shipments or fossil fuel extraction equipment.
No new fossil fuel vehicles in the city fleet.
More investment in walking, cycling, and public transit at the expense of autos, like the Comprehensive Plan or whatever it's called already says we are doing. (We aren't really doing it...)

I want to be able to tell my grandchildren, "Hey, at least we took the issue seriously and tried to do something, even if it was too little too late."

Sincerely,
Brian K. Smith
924 NE 65th Ave. Unit A
Portland, OR 97213

Portland Planning and Sustainability Commission

September 13, 2016
12:30 p.m.
Meeting Minutes

Commissioners Present: Jeff Bachrach (left at 3 p.m.), Andre' Baugh, Mike Houck, Katie Larsell, Gary Oxman (arrived 1:12 p.m.), Katherine Schultz (by phone; left at 2 p.m.), Chris Smith, Eli Spevak, Teresa St Martin, Maggie Tallmadge

Commissioners Absent: Michelle Rudd

City Staff Presenting: Susan Anderson, Joe Zehnder, Michael Armstrong, Tom Armstrong, Phil Nameny, Steve Kountz

Vice Chair Smith called the meeting to order at 12:31 p.m. and gave an overview of the agenda.

Documents and Presentations for today's meeting

Written testimony received

Director's Report

Susan Anderson

- The draft transmittal letter from the PSC to Council for the Comp Plan Task 5 projects will be shared at the officer meeting this Thursday. We had a work session this morning with Council on the Task 5 projects and will have another on Thursday. I will send an email update with further information.

Consent Agenda

Consideration of Minutes from the August 23, 2016 PSC meeting
Commissioner Bachrach moved to approve the Consent Agenda. *Commissioner Baugh* seconded.

The Consent Agenda was approved with an aye vote.
(Y9 – Bachrach, Baugh, Houck, Larsell, Schultz, Smith, Spevak, St Martin, Tallmadge)

Mass Shelters and Housing Zoning Code Update

Hearing / Recommendation: Joe Zehnder, Phil Nameny

Disclosures from PSC members

- none

Joe gave an overview and background about the project. We are all aware of the rising rents and values of housing in Portland, and their effect on people living or attempting to move here. During discussions at City Council about the state of housing in 2015, these listed issues were noted: increases in rents, low vacancy rates, increases in homeless counts and more people being newly homeless.

Council declared the housing emergency in October 2015. Council also directed the City and County to collaborate on housing programs which led to the creation of the joint office, A Home for Everyone. In March of this year, Council passed two other forms of legislation. The first was a resolution that directed the Bureau of Planning and Sustainability to amend Title 33 "to simplify regulations, remove regulatory obstacles and expedite processes for land use review and permits for affordable housing

projects, mass shelters and short-term housing". This resolution requested to have staff present the council with the PSC's recommendation by December 1 whether favorable or unfavorable. The second was an ordinance that created an alternative land use review process for design or historic reviews for affordable housing projects that met specific affordability standards

Phil reviewed the proposal that the PSC is hearing and considering today. He walked through what temporary housing includes as well as issues and concerns we've heard about from providers.

Several zones that allow mass shelters by right have strict limitations on the number of beds allowed within a wide radius of 1300 feet. If these thresholds are not met, the facility can go through a conditional use review to receive approval.

The amendments increase both the number of overall beds allowed by right in the zones and decrease the separation from 1300 to 600 feet which is closer to about 2.5 to 3 blocks. In many cases the number of beds allowed is proposed to be doubled.

In general, many providers feel that 200 beds is the maximum number that can be efficiently cared for. Other commercial zones are often found within neighborhoods, so the number is smaller to limit the impacts of a by-right facility.

To address a potential issue related to having to provide additional parking, we are proposing to waive any additional parking requirements if the mass shelter is provided on the site of an existing institutional use such as a church, school or other community service use.

Currently there is one conditional use approval process for building a new mass shelter. If they are subject to a CU, they must go through a Type III review which requires a pre-application conference, and a hearing. The timeline and fees can be fairly substantial.

The code amendments add flexibility for where a CU is required. If the shelter is provided in an existing building or on the site of an existing institution, the type of review is a Type II staff review that doesn't require a pre-app and only has a hearing if appealed.

CU approval criteria are also amended for shelters within existing buildings so that the focus is less on traffic/service issues and more on livability issues.

Currently mass shelters are prohibited in EG zones, while all other community service uses including short-term housing is allowed by right. We are proposing that a mass shelter be subject to a conditional use review, so any proposal could have reviewed its impacts on the surrounding employment zone through the approval criteria on a case by case basis.

We are not expanding mass shelters in any other zone where they are currently prohibited such as open space and industrial zones, since there are strong city policies to protect these zones for open space and industrial users.

For short-term housing, there are fewer barriers to entry, especially if they are proposed in commercial or EX zones. However, to create a parallel review path, we are amending the code in situations where we would like the short-term housing requirements to mimic those for mass shelters. This includes similar changes to the Conditional Use review and criteria in certain situations and a similar waiver of parking requirements in situations where short term housing is allowed by right with an existing institution.

Religious institutions are currently allowed to host a temporary transitional household for up to 60 days. This does not need to be within a legal dwelling unit. We have heard that several religious institutions have been interested in hosting a larger number, and some of them have a concern that the 60-day limit does not provide enough time to find more permanent living arrangements. In addition,

the city council passed a resolution in 2011 that allowed a church to host up to 4 car camping vehicles without having any code compliance repercussions, but this has never been codified. Our proposal expands the allowance for a religious institution to host a transitional household from 1 to 4 households as an accessory use and extends the number of days from 60 to 180.

The last item that we are reviewing is in response to the Council's ordinance earlier this year to provide a review option to city subsidy affordable housing projects that go through design or historic review. Our proposal codifies the council provision, but expands equitably city wide instead of only applying it to the central city or gateway plan districts.

This option applies to City Subsidy projects that make at least 20 percent of its units available to people earning 60 percent or less median family income. They can choose one of two ways to review their design or historic review. They can either:

- Follow current procedure which, for projects above certain $ thresholds, requires a pre-application conference and a Type III review with a hearing in front of the design or landmarks commission, or
- They can choose to go through a Type IIx staff level review, where only the appeal is heard in front of the respective commissions. However, this option does require the applicant to present their initial proposal through a design advice request in front of the commission. These requests are normally optional.

Phil noted the project has come down the line quite quickly. It is not the "be all, end all" to address our housing crisis. There are several other projects and conversations currently happening that also address affordability including the mixed use zoning project, the CC2035 Plan and inclusionary housing. Changes to the Zoning Code do not have a large effect on coordination, permitting and fee issues. Those need to be addressed by Council.

Discussion

Commissioner Baugh asked about the DLCD letter.

- We are aware of the requirements to protect industrial and employment lands. In EG, we have just taken the step to make it a conditional use.

Commissioner Tallmadge: We heard this code update doesn't facilitate permitting. We heard that it's not design review that's the most cumbersome but permitting for developers is.

- The permitting package is processes with BDS, PHB and PBOT for the post-land-use parts of the permit. The timing it takes to do all this is a big issue, and any time savings we can do is beneficial. But it's not a Zoning Code issue.
- What has to happen is that there are other steps Council has to look at, for example, waiving certain fees, to help facilitate this. Similarly, with some of the processing pieces, there could be a staff member as a process manager, so Council would have to dedicate fees for this. Again, we can't address this with the Zoning Code.

For the conditional use with EG, how long does the process take and how much does it cost?

- It's being placed in an existing building, which can take 8-10 weeks for that review process. Type II review is about $4000. Type III conditional review (new building) requires a pre-app ($5000) and hearing (3-4 months).

Commissioner Spevak: Religious institutions can have four units. What about people who could sleep in their vehicle? Also, if we go beyond 180 days, would the building department step in if they're buildings? What if people are living in their cars?

- We'll have to check on this. In a building, there needs to be adequate safety components in place. If it's a camping situation, there is a coordination between buildings and state code. The definition of household is a whole line of conditions plus up to five unrelated individuals. So the institution could state that cars with up to 6 people total constitute a household.

In Eugene, their car camping includes a 90-day limit to sleep in your car (they used to not have a limit).

Commissioner Bachrach: This is intended for short-term. Is there a potential for others than religious institutions to provide?

- We're talking about providing housing in an institution that is supportive of households through homelessness that arises through a situation that they face. Under an emergency, this is subject through a separate approach (e.g. winter larger-scale temporary cold-weather shelters). This project is more about seeing the Zoning Code that we've allowed religious institutions to house a family for 60 days, so this is looking to just expand that timeline.

Commissioner Tallmadge: Why don't we extend "religious institutions" in the code to more generally "institutions"?

- We can continue to look at this. Generally other institution provisions don't include this in their use.

Testimony

Ryan Diebert, A Home for Everyone: We are a joint City/County office looking at exactly what it would take to achieve having a home for everyone. Increased investments in affordable housing is the long-term solution. We've provided funding and volunteers to support 650 more beds than currently by the end of the year, but many of these are temporary. Smaller volunteer shelters have faced hurdles in the Zoning Code and onerous challenges getting through Type III land use reviews. I've worked closely with BPS and other bureau staff to develop this draft code update. The proposed changes go a long way to achieving the shared vision and address the concerns we've heard along the way. Staff has done great outreach. Our one recommendation to improve the proposal: providers can usually do 75-100 with greater efficiency than smaller shelters. So where it's allowed, we'd like to see these allowed by right.

Commissioner Baugh: Part of Type III review is community input, but there is less of that with a Type II review. How can we assure the neighborhoods that they'll still be involved? What about services and linking those to the beds?

- Even with a Type II process, there is ample testimony review from the community. Beyond that, we've had excellent opportunities to work with community groups through the siting process. The operation after being permitted is really dedicated by the non-profit partners, often through Good Neighbor Agreements and open dialogue with the community.

Commissioner Bachrach: Is changing from Type II to Type III review the issue?

- The full package and expansion of what's allowed by right helps to address the hurdles providers have faced.

Tad Savinar and Julie Livingston, Portland Design Commission: The reason things are taking so long is the sheer volume of projects coming through. DC has gone from 8 to 24 hours of meeting time in the last few months. The Type II process will increase the workload on BDS staff, which is already overloaded. Staff and DC usually see eye-to-eye on projects. The IIx process could dilute public trust. The buildings built to house low-income should be of a design and quality that make people living there feel good. The timeline in our letter is predicated by the Council. There are unintended consequences as proposed. *see written testimony*

Commissioner Baugh noted the Type III review is not the impediment. There are many elements to how much time it takes to develop in Portland, but the public investment projects are where the process has been streamlined.

Commissioner Tallmadge: You noted two projects in your letter, one a Type IIx and one a Type III.

- Only 2 affordable housing projects have come before the DC in the past months. Without IZ playing a role yet, it is a limited impact. With IZ, there will be more burden on the process.

Commissioner Houck noted the volume of permit applications. Could we expedite projects that involve affordable housing?

- Design Commission has specifically given this opportunity and approach to facilitate a quicker process for affordable housing projects.

Kristen Minor, Historic Landmarks Commission: We concur with the DC comments. We presented a letter to Council in March, and the points are still very salient. Staff was directed to remove obstacles to affordable housing. One is the cost of land use reviews. The PHLC concurs with lowering these fees, but we have strong concerns about reducing the process. Maintaining historic districts is our focus. Changing from a Type III to a Type II review reduces public input.

1. Peter Meijer, AIA: We provide advice to applicants going through Design Review as well as support to staff and the commission to provide initial review on projects. We are supportive of taking down the road blocks to building affordable housing. We are not in favor of the change in review process.

2. Jennifer Chang, PHB: Supports BPS' proposed zoning code update. We applaud the work BPS staff has taken that are responsive to our housing emergency. The proposed code changes increase access to safe options and provide links to support. The simpler review process is helpful.

3. Matthew Tschabold, PHB: PHB and Commissioner Saltzman support these code changes. This is one element of a number of actions being taken by the City. Increase URA funds to housing, homeless services dollars, new CET funds directly for affordable housing, dedication of short-term rental income to affordable housing are some of the other measures we're working on to address our housing and homelessness crisis. We are supportive of the proposed code changes.

   Vice Chair Smith: The challenge we've heard is that Type III may be faster and given more certainty than IIx. Are you confident that IIx provides a faster timeline? What about cost?

   We're still determining if that is the case. There are improvements being made and legitimate concerns about the review process. We should establish the Type IIx and give it a full year then evaluate what adjustments we might need to make going forward to ensure development standards and time to get projects built is efficient and effective. We have to design our buildings to last 60 years of affordability for any building we put financing into. Cost is some of the issue, but we're seeing improvements in both process and cost.

   Commissioner Houck: It seems that what's allowed by right and doubling that will have a large impact on what we're trying to accomplish. Why couldn't you retain Type III in the next year instead of IIx?

   We know that the code allows for increased capacity, but BPS has reached out to shelter providers to hear their concerns about the review process.

4. George Devendorf, Transition Projects: Supports the proposed revisions. We are the largest provider of mass shelters in the area. Current code places many restrictions on a difficult process of siting shelters. The revisions bring thoughtful flexibility to the process. We second Ryan Diebert's comments on lessening the restrictions.

5. Charles Johnson, Oregonians for Food, Shelter Plus: The scope of what we have before us is huge. Any type of human services institution should have the same rights as religious institutions. For a 14-story building, the type of review is not the issue. I don't think the type of review is a make-or-break issue. What matters is displacement of people on the Springwater Corridor and making sure people are not able to use the design code to keep people out of housing. Also be sure to think about balancing historic districts and if those have helped a neighborhood's diversity.

6. Mary Ann Schwab: Upset about what's happening to people. We need quality construction when we're building low-income and mass shelters to meet the needs of people.

7. Andrew Riley, 1000 Friends: Staff have done a good job about siting shelters, but we also have some comments and suggestions. Eliminate all parking minimums. Expand housing options for religious institutions. Allow shelters by right in EG zones. *see written testimony*

Vice Chair Smith closed testimony at 2:04 p.m.

Discussion

Joe: On page 17 of the staff report is a list of use categories in the Zoning Code. We'd like to proposed to amend the staff proposal to include community service, schools, colleges, medical centers and religious institutions.

Regarding Type IIx versus Type III: IIx and III reflected in the proposal is about the development of new affordable housing projects. Staff's proposal reflects you can go through IIx for an affordable housing project. This does not pre-empt choosing a Type III review. Type II has a staff review; on appeal it goes to DC. Type III goes to both staff and DC then can be appealed at Council (using the same criteria). Right now, objectively we don't know which type of review is better. Type IIx is not inherently reducing the quality of design. Type IIx is slightly faster and less expensive. Type III has a wider notification and it goes to a hearing; Type II has a smaller notification process and testimony would be written only.

Chair Schultz: It is a complex issue, but price and timing of the process isn't always consistently more for either a II or III review. Both are expensive because of the process, not necessarily because of fees. Design review can hang things up, and that becomes critical path for the project. So being able to shorten timelines is more at issue than the type of review process. I'm not convinced Type IIx is the right review. I'm almost inclined to side with not preceding with Type IIx.

Commissioner Baugh agrees on the Type II versus III review. Having a staff-level review in a historic district could be problematic.

Commissioner Larsell asked about shelter operators wanting to see the size increase for more efficiency. How would we influence this?

- We talked with providers about the numbers that, as a right, would be appropriate. All can be bigger through a conditional use process. The number may be from a concern about concentration of services in, for example, Old Town / Chinatown.

Commissioner Bachrach: The distinction between review types is minimal for affordable housing. Isn't IIx the resolution directive from Council? I would keep it in.

- Yes.

Commissioner Bachrach: Both Ryan and Transition Projects talked about 75-100 beds as an efficiency number. Are there some zones where they're asking to bump it up?

- Table on page 31 (shelter by right and max number of beds): They are suggesting more be available.

Commissioner Tallmadge: Didn't we say we want to avoid siting additional services in Old Town?
- We'd have to put in a separate provision for excluding this district.

Commissioner St Martin: I'm most concerned about unintended consequences. Type II versus Type III is a good example; maybe we need process help rather than changing the types of review process. I also support reducing parking requirements.

Commissioner Spevak: My frustration is the political leadership. I wish we had more of a chance to put something on the table to help our most in-need people.
I have a few amendments to propose:
- Go from 4 to 10 transitional units. Define a transitional housing unit as up to 3 people. (see page 51).
- 100 days to 365 days.
- Density standard for group living to drop. Not limit the number of people who are living in a structure.
- Drop the definition of household.
- Remove parking minimums for all mass shelters.
- 400 from 600 feet on the siting distance reference.

Vice Chair Smith continued the work session and decision to the September 27 PSC meeting. Commissioners should send in any amendments to staff, and we'll compile these and get through a recommendation at that meeting.

The written record will remain open until this Friday, September 16 at 5 p.m.

Fossil Fuel Infrastructure Code Changes
Hearing: Michael Armstrong, Tom Armstrong, Steve Kountz

Tom and Steve presented an overview of the project.

The *proposed amendments*:
- Define Bulk Fossil Fuel Terminals as a regulated land use.
- Prohibit Bulk Fossil Fuel Terminals in all base zones.
- Existing Bulk Fossil Fuel Terminals would become legal, non-conforming uses that can continue to operate.

We propose a *new land use category*, Bulk Fossil Fuel Terminals:
- Marine, railroad, or pipeline transport access; and
- Transloading facilities (such as train-to-ship) or storage capacity exceeding 5 million gallons.

exclusions:
- Distributors with access exclusively by truck;
- End-user facilities, including filling stations and firms that store fossil fuels for use as an input;
- Recovery or reprocessing used petroleum

Definition
Fossil fuels are petroleum products (such as crude oil and gasoline), coal, and gaseous fuels (such as natural gas, methanol, and propane) that are made from decayed plants and animals that lived millions of years ago and are used as a source of energy.
exclusions: Denatured ethanol and similar fuel additives and biodiesel/renewable diesel with less than 5 percent fossil fuel content are not fossil fuels.

Regarding a restricted expansion of existing terminals, we have three options as ways to proceed:

- As proposed, existing terminals become non-conforming uses. It would be difficult to approve any sort of expansion under current standards.
- Limited use with expansion not exceed 10 percent of the total terminal capacity as of adoption.
- Conditional use that would allow expansion greater than 10 percent through a land use review with special criteria for emergency backup capacity, seismic upgrades, GHG emissions and clean and renewable fuels.

In terms of seismic upgrades to existing tanks, we've recommended additional guidance in the Council ordinance for PBEM and BDS to take on a process similar to what they're doing with unreinforced masonry buildings; depending on the risk and the area, you have a certain timeline to bring the tank up to code. We're also recommending as part of the next Climate Action Plan update is a study of market dynamics around compliance to state codes and make adjustments to these standards as part of that update in 2020. We want to make sure we're not keeping companies from not doing necessary seismic upgrades or to clean, renewable fuels.

Commissioner Bachrach: The proposal to make it a non-conforming use makes it impossible (pretty much) to expand. If the Comp Plan direction is to limit, we are implicitly saying there is no greater need or expansion to meet local demand for the next 20 years.

Commissioner Houck: It would be helpful to know projections for expansions local companies may be looking at.

Commissioner Baugh: What region do the current facilities serve today? How far does that product go? What about growth capacity outside of the Portland region?

- It varies by product. 90 percent petroleum in state is housed in Portland. Some serve a wider area, including all on the west coast. As we define bulk fossil fuels in the Zoning Code we want with numerical standards as a regional.
- The declining trend is statewide. The Portland facilities serve the state, and trends state-wide are flat and declining. Also for natural gas. There is more variety, but it is largely flat.

Disclosures from PSC members

- none

Testimony

1. Arlene Burns, Mayor of Mosier, OR: Supports the proposal. We had a derailment in Mosier and are still dealing with the consequences from it, even though we dodged a large bullet. Infrastructure expansion that could happen would make the Columbia River Gorge into a fossil fuel super highway. All we can do until federal regulations change is to stop expansion. Thank you for addressing the seismic concerns as well.

2. Peter Cornelison, Hood River Councilmember: Supportive of the proposal. Hood River passed a resolution opposing all oil by rail shipments through the Gorge.

3. Joana Kirchhoff, Raging Grannies: Terminals are bad for the climate. Don't renege on Portland's promise. 500 million gallons for storage barrels is too large.

4. Daphne Wysham, PDX350: Spoke to sections 2 and 3 of the memo. Revisions to original proposal should be removed. Revisions give preferential treatment to one industry (bulk fossil fuels). 10 percent expansion option is arbitrary. 5M gallon is also arbitrary. *see written testimony*

5. Marilee Dea, Cully NA: Cully has been told by Multnomah County that it's in the crude oil evacuation zone. The Union Pacific rail line runs through our neighborhood. We are concerned about these trains and were pleased that we have a ban on all new fossil fuel infrastructure.

Don't backtrack on what was passed before. We need to transition away from high-carbon fossil fuel.

6. Damon Motz-Storey: Move to Portland less than two weeks ago. Part of the reason I moved here was because of the beauty of the Pacific Northwest. Don't backtrack on the 2015 Council resolution. I believe we can do better by closing loopholes.

7. Mark Darienzo, Climate Jobs PDX: We are working to transition to a clean work situation and have the labor movement understand the climate change crisis. A move to clean energy jobs should be explicitly supported.

8. Rick Brown, 350PDX: We have context versus specifics. Shared a quote from Mark Jacobson at Stanford about renewables and converting energy infrastructure in Oregon for all purposes by 2050 via wind and solar energy. Many jobs would be added, we'd eliminate emissions and stabilize the economy.

9. Sandy Polishuk, 350PDX: The Carbon 200 is a list of public companies holding most oil, coal and gas reserves. These resources must be kept in the ground and untapped. The resolution also recognizes the critical nature of the climate crisis. Cease investment in fossil fuel infrastructure as it will be abandoned as we move to using only renewable energy. There should be no exceptions on fossil fuel expansion or current terminals. Prevent any aggregate increase in capacity here. *see written testimony*

10. Dr Gregory Monahan, OR Sierra Club: Staff has been operating from a business-as-usual framework. We need to change this. If we wish to create the possibility for future generations, we need to stop the use of fossil fuels. The PSC should take a change perspective. Prohibit new terminals and disallow expansion of existing terminals.

11. Deborah Romerin: Climate change is here, and it is now. I was proud of the Council resolution banning all new fossil fuel infrastructure. PSC should uphold the intention of this and commit to a full ban of new fossil fuel infrastructure nor expansion of existing sites.

12. Patricia Bellamy: Think health and safety for now and the future. I'm concerned about health-related illnesses from climate change. Portland has been a national leader. Strengthen and codify a full ban and expansion. Prevent any new fossil fuel infrastructure building. Citizens and nurses will support you.

13. Sharon Miller: Take this opportunity to make Portland a leader in the climate justice movement. I support a full ban on new fossil fuel terminals; stronger restrictions on expansion of current terminals; and don't allow any aggregate increases either.

14. Dr Rose Christopherson, Care of Creation Ministry: Heard the plans of Union Pacific expansion traffic near Mosier. We've seen that the needs for fossil fuels in Oregon are decreasing. Of course we want to upgrade seismically. But if needs are going down, it seems like we don't want a 10 percent increase allowed. Why not cap it and have the seismic upgrades happen under the limitation?

15. Dr Patrick O'Herron, OPSR: Thank you for the work that's already been done. The best way to honor the resolution is to prohibit terminals and make current ones legal non-conforming uses. Existing fossil fuel infrastructure is already a huge liability. Simplify this work and follow the resolution. *see written testimony*

16. Ragna Merrit on behalf of Dr Diana Rempe: Follow the resolution in its entirety, not whittled away by the code.

17. Bob Sallinger, Portland Audubon: Support the amendments that are being proposed. But you need to add criteria for non-conforming use review. Lower the threshold for new facilities down substantially from the 5 million gallons, which is way too much. Allowing existing facilities to increase 10 percent violates the resolution. I think non-conforming use mechanism is the right one, it sends the right message, and it gives the community a way to challenge the decisions the City makes. *see written testimony*

18. Shanna Brownstein, NW Natural: Local distribution company, provide natural gas directly to end users. Territory from northern Clark County south to Coos Bay, east to The Dalles. NWN owns an LNG tank in the harbor that holds 7 million gallons, which is quite small comparatively. We take safety and environmental stewardship very seriously. We are a state-regulated monopoly, and we must provide reliable service to our customers, which means we need to have backup supplies. This is what the LNG facility is for. *see written testimony*

    Commissioner Houck asked about serving the need to address peak could be done somewhere outside of this liquefaction zone.

    Part of the regulatory process is looking at where we can store gas. The Oregon Public Utilities Commission has found that this facility is necessary for our overall capacity.

19. Amy Monahan, on behalf of high school students: *see video*

20. Mia Reback, 350PDX: Supports lowering terminal threshold from 5 million gallons. Supports the proposal for the legal non-conforming use designation for current facilities. We should criteria in the proposal to specifically address climate and safety. We need to transition to 100 percent renewables now.

21. Nicholas Caleb, Center for Sustainable Economy: NW Natural has been a leader in community philanthropy, but it is still a dirty gas.

22. David van't Hof, Climate Solutions: Supports the process and leadership from the City. We also support the idea that we don't need new fossil fuel terminals. Regarding expansion and the region's need, we shouldn't be required to meet all the needs of the state. Any expansions should be looked at outside of liquefaction zones. Concern that with ethanol no be counted as a fossil fuel and then switch the use. Look carefully at how you can specify that the permit is only applicable if the energy facility use is only for that offered in the permitting process. *see written testimony*

    Commissioner Houck: You noted the concern about aggregation of facilities. Do you have examples of smaller facilities aggregating to a larger overall capacity?

    Examples are in BC. And also the Dakota Pipeline is multiple small projects.

23. Dr Theodora Tsongas: Changes to the proposed draft don't fulfill the resolution from 2015. Strengthen the regulations about existing terminals. Ban all new fossil fuel facilities including those smaller than 5 million gallons. Add language to disallow aggregation.

24. Byran Tenant, NECN: The proposal is moving in the right direction but could be strengthened to meet last year's resolution. A new facility could mean additional more trains traveling through our neighborhoods and adding additional risk to our neighborhoods.

25. Maya Jarrad, 350PDX: Terminal aggregation seems to be allowed in the current proposal. We should add language to limit projects that in aggregate are more than allowed by a single facility. *see written testimony*

26. Chris Turner: The proposed code change does not go far enough. Expansions should not be allowed at all. There is an issue with backup capacity and seismic upgrades, but these need appropriate approval criteria. Allow terminals to be upgraded, but not the capacity.

27. Amirah Field: Fossil fuels are toxic. We are adding work for the trees to combat climate changes. Please don't add to this.

28. Captain Peter Wilcox, Columbia Riverkeepers: Supports further steps to ensure the final zoning does not increase capacity for fossil fuels to come through or be stored in the area. It's important that new policies don't conflict with building new infrastructure for clean fuel storage such as biodiesel. *see written testimony*

29. Mike Litt: Why do you think that expansion of fossil fuels capacity may be necessary because of the clean fuels program? Why is it that there is a suspicion that expansion under 5 million gallons may be necessary? *see written testimony card*

30. Rob Lee, Linnton NA: No new or expanding, including height, of tank farm facilities. These should be moved to non-liquefiable lands. *see written testimony*

31. Denise Weller, Linnton NA: Zoning is about protecting people. Tank farms in Linnton are on liquefiable lands. *see written testimony*

32. Nancy Harrison: Thank you for the work you've done on this issue. I have a number of considerations about the amendments. Since we've seen that our use is going down, we shouldn't allow exemptions for new facilities of any size or 10 percent capacity increases. Seismic retrofits would be a good thing to allow.

33. Alona Steinke: What happened between the proposed code and what the Council resolution stated? We need to ban all new fossil fuel terminals as was the intent of the resolution.

34. Don Steinke: Local ports are seen as the fastest route to Asia. A number of west coast cities have banned or reduced capacity for the number of trains they're allowing through or crude oil terminals to be built. Portland is not on this list. The proposed code enables more trains to come through the Gorge to Portland.

35. Tom Sincic: We can't measure need by demand; we need less fossil fuels. Referenced a World Health Organization report on air quality.

36. Tori Cole, SEIU 503: Reject building of any and all new fossil fuel infrastructure in Portland. Transition to 100 percent renewables by 2050. Make deliberate choices for our future. Invest in renewable fuels infrastructure. Don't be divided by labor or environment… it's both or neither. *see written testimony*

37. Charles Johnson, Oregonians for Food, Shelter Plus: Council needs your help. they support the Standing Rock Sioux Tribe. Don't save stranded assets but save the future for the children. Don't make something easier for a fossil fuel terminal. Reduce the 5 million gallons to zero. Don't worry about saving old technology that is holding us back from safer, newer technology.

38. Edith Gillis: Supports a total ban on all new fossil fuel infrastructure. Ban anything larger than the existing truck stops. Oppose allowing the 5-million-gallon exception. Improve and add to permit review to save Portlanders money and risk.

39. Cody Tucker: The current policy draft is not enough to significantly combat climate change. We can't consider building any new facilities without upgrading our current ones for safety.

40. Julio Forges: Originally from Haiti. Our biggest problem at home today is environmental degradation. I'm here working with 350PDX. People in my country feel climate change and suffer the consequences. Beaches are disappearing into the ocean. Portland is a leader in the US and the world against fossil fuels.

41. Mukta Akter: From Bangladesh, one of the most climate change impacted countries in the world. I'm here working with 350PDX. It is mainly a low-elevation country, and that coupled with increasing storms have been devastating. Our country contributes extremely minimally to global carbon emissions but has experienced the effects of climate change more than most countries. Much more needs to be done. *see written testimony*

42. Julie Chapman, League of Women Voters: Global climate change is the largest issue. Any increase in expanding fossil fuels goes against our need to invest in renewable and clean energy industries. We need to shift rapidly to energy sources that don't emit GHGs. *see written testimony*

43. Dawn Smallman: Hold true to Council's resolution and a full ban on all new fossil fuel facilities. Portlanders don't want these dangerous shipments coming through the Gorge and along our waterways through the city. Regulate current terminals as non-conforming uses. Seismic upgrades should be required. Also require public safety and risk, risk to waterways, transit, and criteria that take climate change into consideration. *see written testimony*

44. Micah Meskel: NW Natural and staff have a fear about a non-conforming use designation could stall or eliminate seismic upgrades. Only one of the facilities are being upgraded annually. We should encourage the upgrades. At the current rate, we have a public safety and environmental risk.

45. Marcia Denison: Don't put more facilities (bombs) on our land. No more oil tanks on my river.

46. Ted Gleichman, OR Sierra Club: Pass the strongest ban possible on fossil fuel infrastructure and new facilities. *see written testimony*

47. Samantha Bailey: Children should not be responsible for having to deal with this and coming to testify. They are trying to fix their future, but that is our job.

Vice Chair Smith closed oral testimony at 4:52 p.m. Written testimony will remain open through Friday, September 16 at 5 p.m.

Discussion

In terms of the 5-million-gallon recommendation, Michael noted this allowance was responsive to the Council resolution. We want to oppose expansion but not hamper seismic upgrades. We need to accommodate regional demand, but people disagree about if demand is going down or up. The other piece is to enable blending of fuels. As we get new fuels coming in, you have to mix things in a tank. We don't know about the size of those tank requirements, so there is likely some need for infrastructure (tanks) to do this. To accommodate seismic upgrades, about one tank per year is being retrofitted. When they are retrofitted they are slightly larger. The question of the number is certainly worth discussing.

Commissioner Tallmadge: Why can't we require seismic upgrades to the current tanks?

- We could, but it's much bigger than that. It takes time and money, and there are issues around our ability versus state and national government.
- Seismic standards are embedded in the state building code. The City administers the code. In Oregon you have to comply with current codes, but there's little done about enforcing

retrofits. This is a barrier we've faced, and we'd need to go to the state to get the authority to preempt the state codes.
- Looking at the energy code, for example, Portland has wanted to have a stricter code than the state has allowed us to have. In this case, the way to do it is to build a coalition and go to the state level.

Commissioner Spevak noted the property maintenance code. Is there a way we could say you're built under codes from the past, but you need to conform to today's restrictions?

Staff is interested in working with BDS on non-conforming use as an option, but we wanted to list the other options as well. We can come up with standards around non-conforming versus a conditional use. In the end we have a higher bar under non-conforming because the presumption there is that these will go away in the future.

Vice Chair Smith: My guess is that some of these facilities are viable outside liquefaction zones. Could NW Natural store their gas elsewhere with pipelines and trucks to transfer it? Yes. But most of our industrial lands in Portland are in some sort of liquefaction- or other-impeded location.

Commissioner St Martin noted the energy corridor overlay zone concept. In light of the liquefaction zone, could that be an overlay that has some requirements about what can and can't be developed there? The transition to clean fuels is a safety question. Encouraging these in the liquefaction zone is also not a good idea.

Commissioner Oxman: Concerned about the seismic situation, which is huge health and safety issue. I like the non-conforming use strategy, but I'm not sure if it's realistic or that it makes sense. If we can allow for diminishing fuel use and seismic upgrades over about 20-30 years, that would be a good discussion. The issue of smaller facilities aggregating: you sited 130 small facilities that haven't been inventoried. Is there a huge hole in the policy by setting the limit at "x million"? We need to better understand the market and capacity. I don't think it makes sense to have ethanol on this list.

Commissioner Spevak: We have a role to incent improvements, but I'd like to hear more about the BDS side to require upgrades. Also, Council gave us direction to look at both storage and transport. I don't see any reference about throughput. By just regulating the size of tanks, the throughput could still continue to grow. Storage size is only an indirect way to address transport, so I'd like to see more direct information about quantity and time. It seems the code doesn't address if someone wants to build a pipe directly through Portland to a transfer facility elsewhere.
- Stand-alone pipelines were not part of this proposal.

Commissioner Houck: The document is pretty good. I do have concerns with the proposed changes and in reading it, it seems like lots of policy is being affected by BDS' concern about workload and expertise. I don't think that should drive this type of decision. We can address that separately. I'd like to get as much out of the liquefaction zone. I support non-conforming use, but if it inhibits retrofitting, that is a concern. If the big one hits, I am not sure if have confidence that seismic upgrades will do the job anyway. I did meet with NW Natural, and I heard their concerns about the non-conforming use option.

Commissioner St Martin: I noted my concerns about safety and expansion in the liquefaction zone. Also, if we have more frequent service (trucks and/or trains) to smaller tanks, that is a concern.

Commissioner Larsell: I'm concerned about unintended consequences. I don't want us to pass anything that would cause more transportation of fossil fuels coming through the Gorge. The worst issue in an earthquake are the tanks along the river. How many of the companies that have fuels in Portland are included in the OPUC?
- NW Natural and electric companies.

Commissioner Baugh: Throughput is a big deal. If the price is right, facilities can put a lot of product through without expanding or at least for very few dollars. There is the question of "regional". We are regulating facilities that are broader than the city of Portland. There are a series of regulations from Homeland Security around use that we don't want to take issue with.

Vice Chair Smith: Do we have an obligation for regional consultation with Metro? Have we sufficiently done an economic analysis as required in the resolution? There is an exception for recycled oil, but that is particularly dirty. What about language to cover the change in use loopholes? The Linnton question about the 400-foot buffer is a good one. If the quake does hit, how would we want these facilities rebuilt? A different pattern of development? Should we try to capture that in the code?

Commissioner Tallmadge: If we were to build a coalition and go to the state for new seismic standards, is it possible to build the concept so that it's elective for any given jurisdiction?

- Lots of legislation is enabling to give local governments flexibility.

Staff will take these questions from Commissioners and put together a memo to the PSC. We will summarize additional written testimony we receive and will have proposals for your consideration on October 11. Also to note, there will be a Council work session on this topic next Tuesday at 10:30 a.m.

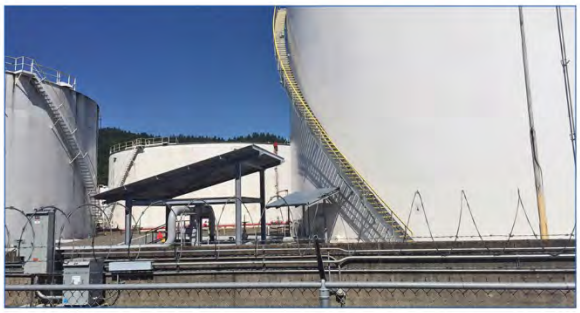
Adjourn
Vice Chair Smith adjourned the meeting at 5:24 p.m.

Submitted by Julie Ocken











Fossil Fuel Terminal Zoning Amendments

Proposed Draft

City of Portland, Oregon
August 12, 2016

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.
City of Portland, Oregon

How can I provide feedback to decision-makers?

The Fossil Fuel Terminal Zoning Amendments project would begin to implement new policy direction on fossil fuel distribution and storage facilities through changes to the Zoning Code. This proposal would restrict development and expansion of bulk fossil fuel terminals.

You may testify about proposed changes to the Planning and Sustainability Commission (PSC) in the following ways:

Testify in person at the PSC public hearing.
You may speak for 2 minutes to the Commission, and your testimony will be added to the public record.

> **PSC Fossil Fuel Terminal Zoning Amendments Public Hearing**
> Tuesday, September 13, 2016 at 12:30 p.m.
> 1900 SW 4th Avenue, Room 2500, Portland, OR
> To confirm the time and date, check the PSC calendar at www.portlandoregon.gov/bps/35452

Testify in writing between now and September 13, 2016.
Please provide your full name and mailing address.

- Email: *psc@portlandoregon.gov* with subject line "PSC Fossil Fuel Zoning Testimony"
- U.S. Mail: Portland Planning and Sustainability Commission, Fossil Fuel Zoning Testimony, 1900 SW 4th Ave., Suite 7100, Portland OR 97201

Next Steps

The PSC may amend this proposal and will subsequently vote to recommend the code changes to Portland City Council. This is called the *Recommended Draft*.

Recommended Draft: City Council will hold an additional public hearing and take formal public testimony on the Recommended Draft. The City Council may amend the Recommended Draft before they vote to adopt the code changes. This will likely occur in December 2016.

The Bureau of Planning and Sustainability is committed to providing equal access to information and hearings. If you need special accommodation, please call 503-823-7700, the City's TTY at 503-823-6868, or the Oregon Relay Service at 1-800-735-2900.

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Acknowledgments

This report was written by project staff from the City of Portland Bureau of Planning and Sustainability.

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1. Introduction

In recent years, the rapid development of fossil fuel resources in the Western United States and Canada has prompted many proposals in the Pacific Northwest for new large fuel terminals and infrastructure projects. In early 2015, Pembina Pipeline Corporation proposed a propane terminal in Portland that drew substantial public opposition. Mayor Charlie Hales withdrew a proposed zoning code amendment that the development needed to move forward, effectively blocking that proposal. In November 2015, Portland City Council adopted Resolution 37168 calling for opposition to expansion of fossil fuel infrastructure. In June 2016, City Council adopted the 2035 Comprehensive Plan, which included Policy 6.48 to limit fossil fuel distribution and storage facilities to those needed to serve the regional market. This code-change project begins to implement the policy direction in the resolution by prohibiting large bulk fossil fuel terminals.

Project summary

The Fossil Fuel Terminal Zoning Amendments project would restrict the development and expansion of Bulk Fossil Fuel Terminals.

Proposed zoning code amendments:

- Identify "Bulk Fossil Fuel Terminals" as a regulated land use, characterized by marine, railroad, or pipeline transport access and storage capacity exceeding 5 million gallons.
- Prohibit Bulk Fossil Fuel Terminals in all base zones.
- Existing Bulk Fossil Fuel Terminals would become legal, non-conforming uses that can continue to operate. Expansion would be limited to their current site and require approval through a Nonconforming Situation Review.

Why is this important?

Fossil fuel distribution policy – New policy directions adopted by City Council in November 2015 and in the 2035 Comprehensive Plan would limit fossil fuel distribution and storage facilities to those serving the regional market. City Council adopted these policies after holding public hearings and hearing testimony from hundreds of Portlanders.

Climate action goals – Fossil fuels are major contributors to climate change and pollution. The rapid development of fossil fuel resources in the Western United States and Canada has prompted many recent proposals for new export terminals in the Pacific Northwest. The City's Climate Action Plan seeks to reduce greenhouse gas emissions with fossil fuels being the largest source of emissions.

Public safety and environmental protection – Several recent accidents involving fossil fuel distribution across the nation and in Oregon highlight public safety risks in cities and environmental risks along rivers. Most of Portland's industrial areas have moderate-to-high liquefaction susceptibility in a major earthquake.

Oregon's industrial and distribution center – Portland is Oregon's largest, most diverse distribution hub, and existing Portland petroleum terminals serve more than 90 percent of the statewide market. Proposed code changes would restrict the expansion of these facilities in Portland.

Project scope and timing

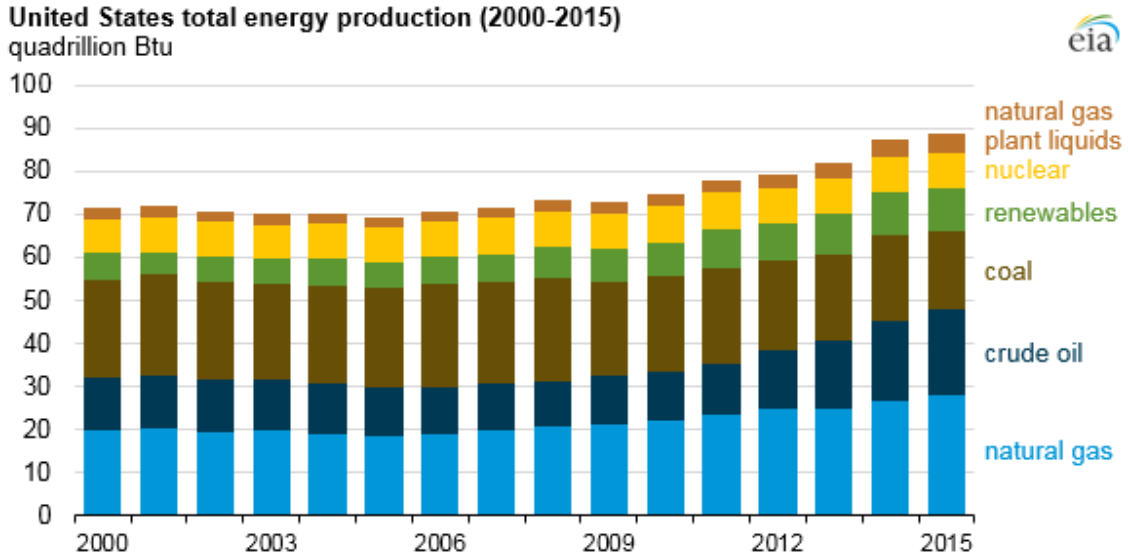
The energy distribution market in the Pacific Northwest is changing. Production of crude oil and natural gas, particularly from North Dakota, has substantially increased in the U.S. since 2009, as shown in Figure 1. In turn, several large new fuel distribution terminals have been proposed in the Pacific Northwest to access West Coast and export markets, as shown in Figure 2. Similar trends have occurred in Alberta and British Columbia.

This project is proposing a prompt, focused response to these market changes. The proposed code amendments will restrict development of new fossil fuel terminals and limit the expansion of existing terminals, consistent with City and State objectives on climate change and public safety.

Where are Portland's existing bulk fossil fuel terminals?

Portland's industrial districts are Oregon's largest seaport, rail hub and truck distribution center. The Northwest Industrial District in Portland is also the end of the Olympic Pipeline, which supplies most of Oregon's petroleum fuels from Puget Sound refineries. The ten petroleum terminals located in Northwest Portland are the gateway distribution facilities serving Oregon and Southern Washington markets. Additionally, NW Natural's GasCo terminal provides peak-consumption storage of natural gas for much of the regional market. In Northwest Portland, these "tank farm" storage facilities have direct access to pipeline, deep-water port, railroad and truck route infrastructure.

Figure 1. Increasing U.S. energy production



Source: U.S. Energy Information Administration, 2016

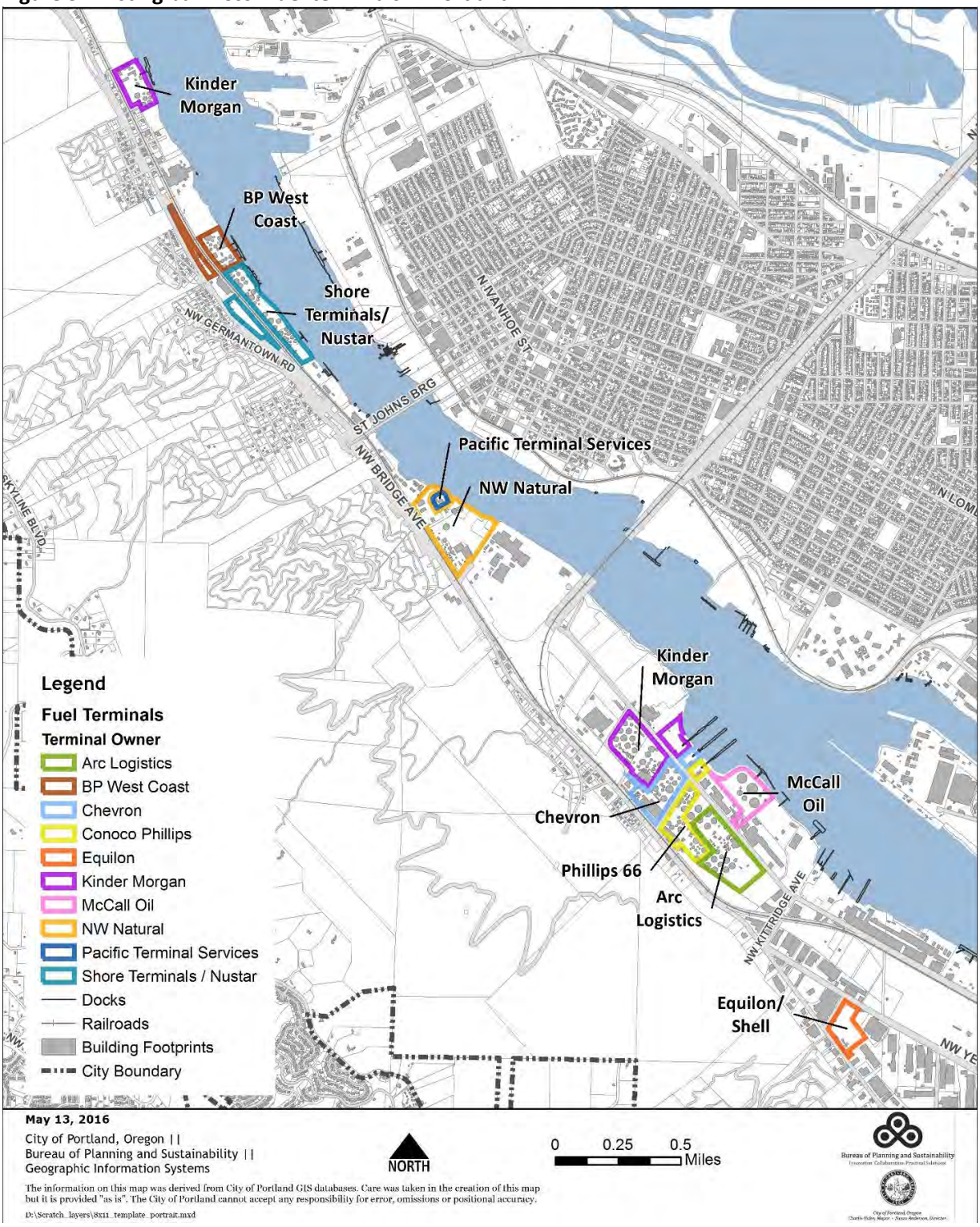
Figure 2. Examples of recent fossil terminal proposals in the Pacific Northwest

Operator	*Facility type*	*Location*	*Proposed new storage capacity*
Petroleum fuels			barrels
Vancouver Energy	Crude oil terminal	Vancouver WA	2,160,000
Imperium Renewables	Biofuels terminal	Grays Harbor WA	720,000
Gaseous fuels			gallons
Oregon LNG terminal	New LNG terminal	Warrenton OR	84,000,000
Jordan Cove LNG	New LNG terminal	Coos Bay OR	84,000,000
Pembina	Propane terminal	Portland	35,000,000
Haven Energy	Propane terminal	Longview WA	23,000,000
Coal			Stockpile acres
Millennium Bulk Terminal	Coal terminal	Longview WA	~20
Ambre Energy	Coal transload facility	St. Helens OR	no storage
Gateway Pacific Terminal	Coal terminal	Bellingham WA	80



Five petroleum terminals are located in the Willbridge area of NW Portland.

Figure 3. Existing bulk fossil fuel terminals in Portland



What's in this report?

This *Proposed Draft* of Fossil Fuel Terminal Zoning Amendment is proposed by the Bureau of Planning and Sustainability for consideration by the Planning and Sustainability Commission. The audience is the Commission and the general public, including stakeholders, inter-governmental partners, implementers and other interested parties. Project stakeholders include property owners, businesses, employees, residents, neighbors, business district and neighborhood associations, underrepresented and underserved groups, environmental groups and other community groups. Implementers include the real estate industry, development review staff and others who use the zoning code.

Your feedback on the Proposed Draft should be directed to the Planning and Sustainability Commission (PSC). You may testify about the proposed changes in person at the PSC public hearing on September 13, 2016, or testify in writing before the public hearing (see information about how to provide feedback on the inside cover of this report).

This report consists of seven parts:

- **Section 1** introduces the project.
- **Section 2** describes how the proposed code changes implement City policies in Resolution 37168 and the 2035 Comprehensive Plan.
- **Section 3** summarizes public and stakeholder involvement activities that have helped shape and inform this project.
- **Section 4** describes background conditions that inform the proposed zoning changes.
- **Section 5** describes the analysis of proposed zoning concepts, including related policy directions, implementation issues and rationale.
- **Section 6** specifies the draft code language, along with code commentary pages that clarify expected implementation.
- **Section 7** recommends future implementation directions for building code amendments to address seismic resilience and periodic monitoring for code effectiveness.

2. Policy direction

Section 2 describes how the proposed code changes implement relevant City policies in Resolution 37168 and the Comprehensive Plan.

City of Portland Fossil Fuel Resolution 37168

> BE IT RESOLVED, that the City Council will actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways; and

The proposed zoning code changes are a key implementation action of Resolution 37168, adopted November 2015. Addressing the overall direction of the resolution to oppose expansion of fossil fuel distribution and storage infrastructure, this project proposes to restrict development and expansion of bulk fossil fuel terminals.

> BE IT FURTHER RESOLVED, that this Resolution does not restrict:
> 1. improvements in the safety, or efficiency, seismic resilience, or operations of existing infrastructure;
> 2. the provision of service directly to end users;
> 3. development of emergency backup capacity;
> 4. infrastructure that enables recovery or re-processing of used petroleum products; or
> 5. infrastructure that will accelerate the transition to non-fossil fuel energy sources; and

The proposed code changes will require a discretionary land use review for many of the exceptions listed in the Resolution. Expansion projects at existing fuel terminals that improve safety (1), provide wholesale fuel supply to local or regional end users (2), add backup capacity (3), or add tanks for clean/renewable fuels (5) would require approval through a Nonconforming Situation Review. The review criteria include that, with mitigation measures, there will be no net increase in overall detrimental impacts on the surrounding industrial zone (such as hours of operation and vehicle trips) and the expansion will not detract from the desired function and character of the industrial zone. Terminal improvements would also be limited to their existing site area. Improvements that address the exceptions 1-5 in the Resolution are not generally expected to result in additional detrimental impacts on the surrounding industrial zone. The proposed code changes also substantially address exceptions 2 and 4 in the Resolution through exclusion of specific end-user facilities and recovery or re-processing of used petroleum products from the proposed new land use restrictions on Bulk Fossil Fuel Terminals.

> BE IT FURTHER RESOLVED, that City bureaus are directed to examine existing laws, including those related to public health, safety, building, electrical, nuisance, and fire codes, and develop recommendations to address fossil fuels that strengthen public health and safety; and

The resolution broadly addresses fossil fuel infrastructure. The zoning code regulates land use patterns and development of fossil fuel distribution facilities on parcels. Zoning does not regulate the quantity of products handled (throughput) on developed sites or their destination (such as exports). Additional amendments to building, fire and energy codes would need to be addressed in future projects.

BE IT FURTHER RESOLVED, that the Bureau of Planning and Sustainability is directed to develop proposed code changes for Council consideration to advance the policies set forth in this Resolution; and

The proposed project will specifically implement this provision of the resolution.

BE IT FURTHER RESOLVED, that prior to any further Council action, the mayor shall schedule (1) a work session to review any proposed code changes and (2) an executive session to review the legal considerations of any proposed code changes; and

The proposed project will implement this process requirement of the resolution.

BE IT FURTHER RESOLVED, that the Bureau of Planning & Sustainability shall undertake an analysis of the economic impacts of any proposed Code changes to advance the policies set forth in this resolution, with a particular focus on potential impacts to local blue-collar jobs; and

This report includes summary analysis of economic impacts in Section 4, specifically addressing impacts on middle-wage blue collar jobs. Analysis to date is limited on the potential impacts on fuel supply to meet regional demand. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts, or may plateau and decline with implementation of climate resilience goals and strategies. Staff will continue to research and analyze potential economic impacts of proposed code changes prior to adoption.

BE IT FURTHER RESOLVED, that the City and applicable bureaus shall seek and identify opportunities to invest in Portland's 'human infrastructure' by supporting programs to retrain our workforce as the city transitions to a clean energy economy; and

This provision of the resolution is expected to be implemented as a future action.

BE IT FURTHER RESOLVED, that the City shall consult with its Tribal Government Partners, the State of Oregon, local governments, and other key stakeholder including labor, business, environment, neighborhoods and communities of color in advancing this policy;

The Mayor's Office staff has sought input from and will continue to reach out to the entities identified above to implement this process requirement of the resolution.

Guiding principles of the 2035 Comprehensive Plan

The Comprehensive Plan sets five Guiding Principles, which encourage balanced, integrated multi-disciplinary approaches that must comply with the Plan. This project is consistent with the Guiding Principles because it promotes major benefits to human health and safety, environmental health and resilience, and integrates considerations for economic prosperity and equity.

Economic prosperity

Guiding Principle: Support a low-carbon economy and foster employment growth, quality education and training, competitiveness, and equitably-distributed household prosperity.

The proposed code changes would restrict expansion at existing fuel terminals and prohibit new terminal development, impacting associated job growth and tax revenue. The proposed code

restrictions on fossil fuel terminal development would also limit potential financial risks from a major accident involving fossil fuel infrastructure.

Human health

> *Guiding Principle:* Avoid or minimize negative health impacts and improve opportunities for Portlanders to lead healthy, active lives.

Major benefit – The proposed code changes would reduce the scale of low, but potentially catastrophic, safety risks associated with the growth of fossil fuel infrastructure, including oil train derailments, explosive accidents at liquefied natural gas (LNG) and liquefied petroleum gas (LPG) facilities, and seismic risks of tank farms. Fossil fuel emissions and coal dust are also significant sources of air pollution associated with respiratory disorders.

Environmental health

> *Guiding Principle: Weave nature into the city and foster a healthy environment that sustains people, neighborhoods, and wildlife. Recognize the intrinsic value of nature and sustain the ecosystem services of Portland's air, water, and land.*

Major benefit – The human health benefits described above also extend to environmental health. The proposed code changes would reduce the scale of environmental health risks associated with the growth of fossil fuel infrastructure, including oil train derailments along the Columbia River, LNG and LPG facilities in riparian areas, and seismic risks of tank farms along the Willamette River. Fossil fuel emissions are also a significant source of air pollution.

Equity

> *Guiding Principle: Promote equity and environmental justice by reducing disparities, minimizing burdens, extending community benefits, increasing the amount of affordable housing, affirmatively furthering fair housing, proactively fighting displacement, and improving socio-economic opportunities for under-served and under-represented populations. Intentionally engage under-served and under-represented populations in decisions that affect them. Specifically recognize, address, and prevent repetition of the injustices suffered by communities of color throughout Portland's history.*

The proposed code changes would restrict expansion at existing fuel terminals and prohibit new terminal development, impacting associated middle-wage, industrial job growth that disproportionately benefits workers of color. Restricting potential increases in regional supply of fossil fuels could also have regressive impacts of increasing fuel costs, disproportionately affecting lower-income people.

Resilience

> *Guiding Principle: Reduce risk and improve the ability of individuals, communities, economic systems, and the natural and built environments to withstand, recover from, and adapt to changes from natural hazards, human-made disasters, climate change, and economic shifts*.

Major benefit – The proposed code changes would restrict development of fossil fuel terminals consistent with City and State objectives on climate change and public safety. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, substituting these fuels for higher-carbon fuels does not begin to approach the goal of an 80% reduction in carbon emissions by 2050 established in Portland's Climate Action Plan or the State's 75% goal.

2035 Comprehensive Plan policies specifically implemented in this project

The proposed zoning changes in the project are implementing the following specific policies.

Overall project direction: Fossil fuel distribution

> *Policy 6.48 Fossil fuel distribution. Limit fossil fuel distribution and storage facilities to those necessary to serve the regional market.*

The proposed code changes would implement Policy 6.48 by restricting development and expansion of fossil fuel distribution terminals. Analysis to date on the potential impacts of code amendments in constraining fossil fuel supply to meet regional demand is limited. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts reviewed in Section 4, or may plateau and decline with implementation of climate resilience goals and strategies. The Zoning Code provides discretionary flexibility for expansion of existing fuel terminals within their existing site area through a non-conforming situation review, subject to mitigating any net increase of detrimental impacts on the surrounding industrial zone.

Related policy directions

> *Policy 4.81 Disaster-resilient development. Encourage development and site-management approaches that reduce the risks and impacts of natural disasters or other major disturbances and that improve the ability of people, wildlife, natural systems, and property to withstand and recover from such events.*
>
> *Policy 4.82 Portland Harbor facilities. Reduce natural hazard risks to critical public and private energy and transportation facilities in the Portland Harbor.*

Policies 4.81 and 4.82 are partly met by prohibiting fuel terminal development in Portland's industrial areas that are predominantly in locations with high susceptibility to soil liquefaction (see Figure 7 in Section 4). Incremental expansion at existing terminals also provides a pathway for market-driven safety improvements, providing financial return to cover improvement costs. As described above, the Zoning Code provides discretionary flexibility for such expansion through a nonconforming situation review.

> *Policy 6.2 Diverse and expanding economy. Align plans and investments to maintain the diversity of Portland's economy and status as Oregon's largest job center with growth across all sectors (commercial, industrial, creative, and institutional) and across all parts of the city.*
>
> *Policy 6.5 Economic resilience. Improve Portland's economic resilience to impacts from climate change and natural disasters through a strong local economy and equitable opportunities for prosperity.*
>
> *Policy 6.6 Low-carbon and renewable energy economy. Align plans and investments with efforts to improve energy efficiency and reduce lifecycle carbon emissions from business operations. Promote employment opportunities associated with the production of renewable energy, energy efficiency projects, waste reduction, production of more durable goods, and recycling.*

The proposed code changes are consistent overall with the range of direction in Policies 6.2, 6.5 and 6.6, providing code-limited flexibility for incremental expansion of existing terminals as part of a diverse, expanding economy and prohibiting development of new fossil fuel terminals that conflict with resilience and climate action goals.

Existing Comprehensive Plan policies specifically implemented in this project

The 2035 Comprehensive Plan was adopted in June 2016 and is not expected to take effect until early 2018. In the meantime, the existing Comprehensive Plan is in effect.

> *Policy 7.6 Energy Efficient Transportation. Provide opportunities for non-auto transportation including alternative vehicles, buses, light rail, bikeways, and walkways. The City shall promote the reduction of gasoline and diesel use by conventional buses, autos and trucks by increasing fuel efficiency and by promoting the use of alternative fuels.*
>
> *Policy 7.8 Energy Supply. The City shall promote conservation as the energy resource of first choice. The City shall also support environmentally acceptable, sustainable energy sources, especially renewable resources such as solar, wind, hydroelectric, geothermal, biomass (wood, farm and municipal waste), cogeneration, and district heating and cooling.*

The proposed code changes are consistent with Policies 7.6 and 7.8, promoting the use of alternative energy sources by restricting development and expansion of fossil fuel terminals.

2015 Climate Action Plan

> *Goal: Reduce local carbon emissions 80 percent from 1990 levels by 2050, with an interim goal of 40 percent by 2030.*

As described in Section 4, lower-carbon fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, but they do not approach the goal of an 80% reduction in carbon emissions by 2050 in Portland's Climate Action Plan or the State's 75% goal. Investments in major infrastructure typically take decades to recoup, and the transition to renewables needs to go much faster than that to stabilize global emissions. The proposed code changes are consistent with the 80% goal of the Climate Action Plan by restricting development of fossil fuel terminals.

3. Public and stakeholder involvement

Section 3 summarizes public and stakeholder involvement activities that have helped shape and inform this project. Stakeholder focus group results are further explained in Appendix A of this report.

What have we heard leading up to this project?

Public hearings at the Planning and Sustainability Commission and City Council on the Pembina terminal development proposal in 2014 and Resolution 37168 in 2015 drew testimony from hundreds of people. The overall theme of that testimony was strong objection to the Pembina project and support for the fossil fuel resolution. Primary reasons included the neighborhood safety and health risks and inconsistency with the City's climate action objectives. The Resolution also drew letters with strong opposition from state and regional business associations.

Following adoption of the Resolution in November 2015, City Council added the related Policy 6.48 on fossil fuel distribution to the 2035 Comprehensive Plan, reflecting the recently adopted policy direction in the Resolution. Public involvement in the Comprehensive Plan Update included public hearings in April 2016 on City Council amendments and thousands of comments on the 2035 Comprehensive Plan over the previous 8 years. The proposed code amendments are consistent with several sustainability-related policies in the Plan. Addressing issues with policy tradeoffs, the 2035 Comprehensive Plan calls for a balanced, integrated approach to implement multiple goals. As described in Section 2, the proposed code amendments provide major benefits toward implementing three of the Plan's five guiding principles and integrates consideration of the other two guiding principles.

Public involvement activities in this project

Extensive public comments were received on the Discussion Draft and influenced substantial changes between the Discussion and Proposed Drafts.

Over 700 people sent emails asking for a "full ban" on new and expanded fossil fuel terminals. Their comments included three generally consistent recommendations: a ban on new bulk fossil fuel terminals; tight limits on expansion at existing facilities; and provisions to improve the safety and resilience of existing terminals. Common themes of these comments included:

- return to the initial intent and plain language of the resolution;
- where the resolution was bold, visionary, and historic, the discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders;
- the discussion draft allows new bulk terminals to be built and existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals;
- transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes;
- require existing fossil fuel terminals to make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River;
- invest heavily in renewables with and urgency befitting the climate crisis.

Similar comments for further restrictions on terminal growth and seismic improvements were also made in letters from 350PDX, Portland Audubon, Center for Sustainable Economy, Columbia Riverkeeper, Oregon Sierra Club, Climate Solutions, members of a City Club seismic safety subcommittee, Linnton Neighborhood Association, League of Women Voters and other residents. Examples of other concerns raised in those letters include that code changes serve as a bold model for other jurisdictions; to partner with Portland Bureau of Emergency Management on seismic safety; and to clarify forecast growth methodologies relative to climate policies.

Themes of comments on the Discussion Draft from business and labor organizations included opposition to proposed code changes, requests for more time and analysis, and clarifications to address practical considerations. Letters were received from NW Natural, Port of Portland, Columbia Pacific Building and Construction Trades Council, Kinder Morgan, Arc Terminals, and Western States Petroleum Association (WSPA). Some examples of comments included that growth rates will change over time, that fuels meeting Oregon's Clean Fuel Standard should be excluded, inclusion of non-fuel methanol is inconsistent, and the economic analysis is cursory. WSPA submitted draft code language, including focusing terminal restrictions on extra-regional facilities beyond the West Coast (PADD V) region and a new Energy Corridor Overlay Zone that protects the historic energy cluster for energy infrastructure growth.

Public involvement in concept development for the project consisted primarily of four stakeholder focus groups, which were held in June 2016 to review preliminary code concepts and help identify and understand potential implementation issues. The focus groups highlighted the range of stakeholder perspectives and interests concerning proposed zoning changes. Figure 4 summarizes the themes of issues raised in the focus groups. Other outreach activities have included meetings with interagency partners, terminal operators, and other interested stakeholders. These activities and what we heard in them are further described in the appendix of this report.

Inter-governmental coordination

The Mayor's Office staff has sought input from and will continue to reach out to Tribal Government Partners to shape and inform the draft code amendments.

An In-House Draft Report was circulated to inter-bureau partners in June 2016, and their comments have helped to shape and inform the Discussion Draft, particularly addressing code administration and legal limitations. Bureau of Planning and Sustainability staff will continue to meet with inter-governmental partners to refine responses to implementation issues.

Figure 4. Summary themes of stakeholder focus group comments

TOPIC	FUEL TERMINAL REPRESENTATIVES	ENVIRONMENTAL AND HEALTH ORGANIZATIONS	STATE AND REGIONAL BUSINESS ORGANIZATIONS	NEIGHBORHOOD AND EQUITY ORGANIZATIONS
Key issues	▸ We've operated safely for decades. We meet the federal/state low-carbon fuel standards. ▸ Difficult to participate: very quick process; emotionally driven; antitrust restrictions. ▸ Unintended impacts: harder to meet clean fuel standards; more trucks on road; costs to rest of the state.	▸ Looking for strong, model code. Expect community backlash if expectations not met. ▸ Safety needs to be integral with climate - Mosier oil train wreck; terminals in liquefaction soils. ▸ Include disaster risks in economic analysis. Bonding or insurance for worst case.	▸ Resolution requires more research on economic impacts, etc. ▸ How will the code hold up in 5 years? ▸ What is the goal? If climate or safety, zoning tool is not the right fit. ▸ Portland is not an economic island. Statewide impact. ▸ Big political decision. Don't rush it.	▸ Safety and pollution are our priority. Look closely at seismic and explosion risks. ▸ A reasonable expectation for growth is smart. ▸ This is aggressive. Without LNG, won't China burn more coal? ▸ Rail safety in the Gorge is also a key issue that this can't resolve.
New land use category	▸ If unclear, permit staff could be pressured - unpredictable results. ▸ Use federal West Coast PADD 5 "region."	▸ Regulate both existing and new facilities. ▸ New code must effectively implement the policy.	▸ Need clear definitions: region, export, end user. ▸ Do not make terminals non-conforming or an ambiguous limited use.	▸ Why allow it in IG2? ▸ A new export terminal in contaminated harbor is unlikely.
Definition of fossil fuels	▸ Natural gas considered a low carbon fuel by State, so why included here? ▸ Tomorrow's cleaner fuels won't meet today's definitions.	▸ Excluding methanol undermines policy. ▸ If end use is mostly fuel, then limit it. ▸ One new LNG tank is a big risk. So is coal.	▸ Federal and state are going a different direction, requiring cleaner fossil fuels. Why restrict cleaner fuels at cross purposes?	▸ Make way for bio-diesel as a cleaner fuel. ▸ Methanol not a fuel in Oregon - overreaching. ▸ Fuels are okay if they have no emissions.
Terminal development restrictions	▸ Some sites are already built-out. ▸ Our non-contiguous sites are connected by pipelines. ▸ Can't comment on size.	▸ Most prefer Option A. ▸ Caution about Commerce Clause. ▸ 1% annual growth metric is too high.	▸ Don't come at sideways. Unclear rationales will lead to appeals. ▸ Size limits would put region on "import diet." ▸ Dated, low forecast.	▸ Option C preferred. ▸ Allow for modest growth of LNG and oil; not coal. ▸ Review size limits every few years.

4. Background conditions

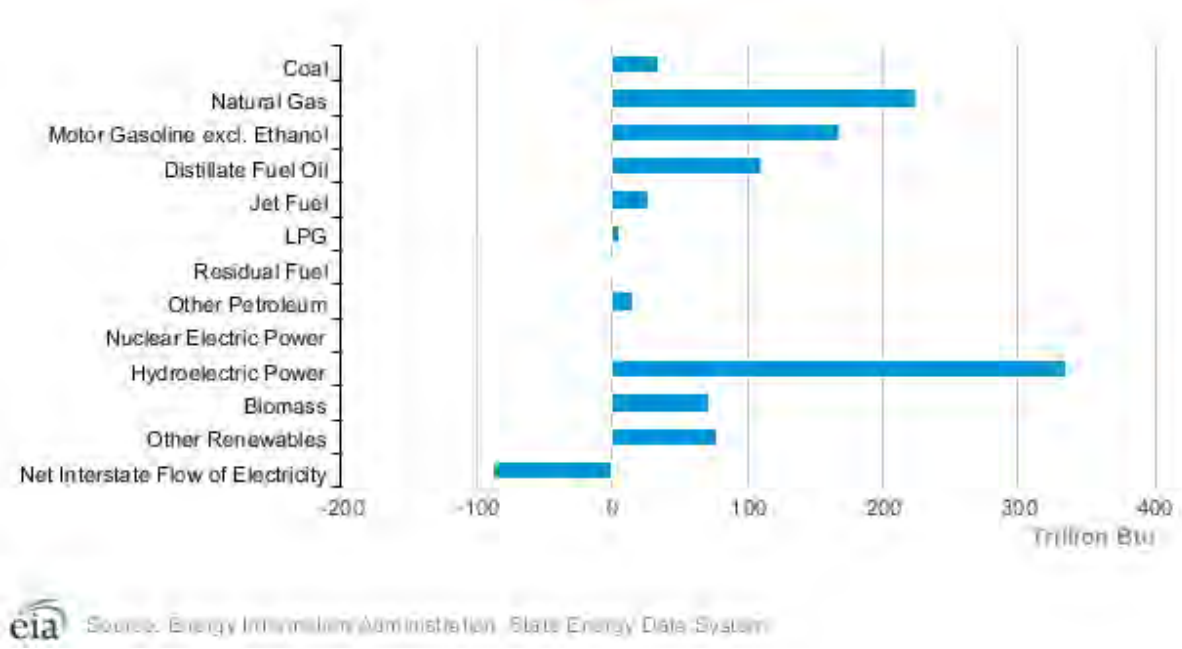
This section of the report describes background conditions that inform the proposed zoning changes. Topics include access to energy, impacts on the economy, climate change impacts, and health and safety impacts of draft zoning code changes. Background information on changing energy markets in the Pacific Northwest and Portland's existing fossil fuel terminals is included in the Section 1. Legal and policy background information is presented in Section 2.

Access to energy

Energy consumption in Oregon

Oregon residents and businesses rely on Portland's fossil fuel distribution and storage facilities as a wholesale distribution hub to meet their energy consumption needs. Estimated state energy consumption by fossil fuels and other sources are shown in Figure 5. Residents and businesses in much of Southern Washington also rely on Portland terminals for access to fuels.

Figure 5. Oregon energy consumption estimates, 2014



Four refineries in the Puget Sound area supply nearly all of the petroleum fuels consumed in Oregon, delivered primarily through the Olympic Pipeline that terminates at the cluster of 10 petroleum terminals in Northwest Portland. From there, petroleum products are delivered to Oregon and Southern Washington markets via truck, pipeline and barge. NW Natural supplies natural gas to its Western Oregon market area and operates peak-consumption storage terminals in Northwest Portland

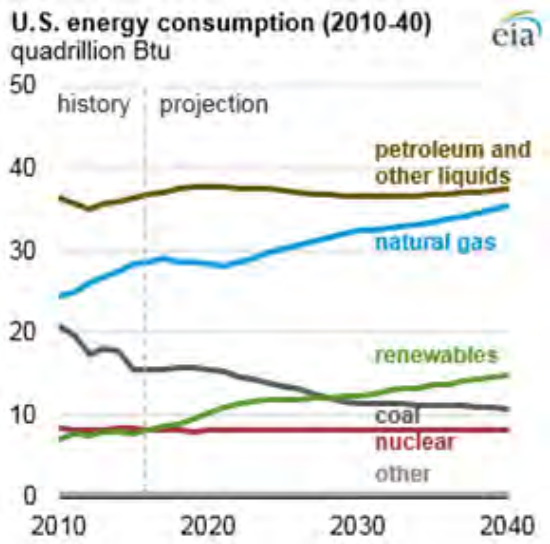
and Newport. Thus, fossil fuel terminals in Portland are a primary statewide distribution hub for transportation fuels and natural gas.

Energy consumption forecasts and the demand for additional storage capacity

Analysis to date is limited on the energy consumption forecasts and how the proposed code changes would impact the demand for additional fossil fuel storage capacity. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts, or may plateau and decline with implementation of climate resilience goals and strategies. National forecasts of energy consumption by the U.S. Energy Information Administration show varying growth trajectories by energy type, including a relatively flat outlook for petroleum fuels, decline for coal, and moderate growth for natural gas and renewables (see Figure 6).

Liquid bulk cargo in Portland Harbor is projected to expand at a range of 0.5% to 1.0% average annual growth (AAG) to 2040 (BST Associates, 2012), providing an estimate of potential market expansion needs for petroleum fuels, which could mean a need for an additional 10-20% increase in storage capacity. However, based on this forecast, ECONorthwest (2012) estimated that there was no additional land needed for new liquid bulk terminals in Portland. The 1.9% average annual growth forecast to 2034 (NW Natural 2014 Integrated Resource Plan) provides an estimate of market expansion needs for natural gas distribution facilities.

Figure 6. U.S. energy production and consumption projections to 2040



Source: US Energy Information Administration, Annual Energy Outlook 2016

Even if regional fossil fuel demand follows trend-based local forecasts, there is a wide margin between the size of recently proposed crude oil, coal, and LNG terminals proposed in the Pacific Northwest and the scale of expected growth of existing Portland fuel terminals that generally serve the regional market area, as shown in Figure 7.

Contradictory stakeholder comments were received that local growth projections are too high, too low, and could change substantially with market innovations. To address this uncertainty, periodic monitoring for code effectiveness is recommended in Section 7 as a future implementation project,

including monitoring for changes in regional fuel demand over time. Staff will continue to research and analyze potential economic impacts of proposed code changes prior to adoption.

Figure 7. Estimated storage capacity at existing and proposed fuel terminals

Operator	*Facility type*	*Location*	*Site acres*	*Storage capacity*	*New Storage capacity*
Petroleum fuels					
Existing Portland terminals				bbls	
Chevron	Petroleum terminal	NW Portland	21	1,600,000	
Kinder Morgan Willbridge	Petroleum terminal	NW Portland	33	1,551,000	
Arc Logistics	Asphalt/crude oil	NW Portland	39	1,466,000	
NuStar	Petroleum terminal	NW Portland	22	1,191,000	
McCall Oil	Petroleum terminal	NW Portland	19	930,000	
Conoco Phillips	Petroleum terminal	NW Portland	21	760,000	
BP West Coast	Petroleum terminal	NW Portland	18	601,500	
Kinder Morgan Linnton	Petroleum terminal	NW Portland	13	420,000	
Equilon/Shell	Petroleum terminal	NW Portland	13	400,000	
Pacific Terminal Services	Petroleum terminal	NW Portland	2	275,000	
Recently proposed new terminals or reinvestment in Pacific NW				bbls	Proposal
Vancouver Energy	Crude oil terminal	Vancouver WA	47	NA	2,160,000
Imperium Renewables	Biofuels terminal	Grays Harbor WA	11	NA	720,000
NuStar	Petroleum terminal	Vancouver WA	19	775,000	Reuse tanks
Gaseous fuels					
Existing Portland terminals				LNG gal	2035 forecast
NW Natural GasCo	LNG plant/terminal	NW Portland	41	7,000,000	3,200,000
Recently proposed natural gas terminals/storage in Pacific NW				LNG gal	Proposal
Oregon LNG terminal	New LNG terminal	Warrenton OR	96	NA	84,000,000
Jordan Cove LNG	New LNG terminal	Coos Bay OR	400	NA	84,000,000
NW Natural North Mist	Gas reservoir storage	Mist OR	2,644	NA	2.5 Bcf gas
Other recent proposals (now inactive) for gaseous fuel terminals				LPG gal	Proposal
Pembina	Propane terminal	Portland	38	NA	34,000,000
Haven Energy	Propane terminal	Longview WA	24	NA	23,000,000
NW Innovation	Methanol plant	Kalama WA	83	NA	67,000,000
Coal					
Existing Portland terminals					
None					
Recently proposed coal terminals in Pacific NW					Stockpile acres
Millennium Bulk Terminal	Coal terminal	Longview WA	100	NA	~20
Ambre Energy	Coal transload facility	St. Helens OR		NA	no storage
Gateway Pacific Terminal	Coal terminal	Bellingham WA	334	NA	80

Terminology: bbls = barrels, Dth = decatherms, LNG = liquified natural gas, LPG = liquified propane gas, Bcf = billion cubic feet, AAG = average annual growth.

Sources: Oregon DEQ for petroleum tank data. NW Natural 2014 Integrated Resource Plan for existing capacity and forecast at 1.9% AAG. BST, Portland Harbor Forecast (2012) for petroleum terminals at 1.0% AAG.

Impacts of draft code changes on the economy

Jobs and wages at Portland's fuel terminals

In 2014, the 11 existing fuel terminals in Portland shown in Figure 3 provided approximately 280 jobs at their sites and supported an estimated 720 total jobs in the metropolitan area. The annual payroll at those terminals was $23 million, which supported total personal income of about $92 million in the metropolitan area.

BPS calculated these supported employment and income estimates from the induced and indirect impacts from metropolitan area purchases by these firms and their employees. For example, the jobs of the Longshore Union workers who unload fuels from tankers at these fuel terminals are not counted as direct jobs at the terminal sites. The multipliers used for these calculations were estimated from the average employment and income effects of marine terminals in Portland (Martin Associates, 2012). The job and wage estimates were calculated from Quarterly Census of Employment and Wages (QCEW) data.

Portland's industrial area jobs also have an important urban equity role in that they consist primarily of middle-wage jobs that do not require 4-year college degrees, which the overall economy has been losing since 2000. In contrast, jobs in commercial districts are concentrated primarily in low- and high-wage quartiles (fourths) of overall city employment. Middle-wage job growth supports the "income self-sufficiency" objectives of the Portland Plan and 2035 Comprehensive Plan (Policy 6.28) to expand access to self-sufficient wage levels.

Long-term job growth to 2035 is estimated at 1.6% average annual growth in the warehousing, transportation and utilities sector in Portland's 2016 Economic Opportunities Analysis and Metro's 2014 Urban Growth Report. Applying this growth rate to Portland's existing fuel terminals, approximately 110 net new permanent jobs are expected between 2014 and 2035, which is the equivalent of about four new terminals at their current average size. The total metropolitan area job impact of this fuel terminal expansion would be approximately 290 new jobs by 2035. If fuel terminal job growth occurred at a slower 1.0% average annual rate, matching the forecast growth of liquid bulk cargo volumes in Portland Harbor, approximately 65 net new terminal jobs would be generated by 2035, supporting a total 170 new jobs in the metro area. Pembina's proposed propane terminal in 2014 was estimated to create 30 to 40 new permanent jobs and 600-800 temporary construction jobs.

The proposed code changes would allow for code-limited expansion at existing terminals and new fuel distribution facilities smaller than 5 million gallons to accommodate potential increases in regional demand and resulting job growth.

Tax revenues of new terminals

State and local revenues from income and property taxes vary widely by facility. For example, property taxes on the depreciated improvements value of existing fuel terminals are much lower than new construction. If fuel terminals added 110 net new direct jobs by 2035 and the resulting state and local tax revenues is typical of businesses and developed facilities in Portland's Working Harbor (Martin Associates, 2016), the estimated new state and local tax revenues in fiscal year 2035 (in 2015 dollars) would be $1.6 million. In contrast, the proposed $500 million Pembina project was estimated to generate approximately $12 million in annual property tax revenue, reflecting the increased improvements value and property taxes of new construction.

The proposed code changes would allow for code-limited expansion at existing terminals and new fuel distribution facilities smaller than 5 million gallons and resulting state and local tax revenue. However, prohibiting large scale new terminals such as Pembina could result in similar levels of foregone property taxes. Development of the limited land supply along Portland Harbor for new auto or grain terminals would also result in substantial local and state tax revenues, offsetting foregone taxes on new fossil fuel terminals.

Growth opportunities in fossil fuel distribution

The most recent cargo forecast for Portland Harbor in 2012 projected 1.0% AAG in liquid bulk tonnage to 2040 as a high scenario and 0.5% AAG as a low scenario (BST Associates, 2012). Based on this forecast, ECONorthwest (2012) estimated no additional land need for new liquid bulk terminals. Since 2012, several new fuel terminals have been proposed in the Pacific Northwest, as shown in Figure 2.

Updating the liquid bulk forecast at this point would be challenging for several reasons. Most of the recent fuel terminal proposals have since been abandoned or appear to be dormant. Policy and permitting uncertainty complicate the development feasibility of new terminals and transportation infrastructure. Crude oil prices have fallen sharply in 2015 and 2016, reducing the current market potential for major investments. Expanding global industrial product markets after the Great Recession slowed substantially in 2015. And energy distribution markets could change abruptly with continuing product innovations and location shifts in global production.

In the long term, Portland has competitive advantages for accommodating energy terminal development as a Pacific Rim gateway location to growing Asian markets, the Columbia River's low-gradient railroad access for heavy cargo through the Cascades, and Oregon's freight infrastructure hub. On the other hand, Portland's industrial land supply for continuing growth is limited, and expanding cargo markets for autos, grain and dry bulks are competing for current growth capacity.

Other economic impacts

Energy infrastructure and terminal investments appear to have low but potentially catastrophic risks of major accidents, as described below. Examples include seismic resilience of petroleum terminals in the event of a Cascadia Subduction Zone earthquake, oil train derailments, explosions at LNG (liquefied natural gas) and LPG (liquefied petroleum gas, such as propane) facilities, and others.

Clean Energy is a target industry in the City of Portland. An emerging cluster of Portland area business activity in solar and wind energy manufacturing, green building development, and other fields of sustainable urban innovation present long-term business growth opportunities. Substantial local investment in fossil fuel infrastructure and large new terminals could hinder local growth momentum in Clean Energy industries.

Climate change impacts of draft code changes

Climate impact of fossil fuels

Fossil fuels are major contributors to climate change and pollution, as described in Portland's 2015 Climate Action Plan. Greenhouse gas emissions from the burning of fossil fuels and land use changes, including deforestation, are primary causes of climate change. The Intergovernmental Panel on Climate Change's most recent report documents the overwhelming evidence that human activities have been

the major driver of recent warming of the Earth's surface, and that climate change and its consequences will continue into the future (IPCC, 2013).

The magnitude of future climate impacts depends largely on the trajectory of future global greenhouse gas emissions. Greenhouse gas emissions from human activities have continued to rise in recent decades, reaching the highest rates in human history between 2000 and 2010 (IPCC, 2014). About half of all carbon dioxide emissions, the most prevalent greenhouse gas, between 1750 and 2010 occurred in the last 40 years. The energy, industry and transportation sectors have dominated these emissions increases. On the current trajectory, global transportation emissions will double by 2050.

Transition to "renewable" and "clean" fuels

The U.S. Environmental Protection Agency (USEPA) implements the federal Renewable Fuel Standard (RFS) that requires transportation fuel sold in the U.S. to contain a minimum volume of renewable fuels. The RFS originated with the Energy Policy Act of 2005 and was expanded and extended by the Energy Independence and Security Act of 2007 (EISA). Similarly, the Oregon Department of Environmental Quality (ODEQ)implements the Oregon Clean Fuel Program. ODEQ describes "clean fuel" as a fuel with a lower carbon intensity than that of the fuel it replaces.

Examples of "clean fuels" in Oregon's program include most types of ethanol, biodiesel, natural gas, biogas, electricity, propane and hydrogen. The Oregon Clean Fuel Standard sets 2015 as a baseline that represents 10 percent ethanol blended with gasoline and 5 percent biodiesel blended with diesel. The rule also requires a 10 percent reduction in average carbon intensity from 2015 levels by 2025.

Terminal representatives and business stakeholders urged that proposed zoning code changes not create a disincentive or barrier to compliance with these federal and state rules, which may require additional tank capacity to implement. Environmental and public health organization representatives pointed out that City Resolution 37168 addresses fossil fuels generally, including lower-carbon fossil fuels like natural gas and propane. The proposed code changes would allow for code-limited expansion at existing terminals and are not expected to hinder compliance with the renewable and clean fuel standards, as described in Section 5.

Velocity of transition to non-fossil fuel energy

Portland's Climate Action Plan sets a goal for an 80% reduction in greenhouse gas emissions by 2050. Oregon's climate action goals similarly call for 75% reduction by 2050. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, they don't begin to approach the 80% reduction that the City is striving for or the State's 75% goal. ODEQ estimates that the greenhouse gas emissions reduction from switching from gasoline to compressed natural gas, for example, is 18%; for propane, it is 15%. The lower-carbon fossil fuels do have appeal as a bridge to widespread use of renewable energy, but investments in major infrastructure typically take decades to recoup, and the transition to renewables needs to go much faster than that to stabilize global emissions.

During recent hearings and analysis on Resolution 37168 and the Pembina terminal proposal, the question of whether to differentiate between fossil fuels with different carbon content was widely

discussed. In the lead up to the resolution, an option was proposed that would oppose new coal and oil infrastructure but allow for other fossil fuels that could show a likely net decrease in carbon emissions. City Council decided not to apply this option in the resolution.

Health, safety and environmental impacts of draft code changes

Seismic resilience and liquefaction soils

The 2035 Comprehensive Plan sets policy direction (4.75 and 4.76) to encourage disaster-resilient development and specifically to reduce natural hazard risks to critical energy and transportation infrastructure in Portland Harbor.

The 2016 Critical Energy Infrastructure Hub Study underway by the Portland Bureau of Emergency Management includes a literature review and modeled risks of structural damage to critical infrastructure from earthquakes, floods, landslides, volcanic activity, wildfire and other sources. Along with petroleum and natural gas infrastructure, the study is also assessing infrastructure risks to emergency services, transportation, electricity, potable water and waste water. The study area includes the Northwest and Linnton industrial areas. PBEM has identified significant seismic risks at the fuel terminals from a major Cascadia Subduction Zone earthquake because of their location in a filled riverfront plateau area with moderate- to high-susceptibility location for soil liquefaction.

As shown in Figure 7, the Oregon Department of Geology and Mineral Industries (DOGAMI) has mapped most of the riverfront plateau areas, which account for over 90 percent of Portland's industrial zoning, as having high susceptibility for soil liquefaction, along with areas along the Central City riverfront and much of the Brooklyn and Sellwood-Moreland neighborhoods. Most of the existing fuel terminals in the Willbridge area are mapped as having moderate susceptibility for soil liquefaction, and the others are mapped in the high susceptibility areas. The proposed code amendments will improve the seismic resilience of new bulk fossil fuel terminals by precluding their development in areas with high susceptibility to soil liquefaction.

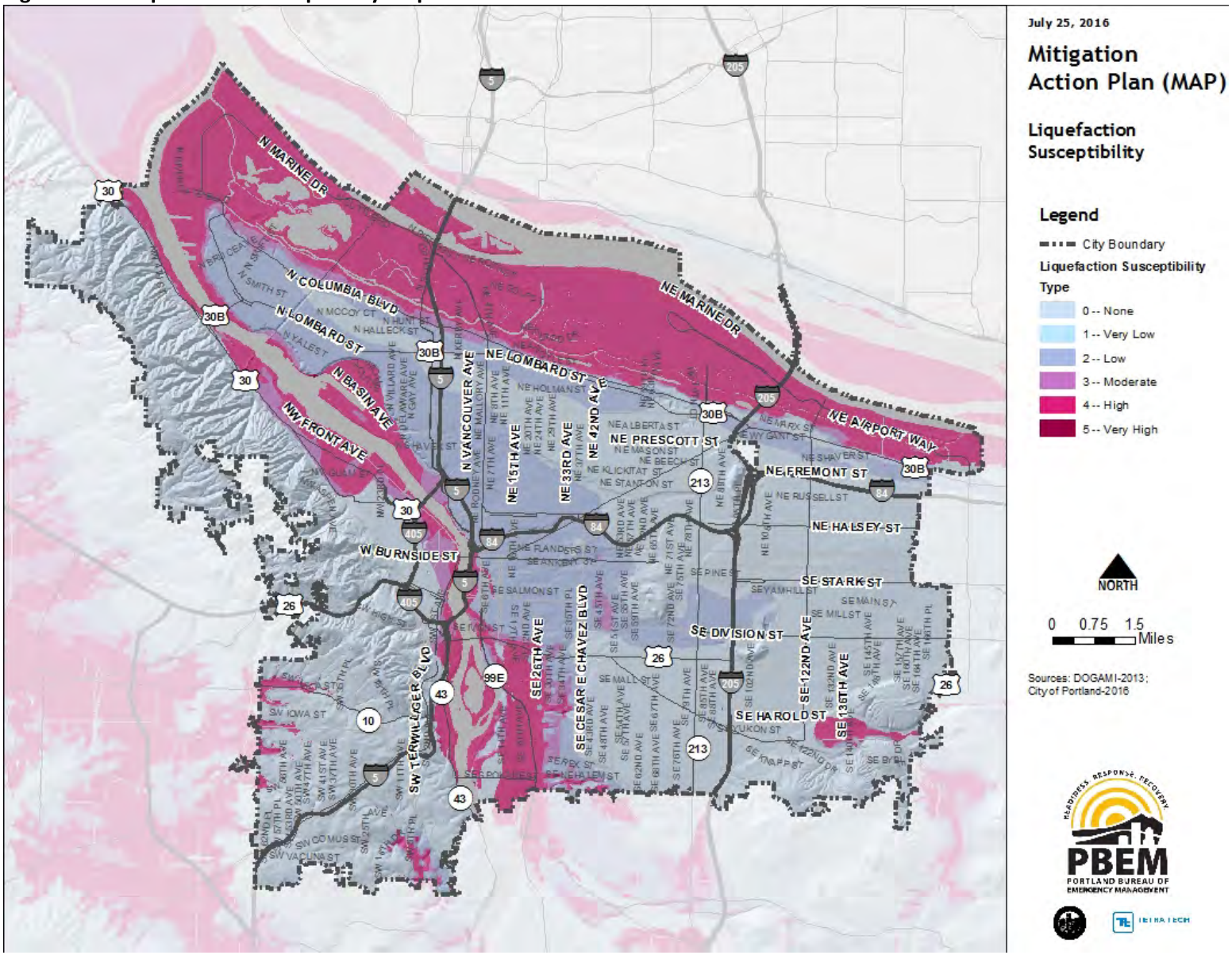
The proposed code changes provide for seismic improvements to existing terminals, through a Nonconforming Situation Review. Future amendments to building and fire codes to improve seismic safety of fossil fuel infrastructure may also be adopted to implement Resolution 37168. A future code project is recommended in Section 7 to develop building code amendments to improve seismic resilience and require seismic upgrades comparable to proposed requirements on unreinforced masonry buildings.

Safety of liquefied gas terminals

Liquefied natural gas (LNG) and liquefied petroleum gas (LPG), such as propane, facilities pose safety risks from potential explosions and fire. The Pembina propane terminal, which was proposed in 2015 at the Port of Portland Terminal 6, is an apt case study. The Pembina terminal would have required environmental zoning code amendments that did not move forward.

The issue of safety risks was discussed extensively during review of the proposed Pembina terminal, and a quantitative risk assessment study was prepared to inform that review process (Det Norske Veritas (U.S.A.), Inc., 2015). The study estimated the risk from flammable releases, such as jet fires, pool fire, flash fire, vapor cloud explosions, fireball and Boiling Liquid Expanding Vapor Explosion (BLEVE).

Figure 8. Soil liquefaction susceptibility map of Portland



The risk was presented as individual risk in the form of location-specific risk contours extending outward from the proposed facilities, and as societal risk in the form of potential loss of life and cumulative frequency of various accidents. The highest offsite risk level was found to be 1 fatality in 1,000 years in areas directly north and south of facility. The nearest residential zones are located beyond the risk level contour of 1 fatality in 100 million years. The cumulative societal risk was estimated at 1 statistical fatality every 38 years. The study also included various facility design and siting recommendations to mitigate identified risks.

Another risk assessment (Northwest Citizen Science Initiative, 2015) on the Pembina project was presented by environmental groups and neighbors including the Hayden Island Neighborhood Association. The analysis identifies additional sources of risk from BLEVE cascades, terrorist events and magnitude 9 earthquakes. The authors recommend not locating a propane terminal within 10 miles of the Portland/Vancouver urban area.

Public safety risks from a new LNG or LPG facility are estimated to be very low relative to other urban hazards, although possible impacts could be catastrophic. The proposed code amendments are expected to reduce public safety risks by prohibiting development of large new LNG or LPG facilities.

Oil train accidents

On June 3, 2016 an oil train traveling through the Columbia River Gorge partially derailed in Mosier en route to Tacoma. The 16-car derailment resulted in a 1,000-barrel spill and fires that lasted nearly a day. Small amounts of oil reportedly reached the river, and nearby drinking water and wastewater facilities in Mosier were affected.

An Associated Press analysis of accident records found that 26 oil-train derailments or fires have occurred nationally in the last decade. The national geography of increasing oil extraction in the inland Great Plains states and refineries concentrated on the coasts is contributing to this trend. Risk of how often such derailments are likely to occur in the Columbia Gorge is disputed, with one estimate as high as one every 30 months.

Preliminary reporting on the cause of the Mosier derailment pointed to failed bolts in the track that are difficult to detect. Union Pacific reported that improvements are underway to replace bolts on 530 miles of curved track nationwide. Railroad safety is regulated at the federal level and monitored by the Federal Railroad Administration. A recent Government Accounting Office report has identified challenges and delays in implementing some federal rail safety regulations.

The proposed code amendments could incrementally reduce rail accident risks by restricting development and expansion of fossil fuel terminals at a West Coast rail hub location. However, restricting the location of new petroleum terminals in the city of Portland is not expected to substantially affect the volume of petroleum cargo transported by rail to Puget Sound refineries. The Portland/Vancouver area is a rail hub location, where West Coast rail lines running north-south intersect the low gradient east-west rail corridor along both sides of the Columbia River. Roughly half of the east-west rail cargo destined for the Seattle-Tacoma area, in addition to Oregon-bound rail cargo, moves through the Portland metropolitan area. Derailment risk within Portland is reduced by the numerous siding destinations and congestion of the “Portland Triangle” area where UP and BNSF lines come together. However, derailment risks to natural resources, especially along rivers, and to rural communities appear to be significant.

5. Code concepts and analysis

This section of the report describes the proposed zoning change concepts by topic area, including the related policy directions, implementation issues, and rationale for the proposed zoning changes.

1. **Types of distribution and storage facilities to be regulated**

Policy direction:

- City Council Resolution 37168 (adopted November 2015) calls for opposing expansion of infrastructure for transportation and storage of fossil fuels, subject to various exceptions, including safety improvements, service to end users, and infrastructure that accelerates transition to non-fossil fuel energy.
- 2035 Comprehensive Plan Policy 6.48 Fossil Fuel Infrastructure (adopted June 2016, not effective until 2018) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Preliminary code concepts:

- Limit development of new Bulk Fossil Fuel Terminals as a regulated land use.
- Bulk Fossil Fuel Terminals are engaged in freight movement or wholesaling of fossil fuels at facilities that are characterized by having (1) marine, pipeline or railroad transport access and (2) either transloading facilities for transferring a shipment between transport modes (such as from rail to ship) or bulk storage facilities exceeding 5 million gallons (or equivalent volume) of fossil fuels. Examples include petroleum terminals, liquid natural gas terminals, and coal terminals. Functionally, these terminals are typically regional gateway facilities, where fossil fuels enter and exit the region, but the use classification is intended to be clearly identifiable and not rely on a definition of region.
- Exceptions that are not Bulk Fossil Fuel Terminals:
    - Retail sales of fossil fuels, such as gasoline or propane filling stations;
    - Distributors, wholesalers, and industrial service uses that receive and deliver fossil fuels exclusively by truck;
    - End-user facilities that store fossil fuels for primary use at or near the site, such as manufacturing, agriculture, and airports;
    - Uses that recover or reprocess used petroleum products;
    - Waste-related uses that transfer or store solid or liquid wastes, such as landfills.

Implementation issues:

- Definition of region – Portland is a regional distribution hub for energy and other products, and this zoning change is not intended to restrict energy access to the growing region. However, the regional market area of Bulk Fossil Fuel Terminals varies by product and is difficult to define. Portland's 10 petroleum terminals generally serve Oregon and Southern Washington. This market area substantially exceeds the Portland metropolitan area, which is often colloquially referred to as the region. Some terminal representatives pointed out that the federal government's 5-state West Coast PADD 5 region is generally their regional market area. Bureau

of Development Services (BDS) staff commented that zoning does not regulate the target market (destination) of wholesale products, and the zoning code does not define region. Business organization representatives commented that the energy markets and related market areas are likely to change over time. Therefore, the proposed land use incorporates the concept of a regional market into the size limits, and a zoning definition of region is not proposed here.

- End users – Resolution 37168 lists a specific exception to not restrict service directly to end users. At a small scale, services to end users include retail gasoline filling stations, natural gas access lines in street right-of-way to residential and business customers, and heating oil tanks at home sites. Larger scale end users with fossil fuel storage and access infrastructure also include manufacturers, jet fuel facilities at the PDX Airport, vessel fuel facilities on Portland Harbor, and others where fossil fuels are used as an input. Again, the limits on new facilities are sized to apply only to larger distribution facilities.

- Interpretation of use category – Terminal and business representatives commented that ambiguity in the use description could result in conflicting expectations, pressured interpretations, appeals, and inconsistent code implementation. While underlying policy accommodates regional access and exceptions that may be difficult to clearly define, the land use designation is proposed to be defined by clear and objective size thresholds and marine/railroad/pipeline access.

2. **Definition of fossil fuels**

Policy direction: City Council Resolution 37168 applies to fossil fuel infrastructure and storage generally, and does not distinguish among types or carbon intensity of fossil fuels.

Preliminary code concept:

- Definition of fossil fuels: petroleum products (such as crude oil and gasoline), coal, and gaseous fuels (such as natural gas and propane) that are made from decayed plants and animals that lived millions of years ago and are used primarily as a source of energy.
- Exclusion of non-fuel products – Petrochemicals that are used primarily for non-fuel products are excluded, such as plastics, lubricants, fertilizer, roofing and paints.
- Methanol is included as a fossil fuel. Development of methanol storage and transportation facilities would be prohibited similarly to LNG and LPG terminals.
- Denatured ethanol and similar fuel additives and biodiesel/renewable diesel with less than 5% fossil fuel content are not fossil fuels.
- Biogas from wastewater treatment plants, anaerobic digesters, landfills and other sources is not a fossil fuel.

Implementation issues:

- Definition of fossil fuels – Definitions of fossil fuels vary by source. Here are some examples.
    - Oregon Department of Environmental Quality (ODEQ) – Fossil fuels: fuels such as oil, natural gas, and coal that are made from decayed plants and animals that lived millions of years ago. These fuels are made of hydrogen and carbon (hydrocarbons).

- U.S. Environmental Protection Agency (USEPA), 40 C.F.R. § 60.41 - Fossil fuel means natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such materials for the purpose of creating useful heat.
- Oregon Department of Energy Administrative Rule, OAR 345-001-0010 - "Fossil fuel" means natural gas, petroleum, coal and any form of solid, liquid or gaseous fuel derived from such materials that serves as useful energy.

- Renewable and clean fuel standards – As described in Section 4, USEPA implements the federal Renewable Fuel Standard (RFS) that requires transportation fuel sold in the U.S. to contain a minimum volume of renewable fuels. Similarly, ODEQ implements the Oregon Clean Fuel Program. ODEQ identifies examples of "clean fuels" in Oregon as most types of ethanol, biodiesel, natural gas, biogas, electricity, propane and hydrogen. Terminal representatives and business stakeholders urged that proposed zoning code changes not create a disincentive or barrier to compliance with these federal and state rules, which may require additional tank capacity to implement. Environmental and public health organization representatives pointed out that City Resolution 37168 addresses fossil fuels generally, including clean fuels. The proposed allowance for code-limited expansion of existing terminals will allow enough supply to comply with the renewable and clean fuel standards.

- *Methanol – Large methanol plants have recently been proposed in Tacoma, Kalama, and St. Helens. Methanol plants tend to have structural similarities to LNG and LPG terminals, including large-scale and gas pipeline access, and they can have similar safety and climate impacts. Stakeholder focus groups were asked whether any* special inclusions, such as methanol, should be considered. Most people commenting noted that methanol is primarily used in the production of plastics and other non-fuel uses. Views differed among environmental organizations commenting. Some noted that excluding it undermines the policy. The proposed code limits development of large methanol plants similarly to LNG or LPG terminals.

- *Denatured ethanol* – A terminal operator pointed out that "pure" ethanol made from corn or other non-fossil source is required by the Alcohol and Tobacco Tax and Trade Bureau to be denatured in order to be transported to the site. Denatured ethanol typically contains up to 5% methanol, so that it is toxic and undrinkable. Storage of denatured ethanol is proposed to be exempted. In other words, denatured ethanol tanks would not be counted as part of the maximum storage capacity of fossil fuel terminals.

- Biogas products from landfills – Bureau of Environmental Services (BES) staff commented that biogas from landfills and other sources are not fossil fuels and should not be restricted by the proposed zoning changes. The proposed description of fossil fuel terminals specifically excludes waste-related uses, such as landfills, which are regulated as a separate land use in the zoning code. Also, the proposed definition of fossil fuels, described as being made from decayed plants and animals that lived millions of years ago, would not include biogas from a landfill.

3. **Prohibition of bulk fossil fuel terminals**

Policy direction:

- City Council Resolution 37168 (adopted November 2015) calls for opposing expansion of infrastructure for transportation and storage of fossil fuels, subject to various exceptions, including safety improvements, service to end users, and infrastructure that accelerates transition to non-fossil fuel energy.
- 2035 Comprehensive Plan Policy 6.48 Fossil Fuel Infrastructure (adopted June 2016, not effective until 2018) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Preliminary code concept:

- Classify Bulk Fossil Fuel Terminals as a prohibited use in all base zones.

Implementation issues:

- Policy implementation – City Resolution 37168 reflected a major change in policy direction on fossil fuel distribution and storage facilities. Prohibition of Bulk Fossil Fuel Terminals is proposed as an unambiguous, assertive approach to implement this policy change, responding to increasingly evident safety risks of fossil fuel infrastructure, aggressive climate change goals, and changing energy markets in the Pacific Northwest.

- Community expectations – Over 700 people sent emails in response to the Discussion Draft asking for a "full ban" on new and expanded fossil fuel terminals. Climate resilience advocates are widely represented in the Portland community and the Pacific Northwest. Public involvement in Resolution 37168 and this project reveal broad community expectations for a bold approach to restrict fossil fuel distribution facilities in Portland.

- Providing regional market access to fuels – Analysis to date is limited on the potential impacts of the prohibition on constraining regional fuel supply. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts, or may plateau and decline with implementation of climate resilience goals and strategies. Staff will continue to research and analyze potential economic impacts of proposed code changes prior to adoption. The fossil fuels consumed in Oregon are generally not extracted or refined in the state. As a result, fossil fuel terminals provide multimodal transportation efficiency and price advantages for distributing fuels to the growing population of the regional market area.

- Option to set size limits on new fossil fuel terminals – The Discussion Draft proposed storage capacity size standards to limit new fossil fuel terminal development. Figure 7 in Section 4 indicates a wide margin between the size of recently proposed crude oil, coal and LNG terminals proposed in the Pacific Northwest and the scale of expected growth by existing Portland fuel terminals that serve the regional market area. Proposed terminal size limitations within that margin would allow for expansion at existing terminals and moderately sized new terminal development to meet potential market area consumption needs. Instead, the Proposed Draft code changes would prohibit Bulk Fossil Fuel Terminals, a more restrictive approach to more

assertively implement the new policy directions and respond to extensive community comments on the proposed code changes. Existing terminals can expand and make safety and seismic upgrades to their facilities within their current sites, providing the opportunity to meet potential market area consumption needs.

- Balanced, integrated policy approach – The proposed restrictions on fossil fuel distribution facilities entail tradeoffs among public goals for environmental protection, public health and safety, meeting energy needs, and economic prosperity, as described in Section 4. The Comprehensive Plan calls for a balanced, integrated approach in land use regulations to meet these public objectives, as described in Section 2. The proposed code changes provide for significant environmental and safety benefits in restricting development and expansion of fossil fuel terminals and provide for limited expansion of fossil fuel terminals to adequately meet regional energy needs and integrate economic prosperity and equity considerations.

4. Legal, nonconforming status of existing facilities

Policy direction:

- City Council Resolution 37168 includes various exemptions to not restrict safety or efficiency improvements, service to end users, emergency backup capacity, infrastructure for recovery or re-processing of used petroleum products, or infrastructure that will accelerate the transition to non-fossil fuel energy sources.
- 2035 Comprehensive Plan Policy 6.48 Fossil Fuel Infrastructure (adopted June 2016, not effective until 2018) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.
- 2035 Comprehensive Plan Policies 4.75 and 4.76 call for encouraging disaster-resilient development and reducing natural hazard risks to critical energy and transportation infrastructure in Portland Harbor.

Preliminary code concept:

- Existing Bulk Fossil Fuel Terminals would become legal, non-conforming uses, which may continue to operate. Expansion would require approval through a nonconforming situation review, which is a Type II discretionary land use review. The Type II procedure is an administrative process with the opportunity for public notice and comment. The Director of the Bureau of Development Services makes the initial decision, which can be appealed to a City Hearings Officer, whose decision in turn can be appealed to the State Land Use Board of Appeals (LUBA).

Implementation issues:

- Flexibility for code-limited expansion - Significant improvements to non-conforming uses generally require a "nonconforming situation review." Given this requirement, the proposed code changes may be more restrictive than the exceptions in the resolution that call for not restricting improvements at existing fuel terminals that improve safety, provide wholesale fuel supply to local or regional end users, add backup capacity, or add tanks for clean/renewable fuels would require approval through a nonconforming situation review. However, the Zoning Code's provisions for expansion of nonconforming uses do provide discretionary flexibility to accommodate such improvements. Approval criteria for a nonconforming situation review

include that, with mitigation measures, there will be no net increase in overall detrimental impacts on the surrounding industrial zone (such as hours of operation and vehicle trips) and the expansion will not detract from the desired function and character of the industrial zone. Terminal improvements would also be limited to their existing site area. Improvements that address the exceptions in the resolution are not generally expected to result in additional detrimental impacts on the surrounding industrial zone. Given the level of community scrutiny about fossil fuel terminal expansion, this discretionary public review process could add to the cost and uncertainty of investments at fossil fuel terminals. Nonconforming situation reviews are "Type 2" staff level permits, which could be appealed to a hearings officer and further to the Land Use Board of Appeals.

- Option to not restrict expansion at existing terminals - The Discussion Draft proposed code concepts (storage capacity size standards to limits new fossil fuel terminal development) that would not restrict development on existing terminals. This option was intended to be consistent with the exceptions in the resolution (as described in the previous point) and to accommodate potential growth in regional fuel demand. Instead, the Proposed Draft code changes would apply a legal, non-conforming use status on existing Bulk Fossil Fuel Terminals, a more restrictive approach to more assertively implement the new policy directions and respond to extensive community comments on the proposed code changes.

- Divergent stakeholder views – Extensive comments on the Discussion Draft recommended tight limits on expansion of existing fuel terminals. In contrast, stakeholder focus group participants generally urged that existing fuel terminals should not be changed to a non-conforming use for reasons ranging from providing a critical product to not discouraging desired seismic and safety improvements on existing facilities. Stakeholder group comments from environmental and public health organizations generally supported restricting expansion of existing terminals, while some participants cautioned about political and legal tradeoffs of making the existing fuel terminals nonconforming.

6. Zoning code changes

This section of the report specifies the draft code language, along with code commentary pages that clarify expected implementation. The section is formatted to facilitate readability, showing proposed code changes on the right-hand pages and related code commentary on the facing left-hand pages.

Table 100-1 Open Space Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in all base zones.

Table 100-1 Open Space Zone Primary Uses	
Use Categories	**OS Zone**
Residential Categories	
Household Living	N
Group Living	N
Commercial Categories	
Retail Sales And Service	CU [1]
Office	N
Quick Vehicle Servicing	N
Vehicle Repair	N
Commercial Parking	N
Self-Service Storage	N
Commercial Outdoor Recreation	CU
Major Event Entertainment	N
Industrial Categories	
Manufacturing And Production	CU [6]
Warehouse And Freight Movement	N
Wholesale Sales	N
Industrial Service	N
Bulk Fossil Fuel Terminal	N
Railroad Yards	N
Waste-Related	N
Institutional Categories	
Basic Utilities	L/CU [5]
Community Service	CU [4]
Parks And Open Areas	L/CU [2]
Schools	CU
Colleges	N
Medical Centers	N
Religious Institutions	N
Daycare	CU
Other Categories	
Agriculture	L[7]
Aviation And Surface Passenger Terminals	N
Detention Facilities	N
Mining	CU
Radio Frequency Transmission Facilities	L/CU [3]
Rail Lines And Utility Corridors	CU

Y = Yes, Allowed L = Allowed, But Special Limitations CU = Conditional Use Review Required
N = No, Prohibited

Commentary

Table 110-1 Single-Dwelling Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in all base zones.

Table 110-1 Single-Dwelling Zone Primary Uses						
Use Categories	**RF**	**R20**	**R10**	**R7**	**R5**	**R2.5**
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	CU	CU	CU	CU	CU	CU
Commercial Categories						
Retail Sales And Service	N	N	N	N	N	N
Office	N	N	N	N	N	N
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	N	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	N
Industrial Categories						
Manufacturing And Production	CU [6]	N	N	N	N	N
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	N
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]
Community Service	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]
Parks And Open Areas	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]
Schools	CU	CU	CU	CU	CU	CU
Colleges	CU	CU	CU	CU	CU	CU
Medical Centers	CU	CU	CU	CU	CU	CU
Religious Institutions	CU	CU	CU	CU	CU	CU
Daycare	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]
Other Categories						
Agriculture	L [7]	L [7]	L/CU [8]	L/CU [8]	L [9]	L [9]
Aviation And Surface Passenger Terminals	CU	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	CU	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]
Railroad Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Table 120-1 Multi-Dwelling Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in all base zones.

Table 120-1 Multi-Dwelling Zone Primary Uses						
Use Categories	**R3**	**R2**	**R1**	**RH**	**RX**	**IR**
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	Y [1]
Commercial Categories						
Retail Sales And Service	N	N	N	CU[2]	L/CU [3]	L/CU [10]
Office	N	N	N	CU[2]	L/CU [3]	L/CU [10]
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	CU [4]	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	CU
Industrial Categories						
Manufacturing And Production	N	N	N	N	N	CU
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	CU
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [13]	L/CU [13]	L/CU [13]	L/CU [13]	L/CU [13]	L/CU [13]
Community Service	CU [6]	CU [6]	CU [6]	L/CU [6]	L/CU [5, 6]	CU [6]
Parks And Open Areas	L/CU [7]	L/CU [7]	L/CU [7]	Y	Y	Y
Schools	CU	CU	CU	CU	L/CU [5]	L/CU [11]
Colleges	CU	CU	CU	CU	CU	L/CU [11]
Medical Centers	CU	CU	CU	CU	CU	L/CU [11]
Religious Institutions	CU	CU	CU	CU	CU	CU
Daycare	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	Y	L/CU [12]
Other Categories						
Agriculture	L [14]	L [14]	L [14]	L [14]	L [14]	L [14]
Aviation And Surface Passenger Terminals	N	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]
Rail Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Commentary

Table 130-1 Commercial Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in all base zones.

Table 130-1 Commercial Zone Primary Uses								
Use Categories	**CN1**	**CN2**	**CO1**	**CO2**	**CM**	**CS**	**CG**	**CX**
Residential Categories								
Household Living	Y	Y	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]
Commercial Categories								
Retail Sales And Service	L [2]	Y	N	L [3]	L [4]	Y	Y	Y
Office	L [2]	Y	Y	Y	L [4]	Y	Y	Y
Quick Vehicle Servicing	N	L [12]	N	N	N	N	Y	L [12]
Vehicle Repair	N	N	N	N	N	Y	Y	L [5]
Commercial Parking	N	N	N	N	N	Y	CU [11]	CU [11]
Self-Service Storage	N	N	N	N	N	N	L [6]	L [6]
Commercial Outdoor Recreation	N	N	N	N	Y	Y	Y	Y
Major Event Entertainment	N	N	N	N	N	CU	CU	Y
Industrial Categories								
Manufacturing And Production	L/CU [2]	L/CU [2]	N	N	L/CU [4, 5]	L/CU [5]	L/CU [5,7]	L/CU [5]
Warehouse And Freight Movement	N	N	N	N	N	N	CU [5,7]	N
Wholesale Sales	N	N	N	N	L [4, 5]	L [5]	L [5,7]	L [5]
Industrial Service	N	N	N	N	N	CU [5]	CU [5,7]	CU [5]
Bulk Fossil Fuel Terminal	N	N	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N	N	N
Institutional Categories								
Basic Utilities	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]
Community Service	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]
Parks And Open Areas	Y	Y	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	Y	Y	Y	Y	Y
Colleges	Y	Y	Y	Y	Y	Y	Y	Y
Medical Centers	Y	Y	Y	Y	Y	Y	Y	Y
Religious Institutions	Y	Y	Y	Y	Y	Y	Y	Y
Daycare	Y	Y	Y	Y	Y	Y	Y	Y

Other Categories								
Agriculture	L [13]	L [13]	L [13]	L [13]	L [13]	L/CU [14]	L/CU [14]	L/CU [14]
Aviation And Surface Passenger Terminals	N	N	N	N	N	N	CU	CU
Detention Facilities	N	N	N	N	N	N	CU	CU
Mining	N	N	N	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]
Rail Lines And Utility Corridors	CU	CU	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Commentary

Table 140-1 Employment and Industrial Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in all base zones.

Table 140-1 Employment and Industrial Zone Primary Uses						
Use Categories	**EG1**	**EG2**	**EX**	**IG1**	**IG2**	**IH**
Residential Categories						
Household Living	CU	CU	Y	CU [1]	CU [1]	CU [1]
Group Living	CU	CU	L/CU [2]	N	N	N
Commercial Categories						
Retail Sales And Service	L/CU [3]	L/CU [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Office	L [3]	L [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Quick Vehicle Servicing	Y	Y	N	Y	Y	Y
Vehicle Repair	Y	Y	Y	Y	Y	Y
Commercial Parking	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]
Self-Service Storage	Y	Y	L [7]	Y	Y	Y
Commercial Outdoor Recreation	Y	Y	Y	CU	CU	CU
Major Event Entertainment	CU	CU	CU	CU	CU	CU
Industrial Categories						
Manufacturing And Production	Y	Y	Y	Y	Y	Y
Warehouse And Freight Movement	Y	Y	Y	Y	Y	Y
Wholesale Sales	Y	Y	Y	Y	Y	Y
Industrial Service	Y	Y	Y	Y	Y	Y
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	Y	Y	Y
Waste-Related	N	N	N	L/CU [8]	L/CU [8]	L/CU [8]
Institutional Categories						
Basic Utilities	Y/CU [12]	Y/CU [12]	Y/CU [12]	Y/CU [13]	Y/CU [13]	Y/CU 13]
Community Service	L [9]	L [9]	L [10]	L/CU [11]	L/CU [11]	L/CU [11]
Parks And Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	N	N	N
Colleges	Y	Y	Y	N	N	N
Medical Centers	Y	Y	Y	N	N	N
Religious Institutions	Y	Y	Y	N	N	N
Daycare	Y	Y	Y	L/CU [11]	L/CU 11]	L/CU 11]
Other Categories						
Agriculture	L [16]	L [16]	L [16]	L [16]	L [16]	L [16]
Aviation And Surface Passenger Terminals	CU	CU	CU	CU	CU	CU
Detention Facilities	CU	CU	CU	CU	CU	CU
Mining	N	N	N	CU	CU	CU
Radio Frequency Transmission Facilities	L/CU [14]	L/CU [14]	L/CU [14]	L/CU [14]	L/CU 14]	L/CU 14]
Rail Lines And Utility Corridors	Y	Y	Y	Y	Y	Y

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

33.910.030 Definitions

The definition of fossil fuels was added to clarify the land use category Bulk Fossil Fuel Terminals.

Petrochemicals that are used primarily for non-fuel products are excluded, such as plastics, lubricants, fertilizer, roofing, and paints. However, methanol is an exception that is included as a fossil fuel, because large methanol storage and distribution facilities tend to have structural similarities to liquid natural gas (LNG) and liquid petroleum gas (LPG) terminals, including large-scale storage and gas pipeline access, and because they can have similar safety and climate impacts.

Fuels containing 5% or less fossil-fuel volume are not considered fossil fuels under this definition. For example, "pure" ethanol made from corn or other non-fossil source is required by the Alcohol and Tobacco Tax and Trade Bureau to be denatured in order to be transported to the site. Denatured ethanol typically contains up to 5% methanol, so that it is toxic and undrinkable.

Some fossil fuels under this definition are also classified as "renewable fuels" in the federal Renewable Fuel Standard and "clean fuels" in Oregon's Clean Fuel Standard, such as liquid natural gas and liquid propane gas. These federal and state standards require transportation fuel sold within their jurisdiction to contain a minimum volume of renewable or clean fuels.

33.910.030 Definitions

The definition of words with specific meaning in the zoning code are as follows:

Fossil Fuel. Fossil fuels are petroleum products (such as crude oil and gasoline), coal, and gaseous fuels (such as natural gas, methanol, and propane) that are made from decayed plants and animals that lived millions of years ago and are used as a source of energy. Denatured ethanol and similar fuel additives and biodiesel/renewable diesel with less than 5% fossil fuel content are not fossil fuels.

Sections:

Introduction to the Use Categories
- 33.920.010 Purpose
- 33.920.020 Category Titles
- 33.920.030 Classification of Uses

Residential Use Categories
- 33.920.100 Group Living
- 33.920.110 Household Living

Commercial Use Categories
- 33.920.200 Commercial Outdoor Recreation
- 33.920.210 Commercial Parking
- 33.920.220 Quick Vehicle Servicing
- 33.920.230 Major Event Entertainment
- 33.920.240 Office
- 33.920.250 Retail Sales And Service
- 33.920 260 Self-Service Storage
- 33.920.270 Vehicle Repair

Industrial Use Categories
- 33.920.300 Bulk Fossil Fuel Terminal
- 33.920.310~~300~~ Industrial Service
- 33.920.320~~310~~ Manufacturing And Production
- 33.920.330~~320~~ Railroad Yards
- 33.920.340~~330~~ Warehouse And Freight Movement
- 33.920.350~~340~~ Waste-Related
- 33.920.360~~350~~ Wholesale Sales

Institutional Use Categories
- 33.920.400 Basic Utilities
- 33.920.410 Colleges
- 33.920.420 Community Service
- 33.920.430 Daycare
- 33.920.450 Medical Centers
- 33.920.460 Parks And Open Areas
- 33.920.470 Religious Institutions
- 33.920.480 Schools

Other Use Categories
- 33.920.500 Agriculture
- 33.920.510 Aviation And Surface Passenger Terminals
- 33.920.520 Detention Facilities
- 33.920.530 Mining
- 33.920.540 Radio Frequency Transmission Facilities
- 33.920.550 Rail Lines And Utility Corridors

Commentary

33.920.300 Bulk Fossil Fuel Terminal

Bulk Fossil Fuel Terminals are added as a new land use category to regulate their development in the Zoning Code. Regulation of Bulk Fossil Fuel Terminals implements policy direction in City of Portland Resolution 37168 (adopted November 2015) and 2035 Comprehensive Plan Policy 6.48 (adopted June 2016, expected to take effect in 2018), both of which address fossil fuel distribution and storage facilities.

Bulk Fossil Fuel Terminals are characterized by having (1) marine, pipeline or railroad transport access and (2) either trans-loading facilities for transferring a shipment between transport modes (such as from rail to ship) or bulk storage facilities exceeding 5 million gallons (or equivalent) of fossil fuels. Functionally, these terminals tend to be regional gateway facilities, where fossil fuels enter and exit the region. Additionally, Policy 6.48 calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market. However, the use classification is intended to be clearly identifiable by physical characteristics and not rely on a definition of region.

The regional market area of Bulk Fossil Fuel Terminals varies by product and is difficult to define. Portland's 10 petroleum terminals generally serve Oregon and Southern Washington. This market area substantially exceeds the Portland metropolitan area, which is often colloquially referred to as the region. Some terminal representatives pointed out that the federal government's 5-state West Coast PADD 5 region is generally their regional market area.

Resolution 37168 lists a specific exception to not restrict service directly to end users. At a small scale, services to end users include retail gasoline filling stations, natural gas access lines in street right-of-way to residential and business customers, and heating oil tanks at home sites. Larger scale end users with fossil fuel storage and access infrastructure also include manufacturers, jet fuel facilities at the PDX Airport, vessel fuel facilities on Portland Harbor, and others, where fossil fuels are used as an input.

Industrial Use Categories

33.920.300 Bulk Fossil Fuel Terminal

A. Characteristics. Bulk Fossil Fuel Terminals are establishments primarily engaged in the transport and bulk storage of fossil fuels. Terminal activities may also include fuel blending, regional distribution, and wholesaling. The firms rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities for transferring a shipment between transport modes, or have storage capacity exceeding 5 million gallons (or equivalent volume) of fossil fuels. There is minimal on-site sales activity with the customer present.

B. Accessory uses. Accessory uses may include retail sales of petroleum products, offices, food membership distribution, parking, storage, truck fleet parking and maintenance areas, rail spur or lead lines, and docks.

C. Examples. Examples include crude oil terminals, petroleum products terminals, natural gas terminals, propane terminals, and coal terminals.

D. Exceptions.

1. Truck or marine freight terminals that do not store, transport or distribute fossil fuels are classified as Warehouse and Freight Movement uses.
2. Truck or marine freight terminals that do not have transloading facilities and have storage capacity of less than 5 million gallons are classified as Warehouse and Freight Movement uses.
3. Gasoline stations and other retail sales of fossil fuels are not Bulk Fossil Fuel Terminals.
4. Distributors and wholesalers that receive and deliver fossil fuels exclusively by truck are classified as Warehouse and Freight Movement uses.
5. Industrial, commercial, institutional, and agricultural firms that exclusively store fossil fuels for use as an input are not Bulk Fossil Fuel Terminals.
6. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.
7. The storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, rail yard, or as part of a fleet vehicle servicing facility are accessory to their use.
8. Uses that recover or reprocess used petroleum products are not Bulk Fossil Fuel Terminals.

33.920.310~~300~~ Industrial Service

33.920.320~~310~~ Manufacturing And Production

33.920.330~~320~~ Railroad Yards

33.920.340~~330~~ Warehouse And Freight Movement

A. Characteristics. Warehouse And Freight Movement firms are involved in the storage, or movement of goods for themselves or other firms. Goods are generally delivered to other firms or the final consumer, except for some will-call pickups. There is little on-site sales activity with the customer present.

B. Accessory uses. Accessory uses may include offices, food membership distribution, truck fleet parking and maintenance areas, rail spur or lead lines, docks, and repackaging of goods.

C. Examples. Examples include separate warehouses used by retail stores such as furniture and appliance stores; household moving and general freight storage; cold storage plants, including frozen food lockers; storage of weapons and ammunition; major wholesale distribution centers; truck, marine, or air freight terminals; bus barns and light rail barns; parcel services; major post offices; grain terminals; and the stockpiling of sand, gravel, or other aggregate materials.

D. Exceptions.

1. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.
2. Miniwarehouses are classified as Self-Service Storage uses.
3. Establishments that engage in the transfer or storage of fossil fuels, rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities or have storage capacity exceeding 5 million gallons of fossil fuels are classified as Bulk Fossil Fuel Terminal use.

33.920.350~~340~~ Waste-Related

33.920.360~~350~~ Wholesale Sales

A. Characteristics. Wholesale Sales firms are involved in the sale, lease, or rent of products primarily intended for industrial, institutional, or commercial businesses. The uses emphasize on-site sales or order taking and often include display areas. Businesses may or may not be open to the general public, but sales to the general public are limited as a result of the way in which the firm operates. Products may be picked up on site or delivered to the customer.

B. Accessory uses. Accessory uses may include offices, food membership distribution, product repair, warehouses, parking, minor fabrication services, and repackaging of goods.

C. Examples. Examples include sale or rental of machinery, equipment, heavy trucks, building materials, special trade tools, welding supplies, machine parts, electrical supplies, janitorial supplies, restaurant equipment, and store fixtures; mail order houses; and wholesalers of food, clothing, auto parts, building hardware, and office supplies.

D. Exceptions.

1. Firms that engage primarily in sales to the general public are classified as Retail Sales And Service.
2. Firms that engage in sales on a membership basis are classified as either Retail Sales And Service or Wholesale Sales, based on a consideration of the characteristics of the use.
3. Firms that are primarily storing goods with little on-site business activity are classified as Warehouse And Freight Movement.
4. Establishments that engage in the regional wholesaling of fossil fuels, rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities or have storage capacity exceeding 5 million gallons of fossil fuels are classified as Bulk Fossil Fuel Terminal uses.

7. Other implementation recommendations

This section of the report recommends future implementation directions for building code amendments to address seismic resilience and periodic monitoring for code effectiveness.

Seismic resilience

Considering setting direction to implement this future action within the adopting ordinance:

- Portland Bureau of Emergency Management and Portland Office of Government Relations are directed to develop proposed State building code changes to improve seismic resilience and require seismic upgrades comparable to proposed requirements on unreinforced masonry buildings.

Seismic resilience is one of the underlying rationales for fossil fuel distribution policies and the proposed code amendments. Seismic safety requirements of land development are addressed in building codes, which are adopted and amended at the state level.

Monitoring for code effectiveness

Considering setting direction to implement this future action within the adopting ordinance:

- Portland Bureau of Planning and Sustainability is directed to periodically monitor the effectiveness of the proposed zoning code amendments to implement underlying policies and consider code adjustments in response to regional fuel demand and market changes, product innovation, safety and climate action considerations, and related regulatory changes.

A monitoring and adaptation approach would provide for ongoing code effectiveness within a context of changing energy markets, products, and associate regulations.

Appendix A: Stakeholder focus group results

Public involvement in the concept development for the Fossil Fuel Terminal Zoning Project consisted primarily of four stakeholder focus groups as well as meetings with fuel terminals and other individuals or organizations. The focus groups were held in June 2016. The purpose of the focus groups was to help identify and understand the issues that should help shape the preliminary zoning code being considered by this project. The focus groups also helped to expeditiously reach out to a broad range of stakeholders. While their perspectives and interests are shared on some topics, they diverge on other topics.

In addition to the stakeholder focus groups, BPS staff met with several fuel terminals to explain the proposal, answer questions, and discuss their individual concerns. This was needed because antitrust regulations constrained discussion about certain topics, for example supply chains, in the presence of representatives from other fuel terminals. Primarily, the terminal operators explained their operations and facilities, many of which differed substantially from other terminals.

Who participated?

Figure 9 lists the participants of the four focus groups conducted. Ten to twelve participants were invited to each meeting, although not everyone was able to attend. The first focus group consisted of fuel terminal representatives who have a direct stake in the proposed regulations. The second group was environmental and public health organizations, some of whom advocated for the resolution before City Council and have community safety and sustainability in mind. The third group were state and regional business and government organizations. Their interest was to protect the state economy by testing the proposal against economic realities. The fourth group was neighborhood and equity community organizations whose interests were to protect neighborhoods adjacent to the terminals and underserved communities who may rely on terminals for employment. Additionally, the Mayor's Office invited input from Native communities and tribal governments.

Preliminary code concepts discussed

- Identify "bulk fossil fuel terminals" as a regulated land use, characterized by inter-regional transport access and larger storage facilities.
- Either prohibit new terminals or set storage capacity limits high enough to accommodate regional growth.
- Allow existing terminals to expand for seismic upgrades, access to greener fuels and capacity for regional growth.

What discussion questions were asked?

The focus groups were provided background materials describing the preliminary code change concepts about two weeks before the focus group meetings. BPS staffed prompted the focus group across four topics:

Figure 9. Stakeholder Focus Group Participants, June 2016

STAKEHOLDER	DATE	ATTENDEES
Fuel terminal representatives	Thursday, June 02, 2016	Gilbert Betancourt, Phillips 66 Nick Giotta, Phillips 66 Stephanie Williams, Phillip 66 Andrew Holbrook, Kinder Morgan Shanna Brownstein, Northwest Natural Kevin Jones, McCall Oil Pamela Brady, BP West Coast Jerry Henderson, Chevron Kevin Buffum, Pacific Terminal Services Steve Kober, NuStar Will Rassmussen, WSPA Frank Holmes, WSPA Chris West, Pac/West and Arc Terminals Nathan Eggers, Arc Terminals Jerome Jackson, NuStar Rob Hill, NuStar Zach Klonoski, Mayor's Office
Environmental and health organizations	Tuesday, June 07, 2016	Regna Merritt, Ore. Physicians for Social Responsibility Trish Weber, Center for Sustainable Economy Meredith Connolly, Climate Solutions Kristen Sheeran, Climate Solutions Nick Caleb, 350PDX/CSE Bob Salinger, Audubon Society Dan Serren, Columbia Riverkeeper Adriana Voss-Andreae, 350PDX Micah Meskel, Portland Audobon
State and regional business organizations	Thursday, June 09, 2016	Jana Jarvis, Oregon Trucking Association Greg Theisen, Port of Portland Ellen Wax, Working Waterfront Jay Clemens, Associated Oregon Industries Mark Landauer, Oregon Public Ports Association Marion Haynes, Portland Business Alliance Corky Collier, Columbia Corridor Association Kelly Ross, NAIOP Shanna Brownstein, Northwest Natural Emerald Bogue, Port of Portland Susan Lahsene, Port of Portland Phil Grillo, Davis Wright Tremaine
Neighborhood and equity organizations	Tuesday, June 14, 2016	Jeff Geisler, Hayden Island Neighborhood Association John Bradley, Northwest District Association Travis Argue, UA Local 290 Willy Myers, Columbia Pacific Building Trades

1. Issues that should shape the project
2. Types of distribution and storage facilities to be regulated
3. Definition of fossil fuels
4. Zoning approach for limiting new storage facilities

In addition to specific questions within each topic, participants were invited to share any general and wrap-up comments during the focus group.

What we heard

For each topic area, the results of the focus groups are summarized in Figure 4 of Section 3. That table summarizes the main themes and concerns raised during the focus groups.

Key issues

Fuel terminal representatives objected to this policy direction in general. They discussed their safe operating history and commitment to implement the federal and state standards for renewable and clean fuels. There were challenges to participating in the conversation, but they agreed to work cooperatively on this project to get the code right. For example, anti-trust laws precluded the group from engaging in certain conversations because it would involve disclosing information about their supply chains and could be considered collusion in court of law. This group was concerned with the fast timeline and felt the policies should be discussed first.

They also felt the process was emotionally driven, not having considered the unintended consequences. For example, with renewable and clean fuel standards constantly in flux, they felt that zoning rules could make it more difficult to meet these standards. Restricting growth here in Portland at the end of the Olympic Pipeline could put more trucks on the road, instead of more efficient pipeline or rail transportation. The group asserted that there could also be significant economic impacts on the rest of the state, given that 95% of Oregon's fuel passes through Portland first. Lastly, fuel terminal representatives expressed concern for additional administrative burdens that a new land use category would bring. For example, what steps would be necessary for these firms to demonstrate that they were existing operations prior to the new zoning rules? Additionally, they warned that their site configuration may pose a challenge to effective zoning rules, as they are often non-contiguous operations connected by interconnected pipelines.

Environmental and public health organizations felt the policy direction was less aggressive toward fossil fuels than what the City Council resolution had proclaimed. They felt the resolution sought to outright prohibit new development and expansion on existing facilities. Because of this, they cautioned about community backlash if this proposal did not meet expectations. In this vein, they highlighted that Portland will be the first city to fully implement this type of policy, so the project could be an opportunity to set a strong precedent and model code for other cities. This group also felt that resident health and safety was also a top priority. They noted the seismic risks posed by fuel terminal tank farms that lie on liquefaction zones as well as the June 2016 oil train wreck in Mosier. For these reasons, they felt Portland Bureau of Emergency Management (PBEM) and other environmental justice groups should be involved in safety considerations. Lastly, the group felt the economic impact statement should include more than the impact on jobs. It should also consider the risks of economic and financial damages from a natural disaster. Members of this focus group offered to provide technical analysis on the impacts that the proposed options could have on the environment and public health and safety.

Some noted that risks should be accounted for through bonding or insurance requirements under worst-case scenarios.

State and regional business organizations felt that this undertaking requires more research. The resolution set required tasks, including an economic impact analysis and an examination of relevant laws, and they felt these tasks should be completed before laying the groundwork through code development. They felt the marine cargo forecast for liquid bulks of 1% growth is outdated and too low. (Note, an opposite reaction was expressed by environmental and health organization representatives who felt this figure was too high.) Similarly, they feared that the code may not hold up well in five years because of constantly changing energy markets. For example, in five years Portland could be shipping cleaner fuels to the Midwest. Some members expressed concern that the zoning code may not be the right tool to achieve some of the GHG (greenhouse gas) reduction and public safety goals that this resolution aimed to achieve. If the goal is public safety, then the City should require or create incentives for seismic upgrades. They stated that, if the goal is to reduce greenhouse gases, then prohibiting the export of cleaner-burning fuels, such as LNG (liquefied natural gas), may have the opposite intended effect. Lastly, the group asserted the important role that Portland's fuel terminal facilities play in rest of the state economy. They warned of political and economic repercussions that these decisions could have. They shared the view with fuel terminal representatives that this is a big political decision—the timeline is too short and the process should not be rushed.

Neighborhood and equity community organizations communicated that safety, pollution and accidental releases were their top priority when considering zoning for fuel terminals. They wanted a close examination of the seismic and explosion risks associated with fuel terminals. For example, which terminals are in liquefaction zones? Where are the storage tanks located in relation to neighborhoods? They sought honesty about the risks posed to the Linnton neighborhood specifically. Rail safety in the Columbia Gorge was also a key issue. The June 2016 incident in Mosier highlighted the risks. A potential solution they offered would be more pipelines, but they are difficult to get built. This group recognized the difficulty in managing competing values. They felt a reasonable expectation of growth is a smart idea. One participant described the proposal as aggressive, adding that by prohibiting LNG export terminals, global export destinations like China may end up burning dirtier fuels, such as coal. They felt this also meant Portland would forego export profits.

New land use category

Fuel terminal representatives were concerned for the clarity of the rules. They felt that the definition of "bulk terminal" is very important to be clear. If the definition was open to interpretation, then permit staff could be pressured. They warned that creating "bulk fuel terminal" as a specifically regulated use could lead to unpredictable results. This group was also concerned with the definition of "region." They were unsure if off-shore distribution was the issue, advocating for using the federally recognized West Coast region (PADD 5) as the definition of "regional market." PADD 5 includes Oregon, Washington, California, Nevada, Arizona, Alaska and Hawaii.

Environmental and public health organizations wanted to see the regulation go beyond new facilities and also look at limits on expansion at existing facilities. They felt the City Council resolution was clear and unambiguous about opposing expansion of fossil fuel infrastructure, which includes expansions at existing sites. They emphasized the importance for getting the right definition of "bulk terminal" and the associated size limit (or prohibition)—these must be correct in order to effectively implement the policy. Some members questioned whether seismic upgrades at existing facilities could be allowed but

expansions prohibited. This group also urged the inclusion of PBEM's work on hazards in liquefaction zones in this project.

State and regional business organizations echoed the concerns for clear and correct definitions that the fossil fuel representatives posed. "Region," "export," "end user," and "fossil fuel" are all important terms to get right. They also were strongly opposed to making existing facilities non-conforming uses, as well as making them limited uses with unclear exceptions. This would expose projects to discretionary land use actions, which is costly and unpredictable, and hence risky. It would likely make improvements that the community values, such as seismic upgrades, more difficult to attain.

Neighborhood and equity community organizations were skeptical that a new export terminal would be proposed in the Portland area in the wake of Pembina. They felt that Superfund sites were too expensive to acquire and build on. The group also wondered whether a new zone for fossil fuels ought to be created instead of a land use. They questioned why it ought to be allowed in IG2.

Definition of fossil fuels

Fuel terminal representatives were primarily concerned with the long-term applicability of the proposed rules. Energy markets and new technologies are constantly in flux, and it is difficult to know what the size requirements might be for newer—perhaps cleaner—fuels, particularly blended fuels. This group sought clarification for what "green fuels" meant. They noted that the proposed inclusion of LNG among city-regulated fossil fuels is inconsistent with the State of Oregon's inclusion of LNG as a "clean fuel." They called for periodic review of the rules when tomorrow's cleaner fuels become known, as they may not meet today's definitions. They cautioned about unintended consequences of placing restrictions on fossil fuel terminals, such as potentially putting more trucks on the road by restricting growth at facilities with pipeline, marine and rail access. This may result in considerably more GHG emissions. They also felt that methanol should not be included in the list of regulated fuels because it is used more as a value-added commodity than a fuel. They shared this last viewpoint with most other focus groups, except the environmental and health organizations.

Environmental and public health organizations looked to the intent of the City Council resolution and noted that it included propane, methanol, natural gas and other low-carbon fuels. At the same time, they agreed that code changes should provide flexibility to meet Oregon's low carbon fuel standard. They noted that methanol is currently being used as a fuel, so excluding it undermines the policy. The group sought clarification on how to address non-fuels. Some suggested that the GHG emissions of these input commodities should help ground their use. Others thought that the proportions (e.g., in blended fuels) should be considered—if the product is mostly used as a fossil fuel, then it should be regulated and restricted. Lastly, they highlighted how even one new LNG tank in Portland is a major safety issue. Although not explosive, coal also poses a significant risk, especially in transportation. Because of these risks, they believed that the resolution should be implemented through health and safety standards.

State and regional business organizations expressed frustration that while the federal and state government are going one direction requiring cleaner-burning fuels, the City of Portland appears to be choosing to restrict distribution of these cleaner fuels in another policy direction. Some members thought the City could try to incentivize a higher blend of renewables, and others warned of the disincentives that could discourage investment—disincentives should limit GHG emissions, not seismic upgrades.

Neighborhood and equity community organizations thought that restricting methanol exports would be an overreach. They said it is not being used as a fuel in the United States, and instead it is a value-added product used in manufacturing of plastics and other goods. Including methanol would negatively impact the manufacturing sector that requires it as an input, and it could open the door to regulating other non-fuel commodities, such as paints and asphalt. In general, they felt that if we can make certain fuels cleaner burning, then it poses minimal threat. They asserted that, since there is no clear transitional path away from our dependency on fossil fuels, we should make way for cleaner alternatives, such as blended bio-diesel.

Terminal development restrictions

Fuel terminal representatives were concerned with potential restrictions precluding development on certain site configurations, which have some peculiarities. For example, where two existing tank farms are non-contiguous (e.g., at Willbridge) and are connected by facility pipelines, they should be allowed an option for expansion. Additionally, some sites may already be built out and cannot accommodate the new growth that is expected. This group could not comment on facility size and anticipated growth, because of anti-trust laws, but they noted that it is critically important. For this reason, they could not provide feedback on the implementation options presented.

Environmental and public health organizations generally preferred Option A. However, some recognized the legal challenges posed by federal restrictions. They wondered if health and human safety risks may provide a defensible rationale. Some members also noted that while prohibiting all new facilities and making existing facilities non-conforming uses might be more legally defensible, it is much less politically feasible. Finally, some members of this group were skeptical of the 1% annual growth forecast for liquid bulks. They felt this was too high, which is contrary to what the state and regional business organization representatives stated.

State and regional business organizations criticized the approach to implementing the City Council resolution. They felt that zoning to regulate tank size approaches the problem sideways, and the unclear rationale could lead to appeals and legal challenges. One participant advocated to prohibit exports more directly, rather than a sideways approach. They cautioned that tank size limits could essentially put the region on an "import diet," even if the intent of the limit is to reduce throughput. They did not think this proposal accounted for these unintended impacts. Docked ships in the harbor may need an LNG tank to power their facilities and improve air quality, for example. They also noted that there are economic advantages and efficiency gains to being a bigger facility, and placing restrictions on size will have consequences that we don't want—lower wages for example. Lastly, they felt the 1% annual growth forecast for liquid bulks was outdated—an updated forecast would be higher. This was the opposite of what environmental and public health organizations stated.

Neighborhood and equity community organizations generally preferred Option C, calling it a realistic proposal that allows for some growth but doesn't restrict it too much. While the group was fairly resolute that coal is not a good alternative, they recognized that LNG is a cleaner-burning fuel. However, since the facilities in the region are already at capacity, Option C would allow for some wiggle room for the region's growth. They felt it would allow the "invisible hand" to guide the market more easily. They recommended that the City review the size limits every few years as the market changes.

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MEMO

DATE: September 9, 2016

TO: Planning and Sustainability Commission

FROM: Tom Armstrong, Steve Kountz

CC: Michael Armstrong, Susan Anderson, Zach Klonoski

SUBJECT: Fossil Fuel Terminal Zoning Amendments

Many comments have been received in last couple weeks on the Proposed Draft of Fossil Fuel Terminal Zoning Amendments. This memo is intended to summarize and discuss themes of comments for major changes to the Proposed Draft.

Summary themes of comments received through September 8th:

- Emailed testimony has been received from about 300 people generally calling for a full ban. While their comments varied, predominant recommendations included removing the 5-million-gallon terminal size threshold and adding expansion criteria on climate and safety impacts.
- BPS convened a meeting on August 31st to review the Proposed Draft with environmental organization representatives who commented on the Discussion Draft. Their recommendations similarly included adding expansion criteria on climate and safety impacts and substantially reducing or removing the 5-million-gallon terminal size threshold.
- BPS convened another meeting on August 31st with business organization representatives and on September 6th with fuel terminal representatives who commented on the Discussion Draft. Their recommendations included allowing 10-20% terminal expansion for seismic upgrades and clean fuel standard compliance without a non-conforming situation review, exempting regulated utilities, expanding the analysis of statewide economic impacts, and clarifying that pipelines are not inadvertently categorized as transloading facilities.

- A September 7th letter from Bureau of Development Services (BDS) commented that approval of expansions of existing terminals may not be possible through a non-conforming situation review. Instead they recommend an alternative approach that provides specific limits on expansions with specific review criteria.

Zoning Code Options

1. Fossil Fuel Terminal size threshold

The 5-million-gallon threshold in the Proposed Draft is intended to represent and focus on regional gateway facilities where fossil fuels are brought into the region. The purpose of the threshold is to implement 2035 Comprehensive Plan Policy 6.48 Fossil Fuel Distribution, which is to limit fossil fuel distribution and storage facilities to those necessary to serve the regional market. In comparison, recent proposals for export terminals are many times larger than the proposed 5 million gallon threshold. For example, the recent crude oil terminal proposal in Vancouver (Washington) was for 91 million gallons of storage capacity and the Pembina propane terminal proposal in Portland was for 34 million gallons of storage capacity. Existing petroleum terminals in Portland are generally supplied by the Olympic Pipeline and tankers or barges rather than unit trains, along with relatively small railcar deliveries of ethanol from Oregon producers. The NW Natural GasCo facility is supplied by a natural gas pipeline.

A size threshold of a use category in the Zoning Code would apply to both new and existing terminals. Staff have not attempted to inventory or reach out to the smaller fossil fuel distributors that could be affected. For example, a recent Yellow Pages listing of oil distributors in Portland found 130 entries. In comparison, BPS identified 11 facilities shown in Figure 3 of the Proposed Draft that fit the draft description of Bulk Fossil Fuel Terminals. BPS involved representatives of these 11 terminals in early outreach activities for this project in May 2016, along with environmental organizations, neighborhood and equity organizations, and state and regional business associations.

A change to effectively eliminate the bulk fossil fuel storage aspect of the use description may also appear to inadvertently expand the use category to include general freight transportation facilities, such as rail yards and barge lines that handle fossil fuels and other commodities. This change would substantially expand the policy scope, resulting in additional economic impacts. A clarification in the use description could be added to exclude railroad yards and freight movement uses that handle fossil fuels among other commodities.

Options:

A. No change. The storage capacity threshold is 5 million gallons.

B. Reduce the storage capacity threshold.

C. Eliminate the storage capacity threshold and exclude general-commodity railroad yards and freight movement facilities.

BPS Recommendation: No change.

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2. Regulating existing terminal expansion

The Proposed Draft assumes some opportunity to approve expansion of existing terminal storage capacity that would allow the existing terminals to expand for new fuel additive tanks to meet clean and renewable fuel standards, seismic upgrades of existing tanks, and emergency backup capacity, consistent with Resolution 37168. However, comments from BDS clarify that such expansion would be difficult to approve through a non-conforming situation review. BDS recommends considering an alternative approach to set limitations on expansion - with or without a land use review.

One option would be to allow no more than 10-20 percent expansion of total storage capacity at existing terminals. New tanks would automatically be required to meet current building code standards for seismic safety. Another approach could allow specific types of expansion, such as emergency backup capacity, seismic upgrades, and tanks for clean and renewable fuels. For example, seismic upgrade limitations could allow for tank replacement projects that include removal of tanks which do not meet current seismic standards and installation of new tanks that do not exceed the capacity of removed tanks by 10-20 percent. This second approach could accommodate long-term flexibility to meet clean and renewable fuel standards.

Options:

A. No change. Prohibit new Bulk Fossil Fuel Terminals and existing terminals become non-conforming uses and any expansion must go through a non-conforming situation review.

B. Prohibit new Bulk Fossil Fuel Terminals and allow limited expansion of existing terminals to not exceed 10 percent of the total terminal capacity on the effective date of the code changes.

C. Prohibit new Bulk Fossil Fuel Terminals and allow expansion of existing terminals greater than 10 percent through a conditional use review process with special criteria for emergency backup capacity, seismic upgrades, and tanks for clean and renewable fuels.

BPS recommendation: Option B - a clear and simple approach.

3. Additional review criteria

A large number of comments support stronger restrictions on expansions at existing terminals through adding binding limits as well as criteria for safety and climate impacts.

The Zoning Code includes multiple sets of review criteria for conditional use reviews that are specific to particular uses and zones.

BDS staff have commented that they do not have staff expertise to implement discretionary land use review criteria addressing greenhouse gas emissions or safety impacts of hazardous material storage and transportation. If new conditional use criteria are added to limit or

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require no net increase of greenhouse gas emissions or safety impacts of hazardous material storage and transportation facilities, applicants would be required to hire specialized consultants to show compliance of the particular criterion, which would affect the complexity, predictability, and cost of land use reviews in new ways. This change would be inconsistent with 2035 Comprehensive Plan Policy 6.16 Regulatory Climate, which calls for improving development review processes and regulations to encourage predictability and support local and equitable employment growth and encourage business retention.

Options:

A. No change.

B. Add conditional use criteria for expansion of existing terminals to mitigate adverse land use impacts on greenhouse gas emissions and safety impacts of hazardous materials storage and transportation.

BPS and BDS recommendation: No change.

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Fossil Fuel Terminal Zoning Amendments: Proposed Draft

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New policy direction on fossil fuel infrastructure

Fossil Fuel Infrastructure Resolution, November 2015: City Council will actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways.

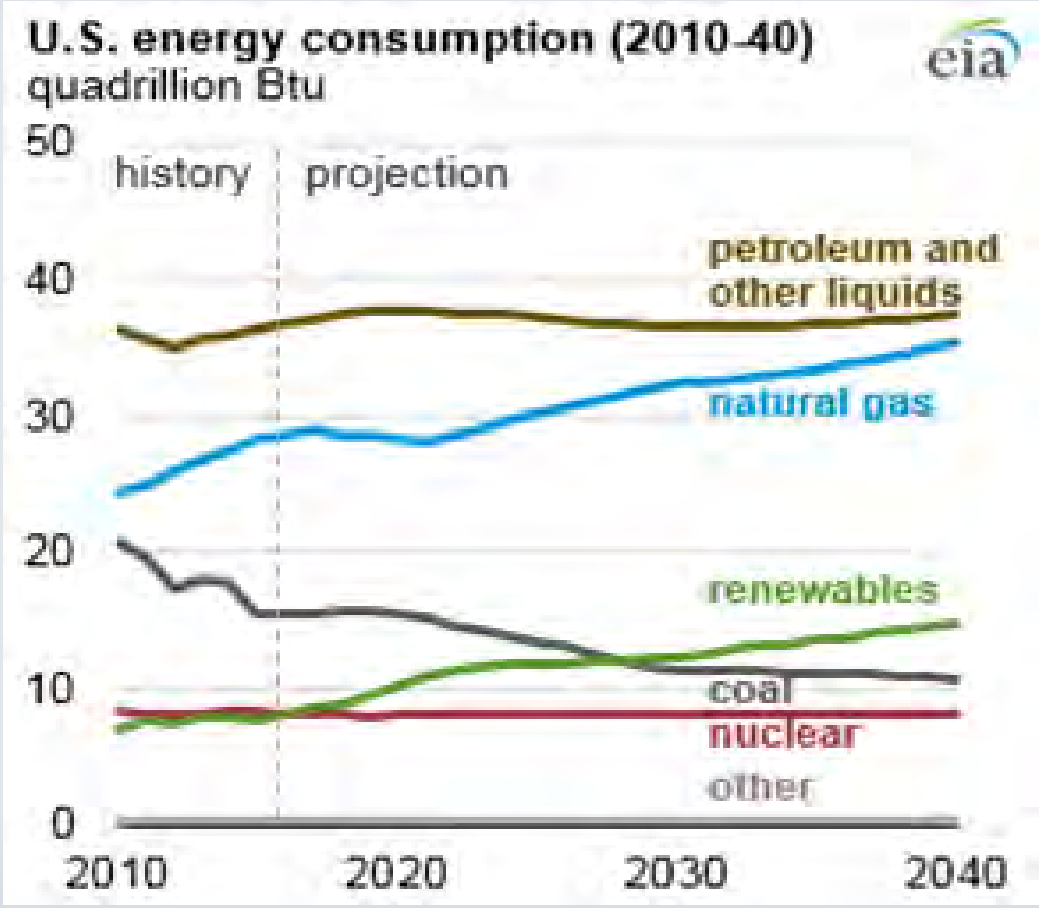
2035 Comprehensive Plan
Policy 6.48 Fossil fuel distribution. Limit fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Statewide fuel distribution hub



- Over 90% of petroleum sold in Oregon is handled at the 10 Portland terminals.
- Hub infrastructure: harbor, pipelines, railroads, truck routes.
- Natural gas storage for regional peak consumption.

U.S. energy consumption projections to 2040



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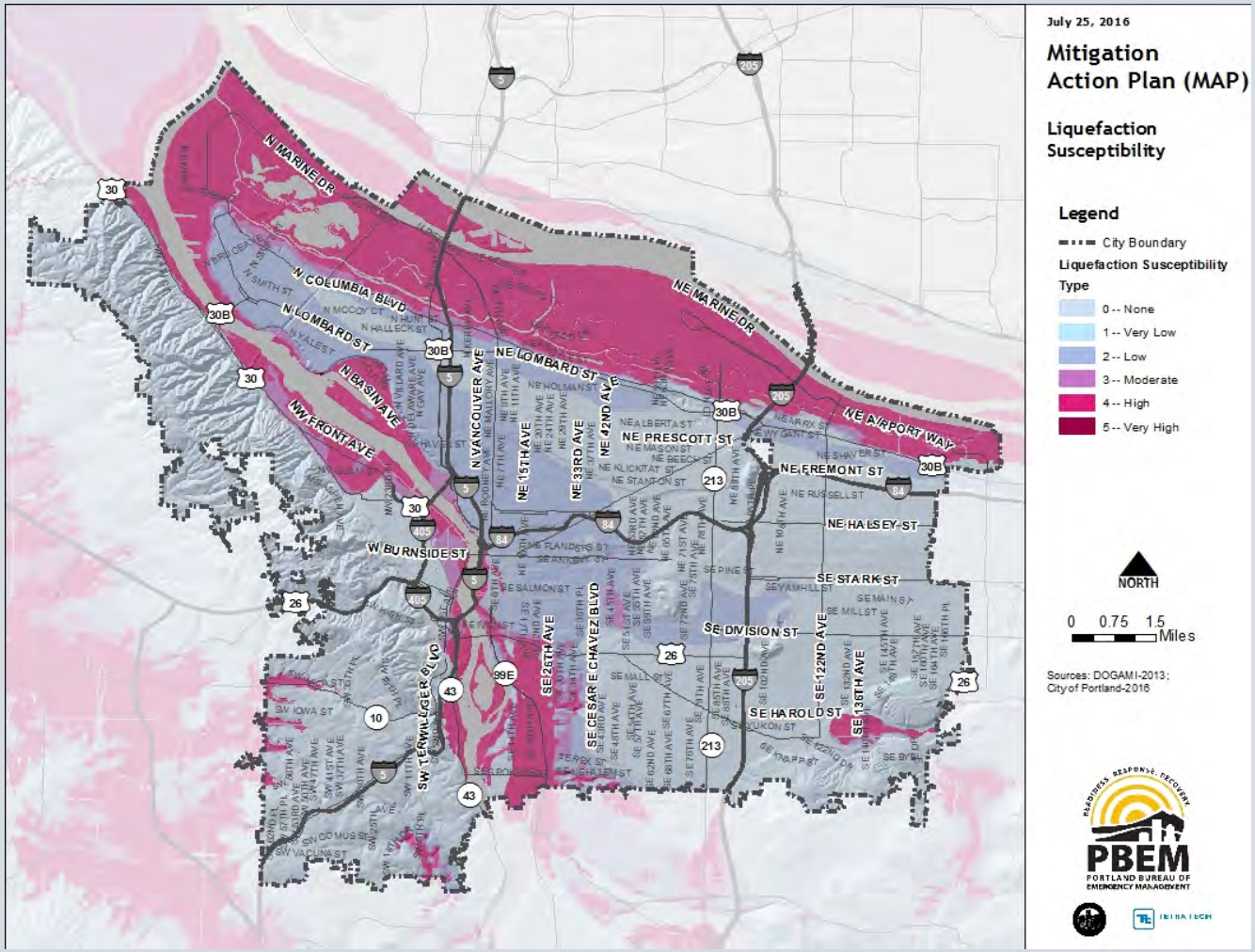

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Proposed zoning code amendments

- **Define** Bulk Fossil Fuel Terminals as a regulated land use.
- **Prohibit** Bulk Fossil Fuel Terminals in all base zones.
- Existing Bulk Fossil Fuel Terminals would become legal, non-conforming uses that can continue to operate.

New land use category:
Bulk Fossil Fuel Terminals

Bulk Fossil Fuel Terminals:

- Marine, railroad, or pipeline transport access; and
- Transloading facilities (such as train-to-ship) or storage capacity exceeding 5 million gallons.

Exclusions:

- Distributors with access exclusively by truck;
- End-user facilities, including filling stations and firms that store fossil fuels for use as an input;
- Recovery or reprocessing used petroleum

Defining fossil fuel

Fossil fuels are petroleum products (such as crude oil and gasoline), coal, and gaseous fuels (such as natural gas, methanol, and propane) that are made from decayed plants and animals that lived millions of years ago and are used as a source of energy.

Exclusions: Denatured ethanol and similar fuel additives and biodiesel/renewable diesel with less than 5% fossil fuel content are not fossil fuels.

Capacity of new terminals

Proposed: 5 million gallons

Existing: Wide range

Largest: 67 million gallons

Average: 32 million gallons

Smallest: 11 million gallons

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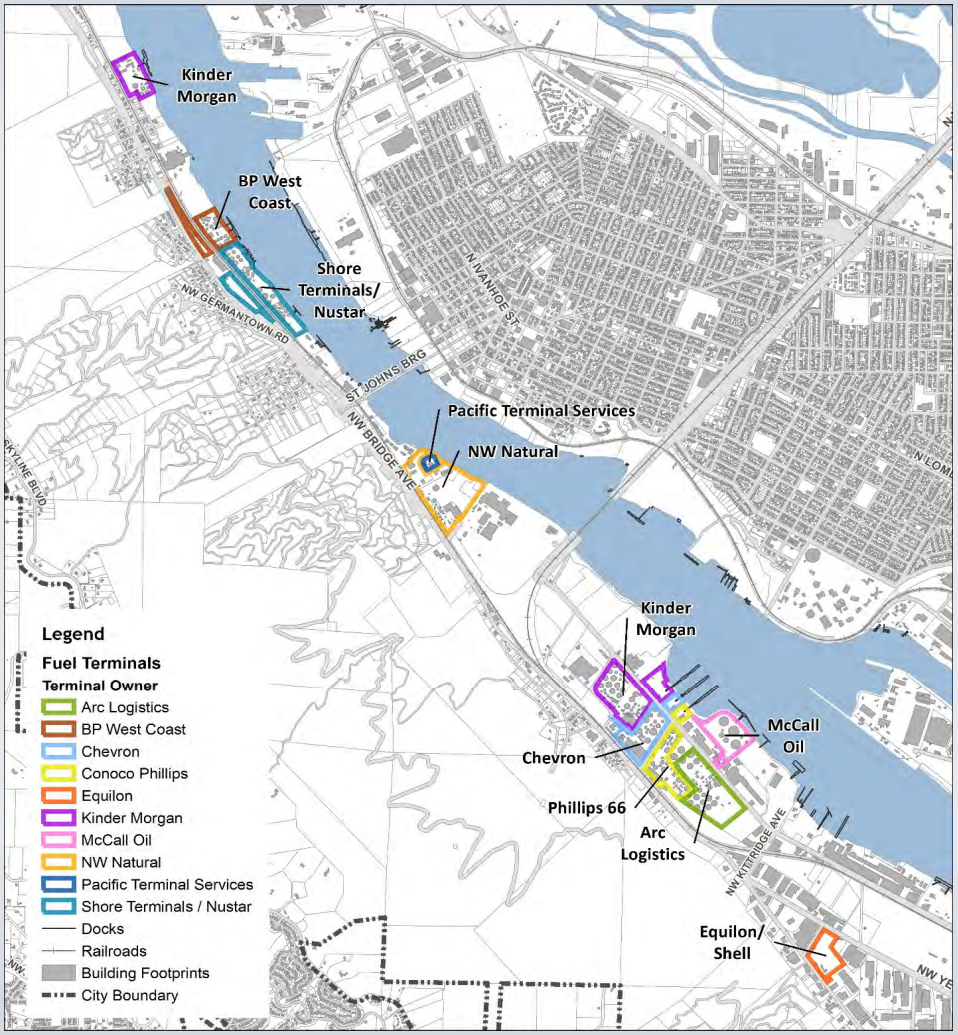
Restricted expansion of existing terminals



Restricted expansion of existing terminals

A. Existing terminals become non-conforming uses.

B. Limited use with expansion not exceed 10 percent of the total terminal capacity as of adoption.

C. Conditional use that would allow expansion greater than 10 percent through a land use review with special criteria for emergency backup capacity, seismic upgrades, GHG emissions and clean and renewable fuels.

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Future code changes on seismic resilience



PBEM's 2016 Critical Energy Infrastructure Hub Study is underway.

Seismic safety requirements are addressed in state building codes.

Future action:
Advocate for state-level code changes to improve seismic resilience and require seismic upgrades.

Next steps

September 13	PSC Hearing
October 11	PSC Recommendation
November 10	City Council Hearing

Proposed Draft available at
www.portlandoregon.gov/bps/71118

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City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

Presort First Class Mail ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37⁶
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

TIBBETTS VILLAGE CONDOMINIUM OWNERS
ASSOCIATION
11
CI

NIXIE 970 FE 1270 0008/23/16
RETURN TO SENDER
UNABLE TO FORWARD
BC: 97201538075 *2929-03870-23-30

22 GAY1 [illegible]

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

ANL

RETURN SERVICE REQUESTED

NODINE WILLIAM C
PO BOX 797
PO

NIXIE 970 FE 1270 0008/23/16
RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD
BC: 97201538075 *2929-00732-23-29

99 GAY1 [illegible]

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
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Measure 56 Notice

RETURN SERVICE REQUESTED

VENTURA FOODS L L C(LEASED MOLDED
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913 NFE 1270A15I0008/22/16
RETURN TO SENDER
: VENTURA FOODS
6 POINTE DR STE 100
BREA CA 92821-6325
RETURN TO SENDER

97201 5380
228 GAY1 I5B 9174

3393

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
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Measure 56 Notice

RETURN SERVICE REQUESTED

HULING TOM D III & HULING STEVEN D
PO BOX 13366
S

NIXIE 980 FE 1270 0008/23/16

RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD

ANK BC: 97201535099 *0526-03437-21-24

240 GAY1 [illegible]

Presort First Class Mail ComBasPrice

US POSTAGE >> PITNEY BOWES

ZIP 97204 $ 000.37[illegible]
02 4W
0001392854 AUG 19 2016

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Measure 56 Notice

RETURN SERVICE REQUESTED

CALLAHAN JAMES F
12235 SW EDGEWOOD ST
PO

970 NFE 1270C15I0008/22/16

RETURN TO SENDER
CALLAHAN JAMES
2015 NW 21ST AVE
PORTLAND OR 97209-1896

RETURN TO SENDER

68 GAY1 [illegible]

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Bureau of Planning and Sustainability
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Measure 56 Notice

RETURN SERVICE REQUESTED

HORNING SHIRLEYANN K TR
29[illegible] SE VILLAGE LOOP #305
VA

970 NFE 1270116I0008/22/16

RETURN TO SENDER
HORNING SHIRLEY ANN K
2997 SE VILLAGE LOOP # 136
VANCOUVER WA 98683-8100

RETURN TO SENDER

3394

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Presort First Class Mail ComBasPrice

U.S. POSTAGE FITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

CALDWELL MICHAEL B
9911 N DECATUR ST
PORTLAND OR 97203

970 NFE 1270816I0008/22/16
RETURN TO SENDER
CALDWELL MICHAEL
3917 N KERBY AVE
PORTLAND OR 97227-1243

RETURN TO SENDER

52 GAY1 [illegible] 97201 [illegible]

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Presort First Class Mail ComBasPrice

U.S. POSTAGE FITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

ROSENBLADT W RODNEY TR (W RODNEY
ROSENBLADT LIVING TRUST DTD 05/19/05)
9925 N DECATUR ST
PO

970 NFE 1270516I0008/22/16
RETURN TO SENDER
ROSENBLADT PHD
13811 MARQUETTE ST
WESTMINSTER CA 92683-3412

RETURN TO SENDER

52 GAY1 [illegible] 97201 [illegible]

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Presort First Class Mail ComBasPrice

U.S. POSTAGE FITNEY BOWES
ZIP 97204 $ 000.[illegible]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

HAYDEN MEADOWS % TMT DEVELOPMENT
805 SW BROADWAY #2020
PC

970 NFE 1270716I0008/22/16
RETURN TO SENDER
:HAYDEN MEADOWS JOINT VENTURE
760 SW 9TH AVE STE 2250
PORTLAND OR 97205-2584

RETURN TO SENDER

53 GAY1 [illegible]

3395

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Bureau of Planning and Sustainability
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Measure 56 Notice

Presort
First Class Mail
ComBasPrice

U.S. POSTAGE » PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

SCHLEINING CAROL J TR
21988 NE LACHENVIEW ST
FA 970 NFE 1270316I0008/22/16
RETURN TO SENDER
SCHLEINING
1102 LINCOLN ST
OREGON CITY OR 97045-2152

RETURN TO SENDER

25 GAY1 [illegible] 01 [illegible]

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Measure 56 Notice

Presort
First Class Mail
ComBasPrice

U.S. POSTAGE » PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

BENHAM JACK
300 N HAYDEN BAY DR
PO * 970 N52 1270516I0108/22/16
RETURN TO SENDER
BENHAM
1002 NW WHITMAN ST
CAMAS WA 98607-8416

RETURN TO SENDER

64 GAY1 [illegible] 01 [illegible]

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First Class Mail
ComBasPrice

U.S. POSTAGE » PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

EVERGREEN FORMS LLC
3334 NW LUZON ST
POI 970 NFE 1270416I0008/21/16
RETURN TO SENDER
:EVERGREEN FORMS LLC DBA SKILLCRAFT F
12826 NE AIRPORT WAY
PORTLAND OR 97230-1029

RETURN TO SENDER

3396

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
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Measure 56 Notice

Presort First Class Mail ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000 37
02 1W
0001392354

RETURN SERVICE REQUESTED

JENNINGS LYNN A
2124 NW WILSON ST
PO

T 970 NFE 1270416I0008/21/16
RETURN TO SENDER
JENNINGS LYNN A
TEMPORARILY AWAY

RETURN TO SENDER
BC: 97201538075 *4291-00278-21-45

57 GAY1 1972 01 97201

City of Portland, Oregon
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Measure 56 Notice

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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000 37
02 1W
0001392354 AUG 19 2016

RETURN SERVICE REQUESTED

GRANT MICHAEL
PO BOX 208
AS

970 NFE 1270C15I0008/21/16
RETURN TO SENDER
GRANT
PO BOX 1624
OREGON CITY OR 97045-0624

RETURN TO SENDER

42 GAY1 1972 01 97103

City of Portland, Oregon
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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000 37
02 1W
0001392354 AUG 19 2016

RETURN SERVICE REQUESTED

TRI-STATE CONSTRUCTION INC
320 106TH AVE NE #B
BELLEVUE WA 98004-5701

980 DEE 1270316C0108/23/16
RETURN TO SENDER
TRI-STATE CONSTRUCTION
PO BOX 3686
BELLEVUE WA 98009-3686

FWD

RETURN TO SENDER

240 GAY1 158.. 980

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City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

Presort First Class Mail ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 20[illegible]

RETURN SERVICE REQUESTED

MET LIFE CAPITAL
10900 NE 8TH AVE
BELLEVUE WA 98000

NIXIE 980 DE 1270 0008/23/16

RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

240 GAY1158 IA 980 97201>5380 BC: 97201538075 *0526-03480-21-24

City of Portland, Oregon
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1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

SCHNITZER INVEST CORP
818 STEWART STREET SUITE 700

NIXIE 980 FE 1270 0008/23/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

240 GAY1158 UTF 981 97201>5380 BC: 97201538075 *0526-03508-21-24

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

Presort First Class Mail ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

MILLICAN PROPERTIES LLC-3/4 & SCHNITZER
STEEL INDUSTRIES INC-1/4
8
S

NIXIE 980 DE 1270 0008/23/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

UTF BC: 97201538075 *0526-03481-21-24

3398

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Measure 56 Notice

Presort First Class Mail ComBasPrice

U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

PORT OF PORTLAND(LEASED EXPEDITE INC
ATTN: CARLA MELLAND
PO
PO
970 NFE 1270415I0008/22/16
RETURN TO SENDER
MELLAND
BOX CLOSED
UNABLE TO FORWARD
RETURN TO SENDER
BC: 97201538075 *0329-03300-20-22

7 GAY1 [illegible]

City of Portland, Oregon
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1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

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U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.[illegible]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

TSIORBA LEV
4119 SE 25TH AVE
PO
970 NFE 1270516I0008/22/16
RETURN TO SENDER
TSIORBA
317 SE 16TH AVE APT 1
PORTLAND OR 97214-1462

RETURN TO SENDER

51 GAY1 [illegible]

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U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37[illegible]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

SCIOLA ANTHONY
42[illegible] SE 24TH AVE
PO
970 NFE 1270316I0008/22/16
RETURN TO SENDER
SCIOLA ANTHONY
PMB 4685
605 MAIN ST
VANCOUVER WA 98660-3129
RETURN TO SENDER

[illegible]

3399

City of Portland, Oregon
Bureau of Planning and Sustainability
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Measure 56 Notice

Presort First Class Mail ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 9720
02 1W
000139

RETURN SERVICE REQUESTED

WHITNEY HENRY E & BERTHA M
11909 SE FOSTER RD
PO

970 NFE 1270616I0008/22/16
RETURN TO SENDER
WHITNEY
MOVED LEFT NO ADDRESS
UNABLE TO FORWARD
RETURN TO SENDER
BC: 97201538075 *0129-07532-22-27

78 GAY1 [illegible]

City of Portland, Oregon
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Measure 56 Notice

ZIP 97204 $ 000.37
02 1W
0001392654 AUG 19 2016

RETURN SERVICE REQUESTED

BOYCE CATHERINE
3525 NE 50TH AVE #211
PO

970 NFE 1270815I0008/22/16
FORWARD TIME EXP RTN TO SEND
BOYCE CATHERINE A
25414 213TH PL SE UNIT 19
MAPLE VALLEY WA 98038-7534

RETURN TO SENDER

60 GAY1 [illegible]

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392654 AUG 19 2016

RETURN SERVICE REQUESTED

MCPHERSON MARCY M
4914 NE PACIFIC ST
PO

970 NFE 1270915I0008/22/16
RETURN TO SENDER
MCPHERSON MARCY M
11675 SW 9TH ST
BEAVERTON OR 97005-4063

RETURN TO SENDER

[illegible]

3400

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Measure 56 Notice

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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37⁶
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

NEWMARK PROPERTIES PARTNERSHIP
9200 SW BARNES RD #C
PO
NIXIE 970 NFE 1270 16I0008/22/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *0129-04241-22-27

City of Portland, Oregon
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Portland, Oregon 97201-5380 P514

Measure 56 Notice

RETURN SERVICE REQUESTED

LAPIN PROPERTIES LLC
3517 NE IONE ST
CA
970 NFE 1270715I0008/22/16
FORWARD TIME EXP RTN TO SEND
LAPIN
4033 NW 77TH AVE
CAMAS WA 98607-7752
RETURN TO SENDER

City of Portland, Oregon
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Measure 56 Notice

RETURN SERVICE REQUESTED

HUFFORD DAVID & PATRICIA D
2939 SE 76TH AVE
PO
T 970 NFE 1270716I0008/22/16
RETURN TO SENDER
HUFFORD
TEMPORARILY AWAY
RETURN TO SENDER
BC: 97201538875 *0129-04403-22-25

City of Portland, Oregon
Bureau of Planning and Sustainability
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U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

Measure 56 Notice

RETURN SERVICE REQUESTED

LEN & POLLY LLC-1/2 & HUFFORD PAULINE TR-
1/2 (PAULINE HUFFORD TRUST)
29
PO
T 970 NFE 1270716I0008/22/16
RETURN TO SENDER
HUFFORD
TEMPORARILY AWAY
RETURN TO SENDER
BC: 97201538075 *0129-04402-22-25

54 GAY1I5B 9720[illegible]

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U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

Measure 56 Notice

RETURN SERVICE REQUESTED

UNITED STATES OF AMERICA % US COAST GUARD
& ATTN LT GILMORE
6
S
NIXIE 980 FE 1270 0008/22/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
UTF BC: 97201538075 *0526-03496-21-24

240 GAY1I5B 97201>5380

City of Portland, Oregon
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U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

Measure 56 Notice

RETURN SERVICE REQUESTED

NEELY MICHAEL P
59-032 HOLAWA ST
HA
970 NFE 1270516I0008/20/16
RETURN TO SENDER
NEELY MICHAEL P
59-003 HOLAWA PL
HALEIWA HI 96712-9704
RETURN TO SENDER

[illegible]

3402

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U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

ABBOTT JOSEPH
PO BOX 2463
POF

970 DFE 1270816I0008/20/16
RETURN TO SENDER
ABBOTT
BOX CLOSED
UNABLE TO FORWARD
RETURN TO SENDER
BC: 97201538075 *4291-00224-20-43

55 GAY1I[illegible]201[illegible]

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1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

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U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

EIDE LEONARD EST OF
PO BOX 56301
POR

970 NFE 1270715I0008/20/16
RETURN TO SENDER
EIDE
BOX CLOSED
UNABLE TO FORWARD
RETURN TO SENDER
BC: 97201538075 *0329-03279-20-22

7 GAY1[illegible]201[illegible]

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Measure 56 Notice

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U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

STOUDT FAMILY PROPERTIES LLC
PO BOX 14340
PO

* 970 NDC 1270716I0108/20/16
RETURN TO SENDER
:STOUDT FAMILY PROPERTIES LLC
PO BOX 82188
PORTLAND OR 97282-0188
RETURN TO SENDER

7 GAY1[illegible]

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Bureau of Planning and Sustainability
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RETURN SERVICE REQUESTED

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U.S. POSTAGE PITNEY BOWES

ZIP 972 02 1W 000139

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1101 SE SALMON ST
PC NIXIE 970 DE 1270 0008/24/16

RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

BC: 97201538075 *0129-05294-24-22

61 GAY1 [illegible]

City of Portland, Oregon
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Measure 56 Notice

RETURN SERVICE REQUESTED

LEONG PAK M

NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD

BC: 97201538075 *2929-06538-25-28

27 GAY1 [illegible]

City of Portland, Oregon
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Measure 56 Notice

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AIRPORT WAY COMMONS CONDOMINIU
A
1 NIXIE 970 FE 1270 0008/25/16
T

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-11120-25-27

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City of Portland, Oregon
Bureau of Planning and Sustainability
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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

PACIFIC REALTY ASSOCIATES #200-WMI
1[illegible]
P NIXIE 970 FE 1270 0008/25/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-10993-25-27
71 GAY1[illegible]

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ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

PACIFIC REALTY ASSOCIATES
1[illegible]
P NIXIE 970 FE 1270 0008/25/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-10991-25-27
71 GAY1[illegible]

City of Portland, Oregon
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First Class Mail
ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

KOENIG MARIAN R & REBA % ROSS MARY A
2[illegible]
H NIXIE 970 FE 1270 0008/25/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-08327-25-27
[illegible] GAY1[illegible]

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First Class Mail
Combas Price

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 4W
0001392854 AUG

2711 INDUSTRIAL LLC
PO
TJ NIXIE 970 DE 1270 0008/25/16
RETURN TO SENDER
VACANT
UNABLE TO FORWARD
BC: 97201538075 *0329-03214-20-22
7 GAY1 [illegible]

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Measure 56 Notice

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WOODRUFF HOWARD CLARK & WASH M % DORAN
EULOGIO & DIAZ YOLANDA
3 NIXIE 970 DE 1270 0008/25/16
M
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-08127-25-29
108 GAY1 [illegible]

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Measure 56 Notice

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RETURN SERVICE REQUESTED

CHASE PACKAGING CORP ATTN KIRKPATRICK
DOUG VP CFO
P NIXIE 970 FE 1270 0008/25/16
Li
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-01613-25-25

3406

NIXIE 970 CE 1270 0108/25/16
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD
BC: 97201538075 *2929-10126-25-24

Presort First Class Mail ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

Measure 56 Notice

RETURN SERVICE REQUESTED

FOX ALBERT J & BARBARA J
10511 SW 43RD AVE
PORTLAND OR 97219-6991

97219

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1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Presort First Class Mail ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

Measure 56 Notice

RETURN SERVICE REQUESTED

DEHART BUSTER R % ABRAHAM JOHN %
INTEGRITY HOMES
1:
M:

NIXIE 970 FE 1270 0003/25/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-09757-25-24

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Presort First Class Mail ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

Measure 56 Notice

RETURN SERVICE REQUESTED

PACIFIC SAW & KNIFE %METSO PAPER US
1
CI

NIXIE 970 DE 1270 0008/25/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-08449-25-30

3407

City of Portland, Oregon
Bureau of Planning and Sustainability
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Measure 56 Notice

Presort
First Class Mail
ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 20

RETURN SERVICE REQUESTED

HAWKINS MARTHA M /STRIETZEL ROSS %
WETHERELL RICHARD
183 T 850 NFE 1270516C0008/24/16
RETURN TO SENDER
SUR WETHERELL
TEMPORARILY AWAY
RETURN TO SENDER
FWD BC: 97201538075 *1679-00156-24-31
97201>5380
223 GAY1158 05374

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
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Measure 56 Notice

Presort
First Class Mail
ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 20

RETURN SERVICE REQUESTED

BURLINGTON NORTHERN RAILROAD C % JOHNSON
A
1(NIXIE 841 DE 1270 0008/24/16
S/
RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD
BC: 97201538075 *0329-01419-20-36
97201 05 [illegible]

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
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Measure 56 Notice

Presort
First Class Mail
ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

PORT OF PORTLAND (LEASED BIG SKY AIRLINES
& BIG SKY TRANSPORTATION
NIXIE 591 FE 1270 0008/24/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *0195-00162-24-35

3408

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Bureau of Planning and Sustainability
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Portland, Oregon 97201-5380 P514

Measure 56 Notice

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Presort First Class Mail ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37⁶
02 1W
0001392854 AUG 19 2016

MULTNOMAH COUNTY % ENGINEERING SERVICES
2115 SE MORRISON ST
PO

NIXIE 970 DE 1270 0008/24/16

RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 97201538075 *0129-06296-24-22

61 GAY11SB01@7384

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

RETURN SERVICE REQUESTED

1135 SALMON LLC
1135 SE SALMON ST
PC

NIXIE 970 DE 1270 0008/24/16

RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

BC: 97201538075 *0129-05293-24-22

61 GAY11SB01@7384

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Measure 56 Notice

RETURN SERVICE REQUESTED

Presort First Class Mail ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37⁶
02 1W
0001392854 AUG 19 2016

FISHER SHIRLEY R C/O CONSECO FINANCE
PO BOX 3290
F

NIXIE 980634029-1N 08/25/16

RETURN TO SENDER
UNABLE TO FORWARD
UNABLE TO FORWARD
RETURN TO SENDER

240 GAY11SB 9806

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Measure 56 Notice

RETURN SERVICE REQUESTED

Presort First Class Mail CountiasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19

PORT OF PORTLAND(LEASED NORTHWEST
AIRLINES INC>
2
E

NIXIE 553 FE 1270 0008/24/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *0878-01594-24-33

205 GAY1 97201 5380 5512

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Portland, Oregon 97201-5380 P514

Measure 56 Notice

RETURN SERVICE REQUESTED

Presort

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

UNK

PORTION PACKAGING INC % LESTOCHI ANNETTE
255
BR

NIXIE 176 FE 1270 0008/25/16
RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD

BC: 97201538075 *0919-07294-25-08

251 GAY1 97201 5380 7

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Measure 56 Notice

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Presort First Class Mail

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

PENINSULA TERMINAL CO
34950 CHARDON RD SUITE 110
W

NIXIE 441 DE 1270 0008/24/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *0832-10313-24-34

3410

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Measure 56 Notice

Presort First Class Mail ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

LYON FINANCIAL SERVICES INC
115 WEST COLLEGE DR
MI NIXIE 553 FE 1270 0008/24/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2878-01441-24-33
206 GAY1 97201@5380

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1900 SW 4th Avenue, Suite 7100
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Measure 56 Notice

Presort First Class Mail ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

BURLINGTON NORTHERN RAILROAD H % PROPERTY
TA
77 NIXIE 750 FE 1270 0008/25/16
FO
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
.. 9314189861406311 UTF BC: 97201538075 *2182-05159-25-28
216 GAY1 97201>5380

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Measure 56 Notice

Presort First Class Mail ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

TPL METALS NORTHWEST INC 23201 LAKE
CENTER DR
SU NIXIE 913 DE 1270 0008/24/16
LA
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *0329-02386-20-36
97201@5380

3411

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Measure 56 Notice

RETURN SERVICE REQUESTED

Presort First Class Mail Combs Price

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37⁰
02 4W
0001382854 AUG 19 2019

FUEL & MARINE MARKETING LLC ATTN GARY SHEETZ

1 NIXIE 913 FE 1270 0008/25/19

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *0329-04235-20-36

97201@5380
9151

City of Portland, Oregon
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1900 SW 4th Avenue, Suite 7100
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Measure 56 Notice

RETURN SERVICE REQUESTED

INTELI COAT TECHNOLOGIES ATTN:MOORE TOM

2 NIXIE 961 FE 1270 0008/25/19

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *1484-04493-25-03

97201@5380
251 GAY1ISB 0107

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1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

RETURN SERVICE REQUESTED

BESSARAB PROPERTIES LLC

201 NE MIDDLEFIELD RD

POI NIXIE 970 DE 1270 0108/27/19

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2489-05606-27-19

3412

PORTLAND
OR 970
22 AUG '16
PM 3 L

Presort
First Class Mail
ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[5]
02 4W
0001392654 AUG 19 2016

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1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

RETURN SERVICE REQUESTED

BRIX MARITIME CO TO KNAPPTON CORP
PO BOX 83018
PO NIXIE 970 DE 1270 0008/26/16

RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 97201538075 *0329-01409-20-36

97201@5380@

Presort
First Class Mail
ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[5]
02 4W
0001392654 AUG 19 2016

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Measure 56 Notice

RETURN SERVICE REQUESTED

RADKE PROPERTIES LLC % RADKE MERLIN
6285 N FESSENDEN ST
PO
NIXIE 970 DE 1270 0008/26/16

RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD

BC: 97201538075 *2929-08490-26-29

52 GAY1AEB201@5380@

Presort
First Class Mail
ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[5]
02 4W
0001392654 AUG 19 2016

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Measure 56 Notice

RETURN SERVICE REQUESTED

LINCOLN & ALLEN CO % NEWMAN PATRICIA A
P O BOX 10745
PO NIXIE 970 FE 1270 0008/26/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *0329-03216-20-22

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Measure 56 Notice

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Presort First Class Mail ComBasPrice

U.S. POST... ...NEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392654 AUG 19 2016

RETURN SERVICE REQUESTED

MC ILVAIN TERRY & CINDY % ARC III LLC
600 GRANT ST #900
PC

NIXIE 970 DE 1270 0008/27/16

RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 97201538075 *0329-01297-20-36

97201[illegible]

City of Portland, Oregon
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Portland, Oregon 97201-5380 P514

Measure 56 Notice

Presort First Class Mail ComBasPrice

U.S. POST... ...NEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392654 AUG 19 2016

RETURN SERVICE REQUESTED IP

YEON INDUSTRIAL PARK CONDOMINIUM
ASSOCIATION
97
PO

NIXIE 970 DE 1270 0008/27/16

RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

BC: 97201538075 *2929-09003-27-22

66 GAY1[illegible]201[illegible]

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U.S. POST... ...NEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392654 AUG 19 2016

RETURN SERVICE REQUESTED

GARDENBURGER INC
1411 SW MORRISON ST #400
POI

Not at

NIXIE 970 DE 1270 0008/27/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-03061-27-22

3414

Presort
First Class Mail
ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 20

City of Portland, Oregon
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Portland, Oregon 97201-5380 P514

Measure 56 Notice

RETURN SERVICE REQUESTED

HAWTHORNE DEPOT LLC
500 E BROADWAY ST
VA NIXIE 970 DE 1270 0108/27/16

RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

BC: 97201538075 *2929-12341-23-30

163 GAY1 15B 01 97201@5380

Presort
First Class Mail
ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

City of Portland, Oregon
Bureau of Planning and Sustainability
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Portland, Oregon 97201-5380 P514

Measure 56 Notice

RETURN SERVICE REQUESTED

GENUINE PARTS COMPANY
2999 CIRCLE 75 PARKWAY
300 NFE 1270616I0008/22/16

RETURN TO SENDER
;GENUINE PARTS COMPANY
2999 WILDWOOD PKWY
ATLANTA GA 30339

RETURN TO SENDER

97201@5380

251 GAY1 15B 909:

Presort
First Class Mail
ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.3
02 1W
0001392F AUG 19

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Measure 56 Notice

RETURN SERVICE REQUESTED

CMS HOMES LLC
10685 SE 42ND AVE
MI NIXIE 970 NFE 1270 16C0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-05877-25-18

City of Portland, Oregon
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U.S. POSTAGE ... BOWES
ZIP 97204 $ 000.37⁶
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

ROBINSON ROBERT L
9000 NE M L KING BLVD SP 5
PC

970 NFE 1270816C0008/25/16
RETURN TO SENDER
ROBINSON ROBERT LAMAR
9000 NE M L KING BLVD UNIT 152
PORTLAND OR 97211-1380

RETURN TO SENDER

58 GAY1 ... 01 ...

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Portland, Oregon 97201-5380 P514

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U.S. POSTAGE ... BOWES
ZIP 97204 $ 000.37⁶
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

Doesn't live here

KUSHNIRYUK PAVEL
645 NW 5TH ST
GR

970 NFE 1270316C0008/26/16
RETURN TO SENDER
KUSHNIRYUK
PO BOX 20036
PORTLAND OR 97294-0036

RETURN TO SENDER

27 GAY1 ... 01 ...

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1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

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U.S. POSTAGE ... BOWES
ZIP 97204 $ 000.37⁶
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

PORT OF PORTLAND(LEASED SUBLIVIN LLC
25030 SW PARKWAY AVE STE 300
WI

970 NFE 1270C15C0008/24/16
RETURN TO SENDER
:SUBLIVIN LLC
4000 KRUSE WAY PL STE 3-130
LAKE OSWEGO OR 97035-5347

RETURN TO SENDER

3416

City of Portland, Oregon
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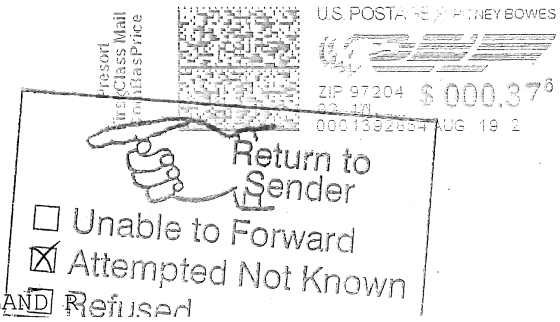
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

RETURN SERVICE REQUESTED

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
0001392854 AUG 19 2

Return to Sender
☐ Unable to Forward
☒ Attempted Not Known
☐ Refused



PREMO ROLAND R
2
P(NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD

BC: 97201535099 *2929-08885-25-28

57 GAY1I5B201 [illegible]

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Measure 56 Notice

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RETURN SERVICE REQUESTED

8TH AVENUE PARTNERS LLC 55% MANDEL ERIC G
T
2 NIXIE 970 DE 1270 0008/25/16
P(

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201535099 *2929-03754-25-3

61 GAY1I5B201 [illegible]

City of Portland, Oregon
Bureau of Planning and Sustainability
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Measure 56 Notice

RETURN SERVICE REQUESTED

TIME OIL CO ET AL % SCHNITZER INVESTMENT
CORP

NIXIE 981014037-1N 08/24/16

RETURN TO SENDER
UNABLE TO FORWARD
UNABLE TO FORWARD
RETURN TO SENDER

3417

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Bureau of Planning and Sustainability
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Measure 56 Notice

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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

CONTAINER-CARE PORTLAND INC HAYDEN
MEADOWS C/O TMT DEVELOPMENT CO INC AAF
80
PO: 970 N7E 1 716C0108/24/16
RETURN TO SENDER
:TMT DEVELOPMENT
760 SW 9TH AVE STE 2250
PORTLAND OR 97205-2584

RETURN TO SENDER

53 GAY1 ISR 01 97205

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Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
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Measure 56 Notice

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ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

PORT OF PORTLAND(LEASED BAMBUZA SOUTH
WATERFRONT LLC %NGUYEN DANIEL
36[illegible]
PO. 970 NFE 1270815C0008/24/16
RETURN TO SENDER
:BAMBUZA
5929 NE 80TH AVE
PORTLAND OR 97218-2891

RETURN TO SENDER

77 GAY1 ISR 01 97209

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
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Measure 56 Notice

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ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

HENDERSON GLORIA M
1915 SE PERSHING ST
PO
T 970 NFE 1270516C0008/24/16
RETURN TO SENDER
HENDERSON
TEMPORARILY AWAY

RETURN TO SENDER
BC: 97201538075 *0129-01250-24-29

[illegible]

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City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
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Measure 56 Notice

RETURN SERVICE REQUESTED

HAYDEN MEADOWS % MEADOWS LAND P?
805 SW BROADWAY #2020
PO 970 NFE 1270716C0008/24/16
RETURN TO SENDER
:HAYDEN MEADOWS JOINT VENTURE
760 SW 9TH AVE STE 2250
PORTLAND OR 97205-2584

RETURN TO SENDER

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

RETURN SERVICE REQUESTED

~~SHIPLEY DAVID J ET AL %~~ DENNIS UNIFORM
MFG CO
71
PO
NIXIE 970 NFE 1270 15C0008/24/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *0129-06451-24-28

City of Portland, Oregon
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Measure 56 Notice

RETURN SERVICE REQUESTED

GXI INC ATTN: BRIAN SCOTT
1020 SE 11TH AVE
PO 970 NFE 1270C15C0008/24/16
RETURN TO SENDER
:GXI INC
1326 NE 68RD AVE
PORTLAND OR 97213-4906

RETURN TO SENDER

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1900 SW 4th Avenue, Suite 7100
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Measure 56 Notice

Presort First Class Mail ComBasPrice

U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

PEACOCK HAZEN M & DAVIS WILLIAM H
910 N HARBOUR DR #408
PO

970 NFE 1270716C0008/24/16
RETURN TO SENDER
PEACOCK
9000 NE M L KING BLVD UNIT 172
PORTLAND OR 97211-1381

RETURN TO SENDER

64 GAY1 [illegible] 01 [illegible]

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1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

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Presort First Class Mail ComBasPrice

U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

PORT OF PORTLAND(LEASED SEAPORT AIR
7505 NE AIRPORT WAY
PO

970 NFE 1270416C0008/24/16
RETURN TO SENDER
:SEAPORT AIRLINES
816 SW 1ST AVE
PORTLAND OR 97204-3308

RETURN TO SENDER

65 GAY1 [illegible] 01 [illegible]

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

Presort First Class Mail ComBasPrice

U.S. POSTAGE >> PITNEY BOWES
ZIP 9[illegible] $ 000.37[6]
02 1[illegible]
0001392[illegible]

RETURN SERVICE REQUESTED

PUGH NORMAN R /82ND AVE TRAILER PARK
8225 SE CLATSOP ST OFFICE
PC

NIXIE 970 DE 1270 0008/24/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *0129-00091-24-25

[illegible]

3420

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Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

Presort
First Class Mail
ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 00
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

SCHNITZER STEEL PRODUCTS CO
3200 NW YEON AVE
PC NIXIE 970 FE 1270 0008/24/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *0129-04406-24-21
57 GAY1 [illegible]

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

Presort
First Class Mail
ComBasPrice

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

RETURN SERVICE REQUESTED

PORT OF PORTLAND(LEASED MCKINNEY & SON
INC
PO NIXIE 970 FE 1270 0008/24/16
EU
RETURN TO SENDER
ATTEMPTED - NOT KNOWN
UNABLE TO FORWARD
BC: 97201538075 *0329-02384-20-36
97201 [illegible]

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

Presort
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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2

RETURN SERVICE REQUESTED

JAMES JOANNE M
4036 SE FRANCIS ST
P 970 NFE 1270116F0008/24/16
RETURN TO SENDER
JAMES
PO BOX 42414
PORTLAND OR 97242-0414
RETURN TO SENDER
51 GAY1 [illegible]

3421

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ZIP 97204 $ 000.37[6]
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0001392854 AUG 19 2016

Measure 56 Notice

RETURN SERVICE REQUESTED

IRWIN-HODSON SCREW MACHINE & STAMPING INC
ATTN: ACCOUNTS PAYABLE
28
PO

NIXIE 970 FE 1270 0008/24/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *0129-04062-24-24

51 GAY1 ISB 201 [illegible]

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STRIDER EQUITIES LLC
2516 SE 8TH AVE
PO

NIXIE 970 FE 1270 0008/24/16
RETURN TO SENDER
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BC: 97201538075 *0129-04057-24-24

51 GAY1 ISB 201 [illegible]

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U.S. POSTAGE » PITNEY BOWES
ZIP 972[illegible]
02 1W
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MP1 LLC
1807 SE POWELL BLVD
PC

NIXIE 970 DE 1270 0008/24/16
RETURN TO SENDER
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BC: 97201538075 *0129-02855-24-24

3422

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U.S. POSTAGE » PITNEY BOWES
ZIP 97204 $ 000.37
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RETURN SERVICE REQUESTED

PORT OF PORTLAND (LEASE LUFTHANSA GERMAN
AIRLINE ATTN: JURGEN STARKS
70
PC

NIXIE 970 FE 1270 0008/24/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *0129-11088-24-23

65 GAY1 [illegible]

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TRACK SEVEN CONDOMINIUM OWNERS
ASSOCIATION % KAISER GROUP
38
PC

NIXIE 970 DE 1270 0008/24/16

RETURN TO SENDER
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BC: 97201538075 *0129-11017-24-23

59 GAY1 [illegible]

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RETURN SERVICE REQUESTED

HUA VIEN TRI & LUU TRAN NGOC
8026 SE ALDER ST
PC

NIXIE 970 FE 1270 0008/24/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *0129-08436-24-22

62 GAY1 [illegible]

3423

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RETURN SERVICE REQUESTED

XLAO LLC
831 SE M L KING BLVD
PC

NIXIE 970 DE 1270 0008/24/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *0129-07247-24-22

61 GAY1 ISR 01 97201

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FADDOUL GHASSAN G
2456 E BURNSIDE ST
PO

NIXIE 970 DE 1270 0008/24/16

RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 97201538075 *0329-01296-20-36

97201 97214

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STARK & SANDY BUILDING LLC % BLATNER
JOSEPH
73
PC

NIXIE 970 DE 1270 0008/24/16

RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 97201538075 *0129-06276-24-22

3424

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U.S. POSTAGE >> PITNEY BOWES
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M R TERMINAL CO
NIXIE 975203053-1N 270 08/25/16
RETURN TO SENDER
UNABLE TO FORWARD
UNABLE TO FORWARD
RETURN TO SENDER

109 GAY1158 9

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RETURN SERVICE REQUESTED

HAGENAUER JAMES C
9000 NE M L KING BLVD SP 228
PO NIXIE 970 FE 1270 0008/25/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-07683-25-24

58 GAY1158201 97201

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U.S. POSTAGE >> PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 20

RETURN SERVICE REQUESTED

OKHICKIYUK PHYLLIS A
9000 NE M L KING BLVD SP 147
PO NIXIE 970 FE 1270 0008/25/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-07682-25-24

3425

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U.S. POSTAGE » PITNEY BOWES
ZIP 97204 $ 000.37⁶
02 1W
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BABLER CHRISTOPHER W & BABLER LLOYD JR
P O BOX 11269
PO

NIXIE 970 DE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-07660-25-24

58 GAY1 [illegible]

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U.S. POSTAGE » PITNEY BOWES
ZIP 97204 $ 000.3[illegible]
02 1W
0001392854 AUG 19 [illegible]

TAJ DEVELOPMENT ROSE ROOM LLC
8102 NE KILLINGSWORTH ST
PO

NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-04156-25-24

65 GAY1 [illegible]

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U.S. POSTAGE » PITNEY BOWES
ZIP 97204 $ 000.37⁶
02 1W
0001392854 AUG 19 2016

CULWELL LYNN RAY
6212 NE KILLINGSWORTH ST
PC

NIXIE 970 DE 1270 0008/25/16

RETURN TO SENDER
NO SUCH NUMBER
UNABLE TO FORWARD

BC: 97201538075 *2929-02701-25-24

3426

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U.S. POSTAGE » PITNEY BOWES
ZIP 97204 $ 000
02 1W
0001392854 AUG 1

RETURN SERVICE REQUESTED

LRG LEASING ATTN: TOM LEAPTROTT
3601 SE COLUMBIA WAY SUITE 10
VA

NIXIE 970 FE 1270 0008/25/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-08274-25-23

164 GAY1 [illegible] 01 [illegible]

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RETURN SERVICE REQUESTED

TRI-COUNTY METROPOLITAN TRANSPORTATION
DIST OF OREGON % REAL ESTATE DEPARTMENT
71
PC

NIXIE 970 FE 1270 0008/25/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-04979-25-23

74 GAY1 [illegible] 01 [illegible]

NIXIE 970 DE 1270 0008/25/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-04779-25-23

97201 [illegible] 5380

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U.S. POSTAGE » PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 2016

Portland, Oregon 97201-5380 P514

Measure 56 Notice

RETURN SERVICE REQUESTED

W G WRIGHT FAMILY LLC
1525 SE 10TH AVE
PORTLAND OR 97214

[illegible] GAY1 [illegible] 97214

3427

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Bureau of Planning and Sustainability
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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.
02 1W
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UNITED AIRLINES
5848 N LAGOON AVE
PC NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *0329-01292-20-36

97201@3687

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RETURN SERVICE REQUESTED

U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 20

PORT OF PORTLAND(LEASED (SWAN
4855 N LAGOON AVE
PO NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-01832-25-23

64 CAY1ISP201@3687

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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392854 AUG 19 20

PAUL JOSEPH & RUTH /SCOTT DANIEL L &
ANITA
90
PC NIXIE 970 DE 1 0108/25/16

RETURN TO SENDER
UNDELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2489-03323-25-28

3428

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U.S. POSTAGE PITNEY BOWES
ZIP 97204 $ 000.37[6]
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MUSIC DEAN M & RAMONA K
RT 2 BOX 144
ES

NIXIE 970 DE 1270 0008/24/16

RETURN TO SENDER
INSUFFICIENT ADDRESS
UNABLE TO FORWARD

BC: 97201538075 *0329-01518-20-36

97201[illegible]

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1900 SW 4th Avenue, Suite 7100
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ZIP 97204 $ 000.[illegible]
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RETURN SERVICE REQUESTED

PDX 4005 NE COLUMBIA LLC
4005 NE COLUMIA BLVD
PC

NIXIE 970 DE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-08271-25-24

58 GAY1[illegible]

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RETURN SERVICE REQUESTED

DAVIE RAYMOND & BYLLEE % FOX RUN MH
COMMUNITY
90
PC

NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-08082-25-24

58 GAY1[illegible]

3429

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RETURN SERVICE REQUESTED

BARE BERNADINE J
9000 NE M L KING BLVD SP 70
PO NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-08080-25-24

58 GAY1 [illegible] 01 [illegible] 1

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ZIP 97204 $ 000.37[illegible]
02 1W
0001392854 AUG 19 20[illegible]

RETURN SERVICE REQUESTED

CHANDLER DAWN MARIE
9000 NE M L KING BLVD #33
PO
NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
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UNABLE TO FORWARD

BC: 97201538075 *2929-08061-25-24

58 GAY1 [illegible] 01 [illegible] 1

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GOVRO OREN LEE % GINGMEN MICHELLE
9000 NE M L KING BLVD #254
PO
NIXIE 970 DE 1270 0008/25/16

RETURN TO SENDER
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UNABLE TO FORWARD

BC: 97201538075 *2929-08051-25-24

3430

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BLANCO MARTINEZ SANTIAGO FILEMON
9000 NE M L KING BLVD #239
PO

NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-08050-25-24

58 GAY1I[illegible]201[illegible]

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RETURN SERVICE REQUESTED

YOUNG CYNTHIA LEE
9000 NE M L KING BLVD SP 120
PO

NIXIE 970 DE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-07720-25-24

58 GAY1I[illegible]201[illegible]

City of Portland, Oregon
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Measure 56 Notice

RETURN SERVICE REQUESTED

MORTENSEN SHANNON & TIMMY / DELANEY
WILLIAM L R
90[illegible]
PO

NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-07711-25-24

58 [illegible]

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U.S. POSTAGE » PITNEY BOWES
ZIP 97204 $ 000.37[6]
02 1W
0001392854 AUG 19 20

RETURN SERVICE REQUESTED

MATTHEWS TOMMIE MARTIN
9000 NE M L KING BLVD SP 243
POI NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-07710-25-24

58 GAY1158201 [illegible]

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RETURN SERVICE REQUESTED

SINGH JULIE C
9115 NE VANCOUVER WAY
PC
NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-07709-25-24

58 GAY1158201 [illegible]

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RETURN SERVICE REQUESTED

RAZ ROBIN ANN
9000 NE M L KING BLVD SP 158
PO
NIXIE 970 DE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-07708-25-24

3432

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ZIP 97204 $ 000.37
02 1W
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RETURN SERVICE REQUESTED

BORTON WILLIAM DANIEL
9000 NE M L KING BLVD SP 006
PO

NIXIE 970 FE 1270 0008/25/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-07707-25-24

58 GAY1 [illegible] 01 [illegible]

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RETURN SERVICE REQUESTED

BOCANEGRA RUBEN D
9000 NE M L KING BLVD SP 92
PO

NIXIE 970 FE 1270 0008/25/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-07706-25-24

58 GAY1 [illegible] 01 [illegible]

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RETURN SERVICE REQUESTED

BRIDEHAGEN TERRY JEANNE
9000 NE M L KING BLVD SP254
PC

NIXIE 970 FE 1270 0008/25/16
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 97201538075 *2929-07705-25-24

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First Class Mail
ComBasPrice

U.S. POSTAGE FITNEY BOWES
ZIP 97204 $ 000.37
02 1W
0001392654 AUG 19 2016

Measure 56 Notice

RETURN SERVICE REQUESTED

BRINDENHAGEN TERRY & EDWARD % ARC
9000 NE M L KING BLVD SP229
PO NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-07704-25-24

58 GAY1 [illegible] 01 [illegible]

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Bureau of Planning and Sustainability
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Measure 56 Notice

RETURN SERVICE REQUESTED

BERGLUND WAYNE
9000 NE M L KING BLVD SP 171A
PO NIXIE 970 DE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-07703-25-24

58 GAY1 [illegible] 01 [illegible]

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Measure 56 Notice

RETURN SERVICE REQUESTED

SWIGART SHAWN TERRANCE
9000 NE M L KING BLVD SP 119
PO NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-07685-25-24

3434

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Measure 56 Notice

RETURN SERVICE REQUESTED

KIRKLAND KAREN % ARC
9000 NE M L KING BLVD SP 82
PO[illegible]

NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-07684-25-24

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Measure 56 Notice

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GONROWSKI BRENT & HOFFERT BRIAN
2569 NE COLUMBIA BLVD
PO[illegible]

NIXIE 970 FE 1270 0008/25/16

RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD

BC: 97201538075 *2929-08277-25-24

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MILLER ALEXANDER
3407 SE 22ND AVE
PC

NIXIE 970 FE 1270 0008/24/16

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UNABLE TO FORWARD

BC: 97201535099 *0129-02841-24-24

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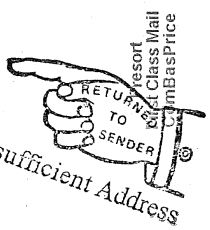

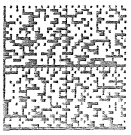



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City of Portland, Oregon
Bureau of Planning and Sustainability
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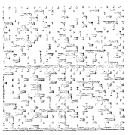

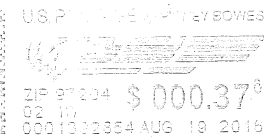

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Measure 56 Notice

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EBONY PROPERTIES LLC
2401 NW 22ND AVE
PORTLAND OR 97210-2117

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WA 980
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Measure 56 Notice

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RETURN SERVICE REQUESTED

HEIDELBERG PRINT FINANCE
PO BOX 198332
ATLANTA GA 30384

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251 [redacted]

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Measure 56 Notice

RETURN SERVICE REQUESTED

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City of Portland, Oregon
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Measure 56 Notice

RETURN SERVICE REQUESTED

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INVESTMENTS INC
20 NIXIE 970 DE 1270 0008/31/16
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DA WEDGE LLC
1980 WILLAMETTE FALLS DR #230
WE NIXIE 970 DE 1270 0009/01/16

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ANK BC: 97201538075 *2929-03352-01-23
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RETURN SERVICE REQUESTED

CROSS ERIC TODD CROSS CHANDA SUE
9000 NE MLK BLVD SP 8
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NIXIE 970 FE 1270 0008/30/16

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Measure 56 Notice

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GAC ACQUISITION CORP % MC COWN DE LEEUW & CO
3000 SAND HILL RD BLDG 3 #29
MENLO PARK CA 94025

Measure 56 Notice

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G A C ACQUISITION CORP % MC COWN DE LEEUW & CO
3000 SAND HILL RD BLDG 3 #29
MENLO PARK CA 94025

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ATEL CASH DISTRIBUTION FUND II
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S[illegible]

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237 71GAY1158201[illegible]

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CROMIE WALTER WAYNE
5408 S GROVE RD
SPOKAN[illegible]

NIXIE 992 DE 1270 0008/30/16

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BC: 97201538075 *2889-05619-23-28

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BC: 97201538075 *2641-01833-29-22

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1 MARKE[illegible]
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ZIP 97204 $ 000.37[6]
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RETURN SERVICE REQUESTED

ELM REALTY PARTNERS ATTN AMY WILLIAMS
[illegible] CUTTER CIR

NIXIE 972174018-1N 270 08/30/16

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UNABLE TO FORWARD
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BENVEGNO KATHLEEN ANN
PC [illegible]
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ANK BC: 97201535099 *2929-05778-01-26

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1900 SW 4th Avenue, Suite 710
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City of Portland, Oregon
Bureau of Planning and Sustainability
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Measure 56 Notice

RETURN SERVICE REQUESTED

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PHOENIXICOR INC
PO BOX 10316
S NIXIE 101 DE 1270 0008/27/16

RETURN TO SENDER
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BC: 97201538075 *0329-02385-20-36

43 97201@53[illegible]

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G E C C
303 INTERNATIONAL CENTER
[illegible] NIXIE 212 DE 1270 0008/26/16

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245 GAY1JEB 2102

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Measure 56 Notice

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UNITED STATES POSTAL SERVICE DENVER
FACILITIES SERV OFFICE
80 NIXIE 808 FE 1270 0008/26/16
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RETURN TO SENDER
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CEF LEASE RESIDUAL HOLDING LLC
P O BOX 10316
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BC: 97201538075 *0329-00077-28-21

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MARLEY BROWN LUMBER SERVICE % FISCHER &
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CARPENTER JIM & KELLY ANN % WASTE
RECOVERY INC
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ANK BC: 97201538075 *0434-00150-28-19

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WHOLESALE GROUP SRV
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M RETURN TO SENDER
:WGS PHOENIX CO
1102 W SOUTHERN AVE STE 2
TEMPE AZ 85282-4558

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CIT GROUP/EQUIPMENT FINANCING
65[illegible]
VA NIXIE 970 DE 1 0008/25/16

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UNABLE TO FORWARD

BC: 97201538075 *0329-00078-20-21

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OMNI PRODUCTS INC
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NOT DELIVERABLE AS ADDRESSED
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ANDERSON DAVID W
411 NW FLANDERS ST UNIT 502
PO

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NOT DELIVERABLE AS ADDRESSED
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UTF BC: 97201538075 *2489-01160-26-23
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LSE-CROWN ZELLERBACH % CHRISTENSON
ELECTRIC INC
1 NIXIE 970 DE 1270 0008/31/16
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NOT DELIVERABLE AS ADDRESSED
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BACCHUS INVESTORS LLC-50% & BAKER GROUP
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RETURN SERVICE REQUESTED

BURLINGTON NORTHERN RAILROAD C % HERMAN
DE
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YOYODYNE LLC
1020 SE 11TH AVE
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UNABLE TO FORWARD

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Measure 56 Notice

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SCHNITZER INVESTMENT CORP
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PO

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PACIFICORP % STRONG R G TAX MGR
700 NE MULTNOMAH ST #700
PO

NIXIE 970 7E 1 0008/31/16

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RUDD TOMMY C
PO BOX 4581
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City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice

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NORTHWESTERN TOWING & RECOVERY
10630 NE MARY ST
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Measure 56 Notice

Legal
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RETURN SERVICE REQUESTED

CHASE EQUIPMENT LEASING INC
1111 POLARIS PKWY #A3
COLUMBUS OH 43240

Received
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Land Transactions

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Land Transactions

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City of Portland, Oregon
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JOSEPH T RYERSON & SON INC ATTN TAX
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2621 W 15TH PL
CHICAGO IL 60608

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Portland, Oregon 97201-5380 P514
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BOC GROUP INC % PRICE WATERHOUSE COOPERS
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CAMERON OREGON PROPERTIES LLC
PO BOX 713 957 NFE 1270915C0009/05/16
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CAMERON
1681 RIDGEWOOD RD
ALAMO CA 94507-1056

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COPPERWELD CORPORATION ATTN CFO
FOUR GATEWAY CTR
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City of Portland, Oregon
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City of Portland, Oregon
Bureau of Planning and S
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Measure 56 Notice

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STAYTON OR 97383-1627

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RETURN SERVICE REQUESTED

SPANGLER DOROTHY M & BUCHER TIMOTHY JAMES
9000 NE M L KING BLVD SP 219
PORTLAND OR 97211

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City of Portland, Oregon
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PORTLAND TERMINAL RAILROAD CO
800 NW 6TH AVE RM 211
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MANUAL PROC REQ *1320-01430-26-36

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To comment on the proposal:

Testify in person at the Planning and Sustainability Commission Hearing:

- You may speak for two minutes to the Commission, and your testimony will be added to the public record.

Testify in writing between now and the hearing date:

- You must provide your full name and mailing address.
  - Email: psc@portlandoregon.gov, refer to this proposal in the subject line.
  - U.S. Mail: Portland Planning and Sustainability Commission, 1900 SW 4th Avenue, Suite 7100, Portland, OR 97201

All testimony to the Planning and Sustainability Commission (PSC) is considered public record.

The Bureau of Planning and Sustainability is committed to providing equal access to information and hearings. If you need special accommodation, translation or interpretation please call 503-8232-7700, the City's TTY line at 503-823-6868, or the Oregon Relay Service at 711.

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Measure 56 Notice
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Planning and Sustainability Commission Public Hearing on the

Fossil Fuel Terminal Zoning Amendments

Tuesday, September 13, 2016, at 12:30 p.m.

1900 SW 4th Avenue, Room 2500, 2nd Floor, Portland, Oregon.

3456

BALLOT MEASURE 56, ADOPTED BY VOTERS IN 1998, REQUIRES THE FOLLOWING LANGUAGE IN THIS NOTICE:

THIS IS TO NOTIFY YOU THAT THE CITY OF PORTLAND HAS PROPOSED A LAND USE REGULATION THAT MAY AFFECT THE PERMISSIBLE USES OF YOUR PROPERTY AND OTHER PROPERTIES.

Date of Notice: August 19, 2016

Why am I receiving this notice?

On September 13, 2016, the Portland Planning and Sustainability Commission will hold a public hearing regarding the adoption of the Fossil Fuel Terminal Zoning Amendments Project and proposed ordinance (ordinance number to be assigned at a later date). This project proposes changes to Portland's Zoning Code. The City used a geographic information system to identify tax lots potentially affected by the Fossil Fuel Terminal Zoning Amendments Project; you have received this notice for this reason. The City has determined that the adoption of this ordinance may affect the permissible uses of your property, and other properties in the affected IH Heavy Industrial, IG1 and IG2 General Industrial, and EG1 and EG2 General Employment zones, and may change the value of your property.

What is this project about?

This code change project would restrict development and expansion of Bulk Fossil Fuel Terminals. These code changes would implement new policy direction on fossil fuel distribution and storage facilities in City Resolution 37168. Specifically, the proposed code changes: (1) add a new definition of the term "fossil fuel;" (2) add a new industrial use category entitled "Bulk Fossil Fuel Terminal" characterized by having more than 5 million gallons of storage capacity; and (3) prohibit bulk fossil fuel terminals in all zones. The effect of these amendments would be:

- Fossil fuels include petroleum products (such as crude oil and gasoline), coal, natural gas, and propane, and methanol, which is produced from natural gas.
- No new terminals would be allowed.
- The existing 11 terminals in the Portland Harbor would become nonconforming uses, which would limit expansions to their current site.

How can I review this proposal?

Copies of the Fossil Fuel Terminal Zoning Amendments Proposed Draft are available (at no charge) at the Portland Bureau of Planning and Sustainability, 1900 SW 4th Ave, 7th Floor. Call 503.823.7700 to request that a copy be sent by mail. The proposal can also be viewed at www.portlandoregon.gov/bps

Will my property's base zone change?

NO.

How does this proposal affect my property?

If adopted, the proposed amendment will prohibit Bulk Fossil Fuel Terminals, which may be currently allowed on your property.

For more information

- Visit: www.portlandoregon.gov/bps/71118
- Contact Tom Armstrong, Supervising Planner, Bureau of Planning and Sustainability
  503-823-3527 or email: tom.armstrong@portlandoregon.gov

FTZ M56 list - Owner name	Address	City	State	Zipcode
10001 N RIVERGATE LLC C/O ORTON DEVELOPMENT INC	3049 RESEARCH DR	RICHMOND	CA	94806
1016-1040 HAWTHORNE LLC	1016 SE HAWTHONE BLVD	PORTLAND	OR	97214
1016-1040 HAWTHORNE LLC	1016 SE HAWTHONE BLVD	PORTLAND	OR	97214
10200 NORTH LOMBARD LLC % GARNIER,THOMAS	9760 SW FREEMAN DR	WILSONVILLE	OR	97070-9221
10200 NORTH LOMBARD LLC % GARNIER,THOMAS	9760 SW FREEMAN DR	WILSONVILLE	OR	97070-9221
1035 SE 12TH APARTMENTS LLC % MCLAWHORN,CHRISTINE A	23913 MCMULLIN CIR	PLAINFIELD	IL	60544
10521 NORTH LOMBARD STREET LLC % DELGADO,MICHAEL	10600 PIONEER BLVD #A	SANTA FE SPRINGS	CA	90670
10643 LLC	7410 N MERCER WAY	MERCER ISLAND	WA	98040
10707 LOMBARD LLC	PO BOX 83715	PORTLAND	OR	97283
10TH STREET PROPERTIES LLC	927 SE 10TH AVE	PORTLAND	OR	97214
11 MAIN VENTURE LLC-50% & SUMPTER HOLDINGS LLC-50%	PO BOX 513	WILSONVILLE	OR	97070-0513
1101 SE 3RD LLC TO NEW ERA PARTNERSHIP % SPAHR,STEVE	1101 SE 3RD AVE	PORTLAND	OR	97214-3343
1101 SE 3RD LLC TO NEW ERA PARTNERSHIP % SPAHR,STEVE	1101 SE 3RD AVE	PORTLAND	OR	97214-3343
1101 SE 3RD LLC TO NEW ERA PARTNERSHIP % SPAHR,STEVE	1101 SE 3RD AVE	PORTLAND	OR	97214-3343
1101 SE 3RD LLC TO NEW ERA PARTNERSHIP % SPAHR,STEVE	1101 SE 3RD AVE	PORTLAND	OR	97214-3343
111 NE 12TH LLC	819 SE MORRISON ST #110	PORTLAND	OR	97214-6308
112TH STREET LLC	17023 S MCCUBBIN RD	OREGON CITY	OR	97045
1135 SALMON LLC	1135 SE SALMON ST	PORTLAND	OR	97214
116 NE 6TH AVENUE LLC	116 NE 6TH AVE #400	PORTLAND	OR	97232-2904
120 CLAY DEVELOPMENT LLC %KILLIAN PACIFIC LLC	500 E BROADWAY #110	VANCOUVER	WA	98660
12005 BURGARD EQUITIES LLC	520 SW 6TH AVE #610	PORTLAND	OR	97204
122 SE 8TH AVE LLC	936 DAVID PL	ANCHORAGE	AK	99501-3223
12423 NE WHITAKER WAY LLC	4170 SW DOGWOOD LN	PORTLAND	OR	97225
12722 NE AIRPORT WAY LLC	PO BOX 20429	PORTLAND	OR	97294
133 SE 9TH AVENUE LLC % FRANCINE H ABOLOFIA	5150 SW 85TH AVE	PORTLAND	OR	97225
1339 LLC	706 SE MAIN ST	PORTLAND	OR	97214-3422
134 NE 6TH AVENUE LLC	116 NE 6TH AVE #400	PORTLAND	OR	97232
134 TAYLOR LLC	PO BOX 69506	PORTLAND	OR	97201
1525 NE COLUMBIA LLC % ZUSMAN,MILTON	5510 SW SWEETBRIAR ST	PORTLAND	OR	97221
1535 SE 9TH LLC % NEW ERA VENTURES LLC	1101 SE 3RD AVE	PORTLAND	OR	97214-3343
1601 NE COLUMBIA LLC % ZUSMAN,MILTON	5510 SW SWEETBRIAR ST	PORTLAND	OR	97221
1603 NW 14TH LLC C/O MATHESON TRI-GAS INC	150 ALLEN RD	BASKING RIDGE	NJ	07920-2977
1624/1634 BROOKLYN LLC	PO BOX 13519	ARLINGTON	TX	76094

1624/1634 BROOKLYN LLC	PO BOX 13519	ARLINGTON	TX	76094
16300 MASON LLC	PO BOX 83406	PORTLAND	OR	97283
16TH AVENUE PROPERTIES LLC % GOLDSTEIN,DAVID JR	4144 SE 24TH AVE	PORTLAND	OR	97202
16TH GROUP LLC	PO BOX 1862	LAKE OSWEGO	OR	97035-0609
16TH GROUP LLC	PO BOX 1862	LAKE OSWEGO	OR	97035-0609
16TH GROUP LLC	PO BOX 1862	LAKE OSWEGO	OR	97035-0609
1701 CORP	1701 NW THURMAN ST	PORTLAND	OR	97209
1750 LOMBARD LLC	20980 SW EDY RD	SHERWOOD	OR	97140
1825 VAUGHN STREET INVESTORS LLC	1825 NW VAUGHN ST #A	PORTLAND	OR	97209
18TH 19TH UPSHUR & VAUGHN LLC % SAVINAR,TAD	PO BOX 10798	PORTLAND	OR	97296-0798
1958 NW UPSHUR LLC	PO BOX 10386	PORTLAND	OR	97296-0386
201 REALTY LLC	201 N COLUMBIA BLVD	PORTLAND	OR	97217-1003
201 REALTY LLC	201 N COLUMBIA BLVD	PORTLAND	OR	97217-1003
2033 NE COLUMBIA LLC ATTN WINKLER,VICTOR	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
205 PROPERTIES LLC	12000 SE MILL PLAIN BLVD #202	VANCOUVER	WA	98684-6062
205 REAL ESTATE INC	113 SW 16TH CT	TROUTDALE	OR	97060
205 REAL ESTATE INC	113 SW 16TH CT	TROUTDALE	OR	97060
20TH AVENUE PROPERTIES LLC % GOLDSTEIN,DAVID JR	5105 SE 36TH AVE	PORTLAND	OR	97202-4130
2108 N INTERSTATE LLC % T L TUCKER ENTERPRISES LLC	PO BOX 3933	PORTLAND	OR	97208
2211 NW SAINT HELENS ROAD LLC % GILMER,MYLES & GILMER,PAN	10426 NW LAIDLAW RD	PORTLAND	OR	97229-3806
222 SE ALDER ST LLC	PO BOX 14218	PORTLAND	OR	97293-0218
2233 NW 23RD LLC	143 NE 6TH AVE	PORTLAND	OR	97232
2250ALBINA LLC	809 N RUSSELL ST #201	PORTLAND	OR	97227-1731
2329 NW 23RD PLACE LLC % ANDREN,STEFAN	2351 NW YORK ST	PORTLAND	OR	97210
2351 NW YORK LLC	PO BOX 10591	PORTLAND	OR	97296-0591
2351 NW YORK LLC ATTN: ANDREN,STEFAN	PO BOX 10591	PORTLAND	OR	97296-0591
240 CLAY DEVELOPMENT LLC ATTN: MANAGER	500 EAST BROADWAY #110	VANCOUVER	WA	98660
2410 BUILDING LLC	PO BOX 175	FAIRVIEW	OR	97024
2410 BUILDING LLC	PO BOX 175	FAIRVIEW	OR	97024
2410 BUILDING LLC	PO BOX 175	FAIRVIEW	OR	97024
2495 NW NICOLAI LLC	PO BOX 10067	PORTLAND	OR	97296-0067
2495 NW NICOLAI LLC % CALBAG METALS	P O BOX 10067	PORTLAND	OR	97296
2495 NW NICOLAI LLC % CALBAG METALS	P O BOX 10067	PORTLAND	OR	97296
2495 NW NICOLAI LLC % CALBAG METALS	P O BOX 10067	PORTLAND	OR	97296

2495 NW NICOLAI LLC % CALBAG METALS	P O BOX 10067	PORTLAND	OR	97296
24TH AVE LLC %JAMES S NICOLA	4625 SE 24TH AVE	PORTLAND	OR	97202
24TH AVENUE PROPERTIES LLC % GOLDSTEIN,DAVID JR	5105 SE 36TH AVE	PORTLAND	OR	97202-4130
2500 NW NICOLAI LLC %SHAKER SQUARE LLC ATTN JENNIFER PITTSI	PO BOX 10067	PORTLAND	OR	97296-0067
2524 BUILDING LLC % THE BOXMAKER INC ATTN SAWTELLE,DWIGH	6412 S 190TH ST	KENT	WA	98032
2525 HOLGATE LLC	733 SW 2ND AVE STE 200	PORTLAND	OR	97204
2537 NW 29TH LLC % STAVER,RALPH L	3247 NW VAUGHN ST	PORTLAND	OR	97210
2615 NW ST HELENS LLC % BOSCH,RICHARD	2615 NW ST HELENS RD	PORTLAND	OR	97210-2241
2625 INDUSTRIAL LLC	8835 SW ROSEWOOD WAY	PORTLAND	OR	97225-1370
265 HANCOCK LLC % FISCO,THAD	265 N HANCOCK ST #100	PORTLAND	OR	97227-1972
265 HANCOCK LLC % FISCO,THAD	265 N HANCOCK ST #100	PORTLAND	OR	97227-1972
26TH AVENUE INVESTORS LLC	16587 MAPLE CIR	LAKE OSWEGO	OR	97034
26TH AVENUE INVESTORS LLC	16587 MAPLE CIR	LAKE OSWEGO	OR	97034
2711 INDUSTRIAL LLC	PO BOX 230474	TIGARD	OR	97281-0474
2715 LLC % MICHAEL L TEVIS	530 OAK GROVE AVE #201	MENLO PARK	CA	94025-3255
2738 SE 15TH LLC	2738 SE 15TH AVE	PORTLAND	OR	97202-2206
2900 NORTH ARGYLE PROPERTIES LLC % SCHLEIGER,DEBRA A	23411 SE BORGES RD	DAMASCUS	OR	97089-6521
2900 NORTH ARGYLE PROPERTIES LLC % SCHLEIGER,DEBRA A	23411 SE BORGES RD	DAMASCUS	OR	97089-6521
2929 LLC	2929 NW 29TH AVE	PORTLAND	OR	97210-1705
2DOCS LLC	607 NE LOMBARD ST	PORTLAND	OR	97211-3559
30 GROUP LLC	PO BOX 1862	LAKE OSWEGO	OR	97035-0609
3003 NW 35TH LLC	3125 NW 35TH AVE	PORTLAND	OR	97210
3003 NW 35TH LLC	3125 NW 35TH AVE	PORTLAND	OR	97210
3133 NW ST HELENS PROPERTIES LLC % SHAVER,MARY S	PO BOX 25357	PORTLAND	OR	97298
324 SE GRAND LLC % SOOSIE BURRIS	324 SE GRAND AVE	PORTLAND	OR	97214
3460 BUILDING LLC ATTN: JENSEN,DON & SUE	7135 SW CHAPEL LN	TIGARD	OR	97223-7510
3530 NW LLC	3530 NW ST HELENS RD	PORTLAND	OR	97210-1314
3605 HLFM LLC %PULLIAM,STEVEN	3605 SE 26TH AVE	PORTLAND	OR	97202-2953
3702 LLC	4605 SE 31ST AVE	PORTLAND	OR	97202
3931 NE COLUMBIA INVESTMENTS LLC	9 SE 3RD AVE #100	PORTLAND	OR	97214-1026
3H FUND LLC	526 EVEREST ST	SAN ANTONIO	TX	78209-1718
3H FUND LLC	526 EVEREST ST	SAN ANTONIO	TX	78209-1718
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3H FUND LLC	526 EVEREST ST	SAN ANTONIO	TX	78209-1718
3MB LLC	9935 SW COMMERCE CIR	WILSONVILLE	OR	97070
4 A'S LLC	4155 CANAL RD	LAKE OSWEGO	OR	97035
407 LLC	909 NW 19TH AVE #B	PORTLAND	OR	97209
433 & 555 N THOMPSON LLC %TUCKER,THOMAS	PO BOX 3933	PORTLAND	OR	97208-3933
433 & 555 N THOMPSON LLC %TUCKER,THOMAS	PO BOX 3933	PORTLAND	OR	97208-3933
4800 N CHANNEL AVENUE LLC % CULBERTSON,JAMES F JR	4800 N CHANNEL AVE	PORTLAND	OR	97217-7616
4800 N CHANNEL AVENUE LLC % CULBERTSON,JAMES F JR	4800 N CHANNEL AVE	PORTLAND	OR	97217-7616
4805 SE 26TH LLC % GRIFFITHS,JACK D & GRIFFITHS,MICHAEL R	4805 SE 26TH AVE	PORTLAND	OR	97202
4805 SE 26TH LLC % GRIFFITHS,JACK D & GRIFFITHS,MICHAEL R	4805 SE 26TH AVE	PORTLAND	OR	97202
5016 N CHANNEL AVENUE LLC % CULBERTSON,JAMES F JR	4800 N CHANNEL AVE	PORTLAND	OR	97217-7616
5018 N CHANNEL AVENUE LLC % CULBERTSON,JAMES F JR	4800 N CHANNEL AVE	PORTLAND	OR	97217
5035 SE 24TH AVENUE A LLC ATTN PAINE,JOE	5035 SE 24TH AVE	PORTLAND	OR	97202-4765
5035 SE 24TH AVENUE A LLC ATTN PAINE,JOE	5035 SE 24TH AVE	PORTLAND	OR	97202-4765
5035 SE 24TH AVENUE A LLC ATTN PAINE,JOE	5035 SE 24TH AVE	PORTLAND	OR	97202-4765
5035 SE 24TH AVENUE B LLC ATTN PAINE,JOSEPH	5035 SE 24TH AVE	PORTLAND	OR	97202-4765
508 TILLAMOOK LLC	4365 NW TAM-O-SHANTER WAY	PORTLAND	OR	97229
50TH AVENUE GARAGE LLC % WARNER,DORUS & COLEEN	2820 SE 50TH AVE	PORTLAND	OR	97206
521 SE TAYLOR STREET LLC % CALDWELL,BARBARA L	16181 NW CANTERWOOD WAY	PORTLAND	OR	97229-7847
524 N TILLAMOOK LLC % FOSTER & ASSOCIATES CPA LLC	9011 SW BVTN HILLSDALE HWY #	PORTLAND	OR	97225-2452
524 N TILLAMOOK LLC % FOSTER & ASSOCIATES CPA LLC	9011 SW BVTN HILLSDALE HWY #	PORTLAND	OR	97225-2452
525 LLC	1120 NW COUCH ST 10TH FLR	PORTLAND	OR	97210
528 INVESTORS LLC ATTN: JAY GRAB	PO BOX 22865	SANTA FE	NM	87502
538 ASH LLC	70 NW COUCH ST #207	PORTLAND	OR	97209-4038
55 MAIN STREET LLC	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218
5610 LLC	5930 SW IDAHO ST	PORTLAND	OR	97221-1630
5610 LLC	5930 SW IDAHO ST	PORTLAND	OR	97221-1630
600 BLOCK LLC	614 SE HAWTHORNE BLVD	PORTLAND	OR	97214
600 BLOCK LLC	614 SE HAWTHORNE BLVD	PORTLAND	OR	97214
6001 INVESTMENTS LLC	16750 SE KENS CT	MILWAUKIE	OR	97267-4759
630 S E YAMHILL L L C % IPM	721 SW OAK ST #100	PORTLAND	OR	97205
66 SE MORRISON LLC & MONTGOMERY HOLDINGS LLC % THE GUIST	9414 SW BARBUR BLVD #150	PORTLAND	OR	97219-5486
6710 LLC	PO BOX 82098	PORTLAND	OR	97282-0098
6710 LLC	PO BOX 82098	PORTLAND	OR	97282-0098

6710 LLC	PO BOX 82098	PORTLAND	OR	97282-0098
6TH & LINCOLN LLC	16997 SE BLANTON ST	MILWAUKIE	OR	97267
732 SE HAWTHORNE LLC	732 SE HAWTHORNE BLVD	PORTLAND	OR	97214
732 SE HAWTHORNE LLC	732 SE HAWTHORNE BLVD	PORTLAND	OR	97214
755 PORTLAND PROPERTY LLC % HANSON PIPE & PRECAST LLC % M 18818 TELLER AVE STE 277		IRVINE	CA	92612
755 PORTLAND PROPERTY LLC % HANSON PIPE & PRECAST LLC % M 18818 TELLER AVE STE 277		IRVINE	CA	92612
755 PORTLAND PROPERTY LLC % HANSON PIPE & PRECAST LLC % M 18818 TELLER AVE STE 277		IRVINE	CA	92612
755 PORTLAND PROPERTY LLC % HANSON PIPE & PRECAST LLC % M 18818 TELLER AVE STE 277		IRVINE	CA	92612
755 PORTLAND PROPERTY LLC % HANSON PIPE & PRECAST LLC % M 18818 TELLER AVE STE 277		IRVINE	CA	92612
755 PORTLAND PROPERTY LLC % HANSON PIPE & PRECAST LLC % M 18818 TELLER AVE STE 277		IRVINE	CA	92612
755 PORTLAND PROPERTY LLC % HANSON PIPE & PRECAST LLC % M 18818 TELLER AVE STE 277		IRVINE	CA	92612
78TH COURT 3S LLC	412 NW COUCH ST #201	PORTLAND	OR	97209
78TH COURT 3S LLC	412 NW COUCH ST #201	PORTLAND	OR	97209
80 SE MADISON LLC	819 SE MORRISON ST #110	PORTLAND	OR	97214-6308
800 SE HAWTHORNE LLC-1/2 & SPAHR,D LORRAINE-1/2 %NEW ERA	1101 SE 3RD AVE	PORTLAND	OR	97214-3343
801 HAWTHORNE INVESTMENTS LLC	801 SE HAWTHORNE BLVD	PORTLAND	OR	97214
81 YAMHILL INVESTORS LLC	75 SE YAMHILL ST #201	PORTLAND	OR	97214
8235 NE MLK BOULEVARD LLC % FRANCINE H ABOLOFIA	5150 SW 85TH AVE	PORTLAND	OR	97225
82ND DEVELOPMENT LLC	3800 SW CEDAR HILLS BLVD #251	BEAVERTON	OR	97005
8414 N VANCOUVER AVE LLC % GOTCHER,RONALD E TR & GOTCHEI	4155 SW DOWNS VIEW CT	PORTLAND	OR	97221-3127
8611 GROUP LLC	1025 98TH AVE	OAKLAND	CA	94603
87 KW DEVELOPMENT LLC ATTN SAUNDERS,THOMAS G	6010 NE FLANDERS ST UNIT B-1	PORTLAND	OR	97213
87 KW DEVELOPMENT LLC ATTN SAUNDERS,THOMAS G	6010 NE FLANDERS ST UNIT B-1	PORTLAND	OR	97213
87 KW DEVELOPMENT LLC ATTN SAUNDERS,THOMAS G	6010 NE FLANDERS ST UNIT B-1	PORTLAND	OR	97213
87 KW DEVELOPMENT LLC ATTN SAUNDERS,THOMAS G	6010 NE FLANDERS ST UNIT B-1	PORTLAND	OR	97213
87 STARK STREET LLC % TAX DEPARTMENT	1121 SW SALMON ST 5TH FLR	PORTLAND	OR	97205-2022
87 STARK STREET LLC % TAX DEPARTMENT	1121 SW SALMON ST 5TH FLR	PORTLAND	OR	97205-2022
88 WATER AVENUE LLC % TAX DEPARTMENT	PO BOX 2708	PORTLAND	OR	97208-2708
880 PACHECO PARTNERS LLC	18064 FADJUR LN	SISTERS	OR	97759
8938 N HARBORGATE LLC	6700 N NEW YORK AVE #300	PORTLAND	OR	97203-2835
8TH AVENUE PARTNERS LLC 55% MANDEL,ERIC G TR 45%	2236 SE BELMONT ST	PORTLAND	OR	97214-2817

8TH AVENUE PARTNERS LLC 55% MANDEL,ERIC G TR 45%	2236 SE BELMONT ST	PORTLAND	OR	97214-2817
900 HAWTHORNE LLC	PO BOX 14953	PORTLAND	OR	97293
900 HAWTHORNE LLC	PO BOX 14953	PORTLAND	OR	97293
900 HAWTHORNE LLC	PO BOX 14953	PORTLAND	OR	97293
906 SE HARRISON LLC % CHRIS SHEPARD	2830 NW 29TH AVE	PORTLAND	OR	97210-1704
909 YAMHILL LLC-1/2 & LIBATION ALLEY BLDG LLC-1/2	PO BOX 14907	PORTLAND	OR	97293
920 SE CARUTHERS LLC	920 SE CARUTHERS ST	PORTLAND	OR	97214
921 SE POWELL BLVD LLC	3591 HIGHLAND AVE	GRANTS PASS	OR	97526
921 SE POWELL BLVD LLC	3591 HIGHLAND AVE	GRANTS PASS	OR	97526
921 SE POWELL BLVD LLC	3591 HIGHLAND AVE	GRANTS PASS	OR	97526
921 SE POWELL BLVD LLC	3591 HIGHLAND AVE	GRANTS PASS	OR	97526
940 SE MADISON LLC	819 SE MORRISON ST #110	PORTLAND	OR	97214
A & A ESTATE LLC	2000 NE 42ND AVE #108	PORTLAND	OR	97213-1305
A & K DESIGNS INC % LEE,IM & LEE,HUI SOON	8325 SE HARNEY ST	PORTLAND	OR	97202-1059
A B BOYD CORPORATION	600 S MC CLURE RD	MODESTO	CA	95357
A B PLATING & MFG INC	P O BOX 20546	PORTLAND	OR	97294-0546
A B PLATING & MFG INC	P O BOX 20546	PORTLAND	OR	97294-0546
A B PLATING & MFG INC	P O BOX 20546	PORTLAND	OR	97294-0546
A B PLATING & MFG INC	P O BOX 20546	PORTLAND	OR	97294-0546
A B PLATING & MFG INC	P O BOX 20546	PORTLAND	OR	97294-0546
A C F INDUSTRIES INC % TAX DEPT	101 CLARK ST	ST CHARLES	MO	63301
A C F INDUSTRIES INC % TAX DEPT	101 CLARK ST	ST CHARLES	MO	63301
A C F INDUSTRIES INC % TAX DEPT	101 CLARK ST	ST CHARLES	MO	63301
A E STALEY MANUFACTURING CO % VENTURA FOODS LLC	40 POINTE DR	BREA	CA	92821
A G A DISTRIBUTION SPECIALISTS INC ATTN GRABINGER,BRENT	PO BOX 30599	PORTLAND	OR	97294-3599
AA RECYCLING LLC	7123 NE 42ND AVE	PORTLAND	OR	97218
AA RECYCLING LLC	7123 NE 42ND AVE	PORTLAND	OR	97218
AAA OREGON/IDAHO % NSHE OAK LLC	600 SW MARKET ST	PORTLAND	OR	97201-5295
AABERG,BRUCE & AABERG,KATHLEEN	2037 NW 21ST AVE	PORTLAND	OR	97209-1806
ABBOTT,JOSEPH	PO BOX 2463	PORTLAND	OR	97208
ABOUND PROPERTIES LLC	1526 NE ALBERTA ST #120	PORTLAND	OR	97211-5046
ABRAMS,STUART TR	7307 SW ARRANMORE WAY	TIGARD	OR	97223
ABRAMS,STUART TR	7307 SW ARRANMORE WAY	TIGARD	OR	97223
ABRAMS,STUART TR	7307 SW ARRANMORE WAY	TIGARD	OR	97223

ABRAMS,STUART TR	7307 SW ARRANMORE WAY	TIGARD	OR	97223
ACE AUTO PARTS %COPART OF WASHINGTON INC	14185 DALLAS PKWY #300	DALLAS	TX	75254
ACE AUTO PARTS INC % COPART OF WA, INC - TAX DEPT	14185 DALLAS PKWY #300	DALLAS	TX	75254
ACE AUTO PARTS INC % COPART OF WA, INC - TAX DEPT	14185 DALLAS PKWY #300	DALLAS	TX	75254
ACE AUTO PARTS INC % COPART OF WA, INC - TAX DEPT	14185 DALLAS PKWY #300	DALLAS	TX	75254
ACE EIGHT CALLING LLC % WINKLER,VICTOR	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
ACKERLEY COMMUNICATIONS OF THE NORTHWEST INC	3601 6TH AVE S	SEATTLE	WA	98134-2212
ACKERLEY COMMUNICATIONS OF THE NORTHWEST INC	3601 6TH AVE S	SEATTLE	WA	98134-2212
ACKERLEY COMMUNICATIONS OF THE NORTHWEST INC	3601 6TH AVE S	SEATTLE	WA	98134-2212
ACKERLEY COMMUNICATIONS OF THE NORTHWEST INC	3601 6TH AVE S	SEATTLE	WA	98134-2212
ACKERLEY COMMUNICATIONS OF THE NORTHWEST INC	3601 6TH AVE S	SEATTLE	WA	98134-2212
ACKERLEY COMMUNICATIONS OF THE NORTHWEST INC	3601 6TH AVE S	SEATTLE	WA	98134-2212
ACKERMAN,CRAIG W & ACKERMAN,CYNTHIA	211 AVENUE DE TERESA	GRANTS PASS	OR	97526-4102
ACKERMAN,DOROTHY N	5632 NW WILLBRIDGE AVE	PORTLAND	OR	97210-3628
ACKERMAN,GABRIELLE TR (GABRIELLE ACKERMAN TRUST)	3025 NW VAUGHN ST	PORTLAND	OR	97210-1950
ACME STORAGE INC	10025 NE SIMPSON ST	PORTLAND	OR	97220
ACME STORAGE INC	10025 NE SIMPSON ST	PORTLAND	OR	97220
ACME STORAGE INC	10025 NE SIMPSON ST	PORTLAND	OR	97220
ACROPOLIS MCLOUGHLIN CORP ATTN POLIZOS	8325 SE MCLOUGHLIN BLVD	PORTLAND	OR	97202-7434
ADAMS,DAVID R	6614 N CURTIS AVE	PORTLAND	OR	97217-4062
ADAMS,DAVID R & ADAMS,LINDA I	6614 N CURTIS AVE	PORTLAND	OR	97217-4062
ADAMS,DAVID R & ADAMS,LINDA I	6614 N CURTIS AVE	PORTLAND	OR	97217-4062
ADAMS,DAVID R & ADAMS,LINDA I	6614 N CURTIS AVE	PORTLAND	OR	97217-4062
ADAMS,DAVID R & ADAMS,LINDA I	6614 N CURTIS AVE	PORTLAND	OR	97217-4062
ADAMS,DAVID R & ADAMS,LINDA I	6614 N CURTIS AVE	PORTLAND	OR	97217-4062
ADAMS,STANLEY R	10462 SE HILLSIDE CT	HAPPY VALLEY	OR	97086-2181
ADAMS,STANLEY R & SHERYL L	10462 SE HILLSIDE CT	HAPPY VALLEY	OR	97086-2181
ADBAT MARINA LLC	PO BOX 301639	PORTLAND	OR	97294-9639
ADBAT MARINA LLC-1/2 & LAMM,ELIZABETH B TR-1/2 (THEODORE I	P O BOX 301639	PORTLAND	OR	97294-9639
ADDINGTON,DONALD E TO WRENN,ROBERT L	PO BOX 86036	PORTLAND	OR	97286
ADIDAS AMERICA INC ATTN BETTY PALUMBO	1895 J W FOSTER BLVD	CANTON	MA	2021

ADIDAS VILLAGE CORPORATION % TARNOVSKY,STEVE	5055 N GREELEY AVE	PORTLAND	OR	97217-3524
ADMIRAL,RYAN S	3525 NE 50TH AVE #304	PORTLAND	OR	97213
ADMO LLC ET AL % COAST AUTO SUPPLY CO ATTN BARRY RUSSELL	125 SE STARK ST	PORTLAND	OR	97214-1019
ADR INVESTMENTS I LLC ET AL	261 SW ASHDOWN CIR	WEST LINN	OR	97068
ADVANCED AMERICAN CONSTRUCTION INC	PO BOX 83599	PORTLAND	OR	97283
ADVANCED AMERICAN CONSTRUCTION PROPERTIES LLC	PO BOX 83599	PORTLAND	OR	97283
ADVANCED AMERICAN CONSTRUCTION PROPERTIES LLC	PO BOX 83599	PORTLAND	OR	97283
ADVANCED AMERICAN CONSTRUCTION PROPERTIES LLC	PO BOX 83599	PORTLAND	OR	97283
ADVANCED AMERICAN CONSTRUCTION PROPERTIES LLC	PO BOX 83599	PORTLAND	OR	97283
ADVANCED AMERICAN CONSTRUCTION PROPERTIES LLC	PO BOX 83599	PORTLAND	OR	97283
ADVANCED AMERICAN CONSTRUCTION PROPERTIES LLC	PO BOX 83599	PORTLAND	OR	97283
ADVANCED AMERICAN CONSTRUCTION PROPERTIES LLC	PO BOX 83599	PORTLAND	OR	97283
ADVENTURE HOLDING LLC	426 SE GRAND AVE	PORTLAND	OR	97214
AEGEAN CORP % LINDA GLASSER	1 CENTER CT #200	PORTLAND	OR	97227
AG PROPERTY LLC	PO BOX 14367	PORTLAND	OR	97293
AGER PETROLEUM PACKAGING CO	P O BOX 10688	PORTLAND	OR	97296
AGUILAR,AMERICA & BAUTISTA,GUILLERMO	9000 NE M L KING BLVD SP 160	PORTLAND	OR	97211
AGUILAR,CARLOS ALBERTO	9000 NE M L KING BLVD SP 82	PORTLAND	OR	97211
AGUILAR,GRISELDA	9221 N WALL AVE	PORTLAND	OR	97203
AINSWORTH CIRCLE LLC	905 N HARBOUR DR #30	PORTLAND	OR	97217
AIR LIQUIDE ELECTRONICS US LP % PROPERTY TAX DEPT	P O BOX 460149	HOUSTON	TX	77056
AIR LIQUIDE INDUSTRIAL US LP	PO BOX 460149	HOUSTON	TX	77056
AIR PRODUCTS & CHEMICALS TAX DEPARTMENT	7201 HAMILTON BLVD	ALLENTOWN	PA	18195-1501
AIR PRODUCTS & CHEMICALS TAX DEPARTMENT	7201 HAMILTON BLVD	ALLENTOWN	PA	18195-1501
AIRGAS-NOR PAC INC	3737 WORSHAM AVE	LONG BEACH	CA	90808
AIRGAS-NOR PAC INC	3737 WORSHAM AVE	LONG BEACH	CA	90808
AIRPORT DRAYAGE CO	6331 NE 112TH AVE	PORTLAND	OR	97220-1016
AIRPORT INN LLC	1905 SE 10TH AVE	PORTLAND	OR	97214-4659
AIRPORT INN LLC	1905 SE 10TH AVE	PORTLAND	OR	97214-4659
AIRPORT WAY COMMONS CONDOMINIU ASSOCIATION	11336 SW BULL MOUNTAIN RD, #	TIGARD	OR	97224
AIRPORT WAY INVESTMENTS LLC	PO BOX 56150	PORTLAND	OR	97238-6150
AIRPORT WAY LLC % SOUTH,SCOTT	12067 NE GLENN WIDING DR #10	PORTLAND	OR	97220-9109
AIRPORT WAY LLC % SOUTH,SCOTT	12067 NE GLENN WIDING DR #10	PORTLAND	OR	97220-9109
AIRPORT WAY LLC % SOUTH,SCOTT	12067 NE GLENN WIDING DR #10	PORTLAND	OR	97220-9109

AIRPORT WAY/ANGEL LLC %TASKAR KIBBEE & ASSOC % BUSINESS SI	11501 SW PACIFIC HWY	TIGARD	OR	97223
AJE LLC	2527 NW WESTOVER RD	PORTLAND	OR	97210
AJINOMOTO TOYO FROZEN NOODLES INC ATTN MICHIKO TSUKAHA	6500 N MARINE DR	PORTLAND	OR	97203
AJINOMOTO TOYO FROZEN NOODLES INC ATTN MICHIKO TSUKAHA	6500 N MARINE DR	PORTLAND	OR	97203
AJINOMOTO TOYO FROZEN NOODLES INC ATTN MICHIKO TSUKAHA	6500 N MARINE DR	PORTLAND	OR	97203
AJINOMOTO WINDSOR INC ATTN: SHELLIE TETZLAFF	7124 N MARINE DR	PORTLAND	OR	97203
AJINOMOTO WINDSOR INC ATTN: SHELLIE TETZLAFF	7124 N MARINE DR	PORTLAND	OR	97203
AK MEDIA/NW	3601 6TH AVE S	SEATTLE	WA	98134
AK MEDIA/NW	3601 6TH AVE S	SEATTLE	WA	98134
ALARCON,DELMY M	3550 SW VICTORIA PL	GRESHAM	OR	97080
ALARCON,DELMY M	3550 SW VICTORIA PL	GRESHAM	OR	97080
ALARCON,DELMY M	3550 SW VICTORIA PL	GRESHAM	OR	97080
ALBANY/EASTSHORE PARTNERS	5801 CHRISTIE AVE #680	EMERYVILLE	CA	94608
ALBERHASKY,SCOTT J	23505 NE BEELER DR	HILLSBORO	OR	97124
ALBERTA STREET LLC	7945 NE ALBERTA ST	PORTLAND	OR	97218
ALCO HOLDINGS LLC % THE AGNEW CO	PO BOX 820508	VANCOUVER	WA	98682
ALCO HOLDINGS LLC %THE AGNEW CO	PO BOX 820508	VANCOUVER	WA	98682
ALDAZ,DAVID & MARIA A	2155 N WEBSTER ST	PORTLAND	OR	97217-3842
ALDAZ,DAVID & MARIA A	2155 N WEBSTER ST	PORTLAND	OR	97217-3842
ALEXAKIS,KONSTANTINOS	P O BOX 17423	PORTLAND	OR	97217
ALEXANDRA PROPERTIES LLC	PO BOX 15069	PORTLAND	OR	97293-5069
ALEXANDRA PROPERTIES LLC	PO BOX 15069	PORTLAND	OR	97293-5069
AL-HADI,FAROUK H	155 B AVE #222	LAKE OSWEGO	OR	97034-3144
AL-HADI,FAROUK H	155 B AVE #222	LAKE OSWEGO	OR	97034-3144
ALLAN,JAMES R TR & ALLAN,MARILYN M TR	2770 NW IMPERIAL TER	PORTLAND	OR	97210-3316
ALLCO LEASING	9570 SW BARBUR BLVD #304	PORTLAND	OR	97219
ALLEN,BARBARA	14851 STAGECOACH	SISTERS	OR	97759-9566
ALLIANCE DEVELOPMENT GROUP LLC	PO BOX 1682	LAKE OSWEGO	OR	97035
ALLIANCE DEVELOPMENT GROUP LLC	PO BOX 1682	LAKE OSWEGO	OR	97035
ALLIED BUILDING PRODUCTS CORP>	15 E UNION AVE	EAST RUTHERFORD	NJ	07073-2127
ALLIED BUILDING PRODUCTS CORP>	15 E UNION AVE	EAST RUTHERFORD	NJ	07073-2127
ALLIED BUILDING PRODUCTS CORP>	15 E UNION AVE	EAST RUTHERFORD	NJ	07073-2127
ALLIED BUILDING PRODUCTS CORP>	15 E UNION AVE	EAST RUTHERFORD	NJ	07073-2127

ALLISON,MAUD TO SCHNEIDER,TONY D	9609 N COLUMBIA BLVD	PORTLAND	OR	97203-1030
ALMAR TOOL & CUTTER GRINDERS C	4715 NE 136TH AVE	PORTLAND	OR	97230
ALSCO INC	PO BOX 17337	SALT LAKE CITY	UT	97217-0339
ALSCO INC	505 E SOUTH TEMPLE	SALT LAKE CITY	UT	84102-1004
ALTA HOME PROPERTIES LLC	4047 SW GREENHILLS WAY	PORTLAND	OR	97221-3205
ALTA HOME PROPERTIES LLC	4047 SW GREENHILLS WAY	PORTLAND	OR	97221-3205
ALTEC INDUSTRIES INC	210 INVERNESS CENTER DR	BIRMINGHAM	AL	35242
ALVAREZ,GILBERTO E & KAREN K	5738 SE 82ND AVE	PORTLAND	OR	97266
ALVES,PEDRO RANGEL & ALVES,ZOILA S	9000 NE M L KING BLVD SP 179	PORTLAND	OR	97211
ALVEZ,EFRAIN SALINAS & ALVEZ,JOSE ALFREDO	9000 NE M L KING BLVD SP73	PORTLAND	OR	97211
AMALGAMATED SUGAR CO	1951 S SATURN WAY #100	BOISE	ID	83709-2900
AMALGAMATED SUGAR CO	1951 S SATURN WAY #100	BOISE	ID	83709-2900
AMANDA ASSOCIATES LLP % SHARI'S MANAGEMENT CORP	9400 SW GEMINI DR	BEAVERTON	OR	97008-7105
AMB LLC % BILL NAITO CO	2701 NW VAUGHN ST #390	PORTLAND	OR	97210-5355
AMERICAN BRUSH CO /AMERICAN POWER BRUSH MANUF IN ATTN:	756 S BYRNE RD STE 1	TOLEDO	OH	43609-1062
AMERICAN INDUSTRIAL SERV CO BY STEINER CORP AMERICAN INDL	505 E SOUTH TEMPLE	SALT LAKE CITY	UT	84102-1004
AMERICAN INDUSTRIAL SERV CO BY STEINER CORP AMERICAN INDL	505 E SOUTH TEMPLE	SALT LAKE CITY	UT	84102-1004
AMERICAN INDUSTRIES INC	1750 NW NAITO PKWY #106	PORTLAND	OR	97209-2532
AMERICAN INDUSTRIES INC % DEMPSEY,JOHN	1750 NW FRONT AVE #106	PORTLAND	OR	97209
AMERICAN INDUSTRIES INC % DEMPSEY,JOHN	1750 NW NAITO PKWY #106	PORTLAND	OR	97209-2532
AMERICAN INDUSTRIES INC % DEMPSEY,JOHN	1750 NW NAITO PKWY #106	PORTLAND	OR	97209-2532
AMERICAN INDUSTRIES INC ATTN HEDINGER,HOWARD H	1750 NW FRONT AVE #106	PORTLAND	OR	97209
AMERICAN MACHINE & GEAR INC ATTN: PATRICK DUFFY	2770 NW INDUSTRIAL ST	PORTLAND	OR	97210
AMERICAN METAL PRODUCTS CO	PO BOX 14891	PORTLAND	OR	97293-0891
AMERICAN METAL PRODUCTS CO	PO BOX 14891	PORTLAND	OR	97293-0891
AMERICAN METALS CORPORATION	525 S SEQUOIA PKWY	CANBY	OR	97013
AMERICAN PETROLEUM ENVIRONMENTAL SERVICES	401 E ALEXANDER AVE BLDG #32	TACOMA	WA	98421-4200
AMERICAN PETROLEUM ENVIRONMENTAL SERVICES	401 E ALEXANDER AVE BLDG #32	TACOMA	WA	98421-4200
AMERICAN POWER BRUSH MANUFACTURING INC	756 S BYRNE RD STE 1	TOLEDO	OH	43609-1062
AMERICAN STEEL LLC	525 S SEQUOIA PKWY	CANBY	OR	97013
AMERICAN STEEL LLC % EQUILON ENTERPRISES LLC TAX DEPT	P O BOX 4369	HOUSTON	TX	77210-4369
AMERICAN STEEL LLC % EQUILON ENTERPRISES LLC TAX DEPT	P O BOX 4369	HOUSTON	TX	77210-4369
AMERICAN STEEL LLC % ERICKSON,KEITH M-CONTROLLER	525 S SEQUOIA PKWY	CANBY	OR	97013
AMERICAN TOKYO KASEI INC ATTN: HARUHITO FUEKI	9211 N HARBORGATE ST	PORTLAND	OR	97203-6308

AMERICAN TOKYO KASEI INC ATTN: HARUHITO FUEKI	9211 N HARBORGATE ST	PORTLAND	OR	97203-6308
AMERICAN TOKYO KASEI INC ATTN: HARUHITO FUEKI	9211 N HARBORGATE ST	PORTLAND	OR	97203-6308
AMERICAN TOKYO KASEI INC ATTN: HARUHITO FUEKI	9211 N HARBORGATE ST	PORTLAND	OR	97203-6308
AMERICAN TOKYO KASEI INC ATTN: HARUHITO FUEKI	9211 N HARBORGATE ST	PORTLAND	OR	97203-6308
AMERICAN WATERWAYS INC	110 SE CARUTHERS ST	PORTLAND	OR	97214-4513
AMERICAN WATERWAYS INC ATTN: YATES,DANIEL H	110 SE CARUTHERS ST	PORTLAND	OR	97214-4513
AMES,ROBERT R	1136 NW HOYT ST #200	PORTLAND	OR	97209
AMMONS,TOM & WALKER,THEODORE E TR & WALKER,BARBARA J T	17637 SE 140TH DR	PORTLAND	OR	97236
AMSTAR HOLLAND CAMERON DC LLC % HOLLAND PARTNER GROUP	1111 MAIN ST #700	VANCOUVER	WA	98660
ANCHOR PARK LLC %WILLIAM E SCARBOROUGH JR	5 CENTERPOINTE DR #240	LAKE OSWEGO	OR	97035
ANDERSEN,JAMES P	1931 S 1700 E	SALT LAKE CITY	UT	84108-3156
ANDERSON PORTLAND PROPERTIES LLC %ANDERSON BROTHERS IN	9111 N VANCOUVER AVE	PORTLAND	OR	97217
ANDERSON,BRANDON E	620 SW 5TH AVE #300	PORTLAND	OR	97204
ANDERSON,CRAIG A & ANDERSON,CAMILLE C	11230 NW PLAINVIEW RD	PORTLAND	OR	97231-2503
ANDERSON,DAVE M & FRANCIE A	11843 SE FOSTER RD	PORTLAND	OR	97266-4048
ANDERSON,DAVID W	411 NW FLANDERS ST UNIT 502	PORTLAND	OR	97209
ANDERSON,IRIS J J	1307 NE 126TH AVE	PORTLAND	OR	97230-1903
ANDERSON,IRIS J J	1307 NE 126TH AVE	PORTLAND	OR	97230-1903
ANDERSON,IRIS J J	1307 NE 126TH AVE	PORTLAND	OR	97230-1903
ANDERSON,JAMES L	5724 NE 109TH AVE	PORTLAND	OR	97220
ANDERSON,KARL R	1316 SE CLINTON ST	PORTLAND	OR	97202
ANDERSON,SHERYL I TR (SHERYL I ANDERSON SURVIVOR'S TRUST D.	3031 WESTVIEW CT	LAKE OSWEGO	OR	97034
ANDERSON,SHERYL I TR (SHERYL I ANDERSON SURVIVOR'S TRUST D.	3031 WESTVIEW CT	LAKE OSWEGO	OR	97034
ANDERSON,SHERYL I TR (SHERYL I ANDERSON SURVIVOR'S TRUST D.	3031 WESTVIEW CT	LAKE OSWEGO	OR	97034
ANDRES FRANCISCO,MIGUEL	9000 NE M L K BLVD #72	PORTLAND	OR	97211
ANDREWS,PATRICIA MAY & ANDREWS,JONN LEE	9000 NE M L KING BLVD SP 244	PORTLAND	OR	97211
ANFIELD & SONS METAL RECYCLERS LLC	PO BOX 30762	PORTLAND	OR	97294
ANFIELD & SONS METAL RECYCLERS LLC	PO BOX 30762	PORTLAND	OR	97294
ANGUSGROUP LLC	10526 NE 13TH AVE	PORTLAND	OR	97211-1560
ANGUSGROUP LLC	10526 NE 13TH AVE	PORTLAND	OR	97211-1560
ANMA LLC	11415 SW AVENTINE CIRCUS	PORTLAND	OR	97219
ANN SACKS TILE & STONE INC % KOHLER CO TAX DEPT	444 HIGHLAND DR	KOHLER	WI	53044
ANN SACKS TILE & STONE INC % KOHLER CO TAX DEPT	444 HIGHLAND DR	KOHLER	WI	53044
ANODIZING INC	7933 NE 21ST AVE	PORTLAND	OR	97211

ANSLOW,RICHARD D JR	2010 NW 21ST PL	PORTLAND	OR	97210-2302
ANVIL PROPERTIES LLC	1419 NE LOMBARD PL	PORTLAND	OR	97211
AOR REAL ESTATE INC %RYAN LLC ATTN PROPERTY TAX	2800 POST OAK BLVD #4200	HOUSTON	TX	77056
APES I LLC	401 E ALEXANDER AVE,BLDG #32(	TACOMA	WA	98421
APES I LLC	401 E ALEXANDER AVE,BLDG #32(	TACOMA	WA	98421
APEX AUTO INC % ELLETT,LEROY E	1630 NE GERTZ RD	PORTLAND	OR	97211-1516
APEX AUTO INC % ELLETT,LEROY E	1630 NE GERTZ RD	PORTLAND	OR	97211-1516
APEX AUTO INC % ELLETT,LEROY E	1630 NE GERTZ RD	PORTLAND	OR	97211-1516
APEX AUTO INC % ELLETT,LEROY E	1630 NE GERTZ RD	PORTLAND	OR	97211-1516
APEX AUTO INC % ELLETT,LEROY E	1630 NE GERTZ RD	PORTLAND	OR	97211-1516
APOLLO CHEMICAL & EQUIPMENT CO LLC	6647 NE 47TH AVE	PORTLAND	OR	97218
ARAGON,ELODIA VILLANUERA & MUNOZ,GABRIEL ENRIQUE	9000 NE M L KING BLVD SP 12	PORTLAND	OR	97211
ARAGON,GABRIEL AZCORRA & GUMEZ,KATINGA VICAB	9000 NE M L KING BLVD SP 97	PORTLAND	OR	97211
ARAMARK UNIFORM & CAREER APPAREL LLC %RYAN LLC	PO BOX 4900	SCOTTSDALE	AZ	85261-4900
ARAMARK UNIFORM & CAREER APPAREL LLC %RYAN LLC	PO BOX 4900	SCOTTSDALE	AZ	85261-4900
ARAMARK UNIFORM SERVICES INC	115 N 1ST ST	BURBANK	CA	91502
ARBOR INVESTMENTS LLC	P O BOX 4442	PORTLAND	OR	97208-4442
ARC	600 GRANT ST #900	DENVER	CO	80203
ARCHER,KATHLEEN M	621 SE HARRISON ST	PORTLAND	OR	97214-4528
ARCHER,STEVE R ET AL TO CHAND,PRAVEEN & CHAND,IRENE L	5654 NW 178TH AVE	PORTLAND	OR	97229-1785
ARCHER,STEVE R ET AL TO CHAND,PRAVEEN & CHAND,IRENE L	5654 NW 178TH AVE	PORTLAND	OR	97229-1785
ARCHER,STEVE R ET AL TO CHAND,PRAVEEN & CHAND,IRENE L	5654 NW 178TH AVE	PORTLAND	OR	97229-1785
ARCHER,STEVE R ET AL TO CHAND,PRAVEEN & CHAND,IRENE L	5654 NW 178TH AVE	PORTLAND	OR	97229-1785
ARCHER-DANIELS-MIDLAND COMPANY ATTN: TAX DEPT TX1	4666 E FARIES PKWY	DECATUR	IL	62526-5678
ARCHER-DANIELS-MIDLAND COMPANY ATTN: TAX DEPT TX1	4666 E FARIES PKWY	DECATUR	IL	62526-5678
ARCLIN SURFACES LLC %PAT SIMPSON	PO BOX 17307	PORTLAND	OR	97217
ARCLIN SURFACES LLC (LSD CITY OF PORTLAND %PAT SIMPSON	PO BOX 17307	PORTLAND	OR	97217
ARCLIN SURFACES LLC (LSD CITY OF PORTLAND %PAT SIMPSON	PO BOX 17307	PORTLAND	OR	97217
ARCTIC SHEET METAL INC	2310 NE COLUMBIA BLVD	PORTLAND	OR	97211
ARDANOLA CO	5000 N BASIN AVE	PORTLAND	OR	97217
ARDANOLA LLC	510 NW 15TH AVE	PORTLAND	OR	97209
ARDISSONO,ROBERT J JR TR & ARDISSONO,BRIDGET A TR	7628 NE 140TH PL	KIRKLAND	WA	98034
ARDISSONO,ROBERT J JR TR & ARDISSONO,BRIDGET A TR	7628 NE 140TH PL	KIRKLAND	WA	98034

ARDISSONO,ROBERT J JR TR & ARDISSONO,BRIDGET A TR	7628 NE 140TH PL	KIRKLAND	WA	98034
AREA 1 ELECTRICAL EDUCATION TRUST FUND>	6915 NE 42ND AVE	PORTLAND	OR	97218-1105
AREA 1 ELECTRICAL EDUCATION TRUST FUND>	6915 NE 42ND AVE	PORTLAND	OR	97218-1105
AREA 1 ELECTRICAL EDUCATION TRUST FUND>	6915 NE 42ND AVE	PORTLAND	OR	97218-1105
AREA 62 LLC	2050 S BEAVERCREEK RD #322	OREGON CITY	OR	97045-4301
ARMSTRONG MFG CO ATTN: SHEILA SIMON	135 INTERVALE RD	FITCHBURG	MA	1420
ARNDT,DENISE B	PO BOX 636	TROUTDALE	OR	97060-0636
ARNTSON,GREGORY S & ARNTSON,ELIZABETH J	9483 SE CARNABY WAY	HAPPY VALLEY	OR	97086
ARROW BUILDING LLC	PO BOX 3590	WILSONVILLE	OR	97070
ARROW BUILDING LLC	PO BOX 3590	WILSONVILLE	OR	97070
ASH GROVE CEMENT CO	11011 CODY STE 300	OVERLAND PARK	KS	66210
ASH GROVE CEMENT CO	11011 CODY STE 300	OVERLAND PARK	KS	66210
ASH GROVE CEMENT CO	11011 CODY ST	OVERLAND PARK	KS	66210
ASH GROVE CEMENT CO	11011 CODY ST	OVERLAND PARK	KS	66210
ASH GROVE CEMENT CO	11011 CODY ST	OVERLAND PARK	KS	66210
ASH GROVE CEMENT CO % RYAN,STEVE	11011 CODY ST	OVERLAND PARK	KS	66210
ASH GROVE CEMENT CO % RYAN,STEVE	11011 CODY ST	OVERLAND PARK	KS	66210
ASH STREET DEVELOPMENT LLC % NORTHPOINT HOUSING INC ATTI	600 CALIFORNIA ST #900	SAN FRANCISCO	CA	94103
ASH STREET PROJECT LLC	3280 NE IRVING ST	PORTLAND	OR	97232-2537
ASIAN-AMERICAN PLAZA LLC	8230 NE SISKIYOU ST #102	PORTLAND	OR	97220-5281
ASSET LEASING	8900 N ARBON DR	MILWAUKEE	WI	53223
ASSOCIATED CHEMISTS INC	4401 SE JOHNSON CREEK BLVD	PORTLAND	OR	97222
ASTERION LLC	3990 SW CONDOR AVE	PORTLAND	OR	97239
ATC LEASING CO	PO BOX 581047	PLEASANT PRAIRIE	WI	53158
ATC LEASING CO LLC	PO BOX 581047	PLEASANT PRAIRIE	WI	53158
ATEL BUSINESS CREDIT CORP	1875 S BASCOM AVE #116	CAMPBELL	CA	95008
ATEL BUSINESS CREDIT CORP	1875 S BASCOM AVE #116	CAMPBELL	CA	95008
ATEL CASH DISTRIBUTION FUND II	235 PINE ST 6TH FLOOR	SAN FRANCISCO	CA	94104
ATHIMATTATHIL,SHAIMON & LUKE,KRISSY	8513 SW 181ST AVE	ALOHA	OR	97007
ATOFINA CHEMICALS INC %RYAN LLC	3344 PEACHTREE RD NE #1000	ATLANTA	GA	30326
ATOFINA CHEMICALS INC %RYAN LLC	3344 PEACHTREE RD NE #1000	ATLANTA	GA	30326
ATOFINA CHEMICALS INC %RYAN LLC	3344 PEACHTREE RD NE #1000	ATLANTA	GA	30326
ATOFINA CHEMICALS INC %RYAN LLC	3344 PEACHTREE RD NE #1000	ATLANTA	GA	30326
ATOFINA CHEMICALS INC %RYAN LLC	3344 PEACHTREE RD NE #1000	ATLANTA	GA	30326

ATOFINA CHEMICALS INC %RYAN LLC	3344 PEACHTREE RD NE #1000	ATLANTA	GA	30326
ATOFINA CHEMICALS INC %RYAN LLC	3344 PEACHTREE RD NE #1000	ATLANTA	GA	30326
ATOFINA CHEMICALS INC %RYAN LLC	3344 PEACHTREE RD NE #1000	ATLANTA	GA	30326
AU,TUYEN T	8135 SE OGDEN ST	PORTLAND	OR	97206
AUSTAD,LAWRENCE R & ESTHER C % FITZ-ENTERPRISES INC	232 NE MIDDLEFIELD RD	PORTLAND	OR	97211
AVILA,SERGIO NIEVES & SALINAS,ELVIRA ALVEZ	9000 NE M L KING BLVD SP 36	PORTLAND	OR	97211
AVOS INC	4207 NE 94TH ST	VANCOUVER	WA	98665-9389
AYACH,FADI H	2010 SUNSET AVE	WEST LINN	OR	97068-3611
AYACH,FADI H	2010 SUNSET AVE	WEST LINN	OR	97068-3611
AYACH,FADI H	2010 SUNSET AVE	WEST LINN	OR	97068-3611
AYACH,FADI H	2010 SUNSET AVE	WEST LINN	OR	97068-3611
AYON,JASON L	9423 N DECATUR ST	PORTLAND	OR	97203
AZCORRA,ENRIQUE J	9000 NE MLK BLVD SP 216	PORTLAND	OR	97211
B & B PAPPENHEIM LLC	9323 N POLK AVE	PORTLAND	OR	97203-2323
B & L STORAGE ATTN SULLIVAN,JAMES M	6795 N PIMA RD	SCOTTSDALE	AZ	85250
B D C PROPERTIES LLC	11035 SW 11TH AVE #270	BEAVERTON	OR	97005
B GENTLE CONCRETE CONSTR CO ATTN: TAX DEPT	PO BOX 82253	PORTLAND	OR	97282-0253
B R P - LAGOON INC	PO BOX 487	LAKE OSWEGO	OR	97034-0487
B R P-BASIN INC	PO BOX 487	LAKE OSWEGO	OR	97034-0487
BA HAWTHORNE LLC-50% & DA HAWTHORNE LLC-50%	1230 MADRONA DR	OREGON CITY	OR	97045
BA LEASING BSC, LLC (LEASED DAIMLER TRUCKS NORTH AMERICA L	PO BOX 3820	PORTLAND	OR	97208
BABCOCK LAND CO LLC	9933 NW 107TH AVE	PORTLAND	OR	97231-1052
BABCOCK LAND CO LLC	9933 NW 107TH AVE	PORTLAND	OR	97231-1052
BABCOCK LAND CO LLC	9933 NW 107TH AVE	PORTLAND	OR	97231-1052
BABCOCK LAND CO LLC	9933 NW 107TH AVE	PORTLAND	OR	97231-1052
BABCOCK LAND CO LLC	9933 NW 107TH AVE	PORTLAND	OR	97231-1052
BABCOCK LAND CO LLC	9933 NW 107TH AVE	PORTLAND	OR	97231-1052
BABCOCK LAND COMPANY LLC	9933 NW 107TH AVE	PORTLAND	OR	97231-1052
BABCOCK LAND COMPANY LLC	9933 NW 107TH AVE	PORTLAND	OR	97231-1052
BABECKOS,BILL TR & DIETRICH,HOWARD N JR TR	3157 NE MARINE DR	PORTLAND	OR	97211-2115
BABLER,CHRISTOPHER W & BABLER,LLOYD JR	P O BOX 11269	PORTLAND	OR	97211
BACCHUS INVESTORS LLC-50% & BAKER GROUP NORTHWEST LLC-50%	1800 SW 1ST AVE #100	PORTLAND	OR	97201
BACCHUS INVESTORS LLC-50% & BEARCAT INVESTMENT PROPERTIE	1800 SW 1ST AVE #100	PORTLAND	OR	97201-5351

BACCHUS INVESTORS LLC-50% & BEARCAT INVESTMENTS PROPERTI	1800 SW 1ST AVE #650	PORTLAND	OR	97201
BACCHUS INVESTORS LLC-50% & BEARCAT INVESTMENTS PROPERTI	1800 SW 1ST AVE #650	PORTLAND	OR	97201
BACCHUS INVESTORS LLC-50% & BEARCAT INVESTMENTS PROPERTI	1800 SW 1ST AVE #650	PORTLAND	OR	97201
BACKYARD LLC	1416 SE 8TH AVE	PORTLAND	OR	97214-3573
BADER FAMILY LLC	4207 SE WOODSTOCK BLVD PMB	PORTLAND	OR	97206
BADER FAMILY LLC %JASON BADER	6324 SE 28TH AVE	PORTLAND	OR	97202
BAHIA LLC	1307 SE 56TH AVE	PORTLAND	OR	97215-2707
BAKER COMMODITIES INC	4020 BANDINI BLVD	VERNON	CA	90058
BAKER COMMODITIES INC	4020 BANDINI BLVD	VERNON	CA	90058
BAKER COMMODITIES INC	4020 BANDINI BLVD	VERNON	CA	90058
BAKER,JOSEPH H & GUINN,JAMIE M	2105 SE OCHOCO ST	PORTLAND	OR	97222
BAKER,JOSEPH H & GUINN,JAMIE M	2105 SE OCHOCO ST	PORTLAND	OR	97222
BAKERSFIELD PIPE & SUPPLY INC	P O BOX 639	BAKERSFIELD	CA	93302
BAKKE, DAVID CARL CONLEY-BAKKE, CINDY DAWN	595 NW BATTAGLIA AVE	GRESHAM	OR	97030-5242
BAKKE,DAVID C & CONLEY,CINDY D	PO BOX 30135	PORTLAND	OR	97294-3135
BAKKE,DAVID C & CONLEY-BAKKE,CINDY	PO BOX 30135	PORTLAND	OR	97294-3135
BALOGH,MARC A	902 WASHINGTON ST	OREGON CITY	OR	97045
BAMBOO ENTERPRISES LLC	2172 SE PALMBALD RD	GRESHAM	OR	97080
BANASKY PROPERTIES LLC	3643 SW IOWA ST	PORTLAND	OR	97221-3414
BANASKY PROPERTIES LLC	3643 SW IOWA ST	PORTLAND	OR	97221-3414
BANC OF AMERICA LEASING & CAPI	PO BOX 105578	TROY	MI	30348-5578
BANC OF AMERICA LEASING & CAPI	2600 W BIG BEAVER RD STE ABN	TROY	MI	48084-3309
BANC OF AMERICA LEASING & CAPI FKA NATIONSBANC LSG CORP	PO BOX 105578	ATLANTA	GA	30348-5578
BANK OF AMERICA OREGON (LSD MU % FACILITIES & PROPERTY M(	401 N DIXON ST	PORTLAND	OR	97227-1865
BARBER BLOCK LLC %BRUCE BURNS	4949 MEADOWS RD #330	LAKE OSWEGO	OR	97035
BARBER BLOCK LLC %BRUCE BURNS	4949 MEADOWS RD #330	LAKE OSWEGO	OR	97035
BARE,BERNADINE J	9000 NE M L KING BLVD SP 70	PORTLAND	OR	97211
BARNABY,PAUL J & BOCKIUS,CHELSEA M	9000 NE M L KING BLVD #249	PORTLAND	OR	97211
BARON-BLACKESLEE INC %HONEYWELL	PO BOX 4900 DEPT 356	SCOTTSDALE	AZ	85261
BASEL,ROBERT R & BASEL,SANDRA J	PO BOX 82955	PORTLAND	OR	97282
BASEL,ROBERT R & SANDRA J	PO BOX 82955	PORTLAND	OR	97202
BASIN STREET ASSOCIATES LLC % NORRIS & STEVENS INC	621 SW MORRISON ST #800	PORTLAND	OR	97205-3825
BASSITT,SCOTT M & CATHERINE E	5670 NE RIVERSIDE DR	MCMINNVILLE	OR	97128-8442
BASTASCH,MARY K	9560 SW HILLSBORO HWY	HILLSBORO	OR	97123-9264

BASTASCH,TERESA & WHITSON,CAMILLE-2/3 & BASTASCH,MARY F-:1750 NE 137TH AVE		PORTLAND	OR	97230-4006
BASTASCH,TERESA & WHITSON,CAMILLE-4/6 & BASTASCH,MARY F-:13045 SE STARK ST #109		PORTLAND	OR	97233-1568
BATES,EARL F	439 GRAND AVE PMB 226	BIGFORK	MT	59911
BATES,EARL F %KIERSEY & MCMILLAN, INC	PO BOX 1696	BEAVERTON	OR	97075
BATES,EARL F TR %KIERSEY & MCMILLAN, INC	PO BOX 1696	BEAVERTON	OR	97075
BATES,EARL F TR %KIERSEY & MCMILLAN, INC	PO BOX 1696	BEAVERTON	OR	97075
BATES,EARL F TR %KIERSEY & MCMILLAN, INC	PO BOX 1696	BEAVERTON	OR	97075
BATES,EARL F TR %KIERSEY & MCMILLAN, INC	PO BOX 1696	BEAVERTON	OR	97075
BATTILEGA,MARC S & KATHY L	2241 NE COLUMBIA BLVD	PORTLAND	OR	97211-1930
BAUER NW STORAGE LLC	14855 SE 82ND DR	CLACKAMAS	OR	97015
BAUER NW STORAGE LLC	14855 SE 82ND DR	CLACKAMAS	OR	97015
BAUER,HOWARD H TR & BAUER,WILLETTE TR	3333 NE 135TH AVE	PORTLAND	OR	97230-2817
BAUER,JAMES & REESE ENTERPRISE	P O BOX 30659	PORTLAND	OR	97294-3659
BBSC MANAGEMENT CO %BART BONIME	2167 EL JARDIN	VENTURA	CA	93001
BBV-PDX LLC	13007 167TH AVE NE	REDMOND	WA	98052
BCS PROPERTIES LLC	3865 NW ST HELENS RD	PORTLAND	OR	97210-1434
BEAGLE BURKE & ASSOCIATES OF OREGON INC SUC TR TO C&C COL 109 NE COLUMBIA BLVD		PORTLAND	OR	97211-1415
BEAIRD,SUSAN M	6041 NW 60TH AVE	PORTLAND	OR	97210-3605
BEAL FAMILY REAL ESTATE LLC	4060 NE FAIRVIEW LAKE WAY	FAIRVIEW	OR	97024-7747
BEAL FAMILY REAL ESTATE LLC	4060 NE FAIRVIEW LAKE WAY	FAIRVIEW	OR	97024-7747
BEAL,GEORGE C	15438 NE EUGENE ST	PORTLAND	OR	97230-8201
BEAL,RAYMOND TR 1/2 & BEAL,ROBERT J 1/2	PO BOX 56508	PORTLAND	OR	97238
BEAL,RAYMOND TR 1/2 & BEAL,ROBERT J 1/2	PO BOX 56508	PORTLAND	OR	97238
BEAL,RAYMOND TR 1/2 & BEAL,ROBERT J 1/2	PO BOX 56508	PORTLAND	OR	97238
BEAL,RAYMOND TR 1/2 & BEAL,ROBERT J 1/2	PO BOX 56508	PORTLAND	OR	97238
BEALS,STEVEN K	4312 SE CENTER ST	PORTLAND	OR	97206-3246
BEARSON,DAVID L	1031 SE MILL ST	PORTLAND	OR	97214-4782
BEAUMONT VILLAGE LOFTS CONDOMINIUM ASSOCIATION	3238 NE THOMPSON ST	PORTLAND	OR	97212-4909
BEAVER STATE SCAFFOLDING EQUIP	5920 NW SALTZMAN RD	PORTLAND	OR	97210
BEC,TIBERIU & EMILIJA	6224 SE 111TH AVE	PORTLAND	OR	97266
BEC,TRAIAN L & ANA	8735 SE 172ND AVE	HAPPY VALLEY	OR	97086-9628
BECKER ANODIZING	P O BOX 11263	PORTLAND	OR	97211
BECKER LAND LLC	6350 S 143RD ST	SEATTLE	WA	98168
BECKER LAND LLC	6350 S 143RD ST	SEATTLE	WA	98168

BECKER,SAMUEL L	6718 NE 47TH AVE	PORTLAND	OR	97218
BECKSTEAD,ERIN	4112 SE 24TH AVE	PORTLAND	OR	97202
BEDELL,JANE	4905 NW KAHNEETA DR	PORTLAND	OR	97229
BEE,EDISON & BEE,FRANCES	1016 SE CLATSOP ST	PORTLAND	OR	97266-6295
BELIAK,ARIEL & BELIAK,ELISE	630 PRINCETON DR	SUNNYVALE	CA	94087
BELIAK,ARIEL & BELIAK,ELISE	630 PRINCETON DR	SUNNYVALE	CA	94087
BELL OIL TERMINAL CO	2737 W COMMODORE WAY	SEATTLE	WA	98199-1233
BELL,DOUGLAS H & BELL,CHRISTINE M	614 NW MACLEAY BLVD	PORTLAND	OR	97210-3328
BELL,MARK & LIZA D	P O BOX 10392	PORTLAND	OR	97296
BELMONT & MORRISON LLC % WEST COAST SELF STORAGE	4012 148TH ST SE UPPER OFFICE	MILL CREEK	WA	98012
BELMONT BUILDING LLC % ELIZABETH CLARK AGOSTI	3212 SE 328TH AVE	WASHOUGAL	WA	98671
BELT,RAYMOND C & BELT,LISA	1820 N TERRY ST	PORTLAND	OR	97217
BELT,RAYMOND C & BELT,LISA	1820 N TERRY ST	PORTLAND	OR	97217
BENDERSON,NATHAN TR ET AL % FRED MEYER STORES INC ATTN NI	1014 VINE ST 7TH FLOOR	CINCINNATI	OH	45202
BENHAM,JACK	300 N HAYDEN BAY DR	PORTLAND	OR	97217-7998
BENHAM,JACK	300 N HAYDEN BAY DR	PORTLAND	OR	97217-7998
BENNETT,JOHN A	3305 SE MARY CT	MILWAUKIE	OR	97222
BENNETT,JOHN A	3305 SE MARY CT	MILWAUKIE	OR	97222
BENSON,JACK H	PO BOX 4144	WILSONVILLE	OR	97070
BENSON,LAWRENCE P	PO BOX 68017	PORTLAND	OR	97268-0017
BENSON,LAWRENCE P	PO BOX 68017	PORTLAND	OR	97268-0017
BENT TUBES LLC	PO BOX 987	JEFFERSON	OR	97352
BENT TUBES LLC	PO BOX 987	JEFFERSON	OR	97352
BENVEGNO,KATHLEEN ANN	PO BOX 74	SPRAGUE RIVER	OR	97639
BENZ INVESTMENT COMPANY LLC % BENZ,WILLIAM J	11855 SW KATHERINE ST	TIGARD	OR	97223
BENZ INVESTMENT COMPANY LLC % BENZ,WILLIAM J	11855 SW KATHERINE ST	TIGARD	OR	97223
BERGE,RONALD J & BERGE,MINDY M	PO BOX 20276	PORTLAND	OR	97294-0276
BERGE,RONALD J TR (RONALD J BERGE TRUST DTD 9/4/12)	100 SEAMOUNT DR	BRINNON	WA	98320
BERGE,RONALD J TR (RONALD J BERGE TRUST DTD 9/4/12)	100 SEAMOUNT DR	BRINNON	WA	98320
BERGE,RONALD J TR (RONALD J BERGE TRUST DTD 9/4/12)	100 SEAMOUNT DR	BRINNON	WA	98320
BERGE,RONALD J TR (RONALD J BERGE TRUST DTD 9/4/12)	100 SEAMOUNT DR	BRINNON	WA	98320
BERGELECTRIC CORP	5650 W CENTINELA AVE	LOS ANGELES	CA	90045
BERGLUND,ERIK O TR ET AL TO HURTADO,RICARDO P	3206 NE GLISAN ST	PORTLAND	OR	97232
BERGLUND,WAYNE	9000 NE M L KING BLVD SP 171A	PORTLAND	OR	97211

BERGSTROM 5629 LLC	9245 SE 129TH AVE	HAPPY VALLEY	OR	97086-6141
BERGSTROM 6140 LLC	9245 SE 129TH AVE	HAPPY VALLEY	OR	97086-6141
BERGSTROM,ERIC ET AL	1007 NE 69TH AVE	PORTLAND	OR	97213-5407
BERGSTROM,ERIC-1/2 & MEIER,DAVID G TR & MEIER,SHARIN M TR-	1007 NE 69TH AVE	PORTLAND	OR	97213-5405
BERLINER PROPERTIES LLC	10824 SE OAK ST #311	MILWAUKIE	OR	97222-6694
BERLINER PROPERTIES LLC	10824 SE OAK ST #311	MILWAUKIE	OR	97222-6694
BERRY,PAUL W	7907 SE EVERGREEN HWY	VANCOUVER	WA	98664
BERT L GEIGER LLC	PO BOX 400	UNION	WA	98592
BESSARAB PROPERTIES LLC	201 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1237
BEST PLAZA LLC	3469 SW WONDERVIEW AVE	GRESHAM	OR	97080
BETTERTON,LETICIA ET AL	6679 N ARMOUR ST	PORTLAND	OR	97203
BETTS,RICHARD F & BETTS,HELLA & RADY,WILLIAM F	2729 SE 6TH AVE	PORTLAND	OR	97202-2601
BETTS,RICHARD F & BETTS,HELLA TO CASCADE WESTERN REP INC	2729 SE 6TH AVE	PORTLAND	OR	97202-2601
BEVERAGE ICE CO	8333 NW HAZELTINE ST	PORTLAND	OR	97229
BEVERAGE ICE CO	8333 NW HAZELTINE ST	PORTLAND	OR	97229
BHGAH AIRPORT LLC %BHG HOTELS	PO BOX 1670	WILSONVILLE	OR	97070
BICKFORD,SONYA L & BICKFORD,CHRIS	10680 SW CLUTTER RD	SHERWOOD	OR	97140-9552
BICKFORD,SONYA L & BICKFORD,CHRIS	10680 SW CLUTTER RD	SHERWOOD	OR	97140-9552
BICKMORE ENTERPRISES	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007

BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BICKMORE ENTERPRISES INC	8279 SW 184TH AVE	ALOHA	OR	97007
BIGFOOT FAMILY INVESTMENTS LLC	8435 NE KILLINGSWORTH ST	PORTLAND	OR	97220
BILL NAITO COMPANY	2701 NW VAUGHN ST #390	PORTLAND	OR	97210
BILL NAITO COMPANY	2701 NW VAUGHN ST #390	PORTLAND	OR	97210
BINGHAM INVESTMENT CO LLC	3939 NW ST HELENS RD	PORTLAND	OR	97210-1442
BINGHAM WILLAMETTE FCU	2800 NW FRONT AVE	PORTLAND	OR	97210
BISHOP,BROUGHTON H JR	507 RHODODENDRON DR	VANCOUVER	WA	98661-5936
BITAR BROS LTD PRTNRSHP	2929 E BURNSIDE ST	PORTLAND	OR	97214-1831
BITAR BROS LTD PRTNRSHP	2929 E BURNSIDE ST	PORTLAND	OR	97214-1831
BITAR BROS LTD PRTNRSHP	2929 E BURNSIDE ST	PORTLAND	OR	97214-1831
BITAR BROS LTD PRTNRSHP	2929 E BURNSIDE ST	PORTLAND	OR	97214-1831
BITAR BROS ROBERT A BITAR CORP	2929 E BURNSIDE ST	PORTLAND	OR	97214-1831

BITAR BROS ROBERT A BITAR CORP	2929 E BURNSIDE ST	PORTLAND	OR	97214-1831
BITAR BROS ROBERT A BITAR CORP	2929 E BURNSIDE ST	PORTLAND	OR	97214-1831
BITAR BROS ROBERT A BITAR CORP	2929 E BURNSIDE ST	PORTLAND	OR	97214-1831
BITAR BROS ROBERT A BITAR CORP	2929 E BURNSIDE ST	PORTLAND	OR	97214-1831
BITAR BROS ROBERT A BITAR CORP	2929 E BURNSIDE ST	PORTLAND	OR	97214-1831
BITAR BROS ROBERT A BITAR CORP % BITAR,ROBERT A	2929 E BURNSIDE ST	PORTLAND	OR	97214-1831
BITAR WILKINS,KRISTINE & LUCAS BITAR LTD	3009 NW QUIMBY ST	PORTLAND	OR	97210
BJORKLAND,MOLLY TR ET AL %VIRGINIA MATHEWS	6808 SW CANYON CREST DR	PORTLAND	OR	97225
BJORKMAN ENTERPRISES LLC	834 SE MILL ST	PORTLAND	OR	97214-3541
BJORKMAN ENTERPRISES LLC	834 SE MILL ST	PORTLAND	OR	97214-3541
BKM HAYDEN ISLAND 101 LLC % BKM CAPITAL PARTNERS LP ATTN:	111 THEORY #250	IRVINE	CA	92617-3041
BKM HAYDEN ISLAND 101 LLC % BKM CAPITAL PARTNERS LP ATTN:	111 THEORY #250	IRVINE	CA	92617-3041
BKM HAYDEN ISLAND 101 LLC % BKM CAPITAL PARTNERS LP ATTN:	111 THEORY #250	IRVINE	CA	92617-3041
BKW LLC	12532 SE STEELE ST	PORTLAND	OR	97236-4244
BLACKFORD,RAY E	8839 NW SPRINGVILLE RD	PORTLAND	OR	97231-1221
BLACKFORD,RAY E & BLACKFORD,MARIAM B	8839 NW SPRINGVILLE RD	PORTLAND	OR	97231-1221
BLAKESLEE,TRACY J TO C L PROPERTY MANAGEMENT LLC	1571 WOODLAND TER	LAKE OSWEGO	OR	97034-5834
BLANCO MARTINEZ SANTIAGO FILEMON	9000 NE M L KING BLVD #239	PORTLAND	OR	97211
BLANE INVESTMENT CO % GALEN,MORRIS J	888 SW 5TH AVE #1600	PORTLAND	OR	97204-2030
BLASEN & BLASEN LUMBER CORP	PO BOX 17130	PORTLAND	OR	97217-0130
BLASEN & BLASEN LUMBER CORP	PO BOX 17130	PORTLAND	OR	97217-0130
BLASEN,DAVID M	PO BOX 591	LA CENTER	WA	98629
BLASER DIE CASTING DBA CONTINENTAL BRASS CO	P O BOX 30839	PORTLAND	OR	97294
BLASER DIE CASTING DBA CONTINENTAL BRASS CO	P O BOX 30839	PORTLAND	OR	97294
BLAUER BUILDING K LLC	7275 SW CHAPEL CT	PORTLAND	OR	97223-4504
BLOCK GRAPHICS INC % ARNOLD,BRIAN L	P O BOX 1207	RICHMOND	TX	77406
BLOCK GRAPHICS INC % ARNOLD,BRIAN L	P O BOX 1207	RICHMOND	TX	77406
BLOOM,OSCAR & SHIRLEY	1747 SW MONTMORE WAY	TROUTDALE	OR	97060
BLUE BELL ENTERPRISES LLC %PACIFICORP ATTN: TAX DEPARTMENT	825 NE MULTNOMAH ST STE 190(	PORTLAND	OR	97232
BLUMENKRON,ART	5315 NW ST HELENS RD	PORTLAND	OR	97210
BLUMENKRON,ART	5315 NW ST HELENS RD	PORTLAND	OR	97210
BLUMENKRON,ART	5315 NW ST HELENS RD	PORTLAND	OR	97210
BLUMENKRON,ART	5315 NW ST HELENS RD	PORTLAND	OR	97210
BLUMENKRON,ARTHUR D	5315 NW ST HELENS RD	PORTLAND	OR	97210-1135

BLUMENKRON,ARTHUR D	5315 NW ST HELENS RD	PORTLAND	OR	97210	
BLUMENKRON,ARTHUR D	5315 NW ST HELENS RD	PORTLAND	OR	97210	
BLUMENKRON,ARTHUR D	5315 NW ST HELENS RD	PORTLAND	OR	97210	
BNSF RAILWAY COMPANY	PO BOX 961089	FORT WORTH	TX	76161-0089

BNSF RAILWAY COMPANY	PO BOX 961089	FORT WORTH	TX	76161-0089
BNSF RAILWAY COMPANY	PO BOX 961089	FORT WORTH	TX	76161-0089
BNSF RAILWAY COMPANY	PO BOX 961089	FORT WORTH	TX	76161-0089
BNSF RAILWAY COMPANY	PO BOX 961089	FORT WORTH	TX	76161-0089
BNSF RAILWAY COMPANY	PO BOX 961089	FORT WORTH	TX	76161-0089
BNSF RAILWAY COMPANY	PO BOX 961089	FORT WORTH	TX	76161-0089
BNSF RAILWAY COMPANY	PO BOX 961089	FORT WORTH	TX	76161-0089
BNSF RAILWAY COMPANY	PO BOX 961089	FORT WORTH	TX	76161-0089
BNSF RAILWAY COMPANY	PO BOX 961089	FORT WORTH	TX	76161-0089
BNSF RAILWAY COMPANY & UNION PACIFIC RAILROAD COMPANY	1400 DOUGLAS STOP 1640	OMAHA	NE	68179-1640
BNSF RAILWAY COMPANY & UNION PACIFIC RAILROAD COMPANY	1400 DOUGLAS STOP 1640	OMAHA	NE	68179-1640
BNSF RAILWAY COMPANY & UNION PACIFIC RAILROAD COMPANY	1400 DOUGLAS STOP 1640	OMAHA	NE	68179-1640
BNSF RAILWAY COMPANY CORP REAL ESTATE DEVELOPMENT	2500 LOU MENK DR AOB-3	FORT WORTH	TX	76131
BNSF RAILWAY COMPANY CORP REAL ESTATE DEVELOPMENT	2500 LOU MENK DR AOB-3	FORT WORTH	TX	76131
BOC GROUP INC % PRICE WATERHOUSE COOPERS LLP ATTN: LAZA,F	P O BOX 988	FLORHAM PARK	NJ	7932
BOCANEGRA,RUBEN D	9000 NE M L KING BLVD SP 92	PORTLAND	OR	97211
BOCCI,CHRISTOPHER C ET AL	4533 CENTURY DR S	SALEM	OR	97302
BOCCI,CHRISTOPHER C ET AL	1415 LIBERTY ST SE	SALEM	OR	97302
BOCKMAN-GIVENS LLC ATTN: GIVENS,CAROLE S	10145 SW MELNORE ST	PORTLAND	OR	97225-4354
BODEN STORE FIXTURES	PO BOX 301009	PORTLAND	OR	97294-9009
BODEN STORE FIXTURES	PO BOX 301009	PORTLAND	OR	97294-9009
BOEING COMPANY THE INC PROPERTY TAX DEPT	PO BOX 3707 M/C 6A1-01	SEATTLE	WA	98124-2207
BOGOR LLC	16823 NW WATERFORD WAY	PORTLAND	OR	97229-1878
BOILERMAKERS UNION LOCAL 104 BUILDING ASSOCIATION	2800 1ST AVE #220	SEATTLE	WA	98121-1131
BOILERMAKERS UNION LOCAL 104 BUILDING ASSOCIATION	2800 1ST AVE #220	SEATTLE	WA	98121-1131
BOLES PROPERTIES LLC	2770 SW PATTON LN	PORTLAND	OR	97201-1645
BOLES PROPERTIES LLC	2770 SW PATTON LN	PORTLAND	OR	97201-1645
BOLES PROPERTIES LLC	2770 SW PATTON LN	PORTLAND	OR	97201-1645
BONUS ENTERPRISES LLC	4605 SE 31ST AVE	PORTLAND	OR	97202
BOOM,DAVID D TR	9945 NE 6TH DR	PORTLAND	OR	97211
BOOTH,EUGENE I ET AL %BROWN,TIMOTHY F S	1635 SE RHONE ST	PORTLAND	OR	97202

BOOTH,MARILYN J & LARSON,RICHARD M	3525 NE 50TH AVE #201	PORTLAND	OR	97213-1766
BORDEN CHEMICAL INC BY BORDEN INC TAX DPT	180 E BROAD ST 25TH FLR	COLUMBUS	OH	43215-3707
BORS INC	PO BOX 83169	PORTLAND	OR	97283-0169
BORS INC	PO BOX 83169	PORTLAND	OR	97283
BORS INC	PO BOX 83169	PORTLAND	OR	97283-0169
BORS,GEORGE J & BORS RIVERGATE LLC	PO BOX 83169	PORTLAND	OR	97283
BORTHWICK BREWERY BLOCK LLC	2050 BEAVERCREEK RD #101-322	OREGON CITY	OR	97045
BORTON,WILLIAM DANIEL	9000 NE M L KING BLVD SP 006	PORTLAND	OR	97211
BOTKE,PETER & BOTKE,SHEILA	6266 SE SCOTT DR	PORTLAND	OR	97215-1951
BOTKE,PETER & BOTKE,SHEILA	6266 SE SCOTT DR	PORTLAND	OR	97215-1951
BOTKE,PETER & BOTKE,SHEILA	6266 SE SCOTT DR	PORTLAND	OR	97215-1951
BOTKE,SHEILA K & PETE A	6266 SE SCOTT DR	PORTLAND	OR	97215
BOYCE,CATHERINE	3525 NE 50TH AVE #211	PORTLAND	OR	97213
BOYDSTUN METAL WORKS INC	9002 N SEVER CT	PORTLAND	OR	97203
BOYDSTUN METAL WORKS INC % ACCOUNTING	515 NW SALTZMAN RD	PORTLAND	OR	97229-6098
BOYDSTUN METAL WORKS INC % ACCOUNTING	515 NW SALTZMAN RD	PORTLAND	OR	97229-6098
BOYDSTUN METAL WORKS INC % ACCOUNTING	515 NW SALTZMAN RD	PORTLAND	OR	97229-6098
BP WEST COAST PRODUCTS LLC % PROPERTY TAX GROUP	PO BOX 3092	HOUSTON	TX	77253-3092
BP WEST COAST PRODUCTS LLC % PROPERTY TAX GROUP	PO BOX 3092	HOUSTON	TX	77253-3092
BP WEST COAST PRODUCTS LLC % PROPERTY TAX GROUP	PO BOX 3092	HOUSTON	TX	77253-3092
BP WEST COAST PRODUCTS LLC % PROPERTY TAX GROUP	PO BOX 3092	HOUSTON	TX	77253-3092
BP WEST COAST PRODUCTS LLC % PROPERTY TAX GROUP	PO BOX 3092	HOUSTON	TX	77253-3092
BRABHAM,EDWARD L TR & BRABHAM,JANIS M TR %7-ELEVEN INC /	PO BOX 711	DALLAS	TX	75221-0711
BRADRICK COMPANY INC	230 NW 10TH AVE	PORTLAND	OR	97209
BRADRICK COMPANY INC	230 NW 10TH AVE	PORTLAND	OR	97209
BRADSHAW,LYNDON ET AL	3429 NE 129TH AVE	PORTLAND	OR	97230
BRADSHAW,LYNDON ET AL	3429 NE 129TH AVE	PORTLAND	OR	97230
BRANDS,DAVID C & JULIE V	8033 NE HOLMAN ST	PORTLAND	OR	97218
BRB PROPERTY #11 LLC	8279 SW 184TH AVE	ALOHA	OR	97007
BRB PROPERTY #11 LLC	14814 SE NORTHSHORE CIR	ALOHA	OR	98683
BRB PROPERTY #11 LLC	8279 SW 184TH AVE	ALOHA	OR	97007
BRB PROPERTY #11 LLC	14814 SE NORTHSHORE CIR	ALOHA	OR	98683
BREIDENBACH,JAY E & SANDSTROM,ROLAND & PHAN,FOU CHOY	8205 N MISSISSIPPI AVE	PORTLAND	OR	97217
BREIDENBACH,JAY E & SANDSTROM,ROLAND & PHAN,FOU CHOY	8205 N MISSISSIPPI AVE	PORTLAND	OR	97217

BREIDENBACH,JAY E ET AL	8205 N MISSISSIPPI AVE	PORTLAND	OR	97217
BREIDENBACH,JAY E ET AL	8205 N MISSISSIPPI AVE	PORTLAND	OR	97217
BREITBARTH,ROBERT J TR (JOY L BREITBARTH CREDIT SHELTER TRUS	10880 SW DAVIES RD #1001	BEAVERTON	OR	97008-8014
BREITBARTH,ROBERT J TR (JOY L BREITBARTH CREDIT SHELTER TRUS	10880 SW DAVIES RD #1001	BEAVERTON	OR	97008-8014
BRENNER,ARTHUR E	10952 SE 21ST AVE	MILWAUKIE	OR	97222-7649
BRENNTAG PACIFIC INC	4545 ARDINE ST	SOUTH GATE	CA	90280
BRENNTAG PACIFIC INC	4545 ARDINE ST	SOUTH GATE	CA	90280
BREUNIG,GERALD D & ROHRBACH,DIANE M	13501 SE RIVERCREST DR	VANCOUVER	WA	98683-6676
BREUNIG,GERALD D & ROHRBACH,DIANE M	13501 SE RIVERCREST DR	VANCOUVER	WA	98683
BREUNIG,GERALD D & ROHRBACH,DIANE M	13501 SE RIVERCREST DR	VANCOUVER	WA	98683-6676
BRIAR PATH LLC %DOUG BEAN & ASSOC INC	1650 NW NAITO PKWY STE 302	PORTLAND	OR	97209-2534
BRIDEHAGEN, TERRY JEANNE	9000 NE M L KING BLVD SP254	PORTLAND	OR	97211
BRIDGE CITY STEEL LLC	3865 NW ST HELENS RD	PORTLAND	OR	97210
BRIDGE CITY STEEL LLC	3865 NW ST HELENS RD	PORTLAND	OR	97210
BRIDGEHEAD DEVELOPMENT LLC % MALSIN,JONATHAN	75 SE YAMHILL ST #201	PORTLAND	OR	97214
BRIDGEHEAD DEVELOPMENT LLC % MALSIN,JONATHAN	75 SE YAMHILL ST #201	PORTLAND	OR	97214
BRIDGEPORT 44 SYSTEMS LLC %CITY HOUSES INC	6010 NE FLANDERS ST #B1	PORTLAND	OR	97213
BRIDGETOWN NATURAL FOODS LLC	11601-A SE FOSTER RD	PORTLAND	OR	97266-4013
BRIDGETOWN NATURAL FOODS LLC	11601-A SE FOSTER RD	PORTLAND	OR	97266-4013
BRIDGETOWN PRINTING CO INC %BADEN TAX MGMNT LLC	6920 POINTE INVERNESS WAY #3(	FORT WAYNE	IN	46804
BRIDGETOWN PRINTING CO INC %BADEN TAX MGMNT LLC	6920 POINTE INVERNESS WAY #3(	FORT WAYNE	IN	46804
BRIDGEVIEW HOUSING LLC % INNOVATIVE HOUSING INC	219 NW 2ND AVE	PORTLAND	OR	97209-3905
BRIGHT LAND LLC	2515 NW NICOLAI ST	PORTLAND	OR	97210-1814
BRIM,EVONA M TR	2165 SW MAIN ST	PORTLAND	OR	97205
BRINDENHAGEN,TERRY & EDWARD % ARC	9000 NE M L KING BLVD SP229	PORTLAND	OR	97211
BRINK INVESTMENTS INC	6134 SE 111TH AVE	PORTLAND	OR	97266
BRISTOL BAY PETROLEUM PROPERTIES LLC %PETROCARD INC	730 CENTRAL AVE SO	KENT	WA	98032
BRISTOW,AMBER LEE % SUN PACIFIC HOMES LLC	PO BOX 790	RICHLAND	WA	99352
BRITT,VICTOR H III & BRITT,GRETA I	3525 NE 50TH AVE #309	PORTLAND	OR	97213-1766
BRIX MARITIME CO	9030 NW ST HELENS RD	PORTLAND	OR	97231-1127
BRIX MARITIME CO	PO BOX 83018	PORTLAND	OR	97283-0018
BRIX MARITIME CO	PO BOX 83018	PORTLAND	OR	97283-0018
BRIX MARITIME CO	PO BOX 83018	PORTLAND	OR	97283-0018
BRIX MARITIME CO	PO BOX 83018	PORTLAND	OR	97283-0018

BRIX MARITIME CO TO KNAPPTON CORP	PO BOX 83018	PORTLAND	OR	97283-3018
BROADMOOR INC	3509 NE COLUMBIA BLVD	PORTLAND	OR	97211-2037
BROADMOOR INC	3509 NE COLUMBIA BLVD	PORTLAND	OR	97211
BROADMOOR INC	3509 NE COLUMBIA BLVD	PORTLAND	OR	97211-2037
BROADMOOR INC	3509 NE COLUMBIA BLVD	PORTLAND	OR	97211-2037
BROCK,ROBERT A	2636 NE SANDY BLVD	PORTLAND	OR	97213
BROMLEY DEVELOPMENT CO	13515 NE FREMONT ST	PORTLAND	OR	97230
BROOKLYN 16 LLC	177 JONATHAN CT	GLEN ELLYN	IL	60137-6475
BROSMONROE-OREGON LLC	717 S LANDER	SEATTLE	WA	98134
BROWN,CYNTHIA A	3819 NE COLUMBIA BLVD	PORTLAND	OR	97211
BROWN,DOLORES J-32.27% & 12722 NE AIRPORT WAY LLC-67.73	5534 NE 122ND AVE	PORTLAND	OR	97230
BROWN,JIMMY W & LAUREL A	PO BOX 362	ESTACADA	OR	97023
BROWN,RONALD R SR & RAMIZ-BROWN,FA'LISHA	4906 NE 62ND AVE	PORTLAND	OR	97218
BROWN,STANLEY J TR & BROWN,SUSAN M S TR	15738 NE SISKIYOU CT	PORTLAND	OR	97230-5154
BROWN,STEVAN P	3546 NE 152ND AVE	PORTLAND	OR	97230-4402
BRP-LAGOON INC	P O BOX 487	LAKE OSWEGO	OR	97034-0487
BRUCE & DANA WHOLESALE INC> ATTN TREMAIN,MARY CPA	2204 SIMPSON ST SE	SALEM	OR	97301-6699
BRUENER,CHARLENE	35160 SE SKOGAN RD	SANDY	OR	97055
BRUMMETT,MICHAELLE	3637 NE COLUMBIA BLVD	PORTLAND	OR	97211-2039
BRUNEAU INVESTMENTS LLC	1321 NW 43RD AVE	CAMAS	WA	98607
BRUNEAU INVESTMENTS LLC	1321 NW 43RD AVE	CAMAS	WA	98607
BRUNO INVESTMENT PROPERTIES LLC % BRUNO,SCOTT H	3361 AMBER BAY LOOP	ANCHORAGE	AK	99515
BRUUN PROPERTY REDEVELOPMENT GROUP LLC	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN PROPERTY REDEVELOPMENT GROUP LLC	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN PROPERTY REDEVELOPMENT GROUP LLC	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN, KELLY C	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN, KELLY C	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,KELLY C % BRUUN PROPERTIES	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,KELLY C TR	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,KELLY C TR	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,KELLY C TR-1% & KING-TAYLOR BUSINESS CENTER LLC-99%	3611 SE 20TH AVE #300	PORTLAND	OR	97202-2967
BRUUN,KELLY C TR-1% & KING-TAYLOR BUSINESS CENTER LLC-99%	3611 SE 20TH AVE #300	PORTLAND	OR	97202-2967
BRUUN,KELLY C TR-1% & KING-TAYLOR BUSINESS CENTER LLC-99%	3611 SE 20TH AVE #300	PORTLAND	OR	97202-2967
BRUUN,KELLY C TR-1% & KING-TAYLOR BUSINESS CENTER LLC-99%	3611 SE 20TH AVE #300	PORTLAND	OR	97202-2967

BRUUN,KELLY C(LEASED INTERSTATE MOBIL PHONE CO	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,KELLY TR & SPECTRE LLC	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,KELLY TR & SPECTRE LLC	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,KELLY TR ET AL	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,KELLY TR ET AL	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,KELLY TR ET AL	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,KELLY TR ET AL	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,KELLY TR ET AL	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,KELLY TR ET AL	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,LARRY TR (BRUUN 2012 CHILDRENS TRUST DTD 12/28/2012	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,LARRY TR (BRUUN 2012 CHILDRENS TRUST DTD 12/28/2012	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,LARRY TR (BRUUN 2012 CHILDRENS TRUST DTD 12/28/2012	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,LARRY TR (BRUUN 2012 CHILDRENS TRUST DTD 12/28/2012	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,LARRY TR (BRUUN 2012 CHILDRENS TRUST DTD 12/28/2012	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,LARRY TR (BRUUN 2012 CHILDRENS TRUST DTD 12/28/2012	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,LARRY TR (BRUUN 2012 CHILDRENS TRUST DTD 12/28/2012	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,LARRY TR (BRUUN 2012 CHILDRENS TRUST DTD 12/28/2012	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,LARRY TR (BRUUN 2012 CHILDRENS TRUST DTD 12/28/2012	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,LARRY TR (BRUUN 2012 CHILDRENS TRUST DTD 12/28/2012	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,LARRY TR (BRUUN 2012 CHILDRENS TRUST DTD 12/28/2012	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,LARRY TR (BRUUN 2012 CHILDRENS TRUST DTD 12/28/2012	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRUUN,LARRY TR (BRUUN 2012 CHILDRENS TRUST DTD 12/28/2012	3611 SE 20TH AVE #300	PORTLAND	OR	97202
BRYSON PROPERTIES LLC ET AL	6518 RAVENNA AVE NE	SEATTLE	WA	98115
BT-OH LLC % UNITED PARCEL SERVICE ATTN TAX DEPARTMENT	PO BOX 28606	ATLANTA	GA	30358-0606
BT-OH LLC ATTN TAX DEPT BLDG 1 FLOOR 6	PO BOX 28606	ATLANTA	GA	30358-0606
BT-OH LLC ATTN TAX DEPT BLDG 1 FLOOR 6	PO BOX 28606	ATLANTA	GA	30358-0606
BT-OH LLC ATTN TAX DEPT BLDG 1 FLOOR 6	PO BOX 28606	ATLANTA	GA	30358-0606
BT-OH LLC ATTN TAX DEPT-PROPERTY	P O BOX 28606	ATLANTA	GA	30358-0606
BT-OH LLC ATTN TAX DEPT-PROPERTY	P O BOX 28606	ATLANTA	GA	30358-0606
BT-OH LLC ATTN TAX DEPT-PROPERTY	P O BOX 28606	ATLANTA	GA	30358-0606
BT-OH LLC UPS - STEPHEN THOMPSON	55 GLENLAKE PKWY NE	ATLANTA	GA	30328
BUBLIK,ANATOLIY	5506 SE LEXINGTON ST	PORTLAND	OR	97206-9024
BUBLIK,ANATOLIY	5506 SE LEXINGTON ST	PORTLAND	OR	97206-9024

BUBLIK,ANATOLIY	5506 SE LEXINGTON ST	PORTLAND	OR	97206-9024
BUBLIK,ANATOLIY	5506 SE LEXINGTON ST	PORTLAND	OR	97206-9024
BUCK DEVELOPMENT CO	PO BOX 10067	PORTLAND	OR	97210-0067
BUCK,KENNETH R	570 NE TOMAHAWK ISLAND DR	PORTLAND	OR	97217-8094
BUCK,KENNETH R	570 NE TOMAHAWK ISLAND DR	PORTLAND	OR	97217-8094
BUCK,KENNETH R	570 NE TOMAHAWK ISLAND DR	PORTLAND	OR	97217-8094
BUCKEYE GAS PRODUCTS CO LP % FERRELLGAS	1 LIBERTY PLZ	LIBERTY	MO	64068-2970
BUCKEYE GAS PRODUCTS CO LP % FERRELLGAS	1 LIBERTY PLZ	LIBERTY	MO	64068-2970
BUCKLAND,LARRY A & SHERRIE A	7802 SE 62ND AVE	PORTLAND	OR	97206
BUCKLEY,LISA P % WILLIAMS,VERN	1359 JUDY ST	WOODBURN	OR	97071
BUCKWOLD INDUSTRIAL PROPERTIES LTD	6330 N CUTTER CIR	PORTLAND	OR	97217
BUFFALO BYE LLC	PO BOX 2788	CLACKAMAS	OR	97015
BUFFALO BYE LLC	PO BOX 2788	CLACKAMAS	OR	97015
BUFFALO BYE LLC	PO BOX 2788	CLACKAMAS	OR	97015
BUFKIN,DOUGLAS G & BUFKIN,JENNA F	9409 N DECATUR ST	PORTLAND	OR	97203
BUHLER,JACK W TR %BUHLER, LEE	018 SW HAMILTON ST	PORTLAND	OR	97239
BUILD PRODUCTS PROPERTIES LLC	4804 NW BETHANY BLVD 1-2 #13	PORTLAND	OR	97229-9195
BULLSEYE GLASS CO	3722 SE 21ST AVE	PORTLAND	OR	97202
BULLSEYE GLASS CO	3722 SE 21ST AVE	PORTLAND	OR	97202-2913
BULLSEYE GLASS CO	3722 SE 21ST AVE	PORTLAND	OR	97202
BULLSEYE GLASS CO	3722 SE 21ST AVE	PORTLAND	OR	97202-2913
BULLSEYE GLASS CO	3722 SE 21ST AVE	PORTLAND	OR	97202-2913
BULLSEYE GLASS CO	3703 SE 22ND AVE	PORTLAND	OR	97202
BULLSEYE GLASS CO	3722 SE 21ST AVE	PORTLAND	OR	97202-2913
BULLSEYE GLASS CO	3722 SE 21ST AVE	PORTLAND	OR	97202-2913
BULLSEYE GLASS CO	3721 SE 21ST AVE	PORTLAND	OR	97202-2912
BULLSEYE GLASS CO	3722 SE 21ST AVE	PORTLAND	OR	97202-2913
BULLSEYE GLASS CO % SCHWOERER,DANIEL	3722 SE 21ST AVE	PORTLAND	OR	97202-2913
BULLSEYE GLASS CO % SCHWOERER,DANIEL	3722 SE 21ST AVE	PORTLAND	OR	97202-2913
BUNKER,WAYNE C	3548 NE COLUMBIA BLVD	PORTLAND	OR	97211
BUNKER,WAYNE C & BUNKER,DIANA G	3548 NE COLUMBIA BLVD	PORTLAND	OR	97211
BUNKER,WAYNE C TR (REYMOND R BUNKER TRUST)	3548 NE COLUMBIA BLVD	PORTLAND	OR	97211-2038
BURBACK FAMILY LLC	1405 SE 75TH CT	VANCOUVER	WA	98664-1782
BURCH,MARY M TR (MARY M BURCH SURVIVOR'S TRUST)	4035 NE MARINE DR	PORTLAND	OR	97211-2133

BURGARD 789 LLC	210 SW MORRISON ST #600	PORTLAND	OR	97204-3150
BURGARD 789 LLC	210 SW MORRISON ST #600	PORTLAND	OR	97204-3150
BURGARD 789 LLC % AMERICAN INDUSTRIES INC	1750 NW NAITO PKWY #106	PORTLAND	OR	97209
BURLINGTON NORTHERN RAILROAD C	810 3RD AVE	SEATTLE	WA	98104-1614
BURLINGTON NORTHERN RAILROAD C	1101 NW HOYT ST	SEATTLE	WA	97209-3006
BURLINGTON NORTHERN RAILROAD C % HERMAN DEVEL CO LLC	1235 SW MYRTLE CT	PORTLAND	OR	97201-2337
BURLINGTON NORTHERN RAILROAD C % JOHNSON,A J PROPERTY M	10 S MAIN ST	SALT LAKE CITY	UT	84101-1501
BURLINGTON NORTHERN RAILROAD C ATTN NAGY,KELLY	PO BOX 961089	FORT WORTH	TX	76161-0089
BURLINGTON NORTHERN RAILROAD C ATTN NAGY,KELLY BNSF	PO BOX 961089	FORT WORTH	TX	76161-0089
BURLINGTON NORTHERN RAILROAD C ATTN NAGY,KELLY BNSF	PO BOX 961089	FORT WORTH	TX	76161-0089
BURLINGTON NORTHERN RAILROAD H % 1ST INTERSTATE CENTER #	999 3RD AVE	SEATTLE	WA	98104-4001
BURLINGTON NORTHERN RAILROAD H % PROPERTY TAX DEPARTME	777 MAIN ST STE 1206	FORT WORTH	TX	76102
BURLINGTON NORTHERN RAILROAD H 2100 1ST INTERSTATE CTR	999 3RD AVE	SEATTLE	WA	98104-4001
BURLINGTON NORTHERN RAILROAD H 2100 1ST INTERSTATE CTR	999 3RD AVE	SEATTLE	WA	98104-4001
BURLINGTON NORTHERN RAILROAD HOLDINGS INC % PROPERTY TA	PO BOX 961089	FORT WORTH	TX	76161-0089
BURNETT PROPERTY MANAGEMENT LLC	2314 SW SHEFFIELD AVE	PORTLAND	OR	97201
BURNETT,GREGORY E TR (AMANDA BURNETT & BLAKE BURNETT TE	14396 SW RANCHER LN	BEAVERTON	OR	97008
BURNETT,GREGORY E TR (AMANDA BURNETT & BLAKE BURNETT TE	14396 SW RANCHER LN	BEAVERTON	OR	97008
BURNETT,PHILIP G	PO BOX 13206	PORTLAND	OR	97213
BURNETT,PHILIP G	PO BOX 13206	PORTLAND	OR	97213
BURNETT,PHILIP G	PO BOX 13206	PORTLAND	OR	97213
BURNS BROS	4949 MEADOWS RD #330	LAKE OSWEGO	OR	97035-3162
BURNS BROS	4949 MEADOWS RD #330	LAKE OSWEGO	OR	97035-3162
BURNS BROS INC & GRIFFITH,DANIEL B TR & GRIFFITH,LEANN D	1935 PASEO VERDE PKWY #122	ANDERSON	NV	89012
BURNS BROS INC ATTN GROSS,STEVE	4949 MEADOWS RD #330	LAKE OSWEGO	OR	97035-3162
BURNS,JOANNE L	11616 NW ST HELENS RD	PORTLAND	OR	97231
BUSACKER,ALAN	2510 NE 163RD ST	RIDGEFIELD	WA	98642
BUSACKER,ALAN W	2510 NE 163RD ST	RIDGEFIELD	WA	98642
BUSACKER,ALAN W	2510 NE 163RD ST	RIDGEFIELD	WA	98642
BUSACKER,ALAN W	2510 NE 163RD ST	RIDGEFIELD	WA	98642
BUSCHO-DUGGAN PROPERTIES LLC	10963 NW APPELLATE WAY	PORTLAND	OR	97229
BUSCHO-DUGGAN PROPERTIES LLC	10963 NW APPELLATE WAY	PORTLAND	OR	97229
BUSHAW,AMY C	1625 SE RHONE ST	PORTLAND	OR	97202
BUSHWACKER INC	6710 N CATLIN AVE	PORTLAND	OR	97203-2833

BUSHWACKER INC	6710 N CATLIN AVE	PORTLAND	OR	97203-2833
BUSHWACKER INC % HIGHLANDER PARTNERS LP ATTN MCRORIE,CH	300 CRESCENT CT #550	DALLAS	TX	75201-1817
BWG LLC % BOJARSKY,TONY	200 SE 44TH AVE	PORTLAND	OR	97215-1005
BWG LLC % BOJARSKY,TONY	200 SE 44TH AVE	PORTLAND	OR	97215-1005
BYERS FAMILY LTD	313 ANTELOPE LN	ROSEBURG	OR	97471-9529
BYERS FAMILY LTD	313 ANTELOPE LN	ROSEBURG	OR	97471-9529
C & J PARTNERSHIP	606 SE 148TH AVE	PORTLAND	OR	97233
C A S T LLC	11215 SE LEXINGTON ST	PORTLAND	OR	97266
C A S T LLC	11215 SE LEXINGTON ST	PORTLAND	OR	97266
C BENSON PROPERTIES	3246 SE LOEFFELMAN ST	MILWAUKIE	OR	97222
C DAVIS INVESTMENTS LLC	725 SE LINCOLN ST	PORTLAND	OR	97214-4638
C DAVIS INVESTMENTS LLC	725 SE LINCOLN ST	PORTLAND	OR	97214-4638
C DAVIS INVESTMENTS LLC	725 SE LINCOLN ST	PORTLAND	OR	97214-4638
C H GUENTHER & SON INC ATTN: TAX DEPT	PO BOX 2250	UNIVERSAL CITY	TX	78148
C H GUENTHER & SON INC ATTN: TAX DEPT	PO BOX 2250	UNIVERSAL CITY	TX	78148
C H X FAMILY LIMITED PARTNERSHIP	9418 SE CHATFIELD CT	HAPPY VALLEY	OR	97086-9197
C J ZELMAR LLC	8311 N DANA AVE	PORTLAND	OR	97203-3603
C2 PARTNERS LLC % CARREON,GILBERT & DIANE	P O BOX 1498	GRESHAM	OR	97030
C2 PARTNERS LLC % CARREON,GILBERT & DIANE	P O BOX 1498	GRESHAM	OR	97030
CAIROLI PROPERTIES LLC	1701 BROADWAY #196	VANCOUVER	WA	98663-3436
CAIROLI PROPERTIES LLC	1701 BROADWAY #196	VANCOUVER	WA	98663-3436
CAIROLI PROPERTIES LLC	1701 BROADWAY #196	VANCOUVER	WA	98663-3436
CAIROLI PROPERTIES LLC	1701 BROADWAY #196	VANCOUVER	WA	98663-3436
CAIROLI PROPERTIES LLC	1701 BROADWAY #196	VANCOUVER	WA	98663-3436
CAL INVESTMENTS LLC	21753 SE FOSTER RD	DAMASCUS	OR	97089
CALBAG METALS % CONTROLLER	P O BOX 10067	PORTLAND	OR	97296-0067
CALBAG METALS CO INC	PO BOX 10067	PORTLAND	OR	97296
CALBAG METALS CO INC	PO BOX 10067	PORTLAND	OR	97296
CALBAG METALS CO INC	PO BOX 10067	PORTLAND	OR	97296
CALBAG METALS CO INC	PO BOX 10067	PORTLAND	OR	97296
CALDERON,RAOUL	3538 COEUR D ALENE DR	WEST LINN	OR	97068-9276
CALDWELL,MICHAEL B	9911 N DECATUR ST	PORTLAND	OR	97203
CALLAHAN,JAMES F	12235 SW EDGEWOOD ST	PORTLAND	OR	97225-4609
CALLAHAN,KELLEY D ET AL % ENTERCOM PORTLAND LLC	PO BOX 71548	PHOENIX	AZ	85050

CALLAHAN,KELLEY D TR ET AL	PO BOX 71548	PHOENIX	AZ	85050
CALLAHAN,KELLEY D TR ET AL	PO BOX 71548	PHOENIX	AZ	85050
CALLISON,SIDNEY M	9625 N RAMSEY BLVD	PORTLAND	OR	97203
CAMCO OR LLC	14912 NE 5TH AVE	VANCOUVER	WA	98685-5804
CAMERON OREGON PROPERTIES LLC	PO BOX 713	POINT REYES	CA	94956
CAMPAIGN PROPERTIES LLC ATTN: BENFIELD,DAN	4341 NE 148TH AVE	PORTLAND	OR	97230-4306
CAMPBELL,CYNDY	9000 NE M L KING BLVD SP 16	PORTLAND	OR	97211
CAMPER DOWNTIME LLC % CAMPERDOWN LLC JAMES PETERS CPA	610 SW ALDER ST #910	PORTLAND	OR	97205
CAMPERDOWN LLC %JAMES PETERS CPA	610 SW ALDER ST #910	PORTLAND	OR	97205
CAMROSE PIPE CORP %EVRAZ INC NA	200 E RANDOLPH STE 7800	CHICAGO	IL	60601
CANTEEN CO OF OREGON % ESTEY,JOHN R TR	5001 N LAGOON AVE	PORTLAND	OR	97217
CANTEL INDUSTRIAL PROPERTIES LLC	1511 SE HOLGATE BLVD	PORTLAND	OR	97202-4718
CAPELLE,PATRICK A & CAPELLE,SARAH D	8813 NE 60TH ST	VANCOUVER	WA	98662
CAPELLE,PATRICK A & CAPELLE,SARAH D	8813 NE 60TH ST	VANCOUVER	WA	98662
CARDINAL ALUMINUM OF OREGON	6800 NE 59TH PL	PORTLAND	OR	97218-2714
CARDINAL HEALTH 414 LLC ATTN TAX MANAGER	7000 CARDINAL PL	DUBLIN	OH	43017
CARDINAL HEALTH 414 LLC ATTN TAX MANAGER	7000 CARDINAL PL	DUBLIN	OH	43017
CAREY DAVIS ENTERPRISES LLC ET AL %STROMMER ENTERPRISES LL 4835 NE PACIFIC ST		PORTLAND	OR	97213
CARGILL INC ATTN PROPERTY TAX	PO BOX 5626	MINNEAPOLIS	MN	55440-5626
CARGILL INC ATTN PROPERTY TAX	PO BOX 5626	MINNEAPOLIS	MN	55440-5626
CARGILL INC ATTN PROPERTY TAX	PO BOX 5626	MINNEAPOLIS	MN	55440-5626
CARGILL INCORPORATED	PO BOX 5626	MINNEAPOLIS	MN	55440-5626
CARMEL INDUSTRIAL PARK-80% & CARMEL INDUSTRIAL PARK LLC-2 1515 SW 5TH AVE #600		PORTLAND	OR	97201
CARMEL INDUSTRIAL PARK-80% & CARMEL INDUSTRIAL PARK LLC-2 1515 SW 5TH AVE #600		PORTLAND	OR	97201
CARMEL INDUSTRIAL PARK-80% & CARMEL INDUSTRIAL PARK LLC-2 1515 SW 5TH AVE #600		PORTLAND	OR	97201
CARPENTER,JIM & KELLY ANN % WASTE RECOVERY INC	8035 E R L THORNTON FWY STE 3	DALLAS	TX	75228-7041
CARPET CARL PROPERTIES LLC ATTN: SKORO,CARL	1635 SE GRAND AVE	PORTLAND	OR	97214
CARR,JAMES L & CARR,PATRICIA M	PO BOX 17423	PORTLAND	OR	97217
CARR,PATRICIA M	PO BOX 17423	PORTLAND	OR	97217
CARSON OIL CO INC	PO BOX 10948	PORTLAND	OR	97210-0948
CARUTHERS STREET PROPERTIES LLC %ROBERT RAMSOUR,MGR	290 SE SPOKANE ST	PORTLAND	OR	97202
CARUTHERS STREET PROPERTIES LLC %ROBERT RAMSOUR,MGR	290 SE SPOKANE ST	PORTLAND	OR	97202
CARUTHERS STREET PROPERTIES LLC %ROBERT RAMSOUR,MGR	290 SE SPOKANE ST	PORTLAND	OR	97202
CARUTHERS STREET PROPERTIES LLC %ROBERT RAMSOUR,MGR	290 SE SPOKANE ST	PORTLAND	OR	97202

CASAS CARDENAZ,GOSAFAT	9000 NE M L KING BLVD SP 57	PORTLAND	OR	97211
CASCADE CONCESSION SERVICE	PO BOX 3524	SEATTLE	WA	98124-3524
CASCADE GENERAL INC ATTN: THOMAS R FERREIRA	PO BOX 4367	PORTLAND	OR	97208-4367
CASCADE GENERAL INC ATTN: THOMAS R FERREIRA	PO BOX 4367	PORTLAND	OR	97208-4367
CASE,ROBERT B & CASE,JACQUELINE	PO BOX 1919	NORTH PLAINS	OR	97133
CASEY,BARNABY	3812 SE 21ST AVE	PORTLAND	OR	97202
CASHAR LLC	PO BOX 55054	PORTLAND	OR	97238
CASSAN,JAMES T & DORIS O % DOLLAR DEVELOPMENT CO	2737 78TH AVE SE #201	MERCER ISLAND	WA	98040
CASSAN,JAMES T & DORIS O % DOLLAR DEVELOPMENT CO	2737 78TH AVE SE #201	MERCER ISLAND	WA	98040
CATALAN & BURNS PROPERTIES LLC	P O BOX 14788	PORTLAND	OR	97214
CATELLUS LAND & DEVELOPMENT CORPORATION % PROLOGIS TAX	4545 AIRPORT WAY	DENVER	CO	80239-5716
CATHEDRAL PARK PLACE LLC	412 NW COUCH ST #220.	PORTLAND	OR	97209
CBS OUTDOOR INC % OUTFRONT MEDIA LLC ATTN: FAIRFIELD	PO BOX 404	BROADWAY	NJ	08808-0404
CDS ENTERPRISES LLC	PO BOX 80794	PORTLAND	OR	97280-1794
CDW HOLDCO LLC % WESCO DISTRIBUTION INC	225 WEST STATION SQ DR #700	PITTSBURGH	PA	15219
CEF LEASE RESIDUAL HOLDING LLC	P O BOX 10316	STAMFORD	CT	6904
CEID HOLDINGS LLC	PO BOX 12145	PORTLAND	OR	97212-0145
CEID HOLDINGS LLC	PO BOX 12145	PORTLAND	OR	97212-0145
CELTIC LEASING CO	4 PARK PLZ STE 300	IRVINE	CA	92614-8511
CELWAVE ATTN AL HERTHLE	2 RYAN RD	MARLBORO	NJ	7746
CENTENNIAL SCHOOL DISTRICT NO. 28J ATTN: DIR OF BUSINESS & C	18135 SE BROOKLYN ST	PORTLAND	OR	97236-1049
CENTENNIAL SCHOOL DISTRICT NO. 28J ATTN: DIR OF BUSINESS & C	18135 SE BROOKLYN ST	PORTLAND	OR	97236-1049
CENTENNIAL SCHOOL DISTRICT NO. 28J ATTN: DIR OF BUSINESS & C	18135 SE BROOKLYN ST	PORTLAND	OR	97236-1049
CENTRAL EASTSIDE PARTNERS LLC	5845 JEAN RD	LAKE OSWEGO	OR	97035
CENTURY PARK HOLDINGS 1914 LP % MAVIS,GEOFFREY O	PO BOX 12910	SAN LUIS OBISPO	CA	93406
CENVEO CORPORATION % JAUREGUI,ARTHUR	PO BOX 110003	STAMFORD	CT	06911-0003
CEREAL FOOD PROCESSORS % RYAN, LLC BANK OF AMERICA CENTEI	15 WEST 6TH ST #2400	TULSA	OK	74119
CETTA INVESTMENT PROPERTIES LL	4140 SE TAGGART ST	PORTLAND	OR	97202
CFMW LLC	8424 N CRAWFORD ST	PORTLAND	OR	97203
CH REALTY VII-BARANOF I PORTLAND I84 SELF STORAGE LLC	1717 MCKINNEY AVE #700	DALLAS	TX	75202
CH REALTY VII-WPC I PORTLAND C %WENTWORTH PROPERTY CO LL	2701 E CAMELBACK RD #185	PHOENIX	AZ	85016
CH REALTY VII-WPC I PORTLAND C %WENTWORTH PROPERTY CO LL	2701 E CAMELBACK RD #185	PHOENIX	AZ	85016
CHAIJAROEN,VACHIRA J	2022 NW 21ST PL	PORTLAND	OR	97210-2302
CHAINRING II LLC ATTN BADER,JORDAN	330 SE SALMON ST	PORTLAND	OR	97214-3357

CHAINRING II LLC ATTN BADER,JORDAN	330 SE SALMON ST	PORTLAND	OR	97214-3357
CHAMBERLAIN PROPERTIES LLC	9109 N WILBUR AVE	PORTLAND	OR	97217
CHAMBERLAIN PROPERTIES LLC	9109 N WILBUR AVE	PORTLAND	OR	97217
CHAN,KA PING	666 N THOMPSON ST	PORTLAND	OR	97227
CHANDLER,DAWN MARIE	9000 NE M L KING BLVD #33	PORTLAND	OR	97211
CHANDRA,ANDREAS K TR & SUTANTO,IRENE TR	970 ARGENTA DR	PACHECO	CA	94553
CHANG,MUN SU & SUN YE	7217 SE 82ND AVE	PORTLAND	OR	97266
CHANG,SUN YE & MUN SU	7217 SE 82ND AVE	PORTLAND	OR	97266
CHANNEL INVESTORS LLC	2455 NW MARSHALL ST #4	PORTLAND	OR	97210
CHASE BUILDING LLC	35393 HWY 19	KIMBERLY	OR	97848-6217
CHASE BUILDING LLC	35393 HWY 19	KIMBERLY	OR	97848-6217
CHASE EQUIPMENT LEASING INC	1111 POLARIS PKWY #A3	COLUMBUS	OH	43240
CHASE PACKAGING CORP ATTN KIRKPATRICK,DOUG VP CFO	P O BOX 100	LAKE OSWEGO	OR	97034-0100
CHEMAX DIVISION	808 SW 15TH AVE	PORTLAND	OR	97205-1907
CHEMCENTRAL PACIFIC CORP %UNIVAR USA (PORTLAND,OR) ATTN:	PO BOX 34325	SEATTLE	WA	98124-1325
CHEN,JOHN Z & MELLISA	10212 SE BROOKMORE CT	HAPPY VALLEY	OR	97086-9185
CHERNOUS,OLEKSANDR	7408 NE 131ST AVE	VANCOUVER	WA	98682-4833
CHEVRON USA INC % PROPERTY TAX DEPT	PO BOX 1392	BAKERSFIELD	CA	93302-1392
CHEVRON USA INC % PROPERTY TAX DEPT	PO BOX 1392	BAKERSFIELD	CA	93302-1392
CHEVRON USA INC % PROPERTY TAX DEPT	PO BOX 1392	BAKERSFIELD	CA	93302-1392
CHEVRON USA INC % PROPERTY TAX DEPT	PO BOX 1392	BAKERSFIELD	CA	93302-1392
CHEVRON USA INC % PROPERTY TAX DEPT	PO BOX 1392	BAKERSFIELD	CA	93302-1392
CHEVRON USA INC %RONALD C CAIN PETROLEUM INC	4512 SW KELLY AVE	PORTLAND	OR	97239-4218
CHEVRON USA INC PROPERTY TAX DEPT	PO BOX 1392	BAKERSFIELD	CA	93302-1392
CHIANG,HAI & CHIANG,FEI	2345 SW CEDAR HILLS RD	PORTLAND	OR	97225
CHILTON,STEVE J	1040 NE SOUTH SHORE RD	PORTLAND	OR	97211
CHIN,BOK YEE & CHIN,YAN QIAN	745 N MAIN ST #A	BELLEVUE	ID	83313
CHIN,BOK YEE & CHIN,YAN QIAN	745 N MAIN ST #A	BELLEVUE	ID	83313
CHIPMAN PROPERTIES	1040 MARINA VILLAGE PKWY #10	ALAMEDA	CA	94501
CHOAT,SHERRY	6517 NE EMERSON ST	PORTLAND	OR	97218
CHOI,HYUNG AE TR (CHOI FAMILY TRUST UAD 7/1/14)	13135 NW RIDGETOP ST	PORTLAND	OR	97229
CHOW CHOW PROPERTIES I LLC	12106 SE 35TH AVE	MILWAUKIE	OR	97222
CHRIS & ALICE LLC	5851 N LAGOON AVE	PORTLAND	OR	97217
CHRIS & ALICE LLC	5851 N LAGOON AVE	PORTLAND	OR	97217

CHRISTIE,ROBERT D	3637 NW GORDON ST	PORTLAND	OR	97210-1285
CHU,PETER CL & ANNIE NG	7941 SE 82ND AVE	PORTLAND	OR	97266
CINTAS SALES CORPORATION	6800 CINTAS BLVD	MASON	OH	45040-9151
CINTAS SALES CORPORATION	6800 CINTAS BLVD	MASON	OH	45040-9151
CIT GROUP ATTN: TAX DEPT	650 CIT DR	LIVINGSTON	NJ	7039
CIT GROUP/EQUIPMENT FINANCING	650 CIT DR	VANCOUVER	WA	7039
CIT TECHNOLOGIES CORP	PO BOX 2017	BLOOMFIELD HILLS	MI	48303
CIT TECHNOLOGY FINANCING SERVICE INC	1 CIT DR	LIVINGSTON	NJ	07039-5703
CITY OF PORTLAND	1120 SW 5TH AVE #1204	PORTLAND	OR	97204-1912
CITY OF PORTLAND BUREAU OF ENVIRONMENTAL SERVIC	1120 SW 5TH AVE	PORTLAND	OR	97204
CITY OF PORTLAND(LEASED WARREN PACIFIC CORPORATION % R/M	1120 SW 5TH AVE #800	PORTLAND	OR	97204
CITY ROSE TRADE LLC ATTN ALIA,ABDULLAH ABU	5832 NE M L KING BLVD	PORTLAND	OR	97211-3118
CITYBIKES WORKERS' COOPERATIVE	734 SE ANKENY ST	PORTLAND	OR	97214-1212
CIVIL WORKS/ALCANTAR LLC	5265 SW 153RD AVE	BEAVERTON	OR	97007
CJ INVESTMENT LLC % JEFF KNAPP	PO BOX 11262	ZEPHYR COVE	NV	89448
CLARIZIO,JAMES P	3644 SE FRANKLIN ST	PORTLAND	OR	97202-1831
CLARK,GEORGE G	4300 SW 197TH AVE	ALOHA	OR	97007-2353
CLARK,MERRILL A % OCCUPANT	9000 NE M L KING BLVD SP 038	PORTLAND	OR	97211
CLASS HARBOR ASSOCIATION INC	3939 N MARINE DR	PORTLAND	OR	97217-7765
CLASS HARBOR ASSOCIATION INC	3939 N MARINE DR	PORTLAND	OR	97217-7765
CLASS HARBOR ASSOCIATION INC	3939 N MARINE DR	PORTLAND	OR	97217-7765
CLASSIC METAL POLISHING LLC	PO BOX 20786	PORTLAND	OR	97294
CLAVERACK LLC	505 NE THOMPSON MILL RD	CORBETT	OR	97019
CLAY STREET-4-LLC % MRG	9877 40TH AVE S	SEATTLE	WA	98118
CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489
CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489
CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489
CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489
CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489
CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489
CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489
CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489
CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489

CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489
CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489
CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489
CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489
CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489
CLEAR CHANNEL OUTDOOR INC TAX DEPT	200 E BASSE RD	SAN ANTONIO	TX	78209-4489
CLEAR CREEK DISTILLERY LLC	PO BOX 240	HOOD RIVER	OR	97031
CLEMENS,CHARLES II	4551 NE CRYSTAL LN	PORTLAND	OR	97218
CLOWER,ROBERT R	1768 LAWNRIDGE AVE	SPRINGFIELD	OR	97477-2451
CLYDE/WEST INC	PO BOX 20577	PORTLAND	OR	97294
CMKB PROPERTIES LLC	10100 NE 116TH CIR	VANCOUVER	WA	98662-1581
CMKNB PROPERTIES LLC	10100 NE 116TH CIR	VANCOUVER	WA	98662
CMKNB PROPERTIES LLC	10100 NE 116TH CIR	VANCOUVER	WA	98662
CMS HOMES LLC	10685 SE 42ND AVE	MILWAUKIE	OR	97222
CO,TRUNG & LUC,HOA MY	7215 SE 83RD AVE	PORTLAND	OR	97266-5826
COAST CAR LOADING CO	P O BOX 875	DANA POINT	CA	92629
COATS INVESTMENT CO LLC % ELLEN PECK	1430 COLUMBIA AVE	GLADSTONE	OR	97027
COATS INVESTMENT CO LLC % ELLEN PECK	1430 COLUMBIA AVE	GLADSTONE	OR	97027
COATS INVESTMENT CO LLC % ELLEN PECK	1430 COLUMBIA AVE	GLADSTONE	OR	97027
COCKCROFT,ANTHONY	3525 NE 50TH AVE #205	PORTLAND	OR	97213-1766
COE PROPERTIES L L C	6255 SW SHERIDAN ST	PORTLAND	OR	97225-8106
COE PROPERTIES LLC	6255 SW SHERIDAN ST	PORTLAND	OR	97225
COE PROPERTIES OF OREGON LLC	7070 SW BAYLOR ST	PORTLAND	OR	97223-2531
COE PROPERTIES OF OREGON LLC	7070 SW BAYLOR ST	PORTLAND	OR	97223-2531
COE PROPERTIES OF OREGON LLC	7070 SW BAYLOR ST	PORTLAND	OR	97223-2531
COE PROPERTIES OF OREGON LLC	7070 SW BAYLOR ST	PORTLAND	OR	97223-2531
COE PROPERTIES OF OREGON LLC	7070 SW BAYLOR ST	PORTLAND	OR	97223-2531
COFFEE BEAN INTERNATIONAL INC ATTN FARMER BROS TAX DEPT	PO BOX 77057	FORT WORTH	TX	76177-0057
COFFEE HOLDINGS LLC	340 SE 7TH AVE	PORTLAND	OR	97214
COFFEE HOLDINGS LLC	340 SE 7TH AVE	PORTLAND	OR	97214
COFFEE WAREHOUSE LLC	75 SE YAMHILL ST #201	PORTLAND	OR	97214
COHO CROSSING LLC	823 SE 3RD AVE	PORTLAND	OR	97214
COHO CROSSING LLC	823 SE 3RD AVE	PORTLAND	OR	97214
COLE,GARY N & COLE,DIANE E	13444 E COUNTY RD 720N	CHARLESTON	IL	61920

COLE,HARRISON P	6030 NW 60TH AVE	PORTLAND	OR	97210-3606
COLE,SANDRA(LEASED BY PREMIER GEAR & MACHINE WORKS INC	1700 NW THURMAN ST	PORTLAND	OR	97209-2521
COLELUKIE PROPERTIES LLC	PO BOX 25538	PORTLAND	OR	97298
COLLEGE PROPERTIES LLC	8111 NE HOLMAN ST	PORTLAND	OR	97218
COLON,ALFONSO ENRIQUE /ARC HOUSING LLC PROPERTY TAX DEPT	PO BOX 790830	SAN ANTONIO	TX	76279-0830
COLOR FACTORY LLC	PO BOX 14704	PORTLAND	OR	97293
COLOR MAGIC INC	12470 NE MARX ST	PORTLAND	OR	97230-1053
COLOR MAGIC INC	12470 NE MARX ST	PORTLAND	OR	97230-1053
COLUMBIA ALUMINUM RECYCLING CO	1200 W 13TH ST	VANCOUVER	WA	98660-2716
COLUMBIA ALUMINUM RECYCLING CO	1200 W 13TH ST	VANCOUVER	WA	98660-2716
COLUMBIA AVIATION CLUB	PO BOX 25391	PORTLAND	OR	97225-0391
COLUMBIA BASIN PROPERTIES LLC	16805 NE MASON CT	PORTLAND	OR	97230-4990
COLUMBIA BLVD LLC % SCHAMP,ERIC J	8400 SW FAIRWAY DR	PORTLAND	OR	97225
COLUMBIA BLVD LLC % SCHAMP,ERIC J	8400 SW FAIRWAY DR	PORTLAND	OR	97225
COLUMBIA CL PROPERTIES LLC	PO BOX 20308	PORTLAND	OR	97294-0308
COLUMBIA CL PROPERTIES LLC	PO BOX 20308	PORTLAND	OR	97294-0308
COLUMBIA CL PROPERTIES LLC	PO BOX 20308	PORTLAND	OR	97294-0308
COLUMBIA DEVELOPMENT ENTERPRISES LLC	PO BOX 301369	PORTLAND	OR	97294
COLUMBIA DEVELOPMENT ENTERPRISES LLC	PO BOX 301369	PORTLAND	OR	97294
COLUMBIA DEVELOPMENT INC	3540 MORGAN CREEK WAY	SURREY	BC	V3S 0J7 CA
COLUMBIA EDGEWATER COUNTRY CLU	2220 NE MARINE DR	PORTLAND	OR	97211-1546
COLUMBIA EDGEWATER COUNTRY CLU	2220 NE MARINE DR	PORTLAND	OR	97211-1546
COLUMBIA EXPORT TERMINAL LLC	1300 SW 5TH AVE #2705	PORTLAND	OR	97201
COLUMBIA EXPORT TERMINAL LLC	1300 SW 5TH AVE #2705	PORTLAND	OR	97201
COLUMBIA FINANCIAL SERVICES	PO BOX 1991	CLACKAMAS	OR	97015
COLUMBIA GRAIN INC	1300 SW 5TH AVE #2929	PORTLAND	OR	97201
COLUMBIA HOUSE LLC	16991 MAPLE CIR	LAKE OSWEGO	OR	97034-5631
COLUMBIA INDUSTRIAL PROPERTIES LLC	10203 NE 23RD AVE	VANCOUVER	WA	98686
COLUMBIA KNIT INC % KRYSZEK, JAKOB MNGR	5200 SE HARNEY DR	PORTLAND	OR	97206
COLUMBIA PACIFIC PROPERTIES LL	3108 DOUGLAS CIR	LAKE OSWEGO	OR	97035
COLUMBIA RIVER BASIN INVESTORS LLC %DENNIS BAKER	4613 SE 14TH ST	GRESHAM	OR	97080-6118
COLUMBIA RIVER BASIN INVESTORS LLC %DENNIS BAKER	4613 SE 14TH ST	GRESHAM	OR	97080-6118
COLUMBIA RIVER BASIN INVESTORS LLC %DENNIS BAKER	4613 SE 14TH ST	GRESHAM	OR	97080-6118
COLUMBIA SPORTSWEAR USA CORP	14375 NW SCIENCE PARK DR	PORTLAND	OR	97229

COLUMBIA SPORTSWEAR USA CORP	14375 NW SCIENCE PARK DR	PORTLAND	OR	97229
COLUMBIA SPORTSWEAR USA CORP	14375 NW SCIENCE PARK DR	PORTLAND	OR	97229
COLUMBIA STATION VENTURES LLC %JAMES E O'CONNOR	20975 SW MURPHY LN	BEAVERTON	OR	97078
COLUMBIA STATION VENTURES LLC %JAMES E O'CONNOR	20975 SW MURPHY LN	BEAVERTON	OR	97078
COLUMBIA STEEL CASTING CO INC	P O BOX 83095	PORTLAND	OR	97283-0095
COLUMBIA STEEL CASTING CO INC	P O BOX 83095	PORTLAND	OR	97283-0095
COLUMBIA WATUMULL	307 LEWERS ST #600	HONOLULU	HI	96815-2357
COLUMBIA WAY WEST L L C %GODDARD,JEWEL	PO BOX 5244	PORTLAND	OR	97208
COLUMBIA WAY WEST L L C %GODDARD,JEWEL	PO BOX 5244	PORTLAND	OR	97208
COLUMBIA/80 L L C	PO BOX 2775	TUALATIN	OR	97062
COLWOOD INDUSTRIAL PARK 2 LLC ATTN: WELLS,STEVE	1300 SW 5TH AVE #3050	PORTLAND	OR	97201-5647
COLWOOD INDUSTRIAL PARK LLC	1300 SW 5TH AVE #3050	PORTLAND	OR	97201-5647
COLWOOD INDUSTRIAL PARK LLC % TRAMMELL CROW PORTLAND I	1300 SW 5TH AVE #3050	PORTLAND	OR	97201-5647
COLYEAR DEVELOPMENT CORPORATIO	PO BOX 5425	EL MONTE	CA	91734-1425
COMMERCIAL PROPERTIES NORTHWEST LLC> % FEASEY,BARRY	PO BOX 306	WASHOUGAL	WA	98671
COMPREHENSIVE OPTIONS FOR DRUG ABUSERS INC	1027 E BURNSIDE ST	PORTLAND	OR	97214-1328
CONAX PROPERTIES USA INC	8183 130 ST	SURREY	BC	V3W 7X4 CA
CONCRETE PUMPING HOLDINGS LLC % PGP INVESTORS LLC	10250 CONSTELLATION BLVD #22 LOS ANGELES		CA	90067
CONCRETE PUMPING HOLDINGS LLC % PGP INVESTORS LLC	10250 CONSTELLATION BLVD #22 LOS ANGELES		CA	90067
CONDIT,JEFFREY C & CONDIT,LAURA L E	4642 SW ARNOLD ST	PORTLAND	OR	97219-7224
CONGER NORTHWEST INC	PO BOX 12570	PORTLAND	OR	97212-0570
CONGER NORTHWEST INC	PO BOX 12570	PORTLAND	OR	97212-0570
CONGER NORTHWEST INC	PO BOX 12570	PORTLAND	OR	97212-0570
CONGER NORTHWEST INC	PO BOX 12570	PORTLAND	OR	97212-0570
CONGER NORTHWEST INC	PO BOX 12570	PORTLAND	OR	97212-0570
CONGER NORTHWEST INC	PO BOX 12570	PORTLAND	OR	97212-0570
CONGER NORTHWEST INC	PO BOX 12570	PORTLAND	OR	97212-0570
CONNALLY,CLAY	3501 N MICHIGAN AVE	PORTLAND	OR	97227-1142
CONNOR MANUFACTURING SERVICES	1301 SHOREWAY RD #375	BELMONT	CA	94002-4155
CONREY ELECT INC	1911 SE 7TH AVE	PORTLAND	OR	97214-4601
CONREY ELECTRIC CO INC	1911 SE 7TH AVE	PORTLAND	OR	97214-4601
CONREY ELECTRIC INC	1911 SE 7TH AVE	PORTLAND	OR	97214-4601

CONREY ELECTRIC INC	1911 SE 7TH AVE	PORTLAND	OR	97214-4601
CONREY ELECTRIC INC	1911 SE 7TH AVE	PORTLAND	OR	97214-4601
CONREY ELECTRIC INC	1911 SE 7TH AVE	PORTLAND	OR	97214-4601
CONTAINER CORP OF AMERICA ET A % SCHNITZER INVESTMENT CO	1211 SW 5TH AVE #2250	PORTLAND	OR	97204
CONTAINER MANAGEMENT SERVICES	8435 NE KILLINGSWORTH ST	PORTLAND	OR	97220
CONTAINER MANAGEMENT SERVICES	8435 NE KILLINGSWORTH ST	PORTLAND	OR	97220
CONTAINER MANAGEMENT SERVICES	8435 NE KILLINGSWORTH ST	PORTLAND	OR	97220
CONTAINER RECOVERY INC % FLETCHER,JOHN	3900 NW YEON AVE	PORTLAND	OR	97210
CONTAINER-CARE PORTLAND INC HAYDEN MEADOWS C/O TMT DE\	805 SW BROADWAY #2020	PORTLAND	OR	97205
CONTAINER-CARE PORTLAND INC HAYDEN MEADOWS C/O TMT DE\	805 SW BROADWAY #2020	PORTLAND	OR	97205
CONTAINER-CARE PORTLAND INC HAYDEN MEADOWS C/O TMT DE\	805 SW BROADWAY #2020	PORTLAND	OR	97205
CON-WAY TRANSPORTATION SERVICES INC	PO BOX 4138	PORTLAND	OR	97208
COOKIN,NORMA L & KING,BILLY J	18376 SE STEPHENS ST	PORTLAND	OR	97233
COOPER TRACTOR & EQUIPMENT INC	PO BOX 30117	PORTLAND	OR	97294
COOPER TRACTOR & EQUIPMENT INC	PO BOX 30117	PORTLAND	OR	97294
COOPER TRACTOR & EQUIPMENT INC	PO BOX 30117	PORTLAND	OR	97294
COPART OF WASHINGTON INC	14185 DALLAS PKWY #300	DALLAS	TX	75254
COPART OF WASHINGTON INC	14185 DALLAS PKWY #300	DALLAS	TX	75254
COPELAND BUILDING LLC-70% & 901 NE GLISAN LLC-30%	901 NE GLISAN ST	PORTLAND	OR	97232
COPELAND BUILDING LLC-70% & 901 NE GLISAN LLC-30%	901 NE GLISAN ST	PORTLAND	OR	97232
COPELAND BUILDING LLC-70% & 901 NE GLISAN LLC-30%	901 NE GLISAN ST	PORTLAND	OR	97232
COPHER,RICK TR	35296 S ELLIS RD	MOLALLA	OR	97038
COPPER MOUNTAIN TRUST CORP % QUEST PROPERTY MANAGEME\	1 SW COLUMBIA ST #435	PORTLAND	OR	97258-2036
COPPER MOUNTAIN TRUST CORP % QUEST PROPERTY MANAGEME\	1 SW COLUMBIA ST #435	PORTLAND	OR	97258-2036
COPPER MOUNTAIN TRUST CORP % QUEST PROPERTY MANAGEME\	1 SW COLUMBIA ST #435	PORTLAND	OR	97258-2036
COPPER MOUNTAIN TRUST CORP % QUEST PROPERTY MANAGEME\	1 SW COLUMBIA ST #435	PORTLAND	OR	97258-2036
COPPER MOUNTAIN TRUST CORP % QUEST PROPERTY MANAGEME\	1 SW COLUMBIA ST #435	PORTLAND	OR	97258-2036
COPPER MOUNTAIN TRUST CORP % QUEST PROPERTY MANAGEME\	1 SW COLUMBIA ST #435	PORTLAND	OR	97258-2036
COPPERWELD CORPORATION ATTN CFO	FOUR GATEWAY CTR	PITTSBURGH	PA	15222
COR LLC	PO BOX 30178	PORTLAND	OR	97294
CORDIEL,RUDOLFO J & QUEVEDO,YOLANDA CORDIEL	9000 NE M L KING BLVD SP 34	PORTLAND	OR	97211
CORNELL,STEPHEN R	2122 NE 95TH PL	PORTLAND	OR	97220-4321

CORONA, MICHELLE LYNETTE	9000 NE M L KING BLVD SP 058	PORTLAND	OR	97211-1375
CORVEL LLC % GARBARINO,TOM	101 E 8TH ST #210	VANCOUVER	WA	98660
COSTCO WHOLESALE CORP PROPERTY TAX DEPT 002	999 LAKE DR	ISSAQUAH	WA	98027
COTTON CREEK LLC	5404 NE 112TH AVE	PORTLAND	OR	97220
COURY,ELISE L	2831 NW ST HELENS RD	PORTLAND	OR	97210
COVELLE,JOHN M	P O BOX 16022	PORTLAND	OR	97292-0022
COVELLE,JOHN M	P O BOX 16022	PORTLAND	OR	97292-0022
COX,BRUCE B ET AL	8105 SE 86TH AVE	PORTLAND	OR	97266-6525
CQ LANDLORD (MULTI) LLC % GENERAL PARTS DIST LLC % RYAN LLC	PO BOX 56607	ATLANTA	GA	30343
CQ LANDLORD (MULTI) LLC % GENERAL PARTS DIST LLC % RYAN LLC	PO BOX 56607	ATLANTA	GA	30343
CRAIG,RANDALL W	PO BOX 91633	PORTLAND	OR	97291-0016
CRAINE,BILL	2620 E BURNSIDE ST	PORTLAND	OR	97214
CRANE FLY LLC	PO BOX 2330	SISTERS	OR	97759-2330
CRAUN,STACY L	9916 SE DUKE ST	PORTLAND	OR	97266
CRAWFORD,JEFFREY D & OVERBECK,CHRISTINA M	2121 NW 23RD AVE	PORTLAND	OR	97210-2336
CRB MANUFACTURING INC	9801 SE LAWNFIELD RD	CLACKAMAS	OR	97015-7636
CRED LLC	5515 N CONCORD AVE	PORTLAND	OR	97217
CREITZ,NORMAN A TR	8799 SW BECKER DR	PORTLAND	OR	97223
CREITZ,NORMAN A TR	8799 SW BECKER DR	PORTLAND	OR	97223
CREITZ,NORMAN A TR	8799 SW BECKER DR	PORTLAND	OR	97223
CREITZ,NORMAN A TR	8799 SW BECKER DR	PORTLAND	OR	97223
CREITZ,NORMAN A TR	8799 SW BECKER DR	PORTLAND	OR	97223
CREITZ,NORMAN ALBERT & CREITZ,MARJORIE JOAN	8799 SW BECKER DR	PORTLAND	OR	97223-7220
CRESWICK,RONALD L & CRESWICK,LORA K	15203 NW BURLINGTON CT	PORTLAND	OR	97231-1313
CRIPPS,KENNETH D & BERTHA J	1620 NE ARGLYE DR	PORTLAND	OR	97211
CRISAN,MATT & CRISAN,AURELIA	14614 SE RHINE ST	PORTLAND	OR	97236-2528
CROMIE,WALTER WAYNE	5408 S GROVE RD	SPOKANE	WA	99224
CRONIN,MEDARD H TR (MEDARD CRONIN LIVING TRUST DTD 7/18/	2 POSSUM RIDGE RD	ROLLING HILLS	CA	90274
CRONIN,MEDARD TR (MEDARD CRONIN LIVING TRUST)	2 POSSUM RIDGE RD	ROLLING HILLS	CA	90274
CROSS CREEK GROUP INC	PO BOX 844	SUMMERLAND	CA	93067
CROSS,ERIC TODD CROSS,CHANDA SUE	9000 NE MLK BLVD SP 8	PORTLAND	OR	97211
CROWN BEVERAGE PACKAGING INC ATTN TAX DEPT	1 CROWN WAY	PHILADELPHIA	PA	19154
CROWN BEVERAGE PACKAGING INC ATTN TAX DEPT	1 CROWN WAY	PHILADELPHIA	PA	19154
CRUMLEY,DAIN P TR & CRUMLEY,SYDNEY TR	5215 N EMERSON DR	PORTLAND	OR	97217-4111

CRYOVAC INC	P O BOX 464	DUNCAN	SC	29334
CRYOVAC INC BUILDING B	100 RODGERS BRIDGE RD	DUNCAN	SC	29334
CRYSTAL LANE AUTO SALVAGE INC>	4540 NE CRYSTAL LN	PORTLAND	OR	97218
CRYSTAL LANE AUTO SALVAGE INC>	4540 NE CRYSTAL LN	PORTLAND	OR	97218
CRYSTAL LANE AUTO SALVAGE INC>	4540 NE CRYSTAL LN	PORTLAND	OR	97218
CRYSTAL LANE AUTO SALVAGE INC>	4540 NE CRYSTAL LN	PORTLAND	OR	97218
CRYSTAL LANE LLC	5726 NE 109TH AVE	PORTLAND	OR	97220
CRYSTAL LANE LLC	5726 NE 109TH AVE	PORTLAND	OR	97220
CRYSTAL,ERNEST M-LE & VERNIE,F-LE ET AL	32153 APPLE VALLEY RD	SCAPPOOSE	OR	97056
CS SHAW LLC	3551 NW FRONT AVE	PORTLAND	OR	97210
CTS PROPERTIES LLC	6601 NE KILLINGSWORTH ST	PORTLAND	OR	97218
CULWELL,LYNN RAY	6212 NE KILLINGSWORTH ST	PORTLAND	OR	97218
CUNNINGHAM,ADRIANA	9000 NE M L KING BLVD SP 256	PORTLAND	OR	97211
CURBSTONE ENTERPRISES LLC & ST HILAIRE,WILLIAM J	915 SE 10TH AVE	PORTLAND	OR	97214-2502
CURTIS,MYRON H TR ET AL % SCHRIEVER,CARLENE H	10177 SE POWELL BLVD	PORTLAND	OR	97266-1812
CURTIS,MYRON H TR ET AL % SCHRIEVER,CARLENE H	10177 SE POWELL BLVD	PORTLAND	OR	97266-1812
CURTIS,MYRON H TR ET AL % SCHRIEVER,CARLENE H	10177 SE POWELL BLVD	PORTLAND	OR	97266-1812
CUSTOM STAMPING & MFG CO	PO BOX 14340	PORTLAND	OR	97293-0340
CUSTOM STAMPING & MFG CO	PO BOX 14340	PORTLAND	OR	97293-0340
CUSTOM STAMPING & MFG CO	PO BOX 14340	PORTLAND	OR	97293-0340
CUSTOM STAMPING & MFG CO	PO BOX 14340	PORTLAND	OR	97293-0340
CUSTOM STAMPING & MFG CO	PO BOX 14340	PORTLAND	OR	97293-0340
CUTTER CIRCLE LLC	PO BOX 10067	PORTLAND	OR	97296
CWC REALTY LLC ATTN: OSHAY,FREDERICK J	2855 MILLER ST	SAN LEANDRO	CA	94577
CWIK,LAWRENCE J	PO BOX 5912	PORTLAND	OR	97228-5912
D & H INDUSTRIES LLC	10300 SW GREENBURG RD #540	PORTLAND	OR	97223-5417
D S U-PETERBILT> & GMC TRUCK I	PO BOX 3486	PORTLAND	OR	97208-3486
D S U-PETERBILT> & GMC TRUCK I	P O BOX 3486	PORTLAND	OR	97208-3486
D S U-PETERBILT> & GMC TRUCK I	PO BOX 3486	PORTLAND	OR	97208-3486
D THOMPSON PROPERTIES LLC	750 NE COLUMBIA BLVD	PORTLAND	OR	97211
D THOMPSON PROPERTIES LLC	750 NE COLUMBIA BLVD	PORTLAND	OR	97211
D THOMPSON PROPERTIES LLC	750 NE COLUMBIA BLVD	PORTLAND	OR	97211
D THOMPSON PROPERTIES LLC	750 NE COLUMBIA BLVD	PORTLAND	OR	97211

D THOMPSON PROPERTIES LLC	750 NE COLUMBIA BLVD	PORTLAND	OR	97211
D THOMPSON PROPERTIES LLC	PO BOX 11272	PORTLAND	OR	97211-0272
D THOMPSON PROPERTIES LLC	PO BOX 11272	PORTLAND	OR	97211-0272
D THOMPSON PROPERTIES LLC	750 NE COLUMBIA BLVD	PORTLAND	OR	97211
D THOMPSON PROPERTIES LLC	750 NE COLUMBIA BLVD	PORTLAND	OR	97211
D THOMPSON PROPERTIES LLC	PO BOX 11272	PORTLAND	OR	97211-0272
D THOMPSON PROPERTIES LLC	750 NE COLUMBIA BLVD	PORTLAND	OR	97211
D THOMPSON PROPERTIES LLC	750 NE COLUMBIA BLVD	PORTLAND	OR	97211
D THOMPSON PROPERTIES LLC	PO BOX 11272	PORTLAND	OR	97211-0272
D THOMPSON PROPERTIES LLC C/O TEC EQUIPMENT	750 NE COLUMBIA BLVD	PORTLAND	OR	97211
D W SIVERS CO INC	4730 SW MACADAM AVE #101	PORTLAND	OR	97239-6417
D W SIVERS CO INC	4730 SW MACADAM AVE #101	PORTLAND	OR	97239-6417
D&E PROPERTIES LLC	7625 NE KILLINGSWORTH ST	PORTLAND	OR	97218
DA WEDGE LLC	1980 WILLAMETTE FALLS DR #23(	WEST LINN	OR	97068
DA WEDGE LLC	1697 19TH ST	WEST LINN	OR	97068-4453
DAHLGREN,ROY K & BARBARA K	PO BOX 19032	PORTLAND	OR	97280-0032
DAHLL,JOEL	3850 N MISSISSIPPI AVE #A221	PORTLAND	OR	97227-1378
DAILY JOURNAL OF COMMERCE	222 S 9TH ST #2300	MINNEAPOLIS	MN	55402-3363
DAILY JOURNAL OF COMMERCE INC	921 SW WASHINGTON ST #210	PORTLAND	OR	97205
DAIMLER TRUCKS NORTH AMERICA LLC	PO BOX 3820	PORTLAND	OR	97208-3820
DAIMLER TRUCKS NORTH AMERICA LLC	PO BOX 3820	PORTLAND	OR	97208-3820
DAIMLER TRUCKS NORTH AMERICA LLC ATTN TAX DEPT	4747 N CHANNEL AVE	PORTLAND	OR	97217
DAIMLER TRUCKS NORTH AMERICA LLC ATTN: PROPERTY TAX MAN, PO BOX 3820		PORTLAND	OR	97208
DAIMLER TRUCKS NORTH AMERICA LLC ATTN: PROPERTY TAX MAN, PO BOX 3820		PORTLAND	OR	97208
DAIRY BUILDING LLC	530 OAK GROVE #201	MENLO PARK	CA	94025
DAIRY EXPORT CO (LSD LAND O'LAKE INC % DARIGOLD INC TAX DEP P O BOX 79007		SEATTLE	WA	98119-7907
DAISY PROPERTIES LLC	672 HAZELTINE AVE SE	SALEM	OR	97306
DAJO LLC	1625 SE LAFAYETTE ST	PORTLAND	OR	97202
DALE BRITTON INC	PO BOX 2325	GRESHAM	OR	97030
DALL,PEGGY M & DALL,ANDREW	3525 NE 50TH AVE #310	PORTLAND	OR	97213
DANCO PROPERTIES LLC	13377 VERMEER DR	LAKE OSWEGO	OR	97035
DANKRIS COMPANY	8740 NE EMERSON ST	PORTLAND	OR	97220
DANNER INC	18201 NE PORTAL WAY #101	PORTLAND	OR	97230-5387
DANNER INC ATTN: FINANCE DEPT	17634 NE AIRPORT WAY	PORTLAND	OR	97230

DANNER INC ATTN: FINANCE DEPT	17634 NE AIRPORT WAY	PORTLAND	OR	97230
DANNON COMPANY INC (THE) %TAX DEPT-MARY CARLETON	100 HILLSIDE AVE	WHITE PLAINS	NY	10603
DANNON COMPANY INC (THE) %TAX DEPT-MARY CARLETON	100 HILLSIDE AVE	WHITE PLAINS	NY	10603
DANNON COMPANY INC (THE) %TAX DEPT-MARY CARLETON	100 HILLSIDE AVE	WHITE PLAINS	NY	10603
DANNON COMPANY INC (THE) %TAX DEPT-MARY CARLETON	100 HILLSIDE AVE	WHITE PLAINS	NY	10603
DARIGOLD INC	PO BOX 34377	SEATTLE	WA	98124-1377
DARIGOLD INC ATTN STENGL,PHYLLIS TAX DEPARTMENT	P O BOX 34377	SEATTLE	WA	98124
DARIGOLD INC ATTN STENGL,PHYLLIS TAX DEPARTMENT	P O BOX 34377	SEATTLE	WA	98124
DARIGOLD INC ATTN STENGL,PHYLLIS TAX DEPARTMENT	P O BOX 34377	SEATTLE	WA	98124
DARIGOLD INC ATTN STENGL,PHYLLIS TAX DEPARTMENT	P O BOX 34377	SEATTLE	WA	98124
DARLING INTERNATIONAL INC	251 OCONNOR RIDGE STE 370	IRVING	TX	75038-6525
DARROW,KIRSTEN & DARROW,DUANE	2838 SE 15TH AVE	PORTLAND	OR	97202
DASH MULTI-CORP INC	2500 ADIE RD	MARYLAND HEIGHTS	MO	63043
DASH MULTI-CORP INC	2500 ADIE RD	MARYLAND HEIGHTS	MO	63043
DATA SYSTEMS INC	975 SE SANDY BLVD	PORTLAND	OR	97214-1300
DATA SYSTEMS INC	975 SE SANDY BLVD	PORTLAND	OR	97214-1300
DATA SYSTEMS INC	975 SE SANDY BLVD	PORTLAND	OR	97214-1300
DATA SYSTEMS INC	975 SE SANDY BLVD	PORTLAND	OR	97214
DAUS,MAXWELL L & HAGEN,KENNETH N % EVERGREEN MACHINE V	7525 NE 33RD DR	PORTLAND	OR	97211
DAUS,MAXWELL L & HAGEN,KENNETH N % EVERGREEN MACHINE V	7525 NE 33RD DR	PORTLAND	OR	97211
DAVIE,RAYMOND & BYLLEE % FOX RUN MH COMMUNITY	9000 NE M L KING BLVD SP97	PORTLAND	OR	97211
DAVIES,BRUCE E	11142 NW ST HELENS RD	PORTLAND	OR	97231-1044
DAVIS INVESTMENTS LLC %PODIUM PROPERTIES	4328 VERANO DR	AUSTIN	TX	78735-5410
DAVIS INVESTMENTS LLC %PODIUM PROPERTIES	4328 VERANO DR	AUSTIN	TX	78735-5410
DAVIS INVESTMENTS LLC %PODIUM PROPERTIES	4328 VERANO DR	AUSTIN	TX	78735-5410
DAVIS,LYNN C & DAVIS,SHARON E	2236 NW NICOLAI ST	PORTLAND	OR	97210-1809
DAYNE,JEFFREY H & PAULLA E	6901 SW 8TH AVE	PORTLAND	OR	97219-2165
DB & EB LLC	2515 NW 28TH AVE	PORTLAND	OR	97210
DD&M ACQUISITION CO LLC % MORGAN DISTRIBUTING INC	15125 S LAKE RIDGE WAY	OREGON CITY	OR	97045-8025
DDP COURIER SERVICE LLC ATTN: AN,WEI	6215 NE 92ND DR	PORTLAND	OR	97220
DDP COURIER SERVICE LLC ATTN: AN,WEI	6215 NE 92ND DR	PORTLAND	OR	97220
DDP COURIER SERVICE LLC ATTN: AN,WEI	6215 NE 92ND DR	PORTLAND	OR	97220
DDS PARTNERS LLC	P O BOX 13100	PORTLAND	OR	97213
DE LA ROSA,MIGUEL	PO BOX 86302	PORTLAND	OR	97286-0302

DE WOLF PROPERTIES RANDOLPH LLC	2303 N RANDOLPH AVE	PORTLAND	OR	97227
DEARBORN,DAVID	225 SE 16TH AVE	PORTLAND	OR	97214
DEARBORN,DAVID S	225 SE 16TH AVE	PORTLAND	OR	97214
DEH LLC	20575 SE HIGH RIDGE CT	DAMASCUS	OR	97089
DEH LLC	20575 SE HIGH RIDGE CT	DAMASCUS	OR	97089-8293
DEH LLC	20575 SE HIGH RIDGE CT	DAMASCUS	OR	97089-8293
DEHART,BUSTER R % ABRAHAM,JOHN % INTEGRITY HOMES	13807 SE MCLOUGHLIN BLVD #41	MILWAUKIE	OR	97222
DEHEN/ARTAIZ LLC-2/3 & HILDE INVESTMENTS LLC-1/3	1040 NE 44TH AVE #3	PORTLAND	OR	97213
DEL MONTE FRESH PRODUCE NA INC % TAX DEPT	PO BOX 149222	CORAL GABLES	FL	33114
DEL MONTE FRESH PRODUCE NA INC % TAX DEPT	P O BOX 149222	CORAL GABLES	FL	33114-9222
DEL MONTE FRESH PRODUCE NA INC % TAX DEPT	P O BOX 149222	CORAL GABLES	FL	33114-9222
DELAVAN,DEAN & DELAVAN,MARCIA	985 SW LONG FARM RD	WEST LINN	OR	97068
DELONG,STEPHEN	3606 NE 51ST AVE	PORTLAND	OR	97213
DELTA INN INC	9930 N WHITAKER RD	PORTLAND	OR	97217
DELTA INN INC	9930 N WHITAKER RD	PORTLAND	OR	97217
DELTA INN INC	9930 N WHITAKER RD	PORTLAND	OR	97217
DELUXE FUEL OIL INC	1013 NE 62ND AVE	PORTLAND	OR	97213
DEMAS,CHRISTINA TR	4408 SW DICKINSON ST #51	PORTLAND	OR	97219-7457
DEMAS,GEORGE J	PO BOX 969	OREGON CITY	OR	97045
DEMAS,GEORGE J & DEMAS,GAYLE M	PO BOX 969	OREGON CITY	OR	97045
DENKEWALTER,CHRISTINE	3806 SE 21ST AVE	PORTLAND	OR	97202
DENNIS,LARRY	2546 NE 45TH AVE	PORTLAND	OR	97213
DENNIS,LARRY	2546 NE 45TH AVE	PORTLAND	OR	97213
DEPARTMENT OF TRANSPORTATION ATTN: RIGHT OF WAY SECTION 4040 FAIRVIEW INDUSTRIAL DR SI SALEM			OR	97302
DEPARTMENT OF TRANSPORTATION ATTN: RIGHT OF WAY SECTION 4040 FAIRVIEW INDUSTRIAL DR SI SALEM			OR	97302
DEPARTMENT OF TRANSPORTATION ATTN: RIGHT OF WAY SECTION 4040 FAIRVIEW INDUSTRIAL DR SI SALEM			OR	97302
DEPPA,VELMA	7407 SE 20TH AVE	PORTLAND	OR	97202-6213
DEPPA,VELMA	7407 SE 20TH AVE	PORTLAND	OR	97202
DEPPA,VELMA	7407 SE 20TH AVE	PORTLAND	OR	97202
DEPPA,VELMA M	7407 SE 20TH AVE	PORTLAND	OR	97202
DEPPA,VELMA M	7407 SE 20TH AVE	PORTLAND	OR	97202-6213
DEPT OF TRANSPORTATION	4040 FAIRVIEW IND DR SE MS#2	SALEM	OR	97302-1142
DEPT OF TRANSPORTATION	4040 FAIRVIEW IND DR SE MS#2	SALEM	OR	97302-1142
DEPT OF TRANSPORTATION(LEASED BIG SPACE LLC ATTN PROP MGI	4040 FAIRVIEW IND DR SE MS#2	SALEM	OR	97302-1142

DEPT OF TRANSPORTATION(LEASED BIG SPACE LLC ATTN PROP MGI	4040 FAIRVIEW IND DR SE MS#2	SALEM	OR	97302-1142
DEPT OF TRANSPORTATION(LEASED EASTBANK COMMERCE CENTEI	4040 FAIRVIEW INDUSTRIAL DR N	SALEM	OR	97302-1142
DERMER & ERNST INVESTMENTS LLC	2945 NE 17TH AVE	PORTLAND	OR	97212-3351
DESHAW HOLDINGS LLC	805 SW BROADWAY #2540	PORTLAND	OR	97205
DETZ,TERRANCE P ET AL % PERROTT,CHRISTINE	1617 NE GERTZ RD	PORTLAND	OR	97211-1515
DETZ,TERRANCE P ET AL % PERROTT,CHRISTINE	1617 NE GERTZ RD	PORTLAND	OR	97211-1515
DETZ,TERRANCE P ET AL % PERROTT,CHRISTINE	1617 NE GERTZ RD	PORTLAND	OR	97211-1515
DEUCHAR,PATRICK A & DEUCHAR,KAREN L	11013 SE VALLEY VIEW TER	HAPPY VALLEY	OR	97086-9713
DEUTSCHE BANK NATIONAL TRUST CO TR	3815 S WEST TEMPLE	SALT LAKE CITY	UT	84115
DEVEREAUX,RICHARD H TR	3941 PARK DR #20326	EL DORADO HILLS	CA	95762
DEVLIN,GARY LEE	485 N 13TH ST	ST HELENS	OR	97051
DFA LLC	1401 MINERAL AVE	LAS VEGAS	NV	89106-4342
DGI PORTLAND LLC % DERMODY PROPERTIES	5500 EQUITY AVE	RENO	NV	89502
DGI PORTLAND LLC % DERMODY PROPERTIES	5500 EQUITY AVE	RENO	NV	89502
DHSF HOLDINGS LLC	2407 SE 10TH AVE	PORTLAND	OR	97214
DIAMOND BEALL DEVELOPMENT LLC	11840 SE SOLOMON CT	PORTLAND	OR	97266
DIBENEDETTO,ANTHONY J & DIBENEDETTO,SUSAN R-1/2 & DIBENEI	1015 SE MARKET ST	PORTLAND	OR	97214
DICK PETERS PROPERTY LLC %P & V MACHINE WORKS LLC	3345 SE 22ND AVE	PORTLAND	OR	97202
DICK PETERS PROPERTY LLC %P & V MACHINE WORKS LLC	3345 SE 22ND AVE	PORTLAND	OR	97202
DICK PETERS PROPERTY LLC %P & V MACHINE WORKS LLC	3345 SE 22ND AVE	PORTLAND	OR	97202
DIEMER,JOE & DIEMER,JAMIESON	3850 SE 21ST AVE	PORTLAND	OR	97202-2949
DIERINGER,KEITH	7315 SE 152ND AVE	PORTLAND	OR	97236-4859
DIESEL CAST WEST INC	8100 NE 14TH PL	PORTLAND	OR	97211
DIESEL CAST WEST INC	8100 NE 14TH PL	PORTLAND	OR	97211
DIESEL CAST WEST INC ATTN: JORJI MCELLRATH	8100 NE 14TH PL	PORTLAND	OR	97218
DINNEEN,KEVIN M	9000 NE M L KING BLVD SP 230	PORTLAND	OR	97211
DISTILLERY BUILDING 900 SE SALMON LLC	900 SE SALMON ST	PORTLAND	OR	97214
DISTILLERY BUILDING 900 SE SALMON LLC	900 SE SALMON ST	PORTLAND	OR	97214
DISTRIBUTION FUNDING II INC %PROLOGIS TAX COORDINATOR	4545 AIRPORT WAY	DENVER	CO	80239
DISTRIBUTION FUNDING III INC %PROLOGIS TAX COORDINATOR	4545 AIRPORT WAY	DENVER	CO	80239
DITTRICH,DANNY FRANK	36 NE 83RD AVE	PORTLAND	OR	97220-6010
DIVISION PLACE PROPERTIES LLC	6140 SW MACADAM AVE	PORTLAND	OR	97239-3648
DIX,ELLA L TR-1/2 & DIX,ELLA L TR-1/2	1545 SE 223RD AVE #254	GRESHAM	OR	97030-2547
DK WEST SIDE L L C	1834 SE 8TH AVE	PORTLAND	OR	97214

DK WEST SIDE L L C	1834 SE 8TH AVE	PORTLAND	OR	97214
DK WEST SIDE L L C	1834 SE 8TH AVE	PORTLAND	OR	97214
DK WEST SIDE L L C	1834 SE 8TH AVE	PORTLAND	OR	97214
DMFK PROPERTIES LLC % LANE REALTY WORKS	143 NE 6TH AVE	PORTLAND	OR	97232
DNP CO LLC	PO BOX 99	CASCADE LOCKS	OR	97014
DOAN,TUYET PHUONG THI	8125 SE LAMBERT ST	PORTLAND	OR	97206
DOLAN AND COMPANY LLC	1919 NW 19TH AVE	PORTLAND	OR	97209
DOLAN AND COMPANY LLC % DOLAN,FLORENCE T	4523 NE DAVIS ST	PORTLAND	OR	97213
DOLAN AND COMPANY LLC % DOLAN,FLORENCE T	4523 NE DAVIS ST	PORTLAND	OR	97213
DOLAN AND COMPANY LLC % DOLAN,FLORENCE T	4523 NE DAVIS ST	PORTLAND	OR	97213
DOLPHIN STREET PROP LLC	5565 N DOLPHIN ST	PORTLAND	OR	97217
DOMINGUEZ,DONALD A & DOMINGUEZ,WENDY B	2801 SE 14TH AVE	PORTLAND	OR	97202
DOMINIUM INC % BERG,GWEN I	226 SW KINGSTON AVE	PORTLAND	OR	97205
DONNER OREGON LLC	2067 SEABROOK CT	REDWOOD CITY	CA	94065
DONNER OREGON LLC	2067 SEABROOK CT	REDWOOD CITY	CA	94065
DONOHUE,NORMAND A & DONOHUE,PATRICIA A	5604 NW 56TH AVE	PORTLAND	OR	97210
DOONEY PROPERTIES LLC	2223 NE 31ST AVE	PORTLAND	OR	97212
DOONEY PROPERTIES LLC	2223 NE 31ST AVE	PORTLAND	OR	97212
DORR,KENNETH D % MILLER,HENRY R & HILARIE	4010 NE BUFFALO ST	PORTLAND	OR	97211-2112
DORSETT,ERNEST L & MARLENE	9841 SW KIMBERLY DR	TIGARD	OR	97224
DOTTED LINE INVESTMENTS LLC	4030 NE BUFFALO ST	PORTLAND	OR	97211
DOTTED LINE INVESTMENTS LLC	4030 NE BUFFALO ST	PORTLAND	OR	97211
DOTTED LINE INVESTMENTS LLC	4030 NE BUFFALO ST	PORTLAND	OR	97211
DOTTED LINE INVESTMENTS LLC	4030 NE BUFFALO ST	PORTLAND	OR	97211
DOTTED LINE INVESTMENTS LLC	4030 NE BUFFALO ST	PORTLAND	OR	97211
DOTTED LINE INVESTMENTS LLC	4030 NE BUFFALO ST	PORTLAND	OR	97211
DOUBLE "O" REAL ESTATE HOLDINGS LLC	12735 NW SKYLINE BLVD	PORTLAND	OR	97231-2414
DOUBLE "O" REAL ESTATE HOLDINGS LLC	12735 NW SKYLINE BLVD	PORTLAND	OR	97231-2414
DOUBLE G L L C	4040 GLEN TER	WEST LINN	OR	97068
DOVER LANE LLC	4721 N WILLAMETTE BLVD	PORTLAND	OR	97203-4767
DOVER LANE LLC	4721 N WILLAMETTE BLVD	PORTLAND	OR	97203-4767
DOVER LANE LLC	4721 N WILLAMETTE BLVD	PORTLAND	OR	97203-4767
DOVYDENAS WINE LLC	1410 SE CLINTON ST	PORTLAND	OR	97202
DOWNEY,RONALD	4637 SE 27TH AVE	PORTLAND	OR	97202

DOWNTOWN RECYCLING LLC	P O BOX 12106	PORTLAND	OR	97212
DOYLE,RONI M	6910A NE 63RD AVE	PORTLAND	OR	97218
DOYLE,RONI M	6910A NE 63RD AVE	PORTLAND	OR	97218-2758
DPF OR I LC-185 LLC % DERMODY ACQUISITION CO LLC	5500 EQUITY AVE	RENO	NV	89502-2343
DPF OR I LC-185 LLC % DERMODY ACQUISITION CO LLC	5500 EQUITY AVE	RENO	NV	89502-2343
DPM LLC % MC NEEL,DARRELL	11401 NE MARX ST	PORTLAND	OR	97220-1041
DRAKOS PROPERTIES LLC-1/2 & ARROW MACHINE WORKS INC-1/2	2340 NW 29TH AVE	PORTLAND	OR	97210
DRAKOS PROPERTIES LLC-1/2 & ARROW MACHINE WORKS INC-1/2	2340 NW 29TH AVE	PORTLAND	OR	97210
DRANSFELDT,STEVE C-1/2 & DRANSFELDT,ERIC-1/2	PO BOX 963	LAKE OSWEGO	OR	97034-0106
DRIVER,JILL DEE /DRIVER,HUGH T % DOWNEY ENTERPRISES	974 NW MAHOGANY LN	PORTLAND	OR	98383
DRL PROPERTIES LLC	2925 SW HARTLEY DR	GRESHAM	OR	97080-6376
DRL PROPERTIES LLC	2925 SW HARTLEY DR	GRESHAM	OR	97080-6376
DRL PROPERTIES LLC	2925 SW HARTLEY DR	GRESHAM	OR	97080-6376
DRL PROPERTIES LLC	2925 SW HARTLEY DR	GRESHAM	OR	97080-6376
DSD INVESTMENT PROPERTIES LLC %BILL DERVILLE	930 NW 170TH PL	BEAVERTON	OR	97006
DSI INC	975 SE SANDY BLVD	PORTLAND	OR	97214
DSM HOLDINGS LLC ATTN METZ,DOUG	4858 L ST	WASHOUGAL	WA	98671-8636
DSM HOLDINGS LLC ATTN METZ,DOUG	4858 L ST	WASHOUGAL	WA	98671-8636
DSM HOLDINGS LLC ATTN METZ,DOUG	4858 L ST	WASHOUGAL	WA	98671-8636
DSM HOLDINGS LLC ATTN METZ,DOUG	4858 L ST	WASHOUGAL	WA	98671-8636
DSM HOLDINGS LLC ATTN METZ,DOUG	4858 L ST	WASHOUGAL	WA	98671-8636
DSRA LLC %BANY,DAVID C TR & BANY,SARAH A TR	9740 SW HILLMAN CT #200	WILSONVILLE	OR	97070-7710
DTC LLC ATTN ANTONSEN,CHET	62765 POWELL BUTTE HWY	BEND	OR	97701-8010
DUERDEN,RAOUL S ET AL % HARRIS,MARTHA A TR	2822 NE ALAMEDA ST	PORTLAND	OR	97212-1620
DUFFY & KINNE INC	2770 NW INDUSTRIAL ST	PORTLAND	OR	97210
DULIEN,FREDERICK M TR & DIAMOND,JOSEF TR % DULIEN,ANN TRU 2501 GRAVEL DR		FORT WORTH	TX	76118
DUNKIN,THOMAS M II %ACCOUNTS PAYABLE DUNKIN & BUSH,INC. PO BOX 97080		KIRKLAND	WA	98083
DUNN FAMILY LIMITED PARTNERSHIP>	P O BOX 25045	PORTLAND	OR	97225
DUNNINGTON,RALPH	9023 N GILBERT PL	PORTLAND	OR	97203-6221
DURKHEIMER,JOHN-15.37% & OREGON WORSTED COMPANY-70% ; PO BOX 82098		PORTLAND	OR	97282-0098
DURKHEIMER,JOHN-15.37% & OREGON WORSTED COMPANY-70% ; PO BOX 82098		PORTLAND	OR	97282-0098
DURKHEIMER,JOHN-15.37% & OREGON WORSTED COMPANY-70% ; PO BOX 82098		PORTLAND	OR	97282-0098
DUTTON FAMILY LLC	15040 NE MASON ST	PORTLAND	OR	97230-4356
DUTTON FAMILY LLC	15040 NE MASON ST	PORTLAND	OR	97230-4356

DUTTON LEASING COMPANY	15040 NE MASON ST	PORTLAND	OR	97230
DW INDUSTRIAL PROPERTIES LLC	4401 SE JOHNSON CREEK BLVD	PORTLAND	OR	97222-9218
DW INDUSTRIAL PROPERTIES LLC	4401 SE JOHNSON CREEK BLVD	PORTLAND	OR	97222-9218
DW INDUSTRIAL PROPERTIES LLC	4401 SE JOHNSON CREEK BLVD	PORTLAND	OR	97222-9218
DW INDUSTRIAL PROPERTIES LLC	4401 SE JOHNSON CREEK BLVD	PORTLAND	OR	97222-9218
DWW/MCW PARTNERS LTD ET AL % ZIMMERMAN,JAMES D	4145 E LIVE OAK AVE	ARCADIA	CA	91006-5828
DYCK,JOHN P TR & DYCK,VIVIAN E TR	415 SE 177TH AVE #314	VANCOUVER	WA	98683
DYMOND,MICHAEL	9527 NE 3RD DR	PORTLAND	OR	97211-1261
DYMOND,MICHAEL	9527 NE 3RD DR	PORTLAND	OR	97211-1261
DZIUBA,JEAN PMB 427	465 NE 181ST AVE	PORTLAND	OR	97230-6660
EAGLE WAREHOUSE TO HELMUT SUCHER ET AL % PORTLAND PATTI	2305 NW 30TH AVE	PORTLAND	OR	97210-2011
EARLE M JORGENSEN COMPANY % JOHNSON,WILLIAM S CFO/VP	PO BOX 801707	DALLAS	TX	75380
EAST BANK STORAGE LLC	14855 SE 82ND DR	CLACKAMAS	OR	97015-7624
EAST BANK STORAGE LLC	14855 SE 82ND DR	CLACKAMAS	OR	97015-7624
EAST SIDE PLATING INC	8400 SE 26TH PL	PORTLAND	OR	97202
EAST SIDE PLATING INC	8400 SE 26TH PL	PORTLAND	OR	97202
EAST SIDE PLATING INC	8400 SE 26TH PL	PORTLAND	OR	97202
EAST SIDE PLATING INC	8400 SE 26TH PL	PORTLAND	OR	97202
EAST SIDE PLATING INC	8400 SE 26TH PL	PORTLAND	OR	97202
EAST SIDE PLATING INC	8400 SE 26TH PL	PORTLAND	OR	97202
EAST SIDE PLATING INC	8400 SE 26TH PL	PORTLAND	OR	97202
EAST SIDE PLATING INC	8400 SE 26TH PL	PORTLAND	OR	97202-0946
EASTBANK COMMERCE CENTER LLC % MALSIN,BRADLEY	75 SE YAMHILL ST #201	PORTLAND	OR	97214
EASTERN WESTERN CORP	PO BOX 3228	PORTLAND	OR	97208
EASTERN WESTERN CORP	PO BOX 3228	PORTLAND	OR	97208
EASTERN WESTERN CORP	PO BOX 3228	PORTLAND	OR	97208
EASTERN WESTERN CORP	PO BOX 3228	PORTLAND	OR	97208
EASTERN WESTERN CORP	PO BOX 3228	PORTLAND	OR	97208
EASTERN WESTERN CORP	PO BOX 3228	PORTLAND	OR	97208
EASTERN WESTERN CORP	PO BOX 3228	PORTLAND	OR	97208
EASTMAN,WILLIAM A	4604 SE BOISE ST	PORTLAND	OR	97206

EASTSIDE BUSINESS CENTER LLC %BRUUN,KELLY	3611 SE 20TH AVE #400	PORTLAND	OR	97202
EBF OF OREGON INC % ARNOLD,BRIAN L	P O BOX 1207	RICHMOND	TX	77406-1207
EBONY PROPERTIES LLC	2401 NW 22ND AVE	PORTLAND	OR	97210-2117
EBONY PROPERTIES LLC	2401 NW 22ND AVE	PORTLAND	OR	97210-2117
EC REAL ESTATE CO	2121 NW THURMAN ST	PORTLAND	OR	97210-2517
EC REAL ESTATE CO	2121 NW THURMAN ST	PORTLAND	OR	97210-2517
EC REAL ESTATE CO	2121 NW THURMAN ST	PORTLAND	OR	97210-2517
ECKERT,FRED J & ECKERT,LA VON J	1804 SE CASCADE AVE	VANCOUVER	WA	98683-6448
ECKERT,FRED J & LAVON	PO BOX 83807	PORTLAND	OR	97283
ECO SERVICES OPERATIONS CORP % PQ CORP ATTN: TREASURER	300 LINDENWOOD DR	MALVERN	PA	19555
ECO SERVICES OPERATIONS CORP % PQ CORP ATTN: TREASURER	300 LINDENWOOD DR	MALVERN	PA	19555
ECO SERVICES OPERATIONS CORP % PQ CORP ATTN: TREASURER	300 LINDENWOOD DR	MALVERN	PA	19555
ECO SERVICES OPERATIONS CORP % PQ CORP ATTN: TREASURER	300 LINDENWOOD DR	MALVERN	PA	19555
EDERER PROPERTIES II	601 UNION ST #3010	SEATTLE	WA	98101
EDERER PROPERTIES II	601 UNION ST #3010	SEATTLE	WA	98101
EDERER PROPERTIES II	601 UNION ST #3010	SEATTLE	WA	98101
EDGE INVESTMENT LLC	PO BOX 66634	PORTLAND	OR	97290-6634
EDMAR INC	8430 SE 45TH PL	PORTLAND	OR	97222
EDMAR INC	8430 SE 45TH PL	PORTLAND	OR	97222
EDMAR INC	7538 SE 29TH AVE	PORTLAND	OR	97202-8827
EDWARDS,JERRY A	12307 NE 56TH ST	VANCOUVER	WA	98682
EDY MORTON & EDY LLC	P O BOX 8	WEST LINN	OR	97068
EFEM CO % FRED MEYER TAX DEPT NICKEL & COMPANY LLC	1014 VINE ST 7TH FLOOR	CINCINNATI	OH	45202
EIDE,LEONARD EST OF	PO BOX 56301	PORTLAND	OR	97238-6301
EIDE,LEONARD EST OF	PO BOX 56301	PORTLAND	OR	97238-6301
EKSTROM PROPERTIES LLC	2630 NW ST HELENS RD	PORTLAND	OR	97210
ELECTRICAL DISTRIBUTING INC	PO BOX 2720	PORTLAND	OR	97208-2720
ELECTRICAL WORKERS LOCAL 48 BUILDING ASSOCIATION INC>	15937 NE AIRPORT WAY	PORTLAND	OR	97230
ELECTRICAL WORKERS LOCAL 48 BUILDING ASSOCIATION INC>	15937 NE AIRPORT WAY	PORTLAND	OR	97230
ELECTRO-CHEM METAL FINISHING I	4849 SE 26TH AVE	PORTLAND	OR	97202-4601
ELECTRO-CHEM METAL FINISHING I	4849 SE 26TH AVE	PORTLAND	OR	97202-4601
ELECTRO-CHEM METAL FINISHING I	4849 SE 26TH AVE	PORTLAND	OR	97202-4601
ELECTRO-CHEM METAL FINISHING I	4849 SE 26TH AVE	PORTLAND	OR	97202-4601
ELEMENTS PROPERTIES LLC	1979 NW VAUGHN ST	PORTLAND	OR	97209

ELKINS RV & BOAT STORAGE LLC	10025 E BURNSIDE ST	PORTLAND	OR	97216-2333
ELKINS,RAYMOND E III	11700 SE SOLOMON CT	HAPPY VALLEY	OR	97086
ELKINS,RAYMOND E III	11700 SE SOLOMON CT	HAPPY VALLEY	OR	97086
ELLETT,LEROY	1630 NE GERTZ RD	PORTLAND	OR	97211
ELLETT,LEROY	1630 NE GERTZ RD	PORTLAND	OR	97211
ELLETT,LEROY E	1630 NE GERTZ RD	PORTLAND	OR	97211-1516
ELLETT,LEROY E	1630 NE GERTZ RD	PORTLAND	OR	97211
ELLETT,LEROY E	1630 NE GERTZ RD	PORTLAND	OR	97211-1516
ELLETT,LEROY E	1630 NE GERTZ RD	PORTLAND	OR	97211-1516
ELLETT,LEROY E-1/2 & ELLETT,CALVIN L-1/2	1630 NE GERTZ RD	PORTLAND	OR	97211
ELLETT,LEROY E-1/2 & ELLETT,CALVIN L-1/2	1630 NE GERTZ RD	PORTLAND	OR	97211
ELLETT,LEROY E-1/2 & ELLETT,CALVIN L-1/2	1630 NE GERTZ RD	PORTLAND	OR	97211
ELLETT,LEROY E-1/2 & ELLETT,CALVIN L-1/2	1630 NE GERTZ RD	PORTLAND	OR	97211
ELLINGSON BROTHERS LLC	2925 70TH AVE E	FIFE	WA	98424
ELLINGSON BROTHERS LLC	2925 70TH AVE E	FIFE	WA	98424
ELLIOTT,VIVICA L	1722 N GOING CT	PORTLAND	OR	97217
ELLIS,GLEN	1511 SE HOLGATE BLVD	PORTLAND	OR	97202
ELLIS,GLEN M	1511 SE HOLGATE BLVD	PORTLAND	OR	97202
ELLIS,GLEN M	1511 SE HOLGATE BLVD	PORTLAND	OR	97202
ELLIS,GLEN M	1511 SE HOLGATE BLVD	PORTLAND	OR	97202
ELLMAKER,KARIN TR ET AL %DOUG BEAN & ASSOCIATES INC.	1650 NW NAITO PKWY #302	PORTLAND	OR	97209
ELLMAKER,KARIN TR ET AL %DOUG BEAN & ASSOCIATES INC.	1650 NW NAITO PKWY #302	PORTLAND	OR	97209
ELM REALTY PARTNERS ATTN AMY WILLIAMS	6840 N CUTTER CIR	PORTLAND	OR	97217
ELO LLC % ELORRIAGA, STEVE	7150 SW RENEE DR	PORTLAND	OR	97225-3258
EMBERLIN,WILLIAM P TR & EMBERLIN,DONNA T TR-50% & EMBERL 4630 SE 26TH AVE		PORTLAND	OR	97202-4743
EMBERLIN,WILLIAM P TR & EMBERLIN,DONNA T TR-75% & EMBERL 4630 SE 26TH AVE		PORTLAND	OR	97202-4743
EMERALD OUTDOOR ADVERTISING LLC	PO BOX 14686	SPOKANE	WA	99214-0686
EMERALD OUTDOOR ADVERTISING LLC	PO BOX 14686	SPOKANE	WA	99214-0686
EMERSON HARDWOOD CO	2279 NW FRONT AVE	PORTLAND	OR	97209-1820
EMERSON HARDWOOD CO	2279 NW FRONT AVE	PORTLAND	OR	97210
EMERSON HARDWOOD CO	2279 NW FRONT AVE	PORTLAND	OR	97209-1820
EMERSON HARDWOOD CO	2279 NW FRONT AVE	PORTLAND	OR	97210

EMERSON HARDWOOD CO INC	2279 NW FRONT AVE	PORTLAND	OR	97209
EM-PAAK PROPERTIES LLC	4143 RIDER TRAIL NORTH	EARTH CITY	MO	63045
EMPIRE RUBBER & SUPPLY CO ATTN: HUTCHINSON,EDWARD J	PO BOX 14950	PORTLAND	OR	97293
ENBERG,STEWART C TR & ENBERG,PAMELA Y TR	2809 SE 16TH AVE	PORTLAND	OR	97202
ENCHANTING EVERLAND LLC	21820 84TH AVE S	KENT	WA	98032-1959
ENGINEERED PRODUCTS INC ATTN DAN CHRISTIANSEN	8040 NE 33RD DR	PORTLAND	OR	97211-2016
ENGLUND LLC ATTN ENGLUND,JON A	PO BOX 296	ASTORIA	OR	97103-0296
ENTERCOM PORTLAND LLC % ENTERCOM COMMUNICATIONS	0700 SW BANCROFT ST	PORTLAND	OR	97239
EQUILON ENTERPRISES LLC %TAX DEPT - PROPERTY	PO BOX 4369	HOUSTON	TX	77210-4369
EQUILON ENTERPRISES LLC %TAX DEPT - PROPERTY	PO BOX 4369	HOUSTON	TX	77210-4369
EQUILON ENTERPRISES LLC %TAX DEPT - PROPERTY	PO BOX 4369	HOUSTON	TX	77210-4369
EQUILON ENTERPRISES LLC %TAX DEPT - PROPERTY	PO BOX 4369	HOUSTON	TX	77210-4369
EQUILON ENTERPRISES LLC %TAX DEPT - PROPERTY	PO BOX 4369	HOUSTON	TX	77210-4369
ERICKSON,BRIAN TR & ERICKSON,NAZ TR % FAIRLEY,SCOTT	4856 SHERLOCK WAY	CARMICHAEL	CA	95608
ERICKSON,LEIF H & ERICKSON,BEATRICE L	PO BOX 83166	PORTLAND	OR	97283-0166
ERICKSON,LEIF H & ERICKSON,BEATRICE L	PO BOX 83166	PORTLAND	OR	97283-0166
ESCO CORP % THOMAS,KEVIN	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORP CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORP CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORP CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORP CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORP CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORP CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORP CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORP CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORP CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORP CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORP CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210

ESCO CORP CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORP CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORP CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORP CORPORATE TAX DEPT % REED ELECTRIC CO	2539 NW VAUGHN ST	PORTLAND	OR	97210
ESCO CORPORATION CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORPORATION CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORPORATION CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESCO CORPORATION CORPORATE TAX DEPT	2141 NW 25TH AVE	PORTLAND	OR	97210
ESTACEY LLC	3103 NE ROCKY BUTTE RD	PORTLAND	OR	97220
ESTEY,J RICHARD ET AL %PACIFICORP	825 NE MULTNOMAH ST #1900	PORTLAND	OR	97232
ESTEY,J RICHARD ET AL %PACIFICORP	825 NE MULTNOMAH ST #1900	PORTLAND	OR	97232
ESTEY,JOHN R TR	5001 N LAGOON AVE	PORTLAND	OR	97217-7634
ESTEY,JOHN R TR	5001 N LAGOON AVE	PORTLAND	OR	97217-7634
ESTRELLA,VIVIANA & INTERIAN,EDWIN	9000 NE MLK BLVD #86	PORTLAND	OR	97211
ETON LANE LLC	P O BOX 14746	PORTLAND	OR	97214-0746
EUGOR II LLC	2320 OSU DR	NEWPORT	OR	97365-5261
EUGOR II LLC	2320 OSU DR	NEWPORT	OR	97365-5261
EVANS METAL FABRICATORS INC	PO BOX 10144	PORTLAND	OR	97296
EVANS PROPERTY LLC % EVANS,DANIEL & MARY	10050 SE CRESTHILL RD	HAPPY VALLEY	OR	97086-6809
EVANS PROPERTY LLC % EVANS,DANIEL & MARY	10050 SE CRESTHILL RD	HAPPY VALLEY	OR	97086-6809
EVANS PROPERTY LLC % EVANS,DANIEL & MARY	10050 SE CRESTHILL RD	HAPPY VALLEY	OR	97086-6809
EVANS PROPERTY LLC % EVANS,DANIEL & MARY	10050 SE CRESTHILL RD	HAPPY VALLEY	OR	97086-6809
EVANS,ADOLPH	PO BOX 17517	PORTLAND	OR	97217
EVANS,ADOLPH	PO BOX 17517	PORTLAND	OR	97217
EVANS,ROBERT V & JEAN R	901 N COLUMBIA BLVD	PORTLAND	OR	97217-1105
EVANS,ROBERT V & JEAN R	901 N COLUMBIA BLVD	PORTLAND	OR	97217-1105
EVANS,ROBERT V & JEAN R	901 N COLUMBIA BLVD	PORTLAND	OR	97217-1105
EVANS,ROBERT V & JEAN R	901 N COLUMBIA BLVD	PORTLAND	OR	97217-1105
EVANS,ROBERT V & JEAN R & EVANS,V M-LE & H D-LE	901 N COLUMBIA BLVD	PORTLAND	OR	97217-1105
EVANS,ROBERT V & JEAN R & EVANS,V M-LE & H D-LE	901 N COLUMBIA BLVD	PORTLAND	OR	97217-1105
EVANS,ROBERT V & JEAN R & EVANS,V M-LE & H D-LE	901 N COLUMBIA BLVD	PORTLAND	OR	97217-1105
EVERGREEN FORMS LLC	3334 NW LUZON ST	PORTLAND	OR	97210
EVERGREEN FORMS LLC	3334 NW LUZON ST	PORTLAND	OR	97210
EVRAZ INC NA	200 E RANDOLPH ST #7800	CHICAGO	IL	60601-7703

EVRAZ INC NA	200 E RANDOLPH STE 7800	CHICAGO	IL	60601
EVRAZ INC NA	200 E RANDOLPH STE 7800	CHICAGO	IL	60601
EVRAZ INC NA	200 E RANDOLPH STE 7800	CHICAGO	IL	60601
EVRAZ INC NA	200 E RANDOLPH ST #7800	CHICAGO	IL	60601-7703
EVRAZ INC NA	200 E RANDOLPH STE 7800	CHICAGO	IL	60601
EVRAZ INC NA	200 E RANDOLPH STE 7800	CHICAGO	IL	60601
EVRAZ INC NA	200 E RANDOLPH STE 7800	CHICAGO	IL	60601
EWERT,PETER H & MARY L % BREUNIG,GERALD & ROHRBACH,DIAN	13501 SE RIVERCREST DR	VANCOUVER	WA	98683
EWH LLC % CHRIS & ALICE LLC	5851 N LAGOON AVE	PORTLAND	OR	97217
EWH LLC % CHRIS & ALICE LLC	5851 N LAGOON AVE	PORTLAND	OR	97217
EXXONMOBIL OIL CORP % PROPERTY TAX DIVISION	PO BOX 53	HOUSTON	TX	77001
EXXONMOBIL OIL CORP % PROPERTY TAX DIVISION	PO BOX 53	HOUSTON	TX	77001
EXXONMOBIL OIL CORP % PROPERTY TAX DIVISION	PO BOX 53	HOUSTON	TX	77001
F S YOUNG LLC % YOUNG,FRED	3202 SW WILBARD ST	PORTLAND	OR	97219
F S YOUNG LLC % YOUNG,FRED	3202 SW WILBARD ST	PORTLAND	OR	97219
FADDOUL,GHASSAN G	2456 E BURNSIDE ST	PORTLAND	OR	97214-1752
FADDOUL,GHASSAN G	2546 E BURNSIDE ST	PORTLAND	OR	97214-1754
FAILLACE,FRANK	3625 SE 17TH AVE	PORTLAND	OR	97202
FAIRMOUNT FINANCIAL INVESTMENT GROUP INC	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
FAIRMOUNT FINANCIAL INVESTMENT GROUP INC	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
FAIRMOUNT FINANCIAL INVESTMENT GROUP INC	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
FAIRMOUNT FINANCIAL INVESTMENT GROUP INC	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
FAIRMOUNT FINANCIAL INVESTMENT GROUP INC % WINKLER,VICT(	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
FAIRMOUNT FINANCIAL INVESTMENT GROUP INC % WINKLER,VICT(	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
FAIRMOUNT FINANCIAL INVESTMENT GROUP INC % WINKLER,VICT(	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
FAIRMOUNT FINANCIAL INVESTMENT GROUP INC % WINKLER,VICT(	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
FAIRMOUNT FINANCIAL INVESTMENT GROUP INC % WINKLER,VICT(	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
FAIRMOUNT FINANCIAL INVESTMENT GROUP INC % WINKLER,VICT(	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
FAIRMOUNT FINANCIAL INVESTMENT GROUP INC % WINKLER,VICT(	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
FAIRMOUNT FINANCIAL INVESTMENT GROUP INC % WINKLER,VICT(	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
FAISON,JAMES & JOHNSON,JAMES A	6136 NE 45TH AVE	PORTLAND	OR	97218
FALCON PROPERTIES LLC	1711 SE 26TH DR	GRESHAM	OR	97080

FALCONBURY,CARNETT L TR & FALCONBURY,RUTH A TR	2135 NW 29TH AVE	PORTLAND	OR	97210-2023
FALCONBURY,CARNETT L TR & FALCONBURY,RUTH A TR	2135 NW 29TH AVE	PORTLAND	OR	97210-2023
FALK,THOMAS P & TEUFEL,THOMAS M	59060 SE CHALET PL	SANDY	OR	97055-7760
FALZONE,ENRICO	5531 NW WILLBRIDGE AVE	PORTLAND	OR	97210
FAMILIAN NORTHWEST % FERGUSON ENTERPRISES INC FINANCE DE	12500 JEFFERSON AVE	NEWPORT NEWS	VA	23602
FAMILIAN NORTHWEST % FERGUSON ENTERPRISES INC FINANCE DE	12500 JEFFERSON AVE	NEWPORT NEWS	VA	23602
FAMILIAN NORTHWEST % FERGUSON ENTERPRISES INC FINANCE DE	12500 JEFFERSON AVE	NEWPORT NEWS	VA	23602
FAMILIAN NORTHWEST % FERGUSON ENTERPRISES INC FINANCE DE	12500 JEFFERSON AVE	NEWPORT NEWS	VA	23602
FAMILIAN NORTHWEST % FERGUSON ENTERPRISES INC FINANCE DE	12500 JEFFERSON AVE	NEWPORT NEWS	VA	23602
FAMILIAN NORTHWEST % FERGUSON ENTERPRISES INC FINANCE DE	12500 JEFFERSON AVE	NEWPORT NEWS	VA	23602
FAMILIAN NORTHWEST % FERGUSON ENTERPRISES INC FINANCE DE	12500 JEFFERSON AVE	NEWPORT NEWS	VA	23602
FAP PROPERTIES LLC	2910 S BRANDYWINE DR	WEST LINN	OR	97068-8313
FAP PROPERTIES LLC	2910 S BRANDYWINE DR	WEST LINN	OR	97068-8313
FAP PROPERTIES LLC	2910 S BRANDYWINE DR	WEST LINN	OR	97068-8313
FAP PROPERTIES LLC	2910 S BRANDYWINE DR	WEST LINN	OR	97068-8313
FAP PROPERTIES LLC	2910 S BRANDYWINE DR	WEST LINN	OR	97068-8313
FAP PROPERTIES LLC	2910 S BRANDYWINE DR	WEST LINN	OR	97068-8313
FAR EAST FOREIGN TRADE LLC	13435 N WOODRUSH WAY	PORTLAND	OR	97203-6626
FAR WEST FIBERS INC	6440 SE ALEXANDER ST	HILLSBORO	OR	97123-8511
FAR WEST FIBERS INC	12820 NE MARX ST	HILLSBORO	OR	97230
FARIES INVEST	12535 SW IRON MOUNTAIN BLVD	PORTLAND	OR	97219-8303
FARIES INVESTMENTS	12535 SW IRON MOUNTAIN BLVD	PORTLAND	OR	97219
FARKAS,PETER	3272 SE MADISON ST	PORTLAND	OR	97214-4249
FARMER BROS CO	20333 NORMANDIE AVE	TORRANCE	CA	90502-1215
FARMER BROS CO	20333 NORMANDIE AVE	TORRANCE	CA	90502-1215
FARWEST STEEL CORP	2000 HENDERSON AVE	EUGENE	OR	97440
FAY FAMILY LLC %MARK FAY	1674 COVE PT RD	KLAMATH FALLS	OR	97601-9300
FAZIO TV LLC	8433 NE 13TH AVE	PORTLAND	OR	97211
FAZIO,ANDREW & DORA %ARDEN,CAROL	11188 S HAVANA AVE	YUMA	AZ	85365
FAZIO,ANTHONY A TR & FAZIO,VIOLET F TR (FAZIO JOINT TRUST)	8433 NE 13TH AVE	PORTLAND	OR	97211-1601

FAZIO,MARY A TR-1/3 & FAZIO,ANTHONY A-2/3	1230 NE GERTZ RD	PORTLAND	OR	97211-1310
FAZZOLARI,MICHAEL V & DEFRANCE-FAZZOLARI,DENISE A	17023 S MCCUBBIN RD	OREGON CITY	OR	97045
FCS INVESTMENT GROUP LLC	53 EAGLE CREST DR	LAKE OSWEGO	OR	97035-1011
FEED COMMODITIES LLC	2006 E PORTLAND AVE	TACOMA	WA	98421-2712
FERGUSON,SHERWIN A TR & FERGUSON,ROBERT S TR	43314 42ND AVE E	EATONVILLE	WA	98328
FINNEY,VIVIENNE R TO 10839 N LOMBARD LLC	5028 N PRINCETON ST	PORTLAND	OR	97203-4465
FIORITO ENTERPRISES INC	1110 NW BALLARD WAY	SEATTLE	WA	98107-4638
FIRE STATION NO 7 LLC % VENERABLE PROPERTIES	70 NW COUCH ST #207	PORTLAND	OR	97209
FIRST LITCHFIELD LEASING CORPO	1057 TORRINGFORD ST	TORRINGTON	CT	6790
FIRST SECURITY LEASING CO	P O BOX 741	SALT LAKE CITY	UT	84110
FISCO,BENJAMIN T TR	265 N HANCOCK ST #100	PORTLAND	OR	97227-1973
FISCO,BENJAMIN T TR	265 N HANCOCK ST #100	PORTLAND	OR	97227-1973
FISH,GARY	28224 E HIST COLUMBIA RIVER H	TROUTDALE	OR	97060-9344
FISHER,SHIRLEY R C/O CONSECO FINANCE	PO BOX 3290	FEDERAL WAY	WA	98063-3290
FITZ ENTERPRISES INC	232 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1238
FITZ ENTERPRISES INC	232 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1238
FITZ ENTERPRISES INC % STAR OILCO	232 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1238
FITZ,MICHAEL	232 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1238
FITZ,MICHAEL	232 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1238
FITZ,MICHAEL	232 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1238
FITZ,MICHAEL	232 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1238
FITZ,MICHAEL	232 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1238
FITZ,MICHAEL	232 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1238
FITZ,TAMARA L	1225 NE RUSSET ST	PORTLAND	OR	97211-1649
FITZGIBBON GLASS BUILDING LLC	PO BOX 10386	PORTLAND	OR	97296-0386
FITZGIBBON GLASS BUILDING LLC	PO BOX 10386	PORTLAND	OR	97296-0386
FITZSTEPHENS,BARBARA A TR	PO BOX 535	GOLD BEACH	OR	97444
FIVEINFIFTY LLC	8400 E SLAUSON AVE	PICO RIVERA	CA	90660-4325
FLANDERS 720 L L C % KREBS,KEN	3341 SW CASCADE TER	PORTLAND	OR	97205
FLATT TIRE SUPPLY INC	17894 S FORSYTHE RD	OREGON CITY	OR	97045-9424
FLEET CAPITAL LEASING COMPLIANCE DIV	111 WESTMINSTER ST 9TH FL	PROVIDENCE	RI	2903
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211

FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211-0264
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211-0264
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211-0264
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211-0264
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211-0264
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211-0264
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211-0264
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211-0264
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211-0264
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211-0264
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211-0264
FLEET LEASING INC	P O BOX 11264	PORTLAND	OR	97211-0264
FLEGER,WILLIAM & BEVERLY	9000 NE M L KING BLVD SP 224	PORTLAND	OR	97211
FLINT GROUP NORTH AMERICA CORP % CRAIG RODEHEFFER TAX DI 14909 N BECK RD		PLYMOUTH	MI	48170
FLINT GROUP NORTH AMERICA CORP % CRAIG RODEHEFFER TAX DI 14909 N BECK RD		PLYMOUTH	MI	48170
FLINT INK NORTH AMERICA CORP % CRAIG RODEHEFFER TAX DIREC 14909 N BECK RD		PLYMOUTH	MI	48170
FLOBERG,WILLIAM C	834 SW ST CLAIR AVE	PORTLAND	OR	97205-1317
FLOG AZ LLC	1455 SOUTH LIPAN ST	DENVER	CO	80223
FLORENCE & LEE LLC %INCOME PROPERTY MGMNT	1800 SW 1ST AVE #220	PORTLAND	OR	97201
FLORES,ANTHONY J	3246 NE HOLLAND CT	PORTLAND	OR	97211
FLOWER MARKET ASSOC L L C	3624 N LEVERMAN ST	PORTLAND	OR	97217
FLOWERS,ORVILLE & FLOWERS,D-50% & SACHSE,RICHARD-50%	7715 NE 21ST AVE	PORTLAND	OR	97211
FLOWERS,ORVILLE L	7715 NE 21ST AVE	PORTLAND	OR	97211-1963
FLOWERS,ORVILLE L	7715 NE 21ST AVE	PORTLAND	OR	97211-1963
FLRF LLC	204 N ROBINSON AVE #709	OKLAHOMA CITY	OK	73102-6832
FLYING PIG RANCH INC % HILDEBRANDT,MICHAEL	PO BOX 893	LAKE OSWEGO	OR	97034-0143
FLYING PIG RANCH INC % SCHNEIDER,SHARI	PO BOX 30509	PORTLAND	OR	97294-3509
FLYNN,THOMAS B	142 LAUREL LANES	WASHOUGAL	WA	98671-7028
FLYNN,THOMAS B	142 LAUREL LANES	WASHOUGAL	WA	98671-7028
FLYNN,THOMAS B	142 LAUREL LN	WASHOUGAL	WA	98671

FMC CORP MARINE/RAIL EQ DIV				
FMC CORP MARINE/RAIL EQ DIV				
FMG CORPORATION % ORLANDO,JOHN	12735 NW SKYLINE BLVD	PORTLAND	OR	97231-2414
FNB HOLDINGS LLC	6540 NE 42ND AVE	PORTLAND	OR	97218
FNB HOLDINGS LLC	6540 NE 42ND AVE	PORTLAND	OR	97218
FONUA,MANISILA & FONUA,KILISITINA	6615 N ATLANTIC AVE	PORTLAND	OR	97217-5033
FORD FAMILY COLFAX LLC-90% & ATLAS COLFAX LLC-10% % RTG PR	333 NW 9TH AVE #1010	PORTLAND	OR	97209-3344
FORD,SHAINAH & FORD,LOYCE	9000 NE M L KING BLVD #198	PORTLAND	OR	97211
FOREMAN,SIMONE C % BEC,TRAIAN L & ANA	8735 SE 172ND AVE	HAPPY VALLEY	OR	97086
FORGE WORKS LLC %NAI NORRIS BEGGS & SIMPSON	121 SW MORRISON ST #200	PORTLAND	OR	97204
FORSYTH,DAVID B & JOYCE R TO SHAW,DENISE	13297 SE MEADOWPARK DR	HAPPY VALLEY	OR	97086-5987
FORWARD PROPERTIES LLC	15540 SE BOLLAM DR	CLACKAMAS	OR	97015
FOSGARD,ERIC R	2758 SE OLSEN ST	PORTLAND	OR	97222-6436
FOSTER OIL LLC	11125 SE FOSTER RD	PORTLAND	OR	97266-4219
FOSTER OIL LLC	11125 SE FOSTER RD	PORTLAND	OR	97266-4219
FOSTER POULTRY FARMS % NAIL,RICHARD TAX MANAGER	P O BOX 457	LIVINGSTON	CA	95334
FOSTER,ROBERT B TR & FOSTER,VICKY L TR	PO BOX 86735	PORTLAND	OR	97286-0735
FOSTER,ROBERT B TR & FOSTER,VICKY L TR	PO BOX 86735	PORTLAND	OR	97286-0735
FOTEFF ENTERPRISES LLC	16142 NE MASON ST	PORTLAND	OR	97230
FOTEFF,JAMES A	10846 SE 93RD CT	HAPPY VALLEY	OR	97086-7443
FOUR S PROPERTIES L P	PO BOX 87908	VANCOUVER	WA	98687
FOWLER,DAVID K	2117 NW 23RD AVE	PORTLAND	OR	97210-2336
FOX,ALBERT J & BARBARA J	10511 SW 43RD AVE	PORTLAND	OR	97219-6991
FOX,DAVID KENDALL /FOX RUN MFG'D HOME COMMUNITY	9000 NE M L KING BLVD #503	PORTLAND	OR	97211
FOX,JESSE R & BLAIR,DEBRA S	16106 NE MULTNOMAH ST	PORTLAND	OR	97230
FRANCHUK,VENIAMIN	7036 SE 82ND AVE	PORTLAND	OR	97266
FRANCIS DEVELOPMENT LLC % FRANCIS,KEN	2345 NW NICOLAI ST	PORTLAND	OR	97210-1810
FRANCIS DEVELOPMENT LLC % FRANCIS,KEN	2345 NW NICOLAI ST	PORTLAND	OR	97210-1810
FRANCIS DEVELOPMENT LLC % FRANCIS,KEN	2345 NW NICOLAI ST	PORTLAND	OR	97210-1810
FRANCIS,ANN K	1445 NE MARINE DR	PORTLAND	OR	97211
FRANCIS,ANN K	1445 NE MARINE DR	PORTLAND	OR	97211
FRANCIS,JUDITH D TR-50% & JOANNE CAMPAU REVOCABLE LIVING	PO BOX 835	TROUTDALE	OR	97060-1086
FRANCISCO,CLAROS	9000 NE M L KING BLVD	PORTLAND	OR	97211
FRANK,MARTIN & FRANK,BEVERLY TO WEST INVESTMENTS LLC	1911 HISTORIC COLUMBIA RIV HV	TROUTDALE	OR	97060

FRANKLIN,GRIFFITH L TR & FRANKLIN,LUCY-AVIS O TR (FRANKLIN FA	PO BOX 1655	LAKE OSWEGO	OR	97035
FRAZIER,AARON & FRAZIER,BRITTANY	9920 N DECATUR ST	PORTLAND	OR	97203-2814
FRED MEYER INC %NICKEL & CO	1014 VINE ST 7TH FL	CINCINNATI	OH	45202-1141
FRED MEYER STORES INC %NICKEL & CO	1014 VINE ST 7TH FL	CINCINNATI	OH	45202-1141
FRED MEYER STORES INC %NICKEL & CO	1014 VINE ST 7TH FL	CINCINNATI	OH	45202-1141
FRED MEYER STORES INC %NICKEL & CO	1014 VINE ST 7TH FL	CINCINNATI	OH	45202-1141
FRED MEYER STORES INC %NICKEL & CO	1014 VINE ST 7TH FL	CINCINNATI	OH	45202-1141
FRED MEYER STORES INC %NICKEL & CO	1014 VINE ST 7TH FL	CINCINNATI	OH	45202-1141
FRED MEYER STORES INC %NICKEL & CO	1014 VINE ST 7TH FL	CINCINNATI	OH	45202-1141
FRED MEYER STORES INC %NICKEL & CO	1014 VINE ST 7TH FL	CINCINNATI	OH	45202-1141
FREEDMAN,HOWARD TR	PO BOX 42127	PORTLAND	OR	97242-0127
FREEMAN 1 LLC %OCH INTERNATIONAL INC	19150 SW 90TH AVE	TUALATIN	OR	97062
FREEMAN, TED ALLEN	16217 NE 72ND AVE	VANCOUVER	WA	98686
FREIGHTLINER	PO BOX 3820	PORTLAND	OR	97208-3820
FREIGHTLINER	PO BOX 3820	PORTLAND	OR	97208-3820
FREIGHTLINER	PO BOX 3820	PORTLAND	OR	97208-3820
FREIGHTLINER	PO BOX 3820	PORTLAND	OR	97208-3820
FREIGHTLINER	PO BOX 3820	PORTLAND	OR	97208-3820
FREIGHTLINER CORPORATION	PO BOX 3820	PORTLAND	OR	97208
FREIGHTLINER CORPORATION	PO BOX 3820	PORTLAND	OR	97208-3820
FREIGHTLINER CORPORATION	PO BOX 3820	PORTLAND	OR	97208-3820
FREIGHTLINER CORPORATION	PO BOX 3820	PORTLAND	OR	97208
FREIGHTLINER CORPORATION	PO BOX 3820	PORTLAND	OR	97208
FREIGHTLINER CORPORATION	PO BOX 3820	PORTLAND	OR	97208-3820
FREIGHTLINER CORPORATION	PO BOX 3820	PORTLAND	OR	97208-3820
FREIGHTLINER CORPORATION	PO BOX 3820	PORTLAND	OR	97208
FREIGHTLINER CORPORATION	PO BOX 3820	PORTLAND	OR	97208-3820
FREIGHTLINER CORPORATION ATTN TAX DEPARTMENT	P O BOX 3820	PORTLAND	OR	97208-3820
FREIGHTLINER CORPORATION ATTN TAX DEPARTMENT	P O BOX 3820	PORTLAND	OR	97208-3820
FRESE,JON A	6237 N CECELIA ST	PORTLAND	OR	97203-1801
FRIENDCO NW LLC	13725 SE LE ANN CT	BORING	OR	97009
FRIENDS TOWING INC	8205 N CONGRESS AVE	PORTLAND	OR	97217-1015
FRIES,ROBERT G	7556 NE ALAMEDA ST	PORTLAND	OR	97213-5930

FRISBIE,STEPHEN C	4440 SE 174TH AVE	PORTLAND	OR	97236
FRISBIE,STEPHEN C	4440 SE 174TH AVE	PORTLAND	OR	97236
FROMHERZ,THOMAS TR & FROMHERZ,KATHY TR	PO BOX 11285	PORTLAND	OR	97211-0285
FRONT AVENUE I LLC	3121 SW MOODY AVE	PORTLAND	OR	97239-4505
FRONT AVENUE I LLC	3121 SW MOODY AVE	PORTLAND	OR	97239-4505
FRONT AVENUE II LLC	3121 SW MOODY AVE	PORTLAND	OR	97239-4505
FRONT AVENUE III LLC	3121 SW MOODY AVE	PORTLAND	OR	97239-4505
FRONT AVENUE III LLC	3121 SW MOODY AVE	PORTLAND	OR	97239-4505
FRONT AVENUE NORTHWEST LLC % NORRIS BEGGS & SIMPSON	121 SW MORRISON ST #200	PORTLAND	OR	97204
FRONT STREET LOT LLC %CORRINE OSHI BULLIVANT HOUSER BAILEY	3865 NW GALES CREEK RD	FOREST GROVE	OR	97116
FRY,TIMOTHY LEROY & FRY,PATRICIA ANN	PO BOX 55051	PORTLAND	OR	97238
FS PROPERTIES LLC	20200 SW STAFFORD RD	TUALATIN	OR	97062
FUEL & MARINE MARKETING LLC ATTN GARY SHEETZ	P O BOX 7764	BURBANK	CA	91510
FULTON PROVISION CO	16123 NE AIRPORT WAY	PORTLAND	OR	97230-4953
FULTON PROVISION CO	16123 NE AIRPORT WAY	PORTLAND	OR	97230-4953
FULTON PROVISION CO	16123 NE AIRPORT WAY	PORTLAND	OR	97230-4953
FUNHAD LLC	1417 SE 9TH AVE	PORTLAND	OR	97214
FUYO GENERAL LEASING	733 3RD AVE SUITE 17F	NEW YORK	NY	10017
G & J 143 BUSINESS LLC	PO BOX 152	SANDY	OR	97055-0152
G & J 143 BUSINESS LLC	PO BOX 152	SANDY	OR	97055-0152
G & R BUILDING LLC	323 SE DIVISION PL	PORTLAND	OR	97202
G A C ACQUISITION CORP % MC COWN DE LEEUW & CO	3000 SAND HILL RD BLDG 3 #29	MENLO PARK	CA	94025
G E C C	303 INTERNATIONAL CENTER	HUNT VALLEY	MD	21031
GAC ACQUISITION CORP % MC COWN DE LEEUW & CO	3000 SAND HILL RD BLDG 3 #29	MENLO PARK	CA	94025
GAIN,ROBERT EUGENE	9000 NE M L KING BLVD SP 055	PORTLAND	OR	97211
GAITTENS-MCLEMORE,SHANNON & GAITTENS-MCLEMORE,ALEXIS &	6028 SE 51ST AVE	PORTLAND	OR	97206
GALICIA PROPERTY HOLDINGS LLC	10490 SW EASTRIDGE ST #110B	PORTLAND	OR	97225-5030
GALLI PROPERTY MANAGEMENT LLC	PO BOX 30956	PORTLAND	OR	97294
GALLI PROPERTY MANAGEMENT LLC	PO BOX 30956	PORTLAND	OR	97294
GALOFTEANU,BEN	2933 NE COLUMBIA BLVD	PORTLAND	OR	97211-2061
GALOFTEANU,DUMITRU & VICTORIA	7324 NE 29TH AVE	PORTLAND	OR	97211
GALOFTEANU,DUMITRU & VICTORIA	7324 NE 29TH AVE	PORTLAND	OR	97211
GALOFTEANU,JOHN	3201 NE COLUMBIA BLVD	PORTLAND	OR	97211
GALVANIZERS CO %ODONNELL & ASSOCIATES	4949 MEADOWS RD STE 375	LAKE OSWEGO	OR	97035

GALVCO PROPERTIES LLC % O'DONNELL,STEPHEN R O'DONNELL & A	4949 MEADOWS RD #375	LAKE OSWEGO	OR	97035-3162
GALVCO PROPERTIES LLC %STEPHEN O'DONNELL,CPA WILLIAMSON	4949 SW MEADOWS RD #375	LAKE OSWEGO	OR	97035
GALVCO PROPERTIES LLC %STEPHEN O'DONNELL,CPA WILLIAMSON	4949 SW MEADOWS RD #375	LAKE OSWEGO	OR	97035
GALVCO PROPERTIES LLC %STEPHEN O'DONNELL,CPA WILLIAMSON	4949 SW MEADOWS RD #375	LAKE OSWEGO	OR	97035
GALVCO PROPERTIES LLC %STEPHEN O'DONNELL,CPA WILLIAMSON	4949 SW MEADOWS RD #375	LAKE OSWEGO	OR	97035
GALVCO PROPERTIES LLC %STEPHEN O'DONNELL,CPA WILLIAMSON	4949 SW MEADOWS RD #375	LAKE OSWEGO	OR	97035
GAMMON ENTERPRISES INC	2918 E BLAINE ST	SPRINGFIELD	MO	65803
GAMMON ENTERPRISES INC	2918 E BLAINE ST	SPRINGFIELD	MO	65803
GANGA LLC	1160 ROUTE 22 WEST	MOUNTAINSIDE	NJ	7092
GANTMAN,MANUS N-25% & GANTMAN,JOSEPH & LUCILE-75%	4748 SW 39TH DR	PORTLAND	OR	97221
GARCIA,MARIA ELENA	9000 NE M L KING BLVD #52	PORTLAND	OR	97211
GARDENBURGER INC	1411 SW MORRISON ST #400	PORTLAND	OR	97205-1912
GARDENERS & RANCHERS ASSN	PO BOX 1685	CLACKAMAS	OR	97015
GARDNERS & RANCHERS ASSN	PO BOX 1685	CLACKAMAS	OR	97015
GATES PROPERTIES LLC	P O BOX 301187	PORTLAND	OR	97294
GATX TANK STORAGE TERMINALS CO % FINANCIAL SVCS CENTER A/	1100 TOWN AND COUNTRY RD	ORANGE	CA	92868
GATX TANK STORAGE TERMINALS CO % FINANCIAL SVCS CENTER A/	1100 TOWN AND COUNTRY RD	ORANGE	CA	92868
GATX TANK STORAGE TERMINALS CO % FINANCIAL SVCS CENTER A/	1100 TOWN AND COUNTRY RD	ORANGE	CA	92868
GATX TERMINALS CORP % FINANCIAL SVCS CENTER A/P	1100 TOWN AND COUNTRY RD	ORANGE	CA	92868
GATX TERMINALS CORP % FINANCIAL SVCS CENTER A/P	1100 TOWN AND COUNTRY RD	ORANGE	CA	92868
GATX TERMINALS CORPORATION % FINANCIAL SVCS CENTER A/P	1100 TOWN AND COUNTRY RD	ORANGE	CA	92868
GATX TERMINALS CORPORATION % FINANCIAL SVCS CENTER A/P	1100 TOWN AND COUNTRY RD	ORANGE	CA	92868
GATX TERMINALS CORPORATION % FINANCIAL SVCS CENTER A/P	1100 TOWN AND COUNTRY RD	ORANGE	CA	92868
GAULT,RICHARD D	4736 NE BUFFALO ST	PORTLAND	OR	97218
GAULT,RICHARD D	4736 NE BUFFALO ST	PORTLAND	OR	97218
GAUTHIER,TIMOTHY J TR ET AL	16021 NE AIRPORT WAY	PORTLAND	OR	97230
GBOSS LLC	17457 S RORY CT	OREGON CITY	OR	97045
GBOSS LLC	17457 S RORY CT	OREGON CITY	OR	97045
GBOSS LLC	17457 S RORY CT	OREGON CITY	OR	97045
GDM LLC %MITCH DICKSON	PO BOX 3623	SPOKANE	WA	99220-3623
GE CAPITAL COMMERCIAL INC %DARIGOLD INC ATTN: PHYLLIS STEN	PO BOX 34377	SEATTLE	WA	98124
GE CAPITAL INFORMATION TECH SO % CHHIT,VIN	P O BOX 3649	DANBURY	CT	6813
GE COMMERCIAL EQUIPMENT HOLDING LLC % CHHIT,VIN	P O BOX 3649	DANBURY	CT	6813
GE EQUIPMENT SMALL TICKET LLC SERIES 2009-1 ATTN PROPERTY T	PO BOX 3649	DANBURY	CT	06813-3649

GEANELLEN'S REAL PROPERTY LLC	PO BOX 18024	PORTLAND	OR	97218
GEANELLEN'S REAL PROPERTY LLC	PO BOX 18024	PORTLAND	OR	97218
GENERAL ELECTRIC CAPITAL CORP	PO BOX 3649	DANBURY	CT	6813
GENERAL ELECTRIC CAPTITAL CORPORATION	P O BOX 3649	DANBURY	CT	6813
GENERAL ELECTRIC CO % PROPERTY TAX- DEPT 201	PO BOX 4900	SCOTTSDALE	AZ	85261-4900
GENERAL ELECTRIC CREDIT CORP O	PO BOX 3649	DANBURY	CT	06813-3649
GENSTAR ROOFING CO INC % RYAN & CO THREE GALLERIA TOWER	13155 NOEL RD 12TH FLR LB 71	DALLAS	TX	75240-5090
GENSTAR ROOFING CO INC % RYAN & CO THREE GALLERIA TOWER	13155 NOEL RD 12TH FLR LB 71	DALLAS	TX	75240-5090
GENT,JOSEPH	725 SE MORGAN	VANCOUVER	WA	98664
GENUINE PARTS COMPANY	2999 CIRCLE 75 PARKWAY	ATLANTA	GA	30339
GEORGE,BRENT	PO BOX 90905	PORTLAND	OR	97290
GEORGIA 01 LLC TO ARRINGTON PROPERTIES LLC	11077 N VANCOUVER WAY	PORTLAND	OR	97217-7688
GIBBINS,WYLIE R	1528 SE PARDEE ST	PORTLAND	OR	97202
GIDEON LLC	1210 SE GIDEON ST	PORTLAND	OR	97202
GILBERT & SEIBEL LLC ET AL %DIANE NIKKILA	13015 NW 46TH AVE	VANCOUVER	WA	98685
GILBERT FAMILY LLC ET AL %DIANE L NIKKILA	13015 NW 46TH AVE	VANCOUVER	WA	98685
GILBERT FAMILY LLC ET AL %DIANE L NIKKILA	13015 NW 46TH AVE	VANCOUVER	WA	98685
GILBERT FAMILY LLC ET AL %DIANE L NIKKILA	13015 NW 46TH AVE	VANCOUVER	WA	98685
GILBERT FAMILY LLC ET AL %DIANE L NIKKILA	13015 NW 46TH AVE	VANCOUVER	WA	98685
GILBERT FAMILY LLC ET AL %DIANE L NIKKILA	13015 NW 46TH AVE	VANCOUVER	WA	98685
GILBERT FAMILY LLC ET AL %DIANE L NIKKILA	13015 NW 46TH AVE	VANCOUVER	WA	98685
GILBERT FAMILY LLC ET AL %DIANE L NIKKILA	13015 NW 46TH AVE	VANCOUVER	WA	98685
GILBERT FAMILY LLC ET AL %DIANE L NIKKILA	13015 NW 46TH AVE	VANCOUVER	WA	98685
GILBERT,BRADLEY W & MARY L	15221 SE HWY 212	CLACKAMAS	OR	97015
GILBERTSON,KENNETH N	PO BOX 9011 PMB 362	CALEXICO	CA	92232-9011
GILBERTSON,KENNETH N	PO BOX 9011 PMB 362	CALEXICO	CA	92232-9011
GILBERTSON,LONNIE TR & GILBERTSON,CANDACE TR	731 SE YAMHILL ST	PORTLAND	OR	97214-2326
GILES FUEL LLC	1013 NE 62ND AVE	PORTLAND	OR	97213
GILES,KENNETH L & GILES,LORA B	6812 SE 30TH AVE	PORTLAND	OR	97202-8612
GILLIS,RONNIE & CLYMER,GEORGE	5109 NW ST HELENS RD	PORTLAND	OR	97210
GINOS HOLDINGS LLC	6712 NE 46TH AVE	PORTLAND	OR	97218
GIZOWSKI,JERZY	7766 SE 82ND DR	PORTLAND	OR	97266-6202
GIZOWSKI,JERZY M	7766 SE 82ND AVE	PORTLAND	OR	97266-6202
GLACIER NORTHWEST INC %CALIFORNIA PORTLAND CEMENT CO AT	2025 E FINANCIAL WAY	GLENDORA	CA	91741-4692

GLACIER NORTHWEST INC %CALIFORNIA PORTLAND CEMENT CO AT	2025 E FINANCIAL WAY	GLENDORA	CA	91741-4692
GLACIER NORTHWEST INC %CALIFORNIA PORTLAND CEMENT CO AT	2025 E FINANCIAL WAY	GLENDORA	CA	91741-4692
GLACIER NORTHWEST INC %CALIFORNIA PORTLAND CEMENT CO AT	2025 E FINANCIAL WAY	GLENDORA	CA	91741-4692
GLASGOW,KENNETH R & DONNA R	14184 SE 120TH PL	CLACKAMAS	OR	97015
GLASNAPP,WAYNE C & GLASNAPP,BARBARA J	1801 NW UPSHUR ST	PORTLAND	OR	97209-1700
GLASS PROPERTY LLC	5700 NW FISHER CREEK DR #100	CAMAS	WA	98607
GLASS TO GLASS LLC	866 N COLUMBIA BLVD	PORTLAND	OR	97217
GLASS TO GLASS LLC	866 N COLUMBIA BLVD	PORTLAND	OR	97217
GLASSBRENNER GROUP LLC	4910 SE 35TH AVE	PORTLAND	OR	97202-4114
GLASSBRENNER GROUP LLC	4910 SE 35TH AVE	PORTLAND	OR	97202-4114
GLASSBRENNER GROUP LLC	4910 SE 35TH AVE	PORTLAND	OR	97202-4114
GLEN WIDING LLC % BUSINESS SERVICES OPTIMIZED	11501 SW PACIFIC HWY #201	TIGARD	OR	97223
GLENN,JANE A	627 SE HARRISON ST	PORTLAND	OR	97214-4528
GLOVER,JAMES A	PO BOX 42128	PORTLAND	OR	97242-0128
GLYNN,DELORES JEAN	21666 SE SMOKEY LN	EAGLE CREEK	OR	97022
GM CARLSTON 24 LLC ATTN: GREGORY S CARLSTON	PO BOX 22529	MILWAUKIE	OR	97269-2529
GM CARLSTON STARK LLC ATTN: CARLSTON,GREGORY S	PO BOX 22529	MILWAUKIE	OR	97269-2529
GOCHE',JOHN E TR	12455 SE 143RD PL	HAPPY VALLEY	OR	97086-6548
GOCHE',JOHN E TR	12455 SE 143RD PL	HAPPY VALLEY	OR	97086-6548
GOCHE',JOHN E TR	12455 SE 143RD PL	HAPPY VALLEY	OR	97086-6548
GOCHE',JOHN E TR	12455 SE 143RD PL	HAPPY VALLEY	OR	97086-6548
GOEKJIAN PROPERTIES LLC	13932 NE MILTON ST	PORTLAND	OR	97230-2975
GOETZ,DENNIS	2614 NE MULTNOMAH ST	PORTLAND	OR	97232-2130
GOLDEN,ROBERT L	3121 SE 134TH AVE	PORTLAND	OR	97236-3032
GOLDINGAY,ROGER & OTIS,CAROL L	0836 SW CURRY ST #1400	PORTLAND	OR	97239-4529
GOLDINGAY,ROGER & OTIS,CAROL L	0836 SW CURRY ST #1400	PORTLAND	OR	97239-4529
GOLDINGAY,ROGER & OTIS,CAROL L	0836 SW CURRY ST #1400	PORTLAND	OR	97239-4529
GONROWSKI,BRENT & HOFFERT,BRIAN	2569 NE COLUMBIA BLVD	PORTLAND	OR	97211
GONZALEZ PONCE,KARINA LIZBETH	9000 NE M L KING BLVD #9	PORTLAND	OR	97211
GOOD STEWARDSHIP INVESTMENTS LLC	3614 NE 50TH AVE	PORTLAND	OR	97213
GOOD STEWARDSHIP INVESTMENTS LLC	3614 NE 50TH AVE	PORTLAND	OR	97213
GOODMAN,DOUGLAS A TR % US BANK CORPORATE REAL EST ATTN	2800 E LAKE ST	MINNEAPOLIS	MN	55406
GOODMAN,FLORENCE TO BLINSMAN,HARMON	24271 S LARKIN RD	BEAVERCREEK	OR	97004-9606
GOODMAN,FLORENCE TO BLINSMAN,HARMON	24271 S LARKIN RD	BEAVERCREEK	OR	97004-9606

GOODMAN,FLORENCE TO BLINSMAN,HARMON	24271 S LARKIN RD	BEAVERCREEK	OR	97004-9606
GOODWILL INDUSTRIES	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GOODWILL INDUSTRIES OF COLUMBIA WILLAMETTE	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GOODWILL INDUSTRIES OF OREGON	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GOODWILL INDUSTRIES OF THE COLUMBIA WILLAMETTE	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GOODWILL INDUSTRIES OF THE COLUMBIA WILLAMETTE	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GOODWILL INDUSTRIES OF THE COLUMBIA WILLAMETTE	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GOODWILL INDUSTRIES OF THE COLUMBIA WILLAMETTE	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GOODWILL INDUSTRIES OF THE COLUMBIA WILLAMETTE	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GOODWILL INDUSTRIES OF THE COLUMBIA WILLAMETTE	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GOODWILL INDUSTRIES OF THE COLUMBIA WILLAMETTE	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GOODWILL INDUSTRIES OF THE COLUMBIA WILLAMETTE	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GOODWILL INDUSTRIES OF THE COLUMBIA WILLAMETTE	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GOODWILL INDUSTRIES OF THE COLUMBIA WILLAMETTE	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GOODWILL INDUSTRIES OF THE COLUMBIA WILLAMETTE INC	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GOODWILL INDUSTRIES OF THE COLUMBIA WILLAMETTE INC	1943 SE 6TH AVE	PORTLAND	OR	97214-4508
GORSON,ANYA & BROOKS,ZACHARY	7702 N WILLIAMS AVE	PORTLAND	OR	97217
GOULINIAN,KARINE	465 NE 181ST AVE PMB 414	PORTLAND	OR	97230
GOULINIAN,KARINE	465 NE 181ST AVE PMB 414	PORTLAND	OR	97230
GOULINIAN,KARINE	465 NE 181ST AVE PMB 414	PORTLAND	OR	97230
GOVRO,OREN LEE % GINGMEN,MICHELLE	9000 NE M L KING BLVD #254	PORTLAND	OR	97211
GPBM LLC	9015 SE FLAVEL ST	PORTLAND	OR	97266-5583
GPBM LLC	9015 SE FLAVEL ST	PORTLAND	OR	97266-5583
GPE INVESTMENTS II LLC	PO BOX 1573	BATTLE GROUND	WA	98604-1573
GPE INVESTMENTS LLC	PO BOX 1573	BATTLE GROUND	WA	98604
GPE INVESTMENTS LLC	PO BOX 1573	BATTLE GROUND	WA	98604
GRABHAM,DOUGLAS C TR & GRABHAM,LONNA S TR	2400 ELDEN AVE #32	COSTA MESA	CA	92627-7005
GRACE MORGAN LAND HOLDINGS LLC ATTN: GEORGE WEBB	9933 NW 107TH AVE	PORTLAND	OR	97231
GRACE MORGAN LAND HOLDINGS LLC ATTN: GEORGE WEBB	9933 NW 107TH AVE	PORTLAND	OR	97231
GRACE MORGAN LAND HOLDINGS LLC ATTN: GEORGE WEBB	9933 NW 107TH AVE	PORTLAND	OR	97231
GRACE MORGAN LAND HOLDINGS LLC ATTN: GEORGE WEBB	9933 NW 107TH AVE	PORTLAND	OR	97231
GRACE MORGAN LAND HOLDINGS LLC ATTN: GEORGE WEBB	9933 NW 107TH AVE	PORTLAND	OR	97231

GRACE MORGAN LAND HOLDINGS LLC ATTN: GEORGE WEBB	9933 NW 107TH AVE	PORTLAND	OR	97231
GRACE MORGAN LAND HOLDINGS LLC ATTN: GEORGE WEBB	9933 NW 107TH AVE	PORTLAND	OR	97231
GRAHAM,GARY L & GRAHAM,CAROL A	48 BROOKSIDE WAY	MISSOULA	MT	59802
GRAND CENTRAL BAKERY OREGON IN	2249 NW YORK ST	PORTLAND	OR	97210
GRAND CENTRAL BAKERY OREGON IN	2249 NW YORK ST	PORTLAND	OR	97210
GRANDOS,ESTELA MILLAN & MONROY,ROQUE	4035 N ATTU ST	PORTLAND	OR	97203
GRANT SUNRISE LLC % WYSE INVESTMENT SERV CO	810 SE BELMONT ST #100	PORTLAND	OR	97214
GRANT SUNRISE LLC % WYSE INVESTMENT SERV CO	810 SE BELMONT ST #100	PORTLAND	OR	97214
GRANT,MICHAEL	PO BOX 208	ASTORIA	OR	97103
GRANT,MICHAEL C & CAROL F % BROOKLYN HARDWARE MFG	P O BOX 82610	PORTLAND	OR	97282
GRANT,MICHAEL C & CAROL F % BROOKLYN HARDWARE MFG	P O BOX 82610	PORTLAND	OR	97282
GRANTEN APARTMENTS LLC	2078 NW EVERETT ST	PORTLAND	OR	97209
GRAPHIC PACKAGING CORP & PACIFIC PAPERBOARD PRODUCTS IN	185 NW SPANISH RIVER BLVD #1C	BOCA RATON	FL	33431-4230
GRAPHIC PACKAGING INTERNATIONAL INC % FRANK,DEBBIE	1500 RIVEREDGE PKWY NW #100	ATLANTA	GA	30328-4658
GRAPHIC PACKAGING INTERNATIONAL INC % FRANK,DEBBIE	1500 RIVEREDGE PKWY NW #100	ATLANTA	GA	30328-4658
GRAPHIC PACKAGING INTERNATIONAL INC % FRANK,DEBBIE	1500 RIVEREDGE PKWY NW #100	ATLANTA	GA	30328-4658
GRAPHIC PACKAGING INTERNATIONAL INC % FRANK,DEBBIE	1500 RIVEREDGE PKWY NW #100	ATLANTA	GA	30328-4658
GRAPHIC PACKAGING INTERNATIONAL INC % FRANK,DEBBIE	1500 RIVEREDGE PKWY NW #100	ATLANTA	GA	30328-4658
GRAPHIC PACKAGING INTERNATIONAL INC ATTN: TAX DEPARTMEN	1500 RIVEREDGE PKW #100, 8TH	ATLANTA	GA	30328
GRAY FAMILY MOCK'S LANDING LLC % WYSE INVESTMENT SERVICE	810 SE BELMONT ST #100	PORTLAND	OR	97214
GRAY,JOHN S	1991 FURLONG CT	WEST LINN	OR	97068-2525
GRAY,ROBERT A TR	7823 SW KINGFISHER WAY	PORTLAND	OR	97224-7070
GRAYROSE PROPERTIES LLC	9631 NE COLFAX ST	PORTLAND	OR	97220-1232
GRAYSON,JANE R	01830 SW GREENWOOD RD	PORTLAND	OR	97219-8369
GRAYSON,JANE R	01830 SW GREENWOOD RD	PORTLAND	OR	97219-8369
GRAYSON,JANE R TO CAPITAL CONSULTANTS INC	01830 SW GREENWOOD RD	PORTLAND	OR	97219
GRAYSON,JANE R TO CAPITAL CONSULTANTS INC	01830 SW GREENWOOD RD	PORTLAND	OR	97219
GREAT WESTERN PROPERTIES LLC ATTN BRYANT,RAYMOND A JR	3939 N MARINE DR SLP #15	PORTLAND	OR	97217
GREAT WESTERN PROPERTIES LLC ATTN BRYANT,RAYMOND A JR	3939 N MARINE DR SLP #15	PORTLAND	OR	97217
GREAT WESTERN PROPERTIES LLC ATTN BRYANT,RAYMOND A JR	3939 N MARINE DR SLP #15	PORTLAND	OR	97217
GREEN & MORAN PROPERTIES LLC % GREEN,SALLY	11547 SW 19TH AVE	PORTLAND	OR	97219-8921
GREEN TRANSFER & STORAGE CO	10099 N PORTLAND RD	PORTLAND	OR	97203-1359
GREEN TRANSFER & STORAGE CO	10099 N PORTLAND RD	PORTLAND	OR	97203-1359

GREEN TRANSFER & STORAGE CO	10099 N PORTLAND RD	PORTLAND	OR	97203-1359
GREEN TRANSFER & STORAGE CO	10099 N PORTLAND RD	PORTLAND	OR	97203
GREEN TRANSFER & STORAGE CO TO FARQUHARSON,W H	10099 N PORTLAND RD	PORTLAND	OR	97203-1359
GREEN,A C JR TR	8516 NE KNOTT ST	PORTLAND	OR	97220
GREEN,SALLY	1054 NE FALOMA RD	PORTLAND	OR	97211-1145
GREEN,SALLY	1054 NE FALOMA RD	PORTLAND	OR	97211-1145
GREENWAY PROPERTIES LLC	PO BOX 4483	PORTLAND	OR	97208-4483
GREENWAY PROPERTIES LLC	PO BOX 4483	PORTLAND	OR	97208-4483
GREENWAY RECYCLING INC	PO BOX 4483	PORTLAND	OR	97208
GREENWAY RECYCLING INC	PO BOX 4483	PORTLAND	OR	97208
GRIFFITH RUBBER MILLS	PO BOX 10066	PORTLAND	OR	97296-0066
GRIGSBY,VICKI A	3525 NE 50TH AVE #307	PORTLAND	OR	97213-1766
GROMYSH,VIKTOR & GROMYSH,LILIYA	16312 SE STEPHENS ST	PORTLAND	OR	97233-4136
GROS JACQUES,LAWRENCE R & DONN % TRAPOLD FARMS INC	P O BOX 30114	PORTLAND	OR	97294
GROSE,BURL D & BYERS-GROSE,MARY	9928 N DECATUR ST	PORTLAND	OR	97203-2814
GRUBBE,BARBARA	4417 NE 136TH AVE	PORTLAND	OR	97230-1203
GRUETTER SANITARY SERVICE INC	7100 NE 42ND AVE	PORTLAND	OR	97218
GRUHLAXMI INC	12010 NE AIRPORT WAY	PORTLAND	OR	97220
GRUNBAUM,HANS H TR & GRUNBAUM,MARILYN K TR	21390 W EDY RD	SHERWOOD	OR	97140
GSB LAND CO	107 SE GRAND AVE	PORTLAND	OR	97214
GSB STARK STREET LLC	107 SE GRAND AVE	PORTLAND	OR	97214
GSB STARK STREET LLC	107 SE GRAND AVE	PORTLAND	OR	97214
GSDR LLC	2333 NW VAUGHN ST	PORTLAND	OR	97210
GSDR LLC	2333 NW VAUGHN ST	PORTLAND	OR	97210
GSI LUMONICS INC	125 MIDDLESEX TPKE	BEDFORD	MA	01730-1409
GSRAI,LLC	330 N MARINE DR	PORTLAND	OR	97217
GUEVARA MAYO,REYNA	900 NE M L KING BLVD SP 231	PORTLAND	OR	97211
GUILD'S LAKE PROPERTIES LLC	2742 NW BIRKENDENE ST	PORTLAND	OR	97229-8080
GUILD'S LAKE PROPERTIES LLC	2742 NW BIRKENDENE ST	PORTLAND	OR	97229-8080
GUILD'S LAKE PROPERTIES LLC	2742 NW BIRKENDENE ST	PORTLAND	OR	97229-8080
GULSONS	307 LEWERS ST #600	HONOLULU	HI	96815
GULSONS	307 LEWERS ST 6TH FLOOR	HONOLULU	HI	96815
GULSONS % SIMMCO PROPERTIES INC	307 LEWERS ST 6TH FLOOR	HONOLULU	HI	96815
GULSONS ARGYLE LLC	307 LEWERS ST 6TH FL	HONOLULU	HI	96815

GULSONS COLUMBIA LLC	307 LEWERS ST 6TH FL	HONOLULU	HI	96815
GULSONS HIGHWAY LLC	307 LEWERS ST, 6TH FLR	HONOLULU	HI	96815
GUMMERSON,TERRY L & GUMMERSON,DIANE	9919 N DECATUR ST	PORTLAND	OR	97203-2819
GUNDERSON INC ATTN DAVID LINDBERG	4350 NW FRONT AVE	PORTLAND	OR	97210-1422
GUNDERSON INC ATTN DAVID LINDBERG	4350 NW FRONT AVE	PORTLAND	OR	97210-1422
GUNDERSON INC ATTN DAVID LINDBERG	4350 NW FRONT AVE	PORTLAND	OR	97210-1422
GUNDERSON INC ATTN DAVID LINDBERG	4350 NW FRONT AVE	PORTLAND	OR	97210-1422
GUNDERSON INC ATTN DAVID LINDBERG	4350 NW FRONT AVE	PORTLAND	OR	97210-1422
GUNDERSON LLC ATTN: GORDON PLAMONDON	4350 NW FRONT AVE	PORTLAND	OR	97210
GUNDERSON PROPERTIES I L L C % GUNDERSON,CHRIS L	3529 SE KNAPP ST	PORTLAND	OR	97202-8346
GUNDERSON PROPERTIES III LLC	3529 SE KNAPP ST	PORTLAND	OR	97202-8346
GUPPY NORTHWEST PROPERTIES LLC % GUPPY,DINA S	0301 SW NEBRASKA ST	PORTLAND	OR	97239-3536
GUPTA,ASHISH & PANDITA,CESARINE	637 SE HARRISON ST	PORTLAND	OR	97214-4528
GUSTIN,KENNETH P & GUSTIN,JULIA TO PATEL,SHANTI ET AL	59 NE GERTZ RD	PORTLAND	OR	97211-1223
GUSTIN,KENNETH P ET AL TO ASM INVEST LLC % PATEL,ARVIND G	59 NE GERTZ RD	PORTLAND	OR	97211
GUTIERREZ-ARAGON,JUAN & GUTIERREZ-ARAGON,DOLORES ET AL	9000 NE M L KING BLVD #238	PORTLAND	OR	97211
GUTSCHOW,ELLA M	3700 "X" STREET #71	VANCOUVER	WA	98663-2667
GUTTERMAN'S SUPPLY CORP	1620 NE ARGYLE DR	PORTLAND	OR	97211
GWC FRONT LLC % MC CALL,EDMUND B B	5480 NW FRONT AVE	PORTLAND	OR	97210-1198
GWC FRONT LLC % MC CALL,EDMUND B B	5480 NW FRONT AVE	PORTLAND	OR	97210-1198
GXI INC ATTN: BRIAN SCOTT	1020 SE 11TH AVE	PORTLAND	OR	97214-2507
H H & D C LTD PARTNERSHIP PMB 503	2034 COLUMBIA BLVD	ST HELENS	OR	97051
H&S OREGON, LLC	11250 NE HOLMAN ST	PORTLAND	OR	97220
HADFIELD LIMITED PARTNERSHIP % HADFIELD,WILLIAM W	12811 NW LORRAINE DR	PORTLAND	OR	97229-8349
HADFIELD,WILLIAM W & HADFIELD,TERRIE L	12811 NW LORRAINE DR	PORTLAND	OR	97229-8349
HAFFNER,EVELYN LISINDA % TABAKOV,OLGA	5541 NE 72ND AVE	PORTLAND	OR	97218
HAGEN PROPERTY INVESTMENTS LLC %HAGEN,ROBIN	3532 NE HARRISON DR	ISSAQUAH	WA	98029
HAGENAUER,JAMES C	9000 NE M L KING BLVD SP 228	PORTLAND	OR	97211
HAGERMAN,JOHN	9000 NE M L KING BLVD SP 76	PORTLAND	OR	97211
HAGGSTROM,ESTHER S TR TO STARK STREET GROUP LLC	PO BOX 1862	LAKE OSWEGO	OR	97035
HAGMULLER,REBECCA E & HAGMULLER,ALEX W	4120 SE 24TH AVE	PORTLAND	OR	97202
HAJ INC	3865 NW ST HELENS RD	PORTLAND	OR	97210
HAJ INC	3865 NW ST HELENS RD	PORTLAND	OR	97210

HAJ INC	3865 NW ST HELENS RD	PORTLAND	OR	97210
HAJARIZADEH,MAJID & HAJARIZADEH,LORI	1901 SE GRAND AVE	PORTLAND	OR	97214-4514
HAJEK,DANIEL J	6130 SE 120TH AVE	PORTLAND	OR	97266-4025
HALDEN,JEREMY & RAINE,ROBERTA	G/F 73 PO WAH YUEN	LAMMA	ND	HONG KONG
HALEY'S BIKE ADVENTURE LLC	706 SE M L KING BLVD	PORTLAND	OR	97214
HALL TOOL CO	1724 SE GRAND AVE	PORTLAND	OR	97214-3535
HALL TOOL CO INC	1724 SE GRAND AVE	PORTLAND	OR	97214-3535
HALL,BRIAN C	PO BOX 551	CORBETT	OR	97019-0551
HALL,KENNETH J TR & REYNOLDS INVEST GROUP LLC	650 LIVINGOOD LN	LAKE OSWEGO	OR	97034
HALL,WARREN G & COYLE,SALLYEANA	2107 NW 22ND AVE	PORTLAND	OR	97210-2303
HALLMARK INNS & RESORTS INC	15455 HALLMARK DR	LAKE OSWEGO	OR	97035-3474
HALSTEN,RICHARD & HALSTEN,SUZANNE	333 S STATE ST #V101	LAKE OSWEGO	OR	97034-3948
HALSTEN,RICHARD W & HALSTEN,SUZANNE	333 S STATE ST #V101	LAKE OSWEGO	OR	97034-3948
HALSTEN,RICHARD W & HALSTEN,SUZANNE	333 S STATE ST #V101	LAKE OSWEGO	OR	97034-3948
HAMBLET,GARY TO BENNYCO	1006 SE SALMON ST	PORTLAND	OR	97214
HAMILTON AND MANNING LLC % MANNING,ARDEN P	7821 NE 33RD DR	PORTLAND	OR	97211
HAMILTON,DOLORES A	11622 SE DIVISION ST #93	PORTLAND	OR	97266
HAMILTON,JAMES M	PO BOX 188	BATTLE GROUND	WA	98604
HAND,AARON T & HAND,DONNA A	4312 SE 24TH AVE	PORTLAND	OR	97202
HANLON BROWN LLC	2130 NW 29TH AVE	PORTLAND	OR	97210
HANSEN,BRUCE W ET AL	4865 N LAGOON AVE	PORTLAND	OR	97217-7687
HANSET BROS INC	P O BOX 42193	PORTLAND	OR	97242
HANSET BROS INC	P O BOX 42193	PORTLAND	OR	97242
HANSET BROS INC	P O BOX 42193	PORTLAND	OR	97242
HANSET BROS INC	1105 SE WOODWARD ST	PORTLAND	OR	97202
HANSET STAINLESS INC	PO BOX 11350	PORTLAND	OR	97211
HARBOR 1 LLC	8320 NE HIGHWAY 99	VANCOUVER	WA	98665-8819
HARBOR 1 LLC	8320 NE HIGHWAY 99	VANCOUVER	WA	98665-8819
HARBOR 1 LLC	8320 NE HIGHWAY 99	VANCOUVER	WA	98665-8819
HARGIS,KRISTIAN	956 CAROLINA ST	SAN FRANCISCO	CA	94107-3337
HARKA LTD PARTNERSHIP	3324 SW SEYMOUR ST	PORTLAND	OR	97239-1264
HARMONY INVESTMENT LTD PARTNER	6363 7TH AVE S STE 210	SEATTLE	WA	98108
HARMONY INVESTMENT LTD PARTNER	6363 7TH AVE S STE 210	SEATTLE	WA	98108
HARMONY INVESTMENT LTD PARTNER	6363 7TH AVE S STE 210	SEATTLE	WA	98108

HARMONY INVESTMENT LTD PARTNER	6363 7TH AVE S STE 210	SEATTLE	WA	98108
HARMONY INVESTMENT LTD PARTNER	6363 7TH AVE S STE 210	SEATTLE	WA	98108
HARMONY INVESTMENT LTD PARTNER	6363 7TH AVE S STE 210	SEATTLE	WA	98108
HARMONY INVESTMENT LTD PARTNERSHIP	6363 7TH AVE S STE 210	SEATTLE	WA	98108
HARMONY INVESTMENT LTD PARTNER	6363 7TH AVE S STE 210	SEATTLE	WA	98108
HARMONY INVESTMENT LTD PARTNER	6363 7TH AVE S STE 210	SEATTLE	WA	98108
HARMONY INVESTMENTS LIMITED PARTNERSHIP	6363 7TH AVE S STE 210	SEATTLE	WA	98108
HARMONY INVESTMENTS LIMITED PARTNERSHIP	6363 7TH AVE S STE 210	SEATTLE	WA	98108
HARRIMAN,RONALD W TR	P O BOX 461	TROUTDALE	OR	97060
HARRIS ENTERPRISES INC % TRUAX HARRIS ENERGY LLC	3077 NW ST HELENS RD	PORTLAND	OR	97210-2043
HARRIS ENTERPRISES INC % TRUAX HARRIS ENERGY LLC	3077 NW ST HELENS RD	PORTLAND	OR	97210-2043
HARRIS PROPERTY HOLDINGS LLC	3077 NW ST HELENS RD	PORTLAND	OR	97210
HARRIS PROPERTY HOLDINGS LLC	3077 NW ST HELENS RD	PORTLAND	OR	97210
HARRIS,MARTHA A TR	2822 NE ALAMEDA ST	PORTLAND	OR	97212
HARRIS,NEAL D & HARRIS,STEVEN C	4610 SE 27TH AVE	PORTLAND	OR	97202
HARRIS,NEAL D & HARRIS,STEVEN C	4610 SE 27TH AVE	PORTLAND	OR	97202
HARRIS,WILLIAM R TR & HARRIS,BRENT R TR % TRUAX HARRIS ENER	3077 NW ST HELENS RD	PORTLAND	OR	97210
HARROLD,WILLIAM W & CHARLOTTE	6941 N ROBERTS AVE	VANCOUVER	WA	97203
HARRY'S REAL ESTATE PARTNERS LLC % HARRY'S FRESH FOODS	17711 NE RIVERSIDE PKWY	PORTLAND	OR	97230-7370
HARSCH INVESTMENT CORP % TAX DEPARTMENT	1121 SW SALMON ST #500	PORTLAND	OR	97205-2022
HARSCH INVESTMENT PROPERTIES LLC ATTN TAX DEPARTMENT	PO BOX 2708	PORTLAND	OR	97208-2708
HARSCH INVESTMENT PROPERTIES LLC ATTN TAX DEPARTMENT	1121 SW SALMON ST SUITE 500	PORTLAND	OR	97205
HARSCH INVESTMENT PROPERTIES LLC ATTN TAX DEPARTMENT	1121 SW SALMON ST SUITE 500	PORTLAND	OR	97205
HARSCH INVESTMENT PROPERTIES LLC ATTN TAX DEPT	1121 SW SALMON ST	PORTLAND	OR	97205
HARSCH INVESTMENT PROPERTIES- STOCKYARDS LLC ATTN TAX DEI	1121 SW SALMON ST SUITE 500	PORTLAND	OR	97205
HARTMAN,THOMAS G & HARTMAN,THOMAS	8310 N BRANDON AVE	PORTLAND	OR	97217-6806
HARTMAN,THOMAS G & HARTMAN,TOM	8310 N BRANDON AVE	PORTLAND	OR	97217-6806
HARVEST HOMES INC	6921 N ROBERTS AVE	PORTLAND	OR	97203-6361
HASKINS,MARIAN S	16890 SE 80TH PL	PORTLAND	OR	97216-3183
HASKINS,MARIAN S	16890 SE 80TH PL	PORTLAND	OR	97216-3183
HATTEN,MARK	4635 NE CRYSTAL LN	PORTLAND	OR	97218-1155
HATTEN,MARK P	4635 NE CRYSTAL LN	PORTLAND	OR	97218-1155
HATTEN,MARK P	4635 NE CRYSTAL LN	PORTLAND	OR	97218-1155

HAWAII TWENTY-O LLC % DOUG BEAN & ASSOCIATES INC ATTN BEA	1211 SW 5TH AVE #1440	PORTLAND	OR	97204
HAWAII TWENTY-O LLC % DOUG BEAN & ASSOCIATES INC ATTN BEA	1211 SW 5TH AVE #1440	PORTLAND	OR	97204
HAWAII TWENTY-O LLC % DOUG BEAN & ASSOCIATES INC ATTN BEA	1211 SW 5TH AVE #1440	PORTLAND	OR	97204
HAWKINS,ELMER A TR & HAWKINS,CATHERINE R TR %OREGON DEC	11050 SW DENNEY RD	BEAVERTON	OR	97008
HAWKINS,MARTHA M /STRIETZEL,ROSS % WETHERELL,RICHARD	18303 N GILA SPRINGS DR	SURPRISE	AZ	85374
HAWKINS,SHANNON K TR	15113 SE EVERGREEN HWY	VANCOUVER	WA	98683-9205
HAWKINS,SHANNON K TR	15113 SE EVERGREEN HWY	VANCOUVER	WA	98683-9205
HAWTHORNE BLOCK LLC % MENASHE,R BARRY	621 SW ALDER ST #800	PORTLAND	OR	97205
HAWTHORNE BLOCK LLC % MENASHE,R BARRY	621 SW ALDER ST #800	PORTLAND	OR	97205
HAWTHORNE BLOCK LLC % MENASHE,R BARRY	621 SW ALDER ST #800	PORTLAND	OR	97205
HAWTHORNE DEPOT LLC	500 E BROADWAY ST	VANCOUVER	WA	98660-3321
HAWTHORNE DEPOT LLC	500 E BROADWAY ST	VANCOUVER	WA	98660-3321
HAWTHORNE DEPOT LLC	500 E BROADWAY ST	VANCOUVER	WA	98660-3321
HAYDAY PROPERTIES LLC	532 SE CLAY ST	PORTLAND	OR	97214
HAYDEN MEADOWS % MEADOWS LAND PARTNERSHIP	805 SW BROADWAY #2020	PORTLAND	OR	97205-3360
HAYDEN MEADOWS % MEADOWS LAND PARTNERSHIP	805 SW BROADWAY #2020	PORTLAND	OR	97205-3360
HAYDEN MEADOWS % MEADOWS LAND PARTNERSHIP	805 SW BROADWAY #2020	PORTLAND	OR	97205-3360
HAYDEN MEADOWS % MEADOWS LAND PARTNERSHIP	805 SW BROADWAY #2020	PORTLAND	OR	97205-3360
HAYDEN MEADOWS % MEADOWS LAND PARTNERSHIP	805 SW BROADWAY #2020	PORTLAND	OR	97205-3360
HAYDEN MEADOWS % MEADOWS LAND PARTNERSHIP	805 SW BROADWAY #2020	PORTLAND	OR	97205-3360
HAYDEN MEADOWS % MEADOWS LAND PARTNERSHIP	805 SW BROADWAY #2020	PORTLAND	OR	97205-3360
HAYDEN MEADOWS % TMT DEVELOPMENT	805 SW BROADWAY #2020	PORTLAND	OR	97205-3360
HAYDEN MEADOWS % TMT DEVELOPMENT	805 SW BROADWAY #2020	PORTLAND	OR	97205-3360
HAYDEN MEADOWS % TMT DEVELOPMENT	805 SW BROADWAY #2020	PORTLAND	OR	97205
HAYDEN MEADOWS % TMT DEVELOPMENT	805 SW BROADWAY #2020	PORTLAND	OR	97205-3360
HAYDEN MEADOWS % TMT DEVELOPMENT	805 SW BROADWAY #2020	PORTLAND	OR	97205-3360
HAYDEN MEADOWS % TMT DEVELOPMENT	805 SW BROADWAY #2020	PORTLAND	OR	97205
HAYDEN MEADOWS % TMT DEVELOPMENT	805 SW BROADWAY #2020	PORTLAND	OR	97205-3360
HAYDEN OPB PARTNERS LLC	111 SW COLUMBIA ST #1380	PORTLAND	OR	97201

HAYDEN,ALAN T & EDITH H	6223 NE HASSALO ST	PORTLAND	OR	97213-4347
HAYES,KEVIN & HAYES,MELISSA	2404 SE GLADSTONE ST	PORTLAND	OR	97202
HAYFORD,ELIZABETH A TR & HALVO % ESP PROPERTY FACTORS INC	PO BOX 1547	LAKE OSWEGO	OR	97035
HAYFORD,ELIZABETH A TR & HALVO % ESP PROPERTY FACTORS INC	PO BOX 1547	LAKE OSWEGO	OR	97035
HB & B ENTERPRISES LLC ATTN: HEIBERG,BRIAN	PO BOX 22069	PORTLAND	OR	97269-2069
HCO PORTLAND PROPERTIES LLC % WILLIAMS,SCOTT A	PO BOX 659	SPRINGFIELD	OR	97477-0121
HD DEVELOPMENT OF MARYLAND INC> %HOME DEPOT USA INC	PO BOX 105842	ATLANTA	GA	30348-5842
HD FAB LLC	1800 SE PERSHING ST	PORTLAND	OR	97202
HD PROPERTIES LLC	1800 SE PERSHING ST	PORTLAND	OR	97202
HD PROPERTIES LLC	1800 SE PERSHING ST	PORTLAND	OR	97202
HDRT LLC % DICK,GERALDINE A	22720 SW STAFFORD RD	TUALATIN	OR	97062-6783
HDRT LLC % DICK,GERALDINE A	22720 SW STAFFORD RD	TUALATIN	OR	97062-6783
HEADDING,DANNY J & DONNA R TO FONVERGNE,LIONEL J & LISA	P O BOX 1277	CLACKAMAS	OR	97015
HEADDING,DANNY J & HEADDING,DONNA R TO FONVERGE,LIONEL	P O BOX 1277	CLACKAMAS	OR	97015
HEARD,WILLIAM A TO HEARD,WILLIAM L & JOETTA	1848 NE 116TH PL	PORTLAND	OR	97220-1925
HEARD,WILLIAM A TO HEARD,WILLIAM L & JOETTA	1848 NE 116TH PL	PORTLAND	OR	97220-1925
HEATH,GREG & LINDA	13472 SW 63RD PL	PORTLAND	OR	97219
HEATH,GREG & LINDA	13472 SW 63RD PL	PORTLAND	OR	97219
HEATH,GREGORY K & LINDA S	10001 SE POWELL BLVD	PORTLAND	OR	97266
HEATH,GREGORY K & LINDA S	10001 SE POWELL BLVD	PORTLAND	OR	97266
HEATH,GREGORY K & LINDA S	10001 SE POWELL BLVD	PORTLAND	OR	97266
HEATH,GREGORY K & LINDA S	10001 SE POWELL BLVD	PORTLAND	OR	97266
HEGELE,CHARLES G JR & HEGELE,CARLLEEN C	7950 N LONE PINE RD	CRKD RVR RNCH	OR	97760
HEGELE,CHARLES G JR & HEGELE,CARLLEEN C	7950 N LONE PINE RD	CRKD RVR RNCH	OR	97760
HEGELE,CHARLES G JR & HEGELE,CARLLEEN C	7950 N LONE PINE RD	CRKD RVR RNCH	OR	97760
HEGELE,CHARLES G JR & HEGELE,CARLLEEN C	7950 N LONE PINE RD	CRKD RVR RNCH	OR	97760
HEGSTAD,CLIFTON E & HEGSTAD,GUY A & HEGSTAD,DOREEN F	29421 E WOODARD RD	TROUTDALE	OR	97060-9313
HEIDELBERG PRINT FINANCE	PO BOX 198332	ATLANTA	GA	30384
HEIMERDINGER,ULRICH & MARGARET	14345 NE MORRIS CT	PORTLAND	OR	97230
HEIPLE,SETH R & REGAN,TIMOTHY M & ENGERT,COLLEEN B	3525 NE 50TH AVE #203	PORTLAND	OR	97213
HEITMAN HOLDINGS INC	2830 E CORONADO ST	ANAHEIM	CA	92806
HEITMAN HOLDINGS INC	2830 E CORONADO ST	ANAHEIM	CA	92806
HELSER TERMINAL CO L L C % HELSER BROS TRANSFER CO ATTN HEI	P O BOX 83183	PORTLAND	OR	97283-0183
HEMMERT,R LYNNE & HEMMERT,DIANN B	4261 CALAROGA DR	WEST LINN	OR	97068-1030

HENDERSON,GLORIA M	1915 SE PERSHING ST	PORTLAND	OR	97202-2339
HENDRICKS COMMERCIAL PROPERTIES LLC	525 3RD ST #300	BELOIT	WI	53511-6272
HENKELS & MC COY INC % ACCOUNTING DEPT	985 JOLLY RD	BLUE BELL	PA	19422
HENKELS & MC COY INC % ACCOUNTING DEPT	985 JOLLY RD	BLUE BELL	PA	19422
HENNES,GREGORY L & LEACH,JUSTIN D	PO BOX 135	JOSEPH	OR	97846-0135
HENRY P OSERAN & ASSOCIATES	P O BOX 10067	PORTLAND	OR	97210-0067
HENRY ST PROPERTIES LLC	10811 SE IDLEMAN RD	HAPPY VALLEY	OR	97086-2109
HERBERT MALARKEY ROOFING CO	PO BOX 17217	PORTLAND	OR	97217-0217
HERBERT MALARKEY ROOFING CO	PO BOX 17217	PORTLAND	OR	97217-0217
HERBERT MALARKEY ROOFING CO	PO BOX 17217	PORTLAND	OR	97217-0217
HERITAGE WATUMULL LLC	307 LEWERS ST 6TH FLOOR	HONOLULU	HI	96815-2364
HERMAN,STAN	5609 NE 60TH AVE	VANCOUVER	WA	98661
HERMAN,STAN	5609 NE 60TH AVE	VANCOUVER	WA	98661
HERMAN,STANLEY R	2817 SW BERTHA BLVD	PORTLAND	OR	97201-1103
HERMAN,STANLEY R & HERMAN,VICKI L	2335 N CLARK AVE	PORTLAND	OR	97227-1747
HERMAN,STANLEY R & HERMAN,VICKI L	2335 N CLARK AVE	PORTLAND	OR	97227-1747
HERMAN,STANLEY R & VICKI L	2817 SW BERTHA BLVD	PORTLAND	OR	97239-1103
HERMAN,STANLEY R & VICKI L	2817 SW BERTHA BLVD	PORTLAND	OR	97239-1103
HERMAN,STANLEY R & VICKI L	2817 SW BERTHA BLVD	PORTLAND	OR	97239-1103
HERNANDEZ AYALA,JUAN M	5024 N MISSOURI AVE	PORTLAND	OR	97217
HERNANDEZ BARRERA,CELESTINO & NIEVES HERNANDEZ,ELVIRA	9000 NE M L KING BLVD SP 91	PORTLAND	OR	97211
HERNANDEZ NIEVES,MARIA CARMEN	9000 NE MLK BLVD SP 51	PORTLAND	OR	97211
HERON LEASING COMPANY % COLUMBIA STEEL CASTING CO INC	P O BOX 83095	PORTLAND	OR	97283-0095
HERON LEASING COMPANY % COLUMBIA STEEL CASTING CO INC	P O BOX 83095	PORTLAND	OR	97283-0095
HERON LEASING COMPANY % COLUMBIA STEEL CASTING CO INC	P O BOX 83095	PORTLAND	OR	97283-0095
HERROLD,WILLIAM N TR-25% & HERROLD,MARILYN R TR-75%	10285 SW WASCO WAY	TUALATIN	OR	97062-7089
HERROLD,WILLIAM N TR-25% & HERROLD,MARILYN R TR-75%	10285 SW WASCO WAY	TUALATIN	OR	97062-7089
HESS,OSKAR	8965 SE DIVISION ST	PORTLAND	OR	97266-1447
HESS,OSKAR TR	8965 SE DIVISION ST	PORTLAND	OR	97266-1447
HESS,OSKAR TR	8965 SE DIVISION ST	PORTLAND	OR	97266-1447
HESS,OSKAR TR	8965 SE DIVISION ST	PORTLAND	OR	97266-1447
HESS,OSKAR TR	8965 SE DIVISION ST	PORTLAND	OR	97266-1447
HESS,OSKAR TR (OSKAR HESS LIVING TRUST)	8965 SE DIVISION ST	PORTLAND	OR	97266-1447
HESS,OSKAR TR (OSKAR HESS LIVING TRUST)	8965 SE DIVISION ST	PORTLAND	OR	97266-1447

HESS,OSKAR TR (OSKAR HESS LIVING TRUST)	8965 SE DIVISION ST	PORTLAND	OR	97266-1447
HESSEL TRACTOR & EQUIP CO /HESSEL,BRAD %PAPE MACHINERY IN	PO BOX 10527	EUGENE	OR	97440
HICHI INVESTMENT LLC	PO BOX 52	LAKE OSWEGO	OR	97034-0006
HICKORY SPRINGS OF CALIFORNIA INC	PO BOX 128	HICKORY	NC	28603-0128
HICKORY SPRINGS OF CALIFORNIA INC	PO BOX 128	HICKORY	NC	28603-0128
HICKS,DONALD L & LYNN M	5026 NE BUFFALO ST	PORTLAND	OR	97218-1150
HIDDEN SPRINGS LIMITED PARTNERSHIP> % ELLIOTT ASSOCIATES	901 NE GLISAN ST	PORTLAND	OR	97232-2730
HIGH-TEMP NW INC	14025 N RIVERGATE BLVD	PORTLAND	OR	97203
HILDEBRANDT,MICHAEL & BARBARA	PO BOX 893	LAKE OSWEGO	OR	97034
HILDEBRANDT,MICHAEL & BARBARA	PO BOX 893	LAKE OSWEGO	OR	97034
HILL,ROBERT TR & HILL,SARAH TR	2309 SE 137TH AVE	PORTLAND	OR	97233-2009
HILL,SCOTT L TO KREUTZ,RANDALL W	3055 NW YEON AVE #63	PORTLAND	OR	97210
HILL,SCOTT TO KREUTZ,RANDALL W	3055 NW YEON AVE #63	PORTLAND	OR	97210
HILL,VALLERIE G & G MEL	3721 NE 134TH AVE	PORTLAND	OR	97230
HILLARD,MICHAEL A	9819 SE FOSTER RD	PORTLAND	OR	97266
HILTON HOTEL CORP DBA: DOUBLE TREE LAUNDRY	755 CROSSOVER LN	MEMPHIS	TN	38117
HIRIGARAY,JEAN-CLAUDE TR & HIRIGARAY,PAMELA S TR	PO BOX 254	TROUTDALE	OR	97060-0254
HIRIGARAY,JEAN-CLAUDE TR & HIRIGARAY,PAMELA S TR	PO BOX 254	TROUTDALE	OR	97060-0254
HIRIGARAY,JEAN-CLAUDE TR & HIRIGARAY,PAMELA S TR	PO BOX 254	TROUTDALE	OR	97060-0254
HIRIGARAY,JEAN-CLAUDE TR & HIRIGARAY,PAMELA S TR	PO BOX 254	TROUTDALE	OR	97060-0254
HIRIGARAY,JEAN-CLAUDE TR & HIRIGARAY,PAMELA S TR	PO BOX 254	TROUTDALE	OR	97060-0254
HIRIGARAY,PAMELA S TR	PO BOX 254	TROUTDALE	OR	97060-0254
HIRSCH HOUSE LLC %KBC MANAGEMENT INC	2107 NW 23RD AVE	PORTLAND	OR	97210
HI-SCHOOL PROPERTIES LLC	915 W 11TH ST #100	VANCOUVER	WA	98660-3058
HI-SCHOOL PROPERTIES LLC	915 W 11TH ST #100	VANCOUVER	WA	98660-3058
HISEY,JAY ALAN	1216 SE 151ST AVE	PORTLAND	OR	97233
HISTORIC COLUMBIAN CEMETERY	PO BOX 261	BRIGHTWOOD	OR	97011-0261
HITCHCOCK,WALTER A & HITCHCOCK,KRISTI	280 E BUFFINGTON LN	SHELTON	WA	98584
HITCHCOCK,WALTER A & HITCHCOCK,KRISTI	280 E BUFFINGTON LN	SHELTON	WA	98584
HITCHCOCK,WALTER A & HITCHCOCK,KRISTI	280 E BUFFINGTON LN	SHELTON	WA	98584
HITCHCOCK,WALTER A & HITCHCOCK,KRISTI	280 E BUFFINGTON LN	SHELTON	WA	98584
HITCHCOCK,WALTER A & HITCHCOCK,KRISTI	280 E BUFFINGTON LN	SHELTON	WA	98584
HO INVESTMENTS LLC	7610 SE TAGGART CT	PORTLAND	OR	97206

HO INVESTMENTS LLC	7610 SE TAGGART CT	PORTLAND	OR	97206
HO INVESTMENTS LLC	7610 SE TAGGART CT	PORTLAND	OR	97206
HO INVESTMENTS LLC	7610 SE TAGGART CT	PORTLAND	OR	97206
HOAH PROPERTIES LLC	3439 NE SANDY BLVD PMB 106	PORTLAND	OR	97232
HOAH PROPERTIES LLC	3439 NE SANDY BLVD PMB 106	PORTLAND	OR	97232
HOAH PROPERTIES LLC	3439 NE SANDY BLVD PMB 106	PORTLAND	OR	97232
HOAH PROPERTIES LLC	3439 NE SANDY BLVD PMB 106	PORTLAND	OR	97232
HODES,STANLEY A TR & HODES,SHIRLEY TR %TRANSMISSION EXCH# 1803 NE M L K BLVD		PORTLAND	OR	97212
HODES,STANLEY A TR & HODES,SHIRLEY TR %TRANSMISSION EXCH# 1803 NE M L K BLVD		PORTLAND	OR	97212
HODES,STANLEY A TR & HODES,SHIRLEY TR %TRANSMISSION EXCH# 1803 NE M L K BLVD		PORTLAND	OR	97212
HOFER,HEINZ W & HOFER,CELIA A	8115 SE OGDEN ST	PORTLAND	OR	97206
HOFFERT,PATRICK S-1/2 & GONROWSKI,DONALD S-1/2	2525 NE COLUMBIA BLVD	PORTLAND	OR	97211
HOFFMANN,C BUDD	2131 N SCHOFIELD ST	PORTLAND	OR	97217
HOLGATE BUILDING L L C	4000 SE TENINO ST	PORTLAND	OR	97202
HOLGATE HOLDING CO LLC	4605 SE 31ST AVE	PORTLAND	OR	97202-3639
HOLGATE SHOP PROPERTIES LLC	1511 SE HOLGATE BLVD	PORTLAND	OR	97202-4718
HOLLABAUGH,BRADFORD A ET AL	PO BOX 42529	PORTLAND	OR	97242-0529
HOLLABAUGH,BRADFORD A ET AL	PO BOX 42529	PORTLAND	OR	97242-0529
HOLLABAUGH,CHRISTOPHER J TR ET AL % HOLLABAUGH BROS & AS	3028 SE 17TH AVE	PORTLAND	OR	97202
HOLLY SALES & SERVICE OF OREGO	1961 PARK FOREST AVE	LAKE OSWEGO	OR	97034-6859
HOLMAN,GARY K & CELESTE L % HOLMAN BLDG MAIN CO	2801 SE 9TH AVE	PORTLAND	OR	97202
HOLMAN/DE WITT L L C	2737 - 78TH AVE SE #201	MERCER ISLAND	WA	98040
HOLMAN/DE WITT L L C	2737 - 78TH AVE SE #201	MERCER ISLAND	WA	98040
HOLMES,TIMOTHY J TR & HOLMES,LEA ANNE TR	217 NE 8TH AVE	PORTLAND	OR	97232
HONCO INVESTMENT COMPANY LLC	PO BOX 547	SAN JOSE	CA	95106-0547
HONCO INVESTMENT COMPANY LLC	PO BOX 547	SAN JOSE	CA	95106-0547
HONCO INVESTMENT COMPANY LLC	PO BOX 547	SAN JOSE	CA	95106-0547
HONEY LLC	21400 SE TILLSTROM RD	DAMASCUS	OR	97089-6026
HONEY LLC	21400 SE TILLSTROM RD	DAMASCUS	OR	97089-6026
HONEY LLC	21400 SE TILLSTROM RD	DAMASCUS	OR	97089-6026
HONEYCUTT ENTERPRISES LLC	16113 NW 27TH CT	VANCOUVER	WA	98685
HONEYCUTT ENTERPRISES LLC	16113 NW 27TH CT	VANCOUVER	WA	98685
HONEYCUTT ENTERPRISES LLC	16113 NW 27TH CT	VANCOUVER	WA	98685
HONEYCUTT ENTERPRISES LLC	16113 NW 27TH CT	VANCOUVER	WA	98685

HONEYCUTT,EDWIN E JR TR & HONEYCUTT,ETHEL L TR	PO BOX 4075	SEQUIM	WA	98382
HOOD,SALLY J	9912 N DECATUR ST	PORTLAND	OR	97203-2814
HOPMAN,LEO R TR & HOPMAN,MOLLY TR	10619 SE 77TH AVE	MILWAUKIE	OR	97222-1101
HOPP,FRED J	2910 BRANDYWINE DR	WEST LINN	OR	97068-8313
HOPP,FRED J	2910 BRANDYWINE DR	WEST LINN	OR	97068-8313
HOPP,FRED J	2910 BRANDYWINE DR	WEST LINN	OR	97068-8313
HORINE,DANIEL P	850 N GRAHAM ST	PORTLAND	OR	97227-1606
HORINE,DANIEL P	850 N GRAHAM ST	PORTLAND	OR	97227-1606
HORMBY,KIMBERLY M & BIEGLER,MITCHELL W	29702 NICEWOOD DR	HALSEY	OR	97348
HORN,GEORGIA R	7121 SE 83RD AVE	PORTLAND	OR	97266
HORNING,SHIRLEYANN K TR	2911 SE VILLAGE LOOP #305	VANCOUVER	WA	98683-8107
HORTON,JAMES D TR & JACKSON,HARRIETT B TR	PO BOX 10067	PORTLAND	OR	97296-0067
HOUSING AUTHORITY OF PORTLAND	135 SW ASH ST #500	PORTLAND	OR	97204-3540
HOWATT,LESLIE J	5514 NE HALSEY ST	PORTLAND	OR	97213-3660
HOWATT,LESLIE J ET AL	5514 NE HALSEY ST	PORTLAND	OR	97213-3660
HOWATT,LESLIE J ET AL	5514 NE HALSEY ST	PORTLAND	OR	97213-3660
HOWATT,LESLIE J TR & HOWATT,NINA A TR	5514 NE HALSEY ST	PORTLAND	OR	97213
HOWATT,LESLIE J TR & HOWATT,NINA A TR	5514 NE HALSEY ST	PORTLAND	OR	97213
HOWSER STEEL INC	8235 N KERBY AVE	PORTLAND	OR	97217
HOWSER,T R & HOWSER,BONNIE R	6800 SW 37TH AVE	PORTLAND	OR	97219-1668
HOWSER,T R & HOWSER,BONNIE RAE	6800 SW 37TH AVE	PORTLAND	OR	97219
HOWSER,T R & HOWSER,BONNIE RAE	6800 SW 37TH AVE	PORTLAND	OR	97219
HOWSER,T R & HOWSER,BONNIE RAE	6800 SW 37TH AVE	PORTLAND	OR	97219
HOWSER,T R & HOWSER,BONNIE RAE	6800 SW 37TH AVE	PORTLAND	OR	97219
HOWSER,T R & HOWSER,BONNIE RAE	6800 SW 37TH AVE	PORTLAND	OR	97219
HOWSER,T R & HOWSER,BONNIE RAE	6800 SW 37TH AVE	PORTLAND	OR	97219
HOWSER,T R & HOWSER,BONNIE RAE	6800 SW 37TH AVE	PORTLAND	OR	97219
HOWSER,T R & HOWSER,BONNIE RAE	6800 SW 37TH AVE	PORTLAND	OR	97219
HOWSER,THERON & HOWSER,BONNIE	6800 SW 37TH AVE	PORTLAND	OR	97219
HRA PROPERTIES LLC ATTN: BRAD BOWDEN	6014 N HAIGHT AVE	PORTLAND	OR	97217
HUA,VIEN TRI & LUU,TRAN NGOC	8026 SE ALDER ST	PORTLAND	OR	97215
HUBBARD,RUSSELL K	P O BOX 10607	PORTLAND	OR	97296
HUBBARD,RUSSELL K	P O BOX 10607	PORTLAND	OR	97296
HUBBARD,RUSSELL K	P O BOX 10607	PORTLAND	OR	97296

HUBBARD,RUSSELL K	P O BOX 10607	PORTLAND	OR	97296
HUERTAS,DONACIANO	9000 NE M L KING BLVD SP 247	PORTLAND	OR	97211
HUFFMAN,KURT A & MELONIS,HEATHER	2000 SE 10TH AVE	PORTLAND	OR	97214-4647
HUFFORD,DAVID & PATRICIA D	2939 SE 76TH AVE	PORTLAND	OR	97206-1825
HUFFORD,DAVID & PATRICIA D	2939 SE 76TH AVE	PORTLAND	OR	97206-1825
HUFFORD,DAVID A & PATRICIA D	2939 SE 76TH AVE	PORTLAND	OR	97206-1825
HUISINGA,JEROME A & SWEET,BERT V	5551 NW WILLBRIDGE AVE	PORTLAND	OR	97210-3625
HULING BROS PROPERTIES LLC	19703 41ST AVE S	SEATTLE	WA	98188-5439
HULING BROS PROPERTIES LLC	19703 41ST AVE S	SEATTLE	WA	98188-5439
HULING BROS PROPERTIES LLC	19703 41ST AVE S	SEATTLE	WA	98188-5439
HULING BROS PROPERTIES LLC	19703 41ST AVE S	SEATTLE	WA	98188-5439
HULING,TOM D III & HULING,STEVEN D	PO BOX 13366	SEATTLE	WA	98198-1006
HUMMON,DAVID B-75% & CHICK,GEOFFREY-25%	P O BOX 324	MEDINA	WA	98039
HUOYENG INVESTMENTS LLC	PO BOX 872043	VANCOUVER	WA	98687
HUSSAIN,AZMAT	2925 NE FREMONT DR	PORTLAND	OR	97220-5344
HYDRA-POWER SYSTEMS INC	PO BOX 20549	PORTLAND	OR	97294-0549
HYUNH,MARTIN & DAU,LINH	5302 NE 105TH AVE	PORTLAND	OR	97220
I M A C C CORP % MYERS CONTAINER CORP	8435 NE KILLINGSWORTH ST	PORTLAND	OR	97220
I-205 BUSINESS PARK LLC	9027 NE CLIFF ST	PORTLAND	OR	97220
I-205 BUSINESS PARK LLC	9027 NE CLIFF ST	PORTLAND	OR	97220
IBJTC LEASSING CORP % GRANPAC FOODS	7124 N MARINE DR	PORTLAND	OR	97203
ICON OWNER POOL 1 WEST LLC %INDCOR PROPERTIES INC ATTN: R PO BOX 460169		HOUSTON	TX	77056-8169
ICON OWNER POOL 1 WEST LLC %INDCOR PROPERTIES INC ATTN: R PO BOX 460169		HOUSTON	TX	77056-8169
ICON OWNER POOL 1 WEST LLC %INDCOR PROPERTIES INC ATTN: R PO BOX 460169		HOUSTON	TX	77056-8169
ICON OWNER POOL 1 WEST LLC %INDCOR PROPERTIES INC ATTN: R PO BOX 460169		HOUSTON	TX	77056-8169
ICON OWNER POOL 1 WEST LLC %INDCOR PROPERTIES INC ATTN: R PO BOX 460169		HOUSTON	TX	77056-8169
ICON OWNER POOL 1 WEST LLC %INDCOR PROPERTIES INC ATTN: R PO BOX 460169		HOUSTON	TX	77056-8169
ICON OWNER POOL 1 WEST LLC %INDCOR PROPERTIES INC ATTN: R PO BOX 460169		HOUSTON	TX	77056-8169
ICON OWNER POOL 1 WEST LLC %INDCOR PROPERTIES INC ATTN: R PO BOX 460169		HOUSTON	TX	77056-8169
ICON OWNER POOL 1 WEST LLC %INDCOR PROPERTIES INC ATTN: R PO BOX 460169		HOUSTON	TX	77056-8169
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ICON OWNER POOL 1 WEST LLC %INDCOR PROPERTIES INC ATTN: R PO BOX 460169	HOUSTON	TX	77056-8169
ICON OWNER POOL 1 WEST LLC %INDCOR PROPERTIES INC ATTN: R PO BOX 460169	HOUSTON	TX	77056-8169
ICON OWNER POOL 1 WEST LLC %INDCOR PROPERTIES INC ATTN: R PO BOX 460169	HOUSTON	TX	77056-8169
ICON OWNER POOL 3 WEST LLC % INDCOR PROPERTIES ATTN KLEIN 2 N RIVERSIDE PLZ STE 2350	CHICAGO	IL	60606-2617
ICON OWNER POOL 3 WEST LLC % INDCOR PROPERTIES ATTN KLEIN 2 N RIVERSIDE PLZ STE 2350	CHICAGO	IL	60606-2617
ICON OWNER POOL 3 WEST LLC % INDCOR PROPERTIES ATTN KLEIN 2 N RIVERSIDE PLZ STE 2350	CHICAGO	IL	60606-2617
IMACC CORP BOX #410	3527 MT DIABLO BLVD	LAFAYETTE	CA	94549
IMACC CORP BOX #410	3527 MT DIABLO BLVD	LAFAYETTE	CA	94549
IMACC CORP BOX #410	3527 MT DIABLO BLVD	LAFAYETTE	CA	94549
IMPERIAL TRUCKING INC	PO BOX 83868	PORTLAND	OR	97283-0868
IMPERIAL TRUCKING INC ATTN VAN HYNING,JEFF	PO BOX 83868	PORTLAND	OR	97283-0868
IMPORT AUTO SALVAGE LLC	P O BOX 640	CORVALLIS	OR	97339
INDEPENDENT BREWERS UNITED COR ATTN JEFF MORDACI	445 ST PAUL ST	ROCHESTER	NY	14605
INDEPENDENT BREWERS UNITED COR ATTN JEFF MORDACI	445 ST PAUL ST	ROCHESTER	NY	14605
INDEPENDENT BREWERS UNITED COR ATTN JEFF MORDACI	445 ST PAUL ST	ROCHESTER	NY	14605
INDEPENDENT PROPERTIES LLC	214 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1238
INDEPENDENT PROPERTIES LLC	214 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1238
INDUSTRIAL AVENUE LLC	14915 SW 100TH AVE	TIGARD	OR	97224
INDUSTRIAL AVENUE LLC	14915 SW 100TH AVE	TIGARD	OR	97224
INDUSTRIAL EXPORT CO	3340 NW ST HELENS RD	PORTLAND	OR	97210-1310
INDUSTRIAL EXPORT CO	3340 NW ST HELENS RD	PORTLAND	OR	97210-1310
INFINITY COLUMBIA LLC	17311 NE 40TH ST	VANCOUVER	WA	98682
INKSTER INVESTMENTS LLC	PO BOX 696	LAKE OSWEGO	OR	97034
INKSTER INVESTMENTS LLC	PO BOX 696	LAKE OSWEGO	OR	97034

INKSTER INVESTMENTS LLC	PO BOX 696	LAKE OSWEGO	OR	97034
INKSTER INVESTMENTS LLC	PO BOX 696	LAKE OSWEGO	OR	97034
INKSTER INVESTMENTS LLC	PO BOX 696	LAKE OSWEGO	OR	97034
INKSTER INVESTMENTS LLC	PO BOX 696	LAKE OSWEGO	OR	97034
INKSTER,MARK P TR & LILIENTHAL,KATHRYN TR	930 BULLOCK ST	LAKE OSWEGO	OR	97034
INLAND HOLDINGS INC	PO BOX 83723	PORTLAND	OR	97283
INLAND SEA MARITIME GROUP LLC	11836 SW BREYMAN AVE	PORTLAND	OR	97219
INLAND SEA MARITIME GROUP LLC	11836 SW BREYMAN AVE	PORTLAND	OR	97219
INNOVA PROPERTIES LLC	10405 N MACRUM AVE	PORTLAND	OR	97203
INNOVA PROPERTIES LLC	10405 N MACRUM AVE	PORTLAND	OR	97203
INTEGRATED POWER SERVICES LLC	3 INDEPENDENCE PT #100	GREENVILLE	SC	29615
INTEGRATED POWER SERVICES LLC	2315 NW 21ST PL	GREENVILLE	SC	97210
INTELI COAT TECHNOLOGIES ATTN:MOORE,TOM	28 GAYLORD ST	SOUTH HADLEY	MA	1075
INTERMOUNTAIN INVESTMENT PROPE % THOMPSON,JOSEPH W	8040 NE 33RD DR	PORTLAND	OR	97211
INTERMOUNTAIN INVESTMENT PROPE % THOMPSON,JOSEPH W	8040 NE 33RD DR	PORTLAND	OR	97211
INTERMOUNTAIN INVESTMENT PROPE % THOMPSON,JOSEPH W	8040 NE 33RD DR	PORTLAND	OR	97211
INTERNATIONAL CORPORATE CENTER % PACIFIC REALTY ASSOC L P	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
INTERNATIONAL CORPORATE CENTER % PACIFIC REALTY ASSOC L P	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
INTERNATIONAL MILLS SERV CO>	1155 BUSINESS CENTER DR #20	HORSHAM	PA	19044-3454
INTERNATIONAL PAPER CO %XPEDX - MTC 127I	6285 TRI-RIDGE BLVD	LOVELAND	OH	45140
INTERNATIONAL RAW MATERIALS LT % PUBLIC LEDGER BLDG #700	150 S INDEPENDENCE MALL WEST	PHILADELPHIA	PA	19106
INTERNATIONAL RAW MATERIALS LT % PUBLIC LEDGER BLDG #700	150 S INDEPENDENCE MALL WEST	PHILADELPHIA	PA	19106
INTERSTATE BUILDING LLC	412 NW COUCH ST #220	PORTLAND	OR	97209
INTERSTATE CROSSROADS LLC % SPECHT PROPERTIES,INC	102600 SW GREENBURG RD STE 1	PORTLAND	OR	97223-5511
INTERSTATEAVE LLC %WRIGHT,WILLIAM S & WRIGHT,JANET C	809 N RUSSELL ST #201	PORTLAND	OR	97227-1731
INTRINSIC VENTURES INC	530 OAK GROVE AVE #201	MENLO PARK	CA	94025-3255
IPC PROPERTY OWNER POOL 3 WEST LLC %INDCOR PROPERTIES	PO BOX 460169	HOUSTON	TX	77056-8169
IPT KELLY POINT DC LLC %IPT	518 17TH ST, 17TH FLR	DENVER	CO	80203
IPT KELLY POINT DC LLC %IPT	518 17TH ST, 17TH FLR	DENVER	CO	80203
IPT KELLY POINT DC LLC %IPT	518 17TH ST, 17TH FLR	DENVER	CO	80203
IPT KELLY POINT DC LLC %IPT	518 17TH ST, 17TH FLR	DENVER	CO	80203
IPT PORTLAND IC LLC % MARVIN F POER AND COMPANY	18818 TELLER AVE #277	IRVINE	CA	92612-1612
IPT PORTLAND IC LLC % MARVIN F POER AND COMPANY	18818 TELLER AVE #277	IRVINE	CA	92612-1612
IPT PORTLAND IC LLC % MARVIN F POER AND COMPANY	18818 TELLER AVE #277	IRVINE	CA	92612-1612

IPT PORTLAND IC LLC % MARVIN F POER AND COMPANY	18818 TELLER AVE #277	IRVINE	CA	92612-1612
IPT PORTLAND IC LLC % MARVIN F POER AND COMPANY	18818 TELLER AVE #277	IRVINE	CA	92612-1612
IPT PORTLAND IC LLC % MARVIN F POER AND COMPANY	18818 TELLER AVE #277	IRVINE	CA	92612-1612
IPT PORTLAND IC LLC % MARVIN F POER AND COMPANY	18818 TELLER AVE #277	IRVINE	CA	92612-1612
IRON FIREMAN BUILDING LLC %SCANLANKEMPERBARD CO LLC	810 NW MARSHALL ST #300	PORTLAND	OR	97209
IRON FIREMAN BUILDING LLC %SCANLANKEMPERBARD CO LLC	810 NW MARSHALL ST #300	PORTLAND	OR	97209
IRON MOUNTAIN INFORMATION MANAGEMENT LLC ATTN: REAL ES	1 FEDERAL ST	BOSTON	MA	02110-2012
IRON MOUNTAIN INFORMATION MANAGEMENT LLC ATTN: REAL ES	1 FEDERAL ST	BOSTON	MA	02110-2012
IRVJOY 3RD GENERATION CORP (FORT JAMES NW LLC) %GEORGIA-F	PO BOX 105681	ATLANTA	GA	30348
IRVJOY 3RD GENERATION CORP (FORT JAMES NW LLC) %GEORGIA-F	PO BOX 105681	ATLANTA	GA	30348
IRWIN HODSON GROUP LLC	17 TANTRAMAR CRESCENT	AMHERST	NS	B4H 4J6 CA
IRWIN-HODSON CO	2838 SE 9TH AVE	PORTLAND	OR	97202-2509
IRWIN-HODSON SCREW MACHINE & STAMPING INC ATTN: ACCOUN	2808 SE 9TH AVE	PORTLAND	OR	97202-2509
ISAAK,KRISTINA	9000 NE M L KING BLVD SP 56	PORTLAND	OR	97211
ITEL AIRPORT WAY LLC % ITEL,EARL & LORIS	12155 SW TUALATIN SHERWOOD	TUALATIN	OR	97062
ITT CAPITAL % TREASURE CHEST ADVERTISING SPECIALIZED TAX SER	462 SOUTH CORONA MALL	CORONA	CA	91719
IVERS,MARGARET TR ET AL % HATFIELD,JANET	201 NW 52ND ST	VANCOUVER	WA	98663-1217
IVEY PROPERTIES LLC	21423 NE HALSEY ST	FAIRVIEW	OR	97024
IVY,JERRY L TR % AUTO-CHLOR	450 FERGUSON DR	MOUNTAIN VIEW	CA	94043-5214
J E M S CORP	3327 SE 68TH AVE	PORTLAND	OR	97206-2609
J R PROPERTIES % MARTIN SPROCKET & GEAR INC ATTN BIRD,ARTH	P O BOX 91588	ARLINGTON	TX	76015-0088
J R SIMPLOT COMPANY ATTN CINDY BENNETT	PO BOX 27	BOISE	ID	83707
J R SIMPLOT COMPANY ATTN CINDY BENNETT	PO BOX 27	BOISE	ID	83707
J R SIMPLOT COMPANY ATTN CINDY BENNETT	PO BOX 27	BOISE	ID	83707
J R SIMPLOT COMPANY ATTN CORPORATE TAX DEPARTMENT	PO BOX 27	BOISE	ID	83707-0027
J R SIMPLOT COMPANY ATTN CORPORATE TAX DEPARTMENT	PO BOX 27	BOISE	ID	83707-0027
J R ZUKIN CORPORATION	PO BOX 331	THE DALLES	OR	97058-0331
J V & D PROPERTIES LLC	PO BOX 2772	EUGENE	OR	97402
J V & D PROPERTIES LLC	PO BOX 2772	EUGENE	OR	97402
J.A.M. HOLDINGS LLC	21777 OCEAN VISTA DR	LAGUNA BEACH	CA	92651
JACKSON, SANDRA BERNADETTE % CAPPS,LINDA	11847 KEASEY RD	VERNONIA	OR	97064
JACKSON,CHARLES EDWARD & JACKSON,ESTHER L	9000 NE M L KING BLVD SP 054	PORTLAND	OR	97211
JACKSON,GARY L TR TO TEA,KEAT-CHHAY & TEA,KATIE	14505 SE NORTHERN HEIGHTS DR	HAPPY VALLEY	OR	97086-1176
JACKSON,HENRY M & JACKSON,KATHLEEN T	3945 NE BRYANT ST	PORTLAND	OR	97211-2171

JACKSON,ROBERT C TR & JACKSON,CYNTHIA C TR	2705 SW STREAMSIDE DR	PORTLAND	OR	97219
JACKSON,ROBERT C TR & JACKSON,CYNTHIA C TR	2705 SW STREAMSIDE DR	PORTLAND	OR	97219
JACKSON,ROBERT C TR & JACKSON,CYNTHIA C TR	2705 SW STREAMSIDE DR	PORTLAND	OR	97219
JACOBS,DANA L TR ET AL	19153 SW CHESAPEAKE DR	TUALATIN	OR	97062-6706
JACOBS,DANA L TR ET AL	19153 SW CHESAPEAKE DR	TUALATIN	OR	97062-6706
JACOBS,DANA L TR ET AL	19153 SW CHESAPEAKE DR	TUALATIN	OR	97062-6706
JACOBSEN PORTLAND LLC	PO BOX 82155	PORTLAND	OR	97282
JACOBSON,JACOB T	1608 NW RIVERSCAPE ST	PORTLAND	OR	97209-1834
JAM PROPERTIES LLC %MOLLET PRINTING	717 NE LOMBARD ST	PORTLAND	OR	97211-3561
JAMD INVESTMENTS LLC	2337 NW YORK ST 2ND FLOOR	PORTLAND	OR	97210
JAMD INVESTMENTS LLC	2303 NW 23RD AVE	PORTLAND	OR	97210-2143
JAMES RIVER CORP FORT JAMES CORP LAND & PROPERTY TAX	349 NW 7TH AVE	CAMAS	WA	98607
JAMES,JOANNE M	4036 SE FRANCIS ST	PORTLAND	OR	97202
JAMES,JOANNE M	4036 SE FRANCIS ST	PORTLAND	OR	97202
JAMESON PARTNERS LLC	2495 NW NICOLAI ST	PORTLAND	OR	97210-1812
JAMESON PARTNERS LLC	2495 NW NICOLAI ST	PORTLAND	OR	97210-1812
JAMESON PARTNERS LLC	2495 NW NICOLAI ST	PORTLAND	OR	97210-1812
JAMESON PARTNERS LLC	2495 NW NICOLAI ST	PORTLAND	OR	97210-1812
JAMESON PARTNERS LLC	2495 NW NICOLAI ST	PORTLAND	OR	97210-1812
JAMESON PARTNERS LLC	2495 NW NICOLAI ST	PORTLAND	OR	97210-1812
JAMESON PARTNERS LLC	2495 NW NICOLAI ST	PORTLAND	OR	97210-1812
JANA'S CLASSICS INC	P O BOX 1050	TUALATIN	OR	97062
JANTOS,JOHANN & ILEANA M TO TRAN,JOHNSON	5242 NE COLUMBIA BLVD	PORTLAND	OR	97218
JARMAN,AMANDA J	4111 SE 25TH AVE	PORTLAND	OR	97202
JAT LLC	15318 SE 35TH ST	VANCOUVER	WA	98683
JAX EPV LLC	PO BOX 14370	PORTLAND	OR	97293-0370
JAX EPV LLC	PO BOX 14370	PORTLAND	OR	97293-0370
JAX EPV LLC	PO BOX 14370	PORTLAND	OR	97293-0370
JBI PROPERTIES LLC	PO BOX 14866	PORTLAND	OR	97293-0866
JBJ HOLDINGS II LLC % NORRIS, BEGGS & SIMPSON 3200 YEON BUSI	121 SW MORRISON ST STE 200	PORTLAND	OR	97204-3132
JCIMDENNIS LLC	PO BOX 2188	BEAVERTON	OR	97075
JCS PROPERTIES LLC	16427 NE AIRPORT WAY	PORTLAND	OR	97230
JDM - 1702 NE 92ND AVENUE BUILDING LLC	2850 SE 82ND AVE #1	PORTLAND	OR	97266

JDM - 1702 NE 92ND AVENUE BUILDING LLC	2850 SE 82ND AVE #1	PORTLAND	OR	97266
JEAN DENNIS LLC-31% & DENNIS BROTHERS ENTERPRISES LLC-69%	P O BOX 17276	PORTLAND	OR	97217
JEAN VENTURE % CARLA PROPERTIES	633 NW 19TH AVE	PORTLAND	OR	97209
JELINEO,JOHN T & JELINEO,SUZANNE R	PO BOX 86159	PORTLAND	OR	97286
JEMA BITAR MANAGEMENT INC	9828 E BURNSIDE ST #200	PORTLAND	OR	97216-2363
JEMA BITAR MANAGEMENT INC	9828 E BURNSIDE ST #200	PORTLAND	OR	97216-2363
JEMA BITAR PROPERTIES LLC	9828 E BURNSIDE ST #200	PORTLAND	OR	97216-2363
JEMA BITAR PROPERTIES LLC	9828 E BURNSIDE ST #200	PORTLAND	OR	97216-2363
JENKINS & SIMONS PROPERTIES LLC	4325 N COMMERCE ST	PORTLAND	OR	97217
JENNINGS,LYNN A	2124 NW WILSON ST	PORTLAND	OR	97210-2316
JFC LACEY LLC	4800 N CHANNEL AVE	PORTLAND	OR	97217-7616
JGDDP LLC	28552 STATE ROAD 14	WASHOUGAL	WA	98671-7637
JH & IS KWON LLC	1310 NE 148TH PL	VANCOUVER	WA	98684
JIMENEZ,SERGIO SR	3414 SE 21ST AVE #2	PORTLAND	OR	97202
JM & LJ LLC	2310 NW 24TH AVE	PORTLAND	OR	97210
JM & LJ LLC	2310 NW 24TH AVE	PORTLAND	OR	97210
JM & LJ LLC	2310 NW 24TH AVE	PORTLAND	OR	97210
JME17 LLC	5135 NW ST HELENS RD	PORTLAND	OR	97210-1131
JMP INC	8000 SE ROOTS RD	MILWAUKIE	OR	97267
JOE CAL JR PROPERTIES LLC	10755 SE 92ND AVE	HAPPY VALLEY	OR	97086
JOE'S TEXACO INC	232 NE MIDDLEFIELD RD	PORTLAND	OR	97211
JOHNSON PORTLAND LLC	20205 59TH PL S	KENT	WA	98032
JOHNSON PORTLAND LLC	20205 59TH PL S	KENT	WA	98032
JOHNSON PORTLAND LLC	20205 59TH PL S	KENT	WA	98032
JOHNSON PORTLAND LLC	20205 59TH PL S	KENT	WA	98032
JOHNSON PORTLAND LLC	20205 59TH PL S	KENT	WA	98032
JOHNSON,BRUCE S & COLLEEN MAE TO PATEL,BABUBHAI N ET UX	11144 NE SANDY BLVD	PORTLAND	OR	97220-2554
JOHNSON,JOAN C TR	20419 NE 10TH AVE	RIDGEFIELD	WA	98642
JOHNSON,JOAN C TR	20419 NE 10TH AVE	RIDGEFIELD	WA	98642
JOHNSON,TERRI G & JOHNSON,ELIZABETH A	PO BOX 17616	PORTLAND	OR	97217
JOHNSTON HOLDINGS LLC	9205 NW KAISER RD	PORTLAND	OR	97231
JOHNSTON,STEVE G & JOHNSTON,MICHELLE R	2798 SAN MINETE DR	LIVERMORE	CA	94550-6854
JONES OREGON STEVEDORING CO	PO BOX 10167	PORTLAND	OR	97210-0167
JONES OREGON STEVEDORING CO	PO BOX 10167	PORTLAND	OR	97210-0167

JONES OREGON STEVEDORING CO	PO BOX 10167	PORTLAND	OR	97210-0167
JONES OREGON STEVEDORING CO	PO BOX 10167	PORTLAND	OR	97210-0167
JONES, AARON	6908 NE 63RD AVE	PORTLAND	OR	97218
JONES, LAURIECE HARRISON	8964 N PORTSMOUTH AVE	PORTLAND	OR	97203
JONES,DEBRA C & WARD,JOHN H	PO BOX 1037	ROCKAWAY BEACH	OR	97136-1037
JONES,DEBRA C & WARD,JOHN H	PO BOX 1037	ROCKAWAY BEACH	OR	97136-1037
JONES,META J TR %R & J METAL FABRICATORS INC	PO BOX 17245	PORTLAND	OR	97217
JONES,META J TR %R & J METAL FABRICATORS INC	PO BOX 17245	PORTLAND	OR	97217
JONES,META J TR %R & J METAL FABRICATORS INC	PO BOX 17245	PORTLAND	OR	97217
JONES,TYSON L	9306 NE 72ND AVE	VANCOUVER	WA	98665-9309
JONES,TYSON L & JONES,MARTHA N & BOENER,RICK	12881 NW JACKSON QUARRY RD	HILLSBORO	OR	97124
JONES,TYSON L & JONES,MARTHA N & BOENER,RICK	12881 NW JACKSON QUARRY RD	HILLSBORO	OR	97124
JONES,TYSON L ET AL %RICK BOERNER	12881 NW JACKSON QUARRY RD	HILLSBORO	OR	97124
JORGENSON,JEFFREY	1527 SW 57TH AVE	PORTLAND	OR	97221-2513
JOSEPH LU BUILDING LLC % LU,JOSEPH	PO BOX 483	TUALATIN	OR	97062
JOSEPH LU BUILDING LLC % LU,JOSEPH	PO BOX 483	TUALATIN	OR	97062
JOSEPH R JOSEPHS LLC	16799 SW MCFEE PL	HILLSBORO	OR	97123-9040
JOSEPH T RYERSON & SON INC ATTN TAX DIVISION	2621 W 15TH PL	CHICAGO	IL	60608
JOSEPH ZUKIN OF CALIFORNIA % J R ZUKIN CORP	PO BOX 331	THE DALLES	OR	97058
JOURNAL GRAPHICS INC	2840 NW 35TH AVE	PORTLAND	OR	97210
JOURNAL GRAPHICS INC	2840 NW 35TH AVE	PORTLAND	OR	97210
JOY ENTERPRISES INC	5111 NE FREMONT ST	PORTLAND	OR	97213-1732
JOY ENTERPRISES INC	5111 NE FREMONT ST	PORTLAND	OR	97213-1732
JOY ENTERPRISES INC	5111 NE FREMONT ST	PORTLAND	OR	97213-1732
JPI DEVELOPMENT LTD PRTNRSHP	15 SW COLORADO AVE #G	BEND	OR	97702
JR CASE ENTERPRISES LLC	2309 NE KNOTT ST	PORTLAND	OR	97212-3431
JRJ PROPERTIES LLC	PO BOX 17196	PORTLAND	OR	97217-0196
JRJR INVEST INC	PO BOX 248	BEAVERTON	OR	97075
JUBITZ CORP	P O BOX 11264	PORTLAND	OR	97211
JUBITZ CORPORATION	P O BOX 11264	PORTLAND	OR	97211
JUBITZ CORPORATION % ACCOUNTING DEPT	33 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1233
JUBITZ CORPORATION % ACCOUNTING DEPT	33 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1233
JUBITZ CORPORATION % ACCOUNTING DEPT	33 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1233
JUBITZ CORPORATION % ACCOUNTING DEPT	33 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1233

JUPPENLATZ,NEIL H	4949 SE 26TH AVE	PORTLAND	OR	97202-4603
JWP WONG REAL ESTATE LLC	3300 NW 185TH AVE #303	PORTLAND	OR	97229-3406
JZ PROPERTY MANAGEMENT LLC	PO BOX 2398	LAKE OSWEGO	OR	97035
K & D HOTEL MANAGEMENT LLC	7622 SE 82ND AVE	PORTLAND	OR	97266
K COMPANY LLC	5200 SE HARNEY DR	PORTLAND	OR	97206-0837
K COMPANY LLC	5200 SE HARNEY DR	PORTLAND	OR	97206-0837
K COMPANY LLC % KRYSZEK, JACOB MNGR	5200 SE HARNEY DR	PORTLAND	OR	97206-0837
K COMPANY LLC % KRYSZEK, JACOB MNGR	5200 SE HARNEY DR	PORTLAND	OR	97206-0837
K F JACOBSEN & CO INC	PO BOX 82245	PORTLAND	OR	97282
K F JACOBSEN & CO INC	PO BOX 82245	PORTLAND	OR	97282
K M NIELSEN TRUCKING LIMITED PARTNERSHIP>	640 SW 173RD AVE	ALOHA	OR	97006
KAADY,CHARLES	2545 SW SPRING GARDEN ST #20I	PORTLAND	OR	97219
KACH MACHINE WORKS INC	3838 N BALLAST ST	PORTLAND	OR	97217-7602
KACHLIK-POWELL LLC	911 SW BROADWAY DR	PORTLAND	OR	97201
KAHUT,JOHN T	PO BOX 20035	PORTLAND	OR	97294
KAISER FOUNDATION HEALTH PLAN OF THE NORTHWEST ATTN PRC 500 NE MULTNOMAH ST #100 KP		PORTLAND	OR	97232-2031
KAISER FOUNDATION HEALTH PLAN OF THE NORTHWEST ATTN PRC 500 NE MULTNOMAH ST #100		PORTLAND	OR	97232-2031
KAISER FOUNDATION HEALTH PLAN OF THE NORTHWEST ATTN PRC 500 NE MULTNOMAH ST #100		PORTLAND	OR	97232-2031
KALAMAFONI,VILIAMI B	8821 N PENINSULAR AVE	PORTLAND	OR	97217-7073
KALBERER COMPANY	321 SW 4TH AVE #800	PORTLAND	OR	97204-2330
KAMPFER,DEAN ET AL	3114 DOUGLAS CIR	LAKE OSWEGO	OR	97035
KAMPFER,DEAN-1/2 & TRUTTMAN,PAUK A & MARGUETIRE I-1/2	3114 DOUGLAS CIR	LAKE OSWEGO	OR	97035-3551
KANN,HERMINA TR (KANN FAMILY TRUST)	1628 NE COBURN DR	MCMINNVILLE	OR	97128
KANN,HERMINA TR (KANN FAMILY TRUST)	1628 NE COBURN DR	MCMINNVILLE	OR	97128
KANTO CORPORATION	13424 N WOODRUSH WAY	PORTLAND	OR	97203
KANTO CORPORATION	13424 N WOODRUSH WAY	PORTLAND	OR	97203
KARKHU,VYACHESLAV	11530 NE MORRIS ST	PORTLAND	OR	97220-1719
KARPENKO,YEKATERINA & KARPENKO,VYACHESLAV & KUSHNIRYUK	34550 NE CHAMBERLAIN RD	CORBETT	OR	97019
KARST,ELISABETH S	2510 12TH ST SE	SALEM	OR	97302-2167
KASTER,KENNY	38200 SE RICKERT RD	CORBETT	OR	97019
KASTER,KENNY C	38200 SE RICKERT RD	CORBETT	OR	97019-9715
KATHERINE THERESA LLC %DULCICH, JEFF	PO BOX 1416	CLACKAMAS	OR	97015
KATKE PROPERTIES LLC	1506 NE 150TH AVE	PORTLAND	OR	97230-8610
KAUTH,MICHAEL	4650 SW ORMANDY WAY	PORTLAND	OR	97221-3116

KB PARTNERS LLC	2155 WEST 8TH ST	CINCINNATI	OH	45204-2051
KB PARTNERS LLC	2155 WEST 8TH ST	CINCINNATI	OH	45204-2051
KEARNEY,HAL & KEARNEY,JANICE	101 5TH ST	LAKE OSWEGO	OR	97034
KEARNEY,HAL & KEARNEY,JANICE	101 5TH ST	LAKE OSWEGO	OR	97034
KEENAN,WILLIAM E TR (THE WILLIAM E KEENAN LIVING TRUST)	11325 CULVER BLVD	LOS ANGELES	CA	90066-6007
KEIRSEY,NOLAN J & SHARON R	7325 SE 83RD AVE	PORTLAND	OR	97266-5828
KELLER PORTLAND #28 LLC % MCGIBBON,LAURIE	3209 17TH AVE W	SEATTLE	WA	98119-1708
KELLER,PAUL D & KELLER,KIRSTEN A	3310 FILMORE ST	EUGENE	OR	97405
KELLER,RONALD JAMES	2710 SE COURTNEY RD UNIT 31	MILWAUKIE	OR	97222-8143
KELLY,BRIAN J	2324 SE 8TH AVE	PORTLAND	OR	97214
KELLY,PEGGY A	3002 SE SHERMAN ST	PORTLAND	OR	97214-5661
KELLY,RONDA & KELLY,KEVIN	2004 NW 21ST PL	PORTLAND	OR	97210-2302
KELSEY,BARBARA SUE	9000 NE M L KING BLVD SP 089	PORTLAND	OR	97211-1377
KELT PROPERTIES WEST LLC % DEERING MANAGEMENT GROUP INC	4800 SW MACADAM AVE #120	PORTLAND	OR	97239-3929
KENCO EQUIPMENT LEASE CO	P O BOX 220	TUALATIN	OR	97062
KENNEDY,STANLEY C TR	PO BOX 2329	LAKE OSWEGO	OR	97035
KENNEDY,STANLEY C TR	PO BOX 2329	LAKE OSWEGO	OR	97035
KENNEDY,STANLEY C TR	PO BOX 2329	LAKE OSWEGO	OR	97035
KENNEDY,STANLEY C TR	PO BOX 2329	LAKE OSWEGO	OR	97035
KENNEDY,STANLEY C TR	PO BOX 2329	LAKE OSWEGO	OR	97035
KENNEDY,STANLEY C TR	PO BOX 2329	LAKE OSWEGO	OR	97035-0080
KENNETH LAINE PROPERTIES LLC	9765 SW 170TH AVE	BEAVERTON	OR	97007
KEPPINGER,KATHLEEN	1983 SW CARTER LN	PORTLAND	OR	97201
KEPPLER,PAUL R JR	1438 NE 88TH AVE	PORTLAND	OR	97220-5600
KESSLER,SCOTT & MARY	1052 TROON RD	LAKE OSWEGO	OR	97034-2834
KESSLER,SCOTT & MARY	1052 TROON RD	LAKE OSWEGO	OR	97034-2834
KESTER,BHAJAN A & PONTE,JOSEPH M	1007 SE 12TH AVE	PORTLAND	OR	97214
KEVEDY INC	2211 NW NICOLAI ST #B	PORTLAND	OR	97210
KEY CORPORATE CAPITAL INC % KCCI TAX SERVICES	54 STATE ST 9TH FLR	ALBANY	NY	12207
KEY EQUIPMENT FINANCE, INC	PO BOX 22055	ALBANY	NY	12201-5055
KEY,CARLA	6908 N ROBERTS AVE	PORTLAND	OR	97203-6362
KEY,CARLA	6908 N ROBERTS AVE	PORTLAND	OR	97203-6362
KIASANTANA LLC % MICHAEL KOERNER	3209 NW THURMAN ST	PORTLAND	OR	97210
KIEPER FAMILY LLC	5925 NE PORTLAND HWY	PORTLAND	OR	97218

KIEPER FAMILY LLC % KIEPER,JOHN	15643 NE SISKIYOU CT	PORTLAND	OR	97230
KIEPER FAMILY LLC % KIEPER,JOHN	15643 NE SISKIYOU CT	PORTLAND	OR	97230
KIEPER FAMILY LLC % KIEPER,JOHN	15643 NE SISKIYOU CT	PORTLAND	OR	97230
KIEPER FAMILY LLC % KIEPER,JOHN	15643 NE SISKIYOU CT	PORTLAND	OR	97230
KIEPER FAMILY LLC % KIEPER,JOHN	15643 NE SISKIYOU CT	PORTLAND	OR	97230
KIEPER FAMILY LLC % KIEPER,JOHN	15643 NE SISKIYOU CT	PORTLAND	OR	97230
KIEWIT INFRASTRUCTURE CO % REAL ESTATE DEPARTMENT	1000 KIEWIT PLAZA	OMAHA	NE	68131
KIEWIT INFRASTRUCTURE CO % REAL ESTATE DEPARTMENT	1000 KIEWIT PLAZA	OMAHA	NE	68131
KIEWIT INFRASTRUCTURE CO % REAL ESTATE DEPARTMENT	1000 KIEWIT PLAZA	OMAHA	NE	68131
KIEWIT INFRASTRUCTURE CO % REAL ESTATE DEPARTMENT	1000 KIEWIT PLAZA	OMAHA	NE	68131
KIEWIT INFRASTRUCTURE CO % REAL ESTATE DEPARTMENT	1000 KIEWIT PLAZA	OMAHA	NE	68131
KIFEZGHI,YEMANE ET AL	8424 NE HANCOCK ST	PORTLAND	OR	97220-5531
KILPATRICK PROPERTIES LLC % NISBET,JOHN	8822 SW 51ST AVE	PORTLAND	OR	97219-3355
KILPATRICK PROPERTIES LLC % NISBET,JOHN	8822 SW 51ST AVE	PORTLAND	OR	97219-3355
KIM,SAM MAE	1012 NE COLUMBIA BLVD	PORTLAND	OR	97211
KIM,SAM MAE	1012 NE COLUMBIA BLVD	PORTLAND	OR	97211
KIM,SU YONG & YANG YI %7-ELEVEN INC AV TAX	PO BOX 711	DALLAS	TX	75221-0711
KIM,UL KYU & YOUNG OK	7460 SE 82ND AVE	PORTLAND	OR	97266
KIM,YONG HA & KIM,OK CHUL	15195 NW CHANNA DR	PORTLAND	OR	97229
KIMBALL,STEVEN B & THARP,ARNIE L	3525 NE 50TH AVE #306	PORTLAND	OR	97213
KINDER MORGAN BULK TERMINALS I %PROPERTY TAX DEPT	PO BOX 4372	HOUSTON	TX	77210-4372
KINDER MORGAN BULK TERMINALS I %PROPERTY TAX DEPT	PO BOX 4372	HOUSTON	TX	77210-4372
KINDER MORGAN LIQUIDS TERMINAL ATTN PRIM,GARY L	1100 TOWN AND COUNTRY RD	ORANGE	CA	92868
KINDER MORGAN LIQUIDS TERMINAL ATTN PRIM,GARY L	1100 TOWN AND COUNTRY RD	ORANGE	CA	92868
KING CYCLE GROUP INC	2801 NW NELA ST	PORTLAND	OR	97210
KING CYCLE GROUP INC	2801 NW NELA ST	PORTLAND	OR	97210
KING PROPERTIES LLC	2801 NW NELA ST	PORTLAND	OR	97210
KING,BERDA MAE % CREEKSIDE HOME SERVICES, INC	76988 ATKINS RD	RAINIER	OR	97048
KING,DANIELLE D-68% & KING,RONALD L & JUDITH C-32%	5532 NW WILLBRIDGE AVE	PORTLAND	OR	97210-3626
KING,SCOTT E	8416 RIDPATH DR	LOS ANGELES	CA	90046-7712
KINGSBRIDGE HOLDINGS LLC	150 N FIELD DRIVE STE 193	LAKE FOREST	IL	60045
KINNEY,MICHAEL	1589 SW RIDGE RD	WARRENTON	OR	97146-9442

KIP HOLDINGS CO	805 SW BROADWAY STE 2100	PORTLAND	OR	97205
KIP HOLDINGS CO	805 SW BROADWAY STE 2100	PORTLAND	OR	97205
KIRBY,KENNETH W TR	1205 SCHUMAN LN	PETALUMA	CA	94952-2053
KIRBY,KENNETH W TR	1205 SCHUMAN LA	PETALUMA	CA	94952
KIRKLAND,KAREN % ARC	9000 NE M L KING BLVD, SP 82	PORTLAND	OR	97211
KISSLER,DOUGLAS & KISSLER,KATHERINE	PO BOX 15098	PORTLAND	OR	97293
KISSLER,DOUGLAS & KISSLER,KATHERINE	PO BOX 15098	PORTLAND	OR	97293
KITTRIDGE PARK ASSOCIATES LLC % JAY MANAGEMENT INC	2051 BAY MEADOWS DR	WEST LINN	OR	97068-2288
KITTSON,DONALD E & KITTSON,DOROTHA A /LOWTHER,CHARLES	16765 HWY 47	YAMHILL	OR	97148
KKD LLC	2525 NW ST HELENS RD	PORTLAND	OR	97210-2239
KKD LLC	2525 NW ST HELENS RD	PORTLAND	OR	97210-2239
KLEIN REAL ESTATE HOLDINGS LLC ATTN: KLEIN,MARK A	PO BOX 14656	PORTLAND	OR	97293
KLIKLOK CORP % BUSTOS,SALLY LEASE ADMIN	5224 SNAPFINGER WOODS DR	DECATUR	GA	30035
KLINE,HARRISON III	536 NE FAILING ST	PORTLAND	OR	97212
KLINGE,EARL M TR ET AL	PO BOX 279	AURORA	OR	97002-0279
KLINGE,EARL M TR ET AL	PO BOX 279	AURORA	OR	97002-0279
KLOECKNER METALS CORP	500 COLONIAL CTR PKWY #500	ROSWELL	GA	30076
KNAKAL,EDWARD JR % CENTRAL IMPROVEMENTS	8205 SE HARNEY ST SP 01	PORTLAND	OR	97266
KNEPPER,ARDEN C TR & KNEPPER,JOYCE P TR	10731 SE HILLCREST DR	HAPPY VALLEY	OR	97086
KNEPPER,ARDEN C TR & KNEPPER,JOYCE P TR	10731 SE HILLCREST DR	HAPPY VALLEY	OR	97086
KNEPPER,ARDEN C TR & KNEPPER,JOYCE P TR	10731 SE HILLCREST DR	HAPPY VALLEY	OR	97086
KNIFE RIVER CORPORATION - NW	32260 OLD HWY 34	TANGENT	OR	97389
KNOCKOUT PROPERTIES LLC %TED REES	3468 SW CHELAN DR	WEST LINN	OR	97068
KNOERNSCHILD,JOHN & KIM	P O BOX 30866	PORTLAND	OR	97294
KNOX,MARK R & ZIRK,WILLANNE	6034 NE 60TH AVE	PORTLAND	OR	97218
KNUTSON DEVELOPMENT LLC	1734 NE 47TH AVE	PORTLAND	OR	97213
KO,REYNALDO W S TR	333 NE 45TH AVE	PORTLAND	OR	97213-2310
KOBBE,PRISCILLA A TR-1/2 & KOBBE,PRISCILLA A TR-1/2	11311 SW KOBBE DR	BEAVERTON	OR	97007-9706
KOBBE,PRISCILLA A TR-1/2 & KOBBE,PRISCILLA A TR-1/2	11311 SW KOBBE DR	BEAVERTON	OR	97007-9706
KOBBE,PRISCILLA A TR-1/2 & KOBBE,PRISCILLA A TR-1/2	11311 SW KOBBE DR	BEAVERTON	OR	97007-9706
KOBBE,PRISCILLA A TR-1/2 & KOBBE,PRISCILLA A TR-1/2	11311 SW KOBBE DR	BEAVERTON	OR	97007-9706
KOBBE,PRISCILLA A TR-1/2 & KOBBE,PRISCILLA A TR-1/2	11311 SW KOBBE DR	BEAVERTON	OR	97007-9706

KOBBE,PRISCILLA A TR-1/2 & KOBBE,PRISCILLA A TR-1/2	11311 SW KOBBE DR	BEAVERTON	OR	97007-9706
KOENIG,MARIAN R & REBA % ROSS,MARY A	2076 N OTT RD	HERMISTON	OR	97838-7532
KOLLER INVESTMENTS LLC % LYNDA BIGNALL	P O BOX 3572	PORTLAND	OR	97208
KOLLER INVESTMENTS LLC % LYNDA BIGNALL	P O BOX 3572	PORTLAND	OR	97208
KOLSON,CAROL M TR	3525 NE 50TH AVE #206	PORTLAND	OR	97213
KOPPERS INC ATTN: CAROLEANN SANTA	1750 KOPPERS BLDG	PITTSBURGH	PA	15219-1800
KOPPERS INC ATTN: CAROLEANN SANTA	1750 KOPPERS BLDG	PITTSBURGH	PA	15219-1800
KORDOSKY,GARY A SR & KORDOSKY,PATREA M	PO BOX 1529	SCAPPOOSE	OR	97056
KORDOSKY,GARY A SR & KORDOSKY,PATREA M	PO BOX 1529	SCAPPOOSE	OR	97056
KORDOSKY,GARY A SR & KORDOSKY,PATREA M	PO BOX 1529	SCAPPOOSE	OR	97056
KORDOSKY,GARY A SR & KORDOSKY,PATREA M	PO BOX 1529	SCAPPOOSE	OR	97056
KOSHER,GREG A	16565 SE BAXTER RD	GRESHAM	OR	97080-3406
KOSHER,MELVIN & SHIRLEY	9885 SW 80TH AVE	TIGARD	OR	97223-8901
KOSHER,MELVIN E & KOSHER,SHIRLEY A	9885 SW 80TH AVE	TIGARD	OR	97223
KOST,MICHAEL & KOST,CAROL	35321 SE CARPENTER LN	GRESHAM	OR	97080
KOST,MICHAEL & KOST,CAROL	35321 SE CARPENTER LN	GRESHAM	OR	97080
KOVALENKO,OLEG V & KOVALENKO,LYUDMILA A	14271 MORTON RD	OREGON CITY	OR	97045
KRISTIN,MICHAEL R	10921 NW FRONT AVE	PORTLAND	OR	97231-1001
KROGSETH & REES LLC % P REES PROPERTIES LLC	22708 JOHNSON RD	WEST LINN	OR	97068
KROGSETH & REES LLC % P REES PROPERTIES LLC	22708 JOHNSON RD	WEST LINN	OR	97068
KROGSETH & REES LLC % P REES PROPERTIES LLC	22708 JOHNSON RD	WEST LINN	OR	97068
KS & C INDUSTRIES LLP	2750 S HANLEY ROAD	ST LOUIS	MO	63143
KS REALTY GROUP INC ATTN RAY CHANG	6221 NE 82ND AVE	PORTLAND	OR	97220
KUCHS,RICHARD & REBECCA J	905 SE 71ST AVE	PORTLAND	OR	97215-2139
KUCHS,RICHARD A & REBECCA J	6039 NE HOLLADAY ST	PORTLAND	OR	97213
KUHNAU,RICHARD B TR ET AL	6767 NE COLUMBIA BLVD	PORTLAND	OR	97218
KUHNAU,RICHARD B TR ET AL	6767 NE COLUMBIA BLVD	PORTLAND	OR	97218
KUHNAU,RICHARD B TR ET AL %RICHARD KUHNAU & RAEJEAN ROS/	PO BOX 2024	FAIRVIEW	OR	97024
KUHNAU,RICHARD B TR ET AL %RICHARD KUHNAU & RAEJEAN ROS/	PO BOX 2024	FAIRVIEW	OR	97024
KUNI,ANDREW	2615 NE 44TH AVE	PORTLAND	OR	97213-1220
KUNI,ANDREW	2615 NE 44TH AVE	PORTLAND	OR	97213-1220
KUNI,ANDREW	2615 NE 44TH AVE	PORTLAND	OR	97213-1220
KUNKEL,ELIZABETH S	2829 SE 16TH AVE	PORTLAND	OR	97202
KUSHNIRYUK,PAVEL	645 NW 5TH ST	GRESHAM	OR	97030-6922

KYSER,RICHARD & KYSER,JOANN	29873 S DHOOGHE RD	COLTON	OR	97017-9420
L & G DEVELOPMENT LLC % LUNDQUIST,GORDON	17415 SE KENDALL CT	PORTLAND	OR	97236
L & L LAND %NORTH AMERICAN BREWERIES	445 ST PAUL ST	ROCHESTER	NY	14605
LA RUE,LEONARD G-1/2 & LIN,XIAOHONG-1/2	231 MANUEL CT	BAY POINT	CA	94565
LA,ROBERT	3228 SE 170TH AVE	PORTLAND	OR	97236-1203
LACAMAS LABORATORIES INC	PO BOX 17659	PORTLAND	OR	97217
LACAMAS LABORATORIES INC	PO BOX 17659	PORTLAND	OR	97217
LACAMAS LABORATORIES INC	PO BOX 17659	PORTLAND	OR	97217
LACAMAS LABORATORIES INC	PO BOX 17659	PORTLAND	OR	97217
LACAMAS LABORATORIES INC ATTN: ALLEN ERICKSON	PO BOX 17659	PORTLAND	OR	97217
LACAMAS LABORATORIES INC ATTN: ALLEN ERICKSON	PO BOX 17659	PORTLAND	OR	97217
LACAMAS LABORATORIES INC ATTN: ALLEN ERICKSON	PO BOX 17659	PORTLAND	OR	97217
LACKEY,JOCELYN A & LACKEY,BRADLEY T	PO BOX 2404	PORTLAND	OR	97208
LAING LEASING LLC	PO BOX 2330	EUGENE	OR	97402
LAKESIDE INDUSTRIES % ANDERSON,RYAN	P O BOX 7016	ISSAQUAH	WA	98027-7016
LAKESIDE INDUSTRIES % ANDERSON,RYAN	P O BOX 7016	ISSAQUAH	WA	98027-7016
LAKESIDE INDUSTRIES % ANDERSON,RYAN	P O BOX 7016	ISSAQUAH	WA	98027-7016
LAKESIDE INDUSTRIES INC %ANDERSON, RYAN	PO BOX 7016	ISSAQUAH	WA	98027
LAKESIDE SUITES LLC	PO BOX 56150	PORTLAND	OR	97238-6150
LAMAR ADVERTISING OF EUGENE	PO BOX 66338	BATON ROUGE	LA	70896
LAMAR ADVERTISING OF EUGENE	PO BOX 66338	BATON ROUGE	LA	70896
LAMAR ADVERTISING OF EUGENE	PO BOX 66338	BATON ROUGE	LA	70896
LAMAR ADVERTISING OF EUGENE	PO BOX 66338	BATON ROUGE	LA	70896
LAMAR ADVERTISING OF EUGENE	PO BOX 66338	BATON ROUGE	LA	70896
LAMAR ADVERTISING OF EUGENE	PO BOX 66338	BATON ROUGE	LA	70896
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LAMAR ADVERTISING OF EUGENE	PO BOX 66338	BATON ROUGE	LA	70896
LAMAR ADVERTISING OF EUGENE	PO BOX 66338	BATON ROUGE	LA	70896
LAMAR ADVERTISING OF EUGENE	PO BOX 66338	BATON ROUGE	LA	70896
LAMAR ADVERTISING OF EUGENE	PO BOX 66338	BATON ROUGE	LA	70896
LAMAR ADVERTISING OF EUGENE	PO BOX 66338	BATON ROUGE	LA	70896
LAMAR ADVERTISING OF EUGENE	PO BOX 66338	BATON ROUGE	LA	70896
LAMBERT,RONALD SR & MAMIE	9000 NE M L KING BLVD SP 077	PORTLAND	OR	97211

LAMM INVESTMENTS LLC % DEBSKI,ANNE C & LANDON,BETH M	PO BOX 301639	PORTLAND	OR	97294-9639
LAMM INVESTMENTS LLC % DEBSKI,ANNE C & LANDON,BETH M	PO BOX 301639	PORTLAND	OR	97294-9639
LAMM INVESTMENTS LLC % DEBSKI,ANNE C & LANDON,BETH M	PO BOX 301639	PORTLAND	OR	97294-9639
LAMM INVESTMENTS LLC % DEBSKI,ANNE C & LANDON,BETH M	PO BOX 301639	PORTLAND	OR	97294-9639
LAMM INVESTMENTS LLC % DEBSKI,ANNE C & LANDON,BETH M	PO BOX 301639	PORTLAND	OR	97294-9639
LAMM INVESTMENTS LLC % DEBSKI,ANNE C & LANDON,BETH M	PO BOX 301639	PORTLAND	OR	97294-9639
LAMM INVESTMENTS LLC % DEBSKI,ANNE C & LANDON,BETH M	PO BOX 301639	PORTLAND	OR	97294-9639
LAMM INVESTMENTS LLC % DEBSKI,ANNE C & LANDON,BETH M	PO BOX 301639	PORTLAND	OR	97294-9639
LAMM INVESTMENTS LLC % DEBSKI,ANNE C & LANDON,BETH M	PO BOX 301639	PORTLAND	OR	97294-9639
LAMM INVESTMENTS LLC % DEBSKI,ANNE C & LANDON,BETH M	PO BOX 301639	PORTLAND	OR	97294-9639
LAMM,ELIZABETH B TR & KEMPTON,ALAN TR	P O BOX 301639	PORTLAND	OR	97294-9639
LAMM,ELIZABETH B TR & KEMPTON,ALAN TR	P O BOX 301639	PORTLAND	OR	97294-9639
LAMPROS PROPERTIES LLC-1/2 & CAMROSE PIPE CORPORATION-1/	2357 NW IRVING ST	PORTLAND	OR	97210
LAND O'LAKES FARMLAND FEED LLC % AD VALOREM TAX MGR	P O BOX 20111 #DEPT 154	KANSAS CITY	MO	64195
LANDA INC	13705 NE AIRPORT WAY	PORTLAND	OR	97230-1048
LANDON ONE LLC % LANDON,MARLENE	19864 SW AUGUSTINE CT	BEAVERTON	OR	97007-8533
LANDON THREE LLC % LANDON,MARLENE	19864 SW AUGUSTINE CT	BEAVERTON	OR	97007-8533
LANDON TWO LLC % LANDON,MARLENE	19864 SW AUGUSTINE CT	BEAVERTON	OR	97007-8533
LANDON,WILLIAM JOE	6116 KITSAP WAY TRLR 25	BREMERTON	WA	98312-2106
LANE,JACK D & SUSAN P TO BILYEU,CHRIS & BILYEU,KARRIE	16369 NE SANDY BLVD	PORTLAND	OR	97230
LANGELIERS,KATHLENE	5742 SE WOODSTOCK BLVD	PORTLAND	OR	97206
LANGLEY ST JOHNS LLC	7211 SE WILSHIRE CT	MILWAUKIE	OR	97267
LANIER BRUGH CORPORATION	339 N COLUMBIA BLVD	PORTLAND	OR	97217
LANIER BRUGH CORPORATION	339 N COLUMBIA BLVD	PORTLAND	OR	97217
LAPIN PROPERTIES LLC	3517 NE IONE ST	CAMAS	WA	98607-1149
LAPIN PROPERTIES LLC	3517 NE IONE ST	CAMAS	WA	98607-1149
LAPIN PROPERTIES LLC	3517 NE IONE ST	CAMAS	WA	98607-1149
LAPIN,ALEKSANDR A	5015 NE BUFFALO ST	PORTLAND	OR	97218
LARSEN OIL CO	3601 NE 134TH AVE	PORTLAND	OR	97230
LARSON & KING LLC	1001 SE HAWTHORNE BLVD	PORTLAND	OR	97214
LATTIMER,RONALD L	24 NE MIDDLEFIELD RD	PORTLAND	OR	97211-1219
LAWRENCE B STONE PROPERTIES #6 LLC	PO BOX 3949	SPOKANE	WA	99220-3949
LAWRENCE PROPERTY MANAGEMENT LLC	4430 SE BELMONT ST	PORTLAND	OR	97215-1634
LAZINKA RANCH INC	PO BOX 40	PILOT ROCK	OR	97868

LAZZERONI,JAMES-1/2 & LAZZERONI,CHARLOTTE Y-1/2 & LAZZERON	11606 SE AERIE CRESCENT RD	HAPPY VALLEY	OR	97086
LBA REALTY FUND II - WBP III LLC % RYAN PTS	PO BOX 847	CARLSBAD	CA	92018-0847
LCP OREGON HOLDINGS LLC % ARC TERMINALS HOLDINGS LLC ATTI	3000 RESEARCH FOREST DR #250	THE WOODLANDS	TX	77381-4385
LCP OREGON HOLDINGS LLC % ARC TERMINALS HOLDINGS LLC ATTI	3000 RESEARCH FOREST DR #250	THE WOODLANDS	TX	77381-4385
LCP OREGON HOLDINGS LLC % ARC TERMINALS HOLDINGS LLC ATTI	3000 RESEARCH FOREST DR #250	THE WOODLANDS	TX	77381-4385
LCP OREGON HOLDINGS LLC % ARC TERMINALS HOLDINGS LLC ATTI	3000 RESEARCH FOREST DR #250	THE WOODLANDS	TX	77381-4385
LCP OREGON HOLDINGS LLC % ARC TERMINALS HOLDINGS LLC ATTI	3000 RESEARCH FOREST DR #250	THE WOODLANDS	TX	77381-4385
LD COMMODITIES NORTHWEST FACILITIES LLC	PO BOX 810	WILTON	CT	06897-0810
LD COMMODITIES NORTHWEST FACILITIES LLC	PO BOX 810	WILTON	CT	06897-0810
LE PROPERTIES LLC	PO BOX 86280	PORTLAND	OR	97286-0280
LE,MINH CONG & NGUYEN,THU K	17717 SE 37TH ST	VANCOUVER	WA	98683
LE,MINH CONG & NGUYEN,THU K	17717 SE 37TH ST	VANCOUVER	WA	98683
LE,MINH CONG & NGUYEN,THU K	17717 SE 37TH ST	VANCOUVER	WA	98683
LE,YNHI T	PO BOX 52	LAKE OSWEGO	OR	97034
LEACH,JUSTIN D	2818 SE 15TH AVE	PORTLAND	OR	97202
LEATHERMAN TOOL GROUP INC	PO BOX 20595	PORTLAND	OR	97294-0595
LEATHERMAN TOOL GROUP INC	PO BOX 20595	PORTLAND	OR	97294-0595
LEATHERMAN TOOL GROUP INC	PO BOX 20595	PORTLAND	OR	97294-0595
LEATHERMAN TOOL GROUP INC	PO BOX 20595	PORTLAND	OR	97294-0595
LEBWOHL,STEPHEN	2127 NE 10TH AVE	PORTLAND	OR	97212-4017
LEE LAND COMPANY L L C ATTN LEE,KEITH K	PO BOX 83035	PORTLAND	OR	97283-0035
LEE ON DONG BENEVOLENT ASSN	1101 SE SALMON ST	PORTLAND	OR	97214
LEE ON DONG BENEVOLENT ASSN	1101 SE SALMON ST	PORTLAND	OR	97214
LEE,KENNETH TR (WAY W LEE ADMINISTRATIVE TRUST)	5210 SE 26TH AVE	PORTLAND	OR	97202-4627
LEE,ROBERT W & LEE,KAREN A	31695 FORWARD RD	MANTON	CA	96059-9310
LEE,SCOTT K TR & LEE,JENNY C TR	2817 NW NELA ST	PORTLAND	OR	97210-1715
LEE,TONI-1/2	1496 S 1165 E	OGDEN	UT	84404
LEE,WAY W	5210 SE 26TH AVE	PORTLAND	OR	97202-4627
LEE,WAY W-50% & LEE,WAY W TR-50%	5210 SE 26TH AVE #A	PORTLAND	OR	97202-4607
LEER,LONNY DEE	8205 SE HARNEY ST SP 07	PORTLAND	OR	97266
LEGACY HEALTH ATTN DIRECTOR OF TAX	1919 NW LOVEJOY ST	PORTLAND	OR	97209
LEGACY HEALTH SYSTEM	1919 NW LOVEJOY ST	PORTLAND	OR	97209
LEGACY HEALTH SYSTEM	1919 NW LOVEJOY ST	PORTLAND	OR	97209
LEHL,MICHAEL P TR & LEHL,DENISE A TR	PO BOX 699	CANBY	OR	97013

LEIF,JERRY TR & OLOFSON,NAIDA J TR	637 SE SALMON ST	PORTLAND	OR	97214
LEIGH INVESTMENTS LLC	PO BOX 364	VANCOUVER	WA	98666-0364
LEIGH,ROY JR	PO BOX 1158	CLACKAMAS	OR	97015
LEIGH,ROY JR	PO BOX 1158	CLACKAMAS	OR	97015
LEIGH,ROY JR & LEIGH,ROY JR TR	P O BOX 1158	CLACKAMAS	OR	97015
LEIGH,ROY JR & LEIGH,ROY JR TR	P O BOX 1158	CLACKAMAS	OR	97015
LEIGH,ROY JR ET AL	PO BOX 1158	CLACKAMAS	OR	97015
LEITZ,J H	5650 NE COLUMBIA BLVD	PORTLAND	OR	97218
LEITZ,J H	5650 NE COLUMBIA BLVD	PORTLAND	OR	97218
LEJAR ENTERPRISE	PO BOX 56027	PORTLAND	OR	97218
LEJAR ENTERPRISE	PO BOX 56027	PORTLAND	OR	97218
LEJAR ENTERPRISE	PO BOX 56027	PORTLAND	OR	97218
LEJAR ENTERPRISE	PO BOX 56027	PORTLAND	OR	97218
LEJAR ENTERPRISE	PO BOX 56027	PORTLAND	OR	97218
LEJAR ENTERPRISE	PO BOX 56027	PORTLAND	OR	97218
LEJAR ENTERPRISE	PO BOX 56027	PORTLAND	OR	97218
LEKAS,THOMAS J & LEKAS,BESSIE E	7225 SW HUNT CLUB LN	PORTLAND	OR	97223-9439
LEKAS,THOMAS J ET AL	7225 SW HUNT CLUB LN	PORTLAND	OR	97223-9439
LEMKE,ERIKA L & HERSCHBACH,GARY R	4020 E GLORY LN	APPLETON	WI	54913
LEMLY,BONNIE J TR %NORMAN LEMLY	15751 S HENRICI RD	OREGON CITY	OR	97045
LEMLY,MICHAEL & LEMLY,RHEA	11813 SE 34TH AVE	MILWAUKIE	OR	97222
LEN & POLLY LLC-1/2 & HUFFORD,PAULINE TR-1/2 (PAULINE HUFFC	2939 SE 76TH AVE	PORTLAND	OR	97206-1825
LEN HIN TRADING INC	P O BOX 30646	PORTLAND	OR	97294
LENZ,MICHAEL R & LENZ,NATALIE L	PO BOX 95	CORBETT	OR	97019-0095
LEON,MANUEL & LEON,CARMEN	315 NW 107TH AVE	PORTLAND	OR	97229
LEON,MANUEL & LEON,CARMEN	315 NW 107TH AVE	PORTLAND	OR	97229
LEONG,MARILYN & LEO,JOHNSON	825 SE MADISON ST	PORTLAND	OR	97214
LEONG,PAK M	1109 SE 213TH AVE	GRESHAM	OR	97030
LEOPOLD,RALF A	1025 SE 6TH AVE	PORTLAND	OR	97214-2374
LEOPOLD,RALF A	1025 SE 6TH AVE	PORTLAND	OR	97214-2374
LERITZ,ANDREW F	PO BOX 42404	PORTLAND	OR	97242
LES SCHWAB TIRE CENTERS OF PORTLAND INC	PO BOX 5350	BEND	OR	97708-5350
LES SCHWAB TIRE CNTR OF OR INC	PO BOX 5350	BEND	OR	97708-5350
LES SCHWAB WAREHOUSE CENTER INC	PO BOX 5350	BEND	OR	97708-5350

LESLIE,JOSHUA A	6812 N CATLIN AVE	PORTLAND	OR	97203
LESZAR,KELLY J	9808 N EDISON ST	PORTLAND	OR	97203-1409
LEWIS,BENJAMIN D & KLINE,HEATHER L	2360 NW ROOSEVELT ST	PORTLAND	OR	97210
LEWIS,FRANCIS D & LEWIS,RODNEY J	9000 NE M L KING BLVD SP 094	PORTLAND	OR	97211
LEWIS,JOHN L & THERESA L	2440 SE TIBBETTS ST	PORTLAND	OR	97202
LFP2204 LLC	2459 SE TUALATIN VALLEY HWY # HILLSBORO		OR	97123
LFP2204 LLC	2459 SE TUALATIN VALLEY HWY # HILLSBORO		OR	97123
LFP2204 LLC	2459 SE TUALATIN VALLEY HWY # HILLSBORO		OR	97123
LFP5100 LLC	2459 SE TUALATIN VALLEY HWY # HILLSBORO		OR	97123
LIEFKE,ELEANOR L	PO BOX 1641	LAKE OSWEGO	OR	97035
LIM,DAVID D & LIM,JANICE H	11625 NE LAUREN LN	NEWBERG	OR	97132
LINCOLN & ALLEN CO % NEWMAN,PATRICIA A	P O BOX 10745	PORTLAND	OR	97296
LINDQUIST DEVEL CO INC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST DEVEL CO INC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST DEVEL CO INC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST DEVEL CO INC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST DEVELOPMENT CO	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST DEVELOPMENT CO INC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST DEVELOPMENT CO INC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST DEVELOPMENT CO INC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST DEVELOPMENT CO INC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST DEVELOPMENT INC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST DEVELOPMENT INC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST DEVELOPMENT INC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST DEVELOPMENT INC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST HOLDINGS LLC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST HOLDINGS LLC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST HOLDINGS LLC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST HOLDINGS LLC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST HOLDINGS LLC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST HOLDINGS LLC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST LANDS LLC	PO BOX 42135	PORTLAND	OR	97242-0135

LINDQUIST PROPERTIES LLC	PO BOX 42135	PORTLAND	OR	97242-0135
LINDQUIST,STUART H % LINDQUIST DEVELOPMENT CO INC	PO BOX 42135	PORTLAND	OR	97242-0135
LINNTON COMMUNITY CENTER	10614 NW ST HELENS RD	PORTLAND	OR	97231-1048
LINNTON COMMUNITY CENTER	10614 NW ST HELENS RD	PORTLAND	OR	97231
LINNTON WATER CREDITS LLC	1875 OLYMPIC BLVD #215	WALNUT CREEK	CA	94596
LINNTON WATER CREDITS LLC	1875 OLYMPIC BLVD #215	WALNUT CREEK	CA	94596
LINNTON WATER CREDITS LLC	1875 OLYMPIC BLVD #215	WALNUT CREEK	CA	94596
LISTON,JAMES D	328 N LOTUS ISLE DR	PORTLAND	OR	97217
LIT FINANCE III LLC ATTN BUSCHER,THERESA	1717 MCKINNEY AVE #1900	DALLAS	TX	75202-1253
LIT INDUSTRIAL LIMITED PARTNERSHIP % ING CLARION PARTNERS	1717 MCKINNEY AVE #1900	DALLAS	TX	75202-1253
LIT INDUSTRIAL LIMITED PARTNERSHIP % ING CLARION PARTNERS	1717 MCKINNEY AVE #1900	DALLAS	TX	75202-1253
LIT INDUSTRIAL LIMITED PARTNERSHIP % ING CLARION PARTNERS	1717 MCKINNEY AVE #1900	DALLAS	TX	75202-1253
LIT INDUSTRIAL LIMITED PARTNERSHIP % ING CLARION PARTNERS	1717 MCKINNEY AVE #1900	DALLAS	TX	75202-1253
LIT INDUSTRIAL LTD PARTNERSHIP % ING CLARION PARTNERS	1717 MCKINNEY AVE #1900	DALLAS	TX	75202-1253
LIT INDUSTRIAL LTD PARTNERSHIP % ING CLARION PARTNERS	1717 MCKINNEY AVE #1900	DALLAS	TX	75202-1253
LIT INDUSTRIAL LTD PARTNERSHIP % ING CLARION PARTNERS	1717 MCKINNEY AVE #1900	DALLAS	TX	75202-1253
LIT INDUSTRIAL LTD PARTNERSHIP % ING CLARION PARTNERS	1717 MCKINNEY AVE #1900	DALLAS	TX	75202-1253
LIT INDUSTRIAL LTD PARTNERSHIP % ING CLARION PARTNERS	1717 MCKINNEY AVE #1900	DALLAS	TX	75202-1253
LIT INDUSTRIAL LTD PARTNERSHIP % ING CLARION PARTNERS	1717 MCKINNEY AVE #1900	DALLAS	TX	75202-1253
LIT WORKSHOP INC ATTN: TAX DEPT.	3333 NW LUZON ST	PORTLAND	OR	97210-1626
LIT WORKSHOP INC ATTN: TAX DEPT.	3333 NW LUZON ST	PORTLAND	OR	97210-1626
LITTLE TACOMA CONSTRUCTION LLC	PO BOX 69506	PORTLAND	OR	97201
LITTLE TACOMA CONSTRUCTION LLC	PO BOX 69506	PORTLAND	OR	97239
LITTLE TACOMA CONSTRUCTION LLC	2030 SE 6TH AVE	PORTLAND	OR	97214
LITTLE TACOMA CONSTRUCTION LLC	PO BOX 69506	PORTLAND	OR	97201
LITTLE,SEBASTIAN A	PO BOX 7732	SANTA CRUZ	CA	95061-7732
LLOYD-JONES,KARI	1604 SE PARDEE ST	PORTLAND	OR	97202
LOCA LLC % LOCA INVESTORS LLC ATTN: MANAGER	500 E BROADWAY #110	VANCOUVER	WA	98660
LOCHRIDGE,JANET	9932 N DECATUR ST	PORTLAND	OR	97203-2814
LOCO LLC	01537 SW COMUS ST	PORTLAND	OR	97219-7842
LOFTIS,JACK G	1921 SE 7TH AVE	PORTLAND	OR	97214-4601

LONCTOT,GARY HOWARD	900 NE M L KING BLVD #235	PORTLAND	OR	97211
LONGAKER,BARBARA-1/2 & MESHER,THOMAS L TR-1/2	PO BOX 14768	PORTLAND	OR	97214
LONGAKER,BARBARA-1/2 & MESHER,THOMAS L TR-1/2	PO BOX 14768	PORTLAND	OR	97214
LONGAKER,BARBARA-1/2 & MESHER,THOMAS L TR-1/2	PO BOX 14768	PORTLAND	OR	97214
LONGWORTH,WADE & IRENE R	11056 SW 131ST PL	TIGARD	OR	97223
LONGWORTH,WADE & IRENE R	11056 SW 131ST PL	TIGARD	OR	97223
LOPEZ,DARWIN & LOPEZ,GLADIS	4805 NE CRYSTAL LN	PORTLAND	OR	97218
LORING ST LLC %SHOBI DAHL	1682 SE WAVERLY DR	MILWAUKIE	OR	97222
LORING STREET BUILDING LLC	412 NW COUCH ST #220	PORTLAND	OR	97209-3880
LOTUS ISLE PATIO HOMES HOMEOWN	277 N LOTUS ISLE DR	PORTLAND	OR	97217-8070
LOTUS ISLE PATIO HOMES HOMEOWN	277 N LOTUS ISLE DR	PORTLAND	OR	97217-8070
LOVELL PROPERTIES LLC % LOVELL,LORNA L & LOVELL,ERIC A	16315 SE RIVER FOREST PL	MILWAUKIE	OR	97267-3615
LOVES GRAVE LOT	2707 N WILLIS BLVD	PORTLAND	OR	97217-7015
LOWE,JAMES A	2400 NW HAYES RD	WOODLAND	WA	98674-2218
LOWE,JENNIFER M	7405 SE 83RD AVE	PORTLAND	OR	97266
LOY,TIMOTHY J & LOY,AMELIA M	2635 NW SAVIER ST	PORTLAND	OR	97210
LPM PROPERTIES LLC	60 SE MAIN ST	PORTLAND	OR	97214
LRG LEASING ATTN: TOM LEAPTROTT	3601 SE COLUMBIA WAY, SUITE 1	VANCOUVER	WA	98661
LSA PARTNERS LLC	2100 NW 22ND AVE	PORTLAND	OR	97210-2304
LSE-CROWN ZELLERBACH % CHRISTENSON ELECTRIC INC	111 SW COLUMBIA ST STE 480	PORTLAND	OR	97201-5838
LTD HOLDINGS LLC	1300 SE GRAND AVE	PORTLAND	OR	97214
LUCE,CHARLES A	7871 SE MACKIE LN	PORTLAND	OR	97222-1316
LUCE,VERN	2480 NW RALEIGH ST	PORTLAND	OR	97210
LUKE-DORF INC	8915 SW CENTER ST	TIGARD	OR	97223
LULL, ROBBIN LEE & LULL, KIM CHAN-LA	9000 NE M L KING BLVD SP 148	PORTLAND	OR	97211
LULL,ROBBIN LEE	9000 NE M L KING BLVD #148	PORTLAND	OR	97211
LUND,OLIVER W & LUND,MARY L	3150 NE 143RD AVE	PORTLAND	OR	97230-3720
LUNDQUIST,GORDON B-1/2 & GUNSTONE,DONALD S TR & GUNSTO	17415 SE KENDALL CT	PORTLAND	OR	97236
LUPEKHA,IGOR & TUNG,CHARLEY	2000 NE 42ND AVE #108	PORTLAND	OR	97212
LUU,ANDY T	2223 MINDEN WAY	SACRAMENTO	CA	95835
LW WAREHOUSE LLC	7750 SW 149TH AVE	ALOHA	OR	97007-5969
LW WAREHOUSE LLC	7750 SW 149TH AVE	ALOHA	OR	97007-5969
LW WAREHOUSE LLC	7750 SW 149TH AVE	ALOHA	OR	97007-5969
LWO CORPORATION	PO BOX 17125	PORTLAND	OR	97217-0125

LWO CORPORATION	PO BOX 17125	PORTLAND	OR	97217-0125
LYON FINANCIAL SERVICES INC	115 WEST COLLEGE DR	MARSHALL	MN	56258
M & M HAGG LLC	8132 NW BLUE POINTE LN	PORTLAND	OR	97229-9111
M A K PROPERTIES LLC ATTN: WEHRLEY,ROBERT	835 SE HAWTHORNE BLVD	PORTLAND	OR	97214
M AND A PROPERTIES LLC	61 SE YAMHILL ST	PORTLAND	OR	97214-2134
M B TERMINAL CO	PO BOX 3595	ASHLAND	OR	97520
M B TERMINAL CO	PO BOX 3595	ASHLAND	OR	97520
M B TERMINAL CO	PO BOX 3595	ASHLAND	OR	97520
M B TERMINAL CO	PO BOX 3595	ASHLAND	OR	97520
M B TERMINAL CO	PO BOX 3595	ASHLAND	OR	97520
M B TERMINAL CO	PO BOX 3595	ASHLAND	OR	97520
M D F C>	4060 LAKEWOOD BLVD 6TH FLOO LONG BEACH		CA	90808-1700
M G SMITH FAMILY LLC % SMITH,M G	1612 SE WAVERLY DR	MILWAUKIE	OR	97222
M K TOOLING INC	4720 NE 135TH AVE	PORTLAND	OR	97230-1237
MABEK CO ATTN KAPLAN,D KENNETH	138 WILLIAMSBURG WAY	WESTLAKE VILLAGE	CA	91361
MACFARLANE,RODERICK & COBB,CATHERINE	751 N KNOTT ST	PORTLAND	OR	97227
MACFARLANE,RODERICK T & COBB,CATHERINE M	751 N KNOTT ST	PORTLAND	OR	97227
MACGUFFIN LLC	657 SE YAMHILL ST	PORTLAND	OR	97214-2326
MACH PORTLAND NAVISTAR INT'L CORP NAVISTAR ACCOUNTING CI CALLER SERVICE 59007		KNOXVILLE	TN	37950-9007
MACHINE PRODUCTS INC	1629 SE 11TH AVE	PORTLAND	OR	97214-4771
MACHINE PRODUCTS INC	1629 SE 11TH AVE	PORTLAND	OR	97214-4771
MACTARNAHAN LIMITED PARTNERSHIP ATTN: TAMIKA WILLIAMSO 445 ST PAUL ST		ROCHESTER	NY	14605
MADAVE LLC	1245 SE 55TH AVE	PORTLAND	OR	97215
MADDEN FAMILY LLC	2550 NW 25TH PL	PORTLAND	OR	97210-1843
MADDEN FAMILY LLC	2550 NW 25TH PL	PORTLAND	OR	97210-1843
MADDEN,MARK R TR (MARK R MADDEN REVOCABLE LIVING TRUST) 2330 NW 31ST AVE		PORTLAND	OR	97210
MADER,ROBERT C	1302 MAIN ST	SUMNER	WA	98390
MADISON ELEVEN LLC ATTN: NASECO	PO BOX 3032	SUNRIVER	OR	97707-0032
MADRONA CUTTER LLC-50% & GULSONS CUTTER LLC-50% % WINKL 210 SW MORRISON ST #600		PORTLAND	OR	97204-3150
MADRONA DUNIWAY LLC	210 SW MORRISON ST #600	PORTLAND	OR	97204
MAGID,ROBERT N & MAGID,JUDITH K	PO BOX 1004	LAKE OSWEGO	OR	97034
MAGID,ROBERT N & MAGID,JUDITH K	PO BOX 1004	LAKE OSWEGO	OR	97034
MAGID,ROBERT N & MAGID,JUDITH K	PO BOX 1004	LAKE OSWEGO	OR	97034

MAGID,ROBERT N & MAGID,JUDITH K	PO BOX 1004	LAKE OSWEGO	OR	97034
MAGID,ROBERT N & MAGID,JUDITH K	PO BOX 1004	LAKE OSWEGO	OR	97034
MAGID,ROBERT N & MAGID,JUDITH K	PO BOX 1004	LAKE OSWEGO	OR	97034
MAGID,ROBERT N & MAGID,JUDITH K	PO BOX 1004	LAKE OSWEGO	OR	97034
MAGID,ROBERT N & MAGID,JUDITH K	PO BOX 1004	LAKE OSWEGO	OR	97034
MAI PROPERTIES LLC	745 SW VIEWMONT DR	PORTLAND	OR	97225-6137
MAI PROPERTIES LLC % MAI,MYCHAEL & CHUNYAN	400 N THOMPSON ST	PORTLAND	OR	97227-1819
MAJ COLUMBIA BLVD AT 60TH LLC	300 W 15TH ST #200	VANCOUVER	WA	98660-2927
MAJ WOODSTOCK LLC	300 W 15TH ST #200	VANCOUVER	WA	98660-2927
MALDONADO,JOSE MANUEL & RUIZ HERNANDEZ,BRENDA RUBI	9000 NE M L KING BLVD #182	PORTLAND	OR	97211
MALONE,VICTORIA LOUISE % CURT CHUMBLEY HOMES	PO BOX 968	PORTLAND	OR	99001-0968
MANHEIM SERV CORP %MANHEIM TAX - MAILSTOPCP3	6205 PEACHTREE DUNWOODY RD	ATLANTA	GA	30328
MANHEIM SERVICES CORP %MANHEIM TAX - MAILSTOP CP3	6205 PEACHTREE DUNWOODY RD	ATLANTA	GA	30328
MANNING LLC	10101 SE STARK ST	PORTLAND	OR	97216
MANUFACTURERS FINANCING SERVIC	995 DALTON AVE	CINCINNATI	OH	45203
MARBLE LLC, THE % NATHAN KADISH	721 NW 9TH AVE #200	PORTLAND	OR	97209
MARBOTT,ERNEST L	1210 NE COLUMBIA BLVD	PORTLAND	OR	97211-1630
MARBOTT,ERNEST L	1210 NE COLUMBIA BLVD	PORTLAND	OR	97211-1630
MARBOTT,ERNEST L	1210 NE COLUMBIA BLVD	PORTLAND	OR	97211-1630
MARBOTT,ERNEST L	1210 NE COLUMBIA BLVD	PORTLAND	OR	97211-1630
MARBOTT,ERNEST S TR	1808 NE COLUMBIA BLVD	PORTLAND	OR	97211
MARBOTT,ERNEST S TR	1808 NE COLUMBIA BLVD	PORTLAND	OR	97211
MARBOTT,ERNEST S TR	1808 NE COLUMBIA BLVD	PORTLAND	OR	97211
MARINE DRIVE BUSINESS CENTER CONDOMINIUM ASSOCIATION %	15956 S NEIBUR RD	OREGON CITY	OR	97045
MARINE DRIVE LLC & NICKILA,DAVID W	6840 N MARINE DR	PORTLAND	OR	97203
MARKET CONTRACTORS LTD	10250 NE MARX ST	PORTLAND	OR	97220-1152
MARKET CONTRACTORS LTD	10250 NE MARX ST	PORTLAND	OR	97220-1152
MARKET CONTRACTORS LTD	10250 NE MARX ST	PORTLAND	OR	97220-1152
MARKET INVESTMENTS L L C	139 SE TAYLOR ST	PORTLAND	OR	97214
MARKET TRANSPORT LTD	110 N MARINE DR	PORTLAND	OR	97217
MARKET TRANSPORT LTD	110 N MARINE DR	PORTLAND	OR	97217
MARKET TRANSPORT LTD	110 N MARINE DR	PORTLAND	OR	97217
MARKET TRANSPORT LTD	110 N MARINE DR	PORTLAND	OR	97217-8030
MARKET TRANSPORT LTD	110 N MARINE DR	PORTLAND	OR	97217

MARKET TRANSPORT LTD	110 N MARINE DR	PORTLAND	OR	97217
MARKET TRANSPORT LTD	110 N MARINE DR	PORTLAND	OR	97217
MARKET TRANSPORT LTD	110 N MARINE DR	PORTLAND	OR	97217
MARKET TRANSPORT LTD	110 N MARINE DR	PORTLAND	OR	97217
MARKET TRANSPORT LTD	110 N MARINE DR	PORTLAND	OR	97217
MARKET TRANSPORT LTD	110 N MARINE DR	PORTLAND	OR	97217
MARKET TRANSPORT LTD % MARIS,BILL	110 N MARINE DR	PORTLAND	OR	97217
MARLEY BROWN LUMBER SERVICE % FISCHER & COMPANY ATTN U	13455 NOEL RD #1900	DALLAS	TX	75240-6630
MARLEY BROWN LUMBER SERVICE % FISCHER & COMPANY ATTN U	13455 NOEL RD #1900	DALLAS	TX	75240-6630
MARRIAGE,LOUISE	9923 N DECATUR ST	PORTLAND	OR	97203
MARSH,DAVID B	9000 NE M L KING BLVD UNIT 254	PORTLAND	OR	97211
MARTINEZ,MISTY	7209 SE 83RD AVE	PORTLAND	OR	97266
MARTINEZ,RUTHEA	11635 SE HAROLD ST #A	PORTLAND	OR	97266-3971
MARTIN-MENDOZA,BERTILDA	7156 NE 47TH AVE	PORTLAND	OR	97218
MARUICHI OREGON STEEL TUBE LLC	8735 N HARBORGATE ST	PORTLAND	OR	97203
MARV TONKIN LEASING CO	1540 SW VISTA AVE #2000	PORTLAND	OR	97201-2476
MARV TONKIN LEASING CO	1540 SW VISTA AVE #2000	PORTLAND	OR	97201-2476
MARX DRIVE LLC	PO BOX 2222	TACOMA	WA	98401
MARX INVESTMENTS LLC	PO BOX 83492	PORTLAND	OR	97283
MARX,ARTHUR III	PO BOX 83492	PORTLAND	OR	97283-0492
MARY A FAZIO LIMITED PARTNERSHIP I ET AL	1230 NE GERTZ RD	PORTLAND	OR	97211
MARY'S HARVEST FRESH FOODS INC	8448 NE 33RD DR #200	PORTLAND	OR	97211
MARY'S HARVEST FRESH FOODS INC	8448 NE 33RD DR #200	PORTLAND	OR	97211
MASCOT LLC % KIN PROPERTIES	185 NW SPANISH RIVER BLVD #10	BOCA RATON	FL	33431-4230
MASON TRADES BUILDING ASSN INC	12812 NE MARX ST	PORTLAND	OR	97230
MASONS SUPPLY COMPANY	PO BOX 42367	PORTLAND	OR	97242-0367
MASONS SUPPLY COMPANY	PO BOX 42367	PORTLAND	OR	97242-0367
MATES,DAN & LIGIA M	1903 NE MAROK RD	TROUTDALE	OR	97060
MATES,DAN & LIGIA M	1903 NE MAROK RD	TROUTDALE	OR	97060
MATES,DAN & LIGIA M	1903 NE MAROK RD	TROUTDALE	OR	97060
MATHEWS,NANCY J TR %MARVIN E BRIDGE	22731 SE 103RD AVE	PORTLAND	OR	97266-1203
MATHEWS,NANCY J TR %MARVIN E BRIDGE	22731 SE 103RD AVE	PORTLAND	OR	97266-1203
MATHEWS,ZEBEDEE TR (MATHEWS FAMILY TRUST) & HANSEN,RICK	8204 NE 109TH AVE	VANCOUVER	WA	98662
MATHIESEN,DIXIE TO MODUN,JEFFREY K	P O BOX 19941	PORTLAND	OR	97280-0941

MATTHEWS,TOMMIE MARTIN	9000 NE M L KING BLVD SP 243	PORTLAND	OR	97211
MATTSON PROPERTIES LLC % MATTSON,THOMAS A	737 SE MARKET ST	PORTLAND	OR	97214-3523
MATTSON PROPERTIES LLC % MATTSON,THOMAS A	737 SE MARKET ST	PORTLAND	OR	97214-3523
MAUCK,DEBRA J	9939 N DECATUR ST	PORTLAND	OR	97203
MAXAM,DONALD R	4065 SE ANGELA WAY	MILWAUKIE	OR	97222-8834
MAXAM,DONALD R	4065 SE ANGELA WAY	MILWAUKIE	OR	97222-8834
MAYS,LATRICIA F	5123 NE 112TH AVE	PORTLAND	OR	97220
MAZER,LINDA & ROBERT	15235 SW SWAN CT	BEAVERTON	OR	97007
MB REAL PROPERTIES LLC	9440 N WHITAKER RD	PORTLAND	OR	97217-7748
MC CALL OIL & CHEMICAL CO	5480 NW FRONT AVE	PORTLAND	OR	97210-1114
MC CALL OIL & CHEMICAL CORP	5480 NW FRONT AVE	PORTLAND	OR	97210-1114
MC CALL OIL & CHEMICAL CORP	5480 NW FRONT AVE	PORTLAND	OR	97210-1114
MC CALL OIL & CHEMICAL CORP %MCCALL,NED	5480 NW FRONT AVE	PORTLAND	OR	97210
MC CALL OIL & CHEMICAL CORP ATTN MCCALL,NED	5480 NW FRONT AVE	PORTLAND	OR	97210-1198
MC CARTER,JAMES W	14413 TRILLIUM CT	LAKE OSWEGO	OR	97035
MC CLASKEY,MICHAEL G SR TR & MC CLASKEY,DONNA M TR	4034 SW 55TH DR	PORTLAND	OR	97221-2026
MC CLOSKEY CORP(OREGON) % EASTMAN CHEMICAL CO	PO BOX 511	KINGSPORT	TN	37662
MC CLURE,MARIANNE	8303 SE 28TH AVE	PORTLAND	OR	97202-8902
MC CORMICK & BAXTER CREOSOTING	PO BOX 3344	PORTLAND	OR	97208-3344
MC CRACKEN,J W JR ET AL % MC CRACKEN MOTOR FREIGHT INC	3147 NW FRONT AVE	PORTLAND	OR	97210-1507
MC CUDDY PROPERTIES INC	250 NE TOMAHAWK IS DR	PORTLAND	OR	97217-7938
MC CUDDY,MICHAEL % MC CUDDY & ASSOC	250 NE TOMAHAWK ISLAND DR	PORTLAND	OR	97217
MC CUDDY,MICHAEL L	250 NE TOMAHAWK ISLAND DR	PORTLAND	OR	97217-7906
MC DONALD FAMILY LLC III	2838 SE 9TH AVE	PORTLAND	OR	97202
MC DONALD FAMILY LLC III	2838 SE 9TH AVE	PORTLAND	OR	97202
MC DONALD FAMILY LLC III	2838 SE 9TH AVE	PORTLAND	OR	97202
MC DONALD,JAMES R TR (HANS GER	PO BOX 55277	PORTLAND	OR	97238
MC DONALD,JAMES R TR (HANS GER	PO BOX 55277	PORTLAND	OR	97238
MC DONALD,JAMES R TR (HANS GER	PO BOX 55277	PORTLAND	OR	97238
MC DONALD'S CORP % SCOOT BOOTS INC	8708 NW KAISER RD	PORTLAND	OR	97231
MC DONALD'S CORP % SCOOT BOOTS INC	8708 NW KAISER RD	PORTLAND	OR	97231
MC DOWELL FAMILY L L C	P O BOX 19094	PORTLAND	OR	97280-0094
MC GEHEE,JAMES R TR & MC GEHEE,JMICHELINA TR	7620 SW WESTGATE WAY	PORTLAND	OR	97225
MC GEHEE,JAMES R TR & MC GEHEE,JMICHELINA TR	7620 SW WESTGATE WAY	PORTLAND	OR	97225

MC GEHEE,JAMES R TR & MC GEHEE,JMICHELINA TR	7620 SW WESTGATE WAY	PORTLAND	OR	97225
MC GEHEE,JAMES R TR & MC GEHEE,JMICHELINA TR	7620 SW WESTGATE WAY	PORTLAND	OR	97225
MC GEHEE,JAMES R TR & MC GEHEE,JMICHELINA TR	7620 SW WESTGATE WAY	PORTLAND	OR	97225
MC GEHEE,JAMES R TR & MC GEHEE,JMICHELINA TR	7620 SW WESTGATE WAY	PORTLAND	OR	97225
MC GEHEE,JAMES R TR & MC GEHEE,JMICHELINA TR	7620 SW WESTGATE WAY	PORTLAND	OR	97225
MC GEHEE,JAMES R TR & MC GEHEE,JMICHELINA TR	7620 SW WESTGATE WAY	PORTLAND	OR	97225
MC GRATH,DANNY	9000 NE M L KING BLVD SP 080	PORTLAND	OR	97211
MC GUIRE BROS LLC % MC GUIRE BEARING CO	947 SE MARKET ST	PORTLAND	OR	97214
MC GUIRE BROS LLC % MC GUIRE BEARING CO	947 SE MARKET ST	PORTLAND	OR	97214
MC GUIRE BROS LLC % MC GUIRE BEARING CO	947 SE MARKET ST	PORTLAND	OR	97214
MC GUIRE BROS LLC % MC GUIRE BEARING CO	947 SE MARKET ST	PORTLAND	OR	97214
MC GUIRE BROS LLC % MC GUIRE BEARING CO	947 SE MARKET ST	PORTLAND	OR	97214
MC GUIRE BROS LLC % MC GUIRE BEARING CO	947 SE MARKET ST	PORTLAND	OR	97214
MC ILVAIN,TERRY & CINDY % ARC III LLC	600 GRANT ST #900	PORTLAND	OR	80203
MC INNIS INVESTMENTS LLC	P O BOX 30087	PORTLAND	OR	97294
MC INNIS INVESTMENTS LLC	P O BOX 30087	PORTLAND	OR	97294
MC INNIS INVESTMENTS LLC	P O BOX 30087	PORTLAND	OR	97294
MC INNIS,STEPHEN J & SARA	P O BOX 30087	PORTLAND	OR	97294
MC KECHNIE,SUZANNE CATHERINE EL FRONTIER	4233 N FLOWING WELL RD #106	TUCSON	AZ	85705
MC KINNON,FRANK V	2345 NW WILSON ST	PORTLAND	OR	97210-2319
MC LEARN,JEANETTE P	11150 NE MARX ST	PORTLAND	OR	97220
MC MARINE LLC	250 NE TOMAHAWK ISLAND DR	PORTLAND	OR	97217-7906
MC MICKLE,GREGORY S	1100 NE DAVIS ST	PORTLAND	OR	97232-3009
MC MICKLE,GREGORY S	1100 NE DAVIS ST	PORTLAND	OR	97232-3009
MC MICKLE,GREGORY S	1100 NE DAVIS ST	PORTLAND	OR	97232-3009
MC MILLEN FAMILY LLC	17693 S ANDERSON RD	OREGON CITY	OR	97045
MC NEFF,KELLIE L ET AL % CORDELL,KARREN S	2754 SW HARTLEY DR	GRESHAM	OR	97080-6374
MC QUOWN,DOUGLAS E	2310 NE COLUMBIA BLVD	PORTLAND	OR	97211
MC QUOWN,DOUGLAS E	2310 NE COLUMBIA BLVD	PORTLAND	OR	97211
MC RAE LLC	PO BOX 82186	PORTLAND	OR	97282-0186
MC&B 92 AVE LLC	227 SW PINE ST #215	PORTLAND	OR	97204
MCCLELLAN ESTATE CO	707 OLD COUNTRY RD	BELMONT	CA	94002
MCCRAW,BETHANY W	2036 NW 21ST PL	PORTLAND	OR	97210
MCCUTCHEON,RICK & MCCUTCHEON,KRISTIN	6610 SE STARK ST	PORTLAND	OR	97215

MCDONALD FAMILY LLC V	2838 SE 9TH AVE	PORTLAND	OR	97202
MCDONALD'S CORPORATION % DOUBLE K VENTURES INC	8255 SW HUNZIKER ST #101	TIGARD	OR	97223
MCDONALD'S USA LLC %KJ TOWER ENTERPRISES INC	10230 SE 252ND DR	DAMASCUS	OR	97089
MCINNIS INVESTMENT LLC	PO BOX 30087	PORTLAND	OR	97294
MCINNIS,STEPHEN I	20000 S DRIFTWOOD DR	OREGON CITY	OR	97045-7336
MCINNIS,STEPHEN I	20000 S DRIFTWOOD DR	OREGON CITY	OR	97045-7336
MCINNIS,STEPHEN J	20000 DRIFTWOOD DR	OREGON CITY	OR	97045
MCINNIS,STEPHEN J	20000 DRIFTWOOD DR	OREGON CITY	OR	97045
MCINNIS,STEPHEN J	20000 DRIFTWOOD DR	OREGON CITY	OR	97045
MCKINSTRY PORTLAND LLC	5005 3RD AVE S	SEATTLE	WA	98134-2423
MCKINSTRY PORTLAND LLC	5005 3RD AVE S	SEATTLE	WA	98134-2423
MCKINSTRY PORTLAND LLC	5005 3RD AVE S	SEATTLE	WA	98134-2423
MCKINSTRY PORTLAND LLC	5005 3RD AVE S	SEATTLE	WA	98134-2423
MCMAHON,DAVID L TR & MCMAHON,MICHELA M TR	2440 NE 10TH AVE	PORTLAND	OR	97212
MCMAHON,DAVID L TR & MCMAHON,MICHELA M TR	2440 NE 10TH AVE	PORTLAND	OR	97212
MCMICKLE,GREGORY S	1100 NE DAVIS ST	PORTLAND	OR	97232-3009
MCPARTLAND,MICHAEL B	11552 NW ST HELENS RD	PORTLAND	OR	97231
MCPHEE,CAROLINE W	3525 NE 50TH AVE #202	PORTLAND	OR	97213
MCPHERSON,MARCY M	4914 NE PACIFIC ST	PORTLAND	OR	97213-2851
MCS PROPERTIES LLC	PO BOX 145	BORING	OR	97009
MCVAY,KENT A TR & MCVAY,LAURIE A TR	3525 NE 50TH AVE #305	PORTLAND	OR	97213
MDRI PROPERTIES LLC	PO BOX 10074	PORTLAND	OR	97296-0074
MDRI PROPERTIES LLC	PO BOX 10074	PORTLAND	OR	97296-0074
MEADOR,DAVID W	15116 NE KLICKITAT ST	PORTLAND	OR	97230
MEADOW OUTDOOR ADVERTISING	P O BOX 331	THE DALLES	OR	97058
MEDINA,PATRICIA REYES	9000 NE M L KING BLVD SP 158	PORTLAND	OR	97211
MEEDER EQUIPMENT CO	3495 S MAPLE AVE	FRESNO	CA	93725-2413
MEIER 2 LLC %WYSE INVESTMENT SERVICES CO	810 SE BELMONT ST #100	PORTLAND	OR	97214
MEISEL,RAYNEY & NANCHY,TRAVIS	2366 NW ROOSEVELT ST	PORTLAND	OR	97210
MEJIA LARA,ROSA MARIA	9000 NE MLK BLVD #149	PORTLAND	OR	97211
MENASHE,R BARRY	621 SW ALDER ST #800	PORTLAND	OR	97205
MENDOZA GOMEZ,ALFONSO & MENDOZA-JIMENEZ,MIRACELD-JOS	9000 NE M L KING BLVD #11	PORTLAND	OR	97211
MENDOZA,RIGOBERTO & CALEL,AGUSTIN	6452 NE SIMPSON ST	PORTLAND	OR	97218
MERIT U S A INC	4150 N SUTTLE RD	PORTLAND	OR	97217-7717

MERIT U S A INC	4150 N SUTTLE RD	PORTLAND	OR	97217-7717
MERIT U S A INC	4150 N SUTTLE RD	PORTLAND	OR	97217-7717
MERIT U S A INC	4150 N SUTTLE RD	PORTLAND	OR	97217-7717
MERIT U S A INC	4150 N SUTTLE RD	PORTLAND	OR	97217-7717
MERRITT,JASON B & MORGAN,SUMMER L	6031 NW 60TH AVE	PORTLAND	OR	97210
MERZ,KENNETH L	6858 MAPLE LEAF DR	CARLSBAD	CA	92011
MESENBRINK,JANET % BLACKLINE INC	PO BOX 10716	PORTLAND	OR	97296
MESERVEY,HARLEY G & MESERVEY,REAGAN M	PO BOX 241	COOS BAY	OR	97420-0028
MESERVEY,HARLEY G & MESERVEY,REAGAN M	PO BOX 241	COOS BAY	OR	97420-0028
MET LIFE CAPITAL	10900 NE 8TH AVE	BELLEVUE	WA	98009
METRO % PORTLAND PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204
METRO % PORTLAND PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204
METRO % PORTLAND PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204
METRO % PORTLAND PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204
METRO % PORTLAND PARKS BUREAU	1120 SW 5TH AVE #1302	PORTLAND	OR	97204
METRO % PROPERTY MANAGER	600 NE GRAND AVE	PORTLAND	OR	97232-2736
METRO % PROPERTY MANAGER	600 NE GRAND AVE	PORTLAND	OR	97232-2736
METRO % PROPERTY MANAGER	600 NE GRAND AVE	PORTLAND	OR	97232-2735
METRO % PROPERTY MANAGER	600 NE GRAND AVE	PORTLAND	OR	97232-2735
METRO % PROPERTY MANAGER	600 NE GRAND AVE	PORTLAND	OR	97232-2735
METRO % PROPERTY MANAGER	600 NE GRAND AVE	PORTLAND	OR	97232-2735
METRO % PROPERTY MANAGER	600 NE GRAND AVE	PORTLAND	OR	97232-2736
METRO % PROPERTY MANAGER	600 NE GRAND AVE	PORTLAND	OR	97232-2736
METRO % PROPERTY MANAGER	600 NE GRAND AVE	PORTLAND	OR	97232-2736
METRO & PORT OF PORTLAND-CI	600 NE GRAND AVE	PORTLAND	OR	97232-2736
METRO & PORTLAND CITY OF(BUREAU OF ENVIRONMENTAL SERVIC	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
METRO & PORTLAND CITY OF(BUREAU OF ENVIRONMENTAL SERVIC	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
METRO (GLEASON BOAT RAMP>	600 NE GRAND AVE	PORTLAND	OR	97232-2736
METRO ATTN OFFICE OF GENERAL COUNSEL	600 NE GRAND AVE	PORTLAND	OR	97232-2736
METRO ATTN OFFICE OF GENERAL COUNSEL	600 NE GRAND AVE	PORTLAND	OR	97232-2736
METRO ATTN OFFICE OF GENERAL COUNSEL	600 NE GRAND AVE	PORTLAND	OR	97232-2736
METRO ATTN OFFICE OF GENERAL COUNSEL	600 NE GRAND AVE	PORTLAND	OR	97232-2736
METRO ATTN PROPERTY MANAGER	600 NE GRAND AVE	PORTLAND	OR	97232-2799

METRO ATTN PROPERTY MANAGER	600 NE GRAND AVE	PORTLAND	OR	97232-2799
METRO ATTN PROPERTY MANAGER	600 NE GRAND AVE	PORTLAND	OR	97232-2799
METRO ATTN PROPERTY MANAGER	600 NE GRAND AVE	PORTLAND	OR	97232-2799
METRO METALS NORTHWEST INC	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218
METRO SERV DIST(LEASED JACK GR	600 NE GRAND AVE	PORTLAND	OR	97232
METRO-1/4 & PORTLAND CITY OF-3/4 % PORTLAND PARKS & RECR	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
METRO-25% & PORTLAND CITY OF-75% ATTN OLBRICH,APRIL	600 NE GRAND AVE	PORTLAND	OR	97232
METRO-50% & PORTLAND CITY OF-50%	600 NE GRAND AVE	PORTLAND	OR	97232-2736
METRO-50% & PORTLAND CITY OF-50%	600 NE GRAND AVE	PORTLAND	OR	97232-2736
METSO MINERALS INDUSTRIES INC	20965 CROSSROADS CIR	WAUKESHA	WI	53186-4083
MICEK GROUP LLC	4910 SE 35TH AVE	PORTLAND	OR	97202-4114
MICEK GROUP LLC	4910 SE 35TH AVE	PORTLAND	OR	97202-4114
MICEK GROUP LLC	4910 SE 35TH AVE	PORTLAND	OR	97202-4114
MICEK GROUP LLC	4910 SE 35TH AVE	PORTLAND	OR	97202-4114
MICHAEL NELSON PROPERTIES LLC	5937 N CUTTER CIR	PORTLAND	OR	97217-3940
MICHAEL NELSON PROPERTIES LLC	5937 N CUTTER CIR	PORTLAND	OR	97217-3940
MICHAEL NELSON PROPERTIES LLC	5937 N CUTTER CIR	PORTLAND	OR	97217-3940
MICHAEL NELSON PROPERTIES LLC	5937 N CUTTER CIR	PORTLAND	OR	97217-3940
MICHAEL WALTON ENTERPRISES LLC	P O BOX 21403	KEIZER	OR	97307
MICHALEK,TIMOTHY J-80% & SPEAR,KENT T TR-20% MORGAN CFS#	7098 N MARINE DR	PORTLAND	OR	97203
MIDDLEBROOK,CARL DAVID	10701 SE HWY 212 SPRUCE 1	CLACKAMAS	OR	97015-9132
MIDLAND INVESTMENT CO	16100 NE 16TH CIR	VANCOUVER	WA	98684
MILAGRO DEVEL GROUP LLC	425 SE 6TH AVE	PORTLAND	OR	97214
MILL BANK MATERIALS USA LTD	APT 102 20329 LOGAN AVE	LANGLEY	BC	V3A 4L8 CA
MILL STREET HOLDINGS LLC	10830 SE EASTMONT DR	DAMASCUS	OR	97089
MILLER PAINT CO INC ATTN: MARSHA SZAREK	12812 NE WHITAKER WAY	PORTLAND	OR	97230
MILLER PAINT CO INC ATTN: MARSHA SZAREK	12812 NE WHITAKER WAY	PORTLAND	OR	97230
MILLER,ALEXANDER	3407 SE 22ND AVE	PORTLAND	OR	97202
MILLER,GORDON W & CAROL M	4950 SE 174TH AVE	PORTLAND	OR	97236
MILLER,GORDON W & MILLER,CAROL M	4950 SE 174TH AVE	PORTLAND	OR	97236-1602
MILLER,HENRY R & MILLER,HILARIE M	4910 NE HOLMAN ST	PORTLAND	OR	97218-1857
MILLER,HENRY R & MILLER,HILARIE M	4910 NE HOLMAN ST	PORTLAND	OR	97218-1857
MILLER,HENRY R & MILLER,HILARIE M	4910 NE HOLMAN ST	PORTLAND	OR	97218-1857

MILLER,HENRY R & MILLER,HILARIE M	4910 NE HOLMAN ST	PORTLAND	OR	97218-1857
MILLER,MARVIN GLENN & SHARON L	2715 SUNNYVIEW RD NE	SALEM	OR	97303
MILLER,PRUDENCE M TR	4220 SW GREENLEAF DR	PORTLAND	OR	97221-3226
MILLER,SIMON S	9940 N DECATUR ST	PORTLAND	OR	97203
MILLICAN PROPERTIES LLC	8316 N LOMBARD ST PMB 330	PORTLAND	OR	97203
MILLICAN PROPERTIES LLC	8316 N LOMBARD ST PMB 330	PORTLAND	OR	97203
MILLICAN PROPERTIES LLC	8316 N LOMBARD ST PMB 330	PORTLAND	OR	97203
MILLICAN PROPERTIES LLC ATTN MILLICAN,ANDREW R	9449 N BURGARD WAY	PORTLAND	OR	97203
MILLICAN PROPERTIES LLC-3/4 & SCHNITZER STEEL INDUSTRIES INC	818 STEWART STREET SUITE 700	SEATTLE	WA	98101
MILLS,GLEN C	10935 SE SPRUCE VIEW LN	HAPPY VALLEY	OR	97086-8771
MILLS,GLEN C	10935 SE SPRUCE VIEW LN	HAPPY VALLEY	OR	97086-8771
MILLS,GLENFORD & MILLS,JOANNE	10935 SE SPRUCE VIEW LN	HAPPY VALLEY	OR	97086
MINCHEFF & MINCHEFF INVEST LLC MINCHEFF & MINCHEFF INVEST	537 SE ASH ST #101	PORTLAND	OR	97214
MINCKLER,JOHN A & MARLENE E	2439 NW 29TH AVE	PORTLAND	OR	97210
MIRANDA N,MARTIN & MIRANDA-ROSA,JOHANNA L	9000 NE M L K BLVD #220	PORTLAND	OR	97211
MISCOE PROPERTIES LLC	PO BOX 4444	PORTLAND	OR	97208
MISCOE PROPERTIES LLC	PO BOX 4444	PORTLAND	OR	97208
MISCOE PROPERTIES LLC	PO BOX 4444	PORTLAND	OR	97208
MIXZON INCORPORATED	1033 SW YAMHILL ST #301	PORTLAND	OR	97205-2539
MLC BROS CAPITAL LLC	PO BOX 1545	WRIGHTW	OD	92397-1545
MLCA LLC	1901 SE GRAND AVE	PORTLAND	OR	97214-4514
MLCA LLC	1901 SE GRAND AVE	PORTLAND	OR	97214-4514
MLCA LLC	1901 SE GRAND AVE	PORTLAND	OR	97214-4514
MMM HOLDINGS LLC	19710 SE 25TH ST	CAMAS	WA	98607
MODERN MACHINERY CO INC	PO BOX 16660	MISSOULA	MT	59808
MODUN,JEFFREY K	PO BOX 19941	PORTLAND	OR	97280-0941
MODUN,JEFFREY K	PO BOX 19941	PORTLAND	OR	97280-0941
MODUN,JEFFREY K	PO BOX 19941	PORTLAND	OR	97280-0941
MODUN,JEFFREY K	PO BOX 19941	PORTLAND	OR	97280-0941
MODUN,JEFFREY K	PO BOX 19941	PORTLAND	OR	97280-0941
MOELLER FAMILY LLC	4920 NW SEWELL RD	HILLSBORO	OR	97124
MOELLER FAMILY LLC	4920 NW SEWELL RD	HILLSBORO	OR	97124
MOFFITT,MELISSA & OSBORNE,DORI	3125 SE 20TH AVE	PORTLAND	OR	97202
MOKULUA INVESTMENTS LLC	5930 SW IDAHO ST	PORTLAND	OR	97221

MOLLET PRINTING INC	717 NE LOMBARD ST	PORTLAND	OR	97211-3561
MONDELEZ GLOBAL LLC C/O THE ALBANO GROUP LLC	PO BOX 1240	MANCHESTER	NH	3105
MONDELEZ GLOBAL LLC C/O THE ALBANO GROUP LLC	PO BOX 1240	MANCHESTER	NH	3105
MONEY SAVER JOHNSON CREEK LLC	5729 LAKEVIEW DR #200	KIRKLAND	WA	98033-7433
MONEY SAVER JOHNSON CREEK LLC	5729 LAKEVIEW DR #200	KIRKLAND	WA	98033-7433
MONSTER HOLDINGS LLC	5440 SE 26TH AVE	PORTLAND	OR	97202
MONTEITH,NANCY L	PO BOX 188	BATTLE GROUND	WA	98604-0188
MONTEITH,NANCY L	PO BOX 188	BATTLE GROUND	WA	98604-0188
MONTEITH-HAMILTON,NANCY L	PO BOX 188	BATTLE GROUND	WA	98604
MONTGOMERY,CAROL A TR ET AL	4124 SW CORBETT AVE	PORTLAND	OR	97239-4202
MOODY,LINDA L TR (MOODY 2005 TRUST DATED 9-19-05) %FISCHE	9811 NE 114TH CIR	VANCOUVER	WA	98662-1589
MOODY,LINDA L TR (MOODY 2005 TRUST DTD 9/19/200 % FISCHER	9811 NE 114TH CIR	VANCOUVER	WA	98662-1589
MOODY,PAUL W TR & MOODY,LINDA L TR	9811 NE 114TH CIR	VANCOUVER	WA	98662
MOODY,PAUL W TR & MOODY,LINDA L TR % FISCHER & COMPANY	9811 NE 114TH CIR	VANCOUVER	WA	98662-1589
MOODY,PAUL W TR & MOODY,LINDA L TR % FISCHER & COMPANY	9811 NE 114TH CIR	VANCOUVER	WA	98662-1589
MOONSTRUCK CHOCOLATE CO INC	6600 N BALTIMORE AVE	PORTLAND	OR	97203
MOORE,COLLEEN O	18442 HAVEN ACRES RD	CLATSKANIE	OR	97016-2123
MOORE,FLOYD C & MOORE,CAROL A	6051 NW 60TH AVE	PORTLAND	OR	97210-3605
MORALES,OCIRES & MORALES HERNANDEZ,CAROLINA	9000 NE M L KING BLVD SP 187	PORTLAND	OR	97211
MORALES,OCIRES O	9000 NE M L KING BLVD SP 63	PORTLAND	OR	97211
MORAN,SUZANNE L	3525 NE 50TH AVE #209	PORTLAND	OR	97213
MORASCH MEATS INC	4050 NE 158TH AVE	PORTLAND	OR	97230
MORASCH MEATS INC	4050 NE 158TH AVE	PORTLAND	OR	97230
MORASCH MEATS INC	4050 NE 158TH AVE	PORTLAND	OR	97230
MORASCH'S BY MORASCH,STEVEN J	P O BOX 30028	PORTLAND	OR	97230
MORASCH'S RP LLC	PO BOX 30028	PORTLAND	OR	97230
MOREC FRONT LLC	5480 NW FRONT AVE	PORTLAND	OR	97210-1114
MOREC POWELL LLC % MC CALL,EDMUND B B	5480 NW FRONT AVE	PORTLAND	OR	97210-1114
MORGAN,D F & JOAN L	8440 N KERBY AVE	PORTLAND	OR	97217
MORGAN,D F & JOAN L	8440 N KERBY AVE	PORTLAND	OR	97217
MORGAN,SHANE L & WRIGHT,JENNIFER	4103 SE 25TH AVE	PORTLAND	OR	97202
MORGAN,SHELLEY M /MASKELL,DAVID	9000 NE M L KING BLVD, SP 222	PORTLAND	OR	97211
MORNING STAR PROPERTIES LLC	7015 NE COLUMBIA BLVD	PORTLAND	OR	97218

MORRIS,STEVE A & DONNA J	33292 HILLCREST DR	SCAPPOOSE	OR	97056-4318
MORRISON OIL CO	PO BOX 17339	PORTLAND	OR	97217-0339
MORRISON OIL CO	PO BOX 17339	PORTLAND	OR	97217-0339
MORRISON,CAROLYN I MORRISON,LARRY W % WILLIAMS,VERN A	1359 JUDY ST	WOODBURN	OR	97071
MORSE BROS INC	32260 OLD HWY 34	TANGENT	OR	97389
MORTENSEN,SHANNON & TIMMY / DELANEY,WILLIAM L R	9000 NE M L KING BLVD SP225	PORTLAND	OR	97211
MORTIMER,SUSAN	5575 NW WILLBRIDGE AVE	PORTLAND	OR	97210
MOSES,BETTY L & MOSES,GARY D %MATT SCHWAB,PORTLAND PRC	5819 N GREELEY AVE	PORTLAND	OR	97217
MOSHBERGER,HENRY TO PORTER,MICHAEL & BRETT,JASON	4435 NE 148TH AVE	PORTLAND	OR	97230-4308
MOSHBERGER,HENRY TO PORTER,MICHAEL & BRETT,JASON	4435 NE 148TH AVE	PORTLAND	OR	97230-4308
MOTOR CARGO INC ATTN TAX DEPT	PO BOX 28606	ATLANTA	GA	30358
MOTT,MELVIN G & MOTT,BEVERLY K	3405 SE 21ST AVE	PORTLAND	OR	97202
MOULTRIE LAND & SEA EXPLORATION LLC	5400 NE COLUMBIA BLVD	PORTLAND	OR	97218
MOUNTAINVALE L L C	1905 SE 10TH AVE	PORTLAND	OR	97214
MOUNTAINVALE L L C	1905 SE 10TH AVE	PORTLAND	OR	97214
MOVENTAS INC	8823 N HARBORGATE ST	PORTLAND	OR	97203
MOVENTAS INC	8823 N HARBORGATE ST	PORTLAND	OR	97203
MOWLDS,RONALD	PO BOX 216	LONG BEACH	WA	98631-0216
MOWLDS,RONALD C & DARALEE E	PO BOX 216	LONG BEACH	WA	98631-0216
MOWLDS,RONALD C & DARALEE E	PO BOX 216	LONG BEACH	WA	98631-0216
MP1 LLC	1807 SE POWELL BLVD	PORTLAND	OR	97202-2342
MP1 LLC	1807 SE POWELL BLVD	PORTLAND	OR	97202-2342
MP1 LLC	1807 SE POWELL BLVD	PORTLAND	OR	97202-2342
MPRS LLC	9020 NE VANCOUVER WAY	PORTLAND	OR	97211
MPSB LLC	5411 NE PORTLAND HWY	PORTLAND	OR	97218
MRA INVESTMENT L L C % MENASHE,MICHAEL E	333 NW 9TH AVE #1504	PORTLAND	OR	97209
MRT EXPLORATION CO % UNION PACIFIC RAILROAD PROPERTY TAX	1400 DOUGLAS STOP 1640	OMAHA	NE	68179-1640
MSB LLC	PO BOX 146	LAKE OSWEGO	OR	97034
MSC COLUMBIA LLC % CALATO,CHRIS	2437 1/2 UNIVERSITY BLVD	HOUSTON	TX	77005-3226
MSC FOSTER LLC	2437 1/2 UNIVERSITY BLVD	HOUSTON	TX	77005
MSC FOSTER LLC	2437 1/2 UNIVERSITY BLVD	HOUSTON	TX	77005
MSC LLC	PO BOX 146	LAKE OSWEGO	OR	97034
MSC LLC	PO BOX 146	LAKE OSWEGO	OR	97034
MSD LLC	PO BOX 146	LAKE OSWEGO	OR	97034

MSI LLC	PO BOX 146	LAKE OSWEGO	OR	97034
MT HOOD SOLUTIONS COMPANY	14546 N LOMBARD ST	PORTLAND	OR	97203
MT SCOTT CONGREGATION OF JEHOV BY HAMBERG,GLEN E	8710 SE 57TH AVE	PORTLAND	OR	97206
MT SCOTT CONGREGATION OF JEHOV BY HAMBERG,GLENN E	8710 SE 57TH AVE	PORTLAND	OR	97206
MT SCOTT INDUSTRIAL PARK LLC	18040 SE BLANTON ST	MILWAUKIE	OR	97267-6029
MTC PROPERTIES LLC	6364 NE 63RD AVE	PORTLAND	OR	97218-2796
MTM GLENN WIDING LLC-34.03% & FINN PROPERTIES LLC-26.93% &	300 W 15TH ST #200	VANCOUVER	WA	98660-2927
MULFLUR FAMILY LLC % MT HOOD CHEMICAL CORP ATTN: MULFLU	14546 N LOMBARD ST	PORTLAND	OR	97203
MULICK,DARYL J & MULICK,ARNOLD J	8045 SE 82ND AVE	PORTLAND	OR	97266-6206
MULICK,DARYL J & MULICK,ARNOLD J	8045 SE 82ND AVE	PORTLAND	OR	97266-6206
MULICK,DARYL J & MULICK,ARNOLD J	8045 SE 82ND AVE	PORTLAND	OR	97266-6206
MULTNOMAH COUNTY % DEPT OF COMMUNITY SERVICES	1620 SE 190TH AVE	PORTLAND	OR	97233-5910
MULTNOMAH COUNTY % DIV OF FACILITIES & PROPERTY MANAGEI	401 N DIXON ST	PORTLAND	OR	97227
MULTNOMAH COUNTY % ENGINEERING SERVICES	2115 SE MORRISON ST	PORTLAND	OR	97214-2865
MULTNOMAH COUNTY % HINDS,PATRICK TRANSPORTATION PROGI	1600 SE 190TH AVE	PORTLAND	OR	97233
MULTNOMAH COUNTY % PROPERTY MANAGEMENT	401 N DIXON ST	PORTLAND	OR	97227-1865
MULTNOMAH COUNTY % PROPERTY MANAGEMENT	401 N DIXON ST	PORTLAND	OR	97227-1865
MULTNOMAH COUNTY % PROPERTY MANAGEMENT	401 N DIXON ST	PORTLAND	OR	97227-1865
MULTNOMAH COUNTY % PROPERTY MANAGEMENT	401 N DIXON ST	PORTLAND	OR	97227-1865
MULTNOMAH COUNTY % PROPERTY MANAGEMENT	401 N DIXON ST	PORTLAND	OR	97227-1865
MULTNOMAH COUNTY % PROPERTY MANAGEMENT	401 N DIXON ST	PORTLAND	OR	97227-1865
MULTNOMAH COUNTY % SPECIAL PROGRAM GROUP	PO BOX 2716	PORTLAND	OR	97208-2716
MULTNOMAH COUNTY %PROPERTY MANAGEMENT	401 N DIXON ST	PORTLAND	OR	97227-1865
MULTNOMAH COUNTY (FACILITIES & 401 N DIXON ST		PORTLAND	OR	97227-1865
MULTNOMAH COUNTY DRAINAGE DISTRICT #1	1880 NE ELROD DR	PORTLAND	OR	97211-1810
MULTNOMAH COUNTY DRAINAGE DISTRICT #1	1880 NE ELROD DR	PORTLAND	OR	97211-1810
MULTNOMAH COUNTY DRAINAGE DISTRICT #1	1880 NE ELROD DR	PORTLAND	OR	97211-1810
MULTNOMAH COUNTY DRAINAGE DISTRICT #1	1880 NE ELROD DR	PORTLAND	OR	97211-1810
MULTNOMAH COUNTY DRAINAGE DISTRICT #1	1880 NE ELROD DR	PORTLAND	OR	97211-1810
MULTNOMAH COUNTY DRAINAGE DISTRICT #1	1880 NE ELROD DR	PORTLAND	OR	97211-1810
MULTNOMAH COUNTY DRAINAGE DISTRICT #1	1880 NE ELROD DR	PORTLAND	OR	97211-1810
MULTNOMAH COUNTY PROPERTY MANAGEMENT DIV	401 N DIXON ST	PORTLAND	OR	97227-1865

MULTNOMAH COUNTY TAX TITLE	PO BOX 2716	PORTLAND	OR	97208-2716
MULTNOMAH COUNTY TAX TITLE	PO BOX 2716	PORTLAND	OR	97208-2716
MULTNOMAH COUNTY TAX TITLE	PO BOX 2716	PORTLAND	OR	97208-2716
MULTNOMAH COUNTY TAX TITLE TO TINDALL FAMILY PROPERTIES	2601 N NEWARK ST	PORTLAND	OR	97217
MULTNOMAH COUNTY TAX TITLE TO TINDALL FAMILY PROPERTIES	2601 N NEWARK ST	PORTLAND	OR	97217
MULTNOMAH COUNTY TAX TITLE TO WESTPHAL,EDGAR A & WESTF	1396 NW BENFIELD DR	PORTLAND	OR	97229-9150
MULTNOMAH COUNTY(LEASED AMERICAN METAL PRODUCTS % PR	401 N DIXON ST	PORTLAND	OR	97227-1865
MULTNOMAH COUNTY(LEASED AMERICAN METAL PRODUCTS % PR	401 N DIXON ST	PORTLAND	OR	97227-1865
MULTNOMAH EDUCATION SERVICE DISTRICT>	11611 NE AINSWORTH CIR	PORTLAND	OR	97220-9017
MUMM,CHRIS R	1516 NE SKIDMORE ST	PORTLAND	OR	97211-5159
MUNOZ,RODRIGO & GONZALEZ,MARTHA	9000 NE M L KING BLVD SP 75	PORTLAND	OR	97211
MUNSON,ROBERT D & DEBRA M	1702 NW 91ST PL	PORTLAND	OR	97229-4123
MUNSON,ROBERT D & DEBRA M	1702 NW 91ST PL	PORTLAND	OR	97229-4123
MUPP LLC % WARREN,WIMBERLY M	6240 SW MILES CT	PORTLAND	OR	97219-1163
MUPP LLC % WARREN,WIMBERLY M	6240 SW MILES CT	PORTLAND	OR	97219-1163
MURAMATSU,HENRY S	999 SW JUNCTION PL	GRESHAM	OR	97080
MURASE PROPERTIES LLC	5214 N WILLIAMS AVE	PORTLAND	OR	97217-2736
MURRAY,JOHN & NANCY	2335 N MARINE DR	PORTLAND	OR	97217-7763
MUSIC,DEAN M & RAMONA K	RT 2 BOX 144	ESTACADA	OR	97023
MVI PORTLAND 1 LLC ATTN: IVY,MARLENE	3007 WEBSTER POINT RD NE	SEATTLE	WA	98105
MVI PORTLAND 1 LLC ATTN: IVY,MARLENE	3007 WEBSTER POINT RD NE	SEATTLE	WA	98105
MW 2000 WILSON LLC % WINKLER,JAMES H	210 SW MORRISON ST #600	PORTLAND	OR	97204-3150
MW 2000 WILSON LLC % WINKLER,JAMES H	210 SW MORRISON ST #600	PORTLAND	OR	97204-3150
MW 2000 WILSON LLC % WINKLER,JAMES H	210 SW MORRISON ST #600	PORTLAND	OR	97204-3150
MW 2000 WILSON LLC % WINKLER,JAMES H	210 SW MORRISON ST #600	PORTLAND	OR	97204-3150
MYERS CONTAINER LLC	8435 NE KILLINGSWORTH ST	PORTLAND	OR	97220
MYERS CONTAINER LLC	PO BOX 3609	PORTLAND	OR	94545-1216
MYERS CONTAINER LLC	8435 NE KILLINGSWORTH ST	PORTLAND	OR	97220
MYERS,ESTHER H-LE & MYERS,ROBERT B & JANET E	1005 NE STAFFORD ST	PORTLAND	OR	97211-3581
MYERS,JANET E & ROBERT B	1005 NE STAFFORD ST	PORTLAND	OR	97211-3581
MYERS,MICHAEL G	110 SE 2ND AVE	PORTLAND	OR	97214
MYERS,ROBERT B & JANET E	1005 NE STAFFORD ST	PORTLAND	OR	97211-3581
N C & T WOOMER LLC	2402 W VALLEY HWY N	AUBURN	WA	98001
N INTERSTATE PROPERTIES LLC	9011 SW BVTN-HILLS HWY #1-A	PORTLAND	OR	97225

N INTERSTATE PROPERTIES LLC	9011 SW BVTN-HILLS HWY #1-A	PORTLAND	OR	97225
N W CASEWORKS LLC	9125 N BRADFORD ST	PORTLAND	OR	97203-2813
N W INVESTMENTS GROUP LLC	7880 SW 184TH AVE	BEAVERTON	OR	97007-7765
N&NRES I LLC %EPROPERTYTAX DEPT 401	PO BOX 4900	SCOTTSDALE	AZ	85261-4900
N&NRES I LLC %EPROPERTYTAX DEPT 401	PO BOX 4900	SCOTTSDALE	AZ	85261-4900
N. COLUMBIA BLVD. LLC ATTN CASEY & DUANE STROUPE	20200 SW STAFFORD RD	TUALATIN	OR	97062
N. COLUMBIA BLVD. LLC ATTN CASEY & DUANE STROUPE	20200 SW STAFFORD RD	TUALATIN	OR	97062
NAGEL FAMILY REAL ESTATE LIMITED PARTNERSHIP % NAGEL,LORR	45 CONDOLEA CT	LAKE OSWEGO	OR	97035-1002
NAGEL FAMILY REAL ESTATE LIMITED PARTNERSHIP % NAGEL,LORR	45 CONDOLEA CT	LAKE OSWEGO	OR	97035-1002
NAGEL FAMILY REAL ESTATE LIMITED PARTNERSHIP % NAGEL,LORR	45 CONDOLEA CT	LAKE OSWEGO	OR	97035-1002
NAGEL FAMILY REAL ESTATE LIMITED PARTNERSHIP % NAGEL,LORR	45 CONDOLEA CT	LAKE OSWEGO	OR	97035-1002
NAHUM,CLAUDE D TR & NAHUM,GITA G TR (NAHUM FAMILY TRUS	630 PRINCETON DR	SUNNYVALE	CA	94087-1851
NAHUM,CLAUDE D TR & NAHUM,GITA G TR (NAHUM FAMILY TRUS	630 PRINCETON DR	SUNNYVALE	CA	94087-1851
NAL LLC	PO BOX 264	DUNDEE	OR	97115-0264
NAMS INC	2770 NW INDUSTRIAL ST	PORTLAND	OR	97210
NAMS INC	2770 NW INDUSTRIAL ST	PORTLAND	OR	97210
NASE MAIN STREET LLC ATTN: NASECO	PO BOX 3032	SUNRIVER	OR	97707-0032
NATIONAL ADVERTISING CO INC % CORP TAX DEPT	P O BOX 33441	ST PAUL	MN	55133
NATIONAL CITY COMMERCIAL CAPIT	995 DALTON AVE	CINCINNATI	OH	45203
NATIONAL COLLEGE OF NATURAL MEDICINE % BORES,GERALD	049 SW PORTER ST	PORTLAND	OR	97201-4848
NATIONAL COLLEGE OF NATURAL MEDICINE % BORES,GERALD	049 SW PORTER ST	PORTLAND	OR	97201-4848
NATIONAL COLLEGE OF NATURAL MEDICINE % BORES,GERALD	049 SW PORTER ST	PORTLAND	OR	97201-4848
NATIONAL COLLEGE OF NATURAL MEDICINE % BORES,GERALD	049 SW PORTER ST	PORTLAND	OR	97201-4848
NATIONAL COLLEGE OF NATURAL MEDICINE % BORES,GERALD	049 SW PORTER ST	PORTLAND	OR	97201-4848
NATIONAL COLLEGE OF NATURAL MEDICINE % BORES,GERALD	049 SW PORTER ST	PORTLAND	OR	97201-4848
NATIONAL COLLEGE OF NATURAL MEDICINE % BORES,GERALD	049 SW PORTER ST	PORTLAND	OR	97201-4848
NATIONAL COLLEGE OF NATURAL MEDICINE % BORES,GERALD	049 SW PORTER ST	PORTLAND	OR	97201-4848
NATIONAL STORAGE CENTERS- PORTLAND LLC	PO BOX 330236	SAN FRANCISCO	CA	94133-0236
NATIVE AMERICAN YOUTH AND FAMILY CENTER	5135 NE COLUMBIA BLVD	PORTLAND	OR	97218
NATMI NATIONAL FX PROPERTIES LLC	201 WEST ST #200	ANNAPOLIS	MD	21401
NATURAL PEAK LLC %BRYAN D MENDEZ	15121 S REDLAND RD	OREGON CITY	OR	97045
NAU,HESTER H	9449 SW MALCOLM GLEN ST	PORTLAND	OR	97225
NAU,HESTER H	9449 SW MALCOLM GLEN ST	PORTLAND	OR	97225

NE 6TH DRIVE LLC % JODI A BROOKS MNGR	12363 CLARA LN	LAKE OSWEGO	OR	97035-1166
NEELY,KEVIN F & LEONARD,KRISTEN L	250 SE SPOKANE ST	PORTLAND	OR	97202-6442
NEELY,MICHAEL P	59-032 HOLAWA ST	HALEIWA	HI	96712-9706
NELA AVENUE LLC	14915 SW 100TH AVE	TIGARD	OR	97224
NELSON,THOMAS E TR & NELSON,ESTHER A TR	2753 NW CALUMET TER	PORTLAND	OR	97210-3307
NELSON,THOMAS E TR & NELSON,ESTHER A TR	2753 NW CALUMET TER	PORTLAND	OR	97210-3307
NEMARNIK,DAVID P	201 NE 2ND AVE	PORTLAND	OR	97232-2993
NESOR INVESTMENT CO	PO BOX 3546	SEATTLE	WA	98124-3546
NEUSTADER BUILDING LLC	35393 HWY 19	KIMBERLY	OR	97848-6217
NEUSTADER BUILDING LLC	35393 HWY 19	KIMBERLY	OR	97848-6217
NEW PARADIGM MANAGEMENT INC	7709 SE 31ST AVE	PORTLAND	OR	97202
NEW PARADIGM MANAGEMENT INC	7709 SE 31ST AVE	PORTLAND	OR	97202
NEW SEASONS MARKET LLC	1300 SE STARK ST STE 401	PORTLAND	OR	97214-2473
NEW SEASONS MARKET LLC	1300 SE STARK ST STE 401	PORTLAND	OR	97214-2473
NEWBY,WILLA % TABAKOV,OLGA	5541 NE 72ND AVE	PORTLAND	OR	97218
NEWMARK AIRPORT LLC	1730 SW SKYLINE BLVD #121	PORTLAND	OR	97221
NEWMARK AIRPORT LLC	1730 SW SKYLINE BLVD #121	PORTLAND	OR	97221
NEWMARK AIRPORT LLC	1730 SW SKYLINE BLVD #121	PORTLAND	OR	97221
NEWMARK AIRPORT LLC	1730 SW SKYLINE BLVD #121	PORTLAND	OR	97221
NEWMARK AIRPORT LLC	1730 SW SKYLINE BLVD #121	PORTLAND	OR	97221
NEWMARK PROPERTIES PARTNERSHIP	9200 SW BARNES RD #C	PORTLAND	OR	97225-6624
NEWMARK PROPERTIES PARTNERSHIP	9200 SW BARNES RD #C	PORTLAND	OR	97225-6624
NEWSOM,BRIAN L	17604 NE 31ST ST	VANCOUVER	WA	98682-3693
NGAN,SIU KING	PO BOX 8001	PORTLAND	OR	97207
NGUYEN,BACHGNOC & THANH	7015 SE 83RD AVE	PORTLAND	OR	97266-5822
NGUYEN,CUONG	7932 NE HALSEY ST	PORTLAND	OR	97213
NGUYEN,PHONG H & NGO,DINH C	4352 NE 82ND AVE	PORTLAND	OR	97220
NGUYEN,PHONG H & NGO,DINH C	4352 NE 82ND AVE	PORTLAND	OR	97220
NICOLAI PROPERTY LLC	PO BOX 296	MARYLHURST	OR	97036
NICOLAI PROPERTY LLC	PO BOX 296	MARYLHURST	OR	97036
NIEMEYER,JOHN-50% & 35TH AVENUE LLC-50%	14915 SW 100TH AVE	TIGARD	OR	97224
NIKKO MATERIALS USA INC % GOULD ELECTRONICS INC	34929 CURTIS BLVD #100	EASTLAKE	OH	44095
NINE BALL ENTERPRISES LLC	444 SE CARUTHERS ST	PORTLAND	OR	97214
NINE BALL ENTERPRISES LLC	444 SE CARUTHERS ST	PORTLAND	OR	97214

NISHINO,ROBERT R TR & NISHINO,GRACE S TR	5210 N EMERSON DR	PORTLAND	OR	97217-4112
NISHINO,ROBERT R TR & NISHINO,GRACE S TR	5210 N EMERSON DR	PORTLAND	OR	97217-4112
NJL PROPERTIES LLC	8960 LURLINE AVE	CHATSWORTH	CA	91311
NJS INVESTMENTS LLC	111 DOE CREEK TRAIL	HERNANDO	MS	38632
NODINE,WILLIAM C	PO BOX 797	PORT ORFORD	OR	97465
NOLAN,TERRI DANAE C/O ASSOCIATES HOUSING FINANCE	ATTN: CLAUDIA	CLACKAMAS	OR	97015
NOLLAR,JANET L ET AL % HATFIELD,JANET	201 NW 52ND ST	VANCOUVER	WA	98663-1217
NOLLAR,JANET L ET AL % HATFIELD,JANET	201 NW 52ND ST	VANCOUVER	WA	98663-1217
NONNEMAN,DAVID J TR & NONNEMAN,GAIL K TR	10811 SE IDLEMAN RD	HAPPY VALLEY	OR	97086-2109
NONNEMAN,DAVID J TR & NONNEMAN,GAIL K TR	10811 SE IDLEMAN RD	HAPPY VALLEY	OR	97086-2109
NONNEMAN,DAVID J TR & NONNEMAN,GAIL K TR	10811 SE IDLEMAN RD	HAPPY VALLEY	OR	97086-2109
NONNEMAN,DAVID J TR & NONNEMAN,GAIL K TR	10811 SE IDLEMAN RD	HAPPY VALLEY	OR	97086-2109
NOOR LLC % MONTAMENI,RAY	2281 NW GLISAN ST	PORTLAND	OR	97210-3418
NORCO INC	3741 SE 21ST AVE	PORTLAND	OR	97202-2912
NORCO INC	3741 SE 21ST AVE	PORTLAND	OR	97202-2912
NORCO INC	3741 SE 21ST AVE	PORTLAND	OR	97202-2912
NORCO INC	3741 SE 21ST AVE	PORTLAND	OR	97202-2912
NORCO INC	3741 SE 21ST AVE	PORTLAND	OR	97202-2912
NORCO INC	3741 SE 21ST AVE	PORTLAND	OR	97202-2912
NORCO INC	3741 SE 21ST AVE	PORTLAND	OR	97202-2912
NORCO INC	3741 SE 21ST AVE	PORTLAND	OR	97202-2912
NORCO INC	3741 SE 21ST AVE	PORTLAND	OR	97202-2912
NORCO INC	3741 SE 21ST AVE	PORTLAND	OR	97202-2912
NORCO INC	3741 SE 21ST AVE	PORTLAND	OR	97202-2912
NORCREST CHINA CO % BILL NAITO CO	2701 NW VAUGHN ST #390	PORTLAND	OR	97210
NORD,JOHN A	PO BOX 905	LAKE OSWEGO	OR	97034-0144

NORDSTROM INC	PO BOX 2229	SEATTLE	WA	98111-2229
NORPAC MAIN LLC	1905 SE 10TH AVE	PORTLAND	OR	97214
NORPAC OFFICES LLC	1905 SE 10TH AVE	PORTLAND	OR	97214
NORSE HALL ASSN OF PORT	111 NE 11TH AVE	PORTLAND	OR	97232-3002
NORSTAR 595 N COLUMBIA BLVD LLC % KIERSEY & MCMILLAN INC	PO BOX 1696	BEAVERTON	OR	97075
NORSTAR 709 N COLUMBIA BLVD LLC %KIERSEY & MCMILLAN, INC	PO BOX 1696	BEAVERTON	OR	97075
NORSTAR 802 N COLUMBIA BLVD LLC %KIERSY & MCMILLAN, INC	PO BOX 1696	BEAVERTON	OR	97075
NORSTAR 8404 N ALBINA AVE LLC % KIERSEY & MCMILLAN INC	PO BOX 1696	BEAVERTON	OR	97075
NORSTAR 8404 N ALBINA AVE LLC % KIERSEY & MCMILLAN INC	PO BOX 1696	BEAVERTON	OR	97075
NORSTAR 8405 N ALBINA AVE LLC % KIERSEY & MCMILLAN, INC	PO BOX 1696	BEAVERTON	OR	97075
NORTH ARMOUR LLC	PO BOX 80794	PORTLAND	OR	97280
NORTH ARMOUR LLC	PO BOX 80794	PORTLAND	OR	97280
NORTH BASIN WATUMULL LLC	5837 JEAN RD	LAKE OSWEGO	OR	97035
NORTH COAST ELECTRIC PROPERTIES II ATTN STEWART,RONALD G	2450 8TH AVENUE S #200	SEATTLE	WA	98134-2005
NORTH COAST ELECTRIC PROPERTIES II ATTN STEWART,RONALD G	2450 8TH AVENUE S #200	SEATTLE	WA	98134-2005
NORTH COAST ELECTRIC PROPERTIES II ATTN STEWART,RONALD G	2450 8TH AVENUE S #200	SEATTLE	WA	98134-2005
NORTH CUTTER LLC %CORDIA CAPITAL MANAGEMENT LLC ATTN: NI	2101 ROSECRANS AVE #4305	EL SEGUNDO	CA	90245
NORTH FORK INVESTMENTS LLC % VERSA-TECH METAL FAB INC ATT	PO BOX 20907	PORTLAND	OR	97284
NORTH FORK INVESTMENTS LLC % VERSA-TECH METAL FAB INC ATT	PO BOX 20907	PORTLAND	OR	97284
NORTH INTERSTATE LLC PMB 322	2050 S BEAVERCREEK RD #101	OREGON CITY	OR	97045-4301
NORTH PORTLAND LUMBER CO TO SHUR CUT INDUSTRIES INC	PO BOX 83892	PORTLAND	OR	97283-0892
NORTH PORTLAND ROAD LLC % BREUNIG,GERALD & ROHRBACH,DI	13501 SE RIVERCREST DR	VANCOUVER	WA	98683
NORTH PORTLAND ROAD LLC % BREUNIG,GERALD & ROHRBACH,DI	13501 SE RIVERCREST DR	VANCOUVER	WA	98683
NORTHGATE ONE LLC % VANDENBERG,JEANETTE	5801 N FESSENDEN ST	PORTLAND	OR	97203-2636
NORTHSIDE LLC	PO BOX 55010	PORTLAND	OR	97238-5010
NORTHSIDE LLC % MCDONOUGH,JIM	PO BOX 55010	PORTLAND	OR	97238
NORTHVIEW INVESTMENTS INC NORTHVIEW INVESTMENTS, INC	33855 VAN DUYN RD	EUGENE	OR	97408
NORTHWEST AGGREGATES INC % ADVANTAX GROUP LLC	200 W RIVER RD	ST CHARLES	IL	60174
NORTHWEST CEDARS MANAGEMENT INC	9828 E BURNSIDE ST #200	PORTLAND	OR	97216-2363
NORTHWEST CEDARS MANAGEMENT INC	9828 E BURNSIDE ST #200	PORTLAND	OR	97216-2363
NORTHWEST FENCE & WIRE WORKS LLC>	70 NW COUCH ST #207	PORTLAND	OR	97209
NORTHWEST FENCE & WIRE WORKS LLC>	70 NW COUCH ST #207	PORTLAND	OR	97209
NORTHWEST LINE CONSTRUCTORS CH	6162 NE 80TH AVE	PORTLAND	OR	97218-4009
NORTHWEST NATURAL GAS CO	220 NW 2ND AVE	PORTLAND	OR	97209-3943

NORTHWEST NATURAL GAS CO	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST NATURAL GAS CO	735 SW MORRISON ST	PORTLAND	OR	97205-3101
NORTHWEST NATURAL GAS CO	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST NATURAL GAS CO	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST NATURAL GAS CO	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST NATURAL GAS CO	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST NATURAL GAS CO	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST NATURAL GAS CO	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST NATURAL GAS CO	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST NATURAL GAS CO	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST NATURAL GAS CO	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST NATURAL GAS CO	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST NATURAL GAS CO % AIMONE,DAVID	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST NATURAL GAS CO % AIMONE,DAVID	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST NATURAL GAS CO % MILLER,DONALD J TREASURER OF	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST NATURAL GAS CO BY BURNSIDE,H N TREAS	220 NW 2ND AVE	PORTLAND	OR	97209-3943
NORTHWEST PAPER BOX MFGS INC ATTN: ACCOUNTING MGR	5617 N BASIN AVE	PORTLAND	OR	97217
NORTHWEST PAPER BOX MFGS INC ATTN: ACCOUNTING MGR	5617 N BASIN AVE	PORTLAND	OR	97217
NORTHWEST PIPE CO % PROPERTY TAX ACCOUNTANT	5721 SE COLUMBIA WAY STE 200	VANCOUVER	WA	98661-5991
NORTHWEST PIPE CO % PROPERTY TAX ACCOUNTANT	5721 SE COLUMBIA WAY STE 200	VANCOUVER	WA	98661-5991
NORTHWEST PIPE CO % PROPERTY TAX ACCOUNTANT	5721 SE COLUMBIA WAY STE 200	VANCOUVER	WA	98661-5991
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296

NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST RECYCLING INC ATTN: TAX DEPT	PO BOX 10047	PORTLAND	OR	97296
NORTHWEST REGIONAL RE-ENTRY CENTER	6000 NE 80TH AVE	PORTLAND	OR	97218-2898
NORTHWEST SUSTAINABLE PROPERTIES LLC % SITEWORKS DESIGN/ 240 SE 2ND AVE		PORTLAND	OR	97214-1004
NORTHWEST SUSTAINABLE PROPERTIES LLC % SITEWORKS DESIGN/ 240 SE 2ND AVE		PORTLAND	OR	97214-1004
NORTHWEST TRAILER PARTS INC %SPII, LLC	8448 NE 33RD DR #200	PORTLAND	OR	97211-2105
NORTHWEST ZEN SANGHA % DHARMA RAIN ZEN CENTER	PO BOX 13325	PORTLAND	OR	97213-0325
NORTHWESTERN TOWING & RECOVERY	10630 NE MARX ST	PORTLAND	OR	97220
NORWEST HOLDINGS LLC	2622 SE 23RD AVE	PORTLAND	OR	97202
NORWEST NW L L C % PACIFIC INNS LLC	2333 NW VAUGHN ST	PORTLAND	OR	97210
NOR'WESTER BREWING CO INC	P O BOX 14220	PORTLAND	OR	97293-0220
NOVAK,RICHARD A & NOVAK,JUDITH D	PO BOX 3738	PORTLAND	OR	97208-3738
NOVURBA LLC	PO BOX 14791	PORTLAND	OR	97293
NSA PROPERTY HOLDINGS LLC %KEVIN HOWARD REAL ESTATE INC	14855 SE 82ND DR	CLACKAMAS	OR	97015
NSC PORTLAND ET AL % MINI MOUSE MANAGEMENT INC	1717 POWELL ST #220	SAN FRANCISCO	CA	94133
NUCK'IN FUTS LLC	5025 NE 82ND AVE	PORTLAND	OR	97220-4928
NUDELMAN,STANFORD J & DOROTHY	2707 NW NELA ST	PORTLAND	OR	97210-1713
NUGENT IBC DEVELOPMENT LLC	12175 SW TRYON ILL RD	PORTLAND	OR	97219
NUGENT IBC DEVELOPMENT LLC	12175 SW TRYON ILL RD	PORTLAND	OR	97219
NUSSBAUMER,JAMES N & SARAH J-62.27% & HOCKETT,WADE & ISC 8316 N LOMBARD ST PMB 326		PORTLAND	OR	97203-3727
NU-WAY OIL CO % GEARY,DEL	7240 NE SACRAMENTO ST	PORTLAND	OR	97213
NW 31ST STREET LLC % GILMER,MYLES & GILMER,PAMELA	10426 NW LAIDLAW RD	PORTLAND	OR	97229
NW FRONT AVENUE LLC	1529 RAINIER AVE SOUTH	SEATTLE	WA	98144
NW FRONT AVENUE LLC	1529 RAINIER AVE SOUTH	SEATTLE	WA	98144
NW PRIORITY CU	PO BOX 16640	PORTLAND	OR	97292-0640
NW PROCESSING SOLAR & MICROELE	PO BOX 219251	PORTLAND	OR	97225
NWAMS LLC & NANCITA PARTNERSHIP & DODSON STREET ASSOCIA 2942 DOW AVE		TUSTIN	CA	92780
NWB/CSPP-MCLOUGHLIN LLC	4012 148TH SE-UPPER OFFICE	MILL CREEK	WA	98012

NWB/CSPP-MCLOUGHLIN LLC	4012 148TH SE-UPPER OFFICE	MILL CREEK	WA	98012
NWB/CSPP-MCLOUGHLIN LLC	4012 148TH SE-UPPER OFFICE	MILL CREEK	WA	98012
NWB/CSPP-MCLOUGHLIN LLC	4012 148TH SE-UPPER OFFICE	MILL CREEK	WA	98012
NWEREM,GODWIN & NWEREM,IJEOMA	3402 NE 127TH AVE	PORTLAND	OR	97230-1523
NWP ENTERPRISES LLC	2800 NW 31ST AVE	PORTLAND	OR	97210-1720
NWTC LIMITED PARTNERSHIP	5925 79TH AVE SE	CALGARY	AB	T2C 5K3 CA
NYLAND,MICHAEL J	23737 SW STAFFORD HILL DR	WEST LINN	OR	97068
O K ENTERPRISES	8205 SE HARNEY ST #1	PORTLAND	OR	97266-6577
O K ENTERPRISES	8205 SE HARNEY ST #1	PORTLAND	OR	97266-6577
OACE,JON R	2335 NW 29TH AVE	PORTLAND	OR	97210-2005
OAK HOLDING COMPANY LLC	201 SE OAK ST	PORTLAND	OR	97214-1017
OAK STREET BLDG LLC & HOENE,FREDERICK J TR & HOENE,ANN M T	19579 NW MELROSE DR	PORTLAND	OR	97229
OBRIST,DAN	6431 SE JENNE RD	PORTLAND	OR	97236
OCEANCREST PROPERTIES LLC	PO BOX 42127	PORTLAND	OR	97242-0127
OCEANCREST PROPERTIES LLC	PO BOX 42127	PORTLAND	OR	97242-0127
OCEANCREST PROPERTIES LLC	PO BOX 42127	PORTLAND	OR	97242-0127
OCEANCREST PROPERTIES LLC	PO BOX 42127	PORTLAND	OR	97242-0127
OCEANCREST PROPERTIES LLC % FREEDMAN,HOWARD MANAGER	P O BOX 42127	PORTLAND	OR	97242-0127
OCHOCO PARTNERS LLC	12115 SE WINTERCRESS CT	HAPPY VALLEY	OR	97086
OCHOMER LLC % ROUMAGOUX,BHREE	PO BOX 221228	ANCHORAGE	AK	99522-1228
ODENTHAL,LESLIE L	8111 29TH AVE SW	SEATTLE	WA	98126
O'DOHERTY,DANIEL K & O'DOHERTY,CAROLYN T	3546 NE US GRANT PL	PORTLAND	OR	97212
OEB INVESTORS LLC	500 E BROADWAY ST #110	VANCOUVER	WA	98660-3323
OEB INVESTORS LLC	500 E BROADWAY ST #110	VANCOUVER	WA	98660-3323
O'GRADY,DALE T TR & O'GRADY,JEAN S TR	228 NE 7TH AVE	PORTLAND	OR	97232-2909
O'GRADY,DALE T TR & O'GRADY,JEAN S TR	228 NE 7TH AVE	PORTLAND	OR	97232-2909
OIL RE-REFINING COMPANY	4150 N SUTTLE RD	PORTLAND	OR	97217
OK ENTERPRISES	8205 SE HARNEY ST SP 01	PORTLAND	OR	97266
OK ENTERPRISES /ROMINE, CODY & ROSE	8205 SE HARNEY ST SP 03	PORTLAND	OR	97266
OKAMOTO,GARY NORIO & OKAMOTO,RYOKO	6753 WALKER MILL DR	SALT LAKE CITY	UT	84121-3585
OKAMOTO,GARY NORIO & OKAMOTO,RYOKO	6753 WALKER MILL DR	SALT LAKE CITY	UT	84121-3585
OKAZAKI,KENNETH J	10908 NE MARX ST	PORTLAND	OR	97220-1032
OKHICKIYUK,PHYLLIS A	9000 NE M L KING BLVD SP 147	PORTLAND	OR	97211
OLD DOMINION FREIGHT LINE INC % ENGLISH,WENDY U LEGAL REA	500 OLD DOMINION WAY	THOMASVILLE	NC	27360-8923

OLD DOMINION FREIGHT LINE INC % ENGLISH,WENDY U LEGAL REA	500 OLD DOMINION WAY	THOMASVILLE	NC	27360-8923
OLD DOMINION FREIGHT LINE INC ATTN PROPERTY TAX	500 OLD DOMINION WAY	THOMASVILLE	NC	27360-8923
OLD DOMINION FREIGHT LINE INC ATTN PROPERTY TAX	500 OLD DOMINION WAY	THOMASVILLE	NC	27360-8923
OLD VANPORT BUILDING LLC	2701 NW VAUGHN ST #710	PORTLAND	OR	97210
OLDCASTLE PRECAST INC %DUCHARME, MCMILLEN & ASSOC	PO BOX 80615	INDIANAPOLIS	IN	46280
OLSON,THERESA J & RIVELLI,GREGORY P	9355 SE QUAIL RIDGE CT	HAPPY VALLEY	OR	97086-9175
OLSON,THERESA J & RIVELLI,GREGORY P	9355 SE QUAIL RIDGE CT	HAPPY VALLEY	OR	97086-9175
OLSON,THERESA J & RIVELLI,GREGORY P	9355 SE QUAIL RIDGE CT	HAPPY VALLEY	OR	97086-9175
OLYMPIC FOUNDRY INC	5200 AIRPORT WAY SOUTH	SEATTLE	WA	98108
OLYMPIC FOUNDRY INC	5200 AIRPORT WAY SOUTH	SEATTLE	WA	98108
OLYMPIC FOUNDRY INC	5200 AIRPORT WAY SOUTH	SEATTLE	WA	98108
OLYMPIC FOUNDRY INC	5200 AIRPORT WAY SOUTH	SEATTLE	WA	98108
OLYMPIC FOUNDRY INC A WASHINGT	5200 AIRPORT WAY S	SEATTLE	WA	98108
OLYMPIC MILLS COMMERCE CENTER %ELLIOTT ASSOCIATES ATTN:	901 NE GLISAN ST	PORTLAND	OR	97232
OLYMPIC PIPE LINE CO MAIL CODE 1930D	550 WESTLAKE PARK BLVD	HOUSTON	TX	77079
OLYMPIC PIPE LINE CO PROPERTY MAIL CODE 1930D	550 WESTLAKE PARK BLVD	HOUSTON	TX	77079
OMNI PRODUCTS INC	P O BOX 15319	PORTLAND	OR	97214
ONE CRUSIERO WAY INC	P O BOX 909	SANDY	OR	97055
ONE CRUSIERO WAY INC	P O BOX 909	SANDY	OR	97055
ONE CRUSIERO WAY INC	P O BOX 909	SANDY	OR	97055
ONE CRUSIERO WAY INC	P O BOX 909	SANDY	OR	97055
OPAL CREEK CONSTRUCTION LLC	4541 N CONGRESS AVE	PORTLAND	OR	97217-3029
OREGON BECKNELL INVESTORS 2011 LLC	704 ADAMS ST #A	CARMEL	IN	46032-1539
OREGON CATHOLIC PRESS	5536 NE HASSALO ST	PORTLAND	OR	97213-3638
OREGON CITY BUILDING LIMITED PARTNERSHIP	3662 SW TUNNELWOOD ST	PORTLAND	OR	97221-4147
OREGON EDUCATION ASSN	6900 SW ATLANTA ST	PORTLAND	OR	97223-2513
OREGON FERALLOY PARTNERS	14400 N RIVERGATE BLVD	PORTLAND	OR	97203
OREGON FERALLOY PARTNERS	14400 N RIVERGATE BLVD	PORTLAND	OR	97203
OREGON FOOD BANK INC	7900 NE 33RD DR	PORTLAND	OR	97211
OREGON FOOD BANK INC	7900 NE 33RD DR	PORTLAND	OR	97211
OREGON FOOD BANK INC	7900 NE 33RD DR	PORTLAND	OR	97211
OREGON HUMANE SOCIETY	1067 NE COLUMBIA BLVD	PORTLAND	OR	97211-1411
OREGON LAND MANAGEMENT LLC ATTN: FRANCI BAILEY-REED & TI	4207 SE WOODSTOCK BLVD #304	PORTLAND	OR	97206
OREGON LUMBER COMPANY ONE LLC	543 3RD ST #B-1	LAKE OSWEGO	OR	97034

OREGON LUMBER COMPANY ONE LLC	543 3RD ST #B-1	LAKE OSWEGO	OR	97034
OREGON LUMBER COMPANY ONE LLC	543 3RD ST #B-1	LAKE OSWEGO	OR	97034
OREGON METAL SLITTERS INC	7227 N LEADBETTER RD	PORTLAND	OR	97203-6490
OREGON METAL SLITTERS INC % GRIFFIN,MIKE	7227 N LEADBETTER RD	PORTLAND	OR	97203-6490
OREGON METAL SLITTERS INC % GRIFFIN,MIKE	7227 N LEADBETTER RD	PORTLAND	OR	97203-6490
OREGON METAL SLITTERS INC % GRIFFIN,MIKE	7227 N LEADBETTER RD	PORTLAND	OR	97203-6490
OREGON METAL SLITTERS INC % GRIFFIN,MIKE	7227 N LEADBETTER RD	PORTLAND	OR	97203-6490
OREGON MUSEUM OF SCIENCE & INDUSTRY	1945 SE WATER AVE	PORTLAND	OR	97214-3356
OREGON MUSEUM OF SCIENCE & INDUSTRY	1945 SE WATER AVE	PORTLAND	OR	97214-3356
OREGON MUSEUM OF SCIENCE & INDUSTRY	1945 SE WATER AVE	PORTLAND	OR	97214-3356
OREGON MUSEUM OF SCIENCE & INDUSTRY	1945 SE WATER AVE	PORTLAND	OR	97214-3356
OREGON MUSEUM OF SCIENCE & INDUSTRY	1945 SE WATER AVE	PORTLAND	OR	97214-3356
OREGON MUSEUM OF SCIENCE & INDUSTRY	1945 SE WATER AVE	PORTLAND	OR	97214-3356
OREGON MUSEUM OF SCIENCE & INDUSTRY	1945 SE WATER AVE	PORTLAND	OR	97214-3356
OREGON PARK DEVELOPMENT LLC	PO BOX 10067	PORTLAND	OR	97296
OREGON PLATING CO INC	PO BOX 849	GLADSTONE	OR	97027-0849
OREGON QUALITY INVESTMENTS LLC BONNEAU,PAUL & BONNEAU, 3002 DOW AVE #112		TUSTIN	CA	92780
OREGON QUALITY INVESTMENTS LLC BONNEAU,PAUL & BONNEAU, 3002 DOW AVE #112		TUSTIN	CA	92780
OREGON QUALITY INVESTMENTS LLC BONNEAU,PAUL & BONNEAU, 3002 DOW AVE #112		TUSTIN	CA	92780
OREGON QUALITY INVESTMENTS LLC BONNEAU,PAUL & BONNEAU, 3002 DOW AVE #112		TUSTIN	CA	92780
OREGON RAIL HERITAGE FOUNDATIO % RIGHT OF WAY ACQUISITIO 1120 SW 5TH AVE #800		PORTLAND	OR	97204
OREGON STATE OF	411 TRANSPORTATION BLDG	SALEM	OR	97310
OREGON STATE OF	355 CAPITOL ST NE #411	SALEM	OR	97301-3871
OREGON STATE OF	411 TRANSPORTATION BLDG	SALEM	OR	97310
OREGON STATE OF	355 CAPITOL ST NE ROOM 411	SALEM	OR	97301-3871
OREGON STATE OF % AGI	PO BOX 14350	SALEM	OR	97309-5047
OREGON STATE OF % AGI	PO BOX 14350	SALEM	OR	97309-5047
OREGON STATE OF (DEPT OF TRANS	DEPT OF TRANS BLDG 119	PORTLAND	OR	97310-0001
OREGON STATE OF (DEPT OF TRANS	DEPT OF TRANS BLDG 119	PORTLAND	OR	97310-0001
OREGON STATE OF (DEPT OF TRANS	P O BOX 1449	PORTLAND	OR	97009
OREGON STATE OF (DEPT OF TRANS	123 NW FLANDERS ST	PORTLAND	OR	97209

OREGON STATE OF (DEPT OF TRANS DISTRICT 2B	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015-8685
OREGON STATE OF (DEPT OF TRANS DISTRICT 2B	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015-8685
OREGON STATE OF (DEPT OF TRANS DISTRICT 2B	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015-8685
OREGON STATE OF (DEPT OF TRANS DISTRICT 2B	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015-8685
OREGON STATE OF (HWY COMM> BY STATE HIGHWAY COMMISSIO	9002 SE MCLOUGHLIN BLVD	MILWAUKIE	OR	97222-7312
OREGON STATE OF (HWY COMM> DISTRICT 2B	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015-8685
OREGON STATE OF (HWY COMM> DISTRICT 2B	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015-8685
OREGON STATE OF ODOT TECH LEADERSHIP CNTR ATTN PROP MGN	4040 FAIRVIEW IND'L DR SE #MS2	SALEM	OR	97302-1142
OREGON STATE OF TO DEPT OF CORRECTIONS	2575 CENTER ST NE	SALEM	OR	97310-0001
OREGON STATE OF TO DEPT OF CORRECTIONS	2575 CENTER ST NE	SALEM	OR	97310-0001
OREGON STATE OF(DEPT OF TRAN	9002 SE MCLOUGHLIN BLVD	MILWAUKIE	OR	97222-7312
OREGON STATE OF(DEPT OF TRAN	9002 SE MCLOUGHLIN BLVD	MILWAUKIE	OR	97222-7312
OREGON STATE OF(DEPT OF TRANS	4040 FAIRVIEW INDUSTRIAL DR SI	SALEM	OR	97302-1142
OREGON STATE OF(DEPT OF TRANS (LEASED 1515 NW 18TH LLC AT	4040 FAIRVIEW IND DR SE MS#2	SALEM	OR	97302-1142
OREGON STATE OF(DEPT OF TRANS (LEASED US WUSHU CENTER IN	4040 FAIRVIEW INDUSTRIAL DR SI	SALEM	OR	97302-1142
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015-8685
OREGON STATE OF(DEPT OF TRANSPORTATION	123 NW FLANDERS ST	PORTLAND	OR	97209
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015-8685
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015-8685
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015-8685
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015-8685
OREGON STATE OF(DEPT OF TRANSPORTATION	4040 FAIRVIEW INDUSTRIAL DR SI	PORTLAND	OR	97302-1142
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015-8685
OREGON STATE OF(DEPT OF TRANSPORTATION	123 NW FLANDERS ST	PORTLAND	OR	97209
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015
OREGON STATE OF(DEPT OF TRANSPORTATION	123 NW FLANDERS ST	PORTLAND	OR	97209

OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015
OREGON STATE OF(DEPT OF TRANSPORTATION	9200 SE LAWNFIELD RD	PORTLAND	OR	97015
OREGON STATE OF(DEPT OF TRANSPORTATION % RIGHT OF WAY SE	4040 FAIRVIEW INDUSTRIAL DR SI	SALEM	OR	97302-1142
OREGON STATE OF(DEPT OF TRANSPORTATION(LEASED PDC	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015
OREGON STATE OF(DEPT OF TRANSPORTATION(LEASED PDC	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015
OREGON STATE OF(DIV OF STATE L	775 SUMMER ST NE	SALEM	OR	97310
OREGON STATE OF(DIV OF STATE L (SUBLSD ALCATEL SUBMARINE N	PO BOX 3529	PORTLAND	OR	97208-3529
OREGON STATE OF(DIV OF STATE LANDS(LEASED BROWN,MILTON C	8320 NE HWY 99	VANCOUVER	WA	98665
OREGON STATE OF(EASEMENT (LEASED PORTLAND CITY OF	#35124 355 CAPITOL ST NE #411	SALEM	OR	97301-3871
OREGON STATE OF(HWY COMM	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015
OREGON STATE OF(HWY COMM	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015
OREGON STATE OF(HWY COMM	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015
OREGON STATE OF(HWY COMM	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015
OREGON STATE OF(HWY COMM	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015
OREGON STATE OF(HWY COMM	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015
OREGON STATE OF(HWY COMM	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015
OREGON STATE OF(HWY COMM	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015
OREGON STATE OF(HWY COMM	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015
OREGON STATE OF(HWY COMM	9200 SE LAWNFIELD RD	CLACKAMAS	OR	97015
OREGON STATE OF(LEASE #28173 ODOT TECH LEADERSHIP CNTR A	4040 FAIRVIEW IND'L DR SE #MS2	SALEM	OR	97302-1142
OREGON STATE OF(LEASE #28173 ODOT TECH LEADERSHIP CNTR A	4040 FAIRVIEW IND'L DR SE #MS2	SALEM	OR	97302-1142
OREGON STATE OF(LEASE #28212 ODOT TEC LEADERSHIP CNTR ATT	4040 FAIRVIEW IND'L DR SE #MS2	SALEM	OR	97302-1142
OREGON STATE OF(LEASED BRIDGEHEAD DEVELOPMENT LLC #1771	355 CAPITOL ST #411	SALEM	OR	97301-3871
OREGON STATE OF(LEASED ELLE/COLE LLC ATTN PROP MGMT #347	4040 FAIRVIEW IND DR SE MS #2	SALEM	OR	97302-1142
OREGON STATE OF(LEASED EMERALD'S AUTO & TOWING #36108 %	355 CAPITOL ST NE #411	SALEM	OR	97301-3871
OREGON STATE OF(LEASED FREEDOM CENTER I LLC ATTN PROP MG	4040 FAIRVIEW INDTL DR SE MS#	SALEM	OR	97302-1142
OREGON STATE OF(LEASED LANDIS & LANDIS CONSTRUCTION L	355 CAPITOL ST NE #411	SALEM	OR	97301-3871
OREGON STATE OF(LEASED MULTIPLE TENANTS % PROP MGMT/OD	4040 FAIRVIEW INDTL DR SE MS#	SALEM	OR	97302-1142

OREGON STATE OF(LEASED NORTHWEST COPPER WORKS #35109 % 4040 FAIRVIEW INDTRL DR SE MS: SALEM		OR	97302-1142
OREGON STATE OF(LEASED ODOT TECH LEADERSHIP CENTER ATTN 4040 FAIRVIEW IND'L DR SE #MS2 SALEM		OR	97302-1142
OREGON STATE OF(LEASED ODOT TECH LEADERSHIP CNTR ATTN PR 4040 FAIRVIEW IND'L DR SE #MS2 SALEM		OR	97302-1142
OREGON STATE OF(LEASED ODOT TECH LEADERSHIP CNTR ATTN PR 4040 FAIRVIEW IND'L DR SE MS # SALEM		OR	97302-1142
OREGON STATE OF(LEASED ODOT TECH LEADERSHIP CNTR ATTN PR 4040 FAIRVIEW IND'L DR SE #MS2 SALEM		OR	97302-1142
OREGON STATE OF(LEASED ODOT TECH LEADERSHIP CNTR ATTN PR 4040 FAIRVIEW INDUSTRIAL DR SI SALEM		OR	97302-1142
OREGON STATE OF(LEASED ODOT TECH LEADERSHIP CNTR ATTN PR 4040 FAIRVIEW IND'L DR SE, MS SALEM		OR	97302-1142
OREGON STATE OF(LEASED ODOT TECH LEADERSHIP CNTR ATTN PR 4040 FAIRVIEW IND'L DR SE, MS# SALEM		OR	97302-1142
OREGON STATE OF(LEASED ODOT TECH LEADERSHIP CNTR ATTN PR 4040 FAIRVIEW IND'L DR SE, MS# SALEM		OR	97302-1142
OREGON STATE OF(LEASED ODOT TECH LEADERSHIP CNTR ATTN PR 4040 FAIRVIEW IND'L DR SE #MS2 SALEM		OR	97302-1142
OREGON STATE OF(LEASED ODOT TECH LEADERSHIP CNTR ATTN PR 4040 FAIRVIEW IND'L DR SE #MS2 SALEM		OR	97302-1142
OREGON STATE OF(LEASED ODOT TECH LEADERSHIP CNTR ATTN PR 4040 FAIRVIEW IND'L DR SE #MS2 SALEM		OR	97302-1142
OREGON STATE OF(LEASED ODOT TECH LEADERSHIP CNTR ATTN PR 4040 FAIRVIEW INDUSTRIAL DR SI SALEM		OR	97302-1142
OREGON STATE OF(LEASED ODOT TECH LEADERSHIP CNTR ATTN PR 4040 FAIRVIEW IND'L DR SE MS # SALEM		OR	97302-1142
OREGON STATE OF(LEASED PARKING ENFORCEMENT SERVICES LLC 4040 FAIRVIEW INDTL DR SE MS#: SALEM		OR	97302-1142
OREGON STATE OF(LEASED PORTLAND CITY OF % KLEPAC,M	2929 N KERBY AVE	PORTLAND	OR 97227-1611
OREGON STATE OF(LEASED PORTLAND CITY OF % KLEPAC,M	2929 N KERBY AVE	PORTLAND	OR 97227-1611
OREGON STATE OF(LEASED PORTLAND CITY OF % KLEPAC,M	2929 N KERBY AVE	PORTLAND	OR 97227-1611
OREGON STATE OF(LEASED PORTLAND CITY OF % KLEPAC,M	2929 N KERBY AVE	PORTLAND	OR 97227-1611
OREGON STATE OF(LEASED PORTLAND CITY OF % KLEPAC,M	2929 N KERBY AVE	PORTLAND	OR 97227-1611
OREGON STATE OF(LEASED PORTLAND CITY OF % KLEPAC,M	2929 N KERBY AVE	PORTLAND	OR 97227-1611
OREGON STATE OF(LEASED PORTLAND CITY OF % KLEPAC,M	2929 N KERBY AVE	PORTLAND	OR 97227-1611
OREGON STATE OF(LEASED PORTLAND CITY OF % KLEPAC,M	2929 N KERBY AVE	PORTLAND	OR 97227-1611
OREGON STATE OF(LEASED PORTLAND CITY OF % KLEPAC,M	2929 N KERBY AVE	PORTLAND	OR 97227-1611
OREGON STATE OF(LEASED PORTLAND CITY OF % KLEPAC,M	2929 N KERBY AVE	PORTLAND	OR 97227-1611
OREGON STATE OF(LEASED PORTLAND CITY OF % KLEPAC,M	2929 N KERBY AVE	PORTLAND	OR 97227-1611

OREGON STATE OF(LEASED PORTLAND CITY OF % KLEPAC,M	2929 N KERBY AVE	PORTLAND	OR	97227-1611
OREGON STATE OF(LEASED PORTLAND CITY OF ATTN PROP MGMN 4040 FAIRVIEW INDUSTRIAL DR SI SALEM			OR	97302-1142
OREGON STATE OF(LEASED RIVERS EAST INVESTOR LLC % GVA KIDD 1 SW COLUMBIA ST STE 950		PORTLAND	OR	97258-2010
OREGON STATE OF(LEASED RIVERS EAST INVESTOR LLC % GVA KIDD 1 SW COLUMBIA ST STE 950		PORTLAND	OR	97258-2010
OREGON STATE OF(LEASED RIVERS EAST INVESTOR LLC % GVA KIDD 1 SW COLUMBIA ST STE 950		PORTLAND	OR	97258-2010
OREGON STATE OF(LEASED VAN'S TOWING INC #34745B ATTN PRO 4040 FAIRVIEW IND DR SE MS#2		SALEM	OR	97302-1142
OREGON STATE OF(LEASED YOSHIDA RE HOLDINGS XII LLC #34747G 4040 FAIRVIEW IND DR SE MS#2		SALEM	OR	97302-1142
OREGON STATE OF(LSD(DEPT/TRAN TO PORTLAND CITY OF % M KLE 2929 N KERBY AVE		PORTLAND	OR	97227-1611
OREGON STATE OF(ODOT LEASED ODOT TECH LEADERSHIP CNTR A 4040 FAIRVIEW IND'L DR SE #MS2 SALEM			OR	97302-1142
OREGON STATE OF(ODOT(LEASED ODOT TECH LEADERSHIP CNTR A 4040 FAIRVIEW IND'L DR SE MS # SALEM			OR	97302-1142
OREGON STATE(LEASED ODOT TECH LEADERSHIP CNTR ATTN PROP 4040 FAIRVIEW IND'L DR SE #MS2 SALEM			OR	97302-1142
OREGON SUSTAINABLE AGRICULTURE LAND TRUST	3519 NE 15TH AVE #502	PORTLAND	OR	97212-2356
OREGON SUSTAINABLE AGRICULTURE LAND TRUST	3519 NE 15TH AVE #502	PORTLAND	OR	97212-2356
OREGON THOROBRED OWNERS AND BR	PO BOX 17248	PORTLAND	OR	97217
OREGON TOWING CO	8658 SE DIVISION ST	PORTLAND	OR	97266
OREGON TRANSFER CO	PO BOX 2804	PORTLAND	OR	97208
OREGON TRANSFER CO	PO BOX 2804	PORTLAND	OR	97208
OREGON TRANSFER CO % THE SHERWIN-WILLIAMS CO ATTN TAX DI PO BOX 6027		CLEVELAND	OH	44101
OREGON TRANSFER CO % THE SHERWIN-WILLIAMS CO ATTN TAX DI PO BOX 6027		CLEVELAND	OH	44101
OREGON TRANSFER COMPANY	PO BOX 2804	PORTLAND	OR	97208
OREGON WASH RR & NAVIGATION CO	PITTOCK BLOCK	PORTLAND	OR	97205
OREGON WORSTED COMPANY	9701 SE MCLOUGHLIN BLVD	PORTLAND	OR	97222-7436
OREGON WORSTED COMPANY	9701 SE MCLOUGHLIN BLVD	PORTLAND	OR	97222-7436
OREGON WORSTED COMPANY	9701 SE MCLOUGHLIN BLVD	PORTLAND	OR	97222-7436
OREGON-COLUMBIA CHAPTER NATL E	601 NE EVERETT ST	PORTLAND	OR	97232-2722
OREGONIAN PUBLISHING PROPERTIES LLC	1320 SW BROADWAY	PORTLAND	OR	97201-3411
OREGONIAN PUBLISHING PROPERTIES LLC	1320 SW BROADWAY	PORTLAND	OR	97201-3411
OREGON-WASHINGTON CARPENTERS- EMPLOYERS APPRENTICESHI PO BOX 4148		PORTLAND	OR	97208
ORION PARTNERS LLC % INTRINSIC INC	530 OAK GROVE AVE #201	MENLO PARK	CA	94025-3255
OSB2LAN IVON LLC	3570 SW RIVER PKWY #1713	PORTLAND	OR	97239-4534
OSB2LAN WILSON LLC % HAITHEM H TOULAN	3570 SW RIVER PKWY #1713	PORTLAND	OR	97239
OSB2LAN28 LLC	3570 SW RIVER PKWY #1713	PORTLAND	OR	97239-4545
OSBORNE,KURTIS A TR & OSBORNE,BETTY J TR TO DONISANU,PETRI 10934 NE SIMPSON ST		PORTLAND	OR	97220-1228
OSERAN INVESTMENT COMPANY LLC	2455 NW MARSHALL ST #4	PORTLAND	OR	97210

OSERAN INVESTMENT COMPANY LLC	2455 NW MARSHALL ST #4	PORTLAND	OR	97210
OSERAN INVESTMENT COMPANY LLC	2455 NW MARSHALL ST #4	PORTLAND	OR	97210
OSERAN,HENRY C/O OSERAN INVESTMENT	2455 NW MARSHALL ST STE 4	PORTLAND	OR	97210
OSERAN,HENRY P ET AL % OSERAN INVESTMENT CO	2455 NW MARSHALL ST #4	PORTLAND	OR	97210
OSWALD,JAMES ALLEN & HANER,STACEY NICOLE	9000 NE M L KING BLVD SP 74	PORTLAND	OR	97211
OSWALT,LINDA R	8205 SE HARNEY ST SP 10	PORTLAND	OR	97266
OTC PROPERTIES LLC	6041 SW CANBY ST	PORTLAND	OR	97219
OTCO BYBEE LLC % OREGON TRANSFER CO	PO BOX 2804	PORTLAND	OR	97208-2804
O'TEY,DEBORAH	9000 NE M L KING BLVD SP 088	PORTLAND	OR	97211
OTIKA,AYOLLO	2536 NE 7TH AVE	PORTLAND	OR	97212
OUGH,CAMERON J TR & OUGH,KEDMA S TR	8345 SE 28TH AVE	PORTLAND	OR	97202-8902
OUR ASSOCIATES ANVIL LLC % LOFTUS,KEVIN	2495 NW NICOLAI ST	PORTLAND	OR	97210
OVERHEAD DOOR CORPORATION ATTN: PROPERTY ACCTG	PO BOX 67	MT HOPE	OH	44660-0067
OVERHEAD DOOR CORPORATION ATTN: PROPERTY ACCTG	PO BOX 67	MT HOPE	OH	44660-0067
OVERHEAD DOOR CORPORATION ATTN: PROPERTY ACCTG	PO BOX 67	MT HOPE	OH	44660-0067
OVERHEAD DOOR CORPORATION ATTN: PROPERTY ACCTG	PO BOX 67	MT HOPE	OH	44660-0067
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OVERHEAD DOOR CORPORATION ATTN: PROPERTY ACCTG	PO BOX 67	MT HOPE	OH	44660-0067
OVERHEAD DOOR CORPORATION ATTN: PROPERTY ACCTG	PO BOX 67	MT HOPE	OH	44660-0067
OVERNITE TRANSPORTATION CO	PO BOX 28606	ATLANTA	GA	30358
OVERNITE TRANSPORTATION CO	PO BOX 28606	ATLANTA	GA	30358
OVERSEAS MERCHANDISE INSPECTION CO LTD %NAGASAKA, TAKAS	3344 NW INDUSTRIAL ST	PORTLAND	OR	97210
OWEN C NIELSEN GIFTING TRUST	1614 HERMAN LAKE RD	MOYIE SPRINGS	ID	83845-5058
OWENS CORNING ROOFING & ASPHALT LLC	1 OWENS CORNING PKWY	TOLEDO	OH	43659
OWENS CORNING ROOFING & ASPHALT LLC	1 OWENS CORNING PKWY	TOLEDO	OH	43659
OWENS CORNING ROOFING & ASPHALT LLC	1 OWENS CORNING PKWY	TOLEDO	OH	43659
OWENS CORNING ROOFING & ASPHALT LLC	1 OWENS CORNING PKWY	TOLEDO	OH	43659
OWENS CORNING ROOFING & ASPHALT LLC	1 OWENS CORNING PKWY	TOLEDO	OH	43659
OWENS CORNING ROOFING & ASPHALT LLC %RYAN/THREE GALLERI	13155 NOEL RD #100	DALLAS	TX	75240
OWENS CORNING ROOFING & ASPHALT LLC %RYAN/THREE GALLERI	13155 NOEL RD #100	DALLAS	TX	75240
OWENS CORNING ROOFING & ASPHALT LLC %RYAN/THREE GALLERI	13155 NOEL RD #100	DALLAS	TX	75240
OWENS CORNING ROOFING & ASPHALT LLC %RYAN/THREE GALLERI	13155 NOEL RD #100	DALLAS	TX	75240
OWENS-BROCKWAY GLASS CONTAINERS INC ONE O-I PLAZA TAX DE	1 MICHAEL OWENS WAY	PERRYSBURG	OH	43551-2999

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OWENS-BROCKWAY GLASS CONTAINERS INC ONE O-I PLAZA TAX DE	1 MICHAEL OWENS WAY	PERRYSBURG	OH	43551-2999
OWENS-BROCKWAY GLASS CONTAINERS INC ONE O-I PLAZA TAX DE	1 MICHAEL OWENS WAY	PERRYSBURG	OH	43551-2999
OWENS-BROCKWAY GLASS CONTAINERS INC ONE O-I PLAZA TAX DE	1 MICHAEL OWENS WAY	PERRYSBURG	OH	43551-2999
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OWENS-BROCKWAY GLASS CONTAINERS INC ONE O-I PLAZA TAX DE	1 MICHAEL OWENS WAY	PERRYSBURG	OH	43551-2999
OWENS-CORNING FIBERGLAS CORP> ATTN TAX DEPT 3G	1 OWENS CORNING PKWY	TOLEDO	OH	43659-0001
OXBOW ENTERPRISES LLC	620 NE KELLY AVE	GRESHAM	OR	97030-7333
P & L DEVELOPMENT LLC	PO BOX 12564	PORTLAND	OR	97212
P & L DEVELOPMENT LLC	PO BOX 12564	PORTLAND	OR	97212
P & L DEVELOPMENT LLC	PO BOX 12564	PORTLAND	OR	97212
P & L DEVELOPMENT LLC	PO BOX 12564	PORTLAND	OR	97212
P & L WATER AVENUE LLC % MICHAEL A PRATT	1201 SE 3RD AVE	PORTLAND	OR	97214
P & M TRADING CO %P VOORHIES	PO BOX 11140	BAINBRIDGE ISLAND	WA	98110
P G E CO 1WTC0510-CORPORATE TAX DEPT	121 SW SALMON ST	PORTLAND	OR	97204
P J FOOD SERVICE INC ATTN TAX DEPT	2002 PAPA JOHNS BLVD	LOUISVILLE	KY	40299
P J FOOD SERVICE INC ATTN TAX DEPT	2002 PAPA JOHNS BLVD	LOUISVILLE	KY	40299
PACIFIC CARBIDE & ALLOYS CO % COYNE, TOM	PO BOX 411450	SAN FRANCISCO	CA	94141-1450
PACIFIC CARBIDE & ALLOYS CO % COYNE, TOM	PO BOX 411450	SAN FRANCISCO	CA	94141-1450
PACIFIC COAST FRUIT CO	201 NE 2ND AVE	PORTLAND	OR	97232-2984
PACIFIC COAST FRUIT CO	201 NE 2ND AVE	PORTLAND	OR	97232-2984
PACIFIC DEVELOPMENT HOLDINGS LLC	4188 SW GREENLEAF DR	PORTLAND	OR	97221-3225
PACIFIC INDUSTRIAL LEASING INC ATTN MILLER,CINDY	110 N MARINE DR	PORTLAND	OR	97217
PACIFIC KEYS LLC-40% & GOLDEN KEYS INVESTMENTS LLC-60%	8165 GRAPHIC DR NE	BELMONT	MI	49306-9448
PACIFIC MACHINERY & TOOL STEEL CO	3445 NW LUZON ST	PORTLAND	OR	97210-1628
PACIFIC MACHINERY & TOOL STEEL CO	3445 NW LUZON ST	PORTLAND	OR	97210-1628
PACIFIC MACHINERY & TOOL STEEL CO	3445 NW LUZON ST	PORTLAND	OR	97210
PACIFIC MOTOR TRUCKING CO % R L GUNN GEN TAX COMM SOUTH	1 MARKET PLZ STE 200	SAN FRANCISCO	CA	94105-1003
PACIFIC NORTHWEST FED CR UN	12106 NE MARX ST	PORTLAND	OR	97220
PACIFIC NW FEDERAL CREDIT UNION	12106 NE MARX ST	PORTLAND	OR	97220-9035
PACIFIC NW IRONWORKERS & EMPLOYERS APPRENTICESHIP & TRAI	PO BOX 33030	PORTLAND	OR	97292-3030
PACIFIC NW PROPERTIES LP	6600 SW 105TH AVE #175	BEAVERTON	OR	97008
PACIFIC NW PROPERTIES LP	6600 SW 105TH AVE #175	BEAVERTON	OR	97008
PACIFIC NW REGIONAL COUNCIL OF CARPENTERS ATTN: TWEEDY,D	21520 PACIFIC HWY S #200	KENT	WA	98032

PACIFIC NW REGIONAL COUNCIL OF CARPENTERS ATTN: TWEEDY,D	21520 PACIFIC HWY S #200	KENT	WA	98032
PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232

PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232	
PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232	
PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232	
PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232	
PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232	
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PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232	
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PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232	
PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232	
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PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232	
PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232	
PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232	
PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232	
PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232	
PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232	

PACIFIC OUTDOOR ADVERTISING ATTN: JAMI KNUTSON	715 NE EVERETT ST	PORTLAND	OR	97232

PACIFIC REALTY ASSOCIATES LP % ACCOUNTING	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
PACIFIC REALTY ASSOCIATES LTD PARTNERSHIP % CONZATTI,MAUR	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
PACIFIC REALTY ASSOCIATES LTD PARTNERSHIP % JONES,CLARISSA I	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
PACIFIC REALTY ASSOCIATES LTD PARTNERSHIP % JONES,CLARISSA I	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
PACIFIC REALTY ASSOCIATES LTD PARTNERSHIP % JONES,CLARISSA I	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
PACIFIC REALTY ASSOCIATES LTD PARTNERSHIP % JONES,CLARISSA I	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
PACIFIC REALTY ASSOCIATES LTD PARTNERSHIP % JONES,CLARISSA I	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
PACIFIC REALTY ASSOCIATES LTD PARTNERSHIP % JONES,CLARISSA I	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
PACIFIC REALTY ASSOCIATES LTD PARTNERSHIP % JONES,CLARISSA I	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
PACIFIC REALTY ASSOCIATES LTD PARTNERSHIP % JONES,CLARISSA I	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
PACIFIC REALTY ASSOCIATES LTD PARTNERSHIP % JONES,CLARISSA I	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
PACIFIC REALTY ASSOCIATES LTD PARTNERSHIP % JONES,CLARISSA I	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
PACIFIC REALTY ASSOCIATES LTD PARTNERSHIP % JONES,CLARISSA I	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
PACIFIC REALTY ASSOCIATES LTD PARTNERSHIP % JONES,CLARISSA I	15350 SW SEQUOIA PKWY #300	TIGARD	OR	97224-7175
PACIFIC ROCK PRODUCTS LLC ATTN: PROPERTY TAX DEPT	1501 BELVEDERE RD	WEST PALM BEACH	FL	33406
PACIFIC ROCK PRODUCTS LLC ATTN: PROPERTY TAX DEPT	1501 BELVEDERE RD	WEST PALM BEACH	FL	33406
PACIFIC ROCK PRODUCTS LLC ATTN: PROPERTY TAX DEPT	1501 BELVEDERE RD	WEST PALM BEACH	FL	33406
PACIFIC SAW & KNIFE %METSO PAPER USA,INC	13009 SE JENNIFER ST,STE 102	CLACKAMAS	OR	97015
PACIFIC SE TACOMA STREET LLC	PO BOX 82155	PORTLAND	OR	97282
PACIFIC SE TACOMA STREET LLC	PO BOX 82155	PORTLAND	OR	97282
PACIFICORP % STRONG,R G TAX MGR	700 NE MULTNOMAH ST #700	PORTLAND	OR	97232-4107
PACWEST INVESTMENTS 1 LLC	1961 SUNSET AVE SW	SEATTLE	WA	98116
PADEN,MICHAEL P & MARY A	11000 SE 121ST CT	CLACKAMAS	OR	97015
PADEN,MICHAEL P & PADEN,MARY A	11000 SE 121ST CT	CLACKAMAS	OR	97015
PAGE NINETEEN LLC	2506 NE 17TH AVE	PORTLAND	OR	97212
PAGE NINETEEN LLC	2506 NE 17TH AVE	PORTLAND	OR	97212
PAGTAKHAN,DARREN & ERIN	1293 NICE CT	LIVERMORE	CA	94551
PAISLEY,ROBIN L	9931 N DECATUR ST	PORTLAND	OR	97203
PALACIOS,MARIA MATA	9000 NE M L KING BLVD SP 241	PORTLAND	OR	97211
PANG,LILI	4719 SE CORA ST	PORTLAND	OR	97206
PAOLA PROPERTIES LLC	PO BOX 22162	MILWAUKIE	OR	97269
PAOLA PROPERTIES LLC	PO BOX 22162	MILWAUKIE	OR	97269

PAPE' PROPERTIES INC ATTN DITCHWITCH NW #901	P O BOX 407	EUGENE	OR	97401
PAPE' PROPERTIES INC ATTN DITCHWITCH NW #901	P O BOX 407	EUGENE	OR	97401
PAPE PROPERTIES INC ATTN PAPE KENWORTH #801	355 GOODPASTURE ISLAND RD	EUGENE	OR	97401
PAPER WAREHOUSE II LLC	23200 64TH AVE S	KENT	WA	98032
PARADISE 39 GRAPE LLC	6010 NE FLANDERS ST UNIT B-1	PORTLAND	OR	97213
PARADISE HOLDINGS LLC % GOUGHNOUR,JERAD	PO BOX 12725	PORTLAND	OR	97212-0725
PARAGON INDUSTRIES II INC	4285 N GOLDEN STATE BLVD	FRESNO	CA	93722-6316
PARAGON INDUSTRIES II INC	4285 N GOLDEN STATE BLVD	FRESNO	CA	93722-6316
PARAMOUNT PARKING LLC	3221 SE BROOKLYN ST	PORTLAND	OR	97202-1924
PARK 100 LLC	PO BOX 86765	PORTLAND	OR	97286
PARK ADDITION LLC	4206 SE TAGGART ST	PORTLAND	OR	97206-1648
PARK PLAZA OFFICES LLC % DIETRICH,HOWARD N JR	P O BOX 82448	PORTLAND	OR	97282
PARK,KENNETH K	3202 SE 92ND AVE	PORTLAND	OR	97266
PARKER PROPERTIES INC % PARKER HANNIFIN CORP TAX DEPT	6035 PARKLAND BLVD	CLEVELAND	OH	44124-4141
PARKER,YVONNE M & MICHAEL A	5100 NE 109TH AVE	PORTLAND	OR	97220
PARKING PROPERTIES LLC % MINOR,RICHARD & PUPPO,SHERI	7450 NE KILLINGSWORTH ST	PORTLAND	OR	97218-3737
PARKLAND PROPERTIES LLC	7211 SE HARMONY RD #170	MILWAUKIE	OR	97222
PARKLAND PROPERTIES LLC (LSD K	12345 SE FULLER RD	PORTLAND	OR	97222
PARSON HOLDINGS LLC	4880 IRELAND LN	WEST LINN	OR	97068-2953
PARSON,RICHARD A & PARSON,KATHERINE A	2324 SE UMATILLA ST	PORTLAND	OR	97202-7439
PARSONS,KAY	8675 N CRAWFORD ST	PORTLAND	OR	97203
PARSONS,KAY	8675 N CRAWFORD ST	PORTLAND	OR	97203
PARTNERS PREFERRED YIELD INC % DEPT PT OR 23115	P O BOX 25025	GLENDALE	CA	91201
PASCUZZI FAMILY LLC	10250 SW NORTH DAKOTA ST	TIGARD	OR	97223-4237
PATEL,BABUBHAI N & SAVITABEN B	11144 NE SANDY BLVD	PORTLAND	OR	97220-2594
PATEL,BHARATKUMAR & PATEL,TARLIKABEN	11011 NE HOLMAN ST	PORTLAND	OR	97220-1208
PATEL,BHARATKUMAR & PATEL,TARLIKABEN	11011 NE HOLMAN ST	PORTLAND	OR	97220-1208
PATEL,MUKESH R	7707 SE 82ND AVE	PORTLAND	OR	97266-6201
PATEL,SHANTY	59 NE GERTZ RD	PORTLAND	OR	97211
PATEL,THAKORBHAI G ET AL % HOLIDAY MOTEL	8050 NE M L KING BLVD	PORTLAND	OR	97211-1454
PATINO,RICARDO	13531 NE MARINE DR	PORTLAND	OR	97230-1011
PAUL,JOSEPH & RUTH /SCOTT,DANIEL L & ANITA	9000 NE M L KING BLVD #251	PORTLAND	OR	97211
PAUL,RICHARD J TR & PAUL,JOANNA L TR	5402 NE COLUMBIA BLVD	PORTLAND	OR	97218
PAUL,RICHARD J TR & PAUL,JOANNA L TR	5402 NE COLUMBIA BLVD	PORTLAND	OR	97218

PAW PRINTS PROPERTIES LLC	6108 SW KRUSE RIDGE DR	PORTLAND	OR	97219
PAYNE,CRAIG & GLASER,JEAN	PO BOX 982617	PARK CITY	UT	84098
PC WEST LLC	PO BOX 98	GRANDVIEW	WA	98930-0098
PC WEST LLC	PO BOX 98	GRANDVIEW	WA	98930-0098
PC WEST LLC	PO BOX 98	GRANDVIEW	WA	98930-0098
PC WEST LLC	PO BOX 98	GRANDVIEW	WA	98930-0098
PC WEST LLC	PO BOX 98	GRANDVIEW	WA	98930-0098
PCC STRUCTURALS INC	4600 SE HARNEY DR	PORTLAND	OR	97206
PCC STRUCTURALS INC	4600 SE HARNEY DR	PORTLAND	OR	97206
PCC STRUCTURALS INC	4600 SE HARNEY DR	PORTLAND	OR	97206
PCC STRUCTURALS INC	4600 SE HARNEY DR	PORTLAND	OR	97206-0825
PDR INVESTMENTS LLC	7202 NE 42ND AVE	PORTLAND	OR	97218-1112
PDR INVESTMENTS LLC-1/2 & CARGNI FAMILY LLC-1/2 % CARGNI,P/	5847 SE QUIET MEADOWS DR	MILWAUKIE	OR	97267-5190
PDX 11555 NE SUMNER LLC % FEIGELSON,RYAN	9 SE 3RD AVE #100	PORTLAND	OR	97214-1026
PDX 11555 NE SUMNER LLC % FEIGELSON,RYAN	9 SE 3RD AVE #100	PORTLAND	OR	97214-1026
PDX 13635 N LOMBARD LLC %NBP CAPITAL LLC	9 SE 3RD AVE #100	PORTLAND	OR	97214
PDX 2828 NE RIVERSIDE LLC % NOECKER,LAUREN	9 SE 3RD AVE #100	PORTLAND	OR	97214-1247
PDX 4005 NE COLUMBIA LLC	4005 NE COLUMIA BLVD	PORTLAND	OR	97211
PDX 4005 NE COLUMBIA LLC	4005 NE COLUMIA BLVD	PORTLAND	OR	97211
PDX 8823 N HARBORGATE LLC % PROPERTY MANAGER	9 SE 3RD AVE #100	PORTLAND	OR	97214-1247
PDX DB LLC	PO BOX 27	WALTERVILLE	OR	97489
PDX DEVELOPMENT	5001 N LAGOON AVE	PORTLAND	OR	97217-7634
PDX PROPERTY INNOVATIONS LLC	1405 SE LONG ST	PORTLAND	OR	97202
PDX-NWTRP LLC	6102 N MARINE DR	PORTLAND	OR	97203-6481
PEACOCK,HAZEN M & DAVIS,WILLIAM H	910 N HARBOUR DR #408	PORTLAND	OR	97217
PEAK,JOHN K & PEAK,JOHN B TO THOMAS,LINDA	2643 NW ST HELENS RD	PORTLAND	OR	97210
PECK,LLOYD A & DIANNA M	6510 NE 63RD AVE	PORTLAND	OR	97218-2722
PECO INC % ROCKWOOD,CRAIG A	11241 SE HWY 212	CLACKAMAS	OR	97015
PEDRO SEBASTIAN,VICENTE JUAN & SEBASTIAN-DOMINGO,MARIA	9000 NE M L KING BLVD #50	PORTLAND	OR	97211
PEI,QIN	14346 SE KALLISTA DR	HAPPY VALLEY	OR	97086
PEI,QIN	14346 SE KALLISTA DR	HAPPY VALLEY	OR	97086

PEIN INVESTMENT GROUP LLC	1036 SE TAYLOR ST	PORTLAND	OR	97214
PEIN INVESTMENT GROUP LLC % REDMOND,MICHAEL	1036 SE TAYLOR ST	PORTLAND	OR	97214-2527
PELETT,WALTER D & PAMELA K	823 SE 3RD AVE	PORTLAND	OR	97214-2101
PELETT,WALTER D & PAMELA K	823 SE 3RD AVE	PORTLAND	OR	97214-2101
PELETT,WALTER D & PAMELA K	823 SE 3RD AVE	PORTLAND	OR	97214-2101
PELETT,WALTER D & PAMELA K	823 SE 3RD AVE	PORTLAND	OR	97214-2101
PELETT,WALTER D & PAMELA K	823 SE 3RD AVE	PORTLAND	OR	97214-2101
PELETT,WALTER D & PAMELA K	823 SE 3RD AVE	PORTLAND	OR	97214-2101
PELETT,WALTER D & PAMELA K	823 SE 3RD AVE	PORTLAND	OR	97214-2101
PELLETROX INC	2606 N NEWARK ST STE A	PORTLAND	OR	97217
PENA,THOMAS A	5229 SE GLADSTONE ST	PORTLAND	OR	97206-3965
PENBERTHY,STEVE & MARGARET	2399 PRESTWICK RD	LAKE OSWEGO	OR	97034
PENDLETON WOOLEN MILLS	PO BOX 3030	PORTLAND	OR	97208-3030
PENDLETON WOOLEN MILLS INC	P O BOX 3030	PORTLAND	OR	97208-3030
PENINSULA DRAINAGE DIST NO 2	1880 NE ELROD DR	PORTLAND	OR	97211-1810
PENINSULA DRAINAGE DIST NO 2	1880 NE ELROD DR	PORTLAND	OR	97211-1810
PENINSULA DRAINAGE DIST NO 2	1880 NE ELROD DR	PORTLAND	OR	97211-1810
PENINSULA DRAINAGE DIST NO 2	1880 NE ELROD DR	PORTLAND	OR	97211-1810
PENINSULA DRAINAGE DIST NO 2	1880 NE ELROD DR	PORTLAND	OR	97211-1810
PENINSULA DRAINAGE DIST NO 2	1880 NE ELROD DR	PORTLAND	OR	97211-1810
PENINSULA DRAINAGE DIST NO 2	1880 NE ELROD DR	PORTLAND	OR	97211-1810
PENINSULA DRAINAGE DIST NO 2	1880 NE ELROD DR	PORTLAND	OR	97211-1810
PENINSULA DRAINAGE DIST NO 2	1880 NE ELROD DR	PORTLAND	OR	97211-1810
PENINSULA DRAINAGE DIST NO 2	1880 NE ELROD DR	PORTLAND	OR	97211-1810
PENINSULA DRAINAGE DIST NO 2	1880 NE ELROD DR	PORTLAND	OR	97211-1810
PENINSULA IRON WORKS	PO BOX 83067	PORTLAND	OR	97283-0067
PENINSULA IRON WORKS	PO BOX 83067	PORTLAND	OR	97283-0067
PENINSULA MACHINERY LLC	PO BOX 83067	PORTLAND	OR	97283-0067
PENINSULA TERMINAL CO	34950 CHARDON RD SUITE 110	WILLOUGHBY HILLS	OH	44094
PENINSULA TERMINAL CO	2416 N MARINE DR	WILLOUGHBY HILLS	OH	97217
PENINSULA TERMINAL CO	2416 N MARINE DR	WILLOUGHBY HILLS	OH	97217-7741
PENINSULA TERMINAL COMPANY	739 E 140TH ST	CLEVELAND	OH	44110-2182
PENINSULA TERMINAL COMPANY	739 E 140TH ST	CLEVELAND	OH	44110-2182

PENNEYKAT LLC	835 N HUMBOLDT ST	PORTLAND	OR	97217-2507
PENNEYKAT LLC	835 N HUMBOLDT ST	PORTLAND	OR	97217-2507
PENNEYKAT LLC	110 SE MAIN ST	PORTLAND	OR	97214
PENNZOIL-QUAKER STATE COMPANY % PROPERTY TAX DEPT	PO BOX 4369	HOUSTON	TX	77210-4369
PENNZOIL-QUAKER STATE COMPANY % PROPERTY TAX DEPT	PO BOX 4369	HOUSTON	TX	77210-4369
PENNZOIL-QUAKER STATE COMPANY % PROPERTY TAX DEPT	PO BOX 4369	HOUSTON	TX	77210-4369
PENSKE TRUCK LEASING CO LP ATTN REAL ESTATE DEPT	PO BOX 563	READING	PA	19603-0563
PENTE INVESTMENTS L L C %THE DANNON CO INC TAX DEPT	100 HILLSIDE AVE	WHITE PLAINS	NY	10603
PENTE NORTH LLC %THE DANNON CO INC TAX DEPT	100 HILLSIDE AVE	WHITE PLAINS	NY	10603
PEOPLE'S CREDIT CO INC	4950 NE 148TH AVE	PORTLAND	OR	97230
PEP PRINTING INC DBA PREMIER PRESS	5000 N BASIN AVE	PORTLAND	OR	97217
PEP PRINTING INC DBA PREMIER PRESS	5000 N BASIN AVE	PORTLAND	OR	97217
PEREZ,RUBEN & CORONEL,DELIA	9000 NE M L KING BLVD SP 85	PORTLAND	OR	97211
PERMACOLD ASSOCIATES L L C	3005 NE ARGYLE ST	PORTLAND	OR	97211-1948
PERMACOLD ASSOCIATES L L C	3005 NE ARGYLE ST	PORTLAND	OR	97211-1948
PERMACOLD ASSOCIATES L L C	3005 NE ARGYLE ST	PORTLAND	OR	97211-1948
PERRL LLC	PO BOX 3109	PORTLAND	OR	97208-3109
PERRL LLC	7000 N CUTTER CIR	PORTLAND	OR	97217
PERROTT,JOHN S & SANDRA D	PO BOX 128	LA CENTER	WA	98629-0128
PETER COTTONTAIL ENTERPRISES L L C>	7265 SW DOGWOOD PL	PORTLAND	OR	97225
PETER COTTONTAIL ENTERPRISES LLC	7265 SW DOGWOOD PL	PORTLAND	OR	97225-1503
PETER COTTONTAIL ENTERPRISES LLC ET AL % MARTIN,RICHARD K	7265 SW DOGWOOD PL	PORTLAND	OR	97225-1503
PETERSON,BURT W & LINDA A	103 TALA SHORE DRIVE	PORT LUDLOW	WA	98365
PETERSON,RAYLYNNA TR (PETERSON FAMILY TRUST)	2725 N KERBY AVE	PORTLAND	OR	97227
PETERSON,TERRY & PETERSON,KATHERINE V	6822 SW 54TH AVE	PORTLAND	OR	97219-1337
PETRINA PROPERTIES II LLC %PETER CORVALLIS	3925 SW 57TH AVE	PORTLAND	OR	97221
PETRINA PROPERTIES III LLC %PETER CORVALLIS	3925 SW 57TH AVE	PORTLAND	OR	97221
PETRINA PROPERTIES IV LLC %PETER CORVALLIS	3925 SW 57TH AVE	PORTLAND	OR	97221
PETRINA PROPERTIES V LLC %PETER CORVALLIS	3925 SW 57TH AVE	PORTLAND	OR	97221
PETRONE,FRANK E	PO BOX 68989	PORTLAND	OR	97268
PH PORTLAND DST	100 N CITY PKWY STE 1700	LAS VEGAS	NV	89106-4614
PHAM,DOAN TRANG THUY	2223 MINDEN WAY	SACRAMENTO	CA	95835
PHAM,TAN B & NGUYEN,PHONG H	7990 NE GLISAN ST	PORTLAND	OR	97213
PHAM,THONG D & BUI,CATHERINE T	11953 SE 312TH DR	BORING	OR	97009

PHAM,TRUNG D & NGUYEN,CHAU P & NGUYEN,ALICE	9774 SE SPY GLASS DR	HAPPY VALLEY	OR	97086
PHAM,VANESSA XUAN & NGUYEN,DUC CONG	6925 SE 152ND AVE	PORTLAND	OR	97236
PHAM,VANESSA XUAN & NGUYEN,DUC CONG	6925 SE 152ND AVE	PORTLAND	OR	97236
PHAN,SEN V	11823 SE FOSTER RD	PORTLAND	OR	97266
PHILLIPS 66 COMPANY	1232 PARK ST #300	PASO ROBLES	CA	93446-7236
PHILLIPS 66 COMPANY %PROPERTY TAX	PO BOX 5600	BARTLESVILLE	OK	74005
PHILLIPS 66 COMPANY %PROPERTY TAX	PO BOX 5600	BARTLESVILLE	OK	74005
PHILLIPS 66 COMPANY %PROPERTY TAX	PO BOX 5600	BARTLESVILLE	OK	74005
PHILLIPS 66 COMPANY %PROPERTY TAX	PO BOX 5600	BARTLESVILLE	OK	74005
PHK YEON LLC	3330 NW YEON AVE #210	PORTLAND	OR	97210
PHOENIX BUILDING VENTURE LLC	PO BOX 14891	PORTLAND	OR	97293-0891
PHOENIXCOR INC	PO BOX 10316	STAMFORD	CT	06904-2316
PIEKUT,ROBERT	6807 N CATLIN AVE	PORTLAND	OR	97203-2815
PIEKUT,ROBERT	6807 N CATLIN AVE	PORTLAND	OR	97203-2815
PIER WEST LLC	8320 NE HWY 99	VANCOUVER	WA	98665-8819
PIERCE WEALTH PARTNERS FUND #1	952 SCHOOL ST #110	NAPA	CA	94559
PIERCE-PACIFIC MANUFACTURING,	PO BOX 30509	PORTLAND	OR	97294-3509
PIERCE-PACIFIC MANUFACTURING,	PO BOX 30509	PORTLAND	OR	97294-3509
PIETKA INVESTMENTS LLC	3514 NE US GRANT PL	PORTLAND	OR	97212
PIETKA,JEFFREY W	4539 NE MALLORY AVE	PORTLAND	OR	97211
PIETROK,THOMAS F	3836 NE COLUMBIA BLVD	PORTLAND	OR	97211
PIETROK,THOMAS F	3836 NE COLUMBIA BLVD	PORTLAND	OR	97211-2044
PIETRZYK,PAUL M	2220 SE 90TH AVE	PORTLAND	OR	97216
PIETRZYK,PAUL M	2220 SE 90TH AVE	PORTLAND	OR	97216-2021
PIETRZYK,PAUL M	2220 SE 90TH AVE	PORTLAND	OR	97216
PIETRZYK,PAUL M & PATRICIA	2220 SE 90TH AVE	PORTLAND	OR	97216
PINBALL PROPERTIES LLC	1003 SE GRANT ST	PORTLAND	OR	97214-5310
PINBALL PROPERTIES LLC	1003 SE GRANT ST	PORTLAND	OR	97214
PINBALL PROPERTIES LLC	2130 SE 10TH AVE	PORTLAND	OR	97214
PITMAN PROPERTIES III L L C	1535 SE 3RD AVE	PORTLAND	OR	97214-3347
PITMAN PROPERTIES L L C % PITMAN,DAN K	1535 SE 3RD AVE	PORTLAND	OR	97214-3347
PITMAN PROPERTIES MLK LLC	1535 SE 3RD AVE	PORTLAND	OR	97214-3347
PITMAN PROPERTIES MLK LLC	1535 SE 3RD AVE	PORTLAND	OR	97214-3347

PITMAN PROPERTIES V LLC ATTN PITMAN,DAN	1535 SE 3RD AVE	PORTLAND	OR	97214-3347
PJ INVESTMENTS LLC	2337 SW 47TH PL	PORTLAND	OR	97221-2301
PJM BLDG II LLC-3/5 ET AL % WYSE INVESTMENT SERVICES CO	810 SE BELMONT ST #100	PORTLAND	OR	97214
PLAN B INVESTMENTS L L C	PO BOX 820128	PORTLAND	OR	97282
PLATINUM PROPERTY HOLDINGS LLC	3220 SE 19TH AVE	PORTLAND	OR	97202
PLAZA PROPERTIES LLC % BLUESTONE & HOCKLEY	9320 SW BARBUR BLVD #300	PORTLAND	OR	97219-5405
PLAZA PROPERTIES LLC % BLUESTONE & HOCKLEY	9320 SW BARBUR BLVD #300	PORTLAND	OR	97219-5405
PLB INVESTMENTS LLC & BACCHUS INVESTORS LLC	1800 SW 1ST AVE #650	PORTLAND	OR	97201
PLB INVESTMENTS LLC & BACCHUS INVESTORS LLC	1800 SW 1ST AVE #650	PORTLAND	OR	97201
PLDAB LLC %PROLOGIS TAX COORDINATOR	4545 AIRPORT WAY	DENVER	CO	80239
PLDAB LLC %PROLOGIS TAX COORDINATOR	4545 AIRPORT WAY	DENVER	CO	80239
PLEIMAN,DAVID G	2821 SE 16TH AVE	PORTLAND	OR	97202-2269
PLEXES LLC	1100 NE 28TH AVE #100	PORTLAND	OR	97232
PLISKA INVESTMENTS LLC % PLISKA,JAMES	PO BOX 1429	CLACKAMAS	OR	97015-1429
PLISKA INVESTMENTS LLC % PLISKA,JAMES	PO BOX 1429	CLACKAMAS	OR	97015-1429
PLUCAR,ROCKY	4620 SE 61ST AVE	PORTLAND	OR	97206
PLUCKY CHARM LLC	PO BOX 871	SCAPPOOSE	OR	97056-0871
PLUMMER,JOHN	2336 NW ROOSEVELT ST	PORTLAND	OR	97210-2323
PM FINANCIAL SERVICES LLC	9980 SW RIVERWOOD LN	TIGARD	OR	97224
PMI PROPERTIES LLC	10100 NE MARX ST	PORTLAND	OR	97220-1162
PMP PROPERTIES LLC PMB 306	9220 SW BARBUR BLVD #119	PORTLAND	OR	97219
PMP PROPERTIES LLC PMB 306	9220 SW BARBUR BLVD #119	PORTLAND	OR	97219
PMP PROPERTIES LLC PMB 306	9220 SW BARBUR BLVD #119	PORTLAND	OR	97219
PMP PROPERTIES LLC PMB 306	9220 SW BARBUR BLVD #119	PORTLAND	OR	97219
PMP PROPERTIES LLC PMB 306	9220 SW BARBUR BLVD #119	PORTLAND	OR	97219
PN RE HOLDINGS LLC	PO BOX 14953	PORTLAND	OR	97293
PNWP LLC #4	6600 SW 105TH AVE #175	BEAVERTON	OR	97008
PNWP LLC #4	6600 SW 105TH AVE #175	BEAVERTON	OR	97008
PNWP LLC #4-50% & APX PARK TWENTY-SIX LLC-50%	6600 SW 105TH AVE #175	BEAVERTON	OR	97008
POCKET CREEK PROPERTIES L L C	729 NE 194TH AVE	PORTLAND	OR	97230-7715
POINT 3 PROPERTIES LLC	PO BOX 1113	LAKE OSWEGO	OR	97035
POLIZOS,HARALAMBOS A & POLIZOS,DIANE L	8325 SE MCLOUGHLIN BLVD	PORTLAND	OR	97202-7434
POLJAKOV,LEV	1217 SE BLAIR RD	WASHOUGAL	WA	98671
POLLEN LLC	110 SE 8TH AVE	PORTLAND	OR	97214

POLY FLOW ACQUISITION LLC %DAN CHRISTANSEN	8040 NE 33RD DR	PORTLAND	OR	97211-2016
POLY FLOW ACQUISITION LLC %DAN CHRISTANSEN	8040 NE 33RD DR	PORTLAND	OR	97211-2016
POOL IV FINANCE LLC ATTN: ANGIE SMEARING MANAGER,FINANCE	2398 E CAMELBACK RD #1000	PHOENIX	AZ	85016
POOL IV FINANCE LLC ATTN: ANGIE SMEARING MANAGER,FINANCE	2398 E CAMELBACK RD #1000	PHOENIX	AZ	85016
POOR,JUSTIN	2833 SE 16TH AVE	PORTLAND	OR	97202-2269
POPE,ALICE & POPE,STEVEN R	2120 NW 135TH AVE	PORTLAND	OR	97229-4404
POPE,GLENDA & POPE,WILLIAM C	11380 NW VALLEY VISTA RD	HILLSBORO	OR	97124
POPE,STEVEN R	2120 NW 135TH AVE	PORTLAND	OR	97229-4404
POPE,STEVEN R	2120 NW 135TH AVE	PORTLAND	OR	97229-4404
POPE,STEVEN R & ALICE E	2120 NW 135TH AVE	PORTLAND	OR	97229-4404
POPE,STEVEN R & POPE,ALICE	2120 NW 135TH AVE	PORTLAND	OR	97229-4404
POPE,STEVEN R & POPE,ALICE E	2120 NW 135TH AVE	PORTLAND	OR	97229-4404
POPE,STEVEN R & POPE,ALICE E	2120 NW 135TH AVE	PORTLAND	OR	97229-4404
POPE,STEVEN R & POPE,ALICE E	2120 NW 135TH AVE	PORTLAND	OR	97229-4404
POPE,STEVEN R & POPE,ALICE E	2120 NW 135TH AVE	PORTLAND	OR	97229-4404
POPE,THOMAS M TR & BECKLAND,JAMIE L TR	2134 SE HAWTHORNE BLVD	PORTLAND	OR	97214
POPE,WILLIAM C & POPE,GLENDA	11380 NW VALLEY VISTA RD	HILLSBORO	OR	97124
PORT OF PORLAND(LEASED CONCESSIONS INTL LLC (WENDY'S	PO BOX 3529	PORTLAND	OR	97208
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PORT OF PORTLAND	7200 NE AIRPORT WAY	PORTLAND	OR	97218

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PORT OF PORTLAND	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND % UNION PACIFIC RAILROAD PROPERTY TAX	1400 DOUGLAS STOP 1640	OMAHA	NE	68179-1640
PORT OF PORTLAND (LEASE LUFTHANSA GERMAN AIRLINE ATTN: JU	7000 NE AIRPORT WAY #2115	PORTLAND	OR	97218
PORT OF PORTLAND (LEASE PACIFIC COAST RESTAURANTS % RESTA	411 1ST AVE S #200N	SEATTLE	WA	98104-3831
PORT OF PORTLAND (LEASE PERMIT FEDERAL EXPRESS CORP BLDG	3630 HACKS CROSS RD	MEMPHIS	TN	38125
PORT OF PORTLAND (LEASE RIVERFRONT CAFE	10359 ROCHESTER AVE	LOS ANGELES	CA	90024
PORT OF PORTLAND (LEASE SANDOVAL'S MEXICAN RESTUARANT	7000 NE AIRPORT WAY #2293	PORTLAND	OR	97218-1009
PORT OF PORTLAND (LEASE STEPHANIE INC (GOOD DOG/BAD DOG	7000 NE AIRPORT WAY #2315	PORTLAND	OR	97218
PORT OF PORTLAND (LEASE USA TODAY ATTN: KYLE MARTIN	13810 SE EASTGATE WAY #110	BELLEVUE	WA	98005
PORT OF PORTLAND (LEASE VANGUARD CAR RENTALS EAN HOLDIN	20400 SW TETON AVE	TUALATIN	OR	97062-8812
PORT OF PORTLAND (LEASED BIG SKY AIRLINES % BIG SKY TRANSPO	1601 AVIATION PL	BILLINGS	MT	59105
PORT OF PORTLAND (LEASED CHRISTENSON ELECTRIC INC	PO BOX 3529	PORTLAND	OR	97208
PORT OF PORTLAND (LEASED DAIMLER TRUCKS NORTH AMERICA LL	PO BOX 3820	PORTLAND	OR	97208-3849
PORT OF PORTLAND (LEASED DAIMLER TRUCKS NORTH AMERICA LL	PO BOX 3820	PORTLAND	OR	97208-3849
PORT OF PORTLAND (LEASED DELTA AIRLINES INC CORPORATE TAXI	PO BOX 45852	ATLANTA	GA	30320-5852
PORT OF PORTLAND (LEASED ENVIRONMENTAL FIBERS INTNL	PO BOX 3529	PORTLAND	OR	97208
PORT OF PORTLAND (LEASED ICTSI OREGON,INC TMC	4004 KRUSE WAY PL, STE 325	LAKE OSWEGO	OR	97035
PORT OF PORTLAND (LEASED JETBLUE AIRWAYS CORP ATTN: TAX D	27-01 QUEENS PLAZA NORTH	LONG ISLAND CITY	NY	11101
PORT OF PORTLAND (LEASED NEW TOWER TRUST CO (PHASE II) PT	PO BOX 320099	ALEXANDRIA	VA	22320-4099
PORT OF PORTLAND (LEASED NEW TOWER TRUST CO (PHASE III) PT	PO BOX 320099	ALEXANDRIA	VA	22320-4099
PORT OF PORTLAND (LEASED PACIFIC CASCADE RESOURCES	PO BOX 3529	PORTLAND	OR	97208
PORT OF PORTLAND (LEASED PD ACC1 LLC BLDG 1 3RD FL	3630 HACKS CROSS RD	MEMPHIS	TN	38125
PORT OF PORTLAND (LEASED POLLIN HOTELS LLC	8235 NE AIRPORT WAY	PORTLAND	OR	97218
PORT OF PORTLAND (LEASED REGIONAL MARITIME SECURITY	PO BOX 3529	PORTLAND	OR	97208
PORT OF PORTLAND (LEASED RIVERSIDE GOLF & COUNTRY CLUB	8105 NE 33RD DR	PORTLAND	OR	97211
PORT OF PORTLAND (LEASED RIVERSIDE GOLF & COUNTRY CLUB	8105 NE 33RD DR	PORTLAND	OR	97211
PORT OF PORTLAND (LEASED TRIANGLE AVIATION RDD LLC ATTN: D	4700 EMPIRE AVE	BURBANK	CA	91505
PORT OF PORTLAND (LEASED TRIANGLE AVIATION RDD LLC ATTN: D	4700 EMPIRE AVE	BURBANK	CA	91505
PORT OF PORTLAND ATTN REAL ESTATE MANAGER	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND ATTN REAL ESTATE MANAGER	PO BOX 3529	PORTLAND	OR	97208-3529

PORT OF PORTLAND ATTN: BROOKS,SUZANNE	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND ATTN: BROOKS,SUZANNE	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND ATTN: BROOKS,SUZANNE	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND ATTN: BROOKS,SUZANNE	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND ATTN: BROOKS,SUZANNE	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND LEASED TO TOYOTA MOTOR SALES % FONG,JAI 19001 S WESTERN AVE #G301		TORRANCE	CA	90501
PORT OF PORTLAND LEASED TO TOYOTA MOTOR SALES % FONG,JAI 19001 S WESTERN AVE #G301		TORRANCE	CA	90501
PORT OF PORTLAND(LEASE COMMAND SECURTIY CORP ATTN MARI PO BOX 340		LAGRANGEVILLE	NY	12540
PORT OF PORTLAND(LEASE HONEYWELL INTERNATIONAL INC %ALTI 21001 N TATUM BLVD #1630-630 PHOENIX			AZ	85050
PORT OF PORTLAND(LEASE HONEYWELL INTERNATIONAL INC %ALTI 21001 N TATUM BLVD #1630-630 PHOENIX			AZ	85050
PORT OF PORTLAND(LEASE PACIFIC MARITIME ASSN	P O BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED % EMPIRE AIRLINES INC	11559 N ATLAS RD	HAYDEN	ID	83835
PORT OF PORTLAND(LEASED % SKYWEST AIRLINES INC ATTN: TAX D 444 S RIVER RD		ST GEORGE	UT	84790
PORT OF PORTLAND(LEASED (SWAN	4855 N LAGOON AVE	PORTLAND	OR	97217
PORT OF PORTLAND(LEASED 533 MA LLC - #2009-018 % ANGELO,CF 400 E MILL PLAIN BLVD #500		VANCOUVER	WA	98660-3492
PORT OF PORTLAND(LEASED AERO PORTLAND II LLC	19115 LEE RD #226	HUMBLE	TX	77338-4189
PORT OF PORTLAND(LEASED AERO PORTLAND LLC	19115 LEE RD #226	HUMBLE	TX	77338-4189
PORT OF PORTLAND(LEASED AERO PORTLAND LLC	19115 LEE RD #226	HUMBLE	TX	77338-4189
PORT OF PORTLAND(LEASED AIR CANADA ATTN: PROPERTY TAX	7373 COTE-VERTU BLVD WEST	ST LAURENT	QC	H4S 1Z3 CA
PORT OF PORTLAND(LEASED AIRCRAFT SERVICE INT'L ATTN: JEANNI 201 S ORANGE AVE #1100		ORLANDO	FL	32801
PORT OF PORTLAND(LEASED AIRPORT TERMINAL SERVICES % CONT 111 WESTPORT PLAZA #400		ST LOUIS	MO	63146-3014
PORT OF PORTLAND(LEASED AIRPORT TERMINAL SERVICES % CONT 111 WESTPORT PLAZA #400		ST LOUIS	MO	63146-3014
PORT OF PORTLAND(LEASED AIRPORT TERMINAL SERVICES INC %CC 111 WESTPORT PLAZA DR, SUITE ' ST LOUIS			MO	63146
PORT OF PORTLAND(LEASED ALASKA AIRLINES INC	PO BOX 68900 (SEABZ)	SEATTLE	WA	98168-0900
PORT OF PORTLAND(LEASED ALASKA AIRLINES INC	PO BOX 68900	SEATTLE	WA	98168-0900
PORT OF PORTLAND(LEASED ALEXANDER GOW INC>	P O BOX 3529	PORTLAND	OR	97208
PORT OF PORTLAND(LEASED ALLIANCE CORPORATION	PO BOX 66338	BATON ROUGE	LA	70896
PORT OF PORTLAND(LEASED AMB PROPERTY LP %AMB PROPERT C(60 STATE ST #1200		BOSTON	MA	2109
PORT OF PORTLAND(LEASED AMERICAN AIRLINES TAX DEPT	PO BOX 619616	DFW AIRPORT	TX	75261-9616
PORT OF PORTLAND(LEASED AMERICAN HONDA MOTOR CO INC % 1919 TORRANCE BLVD		TORRANCE	CA	90501-2722
PORT OF PORTLAND(LEASED AMERICAN HONDA MOTOR CO INC % 1919 TORRANCE BLVD		TORRANCE	CA	90501-2722
PORT OF PORTLAND(LEASED AMERIFLIGHT LLC	4700 EMPIRE AVE HANGAR #1	BURBANK	CA	91505-1048
PORT OF PORTLAND(LEASED ANDALE MANAGEMENT GROUP INC D 845 MARKET ST		SAN FRANCISCO	CA	94103
PORT OF PORTLAND(LEASED APL LOGISTICS AMERICAS LTD	P O BOX 3529	PORTLAND	OR	97208

PORT OF PORTLAND(LEASED ATLANTIC AVIATION OREGON FBO INC	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED ATLANTIC AVIATION OREGON FBO INC	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED ATLANTIC AVIATION OREGON FBO INC	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED ATLANTIC AVIATION OREGON FBO INC	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED ATLANTIC AVIATION OREGON FBO INC	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED ATLANTIC AVIATION OREGON FBO INC	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED ATLANTIC AVIATION OREGON FBO INC	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED ATLANTIC AVIATION OREGON FBO INC	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED ATRIUM FINANCE V LLC WHI	4243 HUNT ROAD	CINCINNATI	OH	45242
PORT OF PORTLAND(LEASED AUTO WAREHOUSING CO	2810 MARSHALL AVE STE B	TACOMA	WA	98421-3135
PORT OF PORTLAND(LEASED AUTO WAREHOUSING CO	2810 MARSHALL AVE STE B	TACOMA	WA	98421-3135
PORT OF PORTLAND(LEASED AUTO WAREHOUSING CO	2810 MARSHALL AVE STE B	TACOMA	WA	98421-3135
PORT OF PORTLAND(LEASED AUTO WAREHOUSING CO	2810 MARSHALL AVE STE B	TACOMA	WA	98421-3135
PORT OF PORTLAND(LEASED AUTO WAREHOUSING CO	2810 MARSHALL AVE STE B	TACOMA	WA	98421-3135
PORT OF PORTLAND(LEASED AUTO WAREHOUSING CO %COOK,NAN	2810 MARSHALL AVE STE B	TACOMA	WA	98421-3135
PORT OF PORTLAND(LEASED AVIS BUDGET CAR RENTAL LLC #2011-(	6 SYLVAN WAY	PARSIPPANY	NJ	7054
PORT OF PORTLAND(LEASED AVIS BUDGET CAR RENTAL LLC % AVIS	6 SYLVAN WAY	PARSIPPANY	NJ	7054
PORT OF PORTLAND(LEASED AVIS BUDGET CAR RENTAL LLC % AVIS	6 SYLVAN WAY	PARSIPPANY	NJ	7054
PORT OF PORTLAND(LEASED AVIS BUDGET CAR RENTAL LLC % AVIS	6 SYLVAN WAY	PARSIPPANY	NJ	7054
PORT OF PORTLAND(LEASED AWC PORT SERVICES INC	2810 MARSHALL AVE #B	TACOMA	WA	98421-3135
PORT OF PORTLAND(LEASED BAMBUZA SOUTH WATERFRONT LLC %	3682 SW BOND AVE	PORTLAND	OR	97239
PORT OF PORTLAND(LEASED BEACHES % MATTHIAS,MARK	1919 SE COLUMBIA RIVER DR	VANCOUVER	WA	98661
PORT OF PORTLAND(LEASED BENSON INDUSTRIES INC	P O BOX 3529	PORTLAND	OR	97208
PORT OF PORTLAND(LEASED BOISE CASCADE CORP	P O BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED BRIDGE TERMINAL TRANSPORT INC	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED BROOKSTONE PROPERTIES INC ATTN: \1	INNOVATION WAY	MERRIMACK	NH	03054-4873
PORT OF PORTLAND(LEASED BYBEE LAKE LOGISTICS CNTR II %COLLI	851 SW 6TH AVE #1200	PORTLAND	OR	97204-1349
PORT OF PORTLAND(LEASED BYBEE LAKE LOGISTICS CNTR LLC %COI	851 SW 6TH AVE #1200	PORTLAND	OR	97204-1349
PORT OF PORTLAND(LEASED CAPERS CAFE & CATERING CO ATTN: J(	12003 NE AINSWORTH CIR	PORTLAND	OR	97220

PORT OF PORTLAND(LEASED CAPERS CAFE CATERING CO DBA CA %. 12003 NE AINSWORTH CIR		PORTLAND	OR	97220
PORT OF PORTLAND(LEASED CARGO SCREENING AND COMPLIANCE PO BOX 56478		PORTLAND	OR	97238-6478
PORT OF PORTLAND(LEASED CASCADE STATION I & II LLC % DEMON 11601 WILSHIRE BLVD #107		LOS ANGELES	CA	90025-0509
PORT OF PORTLAND(LEASED CASCADE STATION I & II LLC % DEMON 11601 WILSHIRE BLVD #107		LOS ANGELES	CA	90025-0509
PORT OF PORTLAND(LEASED CASCADE STATION RETAIL CENTER LLC 7455 SW BRIDGEPORT RD #205		TIGARD	OR	97224
PORT OF PORTLAND(LEASED CASCADE STATION RETAIL CENTER LLC 7455 SW BRIDGEPORT RD #205		TIGARD	OR	97224
PORT OF PORTLAND(LEASED CC MCKENZIE SHOES & APPAREL LL %F 7000 NE AIRPORT WAY		PORTLAND	OR	97218
PORT OF PORTLAND(LEASED CCM AIRPORT LLC %CC MCKENZIE	7000 NE AIRPORT WAY T2342	PORTLAND	OR	97218
PORT OF PORTLAND(LEASED CCM AIRPORT LLC DBA CC MCKENZI	7000 NE AIRPORT WAY #T2342	PORTLAND	OR	97218
PORT OF PORTLAND(LEASED CEREAL FOOD PROCESSORS INC % RYA 15 W 6TH ST STE 2400		TULSA	OK	74119
PORT OF PORTLAND(LEASED CEREAL FOOD PROCESSORS INC % RYA 15 W 6TH ST STE 2400		TULSA	OK	74119
PORT OF PORTLAND(LEASED COLUMB	1300 SW 5TH AVE #2705	PORTLAND	OR	97201
PORT OF PORTLAND(LEASED COLUMBIA EXPORT TERMINAL LLC	1300 SW 5TH AVE #2705	PORTLAND	OR	97201
PORT OF PORTLAND(LEASED COLUMBIA GRAIN INC	1300 SW 5TH AVE #2705	PORTLAND	OR	97201
PORT OF PORTLAND(LEASED COLUMBIA SPORTSWEAR % VICE PRES 14375 NW SCIENCE PARK DR		PORTLAND	OR	97229
PORT OF PORTLAND(LEASED COLUMBIA SPORTSWEAR USA CORP % 14375 NW SCIENCE PARK DR		PORTLAND	OR	97229
PORT OF PORTLAND(LEASED CONCESIONARIA VUELA COMPANIA	1313 PONCE DE LEON BLVD #201	CORAL GABLES	FL	33134
PORT OF PORTLAND(LEASED CONGLOBAL INDUSTRIES INC ATTN CF(8200 185TH ST STE A		TINLEY PARK	IL	60487-9244
PORT OF PORTLAND(LEASED CONTECH STORMWATER SOLUTIONS I 11835 NE GLENN WIDING DR		PORTLAND	OR	97220-9057
PORT OF PORTLAND(LEASED CONTINENTAL AIRLINES	233 S WACKER DR FL 14	CHICAGO	IL	60606
PORT OF PORTLAND(LEASED CY PDX AIRPORT LLC DBA CAFE YU % L 456 CHARNELTON ST		EUGENE	OR	97401-2626
PORT OF PORTLAND(LEASED DAIMLER TRUCKS NORTH AMERICA	PO BOX 3820	PORTLAND	OR	97208
PORT OF PORTLAND(LEASED DBA BURGERVILLE LLC	109 W 17TH ST	VANCOUVER	WA	98660
PORT OF PORTLAND(LEASED DELTA AIRLINES INC %TAX DEPT 852	PO BOX 45852	ATLANTA	GA	30320-5852
PORT OF PORTLAND(LEASED DISTRIBUTION INC DBA FTL INC %HARI 16795 SE EVELYN ST		CLACKAMAS	OR	97015
PORT OF PORTLAND(LEASED DOLLAR RENT A CAR	PO BOX 68428	SEATTLE	WA	98168-0428
PORT OF PORTLAND(LEASED DTG OPERATIONS INC	5330 E 31ST MS 5E2	TULSA	OK	74153-0985
PORT OF PORTLAND(LEASED EAN HOLDINGS LLC DBA ALAMO REN ? 20400 SW TETON AVE		TUALATIN	OR	97062
PORT OF PORTLAND(LEASED EAN HOLDINGS LLC DBA ENTERPRISE R 20400 SW TETON AVE		TUALATIN	OR	97062-8812
PORT OF PORTLAND(LEASED EAN HOLDINGS LLC DBA ENTERPRISE R 20400 SW TETON AVE		TUALATIN	OR	97062-8812
PORT OF PORTLAND(LEASED EAN HOLDINGS LLC DBA NATIONAL CA 20400 SW TETON AVE		TUALATIN	OR	97062-8812
PORT OF PORTLAND(LEASED EAN HOLDINGS LLC DBA NATIONAL CA 20400 SW TETON AVE		TUALATIN	OR	97062-8812
PORT OF PORTLAND(LEASED EAN HOLDINGS LLC DBA NATIONAL CA 20400 SW TETON AVE		TUALATIN	OR	97062-8812
PORT OF PORTLAND(LEASED ELITE LINE SERVICES #2009-029	1625 W CROSBY RD, #100	CARROLLTON	TX	75006

PORT OF PORTLAND(LEASED ELITE LINE SERVICES #2015-203 % ZAR 34375 W TWELVE MILE RD		FARMINTON	MI	48331
PORT OF PORTLAND(LEASED EMPIRE AIRLINES INC 2016-1022 %STR 11559 N ATLAS ROAD		HAYDEN	ID	83835
PORT OF PORTLAND(LEASED EVERGREEN INTERNATIONAL AIRLIN A` 3850 THREE MILE LANE		MCMINNVILLE	OR	97128
PORT OF PORTLAND(LEASED EXPEDITE INC % MELLAND,CARLA	PO BOX 55701	PORTLAND	OR	97238-5701
PORT OF PORTLAND(LEASED EXPEDITE INC ATTN: CARLA MELLAND	PO BOX 55701	PORTLAND	OR	97238
PORT OF PORTLAND(LEASED FAA	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED FEDERAL AVIATION ADMINISTRATIO A`1601 LIND AVE SW		RENTON	WA	98057
PORT OF PORTLAND(LEASED FRONTIER AIRLINES INC>	7001 TOWER RD	DENVER	CO	80249
PORT OF PORTLAND(LEASED GATE GOURMET INC	1880 CAMPUS COMMONS DR #2(	RESTON	VA	20191-1503
PORT OF PORTLAND(LEASED GEORGIA-PACIFIC CONSUMER PRODU PO BOX 105681		ATLANTA	GA	30348-5681
PORT OF PORTLAND(LEASED GEORGIA-PACIFIC CONSUMER PRODU PO BOX 105681		ATLANTA	GA	30348-5681
PORT OF PORTLAND(LEASED H NAITO CORPORATION	13625 NE JARRETT ST	PORTLAND	OR	97230
PORT OF PORTLAND(LEASED HAWAIIAN AIRLINES INC PROPERTIES { PO BOX 30008		HONOLULU	HI	96820
PORT OF PORTLAND(LEASED HERTZ CORP TAX DEPT 2N	225 BRAE BLVD	PARK RIDGE	NJ	07656-0713
PORT OF PORTLAND(LEASED HOMEPORT INSURANCE SERVICES IN 9 1131 SW KLICKITAT WAY		SEATTLE	WA	98134
PORT OF PORTLAND(LEASED HORIZON AIR ATTN: BRETT WEILER	PO BOX 68900 ATTN:SEABZ	SEATTLE	WA	98168-0900
PORT OF PORTLAND(LEASED HORIZON AIR ATTN: BRETT WEILER	PO BOX 68900 ATTN:SEABZ	SEATTLE	WA	98168-0900
PORT OF PORTLAND(LEASED HORIZON AIR INDUSTRIES INC	P O BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED HORIZON AIR INDUSTRIES INC ATTN: B PO BOX 68900 ATTN:SEABZ		SEATTLE	WA	98168-0900
PORT OF PORTLAND(LEASED HORIZON AIR INDUSTRIES INC> ATTN:! PO BOX 68900 ATTN:SEABZ		SEATTLE	WA	98168-0900
PORT OF PORTLAND(LEASED HOST INTERNATIONAL DBA STARBUCK 6905 ROCKLEDGE DR		BETHESDA	MD	20817
PORT OF PORTLAND(LEASED HOST INTERNATIONAL INC DBA STA %6905 ROCKLEDGE DRIVE		BETHESDA	MD	20817
PORT OF PORTLAND(LEASED HOST INTERNATIONAL INC TAX DEPAR 6905 ROCKLEDGE DR		BETHESDA	MD	20817-1828
PORT OF PORTLAND(LEASED HOST INTERNATIONAL INC TAX DEPAR 6905 ROCKLEDGE DR		BETHESDA	MD	20817-1828
PORT OF PORTLAND(LEASED HOST INTERNATIONAL INC TAX DEPAR 6905 ROCKLEDGE DR		BETHESDA	MD	20817-1828
PORT OF PORTLAND(LEASED HOST INTERNATIONAL INC TAX DEPAR 6905 ROCKLEDGE DR		BETHESDA	MD	20817-1828
PORT OF PORTLAND(LEASED HOST INTERNATIONAL-STARBUCKS	6905 ROCKLEDGE DR MS #5-3	BETHESDA	MD	20817
PORT OF PORTLAND(LEASED HOUSE SPIRITS DISTILLERY LLC %KROG 2025 SE 7TH AVE		PORTLAND	OR	97214
PORT OF PORTLAND(LEASED HOUSE SPIRITS DISTILLERY LLC %KROG 65 SE WASHINGTON ST		PORTLAND	OR	97214
PORT OF PORTLAND(LEASED HUDSON BURCH PORTLAND JV ATTN: , PO BOX 3529		PORTLAND	OR	97208
PORT OF PORTLAND(LEASED HUNTLEIGH USA CORPORATION ATTN: PO BOX 140729		IRVING	TX	75014-0729
PORT OF PORTLAND(LEASED ICTSI OREGON INC	4004 KRUSE WAY PL #325	LAKE OSWEGO	OR	97035
PORT OF PORTLAND(LEASED ICTSI OREGON INC	4004 KRUSE WAY PL #325	LAKE OSWEGO	OR	97035
PORT OF PORTLAND(LEASED ICTSI OREGON INC	4004 KRUSE WAY PL #325	LAKE OSWEGO	OR	97035

PORT OF PORTLAND(LEASED IKEA PROPERTY INC ATTN HELENE DAL 420 ALAN WOOD RD		CONSHOHOCKEN	PA	19428-1141
PORT OF PORTLAND(LEASED ILWU L	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED INMOTION ENTERTAINMENT GROUP L 4801 EXECUTIVE PARK CT #100		JACKSONVILLE	FL	32216
PORT OF PORTLAND(LEASED INMOTION ENTERTAINMENT GROUP L 4801 EXECUTIVE PARK CT, #100		JACKSONVILLE	FL	32216
PORT OF PORTLAND(LEASED INMOTION ENTERTAINMENT GROUP L 4801 EXECUTIVE PARK CT STE 10C		JACKSONVILLE	FL	32216
PORT OF PORTLAND(LEASED INTRNAT'L RAW MATERIALS LTD PUBL 150 S INDEPENDENCE MALL WEST		PHILADELPHIA	PA	19106-3407
PORT OF PORTLAND(LEASED INTRNAT'L RAW MATERIALS LTD PUBL 150 S INDEPENDENCE MALL WEST		PHILADELPHIA	PA	19106-3407
PORT OF PORTLAND(LEASED J & R AIRPORT LLC % CUSHMAN & WA 200 SW MARKET ST #200		PORTLAND	OR	97201
PORT OF PORTLAND(LEASED JAZZ AIR INC	5100 DE MAISONNEUVE W 7TH FI	MONTREAL	QC	H3A 3T2 CA
PORT OF PORTLAND(LEASED JL AVIATION INC	PO BOX 97	TROUTDALE	OR	97060
PORT OF PORTLAND(LEASED KITTY HAWK INC>	PO BOX 612787	DFW AIRPORT	TX	75261
PORT OF PORTLAND(LEASED KRUJEX TRANSPORT CORP #2014-03 % 13215 SE MILL PLAIN BLVD #C8		VANCOUVER	WA	98684
PORT OF PORTLAND(LEASED KUDESTROM INVESTMENTS INC	20622 SE DEERFERN LOOP	CAMAS	WA	98607
PORT OF PORTLAND(LEASED LATRELLE'S GALLEY LP DBA PEET' % JAN 2131 GREEN OAK DR		KINGWOOD	TX	77339
PORT OF PORTLAND(LEASED LATRELLE'S GALLEY LP DBA STUMP % J 2131 GREEN OAK DR		KINGWOOD	TX	77339
PORT OF PORTLAND(LEASED LUGGAGE SVCS & LOGISTICS LLC % SAI 6751 FORUM DR #200		ORLANDO	FL	32821-8089
PORT OF PORTLAND(LEASED LWIN FAMILY CO	11949 STEELE CREEK RD	CHARLOTTE	NC	28273
PORT OF PORTLAND(LEASED MADE IN OREGON	13625 NE JARRETT ST	PORTLAND	OR	97230-1082
PORT OF PORTLAND(LEASED MAX J. KUNEY COMPANY %WAUGH, G PO BOX 4008		SPOKANE	WA	99202-0008
PORT OF PORTLAND(LEASED MC DONALD'S USA (36-117)	P O BOX 182571	COLUMBUS	OH	43218-2571
PORT OF PORTLAND(LEASED MC DONALD'S USA (36-117)	P O BOX 182571	COLUMBUS	OH	43218-2571
PORT OF PORTLAND(LEASED MCDONALDS CORP #2012-159	PO BOX 182571	COLUMBUS	OH	43218
PORT OF PORTLAND(LEASED MCKINNEY & SON INC	PO BOX 71668	EUGENE	OR	97401
PORT OF PORTLAND(LEASED MEPS PDX LLC	PO BOX 4349	HAILEY	ID	83333-4349
PORT OF PORTLAND(LEASED MEPT ALDERWOOD CORPORATE CENT PO BOX 92129		SOUTHLAKE	TX	76092
PORT OF PORTLAND(LEASED MEPT RIVERGATE III LLC % ALTUS GRO PO BOX 92129		SOUTHLAKE	TX	76092
PORT OF PORTLAND(LEASED MEPT RIVERGATE IV LLC % ALTUS GRO PO BOX 92129		SOUTHLAKE	TX	76092
PORT OF PORTLAND(LEASED MEPT RIVERGATE LLC % ALTUS GROUF PO BOX 92129		SOUTHLAKE	TX	76092
PORT OF PORTLAND(LEASED MEPT RIVERGATE LLC % ALTUS GROUF PO BOX 92129		SOUTHLAKE	TX	76092
PORT OF PORTLAND(LEASED MEPT RIVERGATE LLC % ATLUS GROUF PO BOX 92129		SOUTHLAKE	TX	76092
PORT OF PORTLAND(LEASED METALSMITHS STERLING OREGON IN 9 17410-107 AVE		EDMONTON	AB	T5S 1E9 CA
PORT OF PORTLAND(LEASED MEXICANA AIRLINES % HIDALGO,ANN/ 9841 AIRPORT BLVD #400		LOS ANGELES	CA	90045
PORT OF PORTLAND(LEASED MILL BANK MATERIALS USA LTD	APT 102 20329 LOGAN AVE	LANGLEY	BC	V3A 4L8 CA
PORT OF PORTLAND(LEASED MILL BANK MATERIALS USA LTD	APT 102 20329 LOGAN AVE	LANGLEY	BC	V3A 4L8 CA

PORT OF PORTLAND(LEASED MOD SUPER FAST PIZZA LLC %CEO OR	PO BOX 6939	BELLEVUE	WA	98008-0939
PORT OF PORTLAND(LEASED MONACO 3 INC DBA PETITE PROVEN	4726 SE DIVISION ST	PORTLAND	OR	97206
PORT OF PORTLAND(LEASED MSC AM	121 SW MORRISON ST #1875	PORTLAND	OR	97204
PORT OF PORTLAND(LEASED NAITO CORP DBA ARIA BOUTIQUE % P	13625 NE JARRETT ST	PORTLAND	OR	97230
PORT OF PORTLAND(LEASED NAITO CORPORATION %BERNING,BRU	888 SW 5TH AVE, STE 1600	PORTLAND	OR	97204
PORT OF PORTLAND(LEASED NAITO CORPORATION DBA MADE IN	13625 NE JARRETT ST	PORTLAND	OR	97230
PORT OF PORTLAND(LEASED NAITO CORPORATION DBA MADE IN O	13625 NE JARRETT ST	PORTLAND	OR	97230
PORT OF PORTLAND(LEASED NAITO DBA MADE IN OREGON-2009-0	13625 NE JERRETT ST	PORTLAND	OR	97230
PORT OF PORTLAND(LEASED NATION	PO BOX 3529	PORTLAND	OR	97208
PORT OF PORTLAND(LEASED NEWPORT PACIFIC CORPORATION %B/	PO BOX 2151	NEWPORT	OR	97365
PORT OF PORTLAND(LEASED NIKE INC ATTN TAX DEPT (NRS)	1 SW BOWERMAN DR	BEAVERTON	OR	97005-6453
PORT OF PORTLAND(LEASED NORTHWEST AIR LINES	PO BOX 45852 DEPT 852	ATLANTA	GA	30320-5852
PORT OF PORTLAND(LEASED NORTHWEST AIRLINES INC>	2700 LONE OAK PARKWAY	EAGAN	MN	55121-1534
PORT OF PORTLAND(LEASED NORTHWEST AIRLINES INC> DELTA AIR	PO BOX 45852	ATLANTA	GA	30320-5852
PORT OF PORTLAND(LEASED NORTHWEST CASCADE INC ATTN PERR	PO BOX 73399	PUYALLUP	WA	98373
PORT OF PORTLAND(LEASED OREGON	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED OREGON ELECTRIC CONSTRUCTION	1709 SE 3RD AVE	PORTLAND	OR	97214
PORT OF PORTLAND(LEASED PACIFI	PO BOX 3529	PORTLAND	OR	97208
PORT OF PORTLAND(LEASED PACIFI %PACIFICORP ATTN: TAX DEPAI	825 NE MULTNOMAH ST #1900	PORTLAND	OR	97232
PORT OF PORTLAND(LEASED PACIFIC ROCK INC	8705 NE 117TH AVE	VANCOUVER	WA	98662
PORT OF PORTLAND(LEASED PACIFIC ROCK PRODUCTS LLC	1501 BELVEDERE RD	WEST PALM BEACH	FL	33406
PORT OF PORTLAND(LEASED PANDA EXPRESS % PANDA RESTAURAI	1683 WALNUT GROVE AVE	ROSEMEAD	CA	91770
PORT OF PORTLAND(LEASED PARADIES-MY-REO LLC OVERLOOK 1 #	2849 PACES FERRY RD SE	ATLANTA	GA	30339-3769
PORT OF PORTLAND(LEASED PDC	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED PDC %REAL ESTATE SERVICES	222 NW 5TH AVE	PORTLAND	OR	97209
PORT OF PORTLAND(LEASED PDC %REAL ESTATE SERVICES	222 NW 5TH AVE	PORTLAND	OR	97209
PORT OF PORTLAND(LEASED PDC %REAL ESTATE SERVICES	222 NW 5TH AVE	PORTLAND	OR	97209
PORT OF PORTLAND(LEASED PDX LOGISTICS CENTER I LLC % CAPSTC	1015 NW 11TH AVE #243	PORTLAND	OR	97209
PORT OF PORTLAND(LEASED PDX LOGISTICS CENTER I LLC % CAPSTC	1015 NW 11TH AVE #243	PORTLAND	OR	97209
PORT OF PORTLAND(LEASED PDX LOGISTICS CENTER II LLC % CAPST	1015 NW 11TH AVE #243	PORTLAND	OR	97209-3496
PORT OF PORTLAND(LEASED PDX LOGISTICS CENTER III LLC % CAPSI	1015 NW 11TH AVE #243	PORTLAND	OR	97209
PORT OF PORTLAND(LEASED PERFORMANCE LOGISTICS LLC	7730 NE AIRPORT WAY	PORTLAND	OR	97218
PORT OF PORTLAND(LEASED PERFORMANCE LOGISTICS LLC %WEAT	7730 NE AIR CARGO RD	PORTLAND	OR	97218
PORT OF PORTLAND(LEASED PERFORMANCE LOGISTICS LLC %WEAT	7730 NE AIR CARGO RD	PORTLAND	OR	97218

PORT OF PORTLAND(LEASED PH PORTLAND DST	100 N CITY PKWY #1700	LAS VEGAS	NV	89106
PORT OF PORTLAND(LEASED PM & O LINE	P O BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED POLLIN HOTELS II LLC (SHERATON HOT	8235 NE AIRPORT WAY	PORTLAND	OR	97218
PORT OF PORTLAND(LEASED POLLIN HOTELS III LLC % CASCADE STA	8235 NE AIRPORT WAY	PORTLAND	OR	97220
PORT OF PORTLAND(LEASED POLLIN HOTELS LLC	8235 NE AIRPORT WAY	PORTLAND	OR	97218
PORT OF PORTLAND(LEASED POLLIN HOTELS LLC	8235 NE AIRPORT WAY	PORTLAND	OR	97218
PORT OF PORTLAND(LEASED POLLIN HOTELS LLC % POLLIN,HAROLD	8235 NE AIRPORT WAY	PORTLAND	OR	97218
PORT OF PORTLAND(LEASED PORTLAND AIRLINES CONSORTIUM LL(	7000 NE AIRPORT WAY #3108	PORTLAND	OR	97218
PORT OF PORTLAND(LEASED PORTLAND BULK TERMINALS % STEW/	2300 SW 1ST AVE #200	PORTLAND	OR	97201-5047
PORT OF PORTLAND(LEASED PORTLAND BULK TERMINALS % STEW/	2300 SW 1ST AVE #200	PORTLAND	OR	97201-5047
PORT OF PORTLAND(LEASED PORTLAND BULK TERMINALS % STEW/	2300 SW 1ST AVE #200	PORTLAND	OR	97201-5047
PORT OF PORTLAND(LEASED PORTLAND BULK TERMINALS % STEW/	2300 SW 1ST AVE #200	PORTLAND	OR	97201-5047
PORT OF PORTLAND(LEASED PORTLAND BULK TERMINALS % STEW/	2300 SW 1ST AVE #200	PORTLAND	OR	97201-5047
PORT OF PORTLAND(LEASED PORTLAND FUELING FACILITIES % AIRC	201 S ORANGE AVE #1100	ORLANDO	FL	32801-3478
PORT OF PORTLAND(LEASED PORTLAND FUELING FACILITIES %AIRC	201 S ORANGE AVE #1100	ORLANDO	FL	32801
PORT OF PORTLAND(LEASED PORTLAND FUELING FACILITIES %AIRC	201 S ORANGE AVE #1100	ORLANDO	FL	32801
PORT OF PORTLAND(LEASED PORTLAND FUELING FACILITIES %AIRC	201 S ORANGE AVE #1100	ORLANDO	FL	32801
PORT OF PORTLAND(LEASED PORTLAND FUELING FACILITIES %AIRC	201 S ORANGE AVE #1100	ORLANDO	FL	32801
PORT OF PORTLAND(LEASED PORTLAND ROASTING HOLDINGS LLC	340 SE 7TH AVE	PORTLAND	OR	97214
PORT OF PORTLAND(LEASED POTBELLY AIRPORT PORTLAND PDX	222 MERCHANDISE MART PLZ	CHICAGO	IL	60654
PORT OF PORTLAND(LEASED POWELL'S BOOKS INC ATTN: ACCOUNT	7 NW 9TH AVE	PORTLAND	OR	97209
PORT OF PORTLAND(LEASED PROJECT HORIZON INC % INMOTION E	4801 EXECUTIVE PARK CT #100	JACKSONVILLE	FL	32216
PORT OF PORTLAND(LEASED PROLOGIX DISTRBTN SERV(W) LLC ATT	3995 70TH AVE E #B	FIFE	WA	98424
PORT OF PORTLAND(LEASED R C DISPLAY VANS INC % COLLINS,ROB	5420 N LAGOON AVE	PORTLAND	OR	97217-7638
PORT OF PORTLAND(LEASED R.L.K. AND COMPANY DBA TIMBERL	27500 E TIMBERLINE RD	GOVERNMENT CAMP	OR	97028
PORT OF PORTLAND(LEASED RESTAURANTS UNLIMITED INC	411 1ST AVE S #200	SEATTLE	WA	98104
PORT OF PORTLAND(LEASED RHINE AND TANZER % TANZER,JAKE &	700 SE CLAY ST	PORTLAND	OR	97214-3511
PORT OF PORTLAND(LEASED RODDA PAINT COMPANY	6107 N MARINE DR #3	PORTLAND	OR	97203-6409
PORT OF PORTLAND(LEASED RODDA PAINT COMPANY	6107 N MARINE DR #3	PORTLAND	OR	97203-6409
PORT OF PORTLAND(LEASED ROGERS TERMINAL SHIPPING % PRICE,	800 N RIVER ST	PORTLAND	OR	97227-1715
PORT OF PORTLAND(LEASED ROSETTA STONE LTD % LEGAL DEPART	135 WEST MARKET STREET	HARRISONBURG	VA	22801
PORT OF PORTLAND(LEASED SANDOVAL'S FRESH MEXICAN GRILL A	7000 NE AIRPORT WAY #2293	PORTLAND	OR	97218
PORT OF PORTLAND(LEASED SCHEIDT & BACHMANN USA, INC % MA	31 NORTH AVE	BURLINGTON	MA	1803
PORT OF PORTLAND(LEASED SEAPORT AIR	7505 NE AIRPORT WAY	PORTLAND	OR	97218

PORT OF PORTLAND(LEASED SHERATON PORTLAND AIRPORT ATTN: 8235 NE AIRPORT WAY		PORTLAND	OR	97220
PORT OF PORTLAND(LEASED SIEMENS #2010-153 % LEASE ADMINIS 170 WOOD AVENUE SOUTH		ISELIN	NJ	8830
PORT OF PORTLAND(LEASED SKY CHEFS INC ATTN: DIRECTOR CORP(6191 N STATE HWY 161		IRVING	TX	75038
PORT OF PORTLAND(LEASED SKY CHEFS INC ATTN: DIRECTOR CORP(6191 N STATE HWY 161		IRVING	TX	75038
PORT OF PORTLAND(LEASED SKYWEST AIRLINES INC ATTN DWIGGIN 444 S RIVER RD		ST GEORGE	UT	84790-0286
PORT OF PORTLAND(LEASED SKYWEST AIRLINES INC ATTN DWIGGIN 444 S RIVER RD		ST GEORGE	UT	84790-0286
PORT OF PORTLAND(LEASED SKYWEST AIRLINES INC ATTN DWIGGIN 444 S RIVER RD		ST GEORGE	UT	84790-0286
PORT OF PORTLAND(LEASED SMARTE CARTE INC % WORLD HEADQU 4455 WHITE BEAR PKWY		ST PAUL	MN	55110-7641
PORT OF PORTLAND(LEASED SOUTHWEST AIRLINES CO	PO BOX 36611 - HDQ6TX	DALLAS	TX	75235-1611
PORT OF PORTLAND(LEASED SOUTHWEST AIRLINES CO HDQ 6TX	PO BOX 36611	DALLAS	TX	75235
PORT OF PORTLAND(LEASED SPIRIT AIRLINES INC %BARRETT,KATHL 2800 EXECUTIVE WAY		MIRAMAR	FL	33025
PORT OF PORTLAND(LEASED SPORTS	P O BOX 3529	PORTLAND	OR	97208
PORT OF PORTLAND(LEASED SSA INC #2005-001	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED SSA INC #2005-002 % ABALAHIN,JENNI 1131 SW KLICKITAT WAY		SEATTLE	WA	98134
PORT OF PORTLAND(LEASED SSA PACIFIC INC #2005-002 % ABALAH 1131 SW KLICKITAT WAY		SEATTLE	WA	98134
PORT OF PORTLAND(LEASED SSP AMERICA INC	7000 NE AIRPORT WAY #2304	PORTLAND	OR	97218
PORT OF PORTLAND(LEASED SSP AMERICA INC	7000 NE AIRPORT WAY #2304	PORTLAND	OR	97218
PORT OF PORTLAND(LEASED SSP AMERICA INC	7000 NE AIRPORT WAY #2304	PORTLAND	OR	97218
PORT OF PORTLAND(LEASED SSP AMERICA INC DBA KENNY & ZU %L 19465 DEERFIELD AVE STE 105		LANSDOWNE	VA	20176
PORT OF PORTLAND(LEASED STATION HOSPITALITY LLC PATEL,ARVI 1922 NE AIRPORT WAY STE 100		PORTLAND	OR	97220
PORT OF PORTLAND(LEASED STEPHANIE INC (JAMBA/HERO/BASKIN 7000 NE AIRPORT WAY #2315		PORTLAND	OR	97218
PORT OF PORTLAND(LEASED STEPHANIE INC (STEPHANIE INC/COFFI 7000 NE AIRPORT WAY #2315		PORTLAND	OR	97218
PORT OF PORTLAND(LEASED SUBLIVIN LLC	25030 SW PARKWAY AVE STE 300 WILSONVILLE		OR	97070
PORT OF PORTLAND(LEASED SUMMIT HOSPITALITY 085 LLC ATTN G 12600 HILL COUNTRY BLVD #R-10 AUSTIN			TX	78738-6748
PORT OF PORTLAND(LEASED SUMMIT HOSPITALITY V LLC ATTN TAX 12600 HILL COUNTRY BLVD #R-10 AUSTIN			TX	78738
PORT OF PORTLAND(LEASED SUMMIT NW CORPORATION	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED TARGET CORP/PROPERTY DEVEL C/O P PO BOX 9456		MINNEAPOLIS	MN	55440-9456
PORT OF PORTLAND(LEASED TASTE INC DBA VINO VOLO %GOLOGO 360 22ND ST #640		OAKLAND	CA	94612-3026
PORT OF PORTLAND(LEASED TCC/AMB AVIATION PDX LLC %CB RICH 60 STATE ST #1200		BOSTON	MA	2109
PORT OF PORTLAND(LEASED TCC/AMB AVIATION PDX LLC %CB RICH 60 STATE ST #1200		BOSTON	MA	2109
PORT OF PORTLAND(LEASED TCC/AMB AVIATION PDX LLC C/O GEO 3131 S VAUGHN WAY #301		AURORA	CO	80014
PORT OF PORTLAND(LEASED THE BARBERS LLC #2010-023 % LOVELI PO BOX 397		CAMAS	WA	98607
PORT OF PORTLAND(LEASED THE BOEING COMPANY PROPERTY TA) PO BOX 3707 M/C 6A1-01		SEATTLE	WA	98124-2207
PORT OF PORTLAND(LEASED THE BOEING COMPANY PROPERTY TA) PO BOX 3707 M/C 6A1-01		SEATTLE	WA	98124-2207

PORT OF PORTLAND(LEASED THE DRAGONTREE INC % BORTEN,BRI/ 2768 NW THURMAN ST	PORTLAND	OR	97210	
PORT OF PORTLAND(LEASED THE HERTZ CORPORATION ATTN TAX C 225 BRAE BLVD	PARK RIDGE	NJ	07656-1870	
PORT OF PORTLAND(LEASED THE HERTZ CORPORATION ATTN TAX C 225 BRAE BLVD	PARK RIDGE	NJ	07656-1870	
PORT OF PORTLAND(LEASED THE OREGON STATE LOTTERY COMMI 500 AIRPORT RD SE	SALEM	OR	97301-5068	
PORT OF PORTLAND(LEASED THE PAPER STATION> ATTN: LINDA LO 9538 NW FLEISCHNER ST	PORTLAND	OR	97229	
PORT OF PORTLAND(LEASED THE PARADIES SHOPS INC OVERLOOK I 2849 PACES FERRY RD	ATLANTA	GA	30339	
PORT OF PORTLAND(LEASED THE REAL MOTHER GOOSE ATTN: STAI 901 SW YAMHILL ST	PORTLAND	OR	97205	
PORT OF PORTLAND(LEASED TO NUSSMEIER,DONALD K 5651 WINDFIELD LOOP	LAKE OSWEGO	OR	97035-2201	
PORT OF PORTLAND(LEASED TO U S %UGL SERVICES 8350 E CRESCENT PKWY #300	GREENWOOD VLG	CO	80111	
PORT OF PORTLAND(LEASED TO YOS % YOSHIDA REAL ESTATE HLDI 8440 NE ALDERWOOD RD #A	PORTLAND	OR	97220	
PORT OF PORTLAND(LEASED TODD INVESTMENT COMPANY PO BOX 68428	SEATTLE	WA	98168	
PORT OF PORTLAND(LEASED TODD INVESTMENT COMPANY DBA D(PO BOX 68428	SEATTLE	WA	98168-0428	
PORT OF PORTLAND(LEASED TODD INVESTMENT COMPANY DBA D(PO BOX 68428	SEATTLE	WA	98168-0428	
PORT OF PORTLAND(LEASED TODD INVESTMENT COMPANY DBA D(PO BOX 68428	SEATTLE	WA	98168-0428	
PORT OF PORTLAND(LEASED TOYOTA MOTOR SALES USA % FONG,J, 19001 S WESTERN AVE #G301	TORRANCE	CA	90501	
PORT OF PORTLAND(LEASED TOYOTA MOTOR SALES USA % FONG,J, 19001 S WESTERN AVE #G301	TORRANCE	CA	90501	
PORT OF PORTLAND(LEASED TOYOTA MOTOR SALES USA % FONG,J, 19001 S WESTERN AVE #G301	TORRANCE	CA	90501	
PORT OF PORTLAND(LEASED TOYOTA MOTOR SALES USA % FONG,J, 19001 S WESTERN AVE #G301	TORRANCE	CA	90501	
PORT OF PORTLAND(LEASED TOYOTA MOTOR SALES USA INC % FOI 19001 S WESTERN AVE #G301	TORRANCE	CA	90501	
PORT OF PORTLAND(LEASED TRANSP PO BOX 3529	PORTLAND	OR	97208-3529	
PORT OF PORTLAND(LEASED TRAVEL OREGON % WEST,SCOTT 250 CHURCH ST SE STE 100	SALEM	OR	97301-3758	
PORT OF PORTLAND(LEASED TRAVELEX CURRENCY SERVICES INC 122 E 42ND ST #2800	NEW YORK	NY	10168-2897	
PORT OF PORTLAND(LEASED TRAVELEX CURRENCY SERVICES INC 122 E 42ND ST #2800	NEW YORK	NY	10168-2897	
PORT OF PORTLAND(LEASED U S BANK #2014-332 % CORPORATE RI 800 NICOLLET MALL 21ST FLOOR	MINNEAPOLIS	MN	55402	
PORT OF PORTLAND(LEASED U S POSTAL SERVICE WESTERN FACILIT 7500 E 53RD PL RM 1108	DENVER	CO	80266-9918	
PORT OF PORTLAND(LEASED UNITED AIRLINES 233 S WACKER DR 14TH FL HDQC CHICAGO	IL	60606		
PORT OF PORTLAND(LEASED UNITED AIRLINES INC 233 S WACKER DR 14TH FL HDQC CHICAGO	IL	60606		
PORT OF PORTLAND(LEASED UNITED AIRLINES INC 233 S WACKER DR 14TH FL HDQC CHICAGO	IL	60606		
PORT OF PORTLAND(LEASED UNITED AIRLINES INC %VICE PRESIDEN 233 S WACKER DR FLOOR 11	CHICAGO	IL	60606-7147	
PORT OF PORTLAND(LEASED UNITED AIRLINES INC %VP CORP REAL 233 S WACKER DR 11TH FLR	CHICAGO	IL	60606	
PORT OF PORTLAND(LEASED UNITED PARCEL SERVICE INC ATTN: AII 1400 N HURSTBOURNE PKWY	LOUISVILLE	KY	40223	
PORT OF PORTLAND(LEASED UNITED PARCEL SERVICE INC ATTN: AII 1400 N HURSTBOURNE PKWY	LOUISVILLE	KY	40223	
PORT OF PORTLAND(LEASED UNITED PARCEL SERVICE> ATTN: KEVIN 1400 N HURSTBOURNE PKWY	LOUISVILLE	KY	40223	

PORT OF PORTLAND(LEASED US AIRWAYS INC KATHY MARTIN/CH-C	4000 E SKY HARBOR BLVD	PHOENIX	AZ	85034-3988
PORT OF PORTLAND(LEASED US DEPT OF ENERGY-BPA	PO BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED USA/OANG	P O BOX 3529	PORTLAND	OR	97208
PORT OF PORTLAND(LEASED USA/OANG	P O BOX 3529	PORTLAND	OR	97208
PORT OF PORTLAND(LEASED USA/OANG	P O BOX 3529	PORTLAND	OR	97208-3529
PORT OF PORTLAND(LEASED USA/OANG	P O BOX 3529	PORTLAND	OR	97208
PORT OF PORTLAND(LEASED USA/OANG	P O BOX 3529	PORTLAND	OR	97208
PORT OF PORTLAND(LEASED USA/ORE AIR NAT'L GRD	PO BOX 3529	PORTLAND	OR	97208
PORT OF PORTLAND(LEASED USO NORTHWEST % EXECUTIVE DIREC	17801 INTERNATIONAL BLVD	SEATTLE	WA	98158
PORT OF PORTLAND(LEASED VIRGIN AMERICA INC ATTN: TAX DEPA	555 AIRPORT BLVD #500	BURLINGAME	CA	94010
PORT OF PORTLAND(LEASED WDFG NORTH AMERICA LLC % TAX DE	6905 ROCKLEDGE DR	BETHESDA	MD	20817-1828
PORT OF PORTLAND(LEASED WELLS FARGO BANK ATTN ASSET MGM	PO BOX 63931	SAN FRANCISCO	CA	94163
PORT OF PORTLAND(LEASED WILLAMETTE RIVER 1 % BARTON,JUST	40 VARDA LANDING	SAUSALITO	CA	94965
PORT OF PORTLAND(LEASED WILLAMETTE RIVER 1 % BARTON,JUST	40 VARDA LANDING	SAUSALITO	CA	94965
PORT OF PORTLAND(LEASED WILLAMETTE RIVER 1 % BARTON,JUST	40 VARDA LANDING	SAUSALITO	CA	94965
PORT OF PORTLAND(LEASED YOSHIDA FAMILY LTD PARTNERSHIP	8440 NE ALDERWOOD RD #A	PORTLAND	OR	97220-1471
PORT OF PORTLAND(LEASED YOSHIDA FAMILY LTD PTRNSHP	8440 NE ALDERWOOD RD STE A	PORTLAND	OR	97220-1471
PORT OF PORTLAND(LEASED YOSHIDA FAMILY LTD PTRNSHP	8440 NE ALDERWOOD RD STE A	PORTLAND	OR	97220-1471
PORT OF PORTLAND(LSD BUDGET RENT A CAR SYSTEM INC #2011-0	6 SYLVAN WAY	PARSIPPANY	NJ	7054
PORT OF PORTLAND(LSD KINDER MORGAN BULK TERMINALS INC A	PO BOX 4372	HOUSTON	TX	77210-4372
PORT OF PORTLAND(LSD KINDER MORGAN BULK TERMINALS INC A	PO BOX 4372	HOUSTON	TX	77210-4372
PORT OF PORTLAND(LSD KINDER MORGAN BULK TERMINALS INC A	PO BOX 4372	HOUSTON	TX	77210-4372
PORT OF PORTLAND(LSD KINDER MORGAN BULK TERMINALS INC A	PO BOX 4372	HOUSTON	TX	77210-4372
PORT OF PORTLAND(LSD KINDER MORGAN BULK TERMINALS INC A	PO BOX 4372	HOUSTON	TX	77210-4372
PORT OF PORTLAND(LSD PENDLETON WOOLEN MILLS INC/RETAIL R	220 NW BROADWAY	PORTLAND	OR	97209-3509
PORT PROPERTIES LLC	2455 NW MARSHALL ST #4	PORTLAND	OR	97210
PORT PROPERTIES LLC	2455 NW MARSHALL ST #4	PORTLAND	OR	97210
PORTER W YETT COMPANY	5949 NE CULLY BLVD	PORTLAND	OR	97218-3354
PORTER W YETT COMPANY	5949 NE CULLY BLVD	PORTLAND	OR	97218-3354
PORTER W YETT COMPANY	5949 NE CULLY BLVD	PORTLAND	OR	97218-3354
PORTER W YETT COMPANY	5949 NE CULLY BLVD	PORTLAND	OR	97218-3354
PORTION PACKAGING INC % LESTOCHI,ANNETTE	2558 PEARL BUCK RD	BRISTOL	PA	19007
PORTLAND & BROADWAY LLC	1245 E BRICKYARD RD #70	SALT LAKE CITY	UT	84106-2599
PORTLAND & COLUMBIA LLC	1245 E BRICKYARD RD #70	SALT LAKE CITY	UT	84106-2599

PORTLAND & POWELL LLC	1245 BRICKYARD RD #70	SALT LAKE CITY	UT	84106
PORTLAND & YORK LLC	1245 BRICKYARD RD #70	SALT LAKE CITY	UT	84106
PORTLAND 59 LLC % TEMPKIN,DANIEL H	PO BOX 249	MEDINA	WA	98039-0249
PORTLAND BOLT & MFG CO	PO BOX 2866	PORTLAND	OR	97208-2866
PORTLAND BULK TERMINALS LLC % STEWART SOKOL & GRAY	2300 SW 1ST AVE #200	PORTLAND	OR	97201-5047
PORTLAND BULK TERMINALS LLC % STEWART SOKOL & GRAY	2300 SW 1ST AVE #200	PORTLAND	OR	97201-5047
PORTLAND BULK TERMINALS LLC % STEWART SOKOL & GRAY	2300 SW 1ST AVE #200	PORTLAND	OR	97201-5047
PORTLAND BULK TERMINALS LLC % STEWART SOKOL & GRAY	2300 SW 1ST AVE #200	PORTLAND	OR	97201-5047
PORTLAND CEMENT BUILDING LLC	2507 SE SALMON ST	PORTLAND	OR	97214-3947
PORTLAND CITY OF	1120 SW 5TH AVE #1204	PORTLAND	OR	97204-1912
PORTLAND CITY OF	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
PORTLAND CITY OF	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
PORTLAND CITY OF	1120 SW 5TH AVE STE 1102	PORTLAND	OR	97204-1931
PORTLAND CITY OF	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF	1120 SW 5TH AVE #1204	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SERVICE	1120 SW 5TH AVE #1000	PORTLAND	OR	97204
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912

PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912

PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912

PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF ENVIRONMENTAL SERVICES	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF ENVIRONMENTAL SERVICES	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF ENVIRONMENTAL SERVICES	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF ENVIRONMENTAL SERVICES	1120 SW 5TH AVE 10TH FLR	PORTLAND	OR	97204
PORTLAND CITY OF % BUREAU OF ENVIRONMENTAL SERVICES	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF ENVIRONMENTAL SERVICES	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF ENVIRONMENTAL SERVICES	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF ENVIRONMENTAL SERVICES	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF ENVIRONMENTAL SERVICES	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF ENVIRONMENTAL SERVICES	1120 SW 5TH AVE #1204	PORTLAND	OR	97204
PORTLAND CITY OF % BUREAU OF ENVIRONMENTAL SERVICES	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF ENVIRONMENTAL SERVICES	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF ENVIRONMENTAL SERVICES	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF FIRE & RESCUE	55 SW ASH ST	PORTLAND	OR	97204-3509
PORTLAND CITY OF % BUREAU OF FIRE & RESCUE	55 SW ASH ST	PORTLAND	OR	97204-3509
PORTLAND CITY OF % BUREAU OF FIRE & RESCUE	55 SW ASH ST	PORTLAND	OR	97204-3509
PORTLAND CITY OF % BUREAU OF FIRE & RESCUE	55 SW ASH ST	PORTLAND	OR	97204-3509
PORTLAND CITY OF % BUREAU OF FIRE & RESCUE	55 SW ASH ST	PORTLAND	OR	97204-3509
PORTLAND CITY OF % BUREAU OF FIRE & RESCUE	55 SW ASH ST	PORTLAND	OR	97204-3509
PORTLAND CITY OF % BUREAU OF GENERAL SERVICES	1120 SW 5TH AVE #1204	PORTLAND	OR	97204
PORTLAND CITY OF % BUREAU OF MAINTENANCE	2929 N KERBY AVE	PORTLAND	OR	97227
PORTLAND CITY OF % BUREAU OF MAINTENANCE	2929 N KERBY AVE	PORTLAND	OR	97227
PORTLAND CITY OF % BUREAU OF MAINTENANCE	2929 N KERBY AVE	PORTLAND	OR	97227
PORTLAND CITY OF % BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912

PORTLAND CITY OF % BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF TRANSPORTATION	1120 SW 5TH AVE 8TH FL	PORTLAND	OR	97204
PORTLAND CITY OF % BUREAU OF TRANSPORTATION	1120 SW 5TH AVE 8TH FL	PORTLAND	OR	97204
PORTLAND CITY OF % BUREAU OF TRANSPORTATION	1120 SW 5TH AVE 8TH FL	PORTLAND	OR	97204
PORTLAND CITY OF % BUREAU OF TRANSPORTATION	1120 SW 5TH AVE 8TH FL	PORTLAND	OR	97204
PORTLAND CITY OF % BUREAU OF TRANSPORTATION	1120 SW 5TH AVE #800	PORTLAND	OR	97204-1912
PORTLAND CITY OF % BUREAU OF TRANSPORTATION	1120 SW 5TH AVE 8TH FL	PORTLAND	OR	97204
PORTLAND CITY OF % BUREAU OF TRANSPORTATION	1120 SW 5TH AVE 8TH FL	PORTLAND	OR	97204
PORTLAND CITY OF % BUREAU OF TRANSPORTATION / RIGHT OF W	1120 SW 5TH AVE #800	PORTLAND	OR	97204-1912
PORTLAND CITY OF % CITY AUDITOR	1221 SW 4TH AVE #130	PORTLAND	OR	97204-1900
PORTLAND CITY OF % CITY AUDITOR	1221 SW 4TH AVE #130	PORTLAND	OR	97204-1900
PORTLAND CITY OF % CITY AUDITOR	1221 SW 4TH AVE #130	PORTLAND	OR	97204-1900
PORTLAND CITY OF % CITY AUDITOR	1221 SW 4TH AVE #130	PORTLAND	OR	97204-1900
PORTLAND CITY OF % CITY AUDITOR	1221 SW 4TH AVE #130	PORTLAND	OR	97204-1900
PORTLAND CITY OF % CITY AUDITOR	1221 SW 4TH AVE #130	PORTLAND	OR	97204-1900
PORTLAND CITY OF % FACILITIES SERVICES	1120 SW 5TH AVE #1204	PORTLAND	OR	97204
PORTLAND CITY OF % FACILITIES SERVICES	1120 SW 5TH AVE #1204	PORTLAND	OR	97204
PORTLAND CITY OF % OFFICE OF TRANSPORTATION	1120 SW 5TH AVE #800	PORTLAND	OR	97204-1912
PORTLAND CITY OF % PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
PORTLAND CITY OF % PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
PORTLAND CITY OF % PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
PORTLAND CITY OF % PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
PORTLAND CITY OF % PORTLAND PARKS & RECREATION ATTN PROP	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912
PORTLAND CITY OF % PORTLAND WATER BUREAU	1120 SW 5TH AVE #609	PORTLAND	OR	97204-1912
PORTLAND CITY OF % PORTLAND WATER BUREAU	1120 SW 5TH AVE #609	PORTLAND	OR	97204-1912
PORTLAND CITY OF % PORTLAND WATER BUREAU	1120 SW 5TH AVE #609	PORTLAND	OR	97204-1912
PORTLAND CITY OF % PORTLAND WATER BUREAU	1120 SW 5TH AVE #609	PORTLAND	OR	97204-1912
PORTLAND CITY OF % PORTLAND WATER BUREAU	1120 SW 5TH AVE #609	PORTLAND	OR	97204-1912
PORTLAND CITY OF % PORTLAND WATER BUREAU	1120 SW 5TH AVE #609	PORTLAND	OR	97204-1912
PORTLAND CITY OF % PORTLAND WATER BUREAU	1120 SW 5TH AVE #609	PORTLAND	OR	97204-1912
PORTLAND CITY OF % PORTLAND WATER BUREAU	1120 SW 5TH AVE #609	PORTLAND	OR	97204-1912

PORTLAND CITY OF % PORTLAND WATER BUREAU	1120 SW 5TH AVE #609	PORTLAND	OR	97204-1912

PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE, 8TH FLOOR	PORTLAND	OR	97204		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT OF WAY ACQUISITION	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204-1912		
PORTLAND CITY OF % RIGHT-OF-WAY ACQUISITION	1120 SW 5TH AVE 8TH FL	PORTLAND	OR	97204		
PORTLAND CITY OF % RIGHT-OF-WAY ACQUISITION	1120 SW 5TH AVE 8TH FL	PORTLAND	OR	97204		
PORTLAND CITY OF % RIGHT-OF-WAY ACQUISITION	1120 SW 5TH AVE 8TH FL	PORTLAND	OR	97204		
PORTLAND CITY OF % WATER BUREAU RIGHT-OF-WAY ACQUISITION	1120 SW 5TH AVE #600	PORTLAND	OR	97204		
PORTLAND CITY OF %BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204		
PORTLAND CITY OF %BES FACILITIES/ADMIN SVCS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204		
PORTLAND CITY OF (LEASED FERGUSON ENTERPRISES INC	1120 SW 5TH AVE #1204	PORTLAND	OR	97204		
PORTLAND CITY OF BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912		
PORTLAND CITY OF BUREAU OF PARKS & RECREATION ATTN PROPE	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912		

PORTLAND CITY OF BY OFFICE OF MGMT & FINANCE BUREAU OF IN	1120 SW 5TH AVE #1204	PORTLAND	OR	97204	
PORTLAND CITY OF ENVIRONMENTAL SERVICES	1120 SW 5TH AVE #1000	PORTLAND	OR	97204	
PORTLAND CITY OF ET AL % PORTLAND PARKS & RECREATION ATTN	1120 SW 5TH AVE #1302	PORTLAND	OR	97204	
PORTLAND CITY OF PORTLAND WATER BUREAU ENGINEERING/SUR	1120 SW 5TH AVE #600	PORTLAND	OR	97204-1926	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	
PORTLAND CITY OF(BUREAU OF PARKS & RECREATION	1120 SW 5TH AVE #1302	PORTLAND	OR	97204-1912	

PORTLAND CITY OF(LEASED % EWING IRRIGATION PRODUCTS IN AT	3441 E HARBOUR DR	PHOENIX	AZ	85034
PORTLAND CITY OF(LEASED % TP PRODUCE INC ATTN: LONG TRAN	410 SE DIVISION PL	PORTLAND	OR	97202
PORTLAND CITY OF(LEASED 5 EAST SIDE STORIES LLC	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204
PORTLAND CITY OF(LEASED 829 NORTH RUSSELL LLC	1120 SW 5TH AVE #1000	PORTLAND	OR	97204
PORTLAND CITY OF(LEASED APPLE FOODS INC	444 SE CARUTHERS ST	PORTLAND	OR	97214
PORTLAND CITY OF(LEASED CALBAG METALS CO % BUREAU OF GEN	1120 SW 5TH AVE #1204	PORTLAND	OR	97204-1972
PORTLAND CITY OF(LEASED COLUMBIA STEEL CASTING % PROPERT	1120 SW 5TH AVE #1204	PORTLAND	OR	97204
PORTLAND CITY OF(LEASED CULVER GLASS % BUREAU OF GENERAL	1120 SW 5TH AVE #1204	PORTLAND	OR	97204-1932
PORTLAND CITY OF(LEASED EASTBANK COMMERCE CENTER LLC % E	75 SE YAMHILL ST #201	PORTLAND	OR	97214
PORTLAND CITY OF(LEASED MULTIPLE TENANTS	1120 SW 5TH AVE #1000	PORTLAND	OR	97204-1972
PORTLAND CITY OF(LEASED MULTIPLE TENANTS % BUREAU OF GEN	1120 SW 5TH AVE #1204	PORTLAND	OR	97204-1932
PORTLAND CITY OF(LEASED MYERS CONTAINER LLC ATTN CHRISTIA	8435 NE KILLINGSWORTH ST	PORTLAND	OR	97220
PORTLAND CITY OF(LEASED NINE BALL ENTERPRISES % RIGHT OF	W. 1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204
PORTLAND CITY OF(LEASED OREGON RAIL HERITAGE FOUNDATIO %	1120 SW 5TH AVE #800	PORTLAND	OR	97204
PORTLAND CITY OF(LEASED OREGON RAIL HERITAGE FOUNDATIO %	1120 SW 5TH AVE #800	PORTLAND	OR	97204
PORTLAND CITY OF(LEASED TITAN UTILITIES LLC % RIGHT OF WAY A	1120 SW 5TH AVE 8TH FLR	PORTLAND	OR	97204
PORTLAND CITY OF(LEASED WENDLAND PROPERTIES LLC	15495 VILLAGE DR	LAKE OSWEGO	OR	97034-3749
PORTLAND CITY OF(PERMIT TO STAR METAL FABRICATORS INC % P(	1120 SW 5TH AVE #609	PORTLAND	OR	97204
PORTLAND CITY OF(PORTLAND BUREAU OF TRANSPORTATION	1120 SW 5TH AVE #800	PORTLAND	OR	97204-1912
PORTLAND CITY OF(PORTLAND BUREAU OF TRANSPORTATION	1120 SW 5TH AVE #800	PORTLAND	OR	97204-1912
PORTLAND CITY OF(TRANS % R/W ACQUISITION	1120 SW 5TH AVE #800	PORTLAND	OR	97204
PORTLAND COMMUNITY COLLEGE %PROCUREMENT & RISK SERVICI	PO BOX 19000	PORTLAND	OR	97280-0990
PORTLAND COMMUNITY COLLEGE ATTN VICE PRESIDENT ADMIN SE	PO BOX 19000	PORTLAND	OR	97280-0990
PORTLAND DISTRIBUTING CO % AR BENAROYA	127 3RD AVE #602	KIRKLAND	WA	98033-6177
PORTLAND DISTRIBUTING CO % AR BENAROYA	127 3RD AVE #602	KIRKLAND	WA	98033-6177
PORTLAND DISTRIBUTING CO % AR BENAROYA	127 3RD AVE #602	KIRKLAND	WA	98033-6177
PORTLAND DISTRIBUTING CO % AR BENAROYA	127 3RD AVE #602	KIRKLAND	WA	98033-6177
PORTLAND DISTRIBUTING CO % AR BENAROYA	127 3RD AVE #602	KIRKLAND	WA	98033-6177
PORTLAND FREIGHTLINER	P O BOX 17218	PORTLAND	OR	97217
PORTLAND FRENCH LTD % PORTLAND FRENCH BAKERY	6840 N MARINE DR	PORTLAND	OR	97203
PORTLAND FRENCH LTD % PORTLAND FRENCH BAKERY	6840 N MARINE DR	PORTLAND	OR	97203
PORTLAND GENERAL ELECTRIC ATTN MISKA,EDWARD P	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC ATTN MISKA,EDWARD P	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC CO	121 SW SALMON ST 3WTCPL	PORTLAND	OR	97204

PORTLAND GENERAL ELECTRIC CO % PROPERTY DEPT	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC CO 1WTC0510-CORPORATE TAX DEP	121 SW SALMON ST	PORTLAND	OR	97204
PORTLAND GENERAL ELECTRIC CO ATTN LAND DEPT	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC CO ATTN MARTIN,PRESTON	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC CO ATTN MISKA,EDWARD P	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR	97204-2901

PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR 97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR 97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR 97204-2901
PORTLAND GENERAL ELECTRIC COMPANY 1WTCO501-CORPORATE	121 SW SALMON ST	PORTLAND	OR 97204-2901
PORTLAND HABILITATION CENTER INC	5312 NE 148TH AVE	PORTLAND	OR 97230-3438
PORTLAND HIGHWAY LLC	9655 SE 250TH AVE	DAMASCUS	OR 97089-6561
PORTLAND HOSPITAL SERVICE CORP	18440 NE PORTAL WAY	PORTLAND	OR 97230-5076
PORTLAND HOSPITALITY INVESTMENTS LLC	4801 N INTERSTATE AVE	PORTLAND	OR 97217-3623
PORTLAND LODGE NO 142 B P O	PO BOX 22242	MILWAUKIE	OR 97269
PORTLAND LODGE NO 142 BPOE	PO BOX 22242	MILWAUKIE	OR 97269
PORTLAND MINI STORAGE LLC ATTN: ED KAWASAKI NW SELF STOR	14855 SE 82ND DR	CLACKAMAS	OR 97015
PORTLAND OPERA ASSOCIATION INC	211 SE CARUTHERS ST	PORTLAND	OR 97214
PORTLAND OPERA ASSOCIATION INC	211 SE CARUTHERS ST	PORTLAND	OR 97214
PORTLAND PRECISION MFG CO	16327 NE CAMERON BLVD	PORTLAND	OR 97230
PORTLAND RIFLE CLUB INC	6130 NE HASSALO ST	PORTLAND	OR 97213-4346
PORTLAND TERMINAL R R CO &> BU	800 NW 6TH AVE	PORTLAND	OR 97209
PORTLAND TERMINAL R R CO &> BU	800 NW 6TH AVE	PORTLAND	OR 97209
PORTLAND TERMINAL R R CO &> BU	800 NW 6TH AVE	PORTLAND	OR 97209
PORTLAND TERMINAL R R CO &> BU	800 NW 6TH AVE	PORTLAND	OR 97209
PORTLAND TERMINAL R R CO &> BU	800 NW 6TH AVE STE 211	PORTLAND	OR 97209-3783
PORTLAND TERMINAL RAILROAD CO	800 NW 6TH AVE RM 211	PORTLAND	OR 97209
PORTLAND TERMINAL RAILROAD COM	800 NW 6TH AVE	PORTLAND	OR 97209
PORTLAND TERMINAL RAILROAD COM	800 NW 6TH AVE	PORTLAND	OR 97209
PORTLAND TERMINAL RAILROAD COM	800 NW 6TH AVE	PORTLAND	OR 97209
PORTLAND TERMINAL RAILROAD COM	800 NW 6TH AVE	PORTLAND	OR 97209
PORTLAND TERMINAL RAILROAD COM	800 NW 6TH AVE	PORTLAND	OR 97209
PORTLAND TERMINAL RAILROAD COM	800 NW 6TH AVE	PORTLAND	OR 97209
PORTLAND TERMINAL RAILROAD COM	800 NW 6TH AVE	PORTLAND	OR 97209
PORTLAND TERMINAL RAILROAD COM	800 NW 6TH AVE	PORTLAND	OR 97209
PORTLAND TERMINAL RAILROAD COM	800 NW 6TH AVE	PORTLAND	OR 97209
PORTLAND TERMINAL RAILROAD COM	800 NW 6TH AVE	PORTLAND	OR 97209

PORTLAND TERMINAL RAILROAD COM	800 NW 6TH AVE	PORTLAND	OR	97209
PORTLAND TERMINAL RAILROAD COM	800 NW 6TH AVE	PORTLAND	OR	97209
PORTLAND TERMINAL RAILROAD COM	800 NW 6TH AVE RM 211	PORTLAND	OR	97209
PORTLAND TERMINAL RAILROAD COM	800 NW 6TH AVE RM 211	PORTLAND	OR	97209
PORTLAND TERMINAL RR CO-3/4 & BURLINGTON NORTHERN RR CC 3500 NW YEON AVE		PORTLAND	OR	97210
PORTLAND TERMINAL RR CO-3/4 & BURLINGTON NORTHERN RR CC 3500 NW YEON AVE		PORTLAND	OR	97210
PORTLAND TERMINALS LLC % CROWN ENTERPRISES INC	PO BOX 869	WARREN	MI	48090
PORTLAND TRAILER & EQUIPMENT	P O BOX 17133	PORTLAND	OR	97217
PORTLAND TUBE FACILITY LLC %EVRAZ INC NA	200 E RANDOLPH STE 7800	CHICAGO	IL	60601
PORTLAND TUBE FACILITY LLC %EVRAZ INC NA	200 E RANDOLPH STE 7800	CHICAGO	IL	60601
PORTLAND/BASIN STREET % ROBERT DRAIN/POULSEN GROUP	3835 E THOUSAND OAKS BLVD #R	THOUSAND OAKS	CA	91362-6622
PORTOFINO HOLDINGS LLC % UNITED TILE	3145 NW YEON AVE	PORTLAND	OR	97210
POST,E BARRY	421 NE 12TH AVE	PORTLAND	OR	97232
POST,E BARRY	421 NE 12TH AVE	PORTLAND	OR	97232
POTTS,RICHARD T & JUDY M	3244 NE HOLLAND CT	PORTLAND	OR	97211
POWELL DISTRIBUTING CO	PO BOX 17160	PORTLAND	OR	97217-0160
POWELL DISTRIBUTING CO INC	PO BOX 17160	PORTLAND	OR	97217-0160
POWELL DISTRIBUTING CO INC	PO BOX 17160	PORTLAND	OR	97217-0160
POWELL FAMILY REAL ESTATE COMPANY LLC % POWELL,MICHAEL N	7 NW 9TH AVE	PORTLAND	OR	97209-3301
POWELL,CLAUDIA J ET AL % DAN M WYATT	5000 NE COLUMBIA BLVD	PORTLAND	OR	97218
POWELL,CLAUDIA J ET AL % DAN M WYATT	5000 NE COLUMBIA BLVD	PORTLAND	OR	97218
POWELL,CLAUDIA J ET AL % DAN M WYATT	5000 NE COLUMBIA BLVD	PORTLAND	OR	97218
POWELL,CLAUDIA J ET AL % DAN M WYATT	5000 NE COLUMBIA BLVD	PORTLAND	OR	97218
POWELL,CLAUDIA J ET AL % DAN M WYATT	5000 NE COLUMBIA BLVD	PORTLAND	OR	97218
POWELL,LEE G TO POWELL DISTRIBUTING CO INC	PO BOX 17160	PORTLAND	OR	97217-0160
POWELL,ROBERT C & POWELL,JUDITH M	2813 SE 16TH AVE	PORTLAND	OR	97202
POWIN CENTER LLC % LU,JOSEPH	PO BOX 483	TUALATIN	OR	97062
POYNTER,DAVID K ET AL	5005 NE FREMONT ST	PORTLAND	OR	97213
PPB LLC	PO BOX 20638	PORTLAND	OR	97294
PPB LLC	PO BOX 20638	PORTLAND	OR	97294
PPI DEVELOPMENT GROUP LLC ATTN HOWE,TIGUE	6015 NE 80TH AVE	PORTLAND	OR	97218
PRAIRIE,HELEN S & SHANNON,JEAN C % HARLOW,BEN	4950 SE 174TH AVE	PORTLAND	OR	97236-1602
PRATT,MICHAEL & LARSON,RETA	1201 SE 3RD AVE	PORTLAND	OR	97214-3337

PRAZEAU,ROBERT TR (ROBERT PRAZEAU LIVING TRUST)	55 SE 71ST AVE	PORTLAND	OR	97215-1407
PRECISION CASTPARTS CORP	4600 SE HARNEY DR	PORTLAND	OR	97206-0825
PRECISION CASTPARTS CORP	4600 SE HARNEY DR	PORTLAND	OR	97206-0825
PRECISION CASTPARTS CORP		PORTLAND	OR	
PRECISION CASTPARTS CORP	4600 SE HARNEY DR	PORTLAND	OR	97206-0825
PRECISION CASTPARTS CORP ATTN: TAX DEPT	4650 SW MACADAM AVE STE 300	PORTLAND	OR	97239
PRECISION CASTPARTS CORP ATTN: TAX DEPT	4650 SW MACADAM AVE STE 300	PORTLAND	OR	97239
PRECISION EQUIPMENT INC	8440 N KERBY AVE	PORTLAND	OR	97217
PREMIER GEAR & MACHINE WORKS I	1700 NW THURMAN ST	PORTLAND	OR	97209-2521
PREMIER GEAR & MACHINE WORKS I	1700 NW THURMAN ST	PORTLAND	OR	97209-2521
PREMIER GEAR & MACHINE WORKS I	1700 NW THURMAN ST	PORTLAND	OR	97209-2521
PREMIER MFG CO INC	19500 SW TETON AVE	TUALATIN	OR	97062-8825
PREMIER PROPERTIES NW LLC ATTN: SCHLECHTER,JERRY M	PO BOX 10004	PORTLAND	OR	97296
PREMIER PROPERTIES NW LLC ATTN: SCHLECHTER,JERRY M	PO BOX 10004	PORTLAND	OR	97296
PREMO,ROLAND R	25 NW 23RD PL #6 PMB 254	PORTLAND	OR	97210
PRENTICE & PREVOST PROPERTIES LLC	5731 NE CHURCH ST	PORTLAND	OR	97218-2455
PRENTICE & PREVOST PROPERTIES LLC % PREVOST,DAVID	5731 NE CHURCH ST	PORTLAND	OR	97218
PRESCOTT PARTNERS LLC	501 NE 224TH CIR	RIDGEFIELD	WA	98642
PRESCOTT PARTNERS LLC	501 NE 224TH CIR	RIDGEFIELD	WA	98642
PRESSWOOD,GREGORY D	10550 N MIDWAY AVE	PORTLAND	OR	97203-6124
PRESTON,BARBARA J	PO BOX 218	FAIRVIEW	OR	97024
PRESTON,BARBARA J	PO BOX 218	FAIRVIEW	OR	97024
PRESTON,BARBARA J	PO BOX 218	FAIRVIEW	OR	97024
PRESTON,THOMAS R & PRESTON,BRIDGETTE J	PO BOX 2255	PALMER	AK	99645
PRIGODIN,ALEKSANDR & PRIGODIN,YELENA	4917 NE CRYSTAL LN	PORTLAND	OR	97218
PROCESS EQUIPMENT INC TO CONGER NORTHWEST INC	P O BOX 12570	PORTLAND	OR	97212-0570
PROCESS EQUIPMENT INC TO KELLOGG,C W	1303 N RIVER ST	PORTLAND	OR	97227-1724
PROCESS EQUIPMENT INC TO KELLOGG,C W	1303 N RIVER ST	PORTLAND	OR	97227-1724
PROCESS EQUIPMENT INC TO KELLOGG,C W	1303 N RIVER ST	PORTLAND	OR	97227-1724
PROCESS EQUIPMENT INC TO KELLOGG,C W	1303 N RIVER ST	PORTLAND	OR	97227-1724
PROCK,STEVE A & KITTIE M	3051 NE COLUMBIA BLVD	PORTLAND	OR	97211
PROCK,STEVEN A TR & PROCK,KITTIE M TR	3051 NE COLUMBIA BLVD	PORTLAND	OR	97211
PROCK,STEVEN A TR & PROCK,KITTIE M TR	3051 NE COLUMBIA BLVD	PORTLAND	OR	97211
PRODUCE ROW LLC	4100 SW ARTHUR WAY	PORTLAND	OR	97221-3202

PROFFUTT LIMITED PARTNERSHIP	PO BOX 7160	FARGO	ND	58106-7160
PROFFUTT LIMITED PARTNERSHIP	PO BOX 7160	FARGO	ND	58106-7160
PROGRESSIVE CASUALTY INSURANCE COMPANY	PO BOX 89429 OHL23	CLEVELAND	OH	44101
PROJECT PM LLC	515 NW 13TH AVE	PORTLAND	OR	97209
PROKHOROVA,VLADIMIR & PROKHOROVA,OKSANA	7101 NE 33RD DR	PORTLAND	OR	97211
PROLOGIS FIRST US PROPERTIES LP %PROLOGIS TAX COORDINATOR	4545 AIRPORT WAY	DENVER	CO	80239
PROLOGIS THIRD U S PROPERTIES LP %PROLOGIS TAX COORDINATC	4545 AIRPORT WAY	DENVER	CO	80239
PROLOGIS THIRD U S PROPERTIES LP %PROLOGIS TAX COORDINATC	60 STATE ST STE 1200	DENVER	CO	2109
PROLOGIS TLF (PORTLAND) LLC % COLLIERS INTERNATIONAL	851 SW 6TH AVE #1200	PORTLAND	OR	97204
PROLOGIS TLF (PORTLAND) LLC % COLLIERS INTERNATIONAL	851 SW 6TH AVE #1200	PORTLAND	OR	97204
PROLOGIS TLF LLC % COLLIERS INTERNATIONAL	851 SW 6TH AVE #1200	PORTLAND	OR	97204
PROLOGIS-A4 CA I LP % PROLOGIS INC ATTN TAX DEPARTMENT	4545 AIRPORT WAY	DENVER	CO	80239-5716
PROLOGIS-EXCHANGE NORTHWEST CORPORATE PARK LLC % PROLC	60 STATE ST #1200	BOSTON	MA	02109-1884
PROLOGIS-EXCHANGE NORTHWEST CORPORATE PARK LLC % PROLC	60 STATE ST #1200	BOSTON	MA	02109-1884
PROLOGIS-EXCHANGE NORTHWEST CORPORATE PARK LLC % PROLC	60 STATE ST #1200	BOSTON	MA	02109-1884
PROPERTIES NW LLC	4124 NE LADDINGTON CT	PORTLAND	OR	97232
PROPERTY 67 LLC	13035 N RIVERGATE BLVD	PORTLAND	OR	97203
PROPERTY OWNER				
PROVIDENCE HEALTH & SERVICES-OREGON ATTN PROPERTY MANA	4400 NE HALSEY ST BLDG 2 #190	PORTLAND	OR	97213-1545
PROVIDENCE HEALTH & SERVICES-OREGON ATTN PROPERTY MANA	4400 NE HALSEY ST BLDG 2 #190	PORTLAND	OR	97213-1545
PRUITT,RUTH & MOSHBERGER,HENRY	159 SW FLORENCE AVE #D19	GRESHAM	OR	97080-7100
PRUITT,RUTH & MOSHBERGER,HENRY	159 SW FLORENCE AVE #D19	GRESHAM	OR	97080-7100
PRUITT,RUTH L & MOSHBERGER,HENRY A	159 SW FLORENCE AVE #D19	GRESHAM	OR	97080-7100
PRUITT,RUTH L & MOSHBERGER,HENRY A	159 SW FLORENCE AVE #D19	GRESHAM	OR	97080-7100
PRUITT,RUTH L & MOSHBERGER,HENRY A	159 SW FLORENCE AVE #D19	GRESHAM	OR	97080-7100
PUBLIC STORAGE PROPERTIES VII % DEPT PT OR 20701	P O BOX 25025	GLENDALE	CA	91201-5025
PUBLIC STORAGE PROPERTIES VII % DEPT PT-OR-20708	P O BOX 25025	GLENDALE	CA	91201-5025
PUBLIC STORAGE PROPERTIES VII INC % DEPT PT-OR-20722	P O BOX 25025	GLENDALE	CA	91201-5025
PUCKETT,JAMES E TR & PUCKETT,AGNES K TR	2635 NW ST HELENS RD	PORTLAND	OR	97210
PUGH,NORMAN R /82ND AVE TRAILER PARK	8225 SE CLATSOP ST, OFFICE	PORTLAND	OR	97266
PURINA ANIMAL NUTRITION LLC % LAND O'LAKES INC	PO BOX 64101 MS4015	ST PAUL	MN	55164-0101
PURINA ANIMAL NUTRITION LLC % LAND O'LAKES INC	PO BOX 64101 MS4015	ST PAUL	MN	55164-0101
PURINA ANIMAL NUTRITION LLC % LAND O'LAKES INC	PO BOX 64101 MS4015	ST PAUL	MN	55164-0101
PURINA ANIMAL NUTRITION LLC % LAND O'LAKES INC	PO BOX 64101 MS4015	ST PAUL	MN	55164-0101

PYCO LLC	5949 NE CULLY BLVD	PORTLAND	OR	97218-3354
PYRITZ,ROBERT L & JANET V	12067 SE 115TH AVE	HAPPY VALLEY	OR	97086
PYRITZ,ROBERT L & JANET V	12067 SE 115TH AVE	HAPPY VALLEY	OR	97086
PYRITZ,ROBERT L & JANET V	12067 SE 115TH AVE	HAPPY VALLEY	OR	97086
QUAD/GRAPHICS MARKETING LLC ATTN: TAX DEPARTMENT	N61 W23044 HARRY'S WAY	SUSSEX	WI	53089
QUAD/GRAPHICS MARKETING LLC ATTN: TAX DEPARTMENT	N61 W23044 HARRY'S WAY	SUSSEX	WI	53089
QUADE,WALTER H III & TATE,MARCIA E	6110 NE 53RD PL	PORTLAND	OR	97218-2379
QUINN,ELLIOTT N-1/2 & QUINN,ROBERT D TR-1/2	2105 PEREGRINE CT	WEST LINN	OR	97068-2825
QUINN,ELLIOTT N-1/2 & QUINN,ROBERT D TR-1/2	2105 PEREGRINE CT	WEST LINN	OR	97068-2825
QUINN,ELLIOTT N-1/2 & QUINN,ROBERT D-1/2	2105 PEREGRINE CT	WEST LINN	OR	97068
QUINN,ELLIOTT N-1/2 & QUINN,ROBERT-1/2	2105 PEREGRINE CT	WEST LINN	OR	97068-2825
QUINN,ELLIOTT N-1/2 & QUINN,ROBERT-1/2	2105 PEREGRINE CT	WEST LINN	OR	97068-2825
QUINN,ELLIOTT N-1/2 & QUINN,ROBERT-1/2	2105 PEREGRINE CT	WEST LINN	OR	97068-2825
QUIXOTE LLC %JOHN R WALSH	9530 SW WASHINGTON ST	PORTLAND	OR	97225
QUIXOTE LLC %JOHN R WALSH	9530 SW WASHINGTON ST	PORTLAND	OR	97225
R & J BERRY PROPERTIES LLC	7605 NE 21ST AVE	PORTLAND	OR	97211
R & J METAL FABRICATORS INC	PO BOX 17245	PORTLAND	OR	97217
R & J REAL ESTATE VENTURE LLC % MCCOY,ROBERT S	9622 NE VANCOUVER WAY	PORTLAND	OR	97211-1224
R & R LEASING L L C	P O BOX 301547	PORTLAND	OR	97294-9547
R & R LEASING L L C	P O BOX 301547	PORTLAND	OR	97294-9547
R & R LEASING L L C	P O BOX 301547	PORTLAND	OR	97294-9547
R & T FACTORS INC	6730 NE 42ND AVE	PORTLAND	OR	97218
R B PAMPLIN CORP	PO BOX 82249	PORTLAND	OR	97282
R B PAMPLIN CORP % ROSS ISLAND SAND & GRAVEL CO	PO BOX 82249	PORTLAND	OR	97282
R C GREENOUGH LLC & LYNN GREENOUGH LLC	7827 SW RUBY TER	PORTLAND	OR	97219-4643
R HARE COLUMBIA LLC & V HARE COLUMBIA LLC	6107 SW MURRAY BLVD UNIT #47	BEAVERTON	OR	97008-4421
R J GORDON INVESTMENTS LLC % IPD CO	PO BOX 20339	PORTLAND	OR	97294
R L R INVESTMENTS LLC ATTN CORPORATE LEGAL	PO BOX 8000	WILMINGTON	OH	45177-8000
R L R INVESTMENTS LLC ATTN CORPORATE LEGAL	PO BOX 8000	WILMINGTON	OH	45177-8000
R&J REAL ESTATE VENTURE LLC ATTN: MCCOY,ROBERT S	9622 NE VANCOUVER WAY	PORTLAND	OR	97211
RA PROPERTIES LLC % AUGUSTON,ROBERT S JR	18028 SKYLAND CIR	LAKE OSWEGO	OR	97034-6452
RAAB FAMILY LLC % RAAB,PAUL	2235 NE 152ND AVE	PORTLAND	OR	97230-5251
RADKE PROPERTIES LLC % RADKE,MERLIN	6285 N FESSENDEN ST	PORTLAND	OR	97203-1810
RADKE PROPERTIES LLC % RADKE,MERLIN	6285 N FESSENDEN ST	PORTLAND	OR	97203-1810

RADKE PROPERTIES LLC % RADKE,MERLIN	6285 N FESSENDEN ST	PORTLAND	OR	97203-1810
RADKE PROPERTIES LLC % RADKE,MERLIN	6285 N FESSENDEN ST	PORTLAND	OR	97203-1810
RAETHKE,SIG B TR & RAETHKE,LINDA J TR	2697 WOODSPRITE CT	WEST LINN	OR	97068-3149
RAETZ,GEOFFREY M	11541 SE 33RD AVE	MILWAUKIE	OR	97222-6727
RAFFAELL PACIFIC II LLC % WASTE MANAGEMENT	PO BOX 1450	CHICAGO	IL	60690-1450
RAFFAELL PACIFIC II LLC % WASTE MANAGEMENT	PO BOX 1450	CHICAGO	IL	60690-1450
RAFFAELL PACIFIC II LLC % WASTE MANAGEMENT	PO BOX 1450	CHICAGO	IL	60690-1450
RAFFAELL PACIFIC L L C %WASTE MANAGEMENT	PO BOX 1450	CHICAGO	IL	60690-1450
RAGLIONE,WILLIAM	5714 NW 57TH AVE	PORTLAND	OR	97210
RAGTIME INVESTMENTS LLC	7223 SW ASCOT CT	PORTLAND	OR	97225-6040
RAIMORE CONSTRUCTION LLC	2522 NE M L KING BLVD	PORTLAND	OR	97212-3732
RAIMORE CONSTRUCTION LLC ATTN: JEFFREY MORELAND, MEMBEI	2522 NE M L KING JR BLVD	PORTLAND	OR	97212
RAINBOW BRIDGE PROPERTIES LLC C/O HENDRICKS FAMILY TRUST	PO BOX 30868	PORTLAND	OR	97294
RAINIER GROUP 1 L L C ATTN HANSET,JAMES	PO BOX 11349	PORTLAND	OR	97211-0349
RAIZES,STEVEN S	9652 CAMASSIA WAY	SAN RAMON	CA	94582-5262
RAMES,JEFFREY M & RAMES,BONNIE J	2834 SE 15TH AVE #2	PORTLAND	OR	97202
RAMIREZ MORA,CESAR	9000 NE M L KING BLVD #95	PORTLAND	OR	97211
RAMIREZ,SHERRIE L & RAMIREZ,ANTHONY J	2115 NW VAUGHN ST	PORTLAND	OR	97210-2307
RAMSAY SIGNS	9160 SE 74TH AVE	PORTLAND	OR	97206
RAMSEY PROPERTIES LIMITED PARTNERSHIP % RAMSEY,TAYLOR	PO BOX 7914	BEND	OR	97708-7914
RAMSEY PROPERTIES LIMITED PARTNERSHIP % RAMSEY,TAYLOR	PO BOX 7914	BEND	OR	97708-7914
RAMSEY PROPERTIES LIMITED PARTNERSHIP % RAMSEY,TAYLOR	PO BOX 7914	BEND	OR	97708-7914
RAMSEY,TAYLOR T & F INVESTMENTS %STEPHEN T RAMSEY	12207 NE 99TH AVE	VANCOUVER	WA	98662
RAMSEY,TAYLOR T & F INVESTMENTS %STEPHEN T RAMSEY	12207 NE 99TH AVE	VANCOUVER	WA	98662
RAMSEY,TAYLOR T & F INVESTMENTS %STEPHEN T RAMSEY	12207 NE 99TH AVE	VANCOUVER	WA	98662
RANDALL,ROBERT JR	8305 SE MONTEREY AVE #230	HAPPY VALLEY	OR	97086-7764
RANDALL,ROBERT JR	8305 SE MONTEREY AVE #230	HAPPY VALLEY	OR	97086-7764
RANDALL,ROBERT JR	8305 SE MONTEREY AVE #230	HAPPY VALLEY	OR	97086-7764
RASULPURI,KHALID	3434 SE 21ST AVE	PORTLAND	OR	97202-2907
RASULPURI,KHALID L % METRIC PLASTICS INC	3434 SE 21ST AVE	PORTLAND	OR	97202-2907
RAWLINGS,LINDA TR	PO BOX 14668	PORTLAND	OR	97293
RAYMOND ST BLDG LLC % SERVICE MASTER	4610 SE 26TH AVE	PORTLAND	OR	97202-4743
RAZ,ROBIN ANN	9000 NE M L KING BLVD SP 158	PORTLAND	OR	97211

RBVH PORTLAND ALDERWOOD LLC % ROCKBRIDGE CAPITAL LLC AT	4100 REGENT ST #G	COLUMBUS	OH	43219
RBVH PORTLAND GLENN WIDING LLC % ROCKBRIDGE CAPITAL LLC A	4100 REGENT ST #G	COLUMBUS	OH	43219
RCM NOCAL LLC ATTN: MACAULAY,ROB	7410 N MERCER WAY	MERCER ISLAND	WA	98040
RCM NOCAL LLC ATTN: MACAULAY,ROB	7410 N MERCER WAY	MERCER ISLAND	WA	98040
REA,DUANE J & SHIRLEY	8970 SE TELFORD RD	BORING	OR	97009
REA,KEITH A	PO BOX 90545	PORTLAND	OR	97290
REACH COMMUNITY DEVELOPMENT INC>	4150 SW MOODY AVE	PORTLAND	OR	97239-4417
REACH ROSE LLC ATTN: BIELER,BRIAN	4150 SW MOODY AVE	PORTLAND	OR	97239-4417
REACH SCATTERED SITES II LLC ATTN: BIELER,BRIAN	4150 SW MOODY AVE	PORTLAND	OR	97239-4417
REALTY INCOME PROPERTIES 25 LL %REALTY INCOME CORP	11995 EL CAMINO REAL	SAN DIEGO	CA	92130
REARDEN,DONALD S TR & REARDEN,LILLIAN D TR	15727 NE RUSSELL ST APT 117	PORTLAND	OR	97230-8297
RECOLOGY OREGON INC	9345 N HARBORGATE ST	PORTLAND	OR	97203-6314
RECOLOGY PORTLAND INC	50 CALIFORNIA ST 24TH FLR	SAN FRANCISCO	CA	94111-4796
REDEMPTION RESEARCH ASSOCIATES	3439 NE SANDY BLVD #670	PORTLAND	OR	97232
REDMAN,VIRGINIA C	7902 SE 92ND AVE	PORTLAND	OR	97266
REECE,GORDON H JR TR	4306 SE MARTINS ST	PORTLAND	OR	97206-7070
REECE,GORDON H JR TR	4306 SE MARTINS ST	PORTLAND	OR	97206-7070
REED,JAMIE L	3525 NE 50TH AVE #208	PORTLAND	OR	97213
REED,RICK	5237 N EMERSON DR	PORTLAND	OR	97217-4111
REEDBERG HOLDING LLC	PO BOX 12564	PORTLAND	OR	97212-0564
REEDBERG HOLDING LLC	PO BOX 12564	PORTLAND	OR	97212-0564
REES PROPERTIES LLC	2146 N BLANDENA ST	PORTLAND	OR	97217-3452
REESE ENTERPRISES L L C	P O BOX 30659	PORTLAND	OR	97294-3659
REESE,DANIEL JO & CINDY L	9000 NE M L KING BLVD SP 039	PORTLAND	OR	97211
REFRIGERATION SUPPLIES DISTRIB	26021 ATLANTIC OCEAN DRIVE	LAKE FOREST	CA	92630
REFRIGERATION SUPPLIES DISTRIB	26021 ATLANTIC OCEAN DRIVE	LAKE FOREST	CA	92630
REFRIGERATION SUPPLIES DISTRIB	26021 ATLANTIC OCEAN DRIVE	LAKE FOREST	CA	92630
REICHLE,WILLIAM C & JOAN M	1906 SE 10TH AVE	PORTLAND	OR	97214
REIMERS & JOLIVETTE INC	2344 NW 24TH AVE	PORTLAND	OR	97210
REIMERS & JOLIVETTE INC	2344 NW 24TH AVE	PORTLAND	OR	97210
REINKE,JOHN T TR	14667 SE OLD BARN LN	DAMASCUS	OR	97089-9267
REINKE,JOHN T TR	14667 SE OLD BARN LN	DAMASCUS	OR	97089-9267
RELLEK PROPERTIES LLC ATTN KELLER,MICHAEL R	9373 SW BARBER ST #B	WILSONVILLE	OR	97070
RELLEK PROPERTIES LLC ATTN KELLER,MICHAEL R	9373 SW BARBER ST #B	WILSONVILLE	OR	97070

RELLEK PROPERTIES LLC ATTN KELLER,MICHAEL R	9373 SW BARBER ST #B	WILSONVILLE	OR	97070
RENARD,BRUCE L	PO BOX 512377	LOS ANGELES	CA	90051-0377
RENARD,BRUCE L	PO BOX 512377	LOS ANGELES	CA	90051-0377
RENARD,BRUCE L TO SUROWIECKI,MATT & MAJ %STEELER INC	10023 M L K JR WAY S	SEATTLE	WA	98178
RENARD,BRUCE L TO SUROWIECKI,MATT & MAJ %STEELER INC	10023 M L K JR WAY S	SEATTLE	WA	98178
RENARD,BRUCE L TO SUROWIECKI,MATT & MAJ %STEELER INC	10023 M L K JR WAY S	SEATTLE	WA	98178
RENARD,BRUCE L TR & RENARD,KATHRYN E TR	PO BOX 512377	LOS ANGELES	CA	90051-0377
RERICK,KIMBERLEY	10918 NW FRONT AVE	PORTLAND	OR	97231-1059
RESUN MODSPACE INC % POPKO,DEB	1200 SWEDESFORD RD	BERWYN	PA	19312-1078
REW2 LLC	1612 SE BROOKLYN ST	PORTLAND	OR	97202-2319
REYES MEDINA,PATRICIA	9000 NE M L KING BLVD #64	PORTLAND	OR	97211
REYNOLDS,MARK E	8120 SE MALDEN ST	PORTLAND	OR	97206-7847
REYNOLDS,SARA	9916 N DECATUR ST	PORTLAND	OR	97203-2814
RGI LLC	2715 NW ST HELENS RD	PORTLAND	OR	97210
RGI LLC	2715 NW ST HELENS RD	PORTLAND	OR	97210
RICE-STEWART L L C	3275 DOGWOOD DR S	SALEM	OR	97302
RICHARDS HOMEWARES INC	10675 N LOMBARD ST	PORTLAND	OR	97203
RICHARDSON LAND AND INVESTMENT COMPANY LLC %RICHARDSO PO BOX 107	PO BOX 107	YAKIMA	WA	98907
RICHARDSON LAND AND INVESTMENT COMPANY LLC %RICHARDSO PO BOX 107	PO BOX 107	YAKIMA	WA	98907
RICHARDSON LAND AND INVESTMENT COMPANY LLC %RICHARDSO PO BOX 107	PO BOX 107	YAKIMA	WA	98907
RICHARDSON,JUDITH M	8500 NE 13TH AVE	PORTLAND	OR	97211
RICHARDSON,JUDITH M	8500 NE 13TH AVE	PORTLAND	OR	97211
RICHMOND,ANNETTE & RICHMOND,TOMMY	18616 S LOWER HIGHLAND RD	BEAVERCREEK	OR	97004
RICKEY,BRUCE R	PO BOX 56784	PORTLAND	OR	97238-6784
RICKTON REALTY OREGON LLC	PO BOX 17779	BEVERLY HILLS	CA	90209
RICKTON REALTY OREGON LLC	PO BOX 17779	BEVERLY HILLS	CA	90209
RICO TIERRA LLC	1300 ANDREWS RD	LAKE OSWEGO	OR	97034
RIGUTTO,LINDA L	2828 NE ROCKY BUTTE RD	PORTLAND	OR	97220-3612
RIGUTTO,NICHOLAS R & RIGUTTO,LINDA L	2828 NE ROCKY BUTTE RD	PORTLAND	OR	97220-3612
RINELLA,DAVID J & CINDY L	231 SE ALDER ST	PORTLAND	OR	97214-2106
RINELLA,DAVID J & CINDY L % RINELLA PRODUCE	231 SE ALDER ST	PORTLAND	OR	97214-2106
RIVELLI,JOSEPHINE	5631 SE 28TH AVE	PORTLAND	OR	97202-4513
RIVER EAST INVESTOR LLC % DLA PIPER LLP (US) ATTN TRACHTENBE	33 ARCH ST 26TH FLOOR	BOSTON	MA	2110
RIVERGATE CONGREGATION OF JEHOVAH'S WITNESSES INC % FRAZ	1637 N WINCHELL ST	PORTLAND	OR	97217

RIVERGATE CONGREGATION OF JEHOVAH'S WITNESSES INC % FRAZ	3408 N HUNT ST	PORTLAND	OR	97217-7171
RIVERGATE LOGISTICS CNTR LLC % KG INVESTMENT MANAGEMENT	10240 SW NIMBUS AVE #L3	PORTLAND	OR	97223-4360
RIVERMAN,DOROTHY A TR-1/2 & YUNCK,MOREEN R TR-1/2	1129 W MOONLIT PL	TUCSON	AZ	85737-9436
RIVERSIDE BUSINESS PARK LLC	1058 SW ARNOLD ST	PORTLAND	OR	97219-7675
RIVERSIDE GOLF & COUNTRY CLUB>	8105 NE 33RD DR	PORTLAND	OR	97211-2017
RIVERSIDE INDUSTRIAL PROPERTIES LLC ATTN: GEORGE WEBB	9933 NW 107TH AVE	PORTLAND	OR	97231
RIVERSIDE OSTLING PROPERTIES LLC	1039 ROSE VALLEY RD	KELSO	WA	98626
RIVERSIDE OSTLING PROPERTIES LLC	1039 ROSE VALLEY RD	KELSO	WA	98626
RIVERSIDE WAREHOUSE LLC % PRANGE,ROY	802 NE DAVIS ST	PORTLAND	OR	97232-2932
RKK DAMASCUS LLC % KRIEG,JOHN	19800 SE DAMASCUS LN	BORING	OR	97009-9237
RKK DAMASCUS LLC % KRIEG,JOHN	19800 SE DAMASCUS LN	BORING	OR	97009-9237
ROBBEN,LIONEL J TR	17238 S RAMSBY RD	MOLALLA	OR	97038-7634
ROBBINS,LURELLE E	3439 NE SANDY BLVD PMB 184	PORTLAND	OR	97232
ROBEDEAU,PETER C TR & ROBEDEAU,LINDA J TR	PO BOX 2044	BEAVERTON	OR	97075-2044
ROBEDEAU,PETER C TR & ROBEDEAU,LINDA J TR	PO BOX 2044	BEAVERTON	OR	97075-2044
ROBEDEAU,PETER C TR & ROBEDEAU,LINDA J TR	PO BOX 2044	BEAVERTON	OR	97075-2044
ROBEDEAU,PETER C TR & ROBEDEAU,LINDA J TR	PO BOX 2044	BEAVERTON	OR	97075-2044
ROBEDEAU,PETER C TR & ROBEDEAU,LINDA J TR	PO BOX 2044	BEAVERTON	OR	97075-2044
ROBEDEAU,PETER C TR & ROBEDEAU,LINDA J TR	PO BOX 2044	BEAVERTON	OR	97075-2044
ROBERT HUNTER PROPERTIES LLC ATTN: HUNTER,ROBERT C JR	910 SE STARK ST	PORTLAND	OR	97214
ROBERT HUNTER PROPERTIES LLC ATTN: HUNTER,ROBERT C JR	910 SE STARK ST	PORTLAND	OR	97214
ROBERT HUNTER PROPERTIES LLC ATTN: HUNTER,ROBERT C JR	910 SE STARK ST	PORTLAND	OR	97214
ROBERTS,STEVEN E & JENNIFER % ADMIRAL MOBILE HOMES INC	PO BOX 68597	OAK GROVE	OR	97268
ROBERTSON HAY & WALLACE	1801 SE GRAND AVE	PORTLAND	OR	97214-3550
ROBERTSON HAY & WALLACE	1801 SE GRAND AVE	PORTLAND	OR	97214-3550
ROBINSON,ROBERT L	9000 NE M L KING BLVD SP 5	PORTLAND	OR	97211
ROCDOG LLC	12806 NW LORRAINE DR	PORTLAND	OR	97229
ROCKHILL HOLDINGS LLC	PO BOX 1600	BATTLE GROUND	WA	98604-1600
ROCKHILL HOLDINGS LLC % BROTHERTON,JEANNETTE M	P O BOX 1600	BATTLE GROUND	WA	98604
ROCKHILL HOLDINGS LLC % BROTHERTON,JEANNETTE M	P O BOX 1600	BATTLE GROUND	WA	98604
ROCKTENN CP LLC % ROCKTENN	PO BOX 4098	NORCROSS	GA	30091
RODDA PAINT CO	6107 N MARINE DR	PORTLAND	OR	97203-6409
RODDA PAINT CO	6107 N MARINE DR	PORTLAND	OR	97203-6409
RODGERS MARINE LLC	3445 NE MARINE DR	PORTLAND	OR	97211-2121

RODGERS MARINE LLC	3445 NE MARINE DR	PORTLAND	OR	97211-2121
RODGERS MARINE LLC	3445 NE MARINE DR	PORTLAND	OR	97211-2121
RODGERS,REBECCA JANE	23086 GLENN ELLEN DR	HAYWARD	CA	94541
RODRIGUEZ,ARTURO	9000 NE MLK BLVD SP 252	PORTLAND	OR	97211
ROEDER,FRANCES E	9000 NE M L KING BLVD SP 245	PORTLAND	OR	97211
ROGER THOMAS GLASS LLC	8114 N MISSISSIPPI AVE	PORTLAND	OR	97217
ROJAS ANAYA,SAMUEL & MEDEZ ROJAS,MARIA ISABEL	9000 NE MLK BLVD UN 253	PORTLAND	OR	97211-1386
ROJAS,MARIA LINA	9000 NE M L KING BLVD SP 045	PORTLAND	OR	97211
ROLAND,BARBARA D	11390 NW SKYLINE BLVD	PORTLAND	OR	97231-2601
ROLLINS PROPERTIES INC ATTN REAL ESTATE DEPT	PO BOX 563	READING	PA	19603
ROLLINS,SUZANNE E & HANEY,ROBERT L	9762 NE SUNDERLAND AVE	PORTLAND	OR	97211-1721
ROLPH,KEVIN B & CAROLE A	400 SW 90TH AVE	PORTLAND	OR	97225-6815
ROLPH,KEVIN B & CAROLE A	400 SW 90TH AVE	PORTLAND	OR	97225-6815
ROLPH,KEVIN B & CAROLE A	400 SW 90TH AVE	PORTLAND	OR	97225
ROMAN,LUIS M & MORA,ERICA J	9921 SE DUKE ST	PORTLAND	OR	97266
RONALD & BEVERLY BURBACK PROPERTIES LLC>	10731 SE POWELL BLVD	PORTLAND	OR	97266
RONALD A DOWNEY LLC	4637 SE 27TH AVE	PORTLAND	OR	97202-3609
RONALD A DOWNEY LLC	4637 SE 27TH AVE	PORTLAND	OR	97202-3609
ROOFERS BUILDING ASSOCIATION INC>	5032 SE 26TH AVE	PORTLAND	OR	97202
ROOFERS BUILDING ASSOCIATION INC>	5032 SE 26TH AVE	PORTLAND	OR	97202
ROOT,BEVERLY J	8240 SE LAMBERT ST	PORTLAND	OR	97266
ROSA,FRANCIS X	3122 SE 19TH AVE	PORTLAND	OR	97202-2310
ROSAN INC	PO BOX 6712	PORTLAND	OR	97228-6712
ROSAN INC	PO BOX 6712	PORTLAND	OR	97228-6712
ROSAN INC	PO BOX 6712	PORTLAND	OR	97228-6712
ROSAN INC	PO BOX 6712	PORTLAND	OR	97228-6712
ROSAN INC	PO BOX 6712	PORTLAND	OR	97228-6712
ROSE CITY CEMETERY ASSN	5625 NE FREMONT ST	PORTLAND	OR	97213-1754
ROSE CITY DEVELOPMENT INC % MILLER,JEFFREY	4917 NE 185TH DR	PORTLAND	OR	97230-6830
ROSE CITY DEVELOPMENT INC % MILLER,JEFFREY	4917 NE 185TH DR	PORTLAND	OR	97230-6830
ROSE CITY FACILITIES LLC	1825 NE 50TH AVE	PORTLAND	OR	97213-2035
ROSE CITY PRINTING & PACKAGING INC	900 SE TECH CENTER DR #100	VANCOUVER	WA	98683-5515
ROSE CITY VETERINARY HOSPITAL LLC	809 SE POWELL BLVD	PORTLAND	OR	97202-2531
ROSE CITY VETERINARY HOSPITAL LLC	809 SE POWELL BLVD	PORTLAND	OR	97202-2531

ROSE HEATING CO INC	9945 NE 6TH DR	PORTLAND	OR	97211
ROSEHILL INVEST L L C % BELMAR PROPERTIES	2001 6TH AVE #2300	SEATTLE	WA	98121-2522
ROSEN INVESTMENT CO BY ALASKAN COPPER & BRASS CO	PO BOX 3546	SEATTLE	WA	98124-3546
ROSENBAUM,JUDITH T	3354 SE 20TH AVE	PORTLAND	OR	97202
ROSENBLADT,ERIN	9944 N DECATUR ST	PORTLAND	OR	97203
ROSENBLADT,W RODNEY TR (W RODNEY ROSENBLADT LIVING TRUS	9935 N DECATUR ST	PORTLAND	OR	97203
ROSENFELD,JOHN H	415 SW EDGE CLIFF RD	PORTLAND	OR	97219
ROSS ISLAND SAND & GRAVEL CO	PO BOX 82249	PORTLAND	OR	97282-0249
ROSS ISLAND SAND & GRAVEL CO	PO BOX 82249	PORTLAND	OR	97282-0249
ROSS ISLAND SAND & GRAVEL CO	PO BOX 82249	PORTLAND	OR	97282-0249
ROSS ISLAND SAND & GRAVEL CO	PO BOX 82249	PORTLAND	OR	97282-0249
ROSS ISLAND SAND & GRAVEL CO	PO BOX 82249	PORTLAND	OR	97282-0249
ROSS ISLAND SAND & GRAVEL CO	PO BOX 82249	PORTLAND	OR	97282-0249
ROSS ISLAND SAND & GRAVEL CO	PO BOX 82249	PORTLAND	OR	97282-0249
ROSS ISLAND SAND & GRAVEL CO	PO BOX 82249	PORTLAND	OR	97282-0249
ROSS ISLAND SAND & GRAVEL CO	PO BOX 82249	PORTLAND	OR	97282-0249
ROSS ISLAND SAND & GRAVEL CO % FRAZIER,MICHAEL L CONTROLL P O BOX 82249		PORTLAND	OR	97282-0249
ROSS ISLAND SAND & GRAVEL CO % FRAZIER,MICHAEL L CONTROLL P O BOX 82249		PORTLAND	OR	97282-0249
ROSS ISLAND SAND & GRAVEL CO % FRAZIER,MICHAEL L CONTROLL P O BOX 82249		PORTLAND	OR	97282-0249
ROSS ISLAND SAND & GRAVEL CO % FRAZIER,MICHAEL L CONTROLL P O BOX 82249		PORTLAND	OR	97282-0249
ROSS ISLAND SAND & GRAVEL CO TO BURNETT,PHILIP G	PO BOX 13206	PORTLAND	OR	97213
ROSS ISLAND SAND & GRAVEL CO> TO BURNETT,PHILIP G	PO BOX 13206	PORTLAND	OR	97213
ROSS ISLAND SAND & GRAVEL CO> TO BURNETT,PHILIP G	PO BOX 13206	PORTLAND	OR	97213
ROTH,RICHARD A & ROTH,DIANE M	9641 SE CARRINGTON LN	HAPPY VALLEY	OR	97086
ROTH,RICHARD A & ROTH,DIANE M	9641 SE CARRINGTON LN	HAPPY VALLEY	OR	97086
ROTH,ROBERT G TR-1/2 & PHILLIPS,MARILYN T-1/2	15820 SW BRECCIA DR	BEAVERTON	OR	97007-8562
ROTH,RONALD & ROTH,DIANE	9641 SE CARRINGTON LN	HAPPY VALLEY	OR	97086-6300
ROTHROCK,MARK /JOHNSON,JAMES	9000 NE M L KING BLVD #232	PORTLAND	OR	97211
ROUNSEVILLE,ROBERT A & ROUNSEVILLE,EMI K	2220 SE SPRUCE AVE	PORTLAND	OR	97214-5362

ROW HOUSE LLC	2703 NE ALBERTA ST	PORTLAND	OR	97211
ROY BUILDING LLC % FOSTER & ASSOCIATES CPA LLC	9011 SW BVTN HILLSDALE HWY #	PORTLAND	OR	97225-2452
ROY BUILDING LLC % FOSTER & ASSOCIATES CPA LLC	9011 SW BVTN HILLSDALE HWY #	PORTLAND	OR	97225-2452
ROY BUILDING LLC % FOSTER & ASSOCIATES CPA LLC	9011 SW BVTN HILLSDALE HWY #	PORTLAND	OR	97225-2452
ROY BUILDING LLC % FOSTER & ASSOCIATES CPA LLC	9011 SW BVTN HILLSDALE HWY #	PORTLAND	OR	97225-2452
ROY BUILDING LLC % FOSTER & ASSOCIATES CPA LLC	9011 SW BVTN HILLSDALE HWY #	PORTLAND	OR	97225-2452
ROY BUILDING LLC % FOSTER & ASSOCIATES CPA LLC	9011 SW BVTN HILLSDALE HWY #	PORTLAND	OR	97225-2452
ROY BUILDING LLC % FOSTER & ASSOCIATES CPA LLC	9011 SW BVTN HILLSDALE HWY #	PORTLAND	OR	97225-2452
ROY BUILDING LLC % FOSTER & ASSOCIATES CPA LLC	9011 SW BVTN HILLSDALE HWY #	PORTLAND	OR	97225-2452
ROYAL WORLD PROPERTIES LLC % IRAJPANAH,ABBAS	P O BOX 702	FAIRVIEW	OR	97024
RP PORTLAND LLC % LISA REINHARD	33400 9TH AVE S #206	FEDERAL WAY	WA	98003
RSB LLC	PO BOX 146	LAKE OSWEGO	OR	97034
RUDD,TOMMY C	PO BOX 4581	PORTLAND	OR	97208
RUIZ ESQUIVEL,LUIS & LOPEZ BORIA,JAZMIN	9000 NE M L KING BLVD SP 081	PORTLAND	OR	97211
RUIZ FLORES,BUENAVENTURA & HERNANDEZ DE RUIZ,MARIA SALO	9000 NE M L KING BLVD SP 176	PORTLAND	OR	97211
RUIZ GUILLEN,ABIGAIL & MENDOZA-ARVIZU,FELIPE & MENDOZA-RU	9000 NE MLK BLVD #40	PORTLAND	OR	97211
RUIZ GUILLEN,ABIGIAL & RUIZ,FELIPE	9000 NE M L KING BLVD SP 090	PORTLAND	OR	97211
RUIZ GUILLEN,YOLANDA	9000 NE M L KING BLVD ##10	PORTLAND	OR	97211
RUIZ,CELSO & CRUZ,ISABEL % AFFORDABLE RESIDENTIAL COMMU	PO BOX 790830	SAN ANTONIO	TX	78279
RUMPAKIS FAMILY TRUST ET AL	2480 MARYLSHIRE LN	LAKE OSWEGO	OR	97034
RUNDEL PRODUCTS	1100 NE 28TH AVE	PORTLAND	OR	97232
RUNDEL PRODUCTS INC % MITCHELL,JOHN TR	PO BOX 2289	LAKE OSWEGO	OR	97035-0074
RUTH ANN BROWN LLC	32222 PLYMOUTH RD	LIVONIA	MI	48150-1925
RYAPOLOV,ANDREY & RYAPOLOV,LYUDMILA	18718 NE 74TH CT	BATTLE GROUND	WA	98604
RYDER TRUCK RENTAL INC % PROPERTY TAX DEPT	PO BOX 25719	MIAMI	FL	33102-5719
RYKO LLC	3382 SE 20TH AVE	PORTLAND	OR	97202
RYKO LLC	3382 SE 20TH AVE	PORTLAND	OR	97202
S & C PROPERTIES LLC	9035 SE HENDERSON ST	PORTLAND	OR	97266
S B & M PROPERTIES LLC	8831 NE EUGENE ST	PORTLAND	OR	97220
S B & M PROPERTIES LLC	8831 NE EUGENE ST	PORTLAND	OR	97220
S B & M PROPERTIES LLC	8831 NE EUGENE ST	PORTLAND	OR	97220
S B & M PROPERTIES LLC	8831 NE EUGENE ST	PORTLAND	OR	97220
S B & M PROPERTIES LLC	8831 NE EUGENE ST	PORTLAND	OR	97220
S B & M PROPERTIES LLC	8831 NE EUGENE ST	PORTLAND	OR	97220

S B & M PROPERTIES LLC	8831 NE EUGENE ST	PORTLAND	OR	97220
S B & M PROPERTIES LLC	8831 NE EUGENE ST	PORTLAND	OR	97220
S B & M PROPERTIES LLC % MONSRUD,EUNICE	8831 NE EUGENE ST	PORTLAND	OR	97220
S B & M PROPERTIES LLC % MONSRUD,EUNICE	8831 NE EUGENE ST	PORTLAND	OR	97220
S B & M PROPERTIES LLC % MONSRUD,EUNICE	8831 NE EUGENE ST	PORTLAND	OR	97220
S D S CO	6712 N CUTTER CIR	PORTLAND	OR	97217
S2CAPITAL LLC	4101 SE 26TH AVE	PORTLAND	OR	97202
S6 INVESTMENTS LLC %STEVEN M MICHAELIS	5615 SE SCENIC WAY #301	VANCOUVER	WA	98661
S6 INVESTMENTS LLC %STEVEN M MICHAELIS	5615 SE SCENIC WAY #301	VANCOUVER	WA	98661
S6 INVESTMENTS LLC %STEVEN M MICHAELIS	5615 SE SCENIC WAY #301	VANCOUVER	WA	98661
S6 INVESTMENTS LLC %STEVEN M MICHAELIS	5615 SE SCENIC WAY #301	VANCOUVER	WA	98661
S6 INVESTMENTS LLC %STEVEN M MICHAELIS	5615 SE SCENIC WAY #301	VANCOUVER	WA	98661
S6 INVESTMENTS LLC %STEVEN M MICHAELIS	5615 SE SCENIC WAY #301	VANCOUVER	WA	98661
SAKRETE OF PACIFIC NORTHWEST INC	1402 N RIVER ST	PORTLAND	OR	97227-1726
SAKRETE OF PACIFIC NORTHWEST INC	1402 N RIVER ST	PORTLAND	OR	97227-1726
SAKRETE OF PACIFIC NORTHWEST INC	1402 N RIVER ST	PORTLAND	OR	97227-1726
SAKS UNLIMITED LLC	PO BOX 30087	PORTLAND	OR	97294
SAKS UNLIMITED LLC	PO BOX 30087	PORTLAND	OR	97294
SAKS UNLIMITED LLC	PO BOX 30087	PORTLAND	OR	97294
SAKS UNLIMITED LLC	PO BOX 30087	PORTLAND	OR	97294
SALAZAR,DOUGLAS R	8144 SE MALDEN ST	PORTLAND	OR	97206-7847
SALHOLM,DAVID G	4404 NE CESAR E CHAVEZ BLVD	PORTLAND	OR	97211-8232
SALINAS,ALFREDO ALVEZ & VILLAFUERTE,GENOVEVA M	9000 NE M L K BLVD #168	PORTLAND	OR	97211
SALVOH HOLDING LLC	PO BOX 1098	MOLALLA	OR	97038
SAMMIS,CAROLYN C TR-1/2 & SAMMIS,ROBERT N & ZAPP,JACQUEL	83981 CLEAR LAKE RD	FLORENCE	OR	97439-8409
SAMNICK HOLDINGS II LLC ATTN: R PATRICK HANLIN	PO BOX 2507	WILSONVILLE	OR	97070
SAMNICK HOLDINGS LLC	PO BOX 2507	WILSONVILLE	OR	97070
SAMSON,EMMETT L	9000 NE M L KING BLVD SP 047	PORTLAND	OR	97211
SANCHEZ,ALMA ALVEZ	9000 NE MLK BLVD SP 250	PORTLAND	OR	97211
SANCHEZ,BRAD & SANCHEZ,RACHEL E	11124 NE HALSEY ST PMB 444	PORTLAND	OR	97220
SANCHEZ,EFREN RAMOS & SANCHEZ,ALICIA JIMENEZ	5918 SE 122ND AVE #2	PORTLAND	OR	97236-4262
SANCHEZ,EFREN RAMOS & SANCHEZ,ALICIA JIMENEZ	5918 SE 122ND AVE #2	PORTLAND	OR	97236-4262
SANCHEZ,EFREN RAMOS & SANCHEZ,ALICIA JIMENEZ	5918 SE 122ND AVE #2	PORTLAND	OR	97236-4262
SANCHEZ,EFREN RAMOS & SANCHEZ,ALICIA JIMENEZ	5918 SE 122ND AVE #2	PORTLAND	OR	97236-4262

SAPA ANODIZING INC	7933 NE 21ST AVE	PORTLAND	OR	97211-1909
SAPA INC	7933 NE 21ST AVE	PORTLAND	OR	97211-1909
SAPA INC % CHRISTENSEN,ALBERT	P O BOX 11263	PORTLAND	OR	97211
SAPA PROFILES INC AIRPORT OFFICE PARK BLDG #2	400 ROUSER RD #300	MOON TOWNSHIP	PA	15108-2749
SAPA PROFILES INC AIRPORT OFFICE PARK BLDG #2	400 ROUSER RD #300	MOON TOWNSHIP	PA	15108-2749
SAPA PROFILES INC AIRPORT OFFICE PARK BLDG #2	400 ROUSER RD #300	MOON TOWNSHIP	PA	15108-2749
SAPA PROFILES INC AIRPORT OFFICE PARK BLDG #2	400 ROUSER RD #300	MOON TOWNSHIP	PA	15108-2749
SAPA PROFILES INC AIRPORT OFFICE PARK BLDG #2	400 ROUSER RD #300	MOON TOWNSHIP	PA	15108-2749
SAPA PROFILES INC AIRPORT OFFICE PARK BLDG #2	400 ROUSER RD #300	MOON TOWNSHIP	PA	15108-2749
SAPA PROFILES INC AIRPORT OFFICE PARK BLDG #2	400 ROUSER RD #300	MOON TOWNSHIP	PA	15108-2749
SAPA PROFILES INC AIRPORT OFFICE PARK BLDG #2	400 ROUSER RD #300	MOON TOWNSHIP	PA	15108-2749
SAPA PROFILES INC AIRPORT OFFICE PARK BLDG #2	400 ROUSER RD #300	MOON TOWNSHIP	PA	15108-2749
SAPA PROFILES INC AIRPORT OFFICE PARK BLDG #2	400 ROUSER RD #300	MOON TOWNSHIP	PA	15108-2749
SARGENT,GARY W	10207 SE FOSTER RD	PORTLAND	OR	97266
SARGENT,GARY W	10207 SE FOSTER RD	PORTLAND	OR	97266
SARGENT,GARY W	10207 SE FOSTER RD	PORTLAND	OR	97266
SARGENT,GARY W	10207 SE FOSTER RD	PORTLAND	OR	97266
SATO,KINICHI & JUNKO	7480 SW 77TH AVE	TIGARD	OR	97223
SAUCEDO,ARMANDO D & ROBLE,MARICELA C	9000 NE M L KING BLVD SP 032	PORTLAND	OR	97211
SAUSE BROS INC	3710 NW FRONT AVE	PORTLAND	OR	97210
SAUTER RENTAL PROPERTY LLC %SAUTER,JAMES W & MARILEE P TF 12297 SE RIDGECREST RD		HAPPY VALLEY	OR	97086
SAUTER RENTAL PROPERTY LLC %SAUTER,JAMES W & MARILEE P TF 12297 SE RIDGECREST RD		HAPPY VALLEY	OR	97086
SAUTER RENTAL PROPERTY LLC %SAUTER,JAMES W & MARILEE P TF 12297 SE RIDGECREST RD		HAPPY VALLEY	OR	97086
SAUTER,JAMES W & SAUTER,MARILEE P TR	12297 SE RIDGECREST RD	HAPPY VALLEY	OR	97086
SAUTER,SAMUEL G	1415 SE MARTINS ST	PORTLAND	OR	97202
SAUTER,SAMUEL G	1415 SE MARTINS ST	PORTLAND	OR	97202
SAUTER,WILLIAM J & SAUTER,JOYCE	3261 SW HUBER ST	PORTLAND	OR	97219-6914
SAUTER,WILLIAM J & SAUTER,JOYCE M	3261 SW HUBER ST	PORTLAND	OR	97219-6914
SAUTER,WILLIAM J ET AL	3261 SW HUBER ST	PORTLAND	OR	97219-6914
SAUTER,WILLIAM J ET AL	3261 SW HUBER ST	PORTLAND	OR	97219-6914

SAVAGE,MARGERY J TR	7320 SE LAKE RD	MILWAUKIE	OR	97267-2110
SAVAGE,MARGERY TR	7320 SE LAKE RD	MILWAUKIE	OR	97267-2110
SAVAGE,REBEL T & DEBBIE L	3415 SE 20TH AVE	PORTLAND	OR	97202-2902
SAWYER,GREGORY T	PO BOX 124	OLGA	WA	98279-0124
SBS GROUP LLC % P & C CONSTRUCTION COMPANY	2133 NW YORK ST	PORTLAND	OR	97210-2108
SCB L L C	12800 NE ROSE PKWY	PORTLAND	OR	97230-1548
SCHAFFER,BETTY JEAN	9000 NE M L KING BLVD SP 221	PORTLAND	OR	97211
SCHANTZ,JOHN D & SCHANTZ,LAURA L	1016 36TH AVE	FOREST GROVE	OR	97116
SCHATZ,DAVID TO DJ ADVENTURES LLC	735 NE 40TH CIR	CAMAS	WA	98607
SCHATZ,DAVID TO DJ ADVENTURES LLC	735 NE 40TH CIR	CAMAS	WA	98607
SCHATZ,DAVID TO DJ ADVENTURES LLC	735 NE 40TH CIR	CAMAS	WA	98607
SCHEIDEGGER,MARK	6131 NW THOMPSON RD	PORTLAND	OR	97210-1056
SCHEIDEGGER,MARK	6131 NW THOMPSON RD	PORTLAND	OR	97210-1056
SCHEIDEGGER,MARK A	6131 NW THOMPSON RD	PORTLAND	OR	97210-1056
SCHETKY-MILNE LLC % MILNE,CATHERINE	211 NE COLUMBIA BLVD	PORTLAND	OR	97211
SCHIEWE PROPERTIES LLC % WEINER,DAVID P	1515 SW 5TH AVE #600	PORTLAND	OR	97201
SCHILLER,DAVID R	9106 N EDISON ST	PORTLAND	OR	97203
SCHLEINING,CAROL J TR	21988 NE LACHENVIEW ST	FAIRVIEW	OR	97024-8775
SCHLEINING,CAROL J TR	21988 NE LACHENVIEW ST	FAIRVIEW	OR	97024-8775
SCHMIDLI,THEODORE M & SCHMIDLI,WILLIE MAE /COTTER,ROBERT	9000 NE M L KING BLVD SP 007	PORTLAND	OR	97211
SCHMITT INDUSTRIES INC	2765 NW NICOLAI ST	PORTLAND	OR	97210-1818
SCHMITT INDUSTRIES INC	2765 NW NICOLAI ST	PORTLAND	OR	97210
SCHNEIDER RESOURCES INC	P O BOX 2545	GREEN BAY	WI	54306-2545
SCHNEIDER,BRUCE M	1015 SE WOODWARD ST	PORTLAND	OR	97202-2538
SCHNEIDER,BRUCE M	1015 SE WOODWARD ST	PORTLAND	OR	97202-2538
SCHNEIDER,BRUCE M	1015 SE WOODWARD ST	PORTLAND	OR	97202-2538
SCHNEIDER,BRUCE M	1015 SE WOODWARD ST	PORTLAND	OR	97202-2538
SCHNEIDER,BRUCE M	1015 SE WOODWARD ST	PORTLAND	OR	97202-2595
SCHNEIDER,TONY D	9609 N COLUMBIA BLVD	PORTLAND	OR	97203-1030
SCHNEIDER,TONY D & KIMBERLY	9609 N COLUMBIA BLVD	PORTLAND	OR	97203-1030
SCHNELL PROPERTY HOLDINGS	3528 E DESMET	SPOKANE	WA	99202
SCHNITZER INVEST CORP	818 STEWART STREET SUITE 700	SEATTLE	WA	98101

SCHNITZER INVEST CORP	818 STEWART ST #700	SEATTLE	WA	98101
SCHNITZER INVEST CORP	818 STEWART STREET SUITE 700	SEATTLE	WA	98101
SCHNITZER INVEST CORP	818 STEWART ST #700	SEATTLE	WA	98101
SCHNITZER INVESTMENT CORP	3200 NW YEON AVE	PORTLAND	OR	97210-0047
SCHNITZER INVESTMENT CORP	818 STEWART STREET SUITE 700	PORTLAND	OR	98101
SCHNITZER STEEL INDUSTRIES INC ATTN: SUE CARROLL	PO BOX 847	CARLSBAD	CA	92018
SCHNITZER STEEL INDUSTRIES INC ATTN: SUE CARROLL	PO BOX 847	CARLSBAD	CA	92018
SCHNITZER STEEL INDUSTRIES INC ATTN: SUE CARROLL	PO BOX 847	CARLSBAD	CA	92018
SCHNITZER STEEL INDUSTRIES INC ATTN: SUE CARROLL	PO BOX 847	CARLSBAD	CA	92018
SCHNITZER STEEL INDUSTRIES INC ATTN: SUE CARROLL	PO BOX 847	CARLSBAD	CA	92018
SCHNITZER STEEL PRODUCTS CO	3200 NW YEON AVE	PORTLAND	OR	97210
SCHOFIELD LLC	425 NE 9TH AVE	PORTLAND	OR	97232-2710
SCHOMMER,ROBERT W A C SCHOMMER	6421 NE COLWOOD WAY	PORTLAND	OR	97218
SCHOOL DISTRICT NO 1 ATTN FINANCE DEPT	PO BOX 3107	PORTLAND	OR	97208-3107
SCHOOL DISTRICT NO 1 ATTN FINANCE DEPT	PO BOX 3107	PORTLAND	OR	97208-3107
SCHOOL DISTRICT NO 1 ATTN FINANCE DEPT	PO BOX 3107	PORTLAND	OR	97208-3107
SCHOOL DISTRICT NO 1 ATTN FINANCE DEPT	PO BOX 3107	PORTLAND	OR	97208-3107
SCHOOL DISTRICT NO 1 ATTN FINANCE DEPT	PO BOX 3107	PORTLAND	OR	97208-3107
SCHOOL DISTRICT NO 1 ATTN FINANCE DEPT	PO BOX 3107	PORTLAND	OR	97208-3107
SCHOOL DISTRICT NO 1 ATTN FINANCE DEPT	PO BOX 3107	PORTLAND	OR	97208-3107
SCHOOL DISTRICT NO 1 ATTN FINANCE DEPT	PO BOX 3107	PORTLAND	OR	97208-3107
SCHOOL DISTRICT NO 1 ATTN FINANCE DEPT	PO BOX 3107	PORTLAND	OR	97208-3107
SCHOOL DISTRICT NO 1 ATTN FINANCE DEPT	PO BOX 3107	PORTLAND	OR	97208-3107
SCHOOL DISTRICT NO 1 ATTN FINANCE DEPT	PO BOX 3107	PORTLAND	OR	97208-3107
SCHOOL DISTRICT NO 1 ATTN FINANCE DEPT	PO BOX 3107	PORTLAND	OR	97208-3107
SCHOOL DISTRICT NO 1 ATTN FINANCE DEPT	PO BOX 3107	PORTLAND	OR	97208-3107

SCHOOL DISTRICT NO 1(LEASED MULTNOMAH COUNTY ATTN FINAN	PO BOX 3107	PORTLAND	OR	97208-3107
SCHOOL DISTRICT NO 1J % PORTLAND PUBLIC SCHOOLS PHYSICAL P	501 N DIXON ST	PORTLAND	OR	97227
SCHOOL DISTRICT NO 1J % PORTLAND PUBLIC SCHOOLS PHYSICAL P	501 N DIXON ST	PORTLAND	OR	97227
SCHOOL DISTRICT NO 3 (LSD MULT % ADMINISTRATIVE OFFICE	10636 NE PRESCOTT ST	PORTLAND	OR	97220-2648
SCHOOLHOUSE FACTORY LLC	2181 NW NICOLAI ST	PORTLAND	OR	97210-1806
SCHRIEVER,CARLENE H TR ET AL	10177 SE POWELL BLVD	PORTLAND	OR	97266-1812
SCHRIEVER,CARLENE H TR ET AL	10177 SE POWELL BLVD	PORTLAND	OR	97266-1812
SCHRIEVER,CARLENE H TR ET AL	10177 SE POWELL BLVD	PORTLAND	OR	97266-1812
SCHRIEVER,CARLENE H TR ET AL	10177 SE POWELL BLVD	PORTLAND	OR	97266-1812
SCHROTH,PAUL & ANNETTE	727 NE 174TH AVE	PORTLAND	OR	97230
SCHROTH,PAUL A & ANNETTE K	727 NE 174TH AVE	PORTLAND	OR	97230-6434
SCHUTZ,DIANA	2805 SE 16TH AVE	PORTLAND	OR	97202
SCHWAB PROPERTIES LTD	PO BOX 5350	BEND	OR	97708-5350
SCHWAB PROPERTIES LTD	PO BOX 5350	BEND	OR	97708-5350
SCHWAB PROPERTIES LTD	PO BOX 5350	BEND	OR	97708-5350
SCHWAB PROPERTIES LTD	PO BOX 5350	BEND	OR	97708-5350
SCHWAB PROPERTIES LTD	PO BOX 5350	BEND	OR	97708-5350
SCHWAB,BETTY ANN & SCHWAB,MICHAEL ROBERT	9000 NE M L KING BLVD SP 255	PORTLAND	OR	97211
SCIOLA,ANTHONY	4220 SE 24TH AVE	PORTLAND	OR	97202-3902
SCIOLA,ANTHONY	4220 SE 24TH AVE	PORTLAND	OR	97202-3902
SCOTT,ANITA LOUISE & DANIEL LE % ENG'S MANUFACTURED HOME	PO BOX 88	WEST LINN	OR	97068
SDK LLC	4223 SW VACUNA ST	PORTLAND	OR	97219-9500
SDK LLC % KAUFFMAN,DON	4223 SW VACUNA ST	PORTLAND	OR	97219-9500
SDP LLC-23% & CANOE BAY LLC-77% % ROBERT E SMITH	7327 SW BARNES RD PMB 120	PORTLAND	OR	97225
SE 17TH LAND DEVELOPMENT LLC %SCANLANKEMPERBARD CO LLC	810 NW MARSHALL ST #300	PORTLAND	OR	97209
SE BROOKLYN STREET PROPERTIES LLC %ROBERT RAMSOUR,MGR	290 SE SPOKANE ST	PORTLAND	OR	97202
SE BROOKLYN STREET PROPERTIES LLC %ROBERT RAMSOUR,MGR	290 SE SPOKANE ST	PORTLAND	OR	97202
SEALY MATTRESS MFG CO INC ATTN: CHRISTIAN EJIMOFOR	ONE OFFICE PKWY AT SEALY DR	TRINITY	NC	27370
SEARLE,HAROLD D	8130 SE OGDEN ST	PORTLAND	OR	97206-7859
SEASTROM,ROSALYN L	PO BOX 55035	PORTLAND	OR	97238-5035
SEBASTIAN DOMINGO,MARIA	9000 NE M L KING BLVD SP 49	PORTLAND	OR	97211
SECRETTI,PATRICIA A	2354 NW ROOSEVELT ST	PORTLAND	OR	97210-2323
SECURITY PUBLIC STORAGE - PORTLAND LLC	51 FEDERAL ST STE 202	SAN FRANCISCO	CA	94107
SECURITY PUBLIC STORAGE - PORTLAND LLC	51 FEDERAL ST STE 202	SAN FRANCISCO	CA	94107

SEET,LAURANCE A TR & SEET,SANDRA L TR	5328 NE WYGANT ST	PORTLAND	OR	97218
SEIL,J P TIMONTY & SADDORIS,MARY B	2919 NW ST HELENS RD	PORTLAND	OR	97210-2041
SELLAND,ROSEMARY	9000 NE M L KING BLVD SP 251	PORTLAND	OR	97211
SEMM LLC	19105 NW LOGIE TRAIL RD	PORTLAND	OR	97231
SEQUOIA GLEN APARTMENTS LLC	555 NW PARK AVE #404	PORTLAND	OR	97209
SERDAR,JOHN C SR TR ET AL % BADER,PAUL P	21196 S LOWER HIGHLAND RD	BEAVERCREEK	OR	97004
SERDAR,JOHN C SR TR ET AL % BADER,PAUL P	21196 S LOWER HIGHLAND RD	BEAVERCREEK	OR	97004
SERRANO,MIGUEL % SERRANO,MARTHA	25293 S NEWKIRCHNER RD	MULINO	OR	97042
SEUFERT,MARGARET	17904 CARDINAL PL	LAKE OSWEGO	OR	97034-6640
SF PROPERTY INVESTMENTS LLC % SCHNITZER,JORDAN D	1121 SW SALMON ST	PORTLAND	OR	97205
SHARMA,ARUN D	5201 N EMERSON DR	PORTLAND	OR	97217-4111
SHARP AUTO BODY & PAINT WORKS INC	4031 SE 26TH AVE	PORTLAND	OR	97202-2951
SHAVER TRANSPORTATION CO	4900 NW FRONT AVE	PORTLAND	OR	97210-1104
SHAW, ROBERT MICHAEL	9000 NE M L KING BLVD SP 065	PORTLAND	OR	97211
SHAW,DENISE G	8935 SE STANLEY PL	PORTLAND	OR	97206
SHAW,MICHAEL A & SHANNON L	9415 N DECATUR ST	PORTLAND	OR	97203-2817
SHAW,SHARON L & RUNYON,PATRICIA P	9000 NE M L KING BLVD SP 37	PORTLAND	OR	97211
SHAWCOR PIPE PROTECTION, LLC	3838 N SAM HOUSTON PKWY E #:	HOUSTON	TX	77032-3405
SHAWCOR PIPE PROTECTION, LLC	3838 N SAM HOUSTON PKWY E #:	HOUSTON	TX	77032-3405
SHEAHAN,GEORGE C JR TR	34180 SW LADD HILL RD	WILSONVILLE	OR	97070-9512
SHEFFIELD FAMILY LLC	10002 N VANCOUVER WAY	PORTLAND	OR	97217-7526
SHELL OIL COMPANY % EQUILON ENTERPRISES LLC TAX DEPT	P O BOX 4369	HOUSTON	TX	77210-4369
SHERWIN WILLIAMS CO % ATTN TAX DEPT/145	PO BOX 6027	CLEVELAND	OH	44101
SHERWIN WILLIAMS CO % ATTN TAX DEPT/145	PO BOX 6027	CLEVELAND	OH	44101
SHETTLER,RICHARD H TR & SHETTLER,BARBARA W TR	620 SW CARUTHERS ST STE 576	PORTLAND	OR	97201-5054
SHICK,KIMBERLY L ET AL	P O BOX 10917	PORTLAND	OR	97296
SHICK,KIMBERLY L ET AL	P O BOX 10917	PORTLAND	OR	97296
SHILO INN PORTLAND/205 L L C	11600 SW SHILO LN	PORTLAND	OR	97225
SHILO INN PORTLAND/205 L L C	11600 SW SHILO LN	PORTLAND	OR	97225
SHIPLEY,DAVID J ET AL % DENNIS UNIFORM MFG CO	714 NE HANCOCK ST	PORTLAND	OR	97212-3968
SHIPMAN,DOUGLAS D & JEAN M	P O BOX 30356	PORTLAND	OR	97294-3356
SHIPMAN,DOUGLAS D & JEAN M	PO BOX 30356	PORTLAND	OR	97294-3356
SHIPYARD COMMERCE CENTER LLC ATTN BRENDA JOHNSON	PO BOX 4367	PORTLAND	OR	97208-4367
SHIPYARD COMMERCE CENTER LLC ATTN BRENDA JOHNSON	PO BOX 4367	PORTLAND	OR	97208-4367

SHIPYARD COMMERCE CENTER LLC ATTN BRENDA JOHNSON	PO BOX 4367	PORTLAND	OR	97208-4367
SHIPYARD COMMERCE CENTER LLC ATTN BRENDA JOHNSON	PO BOX 4367	PORTLAND	OR	97208-4367
SHIPYARD COMMERCE CENTER LLC ATTN: THOMAS R FERREIRA	PO BOX 4367	PORTLAND	OR	97208-4367
SHIPYARD COMMERCE CENTER LLC ATTN: THOMAS R FERREIRA	PO BOX 4367	PORTLAND	OR	97208-4367
SHORE TERMINALS LLC ATTN TILLMAN DAVIS	PO BOX 780339	SAN ANTONIO	TX	78230
SHORE TERMINALS LLC ATTN TILLMAN DAVIS	PO BOX 780339	SAN ANTONIO	TX	78230
SHORE TERMINALS LLC ATTN TILLMAN DAVIS	PO BOX 780339	SAN ANTONIO	TX	78230
SHORE TERMINALS LLC ATTN TILLMAN DAVIS	PO BOX 780339	SAN ANTONIO	TX	78230
SHORE TERMINALS LLC ATTN TILLMAN DAVIS	PO BOX 780339	SAN ANTONIO	TX	78230
SHORT,THOMAS D TR & SHORT,BONNIE J TR	10731 SE 29TH AVE	MILWAUKIE	OR	97222
SHRIYAM LLC-1/2 & SATYAM LLC-1/2 % PATEL,PRAVIN & PATEL,PAI	13986 MAJESTIC CT	LAKE OSWEGO	OR	97035
SHULEVITZ FIVE LLC	PO BOX 17555	PORTLAND	OR	97217
SHYSHLAK,DEAN M & HARRIS,KYM-MARIE	10490 SW EASTRIDGE ST #110B	PORTLAND	OR	97225-5030
SICILIA,ROSS J TR & SICILIA,NEOLA E TR	14021 NE SALMON CREEK	VANCOUVER	WA	98686-1609
SIGNATURE GRAPHICS INC ATTN VALERIE SCATENA	15040 NE MASON ST	PORTLAND	OR	97230
SIGNATURE GRAPHICS INC ATTN VALERIE SCATENA	15040 NE MASON ST	PORTLAND	OR	97230
SILGAN EQUIPMENT CO	1301 W DUGDALE RD	WAUKEGAN	IL	60085
SILTRONIC CORP %HARINSKI,GARY	7200 NW FRONT AVE	PORTLAND	OR	97210-3676
SILTRONIC CORP %HARINSKI,GARY	7200 NW FRONT AVE	PORTLAND	OR	97210-3676
SILTRONIC CORPORATION	7200 NW FRONT AVE	PORTLAND	OR	97210-3676
SILVER EAGLE MFG CO	5825 NE SKYPORT WAY	PORTLAND	OR	97218-1249
SILVER EAGLE MFG CO	5825 NE SKYPORT WAY	PORTLAND	OR	97218
SILVER EAGLE MFG CO	5825 NE SKYPORT WAY	PORTLAND	OR	97218
SILVER STAR LLC	4315 NW ST HELENS RD	PORTLAND	OR	97210
SILVER STAR LLC	4315 NW ST HELENS RD	PORTLAND	OR	97210
SIMONDS INTERNATIONAL LLC ATTN: PAUL GARDNER	2700 SE TACOMA ST	PORTLAND	OR	97202
SIMONDS INTERNATIONAL LLC ATTN: PAUL GARDNER	2700 SE TACOMA ST	PORTLAND	OR	97202
SIMONSEN,ARTHUR L & SIMONSEN,MILLY JUANITA	9000 NE M L KING BLVD SP 099	PORTLAND	OR	97211
SIMONSON,DAVE & DONNA	6457 NE COLUMBIA BLVD	PORTLAND	OR	97218
SIMONSON,DAVE & DONNA	6457 NE COLUMBIA BLVD	PORTLAND	OR	97218
SIMONSON,DAVID A	6457 NE COLUMBIA BLVD	PORTLAND	OR	97218
SIMONSON,DAVID A	6457 NE COLUMBIA BLVD	PORTLAND	OR	97218
SIMONSON,DAVID A & DONNA	6455 NE COLUMBIA BLVD	PORTLAND	OR	97218-2960

SIMONSON,DAVID A & DONNA M	6457 NE COLUMBIA BLVD	PORTLAND	OR	97218
SIMONSON,DAVID A & DONNA M	6457 NE COLUMBIA BLVD	PORTLAND	OR	97218
SIMONSON,DAVID A & DONNA M % DAVE SIMONSON	6457 NE COLUMBIA BLVD	PORTLAND	OR	97218
SIMPSON HOLDINGS LLC	1753 SE 148TH AVE	PORTLAND	OR	97233-2633
SIMPSON,KENT C	PO BOX 1432	OREGON CITY	OR	97045-0098
SINGER,SHARON TR ET AL % FAMILIAN NORTHWEST FERGUSON EN	12500 JEFFERSON AVE	NEWPORT NEWS	VA	23602
SINGH,JULIE C	9115 NE VANCOUVER WAY	PORTLAND	OR	97211-1353
SINGLETON,MARK A & SINGLETON,SHARON L	8922 NE VANCOUVER WAY	PORTLAND	OR	97211-1350
SK COMPANY OF OREGON LLC ATTN: SHAWN KARAMBELAS	250 SE DIVISION PL	PORTLAND	OR	97202-1077
SKIDMORE LIMITED PARTNERSHIP>	PO BOX 707	BEAVERCREEK	OR	97004
SKK LLC % BROWN,TIM	112 W 11TH ST #225	VANCOUVER	WA	98660
SKK LLC % BROWN,TIM	112 W 11TH ST #225	VANCOUVER	WA	98660
SKORO,MARION TR & SKORO,MIRELA TR (SKORO FAMILY TRUST)	1635 SE GRAND AVE	PORTLAND	OR	97214-3512
SKORO,MARION TR & SKORO,MIRELA TR (SKORO FAMILY TRUST)	1635 SE GRAND AVE	PORTLAND	OR	97214-3512
SKORO,MIJO	7227 SE 83RD AVE	PORTLAND	OR	97266-5826
SKORO,MILAN & ROSANDA & GREENOUGH,ROBERT C & LYNN	2150 SE POWELL BLVD	PORTLAND	OR	97202
SKORO,MILAN & SKORO,ROSANDA	14714 SE CROSSCREEK CT	DAMASCUS	OR	97089-8295
SKORO,MILAN & SKORO,ROSANDA	14714 SE CROSSCREEK CT	DAMASCUS	OR	97089-8295
SKORO,MILAN & SKORO,ROSANDA	14714 SE CROSSCREEK CT	DAMASCUS	OR	97089-8295
SKORO,MILAN & SKORO,ROSANDA	14714 SE CROSSCREEK CT	DAMASCUS	OR	97089-8295
SKORO,MILAN & SKORO,ROSANDRA	1740 SE FRANKLIN ST	PORTLAND	OR	97202
SKOVBORG,CATHY	333 NW DRAKE RD	BEND	OR	97701
SKOVBORG,CATHY	333 NW DRAKE RD	BEND	OR	97701
SKOVBORG,CATHY	333 NW DRAKE RD	BEND	OR	97701
SKOVBORG,CATHY	333 NW DRAKE RD	BEND	OR	97701
SKOVBORG,CATHY	333 NW DRAKE RD	BEND	OR	97701
SKYPORT PROPERTIES LLC	601 UNION ST #3010	SEATTLE	WA	98101
SKYPORT PROPERTIES OF OREGON LLC	PO BOX 2775	TUALATIN	OR	97062-2775
SKYPORT PROPERTIES OF OREGON LLC	PO BOX 2775	TUALATIN	OR	97062-2775
SKYPORT PROPERTIES OF OREGON LLC>	PO BOX 2775	TUALATIN	OR	97062-2775
SKYPORT PROPERTIES OF OREGON LLC>	PO BOX 2775	TUALATIN	OR	97062-2775
SKYPORT PROPERTIES OF OREGON LLC>	PO BOX 2775	TUALATIN	OR	97062-2775
SKYPORT PROPERTIES OF OREGON LLC>	PO BOX 2775	TUALATIN	OR	97062-2775
SKYPORT PROPERTIES OF OREGON LLC>	PO BOX 2775	TUALATIN	OR	97062-2775

SKYPORT PROPERTIES OF OREGON LLC>	PO BOX 2775	TUALATIN	OR	97062-2775
SKYPORT PROPERTIES OF OREGON LLC>	PO BOX 2775	TUALATIN	OR	97062-2775
SKYPORT PROPERTIES OF OREGON LLC>	PO BOX 2775	TUALATIN	OR	97062-2775
SLIPHER,RANDOLPH	28626 E HIST COLUMBIA RIVER H'TROUTDALE		OR	97060
SLIPHER,RANDOLPH	28626 E HIST COL RIVER HWY	TROUTDALE	OR	97060
SLIPHER,RANDOLPH W	28626 E HIST COLUMBIA RIVER H'TROUTDALE		OR	97060
SLIPHER,RANDOLPH W	28626 E HIST COLUMBIA RIVER H'TROUTDALE		OR	97060
SLIPHER,RANDOLPH W	28626 E HIST COLUMBIA RIVER H'TROUTDALE		OR	97060
SLIPHER,RANDOLPH W & DEBORA	28626 E HIST COLUMBIA RIVER H'TROUTDALE		OR	97060
SLIPHER,RANDOLPH W & DEBORA	28626 E HIST COLUMBIA RIVER H'TROUTDALE		OR	97060
SLIPHER,RANDOLPH W & DEBORA	28626 E HIST COLUMBIA RIVER H'TROUTDALE		OR	97060
SLIPHER,RANDY	28626 E HIST COLUMBIA RIVER H'TROUTDALE		OR	97060
SLM OREGON LLC	300 SE HEARTHWOOD BLVD	VANCOUVER	WA	98684-7431
SLOAN,DONALD C III	PO BOX 69094	PORTLAND	OR	97239
SLYMAN,JEAN B TR	3525 NE 50TH AVE #303	PORTLAND	OR	97213
SM REALTY LLC	PO BOX 30087	PORTLAND	OR	97294-3087
SMALL BUSINESS ADM (CONT TO HERBERT MALARKEY ROOF TO: M. PO BOX 17217		PORTLAND	OR	97217-0217
SMITH,CARMELA D TR-1/2 & SMITH,CARMELA D-1/2	4140 E BURNSIDE ST	PORTLAND	OR	97214-2026
SMITH,GUY M	706 SE MAIN ST	PORTLAND	OR	97214-3422
SMITH,GUY M	706 SE MAIN ST	PORTLAND	OR	97214-3422
SMITH,GUY M	706 SE MAIN ST	PORTLAND	OR	97214
SMITH,GUY M	706 SE MAIN ST	PORTLAND	OR	97214-3422
SMITH,JOHN F & AMELL,GARY L	5703 N DETROIT AVE	PORTLAND	OR	97217-4332
SMITH,PETER L & NOLES,SUZANNE S TR	9646 NW SKYLINE HEIGHTS DR	PORTLAND	OR	97229-2637
SMITH,WEBB & SMITH,ROSIE	PO BOX 83511	PORTLAND	OR	97283-0571
SMITH,WEBB E	PO BOX 83511	PORTLAND	OR	97283
SMITH,WHITNEY S	9000 NE M L KING BLVD SP 035	PORTLAND	OR	97211
SMITH,WILLIAM E & BETTY	6937 N ROBERTS AVE	PORTLAND	OR	97203-6361
SMURFIT-STONE CONTAINER CORPORATION % ROCKTENN	PO BOX 4098	NORCROSS	GA	30091
SMURFIT-STONE CONTAINER CORPORATION % ROCKTENN	PO BOX 4098	NORCROSS	GA	30091
SMURFIT-STONE CONTAINER CORPORATION % ROCKTENN	PO BOX 4098	NORCROSS	GA	30091
SMURFIT-STONE CONTAINER CORPORATION % ROCKTENN	PO BOX 4098	NORCROSS	GA	30091
SMURFIT-STONE CONTAINER CORPORATION % ROCKTENN	PO BOX 4098	NORCROSS	GA	30091
SMYTHE,DAVID E TR-1/2 & STANWOOD,FRED R-1/2	PO BOX 14403	PORTLAND	OR	97293

SN INVESTMENT PROPERTIES LLC % TAX DEPARTMENT	1121 SW SALMON ST 5TH FLR	PORTLAND	OR	97205
SN PROPERTIES PARTNERSHIP ATTN TAX DEPARTMENT	1121 SW SALMON ST	PORTLAND	OR	97205-2092
SN PROPERTIES PARTNERSHIP ATTN TAX DEPARTMENT	1121 SW SALMON ST	PORTLAND	OR	97205-2092
SN PROPERTIES PARTNERSHIP ATTN TAX DEPT	1121 SW SALMON ST	PORTLAND	OR	97205
SN PROPERTIES PARTNERSHIP ATTN TAX DEPT	1121 SW SALMON ST	PORTLAND	OR	97205
SN PROPERTIES PARTNERSHIP ATTN TAX DEPT	1121 SW SALMON ST	PORTLAND	OR	97205
SN PROPERTIES PARTNERSHIP ATTN TAX DEPT	1121 SW SALMON ST	PORTLAND	OR	97205
SNL INVESTMENTS LLC	4368 LAKEVIEW BLVD	LAKE OSWEGO	OR	97035
SNL INVESTMENTS LLC	4368 LAKEVIEW BLVD	LAKE OSWEGO	OR	97035
SNL INVESTMENTS LLC	4368 LAKEVIEW BLVD	LAKE OSWEGO	OR	97035
SNL INVESTMENTS LLC	4368 LAKEVIEW BLVD	LAKE OSWEGO	OR	97035
SNL INVESTMENTS LLC	4368 LAKEVIEW BLVD	LAKE OSWEGO	OR	97035
SNL INVESTMENTS LLC	4368 LAKEVIEW BLVD	LAKE OSWEGO	OR	97035
SNL INVESTMENTS LLC	4368 LAKEVIEW BLVD	LAKE OSWEGO	OR	97035
SNOW,KEITH A	7907 SE 46TH AVE	PORTLAND	OR	97206-9106
SNYDER,JOHN W-1/2 & SNYDER,JOHN W TR-1/2	3835 NE WISTARIA DR	PORTLAND	OR	97212
SOLENIS LLC %DUFF AND PHELPS	PO BOX 2629	ADDISON	TX	75001-2629
SOLENIS LLC %DUFF AND PHELPS	PO BOX 2629	ADDISON	TX	75001-2629
SOLENIS LLC %DUFF AND PHELPS	PO BOX 2629	ADDISON	TX	75001-2629
SOLENIS LLC %DUFF AND PHELPS	PO BOX 2629	ADDISON	TX	75001-2629
SOLIS,DORA HAYDEE CHACAJ	6403 SE 100TH AVE	PORTLAND	OR	97266-5125
SOLOPOWER INC /SOLOPOWER SYSTEMS INC	6308 N MARINE DR	PORTLAND	OR	97203
SOLOPOWER INC /SOLOPOWER SYSTEMS INC	6308 N MARINE DR	PORTLAND	OR	97203
SOLTERRA DIVISION OFFICE LLC	2910 1ST AVE S #200	SEATTLE	WA	98134
SONO,CRAIG K	3525 NE 50TH AVE #312	PORTLAND	OR	97213
SORIA,RAMIRO & RUIZ,MARGARITA & RUIZ,JOSE	9000 NE M L KING BLVD SP 002	PORTLAND	OR	97211
SOSA AGUILAR,VICENTE KEIBI & AGUILAR,GRISELDA	9221 N WALL AVE	PORTLAND	OR	97203
SOUND BUILDING ASSOCIATES> C/0 CHICK,PETER	942 HARVARD AVE E	SEATTLE	WA	98102
SOUNEY PROPERTIES LLC	6733 SE HAROLD ST	PORTLAND	OR	97206
SOUTHEAST VFW BUILDING LLC	321 SW 4TH AVE #305	PORTLAND	OR	97204-2327
SOUTHEAST VFW BUILDING LLC	321 SW 4TH AVE #305	PORTLAND	OR	97204-2327
SOUTHERN PACIFIC PIPE LINES PA % SANTA FE PACIFIC PIPELINES T/	1100 TOWN & COUNTRY RD	ORANGE	CA	92868
SOUTHERN PACIFIC PIPE LINES PA % SANTA FE PACIFIC PIPELINES T/	1100 TOWN & COUNTRY RD	ORANGE	CA	92868
SOUTHERN PACIFIC PIPE LINES PA % SANTA FE PACIFIC PIPELINES T/	1100 TOWN & COUNTRY RD	ORANGE	CA	92868

SOUTHERN PACIFIC PIPE LINES PA % SANTA FE PACIFIC PIPELINES T/	1100 TOWN & COUNTRY RD	ORANGE	CA 92868
SOUTHERN PACIFIC PIPE LINES PA % SANTA FE PACIFIC PIPELINES T/	1100 TOWN & COUNTRY RD	ORANGE	CA 92868
SOUTHERN PACIFIC PIPE LINES PA % SANTA FE PACIFIC PIPELINES T/	1100 TOWN & COUNTRY RD	ORANGE	CA 92868
SOWAY L L C	PO BOX 291	WOODBURN	OR 97071
SOWAY L L C	PO BOX 291	WOODBURN	OR 97071
SOWAY L L C	PO BOX 291	WOODBURN	OR 97071
SOWERS,DEREK W	3385 ARKANSAS ST	OAKLAND	CA 94602-3707
SOWERS,WARREN C	31374 WEST NINE DR	LAGUNA NIGUEL	CA 92677-2949
SP PROPERTY INVESTMENTS LLC	2331 NW 23RD AVE	PORTLAND	OR 97210
SPADA PROPERTIES INC	8448 NE 33RD DR	PORTLAND	OR 97211
SPADA PROPERTIES INC	8448 NE 33RD DR SUITE 200	PORTLAND	OR 97211-2163
SPADA PROPERTIES INC	8448 NE 33RD DR SUITE 200	PORTLAND	OR 97211-2163
SPADA PROPERTIES INC	8448 NE 33RD DR SUITE 200	PORTLAND	OR 97211-2163
SPANGLER,DOROTHY M & BUCHER, TIMOTHY JAMES	9000 NE M L KING BLVD SP 219	PORTLAND	OR 97211
SPARKS,ROY D & CAROLYN G	12155 SE FOSTER PL	PORTLAND	OR 97266
SPEARS I-84 LLC	01551 SW MILITARY RD	PORTLAND	OR 97219-8350
SPEARS I-84 LLC	01551 SW MILITARY RD	PORTLAND	OR 97219-8350
SPEARS I-84 LLC	01551 SW MILITARY RD	PORTLAND	OR 97219-8350
SPEARS ROOSEVELT LLC	01551 SW MILITARY RD	PORTLAND	OR 97219-8350
SPEARS YORK LLC	01551 SW MILITARY RD	PORTLAND	OR 97219-8350
SPECIAL ASPHALT PRODUCTS INC	PO BOX 427	WILSONVILLE	OR 97070-0427
SPECTRE LLC	3611 SE 20TH AVE #300	PORTLAND	OR 97202-2967
SPENST,BEVERLY A	3324 NE 17TH AVE	PORTLAND	OR 97212-2320
SPIEGEL,DONALD K	828 SW REGENCY PL	PORTLAND	OR 97225
SPII LLC	8448 NE 33RD DR #200	PORTLAND	OR 97211-2105
SPII LLC	8448 NE 33RD DR #200	PORTLAND	OR 97211-2105
SPII LLC	8448 NE 33RD DR #200	PORTLAND	OR 97211-2105
SPII LLC	8448 NE 33RD DR #200	PORTLAND	OR 97211-2105
SPII LLC	8448 NE 33RD DR #200	PORTLAND	OR 97211
SPII LLC-75% & UNITED SALAD CO-25%	8448 NE 33RD DR #200	PORTLAND	OR 97211-2105
SPINNETT,STEVE TR & SPINNETT,CYNTHIA A TR	7315 SE 92ND AVE	PORTLAND	OR 97266
SPIVAK,HELEN	1912 NE 27TH AVE	PORTLAND	OR 97212-5021
SPRAGUE,MABEL IRENE /FOX RUN MFD'G HOME COMMUNITY	9000 NE MLK BLVD #503	PORTLAND	OR 97211
SPRING WATER BUSINESS PARK LLC	10811 SE IDLEMAN RD	HAPPY VALLEY	OR 97086

SPRING WATER BUSINESS PARK LLC	10811 SE IDLEMAN RD	HAPPY VALLEY	OR	97086
SPRINGWATER INDUSTRIAL CENTER LLC	5240 SE 82ND AVE	PORTLAND	OR	97266
SPRINGWATER INDUSTRIAL CENTER LLC	5240 SE 82ND AVE	PORTLAND	OR	97266
SPRINGWATER INDUSTRIAL CENTER LLC	5240 SE 82ND AVE	PORTLAND	OR	97266
SPRINGWATER INDUSTRIAL CENTER LLC	5240 SE 82ND AVE	PORTLAND	OR	97266
SPRINT COMMUNICATIONS CO L P MS KSOPHL0512-5APTX	PO BOX 12913	SHAWNEE MISSION	KS	66282-2913
SPRINT COMMUNICATIONS CO L P TO SPRINT PROPERTY TAX DEPT	PO BOX 12913	SHAWNEE MISSION	KS	66282-2913
SRC REAL ESTATE HOLDINGS LLC	4018 N WILLIAMS AVE	PORTLAND	OR	97227-1447
SREK PROPERTIES LLC	2101 SE 6TH AVE	PORTLAND	OR	97214
ST BIRGITTA CATHOLIC CHURCH PORTLAND OREGON	11820 NW ST HELENS RD	PORTLAND	OR	97231
ST BIRGITTA CATHOLIC CHURCH PORTLAND OREGON	11820 NW ST HELENS RD	PORTLAND	OR	97231
STACK METALLURGICAL SERVICES INC> % NELSON,KENDRA-SEC/TRE	P O BOX 17176	PORTLAND	OR	97217
STACK METALLURGICAL SERVICES INC> % NELSON,KENDRA-SEC/TRE	P O BOX 17176	PORTLAND	OR	97217
STACK METALLURGICAL SERVICES INC> % NELSON,KENDRA-SEC/TRE	P O BOX 17176	PORTLAND	OR	97217
STACK METALLURGICAL SERVICES INC> % NELSON,KENDRA-SEC/TRE	P O BOX 17176	PORTLAND	OR	97217
STACY & WITBECK INC	2800 HARBOR BAY PKWY	ALAMEDA	CA	94502-3040
STACY AND WITBECK INC	2800 HARBOR BAY PKWY	ALAMEDA	CA	94502-3040
STACY AND WITBECK INC	2800 HARBOR BAY PKWY	ALAMEDA	CA	94502-3040
STACY AND WITBECK INC	2800 HARBOR BAY PKWY	ALAMEDA	CA	94502-3040
STACY AND WITBECK INC	2800 HARBOR BAY PKWY	ALAMEDA	CA	94502-3040
STACY AND WITBECK INC	2800 HARBOR BAY PKWY	ALAMEDA	CA	94502-3040
STACY AND WITBECK INC	2800 HARBOR BAY PKWY	ALAMEDA	CA	94502-3040
STAFFORD,LYNN	2020 SW MARKET ST DR #204	PORTLAND	OR	97201-7717
STAHL,SEAN	9433 NE 3RD DR	PORTLAND	OR	97211
STANDARD STEEL HOLDINGS LLC	PO BOX 4828	PORTLAND	OR	97208-4828
STANDARD STEEL PROPERTY LLC	PO BOX 2866	PORTLAND	OR	97208-2866
STANDARD STEEL PROPERTY LLC	PO BOX 2866	PORTLAND	OR	97208-2866
STANDARD STEEL PROPERTY LLC	PO BOX 2866	PORTLAND	OR	97208-2866
STAR INDUSTRIES INC	130 LAKESIDE AVE #20	SEATTLE	WA	98122
STAR INDUSTRIES INC	130 LAKESIDE AVE #20	SEATTLE	WA	98122
STAR INDUSTRIES INC	130 LAKESIDE AVE #20	SEATTLE	WA	98122
STAR INDUSTRIES INC	130 LAKESIDE AVE #20	SEATTLE	WA	98122

STAR LEASING TO NEW DELCO PETROLEUM LLC %BALJIT DHILLON	13 LAKESHORE DR	WEST WINDSOR	NJ	8550
STARK & SANDY BUILDING LLC % BLATNER,JOSEPH	737 SE SANDY BLVD	PORTLAND	OR	97214
STARK GROUP 2 LLC	2330 NW 31ST AVE	PORTLAND	OR	97210-2034
STARK GROUP 2 LLC	2330 NW 31ST AVE	PORTLAND	OR	97210-2034
STARK STREET GROUP LLC	PO BOX 1862	LAKE OSWEGO	OR	97035
STARLING BAY PROPERTIES LLC	PO BOX 11423	PORTLAND	OR	97211-0423
STARLINK LOGISTICS INC % DIRECTOR OF REMEDIATION	55 CORPORATE DR	BRIDGEWATER	NJ	08807-1265
STARLINK LOGISTICS INC % DIRECTOR OF REMEDIATION	55 CORPORATE DR	BRIDGEWATER	NJ	08807-1265
STARLINK LOGISTICS INC % DIRECTOR OF REMEDIATION	55 CORPORATE DR	BRIDGEWATER	NJ	08807-1265
STARLINK LOGISTICS INC % DIRECTOR OF REMEDIATION	55 CORPORATE DR	BRIDGEWATER	NJ	08807-1265
STARR,AARON D & STARR,MOLLY J	4033 SE TENINO ST	PORTLAND	OR	97202-8045
STECA,TONEY	PO BOX 96104	PORTLAND	OR	97296-6002
STEEL HAMMER PROPERTIES LLC	8524 N CRAWFORD ST	PORTLAND	OR	97203
STEEL HAMMER PROPERTIES LLC	8524 N CRAWFORD ST	PORTLAND	OR	97203
STEEL HAMMER PROPERTIES LLC	8524 N CRAWFORD ST	PORTLAND	OR	97203
STEEL HAMMER PROPERTIES LLC	8524 N CRAWFORD ST	PORTLAND	OR	97203
STEEL HAMMER PROPERTIES LLC	8524 N CRAWFORD ST	PORTLAND	OR	97203
STEEL HAMMER PROPERTIES LLC	8524 N CRAWFORD ST	PORTLAND	OR	97203
STEEL HAMMER PROPERTIES LLC	8524 N CRAWFORD ST	PORTLAND	OR	97203
STEELHAMMER INVESTMENTS LLC % GEOFFREY STEELHAMMER	61855 DUNBAR CT	BEND	OR	97702
STEELMAN PROPTS LLC ET AL	PO BOX 4046	PORTLAND	OR	97208
STEELMILL WAREHOUSE LLC	14025 N RIVERGATE BLVD	PORTLAND	OR	97203
STEELMILL WAREHOUSE LLC	14025 N RIVERGATE BLVD	PORTLAND	OR	97203
STEIGERWALD,DENNIS A	3134 NE COLUMBIA BLVD	PORTLAND	OR	97211-2068
STEINER CORPORATION	505 E SOUTH TEMPLE	SALT LAKE CITY	UT	84102
STEINER CORPORATION	PO BOX 2317	SALT LAKE CITY	UT	84110
STEINER CORPORATION	505 E SOUTH TEMPLE	SALT LAKE CITY	UT	84102
STEINER CORPORATION 505 E SOUTH TEMPLE	PO BOX 17337	SALT LAKE CITY	UT	84102-1004
STEINFELDS PRODUCTS CO	15645 N LOMBARD ST	PORTLAND	OR	97203-6469
STEINMETZ CONDOMINIUMS OWNERS ASSOCIATION	1405 SE 8TH AVE	PORTLAND	OR	97214
STEINMETZ,MARY C & STEINMETZ,PETER A	19955 SW WALQUIN CT	ALOHA	OR	97007-3708
STEINMETZ,PAULA-1/2	1567 SYCAMORE CANYON RD	SANTA BARBARA	CA	93108
STENNO CARBON CO	PO BOX 83008	PORTLAND	OR	97283
STENNO CARBON INC	PO BOX 83008	PORTLAND	OR	97283

STEPHENS,ROBERT TR	5812 NE SIMPSON ST	PORTLAND	OR	97218-2369
STEPHENS,ROBERT TR	5812 NE SIMPSON ST	PORTLAND	OR	97218-2369
STEPHENSON,JAMES E TR	18360 SE WILLAMETTE DR	MILWAUKIE	OR	97267
STERN,SHARON A TR ET AL % FERGUSON ENTERPRISES LEGAL/REAL	12500 JEFFERSON AVE	NEWPORT NEWS	VA	23602
STEVENS INTEGRATED SOLUTIONS INC	4101 SE 26TH AVE	PORTLAND	OR	97202
STEVENS INTEGRATED SOLUTIONS INC	4101 SE 26TH AVE	PORTLAND	OR	97202
STEVENS,CORWIN E EST OF BY MARSHALL,H E TR	UNKNOWN ADDRESS			
STEVE'S PERSONALIZED IMPORTS I	7273 SE 92ND AVE	PORTLAND	OR	97266
STONE DISTRICT 1 LLC %NAI NORRIS BEGGS & SIMPSON	121 SW MORRISON ST #200	PORTLAND	OR	97204
STONE WORKS GROUP LLC	1807 SE 7TH AVE	PORTLAND	OR	97214
STONE WORKS GROUP LLC	1807 SE 7TH AVE	PORTLAND	OR	97214
STONER,DAVID	P O BOX 82717	PORTLAND	OR	97282
STORAGE EQUITIES/PS PARTNERS - % PUBLIC STORAGE MGMT INC I	PO BOX 25025	GLENDALE	CA	91221-5025
STORAGE EQUITIES/PS PARTNERS I % PUBLIC STORAGE MGMT INC I	PO BOX 25025	GLENDALE	CA	91221-5025
STORM,ANTHONY G & ANDREA K %ANTHONY G STORM	33325 NE OLD PARRETT MTN RD	NEWBERG	OR	97132
STOR-N-LOK WAREHOUSES INC %CEDARTREE MGMNT CO	PO BOX 2879	VANCOUVER	WA	98668
STOR-N-LOK WAREHOUSES INC %CEDARTREE MGMNT CO	PO BOX 2879	VANCOUVER	WA	98668
STOUDT FAMILY PROPERTIES LLC	PO BOX 14340	PORTLAND	OR	97293-0340
STOUDT FAMILY PROPERTIES LLC	PO BOX 14340	PORTLAND	OR	97293-0340
STOUDT FAMILY PROPERTIES LLC	PO BOX 14340	PORTLAND	OR	97293-0340
STOUDT FAMILY PROPERTIES LLC	PO BOX 14340	PORTLAND	OR	97293-0340
STOVALL,GABRIEL E & KO,JANA L	9049 NE 3RD AVE	PORTLAND	OR	97211
STOVALL,IVY	6814 N ST LOUIS AVE	PORTLAND	OR	97203
STOVALL,IVY & FOSS,CHARLES	6814 N ST LOUIS AVE	PORTLAND	OR	97203
STRAND,TIFFANY	5735 NE 109TH AVE	PORTLAND	OR	97220
STRASSBERG-PHILLIPS,ADAM F TR PHILLIPS,DAJA K TR-37.5% & PHI	450 SEQUOIA AVE	PALO ALTO	CA	94306
STRAUCH INVESTMENTS L L C	5216 SW 52ND AVE	PORTLAND	OR	97221
STRAUCH INVESTMENTS L L C	5216 SW 52ND AVE	PORTLAND	OR	97221
STRAUCH INVESTMENTS L L C	5216 SW 52ND AVE	PORTLAND	OR	97221
STREIMER SHEET METAL WORKS INC	740 N KNOTT ST	PORTLAND	OR	97227-2099
STREIMER,FREDERICK L TR (FREDERICK L STREIMER 2012 IRREVOCA	740 N KNOTT ST	PORTLAND	OR	97227-2099
STREIMER,MICHAEL R & STREIMER,FREDERICK L	740 N KNOTT ST	PORTLAND	OR	97227-1613
STREIMER,MICHAEL R-1/2 & STREIMER,FREDERICK L TR-1/2	740 N KNOTT ST	PORTLAND	OR	97227-1613
STREIMER,MICHAEL R-1/2 & STREIMER,FREDERICK L TR-1/2	740 N KNOTT ST	PORTLAND	OR	97227-1613

STREIMER,MICHAEL R-1/2 & STREIMER,FREDERICK L TR-1/2	740 N KNOTT ST	PORTLAND	OR	97227-1613
STREIMER,MICHAEL R-1/2 & STREIMER,FREDERICK L TR-1/2	740 N KNOTT ST	PORTLAND	OR	97227-1613
STREIMER,MICHAEL R-1/2 & STREIMER,FREDERICK L TR-1/2	740 N KNOTT ST	PORTLAND	OR	97227-1613
STREIMER,MICHAEL R-1/2 & STREIMER,FREDERICK L TR-1/2	740 N KNOTT ST	PORTLAND	OR	97227-1613
STREIMER,MICHAEL R-1/2 & STREIMER,FREDERICK L TR-1/2	740 N KNOTT ST	PORTLAND	OR	97227-1613
STREIMER,MICHAEL R-1/2 & STREIMER,FREDERICK L TR-1/2	740 N KNOTT ST	PORTLAND	OR	97227-1613
STREIMER,MICHAEL R-1/2 STREIMER,FREDERICK L TR-1/2	740 N KNOTT ST	PORTLAND	OR	97227-1613
STRIDER EQUITIES LLC	2516 SE 8TH AVE	PORTLAND	OR	97202
STROMME,MARK R	2300 SW BROADWAY DR	PORTLAND	OR	97201-1607
STUART LLC	PO BOX 20549	PORTLAND	OR	97294-0549
STUDIO 24 LLC % STINSON,L PATRICK & STINSON,CATHY L	7535 SE 21ST AVE	PORTLAND	OR	97206-6225
STUMPTOWN HOLDING CO	915 SE HAWTHORNE BLVD	PORTLAND	OR	97214-3545
STUMPTOWN HOLDING CO	915 SE HAWTHORNE BLVD	PORTLAND	OR	97214-3545
SULLIVAN,DIRK W & SULLIVAN,GWENDOLYN M	1539 SE 35TH PL	PORTLAND	OR	97214
SULLIVAN,DIRK W & SULLIVAN,GWENDOLYN M	1539 SE 35TH PL	PORTLAND	OR	97214
SULZER PUMPS (US) INC	800 KOOMEY RD	BROOKSHIRE	TX	77423
SULZER PUMPS (US) INC	800 KOOMEY RD	BROOKSHIRE	TX	77423
SUMMIT PROPERTIES INC	4380 SW MACADAM AVE #330	PORTLAND	OR	97239-6427
SUMMIT PROPERTIES INC	4380 SW MACADAM AVE #330	PORTLAND	OR	97239-6427
SUMMIT PROPERTIES INC	4380 SW MACADAM AVE #330	PORTLAND	OR	97239-6427
SUMMIT PROPERTIES INC	4380 SW MACADAM AVE #330	PORTLAND	OR	97239-6427
SUMMIT PROPERTIES INC	4380 SW MACADAM AVE #330	PORTLAND	OR	97239-6427
SUMMIT PROPERTIES INC	4380 SW MACADAM AVE #330	PORTLAND	OR	97239-6427
SUNDANCE MARINE GROUP L L C	570 NE TOMAHAWK ISLAND DR	PORTLAND	OR	97217-8058
SUNDANCE MARINE GROUP L L C	570 NE TOMAHAWK ISLAND DR	PORTLAND	OR	97217-8058
SUNDELEAF HOLDING LLC	2037 SE OCHOCO ST	PORTLAND	OR	97222
SUNDERLAND FLAT LLC	7531 NE 33RD DR	PORTLAND	OR	97211-2013
SUNDERLAND FLAT LLC	7531 NE 33RD DR	PORTLAND	OR	97211-2013
SUNEDISON INC	501 PEARL DR	ST PETERS	MO	63376
SUNEDISON INC	501 PEARL DR	ST PETERS	MO	63376
SUNG,BOK-KYONG & MEE-AE	14612 SE BRIGHTWOOD AVE	MILWAUKIE	OR	97267

SUNSHINE DIVISION INC	687 N THOMPSON ST	PORTLAND	OR	97227
SUPER MOSCA LLC TO AXIOMATIC PROPERTY LLC	2746 NE 24TH AVE	PORTLAND	OR	97212-3417
SUPERIOR TANK WASH INC	P O BOX 6245	STOCKTON	CA	95206
SUPREME PERLITE CO	4600 N SUTTLE RD	PORTLAND	OR	97217-7720
SUPREME PERLITE CO	4600 N SUTTLE RD	PORTLAND	OR	97217-7720
SUPREME STEEL INC	4600 NE 138TH AVE	PORTLAND	OR	97230
SUPREME STEEL INC	4600 NE 138TH AVE	PORTLAND	OR	97230
SUPREME STEEL INC	4600 NE 138TH AVE	PORTLAND	OR	97230
SUPREME STEEL INC	4600 NE 138TH AVE	PORTLAND	OR	97230
SUTHERLAND,ROBERT B & SUTHERLAND,SYLVIA S	2211 SW 1ST AVE #502	PORTLAND	OR	97201-5012
SUTHERLAND,ROBERT B & SUTHERLAND,SYLVIA S	2211 SW 1ST AVE #502	PORTLAND	OR	97201-5012
SUTTER,DAVID R	10771 N LOMBARD ST	PORTLAND	OR	97203
SUTTER,DAVID R % DRAINE/PAULSON & CO	10771 N LOMBARD ST	PORTLAND	OR	97203
SWAN FOODS OREGON INC>	7124 N MARINE DR	PORTLAND	OR	97203
SWAN ISLAND DAIRY % THE KROGER CO PROPERTY TAX - 7TH FL	1014 VINE ST	CINCINNATI	OH	45202-1100
SWAN ISLAND DAIRY % THE KROGER CO PROPERTY TAX - 7TH FL	1014 VINE ST	CINCINNATI	OH	45202-1100
SWANSON,ROBERT D & SWANSON,MARIA G	34314 SE COLORADO RD	SANDY	OR	97055-8265
SWIGART,SHAWN TERRANCE	9000 NE M L KING BLVD SP 119	PORTLAND	OR	97211
T F A INC	3121 SW MOODY AVE	PORTLAND	OR	97201-4500
T&K BUILDING LLC	207 SE CLAY ST	PORTLAND	OR	97214
T&K BUILDING LLC	207 SE CLAY ST	PORTLAND	OR	97214
TABLE RAYMOND K & PATRICIA A	28400 NE 2ND AVE	RIDGEFIELD	WA	98642-8731
TAHDCH LLC	5230 NE 109TH AVE	PORTLAND	OR	97220-1125
TAJ DEVELOPMENT ROSE ROOM LLC	8102 NE KILLINGSWORTH ST	PORTLAND	OR	97218
TAJ DEVELOPMENT ROSE ROOM LLC	8102 NE KILLINGSWORTH ST	PORTLAND	OR	97218
TALCOTT,DIANA S & HON,LARRY R	2806 SE 15TH AVE	PORTLAND	OR	97202
TALUS DESIGN INC	3518 SE 21ST AVE	PORTLAND	OR	97202-2909
TALUS DESIGN INC	3518 SE 21ST AVE	PORTLAND	OR	97202-2909
TANKER BASIN LLC	5480 NW FRONT AVE	PORTLAND	OR	97210
TANNER,ROBERT F & JOSEPHINE M	7102 N OMAHA AVE	PORTLAND	OR	97217-5756
TANNER,RONALD D	144 SE 85TH AVE	PORTLAND	OR	97216
TARR ACQUISITION LLC	2946 NE COLUMBIA BLVD	PORTLAND	OR	97211-2062
TARR ACQUISITION LLC ATTN TARR,SKIP	2946 NE COLUMBIA BLVD	PORTLAND	OR	97211-2062
TASMAN PORTLAND REAL ESTATE LLC % TASMAN INDUSTRIES INC	930 GEIGER ST	LOUISVILLE	KY	40206

TAYLOR CORP DBA PHOTOCRAFT	1725 ROE CREST DR	NORTH MANKATO	MN	56003
TAYLOR CORP DBA PHOTOCRAFT	1725 ROE CREST DR	NORTH MANKATO	MN	56003
TAYLOR METZKER LLC	5220 NE 114TH ST	VANCOUVER	WA	98686
TAYLOR,BILLY R & NANCY P TO SABA PAPAYA CORP	3075 NW FRONT AVE	PORTLAND	OR	97210-1505
TAYLOR,JIMMY T	937 NW GLISAN ST #1135	PORTLAND	OR	97209
TAYLOR,TAMMY R /NONAMAKER,DONNA & TED	645 NE 178TH AVE	PORTLAND	OR	97230-6523
TBE LLC	10177 SE POWELL BLVD	PORTLAND	OR	97266-1812
TBH LLC	425 NE 9TH AVE	PORTLAND	OR	97232
TBH LLC	425 NE 9TH AVE	PORTLAND	OR	97232
TBH LLC	425 NE 9TH AVE	PORTLAND	OR	97232
TCN ENTERPRISES INC	PO BOX 20786	PORTLAND	OR	97294
TDR GROUP LLC % TIRE DISPOSAL AND RECYCLING'	PO BOX 83478	PORTLAND	OR	97283-0478
TEAM TUBE LLC	PO BOX 806	KENT	WA	98035
TEETER,DOUGLAS C	9946 N CLARENDON AVE	PORTLAND	OR	97203-1922
TEETER,DOUGLAS C	9946 N CLARENDON AVE	PORTLAND	OR	97203-1922
TEETER,DOUGLAS C	9946 N CLARENDON AVE	PORTLAND	OR	97203-1922
TEN THIRTY-FIVE SE 3RD LLC	1035 SE 3RD AVE	PORTLAND	OR	97214
TENTH STREET PROPERTIES LLC % RAWLINSON,DAVID A	432 NE 10TH AVE	PORTLAND	OR	97232-2713
TENTH STREET PROPERTIES LLC % RAWLINSON,DAVID A	432 NE 10TH AVE	PORTLAND	OR	97232-2713
TEVIS,MICHAEL L TR (1996 TEVIS REVOCABLE TRUST)	530 OAK GROVE AVE #201	MENLO PARK	CA	94025-3255
TEVIS,MICHAEL L TR (1996 TEVIS REVOCABLE TRUST)	530 OAK GROVE AVE #201	MENLO PARK	CA	94025-3255
TEVIS,MICHAEL L TR (1996 TEVIS REVOCABLE TRUST)	530 OAK GROVE AVE #201	MENLO PARK	CA	94025-3255
TFL DEVELOPMENT LLC	PO BOX 6774	PORTLAND	OR	97228
THAMES LLC	PO BOX 56150	PORTLAND	OR	97238-6150
THARP,THOMAS S & CHRISTINE M	P O BOX 13747	PORTLAND	OR	97213
THE AMERICAN NATIONAL RED CROSS % ARC NATIONAL TEST LAB-F	12124 NE AINSWORTH CIR	PORTLAND	OR	97220-9001
THE ARCHAEOLOGICAL CONSERVANCY	1717 GIRARD BLVD NE	ALBUQUERQUE	NM	87106
THE BOEING COMPANY	PO BOX 3707 M/C 6A1-01	SEATTLE	WA	98124-2207
THE CIT GROUP/EQUIPMENT FINANCING INC ATTN PROPERTY TAX I	1 CIT DR	LIVINGSTON	NJ	7039
THE COCA-COLA CO NAT 1116	1 COCA COLA PLZ NW	ATLANTA	GA	30313-2420
THE COCA-COLA CO NAT 1116	1 COCA COLA PLZ NW	ATLANTA	GA	30313-2420
THE COCA-COLA CO NAT 1116	1 COCA COLA PLZ NW	ATLANTA	GA	30313-2420
THE COLUMBIA RIVER PENSIONERS ATTN HANSON,RON	2435 NW FRONT AVE	PORTLAND	OR	97209
THE COLUMBIA RIVER PENSIONERS ATTN HANSON,RON	2435 NW FRONT AVE	PORTLAND	OR	97209

THE CRONN FAMILY LIMITED PARTN	19754 WILDWOOD DR	WEST LINN	OR	97068
THE DANNON COMPANY INC	100 HILLSIDE AVE	WHITE PLAINS	NY	10603
THE DEAN FAMILY LIMITED PARTNERSHIP	5550 SW WOODS CT	PORTLAND	OR	97221
THE FAZIO GERTZ ROAD PROPERTY LLC %PAUL T CASEY CO-PRESIDE	515 S FIGUEROA ST #1230	LOS ANGELES	CA	90071
THE FAZIO TIP VANCOUVER WAY PROPERTY LLC % FAZIO,JACK F & M	20815 NW SAUVIE ISLAND RD	PORTLAND	OR	97231-1342
THE FIFTH THIRD LEASING CO	P O BOX 218	NORTHBROOK	IL	60065-0218
THE FREEMAN GROUP ATTN FREEMAN,KEVIN	2034 NW 27TH AVE	PORTLAND	OR	97210
THE FREEMAN GROUP LLC	2034 NW 27TH AVE	PORTLAND	OR	97210
THE FREEMAN GROUP LLC	2034 NW 27TH AVE	PORTLAND	OR	97210
THE FREEMAN GROUP LLC % FREEMAN,KEVIN	2034 NW 27TH AVE	PORTLAND	OR	97210-2213
THE GALTON FAMILY LIMITED PARTNERSHIP % HOLTZ,THOMAS	3950 NW ST HELENS RD	PORTLAND	OR	97210
THE GALTON FAMILY LIMITED PARTNERSHIP % HOLTZ,THOMAS	3950 NW ST HELENS RD	PORTLAND	OR	97210
THE GREEN PLANET INC	16321 SE HILLSIDE LN	MILWAUKIE	OR	97267
THE HARRIS SOUP CO	17711 NE RIVERSIDE PKWY	PORTLAND	OR	97230
THE HARRIS SOUP CO	17711 NE RIVERSIDE PKWY	PORTLAND	OR	97230
THE IRWIN-HODSON COMPANY ATTN: ACCOUNTS PAYABLE	2838 SE 9TH AVE	PORTLAND	OR	97202
THE LYNCH CO	4706 SE 18TH AVE	PORTLAND	OR	97202
THE LYNCH CO-40%> & FAB FACILI BY RALSTON,MARTIN	4706 SE 18TH AVE	PORTLAND	OR	97202-4289
THE MARINE SALVAGE CONSORTIUM	6211 N ENSIGN ST	PORTLAND	OR	97217
THE NORTHWEST WOODWORKING STUDIO LLC	2906 NE 9TH AVE	PORTLAND	OR	97212-3147
THE OREGON HUMANE SOCIETY % DIRECTOR OF FINANCE	1067 NE COLUMBIA BLVD	PORTLAND	OR	97211-1411
THE OREGON HUMANE SOCIETY % DIRECTOR OF FINANCE	1067 NE COLUMBIA BLVD	PORTLAND	OR	97211-1411
THE OREGON HUMANE SOCIETY % DIRECTOR OF FINANCE	1067 NE COLUMBIA BLVD	PORTLAND	OR	97211-1411
THE OREGON HUMANE SOCIETY % DIRECTOR OF FINANCE	1067 NE COLUMBIA BLVD	PORTLAND	OR	97211-1411
THE OREGON HUMANE SOCIETY % DIRECTOR OF FINANCE	1067 NE COLUMBIA BLVD	PORTLAND	OR	97211-1411
THE OREGON HUMANE SOCIETY % DIRECTOR OF FINANCE	1067 NE COLUMBIA BLVD	PORTLAND	OR	97211-1411
THE OREGON HUMANE SOCIETY % DIRECTOR OF FINANCE	1067 NE COLUMBIA BLVD	PORTLAND	OR	97211-1411
THE OREGON HUMANE SOCIETY % DIRECTOR OF FINANCE	1067 NE COLUMBIA BLVD	PORTLAND	OR	97211-1411
THE OREGON HUMANE SOCIETY % DIRECTOR OF FINANCE	1067 NE COLUMBIA BLVD	PORTLAND	OR	97211-1411
THE OREGON HUMANE SOCIETY % DIRECTOR OF FINANCE	1067 NE COLUMBIA BLVD	PORTLAND	OR	97211-1411
THE PHARMACY BUILDING LLC	2467 SW ARDEN RD	PORTLAND	OR	97201
THE PORT OF PORTLAND ATTN MANAGER OF PROPERTY & DEVELOI	PO BOX 3529	PORTLAND	OR	97208-3529
THE PORT OF PORTLAND ATTN MANAGER OF PROPERTY & DEVELOI	PO BOX 3529	PORTLAND	OR	97208-3529

THE PROPERTY OF THE BLESSINGS %FLINTOFF,CLIFFORD A & FLINT(	PO BOX 749	KENT	WA	98035-0749
THE REDD LLC % ECOTRUST	721 NW 9TH AVE #200	PORTLAND	OR	97209-3448
THE REDD LLC % ECOTRUST	721 NW 9TH AVE #200	PORTLAND	OR	97209-3448
THE REED INSTITUTE ELLIOTT HALL ROOM 303	3203 SE WOODSTOCK BLVD	PORTLAND	OR	97202-8138
THE SALVATION ARMY	180 E OCEAN BLVD 3RD FLR	LONG BEACH	CA	90802
THE SCHETKY FAMILY LLC	8430 NE KILLINGSWORTH ST	PORTLAND	OR	97220-4659
THE SCHETKY FAMILY LLC	8430 NE KILLINGSWORTH ST	PORTLAND	OR	97220-4659
THE SMYTHE CO	1025 SE BROOKLYN ST	PORTLAND	OR	97202
THE STANDARD STEEL COMPANIES	PO BOX 4828	PORTLAND	OR	97208
THE TINDALL FAMILY PROPERTIES	2606 N NEWARK ST	PORTLAND	OR	97217-6926
THE TINDALL FAMILY PROPERTIES	2606 N NEWARK ST	PORTLAND	OR	97217
THE TINDALL FAMILY PROPERTIES	2606 N NEWARK ST	PORTLAND	OR	97217-6926
THE TINDALL FAMILY PROPERTIES	2606 N NEWARK ST	PORTLAND	OR	97217-6926
THE TINDALL FAMILY PROPERTIES	2606 N NEWARK ST	PORTLAND	OR	97217
THE TINDALL FAMILY PROPERTIES	2606 N NEWARK ST	PORTLAND	OR	97217
THE TINDALL FAMILY PROPERTIES	2606 N NEWARK ST	PORTLAND	OR	97217
THE TINDALL FAMILY PROPERTIES	2606 N NEWARK ST	PORTLAND	OR	97217-6926
THE TINDALL FAMILY PROPERTIES	2606 N NEWARK ST	PORTLAND	OR	97217
THE WAREHOUSE LLC %SALLY R ASHLEY	613 NW 11TH AVE	PORTLAND	OR	97209-3235
THE WEBSTER FAMILY LIMITED PAR	PO BOX 11229	PORTLAND	OR	97211-0229
THE WEBSTER FAMILY LIMITED PAR	PO BOX 11229	PORTLAND	OR	97211-0229
THE WEBSTER FAMILY LIMITED PAR	PO BOX 11229	PORTLAND	OR	97211-0229
THE WEBSTER FAMILY LIMITED PAR	PO BOX 11229	PORTLAND	OR	97211-0229
THE WEBSTER FAMILY LTD PRTNRSH	PO BOX 11229	PORTLAND	OR	97211-0229
THEAST LLC-57.16% & SHEAST LLC-42.84%	15171 SW BANGY RD	LAKE OSWEGO	OR	97035
THEAST LLC-57.16% & SHEAST LLC-42.84%	15171 SW BANGY RD	LAKE OSWEGO	OR	97035
THEAST LLC-57.16% & SHEAST LLC-42.84%	15171 SW BANGY RD	LAKE OSWEGO	OR	97035
THEDFORD,SANDRA DEE /FOX RUN MFG'D HOME COMM	9000 NE M L KING BLVD SP 503	PORTLAND	OR	97211
THIDWICK MANAGEMENT CO % WALSH CONSTRUCTION ATTN: WIE	2905 SW 1ST AVE	PORTLAND	OR	97201-4705
THIDWICK MANAGEMENT CO % WALSH CONSTRUCTION ATTN: WIE	2905 SW 1ST AVE	PORTLAND	OR	97201-4705
THIES,CURTIS W & THIES,YVONNE J	18525 NE MARINE DR #E10	PORTLAND	OR	97230
THIES,CURTIS W & THIES,YVONNE J	18525 NE MARINE DR #E10	PORTLAND	OR	97230
THIRD STREET LLC	306 SE ASH ST	PORTLAND	OR	97214-1105
THMAIN LLC-57.16% & SHMAIN LLC-42.84%	15171 SW BANGY RD	LAKE OSWEGO	OR	97035

THMAIN LLC-57.16% & SHMAIN LLC-42.84%	15171 SW BANGY RD	LAKE OSWEGO	OR	97035
THMAIN LLC-57.16% & SHMAIN LLC-42.84%	15171 SW BANGY RD	LAKE OSWEGO	OR	97035
THMAIN LLC-57.16% & SHMAIN LLC-42.84%	15171 SW BANGY RD	LAKE OSWEGO	OR	97035
THOMAS,ROGER V	8114 N MISSISSIPPI AVE	PORTLAND	OR	97217
THOMPSON,DENNIS & THOMPSON,CHRISTINE S	3525 NE 50TH AVE #311	PORTLAND	OR	97213
THOMSON,JOHN P	11800 SE STARFLOWER DR	DAMASCUS	OR	97089
THOMSON,JOHN P	11800 SE STARFLOWER DR	DAMASCUS	OR	97089
THORSFELDT,EARL A TR & THORSFELDT,MARY H TR	15730 SW QUEEN VICTORIA PL	TIGARD	OR	97224
THORSTAD,REBECCA F	2109 SW 35TH ST	REDMOND	OR	97756
THREE CHICKENS LLC	1621 SE PARDEE ST	PORTLAND	OR	97202
THURSTON INVESTMENTS LLC	9472 N BRISTOL AVE	PORTLAND	OR	97203
THURSTON,JO ANN % THURSTON,GENE & CARMA	9472 N BRISTOL AVE	PORTLAND	OR	97203-2227
TIBBETTS VILLAGE CONDOMINIUM OWNERS ASSOCIATION	11785 SE HWY 212 #313	CLACKAMAS	OR	97015
TICE PROPERTIES % MALONEY,JOHN	5405 N LAGOON AVE	PORTLAND	OR	97217
TIDAL HOLDINGS LTD	18411 GOTHARD ST #A	HUNTINGTON BEACH	CA	92648-1208
TIDWELL,RALPH L	PO BOX 87	GLADSTONE	OR	97027-0087
TIEU,HENRY	10404 NE SIMPSON ST	PORTLAND	OR	97220-1219
TIGARD STREET INVESTMENT LLC	PO BOX 2775	TUALATIN	OR	97062
TIGARD STREET INVESTMENT LLC	PO BOX 2775	TUALATIN	OR	97062
TIGARD STREET INVESTMENT LLC	PO BOX 2775	TUALATIN	OR	97062
TILBURY CEMENT CO % MARVIN F POER & CO	18818 TELLER AVE STE 277	IRVINE	CA	92612
TILBURY CEMENT CO % MARVIN F POER & CO	18818 TELLER AVE STE 277	IRVINE	CA	92612
TILGNER,MICHAEL C % BROTHERS TRUCK SERVICE INC	11205 SE FOSTER RD	PORTLAND	OR	97266-4007
TILIKUM BUILDING LLC	3865 NW GALES CREEK RD	FOREST GROVE	OR	97116
TIMBERLAND DEVELOPMENT CO LLC % LEATHERMAN TOOL GROUP PO BOX 20595	PO BOX 20595	PORTLAND	OR	97294
TIMBERLAND DEVELOPMENT CO LLC % LEATHERMAN TOOL GROUP PO BOX 20595	PO BOX 20595	PORTLAND	OR	97294
TIME OIL CO	2737 W COMMODORE WY	SEATTLE	WA	98199
TIME OIL CO	2737 W COMMODORE WY	SEATTLE	WA	98199
TIME OIL CO	2737 W COMMODORE WY	SEATTLE	WA	98199
TIME OIL CO ET AL % SCHNITZER INVESTMENT CORP	818 STEWART STREET SUITE 700	SEATTLE	WA	98101
TIME OIL CO ET AL % SCHNITZER INVESTMENT CORP	818 STEWART STREET SUITE 700	SEATTLE	WA	98101
TIME OIL CO TOC HOLDINGS CO	2737 W COMMODORE WAY	SEATTLE	WA	98199-1233
TIME OIL CO TOC HOLDINGS CO	2737 W COMMODORE WAY	SEATTLE	WA	98199-1233
TINDALL,ILENE K TR	12040 NW TUALATIN AVE	PORTLAND	OR	97229

TINDALL,ILENE K TR	12040 NW TUALATIN AVE	PORTLAND	OR	97229
TKM INVESTMENT PROPERTIES LLC	P O BOX 14607	PORTLAND	OR	97293
TKMR LIM LLC	12350 SW WINTERVIEW DR	TIGARD	OR	97224-0710
TMK PROPERTIES LLC	3948 SE ARBOR CT	HILLSBORO	OR	97123-7587
TMK PROPERTIES LLC	3948 SE ARBOR CT	HILLSBORO	OR	97123-7587
TMNSUZ LLC	12806 NW LORRAINE DR	PORTLAND	OR	97229
TMT AIRPORT WAY INDUSTRIAL INC % CORE & VALUE ADVISORS LL(851 SW 6TH AVE #1200		PORTLAND	OR	97204-1349
TMT AIRPORT WAY INDUSTRIAL INC % CORE & VALUE ADVISORS LL(851 SW 6TH AVE #1200		PORTLAND	OR	97204-1349
TMT AIRPORT WAY INDUSTRIAL INC % CORE & VALUE ADVISORS LL(851 SW 6TH AVE #1200		PORTLAND	OR	97204-1349
TMT AIRPORT WAY INDUSTRIAL INC % CORE & VALUE ADVISORS LL(851 SW 6TH AVE #1200		PORTLAND	OR	97204-1349
TMT AIRPORT WAY INDUSTRIAL INC % CORE & VALUE ADVISORS LL(851 SW 6TH AVE #1200		PORTLAND	OR	97204-1349
TMT AIRPORT WAY INDUSTRIAL INC % CORE & VALUE ADVISORS LL(851 SW 6TH AVE #1200		PORTLAND	OR	97204-1349
TMT AIRPORT WAY INDUSTRIAL INC % CORE & VALUE ADVISORS LL(851 SW 6TH AVE #1200		PORTLAND	OR	97204-1349
TMT AIRPORT WAY INDUSTRIAL INC % CORE & VALUE ADVISORS LL(851 SW 6TH AVE #1200		PORTLAND	OR	97204-1349
TMT AIRPORT WAY INDUSTRIAL INC % CORE & VALUE ADVISORS LL(851 SW 6TH AVE #1200		PORTLAND	OR	97204-1349
TMT AIRPORT WAY INDUSTRIAL INC % CORE & VALUE ADVISORS LL(851 SW 6TH AVE #1200		PORTLAND	OR	97204-1349
TOC HOLDINGS CO	2737 W COMMODORE WY	SEATTLE	WA	98199
TODD,MATTHEW A	4005 NE BRYANT ST	PORTLAND	OR	97211-2169
TODD,MATTHEW A	4005 NE BRYANT ST	PORTLAND	OR	97211-2169
TODD,MATTHEW A	4005 NE BRYANT ST	PORTLAND	OR	97211-2169
TOHLEASE CORP	1251 AVENUE OF THE AMERICAS	NEW YORK	NY	10020
TOKAREV,NIKOLAY & LEVITSKAYA,NATALYA	8121 SE MALDEN CT	PORTLAND	OR	97206
TOLLEY,JAMES A % REVL, IRENE L	301 HWY 22	KEIZER	OR	97303
TOM MOYER THEATRES LLC	805 SW BROADWAY #2020	PORTLAND	OR	97205-3360
TOM MOYER THEATRES LLC(LEASED % JACK IN THE BOX ATTN PROP	9330 BALBOA AVE	SAN DIEGO	CA	92123-1516
TOMAHAWK DESTINY ASSOCIATION	288 N TOMAHAWK ISLAND DR	PORTLAND	OR	97217
TOMAHAWK ISLAND MARINA 1 LLC	3144 SE TUALATIN VALLEY HWY	HILLSBORO	OR	97123
TOMAHAWK ISLAND MARINA 1 LLC	3144 SE TUALATIN VALLEY HWY	HILLSBORO	OR	97123
TOMAS DIEGO,FRANCISCO	9000 NE M L KING BLVD SP 04	PORTLAND	OR	97211
TOMLINSON,STUART J & LANGFORD,LIZA J	2348 NW ROOSEVELT ST	PORTLAND	OR	97210-2323
TON,BILL T & PHAM,DUONG H	7107 SE 82ND AVE	PORTLAND	OR	97266

TONKIN PARTS CENTER PROPERTY LLC	12155 NE AIRPORT WAY	PORTLAND	OR	97220-1083
TONKIN PARTS CENTER PROPERTY LLC	12155 NE AIRPORT WAY	PORTLAND	OR	97220-1083
TONNESON INVESTMENT PARTNERS	756 NE LOMBARD ST	PORTLAND	OR	97211
TONNESON INVESTMENT PARTNERS	756 NE LOMBARD ST	PORTLAND	OR	97211
TONNESON INVESTMENT PARTNERS	756 NE LOMBARD ST	PORTLAND	OR	97211
TONNESON INVESTMENT PARTNERS	756 NE LOMBARD ST	PORTLAND	OR	97211
TONNESON INVESTMENT PARTNERS	940 NE LOMBARD ST	PORTLAND	OR	97211-3566
TONNESON INVESTMENT PARTNERS	756 NE LOMBARD ST	PORTLAND	OR	97211
TONNESON,RICHARD & JOYCE	756 NE LOMBARD ST	PORTLAND	OR	97211-3562
TONQUIN RESOURCES LTD	13225 N LOMBARD ST	PORTLAND	OR	97203-6410
TONY AND THE WYSE GUYS LLC % WYSE REAL ESTATE ADVISORS	810 SE BELMONT ST #100	PORTLAND	OR	97214
TOP TREE LLC	12433 SE SCHERRER ST	HAPPY VALLEY	OR	97086
TORCHIA,CAROL A ET AL % POLEO,JOSEPH C	12545 NE BEECH ST	PORTLAND	OR	97230-1322
TORRES,PROSPERO	5041 NE 112TH AVE	PORTLAND	OR	97220-1004
TORRES,PROSPERO	5041 NE 112TH AVE	PORTLAND	OR	97220
TOTAH,JOSEPH & ARECHIGA,IRMA-28%				
TOTAH,TIMOTHY E & CAROL T	3135 LANSDOWN CT	PLEASANTON	CA	94588
TOWNER,MILES ALLEN	12702 FRY RD NE	AURORA	OR	97002
TOWNSEND FARMS	23303 NE SANDY BLVD	FAIRVIEW	OR	97024
TOYOTA MOTOR SALES U S A INC % CORP TAX DEPT #73012	19001 S WESTERN AVE	TORRANCE	CA	90501-1106
TOYOTA MOTOR SALES USA INC C/O CORP TAX DEPT #73012	19001 S WESTERN AVE	TORRANCE	CA	90501-2991
TPL METALS NORTHWEST INC 23201 LAKE CENTER DR	SUITE 300	LAKE FOREST	CA	92630
TRACK SEVEN CONDOMINIUM OWNERS ASSOCIATION % KAISER GR	3811 N MISSISSIPPI AVE #200	PORTLAND	OR	97227
TRAFFIC SAFETY SUPPLY CO	2324 SE UMATILLA ST	PORTLAND	OR	97202-7439
TRAFFIC SAFETY SUPPLY CO % PARSON,RICHARD A	2324 SE UMATILLA ST	PORTLAND	OR	97202-7439
TRAINOR,PATRICK A	8426 NE WEBSTER ST	PORTLAND	OR	97220-4647
TRAINOR,PATRICK A	8426 NE WEBSTER ST	PORTLAND	OR	97220-4647
TRAINOR,PATRICK A	8426 NE WEBSTER ST	PORTLAND	OR	97220-4647
TRAINOR,PATRICK A	8426 NE WEBSTER ST	PORTLAND	OR	97220-4647
TRAINOR,PATRICK A	8426 NE WEBSTER ST	PORTLAND	OR	97220
TRAN,BANG V & LAM,DAO ANH THI	1515 E BURNSIDE ST	PORTLAND	OR	97214-1452
TRAN,BANG V & LAM,DAO ANH THI	1515 E BURNSIDE ST	PORTLAND	OR	97214-1452
TRAN,KHIET M TR & NGUYEN,ANH H TR	45 VIA DE GUADALUPE	SAN JOSE	CA	95116-2561
TRAN,KHIET M TR & NGUYEN,ANH H TR	45 VIA DE GUADALUPE	SAN JOSE	CA	95116-2561

TRAN,LAN & TRAN,LAN THI PHUONG	4630 SE 52ND AVE	PORTLAND	OR	97206-4923
TRAN,LONG TY & LEE,SUNHY HYOSUN	410 SE DIVISION PL	PORTLAND	OR	97202-1020
TRAN,PHUC H & AU-TRAN,XUAN T % AU,XUAN THI	1531 MAMMOTH PL	ROHNERT PARK	CA	94928
TRANSCO INDUSTRIES INC	PO BOX 20429	PORTLAND	OR	97294
TRANSCO INDUSTRIES INC	PO BOX 20429	PORTLAND	OR	97294
TRANSLOADER INTERNATIONAL COMPANY LLC>	8888 NW ST HELENS RD	PORTLAND	OR	97231
TRANSNATIONAL PRINTING /RUNDEL PRODUCTS INC	4380 SW MACADAM AVE #590	PORTLAND	OR	97239
TRANSPORT PROPERTIES LLC	PO BOX 10748	PORTLAND	OR	97296-0748
TRANSPORT PROPERTIES LLC	PO BOX 10748	PORTLAND	OR	97296-0748
TRANSPORT PROPERTIES LLC	PO BOX 10748	PORTLAND	OR	97296-0748
TRANSPORT PROPERTIES LLC	PO BOX 10748	PORTLAND	OR	97296-0748
TRAPOLD,THOMAS A TR (FBO ELLY M TRAPOLD TRUST>	P O BOX 30114	PORTLAND	OR	97294-3100
TRELSTAD,WENDY D	7029 SE 83RD AVE	PORTLAND	OR	97266
TRENT,STEVEN	1926 SE 9TH AVE	PORTLAND	OR	97214-4612
TRENT,STEVEN	1926 SE 9TH AVE	PORTLAND	OR	97214-4612
TRENT,STEVEN	5823 SW GUNTHER LN	PORTLAND	OR	97219
TREY LLC	5055 NE FREMONT ST	PORTLAND	OR	97213
TRI COUNTY METROPOLITAN TRANS DISTRICT OF OREGON ATTN: RI	4012 SE 17TH AVE	PORTLAND	OR	97202-3940
TRIAD MACHINERY INC	18200 NE RIVERSIDE PKWY	PORTLAND	OR	97230-5178
TRIAD MACHINERY INC	18200 NE RIVERSIDE PKWY	PORTLAND	OR	97230-5178
TRIANGLE AVIATION RDD LLC ATTN: DEROSE,DAVID	4700 EMPIRE AVE	BURBANK	CA	91505
TRIANGLE AVIATION RDD LLC ATTN: DEROSE,DAVID	4700 EMPIRE AVE	BURBANK	CA	91505
TRI-COUNTY METROPOLITAN TRANSP DISTRICT OF OREGON ATTN: I	4012 SE 17TH AVE	PORTLAND	OR	97202-3940
TRI-COUNTY METROPOLITAN TRANSP DISTRICT OF OREGON ATTN: I	4012 SE 17TH AVE	PORTLAND	OR	97202-3940
TRI-COUNTY METROPOLITAN TRANSPORTATION DIST OF OREGON 9	710 NE HOLLADAY ST	PORTLAND	OR	97232-2168

TRI-COUNTY METROPOLITAN TRANSPORTATION DISTRICT	4012 SE 17TH AVE	PORTLAND	OR	97202-3940

TRI-COUNTY METROPOLITAN TRANSPORTATION DISTRICT OF OREG 4012 SE 17TH AVE		PORTLAND	OR	97202-3940

TRI-STATE CONSTRUCTION INC	320 106TH AVE NE #B	BELLEVUE	WA	98004-5791
TRI-STATE CONSTRUCTION INC	320 106TH AVE NE #B	BELLEVUE	WA	98004-5791
TRI-STATE CONSTRUCTION INC	P O BOX 3686	BELLEVUE	WA	98009-3686
TROUTNER,GARY A TR	PO BOX 489	FAIRVIEW	OR	97024
TRUCK TERMINALS INC	PO BOX 2106	BEAVERTON	OR	97075
TRUCK TERMINALS INC	PO BOX 2106	BEAVERTON	OR	97075
TRUDEAU'S OREGON ENTERPRISES LLC	304 E SPRAGUE AVE	SPOKANE	WA	99202
TRUONG,LUAN K & TRUONG,LUAN	13609 SE 128TH AVE	CLACKAMAS	OR	97015
TS & KS ENTERPRISES LLC ATTN: SPITZNAGEL,TOM	PO BOX 25058	PORTLAND	OR	97298-0058
TS APARTMENTS LLC-50% & MINCHEFF & MINCHEFF INVESTMENTS	537 SE ASH ST #101	PORTLAND	OR	97214
TSE DEVELOPMENT LLC	PO BOX 14764	PORTLAND	OR	97293
TSE DEVELOPMENT LLC	PO BOX 14764	PORTLAND	OR	97293
TSIORBA,LEV	4119 SE 25TH AVE	PORTLAND	OR	97202
TSOUMAS,STAN J TR & TSOUMAS,ARMA P TR	3550 SW BOND AVE #1206	PORTLAND	OR	97239-4718
TSOUMAS,STAN J TR & TSOUMAS,ARMA P TR	3550 SW BOND AVE #1206	PORTLAND	OR	97239-4718
TSOUMAS,STAN J TR & TSOUMAS,ARMA P TR	3550 SW BOND AVE #1206	PORTLAND	OR	97239-4718
TSP PORTLAND LLC	2001 CENTER ST	TACOMA	WA	98409
TUBE FORGINGS OF AMERICA INC % VETETO,MARK	3121 SW MOODY AVE	PORTLAND	OR	97239-4500
TUBE FORGINGS OF AMERICA INC % VETETO,MARK	3121 SW MOODY AVE	PORTLAND	OR	97239-4500
TUCKER,BONNIE TR & TUCKER,GARY TR	14498 SE SUMMIT CT	CLACKAMAS	OR	97015-7289
TUCKER,THOMAS L	PO BOX 3933	PORTLAND	OR	97208
TUCKER,THOMAS L	PO BOX 3933	PORTLAND	OR	97208
TURNER,TOMMY L	36548 HIGHWAY 12	DAYTON	WA	99328-9692
TV6-W LLC % TAX DEPT OR16996	8051 CONGRESS AVE	BOCA RATON	FL	33487-1307
TWAIN LLC	203 SE ALDER ST	PORTLAND	OR	97214
TWELFTH STREET BUILDING LLC	411 NE 12TH AVE	PORTLAND	OR	97232-2717
TWIETMEYER URS LLC % TWIETMEYER,MARK D	123 NE 7TH AVE	PORTLAND	OR	97232
TYEE YACHT CLUB INC % BILLUPS & COMPANY	10151 SE SUNNYSIDE RD #499	CLACKAMAS	OR	97015
TYEE YACHT CLUB INC % BILLUPS & COMPANY	10151 SE SUNNYSIDE RD #499	CLACKAMAS	OR	97015
TZIU MARTIN,CARLOS	9000 NE M L KING BLVD SP 33	PORTLAND	OR	97211
U S BANCORP LEASING	7659 SW MOHAWK ST	TUALATIN	OR	97062-9190
U S BANCORP LEASING & FINANCIA % WHITMORE,RON PROP TAX C	7659 SW MOHAWK ST	TUALATIN	OR	97062-9190
U S COAST GUARD	6767 N BASIN AVE	PORTLAND	OR	97217

U S WEST BUSINESS RESOURCES IN ATTN COX,K C	6300 S SYRACUSE WY 700N	ENGLEWOOD	CO	80111
UBEHO INVESTMENT CO % UBEHO	PO BOX 3916	PORTLAND	OR	97208-3916
UNIFIRST CORP % TAX DEPT	68 JONSPIN RD	WILMINGTON	MA	1887
UNIFIRST CORP % TAX DEPT	68 JONSPIN RD	WILMINGTON	MA	1887
UNION BANK OF CALIFORNIA 445 S FIGUEROA ST	15TH FLOOR, MAIL CODE G15-20(	LOS ANGELES	CA	90071
UNION PACIFIC % UNION PACIFIC RAILROAD PROPERTY TAX	1400 DOUGLAS STOP 1640	OMAHA	NE	68179-1640
UNION PACIFIC % UNION PACIFIC RAILROAD PROPERTY TAX	1400 DOUGLAS STOP 1640	OMAHA	NE	68179-1640
UNION PACIFIC % UNION PACIFIC RAILROAD PROPERTY TAX	1400 DOUGLAS STOP 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD CO % BNSF RAILWAY CO ATTN LEGAL DEI	2500 LOU MENK DR	FORT WORTH	TX	76131
UNION PACIFIC RAILROAD CO ATTN ACQUISITIONS	1400 DOUGLAS ST	OMAHA	NE	68179-0002
UNION PACIFIC RAILROAD COMPANY	1400 DOUGLAS ST MS 1640	OMAHA	NE	68179
UNION PACIFIC RAILROAD COMPANY ATTN ASSISTANT VP - TAX	1400 DOUGLAS ST MS 1640	OMAHA	NE	68179
UNION PACIFIC RAILROAD COMPANY ATTN ASSISTANT VP - TAX	1400 DOUGLAS ST MS 1640	OMAHA	NE	68179
UNION PACIFIC RAILROAD COMPANY ATTN ASST VICE PRES-REAL ES	1400 DOUGLAS ST MS 1690	OMAHA	NE	68179
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640

UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640

UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640

UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN: PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN: PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN: PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN: PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN: PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN: PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN: PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN: PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN: PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN: PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN: PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNION PACIFIC RAILROAD COMPANY ATTN: PROPERTY TAX DEPT	1400 DOUGLAS ST - MS 1640	OMAHA	NE	68179-1640
UNITECH SERVICES GROUP INC	68 JONSPIN RD	WILMINGTON	MA	1887
UNITED AIRLINES	5848 N LAGOON AVE	PORTLAND	OR	97217-7654
UNITED PACIFIC FOREST PROD	7157 SW BEVELAND RD #200	TIGARD	OR	97223-9628
UNITED RENTALS NORTHWEST INC ATTN UNITED RENTALS LEASE AI 13727 NOEL RD #900		DALLAS	TX	75240-1355
UNITED RENTALS NORTHWEST INC ATTN UNITED RENTALS LEASE AI 13727 NOEL RD #900		DALLAS	TX	75240-1355
UNITED RENTALS NORTHWEST INC ATTN UNITED RENTALS LEASE AI 13727 NOEL RD #900		DALLAS	TX	75240-1355
UNITED STATES BAKERY	315 NE 10TH AVE	PORTLAND	OR	97232
UNITED STATES BAKERY % JANICE CRUMBAKER	340 NE 11TH AVE	PORTLAND	OR	97232
UNITED STATES BAKERY % JANICE CRUMBAKER	340 NE 11TH AVE	PORTLAND	OR	97232

UNITED STATES BAKERY % JANICE CRUMBAKER	340 NE 11TH AVE	PORTLAND	OR	97232
UNITED STATES BAKERY % JANICE CRUMBAKER	340 NE 11TH AVE	PORTLAND	OR	97232
UNITED STATES BAKERY % JANICE CRUMBAKER	340 NE 11TH AVE	PORTLAND	OR	97232
UNITED STATES BAKERY % JANICE CRUMBAKER	340 NE 11TH AVE	PORTLAND	OR	97232
UNITED STATES BAKERY % JANICE CRUMBAKER	340 NE 11TH AVE	PORTLAND	OR	97232
UNITED STATES BAKERY % JANICE CRUMBAKER	340 NE 11TH AVE	PORTLAND	OR	97232
UNITED STATES BAKERY %TARA MCCARTHY	340 NE 11TH AVE	PORTLAND	OR	97232
UNITED STATES OF AMERICA % US COAST GUARD & ATTN LT GILMC	618 2ND AVE	SEATTLE	WA	98104-2222
UNITED STATES OF AMERICA BONNE US COURTHOUSE	620 SW MAIN ST	PORTLAND	OR	97205-3037
UNITED STATES OF AMERICA US COURTHOUSE	620 SW MAIN ST	PORTLAND	OR	97205-3037
UNITED STATES OF AMERICA US COURTHOUSE	620 SW MAIN ST	PORTLAND	OR	97205-3037
UNITED STATES OF AMERICA US COURTHOUSE	620 SW MAIN ST	PORTLAND	OR	97205-3037
UNITED STATES OF AMERICA US COURTHOUSE	620 SW MAIN ST	PORTLAND	OR	97205-3037
UNITED STATES OF AMERICA US COURTHOUSE	620 SW MAIN ST	PORTLAND	OR	97205-3037
UNITED STATES OF AMERICA US COURTHOUSE	620 SW MAIN ST	PORTLAND	OR	97205-3037
UNITED STATES OF AMERICA US COURTHOUSE	620 SW MAIN ST	PORTLAND	OR	97205-3037
UNITED STATES POSTAL SERVICE DENVER FACILITIES SERV OFFICE	8055 E TUFTS AVE STE 400	DENVER	CO	80237-2881
UNITED TILE CO INC	3145 NW YEON AVE	PORTLAND	OR	97210-1521
UNIVERSITY OF PORTLAND % CONTROLLER'S OFFICE	5000 N WILLAMETTE BLVD	PORTLAND	OR	97203-5743
UNIVERSITY OF PORTLAND % CONTROLLER'S OFFICE	5000 N WILLAMETTE BLVD	PORTLAND	OR	97203-5743
UNIVERSITY OF PORTLAND % CONTROLLER'S OFFICE	5000 N WILLAMETTE BLVD	PORTLAND	OR	97203-5743
UNIVERSITY OF PORTLAND % CONTROLLER'S OFFICE	5000 N WILLAMETTE BLVD	PORTLAND	OR	97203-5743
UNKELES FAMILY L L C % UNKELES,KENNETH J MANAGER	2211 NW FRONT AVE	PORTLAND	OR	97209-1820
UNKELES FAMILY L L C % UNKELES,KENNETH J MANAGER	2211 NW FRONT AVE	PORTLAND	OR	97209-1820
UNKELES FAMILY L L C % UNKELES,KENNETH J MANAGER	2211 NW FRONT AVE	PORTLAND	OR	97209-1820
UNKELES FAMILY L L C % UNKELES,KENNETH J MANAGER	2211 NW FRONT AVE	PORTLAND	OR	97209-1820
UNKELES,KENNETH J-1/3 & UNKELES FAMILY LLC-2/3	2211 NW FRONT AVE	PORTLAND	OR	97209-1820
UNKNOWN OWNER /THOMAS, BEVERLY ANN /DORRANCE, JAMES A	2742 NE 201ST AVE SP 1	FAIRVIEW	OR	97024
UPI PORTLAND LLC %SCHNITZER STEEL INDUSTRIES	PO BOX 10047	PORTLAND	OR	97296-0047
UPI PORTLAND LLC %SCHNITZER STEEL INDUSTRIES	PO BOX 10047	PORTLAND	OR	97296-0047

UPI PORTLAND LLC %SCHNITZER STEEL INDUSTRIES	PO BOX 10047	PORTLAND	OR	97296-0047
UPI PORTLAND LLC %SCHNITZER STEEL INDUSTRIES	PO BOX 10047	PORTLAND	OR	97296-0047
UPI PORTLAND LLC %SCHNITZER STEEL INDUSTRIES	PO BOX 10047	PORTLAND	OR	97296-0047
UPI PORTLAND LLC %SCHNITZER STEEL INDUSTRIES	PO BOX 10047	PORTLAND	OR	97296-0047
UPI PORTLAND LLC %SCHNITZER STEEL INDUSTRIES	PO BOX 10047	PORTLAND	OR	97296-0047
URBACH,JEFFREY A	6435 NE COLWOOD WAY	PORTLAND	OR	97218
URBAN 2ND & 3RD LLC	75 SE YAMHILL ST #203	PORTLAND	OR	97214
URBAN U4IA LLC % URBAN WORKS REAL ESTATE LLC ATTN SWEITZE	75 SE YAMHILL ST #203	PORTLAND	OR	97214
URBAN,DAVID G	5114 NE 109TH AVE	PORTLAND	OR	97220
US BANCORP EQUIPMENT FINANCE ATTN PROPERTY TAX DEPT FKA	1310 MADRID STREET	MARSHALL	MN	56258
US BANCORP EQUIPMENT FINANCE I FKA US BANCORP LEASING & F	1310 MADRID ST	MARSHALL	MN	56258
US BANCORP EQUIPMENT FINANCE INC	13010 SW 68TH PKWY	PORTLAND	OR	97223
US BANCORP LEASING & FINANCIAL % BILL KNEBLS	1111 OLD EAGLE SCHOOL RD	WAYNE	PA	19087
US BANK SIMPLY BUSINESS LEASING % TRANSCO INDUSTRIES INC	P O BOX 20429	PORTLAND	OR	97294
US GREENFIBER LLC % NATIONAL PROPERTY TAX MGMT	P O BOX 42165	HOUSTON	TX	77242
US SPRINT COMMUNICATIONS CO LT	PO BOX 8490	KANSAS CITY	MO	64114-0490
VACARIU,IOAN	17765 SE TROGE RD	DAMASCUS	OR	97089
VALDEZ,JAVIER	9000 NE M L KING BLVD SP 237	PORTLAND	OR	97211-1385
VALENTINE,BRENT M & VALENTINE,YEN N	4031 SE 26TH AVE	PORTLAND	OR	97202
VAN ALLEN PROPERTIES LLC	5617 N BASIN AVE	PORTLAND	OR	97217-3901
VAN DOMELEN FAMILY COMPANY LLC % JAY MANAGEMENT INC	2051 BAY MEADOWS DR	WEST LINN	OR	97068-2288
VAN EMMERIK,DOUGLAS P & AMY J	11383 MARWICK DR	DUBLIN	CA	94568-3611
VAN HORTON,LEAH K	895 SE RIVER FOREST RD	MILWAUKIE	OR	97267
VAN LOM,JANE TR (DARRYL VAN LOM CREDIT SHELTER TRUST)	16200 SE VAN ZYL DR	DAMASCUS	OR	97089
VAN RADEN,WAYNE B & REBECCA A	15090 SW 150TH CT	BEAVERTON	OR	97007-3617
VAN RADEN,WAYNE B & REBECCA A	15090 SW 150TH CT	BEAVERTON	OR	97007-3617
VAN WATERS & ROGERS INC %RYAN & CO	13155 NOEL RD #100	DALLAS	TX	75240-5050
VAN WATERS & ROGERS INC %RYAN & CO	13155 NOEL RD #100	DALLAS	TX	75240-5050
VAN WATERS & ROGERS INC %RYAN & CO	13155 NOEL RD #100	DALLAS	TX	75240-5050
VANBEEK,RAYMOND L & RUTH A	3963 SE PINE ST	PORTLAND	OR	97214
VANCE,JAMES P & VANCE,ROLIN G TR & VANCE,LAUREE G TR	PO BOX 709	LYLE	WA	98635-0015
VANCOUVER IRON & STEEL INC	1200 W 13TH ST	VANCOUVER	WA	98660-2716
VANCOUVER IRON & STEEL INC	1200 W 13TH ST	VANCOUVER	WA	98660-2716
VANCOUVER WAY LAND CO	PO BOX 301009	PORTLAND	OR	97294-9009

VANCOUVER WAY LAND CO	PO BOX 301009	PORTLAND	OR	97294
VANCOUVER WAY LAND CO	PO BOX 301009	PORTLAND	OR	97294
VANCOUVER WAY LAND CO	PO BOX 301009	PORTLAND	OR	97294
VANCOUVER WAY LAND CO	PO BOX 301009	PORTLAND	OR	97294
VANCOUVER WAY LLC	2006 SE 131ST AVE	VANCOUVER	WA	98683
VANCOUVER WAY LLC	2006 SE 131ST AVE	VANCOUVER	WA	98683
VANCOUVER WAY LLC	2006 SE 131ST AVE	VANCOUVER	WA	98683
VANCOUVER WAY LLC % ZALPYS	2006 SE 131ST AVE	VANCOUVER	WA	98683-6514
VANDENBURGH,MICHAEL D TR ET AL	21892 SW STAFFORD RD	TUALATIN	OR	97062-9729
VANDER POL INVESTMENTS #3 LLC	P O BOX 1469	AUBURN	WA	98071-1469
VANDER POL INVESTMENTS #3 LLC % OAK HARBOR FREIGHT	PO BOX 1469	AUBURN	WA	98071-1469
VANDERBERG,EDWARD A	4645 NE 135TH AVE	PORTLAND	OR	97230-1202
VANDERBERG,EDWARD A & CATHY L	16899 NE SCHUYLER CT	PORTLAND	OR	97230
VANDYNE,DONNA MARIE % BURSETT,ANDREW	PO BOX 1538	PORTLAND	OR	97031
VANLUE,WILLIAM D & VANLUE,LEA D	4128 SE 24TH AVE	PORTLAND	OR	97202
VANN,CASEY B & VANN,JESSICA M	6200 SE 120TH AVE	PORTLAND	OR	97266
VANPO LLC	101 SE 82ND AVE	PORTLAND	OR	97215
VASCO PROPERTIES INC	3434 1ST AVE S	SEATTLE	WA	98134-1805
VASILCHISHIN,JULIA & VASILCHISHIN,ALEKSANDR	4927 NE BUFFALO ST	PORTLAND	OR	97218-1147
VDA LLC % FISHER & CO-URI GALLERIA NORTH TOWER II	13727 NOEL RD #900	DALLAS	TX	75240
VDA LLC % FISHER & CO-URI GALLERIA NORTH TOWER II	13727 NOEL RD #900	DALLAS	TX	75240
VDA LLC % FISHER & CO-URI GALLERIA NORTH TOWER II	13727 NOEL RD #900	DALLAS	TX	75240
VEE ENTERPRISES LLC	2438 NW JOHNSON ST	PORTLAND	OR	97210
VEE ENTERPRISES LLC % VRILAKAS,ROGER A	2438 NW JOHNSON ST	PORTLAND	OR	97210-3234
VENTURA FOODS L L C(LEASED MOLDED CONTAINER CORP TO VEN	14840 E DON JULIAN RD	CITY OF INDUSTRY	CA	91746
VENTURA FOODS LLC	40 POINTE DRIVE	BREA	CA	92821
VENTURA FOODS LLC ATTN: NANCY ZHANG	40 POINTE DR	BREA	CA	92821
VENTURA FOODS LLC ATTN: NANCY ZHANG	40 POINTE DR	BREA	CA	92821
VERIZON WIRELESS (VAW) LLC	PO BOX 2549	ADDISON	TX	75001
VERIZON WIRELESS (VAW) LLC	PO BOX 2549	ADDISON	TX	75001
VERMILLION,BRENDAN P	1306 THE ALAMEDA #316	SAN JOSE	CA	95126-5015
VERSA-TECH METAL FAB INC % BARNES,DAN	P O BOX 20907	PORTLAND	OR	97294
VETRO INC	12307 NE 56TH ST	VANCOUVER	WA	98682
VHE II-OR LLC ATTN HAUPT,BEN	PO BOX 7110	APPLETON	WI	54912-7067

VIGOR FAB LLC	PO BOX 4367	PORTLAND	OR	97208-4367
VILLALOBOS ROJAS,ALBERTO & CARRANZA,DANITZA TERESA	9000 NE ML KING BLVD SP 101	PORTLAND	OR	97211
VILLARREAL,JAMES C & ROBIN M	9949 SE POWELL BLVD	PORTLAND	OR	97266
VILLARREAL,JAMES C & ROBIN M	9949 SE POWELL BLVD	PORTLAND	OR	97266
VILLARREAL,JAMES C & ROBIN M	9949 SE POWELL BLVD	PORTLAND	OR	97266
VILLARREAL,JAMES C & ROBIN M	9949 SE POWELL BLVD	PORTLAND	OR	97266
VILLELA,ELDER & VILLELA,TERESA	545 NE WEBSTER ST	PORTLAND	OR	97211
VILLELA,ELDER & VILLELA,TERESA	545 NE WEBSTER ST	PORTLAND	OR	97211
VIPER PROPERTIES LLC	15045 NE MASON ST	PORTLAND	OR	97230-4357
VIPER TECHNOLOGIES LLC	15045 NE MASON ST	PORTLAND	OR	97230
VO,ERIK V	825 NE BROADWAY	PORTLAND	OR	97232
VO,ERIK V	825 NE BROADWAY	PORTLAND	OR	97232
VOITH PAPER SERVICE WEST INC	PO BOX 846	SPRINGFIELD	OR	97477-0142
VOLLMER,WILLIAM M & MOORE-VOLLMER,JEAN M-50% VOLLMER,	3628 NE BRYCE ST	PORTLAND	OR	97212-1857
VOLUNTEERS OF AMERICA	3910 SE STARK ST	PORTLAND	OR	97214-2278
VOLUNTEERS OF AMERICA	3910 SE STARK ST	PORTLAND	OR	97214-2278
VOORHIES,MOLLY M TR BY THE KNOLLWOOD TRUST	PO BOX 11140	BAINBRIDGE ISLAND	WA	98110
VORWALLER,MICHAEL B	8956 NE 4TH AVE	PORTLAND	OR	97211
VORWALLER,MICHAEL B	8956 NE 4TH AVE	PORTLAND	OR	97211
VORWALLER,MICHAEL B	8956 NE 4TH AVE	PORTLAND	OR	97211
VPW LLC	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
VPW LLC	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
VPW LLC	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
VPW LLC % WINKLER,VICTOR	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
VPW LLC % WINKLER,VICTOR	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
VPW LLC % WINKLER,VICTOR	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
VPW LLC % WINKLER,VICTOR	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218-1237
VRA PROPERTIES LLC	P O BOX 4328	PORTLAND	OR	97208
VRA PROPERTIES LLC	P O BOX 4328	PORTLAND	OR	97208
VRA PROPERTIES LLC	P O BOX 4328	PORTLAND	OR	97208
VSK LLC % WINKLER,VICTOR	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218
VW PROPERTIES LLC-1/2 & SHZ PROPERTIES LLC-1/2	5611 NE COLUMBIA BLVD	PORTLAND	OR	97218
W G WRIGHT FAMILY LLC	1525 SE 10TH AVE	PORTLAND	OR	97214
W G WRIGHT FAMILY LLC	1525 SE 10TH AVE	PORTLAND	OR	97214
W HARRISON INVESTMENTS LLC	657 SE YAMHILL ST	PORTLAND	OR	97214-2326

W W GRAINGER INC % MARVIN F POER & CO	18818 TELLER AVE #277	IRVINE	CA	92612
WABASH NATIONAL L P % HURTT,DONALD G	PO BOX 6129	LAFAYETTE	IN	47903
WABASH NATIONAL L P % HURTT,DONALD G	PO BOX 6129	LAFAYETTE	IN	47903
WABASH NATIONAL L P % HURTT,DONALD G	PO BOX 6129	LAFAYETTE	IN	47903
WABASH NATIONAL LP	PO BOX 6129	LAFAYETTE	IN	47903
WACKER,DAVID S	13001 SE 197TH AVE	DAMASCUS	OR	97089-9662
WADE PROPERTIES LLC % WADE,DENNIS C	11304 NE MARX ST	PORTLAND	OR	97220
WADE,DENNIS R ET AL TO ROQD,SHERRI	15730 S LAMMER RD	OREGON CITY	OR	97045-9518
WAGNER,MARY E & CARDOZA,RICHARD E	2312 SE HARNEY ST	PORTLAND	OR	97202
WAGNER,RICHARD D	13844 SE HAPPY VALLEY CT	HAPPY VALLEY	OR	97086-7020
WAGNER,RICHARD D	13844 SE HAPPY VALLEY CT	HAPPY VALLEY	OR	97086-7020
WALDRON,DANIEL J & WALDRON,CLARISSA C	10048 N EDISON ST	PORTLAND	OR	97203-1451
WALDRON,DANIEL J & WALDRON,CLARISSA C	10048 N EDISON ST	PORTLAND	OR	97203-1451
WALKER EMULSIONS INC	4401 SE JOHNSON CREEK BLVD	PORTLAND	OR	97222-9218
WALKER EMULSIONS INC	4401 SE JOHNSON CREEK BLVD	PORTLAND	OR	97222-9218
WALKER PROPERTY LLC	PO BOX 40	CLACKAMAS	OR	97015
WALKER,DAVID G	2025 SE 10TH AVE	PORTLAND	OR	97214-4646
WALKER,DONALD E JR	12508 NW 49TH AVE	VANCOUVER	WA	98685-1982
WALKER,DONALD E JR	12508 NW 49TH AVE	VANCOUVER	WA	98685-1982
WALKER,DONALD E JR	12508 NW 49TH AVE	VANCOUVER	WA	98685-1982
WALKER,DONALD E JR	12508 NW 49TH AVE	VANCOUVER	WA	98685-1982
WALKER,GEORGE E TR & WALKER,BETTY JO TR	1225 NE 135TH AVE	PORTLAND	OR	97230-3217
WALKER,GEORGE EMERY TR & WALKER,BETTY JO TR	1225 NE 135TH AVE	PORTLAND	OR	97230-3217
WALKER,TED & BARBARA	7637 SE 140TH DR	PORTLAND	OR	97236
WALKER,TED E & WALKER,BARBARA J	7637 SE 140TH DR	PORTLAND	OR	97236-6644
WALKER,THEODORE E TR & WALKER,BARBARA J TR (WALKER FAMIL 7637 SE 140TH DR		PORTLAND	OR	97236
WALKER,THEODORE E TR & WALKER,BARBARA J TR (WALKER FAMIL 7637 SE 140TH DR		PORTLAND	OR	97236
WALKER,THEODORE E TR & WALKER,BARBARA J TR (WALKER FAMIL 7637 SE 140TH DR		PORTLAND	OR	97236
WALKER,THEODORE E TR & WALKER,BARBARA J TR (WALKER FAMIL 7637 SE 140TH DR		PORTLAND	OR	97236
WALKER,THEODORE E TR & WALKER,BARBARA J TR (WALKER FAMIL 7637 SE 140TH DR		PORTLAND	OR	97236
WALKER,THEODORE E TR & WALKER,BARBARA J TR (WALKER FAMIL 7637 SE 140TH DR		PORTLAND	OR	97236
WALKER,THEODORE E TR & WALKER,BARBARA J TR (WALKER FAMIL 7637 SE 140TH DR		PORTLAND	OR	97236
WALSH HOLDING LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531

WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH HOLDINGS LLC	1650 NW SUNDIAL RD	TROUTDALE	OR	97060-9531
WALSH,WILLIAM E JR TR & WALSH,MARGARET M TR	8705 SE PORTER CIR	VANCOUVER	WA	98664-2867
WALTHER PROPERTIES L L C % FULTON PROVISION CO	16123 NE AIRPORT WAY	PORTLAND	OR	97230-4953
WALTHER PROPERTIES L L C % FULTON PROVISION CO	16123 NE AIRPORT WAY	PORTLAND	OR	97230-4953
WARREN FAMILY PROPERTIES LLC	14863 SE 82ND DR	CLACKAMAS	OR	97015
WARREN FAMILY PROPERTIES LLC	14863 SE 82ND DR	CLACKAMAS	OR	97015
WARREN FAMILY PROPERTIES LLC	14863 SE 82ND DR	CLACKAMAS	OR	97015
WARREN FAMILY PROPERTIES LLC	14863 SE 82ND DR	CLACKAMAS	OR	97015
WARREN,CAMERON J PROBATE #9606-91087>	14863 SE 82ND DR	CLACKAMAS	OR	97015
WARREN,CAMERON J PROBATE #9606-91087>	14863 SE 82ND DR	CLACKAMAS	OR	97015
WARREN,CAMERON J PROBATE #9606-91087>	14863 SE 82ND DR	CLACKAMAS	OR	97015
WARREN,FRANK M JR TR (FRANK M WARREN JR REVOCABLE LIVING	2310 N KERBY AVE	PORTLAND	OR	97227
WARREN,WENDY L % WARREN,FRED E GUARDIAN & CONSV	1184 DEWING LN	WALNUT CREEK	CA	94595
WASCO ST PARTNERS LLC	PO BOX 12010	PORTLAND	OR	97212
WASHMAN LLC	PO BOX 4124	PORTLAND	OR	97208

WASINGTON STREET BUILDING LLC	6140 SW MACADAM AVE	PORTLAND	OR	97239
WASTECH INC %WASTE MANAGEMENT	PO BOX 1450	CHICAGO	IL	60690-1450
WASTECH INC %WASTE MANAGEMENT	PO BOX 1450	CHICAGO	IL	60690-1450
WASTECH INC %WASTE MANAGEMENT	PO BOX 1450	CHICAGO	IL	60690-1450
WASTECH INC %WASTE MANAGEMENT	PO BOX 1450	CHICAGO	IL	60690-1450
WATER AVE LLC	45 WALDRON VIEW LN	EASTSOUND	WA	98245
WATER AVENUE ASSOC LLC	7925 SE 140TH DR	PORTLAND	OR	97236
WATER AVENUE PROPERTIES LLC	75 SE YAMHILL ST #201	PORTLAND	OR	97214
WATER AVENUE PROPERTIES LLC	75 SE YAMHILL ST #201	PORTLAND	OR	97214
WATER AVENUE PROPERTIES LLC	75 SE YAMHILL ST #201	PORTLAND	OR	97214
WATUMULL PROPERTIES	307 LEWERS ST #600	HONOLULU	HI	96815
WATUMULL PROPERTIES	307 LEWERS ST #600	HONOLULU	HI	96815
WATUMULL PROPERTIES CORP	307 LEWERS ST #600	HONOLULU	HI	96815-2364
WATUMULL PROPERTIES CORP	307 LEWERS ST #600	HONOLULU	HI	96815-2364
WATUMULL PROPERTIES CORP ATTN WATUMULL,J D	307 LEWERS ST #600	HONOLULU	HI	96815
WATUMULL PROPERTIES CORP ATTN WATUMULL,J D	307 LEWERS ST #600	HONOLULU	HI	96815
WATUMULL PROPERTIES CORP ATTN WATUMULL,J D	307 LEWERS ST #600	HONOLULU	HI	96815
WATUMULL PROPERTIES CORP ATTN WATUMULL,J D	307 LEWERS ST #600	HONOLULU	HI	96815
WAYMIRE,JAMES M & WAYMIRE,SYLVIA M	9000 NE M L KING BLVD SP 67	PORTLAND	OR	97211
WAYPOINTS PROPERTIES LLC % SPURGEON,BARBARA A	50 OAK CT #210	DANVILLE	CA	94526-4048
WAYPOINTS PROPERTIES LLC % SPURGEON,BARBARA A	50 OAK CT #210	DANVILLE	CA	94526-4048
WEATHERLY CREAMERY BULDING	2045 NE M L KING BLVD	PORTLAND	OR	97212
WEATHERLY CREAMERY BULDING	2045 NE M L KING BLVD	PORTLAND	OR	97212
WEBBER,ANDREW C & WEBBER,EDNA A	25272 MONTE VISTA DR	HAYWARD	CA	94545
WEBSTER FAMILY LIMITED PARTNERSHIP>	PO BOX 11229	PORTLAND	OR	97211-0229
WEBSTER FAMILY LIMITED PARTNERSHIP> % WEBSTER,DENNIS	PO BOX 11229	PORTLAND	OR	97211
WEBSTER FAMILY LLC	PO BOX 11229	PORTLAND	OR	97211-0229
WEBSTER FAMILY LLC	PO BOX 11229	PORTLAND	OR	97211-0229
WEBSTER FAMILY LLC	41 NE WALKER ST	PORTLAND	OR	97211-1200
WEILER,MICHAEL J	1611 SE 6TH AVE	PORTLAND	OR	97214
WELBILT WALK-INS LTD PRTNRSHP %SHAKER SQUARE LLC	PO BOX 10067	PORTLAND	OR	97296
WELCH,MARY F TR TO MC CUDDY,MICHAEL	250 NE TOMAHAWK ISLAND DR	PORTLAND	OR	97217
WELDIN,KENNETH R & MIRIAM J	5701 83RD AVE SE	SNOHOMISH	WA	98290

WELLS FARGO EQUIPMENT FINANCE, %MANUFACTURER SERV GRP	300 TRI-STATE INTERNATIONAL	LINCOLNSHIRE	IL	60069
WELLS,CHARLES M	9923 SE DUKE ST	PORTLAND	OR	97266-5108
WELLS,MARJORIE F TR BY WELLS,IRVING L	16136 NW CANTERWOOD WAY	PORTLAND	OR	97229-7849
WENDLAND PROPERTIES LLC	3342 NW 26TH AVE #18	PORTLAND	OR	97210-1854
WENTWORTH LAND CO	107 SE GRAND AVE	PORTLAND	OR	97214-1113
WEST COAST WIRE ROPE & RIGGING	2900 NW 29TH AVE	PORTLAND	OR	97210
WEST COAST WIRE ROPE & RIGGING	PO BOX 5999	PORTLAND	OR	97228-5999
WEST HAYDEN ISLAND MOORAGE OWNERS ASSOCIATION	2630 N HAYDEN ISLAND DR	PORTLAND	OR	97217
WEST INVESTMENTS LLC	20125 NE INTERLACHEN LN	FAIRVIEW	OR	97024
WEST LINN INVESTORS LLC % AMES,ROBERT R	1136 NW HOYT ST #200	PORTLAND	OR	97209-3007
WEST,KEVIN & WEST,TAMARA	4434 SE 25TH AVE	PORTLAND	OR	97202
WESTERN ABRASIVES INC	1170 NE 63RD AVE	PORTLAND	OR	97213
WESTERN ABRASIVES INC	1170 NE 63RD AVE	PORTLAND	OR	97213
WESTERN C REIT OR LLC %GLP US MANAGEMENT LLC	2 NORTH RIVERSIDE PLAZA #2350	CHICAGO	IL	60606
WESTERN C REIT OR LLC %GLP US MANAGEMENT LLC	2 NORTH RIVERSIDE PLAZA #2350	CHICAGO	IL	60606
WESTERN GRAPHICS (US) INC % STEVE ISAKSON	PO BOX 3728	N MANKATO	MN	56002-0372
WESTERN GRAPHICS (US) INC % STEVE ISAKSON	PO BOX 3728	N MANKATO	MN	56002-0372
WESTERN MACHINE WORKS INC	PO BOX 83447	PORTLAND	OR	97283
WESTERN PAVING & PYRITZ,BOB	12067 SE 115TH AVE	HAPPY VALLEY	OR	97086
WESTERN PROPANE GAS CO % A P PROPANE INC	P O BOX 798	VALLEY FORGE	PA	19482
WESTERN WAXED PAPER ECU %HUGHES, MINDA ENGLISH	33780 SE JARL RD	BORING	OR	97009-8558
WESTERN WIRE WORKS INC % HOLTZ,THOMAS-CONTROLLER	3950 NW ST HELENS RD	PORTLAND	OR	97210
WESTON INVESTMENT CO LLC	2154 NE BROADWAY RM 200	PORTLAND	OR	97232-1590
WESTON INVESTMENT CO LLC	2154 NE BROADWAY #200	PORTLAND	OR	97232-1561
WESTON INVESTMENT CO LLC	2154 NE BROADWAY #200	PORTLAND	OR	97232-1561
WESTON INVESTMENT CO LLC	2154 NE BROADWAY #200	PORTLAND	OR	97232-1561
WESTON INVESTMENT CO LLC	2154 NE BROADWAY #200	PORTLAND	OR	97232-1561
WESTON INVESTMENT CO LLC	2154 NE BROADWAY #200	PORTLAND	OR	97232-1561
WESTON INVESTMENT CO LLC	2154 NE BROADWAY #200	PORTLAND	OR	97232-1561
WESTON INVESTMENT CO LLC	2154 NE BROADWAY #200	PORTLAND	OR	97232-1561
WESTON INVESTMENT CO LLC	2154 NE BROADWAY #200	PORTLAND	OR	97232-1561
WESTON INVESTMENT CO LLC	2154 NE BROADWAY #200	PORTLAND	OR	97232-1561
WESTON INVESTMENT CO LLC	2154 NE BROADWAY #200	PORTLAND	OR	97232-1561
WESTON INVESTMENT CO LLC	2154 NE BROADWAY #200	PORTLAND	OR	97232-1561

WESTON INVESTMENT CO LLC(LSD INTERSTATE MOBILPHONE CO	2154 NE BROADWAY RM 200	PORTLAND	OR	97232-1590
WESTPHAL,EDGAR A & WESTPHAL,PATRICE M	1396 NW BENFIELD DR	PORTLAND	OR	97229-9150
WESTPORT PROPERTIES LLC	PO BOX 2924	PORTLAND	OR	97208-2924
WEVERHAEUSER CO INC % TAX DEPT	P O BOX 9777	FEDERAL WAY	WA	98063-9777
WEYHRICH,RICHARD L & KAREN A	P O BOX 20608	PORTLAND	OR	97294-0608
WEYHRICH,RICHARD L & KAREN A	P O BOX 20608	PORTLAND	OR	97294-0608
WHIPPLE,ANNA L & WHIPPLE,AUSTIN P	925 SE GRANT ST	PORTLAND	OR	97214-4632
WHIRLWIND PROPERTIES LLC	6801 216TH ST SW	MOUNTLAKE TERRAC	WA	98043
WHISTLER PARTNERS L L C	13406 SE 32ND ST	BELLEVUE	WA	98005
WHISTLER PARTNERS L L C	13406 SE 32ND ST	BELLEVUE	WA	98005
WHITAKER PROPERTIES LLC % FREEDMAN,JOANA	855 SW PENNOYER ST	PORTLAND	OR	97239-4401
WHITAKER PROPERTIES LLC % FREEDMAN,JOANA	855 SW PENNOYER ST	PORTLAND	OR	97239-4401
WHITAKER WAY BUILDINGS LLC	PO BOX 20279	PORTLAND	OR	97294
WHITAKER WAY BUILDINGS LLC	PO BOX 20279	PORTLAND	OR	97294
WHITE HORSE LLC % HOLZMAN,LINDA	3216 NE SKIDMORE ST	PORTLAND	OR	97211-7748
WHITE,RICHARD P	PO BOX 10905	PORTLAND	OR	97210-0905
WHITE/HART PROPERTIES LLC	8503 ETCHEVERRY DR	TRACY	CA	95376
WHITECAP COVE INC % REDD,KURT	P O BOX 83723	PORTLAND	OR	97283-0723
WHITFORD REAL ESTATE LLC	47555 MCKENZIE HWY	VIDA	OR	97488
WHITNEY,HENRY E & BERTHA M	11909 SE FOSTER RD	PORTLAND	OR	97266-4046
WHITTEN,SALLY JO	7153 NE 47TH AVE	PORTLAND	OR	97218-1213
WHOLESALE FOUNTAIN SUPPLY REALTY LLC	1313 NW 17TH AVE	PORTLAND	OR	97209-2412
WHOLESALE TRUCK PARTS, INC. %JOHN L KIEPER	15643 NE SISKIYOU CT	PORTLAND	OR	97230
WHOLESALER'S PROPERTY COMPANY LLC> %WIN WHOLESALE GRO	6644 E BASELINE RD #101	MESA	AZ	85206
WICKER,VAUGHN A & GIERUT-WICKER,NANCY C	3724 NE 37TH AVE	PORTLAND	OR	97212-1840
WICKSTRAND,ALAN K & GEORGENE M	5320 SE 26TH AVE	PORTLAND	OR	97202
WIDMER BROTHER LLC	929 N RUSSELL ST	PORTLAND	OR	97227
WIDMER BROTHERS BREWING CO % PETRIE,TOM	929 N RUSSELL ST	PORTLAND	OR	97227
WIDMER BROTHERS BREWING CO % PETRIE,TOM	929 N RUSSELL ST	PORTLAND	OR	97227
WIDMER BROTHERS BREWING CO ATTN: WIDMER,KURT	929 N RUSSELL ST	PORTLAND	OR	97227
WIDMER BROTHERS BREWING CO ATTN: WIDMER,KURT	929 N RUSSELL ST	PORTLAND	OR	97227
WIDMER BROTHERS BREWING CO INC	929 N RUSSELL ST	PORTLAND	OR	97227
WIDMER BROTHERS LLC	929 N RUSSELL ST	PORTLAND	OR	97227
WIDMER BROTHERS LLC	5531 SW CORBETT AVE	PORTLAND	OR	97239-3701

WIESSNER,VICTOR R TR	2003 NE 158TH PL	PORTLAND	OR	97230-8245
WIEWECK LLC-50% & FLOW STRUCTURES LLC-50%	14314 NW 8TH CT	VANCOUVER	WA	98685
WIGGINS,CHARLES & WIGGINS,DONNA S	2817 SE 16TH AVE	PORTLAND	OR	97202
WILBUR ELLIS CO INC	16300 CHRISTENSEN RD #135	SEATTLE	WA	98188
WILBUR ELLIS CO INC	16300 CHRISTENSEN RD #135	SEATTLE	WA	98188
WILEY DEVELOPEMENT LLC	1504 SE WOODWARD ST	PORTLAND	OR	97202
WILEY DEVELOPEMENT LLC	1504 SE WOODWARD ST	PORTLAND	OR	97202
WILEY DEVELOPEMENT LLC	1504 SE WOODWARD ST	PORTLAND	OR	97202
WILEY DEVELOPEMENT LLC	1504 SE WOODWARD ST	PORTLAND	OR	97202
WILHELM TRUCKING ACQUISITION 3250 NW ST HELENS RD	PO BOX 10363	PORTLAND	OR	97296-0363
WILHELM TRUCKING ACQUISITION C	PO BOX 10363	PORTLAND	OR	97296
WILHELM TRUCKING ACQUISITION C	PO BOX 10363	PORTLAND	OR	97296
WILKERSON,LEE TR	PO BOX 11603	LAS VEGAS	NV	89111-1603
WILKINS TRUCKING CO INC	339 N COLUMBIA BLVD	PORTLAND	OR	97217
WILKINS,MICHAEL P	339 N COLUMBIA BLVD #A	PORTLAND	OR	97217
WILLAIMS,SEAN K	5016 NE BUFFALO ST	PORTLAND	OR	97218-1150
WILLAMETTE WATERFRONT LP	10151 SW WASHINGTON ST	PORTLAND	OR	97225
WILLIAM F BITAR & ASSOC LLC	9828 E BURNSIDE ST STE 200	PORTLAND	OR	97216
WILLIAMS 1 LLC % ANCTIL,THOMAS W	12806 NW LORRAINE DR	PORTLAND	OR	97229-8348
WILLIAMS 1 LLC % ANCTIL,THOMAS W	12806 NW LORRAINE DR	PORTLAND	OR	97229-8348
WILLIAMS 1 LLC % ANCTIL,THOMAS W	12806 NW LORRAINE DR	PORTLAND	OR	97229-8348
WILLIAMS,AL % WILLIAMS,ROMELDA	1359 JUDY ST	WOODBURN	OR	97071
WILLIAMS,JOAN ROMELDA	1359 JUDY ST	WOODBURN	OR	97071
WILLIAMS,KRISTIN	2837 SE 16TH AVE	PORTLAND	OR	97202
WILLIAMS,ROMELDA	1359 JUDY ST	WOODBURN	OR	97071
WILLIAMS,ROMELDA	1359 JUDY ST	WOODBURN	OR	97071
WILLIAMS,ROMELDA	1359 JUDY ST	WOODBURN	OR	97071
WILLIAMS,ROMELDA J /PAUL SCHUNK % CANOPIES UNLIMITED	8536 SE 82ND AVE	PORTLAND	OR	97266
WILLIAMS,ROMELDA JOAN	1359 JUDY ST	WOODBURN	OR	97071
WILLIAMS,SARAH A TR (SARAH WILLIAMS LIVING TRUST)	2018 NW 21ST PL	PORTLAND	OR	97210-2302
WILLIAMS,VERN	1359 JUDY ST	WOODBURN	OR	97071
WILLIAMS,VERN	1359 JUDY ST	WOODBURN	OR	97071
WILLIAMS,VERN A	1359 JUDY ST	WOODBURN	OR	97071

WILLIAMS,VERN ALLEN	1359 JUDY ST	WOODBURN	OR	97071
WILLIAMS-SONOMA STORES, INC % DUCHARME, MCMILLEN, & ASS	PO BOX 80615	INDIANAPOLIS	IN	46280
WILSHIRE RIVERSIDE LITTLE LEAGUE	PO BOX 12494	PORTLAND	OR	97212-0494
WILSON INTNATL IND CORP % HIRIGARAY,JOHN	PO BOX 254	TROUTDALE	OR	97060-0254
WILSON,ARVELL D	5225 N EMERSON DR	PORTLAND	OR	97217-4111
WILSON,PHYLLIS A	15437 SW 114TH CT APT 92	TIGARD	OR	97224-3985
WINDSOR PROPERTIES LTD	2245 NE CORNELL RD	HILLSBORO	OR	97124-5947
WINDSOR PROPERTIES LTD	2245 NE CORNELL RD	HILLSBORO	OR	97124-5947
WINDSOR PROPERTIES LTD	2245 NE CORNELL RD	HILLSBORO	OR	97124-5947
WINDSOR PROPERTIES LTD	2245 NE CORNELL RD	HILLSBORO	OR	97124-5947
WINEBURG RACING ASSOC INC	1001 N SCHMEER RD	PORTLAND	OR	97217
WINGFOOT COMMERCIAL TIRE SYSTEMS LLC %J TYLER-TAX D/616 L	200 INNOVATION WAY	AKRON	OH	44316-0001
WINGNUT INVESTMENTS LLC	3741 SE 21ST AVE	PORTLAND	OR	97202
WINGNUT INVESTMENTS LLC	3741 SE 21ST AVE	PORTLAND	OR	97202
WIRTA,GRAYDON V	40273 ROCKY LN	ASTORIA	OR	97103
WIRTA,GRAYDON V	40273 ROCKY LN	ASTORIA	OR	97103
WIRTA,JUSTIN L & WIRTA,GRAYDON V	40273 ROCKY LN	ASTORIA	OR	97103
WIRTA,STANTON A	PO BOX 31051	PORTLAND	OR	97231-0051
WIRTA,VIVICA L	1722 N GOING CT	PORTLAND	OR	97217
WIRTA,WINSTON O	40679 OLD HIGHWAY 30	ASTORIA	OR	97103-8638
WISE BUYS PROPERTIES LLC-1/2 & CHRISTOPHER SCOTT PROPERTIE	930 SE 82ND AVE	PORTLAND	OR	97216-1213
WISE,GEORGE PMB 162	10350 N VANCOUVER WAY	PORTLAND	OR	97217
WISEMAN,SAMMY A TR & WISEMAN,KRYSTEN D TR (WISEMAN FAM	8 POLONIUS ST	LAKE OSWEGO	OR	97035-1907
WLPII LLC	14863 SE 82ND DR	CLACKAMAS	OR	97015-7624
WLPII LLC	14863 SE 82ND DR	CLACKAMAS	OR	97015-7624
WLPII LLC	14863 SE 82ND DR	CLACKAMAS	OR	97015-7624
WLPII LLC	14863 SE 82ND DR	CLACKAMAS	OR	97015-7624
WLPII LLC	14863 SE 82ND DR	CLACKAMAS	OR	97015-7624
WMR LLC % WASTE CONNECTIONS INC ATTN JUDY CANO	3 WATERWAY SQUARE PL #110	THE WOODLANDS	TX	77380-3488
WMR LLC % WASTE CONNECTIONS INC ATTN JUDY CANO	3 WATERWAY SQUARE PL #110	THE WOODLANDS	TX	77380-3488
WMR LLC % WASTE CONNECTIONS INC ATTN JUDY CANO	3 WATERWAY SQUARE PL #110	THE WOODLANDS	TX	77380-3488
WMR LLC %WASTE CONNECTIONS INC ATTN JUDY CANO TAX DEPT	3 WATERWAY SQUARE PL #110	THE WOODLANDS	TX	77380

WMR LLC %WASTE CONNECTIONS INC ATTN JUDY CANO TAX DEPT	3 WATERWAY SQUARE PL #110	THE WOODLANDS	TX	77380
WOLF FAMILY LLC	15503 SE 39TH CIR	VANCOUVER	WA	98683-5333
WOLF FAMILY LLC	15503 SE 39TH CIR	VANCOUVER	WA	98683-5333
WOLF FAMILY LLC	15503 SE 39TH CIR	VANCOUVER	WA	98683-5333
WOMACK PROPERTIES L L C ATTN WOMACK,HUGH	9831 SE POWELL BLVD	PORTLAND	OR	97266
WOMACK PROPERTIES L L C ATTN WOMACK,HUGH	9831 SE POWELL BLVD	PORTLAND	OR	97266
WOMACK PROPERTIES LLC	9831 SE POWELL BLVD	PORTLAND	OR	97266
WOMACK PROPERTIES LLC	9831 SE POWELL BLVD	PORTLAND	OR	97266
WOMACK,JEFFREY A & WOMACK,R LYNN	670 NW WALLULA AVE	GRESHAM	OR	97030
WONG,JEFFREY	117 NE 8TH AVE	PORTLAND	OR	97232
WONG,JEFFREY M & WONG,FLORA	3525 NE 50TH AVE #207	PORTLAND	OR	97213
WOOD KOTE MFG CORP	8000 NE 14TH PL	PORTLAND	OR	97211
WOOD, MARK L.	33348 ROYAL DR #13	SCAPPOOSE	OR	97056
WOOD,DONNA L	16446 NE SAN RAFAEL DR	PORTLAND	OR	97230
WOOD,LONNIE & WOOD,KATHARINA PMB 113	10350 N VANCOUVER WAY	PORTLAND	OR	97217
WOODHOLE LLC	1020 SE HARRISON ST	PORTLAND	OR	97214
WOODRUFF,HOWARD CLARK & WASH M % DORAN,EULOGIO & DIA 3966 S PACIFIS HWY SP 60		MEDFORD	OR	97501
WOODS,JOSEPH LEE /HANNA,PATTY	9000 NE M L KING BLVD SP 100	PORTLAND	OR	97211
WOODSTOCK RENTAL PROPERTIES LLC	5240 SE 82ND AVE	PORTLAND	OR	97266-4804
WOODYARD,LANCE S & BOUMA,ANITA L	212 NE 50TH AVE	PORTLAND	OR	97213
WORCHESTER BUILDING LLC % TINKER,GARY & JULIE	31020 SW PEACH COVE RD	WEST LINN	OR	97068-9436
WORKSHOPS PORTLAND CARSON L L	819 N 49TH ST #400	PORTLAND	OR	98103-6517
WORRELL,GAIL L	7637 NE 33RD DR	PORTLAND	OR	97211
WORRELL,GAIL L	7637 NE 33RD DR	PORTLAND	OR	97211-1911
WORTHINGTON,CLARENCE ET AL % CENTENNIAL GLASS	7358 SE 92ND AVE	PORTLAND	OR	97266-5514
WOUGHTER,KAREN TR ET AL % DICKEY,ROBERT R TR	829 BESWICK WAY	ASHLAND	OR	97520-3501
WOUGHTER,KAREN TR ET AL % DICKEY,ROBERT R TR	829 BESWICK WAY	ASHLAND	OR	97520-3501
WOUGHTER,KAREN TR ET AL % DICKEY,ROBERT R TR	829 BESWICK WAY	ASHLAND	OR	97520-3501
WPC 59TH LLC % WATUMULL PROPERTIES CORP ATTN WATUMULL	307 LEWERS ST 6TH FLOOR	HONOLULU	HI	96815-2364
WPC KILLINGSWORTH LLC	307 LEWERS ST 6TH FLOOR	HONOLULU	HI	96815-2364
WPC PARKROSE LLC	307 LEWERS ST #600	HONOLULU	HI	96815-2364
WPC PARKROSE LLC	307 LEWERS ST #600	HONOLULU	HI	96815-2364
WPC SUMNER LLC	307 LEWERS RD FL 6	HONOLULU	HI	96815-2364
WRENN,ROBERT L & WRENN,CHERI	PO BOX 86036	PORTLAND	OR	97286

WRIGHT BUSINESS FORMS INC ATTN CICERCHI,BRIAN	18440 NE SAN RAFAEL ST	PORTLAND	OR	97230
WRIGHT EQUIPMENT & LEASING LLC	PO BOX 20489	PORTLAND	OR	97294-0489
WRIGHT INVESTMENT LLC	2537 N WINCHELL ST	PORTLAND	OR	97217-6371
WRIGHT INVESTMENT LLC	2537 N WINCHELL ST	PORTLAND	OR	97217-6371
WRIGHT,WILLIAM S TR & WRIGHT,WILLIAM TR & WRIGHT,KARIN S	809 N RUSSELL ST #201	PORTLAND	OR	97227
WRIGHT,WILLIAM TR ET AL	PO BOX 69627	PORTLAND	OR	97239-0627
WU ENTERPRISES LLC	3712 NW 114TH ST	VANCOUVER	WA	98685
WUNSCH,FRED	4133 NE 74TH AVE	PORTLAND	OR	97218
WUNSCH,FRED D & JUDY A	4133 NE 74TH AVE	PORTLAND	OR	97218-3632
WYNN INVESTMENTS LLC	5949 NE CULLY BLVD	PORTLAND	OR	97218-3354
WYNN INVESTMENTS LLC	5949 NE CULLY BLVD	PORTLAND	OR	97218-3354
WYNN INVESTMENTS LLC	5949 NE CULLY BLVD	PORTLAND	OR	97218-3354
WYNN INVESTMENTS LLC	5949 NE CULLY BLVD	PORTLAND	OR	97218-3354
WYNN INVESTMENTS LLC	5949 NE CULLY BLVD	PORTLAND	OR	97218-3354
WYNN INVESTMENTS LLC	5949 NE CULLY BLVD	PORTLAND	OR	97218-3354
WYNN INVESTMENTS LLC	5949 NE CULLY BLVD	PORTLAND	OR	97218-3354
WYNN INVESTMENTS LLC	5949 NE CULLY BLVD	PORTLAND	OR	97218-3354
WYNN INVESTMENTS LLC	5949 NE CULLY BLVD	PORTLAND	OR	97218-3354
XEROX CORPORATION XEROX SQUARE - 040A	100 CLINTON AVE	ROCHESTER	NY	14644
XEROX CORPORATION XEROX SQUARE-040A	100 CLINTON AVE	ROCHESTER	NY	14644
XLAO LLC	831 SE M L KING BLVD	PORTLAND	OR	97214
XPO PROPERTIES INC % TAX DEPARTMENT	PO BOX 4138	PORTLAND	OR	97208-4138
YACHT HARBOR LLC % DEFREES,MIKE	2501 NE 134TH ST #300	VANCOUVER	WA	98686-3030
YAGER,ROBERT D TR	3503 SPIRIT LAKE HWY	SILVERLAKE	WA	98645-9772
YAGER,ROBERT D TR	3503 SPIRIT LAKE HWY	SILVERLAKE	WA	98645-9772
YAGER,ROBERT D TR (THE REVOCABLE LIVING TRUST OF ROBERT DL	3503 SPIRIT LAKE HWY	SILVERLAKE	WA	98645
YANCEY,RAYMOND R & DOLAN,LEANN M	5105 SW VIEW POINT TER	PORTLAND	OR	97201
YANCEY,RAYMOND R & DOLAN,LEANN M	5105 SW VIEW POINT TER	PORTLAND	OR	97201
YEE HOP REALTY LTD	PO BOX 1759	HONOLULU	HI	96806
YEE,FONG T TR & YEE,JUNE S TR	1905 N HUMBOLDT ST	PORTLAND	OR	97217-3544
YEON ASSOCIATES L L C % JAY MANAGEMENT INC	2051 BAY MEADOWS DR	WEST LINN	OR	97068-2288

YEON INDUSTRIAL PARK CONDOMINIUM ASSOCIATION	9700 SW CAPITOL HWY	PORTLAND	OR	97219
YETSKO,LEON W & YETSKO,DIANA L	9000 NE M L KING BLVD SP 041	PORTLAND	OR	97211
YI,MICHELLE M	4404 NE 166TH AVE	VANCOUVER	WA	98682
YINGER,LOUIS G & GROTH,RAY C	PO BOX 83281	PORTLAND	OR	97283
YIP,LARRY T & OI SIM	P O BOX 86630	PORTLAND	OR	97286
YIP,LARRY T & OI SIM	P O BOX 86630	PORTLAND	OR	97286
YOFFE,SHMUEL & KRAVITZ,NATAN	2149 DUNWOODY GLEN	ATLANTA	GA	30338-4437
YOFFE,SHMUEL & KRAVITZ,NATAN	2149 DUNWOODY GLEN	ATLANTA	GA	30338-4437
YORK,VICTOR S JR & VELMA J	2744 SE 28TH AVE	PORTLAND	OR	97202-1313
YOUKER,LAURIE M	9945 N DECATUR ST	PORTLAND	OR	97203
YOUNES,SAID M	15570 NW SPRINGVILLE RD	PORTLAND	OR	97229-1802
YOUNG,CYNTHIA LEE	9000 NE M L KING BLVD SP 120	PORTLAND	OR	97211
YOUNG,MICHAEL H	2535 JACKSON ST	EUGENE	OR	97405
YOUNGREN,MARK A TR	4041 SW HILLSDALE AVE	PORTLAND	OR	97239-1546
YOUNGREN,MARK A TR	4041 SW HILLSDALE AVE	PORTLAND	OR	97239-1546
YOUNGREN,MARK A TR	4041 SW HILLSDALE AVE	PORTLAND	OR	97239-1546
YOYODYNE LLC	1020 SE 11TH AVE	PORTLAND	OR	97214
YOYODYNE LLC	1020 SE 11TH AVE	PORTLAND	OR	97214
YOYODYNE LLC	1020 SE 11TH AVE	PORTLAND	OR	97214
YRC INC	10990 ROE AVE STOP A515	OVERLAND PARK	KS	66211-1213
YRC INC	10990 ROE AVE STOP A515	OVERLAND PARK	KS	66211-1213
ZAHURSKY,RICHARD TR & ZAHURSKY,KAREN TR	9770 SE CASTLE CT	DAMASCUS	OR	97089-6303
ZAHURSKY,RICHARD TR & ZAHURSKY,KAREN TR	9770 SE CASTLE CT	DAMASCUS	OR	97089-6303
ZAHURSKY,RICHARD TR & ZAHURSKY,KAREN TR	9770 SE CASTLE CT	DAMASCUS	OR	97089-6303
ZANGARA,ALFRED J II & ZANGARA,RENEE S	9539 N DECATUR ST	PORTLAND	OR	97203-2821
ZANOBELLI,GLORIA M	PO BOX 56151	PORTLAND	OR	97238-6151
ZARAGOZA NAVARRO,LUIS D	9000 NE M L KING BLVD #87	PORTLAND	OR	97211
ZEGHBIB,DANIELLE T	7207 N ALBINA AVE	PORTLAND	OR	97217
ZEK LLC	5200 SE HARNEY ST	PORTLAND	OR	97206-0837
ZEK LLC	5200 SE HARNEY ST	PORTLAND	OR	97206-0837
ZELL,JOHN F & CHRISTINE C	4640 NE 36TH AVE	PORTLAND	OR	97211
ZELMER,CURTIS D TO JZ LLC	8311 N DANA AVE	PORTLAND	OR	97203-3603
ZELMER,CURTIS TO SCHNEIDER,TONY D	9609 N COLUMBIA BLVD	PORTLAND	OR	97203-1030

ZEPHYRUS,KRISTEN A & ZEPHYRUS,GEOFFREY M	10540 N MIDWAY AVE	PORTLAND	OR	97203
ZIMMER VENTURES LLC	1434 N FIR ST	CANBY	OR	97013-4374
ZINK (HAWTHORNE) LLC	333 NW 9TH AVE #1013	PORTLAND	OR	97209
ZODIAC PROPERTIES LLC	2041 SE POWELL BLVD	PORTLAND	OR	97202-2344
ZODIAC PROPERTIES LLC	2041 SE POWELL BLVD	PORTLAND	OR	97202-2344
ZOLLER,DEVIN R	628 SE MILL ST	PORTLAND	OR	97214
ZORIN ENTERPRISES LLC	1330 SE 6TH AVE	PORTLAND	OR	97214
ZRKR PROPERTIES LLC	13126 NE WHITAKER WAY	PORTLAND	OR	97230

City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Fossil Fuel Terminal Zoning Amendments

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PETER FINLEY-FRY
COLUMBIA PACIFIC PLANNING
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Fossil Fuel Terminal Zoning Amendments

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STOEL RIVES BOLEY
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:STOEL RIVES LLP
760 SW 9TH AVE STE 3000
PORTLAND OR 97205-2586

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Fossil Fuel Terminal Zoning Amendments

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BC: 97201538075 *2929-01973-13-30

City of Portland, Oregon
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Fossil Fuel Terminal Zoning Amendments

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CHAIR/PRESIDENT NORTH NORTHEAST BA
NORTH NORTHEAST BUSINESS ASSOCIATION
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PC NIXIE 970 FE 1260 0008/17/16

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BC: 97201538075 *0129-00752-17-22

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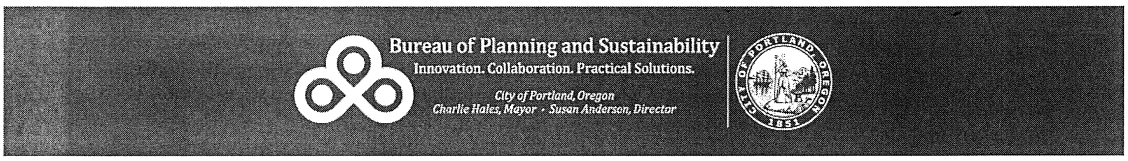
If you need special accommodation, please call 503-823-7700, the City's TTY at 503-823-6868, or the Oregon Relay Service at 1-800-735-2900.

www.portlandoregon.gov/bps



City of Portland, Oregon
Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201-5380 P514

Fossil Fuel Terminal Zoning Amendments

Fossil Fuel Terminal Zoning Amendments

Portland Planning and Sustainability Commission Hearing

September 13, 2016 at 12:30 pm

1900 SW 4th Avenue, Second Floor, Room 2500A

***Please call 503-823-7700 one week before the hearing for the scheduled time of this agenda item.**

Planning and Sustainability Commission Hearing on: Fossil Fuel Terminal Zoning Amendments

Why am I receiving this notice?

You are receiving this notice because you have expressed interest in being notified of certain Bureau of Planning and Sustainability projects, you are on one of our advisory groups, or you are a member of a neighborhood or business association.

What is this project about?

This code change project would restrict development and expansion of Bulk Fossil Fuel Terminals. These code changes would implement new policy direction on fossil fuel distribution and storage facilities in City Resolution 37168. The proposal is to prohibit bulk fossil fuel terminals that have more than 5 million gallons of storage capacity.

- Fossil fuels include petroleum products (such as crude oil and gasoline), coal, natural gas, and propane, and methanol, which is produced from natural gas.
- No new terminals would be allowed.
- The existing 11 terminals in the Portland Harbor would become nonconforming uses, which would limit expansions to their current site.

The zoning code change will not immediately impact the day-to-day operations of the 11 fossil fuel terminals in Portland. It will limit their future expansion to their current sites – but they can make improvements for safety, seismic upgrades, and expand capacity to meet future regional demand.

The code changes will not apply to gas stations; distributors and wholesalers that receive and deliver fossil fuels exclusively by truck; industrial, commercial, institutional, and agricultural uses that store fossil fuels for use as an input; uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses. Fossil fuel storage facilities at airports, marine terminals, rail yards, and fleet vehicle fuel facilities are specifically exempted.

How can I review this proposal?

Get a copy of the report. The *Fossil Fuel Terminal Zoning Amendments Proposed Draft* will be available the week of August 12, 2016. You can pick up a copy at our office at 1900 SW 4th Avenue, 7th Floor. The Bureau receptionist will mail you a copy if you call 503-823-7700. The document will also be available on the Bureau of Planning and Sustainability website at www.portlandoregon.gov/bps/71118.

How can I comment on this proposal?

Testify at the Planning and Sustainability Commission hearing. The hearing, on September 13, 2016 at 12:30 pm, will be on the second floor at 1900 SW Fourth Avenue (SW 4th Avenue and Hall Street). Please call 503-823-7700 a week before the hearing for the scheduled time of this agenda item. Metered and pay parking is available in the vicinity. MAX, the Portland Streetcar and many buses serve this building; call Tri-Met at 503 238 7433 or go to their web site at http://www.trimet.org for routes and times.

Write to the Planning and Sustainability Commission. Mail written testimony to the Planning and Sustainability Commission at 1900 SW Fourth Avenue, Suite 7100, Portland, Oregon 97201, FAX comments to 503-823-7800, or email comments to PSC@PortlandOregon.gov. Written testimony must be received by the time of the hearing and must include your name and address.

What happens next?

The Planning and Sustainability Commission will consider public comments on this proposal. They will then forward a recommendation to City Council for consideration and additional public review and comment.

For more information, contact Tom Armstrong, Supervising Planner, at the Bureau of Planning and Sustainability 503-823-3527 or tom.armstrong@PortlandOregon.gov or visit the Bureau of Planning and Sustainability's website: www.portlandoregon.gov/bps/71118.

FTZ PSC Legislative Notice - Full Name	Organization Name	Address	City/State/Postal Code
Brad Fletcher		01537 SW COMUS ST	PORTLAND OR 97219-7842
Michael Dowd	Dowd Architecture Inc	0753 SW MILES ST	PORTLAND OR 97219-3060
Howard Shapiro and Alice Shapiro , PSC Commissioner		1001 NW LOVEJOY ST APT 1210	PORTLAND OR 97209
Chris Girard	Plaid Pantry	10025 SW ALLEN BLVD	BEAVERTON OR 97005-4124
Steve Janik	Ball Janik LLP	101 SW MAIN ST STE 1100	PORTLAND OR 97204-3228
Debbie Collard	Ball Janik LLP	101 SW MAIN ST STE 1100	PORTLAND OR 97204-3228
Mark Hardie	City of Maywood Park	10100 NE PRESCOTT ST STE 147	PORTLAND OR 97220
Chair/Land Use Chair Powellhurst-Gilbert NA	Powellhurst-Gilbert NA c/o EPNO	1017 NE 117th	Portland OR 97220
President/Chair EPNO	EPNO - East Portland Neighborhood Offic	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Lents NA	Lents NA c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Glenfair NA	Glenfair NA c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Parkrose NA	Parkrose NA c/o EPNP	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Centennial Community	Centennial Community Assn c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Hazelwood NA	Hazelwood NA c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Mill Park NA	Mill Park NA c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Parkrose Heights NA	Parkrose Heights Association of Neighbo	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Pleasant Valley NA	Pleasant Valley NA c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Russell NA	Russell NA	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Wilkes Community NA	Wilkes Community Group c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Woodland Park NA	Woodland Park NA c/o EPNO	1017 NE 117TH AVE	PORTLAND OR 97220-2112
Chair/Land Use Chair Linnton NA	Linnton NA (NWNW)	10250 NW 110th AVE	PORTLAND OR 97231
Gary Madson	CalPortland	1050 N RIVER ST	PORTLAND OR 97227-1719
Bob Short	CalPortland	1050 N RIVER ST	PORTLAND OR 97227-1719
Juliana Lukasik	@Large Films	10526 NE 13TH AVE	PORTLAND OR 97211-1560
Daniel Brainich		1070 Hanover ST	Daly CIty CA 94014
Jeffrey Stuhr	Holst Architecture	110 SE 8TH AVE	PORTLAND OR 97214
Ken Pirie	Walker Macy	111 SW OAK ST STE 200	PORTLAND OR 97204-3406
Police Bureau - Bureau Director	C of P - Police Bureau	1111 SW 2ND AVE	PORTLAND OR 97204
Chair/President Gateway Area BA	Gateway Area Business Association	11124 NE HALSEY ST UNIT PMB 47	PORTLAND OR 97220-2021
Mark Whitlow	Perkins Coie	1120 NW COUCH ST FL 10	PORTLAND OR 97209-4114
Alan Beard	GBD Architects	1120 NW COUCH ST STE 300	PORTLAND OR 97209-4114

Katherine Schultz	GBD Architects	1120 NW COUCH ST STE 300	PORTLAND	OR	97209-4114
Chair/President Venture Portland BA	Venture Portland	1125 SE MADISON ST STE 112	PORTLAND	OR	97214
Joyce Gibson		1128 NE 110TH AVE	PORTLAND	OR	97220-3137
Francesca Gambetti	Shiels Obletz Johnsen Inc	1140 SW 11TH AVE STE 500	PORTLAND	OR	97205-2490
Randy Watson		11435 SE BOISE ST	PORTLAND	OR	97266-2264
Phillips 66		1201 K St, Ste 1930	Sacramento,	CA	95814
Joyce Henstrand	Reynolds School District	1204 NE 201ST AVE	FAIRVIEW	OR	97024
Donald Krahmer	Schwab Williamson + Wyatt	1211 SW 5TH AVE STE 1900	PORTLAND	OR	97204-3713
OCCUPANT	Riverdale Community Group	12112 SW BREYMAN AVE	PORTLAND	OR	97219-8417
Susan Hanson	ODOT - Region 1	123 NW FLANDERS ST	PORTLAND	OR	97209-4012
Jack Brenneman		12532 SE OATFIELD RD	MILWAUKIE	OR	97222-6958
Margaret Labadie		1260 NW NAITO PKWY UNIT 208	PORTLAND	OR	97209
Jocelyn Cox		12705 SE RIVER RD APT 306C	PORTLAND	OR	97222
Jeff Kellis		12910 SE CENTER ST	PORTLAND	OR	97236-3619
Chair/Land Use Chair Sullivan's Gulch NA	Sullivan's Gulch NA c/o Holladay Park Pla	1300 NE 16TH AVE c/o Holladay P	PORTLAND	OR	97232
Phil Grillo		1300 SW 5th Ave, Ste 2400	Portland,	OR	97201-5630
Mike McCulloch	Michael McCulloch Architects	13000 NW OLD GERMANTOWN RI	PORTLAND	OR	97231-2773
Brittain Brewer		1310 NE 24TH AVE	PORTLAND	OR	97232-1625
City of Tigard - Bureau Director	City of Tigard	13125 SW HALL BLVD	TIGARD	OR	97223-8144
Jason Miner	1000 Friends of Oregon	133 SW 2ND AVE STE 201	PORTLAND	OR	97204-3534
Alan Peters	Ambridge Event Center	1333 NE MARTIN LUTHER KING JR	PORTLAND	OR	97232-1152
City of Gresham - Bureau Director	City of Gresham	1333 NW EASTMAN PKWY	GRESHAM	OR	97030-3825
Debra Byers		13465 SW BRIGHTWOOD RD	BEAVERTON	OR	97011
Noell Webb	Webb and Associates	1419 SW ALDER ST	PORTLAND	OR	97205-1946
Dennis Wilde	Gerding Edlen Development	1477 NW EVERETT ST	PORTLAND	OR	97209
Kathi Futornick	Environmental Consulting Associcates	14800 NE BLUE BIRD HILL LN	DAYTON	OR	97114-7005
Director	Clackamas County - Transportation and D	150 BEAVER CREEK RD	OREGON CITY	OR	97045-4143
Sustainability Team	Oregonian, The	1500 SW 1ST AVE STE 400	PORTLAND	OR	97201
Barbara Disciascio		15112 SE YAMHILL ST	PORTLAND	OR	97233-2949
Tom Wright	Group Mackenzie	1515 SE WATER AVE STE 100	PORTLAND	OR	97214-3349
Jeffrey Owen and Heather McCarey		1524 SW 18TH AVE	PORTLAND	OR	97201
Chuck Merrill	Merrill and Langberg	15253 SE LAURIE AVE	MILWAUKEE	OR	97267-2531

Erik Nielsen		15715 NW CENTRAL DR UNIT A51	PORTLAND OR 97229
Jeff Perala	Perlo McCormack Pacific	16101 SW 72ND AVE STE 200	PORTLAND OR 97224
Diane Schneider	Safeway Inc	16300 SE EVELYN ST	CLACKAMAS OR 97015-9515
Chair/President Northeast Broadway BA	Northeast Broadway Business Associatio	1631 NE BROADWAY UNIT 449	PORTLAND OR 97232-1425
Chair/President Alberta Main Street BA	Alberta Main Street Business Association	1722 NE ALBERTA ST	PORTLAND OR 97211-5802
Teresa Baldwin	Centennial School District	18135 SE BROOKLYN ST	PORTLAND OR 97236-1049
Sarah Ffitch		1850 SW HIGH ST	PORTLAND OR 97201-1740
Carmen Lohkamp		18531 SE TIBBETTS CT	GRESHAM OR 97030-6271
Multnomah Drainage District - Bureau Direct	Multnomah Drainage District	1880 NE ELROD DR APT	PORTLAND OR 97211-1810
Sherry Patterson	Oregon Earthquake Preparation Network	18926 ARROWOOD AVE	LAKE OSWEGO OR 97035-8304
City Auditor Hearing Office	City Auditor - Hearings Office	1900 SW 4TH AVE STE 3100	PORTLAND OR 97201-5350
Patrick Christopher		19695 Sun CIR	West Linn OR 97068-1913
Chair/President Downtown Retail Council	Downtown Retail Council c/o Portland Bu	200 SW MARKET ST STE 150	PORTLAND OR 97201-5715
Chair/Land Use Chair Beaumont-Wilshire NA	Beaumont-Wilshire NA c/o The Postal Sta	2000 NE 42ND AVE STE D - #394	PORTLAND OR 97213-1399
Chair/President Hollywood Boosters BA	Hollywood Boosters Business Association	2000 NE 42ND AVE UNIT PMB 388	PORTLAND OR 97213-1399
Jason Sheek , Marine Security		2126 SE 103RD DR	PORTLAND OR 97216-3021
Peter Finley-Fry	Columbia Pacific Planning	2153 SW MAIN ST STE 105	PORTLAND OR 97205-1124
Northwest Natural		220 NW 2nd Ave	Portland, OR 97209
Chair/President Kenton BA	Kenton Business Association	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair Overlook NA	Overlook NA	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair Hayden Island NA	Hayden Island Neighborhood Network	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair Kenton NA	Kenton NA c/o NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair East Columbia NA	East Columbia NA	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair Portsmouth NA	Portsmouth NA	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair University Park NA	University Park NA c/o NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair Piedmont NA	Piedmont NA	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair Arbor Lodge NA	Arbor Lodge NA c/o NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217
Chair/Land Use Chair St Johns NA	St Johns NA	2209 N SCHOFIELD ST Box 441	PORTLAND OR 97217
President/Chair NPNS	NPNS - North Portland Neighborhood Ser	2209 N SCHOFIELD ST FL 2	PORTLAND OR 97217
Michelle Rudd , PSC Commissioner		2213 NW PINNACLE DR	PORTLAND OR 97229-9108
Joanne Jeni		2221 SW 1ST AVE APT 1921	PORTLAND OR 97201-5071
Maggie Tallmadge , PSC Commissioner		2225 NW HOYT ST	PORTLAND OR 97210-3216

Leonard Nomeland			2234 N WILLAMETTE BLVD	PORTLAND OR 97217-4409
President/Chair NWNW		NWNW - Neighbors West / Northwest	2257 NW RALEIGH ST	PORTLAND OR 97210
Chair/President Old Town Chinatown CA		Old Town Chinatown Community Associa	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Northwest Industrial N		Northwest Industrial NA c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Goose Hollow NA		Goose Hollow Foothills League c/o NWN	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Northwest District Assi		Northwest District Assn c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Northwest Heights NA		Northwest Heights NA c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Pearl District NA		Pearl District NA c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Portland Downtown N		Portland Downtown NA c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Sylvan-Highlands NA		Sylvan-Highlands NA c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Forest Park NA		Forest Park NA c/o Neighbors West/Nort	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Arlington Heights NA		Arlington Heights NA c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/Land Use Chair Hillside NA		Hillside NA c/o NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
Chair/President Northwest Industrial NA		Northwest Industrial Business Associatio	2333 NW VAUGHN ST	PORTLAND OR 97210
Chris Smith ,			2343 NW PETTYGROVE ST	PORTLAND OR 97210-2609
Paul Leistner			2350 SE 57TH AVE	PORTLAND OR 97215-4006
Thomasina Gabriele		Gabriele Development Services	2424 NW NORTHRUP ST STE LWR	PORTLAND OR 97210-2923
Mike Houck and Al Miller			2433 NW QUIMBY ST	PORTLAND OR 97210-2644
Emily Schelling			2435 NE 46TH AVE	PORTLAND OR 97213-1907
Chair/President Nob Hill BA		Nob Hill Business Association	25 NW 23RD PL STE 6 - PMB 217	PORTLAND OR 97210
Chair/President Alberta Street BA		Alberta Street Business Association	2529 NE ALBERTA ST	PORTLAND OR 9721
Ken Kailing		Ken Kailing, Planning Consultant	2548 31ST W AVE	SEATTLE WA 98199-3336
Greg Madden		Madden Fabrication	2550 NW 25TH PL	PORTLAND OR 97210-1843
Chair/President Burnside East BA		Burnside East Business Association	2705 E BURNSIDE ST UNIT 110	PORTLAND OR 97214-1763
Mike Pederson		Rose City Awning	2728 NW NELA ST	PORTLAND OR 97210-1714
Patricia Schechter and Nick Fish			2735 NE 39TH AVE	PORTLAND OR 97212-2928
Loren Waxman			2746 SE 26TH AVE	PORTLAND OR 97202-1227
Anne Davidson			2756 NW RALEIGH ST	PORTLAND OR 97210-2457
Leslie Centner and Kenneth Centner			2903 NW LURAY TER	PORTLAND OR 97210-2716
Chair/President East Burnside BA		East Burnside Business Association	2929 E BURNSIDE ST	PORTLAND OR 97214-1831
Ted Sofianos		Mackins Auto Body	300 SE HEARTHWOOD	VANCOUVER WA 98684
Lloyd Lindley		Lloyd Lindley, ASLA	3005 NE 16TH AVE	PORTLAND OR 97212-3348

Teresa Penninger	ODOT - Region 5	3012 ISLAND AVE	LA GRANDE OR 97850-9497
Susan Arthur		3014 NE SCHUYLER ST	PORTLAND OR 97212-5127
Geoff Granum		3039 SE 119TH AVE	PORTLAND OR 97266-1615
Betty Wollam	Swinerton Builders of Oregon	308 SW 2ND AVE STE 210	PORTLAND OR 97204
Chair/Land Use Chair Alameda NA	Alameda NA c/o Gene Avery	3118 NE 32ND AVE	PORTLAND OR 97212-2623
John Barker	John H Barker Architect	3124 SE TAYLOR ST	PORTLAND OR 97214-4037
Andrew Jansky	Flowing Solutions	3305 SW 87TH AVE	PORTLAND OR 97225-2826
Melissa Darby		3327 NE SIMPSON ST	PORTLAND OR 97211-7367
Andre Baugh	Baugh	333 SE 2ND AVE UNIT 200	PORTLAND OR 97214
Barbara Sestak		3330 NE KLICKITAT ST	PORTLAND OR 97212-2668
Chris Davis		3335 NE 27TH AVE	PORTLAND OR 97212-2526
Shelley Holly		3425 NE 18TH AVE	PORTLAND OR 97212-2331
Gary Oxman		3431 NW RALEIGH ST	PORTLAND OR 97210-1932
Gary Learning	ODOT - Region 3	3500 NW STEWART PKY	ROSEBURG OR 97470-1600
Jared Castle	ODOT - Region 3	3500 NW STEWART PKY	ROSEBURG OR 97470-1600
Ralph Sanders		3504 NE DAVIS ST	PORTLAND OR 97232-3433
Chair/President Beaumont Ba	Beaumont Business Association	3519 NE 15TH AVE STE 540	PORTLAND OR 97212
Chair/Land Use Chair Laurelhurst NA	Laurelhurst NA c/o SEUL	3534 SE MAIN	PORLAND OR 97214
Chair/Land Use Chair Creston-Kenilworth NA	Creston-Kenilworth NA c/o SEUL	3534 SE Main ST	PORTLAND OR 97214
Chair/President Belmont BA	Belmont Area Business Association	3534 SE MAIN ST	PORTLAND OR 97214-4263
Chair/President Division/Clinton BA	Division/Clinton Business Association	3534 SE MAIN ST	PORTLAND OR 97214-4263
President/Chair SEUL	SEUL - Southeast Uplift NA	3534 SE MAIN ST	PORTLAND OR 97214-4263
Chair/Land Use Chair Sunnyside NA	Sunnyside NA c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
Chair/Land Use Chair Reed NA	Reed NA	3534 SE MAIN ST	PORTLAND OR 97214-4263
Chair/Land Use Chair Hosford-Abernethy NA	Hosford-Abernethy Neighborhood Devel	3534 SE MAIN ST	PORTLAND OR 97214-4263
Chair/Land Use Chair Richmond NA	Richmond NA c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
Chair/Land Use Chair Woodstock NA	Woodstock NA c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
Chair/Land Use Chair North Tabor NA	North Tabor NA c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
Chair/Land Use Chair Ardenwald/Johnson Cr	Ardenwald / Johnson Creek NA c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
Chair/Land Use Chair Buckman Community A	Buckman Community Assn c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
Chair/Land Use Chair Montavilla NA	Montavilla NA c/o SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
Chair/Land Use Chair Mt. Scott-Arleta NA	Mt Scott-Arleta NA	3534 SE MAIN ST	PORTLAND OR 97214-4263

Chair/President Multnomah Village BA		Multnomah Village Business Association	3540 SW CALIFORNIA ST	PORTLAND OR 97219-1679
Scott Pratt			3545 SE ANKENY ST	PORTLAND OR 97214-2046
Rob Kebbon			3627 SW CORBETT AVE	PORTLAND OR 97239-4328
Chair/President Midway BA		Midway Business Association	3758 SE 122ND AVE	PORTLAND OR 97236-3405
Chair/Land Use Chair Boise NA		Boise NA	3901 N MISSISSIPPI AVE	PORTLAND OR 97227-1162
Kathryn Lavenne			3915 SE 103RD AVE	PORTLAND OR 97266-2407
Shoshana Cohen			3955 NE 8TH AVE	PORTLAND OR 97212-1206
Neil McFarlane		TriMet	4012 SE 17TH AVE	PORTLAND OR 97202-3940
Gregg Everhart			4014 SE TAYLOR ST	PORTLAND OR 97214-4440
Suzanne Jones			4033 SE GRANT ST	PORTLAND OR 97214-5934
Susan Gries			4034 NE 13TH AVE	PORTLAND OR 97212-1307
Jean Baker		Ada's Heir's	4039 SE GRANT CT	PORTLAND OR 97214-5942
Eloise Damrosch		RACC - Regional Arts and Culture Council	411 NW PARK AVE STE 101	PORTLAND OR 97209
Doug Zenn			411 SE 69TH AVE	PORTLAND OR 97215-1338
Elizabeth Clapp			4135 SE EVERGREEN ST	PORTLAND OR 97202-7761
Chair/President Woodstock Community BA		Woodstock Community Business Associa	4207 SE WOODSTOCK BLVD UNIT	PORTLAND OR 97206
Melanie McCandless			4240 SE STARK ST UNIT C	PORTLAND OR 97215-1644
Chair/Land Use Chair Healy Heights NA		Healy Heights NA	4273 SW COUNCIL CREST DR	PORTLAND OR 97239-1530
Abigail Cermak			436 NE WYGANT ST	PORTLAND OR 97211-3360
Tom Archer		PBS Environmental	4412 SW CORBETT AVE	PORTLAND OR 97239-4207
Chair/Land Use Chair Sunderland NA		Sunderland NA	4415 NE 87TH AVE	PORTLAND OR 97220
Chair/Land Use Chair Cully Neighborhood N/		Cully Neighborhood Assn c/o CNN	4415 NE 87TH AVE	PORTLAND OR 97220
Chair/Land Use Chair Sumner NA		Sumner Association of Neighbors	4415 NE 87TH AVE	PORTLAND OR 97220
Chair/Land Use Chair Roseway NA		Roseway NA c/o CNN	4415 NE 87TH AVE	PORTLAND OR 97220
Chair/Land Use Chair Madison South NA		Madison South NA c/o CNN	4415 NE 87TH AVE	PORTLAND OR 97220
Chair/Land Use Chair Hollywood NA		Hollywood NA c/o CNN	4415 NE 87TH AVE	PORTLAND OR 97220
Chair/Land Use Chair Rose City Park NA		Rose City Park NA c/o CNN	4415 NE 87TH AVE	PORTLAND OR 97220
President/Chair Central NE Neighbors		CNN - Central Northeast Neighbors	4415 NE 87TH AVE	PORTLAND OR 97220-4901
Celeste Lewis		Celeste Lewis, Architect	4486 SW WASHOUGA AVE	PORTLAND OR 97239-1393
Louis Torres		ODOT - Region 2	455 Airport RD BLDG B	SALEM OR 97301
David Rasmussen			4764 SE MILWAUKIE AVE	PORTLAND OR 97202-4730
Ken Sandblast		Planning Resources	480 5TH ST	LAKE OSWEGO OR 97034

Craig Hopkins	Ray-Burt's Inc	4800 SE 26TH AVE	PORTLAND OR 97202-4602
Carl Benson	Ray-Burt's Inc	4800 SE 26TH AVE	PORTLAND OR 97202-4602
John Donnerberg	Real Property Consultants	4805 SW OLESON RD	PORTLAND OR 97225-1420
George Donnerberg	Real Property Consultants	4805 SW OLESON RD	PORTLAND OR 97225-1420
Chair/President Swan Island BA	Swan Island Business Association	4810 N LAGOON AVE STE 400	PORTLAND OR 97217
Jeff Henkelman	Northwest Awning and Sign	4812 N INTERSTATE AVE	PORTLAND OR 97217-3647
President/Chair NECN	NECN - Northeast Coalition of Neighbors	4815 NE 7TH AVE	PORTLAND OR 97211
Chair/Land Use Chair Vernon NA	Vernon NA c/o NECN	4815 NE 7TH AVE	PORTLAND OR 97211
Chair/Land Use Chair Humboldt NA	Humboldt NA c/o NECN	4815 NE 7TH AVE	PORTLAND OR 97211
Chair/Land Use Chair Sabin NA	Sabin Community Association c/o NENC	4815 NE 7TH AVE	PORTLAND OR 97211
Chair/Land Use Chair Eliot NA	Eliot NA	4815 NE 7TH AVE	PORTLAND OR 97211
Chair/Land Use Chair King Neighborhood NA	King NA	4815 NE 7th AVE	Portland OR 97211
Chair/President 42nd Avenue BA	42nd Avenue Business Associaiton	4920 NE 42ND AVE	PORTLAND OR 97218-1502
Michael Dangelo		503 NE 29TH AVE	PORTLAND OR 97232-2411
Chair/President North Portland BA	North Portland Business Association	5036 N LOMBARD ST	PORTLAND OR 97203-4402
Chair/Land Use Chair Mt. Tabor NA	Mt Tabor NA	5122 SE HAWTHORNE BLVD	PORTLAND OR 97215-3302
Lezlie Bugg		5124 SE 77TH AVE	PORTLAND OR 97206-4375
Pacific Terminal Services		5211 122nd St SE	Everett, WA 98208
Mike Warwick		535 NE THOMPSON ST	PORTLAND OR 97212-3844
McCall Oil		5480 NW Front Ave	Portland, OR 97210
Chair/Land Use Chair Bridgeton NA	Bridgeton NA	55 NE BRIDGETON RD SLIP 3	PORTLAND OR 97211-1042
Kinder Morgan		5880 NW St Helens Rd	Portland, OR 97210
Steven Yett		5949 NE CULLY BLVD	PORTLAND OR 97218-3354
Tom Hughes	Metro Regional Council	600 NE GRAND AVE	PORTLAND OR 97232-2727
Shirley Caddick	Metro Regional Council	600 NE GRAND AVE	PORTLAND OR 97232-2727
Carlotta Collette	Metro Regional Council	600 NE GRAND AVE	PORTLAND OR 97232-2727
Craig Dirksen	Metro Regional Council	600 NE GRAND AVE	PORTLAND OR 97232-2727
Kathryn Harrington	Metro Regional Council	600 NE GRAND AVE	PORTLAND OR 97232-2727
Sam Chase	Metro Regional Council	600 NE GRAND AVE	PORTLAND OR 97232-2727
Bob Stacey	Metro Regional Council	600 NE GRAND AVE	PORTLAND OR 97232-2727
City of Milwaukee - Bureau Director	City of Milwaukee	6101 SE JOHNSON CREEK BLVD	MILWAUKIE OR 97206-0641
Chair/Land Use Chair Eastmoreland NA	Eastmoreland NA	6123 SE REED COLLEGE PL	PORTLAND OR 97202-8125

Duncan Brown	Land Use Planning & Research	61487 SW ELDER RIDGE ST	BEND OR 97702
Gerik Kransky	Bicycle Transportation Alliance (BTA)	618 NW GLISAN ST suite 401	PORTLAND OR 97209-3781
Debbie McDuffee		6192 SW CAPITOL HWY	PORTLAND OR 97239
Theresa St Martin , PSC Commissioner		6234 SW ORCHID DR	PORTLAND OR 97219-4981
Amy Pfeiffer	ODOT - Region 4	63085 N HIGHWAY 97 STE 107	BEND OR 97701-5765
Chair/President Foster Area BA	Foster Area Business Association	6317 SE HOLGATE BLVD	PORTLAND OR 97206-3610
Eric Wirfs		63820 CLAUSEN DR STE 100	BEND OR 97701-8063
Chair/Land Use Chair Woodlawn NA	Woodlawn NA c/o Luke Groser	6405 NE 7TH AVE	PORTLAND OR 97211-3603
Dwyn Armstrong		6528 NW EARL AVE	SEATTLE WA 98117-5927
Chair/President 82nd Ave Roses BA	82nd Avenue of Roses Business Associati	6631 SE 70TH AVE	PORTLAND OR 97206-7349
Chair/Land Use Chair Foster-Powell NA	Foster-Powell NA c/o SEUL	6721 SE BOISE ST	PORTLAND OR 97206-3545
Steven Kolberg	Petersen Kolberg & Assoc	6969 SW HAMPTON ST	PORTLAND OR 97223-8560
Randy Painter		7017 NE ROSELAWN ST	PORTLAND OR 97218-3439
Christine Frey		7128 SE MALL ST	PORTLAND OR 97206-3472
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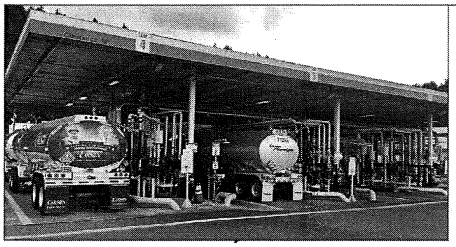

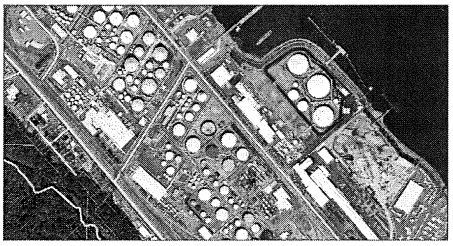

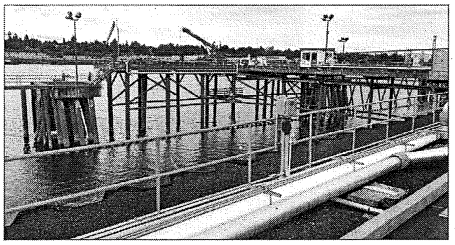

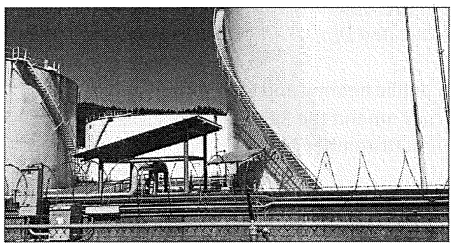

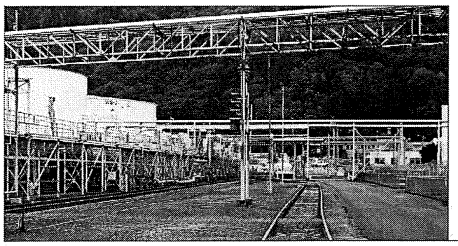

Fossil Fuel Terminal Zoning Amendments

Proposed Draft

City of Portland, Oregon

August 8, 2016

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.
City of Portland, Oregon

How can I provide feedback to decision-makers?

The Fossil Fuel Terminal Zoning Amendments project would begin to implement new policy direction on fossil fuel distribution and storage facilities through changes to the Zoning Code. This proposal would restrict development and expansion of bulk fossil fuel terminals.

You may testify about proposed changes to the Planning and Sustainability Commission (PSC) in the following ways:

Testify in person at the PSC public hearing.
You may speak for 2 minutes to the Commission, and your testimony will be added to the public record.

> **PSC Fossil Fuel Terminal Zoning Amendments Public Hearing**
> Tuesday, September 13, 2016 at 12:30 p.m.
> 1900 SW 4th Avenue, Room 2500, Portland, OR
> To confirm the time and date, check the PSC calendar at *www.portlandoregon.gov/bps/35452*

Testify in writing between now and September 13, 2016.
Your full name and mailing address is required.

- Email: *psc@portlandoregon.gov* with subject line "PSC Fossil Fuel Zoning Testimony"
- U.S. Mail: Portland Planning and Sustainability Commission, Fossil Fuel Zoning Testimony, 1900 SW 4th Ave., Suite 7100, Portland OR 97201

Next Steps

Proposed Draft: The PSC may amend the proposal and will subsequently vote to recommend the code changes to Portland City Council. This is called the *Recommended Draft*.

Recommended Draft: City Council will hold an additional public hearing and take formal public testimony on the Recommended Draft. The City Council may amend the Recommended Draft before they vote to adopt the code changes. This will likely occur in December 2016.

The Bureau of Planning and Sustainability is committed to providing equal access to information and hearings. If you need special accommodation, please call 503-823-7700, the City's TTY at 503-823-6868, or the Oregon Relay Service at 1-800-735-2900.

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Acknowledgments

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1. Introduction

In recent years, the rapid development of fossil fuel resources in the Western United States and Canada has prompted many proposals in the Pacific Northwest for large new fuel terminals and infrastructure projects. In early 2015, Pembina Pipeline Corporation proposed a propane terminal in Portland that drew substantial public opposition. Mayor Charlie Hales withdrew a proposed zoning code amendment that the development needed to move forward, effectively blocking that proposal. In November 2015, Portland City Council adopted Resolution 37168 calling for opposition to expansion of fossil fuel infrastructure. In June 2016, City Council adopted the 2035 Comprehensive Plan, which included Policy 6.48 to limit fossil fuel distribution and storage facilities to those needed to serve the regional market. This code-change project begins to implement the policy direction in the resolution by prohibiting large bulk fossil fuel terminals.

Project summary

The Fossil Fuel Terminal Zoning Amendments project would restrict the development and expansion of Bulk Fossil Fuel Terminals.

Proposed zoning code amendments:

- Identify "Bulk Fossil Fuel Terminals" as a regulated land use, characterized by marine, railroad, or pipeline transport access and storage capacity exceeding 5 million gallons.
- Prohibit Bulk Fossil Fuel Terminals in all base zones.
- Existing Bulk Fossil Fuel Terminals would become legal, non-conforming uses that can continue to operate. Expansion would be limited to their current site and require approval through a Nonconforming Situation Review.

Why is this important?

Fossil fuel distribution policy – New policy directions adopted by City Council in November 2015 and proposed in the 2035 Comprehensive Plan would limit fossil fuel distribution and storage facilities to those serving the regional market. City Council adopted these policies after holding public hearings and hearing testimony from hundreds of Portlanders.

Climate action goals – Fossil fuels are major contributors to climate change and pollution. The rapid development of fossil fuel resources in the Western United States and Canada has prompted many recent proposals for new export terminals in the Pacific Northwest. The City's Climate Action Plan seeks to reduce greenhouse gas emissions, however, and fossil fuels are the largest source of emissions.

Public safety and environmental protection – Several recent accidents involving fossil fuel distribution across the nation and in Oregon highlight public safety risks in cities and environmental risks along rivers. Most of Portland's industrial areas have moderate-to-high liquefaction susceptibility in a major earthquake.

Oregon's industrial and distribution center – Portland is Oregon's largest, most diverse distribution hub, and existing Portland petroleum terminals serve more than 90 percent of the statewide market. Proposed code changes would restrict the expansion of these facilities in Portland.

Project scope and timing

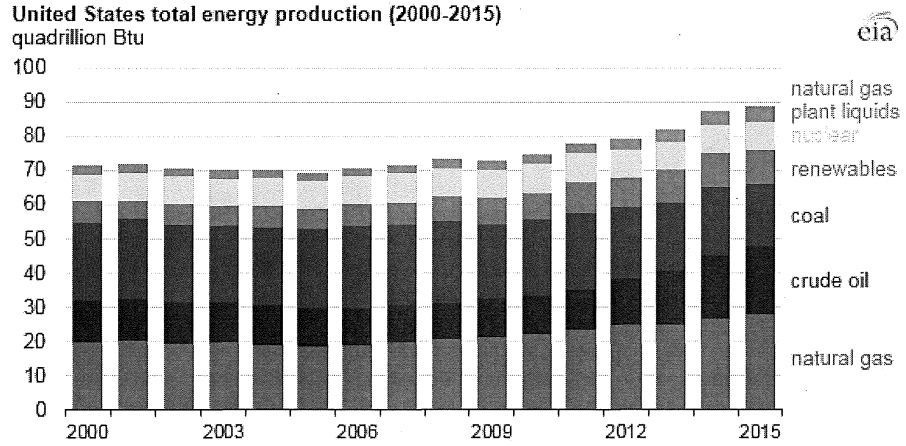
The energy distribution market in the Pacific Northwest is changing. Production of crude oil and natural gas, particularly from North Dakota, has substantially increased in the U.S. since 2009, as shown in Figure 1. In turn, several large new fuel distribution terminals have been proposed in the Pacific Northwest to access West Coast and export markets, as shown in Figure 2. Similar trends have occurred in Alberta and British Columbia.

This project is proposing a prompt, focused response to these market changes. The proposed code amendments are will restrict development of new fossil fuel terminals and limit the expansion of existing terminals , consistent with City and State objectives on climate change and public safety.

Where are Portland's existing bulk fossil fuel terminals?

Portland's industrial districts are Oregon's largest seaport, rail hub, and truck distribution center. The Northwest Industrial District in Portland is also the end of the Olympic Pipeline, which supplies most of Oregon's petroleum fuels from Puget Sound refineries. The ten petroleum terminals located in Northwest Portland are the gateway distribution facilities serving Oregon and Southern Washington markets. Additionally, NW Natural's GasCo terminal provides peak-consumption storage of natural gas for much of the regional market. In Northwest Portland, these "tank farm" storage facilities have direct access to pipeline, deep-water port, railroad, and truck route infrastructure.

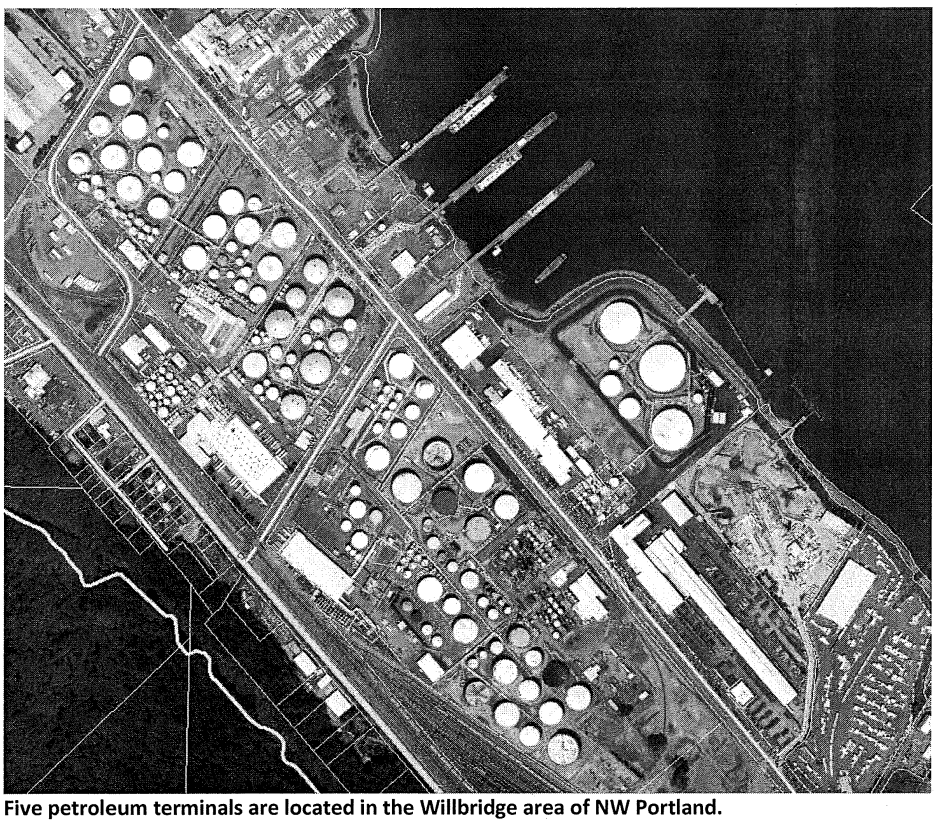
Figure 1. Increasing U.S. energy production



Source: U.S. Energy Information Administration, 2016

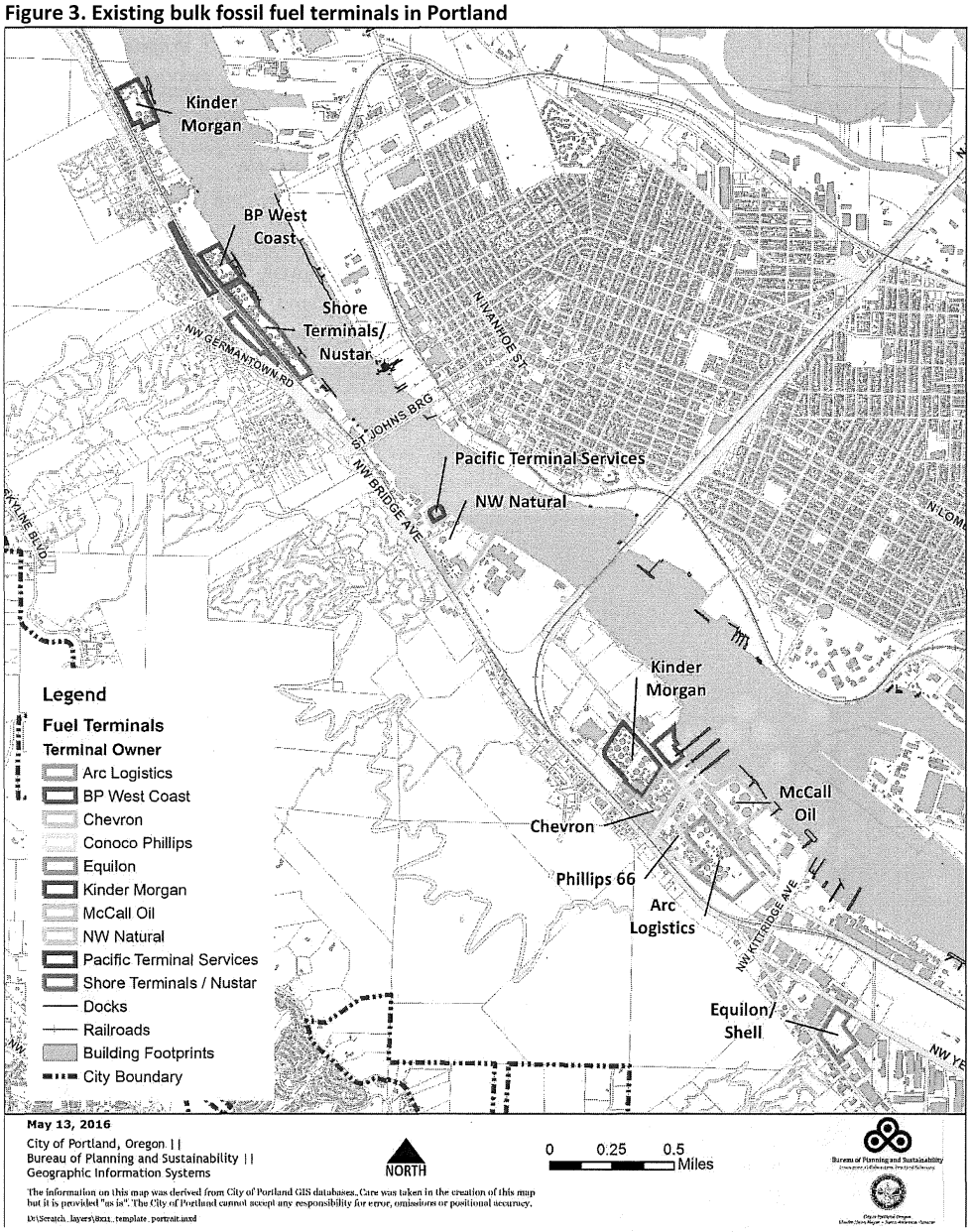
Figure 2. Examples of recent fossil terminal proposals in the Pacific Northwest

Operator	*Facility type*	*Location*	*Proposed new storage capacity*
Petroleum fuels			barrels
Vancouver Energy	Crude oil terminal	Vancouver WA	2,160,000
Imperium Renewables	Biofuels terminal	Grays Harbor WA	720,000
Gaseous fuels			gallons
Oregon LNG terminal	New LNG terminal	Warrenton OR	84,000,000
Jordan Cove LNG	New LNG terminal	Coos Bay OR	84,000,000
Pembina	Propane terminal	Portland	35,000,000
Haven Energy	Propane terminal	Longview WA	23,000,000
Coal			Stockpile acres
Millennium Bulk Terminal	Coal terminal	Longview WA	~20
Ambre Energy	Coal transload facility	St. Helens OR	no storage
Gateway Pacific Terminal	Coal terminal	Bellingham WA	80



Five petroleum terminals are located in the Willbridge area of NW Portland.

Figure 3. Existing bulk fossil fuel terminals in Portland



What's in this report?

This *Proposed Draft* of Fossil Fuel Terminal Zoning Amendment is proposed by the Bureau of Planning and Sustainability for consideration by the Planning and Sustainability Commission. The audience is the Commission and the general public, including stakeholders, inter-governmental partners, implementers, and other interested parties. Project stakeholders include property owners, businesses, employees, residents, neighbors, business district and neighborhood associations, underrepresented and underserved groups, environmental groups and other community groups. Implementers include the real estate industry, development review staff and others who use the zoning code.

Your feedback on the Proposed Draft should be directed to the Planning and Sustainability Commission (PSC). You may testify about the proposed changes in person at the PSC public hearing on September 13, 2016, or testify in writing before the public hearing (see information about how to provide feedback on the inside cover of this report).

This report consists of seven parts:

- **Section 1** introduces the project.
- **Section 2** describes how the proposed code changes implement City policies in Resolution 37168 and the 2035 Comprehensive Plan.
- **Section 3** summarizes public and stakeholder involvement activities that have helped shape and inform this project.
- **Section 4** describes background conditions that inform the proposed zoning changes.
- **Section 5** describes the analysis of proposed zoning concepts, including related policy directions, implementation issues and rationale.
- **Section 6** specifies the draft code language, along with code commentary pages that clarify expected implementation.
- **Section 7** recommends future implementation directions for building code amendments to address seismic resilience and periodic monitoring for code effectiveness.

2. Policy direction

Section 2 describes how the proposed code changes implement relevant City policies in Resolution 37168 and the Comprehensive Plan.

City of Portland Fossil Fuel Resolution 37168

> BE IT RESOLVED, that the City Council will actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways; and

The proposed zoning code changes are a key implementation action of Resolution 37168, adopted November 2015. Addressing the overall direction of the resolution to oppose expansion of fossil fuel distribution and storage infrastructure, this project proposes to restrict development and expansion of bulk fossil fuel terminals.

> BE IT FURTHER RESOLVED, that this Resolution does not restrict:
> 1. improvements in the safety, or efficiency, seismic resilience, or operations of existing infrastructure;
> 2. the provision of service directly to end users;
> 3. development of emergency backup capacity;
> 4. infrastructure that enables recovery or re-processing of used petroleum products; or
> 5. infrastructure that will accelerate the transition to non-fossil fuel energy sources; and

The proposed code changes will require a discretionary land use review for many of the exceptions listed in the Resolution. Expansion projects at existing fuel terminals that improve safety (1), provide wholesale fuel supply to local or regional end users (2), add backup capacity (3), or add tanks for clean/renewable fuels (5) would require approval through a Nonconforming Situation Review. The review criteria include that, with mitigation measures, there will be no net increase in overall detrimental impacts on the surrounding industrial zone (such as hours of operation and vehicle trips) and the expansion will not detract from the desired function and character of the industrial zone. Terminal improvements would also be limited to their existing site area. Improvements that address the exceptions 1-5 in the Resolution are not generally expected to result in additional detrimental impacts on the surrounding industrial zone. The proposed code changes also substantially address exceptions 2 and 4 in the Resolution through exclusion of specific end-user facilities and recovery or re-processing of used petroleum products from the proposed new land use restrictions on Bulk Fossil Fuel Terminals.

> BE IT FURTHER RESOLVED, that City bureaus are directed to examine existing laws, including those related to public health, safety, building, electrical, nuisance, and fire codes, and develop recommendations to address fossil fuels that strengthen public health and safety; and

The resolution broadly addresses fossil fuel infrastructure. The zoning code regulates land use patterns and development of fossil fuel distribution facilities on parcels. Zoning does not regulate the quantity of products handled (throughput) on developed sites or their destination (such as exports). Additional amendments to building, fire, and energy codes would need to be addressed in future projects.

BE IT FURTHER RESOLVED, that the Bureau of Planning and Sustainability is directed to develop proposed code changes for Council consideration to advance the policies set forth in this Resolution; and

The proposed project will specifically implement this provision of the resolution.

BE IT FURTHER RESOLVED, that prior to any further Council action, the mayor shall schedule (1) a work session to review any proposed code changes and (2) an executive session to review the legal considerations of any proposed code changes; and

The proposed project will implement this process requirement of the resolution.

BE IT FURTHER RESOLVED, that the Bureau of Planning & Sustainability shall undertake an analysis of the economic impacts of any proposed Code changes to advance the policies set forth in this resolution, with a particular focus on potential impacts to local blue-collar jobs; and

This report includes summary analysis of economic impacts in Section 4, specifically addressing impacts on middle-wage blue collar jobs. Analysis to date is limited on the potential impacts on fuel supply to meet regional demand. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts, or may plateau and decline with implementation of climate resilience goals and strategies. Staff will continue to research and analyze potential economic impacts of proposed code changes prior to adoption.

BE IT FURTHER RESOLVED, that the City and applicable bureaus shall seek and identify opportunities to invest in Portland's 'human infrastructure' by supporting programs to retrain our workforce as the city transitions to a clean energy economy; and

This provision of the resolution is expected to be implemented as a future action.

BE IT FURTHER RESOLVED, that the City shall consult with its Tribal Government Partners, the State of Oregon, local governments, and other key stakeholder including labor, business, environment, neighborhoods and communities of color in advancing this policy;

The Mayor's Office staff has sought input from and will continue to reach out to the entities identified above to implement this process requirement of the resolution.

Guiding principles of the 2035 Comprehensive Plan

The Comprehensive Plan sets five Guiding Principles, which encourage balanced, integrated multi-disciplinary approaches that must comply with the Plan. This project is consistent with the Guiding Principles because it promotes major benefits to human health and safety, environmental health and resilience and integrates considerations for economic prosperity and equity.

Economic prosperity

Guiding Principle: Support a low-carbon economy and foster employment growth, quality education and training, competitiveness, and equitably-distributed household prosperity.

The proposed code changes would restrict expansion at existing fuel terminals and prohibit new terminal development, impacting associated job growth and tax revenue. The proposed code

restrictions on fossil fuel terminal development would also limit potential financial risks from a major accident involving fossil fuel infrastructure.

Human health

> *Guiding Principle:* Avoid or minimize negative health impacts and improve opportunities for Portlanders to lead healthy, active lives.

Major benefit – The proposed code changes would reduce the scale of low, but potentially catastrophic, safety risks associated with the growth of fossil fuel infrastructure, including oil train derailments, explosive accidents at LNG (liquefied natural gas) and LPG (liquefied petroleum gas) facilities, and seismic risks of tank farms. Fossil fuel emissions and coal dust are also significant sources of air pollution associated with respiratory disorders.

Environmental health

> *Guiding Principle: Weave nature into the city and foster a healthy environment that sustains people, neighborhoods, and wildlife. Recognize the intrinsic value of nature and sustain the ecosystem services of Portland's air, water, and land.*

Major benefit – The human health benefits described above also extend to environmental health. The proposed code changes would reduce the scale of environmental health risks associated with the growth of fossil fuel infrastructure, including oil train derailments along the Columbia River, LNG and LPG facilities in riparian areas, and seismic risks of tank farms along the Willamette River. Fossil fuel emissions are also a significant source of air pollution.

Equity

> *Guiding Principle: Promote equity and environmental justice by reducing disparities, minimizing burdens, extending community benefits, increasing the amount of affordable housing, affirmatively furthering fair housing, proactively fighting displacement, and improving socio-economic opportunities for under-served and under-represented populations. Intentionally engage under-served and under-represented populations in decisions that affect them. Specifically recognize, address, and prevent repetition of the injustices suffered by communities of color throughout Portland's history.*

The proposed code changes would restrict expansion at existing fuel terminals and prohibit new terminal development, impacting associated middle-wage, industrial job growth that disproportionately benefits workers of color. Restricting potential increases in regional supply of fossil fuels could also have regressive impacts of increasing fuel costs, disproportionately affecting lower-income people.

Resilience

> *Guiding Principle: Reduce risk and improve the ability of individuals, communities, economic systems, and the natural and built environments to withstand, recover from, and adapt to changes from natural hazards, human-made disasters, climate change, and economic shifts.*

Major benefit – The proposed code changes would restrict development of fossil fuel terminals consistent with City and State objectives on climate change and public safety. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, substituting these fuels for higher-carbon fuels does not begin to approach the goal of an 80% reduction in carbon emissions by 2050 established in Portland's Climate Action Plan or the State's 75% goal.

2035 Comprehensive Plan policies specifically implemented in this project

The proposed zoning changes in the project are implementing the following specific policies.

Overall project direction: Fossil fuel distribution

> *Policy 6.48 Fossil fuel distribution. Limit fossil fuel distribution and storage facilities to those necessary to serve the regional market.*

The proposed code changes would implement Policy 6.48 by restricting development and expansion of fossil fuel distribution terminals. Analysis to date is limited on the potential impacts of code amendments in constraining fossil fuel supply to meet regional demand. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts reviewed in Section 4, or may plateau and decline with implementation of climate resilience goals and strategies. The Zoning Code provides discretionary flexibility for expansion of existing fuel terminals within their existing site area through a nonconforming situation review, subject to mitigating any net increase of detrimental impacts on the surrounding industrial zone.

Related policy directions

> *Policy 4.81 Disaster-resilient development. Encourage development and site-management approaches that reduce the risks and impacts of natural disasters or other major disturbances and that improve the ability of people, wildlife, natural systems, and property to withstand and recover from such events.*
>
> *Policy 4.82 Portland Harbor facilities. Reduce natural hazard risks to critical public and private energy and transportation facilities in the Portland Harbor.*

Policies 4.81 and 4.82 are partly met by prohibiting fuel terminal development in Portland's industrial areas that are predominantly in locations with high susceptibility to soil liquefaction (see Figure 7 in Section 4). Incremental expansion at existing terminals also provides a pathway for market-driven safety improvements, providing financial return to cover improvement costs. As described above, the Zoning Code provides discretionary flexibility for such expansion through a nonconforming situation review.

> *Policy 6.2 Diverse and expanding economy. Align plans and investments to maintain the diversity of Portland's economy and status as Oregon's largest job center with growth across all sectors (commercial, industrial, creative, and institutional) and across all parts of the city.*
>
> *Policy 6.5 Economic resilience. Improve Portland's economic resilience to impacts from climate change and natural disasters through a strong local economy and equitable opportunities for prosperity.*
>
> *Policy 6.6 Low-carbon and renewable energy economy. Align plans and investments with efforts to improve energy efficiency and reduce lifecycle carbon emissions from business operations. Promote employment opportunities associated with the production of renewable energy, energy efficiency projects, waste reduction, production of more durable goods, and recycling.*

The proposed code changes are consistent overall with the range of direction in Policies 6.2, 6.5, and 6.6, providing code-limited flexibility for incremental expansion of existing terminals as part of a diverse, expanding economy and prohibiting development of new fossil fuel terminals that conflict with resilience and climate action goals.

Existing Comprehensive Plan policies specifically implemented in this project

The 2035 Comprehensive Plan was adopted in June 2016 and is not expected to take effect until early 2018. In the meantime, the existing Comprehensive Plan is in effect.

> 7.6 Energy Efficient Transportation. Provide opportunities for non-auto transportation including alternative vehicles, buses, light rail, bikeways, and walkways. The City shall promote the reduction of gasoline and diesel use by conventional buses, autos and trucks by increasing fuel efficiency and by promoting the use of alternative fuels.
>
> 7.8 Energy Supply. The City shall promote conservation as the energy resource of first choice. The City shall also support environmentally acceptable, sustainable energy sources, especially renewable resources such as solar, wind, hydroelectric, geothermal, biomass (wood, farm and municipal waste), cogeneration, and district heating and cooling.

The proposed code changes are consistent with Policies 7.6 and 7.8, promoting the use of alternative energy sources by restricting development and expansion of fossil fuel terminals.

2015 Climate Action Plan

> Goal: Reduce local carbon emissions 80 percent from 1990 levels by 2050, with an interim goal of 40 percent by 2030.

As described in Section 4, lower-carbon fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, but they do not approach the goal of an 80% reduction in carbon emissions by 2050 in Portland's Climate Action Plan or the State's 75% goal. Investments in major infrastructure typically take decades to recoup, and the transition to renewables needs to go much faster than that to stabilize global emissions. The proposed code changes are consistent with the 80% goal of the Climate Action Plan by restricting development of fossil fuel terminals.

3. Public and stakeholder involvement

Section 3 summarizes public and stakeholder involvement activities that have helped shape and inform this project. Stakeholder focus group results are further explained in Appendix A of this report.

What have we heard leading up to this project?

Public hearings at the Planning and Sustainability Commission and City Council on the Pembina terminal development proposal in 2014 and Resolution 37168 in 2015 drew testimony from hundreds of people. The overall theme of that testimony was strong objection to the Pembina project and support for the fossil fuel resolution. Primary reasons included the neighborhood safety and health risks and inconsistency with the City's climate action objectives. The Resolution also drew letters with strong opposition from state and regional business associations.

Following adoption of the Resolution in November 2015, City Council added the related Policy 6.48 on fossil fuel distribution to the 2035 Comprehensive Plan, reflecting the recently adopted policy direction in the Resolution. Public involvement in the Comprehensive Plan included public hearings in April 2016 on City Council amendments and thousands of comments on the 2035 Comprehensive Plan over the previous 8 years. The proposed code amendments are consistent with several sustainability-related policies in the Plan. Addressing issues with policy tradeoffs, the 2035 Comprehensive Plan calls for a balanced, integrated approach to implement multiple goals. As described in Section 2, the proposed code amendments provide major benefits toward implementing three of the Plan's five guiding principles and integrates consideration of the other two guiding principles.

Public involvement activities in this project

Extensive public comments were received on the Discussion Draft and influenced substantial changes between the Discussion and Proposed Drafts.

Over 700 people sent emails asking for a "full ban" on new and expanded fossil fuel terminals. Their comments included three generally consistent recommendations: a ban on new bulk fossil fuel terminals; tight limits on expansion at existing facilities; and provisions to improve the safety and resilience of existing terminals. Common themes of these comments included:

- return to the initial intent and plain language of the resolution;
- where the resolution was bold, visionary, and historic, the discussion draft is short-sighted and prioritizes the fossil fuel industry over the health and safety of Portlanders;
- the discussion draft allows new bulk terminals to be built and existing facilities to expand, which will grow our carbon footprint past the point of being able to meet our local and state carbon reduction goals.
- transporting and storing fossil fuels are never safe, with risks ranging from oil train derailments and pipeline spills to storage tank explosions and tank destabilization from earthquakes.
- require existing fossil fuel terminals make upgrades for seismic resilience to protect the health and safety of neighboring communities and the Willamette River
- invest heavily in renewables with and urgency befitting the climate crisis.

Similar comments for further restrictions on terminal growth and seismic improvements were also made in letters from 350PDX, Portland Audubon, Center for Sustainable Economy, Columbia Riverkeeper, Oregon Sierra Club, Climate Solutions, members of a City Club seismic safety subcommittee, Linnton Neighborhood Association, League of Women Voters, and other residents. Examples of other concerns raised in those letters include that code changes serve as a bold model for other jurisdictions; to partner with Portland Bureau of Emergency Management on seismic safety; and to clarify forecast growth methodologies relative to climate policies.

Themes of comments on the Discussion Draft from business and labor organizations included opposition to proposed code changes, requests for more time and analysis, and clarifications to address practical considerations. Letters were received from NW Natural, Port of Portland, Columbia Pacific Building and Construction Trades Council, Kinder Morgan, Arc Terminals, and Western States Petroleum Association (WSPA). Some examples of comments included that growth rates will change over time, that fuels meeting Oregon's Clean Fuel Standard should be excluded, inclusion of non-fuel methanol is inconsistent, and the economic analysis is cursory. WSPA submitted draft code language, including focusing terminal restrictions on extra-regional facilities beyond the West Coast (PADD V) region and a new Energy Corridor Overlay Zone that protects the historic energy cluster for energy infrastructure growth.

Public involvement in concept development for the project consisted primarily of four stakeholder focus groups, which were held in June 2016 to review preliminary code concepts and help identify and understand potential implementation issues. The focus groups highlighted the range of stakeholder perspectives and interests concerning proposed zoning changes. Figure 4 summarizes the themes of issues raised in the focus groups. Other outreach activities have included meetings with interagency partners, terminal operators, and other interested stakeholders. These activities and what we heard in them are further described in the appendix of this report.

Inter-governmental coordination

The Mayor's Office staff has sought input from and will continue to reach out to Tribal Government Partners to shape and inform the draft code amendments.

An In-House Draft Report was circulated to inter-bureau partners in June 2016, and their comments have helped to shape and inform the Discussion Draft, particularly addressing code administration and legal limitations. Bureau of Planning and Sustainability staff will continue to meet with inter-governmental partners to refine responses to implementation issues.

Figure 4. Summary themes of stakeholder focus group comments

TOPIC	FUEL TERMINAL REPRESENTATIVES	ENVIRONMENTAL AND HEALTH ORGANIZATIONS	STATE AND REGIONAL BUSINESS ORGANIZATIONS	NEIGHBORHOOD AND EQUITY ORGANIZATIONS
Key issues	▸ We've operated safely for decades. We meet the federal/state low-carbon fuel standards. ▸ Difficult to participate: very quick process; emotionally driven; antitrust restrictions. ▸ Unintended impacts: harder to meet clean fuel standards; more trucks on road; costs to rest of the state.	▸ Looking for strong, model code. Expect community backlash if expectations not met. ▸ Safety needs to be integral with climate - Mosier oil train wreck; terminals in liquefaction soils. ▸ Include disaster risks in economic analysis. Bonding or insurance for worst case.	▸ Resolution requires more research on economic impacts, etc. ▸ How will the code hold up in 5 years? ▸ What is the goal? If climate or safety, zoning tool is not the right fit. ▸ Portland is not an economic island. Statewide impact. ▸ Big political decision. Don't rush it.	▸ Safety and pollution are our priority. Look closely at seismic and explosion risks. ▸ A reasonable expectation for growth is smart. ▸ This is aggressive. Without LNG, won't China burn more coal? ▸ Rail safety in the Gorge is also a key issue that this can't resolve.
New land use category	▸ If unclear, permit staff could be pressured - unpredictable results. ▸ Use federal West Coast PADD 5 "region."	▸ Regulate both existing and new facilities. ▸ New code must effectively implement the policy.	▸ Need clear definitions: region, export, end user. ▸ Do not make terminals non-conforming or an ambiguous limited use.	▸ Why allow it in IG2? ▸ A new export terminal in contaminated harbor is unlikely.
Definition of fossil fuels	▸ Natural gas considered a low carbon fuel by State, so why included here? ▸ Tomorrow's cleaner fuels won't meet today's definitions.	▸ Excluding methanol undermines policy. ▸ If end use is mostly fuel, then limit it. ▸ One new LNG tank is a big risk. So is coal.	▸ Federal and state are going a different direction, requiring cleaner fossil fuels. Why restrict cleaner fuels at cross purposes?	▸ Make way for bio-diesel as a cleaner fuel. ▸ Methanol not a fuel in Oregon - overreaching. ▸ Fuels are okay if they have no emissions.
Terminal development restrictions	▸ Some sites are already built-out. ▸ Our non-contiguous sites are connected by pipelines. ▸ Can't comment on size.	▸ Most prefer Option A. ▸ Caution about Commerce Clause. ▸ 1% annual growth metric is too high.	▸ Don't come at sideways. Unclear rationales will lead to appeals. ▸ Size limits would put region on "import diet." ▸ Dated, low forecast.	▸ Option C preferred. ▸ Allow for modest growth of LNG and oil; not coal. ▸ Review size limits every few years.

4. Background conditions

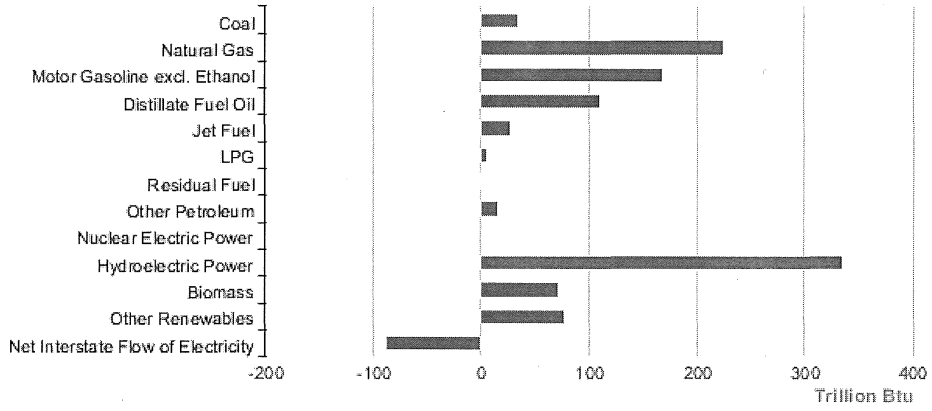
This section of the report describes background conditions that inform the proposed zoning changes. Topics include access to energy, impacts on the economy, climate change impacts, and health and safety impacts of draft zoning code changes. Background information on changing energy markets in the Pacific Northwest and Portland's existing fossil fuel terminals is included in the Section 1. Legal and policy background information is presented in Section 2.

Access to energy

Energy consumption in Oregon

Oregon residents and businesses rely on Portland's fossil fuel distribution and storage facilities as a wholesale distribution hub to meet their energy consumption needs. Estimated state energy consumption by fossil fuels and other sources are shown in Figure 5. Residents and businesses in much of Southern Washington also rely on Portland terminals for access to fuels.

Figure 5. Oregon energy consumption estimates, 2014



eia Source: Energy Information Administration, State Energy Data System

Four refineries in the Puget Sound area supply nearly all of the petroleum fuels consumed in Oregon, delivered primarily through the Olympic Pipeline that terminates at the cluster of 10 petroleum terminals in Northwest Portland. From there, petroleum products are delivered to Oregon and Southern Washington markets via truck, pipeline and barge. NW Natural supplies natural gas to its Western Oregon market area and operates peak-consumption storage terminals in Northwest Portland

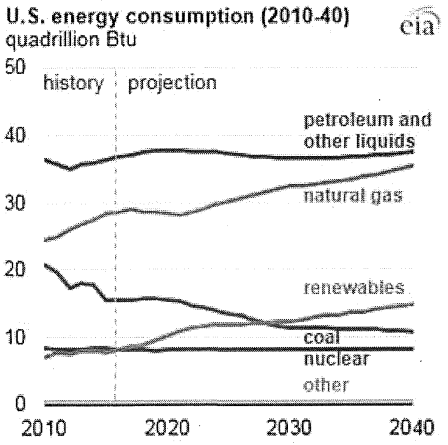
and Newport. Thus, fossil fuel terminals in Portland are a primary statewide distribution hub location for transportation fuels and natural gas.

Energy consumption forecasts and the demand for additional storage capacity

Analysis to date is limited on the energy consumption forecasts and how the proposed code changes would impact the demand for additional fossil fuel storage capacity. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts, or may plateau and decline with implementation of climate resilience goals and strategies. National forecasts of energy consumption by the U.S. Energy Information Administration show varying growth trajectories by energy type, including a relatively flat outlook for petroleum fuels, decline for coal, and moderate growth for natural gas and renewables (see Figure 6).

Liquid bulk cargo in Portland Harbor is projected to expand at a range of 0.5% to 1.0% average annual growth (AAG) to 2040 (BST Associates, 2012), providing an estimate of potential market expansion needs for petroleum fuels, which could mean a need for an additional 10-20% increase in storage capacity. However, based on this forecast, ECONorthwest (2012) estimated that there was no additional land needed for new liquid bulk terminals in Portland. The 1.9% average annual growth forecast to 2034 (NW Natural 2014 Integrated Resource Plan) provides an estimate of market expansion needs for natural gas distribution facilities.

Figure 6. U.S. energy production and consumption projections to 2040



Source: US Energy Information Administration, Annual Energy Outlook 2016

Even if regional fossil fuel demand follows trend-based local forecasts, there is a wide margin between the size of recently proposed crude oil, coal, and LNG terminals proposed in the Pacific Northwest and the scale of expected growth of existing Portland fuel terminals that generally serve the regional market area, as shown in Figure 7.

Contradictory stakeholder comments were received that local growth projections are too high, too low, and could change substantially with market innovations. To address this uncertainty, periodic monitoring for code effectiveness is recommended in Section 7 as a future implementation project,

including monitoring for changes in regional fuel demand over time. Staff will continue to research and analyze potential economic impacts of proposed code changes prior to adoption.

Figure 7. Estimated storage capacity at existing and proposed fuel terminals

Operator	*Facility type*	*Location*	*Site acres*	*Storage capacity*	*New Storage capacity*
Petroleum fuels					
Existing Portland terminals				bbls	
Chevron	Petroleum terminal	NW Portland	21	1,600,000	
Kinder Morgan Willbridge	Petroleum terminal	NW Portland	33	1,551,000	
Arc Logistics	Asphalt/crude oil	NW Portland	39	1,466,000	
NuStar	Petroleum terminal	NW Portland	22	1,191,000	
McCall Oil	Petroleum terminal	NW Portland	19	930,000	
Conoco Phillips	Petroleum terminal	NW Portland	21	760,000	
BP West Coast	Petroleum terminal	NW Portland	18	601,500	
Kinder Morgan Linnton	Petroleum terminal	NW Portland	13	420,000	
Equilon/Shell	Petroleum terminal	NW Portland	13	400,000	
Pacific Terminal Services	Petroleum terminal	NW Portland	2	275,000	
Recently proposed new terminals or reinvestment in Pacific NW				bbls	Proposal
Vancouver Energy	Crude oil terminal	Vancouver WA	47	NA	2,160,000
Imperium Renewables	Biofuels terminal	Grays Harbor WA	11	NA	720,000
NuStar	Petroleum terminal	Vancouver WA	19	775,000	Reuse tanks
Gaseous fuels					
Existing Portland terminals				LNG gal	2035 forecast
NW Natural GasCo	LNG plant/terminal	NW Portland	41	7,000,000	3,200,000
Recently proposed natural gas terminals/storage in Pacific NW				LNG gal	Proposal
Oregon LNG terminal	New LNG terminal	Warrenton OR	96	NA	84,000,000
Jordan Cove LNG	New LNG terminal	Coos Bay OR	400	NA	84,000,000
NW Natural North Mist	Gas reservoir storage	Mist OR	2,644	NA	2.5 Bcf gas
Other recent proposals (now inactive) for gaseous fuel terminals				LPG gal	Proposal
Pembina	Propane terminal	Portland	38	NA	34,000,000
Haven Energy	Propane terminal	Longview WA	24	NA	23,000,000
NW Innovation	Methanol plant	Kalama WA	83	NA	67,000,000
Coal					
Existing Portland terminals					
None					
Recently proposed coal terminals in Pacific NW					Stockpile acres
Millennium Bulk Terminal	Coal terminal	Longview WA	100	NA	~20
Ambre Energy	Coal transload facility	St. Helens OR		NA	no storage
Gateway Pacific Terminal	Coal terminal	Bellingham WA	334	NA	80

Terminology: bbls = barrels, Dth = decatherms, LNG = liquified natural gas, LPG = liquified propane gas, Bcf = billion cubic feet, AAG = average annual growth.

Sources: Oregon DEQ for petroleum tank data. NW Natural 2014 Integrated Resource Plan for existing capacity and forecast at 1.9% AAG. BST, Portland Harbor Forecast (2012) for petroleum terminals at 1.0% AAG.

Impacts of draft code changes on the economy

Jobs and wages at Portland's fuel terminals

In 2014, the 11 existing fuel terminals in Portland shown in Figure 3 provided approximately 280 jobs at their sites and supported an estimated 720 total jobs in the metropolitan area. The annual payroll at those terminals was $23 million, which supported total personal income of about $92 million in the metropolitan area.

BPS calculated these supported employment and income estimates from the induced and indirect impacts from metropolitan area purchases by these firms and their employees. For example, the jobs of the Longshore Union workers who unload fuels from tankers at these fuel terminals are not counted as direct jobs at the terminal sites. The multipliers used for these calculations were estimated from the average employment and income effects of marine terminals in Portland (Martin Associates, 2012). The job and wage estimates were calculated from Quarterly Census of Employment and Wages (QCEW) data.

Portland's industrial area jobs also have an important urban equity role in that they consist primarily of middle-wage jobs that do not require 4-year college degrees, which the overall economy has been losing since 2000. In contrast, jobs in commercial districts are concentrated primarily in low- and high-wage quartiles (fourths) of overall city employment. Middle-wage job growth supports the "income self-sufficiency" objectives of the Portland Plan and 2035 Comprehensive Plan (Policy 6.28) to expand access to self-sufficient wage levels.

Long-term job growth to 2035 is estimated at 1.6% average annual growth in the warehousing, transportation and utilities sector in Portland's 2016 Economic Opportunities Analysis and Metro's 2014 Urban Growth Report. Applying this growth rate to Portland's existing fuel terminals, approximately 110 net new permanent jobs is expected between 2014 and 2035, which is the equivalent of about four new terminals at their current average size. The total metropolitan area job impact of this fuel terminal expansion would be approximately 290 new jobs by 2035. If fuel terminal job growth occurred at a slower 1.0% average annual rate, matching the forecast growth of liquid bulk cargo volumes in Portland Harbor, approximately 65 net new terminal jobs would be generated by 2035, supporting a total 170 new jobs in the metro area. Pembina's proposed propane terminal in 2014 was estimated to create 30 to 40 new permanent jobs and 600-800 temporary construction jobs.

The proposed code changes would allow for code-limited expansion at existing terminals and new fuel distribution facilities smaller than 5 million gallons to accommodate potential increases in regional demand and resulting job growth.

Tax revenues of new terminals

State and local revenues from income and property taxes vary widely by facility. For example, property taxes on the depreciated improvements value of existing fuel terminals is much lower than new construction. If fuel terminals added 110 net new direct jobs by 2035 and the resulting state and local tax revenues is typical of businesses and developed facilities in Portland's Working Harbor (Martin Associates, 2016), the estimated new state and local tax revenues in fiscal year 2035 (in 2015 dollars) are $1.6 million. In contrast, the proposed $500 million Pembina project was estimated to generate approximately $12 million in annual property tax revenue, reflecting the increased improvements value and property taxes of new construction.

The proposed code changes would allow for code-limited expansion at existing terminals and new fuel distribution facilities smaller than 5 million gallons and resulting state and local tax revenue. However, prohibiting large scale new terminals such as Pembina could result in similar levels of foregone property taxes. Development of the limited land supply along Portland Harbor for new auto or grain terminals would also result in substantial local and state tax revenues, offsetting foregone taxes on new fossil fuel terminals.

Growth opportunities in fossil fuel distribution

The most recent cargo forecast for Portland Harbor in 2012 projected 1.0% AAG in liquid bulk tonnage to 2040 as a high scenario and 0.5% AAG as a low scenario (BST Associates, 2012). Based on this forecast, ECONorthwest (2012) estimated no additional land need for new liquid bulk terminals. Since 2012, several new fuel terminals have been proposed in the Pacific Northwest, as shown in Figure 2.

Updating the liquid bulk forecast at this point would be challenging for several reasons. Most of the recent fuel terminal proposals have since been abandoned or appear to be dormant. Policy and permitting uncertainty complicate the development feasibility of new terminals and transportation infrastructure. Crude oil prices have fallen sharply in 2015 and 2016, reducing the current market potential for major investments. Expanding global industrial product markets after the Great Recession slowed substantially in 2015. And energy distribution markets could change abruptly with continuing product innovations and location shifts in global production.

In the long term, Portland has competitive advantages for accommodating energy terminal development as a Pacific Rim gateway location to growing Asian markets, the Columbia River's low-gradient railroad access for heavy cargo through the Cascades, and Oregon's freight infrastructure hub. On the other hand, Portland's industrial land supply for continuing growth is limited, and expanding cargo markets for autos, grain and dry bulks are competing for current growth capacity.

Other economic impacts

Energy infrastructure and terminal investments appear to have low but potentially catastrophic risks of major accidents, as described below. Examples include seismic resilience of petroleum terminals in the event of a Cascadia Subduction Zone earthquake, oil train derailments, explosions at LNG (liquefied natural gas) and LPG (liquefied petroleum gas, such as propane) facilities, and others.

Clean Energy is a target industry in the City of Portland. An emerging cluster of Portland area business activity in solar and wind energy manufacturing, green building development, and other fields of sustainable urban innovation presents long-term business growth opportunities. Substantial local investment in fossil fuel infrastructure and large new terminals could hinder local growth momentum in Clean Energy industries.

Climate change impacts of draft code changes

Climate impact of fossil fuels

Fossil fuels are major contributors to climate change and pollution, as described in Portland's 2015 Climate Action Plan. Greenhouse gas emissions from the burning of fossil fuels and land use changes, including deforestation, are primary causes of climate change. The Intergovernmental Panel on Climate Change's most recent report documents the overwhelming evidence that human activities have been

the major driver of recent warming of the Earth's surface, and that climate change and its consequences will continue into the future (IPCC, 2013).

The magnitude of future climate impacts depends largely on the trajectory of future global greenhouse gas emissions. Greenhouse gas emissions from human activities have continued to rise in recent decades, reaching the highest rates in human history between 2000 and 2010 (IPCC, 2014). About half of all carbon dioxide emissions, the most prevalent greenhouse gas, between 1750 and 2010 occurred in the last 40 years. The energy, industry and transportation sectors have dominated these emissions increases. On the current trajectory, global transportation emissions will double by 2050.

Transition to "renewable" and "clean" fuels

The U.S. Environmental Protection Agency (USEPA) implements the federal Renewable Fuel Standard (RFS) that requires transportation fuel sold in the U.S. to contain a minimum volume of renewable fuels. The RFS originated with the Energy Policy Act of 2005 and was expanded and extended by the Energy Independence and Security Act of 2007 (EISA). Similarly, ODEQ implements the Oregon Clean Fuel Program. ODEQ describes "clean fuel" as a fuel with a lower carbon intensity than that of the fuel it replaces.

Examples of "clean fuels" in Oregon's program include most types of ethanol, biodiesel, natural gas, biogas, electricity, propane and hydrogen. The Oregon Clean Fuel Standard sets 2015 as a baseline that represents 10 percent ethanol blended with gasoline and 5 percent biodiesel blended with diesel. The rule also requires a 10 percent reduction in average carbon intensity from 2015 levels by 2025.

Terminal representatives and business stakeholders urged that proposed zoning code changes not create a disincentive or barrier to compliance with these federal and state rules, which may require additional tank capacity to implement. Environmental and public health organization representatives pointed out that City Resolution 37168 addresses fossil fuels generally, including lower-carbon fossil fuels like natural gas and propane. The proposed code changes would allow for code-limited expansion at existing terminals and are not expected to hinder compliance with the renewable and clean fuel standards, as described in Section 5.

Velocity of transition to non-fossil fuel energy

Portland's Climate Action Plan sets a goal for an 80% reduction in greenhouse gas emissions by 2050. Oregon's climate action goals similarly call for 75% reduction by 2050. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, they don't begin to approach the 80% reduction that the City is striving for or the State's 75% goal. ODEQ estimates that the greenhouse gas emissions reduction from switching from gasoline to compressed natural gas, for example, is 18%; for propane, it is 15%. The lower-carbon fossil fuels do have appeal as a bridge to widespread use of renewable energy, but investments in major infrastructure typically take decades to recoup, and the transition to renewables needs to go much faster than that to stabilize global emissions.

During recent hearings and analysis on Resolution 37168 and the Pembina terminal proposal, the question of whether to differentiate between fossil fuels with different carbon content was widely

discussed. In the lead up to the resolution, an option was proposed that would oppose new coal and oil infrastructure but allow for other fossil fuels that could show a likely net decrease in carbon emissions. City Council decided not to apply this option in the resolution.

Health, safety, and environmental impacts of draft code changes

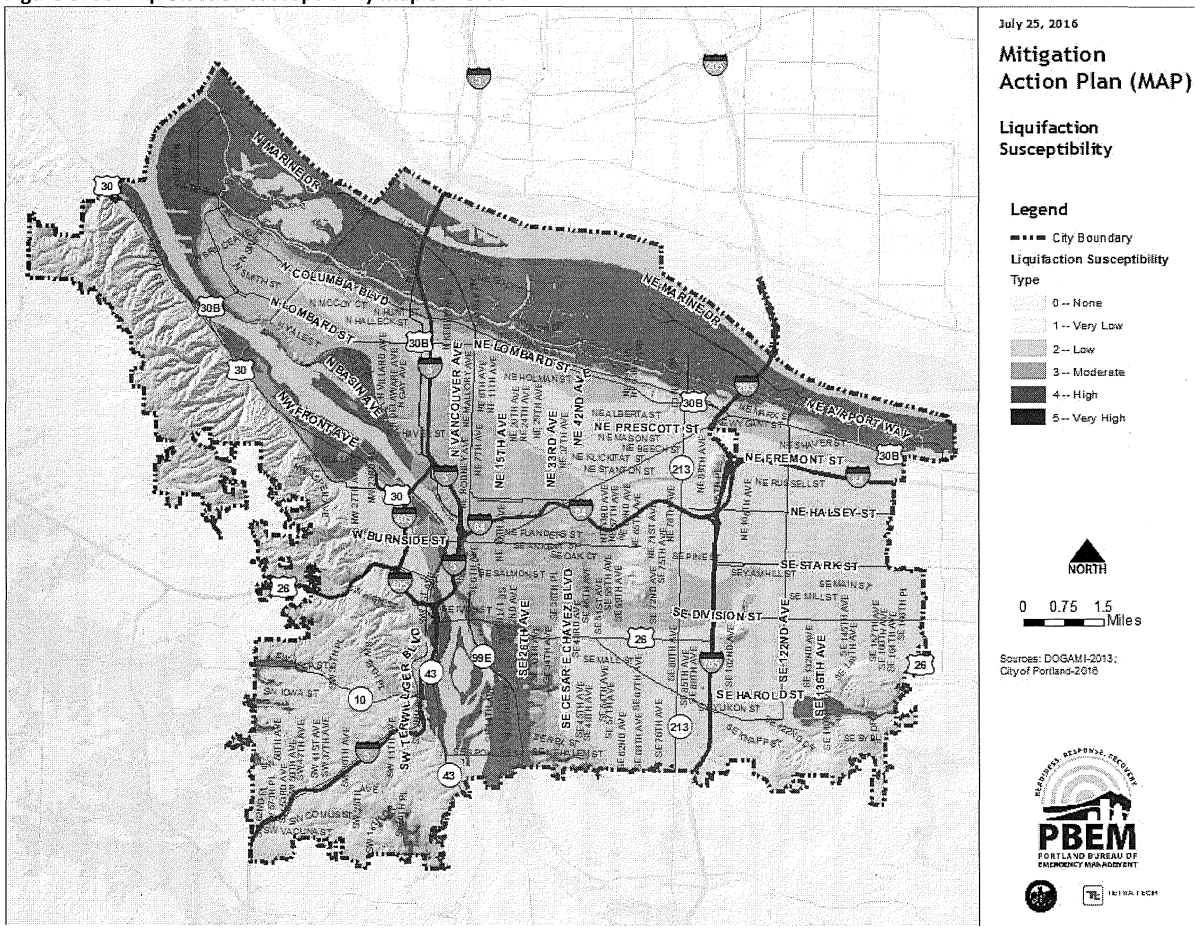
Seismic resilience and liquefaction soils

The 2035 Comprehensive Plan sets policy direction (4.75 and 4.76) to encourage disaster-resilient development and specifically to reduce natural hazard risks to critical energy and transportation infrastructure in Portland Harbor.

The 2016 Critical Energy Infrastructure Hub Study underway by the Portland Bureau of Emergency Management includes a literature review and modeled risks of structural damage to critical infrastructure from earthquakes, floods, landslides, volcanic activity, wildfire, and other sources. Along with petroleum and natural gas infrastructure, the study is also assessing infrastructure risks to emergency services, transportation, electricity, potable water, and waste water. The study area includes the Northwest and Linnton industrial areas. PBEM has identified significant seismic risks at the fuel terminals from a major Cascadia Subduction Zone earthquake because of their location in a filled riverfront plateau area with moderate- to high-susceptibility location for soil liquefaction.

As shown in Figure 7, the Oregon Department of Geology and Mineral Industries (DOGAMI) has mapped most of the riverfront plateau areas, which account for over 90 percent of Portland's industrial zoning, as having high susceptibility for soil liquefaction, along with areas along the Central City riverfront and much of the Brooklyn and Sellwood-Moreland neighborhoods. Most of the existing fuel terminals in the

Figure 8. Soil liquefaction susceptibility map of Portland



Willbridge area are mapped as having moderate susceptibility for soil liquefaction, and the others are mapped in the high susceptibility areas. The proposed code amendments will improve the seismic resilience of new bulk fossil fuel terminals by precluding their development in areas with high susceptibility to soil liquefaction.

The proposed code changes provide for seismic improvements to existing terminals, through a non-conforming situation review. Future amendments to building and fire codes to improve seismic safety of fossil fuel infrastructure may also be adopted to implement Resolution 37168. A future code project is recommended in Section 7 to develop building code amendments to improve seismic resilience and require seismic upgrades comparable to proposed requirements on unreinforced masonry buildings.

Safety of liquefied gas terminals

Liquified natural gas (LNG) and liquefied petroleum gas (LPG, such as propane) facilities pose safety risks from potential explosions and fire. The Pembina propane terminal, which was proposed in 2015 at the Port of Portland Terminal 6, is an apt case study. The Pembina terminal would have required environmental zoning code amendments that did not move forward.

The issue of safety risks was discussed extensively during review of the proposed Pembina terminal, and a quantitative risk assessment study was prepared to inform that review process (Det Norske Veritas (U.S.A.), Inc., 2015). The study estimated the risk from flammable releases, such as jet fires, pool fire, flash fire, vapor cloud explosions, fireball and Boiling Liquid Expanding Vapor Explosion (BLEVE). The risk was presented as individual risk in the form of location-specific risk contours extending outward from the proposed facilities, and as societal risk in the form of potential loss of life and cumulative frequency of various accidents. The highest offsite risk level was found to be 1 fatality in 1,000 years in areas directly north and south of facility. The nearest residential zones are located beyond the risk level contour of one 1 fatality in 100 million years. The cumulative societal risk was estimated at 1 statistical fatality every 38 years. The study also include various facility design and siting recommendations to mitigate identified risks.

Another risk assessment (Northwest Citizen Science Initiative, 2015) on the Pembina project was presented by environmental groups and neighbors, including the Hayden Island Neighborhood Association. The analysis identifies additional sources of risk from BLEVE cascades, terrorist events, and magnitude 9 earthquakes. The authors recommend not locating a propane terminal within 10 miles of the Portland/Vancouver urban area.

Public safety risks from a new LNG or LPG facility are estimated to be very low relative to other urban hazards, although possible impacts could be catastrophic. The proposed code amendments are expected to reduce public safety risks by prohibiting development of large new LNG or LPG facilities.

Oil train accidents

On June 3, 2016 an oil train traveling through the Columbia River Gorge partially derailed in Mosier en route to Tacoma. The 16-car derailment resulted in a 1,000-barrel spill and fires that lasted nearly a day. Small amounts of oil reportedly reached the river, and nearby drinking water and wastewater facilities in Mosier were affected.

An Associated Press analysis of accident records found that 26 oil-train derailments or fires have occurred nationally in the last decade. The national geography of increasing oil extraction in the inland Great Plains states and refineries concentrated on the coasts is contributing to this trend. Risk of how

often such derailments are likely to occur in the Columbia Gorge is disputed, with one estimate as high as one every 30 months.

Preliminary reporting on the cause of the Mosier derailment pointed to failed bolts in the track that are difficult to detect. Union Pacific reported that improvements are underway to replace bolts on 530 miles of curved track nationwide. Railroad safety is regulated at the federal level and monitored by the Federal Railroad Administration. A recent Government Accounting Office report has identified challenges and delays in implementing some federal rail safety regulations.

The proposed code amendments could incrementally reduce rail accident risks by restricting development and expansion of fossil fuel terminals at a West Coast rail hub location. However, restricting the location of new petroleum terminals in the City of Portland is not expected to substantially affect the volume of petroleum cargo transported by rail to Puget Sound refineries. The Portland/Vancouver area is a rail hub location, where West Coast rail lines running north-south intersect the low gradient east-west rail corridor along both sides of the Columbia River. Roughly half of the east-west rail cargo destined for the Seattle-Tacoma area, in addition to Oregon-bound rail cargo, moves through the Portland metropolitan area. Derailment risk within Portland is reduced by the numerous siding destinations and congestion of the "Portland Triangle" area where UP and BNSF lines come together. However, derailment risks to natural resources, especially along rivers, and to rural communities appear to be significant.

5. Code concepts and analysis

This section of the report describes the proposed zoning change concepts by topic area, including the related policy directions, implementation issues, and rationale for the proposed zoning changes. Specific code changes are not included in this report, but will be part of the Proposed Draft, which is scheduled to be completed in August 2016 and discussed by the Planning and Sustainability Commission in September 2016.

1. **Types of distribution and storage facilities to be regulated**

Policy direction:

- City Council Resolution 37168 (adopted November 2015) calls for opposing expansion of infrastructure for transportation and storage of fossil fuels, subject to various exceptions, including safety improvements, service to end users, and infrastructure that accelerates transition to non-fossil fuel energy.
- 2035 Comprehensive Plan Policy 6.48 Fossil Fuel Infrastructure (adopted June 2016, not effective until 2018) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Preliminary code concepts:

- Limit development of new Bulk Fossil Fuel Terminals as a regulated land use.
- Bulk Fossil Fuel Terminals are engaged in freight movement or wholesaling of fossil fuels at facilities that are characterized by having (1) marine, pipeline or railroad transport access and (2) either transloading facilities for transferring a shipment between transport modes (such as from rail to ship) or bulk storage facilities exceeding 5 million gallons (or equivalent volume) of fossil fuels. Examples include petroleum terminals, liquid natural gas terminals, and coal terminals. Functionally, these terminals are typically regional gateway facilities, where fossil fuels enter and exit the region, but the use classification is intended to be clearly identifiable and not rely on a definition of region.
- Exceptions that are not Bulk Fossil Fuel Terminals:
    - Retail sales of fossil fuels, such as gasoline or propane filling stations;
    - Distributors, wholesalers, and industrial service uses that receive and deliver fossil fuels exclusively by truck;
    - End-user facilities that store fossil fuels for primary use at or near the site, such as manufacturing, agriculture, and airports;
    - Uses that recover or reprocess used petroleum products;
    - Waste-related uses that transfer or store solid or liquid wastes, such as landfills.

Implementation issues:

- Definition of region – Portland is a regional distribution hub for energy and other products, and this zoning change is not intended to restrict energy access to the growing region. However, the regional market area of Bulk Fossil Fuel Terminals varies by product and is difficult to define. Portland's 10 petroleum terminals generally serve Oregon and Southern Washington. This

market area substantially exceeds the Portland metropolitan area, which is often colloquially referred to as the region. Some terminal representatives pointed out that the federal government's 5-state West Coast PADD 5 region is generally their regional market area. BDS staff commented that zoning does not regulate the target market (destination) of wholesale products, and the zoning code does not define region. Business organization representatives commented that the energy markets and related market areas are likely to change over time. Therefore, the proposed land use incorporates the concept of a regional market into the size limits, and a zoning definition of region is not proposed here.

- End users – Resolution 37168 lists a specific exception to not restrict service directly to end users. At a small scale, services to end users include retail gasoline filling stations, natural gas access lines in street right-of-way to residential and business customers, and heating oil tanks at home sites. Larger scale end users with fossil fuel storage and access infrastructure also include manufacturers, jet fuel facilities at the PDX Airport, vessel fuel facilities on Portland Harbor, and others, where fossil fuels are used as an input. Again, the limits on new facilities are sized to apply only to larger distribution facilities.

- Interpretation of use category – Terminal and business representatives commented that ambiguity in the use description could result in conflicting expectations, pressured interpretations, appeals, and inconsistent code implementation. While underlying policy accommodates regional access and exceptions that may be difficult to clearly define, the land use designation is proposed to be defined by clear and objective size thresholds and marine/railroad/pipeline access.

2. **Definition of fossil fuels**

Policy direction: City Council Resolution 37168 applies to fossil fuel infrastructure and storage generally and does not distinguish among types or carbon intensity of fossil fuels.

Preliminary code concept:

- Definition of fossil fuels: petroleum products (such as crude oil and gasoline), coal, and gaseous fuels (such as natural gas and propane) that are made from decayed plants and animals that lived millions of years ago and are used primarily as a source of energy.
- Exclusion of non-fuel products – Petrochemicals that are used primarily for non-fuel products are excluded, such as plastics, lubricants, fertilizer, roofing, and paints.
- Methanol is included as a fossil fuel. Development of methanol storage and transportation facilities would be limited similarly to LNG and LPG terminals.
- Denatured ethanol and similar fuel additives and biodiesel/renewable diesel with less than 5% fossil fuel content are not fossil fuels.
- Biogas from wastewater treatment plants, anaerobic digesters, landfills and other sources is not a fossil fuel.

Implementation issues:

- Definition of fossil fuels – Definitions of fossil fuels vary by source. Here are some examples.

- Oregon Department of Environmental Quality (ODEQ) – Fossil fuels: fuels such as oil, natural gas, and coal that are made from decayed plants and animals that lived millions of years ago. These fuels are made of hydrogen and carbon (hydrocarbons).
- U.S. Environmental Protection Agency (USEPA), 40 C.F.R. § 60.41 - Fossil fuel means natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such materials for the purpose of creating useful heat.
- Oregon Department of Energy Administrative Rule, OAR 345-001-0010 - "Fossil fuel" means natural gas, petroleum, coal and any form of solid, liquid or gaseous fuel derived from such materials that serves as useful energy.

- Renewable and clean fuel standards – As described in Section 4, USEPA implements the federal Renewable Fuel Standard (RFS) that requires transportation fuel sold in the U.S. to contain a minimum volume of renewable fuels. Similarly, ODEQ implements the Oregon Clean Fuel Program. ODEQ identifies examples of "clean fuels" in Oregon as most types of ethanol, biodiesel, natural gas, biogas, electricity, propane and hydrogen. Terminal representatives and business stakeholders urged that proposed zoning code changes not create a disincentive or barrier to compliance with these federal and state rules, which may require additional tank capacity to implement. Environmental and public health organization representatives pointed out that City Resolution 37168 addresses fossil fuels generally, including clean fuels. The proposed allowance for code-limited expansion of existing terminals will allow enough supply to comply with the renewable and clean fuel standards.

- *Methanol – Large methanol plants have recently been proposed in Tacoma, Kalama, and St. Helens. Methanol plants tend to have structural similarities to LNG and LPG terminals, including large-scale and gas pipeline access, and they can have similar safety and climate impacts. Stakeholder focus groups were asked whether any* special inclusions, such as methanol, should be considered. Most people commenting noted that methanol is primarily used in the production of plastics and other non-fuel uses. Views differed among environmental organizations commenting. Some noted that excluding it undermines the policy. The draft code concept proposes to prepare code amendments that limit development of large methanol plants similarly to LNG or LPG terminals.

- *Denatured ethanol* – A terminal operator pointed out that "pure" ethanol made from corn or other non-fossil source is required by the Alcohol and Tobacco Tax and Trade Bureau to be denatured in order to be transported to the site. Denatured ethanol typically contains up to 5% methanol, so that it is toxic and undrinkable. Storage of denatured ethanol is proposed to be exempted. In other words, denatured ethanol tanks would not be counted as part of the maximum storage capacity of fossil fuel terminals.

- Biogas products from landfills – BES staff commented that biogas from landfills and other sources are not fossil fuels and should not be restricted by the proposed zoning changes. The proposed description of fossil fuel terminals specifically excludes waste-related uses, such as landfills, which are regulated as a separate land use in the zoning code. Also, the proposed

definition of fossil fuels, described as being made from decayed plants and animals that lived millions of years ago, would not include biogas from a landfill.

3. **Prohibition of bulk fossil fuel terminals**

Policy direction:

- City Council Resolution 37168 (adopted November 2015) calls for opposing expansion of infrastructure for transportation and storage of fossil fuels, subject to various exceptions, including safety improvements, service to end users, and infrastructure that accelerates transition to non-fossil fuel energy.
- 2035 Comprehensive Plan Policy 6.48 Fossil Fuel Infrastructure (adopted June 2016, not effective until 2018) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Preliminary code concept:

- Classify Bulk Fossil Fuel Terminals as a prohibited use in all base zones.

Implementation issues:

- Policy implementation – City Resolution 37168 reflected a major change in policy direction on fossil fuel distribution and storage facilities. Prohibition of Bulk Fossil Fuel Terminals is proposed as an unambiguous, assertive approach to implement this policy change, responding to increasingly evident safety risks of fossil fuel infrastructure, aggressive climate change goals, and changing energy markets in the Pacific Northwest.

- Community expectations – Over 700 people sent emails in response to the Discussion Draft asking for a "full ban" on new and expanded fossil fuel terminals. Climate resilience advocates are widely represented in the Portland community and the Pacific Northwest. Public involvement in Resolution 37168 and this project reveal broad community expectations for a bold approach to restrict fossil fuel distribution facilities in Portland.

- Providing regional market access to fuels – Analysis to date is limited on the potential impacts of constraining regional fuel demand. Fossil fuel demand in this growing region may increase moderately, as indicated by trend-based forecasts, or may plateau and decline with implementation of climate resilience goals and strategies. Staff will continue to research and analyze potential economic impacts of proposed code changes prior to adoption. The fossil fuels consumed in Oregon are generally not extracted or refined in the state. As a result, fossil fuel terminals provide multimodal transportation efficiency and price advantages for distributing fuels to the growing population of the regional market area.

- Option to set size limits on new fossil fuel terminals – The Discussion Draft proposed storage capacity size standards to limits new fossil fuel terminal development. Figure 7 in Section 4 indicates a wide margin between the size of recently proposed crude oil, coal, and LNG terminals proposed in the Pacific Northwest and the scale of expected growth by existing

Portland fuel terminals that serve the regional market area. Proposed terminal size limitations within that margin would allow for expansion at existing terminals and moderately sized new terminal development to meet market area consumption needs. Instead, the Proposed Draft code changes would prohibit Bulk Fossil Fuel Terminals, a more restrictive approach to more assertively implement the new policy directions and respond to extensive community comments on the proposed code changes.

- Balanced, integrated policy approach – The proposed limitations on fossil fuel distribution entail tradeoffs among public goals for environmental protection, public health and safety, meeting energy needs, and economic prosperity, as described in Section 4. The Comprehensive Plan calls for a balanced, integrated approach in land use regulations to meet these public objectives, as described in Section 2. The proposed code changes provide for significant environmental and safety benefits in restricting development and expansion of fossil fuel terminals and provide for code-limited expansion of fuel terminals to adequately meet regional energy needs and integrate economic prosperity and equity considerations.

4. Legal, non-conforming status of existing facilities

Policy direction:

- City Council Resolution 37168 includes various exemptions to not restrict safety or efficiency improvements, service to end users, emergency backup capacity, infrastructure for recovery or re-processing of used petroleum products, or infrastructure that will accelerate the transition to non-fossil fuel energy sources.
- 2035 Comprehensive Plan Policy 6.48 Fossil Fuel Infrastructure (adopted June 2016, not effective until 2018) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.
- 2035 Comprehensive Plan Policies 4.75 and 4.76 call for encouraging disaster-resilient development and reducing natural hazard risks to critical energy and transportation infrastructure in Portland Harbor.

Preliminary code concept:

- Existing Bulk Fossil Fuel Terminals would become legal, non-conforming uses, which may continue to operate. Expansion would require approval through a non-conforming situation review.

Implementation issues:

- Flexibility for code-limited expansion - Significant improvements to non-conforming uses generally require a "non-conforming situation review." Given this requirement, the proposed code changes may be more restrictive than the exceptions in the Resolution that call for not restricting improvements at existing fuel terminals that improve safety, provide wholesale fuel supply to local or regional end users, add backup capacity, or add tanks for clean/renewable fuels would require approval through a non-conforming situation review. However, the Zoning Code's provisions for expansion of non-conforming uses do provide discretionary flexibility to accommodate such improvements. Approval criteria for a non-conforming situation review include that, with mitigation measures, there will be no net increase in overall detrimental impacts on the surrounding industrial zone (such as hours of operation and vehicle trips) and

the expansion will not detract from the desired function and character of the industrial zone. Terminal improvements would also be limited to their existing site area. Improvements that address the exceptions in the Resolution are not generally expected to result in additional detrimental impacts on the surrounding industrial zone. Given the level of community scrutiny about fossil fuel terminal expansion, this discretionary public review process could add to the cost and uncertainty of investments at fossil fuel terminals. Non-conforming situation reviews are "Type 2" staff level permits, which could be appealed to a hearings officer and further to the Land Use Board of Appeals.

- Option to not restrict expansion at existing terminals - The Discussion Draft proposed code concepts that exclude existing terminals from development restrictions on Bulk Fossil Fuel Terminals. This option was intended to be consistent with the exceptions in the Resolution (as described in the previous point) and to accommodate potential growth in regional fuel demand. storage capacity size standards to limits new fossil fuel terminal development. Instead, the Proposed Draft code changes would apply a legal, non-conforming use status on existing Bulk Fossil Fuel Terminals, a more restrictive approach to more assertively implement the new policy directions and respond to extensive community comments on the proposed code changes.

- Divergent stakeholder views – Extensive comments on the Discussion Draft recommended tight limits on expansion of existing fuel terminals. In contrast, stakeholder focus group participants generally urged that existing fuel terminals should not be changed to a non-conforming use for reasons ranging from providing a critical product to not discouraging desired improvements on existing facilities. Stakeholder group comments from environmental and public health organizations generally supported restricting expansion of existing terminals, while some participants cautioned about political and legal tradeoffs of making the existing fuel terminals non-conforming.

6. Zoning code changes

This section of the report specifies the draft code language, along with code commentary pages that clarify expected implementation. The section is formatted to facilitate readability, showing proposed code changes on the right-hand pages and related code commentary on the facing left-hand pages.

Commentary

Table 100-1 Open Space Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in all base zones.

Table 100-1 Open Space Zone Primary Uses	
Use Categories	**OS Zone**
Residential Categories	
Household Living	N
Group Living	N
Commercial Categories	
Retail Sales And Service	CU [1]
Office	N
Quick Vehicle Servicing	N
Vehicle Repair	N
Commercial Parking	N
Self-Service Storage	N
Commercial Outdoor Recreation	CU
Major Event Entertainment	N
Industrial Categories	
Manufacturing And Production	CU [6]
Warehouse And Freight Movement	N
Wholesale Sales	N
Industrial Service	N
Bulk Fossil Fuel Terminal	N
Railroad Yards	N
Waste-Related	N
Institutional Categories	
Basic Utilities	L/CU [5]
Community Service	CU [4]
Parks And Open Areas	L/CU [2]
Schools	CU
Colleges	N
Medical Centers	N
Religious Institutions	N
Daycare	CU
Other Categories	
Agriculture	L[7]
Aviation And Surface Passenger Terminals	N
Detention Facilities	N
Mining	CU
Radio Frequency Transmission Facilities	L/CU [3]
Rail Lines And Utility Corridors	CU

Y = Yes, Allowed L = Allowed, But Special Limitations CU = Conditional Use Review Required
N = No, Prohibited

Commentary

Table 110-1 Single-Dwelling Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in all base zones.

Table 110-1 Single-Dwelling Zone Primary Uses						
Use Categories	**RF**	**R20**	**R10**	**R7**	**R5**	**R2.5**
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	CU	CU	CU	CU	CU	CU
Commercial Categories						
Retail Sales And Service	N	N	N	N	N	N
Office	N	N	N	N	N	N
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	N	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	N
Industrial Categories						
Manufacturing And Production	CU [6]	N	N	N	N	N
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	N
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]
Community Service	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]
Parks And Open Areas	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]
Schools	CU	CU	CU	CU	CU	CU
Colleges	CU	CU	CU	CU	CU	CU
Medical Centers	CU	CU	CU	CU	CU	CU
Religious Institutions	CU	CU	CU	CU	CU	CU
Daycare	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]
Other Categories						
Agriculture	L [7]	L [7]	L/CU [8]	L/CU [8]	L [9]	L [9]
Aviation And Surface Passenger Terminals	CU	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	CU	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]
Railroad Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Commentary

Table 120-1 Multi-Dwelling Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in all base zones.

Table 120-1
Multi-Dwelling Zone Primary Uses

Use Categories	R3	R2	R1	RH	RX	IR
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	Y [1]
Commercial Categories						
Retail Sales And Service	N	N	N	CU[2]	L/CU [3]	L/CU [10]
Office	N	N	N	CU[2]	L/CU [3]	L/CU [10]
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	CU [4]	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	CU
Industrial Categories						
Manufacturing And Production	N	N	N	N	N	CU
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	CU
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [13]	L/CU [13]	L/CU [13]	L/CU [13]	L/CU [13]	L/CU [13]
Community Service	CU [6]	CU [6]	CU [6]	L/CU [6]	L/CU [5, 6]	CU [6]
Parks And Open Areas	L/CU [7]	L/CU [7]	L/CU [7]	Y	Y	Y
Schools	CU	CU	CU	CU	L/CU [5]	L/CU [11]
Colleges	CU	CU	CU	CU	CU	L/CU [11]
Medical Centers	CU	CU	CU	CU	CU	L/CU [11]
Religious Institutions	CU	CU	CU	CU	CU	CU
Daycare	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	Y	L/CU [12]
Other Categories						
Agriculture	L [14]	L [14]	L [14]	L [14]	L [14]	L [14]
Aviation And Surface Passenger Terminals	N	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]
Rail Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Commentary

Table 130-1 Commercial Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in all base zones.

Table 130-1 Commercial Zone Primary Uses								
Use Categories	**CN1**	**CN2**	**CO1**	**CO2**	**CM**	**CS**	**CG**	**CX**
Residential Categories								
Household Living	Y	Y	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]
Commercial Categories								
Retail Sales And Service	L [2]	Y	N	L [3]	L [4]	Y	Y	Y
Office	L [2]	Y	Y	Y	L [4]	Y	Y	Y
Quick Vehicle Servicing	N	L [12]	N	N	N	N	Y	L [12]
Vehicle Repair	N	N	N	N	N	Y	Y	L [5]
Commercial Parking	N	N	N	N	N	Y	CU [11]	CU [11]
Self-Service Storage	N	N	N	N	N	N	L [6]	L [6]
Commercial Outdoor Recreation	N	N	N	N	Y	Y	Y	Y
Major Event Entertainment	N	N	N	N	N	CU	CU	Y
Industrial Categories								
Manufacturing And Production	L/CU [2]	L/CU [2]	N	N	L/CU [4, 5]	L/CU [5]	L/CU [5,7]	L/CU [5]
Warehouse And Freight Movement	N	N	N	N	N	N	CU [5,7]	N
Wholesale Sales	N	N	N	N	L [4, 5]	L [5]	L [5,7]	L [5]
Industrial Service	N	N	N	N	N	CU [5]	CU [5,7]	CU [5]
Bulk Fossil Fuel Terminal	N	N	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N	N	N
Institutional Categories								
Basic Utilities	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]	Y/CU [10]
Community Service	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]
Parks And Open Areas	Y	Y	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	Y	Y	Y	Y	Y
Colleges	Y	Y	Y	Y	Y	Y	Y	Y
Medical Centers	Y	Y	Y	Y	Y	Y	Y	Y
Religious Institutions	Y	Y	Y	Y	Y	Y	Y	Y
Daycare	Y	Y	Y	Y	Y	Y	Y	Y

Commentary

Other Categories								
Agriculture	L [13]	L [13]	L [13]	L [13]	L [13]	L/CU [14]	L/CU [14]	L/CU [14]
Aviation And Surface Passenger Terminals	N	N	N	N	N	N	CU	CU
Detention Facilities	N	N	N	N	N	N	CU	CU
Mining	N	N	N	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]
Rail Lines And Utility Corridors	CU	CU	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Commentary

Table 140-1 Employment and Industrial Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in all base zones.

Table 140-1
Employment and Industrial Zone Primary Uses

Use Categories	EG1	EG2	EX	IG1	IG2	IH
Residential Categories						
Household Living	CU	CU	Y	CU [1]	CU [1]	CU [1]
Group Living	CU	CU	L/CU [2]	N	N	N
Commercial Categories						
Retail Sales And Service	L/CU [3]	L/CU [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Office	L [3]	L [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Quick Vehicle Servicing	Y	Y	N	Y	Y	Y
Vehicle Repair	Y	Y	Y	Y	Y	Y
Commercial Parking	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]
Self-Service Storage	Y	Y	L [7]	Y	Y	Y
Commercial Outdoor Recreation	Y	Y	Y	CU	CU	CU
Major Event Entertainment	CU	CU	CU	CU	CU	CU
Industrial Categories						
Manufacturing And Production	Y	Y	Y	Y	Y	Y
Warehouse And Freight Movement	Y	Y	Y	Y	Y	Y
Wholesale Sales	Y	Y	Y	Y	Y	Y
Industrial Service	Y	Y	Y	Y	Y	Y
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	Y	Y	Y
Waste-Related	N	N	N	L/CU [8]	L/CU [8]	L/CU [8]
Institutional Categories						
Basic Utilities	Y/CU [12]	Y/CU [12]	Y/CU [12]	Y/CU [13]	Y/CU [13]	Y/CU 13]
Community Service	L [9]	L [9]	L [10]	L/CU [11]	L/CU [11]	L/CU [11]
Parks And Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	N	N	N
Colleges	Y	Y	Y	N	N	N
Medical Centers	Y	Y	Y	N	N	N
Religious Institutions	Y	Y	Y	N	N	N
Daycare	Y	Y	Y	L/CU [11]	L/CU 11]	L/CU 11]
Other Categories						
Agriculture	L [16]	L [16]	L [16]	L [16]	L [16]	L [16]
Aviation And Surface Passenger Terminals	CU	CU	CU	CU	CU	CU
Detention Facilities	CU	CU	CU	CU	CU	CU
Mining	N	N	N	CU	CU	CU
Radio Frequency Transmission Facilities	L/CU [14]	L/CU [14]	L/CU [14]	L/CU [14]	L/CU 14]	L/CU 14]
Rail Lines And Utility Corridors	Y	Y	Y	Y	Y	Y

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Commentary

33.910.030 Definitions

The definition of fossil fuels was added to clarify the land use category Bulk Fossil Fuel Terminals.

Petrochemicals that are used primarily for non-fuel products are excluded, such as plastics, lubricants, fertilizer, roofing, and paints. However, methanol is an exception that is included as a fossil fuel, because large methanol storage and distribution facilities tend to have structural similarities to liquid natural gas (LNG) and liquid petroleum gas (LPG) terminals, including large-scale storage and gas pipeline access, and because they can have similar safety and climate impacts.

Fuels containing 5% or less fossil-fuel volume are not considered fossil fuels under this definition. For example, "pure" ethanol made from corn or other non-fossil source is required by the Alcohol and Tobacco Tax and Trade Bureau to be denatured in order to be transported to the site. Denatured ethanol typically contains up to 5% methanol, so that it is toxic and undrinkable.

Some fossil fuels under this definition are also classified as "renewable fuels" in the federal Renewable Fuel Standard and "clean fuels" in Oregon's Clean Fuel Standard, such as liquid natural gas and liquid propane gas. These federal and state standards require transportation fuel sold within their jurisdiction to contain a minimum volume of renewable or clean fuels.

33.910.030 Definitions

The definition of words with specific meaning in the zoning code are as follows:

Fossil Fuel. Fossil fuels are petroleum products (such as crude oil and gasoline), coal, and gaseous fuels (such as natural gas, methanol, and propane) that are made from decayed plants and animals that lived millions of years ago and are used as a source of energy. Denatured ethanol and similar fuel additives and biodiesel/renewable diesel with less than 5% fossil fuel content are not fossil fuels.

Commentary

Sections:

Introduction to the Use Categories
- 33.920.010 Purpose
- 33.920.020 Category Titles
- 33.920.030 Classification of Uses

Residential Use Categories
- 33.920.100 Group Living
- 33.920.110 Household Living

Commercial Use Categories
- 33.920.200 Commercial Outdoor Recreation
- 33.920.210 Commercial Parking
- 33.920.220 Quick Vehicle Servicing
- 33.920.230 Major Event Entertainment
- 33.920.240 Office
- 33.920.250 Retail Sales And Service
- 33.920 260 Self-Service Storage
- 33.920.270 Vehicle Repair

Industrial Use Categories
- 33.920.300 Bulk Fossil Fuel Terminal
- 33.920.310~~300~~ Industrial Service
- 33.920.320~~310~~ Manufacturing And Production
- 33.920.330~~320~~ Railroad Yards
- 33.920.340~~330~~ Warehouse And Freight Movement
- 33.920.350~~340~~ Waste-Related
- 33.920.360~~350~~ Wholesale Sales

Institutional Use Categories
- 33.920.400 Basic Utilities
- 33.920.410 Colleges
- 33.920.420 Community Service
- 33.920.430 Daycare
- 33.920.450 Medical Centers
- 33.920.460 Parks And Open Areas
- 33.920.470 Religious Institutions
- 33.920.480 Schools

Other Use Categories
- 33.920.500 Agriculture
- 33.920.510 Aviation And Surface Passenger Terminals
- 33.920.520 Detention Facilities
- 33.920.530 Mining
- 33.920.540 Radio Frequency Transmission Facilities
- 33.920.550 Rail Lines And Utility Corridors

Commentary

33.920.300 Bulk Fossil Fuel Terminal

Bulk Fossil Fuel Terminals are added as a new land use category to regulate their development in the Zoning Code. Regulation of Bulk Fossil Fuel Terminals implements policy direction in City of Portland Resolution 37168 (adopted November 2015) and 2035 Comprehensive Plan Policy 6.48 (adopted June 2016, expected to take effect in 2018), both of which address fossil fuel distribution and storage facilities.

Bulk Fossil Fuel Terminals are characterized by having (1) marine, pipeline or railroad transport access and (2) either trans-loading facilities for transferring a shipment between transport modes (such as from rail to ship) or bulk storage facilities exceeding 5 million gallons (or equivalent) of fossil fuels. Functionally, these terminals tend to be regional gateway facilities, where fossil fuels enter and exit the region. Additionally, Policy 6.48 calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market. However, the use classification is intended to be clearly identifiable by physical characteristics and not rely on a definition of region.

The regional market area of Bulk Fossil Fuel Terminals varies by product and is difficult to define. Portland's 10 petroleum terminals generally serve Oregon and Southern Washington. This market area substantially exceeds the Portland metropolitan area, which is often colloquially referred to as the region. Some terminal representatives pointed out that the federal government's 5-state West Coast PADD 5 region is generally their regional market area.

Resolution 37168 lists a specific exception to not restrict service directly to end users. At a small scale, services to end users include retail gasoline filling stations, natural gas access lines in street right-of-way to residential and business customers, and heating oil tanks at home sites. Larger scale end users with fossil fuel storage and access infrastructure also include manufacturers, jet fuel facilities at the PDX Airport, vessel fuel facilities on Portland Harbor, and others, where fossil fuels are used as an input.

Industrial Use Categories

33.920.300 Bulk Fossil Fuel Terminal

A. **Characteristics.** Bulk Fossil Fuel Terminals are establishments primarily engaged in the transport and bulk storage of fossil fuels. Terminal activities may also include fuel blending, regional distribution, and wholesaling. The firms rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities for transferring a shipment between transport modes, or have storage capacity exceeding 5 million gallons (or equivalent volume) of fossil fuels. There is minimal on-site sales activity with the customer present.

B. **Accessory uses.** Accessory uses may include retail sales of petroleum products, offices, food membership distribution, parking, storage, truck fleet parking and maintenance areas, rail spur or lead lines, and docks.

C. **Examples.** Examples include crude oil terminals, petroleum products terminals, natural gas terminals, propane terminals, and coal terminals.

D. **Exceptions.**

1. Truck or marine freight terminals that do not store, transport or distribute fossil fuels are classified as Warehouse and Freight Movement uses.
2. Truck or marine freight terminals that do not have transloading facilities and have storage capacity of less than 5 million gallons are classified as Warehouse and Freight Movement uses.
3. Gasoline stations and other retail sales of fossil fuels are not Bulk Fossil Fuel Terminals.
4. Distributors and wholesalers that receive and deliver fossil fuels exclusively by truck are classified as Warehouse and Freight Movement uses.
5. Industrial, commercial, institutional, and agricultural firms that exclusively store fossil fuels for use as an input are not Bulk Fossil Fuel Terminals.
6. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.
7. The storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, rail yard, or as part of a fleet vehicle servicing facility are accessory to their use.
8. Uses that recover or reprocess used petroleum products are not Bulk Fossil Fuel Terminals.

33.920.310~~300~~ Industrial Service

33.920.320~~310~~ Manufacturing And Production

33.920.330~~320~~ Railroad Yards

Commentary

33.920.340~~330~~ Warehouse And Freight Movement

A. **Characteristics.** Warehouse And Freight Movement firms are involved in the storage, or movement of goods for themselves or other firms. Goods are generally delivered to other firms or the final consumer, except for some will-call pickups. There is little on-site sales activity with the customer present.

B. **Accessory uses.** Accessory uses may include offices, food membership distribution, truck fleet parking and maintenance areas, rail spur or lead lines, docks, and repackaging of goods.

C. **Examples.** Examples include separate warehouses used by retail stores such as furniture and appliance stores; household moving and general freight storage; cold storage plants, including frozen food lockers; storage of weapons and ammunition; major wholesale distribution centers; truck, marine, or air freight terminals; bus barns and light rail barns; parcel services; major post offices; grain terminals; and the stockpiling of sand, gravel, or other aggregate materials.

D. **Exceptions.**

1. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.

2. Miniwarehouses are classified as Self-Service Storage uses.

3. Establishments that engage in the transfer or storage of fossil fuels, rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities or have storage capacity exceeding 5 million gallons of fossil fuels are classified as Bulk Fossil Fuel Terminal use.

33.920.350~~340~~ Waste-Related

33.920.360~~350~~ Wholesale Sales

A. **Characteristics.** Wholesale Sales firms are involved in the sale, lease, or rent of products primarily intended for industrial, institutional, or commercial businesses. The uses emphasize on-site sales or order taking and often include display areas. Businesses may or may not be open to the general public, but sales to the general public are limited as a result of the way in which the firm operates. Products may be picked up on site or delivered to the customer.

B. **Accessory uses.** Accessory uses may include offices, food membership distribution, product repair, warehouses, parking, minor fabrication services, and repackaging of goods.

C. **Examples.** Examples include sale or rental of machinery, equipment, heavy trucks, building materials, special trade tools, welding supplies, machine parts, electrical supplies, janitorial supplies, restaurant equipment, and store fixtures; mail order houses; and wholesalers of food, clothing, auto parts, building hardware, and office supplies.

Commentary

D. Exceptions.

1. Firms that engage primarily in sales to the general public are classified as Retail Sales And Service.
2. Firms that engage in sales on a membership basis are classified as either Retail Sales And Service or Wholesale Sales, based on a consideration of the characteristics of the use.
3. Firms that are primarily storing goods with little on-site business activity are classified as Warehouse And Freight Movement.
4. Establishments that engage in the regional wholesaling of fossil fuels, rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities or have storage capacity exceeding 5 million gallons of fossil fuels are classified as Bulk Fossil Fuel Terminal uses.

7. Other implementation recommendations

This section of the report recommends future implementation directions for building code amendments to address seismic resilience and periodic monitoring for code effectiveness.

Seismic resilience

Considering setting direction to implement this future action within the adopting ordinance:

- Portland Bureau of Emergency Management and Portland Office of Government Relations are directed to develop building code changes to improve seismic resilience and require seismic upgrades comparable to proposed requirements on unreinforced masonry buildings.

Seismic resilience is one of the underlying rationales for fossil fuel distribution policies and the proposed code amendments. Seismic safety requirements of land development is addressed in building codes, which are adopted and amended at the state level.

Monitoring for code effectiveness

Considering setting direction to implement this future action within the adopting ordinance:

- Portland Bureau of Planning and Sustainability is directed to periodically monitor the effectiveness of the proposed zoning code amendments to implement underlying policies and consider code adjustments in response to regional fuel demand and market changes, product innovation, safety and climate considerations, and related regulatory changes.

A monitoring and adaptation approach would provide for ongoing code effectiveness within a context of changing energy markets, products, and associate regulations.

Appendix A: Stakeholder focus group results

Public involvement in the concept development for the Fossil Fuel Terminal Zoning Project consisted primarily of four stakeholder focus groups as well as meetings with fuel terminals and other individuals or organizations. The focus groups were held in June 2016. The purpose of the focus groups was to help identify and understand the issues that should help shape the preliminary zoning code being considered by this project. The focus groups also helped to expeditiously reach out to a broad range of stakeholders. While their perspectives and interests are shared on some topics, they diverge on other topics.

In addition to the stakeholder focus groups, BPS staff met with several fuel terminals to explain the proposal, answer questions, and discuss their individual concerns. This was needed because antitrust regulations constrained discussion about certain topics, for example supply chains, in the presence of representatives from other fuel terminals. Primarily, the terminal operators explained their operations and facilities, many of which differed substantially from other terminals.

Who participated?

Figure 9 lists the participants of the four focus groups conducted. Ten to twelve participants were invited to each meeting, although not everyone was able to attend. The first focus group consisted of fuel terminal representatives who have a direct stake in the proposed regulations. The second group was environmental and public health organizations, some of whom advocated for the resolution before City Council and have community safety and sustainability in mind. The third group were state and regional business and government organizations. Their interest was to protect the state economy by testing the proposal against economic realities. The fourth group was neighborhood and equity community organizations whose interests were to protect neighborhoods adjacent to the terminals and underserved communities who may rely on terminals for employment. Additionally, the Mayor's Office invited input from Native communities and tribal governments.

Preliminary code concepts discussed

- Identify "bulk fossil fuel terminals" as a regulated land use, characterized by inter-regional transport access and larger storage facilities.
- Either prohibit new terminals or set storage capacity limits high enough to accommodate regional growth.
- Allow existing terminals to expand for seismic upgrades, access to greener fuels and capacity for regional growth.

What discussion questions were asked?

The focus groups were provided background materials describing the preliminary code change concepts about two weeks before the focus group meetings. BPS staffed prompted the focus group across four topics:

Figure 9. Stakeholder Focus Group Participants, June 2016

STAKEHOLDER	DATE	ATTENDEES
Fuel terminal representatives	Thursday, June 02, 2016	Gilbert Betancourt, Phillips 66 Nick Giotta, Phillips 66 Stephanie Williams, Phillip 66 Andrew Holbrook, Kinder Morgan Shanna Brownstein, Northwest Natural Kevin Jones, McCall Oil Pamela Brady, BP West Coast Jerry Henderson, Chevron Kevin Buffum, Pacific Terminal Services Steve Kober, NuStar Will Rassmussen, WSPA Frank Holmes, WSPA Chris West, Pac/West and Arc Terminals Nathan Eggers, Arc Terminals Jerome Jackson, NuStar Rob Hill, NuStar
Environmental and health organizations	Tuesday, June 07, 2016	Zach Klonoski, Mayor's Office Regna Merritt, Ore. Physicians for Social Responsibility Trish Weber, Center for Sustainable Economy Meredith Connolly, Climate Solutions Kristen Sheeran, Climate Solutions Nick Caleb, 350PDX/CSE Bob Salinger, Audubon Society Dan Serren, Columbia Riverkeeper Adriana Voss-Andreae, 350PDX Micah Meskel, Portland Audobon
State and regional business organizations	Thursday, June 09, 2016	Jana Jarvis, Oregon Trucking Association Greg Theisen, Port of Portland Ellen Wax, Working Waterfront Jay Clemens, Associated Oregon Industries Mark Landauer, Oregon Public Ports Association Marion Haynes, Portland Business Alliance Corky Collier, Columbia Corridor Association Kelly Ross, NAIOP Shanna Brownstein, Northwest Natural Emerald Bogue, Port of Portland Susan Lahsene, Port of Portland Phil Grillo, Davis Wright Tremaine
Neighborhood and equity organizations	Tuesday, June 14, 2016	Jeff Geisler, Hayden Island Neighborhood Association John Bradley, Northwest District Association Travis Argue, UA Local 290 Willy Myers, Columbia Pacific Building Trades

1. Issues that should shape the project
2. Types of distribution and storage facilities to be regulated
3. Definition of fossil fuels
4. Zoning approach for limiting new storage facilities

In addition to specific questions within each topic, participants were invited to share any general and wrap-up comments during the focus group.

What we heard

For each topic area, the results of the focus groups are summarized in Figure 4 of Section 3. That table summarizes the main themes and concerns raised during the focus groups.

Key issues

Fuel terminal representatives objected to this policy direction in general. They discussed their safe operating history and commitment to implement the federal and state standards for renewable and clean fuels. There were challenges to participating in the conversation, but they agreed to work cooperatively on this project to get the code right. For example, anti-trust laws precluded the group from engaging in certain conversations because it would involve disclosing information about their supply chains and could be considered collusion in court of law. This group was concerned with the fast timeline and felt the policies should be discussed first.

They also felt the process was emotionally driven, not having considered the unintended consequences. For example, with renewable and clean fuel standards constantly in flux, they felt that zoning rules could make it more difficult to meet these standards. Restricting growth here in Portland at the end of the Olympic Pipeline could put more trucks on the road, instead of more efficient pipeline or rail transportation. The group asserted that there could also be significant economic impacts on the rest of the state, given that 95% of Oregon's fuel passes through Portland first. Lastly, fuel terminal representatives expressed concern for additional administrative burdens that a new land use category would bring. For example, what steps would be necessary for these firms to demonstrate that they were existing operations prior to the new zoning rules? Additionally, they warned that their site configuration may pose a challenge to effective zoning rules, as they are often non-contiguous operations connected by interconnected pipelines.

Environmental and public health organizations felt the policy direction was less aggressive toward fossil fuels than what the City Council resolution had proclaimed. They felt the resolution sought to outright prohibit new development and expansion on existing facilities. Because of this, they cautioned about community backlash if this proposal did not meet expectations. In this vein, they highlighted that Portland will be the first city to fully implement this type of policy, so the project could be an opportunity to set a strong precedent and model code for other cities. This group also felt that resident health and safety was also a top priority. They noted the seismic risks posed by fuel terminal tank farms that lie on liquefaction zones as well as the June 2016 oil train wreck in Mosier. For these reasons, they felt Portland Bureau of Emergency Management (PBEM) and other environmental justice groups should be involved in safety considerations. Lastly, the group felt the economic impact statement should include more than the impact on jobs. It should also consider the risks of economic and financial damages from a natural disaster. Members of this focus group offered to provide technical analysis on the impacts that the proposed options could have on the environment and public health and safety.

Some noted that risks should be accounted for through bonding or insurance requirements under worst-case scenarios.

State and regional business organizations felt that this undertaking requires more research. The resolution set required tasks, including an economic impact analysis and an examination of relevant laws, and they felt these tasks should be completed before laying the groundwork through code development. They felt the marine cargo forecast for liquid bulks of 1% growth is outdated and too low. (Note, an opposite reaction was expressed by environmental and health organization representatives who felt this figure was too high.) Similarly, they feared that the code may not hold up well in five years because of constantly changing energy markets. For example, in five years Portland could be shipping cleaner fuels to the Midwest. Some members expressed concern that the zoning code may not be the right tool to achieve some of the GHG (greenhouse gas) reduction and public safety goals that this resolution aimed to achieve. If the goal is public safety, then the City should require or create incentives for seismic upgrades. They stated that, if the goal is to reduce greenhouse gases, then prohibiting the export of cleaner-burning fuels, such as LNG (liquefied natural gas), may have the opposite intended effect. Lastly, the group asserted the important role that Portland's fuel terminal facilities play in rest of the state economy. They warned of political and economic repercussions that these decisions could have. They shared the view with fuel terminal representatives that this is a big political decision—the timeline is too short and the process should not be rushed.

Neighborhood and equity community organizations communicated that safety, pollution and accidental releases were their top priority when considering zoning for fuel terminals. They wanted a close examination of the seismic and explosion risks associated with fuel terminals. For example, which terminals are in liquefaction zones? Where are the storage tanks located in relation to neighborhoods? They sought honesty about the risks posed to the Linnton neighborhood specifically. Rail safety in the Columbia Gorge was also a key issue. The June 2016 incident in Mosier highlighted the risks. A potential solution they offered would be more pipelines, but they are difficult to get built. This group recognized the difficulty in managing competing values. They felt a reasonable expectation of growth is a smart idea. One participant described the proposal as aggressive, adding that by prohibiting LNG export terminals, global export destinations like China may end up burning dirtier fuels, such as coal. They felt this also meant Portland would forego export profits.

New land use category

Fuel terminal representatives were concerned for the clarity of the rules. They felt that the definition of "bulk terminal" is very important to be clear. If the definition was open to interpretation, then permit staff could be pressured. They warned that creating "bulk fuel terminal" as a specifically regulated use could lead to unpredictable results. This group was also concerned with the definition of "region." They were unsure if off-shore distribution was the issue, advocating for using the federally recognized West Coast region (PADD 5) as the definition of "regional market." PADD 5 includes Oregon, Washington, California, Nevada, Arizona, Alaska and Hawaii.

Environmental and public health organizations wanted to see the regulation go beyond new facilities and also look at limits on expansion at existing facilities. They felt the City Council resolution was clear and unambiguous about opposing expansion of fossil fuel infrastructure, which includes expansions at existing sites. They emphasized the importance for getting the right definition of "bulk terminal" and the associated size limit (or prohibition)—these must be correct in order to effectively implement the policy. Some members questioned whether seismic upgrades at existing facilities could be allowed but

expansions prohibited. This group also urged the inclusion of PBEM's work on hazards in liquefaction zones in this project.

State and regional business organizations echoed the concerns for clear and correct definitions that the fossil fuel representatives posed. "Region," "export," "end user," and "fossil fuel" are all important terms to get right. They also were strongly opposed to making existing facilities non-conforming uses, as well as making them limited uses with unclear exceptions. This would expose projects to discretionary land use actions, which is costly and unpredictable, and hence risky. It would likely make improvements that the community values, such as seismic upgrades, more difficult to attain.

Neighborhood and equity community organizations were skeptical that a new export terminal would be proposed in the Portland area in the wake of Pembina. They felt that Superfund sites were too expensive to acquire and build on. The group also wondered whether a new zone for fossil fuels ought to be created instead of a land use. They questioned why it ought to be allowed in IG2.

Definition of fossil fuels

Fuel terminal representatives were primarily concerned with the long-term applicability of the proposed rules. Energy markets and new technologies are constantly in flux, and it is difficult to know what the size requirements might be for newer—perhaps cleaner—fuels, particularly blended fuels. This group sought clarification for what "green fuels" meant. They noted that the proposed inclusion of LNG among city-regulated fossil fuels is inconsistent with the State of Oregon's inclusion of LNG as a "clean fuel." They called for periodic review of the rules when tomorrow's cleaner fuels become known, as they may not meet today's definitions. They cautioned about unintended consequences of placing restrictions on fossil fuel terminals, such as potentially putting more trucks on the road by restricting growth at facilities with pipeline, marine and rail access. This may result in considerably more GHG emissions. They also felt that methanol should not be included in the list of regulated fuels because it is used more as a value-added commodity than a fuel. They shared this last viewpoint with most other focus groups, except the environmental and health organizations.

Environmental and public health organizations looked to the intent of the City Council resolution and noted that it included propane, methanol, natural gas and other low-carbon fuels. At the same time, they agreed that code changes should provide flexibility to meet Oregon's low carbon fuel standard. They noted that methanol is currently being used as a fuel, so excluding it undermines the policy. The group sought clarification on how to address non-fuels. Some suggested that the GHG emissions of these input commodities should help ground their use. Others thought that the proportions (e.g., in blended fuels) should be considered—if the product is mostly used as a fossil fuel, then it should be regulated and restricted. Lastly, they highlighted how even one new LNG tank in Portland is a major safety issue. Although not explosive, coal also poses a significant risk, especially in transportation. Because of these risks, they believed that the resolution should be implemented through health and safety standards.

State and regional business organizations expressed frustration that while the federal and state government are going one direction requiring cleaner-burning fuels, the City of Portland appears to be choosing to restrict distribution of these cleaner fuels in another policy direction. Some members thought the City could try to incentivize a higher blend of renewables, and others warned of the disincentives that could discourage investment—disincentives should limit GHG emissions, not seismic upgrades.

Neighborhood and equity community organizations thought that restricting methanol exports would be an overreach. They said it is not being used as a fuel in the United States, and instead it is a value-added product used in manufacturing of plastics and other goods. Including methanol would negatively impact the manufacturing sector that requires it as an input, and it could open the door to regulating other non-fuel commodities, such as paints and asphalt. In general, they felt that if we can make certain fuels cleaner burning, then it poses minimal threat. They asserted that, since there is no clear transitional path away from our dependency on fossil fuels, we should make way for cleaner alternatives, such as blended bio-diesel.

Terminal development restrictions

Fuel terminal representatives were concerned with potential restrictions precluding development on certain site configurations, which have some peculiarities. For example, where two existing tank farms are non-contiguous (e.g., at Willbridge) and are connected by facility pipelines, they should be allowed an option for expansion. Additionally, some sites may already be built out and cannot accommodate the new growth that is expected. This group could not comment on facility size and anticipated growth, because of anti-trust laws, but they noted that it is critically important. For this reason, they could not provide feedback on the implementation options presented.

Environmental and public health organizations generally preferred Option A. However, some recognized the legal challenges posed by federal restrictions. They wondered if health and human safety risks may provide a defensible rationale. Some members also noted that while prohibiting all new facilities and making existing facilities non-conforming uses might be more legally defensible, it is much less politically feasible. Finally, some members of this group were skeptical of the 1% annual growth forecast for liquid bulks. They felt this was too high, which is contrary to what the state and regional business organization representatives stated.

State and regional business organizations criticized the approach to implementing the City Council resolution. They felt that zoning to regulate tank size approaches the problem sideways, and the unclear rationale could lead to appeals and legal challenges. One participant advocated to prohibit exports more directly, rather than a sideways approach. They cautioned that tank size limits could essentially put the region on an "import diet," even if the intent of the limit is to reduce throughput. They did not think this proposal accounted for these unintended impacts. Docked ships in the harbor may need an LNG tank to power their facilities and improve air quality, for example. They also noted that there are economic advantages and efficiency gains to being a bigger facility, and placing restrictions on size will have consequences that we don't want—lower wages for example. Lastly, they felt the 1% annual growth forecast for liquid bulks was outdated—an updated forecast would be higher. This was the opposite of what environmental and public health organizations stated.

Neighborhood and equity community organizations generally preferred Option C, calling it a realistic proposal that allows for some growth but doesn't restrict it too much. While the group was fairly resolute that coal is not a good alternative, they recognized that LNG is a cleaner-burning fuel. However, since the facilities in the region are already at capacity, Option C would allow for some wiggle room for the region's growth. They felt it would allow the "invisible hand" to guide the market more easily. They recommended that the City review the size limits every few years as the market changes.

DLCD FORM 1

NOTICE OF A PROPOSED CHANGE TO A COMPREHENSIVE PLAN OR LAND USE REGULATION

FOR DLCD USE
File No.:
Received:

Local governments are required to send notice of a proposed change to a comprehensive plan or land use regulation **at least 35 days before the first evidentiary hearing**. (*See* OAR 660-018-0020 for a post-acknowledgment plan amendment and OAR 660-025-0080 for a periodic review task). The rules require that the notice include a completed copy of this form.

Jurisdiction: **City of Portland**

Local file no.: **Fossil Fuel Terminal Zoning Amendments**

Please check the type of change that best describes the proposal:

☐ **Urban growth boundary (UGB) amendment** including more than 50 acres, by a city with a population greater than 2,500 within the UGB

☐ **UGB amendment** over 100 acres by a metropolitan service district

☐ **Urban reserve designation,** or amendment including over 50 acres, by a city with a population greater than 2,500 within the UGB

☐ **Periodic review task** – Task no.:

☒ **Any other change** to a comp plan or land use regulation (*e.g.*, a post-acknowledgement plan amendment)

Local contact person (name and title): Tom Armstrong
Phone: 503-823-3527 E-mail: tom.armstrong@portlandoregon.gov
Street address: 1900 SW 4th Ave., Ste. 7100 City: Portland, OR Zip: 97201-

Briefly summarize the proposal in plain language. Please identify all chapters of the plan or code proposed for amendment (maximum 500 characters):

This code change project would implement new policy direction in City Resolution 37168 on fossil fuel distribution and storage, consistent with City and State objectives on climate change and public safety. Draft code changes would prohibit Bulk Fossil Fuel Terminals in all base zones, and existing terminals would become legal, non-conforming uses. Zoning Code Sections that would be amended include 100, 110, 120, 130, and 140 on base zones (allowed uses) and 910 and 920 on general terms.

Date of first evidentiary hearing: 09/13/2016
Date of final hearing: 2016

☐ This is a revision to a previously submitted notice. Date of previous submittal:

Check all that apply:

☐ Comprehensive Plan text amendment(s)

☐ Comprehensive Plan map amendment(s) – Change from to
Change from to

☒ New or amended land use regulation

☐ Zoning map amendment(s) – Change from to
Change from to

☐ An exception to a statewide planning goal is proposed – goal(s) subject to exception:

☐ Acres affected by map amendment:

Location of property, if applicable (site address and T, R, Sec., TL):

List affected state or federal agencies, local governments and special districts: ODEQ, ODOT, DOGAMI, ODOE, Business Oregon, Oregon Building Codes Division, USEPA, USDOT, USDOE, Metro, Port of Portland

NOTICE OF A PROPOSED CHANGE – SUBMITTAL INSTRUCTIONS

1. Except under certain circumstances,[1] proposed amendments must be submitted to DLCD's Salem office at least 35 days before the first evidentiary hearing on the proposal. The 35 days begins the day of the postmark if mailed, or, if submitted by means other than US Postal Service, on the day DLCD receives the proposal in its Salem office. **DLCD will not confirm receipt of a Notice of a Proposed Change unless requested.**

2. A Notice of a Proposed Change must be submitted by a local government (city, county, or metropolitan service district). DLCD will not accept a Notice of a Proposed Change submitted by an individual or private firm or organization.

3. **Hard-copy submittal:** When submitting a Notice of a Proposed Change on paper, via the US Postal Service or hand-delivery, print a completed copy of this Form 1 on light green paper if available. Submit **one copy** of the proposed change, including this form and other required materials to:

Attention: Plan Amendment Specialist
Dept. of Land Conservation and Development
635 Capitol Street NE, Suite 150
Salem, OR 97301-2540

This form is available here:
http://www.oregon.gov/LCD/forms.shtml

4. **Electronic submittals** of up to 20MB may be sent via e-mail. Address e-mails to plan.amendments@state.or.us with the subject line "Notice of Proposed Amendment."

Submittals may also be uploaded to DLCD's FTP site at
http://www.oregon.gov/LCD/Pages/papa_submittal.aspx.

E-mails with attachments that exceed 20MB will not be received, and therefore FTP must be used for these electronic submittals. **The FTP site must be used for all .zip files** regardless of size. The maximum file size for uploading via FTP is 150MB.

Include this Form 1 as the first pages of a combined file or as a separate file.

5. **File format:** When submitting a Notice of a Proposed Change via e-mail or FTP, or on a digital disc, attach all materials in one of the following formats: Adobe .pdf (preferred); Microsoft Office (for example, Word .doc or docx or Excel .xls or xlsx); or ESRI .mxd, .gdb, or .mpk. For other file formats, please contact the plan amendment specialist at 503-934-0017 or plan.amendments@state.or.us.

6. **Text:** Submittal of a Notice of a Proposed Change for a comprehensive plan or land use regulation text amendment must include the text of the amendment and any other information necessary to advise DLCD of the effect of the proposal. "Text" means the specific language proposed to be amended, added to, or deleted from the currently acknowledged plan or land use regulation. A general description of the proposal is not adequate. The notice may be deemed incomplete without this documentation.

7. **Staff report:** Attach any staff report on the proposed change or information that describes when the staff report will be available and how a copy may be obtained.

8. **Local hearing notice:** Attach the notice or a draft of the notice required under ORS 197.763 regarding a quasi-judicial land use hearing, if applicable.

9. **Maps:** Submittal of a proposed map amendment must include a map of the affected area showing existing and proposed plan and zone designations. A paper map must be legible if printed on 8½" x 11" paper. Include text regarding background, justification for the change, and the application if there was one accepted by the local government. A map by itself is not a complete notice.

10. **Goal exceptions:** Submittal of proposed amendments that involve a goal exception must include the proposed language of the exception.

[1] 660-018-0022 provides:
(1) When a local government determines that no goals, commission rules, or land use statutes apply to a particular proposed change, the notice of a proposed change is not required [a notice of adoption is still required, however]; and
(2) If a local government determines that emergency circumstances beyond the control of the local government require expedited review such that the local government cannot submit the proposed change consistent with the 35-day deadline, the local government may submit the proposed change to the department as soon as practicable. The submittal must include a description of the emergency circumstances.

If you have any questions or would like assistance, please contact your DLCD regional representative or the DLCD Salem office at 503-934-0017 or e-mail plan.amendments@state.or.us.

Notice checklist. Include all that apply:

☒ Completed Form 1

☒ The text of the amendment (e.g., plan or code text changes, exception findings, justification for change)

☒ Any staff report on the proposed change or information that describes when the staff report will be available and how a copy may be obtained

☐ A map of the affected area showing existing and proposed plan and zone designations

☒ A copy of the notice or a draft of the notice regarding a quasi-judicial land use hearing, if applicable

☐ Any other information necessary to advise DLCD of the effect of the proposal

RESOLUTION No. 37168 As Amended

Oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways (Resolution)

WHEREAS, the rapid development of fossil fuel resources in the western U.S. and Canada has resulted in numerous facility and infrastructure projects proposed to transport coal, diluted bitumen, natural gas, propane or other fossil fuels through the West Coast; and

WHEREAS, fossil fuels pose risks to safety, health, and livability, including mobility of people, other freight, and other commercial vehicles; and

WHEREAS, fossil fuel infrastructure poses considerable risks in the event of a major earthquake; and

WHEREAS, the extraction and combustion of fossil fuels are significant sources of greenhouse gas emissions and major contributors to climate change and pollution; and

WHEREAS, coal contains toxic heavy metals, including mercury, arsenic and lead, and exposure to these toxic heavy metals is linked to cancer, birth defects and other health problems; and

WHEREAS, transportation of coal using open top rail cars results in significant volumes of materials escaping during transit, exposing communities to toxic heavy metals in coal dust and particulates at levels potentially harmful to adjacent communities, workers, wildlife and nature; and

WHEREAS, crude oil, including oil derived from the Bakken shale reservoir, is known to be volatile, highly flammable and to contain elevated levels of benzene, a potent carcinogen; and

WHEREAS, extraction of fossil fuels through fracking and tar sands processing, which has become widespread throughout the Western United States and Canada, has damaging impacts to human and environmental health and fracking increases the potential for earthquakes; and

WHEREAS, transporting crude oil, coal and other fossil fuels into Oregon involves traversing challenging mountain passes, areas laced with significant earthquake faults and numerous older unsafe bridges lacking appropriate infrastructure maintenance or upgrades, significantly increasing the risks of serious accidents; and

WHEREAS, given the record of crude oil and coal or other fossil fuel transport accidents, such as Lac Mégantic in 2013, the 1999 Bellingham pipeline leak or a coal train derailment, an event could have catastrophic effects if it occurred in any of Oregon's populated areas; and

WHEREAS, the risks posed by the transportation of fossil fuels through the Columbia Gorge are inconsistent with the Gorge's designation as a National Scenic Area; and

WHEREAS, historically, when environmental accidents do occur, litigation over damages is drawn out over years, deflecting blame while undercutting timely assistance to affected communities; and

WHEREAS, tribal communities in Oregon and Washington have expressed concerns about the safety risks of fossil fuel infrastructure and the related threats to human health, cultural heritage, and environmental quality; and

WHEREAS, economic opportunities presented by expanding fossil fuel infrastructure are modest, with few jobs and little value added when compared to the related environmental costs; and

WHEREAS, local, regional and global economies are transitioning to low-carbon energy sources, and West Coast businesses are leaders in providing energy efficiency and renewable energy technologies and services; and

WHEREAS, the future of the fossil fuel industry is questionable given global action to reduce greenhouse gas emissions; and

WHEREAS, climate change, if unchecked, will continue impact human health, natural systems, and infrastructure, creating new costs for individuals, businesses, and governments; and

WHEREAS, the City's *2015 Climate Action Plan* (adopted by Resolution 37135) identifies the need to establish a "fossil fuel export policy that considers lifecycle emissions, safety, economics, neighborhood livability and environmental impacts" (*Climate Action Plan*, action 3G, page 69); and

WHEREAS, the City and Multnomah County, working together with many individuals, and community and business partners, have reduced local carbon emissions 14 percent since 1990 while adding population and jobs; on a per person basis, carbon emissions have decreased 35 percent since 1990; and

WHEREAS, the *2015 Climate Action Plan* commits the City to continue to advance policy and programs to reduce local fossil fuel use both in the City's own operations and through community-wide initiatives; and

WHEREAS, in September 2015, the Council added fossil fuel companies to the City's Corporate Securities Do-Not-Buy List, committing the City to hold no financial stake in the 200 largest fossil fuel firms. Resolution 37153; and

WHEREAS, 27 Oregon and Washington communities have passed resolutions addressing fossil fuel transport and export, and hundreds of public officials, including the governors of Oregon and Washington, state and federal agencies, tribes, health organizations, religious leaders and other community leaders, have recognized the harms presented by fossil fuels to the environment and Northwest communities; and

WHEREAS, in 2012, the Council expressed opposition to coal trains traveling through Portland until a programmatic, comprehensive and area-wide Environmental Impact Statement and comprehensive Health Impact Assessment are completed. Resolutions 36959 and 36962; and

WHEREAS, the City is continuing to work with utilities to reduce coal and other fossil fuels in Portland's electricity supply;

NOW, THEREFORE, BE IT RESOLVED, that the City Council will actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways; and

BE IT FURTHER RESOLVED, that this Resolution does not restrict:

1. improvements in the safety, or efficiency, seismic resilience, or operations of existing infrastructure;
2. the provision of service directly to end users;
3. development of emergency backup capacity;
4. infrastructure that enables recovery or re-processing of used petroleum products; or
5. infrastructure that will accelerate the transition to non-fossil fuel energy sources; and

BE IT FURTHER RESOLVED, that City bureaus are directed to examine existing laws, including those related to public health, safety, building, electrical, nuisance, and fire codes, and develop recommendations to address fossil fuels that strengthen public health and safety; and

BE IT FURTHER RESOLVED, that the Bureau of Planning and Sustainability is directed to develop proposed code changes for Council consideration to advance the policies set forth in this Resolution; and

BE IT FURTHER RESOLVED, that prior to any further Council action, the mayor shall schedule (1) a work session to review any proposed code changes and (2) an executive session to review the legal considerations of any proposed code changes; and

BE IT FURTHER RESOLVED, that the Bureau of Planning & Sustainability shall undertake an analysis of the economic impacts of any proposed Code changes to advance the policies set forth in this resolution, with a particular focus on potential impacts to local blue-collar jobs; and

BE IT FURTHER RESOLVED, that the City and applicable bureaus shall seek and identify opportunities to invest in Portland's 'human infrastructure' by supporting programs to retrain our workforce as the city transitions to a clean energy economy; and

BE IT FURTHER RESOLVED, that the City shall consult with its Tribal Government Partners, the State of Oregon, local governments, and other key stakeholder including labor, business, environment, neighborhoods and communities of color in advancing this policy; and

BE IT FURTHER RESOLVED, notwithstanding anything in this resolution, the Council will exercise its duty as a quasi-judicial land use decision making body in an impartial manner consistent with City Code and Oregon law.

BE IT FURTHER RESOLVED, this resolution is binding City policy.

Adopted by the Council: NOV 12 2015

Mayor Charlie Hales
Prepared by: M. Armstrong, BPS
Date Prepared: October 23, 2015

Mary Hull Caballero
Auditor of the City of Portland
By _____
Deputy

CERTIFICATE OF SERVICE

I hereby certify that I served the foregoing RESPONDENT'S RECORD on:

William L. Rasmussen
Miller Nash Graham & Dunn LLP
Attorneys at Law
3400 U.S. Bancorp Tower
111 SW Fifth Avenue
Portland, Oregon 97204
Attorney for Petitioners

Phillip E. Grillo
Davis Wright Tremaine LLC
1300 SW 5th Ave, Suite 2400
Portland, Oregon 97201
Attorney for Intervenor-Petitioners

Maura Fahey
Crag Law Center
917 SW Oak Street, Suite 417
Portland, Oregon 97205
Attorney for Intervenor-Respondent

on February 10, 2017, by mailing to said person(s) a disc containing a text-searchable PDF of the full, correct RESPONDENT'S RECORD, with postage paid, and deposited in the post office at Portland, Oregon on said day.

I further certify that on February 10, 2017, I filed the original and one copy of the RESPONDENT'S RECORD with the:

LAND USE BOARD OF APPEALS
DSL BUILDING
775 SUMMER STREET NE, SUITE 330
SALEM, OR 97301-1283

by mailing said documents, contained as a text-searchable PDFs on two separate discs, and deposited with the post office at Portland, Oregon on said day.

LAUREN A. KING, OSB #123632
Deputy City Attorney
Attorney for Respondent City of Portland
Telephone: (503) 823-4047

PORTLAND CITY ATTORNEY'S OFFICE
1221 SW 4TH AVENUE, RM. 430
PORTLAND, OREGON 97204
TELEPHONE: (503) 823-4047
FAX: (503) 823-3089

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.

MEMO

DATE: December 17, 2018

TO: Portland City Council

FROM: Tom Armstrong, Supervising Planner

SUBJECT: Fossil Fuel Terminal Zoning Amendments – Technical Amendments

There three technical amendments proposed by BPS staff.

Amendment #1 – amend the ordinance as follows:

27. Ordinance No. 188142 was appealed to the Oregon Land Use Board of Appeals (LUBA). LUBA ~~issued a decision upholding two assignments of error~~ issued an order reversing the City's Ordinance in *Columbia Pacific Building Trades Council et al v. City of Portland*, LUBA Case No. 2017-001, July 19 2017).

NOW THEREFORE, The Council directs:

a. Adopt Exhibit A Findings of Fact Report (as amended) December 2019 as additional findings.
b. Amend Title 33, Planning and Zoning, as shown in Exhibit B, Fossil Fuel Terminal Zoning Amendments, Remand Report, dated ~~October 30~~ December 18, 2019.
c. Adopt the commentary in Exhibit B, Fossil Fuel Terminal Zoning Amendments, Remand Report, dated ~~October 30~~ December 18, 2019, as legislative intent and further findings.

Amendment #2 – Adopt Findings of Fact Report (as amended) December 2019

Adopt the revised Findings of Fact Report with findings that respond to the public testimony.

Amendment #3 – Adopt Remand Report (as amended) December 18, 2019

The Remand Report has been revised to respond to the public testimony.

IMPACT STATEMENT

Legislation title: *Readopt remanded Ordinance No. 188142 to restrict bulk fossil fuel terminals. (Ordinance; Amend Title 33, Planning and Zoning)

Contact name: Tom Armstrong, Bureau of Planning and Sustainability
Contact phone: 503-823-3527
Presenter name: Andrea Durbin and Tom Armstrong, Bureau of Planning and Sustainability

Purpose of proposed legislation and background information:
This ordinance is a reconsideration of Fossil Fuel Terminal Zoning amendments (Ordinance No. 188142) that were adopted in 2016. That ordinance was appealed to the Oregon Supreme Court and is now back before City Council. These code changes restrict development and expansion of Bulk Fossil Fuel Terminals.

- Bulk Fossil Fuel Terminals are characterized by (a) marine, railroad, or pipeline transport access and (b) either storage capacity exceeding 2 million gallons or transload facilities (such as rail-to-ship loading)
- Fossil fuels include petroleum products (such as crude oil and gasoline), coal, natural gas, and propane, and methanol, which is produced from natural gas.
- No new Bulk Fossil Fuel Terminals are allowed.

The existing Bulk Fossil Fuel Terminals in Industrial and General Employment zones become "limited uses" that can continue to operate. Expansion of fossil fuel storage at these existing terminals would be prohibited, with limited exceptions.

The code changes will not apply to gas stations; distributors and wholesalers that receive and deliver fossil fuels exclusively by truck; industrial, commercial, institutional, and agricultural uses that store fossil fuels for use as an input; uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses. Fossil fuel storage facilities for airports, marine terminals, rail yards, and fleet vehicle fuel facilities are specifically exempted.

Previous Council Actions
- Resolutions 36959 and 36962 adopted in 2012, the Council expressed opposition to coal trains traveling through Portland until a programmatic, comprehensive and area-wide Environmental Impact Statement and comprehensive Health Impact Assessment are completed.
- Resolution 37168, adopted November 12, 2015, expressed the City Council's opposition to the "expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." It also expressed the Council's intent not to restrict improvements in safety, efficiency, or seismic resilience; the provision of service directly to end users; or infrastructure that will accelerate the transition to non-fossil fuel energy sources.

- The 2015 Climate Action Plan to advancing policy and programs to reduce local fossil fuel use both in the City's own operations and through community-wide initiatives.
- The 2035 Comprehensive Plan sets policy direction (Policies 4.75 and 4.76) to encourage disaster-resilient development and specifically to reduce natural hazard risks to critical energy and transportation infrastructure in Portland Harbor.
- The original version (Ordinance No. 188142) was adopted in 2016 and appealed to the Oregon Land Use Board of Appeals (LUBA), the Oregon Court of Appeals, and the Oregon Supreme Court. It has been remanded back to the City of Portland for reconsideration of policies and additional evidence.

Financial and budgetary impacts:

- There are no long-term financial impacts for the City (e.g. ongoing debt payments, purchase of property requiring operations and maintenance, ratification of labor contract, etc.)
- There are no budget impacts – the action does not amend the budget.
- The legislation does not authorize additional spending on a new or existing project or program.
- There is no expected change in current and future revenues.
- The legislation does not create, eliminate or re-classify positions now or in the future. This legislation will require staff time to defend an expected appeal of this ordinance and on-going monitoring of development permits associated with the existing fossil fuel terminals.
- The legislation does not result in a new or modified financial obligation or benefit, including IAs, IGAs, MOUs, grants, contracts or contract amendments.

Community impacts and community involvement:

These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under the current development review standards. The FFTZ amendments support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity, such as consolidating smaller tanks into larger tanks, to meet future needs.

Given that this ordinance is a reconsideration of a previously adopted ordinance, BPS relied upon the previous public testimony that informed that ordinance. This ordinance is substantially the same ordinance with a few minor adjustments to reconcile the code amendments with the current Zoning Code.

The community involvement process for the previous ordinance included stakeholder focus group meetings with terminal owners and business groups as well as environmental groups. The process also included extensive public testimony that informed the Planning and Sustainability Commission recommendation as well as the final adoption by the City Council.

100% Renewable Goal:

- This action does not affect the City's total energy use.
- This action supports the City's renewable energy use by allowing for additional storage tank capacity for renewable fuels at existing fossil fuel terminals.

Budgetary Impact Worksheet

Does this action change appropriations?

☐ **YES**: Please complete the information below.
☒ **NO**: Skip this section

Fund	Fund Center	Commitment Item	Functional Area	Funded Program	Grant	Sponsored Program	Amount

CITY OF

PORTLAND, OREGON

OFFICIAL MINUTES

[Excerpt Council Meeting December 18-19, 2019. Item 1194]

A RECESSED MEETING OF THE COUNCIL OF THE CITY OF PORTLAND, OREGON WAS HELD THIS **18th DAY OF DECEMBER, 2019** AT 2:30 P.M.

THOSE PRESENT WERE: Mayor Wheeler, Presiding; Commissioners Eudaly, Fritz and Hardesty, 4.

OFFICERS IN ATTENDANCE: Karla Moore-Love, Clerk of the Council; Matt Farley, Senior Deputy City Attorney, and Lauren King, Deputy City Attorney, from 3:11 to 3:27 p.m.; and Daniel Sipe and Ian Williams, Sergeants at Arms.

1193	**TIME CERTAIN: 2:30 PM –** Amend Motor Vehicle Fuels Code to move authority to establish, revise as necessary and enforce standards for biofuels sold in the City to the Director of the Bureau of Planning and Sustainability (Ordinance introduced by Mayor Wheeler; amend Code Chapter 16.60) 30 minutes requested	**PASSED TO SECOND READING JANUARY 8, 2020 AT 9:30 AM**
***1194**	**TIME CERTAIN: 3:00 PM –** Readopt remanded Ordinance No. 188142 to restrict bulk fossil fuel terminals (Previous Agenda 1082; Ordinance introduced by Mayor Wheeler; amend Title 33, Planning and Zoning) 90 minutes requested **Motion to amend Finding 27 to correct a reference to LUBA decision, and change reference to Exhibits to reflect today's date and decision as amended in the following motions**: Moved by Eudaly and seconded by Fritz. (Y-4) **Motion to Adopt the revised Findings of Fact Report with findings that respond to the public testimony**: Moved by Eudaly and seconded by Fritz. (Y-3, N-1 Hardesty) **Motion to adopt Remand Report as amended December 18, 2019 to respond to the public testimony**: Moved by Eudaly and seconded by Fritz. (Y-3, N-1 Hardesty) **Motion to move the amendment fossil fuels terminal zoning amendments ordinance for a vote to approve**: Moved by Eudaly and seconded by Fritz. (Y-4)	**189807** **AS AMENDED**

At 4:04 p.m., Council recessed.

MARY HULL CABALLERO
Auditor of the City of Portland

By Karla Moore-Love
Clerk of the Council

For a discussion of agenda items, please consult the following Closed Caption File.

Closed Caption File of Portland City Council Meeting
[Excerpt Item 1194]

This file was produced through the closed captioning process for the televised City Council broadcast and should not be considered a verbatim transcript.
Key: ***** means unidentified speaker.

18 DECEMBER 2019 2:30 PM

Item 1194
Wheeler: Colleagues, we're back today to continue our work on the fossil fuel terminal zoning amendments. To help reorient everyone where we are on the proposals, the intent of the fossil fuel terminal zoning amendments is to restrict new storage tank capacity for fossil fuels. This had originally come to the city council back in 2019 and upon legal review by the courts was remanded back to the city of Portland so we have now retooled it. We believe it will withstand even careful legal scrutiny. Voting on this is in line with our values as a city to do everything possible to protect the health and safety of our community from fossil fuel infrastructure expansion. As we work to reduce our dependence on fossil fuels the first step is to ensure that the situation doesn't get any worse. As you may recall we held a public hearing November 20th and we left the written record open until December 2nd. Today we'll be voting on the amendments to the fossil fuel terminal zoning ordinance, the findings and the staff report to reflect on that testimony. I note that a lot of the testimony we received mentioned the urgency with which we need to act to address this danger and to further the transition off fossil fuels which is why this item is presented as an emergency ordinance that will go into effect immediately upon passage. Tom Armstrong from bps will give us an overview of the ordinance amendments, but just briefly to remind you there are three amendments that we'll be voting on. The first is the fossil fuels terminal zoning amendments ordinance, the second is to vote on the amendments to the ordinance findings, the third to then vote on the amendments to exhibit b, the remand report, and then of course to vote on the main motion as amended. Tom, good afternoon. How are you today?
Tom Armstrong, Bureau of Planning and Sustainability: Doing well.
Wheeler: Excellent.
Armstrong: Happy to be here finally this afternoon. I'm Tom Armstrong from the bureau of planning and sustainability. As the mayor just described the first amendment is to amend the ordinance. There's really two types of changes, one of the findings we have modified or corrected the reference to the luba order that identified the remand issues that we needed to address. Then the second changes are to just correct the exhibits to refer to the exhibits that are in front of you today, so that we have the ordinance in alignment with all the other pieces.
Wheeler: All right. Very good. For each of these items staff will provide a very brief introduction followed by a motion, a second and then our votes. Does that make sense to everyone? Commissioner hardesty.
Hardesty: Thank you, mayor. Let me just say when I get this at council and I have only got a couple of page resolution ahead of time that causes me concern.
Wheeler: Tom, can you explain then what these documents are? These are the documents that reflected the hearings that we had last --
Armstrong: Yes. Sure. So I understand commissioner hardesty your concern about this. We have been trying to update this document since the record closed on December 2nd. So really the main, the thick document, exhibit a, are the findings of fact and that is where and this is sort of what the issue was in front of Luba. We have to go through and address

all of the policies in the comp plan and we had done that as part of the original finding and then once we have heard all of the testimony especially the written testimony that raised specific issues, legal issues with respect to the ordinance, we went back through these findings to specifically address and point to evidence in the record as to how the ordinance addresses those issues that have been raised.
Wheeler: Tom, can I try to put this in plain speak? Because my understanding of what this document is, this is our legal defense, correct?
Armstrong: Correct.
Wheeler: Because the last time it was remanded my recollection is the city was admonished for not reviewing the record fully including potential criticisms of the 2016 ordinance and tying it back to the ordinance. So, this is actually the painstaking work of going back through all of the individual testimony that council heard tying it back to the ordinance and responding to each and every criticism. Is that a fair interpretation of what this document is?
Armstrong: Yes, that is. It is and it shows how we considered that testimony and how we respond or refute much of that testimony with evidence in the report, in the record, the seismic safety studies, the fossil fuel consumption forecast that I presented at the hearing and all of that to document how we as the city and the council have considered those issues in adopting this.
Wheeler: This is not additional testimony.
Armstrong: Correct.
Wheeler: This is a statement about why we believe the ordinance is legally defensible given the criticism we all heard in the public testimony.
Armstrong: Correct.
Wheeler: Legal counsel, anything you want to add to that?
Lauren King, Senior Deputy City Attorney: I would just supplement to say that the findings were included in the initial filing. This is just an amendment to further reflect the testimony and respond to that testimony.
Wheeler: Thank you. Commissioner Fritz.
Fritz: Tom, did you present this at commissioners assistance on Monday or at execs last Friday?
Armstrong: I did not. I did send a copy of it yesterday when we finally finished our review and back and forth with the city attorney's office when it was complete.
Fritz: So, Derek in your office and Claire in mine, others at 1:00 yesterday afternoon got this.
Hardesty: Well, that's lovely. Neither of them have a vote on the counsel. So I'm happy they got it yesterday, and it would have been helpful had I had some information prior too. So it's nice that staff finally got it but again, when you're presenting something that thick and you actually -- it's an emergency you probably want to make sure that we have time to actually ask any questions that we may have.
Wheeler: Very good. All right, so the first item is the vote on the amendments to the fossil fuel terminal zoning amendments ordinance. Tom, could you briefly describe these amendments?
Armstrong: Yeah, as shown under amendment 1 on the memo, again there's two types of changes, the first is defining 27 that corrects the reference to the Luba decision and then there are, the second set of changes are to change the references to the exhibits to reflect today's date and today's decision as they will be amended in the next motions.
Wheeler: Very good. I'll entertain a motion to move the amendments to the ordinance for the vote to approve.
Eudaly: So moved.
Fritz: Second.

Wheeler: I have a motion from Commissioner Eudaly, a second from Commissioner Fritz. Any further discussion? Karla, can you please call the roll on that amendment, on those amendments.
Eudaly: So is this the one and only vote? Or are we doing multiple --
Wheeler: No, there are three –
Eudaly: Oh I see.
Wheeler: This is the first package.
Fritz: Just let us know when we're on the last one.
Armstrong: Yes.
Eudaly: Yes, Aye.
Fritz: Aye. **Hardesty:** Aye.
Wheeler: Aye. The amendment package passes. Our next item is to vote on the amendments to the ordinance findings. Tom, could you please describe those?
Armstrong: Yes, this is exhibit a, this is the thick document in your packet. And as I explained we received a number of substantial written testimony from the Portland business alliance, from zenith energy, from the western states petroleum association that raised a number of different legal issues that we needed to consider. This is the document that Luba refers to that shows, well, how did council consider those arguments? And what evidence in the record shows supports the decision that you're taking today? So we have amended and updated this exhibit a to reflect that testimony and to point to specific reports and evidence in the record to show that we have considered and incorporated that into this exhibit.
Eudaly: So moved.
Fritz: Second.
Hardesty: It's been moved and seconded.
Wheeler: Great. Call the roll.
Eudaly: Aye. **Fritz:** Aye. **Hardesty:** No.
Wheeler: Aye. The amendment passes. The next vote is on –
Armstrong: Exhibit b.
Wheeler: Thank you. I'm on the wrong page. The next vote is on amendments to exhibit b, the remand report. Tom, will you please describe these amendments.
Armstrong: Yeah, if you recall back on the November 20th hearing we had some technical amendments to change the neighborhood contact section of the ordinance to make it align with recent changes to the zoning code. That has now been incorporated into this exhibit, this exhibit shows all of the detailed line item strike-throughs to the zoning code along with the commentary explaining those changes and so it's been updated to reflect that amendment.
Wheeler: Any further discussion? Please call the roll.
Eudaly: Did we move it?
Wheeler: Oh, I'm sorry, I apologize.
Eudaly: So moved.
Fritz: Second.
Wheeler: Commissioner Eudaly moves. Commissioner Fritz seconds. Karla, please call the roll.
Eudaly: And there's one more vote, right.
Armstrong: Yes.
Eudaly: Okay, Aye.
Fritz: Aye. **Hardesty:** No.
Wheeler: Aye. The amendment is adopted. Now do I have a motion to move the amendment fossil fuel terminal zoning amendments ordinance for a vote to approve?
Eudaly: So moved.
Fritz: Second.

Wheeler: We have a motion from Commissioner Eudaly. A second from Commissioner Fritz. Karla, can you please call the roll?
Eudaly: Well, I didn't get to be here the first time this passed so it's exciting to be here now. I'm proud to serve on a council at a time when as a collective we're taking forward thinking steps to create resiliency and to protect our future in the city. Knowing how a major earthquake will change the landscape requires us to act now to ensure we aren't fighting a river on fire. River of fire. My favorite earthquake related term. While also trying to save lives and rebuild our community. Decreasing our vulnerabilities now will help save lives, quicken our recovery and strengthen our ability to be there for each other in the event of a major catastrophe. Thank you to my colleagues, bureau staff and especially as always the community for working together on this commitment. I vote Aye.
Fritz: So river of fire would be a great name for a rock band. Other than that we do not want to see it. So thank you, tom Armstrong, and the entire bureau and everybody who's has worked on this. Thank you, mayor wheeler, for your support of this. We have been working so long, it's been, several of my staff who have been involved with it, Cristina Nieves, Claire Adamsick, Cynthia Castro, and of course, Tim Crail my chief of staff, and so thank you to all of them. This has been a very complicated process and we really want to make it right so while I might on occasion nitpick on various details on this one I know that our staff and city attorney's office and with the bureau of planning and sustainability have really dotted all the I's and crossed the T's and I am not qualified to nitpick. So I'm glad to not be able to do that. I'm glad to be able to support it. Thank you to our community advocates who are here to make sure that things went well this afternoon even though we're not taking testimony. We appreciate seeing your smiling faces. Aye.
Hardesty: I appreciate the long time that's been devoted to actually updating this policy. I would have liked to have heard more about it as we were moving through the process. I do understand that there have been a couple of questions that my staff have asked that you answered very quickly and I appreciate that. As a rule I read every single thing I vote on because I want to make sure that where my neighbors walk up to me and say why did you do this stupid thing I actually have a good reason for why I did that stupid thing. Right? And so I understand the sense of urgency with this and therefore I will vote Aye on the motion.
Wheeler: Continuing to allow new fossil fuel terminals and additional storage tank capacity is a threat to our community from a public safety perspective, from a public health perspective and from an environmental perspective. This is especially true in the event of a major Cascadia subduction zone earthquake. We know that. The first step to reduce the risk is to ensure that the situation doesn't get any worse by allowing more terminals and additional storage tanks to be built in an area that we know is at high risk for liquefaction in the event of a significant earthquake. By allowing more terminals we also undermine our local and our global efforts to transition off of fuels that lead to climate change. While we recognize that there are other measures that need to be taken, this in and of itself is hardly sufficient and that we intend to bring forward other ideas in 2020. It's imperative that we adopt readopt these zoning code amendments to have them go into effect without any further delay. I want to thank all of my prior colleagues. This was originally supported back in 2016. It was very controversial then. I want to remind people of that and my former colleagues, mayor hales at the time and other commissioners who are not with us here today, commissioner Fritz who is, commissioner Fish who is probably watching on television, it took a lot of heat for this. It was a very important and a very principled stand that they took. So I feel grateful – well first of all, I'm not grateful that it got remanded but I'm grateful that I get to stand here in their footsteps and second and support the work that they did back in 2016. I thank our legal counsel who has been working on this pretty much nonstop for the last three'ish years and I want to thank the bureau and your hard work on this. Perseverance does pay off. I'm very happy to support this. I vote Aye. The ordinance is adopted as amended. [applause]

CITY OF

PORTLAND, OREGON

OFFICIAL MINUTES

[Excerpt Council Meeting November 20-21, 2019. Item 1082]

A RECESSED MEETING OF THE COUNCIL OF THE CITY OF PORTLAND, OREGON WAS HELD THIS **20th DAY OF NOVEMBER, 2019** AT 2:00 P.M.

THOSE PRESENT WERE: Mayor Wheeler, Presiding; Commissioners Eudaly, Fritz and Hardesty, 4.

OFFICERS IN ATTENDANCE: Karla Moore-Love, Clerk of the Council; Robert Taylor, Chief Deputy City Attorney; and Christopher Alvarez and Tonia Kohlman, Sergeants at Arms.

***1082**	**TIME CERTAIN: 2:00 PM –** Readopt remanded Ordinance No. 188142 to restrict bulk fossil fuel terminals (Ordinance introduced by Mayor Wheeler; amend Title 33, Planning and Zoning) 3 hours requested **No additional oral testimony will be taken. Written testimony will be accepted until December 2, 2019 at 9:00 a.m.** **Motion to accept technical amendments:** Moved by Hardesty and seconded by Fritz. (Y-4)	**CONTINUED TO DECEMBER 18, 2019 AT 3:00 PM TIME CERTAIN AS AMENDED**

At 3:35 p.m., Council recessed.

MARY HULL CABALLERO
Auditor of the City of Portland

By Karla Moore-Love
Clerk of the Council

For a discussion of agenda items, please consult the following Closed Caption File.

This file was produced through the closed captioning process for the televised City Council broadcast and should not be considered a verbatim transcript.
Key: *** means unidentified speaker.**

November 20, 2019 2:00 pm

Wheeler: This is the November 20, 2019 afternoon session of the Portland city council. Welcome, everyone. Hello, Karla, can you please call the roll.
Moore-Love: Yes.
Eudaly: Here. **Fritz:** Here. **Fish: Hardesty:** Here.
Wheeler: Here and now we'll hear from legal counsel on the rules of order and decorum. Good afternoon, Robert.
Robert Taylor, Chief Deputy City Attorney: Thank you mayor. Welcome to Portland city council. The city council represents all Portlanders and meets to do the city's business. The presiding officer preserves order and decorum during city council meetings so everyone can feel welcome, comfortable, respected and safe. To participate in council meetings you may sign up in advance with the council clerk's office for communications to briefly speak about any subject. You may also sign up for public testimony on resolutions or the first readings of ordinances. Your testimony should address the matter being considered at the time. If it does not you may be ruled out of order. When testifying please state your name for the record. Your address is not necessary. Please disclose if you are a lobbyist. If you're representing an organization please identify it. The presiding officer determines the length of testimony. Individuals generally have three minutes to testify unless otherwise stated. When you have 30 seconds left a yellow light goes on. When your time is done a red light goes on. If you are in the audience and would like to show your support for something that is said, please feel free to do thumbs up. If you want to express that you do not support something, please feel free to do a thumbs down. Please remain seated in council chambers unless entering or exiting. If you are filming a proceedings please do not use bright lights or disrupt the meeting. Disruptive conduct such as shouting or interrupting testimony or council deliberations will not be allowed. If there are disruptions a warning will be given that further disruption may result in the person being ejected for the remainder of the meeting. After being ejected a person who fails to leave the meeting is subject to arrest for trespass. Thank you for helping your fellow Portlanders feel welcome, comfortable, respected and safe.
Wheeler: Thank you very much, Karla, please read item 1082.
Item 1082. Readopt remained ordinance number 188142 to restrict bulk fossil fuel terminals.
Wheeler: Colleagues fossil fuels are a dual threat to our community. They are the primary component of carbon emissions that threaten our planet, and they are a safety threat to our community, especially in the event of a major Cascadia subduction zone earthquake which geologists say is not a matter of if its going to happen, but when it's going to happen. As we work to reduce our dependence on fossil fuels the first step we need to take is to ensure that the situation doesn't get any worse. Continuing to allow new fossil fuel terminals increases the risk to the surrounding industrial district, the Willamette river and indeed our entire city. By allowing more terminals we undermine our local and global efforts to transition off the fossil fuels that cause climate change. Reducing our reliance on fossil fuels will take a concerted effort at the local level in the region, by the state of Oregon and by our federal government. City council previously adopted this ordinance back in 2016. Since that time it's been appealed to the Oregon supreme court and now it's

back before us. While we recognize that there are other measures that need to be taken and we intend to bring those forward in 2020, it's imperative that we readopt this package now without any further amendments to have the code go into effect without any further delay. Future amendments and actions will require planning commission review. City staff have already been researching a planning for the future ordinance which is part of our larger action plan to address fossil fuels in Portland. Andrea Durbin, director of bureau of planning and sustainability, will give us an overview of that work. Tom Armstrong from the bureau of planning and sustainability will give us an overview of the ordinance since only two of us, commissioner Fritz and commissioner Fish, who wanted to be here today, but extends his regrets, only two of them were on the council when these changes were originally adopted. Good afternoon, director Durbin.
Andrea Durbin, Director, Bureau of Planning and Sustainability: Good afternoon, mayor, good afternoon city council.
Wheeler: I'm sorry, I have a note, I forgot it. Commissioner Fritz wanted to make a few statements up front. I apologize commissioner.
Fritz: Thank you, mayor. I was proud to co-sponsor this when it was here in December of 2016, so on behalf of commissioner Fish and myself I just wanted to thank everybody for coming back again and thank their staff for getting this back to us. If ever there was a time that I would have liked to do a land acknowledgment this is one of them. Our tribal director Laura John has asked us not to do a land acknowledgment so we have done the necessary research to decide what the language should be. So I thought a fitting substitute would be the words of Greta Thunberg “our house is on fire, I'm here to say our house is on fire. According to the intergovernmental panel on climate change we are less than 12 years away from not being able to undo our mistakes. In that time unprecedented changes in all aspects of society need to have taken place including a reduction of our common dark side emissions by at least 50% and please note these numbers do not include the aspect of equity which is necessary to make the Paris agreement work on a global scale nor does this include tipping points or feedback loops like the extremely powerful methane gas released from the thawing artic permafrost. People like to tell success stories, but financial success has come with an unthinkable price tag and on climate change we have to acknowledge that we have failed. All political movements in their present form have done so and the media has failed to create broad public awareness. We are at a time in history where anyone with any insight of the climate crisis that threatens our civilization and the entire biosphere must speak out in clear language no matter how uncomfortable and unprofitable that may be. We must change almost everything in our current societies, the bigger your carbon footprint the bigger your moral duty. The bigger your platform the bigger your responsibility. Adults keep saying we owe it to the young people to give them hope, but I don't want your hope, I don't you to be hopeful, I want you to panic. I want you to feel the fear I feel every day and then I want you to act. I want you to act as you would in a crisis. I want you to act as if our house is on fire because it is”.
Wheeler: Thank you, director Durbin.
Durbin: Thank you. For the record I’m Andrea Durbin, director of the bureau of planning and sustainability. Mayor as you’ve stated fossil fuel operations pose a significant threat to the health of our community. We have heard from the public community members, youth advocates that reducing the risk and improving community safety is critically important as is transitioning away from our fossil fuel dependence towards cleaner fuels. Before we walk through the zoning amendments today I would like to update you on the other work that the city is doing to address fossil fuels that will be coming before council next year. Bps has been working closely with several other bureaus including the Portland bureau for emergency management, the city attorney's office, bureau of development services and Portland fire and rescue. Reducing the risks posed by these operations in a liquefaction zone and providing the community with more information is one of our priorities. To that

end we appreciated the city council contributing funding to pbem in the fall bump process to join with Multnomah county to research the economic and environmental impacts of the seismic disasters specific to the critical energy infrastructure hub as well as research risk bonding options to support response, cleanup and remediation. We expect the study to be done next year providing important information for both the city and the county to determine the best ways for to mitigate risk. Pbem is also developing a proposal for city council consideration next year to adopt seismic requirements for storage tanks in Portland critical energy infrastructure for safety and resiliency and also to strengthen community right to know and pre notification requirements for the receipt and storage of fossil fuels and other hazardous materials in Portland. Pbem director mike Myers will be joining invited testimony later and he can answer any questions you have specific to the work that they are leading. It's also important to quicken the transition to cleaner fuels including the electrification of the transportation sector to reduce our dependence on fossil fuels. To that end bps will propose in an ordinance scheduled for December 18th to move implementation of the renewable fuels standards from bds to bps, so that we can start the update for renewable fuel standards to help transition more quickly to clean fuels, we expect to do this work next year. Bps is also working with bds and pbot to explore local options for electric vehicle charging. We know that we need to make it easier for people to charge their electric vehicles at home and work to encourage more adoptions of electric vehicles. And finally we are working to place limits and restrictions on expansion of fossil fuel operations in Portland. That is in part what you'll be hearing about today, but what we will consider today is just the first phase of the zoning work. As the mayor mentioned because today's amendment is not as comprehensive as we need to reduce the risks posed by these operations we intend to work on phase 2 and bring that back to council next year. For example we will need an additional ordinance to address offloading and transloading facilities. Public testimony today will likely raise concerns and suggestions for what we might consider in this phase 2 process of the fossil fuel zoning policies. To ensure that Portland has a more comprehensive and protective zoning provisions in place that reduces risks, improves safety and better protects the health of our communities. With that broader context for the work that is currently underway, I will now introduce Tom Armstrong, who's a planning and sustainability supervising planner to brief you on this zoning amendment.

Tom Armstrong, Bureau of Planning and Sustainability: Thank you, yes Tom Armstrong from bps. I have a presentation but the projector isn't working so you have a printout, we've distributed printouts through the audience so they can follow along as well and it has been posted to the project website so people can download it as well. Starting on slide two there's a map of the existing terminals in Portland. All of these are located in what we call the northwest industrial district stretching along the river out past the St. John's bridge. There are 11 fossil fuel terminals, 10 of them are focused on petroleum fuels and products and one natural gas storage facility that really manages the regional peak consumption in the wintertime. These fossil fuel terminals handle over 90% of the fossil fuels that serve Oregon and are sold in Oregon, and it really is often referred to as the critical energy infrastructure hub because you have a confluence of the river access, the freight routes, the rail access, and the pipeline access because almost all of our fuel comes from the refineries in Puget sound, most of it via pipeline, the Olympic pipeline down Washington, and that main pipeline ends in the Portland harbor area and serves these terminals. On page three is the policy direction that we had that guided us in how we constructed these zoning amendments. First the council adopted a resolution in November 2015 to oppose, actively oppose the expansion of infrastructure that was primarily for transporting or storing fossil fuels in or through Portland and then the second policy direction was in 2016 as part of the comprehensive plan we adopted a policy to limit the fossil fuel storage facilities to those necessary to serve the regional market and I will get

into a little bit later as to what that actually means. On slide four is a map that was prepared by dgami, the state department of geology and mineral industries, I think that's it. That shows the probability of liquefaction in and as you can see in the red areas that really covers almost all of Portland's industrial districts. That is why these zoning code amendments apply to all of our industrial and employment zones and not just some sort of overlay that applies to the northwest industrial district. So on page five we get into the zoning code amendments and this package what we did, we defined what we mean by a bulk fossil fuel terminal and that is a larger facility that really handles or does what we call transloading. So, they move the product from one type of transportation mode, pipeline, barge, rail, to another type of transportation mode. Most of this comes in via pipeline and barge and goes out to the rest of Oregon and southwest Washington via truck, there's a smaller pipeline that serves the Willamette valley down to Eugene. Once we have defined that use then we regulate it and what we have essentially done is prohibited all new terminals in all of the zones in Portland and then we've designated the existing fossil fuels as a limited use and designating it as limited use allows it to continue to operate, continue to make seismic upgrades. The only thing they can't do is expand the storage tank capacity from what they have today. In the ordinance, there are a few minor technical changes that we made because since 2016 when these amendments were originally adopted the zoning code there have been subsequent amendments to the zoning code, so we have made some adjustments to realign it and reconcile it with those changes that have been made over the last three years. Slide six is an important concept. The way these regulations are structured is, and we know out there on these terminals that they have a mix of older tanks. I think the last tank out there was built in 2012, and the way the regulations have been structured is that the terminals do have the option of replacing their storage capacity. So that if they want to take down some smaller tanks and consolidate that and put that same amount of storage capacity into a larger tank that is built to current seismic codes they can do that and that's one way that we think that we've allowed those terminals to continue to operate and eventually hopefully invest in their facilities to make them safer. On slide seven is the new use category that I talked about, a bulk fossil fuel terminal, has that multimodal access. I think what we're trying to do there is distinguish it between oftentimes the gasoline will come into these ten terminals that handle it and go by out to other trucks. They may have an intervening distribution facility before it goes out to the retail outlets. If it's coming in by truck and out by truck, that's not covered by these regulations. We also last time around in 2016 when we adopted this we included exclusions for airports and marine and rail service facilities. So at the airport, for example, there's fuel storage, jet fuel storage and in the port and at the railyards there's fuel depos that are not included in these regulations. On slide eight is the definition of what is a fossil fuel and we carefully worded this definition specifically to not include new renewable fuels such as renewable biodiesel and other renewable additives such as ethanol that are going to be needed and used to transition us off of fossil fuels, so we wanted to make that distinction there. As has been stated on slide nine, this was appealed to Luba and then the court of appeals and eventually to the Oregon supreme court. It has come back down to us. There were two errors that were sustained through that whole process. There were three errors, actually, two of them are relevant today. The first error is there's guilds lake industrial sanctuary plan which was actually adopted way back in 2001. The first time around we did not address those policies and so in the policy findings today with this ordinance we have done that. Luba faulted us around not having enough evidence or discussion about addressing the demand, future demand for fossil fuels and how we weigh cargo forecasts versus other consumption forecasts and trends and I'll talk a little bit about those today. The third issue is Luba found that we didn't adequately address an objective in the old comprehensive plan but subsequently we adopted a new comprehensive plan with new policies that were evaluating this proposal against, so that remand issue has

become moot because that policy is no longer in effect. On slide 10, the guilds lake industrial sanctuary plan applies to that northwest industrial district along the river. It was adopted in 2001, it was designed to limit uses, further limit uses in that industrial area to preserve it as an industrial sanctuary. Many of those use limits have been incorporated into our new prime industrial overlay zone that was adopted with the comp plan and these amendments really only apply to one type of use in that area and that I think the higher level or the more important issue we're not changing the map, the zoning map, we're keeping our same industrial base. We are not regulating other industrial uses in that area and so we think we have made findings that show that we are consistent with the guilds lake plan policies. On slide 11 as I mentioned before we have a new policy around fossil fuel distribution, and that it seeks to limit those facilities to those necessary to serve the regional market, and that's the key phrase, is for you to decide what is necessary and what is the regional market. On page 12, it really is sort of again the regional market as we have recommended that you find and define really is the state of Oregon because we are that gateway hub from the petroleum refineries up in Puget sound. We also do we recognize that we serve southwest Washington as well. Unfortunately the data that is available doesn't allow us to parse it below the state level so we think that just limiting it to the state of Oregon is close enough and good enough for defining the regional market under this comprehensive plan policy. So what are we going to need? What's going to be necessary to serve the region? On slide 13 is information from the u.s. energy information administration. Every year they produce what's called the energy outlook, annual energy outlook. This is a chart from the 2019 version, where they project out for the nation what they think the demand for petroleum and other liquids will be out to 2050 and they go through a number of scenarios and we have focused here on the reference case and what that says for the nation they expect it to be flat in terms of the amount of petroleum that will be consumed in the nation, so that's one forecast of what we are going to need in the future. I think what they find is there's increasing energy efficiency across all of the end users, but again unfortunately in this instance they do not break it down to the state level. So we have this forecast at a national level, but there's nothing to indicate that Oregon would be any different than the national. On slide 14 is state level data. This looking back at what the trends have been since 1990. Again this comes from the u.s. energy information administration. The top line is total petroleum fuel consumption and we have broken out subcategories that account for most of that, which is gasoline is the uppermost of those lower lines. The next one is distillate fuel oil or diesel fuel and the bottom one is aviation and jet fuel. Then on slide 15 shows why these are -- these lines are relatively flat when we have a growing population and a growing economy, and that's because fuel efficiency and per capita consumption has been going down over this period, so as we have grown in the number of end users the amount per person has dropped. So that allows these lines to be flat over that time where we have had a lot of growth. The one state forecast that we have on consumption side comes from odot and their projections for gas tax revenue out into the future, this one is was done this year, goes out to the year 2029 and they are projecting a flat or lower in terms of the number of gallons of gas that they expect to be consumed and generate gas tax revenue.

Fritz: What does with or without conditional, what does that mean?

Armstrong: My understanding is when they passed the state legislation to raise the gas tax it's at two steps. They immediately implemented a 4 cent gas tax and there's another 6 cents bump if certain conditions are met, but if you look, those two lines line up exactly the same. So, whether or not those conditions, whether it goes from four cents or ten cents odot saying that price indicator isn't enough to really change the amount of gas that gets consumed and they are both down from where it is today.

Fritz: Is that what we found in Portland since we had the gas tax that hasn’t really affects how much people drive?

Armstrong: I don't know that but I can check with pbot on what they've seen in terms of the gas tax revenue.
Fritz: Thank you.
Armstrong: So on slide 17, what was opposite of this showing flat or declining consumption in the future are a series of cargo forecasts that really look at the types of cargo flowing through the Portland harbor and this is both port of Portland facilities as well as the private facilities, and this is really what Luba found us not clearly addressing last time is how do you reconcile these other consumption forecasts with the cargo forecast and the cargo forecast there's been a number of them over the last eight years. They are sort of declining in terms of the amount of growth that they are projecting and these rates are for what we call liquid bulks which is primarily petroleum fuel and some other materials, but most of it is petroleum products. I would say the 2011 Oregon freight plan really reached back and if you dig into the numbers it's based on 2002 federal data so it's getting pretty old when you look at that. Odot did an update of the freight plan in 2017, they did not update this forecast as part of that, it was mostly a policy update. We had some studies done 2012 as related to the west Hayden island study at that time and that study was really significant in that they projected a .7% annual growth rate. Also those studies found that even at that growth rate out to 2035 there was enough capacity in the system to accommodate that growth. So again, it calls into question how much additional capacity we're going to need in the future. The other balance to this is on page 18 and I think we'll hear in testimony today a series of other policy initiatives that have not been factored into these consumption trends fully yet or the forecasts that really look at reducing fossil fuel use. You know, it is at the state level with odot and deq programs, it's at the regional level with metro and their climate smart communities program and it is at the city level with our climate action plan and our transportation system plan. They are all looking to bend that consumption curve and reduce the consumption of gasoline. On page 19 I think where we're at in the findings and looking at the comp plan policy as a whole is that there's a wide range of policies that we have to balance when making these decisions. I think this ordinance does that in terms of when you look at the policies that talk about reducing risk from natural hazards including earthquakes we have again as we have just gone through limiting fossil fuel terminals to what is existing is likely to be what is necessary to serve the regional market when you look at all of these trends and forecasts.
Then finally we're doing it in a way that maintains our economic base and our industrial sanctuaries. This one use out of many. The other industrial uses are, the regulations do not change for them as part of this. Finally I want to note in your packet and again posted to our website we have one technical amendment that we would like put on the table. They are in this as part of this original adoption. We had a neighborhood contact, and this speaks to some of our other actions about right to know, in that in the future if any of these terminals come in for new storage capacity, whether that's to replace and reconfigure their existing capacity or for nonfossil fuels, or for aviation fuels, they need to notify the neighborhood ahead of time. There's a whole series of regulations about how they do that. So that there is advance notice and a community dialogue about what they are doing and why they are doing it. So everybody understands what is going on, which is not what happens today.
Wheeler: Are there any questions on the technical amendment proposed by bps? Can I get a motion?
Hardesty: So moved.
Fritz: Seconded.
Wheeler: Motion from Commissioner Hardesty. Second from Commissioner Fritz.
Armstrong: Are there any other questions about this amendment package?
Wheeler: Call the roll on the amendment.
Eudaly: Aye. **Fritz:** Aye. **Hardesty:** Aye.

Wheeler: Aye. The amendment is adopted. All right, so we are moving on to the exciting part of the program. That's the public testimony phase. So we're going to be opening up the floor to testimony on the fossil fuels terminal zoning ordinance and the draft amendments. We would like to start with the invited testimony portion of the hearing. We have a few special guests with us today. We're greatly appreciative of their presence. Multnomah county commissioner susheela jayapal is here today. It's good to see you again. Aja Decoteau from the Columbia river intertribal fish commission has joined us. Thank you for being here today. And of course mike Myers, the Portland bureau of emergency management director. Thanks all three of you for being here today.
Susheela Jayapal: Good afternoon. Good afternoon mayor and commissioners. Thank you so much for having us here. My name is Susheela Jayapal, I am the Multnomah county commissioner for district two which represents north and northeast Portland and includes the neighborhood of St. John's and other north Portland neighborhoods that are right across the bridge, right across the river from the critical energy infrastructure hub. I'm really here to thank you for the action today that you've taken today and for your partnership with the county in matters relating to the hub and to fossil fuel infrastructure. The first step to getting out of the hole is to stop digging it deeper. That's what today's action by the council does. It prevents the further development of fossil fuel infrastructure. We can no longer afford fossil fuel infrastructure in our community. We can't afford it because if we hope to prevent climate collapse we must move away from the fossil fuel economy with both speed and urgency. To do that we have to stop investing in 20th century sources of energy, embrace 21st century renewable energy resources and manage the responsible transition away from the fossil fuel economy. In addition to the climate crisis, as you've heard as we know we have another reason to act. The critical energy infrastructure hub that's being regulated with today's council action is built in the worst place imaginable. Next to the river, near neighborhoods and homes, on soils that will liquefy and spread when the earthquake arrives. The cei hub has 360 million gallons of storage tank capacity. Most of that capacity is in tanks that were built before we knew about the risks of earthquakes in our region and those tanks won't survive an earthquake. For comparison the exxon valdez spilled 11 million gallons of oil. Closer to home we saw a small preview of what could happen at a tank farm when two storage tanks at a new star facility in california burst into flames and released a cloud of choking black smoke because of the suspected impact of a small earthquake. The commitment of the city of Portland in today's action is a testament to our community's resolve to address these difficult threats to our safety and the safety of future generations. Today's action combined with the ongoing partnership between the county and the city to address risk from the cei hub is a step in the right direction. It's one of many steps in our journey out of the hole that we are in, an ecological and emergency preparedness crisis caused by the fossil fuel industry. We need to stop digging ourselves further into that hole and start climbing out. This is happening here in Portland and Multnomah county because we have the community's resolve and support and it will happen across the country because we have no choice but to act boldly, bravely and with urgency. Thank you.
Wheeler: Thank you, commissioner jayapal, for being here today. We appreciate your leadership and we appreciate the partnership with Multnomah county. Thank you. Good afternoon.
Aja Decoteau: Good afternoon, mayor Wheeler, members of city council. It's a pleasure to be here today amongst you and also amongst this panel of distinguished folks. My name is Aja Decoteau, I am a citizen of the Yakama nation. I also serve as the watershed department manager for the Columbia river intertribal fish commission who represent the lower Columbia river treaty tribes who have reserved rights throughout the Columbia river basin. The Columbia river is the life blood of this region supporting a rich and diverse ecosystem that has molded cultures, diets and religions of the tribes since time

immemorial. In the past 200 years, the Columbia river and this region has changed dramatically not always for the best for the resources it supports. The tribes are on the frontlines when it comes to bearing the burdens of climate change having already begun experiencing changes to our first foods, the salmon, the game, the roots and the berries. For us, these natural resources are our cultural resources. The Columbia river and its fishery resources are battling impacts from development and pollution. Tribal fishers in the Columbia face even larger risks and potential impacts. In addition to our diets rich in fish we spend much of the year outside where we are exposed to the air and water in and along the river. The tribes and the railroads have a long and complicated relationship. Trains run along both sides of the Columbia river, impeding tribal fishers' access to fishing sites and creating risks of accidents. The recent escalation in hauling fossil fuels by unit trains alarmed our tribal members, not only because of increased risk of harm to them, but also because of the increased risk of what is often called low probably high consequence accident. A spill of any type of crude, be it heavy tar or light bakken will have significant and long term impacts to the aquatic resources of the river. We learned this lesson from the exxon valdez spill 25 years ago. Despite a quarter of a century, alaskans still find oil residue on the beaches and under rocks. The 2016 mosier crude train derailment fortunately did not involve a devastating spill into the river however it woke the region up to the potential of a major catastrophy. There were many lessons learned from this spill but the primary lesson is we must protect the river at all costs. With the current legal landscape we cannot totally prohibit trains laden with fossil fuels from traveling through the gorge, however, we can do our part to reduce our need for them in the first place. We support the city of portland's recent resolutions opposing coal trains and curtailing the expansion of fossil fuel infrastructure as first steps to addressing climate change and protecting the environment. We fully support ordinance #188142. Thank you.
Wheeler: Thank you, ms decoteau. We appreciate it very much. Thanks for your leadership. Good afternoon.
Mike Myers, Director, Portland Bureau of Emergency Management: Good afternoon, mayor, commissioners. For the record my name is mike Myers, I'm the director of the Portland bureau of emergency management. I have worked as a firefighter, fa ire chief, emergency manager for over 30 years. I have seen a lot of disasters both large and small. Not much phases me to be honest. I'm not a nervous guy, but what I do worry about is the cei hub. The concentration of the state's fuel storage tanks in such a perfectly bad location on liquefiable soils in a 500-year flood plain, next to the urban wildland interface with very limited ingress and egress could hardly be worse. In a major earthquake the cei hub poses a grave threat to the safety of the surrounding community. It also threatens our environment and the economy on a scale that is difficult to imagine. A major disaster at the cei hub could hamper lifesaving response actions and delay needed assistance by weeks and months due to fuel shortages. Meanwhile that spilled fuel could poison the Columbia river all the way to its mouth. Together these impacts would economically cripple our state. It is for that reason that I am focused on efforts to decrease the vulnerability of the cei hub. My colleague Andrea Durbin has already mentioned that I intend to propose seismic upgrades requirements for tanks. I very much look forward to bringing this to you and the council in 2020. But in the meantime, the first step to improving safety in the cei hub is to stop making it bigger. The code changes proposed prevent the expansion of fuel storage and location that should never have been used for fuel storage in the first place. At the same time it permits equipment replacements and upgrades that increases safety and that is a good thing. I'm happy to support the work of our partners at bps in taking this important step to increase the disaster resilience of the city and our state. Thank you.
Wheeler: Thank you. We appreciate it very much. Thanks all three of you for being here today. All right, so now we're going to open this up to public testimony. Karla our able board clerk is going to read the names of people in the order in which they signed up,

however, if you have a disability or if you have small children or if there are other pressing circumstances that require you to be moved up in the line please let Karla know and we will accommodate you. She will read three. If people could come up, the microphones slide around and we find that six inches is about the right distance. There are about 16 people signed up so we can give three minutes for each person to testify. I would ask as your testimony comes to an end and the buzzer goes off if you could please stop your testimony. You have three minutes but there's a lot of people who do want to speak. So without further ado, Karla, could you please read the first three.
Moore-Love: Yes, the first three please come on up, are Mario mijares, Cathy sampson-kruse, Elijah cetas, and they'll be followed by kelly o'hanley, ella shriner and violet o'herron.
Wheeler: Welcome. Thank you. Name for the record. We do not need your address unless you want to give it to us for some reason. If you'd like to start please. Thank you.
Mario Mijares: Yes. Hello, my name is Mario Mijares, organizer for Columbia river keeper. Thank you for the opportunity to comment on today's very important gathering. We strongly support the implementation of Portland's landmark fossil fuel zoning code ordinance. We know that city staff have provided information that resolves the few outstanding issues that Oregon's land use board of appeals has identified. We support the policy as it is proposed and as it was approved in 2016. It's an important step in preventing the fossil fuel industry from expanding their shipment of toxic fossil fuels. Fossil fuels pose major risks to the health and safety of nearby neighborhoods, communities on oil train routes and downriver towns that rely on the Columbia river for drinking water. These recent events highlight some of the risks. In september an lpg train car struck the ongoing bridge onto swan island causing more than $1 million in damage and impacting traffic in and out of swan island. This event could have been much worse if the lpg railcar had ruptured and burned. In October a new star tank explosion rocked a refinery complex in Crockett, California, collapsing fuel tanks, closing i-80 and releasing plumes of toxic smoke. It's possible that this fire and tank farm failure resulted from a 4.5 magnitude earthquake. A small fraction of the seismic risks we face here in our region. Those are only two incidents that demonstrate the level of impact and the risk of gambling the safety of people and environment. The community is more motivated than ever to support the city's ordinance. We look forward to the council's vote to readopt the fossil fuel terminal zoning amendments as written and to put this important policy into effect. We also look forward to working with the city to continue to develop proactive policies to address the health, safety and environmental risks associated with fossil fuel infrastructures.
Wheeler: Thank you. We appreciate your support.
Mijares: Thank you.
Wheeler: Thanks for your hard work. Good afternoon.
Cathy Sampson-Kruse:[speaking in foreign language] in my native Walla Walla wallulapum language I say [foreign language] good day. My wallulapum name is wey-ow'-sux, Cathy samson-Kruse. I'm an enrolled member of the Walla Walla tribe, the cayuse and umatilla in eastern Oregon. My parents are otwey carl sampson, chief yellowbird, and marion arleta sampson. I'm not an elected leader but I'm an elder now. I'm on the board of the Columbia river keeper in hood river and the advisory board of the civil liberties defense center in Eugene Oregon. My husband and I have eight children, 12 grandchildren and two great grandchildren. I have lived many places in my life. From our umatilla indian reservation to a Yukon-kuskokwim village of bethel, alaska. In the early 1970s I lived across the river in northeast. I commuted to Portland state university. I have returned to support my daughter who is attending ohsu. I enjoy the parks and the walks near the Willamette river with my granddaughter juniper. I was raised as my ancestors were to cherish mother earth, all that she provides her people and all the creatures living on and with her. In return we have always been taught to respect and protect mother earth. The

land, the air and the water. This is the balance of things that has allowed us to live on this land for all generations before. A new threat is upon us, the rapid growth and execution of plans for northwest expansion of fossil fuel infrastructures, small modular nuclear reactors and the devastation of coal and fracked gas exploration. I was here in 2016, before you. I'm going to continue my pleas for us to move past dependence on king kong. The coal, the oil, the nuclear and the fracked gas which there is nothing natural about fracked gas. Be it solar, wind, net-zero homes and listening to indigenous wisdom for sustainable solutions hand in hand with scientific wisdom for a just transition to clean energy and livable planet. A new attack on mother earth must be stopped. I stand with all who join this fight so I ask you to be on the right side of history. Be the wisdom keepers for the city of Portland, the entire state of Oregon and the northwest communities will follow your lead. Be the ones who look seven generations ahead. Protect your community, protect the rivers, and the beauty our mother earth has given us. Vote in full support of the fossil few zoning ordinance. [foreign language] We are here forever. Aye.
Wheeler: Thank you. I appreciate it. Good afternoon.
Elijah Cetas: Good afternoon. This is close enough.
Wheeler: Yeah, that's perfect.
Cetas: Greetings, commissions. My name is Elijah cetas and I'm grass roots organizer with center for sustainable economy here in Portland. We support the fossil fuel terminal zoning amendments in their present form and we see them as an integral part of an eventual managed decline of the fossil fuel infrastructure in Portland coinciding with a deep investment in our communities in cleanup, restoration and resiliency. The passage of this ordinance in 2016 was a remarkable moment in Portland history when grass roots activists, city staff and elected officials responded to a crisis and decided large scale fossil fuel infrastructure expansion would no longer be legal here. The fossil fuel industry and local business advocacy organizations like the Portland business alliance saw their power threatened and sued the city. Having been thoroughly defeated in the court of popular opinion they turned to their high priced lawyers and sought to defeat the amendments in a court of law. Nevertheless, the city largely prevailed and the remand process before us is about curing some of the minor deficiencies in an otherwise defensible, reasonable and necessary regulation. The fossil fuel terminal zoning amendments represent an enormous step forward when it passed three years ago and it's still is a good law. Our victories have emboldened other jurisdictions to look at the risks that their communities face from spills, explosions and natural disasters, and to begin to regulate the many dangers of the fossil fuel industries in their homes. So in January of this year king county, Washington, passed a moratorium on new fossil fuel projects and will likely adopt permanent restrictions in coming months. In Vermont and New York state there are bills introduced for moratoria on all new fossil fuel infrastructure. These and other efforts are inspired by and directly utilized language from the Portland amendments. Even closer to home, the port of Vancouver recently made a binding policy to not allow new bulk fossil fuel terminals. This is an extraordinary development because it came just one year after the largest oil by rail export facility on the west coast was rejected by Washington state regulators and governor jay inslee in Vancouver. City of Portland has an important role to play in the energy transition beyond the fossil fuel terminal zoning amendments. Your collaboration with Multnomah county on a fossil fuel risk assessment and your commitment to further health and safety policy are welcome steps. Moving forward as we continue to innovate locally as we must we must also push hard on our state legislatures toward a statewide moratorium on new fossil fuel infrastructure and for a framework for a managed but rapid decline of the fossil fuel industry in line with 100% renewable energy powered economy. Portland has showed that cities can lead with direct and effective fossil fuel infrastructure policy. The community has showed up in the streets, in the halls of government and at the ballot to demonstrate

overwhelming support for strong climate action. We support the reduction of the fossil fuel terminal zoning amendments. Thank you.
Wheeler: Thank you. Thanks all three of you. We appreciate it. Next three, please, Karla.
Moore-Love: Kelly O'Hanley, Ella Shriner, Violet O'Herron, and they'll be followed by Robert Boyer, Micah Meskel, and Melanie Plaut.
Wheeler: Good afternoon. Would you like to start please.
Kelly O'Hanley: Sure. My name is dr. Kelly O'Hanley. I'm speaking on behalf of Oregon physicians for social responsibility.
Wheeler: Thank you.
O'Hanley: Thanks for letting us speak. As we have heard this afternoon if we don't act quickly on a global scale climate change will become essentially unsolvable. Technically it is possible to move away from climate busting fossil fuels. And so the real question is how do we get there? How do we make that happen? And that's where politics come in. Unlike other political fights balanced and measured answers will fail us. So we need so-called radical solutions. Happily there are some rays of hope. When trump pulled out the climate accords he explained he had been elected to govern Pittsburgh, not Paris, but the next day the mayor of Pittsburgh said that his town was planning on 100% renewable energy. [laughter] A pledge that was taken up by other cities. Cities and counties across the country are suing exxon, b.p., chevron, shell and others to pay for sea walls and other infrastructure and then there's Portland. We also passed a 100% renewable resolution and acted even more radically. We passed the landmark no fossil fuels infrastructure resolution, we fought and won the legal challenge to it, and hopefully today will pass the zoning code amendments and the eyes of the country have been watching. Milwaukie, Oregon, Eugene, Corvallis, hood river, Seattle, Tacoma, Vancouver b.c., los Angeles, Richmond, California, Baltimore, Honolulu are all considering or have actually passed their own versions. So what's next for Portland? Today hopefully we'll proudly celebrate no new fossil fuel infrastructure. Tomorrow we'll take additional radical steps for reinvention. Hopefully in addressing transportation, mass transit, risk bonding, use of forest products, building codes and so on in other words every aspect of our lives that affect climate. So Portland, keep leading and move fast. Thank you.
Wheeler: Thank you, appreciate it. Good afternoon.
Ella Shriner: Good afternoon. My name is Ella Shriner. I'm 17 years old and I was born and raised in Portland. I'm also a founding member of the Portland youth climate council but today I'm speaking to you as a concerned individual. This morning I was at home thinking about what I wanted to say to you today. I thought I would focus on the risks fossil fuel infrastructure poses to public health and safety, as well as our environment. I wanted my testimony to have facts and I wanted to say the perfect thing that would make it clear to you how important these zoning amendments are and how important it is that they just be the beginning of our rapid journey to dismantling fossil fuel infrastructure in Portland but as I sat hands poised above the keys waiting for inspiration to strike I broke down into tears. The truth is I don't know what I could say that could make it clear. What I could say that would make you and move you as leaders to take the necessary and ongoing actions. If leaders around the world are not stepping up because doing so would threaten their financial support from the very corporations responsible for this crisis, I don't know what I could say. If millions of young people have striked from school and marched together screaming for action without sufficient response I don't know what I could say. If a growing number of climate refugees facing the loss of their home and even death doesn't move us to action, I don't know what I could say. If polar ice melt, ocean acidification, sea level rise, devastating fires, climate enhanced heatwaves, arctic blasts, tornadoes and other extreme weather events are not enough for us to change then I just don't know what I could say. One thing I hear most as a climate activist is, wow, when I was your age I wasn't doing anything like you're doing. When I hear that I always think, well, that's because when you

were my age you didn't have to. The reality is we have never before faced a crisis like the one we're in. This moment in time calls for all of us to step out of our comfort zones and do things we have never done before. We need to take risks. Mayor Wheeler, I remember you told me about your daughter when I delivered a video to you about the danger of natural gas back when you were the state treasurer. Did you ever find yourself thinking about how fast she's grown up?
Wheeler: I do. [laughter]
Shriner: How it feels like just yesterday that you were watching her take her first steps, say her first words, and how old is she now? 12? 13?
Wheeler: 13.
Shriner: Well she was born more years ago than we have left to take drastic action. If we don't her fate, my fate, and the fates of the rest of our and future generations will be sealed. Four years ago I testified as a 13-year-old in favor of the resolution that led to these zoning amendments. Commissioner Fritz, you may remember the little middle schooler singing the times they are a-changing and presenting you with climate champion awards.
Fritz: They're in my office.
Shriner: Those were hopeful times but I'm not a middle schooler and I along with thousands of my peers are preparing to cast our first votes. The times, they really are changing and we're watching to see if all of you are willing to take the risks that this time demands. Thank you.
Wheeler: Thank you. Good afternoon.
Violet O'Herron: Hello, commissioners. My name is Violet O'Herron, I'm a member of the Portland youth climate council and a seventh grader at ockley green middle school in north Portland. I want to start by saying thank you. Makes me hopeful to know the city of Portland is actively working on climate solutions. There's no single simple solution to the climate crisis. It is clear however that there's no way we can solve the problem unless we stop building more fossil fuel facilities and drastically decrease the amount of fossil fuels we're using. The city's law to ban new fossil fuel infrastructure is a really good start. All of us need to do something. Having a future on a planet with a livable climate was something my parents were able to take for granted when they were growing up. I don't get that luxury. My generation doesn't get that luxury. I have a deep desire for things to be okay with the world but I know things are not. My concern that not enough is being done has led me to go on climate strike every Friday here at city hall. I'm inspired by Greta Thunberg and by her example of how much one young person can do. I'm also working together with other young people of Portland youth climate council to advocate for local climate solutions. I'm trying to do what I can do. I want to challenge everyone here to ask themselves, what more can you do? For the commissioners I think stopping the export of tar sands through zenith would be a good next step. Thank you for your time.
Wheeler: Thank you. Thanks all three of you. Commissioner hardesty.
Hardesty: I want to appreciate the two young people who came in and testified. The young woman who said when she was 13 when she testified the first time, I can assure you that at 13, the thought of going to Salem to testify to legislative hearing would not have been in my world view and I want to tell that other young lady what a fabulous job you did. I knew you were nervous when you came up, but I gotta tell you your voice didn't shake at all. You had very powerful testimony. Thank you so, so much for being here.
Wheeler: Next three, please, Karla.
Moore-Love: Robert Boyer, Micah Meskel, and Melanie Plaut, and they'll be followed by Monica Zazueta, Ryan Rittenhouse, and edith gillis.
Wheeler: Would you like to go ahead and start for us, please?
Micah Meskel: Sure.
Wheeler: Thank you.

Meskel: Council and mayor, my name is Micah Meskel, I work for Portland Audubon. Portland Audubon has been advocating on issues regarding the northwest industrial area for over 40 years. We have known for a long time many of the industries located along the river pose a huge risk to our environment and our community. This is especially true for the fossil fuel terminals and that is why we're here today to support the readoption. Situated in a liquefaction zone between two of our city's most important natural resources forest park and the Willamette river is less than ideal. With these facilities built before current building code and seismic standards were in place. This places is a huge public and – this places are public and private investments in the superfund cleanup and forest park restoration at great risk. As important or more important it also puts adjacent neighborhoods like linton and st. John's at risk as well. But also downstream communities, local workers and communities along the infrastructure that services these facilities like pipelines and rail lines. Many of this infrastructure intersects through low income and communities of color in north and northeast Portland. Several years ago alongside our coalition partners we helped push this policy forward. We worked collaboratively with the city to help shape it. We helped defend it in court when the oil industry and the Portland business alliance challenged it. Today we're here to give support for the proposed amendments and readoption. The reinstatement of this ordinance is an important step by the city in reimplementing the grass roots led vision to protect our community and environment from additional fossil fuel infrastructure and it must be followed by additional, more ambitious steps if we are to further mitigate the extensive risks of existing fossil fuel infrastructure located along the Willamette river throughout the city of Portland. We are happy to hear today about the ongoing work that the city is undergoing. As you see we're here to support you and to get behind your leadership and we will also be here to hold you accountable to that. Thank you.
Wheeler: Thank you. Good afternoon.
Melanie Plaut: Hi. Mayor and council, I am Melanie Plaut. I'm speaking today for 350 pdx. Dineen Orourke who is on the staff there was unable to come because she's ill. Three years ago then mayor Charlie hales said before making the vote unanimous, I'm really proud to be a Portlander and I'm really proud to preside over this city council. I vote Aye. The chamber erupted in cheers. In fact, dineen, who was working on the east coast in new England said that it was meaningful to her to all the way across the country when council passed this amendment the first time. The fossil fuel terminal zoning amendment was groundbreaking. I would like to think cities can still lead so I add my voice to those who support the council in reinstituting this code. In the intervening three years much has happened. The climate crisis has accelerated more rapidly than the most pessimistic estimates. Weather changes, floods, droughts and wildfires have made it hard for even those who profit from the fossil fuel industry to deny that climate change is occurring. Yet the federal government and state governments seem unable to take action commensurate with the crisis. What you do this council gives us hope and has proven to be a model for other jurisdictions. Here in Portland we are even more aware than we were three years ago of the risks posed by the tanks and trains in the critical energy hub. In three years trains across the country have derailed, pipelines have leaked and tanks have exploded. You know that here in Portland we have unique safety risks which I think mike Myers outlined more eloquently than anyone else could. This means that not only is it permissible as determined by the courts for the city to take action on the new bulk fuel storage code, it is the only moral option. The transition to renewables has started though not fast enough. To stand a chance of meeting the city goals for 100% renewable energy we will need to greatly accelerate the expansion. It makes less and less sense to build anything new that supports fossil fuel use when what we really need is the rapid transition off fossil fuels. We can do this. We just need to do it faster and we can't go backward. The fossil fuel zoning amendment is like insurance against backsliding. This code is a crucial step yet in itself is

not enough as others have said and we look forward to the discussed actions that the city can take. The first step today, however, is to complete what began in this room three years ago. We ask you to continue to stand strong in the face of the fossil fuel industry and the push to maintain the status quo. Remember cities lead, make us proud again.
Wheeler: Thank you. Appreciate it. Good afternoon.
Bob Boyer: Mr. Mayor, council members, I'm bob buyer. I love Portland. I have been here at the air base since 1961 before a lot of people here were born or in elementary school. I worked on the waterfront over 40 years. I was president of the union that run the tugboats. I had no idea when I worked at the shipyards sand blasting and painting ships that we were polluting the river. So I want to help clean it up. Right now I sit on the board of property tax appeal for Multnomah county, convincing people why their property taxes are at that rate. Here we are sitting on a time bomb. So I have decided to do a little research. I also was a yard foreman for the southern pacific railroad and before that I laid track. We have derailments in Mosier. Suppose they were all cars that went into the river. This heavy oil sinks right down to the bottom. I'm in support of 1082. I'm here to support you. As a yard foreman I have seen derailments. We just had one at the Albina yard in north Portland with a remote engines. So by having four generations here in Portland, father, grandfather and great-grandfather and myself, I love Portland and for that reason alone I put my hand up to protect this country when I went into the air force. I put my hand up to protect the state when I was a state senator. I have been active and created the neighborhood associations so the citizens could have a voice and for the mayor and city council to recognize us. I love Portland. I'm here to support you and some of you already know me. I mean what I say. Thank you.
Wheeler: Thank you, sir. We appreciate it. Thank you for being here. Thanks all three of you. Next three, please, Karla.
Moore-Love: Are Monica Zazueta, Ryan Rittenhouse, and Edith gillis**,** and they'll be followed by dorn burell, tara ota, and nick caleb.
Edith Gillis: I'm Edith Gillis and I'm saying wee need to ban crude oil until safe effective firefighting foam is on site, ban tar sands oil until zenith pays worst case costs to the county and city refundable 30 years after the end of its use and its cleanup. Require oil transport storage refining and use to supply their own safe, fire foam, and I want you to realize there has never been invented any firefighting foam that is effective, prompt thorough or safe or has ever been cleaned up from the environment. Every firefighting foam that's ever been used continues in the bodies and in the children and progeny of those who have used it and the environment and all the species that have been studied in the environment. It affects over 800 -- it causes proven to cause over 800 serious diseases, disabilities and deaths, and it's in every single system of the human body. It continues for generations. Don't allow tar sands oil in Portland or the surrounding waters until the owners and transporters prove through reliable third parties that they have adequate fire and explosion prevention, prompt soil suppression with safe and environmentally beneficial products and processes with each train, tank, terminal, ship and along the routes paid for by the owners. Make sure that their firefighting crews on staff have adequate training, supplies and lifetime for several generations of disability payments. Please read the intercept October 24, 2019 article. The top u.s. toxicologist was barred from saying pfas it causes disease in humans. She's saying it now. After her entire 40 career of study Dr. Linda Burnham retired from the national institute of environmental health sciences 19 years with the epa and the national toxicology program director says firefighting foams are unsafe and harmful. The chemicals known as pfas, or per, polycule and polymolecule and other substances persist in the environment and affect every system in the human body. Don't allow the cause or the need for it until you have proved what we have is safe to deal with it.
Wheeler: Thank you. Commissioner hardesty had a comment.

Hardesty: Thank you mayor, Edith I want you to know one of the things we're looking at is whether or not we can require these industries to have their own firefighting personnel and equipment. What we know is that if we have a major incident in this energy hub that is our firefighters have not been trained nor are we equipped to fight the kind of fire that these oil refineries -- these oil tanks would have. So know that we're working on it. We are working on it.
Gillis: We require fire extinguishers and if they can't come up with the fire extinguisher to put it out they don't have it.
Hardesty: You know Edith I'm not mad at you cause that's one of the first things I thought. I did not want to send my personnel into a situation that they have not been well trained or have the appropriate equipment to respond to, but they would go because that's what they do. That's not acceptable. So thank you.
Wheeler: Good afternoon.
Monica Zazueta: Good afternoon commissioners. My name is Monica Zazueta, I'm from Vancouver, Washington. I'm a wife and a mother of a beautiful five-year-old son named Aries Tabor. Before two months ago I was wrapped up in my own world and didn't watch much news and didn't know what the government really did or what the city council or the port of Vancouver did. I didn't educate myself on those matters because I didn't think they mattered to me. This morning I rewatched a video of Greta Thunberg speaking to the u.n. that was the video that changed everything about my life. I remember feeling scared, confused and shocked. How could we not have known about this, why weren't we pulling away from fossil fuels as soon as possible if our own lives are at stake. I wanted to know more about what was really happening to our planet, our home and wanted to plug in and try to help any way that I could. I didn't know what I could do but I had to do something. Every day the truth became more and more clear in the workshop, trainings and meetings that I was attending. Sierra club and sunrise over Vancouver, Washington were two groups I found. Their support and actions were inspiring and we all were working towards the same thing to save our generations and the generations to come. I'm a mother and when I start to think there's a big possibility that he might be living a miserable life with unbearable temperatures, earthquakes, hurricanes and so much more it breaks my heart. The stress, the anxiety, the fear, the anger all come up when I think about the climate crisis. I promised my son that I would try my best to take care of him and I'm going try to keep that promise. I urge council to reinstate the ordinance and continue to stand strong against fossil fuel companies. The work has just begun so I want you to know I want to tell you all that I'm here to stand with you. Vancouver, Washington and is here to stand with you and Portland is here to stand with you.
Wheeler: Awesome. I appreciate this. You know we're going to win this fight, right?
Zazueta: Yes. We are.
Wheeler: Thank you for being here.
Hardesty: We don't have an alternative.
Ryan Rittenhouse: Good afternoon. Thank you for letting us testify today, my name is Ryan Rittenhouse, I work for friends of the Columbia river gorge. With that name probably comes to mind Mosier and the oil train disaster that happened there which is pertinent to this conversation. One of the things I would like to remind folks about that disaster is one of the reasons it wasn't much worse that it was as bad as it was it could have been much worse, one reason it wasn't worse is that the train wasn't moving very quickly Union pacific is currently right now and actually before that disaster had already started the process of trying to expand their siding right through the town of Mosier for the express purpose of raising the speed of the trains to pass through that area. If they are successful at getting that expansion through as they want it they will be able to increase the speed of the trains to 60 miles an hour. The speed of the train that derailed in Lac-Mégantic Quebec and destroyed the town was running away at 65 miles an hour. So you can imagine how much

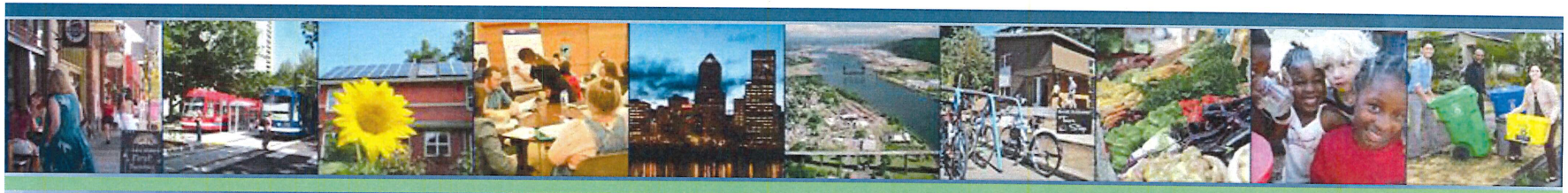
worse the disaster in Mosier would have been had it been moving at 60 miles an hour other that it was moving very, very slow. Also a quick note, I don't have much time but a quick note on biofuels, as you know we're very concerned with the zenith terminal, also global partners, all of the oil trains that serves those facilities, most of the oil trains that serve the facilities in California and of course all the ones up in the Puget sound all come through the Columbia river gorge national scenic area and while we recognize it's important to allow certain kinds of biofuels in the future, those should be disincentivized in favor of truly renewable resources especially because the fossil fuel industry is very savvy and very good at manipulating laws and loopholes. We have seen that. You're familiar with them over the zenith terminal and I'm worried that in the future they may try this again with biofuel terminals. So it needs to be very clear and we're going to need to maintain very extreme diligence over any such terminals that get approved in the future to make sure that the fossil fuel industry doesn't figure out a way to come and buy that facility and flip it as they have done with zenith and global partners. You have also heard a lot already and you'll probably hear more from the fossil fuel industry about how they want to do upgrades and how all of this is bad for them and bad for their economics. Just remember you are not here to make their jobs easier or to make their business more profitable. You are here to protect the citizenry and the environment and we're all here to dismantle the fossil fuel industry, not make it more profitable for them. To wrap up, this is just beginning. I'm glad to see you recognizing that as such. We need to move forward and this is a golden opportunity to make a just transition not just for the environment but for social justice. This is an opportunity to move towards more transit options more accessibility along those lines and just remember that every carbon atom we dig out of the ground and put into the air is one we have to take back out of the air and put back into the ground.
Wheeler: Thanks all three of you. Next three Karla.
Moore-Love: The last three who signed up Doran Burrell, Nick Caleb and Erin Saylor.
Wheeler: Nick you want to go ahead and start, thank you.
Nicholas Caleb: Greetings, commissioner, mayor, my name is Nicholas Caleb I'm the staff attorney for the center for sustainable economy. I have been working on fossil fuel infrastructure campaigns and policy making since 2013. The original energy that brought this infrastructure fight to Portland council has only grown over the years as there's increasing understanding throughout the world that the type of action Portland is taking must happen everywhere at once. I'm very pleased to see the fighting spirit for taking on the fossil fuel industry transcending several different councils. It's necessary given opposition from an industry with nearly bottomless resources. Thank you commissioner Fritz for being an early adopter of strong action, having a strong voice and for your continued attention to these issues. Thank you mayor Wheeler and commissioner Eudaly for your votes to defends the amendments in court and support for remand. Thank you commissioner Hardesty for your advocacy on climate justice issues and for smart and necessary regulations to protect Portland's residents. We look forward to working with you to manage fossil fuel infrastructure and I think we have a great momentum right now. Thank you.
Wheeler: Thank you Nicholas, appreciate it. Last, but not least.
Erin Saylor: Good afternoon, my name is Erin Saylor, I'm a staff person attorney with Columbia river keeper. Thank you for providing us all the opportunity to speak with you today. Industry has submitted testimony into the record arguing adoption of the fossil fuel terminal zoning amendments would prevent the development of renewable fuels. That is simply not the case. Biofuels are specifically exempted from the scope of the amendments and zenith's assertion that the city's recent denial of the request to build three new pipes under northwest front avenue extensively for biofuels was the result of the city resolution against the expansion of fossil fuel terminals completely ignores the rest of the city's decision which was clearly tied to zenith's past performance under its franchise

agreement. Companies who want to construct infrastructure dedicated solely to renewable fuels will not be prevented from doing so under these amendments. Companies who choose to handle both fossil fuels and renewable fuels at the same facility are not only free to but encouraged to reduce the amount of fossil fuels stored at their facilities in order to increase the amount of renewable fuels that they can store. Industries argument that these amendments will prevent them from completing seismic upgrades also falls flat. There are other was to complete the upgrades without building new temporary storage tanks. It's a total red herring to for them to argue that these incredibly important amendments will prevent them from completing these necessary upgrades. Thank you.
Wheeler: Thank you. Does that complete public testimony Karla?
Moore-Love: Yes, that's all who signed up.
Wheeler: Colleagues do we want to bring staff up for additional questions? Let's get on with it. Please call the roll.
Moore-Love: I'm sorry Robert did you have a?
Robert Taylor, Chief Deputy City Attorney: Sorry, mayor. We would like you to please keep the record for written testimony open until 9:00 a.m. Monday, December 2.
Wheeler: Why?
Taylor: To allow staff to complete their work.
Wheeler: What's the work they need to complete. Could you come up and clarify that for us, please?
Armstrong: Yes, mayor, if you will, one of the issues that we got dinged on by luba is not fully considering and responding to all of the testimony a number of testimony has come in this afternoon into our website. So I guess to put us in a better defensive position we want that time to be able to review the testimony over the holiday and to respond to it on the record before you guys make a decision.
Wheeler: We have waited this long. A few more weeks and it gives you something to do over the holidays.
Taylor: Right.
Wheeler: How nice, commissioner Fritz did you have any comments.
Fritz: I was going to suggest since our wonderful constituency here that we could each make our comments now so you don't have to come back next time. You can if you want because it's really nice to see you.
Wheeler: That would be fine. Let's go down the row. Commissioner Eudaly.
Eudaly: Good afternoon, everybody. I don't always feel that Portland deserves its progressive green reputation, but I'm proud of our city and our city council today. Earlier today we passed an item that clears the way for mobility hub on the central east side for electric cars, bikes and scooters. We're also taking action in investing and improving our public transit system. These are just a couple of ways we can combat climate change through sustainable transportation options where we have given preference to single occupant gas powered vehicles in the past. This ordinance is the flip side of these actions. While we make sustainable options more viable, we must carefully regulate and restrict industries and practices that endanger our people and our planet. Thank you to the council of 2016 especially commissioner Fritz and Fish. Thank you to our office and city staff and attorneys who do the hard work of turning our values, priorities and aspirations into making strong, defendable policies. Most of all thank you to community activist, advocates and organizations. We wouldn't be here without you and we need you to keep pushing us to do better.
Fritz: Waiting to be called upon. We have to not vote aye at the end I have to remember that because we of course want to make good findings before doing our vote. Sometimes people think that a remand from the land use board of appeals is a bad thing. In this particular instance it means we get to vote on this ordinance and vote on it again. I think I feel really best that we have the opportunity because it is a really important thing that we

did and that we are doing and we're going to do even more. So I appreciate my colleagues who didn't have that joyful experience in 2016 are getting to have it now. Thank you. I had forgotten about the paper stream as that's such a good thought. Oh, yes, really great. Thank you. I especially appreciate the young person from Ockley green who said that each of us needs to think about what more can with we do. I'm not going to ask for a show of hands if you took transit or walked or biked to get here, but every single day in everything we do we need to think how can I do more. Commissioner novick who you all remember was a strong supporter of this policy, texted me a few months ago to tell me about the energy use of clothes drier, tumble dryers and that's the most energy consumptive things in our homes. So I'm now hanging out my clothes to dry on a nice line that I have. I wouldn't have thought of that without the commissioner doing that. It's a very simple thing it takes a day to dry the clothes instead of an hour but if that can help stop getting millions of tons of carbon dioxide into the atmosphere if everybody in America did it why would we not want to do it? Again if people want to email me with further suggestions on things that could be done that I wouldn't necessarily have thought of, I am really interested and I think we all should be interested in what more can I do rather than as well as what more should the government be doing because it's clear that the cities are going to have to lead, our federal government is letting us all down badly. Each one of us can make a difference. Thank you so much each of you for being here.
Wheeler: Commissioner Hardesty.
Hardesty: I want to echo the thanks. I love when this chamber is filled from top to bottom. I love when this chamber is filled of people of all ages and all backgrounds. I love it especially when we're all here for a common cause. It's always good to have the other side but clearly there is no other side when we're talking about saving the planet, right? And the inhabitants of the planet. I take this issue very seriously because my role as managing three of the four first responder bureaus at the city of Portland means my folks are on the front line of this every single day. When a bad thing happens my folks will be the one that will show up no matter what. They will show up and they will do the best job they can possibly do. We have an obligation and responsibility to make sure that we are not putting public servants in harm's way, and that people who know that their products cause harm and will destroy communities have an obligation to remediate the harm that's done. So I as part of the regional disaster preparedness board talk about a reality check, recently at one of our meetings when there was like a 60-second video, it was a very short video that actually took pictures of all the tankers and just had a helicopter flying around and giving you a visual. When you see it from the air what you see is that these are very, very, very old tanks that you would think are probably leaking if they are not leaking today they leaked sometime in the past. So this action that we're going to take whenever this comes back to the city council is just one small piece of all the pieces that we have to do to address climate change. No one here wants to see the disaster happen because of the, even if it is working the way it is supposed to, disasters could happen and so we have an obligation to make sure that we are protecting the health and safety of not just public servants, but also the public in general. I appreciate each and every one of you for making the time to be here today and I would encourage you to not just show up and talk about this when it is on the agenda, but this is something we have to talk about every single day until we address the big issues that are on the table, thank you.
Wheeler: So, I don't have a well thought out speech so I'm going to wing it, bear with me. Number one, thank you for everybody who showed up today to testify. I thought it was fantastic testimony. This has really been a good day overall for the council in terms of very, very high-quality testimony. I learned a lot from everything that you said and I appreciate it. Number two, I was proud to publicly endorse support the ordinance when it came before the city council in 2016, but I did not have the opportunity to vote for it and so I'm glad I will have the opportunity to vote for it here, not today, but in the near future and I'll get to that

in just a moment. Number three, the sense of urgency here is obvious and has been mentioned many times. Cities have to lead, the federal government, the trump administration they are now working against us in terms of our efforts to address climate change on the planet and I was very proud to have recently gone to the c-40 global mayors global summit in Copenhagen and it was an opportunity for me to interact with mayors and leaders and heads of state from all around the world and the overall message there was we are still in and we are more aggressive than we've ever been in terms of addressing our climate action goals and I have to say this as an envoy from the city of Portland, Portland is very much regarded as a global leader when it comes to the issue of the environment and climate action. I want to second what commissioner Eudaly said earlier about how proud she is about the actions this council has taken recently. I am, too and in effect, we are now backing up a whole host of very specific strategies that we can take as a city and you'll be learning more about that in the weeks and the months ahead and I'm very glad about that. On a cautionary note front. The whole issue of oil trains going through our community bothers me on many fronts. The first is the obvious one the environmental and public health and public safety front. Somebody alluded to the crash in Quebec some number of years ago. I wanted to reiterate that crash killed over four dozen people and burned half the town to the grown. Shortly thereafter the derailment of 1996 fossil fuels cars in mossier, which could have been a environmental public health and a public safety catastrophe had things turned out just a little bit differently. As commissioner hardesty mentioned, and as other mentioned in their testimony, we had a oil train going through are the rail yards here in central city at a very low rate of speed the train still managed to hit an overpass and derail. If that had happened in a typical scenario with a more regular speed, who knows what the outcome could have been, but from my perspective it doesn't take a genius to figure out having oil trains going through natural habitats and then through densely populated neighborhoods is not a safe environmentally sound strategy nor is it in the best interest to the public health and if we are not here to protect those things, while else would we possibly be here? I am proud to have the opportunity to support this fossil fuel ordinance. I'm very glad, Robert is the best public sector legal counsel we can possibly have on these issues and we're right at every step. Let's dot the i's, lets cross the t's. Make sure that once we do this its done and its done we're not have to bring it back and do it again. We are done with oral testimony. The record for written testimony is going to remain open until 9:00 am on Monday, December 2nd, that means if anybody wants to submit an e-mail please submit an email, your testimony must be received by the council clerk by 9:00 am to be included in the official record at that time the record will be closed. This ordinance is continues to Wednesday, December 18th at 3:00 p.m. time certain, if you want to be here that's great you can be. When the council reconvenes there is the opportunity, should commissioners wish, to introduce amendments at that time. The council will determine whether additional public testimony is warranted for any proposed amendments and the council may, if it so chooses to reopen the record for the limited purpose of testimony on the amendments at that time. Is there any other business, colleagues? Then this hearing is continued to Wednesday, December 18th at 3:00 p.m. time certain, thank you everyone for showing up and we are adjourned.

At 3:35 p.m. Council recessed.

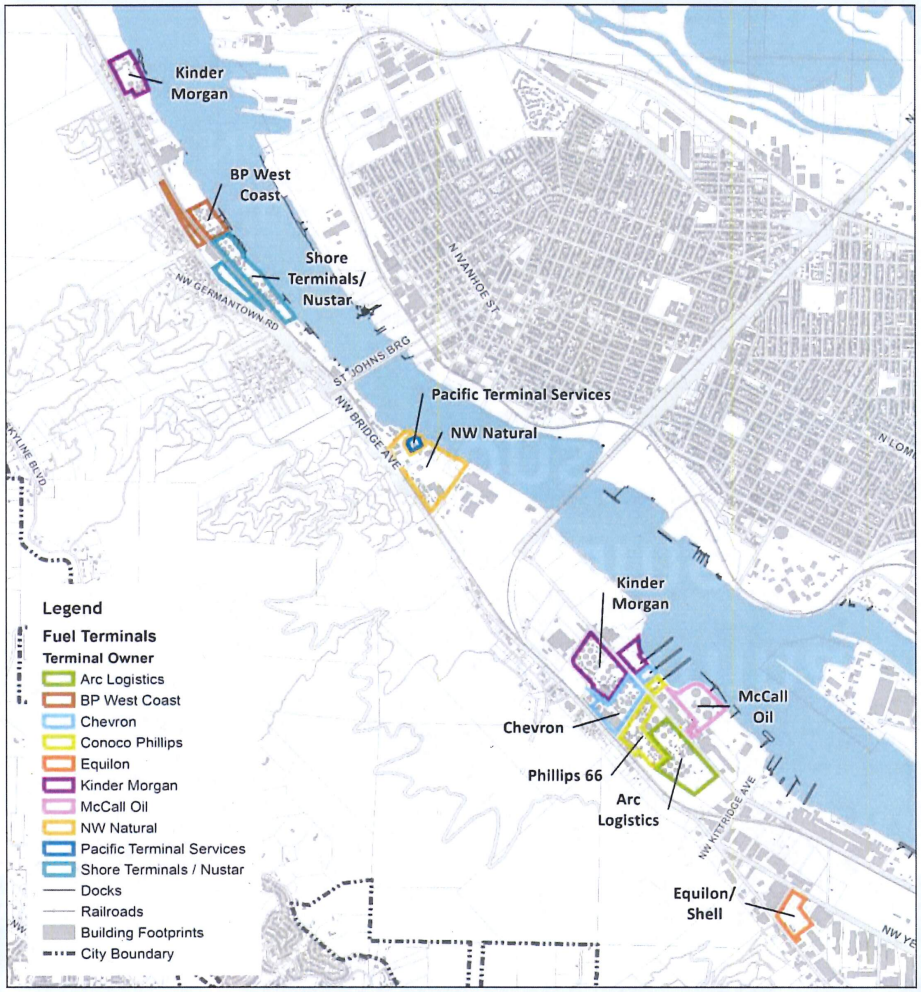


Fossil Fuel Terminal Zoning Amendments: Remand Reconsideration

City Council Public Hearing
November 20, 2019

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.

Existing Terminals



Policy direction on fossil fuel infrastructure

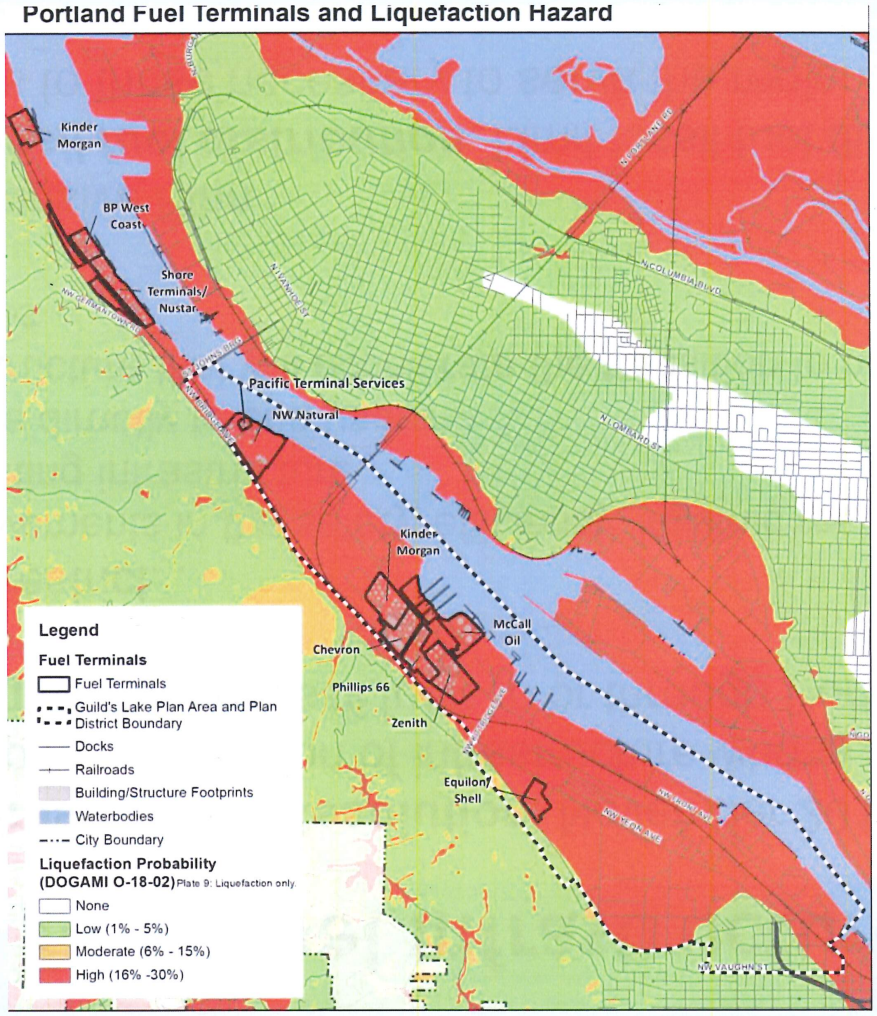
Fossil Fuel Infrastructure Resolution, November 2015:

1. Actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways.
2. But do not restrict. . .
   - improvements in the safety, efficiency, seismic resilience, or operations of existing infrastructure
   - service directly to end users
   - infrastructure that will accelerate the transition to non-fossil fuel energy sources

2035 Comprehensive Plan

Policy 6.48 Fossil fuel distribution. Limit fossil fuel distribution and storage facilities to those necessary to serve the regional market.

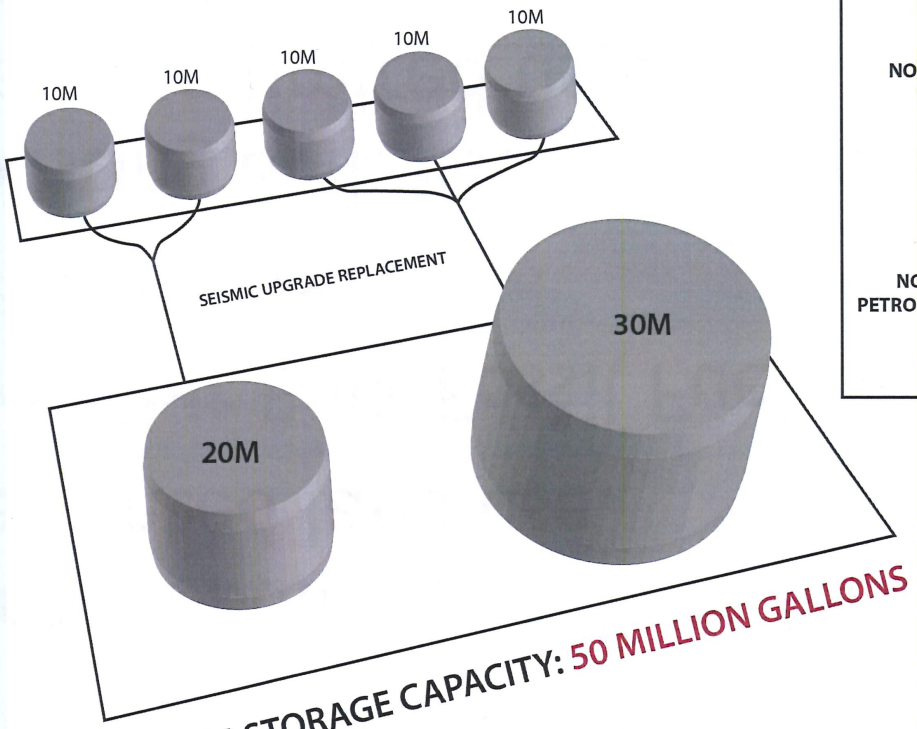
Public safety and environmental risks



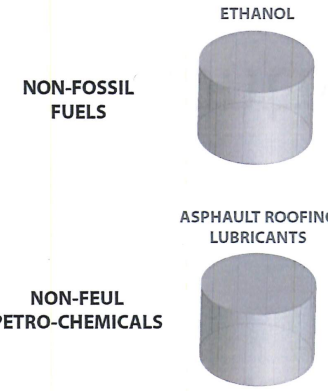
Zoning code amendments

- **Define** Bulk Fossil Fuel Terminals as a regulated land use.
- **Prohibit** Bulk Fossil Fuel Terminals in all base zones.
- Existing Bulk Fossil Fuel Terminals become limited uses that can continue to operate.

Existing Terminals



NOT INCLUDED IN CAPACITY LIMIT:



MAXIMUM STORAGE CAPACITY: 50 MILLION GALLONS

New land use category:
Bulk Fossil Fuel Terminals

Bulk Fossil Fuel Terminals:

- Marine, railroad, or pipeline transport access; and
- Transloading facilities (such as train-to-ship) or storage capacity exceeding 2 million gallons.

Exclusions:

- Distributors with access exclusively by truck;
- End-user facilities, including filling stations and firms that store fossil fuels for use as an input;
- Airports, marine and rail servicing facilities.

Defining fossil fuel

Fossil fuels are petroleum products (such as crude oil and gasoline), coal, methanol, and gaseous fuels (such as natural gas and propane) that are made from decayed plants and animals that lived millions of years ago and are used as a source of energy.

Exclusions: Denatured ethanol and similar fuel additives, biodiesel/renewable diesel with less than 5% fossil fuel content, and petroleum-based products used primarily for non-fuel uses such as asphalt, plastics, lubricants, fertilizer, roofing and paints.

Remand Issues

- Address policies in Guilds Lake Industrial Sanctuary Plan
- Address future demand for fossil fuels

Guilds Lake Industrial Sanctuary Plan

- Foster an environment that promotes continued investments in infrastructure, facilities, equipment and jobs.
- Maintain, protect, and enhance the multimodal transportation investments to ensure its continued viability as a major center for the import and export of industrial products in the state of Oregon.

Future demand for fossil fuels

2035 Comprehensive Plan

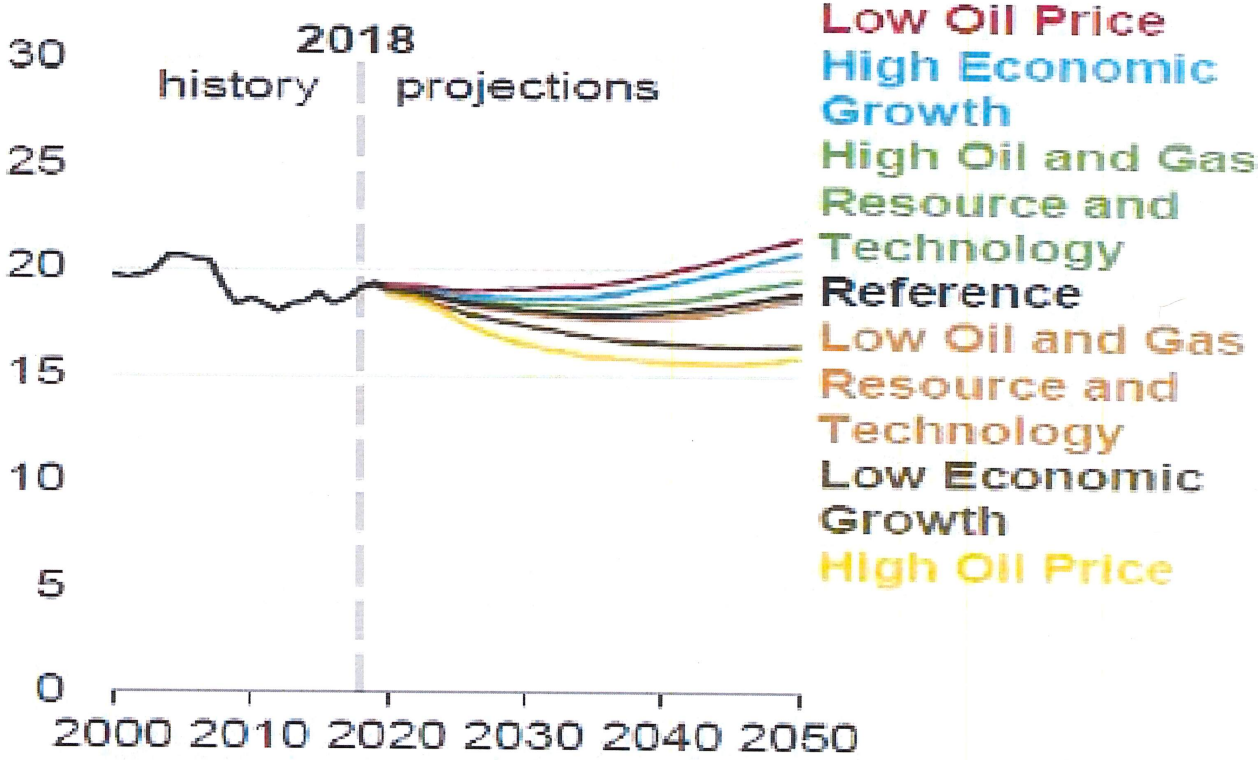
Policy 6.48 Fossil fuel distribution. Limit fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Regional Market

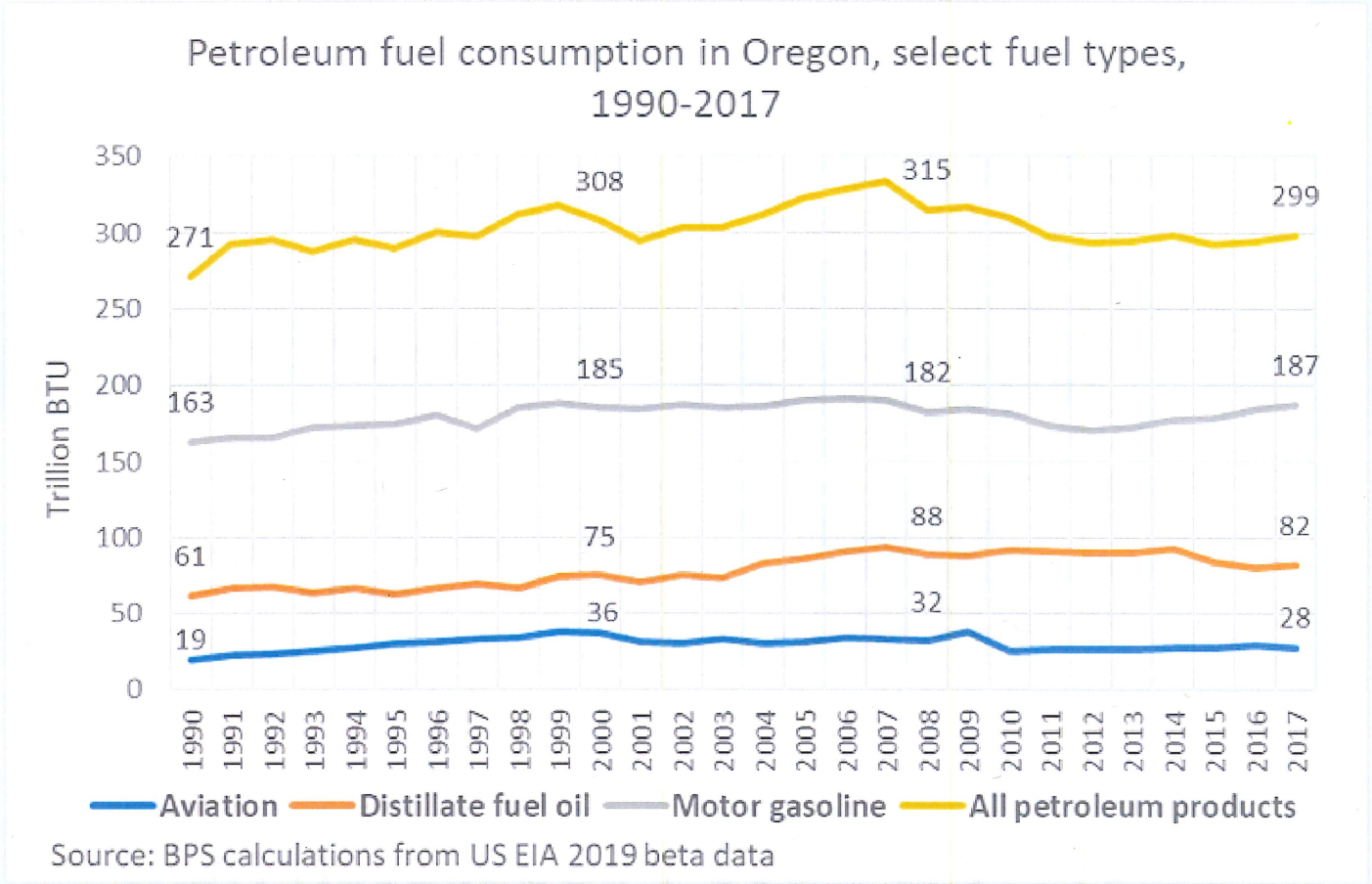


U.S. Energy Information Administration
2050 Reference Case - U.S. Total

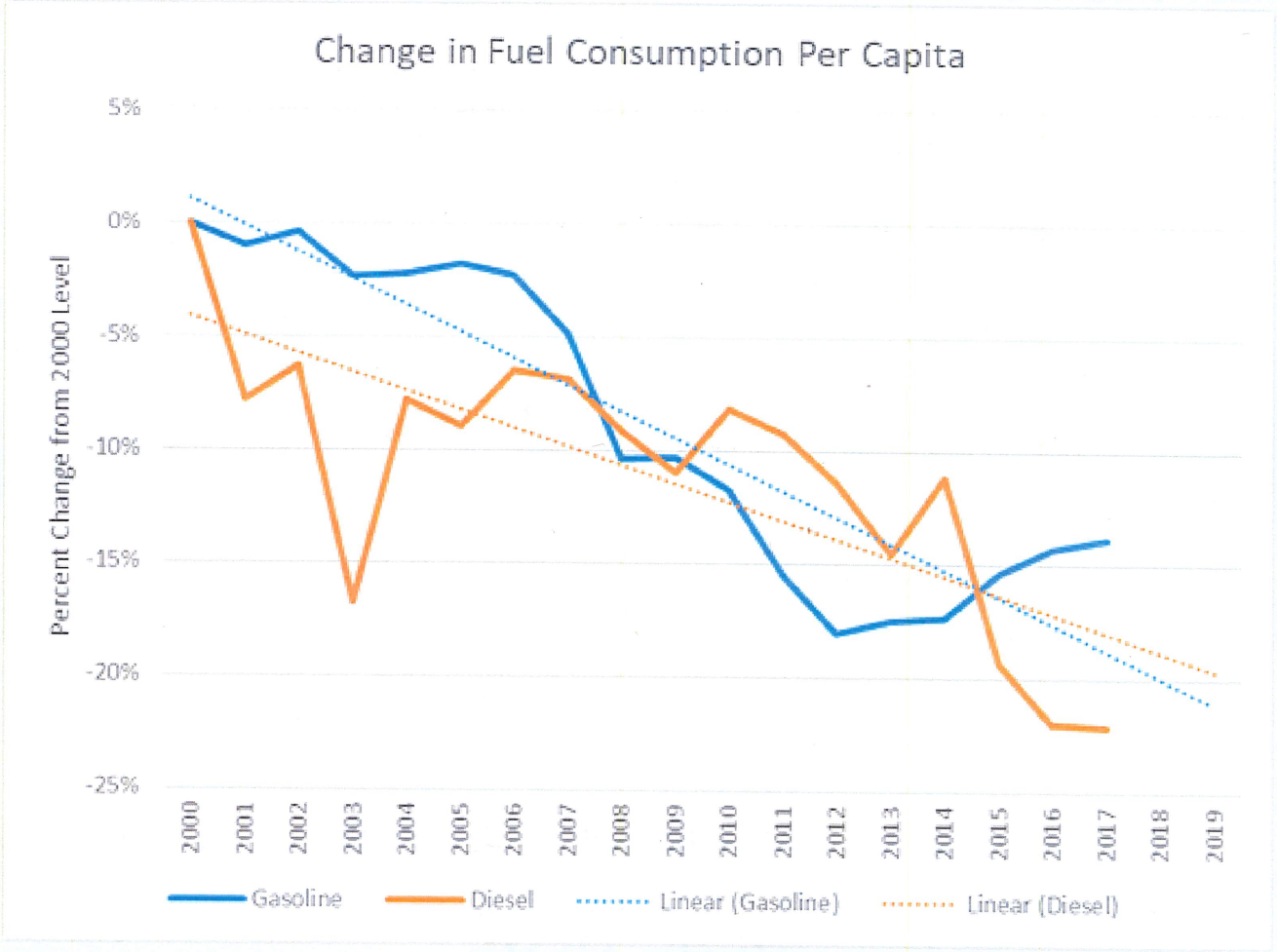
Petroleum and other liquids consumption
million barrels per day



Oregon Petroleum Consumption

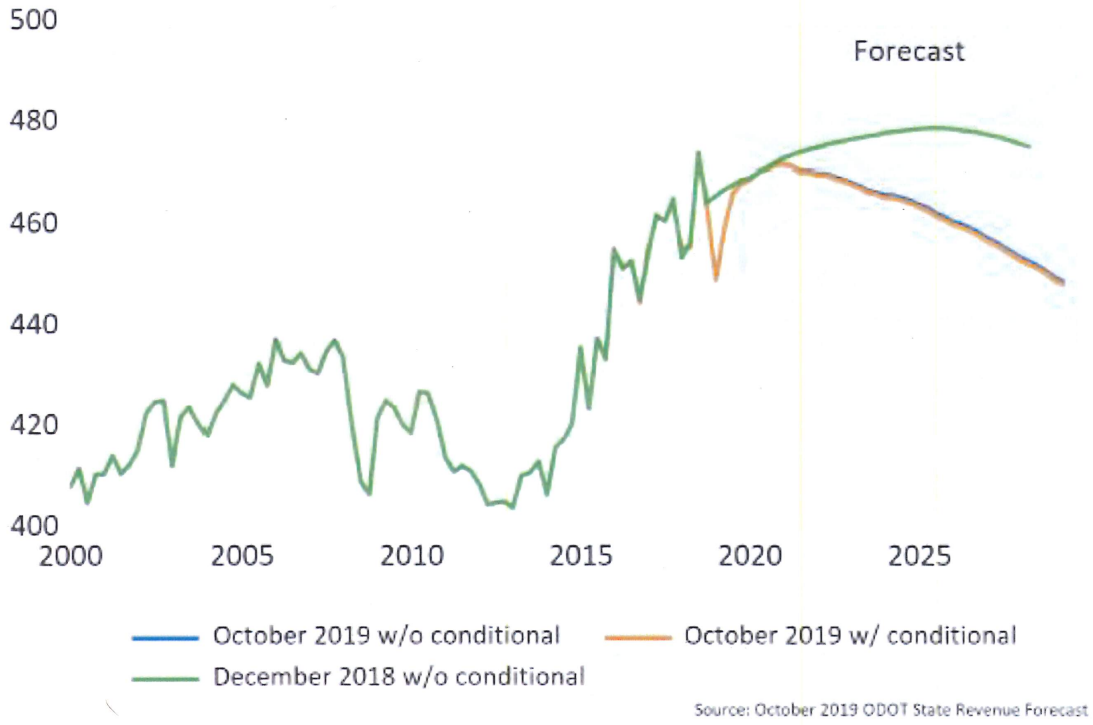


Oregon Gasoline Consumption



ODOT Motor Fuels Forecast 2020-2029

Figure 19. Gallons of Taxable Motor Fuels Forecast Comparison



Source: October 2019 ODOT State Revenue Forecast

Cargo Forecasts

- Liquid bulks – mostly petroleum products
- *2011 Oregon Freight Plan (revised 2017)*
  - 1.7% annual growth from 2002 to 2035
- *2012 Portland Harbor Forecast Update (BST)*
  - 0.7% annual growth from 2008 to 2040
- *2015 Port of Portland Commodity Flow Forecast*
  - 0.7% annual growth to 2040
- *2017 Marine Cargo Forecast (BST)*
  - 0.8% annual growth from 2008 to 2040

Policy and Programs to reduce fossil fuel consumption

- State GHG reduction goal
- ODOT Sustainable Transportation Initiative
- DEQ Clean Fuels Program
- Metro Climate Smart Communities
- Metro Regional Transportation Plan
- Portland Climate Action Plan
- Portland Transportation System Plan

Balance conflicting policies

On balance, is the decision equally or more supportive of the goals and policies as a whole

- Reduce risks from natural hazards
- Limit fossil fuel terminals to what is existing
- Maintain industrial sanctuaries

Technical Amendment

Neighborhood Contact

- Clarification that the neighborhood contact requirement only applies to new non-fossil fuel storage proposals.

Public testimony

189807

AGENDA ITEMS 1082 **TESTIMONY** **2:00 PM TIME CERTAIN**

Readopt remanded Ordinance No. 188142 to restrict bulk fossil fuel terminals

If you wish to speak to Council, please print your name, address and email

		Name (PRINT)	Address and Zip Code (*Optional*)	Email (*Optional*)
✓	1	Mario Mijares	4628 SW Oakridge Rd.	
✓	2	Cathy Sampson-Kruse	2075 Sunray Circle 97068	ulla1955@gmail.com
✓	3	Elijah Cetas		
✓	4	Kelly O'Hanley		
✓	5	Ella Shriner		Ella.Shriner21@gmail.com
✓	6	Violet O'Herron		
✓	7	Robert Boyer		
✓	8	Micah Meskel		
✓	9	Melanie Plaut		
✓	10	Monica Zazueta	Vancouver, WA	zazuetamonica813@gmail.com

(10)

Date 11-20-2019 **Page 1 of 3**

189807

AGENDA ITEMS 1082 **TESTIMONY** **2:00 PM TIME CERTAIN**

Readopt remanded Ordinance No. 188142 to restrict bulk fossil fuel terminals

If you wish to speak to Council, please print your name, address and email

	Name (PRINT)	Address and Zip Code (*Optional*)	Email (*Optional*)
✓ 11	Ryan Rittenhouse	Friends of the Columbia Gorge	ryan@gorgefriends.org
✓ 12	Edith Gillis		
13	Doran Borrell	GOBW.	
14	~~Tara Ohta~~		
15	↓		
16			
17			
18			
19			
20	✓		

Date 11-20-2019

189807

AGENDA ITEMS 1082 **TESTIMONY** **2:00 PM TIME CERTAIN**

Readopt remanded Ordinance No. 188142 to restrict bulk fossil fuel terminals

If you wish to speak to Council, please print your name, address and email

	Name (PRINT)	Address and Zip Code (*Optional*)	Email (*Optional*)
21			
22			
23			
24			
25			
26			
27			
28			
✓ 29	Nick Caleb - CSE		
✓ 30	Erin Saylor - Columbia Riverkeeper		

Date 11-20-2019 **Page 3 of 3**

Sue Tarjan

#62692 | December 2, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Email received on Sunday, December 1, 5:37pm My husband and I attended the Fossil Fuel Zoning Amendments Public Hearing on November 20, 2019, and we applaud the efforts of those who testified and of our city council members and staff. We hope that this issue continues to be prioritized. The matter is urgent. Our responsibility is clear, as we were reminded by the two passionate young ladies and others who testified. On the same day as our hearing, North Dakota's Department of Environmental Quality reported that the October 29 spill from the Keystone pipeline is ten times larger than initially reported. TC Energy Corporation (formerly known as TransCanada) now says that over 380,000 gallons of crude oil were spilled in a rural wetland. Yet nobody has gone to jail for lying about what occurred. This is just one of many oil spills and toxic releases and industrial accidents that happen over and over again across our nation and the world. In the US, the sham of corporate personhood may shield individual shareholders and employees and managers of corporations from criminal liability, but it does not shield them from ethical liability. The corporate practice of privatizing profits and socializing losses is really at issue here. If these corporate "persons" destroy our shared environment and communities, they should be punished. Ultimately, the only real way to do that is to yank their corporate charters. Socialism for the rich (bankruptcy court, bailouts, and tax breaks) and capitalism for the poor (pollution, environmental degradation, and higher taxes to pay for clean-ups) has got to stop. If corporations break it, they should own it, not pass on the costs of catastrophes onto their victims. The city council has heard suggestions about requiring that Zenith Energy and others be insured against catastrophic accidents, but what happens when those insurers go bankrupt? Such an outcome is not unlikely should the Cascadia fault gives way and take with it the tank farms on the Willamette. Who pays for cleanup after a disaster is a trivial issue, however, compared to the deaths, injuries, and permanent environmental damage that will be certain to occur should such a disaster transpire. So we need to be looking at prevention. That means requiring IMMEDIATE earthquake remediation of unsafe industrial structures, not just a ban on future growth. As an example, here is a link to a 2015 ordinance passed by the City of Los Angeles mandating retrofitting of older buildings: https://www.ladbs.org/docs/default-source/publications/misc-publications/ordinance_183893.pdf?sfvrsn=6 What we need is such a mandate covering industrial properties. Remember Fukushima. We are residents of St. Johns neighborhood and willing to help the city get this done to protect our community. Tell us how. Set an example and draw a line in the sand on the banks of the Willamette that will help other communities do the same. With the utmost sincerity, Sue and Jim Tarjan

Testimony is presented without formatting.

McClymont, Keelan 189807

From: Sue Tarjan <soozyti@me.com>
Sent: Sunday, December 1, 2019 5:37 PM
To: Council Clerk – Testimony
Subject: [User Approved] City Council Comment on November 20, 2019, Fossil Fuel Zoning Amendments Public Hearing

My husband and I attended the Fossil Fuel Zoning Amendments Public Hearing on November 20, 2019, and we applaud the efforts of those who testified and of our city council members and staff. We hope that this issue continues to be prioritized. The matter is urgent. Our responsibility is clear, as we were reminded by the two passionate young ladies and others who testified.

On the same day as our hearing, North Dakota's Department of Environmental Quality reported that the October 29 spill from the Keystone pipeline is ten times larger than initially reported. TC Energy Corporation (formerly known as TransCanada) now says that over 380,000 gallons of crude oil were spilled in a rural wetland. Yet nobody has gone to jail for lying about what occurred.

This is just one of many oil spills and toxic releases and industrial accidents that happen over and over again across our nation and the world. In the US, the sham of corporate personhood may shield individual shareholders and employees and managers of corporations from criminal liability, but it does not shield them from ethical liability. The corporate practice of privatizing profits and socializing losses is really at issue here. If these corporate "persons" destroy our shared environment and communities, they should be punished. Ultimately, the only real way to do that is to yank their corporate charters. Socialism for the rich (bankruptcy court, bailouts, and tax breaks) and capitalism for the poor (pollution, environmental degradation, and higher taxes to pay for clean-ups) has got to stop. If corporations break it, they should own it, not pass on the costs of catastrophes onto their victims. The city council has heard suggestions about requiring that Zenith Energy and others be insured against catastrophic accidents, but what happens when those insurers go bankrupt? Such an outcome is not unlikely should the Cascadia fault gives way and take with it the tank farms on the Willamette.

Who pays for cleanup after a disaster is a trivial issue, however, compared to the deaths, injuries, and permanent environmental damage that will be certain to occur should such a disaster transpire. So we need to be looking at prevention. That means requiring IMMEDIATE earthquake remediation of unsafe industrial structures, not just a ban on future growth. As an example, here is a link to a 2015 ordinance passed by the City of Los Angeles mandating retrofitting of older buildings: https://www.ladbs.org/docs/default-source/publications/misc-publications/ordinance_183893.pdf?sfvrsn=6

What we need is such a mandate covering industrial properties. Remember Fukushima.

We are residents of St. Johns neighborhood and willing to help the city get this done to protect our community. Tell us how. Set an example and draw a line in the sand on the banks of the Willamette that will help other communities do the same.

With the utmost sincerity,
Sue and Jim Tarjan
7401 N Ivanhoe Street
Portland, OR 97203

Tom Armstrong

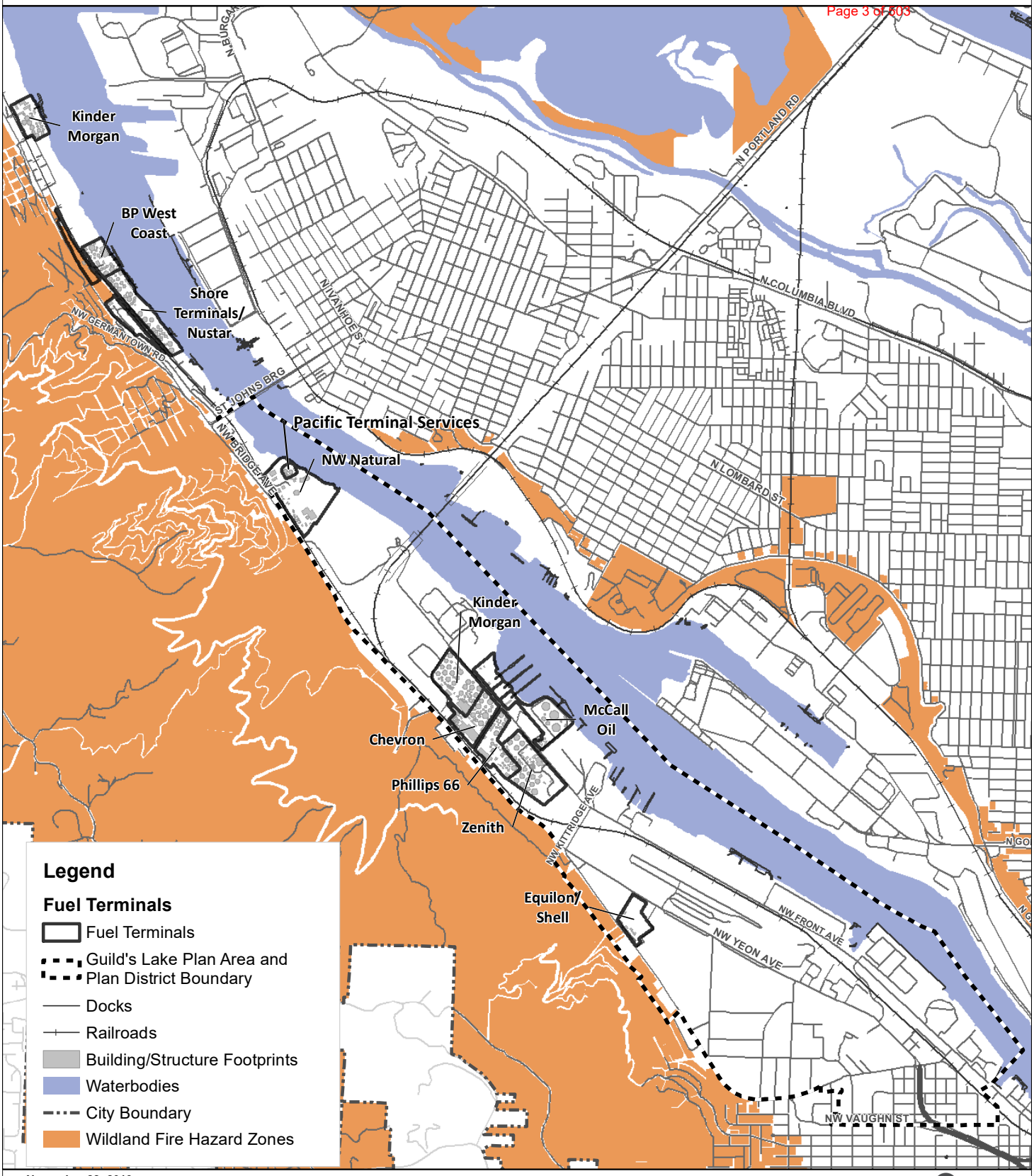
#62691 | December 1, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See attached Wildland Fire Hazard Area Map showing the relationship between the existing terminals and wildland fire hazard areas, in support of testimony provided by Mike Myers, PBEM director.

Testimony is presented without formatting.

Portland Fuel Terminals and Wildlands Fire Hazard



November 22, 2019

City of Portland, Oregon ||
Bureau of Planning and Sustainability ||
Geographic Information Systems

NORTH

0 0.25 0.5 Miles

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City of Portland, Oregon

The information on this map was derived from City of Portland GIS databases. Care was taken in the creation of this map but it is provided "as is". The City of Portland cannot accept any responsibility for error, omissions or positional accuracy.

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Tom Armstrong

#62690 | December 1, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See attached BPS memo on fossil fuel demand

Testimony is presented without formatting.

Bureau of Planning and Sustainability
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MEMO

DATE: December 1, 2019

TO: Mayor Ted Wheeler
Portland City Council

FROM: Tom Armstrong, Supervising Planner

SUBJECT: Fossil Fuel Terminal Zoning (FTTZ) Amendments
Regional Demand for Fossil Fuels

In considering whether the FFTZ amendments are equally or more supportive of the comprehensive plan as a whole, Council must consider Policy 6.48:

> **Policy 6.48 Fossil fuel distribution**. Limit fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Conclusion
What is necessary to serve the region?
The existing FFT storage capacity, with the allowed exceptions, is sufficient to serve the region out to a 2050 planning horizon based on the following findings:

- The US EIA national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington.
- Jet fuel is one sector where consumption is forecasted to grow, but the FFTZ amendments specifically exempt those types of facilities.
- The ODOT gas tax revenue forecast out to 2029 shows a declining volume of motor fuels.
- The most aggressive cargo forecast is the oldest. The more recent cargo forecasts project a modest growth in volumes, but those volumes do not exceed the historic peak volumes that were handled by the Portland terminals.
- Federal energy forecasts out to 2050 do not indicate a significant change in trends.

- State, regional and local carbon reduction, land use, and transportation plans, policies and programs seek to reduce consumption of fossil fuels.

There are two key phrases that must be considered in interpreting Policy 6.48. First, determine what is necessary, as in how much fossil fuel is needed by when (planning horizon year). Second, determine what is the regional market.

Key Findings

- US energy forecast – fossil fuel transportation energy consumption peaks in 2019 because rising fuel efficiency more than offsets the effects of increases in total travel, but this trend reverses toward the end of the projection period (2050).
- Oregon historic trend – gasoline consumption has been essentially flat (1990-2017), overall all petroleum product consumption is still below historic highs (2007). Washington has a similar trend.
- Oregon gas tax revenue forecast – ODOT is forecasting decreased fuel sales out to 2029 compared to 2019. Washington does not have a similar forecast.
- There are other state, regional and local policies and programs, such as the Oregon Clean Fuels program, Metro's Climate Smart Strategy, and TriMet's Non-Diesel Bus Plan. The purpose of these policies and programs is to shift single-occupant vehicle travel to other transportation modes; encourage more fuel-efficient vehicles and more electric vehicles; and provide more renewable fuels that can be expected to further reduce the demand for fossil fuels.
- The projections of moderate growth are found in the cargo forecasts that include liquid bulks, which are mostly petroleum products. The 2012 Portland and Vancouver Harbor Forecast Update has a high scenario of 0.7% annual growth rate and a low scenario of 0.3% annual growth rate to the year 2040. ECONorthwest (2012) found that these volumes could be accommodated without a new terminal because this forecast and analysis was for marine cargo only and in 2000, Portland terminals are estimated to have handled the 2040 volumes when the Olympic pipeline shutdown for an extended period of time.
- As of November 30, no other forecasts or projections on future demand for fossil fuels have been presented, nor has the information presented at the November 20 City Council hearing been disputed.

There is uncertainty inherent in any forecast. In this situation, there is more uncertainty because there is limited data available on throughput capacity because fossil fuel terminals and pipelines are privately owned and not required to publicly disclose information on the amount or volume of product moving through their facilities.

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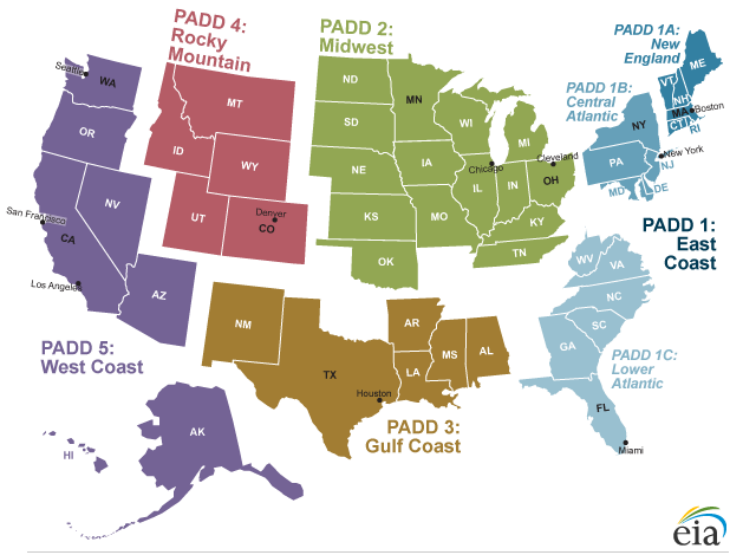
Printed on 100% post-consumer waste recycled paper.

Define the regional market
For this analysis, the "region" or "regional market" for fossil fuels is defined as the State of Oregon and parts of Southwest Washington.

The Portland FFTs serve about 90 percent of the fossil fuels consumed by the State of Oregon. Petroleum refineries in the Puget Sound area supply nearly all the petroleum fuels consumed in Oregon and Southwest Washington, delivered primarily through the Olympic Pipeline that terminates at the cluster of the 10 existing petroleum terminals in Northwest Portland. From there, petroleum products are delivered to Oregon and Southern Washington markets via truck, pipeline and barge. NW Natural supplies natural gas to its Western Oregon market area and operates peak-consumption storage terminals in Northwest Portland and Newport. Thus, fossil fuel terminals in Portland are a primary statewide distribution hub for transportation fuels and natural gas.

As part of the initial adoption of this ordinance in 2016, some terminal operators suggested using the federal PADD 5 geography to define the region. PADDs are geographic aggregations of the 50 States and the District of Columbia into five districts: PADD 5 is the West Coast (see figure). However, for the purposes of determining the regional demand for fossil fuels, the PADD 5 geography is too large. California and Washington are different markets because they are served primarily by their own facilities (Puget Sound in the case of Washington, and the Bay Area and Long Beach in the case of California). Therefore, using PADD 5 to define the region would lead to a gross overestimate of the capacity needed to serve the regional market.

States and cities by PADD for retail motor gasoline



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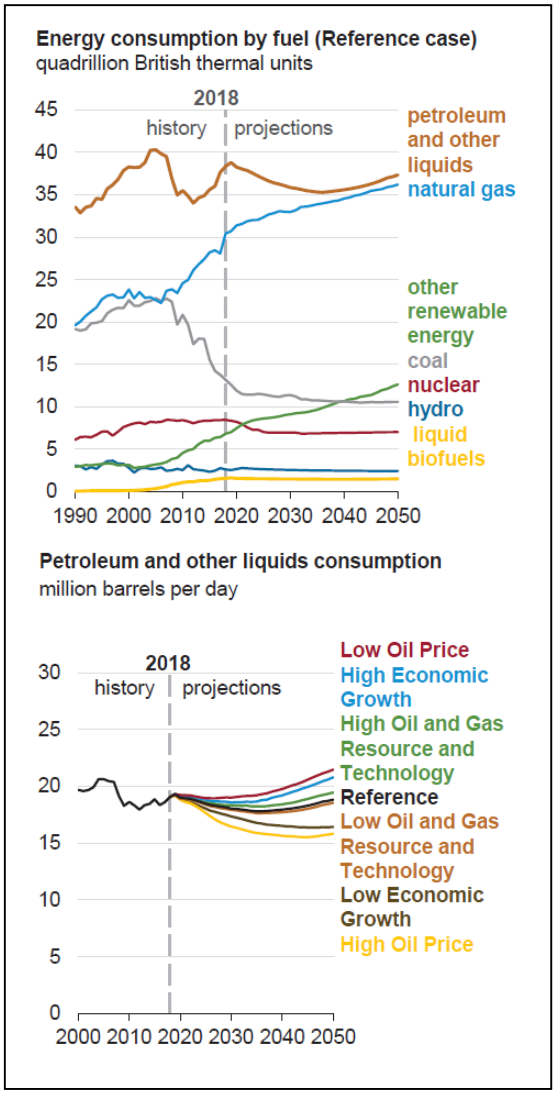
Trends Analysis and Forecasts

There are two types of forecasts that are considered in determining the future demand for fossil fuel storage facilities: 1) energy consumption or 2) marine cargo. There is a wide range of federal and state data and forecast information on the consumption and demand for fossil fuels. This memo presents data from three sources:

- US Energy Information Administration
- State of Oregon Motor Fuels (Gas Tax) Revenue Projections
- State and regional commodity flow/cargo forecasts

US Energy Information Administration (US EIA)

The US EIA presents information at the national and state level. The key finding is that although consumption of petroleum and other liquids has increased in recent years, the long-term projection anticipates declining consumption in the medium term with increases in the out years that brings the consumption back to current levels.



US EIA 2019 Annual Energy Outlook
https://www.eia.gov/outlooks/aeo/pdf/aeo2019.pdf

US Energy Information Administration produces the Annual Energy Outlook, which provides long-term energy projections. The 2019 report includes projections to 2050, and reflects current trends in energy production, delivery, and consumption technology, as well as economic and demographic trends. It includes different assumptions regarding macroeconomic growth, world oil prices, and technological progress. A key takeaway is that increasing energy efficiency across end-use sectors keeps U.S. energy consumption relatively flat, even as the U.S. economy continues to expand.

Transportation travel is measured in three ways, depending on the mode: highway

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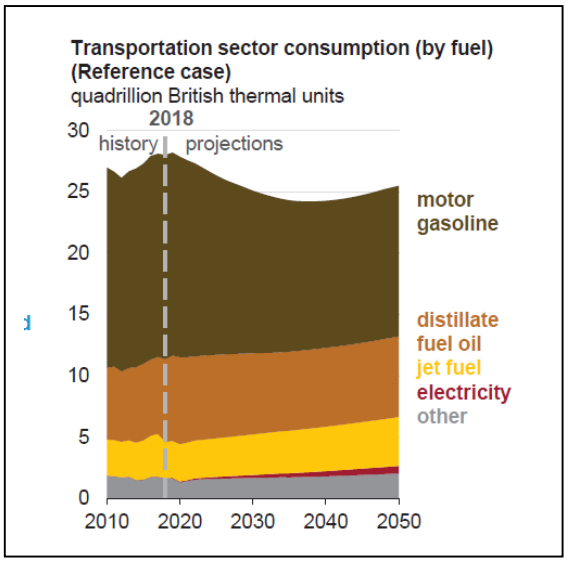
vehicle miles (light- and heavy-duty vehicles), passenger miles (bus, passenger rail, and air), and off-highway freight ton-miles (freight rail, air, and domestic shipping). The steepest decline in energy intensity is in the transportation sector, with the level of energy used per highway vehicle-mile traveled declining by 32% from 2018 to 2050 as a result of increasingly stringent fuel economy and energy efficiency standards for light- and heavy-duty vehicles.

The transportation sector is the largest consumer of petroleum and other liquids, particularly motor gasoline and distillate fuel oil. Transportation energy consumption is forecast to peak in 2019 in the Reference case because rising fuel efficiency more than offsets the effects of increases in total travel and freight movements, but this trend reverses toward the end of the projection period. Current fuel economy standards stop requiring additional efficiency increases in 2025 for light-duty vehicles and in 2027 for heavy-duty vehicles, but travel continues to rise, and as a result, consumption of petroleum and other liquids increases later in the projection period but does not exceed the amount consumed in 2018.



Increases in fuel economy standards temper growth in U.S. motor gasoline consumption, which decreases by 26% between 2018 and 2050. Increases in fuel economy standards result in heavy-duty vehicle energy consumption and related diesel use remaining at approximately the same level in 2050 as in 2018, despite rising economic activity that increases the demand of freight truck travel.

Jet fuel consumption is expected to grow, rising 35% from 2018 to 2050. This growth arises from increases in air transportation outpacing increases in aircraft fuel efficiency.

Energy use per passenger-mile of travel in light-duty vehicles declines nearly 40% between 2018 and 2050 as newer, more fuel-efficient vehicles enter the market, including both more efficient conventional gasoline vehicles and highly efficient alternatives such as battery electric vehicles. New vehicles of all fuel types show significant improvements in fuel economy because of compliance with increasing fuel economy standards. New vehicle fuel economy rises by 43% from 2018 to 2050. Light-duty vehicle energy efficiencies are affected by current federal fuel economy and greenhouse gas emission standards.

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Energy use per ton-mile of travel by freight modes decreases, led by increases in the fuel economy of heavy-duty trucks across all weight classes as the second phase of heavy-duty vehicle efficiency and greenhouse gas standards takes full effect in 2027.

Select Sources	2018	2035	2050	Annual growth 2018-2050
Gasoline	17.22	13.07	13.04	-0.9%
Jet Fuel	3.58	4.15	4.77	0.9%
Natural Gas	30.42	33.86	36.20	0.5%
Coal	13.17	10.73	10.57	-0.7%
Total	**100.13**	**99.27**	**106.55**	**0.2%**

Total US energy consumption, Reference Case, 2019 AEO Table A2
(quadrillion Btu per year)

Gains in energy efficiency offset increases in travel for passenger and freight modes. These efficiency gains decrease energy use by light-duty vehicles and freight trucks later in the projection and temper the rise in energy use by other transportation modes.
The combined share of sales attributable to gasoline and flex-fuel vehicles (which use gasoline blended with up to 85% ethanol) declines from 93% in 2018 to 75% in 2050 because of the growth in battery electric vehicle (BEV), plug-in hybrid electric vehicle (PHEV), and hybrid electric vehicle sales.

US EIA state profile and energy estimates
https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_use/tra/use_tra_OR.html&sid=OR
US EIA State Energy Data System (SEDS) is a comprehensive data set that consists of annual time series estimates of state-level energy use by major economic sectors, energy production and consumption data that are defined as consistently as possible over time and across sectors for analysis and forecasting purposes. For Oregon, the historic trend (back to 1990) shows that overall the energy consumption for all petroleum products is still below historic highs. Gasoline accounts for 63% of petroleum consumption, but since 1993 the energy estimates also includes fuel ethanol blended into motor gasoline, which makes it difficult to determine the total fossil fuel content of that fuel type.

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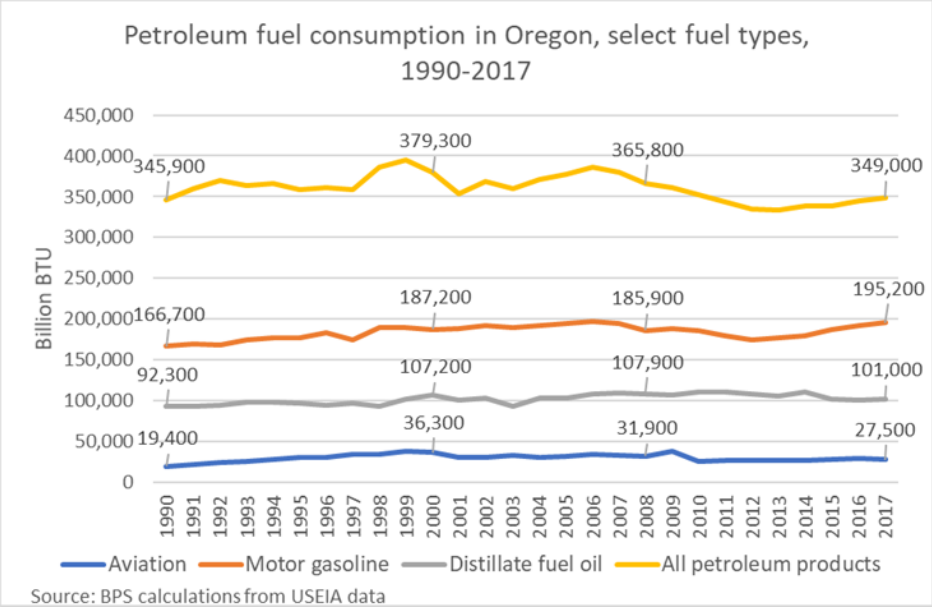
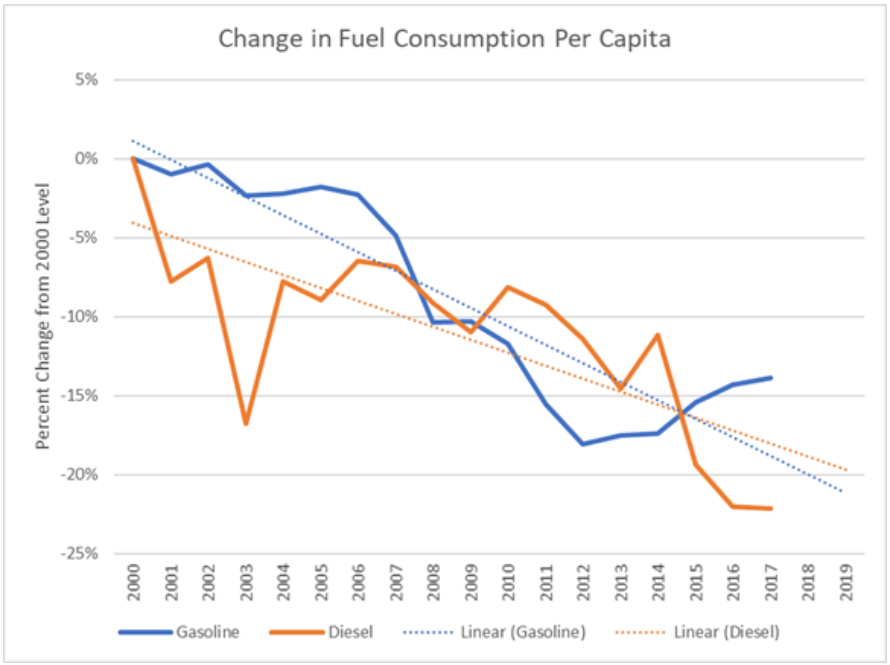


Per-person gasoline sales are down about 15% below 2000 levels. The increase in total motor gasoline consumption is largely the result of more people moving to Oregon and driving vehicles.



Source: BPS calculations from US EIA data

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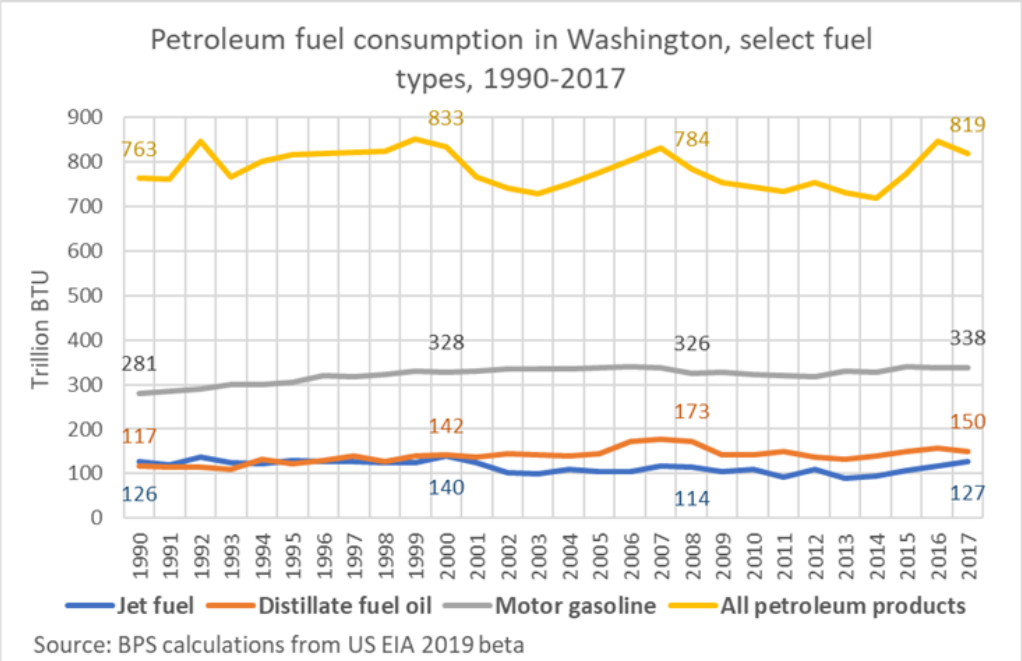
For Washington, the historic trend (back to 1990) shows that overall the energy consumption for all petroleum products is still below historic highs and similar to the Oregon trends. Gasoline accounts for 41% of petroleum consumption.



State Forecasts

Oregon Clean Fuels Program

https://www.oregon.gov/das/OEA/Documents/Clean%20Fuels%20Forecast%202019.pdf

The Clean Fuels Program helps Oregon reduce its consumption of traditional petroleum fuels. Potential fuels that could be used to achieve the standard are ethanol, biodiesel, hydrogen, electricity, natural gas, propane, and biogas. The program goal is to reduce the average carbon intensity of Oregon's transportation fuels by 10 percent by 2025.

The Office of Economic Analysis (OEA), with assistance from the Department of Environmental Quality, produces annually a short-term (2-year) forecast on fossil and alternative fuel consumption. This is a short-term forecast that uses available public and program data to develop the estimates of low-carbon fuels available to Oregon and estimated consumption of fossil and alternative fuels in Oregon.

1,708 million gallons of gasoline, including ethanol, were consumed in 2018, the most recent year of data collected. Growth projections exhibited in the Oregon Department of Transportation's December 2018 forecast equal an annualized 0.8 percent from 2018 to 2020. There were two factors considered in adjusting these initial growth parameters. First, ODOT

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observed gasoline consumption coming in lower than projected through the first two quarters of 2019. Second, the Clean Fuels Program mandated decreases in the carbon intensity targets for fossil fuels incentivize reporting parties to record supplies of fuel in the earliest year.

Table 1: Summary of fossil and alternative fuel consumption

(Mil. gallons, percent)	2018 Actual	2019 Forecast*	% change	2020 Forecast	annual %change vs 2018
Conventional Gasoline	1,535.4	1,437.0	-6.4%	1,546.3	0.4%
Ethanol	172.2	165.0	-4.2%	174.1	0.5%
Ethanol Blend Rate	10.1%	10.3%		10.1%	
Blendstock	1,707.6	1,602.0	-6.2%	1,720.4	0.4%
Fossil Diesel	718.2	705.0	-1.9%	683.2	-2.5%
Biodiesel	51.7	57.5	11.1%	52.6	0.9%
Biodiesel Blend Rate	6.7%	7.3%		6.9%	
Renewable Diesel	1.2	29.9	2370.6%	26.7	369.8%
Renew diesel Blend Rate	0.2%	3.8%		3.5%	
Total Diesel	771.2	792.3	2.7%	762.5	-0.6%
Electricity (on-road)	2.2	2.7	23.0%	3.5	25.0%
Electricity (off-road)	1.7	N/A		N/A	
Fossil Natural Gas	1.5	1.2	-17.8%	1.1	-13.6%
Biogas	1.7	2.8	62.9%	2.5	21.6%
Biogas Blend Rate	54.1%	70.0%		70.0%	
Total Natural Gas	3.2	4.0	25.8%	3.6	6.9%
Propane	0.7	1.3	72.2%	7.3	213.9%
*Forecast equals average of range published for 2019 forecast.					
On-road electricity include calculation of residential charging.					

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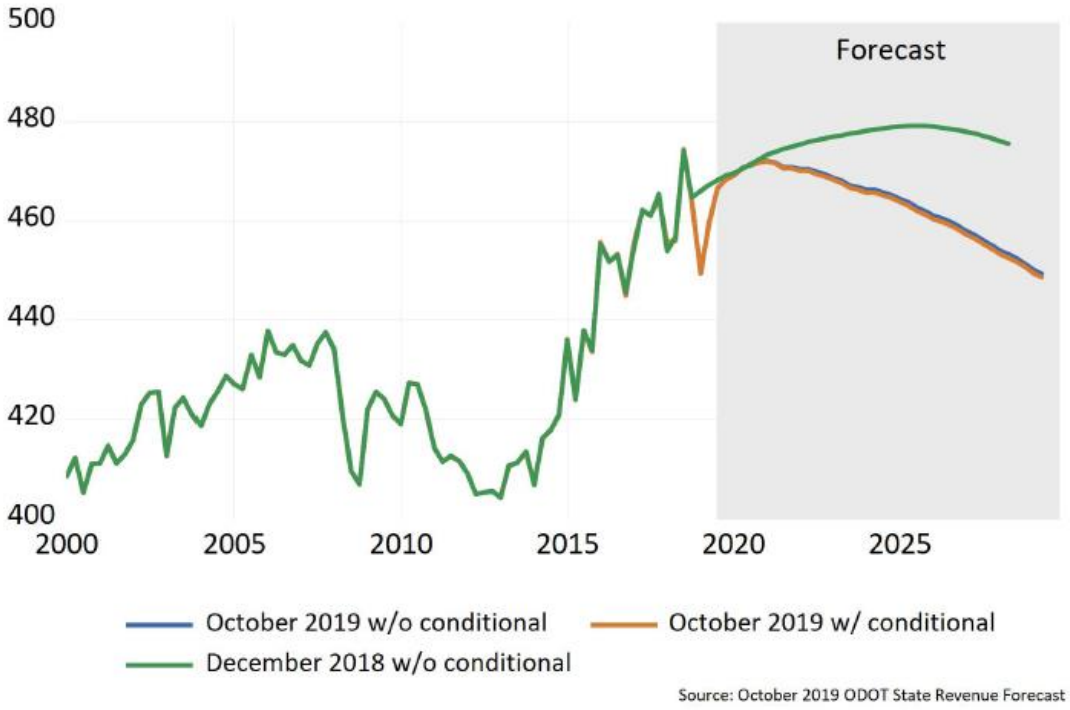
2019 ODOT Revenue Forecast
https://www.oregon.gov/ODOT/Data/Documents/October-2019-Revenue-Report.pdf
ODOT forecasts decreased fuel sales of motor fuels through the year 2029. There are three main reasons for this drop from the December 2018 forecast. First, the ODOT model variables are either all virtually unchanged from the prior forecast or changed in a way that would act as a drag on taxable fuel sales. Second, calendar year 2019 has not started off well for sales, where the first quarter was abnormally low. Third, the lower passenger stock forecast reduces the number of vehicles in the fleet, which translates into fewer gallons sold. By itself this change accounts for about half of the drop in the motor fuel taxable gallons forecast compared to the prior forecast.

Figure 19. Gallons of Taxable Motor Fuels Forecast Comparison



There is not a similar gas tax revenue or motor fuel forecast for the State of Washington.

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Commodity Flow/Cargo Forecasts

The commodity flow or cargo forecasts are estimates that are based primarily on the historic growth trends in each cargo type in the Pacific Northwest, the Portland Harbor market share, as well as regional, national, and domestic macroeconomic variables and trade patterns. The commodity flow forecasts include all modes of freight movement (air, marine, rail, truck and pipeline), whereas much of the available information is focused on the marine cargo moving through the Columbia River ports in Oregon and Washington, which only accounts for waterborne marine cargo.

- The 2011 Oregon Freight Plan has the highest growth rate of the available forecasts but is based on a core commodity forecast based on 2002 federal data and was not updated in 2017.
- More recent cargo forecasts are for marine cargo, which only accounts for a portion of the fossil fuel commodity flows (does not include fossil fuels moving by pipeline, rail, or trucks), and show lower growth rates.

The cargo/commodity flow forecasts for "liquid bulks", which are primarily petroleum products. These cargo forecasts are complicated by the fact that all the fossil fuel terminals in Portland are privately owned and operate on private land, which means cargo volumes and capacity data is not publicly available. The throughput capacity of these facilities to handle petroleum products is not known. The same is true of the Olympic Pipeline, of which there are only passing references in public documents to near capacity utilization but no data. The FFT operators have not provided any data on throughput volumes as part of this process or the original ordinance adoption. Finally, each forecast uses a different unit of measurement—metric tons, barrels, gallons, BTUs—which makes accurate comparisons difficult.

2011 Oregon Freight Plan (revised 2017)
https://www.oregon.gov/ODOT/Planning/Documents/OFP-2017-Amended.pdf
https://www.oregon.gov/ODOT/Planning/Documents/OFP-Modeling-Analysis.pdf
The Oregon Freight Plan is based on 2009 economic and commodity flow forecasts. The 2009 Oregon Commodity Flow Forecast (CFF) is a county level commodity flow forecast for truck, rail, marine, air, and pipeline modes from 2002 to 2035. The key data source for the Oregon CFF is the 2002 Freight Analysis Framework (FAF2), a national commodity flow forecast dataset published by the Federal Highway Administration (FHWA). national commodity flow forecast.

This forecast identifies three types of fossil fuel commodities:

- STCC #11 – coal
- STCC #13 – petroleum, natural gas
- STCC #29 – petroleum or coal products

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Exhibit 5: 2002-2035 Oregon Tonnage by Commodity (1000 tons, all modes)

STCC	Tonnage (1000 tons)			Growth Rate 2002-2035
	2002	2010	2035	
11 Coal	15,458	14,771	30,131	2.0%
13 Crude petroleum, natural gas, and gasoline	5,017	5,074	8,767	1.7%
29 Petroleum or coal products	32,361	34,500	54,487	1.6%

Natural gas is 100% delivered via pipeline. Natural gas imports used by Oregon (4.7M tons in 2002) are forecast to grow by 1.7% annually from 2002 to 2035.

Pipeline-delivered petroleum is imported to Oregon through the Olympic Pipeline from Washington via Portland (92%) and the Chevron Pipeline (8%) from Washington via Umatilla. The Kinder Morgan pipeline distributes petroleum from Portland to the Willamette Valley via Eugene, Oregon. Petroleum delivered by pipeline to Oregon is expected to grow by less than 0.1% from 2002 to 2035.

The Oregon Freight Plan was revised in November 2017, but the revisions did not include an update to the commodity flow forecast data.

2012 Portland and Vancouver Harbor Forecast Update (BST)
This report provides a summary update of the marine cargo forecasts for the Portland-Vancouver area from the April 2010 report, "West Hayden Island Marine Cargo Forecasts & Capacity Assessment". This update considered potential new market opportunities that were evaluated by individual ports in Oregon and Washington. Two growth scenarios were considered. The high-growth forecast included all the market opportunities under consideration. The low-growth forecast included a portion of the market opportunities as well as baseline cargo volumes.

The liquid bulk trades in the Pacific Northwest are dominated by petroleum, including crude oil and refined petroleum products. Other important commodities include chemicals, fertilizers and other liquid bulk products. One significant change that is expected to impact the flow of liquid bulk products is a shift in the source of crude oil for the Puget Sound refineries. The refineries are expected to begin receiving less crude oil by tanker from Alaska and more by rail from North Dakota, which may impact waterborne volumes. New opportunities for liquid bulk cargo are also considered; most notably LNG imports and/or exports. The liquid bulk cargo forecast remains the same for the revised 2012 forecast and the April 10, 2010 forecast.

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Table 1-6: Portland Harbor Liquid Bulk Forecast (1,000 Metric Tons)

	April 2010 Study			2012 Update	
	Low	High		Low	High
2008	6,378	6,378		6,378	6,378
2040	6,912	8,011		6,912	8,011
Compound Annual Growth Rate					
2008-2040	0.3%	0.7%		0.3%	0.7%

Source: BST Associates

Estimates of existing cargo capacity are difficult to obtain, particularly for privately owned marine terminals, like the fossil fuel terminals. ECONorthwest (2012) prepared an estimate based on historical data for total cargo volumes for the years 2000 and 2010 from the BST report and consultation with the Port of Portland to determine the estimated current capacity. For private marine terminals, the assumption was that existing facilities do not have significant excess capacity, based on the assumption that recent historical peaks are a reasonable estimate of maximum capacity. Based on a 2000 report, BST estimated that there was 8.28 million metric tons of capacity for liquid bulks. Based on that capacity estimate, ECONW found that no additional land is needed for new liquid bulk terminals in Portland through the year 2040.[1]

2015 Port of Portland Commodity Flow Forecast
https://popcdn.azureedge.net/pdfs/Trade_Trans_Studies_LCR_Cmdty_Flw_Rpt.pdf
The key data source for this forecast is the federal Freight Analysis Framework 3 (FAF3) for the Portland-Vancouver region. 2040 forecast estimated the tonnage of gasoline and other fuels to increase at a 0.7% average annual growth rate. The forecast notes that future volume will be determined by the success or failure of domestic extraction and refining of oil, and growth of alternative fuels (e.g., natural gas).

2017 Marine Cargo Forecast and Rail Capacity Analysis (BST)
https://www.washingtonports.org/mcf
BST prepared a new cargo forecast for the Washington Public Ports Association that includes the Columbia River Ports in Oregon, including Portland. The study includes forecast of trade by commodity and cargo type from 2015 through 2035.

The summary finding for liquid bulk commodity is that the source will shift. As crude oil production decreases in Alaska, northwest refineries will shift to a combination of rail, pipeline, and foreign waterborne sources. Most of the crude by rail was shipped directly to Washington refineries, but a portion was shipped to a terminal near Clatskanie, Oregon, and then barged to

[1] https://www.portlandoregon.gov/bps/article/408438

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Puget Sound. Shipments through this Oregon terminal peaked in 2014 at 9,151 railcars and then fell to 1,345 railcars in 2015. This decline was due to completion of rail unloading facilities at four of the five Puget Sound refineries.

The Lower Columbia Oregon region ports handled 3.4 million metric tons in 2015 and is projected to grow to 3.9 million tons by 2035 (0.8% per year growth). The Low case forecasts a decline (-0.6% per year growth). The High case includes new methanol facilities at St. Helens and crude-by-rail facilities in Portland and St. Helens and grows to 8.0 million tons (4.4% per year growth).

Policy Direction

The City's and the State's climate action goals call for an 80 percent and 75 percent reduction in greenhouse gas emissions by 2050, which cannot be achieved without a significant reduction in the consumption of fossil fuels. The following policies and plans help achieve these reduction goals.

State of Oregon

The Oregon State Legislature has established a goal of reducing greenhouse gas emissions 10 percent below 1990 levels by 2020 and 75 percent below 1990 levels by 2050.[2]

The Oregon Sustainable Transportation Initiative

https://www.oregon.gov/ODOT/Programs/Pages/OSTI.aspx

In 2018, the Oregon Transportation Commission adopted the Statewide Transportation Strategy, or STS, as part of the Oregon Transportation Plan. The STS, is a state-level scenario planning effort that examines all aspects of the transportation system, including the movement of people and goods, and identifies a combination of strategies to reduce greenhouse gas, or GHG, emissions. The STS identifies a variety of effective GHG emissions reduction strategies in transportation systems, vehicle and fuel technologies, and urban land use patterns. The STS Short-Term Implementation Plan identifies action items for Oregon Department of Transportation to implement in 2-5 years to help move Oregon towards achieving the STS vision. With a horizon year of 2050, implementing the STS will be an ongoing, long-term process that will likely include the development of mid-term and long-term implementation plans. The STS was developed as part of the Oregon Sustainable Transportation Initiative program.

[2] ORS 468A.205 https://www.oregonlaws.org/ors/468A.205

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Oregon Fuel Efficiency Standards
https://www.oregon.gov/ODOT/Data/Documents/December-2018-Revenue-Forecast.pdf
In 2007 legislation was passed establishing new fuel efficiency standards for light vehicles in a two-phase approach. Phase 1 impacts model year 2012-2016 vehicles setting a fuel efficiency target of 34.1 miles per gallon (MPG) by model year 2016. Phase 2 builds on this by continuing to expect improvements with each model year reaching a model year 2025 target of 54.5 MPG. The actual standard is expected to be 49.6 MPG by 2025, with the remaining 5 MPG equivalent reached through improvements in vehicle air conditioners. As the 54.5 MPG target is only required under ideal test conditions not fully representative of all driving conditions, the actual on-road average is expected to be closer to 38 MPG. Still, at a minimum this is an improvement of over 10 miles per gallon compared to the previous standards. The EPA will explore potential changes to the current standards and initiate a rulemaking process to develop new standards. Until any final rule is passed the current standards remain in place and the forecast for fuel efficiency is based on these standards.

While the new vehicle fuel economy is expected to increase rapidly over the next 10 years, fleet fuel efficiency will grow much more slowly. With Oregon's 3.6 million registered passenger vehicles, 150,000 new registrations a year, and an average vehicle age of almost 13 years, it will take time before these new, higher efficient vehicles replace the older, less fuel-efficient ones.

Oregon Clean Fuels Program
https://www.oregon.gov/das/OEA/Documents/Clean%20Fuels%20Forecast%202019.pdf
The Oregon Department of Environmental Quality (ODEQ) is implementing the Oregon Clean Fuels Program, which requires a 10 percent reduction in average carbon intensity by 2025. Oregon DMV vehicle registration data shows that about 12,951 battery electric vehicles (BEVs) and 9,094 plug-in hybrid electric vehicles (PEVs) were registered in Oregon in June 2018. The Office of Economic Analysis (OEA) projects that those numbers will rise. By 2025, Oregon's forecasted annual PEVs sales are expected to be 21% of light-duty vehicle sales.[3]

Oregon Executive Order No. 17-21 Zero Emission Vehicles
https://www.oregon.gov/gov/Documents/executive_orders/eo_17-21.pdf
The Governor issued Executive 17-21 in November 2017 committing the State to the goal of achieving 50,000 or more registered electric vehicles by 2020.

[3] 2017 DEQ CFP Illustrative Compliance Scenarios
https://www.oregon.gov/deq/Rulemaking%20Docs/CFP2017Mtg6itemA.pdf

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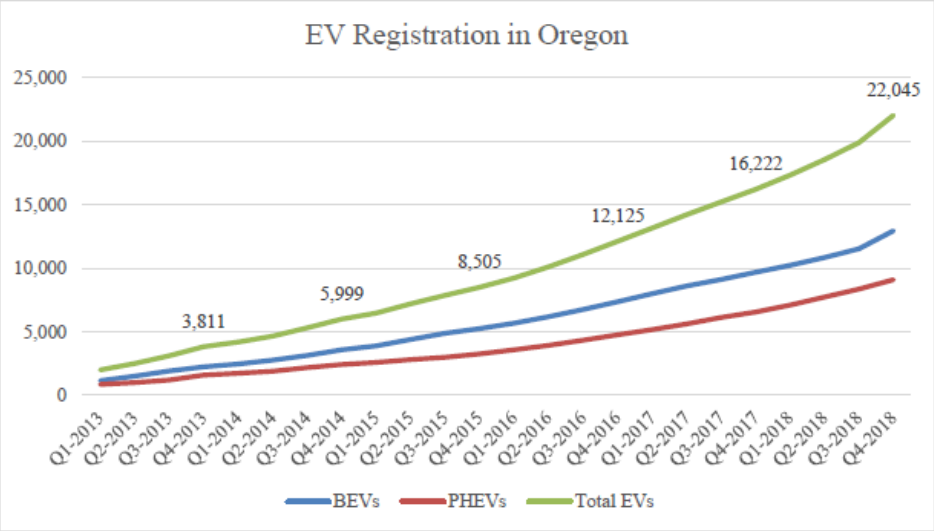

Metro

2014 Climate Smart Strategy

https://www.oregonmetro.gov/sites/default/files/2015/05/29/ClimateSmartStrategy-FinalVersion-2014.PDF

Metro Climate Smart Strategy aims to reduce the region's per capita greenhouse gas emissions from cars and light trucks at least 20 percent by 2035. The Climate Smart Strategy is a set of policies and actions to guide how the region moves forward to integrate reducing greenhouse gas emissions. The strategy relies on adopted local and regional land use and transportation plans and expected advancements in cleaner, low carbon fuels and more fuel-efficient vehicles.

2018 Regional Transportation Policy

https://www.oregonmetro.gov/regional-transportation-plan

The 2018 Regional Transportation Plan is a key tool for implementing the adopted Climate Smart Strategy and achieving a new 2040 target adopted by the Land Conservation and Development Commission in 2017. The RTP recognizes the importance of prioritizing transportation investments that help reduce greenhouse gas emissions from cars and small trucks while making our transportation system safe, reliable, healthy and affordable.

By 2040, the plan, together with advancements in fleet and technology, is expected to reduce total annual greenhouse gas emissions from passenger cars and passenger trucks by 27 percent (compared to 2015 levels) and reduce annual per capita greenhouse gas emissions from passenger cars and passenger trucks by 46 percent (compared to 2015 levels).

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Tri-Met
https://trimet.org/electricbuses/pdf/TriMet-Non-Diesel-Bus-Plan-September-2018.pdf
In 2018, TriMet's Board of Directors approved a plan for TriMet to have a clean-energy bus fleet by 2040. TriMet will use grants from the Federal Transit Administration's Low or No Emission Vehicle Program (Low-No program) and the Statewide Transportation Improvement Fund (STIF) for public transit, which can be used for the purchase of electric or natural-gas buses.

City of Portland Policy
2015 Climate Action Plan
Goal: Reduce local carbon emissions 80 percent from 1990 levels by 2050, with an interim goal of 40 percent by 2030.

As described in Section 4, lower-carbon fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, but they do not approach the goal of an 80% reduction in carbon emissions by 2050 in Portland's Climate Action Plan or the State's 75% goal. Investments in major infrastructure typically take decades to recoup, and the transition to renewables needs to go much faster than that to stabilize global emissions. The adopted code changes are consistent with the 80% goal of the Climate Action Plan by restricting development of fossil fuel terminals.

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Tom Armstrong

#62689 | December 1, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See attached updated Exhibit B Remand Report to reflect technical amendments adopted by City Council.

Testimony is presented without formatting.











Fossil Fuel Terminal Zoning Amendments

Exhibit B
Remand Report
As Amended

City of Portland, Oregon

December 1, 2019

Bureau of Planning and Sustainability
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Proposed Action

The City of Portland is considering the re-adoption of the Fossil Fuel Terminal Zoning Amendments. On December 14, 2016, the Portland City Council adopted Ordinance No. 188142 which amended the Zoning Code to create a new land use category (Bulk Fossil Fuel Terminals) with development standards to regulate the storage tank capacity. The amendments prohibited expansion of storage tank capacity at existing fuel terminals and limited new terminal development to 2 million gallons of storage tank capacity. The storage of coal at Bulk Fossil Fuel Terminals was prohibited.

The amendments allowed for the continued operation of existing terminals as a limited use in the industrial and employment zones. Terminals can continue to operate and invest in seismic and safety upgrades. The prohibition on the expansion of storage capacity included exceptions to the storage capacity limits to address issues identified in previous City Council resolutions, particularly for aviation fuels and renewable fuels.

Ordinance No. 188142 was appealed to the Oregon Land Use Board of Appeals (LUBA). In *Columbia Pacific Building Trades Council v. City of Portland*, LUBA Case No. 2017-001, LUBA reversed the Ordinance holding that the City's decision was unconstitutional; failed to demonstrate compliance with the Guild's Lake Industrial Sanctuary Plan (GLISP) and Statewide Planning Goal 12; and was not supported by an adequate factual base.

LUBA's decision was appealed to the Oregon Court of Appeals. In *Columbia Pacific Building Trades Council v. City of Portland*, 289 Or App 739 (2018), the court reversed LUBA's decision in part and affirmed in part. The Court found that the amendments are constitutional, and the City adequately demonstrated compliance with Goal 12.

The Court of Appeals decision was appealed to the Oregon Supreme Court. The Supreme Court denied review in *Columbia Pacific Building Trades Council v. City of Portland*, 363 Or 390 (2018).

On October 5, 2018, LUBA remanded Ordinance No. 188142 for City Council to demonstrate compliance with GLISP and demonstrate that the decision was supported by an adequate factual base.

The City intends to readopt the Fossil Fuel Terminal Zoning Amendments to comply with LUBA's Order. The Zoning Code amendments are similar to the changes adopted in 2016, except for a few minor adjustments to reconcile the Fossil Fuel Terminal Zoning Amendments with subsequent changes to the Zoning Code that have been adopted since 2016.

On November 20, 2019, the City Council held a public hearing on the consideration of additional evidence to ensure that the amendments are supported by an adequate factual base. Additionally, the findings will demonstrate that the amendments comply with the goals and policies in the 2035 Comprehensive Plan, which was adopted subsequent to the initial adoption of Ordinance No. 188142.

Timeline

In Resolutions 36959 and 36962, adopted in 2012, the City Council expressed opposition to coal trains traveling through Portland until a programmatic, comprehensive and area-wide Environmental Impact Statement and comprehensive Health Impact Assessment are completed.

The City's 2015 Climate Action Plan (adopted by Resolution 37135) identifies the need to establish a "fossil fuel export policy that considers lifecycle emissions, safety, economics, neighborhood livability and environmental impacts" (Climate Action Plan, action 3G, page 69). The City committed in its 2015 Climate Action Plan to advancing policy and programs to reduce local fossil fuel use both in the City's own operations and through community-wide initiatives.

Resolution 37168, adopted November 12, 2015, expressed the City Council's opposition to the "expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." It also expressed the Council's intent not to restrict improvements in safety, efficiency, or seismic resilience; the provision of service directly to end users; or infrastructure that will accelerate the transition to non-fossil fuel energy sources. The City Council also expressed support for accelerating the transition to non-fossil fuel energy sources. As part of that transition, the Oregon Department of Environmental Quality (ODEQ) is implementing the Oregon Clean Fuels Program, which requires a 10 percent reduction in average carbon intensity by 2025. Fuels that could be used to achieve the standards include ethanol, biodiesel, electricity, hydrogen, natural gas, propane, and biogas, which may require additional storage capacity. In order to facilitate implementation of the Clean Fuels Program, non-fossil fuel storage tanks are not subject to the capacity limits.

Portland's existing fossil fuel terminals

Portland's industrial districts are Oregon's largest seaport, rail hub and truck distribution center. The Northwest Industrial District in Portland is also the end of the Olympic Pipeline, which supplies most of Oregon's petroleum fuels from Puget Sound refineries. The ten petroleum terminals located in Northwest Portland are the gateway distribution facilities serving Oregon and Southern Washington markets. Additionally, NW Natural's GasCo terminal provides peak-consumption storage of natural gas for the region. In Northwest Portland, these "tank farm" storage facilities have direct access to pipeline, deep-water port, railroad and truck route infrastructure.



Figure 1. An example of petroleum terminals located in the Willbridge area of NW Portland.

Figure 2. Existing fossil fuel terminals in Northwest Portland

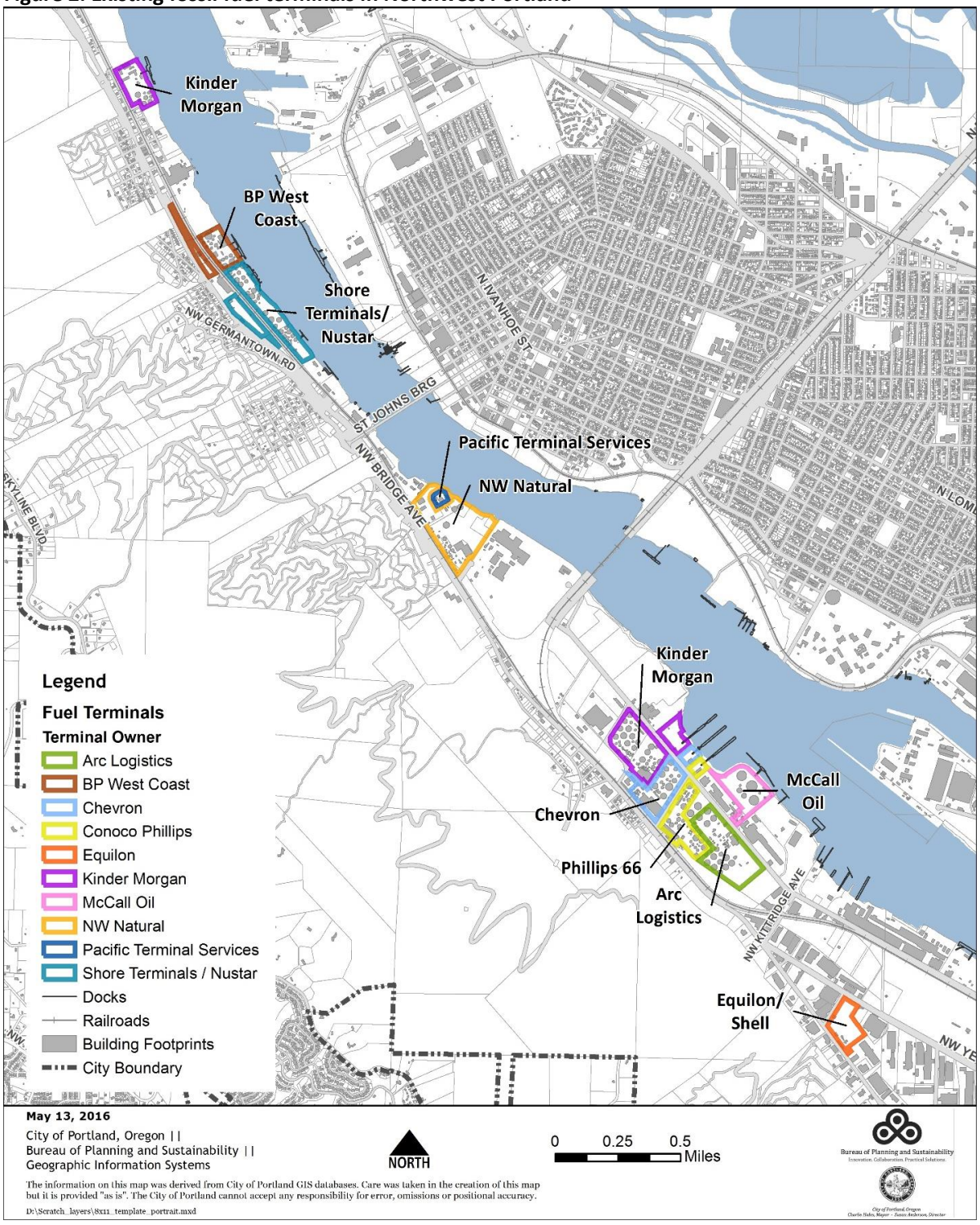


Figure 3. Estimated storage capacity at existing fossil fuel terminals

Operator	*Facility type*	*Site acres*	*Existing Storage capacity*	
Petroleum fuels			barrels	gallons
Chevron	Petroleum terminal	21	1,600,000	67,200,000
Kinder Morgan Willbridge	Petroleum terminal	33	1,551,000	65,142,000
Zenith (Arc Logistics)	Petroleum/crude oil	39	1,518,200	63,764,400
NuStar	Petroleum terminal	22	1,191,000	50,022,000
McCall Oil	Petroleum terminal	19	930,000	39,060,000
Conoco Phillips	Petroleum terminal	21	760,000	31,920,000
BP West Coast	Petroleum terminal	18	601,500	25,263,000
Kinder Morgan Linnton	Petroleum terminal	13	420,000	17,640,000
Equilon/Shell	Petroleum terminal	13	400,000	16,800,000
Pacific Terminal Services	Petroleum terminal	2	278,000	11,676,000
Total			*9,249,700*	*388,487,400*
Gaseous fuels			Dth	
NW Natural GasCo	LNG plant/terminal	41	7,500,000	

Terminology: bbls = barrels, Dth = decatherms, LNG = liquified natural gas
Sources: Oregon DEQ for petroleum tank data. NW Natural 2014 Integrated Resource Plan for existing capacity

Zoning code changes

This section of the report specifies the adopted code language, along with code commentary pages that clarify expected implementation. The section is formatted to facilitate readability, showing adopted code changes on the right-hand pages and related code commentary on the facing left-hand pages.

Commentary

Table 100-1 Open Space Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in the Open Space base zone.

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

Table 100-1 Open Space Zone Primary Uses	
Use Categories	**OS Zone**
Residential Categories	
Household Living	N
Group Living	N
Commercial Categories	
Retail Sales And Service	CU [1]
Office	N
Quick Vehicle Servicing	N
Vehicle Repair	N
Commercial Parking	N
Self-Service Storage	N
Commercial Outdoor Recreation	CU
Major Event Entertainment	N
Industrial Categories	
Manufacturing And Production	CU [6]
Warehouse And Freight Movement	N
Wholesale Sales	N
Industrial Service	N
Bulk Fossil Fuel Terminal	N
Railroad Yards	N
Waste-Related	N
Institutional Categories	
Basic Utilities	L/CU [5]
Community Service	CU [4]
Parks And Open Areas	L/CU [2]
Schools	CU
Colleges	N
Medical Centers	N
Religious Institutions	N
Daycare	CU
Other Categories	
Agriculture	L[7]
Aviation And Surface Passenger Terminals	N
Detention Facilities	N
Mining	CU
Radio Frequency Transmission Facilities	L/CU [3]
Rail Lines And Utility Corridors	CU

Y = Yes, Allowed L = Allowed, But Special Limitations CU = Conditional Use Review Required
N = No, Prohibited
Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.100.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Commentary

Table 110-1 Single-Dwelling Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in single-dwelling base zones.

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

Table 110-1 Single-Dwelling Zone Primary Uses						
Use Categories	**RF**	**R20**	**R10**	**R7**	**R5**	**R2.5**
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	CU	CU	CU	CU	CU	CU
Commercial Categories						
Retail Sales And Service	CU [10]	CU [10]	CU [10]	CU [10]	CU [10]	CU [10]
Office	N	N	N	N	N	N
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	N	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	N
Industrial Categories						
Manufacturing And Production	CU [6]	N	N	N	N	N
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	N
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]
Community Service	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]
Parks And Open Areas	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]
Schools	CU	CU	CU	CU	CU	CU
Colleges	CU	CU	CU	CU	CU	CU
Medical Centers	CU	CU	CU	CU	CU	CU
Religious Institutions	CU	CU	CU	CU	CU	CU
Daycare	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]
Other Categories						
Agriculture	L [7]	L [7]	L/CU [8]	L/CU [8]	L [9]	L [9]
Aviation And Surface Passenger Terminals	CU	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	CU	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]
Railroad Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
CU = Conditional Use Review Required
L = Allowed, But Special Limitations
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.110.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Commentary

Table 120-1 Multi-Dwelling Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in the multi-dwelling base zones.

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

Table 120-1 Multi-Dwelling Zone Primary Uses						
Use Categories	**R3**	**R2**	**R1**	**RH**	**RX**	**RMP**
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	N]
Commercial Categories						
Retail Sales And Service	L [12]	L [12]	L [12]	CU[2]	L/CU [3]	L [13]
Office	N	N	N	CU[2]	L/CU [3]	N
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	CU [4]	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	CU
Industrial Categories						
Manufacturing And Production	N	N	N	N	N	CU
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	CU
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [10]	L/CU [10]	L/CU [10]	L/CU [10]	L/CU [10]	L/CU [10]
Community Service	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [5]	L/CU [6]
Parks And Open Areas	L/CU [7]	L/CU [7]	L/CU [7]	Y	Y	L/CU [7]
Schools	CU	CU	CU	CU	L/CU [5]	CU
Colleges	CU	CU	CU	CU	CU	CU
Medical Centers	CU	CU	CU	CU	CU	CU]
Religious Institutions	CU	CU	CU	CU	CU	CU
Daycare	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	Y	L/CU [8]
Other Categories						
Agriculture	L [11]	L [11]	L [11]	L [11]	L [11]	L [11]
Aviation And Surface Passenger Terminals	N	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]
Rail Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.120.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Commentary

Table 130-1 Commercial/Mixed Use Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in the commercial/mixed use base zones.

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

Table 130-1
Commercial/Mixed Use Zone Primary Uses

Use Categories	CR	CM1	CM2	CM3	CE	CX
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]
Commercial Categories						
Retail Sales And Service	L [2]	L [2]	Y	Y	Y	Y
Office	L [2]	L [2]	Y	Y	Y	Y
Quick Vehicle Servicing	N	L [2]	L [2]	L [2]	Y	N
Vehicle Repair	N	N	Y	Y	Y	L [5]
Commercial Parking	N	N	L [9]	L [9]	Y	CU [9]
Self-Service Storage	N	N	N	L [4]	L [4]	L [4]
Commercial Outdoor Recreation	N	N	Y	Y	Y	Y
Major Event Entertainment	N	N	CU	CU	CU	Y
Industrial Categories						
Manufacturing and Production	N	L/CU [3,5]	L/CU [3,5]	L/CU [3,5]	L/CU [3,5]	L/CU [3,5]
Warehouse and Freight Movement	N	N	N	L [3,5]	L [3,5]	N
Wholesale Sales	N	N	L [3,5]	L [3,5]	L [3,5]	L [3,5]
Industrial Service	N	N	CU [3,5]	CU [3,5]	CU [3,5]	CU [3,5]
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	Y/CU [8]	Y/CU [8]	Y/CU [8]	Y/CU [8]	Y/CU [8]	Y/CU [8]
Community Service	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]
Parks and Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	Y	Y	Y
Colleges	N	Y	Y	Y	Y	Y
Medical Centers	N	Y	Y	Y	Y	Y
Religious Institutions	Y	Y	Y	Y	Y	Y
Daycare	Y	Y	Y	Y	Y	Y
Other Categories						
Agriculture	L [10]	L [10]	L/CU [11]	L/CU [12]	L/CU [12]	L/CU [11]
Aviation and Surface Passenger Terminals	N	N	N	N	CU	CU
Detention Facilities	N	N	N	CU	CU	CU
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	N	L/CU [7]	L/CU [7]	L/CU [7]	L/CU [7]	L/CU [7]
Rail Lines and Utility Corridors	N	CU	CU	CU	CU	CU
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	N	L/CU [7]	L/CU [7]	L/CU [7]	L/CU [7]	L/CU [7]
Rail Lines and Utility Corridors	N	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.130.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Commentary

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

33.140 Employment and Industrial Zones

140

Sections:

General

33.140.010 General Purpose of the Zones
33.140.020 List of the Employment and Industrial Zones
33.140.030 Characteristics of the Zones
33.140.040 Other Zoning Regulations
33.140.050 Neighborhood Contact in EG and I Zones
33.140.055 Neighborhood Contact in EX Zone

Use Regulations

33.140.100 Primary Uses
33.140.110 Accessory Uses
33.140.130 Nuisance-Related Impacts
33.140.140 On-Site Waste Disposal

Site Development Standards

33.140.200 Lot Size
33.140.205 Floor Area Ratio
33.140.210 Height
33.140.215 Setbacks
33.140.220 Building Coverage
33.140.225 Landscaped Areas
33.140.227 Trees
33.140.230 Ground Floor Windows in the EX Zones
33.140.235 Screening
33.140.240 Pedestrian Standards
33.140.242 Transit Street Main Entrance
33.140.245 Exterior Display, Storage, and Work Activities
33.140.250 Trucks and Equipment
33.140.255 Drive-Through Facilities
33.140.265 Residential Development
33.140.270 Detached Accessory Structures
33.140.275 Fences
33.140.280 Demolitions
33.140.290 Nonconforming Development
33.140.295 Parking and Loading
33.140.300 Signs
33.140.310 Superblock Requirements
33.140.315 Recycling Areas

Commentary

33.140.050 Neighborhood Contact

As an alternative to a land use review, a public notice and meeting requirement applies to development of fuel storage structure, such as a new tank, at a Bulk Fossil Fuel Terminal, similar to the requirement for multi-dwelling residential development. This notice and meeting would create public awareness about the project and serve to discuss a proposal in an informal basis.

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

33.140.050 Neighborhood Contact in EG and I Zones

A. Purpose. Neighborhood contact is required when a new storage structure for any type of fuel will be built on a Bulk Fossil Fuel Terminal because of the impacts that fuel projects can have on the surrounding community.

B. Neighborhood contact requirement. Proposals meeting the following conditions are subject to the neighborhood contact requirement steps of 33.705.020.B., Neighborhood Contact II. All of the steps in 33.705.020.B. must be completed before an application for a building permit can be submitted:

1. The proposed development has not been subject to a land use review; and

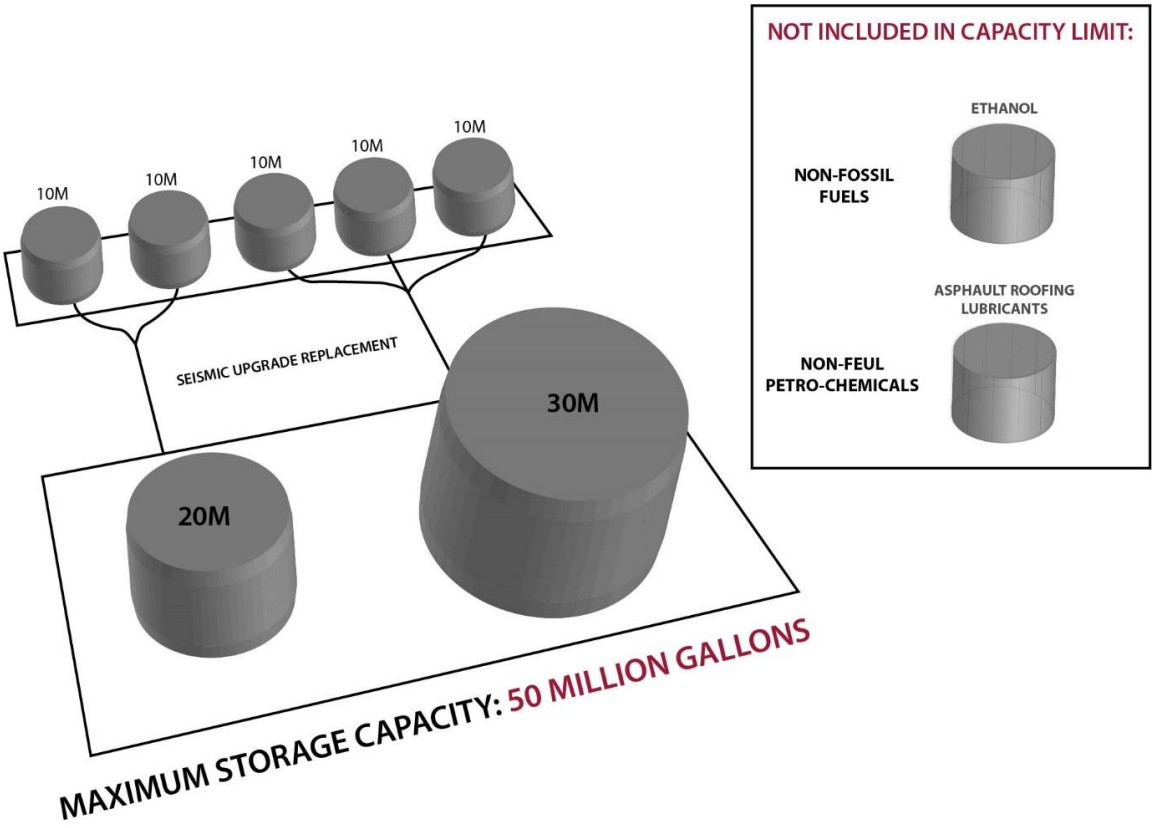
2. The proposed development includes at least one new structure for the storage of any type of fuel on a site with a Bulk Fossil Fuel Terminal use.

Commentary

33.140.100 Primary Uses

The amendments to this section reflect changes to prohibit new Bulk Fossil Fuel Terminals in the employment and industrial base zones and reclassify existing terminals as limited uses. Regulation of Bulk Fossil Fuel Terminals implements policy direction in City of Portland Resolution 37168 (adopted November 2015) and, 2035 Comprehensive Plan Policies 4.79, 4.81, 4.82, 6.48, and 7.14 which address reducing natural hazard risks and fossil fuel distribution and storage facilities.

The limited use designation prohibits expansion of fossil fuel tank capacity at existing Bulk Fossil Fuel Terminals, but allows for the replacement and reconfiguration of existing fossil fuel tank capacity as of the date of adoption as a way to facilitate seismic and safety upgrades.



Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

33.140.100 Primary Uses

A. No change

B. Limited uses. Uses allowed that are subject to limitations are listed in Table 140-1 with an "L". These uses are allowed if they comply with the limitations listed below and the development standards and other regulations of this Title. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters. The paragraphs listed below contain the limitations and correspond with the footnote numbers from Table 140-1.

1. – 16. No change

17. Bulk Fossil Fuel Terminals. This regulation applies to all parts of Table 140-1 that have a [17].

a. Existing Bulk Fossil Fuel Terminals. Bulk Fossil Fuel Terminals that existed on [insert effective date] are allowed, but the total amount of fossil fuel that can be stored on the site in storage tanks is limited to the fossil fuel storage tank capacity that existed on [insert effective date]. Total fossil fuel storage tank capacity on the site in excess of the capacity that existed on [insert effective date] is prohibited. Storing coal on the site is prohibited.

b. New Bulk Fossil Fuel Terminals are prohibited.

Commentary

Table 140-1 Employment and Industrial Zone Primary Uses

The amendments to this section reflect changes to prohibit new Bulk Fossil Fuel Terminals in all employment and industrial base zones and reclassify existing terminals as limited uses.

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

Table 140-1
Employment and Industrial Zone Primary Uses

Use Categories	EG1	EG2	EX	IG1	IG2	IH
Residential Categories						
Household Living	N	N	Y	CU [1]	CU [1]	CU [1]
Group Living	N	N	L/CU [2]	N	N	N
Commercial Categories						
Retail Sales And Service	L/CU [3]	L/CU [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Office	Y	Y	Y	L/CU [4]	L/CU [5]	L/CU [6]
Quick Vehicle Servicing	Y	Y	N	Y	Y	Y
Vehicle Repair	Y	Y	Y	Y	Y	Y
Commercial Parking	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]
Self-Service Storage	Y	Y	L [7]	Y	Y	Y
Commercial Outdoor Recreation	Y	Y	Y	CU	CU	CU
Major Event Entertainment	CU	CU	CU	CU	CU	CU
Industrial Categories						
Manufacturing And Production	Y	Y	Y	Y	Y	Y
Warehouse And Freight Movement	Y	Y	Y	Y	Y	Y
Wholesale Sales	Y	Y	Y	Y	Y	Y
Industrial Service	Y	Y	Y	Y	Y	Y
Bulk Fossil Fuel Terminal	L [17]	L [17]	N	L [17]	L [17]	L [17]
Railroad Yards	N	N	N	Y	Y	Y
Waste-Related	N	N	N	L/CU [8]	L/CU [8]	L/CU [8]
Institutional Categories						
Basic Utilities	Y/CU [12]	Y/CU [12]	Y/CU [12]	Y/CU [13]	Y/CU [13]	Y/CU 13]
Community Service	L/CU [9]	L/CU [9]	L/CU [10]	L/CU [11]	L/CU [11]	L/CU [11]
Parks And Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	N	N	N
Colleges	Y	Y	Y	N	N	N
Medical Centers	Y	Y	Y	N	N	N
Religious Institutions	Y	Y	Y	N	N	N
Daycare	Y	Y	Y	L/CU [11]	L/CU 11]	L/CU 11]
Other Categories						
Agriculture	L [16]	L [16]	L [16]	L [16]	L [16]	L [16]
Aviation And Surface Passenger Terminals	CU	CU	CU	CU	CU	CU
Detention Facilities	CU	CU	CU	CU	CU	CU
Mining	N	N	N	CU	CU	CU
Radio Frequency Transmission Facilities	L/CU [14]	L/CU [14]	L/CU [14]	L/CU [14]	L/CU 14]	L/CU 14]
Rail Lines And Utility Corridors	Y	Y	Y	Y	Y	Y

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.140.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Commentary

Table 150-1 Campus Institutional Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in the campus institutional base zones.

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

Table 150-1 Campus Institutional Zone Primary Uses			
Use Categories	**CI1**	**CI2**	**IR**
Residential Categories			
Household Living	N	Y	Y
Group Living	N	Y	Y [9]
Commercial Categories			
Retail Sales And Service	CU [1]	Y	L/CU [10]
Office	N	Y	L/CU [10]
Quick Vehicle Servicing	N	N	N
Vehicle Repair	N	N	N
Commercial Parking	N	Y	N
Self-Service Storage	N	N	N
Commercial Outdoor Recreation	N	N	N
Major Event Entertainment	CU	CU	CU
Industrial Categories			
Manufacturing And Production	L [2]	L/CU [2]	N
Warehouse And Freight Movement	N	N	CU
Wholesale Sales	N	N	N
Industrial Service	L [2]	L/CU [2]	N
Bulk Fossil Fuel Terminal	N	N	N
Railroad Yards	N	N	CU
Waste-Related	N	N	N
Institutional Categories			
Basic Utilities	L/CU [3]	L/CU [3]	L/CU [3]
Community Service	CU [4]	Y	CU [4]
Parks And Open Areas	L/CU [5]	L/CU [5]	L/CU [5]
Schools	N	N	L/CU [11]
Colleges	Y/CU [6]	Y/CU [6]	L/CU [11]
Medical Centers	Y	Y	L/CU [11]
Religious Institutions	CU	CU	CU
Daycare	Y	Y	L/CU [12]
Other Categories			
Agriculture	L [7]	L [7]	L [7]
Aviation And Surface Passenger Terminals	N	N	N
Detention Facilities	N	N	N
Mining	N	N	N
Radio Frequency Transmission Facilities	L/CU [8]	L/CU [8]	L/CU [8]
Rail Lines And Utility Corridors	CU	CU	CU

Y = Yes, Allowed
CU = Conditional Use Review Required
L = Allowed, But Special Limitations
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.150.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Commentary

33.730 Quasi-Judicial Procedures

The following amendments correct a mistake that was made as part of the recently adopted Neighborhood Contact Update project. The Neighborhood Contact Update project simplified, clarified and made the existing neighborhood contact requirements more effective. The only existing neighborhood contact requirement in the EG and I zones is a requirement related to development of new fuel storage tanks on fossil fuel terminals. In keeping with the policy direction of the project (clarify the exisiting rules), the Neighborhood Contact Update project did not add neighborhood contact requirements for development other than fuel tanks in the EG or I zones. However, an exemption for development in EG and I zones was inadvertently left out of the code that details the neighborhood contact steps for a land use review. The following amendments add that exemption.

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

33.730 Quasi-Judicial Procedures

730

33.730.013 Expedited Land Division Procedure

The Expedited Land Division (ELD) procedure provides an alternative to the standard procedures for some land divisions. The applicant may choose to use the ELD process if the land division request meets all of the elements specified in ORS 197.360. The steps of this procedure are in ORS 197.365 through .375. The application requirements are listed in Section 33.730.060, below. Two additional steps are required for land division requests using the ELD Procedure:

A. Neighborhood contact.

1. When the ELD includes four to ten lots, the applicant is required to meet the neighborhood contact requirements specified in 33.705.020.A., Neighborhood contact I. If the proposed expedited land division is in an EG or I zone, it is exempt from the neighborhood contact requirements.
2. When the ELD includes eleven or more lots, the applicant is required to meet the neighborhood contact requirements specified in 33.705.020.B., Neighborhood contact II. If the proposed expedited land division is in the EG1, EG2, or an I zone, it is exempt from the neighborhood contact requirements.

B. Pre-application conference. A pre-application conference is required for all land division requests processed through the ELD procedure. See 33.730.050, Pre-Application Conference. The pre-application conference must be held before applying for an ELD review.

33.730.014 Type I Procedure

The Type I procedure is an administrative process with public notice but no hearing.

A. Pre-application conferences. A pre-application conference is not required.

B. Neighborhood contact.

1. When the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

Commentary

2. When the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.725.020.B., Neighborhood contact II, are required. If the proposed development is in the EG1 , EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

C.-H.[No change]

33.730.015 Type Ix Procedure
The Type Ix procedure is an administrative process with public notice but no hearing.

A. Pre-application conferences. A pre-application conference is optional.

B. Neighborhood contact.

1. When the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

2. When the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.705.020.B., Neighborhood contact II, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

C.-H.[No change]

33.730.020 Type II Procedure
The Type II procedure is an administrative process, with the opportunity to appeal the Director of BDS's decision to another review body.

A. Pre-application conference. A pre-application conference is optional unless it is a specific requirement of a review. See 33.730.050, Pre-Application Conference.

B. Neighborhood contact.

1. When the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site and no portion of the site is in the Design overlay zone, the neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

Commentary

2. When the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site and no portion of the site is in the Design overlay zone, the neighborhood contact steps of 33.705.020.B., Neighborhood contact II, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

3. When the proposed development associated with the land use review will result in the addition of more than 10,000 square feet of net building area to the site and the site is in the Design overlay zone, the neighborhood contact steps of 33.705.020.C, Neighborhood contact III, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

C.-J. [No change]

33.730.025 Type IIx Procedure

The Type IIx procedure is an administrative process, with the opportunity to appeal the Director of BDS's decision to another review body.

A. Pre-application conference. A pre-application conference is optional. See 33.730.050, Pre-Application Conference.

B. Neighborhood contact.

1. The neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required when:

   a. The application is for a land division that includes four to ten lots; or

   b. The application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

2. When the application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.705.020.B., Neighborhood contact II, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

C.-J. [No change]

Commentary

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

33.730.030 Type III Procedure

A Type III procedure requires a public hearing before an assigned review body. Subsections A through E~~D~~ apply to all sites. If the site is within the City of Portland, Subsections F~~E~~ through I~~H~~ also apply. If the site is in the portion of unincorporated Multnomah County that is subject to City zoning, Subsection J~~I~~ also applies.

A. Pre-application conference. A pre-application conference is required for all requests processed through a Type III procedure. See 33.730.050, Pre-Application Conference.

B. Neighborhood contact.

1. The neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required when:
   a. The application is for a land division that includes four to ten lots and does not include an environmental review; or
   b. The application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site and no portion of the site is in the Design overlay zone. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.
2. The neighborhood contact steps of 33.705.020.B., Neighborhood contact II, are required when:
   a. The application is for a land division that includes eleven or more lots and does not include an environmental review; or
   b. The application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site and no portion of the site is in the Design overlay zone. If the proposed development is in the EG1, EG2, or an I zone, or it was subject to a building permit process, it is exempt from the neighborhood contact requirements.
3. The neighborhood contact steps of 33.705.020.C., Neighborhood contact III, are required when:
   a. The application is for a land division that includes an environmental review; or
   b. The application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of more than 10,000 square feet of net building area to the site and the site is in the Design overlay zone. If the proposed development is in the EG1, EG2, or an I zone it is exempt from the neighborhood contact requirements.

Commentary

33.910.030 Definitions

The definition of fossil fuels was added to clarify the land use category Bulk Fossil Fuel Terminals.

Petrochemicals that are used primarily for non-fuel products are excluded, such as asphalt, plastics, lubricants, fertilizer, roofing, and paints. However, methanol is an exception that is included as a fossil fuel, because large methanol storage and distribution facilities tend to have structural similarities to liquid natural gas (LNG) and liquid petroleum gas (LPG) terminals, including large-scale storage and gas pipeline access, and because they can have similar safety and climate impacts.

Fuels containing 5% or less fossil-fuel volume are not considered fossil fuels under this definition. For example, "pure" ethanol made from corn or other non-fossil source is required by the Alcohol and Tobacco Tax and Trade Bureau to be denatured in order to be transported to the site. Denatured ethanol typically contains up to 5% methanol, so that it is toxic and undrinkable.

Some fossil fuels under this definition are also classified as "renewable fuels" in the federal Renewable Fuel Standard and "clean fuels" in Oregon's Clean Fuel Standard, such as liquid natural gas and liquid propane gas. These federal and state standards require transportation fuel sold within their jurisdiction to contain a minimum volume of renewable or clean fuels. Renewable or clean fuels with more than 5 percent fossil fuel volume are defined as fossil fuels.

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

33.910.030 Definitions
The definition of words with specific meaning in the zoning code are as follows:

Fossil Fuel. Fossil fuels are petroleum products (such as crude oil and gasoline), coal, methanol, and gaseous fuels (such as natural gas and propane) that are made from decayed plants and animals that lived millions of years ago and are used as a source of energy. Denatured ethanol and similar fuel additives with less than 5 percent fossil fuel content, biodiesel/renewable diesel with less than 5 percent fossil fuel content, and petroleum-based products used primarily for non-fuel uses (such as asphalt, plastics, lubricants, fertilizer, roofing, and paints) are not fossil fuels.

Commentary

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

33.920 Descriptions of the Use Categories

920

Sections:

Introduction to the Use Categories
- 33.920.010 Purpose
- 33.920.020 Category Titles
- 33.920.030 Classification of Uses

Residential Use Categories
- 33.920.100 Group Living
- 33.920.110 Household Living

Commercial Use Categories
- 33.920.200 Commercial Outdoor Recreation
- 33.920.210 Commercial Parking
- 33.920.220 Quick Vehicle Servicing
- 33.920.230 Major Event Entertainment
- 33.920.240 Office
- 33.920.250 Retail Sales And Service
- 33.920 260 Self-Service Storage
- 33.920.270 Vehicle Repair

Industrial Use Categories
- 33.920.300 Bulk Fossil Fuel Terminal
- 33.920.310~~300~~ Industrial Service
- 33.920.320~~310~~ Manufacturing And Production
- 33.920.330~~320~~ Railroad Yards
- 33.920.340~~330~~ Warehouse And Freight Movement
- 33.920.350~~340~~ Waste-Related
- 33.920.360~~350~~ Wholesale Sales

Institutional Use Categories
- 33.920.400 Basic Utilities
- 33.920.410 Colleges
- 33.920.420 Community Service
- 33.920.430 Daycare
- 33.920.450 Medical Centers
- 33.920.460 Parks And Open Areas
- 33.920.470 Religious Institutions
- 33.920.480 Schools

Other Use Categories
- 33.920.500 Agriculture
- 33.920.510 Aviation And Surface Passenger Terminals
- 33.920.520 Detention Facilities
- 33.920.530 Mining
- 33.920.540 Radio Frequency Transmission Facilities
- 33.920.550 Rail Lines And Utility Corridors

Commentary

33.920.300 Bulk Fossil Fuel Terminal

Bulk Fossil Fuel Terminals are added as a new land use category to regulate their development in the Zoning Code. Regulation of Bulk Fossil Fuel Terminals implements policy direction in City of Portland Resolution 37168 and 2035 Comprehensive Plan Policies 4.79, 4.81, 4.82, 6.48, and 7.14 which address reducing natural hazard risks and fossil fuel distribution and storage facilities.

Bulk Fossil Fuel Terminals are characterized by having (1) marine, pipeline or railroad transport access and (2) either trans-loading facilities for transferring a shipment between transport modes (such as from rail to ship) or bulk storage facilities exceeding 2 million gallons of fossil fuels. The 2-million-gallon threshold is sized to include facilities that are large enough to unload unit trains. Functionally, these terminals tend to be regional gateway facilities, where fossil fuels enter and exit the region.

The use description is clarified with criteria that are intended to prevent the aggregation of new facilities smaller than 2 million gallons on adjacent sites into a larger terminal that could effectively circumvent the terminal storage capacity threshold.

Resolution 37168 lists a specific exception to not restrict service directly to end users. At a small scale, services to end users include retail gasoline filling stations, natural gas access lines in street right-of-way to residential and business customers, and heating oil tanks at home sites. Larger scale end users with fossil fuel storage and access infrastructure also include manufacturers, jet fuel facilities for PDX Airport, vessel fuel facilities on Portland Harbor, and others, where fossil fuels are used as an input.

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

33.920.300 Bulk Fossil Fuel Terminal

A. Characteristics. Bulk Fossil Fuel Terminals are establishments primarily engaged in the transport and bulk storage of fossil fuels. Terminal activities may also include fuel blending, regional distribution, and wholesaling. The firms rely on access by marine, railroad, or regional pipeline to transport fuels to or from the site, and either have transloading facilities for transferring a shipment between transport modes, or have storage capacity exceeding 2 million gallons for fossil fuels. There is minimal on-site sales activity with the customer present.

B. Accessory uses. Accessory uses may include retail sales of petroleum products, offices, food membership distribution, parking, storage, truck fleet parking and maintenance areas, rail spur or lead lines, and docks.

C. Examples. Examples include crude oil terminals, petroleum products terminals, natural gas terminals, propane terminals, and coal terminals.

D. Exceptions.

1. Truck or marine freight terminals that do not store, transport or distribute fossil fuels are classified as Warehouse And Freight Movement uses.
2. Truck or marine freight terminals that do not have transloading facilities and have storage capacity of 2 million gallons or less are classified as Warehouse And Freight Movement uses. However, multiple fossil fuel facilities, each with 2 million gallons of fossil fuel storage capacity or less but cumulatively having a fossil fuel storage capacity in excess of 2 million gallons, located on separate parcels of land will be classified as a Bulk Fossil Fuel Terminal when two or more of the following factors are present:
   a. The facilities are located or will be located on one or more adjacent parcels of land. Adjacent includes separated by a shared right-of-way;
   b. The facilities share or will share operating facilities such as driveways, parking, piping, or storage facilities; or
   c. The facilities are owned or operated by a single parent partnership or corporation.
3. Gasoline stations and other retail sales of fossil fuels are not Bulk Fossil Fuel Terminals.
4. Distributors and wholesalers that receive and deliver fossil fuels exclusively by truck are not Bulk Fossil Fuel Terminals.
5. Industrial, commercial, institutional, and agricultural firms that exclusively store fossil fuel for use as an input are not Bulk Fossil Fuel Terminals.
6. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.
7. The storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, drydock, ship or barge servicing facility, rail yard, or as part of a fleet vehicle servicing facility are not Bulk Fossil Fuel Terminals.
8. Uses that recover or reprocess used petroleum products are not Bulk Fossil Fuel Terminals.

Commentary

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

33.920.310~~300~~ Industrial Service

33.920.320~~310~~ Manufacturing And Production

33.920.330~~320~~ Railroad Yards

33.920.340~~330~~ Warehouse And Freight Movement

A. Characteristics. Warehouse And Freight Movement firms are involved in the storage, or movement of goods for themselves or other firms. Goods are generally delivered to other firms or the final consumer, except for some will-call pickups. There is little on-site sales activity with the customer present.

B. Accessory uses. Accessory uses may include offices, food membership distribution, truck fleet parking and maintenance areas, rail spur or lead lines, docks, and repackaging of goods.

C. Examples. Examples include separate warehouses used by retail stores such as furniture and appliance stores; household moving and general freight storage; cold storage plants, including frozen food lockers; storage of weapons and ammunition; major wholesale distribution centers; truck, marine, or air freight terminals; bus barns and light rail barns; parcel services; major post offices; grain terminals; and the stockpiling of sand, gravel, or other aggregate materials.

D. Exceptions.

1. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.
2. Miniwarehouses are classified as Self-Service Storage uses.
3. Establishments that engage in the transfer or storage of fossil fuels, rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities or have storage capacity exceeding 2 million gallons for fossil fuels are classified as Bulk Fossil Fuel Terminal uses.

33.920.350~~340~~ Waste-Related

33.920.360~~350~~ Wholesale Sales

A. Characteristics. Wholesale Sales firms are involved in the sale, lease, or rent of products primarily intended for industrial, institutional, or commercial businesses. The uses emphasize on-site sales or order taking and often include display areas. Businesses may or may not be open to the general public, but sales to the general public are limited as a result of the way in which the firm operates. Products may be picked up on site or delivered to the customer.

B. Accessory uses. Accessory uses may include offices, food membership distribution, product repair, warehouses, parking, minor fabrication services, and repackaging of goods.

C. Examples. Examples include sale or rental of machinery, equipment, heavy trucks, building materials, special trade tools, welding supplies, machine parts, electrical supplies, janitorial supplies, restaurant equipment, and store fixtures; mail order houses; and wholesalers of food, clothing, auto parts, building hardware, and office supplies.

Commentary

Language to be **added** is underlined
Language to be **deleted** is shown in ~~strikethrough~~

D. Exceptions.

1. Firms that engage primarily in sales to the general public are classified as Retail Sales And Service.
2. Firms that engage in sales on a membership basis are classified as either Retail Sales And Service or Wholesale Sales, based on a consideration of the characteristics of the use.
3. Firms that are primarily storing goods with little on-site business activity are classified as Warehouse And Freight Movement.
4. Establishments that engage in the regional wholesaling of fossil fuels, rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities or have storage capacity exceeding 2 million gallons for fossil fuels are classified as Bulk Fossil Fuel Terminal uses.

Tom Armstrong

#62688 | December 1, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See attached BPS memo rebutting selected written testimony

Testimony is presented without formatting.

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.

MEMO

DATE: December 1, 2019

TO: Mayor Ted Wheeler
Portland City Council

FROM: Tom Armstrong, Supervising Planner

SUBJECT: Fossil Fuel Terminal Zoning (FTTZ) Amendments
Response to Industry and Business Testimony

There are five significant pieces of written testimony submitted by industry and business groups in opposition to the ordinance. In general, the testimony contains unsupported assertions that do not have sufficient supporting details or evidence. It is not the City's responsibility to presume or substitute our interpretation of these assertions. However, the following is a rebuttal to the key points in the testimony.

PBA OBI WWC Trades Council

1. No substantive changes to code amendments made in response to legal decisions.
   No substantive changes are required by the legal decisions. The assignment of errors are a lack evidence to support the decision, not the code itself. The purpose of this ordinance is to provide additional findings, including findings that address the goals and policies in the 2035 Comprehensive Plan, to support the decision and confirm that the decision is supported by an adequate factual base. The evidentiary record from the first decision is incorporated by reference and supplemented by additional evidence provided by BPS staff, the testimony Council received at the November 20 hearing and the written testimony received by December 2.

2. No public involvement in remand process. Need a collaborative approach.
   The City does not have adopted code or policies for how to respond to a remand decision. Given the extensive public process that happened as part of the initial adoption of the ordinance in 2016 and that no substantive changes are required to address the remand issues, it was appropriate to bring the item directly back to City Council. A legislative notice was sent to the standing list of interested parties, the owners of the existing terminals, and the parties to the appeals. Parties participated in City Council deliberations. Unfortunately, the opponents to the

ordinance only submitted written testimony and failed to appear at the November 20 hearing, so City Council was unable to engage in a discussion about how to achieve common goals. City Council can consider their process concerns and decide to re-open this ordinance for more discussion and deliberation.

3. It would hurt the local economy.
   This unsupported assertion provides no details or explanation as to how this ordinance will hurt the local economy. BPS staff provided evidence in the Council presentation and the written record that demonstrates the ordinance has been narrowly written to minimize impacts to the existing fossil fuel terminals (FFTs), while limiting risk from future natural hazards.

4. It will hinder climate and safety goals.
   This unsupported assertion provides no details or explanation as to how this ordinance will hinder climate or safety goals. BPS staff provided evidence in the Council presentation and the written record that demonstrates the ordinance has been narrowly written to support climate goals. Specifically, the ordinance exempts new storage capacity for non-fossil, renewable fuels and designates the existing FFTs as a limited use to allow those businesses to continue to operate and make safety improvements.

5. Consider the carbon emissions from transportation methods to meet local and regional demand. The current proposal would likely force fuels of all kinds to be transported by truck, instead of pipe and tank, forcing an increase in emissions when transporting fuels of all types.
   This unsupported assertion provides no details or explanation as to how this ordinance will force a change in transportation modes. There is no explanation or evidence on future demand, pipeline capacity utilization, or storage tank utilization or how or why truck traffic would increase. BPS staff provided evidence in the Council presentation and the written record that demonstrates that there is a reasonable expectation that the demand for fossil fuels will be flat and that the existing FFT storage capacity, with the allowed exceptions, will continue to meet the future demand for fossil fuels.

6. Explicitly allow the development of infrastructure that is necessary to transition towards lower emission fuel sources such as blending tanks and new intermodal links.
   New blending tanks that contain more than 5% fossil fuel are not allowed by the ordinance. Currently, gasoline is blended with ethanol and the existing blending tanks can continue to be used for that purpose. No explanation or evidence was provided to support the assertion that additional tanks are needed. BPS staff provided evidence in the Council presentation and the written record that demonstrates that there is a reasonable expectation that the demand for fossil fuels will be flat and that the existing FFT storage capacity, with the allowed exceptions, will continue to meet the future demand for fossil fuels. New intermodal links are not regulated by this ordinance.

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7. The decision to reject a permit application by Zenith for pipes that would have been used exclusively for clean fuels undermines exemption for clean fuels, because the infrastructure for renewable fuels is essentially the same for fossil fuels.

   The Office of Community Technology decision is based on the City's franchise agreement with Zenith, and is not a land use decision and is not an indicator as to how the City will make future land use decisions that involve this ordinance.

8. Explicitly allow terminal safety and seismic upgrades. These upgrades typically occur in conjunction with market-based infrastructure changes, which the amendments prohibit.

   The FFTZ amendments designate existing FFTs as a limited use specifically to allow for safety and seismic upgrades. The ordinance only regulates new storage tank capacity. The testimony does not define or explain what is meant by a "market-based infrastructure changes." There is no evidence provided to support the argument that a seismic upgrade requires an expansion in storage capacity. Nothing in state land use law says local jurisdictions have to allow expansion of a use to make safety upgrades.

Working Waterfront Coalition

1. These multimodal fuel terminals have safely provided fuel.

   Agreed, the existing FFTs have safely provided fuel for decades. However, while there has not yet been a disaster, there have been numerous studies describing the risks and hazards from a major earthquake. The relatively few storage tank upgrades in the past 10 years means that the City should be proactive and limit expansions.

2. To justify private investment needed to upgrade energy and transportation infrastructure, existing FFTs need to grow. This ordinance eliminates incentives to make investments.

   No explanation or evidence is provided on the economics of upgrades and why FFTs need to grow in order to make safety upgrades. There is no state requirement that the City must provide incentives for safety upgrades.

3. The ordinance will create supply constraint/bottleneck, which will lead to more truck traffic to supply fuel, which will increase miles (and emissions).

   No evidence is provided regarding future demand or supply constraint. There is no explanation as to how limiting storage capacity will lead to increased truck traffic or how much truck traffic will increase. BPS presented evidence from federal and State of Oregon forecasts that indicate the opposite – that there will be flat or declining demand for fossil fuels that can be accommodated by the existing FFTs storage capacity.

4. It is important for FFTs to invest in facilities as demand continues and other unforeseen emergencies exist.

   The testimony does not define or explain what is meant by the phrase "as demand continues". Continues to do what? The FFTZ amendments designate existing FFTs as a limited use specifically to continue to operate to supply fossil fuels and to allow for safety and seismic upgrades. The testimony does not define or explain what is meant by the phrase "unforeseen emergencies". To

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the contrary, the record contains ample evidence that a major earthquake is a foreseen event that state and local agencies have begun to prepare for. This ordinance specifically addresses that emergency by limiting expansion of storage capacity in an area at high risk for liquefaction.

Western States Petroleum Association (WSPA)

1. Locks existing infrastructure in place, which prevents efficiency, environmental, and safety improvements.
   This assertion is an oversimplification of the ordinance. The FFTZ amendments only regulates fossil fuel storage capacity. The ordinance allows existing tank capacity to be replaced, and allows, through exceptions, for additional storage capacity for aviation fuel and renewable fuels. Existing FFTs are designated as a limited use specifically to allow them to continue to operate and make efficiency, environmental, and safety improvements (which the testimony does not define or specify).

2. Undercuts the ability to meet future energy needs
   No supporting evidence is provided to define what is needed to meet future energy needs. BPS presented evidence from federal and State of Oregon forecasts that indicates that the demand for future petroleum will be flat.

3. Will inflict significant impacts on the ability to supply fuel and change fuel types as the region grows, technology advances, and fuel standards change.
   "Significant impacts" are not defined or supported by evidence. The letter does not explain how technology advances and fuel standard changes will create the need for additional fossil fuel storage capacity. The ordinance specifically exempts new storage capacity for renewable fuels as a means to support DEQ's Clean Fuels Program.

4. Will freeze existing infrastructure in place by location and size and would hinder improvements.
   The types of improvements are not defined. The ordinance only limits new fossil fuel storage tank capacity. The FFTZ amendments designate existing FFTs as a limited use specifically to continue to operate to supply fossil fuels and to allow for safety and seismic upgrades. Existing fossil fuel storage tank capacity can be reconfigured. Other aspects of terminal infrastructure (pipelines, docks, transloading facilities) are not regulated by this ordinance.

5. Prevent and discourage terminal upgrades, including tank seismic upgrades, due to the business impacts of capping tank capacity, resulting in fewer upgraded tanks.
   There have been relatively few storage tank upgrades in the past 10 years with the unlimited capacity expansion allowed under current regulations. No information is provided on what are the "business impacts" of regulating tank capacity. Only new fossil fuel storage tank capacity expansion is restricted. Renewable fuels and aviation fuels are exempt from these regulations. Other aspects of terminal infrastructure (pipelines, docks, transloading facilities) are not regulated by this ordinance.

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6. Prevent and discourage equipment upgrades necessary to meet market demand or comply with federal and state clean fuels law;
   Only new fossil storage tank capacity is restricted, other equipment upgrades are allowed. "Market demand" is not defined. Compliance with federal and state law is not defined, no specific citations are provided. The ordinance specifically exempts new storage capacity for renewable fuels as a means to support compliance with DEQ's Clean Fuels Program.

7. Prevent and discourage infrastructure upgrades, which typically occur concurrently with market-based infrastructure expansion and improvement;
   Only new fossil storage tank capacity is restricted, other equipment upgrades are allowed. There is no explanation of what is "market-based infrastructure expansion" or as why to storage capacity expansion is needed in conjunction with other infrastructure upgrades.

8. Prevent and discourage efficiency upgrades that generally reduce greenhouse gas emissions;
   Only new fossil storage tank capacity is restricted, other equipment upgrades are allowed. There is no explanation of what are "efficiency upgrades" that reduce greenhouse gas emissions or as why to storage capacity expansion is needed in conjunction with those upgrades.

9. Prevent and discourage the transition to newer lower-carbon-fuel sources in opposition to Oregon's low-carbon-fuel standards, Oregon's Renewable Fuel Standards, federal Renewable Fuel Standards, and similar laws;
   Only new fossil storage tank capacity is restricted, other equipment upgrades are allowed. Infrastructure that is required for the "transition to newer lower-carbon-fuel sources" is not defined. Compliance with federal and state law is not defined, no specific citations are provided. The ordinance specifically exempts new storage capacity for renewable fuels as a means to support compliance with DEQ's Clean Fuels Program.

10. Fail to provide for sufficient facilities and tank capacity to serve future energy needs;
    "Future energy needs" are not defined and no evidence is provided. BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029.

11. Thwart future technologies that do not fit within the current infrastructure framework;
    Only new fossil storage tank capacity is restricted, other equipment upgrades are allowed. "Future technologies" is not defined and there is no explanation as to how this ordinance will "thwart" their deployment. If and when new technologies emerge that are cleaner and seismically safe, City Council can amend the ordinance but there is no reason to draft code around a vague hypothetical future.

12. Exclude Portland from the national and international energy markets;
    There is no explanation of what the opportunity is in national and international energy markets and no explanation as to how the ordinance excludes Portland from those markets. Only fossil tank capacity is regulated. Other types of infrastructure are not regulated by this ordinance.

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Local and regional economic development strategies do not identify the energy sector as a key target industry.

13. Introduce a host of ambiguities and uncertainties to the marketplace that are necessary for a thriving economy;

    The vague terms "ambiguities and uncertainties" are not defined or explained. The FFTZ amendments designate existing FFTs as a limited use specifically to allow the FFTs to continue to operate to supply fossil fuels and to allow for safety and seismic upgrades. The ordinance restricts or limits new fossil fuel storage tank capacity. Existing fossil fuel storage tank capacity can be reconfigured. Other aspects of terminal infrastructure (pipelines, docks, transloading facilities) are not regulated by this ordinance. What is "necessary for a thriving economy" is not defined. BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington, during a period of a thriving economy. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. Therefore, the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs.

14. Not align with state and federal policy regarding siting energy infrastructure or transportation of fuels

    No specific state or federal energy siting or transportation policy is cited. The testimony does not address the risks in citing energy infrastructure in an area of high risk of liquefaction.

15. Encourage less efficient, higher emission, and potentially less safe transportation by truck over more efficient modes of transportation, such as pipeline;

    The testimony fails to describe in detail the scenario that results in more fuel being transported by truck. Pipelines are not subject to these regulations.

16. Prohibit new terminals and new intermodal links that can deliver fuel more efficiently and with lower emissions.

    New FFTs with more than 2 million gallons of storage capacity are prohibited, primarily because Portland's industrial areas are, for the most past, areas with a high risk of liquefaction in a major earthquake. The testimony fails to address this safety issue. New intermodal links are not regulated by this ordinance. How new terminals and intermodal links can be more efficient and reduce emissions is not defined or explained.

17. The Proposed Amendments would freeze current infrastructure in place. This infrastructure is insufficient for future fuel demand, by both quantity and type of fuel.

    The ordinance will not "freeze current infrastructure in place". The FFTZ amendments designate existing FFTs as a limited use specifically to allow the FFTs to continue to operate to supply fossil fuels and to allow for safety and seismic upgrades. The ordinance restricts or limits new fossil fuel storage tank capacity. Existing fossil fuel storage tank capacity can be reconfigured. Other aspects of terminal infrastructure (pipelines, docks, transloading facilities) are not regulated by this ordinance. "Future fuel demand" is not defined. BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic

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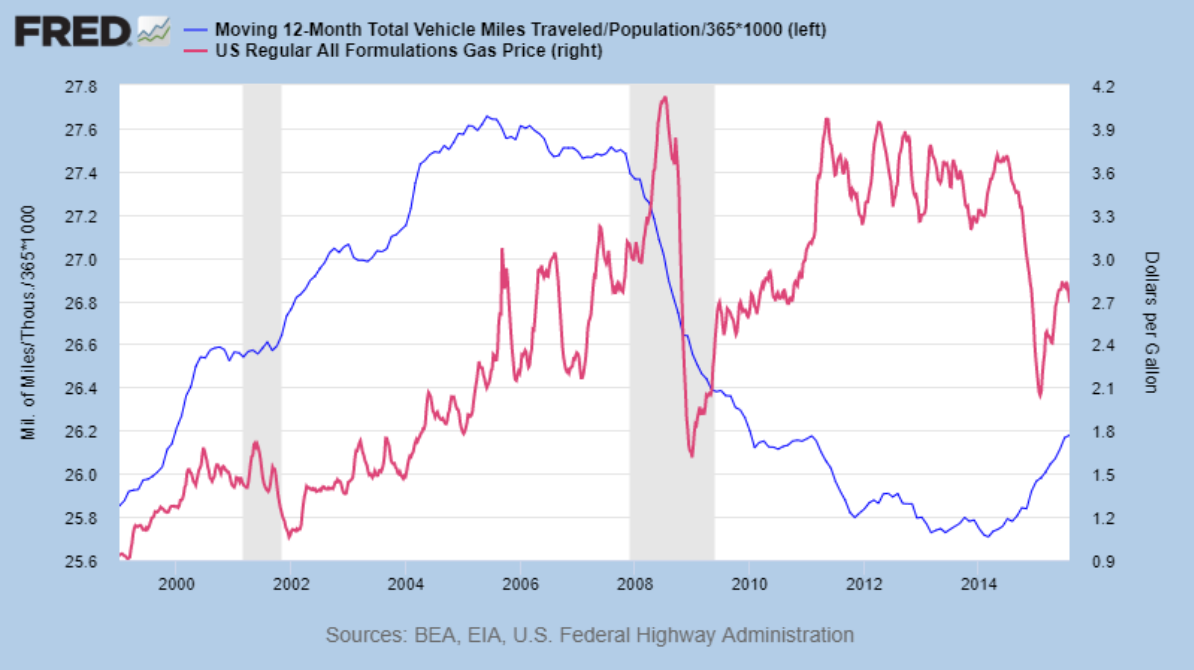
trends in Oregon and Washington, during a period of a thriving economy. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. Therefore, the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs.

18. The Proposed Amendments will inflict these negative impacts on the local, state, and regional economy, and ability to transition energy resources.

    The "negative impacts" to the economy are not defined. BPS presented evidence that the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs. The ordinance specifically exempts new storage capacity for renewable fuels as a means to support compliance with DEQ's Clean Fuels Program and a transition away from fossil fuels.

19. The Proposed Amendments do not limit the regional demand for fuel. Fuel is a classic example of a product with inelastic demand.

    No evidence is provided to demonstrate that the demand for fuel is inelastic. Fuel consumption is elastic and price-sensitive. As evidence, below is a graph retrieved from the Federal Reserve Bank of St. Louis.[1] It shows the elastic relationship between fuel prices and vehicle miles travelled. Since 2009, as fuel prices increased, vehicle miles traveled decreased until 2014, when fuel prices decreased, vehicle miles travelled increased.



There are many factors that go into the regional demand for fuel. "Future fuel demand" is not defined. BPS presented evidence that national petroleum consumption forecast out to 2050 is

[1] https://fred.stlouisfed.org/series/M12MTVUSM227NFWA, November 27, 2019

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essentially flat, which is a continuation of historic trends in Oregon and Washington, during a period of a thriving economy. The testimony does not present any conflicting evidence.

20. Will prohibit new terminals, new intermodal links, and new fuel tanks in Portland, will result in dramatically increased fuel transport by truck

    The ordinance only prohibits new FFTs with storage tank capacity over 2 million gallons and new fossil fuel storage tank capacity at existing FFTs. New intermodal links are not regulated by this ordinance. The assertion that fuel transport by truck will dramatically increase is not supported by evidence. BPS presented evidence that the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs, based on national petroleum consumption forecast out to 2050 that is essentially flat, which is a continuation of historic trends in Oregon and Washington.

21. Prevent and discourage terminal safety improvements, including tank seismic upgrades, due to the business impacts of capping tank capacity, resulting in fewer upgraded tanks;

    There have been relatively few storage tank upgrades in the past 10 years with the unlimited capacity expansion allowed under current regulations. No information is provided on what are the "business impacts" of regulating tank capacity. Only new fossil fuel storage tank capacity expansion is restricted. Renewable fuels and aviation fuels are exempt from these regulations. Other aspects of terminal infrastructure (pipelines, docks, transloading facilities) are not regulated by this ordinance.

22. Prevent and discourage safety upgrades, which typically occur concurrently with market-based infrastructure expansion and improvement;

    Only new fossil storage tank capacity is restricted, other equipment upgrades are allowed. There is no explanation of what is "market-based infrastructure expansion" or as why to storage capacity expansion is needed in conjunction with other infrastructure upgrades.

23. Require locating fossil fuel tanks in liquefaction zones by prohibiting relocation of fossil fuel tanks outside of mapped liquefaction areas in Portland;

    The ordinance does not require locating fossil fuel tanks in liquefaction hazard areas. As shown on the attached map, there are very few areas in Portland's industrial zones, including no areas that have marine/harbor access, that are outside of the high risk liquefaction areas. Therefore, new FFTs are prohibited in all industrial and employment zones in Portland. No evidence has been presented to support the assertion that FFTs have to be located in Portland.

24. Prohibit siting newer, lower emission fuel facilities;

    The term "fuel facilities" is undefined and the testimony does not explain how those facilities will have lower emissions. The ordinance only prohibits new FFTs with storage tank capacity over 2 million gallons and new fossil fuel storage tank capacity at existing FFTs. The FFTZ amendments designate existing FFTs as a limited use specifically to allow the FFTs to continue to operate to supply fossil fuels and to allow for safety and seismic upgrades, including those facilities that lower emissions.

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25. Prevent and discourage efficiency upgrades that generally reduce greenhouse gas emissions;
    The "efficiency upgrades that generally reduce greenhouse gas emissions" are not defined and there is no explanation as to how the ordinance will prevent or discourage them. The ordinance only prohibits new FFTs with storage tank capacity over 2 million gallons and new fossil fuel storage tank capacity at existing FFTs. The FFTZ amendments designate existing FFTs as a limited use specifically to allow the FFTs to continue to operate to supply fossil fuels and to allow for safety and seismic upgrades, including those facilities that lower emissions.

26. Prohibit new fuel tanks for blended fuels that transition towards lower-carbon-fuel sources; and
    The ordinance does not allow new blending tanks with more than 5% fossil fuel. Currently, gasoline is blended with ethanol. The testimony does not explain as to why additional blending tanks are needed.

27. Encourage higher emission and potentially less safe transportation by truck over more efficient modes of transportation, such as pipeline.
    The testimony fails to describe in detail the scenario that results in more fuel being transported by truck. Pipelines are not subject to these regulations.

Zenith Energy

1. Will inhibit infrastructure upgrades for safety and to meet changing market demands.
    The ordinance restricts new fossil storage tank capacity, other safety upgrades are allowed. There is no explanation of what are "changing market demands" or as why to storage capacity expansion is needed in conjunction with other infrastructure upgrades.

2. In light of OCT decision prohibiting development for renewable fuels, the FFTZ amendments also fails to adequately authorize renewable fuel storage.
    The OCT decision is based on the City's franchise agreement with Zenith, and is not a land use decision and is not an indicator as to how the City will make future land use decisions that involve this ordinance.

3. City has not identified and made available for public review additional facts that support re-adopting the FFTZA.
    The City provided additional findings as part of ordinance filing and presented additional evidence as part of City Council hearing. The written record was left open for 11 days to provide an opportunity for any interested party to respond. The record of evidence was publicly available, and, as of November 30, no requests were made to review the record.

4. As provided in previous (2016) testimony, terminal operators are unable to invest in upgrades without incentives.
    Current regulations have provided unlimited storage tank capacity expansion and very few upgrades (three tanks in 2012) have been made in the last 10 years, since the seismic vulnerability of the Critical Energy Infrastructure (CEI) hub has become a state and local concern.

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Nothing in State law requires City to provide incentives as an offset to restrictive land use regulations.

5. Need opportunity to expand to meet market demand.
   "Market demand" and the need to expand storage capacity is not defined. BPS presented evidence that national petroleum consumption forecast out to 2050 is essentially flat, which is a continuation of historic trends in Oregon and Washington. In addition, ODOT is forecasting a decline in motor fuel consumption over the medium term to 2029. Therefore, the fossil fuel storage capacity at the existing FFTs is sufficient to meet future needs.

6. Safety upgrades require the construction of new infrastructure without interrupting service to customers. New storage tanks needed before old tanks can be taken out of service.
   No evidence is provided on storage tank capacity utilization at existing FFTs or the length of time that it takes to replace or retrofit a storage tank that indicates that new storage capacity is needed before existing storage capacity can be retrofitted or replaced. Zenith expanded transloading capacity without expanding storage tank capacity. Zenith proposed adding new transloading/intermodal pipeline capacity to utilize existing storage capacity.

7. Resolution 37168 prohibits City from restricting safety improvements and service to end users, and development of backup capacity.
   The testimony mischaracterizes the resolution. The text says that this resolution does not restrict safety improvements, service directly to end users, and development of emergency backup capacity, as in the resolution itself. The resolution provides guidance on future City actions, such as directing BPS to develop proposed code changes to advance the resolution. However, in the context of making a legislative land use decision (amending the Zoning Code), the 2035 Comprehensive Plan and Title 33 (Planning and Zoning) establish the procedures and approval criteria, which do not reference other resolutions that are not included in the 2035 Comprehensive Plan goals and policies.

8. The OCT decision is an indication that the City will prohibit new storage tanks capable of storing a variety of liquids, including fossil fuels. The City needs to clarify that there is no requirement to prove that storage facilities are not physically capable of being used for fossil fuels.
   The OCT decision addresses a proposed pipe in the public right-of-way and is based on the City's franchise agreement with Zenith, and is not a land use decision. It is not an indicator as to how the City will make future land use decisions that involve this ordinance. Per the limited use regulation (33.140.100.B.17.a), FFTs will need to demonstrate that new storage tanks will not increase the fossil fuel storage capacity beyond what existed on the date of the adoption of this ordinance.

9. Two years since Court of Appeals confirmed glaring evidentiary deficiencies. Use of emergency ordinance is without justification.
   LUBA did not remand the decision to the City until October 5, 2018. The remand assignments of error are based on lack of evidence supporting the decision, not the ordinance itself. The City Council has the discretion to declare an emergency. As evidenced in the oral testimony at the

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November 20 public hearing, this is an urgent issue that requires immediate action. The City has determined that an emergency is appropriate here due to the fact that Portland is currently at risk of a major earthquake.

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Daniel Serres

#62687 | December 1, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Please see the attached December, 1, 2019 comment letter submitted on behalf of Columbia Riverkeeper, Center for Sustainable Economy, Oregon Physicians for Social Responsibility, Portland Audubon Society, 350PDX, Friends of the Columbia Gorge, Willamette Riverkeeper, Climate Action Coalition, Northwest Environmental Defense Center, Oregon Conservancy Foundation, and Human Access Project.

Testimony is presented without formatting.

December 1, 2019

Portland City Council
1221 SW Fourth Avenue
Portland, Oregon 97204

Submitted via Map App portal

RE: Additional Testimony in Support of Re-Adopting Fossil Fuel Terminal Zoning Amendments

Dear Mayor Wheeler and Portland City Council Commissioners,

Thank you for the opportunity to offer additional comments on the proposed re-adoption of the City of Portland's Fossil Fuel Terminal Zoning Amendments ("amendments"). These comments are submitted on behalf of Columbia Riverkeeper, Center for Sustainable Economy, Oregon Physicians for Social Responsibility, Portland Audubon Society, 350PDX, Friends of the Columbia Gorge, Willamette Riverkeeper, Climate Action Coalition, Northwest Environmental Defense Center, Oregon Conservancy Foundation, and Human Access Project. We offer the following comments as response to written testimony submitted by various parties in opposition to the City's decision to re-adopt the amendments.

I. The Amendments Provide Flexibility for Improvements and Expansions for Non-Fossil and Renewable Fuel Storage and Transport.

Comments from Zenith Energy and other groups opposed to the amendments request that Council revise the text of the amendments to explicitly allow development of storage capacity and related infrastructure for renewable and non-fossil fuels. These comments reference the recent decision from the Office of Community Technology rejecting a request from Zenith to amend its franchise agreement to install new pipes for clean fuels and assert that OCT's decision is an indication that the City will deny similar projects in the future. However, Zenith's request to amend its franchise agreement was not reviewed pursuant to the amendments and OCT's letter makes no reference to the amendments as support for its decision.

The amendments clearly restrict "fossil fuel storage tank capacity" and "new bulk fossil fuel terminals." Proposed PCC 33.140.100(B)(17)(a). The amendments define "fossil fuel" to explicitly exclude "denatured ethanol and similar fuel additives with less than 5 percent fossil fuel content, biodiesel/renewable diesel with less than 5 percent fossil fuel content[.]" Proposed PCC 33.190.030 (Fossil Fuel). Thus, the amendments, as written, clearly allow for new or expanded infrastructure that will be used for non-fossil and renewable fuels. Council must assume that City staff will apply the amendments as written once they are actually implemented. Opponents provide no rational justification for revising the text of the amendments based on a decision that was made before the amendments were effective.

//

II. The Amendments Allow for Seismic and Safety Upgrades.

Next, several opponents argue that the amendments prohibit safety and seismic upgrades and should be revised to explicitly allow for these types of improvements. However, the amendments clearly allow safety and seismic upgrades and infrastructure replacement so long as fossil fuel storage tank capacity is not increased. Opponents' real concern is that the amendments may not allow for the most profitable means of performing such safety and seismic upgrades. Indeed, during the initial process leading up to the adoption of the amendments, terminal owners objected to the City's proposed 10% storage expansion allowance for seismic upgrades because they claimed it was not incentive enough to protect their infrastructure and the surrounding community from a catastrophic earthquake event. As Zenith states in its comments, operators of bulk fossil fuel terminals will not invest the resources needed for safety upgrades "without incentives" in the form of unlimited expansion.

However, the history and current state of the CEI Hub infrastructure suggests that even this type of so-called "incentive" will not drive bulk fossil fuel terminal owners to make seismic improvements unless and until it is absolutely necessary to meet their own corporate interests. As outlined in the 2019 PBEM CEI Hub study, the majority of large storage tanks in the CEI Hub were built prior to the 1990s, prior to our current understanding of the serious seismic risks in the region. However, in the past 30+ years nothing has compelled the owners of those storage tanks to implement seismic safety improvements. Thus, it is clear that what is really needed to "incentivize" safety improvements in the CEI Hub is for Council to adopt an enforceable requirement and firm deadline for replacement of older, unsafe tanks. The amendments, as written, clearly allow for such upgrades at any time that terminal owners decide to voluntarily implement them or when the City takes future action to require such upgrades.

III. The City has Satisfied its Obligations on Remand.

Several commenters have taken issue with the City's decision to re-adopt the amendments as they were originally adopted in 2016 without substantive changes, asserting that the amendments were declared "legally defective" by LUBA and the Court of Appeals. However, each of the issues sustained by LUBA and the Court of Appeals pertained to the City's lack of findings to address specific policies or lack of evidence in the record to support particular findings. None of the sustained legal errors touched on the legality of the text or the effect of the amendments. Thus, no substantive changes to the amendments are warranted or required. The City has prepared detailed findings on every potentially applicable policy in the 2035 Comprehensive Plan and other relevant city, regional, and statewide planning policies.

The City has also re-opened the record on remand to allow for the public, including opponents, to submit additional evidence into the record for Council to consider before re-adopting the amendments. BPS staff have also identified additional evidence to support the amendments and draft findings and to address the issues sustained by LUBA and the Court of Appeals. Additionally, Council held a public hearing to accept additional oral testimony before re-adopting the amendments. Notably, not a single representative from the groups opposed to the amendments appeared at the hearing to testify. These steps satisfy the City's procedural

obligations on remand and provided all parties with an adequate opportunity to submit testimony and evidence for Council's consideration.

Opponents Columbia Pacific Building Trades Council, Portland Business Alliance, Working Waterfront Coalition and Oregon Business & Industry take issue with the fact that the City has not attempted to "reach out to and work with our organizations...to find common ground." City staff actively engaged with representatives of these groups and the existing bulk fossil fuel terminals during the initial development of the amendments. Through those discussions and the opponents' lawsuit seeking to overturn the amendments it became clear that there is no "common ground" to be reached here. The City—and the many organizations and community members who support the amendments—are committed to taking action to address the serious health, safety, and climate risks associated with bulk fossil fuel terminals, while the opponents simply want to maintain the status quo where bulk fossil fuel terminals are allowed to expand and develop new infrastructure without limitation.

IV. Opponents Concerns Regarding Fossil Fuel Demand and Distribution Are Entirely Speculative.

Finally, several of the opponents' comments rely on flawed and unsupported assumptions that the amendments will impact fossil fuel transport, local carbon emissions, and market supply. For instance, in its comments Tidewater Barge Lines inexplicably asserts, "[i]f these terminals cease operations, fuel will have to be distributed in other modes of transportation such as truck or railcar." Nothing in the amendments requires existing bulk fossil fuel terminals to cease operations. Instead, the amendments explicitly authorize existing terminals to continue to operate by designating them as a limited use. Thus, there is no support for Tidewater's claim that barging of fossil fuels will be replaced with more trucks and rail cars travelling through Portland.

Similarly, several opponents argue that the amendments will result in an increase in vehicle miles traveled and carbon emissions because the amendments will cause more fossil fuels to be transferred through Portland by truck, instead of pipelines and other transport modes. However, the amendments do not regulate or restrict the format of fossil fuel transport and do not regulate docks, pipelines or rail infrastructure used to transport fuels to or through existing terminals. The opponents do not offer any evidence to support their assertion that the existing terminals will not be able to accommodate changes in market demand for fossil fuels. Council should not be persuaded to abandon this important action based on pure speculation.

As stated in our November 20, 2019 written testimony, we support the City's commitment to re-adopt the amendments as they were originally adopted in December 2016, with the minor revisions proposed by City staff. And we look forward to continuing to work with the City to develop policy solutions to address the risks posed by the CEI Hub infrastructure.

Sincerely,

Dan Serres
Conservation Director
Columbia Riverkeeper

Damon Motz-Storey
Healthy Climate Program Director
Oregon Physicians for Social Responsibility

Nick Caleb
Staff Attorney – Climate Justice Program
Center for Sustainable Economy

Also submitted on behalf of: Portland Audubon Society, 350PDX, Friends of the Columbia Gorge, Willamette Riverkeeper, Climate Action Coalition, Northwest Environmental Defense Center, Oregon Conservancy Foundation, Human Access Project

Robert Carroll

#62669 | November 22, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

a file is attached containing IBEW Local 48's comments

Testimony is presented without formatting.

IBEW 48
UNION ELECTRICAL WORKERS

International Brotherhood of Electrical Workers
15937 NE Airport Way
Portland, OR 97230

November 22, 2019

Portland City Council
1221 SW Fourth Avenue, Room 130
Portland, Oregon 97204

RE: ***Fuel Terminal Zoning Amendments on Remand***

Honorable Mayor Wheeler and Members of the City Council:

I am writing on behalf of IBEW Local Union 48 members that live and work in NW Oregon, we are also affiliated with the Columbia Pacific Building and Construction Trades Council. Our organization represents a broad diversity of members that work on a wide variety of projects that rely on a robust fuel facility infrastructure.

We wish to express our disappointment with the City's decision to once again propose a deeply flawed ordinance targeting fuel facilities. The proposal before you is a virtual carbon copy of the 2016 ordinance, which both the Land Use Board of Appeals (LUBA) declared legally defective on seven counts in 2017 and the Oregon Court of Appeals sustained in part.

We are aware that the new proposal contains "findings" purportedly to address the legal deficiencies of the 2016 proposal, but the official impact statement makes it clear that no substantive changes have been made. In the Community Impacts and Community Involvement section, it states:

> ***"Given that this ordinance is a reconsideration of a previously adopted ordinance, BPS relied upon the previous public testimony that informed that ordinance. This ordinance is substantially the same ordinance with a few minor adjustments to reconcile the code amendments with the current Zoning Code."***

This section also confirms that bureau staff relied almost entirely on the previous public input record, and since the court's decision in 2017, there has been no attempt to reach out and work with any of our organizations, who successfully challenged the 2016 ordinance, to find common ground.

This decision to bring back an ordinance that has already been rejected by LUBA and Oregon Courts, and the failure to event attempt to collaborate with the impacted stakeholders, calls into the question the rational and goals of this entire process. Not only could the current proposal result in another costly legal battle, it would also, if implemented, hurt the local economy and, in several ways, hinder, not help, the City's climate and safety goals.

We respectfully ask the Mayor and Council to reject the current redo of a legally deficient ordinance, and work with all stakeholders to develop a fact based proposal that is not only legal, but will support the City's climate action goals. A collaborative approach driven by facts, rather than ideological politics, would support, rather than prohibit, vital infrastructure improvement projects that increase worker safety; reduce, rather than increase, greenhouse gas emissions; and mitigate, rather than increase, risks posed by earthquakes.

Substantive amendments would address the deficiencies found by LUBA and the Court of Appeals, and could include the following:

1. Consider the carbon emissions of the various transportation methods used to meet local and regional demand. The current proposal would likely force fuels of all kinds to be transported by truck, instead of pipe and tank, forcing an increase in emissions when transporting fuels of all types.

2. Explicitly allow the development of infrastructure that is necessary to transition towards lower emission fuel sources such as blending tanks, and new intermodal links. Current city practice (highlighted in the recent Office of Community Technology decision to reject a permit application by Zenith for pipes that would have been used exclusively for clean fuels) to follow the 2015 fossil fuels resolution adopted by council, in practice, prevents the necessary infrastructure for the cleaner fuels the city says it wants our region to transition to, since the infrastructure for bio diesel and blended clean fuels is essentially the same for fossil fuels.

3. Explicitly allow terminal safety and seismic upgrades. These upgrades typically occur in conjunction with market-based infrastructure changes, which the Amendments prohibit.

IBEW Local Union 48 is committed to working with the City of Portland and all stakeholders to develop real solutions to speed up our community's transition to cleaner fuels and reduce emissions while ensuring that we can meet the energy needs of our City and State.

We understand the political pressure on public and private sector leaders to take more urgent action to address the growing impacts of climate change. We support the City taking real, actionable, and legally defensible steps to meet its climate action goals. We call on the council to reject this ordinance, which is identical to what was successfully contested by business, industry, and the trades in 2016, and work with us to identify those real solutions.

Sincerely,

Garth Bachman
Business Manager
Financial Secretary
GB:lk
OPEIU#11/AFL-CIO

www.ibew48.com tel: 503-256-4848 fax: 503-251-9952

Ella Shriner

#62667 | November 22, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See attached

Testimony is presented without formatting.

November 20th, 2019

Good afternoon commissioners. My name is Ella Shriner, I'm 17 years old, and I was born and raised in Portland. I'm also a founding member of the Portland Youth Climate Council, but I'm here today speaking as a concerned individual.

This morning I was at home before school thinking about what I wanted to say to you today. I thought I would focus on the risks fossil fuel infrastructure poses to our public health and safety, as well as our environment. I wanted my testimony to have facts and I wanted to say the perfect thing that would make it clear to you how important these zoning amendments are, and how important it is that they be just the beginning of our rapid journey to dismantle fossil fuel infrastructure in Portland. But as I sat, hands poised above the keys waiting for inspiration to strike, I broke down into tears.

The truth is, I don't know what I could say that could make it clear. What I could say that would move you as leaders to take the necessary and ongoing action. If leaders around the world are not stepping up because doing so would threaten their financial support from the very corporations that are responsible for this crisis, I don't know what I could say. If millions of young people have striked from school and marched together screaming for action, without sufficient response, then I don't know what I could say. If a growing number of climate refugees facing the loss of their home, and even death, doesn't move us to action, then I don't know what I could say. If polar ice melt, ocean acidification, sea level rise, devastating fires, climate enhanced heat waves, arctic blasts, tornados, and other extreme weather events are not enough for us to change, then I just don't know what I could say.

One of the things I hear most as a climate activist is "wow, when I was your age, I wasn't doing anything like what you're doing." When I hear that, I always think... "Well that's because when you were my age you didn't have to." The reality is, we've never before faced a crisis like the one we're in. This moment in time calls for all of us to step out of our comfort zone and do things we've never done before. We need to take risks.

Mayor Wheeler, I remember you told me about your daughter when I delivered a video to you about the danger of Liquified Natural Gas back when you were the State Treasurer. Do you ever find yourself thinking about how fast she's grown up? How it feels like just yesterday that you were watching her take her first steps, say her first words? And how old is she now? 12? 13? Well she was born more years ago than we have left to take drastic action. If we don't, her fate, my fate, and the fates of the rest of our, and future generations, will be sealed.

4 years ago, I testified as a 13 year old in favor of the resolution that led to these zoning amendments. Commissioner Fritz, you may remember the little middle schoolers singing "the times they are a changin'" and presenting you with climate champion awards. Those were hopeful times. But I'm not a middle schooler anymore, and I, along with thousands of my peers, are preparing to cast our first votes. The time's they really are a changin', and we're watching to see if all of you are willing to take the risks that this time demands.

Dane Pikkola

#62666 | November 22, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See attached

Testimony is presented without formatting.

To: The City Council of Portland, Oregon Nov. 20, 2019
Concerning: Proposed Ordinance On Fossil Fuel Infrastructure

Greetings to the City Council:

You have listened to the citizens of this city; you are aware how much we all love living here. You have also supported a proposed ban on all new fossil fuel infrastructure within it. Now it is time to finally, once and for all, pass it into law.

Most of us have children and grandchildren, and it should not be up to *them* to assure they will inherit a liveable planet. Yet, you on the council, are constantly pressured by powerful entities to maintain the status quo. An unending extraction and transporting of crude oil and petroleum products, with regard only for stock holder earnings...even at the peril of their own children and grandchildren. This is a form of madness seemingly unique to us short-sighted human kind.

To return to a sustainable world will require almost unimaginable *disruption* to this status quo. Yet it must be done, and soon. Otherwise we will surely create an unimaginable hell for all future generations to come.

Please continue the good work you have begun, so it may serve as a model for other cities across the country. When the vote is taken, please make it *unanimous* once again, supporting the proposed ordinance before you.

Thank you.

Dane Pikkola
2255 W. Burnside St. #508
97210

Nancy Hiser

#62661 | November 21, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See attached letter

Testimony is presented without formatting.

September 5, 2018
Endorsed by Linnton Neighborhood Association

TANK FARM POSITION STATEMENT

Communities along the Willamette, such as Linnton, value our views of four mountains and the sight of the flowing river. The forests surround us and sounds of foghorns are heard in the early morning hours. It is generally a peaceful scene. But the 6-mile riverfront is also home to scores of fuel tanks—a potentially catastrophic threat to local people and their homes. However, these tanks supply 90% of the entire state's fuel (gasoline, diesel, jet fuel, electricity) and pose a severe challenge to all of Oregon's resilience following a major seismic event. The Cascadia fault, the primary seismic hazard, runs for 700 miles from northern California to southern Canada.

History of Reports

The Oregon Resiliency Plan was published in 2013 by the Oregon Seismic Safety Policy Advisory Commission. After Oregon's Department of Geology and Mineral Industries (DOGAMI) staff studied the Critical Energy Infrastructure (CEI) Hub, they cited "major seismic vulnerabilities" due to "no or antiquated standards of building structure" and "soils susceptible to liquefaction." According to this report, "Cascadia earthquakes pose substantial risk to the CEI Hub and to Oregon. Not only are the energy sector facilities in the CEI Hub dependent on other sectors and systems in Oregon, including transportation and communication, they are interdependent upon each other." They recommended to the state that placement of tanks be diversified and located on bedrock.

Tony Schick, writing for OPB in 2015 in "How We Mapped NW Portland's 'Tank Farms'" furthered our knowledge of the CEI Hub risks. Schick dubbed the CEI Hub "Oregon's Seismic Achilles Heel" and stated, "when OPB began its coverage of the Cascadia subduction zone and Oregon's seismic vulnerabilities, the 'tank farms' in Northwest Portland emerged very quickly as an important part of the series." OPB produced a mapped database of storage tanks and their contents, each tank shaded according to the year of its construction, confirming these tanks dated back to the 1920's when seismic standards did not exist. Map tiles from historic topographic maps from 1905 were used to show where lakes, marshes, and the river path used to be. Then, using Portland's building footprint data, they identified where fill had been used to create the infrastructure to support the creation of commercial and industrial areas, including fuel tanks, substations, pipelines and transmission lines, thus confirming the locations of liquefaction risk.

So, how vulnerable are we?
Consider the variables here, each of which causes concern but taken together are a recipe for disaster.

- The CEI Hub is built on dredged soil which is likely to liquefy in an earthquake. In OPB's report, "the soils could become permeated with water, giving them the consistency of a sandy pudding. If that happens, it can damage buildings, tanks, and pipes." A report from the City Club of Portland, "Big Steps Before The Big One," echoes that prediction.

- Tanks were constructed scores of years ago. They date back to 1929, before any modern day seismic standards were established. This heightens the risk of their failure during an earthquake: toppling, splitting, and exploding are all possible.

- Pipelines are projected to suffer hundreds of breaks and scores of leaks. How effective will the current remediation efforts of operators be? These efforts include remotely operated valves, check valves, enhanced leak detection systems, and increased surveillance.

- Geologic fault structure and the activity of the Juan de Fuca plate have been studied by experts. They state there is a 15% probability of a whole margin subduction event in the next 50 years, and this figure jumps to 37% for a southern margin subduction event. Predictions of destruction are huge: 15 of 17 bridges, 1 out of every 3 fire stations, 1 of every 2 police stations, 2 out of 3 hospitals, and 3000 schools, according to Scott Burns, PSU seismic geologist. Following a major seismic event there will be no electricity for 1-3 months, no water for 1 month, no sewer or highways for 6 months, and taxpayers will pay 75% of the cost. The New Yorker predicts the devastation in detail at https://www.newyorker.com/magazine/2015/07/20/the-really-big-one

- Structures which are responsible for gasoline, diesel, jet fuel, and electricity are located in close proximity. The energy required for disaster recovery will be high. Resiliency will be inversely proportional due to impaired infrastructure for these key resources: energy, communication, and transportation.

What should we do?
This is not a NIMBY ("not in my backyard") position. Energy sources should not be centralized in any singular location, but especially not in one that is unstable and hazardous. Not only will their proximity exacerbate a disaster, but they will collectively handicap our recovery efforts. Those knowledgeable about the world's seismic events, such as Scott Burns, report the recovery efforts following a major seismic event are daunting and we must do all that we can to minimize the risk and maximize our recovery potential.

We acknowledge the following efforts:

The City Club of Portland recommends the following to reduce the risk of catastrophic CEI Hub Failure:

1. Oregon's DOGAMI should commission a geotechnical study of soils of the CEI Hub and alternatives for soil hardening. If grant funding is available, the Legislature should appropriate funds for the study.
2. The Governor and Legislature should designate a single state agency to oversee seismic risks at the CEI Hub. That agency should have the authority to:
   - Require all owners of CEI Hub facilities to provide an engineering assessment of their facilities' vulnerability to a CSZ earthquake and other information relevant to mitigating the current risks.
   - Develop and implement, in collaboration with industry stakeholders, standards for construction and retrofit of storage tanks at the CEI Hub. The standards should be designed to prevent releases and to preserve substantial functionality in the event of a CSZ earthquake.

The Oregon Seismic Safety Policy Advisory Committee has been formally tasked to conduct a 15-month study of the CEI Hub with a report to be submitted to the Office of the State Resilience Officer by December 31, 2019. The report will be provided to the House and Senate Veteran and Emergency Preparedness Committees with recommendations for the 2020 legislative short session which will focus on:

1. Conducting an analysis of state and federal guidance on the regulatory authority for seismic upgrades to both structures (tanks, terminals) and pipelines, to include land mitigation.
2. Working in conjunction with Oregon Solutions, determine incentives from a public-private view that focuses on hardening current infrastructure.
3. Showcasing the Earthquake Early Warning (ShakeAlert) system to encourage seismic awareness within the private sector.
4. Determining if a current state agency has statutory authority to develop long-term mitigation efforts. If not, recommend which state agency would be best suited for this new authority.

SB 850, Community Resilience Report, will be released in September 2018.
https://gov.oregonlive.com/bill/2017/SB850/

The above efforts promise to be lengthy and costly processes with unknown success. We don't need to make decisions about what is to be done; the experts have already done that: The CEI Hub must be decentralized and relocated to stable bedrock areas.

Nancy Hiser

#62660 | November 21, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See attached letter

Testimony is presented without formatting.

Linnton Neighborhood Association
Environmental Committee
September 13, 2019

We are concerned that transporting tar sands crude oil by rail poses immense risks to our community and the environment from accidents, potential spills, and explosions. We think the terminal facility site is prone to soil liquefaction that could cause tank failure during a Cascadia Subduction Zone earthquake or other seismic event. The marine tankers also pose unique risks to the Willamette River from spills or leaks. The City of Portland's Climate Action Plan acknowledges the need to dramatically reduce greenhouse gas emissions to mitigate the effects of climate change and tar sands are the most polluting form of fossil fuel.

We oppose the Zenith Energy expansion and all projects for new or expanded facilities that will result in an increase of tar sands transport or storage in Portland. We urge the Portland City Council, Multnomah County Commission, agencies, and officials to deny all support and permits for Zenith Energy and all future permits for new or expanded fossil fuel facilities. Portland City Council, Multnomah County Commission, and relevant agencies should conduct a neighborhood-by-neighborhood fossil fuel risk assessment that studies routine and worst case scenarios for spills, leaks, explosions, and train derailment.

We urge the Portland City Council and Multnomah County Commission to pursue policies that hold fossil fuel companies financially accountable for their pollution and other potential and real damage to Portland and surrounding waterways.

As a community living and working along the rail line, we are concerned about the threat to life, safety, health, and the environment due to accidents, potential spills, and explosions posed by oil trains carrying tar sands crude, by marine tankers, and at the CEI Hub. Increased rail traffic brings additional health impacts to Portland residents from diesel pollution.

Sincerely,

Nancy Hiser
Environmental Co-Chair for Linnton Neighborhood Association

Erin Saylor

#62709 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Nick Caleb

#62708 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Ryan Rittenhouse

#62707 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Monica Zazueta

#62706 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Edith Gillis

#62705 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Richard Boyer

#62704 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Melanie Plaut

#62703 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Micah Meskel

#62702 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Violet O'Herron

#62701 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Ella Shriner

#62700 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Kelly O'Hanley

#62699 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Elijah Cetas

#62698 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Cathy Sampson-Kruse

#62697 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Mario Mijares

#62696 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Mike Meyers

#62695 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Aja DeCoteau

#62694 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Susheela Jayapal

#62693 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See video

Testimony is presented without formatting.

Aja DeCoteau

#62668 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See attached. Submitted in support of oral testimony

Testimony is presented without formatting.

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION
700 NE Multnomah Street, Suite 1200
Portland, Oregon 97232
(503) 238-0667
F (503) 235-4228
www.critfc.org

TESTIMONY OF
Aja DeCoteau, Watershed Department Manager
Columbia River Inter-Tribal Fish Commission
Regarding City of Portland Ordinance No. 188142
City of Portland
November 20, 2019

- The Columbia River is the lifeblood of this region, supporting a rich and diverse ecosystem that has molded the cultures, diets, and religions of the region's tribes since time immemorial.
- In the past 200 years, the Columbia River – and this region – has changed dramatically, and not always for the best for the resources it supports.
- The tribes are on the frontlines when it comes to bearing the burdens of climate change, having already begun experiencing changes to our First Foods—the salmon, game, roots, and berries. For us, these natural resources are our cultural resources.
- The Columbia River and its fishery resources are battling impacts from development and pollution.
- Tribal fishers in the Columbia face even larger risks and potential impacts. In addition to our diets rich in fish, we spend much of the year outside where we are exposed to the air and water in and along the river.
- The tribes and the railroads have a long and complicated relationship. Trains run along both sides of the Columbia River, impeding tribal fishers' access to their fishing sites and creating risks of accidents.
- The recent escalation in hauling fossil fuels by unit trains alarmed our tribal members, not only because of increased risk of harm to them, but also because of the increased risk of what is often called a "low probability, high consequence" accident.
- A spill of any type of crude (heavy tar sands or light Bakken) will have significant and long-term impacts to the aquatic resources of the river. We learned this lesson from the Exxon-Valdez spill over 25 years ago. Despite a quarter century, Alaskans still find oil residue on the beaches and under rocks.
- The 2016 Mosier crude train derailment, fortunately, did not involve a devastating spill into the river, however it woke the region up to the potential of a major catastrophe. There were many lessons learned from that spill, but the primary lesson is we must protect the river at all costs.
- With the current legal landscape, we cannot totally prohibit trains laden with fossil fuels from traveling through the Gorge, however we can do our part to reduce the need to have them in the first place.
- We support the City of Portland's recent resolutions opposing coal trains and curtailing expansion of fossil fuel infrastructure as first steps to addressing climate change and protecting the environment.
- We fully support Ordinance No. 188142.

Kathryn Williams

#62651 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Letter attached

Testimony is presented without formatting.

NW Natural
220 NW 2ND AVENUE
PORTLAND, OR 97209
TEL 503.226.4211
www.nwnatural.com

November 19, 2019

Portland City Council
1221 SW Fourth Avenue, Room 130
Portland, Oregon 97204

RE: Fuel Terminal Zoning Amendments on Remand

Honorable Mayor Wheeler and Members of the City Council,

NW Natural appreciates the opportunity to provide comments on the Fuel Terminal Zoning Amendments. NW Natural is a local distribution company (LDC) that provides natural gas directly to end users in Oregon and Washington, and has been operating in Oregon since 1859. It currently provides natural gas to more than 2.5 million people through 750,000 connections in the region, with the largest percentage of those customers residing in the Portland Metro Area.

We recognize along with council, that there is a climate imperative and that we must work together to address this future. It is in this light that NW Natural submits these comment to the record around the Fossil Fuel Terminal Zoning Amendments. This information about our Liquid Natural Gas (LNG) infrastructure and the renewable energy coming onto our system to reduce greenhouse gas emissions indicates that (i) our LNG facility should not be classified as a bulk fossil fuel terminal, (ii) the renewable energy should not be deemed a fossil fuel under the proposed zoning code amendments, and (iii) the City should avoid language that could hinder investment in storage capacity for renewable natural gas.

Background: According to the Fossil Fuel Terminal Zoning Amendments Remand Report, the proposed zoning code amendments seek to implement Resolution 37168. That resolution, which opposes expansion of infrastructure whose primary purpose is transporting or storing fossil fuels, also includes exemptions for safety, efficiency and operational improvements, service to end users, and infrastructure that accelerates transition to non-fossil fuel energy. The 2035 Comprehensive Plan (Policy 6.48) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.

NW Natural's Business: Throughout the region, the company owns pipelines that deliver gas to homes and businesses for water and space heating, cooking, and industrial processes.

NW Natural Environmental Values: As a 160 year old company – one of the oldest in Oregon – NW Natural takes climate action very seriously. In 2018 Energy and Environmental Economics, Inc. released its analysis of alternative pathways to reduce by 2050 economy-wide greenhouse gas emissions in

Oregon and Washington to 80% of 1990 levels.[1] This analysis indicated that direct use of natural gas can be an important part of cost-effective pathways to reach this goal of deep decarbonization.

In addition, NW Natural is uniquely positioned to deliver renewable natural gas and renewable hydrogen. These forms of energy are newer than wind and solar, but offer similar climate benefits. In 2019, Oregon Governor Kate Brown signed Senate Bill 98 into law, creating a path for renewable natural gas to become an increasing part of the state's energy supply. Soon we will begin accepting renewable natural gas onto our pipeline system through a partnership with the City of Portland Bureau of Environmental Services and the Columbia Boulevard Wastewater Treatment Plant – a landmark project in the region.

We can do all this by leveraging one of the newest, tightest pipeline systems in the country because NW Natural took early action and completed our pipeline replacement program in 2015. Additionally, our Smart Energy carbon offset program was one of the first voluntary emission reduction programs offered by an LDC. We also joined the U.S. EPA Natural Gas Star Methane Challenge in March 2016 as a founding member. Under this program, companies adopt best practices and report reductions to the EPA annually.

Critical Service: The purpose and function of our LNG facility in northwest Portland is a central part of NW Natural's portfolio of resources, and is a topic of its Integrated Resource Planning. NW Natural's planning processes demonstrate that the energy stored at that facility is needed to meet customers' peak demands when the region experiences high loads, during cold weather events in the winter. Any changed use or improvement of the facility would be vetted through processes at the Oregon Public Utility Commission (OPUC). These processes are open to the public, and closely monitored and followed by a variety of outside groups – including those mentioned above – and the OPUC's professional staff. We encourage the council to ensure wording that will allow NW Natural to make safety and seismic upgrades to our LNG facility, in order to continue to safely, affordably and reliably serve our customers, especially during times of peak usage when this facility is essential.

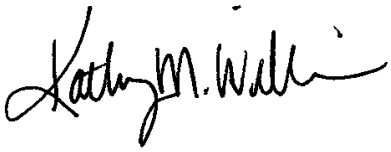
We do not have sample language at this time, but as an example, the City Council should consider the following:

- Include language from Resolution 37168 and Comprehensive Plan so the intent and exemptions are accurately and clearly reflected in the zoning code.
- If a change in law would impose technical or engineering requirements that would curtail capacity and ability to serve customers, modifications (including construction of additional tank capacity) to maintain total capacity and service should be allowed outright as a matter of regulatory entitlement.
- For repair and maintenance, the code should explicitly prohibit the City from using such measures as an opportunity to curtail or impose costly upgrades.
- Renewable sources such as renewable natural gas and renewable hydrogen should be expressly exempted from the fossil fuel designation.
- Avoid language that could hinder investment in storage capacity for renewable natural gas. As a practical matter, renewable natural gas in our distribution system cannot be physically separated from fossil natural gas and stored in its own storage tank(s).

[1] Energy and Environmental Economics, Inc., "Pacific Northwest Pathways to 2050: Achieving an 80% reduction in economy-wide greenhouse gases by 2050" (November 2018).

Again, we appreciate the opportunity to offer comments on this proposed draft. We are happy to answer any questions you may have.

Sincerely,



Kathryn Williams
Vice President, Public Affairs

Moore-Love, Karla

From: Armstrong, Tom
Sent: Wednesday, November 20, 2019 4:44 PM
To: Council Clerk – Testimony
Cc: Diaz, Samuel
Subject: FW: Portland City Council Fossil Fuel Terminal Ban Testimony Final 2019_SW elm.docx
Attachments: Portland City Council Fossil Fuel Terminal Ban Testimony Final 2019_SW elm.pdf

This testimony was submitted via email to staff. It will be uploaded to the Map App.

Tom

From: Carlson, Nina E. <Nina.Carlson@nwnatural.com>
Sent: Wednesday, November 20, 2019 10:35 AM
To: Diaz, Samuel <Samuel.Diaz@portlandoregon.gov>; Armstrong, Tom <Tom.Armstrong@portlandoregon.gov>
Subject: Portland City Council Fossil Fuel Terminal Ban Testimony Final 2019_SW elm.docx

Gentlemen,

My apologies for sending this as a Word document last evening. I would appreciate you deleting that and using this as reference.

Kind regards,

Nina Carlson
NW Natural- Government Affairs
w: 503.721-2474 m: 503.312-0683
nina.carlson@nwnatural.com

189807

NW Natural
220 NW 2ND AVENUE
PORTLAND, OR 97209
TEL 503.226.4211
www.nwnatural.com

November 19, 2019

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1221 SW Fourth Avenue, Room 130
Portland, Oregon 97204

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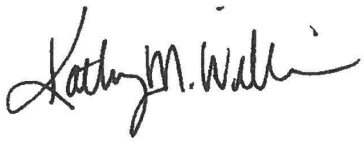


Kathryn Williams
Vice President, Public Affairs

Robert Curcio

#62649 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Thank you for considering our testimony.

Testimony is presented without formatting.

TIDEWATER
TRANSPORTATION & TERMINALS

November 20, 2019

City Council
Fossil Fuel Terminal Zoning Testimony
1221 SW Fourth Avenue, Room 130
Portland, Oregon 97204

RE: City of Portland - Bureau of Planning and Sustainability
Remanded - Fossil Fuel Terminal Zoning Amendments

Thank you for the opportunity for Tidewater Barge Lines ("Tidewater") to provide comments regarding the draft zoning amendments that would restrict development and expansion of bulk fossil fuel terminals.

Tidewater is a marine transportation and terminal company based in the Pacific Northwest that employs approximately 300 people. Tidewater has been in business since 1932 and is the largest inland marine transportation company west of the Mississippi River with a fleet of towboats and barges and five marine terminals. Tidewater's vessels help to move millions of tons of freight every year on Pacific Northwest waterways, reducing congestion on the state's highways and railroads while producing far fewer pollutants and carbon emissions than trucks and trains transporting equivalent tonnage.

We have reviewed the proposed zoning changes and are concerned that these amendments will restrict economic development in the Pacific Northwest. We feel that energy terminals can be built, expanded and operated safely in the City of Portland. Energy terminals have the ability to create a positive economic impact and support new and existing family wage jobs in our region.

In addition, we have concerns that the proposed zoning changes will have negative environmental consequences to the Pacific Northwest. The proposed zoning changes create uncertainty about the future of energy terminals. These terminals are key to a fuel distribution network that allows Tidewater to supply fuel by barge from Portland to Eastern Oregon and Washington in an efficient and environmentally friendly matter. As noted in the enclosed document, four barges pushed by a tugboat is the equivalent of 538.5 trucks or 140 railcars that travel on the highways and railroads in our region. If these terminals cease operations, fuel will have to be distributed in other modes of transportation such as truck and railcar. Therefore, if barging is no longer a viable option for transporting fuel, then every four barge tow would be potentially replaced with approximately 538 trucks or 140 rail cars travelling on the highways and railroads in the Columbia River Gorge.

TIDEWATER
TRANSPORTATION & TERMINALS

In conclusion, Tidewater is an advocate for environmental stewardship in the Pacific Northwest and hopes the City of Portland will consider having a constructive dialogue with Tidewater and the other stakeholders to generate an implementable fossil fuel distribution policy that addresses climate change goals, public safety and environmental protection without significantly adversely impacting the viability of Oregon's economy and its waterfront industry. Tidewater urges the Portland City Council reconsider implementing the remanded fossil fuel terminal zoning amendments.

Thank you for your consideration and the opportunity to comment on this important matter.

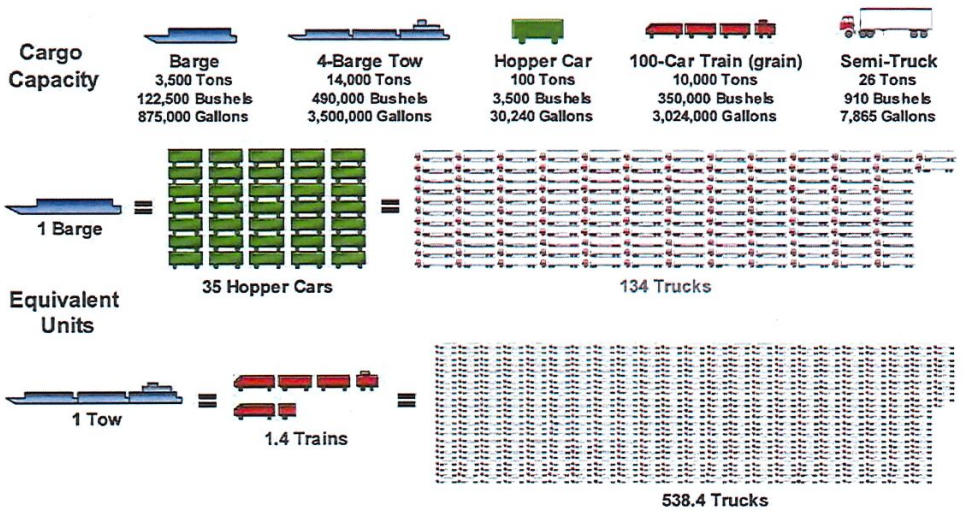
Sincerely,

Robert A. Curcio
President & CEO

Enclosure

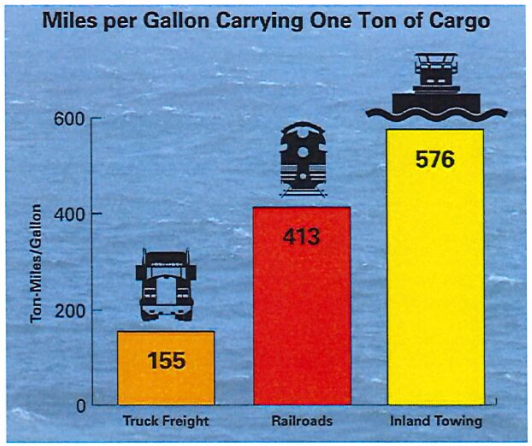
Environmental Advantages of Barging

Freight Comparison of Barges, Trains and Trucks



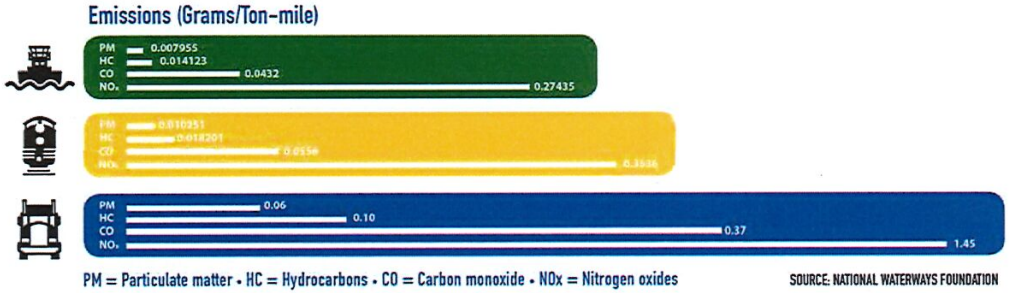
Source: U.S. Army Corps. of Engineers

Saving Energy



Source: Texas Transportation Institute

Ensuring Clean Air



Jon Isaacs

#62563 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Type or paste your testimony in this box...

Testimony is presented without formatting.

Nov. 20, 2019

Portland City Council
1221 SW Fourth Ave., Room 130
Portland, OR 97204

RE: Fuel Terminal Zoning Amendments on Remand

Honorable Mayor Wheeler and members of the City Council:

We are writing on behalf of the thousands of worker and employer members of the Columbia Pacific Building Trades Council, Portland Business Alliance, Working Waterfront Coalition and Oregon Business & Industry. Our organizations represent a broad diversity of businesses and organized labor in our city, region, and throughout the state of Oregon.

We write to express our concern with the city's decision to once again propose a deeply flawed ordinance targeting fuel facilities. The proposal before you is a virtual carbon copy of the 2016 ordinance, which both the Land Use Board of Appeals (LUBA) declared legally defective on seven counts in 2017 and the Oregon Court of Appeals sustained in part.

We are aware that the new proposal contains "findings" purportedly to address the legal deficiencies of the 2016 proposal, but the official impact statement makes it clear that no substantive changes have been made. On the impact statement you have today, under Community Impacts and Community Involvement section, it states on page 9:

"Given that this ordinance is a reconsideration of a previously adopted ordinance, BPS relied upon the previous public testimony that informed that ordinance. This ordinance is substantially the same ordinance with a few minor adjustments to reconcile the code amendments with the current Zoning Code." *(Council Agenda Item 1082, page 9)*

This section also confirms that bureau staff relied almost entirely on the previous public input record. Since the court's decision in 2017, there has been no attempt to reach out to and work with any of our organizations, who successfully challenged the 2016 ordinance, to find common ground.

This decision to bring back an ordinance that has already been rejected, in part by LUBA and Oregon Court of Appeals, and the failure to even attempt to collaborate with the impacted stakeholders, calls into question the stated rationale and goals of this ordinance. Not only could the current proposal result in another costly legal battle, if implemented, it would hurt the local economy and, in several ways, hinder the city's climate and safety goals.

We respectfully ask the mayor and council to reject the current redo of a legally deficient ordinance, and work with all stakeholders to develop a fact-based proposal that is legal and will support the city's climate action goals. A collaborative approach driven by facts, rather than ideological politics,

would support vital infrastructure improvement projects that increase worker safety; reduce greenhouse gas emissions; and mitigate risks posed by earthquakes.

Substantive amendments would address the deficiencies found by LUBA and the Court of Appeals, and could include the following:

1. Consider the carbon emissions of the various transportation methods used to meet local and regional demand. The current proposal would likely force fuels of all kinds to be transported by truck, instead of pipe and tank, forcing an increase in emissions when transporting fuels of all types.

2. Explicitly allow the development of infrastructure that is necessary to transition towards lower emission fuel sources such as blending tanks and new intermodal links. Current city practice to follow the 2015 fossil fuels resolution adopted by council prevents the necessary infrastructure for the cleaner fuels the city says it wants our region to transition to, since the infrastructure for biodiesel and blended clean fuels is essentially the same for fossil fuels. This is highlighted in the recent Office of Community Technology decision to reject a permit application by Zenith for pipes that would have been used exclusively for clean fuels.

3. Explicitly allow terminal safety and seismic upgrades. These upgrades typically occur in conjunction with market-based infrastructure changes, which the amendments prohibit.

Our organizations are committed to working with the City of Portland and all stakeholders to develop real solutions to speed up our community's transition to cleaner fuels, and reduce emissions while ensuring we can meet the energy needs of our city and state today and in the future.

We understand the political pressure on public and private sector leaders to take more urgent action to address the growing impacts of climate change. We support the city taking real, actionable and legally defensible steps to meet its climate action goals. We call on the council to reject this ordinance, which is identical to what was successfully contested by business, industry and the trades in 2016, and work with us to identify those real solutions.

Sincerely,



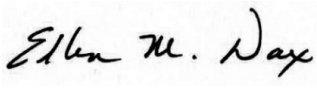
Willy Myers
Executive Secretary Treasurer,
Columbia Pacific Building Trades Council



Andrew Hoan
President & CEO,
Portland Business Alliance



Sandra McDonough
President & CEO,
Oregon Business & Industry



Ellen Wax
Executive Director,
Working Waterfront Coalition

18980/P62

McClymont, Keelan

From:	Jon Isaacs <jisaacs@portlandalliance.com>
Sent:	Wednesday, November 20, 2019 11:13 AM
To:	Council Clerk – Testimony
Subject:	Letter regarding Council agenda item 1082
Attachments:	20191120-FFTO-business and labor groups letter-final.pdf

Portland City Council Clerk,

Please find letter attached regarding Council Agenda Item 1082, scheduled for 2:00pm on 11.20.

Thank you.

Jon Isaacs | *Vice President, Government Affairs*
Portland Business Alliance, *Greater Portland's Chamber of Commerce*
Desk: 503-552-6746 | Mobile: 503-757-5721 | jisaacs@portlandalliance.com

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189807

Nov. 20, 2019

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1221 SW Fourth Ave., Room 130
Portland, OR 97204

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President & CEO,
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Sandra McDonough
President & CEO,
Oregon Business & Industry

Ellen Wax
Executive Director,
Working Waterfront Coalition

4814-6451-5757.1

Ellen Wax

#62561 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Portland City Council November 20, 2019 1221 SW 4th Avenue Portland, OR 97204 Re: Fossil Fuel Terminal Amendments on Remand (City Council Hearing, November 20, 2019) Dear Mayor Weaver and Portland City Commissioners, I am writing on behalf of the Working Waterfront Coalition (WWC) in opposition to the Fossil Fuel Terminal Zoning Amendments (FFT Amendments) Ordinance and Bureau of Planning and Sustainability report titled Fossil Fuel Terminal Zoning Amendments, Remand Report. The WWC represents a wide range of waterfront businesses along the Portland Harbor including several fossil fuel terminals (FFTs). The WWC actively participated and testified in the City's FFT Amendments process and related efforts, including the enactment of Resolution No. 37168, the adoption of the City's 2035 Comprehensive Plan, and the Council adoption of Ordinance No. 188142. Throughout the FFT Amendments process the WWC opposed the City's effort to prohibit new and limit the growth of multimodal terminals along the working waterfront. We testified previously, participated in the appeal, and we are testifying again on remand by virtue of this letter. These multimodal fuel terminals have safely provided the City, the Region and the State with most of the liquid fuel supply for decades. The energy cluster is Oregon's largest fuel distribution hub, providing more than 90 percent of the State's fuel supply. To economically justify the level of private investment needed to comprehensively upgrade critical energy and transportation infrastructure at existing FFTs, existing FFTs must be allowed to grow. This Ordinance eliminates any possible incentive for the massive amount of private investment needed to replace existing tanks in Portland. The Ordinance is shortsighted, and counterproductive to meaningful seismic upgrades over time. By prohibiting new FFTs and limiting the capacity of existing FFTs that serve the regional market the Ordinance creates a significant supply constraint for fossil fuels used within the region. Over time and in times of emergency, this supply constraint will create a significant fossil fuel bottleneck in Portland. When it becomes necessary to bypass this supply constraint, the only remaining option firms will have is to truck fossil fuels to and through Portland. This constraint will therefore increase vehicle miles traveled and will require more fossil fuel to be transferred to and through Portland by truck. For the foreseeable future, fossil fuels will continue to fill an important role in our energy economy. It is critically important for firms to invest in fossil fuel facilities over the next several decades, as demand continues and other unforeseen emergencies continue to exist. The WWC urges City Council to reject the Fossil Fuel Terminal Zoning Ordinance. Sincerely, Ellen M. Wax Executive Director

Testimony is presented without formatting.

Working Waterfront
COALITION

Portland City Council
1221 SW 4th Avenue
Portland, OR 97204

November 20, 2019

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For the foreseeable future, fossil fuels will continue to fill an important role in our energy economy. It is critically important for firms to invest in fossil fuel facilities over the next several decades, as demand continues and other unforeseen emergencies continue to exist. The WWC urges City Council to reject the Fossil Fuel Terminal Zoning Ordinance.

Sincerely,

Ellen M. Wax

Ellen M. Wax
Executive Director

Established in 2005, the Working Waterfront Coalition, with its extensive knowledge of harbor industry needs and active industry participation, is dedicated to working with its partners to ensure an appropriate balance between environmental concerns and the needs of river-related, river-dependent employers. Portland's Harbor is a vital employment area: home to thousands of valuable high-wage, high-benefit jobs. In addition, WWC members are conscientious stewards of the environment, making significant investments in the harbor consistent with state and federal laws.

Daniel Serres

#62559 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Please see the attached exhibit to the comments of Columbia Riverkeeper, Center for Sustainable Economy, Oregon Physicians for Social Responsibility, Portland Audubon Society, 350PDX, Friends of the Columbia Gorge, Willamette Riverkeeper, Climate Action Coalition, Northwest Environmental Defense Center, Oregon Conservancy Foundation, and Human Access Project.

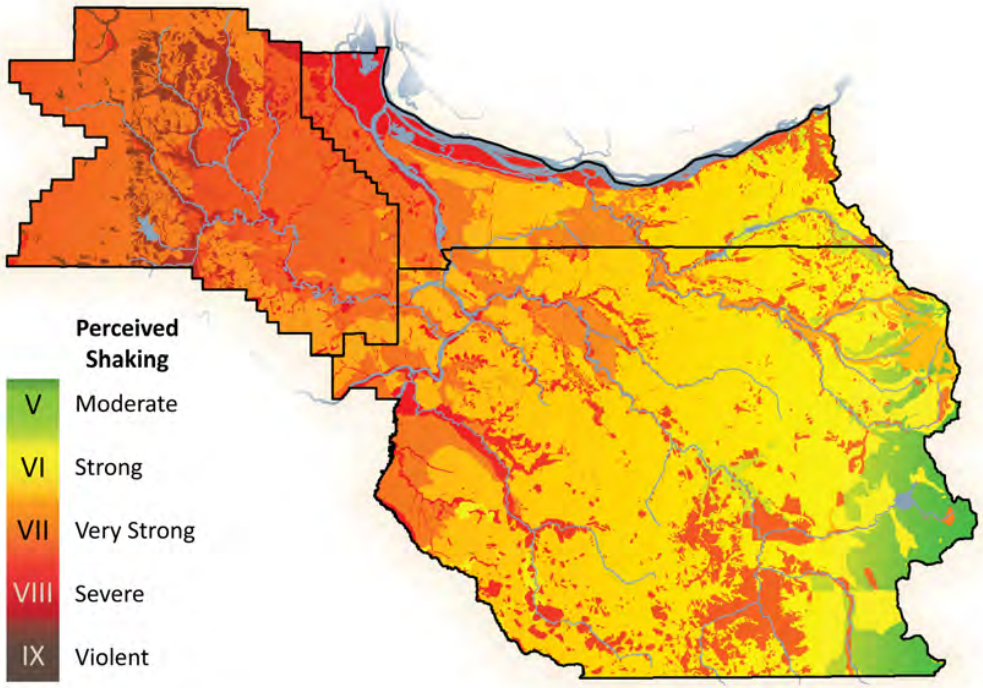
Testimony is presented without formatting.

State of Oregon
Oregon Department of Geology and Mineral Industries
Brad Avy, State Geologist

OPEN-FILE REPORT O-18-02

EARTHQUAKE REGIONAL IMPACT ANALYSIS FOR CLACKAMAS, MULTNOMAH, AND WASHINGTON COUNTIES, OREGON

by John M. Bauer[1], William J. Burns[1], and Ian P. Madin[1]



2018

[1]Oregon Department of Geology and Mineral Industries, 800 NE Oregon Street, Suite 965, Portland, OR 97232

DISCLAIMER

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Cover Image: Perceived shaking for a simulated magnitude 9.0 Cascadia Subduction Zone earthquake in Clackamas, Multnomah, and Washington Counties, Oregon, using updated National Earthquake Hazard Reduction Program site classifications and bedrock ground motion data developed for the 2013 Oregon Resilience Plan. See Appendix E, Plate 6.

Oregon Department of Geology and Mineral Industries Open-File Report O-18-02
Published in conformance with ORS 516.030

For additional information:
Administrative Offices
800 NE Oregon Street, Suite 965
Portland, OR 97232
Telephone (971) 673-1555
http://www.oregongeology.org
http://oregon.gov/DOGAMI/

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GEOGRAPHIC INFORMATION SYSTEM (GIS) DATA

See the digital publication folder for files.
File geodatabase is Esri® version 10.1 format. Metadata is embedded in the geodatabase and is also provided as separate .xml format files.

Metadata in .xml file format:
Each feature class, table, and raster listed below has an associated, standalone xml file containing metadata in the Federal Geographic Data Committee Content Standard for Digital Geospatial Metadata format.

RDPO_Earthquake_Impact_Analysis_Phase1.gdb:

Feature dataset: *Phase1*

Feature classes:

Building_Footprints
Electrical_Transmission_Structures
Emergency_Transportation_Routes
Jurisdictions
Neighborhood_Units
Population_and_Building_Density

Tables:

Loss_Jurisdiction_CSZ_M9p0_dry
Loss_Jurisdiction_CSZ_M9p0_wet
Loss_Jurisdiction_PHF_M6p8_dry
Loss_Jurisdiction_PHF_M6p8_wet
Loss_Neighborhood_Unit_CSZ_M9p0_dry
Loss_Neighborhood_Unit_CSZ_M9p0_wet
Loss_Neighborhood_Unit_PHF_M6p8_dry
Loss_Neighborhood_Unit_PHF_M6p8_wet

RDPO_GroundMotion_GroundFailure_Phase1.gdb:

Feature class:

PHF_M6p8_bedrock_groundmotion

Rasters:

CSZ_M9p0_pga_site
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CSZ_M9p0_sa03_site
CSZ_M9p0_sa10_site
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PHF_M6p8_Prob_landslide_dry
PHF_M6p8_Prob_landslide_wet
PHF_M6p8_Prob_liquefaction_wet

EXECUTIVE SUMMARY

This report was prepared for the Regional Disaster Preparedness Organization (RDPO), with funding provided by the Urban Areas Security Initiative Program. The report provides damage and casualty estimates to buildings, people, and key infrastructure sectors resulting from a major earthquake in the Portland metropolitan region by using updated local geologic information and recent advances in loss estimation methods. Damage and casualty estimates are tabulated at county, jurisdiction, and neighborhood levels, providing actionable information for further use in emergency planning, earthquake mitigation, public awareness, and post-earthquake response and recovery.

The RDPO is a bi-state partnership of local and regional government agencies, non-governmental organizations, and private-sector stakeholders representing the Portland metropolitan region that collaborate to increase the region's resiliency to disasters. The region spans Clackamas, Columbia, Multnomah, and Washington Counties in Oregon and Clark County in Washington. In 2016 the RDPO Steering Committee identified a need for updated, region-wide, detailed loss estimates from a major earthquake and engaged the Oregon Department of Geology and Mineral Industries (DOGAMI) to conduct this study. Previously, earthquake damage estimates in large portions of the Portland metropolitan region were limited to studies conducted in the 1990s, when understanding of the Cascadia Subduction Zone (CSZ) risk was nascent. Since then, advances have occurred in several areas, including loss estimation tool capabilities, subduction zone science, and local geologic mapping in the Portland metropolitan region. The RDPO commissioned this study to harness such advances, thereby enabling local, regional, state, and federal planners and policy makers to apply the results in their efforts to mitigate risk and building seismic resilience and to prepare for response and recovery. DOGAMI and RDPO divided the project into two phases, with the first phase focused on methodology refinement and application of those methods to evaluate impact of a major earthquake in Clackamas, Multnomah, and Washington Counties (Oregon). Phase 2 will apply the same methods in Columbia County, Oregon, and Clark County, Washington.

The Portland metropolitan region is vulnerable to regional and local earthquakes. We modeled damage for two earthquake scenarios: a magnitude 9.0 CSZ earthquake, and a magnitude 6.8 Portland Hills fault earthquake, a local crustal fault situated at the foot of the Tualatin Mountains. In order to better understand the range of possible losses, our analysis quantified impacts during saturated and dry soil conditions—the former are more likely to have earthquake-induced landslides and liquefaction; the latter may have some earthquake-induced landslides, but little occurrence of liquefaction. We derived our damage estimates primarily from Hazus®, a geographic information system (GIS)-based tool and set of methods for loss estimation from natural hazards. Hazus is developed and supported by the Federal Emergency Management Agency (FEMA).

Our project consisted of several major efforts:

- **Building and infrastructure databases**: completion of a region-wide building footprint database, a building database containing detailed descriptions of each building, and an electric power transmission structure database
- **Geotechnical mapping updates:** earthquake-induced landslide susceptibility, liquefaction susceptibility, and soil classification, using recently published high-resolution geologic mapping
- **Ground motion and ground deformation updates:** local ground motion and ground failure data for two earthquake scenarios using the geotechnical mapping updates
- **Earthquake damage estimates:** quantifying impacts to buildings and the people that occupy them, to the region's designated emergency transportation routes, and to the electrical grid

A GIS database containing building footprints, population density grids, detailed casualty, debris, and building loss estimates by jurisdiction and neighborhood, key infrastructure sectors with loss estimates, and updated ground motion and ground deformation data accompanies this report. A separately published report describes the geologic mapping updates for the three-county area, consisting of National Earthquake Hazards Reduction Program (NEHRP) soil types, and earthquake-induced landslide and liquefaction susceptibility.

A Cascadia Subduction Zone (CSZ) magnitude 9.0 earthquake will have a severe impact on the three-county area, with building repair costs amounting to between 23.5 and 36.7 billion dollars (9% and 14% of the total building replacement cost, **Table ES-1**). Although damage estimates vary widely throughout the study area, no community will be unharmed. Depending on the time of day an earthquake occurs, casualties may be in the thousands or low tens of thousands. The earthquake will generate several millions of tons of debris from damaged buildings. Damage and casualty estimates resulting from a magnitude 6.8 Portland Hills fault earthquake are more than twice compared to a CSZ earthquake, primarily because of the Portland Hills fault location below densely populated and heavily developed areas (**Table ES-1**). However, the likelihood of a Portland Hills fault earthquake is considerably less than a Cascadia Subduction Zone earthquake.

Table ES-1. Loss estimate summary for two earthquake scenarios in the Portland metropolitan area. Lower value: dry soil conditions. Upper value: saturated soil conditions.

County	U.S. Census Population Estimate (2010)	Number of Buildings	Building Value ($ Billion)	Building Repair Cost ($ Billion)	Building Loss Ratio	Debris (Millions of Tons)	Long-Term Displaced Population (Thousands)	Total Casualties*	
								Daytime Scenario (Thousands)	Nighttime Scenario (Thousands)
Cascadia Subduction Zone magnitude 9.0 earthquake									
Clackamas	375,992	179,164	62.4	3.2–4.6	5%–7%	1.7–2.1	1.9–10.1	2.0–2.8	0.5–1.1
Multnomah	735,334	255,577	114.0	13.3–20.5	12%–18%	7.7–10.4	9.7–37.5	11.4–16.7	2.8–5.6
Washington	529,710	181,111	82.7	7.0–11.6	8%–14%	3.4–4.8	5.2–37.7	4.9–7.7	1.1–3.7
Total	1,641,036	615,852	259.1	23.5–36.7	9%–14%	12.8–17.3	16.8–85.3	18.3–27.2	4.4–10.4
Portland Hills fault magnitude 6.8 earthquake									
Clackamas	375,992	179,164	62.4	12.9–16.4	21%–26%	4.9–6.0	25.2–50.8	8.9–10.9	3.3–5.2
Multnomah	735,334	255,577	114.0	32.3–42.7	28%–37%	15.7–19.3	50.8–120	28.9–36.3	9.3–15.3
Washington	529,710	181,111	82.7	15.4–24.3	19%–29%	6.0–8.6	19.6–86.0	10.0–15.8	3.2–8.5
Total	1,641,036	615,852	259.1	60.6–83.4	23%–32%	26.6–33.9	95.6–257	47.8–63.0	15.8–29.0

* Casualty estimates include minor injuries, injuries requiring hospitalization, and fatalities.

The damage estimates are significantly higher than those given in previously published studies for the area, primarily due to usage of an updated building inventory that more accurately reflects the region's building code history with respect to seismic resiliency, and usage of updated soils and liquefaction susceptibility data.

This study addressed a major need for consistent, updated earthquake damage estimates in the Portland metropolitan region. The data are intended not as an end in themselves, but as a platform for counties, jurisdictions, and communities to better understand their needs to prepare for, respond to, and recover from a major earthquake. We conclude our report with recommendations supported by findings in this study that can reduce the region's vulnerability, shorten recovery time, and improve emergency operations.

1.0 INTRODUCTION

1.1 Overview

Casualty and loss estimates for a modeled earthquake provide planners with actionable data for pre-earthquake preparations and mitigation and for post-earthquake recovery efforts. The Regional Disaster Preparedness Organization (RDPO), a bi-state partnership of local and regional government agencies, non-governmental organizations, and private-sector stakeholders representing the Portland Metropolitan Region, collaborate to increase the region's resiliency to disasters, including earthquakes. The Portland Metropolitan Region spans Clackamas, Columbia, Multnomah, and Washington Counties in Oregon, and Clark County in Washington (**Figure 1-1**).

Figure 1-1. Regional Disaster Preparedness Organization counties, spanning Oregon and Washington. Phase 1 study area in tan, proposed Phase 2 study area in lavender. County seats shown as dots.



One of RDPO's guiding principles is ensuring equity and fairness in adopting regional policies, and from an earthquake planning perspective, that principle requires loss estimates that are developed using consistent methods and data across the region. Prior to this study, loss estimates from earthquakes in the Portland Metropolitan Region were derived from several studies, each done at different times, using different datasets (Wang, 1998; Hofmeister and others, 2003; FEMA, 2004; Tetra Tech, 2016a). Technologies and data available for earthquake impact analysis have improved since these studies. RDPO requested that Oregon Department of Geology and Mineral Industries (DOGAMI) develop—using the best tools and methods, updated local geological data, and detailed building and infrastructure data—updated loss estimates from a major earthquake for the five-county RDPO area.

We divided the project into two phases. **Phase 1** focused on methodology refinement and application of those methods to evaluate impact of a major earthquake in **Clackamas**, **Multnomah**, and **Washington Counties** (Oregon)—the "study area." Phase 2 will apply the same methods in Columbia County, Oregon, and Clark County, Washington. This report documents our Phase 1 work.

The three-county study area is home to 44% of Oregon's total population. It continues to experience significant growth, with population increasing from 1.45 million people in 2000, to 1.64 million people in 2010, to 1.78 million people in 2016 (Portland State University Population Research Center, 2016, https://www.pdx.edu/prc/population-reports-estimates). By 2030, the study area's total population is projected at 2.10 million people (Oregon Office of Economic Analysis, 2013, http://www.oregon.gov/das/OEA/Pages/forecastdemographic.aspx). The area hosts 894,000 jobs, or 50% of all jobs in Oregon, with total annual wages estimated at $50.5 billion (Oregon Employment Department, 2016). The area includes an infrastructure hub that houses all of Oregon's major liquid fuel port terminals, and Port of Portland facilities that include the state's largest airport. Most of the population in the study area is concentrated in cities (76%), but all three counties contain large tracts of unincorporated suburban development. All three counties have broad areas of dispersed rural development.

Geology in the 3,076-square-mile study area varies widely, influenced by local and regional processes (Evarts and others, 2009). It includes Columbia River basalts, alluvial deposits, volcanic outcrops, loess deposits, dredge and fill material placed on top of former riverine wetlands, and large areas of fine-grained to coarse-grained Missoula flood deposits (Ma and others, 2012). The geological diversity creates significant local variations in earthquake ground motion and in ground failure from earthquake-induced landslides and liquefaction.

1.2 Earthquake Scenarios and Earthquake Loss Estimation

An earthquake scenario tells the story of a defined earthquake and its potential impacts to a community, presenting narratives and data that can help planners and community members better understand the earthquake and plan for the future (Earthquake Engineering Research Institute [EERI], 2006). Scenarios use the best scientific information available on fault placement, rupture frequency, and earthquake magnitude. Because the loss estimate data are used for planning purposes, scenarios incorporate the upper end of predicted magnitude when modeling a specific earthquake. Full earthquake scenario exercises incorporate experts from multiple backgrounds and responsibilities, such as transportation and utilities. Past examples include the Seattle Fault (EERI, 2005) and the Wasatch Fault (EERI, 2015) scenarios.

Our study is more limited in scope compared to the two example scenarios; we focus on damage to buildings and the people that occupy them, and to two key infrastructure sectors. In this report, our use of the term *scenario* refers to a specific combination of a particular earthquake and one or more additional variables. In order to provide planners a more complete picture of the range of potential impacts from a large earthquake, we modeled two distinct earthquakes: a Cascadia Subduction Zone and a Portland Hills fault. Each earthquake was modeled with a *wet* (saturated) and a *dry* soil condition, and each earthquake was modeled at two different times of the day, at "2 AM" and at "2 PM."

In western Oregon and Washington, soil moisture conditions vary widely throughout the calendar year. Soil moisture conditions influence the likelihood of an earthquake-triggered landslide or liquefaction. An earthquake occurring during wet (saturated) soil conditions is much more likely to induce landslides and liquefaction. Some earthquake-induced landslides may occur in dry soil conditions, but liquefaction is much less likely.

Throughout a typical day, people move between various buildings such as residences, schools, work facilities, and commercial facilities. Some buildings, due to their basic structural system, are more likely to sustain significant damage from an earthquake and, thus, depending on how many people are occupying the building at the time of the earthquake, cause more casualties.

Past earthquakes along the 600-mile Cascadia Subduction Zone fault (**Figure 1-1**) have occurred at highly variable intervals, from decades to centuries, and have ranged widely in magnitude (Oregon Seismic Safety Policy Advisory Commission [OSSPAC], 2013). At least 40 large-magnitude earthquakes have occurred along the fault in the past 10,000 years. The most recent earthquake, estimated at magnitude 9.0, occurred on January 26, 1700 A.D. Studies of the geologic record suggest that a Cascadia Subduction Zone earthquake of magnitude 9.0 has a 10% to 14% chance of occurring within the next 50 years (Petersen and others, 2002; Goldfinger and others, 2012). For the central and northern Oregon coast, recent research suggests the chance of occurrence within the next 50 years may be 15% to 20% (Goldfinger and others, 2017).

Although the Cascadia Subduction Zone fault has garnered significant attention, active local crustal faults should also be evaluated in an earthquake impact analysis. Wong and others (2001) concluded that the Portland Hills fault (**Figure 1-2**) might be seismogenic, with evidence suggesting two ruptures in the past 15,000 years (Liberty and others, 2003). Other active crustal faults exist in the Portland Metropolitan Region, but a rupture on the Portland Hills fault would be the most impactful, given its position directly underneath downtown Portland and the population centers of Clackamas County.

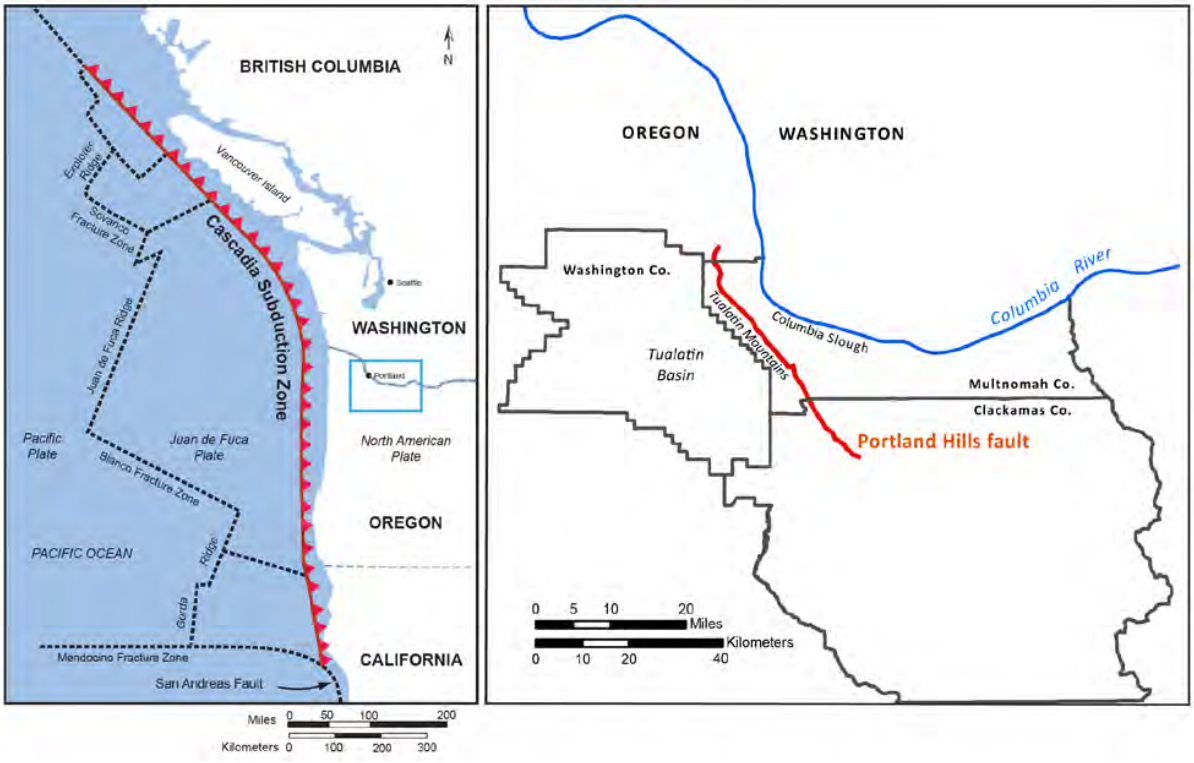
Hazus is a nationally applicable standardized methodology that contains models for estimating potential losses from earthquakes, floods, and hurricanes. Hazus uses geographic information system (GIS) technology to estimate physical, economic, and social impacts of disasters (FEMA, 2011). FEMA developed the earthquake model in cooperation with the National Institute of Building Sciences (Schneider and Schauer, 2006). Hazus damage and loss functions for generic model building types are considered to be reliable predictors of earthquake effects for large groups of buildings (FEMA, 2010). However, good estimates require accurate, updated data inputs.

The first Hazus-based study conducted in Oregon used a magnitude 8.5 model of a Cascadia Subduction Zone earthquake as it was understood at the time (Wang, 1998). The study was intended to provide an overall initial understanding of potential earthquake impacts across Oregon. Further, the Hazus tool at that time did not incorporate liquefaction or landslide information. Subsequent Hazus-based studies were limited to portions of the study area. The City of Portland had two Hazus-based studies (FEMA, 2004; Tetra Tech, 2016a), and Clackamas County had one Hazus-based study (Hofmeister and others, 2003). However, no studies have been conducted for Multnomah County (excluding the City of Portland) and Washington County since Wang (1998).

All previous Hazus-based earthquake studies in the study area were conducted at the census tract level—a spatial unit designated by the U.S. Census Bureau (https://www.census.gov/geo/reference/gtc/gtc_ct.html) that was chosen in the formative days of Hazus tool development out of computational necessity, but one that oversimplifies the building, seismic, and geologic heterogeneity within the census tract (Price and others, 2010). In the past five years, advances in Hazus tools and methods have enabled modeling earthquake damage using detailed data that incorporate local geologic variations and individual building seismic design characteristics. The advancements in the tools and methods provide more accurate loss estimates and permit analysis at a finer, neighborhood-scale level, rather than at the coarser census tract level. The updated methods require that considerable effort be expended on dataset development, including building and infrastructure inventory and local geological data. In Section 2, we provide background on the asset development, which includes all buildings and key infrastructure

sectors in the study area. Further background on the key infrastructure sectors is in the following subsections.

Figure 1-2. Cascadia Subduction Zone fault (left) and Portland Hills fault (right) locations. Blue rectangle in left figure is shown in right figure.



1.2.1 Critical Infrastructure Sectors

The Cities of Eugene and Springfield Multi-Jurisdictional Natural Hazards Mitigation Plan (2014) identified three critical infrastructure sectors fundamental to the operation, maintenance, and restoration of all other infrastructure sectors—namely, electricity, transportation, and fossil fuels. Given the challenges of enumerating the numerous interdependencies among various sectors and of quantifying potential earthquake damage to the components of those sectors, we determined that by limiting our analysis to the key sectors identified in that plan, we could establish a basis upon which to build future infrastructure studies and interdependencies.

In the Portland Metropolitan Region, fossil fuel supply seismic resiliency has been analyzed by Wang and others (2013), with a focus on the Critical Energy Infrastructure (CEI) Hub in northwest Portland. Tetra Tech (2016b) quantified damage estimates to the CEI Hub's fuel storage structures for a Cascadia Subduction Zone and for a Portland Hills fault earthquake scenario, and DOGAMI provided a substantive review of the report. We did not see a need to revisit damage estimates to the nonbuilding structures contained in the CEI Hub. Nonbuilding structures include water towers, storage tanks, piers, dams, and carports, and where human occupancy is incidental (FEMA, 2012b).

A Hazus-based study of the City of Portland (FEMA, 2004) included an analysis of an earthquake impact to electric substations and the transportation network. Although it used best available liquefaction and landslide data, the study was limited to the City of Portland, and its spatial data were not made available for further analysis.

1.2.1.1 Electric Power Transmission

Electric power infrastructure consists of power generation and distribution, including dams, substations, transmission network, and local transformers. Within the network, substation components are typically the most likely to fail given strong ground motion (Fujisaki and others, 2014). Transmission structures (towers and poles) generally perform well under strong ground motion but can fail due to lateral movement from liquefaction or earthquake-induced landslides (Good and others, 2009). Hazus provides a simplified damage model from ground motion and ground failure for substations as a whole unit, but the model may be overly conservative (Kongar and others, 2014), and a more accurate model should consider individual substation components.

From our literature review we determined that our project should 1) provide updated ground motion and ground failure data for local utilities to better quantify their substation seismic resiliency, and 2) address the risk to the transmission network between substations by quantifying potential ground failure at the transmission structures. An example of earthquake-induced ground failure impact on a transmission structure is shown in **Figure 1-3**. Our approach builds on the previous exposure analysis of electric transmission structures to mapped landslides established by Burns and others (2011, 2013).

Figure 1-3. Example of ground failure underneath a transmission tower, 1999 İzmit earthquake (Turkey). Photographic credit: University of California, Irvine Consortium of University for Research in Earthquake Engineering Archives.



1.2.1.2 Emergency Transportation Routes

Functioning transportation networks are essential for emergency response and post-earthquake recovery. Regional planners have identified a subset of arterials in the study area as routes essential for providing emergency services. Understanding which routes may be impacted from an earthquake can permit planners to consider alternative routes or how to distribute services in a more dispersed manner. An example of earthquake-induced ground failure impact on a surface road is shown in **Figure 1-4**. A complete analysis would include a seismic analysis of the bridges and overpasses used by the emergency transportation routes, but such an analysis requires detailed field-gathered information (e.g., Wang, 2017) and was beyond the scope of this project.

Figure 1-4. Damaged road due to liquefaction-induced lateral spreading, 2001 Nisqually, Washington earthquake. Photographic credit: DOGAMI Archives.



1.3 Study Limitations

Hazus-based risk analyses often include damage estimates to various assets such as buildings, buried utilities, above ground utilities, and essential facilities. Such analyses typically use the inventory data that accompany Hazus. Out of necessity, the Hazus inventory data are constructed from readily available nationwide datasets, and often capture a portion of the non-building assets in an area. Users can supplant the inventory with more detailed information, but at significant development cost. Given the constraints on time and budget for this project, and the challenges of obtaining more detailed and accurate local data, we limited our analysis to buildings and the people that occupy them, and the two key infrastructure sectors previously discussed. Specifically, we did not analyze earthquake impacts to communication networks or towers, storage tanks, dams, levees, hazardous material facilities, and buried utilities conveying natural gas, potable water, oil, stormwater, and wastewater.

We did not identify or individually analyze specific buildings that may be considered essential or critical facilities. As discussed in the Recommendations section (Section 7), we maintain that the identification of such facilities should be community driven, and that an earthquake impact analysis of such facilities should be done by using the Rapid Visual Screening method (FEMA, 2015a) rather than a Hazus-based method using generic building models.

The Critical Energy Infrastructure (CEI) Hub along the Willamette River in northwest Portland was not analyzed in this report. A recent analysis conducted by Tetra Tech (2016b) provided a detailed damage assessment of the infrastructure from the same earthquake scenarios we used for this study. We did not include the hub's nonbuilding structures, such as oil tanks, in our building database.

Our economic loss estimates were limited to the direct cost of repairing a damaged building or replacing a severely damaged building with an equivalent structure. Our model assumes standard labor and material costs and availability of capital and credit. It does not factor in any demand surge. We did not model income losses such as wage and rental income, as we maintain that the impacts of a regional earthquake will fundamentally alter the local economy, rendering the basic assumptions used in the current Hazus model moot.

Our study focused on loss to buildings, which includes damage from earthquake-induced landslides and liquefaction. We did not quantify permanent loss of use, and thus value, of the land due to the ground failure. Such loss of use can add to the overall indirect economic loss.

2.0 ASSET DATABASE DEVELOPMENT

In this study we limited our analysis, and thus our asset database, to three components: buildings and the people occupying them, the electric power transmission infrastructure, and emergency transportation routes. A building is defined as a structure containing a roof and walls and occupied by people. Nonbuilding structures include water towers, storage tanks, piers, dams, and carports, and where human occupancy is incidental (FEMA, 2012b). We excluded nonbuilding structures from our building database. The electrical transmission network is limited to the towers and poles that supply power to the distribution substations (Appendix E, **Plate 1**). The surface transportation network is limited to a subset of highways, arterials, and roads identified as Emergency Transportation Routes (Appendix E, **Plate 10**).

2.1 Building Database

A Hazus-compatible building database contains a record for each distinct building, with each record containing required information for estimating damage to the structure and potential harm to the building's occupants (**Table 2-1**). Information associated with the building record, commonly referred to as attributes in a GIS context, is populated primarily from county assessor records or, where better data are available, from other ancillary datasets. Examples of such datasets are provided in **Table 10-1**.

Table 2-1. Building information required by Hazus earthquake model.

Hazus Attribute	Example	Purpose
Location of building	latitude, longitude	Extract ground motion and ground deformation data
Building usage	Single-family Residential; Retail Commercial	Repair/replacement cost; Number of people per building
Building material	wood; steel	Response to ground motion; debris
Year built	1968	Seismic design level: response to ground motion
Number of stories	2	Response to ground motion
Square footage	2250	Repair/replacement cost; debris
Daytime occupancy[+]	2.1	Casualty estimate
Nighttime occupancy[+]	3.4	Casualty estimate

[+]Daytime and nighttime occupancy amounts at the individual building level are based on proration of aggregated population data using the building's square footage, thus are typically fractional.

2.1.1 Building Footprint Development

A building footprint is a GIS polygon representation outlining the shape of the building. It defines a record in the building database. The building footprint establishes the location of the building, thereby placing the building relative to a natural hazard.

Because building footprints define the building record, our first task was to complete a building footprint database for the study area. Building footprints were obtained from Metro Regional Land Information System (http://rlisdiscovery.oregonmetro.gov/, downloaded February 2016) and from two DOGAMI publications (Burns and others, 2011, 2013). Large portions of western Washington County and southwestern Clackamas County had no building footprint data. In these areas we digitized building footprints following the methods described by Mickelson and Burns (2012, Section 3.2.3). Where lidar

data were not present, we used 2016 orthoimagery from the National Agricultural Imagery Program (https://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/index). Our digitization effort included removing obsolete building footprints (teardowns) and modifying existing building footprints where additions had been made or other digitization errors were noted.

We did not digitize structures less than 400 square feet in area, as such features are assumed to be non-building structures, such as kiosks, or are not reasonable to model within Hazus, such as portable storage sheds. Structures obtained from previous digitization efforts that were less than 400 square feet were retained in the building footprint database but were attributed as not modeled.

Nonbuilding structures include developments such as water towers, billboards, docks, dams, piers, and hoop houses. Outlines of such structures are often included in a building footprint database. Our study focuses on estimating damage from an earthquake to buildings and the people that reside in them. Many of the nonbuilding structures have no damage model or an overly simplified damage model within the Hazus framework. We identified such structures using orthoimagery and tax lot database queries, and we attributed them as not modeled.

Floating structures such as houseboats do not directly experience seismic shaking. We identified such structures using orthoimagery, attributed them as floating structures, and excluded them from our analysis. As with nonbuilding structures, we retained the building footprint of floating structures in the database. We note that floating structures may be damaged from seismic seiches (Jones and others, 2008).

In the building footprint database obtained from Metro RLIS, building complexes that contain two or more distinct, contiguous buildings were commonly digitized as a single building. Such buildings typically occur in downtown areas and can be identified by several methods, including their spanning multiple tax lots with unique owners, and distinct building heights derived from lidar elevation models. Seismic design level, building usage, and construction material can vary between such contiguous buildings, each of which can influence the damage estimate. We determined that dividing such polygons into individual buildings would result in a more accurate representation of the built infrastructure. Orthoimagery and street-level imagery further clarified whether a building footprint needed further partition. Building footprints digitized as part of this project factored in the guidelines for contiguous buildings.

Although parking garages are by definition nonbuilding structures, Hazus considers them as buildings in its occupancy class library (FEMA, 2011, Table 3.2). We retained that modest inconsistency in our building database by including parking garages in our damage assessment.

2.1.2 Assessor Database Processing

County assessor databases form the basis for assigning Hazus-required information for individual buildings, as the databases have information for most to all of the tax lots in the study area. We obtained detailed tabular data from the three county assessor offices. We used the tax lot spatial data from the Metro RLIS database to associate assessor tabular data with specific buildings, and we extracted information from the assessor tabular data to assign values to the appropriate attributes (**Table 2-1**). For example, Oregon Administrative Rules (OAR 150-308.215) require that county assessors assign a 3-digit property code for all tax lots in Oregon. We constructed a reference table to translate the tax lot property code into one of 36 Hazus occupancy classes, and we assigned that value to the particular buildings occupying that particular tax lot.

Assessor tabular data provided direct or easily-derived information for the following attributes: year built, square footage, number of stories, and building usage. None of the three county assessor databases had consistent information on building type (e.g., wood, steel).

2.1.3 Usage of Ancillary Data

We used a supersedence paradigm, overriding the assessor-derived data with more accurate data where available (Appendix A, Section **10.1**). For example, Lewis (2007) provided detailed information on square footage and building type for public buildings, such as schools, in Oregon. Other examples include the Metro RLIS spatial data on single-family and multi-family residential buildings, and the locations of educational, fire, and police buildings. Appendix A, Section **10.1** provides a complete list of other datasets used to populate the building database.

2.1.4 Building Type

The Hazus building type attribute specifies the basic structural system of a building. For example, a steel-framed building can be categorized as a steel light frame or a steel moment frame. The Hazus Advanced Engineering Building Module (AEBM) tool provides building damage functions for 36 generic building types (FEMA, 2010), and the FEMA Rapid Visual Screening handbook (FEMA, 2015a) provides qualitative descriptions of each building type. We classified all buildings in the study area into one of the 36 generic building types. Although Hazus AEBM permits one to create a unique performance model for individual buildings, such an effort was well outside of this project's scope, given its three-county scale.

We could not find any information in any of the three county assessor databases that provided consistent information on the building's primary construction material. Building types for a portion of the buildings were available from several sources, and we incorporated these into our building database. Lewis (2007) provided building types for public schools, fire, and police buildings. The most valuable dataset was the Metro Area Disaster GIS (MADGIS) database (Metro, 1998), with 40,000 buildings spread across all counties in the study area, categorized into Hazus-compatible building types.

For buildings that had no information on their primary construction material, we assigned a value based on the building's occupancy class, year built, and number of stories. We used an in-house tool that implements the statistical distributions listed in Tables 3.A1–3.A10 of the Hazus Earthquake Technical Manual (FEMA, 2011).

2.1.5 Building Replacement Value

We used the RSMeans valuation method for estimating a building's replacement cost (Charest, 2017), multiplying the building square footage by a standard cost per square foot. We used values from Hazus SQL database tables ([dbo].[hzReplacementCost] and [dbo].[hzRes1ReplCost]) that incorporated the RSMeans valuation to compute the replacement cost. We made no inflation or regional adjustments to the tabular data, for the following reasons. The Hazus tables were based on 2014 RSMeans national values. Because the Consumer Price Index difference between 2014 and 2017 was minimal, we made no further adjustment. The RSMeans location factor adjusts for regional differences in labor and material costs. Portland area's location factor of 0.98 for residential construction (Charest, 2017) was, for simplicity, rounded to 1.0, and thus we did not adjust cost; the commercial construction location factor at 1.0 also resulted in no adjustment.

Building replacement cost is not the same as a property's assessed value. For analysis purposes, we assume repair or replacement costs to damaged structures will be charged at standard construction rates and are independent of a building's age or the land on which the building is placed. Assessed value

takes into account the land's value, which may fluctuate greatly depending on real estate markets, and for improvements, assessors typically factor in the building's depreciation into the assessed value.

An abnormal shortage of skilled labor or materials can occur after a large-scale disaster. Demand surge is a process resulting in a higher cost to repair building damage after large disasters than to repair the same damage after a small disaster (Olsen and Porter, 2011). Adjusting repair/replacement costs due to a likely demand surge was beyond the scope of this project.

2.1.6 Design Level Assignment

The design level assignment in the Hazus-MH earthquake model allows a user to specify, for the given building type, its seismic performance level. Oregon initially adopted seismic building codes in the mid-1970s (Judson, 2012). The established benchmark years of code enforcement are used in determining a "design level" for individual buildings. The design level attributes (pre-code, low-code, moderate-code, and high-code) are then used in the Hazus earthquake model to determine what damage functions are applied to a given building. The year built and the year of the most recent seismic retrofit are the main considerations for an individual design level attribute. We used the benchmark years listed in **Table 10-2** to assign a design level to each building. We are not aware of any building codes adopted at the local or county level that supersede, from a seismic design perspective, building codes established by the Oregon Building Codes Division.

In the past 20 years, many property owners, including private, public, and institutional, have implemented building seismic retrofits—modifications that improve building's seismic resilience. Ideally, we would obtain and incorporate such information into our database, instead of assigning a seismic design level based on the structure's original year of construction. However, such information was not available in any centralized, usable form from any of the county's permitting or assessor offices. The City Club of Portland's analysis (2017) identified a lack of reliable data, in part because permits are not often filed with seismic upgrades, or the seismic upgrades to a building may be part of a larger renovation. We found only one source of data for such information—the Unreinforced Masonry Building database maintained by the City of Portland (2017). Buildings identified as upgraded, 290 total, were assigned Reinforced Masonry (RM1), moderate code building type and design level values, respectively. The dataset was limited to the City of Portland. City Club of Portland's report (2017) found no other source of data for identifying locations of unreinforced masonry buildings in the region.

2.1.7 Daytime and Nighttime Population

In order to calculate casualties and displaced persons, we estimated the number of people occupying each building under two commonly implemented temporal scenarios: daytime and nighttime, commonly referred in a Hazus context as a "2 PM" and a "2 AM" scenario. The nighttime population assignment assumes that at least 95% of the people are in their primary residences and that nonresidential buildings have some level of occupancy, depending on their function. Fire stations, for example, are occupied by a nighttime shift. The daytime scenario assumes a typical weekday in a school year, with population distributed across schools, work facilities, and homes. The population assignments are primary driven by U.S. Census population data, the building's specific usage (i.e., its Hazus-designated occupancy class), and the building's square footage. We did not implement a "5 PM" scenario, as that requires assumptions on road occupancy and bridge failure models, and an evaluation of bridge and overpass seismic design performance was beyond the scope of this project.

For assigning permanent resident population quantities to residential buildings, we pro-rated the U.S. Census Bureau 2010 permanent population value for a given U.S. Census Bureau-defined census block group across the residential buildings, excepting the RES4 (hotel/motel) type, on a square footage

basis. We determined that the census block geometries are often imprecise relative to building footprints, creating frequent scenarios where a census block has one or more residential buildings and zero permanent residents, or zero residential buildings and one or more permanent residents. The census block group's geometries are generally along arterials or physiographic features. Although pro-rating at the census tract was a possible alternative, we decided the finer resolution of the census block group provided the best estimate of residential building occupancy, one that reflected varying demographics within a larger census tract. We retained a *permanent resident* population field, and we populated the *nighttime population* for residential buildings by multiplying the permanent resident population by 0.95—slightly less than the 99% suggested by FEMA (2011, Table 13.2), and one that accounts for night shift employment and recreational and business travel.

For daytime population in nonresidential buildings, we considered the suggested peak population density numbers published in the Hazus Tsunami Model Technical Guidance (FEMA, 2017c, Table 3.14), but we observed that the daytime population was at least 3 times the permanent population of the study area. We determined that such a ratio was unreasonably high, as we assume that at least 75% of the working population in the study area reside within the study area. Instead, we computed people-per-square-footage (ppsf) values by using the estimated commercial, industrial, and educational population estimates by Census Tract in the Hazus SQL database table [dbo].[hzDemographicsT], and our own building stock square footage summaries, and then used the ppsf values and the individual building's square footage to assign people per building.

We assigned daytime populations for residential buildings and nighttime populations for nonresidential buildings by using the Day to Night ratios provided by FEMA (2017c, Table 3.14).

Permanent resident figures per residential building were based on the April 1, 2010 U.S. Census numbers and the 2010 U.S. Census Block Group boundaries. The study area has seen significant growth since then, with the most recent estimate (July 1, 2016 Certified Population Estimates, Portland State University Population Research Center, https://www.pdx.edu/prc/population-reports-estimates) showing an 8.4% increase from 2010. Several jurisdictions have had boundary adjustments via annexations since 2010. Planners may wish to adjust the displaced population and nighttime casualty estimates using the percentages shown in **Table 2-2**. Given the larger uncertainty with the daytime population assignments compared to nighttime population assignments, we do not recommend adjusting daytime casualty numbers.

Table 2-2. Population changes in the study area, 2010 to 2016. Limited to cities with 2010 population of 20,000 or more people and with no to minimal annexations between 2010 and 2016. Certified Population Estimate: Portland State University Population Research Center.

County or Jurisdiction	2010 U.S. Census Population	Certified Population Estimate July 1, 2016	Percentage Increase
Study Area	1,641,036	1,779,245	8.4%
Clackamas County	375,992	404,980	7.7%
Multnomah County	735,334	790,670	7.5%
Washington County	529,710	583,595	10.2%
Portland	583,776	627,395	7.5%
Gresham	105,594	108,150	2.4%
Lake Oswego	36,619	37,425	2.2%
Oregon City	31,859	34,240	7.5%
Tualatin	26,054	26,840	3.0%
West Linn	25,109	25,615	2.0%

2.2 Electric Power Transmission

We constructed a transmission pole and tower point file database from several data sources, including Burns and others (2011, 2013), spatial data obtained from Portland General Electric Company (PGE, written communication, 2016), and where large gaps occurred, from our own digitization. Gaps in the transmission network were highlighted using the transmission line corridors and substations dataset downloaded from the Homeland Infrastructure Foundation-Level Data (HIFLD; U.S. Department of Homeland Security, 2017). The linear corridor data were used as a backdrop to digitize additional poles and towers, following the method established by Burns and others (2011). We did not distinguish between the type of structure (e.g., lattice tower or wood) or the voltage carried on the wires. To keep the problem tractable, we limited our analysis to the high-voltage network from power generation facilities up to the neighborhood distribution substations.

We identified a total of 18,098 poles and tower locations. The transmission network is incomplete, however, as we did not complete digitization of poles and towers in portions of North Portland, and data were not made available from the local utility. Electric power transmission distribution in North Portland is typically conveyed on single poles, which are difficult to distinguish using lidar-derived imagery or orthoimagery.

2.3 Emergency Transportation Routes

We obtained a GIS shapefile representing the Metro Emergency Transportation Routes (ETR) from Portland Bureau of Emergency Management (L. Bruno, written communication, 2017). Though the Metro Data Resource Center has not maintained the dataset for at least 10 years (S. Erickson, written communication, 2017), it is still considered operative at the regional level. The ETR extends into all five counties within the RPDO (**Figure 1-1**), but our analysis was limited to our three-county study area (Appendix E, **Plate 10**). Multiple transportation agencies have responsibility for various components of the ETR, and as outlined in a 2005 Memorandum of Understanding (Emergency Transportation Route Post-Earthquake Damage Assessment and Coordination Portland, Oregon/Vancouver, Washington Regional Area; State of Oregon Misc. Contracts & Agreements No. 21,273):

> (Terms of Agreement #1): ODOT, WSDOT and Agencies have identified the ETR. […] The ETR have been identified as "critical infrastructure" by the parties to the Memorandum of Understanding. ODOT, WSDOT and Agencies would give their jurisdictional ETR the highest priority for assessment of road and bridge conditions during an earthquake emergency […]
> (Exhibit A, I. Purpose [p. 8]): An Emergency Transportation Route or ETR is defined as a route needed during a major regional emergency or disaster to move response resources such as personnel, supplies, and equipment to heavily damaged areas.

The road network consists of GIS polylines placed at the road centerline and includes highway ramp and detailed highway intersection information. For our analysis purposes, polylines are not as useful as polygons, as we need to quantify the amount of ground deformation to a road that has some width. In order to prepare the road network for analysis, we first buffered the road centerlines by 50 foot, and then we dissolved the geometries. This typically generalizes highway areas, such as the I-5 corridor, into a single polygon. The dissolved polygon file was then manually edited to create a segment/node model,

with segments beginning and ending at intersections. However, major intersections, such as the I-5—I-205 intersection, were treated as a single segment instead of a node. We identified 238 road segments and gave each a unique key for analysis purposes.

3.0 NATURAL HAZARD DATA DEVELOPMENT

3.1 Bedrock Ground Motion

The Hazus model requires four descriptors of ground motion at a building's location: peak ground acceleration (pga), peak ground velocity (pgv), spectral acceleration at 1.0 second (sa10), and spectral acceleration at 0.3 second (sa03). Peak ground acceleration and peak ground velocity are the largest acceleration and velocity that can be expected at a particular site due to an earthquake. Peak ground acceleration is a widely used measure of ground shaking for a range of geotechnical and structural engineering applications. Spectral acceleration definitions and usage are given by the U.S. Geological Survey (USGS) at https://earthquake.usgs.gov/hazards/learn/technical.php.

For the Cascadia Subduction Zone magnitude 9.0 earthquake, Madin and Burns (2013) obtained synthetic bedrock ground motions from Arthur Frankel (USGS, written communication, 2012); we used the same bedrock ground motion data for this project. Bedrock ground motions for a synthetic Portland Hills fault magnitude 6.8 earthquake (firm rock conditions, V_{s30} = 760 m/s) were provided by Arthur Frankel (written communication, 2016) of the USGS at 0.01 degree intervals and are included in the accompanying geodatabase.

3.2 Site Ground Motion

The intensity of ground shaking during an earthquake depends on the geotechnical properties of the soil or bedrock at a particular site. The National Earthquake Hazard Reduction Program (NEHRP) provisions (FEMA, 2015b) specify, for each ground motion descriptor, level of bedrock ground motion, and NEHRP soil classification, a multiplication factor for calculating the ground motion at the surface (also known as the site) where buildings and infrastructure are placed. The NEHRP soil classification for a site is based on the average shear wave velocity within 30 meters of the ground surface. NEHRP classifications and general descriptions of the bedrock and soil material are as follows:

- site class A—hard rock
- site class B—rock
- site class C—very dense soil and soft rock
- site class D—stiff soil
- site class E— soft soil
- site class F—soils susceptible to potential failure

For our site ground motion data, we used updated NEHRP soil classification mapping that we completed as part of this project (Appleby and others, in preparation). Sites classified as "F" were, for amplification purposes, reclassified as "E". This is a conservative but commonly implemented assumption for loss estimation purposes. We overlaid the bedrock ground motion data with the NEHRP soil classification polygons, and we applied the appropriate amplification to derive the site ground motion. Further details on the site ground motion dataset development are provided in Appendix B.

The site ground motion from the synthetic earthquakes in our two scenarios differ dramatically across the study area, with the Portland Hills fault exhibiting significantly higher ground motion proximal to the fault (Appendix E, **Plate 5**). The technical descriptions of earthquake ground motion, such as depicted on Plates 4 and 5 (Appendix E), can be challenging to interpret, so we developed damage potential maps using the Modified Mercalli Intensity (MMI) scale (Appendix E, Plates 6 and 7). The MMI scale is an empirical scale that describes the building damage and felt effects experienced from ground shaking in an earthquake. For the MMI categories, we used our site peak ground velocity ground motion data and the relationships used by USGS ShakeMap products (Wald and others, 2006, Figure 2.5).

What is not depicted in such maps is the duration of the earthquake. A local crustal fault will likely result in strong ground motion for up to 60 seconds, whereas a megathrust earthquake typically results in strong ground motion for 3 to 5 minutes. The Hazus building damage model uses the magnitude of the earthquake as a surrogate for duration, categorizing the earthquake as short, medium, or long duration (FEMA, 2011, Section 5.4), with a longer duration producing more building damage for a given ground motion. The Cascadia Subduction Zone magnitude 9.0 earthquake was modeled in Hazus as long duration, and the Portland Hills fault magnitude 6.8 earthquake was modeled in Hazus as medium duration.

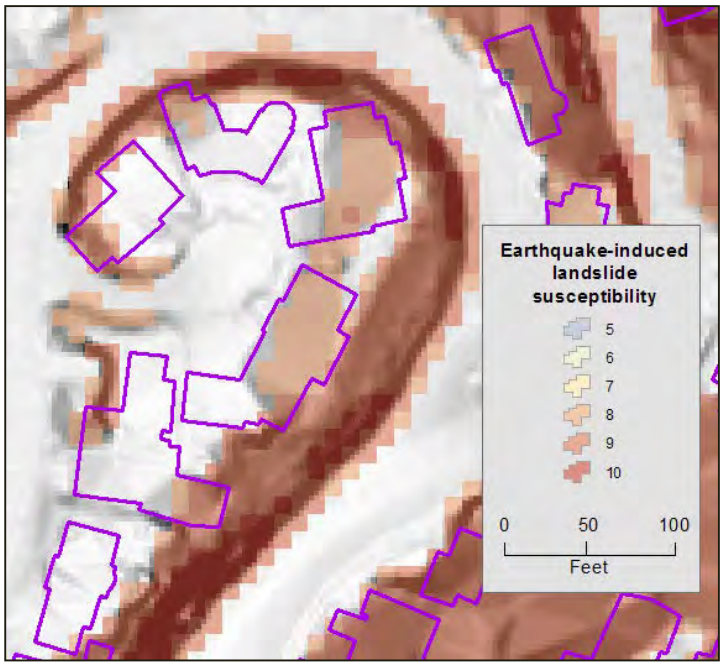
3.3 Liquefaction and Landslide Susceptibility

For our Hazus building damage model, we provided a liquefaction and landslide susceptibility value for each building record, thereby allowing the Hazus model to calculate the amount of ground deformation and probability of ground deformation. The Hazus building loss model incorporates that calculated information into its overall building damage estimate.

A Hazus-based liquefaction susceptibility rating for each building record was obtained by using a simple overlay of the liquefaction susceptibility polygons developed for this project (Appleby and others, in preparation). Because the liquefaction susceptibility polygons are at a coarser scale relative to the building footprints, we determined that assigning the liquefaction susceptibility value at the building centroid was sufficient.

We developed a high-resolution, 10-foot Hazus-based landslide susceptibility grid for this project (Appleby and others, in preparation), following the methods specified in the Hazus®-MH 2.1 Technical manual, Earthquake model (FEMA, 2011, Chapter 4), for both a wet (saturated) and a dry scenario. We calculated landslide susceptibility zonal statistics for each building footprint by using the Esri® Spatial Analyst Zonal Statistics as Table tool. The arithmetic mean of the landslide susceptibility, rounded to the nearest integer, was then assigned to the building record. Such an assignment more accurately captures the earthquake-induced landslide hazard across the entire building footprint area, compared to a simple building centroid sampling approach (**Figure 3-1**).

Figure 3-1. Example: Capturing the variability of landslide susceptibility within building footprints (magenta polygons). Landslide susceptibility values use the Hazus landslide susceptibility 0 through 10 scale. Areas of no shading: minimal to no landslide susceptibility. Earthquake-induced landslide susceptibility data from Appleby and others (in preparation).



Liquefaction requires saturated soil conditions. Hazus permits a user to specify, on a per-building basis, the depth of the water table, and adjusts the ground failure estimates accordingly. However, there currently exists no region-wide groundwater mapping information. Water tables vary significantly throughout the year, and even if such information were available, the use of an average water table level could significantly underestimate liquefaction occurrence during peak moisture conditions. We were aware of a regional groundwater study (Snyder, 2008) but noted that it covered only a portion of the study area. We chose to mimic the "wet" (saturated soil) and "dry" landslide scenarios by setting water depth to two distinct values: 0 feet and 1,000 feet, respectively. Thus, each of the two synthetic earthquakes was run with "wet" and "dry" soil moisture conditions, for a total of four unique scenarios.

3.4 Permanent Ground Deformation

Permanent ground deformation (PGD) data include an estimate of the amount of lateral spreading due to liquefaction and ground failure due to earthquake-induced landslide, along with a probability of their occurrences. We provided the liquefaction and landslide susceptibility data from Appleby and others (in preparation) and the site ground motion data for both earthquakes developed in Section **3.2** as input to the tool developed by Sharifi-Mood and others (M. Sharifi-Mood, M. J. Olsen, D. T. Gillens, and I. P. Madin, Complementary ground motion, ground deformation, and damage potential maps for deterministic scenarios of Cascadia Subduction Zone earthquake events, manuscript in preparation). The tool implements the methods for ground deformation estimation described by Madin and Burns (2013, Section 4), and provides raster grids describing the PGD amount and probability of occurrence, using the Hazus ground deformation models described in the Hazus-MH 2.1 Technical manual (FEMA, 2011).

Because the tool is currently constrained to calculating liquefaction lateral spreading at a fixed water depth, we generated liquefaction ground deformation (lateral spreading) data for only the "wet" (saturated soil) scenario. We calculated earthquake-induced landslide ground failure data for both wet and dry soil condition. The PGD and probability of occurrence data are in the accompanying geodatabase. Further details on the dataset development are documented in Appendix B, Section **11.2**.

To quantify impacts to infrastructure, we combined the grids from the two ground failure mechanisms, obtaining the maximum PGD and maximum probability of occurrence across the area for a given earthquake and soil moisture scenario. Although liquefaction and landslide are two distinct physical mechanisms, the specific cause of the ground failure is not important for our key infrastructure sector analysis purposes.

4.0 LOSS ESTIMATION METHODS

4.1 Impacts to Buildings and People

4.1.1 Building Repair Cost and Casualties

We used the Hazus Advanced Engineering Building Module (AEBM) (FEMA, 2010) included in Hazus-MH v4.0 to calculate individual building repair costs and casualties and to obtain parameters needed to calculate debris and displaced population. Although the AEBM permits a user to specify unique building profiles, including adjusted individual capacity curve or fragility curve parameters, we instead used the generic building profiles provided in the Hazus SQL database table [dbo].[eqAebmProfile]. The particular AEBM profile for an individual building in the building database is constructed from its occupancy class, building type, and seismic design level. The building's square footage, replacement cost, daytime occupants, and nighttime occupants were also supplied to the Hazus AEBM model.

The Hazus AEBM model was run for a given user-supplied seismic scenario, with site ground motions supplied in polygon form. The model returns a building repair cost and casualty estimate for each building, along with five probability of damage state (PDS) values, each, for the structural, nonstructural drift, and nonstructural acceleration components. We used the PDS values to calculate debris and displaced population and to estimate the total number of red-tagged and yellow-tagged buildings.

The Hazus AEBM model first calculates a building's structural and nonstructural probability of damage state values from the ground motion and liquefaction/landslide data provided to the model. It then uses the PDS values to calculate casualties, based on the number of user-specified people occupying the building and the building type. The methodology is based on the assumption of a strong correlation between building damage and number and severity of casualties (FEMA, 2011). Casualties are classified into four levels (**Table 4-1**). Levels 2 and 3 are generally interpreted as "injuries requiring hospitalization."

Table 4-1. Hazus casualty level descriptions (taken from FEMA, 2011). The broad description of each category is shown in boldface.

Injury Severity Level	Injury Level Description
Level 1: **Minor Injuries**	Injuries requiring basic medical aid that could be administered by paraprofessionals. These types of injuries would require bandages or observation. Some examples are: a sprain, a severe cut requiring stitches, a minor burn (first degree or second degree on a small part of the body), or a bump on the head without loss of consciousness. Injuries of lesser severity that could be self-treated are not estimated by Hazus.
Level 2: **Injuries Requiring Hospitalization**	Injuries requiring a greater degree of medical care and use of medical technology such as x-rays or surgery, but not expected to progress to a life threatening status. Some examples are third degree burns or second degree burns over large parts of the body, a bump on the head that causes loss of consciousness, fractured bone, dehydration, or exposure.
Level 3: **Life-Threatening Injuries**	Injuries that pose an immediate life-threatening condition if not treated adequately and expeditiously. Some examples are: uncontrolled bleeding, punctured organ, other internal injuries, spinal column injuries, or crush syndrome.
Level 4: **Deaths**	Instantaneously killed or mortally injured.

4.1.2 Building Debris Estimation

The Hazus AEBM does not provide a debris estimate for a damaged building. We manually calculated debris by first calculating the total weight of each building, in tons, using the total square footage of the building, the type of building (e.g., steel frame or wood frame), and the per-square-footage weight estimates listed in the Hazus SQL database table [dbo].[eqDebrisAnalParms]. Debris was then calculated based on the methods outlined in the Hazus Earthquake Technical Manual (FEMA, 2011, Equation 12-3), by using the structural and nonstructural drift probability of damage states obtained for the individual building from the Hazus AEBM.

The debris estimate is limited to buildings. We did not estimate debris tonnage from landslides, damaged bridges, buckled roads, sand and silt ejecta caused by liquefaction (Villemure and others, 2012), or damaged nonbuilding structures.

4.1.3 Displaced Population and Shelter Needs

Unlike the Hazus General Building Stock tool, Hazus AEBM does not calculate displaced households or displaced population. We adapted the methods outlined in the Hazus Earthquake Technical Manual (FEMA, 2011, Chapter 14), but instead of calculating displaced households we calculated displaced population. Displaced population is more direct to calculate given the methods discussed previously for assigning people, and not households, to distinct multi-family and single-family residential buildings (Section **2.1.7**). We followed the guidance provided by FEMA (2011, Table 14.1) that was based on the work of Perkins and Chuaqui (1998), but we altered the weight factor for multi-family residential building type, W_{MFE}, by setting it to zero. The displaced population then becomes a simple computation: the number of permanent residents in the building times the building's probability of *complete* structural damage state, with the latter factor directly obtained from the Hazus AEBM output.

We equated the red tag term used in a post-earthquake building safety evaluation context (ATC, 1989) with the Hazus "complete" structural damage state, following the guidance of FEMA (2010, Table 6.1). Similarly, yellow tag was associated with "extensive" damage state, and green tag with buildings in a none, slight, or moderate damage state. We recognize that alternate mappings of Hazus damage states or repair costs to ATC-20 tag levels exist (e.g., MMI Engineering [2012] presents two such definitions).

The Hazus displaced population computation assumes the building has been categorized into one of the three ATC-20 tags. In practice, the post-earthquake building inspection process is estimated to take weeks, if not months (EERI, 2015; p. 25). Thus, what is being computed is an estimation of *post*-inspection, longer-term displaced population. Our summary tables use the term *Long-term Displaced Population* to emphasize the point.

The topic of displaced population and shelter needs is involved, and estimates can vary throughout the response and recovery phases based on numerous factors, including psychological, sociological, and economic considerations. For example, some portion of the population may occupy a damaged building until it is officially inspected and red tagged, at which point they must vacate. An owner of a moderately damaged (green-tagged) apartment building may decide to replace the structure rather than repair it. For this project, we provide detailed information on permanent residents per building damage state, thereby allowing a basis from which to estimate Day 1, Day 7, and Day 30 displaced population and shelter needs (Appendix C, **Table 12-4** through **Table 12-7**). A portion of the displaced population may need long-term publicly provided shelter while residences are repaired or replaced (FEMA, 2011, Section 14.3). We determined that the ethnic, racial, and income level factors listed in Hazus Earthquake Technical Manual (FEMA, 2011, Equation 14.2) were too assumption-laden, and thus we did not calculate shelter requirements with such factors. For reference purposes, past Hazus runs for a Cascadia

Subduction Zone earthquake that used these assumptions calculated the portion of displaced population needing temporary shelter/housing solutions between 20% and 30% (Wang, 1998; Hofmeister and others, 2003; EERI, 2015, p. 34).

4.1.4 Aggregation Unit

Although the inputs into the Hazus model are individual buildings with occupants, loss estimates from the model are statistically meaningful only at an aggregated level. As Pinter and others (2016) emphasized, Hazus-calculated damages are estimates appropriate for comparison and planning purposes, particularly when pooled among a group of structures. Hazus-calculated damages are not appropriate for individual building analysis. We considered various aggregation units, including city neighborhoods and fire districts. Several jurisdictions in the study area have well-defined neighborhoods, but most do not. Further, unincorporated areas have no formal or usable neighborhood definitions. For example, we considered fire districts in unincorporated areas, but we determined they were too coarse to be useful for community level planning.

We chose the census block group (CBG), a U.S. Census Bureau-designated geographical unit that is between the census tract and the census block, as the basic mapping aggregation unit for damage estimates. Census block groups typically have between 600 and 3,000 people, but the number of buildings can vary widely, depending on the type of buildings and the number of multi-family residential structures within a CBG. Where warranted, we combined contiguous CBGs to create a larger unit encompassing at least 300 buildings. The process resulted in reducing the study area's 1,041 CBGs into 876 *neighborhood units.*

To provide a larger-scale perspective across the study area, we also aggregated loss at the jurisdictional level, with all buildings associated with a particular city, designated community, or unincorporated county. The jurisdiction layer combined city jurisdictional boundaries published by Metro RLIS (Metro, 2016), along with hamlet and village designations by Clackamas County (2017). Given the City of Portland's size relative to surrounding cities, we used the Portland Bureau of Emergency Management's (PBEM) Risk Reporting Areas (Tetra Tech, 2016a, Section 4.4, Table 4.4) as subdivisions for aggregation. All buildings not associated with a jurisdiction were designated as unincorporated.

4.1.5 Seismic Design Level Improvement Modeling Exercise

Most of the buildings in the study area were constructed with minimal consideration given to seismic resilience (**Table 10-3**). Seismic retrofits to more vulnerable buildings can reduce damage to the building and casualties to the building occupants when an earthquake occurs. Our Hazus model can be used to generate an overall benefit estimate for seismic retrofitting. Levi and others (2015) performed such an analysis for Israeli building inventory, where at least 25% of the building inventory was designed with minimal resistance to earthquakes.

We ran two alternative loss scenarios, wherein we upwardly adjusted seismic design levels within our building database. For the moderate scenario, all buildings with a seismic design level of pre code or low code were updated to moderate code, and all unreinforced masonry buildings were altered to RM1 (reinforced masonry) building type. Buildings with high code were left unchanged. For the high scenario, the seismic design level was set to high code for all buildings, with all unreinforced masonry buildings altered to RM1 (reinforced masonry) building type. We then ran Hazus AEBM, using the same ground motion, liquefaction/landslide susceptibility, and building population occupancy, and tabulated loss estimates (see Section 5.3.1). Our analysis was limited to the Cascadia Subduction Zone earthquake scenario, and run for both wet (saturated) and dry soil conditions.

4.2 Electric Power Transmission

Using the ground deformation estimates, we calculated the mean lateral spread within a 10-meter buffer of each transmission structure for the Cascadia Subduction Zone earthquake and Portland Hills fault earthquake, for wet (saturated) and dry soil moisture conditions. The mean permanent ground deformation at each point was then classified into three categories: less than 1 meter, 1 to 2 meters, and greater than 2 meters. For all points with greater than 1-meter permanent ground deformation, the probability of occurrence is between 20% and 30% (Appendix E, **Plate 13**).

4.3 Emergency Transportation Routes

The Hazus tool provides an analysis of linear features such as roads, but we determined it inadequately captures the range of variability of permanent ground deformation throughout the length of the segment. Currently, the tool samples only at the linear feature segment's endpoints and at its midpoint. We take a conservative approach in our evaluation of earthquake impact on surface transportation by considering the possibility of permanent ground deformation across the entire length of the road segment. A road segment is considered failed if any portion of that road segment exceeds an amount of ground deformation and a probability of occurrence.

Ground deformation and probability estimates were available in a 10-foot raster grid format (Section **3.4**). We combined the landslide and liquefaction PGD grids using Esri Spatial Analyst Cell Statistics function to obtain the maximum value per pixel. For our analysis purposes, the mechanism of the ground failure is not relevant; the amount and probability of lateral spread is of primary concern. Following the methods outlined by Mahalingam and others (2015), we then generated a new grid based on focal statistics of the ground deformation within a 100-foot window (10 pixel × 10 pixel; a pixel is 10 ft). Inclusion of surrounding areas adjacent to the road segment is a more conservative approach, because we wanted to include potential landslides slightly distant from the road. We then classified the maximum value of the ground deformation within each road segment into four bins, using Esri Spatial Analyst Zonal Statistics as Table tool: less than 0.5 meters, 0.5 to 1.0 meters, 1.0 to 2.0 meters, and greater than 2.0 meters. The process was repeated for the CSZ dry soil conditions scenario and the PHF wet (saturated) and dry soil conditions scenarios, with the results stored in the accompanying geodatabase. Appendix E, Plates 10 and 11 represent the impacts of ground failure per segment under a Cascadia Subduction Zone earthquake, given the two soil moisture scenarios. For another perspective, Appendix E, **Plate 12** highlights the maximum potential permanent ground deformation at specific locations throughout the segment.

4.4 Model Limitations

Our damage estimates were primarily derived from the Hazus AEBM. Limitations and uncertainties are inherent in any loss estimation methodology. They arise in part from incomplete scientific knowledge concerning earthquakes and their effects on buildings and facilities.

4.4.1 Geological Models

An actual earthquake may vary significantly in ground motion and site amplification compared to the synthetic data we provided the model in this study. Our analysis used the best available information for a subduction zone fault and a local crustal fault. We used the upper bound for the earthquake magnitude, recognizing that an actual earthquake may rupture on only a portion of its fault. Further, the

NEHRP site classification is a simplification of complex surficial geology, and local site amplification effects within a given NEHRP site class may be at significant variance with the standard ground motion amplification model.

We did not model damage from aftershocks. Wein and others (2017) presented scenario examples and the consequences of such earthquakes. The impact of aftershocks on slightly damaged buildings has be modeled in a Hazus context (Seligson and others, 2015), but we did not have aftershock scenarios available, nor was such modeling within the scope of our project.

Although our loss model includes the impact of earthquake-induced landslides on buildings, we do not model the impact of large landslide flows on structures downhill from the source. Such flow can wreak significant damage to buildings and people (Daniell and others, 2017), but such modeling capability is not available with existing tools.

4.4.2 Building Damage Models

Limitations and uncertainties also result from the approximations and simplifications that are necessary for comprehensive analyses. Although we gave extensive effort to correctly attributing each of the 615,852 individual buildings in this study, we recognize that misclassifications are present, and we made statistical distribution assumptions on building type when attribution information was not otherwise available.

We used the generic building damage models provided by the Hazus tool. These models simplify the vast variability present in existing building construction, such as vertical irregularities, plan irregularities, usage of cripple walls, hybrid construction techniques, and pounding from adjacent buildings (FEMA, 2015b). The Hazus AEBM allows a user to specify individual building-specific parameters, but it is not possible to conduct a study at this regional scale that incorporates such detail. The Hazus generic building damage model captures the *average* building response to an earthquake—the primary reason we present loss estimates not at the individual building level but at a minimum aggregation unit (Section **4.1.4**).

The duration of a subduction zone earthquake is significantly longer than for other types of earthquakes, including those generated from local crustal faults. Although the Hazus tool provides a method to distinguish short, medium, and long shaking duration (FEMA, 2011, Equation 5-10), the damage functions are expert- and model-driven. The most recent long-duration earthquake to impact the United States was Alaska's Good Friday earthquake in 1964, which was approximately 4.5 minutes long. Post-earthquake damage assessment protocols were not in place at the time. Hazus modelers do not have USA-construction-based empirical data for long-duration earthquakes from which to calibrate the model. The current Hazus model may be underestimating the damage to tall buildings and other large structures in response to great subduction zone earthquakes. Gomberg and others (2017) have identified this as an important research need.

In **Tables 12.8** through **Table 12.11**, we present Hazus damages and casualty estimates as single value. Such representations can be misleading, as they suggest a high level of precision that is not warranted, in part by the uncertainties of the data that were provided to the Hazus model (Remo and Pinter, 2012). One reason we chose to model both wet (saturated) and dry soil condition scenarios for a given earthquake is to better communicate our damage estimates as a range of values (**Table ES-1**).

4.4.3 Casualty Estimates

Casualty estimates are dependent on several assumptions and may underestimate the true impact from an earthquake. Daytime occupancy values use people-per-square-footage assumptions, which may be reasonable in the aggregate, but building occupancy density can vary significantly across businesses that

are grouped for our modeling purposes into a fixed classification, such as "Commercial-Retail." Running Hazus with a large number of alternate point-in-time population models may assist in better understanding the uncertainty in daytime casualties (FEMA, 2012a, Section 3.4).

In the Hazus AEBM, the casualty calculations do not include injuries to people outside of and proximal to a building. During strong ground motion, fascias can fall off buildings, masonry walls can collapse, and windows can shatter, sending shards of glass down to the pavement. Other casualties, such as from heart attacks, loss of power to medical devices such as respirators, electrocutions, collapsing bridges, exposure to released hazardous materials, and car accidents are not quantified in the Hazus model. Further, we did not model fire following earthquake, which can result in additional casualties.

4.4.4 Other Model Limitations

Fires typically follow a major earthquake and are exacerbated by compromised transportation networks and broken buried utilities. Fire following earthquake can be a major contributor to building loss and displaced population (Scawthorn and others, 2005). Early versions of the Hazus tool modeled "fire following earthquake" as an induced damage; however, due to significant bugs producing erroneous damage estimates, the option had been disabled in recent versions of the tool. The Hazus v4.2 release (FEMA, 2018) restored the Fire Following functionality, but the tool release was not available in time for this project, which used Hazus v4.0.

Several other sources may contribute to road damage, none of which we modeled in this project, and thus may lead to an underestimate of road damage. Our road damage model does not include debris generated by taller buildings that may block road access, or a road cordoned off due to a proximal building that is in danger of collapse (City Club of Portland, 2017). Our Hazus-based landslide ground deformation model does not incorporate deposits from distant earthquake-induced landslides that may block road access.

Past Hazus-based studies typically attached standardized reports generated by the Hazus tool that summarize casualties and losses in a convenient format. Such reports are currently available only with Hazus analyses using General Building Stock data, which are modeled at the census tract level. Users analyzing loss on a per-building basis, such as what we have done in this study, cannot obtain such summary reports from Hazus; thus, none are attached to this report. Instead, we present such information as tables in Appendices A and C, in graphical form in Appendix E, and in electronic form in the accompanying GIS database (Appendix D).

5.0 RESULTS

5.1 Population and Building Density

We developed a 20-acre hexagonal grid, then overlaid the grid on our building database, totaling the number of individual buildings, the number of residential buildings, and the number of permanent residents associated with the buildings within each hexagonal cell. Cells with no buildings were removed from the dataset. Cells with at least one building yet no permanent residents frequently occur in commercial/industrial corridors or predominantly agricultural areas (Appendix E, Plates 1–3). The hexagon layer provides a convenient overlay to explore population and building exposure relative to a particular natural hazard. The layer can also be useful in focusing the areas of building loss or casualties in neighborhood units with large tracts of undeveloped areas.

5.2 Building Statistics

Single-family residential buildings dominate the building inventory in all three counties (**Figure 5-1**). Wood frame construction dominates the residential buildings (**Table 5-1**). The number of masonry buildings in **Table 5-1** is due primarily to the Hazus building type statistical distribution described in Section **2.1.4**. **Table 10-8** in Appendix A contains a complete breakdown of building type for all generalized building use categories.

Figure 5-1. Building primary usage statistics by county. Tabular summary is in Table 10-7. Single-family residential combines Hazus occupancy classes RES1 and RES2 (manufactured housing). Institutional combines Hazus occupancy classes REL1, GOV1, GOV2, EDU1, and EDU2. Commercial combines all Hazus COM occupancy classes and RES4. Multi-family residential combines Hazus occupancy classes RES3, RES5, and RES6.

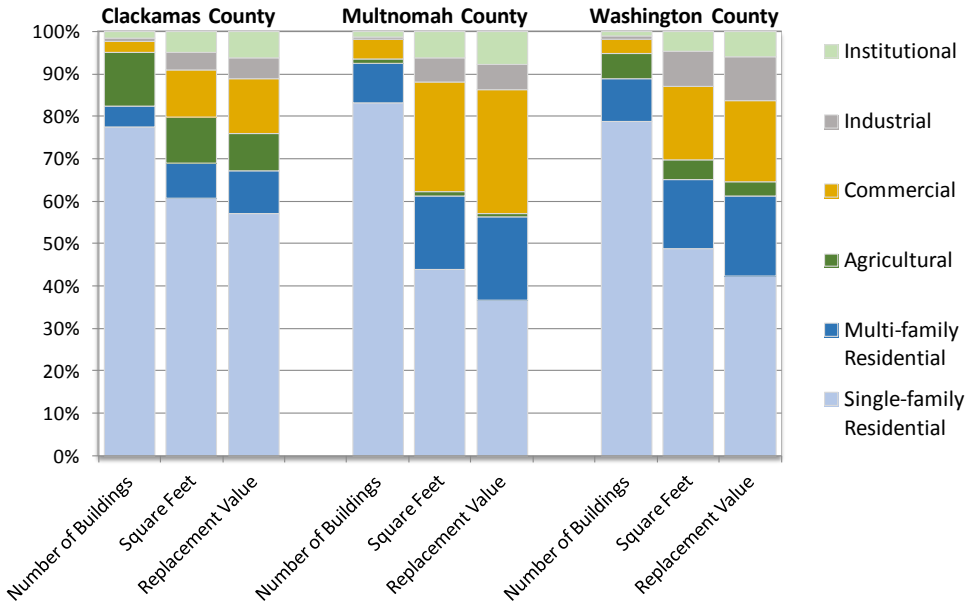


Table 5-1. Residential buildings by building type.

Occupancy Type	Building Type	Number of Buildings	Building Percent	Square Footage (Thousand)	Square Footage Percent	Permanent Residents	Permanent Residents Percent
Single-Family Residential	Wood	471,926	95.5%	914,096	96.7%	1,182,770	96.3%
	Manufactured Housing	16,852	3.4%	20,966	2.2%	32,969	2.7%
	Reinforced Masonry	3,549	0.7%	7,349	0.8%	9,321	0.8%
	Unreinforced Masonry	1,455	0.3%	2,298	0.2%	3,277	0.3%
	Other	138	0.0%	377	0.0%	581	0.0%
Multi-Family Residential	Wood	47,055	91.1%	204,253	73.0%	316,575	76.8%
	Reinforced Masonry	1,331	2.6%	16,026	5.7%	24,203	5.9%
	Unreinforced Masonry	403	0.8%	5,380	1.9%	8,139	2.0%
	Steel	1,636	3.2%	22,913	8.2%	24,051	5.8%
	Concrete*	1,206	2.3%	31,277	11.2%	39,150	9.5%

*Concrete includes the precast concrete building type.

Building occupancy within the different building types varies significantly between the daytime and nighttime scenario (**Table 5-2**). In the 2 AM scenario, most (87%) of the population is within wood frame construction. The daytime and nighttime occupancy models assume people from outlying counties commute into the study area; thus, daytime occupancy totals are generally higher than permanent resident population totals.

Table 5-2. Occupancy by building type.

Building Type	Number of Buildings	"2 PM" Daytime Occupancy	Daytime Percent	"2 AM" Nighttime Occupancy	Night Time Percent	Permanent Residents	Percent
Concrete	8,599	314,378	19%	60,383	4%	35,679	2%
Manufactured Housing	17,295	11,221	1%	31,387	2%	32,969	2%
Precast Concrete	6,603	195,438	12%	12,539	1%	3,811	0%
Reinforced Masonry	16,125	205,964	12%	43,218	3%	33,525	2%
Steel	16,487	213,478	13%	49,246	3%	24,291	1%
Unreinforced Masonry	5,092	52,271	3%	13,766	1%	11,416	1%
Wood	545,651	697,336	41%	1,442,287	87%	1,499,345	91%
All building types	615,852	1,690,086		1,652,825		1,641,036	

5.3 Building Damage, Casualties, and Displaced Population

We tabulated the impacts to buildings and people at the county and jurisdictional level (Appendix C, **Table 12-8** through **Table 12-11**) and at the neighborhood unit level for all earthquake scenarios. Jurisdictional and neighborhood unit level summaries are available in tabular form in the accompanying GIS database. Building damage results were also expressed as a *loss ratio*—the total repair cost estimate for all buildings in a given spatial unit divided by the total replacement cost for all buildings. Building debris tonnage was summarized at the given spatial unit. Casualties were summarized for the given spatial unit at the individual casualty level, and a total casualty level for daytime and nighttime was calculated. The tables in the GIS database enable one to express graphically the damage estimates in any

number of ways, such as displaying Level 2 casualties per 10,000 people. For demonstration purposes, we present the total injuries requiring hospitalization per neighborhood unit, daytime scenario, CSZ earthquake with saturated soil conditions, in Appendix E, Plates 14–16.

Damage estimates vary widely across the study area, depending on local geology, soil moisture conditions, type of building stock, and distance from the fault. In the Cascadia Subduction Zone scenario, damage is generally greater in the western portion of the study area than in the eastern portion. Yet local geology variations can result in significant damage even well east of the Willamette River, such as the neighborhood of North Troutdale (Appendix E, **Plate 15**).

The 9% ("dry" soil conditions) to 14% ("wet") overall estimated loss from a CSZ magnitude 9.0 earthquake includes all buildings in the study area (**Table 12-8** and **Table 12-9**). The damage is not equally distributed across all building uses or building types, as seen in the referenced tables. Many high-value commercial and industrial buildings exist on areas of high to very high liquefaction hazard. The average loss ratio for wood-framed single-family residential buildings ranges from 2% to 7% (for "dry" and "wet" soil conditions, respectively; **Table 5-3**).

Although the timing of an earthquake has no impact on building damage or displaced population, more people will experience casualties during a workday earthquake scenario than if the earthquake occurred at night (Appendix C, **Table 12-8** through **Table 12-11**). During the daytime scenario, most people are occupying non-wood structures (**Table 5-2**), which typically fare worse in an earthquake than wood-frame construction.

Even though a Portland Hills fault earthquake is of shorter duration than a CSZ earthquake, its placement relative to significant assets in the region would result in much higher damage overall (Appendix C, **Table 12-10** and **Table 12-11**). At distances beyond 15 miles from the Portland Hills fault zone, damages from a Cascadia Subduction Zone scenario generally exceed a Portland Hills fault scenario, which can be visualized by comparing the ground motion data in Appendix E, Plates 4 and 5.

Soil moisture conditions significantly influence loss estimates, with overall building loss ratios of 9% versus 14% for the Cascadia earthquake between the "dry" soil conditions and "wet" (saturated) soil conditions (Appendix C, **Table 12-8** and **Table 12-9**). The large percentage of buildings in moderately liquefiable zones, such as the Tualatin Basin in Washington County, combined with the high-value buildings in very high liquefiable zones in the Columbia Slough, downtown Portland near the Willamette River, and the northwest industrial area of Portland account for much of the increase in the wet scenario loss.

Several smaller jurisdictions exhibit higher or lower loss ratios compared to other jurisdictions, due to unique situations. Johnson City in Clackamas County is almost exclusively composed of manufactured housing—a building type that experiences significantly more damage for a given ground motion than does a wood frame house (Kircher and others, 1997). The city of Barlow in Clackamas County is situated entirely on soft soils (Section **3.2**) that amplify the ground motion, on potentially liquefiable soils, and much of its building value is contained in four storage facilities constructed of a more fragile building type compared to wood-frame construction. Although the City of Sandy's boundaries span multiple soil types and liquefaction susceptibility categories, nearly all of its assets are on firm, non-liquefiable soils, and thus its loss ratio is comparatively low (1%, **Table 12-8**).

Building damage is higher in non–single-family residential structures (**Table 5-3**). Single-family residential is dominated by light-frame wood construction (**Table 5-1**), the most resilient of the 36 generic building types available in the Hazus AEBM. Multi-family residential is a mixture of wood frame construction and less resilient building types. "Single-family residential: manufactured housing" was broken out to highlight its relative seismic vulnerability.

Table 5-3. Damage to buildings by building category and by earthquake scenario.

		Cascadia Subduction Zone Magnitude 9.0 Earthquake				Portland Hills Fault Magnitude 6.8 Earthquake			
		"Dry" Conditions		"Wet" (Saturated) Conditions		"Dry" Conditions		"Wet" (Saturated) Conditions	
Building Category	Building Value ($ Million)	Building Repair Cost ($ Million)	Loss Ratio	Building Repair Cost ($ Million)	Loss Ratio	Building Repair Cost ($ Million)	Loss Ratio	Building Repair Cost ($ Million)	Loss Ratio
Agricultural	9,263	947	10%	1,347	15%	1,271	14%	1,796	19%
Commercial	57,134	10,381	18%	14,133	25%	22,240	39%	27,326	48%
Industrial	18,485	3,651	20%	4,888	26%	6,578	36%	8,216	44%
Institutional	17,609	2,438	14%	3,114	18%	5,871	33%	7,089	40%
Multi-family residential	44,391	3,288	7%	5,621	13%	10,118	23%	14,423	32%
Single-family residential	111,408	2,695	2%	7,421	7%	14,234	13%	24,254	22%
Single-family residential: manufactured housing	879	158	18%	186	21%	257	29%	307	35%
Total	259,169	23,558	9%	36,710	14%	60,569	23%	83,411	32%

Institutional combines Hazus occupancy classes REL1, GOV1, GOV2, EDU1, and EDU2. Commercial combines all Hazus COM occupancy classes and RES4. Multi-family residential combines Hazus occupancy classes RES3, RES5, and RES6.

The Hazus AEBM model estimates each building's probability of being in one of five damage states: *None*, *Slight*, *Moderate*, *Extensive*, and *Complete*. The five individual probabilities sum to 1.0. General descriptions for the structural damage states of 16 common building types are provided by FEMA (2011, Section 5.3); **Figure 5-2** shows an example. We obtained the total number of buildings in a particular spatial unit by summarizing all buildings' individual structural probability of damage state values, per the guidance provided by FEMA (2017a). The data in Appendix C, **Table 12-3** can be used to estimate the number of red-tagged and yellow-tagged buildings, and the number of buildings needing structural inspection after an earthquake. In addition, we summarized all permanent residents per building damage state, by generalized building types: single family residential (excluding manufactured housing); single family residential in manufactured housing, and multi-family residential.

Figure 5-2. Example damage state descriptions for a light-frame wood building (FEMA, 2010). The "None" damage state is not provided.

Damage State		Description
	**Slight**	Small plaster cracks at corners of door and window openings and wall-ceiling intersections; small cracks in masonry chimneys and masonry veneers. Small cracks are assumed to be visible with a maximum width of less than 1/8 inch (cracks wider than 1/8 inch are referred to as "large" cracks).
	**Moderate**	Large plaster or gypsum-board cracks at corners of door and window openings; small diagonal cracks across shear wall panels exhibited by small cracks in stucco and gypsum wall panels; large cracks in brick chimneys; toppling of tall masonry chimneys.
	**Extensive**	Large diagonal cracks across shear wall panels or large cracks at plywood joints; permanent lateral movement of floors and roof; toppling of most brick chimneys; cracks in foundations; splitting of wood sill plates and/or slippage of structure over foundations.
	**Complete**	Structure may have large permanent lateral displacement or be in imminent danger of collapse due to cripple wall failure or failure of the lateral load resisting system; some structures may slip and fall off the foundation; large foundation cracks. Three percent of the total area of buildings with Complete damage is expected to be collapsed, on average.

5.3.1 Seismic Design Level Improvement Exercise

Modeling adjustments to the building inventory seismic design level results in much lower amounts across all categories of loss (**Table 5-4**), although the effect is muted in the "wet" (saturated) soil condition scenario. The Hazus building damage model assumes damage due to ground shaking is independent of damage due to ground failure (FEMA, 2011, Section 5.6.3). In the Hazus model, improved seismic design levels will reduce damage estimates from ground shaking but not from ground failure. In our study area, more than half of the building inventory is situated on sites with a moderate or higher liquefaction susceptibility rating (**Table 10-5**). Thus, the reduction in loss in the "wet" (saturated) soil conditions is muted, due primarily to liquefaction probability being incorporated into the damage estimate. The reduction in loss estimates is more dramatic in the "dry" soil conditions scenario, where liquefaction and earthquake-induced landslide impacts are minimal.

Table 5-4. Seismic design level improvement exercise, Cascadia Subduction Zone magnitude 9.0 earthquake. See Section 4.1.5 for scenario definitions.

	"Dry" Soil Conditions			"Wet" (Saturated) Soil Conditions		
Seismic Design Level Scenario	**Unchanged**	**Moderate**	**High**	**Unchanged**	**Moderate**	**High**
Building Repair Cost ($ million)	23,558	6,466	4,230	36,710	20,988	18,979
Building Loss Ratio	9%	2%	2%	14%	8%	7%
Debris (thousands of tons)	12,794	2,512	1,304	17,292	8,148	7,121
Long-term Displaced Population	16,852	2,438	1,664	85,211	72,329	71,617
Casualties — Daytime Scenario						
Total Casualties	18,286	2,032	987	27,175	12,606	11,711
Level 1 Casualties	13,342	1,681	839	19,489	9,005	8,281
Level 2 Casualties	3,518	278	118	5,454	2,567	2,431
Level 3 Casualties	484	25	10	758	352	340
Level 4 Casualties	942	48	20	1,473	682	659
Casualties — Nighttime Scenario						
Total Casualties	4,334	902	596	10,400	7,259	6,989
Level 1 Casualties	3,338	775	525	7,838	5,484	5,262
Level 2 Casualties	739	106	60	1,979	1,404	1,364
Level 3 Casualties	87	7	4	203	131	129
Level 4 Casualties	169	14	7	380	240	235

Loss estimates for unchanged scenario are taken from **Table 12-8** and **Table 12-9**, and provided for reference. Casualty Level definitions are provided in **Table 4-1**. Total building replacement costs used for building loss ratio taken from **Table 5-3**.

5.4 Electric Power Transmission

Of the 18,098 poles and towers in our database, 921 (5%) have a 20% to 30% chance of experiencing between 1 and 2 meters of ground deformation, and 2,203 (12%) have a 20% to 30% chance of experiencing more than 1 meter during a Cascadia magnitude 9.0 earthquake with "wet" (saturated) soil conditions (Appendix E, **Plate 13**). In the "dry" soil conditions, only 6 poles and towers have a 20% to 30% chance of experiencing between 1 and 2 meters of ground deformation, with none experiencing more than 2 meters of deformation. In the "dry" soil conditions scenario, permanent ground deformation is due exclusively to earthquake-induced landslides. In the "wet" (saturated) soil conditions scenario, liquefaction is a significant contributor to permanent ground deformation proximal to the power pole or tower.

Similar potential impact is observed for the Portland Hills fault magnitude 6.8 earthquake scenario. Of the 18,098 poles and towers in our database, 2,367 (13%) have a 20% to 30% chance of experiencing between 1 and 2 meters of ground deformation, and 3,687 (20%) have a 20% to 30% chance of experiencing more than 1 meter during "wet" (saturated) soil conditions. In the "dry" soil conditions scenario, 100 (0.5%) poles and towers have a 20% to 30% chance of experiencing between 1 and 2 meters of ground deformation, and 8 poles and towers have a 20% to 30% chance of experiencing more than 2 meters.

5.5 Emergency Transportation Routes

In the Cascadia magnitude 9.0 earthquake, "wet" (saturated) scenario, most (177 out of 238, or 74%) route segments will have a 20% to 30% chance of experiencing significant ground deformation along some portion of the segment (Appendix E, **Plate 10**). Although the regional post-earthquake road conditions significantly improve under the "dry" soil conditions scenario, (Appendix E, **Plate 11**), several road segments (6 out of 238, or 3%) may still be impacted. In the "dry" soil conditions scenario, the road segments that have a chance of failure are due to their placement on 1) existing landslides, 2) areas of elevated landslide susceptibility based on slope and geology, or 3) fill material that includes a significant slope proximal to the road segment. The 20% to 30% probability of failure on a per segment basis may sound modest when taken in isolation, but when individual location probabilities of failure are combined in a binomial distribution statistical method (probability of failure = $(1 - p)^n$), the overall failure estimate for the segment can increase significantly.

For mapping and planning purposes, we categorized road segments into distinct bins, even though only a fraction of a given road segment may experience significant ground deformation. An example of this effect can be observed in Washington County, where emergency transportation routes commonly cross alluvial deposits that may fail due to liquefaction (inset map in Appendix E, **Plate 12**). Although only a portion of the road may be impacted by ground failure, the road segment is considered impassable in its entirety until repairs are made. **Plate 12** (Appendix E) shows the portions of the segments that may experience significant ground failure in a Cascadia magnitude 9.0 earthquake.

For a Portland Hills fault magnitude 6.8 earthquake, 66 out of 238 (28%), and 205 of 238 (95%) of segments have a 20% to 30% chance of experiencing significant ground deformation along some portion of the segment, in the "dry" and "wet" soil condition scenarios, respectively. The increase in percentage compared to the CSZ can be explained by the significant difference in ground motion between the two earthquake scenarios (Plates 4 and 5).

6.0 DISCUSSION

This study is the first conducted in the three-county area that provides damage estimates at levels useful for both regional and local planning. It presents loss estimates as a range for two building occupancy scenarios and two soil moisture scenarios. By doing so, planners can get a better sense of the range of damages and casualties that may occur with a major earthquake: Which areas may have experienced more damage, given the potential for liquefaction and local site amplification? Where were people when the earthquake occurred? How many casualties might that produce?

A magnitude 9.0 Cascadia Subduction Zone earthquake will result in significant damage to buildings, with concomitant casualties, throughout the three-county area. Transportation networks may be severely impaired, compromising emergency response. Millions of tons of debris will need removal to staging areas for sorting and eventual permanent disposal. Hundreds of thousands of buildings will need timely safety inspections, and thousands to tens of thousands of people will need to find other permanent housing arrangements. In comparison, a magnitude 6.8 Portland Hills fault earthquake will be devastating, primarily due to its position relative to the study area's major assets and population centers, with losses more than double those from a magnitude 9.0 Cascadia Subduction Zone earthquake.

6.1 Earthquake Impacts

6.1.1 Geographic Variations

Damage and casualty estimates vary widely throughout the three-county area. Primary reasons for the variation include the seismology, local geology, and building development history. In a Cascadia Subduction Zone earthquake, ground motion will be less in eastern part of the study area compared to the western part. Local geological characteristics can produce significant variations in ground motion (Appendix E, Plates 4 and 5). Such variation should not be interpreted to suggest that some areas within the three counties are unaffected. The City of Sandy, for example, has a relatively low building loss ratio, at 1% (Appendix C, **Table 12-9**), yet the Cascadia earthquake is estimated to generate $12 million in damage within the city boundaries.

6.1.2 Casualties

For both the Cascadia Subduction Zone earthquake and the Portland Hills fault earthquake, and in both "dry" and "wet" (saturated) soil condition scenarios, casualty estimates for a daytime earthquake are at least double in quantity compared to a nighttime earthquake. During nighttime most, but not all, of the population are in more resilient wood-frame construction (**Table 5-1**, **Table 5-2**), while during the daytime, much of the population is dispersed among non-wood frame construction buildings, such as offices, schools, and factories. This temporal pattern has been observed in past earthquakes, most recently in Christchurch, New Zealand, where two earthquakes struck, one at 4:35 AM on September 4, 2010, and one at 12:51 PM on February 22, 2011 (EERI, 2011). No deaths occurred from the early morning earthquake, whereas the afternoon earthquake resulted in the deaths of 185 people.

We emphasize that our daytime building occupancy model used as a basis for generating daytime casualty numbers is a simplification of the dynamic and complex human environment, but it is still useful for planning purposes. Post-earthquake emergency operations can be enhanced by having an awareness of the types of population shifts between buildings throughout the day and week, and the seismic resiliency of those buildings.

6.1.3 Building Damage Inspection and Displaced Population

After a major earthquake, at least 200,000 buildings in the Portland Metropolitan Region will need timely ATC-20-based safety inspection by qualified personnel (ATC, 1989). Our estimate includes all buildings with slight to complete damage (Appendix C, **Table 12-3**), following the quantification method outlined by EERI (2015), which assumed a rate of four to five buildings per day per inspector. Assuming a goal of completing the task in 30 days, our results identify a need for 1,600 to 2,000 certified inspectors for a Cascadia Subduction Zone magnitude 9.0 earthquake. A Portland Hills fault earthquake would require twice the number of inspectors. Many out-of-area inspectors can be brought into an affected area after an earthquake, as discussed in the Oregon Resilience Plan (OSSPAC, 2013, Section 2). Inspection may displace some portion of building occupants who assumed buildings were structurally sound. In other cases, inspection may restore confidence in the building's structural integrity. We can only speculate on such dynamics, but we can provide permanent resident occupancy counts per building damage state (Appendix C, **Table 12-4** through **Table 12-7**).

6.1.4 Debris

Debris removal will require local staging areas for storing, sorting, and eventual transfer to a permanent disposal location. Assuming 25 tons per truckload, 400,000 to 680,000 truckloads of building debris would be generated by a Cascadia Subduction Zone earthquake ("wet" [saturated] soil scenario). We did not estimate other types of debris, such as buckled roads, collapsed overpasses, and landslide flows. Identifying staging areas is partly a GIS exercise that uses the debris-per-neighborhood estimates supplied with this report, along with information on potential long-term compromises to the local transportation network such as bridge collapse. In addition, debris staging site selection should be informed by other emergency or recovery planning efforts that may identify the same areas for other operational needs.

6.1.5 Infrastructure

Our emergency transportation route analysis graphically shows the likelihood of a fragmented emergency transportation route network, one where distribution of goods and services may be significantly affected. It is intended to inform the planning process, emphasizing the need for adaptability and consideration of alternative routes. Our analysis did not consider other potential route blockages, such as collapsed buildings and failed bridges and overpasses. Engineering judgment from transportation sectors can be applied to determine which segments may be quickly restored and which segments may be out for longer periods. Together, such information and perspectives can be used as a basis for establishing, prior to an earthquake, local points of distribution, including food, water, and fuel for emergency operations.

Portions of the electric distribution network may be significantly impacted due to ground failure compromising the integrity of transmission structures. As with the emergency transportation route analysis, our work is intended to inform the planning process. Engineering judgment from electrical utilities sectors can be applied to determine if some areas will be impacted for longer durations, and if additional capacity or redundancy is warranted. During the Christchurch, New Zealand, earthquake sequences of 2010-2011, electric poles and towers generally fared well in the presence of liquefaction (Kwasinksi and others, 2014).

6.1.6 Alternative Earthquake Scenarios

For planning purposes, we chose to model an earthquake at the upper end of its estimated potential energy release. The Cascadia Subduction Zone magnitude 9.0 earthquake scenario assumes a full margin rupture. Partial ruptures along the CSZ have been inferred from the geologic record, with the most frequent occurrences along the southern portion of the CSZ (summarized by Priest and others, 2014). The Oregon State University Hazard Explorer for Lifelines Program maintains a web-GIS tool that displays a full CSZ rupture and three partial rupture CSZ scenarios (http://ohelp.oregonstate.edu/). We obtained the same synthetic bedrock ground motion data used in the OHELP tool from A. Frankel (written communication, 2016) of the USGS. In the Portland Metropolitan Region, the synthetic CSZ magnitude 8.7 bedrock ground motion data averages about 85% of CSZ 9.0 bedrock ground motion data, and the synthetic CSZ magnitude 8.4 bedrock ground motion, with its northern rupture extent west of Waldport, Oregon, is about 40% of the full rupture CSZ magnitude 9.0 earthquake.

Damage estimates do not scale linearly with bedrock ground motion, and one should not assume damage from a CSZ magnitude 8.4 earthquake would be 40% of the CSZ magnitude 9.0 earthquake damage estimate. Yet significant damage could still occur in the study area, primarily due to the seismic site effect where the bedrock ground motion is strongly amplified by soft soils (Section **3.2**). The most dramatic consequence of the seismic site effect observed to date is from the 1985 Mexico City earthquake, where a relatively distant rupture produced devastating building damage within the historic lakebed (Singh and others, 1988). Future studies could quantify the influence of the site effect on damage estimates across lower magnitude CSZ earthquake scenarios.

The Portland Hills fault was modeled at the upper end of its estimated magnitude range (M 6.8); it could rupture at lower magnitude. Buildings above the rupture zone will likely experience the same damage as estimated in this report. Buildings more distant from the rupture zone but situated on softer soils would experience more damage than nearby buildings situated on stiffer soils. The Portland Hills fault is part of a fault zone that includes the Oatfield fault and the East Bank fault (Wong and others, 2001). Other seismogenic faults exist in the study area (Personius and others, 2003; USGS Quaternary Fault and Fold Database: https://earthquake.usgs.gov/hazards/qfaults/). Again, buildings above the fault will experience the most damage, but buildings distant from the fault situated on soft soils may be significantly damaged.

6.2 Seismic Design Level Improvements

Our seismic design level improvement modeling exercise (Section 5.3.1) provides strong support to the suggestion that seismic upgrades to buildings, or replacement of older buildings, can significantly reduce loss and casualties. Levi and others (2015) provided a case for a wide-scale retrofitting program to poor quality buildings throughout Israel, by using Hazus-generated loss estimates based on existing building inventory and a hypothetically retrofitted building inventory. The study assumed an average estimate of US$100/per square meter (US$9.30 per square foot) to upgrade older buildings to limit extensive or complete damage. Yet any proposed improvement should take site-specific conditions into account. In the “wet” (saturated) soil scenario, ground failure due to liquefaction reduces the benefits of retrofitting, as seismic upgrades do little to prevent foundation rupture, but mitigation techniques such as compaction grouting can minimize the ground failure impact, albeit at additional cost.

We urge caution in interpreting the results of **Table 5-4**. Although it offers a hypothetical upper bound of what could be achieved from seismic retrofitting, it should not be used to support the proposed retrofitting or replacement of a particular building. A building-specific analysis incorporates individual

characteristics of the structure, specifying parameters such as its yield point (FEMA, 2010). We used generic building type models in our Hazus AEBM (Section **2.1.4**), which in the particular case, may over- or underestimate the loss (Lu and others, 2017). Further, the exercise did not incorporate building foundation depth or other local site conditions that may mitigate the effects of ground failure from liquefaction. In the Moderate scenario, our modeling exercise assumed a retrofit brings buildings up to moderate or high seismic design standards. In practice, the decision to retrofit or replace an older structure is complex (Williams and others, 2009; City Club of Portland, 2017; Paxton and others, 2017), and one that we cannot address directly in this report.

6.3 Comparison with Previous Studies

Wang (1998), using an early version of Hazus, quantified the impact of a magnitude 8.5 Cascadia Subduction Zone earthquake scenario across the state of Oregon, reporting losses by individual county. Liquefaction and landslide information were not regionally available, nor was it possible to incorporate such information in the Hazus model at that time. Hofmeister and others (2003) used Hazus to estimate impact of a magnitude 6.8 Portland Hills fault and a magnitude 9.0 Cascadia Subduction Zone earthquake scenario to buildings and bridges in Clackamas County, Oregon. The study incorporated building data from the Metro (1998) inventory, and updated soil classification and liquefaction and landslide susceptibility. Local building data were aggregated into the Hazus-MH model's General Building Stock (GBS) inventory, a census track-based unit, with loss estimates derived at the GBS level. Excluding building content, the building repair cost, expressed as a percentage of the building replacement cost, was 13.3% for the Portland Hills fault and 3.4% for the Cascadia Subduction zone earthquake. More recently, Tetra Tech (2016a) updated General Building Stock inventory data for the City of Portland, using ground motion and ground failure data from Madin and Burns (2013), and estimated loss ratios of 4.3% for a Cascadia Subduction Zone scenario and 14.3% for a Portland Hills fault magnitude 6.5 scenario, using USGS ShakeMap data.

Our building loss ratio estimates of 9% to 14% for a Cascadia Subduction Zone magnitude 9.0 earthquake, and 23% to 32% for a Portland Hills fault magnitude 6.8 earthquake are higher than the loss ratios published in the aforementioned studies. We account for this increase due to several factors. The largest contributor to the difference is the method by which the two Hazus tools (General Building Stock [GBS] and Advanced Engineering Building Module [AEBM]) factor the probability of ground failure from liquefaction or from earthquake-induced landslide into the building damage model. In the GBS model, the Hazus tool distributes the ground failure probability across the Moderate, Extensive, and Complete damage states (FEMA, 2011, Equation 5-16), with most of the ground failure probability assigned to the Moderate and Extensive states and a small (<10%) portion assigned to the Complete state. In the AEBM model, the Hazus tool assigns the ground failure probability in its entirety to the Complete damage state. The effect is that AEBM-derived building loss, casualty, and debris estimates will be larger than GBS-derived estimates when all other model inputs are equal, local geological conditions are set to moderate or higher liquefaction and/or landslide susceptibility levels, and sufficient ground motion is present to induce landslides or liquefaction.

Other contributors to the difference are as follows. In our AEBM building database, our seismic design levels (Section **10.1**) were more conservative than the seismic design level distributions embedded within the GBS database, sometimes referred to as the default Hazus mapping scheme. Our review of that scheme suggested it was primarily based on California benchmark years and thus overly optimistic, as California building codes through the twentieth century were more stringent than Oregon

building codes (Olson, 2003; Judson, 2012, FEMA, 2017c, Table 3.5). Although it is possible to alter the Hazus mapping scheme in the General Building Stock (e.g., Seligson, 2008), to our knowledge, such manipulations were not done in the aforementioned GBS-based studies. A higher level of seismic design assignment to building inventory will result in reduced loss estimates (**Table 5-4**).

Within large portions of the developed areas in the study area, our updated liquefaction susceptibility ratings were higher than the liquefaction susceptibility ratings used in the aforementioned studies (primarily Mabey and others, 1997). Appleby and others (in preparation), using the guidelines provided by FEMA (2011, Table 4.10), classified large areas containing high-value building assets with a Very High and High rating compared to the rating of High and Moderate assigned by Mabey and others (1997), particularly in the Columbia Slough, northwest industrial Portland, and eastern downtown Portland. A large portion of the developed area in Washington County was assigned a Moderate liquefaction rating by Appleby and others, which also contributed to the increased loss estimates observed in our study.

We could not directly compare our loss estimates to the losses published by FEMA (2017b), due to their usage of a probabilistic model that did not include a 500-year earthquake, which most closely resembles the Cascadia Subduction Zone scenario modeled in our study. Their debris estimate for the state of Oregon (2.1 to 21.6 million tons) is smaller than our estimate of 12 to 17 million tons, after adjusting for our study's area. (We assume our study includes about 44% of the building assets in the state, based on the area's population ratio compared to the state of Oregon.) The FEMA report used the GBS model and a simplified NEHRP "D" assignment. To our knowledge, the study did not incorporate any liquefaction susceptibility data. Further, default Hazus building inventories, such as were used in the FEMA study, commonly underestimate the square footage for nonresidential buildings, which are generally more sensitive to ground motion. Although that study provided a good nationwide comparative perspective on earthquake hazards, it is too generalized to use for county loss estimation purposes.

We examined the geological updates and the updated ground motions within the Critical Energy Infrastructure (CEI) Hub, and we compared them to the datasets used by Tetra Tech (2016b). Although some increases were observed in the updated ground motion data, we determined that the changes were not large enough to significantly alter the overall damage estimates and recommendations made in the Tetra Tech study. We note that the Hazus GBS tool was not used to generate the damage estimates in that study; damage estimates to the infrastructure were obtained from a Hazus tool that incorporates the ground failure in a manner equivalent to the Hazus AEBM.

Our Portland Hills fault results are similar to what was estimated for a magnitude 7.0 Wasatch fault earthquake in the Salt Lake City area (EERI, 2015, p. 26). The Salt Lake City area has approximately 775,000 buildings, compared to 616,000 buildings in our study area. The two faults have significant assets constructed on top of, and near to, the fault. Both areas have major assets on moderate to high liquefaction potential soils. The key difference between the two faults is the frequency of occurrence—at least 22 large earthquakes have ruptured along the central segments of the Wasatch Fault in the past 6,000 years, whereas evidence suggests the Portland Hills fault has had two ruptures in the past 15,000 years (Liberty and others, 2003).

7.0 RECOMMENDATIONS

This study provides detailed, actionable earthquake loss estimation data for the Portland metropolitan region at a range of scales. Communities, counties, businesses, non-governmental organizations, and regional agencies can use the accompanying data to better plan for, respond to, and recover from a major earthquake. Many of these recommendations build upon those listed in the Oregon Resilience Plan (OSSPAC, 2013). Planning for, responding to, and recovering from a major earthquake is a multi-faceted, multi-disciplinary effort. The scope of this project was limited to estimating damage to buildings and the people that occupy them, and to two key infrastructure sectors. Our recommendations below are directly supported by the findings in this study, and they should not be considered comprehensive.

Our recommendations build on the efforts done to date by agencies, institutions, businesses, and private homeowners to improve the region's seismic resilience. The Oregon Seismic Rehabilitation Grant Program, in place since 2007, has funded upgrades to more than 50 schools and emergency service buildings (http://www.oregongeology.org/sub/projects/rvs/). Bonneville Power Administration has identified seismic vulnerability of its transmission system and has taken several actions to improve its resiliency (Scruggs, 2014). Modifications to the Oregon statewide building code have, through time, increased the seismic resiliency of newer construction (Judson, 2012). The City of Portland's current building code requires owners of unreinforced masonry buildings to seismically retrofit their buildings on the basis of certain triggers (PBEM, 2017). The Great Oregon Shakeout program, managed by Oregon Office of Emergency Management, has more than 580,000 participants, elevating public awareness of the earthquake hazard; the program suggests actions individuals can take to minimize casualties and preparation for post-earthquake disruption of services.

Planning

We encourage regional and local planners, each who have their own questions and needs, to explore the accompanying GIS data. Static maps, such as in Appendix E, Plates 14–16, are just one representation of the loss estimates. We suggest that a primary value of the database is the spatial component: in addition to asking how many or how much, we can ask *where*—where might we expect casualties to be higher, given the time of day of the earthquake? Where can we plan staging areas for debris? At the same time, we caution against over-interpreting the loss estimates, as the data and methods used in this project contain large uncertainties.

Casualty estimates supplied in this report can be used to compare with the region's existing medical facility capacity, including trained, available personnel. The spatial nature of the data supplied with this report can be used to better understand the potential demands on specific facilities, and to quantify emergency care coordination needs at a regional level.

Counties and jurisdictions updating their natural hazard mitigation plans (NHMPs) can use the earthquake damage estimates provided in this report.

Recovery

Hundreds of thousands of buildings in the study area will need safety inspections after a major earthquake. The state can sponsor annual Applied Technology Council (ATC)-20 training to qualified engineers, and negotiate mutual aid agreements with other neighboring states. Timely inspection of damaged buildings will reduce pressure on temporary shelters.

Resiliency: Buildings

The majority of buildings in the study area do not meet current seismic building code standards, although the buildings did meet code standards in place at time of construction. The state and counties can consider incentives and other options that encourage building owners to seismically upgrade their buildings. Such upgrades will reduce casualties and building repair costs and will minimize potential loss of businesses and workforce housing. Jurisdictions can consider triggers that require seismic upgrades, such as a major building renovation.

Resiliency: Infrastructure Improvements

We cannot overstate the need for a secure, regional liquid fuel supply that supports emergency response and recovery. The emergency transportation route analysis provided in this study suggests the need to identify strategically placed local fuel points of distribution. We encourage counties to work with the Oregon Department of Energy in implementing the Oregon Fuel Action Plan (ODOE, 2017), specifically, identifying priority lifeline routes and fuel points of distribution.

Electric utilities can use this study's updated ground motions and ground failure to evaluate the potential threat to their infrastructure, such as substations. Electric system resiliency analysis can incorporate the transmission structure information provided in our geodatabase to determine if additional capacity or redundancy is needed.

Resiliency: Essential and Critical Facilities

Our project did not explicitly identify or evaluate essential facilities, such as fire stations, in the study area. We encourage all communities and planners to clearly define such facilities and evaluate their seismic resilience by using the updated ground motion and ground failure data accompanying this report along with updated Rapid Visual Screening surveys (FEMA, 2015a; Lewis, 2007). Such facilities include emergency shelters and community points of distribution.

Enhanced Emergency Management Tools

Building footprints developed for this project can be incorporated into regional and statewide databases. Location and number of buildings, especially on larger rural lots, are essential information during emergency operations such as wildfire fighting.

A rapid earthquake loss assessment tool could be developed for Oregon by building on methods established in this study and other research such as that of Erdik and others (2011). Each earthquake presents scientists with new information. The synthetic earthquake ground motion data used for this project is the best estimate available from a full rupture subduction zone and a local crustal fault earthquake. In practice, the magnitude and location of an earthquake and the ground motions and ground deformation will likely vary from what was anticipated. In addition to the Portland Hills fault, several other active local crustal faults, such as the Gales Creek fault zone, exist in the study area (Personius and others, 2003). The USGS ShakeMap program (https://earthquake.usgs.gov/data/shakemap/) provides near-real-time maps of ground motion data following significant earthquakes. Having a building database and tools in place to estimate response to a particular earthquake with its own unique ground motions can provide emergency planners with a rapid post-earthquake assessment of the situation.

Database Improvements

County and city databases could be improved with information on seismic retrofits and upgrades to individual buildings. Currently, such information is not readily available for analysis or to potential buyers of a property. At present, only one jurisdiction in the study area maintains the basics of such a database (City of Portland [2017], Unreinforced Masonry buildings).

Public Awareness

The technical information contained in this report can be used to develop practical tools and materials aimed at increasing public awareness of regional earthquake risks and encouraging preparedness actions. Examples of such tools include the Seattle and King County Ready disaster preparedness website, https://hazardready.org/seattle/ (which incorporates other natural hazards), and the report developed by the Utah Chapter of the Earthquake Engineering Research Institute describing the Wasatch Fault in Salt Lake City (EERI, 2015). Public awareness efforts should strive to reach underserved communities and communities whose primary language is other than English, as well as community members with disabilities and access or functional needs.

Future Studies

Our study was primarily focused on direct physical impacts from a major earthquake, including building repair or replacement costs. It did not consider other direct and indirect economic losses, such as lost wages. We recommend incorporating the detailed loss information from this report into a more sophisticated economic analysis, one that factors in other items such as availability of investment capital and a trained labor force, and willingness of businesses to return to the area after a damaging earthquake.

We aggregated loss data at census block groups, which is often the same aggregation unit used when social vulnerability indices are constructed (e.g., Toké and others, 2015). Schmidtlein and others (2011) compared census tract Hazus-based earthquake loss estimates with their social vulnerability indices. A similar type of an analysis could be conducted in our study area at the census block group level.

The methods developed for this project could facilitate similar earthquake impact analyses for other urbanized areas of Oregon that have known earthquake hazards, such as Klamath Falls/Altamont, Salem/Keizer, Albany/Corvallis, and Eugene/Springfield.

Although our analysis focused on impacts from an earthquake, the underlying building database can be used to quantify potential loss due to other natural hazards, such as floods, landslides, or wildfires.

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10.0 APPENDIX A: BUILDING DATABASE DEVELOPMENT

10.1 Building Database Data Sources

Table 10.1 lists the several data sources used for constructing the building asset database. The table is organized as follows: the most general data source for a particular attribute is listed first, then, where available, the source of more specific and accurate data. For example, the Regional Land Information System tax lot database had an Oregon Department of Revenue-based Property Class designation assigned to each tax lot. A lookup table provided a Hazus-based occupancy class mapping for most Property Class values. All buildings on the tax lot are given that occupancy class assignment. If better information on occupancy class was available, such as the Metro Fire/Police/School/Hospital spatial dataset, we updated the attribute with that information. More detailed datasets are typically restricted to a small subset of the buildings.

The Year Built attribute is not directly consumed by Hazus AEBM, but this attribute is used to establish the seismic design level (Section **10.2**).

Table 10-1. Data sources used in construction of the building database. Table uses Hazus occupancy class names (FEMA, 2011, Table 3.2).

Dataset Owner/Distributor	Dataset	Date of Publication or Acquisition	Occupancy Class	Year Built	Square Footage	Number of Stories	Building Type	Summarization Unit	Notes
Metro, Portland, Oregon	Regional Land Information System: Tax Lots	February 2016	✓						Spatial association of building footprint with assessor tabular information.
Clackamas County Assessor, Oregon City, Oregon	Clackamas County Assessor Database (tabular)	June 2016	✓	✓	✓	✓	(RES2)[+]		Detailed information on individual structures. Square footage available only for residential properties.
Multnomah County Assessor, Portland, Oregon	Multnomah County Assessor Database (tabular)	March 2016	✓	✓	✓	✓	(RES2)[+]		Detailed information on individual structures.
Washington County Assessor, Hillsboro, Oregon	Washington County Assessor Database (tabular)	March 2016	✓	✓	✓	✓	(RES2)[+]		Detailed information on individual structures. Square footage not available for governmental or institutional buildings. Year Built information variable.
Oregon Dept. of Geology and Mineral Industries	Building footprint digitization	December 2016	✓						Assigned occupancy class during heads-up digitization with NAIP and oblique imagery. Limited to building footprint digitized for this project.
Metro, Portland, Oregon	Metro Area Disaster GIS (MADGIS) Database	1999					✓		Building construction type based on field visits and identification for ~40,000 non-single family residential buildings.
Metro, Portland, Oregon	Multi-family housing inventory	February 2017	✓				✓		Refined the distinction between single-family and multi-family residential buildings.
City of Portland	Unreinforced Masonry Building Database	January 2017		✓			✓		Includes information on seismic retrofits to URMs. Limited to City of Portland. https://www.portlandoregon.gov/bds/70767
Oregon Employment Department	North American Industry Classification System (NAICS)	September 2016	✓						Refinement of occupancy class designation for commercial and industrial buildings, building on methods described by Wein and others (2013). Data obtained under terms of a confidentiality agreement; information from dataset can be shared only in aggregate, non-individually identifiable, form.
Metro, Portland, Oregon	Regional Land Information System: Fire, Police, School, Hospital Buildings	February 2016	✓						Refinement of occupancy class designation for educational and certain governmental buildings.
Oregon Dept. of Geology and Mineral Industries	Oregon Statewide Seismic Needs Assessment (Lewis, 2007)	2007	✓	✓	✓	✓	✓		Most detailed information; limited to 777 public schools and government agency buildings.
Metro, Portland, Oregon	Regional Land Information System: Building footprints	February 2016			✓				Combined with other building footprint databases; see Section 2.1.1.
Oregon Dept. of Geology and Mineral Industries	Building footprints (Burns and others, 2011, 2013)	2011, 2013			✓				Previously digitized building footprints for portions of Multnomah and Clackamas counties.
City of Portland	Development Capacity Analysis GIS Model (City of Portland, 2012)	October 2012				✓			Established number of stories attribute for buildings in City of Portland. Used to establish building height to number of stories relationship for buildings where number of stories data were not available.
Oregon Dept. of Geology and Mineral Industries	Lidar compilation: bare earth and highest hit models	2009–2014			✓	✓			Used for building footprint (BF) development in areas where no BFs existed, and to refine existing BF database. Building height derived from lidar elevation models (highest_hit minus the bare_earth) and converted to Number of Stories using relationships established by analysis of data from City of Portland Development Capacity Analysis GIS Model. Lidar acquisition dates vary, depending on area. https://gis.dogami.oregon.gov/lidarviewer/
Metro, Portland, Oregon	Regional Land Information System: County and City Boundaries	February 2016						✓	Building spatial associations with particular jurisdictions and counties, including county unincorporated areas.
Tetra Tech, Portland, Oregon	City of Portland Risk Reporting Areas (Tetra Tech, 2016a)	September 2016						✓	Building spatial associations with one of nine Risk Reporting Areas within the City of Portland.
U.S. Census Bureau	2010 Census Block Groups	April 2010						✓	U.S. Census Block Group (CBG) 2010 boundaries, with contiguous CBGs combined by DOGAMI where needed, to establish neighborhood units. Buildings spatially associated with neighborhood units. Population numbers used to assign residential building population. https://www.census.gov/geo/reference/gtc/gtc_bg.html

[+]RES2 (Single-Family Manufactured Housing) available from Assessor records and, by definition, a Manufactured House building type.

10.2 Seismic Design Level Assignments

We assigned a Hazus seismic design level based on the building's construction year and type. Seismic design codes have evolved with time, with more stringent requirements developing as the natural hazard threat is better understood. We interpreted the relevant state building code histories as described by Judson (2012), Oregon Building Code Division (2002, 2010), and Business Oregon (2015) and developed a seismic design level categorization table (**Table 10-2**). The design level assignment is one of the parameters used by the Hazus tool to derive a damage estimate. Once the seismic design level was assigned to each building, we summarized the number of buildings, square footage, and replacement cost per seismic design level (**Table 10-3**). We did not have sufficient information to further classify buildings into the Hazus-supported Low-Special, Moderate-Special, and High-Special seismic design levels.

Table 10-2. Oregon seismic design level benchmark years.

Building Type	Year Built	Design Level	Basis
Single Family Dwelling (includes Duplexes)	prior to 1976	Pre Code	Interpretation of Judson (2012)
	1976–1991	Low Code	
	1992–2003	Moderate Code	
	2004–present	High Code	
Manufactured Housing	prior to 2003	Pre Code	Interpretation of Oregon Manufactured Dwelling Special Codes (Oregon Building Codes Division, 2002)
	2003–2010	Low Code	
	2011–present	Moderate Code	Interpretation of Oregon Manufactured Dwelling Special Codes Update (Oregon Building Codes Division, 2010)
All other buildings	prior to 1976	Pre Code	Interpretation of Oregon Benefit-Cost Analysis Tool (Business Oregon, 2015, p. 24)
	1976–1990	Low Code	
	1991–present	Moderate Code	

Table 10-3. Building statistics by seismic design level, per county.

County	Seismic Design Level	Number of Buildings	Building Percent	Square Footage (Thousand)	Square Footage Percent	Building Value ($ Million)	Building Cost Percent
Clackamas	Pre Code	89,647	50%	202,323	42%	24,922	40%
	Low Code	43,530	24%	146,754	30%	19,523	31%
	Moderate Code	30,638	17%	88,682	18%	11,550	19%
	High Code	15,349	9%	48,363	10%	6,394	10%
Multnomah	Pre Code	184,704	72%	489,280	60%	67,497	59%
	Low Code	28,280	11%	111,783	14%	15,884	14%
	Moderate Code	26,383	10%	101,405	13%	14,248	12%
	High Code	16,210	6%	107,620	13%	16,418	14%
Washington	Pre Code	55,806	31%	145,812	24%	19,341	23%
	Low Code	46,556	26%	215,049	36%	31,128	38%
	Moderate Code	55,092	30%	147,174	24%	18,728	23%
	High Code	23,657	13%	94,936	16%	13,534	16%
Total Study Area	Pre Code	330,157	54%	837,415	44%	111,760	43%
	Low Code	118,366	19%	473,586	25%	66,535	26%
	Moderate Code	112,113	18%	337,261	18%	44,526	17%
	High Code	55,216	9%	250,918	13%	36,347	14%

10.3 Buildings by Geological Classification

To better understand the potential influence of local geology on the damage estimates, we summarized building information by National Earthquake Hazards Reduction Program (NEHRP) site classification and landslide and liquefaction susceptibility.

The NEHRP site classification bins a soil column's average shear wave velocity (V_{s30}), measured between 0 (surface) and 30 meters depth, into one of six categories. The site classification can be used to estimate the amplification of bedrock ground motion that may be experienced at the surface during an earthquake. Lower ratings, such as "B" and "C," minimally amplify the bedrock ground motion. Softer soil columns with lower V_{s30} values experience more surface ground motion due to the soil column's amplifying the bedrock ground motion. NEHRP site class "F" is assigned to soil columns primarily composed of fill material or certain types of clays or peat. For building seismic design purposes, such soils generally require site-specific investigations. For Hazus modeling purposes, we take a conservative approach by reclassifying NEHRP site class "F" into NEHRP site class "E"—the classification with the highest site amplification (Section **11.1**). Summary statistics in **Table 10-4** show that while a relatively small percentage of buildings are placed on NEHRP Site Classification "E" and "F" soils, their proportional building value in Multnomah County is large.

Table 10-4. Building statistics by NEHRP site classification, per county.

County	NEHRP Site Classification	Number of Buildings	Building Percent	Square Footage (Thousand)	Square Footage Percent	Building Value ($ Million)	Building Value Percent
Clackamas	B	367	0%	746	0%	84	0%
	C	109,012	61%	278,528	57%	35,172	56%
	D	58,301	33%	178,653	37%	23,616	38%
	E, F	11,484	6%	28,195	6%	3,518	6%
Multnomah	B	32	0%	63	0%	8	0%
	C	118,487	46%	251,404	31%	32,828	29%
	D	126,550	50%	403,956	50%	58,160	51%
	E, F	10,508	4%	154,665	19%	23,050	20%
Washington	C	21,724	12%	63,586	11%	8,484	10%
	D	154,153	85%	525,041	87%	72,507	88%
	E, F	5,234	3%	14,343	2%	1,741	2%
Total Study Area	B	399	0%	808	0%	92	0%
	C	249,223	40%	593,519	31%	76,483	30%
	D	339,004	55%	1,107,651	58%	154,284	60%
	E, F	27,226	4%	197,202	10%	28,310	11%

The liquefaction and earthquake-induced landslide susceptibility rating is a description of a site's characteristics; it is *not* descriptive of an earthquake-induced landslide or liquefaction occurrence for a particular earthquake scenario. The susceptibility ratings are a generalization of the Hazus-based classifications, obtained from Appleby and others (in preparation), with the groupings listed at the bottom of each table (**Table 10-5** and **Table 10-6**). In all three counties, relatively few buildings are in high landslide susceptibility areas. In Washington County, at least 80% of the building value is on moderate liquefaction susceptibility soils.

Table 10-5. Building statistics by Hazus-based liquefaction susceptibility rating, per county.

County	Liquefaction Susceptibility	Number of Buildings	Building Percent	Square Footage (Thousand)	Square Footage Percent	Building Value ($ Million)	Building Value Percent
Clackamas	None to Low	113,010	63%	288,505	59%	36,392	58%
	Moderate	58,905	33%	179,466	37%	23,738	38%
	High	746	0%	2,279	0%	276	0%
	Very High	6,503	4%	15,873	3%	1,984	3%
Multnomah	None to Low	118,909	47%	252,600	31%	32,990	29%
	Moderate	115,200	45%	377,721	47%	54,990	48%
	High	13,713	5%	34,224	4%	4,295	4%
	Very High	7,755	3%	145,543	18%	21,772	19%
Washington	None to Low	23,685	13%	67,804	11%	8,964	11%
	Moderate	149,053	82%	510,591	85%	70,625	85%
	High	6,005	3%	17,204	3%	2,239	3%
	Very High	2,368	1%	7,371	1%	903	1%
Total Study Area	None to Low	255,604	42%	608,909	32%	78,346	30%
	Moderate	323,158	52%	1,067,777	56%	149,354	58%
	High	20,464	3%	53,707	3%	6,810	3%
	Very High	16,626	3%	168,787	9%	24,659	10%

Hazus-based liquefaction scale mapping: 0–2: none to low; 3: moderate; 4: high; 5: very high.

Table 10-6. Building statistics by Hazus-based earthquake-induced landslide susceptibility rating, per county.

County	Landslide Susceptibility	Number of Buildings	Building Percent	Square Footage (Thousand)	Square Footage Percent	Building Value ($ Million)	Building Value Percent
Clackamas	Low	161,505	90%	440,935	91%	56,485	91%
	Moderate	14,582	8%	37,445	8%	4,890	8%
	High to Very High	3,077	2%	7,742	2%	1,015	2%
Multnomah	Low	224,754	88%	614,891	76%	84,347	74%
	Moderate	23,638	9%	167,945	21%	25,449	22%
	High to Very High	7,185	3%	27,251	3%	4,250	4%
Washington	Low	164,795	91%	548,657	91%	75,370	91%
	Moderate	13,364	7%	44,242	7%	6,012	7%
	High to Very High	2,952	2%	10,071	2%	1,351	2%
Total Study Area	Low	551,054	89%	1,604,483	84%	216,202	83%
	Moderate	51,584	8%	249,632	13%	36,351	14%
	High to Very High	13,214	2%	45,064	2%	6,616	3%

Hazus-based landslide scale mapping: 0–5: none to low; 6–7: moderate; 8–10: high to very high.

10.4 Buildings by Primary Usage

We summarized the number of buildings on a generalized Hazus occupancy class basis, which is a classification of a building's dominant use (**Table 10-7**). In the case of mixed-use buildings, such as retail stores on the first floor and residential quarters on the upper floors, we assigned the occupancy class based on the largest square foot usage.

Table 10-7. Buildings statistics by primary usage, per county.

County	Building Use	Number of Buildings	Building Percent	Square Footage (Thousand)	Square Footage Percent	Building Value ($ Million)	Building Value Percent
Clackamas	Agricultural	22,768	13%	52,063	11%	5,541	9%
	Commercial	4,593	3%	54,616	11%	7,929	13%
	Industrial	1,573	1%	20,621	4%	3,063	5%
	Institutional	2,558	1%	23,264	5%	3,940	6%
	Multi-family Residential	8,959	5%	40,880	8%	6,293	10%
	Single-family Residential	138,713	77%	294,677	61%	35,624	57%
Multnomah	Agricultural	2,540	1%	8,146	1%	867	1%
	Commercial	11,544	5%	210,231	26%	33,390	29%
	Industrial	1,685	1%	45,292	6%	6,874	6%
	Institutional	3,094	1%	50,145	6%	8,812	8%
	Multi-family Residential	24,197	9%	140,585	17%	22,428	20%
	Single-family Residential	212,517	83%	355,689	44%	41,675	37%
Washington	Agricultural	10,753	6%	26,823	4%	2,855	3%
	Commercial	5,863	3%	104,377	17%	15,815	19%
	Industrial	1,399	1%	50,567	8%	8,548	10%
	Institutional	1,931	1%	28,098	5%	4,856	6%
	Multi-family Residential	18,475	10%	98,385	16%	15,671	19%
	Single-family Residential	142,690	79%	294,721	49%	34,987	42%

Commercial includes the Hazus RES4 class. Institutional combines the Hazus GOV1, GOV2, EDU1, EDU2, and REL1 classes. Single-family residential combine the Hazus RES1 and RES2 classes.

10.5 Building Type by Primary Usage

We summarized the number of buildings by their generalized basic structural system (in Hazus, referred to as the building type), by generalized occupancy class (**Table 10-8**). Although several ancillary datasets informed our assignments (Section **2.1.4**), most (563,583 out of 615,852, or 92%) were based on the statistical distributions listed in the Hazus Earthquake Technical Manual (FEMA, 2011, Tables 3.A1–3.A.10).

Table 10-8. Building type by generalized building use.

Building Use	Building Type	Number of Buildings	Building Percent	Square Footage (Thousand)	Square Footage Percent	Cost ($ Million)	Cost Percent
Agricultural	Concrete	1,650	5%	4,032	5%	429	5%
	Precast Concrete	2,921	8%	7,130	8%	759	8%
	Reinforced Masonry	4,327	12%	10,973	13%	1,168	13%
	Steel	8,772	24%	20,635	24%	2,196	24%
	Trailers	365	1%	588	1%	63	1%
	Unreinforced Masonry	1,097	3%	2,896	3%	308	3%
	Wood	16,929	47%	40,778	47%	4,340	47%
Commercial	Concrete	3,530	16%	78,946	21%	13,635	24%
	Precast Concrete	2,304	10%	82,355	22%	10,624	19%
	Reinforced Masonry	4,660	21%	58,567	16%	8,729	15%
	Steel	3,143	14%	74,659	20%	12,263	21%
	Trailers	7	0%	36	0%	7	0%
	Unreinforced Masonry	1,654	8%	14,842	4%	2,271	4%
	Wood	6,702	30%	59,819	16%	9,606	17%
Industrial	Concrete	579	12%	17,557	15%	2,840	15%
	Precast Concrete	904	19%	40,200	35%	6,557	35%
	Reinforced Masonry	569	12%	13,527	12%	2,332	13%
	Steel	1,649	35%	33,406	29%	5,206	28%
	Trailers	51	1%	179	0%	21	0%
	Unreinforced Masonry	155	3%	1,939	2%	259	1%
	Wood	750	16%	9,672	8%	1,270	7%
Institutional	Concrete	1,685	22%	29,392	29%	5,130	29%
	Precast Concrete	347	5%	7,989	8%	1,337	8%
	Reinforced Masonry	1,689	22%	21,678	21%	3,751	21%
	Steel	1,225	16%	14,277	14%	2,483	14%
	Trailers	9	0%	30	0%	5	0%
	Unreinforced Masonry	328	4%	4,861	5%	853	5%
	Wood	2,300	30%	23,279	23%	4,050	23%
Multi-Family Residential	Concrete	1,091	2%	28,476	10%	5,114	12%
	Precast Concrete	115	0%	2,801	1%	509	1%
	Reinforced Masonry	1,331	3%	16,026	6%	2,876	6%
	Steel	1,636	3%	22,913	8%	4,011	9%
	Unreinforced Masonry	403	1%	5,380	2%	947	2%
	Wood	47,055	91%	204,253	73%	30,934	70%
Single-Family Residential	Other	138	0%	377	0%	44	0%
	Reinforced Masonry	3,549	1%	7,349	1%	893	1%
	Unreinforced Masonry	1,455	0%	2,298	0%	268	0%
	Wood	471,926	99%	914,096	99%	110,199	99%
Single-Family Res. – Manuf. Housing		16,852	100%	20,966	100%	882	100%

Commercial combines all Hazus COM occupancy classes and RES4. Institutional combines Hazus occupancy classes REL1, GOV1, EDU1, and EDU2. Multi-family residential is limited to RES3, RES5, and RES6 types. Single-Family Residential – Manuf. Housing is the Hazus occupancy class RES2, and is broken out separately, given the building type's heightened sensitivity to ground shaking.

11.0 APPENDIX B: SITE GROUND MOTION AND GROUND DEFORMATION MAP DEVELOPMENT

11.1 Site Ground Motion Maps

We converted the bedrock ground motion data referenced in Section 3.1 to a 30-foot grid limited in extent to the three-county study area. For the Portland Hills fault magnitude 6.8 earthquake, we used the Nearest Neighbor tool in the Esri Spatial Analyst. For the Cascadia Subduction Zone magnitude 9.0 earthquake, we used the bedrock data published by Madin and Burns (2013). The NEHRP site classification polygons from Appleby and others (in preparation) were converted to a 30-foot grid. Sites classified as NEHRP "F" were re-assigned to NEHRP "E," a conservative and commonly implemented assumption for loss estimation purposes.

We used the revised F_a, F_v, and F_{PGA} site coefficients as published by FEMA (2015b, Tables 11.4-1, 11.4-2, 11.8-1) to derive site ground motion. For completeness, we include the NEHRP "A" class (V_{S30} > 1,500 m/s), even though such stiff material is not present in the study area. We note the coefficients are identical to what is used by the Hazus 4.0 model for probabilistic and arbitrary earthquake events available in the Hazus SQL database tables as:

[dbo].[eqPGASoilAmpFact],
[dbo].[eqPGVSoilAmpFact] ,
[dbo].[eqSa03SoilAmpFact] , and
[dbo].[eqSa10SoilAmpFact].

The coefficients applied directly will result in a non-monotonic site amplification function. To overcome the problem, we implemented the straight-line interpolation guidance given by FEMA (2015b) for intermediate values, and we added a *y*-intercept to the amplification function and adjusted the slope factor, so that the end point of the interval matches the specified amplification. We note the Hazus tool implements a similar piecewise linear function for probabilistic and arbitrary earthquakes. The functions listed in **Table 11-1** through **Table 11-4** were then implemented using the Esri Spatial Analyst raster calculator as a series of conditional statements.

For Hazus purposes, the raster data were converted to the requisite polygon data format by first discretizing the continuous site ground motion data into integer *percent g* bins, then converting the integer raster data to polygon format. The pgv was rounded to the nearest integer inches/second category, and then converted to polygon format.

Table 11-1. Site amplification coefficients for peak ground acceleration (pga, in g).

	Site Multiplication Coefficients NEHRP Site Classification					Piecewise Linear Representation NEHRP Site Classification				
pga_bedrock	A	B	C	D	E	A	B	C	D	E
0.0–0.1	0.8	0.9	1.3	1.6	2.4	0.8*x + 0	0.9*x + 0	1.3*x + 0	1.6*x + 0	2.4*x + 0
0.1–0.2	0.8	0.9	1.2	1.4	1.9	0.8*x + 0	0.9*x + 0	1.1*x + 0.02	1.2*x + 0.04	1.4*x + 0.1
0.2–0.3	0.8	0.9	1.2	1.3	1.6	0.8*x + 0	0.9*x + 0	1.2*x + 0	1.1*x + 0..06	1.0*x + 0.18
0.3–0.4	0.8	0.9	1.2	1.2	1.4	0.8*x + 0	0.9*x + 0	1.2*x + 0	0.9*x + 0.12	0.8*x + 0.24
0.4–0.5	0.8	0.9	1.2	1.1	1.2	0.8*x + 0	0.9*x + 0	1.2*x + 0	0.7*x + 0.2	0.4*x + 0.4
> 0.5	0.8	0.9	1.2	1.1	1.2	0.8*x + 0	0.9*x + 0	1.2*x + 0	1.1*x + 0	1.1*x + 0.05

Table 11-2. Site amplification coefficients for peak ground velocity (pgv, in inches/second).

	Site Multiplication Coefficients NEHRP Site Classification					Piecewise Linear Representation NEHRP Site Classification				
pgv_bedrock	A	B	C	D	E	A	B	C	D	E
0–3.75	0.8	1.0	1.7	2.4	3.5	0.8*x + 0	1.0*x + 0	1.7*x + 0	2.4*x + 0	3.5*x + 0
3.75–7.5	0.8	1.0	1.6	2.0	3.2	0.8*x + 0	1.0*x + 0	1.5*x + 0.75	1.6*x + 3	2.9*x + 2.25
7.5–11.25	0.8	1.0	1.5	1.8	2.8	0.8*x + 0	1.0*x + 0	1.3*x + 2.25	1.4*x + 4.5	2.0*x + 9.0
11.25–15	0.8	1.0	1.4	1.6	2.4	0.8*x + 0	1.0*x + 0	1.1*x + 4.5	1.0*x + 9	1.2*x + 18
15–18.75	0.8	1.0	1.3	1.5	2.0	0.8*x + 0	1.0*x + 0	0.9*x + 7.5	1.1*x + 7.5	0.4*x + 30
> 18.75	0.8	1.0	1.3	1.5	2.0	0.8*x + 0	1.0*x + 0	1.3*x + 0	1.5*x + 0	2.0*x + 0

Table 11-3. Site amplification coefficients for spectral acceleration at 0.3 second (sa03, in g).

	Site Multiplication Coefficients NEHRP Site Classification					Piecewise Linear Representation NEHRP Site Classification				
sa03_bedrock	A	B	C	D	E	A	B	C	D	E
0–0.25	0.8	0.9	1.3	1.6	2.4	0.8*x + 0	0.9*x + 0	1.3*x + 0	1.6*x + 0	2.4*x + 0
0.25–0.50	0.8	0.9	1.3	1.4	1.7	0.8*x + 0	0.9*x + 0	1.3*x + 0	1.2*x + 0.1	1.0*x + 0.35
0.50–0.75	0.8	0.9	1.2	1.2	1.3	0.8*x + 0	0.9*x + 0	1.0*x + 0.15	0.8*x + 0.3	0.5*x + 0.6
0.75–1.00	0.8	0.9	1.2	1.1	1.1	0.8*x + 0	0.9*x + 0	1.2*x + 0	0.8*x + 0.3	0.5*x + 0.6
1.00–1.25	0.8	0.9	1.2	1.0	0.9	0.8*x + 0	0.9*x + 0	1.2*x + 0	0.6*x + 0.5	1.0*x + 1
> 1.25	0.8	0.9	1.2	1.0	0.9	0.8*x + 0	0.9*x + 0	1.2*x + 0	1.0*x + 0	0.9*x + 0

Table 11-4. Site amplification coefficients for spectral acceleration at 1.0 second (sa10, in g).

	Site Multiplication Coefficients NEHRP Site Classification					Piecewise Linear Representation NEHRP Site Classification				
sa10_bedrock	A	B	C	D	E	A	B	C	D	E
0–0.1	0.8	0.8	1.5	2.4	4.2	0.8*x + 0	0.8*x + 0	1.5*x + 0	2.4*x + 0	4.2*x + 0
0.1–0.2	0.8	0.8	1.5	2.2	3.3	0.8*x + 0	0.8*x + 0	1.5*x + 0	2.0*x + 0.04	2.4*x + 0.18
0.2–0.3	0.8	0.8	1.5	2.0	2.8	0.8*x + 0	0.8*x + 0	1.5*x + 0	1.6*x + 0.12	1.8*x + 0.3
0.3–0.4	0.8	0.8	1.5	1.9	2.4	0.8*x + 0	0.8*x + 0	1.5*x + 0	1.6*x + 0.12	1.2*x + 0.48
0.4–0.5	0.8	0.8	1.5	1.8	2.2	0.8*x + 0	0.8*x + 0	1.5*x + 0	1.4*x + 0.2	1.4*x + 0.4
> 0.5	0.8	0.8	1.4	1.7	2.0	0.8*x + 0	0.8*x + 0	1.4*x + 0.05	1.7*x + 0.05	2.0*x + 0.1

11.2 Ground Deformation Maps

We provided the liquefaction and landslide susceptibility data from Appleby and others (in preparation) and the site peak ground acceleration data for both earthquake scenarios developed in Section 3.2 as input to the tool developed by Sharifi-Mood and others (in preparation). The tool implements the methods for permanent ground deformation (PGD) estimation described by Madin and Burns (2013, Section 4), which implemented the Hazus ground failure models described in the Hazus Earthquake Technical Manual (FEMA, 2011). The tool generates raster grids describing the amount and probability of PGD resulting from liquefaction lateral spreading and earthquake-induced landslides. The tool is currently limited to modeling lateral spread from liquefaction in "wet" (saturated) soil conditions. For earthquake-induced landslide modeling, it implements the WET portion of Table 4.15 in the Hazus Earthquake Technical Manual (FEMA, 2011). For liquefaction, it assumes a water depth of 5.0 feet. The tool provides PGD and probability of occurrence estimates for liquefaction lateral spreading and for earthquake-induced landslides. The data are provided in the accompanying geodatabase for the CSZ and the Portland Hills fault simulated earthquakes.

To aid in interpretation, Appendix E, Plates 8 and 9 combine the PGD and probability occurrence from the two mechanisms (earthquake-induced landslides and lateral spread resulting from liquefaction). For a given raster cell, the plates represent the maximum PGD and maximum probability from the two mechanisms.

Our "dry" soil conditions scenario assumes non-saturated soils, thus ground failure due to liquefaction does not occur. However, earthquake-induced landslides may still occur, depending on the ground shaking intensity and local geologic conditions (FEMA, 2011, Table 4.15(A)). To overcome the current limitation of the tool, we developed a "dry" soil conditions scenario ground failure model due to earthquake-induced landslides as follows. As part of a statewide multi-hazard risk assessment effort for Oregon, we developed a lookup table method for rapid loss estimation from a Cascadia Subduction Zone earthquake (Bauer, 2016). All combinations of ground motion, at discrete intervals, and all combinations of liquefaction and landslide susceptibility values, were run through the Hazus model. Building loss ratios, along with ground failure probabilities and lateral spread amount, were captured in a lookup table. Of the four site ground motion parameters (Section **11.1**), the Hazus ground failure model uses only the site peak ground acceleration. A Hazus-based ground failure layer can then be created by associating the local landslide susceptibility rating and the site peak ground acceleration with the lookup table. We repeated the lookup table process for the Portland Hills fault "dry" soil conditions scenario.

The "dry" soil conditions scenario ground failure and probability values are included in the accompanying geodatabase. The lookup table method used the discretized peak ground acceleration (pga) intervals described in Section **11.1** and while it is not as continuous as what is available via the tool developed by Sharifi-Mood and others (in preparation), we determined it is a reasonable representation of the Hazus ground failure model for earthquake-induced landslides in the "dry" soil conditions scenario.

12.0 APPENDIX C: BUILDING DAMAGE ASSESSMENT AND IMPACTS TO OCCUPANTS

12.1 Number of Buildings by Damage State

We summarized the number of buildings in each damage state, by county (**Table 12-1**), using the structural damage states (StrPDS) obtained from the Hazus AEBM output. The quantification of buildings in each damage state follows the methods discussed by FEMA (2017a). The information can inform the planning process for post-earthquake building inspection needs.

Table 12-1. Number of buildings per damage state, by county and by earthquake and soil moisture scenario. Numbers for buildings in the None damage state are not included.

		Cascadia Subduction Zone Magnitude 9.0 Earthquake				Portland Hills Fault Magnitude 6.8 Earthquake			
County (Number of Buildings)	Building Damage State	"Dry" Soil	Building Percent	"Wet" Saturated Soil	Building Percent	"Dry" Soil	Building Percent	"Wet" Saturated Soil	Building Percent
Clackamas (179,164)	Slight	34,145	19%	33,133	18%	46,152	26%	42,988	24%
	Moderate	15,936	9%	15,386	9%	47,122	26%	43,417	24%
	Extensive	5,390	3%	5,228	3%	22,526	13%	20,761	12%
	Complete	2,265	1%	6,267	3%	12,898	7%	24,008	13%
Multnomah (255,577)	Slight	54,660	21%	52,362	20%	72,471	28%	64,772	25%
	Moderate	25,194	10%	23,946	9%	69,876	27%	61,556	24%
	Extensive	7,478	3%	7,017	3%	28,338	11%	25,590	10%
	Complete	3,536	1%	13,039	5%	14,843	6%	39,970	16%
Washington (181,111)	Slight	44,673	25%	41,807	23%	57,184	32%	49,602	27%
	Moderate	20,381	11%	19,012	11%	44,766	25%	38,807	21%
	Extensive	6,303	3%	5,892	3%	15,892	9%	14,519	8%
	Complete	2,784	2%	14,026	8%	6,492	4%	28,194	16%
Study Area Total (615,852)	Slight	133,478	22%	127,301	21%	175,807	29%	157,363	26%
	Moderate	61,512	10%	58,344	9%	161,765	26%	143,781	23%
	Extensive	19,171	3%	18,137	3%	66,756	11%	60,870	10%
	Complete	8,585	1%	33,331	5%	34,233	6%	92,171	15%
Total number of damaged buildings		232,811	38%	237,113	39%	438,560	71%	454,185	74%

12.2 Number of Collapsed Buildings

We used the collapse percentage rates listed in the Hazus Earthquake Technical Manual (FEMA, 2011, Table 13.8), together with probability of Complete structural damage state from the Hazus AEBM output, to estimate the number of collapsed buildings by county and earthquake scenario (**Table 12-2**). The casualty calculations built into Hazus AEBM factor in an assumption that a percentage of completely damaged buildings will collapse, which varies based on building type. For example, the Hazus methods estimate 15% of completely damaged unreinforced masonry buildings will collapse, whereas completely damaged manufactured housing and single family wood frame construction buildings have only a 3% chance of collapse.

Table 12-2. Collapsed buildings by county and by earthquake and soil moisture conditions

		Cascadia Subduction Zone Magnitude 9.0 Earthquake		Portland Hills Fault Magnitude 6.8 Earthquake	
County	Total Number of Buildings	"Dry" Soils	"Wet" (Saturated) Soils	"Dry" Soil	"Wet" (Saturated) Soils
Clackamas	179,164	158	313	666	1,066
Multnomah	255,577	302	677	1,001	1,876
Washington	181,111	209	619	387	1,155
Total	615,852	668	1,609	2,054	4,097

12.3 Permanent Residents by Building Damage State

We assigned permanent residents to individual residential buildings based on the building's square footage, the total square footage of residential buildings for a census block group, and the U.S. Census 2010 population amount for that census block group (Section **2.1.7**). Using the Hazus AEBM output, we multiplied the individual building's permanent residential population by each structural probability of damage state. Summary statistics by county and earthquake scenario are provided in **Table 12-3**. Note the figures in the Complete state are the same as the long-term displaced population figures in **Table 12-4** through **Table 12-7**. The Hazus Complete damage state equates to the ATC-20 red-tag designation (ATC, 1989), and the Extensive damage state equates to the ATC-20 yellow-tag designation. All other building damage states are considered green-tagged (FEMA, 2010, Table 6.1). Qualitative descriptions of the building damage states as relates to the characteristics of the building, per building type (such as Steel Moment Frame), are provided by FEMA (2011, Section 5.3).

Table 12-3. Permanent residents per building damage state, by county and by earthquake and soil moisture conditions scenario.Numbers for permanent residents occupying buildings in the None damage state are not included.

		Cascadia Subduction Zone Magnitude 9.0 Earthquake		Portland Hills Fault Magnitude 6.8 Earthquake	
County	Building Damage State	"Dry" Soil	"Wet" (Saturated) Soil	"Dry" Soil	"Wet" (Saturated) Soil
Clackamas	Slight	75,828	73,670	101,881	94,448
	Moderate	31,559	30,471	105,523	96,722
	Extensive	6,644	6,580	47,996	44,065
	Complete	1,931	10,093	25,152	50,802
Multnomah	Slight	158,506	151,736	203,333	182,865
	Moderate	84,462	79,688	190,409	167,696
	Extensive	24,258	22,643	81,131	72,394
	Complete	9,736	37,461	50,842	120,124
Washington	Slight	133,418	125,169	168,428	145,320
	Moderate	66,488	62,313	137,364	118,446
	Extensive	16,055	15,165	48,269	43,868
	Complete	5,185	37,657	19,582	86,010
Total	Slight	367,752	350,575	473,642	422,632
	Moderate	182,509	172,471	433,296	382,865
	Extensive	46,957	44,387	177,396	160,328
	Complete	16,852	85,211	95,577	256,936

We recognize that planning for short-term and long-term shelter needs throughout the response and recovery phases is a complex task requiring many assumptions, but at its base the planning requires underlying data on demographics as relates to predicted building damage. **Table 12-4** through **Table 12-7** quantify the number of buildings and permanent residents by generalized occupancy, per county and per building damage state, for the four earthquake scenarios.

Table 12-4. Buildings and permanent residents per building damage state for Cascadia Subduction Zone magnitude 9.0 earthquake, "dry" soil conditions. Dash (—): not applicable

							Number of Buildings								Number of Permanent Residents								
							Slight Damage		Moderate Damage		Extensive Damage		Complete Damage			Slight Damage		Moderate Damage		Extensive Damage		Complete Damage	
Building Category	Total Number of Buildings	Building Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Number of Collapsed Buildings	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Total	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Clackamas County																							
Agricultural	22,768	52,063	5,541	465	8%	78	3,882	17%	3,276	14%	1,818	8%	992	4%	—	—	—	—	—	—	—	—	—
Commercial	4,593	54,616	7,929	927	12%	24	823	18%	894	19%	544	12%	248	5%	—	—	—	—	—	—	—	—	—
Industrial	1,573	20,621	3,063	396	13%	11	246	16%	372	24%	278	18%	145	9%	—	—	—	—	—	—	—	—	—
Institutional	2,558	23,264	3,940	391	10%	17	448	17%	530	21%	335	13%	162	6%	—	—	—	—	—	—	—	—	—
Multi-family residential	8,959	40,880	6,293	305	5%	3	1,964	22%	975	11%	190	2%	50	1%	55,042	13,571	25%	9,036	16%	1,965	4%	563	1%
Single-family residential	132,641	286,514	35,282	672	2%	9	25,687	19%	8,226	6%	1,002	1%	167	0%	309,744	60,191	19%	19,412	6%	2,477	1%	501	0%
Manufactured housing	6,072	8,163	343	51	15%	15	1,096	18%	1,662	27%	1,223	20%	502	8%	11,206	2,067	18%	3,111	28%	2,202	20%	868	8%
Multnomah County																							
Agricultural	2,540	8,146	867	114	13%	16	455	18%	403	16%	252	10%	188	7%	—	—	—	—	—	—	—	—	—
Commercial	11,544	210,231	33,390	7,144	21%	158	1,878	16%	2,387	21%	1,915	17%	1,433	12%	—	—	—	—	—	—	—	—	—
Industrial	1,685	45,292	6,874	1,905	28%	39	204	12%	341	20%	374	22%	398	24%	—	—	—	—	—	—	—	—	—
Institutional	3,094	50,145	8,812	1,257	14%	25	555	18%	664	21%	438	14%	229	7%	—	—	—	—	—	—	—	—	—
Multi-family residential	24,197	140,585	22,428	1,829	8%	22	5,078	21%	2,539	10%	655	3%	248	1%	215,232	46,355	22%	39,385	18%	15,311	7%	7,328	3%
Single-family residential	206,322	348,436	41,371	1,034	2%	23	45,563	22%	16,840	8%	2,203	1%	373	0%	507,022	110,112	22%	40,851	8%	5,648	1%	1,126	0%
Manufactured housing	6,195	7,253	304	57	19%	20	927	15%	2,020	33%	1,641	26%	667	11%	13,080	2,039	16%	4,226	32%	3,299	25%	1,282	10%
Washington County																							
Agricultural	10,753	26,823	2,855	368	13%	76	2,305	21%	1,808	17%	1,120	10%	884	8%	—	—	—	—	—	—	—	—	—
Commercial	5,863	104,377	15,815	2,310	15%	47	1,083	18%	1,321	23%	948	16%	460	8%	—	—	—	—	—	—	—	—	—
Industrial	1,399	50,567	8,548	1,350	16%	13	234	17%	341	24%	276	20%	143	10%	—	—	—	—	—	—	—	—	—
Institutional	1,931	28,098	4,856	790	16%	21	333	17%	438	23%	338	18%	189	10%	—	—	—	—	—	—	—	—	—
Multi-family residential	18,475	98,385	15,671	1,155	7%	20	4,588	25%	2,754	15%	811	4%	305	2%	141,844	35,337	25%	29,225	21%	8,879	6%	3,169	2%
Single-family residential	138,117	289,198	34,755	990	3%	18	35,281	26%	12,139	9%	1,637	1%	308	0%	379,323	96,542	25%	34,321	9%	4,916	1%	1,047	0%
Manufactured housing	4,573	5,523	232	49	21%	15	850	19%	1,582	35%	1,173	26%	495	11%	8,543	1,539	18%	2,943	34%	2,260	26%	969	11%
Study Area (All Three Counties)																							
Agricultural	36,061	87,033	9,263	947	10%	170	6,642	18%	5,487	15%	3,190	9%	2,063	6%	—	—	—	—	—	—	—	—	—
Commercial	22,000	369,224	57,134	10,381	18%	229	3,783	17%	4,603	21%	3,407	15%	2,141	10%	—	—	—	—	—	—	—	—	—
Industrial	4,657	116,480	18,485	3,651	20%	63	683	15%	1,054	23%	928	20%	685	15%	—	—	—	—	—	—	—	—	—
Institutional	7,583	101,507	17,609	2,438	14%	62	1,336	18%	1,632	22%	1,112	15%	580	8%	—	—	—	—	—	—	—	—	—
Multi-family residential	51,631	279,849	44,391	3,288	7%	45	11,630	23%	6,267	12%	1,656	3%	604	1%	412,118	95,262	23%	77,646	19%	26,155	6%	11,060	3%
Single-family residential	477,080	924,147	111,408	2,695	2%	50	106,532	22%	37,205	8%	4,843	1%	848	0%	1,196,089	266,845	22%	94,583	8%	13,041	1%	2,674	0%
Manufactured housing	16,840	20,940	879	158	18%	50	2,872	17%	5,263	31%	4,036	24%	1,664	10%	32,829	5,645	17%	10,280	31%	7,762	24%	3,119	10%
Total	615,852	1,899,180	259,169	23,558	9%	668	133,478	22%	61,512	10%	19,171	3%	8,585	1%	1,641,036	367,752	22%	182,509	11%	46,957	3%	16,852	1%

Number of buildings estimates are derived using the Hazus Advanced Engineering Building Module (AEBM) structural probability of damage states (FEMA, 2010).

Institutional combines Hazus occupancy classes REL1, GOV1, GOV2, EDU1, and EDU2. Commercial combines all Hazus COM occupancy classes and RES4. Multi-family residential combines the Hazus occupancy classes RES3, RES5, and RES6 categories.

Permanent resident values are based on U.S. Census 2010 population data. Permanent residents are assigned only to buildings designated as Hazus occupancy class RES1, RES2, RES3, RES5, and RES6.

Manufactured housing building category is limited to Hazus occupancy class RES2, and does not include modular construction that may be present in other Hazus occupancy classes.

Table 12-5. Buildings and permanent residents per building damage state for Cascadia Subduction Zone magnitude 9.0 earthquake, "wet" (saturated) soil conditions. Dash (—): not applicable

							Number of Buildings								Number of Permanent Residents								
							Slight Damage		Moderate Damage		Extensive Damage		Complete Damage			Slight Damage		Moderate Damage		Extensive Damage		Complete Damage	
Building Category	Total Number of Buildings	Building Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Number of Collapsed Buildings	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Total	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Clackamas County																							
Agricultural	22,768	52,063	5,541	598	11%	114	3,747	16%	3,159	14%	1,733	8%	1,570	7%	—	—	—	—	—	—	—	—	—
Commercial	4,593	54,616	7,929	1,124	14%	34	801	17%	864	19%	516	11%	367	8%	—	—	—	—	—	—	—	—	—
Industrial	1,573	20,621	3,063	476	16%	15	240	15%	360	23%	263	17%	188	12%	—	—	—	—	—	—	—	—	—
Institutional	2,558	23,264	3,940	461	12%	23	437	17%	511	20%	314	12%	229	9%	—	—	—	—	—	—	—	—	—
Multi-family residential	8,959	40,880	6,293	426	7%	9	1,919	21%	946	11%	186	2%	223	2%	55,042	13,269	24%	8,746	16%	1,906	3%	1,663	3%
Single-family residential	132,641	286,514	35,282	1,431	4%	99	24,909	19%	7,924	6%	1,038	1%	3,075	2%	309,744	58,361	19%	18,680	6%	2,548	1%	7,377	2%
Manufactured housing	6,072	8,163	343	57	17%	18	1,080	18%	1,622	27%	1,177	19%	614	10%	11,206	2,040	18%	3,045	27%	2,126	19%	1,053	9%
Multnomah County																							
Agricultural	2,540	8,146	867	191	22%	30	408	16%	358	14%	219	9%	408	16%	—	—	—	—	—	—	—	—	—
Commercial	11,544	210,231	33,390	9,977	30%	226	1,747	15%	2,196	19%	1,713	15%	2,150	19%	—	—	—	—	—	—	—	—	—
Industrial	1,685	45,292	6,874	2,613	38%	53	183	11%	300	18%	317	19%	542	32%	—	—	—	—	—	—	—	—	—
Institutional	3,094	50,145	8,812	1,614	18%	37	530	17%	628	20%	406	13%	364	12%	—	—	—	—	—	—	—	—	—
Multi-family residential	24,197	140,585	22,428	3,180	14%	56	4,868	20%	2,408	10%	621	3%	1,109	5%	215,232	44,050	20%	36,542	17%	13,911	6%	17,065	8%
Single-family residential	206,322	348,436	41,371	2,846	7%	247	43,729	21%	16,126	8%	2,217	1%	7,543	4%	507,022	105,712	21%	39,101	8%	5,664	1%	18,591	4%
Manufactured housing	6,195	7,253	304	68	22%	28	896	14%	1,930	31%	1,523	25%	924	15%	13,080	1,974	15%	4,044	31%	3,068	23%	1,806	14%
Washington County																							
Agricultural	10,753	26,823	2,855	558	20%	123	2,126	20%	1,657	15%	1,016	9%	1,601	15%	—	—	—	—	—	—	—	—	—
Commercial	5,863	104,377	15,815	3,031	19%	76	1,016	17%	1,242	21%	891	15%	784	13%	—	—	—	—	—	—	—	—	—
Industrial	1,399	50,567	8,548	1,799	21%	21	218	16%	318	23%	257	18%	225	16%	—	—	—	—	—	—	—	—	—
Institutional	1,931	28,098	4,856	1,039	21%	31	312	16%	410	21%	315	16%	298	15%	—	—	—	—	—	—	—	—	—
Multi-family residential	18,475	98,385	15,671	2,016	13%	59	4,319	23%	2,592	14%	766	4%	1,367	7%	141,844	33,289	23%	27,529	19%	8,377	6%	11,319	8%
Single-family residential	138,117	289,198	34,755	3,144	9%	287	33,018	24%	11,313	8%	1,556	1%	8,993	7%	379,323	90,437	24%	32,039	8%	4,695	1%	24,858	7%
Manufactured housing	4,573	5,523	232	61	26%	23	798	17%	1,480	32%	1,089	24%	758	17%	8,543	1,442	17%	2,745	32%	2,092	24%	1,480	17%
Study Area (All Three Counties)																							
Agricultural	36,061	87,033	9,263	1,347	15%	268	6,281	17%	5,174	14%	2,969	8%	3,579	10%	—	—	—	—	—	—	—	—	—
Commercial	22,000	369,224	57,134	14,133	25%	337	3,564	16%	4,302	20%	3,121	14%	3,301	15%	—	—	—	—	—	—	—	—	—
Industrial	4,657	116,480	18,485	4,888	26%	89	641	14%	979	21%	837	18%	955	21%	—	—	—	—	—	—	—	—	—
Institutional	7,583	101,507	17,609	3,114	18%	91	1,278	17%	1,549	20%	1,036	14%	891	12%	—	—	—	—	—	—	—	—	—
Multi-family residential	51,631	279,849	44,391	5,621	13%	124	11,106	22%	5,946	12%	1,573	3%	2,698	5%	412,118	90,608	22%	72,818	18%	24,195	6%	30,047	7%
Single-family residential	477,080	924,147	111,408	7,421	7%	632	101,656	21%	35,363	7%	4,812	1%	19,611	4%	1,196,089	254,510	21%	89,820	8%	12,906	1%	50,826	4%
Manufactured housing	16,840	20,940	879	186	21%	69	2,774	16%	5,031	30%	3,789	22%	2,296	14%	32,829	5,457	17%	9,833	30%	7,286	22%	4,338	13%
Total	615,852	1,899,180	259,169	36,710	14%	1,609	127,301	21%	58,344	9%	18,137	3%	33,331	5%	1,641,036	350,575	21%	172,471	11%	44,387	3%	85,211	5%

Number of buildings estimates are derived using the Hazus Advanced Engineering Building Module (AEBM) structural probability of damage states (FEMA, 2010).

Institutional combines Hazus occupancy classes REL1, GOV1, GOV2, EDU1, and EDU2. Commercial combines all Hazus COM occupancy classes and RES4. Multi-family residential combines the Hazus occupancy classes RES3, RES5, and RES6 categories.

Permanent resident values are based on U.S. Census 2010 population data. Permanent residents are assigned only to buildings designated as Hazus occupancy class RES1, RES2, RES3, RES5, and RES6.

Manufactured housing building category is limited to Hazus occupancy class RES2, and does not include modular construction that may be present in other Hazus occupancy classes.

Table 12-6. Buildings and permanent residents per building damage state for Portland Hills fault magnitude 6.8 earthquake, "dry" soil conditions. Dash (—): not applicable

							Number of Buildings								Number of Permanent Residents								
							Slight Damage		Moderate Damage		Extensive Damage		Complete Damage			Slight Damage		Moderate Damage		Extensive Damage		Complete Damage	
Building Category	Total Number of Buildings	Building Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Number of Collapsed Buildings	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Total	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Clackamas County																							
Agricultural	22,768	52,063	5,541	787	14%	145	4,935	22%	4,949	22%	2,794	12%	1,718	8%	—	—	—	—	—	—	—	—	—
Commercial	4,593	54,616	7,929	3,054	39%	111	641	14%	1,042	23%	933	20%	1,096	24%	—	—	—	—	—	—	—	—	—
Industrial	1,573	20,621	3,063	1,141	37%	37	191	12%	342	22%	342	22%	438	28%	—	—	—	—	—	—	—	—	—
Institutional	2,558	23,264	3,940	1,339	34%	58	360	14%	579	23%	514	20%	573	22%	—	—	—	—	—	—	—	—	—
Multi-family residential	8,959	40,880	6,293	1,483	24%	33	2,269	25%	2,742	31%	1,360	15%	723	8%	55,042	12,101	22%	17,230	31%	9,877	18%	6,365	12%
Single-family residential	132,641	286,514	35,282	4,975	14%	219	37,211	28%	36,264	27%	14,899	11%	6,267	5%	309,744	88,733	29%	85,978	28%	34,980	11%	15,010	5%
Manufactured housing	6,072	8,163	343	142	41%	63	545	9%	1,205	20%	1,683	28%	2,083	34%	11,206	1,047	9%	2,315	21%	3,139	28%	3,778	34%
Multnomah County																							
Agricultural	2,540	8,146	867	175	20%	27	476	19%	463	18%	272	11%	313	12%	—	—	—	—	—	—	—	—	—
Commercial	11,544	210,231	33,390	14,269	43%	400	1,614	14%	2,374	21%	2,237	19%	3,470	30%	—	—	—	—	—	—	—	—	—
Industrial	1,685	45,292	6,874	3,025	44%	76	156	9%	272	16%	337	20%	724	43%	—	—	—	—	—	—	—	—	—
Institutional	3,094	50,145	8,812	3,274	37%	75	496	16%	687	22%	565	18%	683	22%	—	—	—	—	—	—	—	—	—
Multi-family residential	24,197	140,585	22,428	5,805	26%	102	6,897	29%	5,714	24%	2,338	10%	1,501	6%	215,232	48,640	23%	48,949	23%	29,097	14%	31,396	15%
Single-family residential	206,322	348,436	41,371	5,677	14%	298	61,845	30%	58,400	28%	21,082	10%	7,363	4%	507,022	152,533	30%	137,314	27%	48,933	10%	17,893	4%
Manufactured housing	6,195	7,253	304	63	21%	24	987	16%	1,966	32%	1,508	24%	789	13%	13,080	2,160	17%	4,145	32%	3,101	24%	1,553	12%
Washington County																							
Agricultural	10,753	26,823	2,855	309	11%	51	2,526	23%	2,057	19%	1,011	9%	593	6%	—	—	—	—	—	—	—	—	—
Commercial	5,863	104,377	15,815	4,917	31%	100	1,062	18%	1,537	26%	1,245	21%	937	16%	—	—	—	—	—	—	—	—	—
Industrial	1,399	50,567	8,548	2,412	28%	22	225	16%	357	26%	317	23%	216	15%	—	—	—	—	—	—	—	—	—
Institutional	1,931	28,098	4,856	1,258	26%	34	342	18%	490	25%	396	21%	316	16%	—	—	—	—	—	—	—	—	—
Multi-family residential	18,475	98,385	15,671	2,831	18%	55	5,664	31%	5,085	28%	2,085	11%	1,016	6%	141,844	38,908	27%	41,465	29%	19,438	14%	10,404	7%
Single-family residential	138,117	289,198	34,755	3,582	10%	109	46,643	34%	33,685	24%	9,504	7%	2,888	2%	379,323	128,109	34%	92,956	25%	26,404	7%	8,275	2%
Manufactured housing	4,573	5,523	232	52	23%	16	722	16%	1,556	34%	1,335	29%	527	12%	8,543	1,411	17%	2,943	34%	2,427	28%	903	11%
Study Area (All Three Counties)																							
Agricultural	36,061	87,033	9,263	1,271	14%	222	7,937	22%	7,469	21%	4,076	11%	2,624	7%	—	—	—	—	—	—	—	—	—
Commercial	22,000	369,224	57,134	22,240	39%	611	3,317	15%	4,953	23%	4,415	20%	5,503	25%	—	—	—	—	—	—	—	—	—
Industrial	4,657	116,480	18,485	6,578	36%	135	571	12%	971	21%	996	21%	1,377	30%	—	—	—	—	—	—	—	—	—
Institutional	7,583	101,507	17,609	5,871	33%	167	1,198	16%	1,756	23%	1,475	19%	1,572	21%	—	—	—	—	—	—	—	—	—
Multi-family residential	51,631	279,849	44,391	10,118	23%	190	14,831	29%	13,541	26%	5,784	11%	3,241	6%	412,118	99,648	24%	107,645	26%	58,413	14%	48,165	12%
Single-family residential	477,080	924,147	111,408	14,234	13%	626	145,699	31%	128,349	27%	45,485	10%	16,518	3%	1,196,089	369,376	31%	316,249	26%	110,317	9%	41,177	3%
Manufactured housing	16,840	20,940	879	257	29%	102	2,254	13%	4,726	28%	4,526	27%	3,399	20%	32,829	4,618	14%	9,403	29%	8,666	26%	6,234	19%
Total	615,852	1,899,180	259,169	60,569	23%	2,054	175,807	29%	161,765	26%	66,756	11%	34,233	6%	1,641,036	473,642	29%	433,296	26%	177,396	11%	95,577	6%

Number of buildings estimates are derived using the Hazus Advanced Engineering Building Module (AEBM) structural probability of damage states (FEMA, 2010).

Institutional combines Hazus occupancy classes REL1, GOV1, GOV2, EDU1, and EDU2. Commercial combines all Hazus COM occupancy classes and RES4. Multi-family residential combines the Hazus occupancy classes RES3, RES5, and RES6 categories.

Permanent resident values are based on U.S. Census 2010 population data. Permanent residents are assigned only to buildings designated as Hazus occupancy class RES1, RES2, RES3, RES5, and RES6.

Manufactured housing building category is limited to Hazus occupancy class RES2, and does not include modular construction that may be present in other Hazus occupancy classes.

Table 12-7. Buildings and permanent residents per building damage state for Portland Hills fault magnitude 6.8 earthquake, "wet" (saturated) soil conditions. Dash (—): not applicable.

							Number of Buildings								Number of Permanent Residents								
							Slight Damage		Moderate Damage		Extensive Damage		Complete Damage			Slight Damage		Moderate Damage		Extensive Damage		Complete Damage	
Building Category	Total Number of Buildings	Building Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Number of Collapsed Buildings	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Total	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Clackamas County																							
Agricultural	22,768	52,063	5,541	1,009	18%	204	4,691	21%	4,671	21%	2,624	12%	2,678	12%	—	—	—	—	—	—	—	—	—
Commercial	4,593	54,616	7,929	3,578	45%	134	589	13%	936	20%	826	18%	1,401	30%	—	—	—	—	—	—	—	—	—
Industrial	1,573	20,621	3,063	1,332	44%	46	176	11%	308	20%	301	19%	541	34%	—	—	—	—	—	—	—	—	—
Institutional	2,558	23,264	3,940	1,520	39%	71	336	13%	529	21%	464	18%	719	28%	—	—	—	—	—	—	—	—	—
Multi-family residential	8,959	40,880	6,293	1,879	30%	57	2,083	23%	2,482	28%	1,229	14%	1,425	16%	55,042	11,141	20%	15,542	28%	8,861	16%	10,644	19%
Single-family residential	132,641	286,514	35,282	6,890	20%	482	34,598	26%	33,393	25%	13,819	10%	14,830	11%	309,744	82,316	27%	79,066	26%	32,402	10%	35,761	12%
Manufactured housing	6,072	8,163	343	158	46%	72	516	9%	1,099	18%	1,498	25%	2,414	40%	11,206	991	9%	2,114	19%	2,803	25%	4,397	39%
Multnomah County																							
Agricultural	2,540	8,146	867	262	30%	44	413	16%	388	15%	221	9%	577	23%	—	—	—	—	—	—	—	—	—
Commercial	11,544	210,231	33,390	17,324	52%	489	1,427	12%	2,064	18%	1,927	17%	4,464	39%	—	—	—	—	—	—	—	—	—
Industrial	1,685	45,292	6,874	3,614	53%	89	135	8%	231	14%	279	17%	863	51%	—	—	—	—	—	—	—	—	—
Institutional	3,094	50,145	8,812	3,862	44%	95	450	15%	610	20%	497	16%	922	30%	—	—	—	—	—	—	—	—	—
Multi-family residential	24,197	140,585	22,428	7,857	35%	183	6,207	26%	5,009	21%	2,075	9%	3,764	16%	215,232	44,235	21%	42,709	20%	24,932	12%	50,070	23%
Single-family residential	206,322	348,436	41,371	9,750	24%	941	55,202	27%	51,428	25%	19,246	9%	28,205	14%	507,022	136,577	27%	121,130	24%	44,695	9%	67,697	13%
Manufactured housing	6,195	7,253	304	79	26%	35	937	15%	1,827	29%	1,344	22%	1,174	19%	13,080	2,053	16%	3,857	29%	2,767	21%	2,357	18%
Washington County																							
Agricultural	10,753	26,823	2,855	525	18%	104	2,309	21%	1,858	17%	914	8%	1,386	13%	—	—	—	—	—	—	—	—	—
Commercial	5,863	104,377	15,815	6,424	41%	157	922	16%	1,328	23%	1,085	19%	1,580	27%	—	—	—	—	—	—	—	—	—
Industrial	1,399	50,567	8,548	3,270	38%	36	198	14%	312	22%	278	20%	355	25%	—	—	—	—	—	—	—	—	—
Institutional	1,931	28,098	4,856	1,707	35%	52	300	16%	426	22%	346	18%	514	27%	—	—	—	—	—	—	—	—	—
Multi-family residential	18,475	98,385	15,671	4,687	30%	142	4,846	26%	4,372	24%	1,876	10%	3,418	19%	141,844	33,220	23%	35,496	25%	17,208	12%	28,812	20%
Single-family residential	138,117	289,198	34,755	7,614	22%	637	40,371	29%	29,117	21%	8,833	6%	20,009	14%	379,323	110,815	29%	80,303	21%	24,493	6%	55,551	15%
Manufactured housing	4,573	5,523	232	70	30%	28	656	14%	1,394	30%	1,188	26%	932	20%	8,543	1,285	15%	2,647	31%	2,168	25%	1,647	19%
Study Area (All Three Counties)																							
Agricultural	36,061	87,033	9,263	1,796	19%	352	7,413	21%	6,916	19%	3,758	10%	4,641	13%	—	—	—	—	—	—	—	—	—
Commercial	22,000	369,224	57,134	27,326	48%	780	2,938	13%	4,328	20%	3,838	17%	7,445	34%	—	—	—	—	—	—	—	—	—
Industrial	4,657	116,480	18,485	8,216	44%	171	510	11%	850	18%	858	18%	1,759	38%	—	—	—	—	—	—	—	—	—
Institutional	7,583	101,507	17,609	7,089	40%	217	1,086	14%	1,566	21%	1,307	17%	2,155	28%	—	—	—	—	—	—	—	—	—
Multi-family residential	51,631	279,849	44,391	14,423	32%	383	13,136	25%	11,863	23%	5,180	10%	8,607	17%	412,118	88,596	21%	93,747	23%	51,000	12%	89,526	22%
Single-family residential	477,080	924,147	111,408	24,254	22%	2,059	130,171	27%	113,938	24%	41,899	9%	63,043	13%	1,196,089	329,708	28%	280,500	23%	101,590	8%	159,009	13%
Manufactured housing	16,840	20,940	879	307	35%	136	2,109	13%	4,320	26%	4,030	24%	4,520	27%	32,829	4,329	13%	8,618	26%	7,737	24%	8,401	26%
Total	615,852	1,899,180	259,169	83,411	32%	4,097	157,363	26%	143,781	23%	60,870	10%	92,171	15%	1,641,036	422,632	26%	382,865	23%	160,328	10%	256,936	16%

Number of buildings estimates are derived using the Hazus Advanced Engineering Building Module (AEBM) structural probability of damage states (FEMA, 2010).

Institutional combines Hazus occupancy classes REL1, GOV1, GOV2, EDU1, and EDU2. Commercial combines all Hazus COM occupancy classes and RES4. Multi-family residential combines the Hazus occupancy classes RES3, RES5, and RES6 categories.

Permanent resident values are based on U.S. Census 2010 population data. Permanent residents are assigned only to buildings designated as Hazus occupancy class RES1, RES2, RES3, RES5, and RES6.

Manufactured housing building category is limited to Hazus occupancy class RES2, and does not include modular construction that may be present in other Hazus occupancy classes.

12.4 Loss Estimates by Jurisdiction

Table 12-8 through **Table 12-11** provide county-level and jurisdictional level building inventory and building loss estimates, along with casualty estimate for the daytime and nighttime earthquake scenarios. The jurisdictional data are available electronically in the accompanying geodatabase. Casualty and displaced population estimates are based on 2010 U.S. Census data and Hazus population distribution models across business types (Section **2.1.7**). The estimates for jurisdictions include all buildings within their 2016 jurisdictional boundaries, as defined by the Metro (2016) Regional Land Information System city boundary layer, dated February 2016.

Table 12-8. Loss estimates by jurisdiction, Cascadia Subduction Zone magnitude 9.0 earthquake, "dry" soil conditions.

	U.S. Census Population 2010	Number of Buildings	Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Debris (Thousands of Tons)	Long-Term Displaced Population	Casualties: Daytime Scenario					Casualties: Nighttime Scenario				
									Total	Level 1	Level 2	Level 3	Level 4	Total	Level 1	Level 2	Level 3	Level 4
Study area total	1,641,036	615,852	1,899,180	259,169	23,558	9%	12,794	16,852	18,286	13,342	3,518	484	942	4,334	3,338	739	87	169
Clackamas County																		
Clackamas County total	375,992	179,164	486,122	62,390	3,207	5%	1,671	1,931	2,034	1,530	368	46	90	461	373	70	7	12
Barlow	135	60	124	15	4	29%	2	1	3	2	1	0	0	1	0	0	0	0
Canby	15,829	5,559	14,978	1,890	58	3%	34	78	38	31	6	1	1	14	12	2	0	0
Estacada	2,695	1,309	3,361	448	23	5%	17	12	29	22	5	1	2	3	3	0	0	0
Gladstone	11,497	4,022	8,749	1,129	51	5%	27	63	48	35	9	1	3	13	10	2	0	0
Happy Valley	13,903	5,856	19,882	2,692	59	2%	28	8	41	31	7	1	2	5	4	1	0	0
Johnson City	566	275	249	11	3	33%	5	88	2	2	0	0	0	9	7	2	0	0
Lake Oswego	36,619	13,770	47,252	6,805	337	5%	134	220	174	132	31	4	8	50	39	8	1	2
Milwaukie	20,291	7,891	21,596	2,890	295	10%	162	93	294	218	56	7	14	34	27	5	1	1
Molalla	8,108	3,176	6,827	854	21	2%	11	8	12	9	2	0	0	3	3	0	0	0
Molalla Prairie Hamlet	—	4,165	10,102	1,137	62	5%	38	8	19	15	3	0	1	3	2	0	0	0
Mulino Hamlet	—	2,021	4,178	491	41	8%	22	10	20	14	4	1	1	3	2	0	0	0
Oregon City	31,859	12,641	31,984	4,190	277	7%	148	102	258	187	50	7	14	38	30	6	1	1
Rivergrove	289	196	539	70	2	3%	0	1	0	0	0	0	0	0	0	0	0	0
Sandy	9,570	3,734	8,551	1,077	11	1%	5	4	5	4	1	0	0	2	2	0	0	0
Stafford Hamlet	—	1,206	3,543	477	23	5%	10	6	21	15	4	1	1	1	1	0	0	0
The Villages at Mt Hood	—	3,795	7,268	886	18	2%	7	7	5	4	1	0	0	3	2	0	0	0
West Linn	25,109	9,170	28,162	3,817	117	3%	39	96	68	51	13	2	4	19	16	3	0	0
Wilsonville	19,509	5,492	31,168	4,410	291	7%	155	147	199	155	34	4	7	38	30	6	1	1
Clackamas County Jurisdictions total[+]	195,979	84,338	248,512	33,289	1,695	5%	844	952	1,238	926	225	29	57	238	191	36	4	7
Clackamas County Unincorporated total	—	94,481	240,494	29,470	1,539	5%	854	1,006	778	594	137	16	31	216	176	32	3	5
Multnomah County																		
Multnomah County total	735,334	255,577	810,087	114,046	13,340	12%	7,724	9,736	11,418	8,231	2,248	318	621	2,762	2,085	493	62	122
Fairview	8,920	2,611	7,976	1,061	24	2%	12	71	10	8	1	0	0	11	9	2	0	0
Gresham	105,594	29,043	83,478	11,160	314	3%	143	399	235	181	39	5	9	81	68	11	1	1
Maywood Park	752	339	627	74	3	4%	1	1	4	3	1	0	0	0	0	0	0	0
Portland (by Bureau of Emergency Management Risk Reporting Areas):																		
Airport	—	284	12,971	1,898	678	36%	439	6	452	308	97	16	31	64	44	13	2	4
Central City	—	2,809	108,884	18,436	3,952	21%	2,615	3,535	3,333	2,373	666	99	195	1,054	771	201	28	54
Central Northeast Neighborhoods	—	19,883	47,310	6,226	741	12%	372	434	575	432	109	12	22	121	94	21	2	4
East Portland Neighborhood Office	—	46,301	114,853	15,359	758	5%	388	658	543	416	96	11	20	182	147	28	3	5
Neighbors West/Northwest	—	7,663	50,308	7,320	1,685	23%	1,043	1,414	1,588	1,123	328	47	91	318	230	62	9	17
North Portland Neighborhood Services	—	25,468	87,894	12,076	2,331	19%	1,292	794	2,039	1,472	408	54	105	268	204	48	6	11
Northeast Coalition	—	22,178	52,444	6,994	434	6%	235	342	520	374	100	15	31	96	75	15	2	4
Southeast Uplift Neighborhood Program	—	57,291	124,011	16,652	1,134	7%	603	978	991	721	187	28	55	278	217	45	5	11
Southwest Neighborhoods	—	24,288	72,458	10,945	952	9%	418	712	966	698	186	28	55	228	175	39	5	9
Portland (total)	583,776	206,165	671,134	95,906	12,666	13%	7,405	8,872	11,008	7,917	2,177	310	604	2,610	1,958	472	61	119
Troutdale	15,962	5,161	13,481	1,730	77	4%	39	12	56	43	10	1	2	8	6	1	0	0
Wood Village	3,878	1,194	3,507	408	9	2%	6	55	5	5	1	0	0	9	7	1	0	0
Multnomah County Jurisdictions total[+]	718,882	244,513	780,203	110,339	13,092	12%	7,606	9,410	11,319	8,157	2,230	316	616	2,720	2,050	487	62	121
Multnomah County Unincorporated total	—	11,053	29,359	3,614	249	7%	117	335	95	70	18	2	5	44	36	7	1	1
Washington County																		
Washington County total	529,710	181,111	602,970	82,732	7,011	8%	3,399	5,185	4,834	3,581	903	119	231	1,110	881	176	18	35
Banks	1,777	646	1,491	194	20	10%	10	7	37	27	7	1	2	3	2	1	0	0
Beaverton	89,803	24,005	96,327	13,813	1,230	9%	548	1,227	845	635	154	19	37	223	175	36	4	8
Cornelius	11,869	3,517	7,844	963	80	8%	36	118	57	44	10	1	2	21	18	3	0	0
Durham	1,351	399	1,887	277	20	7%	6	24	5	4	1	0	0	4	3	1	0	0
Forest Grove	21,083	7,267	19,462	2,617	303	12%	159	492	381	272	76	11	22	74	58	12	1	2
Gaston*	637	312	618	79	8	10%	4	4	9	7	2	0	1	1	1	0	0	0
Hillsboro	91,611	26,846	116,113	17,603	1,810	10%	946	938	1,339	983	253	35	68	262	203	44	5	10
King City	3,111	1,610	3,702	494	33	7%	11	44	8	6	1	0	0	8	6	1	0	0
North Plains	1,947	952	2,602	328	38	12%	24	7	38	27	8	1	2	3	2	0	0	0
Sherwood	18,194	5,873	17,792	2,335	140	6%	87	27	132	97	25	3	7	12	10	2	0	0
Tigard	48,035	16,004	62,578	8,490	756	9%	405	329	448	337	82	10	19	85	68	13	1	2
Tualatin	26,054	7,535	41,411	5,751	521	9%	290	147	381	291	67	8	15	65	51	11	1	2
Washington County Jurisdictions total[+]	315,472	94,966	371,828	52,943	4,958	9%	2,526	3,361	3,680	2,728	686	90	175	760	598	123	13	26
Washington County Unincorporated total	—	86,501	228,783	29,512	2,025	7%	847	1,788	1,178	868	222	30	58	357	287	54	5	10

[+] The jurisdiction is associated with the county it occupies most by area. Figures are for the entire jurisdiction and may include building data from neighboring counties. Summaries by all jurisdictions and unincorporated area for a given county will vary slightly with the county total.

[*] Gaston census numbers are for entire jurisdiction. Gaston loss figures limited to buildings and residences in Washington County and do not include buildings, casualties, debris, and displaced population in Yamhill County.

Casualty level definitions are provided in **Table 4-1** and are based on U.S. Census 2010 population figures.

Table 12-9. Loss estimates by jurisdiction, Cascadia Subduction Zone magnitude 9.0 earthquake, "wet" (saturated) soil conditions.

	U.S. Census Population 2010	Number of Buildings	Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Debris (Thousands of Tons)	Long-Term Displaced Population	Casualties: Daytime Scenario					Casualties: Nighttime Scenario				
									Total	Level 1	Level 2	Level 3	Level 4	Total	Level 1	Level 2	Level 3	Level 4
Study area total	1,641,036	615,852	1,899,180	259,169	36,710	14%	17,292	85,211	27,175	19,489	5,454	758	1,473	10,400	7,838	1,979	203	380
Clackamas County																		
Clackamas County total	375,992	179,164	486,122	62,390	4,573	7%	2,092	10,093	2,757	2,038	523	67	129	1,115	866	202	17	30
Barlow	135	60	124	15	7	47%	3	28	5	4	1	0	0	3	2	1	0	0
Canby	15,829	5,559	14,978	1,890	61	3%	36	159	40	33	6	1	1	20	16	3	0	0
Estacada	2,695	1,309	3,361	448	27	6%	18	27	33	24	6	1	2	5	4	1	0	0
Gladstone	11,497	4,022	8,749	1,129	69	6%	32	235	61	44	12	2	3	26	21	5	0	1
Happy Valley	13,903	5,856	19,882	2,692	75	3%	32	89	50	38	9	1	2	11	9	2	0	0
Johnson City	566	275	249	11	4	35%	5	97	3	2	0	0	0	9	7	2	0	0
Lake Oswego	36,619	13,770	47,252	6,805	523	8%	184	1,207	258	191	49	6	12	130	99	24	2	4
Milwaukie	20,291	7,891	21,596	2,890	394	14%	193	830	380	278	74	10	19	92	71	17	1	3
Molalla	8,108	3,176	6,827	854	21	2%	11	8	12	9	2	0	0	3	3	0	0	0
Molalla Prairie Hamlet	—	4,165	10,102	1,137	83	7%	45	133	29	22	6	1	1	12	10	2	0	0
Mulino Hamlet	—	2,021	4,178	491	70	14%	32	151	28	20	6	1	2	14	10	3	0	0
Oregon City	31,859	12,641	31,984	4,190	342	8%	170	307	318	228	63	9	18	57	44	10	1	2
Rivergrove	289	196	539	70	8	12%	2	40	1	1	0	0	0	3	3	1	0	0
Sandy	9,570	3,734	8,551	1,077	12	1%	5	6	5	4	1	0	0	2	2	0	0	0
Stafford Hamlet	—	1,206	3,543	477	36	8%	14	68	33	23	7	1	2	6	5	1	0	0
The Villages at Mt Hood	—	3,795	7,268	886	67	8%	21	411	15	11	3	0	1	34	26	7	0	1
West Linn	25,109	9,170	28,162	3,817	209	5%	64	797	99	73	19	3	5	72	56	13	1	2
Wilsonville	19,509	5,492	31,168	4,410	423	10%	196	894	315	235	59	7	14	100	77	19	2	3
Clackamas County Jurisdictions total[+]	195,979	84,338	248,512	33,289	2,429	7%	1,063	5,488	1,686	1,239	322	43	82	601	465	109	9	17
Clackamas County Unincorporated total	—	94,481	240,494	29,470	2,180	7%	1,060	4,652	1,058	793	197	23	45	508	397	91	7	13
Multnomah County																		
Multnomah County total	735,334	255,577	810,087	114,046	20,489	18%	10,395	37,461	16,660	11,824	3,397	487	950	5,558	4,126	1,072	124	236
Fairview	8,920	2,611	7,976	1,061	58	6%	29	335	51	36	11	2	3	32	25	6	0	1
Gresham	105,594	29,043	83,478	11,160	726	7%	279	4,244	549	400	107	14	27	382	296	72	5	10
Maywood Park	752	339	627	74	3	4%	1	2	5	3	1	0	0	0	0	0	0	0
Portland (by Bureau of Emergency Management Risk Reporting Areas):																		
Airport	—	284	12,971	1,898	983	52%	565	14	694	470	151	25	48	118	82	25	4	8
Central City	—	2,809	108,884	18,436	5,672	31%	3,369	7,422	4,419	3,102	907	138	271	1,591	1,142	317	45	88
Central Northeast Neighborhoods	—	19,883	47,310	6,226	979	16%	459	1,177	758	562	148	17	31	203	154	38	4	7
East Portland Neighborhood Office	—	46,301	114,853	15,359	1,212	8%	576	1,204	964	705	188	24	47	289	223	50	5	10
Neighbors West/Northwest	—	7,663	50,308	7,320	2,419	33%	1,285	4,073	2,039	1,430	428	62	120	566	411	114	14	28
North Portland Neighborhood Services	—	25,468	87,894	12,076	3,581	30%	1,770	3,972	3,126	2,224	645	88	169	611	455	119	13	24
Northeast Coalition	—	22,178	52,444	6,994	641	9%	308	1,920	697	494	139	21	42	230	175	43	4	8
Southeast Uplift Neighborhood Program	—	57,291	124,011	16,652	1,676	10%	786	5,492	1,431	1,023	284	42	82	656	499	122	12	23
Southwest Neighborhoods	—	24,288	72,458	10,945	1,785	16%	658	5,352	1,518	1,084	304	44	86	666	500	128	13	24
Portland (total)	583,776	206,165	671,134	95,906	18,947	20%	9,776	30,627	15,645	11,095	3,194	459	896	4,930	3,641	955	115	220
Troutdale	15,962	5,161	13,481	1,730	169	10%	83	245	188	130	40	6	12	35	27	7	1	1
Wood Village	3,878	1,194	3,507	408	9	2%	6	55	5	5	1	0	0	9	7	1	0	0
Multnomah County Jurisdictions total[+]	718,882	244,513	780,203	110,339	19,911	18%	10,175	35,507	16,444	11,668	3,354	482	939	5,389	3,996	1,040	121	232
Multnomah County Unincorporated total	—	11,053	29,359	3,614	565	16%	216	1,891	204	148	41	5	10	164	127	31	2	4
Washington County																		
Washington County total	529,710	181,111	602,970	82,732	11,648	14%	4,805	37,657	7,758	5,627	1,534	204	394	3,727	2,846	705	63	113
Banks	1,777	646	1,491	194	35	18%	15	113	56	40	11	1	3	11	9	2	0	0
Beaverton	89,803	24,005	96,327	13,813	1,943	14%	751	6,267	1,313	964	254	33	63	633	481	119	12	22
Cornelius	11,869	3,517	7,844	963	159	17%	62	1,089	119	89	23	2	5	94	73	18	1	2
Durham	1,351	399	1,887	277	33	12%	9	94	10	7	2	0	0	9	7	2	0	0
Forest Grove	21,083	7,267	19,462	2,617	496	19%	223	2,238	596	418	124	19	36	216	165	41	4	6
Gaston*	637	312	618	79	9	12%	5	17	10	7	2	0	1	3	2	1	0	0
Hillsboro	91,611	26,846	116,113	17,603	2,884	16%	1,280	7,124	2,186	1,564	439	62	121	800	602	154	16	29
King City	3,111	1,610	3,702	494	56	11%	17	195	15	11	3	0	1	20	15	4	0	1
North Plains	1,947	952	2,602	328	61	19%	32	157	56	39	12	2	4	15	11	3	0	0
Sherwood	18,194	5,873	17,792	2,335	217	9%	113	534	209	149	42	6	12	54	41	10	1	2
Tigard	48,035	16,004	62,578	8,490	1,087	13%	516	2,306	672	494	130	17	32	248	191	46	4	7
Tualatin	26,054	7,535	41,411	5,751	732	13%	362	1,030	549	409	104	12	24	144	110	27	3	5
Washington County Jurisdictions total[+]	315,472	94,966	371,828	52,943	7,712	15%	3,383	21,164	5,792	4,191	1,146	155	300	2,247	1,707	425	40	74
Washington County Unincorporated total	—	86,501	228,783	29,512	3,913	13%	1,395	16,509	1,992	1,451	394	50	96	1,491	1,146	282	22	40

[+] The jurisdiction is associated with the county it occupies most by area. Figures are for the entire jurisdiction and may include building data from neighboring counties. Summaries by all jurisdictions and unincorporated area for a given county will vary slightly with the county total.
* Gaston census numbers are for entire jurisdiction. Gaston loss figures limited to buildings and residences in Washington County and do not include buildings, casualties, debris, and displaced population in Yamhill County.
Casualty level definitions are provided in **Table 4-1** and are based on U.S. Census 2010 population figures.

Table 12-10. Loss estimates by jurisdiction, Portland Hills fault magnitude 6.8 earthquake, "dry" soil conditions.

	U.S. Census Population 2010	Number of Buildings	Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Debris (Thousands of Tons)	Long-Term Displaced Population	Casualties: Daytime Scenario					Casualties: Nighttime Scenario				
									Total	Level 1	Level 2	Level 3	Level 4	Total	Level 1	Level 2	Level 3	Level 4
Study area total	1,641,036	615,852	1,899,180	259,169	60,569	23%	26,600	95,577	47,853	33,774	9,820	1,442	2,817	15,802	11,957	2,888	328	629
Clackamas County																		
Clackamas County total	375,992	179,164	486,122	62,390	12,922	21%	4,960	25,152	8,881	6,340	1,804	251	486	3,245	2,538	567	50	91
Barlow	135	60	124	15	4	29%	2	2	3	2	1	0	0	1	1	0	0	0
Canby	15,829	5,559	14,978	1,890	159	8%	76	202	109	83	19	2	5	41	34	6	0	1
Estacada	2,695	1,309	3,361	448	42	9%	27	25	55	40	10	2	3	6	5	1	0	0
Gladstone	11,497	4,022	8,749	1,129	437	39%	139	1,816	351	244	74	11	22	197	153	36	3	5
Happy Valley	13,903	5,856	19,882	2,692	243	9%	79	118	179	128	36	5	10	30	24	4	0	1
Johnson City	566	275	249	11	9	82%	11	319	7	5	1	0	0	25	19	5	0	0
Lake Oswego	36,619	13,770	47,252	6,805	1,877	28%	552	3,243	965	691	194	27	53	418	323	74	7	14
Milwaukie	20,291	7,891	21,596	2,890	1,341	46%	542	2,459	1,427	1,002	302	42	82	326	252	59	6	10
Molalla	8,108	3,176	6,827	854	37	4%	16	17	17	13	2	0	1	7	6	1	0	0
Molalla Prairie Hamlet	—	4,165	10,102	1,137	63	6%	33	13	15	11	2	0	1	5	4	1	0	0
Mulino Hamlet	—	2,021	4,178	491	96	19%	43	81	39	27	8	1	3	13	10	2	0	0
Oregon City	31,859	12,641	31,984	4,190	1,319	31%	496	2,983	1,286	896	269	41	80	383	297	68	6	11
Rivergrove	289	196	539	70	8	11%	1	11	1	0	0	0	0	2	1	0	0	0
Sandy	9,570	3,734	8,551	1,077	20	2%	8	4	8	7	1	0	0	3	3	0	0	0
Stafford Hamlet	—	1,206	3,543	477	118	25%	38	112	94	64	20	3	7	15	12	2	0	0
The Villages at Mt Hood	—	3,795	7,268	886	11	1%	3	2	1	1	0	0	0	2	1	0	0	0
West Linn	25,109	9,170	28,162	3,817	899	24%	251	1,679	493	343	103	16	32	216	171	37	3	6
Wilsonville	19,509	5,492	31,168	4,410	406	9%	196	181	255	199	43	5	9	50	40	8	1	1
Clackamas County Jurisdictions total[+]	195,979	84,338	248,512	33,289	7,088	21%	2,513	13,269	5,305	3,756	1,085	158	307	1,737	1,356	303	27	51
Clackamas County Unincorporated total	—	94,481	240,494	29,470	5,895	20%	2,491	12,036	3,582	2,590	720	93	179	1,500	1,177	262	22	39
Multnomah County																		
Multnomah County total	735,334	255,577	810,087	114,046	32,287	28%	15,658	50,842	28,915	20,159	6,032	920	1,805	9,346	6,918	1,773	223	432
Fairview	8,920	2,611	7,976	1,061	30	3%	12	39	13	11	2	0	0	9	8	1	0	0
Gresham	105,594	29,043	83,478	11,160	459	4%	165	314	216	176	32	3	6	103	89	12	1	1
Maywood Park	752	339	627	74	6	8%	2	6	4	3	1	0	0	2	1	0	0	0
Portland (by Bureau of Emergency Management Risk Reporting Areas):																		
Airport	—	284	12,971	1,898	655	35%	411	7	415	286		14	27	57	40	12	2	4
Central City	—	2,809	108,884	18,436	9,989	54%	5,895	13,914	8,942	6,159	1,897	298	588	3,069	2,175	627	90	177
Central Northeast Neighborhoods	—	19,883	47,310	6,226	1,210	19%	535	1,261	913	672	177	22	42	282	220	48	5	10
East Portland Neighborhood Office	—	46,301	114,853	15,359	1,316	9%	549	1,652	776	592	136	16	31	383	314	56	4	8
Neighbors West/Northwest	—	7,663	50,308	7,320	3,786	52%	1,939	6,932	3,392	2,339	728	110	215	1,129	795	233	34	66
North Portland Neighborhood Services	—	25,468	87,894	12,076	4,192	35%	2,023	3,739	3,864	2,727	802	114	221	725	554	131	14	27
Northeast Coalition	—	22,178	52,444	6,994	1,472	21%	639	2,520	1,737	1,200	362	59	116	459	352	80	9	17
Southeast Uplift Neighborhood Program	—	57,291	124,011	16,652	4,296	26%	1,804	10,538	4,082	2,840	848	133	262	1,586	1,211	284	31	60
Southwest Neighborhoods	—	24,288	72,458	10,945	4,129	38%	1,435	8,545	4,276	2,948	903	143	281	1,383	1,032	262	30	58
Portland (total)	583,776	206,165	671,134	95,906	31,046	32%	15,230	49,106	28,396	19,763	5,942	908	1,783	9,074	6,693	1,733	220	427
Troutdale	15,962	5,161	13,481	1,730	67	4%	29	11	35	27	6	1	1	8	7	1	0	0
Wood Village	3,878	1,194	3,507	408	10	2%	4	12	3	3	0	0	0	4	4	1	0	0
Multnomah County Jurisdictions total[+]	718,882	244,513	780,203	110,339	31,618	29%	15,442	49,488	28,667	19,982	5,982	912	1,790	9,200	6,803	1,748	221	428
Multnomah County Unincorporated total	—	11,053	29,359	3,614	636	18%	205	1,320	181	132	35	5	9	142	112	25	2	4
Washington County																		
Washington County total	529,710	181,111	602,970	82,732	15,360	19%	5,982	19,582	10,056	7,275	1,984	271	526	3,211	2,501	547	56	106
Banks	1,777	646	1,491	194	12	6%	5	4	16	12	3	0	1	2	1	0	0	0
Beaverton	89,803	24,005	96,327	13,813	3,510	25%	1,310	5,597	2,721	1,961	546	73	141	787	605	138	15	28
Cornelius	11,869	3,517	7,844	963	52	5%	20	37	22	18	3	0	0	13	11	1	0	0
Durham	1,351	399	1,887	277	47	17%	13	63	12	9	2	0	0	8	7	1	0	0
Forest Grove	21,083	7,267	19,462	2,617	127	5%	61	115	84	66	13	1	3	28	24	4	0	0
Gaston*	637	312	618	79	2	3%	1	1	2	1	0	0	0	0	0	0	0	0
Hillsboro	91,611	26,846	116,113	17,603	3,320	19%	1,476	2,116	2,255	1,625	444	63	122	533	406	94	11	22
King City	3,111	1,610	3,702	494	55	11%	17	78	12	9	2	0	1	14	11	2	0	0
North Plains	1,947	952	2,602	328	53	16%	28	20	44	31	9	1	3	6	4	1	0	0
Sherwood	18,194	5,873	17,792	2,335	148	6%	80	34	98	74	17	2	4	16	13	2	0	0
Tigard	48,035	16,004	62,578	8,490	1,873	22%	870	1,404	1,180	859	233	30	58	272	215	45	4	8
Tualatin	26,054	7,535	41,411	5,751	956	17%	453	432	672	504	125	15	28	134	105	22	2	4
Washington County Jurisdictions total[+]	315,472	94,966	371,828	52,943	10,156	19%	4,335	9,902	7,117	5,170	1,398	187	362	1,812	1,404	311	34	64
Washington County Unincorporated total	—	86,501	228,783	29,512	5,176	18%	1,614	9,563	3,000	2,144	601	86	168	1,410	1,105	239	23	43

[+] The jurisdiction is associated with the county it occupies most by area. Figures are for the entire jurisdiction and may include building data from neighboring counties. Summaries by all jurisdictions and unincorporated area for a given county will vary slightly with the county total.

* Gaston census numbers are for entire jurisdiction. Gaston loss figures limited to buildings and residences in Washington County and do not include buildings, casualties, debris, and displaced population in Yamhill County.

Casualty level definitions are provided in **Table 4-1** and are based on U.S. Census 2010 population figures.

Table 12-11. Loss estimates by jurisdiction, Portland Hills fault magnitude 6.8 earthquake, "wet" (saturated) soil conditions.

	U.S. Census Population 2010	Number of Buildings	Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Debris (Thousands of Tons)	Long-Term Displaced Population	Casualties: Daytime Scenario					Casualties: Nighttime Scenario				
									Total	Level 1	Level 2	Level 3	Level 4	Total	Level 1	Level 2	Level 3	Level 4
Study area total	1,641,036	615,852	1,899,180	259,169	83,411	32%	33,905	256,936	62,977	44,290	13,114	1,891	3,682	29,038	21,830	5,598	563	1,046
Clackamas County																		
Clackamas County total	375,992	179,164	486,122	62,390	16,367	26%	5,990	50,802	10,912	7,768	2,244	307	593	5,232	4,032	973	81	146
Barlow	135	60	124	15	7	48%	3	31	5	3	1	0	0	3	2	1	0	0
Canby	15,829	5,559	14,978	1,890	231	12%	103	874	172	127	32	4	8	93	74	16	1	2
Estacada	2,695	1,309	3,361	448	74	17%	39	197	105	73	22	3	7	21	16	4	0	1
Gladstone	11,497	4,022	8,749	1,129	504	45%	157	2,656	394	275	83	12	24	258	199	48	4	7
Happy Valley	13,903	5,856	19,882	2,692	318	12%	100	552	217	154	44	6	13	65	51	11	1	2
Johnson City	566	275	249	11	9	85%	11	330	7	6	1	0	0	26	20	5	0	1
Lake Oswego	36,619	13,770	47,252	6,805	2,377	35%	685	6,391	1,194	853	243	33	65	659	504	123	11	21
Milwaukie	20,291	7,891	21,596	2,890	1,598	55%	615	5,456	1,595	1,122	338	46	89	546	418	104	9	16
Molalla	8,108	3,176	6,827	854	37	4%	16	17	17	13	2	0	1	7	6	1	0	0
Molalla Prairie Hamlet	—	4,165	10,102	1,137	88	8%	42	149	28	21	5	1	1	15	12	3	0	0
Mulino Hamlet	—	2,021	4,178	491	142	29%	58	319	55	38	12	2	4	30	24	6	0	1
Oregon City	31,859	12,641	31,984	4,190	1,422	34%	525	3,827	1,364	950	286	43	85	448	346	82	7	13
Rivergrove	289	196	539	70	20	29%	5	94	3	2	1	0	0	8	6	2	0	0
Sandy	9,570	3,734	8,551	1,077	21	2%	8	16	9	7	1	0	0	4	4	0	0	0
Stafford Hamlet	—	1,206	3,543	477	151	32%	47	274	123	83	27	5	9	27	21	5	0	1
The Villages at Mt Hood	—	3,795	7,268	886	42	5%	12	240	8	6	2	0	0	20	15	4	0	0
West Linn	25,109	9,170	28,162	3,817	1,093	29%	304	3,457	566	395	118	18	35	347	270	63	5	9
Wilsonville	19,509	5,492	31,168	4,410	681	15%	283	1,616	505	371	98	12	24	173	131	33	3	6
Clackamas County Jurisdictions total[+]	195,979	84,338	248,512	33,289	8,816	26%	3,013	26,497	6,368	4,500	1,315	188	364	2,750	2,118	510	44	78
Clackamas County Unincorporated total	—	94,481	240,494	29,470	7,602	26%	3,024	24,307	4,555	3,276	930	120	229	2,462	1,900	459	37	67
Multnomah County																		
Multnomah County total	735,334	255,577	810,087	114,046	42,747	37%	19,270	120,124	36,278	25,244	7,643	1,146	1,146	15,302	11,333	3,001	335	633
Fairview	8,920	2,611	7,976	1,061	65	6%	29	305	54	38	11	2	3	30	24	5	0	1
Gresham	105,594	29,043	83,478	11,160	1,114	10%	376	6,734	694	510	135	17	33	604	468	113	8	15
Maywood Park	752	339	627	74	8	10%	3	24	7	4	1	0	0	3	2	0	0	0
Portland (by Bureau of Emergency Management Risk Reporting Areas):																		
Airport	—	284	12,971	1,898	1,016	54%	569	19	700	476	152	24	48	116	81	24	4	7
Central City	—	2,809	108,884	18,436	11,593	63%	6,534	17,698	9,845	6,767	2,099	329	650	3,565	2,519	734	105	207
Central Northeast Neighborhoods	—	19,883	47,310	6,226	1,721	28%	714	4,289	1,284	935	257	32	60	552	421	103	10	18
East Portland Neighborhood Office	—	46,301	114,853	15,359	2,193	14%	881	6,597	1,563	1,136	308	41	79	855	664	153	14	25
Neighbors West/Northwest	—	7,663	50,308	7,320	4,513	62%	2,154	10,830	3,724	2,567	801	121	235	1,453	1,032	301	41	79
North Portland Neighborhood Services	—	25,468	87,894	12,076	5,587	46%	2,524	12,934	5,009	3,523	1,051	148	287	1,511	1,139	293	28	51
Northeast Coalition	—	22,178	52,444	6,994	2,200	31%	885	9,004	2,306	1,591	488	77	151	982	743	187	18	33
Southeast Uplift Neighborhood Program	—	57,291	124,011	16,652	6,046	36%	2,365	29,189	5,402	3,757	1,136	172	337	3,050	2,307	585	56	103
Southwest Neighborhoods	—	24,288	72,458	10,945	5,434	50%	1,809	18,570	5,108	3,531	1,084	166	327	2,220	1,654	435	45	85
Portland (total)	583,776	206,165	671,134	95,906	40,304	42%	18,436	109,130	34,942	24,283	7,375	1,110	2,173	14,304	10,561	2,815	320	608
Troutdale	15,962	5,161	13,481	1,730	167	10%	77	281	174	120	37	6	11	39	30	7	1	1
Wood Village	3,878	1,194	3,507	408	10	2%	4	12	3	3	0	0	0	4	4	1	0	0
Multnomah County Jurisdictions total[+]	718,882	244,513	780,203	110,339	41,667	38%	18,925	116,486	35,874	24,958	7,560	1,135	2,221	14,985	11,089	2,941	330	625
Multnomah County Unincorporated total	—	11,053	29,359	3,614	1,030	28%	329	3,505	320	230	65	9	16	306	236	58	4	8
Washington County																		
Washington County total	529,710	181,111	602,970	82,732	24,297	29%	8,645	86,010	15,787	11,279	3,226	437	844	8,503	6,465	1,624	147	267
Banks	1,777	646	1,491	194	27	14%	10	104	35	26	7	1	2	10	8	2	0	0
Beaverton	89,803	24,005	96,327	13,813	5,201	38%	1,775	19,130	3,850	2,751	790	105	203	1,861	1,404	357	35	65
Cornelius	11,869	3,517	7,844	963	125	13%	45	894	80	60	15	2	3	77	60	14	1	2
Durham	1,351	399	1,887	277	84	30%	23	277	26	19	5	1	1	24	19	5	0	1
Forest Grove	21,083	7,267	19,462	2,617	259	10%	107	1,242	236	170	47	7	13	122	94	23	2	3
Gaston*	637	312	618	79	4	5%	2	6	3	2	1	0	0	1	1	0	0	0
Hillsboro	91,611	26,846	116,113	17,603	5,269	30%	2,063	12,836	3,771	2,663	778	112	219	1,476	1,104	287	30	56
King City	3,111	1,610	3,702	494	105	21%	30	412	28	21	5	1	1	41	31	8	1	1
North Plains	1,947	952	2,602	328	92	28%	41	266	73	51	15	2	5	25	20	5	0	1
Sherwood	18,194	5,873	17,792	2,335	295	13%	130	963	250	177	51	7	15	91	70	17	1	3
Tigard	48,035	16,004	62,578	8,490	2,783	33%	1,164	7,409	1,814	1,299	371	49	95	755	578	143	12	22
Tualatin	26,054	7,535	41,411	5,751	1,469	26%	619	2,782	1,072	785	211	26	50	343	261	65	6	12
Washington County Jurisdictions total[+]	315,472	94,966	371,828	52,943	15,713	30%	6,010	46,320	11,239	8,024	2,297	313	605	4,827	3,649	925	89	164
Washington County Unincorporated total	—	86,501	228,783	29,512	8,584	29%	2,603	39,822	4,621	3,302	946	127	246	3,707	2,839	706	59	104

[+] The jurisdiction is associated with the county it occupies most by area. Figures are for the entire jurisdiction and may include building data from neighboring counties. Summaries by all jurisdictions and unincorporated area for a given county will vary slightly with the county total.

[*] Gaston census numbers are for entire jurisdiction. Gaston loss figures limited to buildings and residences in Washington County and do not include buildings, casualties, debris, and displaced population in Yamhill County.

Casualty level definitions are provided in **Table 4-1** and are based on U.S. Census 2010 population figures.

13.0 APPENDIX D: GEOGRAPHIC INFORMATION SYSTEM (GIS) DATABASE

The GIS data included with this publication are partitioned into two ArcGIS version 10.1 file geodatabases. Earthquake loss estimates and impact assessment data are contained in RDPO_Earthquake_Impact_Analysis_Phase1.gdb. Loss estimates for a particular earthquake scenario are contained in independent tables and can be joined to the appropriate polygon dataset to graphically represent impacts. Ground motion and ground deformation data are contained in RDPO_GroundMotion_GroundFailure_Phase1.gdb.

RDPO_Earthquake_Impact_Analysis_Phase1.gdb:

Feature Dataset Phase1:

Building_Footprints	Outlines of buildings and other non-building structures.
Electrical_Transmission_Structures	Pointfile containing locations of electrical transmission poles and towers, and an estimate of permanent ground deformation at the location for all four earthquake scenarios.
Emergency_Transportation_Routes	Buffered and segmented version of the Metro area Emergency Transportation Routes, and a categorization, per segment, of the impact of permanent ground deformation on the segment, for all four earthquake scenarios.
Jurisdictions	Cities, villages, hamlets, and unincorporated areas, and summary statistics for number of buildings, square footage, replacement cost, and population estimates. Contains **Jurisdiction** attribute for joining to loss estimate tables.
Neighborhood_Units	Neighborhood units (876 total), and summary statistics for number of buildings, square footage, replacement cost, and population estimates. Contains **NUID** attribute for joining to loss estimate tables.
Population_and_Building_Density	20-acre hexagonal grid with summary statistics for number of buildings, number of residential buildings, and permanent residents per hexagonal cell. All cells contain at least one building.

Tables with building loss, casualty, and displaced population estimates for a given scenario

Loss estimates by jurisdiction

Tables can be joined to the Jurisdictions *feature class using* **Jurisdiction** *attribute*

Loss_Jurisdiction_CSZ_M9p0_dry	Scenario: Cascadia Subduction Zone M 9.0, “dry” soil conditions
Loss_Jurisdiction_CSZ_M9p0_wet	Scenario: Cascadia Subduction Zone M 9.0, “wet” (saturated) soil conditions
Loss_Jurisdiction_PHF_M6p8_dry	Scenario: Portland Hills fault M 6.8, “dry” soil conditions
Loss_Jurisdiction_PHF_M6p8_wet	Scenario: Portland Hills fault M 6.8, “wet” (saturated) soil conditions

Loss estimates by neighborhood unit

Tables can be joined to the Neighborhood_Units *feature class using the* **NUID** *attribute*

Loss_Neighborhood_Unit_CSZ_M9p0_dry	Scenario: Cascadia Subduction Zone M 9.0, “dry” soil conditions
Loss_Neighborhood_Unit_CSZ_M9p0_wet	Scenario: Cascadia Subduction Zone M 9.0, “wet” (saturated) soil conditions
Loss_Neighborhood_Unit_PHF_M6p8_dry	Scenario: Portland Hills fault M 6.8, “dry” soil conditions
Loss_Neighborhood_Unit_PHF_M6p8_wet	Scenario: Portland Hills fault M 6.8, “wet” (saturated) soil conditions

RDPO_GroundMotion_GroundFailure_Phase1.gdb:

Synthetic Cascadia Subduction Zone magnitude 9.0 earthquake

Site ground motion (rasters)

CSZ_M9p0_pga_site	Site peak ground acceleration, in g (standard gravity).
CSZ_M9p0_pgv_site	Site peak ground velocity, in centimeters per second.
CSZ_M9p0_sa03_site	Site spectral acceleration at 0.3 sec, in g (standard gravity).
CSZ_M9p0_sa10_site	Site spectral acceleration at 1.0 sec, in g (standard gravity).

Permanent Ground Deformation (PGD) (rasters)

Each PGD raster is accompanied with a probability (Prob) raster

CSZ_M9p0_PGD_landslide_dry	Permanent ground deformation due to earthquake-induced landslide under wet (or saturated) soil conditions, in centimeters.
CSZ_M9p0_Prob_landslide_dry	Probability of earthquake-induced landslide under wet (or saturated) soil conditions. In percent.
CSZ_M9p0_PGD_landslide_wet	Permanent ground deformation due to earthquake-induced landslide under wet (or saturated) soil conditions, in centimeters.
CSZ_M9p0_Prob_landslide_wet	Probability of earthquake-induced landslide under wet (or saturated) soil conditions. In percent.
CSZ_M9p0_PGD_liquefaction_wet	Permanent ground deformation due to liquefaction lateral spreading. Liquefaction assumes wet (or saturated) soil conditions, in centimeters.
CSZ_M9p0_Prob_liquefaction_wet	Probability of liquefaction under wet (or saturated) soil conditions. In percent.

Synthetic Portland Hills fault magnitude 6.8 earthquake

Bedrock ground motion

PHF_M6p8_bedrock_groundmotion	Pointfile with descriptors of bedrock ground motion (pga, pgv, sa03, sa10)

Site ground motion (rasters)

PHF_M6p8_pga_site	Site peak ground acceleration, in g (standard gravity).
PHF_M6p8_pgv_site	Site peak ground velocity, in centimeters per second.
PHF_M6p8_sa03_site	Site spectral acceleration at 0.3 sec, in g (standard gravity).
PHF_M6p8_sa10_site	Site spectral acceleration at 1.0 sec, in g (standard gravity).

Permanent Ground Deformation (PGD) (rasters)

Each PGD raster is accompanied with a probability (Prob) raster

PHF_M6p8_PGD_landslide_dry	Permanent ground deformation due to earthquake-induced landslide under wet (or saturated) soil conditions, in centimeters.
PHF_M6p8_Prob_landslide_dry	Probability of earthquake-induced landslide under wet (or saturated) soil conditions. In percent.
PHF_M6p8_PGD_landslide_wet	Permanent ground deformation due to earthquake-induced landslide under wet (or saturated) soil conditions, in centimeters.
PHF_M6p8_Prob_landslide_wet	Probability of earthquake-induced landslide under wet (or saturated) soil conditions. In percent.
PHF_M6p8_PGD_liquefaction_wet	Permanent ground deformation due to liquefaction lateral spreading. Liquefaction assumes wet (or saturated) soil conditions, in centimeters.
PHF_M6p8_Prob_liquefaction_wet	Probability of liquefaction under wet (or saturated) soil conditions. In percent.

14.0 APPENDIX E: MAP PLATES

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Appendix E: Plate 1

Population Density and Building Location
Clackamas County, Oregon

MULTNOMAH CO.
CLACKAMAS CO.
WASHINGTON CO.
YAMHILL CO.
MARION CO.
HOOD RIVER CO.
WASCO CO.

Milwaukie
Happy Valley
Boring
Sandy
Oregon City
Mount Hood Village
Government Camp
Wilsonville
Estacada
Canby
Molalla
Ripplebrook

99W
99E
5
224
26
213

Permanent Residents Per 20-Acre Cell

- 0 (Building(s) present, no permanent residents)
- 1–5
- 6–10
- 11–20
- 21–50
- 51–100
- 101–200
- 201–500
- 501–1,000
- 1,001–2,000

Floating structures and buildings less than 400 square feet not included in building count

0 2.5 5 10 Miles
0 4 8 16 Kilometers

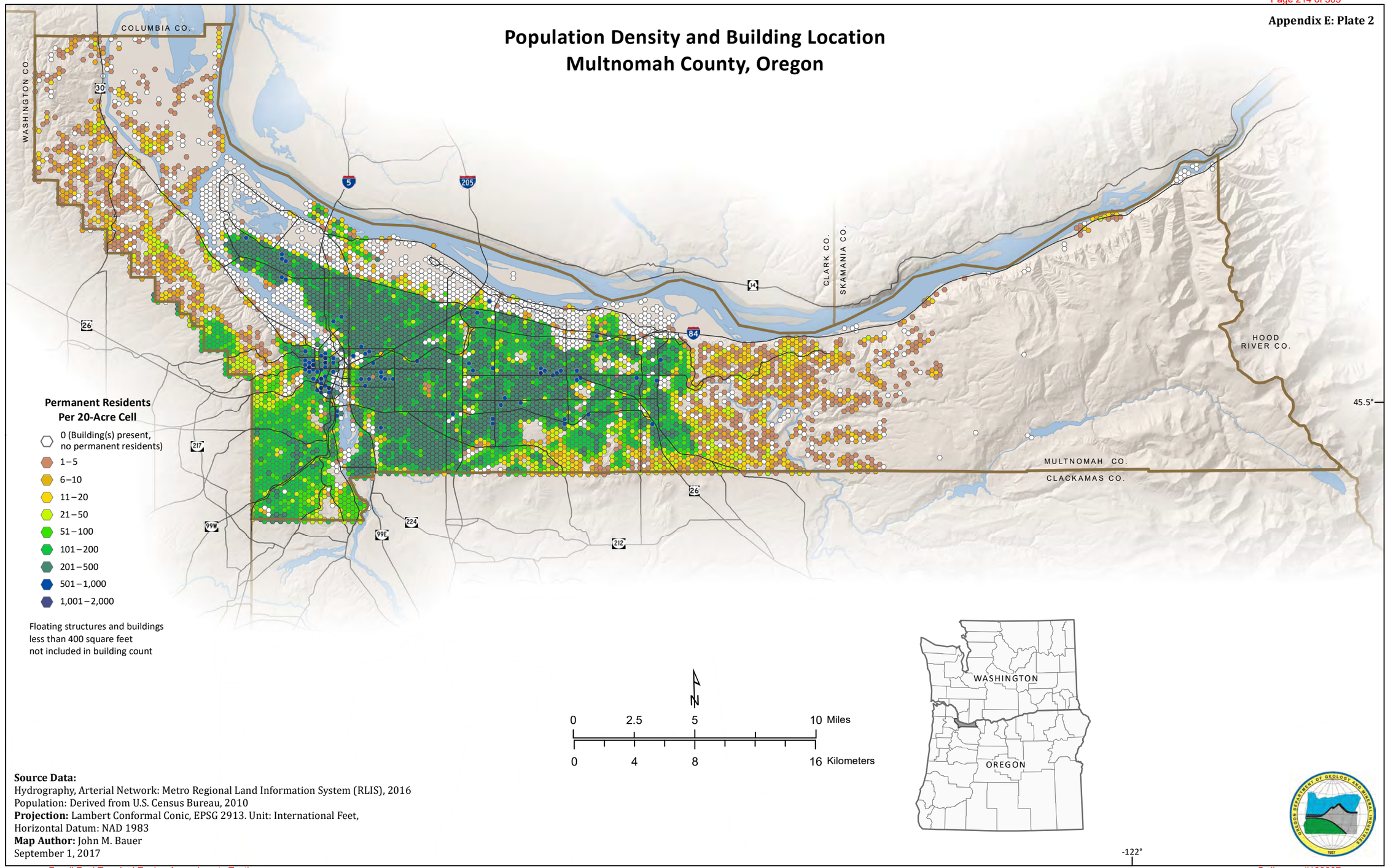
WASHINGTON
OREGON

45°
-122°

Source Data:
Hydrography, Arterial Network: Metro Regional Land Information System (RLIS), 2016
Population: Derived from U.S. Census Bureau, 2010
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet,
Horizontal Datum: NAD 1983
Map Author: John M. Bauer
September 1, 2017

Appendix E: Plate 2

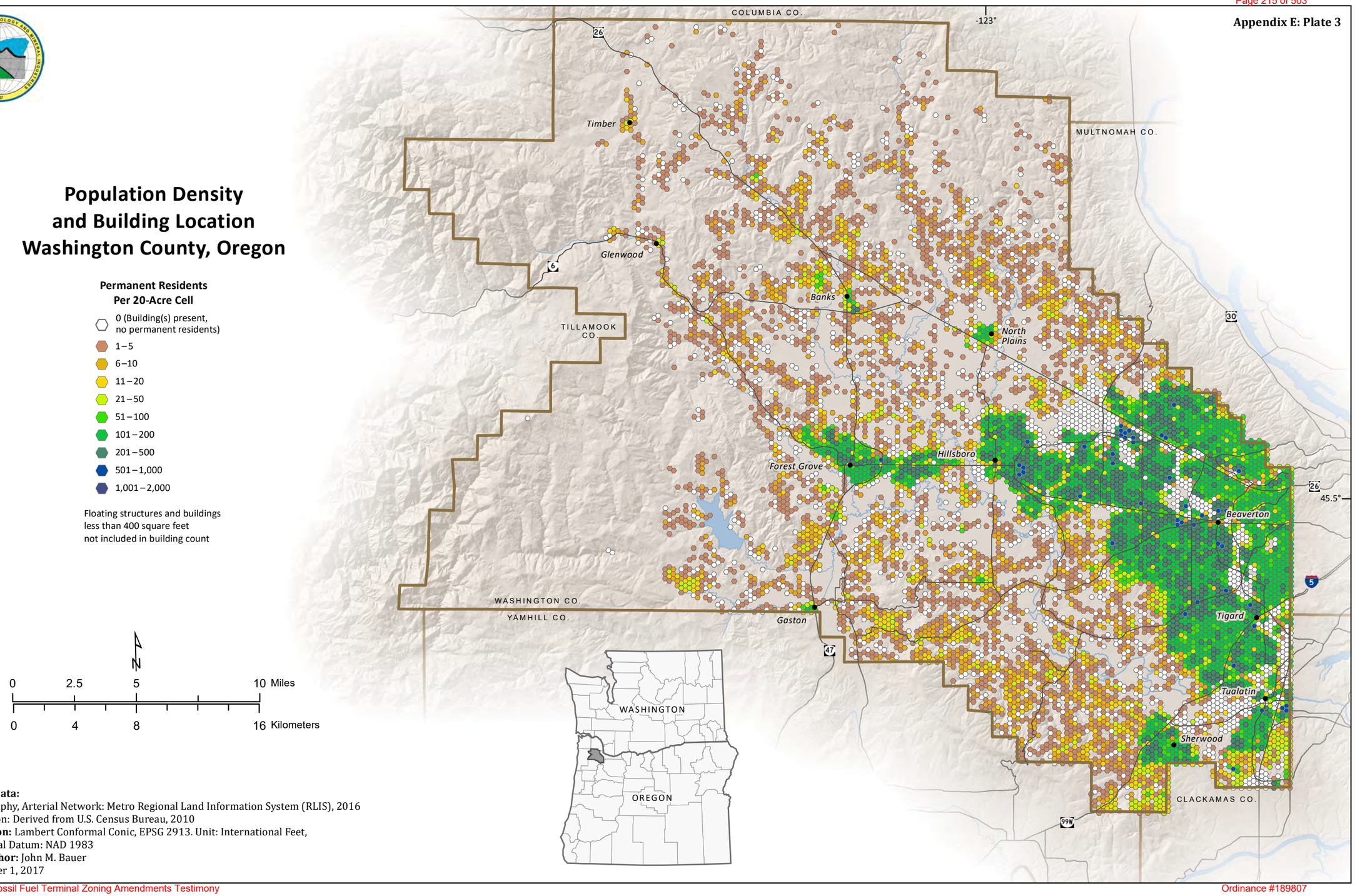
Population Density and Building Location
Multnomah County, Oregon



Source Data:
Hydrography, Arterial Network: Metro Regional Land Information System (RLIS), 2016
Population: Derived from U.S. Census Bureau, 2010
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet,
Horizontal Datum: NAD 1983
Map Author: John M. Bauer
September 1, 2017

Appendix E: Plate 3

Population Density and Building Location Washington County, Oregon



Source Data:
Hydrography, Arterial Network: Metro Regional Land Information System (RLIS), 2016
Population: Derived from U.S. Census Bureau, 2010
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
September 1, 2017

Appendix E: Plate 4

Site Peak Ground Acceleration
Simulated Cascadia Subduction Zone Magnitude 9.0 Earthquake

-123°

45.5°

Scappoose
COLUMBIA CO.
Timber
Glenwood
Burlington
Vancouver
Cascade Locks
Tualatin Mountains
Banks
North Plains
TILLAMOOK CO.
Camas
CLARK CO.
SKAMANIA CO.
Rockcreek
Cedar Mill
Maywood Park
Forest Grove
Cornelius
Hillsboro
Wood Village
Gresham
Aloha
Beaverton
Raleigh Hills
MULTNOMAH CO.
CLACKAMAS CO.
WASHINGTON CO.
Milwaukie
Happy Valley
Gaston
Tigard
Sunnyside
Boring
YAMHILL CO.
Lake Oswego
Oak Grove
Johnson City
King City
Sandy
Brightwood
Mount Hood Village
Tualatin
Gladstone
Sherwood
Oregon City
Rhododendron
Government Camp
Wilsonville
Estacada
HOOD RIVER CO.
WASCO CO.
Canby
MARION CO.
Barlow
Molalla
Ripplebrook
Scotts Mills

Site Peak Ground Acceleration (g)

- < 0.05
- 0.05 – 0.10
- 0.10 – 0.15
- 0.15 – 0.20
- 0.20 – 0.25
- 0.25 – 0.30
- 0.30 – 0.35
- 0.35 – 0.40
- 0.40 – 0.45



N

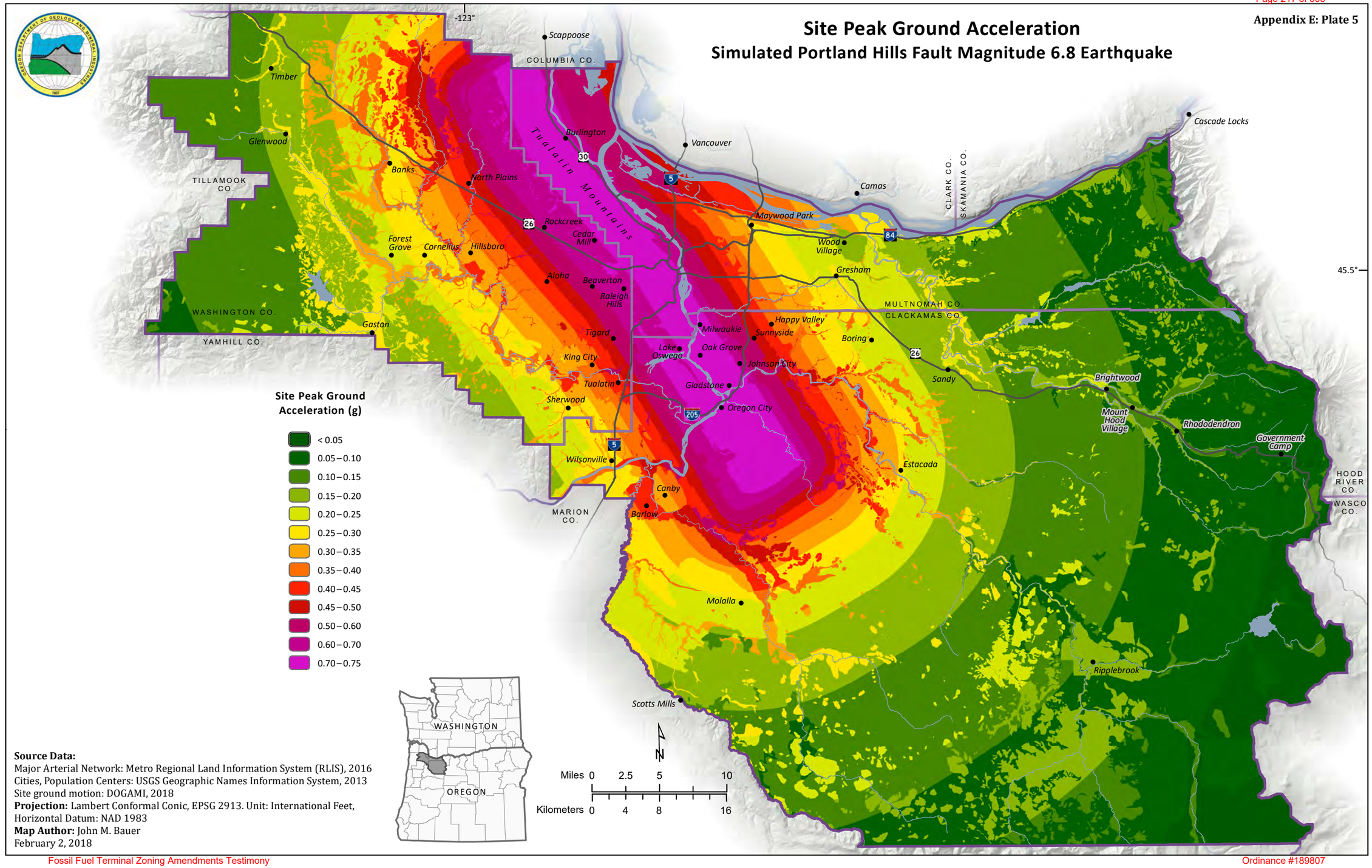
Miles 0 2.5 5 10

Kilometers 0 4 8 16

Source Data:
Major Arterial Network: Metro Regional Land Information System (RLIS), 2016
Cities, Population Centers: USGS Geographic Names Information System, 2013
Site ground motion: DOGAMI, 2018
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 2, 2018

Appendix E: Plate 5

Site Peak Ground Acceleration
Simulated Portland Hills Fault Magnitude 6.8 Earthquake

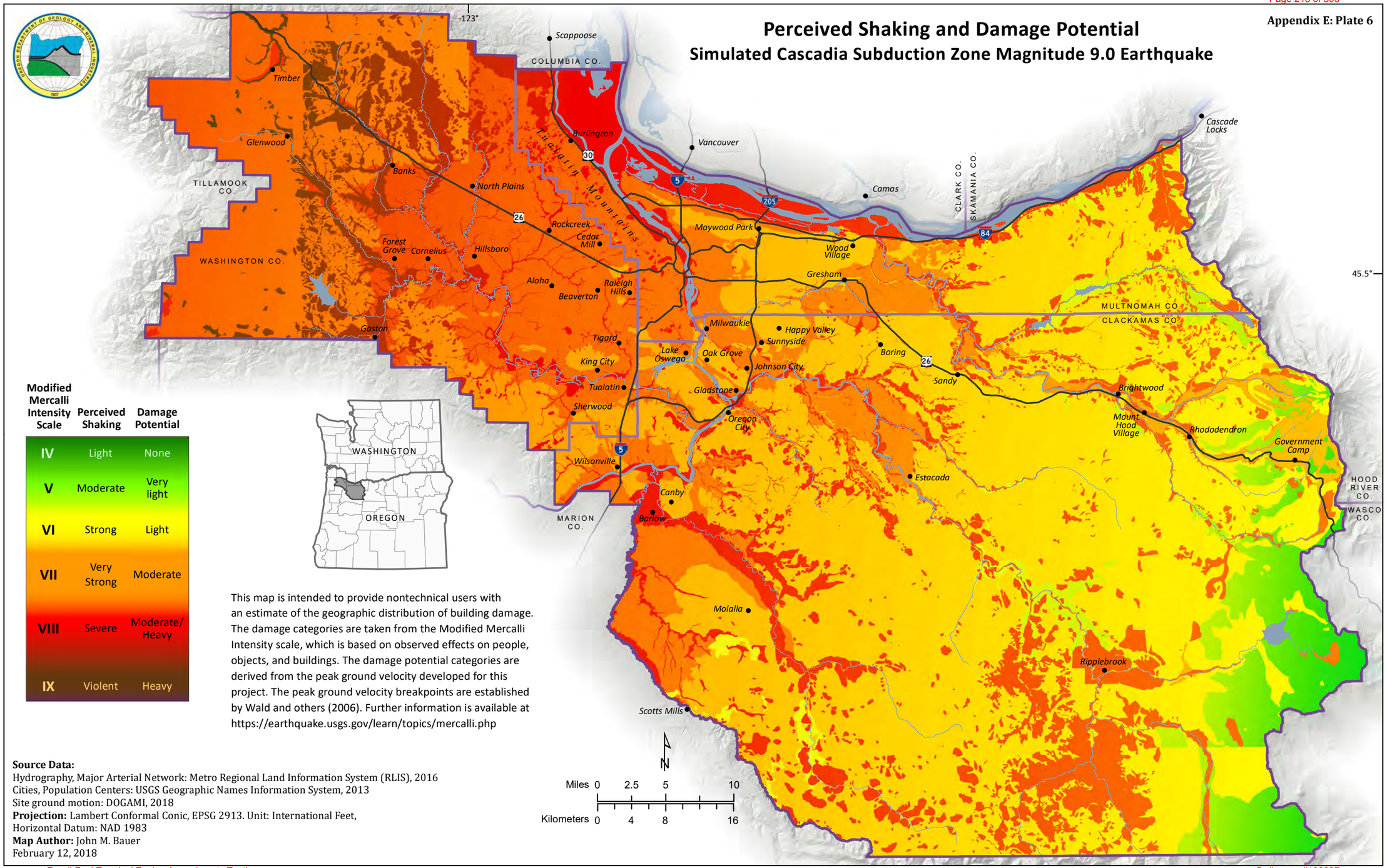


Source Data:
Major Arterial Network: Metro Regional Land Information System (RLIS), 2016
Cities, Population Centers: USGS Geographic Names Information System, 2013
Site ground motion: DOGAMI, 2018
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 2, 2018

Appendix E: Plate 6

Perceived Shaking and Damage Potential

Simulated Cascadia Subduction Zone Magnitude 9.0 Earthquake



Modified Mercalli Intensity Scale	Perceived Shaking	Damage Potential
IV	Light	None
V	Moderate	Very light
VI	Strong	Light
VII	Very Strong	Moderate
VIII	Severe	Moderate/ Heavy
IX	Violent	Heavy

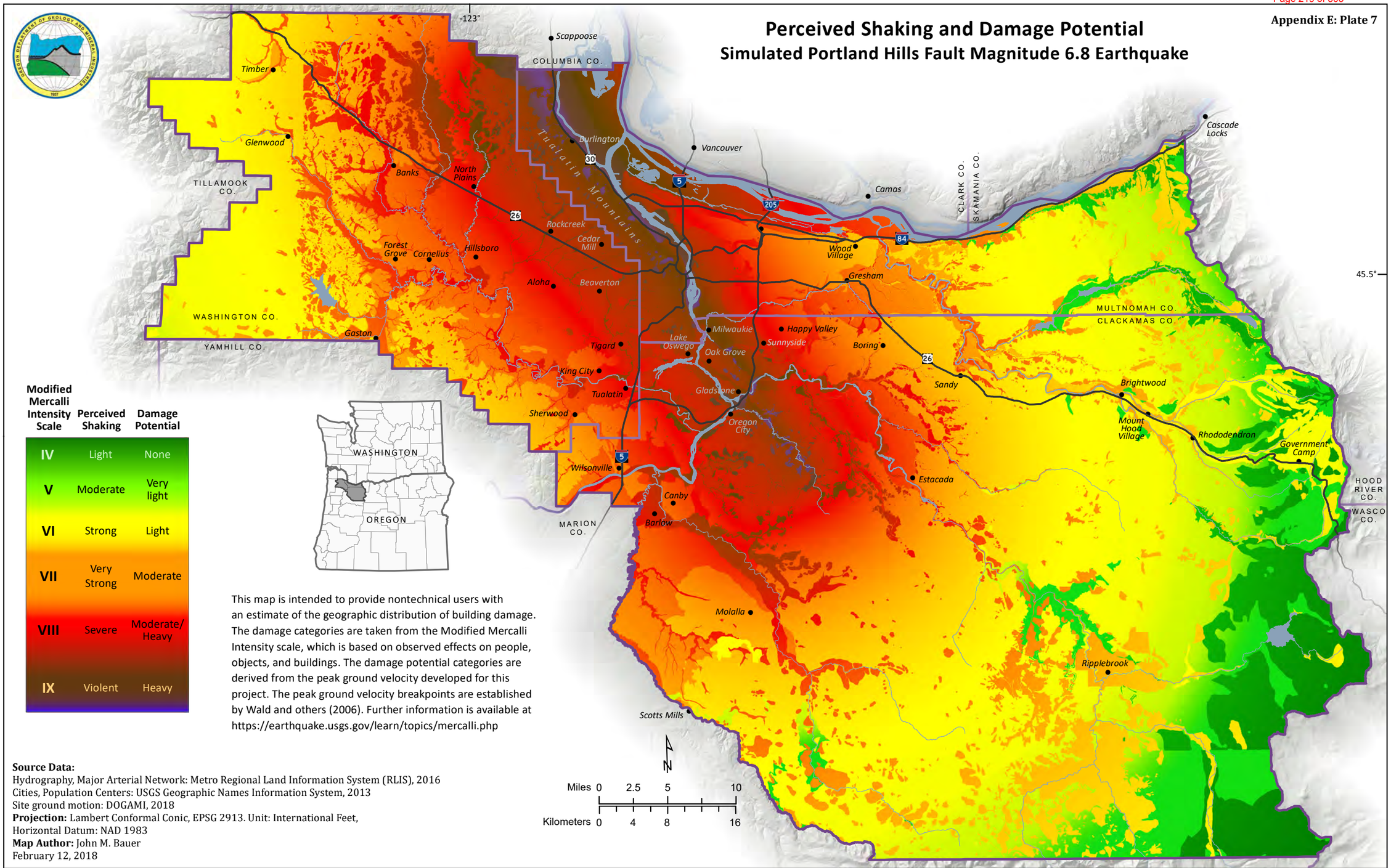
This map is intended to provide nontechnical users with an estimate of the geographic distribution of building damage. The damage categories are taken from the Modified Mercalli Intensity scale, which is based on observed effects on people, objects, and buildings. The damage potential categories are derived from the peak ground velocity developed for this project. The peak ground velocity breakpoints are established by Wald and others (2006). Further information is available at https://earthquake.usgs.gov/learn/topics/mercalli.php

Source Data:
Hydrography, Major Arterial Network: Metro Regional Land Information System (RLIS), 2016
Cities, Population Centers: USGS Geographic Names Information System, 2013
Site ground motion: DOGAMI, 2018
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet,
Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 12, 2018

Appendix E: Plate 7

Perceived Shaking and Damage Potential

Simulated Portland Hills Fault Magnitude 6.8 Earthquake



Modified Mercalli Intensity Scale	Perceived Shaking	Damage Potential
IV	Light	None
V	Moderate	Very light
VI	Strong	Light
VII	Very Strong	Moderate
VIII	Severe	Moderate/ Heavy
IX	Violent	Heavy

This map is intended to provide nontechnical users with an estimate of the geographic distribution of building damage. The damage categories are taken from the Modified Mercalli Intensity scale, which is based on observed effects on people, objects, and buildings. The damage potential categories are derived from the peak ground velocity developed for this project. The peak ground velocity breakpoints are established by Wald and others (2006). Further information is available at https://earthquake.usgs.gov/learn/topics/mercalli.php

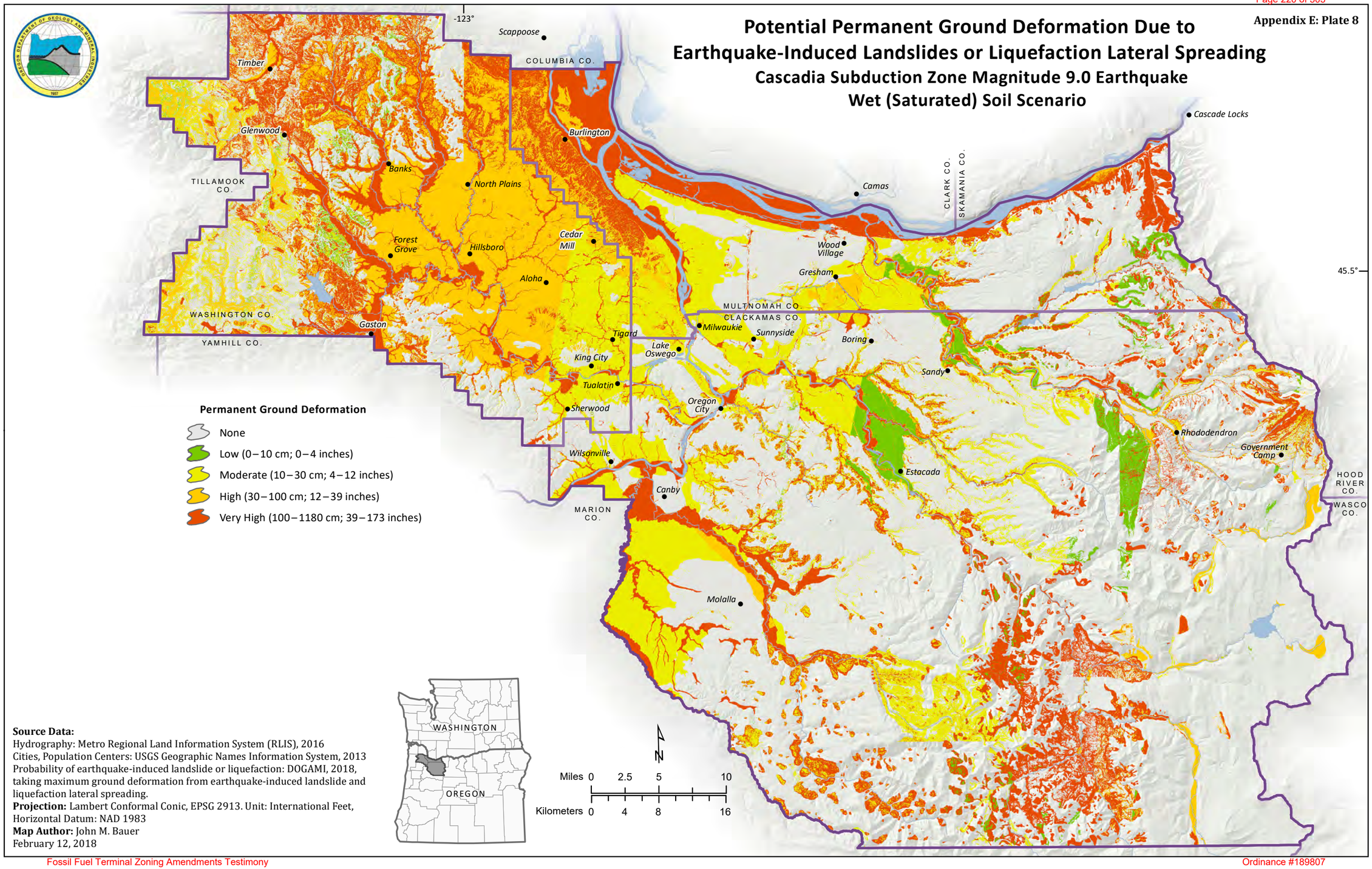
Source Data:
Hydrography, Major Arterial Network: Metro Regional Land Information System (RLIS), 2016
Cities, Population Centers: USGS Geographic Names Information System, 2013
Site ground motion: DOGAMI, 2018
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet,
Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 12, 2018

Appendix E: Plate 8

Potential Permanent Ground Deformation Due to Earthquake-Induced Landslides or Liquefaction Lateral Spreading

Cascadia Subduction Zone Magnitude 9.0 Earthquake

Wet (Saturated) Soil Scenario



Source Data:
Hydrography: Metro Regional Land Information System (RLIS), 2016
Cities, Population Centers: USGS Geographic Names Information System, 2013
Probability of earthquake-induced landslide or liquefaction: DOGAMI, 2018, taking maximum ground deformation from earthquake-induced landslide and liquefaction lateral spreading.
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 12, 2018

Appendix E: Plate 9

Probability of Earthquake-Induced Landslides or Liquefaction
Cascadia Subduction Zone Magnitude 9.0 Earthquake
Wet (Saturated) Soil Scenario

-123°

45.5°

Scappoose
COLUMBIA CO.
Timber
Glenwood
Burlington
Cascade Locks
Banks
TILLAMOOK CO.
North Plains
Camas
CLARK CO.
SKAMANIA CO.
Forest Grove
Hillsboro
Cedar Mill
Wood Village
Gresham
Aloha
MULTNOMAH CO.
CLACKAMAS CO.
WASHINGTON CO.
Gaston
YAMHILL CO.
Milwaukie
Sunnyside
Boring
Tigard
Lake Oswego
King City
Sandy
Tualatin
Oregon City
Sherwood
Rhododendron
Government Camp
Wilsonville
Estacada
HOOD RIVER CO.
WASCO CO.
Canby
MARION CO.
Molalla

Probability of Permanent Ground Deformation

- None
- Low (1%–5%)
- Moderate (6%–15%)
- High (16%–30%)



N

Miles 0 2.5 5 10

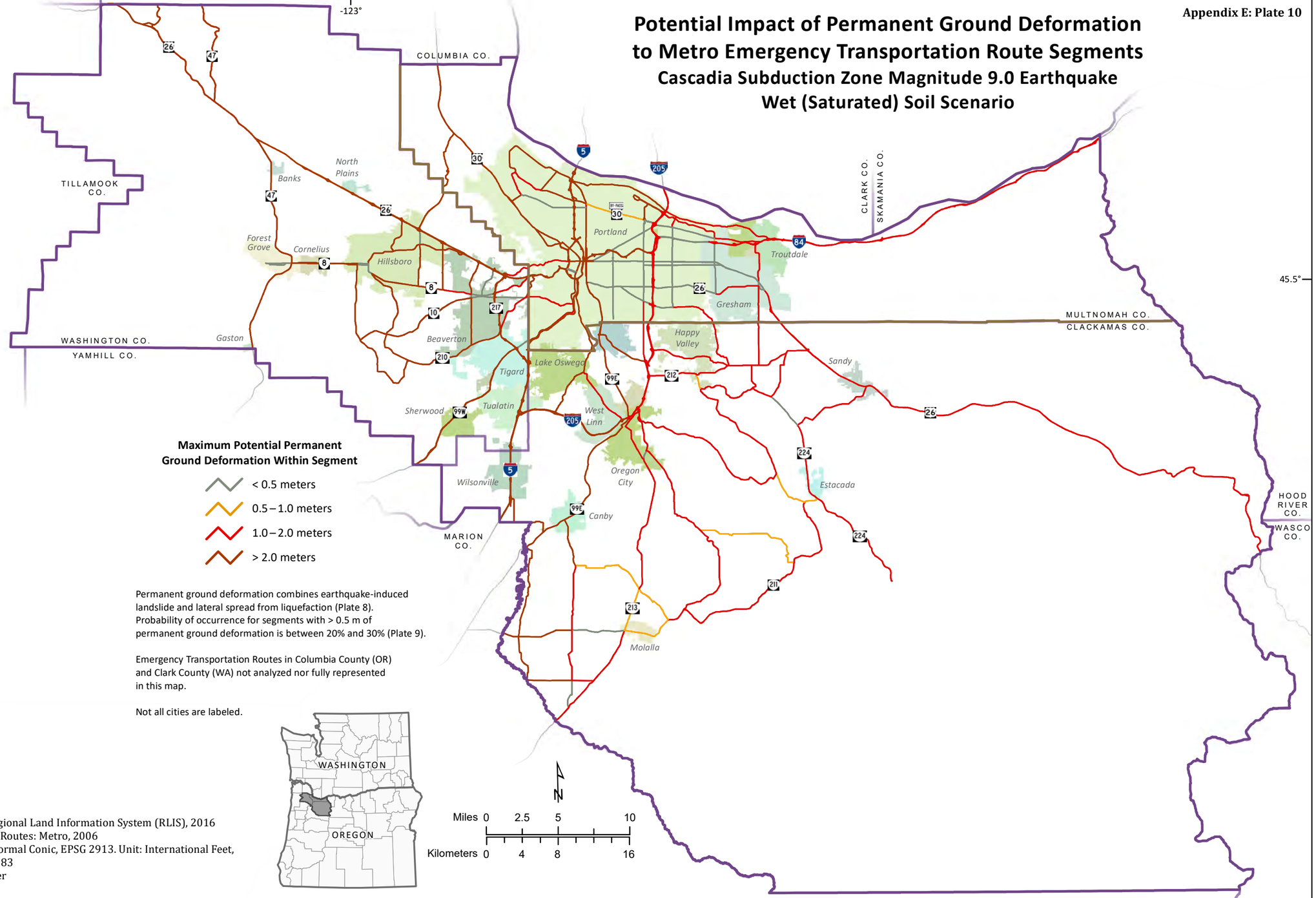
Kilometers 0 4 8 16

Source Data:
Hydrography: Metro Regional Land Information System (RLIS), 2016
Cities, Population Centers: USGS Geographic Names Information System, 2013
Probability of earthquake-induced landslide or liquefaction: DOGAMI, 2018, taking maximum probability from earthquake-induced landslide and liquefaction probabilities.
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 12, 2018

Appendix E: Plate 10

Potential Impact of Permanent Ground Deformation to Metro Emergency Transportation Route Segments

Cascadia Subduction Zone Magnitude 9.0 Earthquake
Wet (Saturated) Soil Scenario



Permanent ground deformation combines earthquake-induced landslide and lateral spread from liquefaction (Plate 8). Probability of occurrence for segments with > 0.5 m of permanent ground deformation is between 20% and 30% (Plate 9).

Emergency Transportation Routes in Columbia County (OR) and Clark County (WA) not analyzed nor fully represented in this map.

Not all cities are labeled.

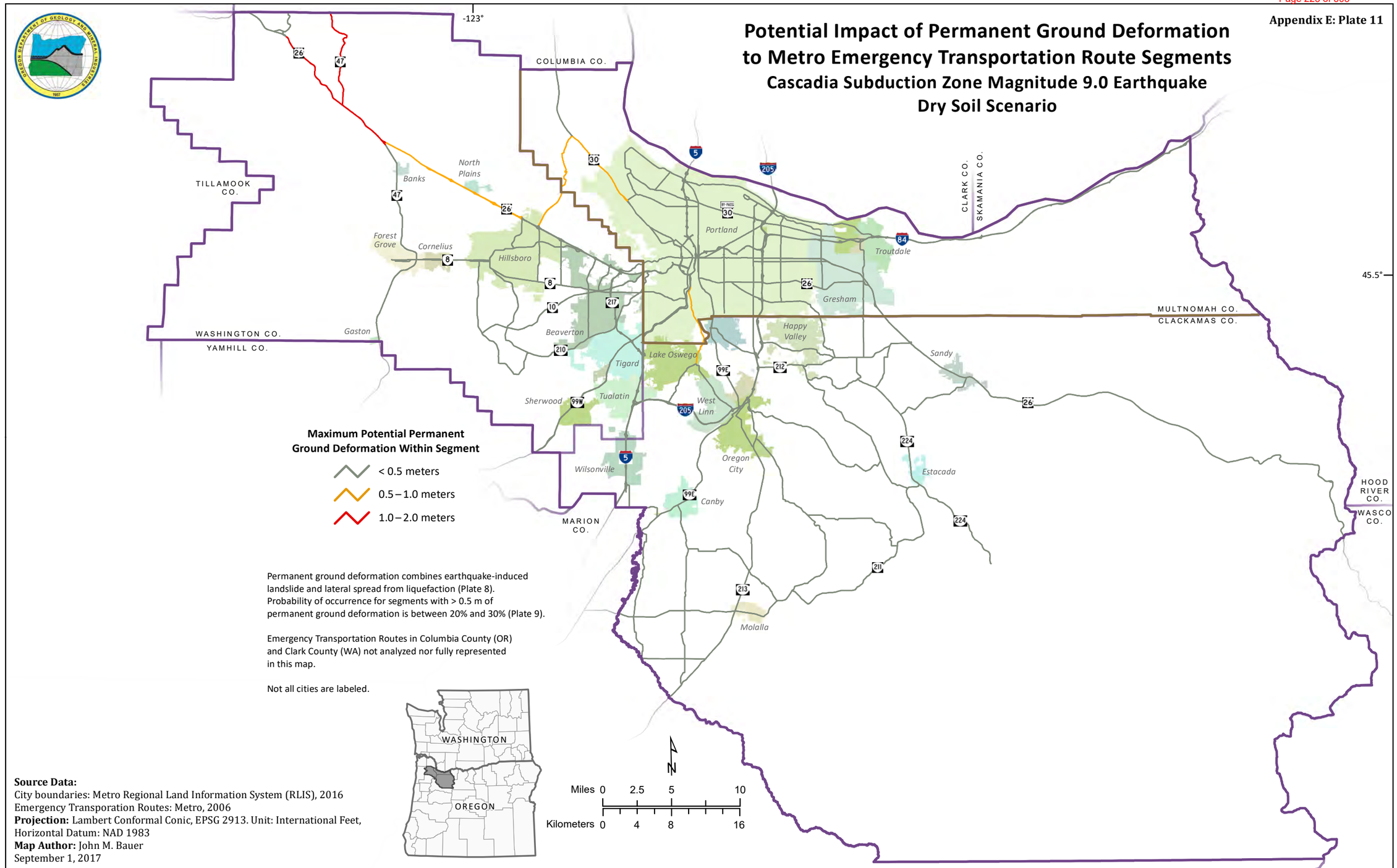
Source Data:
City boundaries: Metro Regional Land Information System (RLIS), 2016
Emergency Transporation Routes: Metro, 2006
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
September 1, 2017

Appendix E: Plate 11

Potential Impact of Permanent Ground Deformation to Metro Emergency Transportation Route Segments

Cascadia Subduction Zone Magnitude 9.0 Earthquake

Dry Soil Scenario



Permanent ground deformation combines earthquake-induced landslide and lateral spread from liquefaction (Plate 8). Probability of occurrence for segments with > 0.5 m of permanent ground deformation is between 20% and 30% (Plate 9).

Emergency Transportation Routes in Columbia County (OR) and Clark County (WA) not analyzed nor fully represented in this map.

Not all cities are labeled.

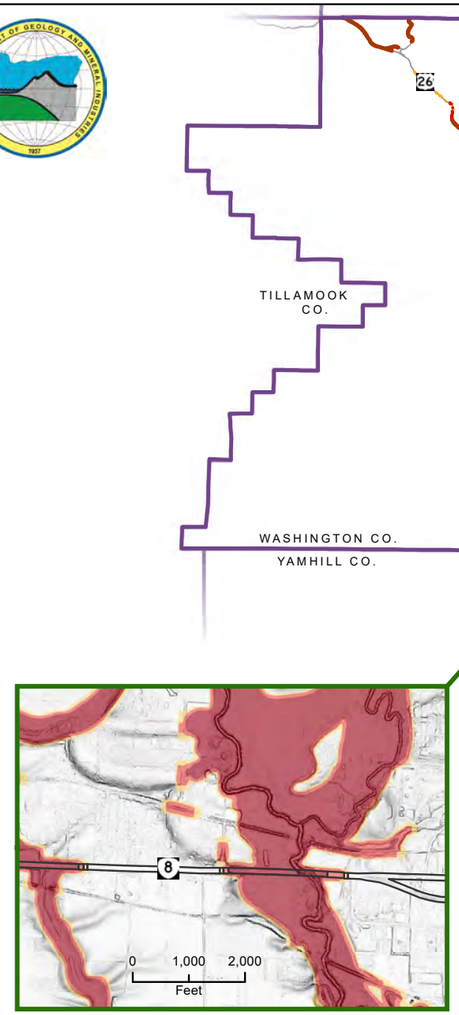
Source Data:
City boundaries: Metro Regional Land Information System (RLIS), 2016
Emergency Transporation Routes: Metro, 2006
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
September 1, 2017

Appendix E: Plate 12

Potential Impact of Permanent Ground Deformation to Metro Emergency Transportation Routes

Cascadia Subduction Zone Magnitude 9.0 Earthquake

Wet (Saturated) Soil Scenario



Closeup, Oregon Highway 8, showing potential permanent ground deformation (same color scale as main map)



Miles 0 2.5 5 10

Kilometers 0 4 8 16

Potential Permanent Ground Deformation

- < 0.5 meters
- 0.5 – 1.0 meters
- 1.0 – 2.0 meters
- > 2.0 meters

Permanent ground deformation takes the maximum of earthquake-induced landslide and lateral spread from liquefaction (Plate 8).

Probability of occurrence for road areas with > 0.5 m permanent ground deformation is between 20% and 30% (Plate 9).

Emergency Transportation Routes in Columbia County (OR) and Clark County (WA) not analyzed nor fully represented in this map.

Highway labels are placed on areas with minimal to no ground deformation (< 0.5 m).

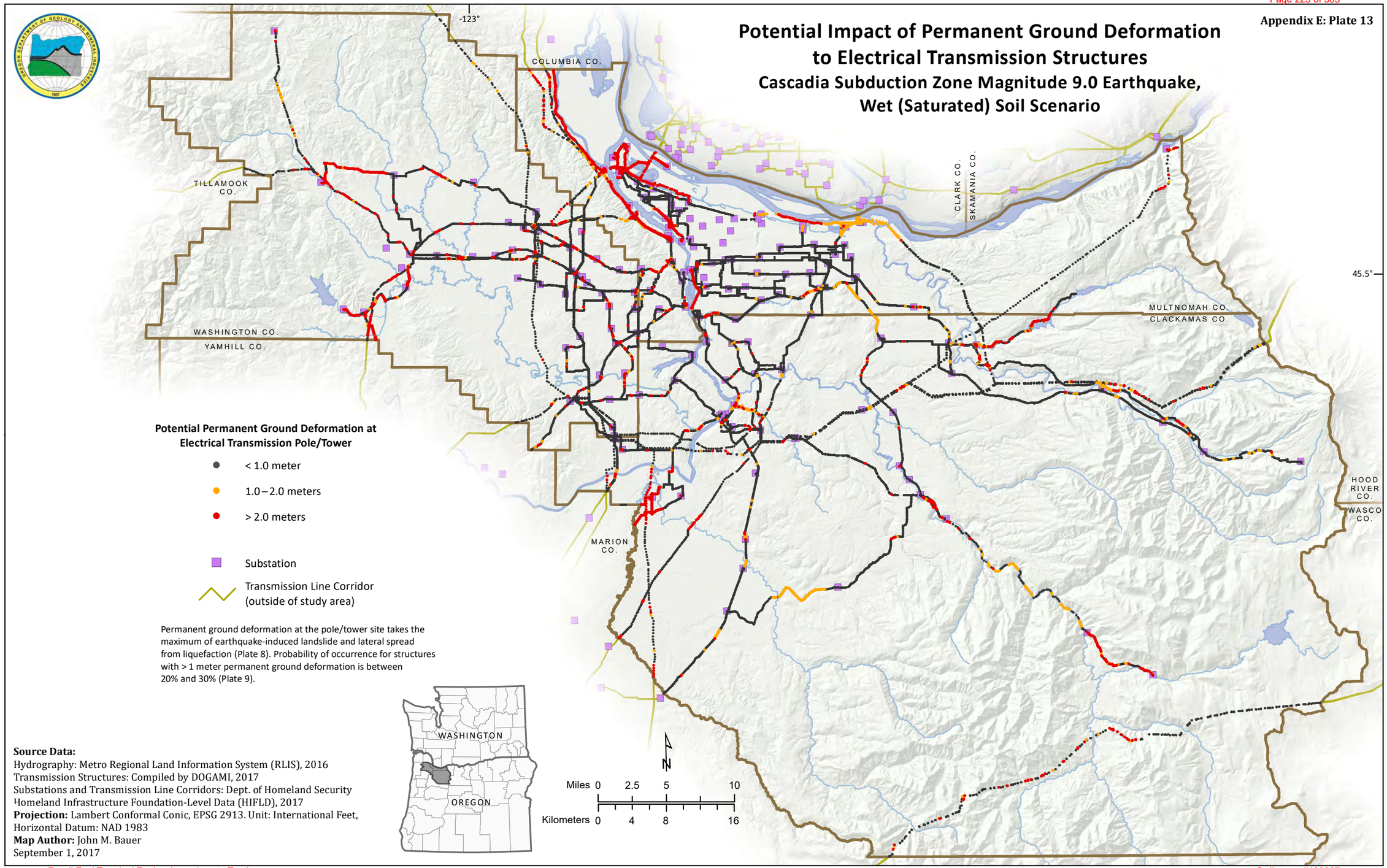
Not all cities are labeled.

Source Data:
Emergency Transporation Routes: Metro, 2006
Cities: Metro Regional Land Information System (RLIS), May 2017
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet.
Horizontal Datum: NAD 1983
Map Author: John M. Bauer
September 1, 2017

Appendix E: Plate 13

Potential Impact of Permanent Ground Deformation to Electrical Transmission Structures

Cascadia Subduction Zone Magnitude 9.0 Earthquake, Wet (Saturated) Soil Scenario



Source Data:
Hydrography: Metro Regional Land Information System (RLIS), 2016
Transmission Structures: Compiled by DOGAMI, 2017
Substations and Transmission Line Corridors: Dept. of Homeland Security Homeland Infrastructure Foundation-Level Data (HIFLD), 2017
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
September 1, 2017

Appendix E: Plate 14

MULTNOMAH CO.

CLACKAMAS CO.

WASHINGTON CO.

YAMHILL CO.

MARION CO.

HOOD RIVER CO.

WASCO CO.

Injuries Requiring Hositalization per Neighborhood Unit

- 0–1
- 2–5
- 6–10
- 11–20
- 21–50
- H Hospital

Hospitals outside of Clackamas County not shown.
"Injuries requiring hospitalization" combines Hazus casualty levels 2 and 3.

0 2.5 5 10 Miles

0 4 8 16 Kilometers

Injuries Requiring Hospitalization
Clackamas County, Oregon
Cascadia Subduction Zone Magnitude 9.0 Earthquake
Wet (Saturated) Soil Conditions, Daytime ("2 PM") Scenario



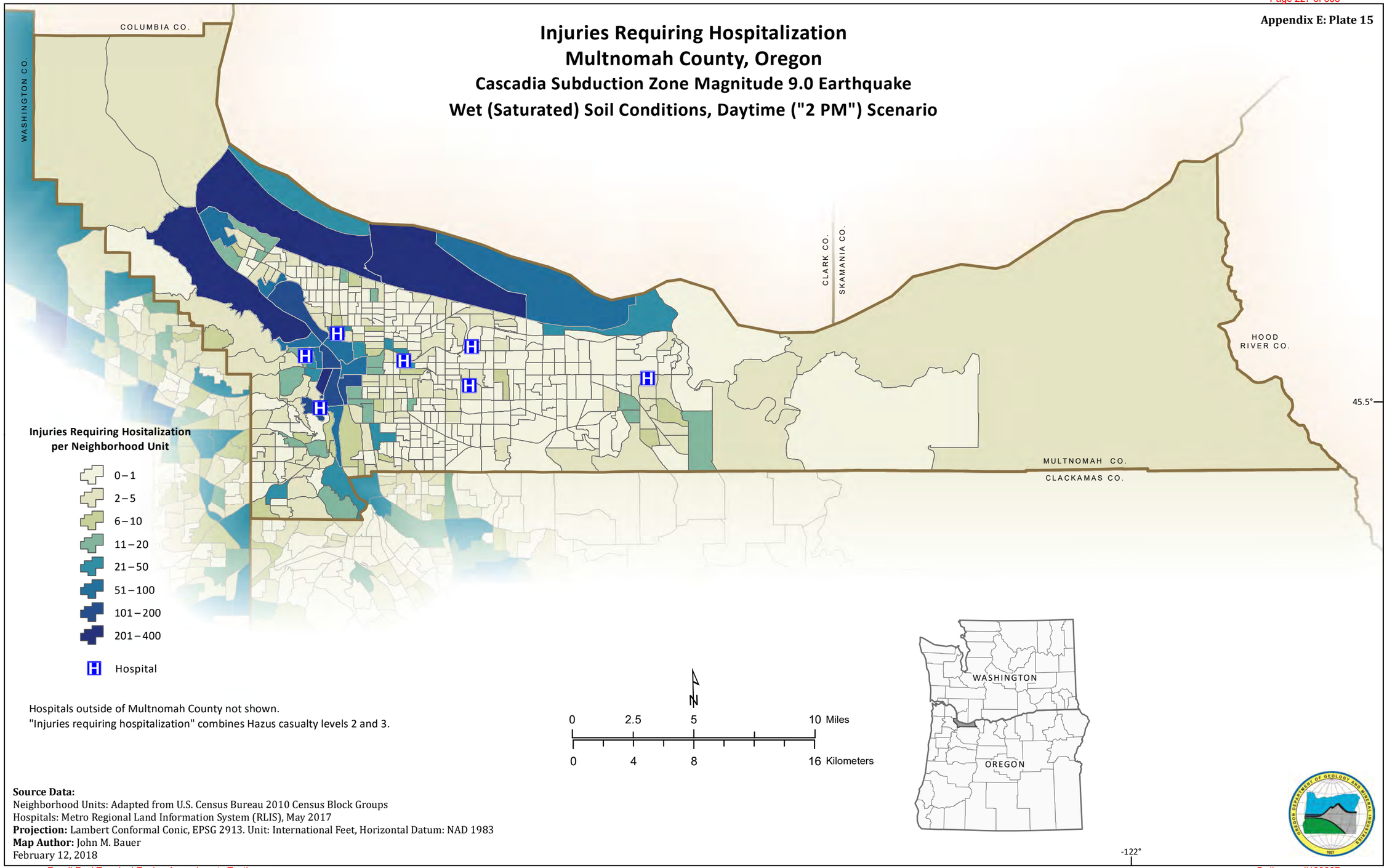
45°

-122°

Source Data:
Neighborhood Units: Adapted from U.S. Census Bureau 2010 Census Block Groups
Hospitals: Metro Regional Land Information System (RLIS), May 2017
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 12, 2018

Appendix E: Plate 15

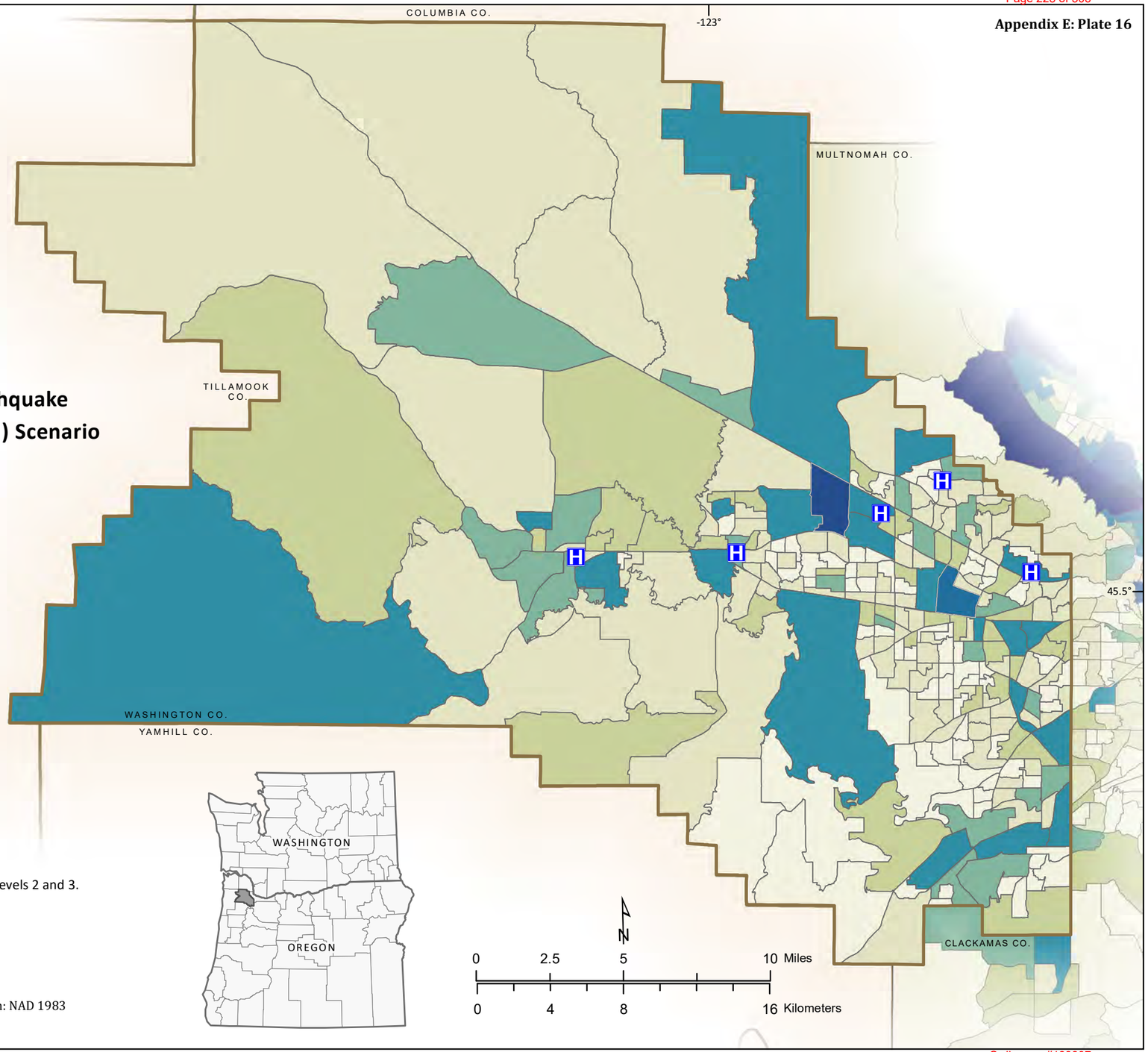
Injuries Requiring Hospitalization
Multnomah County, Oregon
Cascadia Subduction Zone Magnitude 9.0 Earthquake
Wet (Saturated) Soil Conditions, Daytime ("2 PM") Scenario



Source Data:
Neighborhood Units: Adapted from U.S. Census Bureau 2010 Census Block Groups
Hospitals: Metro Regional Land Information System (RLIS), May 2017
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 12, 2018

Appendix E: Plate 16

Injuries Requiring Hospitalization
Washington County, Oregon
Cascadia Subduction Zone Magnitude 9.0 Earthquake
Wet (Saturated) Soil Conditions, Daytime ("2 PM") Scenario



Injuries Requiring Hositalization per Neighborhood Unit

- 0 – 1
- 2 – 5
- 6 – 10
- 11 – 20
- 21 – 50
- 51 – 100
- 101 – 200
- H Hospital

Hospitals outside of Washington County not shown.
"Injuries requiring hospitalization" combines Hazus casualty levels 2 and 3.

Source Data:
Neighborhood Units: Adapted from U.S. Census Bureau 2010 Census Block Groups
Hospitals: Metro Regional Land Information System (RLIS), May 2017
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 12, 2018

Daniel Serres

#62558 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Please see the attached comments of Columbia Riverkeeper, Center for Sustainable Economy, Oregon Physicians for Social Responsibility, Portland Audubon Society, 350PDX, Friends of the Columbia Gorge, Willamette Riverkeeper, Climate Action Coalition, Northwest Environmental Defense Center, Oregon Conservancy Foundation, and Human Access Project.

Testimony is presented without formatting.

November 20, 2019

Portland City Council
1221 SW Fourth Avenue
Portland, Oregon 97204

Submitted via Map App portal

RE: Testimony in Support of Re-Adopting Fossil Fuel Terminal Zoning Amendments

Dear Mayor Wheeler and Portland City Council Commissioners,

Thank you for the opportunity to offer our comments on the proposed re-adoption of the City of Portland's Fossil Fuel Terminal Zoning Amendments ("amendments"). These comments are submitted on behalf of Columbia Riverkeeper, Center for Sustainable Economy, Oregon Physicians for Social Responsibility, Portland Audubon Society, 350PDX, Friends of the Columbia Gorge, Willamette Riverkeeper, Climate Action Coalition, Northwest Environmental Defense Center, Oregon Conservancy Foundation, and Human Access Project. We appreciate and support the City's commitment to address the issues identified by the Land Use Board of Appeals and re-adopt the amendments as they were originally adopted in December 2016, with the minor adjustments as proposed in the Remand Report. We offer the following comments as general support for the proposed amendments and to provide additional evidence that we believe is relevant to the Council's decision.

I. Re-adopting the Amendments is Consistent with Council Resolutions and the City's Commitments.

The City Council has adopted several policies aimed at reducing the risks associated with bulk fossil fuel infrastructure and climate change impacts associated with fossil fuel consumption. The amendments further these policies by designating bulk fossil fuel terminals as a limited use in the city. In November 2015, Council adopted Resolution 37168, where it resolved to "actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways[.]" The amendments directly advance the resolution by prohibiting new bulk fossil fuel terminals and limiting the expansion of existing terminals within the city.

With respect to specific fossil fuel developments, in adopting Resolutions 36959 and 36962 in 2012, Council expressed opposition to coal trains travelling through Portland until a programmatic, comprehensive environmental impact statement and health impact assessment are completed. Similarly, in November 2015, Council adopted its Oil Train Policy through Resolution 37164, which called for the City to oppose any project that would increase oil train traffic through Portland. The amendments are an important first step in advancing these policies by prohibiting new or expanded bulk fossil fuel storage and transloading within the city in order to address existing health and safety risks associated with these facilities.

Portland's 2015 Climate Action Plan sets a goal to reduce local carbon emissions by 80 percent from 1990 levels by 2050. In June 2017, Council adopted Resolution 37289, which established a goal to transition to 100% renewable energy community-wide by 2050. The amendments are consistent with these policies because they restrict new bulk fossil fuel developments and provide flexibility for existing terminals to reconfigure and transition storage capacity to non-fossil fuels to meet shifting energy demands.

Additionally, the amendments are consistent with and support each of the five Guiding Principles of the 2035 Comprehensive Plan. Specifically, the amendments support economic prosperity and a low-carbon economy by prioritizing growth in non-fossil and renewable fuels over additional fossil fuel development on Portland's limited available industrial land. The amendments support human and environmental health by seeking to avoid and minimize the potentially catastrophic health, safety, and environmental risks associated with the existing bulk fossil fuels infrastructure. Finally, the amendments support equity and resilience by halting continued development that concentrates risk in communities disproportionately impacted by fossil fuel infrastructure and in areas that have significant seismic vulnerabilities.

II. The Amendments are Necessary to Address Serious Health and Safety Risks Associated with Existing Fossil Fuel Terminals.

Portland is at risk of a catastrophic earthquake from the Cascadia Subduction Zone, which has a 15–20 percent chance of rupture in the next 50 years and could be similar in impact to the Magnitude 9 earthquake that hit Japan in 2011. Additionally, the Portland Hills fault line, which runs underneath downtown Portland, is considered an active crustal fault line and could have significant impacts on the Portland Metropolitan Region.[1]

All of Portland's existing bulk fossil fuel terminals are located within the Critical Energy Infrastructure ("CEI") Hub. The Portland Bureau of Emergency Management's ("PBEM") 2019 CEI Hub study found that the majority of the facilities in the CEI Hub are constructed to no or low seismic standards and are mostly located on soft liquefiable soils that are typically associated with increased seismic vulnerability. Specifically, the study states, "the permanent ground deformations due to liquefaction and lateral spreading is expected to be very high at all fuel storage tank locations."[2]

Bulk fossil fuel terminals pose serious health and safety risks from explosions and fire as a result of seismic vulnerabilities. The CEI Hub Study evaluated impacts to fossil fuel storage tanks from various earthquakes in recent history. In each instance, tanks of similar design and age to those in the CEI Hub experienced tank buckling and cracking, roof collapse, uplift, and damage to connecting piping causing leakage, spills, and fire. The CEI Hub facilities are located in close proximity to residential neighborhoods, important transportation corridors, and the

[1] Oregon Department of Geology and Mineral Industries, *Earthquake Regional Impact Analysis for Clackamas, Multnomah, and Washington Counties, Oregon*, p.5 (2018).
[2] Portland Bureau of Emergency Management, *Liquid Storage Tanks at the Critical Energy Infrastructure (CEI) Hub, Seismic Assessment of Tank Inventory*, p.12 (May 2019) ("CEI Hub Study").

Willamette River, which provides important habitat, economic, recreational, subsistence, and aesthetic values to residents of Portland and surrounding communities.

A recent example of the potential risks of fossil fuel storage tanks in the CEI Hub is the October 2019 explosion at the NuStar Energy fuel storage facility in Crockett, CA after a 4.5 magnitude earthquake struck near the facility.[3] The tanks erupted in flames for several hours and an explosion blew the roof off one of the storage tanks. Thousands of local residents were forced to stay in their homes to avoid dangerous air pollution, the nearby interstate I-80 was closed for several hours,[4] and it is estimated that thousands of barrels of industrial chemicals were released from the tanks.[5] According to local officials who investigated the incident, the tanks were only at 1% of their storage capacity, indicating that the impacts could have been much worse had the tanks been filled.[6]



Tanks at NuStar Energy facility in Crockett, CA are consumed with flames. Photo: Contra Costa County

In addition to risks with storage tanks, bulk fossil fuel terminals also involve high-risk transport of volatile liquids through communities. Oil trains associated with bulk fossil fuel storage have an estimated risk of derailment as high as one in every 30 months. In 2016, an oil train derailed in the Columbia River Gorge in Mosier, spilling 1,000-barrels of oil and affecting local drinking water facilities. In August 2018, a train carrying tar sands crude oil derailed in Doon, Iowa and released 230,000 gallons of tar sands crude into a local river.[7] Earlier this year, a Union Pacific train carrying liquified petroleum gas (LPG) derailed in Portland and struck a support beam for the Going Street overpass bridge, causing a main access point to Swan Island to close.[8] Thankfully, none of the tank cars leaked, which likely would have caused significantly

[3] https://ktla.com/2019/10/16/officials-investigating-if-earthquake-triggered-explosion-fire-at-bay-area-fuel-storage-facility/
[4] https://www.sfgate.com/traffic/article/refinery-fire-traffic-80-closure-carquinez-bridge-14536712.php
[5] https://www.sfchronicle.com/bayarea/article/Report-Thousands-of-barrels-of-industrial-14840520.php#photo-18482683
[6] https://www.sfchronicle.com/bayarea/article/Investigators-at-scene-of-explosion-at-NuStar-14538415.php
[7] https://www.desmoinesregister.com/story/news/2018/08/10/iowa-train-derailment-spilled-oil-tied-flooding-bnsf-railroad-says/956800002/
[8] https://www.oregonlive.com/news/2019/09/train-with-liquefied-gas-derails-strikes-overpass-support-beam-in-portland.html

more damage to the bridge and surrounding area and prolonged disruption of access to the Swan Island industrial area.

Without the amendments, Portland's zoning code would allow for new bulk fossil fuel terminals to be located within the high-risk liquefaction areas without any restrictions on size or format and would allow for the unlimited expansion of the existing terminals. The City's 2035 Comprehensive Plan recognizes the importance of limiting the potential catastrophic risks to health, safety and the environment associated with bulk fossil fuel terminals (Goal 4.B) and of ensuring long-term resilience of development to withstand natural disasters (Goal 4.D). The amendments are consistent with these goals.

On October 16, 2019, Council adopted an amendment to the City's budget to allocate $50,000 of funding to partner with Multnomah County and Portland State University to study and mitigate the risks of fossil fuel infrastructure in the CEI Hub. During the City Council meeting to adopt the amended budget, Mayor Wheeler stated that this study is a "foundational piece to the city strategy to transition to a clean, secure, and safe energy future." The amendments are the necessary first step to confronting the serious risks posed by Portland's existing bulk fossil fuel infrastructure. The City must first ensure that these risks are not made worse through continued and unlimited development of fossil fuel infrastructure, then it must turn to developing and implementing policy to reduce those risks and improve safety and resilience in the CEI Hub.

III. The Amendments are Consistent with Local and State Efforts to Transition Away from Fossil Fuels.

Greenhouse gas emissions from burning fossil fuels are a major contributor to climate change and pollution. As climate change accelerates, Portland will experience greater incidence of drought, high temperatures and increased risk of wildfire, damaging floods and landslides. The amendments are an important action towards encouraging and facilitating local and state efforts to transition away from reliance on fossil fuels towards renewable and non-fossil fuel alternatives by restricting unlimited growth of fossil fuel storage while providing flexibility for growth in storage of non-fossil fuels.

As discussed above, the City has committed to significantly reduce its greenhouse gas emissions below 1990 levels and to transition to 100% renewable energy by 2050. Multnomah County is a partner in the City's Climate Action Plan and has also committed to numerous actions to reduce carbon emissions by 2020. The State of Oregon has a goal to reduce climate emissions levels 75% below 1990 levels by 2050.

As of 2017, per-capita carbon emissions in Portland had reduced 38% below 1990 levels, despite increases in population and job growth. Total carbon emissions in Multnomah County are down 15% from 1990 levels due to growth in renewable energy sources, investments in transit and bike infrastructure, dense and walkable neighborhoods, renewable transportation fuels and other measures. Continued efforts toward meeting local, statewide and regional goals to transition away from fossil fuels will result in further declines in carbon emissions and in the demand for fossil fuels.

The City has adopted multiple other policies aimed at reducing fossil fuel consumption, increasing reliance on renewable energy and reducing greenhouse gas emission. In Resolution 37255, the City adopted the 2017 Portland Electric Vehicle Strategy to shift from gasoline and diesel to lower-carbon transportation fuels with the specific goal of replacing at least 10,000 fossil fuel-powered vehicles in Multnomah County by 2020.[9] In December 2018, the City adopted rules to incentivize property owners and developers to design highly energy efficient buildings in planned development.[10] In May 2018, Portland voters passed Measure 26-101, which created the Portland Clean Energy Community Benefits Fund (PCEF).[11] The measure imposes a 1% surcharge on certain retail sales in Portland in order to fund clean energy projects, clean energy jobs training, and other programs to reduce greenhouse gas emissions. The City is expected to begin issuing funding awards for these projects in July 2020.

There are also statewide efforts to reduce fossil fuel consumption and the corresponding greenhouse gas emissions. Oregon's electric grid is moving toward becoming one of the cleanest in the country. In signing SB 1547, Governor Brown doubled Oregon's renewable portfolio standard to 50% by 2040. The Oregon Clean Fuels Program requires a 10 percent reduction in average carbon intensity from 2015 levels by 2025.[12] Oregon's 2020 Clean Fuels Forecast predicts a less than 0.5% increase in conventional gasoline and a 2.5% reduction in fossil diesel consumption as compared to 2018 levels.[13] Meanwhile, consumption of electricity for on-road plug-in hybrid and battery electric vehicles is projected to increase 25% over 2018 levels.[14] In Executive Order 17-21, Governor Brown set a target to reach 50,000 electric vehicles in Oregon by 2020–more than double the number of actively registered EVs in 2018.[15]

Several recent studies evaluate various pathways to decarbonization in Oregon and the Pacific Northwest. One report prepared for Portland General Electric, projects that even under the reference case with a continuation of current and planned policy, end-use demand for liquid transportation fuels, such as gasoline and diesel, will decrease by 2050.[16] With additional changes in policy to move towards greater electrification of the energy system, demand for fossil fuels would sharply decline.[17] Another report projects that under the most flexible path to decarbonization, fossil fuels in liquid and gaseous fuel supply mix for diesel and jet fuel will be entirely replaced by biofuels by 2050.[18]

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[9] ENN-5.06 – Portland 2017 Electric Vehicle Strategy, https://www.portlandoregon.gov/citycode/article/634694
[10] BPS Administrative Rule, Energy Efficient Building Requirements for Planned Development Bonuses, Dec. 14, 2018. https://www.portlandoregon.gov/citycode/article/707278
[11] *See* PCC Chapter 7.07; https://beta.portland.gov/cleanenergy/about-portland-clean-energy-community-benefits-fund
[12] *See* OAR Ch. 340, Div. 253.
[13] https://www.oregon.gov/das/OEA/Documents/Clean%20Fuels%20Forecast%202020.pdf, Table 1.
[14] *Id.*
[15] https://www.oregon.gov/gov/policy/Documents/Governor%20Kate%20Brown%20Climate%20Agenda.pdf, p.19.
[16] Evolved Energy Research, *Exploring Pathways to Deep Decarbonization for the Portland General Electric Service Territory*, p.31–32. (April 24, 2018).
[17] *Id.*
[18] Clean Energy Transition Institute, *Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest*, p.33 (June 2019).

The amendments are narrowly tailored to focus on one aspect of fossil fuel infrastructure developments–bulk storage. The amendments do not regulate fossil fuel transport or the docks, pipelines, or rail infrastructure used for fossil fuel transport in or through Portland. The amendments leave flexibility for growth in non-fossil and renewable fuels storage and distribution in order to meet local and regional commitments to transition away from fossil fuels.

IV. Council Should Commit to Future Action to Address Fossil Fuel Infrastructure Risks and Foster a Clean, Safe Energy Economy and Stable Climate.

As noted above, the amendments are an important first step to addressing the serious health, safety, and climate change risks associated with the existing bulk fossil fuel terminals in Portland. We strongly support the Council's action to re-adopt the amendments as drafted and move towards full implementation as soon as possible. Nonetheless, the amendments are far from a complete solution to the risks facing our city and we strongly encourage the Council and City staff to continue to develop and adopt policies and regulations to fully address these risks.

PBEM's 2019 CEI Hub Study recommends that the City develop seismic performance criteria for storage tanks at the CEI Hub.[19] Thus, as directed by Council when it first adopted these amendments, the City should move forward on its commitment to identify policy and regulatory options to require seismic updates of storage tanks in the CEI Hub with a firm deadline for replacement of older, unsafe tanks.

Additionally, we fully support Council's decision to participate in the PSU CEI Hub risk assessment and we encourage the City to analyze and develop a mechanism that places the financial burden of the health and safety risks associated with existing fossil fuel infrastructure on the owners of those facilities. A catastrophic event at the CEI Hub could cause billions of dollars in damage to infrastructure, the Willamette River, and the surrounding Portland community. The owners of the fossil fuel terminals—rather than Portland residents—should bear the burden of the expense for emergency response and clean up from such a disaster.

Finally, while the amendments provide the necessary mechanism to stop continued expansion of bulk fossil fuel storage within the city, it is only a partial solution to the ongoing risks facing our community. As we have witnessed with the Zenith Energy facility over the past few years, existing facilities have the capability to shift their operations and add new infrastructure to intensify fossil fuel transport and storage. Beginning in 2014, the Zenith facility (formerly owned by Arc Logistics) quietly transitioned from an asphalt batch plant into a crude oil storage and transport terminal.[20] Earlier this year, Zenith completed construction on three new rail platforms that nearly quadrupled the facility's capacity for unloading tanks cars carrying tar sands crude oil.[21] With this expansion, Zenith is capable of receiving multiple mile-long oil trains per week—trains which must travel through the Columbia Gorge and Portland neighborhoods to reach the facility in the CEI Hub.

[19] CEI Hub Study, p.18.
[20] https://www.opb.org/news/article/crude-oil-terminal-planned-in-nw-portland/
[21] https://www.opb.org/news/article/more-oil-trains-willamette-columbia-portland/

The amendments do not prohibit this type of expansion or change in operations at existing bulk fossil fuel terminals. Thus, we encourage Council to take further steps to implement Resolution 37168 to oppose the "expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." Specifically, Council should consider regulations on fossil fuel off-loading and transloading facilities and restrictions on the storage of particular fossil fuels such as dangerous tar sands crude oil. With these additional actions, the City can continue its work towards improving safety of Portland neighborhoods while supporting the managed decline of fossil fuel use throughout the region.

We look forward to the Council's vote to readopt the Fossil Fuel Terminal Zoning Amendments as written and to put this important policy into effect. We also look forward to working with the City to continue to develop proactive policies to address the health, safety, and environmental risks associated with fossil fuel infrastructure.

Sincerely,

Dan Serres
Conservation Director
Columbia Riverkeeper

Damon Motz-Storey
Healthy Climate Program Director
Oregon Physicians for Social Responsibility

Nick Caleb
Staff Attorney – Climate Justice Program
Center for Sustainable Economy

Also submitted on behalf of: Portland Audubon Society, 350PDX, Friends of the Columbia Gorge, Willamette Riverkeeper, Climate Action Coalition, Northwest Environmental Defense Center, Oregon Conservancy Foundation, Human Access Project

Daniel Serres

#62557 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Please see the attached exhibit to the comments of Columbia Riverkeeper, Center for Sustainable Economy, Oregon Physicians for Social Responsibility, Portland Audubon Society, 350PDX, Friends of the Columbia Gorge, Willamette Riverkeeper, Climate Action Coalition, Northwest Environmental Defense Center, Oregon Conservancy Foundation, and Human Access Project.

Testimony is presented without formatting.

Oregon Climate Agenda:

A Strong, Innovative, Inclusive Economy While Achieving State Climate Emissions Goals

Kate Brown, Governor
Kristen Sheeran, Ph.D., Director, Carbon Policy Office and Governor's Climate and Energy Policy Advisor

November 28, 2018

STATE OF OREGON
Office of the Governor
KATE BROWN

Vision

Oregon has a strong, innovative, and inclusive economy that achieves the state's climate emissions goals through a complementary set of policies, including a least-cost, market-based greenhouse gas emissions pricing program.

Executive Summary

Climate change threatens our communities, our economy, our ecosystems, and our way of life in Oregon. We see the effects of climate change in record temperatures, declining snowpack, reduced summer streamflow, water scarcity, increased wildfires, and elevated public health risks. Climate change impacts every Oregonian, but our rural communities, our low-income communities, communities of color, and Tribes are especially vulnerable. Climate change also poses serious risks for many of Oregon's natural resource-based industries. Meeting the challenge of climate change and growing our economy are not mutually exclusive goals: we must do both.

Oregon has long been a national and world leader in demonstrating the Oregon Way: policies that preserve our natural environment while also supporting long-term economic competitiveness and business growth. The world is at a crossroads on climate policy, and Oregon must continue to pursue solutions that reduce emissions while creating good jobs and building a clean energy economy. The Governor's strategies for achieving her vision are:

1. Implement a well-designed market-based program to achieve our state climate emissions reduction goals at the least possible cost, while protecting our manufacturing sector and mitigating impacts and providing opportunities for low-income and rural communities, communities of color, and Tribes.

2. Hasten the pace of electrification of vehicles in Oregon by expanding electric vehicle infrastructure and incentives to support 50,000 electric vehicles on Oregon roads by 2020.

3. Decarbonize the electricity sector by achieving the state's renewable energy targets and encouraging grid modernization, while maintaining affordable and competitive electricity rates.

4. Expand opportunities for residential, municipal, and commercial customers to access clean energy services from their utilities while ensuring utility regulation supports the utility system and does not preference new customers over existing ones.

5. Maintain and strengthen strong energy efficiency investments in residential, commercial, industrial and agricultural sectors, expand the reach of energy efficiency programs to ensure all communities benefit, and improve the energy efficiency of state building codes.

6. Support world-leading industrial efficiency initiatives by Oregon's large industrial utility customers.

7. Pursue climate solutions that benefit rural communities and Tribes, support working lands, and foster resilience to climate change.

8. Create the new Oregon Climate Authority to better align state programs and expertise to achieve the state's climate policy goals.

The Governor's strategies will create new clean energy jobs across Oregon over the next five years and put Oregon on a trajectory to achieve the state's greenhouse gas reduction goals.

Background

Science

There is no doubt that the Earth's climate is warming, and Oregon is also experiencing that trend. The last three decades have been the warmest decades on record, and the five warmest years in the global record have all occurred since 2010.[1] Oregon's summers have become hotter and drier with record numbers of 90+ degree days. The Oregon Climate Change Research Institute projects average temperatures in Oregon will climb an additional 3-7 degrees Fahrenheit by mid-century under current emissions trends, or 2-5 degrees Fahrenheit if emissions level off.[2] The scientific consensus attributes the observed warming trend to increased greenhouse gas concentrations in the atmosphere from human activities, especially the combustion of fossil fuels.[3] In Oregon, transportation is the largest single source of greenhouse gas emissions, followed by electricity and natural gas.[4]

While some impacts of warming are now inevitable, every degree of additional warming we can avoid increases the livability of the planet for future generations. The international community's goal, reflected in commitments made by nearly every country in the 2015 Paris Climate Agreement[5], is to prevent the world from warming by more than 2 degrees Celsius (3.6 degrees Fahrenheit). This is the critical threshold beyond which the most serious consequences of climate change may become unavoidable.[6] Though the U.S. pulled out of the Paris Agreement[7], Oregon and 15 other states and Puerto Rico have committed to meeting their respective shares of global emissions reduction through the U.S. Climate Alliance. Together, Alliance jurisdictions represent 40% of the U.S. population and a $9 trillion economy – larger than every economy in the world except for the U.S. and China.[8]

1. National Oceanic and Atmospheric Association, Global Climate Report-Annual 2017, 2018. https://www.ncdc.noaa.gov/sotc/global/201713

2. Oregon Climate Change Research Institute, Third Oregon Climate Assessment Report, 2017. http://www.occri.net/publications-and-reports/third-oregon-climate-assessment-report-2017/

3. Intergovernmental Panel on Climate Change, Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 2013. http://www.climatechange2013.org/report/full-report/

4. Oregon Global Warming Commission, Biennial Report to the Legislature 2017. https://www.keeporegoncool.org/reports

5. United Nations Framework Convention on Climate Change, Paris Agreement, 2015. https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

6. Intergovernmental Panel on Climate Change, Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 2013. http://www.ipcc.ch/report/ar5/wg1/

> "Average temperatures in Oregon will climb an additional 3-7 degrees by mid-century under current emissions trends"

Oregon-Specific Impacts

Climate change threatens our communities, our economy, our ecosystems, and our way of life in Oregon. We see the effects of climate change in declining snowpack, reduced summer streamflow, and water scarcity.[9] We're witnessing larger and more damaging wildfires, insect outbreaks, heat waves, floods, acidic oceans[10], and algal blooms. Rising sea levels place homes and coastal infrastructure at risk[11], while changing ocean conditions compromise the health of fisheries and marine ecosystems.[12]

Climate change is already exacting significant costs on Oregon's economy. Our tourism and natural resource-based industries, including thousands of Oregon farmers, fishermen, and shellfish growers, are already experiencing significant negative effects.[13] The state spent $100 million this year fighting wildfires, a figure which does not include the value of lost timber, infrastructure, or economic activity.[14] The closure of trails due to wildfire, cancellation of outdoor events due to heat and smoke, diminished skiing and rafting due to lack of snowfall and summer streamflow, and fishing and shellfish closures threaten Oregon's $11.8 billion tourism industry.[15]

The impacts of climate change, while experienced by nearly every

7. Originally signed by 200 counties, there were only three countries in 2017 who had not signed the Paris Agreement: Nicaragua, Syria, and the United States. Syria and Nicaragua have since signed.

8. U.S. Climate Alliance, https://www.usclimatealliance.org/

9. Oregon Climate Change Research Institute, Third Oregon Climate Assessment Report, 2017. http://www.occri.net/publications-and-reports/third-oregon-climate-assessment-report-2017

10. Oregon Sea Grant, The U.S. West Coast Shellfish Industry's Perception of and Response to Ocean Acidification, 2016. https://seagrant.oregonstate.edu/sgpubs/us-west-coast-shellfish-industrys-perception-and-response-ocean-acidification

Oregonian, pose even greater risks to vulnerable populations: rural communities, low-income communities, communities of color, and Tribes.[16] These populations may rely heavily on climate-impacted industries and natural resources, may be the least able to afford required adaptations, have fewer resources to plan for and recover from extreme weather events, and often suffer disproportionately from exposure to other pollutants.[17] Communities of color and low-income households already bear a disproportionate burden of disease and may experience cumulative health effects as climate-related disruptions increase in frequency. Climate disruptions may affect resources and habitats important to the cultural, community, medicinal, and economic health of Tribes.[18]

Particulate levels from wildfires may increase 160 percent in our region by mid-century, exacerbating risks to those with asthma, heart and lung disease.[19] When air quality deteriorates from smoke, it is children, the elderly, and those with pre-existing conditions who suffer first and most. The good news is that actions to reduce greenhouse gas emissions can produce other public health co-benefits, including improved air and water quality. The conversion to electric vehicles or biofuels, for example, can reduce exposure to diesel pollution, a known carcinogen and respiratory health risk.

Oregon's Leadership and Legacy

Reducing greenhouse gas emissions, creating climate-resilient communities and growing our economy are not mutually exclusive goals. We have a strong legacy of environmental stewardship in Oregon, and this history has shown us that well-designed programs can deliver public health and environmental benefits while facilitating a strong economy. Oregon has already taken important steps to reduce climate emissions and build a clean energy economy. Some of the foundational legislation addressing climate change in Oregon includes:

- Land use: Oregon's nationally renowned land use planning program (SB100) laid the groundwork for mitigation and adaptation in

11. Oregon Parks and Recreation Department, Climate Change Response: Preparedness and Action Plan, 2010. https://www.oregon.gov/oprd/PLANS/docs/coastal_plans/oprdclimatechangeplan_forcommission_forweb.pdf

12. Oregon Climate Change Research Institute, Third Oregon Climate Assessment Report, 2017. http://www.occri.net/publications-and-reports/third-oregon-climate-assessment-report-2017

13. Oregon Climate Change Research Institute, Third Oregon Climate Assessment Report, 2017. http://www.occri.net/publications-and-reports/third-oregon-climate-assessment-report-2017

14. Oregon Department of Forestry cited statistic, 2018.

15. Travel Oregon, http://industry.traveloregon.com/

16. Oregon Climate and Health Profile Report. 2014. https://www.oregon.gov/oha/ph/HealthyEnvironments/climatechange/Documents/oregon-climate-and-health-profile-report.pdf

17. Oregon Health Authority, Climate and Health Profile Report, 2014. https://www.oregon.gov/oha/ph/HealthyEnvironments/climatechange/Documents/oregon-climate-and-health-profile-report.pdf

Oregon for 45 years by creating dense, livable communities and protecting farms, forests, and natural areas from development.

- Energy Efficiency: The Northwest Power Act (1980) established energy efficiency as a cost-effective priority for the region, establishing Oregon's legacy as an energy efficiency leader nationwide. SB 1149 (1999) required Oregon's largest utilities to consistently invest in energy efficiency, using utility revenues collected through a public purpose charge.

- Renewable Energy: Oregon was one of the early states to adopt a renewable portfolio standard in 2007 (SB 838), when only two percent of Oregon's electricity came from renewable energy.

- CO2 Standard: In 1997, HB 3283 became the first U.S. law to specifically reduce levels of CO2 by requiring new power plants in Oregon to either reduce or offset some of their carbon dioxide emissions.

In 2007, HB 3543 established the Oregon Climate Change Research Institute (OCCRI) to advance regional understanding of climate change science, impacts, adaptation, and mitigation. HB 3543 also set specific, science-based climate emissions reduction goals for Oregon:

- Arrest the growth of emissions by 2010 (achieved)
- Achieve climate emissions levels that are 10 percent below 1990 levels by 2020 (not on track)
- Achieve climate emissions levels that are at least 75 percent below 1990 levels by 2050 (not on track)

Oregon Department of Environmental Quality produces an annual inventory of human-caused greenhouse gas emissions produced by economic sectors within Oregon. The inventory also includes emissions associated

18. Oregon Climate Change Research Institute, Third Oregon Climate Assessment Report, 2017. http://www.occri.net/publications-and-reports/third-oregon-climate-assessment-report-2017

19. Liu et al, 2016. "Particulate air pollution from wildfires in the Western US under climate change". Climatic Change 138(3–4): 655–666. DOI: 10.1007/s10584-016-1762-6

20. Oregon Department of Environmental Quality, Oregon Greenhouse Gas Sector Based Inventory. https://www.oregon.gov/deq/aq/programs/Pages/GHG-Inventory.aspx

> "The impacts of climate change, while experienced by nearly every Oregonian, pose even greater risks to vulnerable populations: rural communities, low-income communities, communities of color, and Tribes"

with electricity imports that serve Oregon utility customers.[20] The Oregon Global Warming Commission uses this emissions inventory to track progress towards the state's emissions goals.[21] In its latest biennial report to the Legislature in 2017, the Oregon Global Warming Commission concluded that, despite Oregon's successes, current programs and policies are not sufficient and additional measures are needed to achieve the state's statutory emissions goals.[22]

Clean Energy Progress

Oregon has long been recognized as a national and global leader in energy efficiency. Energy efficiency reduces energy use, lowers utility system costs, saves customers' money on their utility bills, and avoids greenhouse gas emissions. Weatherization and energy efficiency improvements can also increase comfort, livability, improve public health, and lower health care expenditures, especially for low-income and rural communities. Energy efficiency is the lowest-cost energy resource available to Oregon utilities; for example, for every $1 the Energy Trust invests in energy efficiency, customers across Oregon save nearly $3.[23] Since 2002, the Energy Trust of Oregon has delivered $7.6 billion in savings on customer utility bills, while avoiding 22.8 million tons of carbon emissions. [24] Public utilities across Oregon

21. According to DEQ data, total emissions in Oregon in 2016 were 62 million metric tons of carbon dioxide equivalent. To achieve our 2050 goal, emissions need to fall to 14 million metric tons.

22. Oregon Global Warming Commission, Biennial Report to the Legislature 2017, https://www.keeporegoncool.org/reports

23. Energy Trust of Oregon, Annual Report 2017. https://www.energytrust.org/annualreport2017/

also administer their own energy efficiency programs, which contribute additional monetary savings and avoided carbon emissions.

Oregon's electrical grid is progressing toward becoming one of the cleanest in the country. A natural abundance of clean, zero-emissions hydropower provides about forty-percent of our state's electricity needs.[25] In 2010, Portland General Electric became the first utility in the country to commit to closing a modern baseload coal plant when it agreed to shut Oregon's only in-state coal plant in Boardman twenty years ahead of schedule in 2020.[26] When Governor Brown signed SB 1547, she committed Portland General Electric and PacifiCorp, our state's largest utilities, to eliminating all imported coal from Oregon electricity rates by date-certain, while doubling the amount of renewable energy required to serve Oregon customers to fifty-percent by 2040.

Recent changes in technology and the marketplace have placed a clean electricity system firmly within reach. The costs of wind and solar power have fallen dramatically over the last decade; for example, utility-scale solar costs have fallen more than seventy-percent since 2010. Onshore wind, solar, hydropower, and bioenergy-for-power are very cost-competitive, and in many markets, beating the generation costs for fossil-based electricity.[27] At the same time, the emerging energy storage technologies needed to balance intermittent resources – batteries and smart grid advancements – are rapidly improving in efficiency and price.[28] Our region also shows strong potential for hydroelectric "pumped" energy storage project. Utilities are increasingly using techniques such as demand response and direct load control to shift energy use from peak times in order to reduce the amount of needed generation. The growth and expansion of organized regional electricity markets will further lower costs and risks to customers while enabling greater integration of a diversity of energy resources. There are also opportunities to further decarbonize the natural gas grid through the addition of renewable natural gas.[29]

24. Energy Trust of Oregon, Annual Report 2017. https://www.energytrust.org/annualreport2017/

25. Oregon Department of Energy, Electricity Mix in Oregon. https://www.oregon.gov/energy/energy-oregon/Pages/Electricity-Mix-in-Oregon.aspx

26. Feldman, Stacy, "Early Closure of Oregon's Only Coal-Fired Power Plant Has National Implications", 2010. https://insideclimatenews.org/news/20100118/early-closure-oregons-only-coal-fired-power-plant-has-national-implications

27. International Renewable Energy Agency, Renewable Power Generation Costs, 2018. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2018/Jan/IRENA_2017_Power_Costs_2018.pdf

28. International Renewable Energy Agency, Renewable Power Generation Costs, 2018. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2018/Jan/IRENA_2017_Power_Costs_2018.pdf

29. The recently released Oregon Department of Energy study required under SB 334 (2017) shows substantial technical potential for the development of renewable natural gas (RNG) in Oregon and recommends natural gas utilities be permitted to purchase RNG on behalf of their customers. https://www.oregon.gov/energy/Data-and-Reports/Documents/2018-RNG-Inventory-Report.pdf

Economic Opportunity for Oregon

Oregon's emissions reduction goals reflect the state's share of global reduction efforts. But they are also an important signpost of the readiness of Oregon's economy and industries to compete in a climate-changed future. At the World Economic Forum in 2018, global business leaders identified climate change as this century's biggest business opportunity.[30] Led by China, global annual investment in clean energy exceeded $335 billion last year.[31] If positioned on the right side of this growing technological divide, Oregon can benefit from the investment fueling this global transformation. The world's economies are rapidly transitioning away from fossil fuels. Seventy jurisdictions worldwide have carbon pricing programs implemented or scheduled, representing twenty-percent of global greenhouse gas emissions. This list includes eleven U.S. states, Canada, Mexico, China, and Europe. The total value of the carbon priced under these initiatives exceeds $81 billion.[32]

The jurisdictions leading on climate change are building long-term competitiveness, creating good jobs, and improving access to affordable energy, while creating public health and environmental benefits. The clean energy sector worldwide now employs more than ten million people.[33] Nationally, the fastest growing occupations are in solar and wind power.[34] There are now more people employed in the U.S. in solar than in oil, coal, and gas combined.[35] The Pacific Coast jurisdictions of British Columbia, Washington, Oregon, and California – a region representing the world's fifth largest economy – witnessed regional economic growth of thirty-two percent since 2008, while emissions fell by six percent, demonstrating that it is possible to decouple economic growth from emissions growth. Clean economy jobs in these jurisdictions grew more than twice as fast as regional job growth overall.[36]

30. Reuters, "At Davos, Bosses Paint Climate Change as an Opportunity", 2018. https://www.reuters.com/article/us-davos-meeting-climatechange/at-davos-bosses-paint-climate-change-as-an-opportunity-idUSKBN1FE2LK

31. Bloomberg NEF, "Runaway 53GW Solar Boom in China Pushed Global Clean Energy Investment Ahead in 2017", 2018. https://about.bnef.com/blog/runaway-53gw-solar-boom-in-china-pushed-global-clean-energy-investment-ahead-in-2017/

32. World Bank, Carbon Pricing Dashboard. https://carbonpricingdashboard.worldbank.org/

33. Forbes, "Clean Energy Sector Employs More than 10 Million for the First Time", 2018. https://www.forbes.com/sites/mikescott/2018/05/08/clean-energy-sector-employs-more-than-10-million-for-the-first-time/#8a1662cb500d

34. U.S. Bureau of Labor Statistics, Fastest Growing Occupations, 2016. https://www.bls.gov/emp/tables/fastest-growing-occupations.htm

35. U.S. Department of Energy, U.S. Energy and Employment Report 2017, 2018. https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report_0.pdf

36. Pacific Coast Collaborative, 2018. https://pacificcoastcollaborative.org/wp-content/uploads/2018/08/PCC_ReportCard_Sept2018-email.pdf

Recent Accomplishments

In the past three years under Governor Brown's leadership, Oregon has become a leader in the U.S. and globally on reducing climate pollution and building a clean economy:

Coal to Clean Energy in SB1547 (2016)

- SB 1547 removes coal from Oregon electricity rates, effectively divesting Oregon from out-of-state coal plants.
- SB 1547 doubled Oregon's Renewable Portfolio Standard to 50%.
- SB 1547 reaffirms Oregon's commitment to pursuing all cost-effective energy efficiency and demand response.
- SB 1547 authorized community solar programs and utility investments in electric vehicle charging infrastructure.

Transit, Clean Fuels and EV Rebates in HB2017 (2017)

- The Clean Fuels Program will lower the carbon intensity of transportation fuels by 10% over 10 years. Last year alone, the program reduced emissions by nearly 1 million tons.[37]
- HB 2017 helps modernize our transportation infrastructure, including new investments in public transit, pedestrian and bike lanes.
- A new Zero Emissions Vehicles Rebate Program will accelerate the adoption of electric cars, including specific incentives for low and moderate income households.

Executive Orders: EVs and Building Efficiency

- The Governor's Executive Order on Electric Vehicles established a goal of 50,000 zero-emissions vehicles in Oregon by 2020 (18,000 today).
- The Governor's Executive Order on Efficiency calls for new state-owned buildings to be carbon neutral in 2022; all new buildings to be solar ready by 2022; and new residential buildings to "zero energy ready" starting in 2023.

37. https://www.oregon.gov/deq/aq/programs/Pages/Clean-Fuels-Data.aspx

> "Oregon can no longer wait for federal action to address carbon emissions. States must act to protect their communities and grow their economies"

These efforts are contributing to a thriving clean energy jobs economy in Oregon. There are 50,000 people employed in energy efficiency, clean fuels and clean power generation in Oregon.[38] More than 130 wind and solar companies call Oregon home. Governor Brown is committed to growing the low-carbon economy and achieving our state emissions goals through smart policies and initiatives, including a least-cost, market-based greenhouse gas emissions pricing program that aligns economic incentives in favor of clean energy solutions. Oregon can no longer wait for federal action to address carbon emissions. States and local jurisdictions must act to protect their communities and grow their economies.

Why Oregon? Why Now?

The international scientific consensus on the human causes of climate change is clear. But climate change is a global phenomenon, leading some to question the value of state action to address a global problem of this scale. While it is true that Oregon contributes only a small portion of global greenhouse gas emissions, so too does any single jurisdiction. This is why governments worldwide are pulling together to provide leadership. As discussed above, the world is rapidly transitioning away from fossil fuels and every country in the world except for the United States has signed on to the Paris Agreement to keep the increase in global temperature to below 2 degrees Celsius.

38. U.S. Energy and Employment Report, May 2018. www.usenergyjobs.org

Governor Brown believes that state and local actions to address climate change are justified on both ethical and economic grounds. As the Governor says: "Future generations will judge us not by the fact of climate change, but by how we respond to it." Oregon has a responsibility to address its share of global emissions and the economic evidence strongly suggests our economy will be better for it. Two different economic analyses commissioned by the Legislature, each examining a different approach to carbon pricing in Oregon[39], both found negligible to positive impacts on Oregon's economy under reasonable scenarios.[40] These studies correspond to findings in the economics literature broadly, which demonstrate that well designed carbon pricing programs will not adversely impact the economy.[41]

39. Macroeconomic Impacts and Design Considerations for Carbon Markets: A Literature Review, Environmental & Energy Economics, 2017. https://www.oregon.gov/deq/FilterDocs/App2LitReview.pdf

40. Economic or Emissions Impacts of a Clean Air Tax or Fee in Oregon (SB306), Northwest Economic Research Center, Portland State University, College of Urban and Public Affairs, 2014. http://www.pdx.edu/nerc/sites/www.pdx.edu.nerc/files/carbontax2014.pdf

41. Climate Change Economics. Special Issue on EMF 32 Study on U.S. Carbon Tax Scenarios; Guest Editors: A. A. Fawcett, J. McFarland, A. C. Morris and J. P. Weyant. Volume 9, Issue 1. 2018

The Governor's Strategies to Achieving Our Climate and Economic Goals

ONE: Implement a Market-Based Program to Reduce Emissions

Achieve our state climate emissions reduction goals, while protecting our manufacturing sector and mitigating impacts on low-income and rural communities, communities of color, and Tribes

TWO: Add 50,000 Electric Vehicles to Oregon Roads by 2020

Expand electric vehicle infrastructure and incentives to support 50,000 electric vehicles on Oregon roads by 2020

THREE: Decarbonize the Electricity System

Achieve the state's renewable energy targets and encourage grid modernization while maintaining affordable and competitive electricity rates

FOUR: Expand Access to Clean Energy Services

Expand opportunities for residential, municipal, and commercial customers to access clean energy services from their utilities

FIVE: Strengthen Energy Efficiency Investments

Maintain and strengthen energy efficiency investments in residential, commercial, industrial and agricultural sectors, expand the reach of energy efficiency programs to ensure all communities benefit

SIX: Increase Industrial Energy Savings and Competitiveness

Support world-leading industrial efficiency initiatives by Oregon's large industrial utility customers

SEVEN: Invest in Climate Solutions That Foster Resilience

Pursue climate solutions that benefit rural communities and Tribes, support working lands, and foster resilience to climate change

EIGHT: Create the New Oregon Climate Authority

Align state programs and expertise to acheive the state's climate policy goals

The Governor's strategies will create new clean energy jobs and put Oregon on a trajectory to achieve the state's greenhouse gas reduction goals.

ONE: Implement a Market Based-Program to Reduce Emissions

Implement a well-designed market-based program to achieve our state climate emissions reduction goals at the least possible cost, while protecting our manufacturing industry and mitigating impacts on low-income and rural communities, communities of color, and Tribes.

The state must set a gradually declining cap on emissions to achieve the state's emissions reduction goals with certainty. A market-based, cap-and-trade program will allow the state to achieve those emissions reductions at the least possible cost.

The basic construct of cap-and-trade is straightforward: large emitters either adopt technology to reduce emissions on-site or they purchase an emission allowance. The state caps the total amount of allowances economy-wide and gradually lowers the number of allowances over-time. Entities that can't reduce emissions cost-effectively will purchase allowances from entities that can attain reductions at a lower cost. The state sets the total cap on emissions at levels consistent with its goals, while the market determines where the actual reductions take place.

Cap-and-trade is an approach for reducing emissions widely supported

by economists because it aligns market incentives in favor of clean technologies, while providing regulated sectors flexibility in how they choose to comply. A federal cap-and-trade program in the 1990s reduced sulfur dioxide emissions from power plants and the associated acid rain at considerable savings.[42] Cap-and-trade programs have been adopted by many jurisdictions worldwide to address climate pollution, including Europe, China, California, Quebec, and ten Northeast states in the U.S. Oregon has the opportunity to connect its cap-and-trade program to existing programs, achieving administrative efficiencies and providing regulated sectors access to larger, established carbon markets.

Unlike a carbon tax, the goal of a cap-and-trade program is least-cost emissions reduction with certainty. A carbon tax can also reduce emissions cost-effectively, but may need to be continuously adjusted upward to drive the behavioral and technological change required to hit state emissions goals. Whereas with cap-and-trade, the cap sets a carbon budget across the economy and the cap is slowly and gradually reduced over time to achieve an emissions goal. The cap provides emissions reduction with certainty, and lets the market determine where the lowest cost reduction opportunities are. There is typically more flexibility for regulated industries under cap-and-trade unlike with with a carbon tax, where they pay the tax for every ton of emissions, or adopt technologies to reduce emissions on-site. With a cap-and-trade program, industries can reduce emissions on-site, purchase allowances from other regulated entities, purchase allowances at auction, or receive a distribution of allowances from the state. Moreover, if a jurisdiction links its cap-and-trade program to established carbon markets, its regulated sectors may access a larger market of allowances, offsets, and emissions reduction opportunities.

42. The SO2 Allowance Trading System and the Clean Air Act Amendments of 1990: Reflections on Twenty Years of Policy Innovation, Harvard Kennedy School, 2012. https://www.belfercenter.org/sites/default/files/legacy/files/so2-brief_digital4_final.pdf

A well-designed cap-and-trade program will take preventative measures to protect manufacturers in certain trade-exposed industries from competition in markets where climate emissions are not currently regulated. Once identified, sectors such as cement, pulp-and-paper, and steel could receive some free allowances to level the playing field with their competitors. Some utilities could also receive allowances to maintain competitive and affordable rates for customers. The distribution of allowances from within the state's allowance budget does not change the cap and the level of emissions reduction required economy-wide; it simply eases compliance while maintaining economic incentives to innovate and find ways to lower emissions. If the state auctions allowances, it can redirect proceeds to activities that further reduce emissions or help communities adapt to climate change impacts.

Governor Brown has identified the following priorities for a cap-and-trade program in Oregon:

• Science-based targets and innovation: The program goals should reflect the best available science and incentivize best-in-class technologies and carbon sequestration on natural and working landscapes.

•Protect vulnerable Oregonians: Protect vulnerable Oregonians from increased costs, especially low-income families, communities of color, Tribes, and people in rural areas.

•Maintain adequate cost-controls, certainty and transparency: The program must protect existing jobs and industries and provide certainty and transparency for covered sectors, including workers in those industries.

• Complement existing policies: Work alongside existing state policies to reduce emissions, transition to clean energy, and modernize our transportation infrastructure without duplicating costs.

• Link to the Western Climate Initiative (WCI): Oregon should seek to link its program to the larger, established WCI carbon market. This option could ensure greater price stability, certainty, access to wider range of emission reduction opportunities and administrative

TWO: Add 50,000 Electrical Vehicles to Oregon Roads by 2020

Hasten the pace of electrification of vehicles in Oregon by expanding electric vehicle infrastructure and incentives to support 50,000 electric vehicles on Oregon roads by 2020.

As EVs have entered the mainstream over the past several years, Oregon has consistently been a national leader in EV market share, boasting some of the highest rates of EV sales in the country. There are currently nearly 18,000 electric vehicles in Oregon[43], and in November 2017, Governor Brown established an ambitious target to reach 50,000 EVs by the end of 2020.[44] Executive Order 17-21 outlines a range of state actions to provide additional support to this growing market for clean cars. The executive order deploys more EVs in public fleets, establishes recognition programs for EV champions, helps school and transit districts deploy clean buses, and provides support to many other state programs around low-carbon transportation. The 2017 transportation package (HB2017) created one of the nation's leading rebate programs to incentivize EV purchases.

43. As of 6/30/18, there were 17,893 actively registered electric vehicles in the Oregon Department of Motor Vehicles database.

44. State of Oregon Office of the Governor, 2017. "Executive Order 17-21: Accelerating Zero Emission Vehicle Adoption in Oregon to Reduce Greenhouse Gas Emissions and Address Climate Change." Available at: https://www.oregon.gov/gov/Documents/executive_orders/eo_17-21.pdf

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Governor Brown is committed to seeking innovative ways to reduce transportation emissions. The state will continue to be a national leader in EVs through successful implementation of the components of Executive Order 17-21, successful marketing of the EV rebate, collaboration with utilities, dealerships, auto manufacturers, and other private sector entities, and successful implementation of the Clean Fuels Program. Electric vehicles may play the biggest role in the near term, but hydrogen fuel cell vehicles and vehicles powered by renewable biofuels are also an important part of the Governor's vision for a low-carbon transportation system.

THREE: Decarbonize the Electricity System

Achieve the state's renewable energy targets and encourage grid modernization while maintaining affordable and competitive electricity rates.

For decades, Oregon utilities have served Oregon customers well with reliable, affordable electricity. Looking ahead, our utilities are well-positioned to deliver a wider range of clean energy services and emissions reductions to help the state meet its emissions goals. Utilities are actively investing in clean energy, energy efficiency, grid modernization, and electric charging in response to market demand and existing state policies. To hasten this transition while maintaining low rates for customers, Governor Brown supports:

• Complementing existing policies without duplicating costs: Oregon's energy efficiency programs, the renewable portfolio standard, and coal-to-

clean requirements have set utilities along a path to significant emissions reductions. Customers pay for these investments in their electricity rates. A market-based emissions trading program provides the flexibility to incentivize a faster transition to clean energy without duplicating costs, by allocating carbon allowances to utilities on behalf of their customers to account for emissions reductions already reflected in customer rates. This approach maintains market incentives, while maintaining affordable electricity rates. The cap-and-trade program also provides clear direction to the Public Utility Commission to consider regulated-climate emissions as part of its role as economic regulator of investor-owned utilities.

•Regionalization: Oregon must actively coordinate with neighboring states and utilities to ensure regulatory alignment and safeguard the emergence of regional power markets as it transitions to clean energy and implements a cap-and-trade program. The goal is to ensure that regional electricity markets can continue to enhance reliability, reduce costs, and facilitate greater integration of renewable energy resources, while providing new market opportunities for the low-carbon and hydropower resources abundant in our region.

FOUR: Expand Access to Clean Energy Services

Expand opportunities for residential, municipal, and commercial customers to access clean energy services from their utilities while ensuring utility regulation is designed to support the utility system and does not preference new customers over existing ones.

As technologies improve, residential, municipal, and commercial customers of natural gas and electric utilities increasingly seek more choices in clean energy services from their utility, including options such as rooftop solar, electric vehicle charging, renewable natural gas, carbon offsets and renewable power. These emerging green power options provide utility customers the flexibility they seek to meet their own sustainability and renewable energy goals.

Governor Brown supports expanding green power options and tariffs for residential, municipal, and commercial utility customers, provided these options do not compromise the efficiency and reliability of the utility system or impose costs on existing customers. Designed well, utility green power options can enhance the quality of utility services, continue to attract sustainability-minded businesses to Oregon, create good jobs in the clean power sector, and reduce Oregon's emissions.

FIVE: Strengthen Energy Efficiency Investments

Maintain and strengthen energy efficiency investments in residential, commercial, industrial and agricultural sectors, expand the reach of energy efficiency programs to ensure all communities benefit, and improve the energy efficiency of state building codes.

Energy efficiency is the cornerstone of a low-carbon economic development strategy and Oregon should continue aggressive efforts to acquire energy efficiency in all sectors. At the same time, Oregon needs to expand energy efficiency and weatherization programs to reach traditionally under-served communities by identifying and overcoming barriers to serving these communities. Oregon also needs to capture a wider range of energy efficiency improvements beyond the lowest cost, "low hanging fruit" measures that have already been picked. Carbon pricing can help level the playing field for energy efficiency, just as it does for renewable energy resources, by better accounting for the climate and public health costs of fossil fuels in resource decisions by utilities and other actors in the economy.

Buildings are large consumers of electricity and natural gas. In addition to increasing our efforts to update our existing buildings with energy efficiency improvements, Oregon needs stronger building codes for new construction. By adopting state-of-the-art building codes, Oregon can lock in energy savings and avoided emissions from new residential and commercial buildings for decades to come. Governor Brown's Executive Order No. 17-20 focused specifically on the built environment - residential, commercial, and public buildings across the state. Specifically, the Governor's Executive Order directs:

• Solar-ready buildings. New residential buildings should be ready for solar panel installation by 2020 for residential buildings and 2022 for commercial buildings.

• Zero-energy homes. For new residential construction, structures will need to achieve at least equivalent performance levels with the U.S. Department of Energy "Zero Energy Ready Standard" by 2023.

• High performance buildings. For new commercial construction, buildings will exceed national model energy codes and meet energy efficiency levels of high-performance standards by 2022.

• High efficiency H20. For new construction, the commercial code will require high-efficiency water fixtures by 2020, and the ability to capture and safely reuse water for irrigation or other uses by 2025.

• Building Retrofits: Calls for coordinated agency action to increase energy efficiency in existing buildings, with emphasis on affordable housing, multi-family dwellings, and buildings that are well below current building code requirements.

In these efforts, the state will demonstrate leadership by leading by example, ensuring that existing state-owned buildings operate efficiently and that new buildings operate as carbon-neutral by 2022.

SIX: Increase Industrial Energy Savings and Competitiveness

Support world-leading industrial efficiency initiatives by Oregon's large industrial utility customers.

Oregon's large industrial utility customers have pursued a variety of energy saving measures, including waste heat utilization, lighting modifications, energy management systems, energy efficient pumps, and industrial process modifications. But there is more potential to capture industrial energy efficiency savings in the market. Governor Brown supports a focused effort to reduce the energy intensity of Oregon's industries through creative partnerships and innovative approaches to identify and overcome barriers preventing the acquisition of all cost-effective energy efficiency in the industrial sector. This could include dedicating proceeds from Oregon's cap-and-trade program to help Oregon industries adopt more efficient technologies and equipment. These efforts can help Oregon industries maintain global competitiveness while reducing emissions at the same time.

In addition, Oregon should leverage existing efforts to become a global leader in industrial energy efficiency technologies. Collaborations between industry, universities, and government, such as the Oregon Manufacturing and Innovation Center, can lead to world-class innovations in advanced manufacturing, as well as new jobs and career pathways for Oregonians. Oregon's climate policy should support these and related efforts to build centers-of-excellence in green technologies here in Oregon.

SEVEN: Invest in Climate Solutions That Foster Resilience

Pursue climate solutions that benefit rural communities and Tribes, support working lands, and foster resilience to climate change.

Natural and working lands, including Oregon's farms, forests, ranchlands, grasslands, and wetlands, are vital to the health and resilience of rural communities but are threatened by the impacts of climate change. Working and natural lands also sequester and store carbon emissions at significant levels and play an important role in addressing climate change. Governor Brown is committed to maintaining and enhancing the health and viability of our working and natural lands in the face of climate change. This includes:

• Protecting the resources and habitats threatened by climate change that are important to the cultural, community, medicinal, and economic health of Tribes.

• Working with landownders, producers, and stakeholders to keep agricultural lands in production and avoid the conversion to more emissions-intensive uses.

• Providing technical and other assistance to producers looking to implement practices and technologies that improve soil health, increase productivity, and sequester carbon.

• Exploring innovative investments in working and natural lands that address water scarcity, reduce energy use, foster resilience to climate change, and increase carbon sequestration and storage.

EIGHT: Create the Oregon Climate Authority

Align state programs and expertise to achieve the state's climate policy goals.

In response to the urgency of the climate crisis and the need to better align state programs and expertise to achieve the state's climate goals, Governor Brown proposes a new Oregon Climate Authority and ceasing the operations of the Department of Energy and Carbon Policy Office. The Governor's vision is for a new entity, transparent and responsive to stakeholders and the regulated community, with exceptional domain and market expertise that is responsible for implementing the state's climate and clean energy strategies and tracking progress toward the state's climate goals. This would include the new carbon marketplace, greenhouse gas emissions reporting and accounting, energy markets data collection and analysis, as well as energy programs central to the state's climate and clean energy goals. The Governor would appoint a Director, subject to Senate approval, and work with the Legislature to appoint an advisory board and move existing energy programs to the new entity or other state agencies. By aligning state programs in this new capacity, the state can significantly reduce the Energy Supplier Assessment currently paid by utility rate payers.

Daniel Serres

#62556 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Please see the attached exhibits to the comments of Columbia Riverkeeper, Center for Sustainable Economy, Oregon Physicians for Social Responsibility, Portland Audubon Society, 350PDX, Friends of the Columbia Gorge, Willamette Riverkeeper, Climate Action Coalition, Northwest Environmental Defense Center, Oregon Conservancy Foundation, and Human Access Project.

Testimony is presented without formatting.

2020 Clean Fuels Forecast

Background

Oregon Revised Statutes (2017) Chapter 750, Section 163[1] authorizes the Office of Economic Analysis (OEA), in coordination with the Department of Environmental Quality, to assess the availability of fossil and alternative fuels in Oregon. In particular, the forecast is to determine whether fuel supply will be sufficient to generate alternative fuel credits (on ethanol, electricity, and diesel substitutes - including biodiesel, renewable diesel, natural gas, and propane) to meet the scheduled low carbon fuel standards for the compliance period. The forecast report is required to include an assessment of total deficits and banked credits at the beginning of the compliance period.

In preparing the forecast, the Office of Economic Analysis has formed a Clean Fuels Forecast Advisory Committee comprised of relevant experts and stakeholders to assist in reviewing methodological considerations and various data sources. A membership list can be found in Appendix A.

Data Sources

The forecast uses available public and program data to develop the estimates of low-carbon fuels available to Oregon and estimated consumption of fossil and alternative fuels in Oregon. The sources of this data include:

- Oregon Clean Fuels Program (CFP) Online System
- Fuel Pathway Codes (carbon intensity values) approved in Oregon and California
- Oregon Department of Transportation's (ODOT) Revenue Forecast
- Oregon DMV vehicle registration data
- Annual Energy Outlook and other resources from the US Energy Information Administration
- Trade associations (Renewable Fuels Association and the National Biodiesel Board) on their members' production capacity

Clean Fuels Program 2020 Consumption Forecast

To determine the amount of deficits that will be generated in 2020, and thus the amount of credits needed for compliance, a forecast for consumption of all relevant fuels must be made. The following are the volume projections for each fuel type.

Gasoline Consumption

1,708 million gallons of gasoline, including ethanol, were consumed in 2018, the most recent year of data collected. Growth projections exhibited in the Oregon Department of Transportation's December 2018 forecast equal an annualized 0.8 percent from 2018 to 2020. There were two factors considered in making adjustments to these initial growth parameters: ODOT observed gasoline consumption coming in lower than projected through the first two quarters of 2019. Secondly, the mandated decreases in the carbon intensity targets for fossil fuels incentivize reporting parties to record supplies of fuel in the earliest year

[1] https://olis.leg.state.or.us/liz/2017R1/Downloads/MeasureDocument/HB2017/Enrolled

possible to minimize the deficits generated. For the first factor, growth was adjusted down to 0.4 percentage points. Given that the reduction in the carbon intensity target is the same in percentage terms for 2020 and 2021, ultimately no adjustment was made for potential pull forward in reporting. The final annualized growth in motor gasoline from the 2018 base year through 2020 is 0.4 percent annually, resulting in a projected 1,720.4 million gallons for the total gasoline pool. To determine the amount of conventional gasoline represented, ethanol must be subtracted. The blend rate assumed for 2020 is 10.1 percent, equal to that observed for 2018. The final forecast for conventional gasoline is 1,546.3 million gallons.

Diesel Consumption

According to CFP reported data, 771.2 million gallons of diesel, including bio- and renewable diesel, were consumed in 2018, the most recent year of data collected. Growth projections exhibited in the Oregon Department of Transportation's December 2018 forecast equal an annualized 1.4 percent from 2018 to 2020. The same add-factor considerations noted under the gasoline section were made for diesel as well, particularly the fact that diesel consumption fell far below projections through the first two quarters of 2019. The final annualized growth in total diesel from the 2018 base year through 2020 is -0.6 percent, resulting in a projected 762.5 million gallons of total diesel. To determine the amount of conventional diesel, biodiesel and renewable diesel must be subtracted. The blend rate for these biofuels are assumed to be 6.9 percent and 3.5 percent, respectively. The final forecast for the consumption of conventional diesel in 2020 is 683.2 million gallons.

Ethanol Consumption

The amount of ethanol reported for 2018 equaled 172.2 million gallons. As described above, the amount of ethanol projected for 2020 is based on a blend rate assumption driven by historical observations and trends, as well as blend rates observed in California. Given that the last actual blend rate observation, (for the 2018 compliance year), was 10.1 percent and that most gasoline consumed in Oregon is E10, the assumption for 2020 was maintained at 10.1 percent. This results in a forecast for ethanol consumption of 174.1 million gallons, which is 0.5 percent above the 2018 volume on an annualized basis. As with the fossil fuels, no adjustment was made for behavioral factors associated with the phasing in of the carbon intensity reductions given that the incentive would be similar on either end of the compliance period. This is true for the remaining alternative fuel forecasts, as well.

Electricity Consumption

Consumption of electricity for on-road vehicles is based on a projection of the number of plug-in hybrid and battery electric vehicles in use for the compliance period. DMV vehicle registration data provides actual vehicle numbers historically, from which growth projections and variances are derived to produce the number of electric vehicles projected to be in operation for the 2020 compliance period. This equaled an average of 13,050 Plug-in Hybrids and 19,772 Battery Electric vehicles. Historical volumes of electricity, including estimates for residential charging, are used to calculate average Kilowatt hours per vehicle year. For 2018, this parameter equaled 3,621 Kilowatt hours per year, which was in turn assumed for the 2020 compliance period. When converted to gasoline gallon equivalents, the forecast is 3.5 million gallons including residential charging. This is equivalent to a 25 percent increase from 2018 on an annualized basis.

Biodiesel Consumption

The reported volume of biodiesel in 2018 amounted to 51.7 million gallons. As described above, the amount of biodiesel projected for 2020 is based on a blend rate assumption driven by historical observations and trends, as well as blend rates observed in California. The highest observation in the Clean Fuels program data was 6.9 percent in 2017. This value was assumed for the 2020 forecast, resulting in a consumption projection of 52.6 million gallons. This represents growth of 0.9 percent from the 2018 actual on an annualized basis.

Renewable Diesel Consumption

The amount of renewable diesel reported in 2018 was 1.2 million gallons. Similar to biodiesel, the forecast for renewable diesel is driven by the assumption of the fraction of total diesel consumed comprised of renewable diesel. The blend rate observed for 2018 in the Clean Fuels data was 0.2 percent. In California, similarly small blend rates quickly escalated to 3.0 percent and beyond. Such an adoption schedule is assumed for Oregon, resulting in a blend rate projection for renewable diesel in 2020 of 3.5 percent. This leads to a consumption forecast of 26.7 million gallons, a substantial 369.8 percent above the 2018 value on an annualized basis.

Natural Gas and Propane Consumption

The amount of natural gas, including renewable natural gas (biogas), reported in 2018 in diesel gallon equivalents equaled 3.2 million gallons. This represented 14.7 percent growth from the prior year. Annualized growth from the 2018 base year to 2020 is assumed to be 6.9 percent, equal to the Energy Information Administration's outlook for the Pacific region. This results in a forecast of 3.6 million gallons, which is 6.9 percent annually above the 2018 level.

Propane exhibits the smallest quantity of alternative fuel reported in 2018 at 0.7 million gasoline gallon equivalents. However, this was 477.1 percent above the 2017 reported value. Annualized growth from the 2018 base year to 2020 is assumed to be 213.9 percent, resulting in a forecast of 7.3 million gallons.

The following table presents the 2020 consumption forecast in detail. Note that the percent change figures for 2020 represent annual growth from the last available actuals in 2018. To the extent that 2018 actuals were not known at the time the 2019 forecast was released, this explains the significant variance in changes related to the 2019 forecast. Presenting annualized changes from 2018 is thus more informative.

Table 1: Summary of fossil and alternative fuel consumption

(Mil. gallons, percent)	2018 Actual	2019 Forecast*	% change	2020 Forecast	annual %change vs 2018
Conventional Gasoline	1,535.4	1,437.0	-6.4%	1,546.3	0.4%
Ethanol	172.2	165.0	-4.2%	174.1	0.5%
Ethanol Blend Rate	10.1%	10.3%		10.1%	
Blendstock	1,707.6	1,602.0	-6.2%	1,720.4	0.4%
Fossil Diesel	718.2	705.0	-1.9%	683.2	-2.5%
Biodiesel	51.7	57.5	11.1%	52.6	0.9%
Biodiesel Blend Rate	6.7%	7.3%		6.9%	
Renewable Diesel	1.2	29.9	2370.6%	26.7	369.8%
Renew diesel Blend Rate	0.2%	3.8%		3.5%	
Total Diesel	771.2	792.3	2.7%	762.5	-0.6%
Electricity (on-road)	2.2	2.7	23.0%	3.5	25.0%
Electricity (off-road)	1.7	N/A		N/A	
Fossil Natural Gas	1.5	1.2	-17.8%	1.1	-13.6%
Biogas	1.7	2.8	62.9%	2.5	21.6%
Biogas Blend Rate	54.1%	70.0%		70.0%	
Total Natural Gas	3.2	4.0	25.8%	3.6	6.9%
Propane	0.7	1.3	72.2%	7.3	213.9%
*Forecast equals average of range published for 2019 forecast.					
On-road electricity include calculation of residential charging.					

Deficit and Credit Generation and Banked Credits

In order to estimate the number of deficits and credits associated with the consumption of each fuel type, the energy densities and carbon intensity differentials must be known. Most of the pertinent parameters are published here in administrative rule by the Department of Environmental Quality (see Tables 1, 2, and 4 starting on page 209). The following table presents these parameters for each fuel. Details regarding the estimation of carbon intensities for ethanol, biodiesel and renewable diesel can be found in Appendix B. Also included are the two parameters associated with electricity consumed by passenger vehicles. The carbon intensity assumption is adjusted for the energy economy ratio (EER). The actual carbon intensity of electricity is 109.3.

Table 2: Parameter values for the 2020 forecast

	Energy Density	Carbon Intensity Target	Carbon Intensity Assumption
Units	MJ/gallon	gCO2/MJ	gCO2/MJ
Gasoline	122.48	95.61	100.14
Ethanol	81.51	95.61	57.76
Diesel	134.48	96.27	100.74
Biodiesel	126.13	96.27	35.40
Reneweable Diesel	129.65	96.27	29.17
Electricity	3.6	95.61	32.15
KWh/vehicle	*3621*		
EER	*3.4*		
Natural Gas	134.48	96.27	79.98
Biogas	134.48	96.27	50.00
Liq. Petroleum Gas	89.63	95.61	80.88

Banked Credits

The number of credits is taken from the CFP Online System. The number of gross credits registered through the end of calendar year 2018 equaled 2.73 million, while the number of deficits recorded amounted to 2.23 million. The net credits banked equaled 502,608. Originally, OEA projected that another 365,348 credits will be banked during calendar year 2019. Given that another year of data are available, including actual fuel volumes (and thus blend rates for alternative fuels) for the 2018 compliance period, the 2019 estimated deficits and credits have been updated to reflect this. The total projected banked credits at the beginning of the 2020 compliance period is now expected to be 649,829.

Table 3: Summary of actual and projected net banked credits

Year	Deficits	Credits	Net Banked Credits
2016	-617,071	830,714	213,643
2017	-715,057	924,793	209,736
2018	-899,260	978,489	79,229
2019 (Proj.)	-1,015,633	1,162,854	147,221
Total	-3,247,021	3,896,850	649,829

Credit and Deficit Summary

The table below summarizes the forecast for deficit generation and credit generation. The equations for calculating the deficits and credits can be found in Appendix B.

Table 4: Summary of Deficits and Credits

Credit / Deficit Summary		
Deficits	Gasoline	-857,916
	Diesel	-410,701
Deficit Total		**-1,268,617**
Credits	Ethanol	537,140
	Biodiesel	403,946
	Renewable Diesel	232,191
	Electricity, on-road	92,317
	Electricity, off-road	25,784
	Natural Gas	17,896
	Propane	9,629
Credit Total		**1,318,903**
2020 Net Credits/Deficits		**50,286**
2019 Estimated Ending Banked Credits		**649,829**
Total Net Credits/Deficits		**700,115**

Forecasted Fuel Supply Deferral Analysis

As shown above, the forecast does not imply such an action.

Potential Supply of Alternative Fuels

Oregon Revised Statutes (2017) Chapter 750, Section 163[2] directs the Office of Economic Analysis to estimate the "potential volumes of gasoline, gasoline substitutes and gasoline alternatives and diesel, diesel fuel substitutes and diesel alternatives available to Oregon." In order to make such estimates, a number of assumptions must be made. Potential is read to mean "could be made available to Oregon under a wide range of market conditions". Currently, suppliers must be certified by the Department of Environmental Quality to receive credits for fuel delivered into Oregon. In addition, they must report volumes of fuel sold in Oregon to the Clean Fuels reporting system. It is assumed that selling fuel in Oregon implies established supply chains. Thus, the capacity of facilities that were certified and supplied fuel to Oregon for the most recent compliance period (2018) is assumed to be theoretically "available" to Oregon. The potential supply figures presented in the following sections correspond to the most recently available nameplate capacities for these facilities manufacturing the respective fuels. Where multiple values are available, the highest is presented.

[2] https://olis.leg.state.or.us/liz/2017R1/Downloads/MeasureDocument/HB2017/Enrolled

In addition to estimating potential supply, the Office of Economic Analysis is directed to consider "Constraints that may be preventing access to available and cost-effective low carbon fuels by Oregon, such as geographic and logistical factors, and alleviating factors to the constraints". Only biofuels that might pose a supply constraint that could ultimately limit the number of credits available to deficit holders to comply with the Clean Fuels program requirements are called out explicitly. Should supply issues arise for the more mature fuel markets such as conventional gasoline and diesel, as well as electricity, such issues would be added to the report. This is not anticipated for the foreseeable future.

Ethanol

As exhibited in Table 5, the potential supply of ethanol to Oregon as outlined above is 3.8 billion gallons. This compares to a projected "demand" for ethanol previously characterized of 174.2 million gallons.

Table 5: Ethanol Supply

Ethanol Supply Available to Oregon
(Existing Suppliers in 2018)

State	Nameplate Capacity (Mil. Gallons)	Number of Facilities
South Dakota	900	11
Nebraska	817	10
Iowa	650	7
Minnesota	478	6
North Dakota	300	2
Kansas	220	3
Colorado	110	2
Idaho	75	1
California	50	1
Oregon	43	1
Total Oregon Suppliers	3,643	44

Data from Energy Information Administration and Clean Fuels Program.

Biodiesel

Table 6 presents the potential supply of biodiesel to Oregon, equaling 743 million gallons in capacity for certified facilities with established supply chains in 2018. This compares to a projected demand for biodiesel in 2020 of 52.6 million gallons. Note that the Energy Information Administration is currently updating their data collection regarding biodiesel producers to match that for ethanol. When these data become available, more current estimates of nameplate capacity will be incorporated into the analysis.

Table 6: Biodiesel Supply

Locality	Nameplate Capacity (Mil. Gallons)	Number of Facilities
Missouri	155	4
Iowa	106	2
Washington	105	2
Oregon	105	2
Nebraska	63	1
Arkansas	59	1
Korea	50	2
Oklahoma	35	1
Minnesota	30	1
Canada	22	4
Texas	15	1
Total Oregon Suppliers	743	21
Data from the Clean Fuels Program		

Renewable Diesel

As presented below, the potential supply of renewable diesel to Oregon equals 475 million gallons. This compares to a projected demand for renewable diesel in 2020 of 26.7 million gallons.

Table 7: Renewable Diesel Supply

Locality	Nameplate Capacity (Mil. Gallons)	Number of Facilities
Singapore	291	1
Wyoming	109	1
Louisiana	75	1
Total Oregon Suppliers	475	3
Data from the Clean Fuels Program		

Renewable Natural Gas

The amount of renewable natural gas potentially available to Oregon amounts to 2.2 billion gallon equivalents. This compares to a projected demand for this biofuel of 2.5 million gallon equivalents. The

committee discussed the fact that a number of applications to supply additional renewable natural gas to Oregon are in the process of being evaluated. Given the modest volumes of natural gas currently used in transportation, incorporating these potential supplies would not alter the conclusion that there are no current constraints on the availability of natural gas in Oregon.

Table 8: Renewable Natural Gas

Locality	Nameplate Capacity (Mil. Gallons)	Number of Facilities
Kentucky	1,179	1
Ohio	990	1
Total Oregon Suppliers	2,169	2
Data from the Clean Fuels Program		

Forecast Risks

A risk is defined as a deviation from one or more assumptions that would alter the conclusion outlined in the previous sections. There are a number of potential risks to this 2020 Clean Fuels Forecast, both positive and negative and they are:

(a) The most fundamental risk to the forecast amounts to potential deviations from the assumptions highlighted in each fuel type discussion. In particular, blend rates and carbon intensities for biofuels could be subject to significant error. In addition, this forecast contrasts with prior forecasts in that it assumes that the incentives inherent in the value of the credits generated by supplying alternative fuels will drive the carbon intensities of these fuels downward. Failure to realize these declines would result in fewer credits than currently anticipated.

(b) This forecast represents a "current law" representation of the compliance period in question. OEA's methodology does not take potential future state policy actions into account.

(c) There is a discrepancy between the diesel consumption numbers reported to the Clean Fuels Program data and the taxable gallons tabulated by ODOT. Explicitly, more gallons of diesel are reported to the former that the latter. This forecast applies projected growth of taxable diesel, at least initially, to the base year 2018 reported volumes of diesel in the CFP. To the degree that taxable gallons per ODOT is not a perfect proxy for reported gallons in the CFP, actual consumption of diesel and thereby the number of deficits generated could deviate from this forecast.

(d) House Bill 2017 (2017 Legislative Session) created a rebate for sales of electric vehicles in Oregon. The electric vehicle forecast underlying the credit projections for electricity consumption do not explicitly account for the potential impact of this rebate. To the degree that electric vehicle sales skew higher than expected herein, net credits would be even higher, constituting an upside risk to the forecast.

(e) The ethanol availability presented above is not comprehensive and does not include other potential sources, such as sugarcane ethanol imported from Brazil. Given that potential supply characterized in table 5 greatly exceeds projected demand, this is not an immediate threat to the forecast. However, it may need to be addressed as consumption increases or as carbon intensity targets are lowered.

(f) Alternative fuels used in forklifts, aviation , and certain other uses such as transport refrigeration units were recently added to the Clean Fuels Program but have not been included in the 2020 forecast These uses would generate credits in the program, constituting an upside risk to the forecast.

Accessibility

Documents can be provided upon request in an alternate format for individuals with disabilities or in a language other than English for people with limited English skills. To request a document in another format or language, call Michael Kennedy in the Office of Economic Analysis at (503) 378-5732 or email him at michael.kennedy@oregon.gov

Appendix A

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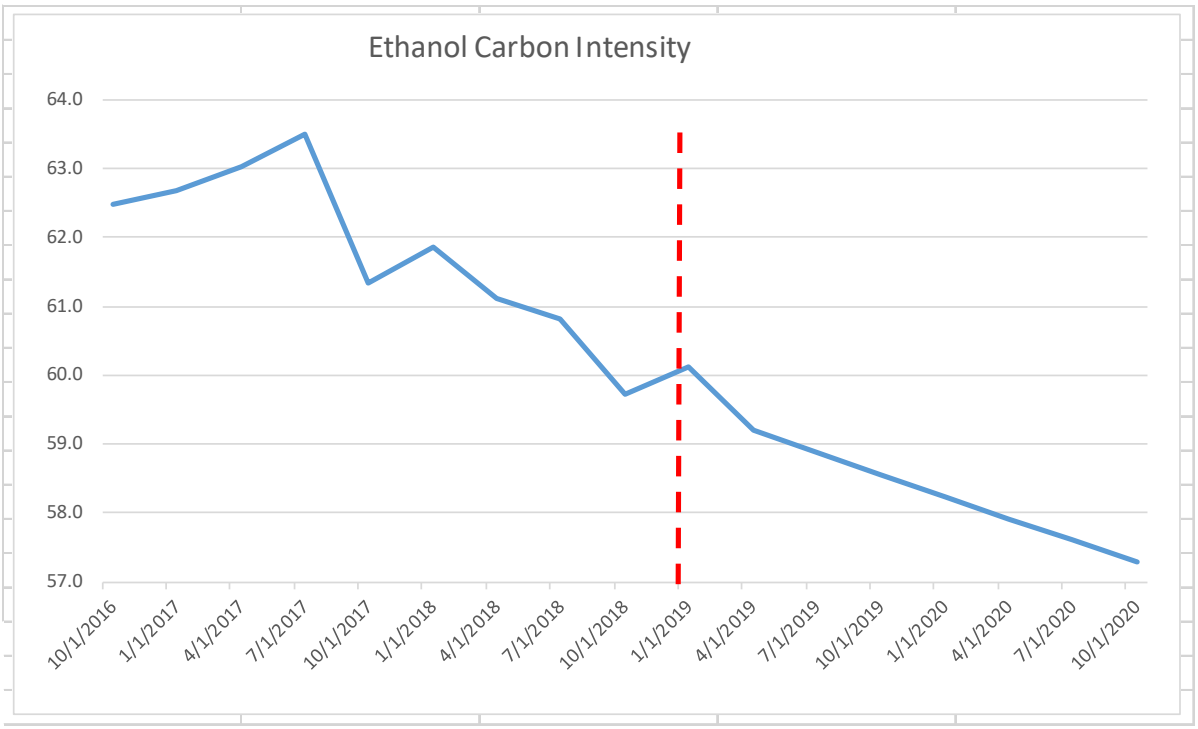
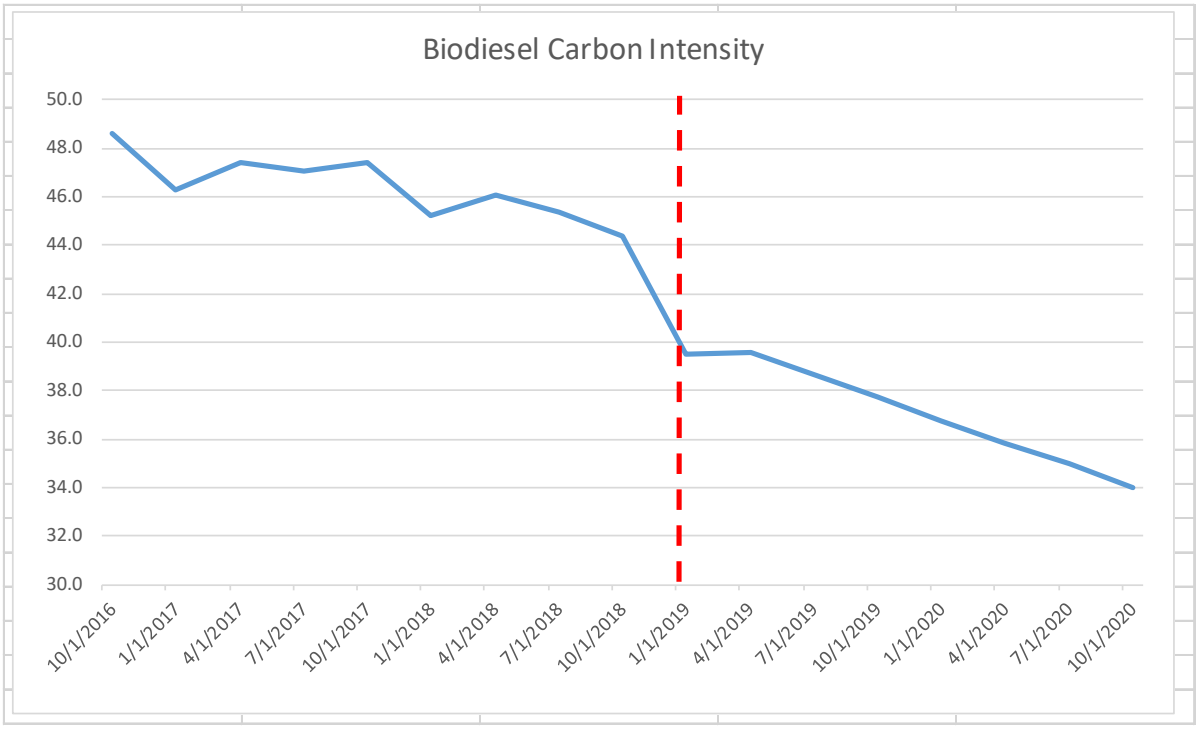
WINE Sean	Clean Energy Fuels	Sean.Wine@cleanenergyfuels.com

Appendix B

The estimated carbon intensities for ethanol, biodiesel and renewable diesel that are not published in rule are projected based on the historical trend in reported carbon intensities. Add factors may be employed where steeper declines are expected due to the incentives inherent in the program, as well as new information regarding potential changes in the mix of feedstocks and the composition of facilities that supply biofuels to Oregon. Currently, thirteen quarters of data are available for ethanol and biodiesel, while six quarters are available for renewable diesel. As more data become available, more advanced econometric techniques (including dynamic modeling) may be employed to provide more accurate projections. The following charts show the expected declines in all three series:




Biodiesel Carbon Intensity
50.0
48.0
46.0
44.0
42.0
40.0
38.0
36.0
34.0
32.0
30.0
10/1/2016
1/1/2017
4/1/2017
7/1/2017
10/1/2017
1/1/2018
4/1/2018
7/1/2018
10/1/2018
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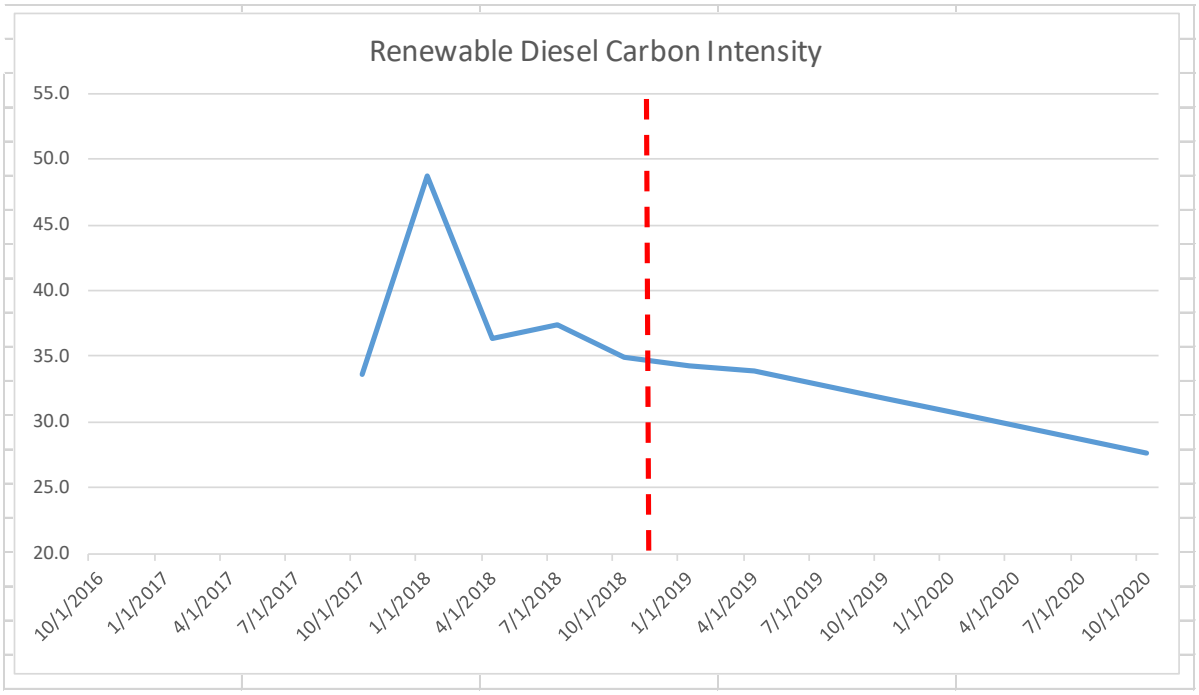
1/1/2020
4/1/2020
7/1/2020
10/1/2020


Renewable Diesel Carbon Intensity
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
10/1/2016
1/1/2017
4/1/2017
7/1/2017
10/1/2017
1/1/2018
4/1/2018
7/1/2018
10/1/2018
1/1/2019
4/1/2019
7/1/2019
10/1/2019
1/1/2020
4/1/2020
7/1/2020
10/1/2020

Appendix C

The following are the formulas resulting in the deficits and credits presented in Table 4.

Gasoline
$Deficit_G = CBOB * ED_G * (CIT_G - CIA_G)/1{,}000{,}000$

Diesel
$Deficit_D = V_D * ED_D * (CIT_D – CIA_D)/1{,}000{,}000$

Ethanol
$Credit_E = V_E * ED_E * (CIT_G – CIA_E)/1{,}000{,}000$

Biodiesel
$Credit_{BD} = V_{BD} * ED_{BD} * (CIT_D – CIA_{BD})/1{,}000{,}000$

Renewable Diesel
$Credit_{RD} = V_{RD} * ED_{RD} * (CIT_D – CIA_{RD})/1{,}000{,}000$

Electricity
$Credit_C = K_C * EER_E * ED_E * (CIT_G – (CIA_C/EER_E)/1{,}000{,}000$

Natural Gas
$Credit_{NG} = V_{NG} * ED_{NG} * (CIT_D – CIA_{NG})/1{,}000{,}000$

Propane
$Credit_P = V_P * ED_P * (CIT_D – CIA_P)/1{,}000{,}000$



INTRODUCTION

Portland's Climate Action Plan provides a road map to reduce carbon emissions 40 percent by 2030 and 80 percent by 2050. Land use planning, transportation policies and investments are among the most important strategies to address climate change. In Portland, the transportation of goods and people accounts for nearly 40 percent of local carbon emissions. Shifting from gasoline and diesel to lower-carbon transportation fuels, like electricity, is a key strategy to achieving Portland's climate action goals.

Portland's approach to personal mobility prioritizes safety, health, affordability and environmental quality. City of Portland staff are working to encourage people movement instead of car movement by creating a healthy connected city that enables safe and convenient walking, biking and transit use (see Figure 1). This Electric Vehicle Strategy focuses on electrification of the public transit system, shared vehicles and the private automobiles that remain in use, which is one of many strategies the City is taking to reduce carbon emissions from the transportation sector. This strategy also seeks to maximize the benefits of air quality and affordability for low-income residents and parts of Portland that are the most dependent on private vehicles.

Portland's transportation hierarchy for people movement.

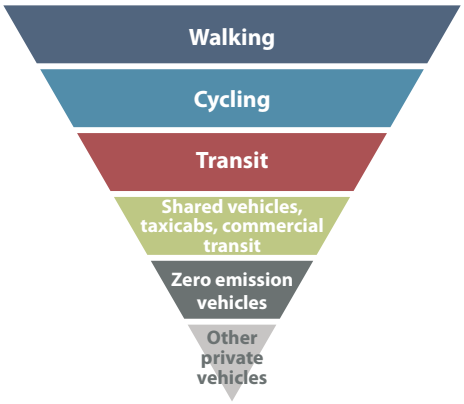


Figure 1: Portland prioritizes transportation options that reduce congestion and carbon emissions. (Source: Comprehensive Plan Policy 9.6)

In the future, significantly more people will need to travel to work and school by taking transit or biking.

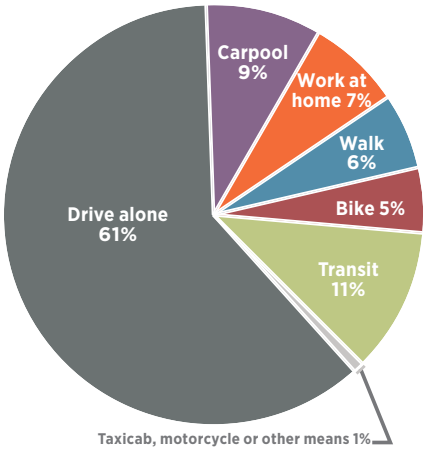


Figure 2: 2012 work commute mode share for Multnomah County (Source: American Community Survey)

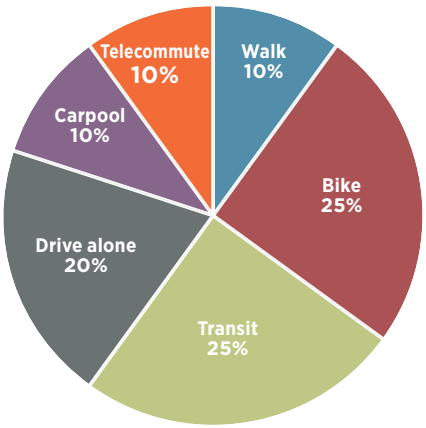
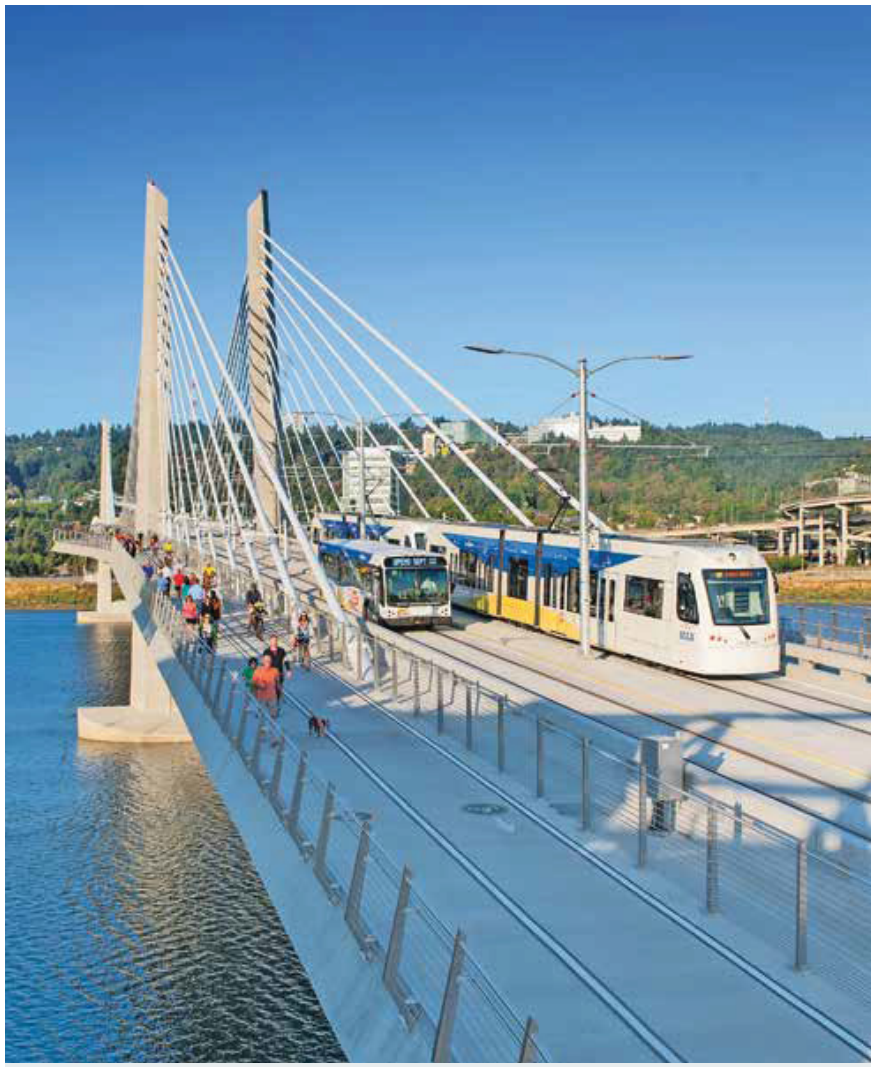


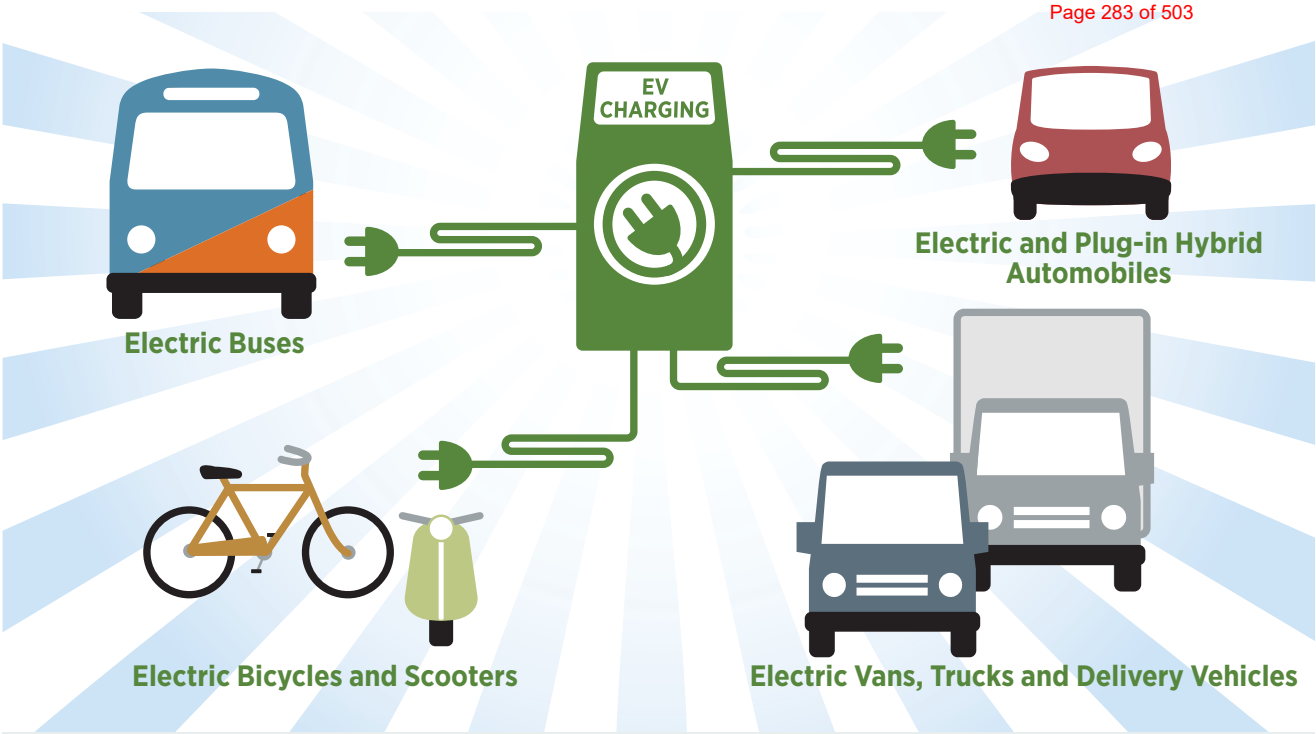
Figure 3: 2030 target work commute mode share for Multnomah County.

Portland's Climate Action Plan also includes goals to decrease the Portland's transportation-related carbon emissions 25 percent below 1990 levels by 2020, 40 percent by 2030 and 80 percent by 2050. To reach those goals, the current commute mode split will need to shift toward walking, bicycling and public transit, and the number of people commuting in single occupancy vehicles will need to decrease from 59 percent to 20 percent by 2030 (see Figures 2 and 3).

A growing proportion of the vehicles that remain on the road in 2030, including public transit and commercial vehicles, will need to be powered by electricity. Specifically, it is estimated that 10 to 15 percent of all non-commercial vehicle miles traveled on Portland's roads in 2030 will need to be in electric vehicles to achieve Portland's broader carbon emission goals. This translates into an estimated 50,000 electric vehicles in the metro area, based on average per capita vehicle miles traveled.



Tilikum Crossing: Bridge of the People, the largest car-free bridge in the United States, was completed in 2015. As the latest addition to our cityscape, Tilikum Crossing carries two of Portland's electric transit choices, the Portland Streetcar and the MAX Orange Light Rail Train, as well as TriMet buses, cyclists and pedestrians.



For the purpose of this strategy the term electric vehicle includes: electric bikes (e-bikes), electric scooters (e-scooters), and electric and plug-in hybrid cars, trucks, buses and freight vehicles.

Portland's first electric vehicle strategy, *Electric Vehicles: The Portland Way*, was developed in 2010 to prepare for the launch of the first widely available electric passenger vehicles. Almost seven years have passed and the electric vehicle market landscape has changed significantly -- for example, more than 25 electric vehicle models are available for purchase today, and many more options with significantly longer range are expected in the next few years. Similarly, the actions the City needs to prioritize to continue to support and accelerate the transition from gas- and diesel-fueled to electric vehicles has changed since the City's first electric vehicle strategy was adopted. This updated strategy establishes the City's current electric vehicle-related priorities and identifies the actions the City will take before the end of 2020 to further the electrification of the transportation sector.



ELECTRIC VEHICLES FOR ALL









The City is committed to creating mobility solutions that are equitable and empowering. Low-income populations and communities of color suffer disproportionately from vehicle-related air pollution, often drive less fuel efficient vehicles, tend to have longer commutes and spend a higher proportion of their income on fuel and transportation costs (PolicyLink/ Prevention Institute/Convergence Partnership, 2009). Improving access to affordable transportation options is critical to improving economic opportunity, wealth building and upward mobility. Electric vehicles offer many opportunities to benefit under-served communities as Portlanders transition from fossil fuels to low-carbon transportation.

Many people hear the words *electric vehicle* and *expensive* immediately comes to mind. This association contributes to the perception that electric vehicles are only accessible to wealthy people. In reality, the two-dozen electric vehicle models available on the market have diverse price and size options. Changing the perception of electric vehicles from expensive to accessible to all income levels will help bring the benefits of cleaner, lower-cost transportation to more households, as well as accelerate the transition away from fossil fuels. People of color are expected to be the majority in the U.S. by 2044 (National Equity Atlas, 2016). This increased buying power makes people of color an important segment for increasing electric vehicle adoption numbers (The Greenlining Institute, 2016). This strategy includes actions to increase access to electric vehicles and charging infrastructure for low-income populations and communities of color.

In Portland, many low-income people and communities of color live in multi-unit dwellings, such as apartment buildings. To increase access to viable electric vehicle options for these communities, charging infrastructure must be available. To begin addressing this barrier the City will explore policy options to require new buildings, especially apartments and condominiums, to be built with the necessary conduits and electrical capacity to enable cost effective installation of charging infrastructure.

Priority Electric Vehicle Charging Areas

The City prioritizes charging infrastructure in areas of Portland that have:

- Fewer existing public charging stations.
- Limited access to frequent transit and bike routes.
- Higher proportions of multifamily housing and garage-free homes.
- Large businesses with employees commuting long distances.
- Residents with higher average vehicle miles traveled.
- Destinations (recreation sites, event venues, etc.) people tend to travel longer distances to access.



ELECTRIC VEHICLE STRATEGY: 2020 GOALS

This Electric Vehicle strategy seeks to accelerate the transition to electric vehicles, including e-bikes, to achieve the people movement hierarchy (see Figure 1, page 1), and mode share and vehicle miles traveled goals of Portland's Climate Action Plan, Comprehensive Plan and Transportation System Plan. To that end, the City seeks to accomplish the following goals by the end of 2020:

- Replace at least 10,000 gas- or diesel-powered vehicles with electric vehicles in Multnomah County.
- Increase access to electric vehicle charging infrastructure by doubling the number of Level 2 and DC Fast Chargers available to the public.
- Increase access to affordable electric vehicle transportation options for low-income populations and communities of color.
- Maximize the air quality and cost savings benefits of electric vehicles for low-income populations and communities of color.
- Add 60 electric vehicles to the City's sedan fleet to increase the percentage of electric vehicles from 20 to 30 percent. Seek options to electrify other classes of vehicles in the City's fleet.
- Prioritize the electrification of shared use vehicles, bikes and buses to reduce the need for personal vehicle ownership.
- Encourage the electrification of automated vehicles to improve safety and mobility options for people who don't drive.



ELECTRIC VEHICLE STRATEGY: 2020 ACTIONS

This Electric Vehicle Strategy identifies nearly 50 actions to be completed or significantly underway by the end of 2020. To draft this strategy, City staff received input from Portland's transit agency, utilities, environmental organizations, staff from West Coast cities, the State of Oregon, Portland State University representatives, low-income Portlanders and local electric vehicle advocates and stakeholders. These groups helped to identify the near-term actions most likely to result in accelerating the transition from gas-powered to electric vehicles (EV). Going forward, the City will continue to work with interested parties and community-based organizations, and will develop a cross-bureau group to facilitate collaboration and implementation of the actions in this plan.

Reading the table of actions

This symbol appearing in the first column denotes actions where the City of Portland is a direct implementer of the action, versus actions where the City plays a supporting role.

The lead bureau for each action appears in **bold** text supporting bureaus are shown in regular text.

Bureau acronyms:

BPS – Bureau of Planning and Sustainability
BES– Bureau of Environmental Services
CBO – City Budget Office
PDC – Portland Development Commission
BDS – Bureau of Development Services
BIBS – Bureau of Information Business Systems
PBOT – Portland Bureau of Transportation
PHB – Portland Housing Bureau

Charging Infrastructure

Owning an electric vehicle is not practical without convenient, reliable access to charging. To support the growth of electric vehicles, Portland needs to have a sufficient charging infrastructure system. Providing Portlanders with a robust and reliable charging network at home, work and in public places will reduce range anxiety (the fear of running out of electricity on the road), provide access to emergency charging and enable longer trips.

Most electric vehicle drivers charge their vehicles at home (National Research Council of National Academies of Sciences, 2015), but this can be difficult for people who rent their homes, do not have a garage or live in multifamily housing. Accessing charging from multifamily residences can be especially difficult due to the complexities of negotiating costs, installation logistics and liability issues with the landlord or site host. This Electric Vehicle Strategy includes actions to increase access to charging in buildings, parking facilities and public places. The City will explore the development of EV-ready requirements for new building construction, develop clear policies and procedures to enable publicly accessible charging and work with partners to install clusters of electric vehicle charging stations in strategic areas around Portland.

	CHARGING INFRASTRUCTURE ACTIONS: BUILDINGS	LEAD BUREAU
⚡	**1. EV-Ready Multifamily and Commercial Buildings –** Explore electric vehicle (EV) parking and charging infrastructure requirements in new multi-family and commercial construction projects that include parking.	**BPS,** BDS
⚡	**2. EV-Ready for Affordable Housing –** Incorporate EV-ready provisions in the City's green building policy for affordable housing.	**PHB,** BPS
⚡	**3. Funding for EV-Ready Affordable Housing –** Seek funding to enable affordable housing projects that have parking to be EV-ready with, at a minimum, the necessary electrical capacity and conduit to enable EV chargers.	**PHB,** BPS
⚡	**4. EV-Ready for PDC-Supported Projects –** Develop EV-ready provisions for construction projects that trigger the Portland Development Commission Green Building Policy.	**PDC**
⚡	**5. Funding for City Fleet Chargers –** Develop a funding mechanism to address the upfront costs for new EV chargers for City vehicles in City-owned or -managed buildings.	**CBO,** BIBS, BPS
⚡	**6. EV-Ready and Retrofits for City Buildings –** Partner with community partners and private industry to develop a strategy to retrofit strategic existing City-owned buildings and facilities with EV chargers. Consider EV-ready construction requirements for new City buildings or major renovation projects that have parking.	**BIBS,** all bureaus
	7. Technical Assistance for Chargers – Work with utility and community partners to provide technical assistance to building managers and homeowners to install EV chargers, especially in existing buildings.	**BPS**
	8. Engage Builders and Architects – Work with partners to develop EV charging outreach and education materials and programs targeted to builders and architects.	**BPS**

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CHARGING INFRASTRUCTURE ACTIONS: PUBLIC	LEAD BUREAU
9. Right-of-Way Charging – Develop public right of way (ROW) priorities and policies to enable installation of publicly accessible EV chargers in strategic locations, and provide clear guidelines for public and private parties. Establish a policy for addressing abandoned EV chargers in the right of way.	**PBOT**
10. EV-Ready and Retrofits for Parking Facilities – Explore the development of EV parking and charging infrastructure requirements in new and existing (public and private) parking facilities.	**BPS,** BDS, PBOT
11. Public Awareness – Work with community partners to increase the public's awareness of EV chargers through improved signage, marketing and outreach.	**BPS,** PBOT
12. City Parking Facilities – Work to increase the utilization of existing EV chargers in City-owned and/or -managed parking lots and garages (e.g., SmartPark Garages).	**PBOT**
13. E-Bike Parking – Explore opportunities to integrate e-bike charging infrastructure into the City's bike parking Title 33 code update.	**PBOT**
14. Major Public Works Projects – Identify opportunities to install EV chargers and/or conduits in conjunction with major public works projects in strategic locations and in streetscape planning.	**BPS, PBOT,** Water, BES
15. Public Charging on Private Property – Establish policies and processes that make it easier to provide publicly accessible charging on private property and encourage private property owners to do so.	**PBOT,** BPS, BDS
16. EV Signage and Parking Standards – Develop policies and standards for EV signage and parking, including parking rates, time limits and "parking while charging" restrictions.	**PBOT**
17. City-Owned and Maintained Chargers – Explore City ownership and maintenance of publicly accessible EV chargers, particularly in under-served areas.	**PBOT,** BPS
18. Streetlight Integration – Explore the integration of electric vehicle charging with streetlights in Portland.	**PBOT**
19. EV Charging Hubs – Work with public and private partners to support the installation of multi-modal EV charging pods similar to Electric Avenue around the metro area. Include e-bike charging infrastructure in these electric mobility hubs.	**PBOT,** BPS
20. Priority Areas for EV Charging – Work with community partners and utilities to install publicly accessible EV chargers in strategic locations. Prioritize EV chargers that serve low-income residences, including multi-family, single-family rental housing and garage-free homes.	**BPS,** PBOT
21. Utility Transportation Electrification Plans – Partner with local utilities to finalize and implement their transportation electrification plans.	**BPS,** PBOT
22. Park and Ride Charging – Encourage TriMet to continue installing and maintaining EV chargers at Park & Ride and Bike & Ride lots.	**PBOT**
23. Public Charging Partnerships – Work with utilities, Neighborhood Prosperity Initiative (NPI) districts and Main Street areas to install publicly accessible EV chargers.	**PDC,** BPS

Fleets

Electrifying fleet vehicles offers a key opportunity to reduce carbon emissions, improve air quality, decrease long-term maintenance and operating costs, and increase electric vehicle visibility for the general public. Many fleet managers are eager to take advantage of these benefits but also face barriers:

- Unlike gas-powered vehicles, a large portion of the costs associated with fueling electric vehicles need to be paid upfront via the installation of charging infrastructure. This contributes to increased upfront costs of buying an electric vehicle compared to a gas-powered vehicle.
- Many electric vehicles have a purchase price premium and government fleets are not able to take advantage of tax credits or rebates to help offset those increased costs.
- Medium- and heavy-duty electric vehicle models are expensive and only a few are currently available on the market.
- Many fleet managers, drivers and maintenance staff have limited awareness of electric vehicles.

To address these barriers and increase fleet electrification the City will: a) seek funding for charging infrastructure in City-owned buildings (see action A6), b) support TriMet's efforts to electrify city buses, c) encourage the electrification of medium- and heavy-duty freight vehicles, and d) partner with stakeholders to electrify car-share, taxi and bike-share fleets. Additionally, Portland will lead by example and add at least 60 additional electric vehicles to the City's sedan fleet to increase the percentage of electric vehicles from 20 to 30 percent by 2020.

	FLEET ACTIONS – TRANSIT	LEAD BUREAU
	24. Bus Electrification – Support TriMet's efforts to transition to electric buses and encourage the electrification of other people transport fleets (e.g., tour vehicles, taxis) in Portland.	**BPS**
	25. Air Quality – Work with TriMet to use new electric buses along routes through portions of the city where air quality issues have the largest impact.	**BPS**
	26. Integrated Transit and Shared EV Mobility – Explore options to integrate public transit and shared EV mobility options such as e-bikes, e-scooters and EV car-share vehicles.	**BPS,** PBOT
	27. E-Bikes on Transit Vehicles – Encourage TriMet to continue accommodating e-bikes on exterior bus bike racks and on board rail vehicles in designated areas.	**PBOT,** BPS
	FLEET ACTIONS – CITY FLEET	**LEAD BUREAU**
⚡	**28. Clean Fuels Credits –** Become a credit generator in the Oregon Clean Fuels Program for City-owned chargers. Adopt a policy to ensure that resources received from these types of credits are spent on EV-related projects.	**BPS,** BIBS
⚡	**29. City EV Purchasing –** Establish "electric first" guidelines directing City bureaus to purchase all-electric vehicles when the vehicle usage is compatible with available electric light-duty vehicles.	**City Fleet,** BPS
⚡	**30. City Employee Workplace Charging –** Explore workplace charging for City employees working in and parking personal vehicles at City-owned and -managed facilities. Encourage City staff who must drive to work to drive EVs.	**BPS,** BIBS, BHR
	FLEET ACTIONS – FREIGHT	**LEAD BUREAU**
	31. Electrifying Delivery Vehicles – Support the electrification of medium- and heavy-duty vehicles used in Portland for the delivery of goods and materials.	**PBOT**
	32. Pilot Projects – Continue to explore urban consolidation centers and support pilot projects to electrify delivery vehicles.	**PBOT,** BPS

Personal Vehicles and Shared Mobility

Key barriers to electric vehicle uptake include upfront costs, accessibility and awareness. The life-cycle costs of electric vehicles are often lower than conventional gas-powered cars, making them a promising strategy to reduce transportation costs in car-dependent areas. The upfront cost of new electric vehicles can easily be $10,000 higher, however. Most consumers need financial subsidies, such as tax credits, to overcome this cost difference. This is especially true for low-income people who often have more limited access to financing options. Used electric vehicles tend to cost less than comparable gas-powered cars and may be a great way to bring electric vehicles to low-income populations at a lower cost, as well as provide a second life for electric vehicles. This strategy includes actions to: a) increase access to used electric vehicles, b) encourage State financial incentives for electric vehicle purchases, and c) research financing options for individuals with no or damaged credit.

Another barrier to electric vehicle uptake is the lack of awareness about the performance and functionality of electric vehicles. Many Portlanders are also unfamiliar with the diversity of available models, electric vehicle purchasing incentives, or the environmental and economic benefits of electric vehicles. This strategy includes several electric vehicle-related education and outreach actions, such as supporting Drive Oregon's Northwest EV Showcase – an electric vehicle marketing and outreach initiative with a downtown Portland showroom funded by the US Department of Energy.

This strategy also calls for a community mobility assessment to ensure that electric vehicle solutions meet the needs of low-income people and communities of color. Building on the findings from that assessment, the City will work with partners to provide outreach and education programs that are targeted to under-served communities. Opportunities include: a) pop-up Northwest EV Showcase locations in East Portland, b) used electric vehicles bulk purchase programs, and c) electric vehicle car-share and e-bike pilot programs that serve these communities.

Car-share and bike-share programs offer a unique avenue for Portlanders to become familiar with electric vehicles, while at the same time reducing carbon emissions and helping to eliminate the need for personal car ownership. The City will work with partners to encourage the electrification of car-share programs (e.g., ReachNow) and ride-sourcing companies (e.g., Uber and Lyft), and seek funding to partially electrify the BIKETOWN bike-share system.

	PERSONAL VEHICLES AND SHARED MOBILITY ACTIONS	LEAD BUREAU
⚡	**33. BIKETOWN Electrification –** Continue to explore opportunities to partially electrify Portland's BIKETOWN bike-share program.	**PBOT**
	34. EV Showcase – Support Drive Oregon's Northwest EV Showcase initiative, including helping to market the EV group purchase program, seeking funding to support the initiative and collaborating to develop the physical space.	**BPS**
	35. Mobility Needs Assessment – Work with partners to leverage existing community mobility needs assessments and conduct additional engagement as necessary to ensure that EV solutions meet the needs of low-income populations and communities of color.	**BPS**
	36. EV Incentives and Pilot Projects – Work with partners to develop programs and incentives to reduce the barriers to EVs for low-income populations, communities of color and individuals with no or damaged credit, such as vouchers, instant rebates and EV car-share and e-bike pilot projects.	**BPS,** PBOT, PHB
	37. Purchasing Process Assistance – Support community partners such as Drive Oregon to help low-income Portlanders navigate the incentives, financing and decision-making process of buying or leasing new or used EVs.	**BPS**
	38. Private for Hire Vehicle Electrification – Encourage taxi, car-share and ride-sourcing companies (such as Uber and Lyft) to utilize EVs in their fleets. Explore incentives to increase shared electric mobility options, particularly in areas with limited transportation options.	**PBOT,** BPS

Innovation and Information

Electric vehicles continue to change and improve as new innovations are introduced into the market. Over the next five years, the distance that can be driven per charge (range) will increase, purchase prices will decrease and more used electric vehicles will be available. This strategy includes actions to research and track new technology, electric vehicle car sales, demographics, vehicle-miles-traveled and commute trends to inform investment and policy priorities for the electrification of the transportation system.

	INNOVATION AND INFORMATION ACTIONS	LEAD BUREAU
⚡	**39. Investment and Policy Decisions –** Develop and utilize the best available information (e.g., charger location, EV car sales, demographics, vehicle-miles-traveled) to inform investment and policy priorities for the electrification of the transportation system.	**BPS,** PBOT
	40. Data Tracking and Sharing – Work with Oregon's Department of Environmental Quality and Portland State University to track and share data on the number of zero emission vehicles registered in Oregon and Multnomah County.	**BPS**
	41. Smart Cities – Partner with public and private stakeholders to integrate EVs into Smart Cities projects.	**PBOT, BPS**
	42. Autonomous Vehicles – Seek opportunities to pilot electric autonomous vehicles (AVs).	**PBOT, BPS**

Economic Development

The electric vehicle industry provides opportunities to contribute to Portland's economy through job creation and local business development. This strategy includes actions to: a) connect local electric vehicle manufacturers, suppliers and customers to large regional and national companies, b) provide electric vehicle-related employment opportunities for underemployed or unemployed residents, and c) support Portland's leadership in clean technologies.

	ECONOMIC DEVELOPMENT ACTIONS	LEAD BUREAU
⚡	**43. Employment Opportunities –** Build resources to connect small- to medium-sized EV manufacturers with employment opportunities for qualified underemployed and unemployed residents.	**PDC**
⚡	**44. Opportunities for People of Color –** Track effectiveness of EV economic development efforts in extending business and employment opportunities to people of color.	**PDC**
⚡	**45. Marketing –** Continue to market Portland's leadership in clean technologies utilizing Portland's "We Build Green Cities" brand to drive EV business development, relocation and expansion opportunities.	**PDC**
⚡	**46. Business Development Assistance –** Prioritize business development visits and technical assistance to EV-related companies with middle-wage employment opportunities.	**PDC**
⚡	**47. Business Opportunities –** Organize supply-chain and investor matchmaking events and trade show participation opportunities for existing EV firms to increase financing, sales and export opportunities.	**PDC**
	48. EV Sector Networking – Work with Drive Oregon, TriMet, Metro and Greater Portland Inc. (GPI) to increase networking among local EV manufacturers and customers.	**PDC**
	49. EV Conferences – Support efforts to bring major EV conferences to Portland.	**PDC,** BPS

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Portland Clean Energy Community Benefits Fund (PCEF)

About the Portland Clean Energy Community Benefits Fund



Purpose, goals, timeline, and frequently asked questions about PCEF.

On this page

- Purpose
- Timeline
- Background
- FAQs

Purpose

The Portland Clean Energy Community Benefits Fund (PCEF) was created by a local ballot measure (#26-201) that is anticipated to bring $54 - $71 million in new revenue for green jobs and healthy homes for all Portlanders. The ballot measure passed with 65 percent of voters in support, making it Oregon's first-ever environmental initiative created and led by communities of color.

In the face of climate change and federal inaction, PCEF offers a community-led vision, grounded in justice and equity, that builds citywide resilience and opportunity. The initiative ensures that the City of Portland's Climate Action Plan is implemented in a manner that supports social, economic and environmental benefits for all Portlanders, including the development of a diverse and well-trained workforce and contractor pool in the field of clean energy.

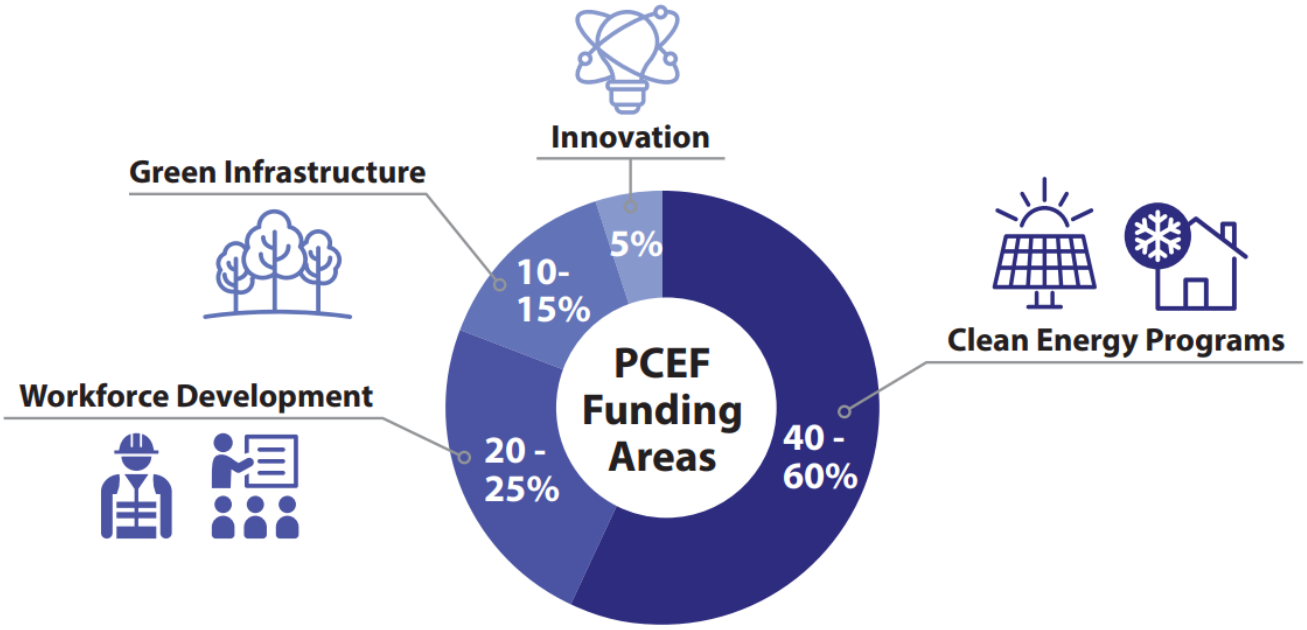
For information on **tax filings and revenue collections** of the Clean Energy Surcharge (Portland City Code Section 7.02, Business License Law), please visit the City's Revenue Division's website.

Funding a clean energy future for underserved communities

Climate change has a disproportionate impact on communities of color and low-income residents. The Fund prioritizes these communities living on the "frontlines" of climate change with clean energy funding, job training programs and green infrastructure projects. This will help ensure they are prepared for a changing climate as we move toward our goal of an 80-percent reduction in carbon emissions and transitioning to 100-percent renewable energy in Portland.

The program is funded through a 1% surcharge on the retail sales of certain large retailers within Portland. The Fund finances programs that meet the following priorities:

- Clean energy projects, including renewable energy and energy efficiency projects
- Regenerative agriculture and green infrastructure projects.
- Clean energy jobs training.
- Programs that both reduce greenhouse gases and promote economic, social and environmental benefits.



All PCEF projects prioritize Portland's underserved populations and neighborhoods, including communities of color and low-income residents. Examples of community benefits include solar panels and energy efficiency upgrades on multifamily housing, new workforce training programs in clean energy manufacturing and installation, shared food gardens, and increased tree canopy in heavily concreted neighborhoods.

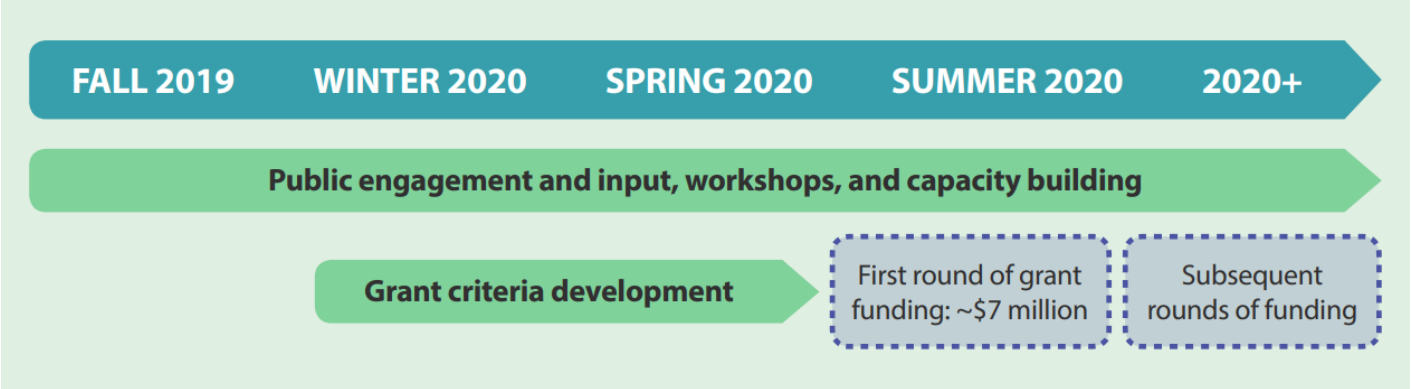
Community benefits committee and City staffing

The Fund is overseen by a nine-member Portland Clean Energy Community Benefits Committee made up of experts and community members. The PCEF Committee will make funding recommendations to the Mayor and City Council and evaluate the effectiveness of the Fund achieving the goals of the initiative.

Per the initiative, membership of this committee must reflect the racial, ethnic and economic diversity of the City of Portland; include at least two residents living east of 82nd Avenue; and possess significant experience in the types of projects supported by the Fund. Project staff are housed at the City's Bureau of Planning and Sustainability.

Timeline

The community coalition that created and led the ballot measure is working together with the City of Portland to implement a successful and standard-setting grant program that faithfully reflects the will of Portland voters. Program design and development is expected to take 18 months, with a goal of launching the Fund and beginning grant awards in July 2020.



Background

Supporters of the ballot measure

The ballot measure campaign was supported by over 200 community organizations, major affordable housing and homelessness service providers and advocates, Business for a Better Portland, the Oregon Food Bank, 16 neighborhood associations, the faith community and elected officials.

The Steering Committee of the community coalition, who developed the measure and are now working with the City to implement the Fund, includes the NAACP Portland Branch, Native American Youth and Family Center, Coalition of Communities of Color, the Asian Pacific American Network of Oregon (APANO), OPAL Environmental Justice Oregon, Verde, 350 PDX, Oregon Physicians for Social Responsibility, Audubon Society of Portland, Columbia Riverkeeper and the Oregon Chapter of the Sierra Club.

FAQs

I noticed a 1% charge on grocery items. Why is this added to my bill?

After Portlanders voted to approve the Portland Clean Energy Community Benefits Initiative, a 1% surcharge ("Clean Energy Surcharge") was imposed on large retailers with $1 billion in national revenue and $500,000 in revenue in Portland. The Clean Energy Surcharge is a surcharge on large retailers and is not a sales tax imposed on customers or consumers.

These large retailers with $1 billion in national revenue and $500,000 in Portland, can choose to separately itemize its obligation to pay the surcharge on its receipts or invoices to customers or consumers. In this case, you may see an increased amount on your receipt.

How is the surcharge applied to groceries?

The 1% surcharge does not apply to certain basic goods and services such as groceries that qualify for purchase under the U.S. Department of Agriculture (USDA) Supplemental Nutritional Assistance Program (SNAP) and qualified medicines or drugs.

Qualified medicines or drugs that are exempt from the surcharge include any medicine, drugs or medical devices that are regulated by the U.S. Food and Drug Administration (FDA) as a medicine or drug. Examples include over-the-counter drugs, prescription drugs, certain pet drugs and medical devices.

Examples of groceries that are not subject to the surcharge based on USDA SNAP guidance include:

- Fruits and vegetables
- Meat, poultry and fish
- Dairy products
- Breads and cereals
- Other foods such as snack foods and non-alcoholic beverages
- Seeds and plants, which produce food for the household to eat

Examples of groceries that are subject to the surcharge include:

- Beer, wine, liquor, cigarettes or tobacco
- Vitamins and supplements (if an item has a Supplement Facts label, it is considered a supplement and is not eligible for SNAP purchase)
- Live animals (except shellfish, fish removed from water, and animals slaughtered prior to pick-up from the store)
- Prepared foods fit for immediate consumption
- Hot foods
- Any nonfood items such as:
    - Pet foods
    - Cleaning supplies, paper products and other household supplies
    - Hygiene items, cosmetics

Is my business subject to the 1% surcharge?

The Clean Energy Surcharge applies to large retailers with annual tax-year total gross revenue from retail sales of $1 billion or more in the U.S. and $500,000 or more within the City of Portland, excluding utilities, co-ops, credit unions, as well as sales of qualified groceries, medicine or drugs and health care services. For more information on the definition of a “large retailer,” tax filings and revenue collections of the Clean Energy Surcharge (Amendments to the Portland City Code Section 7.02, Business License Law), please visit the City’s Revenue Division’s website.

How much will the surcharge raise?

The City of Portland's Revenue Division currently estimates annual tax receipts of $54 million to $71 million. Because of timing differences between tax and fiscal years and an option for taxpayers to extend their filing deadlines for an additional six months, the Revenue Division will not have a final accounting of first year (tax year 2019) revenues until late 2020/early 2021. Actual collections will vary based on economic conditions, the proportion of sales that are classified by taxpayers as retail or wholesale, and the definition of taxpayers and their tax liability.

Where will the money generated through the surcharge go?

Revenues from the Clean Energy Surcharge on large retailers will be deposited into the Portland Clean Energy Community Benefits Fund and disbursed as grants for programs and projects that meet the requirements and priorities of the ballot measure. Nonprofit organizations, including community centers and rental housing providers, will be eligible to apply either solely or in partnership with other nonprofit entities, government entities or for-profit businesses.

How do I apply for a PCEF grant?

Qualified nonprofit organizations will be eligible to apply for grants. Applicants are encouraged to partner with other nonprofits, governmental organizations, and for-profit businesses in developing projects and program proposals. More details about project eligibility will be available and released in Spring 2020 as grant criteria are developed.

How can I be sure the dollars will be spent wisely?

A nine-person oversight committee of experts and community members — modeled after the successful Portland Children's Levy — will recommend which projects get funded and ensure accountability. The Committee's funding recommendations will be approved by City Council in a transparent and public process before funds are awarded. The Committee will also evaluate and report on the effectiveness of the funded programs in meeting their stated objectives and the overall goals of the initiative. In addition, the Fund will be subject to an annual financial audit and a performance audit every two years.

How will the Fund help people with low incomes?

The Fund will directly benefit people with low incomes. It will prioritize creating family-wage jobs, healthier homes and reduced utility costs for underserved communities. Landlords who agree to improve properties through the Fund's energy efficiency

upgrade programs will be required to limit rent increases. Robust contracting standards will also ensure that historically disadvantaged people are trained, and minority- and women-owned businesses are performing the work.

How is this different from the work of Energy Trust of Oregon and State of Oregon clean energy programs?

The Portland Clean Energy Community Benefits Fund is unique because it supports community-driven clean energy solutions and jobs to help Portlanders that need them the most. It also provides resources for families that do not have the disposable income to qualify for energy efficiency rebates and tax credits.

Energy Trust of Oregon provides support and incentives for residential energy efficiency and solar energy to the maximum level governed by the Oregon Public Utilities Commission, whose mission does not include climate change or social justice. The Portland Clean Energy Community Benefits Fund will add much-needed dollars on top of Energy Trust incentives. In addition, the Fund will provide a stable source of long-term funding for energy efficiency projects since the Oregon Department of Energy's Residential Energy Tax Credit (RETC) program expired in 2017.

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Daniel Serres

#62555 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Please see the attached exhibits to the comments of Columbia Riverkeeper, Center for Sustainable Economy, Oregon Physicians for Social Responsibility, Portland Audubon Society, 350PDX, Friends of the Columbia Gorge, Willamette Riverkeeper, Climate Action Coalition, Northwest Environmental Defense Center, Oregon Conservancy Foundation, and Human Access Project.

Testimony is presented without formatting.

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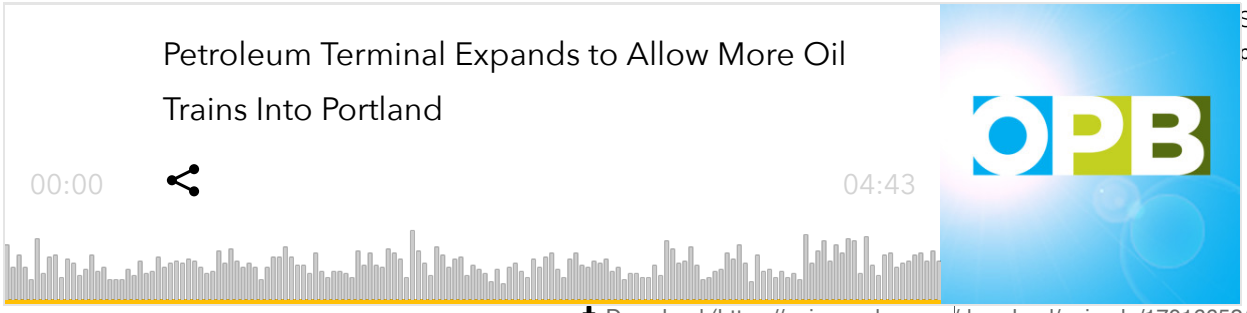
Petroleum Terminal Expands To Allow More Oil Trains Into Portland

by **Tony Schick** (https://www.opb.org/contributor/tony-schick/) Follow () OPB Feb. 7, 2019 8:15 p.m. | Updated: Feb. 11, 2019 8:10 p.m. | Portland, Ore.



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A Portland petroleum terminal is significantly expanding its capacity to unload rail cars, a move that sets the stage to more than double the number of oil trains along the Columbia and Willamette rivers into Oregon's biggest city, OPB has learned.

Related Content

Zenith Energy, sandwiched between the river and Forest Park in the city's northwest industrial district, began receiving train shipments of crude from Canada's oil sands last year (https://www.opb.org/news/article/crude-oil-rail-portland-oregon-canada-ship-china/), records show, which it stored in tanks and later pumped onto ocean-going vessels.

Zenith's outpost in Portland now has visible construction underway on a project to build three new rail platforms that will nearly quadruple the site's previous capacity for offloading oil from tank cars, according to building plans filed with the City of Portland in 2014, which the city's Bureau of Development Services confirmed Wednesday.



()

Construction continues at the Zenith Terminals site in Northwest Portland in early February, 2019.



(https://www.opb.org/news/series/oil-trains/union-pacific-to-restart-oil-trains-columbia-gorge/)

Union Pacific To Restart Running Oil Trains Through Columbia Gorge (https://www.opb.org/news/series/oil-trains/union-pacific-to-restart-oil-trains-columbia-gorge/)

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Tony Schick/OPB

When operational, a terminal with such a capacity could handle multiple oil trains per week — a sizeable increase over Zenith's 2018 operations. According to Oregon Department of Environmental Quality estimates, the site handled fewer than 30 full oil trains throughout last year.

Public Resistance To Oil Projects

The site's expansion of crude-by-rail infrastructure comes despite much public resistance in the Northwest for new oil projects. That includes a vote by Portland's City Council in 2016 (https://www.portlandoregon.gov/citycode/article/557499) to oppose any new fossil fuel infrastructure. That same year the Northwest experienced firsthand one of the oil-train mishaps (https://www.opb.org/news/series/oil-trains/oil-train-bills-in-oregon-legislature/)that have occurred across North America as more and more oil has been moved by what critics have dubbed "rolling pipelines" and "bombs trains."



(https://www.opb.org/support/partners/)

Public records and interviews with state officials indicate those trains would carry a kind of heavy oil that presents a new risk for Northwest communities and rivers, and one the state's emergency spill responders say they are ill-equipped to contain if it spills.

RELATED COVERAGE



(https://www.opb.org/news/article/vancouver-washington-oil-terminal-grassroots-

"It greatly complicates the spill. It's going to take a lot more money and time and cause a lot more harm to the environment probably," said Scott Smith, who regulates the Zenith terminal's oil spill preparedness as part of the Oregon DEQ emergency response program.

He said the increased oil-by-rail traffic creates a risk in Portland of an environmental disaster like the one in Michigan in 2010, when heavy Canadian oil spilled from a pipeline into the Kalamazoo River. It took more than five years (https://www.mlive.com/news/index.ssf/2016/07/kalamazoo_river_oil_spill_time.htm and $1 billion to clean up.

"It's really among the most challenging spills we have out there, and if it was a large spill, it would cause quite a bit of damage," Smith said.

Zenith declined to comment on how the project would affect its ability to unload more crude oil, saying only that the project would allow it to fit additional railcars on site and minimize the need to shuffle cars around.

community-oil-companies/)

How A Grassroots Effort In Vancouver Fought Big Oil — And Won (https://www.opb.org/news/article/vanco washington-oil-terminal-grassroots-community-oil-companies/)

"The multi-million-dollar project will provide an even safer and more efficient operation," Megan Mastal, a public-relations representative for Zenith Energy, said in an emailed statement.

The company also declined to say what products it would handle. Mastal disputed that Zenith would be handling what's known as bitumen, which is a type of petroleum extracted from Canada's oil sands. It is thick like peanut butter and often diluted with other petroleum products before it is transported.

"We are not handling bitumen crude through our terminal," Mastal said.

Records show the facility did handle diluted bitumen in 2018, and Oregon's Department of Environmental Quality said it anticipates the facility will be handling heavy crude from Canada's oil sands.

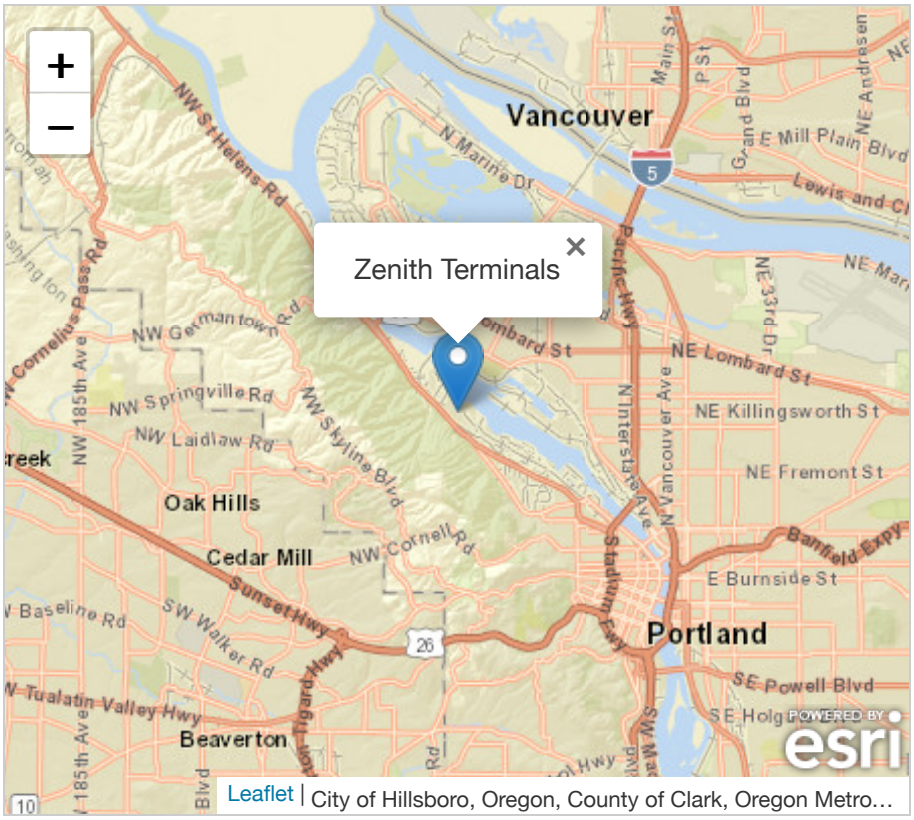
Recent site inspections from Oregon's Department of Transportation found railcars with the placard UN 1267 (Petroleum Crude Oil) on the tracks outside the Zenith facility, and that the cars were from Canada. Photographs of cars at the terminal from earlier this month also show cars with the 1267 placard, along with a placard warning of toxic inhalation.

From Asphalt To Canadian Crude

Five years ago, the site was an asphalt plant in limited operation when a company called Arc Logistics Partners LP, later acquired by Zenith Energy, purchased it and

shifted operations to crude (https://www.opb.org/news/article/crude-oil-terminal-planned-in-nw-portland/). That transition coincided with the North American oil boom and subsequent spike in oil moving by rail. While those shipments have declined since their peak nationally, data from the Energy Information Administration show oil by rail has reached its highest level in three years (https://twitter.com/tatecurtis/status/1079797472812249088), driven largely by Canadian oil.

The Zenith site spans 39 acres with a storage capacity of nearly 1.5 million barrels and access to a nearby dock. Trains can reach it crossing the Willamette over the BNSF Railway bridge south of St. Johns or on Union Pacific tracks across the Steel Bridge.



Its main constraint has been rail capacity. When construction began, the terminal had space to unload 12 cars at a time, records show.

Plans for the facility upgrade of Arc Terminals filed in 2014 with the City of Portland depict a system capable of unloading 44 cars (https://www.documentcloud.org/documents/5732053-Eggers4700BPlans.html).

The company's storage tanks are not getting any larger, but unloading more train cars simultaneously can expedite the process of transferring oil to ships, bound for export or other domestic markets.

Mastal said the work includes new emissions-control technology, which is required by regulations, as well as a state-of-the-art fire suppression system and barrier along the street. The Portland Bureau of Development Services confirmed the work includes numerous safety upgrades, many of which are now required by code.

Mastal said the terminal employs 18 people full time, all of whom are "trained and certified to maintain the highest environmental and operational standards."

"Since Zenith purchased the terminal, we have added full-time staff positions. These jobs pay a family wage with benefits," Mastal said. "In addition, the multi-million-dollar construction project uses local vendors and suppliers – currently averaging 125 individuals on site per day – providing significant economic stimulus for the area."

The city issued permits for the work in 2014 (https://www.portlandmaps.com/detail/permit/2014-251964-000-00-CO/3558079_did/?p=R315845), two years before its leaders voted to oppose new fossil fuel infrastructure.

'These Trains Present A Significant Risk'

Eileen Park, spokeswoman for Portland Mayor Ted Wheeler, said the mayor "supports further action to prohibit the construction of new fossil fuel infrastructure like the site in question."

"These trains present a significant risk to Portlanders, most especially those residents close to railroads and routes through the city," Park said. "On a larger scale, the threat of climate change depends on the bold and decisive actions of governments and leaders. The Mayor's administration will not be supportive of any action that threatens the health and well-being of our city's residents or our natural resources and environment."

Mastal said Zenith's Portland terminal meets all local, state and federal standards, including Portland's 2016 ordinance.

"We are committed to delivering safe, reliable, efficient and flexible service to our customers while maintaining the highest environmental and operational safety standards," she said.

Environmentalists say they fear a “rolling pipeline” of trains through Portland.

“To us, it seems like it’s another quiet effort to increase the capacity of that terminal to handle tar sands crude,” said Travis Williams of the Willamette Riverkeeper. “The vast majority of people in the City of Portland don’t want the risk — they don’t want the potential safety risk, the risk to the Willamette River, the risk to air quality in that area.”

Williams said he fears a repeat of the 2016 oil train derailment in Mosier, Oregon, only with a type of oil that is more difficult to contain and in an area like the Willamette, with a dense population and already a problem with existing pollution.

OPB’s Amelia Templeton contributed reporting.

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Crude Oil Terminal Planned In NW Portland

by **Tony Schick** (https://www.opb.org/contributor/tony-schick/) Follow () OPB Feb. 14, 2014 2:15 p.m. | Updated: Feb. 18, 2015 8:28 a.m.



()

A Google Earth image of the Paramount Petroleum asphalt plant, recently sold to a an investment firm and leased to Arc Logistics Partners LP for use as a crude oil terminal.

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PORTLAND — A national fuel storage company has plans to turn an asphalt plant near the Willamette River into a rail and marine terminal for crude oil.

The former Paramount Petroleum plant in Northwest Portland has become part of Arc Logistics Partners LP, which operates four crude oil plants in Alabama and methanol, ethanol and other fuel plants throughout the East Coast and Midwestern United States. Arc Logistics entered into a lease in January with CorEnergy, an infrastructure investment company that purchased the plant for $40 million, according to the company's financial reports. (https://www.documentcloud.org/documents/1018089-arc-logistics-8k-2014-01-14.html)

(https://www.opb.org/support/partners/)

The Arc Logistics website lists the Portland site (http://arcxlp.com/terminal/portland-terminal/) among its terminals and describes it as "capable of receiving, storing, and delivering heavy and light petroleum products," by both rail lines and marine vessels.

The project is the latest of several potential crude oil terminals in the Pacific Northwest, a region receiving unprecedented amounts of oil by rail shipments because of a surge in North American oil production. Currently, Port Westward on the Columbia River near Clatskanie is the only crude oil terminal in Oregon. In Washington, terminals have been proposed in Grays Harbor,

Vancouver and Tacoma, and expansions to accommodate more Bakken crude shipments have been proposed at refineries in Anacortes and near Bellingham.

Arc Logistics, funded by the investment group Lightfoot Capital, became a public company in November. It describes itself as "principally engaged in the terminalling, storage, throughput and transloading of crude oil and petroleum products," listing production of both U.S. and Canadian crude as factors affecting its business.

The Portland site spans 39 acres and has 84 tanks for a total capacity of 1,466,000 barrels — several times that of Port Westward. At one time, the plant also had a refining operation of nearly 12,000 barrels per day. That portion of the plant ceased operation in 2006.

Arc Logistics did not return calls for comment. In a release on the company's website (http://arcxlp.com/arc-logistics-partners-lp-announces-entrance-into-west-coast-terminalling-market/), CEO Vince Cubbage called the Portland terminal an important addition to the company's asset base, supported by a long-term contract with a major oil company: "We expect the Portland Terminal to provide the opportunity for significant incremental growth as additional customers or terminal capabilities are developed," he said.

The shipment of crude oil through the Northwest has raised concerns over safety and environmental health from environmental groups, state agencies and

emergency responders. A dramatic increase in the shipment of oil by rail has included a string of fiery derailments, and federal data show more oil spilled from rail lines in 2013 than in the previous 40 years combined (http://earthfix.info/energy/article/do-999977-percent-of-crude-oil-rail-shipments-reac/).

“It’s a big threat to our communities and to water quality,” Brett VandenHeuvel, executive director of the Columbia Riverkeeper, said. “We’ve seen that these trains carrying Bakken crude have regularly been exploding. A federal safety board said that this Bakken crude should route around urban areas and the thought of putting one in the heart of Portland is a big problem.”

Another environmental consideration raised in the company’s financial report is the Portland Harbor, designated as an Environmental Protection Agency superfund site in 2002 to cleanup uncontrolled hazardous waste. The boundaries of the superfund site are not yet finalized, but if they were to include the facility, its new owner would become a responsible party.

Matt McClincy, the state’s project manager for the Portland Harbor cleanup, said the EPA occasionally includes upland facilities that do not sit directly on the river, but that state evaluations (http://www.deq.state.or.us/Webdocs/Forms/Output/FPController.ashx?SourceId=1281&SourceIdType=11) haven’t indicated it will be included.

"The hope would be that short of unforeseen accidents they wouldn't be a concern for the river," McClincy said.

Arc Terminals, the operating subsidiary of Arc Logistics, runs 17 facilities throughout the country. Federal data (http://echo.epa.gov/?redirect=echo) show one third of those facilities have been found out of compliance with EPA regulations in the past three years, ranging from minor violations to a $101,500 fine in Alabama in 2012. Arc Terminals facilities have been involved in only a handful of small spills, none larger than 200 gallons, according to National Response Center reports (http://www.nrc.uscg.mil/).

Scott Smith, spill contingency planner for the Oregon Department of Environmental Quality, said the agency typically doesn't judge a facility based on its company's performance in other states. The individual plant's past performance, even under a different owner, is much more telling.

The facility opened in 1947, and since then "numerous releases have occurred, resulting in localized impacts to soil and groundwater at the site by petroleum hydrocarbons, volatile organic compounds (" VOCs "), polycyclic aromatic hydrocarbons (" PAHs "), and metals," according to the Arc Logistics report. One of the

plant's largest spills was in 2011, when corrosion caused a spill of nearly 21,000 gallons of Naphtha, a liquid hydrocarbon that petroleum plants use as a solvent and diluent. Paramount Petroleum, which has owned the facility since 2005, had it in limited operation at the time of the purchase, according to DEQ.

> *"It looks like a fixer-upper to me," Smith said of the plant. "A lot of those terminals are very old, and this is one of them. I'll be looking forward to any infrastructure investment that Arc makes in it."*

The lease agreement between Arc Logistics and CorEnergy includes $10 million worth of additional investments to clean, inspect and upgrade the facility's storage and to enhance the terminal's infrastructure.

Correction: *An earlier version of this story understated the capacity of the facility. The correct capacity is 1,466,000 barrels.*

More News

Train with liquefied gas derails, strikes overpass support beam in Portland

Updated Sep 08, 2019;
Posted Sep 07, 2019



Oil tank cars pictured at a rail yard near in Northwest Portland on Saturday, March 30, 2019. Mark Graves/staff

73 379 shares

By The Associated Press

Update: Swan Island traffic could be backed up for months after train slams into vital Going Street bridge

Union Pacific says two locomotives and three tank cars containing liquefied petroleum gas derailed in Portland, striking and cracking a support beam to an overpass providing access to a major industrial area.

The company says there are no injuries and none of the tanks leaked in the derailment that happened at about 9:20 a.m. Saturday. Crews are working to get the locomotives and tank cars back on the tracks.

Portland Bureau of Transportation spokesman Dylan Rivera says North Going Street is closed until city engineers determine how much damage the overpass sustained. It's not clear when the road might reopen.

The road provides access to Swan Island, a major industrial area of the city with many workers.

Rivera says a small private road is being used to access Swan Island.

-- Associated Press

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#62554 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Please see the attached exhibits to the comments of Columbia Riverkeeper, Center for Sustainable Economy, Oregon Physicians for Social Responsibility, Portland Audubon Society, 350PDX, Friends of the Columbia Gorge, Willamette Riverkeeper, Climate Action Coalition, Northwest Environmental Defense Center, Oregon Conservancy Foundation, and Human Access Project.

Testimony is presented without formatting.

Officials Investigating If Earthquake Triggered Explosion, Fire at Bay Area Fuel Storage Facili

POSTED 9:02 AM, OCTOBER 16, 2019, BY ASSOCIATED PRESS

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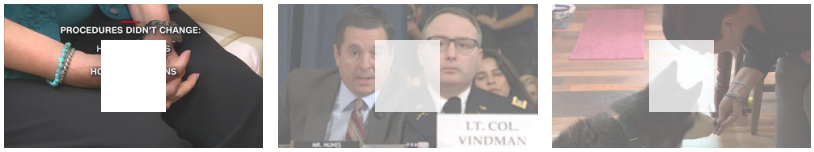

Officials were trying to determine Wednesday if a 4.5 magnitude earthquake triggered an explosion at a fuel storage facility in the San Francisco Bay Area that started a fire and trapped thousands in their homes for hours because of potentially unhealthy air.

The earthquake struck about 15 miles southeast from the NuStar Energy fuel storage facility in the Bay Area community of Crockett 15 hours before the Tuesday fire that consumed thousands of gallons of fuel. Aftershocks in the same area were still being felt Wednesday, including one with a 3.4 magnitude.

State and local inspectors were investigating the fire that shut down the facility, which according to the company has 24 tanks capable of holding more than 3 million barrels of different kinds of fuels.

The seven-hour blaze erupted in towering, stubborn flames Tuesday afternoon at the facility in Crockett, about 30 miles northeast of downtown San Francisco.

A firefighter was injured and was treated at a hospital, said Contra Costa Fire Department spokesman Steve Hill, who had no details about the firefighter's injuries.

Randy Sawyer, Contra Costa County's chief environmental health and hazardous materials officer, told KQED News that Tuesday's earthquake caused malfunctions at two nearby oil refineries operated by Shell and Marathon oil.

Emergency sirens blared and a column of thick black smoke that could be seen for miles prompted Contra Costa County public health officials to order people in Crockett, neighboring Rodeo and part of Hercules to stay inside with fans and air conditioners off and to seal their windows and doors with tape or wet towels.

The concern was that hazardous particulates might be spewing from the fire.

County health officials late Tuesday lifted a shelter in place order affecting about 12,000 people. But at least four schools in the area closed on Wednesday as a precaution.

Contra Costa County health department spokesman Karl Fischer did not immediately return a phone message seeking comment.

The fire began at about 2 p.m. at the tank farm, one of several refining and fuel storage facilities in the Carquinez Strait, a major shipping thoroughfare and a key oil hub.

Video footage of the fire showed flames leading up to an explosion so strong it blew the lid of one of the tanks high into the air.

The fire badly damaged or destroyed two tanks containing about 250,000 gallons of ethanol, a gasoline additive. The facility also stores gasoline, diesel and aviation fuels, according to NuStar Energy LP.

About 200 firefighters fought the flames with foam and water, trying to prevent it from spreading to other tanks containing jet fuel and ethanol. They would knock down the flames but they kept reigniting in the spilled fuel.

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BREAKING NEWS



BART confirms fatality aboard one of its trains 3:36 PM

SFGATE https://www.sfgate.com/traffic/article/refinery-fire-traffic-80-closure-carquinez-bridge-14536712.php

I-80 reopens in both directions after crews contain fire at NuStar in Crockett

By Alix Martichoux, SFGATE Updated 9:30 pm PDT, Tuesday, October 15, 2019





IMAGE 1 OF 35

Interstate 80 is closed as a fire at an oil storage facility burns in the background Tuesday, Oct. 15, 2019, in Rodeo, Calif. A fire burning at NuStar Energy LP facility in Crockett, Calif., in the San ... more



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THE LATEST, Oct. 15, 9:28 p.m.: The CHP is reopening Interstate 80 in both directions after fire crews extinguished a blaze at the NuStar Energy facility in Crockett.

A massive fire that erupted at a NuStar Energy facility in Crockett prompted Caltrans to shut down Interstate 80 near the Carquinez Bridge on Tuesday afternoon. Closures were predicted to last until at least midnight, according to the California Highway Patrol.

The fire broke out before 2 p.m. at NuStar's storage tanks on San Pablo Avenue, about a mile from the Contra Costa County side of the Carquinez Bridge.

At 2:30 p.m., Caltrans requested the CHP start diverting traffic, according to CHP's traffic log.

By about 3 p.m., I-80 was fully closed between the intersection with Highway 4 (in Hercules) and the Carquinez Bridge toll plaza (on the Vallejo side). At 4 p.m., the CHP log warned the closure could last "six hours to all night," and the agency confirmed just after 5:30 p.m. **via Twitter** that I-80 would remain closed until midnight.

POWERED BY CONCERT FEEDBACK

Eastbound traffic was being diverted onto Highway 4, while westbound traffic was being diverted onto Interstate 780. The Benicia Bridge was the alternate crossing between Contra Costa and Solano counties.

The fire and resulting road closures were

already starting to cause a traffic nightmare for afternoon and evening commuters through the East Bay. By 3 p.m., eastbound traffic already appeared to be backed up to El Cerrito.

FULL STORY: Massive fire at refinery in Crockett sends flames, black smoke into air

Keep an eye on traffic conditions on **SFGATE's traffic page**.

*Alix Martichoux is an SFGATE digital editor. Read her **latest stories** and send her news tips at **alix.martichoux@sfgate.com**.*

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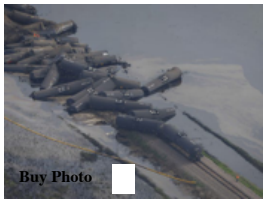
Railroad: Northwest Iowa oil train derailment was related to flooding

Associated Press Published 10:53 a.m. CT Aug. 10, 2018 | **Updated 11:55 a.m. CT Aug. 10, 2018**



(Photo: Bryon Houlgrave/The Register)

DOON, Ia. — BNSF Railway acknowledged Friday that flooding played a role in a derailment that loosed thousands of gallons of oil into northwest Iowa floodwaters.

Railroad spokesman Andy Williams wouldn't say whether the train engineer knew or should have known about washed-out tracks mentioned in a preliminary federal report released Thursday (https://www.ntsb.gov/investigations/AccidentReports/Pages/HMD18LR002-preliminary-report.aspx).

"The train was operating within its authority," Williams told the Associated Press.

"The cause of the derailment is flood related," he said, declining to comment further.

The National Transportation Safety Board report cited heavy rainfall in the area 48 hours before the June 22 derailment just south of Doon, near Rock Valley. The report said the water washed out track and flooded a tributary of the nearby Little Rock River. The report stopped short of saying the flooding caused the 32-car derailment.

PREVIOUS COVERAGE: ***Railroad track reopened at site of train derailment, oil leak (/story/news/2018/06/26/doon-oil-spill-train-derailment-track-reopened-rock-valley-bnsf/737087002/)***

PREVIOUS COVERAGE: ***Seven cars removed after train derailment, oil spill (/story/news/2018/06/24/train-derailment-doon-oil-spill-rock-river-leaked-crude-oil-into-rock-river-flooding-bnsf/729417002/)***

Ten of the oil tank cars were breached, the report said, releasing about 230,000 gallons of tar sands oil from Canada that was headed to a Texas refinery. Last month BNSF updated its similar spill estimate, saying that 160,000 gallons had leaked.

Regarding the differing figures, safety board spokesman Keith Holloway said preliminary data "is subject to change as more information is known." He also said that it could be 12 to 18 months before his agency issues a final report that reviews the cause of the derailment.

Much of the spilled oil was contained to an area east of the tracks then recovered. Floating barriers were installed downstream to keep oil from reaching the riverfronts and polluting the water supplies of larger communities, including Sioux City and Omaha in Nebraska.

The derailment site cleanup is expected to take several months.

The federal report also said the train was moving at 48 mph — just below the authorized speed for that stretch.

Daniel Serres

#62553 | November 20, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Please see the attached exhibits to the comments of Columbia Riverkeeper, Center for Sustainable Economy, Oregon Physicians for Social Responsibility, Portland Audubon Society, 350PDX, Friends of the Columbia Gorge, Willamette Riverkeeper, Climate Action Coalition, Northwest Environmental Defense Center, Oregon Conservancy Foundation, and Human Access Project.

Testimony is presented without formatting.

Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest

An Economy-Wide Deep Decarbonization Pathways Study • June 2019



Clean Energy Transition Institute

Fossil Fuel Terminal Zoning Amendments Testimony

Ordinance #189807



"Limiting global warming to 1.5°C would require 'rapid and far-reaching' transitions in land, energy, industry, buildings, transport, and cities. Global net human-caused emissions of carbon dioxide (CO_2) would need to fall by about 45 percent from 2010 levels by 2030, reaching 'net zero' around 2050."

— IPCC Special Report on Global Warming of 1.5°C, October 8, 2018.

Cover: Bullitt Center, Seattle, Washington.
Photo credit: Ben Benschneider

Umpqua National Forest fire, Oregon, 2018.
Photo credit: U.S. Forest Service Pacific Northwest Region

About the Clean Energy Transition Institute

The Clean Energy Transition Institute is an independent, nonpartisan Northwest research and analysis nonprofit organization with a mission to accelerate the transition to a clean energy economy by identifying deep decarbonization strategies, advancing urban clean energy, and building a clean energy workforce. The Institute provides information about the pathways to a clean energy economy and convenes stakeholders to accelerate the shift to a low-carbon economy.



Idaho Falls wind farm. Photo credit: Daxis

Acknowledgements

The Clean Energy Transition Institute gratefully acknowledges the funders that provided the financial support to commission a Northwest deep decarbonization pathways study and launch the Institute; the consultants whose energy sector modeling expertise provided the basis for this rigorous study; the Technical Advisory Group and stakeholders that advised on the scope and assumptions for the study; the Institute's fiscal sponsor from September 2018 to February 2019, Climate Solutions, without which the Institute could not have operated as a nonprofit organization; the Institute's contractors, for their help reviewing and publicizing the study; and the firms that provide in-kind support to the Institute.

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EER brings tried and tested expertise in planning for least-cost decarbonization, using a tool kit built to answer technical and economic questions about deep decarbonization, including the EnergyPATHWAYS and RIO models. EER's integrated approach to holistic energy planning finds the lowest-cost pathways to future policy goals by co-optimizing investments in the electric and non-electric energy sectors, which is essential for finding realistic and least-cost solutions for a clean energy future.

Decarbonization Pathways Work Group

The Clean Energy Transition Institute convened a work group from February to November 2017 to determine whether to conduct a Northwest deep decarbonization pathways study. The Institute gratefully acknowledges the critical input of the following Decarbonization Pathways Work Group members:

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One Visual Mind designed *Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest*. Founded in 2004, One Visual Mind has offices in Boston, MA, and in Portland, OR, and aims to provide functional design solutions that have an impact.



Seastack, Oregon Coast. Photo credit: Clean Energy Transition Institute

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Terms and Definitions

100% Clean Electricity: Electricity infrastructure that produces no greenhouse gas emissions during the production, transmission, and distribution of electricity.

Bioenergy Potential: A measure of the energy stored within organic materials, such as wood, crops, or solid waste, and their usefulness as fuel sources.

Biofuel/Biomass Feedstocks and Infrastructure: A biofuel/biomass feedstock is a renewable source of organic matter, such as sugarcane, cornstarch, woody plants, crop residues, etc., that can be either used as fuel or converted into fuel. Biofuels require distinct infrastructure: equipment that converts feedstocks into fuel, as well as specialized storage facilities, transportation methods, and pumps.

Biogas: A combustible gas composed predominantly of methane that is collected from waste streams, such as landfills and manure lagoons, for use as fuel. As a fuel, it is virtually identical to conventional natural gas.

Biomass Resources: Sources of organic materials that can be converted into fuel, including dedicated energy crops, agricultural crop residues, forestry residues, algae, wood processing residues, municipal waste, industrial waste, and food waste.

Built Environment: Human-made surroundings, especially buildings.

Capacity Factor: A measure of an electricity resource's utilization; the ratio of actual electrical energy output to maximum possible output.

Carbon-Beneficial Biomass: Sources of biomass that when used for fuel result in net reductions of carbon dioxide emissions.

Carbon Capture: Technology that prevents carbon emissions from escaping into the atmosphere from power plant or industrial waste gas streams and stores it in geological formations or in biological material such as forests, or that converts the carbon into fuel for reuse and recapture. Also called carbon capture and sequestration, carbon capture and storage, carbon capture sequestration and utilization.

Carbon Feedstock: The reservoir of available carbon dioxide in the atmosphere or produced by burning fossil or biofuels that can be captured and converted back into useful fuels and products.

Compressed Natural Gas: A fuel produced by compressing natural gas into a liquid form so that it can be used in place of other liquid fuels such as gasoline.

Cross-Sectoral Decarbonization/ Cross-Sectoral Integrated Energy Economy: In the case of deep decarbonization, integrating low-carbon solutions across the transportation, built environment, and electricity.

Demand-Side Scenario: Decarbonization strategies that involve decisions and technologies that affect energy demand.

Diesel Hybrid Vehicle: Much like gasoline hybrid vehicles, a diesel hybrid vehicle is powered by both a diesel engine and a rechargeable electric battery.

Direct Air Capture: Technology that removes carbon dioxide from the atmosphere.

Electric Boiler: A water tank containing electrical heating elements that heat water.

Electricity System Reliability: The ability for utility operators to deliver electricity to consumers with adequate generation and available operating capacity even after outages or equipment failure. Reliability is measured by frequency, duration, and magnitude of adverse effects on service.

Electrolysis, Power-to-X: Power-to-X is a term that describes a variety of different technologies and processes that enable production of fuels using electric power. See Appendix B for detailed description.

Energy Crops: Plants grown specifically for use in producing biofuels.

Energy Density: Energy density is a measure of how much energy a fuel can store in a given amount of space. Energy-dense fuels include most liquid petroleum fuels such as gasoline, jet fuel, and diesel.

EnergyPATHWAYS Model: Evolved Energy Research's analysis tool that evaluates energy consumption across all end-use sectors and models final energy demand for fuels (electricity, pipeline gas, diesel fuels, gasoline, etc.), as well as the hourly demand for electricity.

Energy-Related Carbon Dioxide Emissions: Carbon dioxide produced from burning carbon-based fuels for energy.

Energy Resource: A source of energy; something that can be burned, harvested, extracted, or processed in order to generate energy.

Flexible Loads/Controllable Loads: A flexible load is an appliance or device with power consumption that can be directly controlled or varied.

Fuel-Switching: In the case of deep decarbonization, substituting fuels with cleaner, less carbon-intense alternatives (e.g., replacing gasoline with electricity).

Gaseous Fuel: Fuel that is stored as a vapor, rather than as a liquid or a solid, such as methane, propane, or hydrogen. Gaseous fuels take up more space but weigh less per unit of energy than liquid or solid fuels.

Generation Mix: The proportion of energy sources used to generate electricity in a given geography or jurisdiction (e.g., coal, natural gas, hydropower, wind, solar, etc.).

Grid Flexibility: The ability for an electrical system to balance power supply and demand under changing or uncertain conditions.

Grid Integration: The process of introducing and connecting new energy resources into an existing power system. Often used in reference to renewable energy, as renewables must be added into an existing grid powered by coal, natural gas, etc.

Grid Reliability: The ability of the power system to deliver electricity to consumers without interruption.

Heavy-Duty Vehicle (HDV): Usually used in reference to non-passenger vehicles, heavy-duty vehicles are freight vehicles, such as large trucks and trains, that weigh more than 8,501 pounds and are powered by diesel.

High-Capacity Factor: A highly utilized electricity resource; an electricity resource that produces almost as much energy during operation as its maximum theoretical energy output.

Hurdle Rates: Costs applied to imports and exports between transmission zones. These represent the transaction costs of trading between regions, wheeling charges, GHG charges associated with California imports, and any additional frictions of trading across borders.

Installed Capacity/Nameplate Capacity/ Maximum Effect: Installed capacity is the intended, maximum, sustained output of a power plant or electrical generator.

Interties: Connections that allow the flow of electricity between two balancing areas or transmission zones.

Least-Cost Optimization Framework: Method used in this study to determine the most cost-effective strategies for maximum carbon emissions reductions.

Light-Duty Vehicles (LDV): Vehicles that weigh less than 8,500 pounds; for example, standard passenger automobiles.

Liquefied Natural Gas: Natural gas that has been cooled to -260°F to compress it into a liquid state for storage and transportation. As a liquid, natural gas takes up 600 times less space than as a vapor.

Lithium-Ion Batteries: Energy storage method that provides a way to generate electricity and save it for use later. Lithium-ion batteries contain solid metal electrodes and allow charged lithium atoms to move in order to generate electricity.

Load: The amount of electricity drawn from the electrical grid.

Load Balancing: Matching supply to demand of electricity, including increasing and decreasing production of power plants, storing electrical power when demand is low and releasing it when demand rises, and adjusting loads through flexible load technologies.

Low-Quality Solar: Electricity produced in areas with relatively low levels of annual sunlight, or on rooftops that are shaded or at a poor angle.

Medium-Duty Vehicle (MDV): A passenger vehicle weighing between 8,501 and 10,000 pounds.

Natural Gas–Fired Generation: Producing electricity by burning natural gas. Combustion of the gas turns a turbine. The hot exhaust (carbon dioxide and water vapor) is redirected to heat water, producing steam, which also turns a turbine.

Non-Energy-Related Carbon Dioxide Emissions: Carbon dioxide emitted from sources other than the burning of fossil fuels, such as deforestation, methane from livestock, soil carbon, landfills and wastewater, and permafrost.

Optimal Electricity Supply Mix: The mixture of energy resources that produce the most efficient, lowest-cost energy with minimal carbon emissions.

Operational Integration: Integration of system dispatch activities across currently separated or only partially integrated balancing areas, lowering costs by using resources and transmission more efficiently.

Overall End-Use Energy Demand: The energy needed by all consumers on the grid.

Overgeneration: When power supply exceeds power demand, resulting in excess or wasted power. Typically, this manifests as curtailed renewable resource output.

Pipeline Gas: Gaseous fuel transported to consumers via pipelines. Today, the vast majority of pipeline gas is fossil natural gas, but in a decarbonized future it may also consist of large quantities of biogas or synthetic gas.

Regional Investment and Operations Model (RIO): Evolved Energy Research's computational tool that finds least-cost resource investments and operations for all energy-supply options and fuel types, including electricity, pipeline gas, gasoline, diesel, jet fuel, hydrogen, and other fuels. The model decides which technologies will be used over time to meet annual emissions targets and other constraints.

Regional Integration/Regional Grid Integration: Strengthening interconnection between transmission zones; a key strategy to resolve issues of overgeneration, undergeneration, or high electricity demand.

Renewable Diversity: Using varied sources of renewable energy to meet electricity demand.

Resource Adequacy: A regulatory construct developed to ensure that there will be sufficient resources to serve electric demand under all but the most extreme conditions.

Residual Fuels: The by-products of crude oil after gasoline and other fuels have been extracted during the refining process; used in thermal power plants and large engines, such as marine vessels.

Scenario-Based Pathways Approach: One of the methodologies used in a pathways study, involving specific sets of economic and policy conditions in order to determine the optimal route and tools to accomplish emissions reduction goals.

Sensitivities/Sensitivity Analyses: A measure of how changes in one resource or condition will impact other resources and conditions in an energy modeling analysis.

Sustainable Biomass: Biomass harvested from renewable resources, such as from forestry and agricultural residues, where waste products are reused to fertilize future biomass feedstocks.

Thermal Power Plants: A power station in which heat energy is converted into electricity, usually using coal or natural gas.

Undergeneration: The production of less electricity than is needed; when the load (demand) exceeds the production (supply).

Waste and Wood Feedstocks: Sources of organic material that can be converted into biofuels derived from waste (e.g., landfills) and wood (e.g., forestry residues).

Vanadium Flow Batteries: Vanadium flow batteries contain salt solutions that interact through a membrane. Flow batteries use both an electrochemical cell and a liquid electrolyte stored in separate tanks, which flow through the cell when the battery is operating. Vanadium flow battery capacity and power can be scaled independently.

Zero-Carbon Electricity/Zero-Carbon Sources: Electricity production that emits no carbon dioxide.

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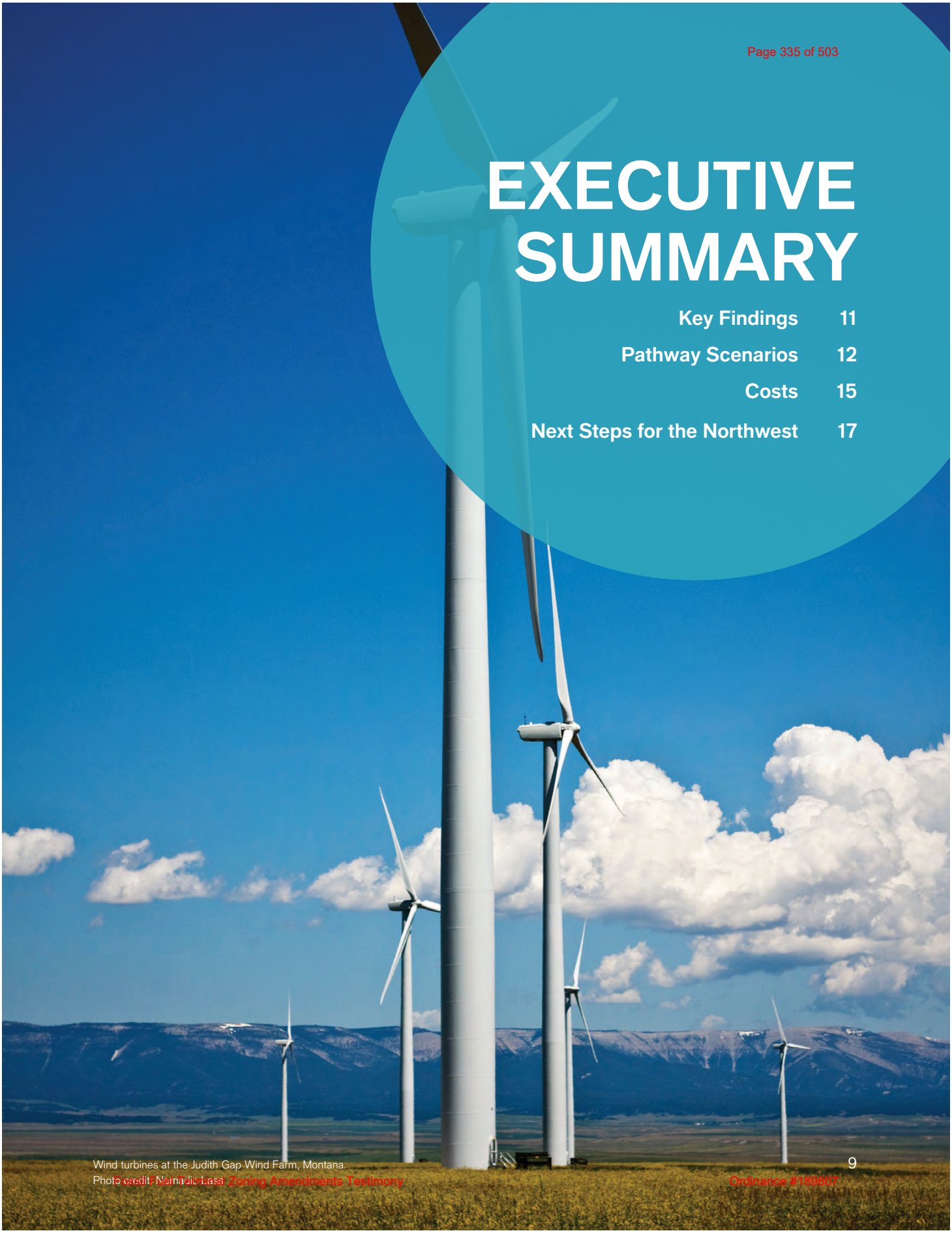

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Wind turbines at the Judith Gap Wind Farm, Montana.
Photo credit: Nomadic Lass Zoning Amendments Testimony

Executive Summary

The Clean Energy Transition Institute commissioned this economy-wide deep decarbonization pathways study to serve as a blueprint for how Idaho, Montana, Oregon, and Washington might achieve a low-carbon, clean energy economy over the next three decades. The study, *Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest*, examines alternative pathways to achieving an 86% reduction of carbon emissions below 1990 levels in the built environment, transport sector, and electricity grid by 2050. A pathways approach enables an understanding of the most economically and technically efficient means of realizing this mid-century decarbonization goal.

The study models the energy systems in each of the four Northwest states to identify the interdependencies, efficiencies, and trade-offs that must be considered when pursuing deep decarbonization. The study's purpose is to provide guidance to policymakers, advocates, leaders, and investors as decisions are made to catalyze the clean energy transition in the Northwest over the coming three decades.

Since the fall of 2017, several regional studies have been conducted for different stakeholders and with varying assumptions that offer insights into different aspects of the Northwest's decarbonization puzzle. *Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest* is the first economy-wide analysis to examine the most likely decarbonization scenarios mapped to the region's economic and institutional realities. Prior studies looked only at the electricity grid, at one state or one utility service territory, or at the role of one fuel in specific sectors or subsectors of the economy as Figure 1 shows.

FIGURE 1. This study is the only four-state and sector-wide decarbonization analysis of the Northwest.

Year	Study	Energy Sectors	Geographic Coverage			
			WA	OR	ID	MT
2016	State of Washington Office of the Governor	All sectors	●	○	○	○
2017	Public Generating Pool	Electricity sector only	●	●	◔	◔
2018	Portland General Electric	All sectors	○	◑	○	○
	Climate Solutions	Electricity sector only	●	●	◔	◔
	Northwest Natural Gas Company	All sectors; optimized decisions limited to electricity sector only	●	●	○	○
2019	Public Generating Pool	Electricity sector only; reliability study	●	●	●	●
	Clean Energy Transition Institute	All sectors; optimized decisions across entire energy supply side	●	●	●	●

Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 9.

Each of these studies had a narrower purpose and answered questions of more limited scope than those posed by *Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest*. For example, none has looked at the impact of constraining biomass, the use of natural gas in transport, limited electrification, or greater integration of the Northwest and California electric grids. This study is unique in offering a blueprint that broadly frames the opportunities and trade-offs for the Northwest to achieve economy-wide deep decarbonization between 2020 and 2050.



Olympic National Forest. Photo credit: Clean Energy Transition Institute

Key Findings

The study demonstrates how the Northwest can rapidly deploy strategies to reduce carbon emissions in the energy sector efficiently and at least cost for the electricity grid, the built environment, and transportation. The region's relatively clean electricity grid and proximity to California, where climate policies aim to achieve a massive transition to clean energy within the coming three decades, are key assets.

Consistent with prior decarbonization pathways efforts, this study demonstrates that the low-carbon system of the future must have four primary features: (1) energy must be used more efficiently than it is today; (2) electricity generation must be as clean as possible; (3) liquid fuels must be as low-carbon as technically and economically feasible; and (4) clean electricity must be used for as many purposes as possible.

The study's key findings include:

- **Deep decarbonization is achievable in the Northwest.** Multiple strategies exist to achieve a deeply decarbonized energy system in the Northwest using today's technologies. Policymakers must decide how to achieve a low-carbon energy system at an acceptable cost.
- **Energy efficiency is a key strategy to reduce costs and meet goals.** Decreasing the demand for energy through efficiency reduces the need for new energy supply and associated infrastructure, and therefore also reduces the cost of decarbonization.

"Clean electricity is the backbone for deep decarbonization and the cross-sectoral role that electricity will play in the coming decades is key to the low-carbon future."

- **A nearly 100% clean electricity grid is needed.** A Northwest electric grid nearly free of fossil fuels efficiently achieves mid-century climate targets. Carbon emissions from electricity generation were reduced by 96% in the study's Central Case, the core decarbonization pathway. While coal is eliminated in a deep decarbonized future, a small amount of natural gas–generated electricity (just 3.7% of annual energy in the study's Central Case by 2050) ensures that the grid can reliably deliver power during periods of low generation from hydroelectricity and other renewable sources.
- **Demand for clean electricity will continue to grow.** A low-carbon future hinges on an integrated energy economy where power sources—and electricity in particular—play a cross-sectoral role in transportation and the built environment. Widespread transportation electrification (100% of light-duty, 60% of medium-duty, and 40% of heavy-duty vehicles in the study's Central Case) will be crucial to reduce emissions at least cost and avoid using either scarce biofuel supplies or relatively expensive electric fuels for transport. Clean electricity also

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needs to replace oil and gas to heat and cool buildings in a low-carbon future. Finally, clean electricity will be used to produce synthetic gas and liquids as additional energy sources.

- **Increased grid integration and transmission between the Northwest and California is cost-effective.** Significant cost savings can be realized if the Northwest and California electric grids are expanded and operations are better integrated. Building additional transmission lines between the Northwest and California electricity grids could reduce the costs of decarbonization by an estimated $11.1 billion in net present value over the 30-year study period accrued to the combined California and Northwest region.
- **Sustainable biomass is best used for jet and diesel fuel.** The best use for sustainable biomass is creating liquid fuels to power the hardest-to-electrify subsectors within transportation, namely aviation and long-distance freight shipping.
- **Emerging technologies will play a critical decarbonizing role.** With the correct mix of regulatory guidance, investment, and research it is likely that a range of technological developments will emerge to solve some of the most challenging deep decarbonization problems in the years beyond 2030. These technologies, which include electrolysis, direct air capture, hybrid boilers, hydrogen, synthetic fuels, and carbon capture, will provide economic value for excess renewables, displace conventional gas and liquid fuels, and help balance the grid.

This study is designed to show the trade-offs between different deep decarbonization pathways, but it does not take into account equity considerations for different communities. The study demonstrates that we can decarbonize our economy, but the critical work ahead must focus on how to do so equitably.

Pathway Scenarios

The study examined eight cases, starting with:

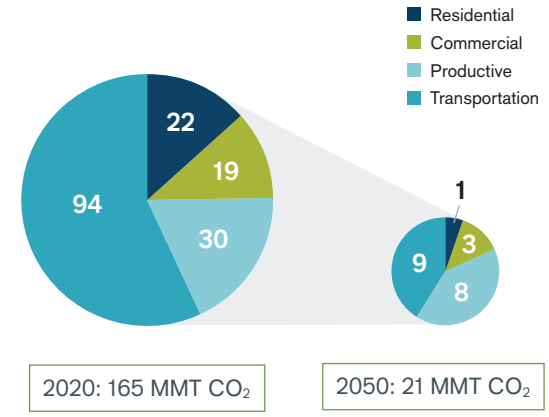
- **Business as Usual Case** based on existing policies and the scenario against which the seven deep decarbonization cases are compared; and
- **Central Case** that represents the study's core optimal deep decarbonization pathway.

The Central Case is the most flexible pathway to achieve emissions reductions because it is technology neutral. Six additional scenarios representing demand and supply variables relevant to current discussions in the Northwest energy community were modeled off the Central Case to understand the energy system trade-offs that occur as a result of different constraints or policies.

- **100% Clean Electricity Grid Case**, where all electricity generation must be zero-carbon in 2045.
- **Limited Electrification and Efficiency Achieved Case**, in which the aggressive electrification and energy efficiency assumptions in the Central Case do not materialize.
- **No New Gas Plants for Electricity Case**, which prohibits any new gas-fired power plants from being built across the region after 2020 and retires existing gas plants at the end of their economic lifespan.
- **Increased Northwest-California Transmission Case**, where unconstrained construction of additional transmission is allowed between the Northwest and California for better grid integration.
- **Limited Biomass Available for Liquid Fuels Case**, where each state's bioenergy potential is limited to only waste and wood feedstocks, and no energy crops or biomass resources outside of the region are permitted.
- **Pipeline Gas Used for Freight Vehicles Case**, where compressed and liquefied pipeline gas replace renewable diesel fuel for freight vehicles in the Central Case.

Northwest CO_2 emissions decrease in the Central Case from 165 million metric tons (MMT) in 2020 to 20.8 MMT in 2050.

FIGURE 2. Comparison by sector of Northwest CO_2 emissions decrease from 2020 to 2050 in the Central Case.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 63.

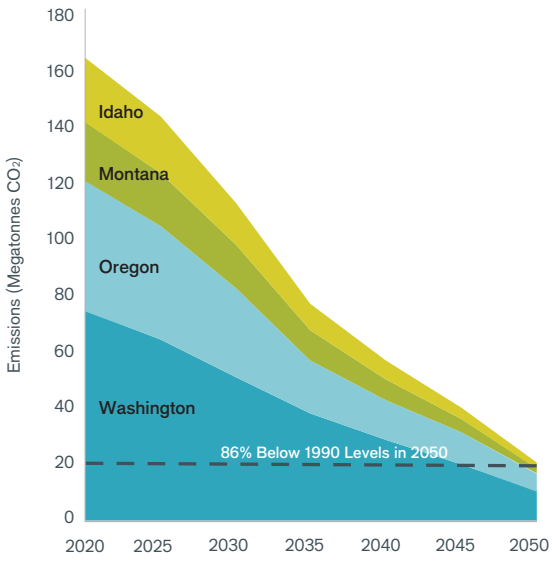
Figure 2 shows that Northwest CO_2 emissions decrease in the Central Case from 165 million metric tons (MMT) in 2020 to 21 MMT in 2050. Emissions in the residential sector decline by 95%; in the commercial sector by 86%; in the productive (industrial) sector by 72%; and in the transportation sector by 91%.

Figure 3 shows the emissions decline from 2020 to 2050 by each state, as well as by fossil fuel type. These emission reductions are achieved through five key decarbonization strategies: energy efficiency; decarbonizing electricity; decarbonizing gas and liquid fuels; fuel-switching in industry, transportation, and buildings; and carbon capture. The cost of achieving these reductions is offset by avoided fossil fuel purchases.

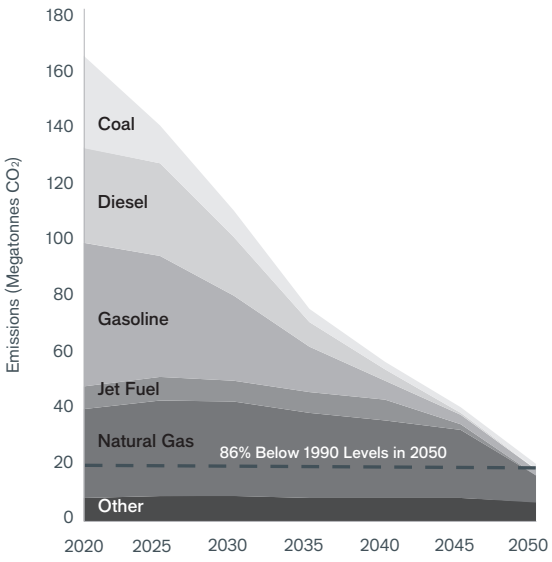
This study is unique in offering a blueprint that broadly frames the opportunities and trade-offs for the Northwest to achieve economy-wide deep decarbonization between today and 2050.

FIGURE 3. Declining emissions by state and by fossil fuel type 2020–2050.

Declining Emissions by State



Declining Emissions by Fossil Fuel Type



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Five Key Decarbonization Strategies

Transitioning the Northwest to a low-carbon energy system relies on five decarbonization strategies:

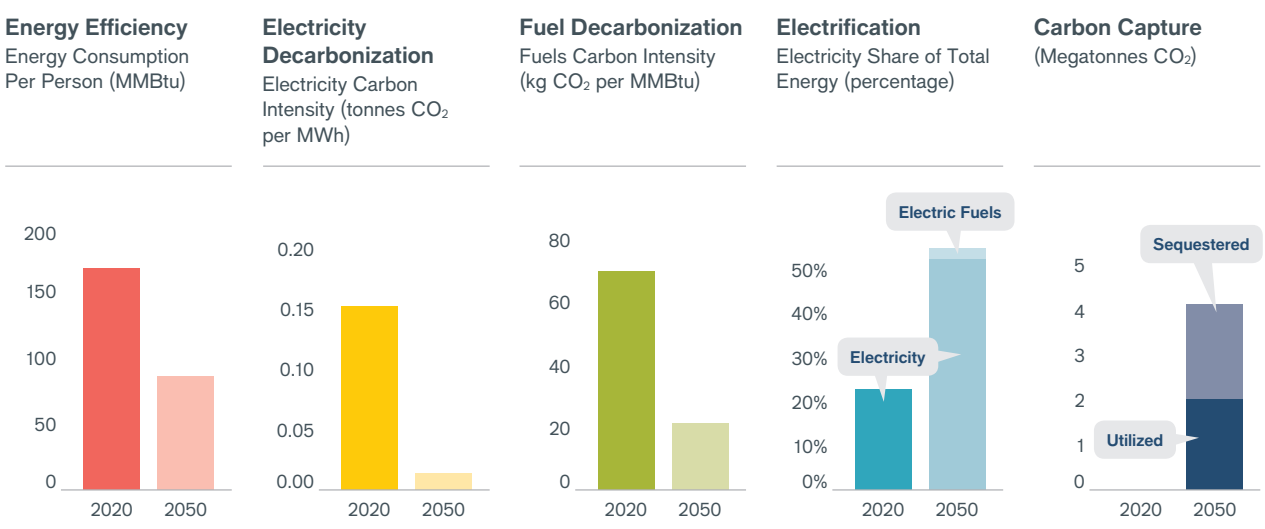
1. **Energy Efficiency:** reducing energy consumed to provide an energy service
2. **Electricity Decarbonization:** reducing the emissions intensity of electricity generation
3. **Fuel Decarbonization:** reducing the emissions intensity of liquid and gaseous fuels
4. **Electrification:** switching end uses from fuel to electricity
5. **Carbon Capture:** capturing CO_2 from a facility or removing CO_2 from the atmosphere

The purpose of the fifth strategy, carbon capture, is twofold: the captured CO_2 can either be used as a carbon feedstock for electric fuel production or sequestered.

Figure 4 shows metrics for the five strategies in the Central Case. Per capita energy consumption decreases from approximately 170 MMBtu per person today to 85 MMBtu per person in 2050, a 50% decrease. The average carbon intensity of electricity generation, which is already relatively low in the Northwest due to the hydroelectric system, decreases to near-zero by 2050.

The carbon intensity of fuels (liquid and gas) decreases by 70% primarily using biofuels. The share of total final energy served by electricity or electrically produced fuels (e.g., hydrogen and synthetic natural gas) more than doubles from approximately 23% today to 55% in 2050. Four million metric tons of CO_2 are captured in 2050, with about half of the CO_2 being utilized to produce synthetic fuels and the other half being sequestered (e.g., in saline aquifers in Montana).

FIGURE 4. Five decarbonization strategies.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 65.

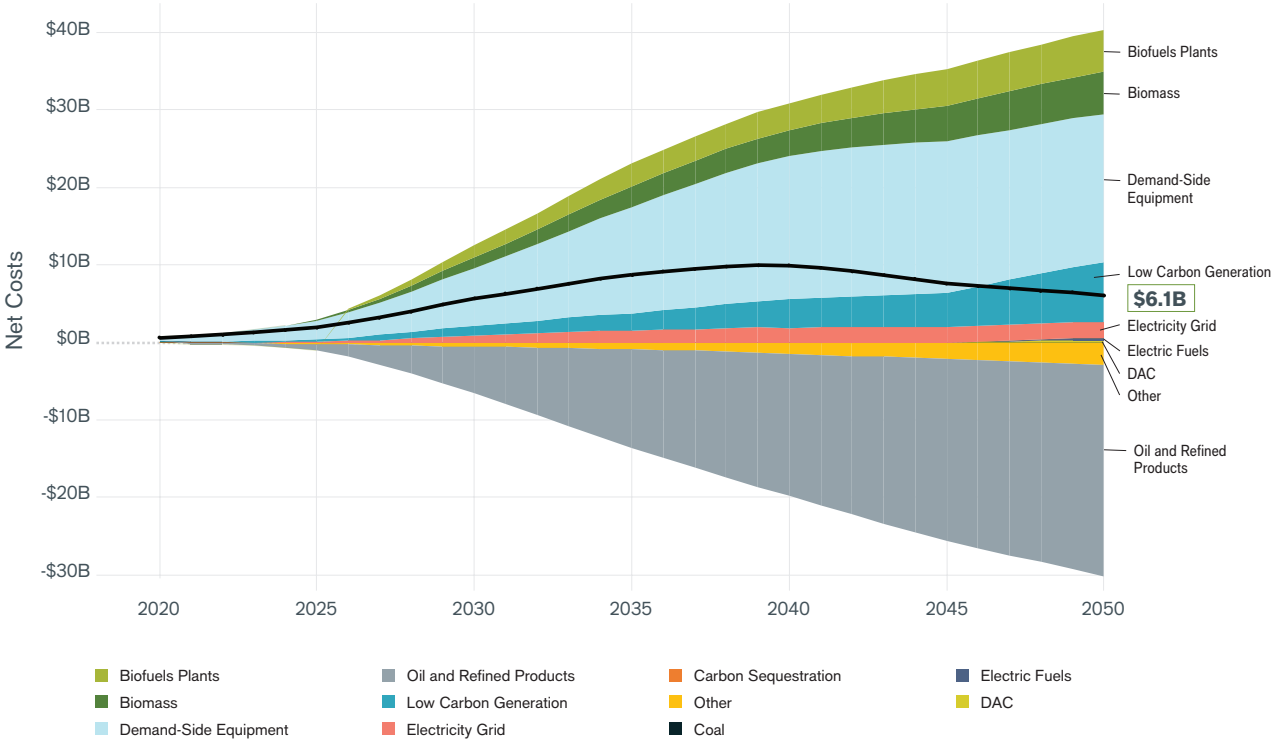
Costs

The study models the annual energy system costs of producing, distributing, and consuming energy, comparing the annual costs of the Business as Usual Case and the Central Case from 2020 to 2050. Net annual costs of the Central Case vary over the modeled period based on the timing of infrastructure investments, peaking at 16.1% ($9.8 billion) above the Business as Usual Case in 2038 and decreasing to 8.3% ($6.1 billion) higher than the Business as Usual Case in 2050. The cumulative costs of decarbonizing the energy system in the Central Case are 9.5% higher than the capital and operating expenses of the Business as Usual Case's energy system, roughly 1% of the region's total GDP in 2017 of more than $870 billion.[1] (See Figure 5.)



ZHome, Issaquah, Washington. Photo credit: City of Issaquah

FIGURE 5. Annual net energy system costs for the Central Case relative to the Business as Usual Case 2020–2050.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 106.

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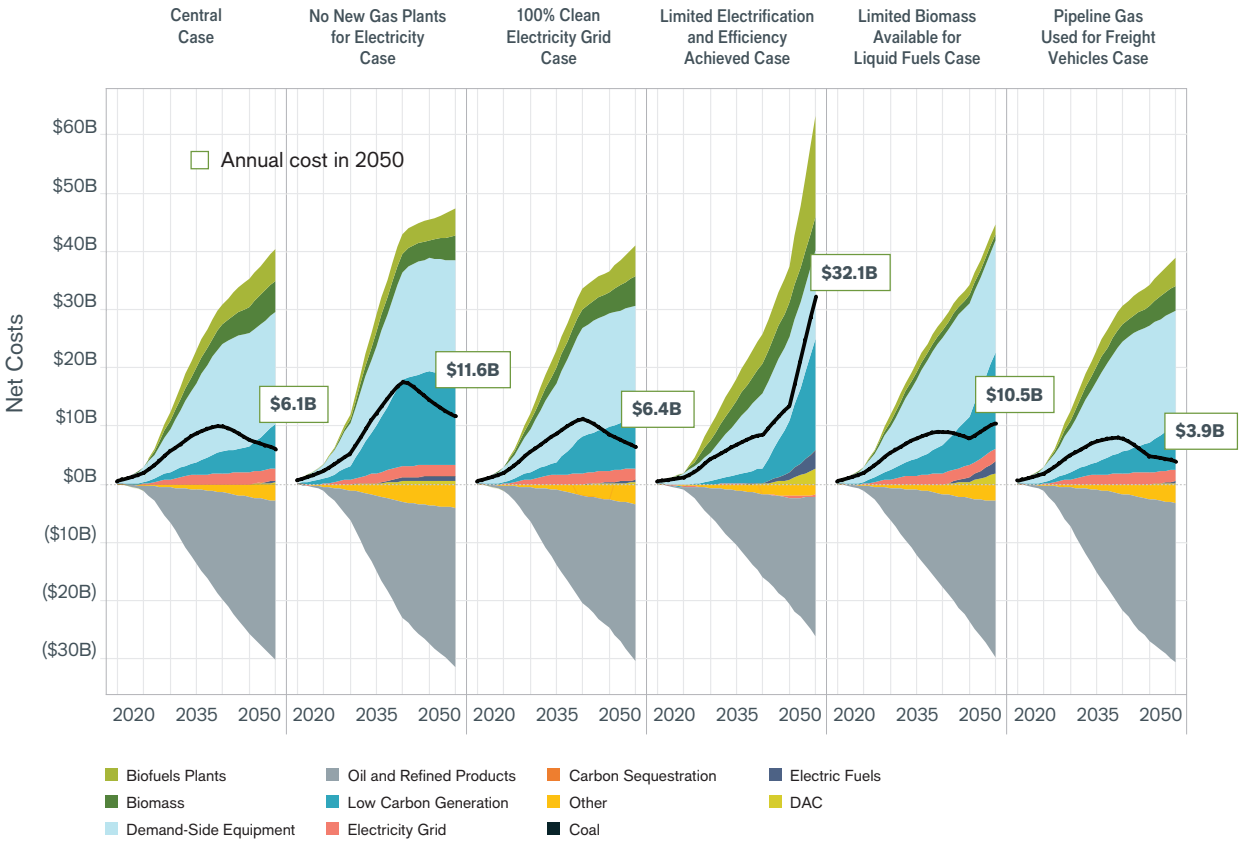
Increased costs in a decarbonized system consist primarily of biofuel feedstocks and infrastructure, demand-side electrification and efficiency investments, and renewable power plants and supporting electricity infrastructure. These costs are mitigated by the savings from reduced spending on fossil fuels, primarily liquid petroleum products such as gasoline, diesel, and jet fuel.

Costs for each scenario were modeled and compared to the Business as Usual Case. All cases performed worse than the Central Case, with the exception of the 100% Clean Electricity Grid scenario, which was only a marginal change from the Central Case and therefore has only a minimal impact on costs. The Pipeline Gas for Transport Case was $2 billion less than the Central Case. While this is a more cost-effective result, there are two issues that must be considered: (1) the model does not take into account the upstream emissions of pipeline gas production, and (2) there are significant technical challenges with using gas in the transport sector.

The Limited Electrification and Efficiency Achieved, No New Gas Plants for Electricity, and Limited Biomass Available for Liquid Fuels scenarios differ the most from the Central Case in terms of an increase in net systems costs. (See Figure 6.)

In 2050, the average cost of avoided carbon is $48/tonne and declining. The model makes conservative assumptions about the costs and scalability trends of clean energy technologies. A future report will explore in greater depth details on costs and emissions reductions, the assumptions that returned these results, and what these results mean for how the Northwest should consider investing in transitioning the region to a low-carbon economy.

FIGURE 6. Annual net energy system costs for six cases compared to the Business as Usual Case.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 107

Next Steps for the Northwest

Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest aims to represent potential energy futures in enough technical detail to be used as blueprints to develop a future of the Northwest's choosing. While this analysis offers a functional technical representation of low-cost deep decarbonization pathways, successful implementation is more uncertain. Implementation challenges include the following:

- A nearly 100% clean grid is a key feature of low-cost decarbonization in the region. Policymakers and utilities must focus on overcoming the policy, technical, business model, and economic barriers to cleaning the grid well in advance of 2050.
- The level of transportation electrification called for by 2050 requires immediate attention to accelerating the widespread adoption of electric vehicles, investing in the essential charging infrastructure, and determining how the grid will handle the additional load required to serve this new demand. Not only must we move quickly to electrify transportation, we also need to invest in solutions that promote greater equity, especially for people historically least served or most impacted by fossil fuel–based transportation systems.
- New grid infrastructure and operational integration are needed to leverage renewable development efficiently and cost-effectively in California and across the West. Achieving this integration and installing the needed grid capacity is complicated politically and technically, so planning must get underway now to ensure successful integration of these markets.

Further work is needed to develop the policies that will accelerate a deep decarbonization path in the Northwest that is affordable, equitable, and meets reliability standards.

There are several areas of additional examination that the study suggests pursuing, including changing assumptions about hydroelectricity and nuclear availability, coal plant retirement dates, and natural gas pricing and carbon intensity. Further examination is needed of the role of natural gas and the decentralization of the electricity grid, as is work on the key policy drivers that are needed to accelerate decarbonization in the Northwest.

This study is designed to show the trade-offs between different deep decarbonization pathways, but it does not take into account equity considerations for different communities. The study demonstrates that we can decarbonize our economy, but the critical work ahead must focus on how to do so equitably.

Meeting the Challenge of Our Time: Pathways to a Clean Energy Future in the Northwest is the only independent and rigorous deep decarbonization analysis framing the choices we must make in the coming decade to achieve a deeply decarbonized future in the next 30 years. Stakeholders can use the results of this and other decarbonization studies to formulate policies and make investments and operational decisions to accelerate the clean energy transition and put the Northwest on a deep decarbonization path that is sustainable, affordable, equitable, and meets reliability and security needs.



Electric bus charging station, Seattle, Washington. Photo credit: SounderBruce

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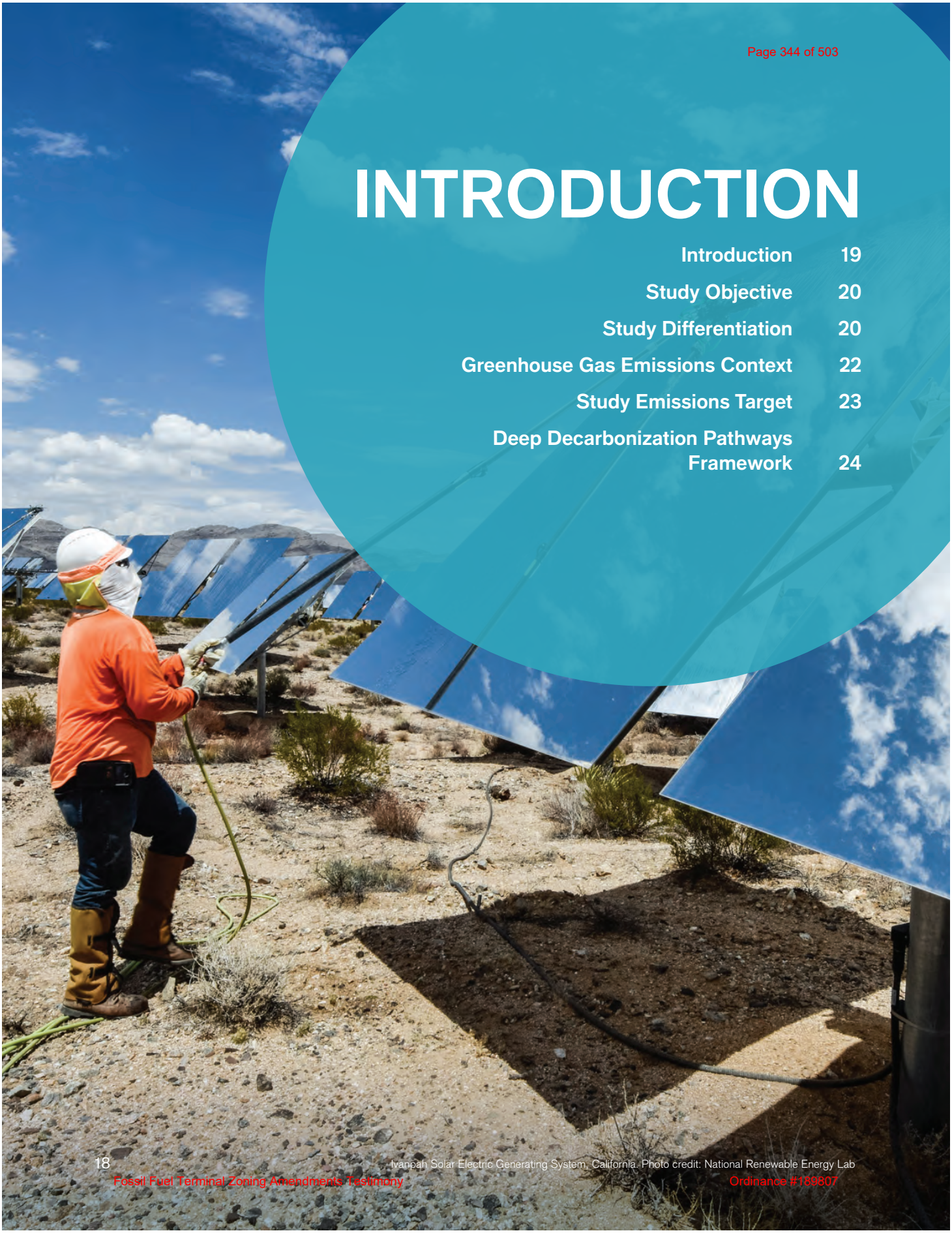

Ivanpah Solar Electric Generating System, California. Photo credit: National Renewable Energy Lab

Introduction

Humanity has a small window in which to reduce greenhouse gas emissions. According to the October 2018 UN Intergovernmental Panel on Climate Change (IPCC) report,[2] "rapid and far-reaching" transitions in worldwide land use, energy, industry, building, transport, and cities are required to keep global warming temperatures to a maximum of 1.5 degrees Celsius (1.5°C) above pre-industrial global temperatures. Scientific consensus indicates that there is a critical 12-year window in which to bring global net human-caused carbon dioxide (CO_2) emissions down by approximately 45% below 2010 levels by 2030, and that the world must be net-zero emitting by 2050.

Just 11 days after the IPCC report was released, an International Energy Agency (IEA) analysis concluded that the world is on a path to build so many fossil fuel power plants and energy-inefficient factories and buildings in the next five years that it will become impossible to hold global warming to safe levels.[3] "The chances of meeting [a 1.5°C target] are becoming weaker and weaker every year, every month,"[4] IEA's executive director Fatih Birol declared to an audience gathered in Paris in late 2018.

The Northwest region of the United States is uniquely suited to lead the country in accelerating a path to deep decarbonization with its longstanding environmental ethic, abundant supply of clean hydroelectricity, and decades-long investment in energy efficiency. The region's built-in advantages suggest that the Pacific Northwest could take the lead in achieving a nearly 100% clean electricity grid by piloting the technologies and strategies required to decarbonize the transportation sector and buildings.

Northwest residents believe that global warming is happening by overwhelming majorities and express concern about climate change impacts.[5] The Northwest's close economic and historical energy linkages to California, as well as that state's ambitious carbon emission reduction policies, offer an opportunity to embrace new technologies that could drive change in Western energy markets, with an eye toward capturing additional efficiency and deeper carbon reductions.



Grand Coulee Dam. Photo credit: U.S. Bureau of Reclamation

According to the Yale Program on Climate Communication, 73% of Washington, 72% of Oregon, 65% of Montana, and 63% of Idaho believe that global warming is happening; 63% of Washington, 62% of Oregon, 55% of Montana, and 56% of Idaho are worried about global warning.

Now is the time for the Northwest to determine the path to a low-carbon future. The Clean Energy Transition Institute, a Northwest research and analysis nonprofit organization, developed *Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest* to offer a roadmap for how to achieve deep greenhouse gas emission reductions across the economy at a reasonable cost.

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Study Objective

An analytical blueprint for decarbonizing the Northwest's economy offers a common set of assumptions to guide the region in making informed decisions about how the clean energy transition could unfold regionally over the coming three decades.

The study aims to provide unbiased analysis of decarbonization strategies for the region and, by doing so, demonstrate a variety of pathways to lower carbon emissions in the Northwest. The study also serves to illuminate the practical implications of achieving mid-century climate targets and broaden conversations about the actions we need to take to get there.

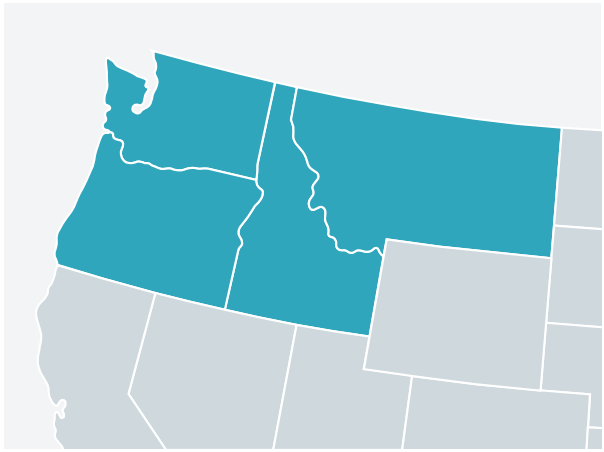


Proterra electric bus. Photo credit: Eric Wheeler, Metro Transit

Study Differentiation

The study is an economy-wide analysis that models the technical and economic implications of different decarbonization choices for the Northwest from now through 2050 for Washington, Oregon, Montana, and Idaho's energy systems—the network of all infrastructure that produces, converts, delivers, and consumes energy. This analysis contributes to an existing body of technical work related to decarbonization in the Northwest but is the first to optimize energy supply decisions for all four Northwest states, revealing new low-cost pathways to decarbonization.

The study includes a detailed representation of residential and commercial buildings and stocks, electricity demand, industrial energy demand, and vehicle fleets and transportation demand for freight and passenger transport to provide a full picture of the Northwest's energy systems. The study does not account for emissions from agriculture nor from industrial processes that are separate from the energy directly consumed by these sectors of the economy, due to data limitations associated with these sectors.



Several studies of decarbonization for the Northwest have been conducted since November 2016 and each of them provides slices of the decarbonization picture for the Northwest. (See Figure 1.)

FIGURE 1. This study is the only four-state and sector-wide decarbonization analysis of the Northwest.

Year	Study	Energy Sectors	Geographic Coverage			
			WA	OR	ID	MT
2016	State of Washington Office of the Governor	All sectors	●	○	○	○
2017	Public Generating Pool	Electricity sector only	●	●	◔	◔
2018	Portland General Electric	All sectors	○	◐	○	○
	Climate Solutions	Electricity sector only	●	●	◔	◔
	Northwest Natural Gas Company	All sectors; optimized decisions limited to electricity sector only	●	●	○	○
2019	Public Generating Pool	Electricity sector only; reliability study	●	●	●	●
	Clean Energy Transition Institute	All sectors; optimized decisions across entire energy supply side	●	●	●	●

Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 9.

The five key differentiators between this study and prior studies are:

Scope: Each of the prior studies had a narrower purpose and answered questions of more limited scope than those that this study poses. None looked at the impact of constraining biomass, the use of natural gas in transport, limited electrification, or greater integration of the Northwest and California electric grids.

Economy-Wide: Looking economy-wide at all energy systems—not just at the electricity grid—yields a better understanding of how the whole energy system could work together to decarbonize and how the sectors interconnect. Evaluating only one source of emissions at a time provides an incomplete assessment of decarbonization. For example: should biomass be used to produce biogas for gas-fired power plants or for renewable jet fuel for aviation? Approaching deep decarbonization holistically provides an understanding of cross-sectoral advantages, impacts, and trade-offs.

Geography: Of the seven studies, only this study and the Public Generating Pool's 2019 study consider all four states in the region, while the other five include only parts of each state.

Energy Sectors: Four of the seven studies are electricity-sector focused only, while the other three, including this study, look at all energy sectors.

Models: The study combines detailed demand-side scenario development using a bottom-up energy system model called EnergyPATHWAYS, with optimal decision-making of the supply side done by an optimal-capacity expansion tool called the Regional Investment and Operations (RIO) model. Prior studies either optimized only for the electricity grid or only used a scenario-based pathways approach. (See Appendix A for a detailed description of the modeling approach.)

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Greenhouse Gas Emissions Context

Energy-related CO_2 emissions have historically dominated greenhouse gas emissions in the Northwest, including emissions from fossil fuel combustion in buildings, industry, transportation, and electricity consumption. As Figure 2 shows, energy-related CO_2 emissions comprise more than 80% of all GHG emissions in Oregon and Washington.[6]

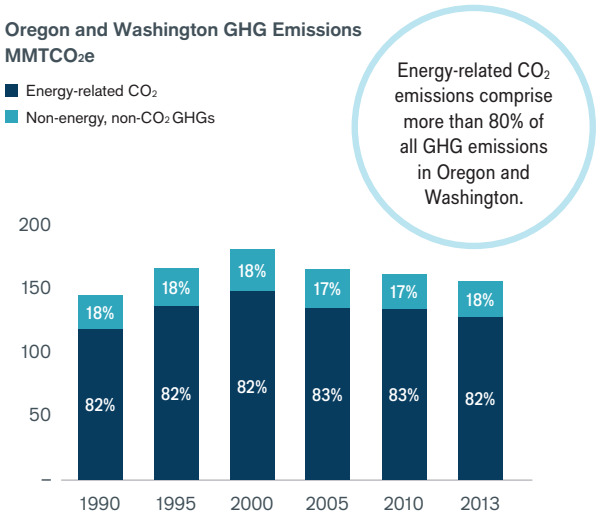
The remaining GHG emissions, colored light blue on the chart, include non-energy CO_2 and non-CO_2 greenhouse gas emissions from agriculture and industrial processes, such as methane from agriculture and waste, as well as hydrofluorocarbons and other high-intensity industrial emissions.

Energy CO_2 emissions are spread across three major sectors: electricity, transportation, and buildings and industry. The transport sector accounts for nearly half of all energy-related CO_2 emissions in Washington and Oregon primarily because of liquid fuel consumption: gasoline in passenger vehicles, diesel fuel in freight transport, fuel for marine transport, and jet fuel for aviation. Figure 3 depicts the breakdown of emissions by sector.



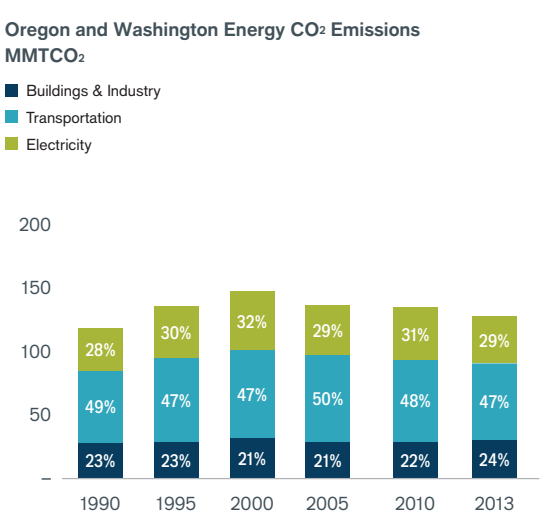
Marine shipping. Photo credit: Pixabay

FIGURE 2. Energy GHG emissions dominate in Washington and Oregon.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 11. Data are from Oregon's Department of Environmental Quality and Washington's Department of Ecology.

FIGURE 3. Transportation emissions are nearly half of all energy-related CO_2 emissions in Washington and Oregon.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 12. Data are from Oregon Department of Environmental Quality and Washington Department of Ecology.

Study Emissions Target

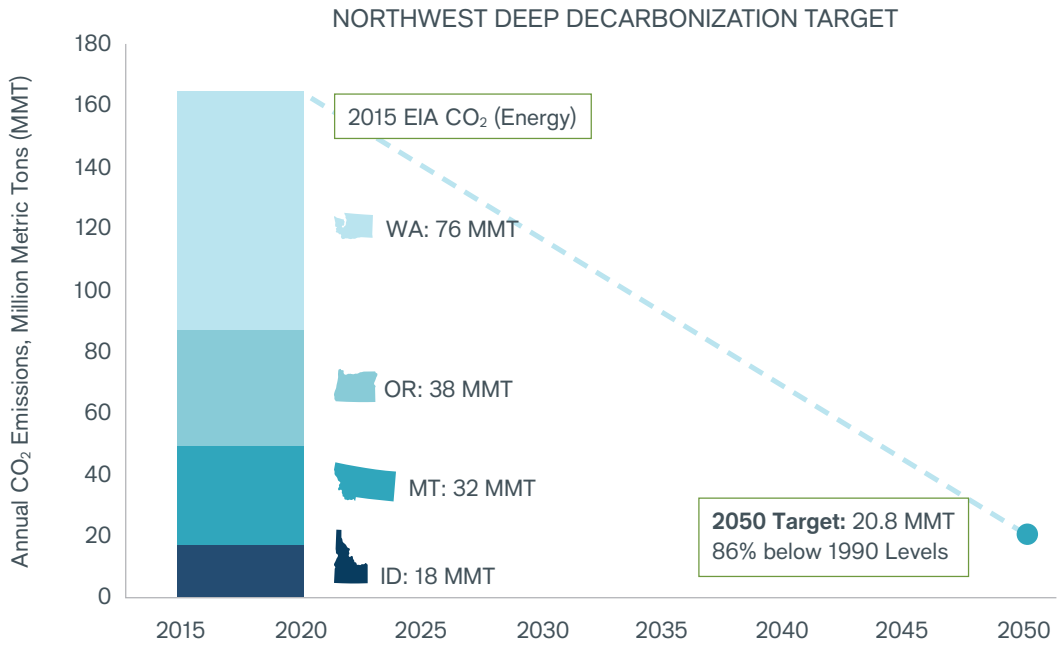
Two of the four Northwest states have set mid-century greenhouse gas emissions reduction targets. Washington established limits on emissions in 2008, including a 50% reduction below 1990 levels by 2050, which the Department of Ecology has recommended strengthening to 80%. Since 2007, Oregon has had the goal of reducing GHG emissions by 75% below 1990 levels by 2050.

This study's analysis uses the carbon emissions reduction target of 80% below 1990 levels by 2050 for all emissions (the global target established by scientific consensus) and assumes that the energy system will need to achieve reductions of 86% in energy-related CO_2 emissions below 1990 by 2050 to achieve the overall target that includes other sources of carbon emissions, such as forestry, agriculture, waste management practices, and others. This target was applied to each Northwest state independently. Targeting an 86% reduction in energy-related CO_2 emissions allows for fewer reductions of non-energy CO_2 emissions and non-CO_2 GHG emissions, where reduction strategies are less well understood.

While achieving the economy-wide target of 80% below 1990 levels by 2050 does not put the Northwest on track to do its part to limit the rise of global temperatures to 1.5°C, it is the standard target that most deep decarbonization pathways studies have modeled to date. An 80% reduction target provides a baseline against which deeper reductions could be measured in future studies.

This study, therefore, represents a floor and not a ceiling for responsible climate action, and while it develops an important pathway, further analysis should be conducted to achieve the targets that scientists recommend for the world to address global warming. Figure 4 depicts the deep decarbonization target for the Northwest energy system to attain.

FIGURE 4. An 86% reduction in energy-related CO_2 emissions below 1990 levels by 2050 is required to achieve an overall Northwest deep decarbonization target.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 15.

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Deep Decarbonization Pathways Framework

To decarbonize energy supply—electricity, pipeline gas, liquid fuels—the study applies a least-cost optimization framework that chooses the most cost-effective investment in resources to develop low-carbon energy supply portfolios. The model determines the fuel and energy supply-side infrastructure simultaneously while also considering constraints, such as the need to maintain electricity system reliability, or how much of a given resource, such as biomass, is available.

The deep decarbonization pathways framework for energy includes these strategies:



1. Use Less Energy

Energy efficiency and conservation reduce energy so fewer resources are needed, less carbon is emitted, and consumers pay less. Buildings, appliances, and vehicles all must become far more efficient to dramatically reduce energy consumption.



2. Decarbonize Electricity

By 2050, low-carbon technologies must replace nearly all fossil fuel electricity generation. A nearly 100% clean electric grid is essential to achieving required emission reductions.



3. Decarbonize Liquid Fuels and Gas

For energy-dense transportation, such as aviation, long-haul trucking, and some industrial heat processes, carbon-beneficial biomass and synthetic fuels may be used.



4. Fuel-Switch

Transportation is currently powered by petroleum, while buildings and industry are currently fueled by a mix of natural gas, petroleum, and electricity. All must switch to cleaner fuels, principally clean electricity.

Photos clockwise: Infrared home detector. Photo credit: iStock; Wind turbines. Photo credit: iStock; Large commercial jet airplane. Photo credit: Cory Hatchel; Under the hood of a Nissan LEAF, Photo credit: Green Energy Futures

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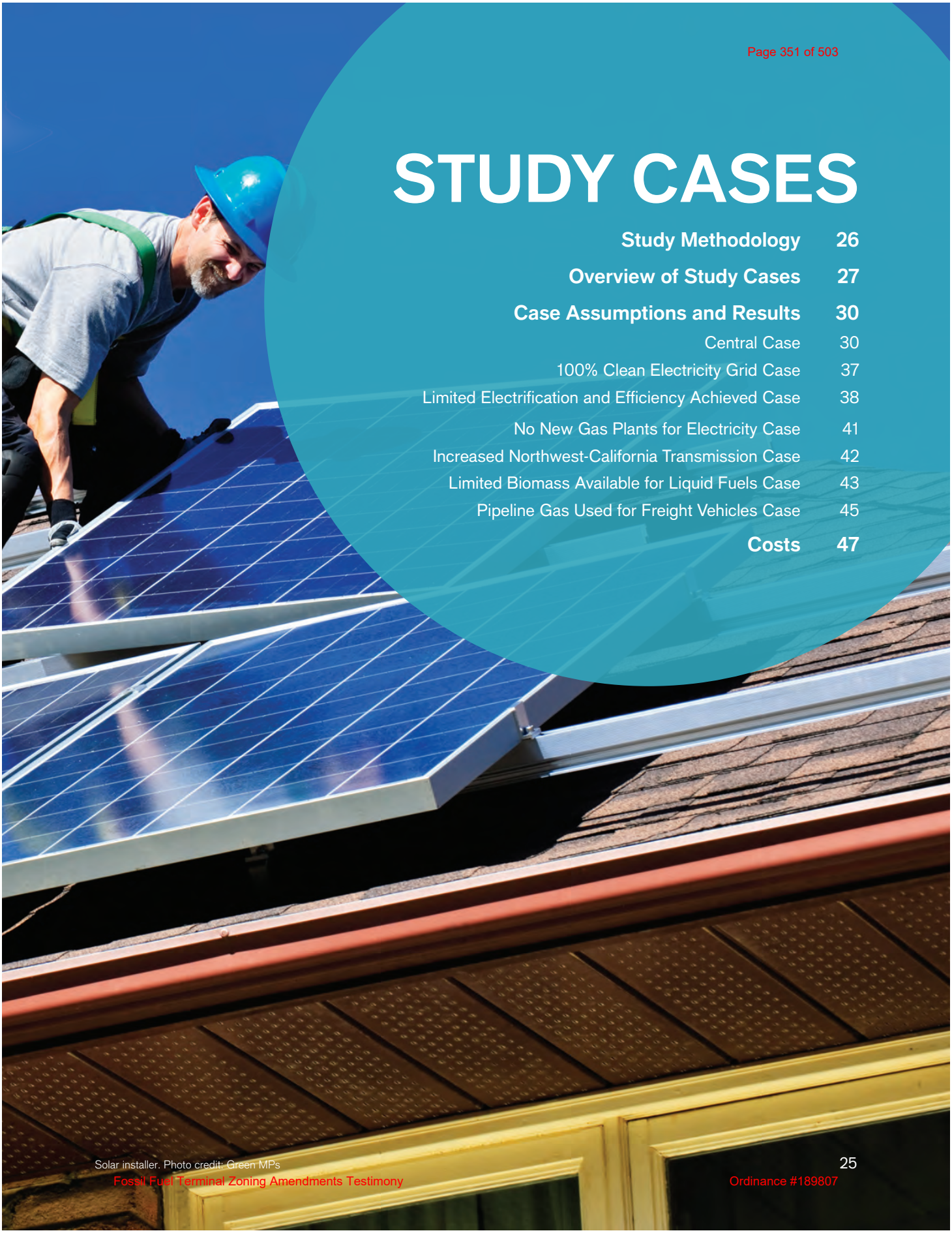

Solar installer. Photo credit: Green MPs

Study Methodology

Prior to commissioning *Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest*, the Clean Energy Transition Institute convened a Deep Decarbonization Pathways Working Group (see page 4 for the list of participants) and conducted numerous interviews with Northwest stakeholders about the value of conducting an economy-wide pathways study.

This stakeholder process revealed a clear need for a common set of facts about the decarbonization pathways for the Northwest that legislators and the advocacy community could agree to. (See Appendix E for the questions that stakeholders developed.) The Clean Energy Transition Institute commissioned Evolved Energy Research (EER) to develop the pathways to deep decarbonization for the four Northwest states with the following study parameters:

- Explore how energy sectors and energy supply need to transform in the most technologically and economically efficient way.
- Examine the extent to which electricity generation needs to be decarbonized to achieve economy-wide carbon reduction goals.
- Estimate the most cost-effective use of biomass for decarbonizing fuels.
- Assess the impacts of alternative assumptions and constraints, such as the limits of available biomass or the failure to achieve a high rate of electrification.
- Explore the value of increased electricity grid transmission between the Northwest and California.

The modeling process began by creating representations of each of the four state energy systems, incorporating state-specific energy infrastructure data and existing policies and creating benchmarks against historical energy use and emissions. The modelers then defined the deep decarbonization pathways by identifying plausible technologies for energy supply and demand and creating multiple scenarios that were designed to address the specific regional decarbonization questions, cases, and sensitivities that the Clean Energy Transition Institute wanted to explore.



King County Cities Climate Collaboration summit, January 2015.
Photo credit: Clean Energy Transition Institute

The model ran scenarios for each pathway through 2050, optimizing energy supply-side decisions within the constraints of the scenario being run and producing outputs of energy, emissions, cost, and infrastructure for different pathways to achieve steep reductions in energy-related CO_2 emissions by 2050. Modeling involved two different models that Evolved Energy Research developed: EnergyPATHWAYS (EP) and the Regional Investment and Operations model (RIO). (See Appendix A for detailed discussion of the modeling approach.)

The deep decarbonization target was applied to each Northwest state independently and assumes that each state complies with the target individually, although each can also use regional energy resources by importing or exporting clean energy to achieve compliance. One advantage of this study methodology is that it produces deep decarbonization pathways for each state individually.

Overview of Study Cases

The study explores multiple pathways for decarbonizing the region's energy system, while addressing policy questions and potential implementation challenges in the context of economy-wide carbon limits. The modeling exercise involved eight cases: the Business as Usual Case and the Central Case, two cases that examine different levels of energy demand, and four cases that assume varying sources of energy supply.

The Business as Usual Case is based on existing policies and is the scenario against which the seven deep decarbonization cases are compared. The Central Case represents the optimal deep decarbonization pathway, and the remaining six pathways cases are developed off the Central Case to draw out insights from alternative assumptions and policies. (See Appendix C for a list of all study assumptions and Appendix D for a list of key references.)



Wind turbine technicians. Photo credit: Pinnacle Career Institute

This approach allows for a better understanding of the trade-offs across the energy system when we assume alternative levels of electrification, mandates to use 100% clean electricity generation or prohibit new gas power plants, constraints on the use of biomass, and further electricity sector integration between the Northwest and California.

FIGURE 5. Overview and descriptions of the eight cases in this study.

Case	Description
Business as Usual Case	• A continuation of current and planned policy • Provides a benchmark against the deep decarbonization pathways
Central Case	• Represents the core pathway to achieve deep decarbonization • Flexible pathway to achieve emissions reductions (e.g., technology agnostic in the electricity sector)
100% Clean Electricity Grid Case	• 100% of electricity generation in the Northwest must come from zero-carbon sources in 2045 • Allows gas-fired generation to burn biogas and synthetic electric fuels
Limited Electrification and Efficiency Achieved Case	• Aggressive electrification fails to materialize • Adoption of electrification is half of the Central Case
No New Gas Plants for Electricity Case	• Pathway prohibits any new gas-fired power plants across the region throughout the study horizon • Existing gas plants retire at the end of their natural life, which effectively results in zero gas plants by 2050
Increased Northwest-California Transmission Case	• NW and CA power systems are currently connected by approximately 8,000 MW of interties • Pathway allows for transmission interties to be expanded as both regions strive to achieve decarbonization
Limited Biomass Available for Liquid Fuels Case	• Each state's bioenergy potential is limited to waste and wood feedstocks without access to energy crops or resources outside of the region • Biomass supply is 60% less than Central Case
Pipeline Gas Used for Freight Vehicles Case	• Freight vehicle fleet has a large composition of compressed and liquefied pipeline gas trucks • Increased pipeline gas use in freight transportation supplants diesel fuel demand in the Central Case

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The eight cases studied are as follows:



Business as Usual Case

The Business as Usual Case assumes the continuation of current and planned policy for the four Northwest states, serves as the benchmark case, and demonstrates that existing policies are not enough to attain the deep decarbonization target.



Central Case

The Central Case is the optimal low-carbon pathway for the Northwest and shows that a diverse set of unconstrained technologies and strategies (including significant energy efficiency and electrification) will achieve deep decarbonization. It is structured to answer multiple questions: How clean must electricity generation be to realize a deep decarbonization target? What is the cost-optimal allocation of biomass? How quickly must we electrify transportation? What is the role of natural gas for electric power generation in 2050?



100% Clean Electricity Grid Case

The 100% Clean Electricity Grid Case puts the grid on a trajectory to zero-carbon sources for all electricity generation starting in 2020, and constrains electricity generation to be 100% clean in 2045 and beyond to align with California's clean energy mandate. Gas-fired power plants are allowed to burn biogas and synthetic electric fuels to meet the target. This case demonstrates how more aggressive decarbonization in the electricity sector can make up the balance with harder-to-mitigate sectors.



Limited Electrification and Efficiency Achieved Case

In this case, the aggressive electrification and efficiency assumed in the Central Case fail to materialize. It explores the strategies needed to achieve deep decarbonization if electrification is only half of that achieved in the Central Case.



No New Gas Plants for Electricity Case

This case prohibits any new gas-fired power plants in the region after 2020 and has existing gas plants retire at the end of their economic lives, which means no gas plants operate on the grid by 2050. This case reveals the options that electric grid managers have for maintaining resource adequacy and flexibility as renewables are added, as well as the role that storage would need to play in maintaining grid reliability.



Increased Northwest-California Transmission Case

In this case, unconstrained construction of additional transmission between the Northwest and California electric grids allows better integration than currently exists. This case reveals how a more efficient use of electricity sector infrastructure can reduce costs and grid-balancing challenges.



Limited Biomass Available for Liquid Fuels Case

For this case, each state's bioenergy potential is limited to waste and wood feedstocks with no access to energy crops or to biomass resources outside of the region, which means 60% less biomass than in the Central Case. This case tests the impact of limiting biomass to see what other strategies would be required to meet deep decarbonization if a sustainable biomass supply fails to materialize.



Pipeline Gas Used for Freight Vehicles Case

Here hybrid diesel vehicles in the Central Case are powered by compressed natural gas for medium-duty vehicles and liquefied pipeline gas for heavy-duty vehicles. The total vehicle fleet has the same proportion of battery electric vehicle fleets as in the Central Case, which helps illuminate the potential role for pipeline gas in transportation.

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Case Assumptions and Results

Central Case

The Central Case was designed to probe how clean the electric grid must be to achieve the economy-wide carbon reduction target and how biomass would be cost-optimally allocated. On the demand side, the Central Case incorporates aggressive levels of efficiency and electrification across all sectors.

On the supply side, the Central Case allows for cost-optimal decarbonization of energy supply without explicitly constraining which fuels are decarbonized. In other words, in the Central Case there is no explicit requirement that all electricity must be 100% clean or an explicit prohibition on building new gas plants.

Figure 6 below shows the demand-side assumptions that the modelers chose for transportation, buildings, and industry.



Electric smart car. Photo credit: Green Energy Futures, David Dodge

FIGURE 6. The assumptions for demand in the Central Case.

Sector	Subsector	Assumption
Transportation	Light-duty vehicles	90% battery electric 10% plug-in hybrid electric
	Medium-duty trucks	60% battery electric 40% hybrid diesel
	Heavy-duty trucks	40% battery electric 60% hybrid diesel
	Aviation	48% reduction in energy intensity
Buildings	Space conditioning	Primarily air source heat pump
	Water heating	Primarily heat pump water heater
	Lighting	LED
	Appliances	Best available technology
Industry	Industrial curing, processing, boilers, machine drives, and process heat	Electrification adoption similar to NREL Electrification Futures Study "High scenario"
	Other subsectors	20% reduction from baseline

Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 49.

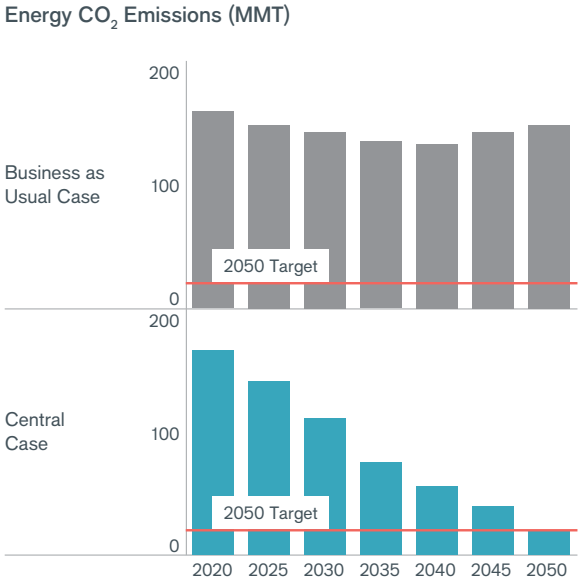
As Figure 7 shows, the Business as Usual Case's emission trajectory falls far short of the 2050 reduction goal, while in the Central Case, electrification, energy efficiency, and decarbonizing the energy supply enable each Northwest state to meet the mid-century energy CO_2 emission target of 86% below 1990 levels.

As Figure 8 demonstrates, overall end-use energy demand in 2050 is more than one-third less than today, in spite of population increase and economic growth; electricity consumption increases by more than 50% and comprises one-half of all end-use demand by 2050; and liquid fuels decrease from one-half of today's demand to one-fifth by 2050 as on-road vehicles transition to electricity.



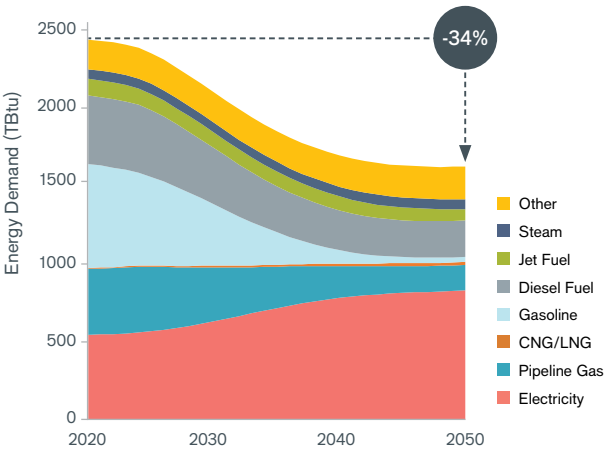
Traffic on the Alaskan Way Viaduct. Photo credit: Tony Webster

FIGURE 7. In the Business as Usual Case emissions trajectory falls far short of the 2050 reduction goal, while the Central Case meets the mid-century energy CO_2 emission target of 86% below 1990 levels.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 62.

FIGURE 8. In the Central Case energy demand is down 34% and electricity consumption is up more than 50% in 2050.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 67.

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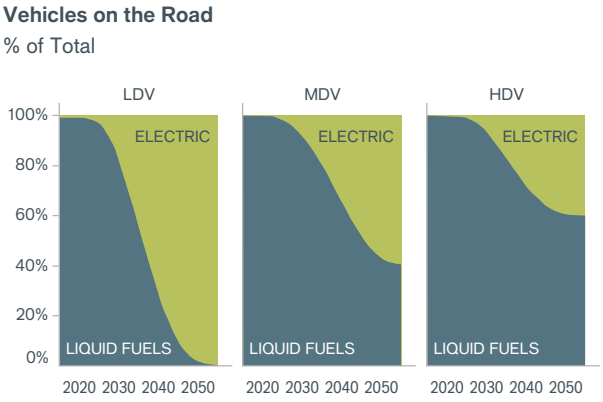
The primary reason for the net increase in electricity consumption in the Central Case is that by 2050 all passenger vehicles (LDVs), 60% of medium-duty vehicles (MDVs), and nearly half of all freight trucks (HDVs) are electric. The freight trucks that continue to use liquid fuels mostly consume renewable diesel in 2050. Figure 9 shows the increasing proportion of electric to liquid fuels for the three vehicle classes in 2020, 2040, and 2050.

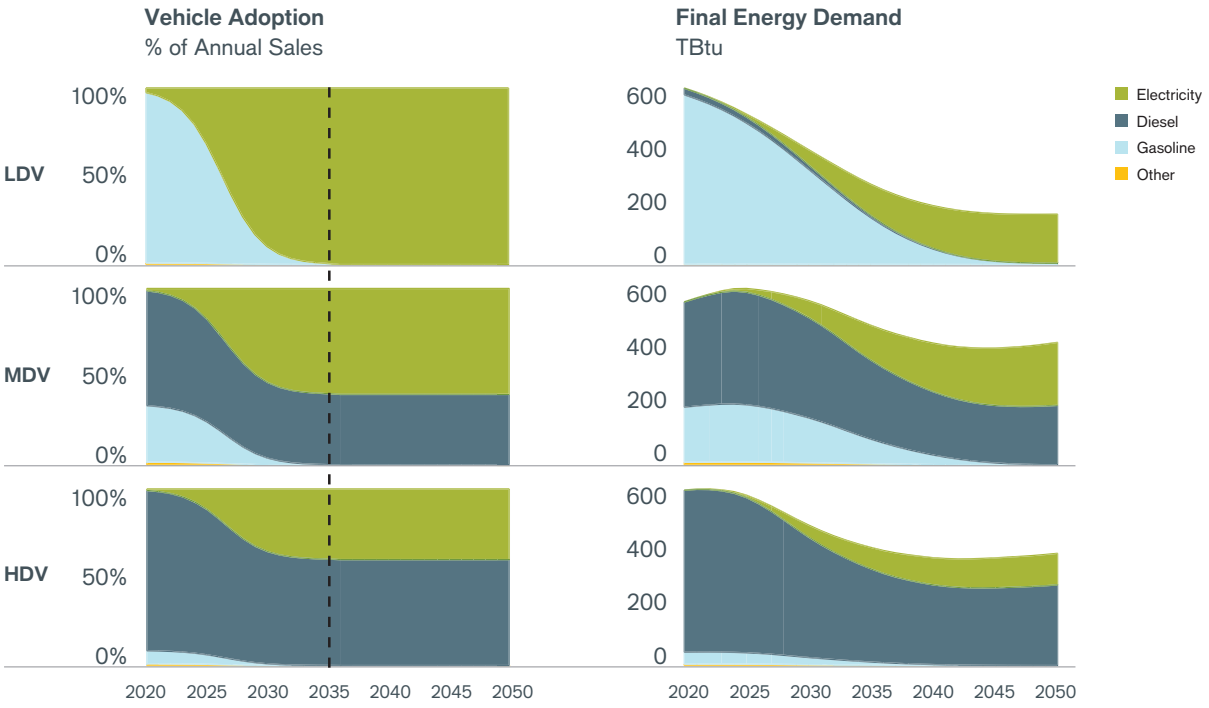
As Figure 10 shows, in the Central Case all LDV (passenger car) sales are electric by 2035 (note the dotted line in the Vehicle Adoption graph). The figure also shows the proportion of electric versus renewable diesel versus gasoline to meet energy demand over the 30-year span. Gasoline is out of the fuel mix in the Central Case. The significant decrease in energy demand for LDVs is all met with clean electricity in 2050 and the freight truck fleet uses a combination of electricity and renewable diesel by 2050.

FIGURE 9. The increasing proportion of electric to liquid fuels for vehicles from 2020 to 2050.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 68.

FIGURE 10. The rate of vehicle adoption as a percentage of annual sales by fuel type from 2020 to 2050 in the Central Case.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 69.

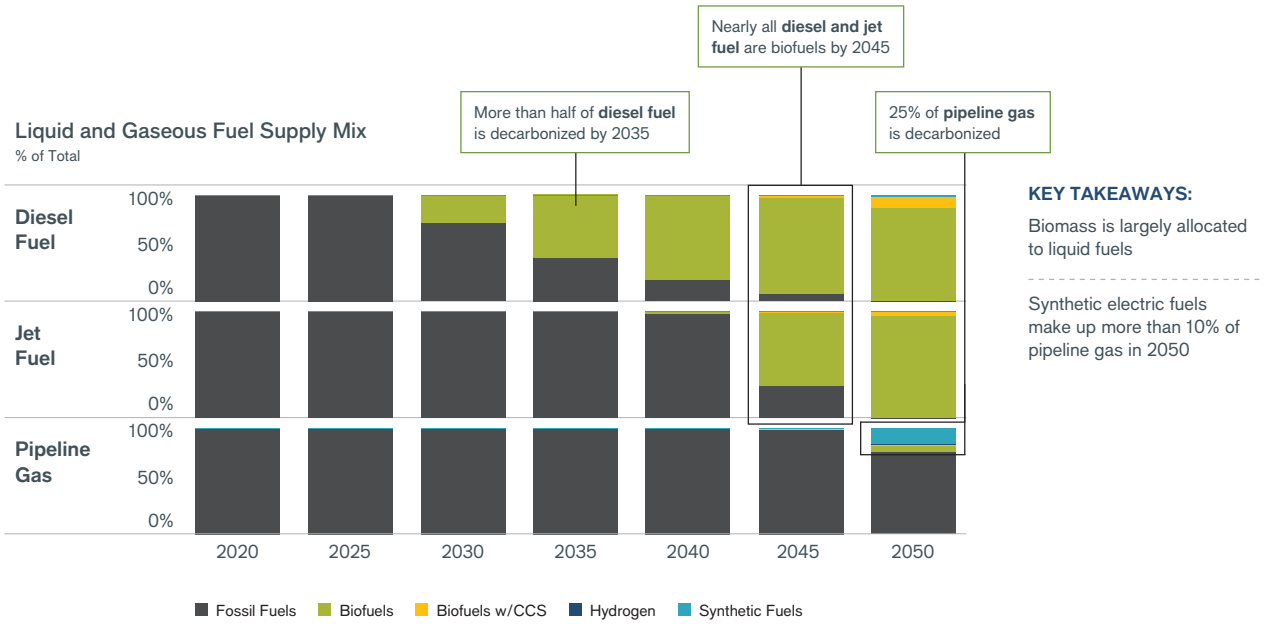
Figure 11 shows the composition of the liquid and gaseous fuel supply mix from 2020 to 2050 in five-year increments, divided among fossil fuels, biofuels and biofuels with carbon capture and sequestration (CCS), hydrogen, and synthetic fuels. Biofuels begin replacing fossil fuels for diesel fuel in 2030, and by 2035 more than half of diesel fuel is decarbonized.

In 2050, biofuels begin decarbonizing jet fuels and nearly all diesel and jet fuel are biofuels by 2045. By 2050, diesel and jet fuel are decarbonized, largely by biofuels, but synthetic electric fuels also make up more than 10% of pipeline gas in 2050, and 25% of pipeline gas is decarbonized, mostly with synthetic electric fuels.

Electricity sector load increases by more than 60% between 2020 and 2050, largely due to the net increase of higher fixed loads from transportation and building electrification. However, producing hydrogen, capturing CO_2, and using electric boilers to produce steam also create significant new load.

Incremental wind and solar photovoltaics (PV) are the principal sources of supply to decarbonize electricity generation and meet the growing demand for electricity in the Central Case from 2020 to 2050. Wind generation is nearly the same as hydroelectricity generation by 2050, while the share of gas-fired generation is only 3.7%, and coal-fired generation is completely eliminated by 2050. The model extends Columbia Generating Station (CGS)'s nuclear power beyond its current 2043 end date through 2050, the study's time horizon.

FIGURE 11. The composition of the liquid and gaseous fuel supply mix in the Central Case in five-year increments from 2020 to 2050.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 71.

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Figure 12 shows electricity generation in gigawatt hours on the left, and the generation mix as a percentage of total generation on the right.

New electricity power generation to be built in the Central Case is significant: nearly 100 gigawatts of new electricity supply resources by 2050, shown in Figure 13. Renewable energy dominates the new capacity, with more than 40 gigawatts of new onshore wind and 35 gigawatts of solar photovoltaic.

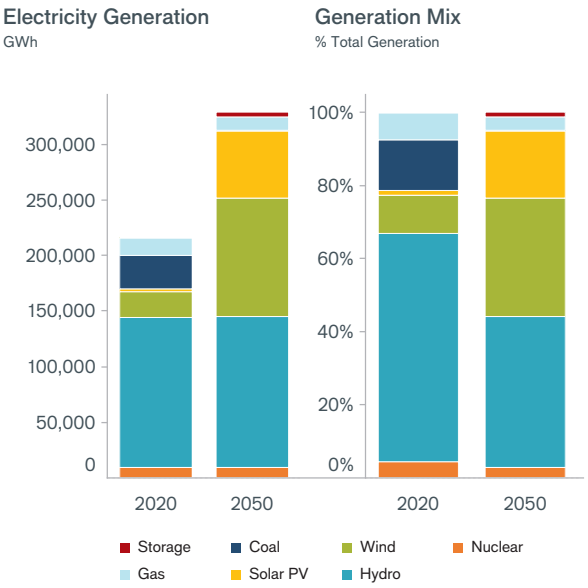
Gas and storage resources are added primarily to ensure that the grid has adequate resources to serve demand for energy and that different power sources are balanced; however, the share of gas-fired generation is 3.7% in 2050.

The large percentage of wind and solar resources is non-dispatchable generation, which creates electricity balancing challenges. In many low-carbon electricity systems studies, thermal and energy storage resources are used for balancing the grid. But these are either not able or too expensive to address grid imbalances that persist over days or weeks. This study expands the portfolio of options available to address balancing challenges by including flexible electric fuel production (electrolysis) as a resource.



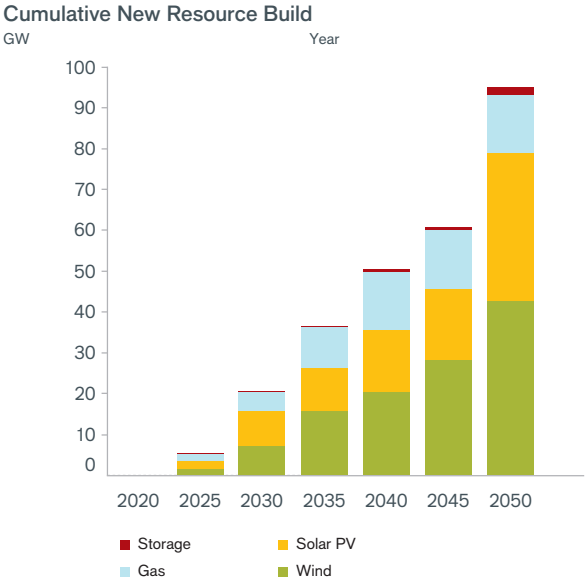
Installing solar panels. Photo credit: Oregon Department of Transportation

FIGURE 12. Amount of electricity generation and the generation mix for electricity supply in the Central Case.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 72.

FIGURE 13. The Northwest region would build 95 gigawatts of new electric generation in the Central Case.

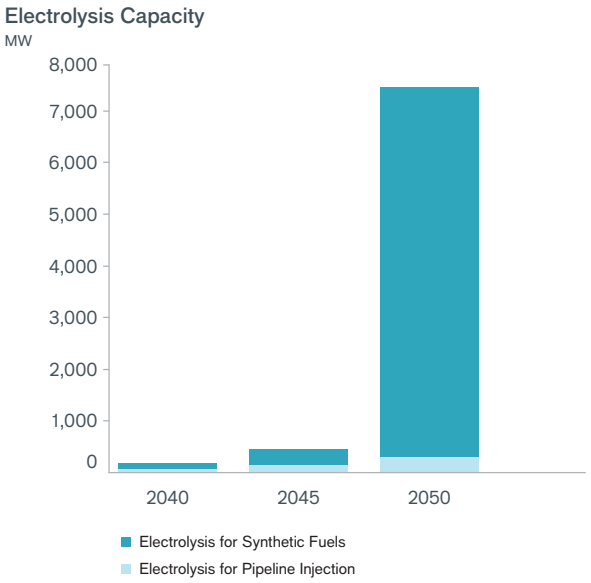


Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 73.

Electrolysis produces hydrogen that can be used in two principal ways: (1) as a feedstock to combine with a source of CO_2 to produce synthetic electric fuels; and (2) to be used as synthetic gas to inject directly into the gas pipeline. In the Central Case, 7,500 megawatts of electrolysis capacity is added in the Northwest by 2050, most of which is used to produce synthetic gas and uses existing gas delivery mechanisms, thereby avoiding new infrastructure expense. This electrolysis capacity is mostly added in 2050, as Figure 14 shows. (See Appendix B for a description of power-to-X, hydrogen electrolysis, and direct air capture.)

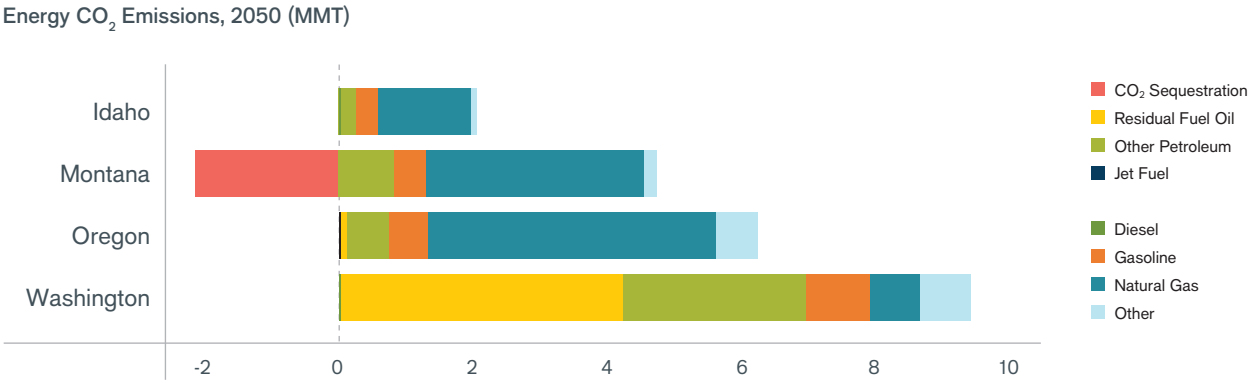
Jet fuel and diesel are almost completely displaced by biofuels and therefore barely register in Figure 15 below, which shows the remaining emissions in 2050 in the Central Case. In three of the four states, the majority of remaining emissions in 2050 are from natural gas combustion. The exception is Washington State, which is home to 75 ports and where residual fuel oil used in shipping is the largest remaining source of emissions. Montana is the only state with enough geological CO_2 sequestration potential to allow for the CO_2 capture and storage in saline aquifers.

FIGURE 14. Flexible electrolysis capacity is added starting in 2040 in the Central Case to address balancing challenges and produce synthetic fuels and gas.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 76.

FIGURE 15. In three of the four states, the majority of remaining emissions in the Central Case in 2050 are from natural gas combustion.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 79.

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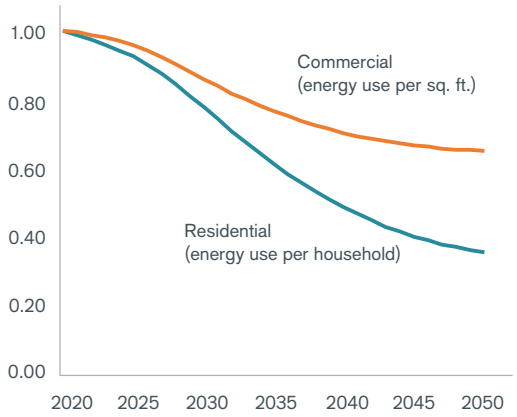
FIGURE 16. Decline in building energy intensity for commercial and residential buildings from 2020 to 2050.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 70.

In terms of energy efficiency, residential and commercial energy intensity drop significantly over time (See Figure 16.) This means that even as the number of households and commercial square footage grow over time, total energy use in the built environment declines and contributes to the Central Case's 34% decrease in overall energy use.

The decline in energy intensity is due to aggressive efficiency in electricity end-uses, such as lighting, clothes washers, and ventilation. The efficiency of heat pump technology relative to the best-in-class combustion equipment also translates into deep energy-use reductions in electrification of space and water heating.



Energy efficiency worker. Photo credit: Consumers Union



Lackland Airforce Base, San Antonio, Texas. Photo credit: William Belcher

100% Clean Electricity Grid Case

In the 100% Clean Electricity Grid Case, the Northwest states achieve economy-wide deep decarbonization with the mandate that all electricity generation must be zero-carbon by 2045, permitting no fossil fuel combustion in electricity generation. Thermal power plants can continue to operate, but pipeline gas consumption must be 100% decarbonized with either biogas or synthetic gas.

Requiring 100% of electricity generation in the Northwest to come from zero-carbon sources produces marginally different results from the Central Case. The share of gas-fired generation decreases from 3.7% to 1.7% due to incremental renewables and energy storage deployment and, by 2050, all of the gas burned for electricity is either clean synthetic or biofuels in the 100% Clean Electricity Grid Case.

Even though biofuels and synthetic gas are expensive, it is still cost-effective to burn them during times when it is challenging to supply adequate power, such as when low renewable generation coincides with periods of high load and low hydro.

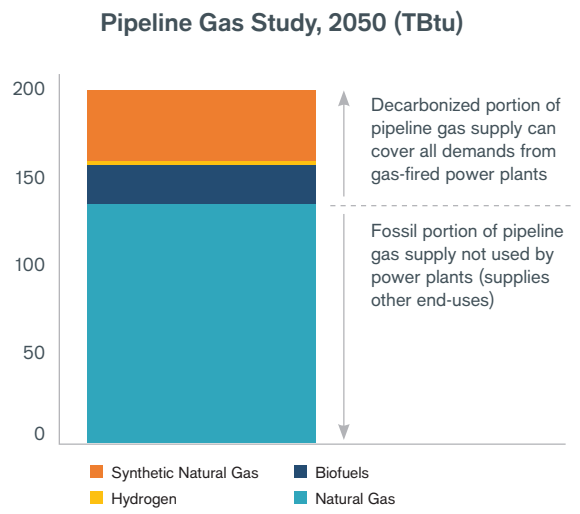
Seen in Figure 17, decarbonized pipeline gas supply (biofuels [dark blue], hydrogen [yellow], and synthetic natural gas [orange]) covers all demand from power generation in 2050. The majority of incremental decarbonized pipeline gas is from synthetic gas.

To achieve deep decarbonization of the energy system, the Central Case is 96% (nearly 100%) clean without a specific mandate, so a relatively small quantity of additional synthetic fuels and biofuels are needed to bridge the gap between 96% and 100% clean electricity in the Northwest. It is easier to obtain 100% clean electricity when the electricity sector is integrated with other parts of the supply-side energy economy that serve fuel demands. Producing fuels from electricity decarbonizes fuel supplies, replacing fossil fuels for transportation, industry, and buildings.

Producing fuels from electricity also provides valuable benefits that reduce investment costs in the electricity sector at high renewable penetrations in two ways: 1) producing flexible electric fuels increases load flexibility and makes it easier to balance the electricity system; and 2) clean synthetic gas can be used to generate electricity during challenging system-balancing conditions.

Furthermore, there are economic benefits with 100% clean electricity that come from sharing a border with California and the resulting renewable resource diversity: The Northwest has excellent wind, California has excellent solar, and both regions benefit economically from running clean electrons through the interties between them. (See the description of the Increased Northwest-California Transmission Case on page 40 for additional discussion of the technical and economic benefits of 100% clean electricity.) By sharing the same clean energy standard, the two regions could more easily take advantage of these resource diversity benefits.

FIGURE 17. In the 100% Clean Electricity Grid Case, decarbonized pipeline gas can fully supply power plants.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 81.

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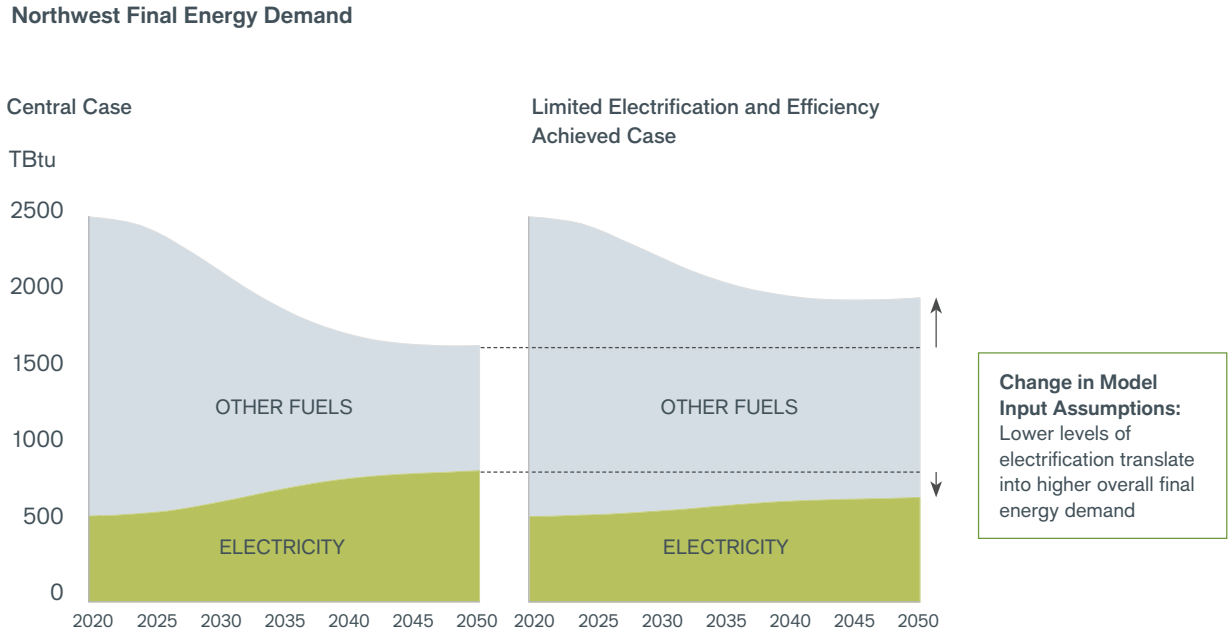
Limited Electrification and Efficiency Achieved Case

The Central Case relies almost completely on clean, efficient electricity replacing gasoline in vehicles, and biofuels replacing diesel and jet fuel, with a very small amount of synthetic fuels providing the remaining decarbonized source for the transportation sector. The Limited Electrification and Efficiency Achieved Case assumes that aggressive electrification fails to materialize and shows that removing clean electricity as a replacement for liquid and gaseous fuels requires using more of the other fuel sources in varying degrees, which results in significant added cost as discussed in the Cost section. (See page 45.)

In the Limited Electrification and Efficiency Achieved Case, adoption of electrification is one-half that of the Central Case (only 50% of passenger cars, 30% percent of medium-duty vehicles, and 20% of trucks are electric) and half of the electrification is achieved for buildings and industry. The demand for fuels shifts from 49% of the final energy demand in the Central Case to 66% in the Limited Electrification and Efficiency Achieved Case, as Figure 18 shows.

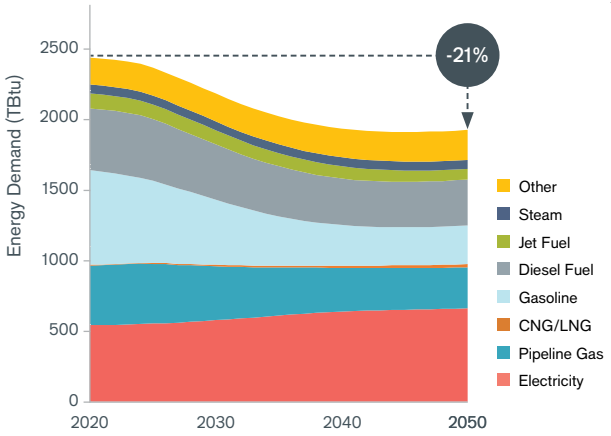
The lower levels of electrification also translate into higher overall final energy demand in the Limited Electrification and Efficiency Achieved Case. Overall end-use energy is 21% less than today's levels but 7% more than in the Central Case, as Figure 19 shows. With more energy demand to meet than in the Central Case, the supply side faces a higher mitigation burden to achieve the emission reduction target.

FIGURE 18. Assumptions for final energy demand in the Central Case vs. the Limited Electrification and Efficiency Achieved Case.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 52.

FIGURE 19. Energy demand declines by 21% in the Limited Electrification and Efficiency Achieved Case vs. 34% in the Central Case.

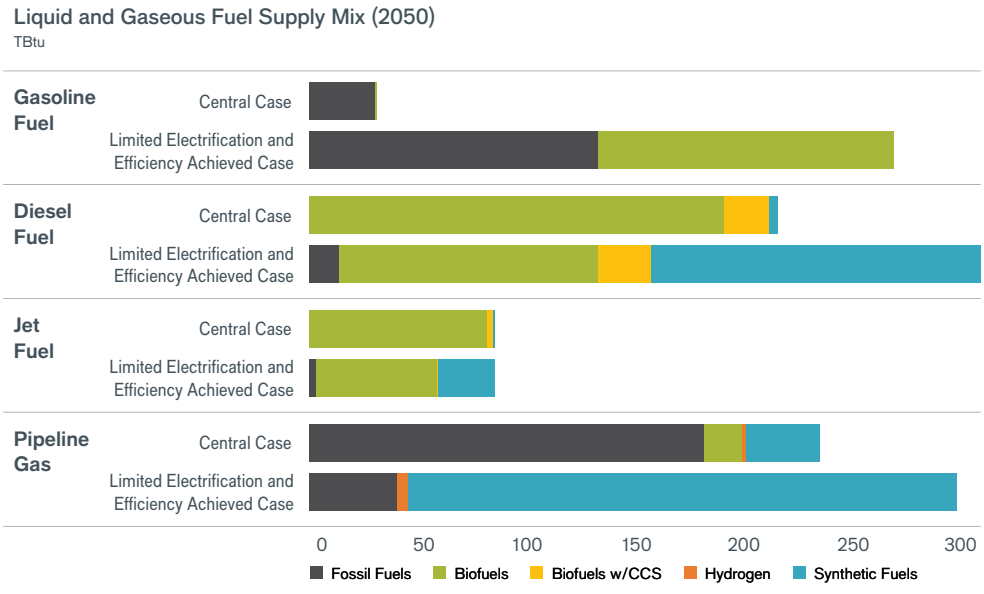


Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 83.

Achieving lower electrification, particularly in the transportation sector, means that large volumes of diesel fuel, jet fuel, and gasoline remain in the energy system during the 30-year study period, unlike in the Central Case where we saw that biofuels largely decarbonize these fuels.

Here, biofuels replace gasoline (which electricity replaced in the Central Case, thus saving biofuels for the harder fuels to decarbonize) and significantly more expensive synthetic fuels are required to decarbonize diesel fuels, jet fuels, and pipeline gas. Figure 20 shows the changes to fuel supply and biomass allocation in the Limited Electrification and Efficiency Achieved Case compared to the Central Case.

FIGURE 20. Changes to fuel supply and biomass allocation in the Limited Electrification and Efficiency Achieved Case.



Biomass is allocated to **gasoline fuel** as cellulosic ethanol, but fossil fuels still account for a large quantity of supply

As a result of the biomass reallocation, power-to-fuels is needed for liquid and gaseous fuels to decarbonize supply

Pipeline gas contains less natural gas to offset higher refined fossil gasoline emissions

Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 84.

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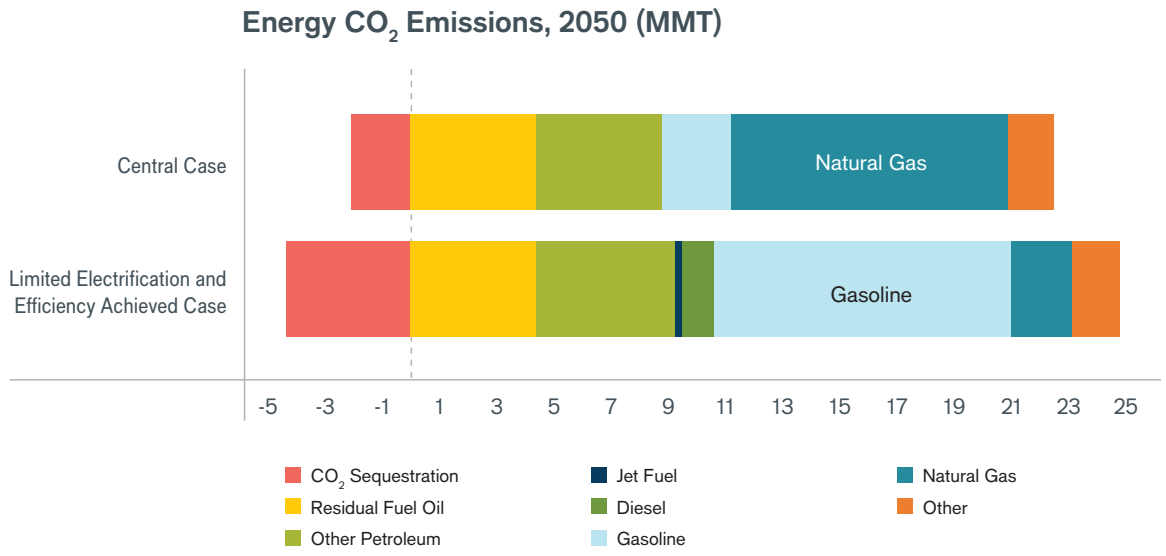
With lower levels of end-use electrification, the Limited Electrification and Efficiency Achieved Case has significantly higher emissions in the transportation fleet, primarily from gasoline, than in the Central Case. To compensate for these higher emissions, pipeline gas must be decarbonized to a greater extent than in the Central Case.

With all available biofuels being used to displace transportation fuels in the Limited Electrification and Efficiency Achieved Case, pipeline gas largely consists of synthetic gas and some hydrogen. Figure 21 shows that the remaining emissions in the Limited Electrification and Efficiency Achieved Case compared to the Central Case are largely in gasoline, jet and diesel fuel, and other petroleum, which includes kerosene, liquefied petroleum gas, and other petroleum products used in industry.

The large quantity of additional synthetic fuels required in the Limited Electrification and Efficiency Achieved Case to decarbonize pipeline gas, diesel, and jet fuel increases the need for CO_2 feedstocks, thus increasing investment in direct air capture (DAC) technology to provide them. In the Central Case, DAC technology captures approximately 2 million metric tons (MMT) of carbon in 2050, whereas in the Limited Electrification and Efficiency Achieved Case, 27 MMT must be captured in 2050.

The bottom line: not replacing gasoline with electricity means both that significantly more fuel is needed with the Limited Electrification and Efficiency Achieved Case than the Central Case and that there are not enough biofuels for jet and diesel fuels, so expensive synthetic fuels are required to decarbonize the fuel supply. In general, the study shows that achieving deep decarbonization in the transportation sector requires either widespread electrification or substantial increases in DAC-produced synthetic fuels.

FIGURE 21. Remaining energy CO_2 emissions in the Limited Electrification and Efficiency Achieved Case vs. the Central Case.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 85.

No New Gas Plants for Electricity Case

For the No New Gas Case, new gas-fired resources cannot be developed anywhere in the Northwest from 2020 to 2050. Existing gas resources retire at the end of their economic lives and cannot be extended or replaced, which means that there are no gas-fired resources online in 2050 in the region. There are no constraints on pipeline gas outside of the electricity sector.

Even though gas-fired resources comprise a small portion of generation in 2050 in the Central Case (3.7%), the resource adequacy value they provide to the system is significant and expensive to replace with other resources. Prohibiting the development of new gas-fired generating resources in the electricity sector results in 12 gigawatts of additional energy storage resources—dominated by lithium-ion batteries—to maintain resource adequacy. In addition to the 75 gigawatts of new renewables required in the Central Case, the No New Gas Case requires an additional 35 gigawatts of wind, solar, or geothermal resources. Figure 22 shows the change in installed capacity in the No New Gas Case relative to the Central Case in 2050.

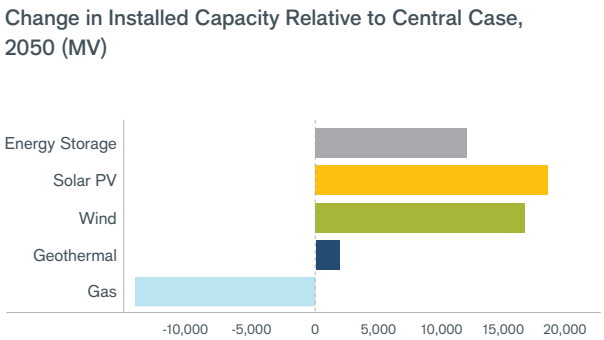


Electrical apprentice works on solar reference array. Photo credit: Northern Alberta Institute of Technology

The constraint on gas-fired resources in the electricity sector also has spillover effects on the rest of the energy system. Higher penetrations of renewables—and resulting overgeneration—incentivize the production of additional electric fuels, notably power-to-diesel and power-to-jet-fuel.

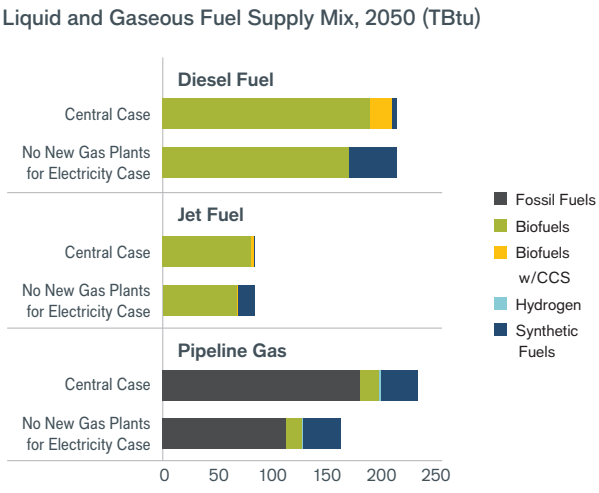
As a result, fewer biofuels are used. In fact, the No New Gas Case is the only case that does not fully use available biomass (biomass use is 30% below the Central Case). Figure 23 shows the impact on the liquid and gaseous fuel supply mix in 2050 when gas is constrained.

FIGURE 22. The No New Gas Case requires installing nearly three times as much renewable generation capacity.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 87.

FIGURE 23. Liquid and gaseous fuel supply mix in the No New Gas Case vs. the Central Case.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 88.

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Increased Northwest-California Transmission Case

The Increased Northwest-California Transmission Case explores how increased transmission between the Northwest and California could allow both regions to achieve deep decarbonization at potentially lower costs. The Northwest's and California's electricity systems are currently connected by approximately 8,000 MW of interties, including the California-Oregon Intertie (COI) and Pacific Direct Current Intertie (PDCI). The model economically expands transmission, relaxes California's net export limit over time, and removes hurdle rates between the two regions starting in 2030.

Approximately 4,500 MW of incremental transmission capacity is developed between the Northwest's and California's power systems. With this infrastructure in place, there are increased exports from California to the Northwest during daylight hours, while the Northwest increases exports to California during traditionally off-peak hours. Net exports from the Northwest increase by approximately 7,000 GWh in 2050.

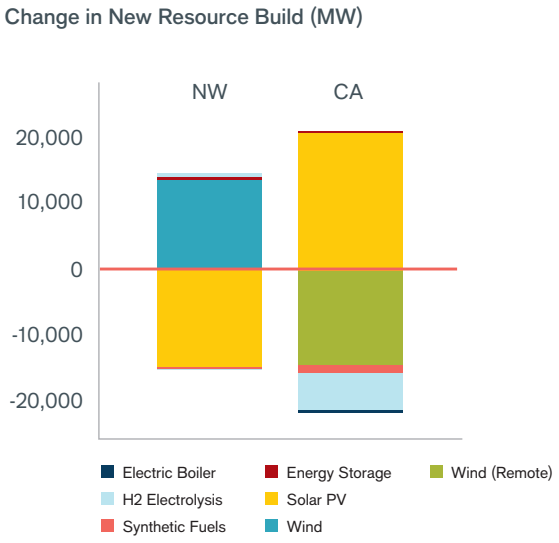
Expanded interties change the optimal electricity supply mix, with each region avoiding the development of local, low-quality renewables and expanding the development of high-quality resources that are more efficiently shared across both areas. Figure 24 shows the difference in resource build between the Central Case and the Increased Northwest-California Transmission Case by region. Those resources shown with positive megawatt changes increase in capacity versus the Central Case, whereas those on the negative side of the scale decrease in capacity.

By allowing greater transfer between regions, the Northwest and California can focus on building their best-quality resources. The Northwest avoids developing low-quality solar and increases wind development, and California avoids procuring remote wind generation from other Western states (New Mexico and Wyoming) and develops additional high-quality solar. In total, it is estimated that increased integration between California and the Northwest could save $11.1 billion in net present value over the 30-year study period (accrued to the combined California and Northwest region), with resource cost savings offsetting higher transmission investment costs.



Electricity transmission wires. Photo credit: Emilian Robert Vicol, Pixabay

FIGURE 24. The Increased Northwest-California Transmission Case means that the Northwest builds more wind and less solar relative to the Central Case.

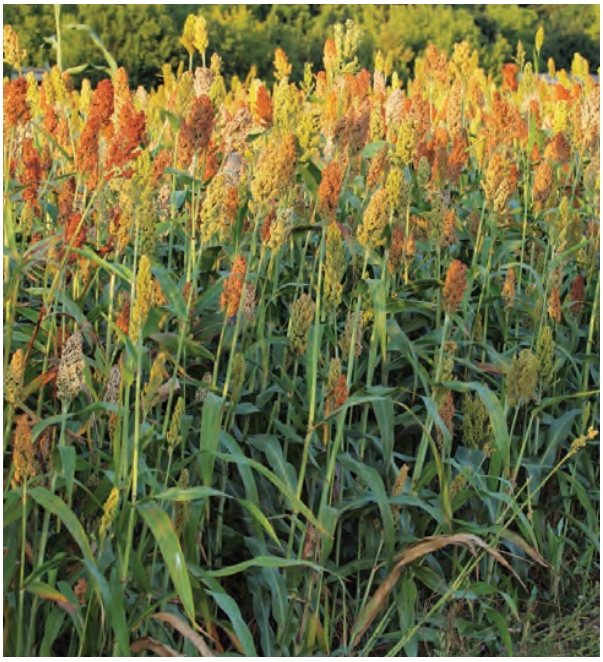


Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 90.

Limited Biomass Available for Liquid Fuels Case

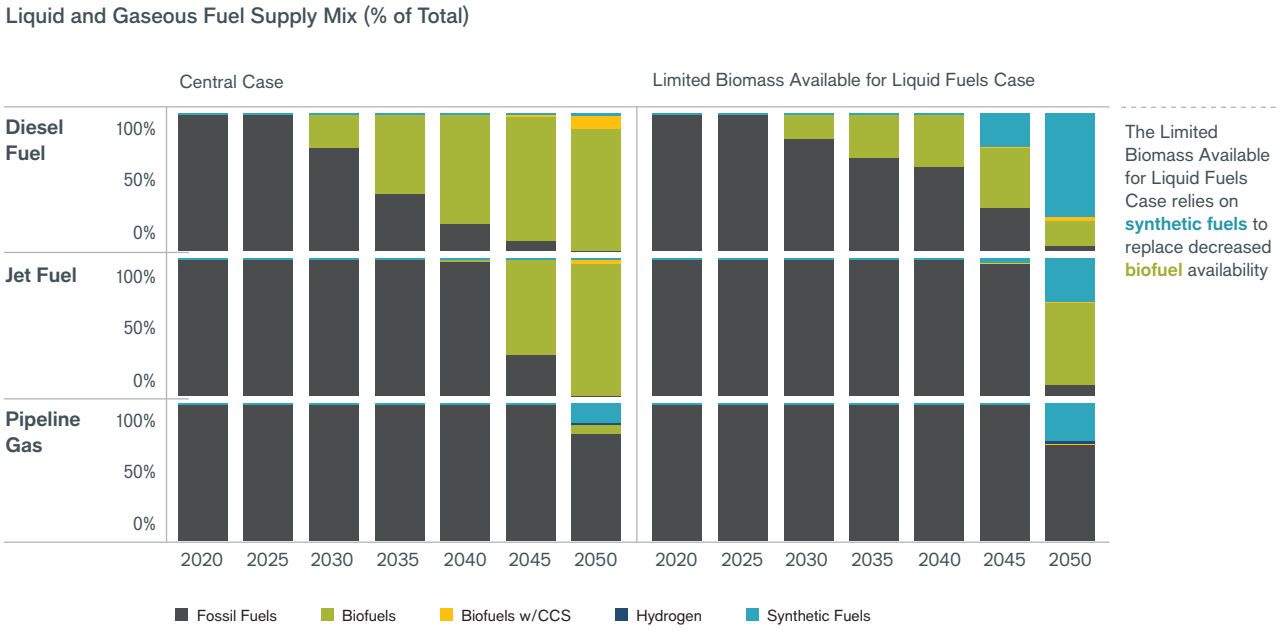
The Limited Biomass Available for Liquid Fuels Case addresses concerns about biomass availability, particularly crops grown expressly for energy. In this case, each state's bioenergy potential is restricted to in-state waste and its population-weighted share of regional wood. This constraint results in an overall biomass supply that is 60% less than the Central Case biomass assumptions.

Figure 25 shows how the fuel supply mix evolves over time for diesel fuel, jet fuel, and pipeline gas. The Limited Biomass Available for Liquid Fuels Case relies on synthetic fuels (seen in teal) to replace the lost biofuels (seen in green) present in the Central Case. The diesel fuel supply mix is impacted the most, shifting from almost 100% biofuels in the Central Case to predominantly synthetic fuels in the Limited Biomass Available for Liquid Fuels Case, which are more expensive.



Sorghum field. Photo credit: Hermann Falkner

FIGURE 25. The Limited Biomass Available for Liquid Fuels Case requires more expensive fuel sources.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 91.

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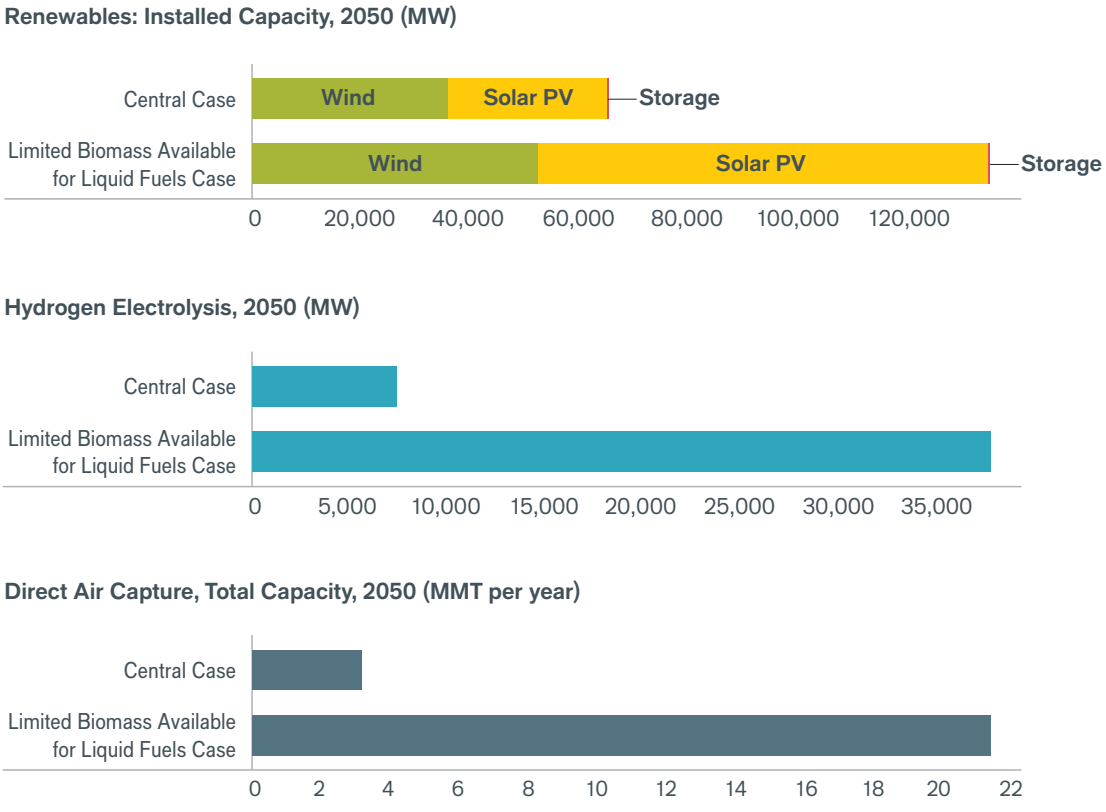
Producing high volumes of synthetic electric fuels to replace biofuels means building considerably more infrastructure, including two times the installed capacity of wind and solar resources, five times the requirement for electrolysis capacity, and six times the direct air capture capacity.

Hence, on top of the 40 gigawatts of new onshore wind and 35 gigawatts of solar PV already built in the Central Case, substantial investments in generation to power synthetic gas production would be required to offset the lack of biofuels. (See Figure 26 to understand the infrastructure implications of a constrained biomass supply.)



Biofuels work at Argonne. Photo credit: Argonne National Laboratory

FIGURE 26. The substantial infrastructure implications of the Limited Biomass Available for Liquid Fuels Case.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 92.

Pipeline Gas Used for Freight Vehicles Case

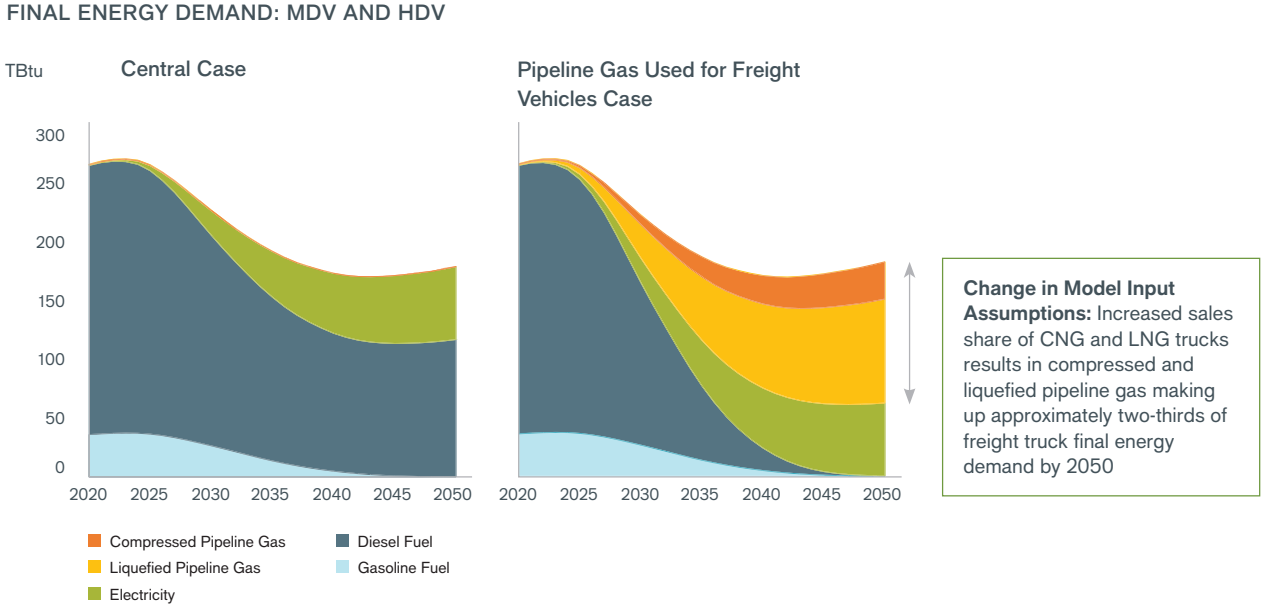
The freight vehicles in the Central Case that are not electric are diesel hybrid vehicles and in the Pipeline Gas Used for Freight Vehicles Case, compressed and liquefied pipeline gas substitute for diesel hybrid vehicles. Specifically, the Central Case assumes that medium-duty vehicles (MDVs) are 60% battery electric and 40% are diesel hybrid vehicles. In the Pipeline Gas Used for Freight Vehicles Case, the same number of MDVs are electric, but the remaining 40% of MDVs are powered by compressed natural gas.

Similarly, the 40% of heavy-duty trucks (HDVs) in the Central Case that are electric remain electric in the Pipeline Gas Used for Freight Vehicles Case, while the remaining 60% of HDVs are fueled by liquefied natural gas. Compressed and liquefied pipeline gas make up approximately two-thirds of freight truck final energy demand by 2050 as Figure 27 shows.



United Parcel Service truck fuels with compressed natural gas.
Photo credit: U.S. Department of Energy

FIGURE 27. Final energy demand for medium-duty and heavy-duty vehicles in the Central Case vs. the Pipeline Gas Used for Freight Vehicles Case.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 58.

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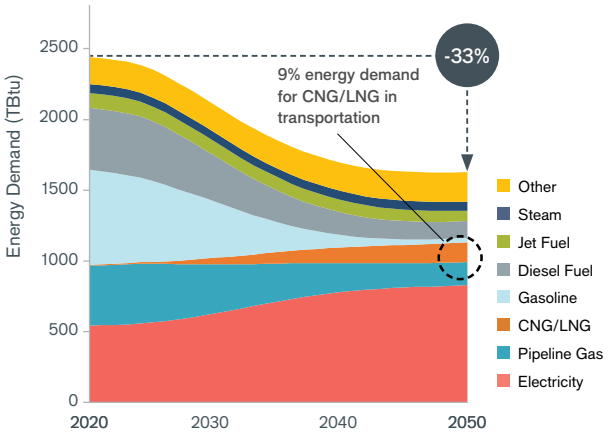
Compressed and liquefied pipeline gas are nearly 10% of end-use demand by 2050 in the Pipeline Gas Used for Freight Vehicles Case, with half of freight trucks consuming compressed or liquefied gas. Demand for diesel fuel is further reduced relative to the Central Case. (See Figure 28.)

As Figure 29 shows, freight trucks in the Pipeline Gas Used for Freight Vehicles Case consume more pipeline gas, which is supplied by increasing biofuels to pipeline gas and decreasing biofuels to diesel fuel. The main impact across energy systems in the Pipeline Gas Used for Freight Vehicles Case is the reallocation from liquid fuels to gaseous biofuels, as Figure 29 indicates.

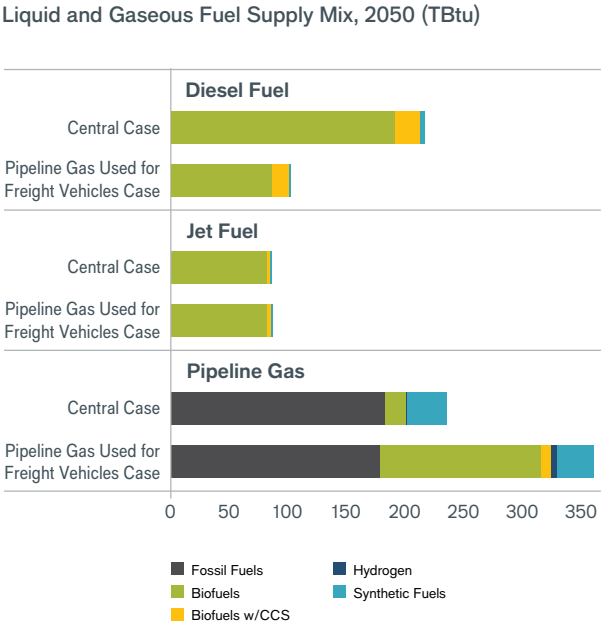
Important Note: The study does not take into account the carbon emissions from methane leakage or upstream emissions in the production of natural gas. Hence, the carbon benefit in the Pipeline Gas Used for Freight Vehicles Case is likely over-estimated and further study is required to investigate higher carbon emissions in the production and transport of pipeline gas.

FIGURE 28. Final energy demand in the Pipeline Gas Used for Freight Vehicles Case is down 33%, with compressed and liquefied pipeline gas constituting 9% of end-use demand in 2050.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 94.

FIGURE 29. The changes in the liquid and gaseous fuel supply mix in the Central Case vs. the Pipeline Gas Used for Freight Vehicles Case.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 95.

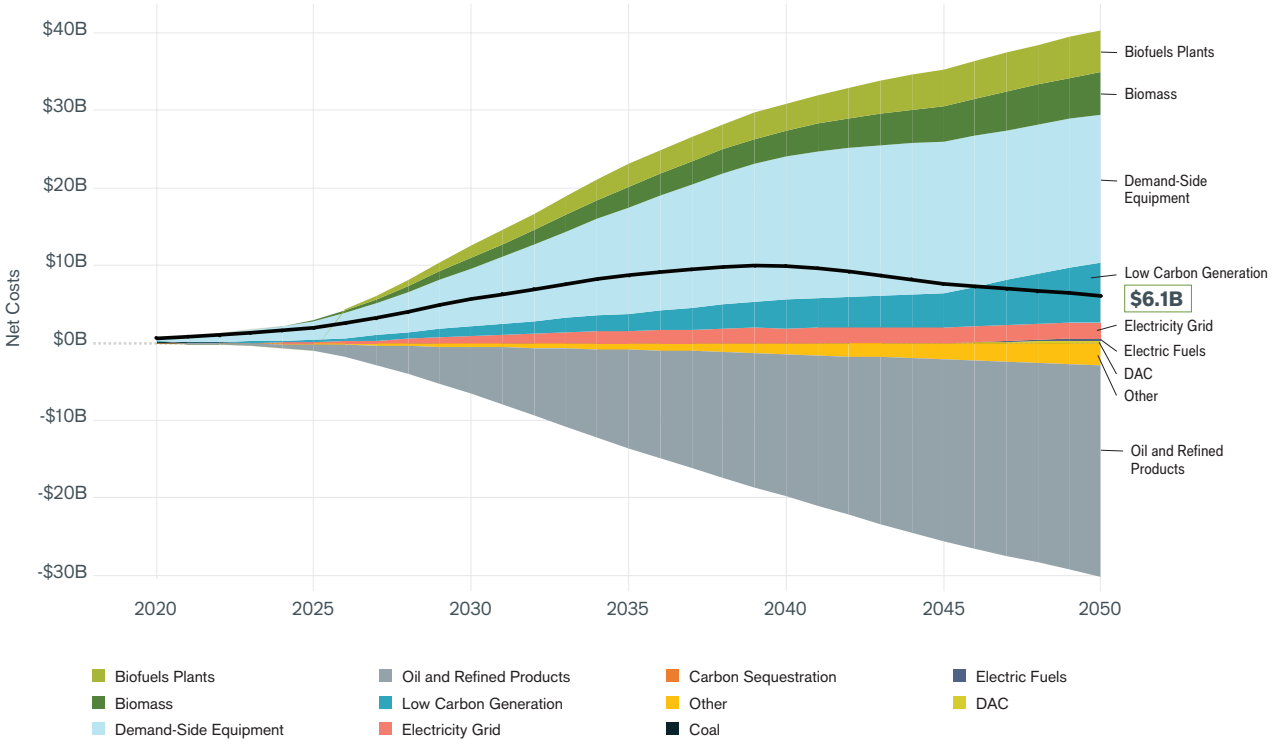
Costs

The scope of costs in this study is limited to energy system costs, which represent the annual cost of producing, distributing, and consuming energy. This study considered the annualized capital costs of equipment (both supply and demand), fixed and variable operations and maintenance (O&M) costs, and fuel costs. (See Appendix C for details on the cost assumptions used in this study.) The study excludes costs outside of the energy system or benefits from avoiding climate change and air pollution.

The study compares the annual costs of the Business as Usual Case and the Central Case from 2020 to 2050. Net annual costs of the Central Case vary over the modeled period based on the timing of infrastructure investments, peaking at 16.1% ($9.8 billion) above the Business as Usual Case in 2038 and decreasing to 8.3% ($6.1 billion) higher than the Business as Usual Case in 2050. The cumulative costs of decarbonizing the energy system in the Central Case are 9.5% higher than the capital and operating expenses of the Business as Usual Case's energy system, roughly 1% of the region's total GDP in 2017 of more than $870 billion. (See Figure 30.)

The increased costs in a decarbonized system consist primarily of biofuel feedstocks and infrastructure, demand-side electrification and efficiency investments, and renewable power plants and supporting electricity infrastructure. These increased costs are mitigated by the savings from decreased fossil fuel use, primarily expensive liquid petroleum products.

FIGURE 30. Annual net energy system costs for the Central Case relative to the Business as Usual Case 2020–2050.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 106.

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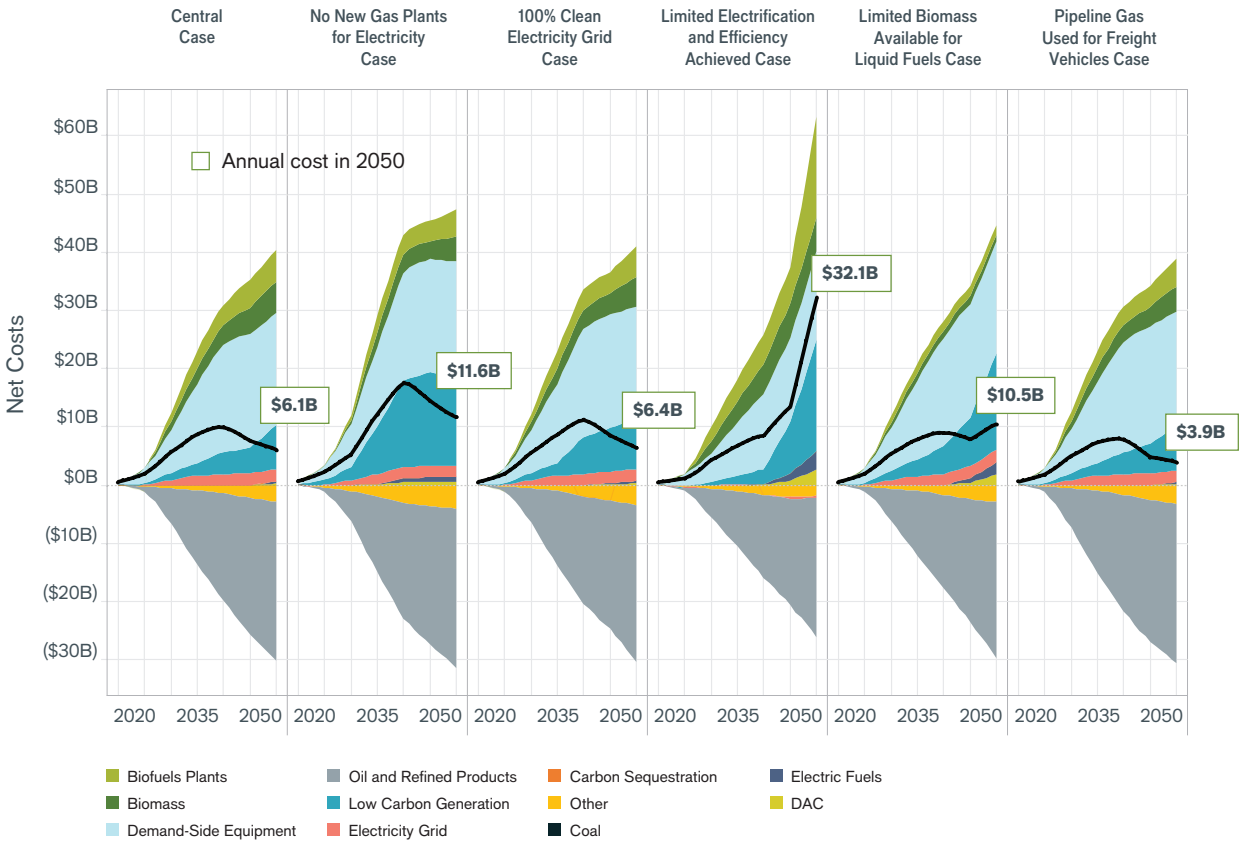
In Figure 31, the black line shows the net annual energy system costs as the difference in cost between each of the cases (except the Increased Northwest-California Transmission Case) and the Business as Usual Case. The stacked areas show the differences in investment by category between each case and the Business as Usual Case. Investments in additional clean energy measures (positive cost differences) are offset by avoided fuel purchases (negative cost differences).

The most impactful sensitivities in terms of net system costs include prohibiting new gas assets, not achieving demand-side transformation, and constrained biomass. Because 100% clean electricity has only a marginal change from the Central Case, it has minimal impact on costs.



City of Eugene, Oregon, transit service. Photo credit: City of Eugene, Oregon

FIGURE 31. Annual net energy system costs for six cases compared to the Business as Usual Case.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 107

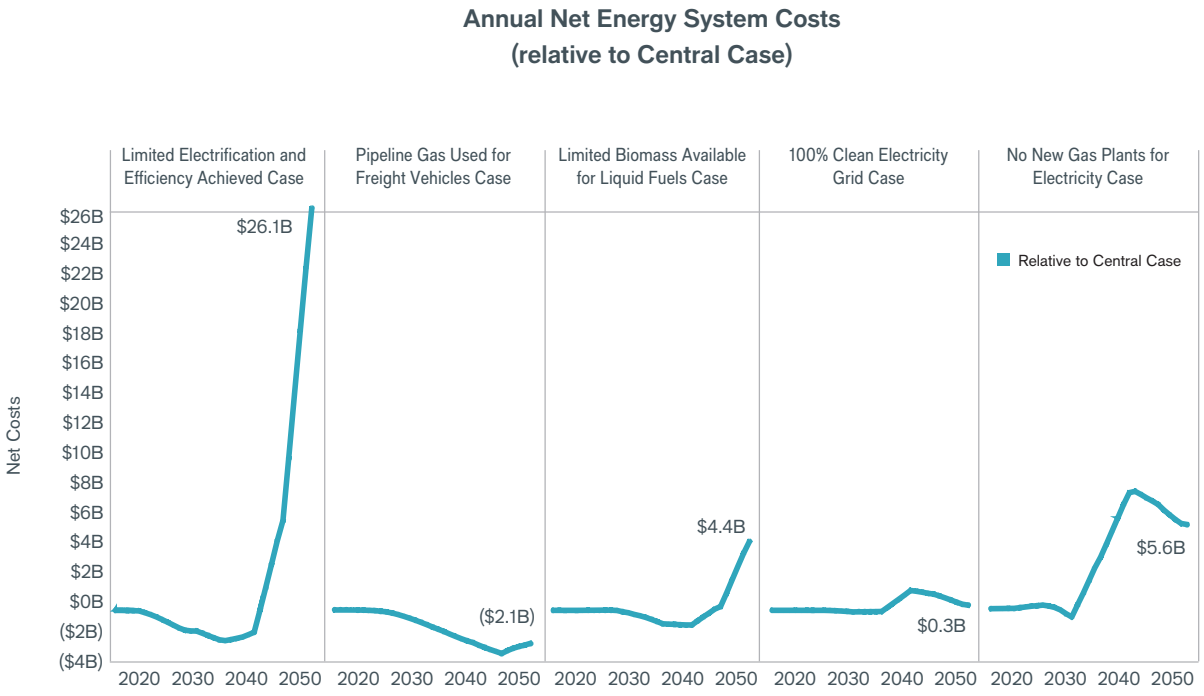
Increased gas in transportation allows access to a lower-emissions/lower-cost fossil fuel than diesel, but as previously noted, this result does not consider the carbon emissions of methane leakage, so its lower cost must be viewed in light of its uncounted higher carbon emissions. Further, there are technical challenges with using pipeline gas for heavy-duty trucks. (See Figure 32.)

Most cases show a slight increase in household expenditures in the 2030 time frame—roughly $25 per month. But by 2050, most cases show small monthly savings, due to the increasing cost-effectiveness of electric vehicles and the elimination of gas costs.



Fort Dix solar panels. Photo credit: U.S. Army Environmental Command

FIGURE 32. Annual net energy system costs for the cases (not including the Business As Usual Case and the Increased Northwest-California Transmission Case) relative to the Central Case.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 108.

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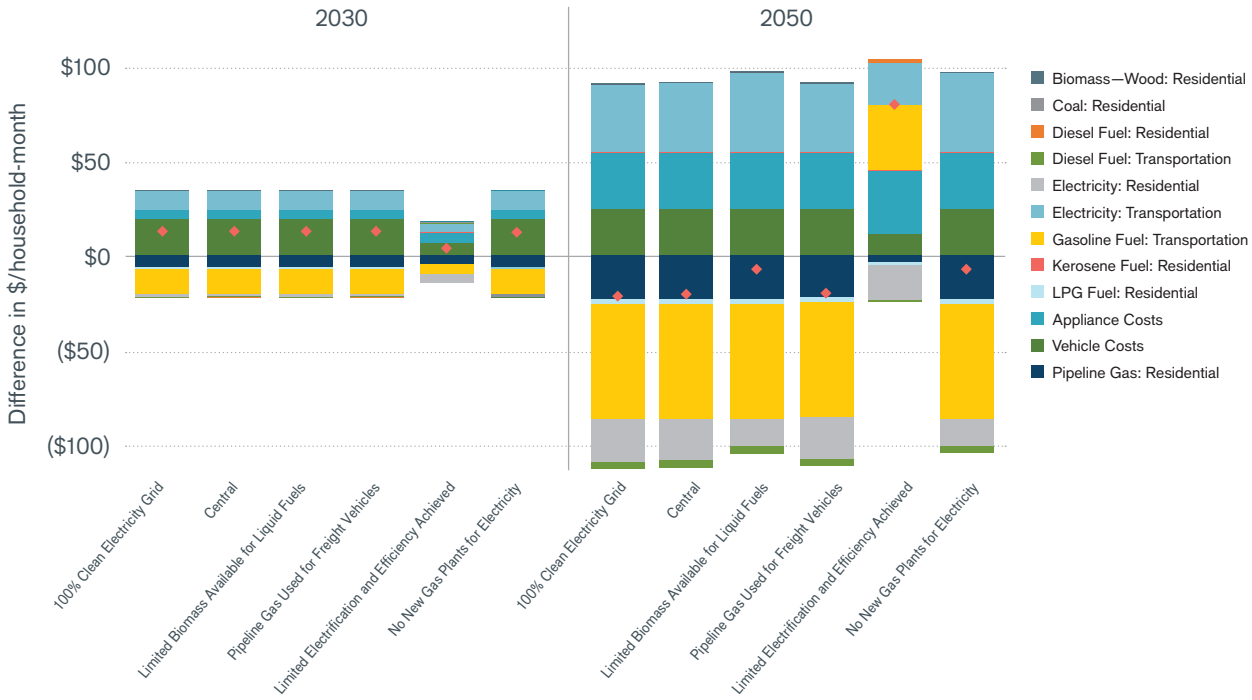
The Limited Electrification and Efficiency Achieved Case has the lowest cost in the 2030 time frame as it does not have to incur as much in incremental costs for electric vehicles and other electrified appliances. But by 2050, limited electrification necessitates huge investments in electric sector infrastructure for electrolysis and direct air capture to produce electric fuels and biofuels to offset the increased fuel usage, driving up costs. (See Figure 33.)

In 2050, the average cost of avoided carbon in the Central Case is $48/tonne and declining. The model makes conservative assumptions about the costs and scalability trends of clean energy technologies. A future report will explore in greater depth details on costs and emissions reductions, the assumptions that returned these results, and what these results mean for how the Northwest should consider investing in transitioning the region to a low-carbon economy.



2016 Chevrolet Volt. Photo credit: Green Energy Futures, David Dodge

FIGURE 33. Residential cost impacts across six cases.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 109.

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Aerial view of the Cascade Range. Photo credit: Clean Energy Transition Institute

Study Conclusions and Case Comparisons

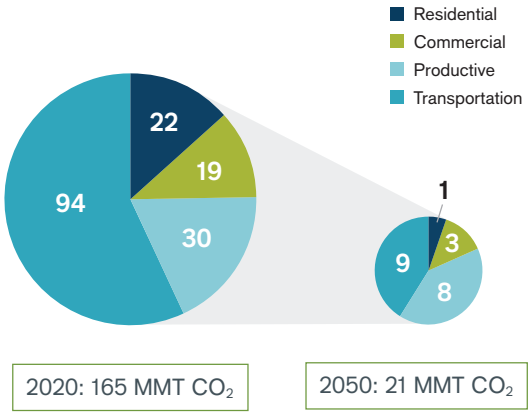
The results of *Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest* demonstrate the feasibility of Northwest states to achieve deep decarbonization by mid-century, even if we postulate several potential implementation challenges, such as lower levels of electrification and constraints on biomass availability.

This study incorporates several new and unique analytical approaches to assess deep decarbonization in the Northwest, including developing cost-optimal energy supply portfolios, incorporating new electric loads (direct air capture, fuel production, steam production), and accounting for changing dynamics outside of the region (California energy policy).

The study's Central Case is a flexible pathway to achieve emissions reductions, and highlights several key findings:

- Electricity generation approaches 100% clean.
- Aggressive electrification on the demand side is required, particularly in the transportation and building sectors. All passenger transportation is electric by 2050.
- Biomass is primarily allocated to jet fuel and diesel fuel even after partial electrification of freight trucks.
- Flexible electricity demand, notably from facilities that produce hydrogen and synthetic gas, plays a large role in electricity balancing and energy system–wide carbon mitigation.

FIGURE 34. Comparison by sector of Northwest CO_2 emissions decrease from 2020 to 2050 in the Central Case.

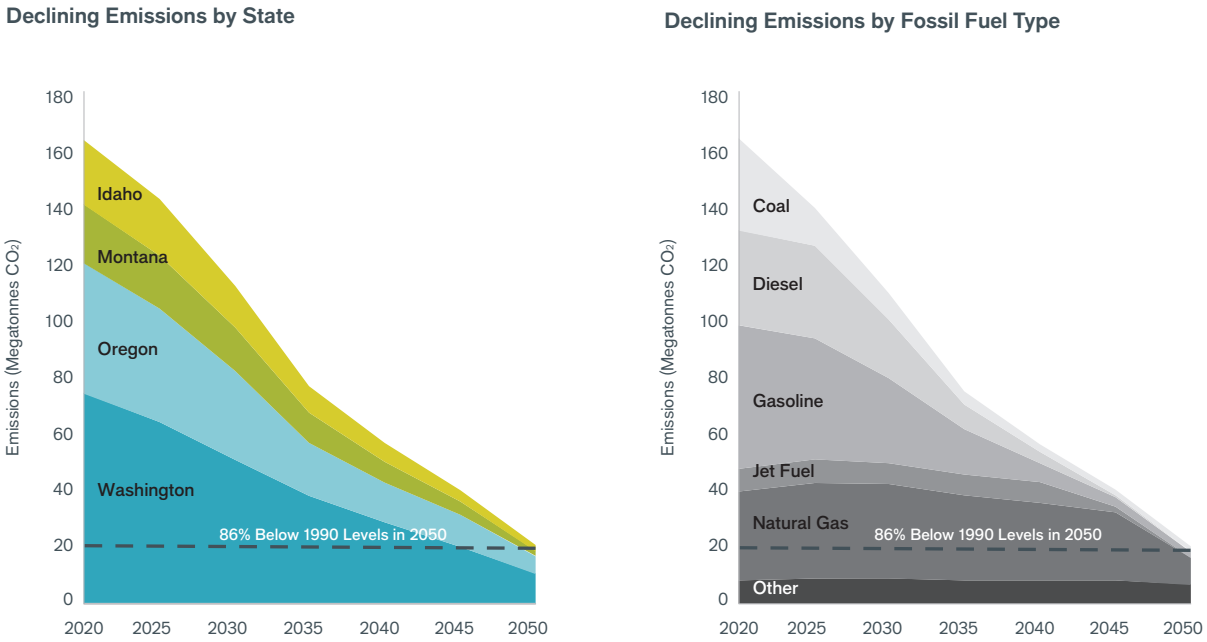


Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 63.

Northwest CO_2 emissions decrease in the Central Case from 165 million metric tons (MMT) in 2020 to 21 MMT in 2050. Emissions in the residential sector decline by 95%; in the commercial sector by 86%; in the productive (industrial) sector by 72%; and in the transportation sector by 91%. Relatively inexpensive abatement measures for the built environment (residential and commercial sectors) and transportation enable a greater percentage of emission decreases for those sectors. The difficulty and expense of decarbonizing industrial end uses explains the increase in the productive sector. (See Figure 34.)

Figure 35 shows the emissions decline from 2020 to 2050 by each state, as well as by fossil fuel type. These emission reductions are achieved through five key decarbonization strategies: energy efficiency; decarbonizing electricity; decarbonizing gas and liquid fuels; fuel-switching in industry, transportation, and buildings; and carbon capture. The cost of achieving these reductions is offset by avoided fossil fuel purchases.

FIGURE 35. Declining emissions by state and by fossil fuel type 2020–2050.





Nissan LEAF license plate. Photo credit: Washington State Department of Transportation

Five Key Decarbonization Strategies

Transitioning the Northwest to a low-carbon energy system relies on five decarbonization strategies:

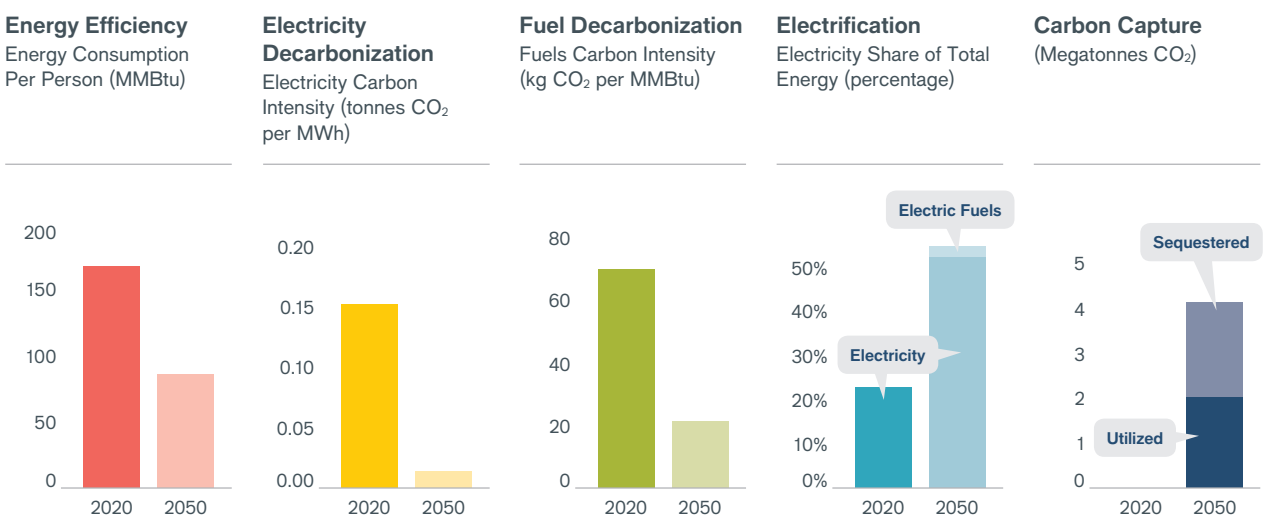
1. **Energy Efficiency:** reducing energy consumed to provide an energy service
2. **Electricity Decarbonization:** reducing the emissions intensity of electricity generation
3. **Fuel Decarbonization:** reducing the emissions intensity of liquid and gaseous fuels
4. **Electrification:** switching end uses from fuel to electricity
5. **Carbon Capture:** capturing CO_2 from a facility or removing CO_2 from the atmosphere

The purpose of the fifth strategy, carbon capture, is twofold: the captured CO_2 can either be used as a carbon feedstock for electric fuel production or sequestered.

Figure 36 shows metrics for the five strategies in the Central Case. Per capita energy consumption decreases from approximately 170 MMBtu per person today to 85 MMBtu per person in 2050, a 50% decrease. The average carbon intensity of electricity generation, which is already relatively low in the Northwest due to the hydroelectric system, decreases to near-zero by 2050.

The carbon intensity of fuels (liquid and gas) decreases by 70% primarily using biofuels. The share of total final energy served by electricity or electrically produced fuels (e.g., hydrogen and synthetic natural gas) more than doubles from approximately 23% today to 55% in 2050. Four million metric tons of CO_2 are captured in 2050, with about half of the CO_2 being utilized to produce synthetic fuels and the other half being sequestered (e.g., in saline aquifers in Montana).

FIGURE 36. Five decarbonization strategies.



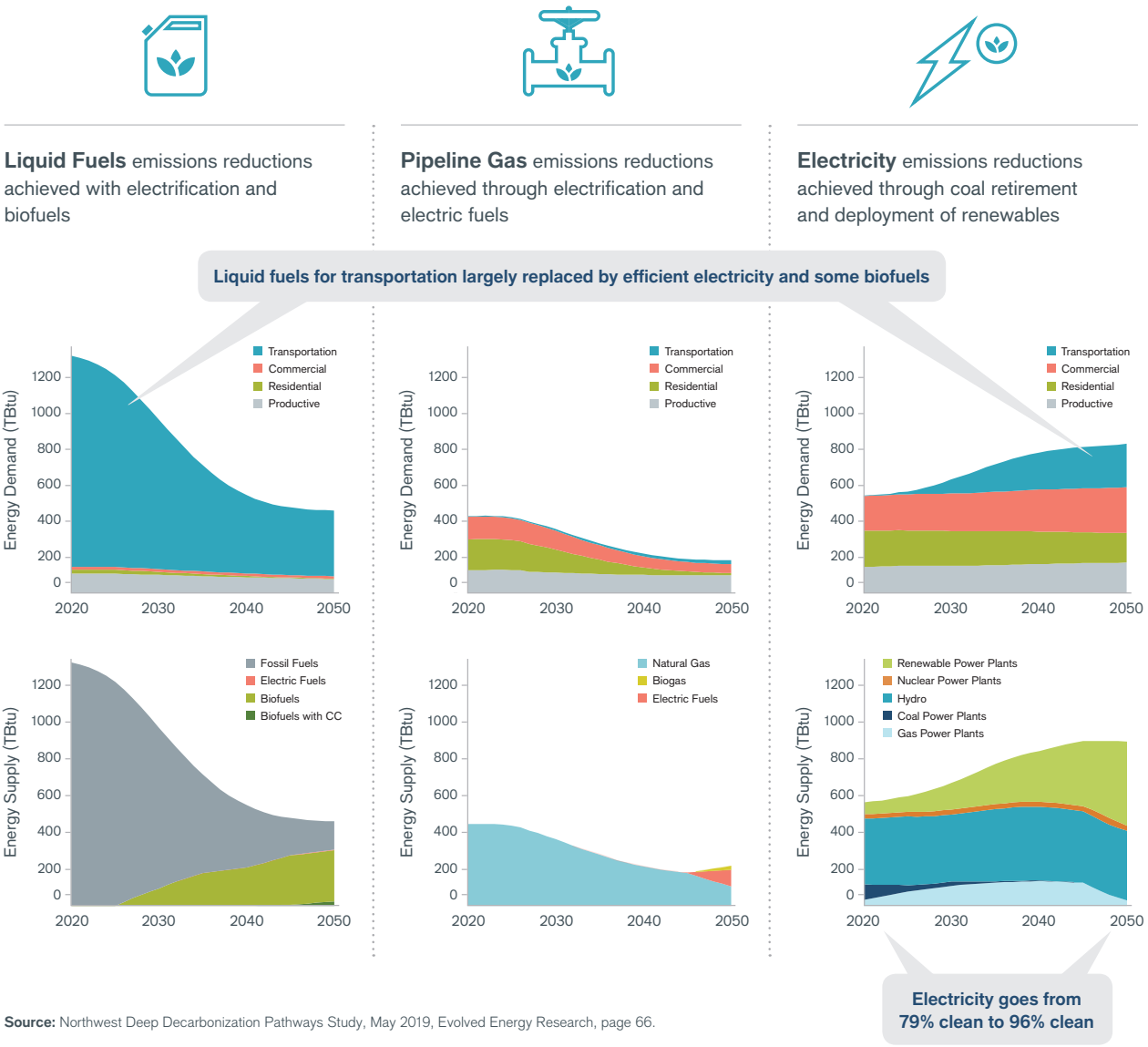
Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 65.

Figure 37 combines all of the results of the Central Case in one graphic to show the changes in energy demand and supply for the three energy sources—liquids, gas, and electricity—from 2020 to 2050 by sector. The right-hand side of the graphic shows the overall emissions decrease by energy source over the 30-year period of the study, demonstrating the significant drop in the carbon intensity of liquid fuels.

The graphic clearly shows the critical role of electrification for all three sources. Electrification decreases liquid fuel and gas demand for the transport, building, and productive (industrial) sectors. The increased demand for electricity across the sectors is also displayed.

On the supply side, biofuels, along with synthetic liquids produced with clean electricity, significantly reduce the carbon intensity of liquid fuels, while synthetic gas decarbonizes pipeline gas. Coal retirement and renewable deployments decarbonize the electricity supply. Overall demand and supply for clean electricity increase substantially.

FIGURE 37. Central Case emissions reduction for liquid fuels, gaseous fuels, and electricity from 2020 to 2050.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 66.

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Study Highlights

Critical Role of Electricity

Clean electricity is the backbone for deep decarbonization, and the cross-sectoral role that electricity will play in the coming decades is vital to achieving a low-carbon future. A clean grid decarbonizes all existing electricity uses, including industrial processes powered by electricity and buildings heated and cooled by electricity in the years to come.

In the low-carbon energy future, clean electricity must include electrifying as many transportation operations as possible to replace petroleum-generated liquid fuels, as well as substitute for the oil and natural gas that heats and cools buildings.

Electrifying the Northwest transportation sector is critical to achieving deep decarbonization and provides the least-cost path to reducing fossil fuels in transportation. Hence, the interactions between the fuel and electricity sectors in long-term planning processes is paramount.

Electricity Sector Insights

The difference between the 100% Clean Electricity Grid Case and the Central Case is much smaller than anticipated, where a nominal quantity of additional synthetic fuels and biofuels is needed to bridge the gap. Economy-wide decarbonization involving the fuel supply sectors and not just the electricity grid brings two benefits that make it easier to attain 100% clean electricity. First, flexible electric fuels increase load flexibility and make balancing the electricity system easier, and second, the clean synthetic gas that is produced can be used to generate electricity during challenging system-balancing conditions.

In addition, California's 100% clean electricity requirement encourages the Northwest to export power to California that would otherwise be curtailed, thus giving that resource economic value, and makes it possible for there to be fewer requirements for California to build storage or additional resources to balance its California grid.

Significant cost savings ($11.1 billion in net present value from 2020 to 2050 accrued to the combined California and Northwest region) could be realized if interties between the Northwest and California were expanded (Northwest-California Transmission Case). But further investigation is required to understand the benefits fully.

Prohibiting new gas plants (No New Gas Case) would require additional energy storage and renewable generation facilities to provide reliable supply. Electric fuels using excess renewables implement this pathway, which would otherwise involve a large amount of curtailment, but at a significantly higher cost than the Central Case.

New Sources of Clean Electric Fuel

Emerging technologies that can deploy hydrogen, carbon capture, and synthetic gas to create very low-carbon fuels will be important in the out-years. Clean electric fuels can be produced using renewable electricity. Splitting water molecules through electrolysis produces hydrogen that can constitute up to 7% of the gas in pipeline gas or be used as a feedstock in other processes. Combining that feedstock with carbon dioxide can create synthetic gas or liquid fuels that are as clean as the energy used to produce them.

Carbon dioxide as a feedstock can be captured via industrial waste streams, direct air capture, or from biorefineries that use carbon capture. Synthetic gas can be used for either heating or cooling instead of natural gas, or for powering transport as compressed liquefied gas, while synthetic liquid fuels can substitute for conventional transportation fuels.

Flexible Electric Loads

The study highlights the important cross-sectoral role that new technologies and flexible electric loads could play in making economic use of renewable overgeneration and with balancing the grid in two key ways. First, the Northwest's reliance on hydroelectric and wind resources means that periods of sustained overgeneration may become common. This is a component of a least-cost decarbonized energy economy. However, when considering all possible system-balancing options, it is important to limit costs. Electric storage solutions, outside of limited pumped hydro, do not yet economically address long-duration balancing and system reliability when renewable energy production is low.

The mismatch between load and intermittent supply and the subsequent curtailment of generation is a lost opportunity to use that energy to decarbonize the economy. Hence a key challenge is how to minimize the costs of a deeply decarbonized, intermittent, renewable-dominant system, recognizing the many cross-sectoral opportunities that exist at high levels of decarbonization.



Transmission lines. Photo credit: Mike Wilson

Electricity that would otherwise be curtailed is put to good use when the electricity system is integrated with fuels production for the rest of the energy economy, and electric loads can more flexibly respond to levels of renewable production. Gas and liquid transportation fuels can be stored far more cheaply than energy in electrochemical storage and large quantities of storage for these fuels exist today.

The lowest-cost pathways to deep decarbonization include electric fuels production, moderating the variability in intermittent renewables by increasing production in periods with high renewable and hydro output, and decreasing production during periods of low output.

Second, Northwest grid planners need to address the challenge of interannual variability in hydroelectric and wind resources. Achieving high percentages of renewables is a fundamentally different challenge in years of low hydro and wind production than in high hydro and high wind years.

Several nontraditional solutions exist for electricity balancing: electrolysis that uses renewable overgeneration to produce hydrogen, steam production with electric boilers, and direct air capture technologies that supply energy or feedstocks for synthetic gas. Models and approaches that don't incorporate this sectoral integration and the potential for this portfolio of solutions tend to be suboptimal, as they result in higher cost for renewables systems and large amounts of unused energy.

Limited Thermal Generation Needed

The inverse of overgeneration in high-renewables systems is rare periods of undergeneration, when hydro and other renewable energy production is diminished, typically during the winter. Renewable diversity and regional integration could help address this issue, while storage can be used for short (4- to 8-hour) periods of undergeneration.

These rare undergeneration events are most economically served by thermal generators that operate only for a very limited number of hours each year and can be fueled by biofuels, electric fuels, or fossil gas depending on policy design. In the study, gas and storage are added as new resources to provide resource adequacy and balancing, and the share of gas-fired generation is 3.7% in 2050.

Role for Carbon Capture

In modeling regional 80% of 1990 levels by 2050 emissions targets, it is important to note the long-term role of carbon capture, either for high-capacity factor biofuels facilities or in the use of direct air capture facilities. This captured carbon may be used to provide a feedstock for power-to-fuels production or directly sequestered.

The study does not project a significant use of carbon capture and sequestration in the Northwest's power sector (where the role of carbon capture has traditionally been most closely examined), due to the low-capacity factors at which thermal generators would operate in highly renewable systems.

Carbon capture and sequestration infrastructure is expensive, and low utilization makes it too costly to be part of a least-cost resource solution. As carbon reduction targets become even more stringent—with some even contemplating net-zero emissions futures—developing this technology will become more important.

Regional Electricity Collaboration

Understanding California's electricity policy landscape is critical for cost-effective electricity planning in the Northwest. California lacks non-solar renewable resources and requires off-peak renewable energy to meet its 100% clean electricity goal, which is driving renewables development across the Western grid.

The Northwest has an opportunity to create a complementary resource portfolio to meet California's clean energy needs. Expanding interconnection capacity to California would allow greater integration of resources, relieving California's overgeneration conditions and enabling the Northwest access to higher-quality California solar than what can be produced regionally.

Demand-Side Electrification and Biomass

Failure to electrify on the consumer side has enormous implications for energy supply, as depicted in the Limited Electrification and Efficiency Achieved Case. The scale of new wind, solar, direct air capture, electrolysis, and power-to-X facilities in this case (see Appendix B for a description and graphic of power-to-X) could be considered prohibitive in implementation and may ultimately require imports of electric fuels produced elsewhere.

Restricted availability of net-zero-carbon biomass as in the Limited Biomass Available for Liquid Fuels Case results in similar energy system impacts. If consumers don't electrify or biofuels are not available, then the "backstop" resource to decarbonize is synthetic electric fuels, which may face implementation challenges to develop at the necessary scale and are expensive.



Power County wind farm, Idaho. Photo credit: U.S. Department of Energy

Cross-Case Comparisons

Significant Positive Benefit Case

Expanded interties between the Northwest and California change the optimal electricity supply mix, with each region avoiding the development of local, low-quality renewables and expanding the development of high-quality resources that are more efficiently shared across both areas. The Northwest avoids developing low-quality solar and increases wind development, while California develops additional high-quality solar and avoids procuring remote wind generation from other Western states. Savings are estimated as $11.1 billion net present value over the 30 years of the study (accrued to the combined California and Northwest region).

Significant Negative Impact Cases

In the Limited Electrification and Efficiency Achieved Case, where deep electrification of building, transport, and industry does not occur, there are large volumes of residual liquid fuel demand for diesel fuel, jet fuel, and gasoline in the system. This necessitates squeezing the use of gas-fired resources out of electricity generation to reduce emissions as much as possible in non-transportation sectors, and substantially ramps up direct air capture. While 2 million metric tons (MMT) are captured in 2050 in the Central Case, the Limited Electrification and Efficiency Achieved Case requires 27 MMT of carbon to be captured in 2050.

In the No New Gas Plants for Electricity Case, more than 35 gigawatts of additional wind, solar, and geothermal resources are required—on top of the 75 gigawatts of new renewables built in the Central Case. In addition, 12 gigawatts of additional energy storage resources are needed to maintain resource adequacy. This higher penetration of renewables and associated overgeneration incentivizes the production of additional electric fuels, in the form of power-to-diesel and power-to-jet-fuel.

When biomass is constrained, high volumes of synthetic electric fuels must be produced to replace biofuels. This has considerable infrastructure implications, including two times the installed capacity of wind and solar resources, five times the electrolysis capacity, and six times the direct air capture capacity than what is needed in the Central Case.



Poplar harvest and swallows. Photo credit: Marcus Kaufman

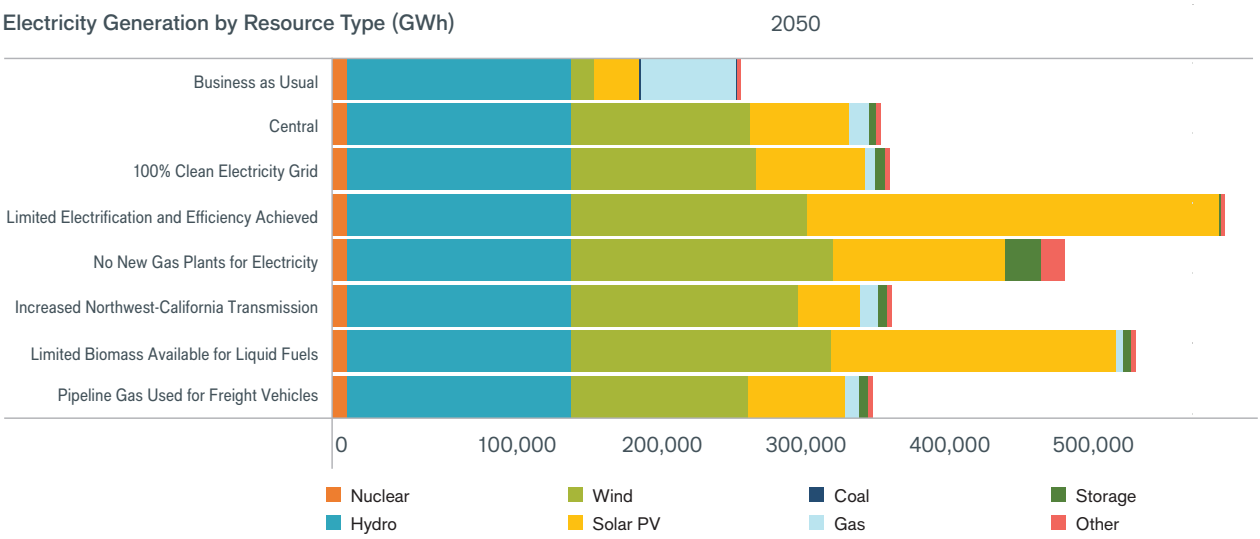
Marginal Impact Cases

The 100% Clean Energy case produces marginally different results from the Central Case. The share of gas-fired generation decreases from 3.7% to 1.7%, due to incremental renewables and energy storage deployment. Decarbonized pipeline gas supply (biofuels, hydrogen, and synthetic natural gas) covers all gas demand from power generation, and most of the incremental decarbonized pipeline gas is from synthetic gas.

Increasing gas in transport also has limited impact, but the study did not account for upstream methane leakage, so this result comes with a significant caveat. Freight trucks consuming higher pipeline gas means biofuels are not used to substitute for diesel fuel and are available for pipeline gas. This means minimal impacts across the energy system other than that reallocation from liquid biofuels to gaseous biofuels. But this case would be far less salutary if the full carbon accounting for methane leakage were considered.

Figure 38 combines all eight cases in one graphic to show the quantity and type of electricity generation (in GWh) required to achieve deep decarbonization in 2050.

FIGURE 38. There are significant impacts on total electricity generation for the Limited Electrification and Efficiency Achieved Case, Limited Biomass Available for Liquid Fuels Case, and No New Gas Plants for Electricity Case.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 99.



Geyser Basin, Yellowstone National Park. Photo credit: Clean Energy Transition Institute

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Conclusion

A principal goal of this deep decarbonization pathways study was to represent potential energy futures in enough technical detail to be used as blueprints to develop a future of the Northwest's choosing. There are several areas of additional examination that the study suggests pursuing.

Focus on Equity. This study is designed to show the trade-offs between different deep decarbonization pathways, but it does not take into account equity considerations for different communities. The study demonstrates we can decarbonize our economy, but the critical work ahead must focus on how to do so equitably.

Areas for Further Study. Understanding the dynamics of alternative fuel development on refinery activity and relative fuel prices is important for the Northwest. While it might be possible to predict the decline of certain fuels as electrification increases in buildings and transportation, the development of biofuels or electric fuels that also displace fossil fuels may be more challenging to foresee. This is an unanswered question in almost all deep decarbonization transformations and developing long-term strategies today could mitigate the clean energy transition's disruptive impacts and avoid unnecessary investments.

This study examined low, normal, and high hydro years; however, it held the likelihood of experiencing these hydro conditions constant through 2050 and did not consider even lower future water years, assumptions that require examination. Follow-on work should involve a scenario in which lower snowpack occurs more frequently, and seasonal dynamics are altered due to climate change.

Sensitivity analyses are needed to understand how a 10% to 20% lower hydro resource would impact other resources, as well as how removing the Lower Snake River dams and retiring the nuclear Columbia Generating Station before 2043 would affect clean power supply. Finally, a combination of all three of these changes in low-carbon resources should be modeled together.

Modeling the retirement of all coal-fired electricity generation by 2030 is an additional area for study, as is modeling natural gas at higher prices than the study assumed and, if possible, modeling natural gas with a higher emissions level to account for upstream emissions and methane leakage.

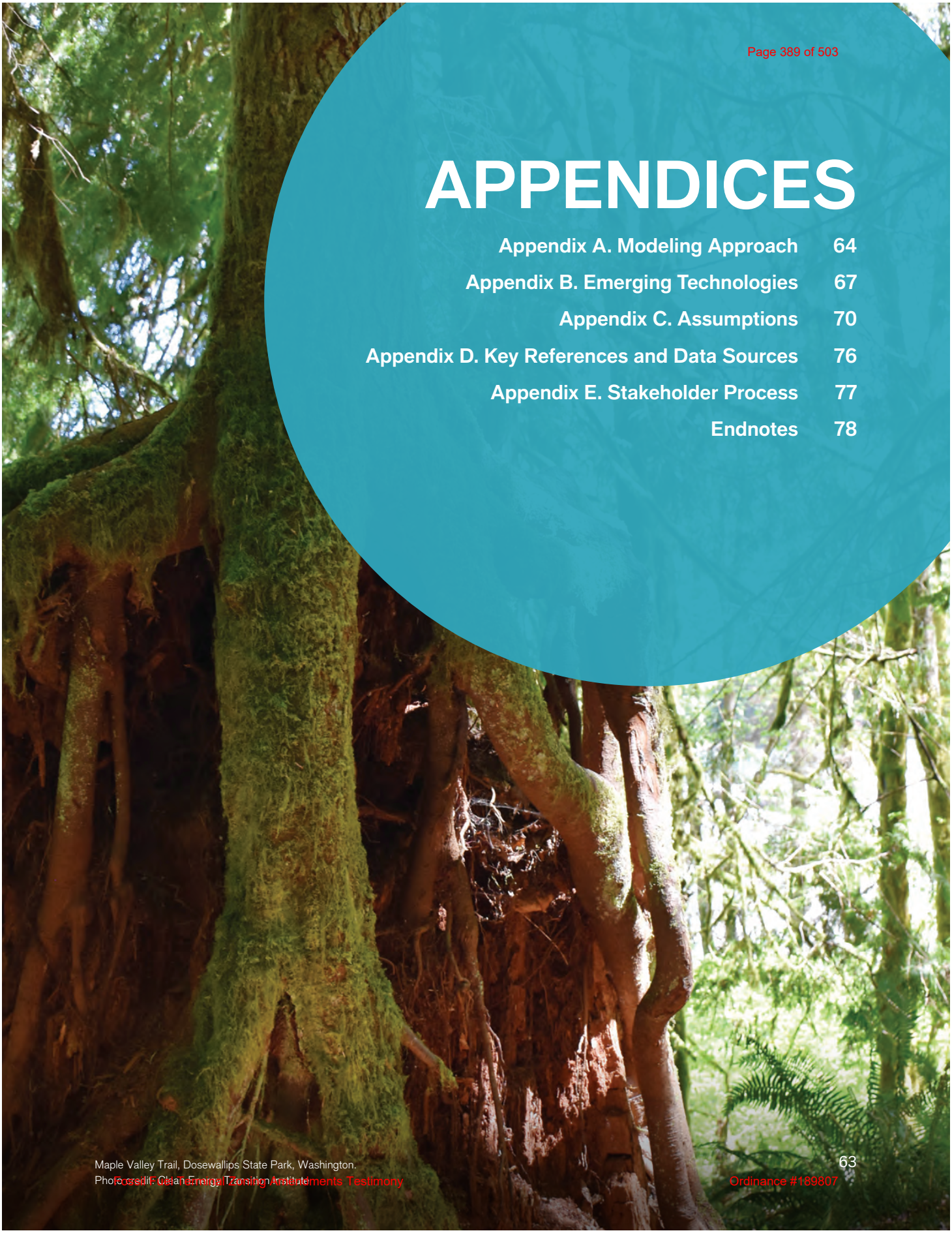
Focus on Implementation. While this study offers a functional technical representation of low-cost deep decarbonization pathways, successful implementation is more uncertain. Some implementation challenges include:

- A nearly 100% clean grid is a feature of low-cost decarbonization in the region. Policymakers and utilities must overcome the technical and economic barriers to cleaning the grid well in advance of 2050.
- The level of transportation electrification called for by 2050 requires immediate attention to overcoming barriers to massive adoption of electric vehicles, and to determining how the electric grid will handle the additional load required to serve new electricity needs.
- Grid infrastructure development and operational integration are needed to most efficiently leverage renewable development in California and across the West; this is complicated politically and technically and will take time. Planning must get underway now to ensure successful integration of these markets.

With several recent international and national reports clearly establishing that there is a small window of time within which to massively reduce fossil fuel dependence, and a U.S. federal government currently focused on increasing, not decreasing, the use of fossil fuels, it is imperative that states and regions in the United States step up to the decarbonization challenge.

Initiatives such as the Green New Deal, the Keep it in the Ground Movement, and 100% Clean Energy campaigns set forth a range of goals and strategies to reduce carbon emissions. Achieving these goals requires technology investment, smart policies, innovation, and regulatory reform to shape the low-carbon energy system of the future.

Solutions need time to be developed and implemented, so policymakers must anticipate them now. *Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest* provides support and direction for policy-makers, advocates, businesses, government leaders, and investors to begin implementing effective solutions for a deeply decarbonized future in the Northwest.



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Maple Valley Trail, Dosewallips State Park, Washington.
Photo credit: Clean Energy Transition Institute

Appendix A: Modeling Approach

Modeling involved two different models that Evolved Energy Research has created: (1) EnergyPATHWAYS, and (2) the Regional Investment and Operations model (RIO).

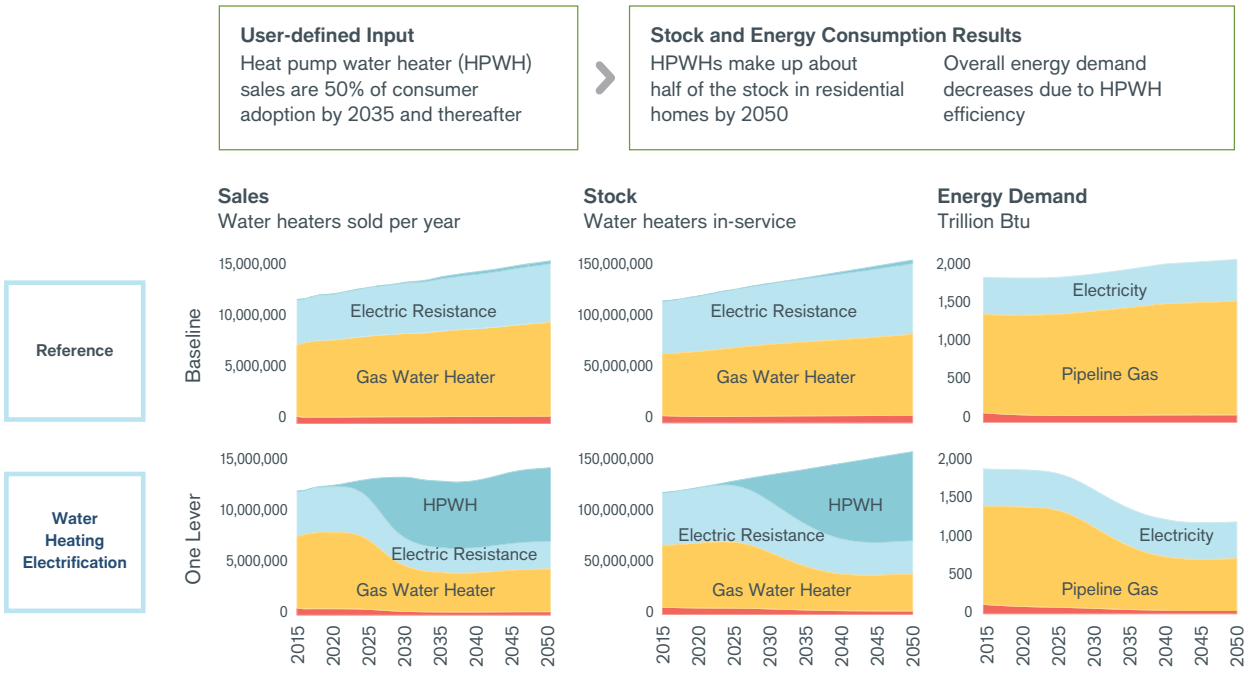
EnergyPATHWAYS

The EnergyPATHWAYS (EP) model is a bottom-up energy system scenario analysis tool that tracks energy infrastructure, including stocks for building, industry, and transportation infrastructure.

EP develops demand-side scenarios across all end-use sectors and produces annual final energy demand for electricity, pipeline gas, diesel fuels, gasoline, etc., as well as hourly electricity load shape demand.

User-defined measures specify low-carbon and efficient technologies to replace energy infrastructure over time. Specifically, modelers choose the scale and rate of adoption for new technologies for different sectors (e.g., the percent of light-duty car sales that are battery electric vehicles in each year). Figure 39 demonstrates how user-defined decisions for residential water heaters generate the stock and energy demand for heaters over time from now until 2050.

FIGURE 39. EnergyPATHWAYS: residential water heating example.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 23.

EP represents approximately 80 demand subsectors for the residential, commercial, industrial, and transportation sectors, the major energy-consuming subsectors of which are displayed in Figure 40 below.

Regional Investment and Operations (RIO)

The Regional Investment and Operations (RIO) model is a capacity expansion tool that produces cost-optimal resource portfolios for all energy supply options and fuel types, including electricity, pipeline gas, gasoline, diesel, jet fuel, hydrogen, and other fuels. The model decides the suite of technologies that will be used over time to meet annual emissions targets and other constraints. RIO's optimization allows for trade-offs of limited resources across the energy system (like biomass) to be determined simultaneously.

For the electricity sector, RIO simulates sequential hourly system operations for every modeled year from now until 2050, incorporating long-duration energy storage logic that optimizes investment and operations of all types of energy storage, which is required to manage high renewable penetrations. RIO simulates operations and investment across the energy supply side, including electricity and fuels, while accounting for dynamically changing inputs and constraints across the energy system.

The model incorporated load, wind, solar, and hydro profiles from multiple weather years to capture a range of electricity system operating conditions because weather-driven or seasonal trends in load, hydro availability, and renewable production cause operational challenges that can persist over long periods. For load, wind, and solar, the modelers used hourly profiles from 2010, 2011, and 2012, and for hydro, the modelers represented conditions from three historical years—2001 (dry), 2005 (normal), and 2011 (wet).

RIO invests across a range of thermal, renewable, and energy storage technologies to satisfy energy, capacity, balancing, and environmental needs, as Figure 41 below demonstrates. RIO can select from three gas-fired resource alternatives.

FIGURE 40. Key energy-consuming subsectors.



Residential Sector
- Air-conditioning
- Space heating
- Water heating
- Lighting
- Cooking
- Dishwashing
- Freezing
- Refrigeration
- Clothes washing
- Clothes drying



Commercial Sector
- Air-conditioning
- Space heating
- Water heating
- Ventilation
- Lighting
- Cooking
- Refrigeration



Industrial Sector
- Boilers
- Process heat
- Space heating
- Curing
- Drying
- Machine drives
- Additional subsectors (e.g., machinery, cement)



Transportation Sector
- Light-duty autos
- Light-duty trucks
- Medium-duty vehicles
- Heavy-duty vehicles
- Transit buses
- Aviation
- Marine vessels

Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 24.

FIGURE 41. New electric sector resource options.

THERMAL
- Gas Combustion Turbine (CT)
- Gas Combined Cycle (CC)
- Gas CC with Carbon Capture and Sequestration (CC w/CCS)

RENEWABLE
- Onshore Wind
- Solar PV
- Geothermal

ENERGY STORAGE
- Pumped Hydro
- Lithium-ion
- Vanadium Flow

Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 36.

RIO invests across a range of thermal, renewable, and energy storage technologies to satisfy energy, capacity, balancing, and environmental needs

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FIGURE 42. Conversion technology options.

BIOMASS-BASED

- Biomass feedstock can be converted into liquid or gaseous fuels using a variety of conversion technologies
- Biomass gasification technology can produce biogas
- Fischer-Tropsch can produce renewable diesel and renewable jet fuel

ELECTRIC-BASED

- **Power-to-X** processes convert carbon-free electricity into synthetic fuels (e.g., power-to-gas, power-to-liquids)
- Processes rely on:
  - Electrolysis to produce hydrogen
  - Carbon feedstocks either from CO_2 embodied in biomass or direct air capture

RIO represents a suite of conversion technologies to produce useful low-carbon fuels that depend on biomass- or electric-based feedstocks

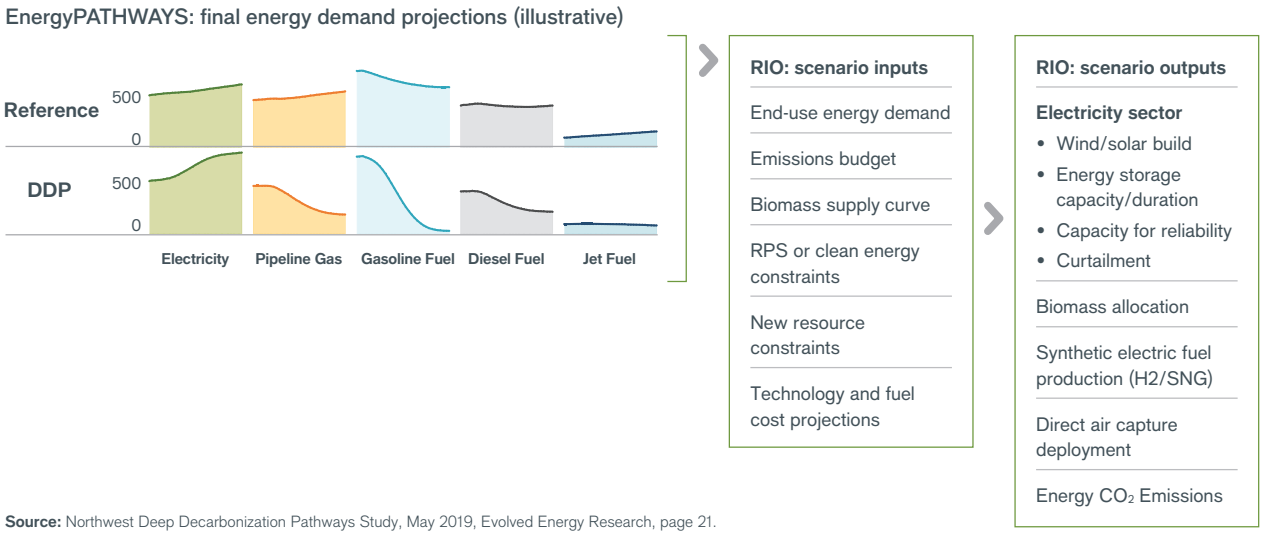
Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 40.

RIO represents a suite of conversion technologies to produce useful low-carbon fuels that depend on either biomass- or electric-based feedstocks, as Figure 42 shows.

Pairing EnergyPATHWAYS and RIO

The energy demand parameters that EP produces are then fed into RIO. Taking the demand projections aggregated from subsector loads that the EP model produced, RIO provides cost-optimal energy supply investments and operations for the electricity sector, biomass allocation for fuels, synthetic electric fuels, and direct air capture. Figure 43 below illustrates how EP and RIO are paired together.

FIGURE 43. Modeling framework: pairing EnergyPATHWAYS and RIO.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 21.

Appendix B. Emerging Technologies

Power-to-X

A major finding of *Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest* is the crucial role that power-to-X (either fuels or liquids) will play in the later years of this study. Power-to-X is a term that describes a variety of different technologies and processes that enable surplus electric power to be stored or used to produce fuels.

In this study, power-to-X is primarily referring to electrolysis that converts surplus electricity captured by power-to-X technology into hydrogen and then further converts it to methane gas or ammonia (e.g., power-to-gas). Carbon that is captured from power plants can also be recycled into synthetic fuels, which can replace the oil and gas that have been the traditional feedstocks for fuels used in transport.

Emmanouil Kakaras, senior vice president and the head of the department of innovation and new products at Mitsubishi Hitachi Power Systems Europe, told *Forbes* magazine in June 2018[10] that "gasoline produced by combining the captured carbon and hydrogen produced by renewable energy emits 90% less carbon than gasoline produced by conventional means."

Hydrogen Electrolysis

Using electricity to produce hydrogen by electrolyzing water plays a key role in balancing the electricity system during periods of renewable energy overgeneration. The hydrogen produced is used to create synthetic fuels that can be used for difficult-to-electrify applications. Electrically produced hydrogen is used as a feedstock to produce renewable liquid and gaseous fuels that already have existing delivery mechanisms.

Hydrogen can be combined with captured CO_2 to produce methane (the main component of natural gas). Chemical synthesis using the Fischer-Tropsch process can produce synthetic liquid fuels that are interchangeable with refined petroleum products, including diesel, gasoline, and jet fuel. Produced hydrogen can be injected into a natural gas pipeline directly, limited to 7% by energy, which research has shown can be blended with fossil-based or synthetic natural gas without damaging end-use equipment or the delivery infrastructure.



Electrical power lines. Photo credit: Public Domain

Producing electrolytic hydrogen and synthetic fuels provides a primary method of long-duration storage for systems with high penetrations of renewable generation. When peak electricity generation exceeds demand, the extra electricity is used to synthesize the hydrogen and synthetic fuels. These fuels in turn can be used directly to meet liquid and gaseous fuel demand and—to a limited extent—to produce electricity during times when renewable energy is not created.

The principal mechanism by which electric fuels balance the electricity system is not "round-trip" electricity storage in which energy is stored in one time period and discharged back to the electricity grid in another. Instead, the dominant economic means of balancing with electric fuels involves producing fuels that will be used to meet demand from hard-to-decarbonize end uses.[11]

Electric fuel production utilizes otherwise curtailed renewable energy, which means that electric fuels create value for electricity overgeneration. In doing so, electric fuels increase loads during times of renewable abundance and decrease them during low production periods. Because fuels can be stored far more cheaply than electrical energy, this method of balancing is the economic option for long-term balancing challenges.

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Direct Air Capture

Direct air capture (DAC) removes CO_2 directly from the atmosphere. In this study, DAC created a carbon feedstock to be used for electric fuel production. Heightened emphasis on early commercialization of DAC is needed, as DAC can accelerate overall decarbonization and also serve as a technological backstop if widespread electrification does not take place or biomass for biofuels is constrained.

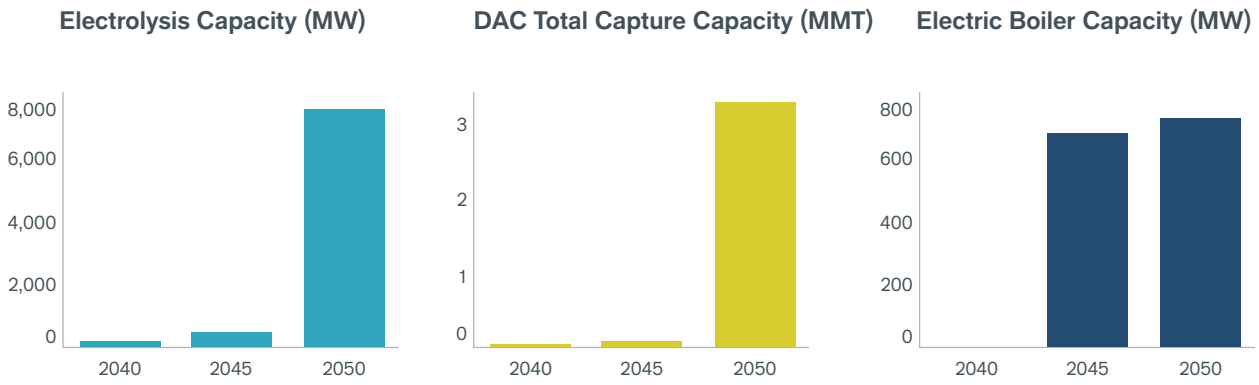
While there are legitimate concerns that DAC can be used to justify the continued development and combustion of fossil fuels, there is increasing understanding that DAC could play an important and complementary role in deep decarbonization. DAC pairs best economically with low-cost zero-carbon resources, such as wind or solar, because CO_2 feedstock (like hydrogen) can be stored and therefore DAC can operate flexibly to take advantage of periods of renewable overgeneration. Carbon capture scenarios where fossil fuels provide the grid electricity do not offer the same economic benefit.[12] Figure 45 illustrates how synthetic gas is produced from renewably generated hydrogen when methanated with captured CO_2.

Electric Boilers

Electric boilers produce steam for commercial and industrial activity. When used in conjunction with a fuel boiler at the same location, they can provide electric load flexibility. In periods of excess renewable energy, the electric boiler produces steam and the fuel boiler sits idle. In periods short of renewable energy, i.e., when the wind is not blowing, the fuel boiler takes over and the electric boiler sits idle, reducing electric loads. This functionality helps balance the electricity grid.

In the 2040s, new sources of electric load play essential roles for both the electricity system and the energy system as a whole. First, the new loads are flexible and can manage electricity imbalances across the year. Second, these new electric loads produce co-products that assist with energy system–wide decarbonization in the form of (1) hydrogen from electrolysis and CO_2 from DAC to produce synthetic natural gas, and (2) electric boilers that produce steam for commercial and industrial activity. Figure 44 shows the builds for each of these new sources of electric load in the Central Case.

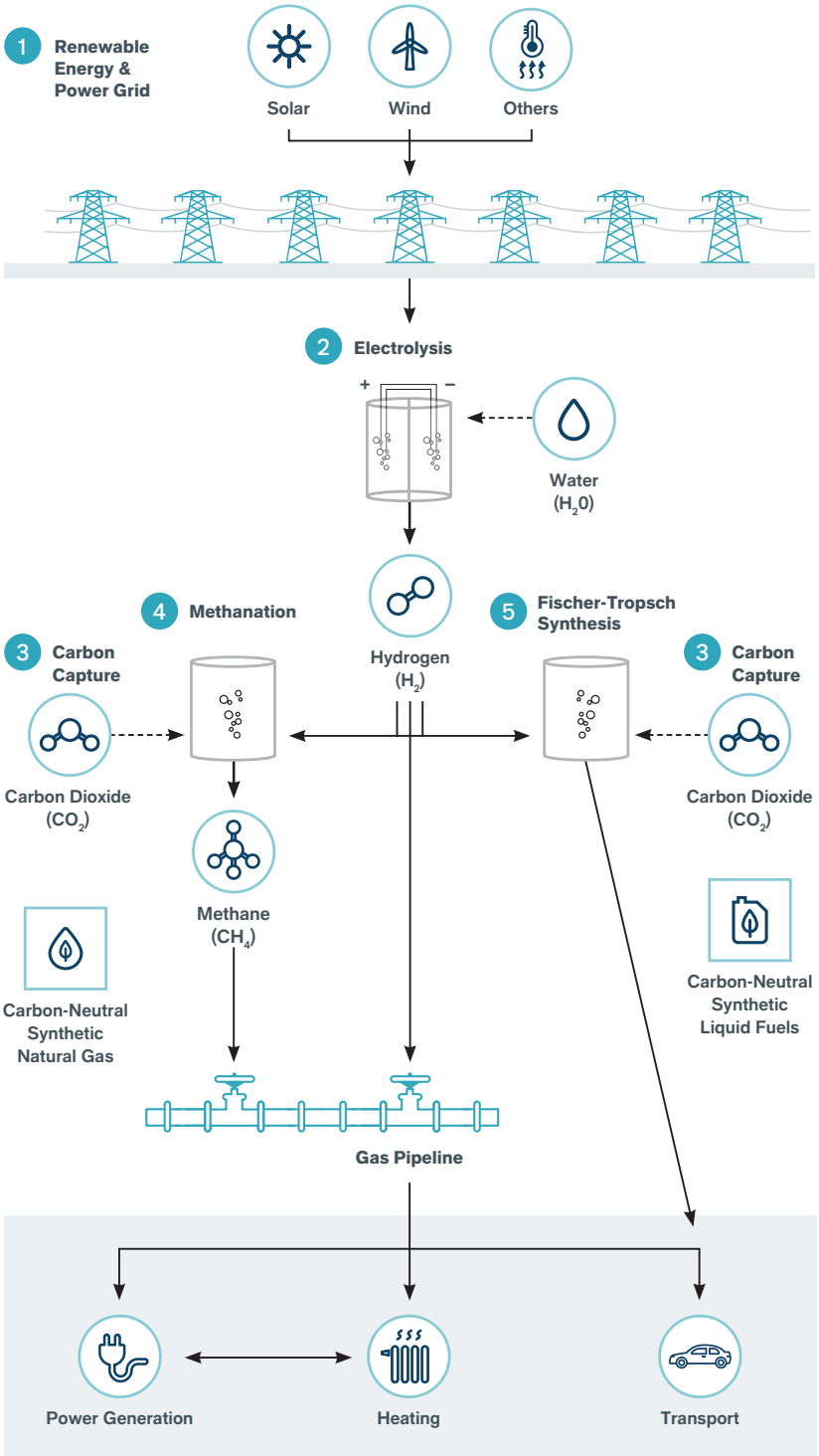
FIGURE 44. New sources of electric load.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 77.

FIGURE 45. Illustration of power-to-gas and power-to-liquids (P2X).

A major finding of *Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest* is the crucial role that power-to-X will play in 2040–50 to create synthetic gas or synthetic liquid fuels. Power-to-X is a term that describes a variety of different technologies and processes that enable surplus electric power to be stored or used to produce fuels.



In the study, power-to-X refers to electrolysis that converts surplus electricity into hydrogen, which then is combined with carbon dioxide, captured either through direct air capture powered by carbon-free electricity, or from biorefineries to produce methane gas (power-to-gas). The Fischer-Tropsch synthesis process can also be used to create synthetic liquid fuels to replace conventional oil based transport fuels (power-to-liquids).

1. **Renewable Energy & Power Grid:** Clean electricity powered by sources such as solar, wind, and hydroelectricity supplies the power grid.

2. **Electrolysis:** The process of using electricity, in this case carbon-free, to split water into hydrogen and oxygen.

3. **Carbon Capture:** Carbon dioxide is captured either through direct air capture powered by carbon-free electricity or from biorefineries.

4. **Methanation:** Combines hydrogen with carbon dioxide to produce methane that can be injected into the gas pipeline as carbon-neutral synthetic gas.

5. **Fischer-Tropsch Synthesis:** Chemical reactions that change a mixture of carbon dioxide gas and hydrogen gas into liquid hydrocarbons, such as gasoline or kerosene, that can be used for transportation.

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Appendix C. Assumptions

Deep decarbonization analyses require a wide variety of inputs and data sources to characterize current and future energy systems. This study relies on state and regional data sources where available, and leverages public sources primarily from federal government reports, including the U.S. Energy Information Administration (EIA), U.S. Department of Energy (DOE), and National Renewable Energy Laboratory (NREL).

This section describes how various assumptions were derived and the way the models incorporated those assumptions. The list of key references and data sources is provided in Appendix D. These sources tend to be conservative about the projected cost and performance of low-carbon technologies.

End-Use Stocks and Technologies Assumptions

Regional building stock assessments from Northwest Energy Efficiency Alliance (NEEA)[13] were used to characterize the existing building stocks in each of the four states.

Cost and performance for new end-use technologies were primarily derived from the NREL Electrification Futures Study,[14] which includes projections for:

- **Buildings Sector:** Air source heat pumps and heat pump water heaters
- **Transportation Sector:** Battery electric vehicles for light-duty cars and trucks, medium-duty battery electric trucks, heavy-duty battery electric trucks, and battery electric buses
- **Industrial Sector:** Air source heat pumps, electric machine drives, industrial heat pumps, electric boilers, and electric process heating

The Annual Energy Outlook (AEO) produced from the U.S. Energy Information Administration (EIA)'s National Energy Modeling System[15] was used to develop the demand-side database, including baseline and projected cost and performance for residential and commercial equipment, such as residential clothes dryers and commercial ventilation systems.



Link light rail train pulls into SoDo Station. Photo credit: Joe A. Kunzler

Electric Topology

Electricity sector operations and investment were modeled across the four Northwest states, California, and the rest of the Western Electric Coordination Council (WECC). Transfer capability between zones is based on major WECC paths and their line ratings. The capacity of Colstrip's major remote generation resources is allocated to the four states based on utility ownership.

Existing Generation Resources

The model derived the installed capacity of generation resources in each state from the U.S. Energy Information Administration's Form EIA-860.[16] Capacity from the existing hydroelectric system was assumed to remain constant through 2050.

Existing Coal Resources

The study incorporates planned retirement of coal-fired resources as the table below demonstrates.

Plants without a planned retirement year are assumed to retire at the end of their economic lifetimes.

Existing Nuclear Resources

The Columbia Generating Station (CGS) is the only operating nuclear power plant in the Northwest and its current license expires at the end of 2043. RIO allows CGS to retire or continue operations after 2043 to maintain dependable capacity and carbon-free energy.

The going-forward fixed costs of maintaining CGS are derived from Energy Northwest's Fiscal Year 2019 Long-Range Plan:[17]

- Fixed capital costs are assumed to equal $85/kW-yr
- Fixed operations and maintenance costs are assumed to equal $238/kW-yr
- Total going-forward fixed costs are equal to $323/kW-yr

Thermal Resource Options

Capital, fixed operations and maintenance (O&M), variable O&M, and heat rate characteristics are from NREL's 2018 Annual Technology Baseline (ATB).[18]

Fuel costs vary depending on the pipeline gas composition. Natural gas fuel costs are from the Annual Energy Outlook 2017[19] and the cost of decarbonized pipeline gas is solved for endogenously in RIO.

New coal and advanced nuclear resources were not considered.

Renewables Resource Options

Various state-level inputs characterizing renewable resources (potential, performance/capacity factor, transmission costs) are derived from NREL's Regional Energy Deployment System (ReEDS).[20]

Capital cost projections for wind, solar, and geothermal are from NREL's 2018 Annual Technology Baseline (ATB).[21]

Energy Storage Resource Options

Cost and efficiency inputs are derived from the International Renewable Energy Agency (IRENA) "Electricity Storage and Renewables: Costs and Markets to 2030" report. Costs are portioned into capacity ($/kW) and energy ($/kWh) components, where RIO selects the optimal duration of new resources over time.

New pumped hydro storage potential is limited to 2,000 MW in the Northwest based on a review of existing projects under development, which reflects the Gordon Butte, Goldendale, and Swan Lake pumped storage projects.

Table 1. Washington and Oregon coal plant retirement schedule.

Unit	Assumed Retirement Year (First Year Offline)
Boardman	2021
Centralia 1	2021
Centralia 2	2026
Colstrip 1 and 2	2022
Colstrip 3 and 4	▪ Avista and PSE share: 2028 (reflects accelerated depreciation schedule) ▪ PACW share: 2030 ▪ PGE share: 2035

Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 34.



Ludington Pumped Storage Plant. Photo credit: Consumers Energy

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Supply-Side Resource Options

The model assumes the following supply-side energy resource options:

TABLE 2. Supply-side resource options.

Diesel Fuel	Jet Fuel	Pipeline Gas	Liquid Hydrogen	Gasoline Fuel
Power-to-Diesel	Power-to-Jet-Fuel	Power-to-Gas	Electrolysis	Corn Ethanol
FT Diesel	FT Jet Fuel	Hydrogen	Natural Gas Reformation	Cellulosic Ethanol
FT Diesel with CCS	FT Jet Fuel with CCS	Biomass Gasification	Natural Gas Reformation with CCS	Steam
FT Diesel with CCU	FT Jet Fuel with CCU	Biomass Gasification with CCS	Natural Gas Reformation with CCU	Fuel Boilers
Acronyms CHP: combined heat and power CCS: carbon capture and sequestration CCU: carbon capture and utilization DAC: direct air capture FT: Fischer-Tropsch		Biomass Gasification with CCU	Direct Air Capture	CHP
		Landfill Gas	DAC with CCS	Electric Boilers
			DAC with CCU	

Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 41.

Biomass Availability and Costs

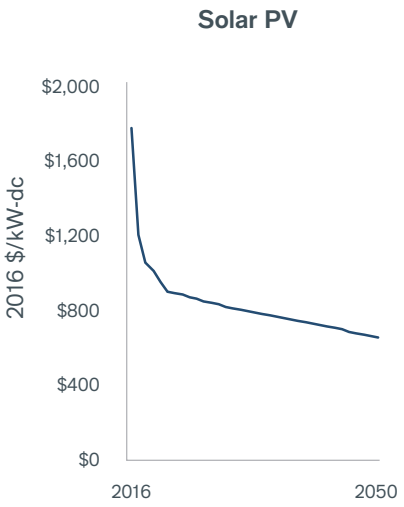
Prior deep decarbonization pathways studies have relied on the Department of Energy (DOE) Billion-Ton Study[22] for estimates of biomass availability and costs. This study includes feedstock potential by U.S. county at different price points for agricultural residues, forest residues, purpose-grown energy crops, and waste stream.

The Washington State and Portland General Electric deep decarbonization pathways studies assumed an allocation of biomass to the jurisdiction that is equal to its population-weighted share of national supply. This study follows the same approach as earlier work, where each state in the Northwest is allocated a share of national supply based on its relative population. RIO determines the application of biomass for the energy system by allocating limited supply to the most cost-optimal fuel type.

Electricity Supply Technology Cost Projections

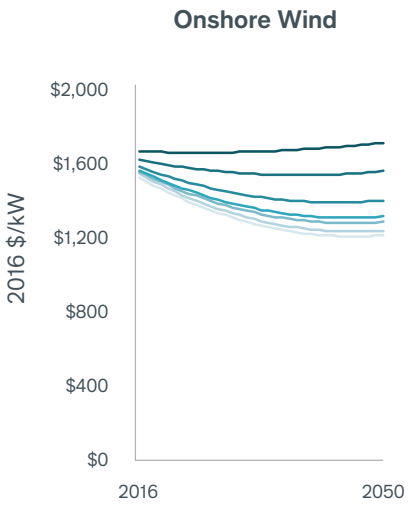
Onshore wind and solar PV cost projections were sourced from the NREL 2018 Annual Technology Baseline (ATB).[23] The different trajectories of onshore wind cost represent NREL resource bins that differ in wind speed. These map to the wind resource potential within the Northwest states and are derived from the NREL Regional Energy Deployment System (ReEDS) model database.[24]

FIGURE 46. Solar PV technology cost projections.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 121.

FIGURE 47. Onshore wind technology cost projections.



Note: Lines represent separate resource bins. **Source:** Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 121.

Battery Electric Vehicles Technology Cost Projections

The energy storage costs used in the study were sourced from the International Renewable Energy Agency (IRENA) "2017 Electricity Storage and Renewables: Costs and Markets to 2030" report. IRENA projects battery costs only to 2030. We therefore assumed battery prices follow the IRENA baseline projection through 2030, then drop to the IRENA 2030 Low Cost Case projection by 2050.

This assumes that the additional price declines due to various factors assumed in the IRENA Low Cost Case projection happen post-2030 and may be conservative depending on whether new battery chemistries become more competitive than the current market leaders.

Battery costs are separated by energy (kWh of storage) and capacity (kW of power) components. For example, the total kilowatt hours stored in a flow battery are driven by the quantity of electrolyte, whereas a flow battery's maximum discharge is driven by its membrane. Separation of the energy and capacity components allows the RIO model to optimally size new battery build.

The cost evolution of electric vehicles in each of the categories modeled in the study is shown in the figures below. These are sourced from the NREL Electrification Futures Study that provides price projections by vehicle class out to 2050.[26]

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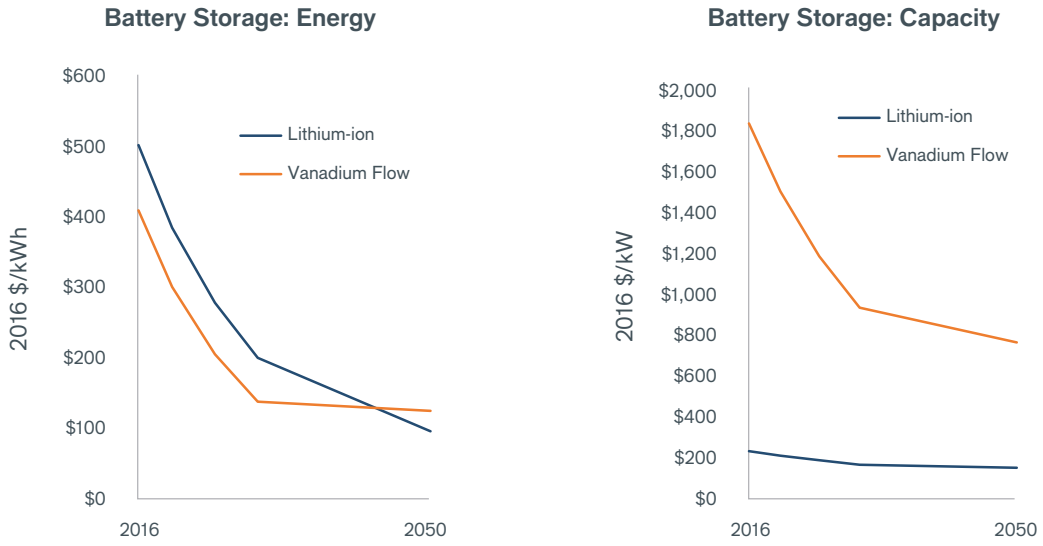
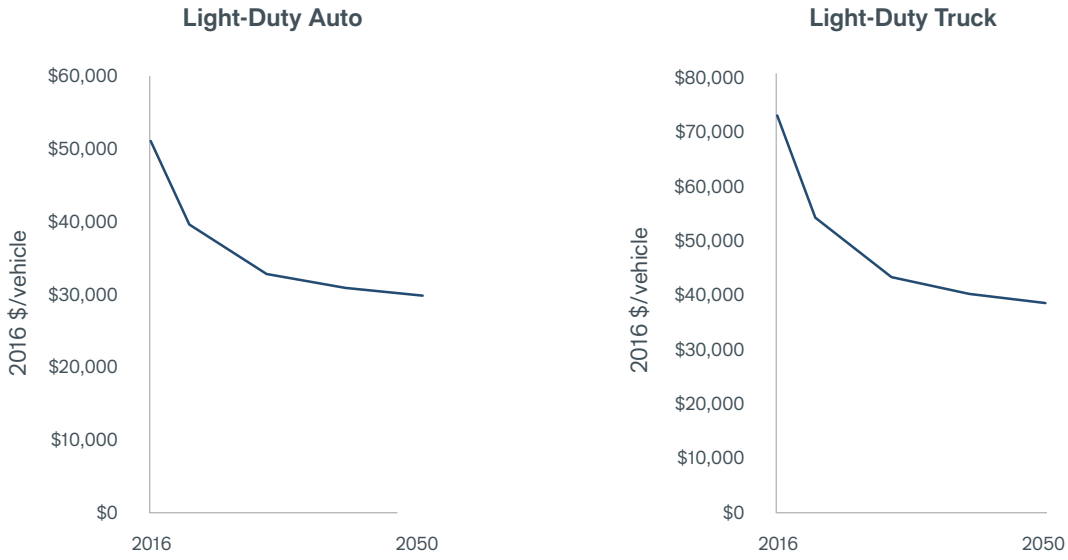
FIGURE 48. Battery storage energy and capacity technology cost projections.



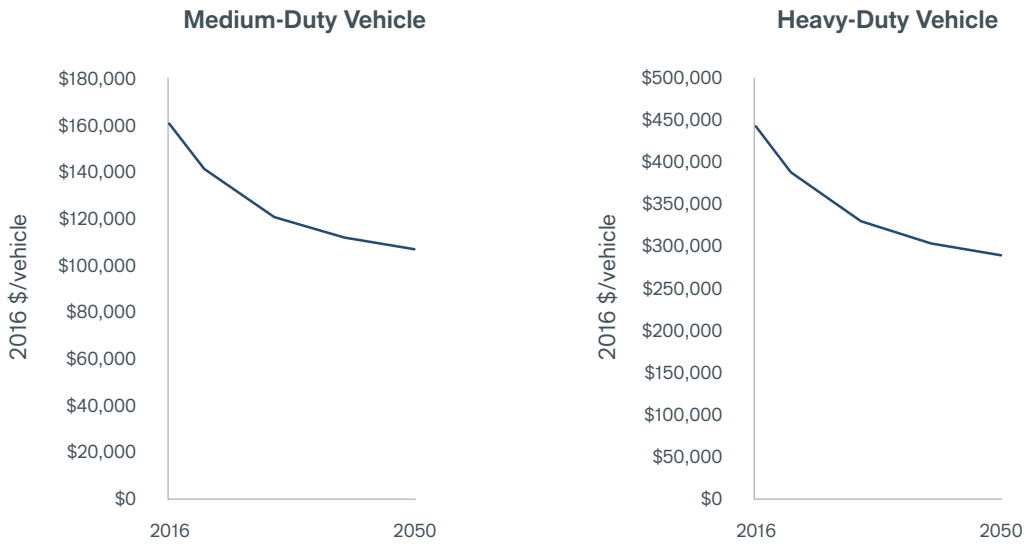
Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 121.

FIGURE 49. Light-duty auto and truck cost projections.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 122.

FIGURE 50. Medium- and heavy-duty vehicle cost projections.



Source: Northwest Deep Decarbonization Pathways Study, May 2019, Evolved Energy Research, page 122.



Freight truck. Photo credit: Rhys Moult

Appendix D. Key References and Data Sources

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Building Stock (Commercial): Northwest Energy Efficiency Alliance (NEEA). "Commercial Building Stock Assessment 2014." https://neea.org/data/commercial-building-stock-assessments

Demand-Side Database (including baseline and projected cost and performance for residential and commercial equipment): U.S. Energy Information Agency (EIA). National Energy Modeling System. https://www.eia.gov/outlooks/aeo/nems/documentation/

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Fossil Fuel Cost Projections: U.S. Energy Information Agency (EIA). "Annual Energy Outlook 2017." https://www.eia.gov/outlooks/archive/aeo17/

Population Projections: U.S. Census; University of Virginia Weldon Cooper Center for Public Service Demographics Research Group. "National Population Projections." https://demographics.coopercenter.org/national-population-projections

Renewable Resource Potential and Transmission Costs: National Renewable Energy Laboratory (NREL). "Regional Energy Deployment System Model." https://www.nrel.gov/analysis/reeds/

Appendix E: Stakeholder Process

Prior to commissioning *Meeting the Challenge of Our Time: Achieving a Low-Carbon Future in the Northwest*, the Clean Energy Transition Institute convened a Deep Decarbonization Pathways Working Group (see page 4 for the list of participants) and conducted numerous interviews with Northwest stakeholders about the value of conducting an economy-wide pathways study.

This stakeholder process revealed a clear need for a common set of facts about the decarbonization pathways for the Northwest that legislators and the advocacy community could agree to. Stakeholders' questions were summarized as:

1. **What is the likely trajectory by which we will clean the electricity grid in the Northwest by 2030, 2040, and 2050?**
   - When looking at economy-wide decarbonization in the Northwest, how close to 100% clean does the electricity sector have to be, by when?
   - How quickly can we remove coal from the Northwest grid?
   - How realistic is it that we will not replace coal with natural gas to power the grid?

2. **How will electrification of the transportation and buildings sectors contribute to deep decarbonization in the Northwest?**
   - How will energy efficiency help in decreasing load and therefore contribute to decarbonization?
   - How much decarbonization can we achieve through electrifying the transport sector with a nearly 100% clean electricity grid?
   - How does demand management contribute to peak load reduction and decarbonization?
   - How does transportation electrification impact load in Washington and Oregon?

3. **What is the role of natural gas for power generation and other end uses, including transportation?**
   - How do trade-offs in natural gas infrastructure impact emission reductions? From a carbon emissions reduction point of view, should we replace old natural gas plants with peakers if storage prices are high?
   - Absent policy changes, how soon do we expect storage to directly compete with natural gas for peaking?
   - What is the role of compressed natural gas/liquefied natural gas in reducing emissions in the transport sector over the next 20–30 years? Are there transportation subsectors (maritime, freight) where the role may be more prominent, given technology trajectories? How would knowing the answer to this question inform our policy choices and our approach to this sector and to natural gas?

4. **What is the cross-sector role of biomass?**
   - What are the highest value allocations of biomass among fuels, electricity, and gas?
   - What is the role of renewable natural gas derived from biomass and used for power generation or transportation?

5. **How would greater integration between the Northwest and California contribute to deep decarbonization?**
   - How much could Northwest-California integration reduce energy infrastructure needs and costs?

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Endnotes

1 U.S. Bureau of Economic Analysis, Total Gross Domestic Product for Washington, Oregon, Idaho, and Montana, retrieved from FRED, Federal Reserve Bank of St. Louis.

2 Intergovernmental Panel on Climate Change IPCC, 2018: *Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P. R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland. October 8, 2018. http://www.ipcc.ch/report/sr15/ https://www.ipcc.ch/news_and_events/pr_181008_P48_spm.shtml

3 Fiona Harvey. *The Guardian*. November 9, 2018. "World headed for irreversible climate change in five years, IEA warns." https://www.theguardian.com/environment/2011/nov/09/fossil-fuel-infrastructure-climate-change

4 Catherine Hours, Marlowe Hood. "'Bad News': CO_2 emissions to rise in 2018, says IEA chief." Phys.org. October 18, 2018. https://phys.org/news/2018-10-bad-news-co2-emissions-iea.html

5 73% of Washington, 72% of Oregon, 65% of Montana, 63% of Idaho believe that global warming is happening; 63% of Washington, 62% of Oregon, 55% of Montana, 56% of Idaho are worried about global warning. Yale Climate Communications http://climatecommunication.yale.edu/visualizations-data/ycom-us-2018/?est=happening&type=value&-geo=state&id=53

6 Figures 1 and 2 depict only Oregon and Washington data for the ratio of CO_2 emissions and the breakdown by sector because data for Montana and Idaho are not available.

7 Biofuels can either be burned with their emissions released into the atmosphere, in which case their CO_2 is cycled rather than removed. Biomass with CCS is similar to direct air capture (DAC) that removes CO_2 from the air, but plants remove the CO_2 and when burned they produce the same end-use fuel as DAC, but the process is different.

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Wind turbines in northern Montana. Photo credit: Mark Stevens


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Exploring Pathways to Deep Decarbonization for the Portland General Electric Service Territory

April 24, 2018

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Portland General Electric

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EVOLVED ENERGY RESEARCH

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Executive Summary

Background

Portland General Electric (PGE) retained Evolved Energy Research to undertake an independent study exploring pathways to deep decarbonization for its service territory. This study comes amidst a broad interest in decarbonization from customers and stakeholders, as well as policies and goals to promote clean energy and emissions reductions.

Since 2007, Oregon has had a goal of reducing statewide greenhouse gas (GHG) emissions by 75 percent below 1990 levels by 2050. Recently proposed legislation seeking to establish a cap-and-trade program in Oregon also proposes to tighten the statewide GHG reduction goal to 80 percent below 1990 levels by 2050. At the local level, the City of Portland and Multnomah County passed resolutions in June 2017 committing to 100 percent renewable electricity by 2035 and a complete transition to carbon-free energy by 2050.

These drivers to deeply decarbonize the economy would require a transformation of the energy system, and major choices will need to be made about which technologies play a role and how aggressively to pursue carbon reductions across different sectors. A substantial body of existing technical work shows that the electricity sector plays a pivotal role in a low-carbon transition, but the extent and type of role depends on choices made in other sectors.[1] For example, the level of electrification pursued in buildings and the decision to produce fuels from electricity, such as hydrogen from electrolysis, will have implications for electricity demand and the quantity of renewable electricity generation that will need to be developed.

Due to the potential impact on long-term planning, PGE sponsored this study to inform its Integrated Resource Planning (IRP) efforts. This study is intended to provide an understanding of: (1) the opportunities and challenges of achieving economy-wide deep decarbonization; and (2) the resulting implications for electricity system operations and planning.

Approach

The overarching emissions target for this study is an 80 percent reduction below 1990 levels by 2050 in energy-related CO_2 emissions. CO_2 emissions from fossil fuel combustion have been the predominant source of Oregon's historical GHG emissions, and, since 1990, they have accounted for approximately four-fifths of total GHG emissions in the state. This target would allow for fossil fuel combustion emissions of no more than 9.2 $MMTCO_2$ in 2050 for the state of Oregon. We allocate the statewide carbon budget to PGE's service territory using its projected share of Oregon's population, which is estimated to be 47 percent in 2050.[2] This results in a carbon budget of 4.3 $MMTCO_2$ in 2050 for the PGE service territory.

We designed three future energy scenarios that reduce emissions to comply with the 4.3 $MMTCO_2$ target. These scenarios are referred to as "deep decarbonization pathways" or "pathways", and they provide alternative blueprints for achieving deep decarbonization of the energy system.

[1] For example, see Williams, et al. (2014) and Haley, et al. (2016).
[2] Population growth rate projections from OEA (2013).

For each sector of the energy economy, we developed a range of measures to replace today's energy infrastructure with efficient and low-carbon technologies over the next three decades. For example, passenger travel currently provided by a gasoline vehicle is replaced by an electric vehicle, and a compact fluorescent (CFL) light bulb is replaced by a light emitting diode (LED) light bulb. Each pathway combines measures across sectors at the scale and rate necessary to meet the study's emissions target.

We use EnergyPATHWAYS, a bottom-up energy systems model, to estimate energy demand, emissions and costs for each pathway. Our analysis starts with the same model and approach we have previously used to evaluate deep decarbonization for the United States, the State of Washington and other jurisdictions. We developed a detailed representation of the PGE service territory energy system, including infrastructure stocks and energy demands for buildings, industry, and transportation. Our analysis incorporates an hourly dispatch of PGE's electricity system, which allows us to better understand fundamental changes to electricity supply and demand, such as how to balance very high levels of intermittent renewables and the impact of electrification on hourly electricity demand.

Pathways

Our study aims to provide an understanding of the broad choices available to achieve deep decarbonization across the economy and the potential implications on the electricity sector. To inform this understanding, we develop three plausible energy futures for PGE's service territory that achieve steep reductions in energy-related CO_2 emissions between now and 2050. These future energy scenarios outline: (1) potential sources and demands for energy types over time; and (2) the scale and timing of change over the next three decades.

Table 1 provides a high-level summary of the three pathways included in this study, where each scenario incorporates alternative emissions reduction strategies and technologies. One of the primary objectives of our scenario design was to reflect a broad range of outcomes for the electricity sector. The High Electrification pathway relies on electrifying space and water heating in buildings and deploying bulk energy storage to balance high levels of renewable generation. Passenger transportation is characterized by high levels of battery electric vehicles (BEV), while freight transportation includes both battery electric and hybrid diesel trucks. The Low Electrification pathway decarbonizes energy supply with a variety of renewable fuels, and electrolysis and power-to-gas facilities provide both electricity balancing services and decarbonized pipeline gas. Passenger transportation is primarily BEV, while compressed and liquefied natural gas trucks are incorporated in the freight transportation sector. The High DER pathway is highly electrified and distributed, with increased rooftop solar PV and distributed energy storage in buildings and industry. The Reference Case projects business-as-usual conditions, including the Oregon Clean Electricity and Coal Transition (OCEP) and Clean Fuels Program (CFP).

Table 1 Scenario Summary

Scenario	Description
High Electrification	Fossil fuel consumption is reduced by electrifying end-uses to the extent possible and increasing renewable electricity generation
Low Electrification	Greater use of renewable fuels, notably biofuels and synthetic electric fuels, to satisfy energy demand and reduce emissions
High DER	Distributed energy resources proliferate in homes and businesses, which also realize higher levels of electrification
Reference	A continuation of current and planned policy, and provides a benchmark against the deep decarbonization pathways

We are not choosing or recommending a pathway to 2050, and the scenarios presented above are not exhaustive. However, the pathways we have included in this study illustrate possible routes to a deeply decarbonized energy system and provide an understanding of trade-offs between complex decisions made by consumers and producers across the energy economy.

Key Findings

The three pathways evaluated in this study demonstrate that achieving deep decarbonization is both possible and there are multiple ways of doing so. Through this analytical exercise, we have identified a number of key findings, which we describe in detail below.

Common Elements to Achieve Deep Decarbonization

Although our pathways demonstrate that a variety of technologies and approaches are possible to realize a low-carbon economy, they also share common strategies, including: energy efficiency, decarbonization of electricity generation and electrification. These *three pillars* are common themes in all pathways, and the energy transformation from today to 2050 reflects: (1) a decline in per capita final energy consumption by approximately 40 percent; (2) a decrease in the carbon intensity of electricity generation to near zero; and (3) an increase in the share of energy coming from electricity or fuels produced from electricity from approximately one-quarter today to at least half by 2050. All three strategies are required and pursuing only one is insufficient.

Planning for a 2050 Energy System

In order to facilitate a pathway to 2050, new energy infrastructure will be required that is low-carbon and efficient. Transformation is required across all sectors with consumers and energy suppliers both playing a key role. The analysis identifies the scale and rate of change for each pathway, and highlights trade-offs between choices made to achieve deep decarbonization. One example is the choice of decarbonizing heat in buildings. Electrification of heat with heat pumps may require electricity distribution network upgrades to allow for growth in electricity demand, but they also provide a source of flexibility and efficient cooling services during the summer. The alternative is decarbonized pipeline gas that requires new central-station fuel production facilities, additional renewable generation and

transmission network upgrades. *Both* choices require new infrastructure and highlight how long-term planning will need to address several uncertainties.

Energy Demand and Electricity Demand

Energy efficiency plays a crucial role in all pathways, and *total energy demand* in 2050 is approximately 10 to 20 percent below today's level, while the population grows by more than 40 percent. Despite overall energy demand decreasing, *electricity consumption* increases in all pathways. By 2050, retail electricity sales are projected to increase by 60 to 75 percent relative to today's level. As a result, electricity's share of overall energy demand is projected to increase in a deeply decarbonized future.

Transportation Electrification

Electrification of passenger transportation is a critical component of decarbonizing the energy system, and passenger vehicles are at least 90 percent BEV by 2050 across all pathways. To ensure these vehicles are on the road by 2050 requires consumer adoption to be near 100 percent of vehicle sales during the mid-2030s. Delays in adoption increase the likelihood of missing the 2050 target.

Widespread adoption of electric vehicles (EVs) is projected to be the largest source of increased electricity consumption, and, left unmanaged, would increase peak demand. However, the fleet of EVs across PGE's service territory can employ smart charging by shifting their demand to more efficient times of day. Charging off peak, such as when renewable generation is high or during the middle of the night can mitigate peak load impacts while ensuring that passengers complete all of their intended trips.

Scale of Renewable Resources

Oregon's existing renewable portfolio standard (RPS) requires half of the energy PGE delivers to its customers to come from qualifying renewable resources by 2040. Deep decarbonization extends that ambition in two ways. First, the overall electricity generation mix is more than 90 percent carbon-free by 2050, including onshore wind, solar PV, hydro and geothermal resources. Second, the total quantity that must be generated (in average megawatts) increases due to: (a) electrification of end-use demand, such as heating and transportation; and (b) producing fuels from electricity, such as hydrogen and synthetic natural gas. As a result, the installed capacity of renewables is substantially higher than what's anticipated in any current planning proceedings and is more than double the quantity we would expect under current RPS policy.

Rooftop solar PV can play a key role in electricity supply, but its share of the overall electricity generation mix in a deeply decarbonized energy system is limited by the resource quality in Northwest Oregon (i.e., low capacity factors) and growth in electricity consumption. Distributed solar reduces the need for, but does not completely replace, transmission-connected renewables. Although the Low Electrification pathway has the lowest retail energy deliveries by 2050, the pathway requires the highest level of transmission-connected renewable generation due to electric loads from producing hydrogen and synthetic natural gas.

The scale of renewable resource development present in all scenarios highlights the need for proactive planning to ensure that these resources are available to come online in a timely fashion. This includes identifying promising areas for resource development, possible transmission network upgrades to

ensure renewable generation is delivered to load, and operational considerations to balance a highly renewable electricity grid.

Balancing the Electricity System

Electricity systems must be continually balanced across several timescales, from seconds to daily, weekly and seasonal changes. Today, generation from thermal and hydro resources is varied to meet changes in demand. However, balancing electricity supply and demand becomes more challenging when inflexible, variable renewable generation is the principal source of electricity supply. For example, renewable generation exceeds load in approximately half of all hours in 2050 in our pathways.

This operational paradigm necessitates a transition to new forms of balancing resources to integrate renewables and avoid curtailment. New sources of flexibility, including energy storage and flexible demand, can complement traditional sources of flexibility. Flexible demand includes both: (a) flexible end-use loads, such as smart EV charging and water heating; and (b) flexible transmission-connected loads, such as electrolysis and power-to-gas facilities that produce low-carbon fuels. The portfolio of available balancing options depends on choices made across the energy economy.

I. Background

Portland General Electric (PGE) retained Evolved Energy Research to undertake an independent study exploring pathways to deep decarbonization for its service territory. This study comes amidst a broad interest in decarbonization from customers and stakeholders, as well as policies and goals to promote clean energy and emissions reductions at the state and local level. Transitioning towards a low-carbon energy economy will have significant implications for electricity supply and demand, and the various technologies and strategies deployed during this transformation can result in broad outcomes for the electricity sector. Due to the potential impact on long-term planning, PGE sponsored this study to inform its Integrated Resource Planning (IRP) efforts and provide an understanding of: (1) the opportunities and challenges of achieving economy-wide deep decarbonization across its service territory; and (2) the resulting implications for electricity system operations and planning.

A. Motivation and Context

Oregon has long been at the forefront of recognizing the risks imposed by climate change. In 2007, the Oregon legislature passed House Bill 3543 (HB 3543), which established GHG reduction goals, including: (a) 10 percent reduction below 1990 levels by 2020; and (b) 75 percent reduction below 1990 levels by 2050. The Oregon Global Warming Commission (OGWC) was established through the same bill, and later recommended an interim goal of a 40 percent reduction below 1990 levels by 2035.

Recently proposed legislation seeking to establish a cap-and-trade program in Oregon also proposes to tighten the statewide GHG reduction goal. The proposed legislation would require a reduction in statewide GHG emissions to: (a) a goal of 20 percent below 1990 levels by 2025; (b) a limit of 45 percent below 1990 levels by 2035; and (c) a limit of 80 percent below 1990 levels by 2050.

Oregon has existing climate policies targeting specific sectors. The Clean Fuels Program requires the average carbon intensity of transportation fuels to be reduced by 10 percent between 2015 and 2025. The state adopted a Renewable Portfolio Standard (RPS) in 2007, which requires a percentage of retail electricity sales to be met by qualifying renewable electricity generation. This policy originally required 25 percent of load to be met by renewables by 2025. Senate Bill 1547 (SB 1547), also known as the Oregon Clean Electricity and Coal Transition (OCEP), was passed in March 2016 and requires: (1) an increase in the RPS to 50 percent renewables by 2040; and (2) removing coal-fired electricity generation from the state's electricity supply by 2035.

PGE's 2016 IRP reflected the increase in renewable energy requirements and transition from coal generation called for in the OCEP. Throughout the IRP process, stakeholders and customers have expressed interest in low-carbon portfolios and exploring deep emissions reductions. In addition, the City of Portland and Multnomah County passed resolutions committing to ambitious clean energy goals shortly after, including: (a) 100 percent renewable electricity by 2035; and (b) a complete transition to carbon-free energy by 2050.

These drivers to deeply decarbonize the economy would require ambitious energy system transformation. Prior studies examining similar levels of GHG reductions for the states of Washington and California, the United States and countries representing more than 75 percent of global GHG emissions have all identified the following required changes to their future energy systems: (1) highly efficient use of energy; (2) generating electricity with low- and zero-carbon resources; and (3)

substituting fossil fuels with electricity and electricity-derived fuel.[3] Pursuing only one change, such as decarbonizing electricity generation, is insufficient to meet economy-wide goals and all three strategies are needed.

In addition to these common themes, there are a range of alternative strategies that make it possible to achieve the same GHG goal. Different technologies and fuels can be deployed to decarbonize energy supply and demand, and the extent of decarbonization by end-use sector may vary. Key differences between pathways identified in prior studies include the level of end-use electrification and the allocation of limited bioenergy resources to decarbonize gaseous and liquid fuels.

As a result, long-term planning for the electricity sector will need to account for decarbonization efforts in other sectors and the complex mix of choices that may be pursued. Examples of actions that would affect long-term electricity planning include: (a) adoption of high levels of electric vehicles in the transportation sector, which affects overall electricity demand and its shape; (2) production of synthetic electric fuels, such as hydrogen from electrolysis, which will increase the demand for clean electricity generation; and (3) deployment of distributed energy resources across homes and businesses. However, the likelihood and timing of these developments and other potential decarbonization efforts is uncertain.

Our study aims to provide an understanding of the broad choices available to achieve deep decarbonization across the economy and the potential implications on the electricity sector. To inform this understanding, we develop a range of plausible energy futures for PGE's service territory that achieve steep reductions in energy-related CO_2 emissions between now and 2050. These future energy scenarios outline: (1) potential sources and demands for energy types over time; and (2) the scale and timing of change over the next three decades.

B. Study Scope

Our study scope includes designing and evaluating three future energy scenarios that deeply decarbonize the PGE service territory's energy system. We refer to these scenarios throughout the report as "deep decarbonization pathways" or simply "pathways". We also developed a Reference Case reflecting current policy to provide a benchmark against the pathways scenarios.

The primary results of our study include projections from today to 2050 of: (1) energy demand by sector and type; (2) energy supply; (3) energy-related CO_2 emissions; and (4) energy system-related costs. This is supplemented by detailed results for the electricity sector, including electricity demand, installed capacity, generation, and hourly dispatch results for PGE's bulk power system.

Given our focus on exploring energy system transformation, we account for all forms of energy (e.g., gasoline, pipeline gas, hydrogen) and our analysis is not limited to electricity. We include CO_2 emissions from energy use, but we do not track non-energy CO_2 and non-CO_2 GHGs. The geography for our analysis is confined to PGE's service territory and excludes the rest of Oregon. Since one of the primary objectives of the study is to explore economy-wide compliance with a GHG target, we include load from customers that are currently under direct access to account for all energy use.

[3] These strategies are commonly referred to as the "three pillars".

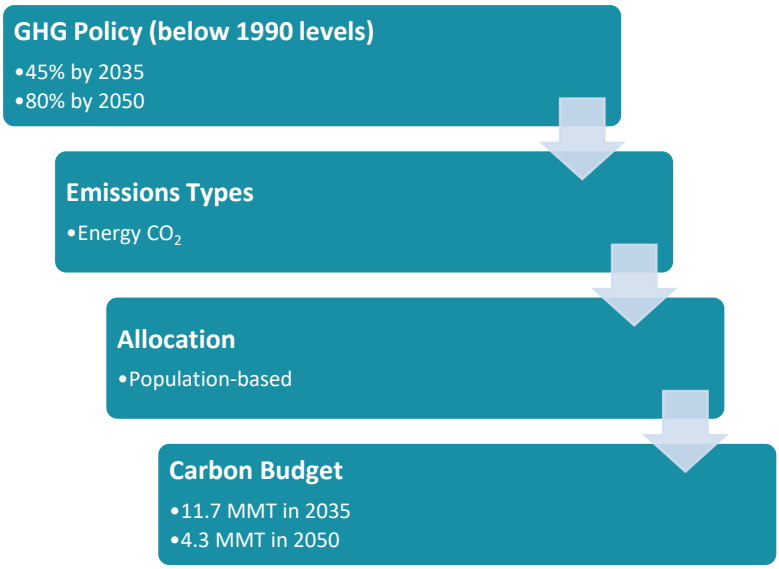
Given the exploratory nature of this study, it is important to emphasize what this study *is not*:

- Our scenarios are not a forecast of the future;
- We are not predicting future outcomes or assigning probabilities to scenarios;
- We are not choosing or recommending a pathway to 2050;
- Scenarios assessed here are not exhaustive and thousands of plausible alternatives exist;
- Scenarios do not reflect PGE's business plan or future resource acquisitions; and
- This study's modeling approach and results do not replace existing tools or processes used in IRP, such as defining "need" for resource adequacy or identifying optimal portfolios, nor do they replace cost-effectiveness evaluation, etc.

C. Study Emissions Target

For the purposes of this study, the energy-related CO_2 emissions budget for PGE's service territory is 11.7 million metric tons ($MMTCO_2$) in 2035 and 4.3 $MMTCO_2$ in 2050. Developing an appropriate emissions budget to evaluate deep decarbonization requires numerous assumptions to account for: (a) the fact that currently there is no binding, economy-wide GHG policy covering PGE's service territory; (b) any state-wide emissions limit must be translated into a budget for PGE's service territory; and (c) the scope of our work includes energy-related CO_2 emissions and excludes non-energy CO_2 and non-CO_2 GHGs. Our approach for deriving the study's emissions budget is summarized in Figure 1 and further described below:

Figure 1 Approach to Develop Study's CO_2 Target



- **GHG Policy**. The context for emission reductions, discussed in the proposed cap-and-trade legislation, requires a reduction in statewide GHG emissions to: (a) 45 percent below 1990 levels by 2035; and (b) 80 percent below 1990 levels by 2050.

- **Emissions Types**. CO_2 emissions from fossil fuel combustion have been the predominant source of Oregon's historical GHG emissions, and, since 1990, energy-related CO_2 emissions have accounted for four-fifths of total gross GHG emissions in the state. For simplicity, we apply the emissions reductions from the above GHG policy to Oregon's 1990 energy-related CO_2 emissions, which were approximately 46 $MMTCO_2$.[4] This results in a state-wide budget for CO_2 emissions from fossil fuel combustion of approximately 25.2 $MMTCO_2$ in 2035 and 9.2 $MMTCO_2$ in 2050. Based on a state population forecast of 5.59 million in 2050, this results in a per capita emissions budget of 1.6 tCO_2 per person, which is consistent with prior decarbonization studies.
- **Budget Allocation**. We allocate the state-wide emissions budget to PGE's service territory using its projected share of Oregon's population. In 2015, the PGE service territory included approximately 1.8 million people or 45 percent of Oregon's population. Projections of long-term population growth show counties within PGE's service territory growing at a slightly faster rate than the state as a whole. PGE's share of the state's population is projected to increase to 46.3 percent in 2035 and 47 percent by 2050. This translates into a carbon budget of 11.7 $MMTCO_2$ in 2035 and 4.3 $MMTCO_2$ in 2050.

The carbon budget we have developed for PGE's service territory is specific to this study. Any future policy mechanisms used to achieve emissions reductions, such as a price on carbon or complementary measures, may result in alternative emissions outcomes than those modeled here. In other words, the *total* statewide GHG emissions target may be compliant in the future, but *where* mitigation occurs is not definite. For example, more or less mitigation may occur between: (a) PGE's service territory and the rest of Oregon; (b) buildings and the industrial sector; and (c) sources of energy CO_2 and other GHGs.

[4] We note that our approach implicitly assumes that non-energy CO_2 and non-CO_2 GHGs will be reduced on an equivalent percentage basis in order to achieve the overall GHG targets. Historical emissions data from DEQ (2016).

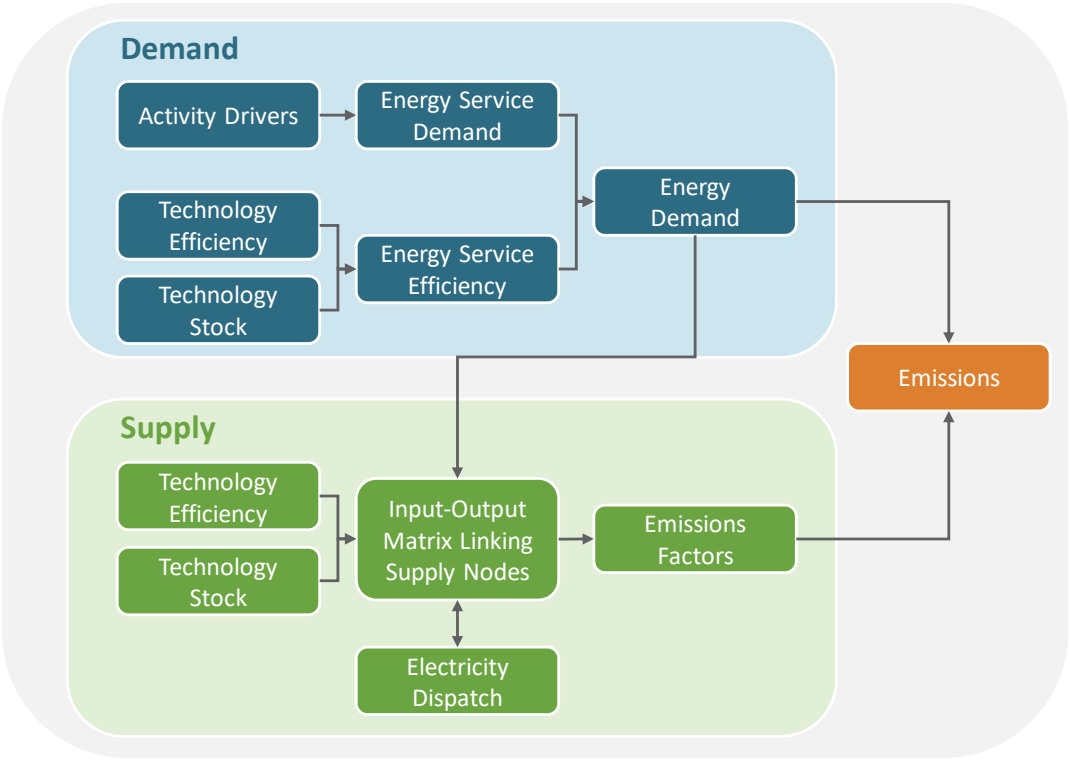
II. Study Assumptions and Approach

A. EnergyPATHWAYS Modeling Framework

We use EnergyPATHWAYS, a bottom-up energy systems model, to estimate energy demand, emissions and costs for each future energy scenario. Our analysis starts with the same model and approach we have previously used to evaluate deep decarbonization for the United States, the State of Washington and other jurisdictions. We developed a detailed representation of the PGE service territory's energy system, including infrastructure stocks and energy demands for buildings, industry, and transportation. Our analysis incorporates an hourly dispatch of PGE's electricity system, which allows us to better understand fundamental changes to electricity supply and demand, such as how to balance very high levels of intermittent renewables and the impact of electrification on hourly load.

Figure 2 depicts the general structure of EnergyPATHWAYS with the demand- and supply-side of the energy system shown separately. The demand-side calculates the quantity of energy demanded by different services at the technology level, such as the kWh of electricity and therms of pipeline gas demanded by water heaters in the residential sector. The supply-side determines how energy demand is met, such as the share of electricity provided by gas-fired combined cycle power plants, onshore wind power plants and rooftop solar PV. The energy system is simulated in sequence with the demand-side run prior to the supply-side.

Figure 2 General Structure of EnergyPATHWAYS



The demand-side starts with exogenous projections of activity drivers, such as population, households, commercial floorspace and industrial value of output. These drivers serve as the basis for projecting demand for energy services. For example, as the number of total residential households and square footage increases, then the demand for lighting will similarly increase. The technology composition of the stock along with the efficiency of each technology creates a service efficiency. In the lighting example, a transition from incandescent to CFL and LED light bulbs would improve service efficiency. Energy service demand and service efficiency are then combined to calculate the demand for energy, while the fuel type depends on the stock of technologies used to satisfy the demand for energy services.[5]

The supply-side is characterized by an input-output (IO) matrix that specifies the flow of energy between "supply nodes" that produce or deliver energy. Examples of supply nodes include power plants and transmission and distribution infrastructure. The coefficients in the matrix specify the amount of input energy required to produce one unit of output energy. For example, a gas-fired combined cycle power plant with a heat rate of 6,824 Btu/kWh (50% efficiency) would require 2.0 units of natural gas to generate 1.0 unit of electricity. These coefficients are dynamic and reflect: (1) changes in the composition and efficiency of supply-side technologies; and (2) outputs from an hourly electricity dispatch (i.e., the generation mix). From this process, emission factors are developed for each fuel. Finally, the emission factors from the supply-side are combined with final energy demand from the demand-side to estimate system-wide emissions.

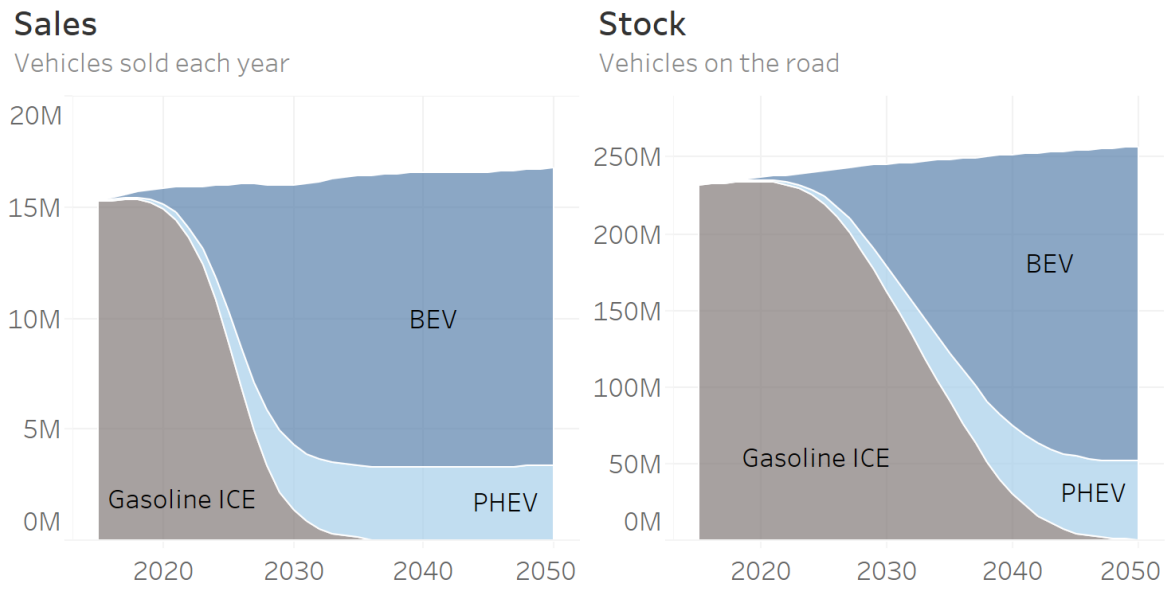
To reduce emissions, we develop measures to replace existing demand- and supply-side equipment and infrastructure with efficient and low-carbon technologies. For example, passenger travel currently provided by a gasoline vehicle is replaced by an EV, and a CFL light bulb is replaced by an LED light bulb. Future energy scenarios are designed by combining measures across sectors at the scale and rate necessary to meet the study's emissions target.

We implement measures through a stock rollover process, where a portion of energy infrastructure retires in each year and must be replaced by new energy infrastructure. In a baseline scenario, retiring infrastructure is generally replaced with the same category of technology, but the cost and performance characteristics reflect the more recent installation year (e.g., a retiring reference dishwasher is replaced by a new reference dishwasher). Alternatively, measures specify the composition of new energy infrastructure (e.g., half of vehicle sales are plug-in hybrid electric vehicles by 2025).

The stock rollover process is illustrated for light-duty vehicles in Figure 3, where the measure shown on the left-hand side of the chart specifies that sales of new light-duty vehicles are 80 percent BEV and 20 percent PHEV by 2035. Changes to the vehicle stock, shown on the right-hand side, are moderated by this process and BEV/ZEV vehicles do not make up all vehicles on the road until 2050. All scenarios in this study assume that infrastructure is retired naturally (i.e., at the end of its lifetime), and there are no early retirements.

[5] A portion of electric energy can be dispatched (i.e., flexible load), and this process is modeled on the supply-side.

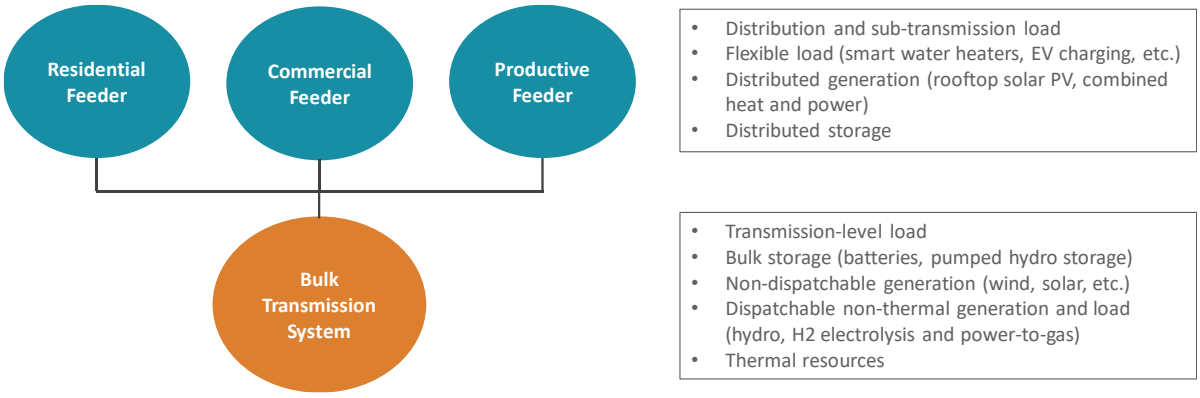
Figure 3 Illustrative Example of Stock Rollover in EnergyPATHWAYS



B. Electricity Sector Modeling

Electricity system operations in EnergyPATHWAYS are modeled on an hourly basis for each year through 2050. This includes a detailed representation of loads and resources at the feeder-level and the bulk transmission system. The structure of the electric system is shown in Figure 4 below, with the boxes illustrating the type of resources included within each node. Electricity dispatch and the development of load shapes are further described below, and we illustrate our approach for a three-day period (February 6-8, 2050).

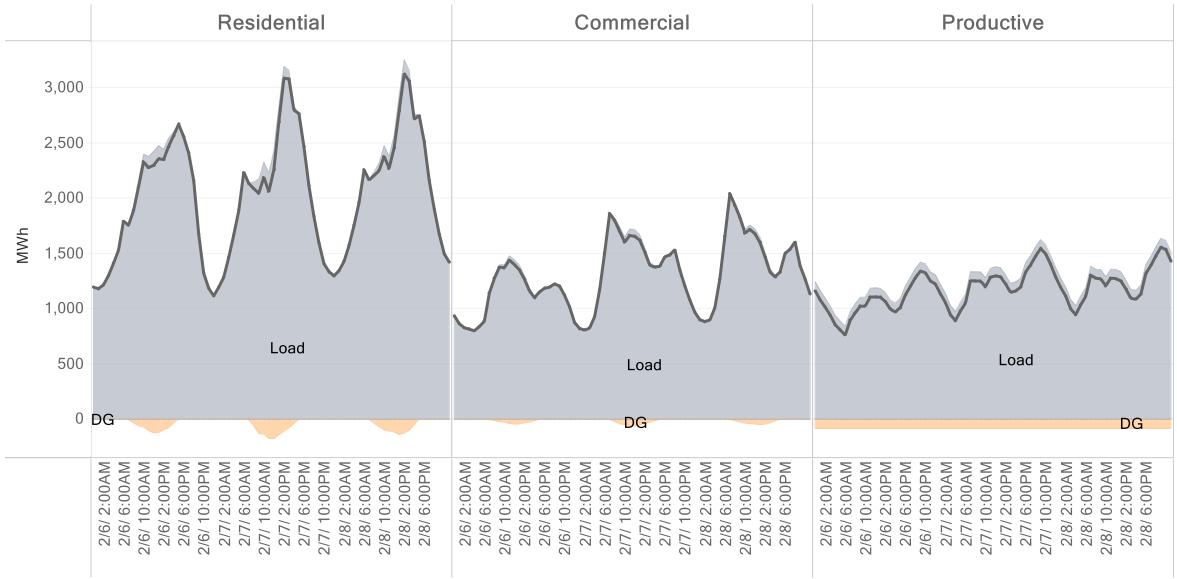
Figure 4 EnergyPATHWAYS Electricity System Structure



System load shapes are developed from the "bottom-up" by multiplying hourly sector, sub-sector, and technology-specific load shapes by the associated annual electricity consumption.[6] The bottom-up shape is then calibrated against a historical, top-down system load shape. Going forward, the system load shape changes in each year as the contribution from end-uses evolves. For example, as LED lighting penetration increases, then night-time demand will decrease due to their higher efficiency relative to incandescent and CFL light bulbs. In addition, the electrification of space heating will increase electric load during winter hours to account for the contribution of heating during winter months.

Sub-sector loads are aggregated to sectors and mapped to a "stylized" residential, commercial and/or productive (industrial) feeder, which models customer type at the distribution level. This is primarily to allocate electric vehicle charging, which could take place at home or at the workplace, onto the electricity distribution system. Distributed generation, such as combined heat and power (CHP) and rooftop solar PV resources are modeled across feeders. Figure 5 shows load and distributed generation for three feeders with the net load shown as the black line.

Figure 5 Distribution System: Net Load

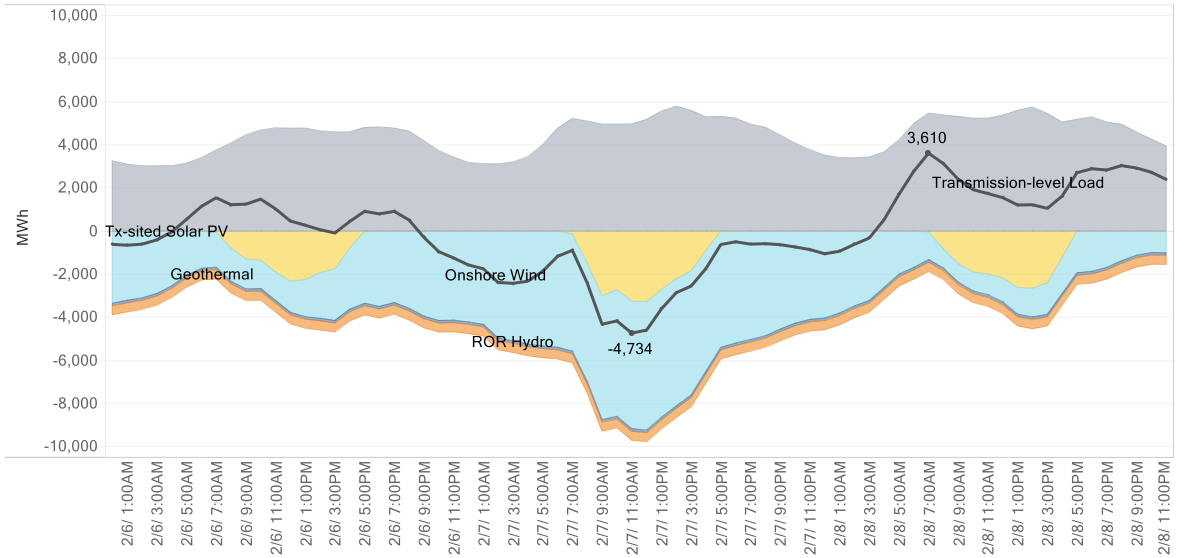


Note: figure is illustrative.

The bulk transmission system receives the distribution-level net load and combines them with transmission-level loads, such as electrolysis and power-to-gas facilities. Output from non-dispatchable resources on the transmission system, such as wind, solar, geothermal and run-of-river hydro, is then accounted for to produce an initial system net load signal, as shown in Figure 6 below. During this three-day snapshot, the minimum net load in a single hour is -4,734 MW due to the coincidence of high wind and solar generation.

[6] Load and resource shapes reflect 2011 weather conditions.

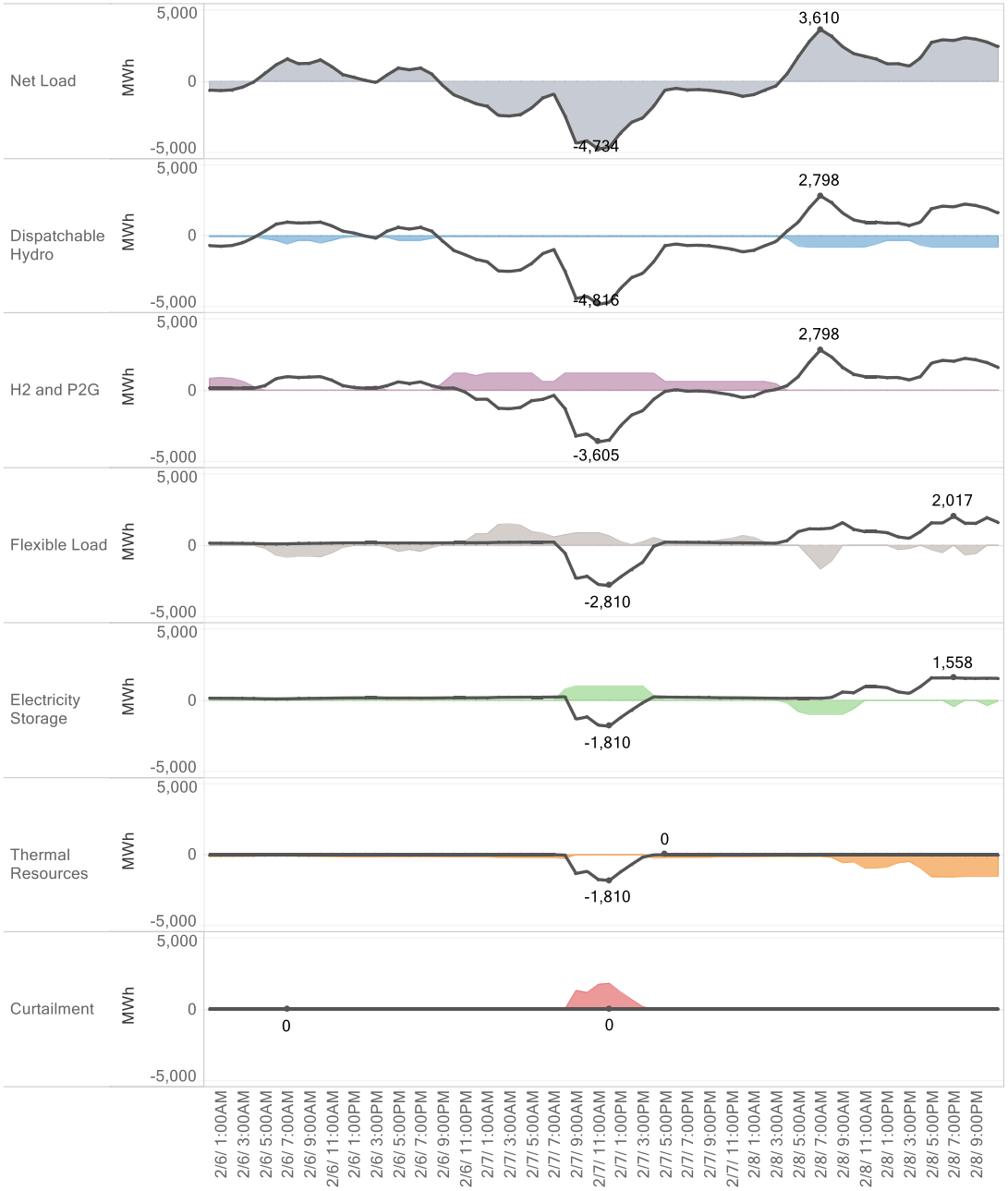
Figure 6 Transmission System: Net Load



Note: figure is illustrative.

Figure 7 illustrates the dispatch of flexible resources in sequence, with each resource dispatching to minimize the net load peaks and valleys. During the three-day period, net load starts with a maximum of 3,610 MW and and a minimum of -4,734 MW. Flexible, carbon-free resources, including dispatchable hydro plants, electric fuel production facilities, flexible loads and energy storage, flatten the net load to a maximum of 1,558 MW and a minimum of -1,810 MW. Thermal generators are dispatched in order of marginal cost to serve the remaining positive net load, while the remaining negative net load is curtailed.

Figure 7 Flexible Resource Dispatch



Note: figure is illustrative.

We model all generation resources in PGE's system, including existing power plants and contracts. The capacity of these resources was provided by PGE, and we developed plant heat rates (efficiencies) for thermal resources based on historical generation and fuel input data from Form EIA-923. Hydro resources are differentiated between dispatchable (e.g., Pelton-Round Butte) and run-of-river, and both resources types are constrained by a monthly energy budget. For imports, we use projected electricity

market prices (in $/MWh) and natural gas prices (in $/MMBtu) provided by PGE to develop market heat rates (in MMBtu/MWh) to both cost and assign an emissions intensity.

We use the following heuristic to ensure the quantity of installed generating capacity meets system load in every hour of the year. First, "annual capacity need" is estimated as the maximum hourly net load plus operating reserves. Next, the installed capacity of dispatchable resources is de-rated by their forced outage rate to estimate their contribution. Finally, generic capacity resources are added to fill any gap between "annual capacity need" and the contribution of dispatchable resources. We assume generic capacity resources have the cost and performance characteristics of a frame type combustion turbine, which is consistent with PGE's IRP.

We note that our modeling results may differ from PGE's IRP due to the use of alternative models and the inclusion of direct access loads in our scope. We describe the electricity resources for each scenario in Section III.B.1 below.

C. Energy Demand and Supply

EnergyPATHWAYS was originally developed to assess deep decarbonization for the United States, and most of the energy demand and supply inputs are drawn from the EIA's National Energy Modeling System (NEMS) that produces the *Annual Energy Outlook*.[7] NEMS input data is comprehensive of the U.S. energy system and internally consistent. The primary geography for energy demand in NEMS is the census division, which each include a collection of states. For example, the Pacific census division includes Washington, Oregon and California, while the Mountain census division aggregates the remaining states in the West.

Given the common input data and energy system representation, EnergyPATHWAYS also uses census division as the primary geography. However, the model is geographically flexible by accepting energy demand and supply input data at a variety of geographical resolutions (e.g., state-level) and mapping these together onto one consistent geography. We used this geographic mapping feature to develop the underlying energy system representation for PGE's service territory. Figure 8 illustrates this process, where energy system data for a variety of geographies is mapped to PGE's service territory. This "downscaled" energy data is combined with direct inputs of PGE's service territory to characterize the entire energy system. To allocate input data at various geographical resolutions to PGE's service territory, we used: (1) households by county in PGE's service territory; (2) land area (in square miles) by county in PGE's service territory; and (3) value of shipments of products by industrial sector by state of origin, which allows us to estimate the quantity of industrial activity within a given subsector and state.[8]

[7] For example, see Risky Business Project (2016).

[8] PGE provided county-level households and land area. Value of shipments data is from the Bureau of Transportation Statistics and Federal Highway Administration's 2015 Freight Analysis Framework.

Figure 8 Geographic Downscaling

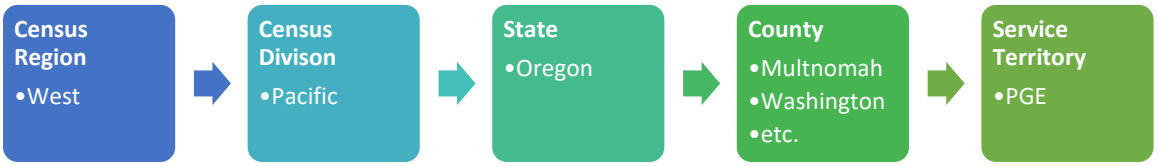


Table 2 summarizes the primary input data sources for energy demand by subsector. We use the 2013 PGE Residential Appliance Saturation Survey (RASS) to characterize the existing stock of the residential space heating, air conditioning and water heating subsectors. This includes the composition of technologies and fuels used in single-family, multi-family and manufactured homes. Energy use intensity (energy consumption per stock) is derived from the EIA's Residential Energy Consumption Survey (RECS) and the Northwest Energy Efficiency Alliance's (NEEA) Residential Building Stock Assessment. Energy demand for the remaining residential subsectors (e.g., refrigerators, dishwashers, etc.) is from the EIA AEO 2017. Vehicle miles traveled (VMT) for light-, medium- and heavy-duty vehicles are from Oregon's 2017 Highway Cost Allocation Study (HCAS), while the remaining energy demand is primarily from the EIA's AEO 2017.

Table 2 Summary of Energy Demand Input Data

Demand Subsector	Input Data Sources	Input Data Geography
Residential Space Conditioning and Water Heating	PGE 2013 RASS Study: existing stocks	Service Territory
	EIA RECS and NEEA: energy use intensity	State
Other Residential Subsectors	EIA AEO 2017: energy demand	Census Division
Commercial Subsectors	NWPCC 7th Power Plan: square footage	State
	EIA AEO 2017: energy demand	Census Division
Industrial Subsectors	EIA AEO 2017: energy demand	Census Region
Passenger and Freight Transportation	2017 Oregon HCAS: vehicle miles traveled	State

We compared the initial bottom-up energy demand projections against top-down energy demand data from the EIA's State Energy Data System (SEDS), which includes historical energy demand by fuel and sector. We calibrated EnergyPATHWAYS to reconcile any differences between our near-term modeling outputs and historical data by scaling energy service demand or energy demand. We further calibrated electricity consumption by sector to ensure consistency with PGE's load forecast through 2050.

Energy demand projections are developed separately for a variety of final energy types, which can broadly be categorized as: (1) electricity; (2) pipeline gas; and (3) liquid fuels.[9] Table 3 summarizes the types of resources that can supply each final energy type, and the supply mix determines the emissions intensity of fuels. For example, electricity can be supplied by a variety of fossil and carbon-free

[9] Additional final energy types are modeled, but these represent the vast majority of final energy demand.

resources, and Section III.B.1 details electricity supply assumptions for PGE's service territory. Pipeline gas can be supplied with a mix of natural gas, renewable natural gas (RNG) produced from bioenergy, hydrogen (H2) produced through electrolysis, and synthetic natural gas (SNG) produced though power-to-gas (P2G). Liquid fuels are supplied by refined fossil sources, as well as fuels developed using bioenergy (i.e., renewable diesel and jet fuel).

Table 3 Final Energy Types and Supply Sources

Category	Final Energy Type	Supply Sources
Electricity	Electricity	Coal and natural gas (fossil); hydro; wind; solar PV; geothermal
Pipeline Gas	Pipeline Gas	Natural gas (fossil); RNG (biomethane); H2; SNG
	Compressed Pipeline Gas (CNG)	
	Liquefied Pipeline Gas (LNG)	
Liquid Fuels	Gasoline	Fossil gasoline; ethanol
	Diesel	Fossil diesel; renewable diesel
	Jet Fuel	Fossil jet fuel; renewable jet fuel

D. Biomass

Biomass is key resource for decarbonizing energy systems due to its versality, which allows for biofuels to directly replace both liquid and gaseous fossil fuels. Examples of conversion routes include renewable natural gas (RNG) that replaces natural gas and renewable diesel that replaces diesel. However, the supply of sustainable or net-zero carbon bioenergy resources is limited, and, in prior analyses, scarce bioenergy resources are allocated to fuels and sectors that are challenging to electrify, such as jet fuel for aviation.

In this study, we use the U.S. Department of Energy's *2016 Billion-Ton Report* as the primary source for the availability and cost of bioenergy resources. Given that the supply curve is for the U.S., we make the following assumptions. First, the PGE service territory's allocation of the national supply is its population-weighted share, which is equal to 7.3 million dry tons (MDT), as shown below:

$$PGE's\ share = \frac{PGE\ population}{U.S.\ population} \times U.S.\ supply\ of\ sustainable\ biomass\ feedstocks$$

$$7.3\ MDT = \frac{1.8\ million}{320.9\ million} \times 1{,}300\ MDT$$

Second, we assume that other jurisdictions pursue similar bioenergy-related actions, which means that the cost of producing and consuming biofuels reflects movement up the national supply curve. This assumption addresses two considerations: (1) for sub-national (e.g., state or utility service territory) deep decarbonization analyses, it would be unrealistic to assume individual jurisdictions all consume the same (low-cost) portion of the bioenergy supply curve; and (2) given the high cost of transporting biomass across long distances, it's likely that biofuels would be developed close to their source and transported across the country via the same networks that currently transport fossil fuels. Finally, we assume that the biomass feedstock is net-zero carbon, which results in biofuels with very low emissions rates due to some emissions from non-bioenergy use in conversion and refining processes.

E. Key Data Sources

Table 4 summarizes the key data sources used in our energy system modeling. We use data from PGE's 2016 IRP to characterize the cost and performance of electricity supply technologies and rely on the 2013 PGE RASS study to characterize the existing stock of residential appliances, as described above. This is supplemented by state and regional data sources, such as Oregon's Office of Economic Analysis (OEA) and the Northwest Energy Efficiency Alliance (NEEA). Most of the remaining sources are publicly-available reports produced by national laboratories, such as the U.S. Department of Energy (DOE).

Table 4 Overview of Key Data Sources

Category	Sources
Energy Supply Technology Cost and Performance	• PGE 2016 Integrated Resource Plan • NREL Annual Technology Baseline 2017 • EIA Form 923 • DOE Hydrogen Analysis (H2A) Project • ENEA Consulting (2016)
End-Use Technology Cost and Performance	• Input data for EIA's National Energy Modeling System (NEMS) used to produce the Annual Energy Outlook • NREL Electrification Futures Study: End-Use Electric Technology Cost and Performance Projections
Building Stock Characteristics	• PGE 2013 Residential Appliance Saturation Study • NEEA Building Stock Assessment reports
Fossil Fuel Prices	• EIA Annual Energy Outlook 2017
Miscellaneous	• DOE 2017 Billion-Ton Report • FERC Form 714 • 2017 Oregon Highway Cost Allocation Study • OEA Forecasts of Oregon's County Populations and Components of Change, 2010 – 2050

Note: DOE is the U.S. Department of Energy; EIA is the U.S. Energy Information Administration; FERC is the Federal Energy Regulatory Commission; NEEA is the Northwest Energy Efficiency Alliance; NREL is National Renewable Energy Laboratory; and OEA is Oregon's Office of Economic Analysis.

III. Scenarios

A. Overview

Table 5 provides an overview of the three pathways included in this study, which each incorporate alternative emissions reduction strategies and technologies. One of the primary objectives of our scenario design was to reflect a broad range of outcomes for the electricity sector.

The **High Electrification** pathway relies on electrifying space and water heating in buildings and deploying bulk energy storage to balance high levels of renewable generation. Passenger transportation is characterized by high levels of battery electric vehicles (BEV), while freight transportation includes both battery electric and hybrid diesel trucks. The **Low Electrification** pathway decarbonizes energy supply with a variety of renewable fuels, and electrolysis and power-to-gas facilities provide both electricity balancing services and decarbonized pipeline gas. Passenger transportation is primarily BEV, while compressed and liquefied natural gas trucks are incorporated in the freight transportation sector. The **High DER** pathway is highly electrified and distributed, with increased rooftop solar PV and distributed energy storage in buildings and industry.

To provide a benchmark to compare the pathways against, we developed a **Reference Case** that projects business-as-usual conditions. This includes compliance with state-level policy such as the OCEP and CFP, as well as major federal policy such as improvements in corporate average fuel economy standards. The scenario is not designed to achieve an emissions target.

Table 5 Overview of Scenarios

Scenario	Description
High Electrification	Fossil fuel consumption is reduced by electrifying end-uses to the extent possible and increasing renewable electricity generation
Low Electrification	Greater use of renewable fuels, notably biofuels and synthetic electric fuels, to satisfy energy demand and reduce emissions
High DER	Distributed energy resources proliferate in homes and businesses, which also realize higher levels of electrification
Reference	A continuation of current and planned policy, and provides a benchmark against the deep decarbonization pathways

Although the future energy scenarios are characterized by alternative mitigation strategies, they are all constrained by a set of common scenario design principles. This conservative approach allays a broad range of concerns surrounding the technical feasibility and economic affordability of realizing a deeply decarbonized energy system, such as the need for revolutionary technological improvements or disruptive lifestyle changes. The scenario design principles in this analysis include: (a) applying the same demand for energy services; (b) replacing energy infrastructure at the end of its natural life (i.e., there are no early retirements); (c) using commercial or near-commercial technologies; (d) limiting the supply of sustainable bioenergy use; and (e) ensuring there are sufficient electricity resources to serve load in all hours. The sections below describe the energy supply and demand assumptions for each pathway.

B. Energy Supply

1. Electricity Resources

Table 6 summarizes our electricity supply assumptions for each pathway. Coal-fired resource assumptions are consistent with PGE's 2016 IRP and OCEP, where Boardman ceases operations by the end of 2020 and Colstrip units 3 and 4 are out of the resource mix by 2035. We assume the capacity of PGE's existing gas-fired resource fleet is online through 2050, while the amount of energy generated from these resources is a function of our electricity dispatch.

Hydroelectric resources include Pelton-Round Butte, run-of-river (ROR) hydro, Mid-C hydro and other contracts. We assume projected hydro resources and contracts are extended through 2050 (a total of 933 MW), and an additional 23 MW of small hydro is placed on-line in 2035. We assume new geothermal resources of 100 MW in 2035 and growing to 500 MW by 2050. Prior studies have identified 832 MW of conventional geothermal potential in Oregon with a further undiscovered enhanced geothermal system potential of 1,800 MW.[10]

The High DER pathway includes approximately 2,500 MW of behind-the-meter (BTM) solar PV resources across buildings and industry by 2050. We developed this target based on the technical potential of distributed solar PV across PGE's service territory identified in the 2016 IRP.[11] The High and Low Electrification pathways assume approximately 400 MW of BTM solar PV, which is two times the highest level of adoption from the same study.

Pathways rely on high levels of transmission-connected wind and solar PV to decarbonize electricity generation, including: (a) onshore wind located in the Pacific Northwest (PNW); (b) onshore wind located in central Montana; and (c) solar PV located in central Oregon. Approximately 75 percent of electricity generation comes from these resources in the High and Low Electrification pathways, and this level is lower in the High DER pathway due to the quantity of BTM solar PV resources. The installed capacity of these resources depends on the level of transmission-connected load.

Our Reference Case reflects current RPS policy (i.e., 50% in 2040) and any gap between the RPS obligation and generation from existing/projected qualifying resources is met with an equal amount of energy from PNW onshore wind and central Oregon utility-scale solar PV resources. Our analysis did not consider low-carbon generation from new carbon capture and storage (CCS) or nuclear resources.

[10] See Pletka and Finn (2009).
[11] See Table 1-3 of Black and Veatch (2015). Technical potential of 2,810 MW_{dc} translated to 2,555 MW_{ac} assuming an inverter loading ratio of 1.1.

Table 6 Electricity Supply

	High Electrification	Low Electrification	High DER
Coal	Boardman ceases operations by the end of 2020 Colstrip 3 and 4 out of the resource mix by 2035		
Gas	Maintain current fleet		
Hydro	Extend projected hydro contracts through 2050 (933 MW) Additional 23 MW of small hydro		
Geothermal	500 MW additional		
Behind-the-meter Solar PV	405 MW_{ac}		2,555 MW_{ac}
Utility-scale Wind and Solar PV	75% of electricity generation		67% of electricity generation

Note: values for 2050 unless specified otherwise.

The high levels of variable renewable generation included in the pathways necessitate balancing resources to ensure renewables are sufficiently integrated. Table 7 summarizes the flexible resource assumptions for each pathway, all of which include 36 MW/160 MWh of energy storage that comes online in 2021 to approximate PGE's proposed energy storage projects. Balancing in the High Electrification pathway is accomplished through 1,000 MW of bulk 8-hour energy storage, whereas the High DER pathway relies on 2,555 MW of distributed 6-hour storage, which is sized to the same capacity of distributed solar PV. No additional energy storage is developed in the Low Electrification pathway, which alternatively relies on flexible electrolysis and P2G loads. The size of these facilities depends on demand for hydrogen and synthetic natural gas, respectively.

All pathways incorporate flexible demand from select end-use sectors where: (a) load automatically shifts with changing electricity grid conditions; and (b) total electricity consumption does not change.[12] For example, the owner of an EV may wish to charge his or her vehicle when they arrive home, but they're willing to delay charging to later in the evening without affecting the ability to take future trips. Two promising electric loads to operate flexibility include: (1) loads that have a thermal storage medium (i.e., hot water heater) that can operate within a range and allow for flexible operation without service degradation; and (2) transportation loads that require battery storage, which can allow for flexible charging and state-of-charge management without degrading service.

We assume 75 percent of load from light-duty vehicles and water heaters in buildings is flexible by 2050, and 50 percent is flexible in residential space conditioning, residential clothes washing and drying, and commercial space heating subsectors. The amount of flexible load in each pathway depends on the level of electrification, and the higher quantity of electric appliances (e.g., heat pump water heaters) in the High Electrification and High DER pathways provides higher end-use demand flexibility relative to the Low Electrification pathway.

[12] Flexible load is further constrained by the number of hours load can be delayed and advanced in time.

Table 7 Balancing Resources

	High Electrification	Low Electrification	High DER
Energy storage	Proposed energy storage resources (36 MW / 160 MWh)		
	1,000 MW bulk 8-hour storage	No additional	2,555 MW distributed 6-hour storage
Flexible Electric Fuel Loads	Excluded	H2 electrolysis and P2G facilities	Excluded
Flexible End-Use Loads	Percent of electric load that is flexible by 2050: • Light duty vehicles = 75% • Residential and commercial water heating = 75% • Residential space conditioning = 50% • Residential clothes washing and drying = 50% • Commercial space heating = 50%		

2. Liquid and Pipeline Gas Fuel Blends

Table 8 summarizes our assumptions about the composition of pipeline gas, diesel and jet fuel in 2050. The Low Electrification pathway is characterized by several renewable fuels to decarbonize energy supply. Pipeline gas for buildings and industry is assumed to contain 15 percent renewable natural gas (RNG) and 15 percent synthetic electric fuels (H2 and SNG). The share of RNG is 85 percent in pipeline gas that is further liquefied or compressed for transportation vehicles, while the share of H2 and SNG is the same. Biomass is further used to produce liquid transportation fuels (e.g., renewable diesel). The High Electrification and High DER pathways assume no change to the supply of pipeline gas, with all biomass resources allocated to liquid transportation fuels.

Table 8 Liquid and Pipeline Gas Fuel Blend Assumptions in 2050

Type	Blend	High Electrification and High DER	Low Electrification	
		All Sectors	Res/Com/Ind	Transportation
Pipeline Gas	Natural Gas	100%	70%	0%
	RNG	0%	15%	85%
	SNG	0%	8%	8%
	H2	0%	7%	7%
Diesel	Fossil Diesel	0%	0%	0%
	Renewable Diesel	100%	100%	100%
Jet Fuel	Fossil Jet Fuel	0%	0%	0%
	Renewable Jet Fuel	100%	100%	100%

C. Energy Demand

1. Buildings and Industry

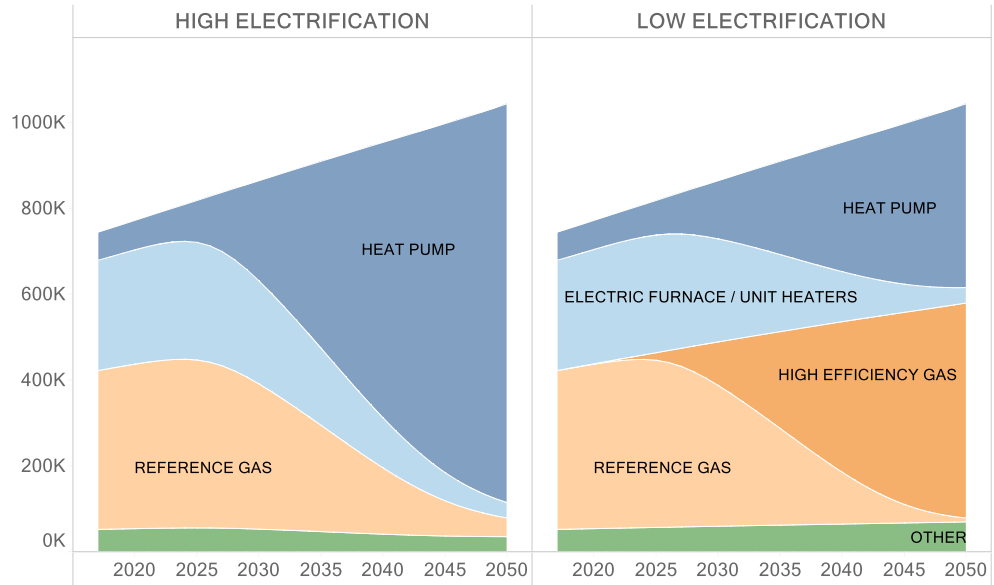
Table 9 summarizes the major low-carbon and efficient technologies in residential and commercial buildings. The High Electrification and High DER pathways are characterized by high levels of air source heat pump (ASHP) adoption for space heating and cooling needs, as well as efficient heat pump water heaters. The Low Electrification pathway relies on high efficiency gas-fired equipment to service space and water heating loads. In both pathways, lighting is provided by LEDs and the best available technology is adopted for other appliances, such as clothes washers, clothes dryers, refrigerators, etc.

Table 9 Predominant End-use Technologies in Buildings

	High Electrification and High DER	Low Electrification
Space Conditioning	Air source heat pump	High efficiency gas furnace High efficiency air conditioner
Water Heating	Heat pump water heater	High efficiency gas water heater
Lighting	LED	
Other Appliances	Best available technology	

We illustrate the change in today's building equipment by showing the evolution of the residential space heating stock through 2050 in Figure 9. Heat in the High Electrification and High DER pathways is largely provided by heat pumps, which includes both standard systems and ductless, mini-split heat pumps. In contrast, heat in the Low Electrification pathway is met by adopting high-efficiency natural gas furnaces, as well as pursuing electric energy efficiency by replacing electric furnaces and heaters with heat pumps.

Figure 9 Residential Space Heating Stock



We incorporated electrification measures in the High Electrification and High DER pathways for a limited number of industrial end-uses, including process heat and boilers. This was informed by NREL's Electrification Futures Study and includes adoption of electrotechnologies such as industrial heat pumps, resistance heating, induction furnaces and electric boilers.[13] These measures translate into electricity representing slightly less than 10 percent of final energy demand for industrial boilers and process heat by 2050.

2. Transportation

Table 10 summarizes our assumptions for vehicle sales shares in 2035 for passenger transportation and freight trucks. In all pathways, battery electric vehicles (BEV) are 90 percent of light-duty vehicle sales, while the remaining 10 percent is: (a) plug-in hybrid electric vehicles (PHEV) in the High Electrification and Higher DER pathways; and (b) hydrogen fuel cell vehicles (HFCV) in the Low Electrification pathway. We assume battery electric trucks account for half of freight truck sales, while the remaining 50 percent is: (a) hybrid diesel trucks consuming renewable diesel fuel in the High Electrification and High DER pathways; and (b) CNG and LNG trucks consuming decarbonized gas in the Low Electrification pathway.

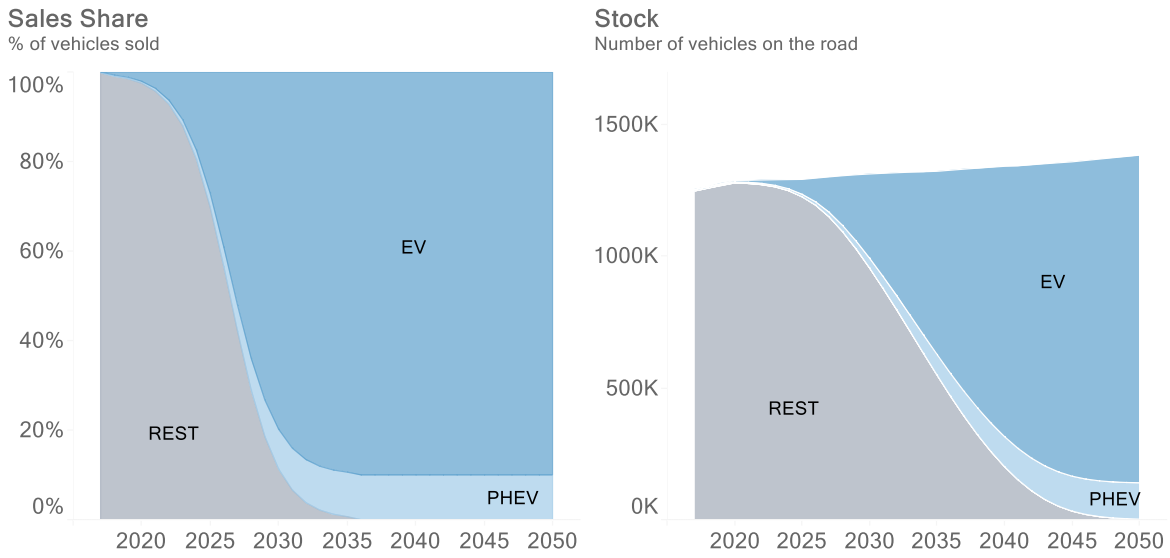
Table 10 On-Road Transportation Vehicle Sales Shares in 2035

Subsector	Technology Type	High Electrification and High DER	Low Electrification
Light-Duty Vehicles	Battery Electric	90%	90%
	Plug-in Hybrid Electric	10%	0%
	Hydrogen Fuel Cell	0%	10%
Medium-Duty Vehicles	Battery Electric	50%	50%
	Hybrid Diesel	50%	0%
	Hybrid CNG	0%	50%
Heavy-Duty Vehicles	Battery Electric	50%	50%
	Hybrid Diesel	50%	0%
	Hybrid LNG	0%	50%

Figure 10 shows how the assumptions in Table 10 change the stock of infrastructure over time, with light-duty vehicle sales shown on the left-hand side and the light-duty stock shown on the right-hand side. In the near-term, EV and PHEV light-duty autos and trucks make up a small portion of sales, but then increase to all vehicle sales in 2035. By the early 2030s, there are more than half a million EVs and PHEVs on the road, but the stock of vehicles does not completely turn-over to ZEVs until the mid-century.

[13] See Section 4 of P. Jadun, et al. (2017).

Figure 10 Light-Duty Vehicle Stock-Rollover: High Electrification Pathway



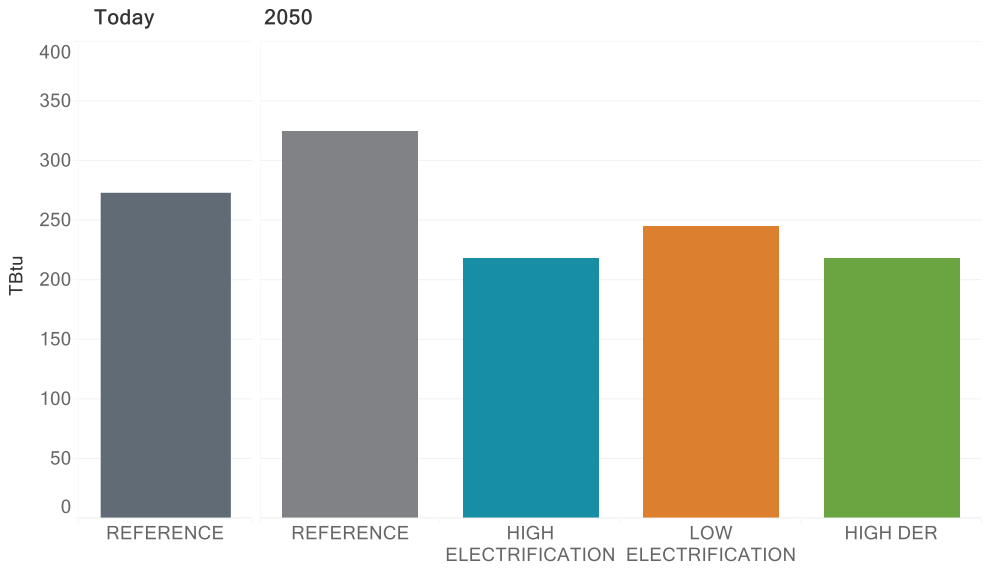
IV. Results: Energy System

In this section, we summarize the changes in the energy system for our future energy scenarios. We report several metrics for the energy system, including final energy demand, energy supply, energy related CO_2 emissions, and incremental energy system costs.

A. High-Level Summary

Reference Case final energy demand is projected to increase from 272 TBtu today to 325 TBtu, approximately a 20 percent increase, as shown in Figure 11 below. End-use demand is projected to increase as the drivers of energy use, such as population and economic activity, all grow through 2050. Final energy is used more efficiently in the pathways scenarios with a range of 218 to 245 TBtu by 2050, which represents a decrease of 25 to 33 percent below the Reference Case in 2050, and 11 to 19 percent below today's level.

Figure 11 Final Energy Demand



Energy-related CO_2 emissions are projected to slightly decrease (-4%) in the Reference Case between 2017 and 2050, as shown in Figure 12. This is largely due to existing policies decarbonizing electricity generation and transportation fuels being offset by growth in overall electricity consumption and vehicle miles traveled. Emissions for all three pathways are below the study's 2050 GHG target of 4.3 $MMTCO_2$. Emissions per capita decrease from 10.9 tCO_2 per person in 2017 to 1.6 tCO_2 per person in 2050, an 85 percent decrease.

Figure 12 Energy-related CO_2 Emissions

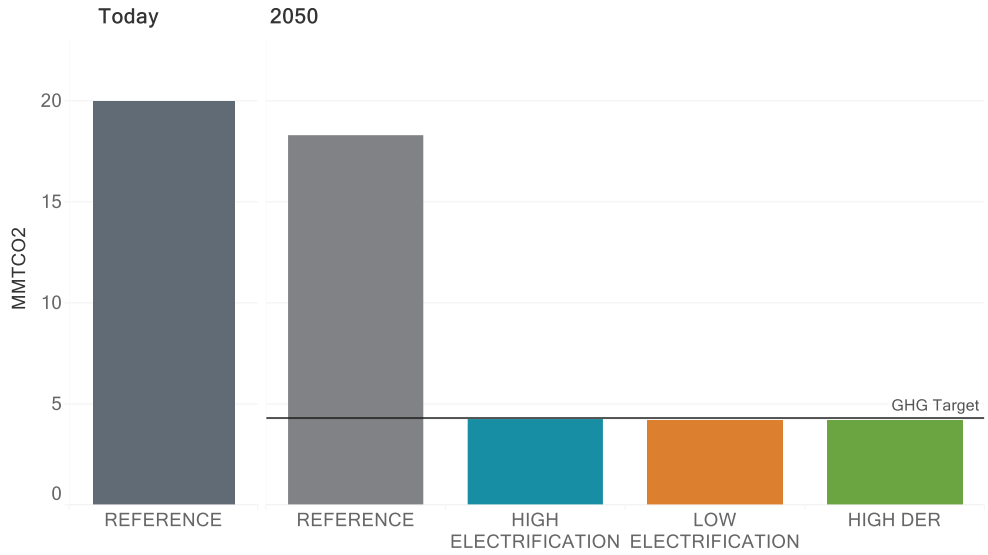
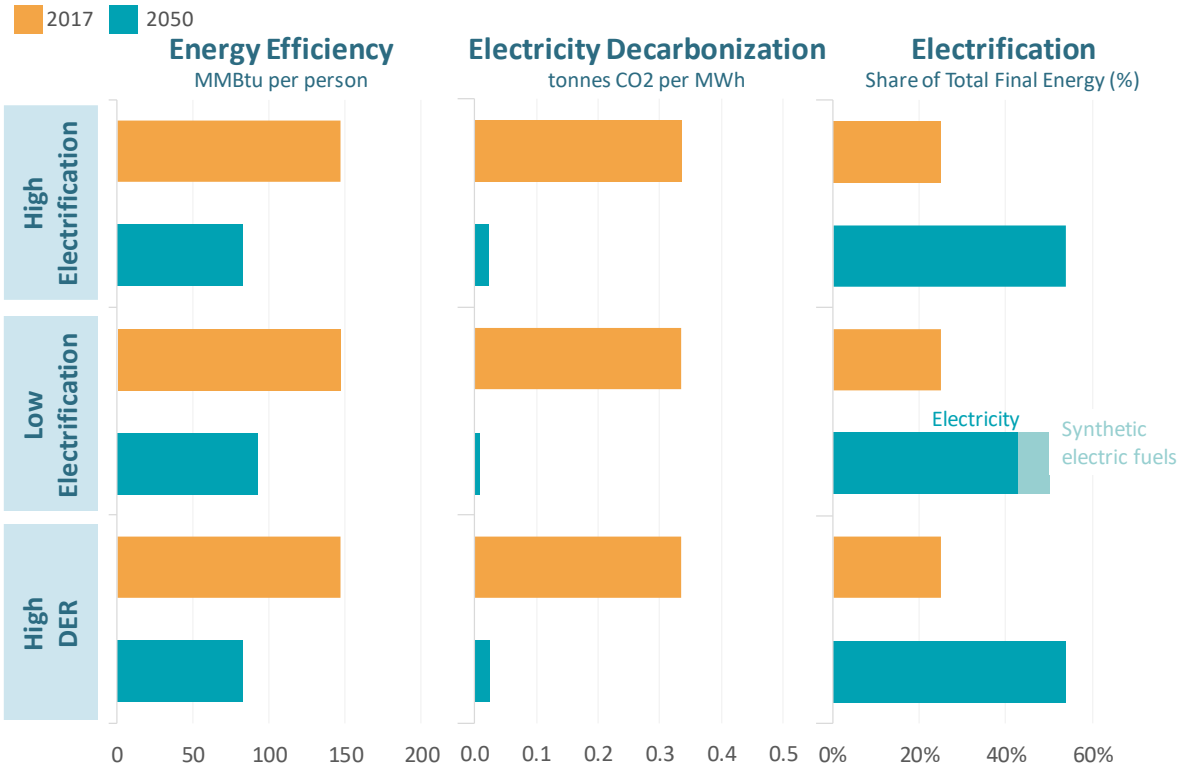


Figure 13 shows three metrics for decarbonization strategies ("three pillars"): (1) energy efficiency, which is estimated as final energy consumed per person; (2) electricity decarbonization, which is measured in tCO_2 emitted per MWh of generation; and (3) electrification, which is expressed as the share of total final energy that is electricity and electric fuels. Per capita energy consumption decreases from approximately 150 MMBtu per person today to between 83 and 93 MMBtu per person, a 37 to 44 percent decrease. This is accomplished without explicit reductions from baseline (Reference Case) energy service demand (e.g., vehicle miles traveled). The carbon intensity of electricity generation decreases by more than 90 percent and is below 0.03 tCO_2/MWh (300 kg CO_2/MWh) in all pathways. The percentage of electricity and electric fuels in total final energy increases from one-quarter today to at least half by 2050. In the Low Electrification pathway, the share of electricity is 43 percent (11 percentage points below the High Electrification pathway), but electric fuels make up 7 percent of total final energy, resulting in a total of 50 percent.

Figure 13 Three Pillars of Decarbonization



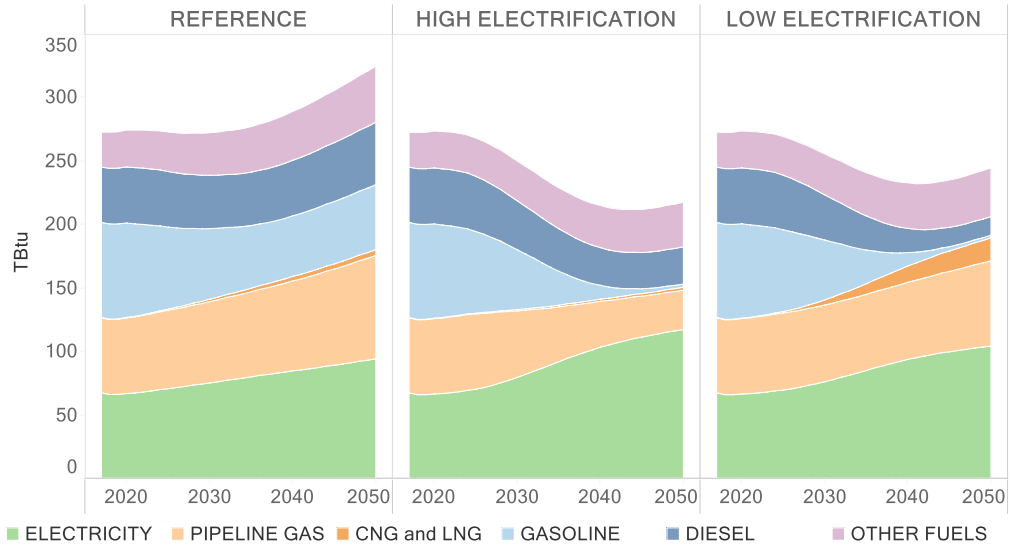
B. Energy Demand

Figure 14 shows end-use demand disaggregated by final energy type for each energy future.[14] The role of electricity expands across all pathways and increases from 25 percent of total end-use demand to 43 to 54 percent in 2050.[15] For comparison, the share of electricity only increases to 29 percent by 2050 in the Reference Case. Demand for liquid transportation fuels, such as gasoline and diesel, sharply decrease in all pathways. This decrease is compensated by higher demand for electricity, as well as CNG and LNG demand in freight transportation in the Low Electrification pathway.

[14] In this section, results for the High DER scenario are not shown, because final energy demand is equivalent to the High Electrification scenario. The impact of increased rooftop solar PV is accounted for when we show retail energy deliveries, which is discussed in Section V.A.

[15] This excludes synthetic electric fuels, which are categorized as "intermediate energy carriers".

Figure 14 Final Energy Demand by Type



Note: "Other Fuels" includes final energy types such as jet fuel, liquefied petroleum gas, biomass, and steam.

Figure 15 summarizes final energy demand for the residential, commercial, productive and transportation sectors. The figure shows Reference Case final energy demand growing over time, with decreases in the transportation sector (primarily due to fuel economy standards) offset by increases in buildings and industry. Total end-use demand decreases by 2050 for all pathways largely due to the efficiency improvements in passenger transportation related to adopting battery electric vehicles. As a result, the transportation sector's share of end-use demand decreases from approximately 46 percent today to 30 percent in 2050. Energy is used more efficiently in residential and commercial buildings, but the level of change varies across pathways based on technology adoption, which we discuss in more detail below.

Figure 15 Final Energy Demand by Sector

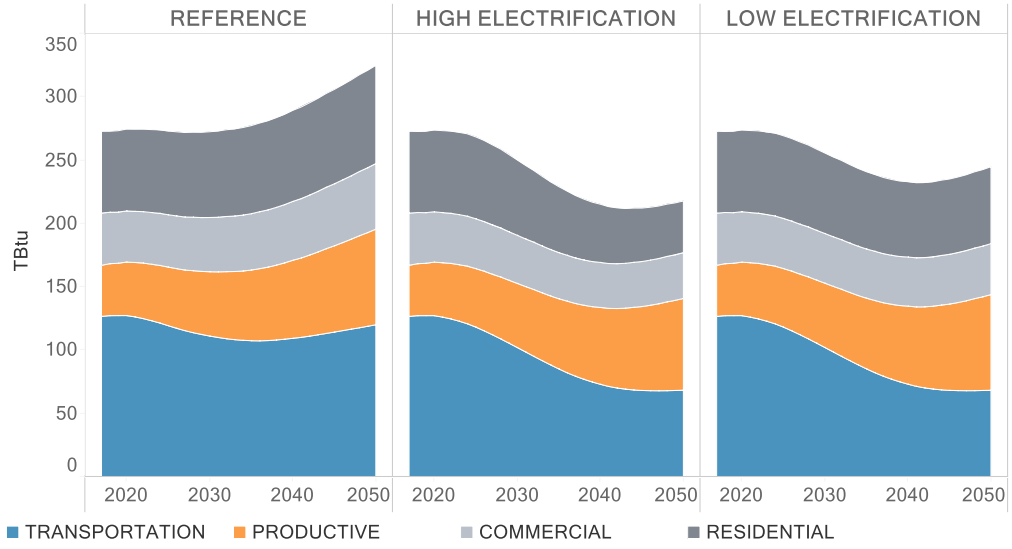
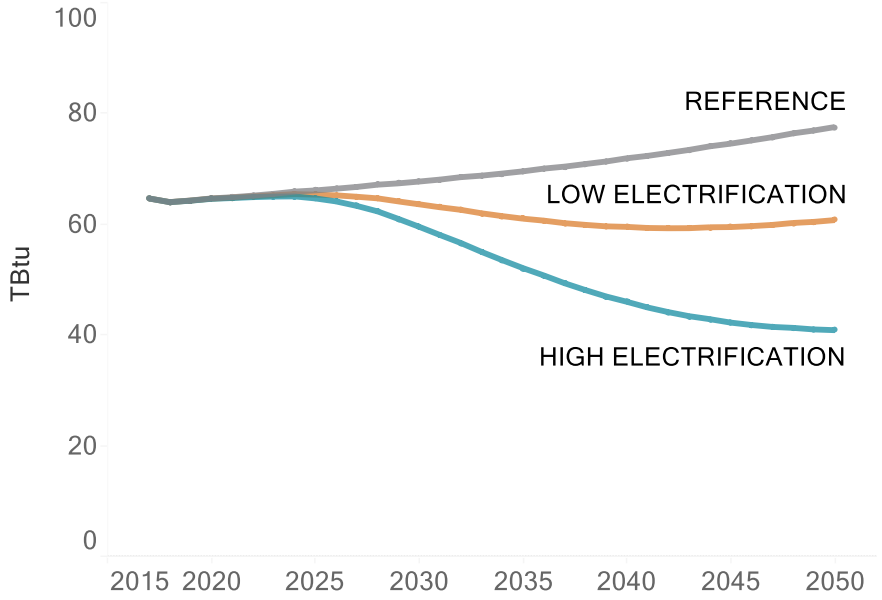


Figure 16 compares projections of residential energy demand and illustrates the improved use of energy in homes in the pathways scenarios relative to the Reference Case. All pathways include several electric energy efficiency measures, such as more efficient clothes washers and dryers, refrigerators, dishwashers and LED lighting. However, the large difference in final energy demand by 2050 between the High and Low Electrification scenarios is due to choices in space and water heating. The High Electrification pathway represents a world where households replace combustion-based furnaces and water heaters with air source heat pumps and heat pump water heaters, respectively. In the Low Electrification pathway, households adopt the most efficient gas furnaces and gas water heaters. However, the efficiency of heat pump technology relative to the best-in-class combustion equipment translates into deeper energy demand reductions.[16]

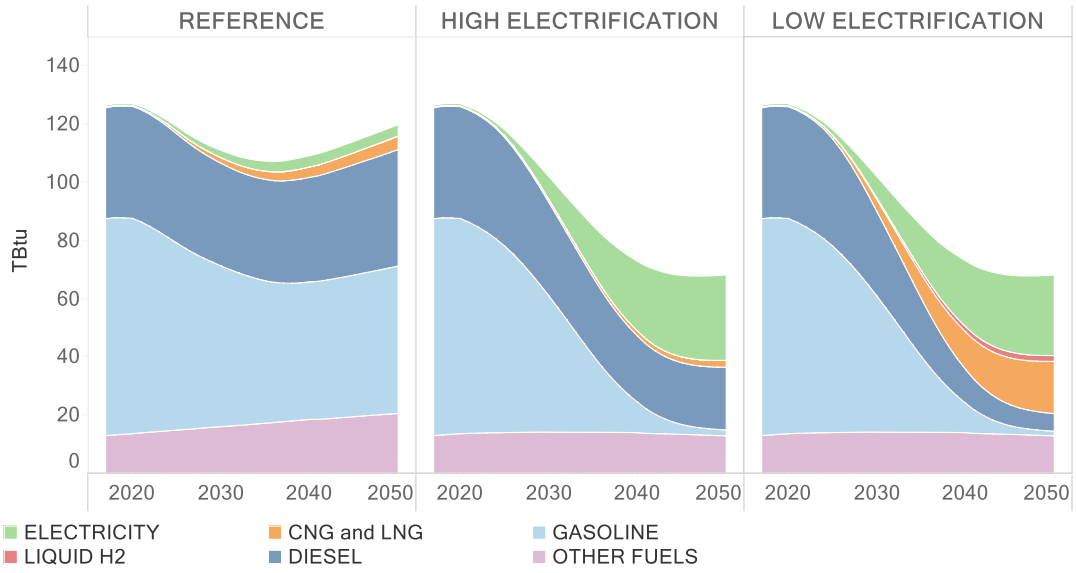
Figure 16 Residential Sector Energy Demand



The projections of energy demand for the transportation sector shown in Figure 17 reflect the changing composition of vehicles on the road. By 2050, the light-duty vehicle fleet is almost entirely electric vehicles, which results in significant decreases in gasoline fuel consumption and only modest increases in electricity consumption, because battery electric powertrains are more efficient than internal combustion engines. In all pathways, half of all freight trucks are electric by 2050, resulting in electricity becoming the largest transportation fuel type. The High Electrification pathway continues to use diesel fuel for the remainder of its freight trucks, but the supply is increasingly renewable diesel (100 percent by 2050). The Low Electrification pathway alternatively relies on hybrid CNG medium-duty trucks and LNG hybrid heavy-duty trucks. By 2050, demand from the CNG and LNG trucks in the Low Electrification pathway accounts for over 20 percent of total pipeline gas demand.

[16] For example, a high efficiency gas furnace has an annual fuel utilization efficiency (AFUE) of 0.98, whereas a standard air source heat pump installed in 2015 in the U.S. has a seasonal coefficient of performance (COP) of 2.45 and this is projected to increase to 3.75 by 2030. See Navigant Consulting (2014) and Jadun, et al. (2017).

Figure 17 Transportation Sector Energy Demand by Final Energy Type



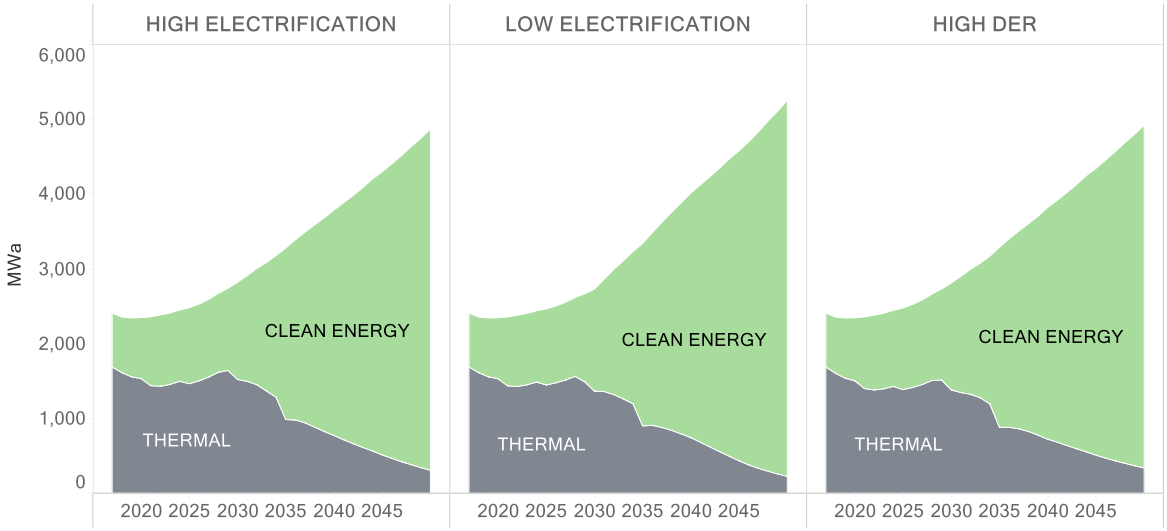
C. Energy Supply

1. Electricity

Figure 18 summarizes electricity supply through 2050, with generation from various resource types categorized as: (a) thermal, which includes generation from coal- and gas-fired resources, generic capacity and market purchases; and (b) clean energy, which includes generation from wind, solar, hydro and geothermal resources.[17] The figure shows that total electricity generation across all pathways grows rapidly, and total generation requirements in 2050 are more than double today's level. In all pathways, generation from non-emitting resources is more than 90 percent of the total and increases by 165 to 190 MWa per year between 2030 and 2050. Generation from thermal resources decreases significantly after 2035, and annual generation falls between 300 and 400 MWa by 2050.

[17] Our generation projections are not directly comparable to PGE's most recent IRP dispatch modeling due to the vintage of the load forecast provided for this study and the inclusion of direct access loads.

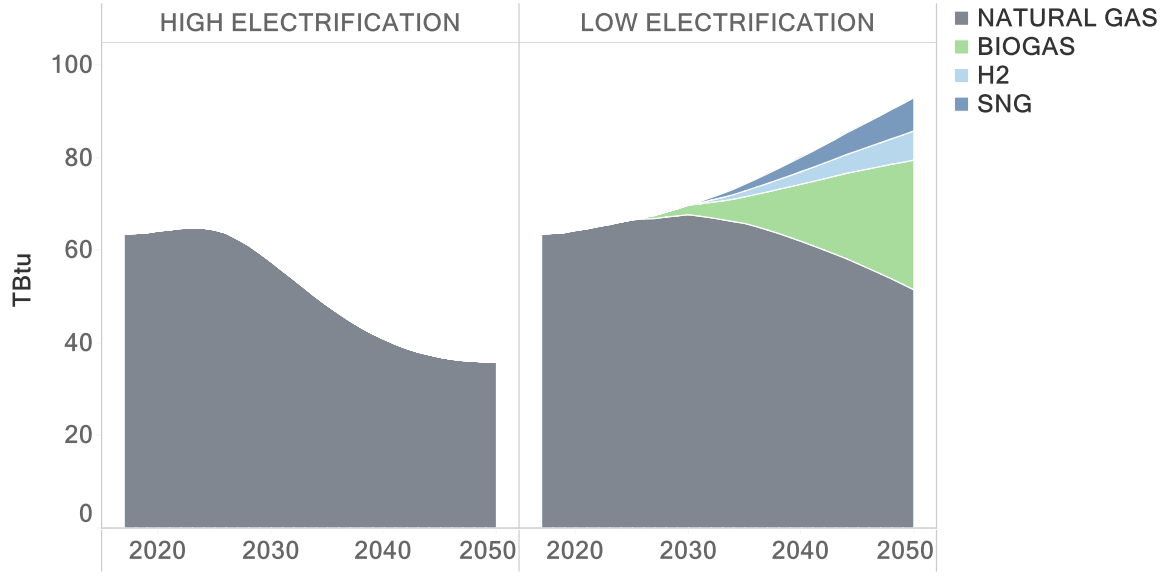
Figure 18 Electricity Supply



2. Pipeline Gas

Figure 19 compares pipeline gas supply for the High Electrification and Low Electrification pathways. In the High Electrification pathway, the pipeline gas supply remains entirely natural gas and total supply decreases by more than 40 percent relative to today due to electrification in buildings. Pipeline gas is decarbonized in the Low Electrification pathway with a combination of biogas and synthetic electric fuels, which reduces the share of natural gas to approximately 55 percent by 2050. Total gas supply increases by approximately 40 percent relative to today largely due to incremental gas demand from freight trucks with only a portion offset by more efficient use of pipeline gas in buildings.

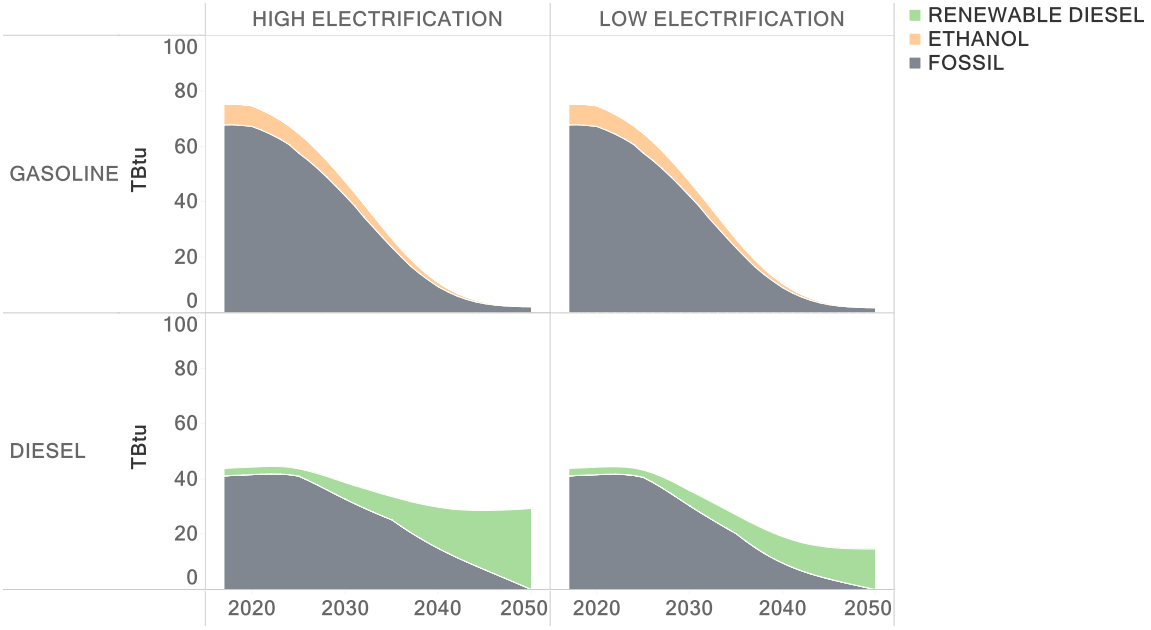
Figure 19 Pipeline Gas Supply



3. Liquid Fuels

Figure 20 summarizes the supply of today's two largest liquid fuels: gasoline and diesel. The supply of gasoline decreases by more than 95 percent by 2050 due to adoption of BEV, PHEV and HFCV vehicles in passenger transportation. Diesel remains a major fuel type in the High Electrification pathway, where half of freight trucks are hybrid diesel trucks. However, diesel supply transitions to 100 percent renewable diesel by 2050. The same supply transition occurs in the Low Electrification pathway, but total demand decreases by two-thirds by 2050 relative to today due to a shift from diesel trucks towards LNG and CNG freight trucks.

Figure 20 Liquid Fuels Supply



D. Energy-related CO_2 Emissions

Figure 21 and Figure 22 summarize energy-related CO_2 emissions by sector and energy type, respectively. The transportation sector's emissions, which is the largest source of emissions today, decrease by more than 90 percent across all pathways. This is the largest reduction by sector and total transportation emissions are less than the combined emissions from residential and commercial buildings by 2050. The transportation sector is primarily decarbonized through the following strategies: (1) electrification of passenger vehicles and freight trucks paired with very low-carbon electricity generation; and (2) decarbonization of liquid and gaseous fuels supplying the remaining fleet of freight trucks with bioenergy. The productive sector contains the largest remaining CO_2 emissions by 2050, and these are primarily from the direction combustion of fossil fuels, as opposed to emissions associated with electricity consumption. Most of the residual emissions in buildings are from combusting pipeline gas, and these are 50 percent higher in the Low Electrification pathway relative to the other pathways.

Figure 21 CO_2 Emissions by Sector

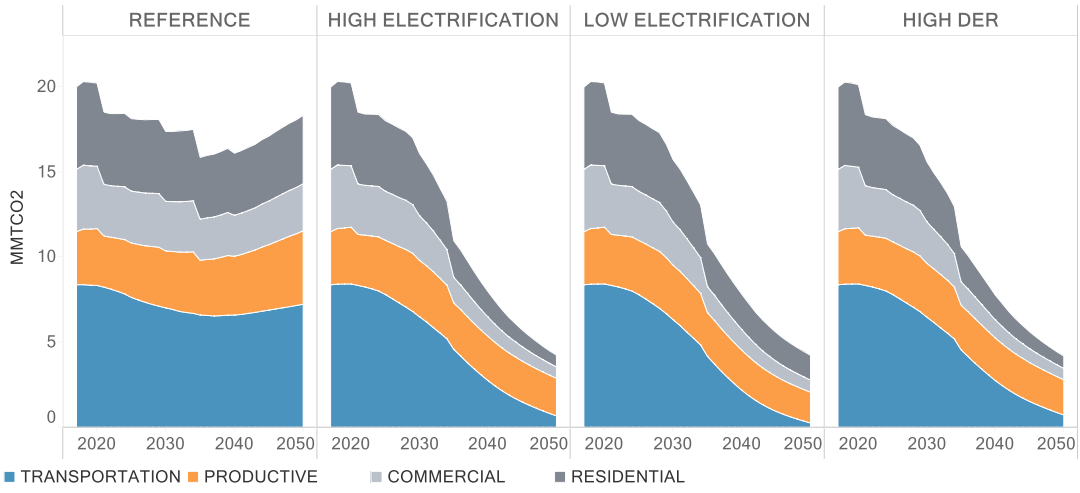


Figure 22 CO_2 Emissions by Energy Type

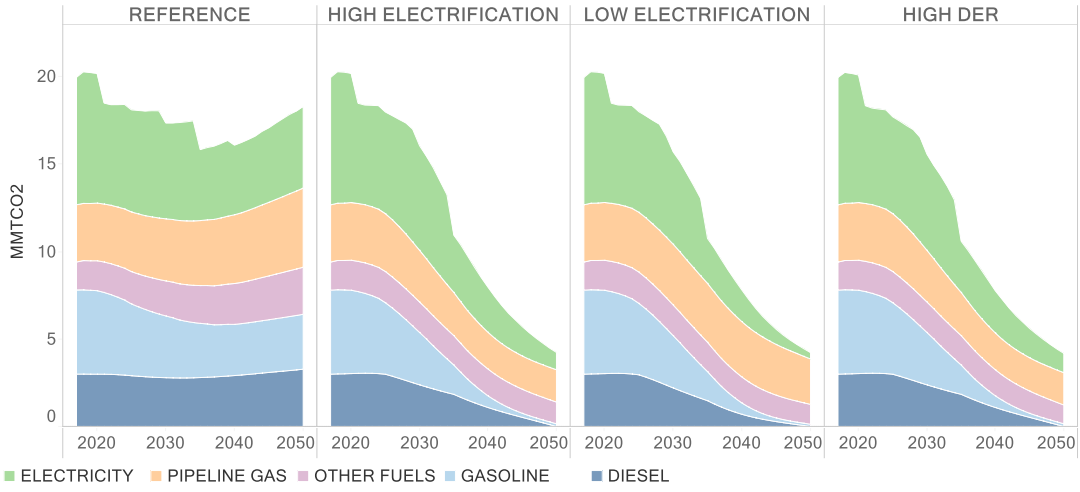
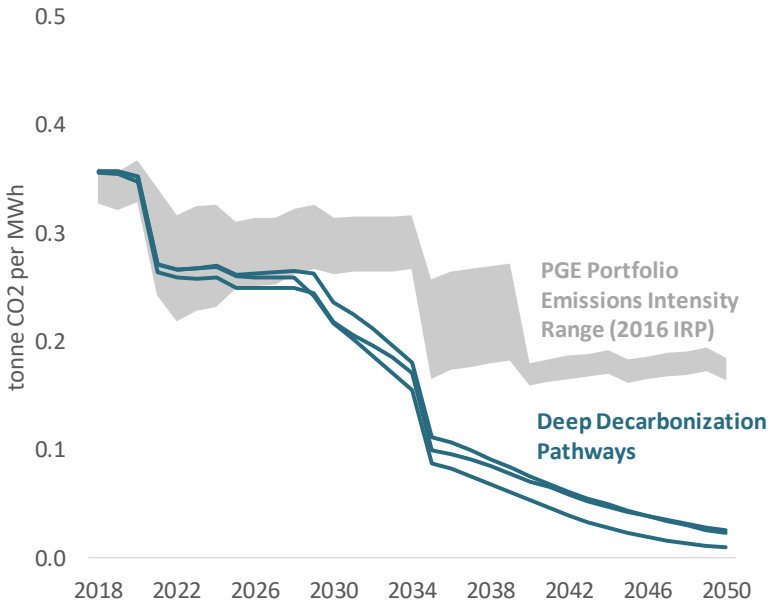


Figure 23 compares the emissions intensity of electricity generation from the three pathways against the range of PGE's portfolio from the 2016 IRP. Both projections decrease over time, with noticeable drops in 2020 and 2035 due to the assumed phase out of coal-fired electricity supply. The emissions intensity in the pathways scenarios begins to aggressively decrease beginning in the mid-2020s, and, relative to the minimum of the range, is at least 33 percent lower in 2035 and more than 85 percent lower by 2050. In 2050, the emissions intensity is below 0.03 tCO_2/MWh for all pathways, while the 2016 IRP ranges from 0.16 to 0.19 tCO_2/MWh.

Figure 23 Emissions Intensity of Electricity Generation



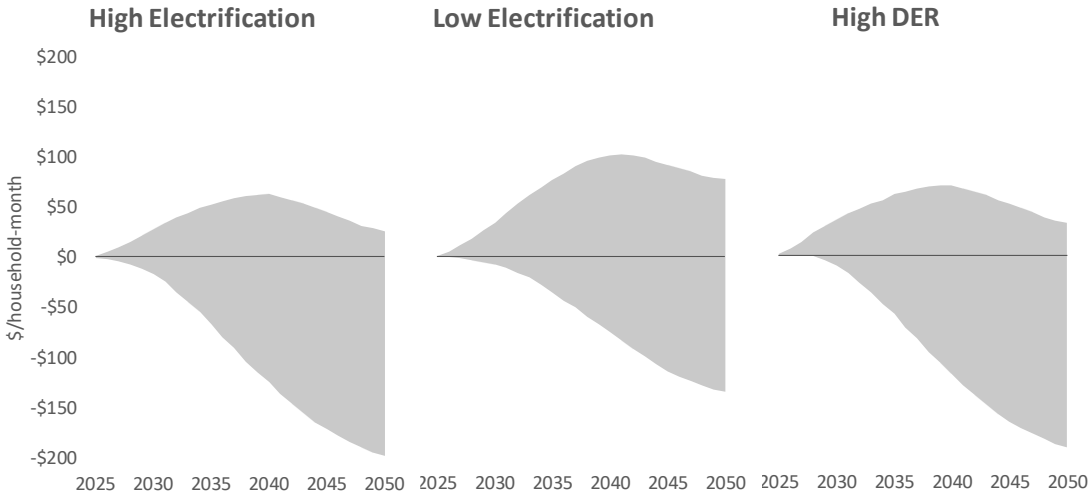
E. Energy System Costs

We measure the cost of transitioninig towards a low-carbon energy economy by comparing the incremental cost of investment in low-carbon and efficient equipment and infrastructure against the savings from avoiding fossil fuel purchases. This is calculated by taking the difference in energy system-related costs between a pathway scenario and the Reference Case. We exclude costs outside of the energy system, as well as benefits from avoiding climate change and air polution.

The annual, incremental cost for households is shown in Figure 24, which includes: (a) the annualized cost of appliances (e.g., high efficiency dishwasher); (b) the annualized cost associated with passenger transportation (e.g., electric vehicle); and (c) energy costs associated with using the equipment (e.g., gasoline for a vehicle and electricity for lighting). Given the challenge of projecting relative costs through a long study horizon (i.e., 2050), we show the results across a range of alternative fossil fuel price and end-use electric technology cost projections.[18] Year-to-year variations are due to: (a) the timing of investment needs; and (b) the assumed projections of technology costs and fuel prices. The range of uncertainties encompass both net cost increases and net cost decreases (savings) by 2050.

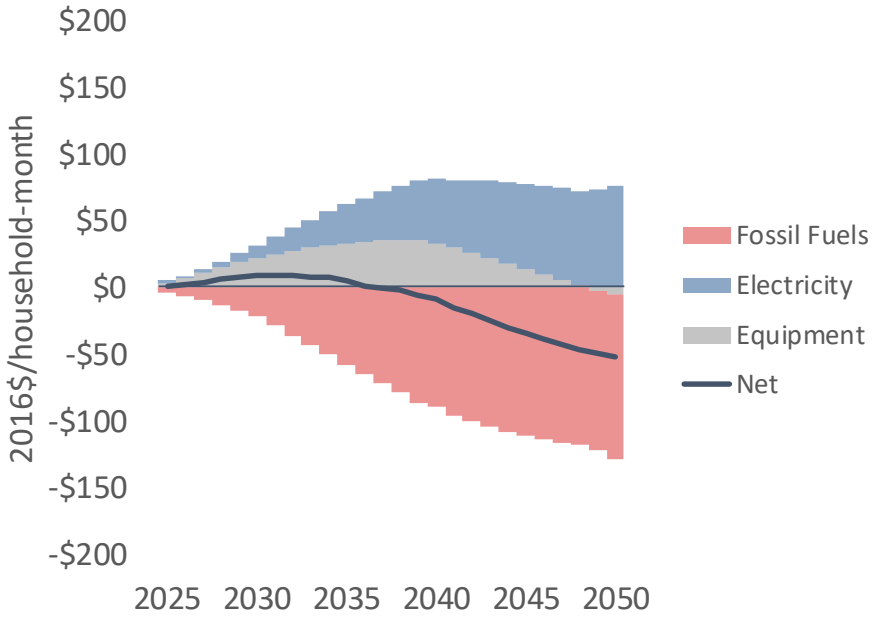
[18] Range of fossil fuel price projections are from the EIA's *Annual Energy Outlook 2017* and end-use electric technology cost projections are from NREL's *Electrification Futures Study*.

Figure 24 Range of Incremental Household Costs



Incremental household costs reflect the underlying changes in the energy system, such as: (a) increased spending on efficient end-use equipment (fixed costs); (b) increased spending on clean electricity infrastructure (fixed costs); and (c) decreased spending on fossil fuel costs (variable costs). Figure 25 illustrates how the structure of incremental household costs evolve over time for the High Electrification pathway under base fossil fuel price and end-use electric technology cost assumptions. Between 2025 and 2050, the average household spends additional money on equipment, such as an electric vehicle, air source heat pump and heat pump hot water heater, as well as additional money to power their equipment with clean electricity, including renewable power plants and transmission/distribution network upgrades. Meanwhile, households spend less money on fossil fuels, such as: (1) gasoline and diesel for their cars and trucks; and (2) natural gas for space and water heating.

Figure 25 Incremental Household Costs by Component: High Electrification Pathway

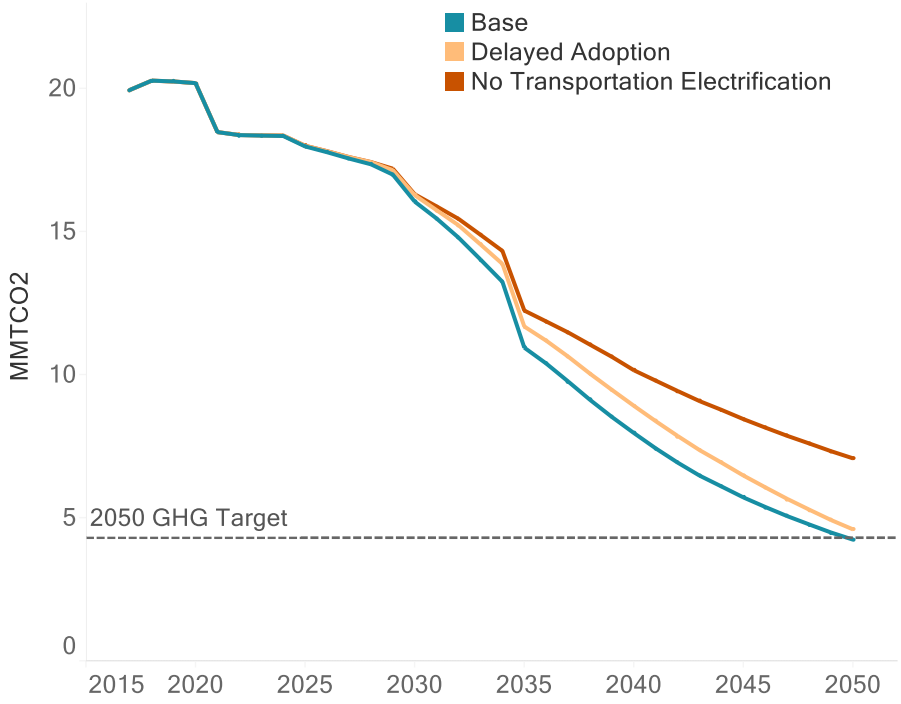


F. Transportation Electrification Sensitivity Analysis

Decarbonizing the transportation sector is essential to realizing economy-wide GHG reduction goals, and the pathways outlined above rely on passenger and freight transportation electrification. This requires aggressive consumer adoption by the mid-2030s for the fleet of vehicles on the road in 2050 to have the necessary low-carbon attributes. In the High Electrification pathway, 100 percent of light-duty vehicle sales are BEV or PHEV by 2035 and 50 percent of medium- and heavy-duty vehicle sales are BEV by 2035. To assess the importance of these aggressive transportation electrification strategies, we tested two sensitivities: (1) delay the assumed year of 100 percent BEV/PHEV adoption for light-duty vehicles from 2035 to 2050 ("Delayed Adoption"); and (2) remove all passenger and freight transportation electrification measures ("No Transportation Electrification").

Figure 26 shows the difference in CO_2 emissions between the High Electrification pathway ("Base") and the two sensitivities. The figure shows that delaying adoption of EVs in passenger transportation increases emissions in 2050 by 8 percent or 0.36 $MMTCO_2$, which results in the pathway no longer complying with the study's 2050 GHG target. This is because more than 10 percent of cars and trucks on the road in 2050 still consume petroleum rather than clean electricity as their fuel. CO_2 emissions increase by two-thirds without any transportation electrification (above 7 $MMTCO_2$) and the sensitivity does not achieve the emissions reductions necessary to meet the 2050 GHG target. We also note that the increase in emissions is partially mitigated through increased renewable diesel consumption by freight trucks (i.e., diesel freight trucks that transition to electric freight trucks in the base case now consume renewable diesel). However, the amount of bioenergy in this sensitivity exceeds the limit described in Section II.D, and, if strictly enforced, then emissions would be higher than shown here.

Figure 26 Energy-related CO_2 Emissions: Transportation Electrification Sensitivities



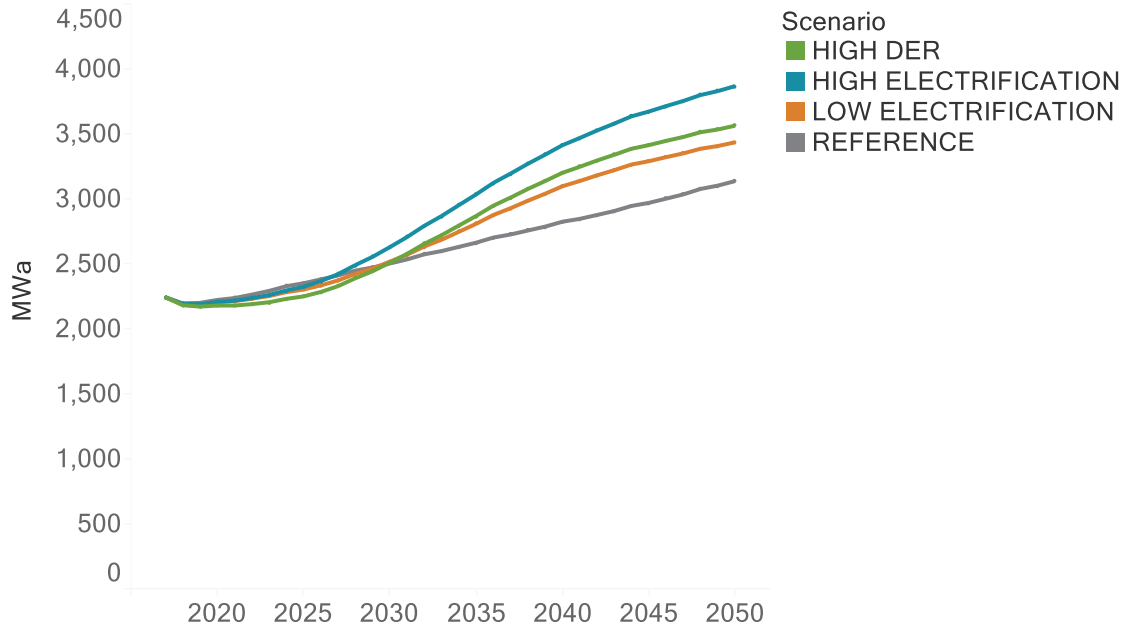
V. Results: Electricity System

This section summarizes results for the electricity system, including load, resources and hourly system operations. We also report the sensitivity of the results to variations in flexible end-use load, flexible electric fuel production, battery energy storage and pumped hydro storage assumptions.

A. Load

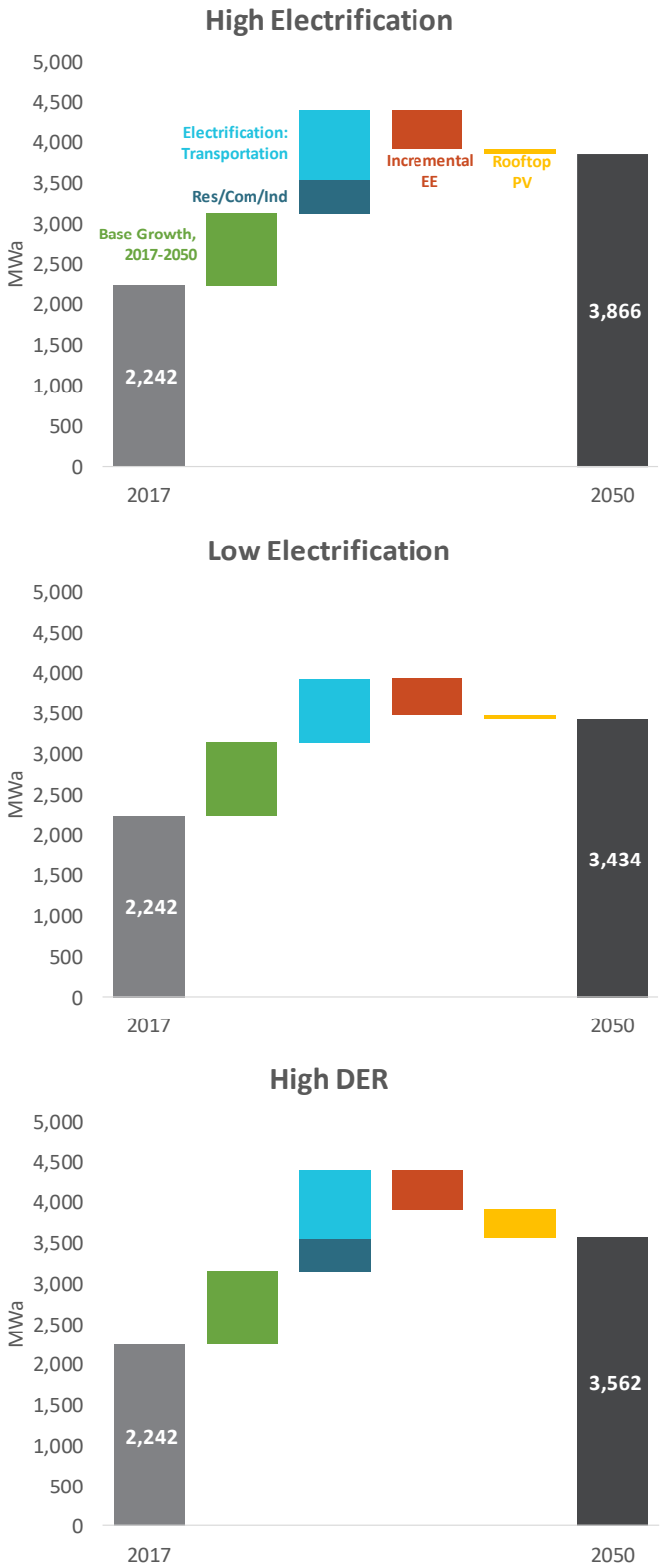
Figure 27 shows the trajectory of retail electricity sales for each scenario through 2050. In the long-run, retail sales in all pathways are higher than the Reference Case, and, as expected, the High Electrification pathway is the highest. Deployment of rooftop solar PV resources in the High DER pathway partially offsets end-use electrification measures, resulting in retail sales that are slightly above the Low Electrification pathway in 2050. Relative to today, retail sales increase by 50 to 70 percent by 2050.

Figure 27 Retail Electricity Sales



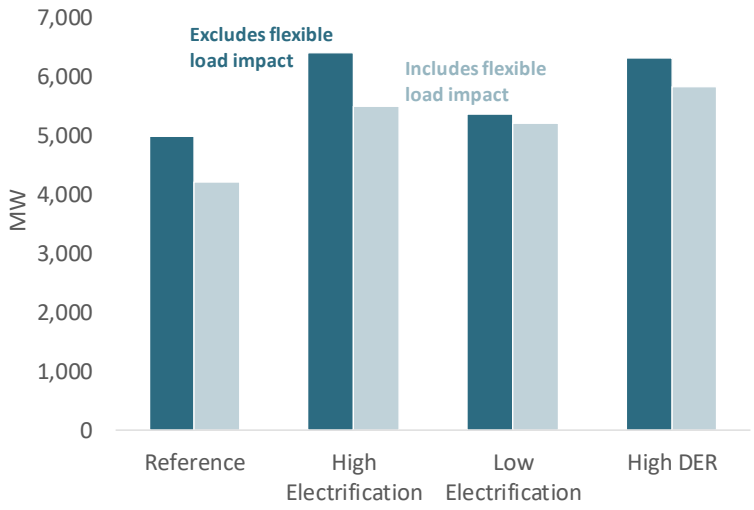
The components of the change in retail sales between 2017 and 2050 are shown in Figure 28, which separates: (a) baseline growth (i.e., growth that is embedded in the Reference Case); (b) electrification of buildings and industry; (c) transportation electrification; (d) incremental energy efficiency (EE measures beyond what's embedded in the Reference Case); and (e) rooftop solar PV generation. This figure highlights two key insights. First, transportation electrification is responsible for 50 to 65 percent of the net increase, as liquid fuels are replaced by electricity. Second, generation from rooftop solar PV has a smaller than expected *net* impact on retail sales. This is most apparent in the High DER scenario, where rooftop solar PV exceeds 2,500 MW (larger than today's average load). In this pathway, incremental electricity demand from end-use electrification still outweighs the directionally opposite impact from rooftop solar. This is a result of the lower-quality solar resource (i.e., low capacity factor) in PGE's service territory, and we would not expect similar conclusions to be drawn in geographies such as California or Arizona.

Figure 28 Evolution of Retail Electricity Sales, 2017-2050



We estimate the system peak load as the highest hourly load value from our simulations. As discussed in Section II.B, our hourly load (and resource) shapes reflect 2011 weather conditions, which means that the results we report here will not exactly match a 1-in-2 (weather-normalized) peak demand. Figure 29 plots the system peak load in 2050 in two ways. The first metric (in dark blue) represents "fixed demand" and excludes any impacts from load shifting, storage charge/discharge and flexible electric fuel production. The chart illustrates how widespread end-use electrification in the High Electrification and Higher DER pathways results in a system peak load of approximately 6,400 MW, which is about 1,400 MW higher than the Reference Case. Despite the proliferation of rooftop solar PV in the High DER pathway, the system peak load is nearly equivalent to the High Electrification pathway since it occurs during a winter morning before meaningful insolation. The second system peak load metric (in light blue) accounts for impacts from flexible end-use loads during the same hour, which moderates the impacts of electrification on peak loads.

Figure 29 2050 System Peak Load



B. Resources

1. Installed Capacity

Figure 30 shows the projection of installed capacity for thermal, generic capacity and renewable resources. Decarbonization of electricity generation and electrification requires renewable resource additions that far exceeds additions included in the Reference Case. The installed capacity of wind, solar, geothermal and hydro resources in the pathways is more than 2x the Reference Case quantity by 2050 and includes: (a) 5,100 to 5,900 MW of onshore wind in the Pacific Northwest; (b) 1,700 to 1,900 MW of onshore wind in Montana; and (c) 3,600 to 5,200 MW of utility-scale solar PV in central Oregon.[19] Rooftop solar PV in the High DER scenario reduces the amount of transmission-connected renewable generation, but its generation portfolio still requires utility-scale additions to reduce the carbon

[19] For context, NREL estimates technical potential of onshore wind resources in Oregon and Washington of approximately 45,480 MW and Black & Veatch estimates approximately 56,150 MW of utility-scale solar PV in Oregon alone. See Lopez et al. (2012) and Black & Veatch (2015).

intensity of electricity generation to levels consistent with the study's carbon budget. The Low Electrification pathway contains the highest installed capacity due to the amount of electricity required to serve synthetic electric fuel production loads.

Figure 30 Installed Generating Capacity

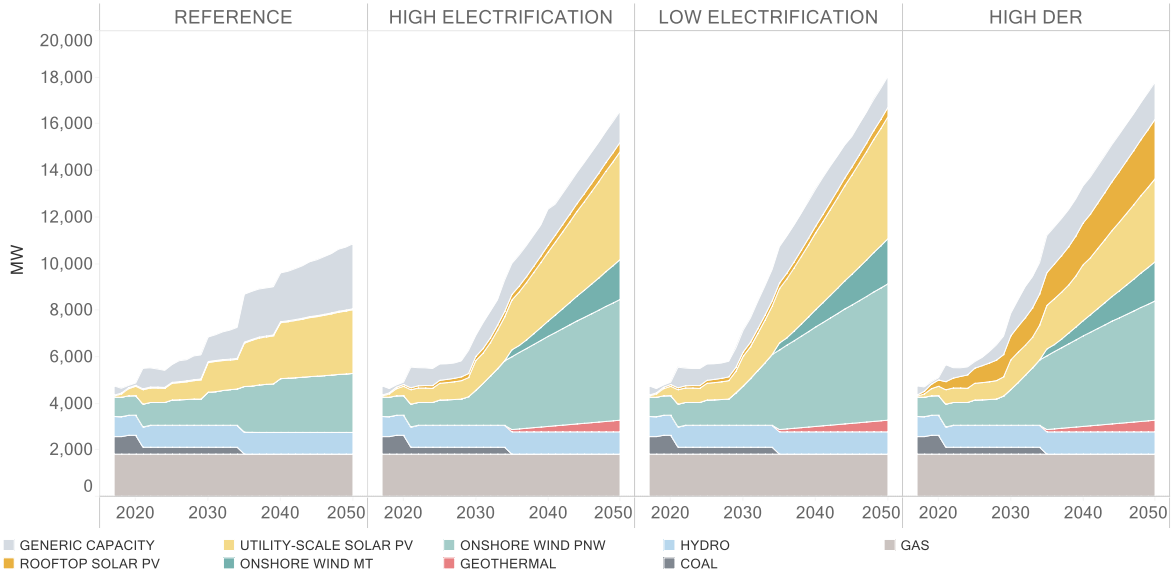
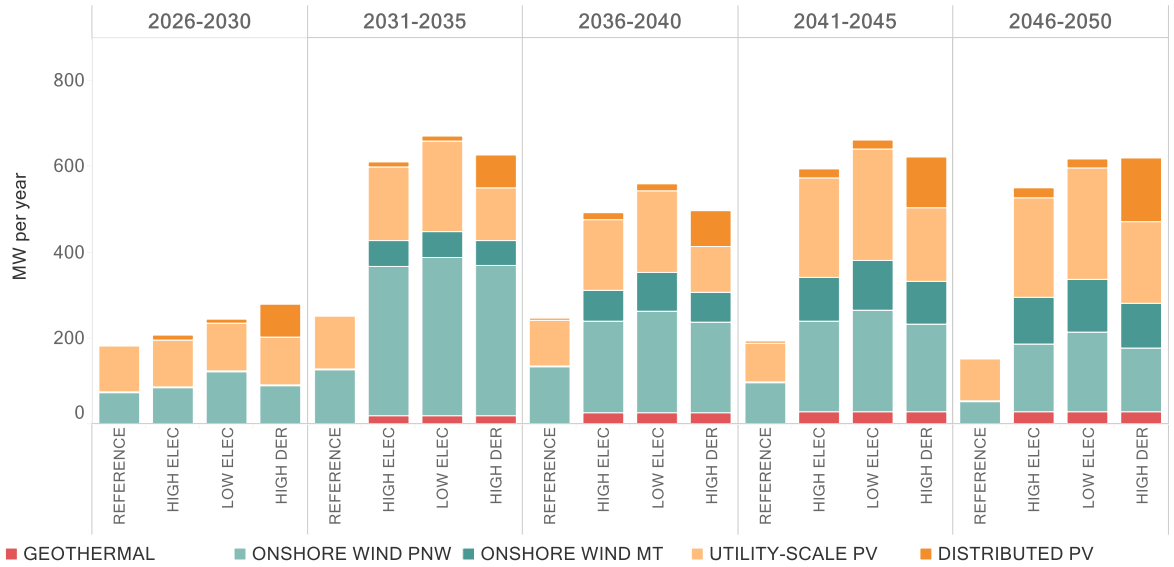


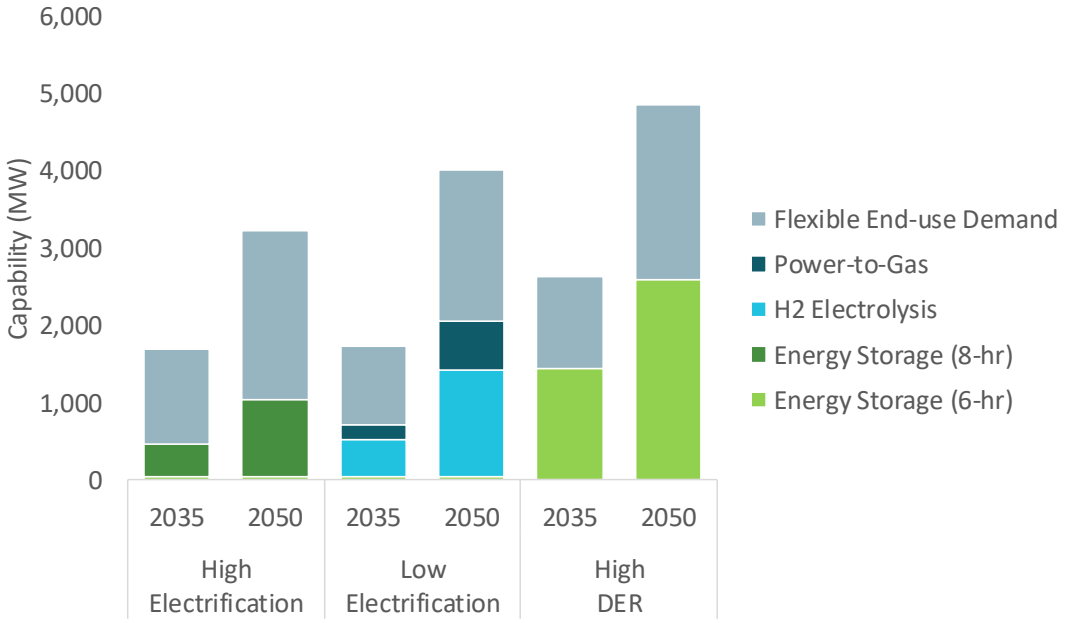
Figure 31 shows the annual average capacity additions of renewable resources, which are approximately 600 MW per year between 2030 and 2050 for the pathways scenarios. Annual renewable additions for the pathways scenarios are more than 2.0x Reference Case levels during the 2030s and more than 3.0x during the 2040s. For context, the amount of new onshore wind capacity beginning in 2030 is the equivalent to one to two Tucannon River (267 MW) wind power plants installed each year.

Figure 31 Average Annual Renewable Installations



The high penetrations of must-run renewable resources added across the pathways necessitate resources to balance electricity supply and demand. In addition to traditional sources of flexibility, such as hydro and thermal, the pathways incorporate a variety of new balancing resources to mitigate curtailment of renewable generation. Figure 32 shows the type and quantity of balancing resources incorporated in each pathway, including: (a) energy storage, which is differentiated between 6- and 8-hr duration; (b) hydrogen electrolysis facilities; (c) power-to-gas facilities; and (d) flexible end-use demand, which is estimated as the maximum hourly load shift in each year. The High Electrification and High DER pathways rely on a combination of flexible end-use demand and energy storage, while the Low Electrification pathway incorporates more than 2,000 MW of hydrogen electrolysis and P2G facilities by 2050 to consume excess renewable electricity generation and produce decarbonized pipeline gas. The High Electrification pathways contains the lowest quantity of physical / central-station balancing resources (i.e., 1000 MW of 8-hr energy storage) and relies on end-use loads to shift energy. The ability of these balancing fleets to minimize curtailment is further discussed in Section C.4 below.

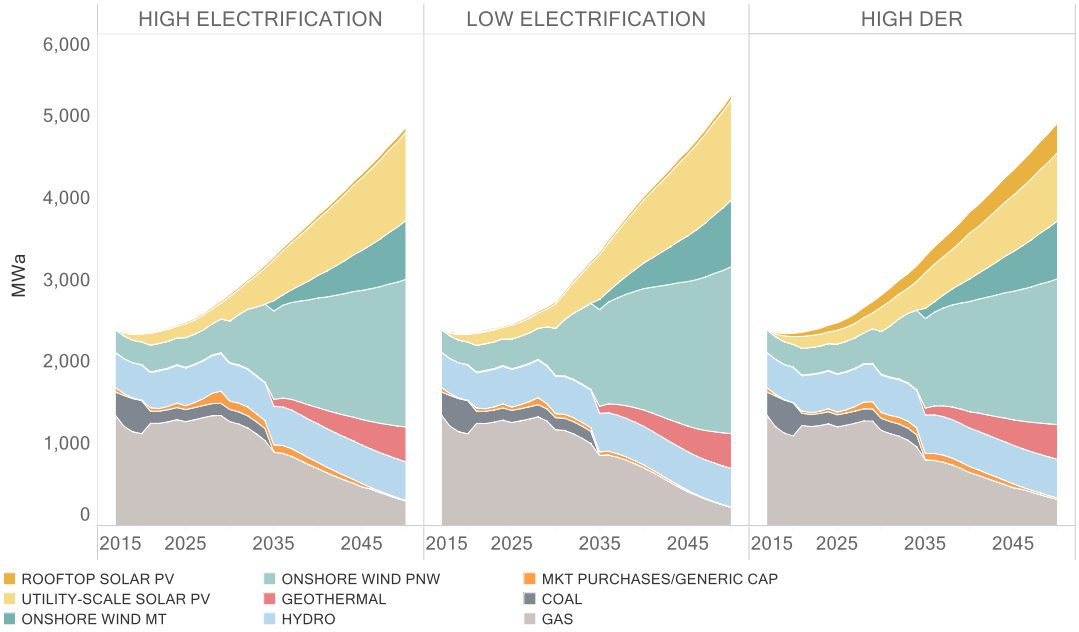
Figure 32 Balancing Resources



2. Generation

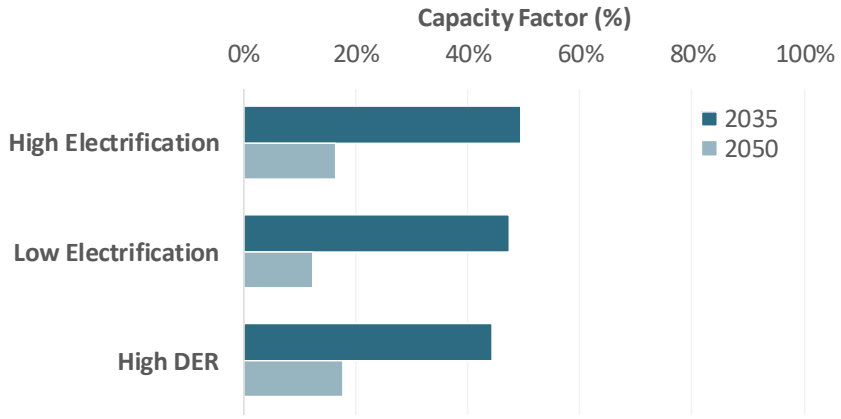
The overall generation mix by resource type for each pathway is shown in Figure 33. Annual generation more than doubles from approximately 2,400 MWa today to between 4,900 and 5,300 MWa by 2050. Carbon-free generation is more than 90 percent of the total by 2050, including an approximate mix of: (a) 50 percent onshore wind in the Pacific Northwest and Montana; (b) 25 percent solar PV, including both utility-scale in central Oregon and rooftop PV resources located within PGE's service territory; (c) 9 percent hydro; and (d) 8 percent geothermal. Due to the increased penetrations of renewable resources, thermal generation decreases significantly over time and is between 4 to 7 percent of total generation by 2050.

Figure 33 Generation by Resource Type



The capacity factor of PGE's existing gas-fired resource fleet is shown in Figure 34. The figure highlights how the growth in intermittent renewable generation between 2035 and 2050 decreases the utilization of these dispatchable resources from approximately 50 percent in 2035 to below 20 percent in 2050, a decrease of approximately 30 percentage points. The highly renewable power systems modeled in this study still require dispatchable resources to maintain reliability, and the gas-fired resource fleet, along with a variety of other balancing resources, have the characteristics to avoid unserved energy. The results here do indicate a shift in the role of these resources, particularly for combined cycle plants, from an energy to a capacity resource.

Figure 34 Gas-fired Resource Fleet Capacity Factor



C. System Operations

1. Load and Net Load

We compare the distribution of hourly load and net load in 2050 for each scenario as histograms in Figure 35, and report summary statistics in Table 11. These two metrics are estimated as follows: (a) load includes inflexible, transmission-level load less behind-the-meter generation (e.g., rooftop solar PV); and (b) net load is load minus non-dispatchable generation, including onshore wind, utility-scale solar PV, geothermal and run-of-river hydro resources. Both exclude the impact of flexible loads and resources.

The load distributions show the expected impacts of electrification, with the High Electrification and High DER distributions shifting towards the right. The net load distributions provide a more meaningful benchmark in terms of assessing the amount of dispatchable capacity needed to reliably meet demand and the flexibility required to avoid curtailment. The net load distribution for the Reference Case, which includes a 50% RPS in 2050, shows net load below zero for 5 percent of hours in the year. The pathways scenarios, which include at least twice as many non-dispatchable renewables, have net load distributions that are much flatter than the Reference Case and frequently below zero.

The High Electrification net load distribution is below zero in approximately 50 percent of hours per year, and the minimum net load experienced is approximately -8,000 MW. During these hours, flexible resources are needed to consume additional load (e.g., energy storage charge) to avoid curtailment. The maximum net load is approximately 5,000 MW, which is about 4 percent higher than the Reference Case's maximum net load. The High DER pathway shows similar net load distribution results due to comparable levels of electrification and renewables.

Relative to the other pathways, the Low Electrification pathway's net load is distributed further left (i.e., more hours with negative net load). Net load is below zero for 64 percent of hours in the year and nearly reaches -10,000 MW in a single hour. This shape is due to different load and resource characteristics, including: (a) lower levels of end-use electrification; and (b) higher levels of inflexible renewable generation. Flexible hydrogen electrolysis and power-to-gas facilities consume load during these negative net load hours to produce low-carbon electric fuels and avoid curtailment.

Figure 35 Distribution of Hourly Load and Net Load in 2050

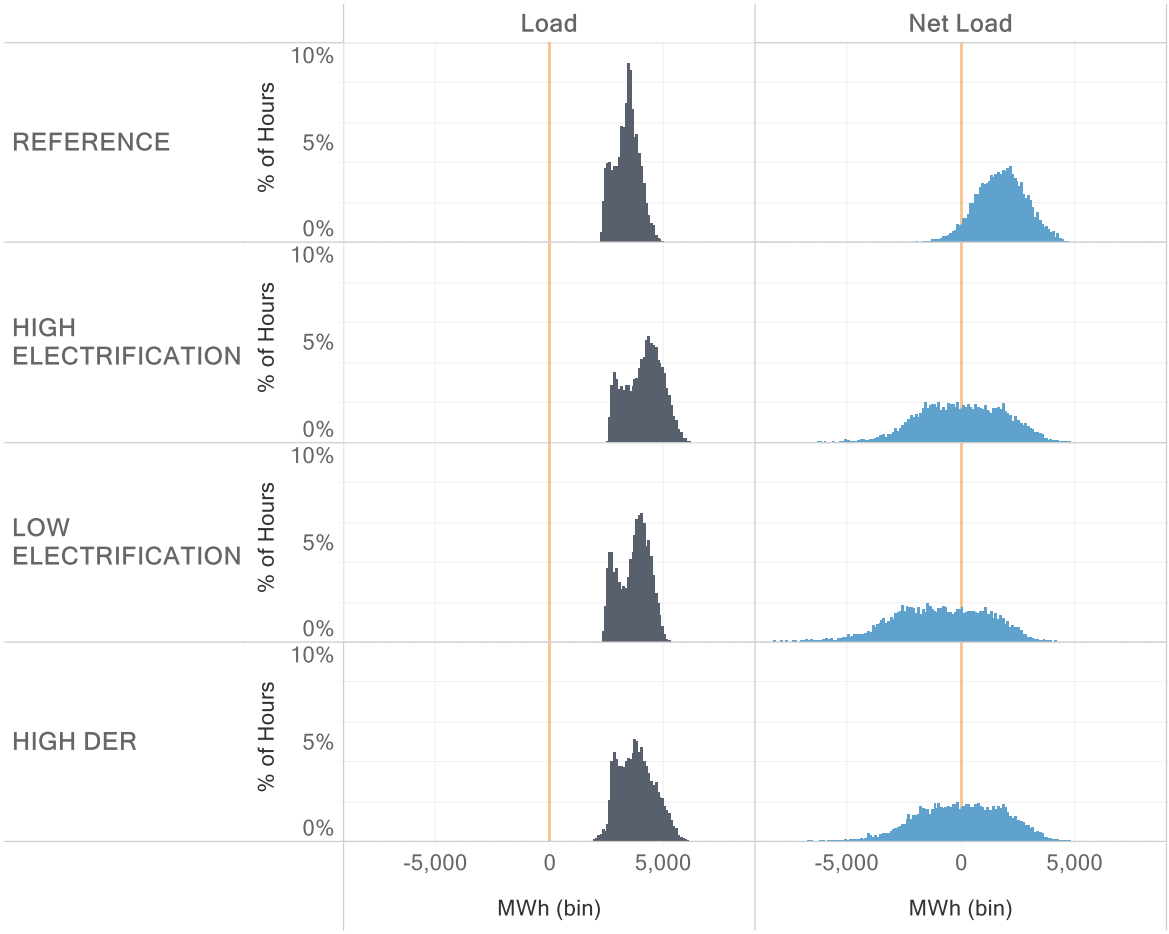


Table 11 Statistics for Hourly Load and Net Load in 2050

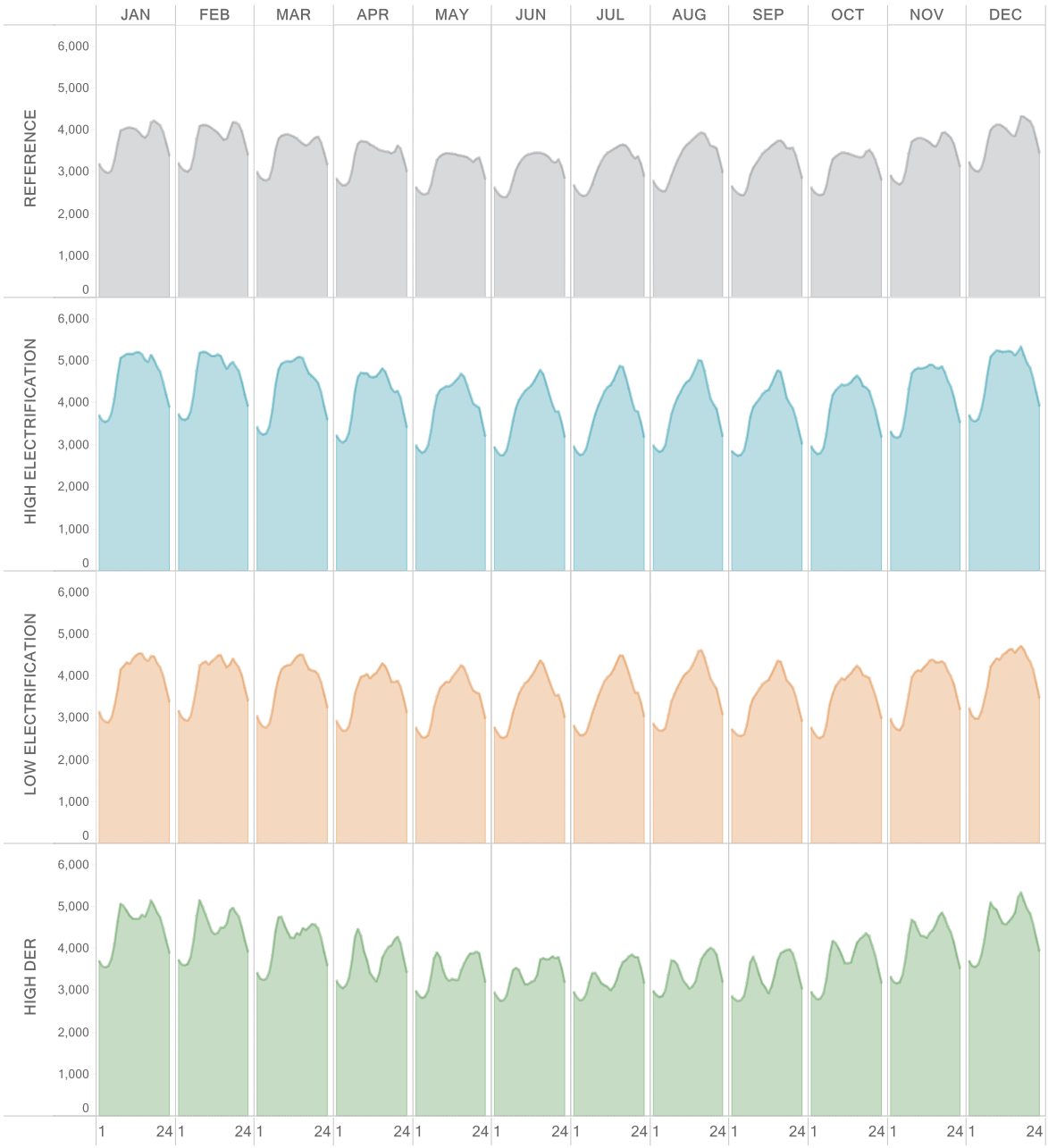
Scenario	Load		Net Load			
	Max	Min	Max	Min	Frequency below 0 MW	
	MW	MW	MW	MW	hrs	% of hrs
Reference	4,972	2,191	4,758	-2,392	457	5%
High Electrification	6,391	2,555	4,957	-7,942	4,346	50%
Low Electrification	5,351	2,273	4,261	-9,996	5,600	64%
High DER	6,310	1,920	4,961	-8,574	4,337	50%

2. Hourly System Load Shape

The average load by month and hour in 2050 for each scenario is summarized in Figure 36. The figure shows the system load shape prior to accounting for flexible loads and illustrates how the nature of electricity demand is affected by rooftop solar PV and varying levels of electrification.[20] The High Electrification pathway shows higher winter loads relative to the Reference Case primarily due to the electrification of space heating, but large new loads are also present in non-winter months largely due to transportation electrification. These non-heating related load increases are also present in the Low Electrification pathway and are most apparent in the early evening hours when most EV charging is assumed to take place. Although the High DER pathway contains the same electrification measures as the High Electrification pathway, the proliferation of rooftop solar PV changes both the daily and seasonal characteristics of electricity demand, including: (a) steep upward and downward ramps during the daylight hours across all months; and (b) large differences in daily energy requirements between winter and spring/summer months.

[20] The load shapes for the pathways also reflect high levels of electric energy efficiency.

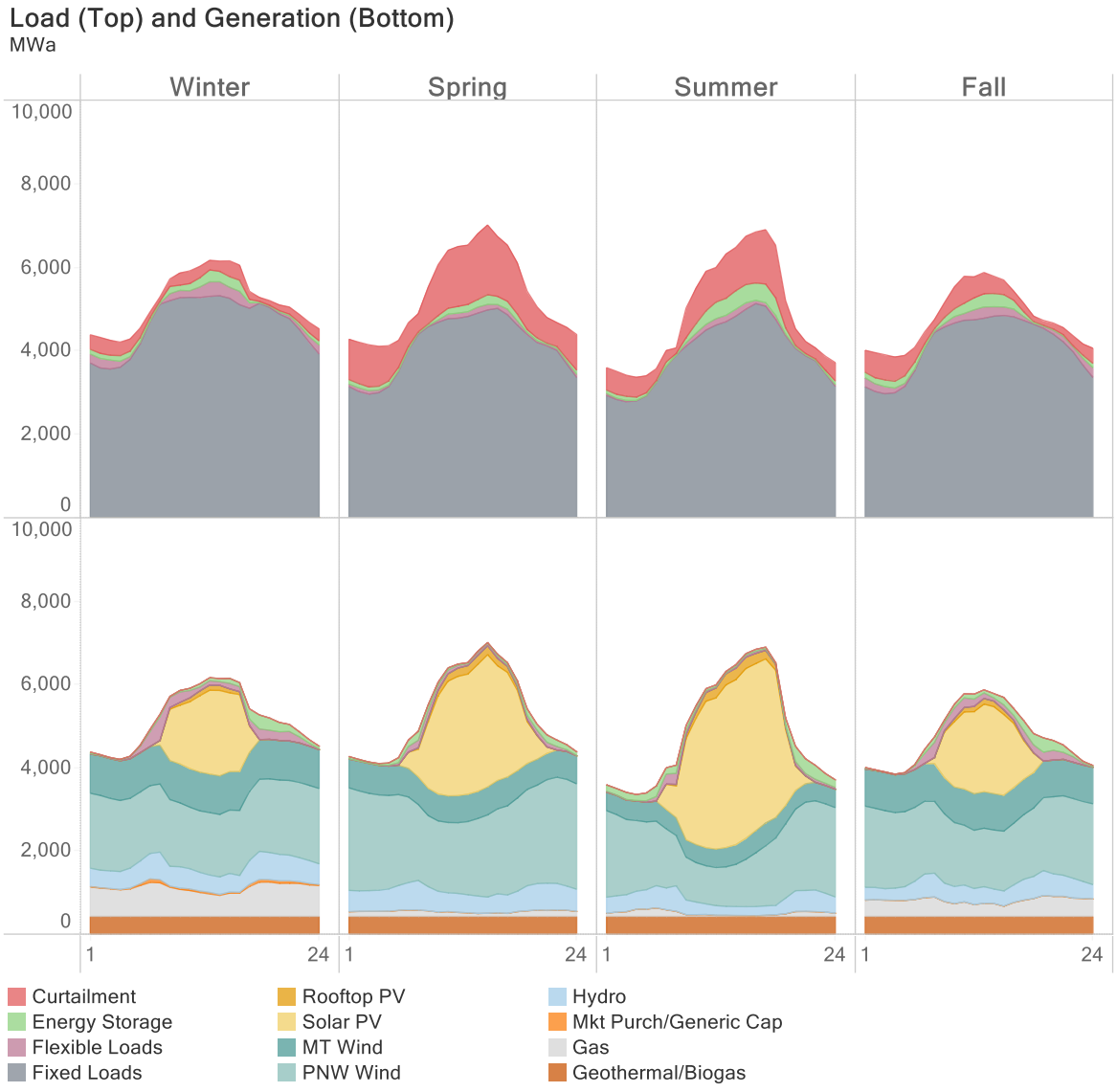
Figure 36 System Load Shape: Month-Hour Average in 2050



3. Month-Hour Electricity Dispatch

Figure 37 through Figure 39 show hourly average dispatch profiles by season for each pathway, where the top panel contains all sources of load and the bottom panel contains all sources of generation.[21] The figures illustrate how electricity supply and demand technologies combine across hours and seasons, and the operating profiles of flexible balancing resources.

Figure 37 Electricity Dispatch: High Electrification Pathway, 2050



[21] Seasons defined as: (a) winter includes December through February; (b) spring includes March through June; (c) summer includes July through September; and (d) fall includes October through November.

Figure 38 Electricity Dispatch: Low Electrification Pathway, 2050

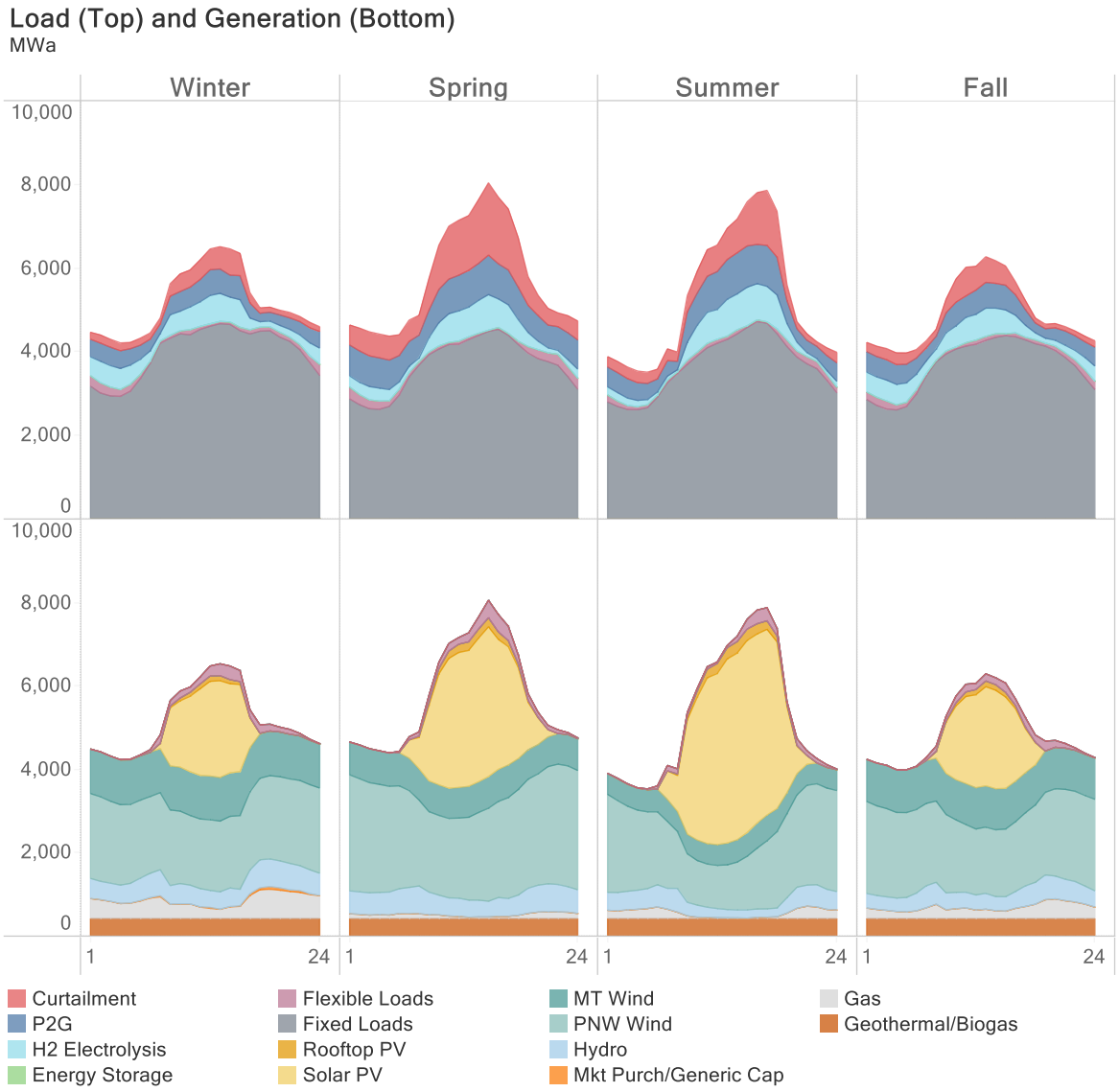
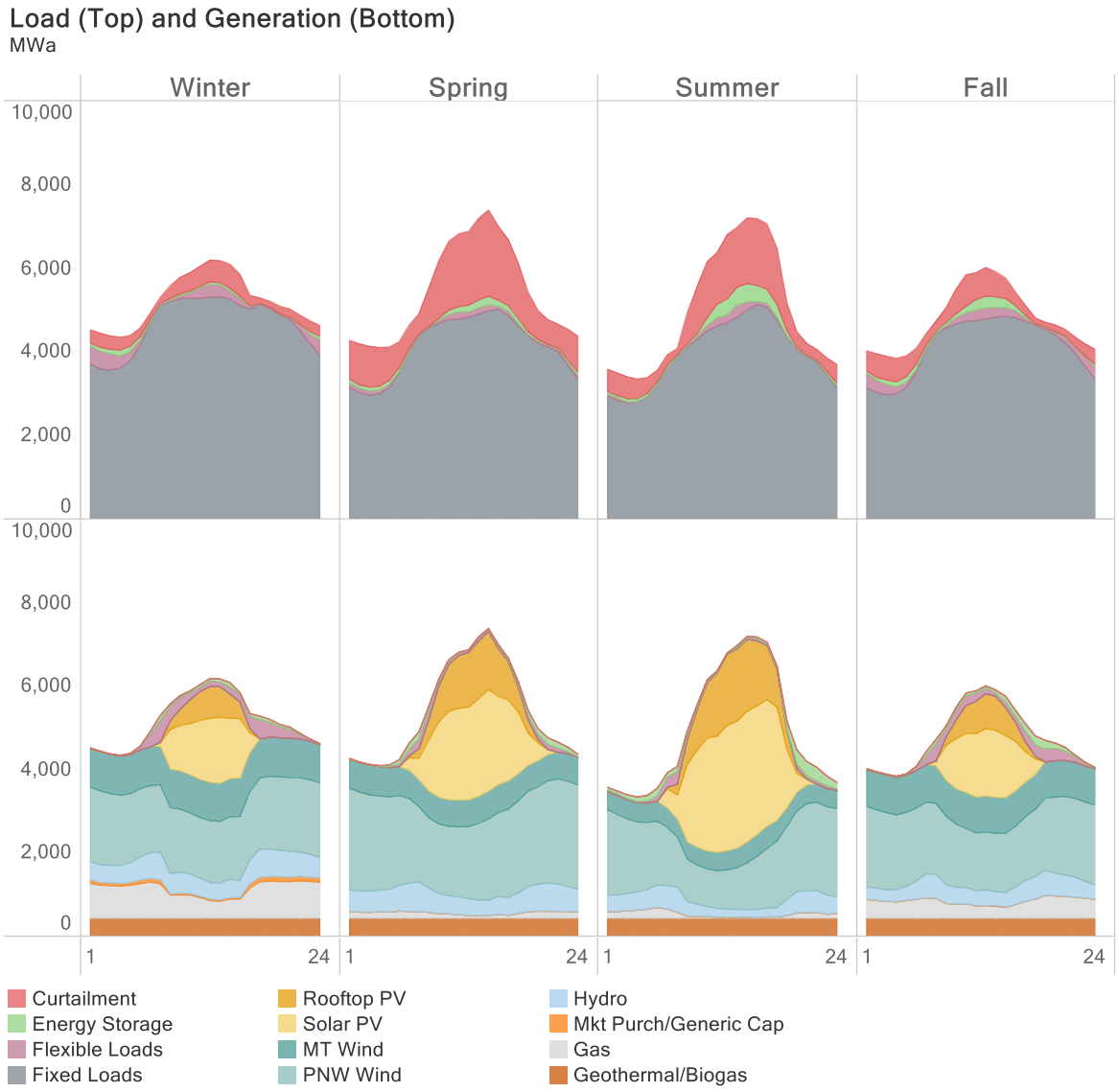


Figure 39 Electricity Dispatch: High Distributed Energy Resources Pathway, 2050



4. Curtailment

Curtailment of renewable generation occurs during periods where: (1) must-run generation exceeds load, resulting in an initial negative net load signal; and (2) balancing resources are unable to shift surplus energy to hours with energy deficits (i.e., positive net load signal). Figure 40 plots annual curtailment for each scenario and shows that curtailment does not become prevalent until the 2035 timeframe. As the share of inflexible, renewable generation increases above 85 percent by 2050, curtailment increases exponentially even after the impacts of balancing resource are accounted for.

Figure 40 Annual Curtailment

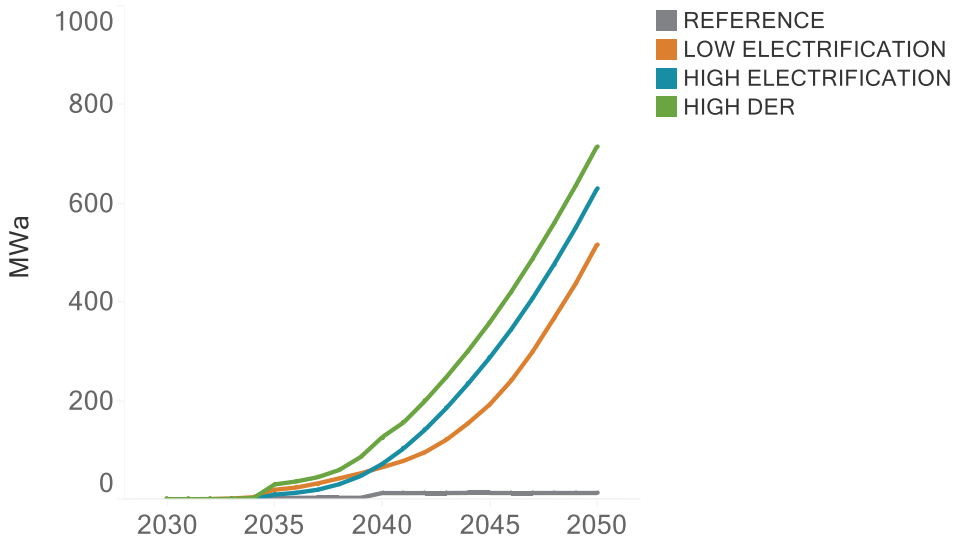


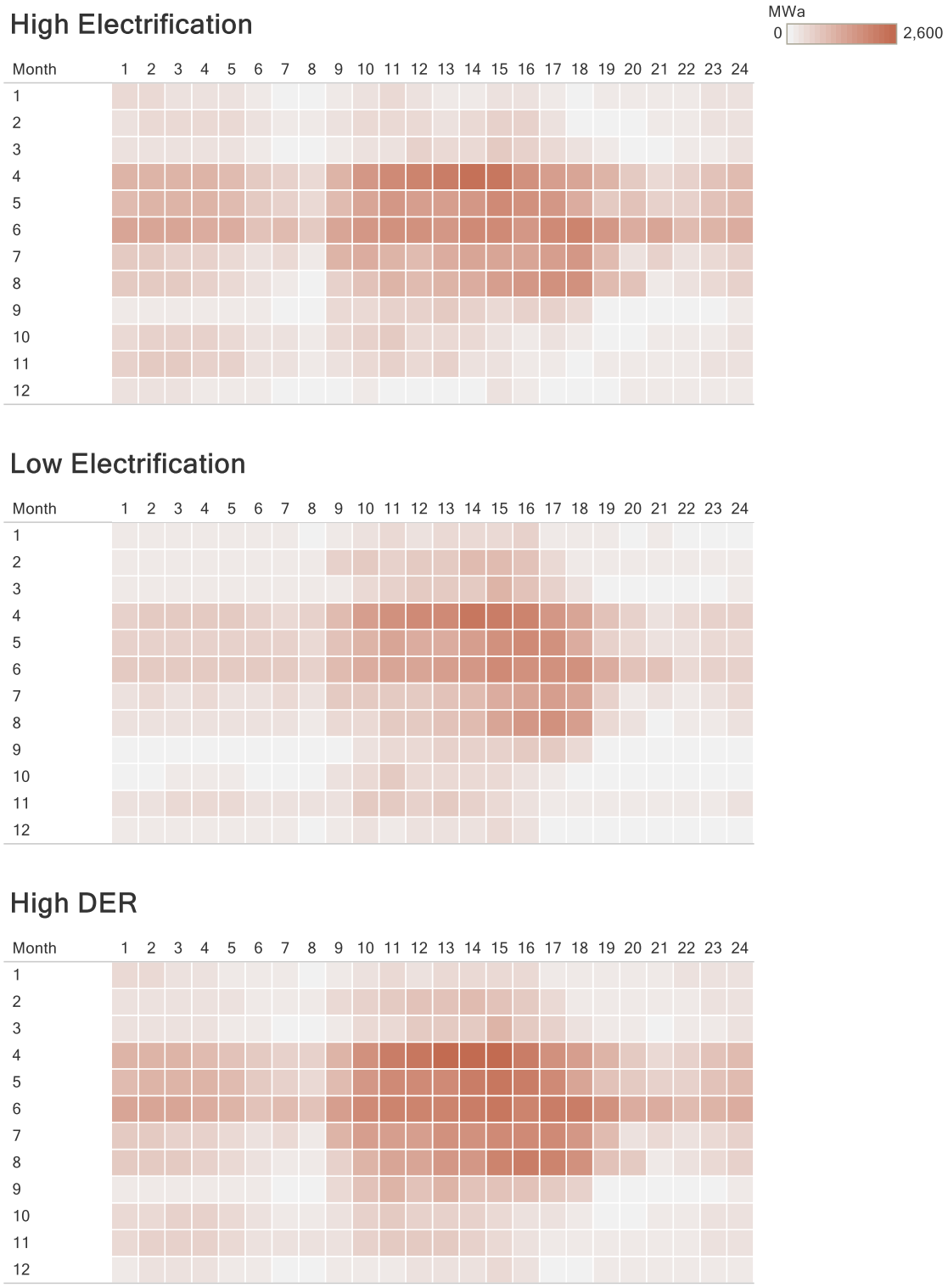
Table 12 summarizes several curtailment metrics for 2035 and 2050, including: (a) the amount of energy curtailed in average megawatts; (b) curtailment normalized as a percentage of available renewable energy; (c) maximum hourly observation; and (d) frequency, expressed in percentage of hours in a year. Curtailed generation is less than 2 percent of available renewable energy in 2035 across all pathways and increases to between 11 and 17 percent by 2050. Curtailment is experienced between 40 and 55 percent of hours in 2050, which is a decrease from the number of hours with negative net load (see Table 11) and reaches a maximum depth between 7,600 and 8,700 MW in a single hour. We explore the impact of alternative demand- and supply-side balancing resource assumptions on curtailment in the following section.

Table 12 Curtailment Metrics for 2035 and 2050

Scenario	Energy		Percent of Available RE		Hourly Maximum		Frequency	
	2035 MWa	2050 MWa	2035 %	2050 %	2035 MW	2050 MW	2035 % hours	2050 % hours
Reference	2	13	0.2%	0.8%	966	2,048	1%	3%
High Electrification	9	630	0.5%	15.0%	2,146	8,032	2%	39%
Low Electrification	19	517	0.9%	11.1%	2,378	7,597	4%	53%
High DER	30	716	1.5%	16.9%	3,121	8,663	5%	46%

The average amount of curtailment for each month and hour in 2050 is depicted as a heat map in Figure 41, with a darker red highlighting more extreme curtailment. The heat maps show that curtailment is concentrated during spring months when loads are low and renewable generation is high. Curtailment experienced during April through June makes up approximately half of annual curtailment, while only 11 to 13 percent occurs between December through February. Although most curtailment is concentrated during day-light hours, it is still experienced during the night-time and is up to 30 percent of the total in the High Electrification pathway.

Figure 41 Curtailment Heat Map for 2050



D. Sensitivity Analyses

In this section, we evaluate the sensitivity of our modeling results to alternative assumptions about the availability of demand- and supply-side resource flexibility. These sensitivities explore the impacts of alternative assumptions from the High Electrification pathway, including: (a) varying the availability of flexible end-use load; (b) including flexible electric fuel production (i.e., electrolysis); and (c) varying the quantity and type of energy storage. These sensitivities are summarized below.

Flexible End-use Load. In the High Electrification pathway, we assume a percentage of electric load is flexible in key end-uses: (a) 75 percent of light-duty vehicle electric load is flexible by 2050; (b) 75 percent of residential and commercial water heating electric load is flexible by 2050; and (c) 50 percent of electric load is flexible for residential space conditioning, residential clothes washing and drying and commercial space heating. We tested three cases designed to assess the importance of end-use flexibility: (a) no flexible end-use load; (b) only flexibility from electric vehicles; and (c) only flexibility from water heaters.

Flexible Electric Fuel Production. The results presented in the prior section highlight the seasonal imbalance between electricity supply and demand in a highly renewable power system. The base assumption in the High Electrification pathway is that energy storage and flexible end-use loads are the principal balancing resources. To assess the impact of long-term or seasonal storage, we conducted a sensitivity analysis where hydrogen produced from electrolysis facilities provides 3.5 percent of pipeline gas supply, which translates into more than 300 MW of electrolysis facilities.

Variation in Energy Storage. Varying the quantity of energy storage affects the ability of a power system to successful integrate inflexible renewable electricity generation. In the High Electrification pathway, the base assumption is that 1,000 MW of 8-hour energy storage is in-service by 2050. In this sensitivity, we assess the implications of: (a) increasing the quantity of 8-hour energy storage from 1,000 MW to 1,500 MW; and (b) assuming 500 MW of 24-hour pumped hydro storage (PHS) by 2050.

Table 13 summaries the results of our sensitivity analyses for 2050, which are shown as differences relative to the High Electrification pathway. We report changes in: (a) curtailment, in terms of average megawatts and percent difference; and (b) energy system CO_2 emissions, in million metric tonnes and percent difference. Removing flexibility from end-use loads increases curtailment by nearly 10 percent and emissions increase by 5 percent due to higher thermal generation, which results in the sensitivity exceeding the study's 2050 carbon budget. Including flexibility from electric vehicles and hot water heaters dampens the effect of losing other end-use flexibility, with curtailment and emissions rising modestly. The sheer volume of electric load from electric vehicles (more than 15 percent of total load in 2050) relative to water heaters allows for better curtailment and emissions outcomes. Electrolysis facilities and pumped hydro, both long-duration storage, show similar outcomes with curtailment decreasing by more than 10 percent. In contrast, increasing the quantity of 8-hour storage produces less than half the reductions in curtailment. The results of these sensitivity analyses highlight the importance of flexible end-use loads for integrating renewable generation, as well as the effectiveness of long-duration energy storage to reduce curtailment and address seasonal energy imbalances that occur in highly renewable electricity systems.

Table 13 Flexibility Sensitivity Analysis Results (Relative to Base Assumptions)

Sensitivity	Curtailment (MWa)	Curtailment (%)	Emissions ($MMTCO_2$)	Emissions (%)
Flexible End-Use Load				
None	+54	+9%	+0.21	+5%
Flexible EV Load Only	+14	+2%	+0.05	+1%
Flexible WH Load Only	+36	+6%	+0.14	+3%
Flexible Electric Fuel Production				
Add Electrolysis Facilities	-78	-12%	-0.08	-2%
Energy Storage				
Increase 8-hr energy storage	-31	-5%	-0.07	-2%
Add 24-hr PHS	-68	-11%	-0.15	-4%

Notes: values for 2050 and relative to High Electrification pathway base assumptions.

VI. Summary

We find that deep decarbonization of the PGE service territory's energy economy is possible and can be achieved using a variety of energy technologies and mitigation strategies. Our analysis of multiple pathways shows that they depend on a set of three pillars that are consistent with many studies examining deep decarbonization in the U.S. and abroad, including: (1) energy efficiency; (2) decarbonizing electricity generation; and (3) increasing the share of electricity and electric fuels. All three pillars are required and pursuing only one is insufficient.

The level of change to the energy system identified in this study is transformational and cannot be achieved with incremental improvements to energy supply and demand. In order to facilitate a pathway to 2050, both consumers and producers will need to participate to ensure that energy infrastructure is low-carbon and efficient. Although 2050 is more than three decades away, a successful transition to a low-carbon economy requires timely planning to account for: (a) the pace of consumer adoption; and (b) the fact that energy infrastructure is long-lasting and takes years to plan for. Despite the ambitious transformation of the energy system, the changes would not entail major lifestyle changes, but the structure of a household's energy bill will shift from fossil fuel expenditures to investments in technology.

Economy-wide decarbonization will profoundly change the way electricity systems are operated and planned for. In terms of power system operations, balancing electricity supply and demand becomes more challenging as inflexible, variable renewable generation becomes the principal source of supply. For example, the three pathways show renewable generation exceeding load in approximately half of all hours by 2050. This operational paradigm necessitates a transition to new forms of balancing resources to integrate renewables and avoid curtailment. New sources of flexibility, including energy storage and flexible demand, can complement traditional sources of flexibility, such as hydro and thermal resources. This also provides an opportunity for PGE's customers to facilitate renewable integration by playing a more active role through smart EV charging and water heating (among others), which expands upon traditional demand response programs.

Electricity system planning in the context of deep decarbonization will need to account for broad changes across the energy economy to ensure that infrastructure with the right attributes is available to come online in a timely fashion. For example, future resource adequacy analyses will need to address changes in: (a) overall load requirements; (b) the shape of hourly load; (c) the level of inflexible renewable resources; and (d) penetration of flexible demand. In addition, the scale of resource additions identified in this study exceeds historical levels due to: (1) reducing the carbon intensity of electricity generation to nearly zero; and (2) increased generation requirements from electrification and/or producing fuels from electricity (i.e., H2 and SNG). As a result, the installed capacity of renewables is substantially higher than what's anticipated in any current planning proceedings and is more than double the quantity we would expect under current RPS policy. If regulators pursue policies commensurate with the emissions reductions evaluated here, then the results of this study highlight a number of considerations that could be investigated in PGE's integrated resource planning efforts to ensure that near-term actions are consistent with a long-term decarbonized future.

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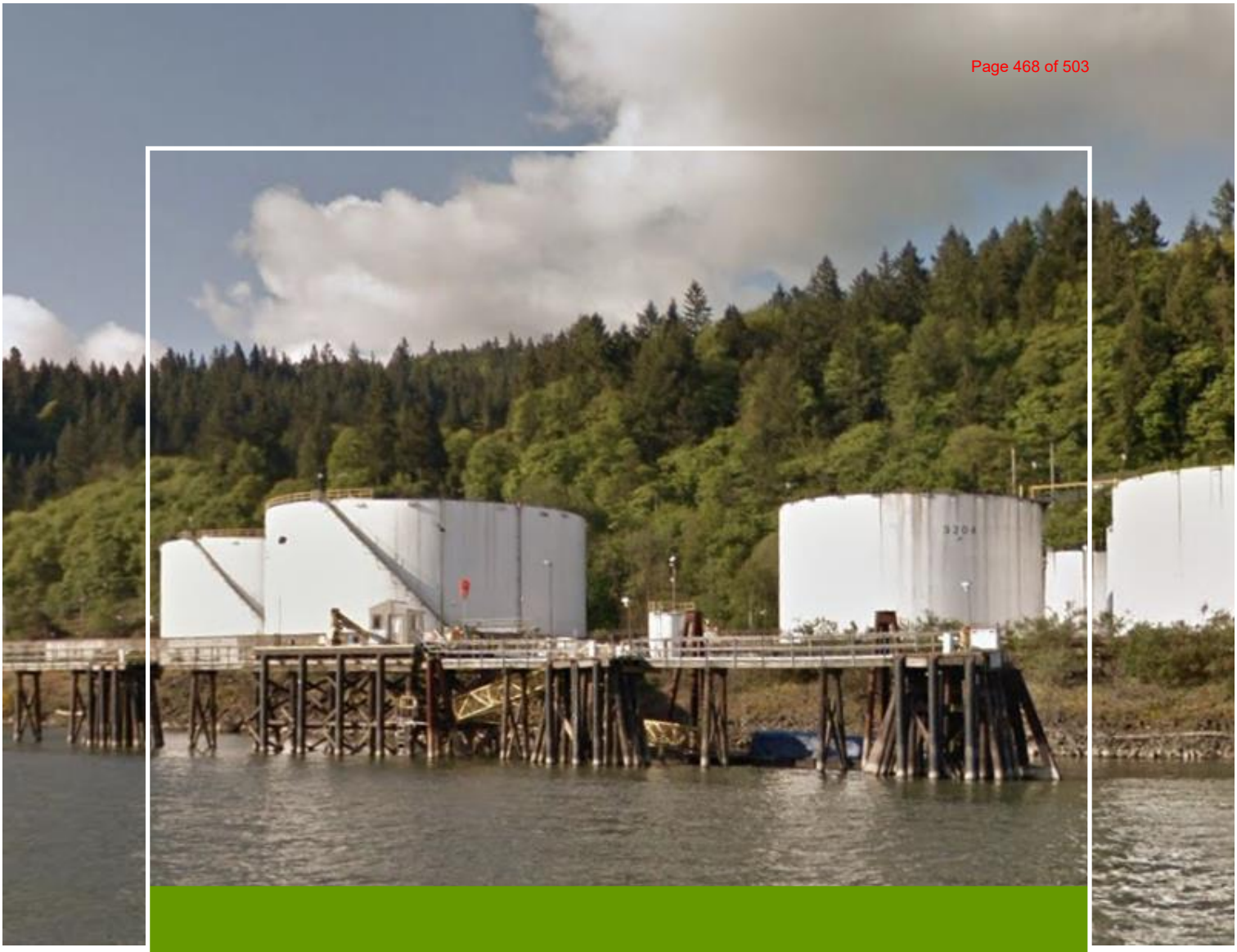

Liquid Storage Tanks at the Critical Energy Infrastructure (CEI) Hub

Seismic Assessment of Tank Inventory

May 2019

ACKNOWLEDGEMENTS

This report was written for the city of Portland's Bureau of Emergency Management (PBEM). The work was conducted though a collaboration between Mapleaf LLC and Portland State University.

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COVER

Photograph of liquid fuel storage tanks for NuStar Energy L.P. that form part of the Critical Energy Infrastructure Hub in Portland, OR.

Source: Google Maps, 2019.

REPORT SUMMARY

Seismic vulnerability of the Critical Energy Infrastructure (CEI) hub in Portland has been recently highlighted in several regional resiliency assessments. This report focuses on the liquid fuel storage tanks located at the CEI hub due to the adverse consequences of failure. General structural and geotechnical damage of similar facilities were identified by reviewing the seismic performance of liquid fuel storage tanks during past earthquakes. Data was then gathered on the storage tanks at the CEI hub and analyzed in an effort to quantitatively assess the tank inventory. There are nine different companies with hundreds of in-service tanks holding various forms of liquid products that have a potential storage capacity of over 8.6 million barrels. Over 95% of this capacity can be stored in large tanks that are 25ft in diameter or larger. The majority of the large tanks were built prior to 1970s and the vast majority prior to 1990s, eras when regional seismicity and seismic design were not fully appreciated or developed. Consequently, the structural and geotechnical issues revealed in tanks from past earthquakes are likely to manifest at the CEI hub unless mitigation steps are taken to minimize the risk. A conceptual order of magnitude cost of seismic mitigation for the large capacity tanks was estimated to exceed $300 million. This estimate made gross assumptions on soil mitigation, structural anchoring and design/permitting costs and did not consider fuel distribution past the tanks. Based on the findings and associated limitations of this study, recommendations are made for next steps that would fill gaps in existing data and generate new critical knowledge to better quantify and mitigate the seismic risk of this critical facility.

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INTRODUCTION

Brief Background

The six-mile stretch of industrial land along the west shore of the Willamette River in Northwest Portland is often referred to as the Critical Energy Infrastructure (CEI) hub. Energy facilities in the CEI hub include liquid fuel port terminals, storage tanks, pipelines and transfer stations, natural gas transmission and storage, electrical substations, and high voltage transmission lines. There are no petrochemical refinery operations in Oregon, so all of Oregon's liquid fuel is imported and over 90% is stored at fuel storage facilities in the CEI hub. This includes gas and diesel for the Portland metro area and all of the jet fuel for the Portland International Airport. These liquid fuel storage facilities are located along the river with the original intent for ships to import the fuel through port terminals. Now, most of the liquid fuel is brought in and out through pipelines. Numerous reports have highlighted the criticality of the CEI hub, the interconnectivity and the general earthquake risk to Portland and to the State (DOGAMI 2012, Bureau of Planning and Sustainability 2012, OSSPAC 2015, City Club of Portland 2017).

Purpose of Study

The purpose of this study was to focus on the liquid fuel storage aspect of the CEI hub and more specifically the storage tanks that hold the fuel. The storage tanks were chosen because they are some of the most visible aspects of the hub and pose the greatest risk if the tanks were to fail. The risk includes not only the regions inability to access fuel following a major earthquake, but also health and environmental concerns should failure occur.

This report summarizes the findings of the study, which had three main goals:

- Review past earthquake experiences from available literature of liquid fuel storage facilities in order to identify common vulnerabilities and key factors leading to tank damage and failure.
- Gather data from publicly available sources to identify the quantity and characteristics of the tanks and the supporting soil at the CEI hub. Contrast the information with past earthquake observations in order to gain a better appreciation of the expectations for seismic performance of the fuel storage tanks at the hub.
- Review potential mitigation options that aim to enhance the seismic performance of liquid storage tanks and estimate order-of-magnitude costs for implementing the mitigations.

The subsequent sections of the report address the above goals in a similar chronological order.

EARTHQUAKE DAMAGE TO LIQUID FUEL STORAGE TANKS

OVERVIEW FROM PAST EARTHQUAKES

Liquid petroleum products are commonly held in cylindrical, above-ground storage tanks. These are relatively simple structures comprised of a soil supported base-plate, a welded or riveted steel wall supported on a ring reinforced concrete foundation and a roof. The tanks are often categorized by their roof type; floating or fixed. To store liquids with low vapor pressures, such as propane, butane, or kerosene, a fixed roof tank is required to maintain pressure. For liquids that do not need to be pressurized for storage, floating roof tanks are utilized. As liquid is drained from a floating roof tank, the roof descends with the liquids surface and prevents the buildup of vapors that would otherwise form in the void of a fixed roof tank. Floating roof tanks are desirable for products such as crude oil, gasoline and diesel. The presence or absence of a floating roof in a large tank can influence the dynamic behavior when shaken by an earthquake.

Above ground storage tanks are well known to be vulnerable to seismic events. Since their simple design has been relatively unchanged for over a century, their seismic reliability has been tested numerous times. Previous earthquakes involving documented cases of tank damage are listed in Table 1. Selected examples from these earthquakes are used in the following sections to highlight some of the common vulnerabilities and the resulting damage.

Table 1: Earthquakes with Documented Significant Damage to Fuel Storage Tanks

Location	Magnitude	Date
Tokyo, Japan	8.3	September 1, 1923
Long Beach, California	6.4	March 10, 1933
Kern County, California	7.3	July 21, 1952
Prince William Sound, Alaska	9.2	March 27, 1964
Niigata, Japan	7.6	June 16, 1964
San Fernando, California	6.5	February 9, 1971
Managua, Nicaragua	6.3	December 23, 1972
Miyagi-Ken-Oki, Japan	7.7	June 12, 1978
Imperial County, California	6.5	October 15, 1979
Greenville, California	5.9	January 24, 1980
Central Greece	6.7	February 24, 1981
Coalinga, California	6.2	May 2, 1983
Loma Prieta, California	6.9	October 17, 1989
Marmara, Turkey	7.6	August 17, 1999
Tōhoku, Japan	9.0	March 11, 2011

STRUCTURAL DAMAGE

Although there are some references to an event in 1923 in Tokyo, the first reasonably well-documented case of damage to oil storage tanks followed the 1933 earthquake in Long Beach, California. The earthquake affected an industrial area that produced, refined, and stored petroleum. Complete tank failures were reported at three different locations, all less than 30 miles from the epicenter of the magnitude M6.4 earthquake. Peak ground acceleration (PGA) of 0.19g recorded at stations with similar distance from the epicenter were thought to be representative of those at the storage tanks (Housner 1952). Many tanks exhibited distortion, elongation, strain in riveted joints and buckling of the roof plates. Two of the tanks' riveted joints failed and while the tanks did not collapse as a result, the oil leaked. In one group of tanks, three partially full tanks sustained no damage while a full tank experienced total failure. The lost oil overcame the firewall and damaged neighboring buildings over 300 ft away (Nielsen & Kiremidjian 1986). There were other failures including overtopping where the roof was found 200 ft from the failed tank as shown in Figure 1. Other tanks did not necessarily fail in their structure, but were not anchored and separated from the inlet/outlet (I/O), resulting in loss of the oil. All failed tanks were of riveted construction and their structural failures were due to damage in the tank shell. The behavior of riveted shell wall tanks differs from the newer, welded shells construction. The long beach earthquake demonstrated that structural vulnerabilities of tanks relate to the riveted shell construction, to how full the tank is and to the connectivity of the I/O piping.

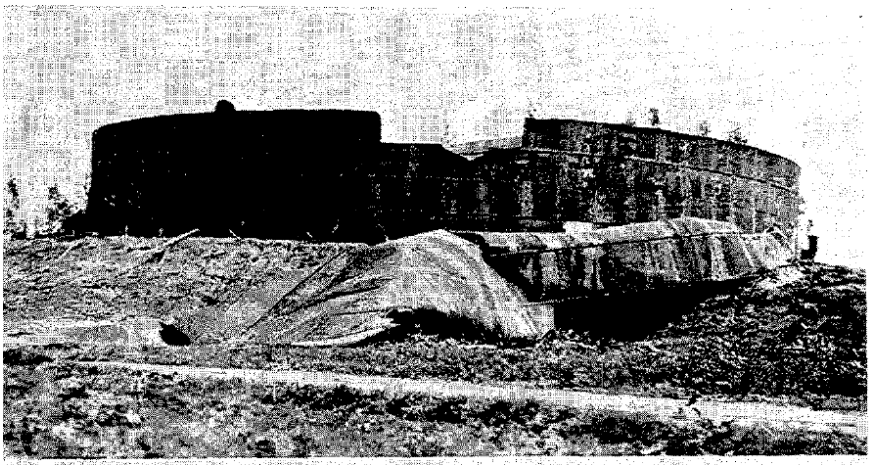

Figure 1: Failed Tank following 1933 Long Beach Earthquake (Cooper 1997)

The Great Alaskan earthquake of 1964 significantly influenced numerous aspects of earthquake engineering and also highlighted the vulnerability of petroleum storage tanks. The magnitude M9.2 subduction zone earthquake is the most powerful earthquake on record in North America. At the time of the earthquake,

the petroleum industry was Alaska's largest mineral industry and damage to petroleum storage facilities was reported in the cities of Valdez, Whittier, Seward, Anchorage, and Nikiska. Direct structural damage to fuel storage tanks included: shell buckling near the bottom of the tank, buckling of cone roofs and top courses of shells, damage to floating roofs and accessories, and damage to I/O connecting piping (Rinne 1967). These were the result from liquid sloshing induced deformations, hydrodynamic pressure acting on the tank walls, shear force and overturning moment acting at the base of the tank, the buckling strength of tanks and, uplift on the axial stresses acting on the tank wall in contact with the ground. Sloshing can damage the top of the tank and can also result in roof damage. Buckling of the steel shell near the bottom of the tank is referred to as elephant-foot buckling. An example of roof damage and elephant-foot buckling is photographed in Figure 2. This type of damage usually occurs in tanks with a low height to radius ratio. Many tanks experienced elephant-foot buckling in this earthquake, all of them were near full capacity. Extreme elephant-foot buckling had resulted in leakage and also complete collapse. Sudden loss of oil from a leak can produce suction that implodes the roof of a tank. The structural damage to fuel storage tanks following the Great Alaskan earthquake exposed vulnerabilities even when the tank shells were welded.

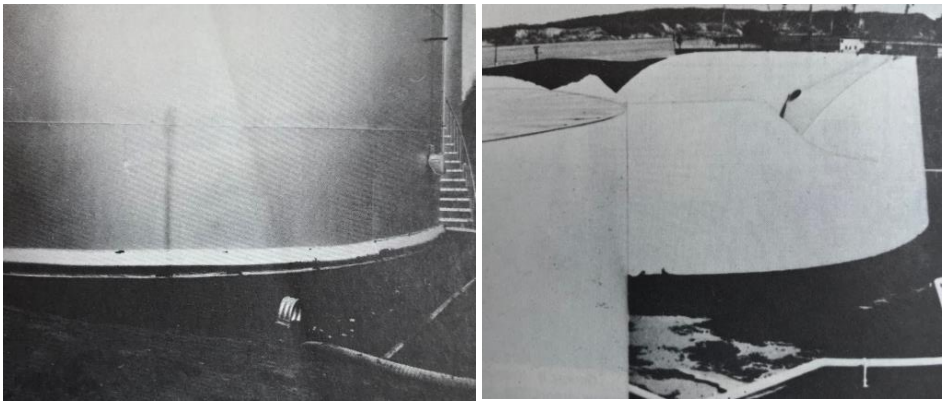

Figure 2: Elephant Foot Buckling (left) and Roof Collapse (right) following 1964 Great Alaskan Earthquake (Hanson 1973)

In 1978, a magnitude M7.4 earthquake occurred of the east coast of Japan with the epicenter approximately 95 km to 120 km from several oil storage or refineries. The peak ground acceleration near Sendai City was thought to have exceeded 0.25 g. The complex of over 87 fixed and floating roof tanks containing various petroleum products was constructed in 1971 and had been designed with reasonable seismic criteria. All piping as well as the tanks were anchored, where the tank anchors were located around the perimeter and embedded into a concrete pad (NBS 1980). Stretched anchor bolts indicated that tank uplift was limited to approximately 6 inches. Three crude oil tanks failed and the contents spilled. The

tanks were surrounded by a reinforced concrete dike, but the volume of spilled oil exceed the capacity of the dike and the oil escaped as shown by the dark areas in Figure 3. The top of the fixed roof tank buckled inward due to low pressure caused by rapid evacuation of the oil through the ruptured connection of the base and wall of the tank. While containment areas in the form of dikes or walls are common, the consequence of failure of fuel storage tanks can extend beyond these containment areas due to overtopping following multiple tank failures or due to potential earthquake damage to the walls themselves.

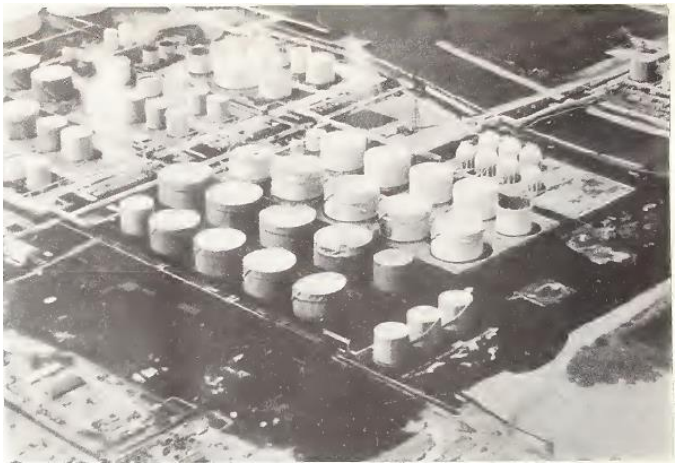

Figure 3: Spilled Oil Past the Containment Dikes following 1978 Earthquake in Japan (NBS 1980)

Soil Induced Damage

There are two major aspects of soil behavior during an earthquake that can influence the overall damage to the fuel storage tanks; amplification and liquefaction. Amplification of the ground motion has been recognized and documented for soft soils in numerous earthquakes, including the iconic 1985 Mexico City and 1989 Loma Prieta. The resulting accelerations manifest in the severity of the above discussed structural damage. Liquefaction of the ground on the other hand, can result in additional damage that is related to permanent settlement of the ground or to lateral soil movement referred to as lateral spreading.

The Great Alaskan earthquake of 1964 resulted in numerous examples of damage caused by liquefaction. Another 1964 earthquake occurred in Japan and was a magnitude 7.6 near the city of Niigata. Two oil refineries were located near a river and had liquid fuel storage tanks built on loose sandy ground. Settlements due to liquefaction were observed to be 8 to 12 inches on compacted ground and up to 20 inches of unequal settlement in uncompacted sand. These resulted in many damaged tanks in both refineries. In contrast, newly built tanks constructed

on compacted soil at the refineries settled uniformly, and approximately 1 in. These tanks exhibited minimal to no damage and remained operational, while surrounding tanks were severely damaged from large ground settlement (Watanabe 1966).

Liquefaction induced lateral spreading can move entire tanks or cause relative ground deformations of the tank. During the 2011 Tohoku subduction zone earthquake, surrounding soil spread and caused uplift on the side of a tank of approximately 20 inches, resulting in the tank cracking and the contents leaking out (Zama et al 2012). An example of tank settlement and of lateral spreading induced uplift is photographed in Figure 4. In addition to damaging the tank itself, liquefaction can sever I/O connectivity. These examples underscore that minimizing the effects of liquefaction can minimize the risk of damage to liquid fuel storage facilities.



Figure 4: Liquefaction Induced Settlement following 1964 Niigata and 2011 Tohoku Earthquakes in Japan (Watanabe 1966, Zama et al 2012)

FIRE

While fire can be thought of as a secondary effect resulting from the damage caused by the earthquake, it is particularly relevant given the volatile contents of the tanks. Numerous instances of fires at liquid fuel storage facilities following an earthquake have been reported, with examples provided in Figure 5. Approximately 37 miles from the epicenter of the Great Alaskan earthquake, oil storage tanks were constructed in the port city of Whittier on fill that consisted of delta deposits and glacial outwash. All of the storage tanks were completely destroyed by a fire that broke out and burned for three days. The fire, and subsequent tsunami, destroyed the evidence and the cause of the fire was never determined. Two possible causes included a live power line that was snapped during the earthquake, or fuel from a leaking tank could have spilled into an operating boiler (Kachadoorian, 1965).

A refinery was located approximately 19 km from the epicenter of magnitude 7.4 earthquake near Istanbul, Turkey. Constructed in 1961 and expanded in 1974 and

1983, the facility had a large tank farm with over 100 unanchored, aboveground liquid storage tanks. The tanks were designed by American contractors adhering to seismic design code of California in 1961 (Sezen & Whittaker 2004). The damage at the refinery is thought to have been largely overlooked due to the extensive damage in more populated areas. The majority of the damage was caused by a fire that was ignited by sparks created from the collision of a metallic floating roof seal against the tank wall. The tanks contained naphtha, a highly volatile and flammable petroleum product. A total of 6 tanks of diameter 33ft to 82 ft, completely burned down. The fire spread to other tanks and 30 of the 45 floating roof tanks were damaged (Yazici and Cili 2008). More recent examples of fire at fuel storage was also observed in 2011 Tohoku, Japan in different refineries built in 1963 and 1971. The fire was attributed in different instances to damage to the tanks themselves or to leaks in the surrounding pipes. In these examples, fire remains a threat to fuel storage facilities despite construction practices that had at least some awareness of the associated earthquake risk.



Figure 5: Fire Caused by Tank Damage following 1999 Turkey (left) and 2011 Tohoku Earthquakes (right) (French Ministry of Ecology, Sustainable Development and Energy, 2013)

LIQUID FUEL STORAGE TANKS AT THE CEI HUB

OPERATING COMPANIES

While the CEI Hub is generally referred to as a singular area, the liquid storage tanks are actually clustered in a few distinct locations and are owned by different operating companies. Map with relative locations of the various companies between U.S. Route 30 and the Willamette River is shown in Figure 6. The majority of the fuel storage facilities are either near the Linnton neighborhood to the north or within the Northwest Industrial Area to the south.

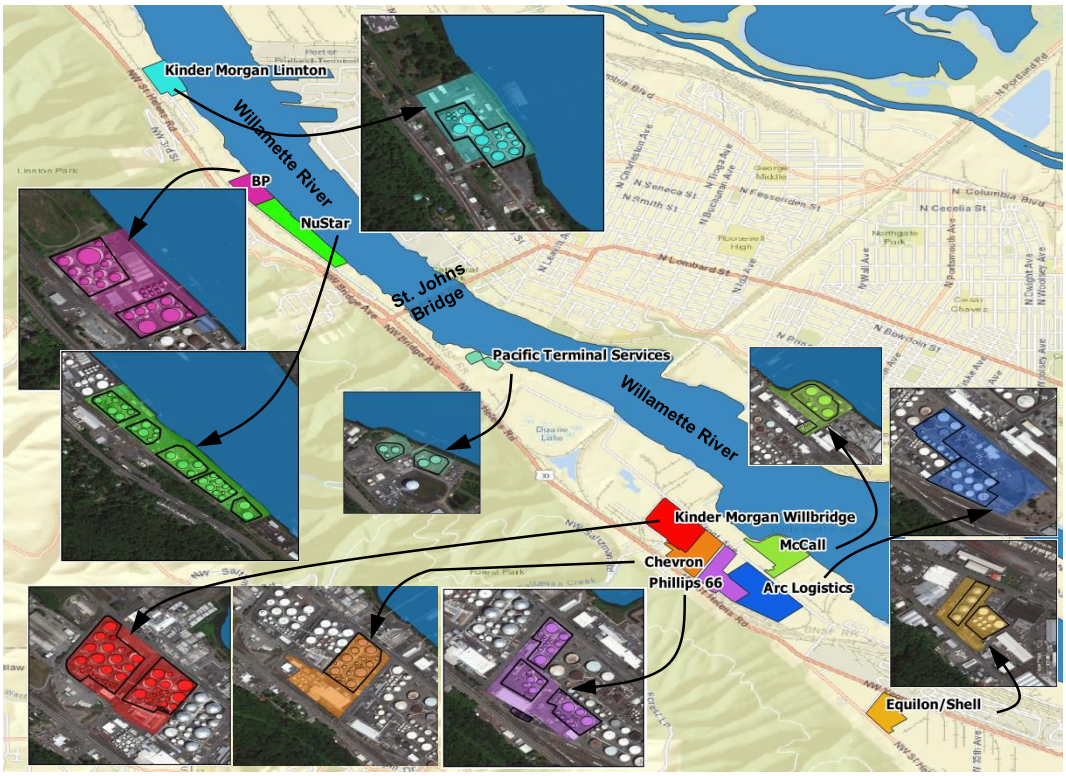

Figure 6: Companies with Liquid Fuel Facilities at the CEI Hub (background Google Maps)

The petroleum storage tank owners are required to submit an oil spill contingency plan to the Department of Environmental Quality (DEQ). In 2015 Oregon Public Broadcasting (OPB) made a public records request and attained records from seven owners of liquid fuel storage tanks (Schick 2015). These included BP, Chevron, Kinder Morgan, McCall, NuStar, Pacific Terminal Services and Phillips 66. Further queries into the City of Portland permits

database indicated that no additional fuel storage tanks were constructed since 2015, making the data set relevant to date. In addition to this dataset, two additional companies were identified through review of The City of Portland Bureau of Planning and Sustainability documentation from 2016 (Bureau of Planning and Sustainability 2016). These companies were Arc Logistics and Shell/Equilon.

In all, there were 10 properties with liquid fuel storage tanks, owned by 9 different companies. Within each property, large tanks appear to be collocated within shared secondary containment areas that are built to contain potential spillage or leaks. These containment areas are typically intended to contain the volume of the largest tank in the group and are constructed using soil dikes or structural walls. No data was found related to the secondary containment aspect of the facilities in any of the properties, so the areas were manually traced and acreage calculated based on satellite imagery. The resulting tank locations and associated containment areas are depicted in Figure 6 via zoomed in details for each property. The acreage and the number of storage tanks are summarized in Table 2 for each company. To help parse the data when available, the tanks were grouped into tank diameters that were 25 ft and larger or smaller than 25 ft.

Table 2: Total Area and Fuel Storage Overview

Company	**Site Area** (acres)	**Secondary Containment** No.	(acres)	**No. of Storage Tanks** ≥ 25ft	< 25ft	**Tank Capacity** (million Gallons) ≥ 25ft	< 25ft
Kinder Morgan							
Linnton Terminal	13	1	5.5	19	14	20.4	0.3
Willbridge Terminal	33	2	17.0	46	88	70.0	1.5
BP	18	2	5.6	26	6	23.9	0.0
NuStar	22	5	11.8	31	4	53.4	0.1
Pacific Terminal Services	2	2	3.2	5	2	11.6	0.0
Chevron	21	1	8.5	35	109	47.4	3.0
Phillips 66	21	4	10.8	36	61	29.3	1.1
McCall	19	2	10.0	10	16	40.0	0.5
Arc Logistics	39	2	14.0	25		61.6	
Equilon/Shell	38	2	6.8	13		16.8	

TANK TYPE AND QUANTITY

The records for seven of the companies list a total of 514 tanks, of which 146 were tagged to be out-of-service (O.O.S). While it is unclear if O.O.S. tanks could be brought back to service, examination of aerial photographs of some of the known locations of large O.O.S. tanks show visual signs of tank deterioration that make that possibility less likely. The data for each tank include the storage capacity, substance, and year built for each tank. Tank type is also included, although this identification is not consistent across the different companies.

Phillips 66 reported container type as welded or riveted steel while the others reported container type by the roof characteristics (e.g. floating roof, fixed roof, cone roof, vertical fixed roof). There were no tank details available for Shell/Equilon and Arc Logistics, so the additional 38 tanks were estimated from satellite imagery. The number of tanks breakdown along with the fuel storage capacity for each of the companies is summarized in Figure 7. Given that floating roof tanks can exhibit different dynamic behavior to fixed roof under earthquake motion, the tank types are differentiated where known.

Discounting the O.O.S. tanks, there are at least 362 tanks with a total capacity of 8.64 million barrels (362.9 million gallons) of liquid product of various types. Despite approximately 40% of the tanks being 25 ft in diameter or larger, they can hold over 95% of the total volume capacity. The total volume is not present on site at any given time because the tanks are not always full. The average fill varies, nonetheless there is a significant amount of liquid fuel products stored in above ground storage tanks at the CEI Hub. There also appear to be a wide spectrum of tank types. The tank construction includes riveted and welded, as well as fixed and floating roof. The variability in construction and tank type make relevant all of the aforementioned structural damage vulnerabilities exposed by past earthquakes.

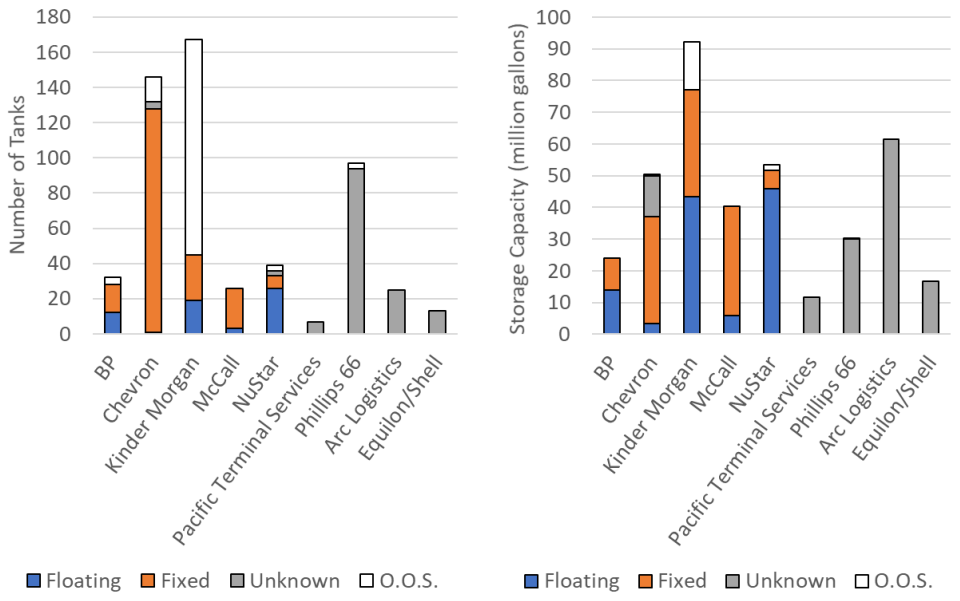

Figure 7: Number of Tanks (left) and Total Storage Capacity (right) by Company

TANK AGE AND SIZE

Knowledge about a seismic hazard evolves over time. In Oregon, our understanding of the threat of the looming Cascadia Subduction Zone (CSZ) has only come to light in the last 20 years. Design standards follow and therefore the age of any structure is often a strong indicator of the potential vulnerability. To get a sense of the age of the tank inventory at the CEI Hub, the tank age is summarized in Figure 8 by showing the number of in-operation storage tanks built within a particular decade. Within each decade, the number of tanks are binned by the tank diameter in increments of 20 ft. This allows for a visual representation of the physical size of the tank and indirectly the volume of fuel capacity. The tank diameters were only provided for approximately half of the tanks. Regression model based on the tank volume and the known tank diameters was developed and used to estimate the tanks for which diameters information was not available.

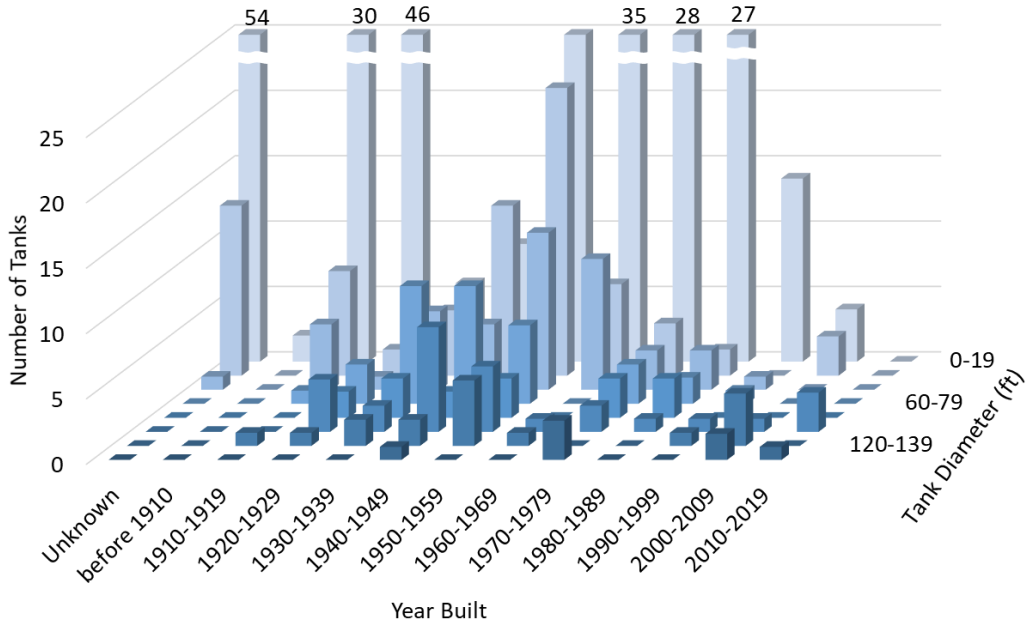

Figure 8: Distribution of In-operation Tank Age and Size

There are numerous in-service large tanks built prior to 1930s. Most significantly, majority of the tanks and majority of the fuel capacity within the hub has been built prior to 1960s. Even if the designers were fully aware of the seismic hazard, this time frame is prior to any design and performance lessons learned from the damaging Great Alaskan earthquake of 1964 and the many other

documented earthquakes that followed. The next construction active period in the CEI hub spanned 1970s-1980s, with only a few large tanks built in the last couple of decades.

The industry standard for the design of petroleum storage tanks is published by the American Petroleum Institute (API); API Standard 650 establishes the minimum design requirements for welded tanks. It is unclear what standards were used for the design of the tanks as the City of Portland had not been overseeing these non-building structures. Even so, the seismic load requirements in Portland have significantly increased for buildings during the 1990s, reflecting the state of science of the regions seismicity. Regardless of the design standards followed, the vast majority of the tanks were constructed with minimal, if any, considerations of seismic loading given their vintage.

Soil Characterization

Detailed subsurface information at CEI hub in general is very limited. Based on the available information, loose to medium dense silty sand lie below the groundwater table and the soil is susceptible to liquefaction (Beaty et al 2014). There is also a possibility of landslides from the nearby slope entering the area. Raster data that included permanent ground deformations from liquefaction was made available by the Oregon Department of Geology and Mineral Industries (DOGAMI 2012) and was overlaid on the fuel storage facilities as shown in Figure 9. Because of the proximity to the river, the permanent ground deformations due to liquefaction and lateral spreading is expected to be very high at all fuel storage tank locations. The underlying raster data is a high level assessment and serves only as an indicator for liquefaction risk at any particular location within the hub. More detailed geotechnical assessment would be needed to quantify the severity, nonetheless, liquefaction clearly poses a significant risk for all of the liquid fuel tanks in the CEI Hub. If left unmitigated, the seismically induced damage observed in past earthquakes is likely to manifest.

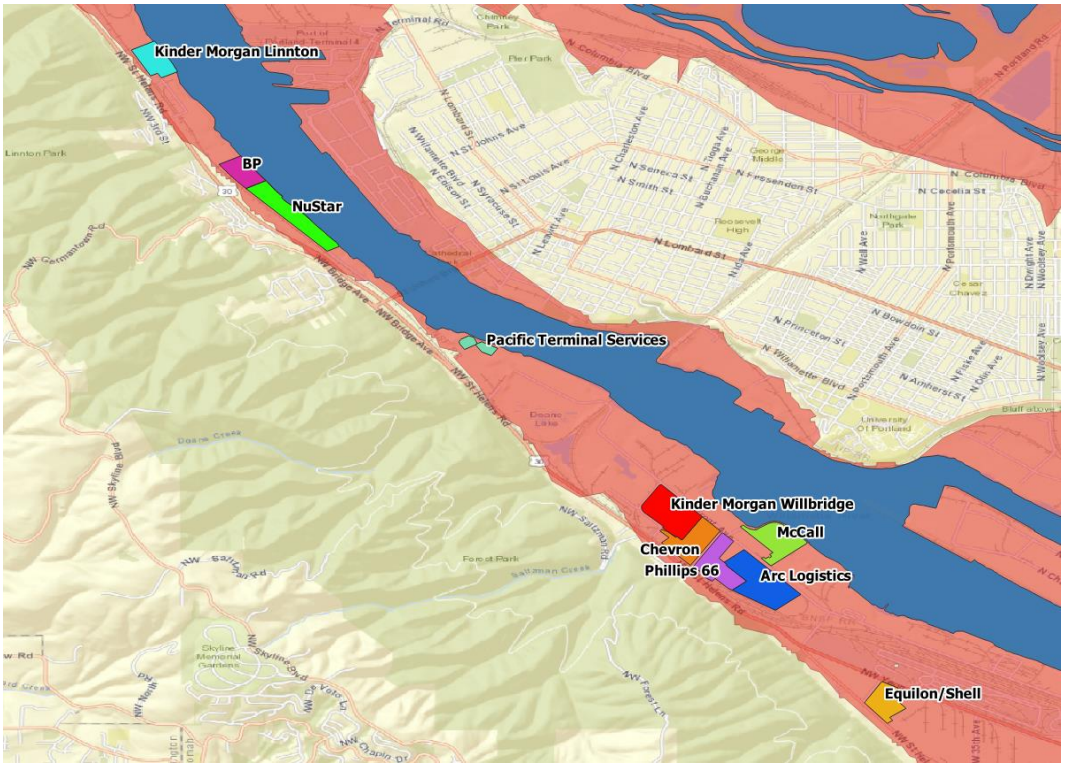

Figure 9: Areas of High Permanent Ground Deformations (shaded red) following CSZ Earthquake (background Google Maps)

POTENTIAL SEISMIC HAZARD MITIGATIONS

SEISMIC HAZARD

Factors contributing to seismic performance of above ground storage tanks include the amount of shaking, the existence of anchorage, subsurface soil condition and the amount filled at the time of the earthquake. The amount of shaking relates to the seismic risk characteristics and for Portland and Oregon, the CSZ is one of the more significant considerations. The expected severity of the shaking is represented by the 5% critically damped spectral acceleration plot in Figure 10 and includes a probabilistic hazard of a 500 year return and 1000 year return earthquake as well as the anticipated full rupture of the CSZ. These values consider the location of the CEI hub relative to the earthquake as well as a relatively soft soil (Vs_{30}=270 m/s). The expected accelerations ranging between 0.2g and 0.56g are well within the range of accelerations where structural tank damage as well as soil liquefaction were reported in past earthquakes. The level of shaking is therefore expected to be significant and have the potential to cause damage or failure to vulnerable fuel storage tanks.

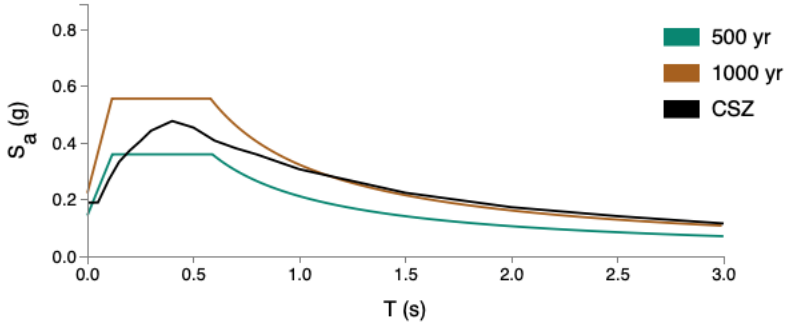

Figure 10: Spectral Acceleration for Portland's CEI Hub

The stresses generated on the tank can be correlated to the amount of fuel in the tank. Performance during past earthquakes have indicated a lower susceptibility to damage for tanks that are partially filled. One potential mitigation of the risk of damage can therefore employ practices that at maximum only partially fill any vulnerable tank.

STRUCTURAL MITIGATION

The large diameter fuel storage tanks are typically above-ground and constructed with flexible floors and steel perimeter shell that is supported on a reinforced

concrete ring foundation. Smaller diameter tanks are likely to be supported by a reinforced concrete slab on grade. In either case, anchorage for the tanks have the potential to limit or minimize the uplift of the walls of the tank as the liquid imposes stresses on the tank walls. Effectiveness of anchoring storage tanks has been demonstrated in past earthquakes and would most likely be implemented for any new tank construction. Tanks in the CEI hub are unlikely to be anchored and would need to be retrofitted. As with most seismic retrofit cases, mitigating existing structures is more challenging than starting with a blank site. The anchorage would need to be implemented around the perimeter, connecting the steel shell with the foundation. The details of the connectivity will need to be evaluated depending on the individual tank as additional challenges may arise from having the ability to attach to the tank wall or the foundation. Issues with welding ranging from the steel vintage to shell thickness need to evaluated as is the ability of the foundation to resist the anchorage forces.

Soil Mitigation

For storage tanks located further away from the edge of the river, lateral spreading may not necessarily be as great a concern. However, liquefaction settlement and bearing capacity failures could result in damage to the tanks. To mitigate liquefaction settlement, the ring foundations could be mitigated by installing sheet piles or compaction grout columns around the perimeter. Sheet piling consists of installing steel interlocking sheets around the perimeter. Compaction grouting displaces and densifies loose granular soils by staged injection of fluid grout. These sub surface columns would support the tank shell and potentially the I/O connections, but the centers of the tanks could still settle. Site specific studies would be necessary to assess the differential.

To mitigate lateral spreading in addition to settlement, jet grout columns could be installed under the tanks. Jet grouting is a hydrodynamic jet process that breaks up and loosen the ground, and mixes fluid grout with the soil. The jet grouting can be inserted at an angle, potentially reaching and mitigating soil under the tank as well as the perimeter. For large diameter tanks the jet grouting might require the tanks to be drained and cut open so that low-overhead equipment can work from within the tank.

Alternatively and less conventionally, instead of treating the soil, the water table could be lowered because without water, no liquefaction of the soil can occur. An example of this was implemented in three sites in Japan in 1970s. Underground cutoff wall was constructed using the slurry wall technique with soil/bentonite backfill. The cutoff wall surrounded a group of tanks and the water table was lowered. The refinery reported that these tanks had no damage after the 2011 Tohoku Earthquake.

CONCEPTUAL ESTIMATION OF SEISMIC MITIGATION COSTS

In order to get a sense of the magnitude of costs required to mitigate the major vulnerabilities of the liquid fuel storage tanks at the CEI hub, a high level cost estimation was made based on the tank data available. Three components of the mitigation costs were estimated; soil mitigation, structural anchoring and associated design/permitting. These were estimated as follows:

- Soil mitigation – in order to address both liquefaction induced settlement as well as lateral spreading, jet grouting was selected for estimating the cost. Jet grouting estimates were obtained from one of the major national geotechnical construction contractors. The calculated cost include an initial mobilization of $100K/tank plus the cost of the grouting procedure. While economies of scale could be employed to lower the mobilization costs, there is much uncertainty at this conceptual stage to be fine-tuned. The grouting procedure costs were estimated at $400/cubic yard of grout, 35% grouted mixing for 40ft depth under the entire area of the tank. This cost was calculated for each 25ft diameter or larger tank, each rounded to the nearest $100K. The resulting cost aims to represent the material and labor cost of soil mitigation implementation for the larger tanks.

- Tank anchoring – as an initial estimate, mobilization cost of $50K/tank was used plus an additional $1K/ft of the tank perimeter. This cost was calculated for each 25ft diameter or larger tank, each rounded to the nearest $100K. The resulting cost aims to represent the material and labor cost of implementation for the larger tanks.

- Design and permitting – in order to implement the above mitigation, engineering assessment, design and permitting needs to be conducted. This cost was simply estimated as 10% percent of the total cost for both soil and structural mitigation implementation combined.

The calculated cost is summarized in Figure 11. Values are separated for floating tanks and other because floating tanks on average have larger diameters and at a future date could also include the cost of installation of fire suppression measures, which at this time were not estimated. The total cost for implementing these conceptual mitigation measures to storage tanks of 25 ft diameter and larger is estimated to exceed $300 million. Over one third of the cost is for floating roof tanks alone. Unsurprisingly, the cost of soil remediation dominates the overall cost for all tanks, especially for floating roof tanks that tend to have a higher ratio of area to perimeter given their general larger size. The cost of mitigating storage tanks smaller than 25 ft in diameter is expected to only incrementally add to the overall cost as the mitigation measures would more likely be associated with structural anchoring rather than deep soil mitigation.

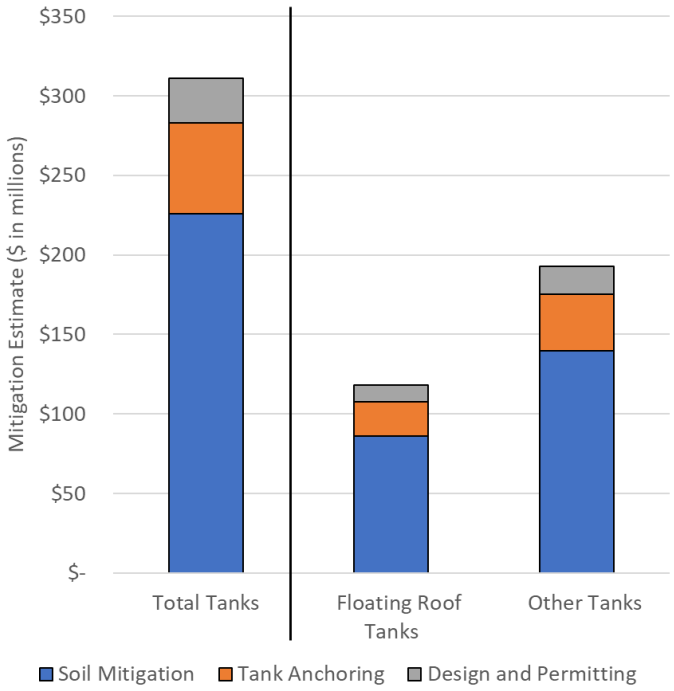

Figure 11: Conceptual Seismic Mitigation Cost Estimates for Tanks 25ft in Diameter and Larger

The conceptual cost estimate was intended as a first pass order of magnitude number for mitigating the damage and failure of only the tanks. No cost consideration was given to maintaining integrity of the fuel distribution system, support mechanical systems, secondary containment areas or the shore terminals that are also located on the site. And, the aim of the remediation measures for the tanks was to minimize the potential for failure that would result in loss of fuel. Much more detailed analyses would need to be conducted to estimate each property ability to operate following a major earthquake event.

RECOMMENDATIONS FOR NEXT STEPS

This study provided a closer look at the seismic vulnerability of the CEI hub by assessing more quantitatively the available inventory of fuel storage tanks at the site. The recommended next steps aim to build on this work to fill information gaps and generate new critical knowledge with the overarching goal of quantifiable assessment and mitigation of seismic risk.

- Develop seismic performance criteria for storage tanks at the CEI hub:

  The philosophy behind majority of design standards and codes is to prevent catastrophic failure. Given the criticality of the fuel, specific seismic performance criteria for the storage tanks in the CEI hub need to be developed. The criteria need to address the input earthquake motion as well as the desired output performance goals, such as tank collapse, prevention of leakage, access to fuel or continued operations. Having established criteria will provide basis for evaluation and eventual design. The decisions made in establishing the criteria can significantly affect the mitigation costs and if adhered to, the associated performance level of post-earthquake performance.

- Quantify tank seismic fragility:

  Seismic fragility describes the anticipated performance for a particular ground motion input parameter. For example, the potential for tank wall collapse given the earthquake peak ground acceleration. Limited literature exists on the topic, quantifying liquid storage tank fragility difficult. To address this shortcoming, archetype tanks should be defined that represent different storage sizes, roof types, structural as well as soil characteristics. Numerical models of the archetypes need to be analyzed to determine their seismic fragility. This new knowledge would be used to inform the seismic loss assessment process and provide a tool to quantify the effectiveness of particular mitigation measures. For example, the amount of fuel fill in the tank can be used as a variable in the analyses to determine the seismic performance benefit gained by lowering the amount of fuel stored. The fragility is useful on individual tank basis, can be applied across the tank inventory and can be used to better understand cost/benefit.

- Investigate mitigation options for fuel distribution:

  The focus of the study has been on the storage tank inventory, but aspects related to connectivity and distribution of the fuel are also important. Pipelines, support mechanical systems and access terminals need to be better understood, existing condition assessed and mitigation options investigated.

- Conduct subsurface geotechnical investigations:

  All of the sites are located close to the river and have been generally identified as susceptible to liquefaction. Detail survey of the properties of the soil at depth are needed. This information could then be used to estimate soil amplification of ground motion, the amount of settlement as well as lateral spread from liquefaction, and be used to refine the cost of the extent of the soil remediation required.

- Obtain detailed structural tank information:

  The current tank data set is incomplete and basic information that was inferred needs to obtained, including missing tank diameters, tank roof types and physical locations. Additional structural data currently not available needs to be gathered. Details of existing foundation size, tank to foundation anchorage, tank wall thickness, roof support and I/O connectivity. Some of this information can be gathered through site visits while other would require more direct tank owner cooperation.

- Prioritize fuel storage tanks:

  From the hundreds of tanks identified, certain types of fuel and certain size of tanks are likely to be more critical to post-earthquake recovery than others. Prioritization of the tanks based on post-earthquake needs and consequences of failure should be conducted. Having prioritized tanks would help focus the associated assessment and mitigation efforts.

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JT Hendrix

#62548 | November 19, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Please See Attached Testimony.

Testimony is presented without formatting.

ZENITH ENERGY

ZENITH ENERGY TERMINALS HOLDINGS LLC
5501 NW Front Avenue
Portland, Oregon 97210

Portland City Council
1221 SW Fourth Avenue, Room 130
Portland, Oregon 97204

Re: Testimony - Proposed Re-adoption of the Fossil Fuel Terminal Zoning Amendments, November 20, 2019 Hearing

Dear Mayor Wheeler and City Council Members:

Zenith Energy Terminals Holdings LLC ("Zenith") owns and operates a terminal located at 5501 NW Front Avenue in Portland (the "Terminal"; parcels R315777, R315845, R315892) that stores Zenith's customers' liquid products, which Zenith receives from, and delivers to, marine vessels, railcars and/or trucks on behalf of its customers. These liquid products currently include petroleum, petroleum products and renewable fuels, which are brought to the Terminal from outside Oregon and returned to customers for transportation within Oregon and elsewhere in the United States. The Terminal meets the City's proposed definition of a "Bulk Fossil Fuel Terminal" and, along with other terminals, would be subject to the proposed Fossil Fuel Terminal Zoning Amendments ("FFTZA").

Zenith objects to the City's proposed action to readopt the FFTZA. The FFTZA will inhibit infrastructure upgrades for safety and to meet changing market demands. In light of the recent decision from the City's Office for Community Technology ("OCT") prohibiting development for renewable fuels at Zenith's Terminal, the FFTZA also fails to adequately authorize storage capacity development for renewable fuels. The FFTZA was remanded to the City because the City relied on "unsupported speculations" rather than factual evidence to make its original decision adopting the FFTZA. The City now proposes to adopt a substantively identical version of the FFTZA, but to date (years after the evidentiary deficiencies were recognized in the courts), the City has not identified and made available for public review any additional facts that support readopting the FFTZA.

Please include this testimony in the record of the above-referenced proceeding and provide us notice of the final decision.

The FFTZA Inhibits Safety and Modernization Improvements

The FFTZA prohibits expansion of fossil fuel storage capacity at existing Bulk Fossil Fuel Terminals even in conjunction with facility modernization or otherwise desirable safety upgrades, such as to address seismic concerns. As was detailed by many terminal operators and representatives during the City's original consideration of the FFTZA in 2016, owners and operators of Bulk Fossil Fuel Terminals are unable to invest the significant private resources needed for these improvements without incentives, including opportunities for expansion to meet market demand. Moreover, upgrading tanks, pipes, containment, and associated infrastructure to a new seismic or safety standard often requires the construction of new infrastructure so that

repairs/upgrades can be made without interrupting service to customers, including service to end users. As relevant here, storage tanks cannot be upgraded while containing product, so new storage tanks would need to be constructed before existing storage tanks are taken out of service. The FFTZA, though, prevents that as constructing new storage tanks would (at least temporarily) increase storage capacity. As a result, if adopted in its current form, the FFTZA will most likely prevent the City's desired upgrades from occurring at Bulk Fossil Fuel Terminals. Importantly, this conflicts with Resolution 37168, which prohibits the City Council from restricting (i) improvements in safety, efficiency, seismic resiliency, or operations of existing Bulk Fossil Fuel Terminals, (ii) the provision of service by Bulk Fossil Fuel Terminals directly to end users, and (iii) development of emergency backup capacity at Bulk Fossil Fuel Terminals.

The FFTZA Provides Inadequate Protection for Renewable Fuel Development

Based on recent City actions, Zenith has serious concerns about implementation of the FFTZA, should it be enacted, with regard to increasing Portland's storage capacity for renewable fuels. The City's draft findings state that "the City Council expressed support for accelerating the transition to non-fossil fuel energy sources" under Resolution 37168, and indicate support for the DEQ-led Oregon Clean Fuels Program, which promotes increased use of ethanol, biodiesel and other renewable fuels. The City's draft findings conclude that "in order to facilitate implementation of the Clean Fuels Program" and provide capacity needed for renewable fuels, "non-fossil fuel storage tanks are not subject to the capacity limits" under the FFTZA.

Zenith desires to increase the Terminal's capacity to handle and store renewable fuels and strongly supports excluding renewable fuels, including renewable diesel and biodiesel from the FFTZA storage tank capacity limits. However, Zenith has grave concerns about the implementation of this renewable fuel exclusion due to a recent decision involving Zenith's Terminal. Last month, the OCT, with full support of the City Attorney's Office and Mayor Wheeler, relied on the same Resolution 37168 to deny Zenith's proposal to construct two pipelines that would be exclusively used for renewable diesel and biodiesel (and a third pipeline that would be exclusively used for a non-fuel liquid). The OCT denied the proposal because it found the pipelines (which like any pipes capable of transporting liquids) were "capable" of being used to transport fossil fuels, despite Zenith proactively offering a condition prohibiting such use. Given this very recent history, Zenith is concerned that the City will also deny any proposal to increase renewable fuel storage capacity at a Bulk Fossil Fuel Terminal for the same reason.

As the City is no doubt aware, much like pipes, storage tanks are capable of storing a variety of liquids. If the City interprets its existing policies to not allow new pipelines for renewable fuels because the pipes are "physically capable" of being used to transport fossil fuels, what assurance do Zenith and other operators seeking to add renewable fuel storage capacity have that the City will not similarly prohibit new storage tanks that are "physically capable" of storing fossil fuels, even if that capacity is dedicated to renewables (or other non-fuel liquids)? Zenith urges the City to revise the FFTZA to make abundantly clear that new non-fossil fuel storage capacity at a Bulk Fossil Fuel Terminal is allowed and there is no requirement to prove, under either the FFTZA or

ZENITH ENERGY

ZENITH ENERGY TERMINALS HOLDINGS LLC

Resolution 37168, that such storage facilities are not "physically capable" of being used for fossil fuels.

Emergency Ordinance

In January 2018 the Oregon Court of Appeals confirmed the existence of glaring evidentiary deficiencies regarding the market demand for fossil fuels. The subsequent passage of almost two years indicates that the City Council's use of an emergency ordinance in this situation is without justification.

Sincerely,

JT Hendrix
Terminal Manager - Portland

189807

Moore-Love, Karla

From: Reynolds, Allison J. <allison.reynolds@stoel.com>
Sent: Tuesday, November 19, 2019 5:16 PM
To: Moore-Love, Karla
Cc: Martin, Eric
Subject: Testimony for Fossil Fuel Terminal Zoning Amendments
Attachments: JT Hendrix Testimony.pdf

Hi Karla,

I believe we submitted this testimony online via the Map App, but wanted to send it to you just in case that didn't work. Please see attached and add this to the Council's record.

Thank you!

Allison Reynolds | Of Counsel
STOEL RIVES LLP | 760 SW Ninth Avenue, Suite 3000 | Portland, OR 97205
Direct: (503) 294-9625 | Fax: (503) 220-2480

This email may contain material that is confidential, privileged and/or attorney work product for the sole use of the intended recipient. Any unauthorized review, use, or distribution is prohibited and may be unlawful.

189807

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ZENITH ENERGY TERMINALS HOLDINGS LLC

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Sincerely,

JT Hendrix
Terminal Manager - Portland

Catherine H. Reheis-Boyd

#62537 | November 18, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

See attached

Testimony is presented without formatting.

Western States Petroleum Association
Credible Solutions • Responsive Service • Since 1907

Catherine H. Reheis-Boyd
President

November 18, 2019

Sent via US Mail and
City Map App Testimony Portal
https://www.portlandmaps.com/bps/testify/#/fft

Portland City Council
Fossil Fuel Zoning Testimony
1221 SW Fourth Avenue, Room 130
Portland, Oregon 97204

RE: Fossil Fuel Terminal Zoning Amendments Remand Report

Mayor Wheeler and Honorable Members of the City Council:

I am writing on behalf of Western States Petroleum Association ("WSPA"), a nonprofit trade association that represents companies engaged in petroleum exploration, production, refining, transportation, and marketing in the western United States. As we did in 2016, we are writing in opposition to the City's proposed amendments to its zoning code targeting fuel facilities (the "Proposed Amendments"). We ask the City to reject this policy because it is bad for the local economy, hinders transition to cleaner fuels, and hinders safety upgrades.

WSPA members have operated in the energy corridor along Northwest St. Helens Road for decades. This corridor provides key energy and emergency infrastructure as recognized by various city, state, and federal documents. WSPA members remain concerned that the Proposed Amendments lock existing infrastructure in place, which prevents efficiency, environmental, and safety improvements. It also undercuts the ability to meet future energy needs.

If adopted, the Proposed Amendments would be a public policy failure because they create significant adverse impacts on local energy supply, transportation resources, safety, and the economy without achieving their purported objectives, including the intent to reduce greenhouse gas emissions and to mitigate risks posed by earthquakes.

The Proposed Amendments Will Have Significant Adverse Impacts on Regional Energy Supply, Clean Fuels Transition, and Safety.

The Proposed Amendments create more harm than good. They will inflict significant impacts on the ability to supply fuel and change fuel types as the region grows, technology advances, and fuel standards change. The Proposed Amendments freeze existing infrastructure in place by location and size. They would hinder improvements to fuel infrastructure.

1415 L Street, Suite 900, Sacramento, California 95814
(916) 498-7752 ▪ Fax: (916) 444-5745 ▪ Cell: (916) 835-0450
cathy@wspa.org ▪ www.wspa.org

Specifically, the Proposed Amendments would:

- Prevent and discourage terminal upgrades, including tank seismic upgrades, due to the business impacts of capping tank capacity, resulting in *fewer* upgraded tanks;
- Prevent and discourage equipment upgrades necessary to meet market demand or comply with federal and state clean fuels law;
- Prevent and discourage infrastructure upgrades, which typically occur concurrently with market-based infrastructure expansion and improvement;
- Prevent and discourage efficiency upgrades that generally reduce greenhouse gas emissions;
- Prevent and discourage the transition to newer lower-carbon-fuel sources in opposition to Oregon's low-carbon-fuel standards, Oregon's Renewable Fuel Standards, federal Renewable Fuel Standards, and similar laws;
- Fail to provide for sufficient facilities and tank capacity to serve future energy needs;
- Thwart future technologies that do not fit within the current infrastructure framework;
- Exclude Portland from the national and international energy markets;
- Introduce a host of ambiguities and uncertainties to the marketplace that are necessary for a thriving economy;
- Not align with state and federal policy regarding siting energy infrastructure or transportation of fuels;
- Encourage less efficient, higher emission, and potentially less safe transportation by truck over more efficient modes of transportation, such as pipeline; and
- Prohibit new terminals and new intermodal links that can deliver fuel more efficiently and with lower emissions.

In short, the Proposed Amendments would freeze current infrastructure in place. This infrastructure is insufficient for future fuel demand, by both quantity and type of fuel. If Portland had passed a similar ordinance 10, 20, or 30 years ago, the fuel infrastructure in Portland today would have a higher carbon footprint and be less safe.

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The Proposed Amendments will fail to deliver the intended benefits, including any reduction of greenhouse gases ("GHGs") and any increased safety.

While the Proposed Amendments will inflict these negative impacts on the local, state, and regional economy, and ability to transition energy resources, they simultaneously fail to achieve some of their basic objectives. Most notably, they will not reduce GHG emissions. The Proposed Amendments suffer from an incorrect understanding of how GHG emissions occur in the fuel supply chain.

The Proposed Amendments do not limit the regional demand for fuel. Fuel is a classic example of a product with inelastic demand. There are few to no supplements for most types of fuel, so consumers will continue to demand fuel, even if it must be delivered though less efficient modes with greater cost and emissions. As regional demand for fuel quantity grows and demand for types of fuel changes (including increased demand for fuel with less carbon), that fuel will be supplied through some delivery mechanism. The Proposed Amendments, which prohibit new terminals, new intermodal links, and new fuel tanks in Portland, will result in dramatically increased fuel transport by truck. Moving fuel by truck costs more, clogs roads, and increases GHG emissions compared to transport by pipe and tank.

The Proposed Amendments undercut the City's goals. Specifically, the Proposed Amendments would:

- Prevent and discourage terminal safety improvements, including tank seismic upgrades, due to the business impacts of capping tank capacity, resulting in *fewer* upgraded tanks;
- Prevent and discourage safety upgrades, which typically occur concurrently with market-based infrastructure expansion and improvement;
- Require locating fossil fuel tanks in liquefaction zones by prohibiting relocation of fossil fuel tanks outside of mapped liquefaction areas in Portland;
- Prohibit siting newer, lower emission fuel facilities;
- Prevent and discourage efficiency upgrades that generally reduce greenhouse gas emissions;
- Prohibit new fuel tanks for blended fuels that transition towards lower-carbon-fuel sources; and
- Encourage higher emission and potentially less safe transportation by truck over more efficient modes of transportation, such as pipeline.

The Proposed Amendments unfortunately do not help—and in fact, significantly hinder—the City's goals of reducing GHG emissions and increasing facility safety, particularly as it relates to earthquake hazards.

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Conclusion.

We respectfully ask that the City Council reject the Proposed Amendments. If enacted, the Proposed Amendments would cause significant negative impacts to the City's economy, energy supply, and transportation resources. At the same time, the amendments would undercut the City's goals by causing a net increase in GHG emissions, hinder the transition to cleaner fuels, reduce the number of safety improvements in Portland, and prohibit relocating fuel tanks out of liquefaction zones.

We welcome any questions or comments you might have. Please contact me or my staff Holli Johnson at (360) 352-4506 or by email at hjohnson@wspa.org.

Sincerely,



cc: Holli Johnson - WSPA
Jessica Spiegel - WSPA
Sophie Ellinghouse - WSPA

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Moore-Love, Karla

From:	Nancy Hiser <nancyhiser@comcast.net>
Sent:	Monday, November 18, 2019 6:49 PM
To:	Council Clerk – Testimony
Subject:	Linnton Neighborhood Association Written Testimony on CEI Hub, Zenith Energy
Attachments:	CC Testimony Zenith Energy Expansion.docx; CC Testimony Tank Farm Statement.docx

Dear Mayor Wheeler and City Commissioners,

Since we are unable to be present on 4/20/19 to testify before you, please find 2 written documents from
Linnton Neighborhood Association:
1) Tank Farm Position Statement (September 2018)
2) Zenith Energy Expansion Position Statement (September 2019)

Past President of LNA, Shawn Looney, testified before the Multnomah County Commissioners on 10/31/19 about
The CEI Hub and Zenith's planned expansion. We were very pleased in the Commissions unanimous vote to reject
Zenith's expansion and to seek financial surety for any potential damage caused by the tank farms.

We look forward to learning of the city's decisions on these matters.

Sincerely,

Nancy Hiser
Linnton Neighborhood Association Co-Chair
503-713-3468

189807

Linnton Neighborhood Association
Environmental Committee
September 13, 2019

We are concerned that transporting tar sands crude oil by rail poses immense risks to our community and the environment from accidents, potential spills, and explosions. We think the terminal facility site is prone to soil liquefaction that could cause tank failure during a Cascadia Subduction Zone earthquake or other seismic event. The marine tankers also pose unique risks to the Willamette River from spills or leaks. The City of Portland's Climate Action Plan acknowledges the need to dramatically reduce greenhouse gas emissions to mitigate the effects of climate change and tar sands are the most polluting form of fossil fuel.

We oppose the Zenith Energy expansion and all projects for new or expanded facilities that will result in an increase of tar sands transport or storage in Portland. We urge the Portland City Council, Multnomah County Commission, agencies, and officials to deny all support and permits for Zenith Energy and all future permits for new or expanded fossil fuel facilities. Portland City Council, Multnomah County Commission, and relevant agencies should conduct a neighborhood-by-neighborhood fossil fuel risk assessment that studies routine and worst case scenarios for spills, leaks, explosions, and train derailment.

We urge the Portland City Council and Multnomah County Commission to pursue policies that hold fossil fuel companies financially accountable for their pollution and other potential and real damage to Portland and surrounding waterways.

As a community living and working along the rail line, we are concerned about the threat to life, safety, health, and the environment due to accidents, potential spills, and explosions posed by oil trains carrying tar sands crude, by marine tankers, and at the CEI Hub. Increased rail traffic brings additional health impacts to Portland residents from diesel pollution.

Sincerely,

Nancy Hiser
Environmental Co-Chair for Linnton Neighborhood Association

September 5, 2018
Endorsed by Linnton Neighborhood Association

TANK FARM POSITION STATEMENT

Communities along the Willamette, such as Linnton, value our views of four mountains and the sight of the flowing river. The forests surround us and sounds of foghorns are heard in the early morning hours. It is generally a peaceful scene. But the 6-mile riverfront is also home to scores of fuel tanks—a potentially catastrophic threat to local people and their homes. However, these tanks supply 90% of the entire state's fuel (gasoline, diesel, jet fuel, electricity) and pose a severe challenge to all of Oregon's resilience following a major seismic event. The Cascadia fault, the primary seismic hazard, runs for 700 miles from northern California to southern Canada.

History of Reports

The Oregon Resiliency Plan was published in 2013 by the Oregon Seismic Safety Policy Advisory Commission. After Oregon's Department of Geology and Mineral Industries (DOGAMI) staff studied the Critical Energy Infrastructure (CEI) Hub, they cited "major seismic vulnerabilities" due to "no or antiquated standards of building structure" and "soils susceptible to liquefaction." According to this report, "Cascadia earthquakes pose substantial risk to the CEI Hub and to Oregon. Not only are the energy sector facilities in the CEI Hub dependent on other sectors and systems in Oregon, including transportation and communication, they are interdependent upon each other." They recommended to the state that placement of tanks be diversified and located on bedrock.

Tony Schick, writing for OPB in 2015 in "How We Mapped NW Portland's 'Tank Farms'" furthered our knowledge of the CEI Hub risks. Schick dubbed the CEI Hub "Oregon's Seismic Achilles Heel" and stated, "when OPB began its coverage of the Cascadia subduction zone and Oregon's seismic vulnerabilities, the 'tank farms' in Northwest Portland emerged very quickly as an important part of the series." OPB produced a mapped database of storage tanks and their contents, each tank shaded according to the year of its construction, confirming these tanks dated back to the 1920's when seismic standards did not exist. Map tiles from historic topographic maps from 1905 were used to show where lakes, marshes, and the river path used to be. Then, using Portland's building footprint data, they identified where fill had been used to create the infrastructure to support the creation of commercial and industrial areas, including fuel tanks, substations, pipelines and transmission lines, thus confirming the locations of liquefaction risk.

So, how vulnerable are we?
Consider the variables here, each of which causes concern but taken together are a recipe for disaster.

- The CEI Hub is built on dredged soil which is likely to liquefy in an earthquake. In OPB's report, "the soils could become permeated with water, giving them the consistency of a sandy pudding. If that happens, it can damage buildings, tanks, and pipes." A report from the City Club of Portland, "Big Steps Before The Big One," echoes that prediction.

- Tanks were constructed scores of years ago. They date back to 1929, before any modern day seismic standards were established. This heightens the risk of their failure during an earthquake: toppling, splitting, and exploding are all possible.

- Pipelines are projected to suffer hundreds of breaks and scores of leaks. How effective will the current remediation efforts of operators be? These efforts include remotely operated valves, check valves, enhanced leak detection systems, and increased surveillance.

- Geologic fault structure and the activity of the Juan de Fuca plate have been studied by experts. They state there is a 15% probability of a whole margin subduction event in the next 50 years, and this figure jumps to 37% for a southern margin subduction event. Predictions of destruction are huge: 15 of 17 bridges, 1 out of every 3 fire stations, 1 of every 2 police stations, 2 out of 3 hospitals, and 3000 schools, according to Scott Burns, PSU seismic geologist. Following a major seismic event there will be no electricity for 1-3 months, no water for 1 month, no sewer or highways for 6 months, and taxpayers will pay 75% of the cost. The New Yorker predicts the devastation in detail at https://www.newyorker.com/magazine/2015/07/20/the-really-big-one

- Structures which are responsible for gasoline, diesel, jet fuel, and electricity are located in close proximity. The energy required for disaster recovery will be high. Resiliency will be inversely proportional due to impaired infrastructure for these key resources: energy, communication, and transportation.

What should we do?
This is not a NIMBY ("not in my backyard") position. Energy sources should not be centralized in any singular location, but especially not in one that is unstable and hazardous. Not only will their proximity exacerbate a disaster, but they will collectively handicap our recovery efforts. Those knowledgeable about the world's seismic events, such as Scott Burns, report the recovery efforts following a major seismic event are daunting and we must do all that we can to minimize the risk and maximize our recovery potential.

We acknowledge the following efforts:

The City Club of Portland recommends the following to reduce the risk of catastrophic CEI Hub Failure:

1. Oregon's DOGAMI should commission a geotechnical study of soils of the CEI Hub and alternatives for soil hardening. If grant funding is available, the Legislature should appropriate funds for the study.
2. The Governor and Legislature should designate a single state agency to oversee seismic risks at the CEI Hub. That agency should have the authority to:
   - Require all owners of CEI Hub facilities to provide an engineering assessment of their facilities' vulnerability to a CSZ earthquake and other information relevant to mitigating the current risks.
   - Develop and implement, in collaboration with industry stakeholders, standards for construction and retrofit of storage tanks at the CEI Hub. The standards should be designed to prevent releases and to preserve substantial functionality in the event of a CSZ earthquake.

The Oregon Seismic Safety Policy Advisory Committee has been formally tasked to conduct a 15-month study of the CEI Hub with a report to be submitted to the Office of the State Resilience Officer by December 31, 2019. The report will be provided to the House and Senate Veteran and Emergency Preparedness Committees with recommendations for the 2020 legislative short session which will focus on:

1. Conducting an analysis of state and federal guidance on the regulatory authority for seismic upgrades to both structures (tanks, terminals) and pipelines, to include land mitigation.
2. Working in conjunction with Oregon Solutions, determine incentives from a public-private view that focuses on hardening current infrastructure.
3. Showcasing the Earthquake Early Warning (ShakeAlert) system to encourage seismic awareness within the private sector.
4. Determining if a current state agency has statutory authority to develop long-term mitigation efforts. If not, recommend which state agency would be best suited for this new authority.

SB 850, Community Resilience Report, will be released in September 2018. https://gov.oregonlive.com/bill/2017/SB850/

The above efforts promise to be lengthy and costly processes with unknown success. We don't need to make decisions about what is to be done; the experts have already done that: The CEI Hub must be decentralized and relocated to stable bedrock areas.

Sarita Vasquez

#62458 | November 13, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

Hello Council Members, Quite simply, supporting fossil fuels and all of their evils way back when we didn't have solar ad wind maybe was ok but now we are in a different era. We can do things differently and one of those things we can do differently is make better choices. We've seen time and time again the issues with regard to the impact on our environment. It's time we choose the environment over big bully corporate pressure and let's keep moving forward with clean fuels that are renewable and don't create harm to our environment. No to fossil fuel terminals.

Testimony is presented without formatting.

Todd Aschoff

#62415 | November 9, 2019

Testimony to on the **Fossil Fuel Terminals Zoning Amendments, Remand Draft**

If Les Schwab wants to expand a truck tire facility (trucks deliver gasoline, oil) , wouldn't that be improving Fossil Fuel infrastructure. Their competitors will sue and stop the expansion. When PGE upgrades their natural gas lines, isn't that ..... When an asphalt factory improves their pollution control schemes, aren't they improving fossil fuel infrastructure? I think the ordinance , while well intentioned, is severely flawed.

Testimony is presented without formatting.

Fossil Fuel Terminal Zoning Amendments
Technical Amendment
Neighborhood Contact in EG and I zones

November 20, 2019

Commentary

33.140.050 Neighborhood Contact in EG and I zones

Paragraph B.2 is being amended to include reference to sites with a Bulk Fossil Fuel Terminal use. The contact requirement in the EG and I zones was specifically intended for Bulk Fossil Fuel Terminals as is clearly described in the purpose statement. Reference to sites with Bulk Fossil Fuel Terminal uses was inadvertently left out of the code.

33.140.050 Neighborhood Contact in EG and I Zones

A. Purpose. Neighborhood contact is required when a new storage structure for any type of fuel will be built on a Bulk Fossil Fuel Terminal because of the impacts that fuel projects can have on the surrounding community.

B. Neighborhood contact requirement. Proposals meeting the following conditions are subject to the neighborhood contact steps of 33.705.020.B., Neighborhood contact II. All of the steps in 33.705.020.B must be completed before an application for a building permit can be submitted.

1. The proposed development has not been subject to a land use review; and

2. The proposed development includes at least one new structure for the storage of any type of fuel on a site with a Bulk Fossil Fuel Terminal use.

Commentary

33.730 Quasi-Judicial Procedures

The following amendments correct a mistake that was made as part of the recently adopted Neighborhood Contact Update project. The Neighborhood Contact Update project simplified, clarified and made the existing neighborhood contact requirements more effective. The only existing neighborhood contact requirement in the EG and I zones is a requirement related to development of new fuel storage tanks on fossil fuel terminals. In keeping with the policy direction of the project (clarify the exisiting rules), the Neighborhood Contact Update project did not add neighborhood contact requirements for development other than fuel tanks in the EG or I zones. However, an exemption for development in EG and I zones was inadvertently left out of the code that details the neighborhood contact steps for a land use review. The following amendments add that exemption.

33.730.013 Expedited Land Division Procedure

The Expedited Land Division (ELD) procedure provides an alternative to the standard procedures for some land divisions. The applicant may choose to use the ELD process if the land division request meets all of the elements specified in ORS 197.360. The steps of this procedure are in ORS 197.365 through .375. The application requirements are listed in Section 33.730.060, below. Two additional steps are required for land division requests using the ELD Procedure:

A. Neighborhood contact.

1. When the ELD includes four to ten lots, the applicant is required to meet the neighborhood contact requirements specified in 33.705.020.A., Neighborhood contact I. If the proposed expedited land division is in an EG or I zone, it is exempt from the neighborhood contact requirements.

2. When the ELD includes eleven or more lots, the applicant is required to meet the neighborhood contact requirements specified in 33.705.020.B., Neighborhood contact II. If the proposed expedited land division is in the EG1, EG2, or an I zone, it is exempt from the neighborhood contact requirements.

B. Pre-application conference. A pre-application conference is required for all land division requests processed through the ELD procedure. See 33.730.050, Pre-Application Conference. The pre-application conference must be held before applying for an ELD review.

33.730.014 Type I Procedure

The Type I procedure is an administrative process with public notice but no hearing.

A. Pre-application conferences. A pre-application conference is not required.

B. Neighborhood contact.

1. When the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

Commentary

2. When the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.725.020.B., Neighborhood contact II, are required. If the proposed development is in the EG1 , EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

C.-H.[No change]

33.730.015 Type Ix Procedure
The Type Ix procedure is an administrative process with public notice but no hearing.

A. Pre-application conferences. A pre-application conference is optional.

B. Neighborhood contact.

1. When the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

2. When the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.705.020.B., Neighborhood contact II, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

C.-H.[No change]

33.730.020 Type II Procedure
The Type II procedure is an administrative process, with the opportunity to appeal the Director of BDS's decision to another review body.

A. Pre-application conference. A pre-application conference is optional unless it is a specific requirement of a review. See 33.730.050, Pre-Application Conference.

B. Neighborhood contact.

1. When the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site and no portion of the site is in the Design overlay zone, the neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

Commentary

2. When the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site and no portion of the site is in the Design overlay zone, the neighborhood contact steps of 33.705.020.B., Neighborhood contact II, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

3. When the proposed development associated with the land use review will result in the addition of more than 10,000 square feet of net building area to the site and the site is in the Design overlay zone, the neighborhood contact steps of 33.705.020.C, Neighborhood contact III, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

C.-J. [No change]

33.730.025 Type IIx Procedure

The Type IIx procedure is an administrative process, with the opportunity to appeal the Director of BDS's decision to another review body.

A. Pre-application conference. A pre-application conference is optional. See 33.730.050, Pre-Application Conference.

B. Neighborhood contact.

1. The neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required when:

   a. The application is for a land division that includes four to ten lots; or

   b. The application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

2. When the application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site, the neighborhood contact steps of 33.705.020.B., Neighborhood contact II, are required. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

C.-J. [No change]

Commentary

33.730.030 Type III Procedure

A Type III procedure requires a public hearing before an assigned review body. Subsections A through ED apply to all sites. If the site is within the City of Portland, Subsections FE through IH also apply. If the site is in the portion of unincorporated Multnomah County that is subject to City zoning, Subsection JI also applies.

A. Pre-application conference. A pre-application conference is required for all requests processed through a Type III procedure. See 33.730.050, Pre-Application Conference.

B. Neighborhood contact.

1. The neighborhood contact steps of 33.705.020.A., Neighborhood contact I, are required when:

   a. The application is for a land division that includes four to ten lots and does not include an environmental review; or

   b. The application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of at least 10,000 square feet and not more than 25,000 square feet of net building area to the site and no portion of the site is in the Design overlay zone. If the proposed development is in the EG1, EG2, or an I zone, or it has already met the neighborhood contact requirements as part of a building permit process, it is exempt from the neighborhood contact requirements.

2. The neighborhood contact steps of 33.705.020.B., Neighborhood contact II, are required when:

   a. The application is for a land division that includes eleven or more lots and does not include an environmental review; or

   b. The application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of more than 25,000 square feet of net building area to the site and no portion of the site is in the Design overlay zone. If the proposed development is in the EG1, EG2, or an I zone, or it was subject to a building permit process, it is exempt from the neighborhood contact requirements.

3. The neighborhood contact steps of 33.705.020.C., Neighborhood contact III, are required when:

   a. The application is for a land division that includes an environmental review; or

   b. The application is for a land use review other than a land division and the proposed development associated with the land use review will result in the addition of more than 10,000 square feet of net building area to the site and the site is in the Design overlay zone. If the proposed development is in the EG1, EG2, or an I zone it is exempt from the neighborhood contact requirements.

The Bureau of Planning and Sustainability is committed to providing equal access to information and hearings.

If you need special accommodation, please call 503-823-7700, the City's TTY at 503-823-6868, or the Oregon Relay Service at 711.

www.portlandoregon.gov/bps

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Fossil Fuel Terminal Zoning

RETURN SERVICE REQUESTED

Fossil Fuel Terminal Zoning

Portland City Council Hearing
November 20, 2019 at 2:00 P.M.

Council Chambers, City Hall
1221 SW 4th Avenue, Portland, Oregon.

Watch City Council sessions live: www.portlandoregon.gov/28258

City Council Hearing on:
Fossil Fuel Terminal Zoning

Why am I receiving this notice?

You are receiving this notice because you responded in writing to the matter, testified at a previous related hearing, or have requested notice of this hearing.

What is this project about?

This City Council hearing is a reconsideration of Fossil Fuel Terminal Zoning amendments that were adopted in 2016. That ordinance was appealed to the Oregon Supreme Court and is now back before City Council. These code changes restrict development and expansion of Bulk Fossil Fuel Terminals.

- Bulk Fossil Fuel Terminals are characterized by (a) marine, railroad, or pipeline transport access and (b) either storage capacity exceeding 2 million gallons or transload facilities (such as rail-to-ship loading)
- Fossil fuels include petroleum products (such as crude oil and gasoline), coal, natural gas, and propane, and methanol, which is produced from natural gas.
- No new Bulk Fossil Fuel Terminals are allowed.

The existing Bulk Fossil Fuel Terminals in Industrial and General Employment zones become "limited uses" that can continue to operate. Expansion of fossil fuel storage at these existing terminals would be prohibited, with limited exceptions.

The code changes will not apply to gas stations; distributors and wholesalers that receive and deliver fossil fuels exclusively by truck; industrial, commercial, institutional, and agricultural uses that store fossil fuels for use as an input; uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses. Fossil fuel storage facilities for airports, marine terminals, rail yards, and fleet vehicle fuel facilities are specifically exempted.

How can I review this proposal?

The Remand Report is available at www.portlandoregon.gov/bps/71118. Hard copies are available at the BPS office at 1900 SW 4th Avenue, 7th floor. The bureau receptionist will mail you a copy if you call 503-823-7700.

How can I comment on this proposal?

Testify at the City Council hearing. The hearing, on **November 20, 2019, at 2:00 p.m.**, will be in Council Chambers at City Hall, 1221 SW 4th Avenue. MAX and many buses serve this building; call Tri-Met at 503-238-7433 or go to their web site at http://www.trimet.org for routes and times.

Submit written testimony to City Council. Written testimony can be provided by the following options and must be received by the time of the hearing and include your name and address.

Use the Map App	Use U.S. Mail:
www.portlandoregon.gov/bps/mapapp Select **Fossil Fuel Terminal Zoning** and click on the "Testify" button. Testifying in the Map App is as easy as sending an email.	City Council Fossil Fuel Terminal Zoning Testimony 1221 SW Fourth Avenue, Room 130 Portland, OR 97204

For more information

Contact Tom Armstrong, Supervising Planner, at the Bureau of Planning and Sustainability 503-823-3527 or tom.armstrong@PortlandOregon.gov or visit the Bureau of Planning and Sustainability's website: www.portlandoregon.gov/bps/71118.

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CHAIR/LAND USE CHAIR ST JOHNS NA	ST JOHNS NA C/O NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217-6827
CHAIR/LAND USE CHAIR HAYDEN ISLAND NA	HAYDEN ISLAND NEIGHBORHOOD NETWORK	2209 N SCHOFIELD ST	PORTLAND OR 97217-6827
CHAIR/LAND USE CHAIR KENTON NA	KENTON NA C/O NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217-6827
CHAIR/LAND USE CHAIR BRIDGETON NA	BRIDGETON NA C/O NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217-6827
CHAIR/LAND USE CHAIR EAST COLUMBIA NA	EAST COLUMBIA NA C/O NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217-6827
CHAIR/LAND USE CHAIR PORTSMOUTH NA	PORTSMOUTH NA C/O NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217-6827
CHAIR/LAND USE CHAIR UNIVERSITY PARK NA	UNIVERSITY PARK NA C/O NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217-6827
CHAIR/LAND USE CHAIR PIEDMONT NA	PIEDMONT NA C/O NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217-6827
CHAIR/LAND USE CHAIR ARBOR LODGE NA	ARBOR LODGE NA C/O NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217-6827
CHAIR/LAND USE CHAIR CATHEDRAL PARK NA	CATHEDRAL PARK NA C/O NPNS	2209 N SCHOFIELD ST	PORTLAND OR 97217-6827
PRESIDENT/CHAIR NPNS	NPNS - NORTH PORTLAND NEIGHBORHOOD S	2209 N SCHOFIELD ST FL 2	PORTLAND OR 97217
MICHELLE RUDD PSC COMMISSIONER		2213 NW PINNACLE DR	PORTLAND OR 97229-9108
PDC - BUREAU DIRECTOR	PORTLAND DEVELOPMENT COMMISSION	222 NW 5TH AVE	PORTLAND 97209
PDC PORTLAND DEV COMMISSION	PDC - PORTLAND DEVELOPMENT COMMISSIC	222 NW 5TH AVE	PORTLAND OR 97209
JOANNE JENI		2221 SW 1ST AVE APT 1921	PORTLAND OR 97201-5071
PRESIDENT/CHAIR NWNW	NWNW - NEIGHBORS WEST / NORTHWEST	2257 NW RALEIGH ST	PORTLAND OR 97210
CHAIR/LAND USE CHAIR NORTHWEST INDUST	NORTHWEST INDUSTRIAL NA C/O NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
CHAIR/LAND USE CHAIR GOOSE HOLLOW NA	GOOSE HOLLOW FOOTHILLS LEAGUE C/O NW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
CHAIR/LAND USE CHAIR NORTHWEST DISTRIC	NORTHWEST DISTRICT ASSN C/O NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
CHAIR/LAND USE CHAIR OLD TOWN CHINATC	OLD TOWN COMMUNITY ASSOCIATION C/O N	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
CHAIR/LAND USE CHAIR NORTHWEST HEIGHT	NORTHWEST HEIGHTS NA C/O NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
CHAIR/LAND USE CHAIR PEARL DISTRICT NA	PEARL DISTRICT NA C/O NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
CHAIR/LAND USE CHAIR PORTLAND DOWNTC	PORTLAND DOWNTOWN NA C/O NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
CHAIR/LAND USE CHAIR SYLVAN-HIGHLANDS	SYLVAN-HIGHLANDS NA C/O NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
CHAIR/LAND USE CHAIR FOREST PARK NA	FOREST PARK NA C/O NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
CHAIR/LAND USE CHAIR ARLINGTON HEIGHTS	ARLINGTON HEIGHTS NA C/O NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
CHAIR/LAND USE CHAIR HILLSIDE NA	HILLSIDE NA C/O NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
CHAIR/LAND USE CHAIR LINNTON NA	LINNTON NA C/O NWNW	2257 NW RALEIGH ST	PORTLAND OR 97210-2630
CHRIS SMITH		2343 NW PETTYGROVE ST	PORTLAND OR 97210-2609
PAUL LEISTNER		2350 SE 57TH AVE	PORTLAND OR 97215-4006

EMILY SCHELLING		2435 NE 46TH AVE	PORTLAND OR 97213-1907
CHAIR/PRESIDENT NOB HILL BA	NOB HILL BUSINESS ASSOCIATION	25 NW 23RD PL STE 6 - PMB 217	PORTLAND OR 97210
CHAIR/PRESIDENT ALBERTA STREET BA	ALBERTA STREET BUSINESS ASSOCIATION	2529 NE ALBERTA ST	PORTLAND OR 9721
GREG MADDEN	MADDEN FABRICATION	2550 NW 25TH PL	PORTLAND OR 97210-1843
CHAIR/PRESIDENT BURNSIDE EAST BA	BURNSIDE EAST BUSINESS ASSOCIATION	2705 E BURNSIDE ST UNIT 110	PORTLAND OR 97214-1763
MIKE PEDERSON	ROSE CITY AWNING	2728 NW NELA ST	PORTLAND OR 97210-1714
ANNE DAVIDSON		2756 NW RALEIGH ST	PORTLAND OR 97210-2457
THERESA ST MARTIN		2833 NE KNOTT ST	PORTLAND 97212
LESLIE CENTNER AND KENNETH CENTNER		2903 NW LURAY TER	PORTLAND OR 97210-2716
CHAIR/PRESIDENT EAST BURNSIDE BA	EAST BURNSIDE BUSINESS ASSOCIATION	2929 E BURNSIDE ST	PORTLAND OR 97214-1831
TED SOFIANOS	MACKINS AUTO BODY	300 SE HEARTHWOOD	VANCOUVER WA 98684
TERESA PENNINGER	ODOT - REGION 5	3012 ISLAND AVE	LA GRANDE OR 97850-9497
PETER FINLEY-FRY	COLUMBIA PACIFIC PLANNING	303 NW UPTOWN TER UNIT 1B	PORTLAND 97210
GEOFF GRANUM		3039 SE 119TH AVE	PORTLAND OR 97266-1615
JOHN BARKER	JOHN H BARKER ARCHITECT	3124 SE TAYLOR ST	PORTLAND OR 97214-4037
TYLER GILLIGAN	KINDER MORGAN LIQUIDS TERMINALS LLC	3250 LACEY RD SUITE 700	DOWNERS GROVE IL 60515
ANDREW JANSKY	FLOWING SOLUTIONS	3305 SW 87TH AVE	PORTLAND OR 97225-2826
MELISSA DARBY		3327 NE SIMPSON ST	PORTLAND OR 97211-7367
BARBARA SESTAK		3330 NE KLICKITAT ST	PORTLAND OR 97212-2668
CHRIS DAVIS		3335 NE 27TH AVE	PORTLAND OR 97212-2526
BETTY WOLLAM	SWINERTON BUILDERS OF OREGON	342 SW 2ND AVE	PORTLAND 97204
SHELLEY HOLLY		3425 NE 18TH AVE	PORTLAND OR 97212-2331
GARY LEARNING	ODOT - REGION 3	3500 NW STEWART PKY	ROSEBURG OR 97470-1600
JARED CASTLE	ODOT - REGION 3	3500 NW STEWART PKY	ROSEBURG OR 97470-1600
CHAIR/PRESIDENT BEAUMONT BA	BEAUMONT BUSINESS ASSOCIATION	3519 NE 15TH AVE STE 540	PORTLAND OR 97212
CHAIR/PRESIDENT DIVISION/CLINTON BA	DIVISION/CLINTON BUSINESS ASSOCIATION	3534 SE MAIN ST	PORTLAND OR 97214-4263
PRESIDENT/CHAIR SEUL	SEUL - SOUTHEAST UPLIFT NA	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR SUNNYSIDE NA	SUNNYSIDE NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR CRESTON-KENILWOR	CRESTON-KENILWORTH NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR FOSTER-POWELL NA	FOSTER-POWELL NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR REED NA	REED NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR LAURELHURST NA	LAURELHURST NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR BROOKLYN ACTION C	BROOKLYN ACTION CORPS C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR HOSFORD-ABERNETH	HOSFORD-ABERNETHY NEIGHBORHOOD DEV	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR MT TABOR NA	MT TABOR NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR RICHMOND NA	RICHMOND NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR SELLWOOD-MORELA	SELLWOOD-MORELAND IMPROVEMENT LEAG	3534 SE MAIN ST	PORTLAND OR 97214-4263

CHAIR/LAND USE CHAIR SOUTH TABOR NA	SOUTH TABOR NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR WOODSTOCK NA	WOODSTOCK NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR NORTH TABOR NA	NORTH TABOR NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR ARDENWALD/JOHNS	ARDENWALD-JOHNSON CREEK NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR BRENTWOOD/DARLI	BRENTWOOD-DARLINGTON NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR EASTMORELAND NA	EASTMORELAND NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR BUCKMAN COMMUI	BUCKMAN COMMUNITY ASSN C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR MONTAVILLA NA	MONTAVILLA NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR MT SCOTT-ARLETA N	MT SCOTT-ARLETA NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/LAND USE CHAIR KERNS NA	KERNS NA C/O SEUL	3534 SE MAIN ST	PORTLAND OR 97214-4263
CHAIR/PRESIDENT MULTNOMAH VILLAGE BA	MULTNOMAH VILLAGE BUSINESS ASSOCIATIC	3540 SW CALIFORNIA ST	PORTLAND OR 97219-1679
SCOTT PRATT		3545 SE ANKENY ST	PORTLAND OR 97214-2046
ROB KEBBON		3627 SW CORBETT AVE	PORTLAND OR 97239-4328
CHAIR/PRESIDENT MIDWAY BA	MIDWAY BUSINESS ASSOCIATION	3758 SE 122ND AVE	PORTLAND OR 97236-3405
OCCUPANT	ZENITH ENERGY TERMINALS HOLDINGS LL	3900 ESSEX LN STE 700	HOUSTON TX 77027
SUSAN ARTHUR		3909 E FOURTH PLAIN BLVD UNIT 55	VANCOUVER WA 98661-5127
KATHRYN LAVENNE		3915 SE 103RD AVE	PORTLAND OR 97266-2407
NEIL MCFARLANE	TRIMET	4012 SE 17TH AVE	PORTLAND OR 97202-3940
GREGG EVERHART		4014 SE TAYLOR ST	PORTLAND OR 97214-4440
JEAN BAKER	ADA'S HEIR'S	4039 SE GRANT CT	PORTLAND OR 97214-5942
CHAIR/PRESIDENT WOODSTOCK COMMUNIT	WOODSTOCK COMMUNITY BUSINESS ASSOCI	4207 SE WOODSTOCK BLVD UNIT PMB 130	PORTLAND OR 97206
BHCD - BUREAU DIRECTOR	PORTLAND HOUSING BUREAU	421 SW 6TH AVE STE 500	PORTLAND 97205
MELANIE MCCANDLESS		4240 SE STARK ST UNIT C	PORTLAND OR 97215-1644
CHAIR/LAND USE CHAIR HEALY HEIGHTS NA	HEALY HEIGHTS NA	4273 SW COUNCIL CREST DR	PORTLAND OR 97239-1530
ABIGAIL CERMAK		436 NE WYGANT ST	PORTLAND OR 97211-3360
TOM ARCHER	PBS ENVIRONMENTAL	4412 SW CORBETT AVE	PORTLAND OR 97239-4207
PRESIDENT/CHAIR CENTRAL NE NEIGHBORS	CNN - CENTRAL NORTHEAST NEIGHBORS	4415 NE 87TH AVE	PORTLAND OR 97220-4901
CHAIR/LAND USE CHAIR SUNDERLAND NA	SUNDERLAND NA C/O CNN	4415 NE 87TH AVE	PORTLAND OR 97220-4901
CHAIR/LAND USE CHAIR CULLY NEIGHBORHO	CULLY NEIGHBORHOOD ASSN C/O CNN	4415 NE 87TH AVE	PORTLAND OR 97220-4901
CHAIR/LAND USE CHAIR SUMNER NA	SUMNER ASSOCIATION OF NEIGHBORS C/O C	4415 NE 87TH AVE	PORTLAND OR 97220-4901
CHAIR/LAND USE CHAIR BEAUMONT-WILSHIF	BEAUMONT-WILSHIRE NA C/O CNN	4415 NE 87TH AVE	PORTLAND OR 97220-4901
CHAIR/LAND USE CHAIR ROSEWAY NA	ROSEWAY NA C/O CNN	4415 NE 87TH AVE	PORTLAND OR 97220-4901
CHAIR/LAND USE CHAIR MADISON SOUTH NA	MADISON SOUTH NA C/O CNN	4415 NE 87TH AVE	PORTLAND OR 97220-4901
CHAIR/LAND USE CHAIR HOLLYWOOD NA	HOLLYWOOD NA C/O CNN	4415 NE 87TH AVE	PORTLAND OR 97220-4901
CHAIR/LAND USE CHAIR GRANT PARK NA	GRANT PARK NA C/O CNN	4415 NE 87TH AVE	PORTLAND OR 97220-4901
CHAIR/LAND USE CHAIR ROSE CITY PARK NA	ROSE CITY PARK NA C/O CNN	4415 NE 87TH AVE	PORTLAND OR 97220-4901
CELESTE LEWIS	CELESTE LEWIS ARCHITECT	4486 SW WASHOUGA AVE	PORTLAND OR 97239-1393

JEFFREY OWEN AND HEATHER MCCAREY		4526 SE HARRISON ST	PORTLAND OR 97215-3172
LOUIS TORRES	ODOT - REGION 2	455 AIRPORT RD BLDG B	SALEM OR 97301
DAVID RASMUSSEN		4764 SE MILWAUKIE AVE	PORTLAND OR 97202-4730
KEN SANDBLAST	PLANNING RESOURCES	480 5TH ST	LAKE OSWEGO OR 97034
CRAIG HOPKINS	RAY-BURT'S INC	4800 SE 26TH AVE	PORTLAND OR 97202-4602
CARL BENSON	RAY-BURT'S INC	4800 SE 26TH AVE	PORTLAND OR 97202-4602
JOHN DONNERBERG	REAL PROPERTY CONSULTANTS	4805 SW OLESON RD	PORTLAND OR 97225-1420
GEORGE DONNERBERG	REAL PROPERTY CONSULTANTS	4805 SW OLESON RD	PORTLAND OR 97225-1420
PRESIDENT/CHAIR NECN	NECN - NORTHEAST COALITION OF NEIGHBOI	4815 NE 7TH AVE	PORTLAND OR 97211
CHAIR/LAND USE CHAIR KING NEIGHBORHOC	KING NA C/O NECN	4815 NE 7TH AVE	PORTLAND OR 97211-3939
CHAIR/LAND USE CHAIR SULLIVAN'S GULCH N	SULLIVAN'S GULCH NA C/O NECN	4815 NE 7TH AVE	PORTLAND OR 97211-3939
CHAIR/LAND USE CHAIR VERNON NA	VERNON NA C/O NECN	4815 NE 7TH AVE	PORTLAND OR 97211-3939
CHAIR/LAND USE CHAIR WOODLAWN NA	WOODLAWN NA C/O NECN	4815 NE 7TH AVE	PORTLAND OR 97211-3939
CHAIR/LAND USE CHAIR CONCORDIA NA	CONCORDIA NA C/O NECN	4815 NE 7TH AVE	PORTLAND OR 97211-3939
CHAIR/LAND USE CHAIR HUMBOLDT NA	HUMBOLDT NA C/O NECN	4815 NE 7TH AVE	PORTLAND OR 97211-3939
CHAIR/LAND USE CHAIR ALAMEDA NA	ALAMEDA NA C/O NECN	4815 NE 7TH AVE	PORTLAND OR 97211-3939
CHAIR/LAND USE CHAIR BOISE NA	BOISE NA C/O NECN	4815 NE 7TH AVE	PORTLAND OR 97211-3939
CHAIR/LAND USE CHAIR ELIOT NA	ELIOT NA C/O NECN	4815 NE 7TH AVE	PORTLAND OR 97211-3939
CHAIR/LAND USE CHAIR IRVINGTON NA	IRVINGTON COMMUNITY ASSN	4815 NE 7TH AVE	PORTLAND OR 97211-3939
CHAIR/LAND USE CHAIR SABIN COMMUNITY	SABIN COMMUNITY ASSOCIATION C/O NECN	4815 NE 7TH AVE	PORTLAND OR 97211-3939
CHAIR/PRESIDENT 42ND AVENUE BA	42ND AVENUE BUSINESS ASSOCIAITON	4920 NE 42ND AVE	PORTLAND OR 97218-1502
MICHAEL DANGELO		503 NE 29TH AVE	PORTLAND OR 97232-2411
CHAIR/PRESIDENT NORTH PORTLAND BA	NORTH PORTLAND BUSINESS ASSOCIATION	5036 N LOMBARD ST	PORTLAND OR 97203-4402
LEZLIE BUGG		5124 SE 77TH AVE	PORTLAND OR 97206-4375
OCCUPANT	MC CALL OIL & CHEMICAL CORP	5480 NW FRONT AVE	PORTLAND OR 97210
KEVIN JONES	MC CALL OIL & CHEMICAL CORP	5480 NW FRONT AVE	PORTLAND OR 97210
OCCUPANT	MOREC FRONT LLC	5480 NW FRONT AVE	PORTLAND OR 97210
OCCUPANT	TANKER BASIN LLC	5480 NW FRONT AVE	PORTLAND OR 97210
OCCUPANT	OLYMPIC PIPE LINE CO	550 WESTLAKE PARK BLVD M/C1930D	HOUSTON TX 77079
DIRK KRAMER	ZENITH ENERGY TERMINALS HOLDINGS LL	5501 NW FRONT AVE	PORTLAND OR 97210
NICK GIOTTA	PHILLIPS 66 COMPANY	5528 NW DOANE AVE	PORTLAND OR 97210
JERRY HENDERSON	CHEVRON USA INC	5531 NW DOANE AVE	PORTLAND OR 97210
ERIK NIELSEN		5701 SW 42ND AVE	PORTLAND OR 97221-3520
ANDREW HOLBROOK	KINDER MORGAN LIQUIDS TERMINALS LLC	5880 NW ST HELENS RD	PORTLAND OR 97210
STEVEN YETT		5949 NE CULLY BLVD	PORTLAND OR 97218-3354
TOM HUGHES	METRO REGIONAL COUNCIL	600 NE GRAND AVE	PORTLAND OR 97232-2727
SHIRLEY CADDICK	METRO REGIONAL COUNCIL	600 NE GRAND AVE	PORTLAND OR 97232-2727

CARLOTTA COLLETTE	METRO REGIONAL COUNCIL	600 NE GRAND AVE	PORTLAND OR 97232-2727
CRAIG DIRKSEN	METRO REGIONAL COUNCIL	600 NE GRAND AVE	PORTLAND OR 97232-2727
KATHRYN HARRINGTON	METRO REGIONAL COUNCIL	600 NE GRAND AVE	PORTLAND OR 97232-2727
SAM CHASE	METRO REGIONAL COUNCIL	600 NE GRAND AVE	PORTLAND OR 97232-2727
BOB STACEY	METRO REGIONAL COUNCIL	600 NE GRAND AVE	PORTLAND OR 97232-2727
DIRECTOR	CITY OF MILWAUKEE	6101 SE JOHNSON CREEK BLVD	MILWAUKIE OR 97206-0641
DUNCAN BROWN	LAND USE PLANNING & RESEARCH	61487 SW ELDER RIDGE ST	BEND OR 97702
ALAN PETERS	AMBRIDGE EVENT CENTER	615 SE ALDER ST	PORTLAND OR 97214-2228
GERIK KRANSKY	BICYCLE TRANSPORTATION ALLIANCE (BTA)	618 NW GLISAN ST SUITE 401	PORTLAND OR 97209-3781
DEBBIE MCDUFFEE		6192 SW CAPITOL HWY	PORTLAND OR 97239
AMY PFEIFFER	ODOT - REGION 4	63085 N HIGHWAY 97 STE 107	BEND OR 97701-5765
ERIC WIRFS		63820 CLAUSEN DR STE 100	BEND OR 97701-8063
CHAIR/PRESIDENT 82ND AVE ROSES BA	82ND AVENUE OF ROSES BUSINESS ASSOCIAT	6631 SE 70TH AVE	PORTLAND OR 97206-7349
STEVEN KOLBERG	PETERSEN KOLBERG & ASSOC	6969 SW HAMPTON ST	PORTLAND OR 97223-8560
RANDY PAINTER		7017 NE ROSELAWN ST	PORTLAND OR 97218-3439
BOB LEFEBER	COMMERCIAL REALTY ADVISORS	733 SW 2ND AVE STE 200	PORTLAND OR 97204-3116
ANGELINA MARINO	MARINO MURALS	7331 SW BARBUR BLVD	PORTLAND OR 97219-2807
OCCUPANT	NORTHWEST NATURAL GAS CO	735 SW MORRISON ST	PORTLAND OR 97205
MICHAEL STREIMER	STREIMER SHEET METAL	740 N KNOTT ST	PORTLAND OR 97227-1613
ALLISON REYNOLDS	STOEL RIVES	760 SW NINTH AVE SUITE 3000	PORTLAND OR 97205
PRESIDENT/CHAIR SWNI	SWNI - SOUTHWEST NEIGHBORHOODS INC	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR COLLINS VIEW NA	COLLINS VIEW NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR SOUTHWEST HILLS N	SOUTHWEST HILLS RESIDENTIAL LEAGUE C/O	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR FAR SOUTHWEST NA	FAR SOUTHWEST NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR SOUTH PORTLAND N	SOUTH PORTLAND NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR HILLSDALE NA	HILLSDALE NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR ARNOLD CREEK NA	ARNOLD CREEK NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR ASHCREEK NA	ASHCREEK NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR BRIDLEMILE NA	BRIDLEMILE NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR CRESTWOOD NA	CRESTWOOD NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR HAYHURST NA	HAYHURST NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR HOMESTEAD NA	HOMESTEAD NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR MAPLEWOOD NA	MAPLEWOOD NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR MARKHAM NA	MARKHAM NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR MARSHALL PARK NA	MARSHALL PARK NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR MULTNOMAH NA	MULTNOMAH NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/LAND USE CHAIR SOUTH BURLINGAME	SOUTH BURLINGAME NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457

CHAIR/LAND USE CHAIR WEST PORTLAND NA	WEST PORTLAND PARK NA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2457
CHAIR/PRESIDENT HILLSDALE MAIN STREET B	HILLSDALE MAIN STREET BA C/O SWNI	7688 SW CAPITOL HWY	PORTLAND OR 97219-2692
DOUG ARMSTRONG	ARMSTRONG	7819 SE 105TH AVE	PORTLAND 97266
KEVIN BUFFUM	PACIFIC TERMINAL SERVICES	7900 NW ST HELENS RD	PORTLAND OR 97210
LAURIE WALL		7904 SW 4TH AVE	PORTLAND OR 97219-4618
DAVE WARRINGTON		8131 SW 56TH AVE	PORTLAND OR 97219-3222
SHEILA HOLDEN	PACIFICORP	825 NE MULTNOMAH ST STE 2000	PORTLAND OR 97232-2157
MICHAEL HARRISON	HARRISON CONSULTING	837 NW 25TH AVE	PORTLAND OR 97210-2827
MICHAEL LILLY	MICHAEL J LILLY ATTORNEY AT LAW	8490 SW CECILIA TER	PORTLAND OR 97223
ALLISON MILIONIS		8702 N DELAWARE AVE	PORTLAND OR 97217
GREER KERN		9029 N VAN HOUTEN AVE	PORTLAND OR 97203-2740
MAURA FAHEY	CRAG LAW CENTER	917 SW OAK STREET SUITE 417	PORTLAND OR 97205
GREG GOODMAN	DOWNTOWN DEVELOPMENT GROUP	920 SW 6TH AVE STE 223	PORTLAND OR 97204-1203
TIM EDDY	HENNEBERY EDDY ARCHITECTS	921 SW WASHINGTON ST STE 250	PORTLAND OR 97205-2817
LOU HANSEN		926 SE REX ST	PORTLAND OR 97202-5915
STEVE KOBER	NUSTAR ENERGY	9420 NW ST HELENS RD	PORTLAND OR 97231
ZACHARY KATZ		9440 CLAIRE AVE	NORTHRIDGE CA 91324-2713
MELVIN BROADOUS	RE/MAX EQUITY GROUP	9790 SW NIMBUS AVE	BEAVERTON OR 97008-7172
BARBUR WORLD FOODS	BARBUR WORLD FOODS	9845 SW BARBUR BLVD	PORTLAND OR 97219-6036
BUREAU DIRECTOR POEM	PBEM- PORTLAND BUREAU OF EMERGENCY M	9911 SE BUSH ST	PORLTAND OR 97266
WARREN ROSENFELD	CALBAG METALS	PO BOX 10067	PORTLAND OR 97296-0067
CHAIR/PRESIDENT HISTORIC MISSISSIPPI BA	HISTORIC MISSISSIPPI BUSINESS ASSOCIATION	PO BOX 11106	PORTLAND OR 97211
OCCUPANT	CHEVRON USA INC	PO BOX 1392	BAKERSFIELD CA 93302
CHAIR/PRESIDENT CENTRAL EASTSIDE INDUST	CENTRAL EASTSIDE INDUSTRIAL COUNCIL	PO BOX 14251	PORTLAND OR 97293-0251
CHAIR/PRESIDENT HAWTHORNE BLVD BA	HAWTHORNE BLVD BUSINESS ASSOCIATION	PO BOX 15271	PORTLAND OR 97293
CHAIR/LAND USE CHAIR ARGAY TERRACE NA	ARGAY TERRACE NA C/O EPNO	PO BOX 20635	PORTLAND OR 97294
SHARANE ANTONETTE		PO BOX 2584	PORTLAND OR 97208-2584
OCCUPANT	CHEVRON USA INC	PO BOX 285	HOUSTON TX 77001
CHAIR/PRESIDENT PARKROSE BA	PARKROSE BUSINESS ASSOCIATION	PO BOX 301326	PORTLAND OR 97294-9326
KERRY HAMPTON	PPS - PORTLAND PUBLIC SCHOOLS	PO BOX 3107	PORTLAND OR 97208
CHAIR/PRESIDENT MONTAVILLA/EAST TABOR	MONTAVILLA / EAST TABOR BUSINESS ASSOC	PO BOX 33342	PORTLAND OR 97292-3342
GREG THEISEN	PORT OF PORTLAND	PO BOX 3529	PORTLAND OR 97208-3529
JASON SHEEK	PORT OF PORTLAND	PO BOX 3529	PORTLAND OR 97208-3529
DIRECTOR CITY OF LAKE OSWEGO	CITY OF LAKE OSWEGO	PO BOX 369	LAKE OSWEGO OR 97034-0369
OCCUPANT	TRITON WEST LLC	PO BOX 4369	HOUSTON TX 77210
DIRECTOR CITY OF BEAVERTON	CITY OF BEAVERTON	PO BOX 4755	BEAVERTON OR 97076-4755
CHAIR/PRESIDENT COLUMBIA COORIDOR BA	COLUMBIA CORRIDOR BUSINESS ASSN	PO BOX 55651	PORTLAND OR 97238

HAROLD COE	SPEEDS AUTOMOTIVE & TOWING	PO BOX 55940	PORTLAND OR 97238-5940
OCCUPANT	PHILLIPS 66 COMPANY	PO BOX 5600	BARTLESVILLE OK 74005
OCCUPANT	SEAPORT MIDSTREAM HOLDINGS LLC	PO BOX 5660	DENVER CO 80218
OCCUPANT	EXXONMOBIL OIL CORP	PO BOX 64106	SPRING TX 77387
CHAIR/LAND USE CHAIR LLOYD DISTRICT COM	LLOYD DISTRICT COMMUNITY ASSOCIATION	PO BOX 6762	PORTLAND OR 97228
CHAIR/PRESIDENT PEARL DISTRICT BA	PEARL DISTRICT BUSINESS ASSOCIATION	PO BOX 6767	PORTLAND OR 97228
MIKE HOUCK	URBAN GREENSPACE INSTITUTE	PO BOX 6903	PORTLAND OR 97228-6903
ED WASHINGTON	PSU	PO BOX 751	PORTLAND OR 97206
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OCCUPANT	SHORE TERMINALS LLC	PO BOX 780339	SAN ANTONIO TX 78278
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CHAIR/PRESIDENT HILLSIDE BUSINESS & PROI	HILLSIDE BUSINESS & PROFESSIONAL ASSOCI/	PO BOX 80885	PORTLAND OR 97280
CHAIR/PRESIDENT SELLWOOD-WESTMORELA	SELLWOOD WESTMORELAND BUSINESS ASSO	PO BOX 82103	PORTLAND OR 97282
LYNNE HOFFMAN		PO BOX 82125	PORTLAND OR 97282-0125

Armstrong, Tom

From: DLCD Plan Amendments <plan.amendments@state.or.us>
Sent: Wednesday, October 16, 2019 9:13 AM
To: Armstrong, Tom
Subject: Confirmation of PAPA Online submittal to DLCD

Portland

Your notice of a proposed change to a comprehensive plan or land use regulation has been received by the Oregon Department of Land Conservation and Development.
Local File #: Fossil Fuel Terminal Zoning Re-adoption
DLCD File #: 006-19
Proposal Received: 10/16/2019
First Evidentiary Hearing: 11/20/2019
Submitted by: tarmstrong

If you have any questions about this notice, please reply or send an email to plan.amendments@state.or.us.

2020 Clean Fuels Forecast

Background

Oregon Revised Statutes (2017) Chapter 750, Section 163[1] authorizes the Office of Economic Analysis (OEA), in coordination with the Department of Environmental Quality, to assess the availability of fossil and alternative fuels in Oregon. In particular, the forecast is to determine whether fuel supply will be sufficient to generate alternative fuel credits (on ethanol, electricity, and diesel substitutes - including biodiesel, renewable diesel, natural gas, and propane) to meet the scheduled low carbon fuel standards for the compliance period. The forecast report is required to include an assessment of total deficits and banked credits at the beginning of the compliance period.

In preparing the forecast, the Office of Economic Analysis has formed a Clean Fuels Forecast Advisory Committee comprised of relevant experts and stakeholders to assist in reviewing methodological considerations and various data sources. A membership list can be found in Appendix A.

Data Sources

The forecast uses available public and program data to develop the estimates of low-carbon fuels available to Oregon and estimated consumption of fossil and alternative fuels in Oregon. The sources of this data include:

- Oregon Clean Fuels Program (CFP) Online System
- Fuel Pathway Codes (carbon intensity values) approved in Oregon and California
- Oregon Department of Transportation's (ODOT) Revenue Forecast
- Oregon DMV vehicle registration data
- Annual Energy Outlook and other resources from the US Energy Information Administration
- Trade associations (Renewable Fuels Association and the National Biodiesel Board) on their members' production capacity

Clean Fuels Program 2020 Consumption Forecast

To determine the amount of deficits that will be generated in 2020, and thus the amount of credits needed for compliance, a forecast for consumption of all relevant fuels must be made. The following are the volume projections for each fuel type.

Gasoline Consumption

1,708 million gallons of gasoline, including ethanol, were consumed in 2018, the most recent year of data collected. Growth projections exhibited in the Oregon Department of Transportation's December 2018 forecast equal an annualized 0.8 percent from 2018 to 2020. There were two factors considered in making adjustments to these initial growth parameters: ODOT observed gasoline consumption coming in lower than projected through the first two quarters of 2019. Secondly, the mandated decreases in the carbon intensity targets for fossil fuels incentivize reporting parties to record supplies of fuel in the earliest year

[1] https://olis.leg.state.or.us/liz/2017R1/Downloads/MeasureDocument/HB2017/Enrolled

possible to minimize the deficits generated. For the first factor, growth was adjusted down to 0.4 percentage points. Given that the reduction in the carbon intensity target is the same in percentage terms for 2020 and 2021, ultimately no adjustment was made for potential pull forward in reporting. The final annualized growth in motor gasoline from the 2018 base year through 2020 is 0.4 percent annually, resulting in a projected 1,720.4 million gallons for the total gasoline pool. To determine the amount of conventional gasoline represented, ethanol must be subtracted. The blend rate assumed for 2020 is 10.1 percent, equal to that observed for 2018. The final forecast for conventional gasoline is 1,546.3 million gallons.

Diesel Consumption

According to CFP reported data, 771.2 million gallons of diesel, including bio- and renewable diesel, were consumed in 2018, the most recent year of data collected. Growth projections exhibited in the Oregon Department of Transportation's December 2018 forecast equal an annualized 1.4 percent from 2018 to 2020. The same add-factor considerations noted under the gasoline section were made for diesel as well, particularly the fact that diesel consumption fell far below projections through the first two quarters of 2019. The final annualized growth in total diesel from the 2018 base year through 2020 is -0.6 percent, resulting in a projected 762.5 million gallons of total diesel. To determine the amount of conventional diesel, biodiesel and renewable diesel must be subtracted. The blend rate for these biofuels are assumed to be 6.9 percent and 3.5 percent, respectively. The final forecast for the consumption of conventional diesel in 2020 is 683.2 million gallons.

Ethanol Consumption

The amount of ethanol reported for 2018 equaled 172.2 million gallons. As described above, the amount of ethanol projected for 2020 is based on a blend rate assumption driven by historical observations and trends, as well as blend rates observed in California. Given that the last actual blend rate observation, (for the 2018 compliance year), was 10.1 percent and that most gasoline consumed in Oregon is E10, the assumption for 2020 was maintained at 10.1 percent. This results in a forecast for ethanol consumption of 174.1 million gallons, which is 0.5 percent above the 2018 volume on an annualized basis. As with the fossil fuels, no adjustment was made for behavioral factors associated with the phasing in of the carbon intensity reductions given that the incentive would be similar on either end of the compliance period. This is true for the remaining alternative fuel forecasts, as well.

Electricity Consumption

Consumption of electricity for on-road vehicles is based on a projection of the number of plug-in hybrid and battery electric vehicles in use for the compliance period. DMV vehicle registration data provides actual vehicle numbers historically, from which growth projections and variances are derived to produce the number of electric vehicles projected to be in operation for the 2020 compliance period. This equaled an average of 13,050 Plug-in Hybrids and 19,772 Battery Electric vehicles. Historical volumes of electricity, including estimates for residential charging, are used to calculate average Kilowatt hours per vehicle year. For 2018, this parameter equaled 3,621 Kilowatt hours per year, which was in turn assumed for the 2020 compliance period. When converted to gasoline gallon equivalents, the forecast is 3.5 million gallons including residential charging. This is equivalent to a 25 percent increase from 2018 on an annualized basis.

Biodiesel Consumption

The reported volume of biodiesel in 2018 amounted to 51.7 million gallons. As described above, the amount of biodiesel projected for 2020 is based on a blend rate assumption driven by historical observations and trends, as well as blend rates observed in California. The highest observation in the Clean Fuels program data was 6.9 percent in 2017. This value was assumed for the 2020 forecast, resulting in a consumption projection of 52.6 million gallons. This represents growth of 0.9 percent from the 2018 actual on an annualized basis.

Renewable Diesel Consumption

The amount of renewable diesel reported in 2018 was 1.2 million gallons. Similar to biodiesel, the forecast for renewable diesel is driven by the assumption of the fraction of total diesel consumed comprised of renewable diesel. The blend rate observed for 2018 in the Clean Fuels data was 0.2 percent. In California, similarly small blend rates quickly escalated to 3.0 percent and beyond. Such an adoption schedule is assumed for Oregon, resulting in a blend rate projection for renewable diesel in 2020 of 3.5 percent. This leads to a consumption forecast of 26.7 million gallons, a substantial 369.8 percent above the 2018 value on an annualized basis.

Natural Gas and Propane Consumption

The amount of natural gas, including renewable natural gas (biogas), reported in 2018 in diesel gallon equivalents equaled 3.2 million gallons. This represented 14.7 percent growth from the prior year. Annualized growth from the 2018 base year to 2020 is assumed to be 6.9 percent, equal to the Energy Information Administration's outlook for the Pacific region. This results in a forecast of 3.6 million gallons, which is 6.9 percent annually above the 2018 level.

Propane exhibits the smallest quantity of alternative fuel reported in 2018 at 0.7 million gasoline gallon equivalents. However, this was 477.1 percent above the 2017 reported value. Annualized growth from the 2018 base year to 2020 is assumed to be 213.9 percent, resulting in a forecast of 7.3 million gallons.

The following table presents the 2020 consumption forecast in detail. Note that the percent change figures for 2020 represent annual growth from the last available actuals in 2018. To the extent that 2018 actuals were not known at the time the 2019 forecast was released, this explains the significant variance in changes related to the 2019 forecast. Presenting annualized changes from 2018 is thus more informative.

Table 1: Summary of fossil and alternative fuel consumption

(Mil. gallons, percent)	2018 Actual	2019 Forecast*	% change	2020 Forecast	annual %change vs 2018
Conventional Gasoline	1,535.4	1,437.0	-6.4%	1,546.3	0.4%
Ethanol	172.2	165.0	-4.2%	174.1	0.5%
Ethanol Blend Rate	10.1%	10.3%		10.1%	
Blendstock	1,707.6	1,602.0	-6.2%	1,720.4	0.4%
Fossil Diesel	718.2	705.0	-1.9%	683.2	-2.5%
Biodiesel	51.7	57.5	11.1%	52.6	0.9%
Biodiesel Blend Rate	6.7%	7.3%		6.9%	
Renewable Diesel	1.2	29.9	2370.6%	26.7	369.8%
Renew diesel Blend Rate	0.2%	3.8%		3.5%	
Total Diesel	771.2	792.3	2.7%	762.5	-0.6%
Electricity (on-road)	2.2	2.7	23.0%	3.5	25.0%
Electricity (off-road)	1.7	N/A		N/A	
Fossil Natural Gas	1.5	1.2	-17.8%	1.1	-13.6%
Biogas	1.7	2.8	62.9%	2.5	21.6%
Biogas Blend Rate	54.1%	70.0%		70.0%	
Total Natural Gas	3.2	4.0	25.8%	3.6	6.9%
Propane	0.7	1.3	72.2%	7.3	213.9%
*Forecast equals average of range published for 2019 forecast.					
On-road electricity include calculation of residential charging.					

Deficit and Credit Generation and Banked Credits

In order to estimate the number of deficits and credits associated with the consumption of each fuel type, the energy densities and carbon intensity differentials must be known. Most of the pertinent parameters are published here in administrative rule by the Department of Environmental Quality (see Tables 1, 2, and 4 starting on page 209). The following table presents these parameters for each fuel. Details regarding the estimation of carbon intensities for ethanol, biodiesel and renewable diesel can be found in Appendix B. Also included are the two parameters associated with electricity consumed by passenger vehicles. The carbon intensity assumption is adjusted for the energy economy ratio (EER). The actual carbon intensity of electricity is 109.3.

Table 2: Parameter values for the 2020 forecast

	Energy Density	Carbon Intensity Target	Carbon Intensity Assumption
Units	MJ/gallon	gCO2/MJ	gCO2/MJ
Gasoline	122.48	95.61	100.14
Ethanol	81.51	95.61	57.76
Diesel	134.48	96.27	100.74
Biodiesel	126.13	96.27	35.40
Reneweable Diesel	129.65	96.27	29.17
Electricity	3.6	95.61	32.15
KWh/vehicle	*3621*		
EER	*3.4*		
Natural Gas	134.48	96.27	79.98
Biogas	134.48	96.27	50.00
Liq. Petroleum Gas	89.63	95.61	80.88

Banked Credits

The number of credits is taken from the CFP Online System. The number of gross credits registered through the end of calendar year 2018 equaled 2.73 million, while the number of deficits recorded amounted to 2.23 million. The net credits banked equaled 502,608. Originally, OEA projected that another 365,348 credits will be banked during calendar year 2019. Given that another year of data are available, including actual fuel volumes (and thus blend rates for alternative fuels) for the 2018 compliance period, the 2019 estimated deficits and credits have been updated to reflect this. The total projected banked credits at the beginning of the 2020 compliance period is now expected to be 649,829.

Table 3: Summary of actual and projected net banked credits

Year	Deficits	Credits	Net Banked Credits
2016	-617,071	830,714	213,643
2017	-715,057	924,793	209,736
2018	-899,260	978,489	79,229
2019 (Proj.)	-1,015,633	1,162,854	147,221
Total	-3,247,021	3,896,850	649,829

Credit and Deficit Summary

The table below summarizes the forecast for deficit generation and credit generation. The equations for calculating the deficits and credits can be found in Appendix B.

Table 4: Summary of Deficits and Credits

Credit / Deficit Summary		
Deficits	Gasoline	-857,916
	Diesel	-410,701
Deficit Total		**-1,268,617**
Credits	Ethanol	537,140
	Biodiesel	403,946
	Renewable Diesel	232,191
	Electricity, on-road	92,317
	Electricity, off-road	25,784
	Natural Gas	17,896
	Propane	9,629
Credit Total		**1,318,903**

2020 Net Credits/Deficits	**50,286**
2019 Estimated Ending Banked Credits	**649,829**
Total Net Credits/Deficits	**700,115**

Forecasted Fuel Supply Deferral Analysis

As shown above, the forecast does not imply such an action.

Potential Supply of Alternative Fuels

Oregon Revised Statutes (2017) Chapter 750, Section 163[2] directs the Office of Economic Analysis to estimate the "potential volumes of gasoline, gasoline substitutes and gasoline alternatives and diesel, diesel fuel substitutes and diesel alternatives available to Oregon." In order to make such estimates, a number of assumptions must be made. Potential is read to mean "could be made available to Oregon under a wide range of market conditions". Currently, suppliers must be certified by the Department of Environmental Quality to receive credits for fuel delivered into Oregon. In addition, they must report volumes of fuel sold in Oregon to the Clean Fuels reporting system. It is assumed that selling fuel in Oregon implies established supply chains. Thus, the capacity of facilities that were certified and supplied fuel to Oregon for the most recent compliance period (2018) is assumed to be theoretically "available" to Oregon. The potential supply figures presented in the following sections correspond to the most recently available nameplate capacities for these facilities manufacturing the respective fuels. Where multiple values are available, the highest is presented.

[2] https://olis.leg.state.or.us/liz/2017R1/Downloads/MeasureDocument/HB2017/Enrolled

In addition to estimating potential supply, the Office of Economic Analysis is directed to consider "Constraints that may be preventing access to available and cost-effective low carbon fuels by Oregon, such as geographic and logistical factors, and alleviating factors to the constraints". Only biofuels that might pose a supply constraint that could ultimately limit the number of credits available to deficit holders to comply with the Clean Fuels program requirements are called out explicitly. Should supply issues arise for the more mature fuel markets such as conventional gasoline and diesel, as well as electricity, such issues would be added to the report. This is not anticipated for the foreseeable future.

Ethanol

As exhibited in Table 5, the potential supply of ethanol to Oregon as outlined above is 3.8 billion gallons. This compares to a projected "demand" for ethanol previously characterized of 174.2 million gallons.

Table 5: Ethanol Supply

Ethanol Supply Available to Oregon
(Existing Suppliers in 2018)

State	Nameplate Capacity (Mil. Gallons)	Number of Facilities
South Dakota	900	11
Nebraska	817	10
Iowa	650	7
Minnesota	478	6
North Dakota	300	2
Kansas	220	3
Colorado	110	2
Idaho	75	1
California	50	1
Oregon	43	1
Total Oregon Suppliers	3,643	44

Data from Energy Information Administration and Clean Fuels Program.

Biodiesel
Table 6 presents the potential supply of biodiesel to Oregon, equaling 743 million gallons in capacity for certified facilities with established supply chains in 2018. This compares to a projected demand for biodiesel in 2020 of 52.6 million gallons. Note that the Energy Information Administration is currently updating their data collection regarding biodiesel producers to match that for ethanol. When these data become available, more current estimates of nameplate capacity will be incorporated into the analysis.

Table 6: Biodiesel Supply

Locality	Nameplate Capacity (Mil. Gallons)	Number of Facilities
Missouri	155	4
Iowa	106	2
Washington	105	2
Oregon	105	2
Nebraska	63	1
Arkansas	59	1
Korea	50	2
Oklahoma	35	1
Minnesota	30	1
Canada	22	4
Texas	15	1
Total Oregon Suppliers	743	21
Data from the Clean Fuels Program		

Renewable Diesel
As presented below, the potential supply of renewable diesel to Oregon equals 475 million gallons. This compares to a projected demand for renewable diesel in 2020 of 26.7 million gallons.

Table 7: Renewable Diesel Supply

Locality	Nameplate Capacity (Mil. Gallons)	Number of Facilities
Singapore	291	1
Wyoming	109	1
Louisiana	75	1
Total Oregon Suppliers	475	3
Data from the Clean Fuels Program		

Renewable Natural Gas
The amount of renewable natural gas potentially available to Oregon amounts to 2.2 billion gallon equivalents. This compares to a projected demand for this biofuel of 2.5 million gallon equivalents. The

committee discussed the fact that a number of applications to supply additional renewable natural gas to Oregon are in the process of being evaluated. Given the modest volumes of natural gas currently used in transportation, incorporating these potential supplies would not alter the conclusion that there are no current constraints on the availability of natural gas in Oregon.

Table 8: Renewable Natural Gas

Locality	Nameplate Capacity (Mil. Gallons)	Number of Facilities
Kentucky	1,179	1
Ohio	990	1
Total Oregon Suppliers	2,169	2
Data from the Clean Fuels Program		

Forecast Risks

A risk is defined as a deviation from one or more assumptions that would alter the conclusion outlined in the previous sections. There are a number of potential risks to this 2020 Clean Fuels Forecast, both positive and negative and they are:

(a) The most fundamental risk to the forecast amounts to potential deviations from the assumptions highlighted in each fuel type discussion. In particular, blend rates and carbon intensities for biofuels could be subject to significant error. In addition, this forecast contrasts with prior forecasts in that it assumes that the incentives inherent in the value of the credits generated by supplying alternative fuels will drive the carbon intensities of these fuels downward. Failure to realize these declines would result in fewer credits than currently anticipated.

(b) This forecast represents a "current law" representation of the compliance period in question. OEA's methodology does not take potential future state policy actions into account.

(c) There is a discrepancy between the diesel consumption numbers reported to the Clean Fuels Program data and the taxable gallons tabulated by ODOT. Explicitly, more gallons of diesel are reported to the former that the latter. This forecast applies projected growth of taxable diesel, at least initially, to the base year 2018 reported volumes of diesel in the CFP. To the degree that taxable gallons per ODOT is not a perfect proxy for reported gallons in the CFP, actual consumption of diesel and thereby the number of deficits generated could deviate from this forecast.

(d) House Bill 2017 (2017 Legislative Session) created a rebate for sales of electric vehicles in Oregon. The electric vehicle forecast underlying the credit projections for electricity consumption do not explicitly account for the potential impact of this rebate. To the degree that electric vehicle sales skew higher than expected herein, net credits would be even higher, constituting an upside risk to the forecast.

(e) The ethanol availability presented above is not comprehensive and does not include other potential sources, such as sugarcane ethanol imported from Brazil. Given that potential supply characterized in table 5 greatly exceeds projected demand, this is not an immediate threat to the forecast. However, it may need to be addressed as consumption increases or as carbon intensity targets are lowered.

(f) Alternative fuels used in forklifts, aviation , and certain other uses such as transport refrigeration units were recently added to the Clean Fuels Program but have not been included in the 2020 forecast These uses would generate credits in the program, constituting an upside risk to the forecast.

Accessibility
Documents can be provided upon request in an alternate format for individuals with disabilities or in a language other than English for people with limited English skills. To request a document in another format or language, call Michael Kennedy in the Office of Economic Analysis at (503) 378-5732 or email him at michael.kennedy@oregon.gov

Appendix A

Membership of the Clean Fuels Forecast Advisory Committee:

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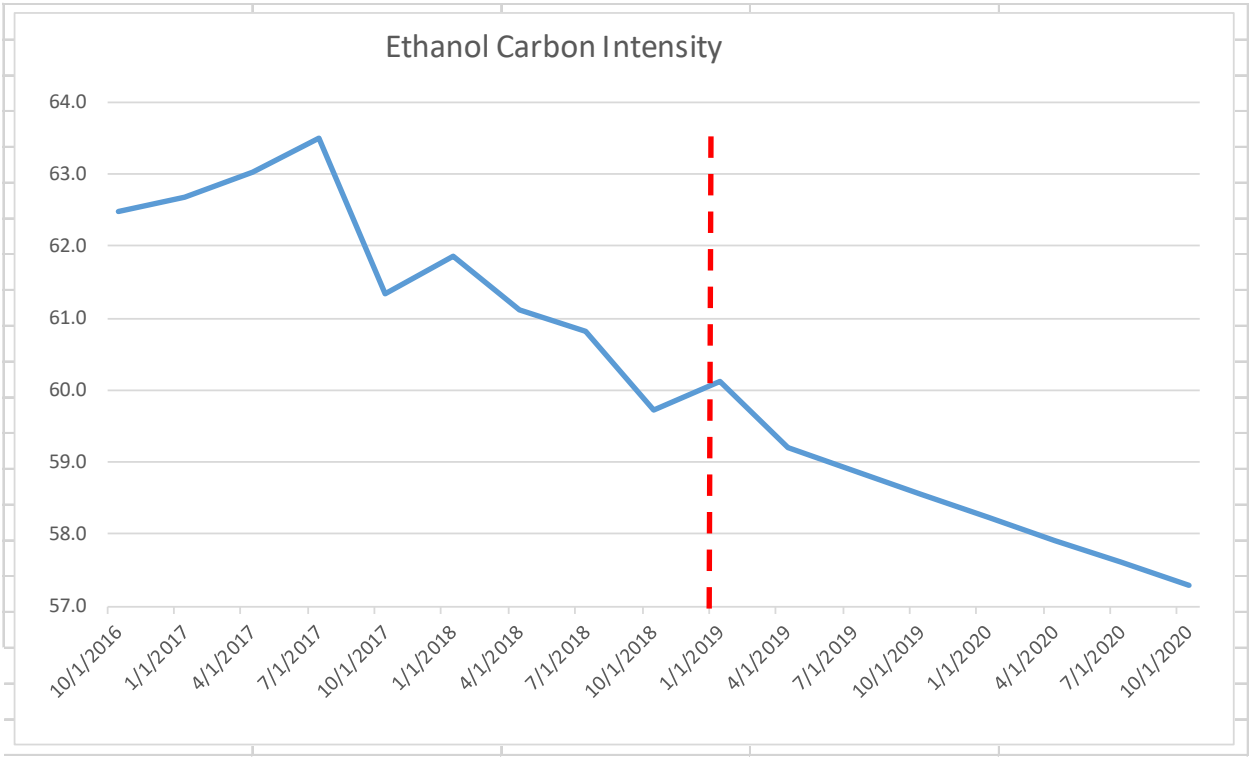
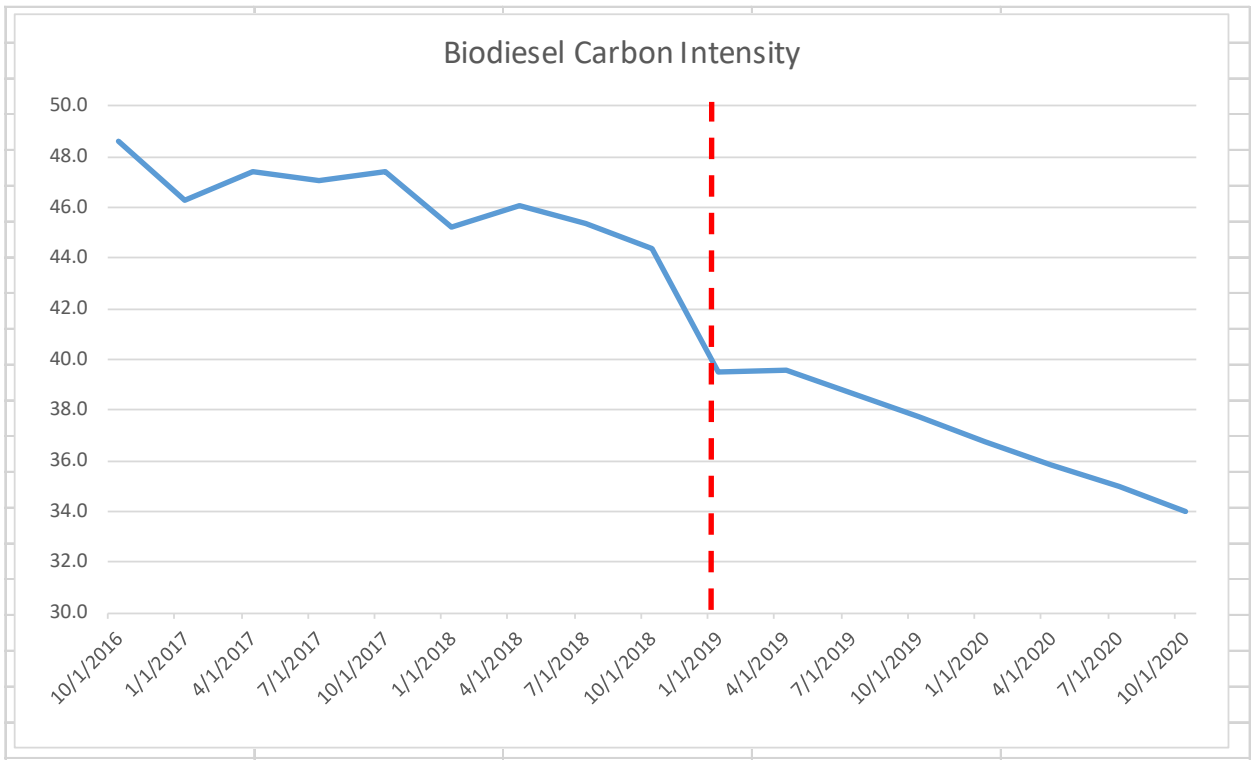
Appendix B

The estimated carbon intensities for ethanol, biodiesel and renewable diesel that are not published in rule are projected based on the historical trend in reported carbon intensities. Add factors may be employed where steeper declines are expected due to the incentives inherent in the program, as well as new information regarding potential changes in the mix of feedstocks and the composition of facilities that supply biofuels to Oregon. Currently, thirteen quarters of data are available for ethanol and biodiesel, while six quarters are available for renewable diesel. As more data become available, more advanced econometric techniques (including dynamic modeling) may be employed to provide more accurate projections. The following charts show the expected declines in all three series:




Biodiesel Carbon Intensity
50.0
48.0
46.0
44.0
42.0
40.0
38.0
36.0
34.0
32.0
30.0
10/1/2016
1/1/2017
4/1/2017
7/1/2017
10/1/2017
1/1/2018
4/1/2018
7/1/2018
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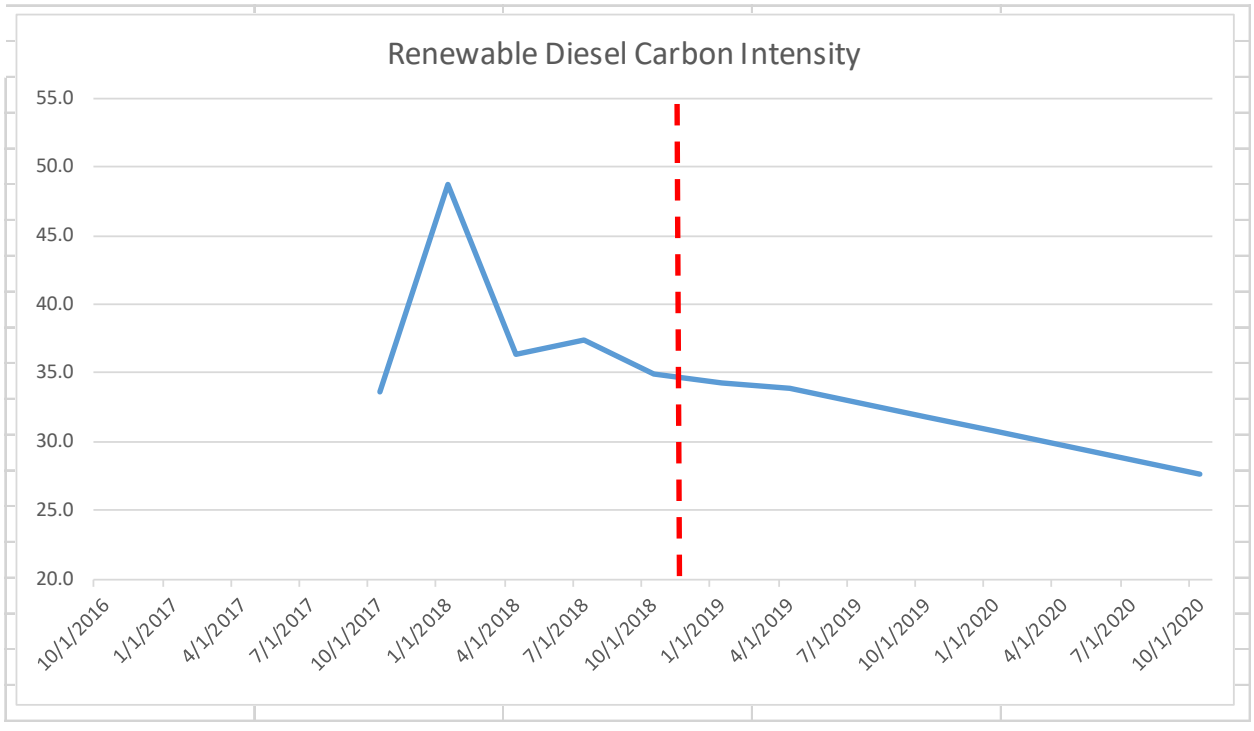
7/1/2020
10/1/2020


Renewable Diesel Carbon Intensity
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
10/1/2016
1/1/2017
4/1/2017
7/1/2017
10/1/2017
1/1/2018
4/1/2018
7/1/2018
10/1/2018
1/1/2019
4/1/2019
7/1/2019
10/1/2019
1/1/2020
4/1/2020
7/1/2020
10/1/2020

Appendix C

The following are the formulas resulting in the deficits and credits presented in Table 4.

Gasoline
$Deficit_G = CBOB * ED_G * (CIT_G - CIA_G)/1{,}000{,}000$

Diesel
$Deficit_D = V_D * ED_D * (CIT_D – CIA_D)/1{,}000{,}000$

Ethanol
$Credit_E = V_E * ED_E * (CIT_G – CIA_E)/1{,}000{,}000$

Biodiesel
$Credit_{BD} = V_{BD} * ED_{BD} * (CIT_D – CIA_{BD})/1{,}000{,}000$

Renewable Diesel
$Credit_{RD} = V_{RD} * ED_{RD} * (CIT_D – CIA_{RD})/1{,}000{,}000$

Electricity
$Credit_C = K_C * EER_E * ED_E * (CIT_G – (CIA_C/EER_E)/1{,}000{,}000$

Natural Gas
$Credit_{NG} = V_{NG} * ED_{NG} * (CIT_D – CIA_{NG})/1{,}000{,}000$

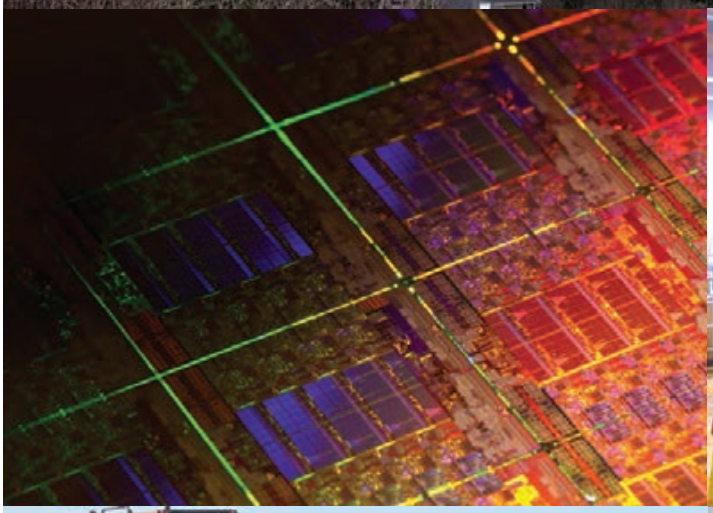
Propane
$Credit_P = V_P * ED_P * (CIT_D – CIA_P)/1{,}000{,}000$



GREATER PORTLAND GLOBAL

GLOBAL TRADE AND INVESTMENT PLAN






Oregon Iron Works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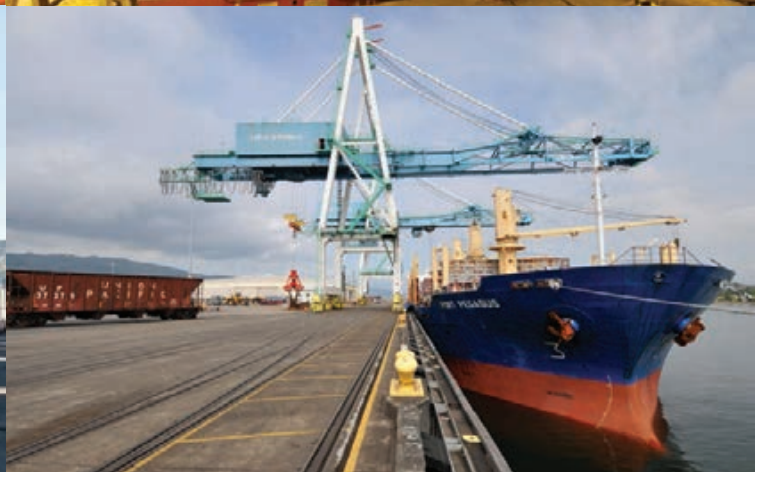

INTRODUCTION

GREATER PORTLAND'S REGIONAL ECONOMIC DEVELOPMENT community is uniting locally to compete globally, with a shared focus on target industry clusters, innovation, and international trade and investment as the essential elements of a competitive, sustainable and globally integrated region. Greater Portland Global, a global trade and investment plan, draws on the region's work in the Global Cities Initiative, a joint project of the Brookings Institution and JPMorgan Chase, to integrate exports and foreign direct investment (FDI) into one strategic plan that replaces the Greater Portland Export Initiative and escalates global engagement to realize a stronger regional economy. The plan recognizes Portland's rich interaction between local innovation, exports, global excellence, and foreign direct investment as the foundation of a unique process that can propel small, innovative entrepreneurs and domestically-focused companies along a continuum to become companies with global presence.

A shared focus on target industry clusters, innovation, and international trade and investment are the essential elements of a competitive, sustainable and globally integrated region.

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THE IMPERATIVE TO GO GLOBAL

GLOBAL ENGAGEMENT IS NOT OPTIONAL if Greater Portland is to realize widely-shared economic growth and prosperity—it is imperative. Increased access to global markets and foreign investment is the most direct path for Greater Portland to create and maintain a sufficient number of quality jobs to support the region's growing population.

The need to embrace international markets is urgent. Ninety-five percent (95%) of the world's consumers live outside the United States, and 79% of global GDP growth is projected to occur outside the U.S. over the next five years. Fortunately, the region has within its reach the building blocks of enviable innovation, globally-competitive industries, and a productive, educated and increasingly diverse workforce to compete.

Greater Portland has a long history as a leading exporter and since the 1980s has attracted substantial FDI. But while Greater Portland has made progress, it remains the case that too few firms and industries are benefiting from global engagement, pointing to the need for a better integrated, more strategic focus on exports and FDI.

Greater Portland's opportunity for heightened global engagement is immediate and compelling, as evidenced by the following conditions:

- **Greater Portland is a trading region, but recent export growth is lagging.** Exports are critical to regional economic growth and job creation, supporting approximately 145,000 direct and indirect jobs (including some outside the region). Yet, while ranking high in 2013 Brookings Institution data in total exports ($26.7 billion or 13th highest metro) and exports' share of metro economic output (17.4% or 11th highest metro), the region's top ranked export growth rate is slower in the recovery from the Great Recession than in pre-recession years.

- **Foreign owned enterprises (FOEs) can bring highly productive and high-paying jobs to the region.** FOEs account for 20% higher wages and doubling of money spent on benefits compared to the average U.S. firm, and for 19% of all corporate R&D in the U.S., which facilitates the spread of new knowledge, technologies and ideas—all drivers of job creation and economic growth.

- **Foreign direct investment can strengthen the region's dynamic, growing companies.** Foreign direct investment is attracted to innovative companies and clusters that possess excellence in talent, processes, products, services, and exporting. The region has emerging excellence in such in-demand sectors as software and clean tech/sustainability, adding to its established computers and electronics (C&E) industry and its attractive legacy sectors of metal manufacturing and wood products.

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➤ **The region's plentiful and diverse assets have not been adequately promoted internationally.** FOE executives interviewed, who made either a greenfield investment or acquisition into the local market, mentioned a variety of assets that attracted them to the region:

- Natural resources – water, low cost of electricity, climate security
- Logistics – rail access and a port with room to expand
- Quality of life – low cost of living, natural beauty, transit
- A resurgent real estate market that is largely untouched by foreign investment
- The anchor educational institutions of Oregon Health & Science University (OHSU), Portland State University (PSU), and Washington State University (WSU) Vancouver

➤ **Greater Portland has the opportunity to solidify its global business prominence.** The region's traditional strengths in advanced manufacturing and computers and electronics have attracted high levels of FDI concentrated in German and Japanese companies; leading international brands such as Adidas, Ajinomoto, Daimler, Epson, and Genentech are prominent foreign investors in the regional economy, and many of them export from Greater Portland.

➤ **Unprecedented expansion by Greater Portland's largest employers will position the region well for international interest and investment.** The region's largest employers are on the cusp of enormous transformation. Intel's presence, already its largest in the world, is still growing; the $1 billion Knight Cancer Challenge at OHSU in Portland will attract worldwide attention in bioscience. Joined by Nike, these three major companies/institutions have embarked upon mega-expansions that, as regional business history has shown, will spin out new clusters, accelerate innovation and further the excellence that will attract investment interest.

➤ **Deep international ties exist in Greater Portland's community that can be the foundation for business growth.** The local business community's key connections to fertile foreign markets encompass PSU's deep ties to Qatar, a vibrant local Chinese community, cultural institutions like the German American Society and Japan-America Society of Oregon, and long-standing Asian sister city relationships established by Portland, Beaverton and Hillsboro.

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GREATER PORTLAND'S RESPONSE TO A GLOBAL ECONOMY

Greater Portland is doing business in an age of global competition. As the region builds a stronger economic foundation for current and future generations, it requires a bold, strategic response to new and evolving market realities. In 2011, Greater Portland's aspirations for effective economic development on a global stage found a home in the Global Cities Initiative (GCI), a joint project of Brookings and JPMorgan Chase, when the region was named one of four metros selected for the Metro Export Initiative pilot. Greater Portland Inc (GPI), the region's public-private economic development organization, received additional resources from key partners to create a new position to oversee coordination and implementation of the Export Initiative beginning in 2012.

The Greater Portland Export Initiative broke ground from the start, achieving export wins and drawing national and international press coverage of the region's export strengths and its dynamic export growth. Greater Portland was selected as the top metropolitan region in the Exports category in the 2013 "Top Ten Innovations to Watch List" developed by Brookings' Metropolitan Policy Program and The Rockefeller Foundation. The National Journal selected the We Build Green Cities initiative, led by the Portland Development Commission (PDC), as the winning innovation of 2013 for "Expanding Exports."

Greater Portland conducted training sessions for economic development professionals to provide greater export assistance to local businesses, and two of those key partners—the City of Beaverton and Business Oregon—were named the U.S. Export-Import Bank's 2014 City/State Partners of the Year. The Export Initiative's Westside Freight and Logistics Analysis and a separate supply chain study both focused on the computer and electronics industry. The former stimulated a $10.1 million U.S. Department of Transportation TIGER grant for

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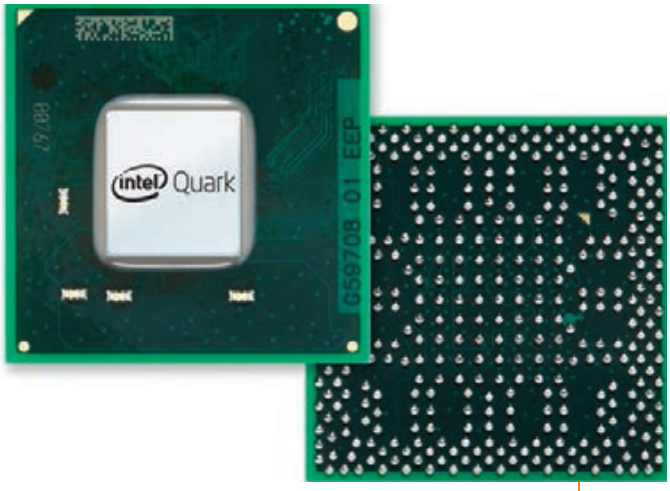

Washington County, and the latter was immediately incorporated into the region's business recruitment efforts.

We Build Green Cities has helped companies make export sales in Japan and inspired the U.S. Department of Commerce to award PDC $300,000 from the International Trade Administration's Market Development Cooperator Program to help the green building and clean tech industries generate foreign exports.

Greater Portland seized the opportunity again to apply for a Brookings FDI pilot in early 2014, recognizing it as a natural progression for the development of a globalized metro and a transformative regional economic development and business culture. Greater Portland was one of six metros selected for the FDI pilot. Guided by new partnerships and a fortuitous alignment of federal, state and local efforts, Greater Portland's global strategy is expanding to include a deliberate plan to attract more FDI.

The push for greater global engagement dovetails with the region's current work creating Greater Portland 2020, a five-year regional comprehensive economic development strategy prioritizing international trade and investment to be publicly unveiled in fall 2015. It also coincides with the 2015 Year of Trade campaign led by the Port of Portland and the Pacific Northwest International Trade Association.

Greater Portland has strong international ties, productive working relationships among key public, private, and nonprofit partners, and a track record of pursuing innovative economic development projects. The region is well positioned and prepared to pursue Greater Portland Global, an ambitious trade and investment plan.

As the region builds a stronger economic foundation for current and future generations, it requires a bold, strategic response to new and evolving market realities.

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THE INTERACTION BETWEEN EXPORTS AND FDI

Exports and FDI are integrated parts of global business, but until now they have not been unified under a coordinated regional approach. With distinct assessments of both exports and FDI now in hand, areas of linkage have surfaced, with a key overlap centered on the concept of excellence. The interaction between exports and FDI are highlighted by these facts:

- **Foreign-owned companies account for 20% of U.S. exported goods.** In Greater Portland, foreign-owned firms like Daimler Trucks North America are among the largest exporters.

- **FDI is relatively concentrated in advanced industries and manufacturing**, with 18% of U.S. manufacturing jobs in foreign-owned companies, many of which are strong exporters. In Greater Portland, examples include Wafertech, Evraz, and Fiskars.

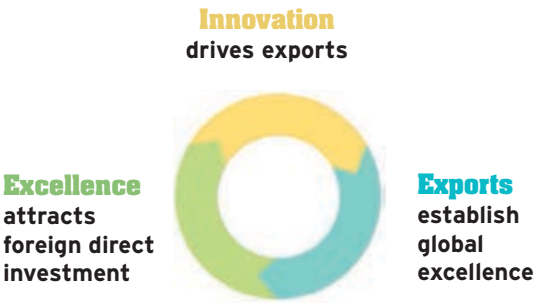
- **Foreign students and tourists, which can be considered as a service export for the region, are key links for potential future FDI.** Alumni (and their parents) have lasting ties to this region. Chinese and Saudi Arabian students account for 55% of foreign students at Oregon universities, but Chinese and Saudi Arabian FDI is almost nonexistent in the region.

- **Some FDI is part of a value chain that involves importing into the U.S. from a foreign market**, adding value, and then exporting to a foreign market. Greater Portland's role in the global computers and electronics supply chain (with companies like Asahi Glass and Tokai Carbon) exemplifies this process.

Greater Portland's market assessments, first of exports and more recently of FDI, have illuminated the rich interplay between exports and FDI and its roots in innovation. Whether in the laboratory, on the shop floor, or in a line of code, products and services seeking to do something new—or something old in a vastly new and improved manner—will find reception in the global marketplace. Firms marketing their products internationally not only bring home new revenue streams but also manifest processes and labor honed by global competition.

Products and services seeking to do something new—or something old in a vastly new and improved manner—will find reception in the global marketplace.

Greater Portland sees the link between exports and FDI as a three-step interaction:



This interaction is enhanced by an added element that extends beyond industry: Greater Portland's unique excellence of place, which has incalculable influence on the influx of talent and the attraction of FDI.

As firms in a region move through this virtuous cycle, the cluster matures and moves from a position of early, nascent innovation to emerging excellence and, finally, established excellence. During this maturation process, clusters often develop new innovations, spinning off new subsectors that go through their own maturation process.

Due to global trends and shifts in macroeconomic conditions, some established sectors transition to legacy sectors. These sectors are not seeing the growth and continued innovation of other sectors although they are often still rich with talent and in-demand products.

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The continuum of industries has the following characteristics:

Stage	Sector Attributes	Examples
Nascent	• Often offshoots of established sectors • Result of significant new funding sources • Exist at junction between established sectors	Oregon Health & Science University's $1 Billion Knight Cancer Challenge; wearables sector
Emerging	• Known domestically for innovation and excellence • Showing early export success • Products/services have demonstrable demand in growth economies • Early, small-scale FDI successes	Software and We Build Green Cities
Established	• Region is globally known for excellence in sector • Significant FDI has occurred • Sector includes dominant exporters	Computer and electronics industry, athletic and outdoor industry
Legacy	• Sector has significant labor talent and uses advanced processes • Global need for sectors' assets exists • Need for expansion or exit capital	Metals manufacturing, family-owned industries, wood products industry

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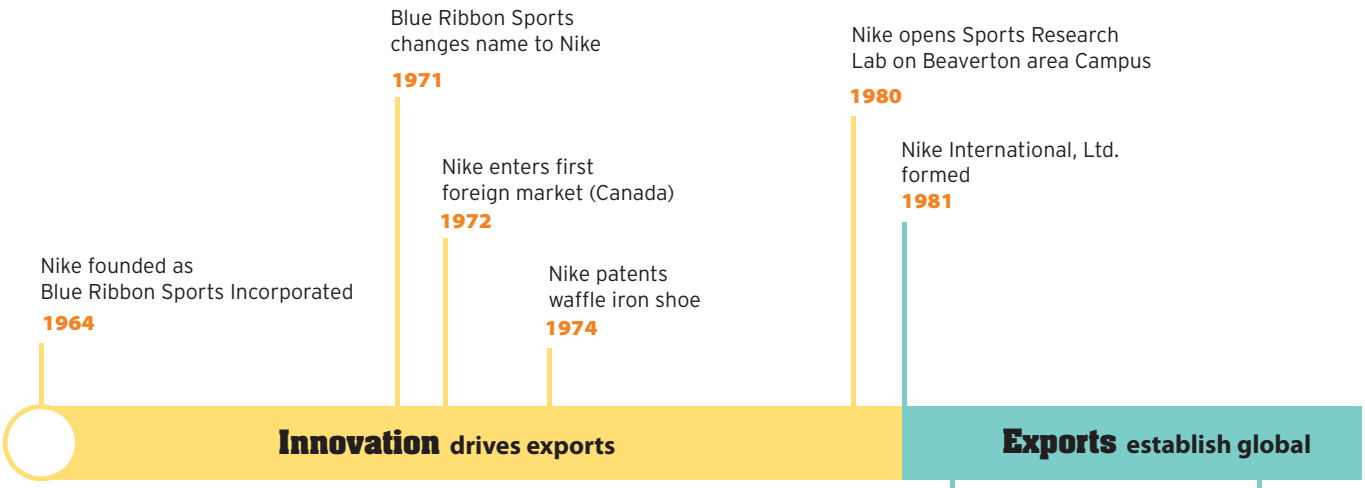
The fifty-year history of Nike, headquartered in the Beaverton area, perfectly illustrates how a lightning strike of innovation can spark a cluster rich with talent and technology that drives investment to a region and furthers innovation through spinoff clusters.

Timeline: Athletic & Outdoor, Creative Services and Wearables Clusters

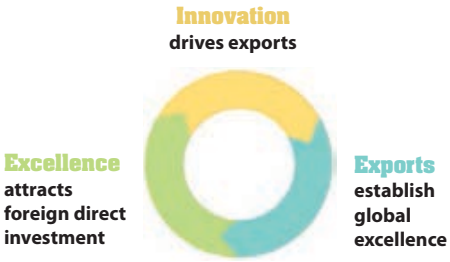


ATHLETIC & OUTDOOR CLUSTER



CREATIVE SERVICES CLUSTER





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"A&O Ecosystem" tool released listing 800+ cluster companies in Oregon
2014

Nike Shanghai opens
2013

Keen & Showers Pass move HQ to Portland
2005

Merrill opens Portland HQ
2007

Danner acquired by Japanese firm
2012

50% of Nike's revenues are outside of U.S.
2005



Adidas moves North American HQ to Portland
1993

Columbia Sportswear goes public
1998

Icebreaker opens North American HQ
2007

Nike plans massive Beaverton area expansion
2012

Montbell and Mizuno open in Portland
2013

excellence **Excellence attracts foreign direct investment**

2012 Nike Fuel Band launch

1998
W+K opens London office

2000
W+K opens new Portland HQ

WEARABLES CLUSTER

2012
Intel & OHSU collaborate on wearables for clinical research

2014
Nike & Apple working together on wearables

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KEY FINDINGS
FROM THE FDI MARKET ASSESSMENT



Benchmade Knife Company

GREATER PORTLAND CONDUCTED AN IN-DEPTH FDI MARKET ASSESSMENT in the summer/fall of 2014 to serve as a foundation for the development of FDI components of Greater Portland Global. The assessment included Brookings data benchmarking against other metros and more than 35 one-on-one interviews with local companies and FDI service providers.

The following are key findings from the market assessment:

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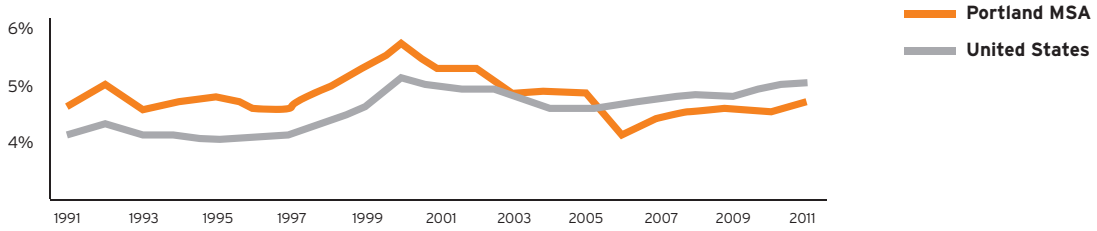
KEY FINDING 1

The Greater Portland region lags in FDI behind other comparably-sized metropolitan areas. According to the Brookings Institution, the region is the 23rd largest economy in the U.S., yet 29th in total FDI employment and 50th in FDI employment intensity. Employment growth in Greater Portland's foreign-owned enterprises (FOEs) has only been 1.6% annually since 1991, which ranks 67th out of the top 100 U.S. metros.

Foreign Share of Domestic Area Employment, Portland Metro and U.S., 1991 - 2011



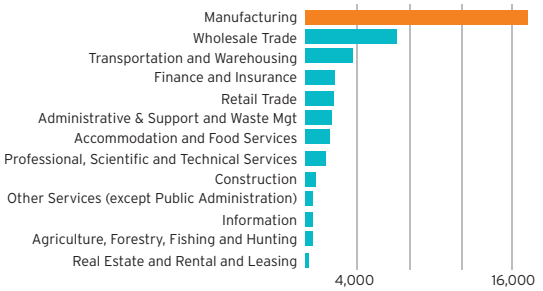
Source: FDI in U.S. Metro Areas, Brookings Institution, 2014

KEY FINDING 2:

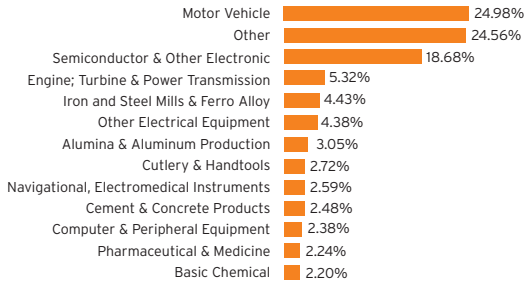
FDI has been concentrated in the region's legacy and established advanced manufacturing industries, specifically motor vehicle manufacturing and computers and electronics. Similar to national trends, FDI has gravitated to the region's manufacturing industries, accounting for 42% of total foreign-owned establishment employment.

The importance of Intel—the state's biggest exporter—and its supply chain as an attractor of foreign investment cannot be overestimated. The high concentration of FOEs in the semiconductor sector—3,200 jobs or 7.8% of FOE jobs—is proof of this strong investment by European and Japanese companies. Silicon expertise also set the stage for the investment by German manufacturer SolarWorld.

Greater Portland's FOE Employment by Industry, 2011



FOE Employment in Manufacturing Subsectors, 2011



Source: FDI in U.S. Metro Areas, Brookings Institution, 2014

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Total Employment in Foreign-Owned Enterprises by Country, Greater Portland, 2011

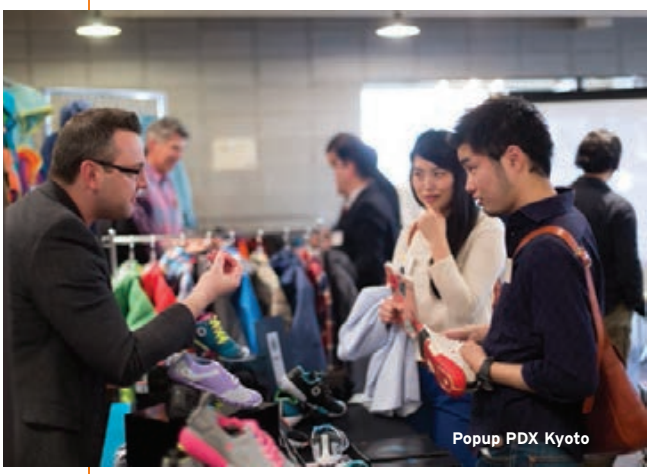


Source: FDI in U.S. Metro Areas, Brookings Institution, 2014

KEY FINDING 3:

Germany and Japan are responsible for a large concentration of FDI in the region. Together, these two countries account for 43% of total foreign-owned employment in the region, with Switzerland a distant third at 8%. While German FDI is centered on landmark investments in the region by Daimler and Adidas, Japanese investment is spread across a larger number of firms and a variety of sectors.

Interviews revealed that the role of these two markets in Greater Portland's economy is no accident and directly resulted from many years of effort and relationship building by the local public and private sectors. Executives from local German and Japanese companies mentioned the importance of government outreach and cultural institutions as "guide rails" for their eventual investment in the region.


Popup PDX Kyoto

KEY FINDING 4:

The region's strategic positioning on the Pacific Rim is not reflected in the region's FDI partners, outside of Japan. Almost 30% of regional exports go to three East Asian countries: China, Japan and Korea. These same three countries also make up 50% of foreign students at Oregon universities and account for approximately 40% of tourists to the Portland metro (excluding Canada, Greater Portland's most proximate foreign country). Yet—outside of Japan, the region's 2nd largest FDI partner ranked by employment—Korean and Chinese investment has largely not flowed into the region.

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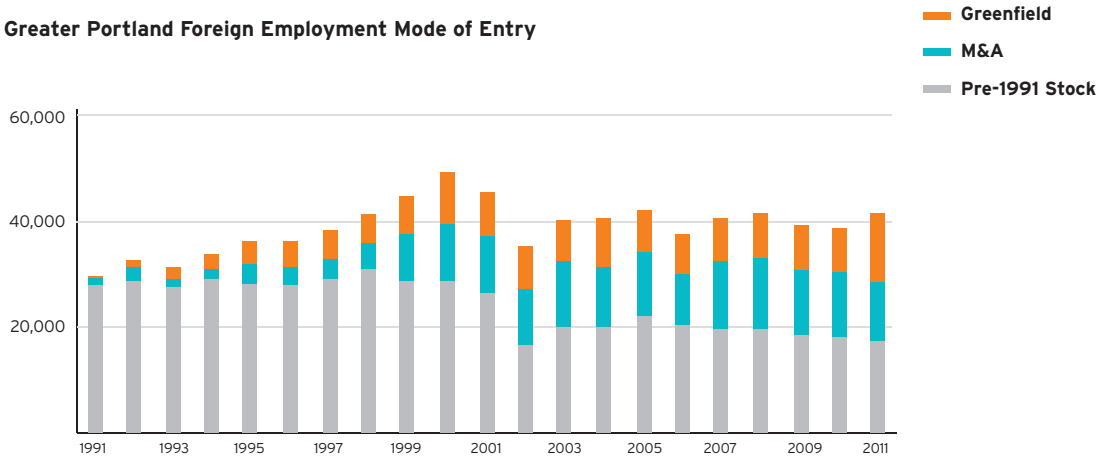
KEY FINDING 5:

Greenfield investment, followed closely by mergers and acquisitions (M&A), has driven the region's growth in employment under foreign ownership. Since 1991, 53% of the new jobs under foreign ownership were the result of greenfield investment, representing 12,600 jobs. During the same period, 47% of the new jobs under foreign ownership were the result of M&A (approximately 11,100 jobs). Not all of these numbers or the greenfield jobs are net additions to the regional economy, as FOEs—like their domestic counterparts—are also responsible for job churn: jobs lost due to closings, relocations, or consolidations. FOE jobs have boosted the regional economy, which gained a net 11,000 jobs from FOEs, and this growth occurred predominantly in FOEs that technically have a small business presence in the region, employing 51-250 people, even if the parent company may be a large business.

The data confirms what FOEs stated in interviews: the region is attractive as a "beachhead" to North American markets; its attraction is further buttressed by assets such as cheap electricity and abundant water and the highly developed talent pool of established sectors such as athletic and outdoor and computers and electronics.

Greater Portland Foreign Employment Mode of Entry



Source: FDI in U.S. Metro Areas, Brookings Institution, 2014

KEY FINDING 6:

Traditional business retention and expansion (BR&E) strategies can play a large role in retaining and increasing FDI. Daimler's 1981 acquisition of local legacy manufacturer Freightliner Trucks has resulted in the acquired company's growth and the foreign parent's continued commitment in the region. But with foreign (or domestic) M&As, as stated in the previous finding, the new owner sometimes closes or shrinks local operations, highlighting the importance of BR&E.

Additionally, FOEs interviewed explained the complexities and risk that they often face in opening a foreign outpost, ranging from cultural issues and legal considerations, to the constant imperative of making the case for additional resources and investment from the corporate parent.

To mitigate these risks, business leaders interviewed saw an opportunity for the local economic development community to expand on existing business retention and expansion protocols to include aftercare for new FOEs and foster closer ties to local companies.

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KEY FINDING 7:

Large-scale foreign capital flows have yet to enter the local market. Interviewees reported that large foreign investors view the region as a "Tier Two" metro, lacking the reputation and strong returns of investment havens like New York, Los Angeles and San Francisco. Nonetheless, reports have emerged of "under the radar" interest and investment activity by foreign investment banks, private equity firms, and sovereign wealth funds.

Business leaders and service providers alike expressed a lack of knowledge and expertise on attracting foreign investment capital to the region and local firms—an opinion shared by economic development professionals. Interviews also revealed many conflicting opinions on the pros and cons that large amounts of capital would have on the region's economy, and without data confirming best practices, a "wait and see" attitude has prevailed. As the region learns more about capital attraction, there are great possibilities in extending economic development practice to suit Greater Portland's goals of strengthening the region. The PDC, with assistance from Business Oregon, has developed an EB-5 immigrant investor visa program to connect foreign capital to local urban development projects. While in its infancy, this program could serve as a model for the region's new and open approach to capital attraction.

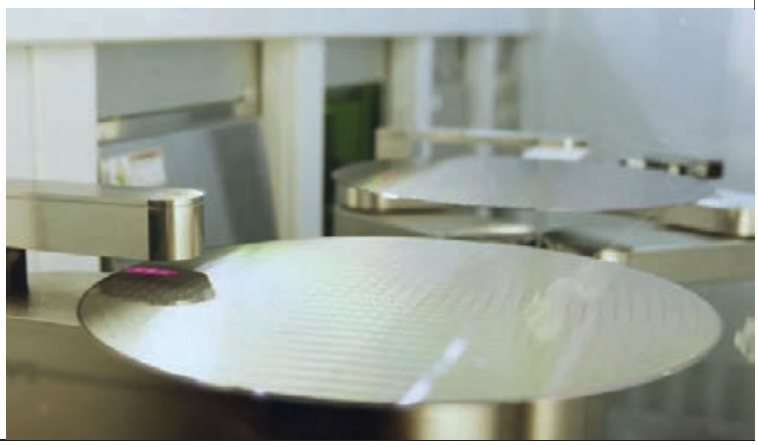
KEY FINDING 8:

Greater Portland's emerging sectors show strong potential for growth. In recent years, innovative sectors such as green building, clean tech and software—which are growing at home—have begun to establish excellence internationally and drive investment locally from M&A, such as the Korean company HanmiGlobal's acquisition of the local architectural/engineering/planning firm OTAK.

The Spanish Banco Bilbao Vizcaya Argentaria's (BBVA's) recent $117 million acquisition of Portland-based Simple was a landmark investment for the region's emerging software sector. A spillover from the region's established computers and electronics sector, software is gaining a reputation domestically but is still establishing its footing internationally. That a multinational bank of BBVA's stature—with $25 billion in yearly revenues—can find innovation worthy of investment in the region points to further opportunities for other firms in the software sector.



Climax Portable Machining & Welding Systems



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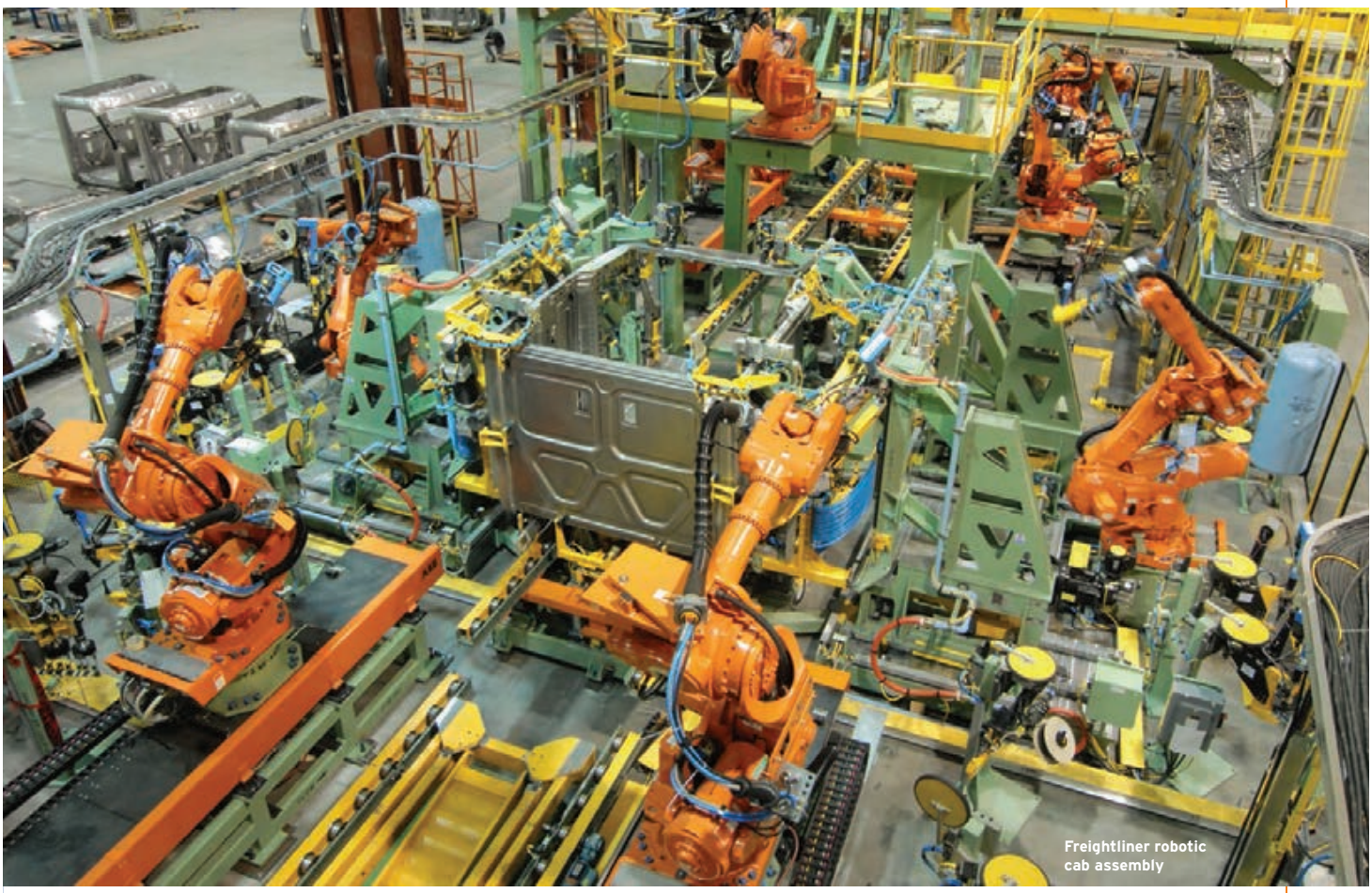
KEY FINDINGS
FROM THE EXPORT MARKET ASSESSMENT



Freightliner robotic cab assembly

GREATER PORTLAND CONDUCTED AN IN-DEPTH EXPORT MARKET ASSESSMENT in 2011 to serve as a foundation for the development of the original Greater Portland Export Initiative. The assessment included Brookings data benchmarking against other metros, a survey of 268 local companies, and more than 40 one-on-one interviews with local companies and export service providers. Economic data from Brookings was updated in 2014 during the creation of Greater Portland Global.

In addition to the information gained from the initial market assessment, the region has embarked on a three-year education initiative around exports and effective service delivery through the implementation of the Greater Portland Export Initiative. The experience—comprising experimentation, success and failure—has provided grounding on where and how the economic development community can continue to be effective.

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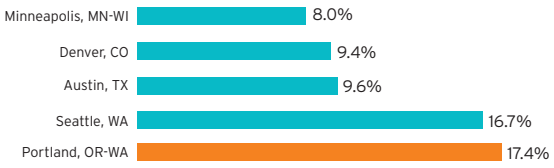
KEY FINDING 1:

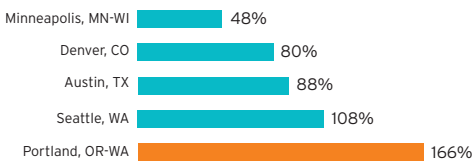
Exports are at the core of Greater Portland's economy. Between 2003 and 2013, Greater Portland increased its export volume by 166%, creating 39,374 direct new jobs for the region. This growth made Greater Portland the fifth-fastest growing export market among the 100 largest metropolitan areas. The region was 13th largest by export volume in 2013, with $26.7 billion in exports, and had the 11th highest export intensity, with exports accounting for 17.4 percent of its economy.

Exports as a Share of Output, 2013



Source: Export Nation, Brookings Institution, 2014

Real Export Growth, 2003 - 2013



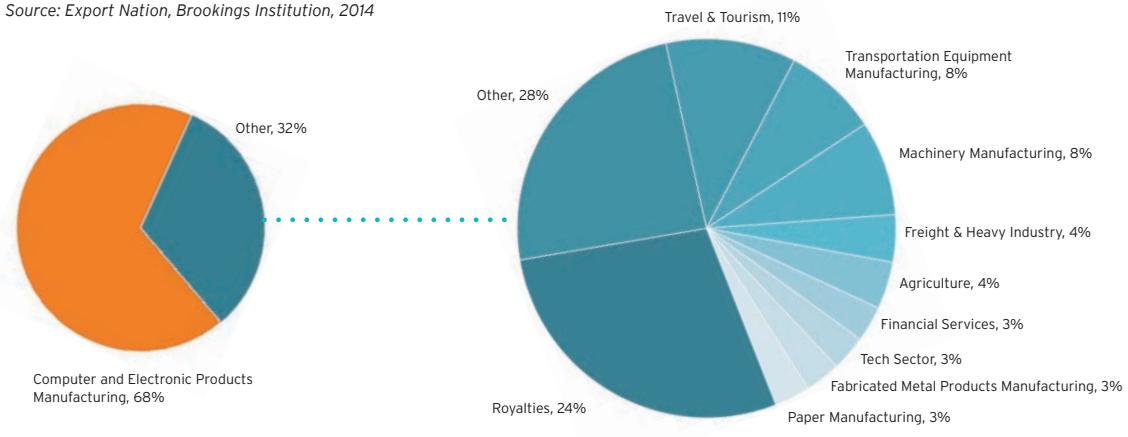
Source: Export Nation, Brookings Institution, 2014

KEY FINDING 2:

A handful of companies and clusters drive much of Greater Portland's export strength. Eighty-eight percent of Greater Portland's exports in 2013 and 89 percent of export growth from 2003 to 2013 came from the region's top 10 exporting industries. The region's largest export industry, computers and electronics, anchored by Intel, accounted for 68 percent of total exports in 2013 and 69 percent of export growth, and grows each year.

Industry Share of Total Exports in 2013

Source: Export Nation, Brookings Institution, 2014



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KEY FINDING 3:

Greater Portland's emerging export strengths show potential for growth. Though the computers and electronics industry plays the leading role in the region, Greater Portland possesses numerous other export sectors that have developed excellence and are just beginning to go abroad. Clean tech and sustainability firms, which have leveraged the region's excellence in urban development via the We Build Green Cities program, have made inroads in rapidly urbanizing markets in Asia and Latin America. The software sector—a spillover from the region's mature computers and electronics industry—has grown its brand domestically, and its most established companies are just beginning to enter international markets.

KEY FINDING 4:

The most successful exporting companies are intentional about exporting. Companies acknowledged that pursuing business opportunities in new foreign markets requires significant resources and persistence. While resources need to be set aside for relationship development (extensive travel, knowledge of foreign language and culture and even, in some cases, setting up a foreign outpost) and business development (legal expertise of foreign contracts, protecting intellectual property and securing payment), what is really needed is a commitment at all levels of a company that exporting is an important facet of the company's culture and future.

KEY FINDING 5:

Greater Portland's economy is replete with small and mid-sized companies that have limited awareness of global opportunities. Many of the small and mid-sized companies have trouble getting out of the gate to pursue exports. Companies most frequently cited their limited knowledge of foreign export opportunities as the most significant challenge to expanding into new markets. Many companies express a preference to stick to what they know and expand in the United States, where they are more comfortable.

KEY FINDING 6:

Greater Portland has developed an effective export services system, but serious risks will always remain with exporting. Under the Greater Portland Export Initiative, the region's export services system has become more streamlined. An array of services now exist locally: from economic development practitioners (on BR&E visits) asking firms about exporting and making referrals to the U.S. Export Assistance Center Portland and Business Oregon/Washington Department of Commerce to make use of their wide-ranging toolbox of services and tools, to more targeted services such as the We Build Green Cities program that seeks to develop business abroad for the region's clean tech and sustainability firms.

While the Export Initiative helped to develop a more robust export services system in the region, significant challenges still limit export opportunities for firms. During the last three years, impediments such as lack of financing, high tariffs, political uncertainty in foreign markets and transportation/shipping costs have held up export deals. Other companies do not even pursue export opportunities due to problems connecting to global partners, complying with foreign regulations, or competing against foreign tariffs and unfair trade practices.

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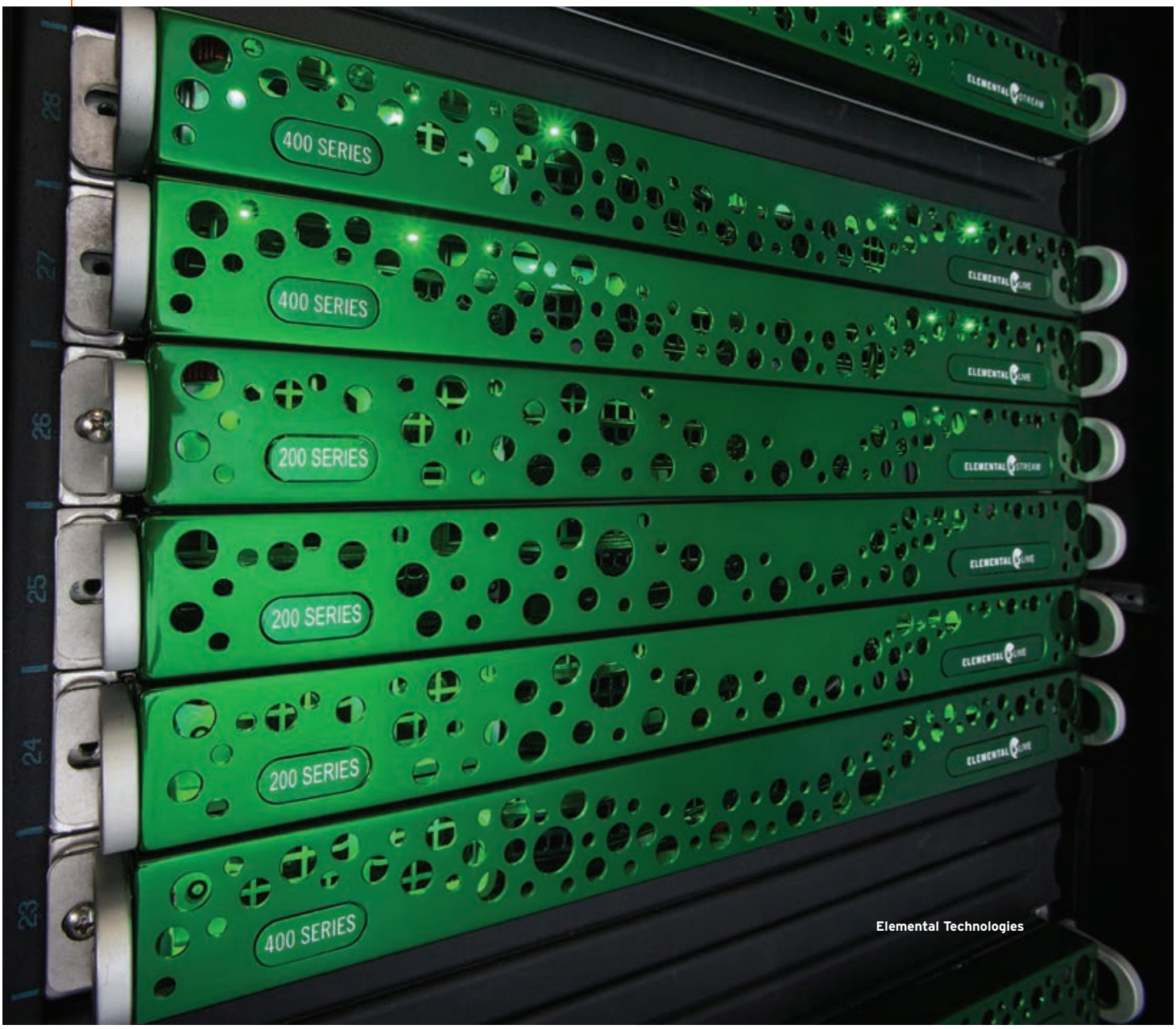
KEY FINDING 7:

Service provision is most effective when delivered with an understanding that firms are on a continuum of preparedness for exporting. The needs of companies vary greatly based on where on the industry range they lie, from nascent to legacy. Working with trade associations and individual companies can help economic development professionals in general and export service providers in particular target their advice and assistance more effectively.

KEY FINDING 8:

An investment from abroad can also be an export opportunity. At the company level, the link between exports and FDI can be impossible to separate. FOEs who enter the market to export or foreign investors who seek early-stage investment in clean technology that can be commercialized to their home country are examples of "two-fers" that doubly benefit the regional economy.



Elemental Technologies

GOAL & OBJECTIVES

GOAL

THROUGH A HEIGHTENED, INTENTIONAL FOCUS ON REGIONAL ECONOMIC GROWTH, cluster development, exports and FDI, Greater Portland will secure and strengthen its long-term position as a competitive, sustainable, and globally integrated economic region.

OBJECTIVES

BASED ON KEY FINDINGS FROM THE MARKET ASSESSMENTS, Greater Portland Global, the region's trade and investment plan, has four primary objectives designed to support the region's vision for growth:

1. Create a strong local export and FDI culture and a global reputation for Greater Portland as a competitive region for international business.
2. Grow exports and foreign direct investment by aligning and coordinating the region's economic development efforts around key industries and markets.
3. Diversify export industries, increasing the number of companies exporting and the markets they access.
4. Build on FDI from leading source countries and industries, while also seeking to grow FDI from underrepresented source countries and industries.



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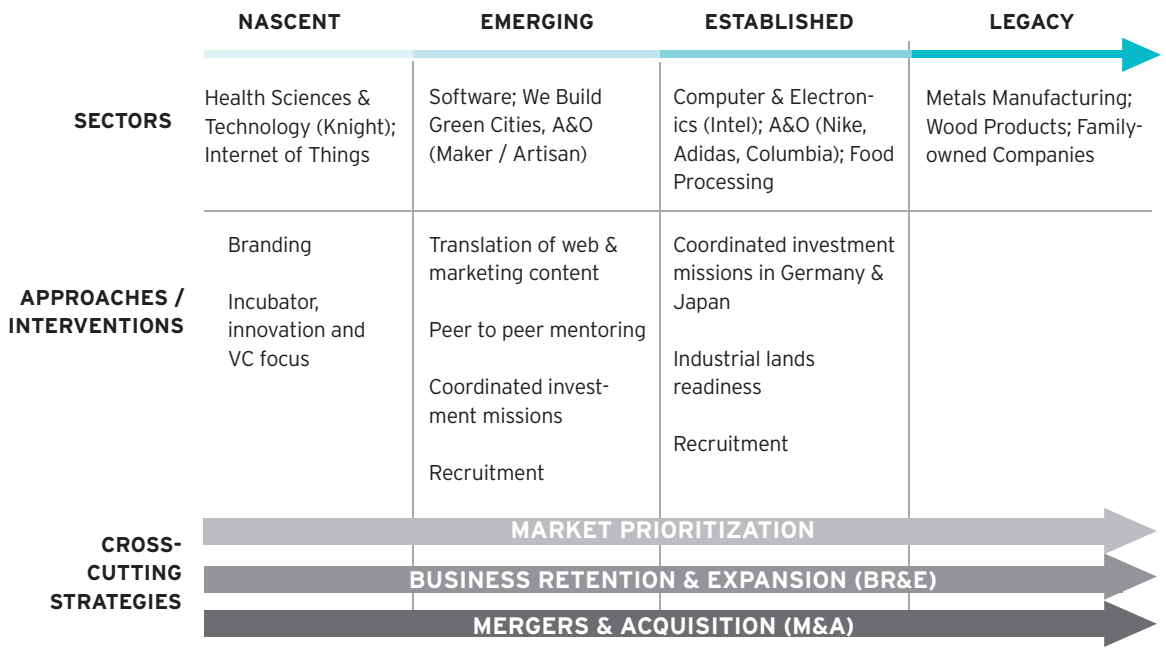
STRATEGIES & TACTICS

GREATER PORTLAND'S EXPERIENCES IMPLEMENTING THE GREATER PORTLAND EXPORT INITIATIVE and conducting the FDI market assessment have shaped how and where the region focuses its interventions. Hence Greater Portland's strategies and tactics are blended to serve both export and FDI objectives. The region seeks to investigate where sectors are in the continuum of excellence and develop strategies to nurture newly formed sectors, further the international aspirations of emerging sectors, and secure the future of key firms that anchor the region's most mature sectors.

The four stages in that continuum—nascent, emerging, established, and legacy—each call for differing levels of intervention, focus and support. In addition to stage-specific interventions, strategies around BR&E, M&A and market prioritization will be applied across the continuum.



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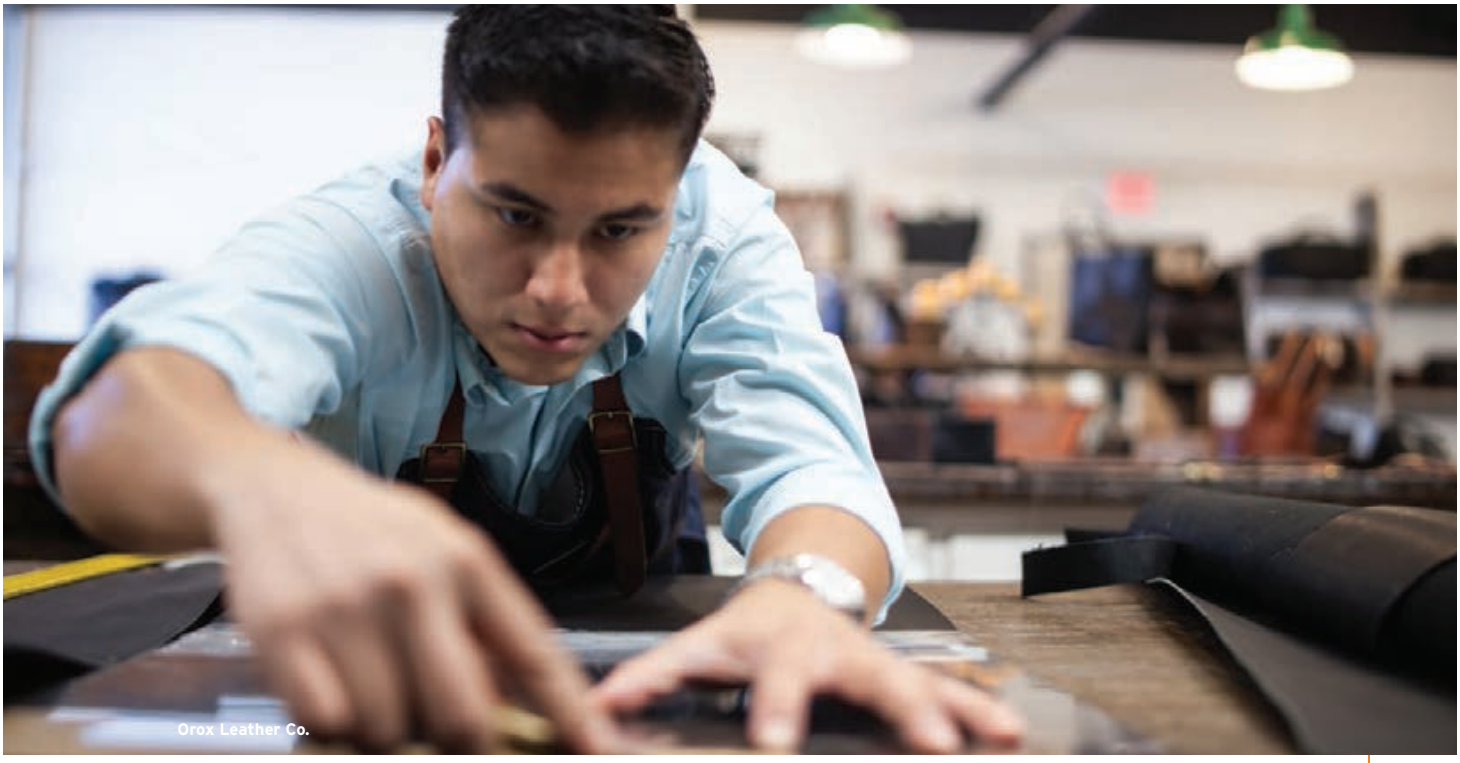
Orox Leather Co.

STAGE-SPECIFIC STRATEGIES

NASCENT

Whether as spillover from established sectors, offshoots from state-funded incubators, or brainstorms from talented entrepreneurs, the region is full of companies trying to create the next great idea. The job of economic development professionals is not to pick which idea or technology may succeed, but to create a fertile ground where innovation will thrive locally and become a pipeline to the region's next emerging sector.

Knitting the story of innovation into Greater Portland's evolving global brand will not only tell the region's economic story more fully, it will also serve to attract investors who are not currently knowledgeable about Greater Portland's assets and opportunities.

This strategy aims to:

1. Include nascent innovative sectors in the region's brand, focusing on the Knight Cancer Institute opportunity at Oregon Health & Science University and the bioscience/medical products sector.

2. Support and work with Oregon Innovation Council initiatives and Signature Research Centers and the Washington Innovation Partnership Zone in Vancouver to accelerate technologies in nascent innovative sectors.

3. Facilitate introductions between early-stage firms and foreign companies for investment, commercialization and deployment opportunities at events such as Oregon BestFest.

4. Connect local venture capital firms to international sources of capital.

5. Leverage the role of universities in attracting foreign students and investment and cultivating foreign alumni to grow international business connections. For example, the strong student/alumni ties that Portland State University has with Saudi Arabia and the Gulf States present a particular opportunity.

6. Diversify participation in the region's startup ecosystem to create an environment where new products and services are applicable to broad global needs and tastes.

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EMERGING

The Greater Portland Export Initiative focused attention on the We Build Green Cities program, which started as a marketing brand and transformed into a business development platform that has had initial success in securing work in target markets for local firms. The export market assessment further revealed that the software industry, known domestically and emerging internationally, would also benefit from an international marketing and business development program.

To address the finding that firms struggle with the "where and how" of exports—questions that also confront economic development professionals who often receive requests or host visitors from around the world—Greater Portland will develop a quantitative and qualitative model to prioritize outbound markets for the two emerging regional sectors of clean tech and software. A tool that can quantify which markets represent the most priority—based on Opportunity, Ease of Doing Business, Size of Market and Connections—will be useful to firms and economic development professionals alike.

This strategy aims to:

1. Translate/globalize web and marketing content for We Build Green Cities clean tech/sustainability and Techtown software brands.

2. Offer local export and investment case management services to companies, building on the work of the Export Initiative in partnership with state and federal partners:

    - Align regional clean tech and architectural and engineering firms with the We Build Green Cities program and its recent partnership with the U.S. Department of Commerce Market Development Cooperator Program

    - Partner with Business Oregon, Washington Department of Commerce and SelectUSA for inbound and outbound investment missions



The Poler flagship store in Portland

3. Expand pilot of peer-to-peer (P2P) mentoring program, which matches experienced exporters with new-to-export or new-to-market exporters, starting with the Technology Association of Oregon.

4. Create a quantitative and qualitative index that prioritizes export markets for software and clean tech/sustainability sectors.

5. Coordinate trade and investment missions to prioritized markets, working with local, regional, state and federal partners.

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ESTABLISHED

The global excellence of the region is largely the result of its two biggest companies, Nike and Intel, and the industry clusters that orbit around them: athletic and outdoor, and computers and electronics. While neither firm needs direct assistance with exporting, their success has created a rich vein of ancillary opportunities to build on the Greater Portland Export Initiative work with secondary and tertiary suppliers and exporters in these industries.

Similar to the twin impacts of Nike and Intel in the region, Germany and Japan also tower over other markets' investment in the region. Local economic development professionals have spent considerable time and attention on German and Japanese markets, but their importance and value must be overtly acknowledged by the region and its leaders. Even as Greater Portland begins to look at other markets, the region's 30 years of history with Germany and Japan call for a renewed commitment through visits and closer ties to local firms and cultural institutions.

This strategy aims to:

1. Support established industry clusters with a focus on maintaining and protecting the region's location advantages.

2. Develop and prepare market-ready industrial sites in Greater Portland that will meet target cluster needs.

3. Connect existing businesses in the region to supply chain opportunities as part of business retention and expansion efforts (BR&E).

4. Implement the recommendations of the Regional Large Site Industrial Recruitment Strategy, including specific FDI-related aspects.

5. Coordinate investment missions between city, regional, state and federal partners to the key markets of Germany and Japan to recruit identified foreign supply chain targets and further strengthen cultural ties.

LEGACY

The region is rich with firms in legacy industries such as metals manufacturing and wood processing that use advanced processes and possess a highly skilled labor pool. Though they are not growing apace with other sectors, they represent an important and integral part of Greater Portland's economy. The region has a shining example of how foreign ownership can transform legacy firms into 21st century companies: Germany's Daimler-Benz's 1981 acquisition of Portland's Freightliner Trucks.

Daimler's recent innovations, investment in a new headquarters facility, and creation of hundreds of new jobs all demonstrate the capacity of FDI to shift legacy companies to an upward trajectory. In addition, while the FDI market assessment demonstrated that greenfield investment is the marginally preferred method of entry by foreign firms and that large-scale investment capital has not yet entered the market, it is time for the region to prepare the ground for such interest.

The region's intervention for legacy industries will be limited to the cross-cutting strategies described in the next section.



The Freightliner Cascadia

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CROSS-CUTTING STRATEGIES

BUSINESS RETENTION & EXPANSION (BR&E)

Expanding BR&E protocols to deepen relationships with FOEs will allow the economic development community to monitor the pulse of these firms, yielding information on their needs and displaying that their community is willing to partner with them on success.

To address these goals, the strategy aims to:

1. Develop "Global 201" economic development professional training, in conjunction with state, federal, and private sector experts on exports and FDI that builds on the success of "Export 101" export assistance trainings.

2. Codify expanded BR&E protocols around financing and capital considerations for legacy firms.

3. Integrate aftercare strategies into existing FOE BR&E efforts.

4. Support the Port of Portland in efforts to reestablish air and sea cargo service with key Asian markets.

MERGERS & ACQUISITION (M&A)

To further prepare the ground for foreign direct investment, the region will develop M&A–specific strategies that market firms looking for capital or foreign acquisition, extend BR&E strategies, and develop regional procedures for effective response to foreign acquisition.

These strategies aim to:

1. Craft M&A policy and procedures to effectively manage responses by the region and individual jurisdictions.

2. Develop a portfolio of firms and projects seeking capital for inclusion in investment missions.

3. Tap foreign reach of regional companies and business facilitators (such as lawyers, accountants, and consultants) including those with overseas offices, to connect with potential customers and investors.

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MARKET PRIORITIZATION

The data support Germany and Japan as the region's most established investment partners with long term investment in a variety of sectors and deeply embedded local cultural institutions. Greater Portland Global seeks to reaffirm the primary importance of these markets to the region, even as Greater Portland casts a wider net for nascent and emerging markets around the world. Similar to the industry approach outlined previously, these would be countries that are beginning to make investments in the region or those that demonstrate a strong complementarity between the region's assets and the country's recent investments.

Stage	Market Attributes	Strategies	Markets
Nascent	• Lack of familiarity with investing in U.S. • Complementarity between investment areas and region's assets/strengths • High growth in outbound investment or existence of sovereign wealth fund investment in U.S.	• Educating inbound investors • Implementation of BR&E aftercare protocols to nurture further investment	TBD by market prioritization
Emerging	• Recent beachhead investments in region • Growing tourist and student enrollment numbers • Deep local connections exist • "Top-down" nature • Ranks highly or growing rapidly in overall U.S. FDI • No restrictions in free flow of capital	• Development of translated investment portfolios • Setting yearly outreach goals • Coordinated response to inbound visits • Exploratory investment missions • Implementation of BR&E aftercare protocols to nurture further investment	TBD by market prioritization
Established	• Long term investment and engagement in variety of local sectors • Existence of local cultural institutions	• "High touch" inbound and outbound meetings • Support of local cultural institutions	Germany and Japan
Legacy	• History of investment but lack of recent investment	• Limited economic development role to play	TBD by market prioritization

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PERFORMANCE MEASUREMENT

MANY OF THE FACTORS THAT AFFECT EXPORTS AND FDI are beyond local control (e.g., exchange rates, financial crises, global energy prices), creating challenges for performance measures. To track progress as effectively as possible, Greater Portland Global will use metrics at several different levels:

- Macro indicators in Brookings' Export Nation reports: export value; export intensity; export jobs; indexed performance rank; and diversification of export industries; and Brookings' FDI in U.S. Metro Areas, measuring FDI intensity, trends in greenfield and M&A, and jobs in foreign-owned establishments.

- Regional indicators derived from partners measuring changes in metro export activity, such as number of new firms entering the export service system or the export supply chain, or metro FDI activity, such as inbound and outbound missions or FDI leads; overall demand for export or FDI services; use of regional port facilities (marine and air service); new export markets and FDI source countries; trends in export and FDI services and industry clusters; and new sales contracts or investment deals.

- Qualitative changes to the export and FDI environment, such as recommended policies adopted; integration of export and FDI goals into regional planning; metro-led trade and investment missions and their outcomes; identification of executive level export and FDI leaders in metro companies; and increased media coverage.



Shimadzu



Lam Research

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IMPLEMENTATION

GREATER PORTLAND INC (GPI), the region's public-private economic development organization, will coordinate Greater Portland Global's implementation.

GPI staffs a public/private Global Leaders steering committee, which reflects regional and industry balance across the metro area. The steering committee will:

- Oversee implementation of Greater Portland Global goals;
- Help generate public support and financial resources for Greater Portland Global;
- Issue periodic export and/or FDI policy recommendations on behalf of the region.

GPI's coordination will involve a Global Work Team reporting to the Global Leaders and comprising representatives from local/state/federal economic development organizations, trade associations, academic institutions, and private sector partners. The Global Work Team will evolve as needed.

The aim of the Global Work Team is to improve the pipeline from economic development to export promotion and FDI attraction, broadening outreach to export-ready companies and potential foreign investors. The successful implementation of Greater Portland Global should maximize regional participation in the strong export and FDI services provided by the state and federal governments. To ensure full alignment, the Global Work Team will include participation by the federal and state export promotion and FDI attraction organizations in the Greater Portland region: the U.S. Export Assistance Center Portland, the Small Business Development Center, the Columbia River Economic Development Council (an associate development organization in Southwest Washington of the Washington Department of Commerce), and Business Oregon.

The Greater Portland Global strategy proposes a five-year work plan as part of Greater Portland 2020, a five-year regional comprehensive economic development strategy that may include and/or replace oversight of certain strategic elements once the governing and implementation structure is determined. In addition to specific goals and objectives, Greater Portland Global will be truly successful when exports and FDI are mainstreamed into the daily processes of economic development and planning in the region.

GPI will require ongoing funding to provide project management, marketing resources, and administrative support for Greater Portland Global. Partner organizations will support implementation, primarily through existing resources and in-kind staffing, using program and grant funds to coordinate and implement strategies and tactics. This approach encourages regional efficiency and a cultural shift within organizations to support exports and FDI.

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POLICY PROPOSALS

In the implementation of Greater Portland Global, the region will uncover obstacles facing both firms and economic development professionals. Part of Greater Portland Global's purpose is to identify these impediments to export and FDI growth, and to propose policy corrections for improved performance. During the development of Greater Portland Global, Greater Portland has gathered initial recommendations on the following topics for both federal and state/local policymakers:

1. Funding for economic growth through exports and FDI
2. Metro-level export and FDI tracking data
3. Freight strategy to support export growth and FDI
4. Strong workforce system
5. Conducive land use, tax structure and general business climate
6. Movement of people and ideas
7. Alignment of performance measures

For additional details please see the Greater Portland Global Policy Memo.

MARKETING AND COMMUNICATIONS

Greater Portland Inc will provide professional, proactive, and clear communications to both project participants and outside stakeholders (regional, national, and international). Marketing and communicating the successes of the region and companies located in Greater Portland will help fulfill the objective to create a strong local export and FDI culture and a global reputation for Greater Portland as a competitive region for international business. Specific tactics will include sector-specific work, like the We Build Green Cities website and translated materials. The launch of the Greater Portland Global will be followed by regional rollout presentations to interested business associations and economic development partners.

GPI's outreach will include:

- Release of Greater Portland Global (project participants and outside stakeholders)
- GPI website's Global section (project participants and outside stakeholders)
- Yearly updated reports (project participants and outside stakeholders)
- Meeting management, including clear definition of roles and responsibilities and conflict management as needed (project participants)
- Public presentations, status updates, and joint press release management/media interaction (outside stakeholders).

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ACKNOWLEDGMENTS

For the Greater Portland Export Initiative, the City of Portland and the Portland Development Commission (PDC) led the export strategy process, with a core team that included the Port of Portland, Greater Portland Inc (GPI), Business Oregon, the U.S. Export Assistance Center (USEAC) Portland, and other regional stakeholders.

For Greater Portland Global, the Greater Portland Global Trade and Investment Plan, GPI and PDC co-led a FDI Pilot Core Team, which also included Business Oregon, the City of Hillsboro, the Port of Portland, Portland State University, and USEAC Portland.

In addition to the work of the strategy development teams, Greater Portland sought significant input from a wide range of public sector organizations, higher education institutions, regional decision-makers, and private sector businesses through working sessions, one-on-one meetings, and presentations to regional organizations.

Thanks also to the Metropolitan Policy Program at the Brookings Institution and JPMorgan Chase for support of this work and the Global Cities Initiative. Ryan Donahue of Brookings provided significant feedback and input for this report.

For more information about the GTIP, please contact Greater Portland Inc:
www.greaterportlandinc.com
#GreaterPortlandGlobal

ABOUT THE GLOBAL CITIES INITIATIVE

The Global Cities Initiative is a five-year project of the Brookings Institution and JPMorgan Chase aimed at helping the leaders of metropolitan America strengthen their regional economies by becoming more competitive in the global marketplace. It seeks to catalyze a shift in economic growth policy and practice to position metro areas for high-quality growth and better jobs for more workers. The Global Cities Initiative has three pillars: research, forums, and the Exchange. The Exchange is a four-year learning and action network that enables leaders to act on the ideas and collaborations generated by GCI's research and forums. At the core of the Exchange are the efforts of 28 U.S. metropolitan areas, including Greater Portland, to create integrated export and FDI strategies in Global Trade and Investment Plans.

For more information, see
www.brookings.edu/projects/global-cities.aspx
#GlobalCities



This report was developed by Greater Portland Inc and the Portland Development Commission through the collaboration of political, business, and civic leaders of the Greater Portland Region. The conclusions and recommendations of this report are solely those of its authors and do not reflect the views of the Brookings Institution or JPMorgan Chase.

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GLOBAL CITIES INITIATIVE

A Joint Project of Brookings and JPMorgan Chase



GREATER PORTLAND 2020

Greater Portland Economic Development District // Comprehensive Economic Development Strategy

Development of this plan is funded by the United States Economic Development Administration

GREATER PORTLAND 20|20

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ABOUT GREATER PORTLAND ECONOMIC DEVELOPMENT DISTRICT

The Greater Portland Economic Development District (GPEDD), staffed by Greater Portland Inc, is a 501(c)4, not-for-profit organization serving Clackamas, Multnomah and Washington counties in Oregon and Clark County in Washington. GPEDD is funded primarily through grants awarded by the U.S. Department of Commerce's Economic Development Administration (EDA).

GPEDD focuses on regional economic development in two critical areas. First, GPEDD leads the regular update to the Comprehensive Economic Development Strategy (CEDS)—a cornerstone of the U.S. EDA's programs defined as a strategy-driven plan for regional economic development. The CEDS is a prerequisite for designation by EDA as an Economic Development District (EDD). Second, GPEDD coordinates regional responses to U.S. federal government economic development grant opportunities, such as the Investing in Manufacturing Communities Partnership (IMCP) and the Jobs and Innovation Accelerator Challenge (JIAC) grants.

ACCOMPLISHMENTS

Pacific Northwest Manufacturing Partnership (PNMP)
PNMP was formed in response to IMCP, a federal initiative which aims to accelerate the resurgence of manufacturing in the United States and create a competitive climate for job creation and private investment. On July 8, 2015, a bi-state supra-region led by Business Oregon that includes Greater Portland received the designation of "Manufacturing Community" that gives the supra-region elevated consideration for $1.3 billion in federal dollars and assistance from 13 cabinet departments and agencies. The strength and synergy of the PNMP is woven in our combined "manufacturing ecosystem". The PNMP region's historical strength in materials and metals forms the basis of the Advanced Materials Science for Advanced Manufacturing cluster.

PNMP's catalytic project component to the IMCP application is related to the commercialization of cross laminated timber (CLT) in the Northwest. CLT and associated advanced wood products manufacturing technologies combine our region's traditional competitive advantage in softwood timber supply from Pacific Northwest forests with advanced material science.

The JIAC grants are a partnership between the U.S. Department of Commerce's EDA, U.S. Department of Labor's Employment and Training Administration, and the U.S. Small Business Administration, with the Innovations in Advanced Materials and Metals grant also including the U.S. Department of Commerce's National Institute of Standards and Technology and the U.S. Department of Energy.

JIAC Clean Tech Advance Initiative
In October 2011, the Greater Portland region was awarded $2,150,000 in federal funds to accelerate innovation in clean technologies for the next three years, later extended. The Clean Tech Advance Initiative is a bi-state partnership under the leadership of the Portland Development Commission to support innovation and job creation in the Clean Tech and Advanced Manufacturing Industry Clusters.

JIAC Innovations in Advanced Materials and Metals
In October 2012, the Greater Portland region was awarded $2,192,000 in federal funds to accelerate innovation in the advanced materials and metals industries for the next three years. The Innovations in Advanced Materials and Metals is a bi-state partnership under the leadership on the Columbia River Economic Development Commission to support advanced manufacturers that specialize in metals, machinery, computer and electronics, plastics, composites, polymers and other advanced materials.

[1] http://www.eda.gov/ceds/files/CEDS-Content-Guidelines-full.pdf

GREATER PORTLAND 2020 OVERVIEW

Greater Portland's business, education and civic leaders are collaborating to align economic priorities across the bi-state, multi-county region. For the first time, the region is coming together to develop an action-oriented, five-year comprehensive economic development strategy (CEDS) that builds on existing efforts and spotlights what's needed to achieve economic prosperity in Greater Portland.

Following is a summary of phases that have helped to shape the framework of the CEDS, which is also known as the Greater Portland 2020 plan. This research was guided by Atlanta-based economic development strategy firm, Market Street Services. Specific research relative to each phase is referenced throughout the following pages within each strategy. Data and information from these phases are included as an addendum to this document.

PHASE 1: COMPETITIVE BASELINE ASSESSMENT

The Competitive Baseline Assessment presented a detailed examination of the Greater Portland region's competitiveness as a place to live, work, visit and do business. Nine U.S. metros were selected to show not only those comparable to Greater Portland, but also which metros are ahead of or more competitive than the region, illustrating the strengths and weaknesses through a comparative data set. The Assessment leveraged a number of indicators through the use of benchmarking dashboards to outline the key strengths, weaknesses, opportunities and challenges facing the metro area. The Competitive Baseline Assessment was a starting point to lay the groundwork for the next research phases, stakeholder input, and strategic implications that directly informed the Greater Portland 2020 action agenda.

PHASE 2: REGIONAL TALENT REVIEW

Expanding on the findings and conclusions of the Competitive Baseline Assessment, the Regional Talent Review explored Greater Portland's current talent pool and examined its long-term capacity to drive job growth and prosperity in the region. This evaluation combined data, analysis, existing reports and some stakeholder input to paint a clear picture of the Greater Portland region's talent standing. This report highlighted the younger and advancing workforce cohort's trends and dynamics in the context of many of the initial indicators from the Competitive Baseline Assessment, and its findings related to the region's occupational structure directly informed the Target Business Analysis phase of the process.

PHASE 3: TARGET BUSINESS ANALYSIS

The Target Business Analysis phase provided a more complete picture of the competitive realities surrounding the development of identified target industries around which Greater Portland Inc (GPI) and partners should focus their economic, talent and site development efforts. Greater Portland has a strong complement of homegrown corporations and exciting startup activity, but the conditions that build economic clusters and launch new ventures are not necessarily the same conditions that sustain and grow these diverse components of the regional economy. The goal of the Target Business Analysis was to ensure that metro leaders gain a better understanding of Greater Portland's strengths and potential areas of challenge in each sector, particularly as they relate to technology, innovation, educational and research development assets. A fundamental belief in the three legs of the economic development stool (retention, recruitment and entrepreneurship) drove the analysis.

REGIONAL STRENGTHS + ADVANTAGES

There are three factors that contribute to the advancement of Greater Portland's economy: **Workforce**, **Business Infrastructure** and **Quality of Life**. While there are clear strengths within each factor, there are also areas of opportunity to build upon that help to frame the strategies contained within the CEDS. The following findings are derived from the Phase I Competitive Baseline Assessment.

WORKFORCE

High Productivity

Greater Portland businesses benefit from high workforce productivity. Each of the region's workers, on average, generates $195,143 in exports. Only San Jose ($201,644 exports per worker) displayed higher productivity levels. Gross metropolitan product (GMP), a measure of total economic output, is the 3rd highest ($169,209 GMP per worker) of Greater Portland's benchmark metros. Only tech hubs San Jose and Seattle boast higher productivity levels, but that gap is narrowing. In the last five years, Greater Portland (25.8 percent) experienced a larger GMP increase than both San Jose (16.7 percent) and Seattle (17.2 percent).

Talent In-migration

Over the last five years, Greater Portland added more than 110,000 new residents, a gain of five percent since 2008—growth that's on par with San Jose, San Diego and Salt Lake City. Despite moderate growth, the region remains a prime destination for domestic and international migrants. Total net migration between 2000 and 2013 represented 10.4 percent of the region's total 2013 population, the 4th-highest of all benchmark metros.

BUSINESS AND INFRASTRUCTURE

Air and Freight

Whether moving people by air or goods by sea, Greater Portland businesses can easily connect to global economic activity. From 2012-2013, Portland International air passenger departures per capita grew by 4.2 percent, the fastest of 10 benchmark metro regions. Portland International Airport also demonstrates strong capacity to handle air cargo, moving 437 million pounds in 2013 alone. As a major infrastructure asset to export-oriented trade activity, the Port of Portland handles roughly 11 million tons of exports, 14th out of the 171 ports in the nation. In comparison, the Port moves only four million tons of imported products, the 42nd busiest out of 171 ports.

QUALITY OF LIFE

Livability

While hard to quantify, quality of life is notably the region's strongest asset, nationally and increasingly, globally. The in-migration of talent that Greater Portland is experiencing affirms the region's reputation for livability. A quality of life scan shows that transportation options, job density and civic engagement are high. There is an intricate link between Greater Portland's quality of life and its capacity to provide its businesses with a sustainable pipeline of workers.

REGIONAL CHALLENGES + AREAS OF OPPORTUNITY

Factors that challenge the region's present and future economic growth include **Innovation and Entrepreneurship**, **Equity** and **Cost of Living**.

INNOVATION AND ENTREPRENEURSHIP

Access to Capital

Companies in Oregon received just $9.3 million in venture capital funding in 2013—0.02 percent of the nation's venture capital investment that year. At the same time, 35.5 percent of the state's total venture capital is generated in Oregon. In comparison, California reports a little over $10 billion in venture capital activity (68.4 percent from in state), and Texas reports almost $600 million of activity. Greater Portland has been proactive in filling venture needs through establishment of state- and locally-run venture capital funds to maximize the efficiency of capital used outside of more expensive innovation hubs like San Jose.

EQUITY

Lagging Economic Prosperity

Five-year changes in the region's household incomes show a reduction in the amount of middle-income households, and growth at the poles of the income scale. Between 2008 and 2013, the number of households with incomes of $24,999 or less increased by 9.4 percent and the number of households earning more than $100,000 annually rose 11.7 percent. Both of these growth rates far exceeded the increase in the total number of households in Greater Portland, which rose 5.6 percent during the five-year timeframe. This demonstrates a clear need to generate more opportunities for employment and advancement to give households at the low end of the income ladder an opportunity to move up.

COST OF LIVING

Affordability

Greater Portland's cost of living, ranging from annual congestion costs to housing and rental affordability are among the highest of all the 10 benchmark metros. In terms of rental affordability, more than half the region's residents pay 30 percent or more of their gross income on rent—a commonly used measure for housing affordability. With the U.S. cost of living indexed at 100, Greater Portland's cost of living index (121.7), a broad measure of a region's costs of goods and personal services, was well above the national average. While costs in California metros (San Jose and San Diego) were comparatively higher, it is important to note that both region's residents command higher wages and per-capita incomes.

WHERE IS GREATER PORTLAND NOW?

KEY RESEARCH AND INPUT FINDINGS

Market Street Services conducted three research phases, public surveys for input, and a close review of existing research that directly informed many of the objectives and actions of the Greater Portland 2020 strategy. These findings point to urgency for the region to accelerate positive momentum in Greater Portland's components of people, place and business and to address head-on the challenges and vulnerabilities that threaten to chip away at its current status. In order to improve Greater Portland's trends and assets, decisive, collaborative, regional action is necessary. The status quo will result in Greater Portland falling further behind.

At the onset of the Greater Portland 2020 research process, the general public and the Greater Portland 2020 Steering Committee were surveyed on their insights into the economic development climate of the region. They ranked lists of economic development activities on how effective or ineffective these tactics have been for Greater Portland.

This insight was important in understanding the regional context and economic development ecosystem in which the quantitative trends (examined in the research phases) play out. While some key parts of economic development are successful and well understood by the public and steering committee, much of the foundation of a sustainable, vibrant metro economy—the place for business to start and thrive—is on shaky ground. If those areas identified in the surveys as less successful do not improve, the competitive advantages and accomplishments in Greater Portland's startups, talent attraction and quality of life will not survive.

SURVEY RANKING OF ECONOMIC DEVELOPMENT ACTIVITIES

MOST SUCCESSFUL ECONOMIC DEVELOPMENT ACTIVITIES IN GREATER PORTLAND

1. Quality of life
2. Entrepreneurship and innovation
3. International exports and foreign direct investment
4. Existing business retention
5. Talent attraction and retention

LEAST SUCCESSFUL ECONOMIC DEVELOPMENT ACTIVITIES IN GREATER PORTLAND

1. Industrial site development
2. Competitive business climate
3. External marketing and communications
4. Infrastructure development (including transportation, utilities and technology)
5. Incentives and policy

WHERE IS GREATER PORTLAND NOW?

continued

COMPETITIVE BASELINE ASSESSMENT *(Phase 1)*
Greater Portland's middle or low rankings on many of the indicators in the five areas examined—economic performance, workforce competitiveness, innovation and entrepreneurship, business environment and quality of life—pointed to a significant amount of growth that must continue to maintain quality of life, economic opportunities and advancement across the region's businesses and workforce. The Competitive Baseline Assessment against nine other U.S. metros demonstrated that Greater Portland 2020 must have a spirit of urgency to slow or reverse some of the affordability, wage and unemployment trends that threaten the region's prosperity.

- **Low wages and relatively low share of per-capita income driven by wages** are a major concern for the region's economic prosperity. Greater Portland showed solid wage growth, but wages still lag competitor metros.
- Job growth has been coming from new establishments and seems to have the **strongest potential in businesses starting and expanding** in the region.
- **Bachelor's degree attainment and growth, and the potential to raise attainment through educated young adults and in-migrants, lags** peer metros. In addition, the larger share of the workforce who may be aging into retirement in the coming decade poses a concern for workforce sustainability.
- Greater Portland **competes for talent, funding and enterprises against some of the most innovative startup and research hubs in the world.** The region boasts a stronger-than-average startup density and relatively large share of self-employed workers and employment in small firms. However, with lower earnings and income growth and venture capital for these enterprises, it is clear many of the region's startups and entrepreneurs are bootstrapping, stretching lower revenues and investment dollars. On the positive side, stakeholders pointed to high capital efficiency among the region's startups and second-stage firms.
- The region has a favorable business climate, especially relative to other West Coast metros. In addition, its infrastructure for the movement of people and goods is competitive. Notable is water availability for businesses and residents, which will be an increasingly critical location decision factor for talent and firms.
- Residents' well-being—as measured in poverty rates, rates of uninsured, health outcomes and crime—is concerning. Greater Portland does not stack up to many peer metros on these well-being metrics. In addition, as residential growth expands in counties outside of the core while the central business district adds jobs, the already high cost of traffic congestion in Greater Portland could grow even more. A relatively high cost of living coupled with the region's lagging wages and per-capita income are likely serious hindrances to economic advancement for many residents.

COMPETITOR METROS

1. Austin, TX
2. Denver, CO
3. Minneapolis, MN
4. Phoenix, AZ
5. Raleigh, NC
6. Salt Lake City, UT
7. San Diego, CA
8. San Jose, CA
9. Seattle, WA

Nine U.S. metros were selected to show not only those comparable to Greater Portland, but also which metros are ahead of or more competitive than the region, illustrating the strengths and weaknesses through a comparative data set.

WHERE IS GREATER PORTLAND NOW?

continued

REGIONAL TALENT REVIEW *(Phase 2)*
At its most fundamental level, economic development is about increasing prosperity for individuals through creating, retaining and attracting quality jobs. A prosperous regional economy depends on a talented workforce, and the region's ability to retain and advance those workers. Nationally, businesses have begun to value skilled workforce availability above all over factors (including cost of labor and business climate).

The Regional Talent Review focused on Greater Portland's existing workforce strengths and shortcomings, and its opportunities for future talent growth, leveraging numerous existing reports and strategies. These reports build off a few key themes echoed in Greater Portland 2020 stakeholder input: equity, wages and opportunities for workforce engagement and advancement.

Some of Greater Portland's fundamentals are strong, but the competition is fierce and the region has achieved only modest gains in prosperity relative to comparison metros. The current economy is leaving behind many of the region's residents. Greater Portland must proactively work to boost its economic prosperity in the form of more jobs, better jobs and opportunities for advancement for all of its residents.

- **Young, more educated, increasingly diverse talent—but not at the level of its competitor metros.** Greater Portland has enough younger residents to replace those who will retire in the next 20 years. However, other competitor metros have even more favorable age dynamics. In every age group, the U.S. is more racially and ethnically diverse than Greater Portland, but overall, the region is clearly becoming more diverse. Just over 35 percent of adults have a bachelor's degree or higher—a larger share than the U.S. but behind some competitor metros. Education attainment levels in most of Greater Portland's race and ethnic groups are slightly higher than national averages, but gaps persist between white adults and Black and Hispanic adults.
- Greater Portland's **workers between the ages of 25 to 34 are more likely to be employed in food service or other service jobs** and less likely to hold a business, finance or computer-related occupation than young workers in competitor metros like Denver and Seattle.
- Greater Portland is a significant net attractor of people, particularly from other places in the West—Los Angeles, San Diego, Las Vegas and Honolulu. That said, Greater Portland has experienced a net loss of population to Seattle and Austin. Greater Portland's **status as a major talent magnet is somewhat dependent on the economic opportunities it can provide to new residents**. In the two most recent economic downturns, Greater Portland's in-migration slowed down much more so than out-migration sped up.
- **New residents bring more education but less income.** In-migrants into Greater Portland tend to be young and highly educated, indicating that educational attainment levels in the region are likely to rise as more new residents move in. However, in-migrants to Greater Portland are also less wealthy prior to moving to the region than in-migrants into comparison metros.
- **Mismatch between quality of life and quality of economic opportunities threatens long-term competitiveness.** While many regions must address significant quality of life concerns before they can even begin to attract significant levels of outside talent, Greater Portland's attractiveness as a place to live is perhaps its main strength. At the same time, the region must focus on providing jobs and advancement opportunities to match its overall quality of place.
- **The sheer number of scattered K–12 districts (50 in total) hinder strategies to address systemic issues.** Quantitative data confirms that the performance of the area's largest public school systems runs the gamut, and data show significant equity issues. Complicating matters further, districts are divided between two state systems that have different sets of administrators, funding structures and legislative mandates.

WHERE IS GREATER PORTLAND NOW?
continued

- Despite the lack of a single powerhouse research university, there are **major opportunities ahead for higher education in the region**. Greater Portland has strong higher education assets but produces relatively fewer degrees than its comparison metros. The region also lacks one major research university, but Portland State University (PSU) and Washington State University-Vancouver (WSUV) are growing rapidly. In addition, Oregon State University (OSU) and University of Oregon (UO) are increasingly expanding their reach into Greater Portland. In terms of research, the Life Sciences Collaborative of Oregon Health & Science University (OHSU), PSU, and OSU unites resources and OHSU's Knight Cancer Center will build even more research capacity.

- **Competitive workforce skill sets support Greater Portland's legacy, established and emerging industry sectors.** The region has a several core workforce competencies, including significant corporate capacity, a strong concentration of management occupations, and a thriving base of "creative" talent. Software development, metal manufacturing, semiconductor manufacturing, and engineering talent are also concentrated in Greater Portland relative to other metros. The depth and breadth of these occupational skill sets are highly competitive. It should also be noted that Greater Portland's overall production occupational capacity is average relative to the U.S., but compared to similar metro areas, it stands out as a competitive advantage.

- **Low wages could hurt emerging and nascent tech sectors.** Greater Portland's wages in software development occupations are significantly below the national average and pay levels found in comparison metros. Wages are important in software development—this could impact the region's ability to attract talent. Greater Portland's tech workforce is also older than comparison metros and the U.S. average—the region will need to work harder just to keep pace with its tech firms' talent needs.

- **A call for coordination and amplified efforts is necessary.** There are a number of positive initiatives underway in Greater Portland that help connect individuals, the education pipeline and the region's businesses. However, according to input participants, the major shortcoming is a lack of coordination between these efforts, creating "silos." The big need is for the region to coordinate more of these activities around shared workforce goals that are strategic and regional. Competition in the economic development world has never been more intense, and many of the regions with which Greater Portland competes for talent have similar advantages and are pulling ahead in some key objective workforce measures. This highlights a clear need for the region to take action to boost the skills and competitiveness of its talent, thereby increasing its ability to create wealth and prosperity for all its citizens.

TARGET BUSINESS REVIEW *(Phase 3)*
Targeting is the practice of focusing limited resources on those business sectors—and the asset base that supports them—that have the greatest potential to support future job creation, business investment, and wage growth in Greater Portland. The Target Business Review proposes six targets, which evolve out of Greater Portland's existing four target industries.

Metal + Machinery
With heavy investments from Vigor, Schnitzer Steel, Columbia Steel and Daimler, the region's significant manufacturing base stands apart from other metros. It has historical skill sets that remain entrenched, and the workforce is relatively young. However, the comparatively high business cost structure in Oregon and Washington make recruiting a challenge for any prospects looking at locations beyond the West Coast. There are also few prepared large sites in the region, and despite the presence of Asia-facing ports, transportation infrastructure to support the movement of goods is a concern for firms in this sector. Many of the Metal & Machinery occupations in Greater Portland require only a high school diploma, but regional employers still point to needs in increased STEM and career-preparation training.

WHERE IS GREATER PORTLAND NOW?

continued

Computer + Electronics
Though global competition and uncertainty persist, this is a mature, highly productive and well-known cluster in Greater Portland. While semiconductor manufacturing (anchored by Intel) is the most recognized component of this sector, Greater Portland is also concentrated in computer and peripheral equipment and communications equipment. Crucial to the local economy, this industry has site, regulatory and workforce needs that are critical to these employers' continued investment. The production, talent and market expertise of this sector also have good implications for the growth of emerging fields like Clean Tech or Health Sciences & Technology.

Clean Tech
Propelled by Greater Portland's sustainable mindset and its capacity for innovation, Clean Tech specifically focuses on manufacturing and associated research and development efforts. Clean Tech increasingly aligns with export efforts as U.S. demand is lower overall, and the *We Build Green Cities* program is a promising initiative for exporting Greater Portland's clean tech strengths—especially in consulting. The sector connects to other target strengths like metals and electronics, and these production jobs have low barriers to entry for the workforce. One challenge to address is that Greater Portland's clean tech firms tend to be small, and the field is not ideal for angel investors.

Athletic & Outdoor
Built around homegrown Fortune 500 company Nike, this sector in Greater Portland has since evolved into the most concentrated cluster of these firms in the U.S. The region's beautiful natural setting is ideal as a place to attract talent, innovate products and reach consumer markets. The industry centers on designing products and managing the corporate operations of these companies more than manufacturing products. There are relatively few entry points for less-skilled and local workers. Athletic & Outdoor is a great attraction target for Greater Portland as firms continue to relocate to the region. A major opportunity for this sector is crossing over into the Health Science & Technology emerging area to make the region a leader for "wearable" medical devices and other health and wellness technology that harnesses the Internet of Things.

Software + Media
This sector builds on Greater Portland's reputation as a tech and innovation hub. The diversity of the sector and the products it creates are evident in the region's mix of companies—from Ascension Software (mobile app developer for the hospitality industry) to Elemental Technologies (multiscreen video solution) to Salesforce (cloud-based customer relationship management), Greater Portland has a wide range of homegrown enterprises and major operations of firms headquartered elsewhere. While the software development side of this cluster is established, the emerging field of digital media can help it diversify. These firms are often small and need assistance to scale, but the overlap of Software & Media with so many other target industries is promising. Two major potential threats to this cluster's long-term success in Greater Portland: ages and wages. The region's computer occupations workforce is much older than the U.S. average, and local wages significantly lag competitor metros.

Health Sciences + Technology
Unlike other targets, this is primarily an emerging area. The region's medical devices niche is small but well established. This sector primarily builds off the opportunity from the Knight Cancer Challenge, which could help stimulate additional biotechnology and health innovation in Greater Portland. As found in the Regional Talent Review, there is some life sciences occupational capacity in Greater Portland, but not compared to the true sector hubs, so recruiting outside talent will be an absolute must as this sector gains steam. Still, many lab tech jobs require a two-year degree or less, so with focused STEM training, this sector could connect less-skilled workers to emerging opportunities in Health Sciences & Technology. A special confluence of factors could make Greater Portland a world leader in "wearable" medical devices—factors like its Athletic & Outdoor product innovation, computer manufacturing capacity, and Software & Media firm diversity.

COMMUNITY OUTREACH

Consensus-driven community input was critical to developing this strategy, which includes a diverse mix of realities and needs within the region. To guarantee proper representation of the diverse region, a committee of 40 members serving the public's interests convened regularly over 10 months. Input occurred through Steering Committee meetings, Technical Advisory Committee meetings, Small City Consortium meetings, regional economic development professional roundtables and a public regional community survey. Meetings took place throughout the region in Hillsboro, Portland, Tualatin and Vancouver to accommodate meeting participants and gain firsthand experience of the unique needs expressed about the surrounding area. The community survey was announced in a press release, advertised in the *Portland Business Journal*, distributed to local chambers of commerce and GPI's network.

In total, 21 input and planning meetings took place consisting of eight Steering Committee meetings, nine Technical Advisory Committee meetings, four Small City Consortium meetings and three regional economic development professional roundtables. These meetings were designed around three phases: Competitive Baseline Assessment, Regional Talent review, and Target Business Review.

The Steering Committee included key members of the public and private sectors who, combined, reflect the interests and diversity of the region at large. Committee member characteristics included: business leaders and executives (large and small employers), elected officials, young professionals, civic leaders, technology entrepreneurs and start-up community leaders, education leaders (community college and four-year research postsecondary institutions), public sector representatives, leaders reflecting diverse constituencies, leaders reflecting diverse geographies within the district and leaders representing major economic development assets in the region.

The Technical Advisory Committee was comprised of 24 professionals that provided additional economic development perspectives as needed to inform the process, review draft deliverables, and contribute input. The committee members consisted of community, economic, and workforce development practitioners from individual communities and organizations throughout the district.

The Small City Consortium is a group of small cities and public entities throughout the region that are represented by the city's mayor or economic development professional. This group provided key insights to their communities' issues and needs, as well as feedback on the development of the plan.

Economic development professional roundtables are meetings of economic development organizations, including cities, counties, economic development corporations, ports and utilities. This group provided key insights to their organizations' issues and needs, as well as feedback on the development of the plan.

PHASE 1: COMPETITIVE BASELINE ASSESSMENT

Phase 1 meetings occurred in September 2014 to assess the key strengths, weaknesses, and opportunities of Greater Portland's economic performance, workforce competitiveness, innovation and entrepreneurship, business environment and quality of life. The following four questions were asked of the meeting's attendees:

1. How do you define regional economic development?
2. What are Greater Portland's three greatest strengths, in terms of economic development?
3. What are Greater Portland's top three opportunities for economic development to further examine and develop in the next five years?
4. What are Greater Portland's three greatest weaknesses to overcome in order to remain economically competitive?

COMMUNITY OUTREACH
continued

PHASE 2: REGIONAL TALENT REVIEW
Phase 2 meetings occurred in October 2014 to explore the current talent pool and examine its long-term capacity to drive job growth and prosperity in the region. The following four questions rose in these meetings:

1. What do you see as Greater Portland's greatest talent advantage for businesses and job creation?
2. Which challenges are the most urgent to address regionally?
3. What big opportunities need to be addressed?
4. What efforts are in place to bridge the talent attraction/wealth creation divide in Greater Portland?
5. How should siloes among workforce development/education initiatives be overcome?

PHASE 3: TARGET BUSINESS ANALYSIS
Phase 3 meetings took place in December 2014 to examine the competitive realities within identified target industries around which GPI and partners should focus their economic, talent and site development efforts. Questions asked during these meetings were:

1. Where is Greater Portland's economy now in terms of job creation, wage growth, business success, economic advancement opportunities, and global and national competitiveness?
2. Where is the opportunity within the economy to build momentum?
3. Where are the weaknesses that would decline the status quo if something is not done about them?
4. What is the desired future for Greater Portland's economy?
5. What is success five years down the road?
6. What could be the region's boldest, most aspirational goal for economic development?
7. What are the biggest threats to getting there?
8. What are the biggest opportunities?

PUBLIC REGIONAL OVERVIEW
In addition to public meetings, a community survey captured the full spectrum of voices across the region and elicited responses aligned with the questions and discussions in the public meetings. Overall, 226 surveys were completed online and analyzed for trends and compelling content. The survey consisted of 45 multiple choice and open-ended questions, and below are a sample of questions.

Tell us about your connection or attachment to the Greater Portland region.

What, in your opinion, is the top action the Greater Portland region could initiate to improve its economy and drive job creation?

In your opinion, what industry faces the biggest challenges in the Greater Portland regional economy?

What do you think needs to be done to improve your school or school system?

Please list any degree programs not currently offered in the area that you feel should be added to local colleges' curricula.

Do you feel there will be job opportunities available to you (or your child) in Greater Portland upon graduation from high school, college, or university, or upon completion of military service?

What must the Greater Portland region do to attract and retain young and mid-career professionals? *(Examples could include efforts to increase nightlife/entertainment options, enhance networking/mentor opportunities, targeted job recruitment from regional colleges/universities, etc.)*

If you could make one recommendation for strengthening the effectiveness of your community's leadership (within the public or private sector), what would it be?

What do you feel is the greatest strength/ weakness of the regional workforce?

In your opinion, what is Greater Portland's greatest strength?

In your opinion, what is Greater Portland's greatest weakness or challenge to overcome?

COMMUNITY OUTREACH
continued

RESPONDENT DEMOGRAPHICS
The survey asked a series of demographic questions, which allowed the analysis to consider demographic sub-groups of the 226 respondents. The following is a brief summary of respondent characteristics:

County Residence
- 51% in Multnomah
- 20.8% in Clark
- 11.1% in Clackamas
- 9.3% in Washington
- 3.1% Skamania
- 4.7% did not live in the region

Self-described Area
- 46% urban or central city
- 41.2% suburban, close to an urban area
- 8% rural
- 6.2% small town

Length of Residence (of those living within the region)
- 60.8% for 15 or more years
- 21.2% for 6-15 years
- 8.1% for 3-5 years
- 9.9% fewer than 3 years

Ethnicity
- 87.9% White
- 3.6% Black
- 1.3% Asian or Asian-American
- 0.9% American Indian
- 0.9% Hispanic
- 1.8% Other
- 3.6% preferred not to answer

Age Range (for respondents 25 and older)
- 30.1% ages 55+
- 36.7% ages 40-55
- 31.9% ages 25-39

1.3% respondents were age 24 or younger.

GREATER PORTLAND 2020 ACTION AGENDA

The goal of Greater Portland 2020 is **economic prosperity for all across the region**, which can be accomplished by aligning Greater Portland's business, education and civic leaders.

Three core strategies frame Greater Portland 2020 and are guided by principles of **equity** and **advancement**:

PEOPLE - Talent development and recruitment

BUSINESS - Growing business and pioneering innovation

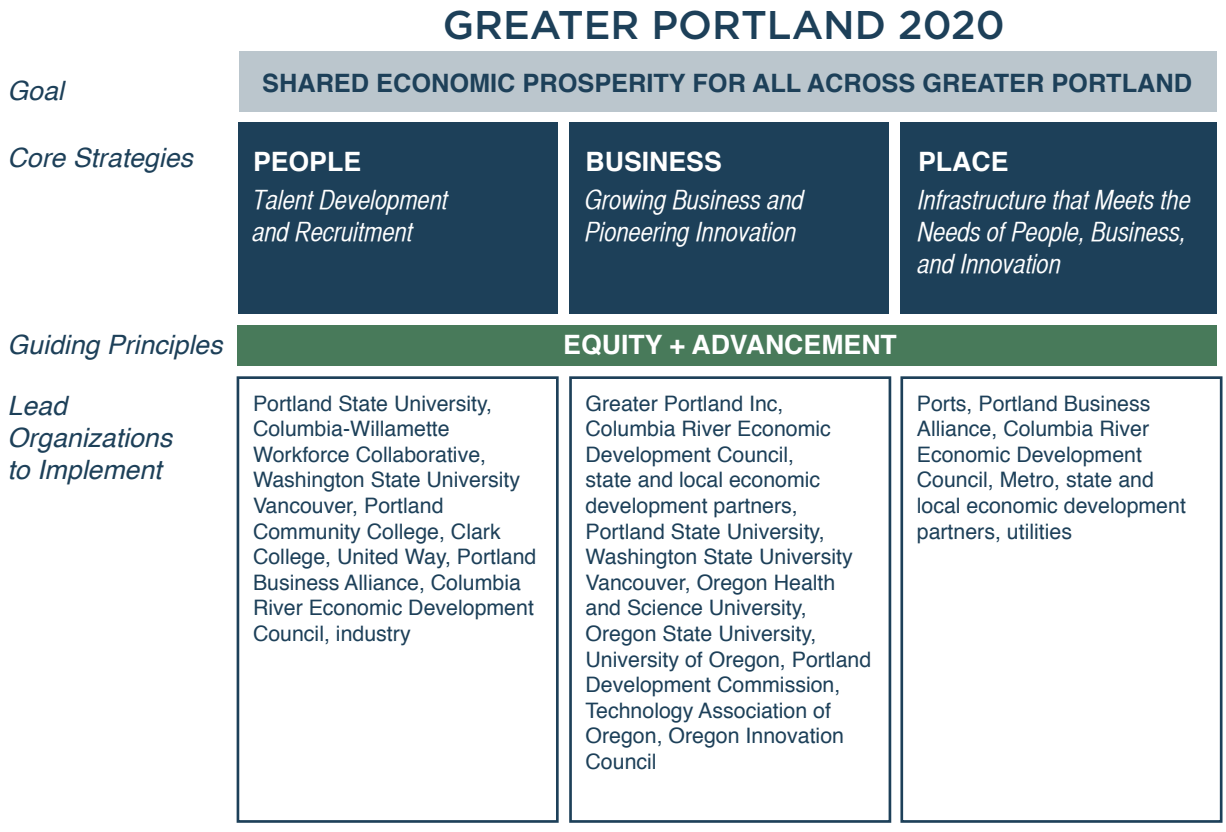
PLACE - Infrastructure that meets the needs of people, business and innovation

The Greater Portland 2020 Action Agenda is structured throughout with these components:

CORE STRATEGIES: Broader themes for Greater Portland 2020 which set the direction and urgency of the effort—People, Place, and Business.

OBJECTIVES: Purpose and case building behind the strategies and actions.

ACTIONS: Concrete tactics, tasks, or initiatives that outline the steps to attain each objective.



CORE STRATEGY: PEOPLE

PEOPLE
The goal of this core strategy is to **recruit, develop and advance the region's talent**.

PRIORITIES
- Activate industry in training and education to advance career and technical education
- Own, practice, and perfect diversity
- Close the income gap in underrepresented, disadvantage populations

WHAT WE'RE AIMING FOR
- A workforce fully prepared to advance Greater Portland's target sectors and innovative businesses
- Greater Portland is the best metro in which diverse talent thrives and where businesses are at the forefront of attracting, advancing and effectively engaging diverse talent
- Access to quality jobs through adequate infrastructure between affordable places to live and employment centers

LEAD ORGANIZATIONS
- Portland State University, Columbia-Willamette Workforce Collaborative, Washington State University Vancouver, Portland Community College, Clark College, United Way, Portland Business Alliance, Columbia River Economic Development Council, industry

OBJECTIVE 1
ALIGN WORKFORCE DEVELOPMENT CAPACITY, RESOURCES AND ENERGY
Alignment of the region's collective impact partners is already underway; however, since education and workforce development funding flows from local and state sources, full coordination between Oregon and Washington efforts may be challenging. Improved communication and coordination among workforce development organizations, education partners and companies will help further career technical education objectives.

ACTION 1.1
Advance Career Technical Education (CTE) by Activating Industry in Education
Business and industry groups must continue to commit to communicating with training and education providers along the spectrum of talent development. The states' and region's extensive science, technology, education and mathematics (STEM) initiatives are a great example of how seriously some major employers take preparing Greater Portland's future workforce to support their growth. In addition, as postsecondary institutions grow rapidly and improve their programs, this growth should be aligned with the expansion and success of business partners.

- Integrate emerging and established businesses with roles in these initiatives to ensure a balanced investment from private, public and non-profit sectors.
- Work with public school systems' achievement gap efforts, identifying how the business community and stakeholders can invest in and engage with initiatives to close gaps through mentoring, training and public school foundations.
- Form new skills panels as needed to support target sector development, and partner with relevant organizations to develop appropriate strategies based on the skills panels' findings.
- Build a flexible relationship structure for industry and higher education institutions. Develop input opportunities between universities and target cluster businesses to create clear career pathways within universities.

CORE STRATEGY: PEOPLE
continued

- Understand how and where nascent and emerging sectors (ie, *Health Sciences & Technology* and *Software & Media*) should incorporate career preparedness, skills training and other curricula.
- Work with higher education, community colleges and K-12 institutions to design and implement world-class career pathway programs focused on preparing students and workers for the increasingly technology-driven jobs of the future.
- Advance the current career pathway programs by developing standards and systems to be applied throughout the region.

OBJECTIVE 2
ATTRACT AND EMBRACE DIVERSE TALENT
Greater Portland is known as a place for talent, yet its workforce is not growing as quickly and is older than most of its competitor metros. In addition, the share of in-migrants bachelor's degree or higher—while higher than the national average—still falls behind new residents in high-performing peer metros. The region's communities of color and international populations, however, are growing quickly and pose an incredible opportunity to build the long-term sustainability, vibrancy, and competitiveness of Greater Portland's talent.

ACTION 2.1
Own, Practice and Perfect Diversity
As consumer markets open up and expand across the world, businesses have increasingly understood the value of embracing a diverse global workforce. Still, the practice of and investment in diverse talent development are major hurdles for many businesses to overcome. As Greater Portland's population grows and changes, and as business actively recruits talent from outside of the area, it is important that leadership structures represent the changing stakeholders of the region. There is an opportunity to maximize existing programs that develop the current and next generation of leaders, to also develop more diverse leadership in the public, private and non-profit spheres of influence in the region.

Greater Portland also falls behind some of its larger competitor metros like Seattle in international in-migration, although 19 percent of the region's population growth between 2003 and 2013 came from new residents moving from outside of the U.S. With the integration of Greater Portland Global into GPI's business development efforts, the region will be better positioned to interact with talent from companies around the world. This is a prime opportunity for Greater Portland to embrace an approach for immigrant talent in industries with high demand.

- Draft a Greater Portland diversity and equity charter that defines the region's diversity values and intentional objectives to advance diverse, homegrown talent within target sectors and be the most welcoming global metro in the nation.
- Through Partners in Diversity and organizations with a diversity focus, gather best practices and innovative approaches to diverse talent attraction and leadership development from Greater Portland's businesses, non-profit organizations and public agencies and institutions, like Intel's Global Diversity Initiative and Clackamas County's Diversity, Equity and Inclusion program.
- Develop a "Next Generation Leadership" plan for the two-state region to tactically lay out an approach to advancing the types of voices and implementers that Greater Portland needs.
- Develop a plan to attract, embrace and advance global talent in target sectors.
- Develop an earned media campaign about Greater Portland's diverse talent and the commitment of employers to embrace and advance a dynamic, rapidly changing workforce base.
- Create a web presence to serve as the first stop for information for diverse talent to connect them with information about the region, schools, jobs (especially for trailing spouse) and civic or social groups.
- Outline pathways to employment for international talent in Greater Portland, and identify where gaps exist that need to be addressed through policy.

- Work with major employers in the region that sponsor international workers to ensure that new companies seeking to attract talent from outside of the U.S. are following best practices and federal and state guidelines.
- Identify ways to draw international talent to invest in Greater Portland as foreign direct investment grows and the region's international networks expand.
- Work with existing immigrant communities, resources, and employment hubs for immigrants to connect these efforts to a broader view of international investment in the region.

OBJECTIVE 3
FOSTER EQUITY AND ACCESS

One of the region's biggest opportunities for a healthier economy is to achieve equity in talent development, which requires the support and participation of many partners. As the Regional Talent Review uncovered, significant equity issues in the region's K-12 systems. Students of color and students from low-income households are struggling the most—and as incomes lag, housing costs increase, and the region diversifies, these achievement gaps and access to career opportunities could widen and spread out further across Greater Portland. The region cannot afford to let these students and workers fall further behind.

In addition, the region has expressed a commitment to equity and addressing Greater Portland's relatively lower—but growing—wages as jobs, wealth and investment increase during this period of post-recession growth. The Brookings Institution and other economic researchers have examined the trends of inequality and stagnant wages that are increasing in many of the nation's most vibrant metro economies. Greater Portland's time to address this dynamic is now, while there is urgency at the regional level and many local efforts to leverage.

ACTION 3.1
Close the Income Gap in Underrepresented, Disadvantaged Populations

Equity is often defined on a human capital scale, but businesses and other parts of the regional economy also have a stake in equity. As the value of equity for business is articulated, the leaders in developing Greater Portland's homegrown talent must convene around a common definition and metrics for human capital equity. Equity is inherently a human concept so the main outcome of this coordination is to determine how equity will be measured and actionably advanced. Too many in Greater Portland's minority populations fall behind their white peers in educational attainment.

The region's diversity is also not reflected in many of the visible leadership roles. The region's education leaders must decide what equity means for each point on the talent development spectrum and ensure that they are all playing their part advance a common agenda.

The region's relatively low wages are a major concern for long-term economic prosperity. The Oregon Business Plan (OBP) has a goal to raise per-capita income (PCI) to above the national average by 2020. With 66.8 percent of Greater Portland's PCI driven by its relatively low wages, the region faces an uphill climb in meeting its share of the OBP goal. Supporting business and quality-of-life infrastructure, and attracting and retaining top talent depend on regional wage advancement. Yet, the lower cost of labor is a competitive advantage for employers. Regional economic development partners must understand how businesses view wages and create a plan to address accordingly—either market this as a strength to attract more business, or accept the results and implications of less-competitive wages.

- Implement public-private programs and practices to improve wages and incomes in underserved-communities due to hurdles to quality employment. These populations may include communities of color and people who do not speak English at home.
- Create and agree upon a set of regional equity indicators with support from the business case for equity. Utilize these indicators to track and report inequality's growth and decline across key communities of the regional population.

CORE STRATEGY: PEOPLE
continued

- Align with existing metrics across the region such as All Hands Raised, Portland Public Schools' Racial Educational Equity Policy and Milestones Framework, and City of Beaverton's Diversity, Equity and Inclusion Plan.
- Identify partners to actionably address negative or concerning trends. Create short-term task forces and work plans to dig into these issues and prioritize next steps for action.
- Through meetings with business leaders and other tools for gathering information, identify employers' barriers to and concerns with raising wages for workers.
- Focus specifically on target sectors with wages below peer metro's averages, like *Software & Media*, to determine if low wages are the result of a lower flow of capital to startups in the region or overall less competitive pay at larger firms.
- Ensure the connection between wages and regional economic development goals are clearly defined and articulated to support complementary outcomes.

ACTION 3.1a
Build a Framework for Access to Economic Opportunities, and Identify/Eliminate Hurdles to Quality Employment
Partners must ensure that the region's residents have access to quality job opportunities. As the workforce shifts to find affordable housing, the network that connects these workers to jobs must also be modified. While options for transportation to and from jobs exist, these transit investments are not evenly distributed throughout the region, especially across state lines. Traffic congestion continues to be a costly burden for workers and businesses, and as housing gets less affordable, low- and middle-income workers will continue to be pushed into communities within the region that are farther from developed job hubs.

- Through input from businesses, workforce data, and community-pattern data, identify transportation gaps that limit worker mobility and access to jobs and workforce development resources.
- Support studies and analyses that examine disconnected workers, communities and other stakeholders in the region. Ensure that as research is conducted in Greater Portland on mobility and access, actionable strategies are developed and partners are activated to address these findings.
- Partner with bus, light rail and commuter rail transit services TriMet and C-TRAN to create or extend routes to efficiently connect disconnected workers to employment and training hubs.
- Work across state lines to update transportation planning and investments based on workforce commute flows and the movement of goods.
- Collect and share regional best practices of local economic development partners' improvements in neighborhoods, corridors and other place-based infrastructure that connect businesses to their workforce.

CORE STRATEGY: BUSINESS

BUSINESS
The goal of this core strategy is to **grow business and pioneer innovation.**

PRIORITIES
- Implement regional approach to traded-sector industries; advance Greater Portland as the global leader in its legacy, established and emerging target sectors; and develop opportunities to grow and converge sectors
- Formalize a global marketing program for business recruitment and expansion, trade and investment
- Build out the region's innovation infrastructure to capitalize on Greater Portland's entrepreneurial ecosystem
- Develop a regional public-private higher education innovation network

WHAT WE'RE AIMING FOR
- Net-new jobs in the region's core traded-sector industries and new target sectors
- Diverse, sustainable range of successful firms in every community within the region
- Cross-cluster connections among targets to develop new opportunities for job creation
- Greater Portland is the best location for foreign direct investment
- Early- and second-stage firms have access to support that enables them to launch and expand
- Higher education institutions are a platform for new business creation and innovation

LEAD ORGANIZATIONS
- Greater Portland Inc, Columbia River Economic Development Council, state and local economic development partners, Portland State University, Washington State University Vancouver, Oregon Health and Science University, Oregon State University, University of Oregon, Portland Development Commission, Technology Association of Oregon, Oregon Innovation Council

OBJECTIVE 4
GROW AND RECRUIT BUSINESSES
Existing businesses are the nation's job creation engine—studies show that between 70 and 95 percent of the country's employment gains is attributable to the expansion of existing companies. For early-stage, mid-sized or high growth-potential firms to scale within the region, stakeholders identified needs for improved infrastructure and tech transfer capabilities, support for potentially emerging clusters, public-private research and development collaboration and unified, efficient communication to existing businesses.

Likewise, it is also important to look beyond the boundaries of the region for business growth. Greater Portland has compelling assets for business recruitment—including its position in a region with two state business climates—but operates in constraints that require strategic and realistic plans for business recruitment. A balanced approach to business expansion and recruitment is especially critical in order to support the growth and competitiveness of firms in the region's target industries, since their suppliers, workforce and infrastructure cross city limits, county boundaries, state lines and even oceans.

ACTION 4.1
Execute a Regional Approach to Industries
Cluster strategies build off the foundation of a robust, well-coordinated regional business retention and expansion (BRE) program and sophisticated, multi-dimensional marketing and recruitment program. The region's targets and clusters—*Metals & Machinery*, *Computer & Electronics*, *Clean Tech*, *Athletic & Outdoor*, *Software & Media*, and *Health Sciences & Technology*—all have different needs but many overlapping assets.

As the principal regional business recruitment and attraction organization for Greater Portland, GPI must lead communication with prospective and existing firms to ensure the region remains highly competitive for these dynamic sectors of the economy. GPI must also be nimble enough to attract burgeoning opportunities for the region that fall outside of the established portfolio of target sectors. GPI's role as

recruiter of and marketer to external businesses can be more effective with direct and regular relationships with firms and leaders in the industries on which it has built an investment attraction platform.

- Build industry expertise through in-depth research to understand projected growth, and evaluate and pursue opportunities that align with market strengths and advantages.
- Develop and implement industry and stage-specific strategies (nascent, emerging, established and legacy).
- Engage industry leaders and partners in further identifying local/global trends to support marketing, recruitment and expansion efforts. Strategies should include these key activities:
    1. Improve services to businesses and entrepreneurs.
    2. Build capacity to respond quickly to changing industry trends and new opportunities.
    3. Develop and align better networks to connect businesses within the clusters.
    4. Create better cross-cluster collaboration across industries.
- Establish a research and competitiveness resource for regional partners and policy makers tied to place-based assets and challenges for businesses.
- Inventory industries pursued by city and county economic development professionals to identify where local targets are part of the broader regional clusters and where they differ from the regional portfolio. Acknowledge that regional target pursuits should not undercut local efforts to pursue a different range of targets.

OBJECTIVE 5
EXPAND GLOBAL REACH AND INVESTMENT
Having launched Greater Portland Global (GPG)—the region's global trade and investment plan—the opportunity exists to increase the region's international standing and reputation as a place for business investment and growth. GPG identified that while Greater Portland is the 23rd largest economy in the U.S., it is 50th in foreign direct investment (FDI) intensity. Greater Portland's persistent external perception as a "Tier 2" metro means significant work must be done to elevate its image and brand among global decision makers.

ACTION 5.1
Make Greater Portland a Top Location for Global Investment and Trade
GPG identified that recent export growth is lagging. However, conditions for FDI are ideal due to dynamic clusters of economic activity, diverse place-based and higher education assets, name-brand firms and existing international ties from Greater Portland to key markets. Market assessments of Greater Portland have uncovered overlap between the region's exports, FDI and innovation. Greater Portland is a smaller metro compared to other regions embarking on similar foreign investment plans, which makes it more nimble in implementation but also means some assets may not have as much capacity to leverage. GPI's parallel roles in business attraction and keeper of GPG strategies are key for maximizing the region's potential, recruiting investment and jobs from global markets, and coordinating myriad local, regional, state and federal partners.

- Use market prioritization findings to expand regional marketing activities and target foreign markets, industries and investors. In addition to stage-specific interventions, develop BRE and and merger-and-acquisition strategies to apply to the continuum.
- Work with state/local partners and companies to coordinate global marketing and sales mission activities.
- Develop a regional economic development clearinghouse for data and analysis related to the region's exports, FDI, supply chains, existing business trends, economic competitiveness, economic development equity and other research useful to local economic development professionals, prospective investors and location decision makers.

CORE STRATEGY: BUSINESS
continued

- Ensure economic development projects get extensive coverage in local media. Demonstrate how business investments strengthen quality of life, talent, access, equity and other priorities of Greater Portland's stakeholders.

OBJECTIVE 6
ADVANCE POLICY SOLUTIONS TO COMPETITIVE ISSUES

Greater Portland's distinct advantages for business and talent cannot be separated from the region's policy climate. The region's leaders must be responsible for advocating for policies that make the region competitive for sustainable, quality investments, while also aiming for the Greater Portland 2020 vision of economic prosperity across the region.

ACTION 6.1
Sharpen the Region's Competitiveness for Jobs and Investment from Target Sectors

Marketing Greater Portland, attracting business and investment, and working to expand existing companies cannot be effective if the business climate for traded-sector industries is uncompetitive. Without a strong product, business development efforts will fall short. GPI should influence conversations that inform policy relative to investment from target industries but not lead actual policymaking. This requires the ongoing leadership of many groups already engaged in this area to support a unified voice, alignment of goals and consensus actions that result from dialogue around economic development policy. From major tools like Oregon's Strategic Investment Program, enterprise zones and new market tax credits, to the city- and county-level regulations for businesses, Greater Portland has both significant advantages and challenges for which traded-sector businesses and regional economic development partners must take on a more vocal advocacy role.

- Examine gaps in advocacy on regional competitiveness and align efforts to more effectively relay the need for sound economic development programs.
- Develop an annual two-state economic development advocacy agenda.
- Through industry intelligence, site-selector insights and best practices from competitor markets, identify policy, programs, legislative and regulatory factors that encourage the growth of firms in the six target sectors.

OBJECTIVE 7
ADVANCE GREATER PORTLAND'S INNOVATION INFRASTRUCTURE

Over the past decade, the entrepreneurial ecosystem in Greater Portland has exploded with high-performing firms and new opportunities. Through more sophisticated opportunities for capital, an infusion of Bay Area-talent and money, advancement of universities into entrepreneurship and tech transfer, international visibility as a competitive location for startups and high-growth companies, and a cast of supporting organizations helping to create and scale new ventures, Greater Portland's innovation landscape has dramatically changed.

In addition to developing the future leaders and workers of the region, higher education institutions across Greater Portland must better align with each other and key traded sectors around entrepreneurship, licensing, technology transfer and commercialization as they build their own capacities in those areas. With investment from the Knight Cancer Center coming online, the region's ability to augment its higher education capabilities to create and leverage new products will be immense.

The role of the region's economic development leaders is to invest in this emerging infrastructure of innovation to maintain its momentum.

ACTION 7.1
Connect Entrepreneurial Support Initiatives and Networks

Greater Portland is home to a wide range of groups, programs and tools that support innovation and entrepreneurs, but efforts and outcomes need to better connect across the communities they serve while still maintaining the strategic purposes on which these programs were launched.

- Map and detail the range of incubators, accelerators, innovation zones, competitions, capital funds, networking and membership groups, and other efforts across the two-state region. Use this inventory to market the region as a destination for investment and capital.
- Convene these entities and groups to identify needs, where gaps exist and any urgent issues for the region's economic development professionals, industry leaders, public sector leaders and partners to act on.
- Ensure startup and second-stage firm information and input are captured in industry cluster research, BRE data and other intelligence that drives regional economic development priorities and business climate policy.

ACTION 7.2
Develop a Regional Public-Private Higher Education Innovation Network
With access to major employers and corporate innovators concentrated in Greater Portland, there are vast opportunities for corporate-sponsored innovation and more industry-university research collaboration.

The region is home to a number of pioneering university-led initiatives like the Portland State University (PSU) Business Accelerator. The Collaborative Life Sciences Building (Oregon Health & Science University, Oregon State University, and PSU) represents one type of cross-institutional collaboration, as does the partnership of Columbia River Economic Development Council, Clark College and Washington State University Vancouver around Vancouver's Innovation Partnership Zone. The entrepreneur development and business-facing programs of Greater Portland's universities and colleges could have an even farther-reaching impact on the innovation and new venture success of the region, if aligned and leveraged with each other and private industry.

While building better connections among institutions is critical, so is improving communication and an understanding among universities and industry. In a talent- and innovation-fueled regional economy like Greater Portland, the roles of both of these sectors cannot be understated.

- Work with partners like Business Oregon's innovation and entrepreneurship task force, Oregon InC innovation plan, local economic development plans and universities, to identify where industry and university players can partner directly in implementation.
- Identify local and national best practices in university-private sector innovation and commercialization that can be expanded in Greater Portland.
- Partner with community colleges and private universities and colleges to define their roles and strategies for advancing commercialization and industry engagement in innovation.
- Invest in and promote targeted initiatives, like the Northwest Collaboratory for Sustainable Manufacturing and Innovate Collaborate Oregon that bring together industry and universities around Greater Portland's target sectors.
- Work with partners to identify current nascent efforts to increase innovation between private sector and universities.
- Ensure these efforts to develop innovation partnerships among industry and businesses in the Greater Portland region are adequately resourced, staffed and have the capacity to get off the ground and meet the needs of their constituent institutions and businesses.

CORE STRATEGY: PLACE

PLACE
The goal of this core strategy is to **improve infrastructure to meet the needs of people, business and innovation.**

PRIORITIES
- Improve Greater Portland's transportation capabilities to mitigate congestion, enhance the positive impact of regional transit and augment freight movement
- Identify future needs for jobs-ready industrial and employment lands
- Address regional housing supply and affordability
- Plan for Greater Portland's economic resiliency

WHAT WE'RE AIMING FOR
- A coordinated portfolio of competitive offerings across the two-state metro in sites, access and cost for business investment and growth
- State and local policies that encourage investment from Greater Portland's high-value, traded-sector firms and industries
- Seamless movement of goods, people and ideas that enhance Greater Portland's global influence

LEAD ORGANIZATIONS
- Ports, Portland Business Alliance, Columbia River Economic Development Council, Metro, state and local economic development partners, utilities

OBJECTIVE 8
ACCELERATE SITE AND INFRASTRUCTURE OPPORTUNITIES
As the low-cost labor and land in other parts of the U.S. become increasingly imbalanced with the disadvantages of less-educated workforces and under-invested infrastructure in those regions, Greater Portland's assets in human capital and infrastructure will be even more critical for business growth. However, the region has distinct challenges that must be addressed to provide the type of place where businesses can expect to invest for the long term.

ACTION 8.1
Improve Greater Portland's Transportation Capabilities
Greater Portland's seaports and waterways, international airport, Class I rail, air and port cargo capacity, intermodal terminals, utility networks and interstates and highways facilitate the flow of commerce and wealth through the region. According to the Competitive Baseline Assessment, they are vital to the competitiveness of the regional business climate. However, Greater Portland is facing increasing road congestion, which threatens to chip away at the region's advantages for trade and mobility.

- Starting with the 2014 Cost of Congestion data, identify key points of congestion impacting freight and employee movement in the region.
- Develop plans for mitigating congestion from and augmenting freight activity for international trade.
- Prioritize regional investments, actions and locations that provide the most significant near-term impacts.
- Launch a bi-state coordination committee that includes public- and private-sector participation to address transportation issues across state lines. Identify regional priorities based on research, data and greatest return on investment.
- Generate ongoing advocacy for stable transportation funding for the Washington and Oregon region.

CORE STRATEGY: PLACE
continued

- Secure the regional transportation plan priorities in the tri-county Metro and Clark County regional transportation plans.

ACTION 8.2
Identify Future Needs for Jobs-ready Industrial and Employment Lands
Sites and buildings are at the critical convergence of the region's infrastructure assets. While much are constrained in the short-term by an urban growth boundary, Greater Portland still has a number of greenfield and brownfield sites that offer opportunities for local, national and foreign direct investment. As demand for office space increases (and as the cost for Class A and industrial space climbs), the region must ensure that permitting and responsiveness to development needs are keeping pace with the growth of business. Still, Greater Portland retains competitive advantages as the costs of industrial electricity and real estate, as well as the availability of water are all highly competitive relative to other West Coast metros.

- Implement the existing work of the Regional Industrial Site Readiness, Lands for Jobs and Regional Large Site Industrial Recruitment Strategy.
- Develop protocols to keep site data updated to share with prospects, key partners in business development and local economic development professionals.
- Maintain an up-to-date inventory of the region's brownfield sites and their development needs to market through GPG initiatives with prospective foreign investors.
- Develop a regional inventory of permitting and site development best practices to assist local governments in adopting and transitioning to responsive, streamlined, timely and efficient permitting protocols for businesses. Develop regional best practices for jurisdictions to provide business incentives and develop prepared sites.
- Identify and pursue projects that leverage Greater Portland's freight infrastructure through ports, airports and rail for international trade over the long term.
- Continue to study and market the advantages of Greater Portland's access to water.
- Pursue opportunities to increase competitive fiber capacity and connectivity throughout the region.

ACTION 8.3
Address the Regional Housing Supply and Affordability
Greater Portland's cost of living seems low compared to other West Coast metros, but when accounting for the lower wages of the region's workers and the constrained developable land, it is clear that workforce housing will increasingly be an issue, not only for individuals and families but also for businesses that need to attract and retain a skilled workforce. The region's high cost of living coupled with lagging wages and per-capita income are likely serious hindrances to economic advancement for many workers.

- Develop a region-wide housing plan.
- Ensure an adequate supply of workforce housing that is both affordable for middle-income workers and accessible from middle-income job sites.
- Create a plan that also addresses the regional availability of affordable housing for low-income workers.

ACTION 8.4
Plan for Greater Portland's Economic Resiliency
The departure of Hanjin and Hapag-Lloyd from the Port of Portland container cargo shipping and the resignation of Oregon's Governor show how quickly a chain of events can impact a significant share of the region's businesses or negatively skew the image of Greater Portland. More globally, natural or economic disasters in Greater Portland's priority markets like Japan and Germany could also wreak havoc on the regional economy. Greater Portland's larger global presence also makes it more exposed to cycles of international markets and disasters that happen far from the Pacific Northwest. While embracing the opportunities of global trade and increased FDI, it is also important to prepare for these unexpected catastrophes that can send shockwaves through Greater Portland's businesses.

CORE STRATEGY: PLACE
continued

- Develop the regional capacity to deploy support, make quick decisions and chart a new path in the face of major vulnerabilities to the regional economy.
- Through BRE and GPG intelligence, identify regional businesses' primary international and domestic markets, major infrastructure resources and other information so in the face of internal/ external disaster, firms can be quickly contacted for support and assistance in developing alternatives and accessing capital.
- Gather emergency preparedness plans for Greater Portland's communities, counties, Metro and major assets (like Port of Portland and Port of Vancouver), and aggregate the response to businesses at the regional level.
- Through existing business data gathered at the local level, identify barriers to businesses' adoption of disaster preparedness plans and protocols.
- Work with state and local officials to develop mitigation, preparedness, financial, response and outreach tools for businesses that can be activated in the event of a disaster.

IMPLEMENTATION PLAN 2016-2020

#	PEOPLE OBJECTIVES AND ACTIONS	YEAR 1	YEARS 2-5
1	**ALIGN WORKFORCE DEVELOPMENT CAPACITY, RESOURCES AND ENERGY**		
1.1	*Advance Career Technical Education (CTE) by Activating Industry in Education*		X
	• Integrate emerging and established businesses with roles in these initiatives to ensure a balanced investment from private, public and non-profit sectors.		X
	• Work with public school systems' achievement gap efforts, identifying how the business community and stakeholders can invest in and engage with initiatives to close gaps through mentoring, training and public school foundations.		X
	• Form new skills panels as needed to support target sector development, and partner with relevant organizations to develop appropriate strategies based on the skills panels' findings.		X
	• Build a flexible relationship structure for industry and higher education institutions. Develop input opportunities between universities and target cluster businesses to create clear career pathways within universities.		X
	• Understand how and where nascent and emerging sectors (ie, *Health Sciences & Technology* and *Software & Media*) should incorporate career preparedness, skills training and other curricula.		X
	• Work with higher education, community colleges and K-12 institutions to design and implement world-class career pathway programs focused on preparing students and workers for the increasingly technology-driven jobs of the future.	X	
	• Advance the current career pathway programs by developing standards and systems to be applied throughout the region.		X
2	**ATTRACT AND EMBRACE DIVERSE TALENT**		
2.1	*Own, Practice and Perfect Diversity*		
	• Draft a Greater Portland diversity and equity charter that defines the region's diversity values and intentional objectives to advance diverse, homegrown talent within target sectors and be the most welcoming global metro in the nation.	X	
	• Through Partners in Diversity and organizations with a diversity focus, gather best practices and innovative approaches to diverse talent attraction and leadership development from Greater Portland's businesses, non-profit organizations and public agencies and institutions, like Intel's Global Diversity Initiative and Clackamas County's Diversity, Equity and Inclusion program.	X	
	• Develop a "Next Generation Leadership" plan for the two-state region to tactically lay out an approach to advancing the types of voices and implementers that Greater Portland needs.		X
	• Develop a plan to attract, embrace and advance global talent in target sectors.	X	
	• Develop an earned media campaign about Greater Portland's diverse talent and the commitment of employers to embrace and advance a dynamic, rapidly changing workforce base.		X
	• Create a web presence to serve as the first stop for information for diverse talent to connect them with information about the region, schools, jobs (especially for trailing spouse) and civic or social groups.		X
	• Outline pathways to employment for international talent in Greater Portland, and identify where gaps exist that need to be addressed through policy.	X	
	• Work with major employers in the region that sponsor international workers to ensure that new companies seeking to attract talent from outside of the U.S. are following best practices and federal and state guidelines.	X	

IMPLEMENTATION PLAN 2016-2020

continued

#	PEOPLE OBJECTIVES AND ACTIONS	YEAR 1	YEARS 2-5
2	**ATTRACT AND EMBRACE DIVERSE TALENT**		
2.1	*Own, Practice and Perfect Diversity*		
	• Identify ways to draw international talent to invest in Greater Portland as foreign direct investment grows and the region's international networks expand.	X	
	• Work with existing immigrant communities, resources, and employment hubs for immigrants to connect these efforts to a broader view of international investment in the region.	X	
3	**FOSTER EQUITY AND ACCESS**		
3.1	*Close the Income Gap in Underrepresented, Disadvantaged Populations*		
	• Implement public-private programs and practices to improve wages and incomes in underserved-communities due to hurdles to quality employment. These populations may include communities of color and people who do not speak English at home.	X	
	• Create and agree upon a set of regional equity indicators with support from the business case for equity. Utilize these indicators to track and report inequality's growth and decline across key communities of the regional population.	X	
	• Align with existing metrics across the region such as All Hands Raised, Portland Public Schools' Racial Educational Equity Policy and Milestones Framework, and City of Beaverton's Diversity, Equity and Inclusion Plan.	X	
	• Identify partners to actionably address negative or concerning trends. Create short-term task forces and work plans to dig into these issues and prioritize next steps for action.	X	
	• Through meetings with business leaders and other tools for gathering information, identify employers' barriers to and concerns with raising wages for workers.		X
	• Focus specifically on target sectors with wages below peer metro's averages, like *Software & Media*, to determine if low wages are the result of a lower flow of capital to startups in the region or overall less competitive pay at larger firms.		X
	• Ensure the connection between wages and regional economic development goals are clearly defined and articulated to support complementary outcomes.		X
3.1a	*Build a Framework for Access to Economic Opportunities, and Identify/Eliminate Hurdles to Quality Employment*		
	• Through input from businesses, workforce data, and community-pattern data, identify transportation gaps that limit worker mobility and access to jobs and workforce development resources.		X
	• Support studies and analyses that examine disconnected workers, communities and other stakeholders in the region. Ensure that as research is conducted in Greater Portland on mobility and access, actionable strategies are developed and partners are activated to address these findings.		X
	• Partner with bus, light rail and commuter rail transit services TriMet and C-TRAN to create or extend routes to efficiently connect disconnected workers to employment and training hubs.		X
	• Work across state lines to update transportation planning and investments based on workforce commute flows and the movement of goods.		X
	• Collect and share regional best practices of local economic development partners' improvements in neighborhoods, corridors and other place-based infrastructure that connect businesses to their workforce.		X

IMPLEMENTATION PLAN 2016-2020

continued

#	BUSINESS OBJECTIVES AND ACTIONS	YEAR 1	YEARS 2-5
4	**GROW AND RECRUIT BUSINESSES**		
4.1	*Execute a Regional Approach to Industries*		
	• Build industry expertise through in-depth research to understand projected growth, and evaluate and pursue opportunities that align with market strengths and advantages.	X	
	• Develop and implement industry and stage-specific strategies (nascent, emerging, established and legacy).	X	
	• Engage industry leaders and partners in further identifying local/global trends to support marketing, recruitment and expansion efforts. Strategies should include these key activities: 1. Improve services to businesses and entrepreneurs. 2. Build capacity to respond quickly to changing industry trends and new opportunities. 3. Develop and align better networks to connect businesses within the clusters. 4. Create better cross-cluster collaboration across industries.	X	
	• Establish a research and competitiveness resource for regional partners and policy makers tied to place-based assets and challenges for businesses.	X	
	• Inventory industries pursued by city and county economic development professionals to identify where local targets are part of the broader regional clusters and where they differ from the regional portfolio. Acknowledge that regional target pursuits should not undercut local efforts to pursue a different range of targets.	X	
5	**EXPAND GLOBAL REACH AND INVESTMENT**		
5.1	*Make Greater Portland a Top Location for Global Investment and Trade*		
	• Use market prioritization findings to expand regional marketing activities and target foreign markets, industries and investors. In addition to stage-specific interventions, develop BRE and and merger-and-acquisition strategies to apply to the continuum.	X	
	• Work with state/local partners and companies to coordinate global marketing and sales mission activities.	X	
	• Develop a regional economic development clearinghouse for data and analysis related to the region's exports, FDI, supply chains, existing business trends, economic competitiveness, economic development equity and other research useful to local economic development professionals, prospective investors and location decision makers.	X	
	• Ensure economic development projects get extensive coverage in local media. Demonstrate how business investments strengthen quality of life, talent, access, equity and other priorities of Greater Portland's stakeholders.	X	
6	**ADVANCE POLICY SOLUTIONS TO COMPETITIVE ISSUES**		
6.1	*Sharpen the Region's Competitiveness for Jobs and Investment from Target Sectors*		
	• Examine gaps in advocacy on regional competitiveness and align efforts to more effectively relay the need for sound economic development programs.	X	
	• Develop an annual two-state economic development advocacy agenda.	X	
	• Through industry intelligence, site-selector insights and best practices from competitor markets, identify policy, programs, legislative and regulatory factors that encourage the growth of firms in the six target sectors.	X	

IMPLEMENTATION PLAN 2016-2020

continued

#	BUSINESS OBJECTIVES AND ACTIONS	YEAR 1	YEARS 2-5
7	**ADVANCE GREATER PORTLAND'S INNOVATION INFRASTRUCTURE**		
7.1	*Connect Entrepreneurial Support Initiatives and Networks*		
	• Map and detail the range of incubators, accelerators, innovation zones, competitions, capital funds, networking and membership groups, and other efforts across the two-state region. Use this inventory to market the region as a destination for investment and capital.	X	
	• Convene these entities and groups to identify needs, where gaps exist and any urgent issues for the region's economic development professionals, industry leaders, public sector leaders and partners to act on.	X	
	• Ensure startup and second-stage firm information and input are captured in industry cluster research, BRE data and other intelligence that drives regional economic development priorities and business climate policy.	X	
7.2	*Develop a Regional Public-Private Higher Education Innovation Network*		
	• Work with partners like Business Oregon's innovation and entrepreneurship task force, Oregon InC innovation plan, local economic development plans and universities, to identify where industry and university players can partner directly in implementation.		X
	• Identify local and national best practices in university-private sector innovation and commercialization that can be expanded in Greater Portland.	X	
	• Partner with community colleges and private universities and colleges to define their roles and strategies for advancing commercialization and industry engagement in innovation.		X
	• Invest in and promote targeted initiatives, like the Northwest Collaboratory for Sustainable Manufacturing and Innovate Collaborate Oregon that bring together industry and universities around Greater Portland's target sectors.		X
	• Work with partners to identify current nascent efforts to increase innovation between private sector and universities.		X
	• Ensure these efforts to develop innovation partnerships among industry and businesses in the Greater Portland region are adequately resourced, staffed and have the capacity to get off the ground and meet the needs of their constituent institutions and businesses.		X
	PLACE OBJECTIVES AND ACTIONS		
8	**ACCELERATE SITE AND INFRASTRUCTURE OPPORTUNITIES**		
8.1	*Improve Greater Portland's Transportation Capabilities*		
	• Starting with the 2014 Cost of Congestion data, identify key points of congestion impacting freight and employee movement in the region.	X	
	• Develop plans for mitigating congestion from and augmenting freight activity for international trade.	X	
	• Prioritize regional investments, actions and locations that provide the most significant near-term impacts.	X	
	• Launch a bi-state coordination committee that includes public- and private-sector participation to address transportation issues across state lines. Identify regional priorities based on research, data and greatest return on investment.	X	
	• Generate ongoing advocacy for stable transportation funding for the region.	X	
	• Secure the regional transportation plan priorities in the tri-county Metro and Clark County regional transportation plans.	X	

IMPLEMENTATION PLAN 2016-2020

continued

#	PLACE OBJECTIVES AND ACTIONS	YEAR 1	YEARS 2-5
8.2	*Identify Future Needs for Jobs-ready Industrial and Employment Lands*		
	• Implement the existing work of the Regional Industrial Site Readiness, Lands for Jobs and Regional Large Site Industrial Recruitment Strategy.	X	
	• Develop protocols to keep site data updated to share with prospects, key partners in business development and local economic development professionals.	X	
	• Maintain an up-to-date inventory of the region's brownfield sites and their development needs to market through GPG initiatives with prospective foreign investors.	X	
	• Develop a regional inventory of permitting and site development best practices to assist local governments in adopting and transitioning to responsive, streamlined, timely and efficient permitting protocols for businesses. Develop regional best practices for jurisdictions to provide business incentives and develop prepared sites.		X
	• Identify and pursue projects that leverage Greater Portland's freight infrastructure through ports, airports and rail for international trade over the long term.		X
	• Continue to study and market the advantages of Greater Portland's access to water.		X
	• Pursue opportunities to increase competitive fiber capacity and connectivity throughout the region.		X
8.3	*Address the Regional Housing Supply and Affordability*		
	• Develop a region-wide housing plan.	X	
	• Ensure an adequate supply of workforce housing that is both affordable for middle-income workers and accessible from middle-income job sites.	X	
	• Create a plan that also addresses the regional availability of affordable housing for low-income workers.	X	
8.4	*Plan for Greater Portland's Economic Resiliency*		
	• Develop the regional capacity to deploy support, make quick decisions and chart a new path in the face of major vulnerabilities to the regional economy.	X	
	• Through BRE and GPG intelligence, identify regional businesses' primary international and domestic markets, major infrastructure resources and other information so in the face of internal/external disaster, firms can be quickly contacted for support and assistance in developing alternatives and accessing capital	X	
	• Gather emergency preparedness plans for Greater Portland's communities, counties, Metro and major assets (like Port of Portland and Port of Vancouver), and aggregate the response to businesses at the regional level.		X
	• Through existing business data gathered at the local level, identify barriers to businesses' adoption of disaster preparedness plans and protocols.		X
	• Work with state and local officials to develop mitigation, preparedness, financial, response and outreach tools for businesses that can be activated in the event of a disaster.		X

PERFORMANCE MEASURES

To record meaningful economic development, a set of measurements have been established to determine whether the regional economy is growing as planned by meeting the goals and objectives of the strategy. The strategy will be assessed by the performance measures and allow for modifications to reflect the changing economy. The measures will be accessible on the Greater Portland Pulse website (portlandpulse.org) and within annual GPEDD reports to EDA.

PEOPLE

ACTION 1.1
Advance Career Technical Education by Activating Industry in Education

1. Number of school districts covered by cradle-to-career collective impact initiative
2. Percent of public school enrollees covered by a cradle-to-career collective impact initiative
3. Share of students engaged in career pathway program
4. Number of businesses engaged in career pathway education programs and curricula
5. Members of community college workforce alliance
6. Number of businesses in “idea and action lab”
7. Number of higher education institutions in “idea and action lab”

ACTION 2.1
Own, Practice and Perfect Divsersity

1. Number of people of color and international residents engaged in leadership development programs
2. Number of signees to Greater Portland diversity and equity charter
3. Number of employers engaged in international talent recruitment
4. Number of national/international news stories about Greater Portland’s value of diverse talent
5. Percent of in-migrants who are not white and non-Hispanic

ACTION 3.1
Close the Income Gap in Underrepresented, Disadvantaged Populations

1. Percent unemployed
2. Percent of personal income derived from wages
3. Percent of adults 25 and over with postsecondary degree (associates or higher)
4. Median household income
5. Continuing education rate/percent going to college for high school seniors
6. Poverty rate
7. PCI in communities of color as a % or PCI in white, non-Hispanic
8. Postsecondary degree attainment for adults 25 and over in communities of color (aggregated)
9. Dollar amount companies investing in training new employees

ACTION 3.1a
Build a Framework for Access to Economic Opportunities and Identify/Eliminate Hurdles to Quality Employment

1. Percent of transit riders with at least one-hour commute to work
2. Number and type of short-term actions executed and/or developed into projects
3. Number of expanded/added transit routes to connect more workers to jobs

BUSINESS

ACTION 4.1
Execute a Regional Approach to Industries

1. Total employment
2. Employment by industry
3. Productivity (gross metro product) per worker

PERFORMANCE MEASURES
continued

ACTION 5.1
Make Greater Portland a Top Location for Global Trade and Investment

1. Dollar amount of foreign exports per worker
2. Port of Portland exports minus pass through
3. Port of Vancouver exports minus pass through

ACTION 6.1
Sharpen the Region's Competitiveness for Jobs and Investment from Target Sectors

1. Employment in identified target traded sectors
2. Productivity in identified target sectors

ACTION 7.1
Connect Entrepreneurial Support Initiatives and Networks

1. Number of new startups in high-tech industry
2. Number of commercialization licenses

ACTION 7.2
Develop a Regional Public-Private Higher Education Innovation Network

1. Total higher education R&D expenditures
2. Startups spun off from university technologies
3. Percent of startups spun off from university technologies that locate in the region

PLACE

ACTION 8.1
Improve Greater Portland's Transportation Capabilities

1. Annual PDX air freight cargo (lbs.)
2. Port of Portland exports
3. Port of Vancouver exports
4. Port of Portland value of exports
5. Port of Vancouver value of exports
6. Port of Portland leakage
7. Port of Vancouver leakage
8. PDX retention of nonstop flight destinations
9. PDX international travel – time to market
10. PDX air passengers
11. Aggregate congestion costs
12. Commute time
13. Volume of vehicles between Vancouver and Portland
14. Number and type of short-term tactics executed and/or developed into projects

ACTION 8.2
Identify Future Needs for Jobs-ready Industrial and Employment Lands

1. Number and type of short-term tactics executed and/or developed into projects

ACTION 8.3
Address the Regional Housing Supply and Affordability

1. Housing affordability index
2. Renters spending 30% or more of income on rent

ACTION 8.4
Plan for Greater Portland's Economic Resiliency

1. Grant funding proposals developed and grants received
2. Establishment of emergency preparedness plan for businesses

ADDENDUM

KEY

The table below is provided as a quick reference guide to the terminology and requirements necessary for a Comprehensive Economic Development Strategy (CEDS) document and those equivalents found in this Greater Portland 2020 plan.

CEDS	GREATER PORTLAND 2020	PAGE
Background	Where is Greater Portland Now?	5
Analysis of Economic Development Problems and Opportunities	Regional Strengths + Advantages Regional Challenges + Areas of Opportunity	3 4
CEDS Goals and Objectives – Defining Regional Expectations	Greater Portland 2020 Action Agenda	13
Community and Private-sector Involvement	Community Outreach	10
Strategic Projects, Programs and Activities	Core Strategy: People Core Strategy: Business Core Strategy: Place	14 18 22
CEDS Plan of Action	Implementation Plan 2016-2020	25
Performance Measures	Performance Measures	30



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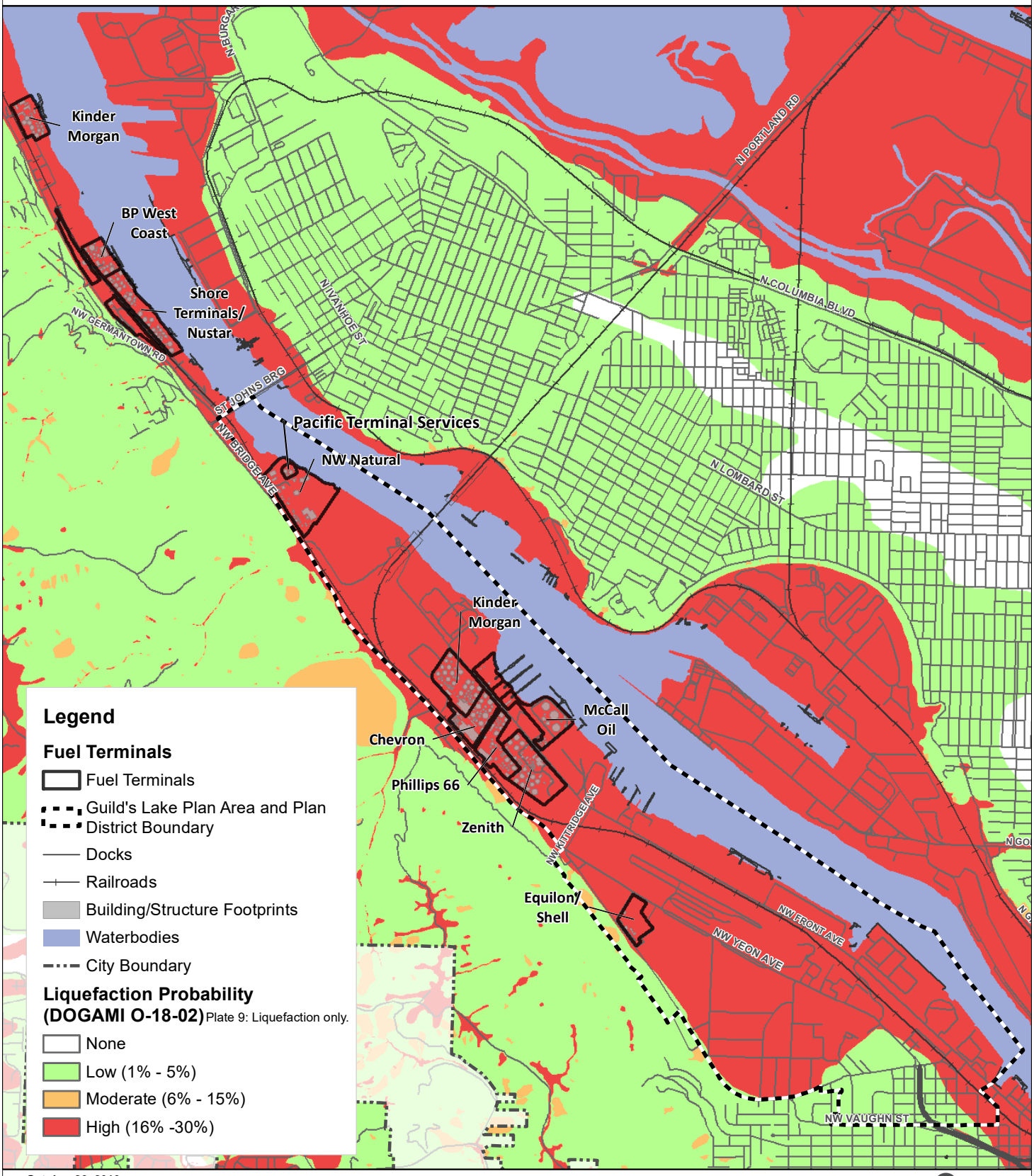
Portland Fuel Terminals and Liquefaction Hazard



October 23, 2019

City of Portland, Oregon ||
Bureau of Planning and Sustainability ||
Geographic Information Systems

NORTH

0 0.25 0.5 Miles

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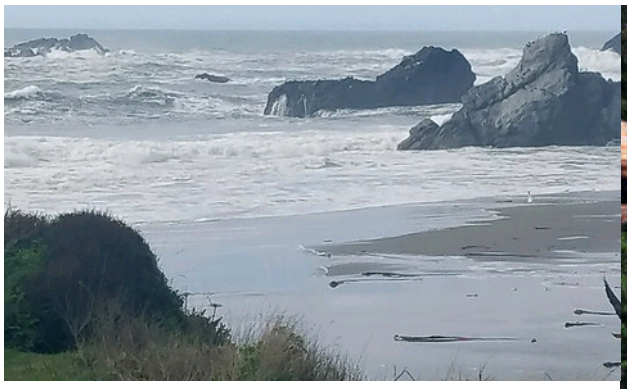
ODOT State Revenue Forecast

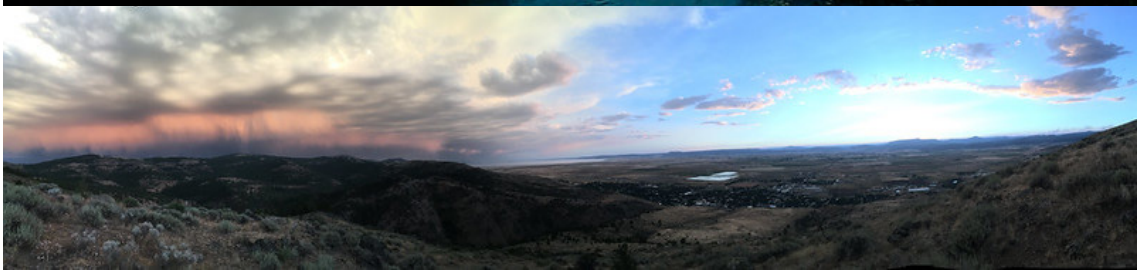




Oregon Department of Transportation

Transportation Development Division
State Revenue Forecast
October 2019





Foreword

This summary report presents a selection of State Other Funds Revenue forecasts for the Oregon Department of Transportation. It is published twice a year to assist in financial planning, the formulation of transportation budgets, and to support other decision-making activities. The forecast is consistent with the Department of Administrative Services' Oregon Economic & Revenue Forecast (Vol. XXXIX, No. 3, September 2019) and the associated baseline macroeconomic forecast from IHS Markit.

This document is also available at: https://www.oregon.gov/ODOT/Data/Pages/Revenue-Forecasts.aspx and scroll down to the "Most Recent Forecast."

Questions and comments should be directed to:

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Forecast Summary

Overall, State Highway Fund revenues continue to grow as a result of the tax increases from HB 2017, but compared to the prior forecast growth is weaker due to a larger than anticipated slowdown in new vehicle sales, trucking activity, and fuel sales.

As expected, HB 2017 is providing a large increase in overall State Highway revenues.

The first round of tax and fee increases by HB 2017 from the 2017 Legislative Session have been effective since January 1, 2018. The next phase of increases are scheduled to take effect in January of 2020, which will increase DMV fees, weight-mile tax rates and motor fuel tax rates if certain conditions are met. Tables 6-8 in the main body of this forecast report include only the guaranteed motor fuels tax increases. The appendix at the end of the report presents alternative Tables 6A-8A, which include the conditional six cents in future fuels tax increases.

Overall, the economic backdrop has not changed much since the last forecast. Employment growth is expected to continue slowing but remain above one percent through 2021. Oregon's population growth rate is lower than in the prior forecast. Part of this change is due to a drop in the net natural increase in population and another part is due to lower net-migration numbers. The current population forecast now calls for deaths to exceed births in the latter 2020's. This will place the entire burden for any population growth on net migration, which is a key factor for growth in transportation revenues.

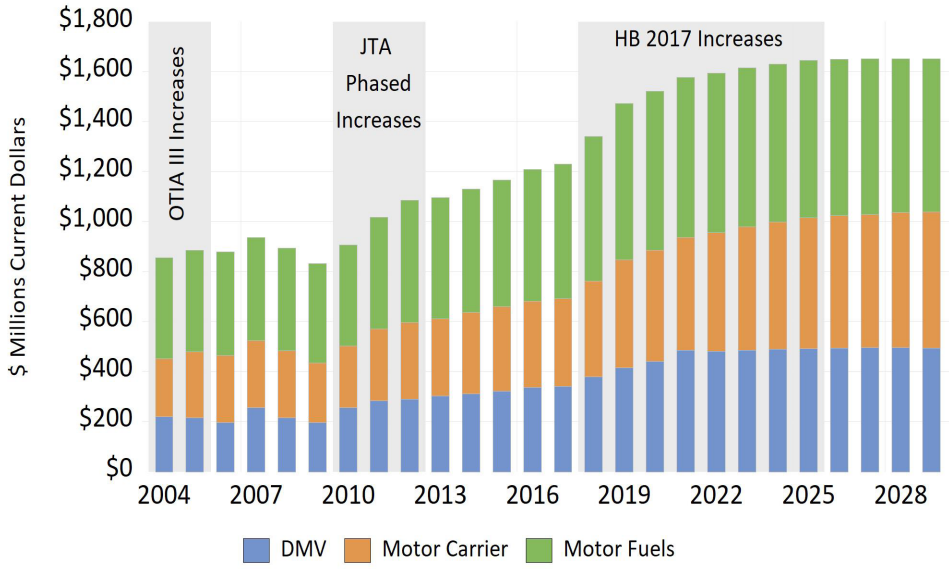
Motor Fuels revenue growth finished state fiscal year 2019 up 7.5 percent due to the tax rate change in January of 2018. This rate is 0.6 percentage points lower than the prior forecast. Absent any tax changes, revenues grow through fiscal year 2021 before declining through the remainder of the forecast. If the conditions are met enabling the additional $0.02 per gallon rate to take effect in calendar years 2020, 2022 and 2024, revenue growth will increase through fiscal year 2025.

Motor Carrier revenue, led by weight-mile collections, finished state fiscal year 2019 with growth of 14.2 percent, due to the tax rate changes. This rate is 1.9 percentage points lower than the prior forecast, as weight-mile revenue came in weaker than previously anticipated. HB 2017 increased weight-mile rates in a phased approach every two years beginning in January of 2018. Looking ahead, significant revenue growth is expected through fiscal year 2025 as the rates increase. However, the slowing economy is expected to lead to overall slower growth if the rates were held constant.

Like Motor Fuels and Motor Carrier, DMV revenues finished state fiscal year 2019 significantly higher, increasing 9.7 percent. Motor Carrier and Motor Fuels, DMV revenues for fiscal year 2019 were lower than previously forecasted as well. HB 2017 increased fees for most registration and title transactions beginning in January of 2018, and phasing some increases in 2020 and 2022. Absent the fee changes, transaction growth has been buoyed by strong in-migration. Going forward, transaction growth is expected to slow as in-migration growth slows. However, revenue should continue growing at a higher rate over the next several fiscal years as the fee increases from HB 2017 are implemented.

Figure 1. Total Gross State Highway Revenue by Fiscal Year

Revenue growth will continue through FY 2025 as the tax and fee increases are phased in from HB 2017.



Source: October 2019 ODOT State Revenue Forecast

On a fiscal year basis, total gross revenues show a sharp increase year over year beginning in FY 2018, continuing through FY 2025, with the largest increases coming in FY 2018 and FY 2019. On a biennial basis, compared to the prior forecast gross revenues are down over the forecast period, with the gap increasing in the outer forecast years. Net revenues follow a similar pattern but display a larger gap between forecasts as costs are anticipated to rise faster than in the prior forecast.

Table 1. Change in Revenues from the December 2018 Forecast

($ Millions)	2017-19	2019-21	2021-23	2023-25	2025-27
Motor Fuels (w/ triggered increases)					
Gross	$(14.2)	$(2.3)	$(18.7)	$(40.6)	$(59.6)
Net Apportionable	$(14.5)	$(3.1)	$(19.6)	$(41.5)	$(60.5)
Motor Fuels (w/o triggered increases)					
Gross	$(14.2)	$(2.2)	$(16.9)	$(34.8)	$(50.6)
Net Apportionable	$(14.5)	$(5.2)	$(22.9)	$(44.1)	$(60.8)
Motor Carrier					
Gross	$(1.8)	$(14.2)	$(8.0)	$(11.1)	$(10.5)
Net Apportionable	$(1.8)	$(13.9)	$(7.8)	$(10.9)	$(10.3)
DMV					
Gross	$(7.3)	$14.3	$(1.3)	$(5.2)	$(3.6)
Net Apportionable	$(7.3)	$2.4	$(16.9)	$(19.0)	$(16.7)
Total (w/ triggered increases)					
Gross	$(23.3)	$(2.1)	$(28.0)	$(56.9)	$(73.8)
Net Apportionable	$(23.7)	$(14.6)	$(44.3)	$(71.4)	$(87.5)
Total (w/o triggered increases)					
Gross	$(23.3)	$(2.0)	$(26.2)	$(51.1)	$(64.8)
Net Apportionable	$(23.7)	$(16.7)	$(47.7)	$(74.0)	$(87.8)

A penny increase in the motor fuels tax will yield about $29.2 million in net revenue with the heavy equivalent included.

Forecast yields have changed with this forecast, decreasing into the outer years of the forecast. On average, we estimate a penny increase in the motor fuel tax rate will yield $17.6 million in net revenue per year without the weight-mile tax and $29.2 million in net revenue per year with the weight-mile tax included through fiscal year 2029. Net motor fuel tax revenue is defined as gross revenue minus collection costs and the non-highway fuel tax transfers for the fuel used in non-highway sources, like ATV's and lawnmowers. The amount of the non-highway transfers is based on the tax rate. Assuming consumption does not change, it will increase as the tax rate increases.

Transportation Backdrop

Slowing economic growth will act as a drag on transportation transaction growth.

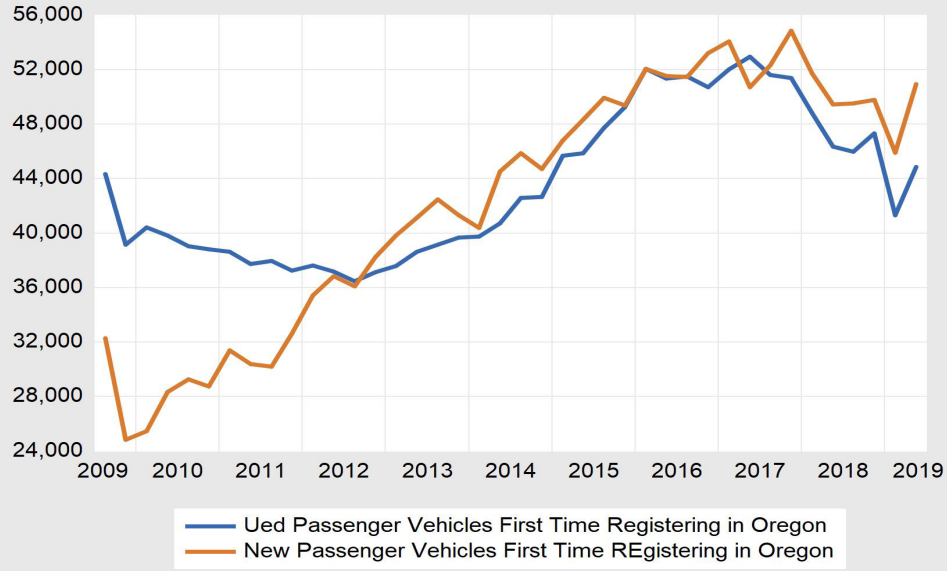
The current outlook for Oregon's economy has not changed much compared to the previous forecast provided by the Office of Economic Analysis, Oregon Department of Administrative Services. The general expectation is that the economy will continue growing, but at slowing rates (Table 2). As our growth slows, we are no longer outpacing the nation, which likely is contributing to slowing net migration. While income growth remains strong, this is no longer translating into new vehicle sales or increased fuel consumption.

A full discussion of the state and national economic forecasts can be found on Oregon Office of Economic Analysis website located here. http://www.oregon.gov/DAS/OEA/Pages/index.aspx

Overall, the number of passenger vehicles entering Oregon's fleet has been declining in the last few years, indicative of a slowing economy. Data for the first two quarters of 2019 is a bit misleading because of the DMV data system migration that happened in January of 2019. The proportion of new vehicles entering the fleet is slightly above the proportion of used vehicles first time registering in Oregon (Figure 2). The proportion of new vehicles entering the fleet typically declines during the recessions.

Figure 2. New and Used Passenger Vehicles First Time Registering in Oregon (quarterly frequency – seasonally adjusted)

The number of used vehicles entering the fleet is about the same as the number of new vehicles entering the fleet.

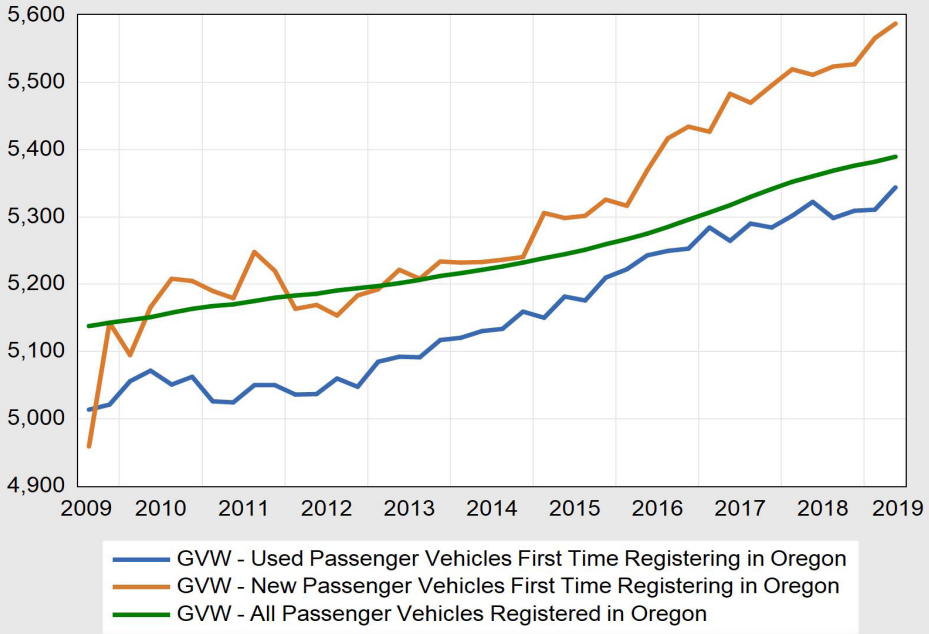


Source: ODOT DMV Data

There are some interesting differences between new vehicles first time registering and used vehicles first time registering in Oregon. Used vehicles on average have a lower gross vehicle weight (GVW). Most of these vehicles likely belong to people who just moved to Oregon from another state. Another interesting fact is that people moving from other states on average have lighter vehicles compared to all passenger vehicles currently registered in Oregon (Figure 3). The other pattern that has emerged in the past three years is the rapid increase in average GVW for new vehicles, which explains the recent pattern of slower growth in fuel efficiency of Oregon's fleet.

Figure 3. Gross Vehicle Weight (GVW) of New and Used Passenger Vehicles First Time Registering in Oregon

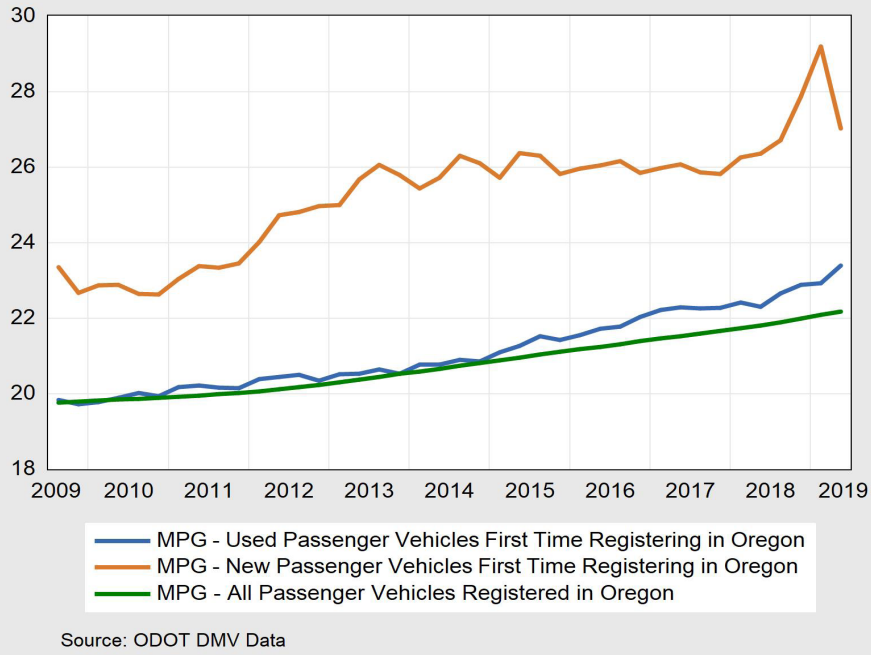
The average GVW has been increasing over time.



Source: ODOT DMV Data

The overall average fuel efficiency of new passenger vehicles entering the fleet is higher than the average fuel efficiency of all currently registered passenger vehicles in Oregon. This contributes positively to overall improvements in fuel efficiency of the entire fleet (Figure 4).

Figure 4. Fuel Efficiency, Miles per Gallon (MPG), of New and Used Passenger Vehicles First Time Registering in Oregon



Source: ODOT DMV Data

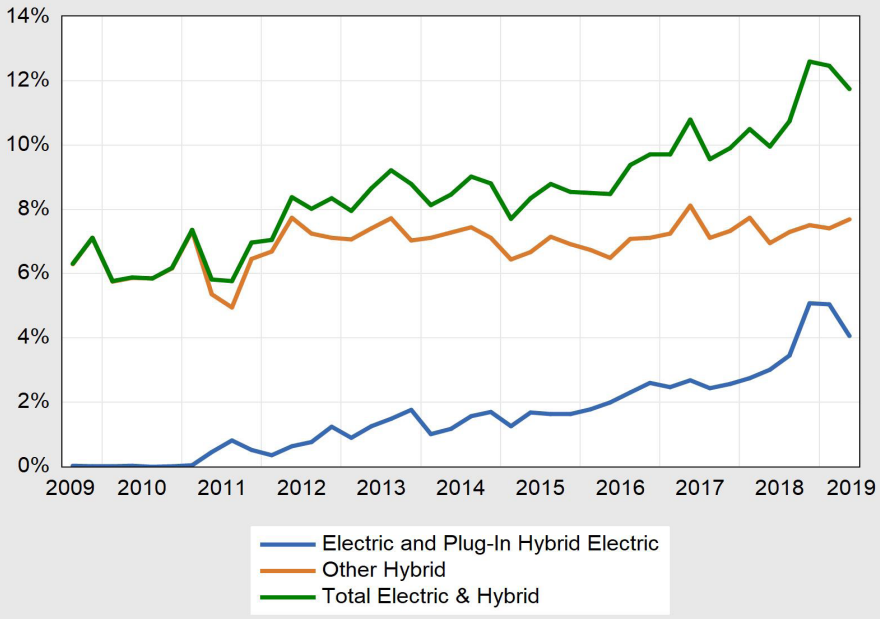
The average MPG of new vehicles was stagnant for a while. It has jumped in the last two years, due to increased share of electric vehicle sales.

The share of electric and hybrid vehicles entering the fleet has been steadily increasing (Figure 5). The proportion of Electric vehicles is growing rapidly, reflective of government policies, such as: Oregon's Electric Vehicle Rebate program administered by DEQ, investments in charging station infrastructure, zero emission vehicle (ZEV) sale mandate imposed on dealers, and other policies promoting the adoption of electric vehicles.



Figure 5. Share of New Electric and Hybrid Passenger Vehicles Entering the Fleet

The share of electric and hybrid vehicles entering the fleet has been steadily increasing.



Source: ODOT DMV Data

Table 3 highlights changes for some of the most important revenue generating variables in the ODOT state highway revenue forecast. Growth across DMV, Motor Carrier and Motor Fuels peaked in 2015-2016. Growth has slowed through 2017 and in some cases has turned negative into 2018. Looking ahead, with a continual slowdown in the economy expected, transportation transactions face significant headwinds to growth.



Table 2. Percentage Change in Key Economic Variables

	Actual		Forecast									
	CY 17	CY 18	CY 19	CY 20	CY 21	CY 22	CY 23	CY 24	CY 25	CY 26	CY 27	CY 28
OREGON EMPLOYMENT--TOTAL	2.3%	2.0%	1.8%	1.8%	1.3%	1.0%	0.7%	0.7%	0.8%	0.7%	0.6%	0.6%
EMPLOYMENT--CONSTRUCTION	8.2%	7.6%	3.9%	1.3%	1.3%	0.6%	0.7%	0.3%	0.3%	0.4%	0.5%	0.4%
EMPLOYMENT--TRANSPORTATION	3.3%	4.0%	5.2%	0.1%	0.1%	0.0%	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%
EMPLOYMENT--DURABLE GOODS	0.3%	3.0%	1.9%	-0.0%	-0.3%	0.2%	0.1%	0.0%	0.2%	0.3%	0.1%	0.0%
OREGON HOUSING STARTS	1.6%	2.1%	9.3%	4.9%	4.0%	2.2%	-1.3%	0.9%	-1.8%	-0.7%	-1.4%	-0.6%
OREGON POPULATION	1.6%	1.3%	1.2%	1.2%	1.2%	1.1%	1.1%	1.1%	1.0%	1.0%	0.9%	0.9%
PORTLAND METRO CONSUMER PRICE INDEX	2.8%	3.3%	2.8%	2.5%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.5%
OREGON REAL PERSONAL INCOME	3.3%	2.9%	3.7%	3.4%	3.1%	2.9%	2.7%	2.7%	2.7%	2.7%	2.6%	2.7%
NATIONAL REAL PRICE OF GASOLINE	10.9%	10.4%	-7.7%	1.0%	6.6%	1.7%	0.8%	0.8%	0.8%	0.8%	1.3%	1.7%
NATIONAL UNIT SALES OF NEW LIGHT VEHICLES	-1.9%	0.3%	-2.5%	-0.8%	-0.9%	-0.5%	0.8%	0.7%	0.5%	0.1%	0.2%	0.3%

Table 3. Percentage Change in Transactions for Key Oregon Transportation Variables

	Actual		Forecast									
	CY 17	CY 18	CY 19	CY 20	CY 21	CY 22	CY 23	CY 24	CY 25	CY 26	CY 27	CY 28
MOTOR FUELS GALLONS (WITHOUT TRIGGERS)	2.2%	0.3%	-0.2%	2.0%	0.1%	-0.3%	-0.5%	-0.4%	-0.6%	-0.7%	-0.8%	-0.8%
MOTOR FUELS GALLONS (WITH TRIGGERS)	2.2%	0.3%	-0.2%	2.0%	0.1%	-0.3%	-0.5%	-0.4%	-0.6%	-0.7%	-0.8%	-0.8%
ORIGINAL CLASS C LICENSES	-0.2%	-1.4%	-4.0%	1.2%	28.4%	-16.2%	-1.6%	-0.1%	-1.0%	-1.6%	-1.1%	-0.7%
PASSENGER VEHICLE REGISTRATIONS	1.1%	1.1%	-0.5%	0.7%	1.3%	0.1%	0.5%	0.5%	0.5%	0.4%	0.4%	0.4%
TITLE TRANSFERS	2.3%	-1.1%	-3.8%	-1.6%	0.2%	-0.6%	0.1%	0.5%	0.3%	0.3%	0.2%	0.3%
TRUCKING ACTIVITY (WEIGHT-MILE)	1.4%	-2.1%	1.3%	0.1%	1.7%	-1.5%	1.1%	-0.5%	1.2%	1.1%	1.1%	1.1%

DMV

The Driver and Motor Vehicle Services Division (DMV) is responsible for administration of driver and motor vehicle related activities. Revenues collected from the fees charged for the various DMV activities flow into the State Highway Fund, the Transportation Operating Fund and into other funds administered by ODOT divisions such as Public Transit and Passenger Rail. Additionally some fees net of costs are transferred to outside entities. For example, RV-related fees are transferred to the Oregon Parks and Recreation Department. Lastly, revenues remaining after deducting transfers and costs are apportioned to cities and counties statewide for local road repair, maintenance and construction.

The DMV forecast is produced at the transaction level and aggregated to the summary level. The transactions are grouped into three different business lines: Vehicle, Driver, and Business Regulation. The Vehicle program area contains the transactions related to legal ownership and operation of a vehicle, including titling, plates, registrations and permits. The Driver program contains the transactions related to the legal right to operate a vehicle, including permits, licenses, endorsements and the associated tests to obtain these rights to drive. The Business Regulation program is tasked with ensuring the businesses that sell vehicles in Oregon are properly licensed along with those that dismantle and transport vehicles.

DMV has the largest number of transactions to forecast but only a handful have significant impacts on revenue.



In total the DMV forecast contains over 240 individual product transactions and over 100 different forecast equations. However, most of these transactions have little significant impact on the

overall forecast as their volumes and fee levels are small. In FY 2019, of the total number of transactions, about 80 percent of the revenue was collected by about 10 DMV transactions. Passenger vehicle registrations alone accounted for almost 47 percent of all revenue collected by DMV. Other significant contributors are truck and light trailer registrations, light vehicle trip permits, light title transactions, plate manufacturing fees, vehicle and driver related record fees and class C non-commercial licenses and renewals.

DMV provides the gateway to access Oregon's transportation system and is heavily influenced by changes in population.



DMV activities are affected by various economic and demographic variables and provide a reflection of broad undercurrents in the state. The impacts from changes in population, employment, migration, and economic production are readily evident in many of the DMV data series. In general, DMV activities are more strongly affected by demographic than economic changes, and as such are generally more immune to cyclical swings typical with economic variables. Of the three business lines in DMV, the Vehicle and Business Regulation programs are most susceptible to economic influences, especially related to new vehicle titles.

Currently DMV is in a transition period; after several years of strong growth DMV is likely headed toward several years of slow growth. While the economy is still expanding, the rate is slowing. U.S. economic expansion generally means jobs are plentiful and

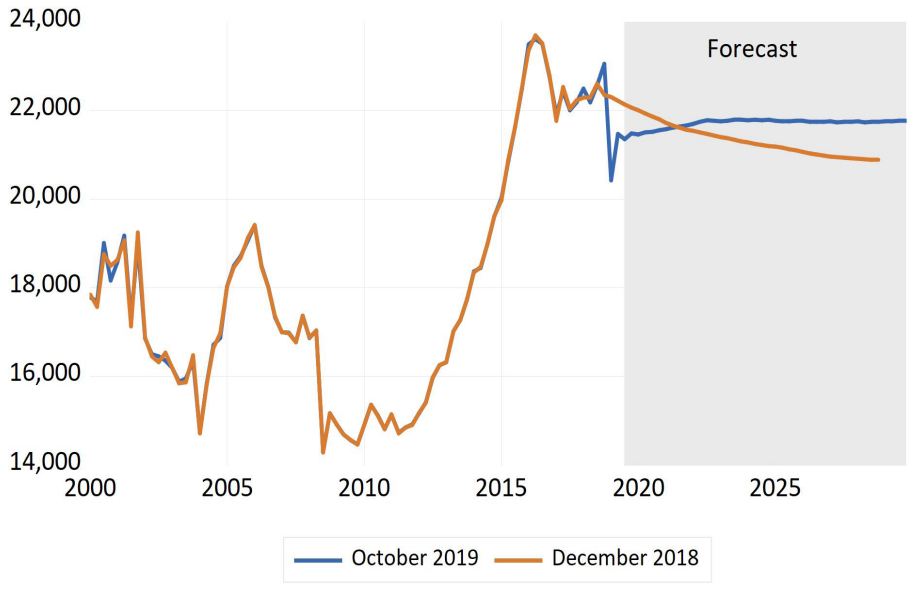
movement across state borders is easier. States with higher quality of lives see increases in in-migration during these periods. As Oregon enjoys a high standard of living, its population is currently increasing, which impacts both the Driver and Vehicle programs in DMV.

A surrendered license transaction occurs when a person moves to Oregon from another state surrendering their out-of-state license to DMV. This is the first contact with DMV for this group of people. Unfortunately, we lack additional information about who these people are, such as their age and location to which they are moving. Regardless, it is a valuable statistic that influences other DMV transactions. Figure 6 compares the surrendered license forecast to the prior outlook. Data shows that growth peaked at the end of 2016 and the rate has dropped a bit. The current outlook is for the rate to stay stable.

The impact that surrendered licenses has on other DMV transactions begins first with non-commercial class C licenses. As

Figure 6. Out-of-State Surrendered License – Forecast Comparison (quarterly frequency – seasonally adjusted)

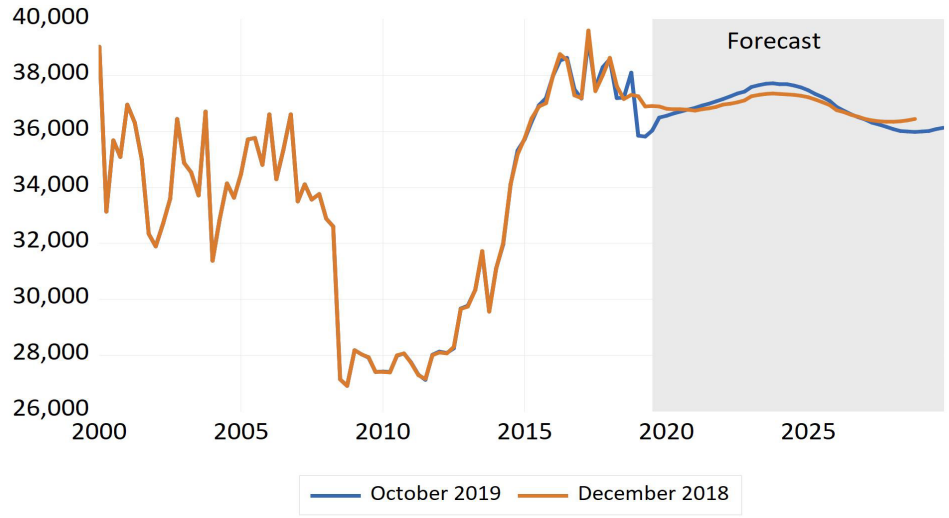
The number of out-of-state surrendered licenses peaked in 2016.



Source: October 2019 ODOT Forecast

an individual moves to Oregon and surrenders their old license, they get a new Oregon issued license. Figure 7 compares the current forecast to the prior one. The license sales bottomed out in 2011 with about 110,000 licenses sold that year before growing rapidly in a very similar pattern to the surrendered licenses. Following the pattern in surrendered licenses, growth seems to have peaked in 2016 at over 152,000 sold.

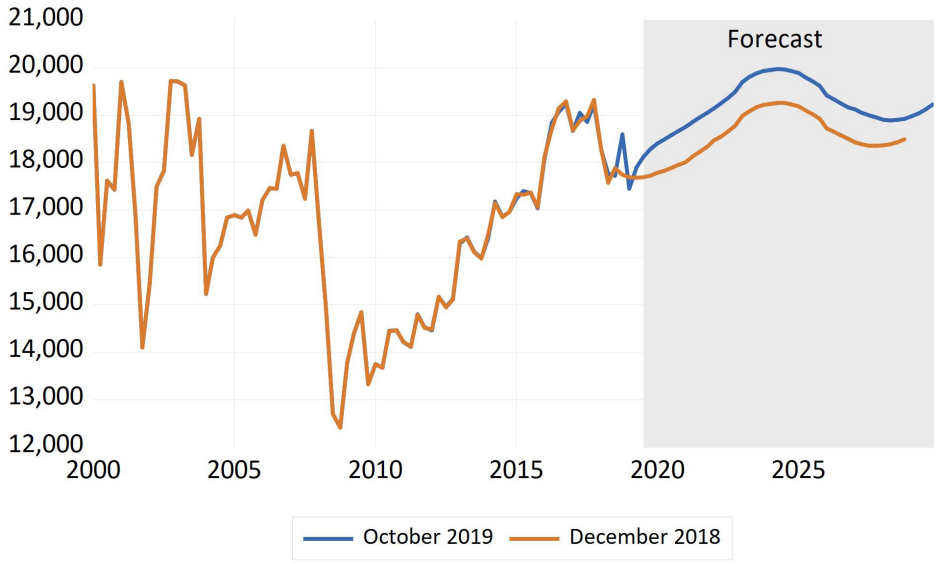
Figure 7. Original Class C Non-Commercial License – Forecast Comparison (quarterly frequency – seasonally adjusted)



Source: October 2019 ODOT Forecast

The other factor influencing the growth in driver licenses is instructional permits. Beginning in March of 2000, young adults under the age of 18 looking to obtain their driver license must first get their permit and complete 50 hours of certified driving experience. Prior to this, the instruction permit was only required for drivers under 16. As Figure 8 shows, the recession and stricter documentation requirements had a negative impact on permit sales. As the economy recovered so did the permit sales, with growth peaking toward the end of 2016. Fast forward several months and a lot of these permittees will be applying for an original class C driver license, which helps explain the jump in license sales. This increased workload from in-migration and from existing

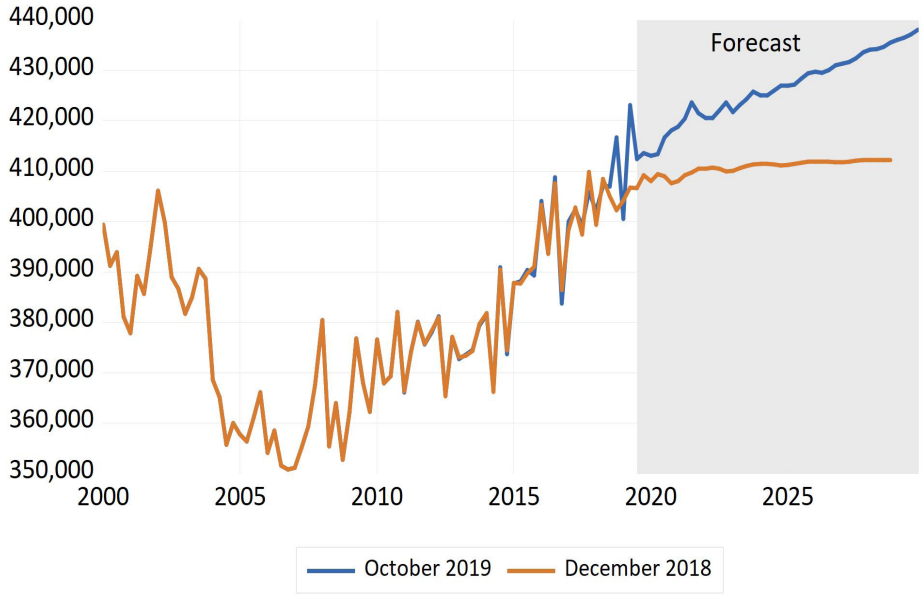
Figure 8. Non-Commercial Instructional Permits – Forecast Comparison (quarterly frequency – seasonally adjusted)



Source: October 2019 ODOD Forecast

Oregon residents impacts the Vehicle program as well. When someone surrenders their license they likely have a vehicle they want to legally title and register in Oregon. While having an Oregon title provides documented ownership of a vehicle, to be driven legally on the road the vehicle needs to be registered. New vehicles are eligible to register for a four year period, while used vehicles brought into the state or vehicles already registered in Oregon renewing their registration will typically register for two years. The forecast for two year registrations is primarily impacted by the existing fleet as it renews, but strong in-migration is also causing a pronounced increase in registrations (Figure 9).

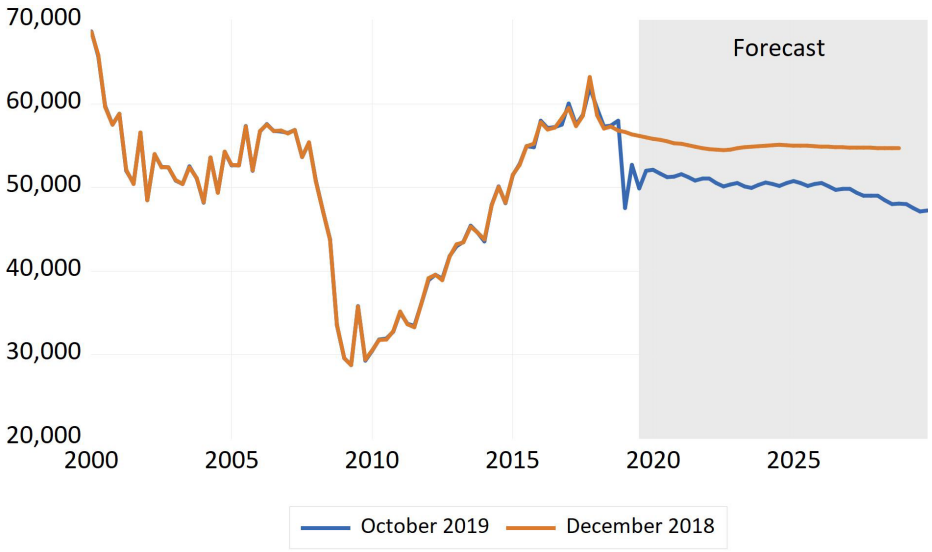
Figure 9. Two-Year Passenger Vehicle Registrations – Forecast Comparison (quarterly frequency – seasonally adjusted)



Source: October 2019 ODOD Forecast

The recession created pent-up demand for new vehicle sales, leading to consistent growth between 2012 and 2015 in light vehicle sales (Figure 10). Sales peaked in 2017 and now are gradually declining.

Figure 10. New New Light Vehicle Titles – Forecast Comparison (quarterly frequency – seasonally adjusted)

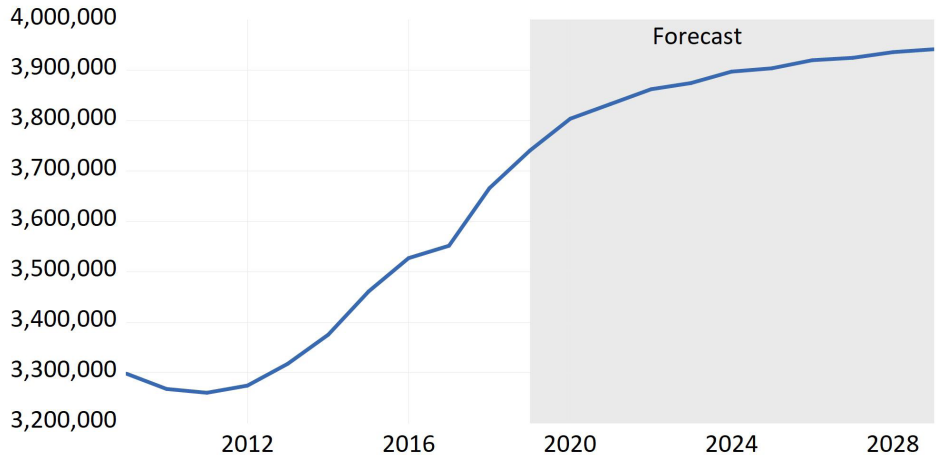


Source: October 2019 ODOT Forecast

As of July 2019, there were 3,707,100 registered passenger vehicles in Oregon (Figure 11). The number will continue to grow for the forecast horizon, but the growth rates are expected to slow down because of declining new vehicle sales. The proportion of hybrid and electric vehicles in the stock is expected to grow fairly rapidly as more consumer options become available and the infrastructure grows (Figure 12). This forecast is a baseline projection of what we expect to happen if current policies remained unchanged. The stock forecasts are developed based on vehicle in and out flow. The flow in is projected based on Energy Information Agency (EIA) reference scenario forecast from 2019 Annual Energy Outlook. The flow out is projected utilizing survival analysis of Oregon's historic vehicle registration data.

Figure 11. Registered Passenger Vehicles Stock Forecast

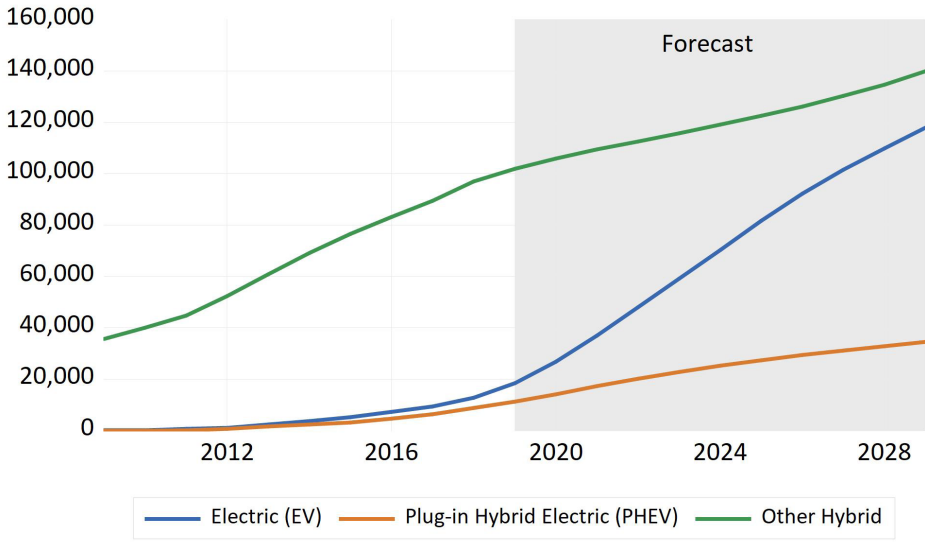
Total number of registered passenger vehicles will continue to grow but at a slower rate.



Source: October 2019 ODOT Forecast

Figure 12. Electric and Hybrid Vehicle Stock Forecast

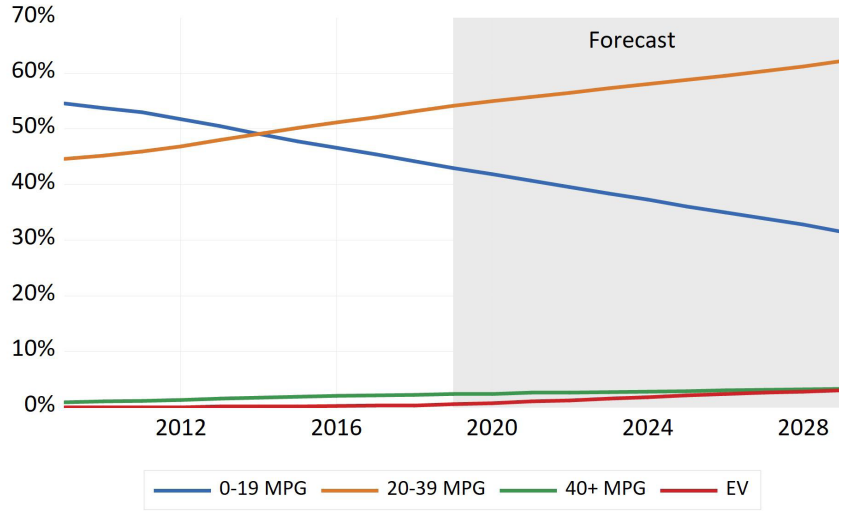
Electric vehicle stock grows the fastest compared to other vehicle stocks.



Source: October 2019 ODOT Forecast

Overshadowing the impact of population and economic changes are the increases related to HB 2017. This bill significantly increases most light vehicle registration and title fees along with trip permits. The most significant increases in terms of revenue are in passenger registrations and light titles. In both cases fees are increased in stages, beginning in January of 2018 with subsequent increases in January of 2020 and 2022. In addition to increased fees over time the bill also creates varying fee structures for both passenger registrations and light titles based on the EPA fuel efficiency rating of the vehicle, beginning with the increases in 2020. Under this structure a higher rated vehicle pays more in registration and title fees. The tiered schedule is created to address the issue of user equity (Figure 13). Because our current taxation is based on gas/diesel consumption, more efficient light vehicles end up not paying their fair share of road usage compared to their lower efficient counterparts. While the tiered fee structure is not user based it does attempt to address this equity concern.

Figure 13. Passenger Stock Shares by MPG Tier



Source: October 2019 ODOT Forecast

Tiered fee schedule will help to maintain equity among highway system users.

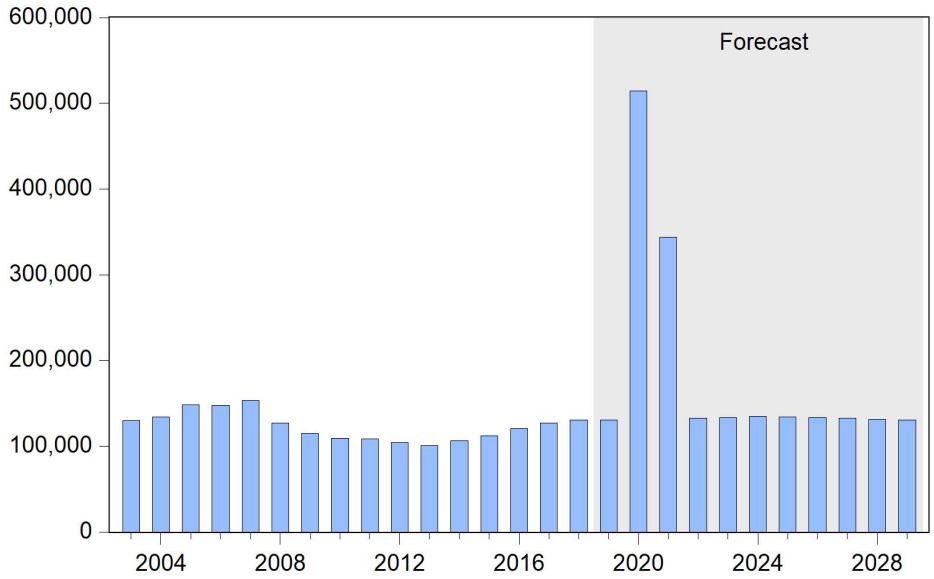
Table 4 shows DMV revenues based on forecasted transaction volumes. The gross revenue portion of Table 4 is grouped into three major components reflecting the primary revenue sources: vehicle registrations, driver licenses, and vehicle titles. Row one and three contain the Vehicle program revenue which is dominated by light vehicle title transfer and passenger vehicle registration revenue.

Driver revenue includes original issuance, renewal, and replacement of commercial and non-commercial licenses and permits, testing fees and other associated fees. Gross revenues are shown in row 2 of Table 4. There are two policy changes that will have an impact on a number of driver related transactions. First, is the implementation of Real ID: as of October 2020, Oregon residents would have to have Real ID compliant driver licenses/ID cards to be able to travel to other states. DMV will start issuing Real ID compliant cards in July of 2020. This will create a significant increase in replacement card transactions as well as an increase in early renewals (drivers are allowed to renew their cards within 12 months of expiration date). Second, is the implementation of HB 2015, where undocumented immigrants will be able to get driver licenses, permits, and ID cards. These impacts were added to ODOT's October 2019 baseline forecast.

As a result, driver revenues increased by 29% for 2019-21 biennium compared to the previous forecast, and 12% for 2021-23 biennium.

Implementation of Real ID will nearly triple replacement card transactions for 2019-21 biennium.

Figure 14. Replacement Driver Licenses



Source: October 2019 ODOT Forecast

Row 5 of Table 4 summarizes the change in gross revenues from the previous forecast. FY19 to FY23 show a negative change from the last forecast.

Rows 6 through 11 and 13 through 15 of Table 4 give the costs associated with administration of DMV and transfers of the DMV revenues to support JTA and OTIA projects and for other statutory purposes.

DMV program costs primarily change when personal services costs change or programs are phased in or phased out. ODOT's approved budget for 2017-19 includes expenditure authorization for DMV computer system modernization project. This project replaces a system created in the 1960's with one using current technologies, and is estimated to cost $90 million over 10 years. Below is the updated schedule for project expenses:

	Actual	Forecast				Project Total
Biennium	**2015-17**	**2017-19**	**2019-21**	**2021-23**	**2023-25**	**2015-2025**
Estimated Total Expenses (in millions)	$12.0	$35.0	$30.0	$10.0	$3.0	$90.0

Net DMV revenues, as represented in row 12 of Table 4, show the impact of the DMV projects on revenue growth as well as general inflation impacts on DMV programs.



Table 4. Highway Fund Revenue Collected by DMV (Millions of Dollars)

		Actual		Forecast										Actual	Forecast				
		FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	BI 17-19	BI 19-21	BI 21-23	BI 23-25	BI 25-27	BI 27-29
1	VEHICLE REGISTRATIONS	$221.8	$250.7	$271.7	$293.3	$301.3	$308.3	$311.4	$313.7	$316.4	$318.1	$319.9	$318.6	$472.4	$565.0	$609.6	$625.1	$634.5	$638.5
2	DRIVER LICENSES & OTHER	$32.6	$32.9	$33.1	$53.9	$39.4	$36.7	$37.2	$36.5	$35.4	$34.8	$34.3	$34.2	$65.4	$86.9	$76.1	$73.7	$70.2	$68.5
3	TITLE, PLATE & OTHER	$122.7	$130.2	$135.1	$137.9	$138.8	$139.5	$140.2	$141.0	$141.2	$141.4	$141.5	$141.3	$252.9	$273.0	$278.4	$281.1	$282.6	$282.8
4	**TOTAL DMV COLLECTIONS**	**$377.1**	**$413.7**	**$439.9**	**$485.1**	**$479.5**	**$484.5**	**$488.8**	**$491.2**	**$493.0**	**$494.2**	**$495.8**	**$494.1**	**$790.8**	**$925.0**	**$964.1**	**$980.0**	**$987.2**	**$989.9**
5	Change from Previous Forecast	($3.2)	($4.1)	($1.6)	$16.0	$1.2	($2.5)	($2.8)	($2.4)	($1.8)	($1.8)	$0.5	NA	($7.3)	$14.3	($1.3)	($5.2)	($3.6)	NA
6	COLLECTION/ADMINISTRATION & PROGRAM COST	($109.5)	($111.7)	($118.7)	($121.1)	($116.1)	($118.5)	($120.4)	($122.9)	($127.3)	($129.8)	($136.2)	($138.9)	($221.2)	($239.9)	($234.6)	($243.3)	($257.1)	($275.1)
7	TRAFFIC SAFETY TRANSFER	($0.6)	($0.6)	($0.6)	($0.6)	($0.7)	($0.7)	($0.7)	($0.7)	($0.8)	($0.8)	($0.9)	($0.9)	($1.2)	($1.3)	($1.4)	($1.5)	($1.6)	($1.7)
8	DEPARTMENT OF EDUCATION TRANSFER	($0.1)	$0.0	($0.1)	$0.0	($0.1)	$0.0	($0.1)	$0.0	($0.1)	$0.0	($0.1)	$0.0	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)
9	E-GOV RECORDS INCREMENTAL REVENUE TRANSFER	($5.3)	($5.6)	($8.1)	($8.2)	($8.2)	($8.3)	($8.3)	($8.3)	($8.3)	($8.4)	($8.4)	($8.4)	($10.9)	($16.3)	($16.5)	($16.6)	($16.7)	($16.7)
10	ODOT CENTRAL SERVICES ASSESSMENT	($30.1)	($30.7)	($30.7)	($31.3)	($32.9)	($33.5)	($35.2)	($35.9)	($37.6)	($38.4)	($38.4)	($38.4)	($60.8)	($62.0)	($66.4)	($71.0)	($76.0)	($76.8)
11	**NET DMV REVENUE**	**$231.6**	**$265.2**	**$281.6**	**$323.8**	**$321.6**	**$323.6**	**$324.0**	**$323.4**	**$318.8**	**$316.9**	**$311.9**	**$307.6**	**$496.8**	**$605.4**	**$645.1**	**$647.5**	**$635.7**	**$619.5**
12	REVENUE SET-ASIDE TO OTIA I & II - memo	($7.0)	($7.0)	($7.1)	($7.8)	($7.3)	($7.3)	($7.4)	($7.5)	($7.5)	($7.5)	($7.5)	($7.5)	($14.0)	($14.9)	($14.6)	($14.9)	($15.0)	($15.1)
13	REVENUE PLEDGED TO OTIA III - memo	($84.3)	($83.6)	($83.3)	($84.2)	($84.3)	($84.1)	($84.5)	($84.8)	($85.0)	($85.1)	($85.3)	($85.3)	($167.9)	($167.5)	($168.4)	($169.3)	($170.2)	($170.5)
14	REVENUE DUE TO JTA - memo	($112.3)	($111.5)	($111.3)	($111.7)	($111.8)	($111.7)	($112.3)	($112.7)	($113.2)	($113.4)	($113.6)	($113.0)	($223.9)	($223.0)	($223.6)	($225.1)	($226.5)	($226.6)
15	REVENUE DUE TO HB 2017 - memo	($38.5)	($74.7)	($97.6)	($121.7)	($129.8)	($137.5)	($139.8)	($141.9)	($143.8)	($145.2)	($146.8)	($147.1)	($113.2)	($219.3)	($267.3)	($281.6)	($289.0)	($293.8)

Motor Carrier

Trucking activity and the freight industry contribute to the State Highway Fund through the weight-mile tax, heavy vehicle registration fees, and other Motor Carrier fees. Changes in economic conditions within Oregon and the nation as a whole influence each of these revenue sources. State and federal legislation can also impact trucking activity.

The weight-mile tax was created in 1933 based on loaded weight and number of miles traveled each year.

The weight-mile tax is the largest source of trucking-related revenue. This highway use tax applies to trucks with a gross weight over 26,000 pounds. The tax paid by a motor carrier varies with the weight of the vehicle, the number of miles traveled, and the axle configuration. The carriers generally have the option of paying on a monthly or quarterly schedule, but in some cases will pay by the trip. Certain qualifying motor carriers, such as those transporting logs, wood chips and sand/gravel, may pay the highway use tax based on a flat monthly fee. The weight-mile revenue and transaction totals discussed in this report include the trip based, monthly, quarterly and flat fee revenue, as well as revenues from a small number of other trip-related fees.



An estimate of weight-mile "transactions" provides the basis for the current forecast of weight-mile revenues. This methodology, also used for prior forecasts, constructs a measure of weight-mile transactions by normalizing revenue by the tax rate paid for a typical heavy vehicle. The forecasting model regresses the normalized weight-mile transactions on Oregon construction and durable goods employment, real consumer spending on durable goods, and industrial production and sales of heavy trucks in order to estimate weight-mile transactions. The variables in the model that have the most significant impact on the forecast are real consumer spending on durable goods and Oregon construction employment. Afer several years of strong growth, construction employment growth slowed some in 2018 with a couple weak quarters. It is set to slow considerably further in 2019 and beyond, slowing to rates under 1 percent by 2022. Real consumer spending on durable goods is also expected

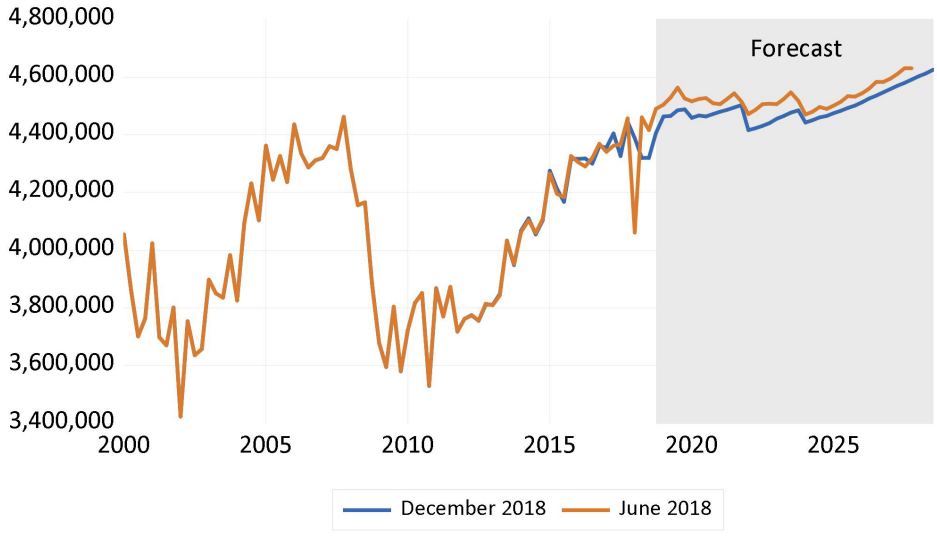
to see slower growth over the forecast as the overall economy cools.

In addition to the economic changes, the weight-mile tax rates increase in 2018, 2020, 2022 and 2024 for a total of 53 percent over the 2017 rates. These significant rate increases will also have an impact on trucking activity as businesses look for ways to minimize the impact of these higher rates.

Combined, these variables produce the forecast shown below in Figure 15. Compared to the prior forecast, the drop in transactions in the first quarter of 2019 was unexpected. However, overall growth has stalled and at the end of 2018 turned negative. After consultation with Motor Carrier staff, they are concerned that trucking firms are struggling to find qualified drivers and that some firms are moving to smaller trucks for local deliveries. Both of these would negatively affect and limit growth in trucking activity. Looking ahead, the drops in the future, shown in 2020, 2022 and 2024 are the result of the coming tax increases.

Figure 15. Weight-Mile Transactions Forecast Comparison

While weight-mile is expected to grow in the coming years, the business cycle will influence the shape of the forecast.



Source: December 2018 ODOT State Revenue Forecast

Row 1 of Table 5 shows the amount of weight-mile and flat fee revenues collected each fiscal year. In 2019, weight-mile and flat-fee revenue totaled $374.6 million, increasing 14.2 percent over 2018. This strong growth is from the HB 2017 rate increases.

Row 2 of Table 5 shows heavy vehicle registration fee revenues. It includes both International Registration Plan (IRP) registration fees paid by interstate carriers and the Commercial registration fees paid by intrastate carriers. Together these heavy vehicle registration fees totaled $48.1 million in fiscal year 2019. Historically, revenues have been consistent for these sources. However, recently IRP revenue has been growing as firms register more trucks. Unfortunately, this increase is not reflected in the weight-mile data and Motor Carrier staff believe these additional trucks are ultimately not being driven in Oregon. Going forward, revenues are expected to maintain the historical consistency, staying around $47 million per year.

HB 2592 from the 2019 Session eliminated the weight receipt fee, a loss of about $4.5 million per year in gross revenue.

Row 3 shows the revenues from Road Use Assessment Fees (RUAF), permits, passes, and credentials such as weight receipts and cab cards. This row also includes OTIA III Local Fund fee in¬crements from the commercial driver permits, licenses, and tests, along with weight receipts. Overall, total revenue from these heavy vehicle sources increased slightly as the rates were increased for a few of these transactions as part of HB 2017. However, HB 4059 passed in the 2018 Legislative Session rolled back some of these rate increases effective January 2020. In addition, HB 2592 passed during the 2019 Legislative Session eliminated the weight receipt. This was effective October of 2019, and is responsible for the drop in revenue from FY19 to FY20, as it averaged about $4.5 million per year.

Row 4 reports the total gross revenues for the Motor Carrier Division and row 5 shows the change from the prior forecast. Overall, the differences between the two forecasts are primarily due to the elimination of the weight receipt.

Row 9 reports the revenues net of collection costs. Rows 10 through 13 highlight the amounts Motor Carrier contributes to the OTIA, JTA and HB 2017 programs.

Table 5. Highway Fund Revenue Collected by MCTD (Millions of Dollars)

		Actual		Forecast										Actual	Forecast				
		FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	BI 17-19	BI 19-21	BI 21-23	BI 23-25	BI 25-27	BI 27-29
1	WEIGHT-MILE TAX	$328.2	$374.6	$391.4	$397.7	$422.2	$440.9	$454.8	$470.5	$475.8	$480.7	$486.1	$490.9	$702.8	$789.2	$863.2	$925.3	$956.4	$977.1
2	IRP & COMMERCIAL VEHICLE REGISTRATIONS*	$45.6	$48.1	$46.5	$46.6	$46.8	$47.0	$47.1	$47.1	$47.2	$47.3	$47.4	$47.5	$93.7	$93.1	$93.8	$94.2	$94.5	$94.9
3	RUAF, PERMITS, PASSES & CREDENTIALS**	$10.0	$10.8	$6.7	$6.3	$6.4	$6.4	$6.5	$6.6	$6.6	$6.6	$6.6	$6.6	$20.8	$13.0	$12.8	$13.1	$13.1	$13.1
4	**TOTAL MCTD COLLECTIONS**	**$383.7**	**$433.5**	**$444.6**	**$450.7**	**$475.4**	**$494.3**	**$508.4**	**$524.2**	**$529.6**	**$534.5**	**$540.1**	**$545.0**	**$817.2**	**$895.3**	**$969.7**	**$1,032.6**	**$1,064.1**	**$1,085.1**
5	Change from Previous Forecast	$0.0	($1.8)	($4.8)	($9.3)	($3.1)	($4.9)	($5.9)	($5.3)	($4.9)	($5.6)	($5.4)	NA	($1.8)	($14.2)	($8.0)	($11.1)	($10.5)	NA
6	COLLECTION/ADMINISTRATION & PROGRAM COST	($32.8)	($33.4)	($35.4)	($36.2)	($37.9)	($38.7)	($40.6)	($41.4)	($43.4)	($44.3)	($46.5)	($47.4)	($66.2)	($71.6)	($76.6)	($82.0)	($87.7)	($93.8)
7	IFTA BUDGETED EXPENDITURES***	$1.1	$1.1	$0.4	$0.4	$0.4	$0.4	$0.4	$0.4	$0.4	$0.4	$0.4	$0.4	$2.2	$0.7	$0.7	$0.7	$0.7	$0.7
8	ODOT CENTRAL SERVICES ASSESSMENT	($9.9)	($10.1)	($11.8)	($12.1)	($12.7)	($12.9)	($13.5)	($13.8)	($14.5)	($14.8)	($15.5)	($15.8)	($20.1)	($23.9)	($25.6)	($27.4)	($29.3)	($31.3)
9	**NET MCTD REVENUE**	**$342.1**	**$391.0**	**$397.7**	**$402.8**	**$425.2**	**$443.1**	**$454.7**	**$469.4**	**$472.0**	**$475.8**	**$478.5**	**$482.2**	**$733.1**	**$800.5**	**$868.3**	**$924.0**	**$947.9**	**$960.6**
10	REVENUE SET-ASIDE TO OTIA I & II - memo	($9.4)	($9.5)	($9.2)	($8.9)	($9.1)	($9.1)	($9.0)	($9.1)	($9.1)	($9.2)	($9.3)	($9.4)	($19.0)	($18.1)	($18.1)	($18.1)	($18.4)	($18.7)
11	REVENUE PLEDGED TO OTIA III - memo	($31.2)	($32.1)	($30.9)	($30.6)	($30.9)	($30.8)	($30.9)	($30.9)	($31.2)	($31.5)	($31.7)	($32.0)	($63.4)	($61.5)	($61.7)	($61.8)	($62.7)	($63.7)
12	REVENUE DUE TO JTA - memo	($82.0)	($84.3)	($84.9)	($84.4)	($85.2)	($84.9)	($85.1)	($85.3)	($86.0)	($86.7)	($87.4)	($88.1)	($166.3)	($169.2)	($170.1)	($170.4)	($172.8)	($175.6)
13	REVENUE DUE TO HB 2017 - memo	($34.6)	($75.8)	($86.1)	($95.4)	($116.0)	($137.1)	($150.2)	($164.9)	($166.8)	($168.5)	($170.4)	($172.0)	($110.3)	($181.5)	($253.1)	($315.1)	($335.2)	($342.4)

Motor Fuels

Oregon implemented the nation's first gasoline tax in 1919 at 1 cent per gallon.

Motor Fuels revenue is derived from the tax paid on the sale of both motor vehicle fuels (gasoline) and use fuels (predominately diesel). The distinction is important because the tax is collected in different parts of the supply chain. Gasoline is taxed at the point of first sale, when the dealer or distributor purchases the fuel from the terminal. Diesel on the other hand is taxed later in the supply chain, at the retail level. This gives retailers like card lock stations the option of not imposing the tax for heavy trucks that pay the weight-mile tax instead of the motor fuels tax. The separation between when a vehicle pays the fuels tax or pays the weight-mile tax is at a weight of 26,000 pounds. Generally a vehicle up to 26,000 pounds will pay the fuels tax and register their vehicle through DMV, while vehicles over this weight will pay the weight-mile tax and register their vehicle through Motor Carrier. Gasoline comprises the largest share of taxable fuel at roughly 90 percent, while diesel comprises the remaining 10 percent. This has not always been the case: in the past, taxable diesel represented as low as one percent of sales back in 1980. However as more vehicles required to pay the fuels tax switch to diesel, it has been steadily increasing its share. Since about 2014, diesel's share has leveled out at just over 10 percent.

As more vehicles that pay the fuels tax have diesel engines, diesel's share has grown steadily over the years.

Weighing on the future viability of the motor fuels tax as a stable revenue source is the fuel efficiency of the vehicles paying the fuels tax. For many years through the 1990's and early 2000's the fuel efficiency of the light vehicle fleet did not significantly change, as fuel prices remained low and vehicle manufacturers had no real incentive to improve the fuel economy of the vehicles they produced. However, in 2007 legislation was passed establishing new fuel efficiency standards for light vehicles in a



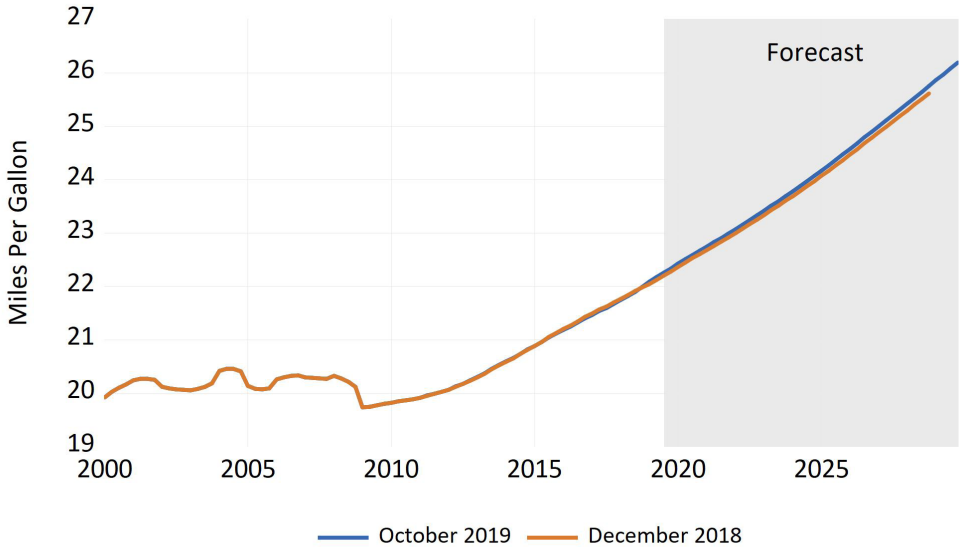
two phase approach. Phase 1 affected model year 2012-2016 vehicles setting a fuel efficiency target of 34.1 miles per gallon (MPG) by model year 2016. Phase 2 builds on this by continuing to expect improvements with each model year reaching a model year 2025 target of 54.5 MPG. The actual standard is expected to be 49.6 MPG by 2025, with the remaining 5 MPG equivalent reached through improvements in vehicle air conditioners. As the 54.5 MPG target is only required under ideal test con-ditions not fully representative of all driving conditions, the actual on-road average is expected to be closer to 38 MPG. Still, at a minimum this is an improvement of over 10 miles per gallon compared to the previous standards.

Recently there has been movement to modify the current standards. However, nothing is final as of this publication date, and until final rules are passed we will continue to assume the standards laid out above will remain in effect.

While the new vehicle fuel economy is expected to increase rapidly over the next 10 years, stock fuel efficiency will grow much more slowly. Oregon has 3.7 million registered passenger vehicles, and only about 180,000 new model year registrations a year. This coupled with an average vehicle age of almost 13 years, means it will take quite some time for these new higher efficient vehicles to replace the older less fuel efficient ones. Additionally, the health of the economy impacts vehicle purchase decisions. Prior to the recession the average vehicle age was only 10 years, but during and after the recession people have hung onto their vehicles for longer. This also could be due to the increased durability of
newer cars. When people do replace their older vehicles, the type of replacement vehicle will impact the overall fleet fuel economy. In recent years Oregon has been experiencing an increase in heavier less efficient vehicle sales, which mutes the impact of fuel efficiency growth.

The current fuel efficiency forecast is almost identical to the prior forecast (Figure 16). The slight increase in the current forecast is due to stronger than expected growth in the last few quarters.

Figure 16. Light Duty Stock Fuel Efficiency Forecast Comparison



Source: October 2019 ODOT State Revenue Forecast

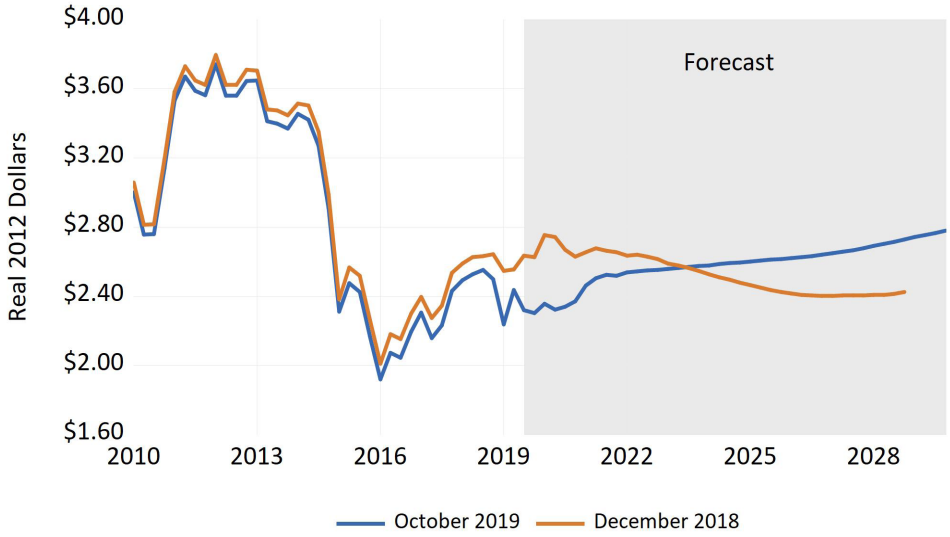
Current CAFE standards aimed at reducing emissions will lead to light vehicles getting increasingly better fuel economy.

Consumption of motor vehicle fuel is generally considered a means to an end rather than an end itself. Because of this, the price of fuel is not as significant a consideration of whether a person will choose to drive as other considerations. However, at higher price levels, price of fuel has a greater impact on a decision to drive than at lower price levels, as it impacts households disposable income more noticeably.

Fuel prices have experienced a lot of volatility over the last decade compared to the stability of prior decades. This is due mainly to the run up in oil prices beginning in 2004, peaking in the summer of 2008. After falling briefly during the recession, oil and fuel prices rose again and sustained elevated levels through the summer of 2014 before falling through most of 2017. However, through much of 2018 tightening oil supplies pushed oil prices back up again, albeit to lower levels than prior peaks. Looking into the future, abundant crude oil stocks and production, coupled with a slowing global economy, are expected to keep fuel prices under $3.00 per gallon in real dollars as shown in Figure 17.

Figure 17. Real Gasoline Price Forecast Comparison

Robust oil inventories and mild global demand have allowed oil prices to remain low and are expected to stay low over the forecast period.



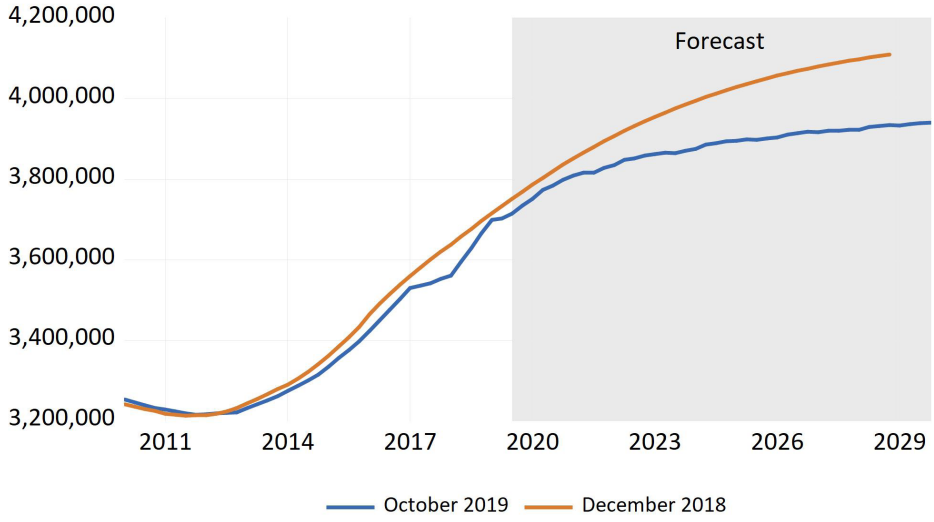
Source: October 2019 ODOT State Revenue Forecast

How much fuel a vehicle consumes is not only a function of the fuel efficiency and fuel price, but also by the stock of vehicles. Of the total number of registered vehicles that consume taxable fuel in Oregon, about 94 percent of them are passenger vehicles. As the total size of the passenger vehicle fleet increases, so does the taxable fuel sales assuming all other factors are held constant. Figure 18 below, contrasts the current forecast of the passenger stock to the prior forecast. With the updated passenger stock model the current forecast has slower growth in the passenger stock compared to the prior forecast.

Table 6 shows the results of the motor fuels forecast. The current forecast model combines the use fuel and motor vehicle fuel to produce one forecast including both sources. Model variables include fuel efficiency, total Oregon nonfarm employment, stock of registered passenger vehicles in Oregon and the real price of gasoline. The model forecasts the quantity of taxable fuel consumed and is multiplied by the fuels tax rate to arrive at the gross revenues reported in row 1.

Figure 18. Passenger Stock Forecast Comparison

Of the total number of vehicles registered in oregon that use taxable gasoline and diesel, about 94% are passenger vehicles.



Source: October 2019 ODOT State Revenue Forecast

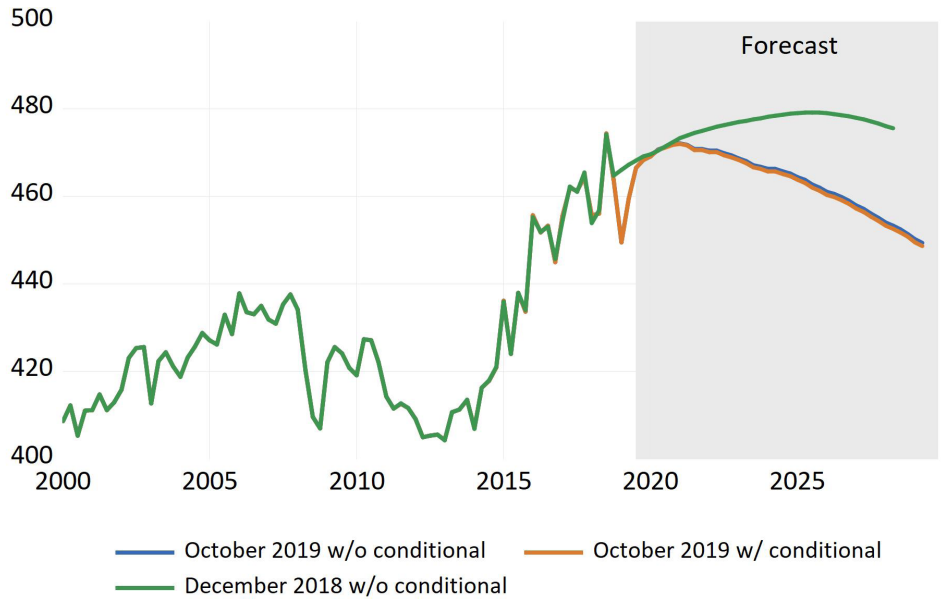
As discussed above, the fuel efficiency variable is expected to have a significant impact on fuel sales in the future. The increasing CAFE standards will slowly increase the overall fleet fuel efficiency, enabling drivers to go further on the same amount of fuel. In a static environment holding all else constant, a ten percent increase in the fuel efficiency roughly equates to a nine percent decrease in consumption. However, there is a rebound effect associated with fuel efficiency where miles driven increase as fuel economy increases. This effect has been measured in the short-run at around 0.2 to 0.4 percent for a one percent increase in fuel efficiency. Adjusting for the rebound effect yields an estimated decrease in consumption of between five and seven percent for a ten percent increase in fuel efficiency.

The sensitivity of the fuel efficiency variable over the estimation sample interval is estimated to be -0.57 with respect to fuel consumption. That means a one percent increase in fuel efficiency leads to a 0.57 decrease in consumption. For a ten percent increase in fuel efficiency this leads to a 5.7 percent decrease in fuel consumption, falling into the middle of the expected range above.

Figure 19 below, shows the current forecast compared to the prior forecast. Overall, the forecast is predicting decreased fuel sales compared to the prior forecast. There are three main reasons for this drop. First, the model variables are either all virtually unchanged from the prior forecast or changed in a way that would act as a drag on taxable fuel sales. Second, calendar year 2019 has not started off well for sales, where the first quarter in particular was abnormally low. Third, the lower passenger stock forecast reduces the number of vehicles in the fleet, which translates into fewer gallons sold. By itself this change accounts for about half of the drop in the motor fuel taxable gallons forecast compared to the prior forecast.

The negative impact of steadily increasing fuel efficiency on fuel consumption is dragging the motor fuel forecast down in the slow growth economic environment Oregon is projected to be heading towards.

Figure 19. Gallons of Taxable Motor Fuels Forecast Comparison



Source: October 2019 ODOT State Revenue Forecast

Lastly, as noted earlier in the report, HB 2017 included guaranteed and conditional fuels tax rate increases. Since the bill only guarantees the first four cent tax rate increase, this necessitates creating a forecast where we assume all the conditions are met and the full ten cents in increases are implemented, and one where only what is guaranteed is implemented. For now, only the first four cents are included in the guaranteed version. The chart above includes both forecasts.



Since consumption is not very sensitive to price changes, the impact of the six cent increase is very minor.

Row 2 of Table 6 shows the total gross revenue from the motor fuels taxes. Fiscal year 2019 finished with $625 million in gross revenues growing at a 7.7 percent rate, which includes the first full year of new revenue from HB 2017. Going forward, the economic and passenger stock growth overcomes the increasing fuel efficiency through fiscal year 2021, but beyond that point the weak economic growth and slower passenger stock growth is not enough to offset the increasing fuel economy, leading to declining tax revenue.

Row 3 shows the change from the prior forecast. The abnormally low first quarter of calendar year 2019 along with the slower than anticipated second quarter brought down taxable sales in fiscal year 2019 by $10.9 million.

The fuels tax program is very efficient. Collection costs are only about 0.3% of total revenue collected.

Rows 4 through 13 list the costs associated with the Fuels Tax program and the statutory transfers that occur prior to apportionment. Row 14 is a special memo row to show the impact of the B20 biofuels tax exemption program. Since the B20 fuel is tax exempt, it is not included in the gross revenue above and is included as a memo item only for tracking purposes. This exemption is currently set to sunset at the end of calendar year 2019.

Rows 16 through 19 highlight the amounts that the motor fuels tax contributes to the OTIA, JTA and HB 2017 programs, either as a portion of the OTIA I set-aside shown in row 10 or as the incremental revenues from the OTIA III, JTA and HB 2017 programs shown in rows 17 through 19. Note that the OTIA III legislation did not increase the motor fuels tax rate so the incremental amount is zero.

Table 6. Highway Fund Revenue Collected by FSB (Millions of Dollars) (Includes Guaranteed Fuels Tax Increases Only - Currently 4 Cents)

		Actual		Forecast										Actual	Forecast				
		FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	BI 17-19	BI 19-21	BI 21-23	BI 23-25	BI 25-27	BI 27-29
1	MOTOR FUELS TAXES	$580.7	$625.2	$636.9	$641.1	$639.5	$637.0	$633.7	$631.1	$626.8	$622.3	$617.0	$612.0	$1,205.9	$1,278.0	$1,276.5	$1,264.9	$1,249.1	$1,229.1
2	**TOTAL FSB COLLECTIONS**	**$580.7**	**$625.2**	**$636.9**	**$641.1**	**$639.5**	**$637.0**	**$633.7**	**$631.1**	**$626.8**	**$622.3**	**$617.0**	**$612.0**	**$1,205.9**	**$1,278.0**	**$1,276.5**	**$1,264.9**	**$1,249.1**	**$1,229.1**
3	Change from Previous Forecast	($3.3)	($10.9)	($0.9)	($1.3)	($6.2)	($10.6)	($15.5)	($19.3)	($23.7)	($26.9)	($29.7)	NA	($14.2)	($2.2)	($16.9)	($34.8)	($50.6)	NA
4	COLLECTION/ADMINISTRATION COST	($1.9)	($1.9)	($2.0)	($2.1)	($2.2)	($2.2)	($2.3)	($2.4)	($2.5)	($2.6)	($2.7)	($2.7)	($3.8)	($4.1)	($4.4)	($4.7)	($5.1)	($5.4)
5	ODOT CENTRAL SERVICES ASSESSMENT	($0.4)	($0.4)	($0.3)	($0.4)	($0.4)	($0.4)	($0.4)	($0.4)	($0.4)	($0.4)	($0.5)	($0.5)	($0.8)	($0.7)	($0.8)	($0.8)	($0.9)	($0.9)
6	SNOWMOBILE TRANSFER	($0.7)	($0.7)	($0.7)	($0.8)	($0.8)	($0.8)	($0.8)	($0.9)	($0.9)	($0.9)	($0.8)	($0.8)	($1.5)	($1.5)	($1.6)	($1.7)	($1.7)	($1.7)
7	CLASS I ATV TRANSFER	($2.8)	($2.7)	($2.8)	($2.9)	($2.9)	($3.0)	($3.1)	($3.1)	($3.1)	($3.1)	($3.1)	($3.1)	($5.5)	($5.7)	($6.0)	($6.2)	($6.2)	($6.2)
8	MARINE BOARD TRANSFER	($4.1)	($4.5)	($4.6)	($4.7)	($4.9)	($5.0)	($5.1)	($5.2)	($5.2)	($5.2)	($5.2)	($5.2)	($8.6)	($9.3)	($9.8)	($10.3)	($10.5)	($10.5)
9	CLASS II ATV TRANSFER	($1.4)	($1.4)	($1.5)	($1.5)	($1.5)	($1.6)	($1.6)	($1.7)	($1.7)	($1.6)	($1.6)	($1.6)	($2.8)	($3.0)	($3.1)	($3.3)	($3.3)	($3.3)
10	CLASS III ATV TRANSFER	($1.3)	($1.4)	($1.4)	($1.5)	($1.5)	($1.5)	($1.6)	($1.6)	($1.6)	($1.6)	($1.6)	($1.6)	($2.7)	($2.9)	($3.0)	($3.2)	($3.2)	($3.2)
11	CLASS IV ATV TRANSFER	($0.9)	($1.0)	($1.1)	($1.1)	($1.1)	($1.2)	($1.2)	($1.2)	($1.2)	($1.2)	($1.2)	($1.2)	($1.9)	($2.2)	($2.3)	($2.4)	($2.4)	($2.4)
12	TRANSPORTATION OPERATING FUND (TOF)	($12.3)	($13.3)	($13.9)	($14.5)	($15.2)	($15.8)	($16.5)	($17.1)	($17.4)	($17.7)	($17.9)	($18.2)	($25.7)	($28.5)	($31.0)	($33.6)	($35.1)	($36.1)
13	AVIATION TRANSFER	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.2)	($0.2)	($0.2)
14	HB 2435 (2013 Session) B20 FUEL TAX EXEMPTION -memo	($5.3)	($5.6)	($2.9)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	($10.9)	($2.9)	$0.0	$0.0	$0.0	$0.0
15	**NET FSB REVENUE**	**$554.9**	**$597.7**	**$608.4**	**$611.6**	**$608.9**	**$605.5**	**$601.0**	**$597.4**	**$592.6**	**$587.9**	**$582.2**	**$576.9**	**$1,152.6**	**$1,220.0**	**$1,214.4**	**$1,198.4**	**$1,180.5**	**$1,159.1**
16	REVENUE ALLOCATION TO OTIA I & II SET-ASIDE - memo	($19.2)	($19.1)	($19.3)	($19.0)	($19.2)	($19.2)	($19.1)	($19.0)	($19.0)	($18.9)	($18.8)	($18.7)	($38.2)	($38.3)	($38.4)	($38.2)	($37.8)	($37.4)
17	REVENUE PLEDGED TO OTIA III - memo	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
18	REVENUE DUE TO JTA - memo	($110.3)	($111.0)	($112.5)	($113.2)	($113.0)	($112.6)	($112.0)	($111.6)	($110.8)	($110.0)	($109.1)	($108.2)	($221.2)	($225.7)	($225.5)	($223.6)	($220.8)	($217.3)
19	REVENUE DUE TO HB 2017 - memo	($35.4)	($74.0)	($75.0)	($75.5)	($75.3)	($75.0)	($74.7)	($74.4)	($73.9)	($73.4)	($72.7)	($72.2)	($109.4)	($150.5)	($150.4)	($149.0)	($147.2)	($144.9)

Highway Revenue Forecast Summary

The forecasted revenue is based on current law tax and fee rates. While it is likely that sometime in the near future rates will increase, this forecast is based only on what is enrolled in the current Oregon revised Statutes.

Aside from the tax and fee increases from HB 2017, we are now fully into a transition period from the 2015-2017 years of robust growth into a much slower growth environment. However, the influx in revenue from HB 2017 changes this outlook dramatically and should provide growth into the middle 2020's as the fee and tax increases are implemented over time. Compared to the prior forecast, cumulative changes in gross revenue from FY19 through FY28 are significant. A loss of $4.5 million per year due to the elimination of the weight receipt is a large part of it. In addition, the drop in the motor fuels forecast is the other significant component of this change.

Row 5 of Table 7 sums all the collection and program costs for DMV, Motor Carrier, and Motor Fuels, and the pre-apportionment transfers. It also includes the incremental revenues from the OTIA III, JTA and HB 2017 programs. Row 6 is the total gross revenue minus the amount in row 5.

Rows 7 through 19 are memo items creating summaries of different bill components related to forecast revenues. Note that HB 2017 created not only new revenues but also included some dedicated funds prior to apportionment and new bonding potential. Row 17 includes a placeholder for bonds to support the projects from Section 71 of the bill. The 2019 Legislature authorized the sale of these bonds, with the anticipated sale during the spring of 2021.

Rows 20 through 26 summarize the net revenue for each OTIA, JTA and HB 2017 program disaggregated by amounts to the local governments or to the state. Row 27 represents the total net revenue for distribution by summing rows 20 through 26 plus row 6.

Table 8 separates the total from row 22 in Table 7 into county, city and state apportionments by apportionment formula, whether it is pre-OTIA, OTIA I&II, OTIA III, JTA or HB 2017.

A separate monthly forecast of the County/City Apportionments is available under "Highway Revenue Apportionment Forecasts" at http://www.oregon.gov/ODOT/Data/Pages/Revenue-Forecasts.aspx

Table 7. Highway Fund Revenue by Fiscal Year and Biennium (Millions of Dollars) (Includes Guaranteed Fuels Tax Increases Only - Currently 4 Cents)

		Actual		Forecast										Actual	Forecast				
		FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	BI 17-19	BI 19-21	BI 21-23	BI 23-25	BI 25-27	BI 27-29
1	TOTAL MCTD COLLECTIONS	$383.7	$433.5	$444.6	$450.7	$475.4	$494.3	$508.4	$524.2	$529.6	$534.5	$540.1	$545.0	$817.2	$895.3	$969.7	$1,032.6	$1,064.1	$1,085.1
2	TOTAL FSB COLLECTIONS	$580.7	$625.2	$636.9	$641.1	$639.5	$637.0	$633.7	$631.1	$626.8	$622.3	$617.0	$612.0	$1,205.9	$1,278.0	$1,276.5	$1,264.9	$1,249.1	$1,229.1
3	TOTAL DMV COLLECTIONS	$377.1	$413.7	$439.9	$485.1	$479.5	$484.5	$488.8	$491.2	$493.0	$494.2	$495.8	$494.1	$790.8	$925.0	$964.1	$980.0	$987.2	$989.9
4	**TOTAL GROSS HIGHWAY FUND**	**$1,341.5**	**$1,472.4**	**$1,521.4**	**$1,576.9**	**$1,594.4**	**$1,615.9**	**$1,630.9**	**$1,646.6**	**$1,649.3**	**$1,651.1**	**$1,652.9**	**$1,651.1**	**$2,814.0**	**$3,098.3**	**$3,210.3**	**$3,277.5**	**$3,300.4**	**$3,304.0**
5	COLLECTION, PROGRAMS, & TRANSFERS (incl.obligated OTIA & JTA)	($717.5)	($845.7)	($893.5)	($930.6)	($960.2)	($992.7)	($1,015.8)	($1,038.0)	($1,051.5)	($1,059.2)	($1,072.26)	($1,077.51)	($1,563.2)	($1,824.1)	($1,952.9)	($2,053.8)	($2,110.7)	($2,149.8)
6	**NET REVENUE TO HIGHWAY FUND**	**$624.0**	**$626.8**	**$627.9**	**$646.2**	**$634.2**	**$623.2**	**$615.1**	**$608.6**	**$597.8**	**$591.9**	**$580.6**	**$573.6**	**$1,250.8**	**$1,274.2**	**$1,257.4**	**$1,223.7**	**$1,189.7**	**$1,154.3**
7	OTIA I & II SET ASIDE - memo	$35.6	$35.6	$35.6	$35.6	$35.6	$35.6	$35.6	$35.6	$35.6	$35.6	$35.6	$35.6	$71.2	$71.2	$71.2	$71.2	$71.2	$71.2
8	DEBT SERVICE (OTIA I & II) - memo	($32.4)	($30.7)	($28.8)	($25.9)	($20.6)	($18.2)	($18.2)	($17.7)	($17.4)	($18.2)	($22.9)	($26.3)	($63.1)	($54.7)	($38.8)	($35.9)	($35.6)	($49.1)
9	OTIA III Dedicated Revenues - memo	$107.3	$107.0	$106.7	$106.7	$107.1	$106.9	$107.3	$107.7	$108.2	$108.5	$108.9	$109.2	$214.3	$213.4	$214.0	$215.0	$216.7	$218.1
10	DEBT SERVICE (OTIA III) - memo	($98.4)	($100.0)	($97.9)	($102.0)	($109.2)	($111.2)	($111.1)	($110.1)	($109.2)	($119.0)	($131.1)	($136.8)	($198.4)	($199.9)	($220.4)	($221.2)	($228.2)	($267.9)
11	JTA Total Gross Revenues - memo	$304.6	$306.8	$308.6	$309.3	$310.0	$309.2	$309.4	$309.6	$310.0	$310.1	$310.2	$309.3	$611.4	$618.0	$619.2	$619.0	$620.1	$619.5
12	JTA Allocation for Long-Range Planning - memo	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($48.0)	($48.0)	($48.0)	($48.0)	($48.0)	($48.0)
13	DEBT SERVICE (JTA) - State Only - memo	($44.7)	($57.4)	($64.4)	($66.5)	($66.8)	($67.1)	($67.1)	($68.3)	($69.2)	($59.9)	($42.7)	($32.1)	($102.1)	($130.9)	($134.0)	($135.5)	($129.1)	($74.8)
14	HB 2017 Total Gross Revenues - memo	$108.5	$224.4	$258.7	$292.6	$321.1	$349.7	$364.6	$381.2	$384.4	$387.1	$389.9	$391.2	$332.9	$551.3	$670.8	$745.8	$771.5	$781.1
15	Safe Routes to School set aside - memo	($5.0)	($10.0)	($10.0)	($10.0)	($10.0)	($12.5)	($15.0)	($15.0)	($15.0)	($15.0)	($15.0)	($15.0)	($15.0)	($20.0)	($22.5)	($30.0)	($30.0)	($30.0)
16	Rose Quarter project set aside - memo	$0.0	$0.0	$0.0	$0.0	($15.0)	($30.0)	($30.0)	($30.0)	($30.0)	($30.0)	($30.0)	($30.0)	$0.0	$0.0	($45.0)	($60.0)	($60.0)	($60.0)
17	DEBT SERVICE (HB 2017 Section 71d) - State Only - memo	$0.0	$0.0	$0.0	($5.4)	($34.4)	($35.8)	($35.8)	($35.9)	($35.9)	($35.9)	($35.9)	($35.9)	$0.0	($5.4)	($70.2)	($71.7)	($71.8)	($71.8)
18	Oregon Travel Experience Transfer - State Only - memo	($3.3)	($8.0)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($11.3)	($18.3)	($18.3)	($18.3)	($18.3)	($18.3)
19	E-GOV Records Incremental Revenue Transfer - memo	($5.3)	($5.6)	($8.1)	($8.2)	($8.2)	($8.3)	($8.3)	($8.3)	($8.3)	($8.4)	($8.4)	($8.4)	($10.9)	($16.3)	($16.5)	($16.6)	($16.7)	($16.7)
20	NET OTIA I & II REVENUE FOR DISTRIBUTION	$3.2	$4.9	$6.8	$9.7	$15.0	$17.4	$17.4	$17.9	$18.2	$17.4	$12.7	$9.3	$8.1	$16.5	$32.4	$35.3	$35.6	$22.1
21	NET OTIA III REVENUE FOR DISTRIBUTION - LOCAL	$34.9	$37.0	$38.5	$38.0	$32.2	$28.9	$29.1	$29.3	$29.4	$32.4	$34.6	$44.6	$71.8	$76.5	$61.1	$58.4	$61.9	$79.2
22	NET OTIA III REVENUE FOR DISTRIBUTION -STATE	($17.7)	($21.3)	($22.2)	($25.1)	($26.2)	($25.2)	($24.9)	($23.6)	($22.4)	($34.8)	($48.8)	($64.1)	($39.0)	($47.3)	($51.4)	($48.5)	($57.3)	($112.9)
23	NET JTA REVENUE FOR DISTRIBUTION - LOCAL	$140.3	$141.4	$142.3	$142.7	$143.0	$142.6	$142.7	$142.8	$143.0	$143.1	$143.1	$142.7	$281.7	$285.0	$285.6	$285.5	$286.1	$285.7
24	NET JTA REVENUE FOR DISTRIBUTION ABOVE D/S -STATE	$27.2	$15.1	$8.5	$6.6	$6.5	$5.9	$6.0	$4.9	$4.1	$13.4	$30.6	$41.0	$42.3	$15.1	$12.4	$10.9	$17.5	$71.6
25	NET HB 2017 REVENUE FOR DISTRIBUTION - LOCAL	$51.7	$107.2	$124.4	$141.3	$148.1	$153.6	$159.8	$168.1	$169.7	$171.0	$172.4	$173.1	$158.9	$265.7	$301.7	$327.9	$340.7	$345.6
26	NET HB 2017 REVENUE FOR DISTRIBUTION -STATE	$51.7	$107.2	$124.4	$135.9	$113.7	$117.8	$124.0	$132.2	$133.8	$135.1	$136.5	$137.2	$158.9	$260.3	$231.4	$256.2	$269.0	$273.7
27	**TOTAL NET REVENUE FOR DISTRIBUTION**	**$915.5**	**$1,018.2**	**$1,050.6**	**$1,095.3**	**$1,066.5**	**$1,064.1**	**$1,069.2**	**$1,080.1**	**$1,073.7**	**$1,069.5**	**$1,061.9**	**$1,057.4**	**$1,933.6**	**$2,145.8**	**$2,130.5**	**$2,149.3**	**$2,143.1**	**$2,119.3**

Note: Row and column sums may vary slightly due to rounding.

Table 8. Distribution of Total Net Revenues (Millions of Dollars) (Includes Guaranteed Fuels Tax Increases Only - Currently 4 Cents)

		Distribution Percentage	Actual FY 18	Actual FY 19	Forecast FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	Actual BI 17-19	Forecast BI 19-21	BI 21-23	BI 23-25	BI 25-27	BI 27-29
1	COUNTY APPORTIONMENT (ORS 366.739)	24.38%	$136.3	$137.9	$138.4	$142.8	$139.9	$137.2	$135.2	$133.6	$131.0	$129.5	$126.8	$125.1	$274.2	$281.2	$277.1	$268.9	$260.5	$251.9
2	SPECIAL COUNTY (ORS 366.772)		($2.8)	($5.5)	($5.5)	($5.5)	($5.5)	($5.5)	($5.5)	($5.5)	($5.5)	($5.5)	($5.5)	($5.5)	($8.3)	($11.0)	($11.0)	($11.0)	($11.0)	($11.0)
4	COUNTY APPORTIONMENT (OTIA I & II)	30.00%	$1.0	$1.5	$2.0	$2.9	$4.5	$5.2	$5.2	$5.4	$5.5	$5.2	$3.8	$2.8	$2.4	$5.0	$9.7	$10.6	$10.7	$6.6
5	COUNTY APPORTIONMENT (OTIA III)	25.48%	$27.3	$27.3	$27.2	$27.2	$27.3	$27.2	$27.3	$27.4	$27.6	$27.7	$27.8	$27.8	$54.6	$54.4	$54.5	$54.8	$55.2	$55.6
6	DEBT SERVICE (OTIA III)	84.07%	($15.9)	($14.4)	($12.1)	($13.0)	($18.0)	($20.6)	($20.6)	($20.6)	($20.6)	($18.3)	($16.6)	($8.3)	($30.4)	($25.1)	($38.6)	($41.2)	($38.9)	($24.8)
7	COUNTY APPORTIONMENT (OTIA III-Local)	60.00%	$5.0	$5.2	$4.5	$4.9	$4.9	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$10.2	$9.4	$9.7	$9.7	$9.6	$9.7
8	COUNTY APPORTIONMENT (JTA)	30.00%	$84.2	$84.8	$85.4	$85.6	$85.8	$85.5	$85.6	$85.7	$85.8	$85.8	$85.8	$85.6	$169.0	$171.0	$171.4	$171.3	$171.6	$171.4
9	COUNTY APPORTIONMENT (HB 2017)	30.00%	$31.0	$64.3	$74.6	$84.8	$88.8	$92.2	$95.9	$100.9	$101.8	$102.6	$103.5	$103.9	$95.4	$159.4	$181.0	$196.7	$204.4	$207.3
10	**NET COUNTY APPORTIONMENT**		**$266.1**	**$301.1**	**$314.6**	**$329.7**	**$327.7**	**$326.1**	**$328.0**	**$331.7**	**$330.3**	**$331.9**	**$330.4**	**$336.3**	**$567.2**	**$644.3**	**$653.7**	**$659.7**	**$662.2**	**$666.7**
11	CITY APPORTIONMENT (ORS 366.739)	15.57%	$87.0	$88.1	$88.4	$91.2	$89.3	$87.6	$86.4	$85.3	$83.6	$82.7	$81.0	$79.9	$175.1	$179.6	$176.9	$171.7	$166.4	$160.9
12	SPECIAL CITY (ORS 366.805)		($1.3)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($3.8)	($5.0)	($5.0)	($5.0)	($5.0)	($5.0)
13	CITY APPORTIONMENT (OTIA I & II)	20.00%	$0.6	$1.0	$1.4	$1.9	$3.0	$3.5	$3.5	$3.6	$3.6	$3.5	$2.5	$1.9	$1.6	$3.3	$6.5	$7.1	$7.1	$4.4
14	CITY APPORTIONMENT (OTIA III)	16.99%	$18.2	$18.2	$18.1	$18.1	$18.2	$18.2	$18.2	$18.3	$18.4	$18.4	$18.5	$18.6	$36.4	$36.3	$36.4	$36.5	$36.8	$37.1
15	DEBT SERVICE (OTIA III)	15.93%	($3.0)	($2.7)	($2.3)	($2.5)	($3.4)	($3.9)	($3.9)	($3.9)	($3.9)	($3.5)	($3.1)	($1.6)	($5.8)	($4.8)	($7.3)	($7.8)	($7.4)	($4.7)
16	CITY APPORTIONMENT (OTIA III-Local)	40.00%	$3.3	$3.5	$3.0	$3.2	$3.2	$3.2	$3.2	$3.2	$3.2	$3.2	$3.2	$3.2	$6.8	$6.3	$6.4	$6.4	$6.4	$6.4
17	CITY APPORTIONMENT (JTA)	20.00%	$56.1	$56.6	$56.9	$57.1	$57.2	$57.0	$57.1	$57.1	$57.2	$57.2	$57.2	$57.1	$112.7	$114.0	$114.2	$114.2	$114.4	$114.3
18	CITY APPORTIONMENT (HB 2017)	20.00%	$20.7	$42.9	$49.7	$56.5	$59.2	$61.4	$63.9	$67.2	$67.9	$68.4	$69.0	$69.2	$63.6	$106.3	$120.7	$131.2	$136.3	$138.2
19	**NET CITY APPORTIONMENT**		**$181.8**	**$204.9**	**$212.8**	**$223.2**	**$224.3**	**$224.5**	**$225.9**	**$228.4**	**$227.6**	**$227.5**	**$225.8**	**$225.8**	**$386.7**	**$435.9**	**$448.8**	**$454.3**	**$455.1**	**$451.6**
20	HIGHWAY DIVISION (including small City/County)	60.05%	$335.7	$339.8	$340.9	$351.8	$344.5	$338.0	$333.1	$329.1	$322.6	$319.0	$312.3	$308.2	$675.4	$692.7	$682.4	$662.2	$641.7	$620.5
21	SPECIAL COUNTY (ORS 366.772)		($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.5)	($0.5)	($0.5)	($0.5)	($0.5)	($0.5)
22	SPECIAL CITY (ORS 366.805)		($1.3)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($3.8)	($5.0)	($5.0)	($5.0)	($5.0)	($5.0)
23	HIGHWAY DIVISION: TOTAL (OTIA I & II)	50.00%	$1.6	$2.4	$3.4	$4.9	$7.5	$8.7	$8.7	$8.9	$9.1	$8.7	$6.4	$4.7	$4.1	$8.3	$16.2	$17.6	$17.8	$11.0
24	HIGHWAY DIVISION: TOTAL (OTIA III)	57.53%	$61.7	$61.6	$61.4	$61.4	$61.6	$61.5	$61.7	$61.9	$62.2	$62.4	$62.7	$62.8	$123.3	$122.8	$123.1	$123.7	$124.7	$125.5
25	DEBT SERVICE (OTIA III)	100.00%	($79.5)	($82.9)	($83.6)	($86.5)	($87.8)	($86.7)	($86.6)	($85.5)	($84.7)	($97.3)	($111.4)	($127.0)	($162.3)	($170.1)	($174.5)	($172.1)	($181.9)	($238.4)
26	STATE APPORTIONMENT (OTIA III)	0.00%	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$1.0	$2.0	$0.0	$0.0	$0.0	$0.0	$0.0	$3.0
27	HIGHWAY DIVISION: NON-DEDICATED JTA REVENUES	48.75%	$68.4	$68.9	$69.4	$69.6	$69.7	$69.5	$69.6	$69.6	$69.7	$69.7	$69.8	$69.5	$137.3	$138.9	$139.2	$139.2	$139.5	$139.3
28	HIGHWAY DIVISION: DEDICATED JTA DEBT SERVICE	51.25%	$71.9	$72.5	$72.9	$73.1	$73.3	$73.1	$73.1	$73.2	$73.3	$73.3	$73.3	$73.1	$144.4	$146.1	$146.4	$146.3	$146.6	$146.4
29	DEBT SERVICE (JTA)		($44.7)	($57.4)	($64.4)	($66.5)	($66.8)	($67.1)	($67.1)	($68.3)	($69.2)	($59.9)	($42.7)	($32.1)	($102.1)	($130.9)	($134.0)	($135.5)	($129.1)	($74.8)
30	STATE APPORTIONMENT (HB 2017)	50.00%	$51.7	$107.2	$124.4	$141.3	$148.1	$153.6	$159.8	$168.1	$169.7	$171.0	$172.4	$173.1	$158.9	$265.7	$301.7	$327.9	$340.7	$345.6
31	DEBT SERVICE (HB 2017 Section 71d)		$0.0	$0.0	$0.0	($5.4)	($34.4)	($35.8)	($35.8)	($35.9)	($35.9)	($35.9)	($35.9)	($35.9)	$0.0	($5.4)	($70.2)	($71.7)	($71.8)	($71.8)
32	OREGON TRAVEL EXPERIENCE TRANSFER		($3.3)	($8.0)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($11.3)	($18.3)	($18.3)	($18.3)	($18.3)	($18.3)
33	**NET HIGHWAY DIVISION**		**$462.1**	**$501.4**	**$512.5**	**$531.6**	**$503.8**	**$502.7**	**$504.6**	**$509.3**	**$505.0**	**$499.3**	**$495.9**	**$486.5**	**$963.5**	**$1,044.1**	**$1,006.5**	**$1,013.9**	**$1,004.3**	**$982.5**
34	Memo: HIGHWAY MODERNIZATION PROGRAM (included in NET HIGHWAY DIVISION)		$80.7	$81.6	$82.9	$83.1	$83.0	$82.3	$81.8	$81.5	$81.2	$81.0	$80.6	$80.2	$162.3	$166.0	$165.3	$163.3	$162.2	$160.8
35	NET COUNTY APPORTIONMENT		$266.1	$301.1	$314.6	$329.7	$327.7	$326.1	$328.0	$331.7	$330.3	$331.9	$330.4	$336.3	$567.2	$644.3	$653.7	$659.7	$662.2	$666.7
36	NET CITY APPORTIONMENT		$181.8	$204.9	$212.8	$223.2	$224.3	$224.5	$225.9	$228.4	$227.6	$227.5	$225.8	$225.8	$386.7	$435.9	$448.8	$454.3	$455.1	$451.6
37	NET HIGHWAY DIVISION		$462.1	$501.4	$512.5	$531.6	$503.8	$502.7	$504.6	$509.3	$505.0	$499.3	$495.9	$486.5	$963.5	$1,044.1	$1,006.5	$1,013.9	$1,004.3	$982.5
38	**NET HIGHWAY FUNDS REVENUE**		**$910.0**	**$1,007.4**	**$1,039.8**	**$1,084.5**	**$1,055.7**	**$1,053.3**	**$1,058.5**	**$1,069.4**	**$1,062.9**	**$1,058.7**	**$1,052.2**	**$1,048.6**	**$1,917.4**	**$2,124.3**	**$2,109.0**	**$2,127.8**	**$2,121.6**	**$2,100.8**
39	SPECIAL COUNTY/CITY TRANSFERS TO ALLOTMENT FUND		$5.5	$10.8	$10.8	$10.8	$10.8	$10.8	$10.8	$10.8	$10.8	$10.8	$10.8	$10.7	$16.3	$21.5	$21.5	$21.5	$21.5	$21.5
40	**TOTAL NET REVENUES FOR DISTRIBUTION**		**$915.5**	**$1,018.2**	**$1,050.6**	**$1,095.3**	**$1,066.5**	**$1,064.1**	**$1,069.2**	**$1,080.1**	**$1,073.7**	**$1,069.5**	**$1,062.9**	**$1,059.4**	**$1,933.6**	**$2,145.8**	**$2,130.5**	**$2,149.3**	**$2,143.1**	**$2,122.3**

Note: Row and column sums may vary slightly due to rounding.

Appendix – Alternative Conditional Motor Fuel Forecast

If we assume the conditions are met triggering the three two cent increases in the motor fuels tax rate in January's of 2020, 2022, and 2024, this will significantly increases motor fuels tax revenue in these years. As of now, we are on course to meet the requirements for the 2020 increase. Below are updated tables 6A, 7A and 8A where these conditional tax increases are included. In addition to generating revenue for the State Highway Fund and apportionable revenue to share with local governments, it also increases the revenue transferred for the non-highway fuel uses. This is shown in Table 6A rows 6 through 13.

Tables 6A-8A (Includes All Conditional Rate Increases)

Table 6A. Highway Fund Revenue Collected by FSB (Millions of Dollars) (Includes all Conditional Fuels Tax Increases - Currently an Additional 6 Cents)

		Actual		Forecast										Actual	Forecast				
		FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	BI 17-19	BI 19-21	BI 21-23	BI 23-25	BI 25-27	BI 27-29
1	MOTOR FUELS TAXES	$580.7	$625.2	$655.2	$678.7	$695.2	$711.8	$726.2	$742.3	$737.1	$731.9	$725.7	$719.8	$1,205.9	$1,333.9	$1,407.1	$1,468.4	$1,469.0	$1,445.5
2	**TOTAL FSB COLLECTIONS**	**$580.7**	**$625.2**	**$655.2**	**$678.7**	**$695.2**	**$711.8**	**$726.2**	**$742.3**	**$737.1**	**$731.9**	**$725.7**	**$719.8**	**$1,205.9**	**$1,333.9**	**$1,407.1**	**$1,468.4**	**$1,469.0**	**$1,445.5**
3	Change from Previous Forecast	($3.3)	($10.9)	($0.9)	($1.4)	($6.8)	($11.9)	($17.9)	($22.7)	($28.0)	($31.7)	($35.0)	NA	($14.2)	($2.3)	($18.7)	($40.6)	($59.6)	NA
4	COLLECTION/ADMINISTRATION COST	($1.9)	($1.9)	($2.0)	($2.1)	($2.2)	($2.2)	($2.3)	($2.4)	($2.5)	($2.6)	($2.7)	($2.7)	($3.8)	($4.1)	($4.4)	($4.7)	($5.1)	($5.4)
5	ODOT CENTRAL SERVICES ASSESSMENT	($0.4)	($0.4)	($0.3)	($0.4)	($0.4)	($0.4)	($0.4)	($0.4)	($0.4)	($0.4)	($0.5)	($0.5)	($0.8)	($0.7)	($0.8)	($0.8)	($0.9)	($0.9)
6	SNOWMOBILE TRANSFER	($0.7)	($0.7)	($0.7)	($0.8)	($0.8)	($0.8)	($0.8)	($0.9)	($0.9)	($0.9)	($0.8)	($0.8)	($1.5)	($1.5)	($1.6)	($1.7)	($1.7)	($1.7)
7	CLASS I ATV TRANSFER	($2.8)	($2.7)	($2.8)	($2.9)	($2.9)	($3.0)	($3.1)	($3.1)	($3.1)	($3.1)	($3.1)	($3.1)	($5.5)	($5.7)	($6.0)	($6.2)	($6.2)	($6.2)
8	MARINE BOARD TRANSFER	($4.1)	($4.5)	($4.6)	($4.7)	($4.9)	($5.0)	($5.1)	($5.2)	($5.2)	($5.2)	($5.2)	($5.2)	($8.6)	($9.3)	($9.8)	($10.3)	($10.5)	($10.5)
9	CLASS II ATV TRANSFER	($1.4)	($1.4)	($1.5)	($1.5)	($1.5)	($1.6)	($1.6)	($1.7)	($1.7)	($1.6)	($1.6)	($1.6)	($2.8)	($3.0)	($3.1)	($3.3)	($3.3)	($3.3)
10	CLASS III ATV TRANSFER	($1.3)	($1.4)	($1.4)	($1.5)	($1.5)	($1.5)	($1.6)	($1.6)	($1.6)	($1.6)	($1.6)	($1.6)	($2.7)	($2.9)	($3.0)	($3.2)	($3.2)	($3.2)
11	CLASS IV ATV TRANSFER	($0.9)	($1.0)	($1.1)	($1.1)	($1.1)	($1.2)	($1.2)	($1.2)	($1.2)	($1.2)	($1.2)	($1.2)	($1.9)	($2.2)	($2.3)	($2.4)	($2.4)	($2.4)
12	TRANSPORTATION OPERATING FUND (TOF)	($12.3)	($13.3)	($13.9)	($14.5)	($15.2)	($15.8)	($16.5)	($17.1)	($17.4)	($17.7)	($17.9)	($18.2)	($25.7)	($28.5)	($31.0)	($33.6)	($35.1)	($36.1)
13	AVIATION TRANSFER	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.2)	($0.2)	($0.2)
14	HB 2435 (2013 Session) B20 FUEL TAX EXEMPTION -memo	($5.3)	($5.6)	($2.9)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	($10.9)	($2.9)	$0.0	$0.0	$0.0	$0.0
15	**NET FSB REVENUE**	**$554.9**	**$597.7**	**$626.6**	**$649.3**	**$664.7**	**$680.3**	**$693.5**	**$708.5**	**$703.0**	**$697.5**	**$690.9**	**$684.7**	**$1,152.6**	**$1,275.9**	**$1,344.9**	**$1,402.0**	**$1,400.5**	**$1,375.6**
16	REVENUE ALLOCATION TO OTIA I & II SET-ASIDE - memo	($19.2)	($19.1)	($19.3)	($19.0)	($19.2)	($19.2)	($19.1)	($19.0)	($19.0)	($18.9)	($18.8)	($18.7)	($38.2)	($38.3)	($38.4)	($38.2)	($37.8)	($37.4)
17	REVENUE PLEDGED TO OTIA III - memo	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
18	REVENUE DUE TO JTA - memo	($110.3)	($111.0)	($112.5)	($113.2)	($112.9)	($112.5)	($111.9)	($111.4)	($110.6)	($109.9)	($109.0)	($108.1)	($221.2)	($225.7)	($225.4)	($223.3)	($220.5)	($217.0)
19	REVENUE DUE TO HB 2017 - memo	($35.4)	($74.0)	($93.2)	($113.2)	($131.1)	($150.0)	($167.2)	($185.7)	($184.4)	($183.1)	($181.6)	($180.1)	($109.4)	($206.4)	($281.1)	($352.9)	($367.5)	($361.7)

Table 7A. Highway Fund Revenue by Fiscal Year and Biennium (Millions of Dollars) (Includes all Conditional Fuels Tax Increases - Currently an Additional 6 Cents)

		Actual		Forecast										Actual	Forecast				
		FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	BI 17-19	BI 19-21	BI 21-23	BI 23-25	BI 25-27	BI 27-29
1	TOTAL MCTD COLLECTIONS	$383.7	$433.5	$444.6	$450.7	$475.4	$494.3	$508.4	$524.2	$529.6	$534.5	$540.1	$545.0	$817.2	$895.3	$969.7	$1,032.6	$1,064.1	$1,085.1
2	TOTAL FSB COLLECTIONS	$580.7	$625.2	$655.2	$678.7	$695.2	$711.8	$726.2	$742.3	$737.1	$731.9	$725.7	$719.8	$1,205.9	$1,333.9	$1,407.1	$1,468.4	$1,469.0	$1,445.5
3	TOTAL DMV COLLECTIONS	$377.1	$413.7	$439.9	$485.1	$479.5	$484.5	$488.8	$491.2	$493.0	$494.2	$495.8	$494.1	$790.8	$925.0	$964.1	$980.0	$987.2	$989.9
4	**TOTAL GROSS HIGHWAY FUND**	**$1,341.5**	**$1,472.4**	**$1,539.6**	**$1,614.5**	**$1,650.2**	**$1,690.7**	**$1,723.3**	**$1,757.7**	**$1,759.6**	**$1,760.7**	**$1,761.6**	**$1,758.9**	**$2,814.0**	**$3,154.2**	**$3,340.8**	**$3,481.1**	**$3,520.3**	**$3,520.5**
5	COLLECTION, PROGRAMS, & TRANSFERS (incl.obligated OTIA & JTA)	($717.5)	($845.7)	($911.7)	($968.3)	($1,016.0)	($1,067.5)	($1,108.2)	($1,149.2)	($1,161.9)	($1,168.9)	($1,180.98)	($1,185.34)	($1,563.2)	($1,880.0)	($2,083.5)	($2,257.4)	($2,330.7)	($2,366.3)
6	**NET REVENUE TO HIGHWAY FUND**	**$624.0**	**$626.8**	**$627.9**	**$646.2**	**$634.2**	**$623.1**	**$615.1**	**$608.5**	**$597.8**	**$591.8**	**$580.6**	**$573.6**	**$1,250.8**	**$1,274.1**	**$1,257.3**	**$1,223.6**	**$1,189.6**	**$1,154.2**
7	OTIA I & II SET ASIDE - memo	$35.6	$35.6	$35.6	$35.6	$35.6	$35.6	$35.6	$35.6	$35.6	$35.6	$35.6	$35.6	$71.2	$71.2	$71.2	$71.2	$71.2	$71.2
8	DEBT SERVICE (OTIA I & II) - memo	($32.4)	($30.7)	($28.8)	($25.9)	($20.6)	($18.2)	($18.2)	($17.7)	($17.4)	($18.2)	($22.9)	($26.3)	($63.1)	($54.7)	($38.8)	($35.9)	($35.6)	($49.1)
9	OTIA III Dedicated Revenues - memo	$107.3	$107.0	$106.7	$106.7	$107.1	$106.9	$107.3	$107.7	$108.2	$108.5	$108.9	$109.2	$214.3	$213.4	$214.0	$215.0	$216.7	$218.1
10	DEBT SERVICE (OTIA III) - memo	($98.4)	($100.0)	($97.9)	($102.0)	($109.2)	($111.2)	($111.1)	($110.1)	($109.2)	($119.0)	($131.1)	($136.8)	($198.4)	($199.9)	($220.4)	($221.2)	($228.2)	($267.9)
11	JTA Total Gross Revenues - memo	$304.6	$306.8	$308.6	$309.3	$310.0	$309.1	$309.3	$309.5	$309.8	$309.9	$310.0	$309.1	$611.4	$617.9	$619.0	$618.8	$619.8	$619.1
12	JTA Allocation for Long-Range Planning - memo	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($24.0)	($48.0)	($48.0)	($48.0)	($48.0)	($48.0)	($48.0)
13	DEBT SERVICE (JTA) - State Only - memo	($44.7)	($57.4)	($64.4)	($66.5)	($66.8)	($67.1)	($67.1)	($68.3)	($69.2)	($59.9)	($42.7)	($32.1)	($102.1)	($130.9)	($134.0)	($135.5)	($129.1)	($74.8)
14	HB 2017 Total Gross Revenues - memo	$108.5	$224.4	$277.0	$330.3	$377.0	$424.6	$457.2	$492.5	$494.9	$496.8	$498.7	$499.2	$332.9	$607.3	$801.6	$949.7	$991.8	$997.9
15	Safe Routes to School set aside - memo	($5.0)	($10.0)	($10.0)	($10.0)	($10.0)	($12.5)	($15.0)	($15.0)	($15.0)	($15.0)	($15.0)	($15.0)	($15.0)	($20.0)	($22.5)	($30.0)	($30.0)	($30.0)
16	Rose Quarter project set aside - memo	$0.0	$0.0	$0.0	$0.0	($15.0)	($30.0)	($30.0)	($30.0)	($30.0)	($30.0)	($30.0)	($30.0)	$0.0	$0.0	($45.0)	($60.0)	($60.0)	($60.0)
17	DEBT SERVICE (HB 2017 Section 71d) - State Only - memo	$0.0	$0.0	$0.0	($5.4)	($34.4)	($35.8)	($35.8)	($35.9)	($35.9)	($35.9)	($35.9)	($35.9)	$0.0	($5.4)	($70.2)	($71.7)	($71.8)	($71.8)
18	Oregon Travel Experience Transfer - State Only - memo	($3.3)	($8.0)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($11.3)	($18.3)	($18.3)	($18.3)	($18.3)	($18.3)
19	E-GOV Records Incremental Revenue Transfer - memo	($5.3)	($5.6)	($8.1)	($8.2)	($8.2)	($8.3)	($8.3)	($8.3)	($8.3)	($8.4)	($8.4)	($8.4)	($10.9)	($16.3)	($16.5)	($16.6)	($16.7)	($16.7)
20	NET OTIA I & II REVENUE FOR DISTRIBUTION	$3.2	$4.9	$6.8	$9.7	$15.0	$17.4	$17.4	$17.9	$18.2	$17.4	$12.7	$9.3	$8.1	$16.5	$32.4	$35.3	$35.6	$22.1
21	NET OTIA III REVENUE FOR DISTRIBUTION - LOCAL	$34.9	$37.0	$38.5	$38.0	$32.2	$28.9	$29.1	$29.3	$29.4	$32.4	$34.6	$44.6	$71.8	$76.5	$61.1	$58.4	$61.9	$79.2
22	NET OTIA III REVENUE FOR DISTRIBUTION -STATE	($17.7)	($21.3)	($22.2)	($25.1)	($26.2)	($25.2)	($24.9)	($23.6)	($22.4)	($34.8)	($48.8)	($64.1)	($39.0)	($47.3)	($51.4)	($48.5)	($57.3)	($112.9)
23	NET JTA REVENUE FOR DISTRIBUTION - LOCAL	$140.3	$141.4	$142.3	$142.7	$143.0	$142.5	$142.6	$142.7	$142.9	$143.0	$143.0	$142.6	$281.7	$285.0	$285.5	$285.4	$285.9	$285.6
24	NET JTA REVENUE FOR DISTRIBUTION ABOVE D/S -STATE	$27.2	$15.1	$8.5	$6.6	$6.5	$5.9	$6.0	$4.8	$4.1	$13.4	$30.6	$40.9	$42.3	$15.1	$12.4	$10.8	$17.4	$71.6
25	NET HB 2017 REVENUE FOR DISTRIBUTION - LOCAL	$51.7	$107.2	$133.5	$160.2	$176.0	$191.1	$206.1	$223.7	$225.0	$225.9	$226.8	$227.1	$158.9	$293.6	$367.0	$429.8	$450.9	$454.0
26	NET HB 2017 REVENUE FOR DISTRIBUTION -STATE	$51.7	$107.2	$133.5	$154.8	$141.6	$155.2	$170.3	$187.9	$189.1	$190.0	$190.9	$191.2	$158.9	$288.2	$296.8	$358.1	$379.1	$382.1
27	**TOTAL NET REVENUE FOR DISTRIBUTION**	**$915.5**	**$1,018.2**	**$1,068.8**	**$1,132.9**	**$1,122.2**	**$1,138.9**	**$1,161.7**	**$1,191.2**	**$1,184.0**	**$1,179.1**	**$1,170.6**	**$1,165.1**	**$1,933.6**	**$2,201.7**	**$2,261.1**	**$2,352.9**	**$2,363.1**	**$2,335.7**

Note: Row and column sums may vary slightly due to rounding.

Table 8A. Distribution of Total Net Revenues (Millions of Dollars) (Includes all Conditional Fuels Tax Increases - Currently an Additional 6 Cents)

			Actual		Forecast										Actual	Forecast				
		Distribution Percentage	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	BI 17-19	BI 19-21	BI 21-23	BI 23-25	BI 25-27	BI 27-29
1	COUNTY APPORTIONMENT (ORS 366.739)	24.38%	$136.3	$137.9	$138.4	$142.8	$139.9	$137.2	$135.2	$133.6	$131.0	$129.5	$126.8	$125.1	$274.2	$281.2	$277.1	$268.9	$260.5	$251.9
2	SPECIAL COUNTY (ORS 366.772)		($2.8)	($5.5)	($5.5)	($5.5)	($5.5)	($5.5)	($5.5)	($5.5)	($5.5)	($5.5)	($5.5)	($5.5)	($8.3)	($11.0)	($11.0)	($11.0)	($11.0)	($11.0)
4	COUNTY APPORTIONMENT (OTIA I & II)	30.00%	$1.0	$1.5	$2.0	$2.9	$4.5	$5.2	$5.2	$5.4	$5.5	$5.2	$3.8	$2.8	$2.4	$5.0	$9.7	$10.6	$10.7	$6.6
5	COUNTY APPORTIONMENT (OTIA III)	25.48%	$27.3	$27.3	$27.2	$27.2	$27.3	$27.2	$27.3	$27.4	$27.6	$27.7	$27.8	$27.8	$54.6	$54.4	$54.5	$54.8	$55.2	$55.6
6	DEBT SERVICE (OTIA III)	84.07%	($15.9)	($14.4)	($12.1)	($13.0)	($18.0)	($20.6)	($20.6)	($20.6)	($20.6)	($18.3)	($16.6)	($8.3)	($30.4)	($25.1)	($38.6)	($41.2)	($38.9)	($24.8)
7	COUNTY APPORTIONMENT (OTIA III-Local)	60.00%	$5.0	$5.2	$4.5	$4.9	$4.9	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$4.8	$10.2	$9.4	$9.7	$9.7	$9.6	$9.7
8	COUNTY APPORTIONMENT (JTA)	30.00%	$84.2	$84.8	$85.4	$85.6	$85.8	$85.5	$85.6	$85.6	$85.7	$85.8	$85.8	$85.5	$169.0	$171.0	$171.3	$171.2	$171.5	$171.3
9	COUNTY APPORTIONMENT (HB 2017)	30.00%	$31.0	$64.3	$80.1	$96.1	$105.6	$114.6	$123.7	$134.2	$135.0	$135.5	$136.1	$136.3	$95.4	$176.2	$220.2	$257.9	$270.5	$272.4
10	**NET COUNTY APPORTIONMENT**		**$266.1**	**$301.1**	**$320.1**	**$341.0**	**$344.4**	**$348.5**	**$355.8**	**$365.0**	**$363.4**	**$364.8**	**$363.1**	**$368.6**	**$567.2**	**$661.0**	**$692.9**	**$720.8**	**$728.2**	**$731.7**
11	CITY APPORTIONMENT (ORS 366.739)	15.57%	$87.0	$88.1	$88.4	$91.2	$89.3	$87.6	$86.4	$85.3	$83.6	$82.7	$81.0	$79.9	$175.1	$179.6	$176.9	$171.7	$166.4	$160.9
12	SPECIAL CITY (ORS 366.805)		($1.3)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($3.8)	($5.0)	($5.0)	($5.0)	($5.0)	($5.0)
13	CITY APPORTIONMENT (OTIA I & II)	20.00%	$0.6	$1.0	$1.4	$1.9	$3.0	$3.5	$3.5	$3.6	$3.6	$3.5	$2.5	$1.9	$1.6	$3.3	$6.5	$7.1	$7.1	$4.4
14	CITY APPORTIONMENT (OTIA III)	16.99%	$18.2	$18.2	$18.1	$18.1	$18.2	$18.2	$18.2	$18.3	$18.4	$18.4	$18.5	$18.6	$36.4	$36.3	$36.4	$36.5	$36.8	$37.1
15	DEBT SERVICE (OTIA III)	15.93%	($3.0)	($2.7)	($2.3)	($2.5)	($3.4)	($3.9)	($3.9)	($3.9)	($3.9)	($3.5)	($3.1)	($1.6)	($5.8)	($4.8)	($7.3)	($7.8)	($7.4)	($4.7)
16	CITY APPORTIONMENT (OTIA III-Local)	40.00%	$3.3	$3.5	$3.0	$3.2	$3.2	$3.2	$3.2	$3.2	$3.2	$3.2	$3.2	$3.2	$6.8	$6.3	$6.4	$6.4	$6.4	$6.4
17	CITY APPORTIONMENT (JTA)	20.00%	$56.1	$56.6	$56.9	$57.1	$57.2	$57.0	$57.1	$57.1	$57.2	$57.2	$57.2	$57.0	$112.7	$114.0	$114.2	$114.2	$114.4	$114.2
18	CITY APPORTIONMENT (HB 2017)	20.00%	$20.7	$42.9	$53.4	$64.1	$70.4	$76.4	$82.4	$89.5	$90.0	$90.4	$90.7	$90.8	$63.6	$117.5	$146.8	$171.9	$180.4	$181.6
19	**NET CITY APPORTIONMENT**		**$181.8**	**$204.9**	**$216.4**	**$230.7**	**$235.4**	**$239.5**	**$244.4**	**$250.6**	**$249.6**	**$249.4**	**$247.5**	**$247.4**	**$386.7**	**$447.1**	**$474.9**	**$495.0**	**$499.1**	**$494.9**
20	HIGHWAY DIVISION (including small City/County)	60.05%	$335.7	$339.8	$340.9	$351.8	$344.5	$338.0	$333.1	$329.1	$322.6	$319.0	$312.3	$308.2	$675.4	$692.7	$682.4	$662.2	$641.7	$620.5
21	SPECIAL COUNTY (ORS 366.772)		($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.3)	($0.5)	($0.5)	($0.5)	($0.5)	($0.5)	($0.5)
22	SPECIAL CITY (ORS 366.805)		($1.3)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($2.5)	($3.8)	($5.0)	($5.0)	($5.0)	($5.0)	($5.0)
23	HIGHWAY DIVISION: TOTAL (OTIA I & II)	50.00%	$1.6	$2.4	$3.4	$4.9	$7.5	$8.7	$8.7	$8.9	$9.1	$8.7	$6.4	$4.7	$4.1	$8.3	$16.2	$17.6	$17.8	$11.0
24	HIGHWAY DIVISION: TOTAL (OTIA III)	57.53%	$61.7	$61.6	$61.4	$61.4	$61.6	$61.5	$61.7	$61.9	$62.2	$62.4	$62.7	$62.8	$123.3	$122.8	$123.1	$123.7	$124.7	$125.5
25	DEBT SERVICE (OTIA III)	100.00%	($79.5)	($82.9)	($83.6)	($86.5)	($87.8)	($86.7)	($86.6)	($85.5)	($84.7)	($97.3)	($111.4)	($127.0)	($162.3)	($170.1)	($174.5)	($172.1)	($181.9)	($238.4)
26	STATE APPORTIONMENT (OTIA III)	0.00%	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$1.0	$2.0	$0.0	$0.0	$0.0	$0.0	$0.0	$3.0
27	HIGHWAY DIVISION: NON-DEDICATED JTA REVENUES	48.75%	$68.4	$68.9	$69.4	$69.5	$69.7	$69.5	$69.5	$69.6	$69.7	$69.7	$69.7	$69.5	$137.3	$138.9	$139.2	$139.1	$139.4	$139.2
28	HIGHWAY DIVISION: DEDICATED JTA DEBT SERVICE	51.25%	$71.9	$72.5	$72.9	$73.1	$73.3	$73.0	$73.1	$73.1	$73.2	$73.3	$73.3	$73.1	$144.4	$146.0	$146.3	$146.3	$146.5	$146.4
29	DEBT SERVICE (JTA)		($44.7)	($57.4)	($64.4)	($66.5)	($66.8)	($67.1)	($67.1)	($68.3)	($69.2)	($59.9)	($42.7)	($32.1)	($102.1)	($130.9)	($134.0)	($135.5)	($129.1)	($74.8)
30	STATE APPORTIONMENT (HB 2017)	50.00%	$51.7	$107.2	$133.5	$160.2	$176.0	$191.1	$206.1	$223.7	$225.0	$225.9	$226.8	$227.1	$158.9	$293.6	$367.0	$429.8	$450.9	$454.0
31	DEBT SERVICE (HB 2017 Section 71d)		$0.0	$0.0	$0.0	($5.4)	($34.4)	($35.8)	($35.8)	($35.9)	($35.9)	($35.9)	($35.9)	($35.9)	$0.0	($5.4)	($70.2)	($71.7)	($71.8)	($71.8)
32	OREGON TRAVEL EXPERIENCE TRANSFER		($3.3)	($8.0)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($9.2)	($11.3)	($18.3)	($18.3)	($18.3)	($18.3)	($18.3)
33	**NET HIGHWAY DIVISION**		**$462.1**	**$501.4**	**$521.6**	**$550.5**	**$531.6**	**$540.1**	**$550.8**	**$564.9**	**$560.2**	**$554.1**	**$550.3**	**$540.4**	**$963.5**	**$1,072.1**	**$1,071.8**	**$1,115.6**	**$1,114.3**	**$1,090.7**
34	Memo: HIGHWAY MODERNIZATION PROGRAM (included in NET HIGHWAY DIVISION)		$80.7	$81.6	$82.9	$83.1	$83.0	$82.3	$81.8	$81.5	$81.2	$81.0	$80.6	$80.2	$162.3	$166.0	$165.3	$163.3	$162.1	$160.8
35	NET COUNTY APPORTIONMENT		$266.1	$301.1	$320.1	$341.0	$344.4	$348.5	$355.8	$365.0	$363.4	$364.8	$363.1	$368.6	$567.2	$661.0	$692.9	$720.8	$728.2	$731.7
36	NET CITY APPORTIONMENT		$181.8	$204.9	$216.4	$230.7	$235.4	$239.5	$244.4	$250.6	$249.6	$249.4	$247.5	$247.4	$386.7	$447.1	$474.9	$495.0	$499.1	$494.9
37	NET HIGHWAY DIVISION		$462.1	$501.4	$521.6	$550.5	$531.6	$540.1	$550.8	$564.9	$560.2	$554.1	$550.3	$540.4	$963.5	$1,072.1	$1,071.8	$1,115.6	$1,114.3	$1,090.7
38	**NET HIGHWAY FUNDS REVENUE**		**$910.0**	**$1,007.4**	**$1,058.1**	**$1,122.2**	**$1,111.5**	**$1,128.1**	**$1,150.9**	**$1,180.5**	**$1,173.2**	**$1,168.3**	**$1,160.9**	**$1,156.4**	**$1,917.4**	**$2,180.2**	**$2,239.6**	**$2,331.4**	**$2,341.6**	**$2,317.2**
39	SPECIAL COUNTY/CITY TRANSFERS TO ALLOTMENT FUND		$5.5	$10.8	$10.8	$10.8	$10.8	$10.8	$10.8	$10.8	$10.8	$10.8	$10.8	$10.7	$16.3	$21.5	$21.5	$21.5	$21.5	$21.5
40	**TOTAL NET REVENUES FOR DISTRIBUTION**		**$915.5**	**$1,018.2**	**$1,068.8**	**$1,132.9**	**$1,122.2**	**$1,138.9**	**$1,161.7**	**$1,191.2**	**$1,184.0**	**$1,179.1**	**$1,171.6**	**$1,167.1**	**$1,933.6**	**$2,201.7**	**$2,261.1**	**$2,352.9**	**$2,363.1**	**$2,338.7**

Note: Row and column sums may vary slightly due to rounding.





Oregon Department of Transportation

October 17, 2019







Multnomah County 2017

Carbon Emissions and Trends

September 18, 2019

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.
City of Portland, Oregon

Multnomah County 2017 Carbon Emissions and Trends

We are in a climate crisis. July 2019 was the hottest month in recorded history with scorching heat in Europe and massive wildfires in Siberia and Alaska. According to the World Meteorological Organization, "July 2019 has rewritten climate history, with dozens of new temperature records at the local, national and global level[1]."

In the Pacific Northwest, the region has warmed substantially, nearly 2°F since 1900[2]. This temperature rise is leading to warmer winters, decreasing snowpacks, hotter summers, and heavier storms. Scientific models predict increasing the risk of both flooding and drought, water scarcity, large wildfires, warmer stream temperatures, harmful algae blooms, life-cycle impacts for salmon, damage to recreational tourism economies, and negative human health impacts from poor air quality and heat.

Despite 26 years of climate planning and mitigation in Portland, local carbon emission reductions have started to plateau around 15% below 1990 levels, see Figure 1. This is both a success story, and a warning. The reductions to date are impressive given we've welcomed 38% more people and 34% more jobs during the same time. Collectively we have reduced per person emissions in Multnomah County by 38% since 1990, although these reductions have slowed. Despite our successes, our emission reduction efforts clearly need to rapidly accelerate.

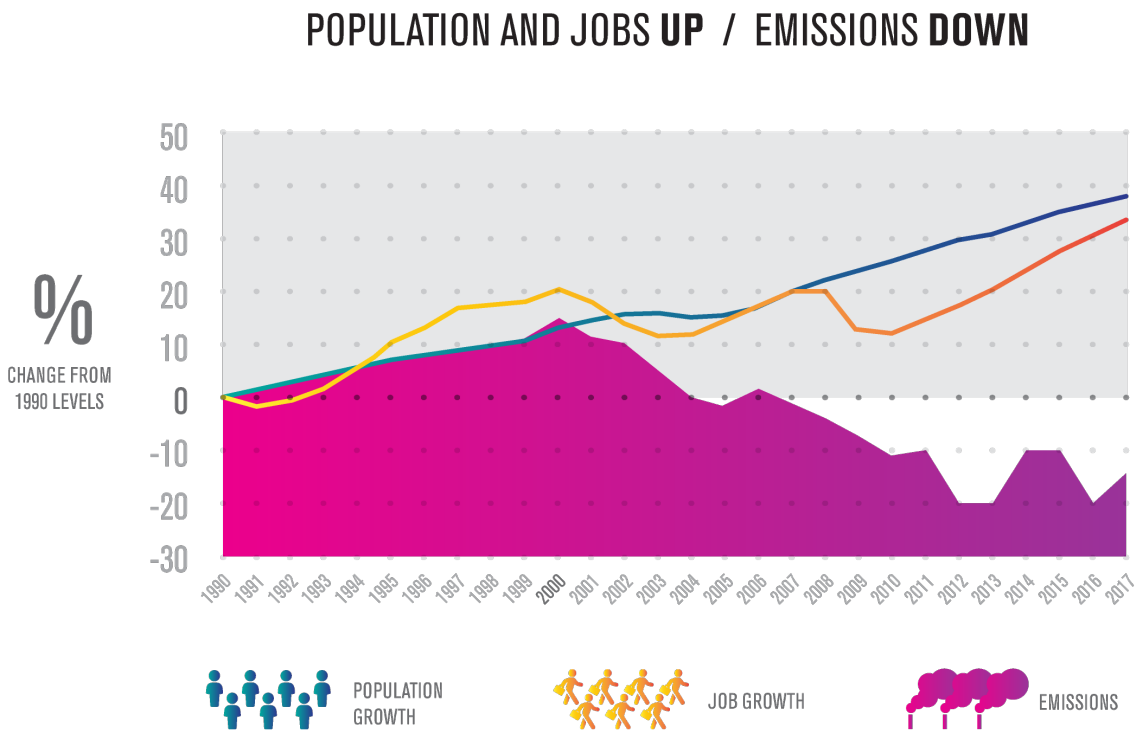


Figure 1: Emissions continue to decline from their peak in 2000, despite significant population growth and increase in jobs. Portland has maintined the decoupling of emissions from growth. However, reductions have reached a plateau in recent years.

Transportation sector emissions are increasing dramatically, currently 8% over 1990 levels, and 14% over their lowest levels in 2012. Portland has experienced year over year increases in transportation related emissions for the past five years, with transportation emissions growing faster than population growth over the same period.

The United Nations International Panel on Climate Change (IPCC) released a special report in October 2018[3] that reiterated the need to limit global warming to 1.5°C to avoid the worst impacts of climate change, including the risk of severe weather events, reduced heat-related mortality, reduced water scarcity, prevent sea level rise that could render delta and low-coastal regions uninhabitable, where two-thirds of the world's population live. IPCC projects that limiting warming to the 1.5°C will require an unprecedented transformation of every sector of the global economy to achieve a 50% reduction in carbon emissions by 2030 and net-zero carbon emissions by 2050. To achieve this Portland must reduce our local emissions by an additional 35% in the next 11 years, a daunting task.

This white paper presents Portland's carbon emission inventory, including sources and trends for the years 1990 to 2017 for Multnomah County. The intent of this paper is to provide information about the pressing challenge to uphold Portland's share of the Paris Climate Agreement. Portland conducts annual emissions inventories to inform policy and planning to reduce emissions. The inventory shows where to focus mitigation efforts and whether we are on track with emission reduction goals. Households and businesses can also assess their own carbon emissions by using free online tools, like the Cool Climate Network's calculators:

- Households - https://coolclimate.berkeley.edu/calculator
- Businesses - https://coolclimate.berkeley.edu/business-calculator

Emissions overview from 2017

Portland and Multnomah County have been tracking local carbon emissions for nearly 30 years using an annual sector-based emissions inventory. This sector-based carbon emissions inventory is widely used by local, state and national governments and meets the Global Protocol for Community-scale GHG Emission Inventories (GPC).

A conventional sector-based carbon emissions inventory shows emissions resulting from four primary categories: fuel use in transportation (e.g. gasoline, diesel, and propane) and energy use in homes, commercial buildings, and industrial facilities (e.g. natural gas for heating, electricity, industrial process fuels), see Figure 2. The City maintains an annual inventory of countywide emissions from these sources, together with landfilled solid waste, wastewater treatment, and other fugitive emissions.

Fugitive emissions *are emissions of gases or vapors from pressurized equipment that escape due to leaks and other unintended releases of gases. These leaks occur during gas extraction from the ground, gas distribution to end users, or gas that escapes from equipment like air conditioning or refrigeration units. Fugitive emissions contribute to air pollution and climate change.*

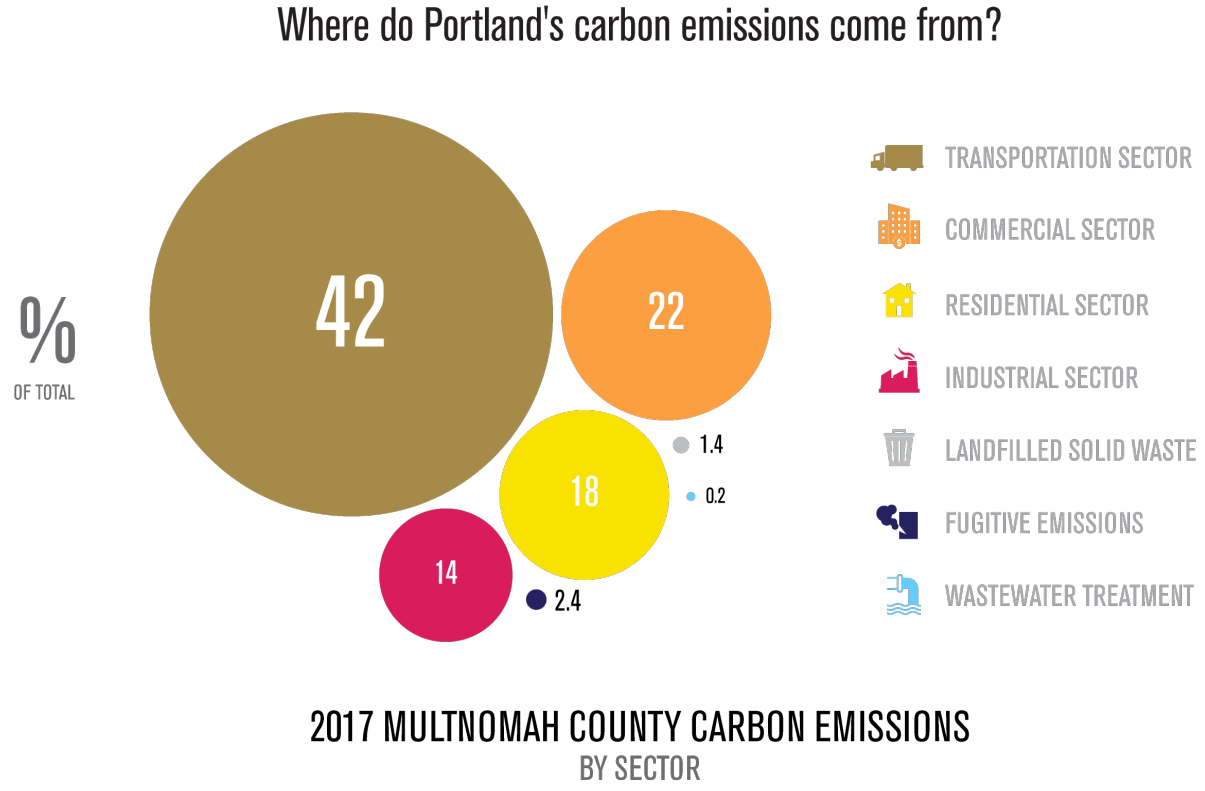


Figure 2: 40 percent of local emissions come from the energy used to run, heat and cool our homes and businesses, and over 40 percent come from transporting people and goods. These proportions have changed as the transportation sector share of local emissions has increased significantly since 2013, when they only accounted for 38 percent of emissions.

This inventory method allocates carbon emissions across the residential, commercial, industrial and transportation sectors based on fuel and energy use in those sectors. It also assigns emissions to solid waste disposal based on the tonnage and type of materials hauled to regional landfills, local wastewater treatment practices, and estimates of fugitive emissions generated in Multnomah County based on population.

Two primary factors influence the emissions trends over time:

1. The amount of energy used in the different sectors (e.g. residential, commercial, industrial, transportation).
2. The carbon-intensity (carbon emissions per unit of energy) of the different energy sources (e.g., electricity, natural gas, gasoline, diesel).

The carbon intensity of energy used in Multnomah County has declined substantially, carbon emissions per unit of energy were 21% lower in 2017 than in 1990. This results in overall reduction in carbon emissions even as the total amount of energy use has increased 8% since 1990.

Today, carbon emissions from Multnomah County total 7,702,000 Metric tons of carbon dioxide equivalents (MT CO2e), which is a 15% reduction from 1990 levels, see figure 5. This decline reflects the continued growth of renewable energy resources like wind and solar in the Pacific Northwest, investments in transit and bike infrastructure, dense and walkable neighborhoods, renewable transportation fuels, as well as the transition from fuel oil to natural gas for heating. These efforts combined have reduced per-person emissions in Multnomah County to 38% below 1990 levels, see Figure 3. This means that a person living in Portland today produces 38% fewer carbon emissions than they would have in 1990.

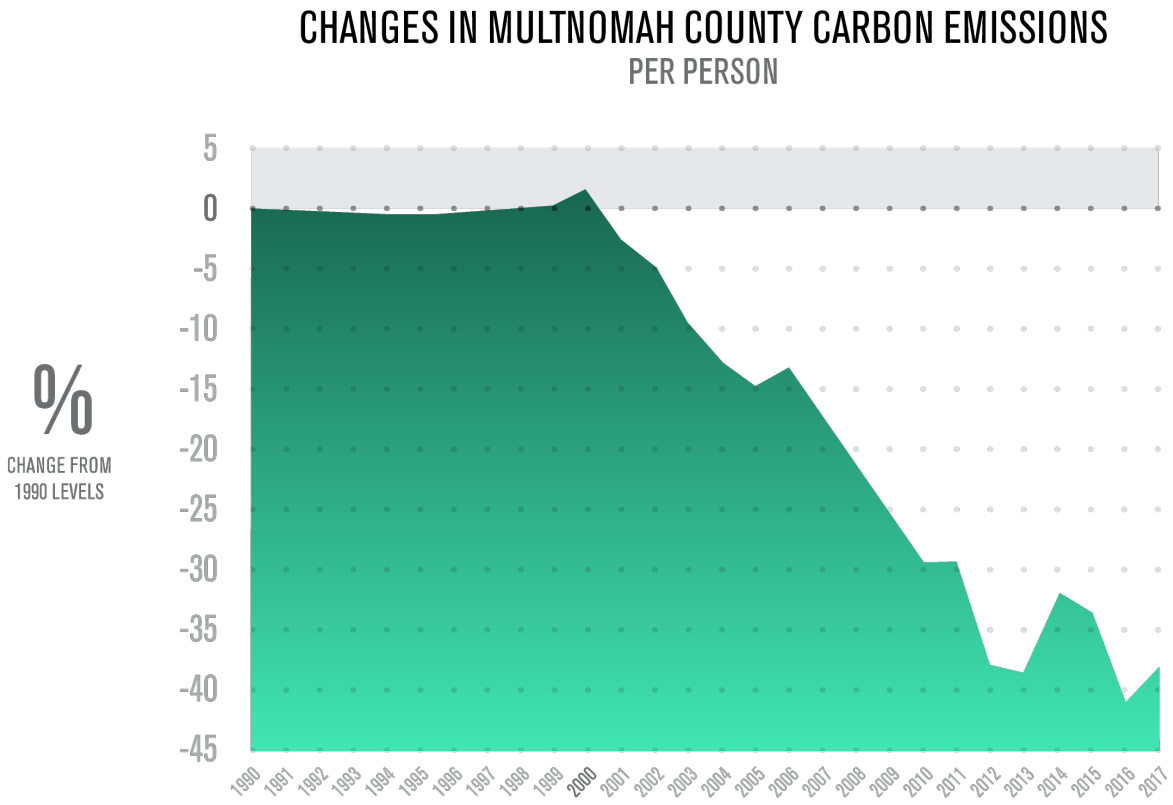


Figure 3: Multnomah County per person carbon emissions have fallen significantly, currently 38% below 1990 levels.

Electricity generation is the single largest source of local carbon emissions, 28%, see Figure 4. These emissions are the result of the carbon intensity of coal and natural gas burned to produce the electricity that powers Multnomah County households and businesses.

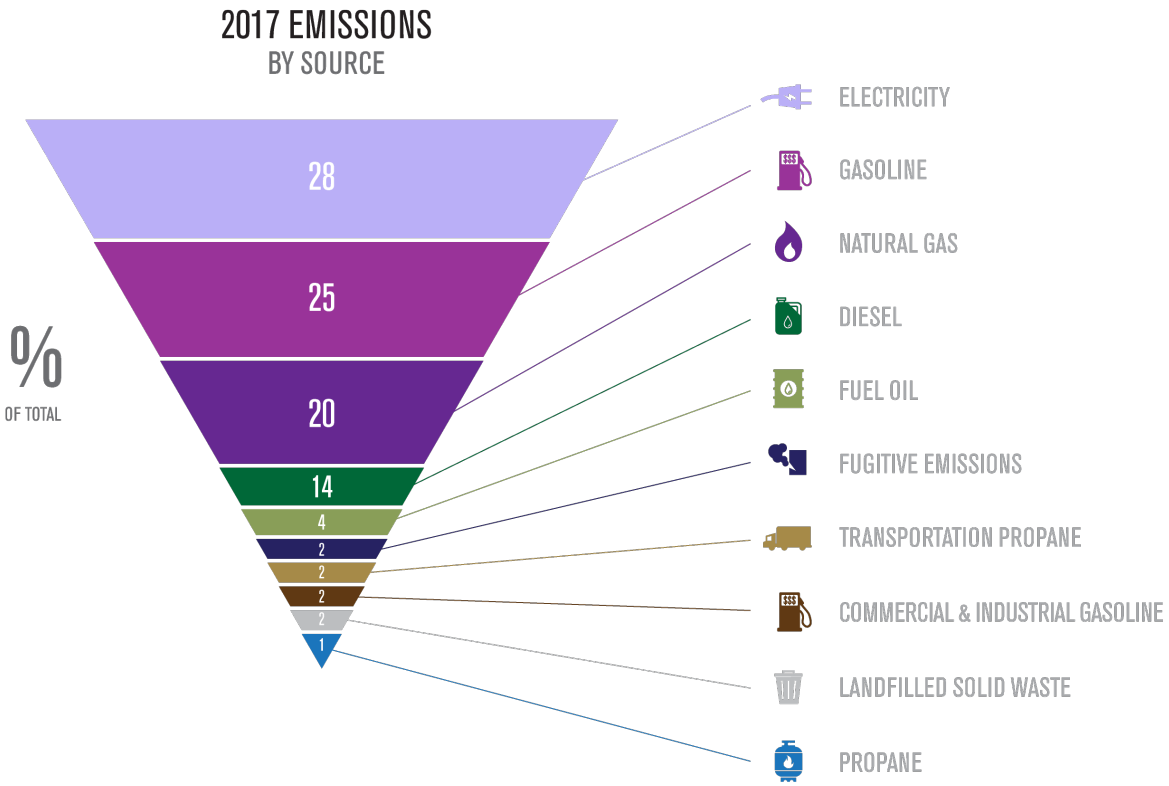


Figure 4: Nearly all of Multnomah County's carbon emissions come from four sources - electricity, gasoline, natural gas, and diesel fuel. Emissions from electricity are the single largest source of local carbon emissions. Additional emissions not shown on chart include wastewater treatment, kerosene, and residual fuel oil -- less than 1% of total emissions.

All transportation fuels (gasoline, diesel, propane, ethanol, biodiesel) combined account for 42% of carbon emissions. These emissions are the result of driving vehicles powered by gasoline, diesel and propane, the transportation of goods, off road vehicles and equipment used for construction, and a transit system dominated by diesel buses.

Direct use of natural gas, primarily used to heat buildings, water, and in industrial processes, is the third major source, at 20%.

Emissions trends

Over time, emissions fluctuate depending on numerous complex factors like the economy, weather, population growth, and local individual behavior. For instance, from 2016 to 2017 emissions increased 6%, due primarily to a very cold winter and increased use of transportation fuels. Due to the complex interaction of numerous factors, this year-to-year change is less significant than the overall trend. Tracking emissions with the same methodology since 1990 allows us to focus on the main sources of carbon emissions and track our overall trajectory towards long-range goals.

The emissions trend, in Figure 5, shows that since 2010 emissions have varied substantially from year to year, due to the carbon intensity of the electric grid and variations in weather. This inventory uses eGRID emission factors for the Northwest Power Pool, which includes Washington, Oregon and most of Montana, Idaho, Wyoming, Nevada, and Utah, and cannot be disaggregated by State. These factors are based on data collected every other year and are heavily affected by weather patterns, as the Northwest Power Pool is dominated by hydroelectric power from Pacific Northwest dams. When there are high rainfall years, hydroelectric dams generate more power, reducing the carbon emissions that result from electricity generation. In dryer years, emissions increase, causing up to 10% variation in emissions. However, if we look through the annual variations from 2010-2017, at the larger trend, we see that emission reductions have reached a plateau.

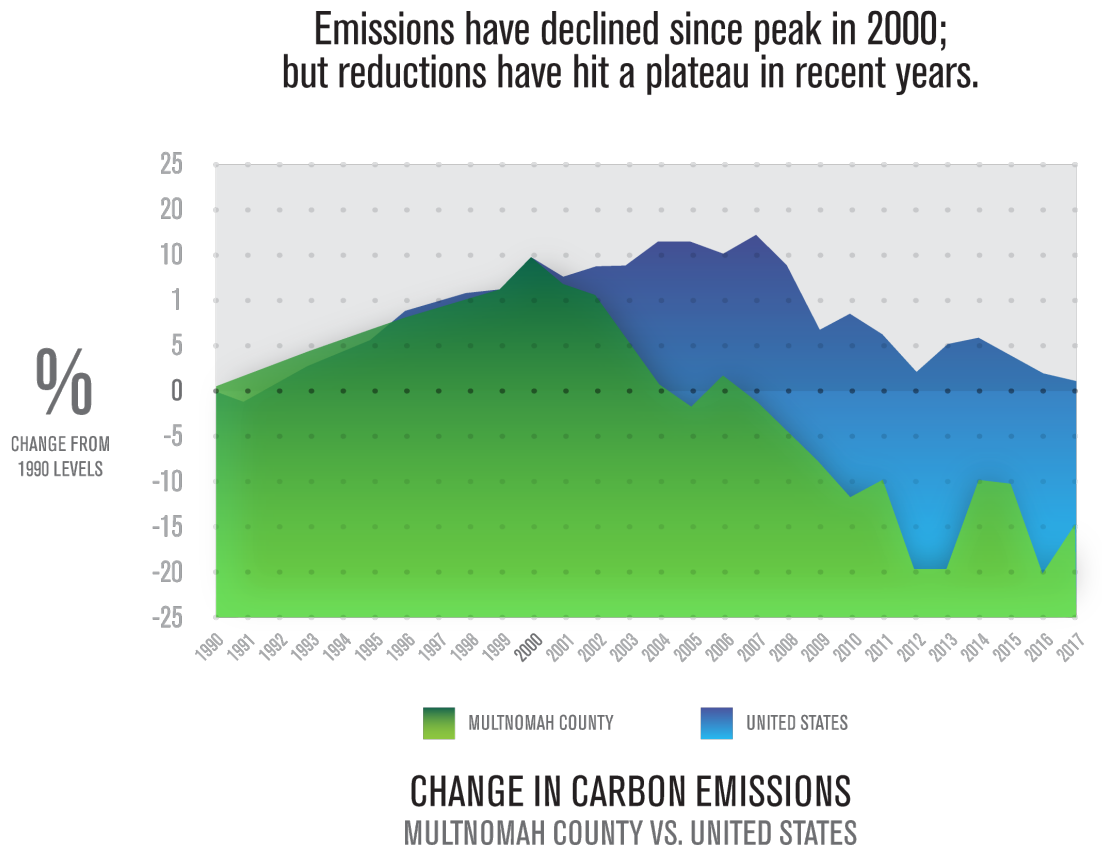


Figure 5: Total carbon emissions in 2017 were 15 percent below 1990 levels. There was a 6 % increase in emissions from 2016 to 2017, mostly the result of winter heating and increased transportation fuel use.

Emissions resulting from residential and multifamily energy use have declined 19% below 1990 levels, a per-person decrease of 41%. This is primarily a result of the improved efficiency of appliances and lighting, weatherization retrofits of homes, the transition from oil to natural gas as a home heating fuel, and the increased use of renewable energy by utilities.

Emissions from energy use in the commercial sector have declined by 10% since 1990. Over the same period, emissions from the industrial sector have declined by 42%, while the total number of jobs has increased by 34%. This is the result of improved efficiency and shifts toward lower-carbon fuels, both in direct consumer use and by electric utilities. For the industrial sector, there remains strong demand for industrial jobs and industrial land, indicating that the reductions are the result in a decrease in the carbon-intensity of industrial jobs, as opposed to a loss of industrial sector jobs[4]. There has also been a shift from energy intensive manufacturing, like aluminum smelting to less energy intensive manufacturing activities.

While emissions are down in other sectors, the reverse is true for transportation, see Figure 6. Over the last six years, transportation sector emissions have climbed above 1990 levels, a 14% increase from their lowest level in 2012. Transportation sector emissions are not as high as they would have been without a 2% decrease in the carbon intensity of transportation fuels. This was largely achieved by the increased use of biofuels in Oregon, including a statewide Renewable Fuel Standard that requires diesel to be blended with a minimum of 5% biodiesel and gasoline to be blended with a minimum of 10% ethanol for fuels sold in Oregon.

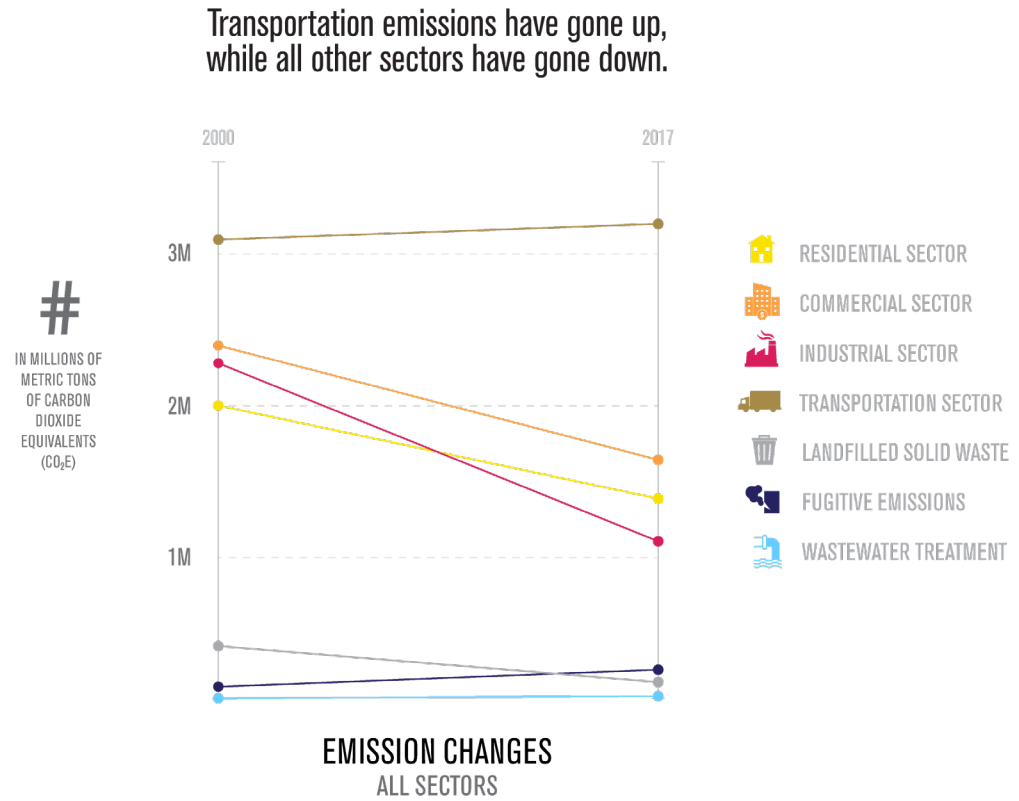


Figure 6: Since peak emissions in 2000, emissions have declined across all sectors, except for transportation which is currently 3% over 2000 levels. Due to the limited availability of data, fugitive emissions are estimated based on population and will therefore increase annually with population growth.

The following sections explore our primary emissions sources in more detail – transportation fuels, natural gas, and electricity.

Deep dive on transportation sector data

As discussed above, transportation sector emissions have increased in recent years. The increase in transportation emissions has tracked closely with recovery from the 2009 recession and are currently 8% above 1990 levels.

Transportation sector emissions come from use of transportation fuels (gasoline, diesel, propane, ethanol, biodiesel) and estimated vehicle miles travelled. These emissions are the result of driving vehicles powered by gasoline, diesel and propane, the transportation of goods, off road vehicles and equipment used for construction, and a transit system dominated by diesel buses. In recent years there have been more electric vehicles on the road, but because these vehicles are fueled with electricity – charged in people's homes and businesses without metering - the emissions are allocated to the buildings sector.

According to Metro, per person daily vehicle miles travelled (VMT) have remained relatively flat across the region since 2010, despite significant population growth. More Portlanders are on the road driving, but they aren't driving longer distances.

This section focuses on gasoline sales, see Figure 7 below, because gasoline data is the most accurate transportation fuel source at the local level. Total gasoline sales in Multnomah County in 2017 were 2% below 1990 levels, notable given the 38% increase in population over the same period.

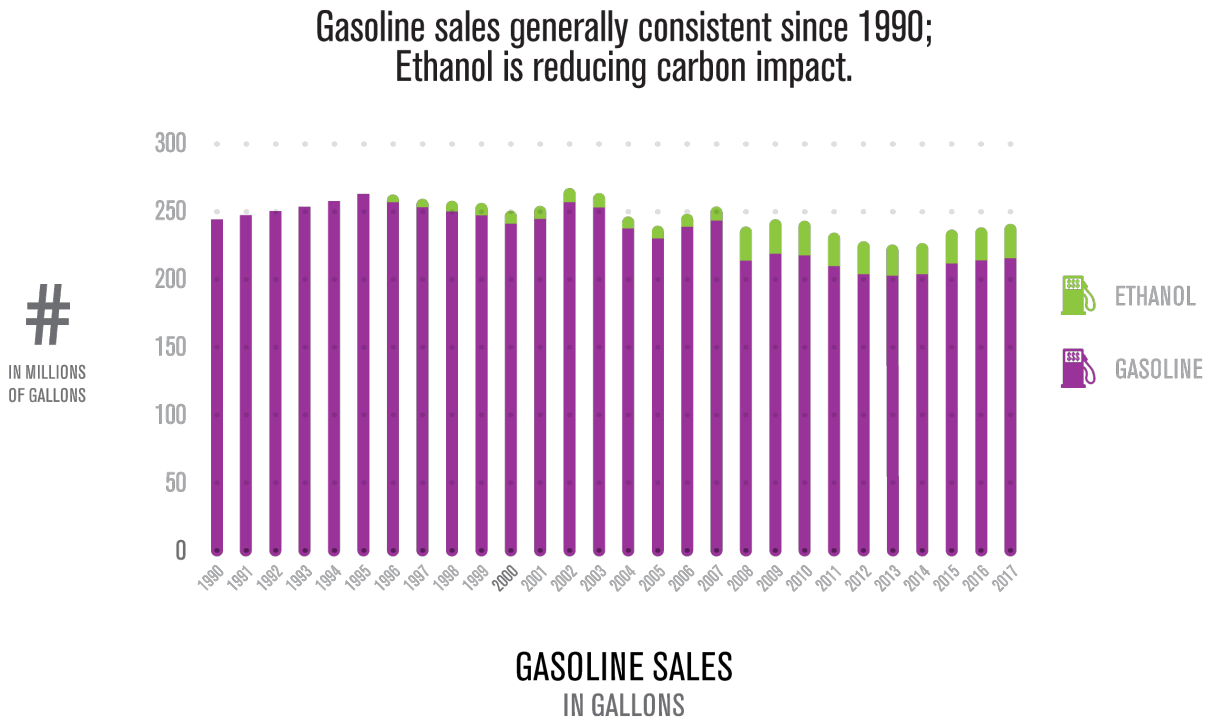


Figure 7: Gasoline sales have remained generally consistent since 1990. We've reduced the carbon emissions per unit of gasoline sold through Portland and Oregon's Renewable Fuel Standards, which require 10% ethanol in every gallon of gasoline. Gasoline sales data is available at the County level, reported by the Oregon Department of Transportation as fuel tax revenue is distributed by County.

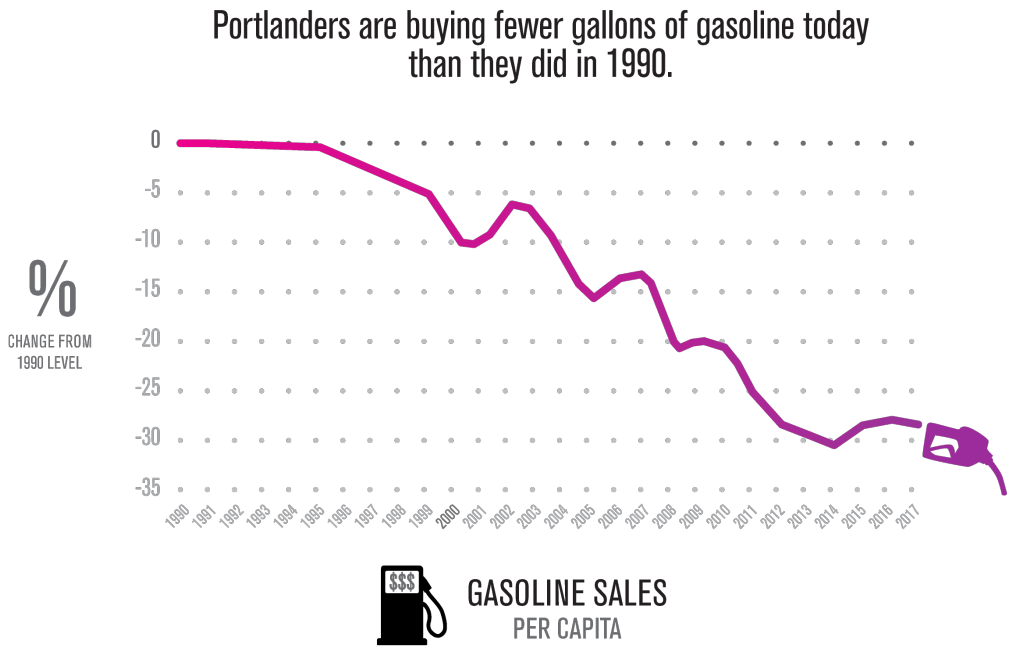


Figure 8: Since 1990 sales of gasoline per person have declined rapidly, the result of more efficient vehicles and more complete and connected neighborhoods that enable better walking, biking, and access to public transit.

Per-person gasoline sales are down 28% below 1990 levels, see Figure 8. This is the result of increasingly complete and connected neighborhoods, regional transit system investments, shifts from driving to walking and bicycling, improved vehicle fuel efficiency and use of lower-carbon fuels such as biodiesel, ethanol and electricity.

The increase in total transportation sector emissions is largely the result of more people moving to Portland and driving vehicles on our roads.

Deep dive on natural gas

Natural gas is one of the primary sources for carbon emissions in Multnomah County. Natural gas is used for heating buildings, heating water, and used in industrial processes. Natural gas accounts for 20% of total Multnomah County carbon emissions. Both the City of Portland and Multnomah County have adopted resolutions establishing a goal of 100 percent renewable energy to replace natural gas communitywide by 2050.

Since 1990, natural gas has largely replaced fuel oil for home heating and associated carbon emissions have declined as a result. Historically, natural gas has been used as a transition fuel, as it is cleaner burning fuel than fuel oil. Fuel oil sales in Portland have declined 80% since 1990. Today in Portland, only 4% of housing units are heated with fuel oil and 51% are heated with natural gas. Natural gas is the primary heating source for Portland's single-family, owner-occupied housing, see Table 1. The challenge of decarbonizing home heating will require extensive private investment and public policies to switch to lower carbon energy sources.

Table 1: Portland's owner-occupied housing stock is primarily heated by natural gas. The renter occupied housing stock is primarily heated with electricity, making these units easier to decarbonize as the electricity grid becomes more renewable. According to the US Census, 1% of Portland housing units, or nearly 2,000 units, do not have heat.

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

House Heating Fuel	Number of Occupied Units	Percent Total Occupied Units	Percent of Owner-Occupied units	Percent of Renter-Occupied Units
Natural Gas	134,280	51%	71%	29%
Propane Gas	3,001	1%	1%	1%
Electricity	107,116	41%	20%	65%
Fuel Oil	10,462	4%	6%	2%
All other	4,277	2%	2%	1%
No fuel	1,813	1%	0%	1%
	260,949			

In addition, national studies have demonstrated that lifecycle emissions from natural gas extraction and distribution systems are greater than previously understood. Fortunately, NW Natural's Portland-area distribution system for natural gas is one of the best in the nation, with 100% of its cast iron and bare steel pipes having been replaced. There are still opportunities for property owners to upgrade natural gas pipes on their properties to further reduce these fugitive emissions from escaping the natural gas distribution system. Portland's emissions inventory includes federally reported fugitive emissions from the natural gas distribution system.

In 2017 NW Natural logged their highest-ever sales of natural gas in Multnomah County, 6% over the previous peak in 2000, see Figure 9 below. In 2017, compared to 2016, there was a 27% increase in residential usage and a 22% increase in commercial usage.

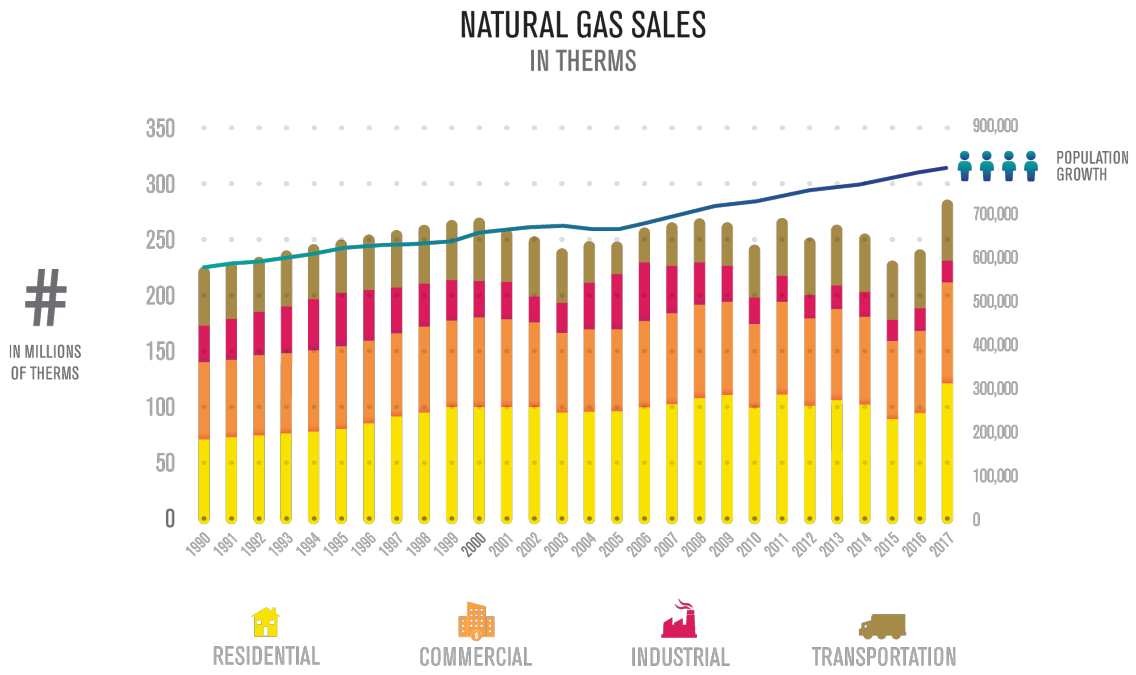


Figure 9: Natural gas sales, primarily used for heating, track with weather patterns. 2017 was an unusually cold winter, resulting in higher than average natural gas use in the residential and commercial sectors. 2017 had the highest ever natural gas sales for NW Natural in Portland, 6 percent over the previous peak in 2000. As Portland is growing we have become more efficient in the use of natural gas, reducing per person natural gas usage, primarily because buildings owners have upgraded gas furnaces and water heaters to more efficient models. Data reported by NW Natural.

This increase was not the result of new construction of gas heated units or new people moving to Portland, but the result of an unusually cold winter. Winter heating days in 2017 were higher than normal levels. 2017 was the coldest winter heating season since 2008 and 1985 before that. To provide context, natural gas usage in 2008 was 153 therms per person. In 2017 natural gas usage per person was lower, down to 150 therms per person. Therefore, even with colder temperatures, our use of natural gas today is more efficient than a decade ago. Given this, we expect natural gas emissions to decline for 2018 with a return to more normal winter heating.

Deep Dive on Electricity

Electricity is our single largest local source of carbon emissions. Electricity is used for power in all sectors. Electricity grid mix must become more renewable over time. This is even more important as electrification of our transportation system, homes, and businesses play a key role in decarbonizing the local economy. Unfortunately, the grid is not as green as we think, see figure 10. For our local utilities, Portland General Electric (PGE) and Pacific Power (PAC), 63% of electricity is still sourced from fossil fuels.

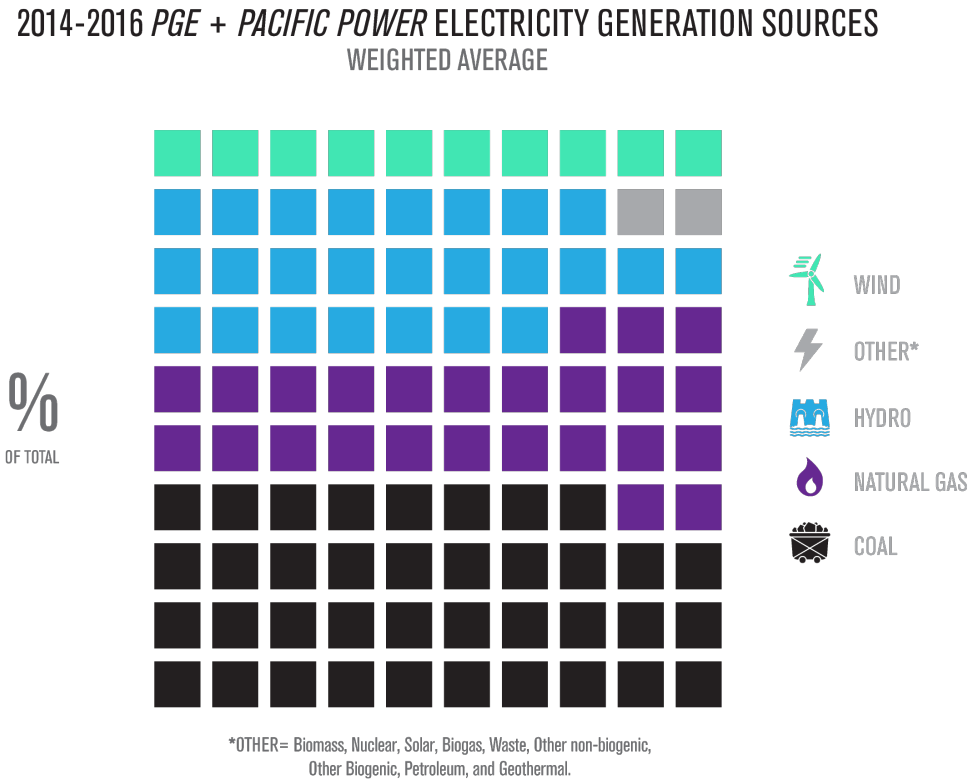


Figure 10: Weighted three-year average of electric generation sources for Portland's two electric utilities, based on data from the Oregon Department of Energy, including direct generation and grid power purchases. The data shows that 63% of Portland's electrical grid mix is sourced from fossil fuels that contribute to climate change.

PGE provides 75% of electricity purchases in Multnomah County. According to the Oregon Department of Energy[5] three-year weighted average. PGE generates or purchases electricity sourced from 28% natural gas and 29% coal. PGE generates 80% of their power and purchases 20% from the Northwest Power Pool, an organization of major utility providers in the Northern US and lower Canada.

PAC provides 25% of electricity purchases in Multnomah County. 63% of their electricity is directly generated from coal and 17% is from natural gas. PAC purchases 10% of their power from the Northwest Power Pool.

Emissions included in this paper are based on the Northwest Power Pool, with emission factors published by eGRID, for compliance with international reporting and protocols. The City of Portland also reviews emissions using utility specific emission factors on an annual basis. Using emission factors for PGE and PAC, the trends track very closely to the Northwest Power Pool emission factors, except that

PGE and PAC emissions are higher due to the lack of hydroelectric generation, as compared to the Pacific Northwest grid as a whole.

As we seek to move more sources to electricity, we must also work to reduce the carbon intensity of the grid. Currently a 50% reduction is required by the Oregon Renewable Portfolio Standard by 2040, but only 15 to 20% is renewable today. Both the City of Portland and Multnomah County have adopted resolutions establishing a goal of 100 percent renewable electricity communitywide by 2035.

As shown in Figure 11, electricity purchases peaked in 2000 and have generally declined since. Currently grid power purchases (excluding voluntary green power) are down 5% below 1990 levels, even with a 38% increase in population over the same period. Figure 11 shows grid electricity purchases by sector. The slow reduction in energy use speaks to the need to accelerate energy efficiency investments to reduce per person electricity use. The figure also shows the share of electricity purchases for voluntary green power, which have helped to reduce overall emissions from electricity.

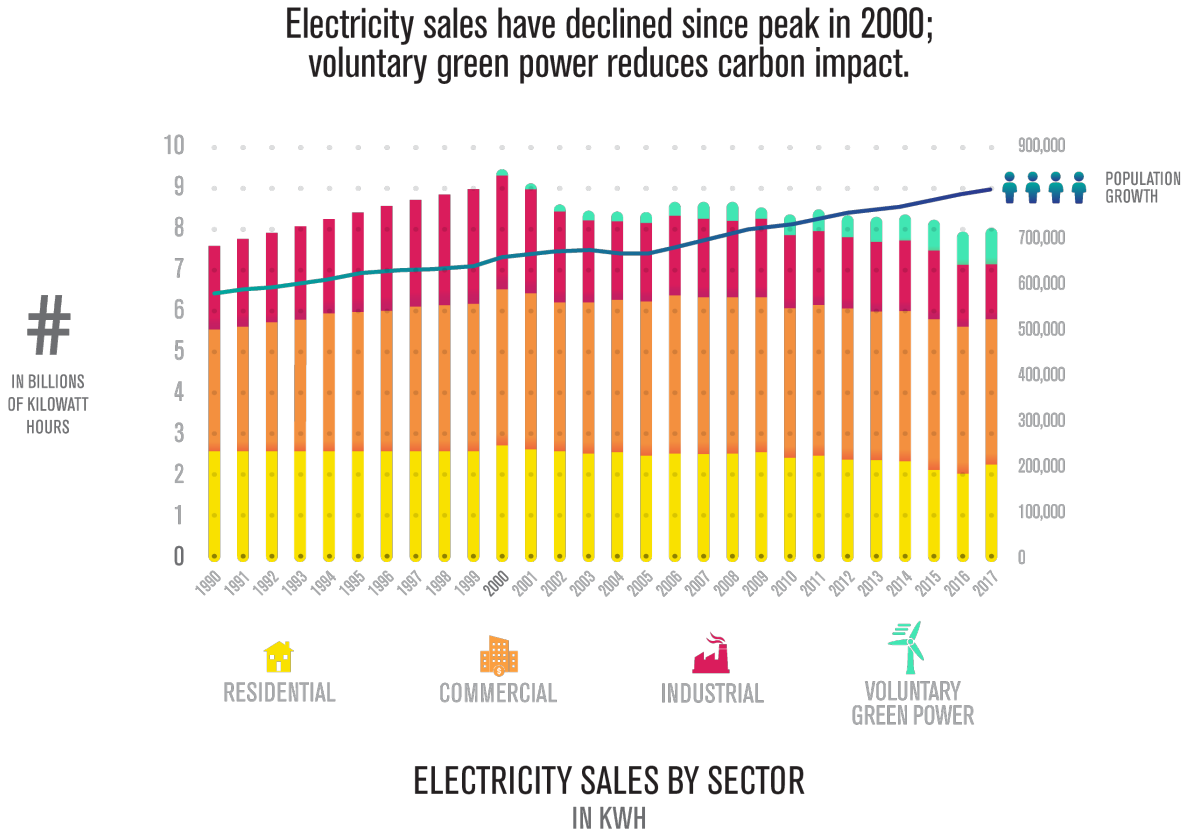


Figure 11: Electricity sales for Portland General Electric and Pacific Power have declined from their peak in 2000, even with significantly more people in Multnomah County. Electricity is primarily used to power lighting and electronics. Although 41% of Portland's housing units are heated with electricity, mostly in multifamily buildings. Half of all electricity use is from the commercial sector, primarily used to power lighting, water heating, refrigeration, air conditioning and ventilation. Voluntary green power purchases by utility customers have helped to reduce carbon emissions that result from electricity generation. Data reported by Portland General Electric and Pacific Power.

Voluntary green power purchases are electricity purchases where the customer has selected to pay a higher rate for green power. These voluntary green power purchases require utilities to procure more renewable energy and do not count towards State Renewable Portfolio Standard targets. Voluntary

green power purchases have increased year over year since 2000, see Figure 12. These purchases help reduce overall emissions from electricity generation. Portland has one of the highest participation rates in voluntary green power programs in the country, with participants accounting for more than ten percent of all electricity purchases.

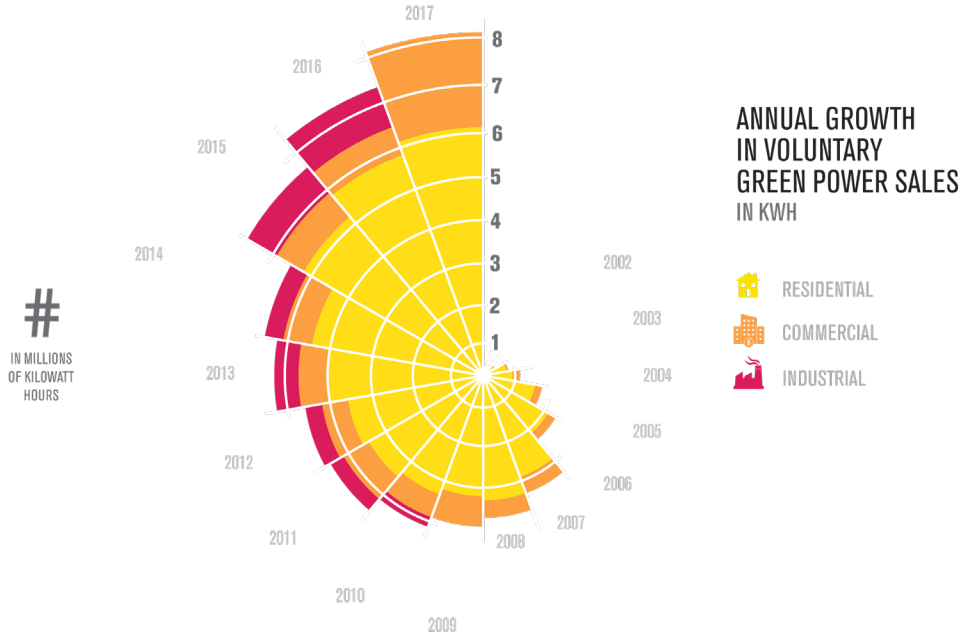


Figure 12: Both of Portland's electric utilities have been nationally recognized for their successful voluntary green power programs. These programs have seen year-over-year growth and currently account for 10% of all electricity sales. Data reported by Portland General Electric and Pacific Power.

Over the same period, Portlanders have invested in solar photovoltaic panels, or solar panels. Solar panel installs have continued to grow, even with reduced State and Federal incentives, see figure 13. Collectively, Portlanders have installed more than 4,600 solar systems, generating 34 MW of power annually. In terms of carbon emissions, that's the equivalent of driving 62 million miles per year.

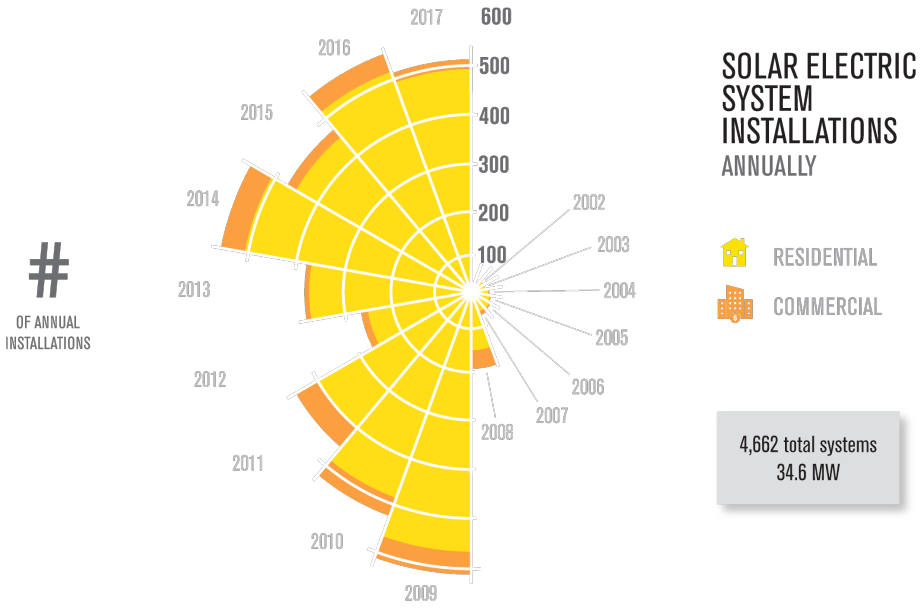


Figure 13: Solar installs in Portland remain strong, even with declining state and federal incentives. There is much more opportunity for cost effective large-scale solar systems on commercial and industrial facilities. The State's new community solar program should enable more Portlanders to benefit from renewable solar energy. Data reported by Energy Trust of Oregon.

Solar electric systems are an important part of our overall grid mix and a pathway to decarbonize our energy supply by 2050. Solar electric systems are challenging at a small scale, however, and not every home can accommodate solar panels. Opportunities exist to focus investment on larger utility scale solar facilities, these could include commercial and industrial solar installs, or community solar.

> ***"Community solar"*** *means solar photovoltaic energy systems that provide owners and subscribers the opportunity to share the costs and benefits associated with the generation of electricity. Subscribers receive credits on their utility bill for a share of the solar electricity generated by a community solar project.*

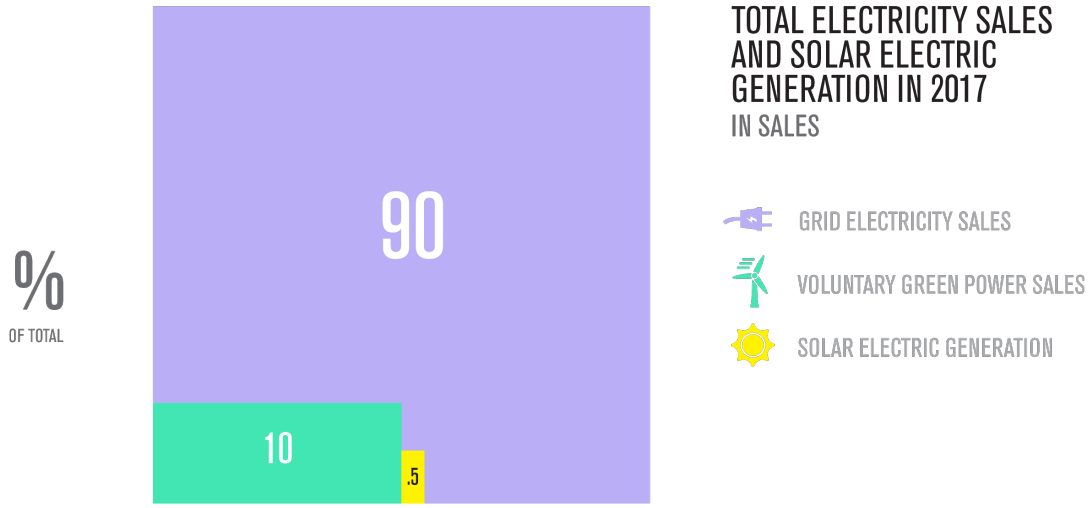


Figure 14: Portland's total electricity use is offset partially by voluntary green power purchases (10% of electricity used) and solar electric systems (.5% of electricity used) installed on Portland's homes and businesses. Data reported by Portland General Electric, Pacific Power, and Energy Trust of Oregon.

Investments in voluntary green power purchases remain an important way to reduce carbon emissions from electricity purchases, see figure 14. In addition, PGE is now offering a green tariff – Green Future Impact program - that provides customers with bundled renewable energy certificates. To strengthen its renewable energy commitment, the City of Portland infrastructure bureaus enrolled in PGE's Green Future Impact program. Starting in 2021, the City will receive 46,600 annual megawatt-hours – approximately 40 percent of its annual PGE electricity load- from a new solar facility in Central Oregon.

Renewable energy certificates (RECs) *are tradeable, market-based instruments that represent the legal property rights to the environmental attributes of one megawatt-hour (MWh) of renewable electricity generation. A REC is issued for every MWh of electricity generated and delivered to the electric grid from a renewable energy resource. Electricity cannot be considered renewable without a REC.*

Unbundled Renewable Energy Certificates (RECs) refer to RECs that are sold, delivered, or purchased separately from electricity. RECs provide no physical delivery of electricity to customers and as such the customer is purchasing power from a separate entity than the one selling them the REC. A bundled REC is when the customer is purchasing the electricity and the REC together from the same utility.

Inventory methodology changes

Portland tracks carbon emissions annually. Since the 2017 Progress report, staff have worked to update emissions inventories in accordance with the new Global Protocol for Community-scale GHG Emission Inventories to stay in alignment with Paris Agreement (limiting global warming to 1.5 degrees Celsius).

Protocols

By updating protocols, Portland stays in alignment with other cities around the world, enabling better tracking against long range goals with greater confidence. Updating protocols is a challenge for cities and can create discrepancies with previously reported emissions. For example, to move to the global reporting protocol, Portland had to update accounting methods for emissions from landfilled waste, wastewater treatment, and fugitive emissions. This required finding new data sources all the way back to the 1990 baseline to consistently compare data year over year.

The City of Portland utilizes multiple emission protocols to compare results and better refine estimates of emissions produced locally. By reviewing data using different protocols, Portland can make up for gaps in individual methodologies. For example, Portland reports electricity sector emissions by greenhouse gas, a level of detail only available for the Northwest Power Pool, although as discussed above, those emissions are lower than the emissions from Portland's two electric utilities. Therefore, the use of multiple protocols allows Portland to better understand what's happening locally.

The time required to find and evaluate new data sets for a protocol change delays the frequency of emissions inventory reporting. Changes to protocols that affect data collection and carbon accounting limit comparability with previously reported data using older methodologies. With a baseline year of 1990, protocol changes create substantial new work as more than 20 years of inventories need to be consistently updated.

Changes in data sources

This 2017 inventory includes a variety of new data sources and emission factors that have been applied back to the 1990 baseline. New data sources increase annual emissions as they are added to the inventory. These changes help improve the accuracy of the emissions inventory but can negate comparability with previously published emissions.

New data sources include:

- New eGRID electricity emission factors for 2014 and 2016, (US EPA)
- Waste incineration, (Oregon DEQ)
- Improved estimates of propane use, (US EIA)
- Better accounting of emissions from wastewater treatment and septic tanks, (Oregon DEQ)
- Better accounting of fugitive emissions (NW Natural, US EPA, Oregon DEQ)

Reporting carbon emission data

Portland reports emissions annually through the Carbon Disclosure Project for compliance with international agreements, like the Covenant of Mayors and C40's Deadline 2020. Portland will continue to monitor and report on annual carbon emissions, noting when changes are made to methodologies that limit comparability with previously reported data. When data is fully updated, the emission data are released publicly through Climate Action Plans, Progress Reports, or periodic publications like this one.

[1] Source: World Meteorological Organization, 2019, https://public.wmo.int/en/media/news/july-matched-and-maybe-broke-record-hottest-month-analysis-began

[2] Source: Oregon Fourth Climate Assessment, 2019, http://www.occri.net/media/1095/ocar4full.pdf
[3] Source: Intergovernmental Panel on Climate Change, 2018, https://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf

[4] Source: Regional Industrial Site Readiness Full Report, Mackenzie, 2017, https://portlandalliance.com/assets/pdfs/RPT-Regional%20Industrial%20Site%20Readiness-2017%20Inventory%20Update-171020.pdf
[5] Source: Oregon Department of Energy, 2019, https://www.oregon.gov/energy/energy-oregon/Pages/Electricity-Mix-in-Oregon.aspx

Carbon dioxide emissions in Multnomah County, 1990 - 2017

This report has been generated for Portland, Oregon using ClearPath software suite from ICLEI-USA

Note: Figures have been revised from previous years to incorporate revised data from U.S. E.I.A., updated electricity emission coefficients provided by eGRID and changes to estimated propane use.

Total emissions (metric tons CO2-equivalent)

Year	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	Change since previous year	Change since1990
Residential	1,725,000	1,756,000	2,007,000	1,639,000	1,553,000	1,635,000	1,342,000	1,367,000	1,594,000	1,438,000	1,190,000	1,397,000	17.4%	-19%
Commercial	1,877,000	2,042,000	2,393,000	2,006,000	1,892,000	1,923,000	1,575,000	1,585,000	2,010,000	2,004,000	1,579,000	1,680,000	6.4%	-10%
Industrial	1,891,000	2,104,000	2,299,000	1,470,000	1,335,000	1,432,000	1,237,000	1,193,000	1,397,000	1,391,000	1,173,000	1,099,000	-6.3%	-42%
Transportation	2,979,000	3,155,000	3,120,000	3,145,000	2,940,000	2,874,000	2,815,000	2,823,000	2,846,000	2,949,000	3,008,000	3,216,000	6.9%	8%
Solid Waste	510,000	490,000	423,000	474,000	98,000	98,000	93,000	107,000	102,000	117,000	117,000	110,000	-6.0%	-78%
Wastewater Treatment	19,000	23,000	16,000	13,000	15,000	15,000	17,000	17,000	18,000	18,000	17,000	17,000	0.0%	-11%
Fugitive Emissions	36,000	76,000	133,000	153,000	184,000	184,000	191,000	168,000	173,000	184,000	183,000	183,000	0.0%	408%
Total	**9,037,000**	**9,646,000**	**10,391,000**	**8,900,000**	**8,017,000**	**8,161,000**	**7,270,000**	**7,260,000**	**8,140,000**	**8,101,000**	**7,267,000**	**7,702,000**	**6.0%**	**-15%**
% change from 1990	0%	7%	15%	-2%	-11%	-10%	-20%	-20%	-10%	-10%	-20%	-15%		
% change from 2000			0%	-14%	-23%	-21%	-30%	-30%	-22%	-22%	-30%	-26%		

Year	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	Change since previous year	Change since1990
Multnomah Co. population	583,887	626,500	660,486	675,175	735,334	747,977	758,817	766,082	776,712	790,294	799,766	807,555	0.97%	38%
Multnomah Co. Jobs	375,768	415,113	453,254	428,305	421,452	430,662	441,648	451,880	465,483	480,109	492,062	502,929	2.21%	34%

Per capita emissions (metric tons CO2-equivalent)

Year	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	Change since previous year	Change since1990
Residential	3.0	2.8	3.0	2.4	2.1	2.2	1.8	1.8	2.1	1.8	1.5	1.7	16%	-41%
Commercial	3.2	3.3	3.6	3.0	2.6	2.6	2.1	2.1	2.6	2.5	2.0	2.1	5%	-35%
Industrial	3.2	3.4	3.5	2.2	1.8	1.9	1.6	1.6	1.8	1.8	1.5	1.4	-7%	-58%
Transportation	5.1	5.0	4.7	4.7	4.0	3.8	3.7	3.7	3.7	3.7	3.8	4.0	6%	-22%
Solid Waste	0.9	0.8	0.6	0.7	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-7%	-84%
Wastewater Treatment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1%	-35%
Fugitive Emissions	0.1	0.1	0.2	0.2	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.2	-1%	268%
Total	**15.5**	**15.4**	**15.7**	**13.2**	**10.9**	**10.9**	**9.6**	**9.5**	**10.5**	**10.3**	**9.1**	**9.5**	**5%**	**-38%**
% change from 1990	0%	-1%	2%	-15%	-30%	-30%	-38%	-39%	-32%	-34%	-41%	-38%		
% change from 2000			0%	-16%	-31%	-31%	-39%	-40%	-33%	-35%	-42%	-39%		

Energy use in Multnomah County, 1990 - 2017

This report has been generated for Portland, Oregon using ClearPath software suite from ICLEI-USA

Note: Figures have been revised from previous years to incorporate revised data from U.S. E.I.A., updated electricity emission coefficients provided by eGRID and changes to estimated propane use.

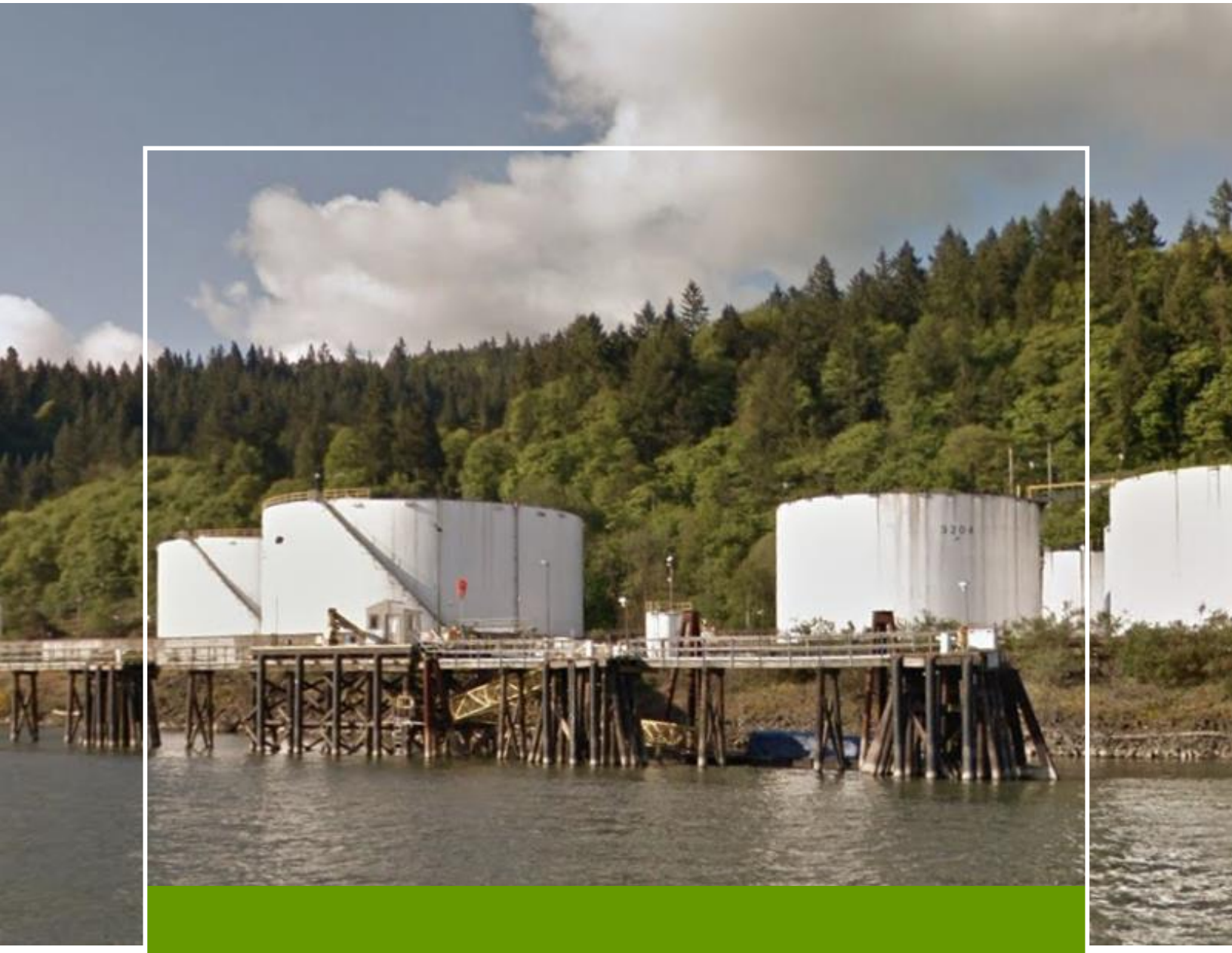
Total energy use (million BTUs)

Year	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	Change since previous year	Change since1990
Residential	18,214,000	18,900,000	21,253,000	20,012,000	20,554,000	21,965,000	20,586,000	21,269,000	20,759,000	18,910,000	19,493,000	23,024,000	18.1%	26%
Commercial	19,415,000	20,606,000	22,593,000	21,236,000	21,465,000	22,062,000	21,217,000	21,440,000	21,579,000	21,442,000	21,620,000	23,520,000	8.8%	21%
Industrial	22,064,000	24,657,000	24,670,000	18,127,000	17,124,000	18,559,000	17,890,000	17,448,000	17,610,000	17,569,000	17,441,000	16,269,000	-6.7%	-26%
Transportation	40,496,000	42,822,000	42,889,000	43,683,000	43,257,000	42,260,000	41,394,000	41,463,000	41,801,000	43,524,000	44,242,000	44,803,000	1.3%	11%
Wastewater Treatment	363,000	373,000	354,000	593,000	677,000	597,000	599,000	717,000	746,000	749,000	698,000	705,000	1.0%	94%
Total	**100,552,000**	**107,358,000**	**111,759,000**	**103,651,000**	**103,077,000**	**105,443,000**	**101,686,000**	**102,337,000**	**102,495,000**	**102,194,000**	**103,494,000**	**108,321,000**	**4.7%**	**8%**
% change from 1990	0%	7%	11%	3%	3%	5%	1%	2%	2%	2%	3%	8%		
% change from 2000			0%	-7%	-8%	-6%	-9%	-8%	-8%	-9%	-7%	-3%		

Year	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	Change since1990
Multnomah Co. population	583,887	626,500	660,486	675,175	735,334	747,977	758,817	766,082	776,712	790,294	799,766	807,555	38%

Per capita energy use (million BTUs)

Year	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	Change since previous year	Change since1990
Residential	31.2	30.2	32.2	29.6	28.0	29.4	27.1	27.8	26.7	23.9	24.4	28.5	17%	-9%
Commercial	33.3	32.9	34.2	31.5	29.2	29.5	28.0	28.0	27.8	27.1	27.0	29.1	8%	-12%
Industrial	37.8	39.4	37.4	26.8	23.3	24.8	23.6	22.8	22.7	22.2	21.8	20.1	-8%	-47%
Transportation	69.4	68.4	64.9	64.7	58.8	56.5	54.6	54.1	53.8	55.1	55.3	55.5	0%	-20%
Wastewater Treatment	0.6	0.6	0.5	0.9	0.9	0.8	0.8	0.9	1.0	0.9	0.9	0.9	0%	40%
Total	**172.2**	**171.4**	**169.2**	**153.5**	**140.2**	**141.0**	**134.0**	**133.6**	**132.0**	**129.3**	**129.4**	**134.1**	**4%**	**-22%**
% change from 1990	0%	0%	-2%	-11%	-19%	-18%	-22%	-22%	-23%	-25%	-25%	-22%		
% change from 2000			0%	-9%	-17%	-17%	-21%	-21%	-22%	-24%	-24%	-21%		



Liquid Storage Tanks at the Critical Energy Infrastructure (CEI) Hub

Seismic Assessment of Tank Inventory

May 2019

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COVER

Photograph of liquid fuel storage tanks for NuStar Energy L.P. that form part of the Critical Energy Infrastructure Hub in Portland, OR.

Source: Google Maps, 2019.

REPORT SUMMARY

Seismic vulnerability of the Critical Energy Infrastructure (CEI) hub in Portland has been recently highlighted in several regional resiliency assessments. This report focuses on the liquid fuel storage tanks located at the CEI hub due to the adverse consequences of failure. General structural and geotechnical damage of similar facilities were identified by reviewing the seismic performance of liquid fuel storage tanks during past earthquakes. Data was then gathered on the storage tanks at the CEI hub and analyzed in an effort to quantitatively assess the tank inventory. There are nine different companies with hundreds of in-service tanks holding various forms of liquid products that have a potential storage capacity of over 8.6 million barrels. Over 95% of this capacity can be stored in large tanks that are 25ft in diameter or larger. The majority of the large tanks were built prior to 1970s and the vast majority prior to 1990s, eras when regional seismicity and seismic design were not fully appreciated or developed. Consequently, the structural and geotechnical issues revealed in tanks from past earthquakes are likely to manifest at the CEI hub unless mitigation steps are taken to minimize the risk. A conceptual order of magnitude cost of seismic mitigation for the large capacity tanks was estimated to exceed $300 million. This estimate made gross assumptions on soil mitigation, structural anchoring and design/permitting costs and did not consider fuel distribution past the tanks. Based on the findings and associated limitations of this study, recommendations are made for next steps that would fill gaps in existing data and generate new critical knowledge to better quantify and mitigate the seismic risk of this critical facility.

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INTRODUCTION

BRIEF BACKGROUND

The six-mile stretch of industrial land along the west shore of the Willamette River in Northwest Portland is often referred to as the Critical Energy Infrastructure (CEI) hub. Energy facilities in the CEI hub include liquid fuel port terminals, storage tanks, pipelines and transfer stations, natural gas transmission and storage, electrical substations, and high voltage transmission lines. There are no petrochemical refinery operations in Oregon, so all of Oregon's liquid fuel is imported and over 90% is stored at fuel storage facilities in the CEI hub. This includes gas and diesel for the Portland metro area and all of the jet fuel for the Portland International Airport. These liquid fuel storage facilities are located along the river with the original intent for ships to import the fuel through port terminals. Now, most of the liquid fuel is brought in and out through pipelines. Numerous reports have highlighted the criticality of the CEI hub, the interconnectivity and the general earthquake risk to Portland and to the State (DOGAMI 2012, Bureau of Planning and Sustainability 2012, OSSPAC 2015, City Club of Portland 2017).

PURPOSE OF STUDY

The purpose of this study was to focus on the liquid fuel storage aspect of the CEI hub and more specifically the storage tanks that hold the fuel. The storage tanks were chosen because they are some of the most visible aspects of the hub and pose the greatest risk if the tanks were to fail. The risk includes not only the regions inability to access fuel following a major earthquake, but also health and environmental concerns should failure occur.

This report summarizes the findings of the study, which had three main goals:

- Review past earthquake experiences from available literature of liquid fuel storage facilities in order to identify common vulnerabilities and key factors leading to tank damage and failure.
- Gather data from publicly available sources to identify the quantity and characteristics of the tanks and the supporting soil at the CEI hub. Contrast the information with past earthquake observations in order to gain a better appreciation of the expectations for seismic performance of the fuel storage tanks at the hub.
- Review potential mitigation options that aim to enhance the seismic performance of liquid storage tanks and estimate order-of-magnitude costs for implementing the mitigations.

The subsequent sections of the report address the above goals in a similar chronological order.

EARTHQUAKE DAMAGE TO LIQUID FUEL STORAGE TANKS

OVERVIEW FROM PAST EARTHQUAKES

Liquid petroleum products are commonly held in cylindrical, above-ground storage tanks. These are relatively simple structures comprised of a soil supported base-plate, a welded or riveted steel wall supported on a ring reinforced concrete foundation and a roof. The tanks are often categorized by their roof type; floating or fixed. To store liquids with low vapor pressures, such as propane, butane, or kerosene, a fixed roof tank is required to maintain pressure. For liquids that do not need to be pressurized for storage, floating roof tanks are utilized. As liquid is drained from a floating roof tank, the roof descends with the liquids surface and prevents the buildup of vapors that would otherwise form in the void of a fixed roof tank. Floating roof tanks are desirable for products such as crude oil, gasoline and diesel. The presence or absence of a floating roof in a large tank can influence the dynamic behavior when shaken by an earthquake.

Above ground storage tanks are well known to be vulnerable to seismic events. Since their simple design has been relatively unchanged for over a century, their seismic reliability has been tested numerous times. Previous earthquakes involving documented cases of tank damage are listed in Table 1. Selected examples from these earthquakes are used in the following sections to highlight some of the common vulnerabilities and the resulting damage.

Table 1: Earthquakes with Documented Significant Damage to Fuel Storage Tanks

Location	Magnitude	Date
Tokyo, Japan	8.3	September 1, 1923
Long Beach, California	6.4	March 10, 1933
Kern County, California	7.3	July 21, 1952
Prince William Sound, Alaska	9.2	March 27, 1964
Niigata, Japan	7.6	June 16, 1964
San Fernando, California	6.5	February 9, 1971
Managua, Nicaragua	6.3	December 23, 1972
Miyagi-Ken-Oki, Japan	7.7	June 12, 1978
Imperial County, California	6.5	October 15, 1979
Greenville, California	5.9	January 24, 1980
Central Greece	6.7	February 24, 1981
Coalinga, California	6.2	May 2, 1983
Loma Prieta, California	6.9	October 17, 1989
Marmara, Turkey	7.6	August 17, 1999
Tōhoku, Japan	9.0	March 11, 2011

STRUCTURAL DAMAGE

Although there are some references to an event in 1923 in Tokyo, the first reasonably well-documented case of damage to oil storage tanks followed the 1933 earthquake in Long Beach, California. The earthquake affected an industrial area that produced, refined, and stored petroleum. Complete tank failures were reported at three different locations, all less than 30 miles from the epicenter of the magnitude M6.4 earthquake. Peak ground acceleration (PGA) of 0.19g recorded at stations with similar distance from the epicenter were thought to be representative of those at the storage tanks (Housner 1952). Many tanks exhibited distortion, elongation, strain in riveted joints and buckling of the roof plates. Two of the tanks' riveted joints failed and while the tanks did not collapse as a result, the oil leaked. In one group of tanks, three partially full tanks sustained no damage while a full tank experienced total failure. The lost oil overcame the firewall and damaged neighboring buildings over 300 ft away (Nielsen & Kiremidjian 1986). There were other failures including overtopping where the roof was found 200 ft from the failed tank as shown in Figure 1. Other tanks did not necessarily fail in their structure, but were not anchored and separated from the inlet/outlet (I/O), resulting in loss of the oil. All failed tanks were of riveted construction and their structural failures were due to damage in the tank shell. The behavior of riveted shell wall tanks differs from the newer, welded shells construction. The long beach earthquake demonstrated that structural vulnerabilities of tanks relate to the riveted shell construction, to how full the tank is and to the connectivity of the I/O piping.

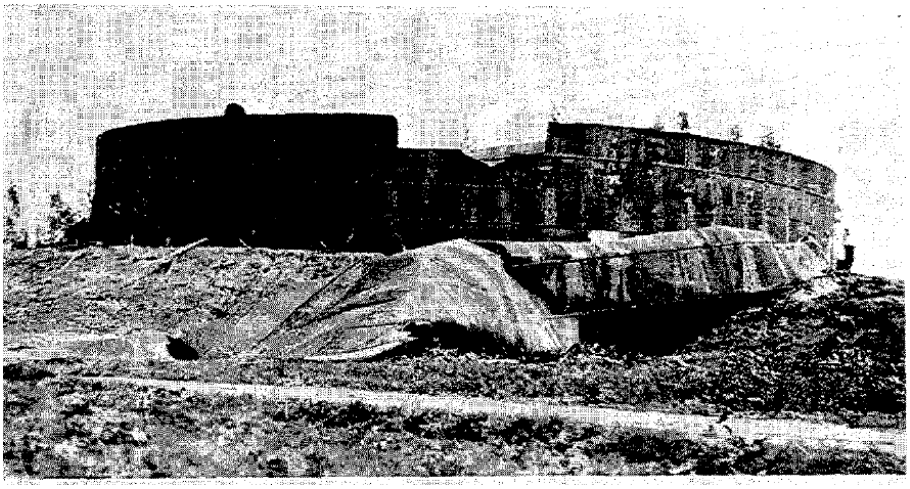

Figure 1: Failed Tank following 1933 Long Beach Earthquake (Cooper 1997)

The Great Alaskan earthquake of 1964 significantly influenced numerous aspects of earthquake engineering and also highlighted the vulnerability of petroleum storage tanks. The magnitude M9.2 subduction zone earthquake is the most powerful earthquake on record in North America. At the time of the earthquake,

the petroleum industry was Alaska's largest mineral industry and damage to petroleum storage facilities was reported in the cities of Valdez, Whittier, Seward, Anchorage, and Nikiska. Direct structural damage to fuel storage tanks included: shell buckling near the bottom of the tank, buckling of cone roofs and top courses of shells, damage to floating roofs and accessories, and damage to I/O connecting piping (Rinne 1967). These were the result from liquid sloshing induced deformations, hydrodynamic pressure acting on the tank walls, shear force and overturning moment acting at the base of the tank, the buckling strength of tanks and, uplift on the axial stresses acting on the tank wall in contact with the ground. Sloshing can damage the top of the tank and can also result in roof damage. Buckling of the steel shell near the bottom of the tank is referred to as elephant-foot buckling. An example of roof damage and elephant-foot buckling is photographed in Figure 2. This type of damage usually occurs in tanks with a low height to radius ratio. Many tanks experienced elephant-foot buckling in this earthquake, all of them were near full capacity. Extreme elephant-foot buckling had resulted in leakage and also complete collapse. Sudden loss of oil from a leak can produce suction that implodes the roof of a tank. The structural damage to fuel storage tanks following the Great Alaskan earthquake exposed vulnerabilities even when the tank shells were welded.

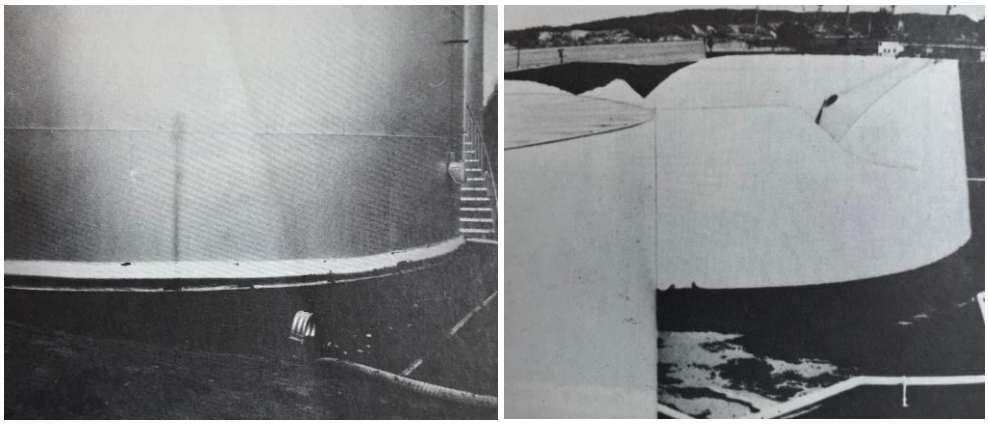

Figure 2: Elephant Foot Buckling (left) and Roof Collapse (right) following 1964 Great Alaskan Earthquake (Hanson 1973)

In 1978, a magnitude M7.4 earthquake occurred of the east coast of Japan with the epicenter approximately 95 km to 120 km from several oil storage or refineries. The peak ground acceleration near Sendai City was thought to have exceeded 0.25 g. The complex of over 87 fixed and floating roof tanks containing various petroleum products was constructed in 1971 and had been designed with reasonable seismic criteria. All piping as well as the tanks were anchored, where the tank anchors were located around the perimeter and embedded into a concrete pad (NBS 1980). Stretched anchor bolts indicated that tank uplift was limited to approximately 6 inches. Three crude oil tanks failed and the contents spilled. The

tanks were surrounded by a reinforced concrete dike, but the volume of spilled oil exceed the capacity of the dike and the oil escaped as shown by the dark areas in Figure 3. The top of the fixed roof tank buckled inward due to low pressure caused by rapid evacuation of the oil through the ruptured connection of the base and wall of the tank. While containment areas in the form of dikes or walls are common, the consequence of failure of fuel storage tanks can extend beyond these containment areas due to overtopping following multiple tank failures or due to potential earthquake damage to the walls themselves.

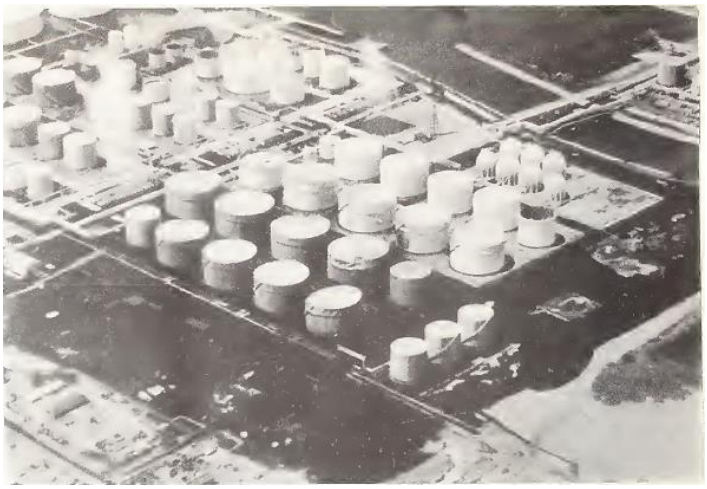

Figure 3: Spilled Oil Past the Containment Dikes following 1978 Earthquake in Japan (NBS 1980)

SOIL INDUCED DAMAGE

There are two major aspects of soil behavior during an earthquake that can influence the overall damage to the fuel storage tanks; amplification and liquefaction. Amplification of the ground motion has been recognized and documented for soft soils in numerous earthquakes, including the iconic 1985 Mexico City and 1989 Loma Prieta. The resulting accelerations manifest in the severity of the above discussed structural damage. Liquefaction of the ground on the other hand, can result in additional damage that is related to permanent settlement of the ground or to lateral soil movement referred to as lateral spreading.

The Great Alaskan earthquake of 1964 resulted in numerous examples of damage caused by liquefaction. Another 1964 earthquake occurred in Japan and was a magnitude 7.6 near the city of Niigata. Two oil refineries were located near a river and had liquid fuel storage tanks built on loose sandy ground. Settlements due to liquefaction were observed to be 8 to 12 inches on compacted ground and up to 20 inches of unequal settlement in uncompacted sand. These resulted in many damaged tanks in both refineries. In contrast, newly built tanks constructed

on compacted soil at the refineries settled uniformly, and approximately 1 in. These tanks exhibited minimal to no damage and remained operational, while surrounding tanks were severely damaged from large ground settlement (Watanabe 1966).

Liquefaction induced lateral spreading can move entire tanks or cause relative ground deformations of the tank. During the 2011 Tohoku subduction zone earthquake, surrounding soil spread and caused uplift on the side of a tank of approximately 20 inches, resulting in the tank cracking and the contents leaking out (Zama et al 2012). An example of tank settlement and of lateral spreading induced uplift is photographed in Figure 4. In addition to damaging the tank itself, liquefaction can sever I/O connectivity. These examples underscore that minimizing the effects of liquefaction can minimize the risk of damage to liquid fuel storage facilities.



Figure 4: Liquefaction Induced Settlement following 1964 Niigata and 2011 Tohoku Earthquakes in Japan (Watanabe 1966, Zama et al 2012)

FIRE

While fire can be thought of as a secondary effect resulting from the damage caused by the earthquake, it is particularly relevant given the volatile contents of the tanks. Numerous instances of fires at liquid fuel storage facilities following an earthquake have been reported, with examples provided in Figure 5. Approximately 37 miles from the epicenter of the Great Alaskan earthquake, oil storage tanks were constructed in the port city of Whittier on fill that consisted of delta deposits and glacial outwash. All of the storage tanks were completely destroyed by a fire that broke out and burned for three days. The fire, and subsequent tsunami, destroyed the evidence and the cause of the fire was never determined. Two possible causes included a live power line that was snapped during the earthquake, or fuel from a leaking tank could have spilled into an operating boiler (Kachadoorian, 1965).

A refinery was located approximately 19 km from the epicenter of magnitude 7.4 earthquake near Istanbul, Turkey. Constructed in 1961 and expanded in 1974 and

1983, the facility had a large tank farm with over 100 unanchored, aboveground liquid storage tanks. The tanks were designed by American contractors adhering to seismic design code of California in 1961 (Sezen & Whittaker 2004). The damage at the refinery is thought to have been largely overlooked due to the extensive damage in more populated areas. The majority of the damage was caused by a fire that was ignited by sparks created from the collision of a metallic floating roof seal against the tank wall. The tanks contained naphtha, a highly volatile and flammable petroleum product. A total of 6 tanks of diameter 33ft to 82 ft, completely burned down. The fire spread to other tanks and 30 of the 45 floating roof tanks were damaged (Yazici and Cili 2008). More recent examples of fire at fuel storage was also observed in 2011 Tohoku, Japan in different refineries built in 1963 and 1971. The fire was attributed in different instances to damage to the tanks themselves or to leaks in the surrounding pipes. In these examples, fire remains a threat to fuel storage facilities despite construction practices that had at least some awareness of the associated earthquake risk.



Figure 5: Fire Caused by Tank Damage following 1999 Turkey (left) and 2011 Tohoku Earthquakes (right) (French Ministry of Ecology, Sustainable Development and Energy, 2013)

LIQUID FUEL STORAGE TANKS AT THE CEI HUB

OPERATING COMPANIES

While the CEI Hub is generally referred to as a singular area, the liquid storage tanks are actually clustered in a few distinct locations and are owned by different operating companies. Map with relative locations of the various companies between U.S. Route 30 and the Willamette River is shown in Figure 6. The majority of the fuel storage facilities are either near the Linnton neighborhood to the north or within the Northwest Industrial Area to the south.

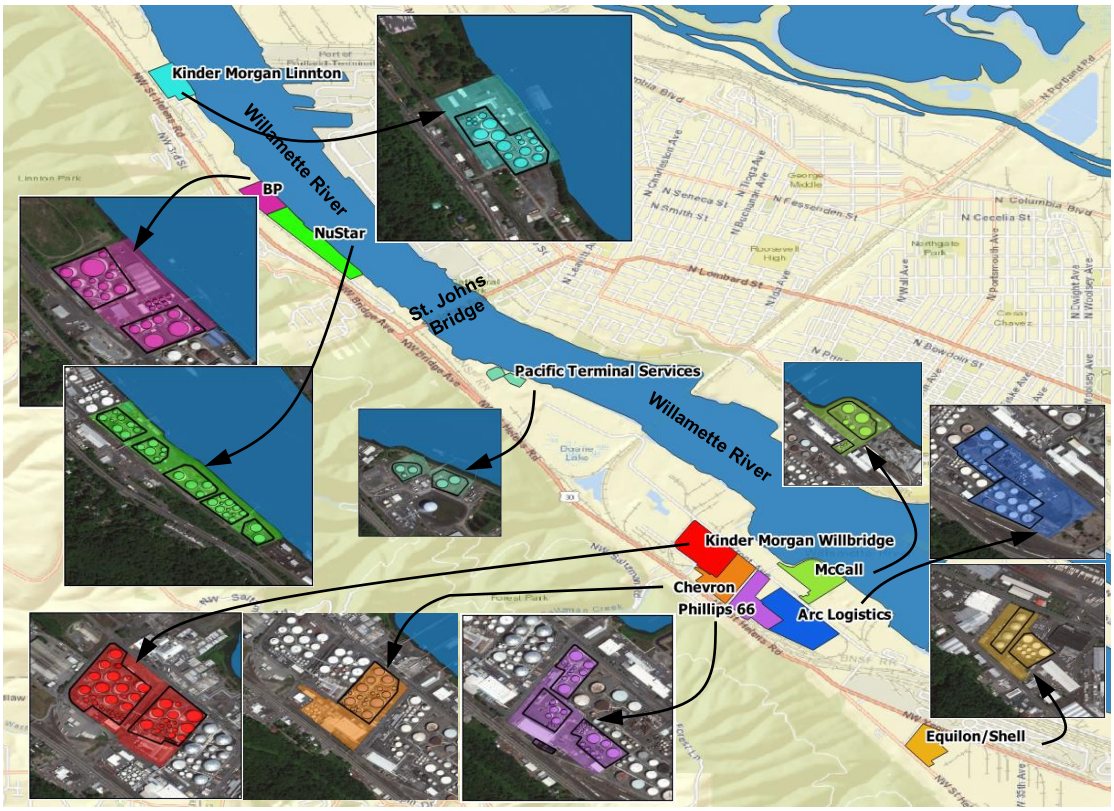

Figure 6: Companies with Liquid Fuel Facilities at the CEI Hub (background Google Maps)

The petroleum storage tank owners are required to submit an oil spill contingency plan to the Department of Environmental Quality (DEQ). In 2015 Oregon Public Broadcasting (OPB) made a public records request and attained records from seven owners of liquid fuel storage tanks (Schick 2015). These included BP, Chevron, Kinder Morgan, McCall, NuStar, Pacific Terminal Services and Phillips 66. Further queries into the City of Portland permits

database indicated that no additional fuel storage tanks were constructed since 2015, making the data set relevant to date. In addition to this dataset, two additional companies were identified through review of The City of Portland Bureau of Planning and Sustainability documentation from 2016 (Bureau of Planning and Sustainability 2016). These companies were Arc Logistics and Shell/Equilon.

In all, there were 10 properties with liquid fuel storage tanks, owned by 9 different companies. Within each property, large tanks appear to be collocated within shared secondary containment areas that are built to contain potential spillage or leaks. These containment areas are typically intended to contain the volume of the largest tank in the group and are constructed using soil dikes or structural walls. No data was found related to the secondary containment aspect of the facilities in any of the properties, so the areas were manually traced and acreage calculated based on satellite imagery. The resulting tank locations and associated containment areas are depicted in Figure 6 via zoomed in details for each property. The acreage and the number of storage tanks are summarized in Table 2 for each company. To help parse the data when available, the tanks were grouped into tank diameters that were 25 ft and larger or smaller than 25 ft.

Table 2: Total Area and Fuel Storage Overview

Company	**Site Area** (acres)	**Secondary Containment** No.	(acres)	**No. of Storage Tanks** ≥ 25ft	< 25ft	**Tank Capacity** (million Gallons) ≥ 25ft	< 25ft
Kinder Morgan							
Linnton Terminal	13	1	5.5	19	14	20.4	0.3
Willbridge Terminal	33	2	17.0	46	88	70.0	1.5
BP	18	2	5.6	26	6	23.9	0.0
NuStar	22	5	11.8	31	4	53.4	0.1
Pacific Terminal Services	2	2	3.2	5	2	11.6	0.0
Chevron	21	1	8.5	35	109	47.4	3.0
Phillips 66	21	4	10.8	36	61	29.3	1.1
McCall	19	2	10.0	10	16	40.0	0.5
Arc Logistics	39	2	14.0	25		61.6	
Equilon/Shell	38	2	6.8	13		16.8	

TANK TYPE AND QUANTITY

The records for seven of the companies list a total of 514 tanks, of which 146 were tagged to be out-of-service (O.O.S). While it is unclear if O.O.S. tanks could be brought back to service, examination of aerial photographs of some of the known locations of large O.O.S. tanks show visual signs of tank deterioration that make that possibility less likely. The data for each tank include the storage capacity, substance, and year built for each tank. Tank type is also included, although this identification is not consistent across the different companies.

Phillips 66 reported container type as welded or riveted steel while the others reported container type by the roof characteristics (e.g. floating roof, fixed roof, cone roof, vertical fixed roof). There were no tank details available for Shell/Equilon and Arc Logistics, so the additional 38 tanks were estimated from satellite imagery. The number of tanks breakdown along with the fuel storage capacity for each of the companies is summarized in Figure 7. Given that floating roof tanks can exhibit different dynamic behavior to fixed roof under earthquake motion, the tank types are differentiated where known.

Discounting the O.O.S. tanks, there are at least 362 tanks with a total capacity of 8.64 million barrels (362.9 million gallons) of liquid product of various types. Despite approximately 40% of the tanks being 25 ft in diameter or larger, they can hold over 95% of the total volume capacity. The total volume is not present on site at any given time because the tanks are not always full. The average fill varies, nonetheless there is a significant amount of liquid fuel products stored in above ground storage tanks at the CEI Hub. There also appear to be a wide spectrum of tank types. The tank construction includes riveted and welded, as well as fixed and floating roof. The variability in construction and tank type make relevant all of the aforementioned structural damage vulnerabilities exposed by past earthquakes.

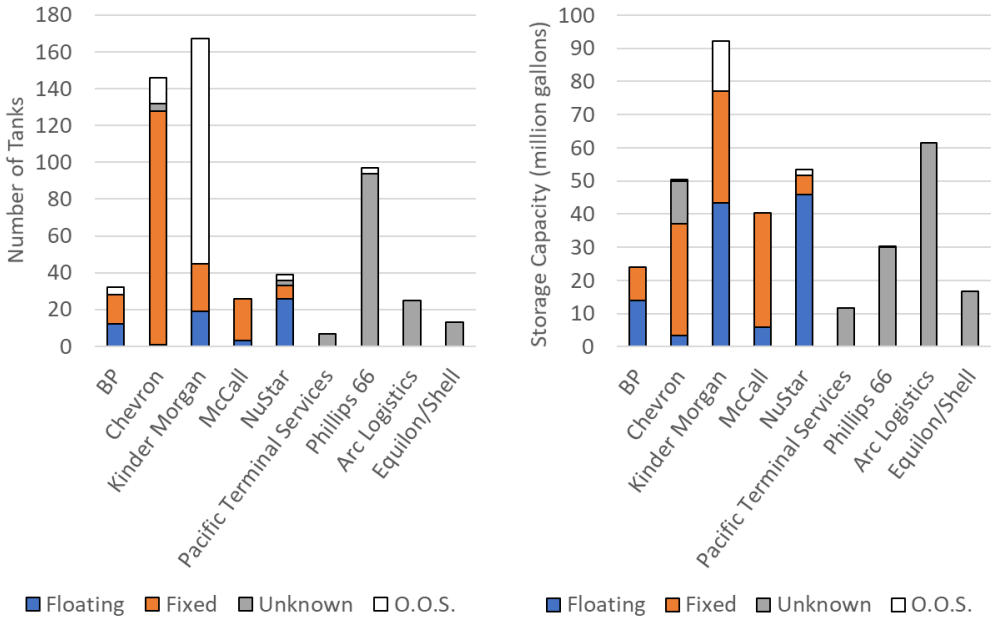

Figure 7: Number of Tanks (left) and Total Storage Capacity (right) by Company

TANK AGE AND SIZE

Knowledge about a seismic hazard evolves over time. In Oregon, our understanding of the threat of the looming Cascadia Subduction Zone (CSZ) has only come to light in the last 20 years. Design standards follow and therefore the age of any structure is often a strong indicator of the potential vulnerability. To get a sense of the age of the tank inventory at the CEI Hub, the tank age is summarized in Figure 8 by showing the number of in-operation storage tanks built within a particular decade. Within each decade, the number of tanks are binned by the tank diameter in increments of 20 ft. This allows for a visual representation of the physical size of the tank and indirectly the volume of fuel capacity. The tank diameters were only provided for approximately half of the tanks. Regression model based on the tank volume and the known tank diameters was developed and used to estimate the tanks for which diameters information was not available.

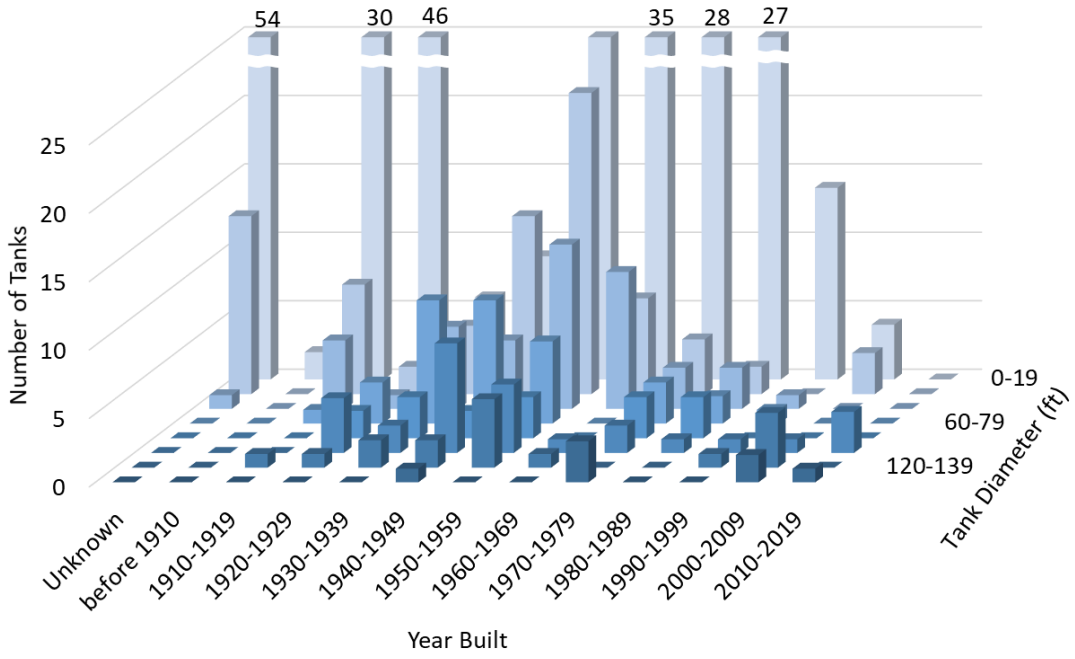

Figure 8: Distribution of In-operation Tank Age and Size

There are numerous in-service large tanks built prior to 1930s. Most significantly, majority of the tanks and majority of the fuel capacity within the hub has been built prior to 1960s. Even if the designers were fully aware of the seismic hazard, this time frame is prior to any design and performance lessons learned from the damaging Great Alaskan earthquake of 1964 and the many other

documented earthquakes that followed. The next construction active period in the CEI hub spanned 1970s-1980s, with only a few large tanks built in the last couple of decades.

The industry standard for the design of petroleum storage tanks is published by the American Petroleum Institute (API); API Standard 650 establishes the minimum design requirements for welded tanks. It is unclear what standards were used for the design of the tanks as the City of Portland had not been overseeing these non-building structures. Even so, the seismic load requirements in Portland have significantly increased for buildings during the 1990s, reflecting the state of science of the regions seismicity. Regardless of the design standards followed, the vast majority of the tanks were constructed with minimal, if any, considerations of seismic loading given their vintage.

SOIL CHARACTERIZATION

Detailed subsurface information at CEI hub in general is very limited. Based on the available information, loose to medium dense silty sand lie below the groundwater table and the soil is susceptible to liquefaction (Beaty et al 2014). There is also a possibility of landslides from the nearby slope entering the area. Raster data that included permanent ground deformations from liquefaction was made available by the Oregon Department of Geology and Mineral Industries (DOGAMI 2012) and was overlaid on the fuel storage facilities as shown in Figure 9. Because of the proximity to the river, the permanent ground deformations due to liquefaction and lateral spreading is expected to be very high at all fuel storage tank locations. The underlying raster data is a high level assessment and serves only as an indicator for liquefaction risk at any particular location within the hub. More detailed geotechnical assessment would be needed to quantify the severity, nonetheless, liquefaction clearly poses a significant risk for all of the liquid fuel tanks in the CEI Hub. If left unmitigated, the seismically induced damage observed in past earthquakes is likely to manifest.

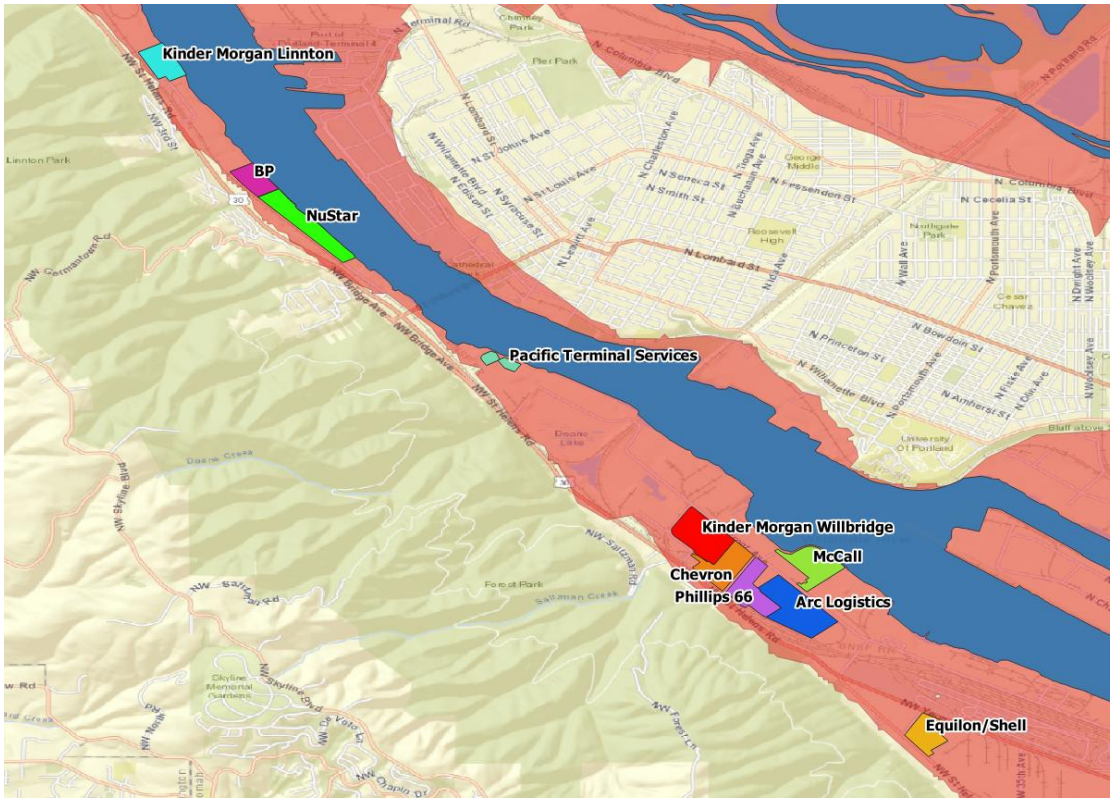

Figure 9: Areas of High Permanent Ground Deformations (shaded red) following CSZ Earthquake (background Google Maps)

POTENTIAL SEISMIC HAZARD MITIGATIONS

SEISMIC HAZARD

Factors contributing to seismic performance of above ground storage tanks include the amount of shaking, the existence of anchorage, subsurface soil condition and the amount filled at the time of the earthquake. The amount of shaking relates to the seismic risk characteristics and for Portland and Oregon, the CSZ is one of the more significant considerations. The expected severity of the shaking is represented by the 5% critically damped spectral acceleration plot in Figure 10 and includes a probabilistic hazard of a 500 year return and 1000 year return earthquake as well as the anticipated full rupture of the CSZ. These values consider the location of the CEI hub relative to the earthquake as well as a relatively soft soil (Vs_{30}=270 m/s). The expected accelerations ranging between 0.2g and 0.56g are well within the range of accelerations where structural tank damage as well as soil liquefaction were reported in past earthquakes. The level of shaking is therefore expected to be significant and have the potential to cause damage or failure to vulnerable fuel storage tanks.

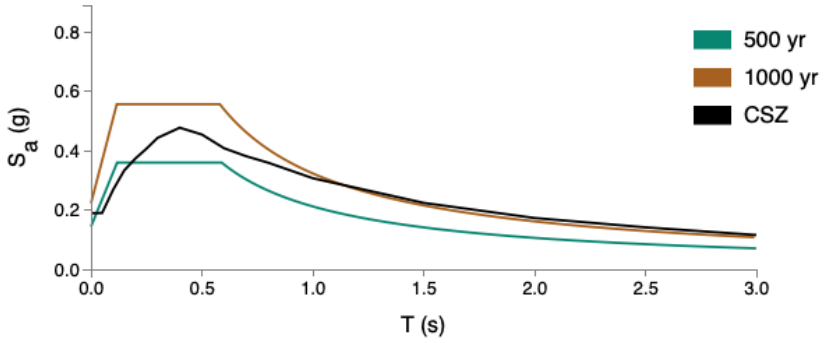

Figure 10: Spectral Acceleration for Portland's CEI Hub

The stresses generated on the tank can be correlated to the amount of fuel in the tank. Performance during past earthquakes have indicated a lower susceptibility to damage for tanks that are partially filled. One potential mitigation of the risk of damage can therefore employ practices that at maximum only partially fill any vulnerable tank.

STRUCTURAL MITIGATION

The large diameter fuel storage tanks are typically above-ground and constructed with flexible floors and steel perimeter shell that is supported on a reinforced

concrete ring foundation. Smaller diameter tanks are likely to be supported by a reinforced concrete slab on grade. In either case, anchorage for the tanks have the potential to limit or minimize the uplift of the walls of the tank as the liquid imposes stresses on the tank walls. Effectiveness of anchoring storage tanks has been demonstrated in past earthquakes and would most likely be implemented for any new tank construction. Tanks in the CEI hub are unlikely to be anchored and would need to be retrofitted. As with most seismic retrofit cases, mitigating existing structures is more challenging than starting with a blank site. The anchorage would need to be implemented around the perimeter, connecting the steel shell with the foundation. The details of the connectivity will need to be evaluated depending on the individual tank as additional challenges may arise from having the ability to attach to the tank wall or the foundation. Issues with welding ranging from the steel vintage to shell thickness need to evaluated as is the ability of the foundation to resist the anchorage forces.

SOIL MITIGATION

For storage tanks located further away from the edge of the river, lateral spreading may not necessarily be as great a concern. However, liquefaction settlement and bearing capacity failures could result in damage to the tanks. To mitigate liquefaction settlement, the ring foundations could be mitigated by installing sheet piles or compaction grout columns around the perimeter. Sheet piling consists of installing steel interlocking sheets around the perimeter. Compaction grouting displaces and densifies loose granular soils by staged injection of fluid grout. These sub surface columns would support the tank shell and potentially the I/O connections, but the centers of the tanks could still settle. Site specific studies would be necessary to assess the differential.

To mitigate lateral spreading in addition to settlement, jet grout columns could be installed under the tanks. Jet grouting is a hydrodynamic jet process that breaks up and loosen the ground, and mixes fluid grout with the soil. The jet grouting can be inserted at an angle, potentially reaching and mitigating soil under the tank as well as the perimeter. For large diameter tanks the jet grouting might require the tanks to be drained and cut open so that low-overhead equipment can work from within the tank.

Alternatively and less conventionally, instead of treating the soil, the water table could be lowered because without water, no liquefaction of the soil can occur. An example of this was implemented in three sites in Japan in 1970s. Underground cutoff wall was constructed using the slurry wall technique with soil/bentonite backfill. The cutoff wall surrounded a group of tanks and the water table was lowered. The refinery reported that these tanks had no damage after the 2011 Tohoku Earthquake.

CONCEPTUAL ESTIMATION OF SEISMIC MITIGATION COSTS

In order to get a sense of the magnitude of costs required to mitigate the major vulnerabilities of the liquid fuel storage tanks at the CEI hub, a high level cost estimation was made based on the tank data available. Three components of the mitigation costs were estimated; soil mitigation, structural anchoring and associated design/permitting. These were estimated as follows:

- Soil mitigation – in order to address both liquefaction induced settlement as well as lateral spreading, jet grouting was selected for estimating the cost. Jet grouting estimates were obtained from one of the major national geotechnical construction contractors. The calculated cost include an initial mobilization of $100K/tank plus the cost of the grouting procedure. While economies of scale could be employed to lower the mobilization costs, there is much uncertainty at this conceptual stage to be fine-tuned. The grouting procedure costs were estimated at $400/cubic yard of grout, 35% grouted mixing for 40ft depth under the entire area of the tank. This cost was calculated for each 25ft diameter or larger tank, each rounded to the nearest $100K. The resulting cost aims to represent the material and labor cost of soil mitigation implementation for the larger tanks.

- Tank anchoring – as an initial estimate, mobilization cost of $50K/tank was used plus an additional $1K/ft of the tank perimeter. This cost was calculated for each 25ft diameter or larger tank, each rounded to the nearest $100K. The resulting cost aims to represent the material and labor cost of implementation for the larger tanks.

- Design and permitting – in order to implement the above mitigation, engineering assessment, design and permitting needs to be conducted. This cost was simply estimated as 10% percent of the total cost for both soil and structural mitigation implementation combined.

The calculated cost is summarized in Figure 11. Values are separated for floating tanks and other because floating tanks on average have larger diameters and at a future date could also include the cost of installation of fire suppression measures, which at this time were not estimated. The total cost for implementing these conceptual mitigation measures to storage tanks of 25 ft diameter and larger is estimated to exceed $300 million. Over one third of the cost is for floating roof tanks alone. Unsurprisingly, the cost of soil remediation dominates the overall cost for all tanks, especially for floating roof tanks that tend to have a higher ratio of area to perimeter given their general larger size. The cost of mitigating storage tanks smaller than 25 ft in diameter is expected to only incrementally add to the overall cost as the mitigation measures would more likely be associated with structural anchoring rather than deep soil mitigation.

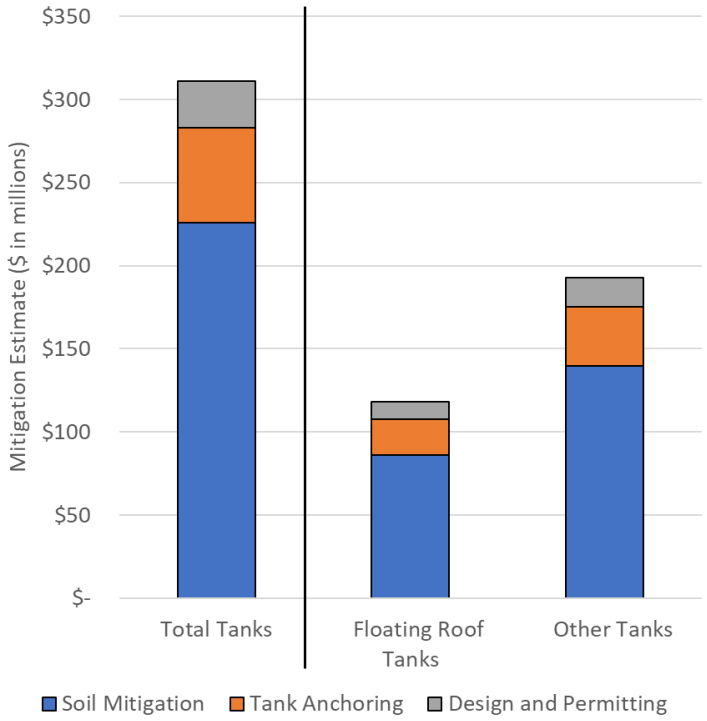

Figure 11: Conceptual Seismic Mitigation Cost Estimates for Tanks 25ft in Diameter and Larger

The conceptual cost estimate was intended as a first pass order of magnitude number for mitigating the damage and failure of only the tanks. No cost consideration was given to maintaining integrity of the fuel distribution system, support mechanical systems, secondary containment areas or the shore terminals that are also located on the site. And, the aim of the remediation measures for the tanks was to minimize the potential for failure that would result in loss of fuel. Much more detailed analyses would need to be conducted to estimate each property ability to operate following a major earthquake event.

RECOMMENDATIONS FOR NEXT STEPS

This study provided a closer look at the seismic vulnerability of the CEI hub by assessing more quantitatively the available inventory of fuel storage tanks at the site. The recommended next steps aim to build on this work to fill information gaps and generate new critical knowledge with the overarching goal of quantifiable assessment and mitigation of seismic risk.

- Develop seismic performance criteria for storage tanks at the CEI hub:

  The philosophy behind majority of design standards and codes is to prevent catastrophic failure. Given the criticality of the fuel, specific seismic performance criteria for the storage tanks in the CEI hub need to be developed. The criteria need to address the input earthquake motion as well as the desired output performance goals, such as tank collapse, prevention of leakage, access to fuel or continued operations. Having established criteria will provide basis for evaluation and eventual design. The decisions made in establishing the criteria can significantly affect the mitigation costs and if adhered to, the associated performance level of post-earthquake performance.

- Quantify tank seismic fragility:

  Seismic fragility describes the anticipated performance for a particular ground motion input parameter. For example, the potential for tank wall collapse given the earthquake peak ground acceleration. Limited literature exists on the topic, quantifying liquid storage tank fragility difficult. To address this shortcoming, archetype tanks should be defined that represent different storage sizes, roof types, structural as well as soil characteristics. Numerical models of the archetypes need to be analyzed to determine their seismic fragility. This new knowledge would be used to inform the seismic loss assessment process and provide a tool to quantify the effectiveness of particular mitigation measures. For example, the amount of fuel fill in the tank can be used as a variable in the analyses to determine the seismic performance benefit gained by lowering the amount of fuel stored. The fragility is useful on individual tank basis, can be applied across the tank inventory and can be used to better understand cost/benefit.

- Investigate mitigation options for fuel distribution:

  The focus of the study has been on the storage tank inventory, but aspects related to connectivity and distribution of the fuel are also important. Pipelines, support mechanical systems and access terminals need to be better understood, existing condition assessed and mitigation options investigated.

- Conduct subsurface geotechnical investigations:

  All of the sites are located close to the river and have been generally identified as susceptible to liquefaction. Detail survey of the properties of the soil at depth are needed. This information could then be used to estimate soil amplification of ground motion, the amount of settlement as well as lateral spread from liquefaction, and be used to refine the cost of the extent of the soil remediation required.

- Obtain detailed structural tank information:

  The current tank data set is incomplete and basic information that was inferred needs to obtained, including missing tank diameters, tank roof types and physical locations. Additional structural data currently not available needs to be gathered. Details of existing foundation size, tank to foundation anchorage, tank wall thickness, roof support and I/O connectivity. Some of this information can be gathered through site visits while other would require more direct tank owner cooperation.

- Prioritize fuel storage tanks:

  From the hundreds of tanks identified, certain types of fuel and certain size of tanks are likely to be more critical to post-earthquake recovery than others. Prioritization of the tanks based on post-earthquake needs and consequences of failure should be conducted. Having prioritized tanks would help focus the associated assessment and mitigation efforts.

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Critical Energy Infrastructure Hub

Assessment Findings

May 2019

OREGON SOLUTIONS

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Cover photo
Site map of the critical energy infrastructure (CEI) hub on the western bank of the lower Willamette River area in northwest Portland, Oregon. The CEI hub, outlined in red, stretches for six miles. (Source: Oregon Department of Geology and Mineral Industries. Base map, Google Earth.)

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1. INTRODUCTION

During summer 2018, city of Portland's Bureau of Emergency Management (PBEM) requested that Oregon Solutions conduct an assessment to determine potential avenues for collaborative action that might increase resiliency of the Critical Energy Infrastructure (CEI) hub located in northwest Portland. This request came after several meetings between members of the Portland City Club's Earthquake Resiliency Advocacy Committee (CCERAC) and staff from the Governor's Office, Oregon Solutions, and PBEM. According to a February 14, 2017, Portland City Club report, "approximately 90 percent of the liquid fuel for the entire state of Oregon and 100 percent of the jet fuel for Portland's airport comes through the CEI hub." But the tanks on this site are vulnerable to a Cascadia Subduction Zone event (CZE) given their age and that they were constructed on seismically vulnerable soils susceptible to liquefaction, which could potentially cause the tanks to "sink, split, tilt or leak." Additionally, risks to the environment, life, safety, and property at and near the site from a CZE are unclear.

PBEM requested Oregon Solutions conduct an assessment focused on determining potential avenues for collaborative action that might increase resiliency of the hub. Specifically, this assessment looked at the following areas of inquiry:

- What ideas could reduce the risks associated with seismic activity impacting fuel storage facilities in northwest Portland at the CEI hub?
- What are the long- or short-term incentives, regulations, agreements, or other creative approaches that could be identified in order to bring all relevant parties to a collaborative table to improve resiliency?

The goal of this assessment interview process was to determine if there was enough substantive interest from stakeholders to work in a neutral process, such as an Oregon Solutions process, to look for ways to improve

ABOUT OREGON SOLUTIONS

Oregon Solutions is the state of Oregon's program to help communities address community-based problems and opportunities through sustainable solutions. We do this by creating a neutral forum for collaboration where businesses, governments, nonprofits, community-based organizations, sovereigns, and other stakeholders can align resources and pool efforts to achieve desired results.

OREGON SOLUTIONS PROCESS

Oregon Solutions' engagement starts with an assessment. When invited, Oregon Solutions begins an assessment to explore whether and how a collaborative approach might be structured to address a particular community issue. The assessment is composed of a series of one-on-one or small group interviews. If an assessment finds there is a project that can be conducted by Oregon Solutions, it will go before the governor for consideration of a designation as an Oregon Solutions project.

seismic resiliency at the CEI Hub. This report reflects the findings from our assessment interviews.

1.1. Methods

This assessment report is the product of interviews conducted by Oregon Solutions with parties and stakeholders representing key interests related to the CEI hub. Between July 2018 and January 2019, Oregon Solutions interviewed thirty-two individuals representing city, county, state, and federal government, as well as civic groups, energy associations, and the energy sector. Initial interviews for this assessment were conducted from July 2018 through January 2019. The overarching purpose of our assessment is to gauge stakeholder interest in a collaborative approach, such as an Oregon Solutions process, to address identified issues.

The team was not able to interview everyone with an interest in the CEI hub. Some requests that Oregon Solutions staff made for assessment interviews went unanswered even though several attempts were made over several months. We made every effort to reach out to stakeholders with an interest in the seismic resiliency of the hub. Our goal with assessment interviews is to have all interested parties feel their perspectives and interests will be represented by those interviewed. A list of those interviewed and their affiliations can be found in appendix A.

Most interviews were held in person—a few by phone. Before each interview, individuals were briefed about the purpose of the assessment. All interviews were voluntary and lasted approximately one to one-and-a-half hours. Interviewees were informed that the final report would aggregate responses into key issues without individual attribution.

1.2. Intent of this report

This report is ***not*** intended to be a comprehensive review of all issues published, reported on, or discussed about the hub. Instead, this assessment report reflects what Oregon Solutions heard from interviewees at a single point in time, and it is an overview for stakeholders and policy makers about the key topics of interest to parties engaged in the hub.

2. BACKGROUND

2.1. History

The state of Oregon and the greater Pacific Northwest are vulnerable to an earthly force little understood until the end of the twentieth century: powerful subduction zone earthquakes and coastal tsunamis that occur with periodic frequency along the Juan de Fuqua and North American plates.

In the past, both the Huu-ay-aht First Nation peoples and the Makah tribe shared similar stories of lost land and peoples as a result of these earthquakes and tsunamis. But as recounted in a 2015 *The New Yorker* article, their stories were long overlooked as fact until scientific research paired Japanese tsunami records with on-the-ground geologic field

research to reconstruct the Cascadia earthquake of 1700.[1] What this research unveiled was that subduction zone earthquakes have occurred along the Pacific Northwest with relative regularity over the last 10,000 years, and if averages from past events are predictive, the region could be overdue for another powerful subduction zone earthquake. [2]

2.2. Critical infrastructure and community resiliency

Many of the region's buildings and critical infrastructure were built before the region's seismic exposure was widely understood.[3] This infrastructure includes Oregon's primary liquid fuel storage facility, the CEI hub. This hub is located in northwest Portland and receives 90 percent of the state's liquid fuel supply either via pipe or marine vessel.[4] One interviewee for this assessment noted that roughly 70 percent of the fuel arrives by pipe and another 30 percent arrives by tanker barge.

The CEI hub is considered by many experts to be vulnerable to failure in the event of a CZE event. A 2012 Oregon Department of Geology and Mineral Industries (DOGAMI) study notes that the hub has a "significant portion of Oregon's electricity, natural gas, and fuel oil infrastructure."[5] Specific to the liquid fuel, DOGAMI's high-level findings spelled out the following areas of vulnerability:

- *General.* The facilities on the site range in age from a handful of years old up to one hundred years old; consequently, they range from "[infrastructure] built to no or very antiquated standards to new infrastructure built to the current state-of-practice standards."
- *General.* "Current building codes do not adequately address the seismic deficiencies in existing CEI hub facilities."
- *Liquid fuel pipeline.* "Liquid fuel pipeline was largely constructed in the 1960s when the regional seismic hazards were unknown and state-of-practice construction techniques at that time did not include any reference to seismic standards."
- *Marine terminals.* "All of the port facilities in the CEI hub have significant seismic risks due to liquefaction, lateral spreading, and seiches." Also, some "older piers were constructed without any seismic protection, have deteriorated, and are likely to fail in even a moderate earthquake."
- *Fuel supply.* At the time when the report was published, only "three existing tanks [were] known to have addressed liquefaction vulnerabilities." Moreover, the hub

1. Kathryn Shulz, "Annals of Seismology: The Really Big One," *The New Yorker,* July 20, 2015, https://www.newyorker.com/magazine/2015/07/20/the-really-big-one.
2. Ibid.
3. US Department of Homeland Security website, Cyber and Infrastructure, Overview, What is Critical Infrastructure? https://www.dhs.gov/what-critical-infrastructure.
4. Oregon Seismic Safety Policy Advisory Committee, "The Oregon Resilience Plan: Reducing Risk and Improving Recover for the Next Cascadia Earthquake and Tsunami," Energy chapter, February 2013, https://www.oregon.gov/oem/Documents/06_ORP_Energy.pdf.
5. Yumei Wang, Steven F. Bartlett, and Scott B. Miles, "Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub: Final Report to Oregon Department of Energy and Oregon Public Utility Commission," Oregon Department of Geology and Mineral Industries, August 2012.

> has on average a "three to five day supply… for regular unleaded and diesel fuel," with premium gasoline subject to daily delivery.[6]

A 2013 Oregon Resilience Plan echoed concerns from the DOGAMI report raising questions about the sturdiness of facilities constructed on soils susceptible to liquefaction, and infrastructure not built to current standards given the hub's age-range of structures. [7]

These vulnerabilities mean that in the event of a CZE, Oregon communities dependent on fuel to respond to a disaster could struggle for adequate supply, and environmental and safety risks would be likely for people and natural places near the hub. Further, if the hub was majorly damaged, "operations could be degraded for months or years, with complete repairs and equipment replacement potentially taking many years."[8]

In recent years, a great deal of research has been conducted into how crises or disasters (e.g., earthquake, hurricane, tsunami, and terrorism) are made worse by a failure or disruption of critical infrastructure.[9] Pescaroli and Alexander researched how a breakdown in one critical sector, like energy, "can rapidly create much broader effects by cascading throughout the network and possibly…over into other networks…which may cause great harm and may become full-blown transboundary catastrophes."[10] They use the 2003 power outage in Italy and Switzerland to illustrate their point:

> On the night of 28 September 2003, electricity was being imported into Italy from Switzerland via three routes. A short circuit occurred when one transmission line overheated and touched the branch of a tree. Transmission automatically switched to the other two lines and then shut itself down to prevent them from overheating too. A series of blackouts propagated from the Swiss–Italian border progressively as far as Sicily and Geneva, affecting 56 million people. Trains were marooned in tunnels, and people were trapped in elevators. Civil aviation was briefly shut down…transportation, health systems, the Internet and building maintenance were affected, and lack of refrigeration put foodstuffs at risk.[11]

This real word example shows how a "very localized fault" can "rapidly spread to the level of international system-wide effects."[12]

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6. Yumei Wang, Steven F. Bartlett, and Scott B. Miles, "Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub: Final Report to Oregon Department of Energy and Oregon Public Utility Commission," Oregon Department of Geology and Mineral Industries, August 2012.
7. Oregon Seismic Safety Policy Advisory Committee, "The Oregon Resilience Plan: Reducing Risk and Improving Recovery for the Next Cascadia Earthquake and Tsunami," February 2013, https://www.oregon.gov/oem/Documents/Oregon_Resilience_Plan_Final.pdf.
8. US Department of Homeland Security, "Columbia River Basin Petroleum and Refined-Product Supplies: Disruptions and Mitigations Under Cascadia Subduction Zone Earthquake Scenario," July 2016.
9. Gianluca Pescaroli and David Alexander, 2016, "Critical Infrastructure, Panarchies and the Vulnerability Paths of Cascading Disasters, Natural Hazards (82) 1, 175–192, https://link.springer.com/article/10.1007/s11069-016-2186-3.
10. Ibid.
11. Ibid.
12. Ibid.

Professor Stephanie Chang, another leading researcher in disaster preparedness and community resilience says today's "infrastructure services are so ingrained in modern life," they are "both ubiquitous and taken for granted." Because these systems are "highly interdependent," damage and ensuing losses from outages are often substantial and disproportionately large. A community's ability to manage the severity of impacts of a disaster also depends "not only upon the occurrence and duration of infrastructure loss but also upon preparedness and response actions undertaken by governments and individuals." To that end, she says "reducing the likelihood of damage through pre-disaster mitigation, reducing the duration of outage through rapid restoration, and enhancing the capacity of people and businesses to withstand outage disruption through preparedness and emergency response planning will all enhance disaster resilience."[13]

These and other examples speak to the importance of shoring up critical infrastructure, understanding how interdependent critical infrastructure is as part of emergency preparedness planning, and preparing communities to be as resilient as possible in case of a disaster that impacts essential services.

3. FINDINGS

3.1 Introduction

This section details findings from assessment interviews. **Note:** Findings do *not* reflect a point of view of the National Policy Consensus Center or any of our team members. Instead, findings reflect what we heard from interviewees.

We asked interviewees their perspectives on a variety of substantive issues during these interviews, including ideas to mitigate risk at the hub, perceived challenges that need to be addressed, thoughts on incentives and a distributed system of hubs, and interest in a collaborative approach to work through these issues. Interviewees were also asked to identify and consider how to overcome perceived challenges to collaboration. Interview questions can be found in appendix C.

Many ***substantive issues*** or themes emerged, which the assessment team saw as being related to the key assessment questions. These themes were described explicitly and implicitly by many interviewees. We have incorporated content from interviews, and these responses are listed in no particular order. We did not include comments that were not germane to the scope of this assessment. We note areas where lack of shared knowledge may currently impact individual perceptions about how a sector works and/or its capacity. We have also listed brainstormed ideas offered by interviewees related to incentives, and general interest in an Oregon Solutions-like collaborative process that could identify mitigation approaches.

13. Stephanie E. Chang, (2016), "Socioeconomic Impacts of Infrastructure Disruptions," Oxford Research Encyclopedias (online), Natural Hazard Science, DOI: 10.1093/acrefore/9780199389407.013.66, http://oxfordre.com /naturalhazardscience/oso/viewentry/10.1093$002facrefore$002f9780199389407.001.0001$002facrefore -9780199389407-e-66;jsessionid=23E71F730780B95766656C3731E0B749.

3.2. Substantive findings

3.2.1. Likelihood of CZE event well understood

We found most interviewees had a good understanding of the risks associated with a CZE event, the potential risks to the hub, and the larger systems that the hub relies on (e.g., pipelines, docks, roads, bridges, and highways). This was significant since some interviewees noted that knowledge of a potential CZE event was not well understood—across sectors—even a handful of years ago.

There is also confidence that, in the event of an accident involving a single tank or a few tanks, emergency responders could respond well. But when it comes to a worst-case disaster like a CZE event, we found little clarity for how an emergency response would work. We found there to be speculation about what resources the public and private sectors have when it comes to a worst-case scenario event.

3.2.2. Shoring up the hub versus moving it

One of the main areas of interest for CCERAC and PBEM was to find out what people thought about the possibility of moving the hub from its current site to a more seismically-resilient location. With a few exceptions, most interviewees felt that moving the hub was not feasible because it would cost billions of dollars and it was unclear if there was a better location. Some interviewees noted a hub would still need to be accessed by river, proximate to existing pipeline infrastructure, and relatively close to the population center to have a rational product distribution mechanism. In light of that, some interviewees also questioned what other stretch of river would be safer for siting a hub facility.

We note a few interviewees felt a hub could be moved to eastern Oregon. These interviewees said an eastern Oregon hub would be safer and less exposed to earthquake east of the Cascades. In this example, other interviewees who were not as interested in moving the hub said, depending on the proposed location, new pipelines would likely need to go on tribal and public lands, which could be controversial. Oil would also still come via the traditional delivery methods of pipe, barge, rail, and truck—and river and pipeline access would remain essential.

The majority of interviewees felt that shoring up the existing site and mitigating for a CZE event was the best approach. Some even said a few other sites for oil storage inside and outside the Portland area should be considered. But a wholesale move of the hub was not seen as practical.

3.2.3. Long- or short-term incentives, regulations, agreements, and other approaches

Another main area of interest for CCERAC and PBEM was what, if any, *incentives* might bring parties to the table to work on the hub's resilience. When asked about incentives, we found interviewees to be creative and inventive. Interviewees saw incentives not simply as cash (although that was brought up as an important option). The following is a compiled list of the multitude of ideas offered in the spirit of brainstorming. We did not screen or vet them with subject matter experts as to the merit and feasibility of these ideas. Rather, we

share the ideas we heard as an illustration of the creativity of interviewees and potential for many good ideas for consideration as part of any collaborative effort:

- Be open to options for some kind of cost recovery models like those seen with regulated utilities under Public Utility Commission purview.
- Look at state and federal regulations for incentives or flexibility.
- Look at permitting issues for incentives or flexibility. For example, consider allowing an entity to submit a twenty-year plan for retrofitting that, if approved with measures for seismic resiliency, would allow for easing of the permitting process. (Changes to permitting processes could be made legislatively, by contract, or both.)
- Offer tax credits to a company that moves tanks or builds more seismically-sound tanks.
- Explore public/private partnerships as a way to set up infrastructure with shared ownership and responsibility.
- For improvements in Portland, be open to increasing capacity for storage to help pay for new facilities that are seismically sound.
- Increase funds for seismic improvements by considering expanding Oregon Department of State Land's moorage fees to include companies that are exempt.
- Offer back-up generators to oil companies located at the hub.
- Use tank consolidation as a "carrot" and regulations as a "stick."
- Provide financing for facilities.
- Look at other properties in the region where tanks could be located to gain seismic improvements; exhaust private- and publicly-owned properties.
- Consider a business license tax.
- Create a seismic resiliency fund at Business Oregon that could be used by facilities like the hub.
- Create incentives for storage of a cache of usable fuel around the state. (Industry would need to advise how to do this strategically.)
- Look at ideas from other states like Florida, which is studying the possible construction of additional petroleum distribution centers around the state as a way to improve access to fuel during large-scale emergencies. (Florida's Legislative Office of Program Policy Analysis and Government Accountability is conducting the research.)
- Look at flexibility related to the low carbon fuel standard.
- Look at who should have authority over seismic issues to rationalize how critical infrastructure is regulated and managed.

Some interviewees also felt that for incentives to be viable at the end of any collaborative process, the support of elected officials at the local and state levels (mayors, councils, legislators, etc.) will be needed. Also, other interviewees felt strongly that a collaborative process that looked at incentives would be seen as positive and a high priority for industry in order to help balance out long-term return on investments.

3.2.4. Importance of defining regulatory authorities

Several interviewees noted state agencies have limited regulatory authority over liquid fuel hubs, and that what exists is not well understood. Some interviewees report they know of no authority to make fuel companies mitigate for a CZE event. They offered ideas on regulation as a potential task/incentive for a collaborative effort. The following is a compilation of the suggestions interviewees presented during our interviews:

- Some interviewees felt that if it's not already being done, a collaborative process could work to clarify regulators' road map and oversight. For example, a process could work through the difference between the scope of federal, state, and local regulations, and programs, including the Oregon Department of Environmental Quality's oil spill program, the Oregon State Fire Marshal's inspections of tank farms, and the Oregon Public Utilities Commission's oversight of regulated utilities.
- An interviewee felt collaborative process could include a review of the scope of the Oregon Seismic Safety Policy Advisory Commission to better understand how it could help on mitigation issues specific to a hub.
- Any process could explore recommended changes to federal, state, or local regulations. Some interviewees stressed any proposed regulatory change should be clear-eyed about what it does, how it works, how it fits, who owns it, and do its best to consider unintended consequences.

3.2.5. Need to address gaps in emergency response, recovery planning, and coordination

Interviewees felt a collaborative table across sectors could be a helpful place to work on gaps of knowledge across sectors related to emergency response, recovery planning, and coordination at the hub. For example, while interviewees understand that industry and emergency responders train for traditional events, there is no clear understanding how a coordinated emergency response would work at the hub in a worst-case CZE scenario. Interviewees questioned whether entities are even prepared: what is the plan, who needs it, and, if there is no plan, how can a plan be achieved?

Some interviewees said they are concerned industry and emergency responders cannot provide the necessary response to a worst-case CZE. An example was given related to the six fire stations around the CEI hub. These are traditional fire stations designed to respond to their fire management area. We were told they would likely respond to their management area for triage in a CZE event. Some interviewees expressed interest in developing a fire brigade model around the CEI hub for response during a CZE-like event.[14]

14. For an example of a fire brigade model, see http://www.iturri.com/en/solutions/fire-fighting-solutions/fire-fighting-solutions-in-industrial-plants.

Portland International Airport Fire Department was shared as another fire house model for structuring day-to-day work.[15]

Some interviewees were specifically unclear what provisions industry could bring to respond during a worst-case scenario. Other felt assumptions are being made on how quickly industry could recover from a CZE. For example, some interviewees feel there is an assumption they could recover quickly, while others said depending on damage, it could take months or years. There is also concern about the maritime damage from a CZE event that could hinder river travel and delay recovery. Some suggested that wildland interface protection of nearby Forest Park needs to be part of any discussion about reducing the risks of a CZE to the hub. Finally, some suggested a process to address incorporating concepts of Shake Alert (earthquake early warning system) to provide facility managers more time to implement quick prevention measures in case of near-term incident.

3.2.6. Conversation needed on mitigation

Interviewees said they need a better picture of the overall capacity to do specific mitigation projects, resources to do mitigation work at the site, and gaps that could prevent work on mitigation from happening. Some said that recent ideas implemented in singularity, such as providing industry with portable generators, which is appreciated, does not represent a robust mitigation effort. They hoped for more global conversations to outline mitigation needs of the hub.

3.2.7. Need for shared information across sectors

On a related topic, interviewees said there is a lack of a general knowledge about the basic interworkings of a sector. This has led to a sense that there are misperceptions and poor information, and in some instances mistrust, between sectors. For example, we heard a concern that since sectors are not sharing emergency response plans with one another, it is creating a "we don't know what we don't know" climate. Others say there is limited understanding in Oregon of how the macro fuel sector works and limited awareness of infrastructure improvements already completed at the hub.

To confront this information issue, there is an interest in educating relevant parties on these issues to create a shared base of knowledge and better understanding of the unique challenges facing each sector. Examples of misperceptions shared by interviewees include the belief that industry has "limitless pockets," or that public sector emergency responders already have resources to protect the hub. There is awareness between sectors that misperceptions are out there. We found that many interviewees have a genuine interest to learn more about other sectors and share information from their sector at a collaborative table. This was seen as a way to build knowledge, verify information, and build trust.

15. Port of Portland website, https://www.portofportland.com/PublicSafety/Firedepartment.

3.2.8. General support for a collaborative effort

The primary purpose of an assessment like this one is to determine what would be needed for a productive, collaborative process to succeed. This section outlines what we heard from interviewees directly.

We did find that interviewees generally felt a neutral, non-political process, such as an Oregon Solutions process, would be a good way to get parties to the table to layout issues and to begin relationship building seen as critical to successfully implementing solutions. This was seen as potentially helping with trust issues, gaps of knowledge, and general understanding of how sectors work.

3.2.8.1. On the political climate

Some told us they prefer a third-party collaborative effort where all key parties are at the table working collaboratively instead of a political body taking the lead. The presumption is that it would lead to better outcomes. There was a general concern from most interviewees that the current politic climate related to liquid fuel vs. a greener economy has had an unintended consequence of introducing high political risk for efforts to mitigate the seismic risks of the CEI hub. Put another way, the need to improve safety of the hub site is seen as having statewide significance, but the politics of liquid fuel is a challenging environment for emergency responders to navigate. Some are concerned that political actions involving the hub could be seen by industry as burdensome.[16] There is also a concern that any exploration of a diverse array of potential incentives as a way to improve seismic resiliency would be frowned upon by some political jurisdictions. Even with these challenges, interviewees see value in participating in a collaborative process to proactively work on this significant infrastructure challenge.

3.2.8.2. On the focus of a collaborative effort

We heard that any process should keep to a specific agenda focused on resiliency and mitigation for the hub in preparation for a CZE event. Some interviewees told us that focusing beyond liquid fuels could be unwieldy for the group and of no interest to industry. Interviewees also expressed interest in being clear what success looks like for minimizing environmental disaster, creating structurally-sound infrastructure that can withstand a CZE, planning properly for sequenced infrastructure improvements, and creating clarity on needs for resources and response during a CZE. A few interviewees also said that, while their organization might not play a lead role at a collaborative table, their organization would want to participate nonetheless.

3.2.8.3. On teeing up a process and what it would take to bring people together

We heard that taking the time to set up any neutral process would be essential. *Process development* in this case would be complex, and all stakeholders would want to confer on the structure of a process. Any actual process should also be well-framed, well-timed, and well-structured. Also, a process should not be rushed. We found from our interviews that

16. Note: Industry has been wary of participating in past stakeholder research efforts as those efforts were perceived as adversarial.

interviewees feel investing front-end time in building trust, relationships, and shared knowledge would give any process a better chance for long-term success on mitigation and infrastructure improvements.

We also note that some interviewees said no one wants to throw good money after bad in a process that is not well thought out or infrastructure investments that are not strategic. Some also said if lawyers were involved, conversations might not be frank.

3.2.8.4. On potential activities for a neutral process

Some interviewees began to brainstorm approaches for consideration by a collaborative, neutral table during our interviews. For example, some interviewees said it would be important to develop a group agreement on what the hazards and threats are in order to establish a baseline on mitigation. Another interviewee mused that a group could work on a phased approach to make infrastructure improvements based on the hub-based experts' estimate of a CZE event occurring in a fifty-year horizon. Such an approach could have immediate approaches (one to ten years, focus on trust building, resiliency, education, research, planning, infrastructure improvements, and drills), intermediate approaches (ten to twenty years, focus on mitigation, next-phase infrastructure improvements, research, and drills), and long-term approaches (for twenty to thirty years, focus on next-phase infrastructure improvements, research, and drills).

Other interviewees said it could be helpful to get an agreement among parties on geotechnical studies and their findings as a way to advance shoring up the hub. This is considered important because there is perception that research conducted by a party considered a stakeholder would be discounted by other parties or stakeholders regardless of the quality of the research. Finally, some interviewees also said a group could consider going through the recommendations in the Oregon Resilience Plan (2013) to identify actionable items.

3.2.8.5. On potential obstacles to a collaborative process

A number of potential obstacles were identified. The following is a list of what we heard:

- Some expressed the need for a place in a process where they could freely speak to express points of view without attribution. Some worried that if comments were attributed to them before they could run them by their organizations, it could stymie their involvement. These interviewees said having comments attributed to them out of context could hurt their relationships with peers and within their sector.
- Interviewees said there is a perception that additional fuel infrastructure is never a good thing. Related to this, some interviewees said Portland's limitation on tankage is politically charged for some and could be an obstacle.
- Many interviewees said that in the past, industry has said that antitrust regulations prevent them from participating in work related to CZE resiliency efforts; this

concern would need to be addressed as part of any new effort going forward if industry is to participate.

- Clarifying the regulatory roadmap at the outset of a process was also seen as helpful because it has been an obstacle to past efforts. For example, some are concerned there is no state agency with direct regulatory authority or oversight of a liquid fuel storage facility like the CEI hub. Others are more specifically concerned that the lack of clarity about the current regulatory roadmap has created misperceptions and misunderstandings about current authorities that public entities have today.
- One final obstacle that was raised was lack of clarity how the Portland Harbor Superfund cleanup might impact CEI hub mitigation work. No one had a resolution for this obstacle, but many were mindful that is an overlay to any work at the hub in the future.

3.2.9. Other considerations of note raised by interviewees

The following considerations did not fit neatly into other categories; so they are listed here in an effort to comprehensively capture what we heard:

- It is unclear what impact increasingly fuel-efficient vehicles and alternative fuel vehicles will have, if any. These vehicles could result in less oil coming to the region and may mean less revenue for seismic improvements.
- Even if markets shift to renewables, the oil industry has all of the existing infrastructure that could serve that market.
- Interviewees noted that industry staff live here, too, and felt they (individually and at the corporate level) want to do the right thing.
- Pump stations for the pipeline are at the hub; a critical item could also be work on pump stations and preparation of the system that connects to Eugene.
- The CEI hub has other gathering lines from other terminals that should be strengthened—doing so would help the overall state system.
- We were told it is important not to lump industry together as a monolith; each company operates differently and some said trade associations don't necessarily represent individual company perspectives.
- We were told by some interviewees that industry is interested in having safer assets.
- Some experts told us they believe the pipeline system will do well during a CZE event in existing soils; the system will float during a CZE and oil lost from pipes will be more recoverable because the steel pipes have been replaced with cast iron. (Uncoated older steel was brittle.)
- Many interviewees said it is unlikely that oil will not be an important energy source over the next 50 years—even with current efforts to transition to alternative fuel

sources. Therefore, resiliency of the hub remains important and any investments to shore up the infrastructure for seismic resiliency would not be in vain.

- That utilities and emergency response entities will need access to liquid fuel during a disaster is on the top of the list of needs in order to respond to a CZE event.
- Fuel associations are stepping up outreach on the importance of resiliency planning.

3. ASSESSMENT RECOMMENDATIONS FOR AN OREGON SOLUTIONS/COLLABORATIVE PROCESS

Oregon Solutions found that among those we were able to interview there is significant interest in proceeding with a collaborative process, convened by a neutral third party, to explore mitigation, trust building, education, and incentives discussed in this report.

3.1. Recommendation one: Continue to engage critical parties

Despite the interest in collaboration, we did not find conditions exist at this time for a collaborative effort based on the scope.[17] ***Specifically, we were unable to secure enough responses from critical parties who have a direct interest in the hub to recommend going forward with a collaborative process as outlined in the scope at this time***. We found some of our requests for assessment interviews were met with silence, confusion, and even mistrust, because of sensitivities surrounding the hub. Even so, we do believe ***a collaborative table is within reach***. With more time, efforts to engage those parties could be successful.

3.2. Recommendation two: Convene an education-focused collaborative table

We did, however, find other areas where we feel it would be beneficial to begin a collaborative process now. Given the consistent concerns voiced about lack of trust and need for relationship building, we find one way to begin testing the waters for working together would best be focused around information sharing and mutual education. Some of the ideas generated during our interviews included the following:

- Do cross-sector education on how each sector works. Work through worst case scenario emergency response planning across sectors for a CZE event. As part of this effort, identify gaps of knowledge across sectors related to emergency response, resources that currently exist that could help a response effort. Outline recovery planning and coordination at the hub.
- Clarify regulatory authority and oversight of hubs, either through ongoing work through state commissions, and/or through work of a collaborative table. For example, a process could work through the difference between the scope of federal,

[17] 1) What ideas could reduce the risks associated with seismic activity impacting fuel storage facilities in northwest Portland at the CEI hub? 2) What are the long- or short-term incentives, regulations, agreements, or other creative approaches that could be identified in order to bring all relevant parties to a collaborative table to improve resiliency?

state, and local regulations as it relates to the hub. This effort could also explore programs at the Oregon Department of Environmental Quality's oil spill program, the Oregon State Fire Marshal's inspections of tank farms, the Oregon Public Utilities Commission's oversight of regulated utilities, and a review of the scope of the Oregon Seismic Safety Policy Advisory Commission to better understand how it could help on mitigation issues specific to a hub.

- Identify initial mitigation options, resources, and gaps in order to protect human and natural resources beyond the hub; longer-term planning could be part of this effort if there is ***adequate participation across sectors.***

These ideas could start a conversation, but we emphasize that part of the convening effort would be for the convened group to identify areas where to start with sector education.

3.3. Recommendation three: Convene to explore incentives

As a second phase building off of an education-focused effort, we do believe a collaborative table effort, working on an exploration of incentives, would be beneficial. We found those we interviewed to be creative when asked to provide off-the-cuff ideas, and we think a collaborative table could further explore and vet more ideas. We also think, if such a table proves beneficial, it could attract those entities that did not respond to our request for interviews as part of this assessment process, and could lead to the needed level of engagement on mitigation efforts.

3. FINAL COMMENTS

We acknowledge that securing the interviews we did for this assessment took significantly more time than we anticipated from the outset. We appreciate that the city of Portland team gave us more time to make additional attempts to secure interviews for this assessment report.

Finally, we want to recognize and acknowledge the support of the staff at the City of Portland and the representatives of the Portland City Club in this effort. City emergency response staff, in particular, has been invaluable in ensuring that the hard work to ensure the issue of seismic preparedness of the CEI hub remains on the forefront of policymakers' and industry leaders' agendas. This assessment process, while not leading to an immediate recommendation for an Oregon Solutions process at this time, demonstrated the strong interest in a collaborative effort to improve seismic resiliency of the CEI hub. This was unclear prior to this assessment process.

APPENDIX A: INTERVIEWEES

Raihana Ansary
Regional Solutions Coordinator Metro Region

Denise Barrett
Regional Disaster Preparedness Organization Manager

Chief Sara Boone
City of Portland

Kevin Brice
US Army Corps of Engineers

Abby Boudouris
Oregon Department of Environmental Quality

Tom Dyke
Portland City Club

Barnes Ellis
Portland City Club

Allen Fore
Kinder Morgan

Mark Fritz
Star Oil

Rob Fullmer
Portland City Club

Bruce Gilles
Oregon Department of Environmental Quality

Mike Harryman
Oregon Governor's Office

Deanna Henry
Oregon Department of Energy

Jeff Hibner
NuStar

Andrew Holbrook
Kinder Morgan

Holli Johnson
Western States Petroleum Association

Joe Karney
NW Natural Gas

Leon Kempner
BPA

Lori Koho
Oregon Public Utility Commission

Suzanne Lemieux
American Petroleum Industry

Lance Lindsey
US Army Corps of Engineers

Jim McKenna
Oregon Governor's Office

Carmen Merlo
City of Portland

Jim Merten
US Coast Guard

Chief Mike Myers
City of Portland

Jonna Papefthimiou
City of Portland

Andrew Phelps
Oregon Emergency Management Department

Dan Pippenger
Port of Portland

Danelle Romain
Oregon Fuels Association

Marianna Ruiz-Temple
Oregon State Fire Marshal's Office

Kristen Sheeran
Oregon Governor's Office

Yumei Wang
Oregon Department of Geology and Mineral Industries

APPENDIX B: CRITICAL PLAYERS

Federal Agencies
Pipelines & Hazardous Materials Safety Administration PHMSA (within US Department of Transportation)
Federal Energy Regulatory Commission
US Coast Guard
Bonneville Power Administration
Department of Homeland Security
US Geological Survey
Federal Emergency Management Administration
US Army Corps of Engineers
Environmental Protection Agency (if there is a connection to Portland Harbor Superfund)

State Agencies/Tribes
Oregon Public Utilities Commission
Oregon Department of Environmental Quality
Oregon Department of Energy
Oregon State Fire Marshal
Oregon Department of State Lands (they own riverbeds)
Oregon Department of Geology and Mineral Industries
Oregon Department of Consumer & Business Services—State Building Codes
Oregon Emergency Management
Oregon Department of Transportation
Oregon Health Authority
Oregon Tribes
Oregon Department of Land Conservation & Development

Local/Regional Agencies
City of Portland
City of Salem
City of Eugene
City of Medford
Firefighting divisions
Regional Disaster Preparedness

Other
Individual oil companies
Conservation groups
Public leaders, including leaders from Eugene, Salem, and Medford (see this as a statewide issue)
Western States Petroleum Association
Oregon Fuel Association
Community groups
Utilities
Port of Portland

APPENDIX C: OREGON SOLUTIONS ASSESSMENT INTERVIEW QUESTIONS

QUESTIONS PART A

- What has been your level of involvement in this issue?
    - If not at all, what information would you need in order to effectively engage in a process to improve resiliency at the hub?
- From your perspective, what could be done to minimize the risk at the CEI hub from a Cascadia Subduction Zone event; (e.g., replacing, retrofitting, or consolidating of tanks, barriers, building code changes, pipelines crossing the river, liquefaction, general public's available knowledge of risk, etc.)?
    - Of these, what is your *highest priority*?
- Are there external factors that could impact the need for the hub in the mid-term future (e.g., transition to alternative fuels/energy, unforeseen decommissioning of tanks)?
- Would a distributed system of hubs be possible in the future to minimize risk?
    - If yes, what would need to be done to move a hub? What barriers do you foresee?

QUESTIONS PART B

- From your perspective, where might there be an opportunity to work together to impact this issue?
- What unforeseen *opposition* or *conflict* might there be for a project like this?
- What unforeseen *support* might there be for a project like this?
- What incentives are needed to *get the parties together* to work on improving resiliency at the CEI hub (e.g., from funding to backup generators for tanks that currently do not have them)?
- Are there (other) critical issues/challenges/hurdles that might need to be resolved in order to bring people to the table? How would you suggest going about addressing these challenges/issues/hurdles?
- Who are the *critical* players in relation to this issue (e.g., federal, state, local, private)

- How willing do you think they would be to engage in an Oregon Solutions process focused on incentives to improve the resiliency of the CEI hub?

- How might you/your organization be willing to participate in an Oregon Solutions process?

- Who else would you recommend be interviewed for this assessment?

- If an Oregon Solutions project moves forward, who do you think has the credibility and gravitas to be a convener who could engage diverse partners to accomplish a project like this?

- Is there anything else you want to address that wasn't addressed already?

APPENDIX D: OREGON FUEL REPORT, LIQUID FUEL INFRASTRUCTURE

The following is an excerpt from "Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub," August 1, 2012, by Yumei Wang, Steven F. Bartlett, and Scott B. Miles of the State of Oregon Department of Geology and Mineral Industries.

PLANNING BASIS: WORST CASE SCENARIO

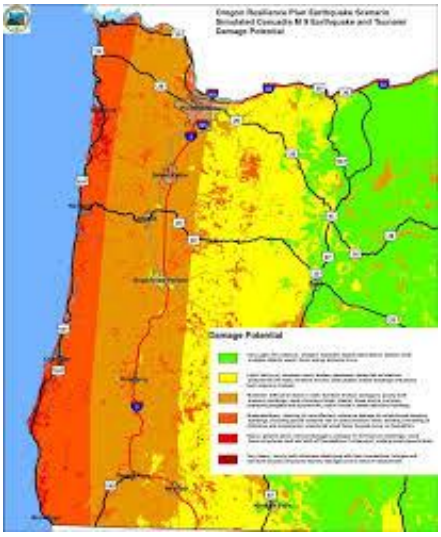
The Pacific Northwest region's most likely catastrophic event is the 9.0 Cascadia Subduction Zone (CSZ) earthquake and tsunami. Expected impacts include ground shaking for 4 – 6 minutes causing massive critical infrastructure damage along with a tsunami reaching some parts of the Oregon coast within 15 minutes of the quake.



The Federal Emergency Management Agency (FEMA) anticipates up to 25,000 fatalities, tens of thousands of people in need of shelter, and $30+ billion in economic losses.

Oregon counties in the high impact areas along the coast include: Clatsop, Tillamook, Lincoln, Lane, Douglas, Coos, and Curry counties. Mid-range impacted areas include the Portland metropolitan area with Washington, Multnomah, and Clackamas counties. Additional counties west of the Cascades in the mid-range impact areas include: Columbia, Yamhill, Polk, Marion, Benton, Linn, Jackson, and Josephine counties.

This event would devastate the region's petroleum supply and distribution system. Oregon can expect to lose most of the normal incoming supply of fuel. The Oregon Department of Geology and Mineral Industries (DOGAMI) 2013 Seismic Study found that the region's refineries and petroleum distribution terminals are expected to sustain moderate to significant damage. The facilities will have tank farm failures, marine dock failures, pipeline system breaks, hazardous material spills, fires, and structural damages onsite. Restoring the region's petroleum infrastructure would likely take months if not longer. In addition, the Olympic Pipeline that transports the majority of gasoline, diesel, and jet fuel to Oregon is projected to suffer as many as 250 breaks and 82 leaks.

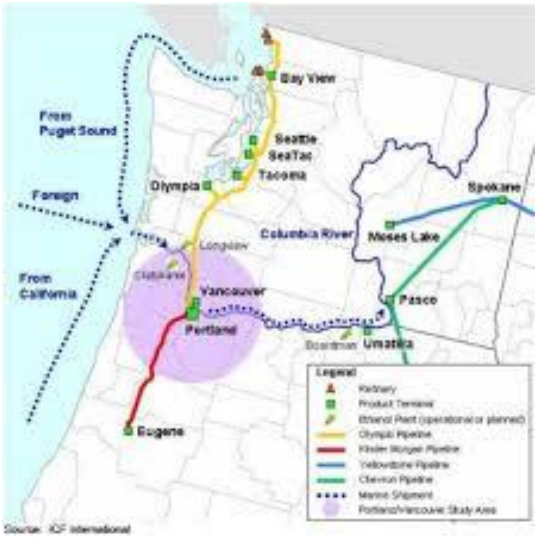


ODOE has no regulatory authority to require its private sector partners to make seismic upgrades to their fuel tank farms, pipeline systems, marine docks, or other facilities. However, ODOE is responsible for ensuring the state can

respond to a catastrophic event whenever it may happen and is prepared to address the impacts to the fuel infrastructure in its current state with all of its vulnerabilities.

OREGON PETROLEUM INFRASTRUCTURE

Oregon does not have refining capabilities and imports 100 percent of the refined petroleum products used in the state. That is an estimated three billion gallons of fuel each year or roughly 250 million gallons each month.



Gasoline & Diesel Supply and Distribution System

More than 90 percent of the refined petroleum product used in Oregon come from four refineries located in the Puget Sound area of Washington State. Product is transported from the refineries in Washington to Oregon via the 400 mile Olympic Pipeline (est. 90 percent) and barges (est. 10 percent) entering the state at the Port of Portland where seven petroleum distribution terminals are located in what is called the Portland Fuel Hub.

Oregon receives the remaining less than 10 percent of the state's refined petroleum products from refineries in Salt Lake City, Utah and the California Bay Area. From Salt Lake City, the refineries transport product via Tesoro's Salt Lake Products Pipeline System to a distribution terminal in Pasco, Washington. From the Pasco facility, fuel is trucked into Oregon to service eastern Oregon communities. California Bay Area refineries supply minimal quantities of fuel to a Chico, California terminal and then product is trucked into Oregon to supply southern Oregon communities.

Portland Distribution Terminals (Fuel Hub)—From the Portland Fuel Hub, product is distributed throughout Oregon by:

- Two Pipelines—Kinder Morgan's pipelines link petroleum terminals in the Portland Fuel Hub with the petroleum distribution terminal in Eugene, Oregon and provide jet fuel to the Portland International Airport.

- Barges—Product is loaded onto barges from the BP, Chevron, and Phillips 66 marine docks and delivered up the Columbia River to Pasco to service eastern Oregon communities.

- Tanker Trucks—An estimated 1,500 tanker trucks deliver fuel throughout the state to about 2,400 fueling locations.

Jet Fuel and Aviation Gas Supply & Distribution System



Oregon imports about 15 million gallons of jet fuel each month (about 180 million gallons of jet fuel annually) from the refineries in Washington State. An estimated 90 percent of the jet fuel is transported via the Olympic Pipeline to the petroleum distribution terminals located at the Port of Portland Fuel Hub. The remaining estimated 10 percent of the jet fuel is transported by ship or barge directly to the Port of Portland.

From the Fuel Hub, the Kinder Morgan Pipeline transports the bulk of the jet fuel to the Portland International Airport. Jet fuel is delivered by truck to other airports and air fields in the state from the Fuel Hub.

Oregon also imports up to 170,000 gallons of aviation gasoline (AVGAS) each month (just over two million gallons annually) from Canada and Texas. AVGAS is transported by rail to the Chevron and Kinder Morgan terminals in the Fuel Hub then trucked to airports and airfields throughout Oregon.

Constraints and Limitations

The petroleum industry exercises a "just in time" business strategy. Refineries and distribution terminals maintain adequate supplies to meet expected demands under normal conditions. Because of this, a significant increase in demand regardless of the cause will likely result in a fuel disruption or shortage.

Crude Supply in Alaska—At any given time, there is less than one week of crude oil available at the Alaska Terminal that supplies Washington's four refineries.

Refineries in Washington—Refineries located in the Puget Sound area of Washington State also have about a one week supply of product on hand. These refineries have been operating above 90 percent capacity for decades. The refineries have no plans to increase capacity and cannot accommodate a dramatic demand increase.

Portland Petroleum Distribution Terminals—The seven terminals located in the Fuel Hub in Portland are on a six-day refueling cycle. At any given time, the Fuel Hub has only a one week supply of refined gasoline and diesel reserves on hand.

Retail Service Stations—Depending on the storage capacity and refueling cycles, retail service stations throughout the state have about a two to three day supply on site.

PETROLEUM SECTOR INTERDEPENDENCIES

The rapid recovery of the region's petroleum supply and distribution system is heavily dependent on other critical lifeline services. The fuel sector is reliant on other ESFs to gain situational awareness; conduct damage assessment; obtain and transport fuel to priority users; and support recovery operations in the aftermath of a Cascadia earthquake. These interdependencies include:

ESF 1: Transportation—Viable roads, highways, bridges, and waterways are essential to supporting fuel deliveries to priority users.

ESF 2: Communications—Viable communications are essential to ODOE's ability to: 1) assess impacts to the petroleum supply and distribution system; 2) work with USDOE and petroleum industry partners to obtain fuel from outside the region and transport it into Oregon; 3) facilitate emergency fuel requests and deliveries to priority users; 4) provide fuel sector situational awareness to key federal, state, and local emergency response agencies and other critical stakeholders; and 5) provide emergency information and instructions regarding critical fuel conservation measures to the news media and public.

ESF 12: Energy (Electricity) —Operators at the petroleum terminals need electricity to conduct damage assessments to the facilities, tanks, equipment, and systems. Power is essential to getting the fuel out of the storage tanks into delivery trucks. Electricity is also needed at designated fuel distribution points and emergency fueling locations for responders to fuel up their response vehicles. Electric power is also required for pipeline operation.

State of Oregon Department of Environmental Quality

Electric Vehicles in Oregon – End of 2018

Updated: April 19, 2019
Contact: Cory-Ann Wind, wind.cory@deq.state.or.us

This document provides data on the electric vehicles registered in Oregon. DEQ compiles this report quarterly based on Oregon vehicle registration records provided by the Oregon Department of Motor Vehicles (DMV). This information is used for many purposes, including:

- To measure Oregon's progress towards Governor Brown's Executive Order 17-21 to have 50,000 electric vehicles registered in the state by the end of 2020;
- To implement two of DEQ's regulatory programs: the Zero Emissions Vehicle (ZEV) mandate and the Clean Fuels Program (CFP) and
- To provide information to the many stakeholders interested in transportation electrification.

Table 1 shows the number of electric vehicles registered in Oregon through the end of 2018.

Battery Electric Vehicles (BEVs)	Plug-in Hybrid Electric Vehicles (PHEVs)	Total Electric Vehicles (EVs)
12,951	9,094	22,045

Figure 1 shows the growth in BEV, PHEV and total EV registrations since 2013.

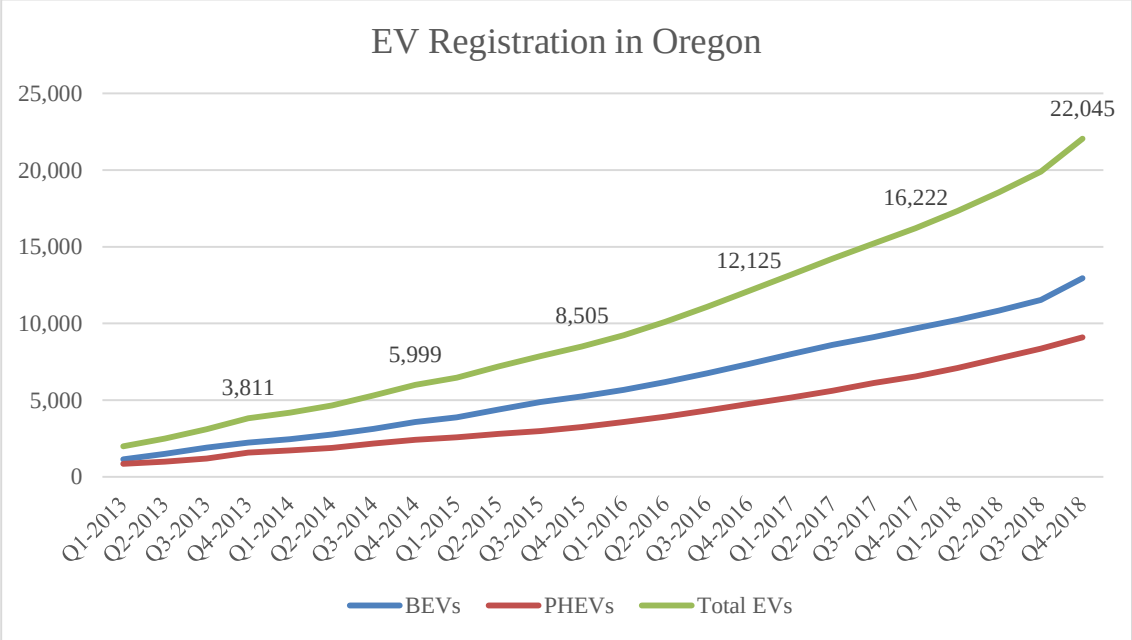


Table 2 shows the number of BEV, PHEV and total EVs registered by county, including registrations per capita and changes in registrations since the end of June 2018.

	End of Dec 2018						Changes since June 2018			
County	BEVs	PHEVs	EVs	% Registered in County	Population	Registrations per capita	BEVs	PHEVs	EVs	% change
Baker	5	8	13	0.06%	15,980	0.08%	(2)	1	(1)	-7.69%
Benton	370	266	636	3.06%	88,249	0.76%	132	39	171	26.89%
Clackamas	1,846	1,116	2,962	14.58%	399,962	0.80%	566	163	729	24.61%
Clatsop	48	61	109	0.56%	38,021	0.32%	18	15	33	30.28%
Columbia	83	102	185	0.89%	50,207	0.39%	18	11	29	15.68%
Coos	57	69	126	0.61%	62,921	0.21%	14	9	23	18.25%
Crook	16	23	39	0.18%	21,717	0.18%	7	4	11	28.21%
Curry	35	40	75	0.35%	22,377	0.34%	19	8	27	36.00%
Deschutes	464	326	790	3.89%	175,321	0.49%	166	68	234	29.62%
Douglas	53	93	146	0.74%	107,576	0.15%	29	16	45	30.82%
Gilliam	0	3	3	0.01%	1,910	0.16%	0	1	1	33.33%
Grant	1	4	5	0.02%	7,209	0.07%	1	2	3	60.00%
Harney	1	7	8	0.04%	7,195	0.11%	0	1	1	12.50%
Hood River	75	46	121	0.61%	22,938	0.58%	28	6	34	28.10%
Jackson	466	447	913	4.45%	212,070	0.46%	107	83	190	20.81%
Jefferson	8	20	28	0.14%	22,707	0.13%	4	6	10	35.71%
Josephine	71	84	155	0.76%	84,514	0.20%	24	13	37	23.87%
Klamath	34	43	77	0.38%	66,018	0.13%	17	15	32	41.56%
Lake	2	4	6	0.03%	7,807	0.08%	2	0	2	33.33%
Lane	862	696	1,558	7.65%	363,471	0.46%	307	136	443	28.43%
Lincoln	84	87	171	0.83%	47,307	0.38%	27	24	51	29.82%
Linn	123	143	266	1.29%	121,074	0.23%	45	37	82	30.83%
Malheur	10	8	18	0.09%	30,421	0.07%	6	2	8	44.44%
Marion	532	537	1,069	5.17%	330,453	0.34%	152	100	252	23.57%
Morrow	0	5	5	0.02%	11,153	0.04%	0	2	2	40.00%
Multnomah	4,107	2,439	6,546	32.09%	788,459	0.89%	1,256	443	1,699	25.95%
Polk	150	163	313	1.50%	79,666	0.41%	36	28	64	20.45%
Sherman	0	3	3	0.02%	1,635	0.24%	0	1	1	33.33%
Tillamook	44	37	81	0.41%	25,840	0.34%	13	9	22	27.16%
Umatilla	27	39	66	0.32%	76,736	0.09%	8	12	20	30.30%
Union	11	8	19	0.09%	25,810	0.08%	6	0	6	31.58%
Wallowa	3	4	7	0.03%	6,864	0.10%	2	0	2	28.57%
Wasco	23	46	69	0.32%	25,687	0.27%	(2)	4	2	2.90%
Washington	2,961	1,849	4,810	23.92%	572,071	0.92%	1,006	381	1,387	28.84%
Wheeler	0	2	2	0.01%	1,415	0.14%	0	0	0	0.00%
Yamhill	217	163	380	1.83%	102,366	0.39%	48	16	64	16.84%

Table 3 shows the number of BEV, PHEV and total EVs registered by electric utility district and changes in registrations since the end of June 2018.

Electric Utility	End of Dec 2018			Changes since June 2018				Opted in to the CFP for 2018
	BEVs	PHEVs	EVs	BEVs	PHEVs	EVs	% change	
Blachly-Lane Electrical Cooperative	11	9	20	6	4	10	50.00%	no
Canby Utility Board	30	32	62	8	9	17	27.42%	no
Central Electric	143	117	260	36	23	59	22.69%	yes
Central Lincoln PUD	88	101	189	26	24	50	26.46%	yes
City of Ashland	359	341	700	72	74	146	20.86%	yes
City of Bandon	11	6	17	5	3	8	47.06%	no
City of Cascade Locks	7	4	11	2	2	4	36.36%	yes
City of Monmouth Power & Light	13	16	29	6	-	6	20.69%	no
Clatskanie PUD	10	9	19	3	1	4	21.05%	yes
Columbia Basin Electric Coop		3					0.00%	no
Columbia Power Coop Association		3	3		2	2	66.67%	no
Columbia River PUD	74	96	170	14	10	24	14.12%	no
Consumers Power Inc.	174	127	301	45	15	60	19.93%	yes
Coos-Curry Electric Coop	36	45	81	17	8	25	30.86%	no
Douglas Electric Coop	12	18	30	3	-	3	10.00%	no
Emerald PUD	160	134	294	50	13	63	21.43%	yes
Eugene Water and Electric Board	615	426	1,041	205	92	297	28.53%	yes
Forest Grove	74	65	139	19	22	41	29.50%	no
Harney Electric Coop		2	2		-		0.00%	no
Hermiston	5	3	8	1	-	1	12.50%	yes
Hood River Electric Coop	13	6	19	5	(2)	3	15.79%	no
Idaho Power	13	9	22	6	1	7	31.82%	no
Lane Elec	88	54	142	27	4	31	21.83%	yes
McMinnville PUD	53	57	110					no
Midstate Electric Coop	37	33	70	13	1	14	20.00%	yes
Milton-Freewater Light & Power	2	3	5	1	-	1	20.00%	no
N Wasco Co PUD	17	40	57	4	7	11	19.30%	yes
Oregon Trail Electric Coop	17	24	41	5	4	9	21.95%	no
PacifiCorp	2,410	1,823	4,233	823	373	1,196	28.25%	yes
PGE	9,371	5,492	14,863	2,479	771	3,250	21.87%	yes
Salem Electric	98	104	202					no
Springfield Utility Board	61	74	135	16	21	37	27.41%	yes
Surprise Valley Electric Coop	1	1	2	1	-	1	50.00%	no
Tillamook People's Utility District	50	39	89	13	9	22	24.72%	yes
Umatilla Electric Coop	7	18	25	2	6	8	32.00%	yes
Wasco Electric Coop	3	5	8					no
West Oregon Electric Coop	12	10	22	2	3	5	22.73%	no

Table 4 shows the Top 10 Make/Model of BEVs by Model Year.

Battery Electric Vehicles (BEVs)										
Make / Model / Year	pre-2012	2012	2013	2014	2015	2016	2017	2018	2019	TOTAL
Nissan LEAF	461	410	1,194	424	801	318	202	289	61	4,160
Tesla Model 3							7	2,435	23	2,465
Tesla Model S		40	270	212	397	473	404	271	5	2,072
Chevrolet Bolt EV							650	251	176	1,077
Chevrolet Spark EV				73	446	431				950
Tesla Model X						277	347	322	4	950
Volkswagen e-Golf					146	306	64	15	6	537
FIAT 500e			49	60	241	75	40	12		477
Smart Fortwo electric drive			25	36	63	32	41	56		253
Kia Soul EV					14	126	76	32	1	249
Other	121	55	71	185	132	97	188	104	9	962

Table 5 shows the Top 10 Make/Model of PHEVs by Model Year.

Plug-in Hybrid Electric Vehicles (PHEVs)										
Make / Model / Year	pre-2012	2012	2013	2014	2015	2016	2017	2018	2019	TOTAL
Chevrolet Volt	33	291	444	359	194	206	574	363	27	2,491
Toyota Prius Prime							806	430	1	1,237
Ford C-MAX Energi			248	163	240	245	209			1,105
Ford Fusion Energi			96	148	129	248	263	110	10	1,004
BMW i3				143	161	103	224	77	1	709
Toyota Prius Plug-in Hybrid		339	216	87	58					700
Honda Clarity Plug-In Hybrid								322		322
Audi A3 Sportback e-tron						90	92	83		265
Chrysler Pacifica Hybrid							42	201	22	265
BMW X5						116	69	73		258
Other		6		41	46	207	188	461	106	1,055

Alternative formats

DEQ can provide documents in an alternate format or in a language other than English upon request. Call DEQ at 800-452-4011 or email deqinfo@deq.state.or.us.

Oregon Fuel Action Plan

Oregon Seismic Safety Policy Advisory Commission

Deanna Henry
Emergency Preparedness Manager

January 8, 2019



OREGON DEPARTMENT OF ENERGY

Emergency Powers: Fuel

State Declared Emergency – Management of Resources (ORS 401.188)

- ✓ Control, restrict, and regulate the use of food, feed, **fuel**, clothing, and other commodities, materials, goods, and services

Oregon Department of Energy (ODOE) Authority – (ORS 176.750-785)

- ✓ Develop and maintain a statewide contingency plan in response to petroleum shortages that impact Oregon
- ✓ Provide adequate fuel supplies to maintain emergency services, transportation, and the operation of the economy to ensure the health, safety, and welfare of the residents of the State of Oregon while an emergency exists

Fuel Executive Order

- ✓ Authorizes ODOE to implement the strategies in the Oregon Fuel Action Plan in response to a Cascadia Subduction Zone Earthquake and Tsunami

HISTORY: Energy Assurance & Resiliency

Awards Grants to 50 States – Fall 2009

To enhance state government energy assurance and resiliency







Oregon Department of Energy (ODOE)

- Partnered with the Oregon Public Utility Commission (OPUC) and the Oregon Department of Geology and Mineral Industries (DOGAMI)
- Assessed seismic vulnerabilities and earthquake impacts on critical energy infrastructure from a 9.0 Cascadia Subduction Zone (CSZ) earthquake
- Coincided with the state's development of the Oregon Resilience Plan

USDOE Definition: Resilience

"The ability of the energy critical infrastructure to absorb, adapt to, and/or rapidly recover from a potentially severe and disruptive event"

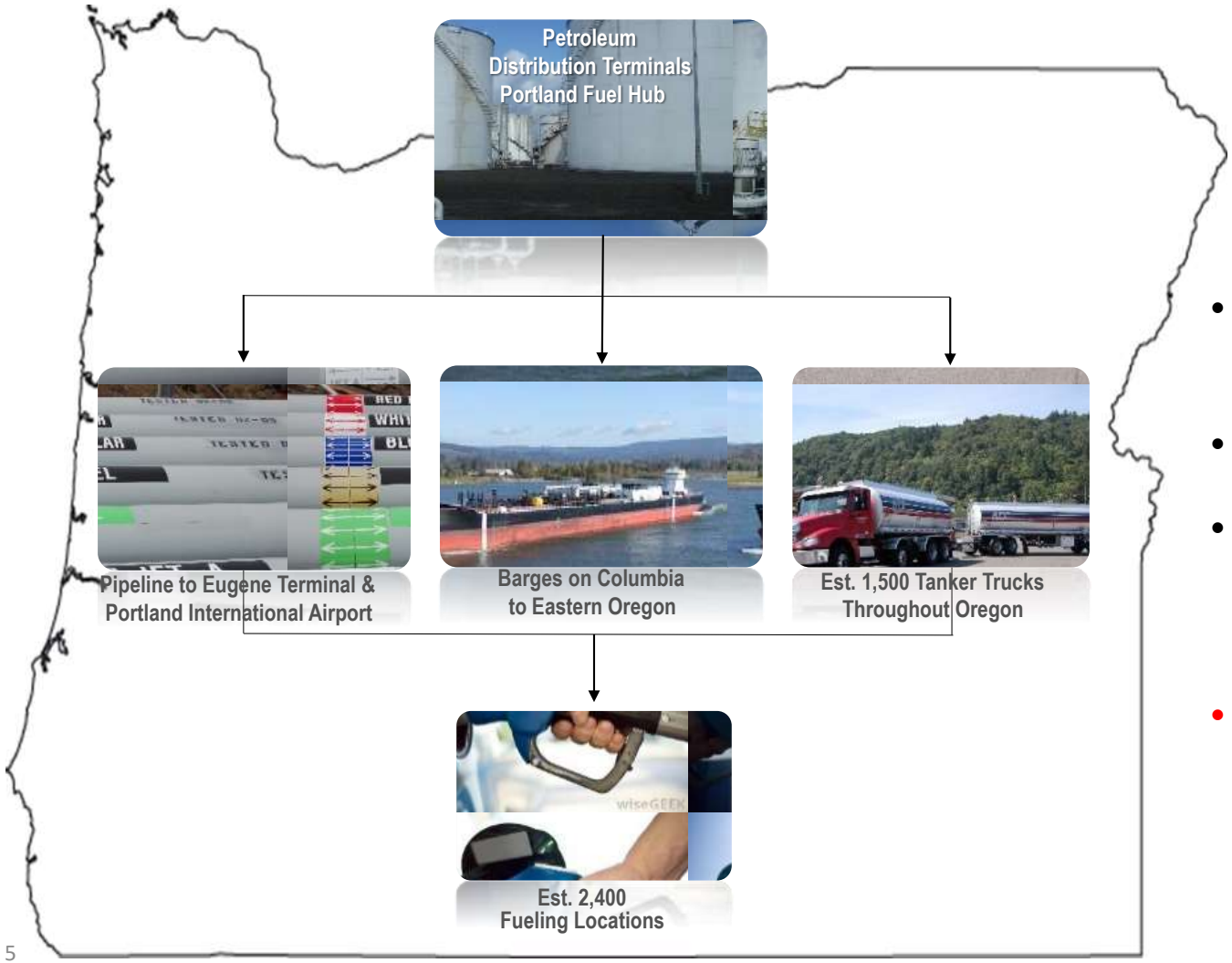


Oregon Imports 100 Percent of the State's Refined Petroleum Products

- Washington refineries supply more than 90 percent
  - ✓ About 75 percent by Olympic Pipeline to Oregon
  - ✓ Remaining product by tanker ships to Oregon
  - ✓ Portland Fuel Hub – located on liquefiable soils *anticipate significant fuel supply loss*
- Utah refineries supply less than 5 percent to eastern Oregon communities
- California refineries supply less than 5 percent to southern Oregon communities

OREGON DEPARTMENT OF ENERGY

Oregon Fuel Supply & Distribution System



- Annual fuel imports estimated at three billion gallons
- Six day fuel delivery cycle
- Product delivered throughout Oregon by pipeline, barges, and tanker trucks
- Anticipate significant impacts to distribution system post Cascadia

OREGON DEPARTMENT OF ENERGY

DOGAMI Study Sites Aging Petroleum Infrastructure







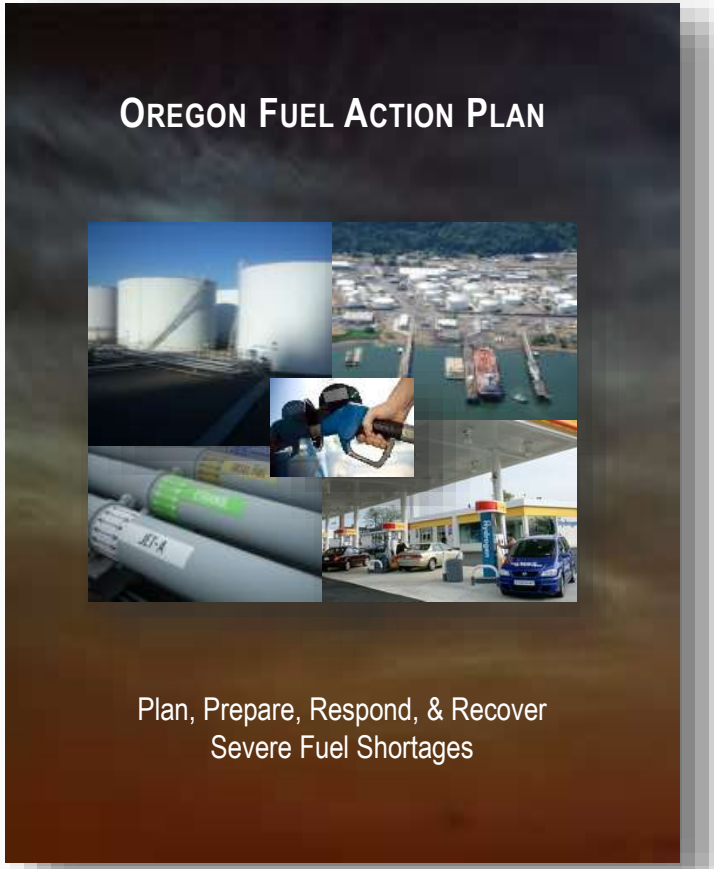
Olympic Pipeline built in the 1960s without seismic design standards

Only 3 of the hundreds of fuel tanks at the Portland fuel hub likely to survive Cascadia

Marine docks receiving fuel will be damaged with moderate earthquake

OREGON DEPARTMENT OF ENERGY

Oregon Fuel Action Plan



- Identifies ODOE authority and responsibilities to control and direct the state's overall response to petroleum emergencies
- Provides coordination structure for federal, state, county, tribal, and petroleum industry partners
- Provides structure for fuel allocation that identifies pre-approved priority users of fuel and user responsibilities
- Identifies state and county priority lifeline routes to support fuel deliveries
- Pre-designates Fuel Points of Distribution (FPOD) for receiving emergency fuel
- Plan on ODOE website - ***www./Oregon.gov/ENERGY***

Oregon Fuel Action Plan: 9 Priority Actions

OREGON DEPARTMENT OF ENERGY

Action 1	Action 2	Action 3	Action 4	Action 5	Action 6	Action 7	Action 8	Actions 9
Notification Activation and Authorities	**Public Information**	**Damage Assessment**	**Assess Fuel Needs & Determine Priorities**	**Outside Assistance: Fuel Supply**	**Fuel Conservation Measures**	**Temporary Waivers**	**Fuel Allocation**	**Recovery**
- Initial Notifications - Activate ODOE AOC - Succession & Authorities	- ODOE Fuel Emergency Outlook Web Page - Public Information Campaign – social media - News conferences - Telephone Information Center	- Assess impacts to petroleum infrastructure - Estimate timeline for repairs - Provide fuel sector info & status updates	- Assess fuel availability in Oregon - Assess 18 state ESFs, counties, and tribal fuel needs - Determine state & regional fuel priorities - Governor's Disaster Cabinet	- Identify & obtain fuel source - Identify viable fuel delivery options into Oregon - Identify viable options for dispensing fuel	- Issue voluntary fuel conservation measures - Issue mandatory fuel conservation measures	- Obtain temporary environmental operational, and safety waivers as needed to ensure the timely delivery of fuel	- Review & approve/deny fuel requests *(ESF Primary State Agencies, counties & tribes)* - Allocate fuel to approved state agencies, counties & tribes - Odd/Even Fuel Allocation - ***Fuel Request Form Provided***	- Allocate fuel to support recovery activities - State Recovery Coordinating Team - Governor's Recovery Cabinet - Terminate fuel recovery activities as appropriate

Fuel Allocation: All Hazards

Saving Lives and Restoring Critical Lifelines & Services

OREGON DEPARTMENT OF ENERGY

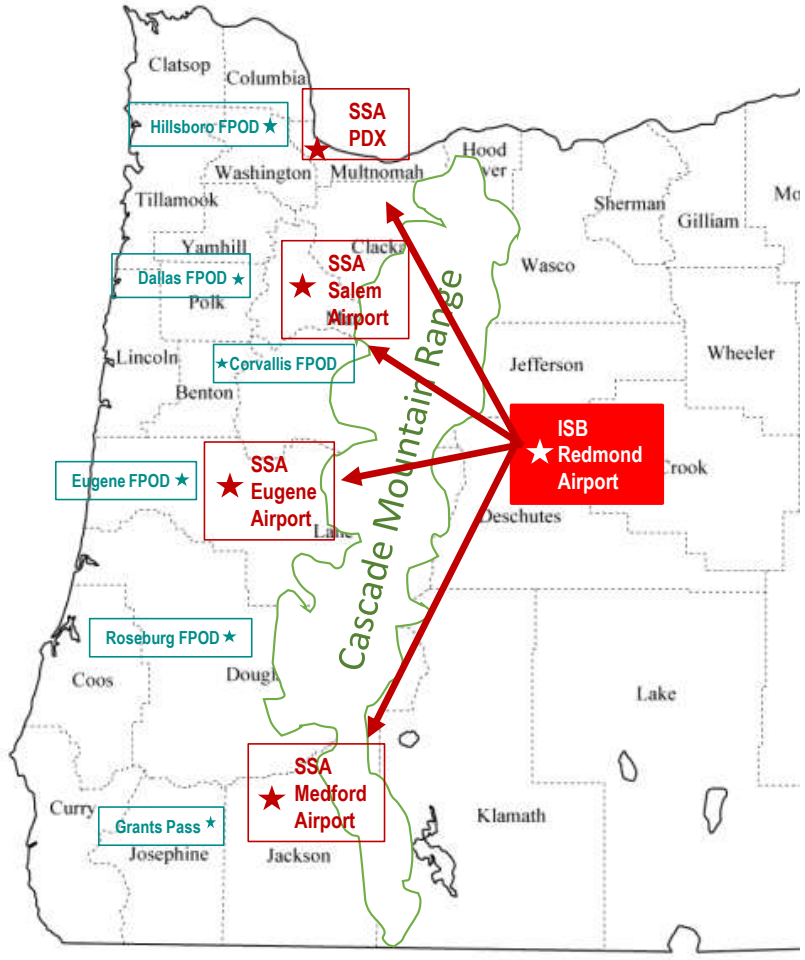
Challenge – Allocating fuel to emergency and essential service providers in the state involves 120 state agencies, 36 counties, 240 cities, and 9 federally-recognized tribes

Standardized Structure – Identifies three categories of priority fuel users:

- 18 ESF Primary State Agencies
- 36 Counties
- 9 Federally-Recognized Tribes



Fuel Strategy: Air Response



INITIAL AIR RESPONSE ACTIVITIES

Required Support: Federal, Military, and Industry

Bulk Fuel Source – Outside Region

- Bulk fuel "pushed" into the federal Incident Support Base - Redmond Municipal Airport
- Initial daily bulk fuel push into Oregon
  - Unleaded gasoline – est. 75,000 gallons
  - Diesel – est. 400,000 gallons
- ODOE directs fuel movement from federal ISB to State Staging Areas and to the pre-designated fuel points in the impacted communities

Fuel Strategy: State & Local Lifeline Routes

Oregon Department of Transportation (ODOT)





- **State Lifeline Routes** – Guide initial repairs on the transportation, power, and communication systems to support fuel delivery
- **County Lifeline Routes** – Counties to identify local priority routes that connect to state lifeline routes
- **Fuel Points of Distribution (FPOD)** – Counties pre-designate FPODs to receive emergency fuel supplies

- **Marion County Example:**
  - Identified Tier 1 priority routes connecting to state lifeline routes
  - Pre-designated 9 FPODs to receive emergency bulk fuel supplies

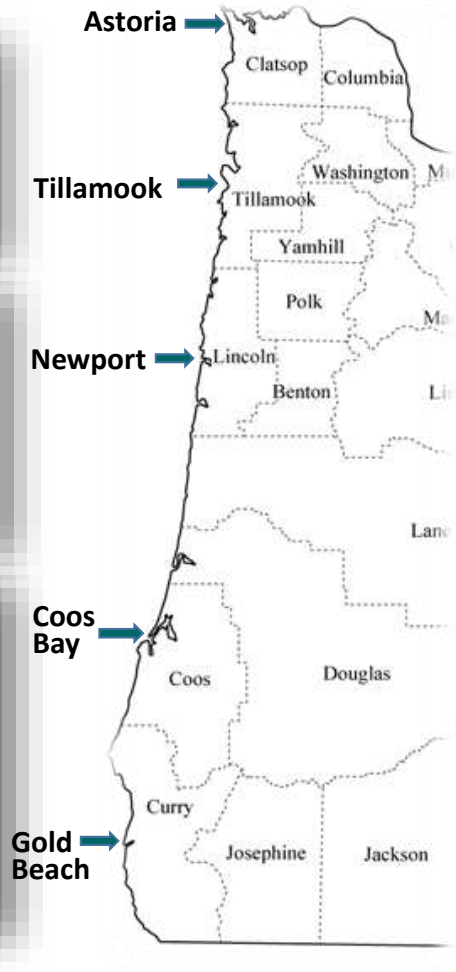
ODOE has fuel data from 26 of 36 counties

Fuel Strategy: Oregon Coast









U.S. MARITIME ADMINISTRATION (MARAD) ASSETS

Fuel Source: Outside Region

Maritime Assets – Deliver bulk fuel and operate portable fueling points along the Oregon Coast

- Ready Reserve Force ships out 7 – 10 days of notification
- Larger MARAD vessels ship out within 30 days of notification

Foreign Vessels – Lift Jones Act to allow foreign vessels to deliver bulk fuel to Oregon ports

- Superstorm Sandy – Foreign vessels shipped 115 million gallons of fuel to ports in New York and New Jersey

Fuel Strategy: Central & Eastern Oregon

OREGON DEPARTMENT OF ENERGY

VIABLE CRITICAL INFRASTRUCTURE

Working Transportation, Power & Communications Systems

Fuel Source: Pasco Distribution Terminal-Petroleum Industry

- Reliant on petroleum industry to meet fuel demands
- Obtain temporary waivers to ensure timely fuel movement
- Implement voluntary/mandatory fuel conservation measures
- Implement Odd/Even Fuel Allocation Program if needed
- Implement public information campaign to reduce fuel consumption



Oregon Fuel Action Plan: In Progress





JANUARY 25, 2018 FUELING ANXIETY TABLETOP: GAP IDENTIFIED

- Need for ODOE to assist counties with developing local fuel management plans
- ODOE works with the Oregon Fuels Association and member companies to identify strategies for local fuel management *(acquisition, storage, distribution)* post - Cascadia
  - Presented Oregon Fuel Action Plan at OFA Conference *(July 2018)*
  - Survey completed of OFA member companies *(November 2018)*
- ODOE to review survey results
- ODOE to facilitate meetings between counties and fuel distributors as appropriate to assist in local fuel management plan development

Partnership With OFA & Members

Alternate Fuel Hub: Post Cascadia



JANUARY 25, 2018 FUELING ANXIETY TABLETOP: GAP IDENTIFIED

- Need to identify an alternate location for a Fuel Hub if industry determines the existing location is unsalvageable post - Cascadia

- Industry Requirements for Alternate Fuel Hub:
  - Upriver on stable soils within close proximity to current location
  - Access to waterway
  - Access to rail systems
  - Government support





Oregon Only As Resilient as the Region's Fuel Infrastructure

- Washington Refineries Resilience
  - ✓ Anticipate moderate/significant damage – inoperable for months if not longer
- Olympic Pipeline Resilience
  - ✓ Anticipate widespread damage *(est. 250 breaks/82 leaks)* – inoperable for months if not longer
- Oregon Fuel Sector Resilience (CEI Hub)
  - ✓ No seismic assessments or risk mitigation plans have been conducted by fuel companies
  - ✓ Need to identify alternate CEI Hub post - Cascadia
  - ✓ Challenge remains getting fuel to the impacted communities with compromised roads and bridges

Oregon Fuel Action Plan

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OREGON DEPARTMENT OF ENERGY

Table A1. Total energy supply, disposition, and price summary
(quadrillion Btu per year, unless otherwise noted)

Supply, disposition, and prices	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Production								
Crude oil and lease condensate	19.54	22.42	29.31	30.01	29.73	29.18	24.57	0.3%
Natural gas plant liquids	5.04	5.86	7.58	8.01	8.08	8.05	7.65	0.8%
Dry natural gas	28.18	30.56	37.98	39.92	41.05	42.22	45.01	1.2%
Coal[1]	15.90	15.69	13.57	13.29	12.46	12.40	12.12	-0.8%
Nuclear / uranium[2]	8.42	8.46	7.03	6.95	6.87	6.92	7.03	-0.6%
Conventional hydroelectric power	2.76	2.61	2.65	2.56	2.49	2.46	2.42	-0.2%
Biomass[3]	4.57	4.69	4.79	4.90	5.00	5.13	5.38	0.4%
Other renewable energy[4]	3.42	3.76	5.37	5.75	6.18	7.05	8.77	2.7%
Other[5]	1.53	1.13	0.91	0.72	0.72	0.74	0.78	-1.1%
Total	**89.36**	**95.18**	**109.19**	**112.11**	**112.58**	**114.16**	**113.74**	**0.6%**
Imports								
Crude oil	17.60	17.32	12.43	10.71	11.49	12.90	16.29	-0.2%
Petroleum and other liquids[6]	4.43	5.07	4.54	4.05	3.85	3.97	4.49	-0.4%
Natural gas	3.11	2.99	2.89	2.72	2.65	2.45	1.81	-1.6%
Other imports[7]	0.34	0.34	0.25	0.25	0.25	0.25	0.23	-1.2%
Total	**25.47**	**25.72**	**20.10**	**17.72**	**18.24**	**19.58**	**22.82**	**-0.4%**
Exports								
Petroleum and other liquids[8]	12.18	15.16	19.64	19.43	20.33	21.04	18.19	0.6%
Natural gas	3.19	3.72	8.14	9.23	9.37	9.65	10.13	3.2%
Coal	2.54	2.61	2.13	1.91	1.72	1.77	1.54	-1.6%
Total	**17.92**	**21.49**	**29.91**	**30.56**	**31.41**	**32.45**	**29.86**	**1.0%**
Discrepancy[9]	**-0.49**	**-0.72**	**0.08**	**0.11**	**0.14**	**0.13**	**0.16**	**- -**
Consumption								
Petroleum and other liquids[10]	37.64	38.34	36.89	35.85	35.30	35.57	37.34	-0.1%
Natural gas	28.08	30.42	32.33	32.96	33.86	34.55	36.20	0.5%
Coal[11]	13.76	13.17	11.47	11.37	10.73	10.63	10.57	-0.7%
Nuclear / uranium[2]	8.42	8.46	7.03	6.95	6.87	6.92	7.03	-0.6%
Conventional hydroelectric power	2.76	2.61	2.65	2.56	2.49	2.46	2.42	-0.2%
Biomass[12]	3.00	3.05	3.25	3.36	3.47	3.61	3.86	0.7%
Other renewable energy[4]	3.42	3.76	5.37	5.75	6.18	7.05	8.77	2.7%
Other[13]	0.32	0.31	0.31	0.36	0.36	0.37	0.36	0.5%
Total	**97.41**	**100.13**	**99.30**	**99.16**	**99.27**	**101.15**	**106.55**	**0.2%**
Prices (2018 dollars per unit)								
Crude oil spot prices (dollars per barrel)								
Brent	55	74	82	93	100	105	108	1.2%
West Texas Intermediate	52	68	78	87	95	100	105	1.3%
Natural gas at Henry Hub (dollars per million Btu)	3.08	2.99	3.53	3.76	4.02	4.21	4.87	1.5%
Coal (dollars per ton)								
at the minemouth[14]	36.7	33.6	32.8	32.0	32.3	32.7	33.0	-0.1%
Coal (dollars per million Btu)								
at the minemouth[14]	1.78	1.65	1.59	1.57	1.59	1.61	1.62	0.0%
Average end-use[15]	2.23	2.30	2.35	2.40	2.41	2.44	2.44	0.2%
Average electricity (cents per kilowatthour)	10.8	10.6	10.3	10.4	10.6	10.5	10.5	0.0%

Table A1. Total energy supply, disposition, and price summary (continued)
(quadrillion Btu per year, unless otherwise noted)

Supply, disposition, and prices	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Prices (nominal dollars per unit)								
Crude oil spot prices (dollars per barrel)								
Brent	54	74	97	124	148	174	226	3.5%
West Texas Intermediate	51	68	93	116	141	166	219	3.7%
Natural gas at Henry Hub (dollars per million Btu)	3.02	2.99	4.20	5.00	5.95	6.96	10.18	3.9%
Coal (dollars per ton)								
at the minemouth[14]	36.0	33.6	39.0	42.5	47.8	54.2	69.0	2.3%
Coal (dollars per million Btu)								
at the minemouth[14]	1.75	1.65	1.89	2.08	2.35	2.66	3.39	2.3%
Average end-use[15]	2.18	2.30	2.80	3.19	3.56	4.03	5.11	2.5%
Average electricity (cents per kilowatthour)	10.6	10.6	12.3	13.9	15.6	17.4	22.0	2.3%

[1]Includes waste coal.
[2]These values represent the energy obtained from uranium when it is used in light water reactors. The total energy content of uranium is much larger, but alternative processes are required to take advantage of it.
[3]Includes grid-connected electricity from wood and wood waste; biomass, such as corn, used for liquid fuels production; and non-electric energy demand from wood. Refer to Table A17 for details.
[4]Includes grid-connected electricity from landfill gas; biogenic municipal waste; wind; photovoltaic and solar thermal sources; and non-electric energy from renewable sources, such as active and passive solar systems. Excludes electricity imports using renewable sources and nonmarketed renewable energy. See Table A17 for selected nonmarketed residential and commercial renewable energy data.
[5]Includes non-biogenic municipal waste, liquid hydrogen, methanol, and some domestic inputs to refineries.
[6]Includes imports of finished petroleum products, unfinished oils, alcohols, ethers, blending components, and renewable fuels such as ethanol.
[7]Includes coal, coal coke (net), and electricity (net). Excludes imports of fuel used in nuclear power plants.
[8]Includes crude oil, petroleum products, ethanol, and biodiesel.
[9]Balancing item. Includes unaccounted for supply, losses, gains, and net storage withdrawals.
[10]Estimated consumption. Includes petroleum-derived fuels and non-petroleum derived fuels, such as ethanol and biodiesel, and coal-based synthetic liquids. Petroleum coke, which is a solid, is included. Also included are hydrocarbon gas liquids and crude oil consumed as a fuel. Refer to Table A17 for detailed renewable liquid fuels consumption.
[11]Excludes coal converted to coal-based synthetic liquids and natural gas.
[12]Includes grid-connected electricity from wood and wood waste, non-electric energy from wood, and biofuels heat and coproducts used in the production of liquid fuels, but excludes the energy content of the liquid fuels.
[13]Includes non-biogenic municipal waste, liquid hydrogen, and net electricity imports.
[14]Includes reported prices for both open market and captive mines. Prices weighted by production, which differs from average minemouth prices published in EIA data reports where it is weighted by reported sales.
[15]Prices weighted by consumption; weighted average excludes export free-alongside-ship (f.a.s.) prices.
Btu = British thermal unit.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 natural gas supply values: U.S. Energy Information Administration (EIA), *Natural Gas Monthly*, July 2018. 2017 coal minemouth and delivered coal prices: EIA, *Annual Coal Report 2013*. 2017 petroleum supply values: EIA, *Petroleum Supply Annual 2017*. 2017 crude oil spot prices and natural gas spot price at Henry Hub: Thomson Reuters. Other 2017 coal values: *Quarterly Coal Report, October-December 2017*. Other 2017 values: EIA, *Monthly Energy Review*, September 2018. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A2. Energy consumption by sector and source
(quadrillion Btu per year, unless otherwise noted)

Sector and source	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Energy consumption								
Residential								
Propane	0.49	0.50	0.42	0.39	0.38	0.37	0.37	-1.0%
Distillate fuel oil[1]	0.48	0.49	0.38	0.33	0.30	0.27	0.22	-2.5%
Petroleum and other liquids subtotal	0.97	0.99	0.79	0.73	0.68	0.64	0.59	-1.6%
Natural gas	4.58	5.02	4.71	4.65	4.62	4.61	4.60	-0.3%
Renewable energy[2]	0.37	0.44	0.42	0.41	0.39	0.38	0.34	-0.8%
Electricity	4.70	4.99	4.89	4.95	5.07	5.24	5.58	0.4%
Delivered energy	**10.62**	**11.43**	**10.80**	**10.73**	**10.77**	**10.87**	**11.11**	**-0.1%**
Electricity related losses	9.27	9.71	8.58	8.37	8.26	8.36	8.57	-0.4%
Total	**19.89**	**21.14**	**19.39**	**19.11**	**19.03**	**19.22**	**19.68**	**-0.2%**
Commercial								
Propane	0.15	0.16	0.15	0.16	0.17	0.18	0.19	0.7%
Motor gasoline[3]	0.37	0.37	0.37	0.38	0.38	0.38	0.39	0.1%
Kerosene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.1%
Distillate fuel oil	0.33	0.35	0.33	0.31	0.30	0.29	0.28	-0.6%
Residual fuel oil	0.00	0.02	0.01	0.00	0.00	0.00	0.01	-1.4%
Petroleum and other liquids subtotal	0.86	0.89	0.87	0.85	0.85	0.85	0.88	0.0%
Natural gas	3.28	3.42	3.38	3.45	3.56	3.70	4.07	0.5%
Coal	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.0%
Renewable energy[4]	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.0%
Electricity	4.60	4.68	4.80	4.87	4.96	5.10	5.54	0.5%
Delivered energy	**8.91**	**9.15**	**9.21**	**9.33**	**9.53**	**9.81**	**10.65**	**0.5%**
Electricity related losses	9.07	9.11	8.43	8.24	8.08	8.13	8.52	-0.2%
Total	**17.98**	**18.27**	**17.63**	**17.57**	**17.61**	**17.94**	**19.17**	**0.2%**
Industrial[5]								
Liquefied petroleum gases and other[6]	2.80	3.11	3.62	3.88	4.03	4.18	4.41	1.1%
Motor gasoline[3]	0.26	0.26	0.29	0.30	0.31	0.32	0.33	0.8%
Distillate fuel oil	1.17	1.22	1.27	1.30	1.34	1.39	1.52	0.7%
Residual fuel oil	0.06	0.05	0.06	0.06	0.06	0.07	0.07	0.9%
Petrochemical feedstocks	0.70	0.66	0.93	1.08	1.16	1.24	1.36	2.3%
Other petroleum[7]	3.40	3.47	3.22	3.22	3.39	3.60	4.06	0.5%
Petroleum and other liquids subtotal	8.38	8.77	9.39	9.84	10.29	10.79	11.76	0.9%
Natural gas	8.24	8.53	9.44	9.72	9.84	10.13	10.71	0.7%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Lease and plant fuel[8]	1.63	1.81	2.20	2.30	2.37	2.46	2.42	0.9%
Natural gas to liquefy gas for export[9]	0.07	0.11	0.43	0.53	0.53	0.53	0.53	5.0%
Natural gas subtotal	9.94	10.45	12.08	12.56	12.74	13.11	13.66	0.8%
Metallurgical coal	0.50	0.55	0.48	0.48	0.49	0.50	0.47	-0.5%
Other industrial coal	0.64	0.59	0.64	0.62	0.59	0.58	0.57	-0.1%
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Net coal coke imports	-0.03	-0.01	-0.02	-0.01	-0.01	-0.01	-0.01	-1.1%
Coal subtotal	1.12	1.12	1.10	1.09	1.07	1.06	1.03	-0.2%
Biofuels heat and coproducts	0.78	0.78	0.85	0.86	0.85	0.85	0.84	0.2%
Renewable energy[10]	1.65	1.64	1.78	1.90	2.04	2.21	2.53	1.4%
Electricity	3.23	3.24	3.67	3.85	3.94	4.07	4.31	0.9%
Delivered energy	**25.10**	**26.00**	**28.88**	**30.08**	**30.93**	**32.09**	**34.12**	**0.9%**
Electricity related losses	6.37	6.30	6.45	6.50	6.42	6.49	6.62	0.2%
Total	**31.47**	**32.31**	**35.33**	**36.59**	**37.35**	**38.58**	**40.74**	**0.7%**

Table A2. Energy consumption by sector and source (continued)
(quadrillion Btu per year, unless otherwise noted)

Sector and source	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Transportation								
Propane	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.5%
Motor gasoline[3]	16.69	16.66	14.62	13.28	12.35	12.00	12.29	-0.9%
of which: E85[11]	0.01	0.04	0.14	0.21	0.24	0.25	0.11	3.1%
Jet fuel[12]	2.91	2.95	3.15	3.31	3.47	3.63	3.99	0.9%
Distillate fuel oil[13]	6.69	6.77	6.81	6.61	6.45	6.43	6.58	-0.1%
Residual fuel oil	0.69	0.64	0.64	0.59	0.55	0.53	0.51	-0.7%
Other petroleum[14]	0.16	0.16	0.15	0.15	0.15	0.15	0.15	-0.1%
Petroleum and other liquids subtotal	27.15	27.19	25.38	23.95	22.98	22.75	23.54	-0.4%
Pipeline and distribution fuel natural gas	0.68	0.70	0.65	0.68	0.70	0.71	0.76	0.3%
Compressed / liquefied natural gas	0.07	0.08	0.14	0.20	0.27	0.36	0.55	6.2%
Liquid hydrogen	0.00	0.00	0.02	0.03	0.03	0.04	0.05	12.4%
Electricity	0.04	0.04	0.16	0.25	0.34	0.43	0.61	8.7%
Delivered energy	**27.94**	**28.02**	**26.34**	**25.10**	**24.32**	**24.28**	**25.51**	**-0.3%**
Electricity related losses	0.07	0.08	0.28	0.42	0.55	0.68	0.94	7.9%
Total	**28.01**	**28.10**	**26.62**	**25.52**	**24.87**	**24.97**	**26.45**	**-0.2%**
Unspecified sector[15]	**0.06**	**0.32**	**0.34**	**0.37**	**0.41**	**0.44**	**0.51**	**1.4%**
Delivered energy consumption for all sectors								
Liquefied petroleum gases and other[6]	3.45	3.77	4.20	4.44	4.59	4.73	4.98	0.9%
Motor gasoline[3]	17.21	17.22	15.32	13.98	13.07	12.72	13.04	-0.9%
of which: E85[11]	0.01	0.04	0.14	0.21	0.24	0.25	0.11	3.1%
Jet fuel[12]	3.48	3.58	3.76	3.95	4.15	4.33	4.77	0.9%
Kerosene[16]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.1%
Distillate fuel oil[1]	8.27	8.59	8.48	8.26	8.10	8.09	8.31	-0.1%
Residual fuel oil	0.75	0.71	0.71	0.66	0.62	0.60	0.59	-0.6%
Petrochemical feedstocks	0.70	0.66	0.93	1.08	1.16	1.24	1.36	2.3%
Other petroleum[17]	3.56	3.63	3.37	3.37	3.54	3.75	4.21	0.5%
Petroleum and other liquids subtotal	37.42	38.16	36.77	35.74	35.21	35.48	37.26	-0.1%
Natural gas	16.17	17.05	17.66	18.01	18.29	18.79	19.93	0.5%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Lease and plant fuel[8]	1.63	1.81	2.20	2.30	2.37	2.46	2.42	0.9%
Natural gas to liquefy gas for export[9]	0.07	0.11	0.43	0.53	0.53	0.53	0.53	5.0%
Pipeline and distribution fuel natural gas	0.68	0.70	0.65	0.68	0.70	0.71	0.76	0.3%
Natural gas subtotal	18.55	19.67	20.95	21.53	21.89	22.49	23.64	0.6%
Metallurgical coal	0.50	0.55	0.48	0.48	0.49	0.50	0.47	-0.5%
Other coal	0.66	0.60	0.66	0.64	0.61	0.60	0.59	-0.1%
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Net coal coke imports	-0.03	-0.01	-0.02	-0.01	-0.01	-0.01	-0.01	-1.1%
Coal subtotal	1.14	1.14	1.12	1.11	1.09	1.08	1.05	-0.2%
Biofuels heat and coproducts	0.78	0.78	0.85	0.86	0.85	0.85	0.84	0.2%
Renewable energy[18]	2.15	2.22	2.34	2.45	2.57	2.72	3.01	1.0%
Liquid hydrogen	0.00	0.00	0.02	0.03	0.03	0.04	0.05	12.4%
Electricity	12.57	12.95	13.52	13.92	14.32	14.83	16.04	0.7%
Delivered energy	**72.62**	**74.92**	**75.56**	**75.63**	**75.96**	**77.49**	**81.89**	**0.3%**
Electricity related losses	24.79	25.21	23.74	23.54	23.32	23.66	24.66	-0.1%
Total	**97.41**	**100.13**	**99.30**	**99.16**	**99.27**	**101.15**	**106.55**	**0.2%**
Electric power[19]								
Distillate fuel oil	0.05	0.09	0.08	0.07	0.06	0.06	0.06	-1.3%
Residual fuel oil	0.16	0.09	0.04	0.04	0.04	0.03	0.02	-4.8%
Petroleum and other liquids subtotal	0.22	0.18	0.12	0.11	0.10	0.09	0.08	-2.6%
Natural gas	9.53	10.74	11.38	11.43	11.97	12.06	12.55	0.5%
Steam coal	12.63	12.04	10.34	10.26	9.65	9.55	9.52	-0.7%
Nuclear / uranium[20]	8.42	8.46	7.03	6.95	6.87	6.92	7.03	-0.6%
Renewable energy[21]	6.25	6.43	8.08	8.38	8.72	9.54	11.21	1.8%
Non-biogenic municipal waste	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.0%
Electricity imports	0.19	0.18	0.17	0.21	0.21	0.21	0.19	0.2%
Total	**37.36**	**38.16**	**37.26**	**37.45**	**37.63**	**38.49**	**40.70**	**0.2%**

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Table A2. Energy consumption by sector and source (continued)
(quadrillion Btu per year, unless otherwise noted)

Sector and source	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Total energy consumption								
Liquefied petroleum gases and other[6]	3.45	3.77	4.20	4.44	4.59	4.73	4.98	0.9%
Motor gasoline[3]	17.21	17.22	15.32	13.98	13.07	12.72	13.04	-0.9%
of which: E85[11]	0.01	0.04	0.14	0.21	0.24	0.25	0.11	3.1%
Jet fuel[12]	3.48	3.58	3.76	3.95	4.15	4.33	4.77	0.9%
Kerosene[16]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.1%
Distillate fuel oil[1]	8.32	8.67	8.56	8.33	8.16	8.15	8.36	-0.1%
Residual fuel oil	0.92	0.81	0.75	0.70	0.65	0.63	0.61	-0.9%
Petrochemical feedstocks	0.70	0.66	0.93	1.08	1.16	1.24	1.36	2.3%
Other petroleum[17]	3.56	3.63	3.37	3.37	3.54	3.75	4.21	0.5%
Petroleum and other liquids subtotal	37.64	38.34	36.89	35.85	35.30	35.57	37.34	-0.1%
Natural gas	25.70	27.79	29.04	29.44	30.26	30.85	32.48	0.5%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Lease and plant fuel[8]	1.63	1.81	2.20	2.30	2.37	2.46	2.42	0.9%
Natural gas to liquefy gas for export[9]	0.07	0.11	0.43	0.53	0.53	0.53	0.53	5.0%
Pipeline and distribution fuel natural gas	0.68	0.70	0.65	0.68	0.70	0.71	0.76	0.3%
Natural gas subtotal	28.08	30.42	32.33	32.96	33.86	34.55	36.20	0.5%
Metallurgical coal	0.50	0.55	0.48	0.48	0.49	0.50	0.47	-0.5%
Other coal	13.29	12.64	11.00	10.90	10.25	10.14	10.11	-0.7%
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Net coal coke imports	-0.03	-0.01	-0.02	-0.01	-0.01	-0.01	-0.01	-1.1%
Coal subtotal	13.76	13.17	11.47	11.37	10.73	10.63	10.57	-0.7%
Nuclear / uranium[20]	8.42	8.46	7.03	6.95	6.87	6.92	7.03	-0.6%
Biofuels heat and coproducts	0.78	0.78	0.85	0.86	0.85	0.85	0.84	0.2%
Renewable energy[22]	8.40	8.65	10.42	10.82	11.29	12.26	14.21	1.6%
Liquid hydrogen	0.00	0.00	0.02	0.03	0.03	0.04	0.05	12.4%
Non-biogenic municipal waste	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.0%
Electricity imports	0.19	0.18	0.17	0.21	0.21	0.21	0.19	0.2%
Total	**97.41**	**100.13**	**99.30**	**99.16**	**99.27**	**101.15**	**106.55**	**0.2%**
Energy use and related statistics								
Delivered energy use	72.62	74.92	75.56	75.63	75.96	77.49	81.89	0.3%
Total energy use	97.41	100.13	99.30	99.16	99.27	101.15	106.55	0.2%
Ethanol consumed in motor gasoline and E85	1.23	1.22	1.21	1.16	1.11	1.11	1.17	-0.1%
Population (millions)	326	328	345	355	365	374	389	0.5%
Gross domestic product (billion 2009 dollars)	17,096	17,582	20,116	22,157	24,348	26,675	32,006	1.9%
Carbon dioxide emissions (million metric tons)	5,147	5,250	4,977	4,903	4,830	4,856	5,019	-0.1%

[1]Includes residential use of kerosene.
[2]Includes wood used for residential heating. See Table A4 and/or Table A17 for estimates of nonmarketed renewable energy consumption for geothermal heat pumps, solar thermal water heating, and electricity generation from wind and solar photovoltaic sources.
[3]Includes ethanol and ethers blended into gasoline.
[4]Excludes ethanol. Includes commercial sector consumption of wood and wood waste, landfill gas, municipal waste, and other biomass for combined heat and power. See Table A5 and/or Table A17 for estimates of nonmarketed renewable energy consumption for solar thermal water heating and electricity generation from wind and solar photovoltaic sources.
[5]Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[6]Includes ethane, natural gasoline, and refinery olefins.
[7]Includes petroleum coke, asphalt, road oil, lubricants, still gas, and miscellaneous petroleum products.
[8]Represents natural gas used in well, field, and lease operations, and in natural gas processing plant machinery.
[9]Fuel used in facilities that liquefy natural gas for export.
[10]Includes consumption of energy produced from hydroelectric, wood and wood waste, municipal waste, and other biomass sources. Excludes ethanol in motor gasoline.
[11]E85 refers to a blend of 85 percent ethanol (renewable) and 15 percent motor gasoline (nonrenewable). To address cold starting issues, the percentage of ethanol varies seasonally. The annual average ethanol content of 74 percent is used for these projections.
[12]Includes only kerosene type.
[13]Diesel fuel for on- and off- road use.
[14]Includes aviation gasoline and lubricants.
[15]Represents consumption unattributed to the sectors above.
[16]Does not include residential use of kerosene.
[17]Includes aviation gasoline, petroleum coke, asphalt, road oil, lubricants, still gas, and miscellaneous petroleum products.
[18]Includes electricity generated for sale to the grid and for own use from renewable sources, and non-electric energy from renewable sources. Excludes ethanol and nonmarketed renewable energy consumption for geothermal heat pumps, buildings photovoltaic systems, and solar thermal water heaters.
[19]Includes consumption of energy by electricity-only and combined heat and power plants that have a regulatory status.
[20]These values represent the energy obtained from uranium when it is used in light water reactors. The total energy content of uranium is much larger, but alternative processes are required to take advantage of it.
[21]Includes conventional hydroelectric, geothermal, wood and wood waste, biogenic municipal waste, other biomass, wind, photovoltaic, and solar thermal sources. Excludes net electricity imports.
[22]Includes conventional hydroelectric, geothermal, wood and wood waste, biogenic municipal waste, other biomass, wind, photovoltaic, and solar thermal sources. Excludes ethanol, net electricity imports, and nonmarketed renewable energy consumption for geothermal heat pumps, buildings photovoltaic systems, and solar thermal water heaters.
Btu = British thermal unit.
- - = Not applicable.
Note: Includes estimated consumption for petroleum and other liquids. Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 consumption based on: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, September 2018. 2017 and 2018 population and gross domestic product: IHS Markit, Macroeconomic model, August 2018. 2017 carbon dioxide emissions and emission factors: EIA, *Monthly Energy Review*, September 2018. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A3. Energy prices by sector and source
(2018 dollars per million Btu, unless otherwise noted)

Sector and source	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Residential								
Propane	17.85	21.00	30.27	33.12	34.43	35.49	36.08	1.7%
Distillate fuel oil	18.59	22.21	25.72	27.71	28.87	29.66	29.63	0.9%
Natural gas	10.76	10.35	11.51	12.18	12.60	12.89	13.73	0.9%
Electricity	38.49	36.63	37.24	38.08	38.63	38.58	38.68	0.2%
Commercial								
Propane	15.96	18.19	21.71	23.01	23.79	24.32	24.49	0.9%
Distillate fuel oil	18.64	22.28	20.96	23.22	24.39	25.15	25.09	0.4%
Residual fuel oil	7.20	9.11	11.23	12.84	13.67	14.36	14.84	1.5%
Natural gas	7.81	7.71	8.83	9.26	9.54	9.72	10.38	0.9%
Electricity	32.50	31.76	30.83	31.07	31.23	30.94	30.55	-0.1%
Industrial[1]								
Propane	12.89	13.67	16.46	17.41	18.17	18.68	18.82	1.0%
Distillate fuel oil	18.58	22.20	20.98	23.02	24.19	24.96	24.89	0.4%
Residual fuel oil	6.78	8.60	13.28	14.92	15.73	16.40	16.83	2.1%
Natural gas[2]	3.88	3.89	4.39	4.59	4.85	5.03	5.74	1.2%
Metallurgical coal	4.65	5.23	4.55	4.71	4.83	4.89	5.03	-0.1%
Other industrial coal	2.84	3.30	3.45	3.51	3.51	3.55	3.62	0.3%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electricity	20.55	20.94	19.81	19.90	20.02	19.95	20.09	-0.1%
Transportation								
Propane	19.09	18.01	20.09	21.56	22.23	22.62	22.66	0.7%
E85[3]	22.15	29.23	26.99	24.80	24.33	25.34	33.85	0.5%
Motor gasoline[4]	21.52	24.06	26.21	27.94	28.99	29.79	30.57	0.8%
Jet fuel[5]	12.36	16.16	17.78	19.88	21.21	22.10	22.83	1.1%
Diesel fuel (distillate fuel oil)[6]	19.59	23.16	25.22	27.38	28.63	29.38	29.16	0.7%
Residual fuel oil	8.64	10.94	11.57	13.38	14.79	15.67	16.51	1.3%
Natural gas[7]	14.74	14.39	13.36	13.11	12.77	12.58	13.03	-0.3%
Electricity	29.10	33.29	38.43	38.99	38.96	38.11	36.36	0.3%
Electric power[8]								
Distillate fuel oil	18.69	22.24	20.10	21.84	22.76	23.53	23.95	0.2%
Residual fuel oil	10.82	12.71	14.72	16.39	17.21	17.76	17.38	1.0%
Natural gas	3.47	3.42	4.03	4.21	4.49	4.66	5.36	1.4%
Steam coal	2.09	2.11	2.17	2.22	2.21	2.23	2.23	0.2%
Uranium	0.66	0.66	0.67	0.68	0.69	0.70	0.72	0.2%
Average price to all users[9]								
Propane	15.56	17.36	24.91	26.68	27.49	28.06	28.03	1.5%
E85[3]	22.15	29.23	26.99	24.80	24.33	25.34	33.85	0.5%
Motor gasoline[4]	21.50	24.04	26.21	27.95	29.00	29.81	30.59	0.8%
Jet fuel[5]	12.36	16.16	17.78	19.88	21.21	22.10	22.83	1.1%
Distillate fuel oil	19.34	22.92	24.39	26.50	27.69	28.41	28.20	0.6%
Residual fuel oil	8.91	10.95	11.89	13.68	15.01	15.84	16.54	1.3%
Natural gas	5.49	5.38	5.97	6.25	6.52	6.72	7.44	1.0%
Metallurgical coal	4.65	5.23	4.55	4.71	4.83	4.89	5.03	-0.1%
Other coal	2.14	2.17	2.26	2.30	2.29	2.32	2.32	0.2%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electricity	31.66	30.94	30.24	30.62	30.95	30.83	30.79	0.0%
Non-renewable energy expenditures by sector (billion 2018 dollars)								
Residential	248	256	258	267	276	283	299	0.5%
Commercial	192	194	198	205	212	217	236	0.6%
Industrial[1]	176	195	235	261	280	297	329	1.6%
Transportation	533	620	630	641	645	661	708	0.4%
Total non-renewable expenditures	1,149	1,265	1,321	1,375	1,413	1,458	1,571	0.7%
Transportation renewable expenditures	0	1	4	5	6	6	4	3.6%
Total expenditures	**1,149**	**1,266**	**1,325**	**1,380**	**1,418**	**1,464**	**1,575**	**0.7%**

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Table A3. Energy prices by sector and source (continued)
(nominal dollars per million Btu, unless otherwise noted)

Sector and source	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Residential								
Propane	17.51	21.00	36.01	44.01	50.97	58.71	75.46	4.1%
Distillate fuel oil	18.23	22.21	30.60	36.82	42.73	49.05	61.96	3.3%
Natural gas	10.55	10.35	13.70	16.19	18.66	21.32	28.70	3.2%
Electricity	37.75	36.63	44.30	50.60	57.17	63.81	80.89	2.5%
Commercial								
Propane	15.65	18.19	25.82	30.58	35.22	40.22	51.21	3.3%
Distillate fuel oil	18.29	22.28	24.93	30.85	36.10	41.59	52.47	2.7%
Residual fuel oil	7.06	9.11	13.35	17.06	20.23	23.75	31.04	3.9%
Natural gas	7.66	7.71	10.50	12.31	14.12	16.08	21.70	3.3%
Electricity	31.88	31.76	36.68	41.29	46.23	51.17	63.88	2.2%
Industrial[1]								
Propane	12.65	13.67	19.58	23.14	26.89	30.90	39.36	3.4%
Distillate fuel oil	18.22	22.20	24.95	30.59	35.81	41.28	52.05	2.7%
Residual fuel oil	6.65	8.60	15.80	19.82	23.29	27.13	35.19	4.5%
Natural gas[2]	3.81	3.89	5.23	6.10	7.18	8.32	12.00	3.6%
Metallurgical coal	4.57	5.23	5.41	6.26	7.15	8.09	10.53	2.2%
Other industrial coal	2.79	3.30	4.10	4.67	5.19	5.87	7.58	2.6%
Coal to liquids	--	--	--	--	--	--	--	--
Electricity	20.15	20.94	23.57	26.44	29.63	32.99	42.02	2.2%
Transportation								
Propane	18.73	18.01	23.90	28.64	32.91	37.42	47.39	3.1%
E85[3]	21.72	29.23	32.10	32.95	36.02	41.92	70.79	2.8%
Motor gasoline[4]	21.11	24.06	31.17	37.12	42.91	49.28	63.94	3.1%
Jet fuel[5]	12.12	16.16	21.15	26.42	31.39	36.55	47.75	3.4%
Diesel fuel (distillate fuel oil)[6]	19.21	23.16	30.00	36.38	42.38	48.59	60.97	3.1%
Residual fuel oil	8.48	10.94	13.77	17.78	21.90	25.92	34.52	3.7%
Natural gas[7]	14.46	14.39	15.90	17.42	18.90	20.81	27.24	2.0%
Electricity	28.54	33.29	45.71	51.81	57.67	63.04	76.03	2.6%
Electric power[8]								
Distillate fuel oil	18.33	22.24	23.91	29.01	33.69	38.92	50.09	2.6%
Residual fuel oil	10.61	12.71	17.51	21.78	25.48	29.37	36.34	3.3%
Natural gas	3.40	3.42	4.79	5.60	6.64	7.71	11.21	3.8%
Steam coal	2.05	2.11	2.58	2.95	3.27	3.69	4.67	2.5%
Uranium	0.65	0.66	0.80	0.90	1.02	1.15	1.50	2.6%

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Table A3. Energy prices by sector and source (continued)
(nominal dollars per million Btu, unless otherwise noted)

Sector and source	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Average price to all users[9]								
Propane	15.27	17.36	29.63	35.46	40.70	46.42	58.63	3.9%
E85[3]	21.72	29.23	32.10	32.95	36.02	41.92	70.79	2.8%
Motor gasoline[4]	21.08	24.04	31.18	37.14	42.93	49.30	63.96	3.1%
Jet fuel[5]	12.12	16.16	21.15	26.42	31.39	36.55	47.75	3.4%
Distillate fuel oil	18.97	22.92	29.01	35.21	40.98	47.00	58.97	3.0%
Residual fuel oil	8.74	10.95	14.14	18.18	22.22	26.20	34.59	3.7%
Natural gas	5.38	5.38	7.10	8.31	9.65	11.11	15.56	3.4%
Metallurgical coal	4.57	5.23	5.41	6.26	7.15	8.09	10.53	2.2%
Other coal	2.09	2.17	2.68	3.06	3.39	3.84	4.86	2.6%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electricity	31.05	30.94	35.98	40.68	45.81	50.99	64.39	2.3%
Non-renewable energy expenditures by sector (billion nominal dollars)								
Residential	243	256	307	355	408	468	625	2.8%
Commercial	188	194	236	273	313	359	493	3.0%
Industrial[1]	173	195	279	347	414	492	687	4.0%
Transportation	523	620	749	852	955	1,093	1,480	2.8%
Total non-renewable expenditures	1,127	1,265	1,572	1,827	2,091	2,411	3,286	3.0%
Transportation renewable expenditures	0	1	4	7	8	10	8	6.0%
Total expenditures	**1,127**	**1,266**	**1,576**	**1,834**	**2,099**	**2,422**	**3,294**	**3.0%**

[1]Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[2]Excludes use for lease and plant fuel and fuel used for liquefaction in export facilities.
[3]E85 refers to a blend of 85 percent ethanol (renewable) and 15 percent motor gasoline (nonrenewable). To address cold starting issues, the percentage of ethanol varies seasonally. The annual average ethanol content of 74 percent is used for these projections.
[4]Sales weighted-average price for all grades. Includes Federal, State, and local taxes.
[5]Kerosene-type jet fuel. Includes Federal and State taxes while excluding county and local taxes.
[6]Diesel fuel for on-road use. Includes Federal and State taxes while excluding county and local taxes.
[7]Natural gas used as fuel in motor vehicles, trains, and ships. Includes estimated motor vehicle fuel taxes and estimated dispensing costs or charges.
[8]Includes electricity-only and combined heat and power plants that have a regulatory status.
[9]Weighted averages of end-use fuel prices are derived from the prices shown in each sector and the corresponding sectoral consumption.
Btu = British thermal unit.
- - = Not applicable.
Note: Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 prices for motor gasoline, distillate fuel oil, and jet fuel are based on prices in the U.S. Energy Information Administration (EIA), *Petroleum Marketing Monthly*, July 2018. 2017 residential and commercial natural gas delivered prices: EIA, *Natural Gas Monthly*, July 2018. 2017 industrial natural gas delivered prices derived on: EIA, *Manufacturing Energy Consumption Survey*, 2002-2014. 2017 transportation sector natural gas delivered prices are model results. 2017 electric power sector distillate and residual fuel oil prices: EIA, *Monthly Energy Review*, September 2018. 2017 electric power sector natural gas prices: EIA, *Electric Power Monthly*, July 2018, and EIA, *State Energy Data Report 2016*. 2017 coal prices based on: EIA, *Quarterly Coal Report, October-December 2017* and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. 2017 electricity prices: EIA, *Monthly Energy Review*, September 2018. 2017 E85 prices derived from monthly prices in the Clean Cities Alternative Fuel Price Report. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A4. Residential sector key indicators and consumption
(quadrillion Btu per year, unless otherwise noted)

Key indicators and consumption	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Key indicators								
Households (millions)								
Single-family	82.03	82.70	87.98	91.52	95.08	98.60	105.76	0.8%
Multifamily	30.98	31.25	33.16	34.38	35.47	36.52	38.70	0.7%
Mobile homes	6.51	6.40	5.81	5.52	5.33	5.13	4.88	-0.8%
Total	**119.52**	**120.35**	**126.95**	**131.41**	**135.89**	**140.25**	**149.34**	**0.7%**
Average house square footage	**1,772**	**1,779**	**1,826**	**1,858**	**1,889**	**1,920**	**1,978**	**0.3%**
Energy intensity								
(million Btu per household)								
Delivered energy consumption	88.7	94.9	85.0	81.6	79.2	77.4	74.3	-0.8%
Total energy consumption	166.3	175.5	152.6	145.3	140.0	137.0	131.7	-0.9%
(thousand Btu per square foot)								
Delivered energy consumption	50.1	53.3	46.6	43.9	41.9	40.3	37.6	-1.1%
Total energy consumption	93.8	98.7	83.6	78.2	74.1	71.4	66.6	-1.2%
Delivered energy consumption by fuel								
Purchased electricity								
Space heating	0.54	0.71	0.61	0.58	0.54	0.51	0.46	-1.3%
Space cooling	0.61	0.73	0.71	0.74	0.79	0.84	0.96	0.8%
Water heating	0.59	0.59	0.60	0.58	0.58	0.58	0.59	0.0%
Refrigeration	0.30	0.30	0.29	0.28	0.28	0.29	0.32	0.3%
Cooking	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.3%
Clothes dryers	0.20	0.21	0.23	0.24	0.25	0.26	0.29	1.1%
Freezers	0.07	0.07	0.07	0.07	0.06	0.06	0.07	-0.1%
Lighting	0.33	0.31	0.19	0.19	0.19	0.19	0.19	-1.5%
Clothes washers[1]	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.8%
Dishwashers[1]	0.03	0.03	0.03	0.03	0.03	0.04	0.04	1.6%
Televisions and related equipment[2]	0.22	0.21	0.19	0.20	0.21	0.24	0.27	0.7%
Computers and related equipment[3]	0.09	0.09	0.07	0.07	0.06	0.05	0.04	-2.7%
Furnace fans and boiler circulation pumps	0.07	0.09	0.08	0.08	0.08	0.07	0.06	-1.0%
Other uses[4]	1.58	1.57	1.73	1.81	1.89	1.99	2.18	1.0%
Delivered energy	**4.70**	**4.99**	**4.89**	**4.95**	**5.07**	**5.24**	**5.58**	**0.4%**
Natural gas								
Space heating	3.15	3.59	3.29	3.20	3.13	3.07	2.98	-0.6%
Space cooling	0.06	0.06	0.06	0.05	0.05	0.05	0.05	-0.6%
Water heating	1.00	1.00	1.00	1.03	1.08	1.12	1.20	0.6%
Cooking	0.10	0.10	0.10	0.10	0.11	0.11	0.12	0.5%
Clothes dryers	0.04	0.04	0.04	0.04	0.05	0.05	0.06	1.2%
Other uses[5]	0.23	0.23	0.22	0.22	0.21	0.21	0.20	-0.4%
Delivered energy	**4.58**	**5.02**	**4.71**	**4.65**	**4.62**	**4.61**	**4.60**	**-0.3%**
Distillate fuel oil[6]								
Space heating	0.40	0.42	0.32	0.28	0.25	0.23	0.18	-2.5%
Water heating	0.06	0.05	0.04	0.03	0.03	0.03	0.02	-2.7%
Other uses[7]	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-0.7%
Delivered energy	**0.48**	**0.49**	**0.38**	**0.33**	**0.30**	**0.27**	**0.22**	**-2.5%**
Propane								
Space heating	0.33	0.35	0.28	0.26	0.24	0.23	0.21	-1.5%
Water heating	0.07	0.07	0.05	0.04	0.04	0.03	0.03	-2.7%
Cooking	0.02	0.02	0.02	0.01	0.01	0.01	0.01	-1.3%
Other uses[7]	0.07	0.07	0.07	0.08	0.09	0.10	0.12	1.7%
Delivered energy	**0.49**	**0.50**	**0.42**	**0.39**	**0.38**	**0.37**	**0.37**	**-1.0%**
Marketed renewables (wood)[8]	0.37	0.44	0.42	0.41	0.39	0.38	0.34	-0.8%

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Table A4. Residential sector key indicators and consumption (continued)
(quadrillion Btu per year, unless otherwise noted)

Key indicators and consumption	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Delivered energy consumption by end use								
Space heating	4.79	5.50	4.92	4.72	4.56	4.42	4.17	-0.9%
Space cooling	0.66	0.79	0.77	0.80	0.84	0.90	1.01	0.7%
Water heating	1.71	1.71	1.68	1.69	1.72	1.76	1.84	0.2%
Refrigeration	0.30	0.30	0.29	0.28	0.28	0.29	0.32	0.3%
Cooking	0.17	0.17	0.17	0.17	0.18	0.18	0.19	0.3%
Clothes dryers	0.24	0.24	0.27	0.28	0.30	0.31	0.35	1.1%
Freezers	0.07	0.07	0.07	0.07	0.06	0.06	0.07	-0.1%
Lighting	0.33	0.31	0.19	0.19	0.19	0.19	0.19	-1.5%
Clothes washers[1]	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.8%
Dishwashers[1]	0.03	0.03	0.03	0.03	0.03	0.04	0.04	1.6%
Televisions and related equipment[2]	0.22	0.21	0.19	0.20	0.21	0.24	0.27	0.7%
Computers and related equipment[3]	0.09	0.09	0.07	0.07	0.06	0.05	0.04	-2.7%
Furnace fans and boiler circulation pumps	0.07	0.09	0.08	0.08	0.08	0.07	0.06	-1.0%
Other uses[9]	1.89	1.88	2.04	2.11	2.20	2.30	2.50	0.9%
Delivered energy	**10.60**	**11.42**	**10.79**	**10.72**	**10.76**	**10.86**	**11.10**	**-0.1%**
Electricity related losses	**9.27**	**9.71**	**8.58**	**8.37**	**8.26**	**8.36**	**8.57**	**-0.4%**
Total energy consumption by end use								
Space heating	5.86	6.87	5.99	5.70	5.44	5.24	4.88	-1.1%
Space cooling	1.85	2.22	2.01	2.06	2.13	2.24	2.48	0.3%
Water heating	2.87	2.86	2.72	2.68	2.67	2.69	2.75	-0.1%
Refrigeration	0.89	0.88	0.79	0.75	0.74	0.76	0.82	-0.2%
Cooking	0.28	0.28	0.27	0.27	0.27	0.27	0.28	0.0%
Clothes dryers	0.63	0.64	0.66	0.68	0.70	0.74	0.80	0.7%
Freezers	0.21	0.20	0.18	0.18	0.17	0.17	0.17	-0.6%
Lighting	0.97	0.92	0.53	0.51	0.50	0.50	0.48	-2.0%
Clothes washers[1]	0.11	0.11	0.10	0.11	0.11	0.11	0.12	0.3%
Dishwashers[1]	0.07	0.08	0.08	0.08	0.09	0.09	0.11	1.1%
Televisions and related equipment[2]	0.64	0.63	0.53	0.53	0.56	0.61	0.67	0.2%
Computers and related equipment[3]	0.28	0.27	0.20	0.18	0.16	0.14	0.10	-3.1%
Furnace fans and boiler circulation pumps	0.20	0.25	0.22	0.21	0.20	0.18	0.16	-1.5%
Other uses[9]	5.01	4.93	5.08	5.17	5.28	5.47	5.86	0.5%
Total	**19.87**	**21.13**	**19.37**	**19.10**	**19.02**	**19.21**	**19.67**	**-0.2%**
Nonmarketed renewables[10]								
Geothermal heat pumps	0.03	0.04	0.05	0.06	0.07	0.08	0.10	2.6%
Solar hot water heating	0.02	0.03	0.05	0.04	0.04	0.05	0.05	1.5%
Solar photovoltaic	0.13	0.16	0.33	0.46	0.63	0.86	1.46	7.2%
Wind	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.4%
Total	**0.18**	**0.23**	**0.42**	**0.57**	**0.75**	**0.98**	**1.61**	**6.3%**
Heating degree days[11]	**3,828**	**4,232**	**3,962**	**3,874**	**3,786**	**3,699**	**3,525**	**-0.6%**
Cooling degree days[11]	**1,426**	**1,579**	**1,543**	**1,598**	**1,653**	**1,710**	**1,824**	**0.5%**

[1]Does not include water heating portion of load.
[2]Includes televisions, set-top boxes, home theater systems, DVD players, and video game consoles.
[3]Includes desktop and laptop computers, monitors, and networking equipment.
[4]Includes small electric devices, heating elements, and motors not listed above. Electric vehicles are included in the transportation sector.
[5]Includes such appliances as outdoor grills, natural gas-fueled lights, pool heaters, spa heaters, and backup electricity generators.
[6]Includes kerosene use.
[7]Includes such appliances as pool heaters, spa heaters, and backup electricity generators.
[8]Includes wood used for primary and secondary heating in wood stoves or fireplaces as reported in the *Residential Energy Consumption Survey*.
[9]Includes small electric devices, heating elements, outdoor grills, natural gas-fueled lights, pool heaters, spa heaters, backup electricity generators, and motors not listed above. Electric vehicles are included in the transportation sector.
[10]Consumption determined by using the average electric power sector fossil-fuels net heat rate.
[11]See Table A5 for regional detail.
Btu = British thermal unit.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 consumption based on: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, September 2018. 2017 degree days based on state-level data from the National Oceanic and Atmospheric Administration's Climatic Data Center and Climate Prediction Center. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A5. Commercial sector key indicators and consumption
(quadrillion Btu per year, unless otherwise noted)

Key indicators and consumption	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Key indicators								
Total floorspace (billion square feet)								
Surviving	88.7	89.6	97.0	102.0	107.2	112.2	122.5	1.0%
New additions	2.0	2.1	2.1	2.2	2.3	2.3	2.4	0.5%
Total	**90.7**	**91.7**	**99.1**	**104.2**	**109.5**	**114.5**	**124.9**	**1.0%**
Energy consumption intensity (thousand Btu per square foot)								
Delivered energy consumption	98.2	99.8	92.9	89.5	87.0	85.6	85.3	-0.5%
Electricity related losses	100.1	99.4	85.0	79.1	73.8	71.0	68.2	-1.2%
Total energy consumption	198.3	199.1	177.9	168.6	160.9	156.6	153.5	-0.8%
Delivered energy consumption by fuel								
Purchased electricity								
Space heating[1]	0.11	0.12	0.11	0.10	0.10	0.09	0.08	-1.3%
Space cooling[1]	0.50	0.56	0.51	0.51	0.52	0.53	0.56	0.0%
Water heating[1]	0.03	0.03	0.02	0.02	0.02	0.02	0.02	-1.1%
Ventilation	0.51	0.51	0.50	0.45	0.42	0.39	0.37	-1.0%
Cooking	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-0.2%
Lighting	0.49	0.48	0.44	0.41	0.38	0.35	0.30	-1.5%
Refrigeration	0.65	0.65	0.66	0.67	0.68	0.69	0.73	0.4%
Computing	0.34	0.34	0.31	0.31	0.33	0.34	0.33	-0.1%
Office equipment	0.36	0.39	0.53	0.60	0.65	0.70	0.86	2.5%
Other uses[2]	1.53	1.53	1.63	1.71	1.79	1.90	2.21	1.2%
Delivered energy	**4.60**	**4.68**	**4.80**	**4.87**	**4.96**	**5.10**	**5.54**	**0.5%**
Natural gas								
Space heating[1]	1.64	1.85	1.71	1.67	1.64	1.61	1.56	-0.5%
Space cooling[1]	0.03	0.03	0.02	0.02	0.02	0.02	0.02	-1.0%
Water heating[1]	0.60	0.60	0.61	0.62	0.63	0.64	0.67	0.3%
Cooking	0.33	0.33	0.36	0.39	0.41	0.44	0.49	1.2%
Other uses[3]	0.69	0.61	0.68	0.75	0.85	0.98	1.33	2.5%
Delivered energy	**3.28**	**3.42**	**3.38**	**3.45**	**3.56**	**3.70**	**4.07**	**0.5%**
Distillate fuel oil								
Space heating[1]	0.23	0.23	0.21	0.19	0.18	0.17	0.15	-1.3%
Water heating[1]	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-0.6%
Other uses[4]	0.10	0.11	0.12	0.12	0.12	0.12	0.12	0.4%
Delivered energy	**0.33**	**0.35**	**0.33**	**0.31**	**0.30**	**0.29**	**0.28**	**-0.6%**
Marketed renewables (biomass)	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.0%
Other fuels[5]	0.55	0.56	0.56	0.56	0.57	0.58	0.61	0.3%
Delivered energy consumption by end use								
Space heating[1]	1.98	2.20	2.02	1.96	1.92	1.88	1.80	-0.6%
Space cooling[1]	0.53	0.58	0.54	0.54	0.54	0.55	0.58	0.0%
Water heating[1]	0.63	0.64	0.64	0.65	0.66	0.67	0.69	0.2%
Ventilation	0.51	0.51	0.50	0.45	0.42	0.39	0.37	-1.0%
Cooking	0.41	0.42	0.45	0.47	0.50	0.52	0.57	1.0%
Lighting	0.49	0.48	0.44	0.41	0.38	0.35	0.30	-1.5%
Refrigeration	0.65	0.65	0.66	0.67	0.68	0.69	0.73	0.4%
Computing	0.34	0.34	0.31	0.31	0.33	0.34	0.33	-0.1%
Office equipment	0.36	0.39	0.53	0.60	0.65	0.70	0.86	2.5%
Other uses[6]	3.01	2.95	3.13	3.28	3.47	3.72	4.42	1.3%
Delivered energy	**8.91**	**9.15**	**9.21**	**9.33**	**9.53**	**9.81**	**10.65**	**0.5%**

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Table A5. Commercial sector key indicators and consumption (continued)
(quadrillion Btu per year, unless otherwise noted)

Key indicators and consumption	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Electricity related losses	**9.07**	**9.11**	**8.43**	**8.24**	**8.08**	**8.13**	**8.52**	**-0.2%**
Total energy consumption by end use								
Space heating[1]	2.19	2.44	2.22	2.14	2.08	2.02	1.92	-0.7%
Space cooling[1]	1.51	1.67	1.44	1.40	1.38	1.39	1.44	-0.5%
Water heating[1]	0.68	0.69	0.68	0.68	0.69	0.70	0.72	0.1%
Ventilation	1.52	1.51	1.37	1.21	1.10	1.02	0.94	-1.5%
Cooking	0.58	0.58	0.60	0.61	0.63	0.65	0.69	0.5%
Lighting	1.45	1.42	1.20	1.12	0.99	0.91	0.76	-1.9%
Refrigeration	1.92	1.92	1.82	1.79	1.78	1.80	1.86	-0.1%
Computing	1.02	0.99	0.86	0.85	0.86	0.88	0.84	-0.5%
Office equipment	1.07	1.13	1.45	1.60	1.71	1.82	2.18	2.1%
Other uses[6]	6.04	5.92	6.00	6.17	6.39	6.74	7.82	0.9%
Total	**17.98**	**18.27**	**17.63**	**17.57**	**17.61**	**17.94**	**19.17**	**0.2%**
Nonmarketed renewable fuels[7]								
Solar thermal	0.07	0.07	0.07	0.07	0.07	0.07	0.07	-0.3%
Solar photovoltaic	0.11	0.13	0.27	0.31	0.36	0.43	0.58	4.7%
Wind	0.01	0.01	0.01	0.01	0.01	0.01	0.02	3.4%
Total	**0.20**	**0.22**	**0.35**	**0.38**	**0.44**	**0.51**	**0.67**	**3.6%**
Heating degree days								
New England	6,051	6,196	5,997	5,899	5,801	5,702	5,505	-0.4%
Middle Atlantic	5,333	5,716	5,382	5,292	5,202	5,112	4,933	-0.5%
East North Central	5,684	6,313	5,958	5,889	5,820	5,751	5,612	-0.4%
West North Central	5,999	6,767	6,200	6,127	6,051	5,975	5,821	-0.5%
South Atlantic	2,232	2,665	2,460	2,408	2,357	2,306	2,205	-0.6%
East South Central	2,832	3,480	3,236	3,193	3,149	3,104	3,014	-0.4%
West South Central	1,582	2,161	1,887	1,835	1,783	1,732	1,630	-0.9%
Mountain	4,573	4,671	4,688	4,608	4,526	4,442	4,276	-0.3%
Pacific	3,180	3,257	3,204	3,150	3,094	3,038	2,925	-0.3%
United States	**3,828**	**4,232**	**3,962**	**3,874**	**3,786**	**3,699**	**3,525**	**-0.6%**
Cooling degree days								
New England	445	669	569	593	617	640	688	0.1%
Middle Atlantic	660	897	819	852	885	919	985	0.3%
East North Central	707	985	822	841	859	878	915	-0.2%
West North Central	910	1,140	1,009	1,026	1,044	1,062	1,099	-0.1%
South Atlantic	2,250	2,348	2,339	2,398	2,458	2,518	2,641	0.4%
East South Central	1,585	1,912	1,792	1,835	1,878	1,921	2,008	0.2%
West South Central	2,714	2,882	2,920	2,997	3,074	3,151	3,304	0.4%
Mountain	1,543	1,601	1,581	1,625	1,671	1,719	1,814	0.4%
Pacific	1,056	1,004	998	1,033	1,069	1,105	1,177	0.5%
United States	**1,426**	**1,579**	**1,543**	**1,598**	**1,653**	**1,710**	**1,824**	**0.5%**

[1]Includes fuel consumption for district services.
[2]Includes (but is not limited to) miscellaneous uses such as transformers, medical imaging and other medical equipment, elevators, escalators, off-road electric vehicles, laboratory fume hoods, laundry equipment, coffee brewers, and water services.
[3]Includes miscellaneous uses, such as emergency generators, combined heat and power in commercial buildings, and manufacturing performed in commercial buildings.
[4]Includes miscellaneous uses, such as cooking, emergency generators, and combined heat and power in commercial buildings.
[5]Includes residual fuel oil, propane, coal, motor gasoline, and kerosene.
[6]Includes (but is not limited to) miscellaneous uses such as transformers, medical imaging and other medical equipment, elevators, escalators, off-road electric vehicles, laboratory fume hoods, laundry equipment, coffee brewers, water services, emergency generators, combined heat and power in commercial buildings, manufacturing performed in commercial buildings, and cooking (distillate), plus residual fuel oil, propane, coal, motor gasoline, kerosene, and marketed renewable fuels (biomass).
[7]Consumption determined by using the average electric power sector fossil-fuels net heat rate.
Btu = British thermal unit.
Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 consumption based on: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, September 2018. 2017 degree days based on state-level data from the National Oceanic and Atmospheric Administration's Climatic Data Center and Climate Prediction Center. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A6. Industrial sector key indicators and consumption

Shipments, prices, and consumption	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Key indicators								
Value of shipments (billion 2009 dollars)								
Manufacturing	5,382	5,540	6,298	6,931	7,611	8,360	10,032	1.9%
Agriculture, mining, and construction	2,062	2,146	2,504	2,639	2,788	2,938	3,280	1.3%
Total	**7,444**	**7,686**	**8,803**	**9,570**	**10,400**	**11,299**	**13,312**	**1.7%**
Energy prices								
(2018 dollars per million Btu)								
Propane	12.89	13.67	16.46	17.41	18.17	18.68	18.82	1.0%
Motor gasoline	21.03	23.49	26.13	27.61	28.69	29.52	30.32	0.8%
Distillate fuel oil	18.58	22.20	20.98	23.02	24.19	24.96	24.89	0.4%
Residual fuel oil	6.78	8.60	13.28	14.92	15.73	16.40	16.83	2.1%
Asphalt and road oil	3.50	3.46	9.15	10.40	11.11	11.60	11.93	3.9%
Natural gas heat and power	3.87	3.89	4.41	4.60	4.86	5.04	5.77	1.2%
Natural gas feedstocks	3.89	3.89	4.38	4.58	4.84	5.02	5.71	1.2%
Metallurgical coal	4.65	5.23	4.55	4.71	4.83	4.89	5.03	-0.1%
Other industrial coal	2.84	3.30	3.45	3.51	3.51	3.55	3.62	0.3%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electricity	20.55	20.94	19.81	19.90	20.02	19.95	20.09	-0.1%
(nominal dollars per million Btu)								
Propane	12.65	13.67	19.58	23.14	26.89	30.90	39.36	3.4%
Motor gasoline	20.62	23.49	31.09	36.69	42.47	48.82	63.40	3.2%
Distillate fuel oil	18.22	22.20	24.95	30.59	35.81	41.28	52.05	2.7%
Residual fuel oil	6.65	8.60	15.80	19.82	23.29	27.13	35.19	4.5%
Asphalt and road oil	3.43	3.46	10.89	13.81	16.44	19.19	24.94	6.4%
Natural gas heat and power	3.79	3.89	5.25	6.11	7.19	8.34	12.06	3.6%
Natural gas feedstocks	3.82	3.89	5.21	6.09	7.16	8.30	11.95	3.6%
Metallurgical coal	4.57	5.23	5.41	6.26	7.15	8.09	10.53	2.2%
Other industrial coal	2.79	3.30	4.10	4.67	5.19	5.87	7.58	2.6%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electricity	20.15	20.94	23.57	26.44	29.63	32.99	42.02	2.2%
Energy consumption (quadrillion Btu)[1]								
Industrial consumption excluding refining								
Propane heat and power	0.44	0.52	0.20	0.21	0.21	0.22	0.24	-2.4%
Liquefied petroleum gas and other feedstocks[2]	2.35	2.58	3.42	3.68	3.82	3.96	4.17	1.5%
Motor gasoline	0.26	0.26	0.29	0.30	0.31	0.32	0.33	0.8%
Distillate fuel oil	1.16	1.22	1.27	1.30	1.34	1.39	1.52	0.7%
Residual fuel oil	0.05	0.05	0.06	0.06	0.06	0.07	0.07	1.0%
Petrochemical feedstocks	0.70	0.66	0.93	1.08	1.16	1.24	1.36	2.3%
Petroleum coke	0.09	0.09	0.08	0.07	0.07	0.08	0.08	-0.2%
Asphalt and road oil	0.85	0.85	0.94	1.00	1.13	1.26	1.56	1.9%
Miscellaneous petroleum[3]	0.45	0.46	0.34	0.32	0.33	0.33	0.35	-0.8%
Petroleum and other liquids subtotal	6.35	6.69	7.53	8.02	8.43	8.85	9.69	1.2%
Natural gas heat and power	5.94	6.18	6.92	7.23	7.34	7.56	8.02	0.8%
Natural gas feedstocks	0.83	0.89	1.03	1.08	1.10	1.12	1.15	0.8%
Lease and plant fuel[4]	1.63	1.81	2.20	2.30	2.37	2.46	2.42	0.9%
Natural gas to liquefy gas for export[5]	0.07	0.11	0.43	0.53	0.53	0.53	0.53	5.0%
Natural gas subtotal	8.47	8.99	10.59	11.14	11.33	11.67	12.12	0.9%
Metallurgical coal and coke[6]	0.47	0.53	0.46	0.47	0.48	0.49	0.46	-0.5%
Other industrial coal	0.62	0.56	0.61	0.59	0.56	0.55	0.54	-0.1%
Coal subtotal	1.09	1.10	1.07	1.06	1.04	1.03	1.00	-0.3%
Renewables[7]	1.65	1.64	1.78	1.90	2.04	2.21	2.53	1.4%
Purchased electricity	3.03	3.04	3.49	3.67	3.76	3.88	4.10	0.9%
Delivered energy	**20.58**	**21.45**	**24.45**	**25.79**	**26.61**	**27.64**	**29.44**	**1.0%**
Electricity related losses	5.97	5.91	6.12	6.20	6.13	6.19	6.31	0.2%
Total	**26.55**	**27.36**	**30.57**	**31.99**	**32.73**	**33.83**	**35.75**	**0.8%**

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Table A6. Industrial sector key indicators and consumption (continued)

Shipments, prices, and consumption	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Refining consumption								
Liquefied petroleum gas heat and power[2]	0.01	0.01	0.00	0.00	0.00	0.00	0.00	- -
Distillate fuel oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Residual fuel oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Petroleum coke	0.53	0.53	0.33	0.32	0.35	0.38	0.42	-0.7%
Still gas	1.48	1.54	1.53	1.48	1.50	1.56	1.64	0.2%
Miscellaneous petroleum[3]	0.01	0.01	0.00	0.02	0.00	0.00	0.00	-16.2%
Petroleum and other liquids subtotal	2.03	2.09	1.87	1.82	1.85	1.94	2.07	0.0%
Natural gas heat and power	1.29	1.12	1.24	1.19	1.18	1.19	1.23	0.3%
Natural gas feedstocks	0.19	0.34	0.25	0.22	0.23	0.26	0.31	-0.3%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Natural gas subtotal	1.48	1.46	1.49	1.41	1.41	1.44	1.54	0.2%
Other industrial coal	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.8%
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Coal subtotal	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.8%
Biofuels heat and coproducts	0.78	0.78	0.85	0.86	0.85	0.85	0.84	0.2%
Purchased electricity	0.20	0.20	0.19	0.18	0.18	0.19	0.20	0.0%
Delivered energy	**4.52**	**4.55**	**4.42**	**4.29**	**4.33**	**4.45**	**4.68**	**0.1%**
Electricity related losses	0.40	0.39	0.33	0.30	0.30	0.30	0.31	-0.8%
Total	**4.92**	**4.95**	**4.75**	**4.59**	**4.62**	**4.75**	**4.99**	**0.0%**
Total industrial sector consumption								
Liquefied petroleum gas heat and power[2]	0.45	0.53	0.20	0.21	0.21	0.22	0.24	-2.5%
Liquefied petroleum gas and other feedstocks[2]	2.35	2.58	3.42	3.68	3.82	3.96	4.17	1.5%
Motor gasoline	0.26	0.26	0.29	0.30	0.31	0.32	0.33	0.8%
Distillate fuel oil	1.17	1.22	1.27	1.30	1.34	1.39	1.52	0.7%
Residual fuel oil	0.06	0.05	0.06	0.06	0.06	0.07	0.07	0.9%
Petrochemical feedstocks	0.70	0.66	0.93	1.08	1.16	1.24	1.36	2.3%
Petroleum coke	0.61	0.62	0.41	0.40	0.42	0.46	0.51	-0.6%
Asphalt and road oil	0.85	0.85	0.94	1.00	1.13	1.26	1.56	1.9%
Still gas	1.48	1.54	1.53	1.48	1.50	1.56	1.64	0.2%
Miscellaneous petroleum[3]	0.45	0.46	0.34	0.34	0.33	0.33	0.35	-0.8%
Petroleum and other liquids subtotal	8.38	8.77	9.39	9.84	10.29	10.79	11.76	0.9%
Natural gas heat and power	7.23	7.30	8.16	8.42	8.52	8.75	9.25	0.7%
Natural gas feedstocks	1.02	1.23	1.28	1.30	1.33	1.38	1.46	0.5%
Natural-gas-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Lease and plant fuel[4]	1.63	1.81	2.20	2.30	2.37	2.46	2.42	0.9%
Natural gas to liquefy gas for export[5]	0.07	0.11	0.43	0.53	0.53	0.53	0.53	5.0%
Natural gas subtotal	9.94	10.45	12.08	12.56	12.74	13.11	13.66	0.8%
Metallurgical coal and coke[6]	0.47	0.53	0.46	0.47	0.48	0.49	0.46	-0.5%
Other industrial coal	0.64	0.59	0.64	0.62	0.59	0.58	0.57	-0.1%
Coal-to-liquids heat and power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Coal subtotal	1.12	1.12	1.10	1.09	1.07	1.06	1.03	-0.2%
Biofuels heat and coproducts	0.78	0.78	0.85	0.86	0.85	0.85	0.84	0.2%
Renewables[7]	1.65	1.64	1.78	1.90	2.04	2.21	2.53	1.4%
Purchased electricity	3.23	3.24	3.67	3.85	3.94	4.07	4.31	0.9%
Delivered energy	**25.10**	**26.00**	**28.88**	**30.08**	**30.93**	**32.09**	**34.12**	**0.9%**
Electricity related losses	6.37	6.30	6.45	6.50	6.42	6.49	6.62	0.2%
Total	**31.47**	**32.31**	**35.33**	**36.59**	**37.35**	**38.58**	**40.74**	**0.7%**

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Table A6. Industrial sector key indicators and consumption (continued)

Shipments, prices, and consumption	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Energy consumption per dollar of shipments (thousand Btu per 2009 dollar)								
Petroleum and other liquids	1.13	1.14	1.07	1.03	0.99	0.96	0.88	-0.8%
Natural gas	1.34	1.36	1.37	1.31	1.23	1.16	1.03	-0.9%
Coal	0.15	0.15	0.13	0.11	0.10	0.09	0.08	-1.9%
Renewable fuels[7]	0.33	0.31	0.30	0.29	0.28	0.27	0.25	-0.7%
Purchased electricity	0.43	0.42	0.42	0.40	0.38	0.36	0.32	-0.8%
Delivered energy	**3.37**	**3.38**	**3.28**	**3.14**	**2.97**	**2.84**	**2.56**	**-0.9%**
Industrial combined heat and power[1]								
Capacity (gigawatts)	25.3	25.9	28.6	30.0	31.8	33.8	39.2	1.3%
Generation (billion kilowatthours)	140	147	164	172	181	192	221	1.3%

[1]Includes combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[2]Includes ethane, natural gasoline, and refinery olefins.
[3]Includes lubricants and miscellaneous petroleum products.
[4]Represents natural gas used in well, field, and lease operations, and in natural gas processing plant machinery.
[5]Fuel used in facilities that liquefy natural gas for export.
[6]Includes net coal coke imports.
[7]Includes consumption of energy produced from hydroelectric, wood and wood waste, municipal waste, and other biomass sources.
Btu = British thermal unit.
- - = Not applicable.
Note: Includes estimated consumption for petroleum and other liquids. Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 prices for motor gasoline and distillate fuel oil are based on: U.S. Energy Information Administration (EIA), *Petroleum Marketing Monthly*, July 2018. 2017 petrochemical feedstock and asphalt and road oil prices are based on: EIA, *State Energy Data Report 2016*. 2017 coal prices are based on: EIA, *Quarterly Coal Report, October-December 2017* and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. 2017 electricity prices: EIA, *Monthly Energy Review*, September 2018. 2017 natural gas prices: *Natural Gas Monthly*, July 2018. 2017 refining consumption based on: *Petroleum Supply Annual 2017*, and EIA, *Refinery Capacity Report*, June 2017. Other 2017 consumption values are based on: EIA, *Monthly Energy Review*, September 2018. 2017 shipments: IHS Markit, Industry model, May 2018. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A7. Transportation sector key indicators and delivered energy consumption

Key indicators and consumption	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Key indicators								
Travel indicators								
(billion vehicle miles traveled)								
Light-duty vehicles less than 8,501 pounds	2,836	2,883	3,018	3,107	3,172	3,269	3,473	0.6%
Commercial light trucks[1]	97	99	110	118	126	135	156	1.4%
Freight trucks greater than 10,000 pounds	290	297	329	350	372	396	445	1.3%
(billion passenger miles traveled)								
Bus transportation	205	206	213	218	221	224	229	0.3%
Passenger rail	40	40	43	45	47	49	52	0.8%
(billion seat miles available)								
Air	1,174	1,189	1,337	1,465	1,601	1,745	2,076	1.8%
(billion ton miles traveled)								
Rail	1,788	1,789	1,794	1,894	1,930	2,003	2,149	0.6%
Domestic shipping	448	445	378	329	305	284	271	-1.5%
Energy efficiency indicators								
(miles per gallon)								
New light-duty vehicle CAFE standard[2]	33.2	33.8	45.6	46.2	46.6	46.9	47.0	1.0%
New car[2]	38.6	39.4	53.2	53.2	53.2	53.2	53.2	0.9%
New light truck[2]	28.8	29.2	39.0	39.0	39.0	39.0	39.0	0.9%
Compliance new light-duty vehicle[3]	33.5	34.0	46.2	47.0	47.9	48.4	48.8	1.1%
New car[3]	39.2	40.2	53.6	54.2	55.2	55.9	56.2	1.1%
New light truck[3]	28.8	29.0	39.6	39.6	39.6	39.4	39.5	1.0%
Tested new light-duty vehicle[4]	32.9	33.6	46.2	47.0	47.9	48.4	48.8	1.2%
New car[4]	38.8	39.8	53.6	54.2	55.2	55.9	56.2	1.1%
New light truck[4]	28.2	28.6	39.6	39.6	39.6	39.4	39.5	1.0%
On-road new light-duty vehicle[5]	26.9	27.4	37.7	38.4	39.1	39.5	39.8	1.2%
New car[5]	31.7	32.5	43.8	44.3	45.1	45.7	45.9	1.1%
New light truck[5]	23.0	23.3	32.3	32.3	32.3	32.1	32.2	1.0%
Light-duty stock[6]	23.0	23.4	27.8	31.5	34.6	36.7	38.5	1.6%
New commercial light truck[1]	13.3	15.0	16.7	17.7	17.6	17.7	17.8	0.5%
Stock commercial light truck[1]	13.7	13.8	15.0	16.1	16.8	17.1	17.5	0.7%
Freight truck	7.1	7.2	8.0	8.8	9.6	10.1	10.5	1.2%
(seat miles per gallon)								
Aircraft	68.4	68.7	71.1	73.3	75.6	78.1	82.8	0.6%
(ton miles per thousand Btu)								
Rail	3.4	3.4	3.6	3.7	3.8	4.0	4.2	0.6%
Domestic shipping	4.8	4.8	5.0	5.1	5.3	5.5	5.8	0.6%
Energy use by mode (quadrillion Btu)								
Light-duty vehicles	15.43	15.41	13.57	12.34	11.48	11.14	11.27	-1.0%
Commercial light trucks[1]	0.89	0.90	0.91	0.91	0.94	0.99	1.12	0.7%
Bus transportation	0.24	0.24	0.24	0.25	0.25	0.25	0.25	0.2%
Freight trucks	5.65	5.72	5.78	5.60	5.50	5.60	6.13	0.2%
Rail, passenger	0.05	0.05	0.05	0.05	0.06	0.06	0.06	1.0%
Rail, freight	0.52	0.52	0.50	0.51	0.50	0.50	0.51	-0.1%
Shipping, domestic	0.09	0.09	0.08	0.06	0.06	0.05	0.05	-2.1%
Shipping, international	0.96	0.92	0.94	0.93	0.91	0.91	0.91	0.0%
Recreational boats	0.24	0.24	0.24	0.25	0.24	0.24	0.24	-0.1%
Air	2.52	2.54	2.75	2.91	3.07	3.22	3.59	1.1%
Military use	0.54	0.56	0.55	0.55	0.55	0.56	0.56	0.0%
Lubricants	0.14	0.13	0.13	0.13	0.13	0.13	0.13	-0.1%
Pipeline and distribution fuel	0.68	0.70	0.65	0.68	0.70	0.71	0.76	0.3%
Total	**27.94**	**28.03**	**26.39**	**25.16**	**24.38**	**24.37**	**25.57**	**-0.3%**

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Table A7. Transportation sector key indicators and delivered energy consumption (continued)

Key indicators and consumption	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Energy use by mode (million barrels per day oil equivalent)								
Light-duty vehicles	8.36	8.35	7.38	6.72	6.25	6.07	6.12	-1.0%
Commercial light trucks[1]	0.46	0.47	0.48	0.48	0.50	0.53	0.60	0.8%
Bus transportation	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.2%
Freight trucks	2.72	2.75	2.78	2.70	2.65	2.71	2.97	0.2%
Rail, passenger	0.02	0.02	0.02	0.03	0.03	0.03	0.03	1.0%
Rail, freight	0.25	0.25	0.24	0.24	0.24	0.24	0.24	-0.1%
Shipping, domestic	0.04	0.04	0.04	0.03	0.03	0.02	0.02	-2.1%
Shipping, international	0.43	0.41	0.42	0.42	0.41	0.41	0.41	0.0%
Recreational boats	0.13	0.13	0.13	0.13	0.13	0.13	0.13	-0.1%
Air	1.22	1.23	1.33	1.41	1.48	1.56	1.73	1.1%
Military use	0.26	0.27	0.26	0.26	0.27	0.27	0.27	0.0%
Lubricants	0.06	0.06	0.06	0.06	0.06	0.06	0.06	-0.1%
Pipeline and distribution fuel	0.32	0.33	0.31	0.32	0.33	0.34	0.36	0.3%
Total	**14.39**	**14.44**	**13.57**	**12.92**	**12.50**	**12.49**	**13.07**	**-0.3%**

[1]Commercial trucks 8,501 to 10,000 pounds gross vehicle weight rating.
[2]CAFE standard based on projected new vehicle sales.
[3]Includes CAFE credits for alternative fueled vehicle sales and credit banking.
[4]U.S. Environmental Protection Agency rated miles per gallon.
[5]Tested new vehicle efficiency revised for on-road performance.
[6]Combined "on-the-road" estimate for all cars and light trucks.
CAFE = Corporate average fuel economy.
Btu = British thermal unit.
Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, September 2018; EIA, Alternatives to Traditional Transportation Fuels 2009 (Part II - User and Fuel Data), April 2011; Federal Highway Administration, *Highway Statistics 2016*; Oak Ridge National Laboratory, *Transportation Energy Data Book: Edition 36*; National Highway Traffic and Safety Administration, *Summary of Fuel Economy Performance*, June 2015; U.S. Department of Commerce, Bureau of the Census, "Vehicle Inventory and Use Survey," EC02TV; U.S. Environmental Protection Agency, Engines and Vehicles Compliance Information System, various years; U.S. Department of Transportation, Federal Transit Administration, National Transit Database, various years; U.S. Department of Transportation, Research and Special Programs Administration, *Air Carrier Statistics Monthly, December 2010/2009*; and United States Department of Defense, Defense Logistics Agency Energy, Fiscal Year 2015 Fact Book. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A8. Electricity supply, disposition, prices, and emissions
(billion kilowatthours, unless otherwise noted)

Supply, disposition, prices, and emissions	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Net generation by fuel type								
Electric power sector[1]								
Power only[2]								
Coal	1,186	1,136	988	987	926	916	914	-0.7%
Petroleum	18	16	10	9	8	8	6	-2.9%
Natural gas[3]	1,065	1,209	1,428	1,487	1,603	1,642	1,748	1.2%
Nuclear power	805	809	672	664	657	662	672	-0.6%
Pumped storage/other[4]	0	1	1	1	0	-1	-3	- -
Renewable sources[5]	648	666	905	965	1,032	1,147	1,378	2.3%
Distributed generation (natural gas)	0	0	1	2	4	7	14	- -
Total	**3,722**	**3,837**	**4,007**	**4,116**	**4,230**	**4,380**	**4,728**	**0.7%**
Combined heat and power[6]								
Coal	13	17	16	16	16	16	16	-0.2%
Petroleum	2	1	1	1	1	1	1	0.0%
Natural gas	116	123	119	118	118	118	118	-0.1%
Renewable sources	3	4	4	4	4	4	4	0.1%
Other	5	0	0	0	0	0	0	0.2%
Total	**138**	**145**	**140**	**139**	**139**	**139**	**139**	**-0.1%**
Total net electric power sector generation	**3,860**	**3,982**	**4,147**	**4,255**	**4,369**	**4,519**	**4,868**	**0.6%**
Less direct use	16	17	16	16	16	16	16	-0.1%
Net available to the grid	**3,844**	**3,965**	**4,131**	**4,239**	**4,353**	**4,503**	**4,852**	**0.6%**
End-use sector[7]								
Coal	11	11	11	10	10	9	8	-0.9%
Petroleum	1	1	1	1	1	1	1	-0.6%
Natural gas	104	108	128	142	158	179	237	2.5%
Other gaseous fuels[8]	15	17	20	20	20	20	20	0.5%
Renewable sources[9]	58	64	105	131	164	205	313	5.1%
Other[10]	2	2	3	3	3	3	3	0.5%
Total end-use sector net generation	**191**	**204**	**267**	**305**	**355**	**416**	**582**	**3.3%**
Less direct use	152	166	225	257	297	348	476	3.3%
Total sales to the grid	**39**	**37**	**42**	**48**	**57**	**68**	**106**	**3.3%**
Total net electricity generation by fuel								
Coal	1,209	1,165	1,015	1,013	951	942	938	-0.7%
Petroleum	20	17	11	10	9	9	7	-2.6%
Natural gas	1,285	1,440	1,677	1,750	1,884	1,946	2,117	1.2%
Nuclear power	805	809	672	664	657	662	672	-0.6%
Renewable sources[5,9]	710	734	1,015	1,100	1,199	1,356	1,696	2.7%
Other[11]	21	21	24	24	23	22	19	-0.2%
Total net electricity generation	**4,051**	**4,186**	**4,414**	**4,560**	**4,724**	**4,936**	**5,449**	**0.8%**
Net generation to the grid	**3,883**	**4,003**	**4,173**	**4,288**	**4,411**	**4,572**	**4,958**	**0.7%**
Net imports	**56**	**54**	**51**	**61**	**61**	**62**	**57**	**0.2%**
Electricity sales by sector								
Residential	1,379	1,462	1,432	1,451	1,487	1,536	1,635	0.4%
Commercial	1,349	1,372	1,406	1,428	1,454	1,494	1,625	0.5%
Industrial	946	949	1,077	1,127	1,156	1,193	1,262	0.9%
Transportation	11	13	47	72	99	126	180	8.7%
Total	**3,685**	**3,796**	**3,962**	**4,079**	**4,196**	**4,348**	**4,702**	**0.7%**
Direct use	168	183	241	273	313	364	492	3.1%
Total electricity use	**3,853**	**3,979**	**4,203**	**4,352**	**4,509**	**4,712**	**5,193**	**0.8%**

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Table A8. Electricity supply, disposition, prices, and emissions (continued)
(billion kilowatthours, unless otherwise noted)

Supply, disposition, prices, and emissions	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
End-use prices								
(2018 cents per kilowatthour)								
Residential	13.1	12.5	12.7	13.0	13.2	13.2	13.2	0.2%
Commercial	11.1	10.8	10.5	10.6	10.7	10.6	10.4	-0.1%
Industrial	7.0	7.1	6.8	6.8	6.8	6.8	6.9	-0.1%
Transportation	9.9	11.4	13.1	13.3	13.3	13.0	12.4	0.3%
All sectors average	**10.8**	**10.6**	**10.3**	**10.4**	**10.6**	**10.5**	**10.5**	**0.0%**
(nominal cents per kilowatthour)								
Residential	12.9	12.5	15.1	17.3	19.5	21.8	27.6	2.5%
Commercial	10.9	10.8	12.5	14.1	15.8	17.5	21.8	2.2%
Industrial	6.9	7.1	8.0	9.0	10.1	11.3	14.3	2.2%
Transportation	9.7	11.4	15.6	17.7	19.7	21.5	25.9	2.6%
All sectors average	**10.6**	**10.6**	**12.3**	**13.9**	**15.6**	**17.4**	**22.0**	**2.3%**
Prices by service category								
(2018 cents per kilowatthour)								
Generation	6.7	6.4	5.7	5.6	5.5	5.4	5.4	-0.5%
Transmission	1.3	1.3	1.4	1.5	1.5	1.6	1.6	0.5%
Distribution	2.8	2.8	3.2	3.4	3.6	3.6	3.5	0.7%
(nominal cents per kilowatthour)								
Generation	6.5	6.4	6.8	7.4	8.1	8.9	11.3	1.8%
Transmission	1.3	1.3	1.7	1.9	2.2	2.6	3.2	2.9%
Distribution	2.7	2.8	3.8	4.5	5.3	5.9	7.4	3.0%
Electric power sector emissions[1]								
Sulfur dioxide (million short tons)	1.32	0.97	0.94	0.92	0.90	0.91	1.00	0.1%
Nitrogen oxide (million short tons)	1.05	1.07	0.84	0.83	0.77	0.76	0.75	-1.1%
Mercury (short tons)	4.81	4.74	3.89	3.84	3.61	3.54	3.48	-1.0%

[1]Includes electricity-only and combined heat and power plants that have a regulatory status.
[2]Includes plants that only produce electricity and that have a regulatory status.
[3]Includes electricity generation from fuel cells.
[4]Includes non-biogenic municipal waste.
[5]Includes conventional hydroelectric, geothermal, wood, wood waste, biogenic municipal waste, landfill gas, other biomass, solar, and wind power.
[6]Includes combined heat and power plants whose primary business is to sell electricity and heat to the public (i.e., those that report North American Industry Classification System code 22 or that have a regulatory status).
[7]Includes combined heat and power plants and electricity-only plants in the commercial and industrial sectors that have a non-regulatory status; and small on-site generating systems in the residential, commercial, and industrial sectors used primarily for own-use generation, but which may also sell some power to the grid.
[8]Includes refinery gas and still gas.
[9]Includes conventional hydroelectric, geothermal, wood, wood waste, all municipal waste, landfill gas, other biomass, solar, and wind power.
[10]Includes batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.
[11]Includes pumped storage, non-biogenic municipal waste, refinery gas, still gas, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 electric power sector generation; sales to the grid; net imports; electricity sales; and electricity end-use prices: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, September 2018, and supporting databases. 2017 emissions: U.S. Environmental Protection Agency, Clean Air Markets Database. 2017 electricity prices by service category: EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections**: EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A9. Electricity generating capacity
(gigawatts)

Net summer capacity[1]	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Electric power sector[2]								
Power only[3]								
Coal[4]	249.1	236.7	176.3	161.8	151.1	150.0	148.2	-1.5%
Oil and natural gas steam[4,5]	86.2	82.6	64.0	57.4	57.2	56.7	55.9	-1.2%
Combined cycle	215.5	233.1	307.2	343.8	380.4	412.3	475.2	2.3%
Combustion turbine/diesel	137.2	138.8	152.6	156.0	158.8	163.3	181.8	0.8%
Nuclear power[6]	99.6	99.1	82.7	81.7	80.8	81.4	82.7	-0.6%
Pumped storage	22.8	22.8	22.8	22.8	22.8	22.8	22.8	0.0%
Diurnal storage	0.6	0.8	1.9	1.9	8.0	15.5	30.8	12.3%
Fuel cells	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.6%
Renewable sources[7]	201.2	214.3	285.5	304.2	327.4	366.7	446.2	2.3%
Distributed generation (natural gas)[8]	0.0	0.0	2.7	5.0	8.4	14.2	31.6	- -
Total	**1,012.4**	**1,028.3**	**1,096.0**	**1,134.7**	**1,195.2**	**1,282.9**	**1,475.3**	**1.1%**
Combined heat and power[9]								
Coal	3.1	3.0	2.7	2.7	2.7	2.7	2.7	-0.3%
Oil and natural gas steam[5]	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0%
Combined cycle	23.6	23.4	23.4	23.4	23.4	23.4	23.4	0.0%
Combustion turbine/diesel	3.2	3.2	3.1	3.1	3.1	3.1	3.1	-0.1%
Renewable sources[7]	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.0%
Total	**31.5**	**31.1**	**30.7**	**30.7**	**30.7**	**30.7**	**30.7**	**0.0%**
Cumulative planned additions[10]								
Coal	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Oil and natural gas steam[5]	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Combined cycle	- -	- -	16.5	16.5	16.5	16.5	16.5	- -
Combustion turbine/diesel	- -	- -	7.0	7.0	7.0	7.0	7.0	- -
Nuclear power	- -	- -	2.2	2.2	2.2	2.2	2.2	- -
Pumped storage	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Diurnal storage	- -	- -	1.2	1.2	1.2	1.2	1.2	- -
Fuel cells	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Renewable sources[7]	- -	- -	23.6	23.6	23.6	23.6	23.6	- -
Distributed generation[8]	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Total	**- -**	**- -**	**50.5**	**50.5**	**50.5**	**50.5**	**50.5**	**- -**
Cumulative unplanned additions[10]								
Coal	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Oil and natural gas steam[5]	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Combined cycle	- -	- -	62.5	99.9	139.0	172.4	239.0	- -
Combustion turbine/diesel	- -	- -	10.0	15.9	19.0	23.9	44.0	- -
Nuclear power	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Pumped storage	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Diurnal storage	- -	- -	0.0	0.0	6.1	13.5	28.9	- -
Fuel cells	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Renewable sources[7]	- -	- -	47.7	66.4	89.7	128.9	208.5	- -
Distributed generation[8]	- -	- -	2.7	5.0	8.4	14.2	31.6	- -
Total	**- -**	**- -**	**122.9**	**187.1**	**262.1**	**352.9**	**551.9**	**- -**
Cumulative electric power sector additions[10]	**- -**	**- -**	**173.4**	**237.6**	**312.6**	**403.4**	**602.4**	**- -**
Cumulative retirements[11]								
Coal	- -	- -	60.7	75.2	85.5	86.7	88.5	- -
Oil and natural gas steam[5]	- -	- -	18.6	25.2	25.7	26.3	27.0	- -
Combined cycle	- -	- -	5.0	5.7	8.2	9.7	13.4	- -
Combustion turbine/diesel	- -	- -	3.3	5.8	6.1	6.5	8.1	- -
Nuclear power	- -	- -	19.0	20.1	21.6	21.6	21.6	- -
Pumped storage	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Diurnal storage	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Fuel cells	- -	- -	0.0	0.0	0.0	0.0	0.0	- -
Renewable sources[7]	- -	- -	0.1	0.1	0.1	0.1	0.2	- -
Total	**- -**	**- -**	**106.6**	**132.2**	**147.2**	**150.9**	**158.8**	**- -**
Total electric power sector capacity	**1,043.9**	**1,059.4**	**1,126.7**	**1,165.4**	**1,225.9**	**1,313.6**	**1,506.0**	**1.1%**

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Table A9. Electricity generating capacity (continued)
(gigawatts)

Net summer capacity[1]	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
End-use generators[12]								
Coal	2.8	2.8	2.6	2.5	2.4	2.3	2.1	-0.9%
Petroleum	0.6	0.6	0.5	0.5	0.5	0.5	0.5	-0.2%
Natural gas	16.6	17.0	20.1	22.4	25.2	28.5	37.8	2.5%
Other gaseous fuels[13]	2.9	3.1	3.0	3.0	2.9	2.9	3.0	-0.1%
Renewable sources[7]	25.9	29.8	58.9	76.0	97.8	124.9	195.5	6.1%
Other[14]	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.4%
Total	**49.2**	**53.8**	**85.7**	**105.0**	**129.4**	**159.8**	**239.4**	**4.8%**
Cumulative capacity additions[10]	**- -**	**- -**	**32.8**	**52.4**	**77.0**	**107.5**	**187.5**	**- -**

[1]Net summer capacity is the steady hourly output that generating equipment is expected to supply to system load (exclusive of auxiliary power), as demonstrated by tests during summer peak demand.
[2]Includes electricity-only and combined heat and power plants that have a regulatory status.
[3]Includes plants that only produce electricity and that have a regulatory status. Includes capacity increases (uprates) at existing units.
[4]Total coal and oil and natural gas steam capacity account for the conversion of coal capacity to gas steam capacity, but the conversions are not included explicitly as additions or retirements. No planned conversions are assumed. The totals may reflect any conversions projected by the model.
[5]Includes oil-, gas-, and dual-fired capacity.
[6]Nuclear capacity includes 3.0 gigawatts of uprates.
[7]Includes conventional hydroelectric, geothermal, wood, wood waste, all municipal waste, landfill gas, other biomass, solar, and wind power. Facilities co-firing biomass and coal are classified as coal.
[8]Primarily peak load capacity fueled by natural gas.
[9]Includes combined heat and power plants whose primary business is to sell electricity and heat to the public (i.e., those that report North American Industry Classification System code 22 or that have a regulatory status).
[10]Cumulative additions after December 31, 2018.
[11]Cumulative retirements after December 31, 2018.
[12]Includes combined heat and power plants and electricity-only plants in the commercial and industrial sectors that have a non-regulatory status; and small on-site generating systems in the residential, commercial, and industrial sectors used primarily for own-use generation, but which may also sell some power to the grid.
[13]Includes refinery gas and still gas.
[14]Includes batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 capacity and projected planned additions: U.S. Energy Information Administration (EIA), Form EIA-860, "Annual Electric Generator Report" (preliminary). 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A10. Electricity trade

(billion kilowatthours, unless otherwise noted)

Electricity trade	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Interregional electricity trade								
Gross domestic sales								
Firm power	124	122	114	108	94	81	65	-1.9%
Economy	155	160	207	189	189	193	239	1.3%
Total	**279**	**283**	**320**	**297**	**283**	**274**	**304**	**0.2%**
Gross domestic sales (million 2018 dollars)								
Firm power	8,386	8,254	7,680	7,310	6,378	5,478	4,408	-1.9%
Economy	4,815	6,157	7,754	7,248	7,338	7,541	10,187	1.6%
Total	**13,201**	**14,411**	**15,434**	**14,557**	**13,716**	**13,020**	**14,595**	**0.0%**
International electricity trade								
Imports from Canada and Mexico								
Firm power	21.0	25.1	22.5	27.3	26.3	26.0	26.0	0.1%
Economy	44.7	39.1	37.4	42.4	43.3	44.9	39.8	0.1%
Total	**65.7**	**64.1**	**59.8**	**69.7**	**69.6**	**70.9**	**65.9**	**0.1%**
Exports to Canada and Mexico								
Firm power	2.3	0.0	0.0	0.0	0.0	0.0	0.0	- -
Economy	7.0	10.2	9.1	9.1	9.1	9.1	9.1	-0.4%
Total	**9.4**	**10.2**	**9.1**	**9.1**	**9.1**	**9.1**	**9.1**	**-0.4%**

- - = Not applicable.

Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports. Firm power sales are capacity sales, meaning the delivery of the power is scheduled as part of the normal operating conditions of the affected electric systems. Economy sales are subject to curtailment or cessation of delivery by the supplier in accordance with prior agreements or under specified conditions.

Sources: 2017 interregional firm electricity trade data: Federal Energy Regulatory Commission, Form 1, "Electric Utility Annual Report", and 2016 seasonal reliability assessments from North American Electric Reliability Council regional entities and Independent System Operators. 2017 interregional economy electricity trade data are model results. 2017 Mexican electricity trade data and Canadian economy trade data: U.S. Energy Information Administration (EIA), Form 111, "Quarterly Electricity Imports and Exports Report". 2017 Canadian firm electricity trade data: National Energy Board, *Electricity Exports and Imports Statistics, 2017*. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A11. Petroleum and other liquids supply and disposition
(million barrels per day, unless otherwise noted)

Supply and disposition	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Crude oil								
Domestic crude production[1]	9.36	10.74	14.09	14.46	14.33	14.05	11.86	0.3%
Alaska	0.49	0.48	0.58	0.63	0.94	1.30	0.51	0.2%
Lower 48 states	8.86	10.26	13.51	13.83	13.39	12.75	11.35	0.3%
Net imports	6.81	5.93	3.08	2.72	2.75	3.01	5.30	-0.4%
Gross imports	7.97	7.74	5.58	4.81	5.13	5.76	7.28	-0.2%
Exports	1.16	1.81	2.50	2.09	2.38	2.75	1.98	0.3%
Other crude supply[2]	0.43	0.24	0.07	0.00	0.00	0.00	0.00	- -
Total crude supply	**16.59**	**16.91**	**17.24**	**17.18**	**17.08**	**17.06**	**17.16**	**0.0%**
Net product imports	-3.00	-3.49	-5.42	-6.04	-6.30	-6.18	-5.22	1.3%
Gross refined product imports[3]	0.88	1.10	0.86	0.91	0.95	1.10	1.43	0.8%
Unfinished oil imports	0.63	0.65	0.63	0.57	0.57	0.55	0.54	-0.6%
Blending component imports	0.61	0.65	0.63	0.41	0.30	0.28	0.33	-2.1%
Exports	5.12	5.89	7.54	7.92	8.12	8.11	7.51	0.8%
Refinery processing gain[4]	1.11	1.12	0.92	0.86	0.92	0.99	1.08	-0.1%
Product stock withdrawal	0.11	0.02	0.00	0.00	0.00	0.00	0.00	- -
Natural gas plant liquids	3.73	4.36	5.68	6.01	6.05	6.03	5.74	0.9%
Supply from renewable sources	1.09	1.10	1.08	1.05	1.03	1.03	1.06	-0.1%
Ethanol	0.93	0.92	0.90	0.87	0.83	0.83	0.88	-0.1%
Domestic production	1.01	1.02	0.98	0.98	0.95	0.95	0.97	-0.2%
Net imports	-0.09	-0.10	-0.08	-0.11	-0.12	-0.12	-0.09	-0.3%
Stock withdrawal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Biodiesel	0.14	0.15	0.12	0.13	0.13	0.13	0.13	-0.6%
Domestic production	0.10	0.13	0.08	0.08	0.09	0.08	0.08	-1.4%
Net imports	0.03	0.02	0.04	0.04	0.04	0.04	0.05	2.1%
Stock withdrawal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Other biomass-derived liquids[5]	0.03	0.03	0.05	0.05	0.07	0.07	0.06	1.8%
Domestic production	0.03	0.03	0.05	0.05	0.07	0.07	0.06	1.8%
Net imports	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Stock withdrawal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Liquids from gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Liquids from coal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Other[6]	0.22	0.22	0.28	0.26	0.26	0.27	0.29	0.8%
Total primary supply[7]	**19.86**	**20.24**	**19.78**	**19.31**	**19.04**	**19.19**	**20.12**	**0.0%**
Product supplied								
by fuel								
Liquefied petroleum gases and other[8]	2.64	2.92	3.37	3.57	3.69	3.81	4.01	1.0%
Motor gasoline[9]	9.33	9.32	8.33	7.62	7.13	6.95	7.13	-0.8%
of which: E85[10]	0.01	0.03	0.09	0.14	0.16	0.17	0.08	3.1%
Jet fuel[11]	1.68	1.73	1.82	1.91	2.00	2.09	2.30	0.9%
Distillate fuel oil[12]	3.93	4.12	4.06	3.95	3.87	3.87	3.97	-0.1%
of which: Diesel	3.77	3.95	3.66	3.58	3.52	3.52	3.64	-0.3%
Residual fuel oil	0.34	0.32	0.33	0.30	0.28	0.28	0.27	-0.6%
Other[13]	2.00	1.99	1.93	2.00	2.11	2.24	2.50	0.7%
by sector								
Residential and commercial	1.05	1.07	0.95	0.91	0.88	0.87	0.86	-0.7%
Industrial[14]	4.76	5.07	5.60	5.90	6.16	6.44	6.96	1.0%
Transportation	14.01	14.03	13.06	12.31	11.79	11.67	12.07	-0.5%
Electric power[15]	0.10	0.08	0.06	0.05	0.04	0.04	0.04	-2.6%
Unspecified sector[16]	0.02	0.15	0.17	0.19	0.20	0.22	0.25	1.5%
Total product supplied	**19.92**	**20.40**	**19.83**	**19.35**	**19.09**	**19.24**	**20.18**	**0.0%**
Discrepancy[17]	-0.06	-0.15	-0.05	-0.05	-0.05	-0.05	-0.06	-2.9%

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Table A11. Petroleum and other liquids supply and disposition (continued)
(million barrels per day, unless otherwise noted)

Supply and disposition	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Domestic refinery distillation capacity[18]	18.6	18.6	19.0	19.0	19.0	19.0	19.0	0.1%
Capacity utilization rate (percent)[19]	91.1	92.6	91.6	91.2	90.7	90.5	91.0	-0.1%
Total gross imports	10.14	10.18	7.78	6.77	7.02	7.76	9.67	-0.2%
Total gross exports	6.37	7.82	10.16	10.17	10.65	11.01	9.63	0.7%
Total net imports	3.76	2.37	-2.38	-3.39	-3.63	-3.25	0.04	-12.1%
Net import share of product supplied (percent)	18.9	11.7	-12.0	-17.6	-19.1	-16.9	0.2	-12.1%
Expenditures for imported crude oil and petroleum products (billion 2018 dollars)	138	170	174	172	195	227	290	1.7%

[1]Includes lease condensate.
[2]Strategic petroleum reserve stock additions plus unaccounted for crude oil and crude oil stock withdrawals.
[3]Includes other hydrocarbons and alcohols.
[4]The volumetric amount by which total output is greater than input due to the processing of crude oil into products which, in total, have a lower specific gravity than the crude oil processed.
[5]Includes pyrolysis oils, biomass-derived Fischer-Tropsch liquids, biobutanol, and renewable feedstocks used for the on-site production of diesel and gasoline.
[6]Includes domestic sources of other blending components, other hydrocarbons, and ethers.
[7]Total crude supply, net product imports, refinery processing gain, product stock withdrawal, natural gas plant liquids, supply from renewable sources, liquids from gas, liquids from coal, and other supply.
[8]Includes ethane, natural gasoline, and refinery olefins.
[9]Includes ethanol and ethers blended into gasoline.
[10]E85 refers to a blend of 85 percent ethanol (renewable) and 15 percent motor gasoline (nonrenewable). To address cold starting issues, the percentage of ethanol varies seasonally. The annual average ethanol content of 74 percent is used for these projections.
[11]Includes only kerosene type.
[12]Includes distillate fuel oil from petroleum and biomass feedstocks and kerosene use in the residential sector.
[13]Includes aviation gasoline, petrochemical feedstocks, lubricants, waxes, asphalt, road oil, still gas, special naphthas, petroleum coke, crude oil product supplied, methanol, miscellaneous petroleum products, and kerosene not used in the residential sector.
[14]Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[15]Includes consumption of energy by electricity-only and combined heat and power plants that have a regulatory status.
[16]Represents consumption unattributed to the sectors above.
[17]Balancing item. Includes unaccounted for supply, losses, and gains.
[18]End-of-year operable capacity.
[19]Rate is calculated by dividing the gross annual input to atmospheric crude oil distillation units by their operable refining capacity in barrels per calendar day.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 product supplied based on: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, September 2018. Other 2017 data: EIA, *Petroleum Supply Annual 2017*. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.
Projections: EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A12. Petroleum and other liquids prices

(2018 dollars per gallon, unless otherwise noted)

Sector and fuel	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Crude oil prices (2018 dollars per barrel)								
Brent spot	55	74	82	93	100	105	108	1.2%
West Texas Intermediate spot	52	68	78	87	95	100	105	1.3%
Average imported refiners acquisition cost[1]	50	65	78	89	95	100	102	1.4%
Brent / West Texas Intermediate spread	3	6	4	6	5	5	3	-1.7%
Delivered sector product prices								
Residential								
Propane	1.63	1.92	2.77	3.02	3.14	3.24	3.30	1.7%
Distillate fuel oil	2.56	3.05	3.54	3.81	3.97	4.08	4.07	0.9%
Commercial								
Distillate fuel oil	2.56	3.06	2.88	3.19	3.35	3.46	3.45	0.4%
Residual fuel oil	1.08	1.36	1.68	1.92	2.05	2.15	2.22	1.5%
Residual fuel oil (2018 dollars per barrel)	45	57	71	81	86	90	93	1.5%
Industrial[2]								
Propane	1.18	1.25	1.50	1.59	1.66	1.71	1.72	1.0%
Distillate fuel oil	2.55	3.05	2.88	3.16	3.33	3.43	3.42	0.4%
Residual fuel oil	1.01	1.29	1.99	2.23	2.36	2.46	2.52	2.1%
Residual fuel oil (2018 dollars per barrel)	43	54	84	94	99	103	106	2.1%
Transportation								
Propane	1.74	1.65	1.83	1.97	2.03	2.07	2.07	0.7%
E85[3]	2.11	2.78	2.56	2.36	2.31	2.41	3.22	0.5%
Ethanol wholesale price	1.59	1.53	2.60	2.56	2.38	2.40	2.42	1.4%
Motor gasoline[4]	2.59	2.90	3.15	3.36	3.48	3.58	3.66	0.7%
Jet fuel[5]	1.67	2.18	2.40	2.68	2.86	2.98	3.08	1.1%
Diesel fuel (distillate fuel oil)[6]	2.69	3.18	3.47	3.76	3.94	4.04	4.01	0.7%
Residual fuel oil	1.29	1.64	1.73	2.00	2.21	2.35	2.47	1.3%
Residual fuel oil (2018 dollars per barrel)	54	69	73	84	93	99	104	1.3%
Electric power[7]								
Distillate fuel oil	2.57	3.06	2.76	3.00	3.13	3.23	3.29	0.2%
Residual fuel oil	1.62	1.90	2.20	2.45	2.58	2.66	2.60	1.0%
Residual fuel oil (2018 dollars per barrel)	68	80	93	103	108	112	109	1.0%
Average prices, all sectors[8]								
Propane	1.42	1.59	2.28	2.44	2.51	2.56	2.56	1.5%
Motor gasoline[4]	2.59	2.89	3.15	3.36	3.48	3.58	3.66	0.7%
Jet fuel[5]	1.67	2.18	2.40	2.68	2.86	2.98	3.08	1.1%
Distillate fuel oil	2.66	3.15	3.35	3.64	3.81	3.91	3.87	0.6%
Residual fuel oil	1.33	1.64	1.78	2.05	2.25	2.37	2.48	1.3%
Residual fuel oil (2018 dollars per barrel)	56	69	75	86	94	100	104	1.3%
Average	**2.20**	**2.54**	**2.70**	**2.86**	**2.96**	**3.03**	**3.06**	**0.6%**

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Table A12. Petroleum and other liquids prices (continued)
(nominal dollars per gallon, unless otherwise noted)

Sector and fuel	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Crude oil prices (nominal dollars per barrel)								
Brent spot	54	74	97	124	148	174	226	3.5%
West Texas Intermediate spot	51	68	93	116	141	166	219	3.7%
Average imported refiners acquisition cost[1]	49	65	93	118	141	165	214	3.8%
Delivered sector product prices								
Residential								
Propane	1.60	1.92	3.29	4.02	4.66	5.36	6.89	4.1%
Distillate fuel oil	2.51	3.05	4.21	5.06	5.87	6.74	8.51	3.3%
Commercial								
Distillate fuel oil	2.51	3.06	3.43	4.24	4.96	5.72	7.21	2.7%
Residual fuel oil	1.06	1.36	2.00	2.55	3.03	3.56	4.65	3.9%
Residual fuel oil (nominal dollars per barrel)	44	57	84	107	127	149	195	3.9%
Industrial[2]								
Propane	1.15	1.25	1.79	2.11	2.46	2.82	3.59	3.4%
Distillate fuel oil	2.51	3.05	3.43	4.21	4.92	5.67	7.15	2.7%
Residual fuel oil	0.99	1.29	2.37	2.97	3.49	4.06	5.27	4.5%
Residual fuel oil (nominal dollars per barrel)	42	54	99	125	146	171	221	4.5%
Transportation								
Propane	1.71	1.65	2.18	2.62	3.01	3.42	4.33	3.1%
E85[3]	2.07	2.78	3.05	3.13	3.42	3.98	6.72	2.8%
Ethanol wholesale price	1.56	1.53	3.09	3.41	3.53	3.97	5.05	3.8%
Motor gasoline[4]	2.54	2.90	3.75	4.46	5.15	5.91	7.65	3.1%
Jet fuel[5]	1.64	2.18	2.86	3.57	4.24	4.93	6.45	3.4%
Diesel fuel (distillate fuel oil)[6]	2.64	3.18	4.12	5.00	5.83	6.68	8.38	3.1%
Residual fuel oil	1.27	1.64	2.06	2.66	3.28	3.88	5.17	3.7%
Residual fuel oil (nominal dollars per barrel)	53	69	87	112	138	163	217	3.7%
Electric power[7]								
Distillate fuel oil	2.52	3.06	3.29	3.99	4.63	5.35	6.88	2.6%
Residual fuel oil	1.59	1.90	2.62	3.26	3.81	4.40	5.44	3.3%
Residual fuel oil (nominal dollars per barrel)	67	80	110	137	160	185	228	3.3%
Average prices, all sectors[8]								
Propane	1.39	1.59	2.71	3.24	3.72	4.24	5.35	3.9%
Motor gasoline[4]	2.54	2.89	3.75	4.46	5.16	5.92	7.65	3.1%
Jet fuel[5]	1.64	2.18	2.86	3.57	4.24	4.93	6.45	3.4%
Distillate fuel oil	2.61	3.15	3.99	4.84	5.63	6.46	8.10	3.0%
Residual fuel oil	1.31	1.64	2.12	2.72	3.33	3.92	5.18	3.7%
Residual fuel oil (nominal dollars per barrel)	55	69	89	114	140	165	217	3.7%
Average	**2.16**	**2.54**	**3.21**	**3.81**	**4.38**	**5.01**	**6.40**	**2.9%**

[1]Weighted average price delivered to U.S. refiners.
[2]Includes combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[3]E85 refers to a blend of 85 percent ethanol (renewable) and 15 percent motor gasoline (nonrenewable). To address cold starting issues, the percentage of ethanol varies seasonally. The annual average ethanol content of 74 percent is used for these projections.
[4]Sales weighted-average price for all grades. Includes Federal, State, and local taxes.
[5]Includes only kerosene type.
[6]Diesel fuel for on-road use. Includes Federal and State taxes while excluding county and local taxes.
[7]Includes electricity-only and combined heat and power plants that have a regulatory status.
[8]Weighted averages of end-use fuel prices are derived from the prices in each sector and the corresponding sectoral consumption.
Note: Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 Brent and West Texas Intermediate crude oil spot prices: Thomson Reuters. 2017 average imported crude oil price: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, September 2018. 2017 prices for motor gasoline, distillate fuel oil, and jet fuel are based on: EIA, *Petroleum Marketing Monthly*, July 2018. 2017 residential, commercial, industrial, and transportation sector petroleum product prices are derived from: EIA, Form EIA-782A, "Refiners'/Gas Plant Operators' Monthly Petroleum Product Sales Report." 2017 electric power prices based on: EIA, *Monthly Energy Review*, September 2018. 2017 E85 prices derived from monthly prices in the Clean Cities Alternative Fuel Price Report. 2017 wholesale ethanol prices derived from Oil Price Information Service, Chicago average spot price. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A13. Natural gas supply, disposition, and prices
(trillion cubic feet, unless otherwise noted)

Supply, disposition, and prices	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Supply								
Dry gas production[1]	27.17	29.47	36.62	38.49	39.58	40.72	43.41	1.2%
Supplemental natural gas[2]	0.07	0.07	0.06	0.06	0.06	0.06	0.06	-0.5%
Net imports	-0.13	-0.77	-5.25	-6.49	-6.70	-7.17	-8.27	7.7%
Pipeline[3]	0.50	0.24	-1.16	-1.47	-1.67	-2.14	-3.24	- -
Liquefied natural gas	-0.63	-1.01	-4.09	-5.02	-5.02	-5.03	-5.02	5.1%
Total supply	**27.10**	**28.77**	**31.43**	**32.06**	**32.95**	**33.60**	**35.20**	**0.6%**
Consumption by sector	**27.09**	**29.34**	**31.21**	**31.83**	**32.70**	**33.38**	**34.98**	**0.6%**
Residential	4.40	4.83	4.53	4.47	4.45	4.44	4.43	-0.3%
Commercial	3.16	3.29	3.25	3.32	3.42	3.56	3.92	0.5%
Industrial[4]	9.57	10.06	11.63	12.09	12.27	12.63	13.15	0.8%
Other industrial[4]	7.93	8.21	9.09	9.36	9.47	9.75	10.31	0.7%
Lease and plant fuel[5]	1.57	1.74	2.12	2.22	2.28	2.37	2.33	0.9%
Fuel used to liquefy gas for export[6]	0.07	0.11	0.42	0.51	0.51	0.51	0.51	5.0%
Natural-gas-to-liquids heat and power[7]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Natural gas to liquids production[8]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	- -
Transportation	0.72	0.76	0.78	0.88	0.98	1.08	1.33	1.8%
Motor vehicles, trains, and ships	0.07	0.08	0.15	0.23	0.31	0.39	0.59	6.5%
Pipeline and distribution fuel	0.65	0.68	0.63	0.66	0.67	0.69	0.74	0.3%
Electric power[9]	9.23	10.40	11.02	11.07	11.59	11.67	12.15	0.5%
Discrepancy[10]	**0.02**	**-0.57**	**0.22**	**0.23**	**0.24**	**0.23**	**0.22**	**- -**
Natural gas spot price at Henry Hub								
(2018 dollars per million Btu)	3.08	2.99	3.53	3.76	4.02	4.21	4.87	1.5%
(nominal dollars per million Btu)	3.02	2.99	4.20	5.00	5.95	6.96	10.18	3.9%
Delivered prices								
(2018 dollars per thousand cubic feet)								
Residential	11.18	10.75	11.96	12.66	13.10	13.39	14.26	0.9%
Commercial	8.12	8.01	9.17	9.62	9.91	10.10	10.78	0.9%
Industrial[11]	4.03	4.04	4.57	4.77	5.04	5.23	5.96	1.2%
Transportation[12]	15.32	14.95	13.89	13.62	13.27	13.07	13.54	-0.3%
Electric power[9]	3.58	3.54	4.16	4.35	4.64	4.81	5.54	1.4%
Average[13]	**5.69**	**5.57**	**6.19**	**6.48**	**6.76**	**6.97**	**7.72**	**1.0%**
(nominal dollars per thousand cubic feet)								
Residential	10.97	10.75	14.23	16.82	19.38	22.15	29.82	3.2%
Commercial	7.96	8.01	10.91	12.79	14.67	16.70	22.55	3.3%
Industrial[11]	3.96	4.04	5.43	6.34	7.46	8.65	12.47	3.6%
Transportation[12]	15.02	14.95	16.52	18.10	19.64	21.62	28.31	2.0%
Electric power[9]	3.51	3.54	4.95	5.78	6.86	7.96	11.58	3.8%
Average[13]	**5.58**	**5.57**	**7.36**	**8.62**	**10.01**	**11.53**	**16.14**	**3.4%**

[1]Marketed production (wet) minus extraction losses.
[2]Synthetic natural gas, propane air, coke oven gas, refinery gas, biomass gas, air injected for Btu stabilization, and manufactured gas commingled and distributed with natural gas.
[3]Natural gas imported to and exported from Canada and Mexico.
[4]Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[5]Represents natural gas used in well, field, and lease operations, and in natural gas processing plant machinery.
[6]Fuel used in facilities that liquefy natural gas for export.
[7]Includes any natural gas used in the process of converting natural gas to liquid fuel that is not actually converted.
[8]Includes any natural gas converted into liquid fuel.
[9]Includes consumption of energy by electricity-only and combined heat and power plants that have a regulatory status.
[10]Balancing item. Natural gas lost as a result of converting flow data measured at varying temperatures and pressures to a standard temperature and pressure and the merger of different data reporting systems which vary in scope, format, definition, and respondent type. In addition, 2017 values include net storage injections.
[11]Excludes use for lease and plant fuel and fuel used for liquefaction in export facilities. Includes energy for combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[12]Natural gas used as fuel in motor vehicles, trains, and ships. Price includes estimated motor vehicle fuel taxes and estimated dispensing costs or charges.
[13]Weighted average prices. Weights used are the sectoral consumption values excluding lease, plant, pipeline and distribution fuel, and fuel used for liquefaction in export facilities.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 supply values; lease, plant, and pipeline fuel consumption; and residential and commercial delivered prices: U.S. Energy Information Administration (EIA), *Natural Gas Annual 2017*. 2017 industrial delivered prices derived from: EIA, *Manufacturing Energy Consumption Survey*, 2002-2014. Other 2017 consumption based on: EIA, *Monthly Energy Review*, September 2018. 2017 natural gas spot price at Henry Hub: Thomson Reuters. 2017 electric power prices: EIA, *Electric Power Monthly*, July 2018, and EIA, *State Energy Data Report 2016*. 2017 transportation sector delivered prices are model results. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

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Table A14. Oil and gas supply

Production and supply	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Crude oil								
Lower 48 average wellhead price[1] (2018 dollars per barrel)	**49**	**65**	**78**	**87**	**95**	**100**	**104**	**1.5%**
Production (million barrels per day)[2]								
United States total	9.36	10.74	14.09	14.46	14.33	14.05	11.86	0.3%
Lower 48 onshore	7.12	8.52	11.30	12.09	11.92	11.31	10.09	0.5%
Tight oil[3]	5.06	6.53	9.45	10.22	10.03	9.46	8.38	0.8%
Carbon dioxide enhanced oil recovery	0.31	0.31	0.40	0.46	0.49	0.45	0.36	0.4%
Other	1.75	1.67	1.45	1.41	1.41	1.41	1.35	-0.7%
Lower 48 offshore	1.74	1.73	2.22	1.74	1.46	1.44	1.26	-1.0%
State	0.06	0.06	0.04	0.03	0.03	0.02	0.02	-3.3%
Federal	1.69	1.68	2.18	1.71	1.43	1.41	1.24	-0.9%
Alaska	0.49	0.48	0.58	0.63	0.94	1.30	0.51	0.2%
Onshore	0.39	0.39	0.46	0.40	0.61	0.89	0.32	-0.6%
State offshore	0.10	0.09	0.12	0.21	0.29	0.39	0.19	2.2%
Federal offshore	0.00	0.00	0.00	0.01	0.04	0.02	0.01	1.9%
Natural gas plant liquids production (million barrels per day)								
United States total	3.73	4.36	5.68	6.01	6.05	6.03	5.75	0.9%
Lower 48 onshore	3.54	4.13	5.31	5.69	5.73	5.66	5.46	0.9%
Lower 48 offshore	0.16	0.20	0.31	0.25	0.23	0.24	0.23	0.5%
Alaska	0.03	0.03	0.06	0.06	0.09	0.13	0.05	1.4%
Natural gas								
Natural gas spot price at Henry Hub (2018 dollars per million Btu)	**3.08**	**2.99**	**3.53**	**3.76**	**4.02**	**4.21**	**4.87**	**1.5%**
Dry production (trillion cubic feet)[4]								
United States total	27.17	29.47	36.62	38.49	39.58	40.72	43.41	1.2%
Lower 48 onshore	25.79	27.79	34.90	37.01	38.17	39.12	41.80	1.3%
Tight gas	4.35	4.52	4.45	4.77	4.70	4.85	5.40	0.6%
Shale gas and tight oil plays[3]	16.54	18.41	26.28	28.47	29.94	30.87	33.35	1.9%
Coalbed methane	0.90	0.94	0.76	0.62	0.54	0.49	0.42	-2.5%
Other	4.00	3.92	3.41	3.16	2.98	2.91	2.64	-1.2%
Lower 48 offshore	1.07	1.35	1.38	1.13	1.03	1.17	1.26	-0.2%
State	0.11	0.11	0.04	0.03	0.02	0.02	0.01	-6.1%
Federal	0.96	1.24	1.34	1.10	1.00	1.15	1.25	0.0%
Alaska	0.32	0.33	0.34	0.35	0.39	0.43	0.35	0.2%
Supplemental gas supplies (trillion cubic feet)[5]	**0.07**	**0.07**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**-0.5%**
Total lower 48 wells drilled (thousands)	**18.5**	**24.7**	**34.0**	**38.1**	**39.9**	**40.0**	**39.4**	**1.5%**

[1]Represents lower 48 onshore and offshore supplies.
[2]Includes lease condensate.
[3]Tight oil represents resources in low-permeability reservoirs, including shale and chalk formations. The specific plays included in the tight oil category are Bakken/Three Forks/Sanish, Eagle Ford, Woodford, Austin Chalk, Spraberry, Niobrara, Avalon/Bone Springs, and Monterey.
[4]Marketed production (wet) minus extraction losses.
[5]Synthetic natural gas, propane air, coke oven gas, refinery gas, biomass gas, air injected for Btu stabilization, and manufactured gas commingled and distributed with natural gas.
Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 crude oil lower 48 average wellhead price: U.S. Energy Information Administration (EIA), *Petroleum Marketing Monthly*, July 2018. 2017 lower 48 onshore, lower 48 offshore, and Alaska crude oil production: EIA, *Petroleum Supply Monthly*, July 2018. 2017 natural gas spot price at Henry Hub: Thomson Reuters. 2017 Alaska and total natural gas production: EIA, *Natural Gas Monthly*, July 2018. 2017 supplemental gas supplies: EIA, *Natural Gas Annual 2017*. Other 2017 values: EIA, Office of Energy Analysis. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A15. Coal supply, disposition, and prices
(million short tons, unless otherwise noted)

Supply, disposition, and prices	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Production[1]								
Appalachia	206	200	158	146	133	130	116	-1.7%
Interior	143	146	165	155	147	152	166	0.4%
West	420	416	332	346	327	323	310	-0.9%
East of the Mississippi	310	314	298	284	269	270	269	-0.5%
West of the Mississippi	458	448	356	363	339	335	323	-1.0%
Total	**769**	**762**	**654**	**647**	**608**	**605**	**592**	**-0.8%**
Waste coal supplied[2]	**9**	**10**	**7**	**7**	**7**	**7**	**7**	**-0.9%**
Net imports								
Imports[3]	8	7	4	2	2	2	2	-3.8%
Exports	97	103	81	74	68	71	63	-1.5%
Total	**-89**	**-96**	**-77**	**-71**	**-66**	**-69**	**-61**	**-1.4%**
Total supply[4]	**688**	**677**	**584**	**583**	**549**	**543**	**538**	**-0.7%**
Consumption by sector								
Commercial and institutional	1	1	1	1	1	1	1	0.0%
Coke plants	17	19	17	17	17	17	17	-0.4%
Other industrial[5]	34	31	33	32	31	30	30	-0.1%
Coal-to-liquids heat and power	0	0	0	0	0	0	0	- -
Coal to liquids production	0	0	0	0	0	0	0	- -
Electric power[6]	665	626	534	533	500	495	491	-0.8%
Total	**717**	**677**	**584**	**583**	**549**	**543**	**538**	**-0.7%**
Discrepancy and stock change[7]	**-29**	**0**	**0**	**0**	**0**	**0**	**0**	**- -**
Average minemouth price[8]								
(2018 dollars per short ton)	36.7	33.6	32.8	32.0	32.3	32.7	33.0	-0.1%
(2018 dollars per million Btu)	1.78	1.65	1.59	1.57	1.59	1.61	1.62	0.0%
Delivered prices[9]								
(2018 dollars per short ton)								
Commercial and institutional	84.2	93.5	94.4	95.0	95.3	95.7	95.9	0.1%
Coke plants	133.5	149.4	129.4	134.0	137.4	139.2	143.3	-0.1%
Other industrial[5]	59.0	68.7	72.2	73.4	73.0	73.8	75.3	0.3%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electric power[6]								
(2018 dollars per short ton)	39.9	40.5	42.1	42.7	42.6	43.1	43.3	0.2%
(2018 dollars per million Btu)	2.09	2.11	2.17	2.22	2.21	2.23	2.23	0.2%
Average	**43.2**	**45.0**	**46.4**	**47.2**	**47.4**	**48.0**	**48.3**	**0.2%**
Exports[10]	78.8	94.0	88.5	84.3	79.7	75.8	72.5	-0.8%

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Table A15. Coal supply, disposition, and prices (continued)
(million short tons, unless otherwise noted)

Supply, disposition, and prices	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Average minemouth price[8]								
(nominal dollars per short ton)	36.0	33.6	39.0	42.5	47.8	54.2	69.0	2.3%
(nominal dollars per million Btu)	1.75	1.65	1.89	2.08	2.35	2.66	3.39	2.3%
Delivered prices[9]								
(nominal dollars per short ton)								
Commercial and institutional	82.6	93.5	112.3	126.3	141.1	158.3	200.7	2.4%
Coke plants	130.9	149.4	153.9	178.1	203.4	230.3	299.7	2.2%
Other industrial[5]	57.9	68.7	85.8	97.6	108.1	122.1	157.6	2.6%
Coal to liquids	- -	- -	- -	- -	- -	- -	- -	- -
Electric power[6]								
(nominal dollars per short ton)	39.1	40.5	50.1	56.8	63.0	71.3	90.6	2.5%
(nominal dollars per million Btu)	2.05	2.11	2.58	2.95	3.27	3.69	4.67	2.5%
Average	**42.3**	**45.0**	**55.2**	**62.7**	**70.1**	**79.4**	**100.9**	**2.6%**
Exports[10]	77.3	94.0	105.2	112.0	118.0	125.4	151.6	1.5%

[1]Includes anthracite, bituminous coal, subbituminous coal, and lignite.
[2]Includes waste coal consumed by the electric power and industrial sectors. Waste coal supplied is counted as a supply-side item to balance the same amount of waste coal included in the consumption data.
[3]Excludes imports to Puerto Rico and the U.S. Virgin Islands.
[4]Production plus waste coal supplied plus net imports.
[5]Includes consumption for combined heat and power plants that have a non-regulatory status, and small on-site generating systems. Excludes all coal use in the coal-to-liquids process.
[6]Includes all electricity-only and combined heat and power plants that have a regulatory status.
[7]Balancing item: the sum of production, net imports, and waste coal supplied minus total consumption.
[8]Includes reported prices for both open market and captive mines. Prices weighted by production, which differs from average minemouth prices published in EIA data reports where it is weighted by reported sales.
[9]Prices weighted by consumption; weighted average excludes commercial and institutional prices, and export free-alongside-ship prices.
[10]Free-alongside-ship price at U.S. port of exit.
- - = Not applicable.
Btu = British thermal unit.
Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 data based on: U.S. Energy Information Administration (EIA), *Annual Coal Report 2013*; EIA, *Quarterly Coal Report, October-December 2017*; and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A16. Renewable energy generating capacity and generation
(gigawatts, unless otherwise noted)

Net summer capacity and generation	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Electric power sector[1]								
Net summer capacity								
Conventional hydroelectric power	78.9	79.0	79.2	79.2	79.3	79.3	79.5	0.0%
Geothermal[2]	2.4	2.5	3.5	4.9	6.4	7.3	8.4	3.9%
Municipal waste[3]	3.7	3.7	3.7	3.7	3.7	3.7	3.7	0.0%
Wood and other biomass[4]	3.4	3.3	3.5	3.5	3.5	3.5	3.6	0.2%
Solar thermal	1.8	1.8	1.8	1.8	1.8	1.8	1.8	0.0%
Solar photovoltaic[5]	24.8	30.3	76.7	92.3	113.1	149.0	215.5	6.3%
Wind	87.2	94.7	118.1	119.7	120.6	123.0	134.7	1.1%
Offshore wind	0.0	0.0	0.1	0.1	0.1	0.1	0.1	2.2%
Total electric power sector capacity	**202.2**	**215.2**	**286.5**	**305.1**	**328.4**	**367.6**	**447.2**	**2.3%**
Generation (billion kilowatthours)								
Conventional hydroelectric power	297.5	281.6	308.4	306.8	306.0	306.4	307.8	0.3%
Geothermal[2]	15.8	16.3	24.9	36.1	48.4	56.0	65.6	4.4%
Biogenic municipal waste[6]	17.9	19.5	19.5	19.8	19.9	19.9	20.4	0.1%
Wood and other biomass	13.8	13.6	14.7	14.9	14.9	15.4	16.3	0.6%
Dedicated plants	13.2	13.1	14.5	14.8	14.7	15.0	15.9	0.6%
Cofiring	0.7	0.5	0.2	0.1	0.2	0.4	0.4	-0.4%
Solar thermal	3.3	3.6	3.3	3.2	3.3	3.2	3.2	-0.3%
Solar photovoltaic[5]	49.7	63.0	174.6	219.5	271.2	370.1	543.6	7.0%
Wind	253.7	272.5	364.0	368.7	371.9	379.8	425.5	1.4%
Offshore wind	0.0	0.1	0.2	0.2	0.2	0.2	0.2	1.3%
Total electric power sector generation	**651.7**	**670.3**	**909.5**	**969.3**	**1,035.8**	**1,151.0**	**1,382.6**	**2.3%**
End-use sectors[7]								
Net summer capacity								
Conventional hydroelectric power	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	- -
Municipal waste[8]	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0%
Biomass	4.3	4.3	4.9	5.1	5.4	5.7	6.4	1.2%
Solar photovoltaic[5]	20.1	24.0	52.5	69.4	90.8	117.1	185.9	6.6%
Wind	0.6	0.6	0.6	0.6	0.7	1.2	2.4	4.4%
Total end-use sector capacity	**25.9**	**29.8**	**58.9**	**76.0**	**97.8**	**124.9**	**195.5**	**6.1%**
Generation (billion kilowatthours)								
Conventional hydroelectric power	1.6	1.7	1.7	1.7	1.7	1.7	1.7	0.0%
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	- -
Municipal waste[8]	3.9	3.9	3.8	3.8	3.8	3.8	3.8	0.0%
Biomass	23.9	24.0	25.1	26.3	27.9	29.9	33.3	1.0%
Solar photovoltaic[5]	28.2	33.6	73.7	98.1	129.3	168.2	271.1	6.7%
Wind	0.8	0.8	0.8	0.8	0.9	1.6	3.3	4.6%
Total end-use sector generation	**58.3**	**63.9**	**105.1**	**130.6**	**163.7**	**205.2**	**313.2**	**5.1%**

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Table A16. Renewable energy generating capacity and generation (continued)
(gigawatts, unless otherwise noted)

Net summer capacity and generation	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Total, all sectors								
Net summer capacity								
Conventional hydroelectric power	79.2	79.3	79.6	79.6	79.6	79.6	79.9	0.0%
Geothermal	2.4	2.5	3.5	4.9	6.4	7.3	8.4	3.9%
Municipal waste	4.3	4.2	4.2	4.2	4.2	4.2	4.2	0.0%
Wood and other biomass[4]	7.7	7.7	8.4	8.6	8.9	9.3	9.9	0.8%
Solar[5]	46.6	56.1	131.0	163.5	205.6	267.8	403.1	6.4%
Wind	87.8	95.4	118.7	120.4	121.4	124.3	137.2	1.1%
Total capacity, all sectors	**228.1**	**245.1**	**345.4**	**381.1**	**426.2**	**492.5**	**642.7**	**3.1%**
Generation (billion kilowatthours)								
Conventional hydroelectric power	299.1	283.3	310.1	308.5	307.7	308.1	309.4	0.3%
Geothermal	15.8	16.3	24.9	36.1	48.4	56.0	65.6	4.4%
Municipal waste	21.8	23.4	23.3	23.7	23.8	23.7	24.3	0.1%
Wood and other biomass	37.7	37.6	39.8	41.2	42.8	45.3	49.6	0.9%
Solar[5]	81.1	100.2	251.5	320.8	403.8	541.5	818.0	6.8%
Wind	254.5	273.4	364.9	369.7	373.0	381.5	428.9	1.4%
Total generation, all sectors	**710.0**	**734.2**	**1,014.6**	**1,100.0**	**1,199.5**	**1,356.2**	**1,695.9**	**2.7%**

[1]Includes electricity-only and combined heat and power plants that have a regulatory status.
[2]Includes both hydrothermal resources (hot water and steam) and near-field enhanced geothermal systems (EGS). Near-field EGS potential occurs on known hydrothermal sites, however this potential requires the addition of external fluids for electricity generation and is only available after 2025.
[3]Includes municipal waste, landfill gas, and municipal sewage sludge. Incremental growth is assumed to be for landfill gas facilities. All municipal waste is included, although a portion of the municipal waste stream contains petroleum-derived plastics and other non-renewable sources.
[4]Facilities co-firing biomass and coal are classified as coal.
[5]Does not include off-grid photovoltaics.
[6]Includes biogenic municipal waste, landfill gas, and municipal sewage sludge. Incremental growth is assumed to be for landfill gas facilities.
[7]Includes combined heat and power plants and electricity-only plants in the commercial and industrial sectors that have a non-regulatory status; and small on-site generating systems in the residential, commercial, and industrial sectors used primarily for own-use generation, but which may also sell some power to the grid.
[8]Includes municipal waste, landfill gas, and municipal sewage sludge. All municipal waste is included, although a portion of the municipal waste stream contains petroleum-derived plastics and other non-renewable sources.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 capacity: U.S. Energy Information Administration (EIA), Form EIA-860, "Annual Electric Generator Report" (preliminary). 2017 generation: EIA, *Monthly Energy Review*, September 2018. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A17. Renewable energy consumption by sector and source
(quadrillion Btu per year)

Sector and source	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Marketed renewable energy[1]								
Residential (wood)	**0.37**	**0.44**	**0.42**	**0.41**	**0.39**	**0.38**	**0.34**	**-0.8%**
Commercial (biomass)	**0.14**	**0.14**	**0.14**	**0.14**	**0.14**	**0.14**	**0.14**	**0.0%**
Industrial[2]	**2.43**	**2.42**	**2.63**	**2.75**	**2.89**	**3.06**	**3.36**	**1.0%**
Conventional hydroelectric power	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
Municipal waste[3]	0.17	0.17	0.17	0.18	0.19	0.21	0.24	1.2%
Biomass	1.48	1.47	1.61	1.71	1.84	1.99	2.28	1.4%
Biofuels heat and coproducts	0.78	0.78	0.85	0.86	0.85	0.85	0.84	0.2%
Transportation	**1.52**	**1.55**	**1.52**	**1.48**	**1.46**	**1.46**	**1.50**	**-0.1%**
Ethanol used in E85[4]	0.01	0.03	0.09	0.14	0.16	0.16	0.07	3.1%
Ethanol used in gasoline blending	1.19	1.16	1.08	0.98	0.91	0.91	1.06	-0.3%
Biodiesel used in distillate blending	0.27	0.30	0.24	0.25	0.25	0.25	0.25	-0.6%
Biobutanol	0.00	0.00	0.00	0.00	0.02	0.02	0.00	- -
Liquids from biomass	0.00	0.00	0.00	0.01	0.01	0.01	0.00	7.6%
Renewable diesel and gasoline[5]	0.05	0.07	0.11	0.11	0.11	0.11	0.12	1.7%
Electric power[6]	**6.25**	**6.43**	**8.08**	**8.38**	**8.72**	**9.54**	**11.21**	**1.8%**
Conventional hydroelectric power	2.76	2.61	2.65	2.56	2.49	2.46	2.42	-0.2%
Geothermal	0.15	0.15	0.21	0.30	0.39	0.45	0.52	3.9%
Biogenic municipal waste[7]	0.27	0.30	0.30	0.31	0.31	0.31	0.32	0.2%
Biomass	0.23	0.22	0.24	0.24	0.24	0.25	0.26	0.5%
Dedicated plants	0.18	0.18	0.20	0.20	0.20	0.20	0.21	0.6%
Cofiring	0.05	0.05	0.04	0.04	0.04	0.04	0.05	0.1%
Solar thermal	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-0.8%
Solar photovoltaic	0.46	0.58	1.52	1.85	2.23	3.00	4.31	6.5%
Wind	2.35	2.53	3.13	3.08	3.03	3.05	3.35	0.9%
Total marketed renewable energy	**10.70**	**10.98**	**12.79**	**13.16**	**13.60**	**14.57**	**16.55**	**1.3%**
Sources of ethanol								
from corn and other starch	1.31	1.32	1.26	1.26	1.22	1.22	1.25	-0.2%
from cellulose	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.8%
Net imports	-0.11	-0.13	-0.10	-0.15	-0.16	-0.15	-0.12	-0.3%
Total	**1.20**	**1.19**	**1.17**	**1.12**	**1.07**	**1.07**	**1.13**	**-0.1%**

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Table A17. Renewable energy consumption by sector and source (continued)
(quadrillion Btu per year)

Sector and source	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Nonmarketed renewable energy[8]								
Selected consumption								
Residential	**0.18**	**0.23**	**0.42**	**0.57**	**0.75**	**0.98**	**1.61**	**6.3%**
Solar hot water heating	0.02	0.03	0.05	0.04	0.04	0.05	0.05	1.5%
Geothermal heat pumps	0.03	0.04	0.05	0.06	0.07	0.08	0.10	2.6%
Solar photovoltaic	0.13	0.16	0.33	0.46	0.63	0.86	1.46	7.2%
Wind	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.4%
Commercial	**0.20**	**0.22**	**0.35**	**0.38**	**0.44**	**0.51**	**0.67**	**3.6%**
Solar thermal	0.07	0.07	0.07	0.07	0.07	0.07	0.07	-0.3%
Solar photovoltaic	0.11	0.13	0.27	0.31	0.36	0.43	0.58	4.7%
Wind	0.01	0.01	0.01	0.01	0.01	0.01	0.02	3.4%

[1]Includes nonelectric renewable energy groups for which the energy source is bought and sold in the marketplace, although all transactions may not necessarily be marketed, and renewable energy inputs for electricity entering the marketplace on the electric power grid. Excludes electricity imports; see Table A2. Actual heat rates used to determine fuel consumption for all renewable fuels except hydroelectric, geothermal, solar, and wind. Consumption at hydroelectric, geothermal, solar, and wind facilities is determined by using the average electric power sector fossil-fuels net heat rate.
[2]Includes combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[3]Includes municipal waste, landfill gas, and municipal sewage sludge. All municipal waste is included, although a portion of the municipal waste stream contains petroleum-derived plastics and other non-renewable sources.
[4]Excludes motor gasoline component of E85. E85 refers to a blend of 85 percent ethanol (renewable) and 15 percent motor gasoline (nonrenewable). To address cold starting issues, the percentage of ethanol varies seasonally. The annual average ethanol content of 74 percent is used for these projections.
[5]Renewable feedstocks for the on-site production of diesel and gasoline.
[6]Includes consumption of energy by electricity-only and combined heat and power plants that have a regulatory status.
[7]Includes biogenic municipal waste, landfill gas, and municipal sewage sludge. Incremental growth is assumed to be for landfill gas facilities.
[8]Includes selected renewable energy consumption data for which the energy is not bought or sold, either directly or indirectly as an input to marketed energy. The U.S. Energy Information Administration does not estimate or project total consumption of nonmarketed renewable energy.
- - = Not applicable.
Btu = British thermal unit.
Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 ethanol: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, September 2018. 2017 electric power sector: EIA, Form EIA-860, "Annual Electric Generator Report" (preliminary). Other 2017 values: EIA, Office of Energy Analysis. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

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Table A18. Energy-related carbon dioxide emissions by sector and source
(million metric tons, unless otherwise noted)

Sector and source	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Residential								
Petroleum	61	67	54	49	46	43	39	-1.7%
Natural gas	243	266	250	246	245	245	244	-0.3%
Electricity[1]	652	671	581	570	556	553	552	-0.6%
Total residential	**956**	**1,004**	**884**	**865**	**847**	**841**	**835**	**-0.6%**
Commercial								
Petroleum	59	63	61	60	60	60	62	-0.1%
Natural gas	175	181	179	183	189	196	216	0.5%
Coal	2	2	2	2	2	2	2	0.0%
Electricity[1]	638	630	570	561	544	538	548	-0.4%
Total commercial	**874**	**876**	**813**	**805**	**794**	**796**	**828**	**-0.2%**
Industrial[2]								
Petroleum	349	391	364	370	382	398	428	0.3%
Natural gas[3]	510	528	610	634	643	662	691	0.8%
Coal	109	110	108	107	105	104	102	-0.3%
Electricity[1]	448	435	437	443	432	429	426	-0.1%
Total industrial	**1,415**	**1,464**	**1,519**	**1,554**	**1,562**	**1,593**	**1,646**	**0.4%**
Transportation								
Petroleum[4]	1,856	1,858	1,699	1,602	1,535	1,521	1,577	-0.5%
Natural gas[5]	40	42	43	49	54	59	73	1.8%
Electricity[1]	5	6	19	28	37	45	61	7.6%
Total transportation	**1,902**	**1,906**	**1,761**	**1,679**	**1,626**	**1,626**	**1,711**	**-0.3%**
Electric power[6]								
Petroleum	19	14	9	8	7	7	6	-2.7%
Natural gas	506	570	604	606	633	639	665	0.5%
Coal	1,207	1,146	982	975	916	907	903	-0.7%
Other[7]	12	12	12	12	12	13	13	0.3%
Total electric power	**1,744**	**1,741**	**1,607**	**1,601**	**1,570**	**1,565**	**1,587**	**-0.3%**
Total by fuel								
Petroleum[4]	2,343	2,393	2,187	2,089	2,030	2,029	2,111	-0.4%
Natural gas	1,474	1,587	1,686	1,718	1,765	1,801	1,889	0.5%
Coal	1,318	1,258	1,092	1,084	1,023	1,013	1,006	-0.7%
Other[7]	12	12	12	12	12	13	13	0.3%
Total	**5,147**	**5,250**	**4,977**	**4,903**	**4,830**	**4,856**	**5,019**	**-0.1%**
Carbon dioxide emissions (metric tons per person)	**15.8**	**16.0**	**14.4**	**13.8**	**13.2**	**13.0**	**12.9**	**-0.7%**

[1]Emissions from the electric power sector are distributed to the end-use sectors.
[2]Includes combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[3]Includes lease and plant fuel.
[4]This includes carbon dioxide from international bunker fuels, both civilian and military, which are excluded from the accounting of carbon dioxide emissions under the United Nations convention.
[5]Includes pipeline and distribution fuel natural gas and natural gas used as fuel in motor vehicles, trains, and ships.
[6]Includes electricity-only and combined heat and power plants that have a regulatory status.
[7]Includes emissions from geothermal power and nonbiogenic emissions from municipal waste.

Note: By convention, the direct emissions from biogenic energy sources are excluded from energy-related carbon dioxide emissions. The release of carbon from these sources is assumed to be balanced by the uptake of carbon when the feedstock is grown, resulting in zero net emissions over some period of time. If, however, increased use of biomass energy results in a decline in terrestrial carbon stocks, a net positive release of carbon may occur. See Table A19, "Energy-Related Carbon Dioxide Emissions by End Use", for the emissions from biogenic energy sources as an indication of the potential net release of carbon dioxide in the absence of offsetting sequestration. Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.

Sources: 2017 emissions and emission factors: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, September 2018. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

Table A19. Energy-related carbon dioxide emissions by end use
(million metric tons)

Sector and end use	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Residential								
Space heating	292	337	288	273	259	248	230	-1.2%
Space cooling	87	102	87	88	89	92	97	-0.1%
Water heating	143	141	129	127	125	125	125	-0.4%
Refrigeration	41	40	34	32	31	31	32	-0.7%
Cooking	14	14	13	13	13	13	13	-0.2%
Clothes dryers	30	30	29	30	30	31	32	0.2%
Freezers	10	9	8	8	7	7	7	-1.0%
Lighting	45	42	23	22	21	20	19	-2.5%
Clothes washers[1]	5	5	4	5	4	4	5	-0.2%
Dishwashers[1]	3	3	3	3	4	4	4	0.6%
Televisions and related equipment[2]	30	29	23	23	24	25	26	-0.3%
Computers and related equipment[3]	13	12	9	8	7	6	4	-3.6%
Furnace fans and boiler circulation pumps	9	12	9	9	8	7	6	-2.0%
Other uses[4]	237	228	223	225	225	227	234	0.1%
Discrepancy[5]	-3	1	1	1	1	1	1	-1.2%
Total residential	**956**	**1,004**	**884**	**865**	**847**	**841**	**835**	**-0.6%**
Commercial								
Space heating[6]	119	132	119	114	111	108	102	-0.8%
Space cooling[6]	71	76	62	60	58	57	56	-0.9%
Water heating[6]	36	36	36	36	36	37	37	0.1%
Ventilation	71	69	59	52	46	42	37	-1.9%
Cooking	29	29	29	30	31	32	34	0.5%
Lighting	67	65	52	48	41	37	30	-2.4%
Refrigeration	90	87	78	77	74	73	73	-0.6%
Computing	48	45	37	36	36	36	33	-1.0%
Office equipment	50	52	63	69	71	74	85	1.6%
Other uses[7]	294	285	278	284	290	301	341	0.6%
Total commercial	**874**	**876**	**813**	**805**	**794**	**796**	**828**	**-0.2%**
Industrial[8]								
Manufacturing								
Refining	259	261	237	228	231	239	253	-0.1%
Food products	84	83	90	96	101	106	118	1.1%
Paper products	55	53	53	52	49	49	49	-0.3%
Bulk chemicals	279	284	333	351	354	359	366	0.8%
Glass	10	11	11	11	11	11	10	-0.2%
Cement and lime	30	29	29	27	24	24	26	-0.3%
Iron and steel	106	113	105	105	103	102	95	-0.5%
Aluminum	20	20	20	20	20	20	20	-0.1%
Fabricated metal products	30	30	31	32	33	34	35	0.4%
Machinery	14	14	15	16	17	18	19	0.9%
Computers and electronics	14	14	15	15	16	16	17	0.7%
Transportation equipment	30	30	29	31	32	34	38	0.7%
Electrical equipment	8	8	8	9	9	10	11	1.1%
Wood products	13	13	12	12	13	13	13	0.0%
Plastics	28	28	28	29	29	30	32	0.4%
Balance of manufacturing	115	113	110	112	111	112	116	0.1%
Total manufacturing	**1,098**	**1,105**	**1,124**	**1,148**	**1,153**	**1,176**	**1,219**	**0.3%**
Nonmanufacturing								
Agriculture	82	84	78	79	81	83	88	0.2%
Construction	72	76	68	70	72	74	81	0.2%
Mining	108	110	120	119	115	114	112	0.0%
Total nonmanufacturing	**262**	**270**	**266**	**268**	**268**	**272**	**281**	**0.1%**
Discrepancy[5]	55	89	129	138	141	146	146	1.5%
Total industrial	**1,415**	**1,464**	**1,519**	**1,554**	**1,562**	**1,593**	**1,646**	**0.4%**

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Table A19. Energy-related carbon dioxide emissions by end use (continued)
(million metric tons)

Sector and end use	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Transportation								
Light-duty vehicles	1,035	1,018	893	811	756	734	744	-1.0%
Commercial light trucks[9]	60	60	60	58	58	61	70	0.5%
Bus transportation	16	16	16	16	16	16	16	0.0%
Freight trucks	391	394	397	384	376	382	415	0.2%
Rail, passenger	5	5	5	5	5	5	5	0.4%
Rail, freight	36	36	34	34	33	32	31	-0.4%
Shipping, domestic	7	6	5	4	4	4	3	-2.2%
Shipping, international	73	69	70	69	67	66	66	-0.2%
Recreational boats	16	16	16	16	16	16	16	-0.1%
Air	179	180	195	206	217	228	254	1.1%
Military use	38	40	39	39	39	39	40	0.0%
Lubricants	5	5	5	5	5	5	5	-0.1%
Pipeline and distribution fuel	36	37	35	36	37	38	41	0.3%
Discrepancy[5]	4	22	-9	-5	-3	0	5	-4.7%
Total transportation	**1,902**	**1,906**	**1,761**	**1,679**	**1,626**	**1,626**	**1,711**	**-0.3%**
Biogenic energy combustion[10]								
Biomass	208	213	226	235	246	259	284	0.9%
Electric power sector	22	21	22	23	23	23	24	0.5%
Other sectors	187	192	203	212	223	235	259	0.9%
Biogenic waste	25	27	27	28	28	28	29	0.2%
Biofuels heat and coproducts	74	73	79	80	80	80	79	0.2%
Ethanol	82	81	80	77	73	74	78	-0.1%
Biodiesel	19	21	18	18	18	18	18	-0.6%
Liquids from biomass	0	0	0	0	0	0	0	7.6%
Renewable diesel and gasoline	4	5	8	8	8	8	9	1.7%
Total	**412**	**422**	**438**	**446**	**453**	**466**	**495**	**0.5%**

[1]Does not include water heating portion of load.
[2]Includes televisions, set-top boxes, home theater systems, DVD players, and video game consoles.
[3]Includes desktop and laptop computers, monitors, and networking equipment.
[4]Includes small electric devices, heating elements, outdoor grills, natural gas-fueled lights, pool heaters, spa heaters, backup electricity generators, and motors not listed above. Electric vehicles are included in the transportation sector.
[5]Represents differences between total emissions by end-use and total emissions by fuel as reported in Table A18. Emissions by fuel may reflect benchmarking and other modeling adjustments to energy use and the associated emissions that are not assigned to specific end uses.
[6]Includes emissions related to fuel consumption for district services.
[7]Includes emissions related to (but not limited to) miscellaneous uses such as transformers, medical imaging and other medical equipment, elevators, escalators, off-road electric vehicles, laboratory fume hoods, laundry equipment, coffee brewers, water services, emergency generators, combined heat and power in commercial buildings, manufacturing performed in commercial buildings, and cooking (distillate), plus residual fuel oil, propane, coal, motor gasoline, kerosene, and marketed renewable fuels (biomass).
[8]Includes combined heat and power plants that have a non-regulatory status, and small on-site generating systems.
[9]Commercial trucks 8,501 to 10,000 pounds gross vehicle weight rating.
[10]By convention, the direct emissions from biogenic energy sources are excluded from energy-related carbon dioxide emissions. The release of carbon from these sources is assumed to be balanced by the uptake of carbon when the feedstock is grown, resulting in zero net emissions over some period of time. If, however, increased use of biomass energy results in a decline in terrestrial carbon stocks, a net positive release of carbon may occur. Accordingly, the emissions from biogenic energy sources are reported here as an indication of the potential net release of carbon dioxide in the absence of offsetting sequestration.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 emissions and emission factors: U.S. Energy Information Administration (EIA), *Monthly Energy Review*, September 2018. 2018: EIA, *Short-Term Energy Outlook*, October 2018 and EIA, AEO2019 National Energy Modeling System run ref2019.d111618a. **Projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a.

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Table A20. Macroeconomic indicators
(billion 2009 chain-weighted dollars, unless otherwise noted)

Indicators	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Real gross domestic product	**17,096**	**17,582**	**20,116**	**22,157**	**24,348**	**26,675**	**32,006**	**1.9%**
Components of real gross domestic product								
Real consumption	11,891	12,180	14,087	15,600	17,225	18,975	23,009	2.0%
Real investment	2,314	2,450	3,020	3,367	3,794	4,250	5,343	2.5%
Real government spending	2,903	2,958	3,070	3,162	3,258	3,358	3,578	0.6%
Real exports	2,191	2,310	3,177	3,695	4,321	5,053	6,806	3.4%
Real imports	2,813	2,974	3,959	4,398	4,983	5,654	7,383	2.9%
Energy intensity (thousand Btu per 2009 dollar of GDP)								
Delivered energy	4.25	4.26	3.76	3.41	3.12	2.91	2.56	-1.6%
Total energy	5.70	5.70	4.94	4.48	4.08	3.79	3.33	-1.7%
Price indices								
GDP chain-type price index (2009=1.00)	1.13	1.16	1.38	1.54	1.71	1.91	2.42	2.3%
Consumer price index (1982-4=1.00)								
All-urban	2.45	2.51	2.96	3.31	3.70	4.14	5.24	2.3%
Energy commodities and services	2.05	2.20	2.49	2.77	3.14	3.57	4.66	2.4%
Wholesale price index (1982=1.00)								
All commodities	1.94	2.02	2.34	2.58	2.80	3.03	3.59	1.8%
Fuel and power	1.64	1.83	2.32	2.74	3.16	3.62	4.74	3.0%
Metals and metal products	2.08	2.25	2.43	2.49	2.53	2.58	2.67	0.5%
Industrial commodities excluding energy	2.00	2.06	2.32	2.49	2.66	2.84	3.25	1.4%
Interest rates (percent, nominal)								
Federal funds rate	1.00	1.83	2.97	2.72	2.72	2.72	2.72	- -
10-year treasury note	2.33	3.08	3.70	3.68	3.67	3.65	3.65	- -
AA utility bond rate	3.82	4.35	5.79	5.79	5.84	5.85	5.96	- -
Value of shipments (billion 2009 dollars)								
Non-industrial and service sectors	22,237	22,924	26,734	29,744	33,383	37,544	46,761	2.3%
Total industrial	7,444	7,686	8,803	9,570	10,400	11,299	13,312	1.7%
Agriculture, mining, and construction	2,062	2,146	2,504	2,639	2,788	2,938	3,280	1.3%
Manufacturing	5,382	5,540	6,298	6,931	7,611	8,360	10,032	1.9%
Energy-intensive	1,906	1,950	2,141	2,260	2,377	2,516	2,808	1.1%
Non-energy-intensive	3,476	3,590	4,157	4,671	5,234	5,844	7,224	2.2%
Total shipments	**29,681**	**30,610**	**35,537**	**39,314**	**43,783**	**48,843**	**60,073**	**2.1%**
Population and employment (millions)								
Population, with armed forces overseas	326	328	345	355	365	374	389	0.5%
Population, aged 16 and over	261	263	278	288	297	305	320	0.6%
Population, aged 65 and over	51	53	66	73	78	81	86	1.5%
Employment, nonfarm	146	149	155	159	164	169	179	0.6%
Employment, manufacturing	12.1	12.3	13.2	13.5	13.8	14.1	14.7	0.6%
Key labor indicators								
Labor force (millions)	160	162	170	174	180	185	195	0.6%
Nonfarm labor productivity (2009=1.00)	1.08	1.10	1.22	1.33	1.43	1.53	1.76	1.5%
Unemployment rate (percent)	4.35	3.87	4.54	4.49	4.58	4.72	4.71	- -
Key indicators for energy demand								
Real disposable personal income	12,764	13,037	15,379	17,287	19,256	21,290	25,744	2.1%
Housing starts (millions)	1.30	1.45	1.57	1.53	1.55	1.52	1.60	0.3%
Commercial floorspace (billion square feet)	91	92	99	104	109	115	125	1.0%
Unit sales of light-duty vehicles (millions)	17.2	16.9	16.3	16.6	17.3	17.7	18.0	0.2%

GDP = Gross domestic product.
Btu = British thermal unit.
- - = Not applicable.
Sources: 2017 and 2018: IHS Markit, Macroeconomic and Employment models, August 2018; and IHS Markit, Industry model, May 2018. **Projections:** U.S. Energy Information Administration, AEO2019 National Energy Modeling System run ref2019.d111618a.

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Table A21. International petroleum and other liquids supply, disposition, and prices
(million barrels per day, unless otherwise noted)

Supply, disposition, and prices	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Crude oil spot prices								
(2018 dollars per barrel)								
Brent	55	74	82	93	100	105	108	1.2%
West Texas Intermediate	52	68	78	87	95	100	105	1.3%
(nominal dollars per barrel)								
Brent	54	74	97	124	148	174	226	3.5%
West Texas Intermediate	51	68	93	116	141	166	219	3.7%
Petroleum and other liquids consumption[1]								
OECD								
United States (50 states)	19.92	20.40	19.83	19.35	19.09	19.24	20.18	0.0%
United States territories	0.25	0.25	0.27	0.28	0.29	0.30	0.33	0.9%
Canada	2.44	2.40	2.40	2.36	2.35	2.36	2.43	0.0%
Mexico and Chile	2.34	2.34	2.40	2.44	2.52	2.63	2.72	0.5%
OECD Europe[2]	14.54	14.52	14.39	14.14	13.99	13.89	13.46	-0.2%
Japan	3.89	3.78	3.37	3.30	3.26	3.20	3.13	-0.6%
South Korea	2.58	2.64	2.71	2.72	2.76	2.81	2.93	0.3%
Australia and New Zealand	1.34	1.39	1.58	1.65	1.70	1.79	2.08	1.3%
Total OECD consumption	**47.32**	**47.71**	**46.95**	**46.24**	**45.95**	**46.21**	**47.25**	**0.0%**
Non-OECD								
Russia	3.68	3.75	3.82	3.67	3.63	3.61	3.53	-0.2%
Other Europe and Eurasia[3]	1.86	1.91	1.94	1.89	1.87	1.89	1.93	0.0%
China	13.36	13.87	16.56	17.08	17.24	17.18	16.42	0.5%
India	4.55	4.79	6.09	7.06	8.51	10.13	12.84	3.1%
Other Asia[4]	8.66	8.85	10.37	11.47	12.73	14.18	16.80	2.0%
Middle East	8.39	8.45	8.68	8.35	8.74	9.21	10.17	0.6%
Africa	4.27	4.38	4.91	5.21	5.65	6.23	7.72	1.8%
Brazil	3.04	3.05	3.50	3.66	3.76	3.86	3.99	0.8%
Other Central and South America	3.22	3.15	3.40	3.47	3.56	3.71	4.06	0.8%
Total non-OECD consumption	**51.04**	**52.21**	**59.27**	**61.85**	**65.68**	**70.00**	**77.46**	**1.2%**
Total consumption	**98.36**	**99.93**	**106.22**	**108.09**	**111.63**	**116.21**	**124.72**	**0.7%**
Petroleum and other liquids production								
OPEC[5]								
Middle East	29.76	30.07	31.81	32.36	34.01	35.97	39.78	0.9%
North Africa	2.57	2.64	2.20	2.50	2.91	3.38	4.22	1.5%
West Africa	4.36	4.40	4.88	4.95	5.07	5.20	6.18	1.1%
South America	2.60	1.97	1.08	1.47	1.97	2.56	3.53	1.8%
Total OPEC production	**39.29**	**39.09**	**39.97**	**41.27**	**43.96**	**47.13**	**53.70**	**1.0%**
Non-OPEC								
OECD								
United States (50 states)	15.56	17.63	22.09	22.70	22.67	22.43	20.08	0.4%
Canada	4.96	5.12	5.46	5.55	5.85	6.21	7.17	1.1%
Mexico and Chile	2.27	2.18	2.13	2.15	2.30	2.61	3.51	1.5%
OECD Europe[2]	3.89	3.89	3.94	3.70	3.56	3.33	2.92	-0.9%
Japan and South Korea	0.23	0.24	0.29	0.30	0.30	0.29	0.29	0.6%
Australia and New Zealand	0.39	0.41	0.54	0.52	0.51	0.60	0.83	2.2%
Total OECD production	**27.31**	**29.48**	**34.44**	**34.91**	**35.19**	**35.48**	**34.79**	**0.5%**
Non-OECD								
Russia	11.20	11.37	10.84	10.69	10.81	11.24	11.75	0.1%
Other Europe and Eurasia[3]	3.27	3.37	3.48	3.62	3.70	3.65	3.47	0.1%
China	4.78	4.79	5.38	5.45	5.50	5.66	6.04	0.7%
Other Asia[4]	3.86	3.80	3.46	3.23	3.20	3.22	3.41	-0.3%
Middle East	1.07	1.09	0.97	0.85	0.82	0.81	0.85	-0.8%
Africa	1.53	1.48	1.54	1.49	1.48	1.49	1.61	0.3%
Brazil	3.36	3.51	4.19	4.65	5.00	5.33	6.18	1.8%
Other Central and South America	1.96	1.96	1.96	1.90	1.95	2.20	2.92	1.3%
Total non-OECD production	**31.03**	**31.37**	**31.82**	**31.90**	**32.48**	**33.59**	**36.23**	**0.5%**
Total petroleum and other liquids production	**97.63**	**99.93**	**106.22**	**108.09**	**111.63**	**116.21**	**124.72**	**0.7%**
OPEC market share (percent)	40.2	39.1	37.6	38.2	39.4	40.6	43.1	- -

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Table A21. International petroleum and other liquids supply, disposition, and prices (continued)
(million barrels per day, unless otherwise noted)

Supply, disposition, and prices	Reference case							Annual growth 2018-2050 (percent)
	2017	2018	2025	2030	2035	2040	2050	
Selected world production subtotals:								
Crude oil and equivalents[6]	81.06	82.50	86.73	87.89	91.00	95.13	103.24	0.7%
Tight oil	5.42	6.87	9.77	10.58	10.75	11.18	12.71	1.9%
Bitumen[7]	2.53	2.76	3.38	3.55	3.73	3.92	4.33	1.4%
Refinery processing gain[8]	2.59	2.62	2.92	3.02	3.13	3.25	3.45	0.9%
Natural gas plant liquids	10.60	11.18	12.80	13.26	13.41	13.49	13.53	0.6%
Liquids from renewable sources[9]	2.32	2.39	2.62	2.88	3.09	3.34	3.45	1.1%
Liquids from coal[10]	0.30	0.30	0.18	0.20	0.22	0.24	0.29	-0.1%
Liquids from natural gas[11]	0.23	0.23	0.41	0.41	0.42	0.42	0.44	2.0%
Liquids from kerogen[12]	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.0%
Crude oil production[6]								
OPEC[5]								
Middle East	26.48	26.77	28.41	28.98	30.64	32.62	36.45	1.0%
North Africa	2.20	2.29	1.86	2.08	2.40	2.77	3.29	1.1%
West Africa	4.24	4.27	4.71	4.77	4.90	5.02	5.99	1.1%
South America	2.53	1.93	1.05	1.43	1.93	2.53	3.49	1.9%
Total OPEC production	**35.46**	**35.25**	**36.03**	**37.27**	**39.87**	**42.94**	**49.23**	**1.0%**
Non-OPEC								
OECD								
United States (50 states)	9.36	10.74	14.09	14.46	14.33	14.05	11.86	0.3%
Canada	3.98	4.15	4.42	4.45	4.74	5.10	6.05	1.2%
Mexico and Chile	1.98	1.92	1.86	1.88	2.02	2.34	3.23	1.6%
OECD Europe[2]	2.92	2.91	2.72	2.43	2.28	2.02	1.57	-1.9%
Japan and South Korea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.0%
Australia and New Zealand	0.29	0.32	0.40	0.38	0.38	0.47	0.70	2.5%
Total OECD production	**18.54**	**20.04**	**23.50**	**23.61**	**23.75**	**23.98**	**23.41**	**0.5%**
Non-OECD								
Russia	10.58	10.75	10.17	10.03	10.14	10.58	11.09	0.1%
Other Europe and Eurasia[3]	3.05	3.13	3.22	3.35	3.43	3.38	3.19	0.1%
China	3.84	3.77	4.24	4.24	4.22	4.24	4.54	0.6%
Other Asia[4]	3.03	2.96	2.53	2.24	2.18	2.15	2.27	-0.8%
Middle East	1.04	1.06	0.95	0.83	0.81	0.79	0.83	-0.8%
Africa	1.32	1.27	1.23	1.18	1.16	1.17	1.28	0.0%
Brazil	2.62	2.67	3.31	3.67	3.91	4.13	4.94	1.9%
Other Central and South America	1.59	1.59	1.54	1.48	1.52	1.77	2.47	1.4%
Total non-OECD production	**27.06**	**27.21**	**27.20**	**27.01**	**27.37**	**28.20**	**30.60**	**0.4%**
Total crude oil production[6]	**81.06**	**82.50**	**86.73**	**87.89**	**91.00**	**95.13**	**103.24**	**0.7%**
OPEC market share (percent)	43.7	42.7	41.5	42.4	43.8	45.1	47.7	0.3%

[1]Estimated consumption. Includes both OPEC and non-OPEC consumers in the regional breakdown.
[2]OECD Europe = Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, and United Kingdom. (Note: Israel is included in OECD Europe for statistical reporting purposes. Latvia became an OECD member country on July 16, 2016, but it is not reported in OECD Europe for AEO2018.)
[3]Other Europe and Eurasia = Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Faroe Islands, Georgia, Gibraltar, Kazakhstan, Kosovo, Kyrgyzstan, Latvia, Lithuania, Macedonia, Malta, Moldova, Montenegro, Romania, Serbia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan. (Note: Latvia became an OECD member country on July 16, 2016, but it is reported in Other Europe and Eurasia for AEO2018.)
[4]Other Asia = Afghanistan, Bangladesh, Bhutan, Brunei, Burma (Myanmar), Cambodia (Kampuchea), Cook Islands, Fiji, French Polynesia, Hawaiian Trade Zone, Hong Kong, India (for production), Indonesia, Kiribati, Laos, Macau, Malaysia, Maldives, Mongolia, Nauru, Nepal, New Caledonia, Niue, North Korea, Pakistan, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Taiwan, Thailand, Timor-Leste (East Timor), Tonga, Vanuatu, Vietnam, and Wake Islands.
[5]OPEC = Algeria, Angola, Ecuador, Equatorial Guinea, Gabon, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates, and Venezuela.
[6]Includes crude oil, lease condensate, tight oil (shale oil), extra-heavy oil, and bitumen (oil sands).
[7]Includes diluted and upgraded/synthetic bitumen (syncrude).
[8]The volumetric amount by which total output is greater than input due to the processing of crude oil into products which, in total, have a lower specific gravity than the crude oil processed.
[9]Includes liquids produced from energy crops.
[10]Includes liquids converted from coal via the Fischer-Tropsch coal-to-liquids process.
[11]Includes liquids converted from natural gas via the Fischer-Tropsch gas-to-liquids process.
[12]Includes liquids produced from kerogen (oil shale, not to be confused with tight oil (shale oil)).
OECD = Organization for Economic Cooperation and Development.
OPEC = Organization of the Petroleum Exporting Countries.
- - = Not applicable.
Note: Totals may not equal sum of components due to independent rounding. Data for 2017 are model results and may differ from official EIA data reports.
Sources: 2017 Brent and West Texas Intermediate crude oil spot prices: Thomson Reuters. **2017 quantities and projections:** EIA, AEO2019 National Energy Modeling System run ref2019.d111618a and EIA, Generate World Oil Balance application.

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2019 Fuel Supply Forecast

Background

Oregon Revised Statutes (2017) Chapter 750, Section 163[1] authorizes the Office of Economic Analysis (OEA), with substantial assistance from the Department of Environmental Quality, to produce annually a forecast regarding deficits and credits owing to fossil and alternative fuel consumption, as well as the availability of fossil and alternative fuels in Oregon. In particular, the forecast is to determine whether fuel supply will be sufficient to generate alternative fuel (ethanol, electricity, and diesel substitutes - including biodiesel, renewable diesel, natural gas, and propane) credits to meet the scheduled applicable low carbon fuel standards for the compliance period. The forecast report is required to include an assessment of banked deficits and credits at the beginning of the compliance period.

In preparing the forecast, the Office of Economic Analysis has formed a Clean Fuels Forecast Advisory Committee comprised of relevant experts and stakeholders to assist in reviewing methodological considerations and various data sources. A membership list can be found in Appendix A.

Data Sources

The forecast uses available public and program data to develop the estimates of low-carbon fuels available to Oregon and estimated consumption of fossil and alternative fuels in Oregon. The sources of this data include:

- Oregon Clean Fuels Program (CFP) Online System
- Fuel Pathway Codes (carbon intensity values) approved in Oregon and California
- Oregon Department of Transportation's (ODOT) Revenue Forecast
- Oregon DMV vehicle registration data
- Annual Energy Outlook from the US Energy Information Administration
- Trade associations (Renewable Fuels Association and the National Biodiesel Board) on their members' production capacity

Methodology

The current methodology was developed by ICF Incorporated for the 2017 Clean Fuels Forecast and is based on the following components: a fuel demand component, a fuel supply component, and a carbon intensity component.

Demand Inputs

- Vehicle stocks – OEA uses Oregon DMV vehicle registration data to analyze for which vehicle types are currently registered as well as historical trends.
- Fuel consumption – OEA uses a combination of the ODOT Revenue Forecast and the EIA Annual Energy Outlook to analyze for projected and historical trends in fuel consumption.

Fuel Supply

[1] https://olis.leg.state.or.us/liz/2017R1/Downloads/MeasureDocument/HB2017/Enrolled

- Fuels and associated feedstocks - OEA reviews data regarding the supply of gasoline, diesel, ethanol, biodiesel, renewable diesel, natural gas, propane and electricity.
- Regional fuel supply – OEA primarily uses data reported to CFP to analyze the volumes and types of fuels facilities are supplying fuels to Oregon. If needed, this information can be supplemented by information from California or British Columbia to demonstrate what fuels are broadly available to the West Coast.

Carbon Intensity

- Oregon and California-approved values – OEA looks at individual carbon intensity values to facilities that have been approved by either itself or by the California Air Resources Board.

Numerous issues were raised during the development of the 2019 forecast. For the 2020 forecast cycle, the Office of Economic Analysis will form a technical advisory committee to consider modifications to the existing methodology, as well as the incorporation of additional data sources not factored into the current methodology. In addition, much of the data underlying the clean fuels forecast has only recently begun to be collected. To the degree that the passage of time will generate longitudinal time series more amenable to the econometric techniques that are the cornerstone of OEA's forecasting processes, better projections will avail themselves over time.

Deficit Generation from Fossil Fuel Consumption – Credits Needed

The amount of credits needed to comply with the 2019 clean fuel standards is based on assumptions about the consumption of fossil fuels that generate deficits.

Gasoline Consumption

1,626 million gallons of gasoline, including ethanol, were consumed in 2017, the most recent year of data collected. Growth projections exhibited in the Oregon Department of Transportation's June 2018 forecast equal -1.7 percent growth for calendar year 2018 and 0.2 percent growth for calendar year 2019. CFP data shows that gasoline is being blended with ethanol statewide at 10.3 percent of the gasoline pool. As presented in Table 1, this results in a projected 1,436 million gallons of CBOB gasoline blendstock in 2019. In comparison, AEO estimates -0.3 percent growth in 2018 and -0.5 percent growth in 2019 for the Pacific Region. Furthermore, projected deficit generation assumes a CBOB energy density of 122.5 and a carbon intensity differential of -3.6 (a projected actual value of 97.2 minus a target value of 100.8. This results in an expected deficit generation equaling 634,994 deficits.

Diesel Consumption

According to CFP reported data, 750 million gallons of diesel, including bio- and renewable diesel, were consumed in 2017, the most recent year of data collected. Growth projections from the Department of Transportation's June 2018 forecast indicate 1.4 percent growth for calendar year 2018 and1.0 percent growth for calendar year 2019. AEO estimates -1.0 percent growth in 2018 and 1.1 percent growth for 2019 for the Pacific Region. The diesel pool has a greater variance in the amount of biodiesel and renewable diesel being blended with clear diesel blendstock. Therefore, OEA and DEQ developed a low and high case of diesel consumption based on low and high scenarios for biodiesel and renewable diesel blend rates. Both cases assume an energy density of 134.5 and a carbon intensity differential of -3.6 (a projected actual value of 98.1 minus a target value of 101.7). The low fossil diesel demand case forecasts 2019 diesel consumption at 642 million gallons by assuming blending 10 percent biodiesel and 6.5 percent renewable diesel into the diesel pool, resulting in 304,536 deficits generated in 2019. The high fossil diesel

demand case forecasts 2019 diesel consumption at 705 million gallons by blending 6.9 percent biodiesel and 1.3 percent renewable diesel into the diesel pool, resulting in 334,808 deficits generated in 2019.

Table 1: Fossil Fuel Consumption and Deficits

Fuel	2019 Projected Consumption		Energy Density/ (Carbon Intensity Differential)	Deficits	
Gas Blendstock (CBOB)	1,436 million gallons (Ethanol blend = 10.3%)		122.48/(100.8-97.2)	634,994	
Diesel Blendstock	705 mil. gallons BR = 8.2%	642 mil. gallons BR = 16.5%	134.48/(101.7-98.1)	334,808	304,536

Credit Generation from Gasoline Substitutes and Alternatives

Credits can be generated by supplying transportation fuels that are lower in carbon intensity than the higher carbon fuels they replace. For gasoline, the most likely substitutes and alternatives are ethanol and electricity.

Ethanol Consumption

In order to estimate the number of credits that may be generated from the ethanol available to Oregon, the volume and carbon intensities must be estimated. 164 million gallons of ethanol are estimated to be consumed in 2019, based on the gasoline consumption forecast discussed above and a blend rate assumption of 10.3 percent.

For carbon intensities, OEA reviewed facilities that have Oregon-approved carbon intensity values, and focused on four of which are mostly like to deliver their ethanol to Oregon. They have a combined production capacity of 342 million gallons of ethanol, well in excess of the 164 million gallons needed, and are:

Table 2: Ethanol Producers and Capacity

Facility	Location	Production Capacity	Carbon Intensity
Pacific Ethanol Columbia	Boardman, OR	40 mil. gallons	53.81 gCO2e/MJ
Guardian Energy Janesville	Janesville, MN	110 mil. gallons	62.40 gCO2e/MJ
Guardian Energy Hankinson	Hankinson, ND	132 mil. gallons	60.11 gCO2e/MJ
Pacific Ethanol Magic Valley	Burley, ID	60 mil. gallons	54.00 gCO2e/MJ
Totals/Average		342 mil. gallons	61.6 gCO2e/MJ

CFP data shows that the average ethanol carbon intensity exhibited in 2017 was 62.7 gCO2e/MJ, which is the basis for the low credit scenario. The high credit scenario is based on the observed 61.6 carbon intensity for the supply that is assumed available to Oregon (see Table 2). The resulting ethanol credits projected for 2019 range from 490,763 and 560,412.

Electricity Consumption

In order to estimate the number of credits that may be generated from electricity used in light-duty vehicles, three factors must be considered: 1) the number of electric vehicles registered in Oregon, 2) the average amount of electricity consumed per vehicle, and 3) the carbon intensity of electricity.

Oregon DMV vehicle registration data shows that about 10,107 battery electric vehicles (BEVs) and 7,786 plug-in hybrid electric vehicles (PEVs) were registered in Oregon in June 2018. OEA projects that those numbers will rise to 11,366 BEVs and 9,050 PEVs by the end of 2018. Further, growth rates assumed for 2019 are based on historical quarterly year-over-year growth rates and variance in growth over time to produce 95 percent confidence interval of 22.5 percent (low) to 33.6 percent (high). The resulting projections put the number of electric vehicles in use in 2019 at between approximately 23,105 and 25,207.

Using assumptions that electricity consumption per vehicle is 10 kWh/day (or roughly 30 miles per day) and that the average electric vehicle is driven 347 days per year, the average electricity consumption per vehicle is 3,470 kWh of charging per year. The statewide electric mix carbon intensity is 120.27 gCO2e/MJ, although when adjusted to reflect the energy efficiency ratio of 3.4 the intensity comparable to gasoline is 35.4 gCO2e/MJ. This results in between 60,632 and 66,150 credits projected for 2019. Also, note that some charging of electric vehicles will occur in places where the carbon intensity electricity is less than the statewide mix, but this was not factored into the forecast.

Credit Generation from Diesel Substitutes and Alternatives

Credits can be generated by supplying transportation fuels that are lower in carbon intensity than the higher carbon fuels they replace. For diesel, the most likely substitutes and alternatives are biodiesel, renewable diesel, natural gas, propane and electricity.

Biodiesel Consumption

In order to estimate the number of credits that may be generated from the biodiesels available to Oregon, the volume and carbon intensities must be estimated. For biodiesel, the blend rate varies between 6.9 percent and 10 percent, as shown above in the diesel consumption discussion. The committee discussed these assumptions and noted that blend rates could range as high as 20 percent in 2019. OEA chose to go with the historical range, resulting in a range of 52 – 75 million gallons of biodiesel demand.

For carbon intensities, OEA reviewed facilities that are mostly like to deliver biodiesel to Oregon. They have a combined production capacity of 125 million gallons of biodiesel, well in excess of the gallons needed (see Forecast Risks later in the report), and are:

Table 3: Biodiesel Suppliers and Capacity

Facility	Location	Production Capacity	Carbon Intensity
SeQuential Biodiesel	Salem, OR	15 million gallons	14.62 gCO2e/MJ
REG Grays Harbor-Canola	Grays Harbor, WA	100 million gallons	52.87 gCO2e/MJ
REG Grays Harbor-UCO	Grays Harbor, WA		18.26 gCO2e/MJ
General Biodiesel	Seattle, WA	10 million gallons	28.59 gCO2e/MJ
Totals/Average		125 million gallons	33.86 gCO2e/MJ

CFP data shows that average biodiesel carbon intensity was 47.1 gCO2e/MJ in 2017. Assuming the same CI in 2019 and incorporating the projected range of biodiesel consumption, the forecast for credits in 2019 ranges from 341,203 to 494,498.

Renewable Diesel Consumption

In order to estimate the number of credits that may be generated from renewable diesel available to Oregon, the volume and carbon intensities must be estimated. In 2016, approximately 5 million gallons of renewable diesel were supplied to Oregon based on a DEQ survey. Renewable diesel consumption volumes were first reported to the CFP for the fourth quarter 2017. Since fuel consumption exhibits a significant degree of seasonality, the first full year of data on renewable diesel consumption in Oregon will be calendar year 2018.

Table 4: Renewable Diesel Capacity

Feedstock	Potential Supply to Oregon (Low/High)	Carbon Intensity
Tallow	0 gallons/12.2 million gallons	34.48gCO2e/MJ
Soy	10 million gallons/12.2 million gallons	55.25 gCO2e/MJ
UCO	0 gallons/12.2 million gallons	20.97 gCO2e/MJ
Corn oil	0 gallons/12.2 million gallons	34.32 gCO2e/MJ
Totals/Average	10 million gallons/48.8 million gallons	36.25 gCO2e/MJ

Additionally, EIA data shows that 198.6 million gallons of renewable diesel was supplied to the West Coast in 2017 and OEA projects that between 10.0 – 48.8 million of those gallons are available to be supplied to Oregon, which would be between 1.3 - 6.5 percent of the state's diesel pool. The energy density of renewable diesel is 129.65 MJ/gallon. For carbon intensities, OEA assumed weighted average carbon intensities for available feedstocks supplied to Oregon with a range of 34.32 – 55.25 gCO2e/MJ. Those volumes and carbon intensities would result in between 55,512 – 400,545 credits generated in 2019.

Natural Gas and Propane Consumption

In order to estimate the number of credits that may be generated from natural gas used in medium and heavy-duty vehicles, OEA reviewed Oregon DMV vehicle registration data and volumes reported to CFP to date. OEA estimates that between 4 - 14 million diesel gallon equivalents of natural gas will be consumed in Oregon in 2019. Additionally, by reviewing data reported to Oregon and California, OEA estimates that 60 – 80 percent of the natural gas consumption will be in the form of renewable natural gas. The carbon intensities of renewable natural gas can vary greatly, from manure digesters, wastewater treatment plants and landfills. For the forecast, OEA assumed carbon intensity in the range of 44.0 to 53.0 gCO2e/MJ based on the assumed blend rate of biogas. Those volumes and carbon intensities would result in between 24,286 and 101,919 credits generated in 2019.

In order to estimate the number of credits that may be generated from propane used in medium and heavy-duty vehicles, DEQ reviewed Oregon DMV vehicle registration data and volumes reported to CFP to date. OEA estimates that between 0.8 - 1.3 million gasoline gallon equivalents of propane will be consumed in Oregon in 2019. The statewide carbon intensity value for propane is 83.1 gCO2e/MJ, which results in between 1,336 - 2,171 credits projected for 2019.

Electricity Consumption

For electricity used in public transit, ICF estimated credit generation from light rail, street cars, and aerial tram in their 2017 Additional Electrification memo. ICF estimated that 20,300 credits would be generated in 2018. This credit value is carried forward into 2019 as explicit data on non-road consumption of transportation electricity are just being collected by the CFP program. In addition, electricity used in public transit buses were not included in the forecast but credits will be generated in 2018 for this category. Also note that some charging of electric vehicles will occur in places where the carbon intensity electricity is less than the statewide mix, but this was not factored into the forecast.

Table 5: Alternative Fuels Consumption and Credits

Fuel Type	Consumption Forecast	Energy Density/CI Diff.	Credits Generated
Ethanol	165 mil. gallons	81.5/(97.2 – 62.7/56.4)	490,763 – 560,412
Electricity	2.4 – 2.6 mil. gallons	3.6/(97.2 - 35.4)	60,632 – 66,150
Biodiesel	52 – 75 mil. gallons	126.1/(98.1 – 47.1)	341,203 – 494,498
Renewable Diesel	10 – 49 mil. gallons	129.65/(98.1 – 39.5)	55,512 – 400,545
Natural Gas	4 – 14 mil. gallons.	78.8/(98.1 – 49.4)	3,914 – 6,849
Biogas	2.4 – 11.2 mil. gallons	134.5/(98.1 – 35.0)	20,372 – 95,070
Propane	0.8 – 1.3 mil. gallons	89.6/(97.2 – 83.1)	1,336 – 2,171

Banked Credits

The number of credits is taken from the CFP Online System. The number of gross credits registered through the end of calendar year 2017 equaled 1.76 million, while the number of deficits recorded amounted to 1.33 million. The net credits banked equaled 423,379. OEA projects that another 222,784 credits will be banked during calendar year 2018. It is important to note that credits were not generated for residential electric vehicle charging in 2016 and 2017 but will be retroactively generated as per recent changes to the regulation, these credits are not included in that bank.

Table 6: Summary of actual and projected net banked credits

Year	Deficits	Credits	Net Banked Credits
2016	617,071	830,714	213,643
2017	715.057	924,793	209,736
2018 (Projected)	814,395	1,037,179	222,784
Total	2,146,523	2,792,686	646,163

Data Summary

The table below summarizes the forecast for deficit generation and credit generation:

Table 7: Summary of Deficits and Credits

	Credit / Deficit Summary		
Deficits	RBOB (Gasoline)	-634,994	
	Diesel	-334,808	-304,536
		Low	**High**
Credits	Ethanol	490,763	560,412
	Biodiesel	341,203	494,498
	Renewable Diesel	55,512	400,545
	Electricity, on-road	60,632	66,150
	Electricity, off-road	20,300	20,300
	Natural Gas	24,286	101,919
	Propane	1,336	2,171
2019 Net Credits/Deficits		**24,232**	**706,464**
2018 Banked Credits/Deficits		**646,163**	**646,163**
Total Net Credits/Deficits		**670,395**	**1,352,627**
Percent of Credits Needed		**69.1%**	**144.0%**

Forecasted Fuel Supply Deferral Analysis & Determination

If OEA forecasts a shortfall in clean fuel credits greater than five percent of the credits that are estimated to be needed for compliance, then the forecasted fuel supply deferral is triggered. House Bill 2017 changed

the calculation to include projected banked credits. As shown above, neither scenario results in an expected deferral.

Forecast Risks

There are a number of potential risks to this 2019 Clean Fuels Forecast. A risk is defined as a deviation from one or more assumptions that would alter the conclusion outlined in the previous section. They are:

(a) The most fundamental risk to the forecast amounts to potential deviations from the assumptions highlighted in each fuel type discussion. Further, there is risk that the actuals used as the basis for consumption predictions in 2019 are not completely accurate to one degree or another, given that they are reported figures rather than direct counts (e.g., tax collections and prison beds). More detailed descriptions of these types of error are described below.

(b) The forecasting model developed by ICF uses historical carbon intensities with the assumption that projected carbon intensities will not increase (no backsliding). However, many members of the committee expressed concern that this was a significantly conservative assumption given that new technologies have been reducing carbon intensities over time. As the CFP data increase in historical coverage, more advanced longitudinal and statistical techniques become possible to better produce unbiased estimates of future carbon intensities.

(c) There is a significant discrepancy between the diesel consumption numbers in the Clean Fuels Program data and the number generated by ODOT's Weight Mile Tax program, with the former being higher than the latter. This forecast uses the CFP consumption numbers for 2017, but inflates them using the growth rates exhibited in the ODOT June 2018 forecast. To the degree that the actual diesel consumption for 2017 is more similar to the ODOT numbers, the net credits figures in Table 7 would skew more positive, potentially even eliminating the small likelihood of deferral. In addition, CFP data indicate a 2.9 percent decrease in diesel consumption for 2017, whereas the ODOT data result in a growth rate of 6.7 percent. If the ODOT growth forecast is higher than actually transpires, diesel deficits would be lower and the net credits would skew even higher. Bottom line, this issue is only a "risk" in the sense that net credits might deviate significantly outside the range presented in Table 7.

(d) House Bill 2017 (2017 Legislative Session) created a rebate for sales of electric vehicles in Oregon. The Oregon Supreme Court upheld that this component of the bill was constitutional. The electric vehicle forecast underlying the credit projections for electricity consumption do not explicitly account for the potential impact of this rebate. To the degree that electric vehicle sales skew higher than expected herein, net credits would be even higher than exhibited in table 7, constituting an upside risk to the forecast.

(e) The ethanol availability presented above does not include other potential sources, such as sugarcane ethanol imported from Brazil. To the degree that available ethanol in Oregon exceeds the amount indicated, the likelihood that capacity impinges on consumption is even less, thus reinforcing the credit generation from ethanol presented in Table 7. This mirrors the characterization of risk for diesel consumption in section (b).

(f) Forklifts, aviation fuels, and certain other fuel types not currently included in the Clean Fuels Program are being considered for inclusion in 2019. To the degree that this would increase deficits, the probability for deferral would be higher that exhibited in this forecast.

Accessibility

Documents can be provided upon request in an alternate format for individuals with disabilities or in a language other than English for people with limited English skills. To request a document in another format

or language, call Michael Kennedy in the Office of Economic Analysis at (503) 378-5732 or email him at michael.kennedy@oregon.gov

Appendix A

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7.4.1 Multimodal travel

Data source: Metro travel forecast model

Description: System-wide number of miles traveled (total and share of overall travel) within the Metropolitan Planning Area Boundary (MPA) by different modes of travel.

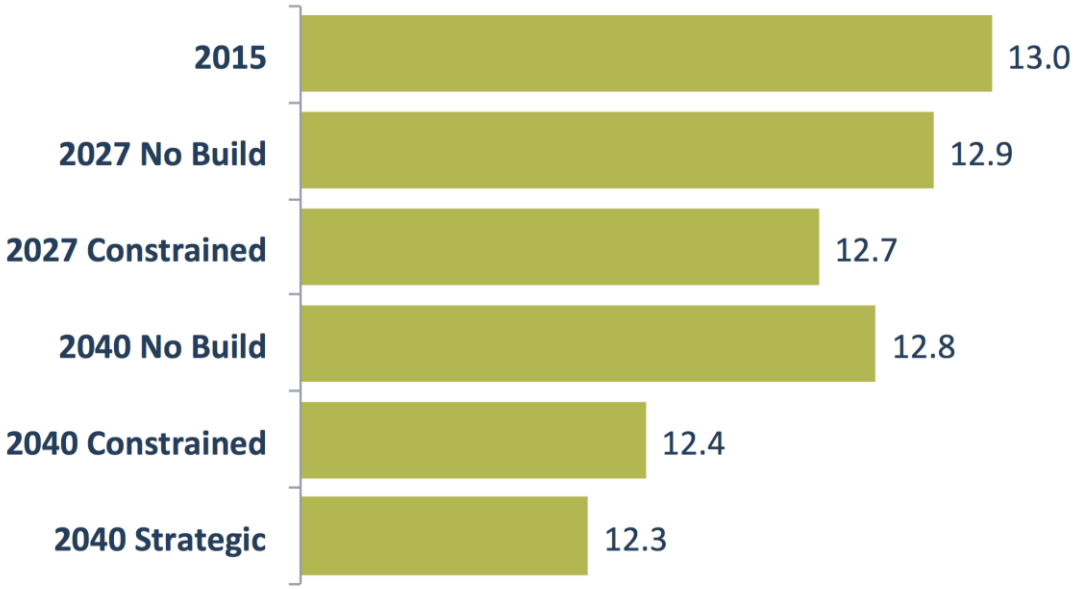
- Person miles traveled *(total and per capita)*
- Vehicle miles traveled (VMT) *(total, per capita, per employee)*
- Transit miles traveled *(total, per capita, per employee)*
- Bicycle miles traveled *(total, per capita, per employee)*
- Pedestrian miles traveled *(total, per capita, per employee)*
- Freight miles traveled *(total)*

Target or desired direction: By 2040, reduce vehicle miles traveled per person by 10% compared to 2015.

Findings: Overall travel (person miles traveled – all modes) per capita is increasing in future strategies while vehicle miles traveled per capita decreases over 5 percent between 2015 and the 2040 Constrained strategies – making progress towards the target but not reaching it. That means that other modes such as transit and bicycling are increasing. In the 2040 Constrained strategies transit miles traveled per person increases by 82 percent from 1.1 to 2.0, and bicycle miles travel per person increases by 20 percent, from 0.50 to 0.60 between 2015 and 2040. Miles traveled by any mode are higher per employee than per capita.

Equity findings: Not included in transportation equity analysis.

Figure 7.3 Vehicle miles traveled per person each day (within the MPA)



Source: Metro Travel Demand Model

Table 7.4 Daily person miles traveled per person

Person Miles Traveled	2015 Base Year	2027 No Build	2027 Constrained	2040 No Build	2040 Constrained	2040 Strategic
Total	30,403,023	36,272,364	36,639,935	41,359,645	42,069,444	42,236,504
Per Person	18.9	19.0	19.2	19.0	19.3	19.4

Table 7.5 Daily vehicle miles traveled per person

Vehicle Miles Traveled	2015 Base Year	2027 No Build	2027 Constrained	2040 No Build	2040 Constrained	2040 Strategic
Total	20,798,618	24,534,300	24,128,244	27,879,927	27,098,119	26,883,845
Per person	13.0	12.9	12.7	12.8	12.4	12.3
Per employee	23.2	22.9	22.5	22.5	21.8	21.7

Table 7.6 Daily transit miles traveled per person

Transit Miles Traveled	2015 Base Year	2027 No Build	2027 Constrained	2040 No Build	2040 Constrained	2040 Strategic
Total	1,814,208	2,537,005	3,212,334	3,033,836	4,421,606	4,860,131
Per person	1.1	1.3	1.7	1.4	2.0	2.2
Per employee	2.0	2.4	3.0	2.4	3.6	3.9

Table 7.7 Daily bicycle miles traveled per person

Bicycle Miles Traveled	2015 Base Year	2027 No Build	2027 Constrained	2040 No Build	2040 Constrained	2040 Strategic
Total	750,707	970,434	997,531	1,198,724	1,231,769	1,204,307
Per person	0.5	0.5	0.5	0.6	0.6	0.6
Per employee	0.8	0.9	0.9	1.0	1.0	1.0

Table 7.8 Daily pedestrian miles traveled per person

Pedestrian Miles Traveled	2015 Base Year	2027 No Build	2027 Constrained	2040 No Build	2040 Constrained	2040 Strategic
Total	262,288	311,833	317,059	362,741	371,315	368,959
Per person	0.2	0.2	0.2	0.2	0.2	0.2
Per employee	0.3	0.3	0.3	0.3	0.3	0.3

Table 7.9 Daily freight truck miles traveled

Freight Miles Traveled	2015 Base Year	2027 No Build	2027 Constrained	2040 No Build	2040 Constrained	2040 Strategic
Total	361,770	501,027	500,799	651,897	651,127	650,913

7.4.2 Mode share

Data source: Metro travel forecast model

Description: Evaluates percent of non-drive alone trips (daily walking, bicycling, transit and shared ride trips) at multiple geographies (system wide, sub region, mobility corridor, and 2040 design type). The data is categorized by 'trips to, from within'. '.

Target or desired direction: Increase non-drive alone mode share at all geographic levels. Triple walking, biking and transit region wide by 2040 compared to 2015 levels.

Findings: Findings for mode share are provided below for region-wide, sub-regions, centers and other 2040 design types, and mobility corridors.

Equity findings: Not included in transportation equity analysis

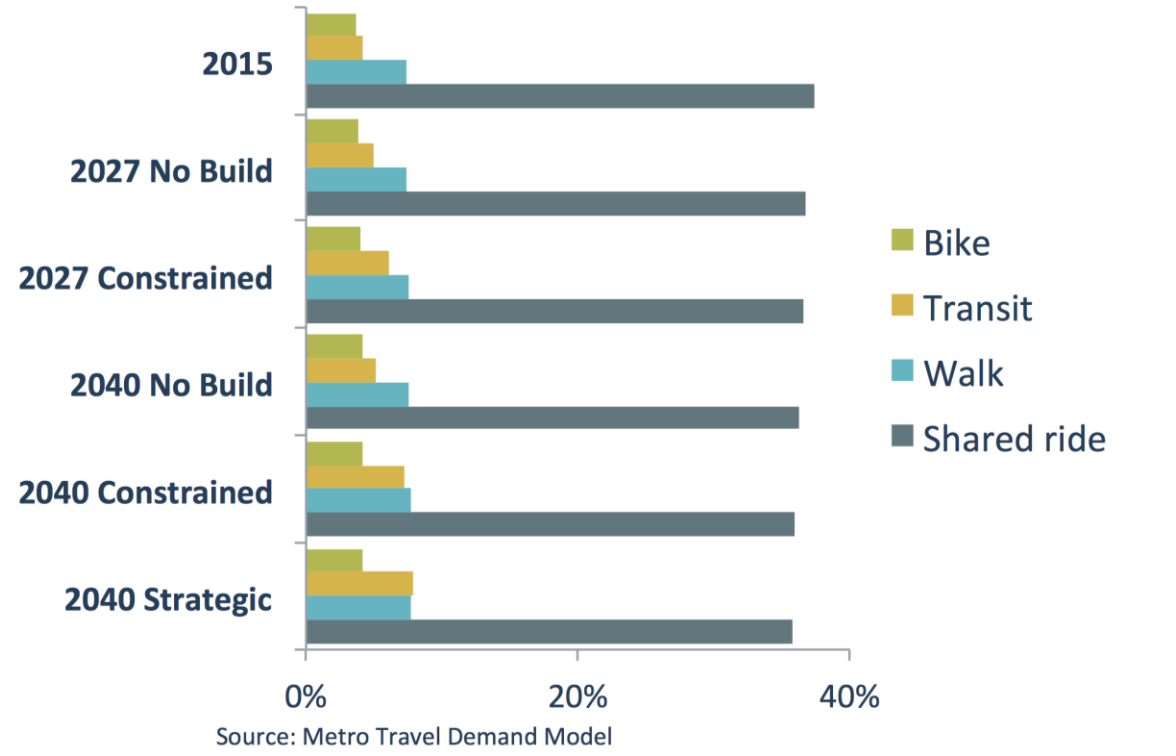
Region-wide (within MPA boundary)
Plan does not meet target of tripling walking, biking, shared ride and transit within the MPA between 2015 and 2040.

Table 7.10 Regional mode share (within the MPA)

Travel Mode	2015 Base Year	2027 No Build	2027 Constrained	2040 No Build	2040 Constrained	2040 Strategic
Walk	7	7	8	8	8	8
Bike	4	4	4	4	4	4
Transit	4	5	6	5	7	8
Shared ride	37	37	37	36	36	36
Drive alone	45	45	43	45	43	43

Note: For all trips to, from and within the metropolitan planning area boundary, except school bus trips. Values have been rounded.

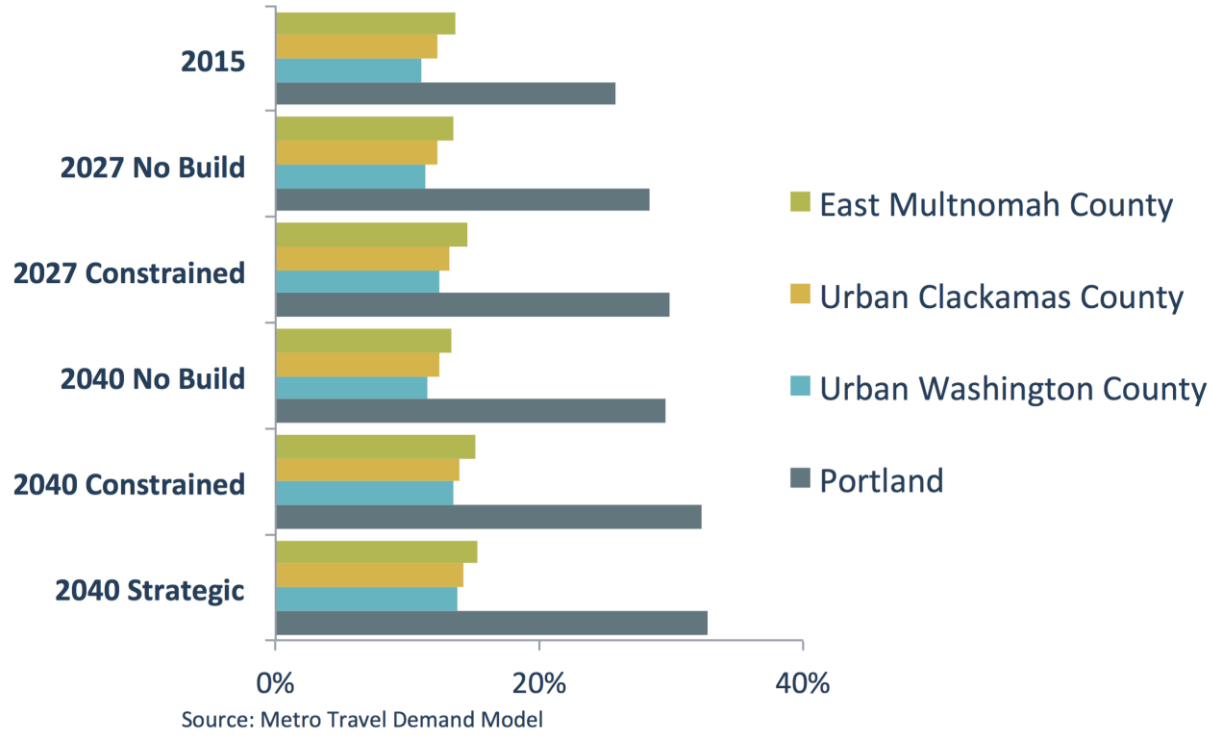
Figure 7.4 Non driving mode share within the MPA



Sub-region non-drive alone mode share

As the figure below shows, there are relatively large increase in walking, bike, shared ride and transit from 2015 to 2040 Constrained for travel within the City of Portland (from 26 percent to 32 percent) and urban Washington County (from 11 percent to 14 percent), with more moderate increases within other sub-regions. However, non-drive alone mode share does not triple for any sub-region.

Figure 7.5 Non-drive alone mode share by sub-region



Source: Metro Travel Demand Model

Table 7.11 Non-drive alone mode share by sub-region

Sub-region	2015 Base Year	2027 No Build	2027 Constrained	2040 No Build	2040 Constrained	2040 Strategic
City of Portland	61	62	63	63	65	65
East Multnomah County	57	56	57	56	57	57
Urban Clackmas County	54	54	55	53	55	55
Urban Washington County	52	52	53	52	54	54

Note: For all walking, biking, transit and shared ride trips to, from and within each sub-regio. Does not include school bus trips. Values are rounded.

Centers and other 2040 land use design types

Shown in Table 7.12, centers across the region display relatively large increases in non-SOV mode share (transit, biking, walking and shared ride) between 2015 and 2040 demonstrating the RTP continues to comply with Section 0035(5) of the Oregon Transportation Planning Rule.

First adopted in the 2000 RTP and approved by the Land Conservation and Development Commission in 2001, the RTP targets shown in Tables 7.12 and 7.13 reflect the non-SOV mode share needed to comply with Section 0035(5). Section 0035(5) allows the RTP to include an "alternative standard" to measure progress in reducing reliance on the automobile in place of the requirement to achieve a specific reduction in per capita vehicle miles traveled. Cities and counties are responsible for identifying actions that will result in progress towards achieving these targets as they develop local transportation system plans, as required in Section 3.08.230 of the Regional Transportation Functional Plan. Progress toward achieving the targets is monitored through scheduled updates to the RTP.

Table 7.12 Non-drive alone mode share for 2040 centers

2040 Center	2015 Base Year	2027 No Build	2027 Constrained	2040 No Build	2040 Constrained	2040 Strategic	RTP Target
Portland central city – downtown							60-70%
Portland central city – Lloyd district							
Portland central city – Central eastside							
Portland central city – River district							
Portland central city – South Waterfront							
Amberglen regional center							45-55%
Beaverton regional center							
Clackamas regional center							
Gateway regional center							
Gresham regional center							
Hillsboro regional center							
Oregon City regional center							

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2040 Center	2015 Base Year	2027 No Build	2027 Constrained	2040 No Build	2040 Constrained	2040 Strategic	RTP Target
Washington Square regional center							
Vancouver, WA – downtown							
Town centers Tier 1							
Town centers Tier 3							45-55%
Town centers Tier 3							
Town centers Tier 4							

Note: For all walking, biking, transit and shared ride trips to, from and within each designated 2040 area. Does not include school bus trips.

Table 7.13 Non-drive alone mode share for other 2040 Growth Concept Design Types

Other Design Types	2015 Base Year	2027 No Build	2027 Constrained	2040 No Build	2040 Constrained	2040 Strategic	RTP Target
Station communities Tier 1							
Station communities Tier 2							45-55%
Station communities Tier 3							
Mainstreets and corridors							
Industrial areas							40-45%
Employment areas							
Neighborhoods							40-45%

Note: For all walking, biking, transit and shared ride trips to, from and within each designated 2040 area. Does not include school bus trips.

7.4.12 Climate change

Data source: The on-road vehicle emissions estimates for the 2018 RTP were produced within a software framework that combines the regional transportation model with EPA's emissions projection MOVES model, version MOVES2014a. A newer version of MOVES (MOVES2014b) has since been released, but it should be noted that the improvements incorporated into this update pertain almost exclusively to estimates of non-road emissions and are, therefore, not relevant to this analysis.

Description: Evaluates projected mobile source emissions of carbon dioxide (CO2) a primary greenhouse gas pollutant to determine mobile source greenhouse gas emissions in the base year and for 2027 and 2040 to determine if mobile source greenhouse gas emissions are declining as a whole and on a per capita basis.

Metro's current implementation of MOVES was developed for air quality conformity purposes in accordance with all pertinent EPA guidance included in the document, "Using MOVES to Prepare Emission Inventories in State Implementation Plans and Transportation Conformity: Technical Guidance for MOVES2010, 2010a and 2010b" (April 2012).

Metro estimates future mobile source greenhouse gas emissions by using existing and proposed transportation project information and inputting the project information into the travel demand model to understand the travel behavior in the region with and without proposed investments at key times in the future (2027 and 2040). Key travel behavior outputs include trip generated, mode split (i.e. percentage of trips taken by different transportation modes), trip distances, and vehicles miles traveled. This information is then taken into the MOVES2014a emissions model to estimate projected greenhouse gas emissions with and without the proposed transportation investments for the Portland airshed in 2027 and 2040. Then the total vehicle emissions are divided by projected population estimate to understand emissions per capita and ultimately the reduction level from the base year of 2015. Detailed information about the fleet and technology assumptions used in the 2018 RTP on-road vehicle emissions analysis and a comparative assessment of VisionEval and MOVES emissions estimation methodologies is provided in Appendix J.

Target or desired direction: The target adopted in the 2014 Climate Smart Strategy is to reduce per capita greenhouse gas emissions from cars and small trucks by 29 percent by 2035 and 25 percent by 2040, compared to 2005 levels. The Climate Smart Strategy performance measures and monitoring targets were adopted with an acknowledgement that they will be reviewed during development of the 2018 Regional Transportation Plan to address new information, such as federal transportation performance-based planning rulemaking. At the time of adoption, Metro also anticipated transitioning from using ODOT's GreenSTEP software tool (VisionEval) to the Environmental Protection Agency's MOVES model for forecasting on-road mobile source greenhouse gas emissions in the region. This transition was anticipated because Metro maintains and implements MOVES to conduct federally-required air quality and other on-road vehicle emissions analysis, and does not have the expertise nor the resources necessary to maintain and implement VisionEval on an on-going basis. Further, significant methodological differences in how

VisionEval and MOVES estimate on-road vehicle emissions do not allow for direct comparison of forecasted on-road vehicle emissions results.

To assess progress towards the targets, the region's Climate Smart Strategy calls for the implementation of nine key land use and transportation policies to reduce greenhouse gas emissions. Monitoring targets are used to track progress. One of the most significant transportation strategies outlined in the Climate Smart Strategy is increasing transit service hours. The Climate Smart Strategy called for 9,400 transit service revenue hours (excluding C-TRAN) within the metropolitan planning area boundary by 2035 to meet the region's greenhouse gas reduction target. Refer to Appendix J for details on the monitoring targets and other performance outcomes.

Findings: The 2018 Regional Transportation makes satisfactory progress towards implementing the Climate Smart Strategy and, if fully funded and implemented, can reasonably be expected to meet the state-mandated targets for reducing per capita greenhouse gas emissions from cars and small trucks (light-duty vehicles) for 2035 and 2040.

- By 2040, the plan, together with advancements in fleet and technology, is expected to reduce total annual greenhouse gas emissions from all on-road vehicles by 19 percent (compared to 2015 levels) and annual per capita greenhouse gas emissions from all on-road vehicles by 40 percent (compared to 2015 levels).
- By 2040, the plan, together with advancements in fleet and technology, is expected to reduce total annual greenhouse gas emissions from passenger cars and passenger trucks by 27 percent (compared to 2015 levels) and reduce annual per capita greenhouse gas emissions from passenger cars and passenger trucks by 46 percent (compared to 2015 levels).

Due to differences in emissions analysis tools, the 2018 RTP greenhouse gas emissions estimates are not directly comparable to the state-mandated greenhouse gas emissions reduction targets that were set using VisionEval. However, the findings above and in Appendix J demonstrate the region is making satisfactory progress implementing the Climate Smart Strategy.

The findings also demonstrate that more investment, actions and resources will be needed to ensure the region achieves the mandated greenhouse gas emissions reductions defined in OAR 660-044-0060. In particular, additional funding and prioritization of Climate Smart Strategy investments and policies will be needed.

Equity findings: Not included in transportation equity analysis.

Table 7.33 Projected Mobile Source Greenhouse Gas Emissions — All Vehicles

	2015 Base Year	2027 No Build	2027 Constrained	2040 No Build	2040 Constrained	2040 Strategic
Average daily GHG emissions from all vehicles (metric tons)	14,418	12,773	12,625	11,942	11,670	11,597
Percent reduction from 2015	N/A	-11%	-12%	-17%	-19%	-20%
Percent reduction per person from 2015	N/A	-25%	-26%	-39%	-40%	-41%

Note: Results are from MOVES 2014a and reflect summer emissions within the metropolitan planning area boundary.

Table 7.34 Projected Mobile Source Greenhouse Gas Emissions – Passenger Vehicles Only

	2015 Base Year	2027 No Build	2027 Constrained	2040 No Build	2040 Constrained	2040 Strategic
Average daily GHG emissions from passenger vehicles (metric tons)	11,472	9,732	9,611	8,564	8,357	8,299
Percent reduction from 2015	N/A	-15%	-16%	-25%	27%	-28%
Percent reduction per person from 2015	N/A	-28%	-29%	-45%	-46%	-47%

Note: Results are from MOVES 2014a and reflect summer emissions within the metropolitan planning area boundary.

7.4.13 Clean air

Data source: The on-road vehicle emissions estimates for the 2018 RTP were produced within a software framework that combines the regional transportation model with EPA's emissions projection MOVES model, version MOVES2014a. A newer version of MOVES (MOVES2014b) has since been released, but it should be noted that the improvements incorporated into this update pertain almost exclusively to estimates of non-road emissions and are, therefore, not relevant to this analysis.

Description: Evaluates projected mobile source emissions of criteria pollutants: carbon monoxide (CO), nitrogen oxide (NO_X), volatile organic compounds (VOC), and particulate matter (PM_{10} and $PM_{2.5}$) and transportation-related air toxics identified with guidance from the Oregon Department of Environmental Quality.[9]

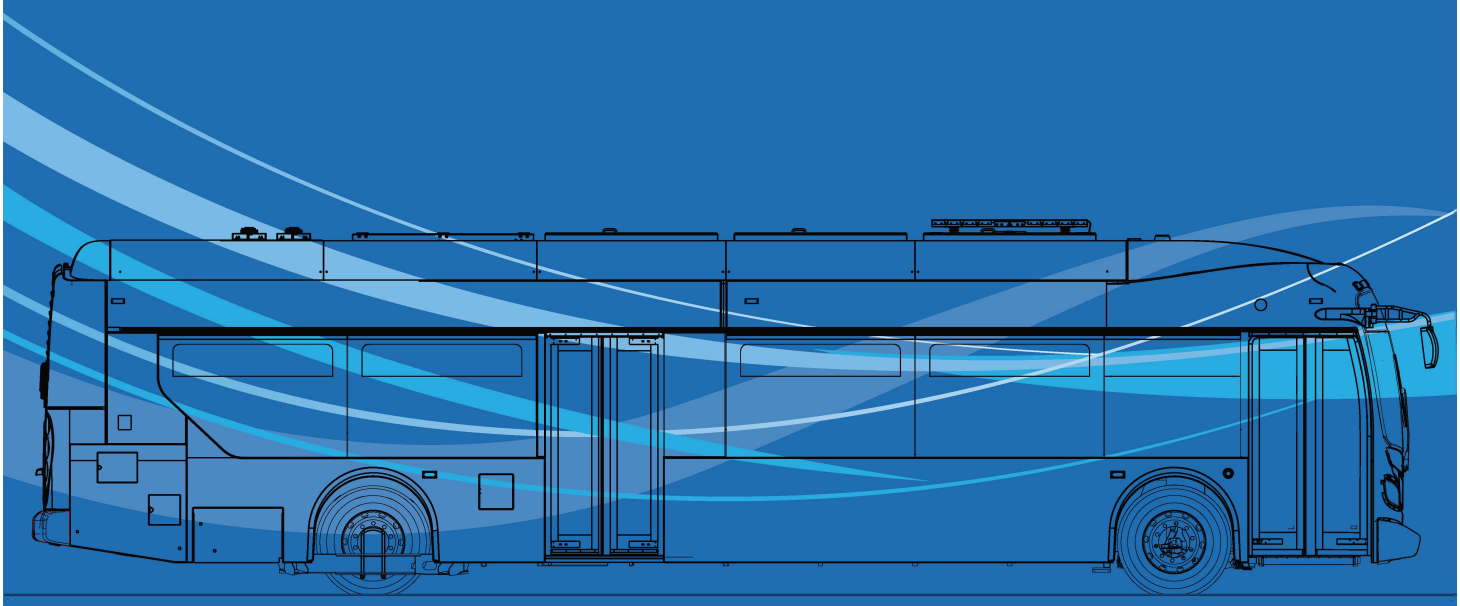
Metro estimates future mobile source emissions by using existing and proposed transportation project information and inputting the project information into the travel demand model to understand the travel behavior in the region with and without proposed investments at key times

[9] Nitrogen oxide and volatile organic compounds are precursors to Ozone. Transportation-related air toxics are: Acrolein, Arsenic, Benzene, 1,3-Butadiene, Chromium 6, Diesel particulate matter plus diesel exhaust organic gases (Diesel PM), Formaldehyde, Naphthalene, Polycyclic organic matter

TRIMET

Non-Diesel Bus Plan

September 2018



Introduction

TriMet has long been a leader in the Portland region's efforts to reduce air pollution. In the 1970s, expansion of the TriMet system played an important role in reducing the region's chronic smog. In more recent years, the agency has invested heavily in clean diesel technology, incorporated biodiesel into its fuel and switched to ultra-low sulfur diesel to reduce bus emissions significantly while continuing to expand service.

Expanded and improved transit service is central to achieving the region's climate change goals. By reducing the number of single-occupancy car trips and encouraging compact, walkable neighborhoods, TriMet services reduce the level of global climate change-inducing carbon emissions by an estimated 21,000 metric tons per year. TriMet's MAX Light Rail system, powered with lower carbon intensity electricity, today provides one-third of all transit trips in the system.

In the coming years, TriMet expects to significantly expand service — particularly to unserved and underserved areas – increase frequency, add evening and weekend service and speed transit travel times. These improvements will help promote additional transit use, reduce auto trips, help alleviate congestion and promote a more compact land use pattern – all of which reduce our collective carbon footprint.

TriMet's bus fleet, while diesel powered, is being rapidly modernized to high efficiency, low emissions models. Today 65 percent of TriMet's fleet has post-2012 emissions technology, employing cleaner-burning diesel engines and selective catalytic reduction (SCR) technology, which scrubs nitrogen oxides and particulates from the exhaust. TriMet uses a biodiesel blend to further reduce its carbon footprint.

Although TriMet's existing service delivers extensive benefits to the environment and supports efforts to reduce carbon emission, we also recognize that more can and should be done to reduce the environmental impact of the region's transportation sector. Moving away from diesel buses, combined with expansion of service, will provide a double win: reducing emissions by expanding transit use while using vehicles that themselves emit less carbon. TriMet does not believe a one-sided strategy that sacrifices additional service to achieve low emissions or providing only more service without embarking on the transition to a non-diesel fleet will best serve the community. The following plan seeks to achieve the twin goals of expanded service with cleaner technology.

Chapter 1: Context

TriMet has the 11th largest bus fleet in the United States. TriMet operates 658 buses, the vast majority of which (97 percent) are standard 40-foot diesel buses. The average bus is 7.4 years old. The oldest bus is 19 years old. The fleet also contains 22 smaller, 30-foot buses. Today, 65 percent of TriMet's fleet has post-2012 emissions technology, employing cleaner-burning diesel engines and SCR technology, which scrubs nitrogen oxides and particulates from the exhaust. Seventy percent of TriMet's fleet has 2007 or better emissions technologies and TriMet began using biodiesel fuel blends in 2006.

Diesel buses are a tried and true technology. Historically, they have been cost-effective and reliable. On a full tank of fuel, they have sufficient range for any typical service route and can be refueled easily and

safely within a matter of minutes. Mechanics have been servicing them for decades, original equipment manufacturers (OEMs) have honed the technology and established trusted relationships with transit agencies. Lifecycle statistics regarding reliability and maintenance costs also are well documented.

On the other hand, even low-emission buses running on a biodiesel blended fuel still rely on fossil fuels that generate emissions, contributing to climate change. Although TriMet's total carbon emissions are low relative to the entire transportation sector, TriMet is Oregon's largest single consumer of diesel fuel, and – with anticipated growth in TriMet services – its consumption of diesel will continue to increase unless alternatives are developed.

State, regional and local governments have adopted legislative and policy direction to address climate change. The Oregon State Legislature established a goal, through House Bill 3543, of reducing greenhouse gas emissions 10 percent below 1990 levels by 2020 and 75 percent below 1990 levels by 2050. To support these goals and improve sustainable transportation infrastructure in the state, the Oregon Legislature passed House Bill 2017 (HB 2017) to fund public transportation and other transportation improvements through a variety of revenue sources. This bill establishes a Statewide Transportation Improvement Fund (STIF) for public transit, which can be used for the purchase of electric or natural gas buses.

The Metro Council has adopted the Climate Smart Strategy, which fulfills a 2009 mandate by the Oregon Legislature requiring Metro to develop and implement a strategy to reduce the region's per capita greenhouse gas emissions from cars and light trucks at least 20 percent by 2035. One specific action recommended as part of this strategy is to lead by example by increasing the number of alternative-fuel vehicles in public sector fleets.

The City of Portland and Multnomah County have also created a joint Climate Action Plan, which calls for transition to 100 percent clean energy by the year 2050 and provides a roadmap to achieve an 80 percent reduction in carbon emissions by 2050, with an interim goal of a 40 percent reduction by 2030. This plan also includes a public transit system electrification strategy. Similarly, in 2017, both the City of Portland and Multnomah County adopted a 100 percent renewable energy resolution that calls for collaboration between Portland, Multnomah County, Metro and TriMet to expand service, reduce fares for those with a low income and complete a rapid transition to an electric fleet.[1]

While progress has been made in a number of areas toward meeting the state, regional and local emissions reduction goals, achieving progress in the transportation sector has been more challenging. In the past two reporting years, greenhouse gas emissions in the transportation sector have actually risen in Oregon, either due to increased economic activity or vehicle miles traveled. A TriMet transition to non-diesel buses would begin to contribute to reversing this trend in Oregon and achieving relevant state, regional and local climate goals.

Fortuitously, improving technology and decreasing costs of non-diesel buses, combined with credit programs and new funding from HB 2017, provide an opportunity to begin the process of transitioning away from diesel buses.

[1] https://multco.us/file/100-renewable-resolution-finaldoc.

Chapter 2: Evaluation Process

This report summarizes the results of an assessment of whether TriMet should transition from a primarily diesel bus fleet to a non-diesel fleet, and, if so, how. The assessment is based on four interrelated analyses.

Industry Review of Non-Diesel Bus Technology: Several non-diesel bus technologies are in operation or development, each with its unique set of advantages and disadvantages; and the technologies are rapidly evolving. It was concluded that a preferred technology should be selected for testing prior to fully committing to a specific technology. To make this choice, as discussed in Chapter 3, TriMet assessed the performance, operations, cost-efficiency and challenges of alternative non-diesel bus options based on industry reports and discussions with industry officials. As explained in Chapter 5, as a result of this assessment, battery electric buses (BEBs) is recommended as the preferred option for testing. However, it is also recommended that continued assessment of two other technologies (renewable natural gas and hydrogen fuel cells) is warranted during the testing period.

Net Present Value Analysis of Transitioning to a BEB Fleet: While BEBs' initial capital costs are greater than diesel buses, industry reports indicate they may be less expensive to operate than diesel over the long term. In addition, BEBs generate less air and noise emissions, which are societal costs that can be measured in monetary terms. Generally a BEB fleet would be more expensive than a diesel fleet in the early years of the transition and less expensive in the later years, taking into account the total cost to TriMet and the societal costs. Net present value (NPV) analysis is a traditional methodology to compare differing cost streams. It addresses the monetary value of time by applying discount rates to the year-by-year costs of both the BEB fleet scenario and diesel bus scenario, and then totaling the discounted values. While the totaled discounted values are not actual costs, a comparison of these values shows, as described in Chapter 4, that the BEB fleet is less expensive than diesel, i.e., most cost-efficient, given the value of time.

Recommendation for Short- and Long-Range Strategy: Chapter 5 of the report recommends a two-step approach for converting the TriMet fleet to a non-diesel system. The long-range strategy is to adopt a goal of converting the entire TriMet fleet to non-diesel vehicles by the year 2040 or before. While this strategy will require the identification of additional resources to be successful, TriMet believes it is important to signal its commitment to achieving this important goal. The plan also suggests a short-term strategy for testing BEBs as the initial step in this long-term strategy. The test period will involve purchasing 80 BEBs over the next five years.

Fiscal Analysis of Transitioning to a BEB Fleet: Where the NPV analysis focuses on which fleet scenario is most cost efficient in relative terms, the fiscal analysis addresses the actual cost that would be incurred by TriMet in implementing the short- and long-term strategies – assuming BEB is the technology for all diesel bus replacements and expansions. Instead of using discounted present values, the fiscal analysis focuses on the anticipated year-by-year costs in year-of-expenditure (inflated) dollars. It does not consider the societal costs (air and noise emissions), only the capital and operating costs to be paid by TriMet, minus tax credits. The analysis considered the use of a portion of the state funding made available by HB 2017 to offset a portion of the added costs of BEBs, but notes the need for added funding for a full fleet conversion. The results are shown in Chapter 5.

Chapter 3: Industry Review of Non-Diesel Bus Technology

In evaluating potential non-diesel bus technologies, TriMet seeks to find a technology that has the fewest negative impacts on current operations and customer service. This approach helps to ensure that the community gains the benefits of reduced emissions without sacrificing good customer service and the efficiencies gained from an experienced and expert maintenance staff.

While BEBs are the non-diesel bus technology that is being deployed most widely today, there are other zero- (or near zero) emission technologies in use or under development. In addition to non-diesel technologies, many transit agencies have sought to reduce their emissions through the use of hybrid-electric buses that get greater fuel efficiency through the use of regenerative breaking and other features. Many others have transitioned some or all of their fleets to compressed natural gas (CNG), which produces much less particulate matter and other pollutants but, depending on a number of variables such as sourcing and pipeline leakage, can vary in the amount of greenhouse gas emissions. The technologies that were evaluated as part of this analysis are as follows.

Battery-Electric Buses (BEBs)
BEBs have a number of benefits that make them an appealing technology for transit agencies. They emit zero point source pollution and lifecycle emissions are related to the emissions from associated power generation. In Portland General Electric's (PGE) service area,[2] an overall reduction in emissions of 57 percent is estimated with the current mix of electrical generation.[3] As PGE implements strategies to integrate more renewable electric energy sources this is expected to improve. BEBs also have significant noise-related benefits relative to traditional diesel buses.

However, BEBs also come with challenges and limitations at this point in their development. Purchase prices are currently much higher for BEBs than for comparable diesel buses (nearly twice as expensive). BEBs also require additional infrastructure to accommodate electric charging. While these capital costs have been declining in recent years, they are expected to remain higher than those of equivalent diesel buses for the foreseeable future.

In addition, in the United States, experience with BEB technology is relatively limited. Most U.S. transit agencies would need to learn to operate and maintain this type of vehicle. A growing number of transit providers are conducting trials with BEBs, so in the coming years there will be more peer experience to share about practical performance, maintenance techniques and operational best practices.

One vulnerability of BEBs is the potential for electric outages that could prevent buses from being charged. TriMet is working with PGE to understand strategies for preventing outages, such as redundant feeders and hardening against cyber intrusion, and contingency options should outages occur. Generally, TriMet's maintenance facilities are near major PGE substations and transmission facilities.

[2] Although there are two electric utilities serving the Portland area, this analysis examined only PGE energy supply characteristics because TriMet's three existing bus maintenance facilities are located in PGE service territory. Given the depot-based charging technology recommended in this report, it anticipated that all battery recharging during the initial phases of BEB adoption will occur at PGE-served facilities.

[3] This reduction reflects PGE's current generation portfolio. However, PGE has adopted plans to reduce greenhouse gas emissions by more than 80 percent by 2050, including transitioning away from coal-fired power generation by 2035. As these transitions take place, the emissions savings from transitioning to BEBs will also increase.

During outages, these are typically the first equipment restored, so even if outages occur they tend to be for shorter periods.

One question that remains to be answered is the projected useful life of BEB batteries. Many BEB manufacturers are currently projecting a 14-year lifespan,[4] which is a standard retirement age for many transit properties in the U.S. However, TriMet keeps its buses for an average of 16 years to reduce the cost of vehicles. The longevity of the vehicle plays an important role in its overall lifecycle costs. Achieving a 16-year lifespan for BEBs will be an important factor in implementing a long-term BEB adoption strategy.

Depot-Based and On-Route Opportunity Charging

There are two dominant varieties of BEBs: depot-based charging and on-route opportunity charging vehicles. Depot-based charging involves charging vehicles at the bus depot during a midday layover or overnight. Their large batteries hold more energy than the smaller batters in on-route opportunity charging buses but require between one and four hours to charge, depending on battery capacity and charger type. On-route opportunity-charging vehicles, on the other hand, can charge during the course of their scheduled service using chargers at layover terminals. Opportunity charging batteries hold a smaller amount of energy, but only require several minutes to fully charge. Each of these technologies comes with tradeoffs related to neighborhood impacts, TriMet's scheduling, maintenance, operations and costs.

On-route opportunity-charging technology is quickly developing, and some manufacturers currently advertise nominal ranges of 50-70 miles between charges. However, based on a review of King County Metro's experience with opportunity charging technology, a "real-world" range of 25 miles is considered most realistic to allow for variations in topography, traffic congestion and use of heating and air conditioning, among other factors. A planned pilot of BEBs on TriMet's Line 62-Murray Blvd will provide a more precise understanding of how opportunity-charging technology performs locally.

The challenges related to opportunity charging are primarily associated with the need for distributed charging infrastructure located along transit routes. To use the infrastructure efficiently, charging locations should be sited where they can serve multiple routes, and ideally up to six to eight buses per hour. These locations would require approval of the appropriate local municipalities and property owners. Additionally, schedule revisions also might be needed to ensure adequate charging time between bus trips, and the costly location of on-route charging equipment does not easily allow for route changes.

Sufficient power supplies may not be available at all potential opportunity charging locations, and daytime charging means that buses are charging when electricity rates tend to be higher. Lastly, and importantly, opportunity chargers are significantly more expensive than depot chargers, and more of them may be needed depending on configuration at layover locations. In 2018, one depot charger costs approximately $69,000, whereas one opportunity charger costs approximately $584,000. This can make a difference in whether an agency BEB plan is financially viable or not.

Depot-charging technology is also developing rapidly. Again, taking account of real world factors such as traffic congestion, varying topography and use of heating and cooling systems, it is estimated that

[4] Projected lifespans assume one battery replacement. This is similar to diesel buses, which typically have at least one major engine rebuild during their lifespan.

today's depot-charging buses can reliably travel up to 150 miles on a single charge This is not sufficient to support all of TriMet's current routes. This issue can be addressed by deploying the first generations of depot-charging buses on shorter routes. Battery ranges are growing steadily as battery technology is developing, and 300-mile ranges on a single charge, comparable to a full tank of fuel in a diesel bus, are generally expected in the coming years. As battery ranges expand, the universe of routes within TriMet's system that could be served by BEBs will grow.

Depot-charging buses also have tradeoffs related to the space the charging infrastructure consumes at depots. Installation of new charging infrastructure would require reconfiguration of bus depot space used for storage and fueling. Overall this would cause a net reduction in storage capacity, on the order of 12-17 percent, depending on site configuration. In addition, while these buses would not need to be fueled as part of the normal bus intake process, they would need to be plugged in during their midday and overnight layovers, requiring attendant attention at this point in the daily schedule.

A number of transit agencies are buying and testing on-route opportunity charging buses (including TriMet's purchase of five opportunity charging buses using Federal Transit Administration (FTA) Low-No funding), and there are uses for which this is the preferred technology. However, because they perform more like a traditional diesel bus, have lower charging infrastructure costs and fewer community impacts, the trend among transit agencies planning for a full transition to BEBs is to assume the use of all depot-charging technology.

Lastly, while 40-foot BEBs are in relatively widespread deployment, 60-foot BEBs (articulated buses) are still relatively new to market. While some agencies such as LA Metro and King County Metro are currently testing 60-foot BEBs, many agencies are still waiting for early-adopting agencies to more extensively report on their experiences with them. Although TriMet does not currently operate any 60-foot buses, it will begin doing so with the opening of the Division Transit Project and is interested in deploying 60-foot vehicles on other high ridership routes in the future.

For both depot-charging and on-route opportunity charging technologies, it will be important for the electric utilities to work with TriMet to ensure that adequate service is available at the necessary locations and that major facilities, such as maintenance depots, have redundant service to ensure TriMet's ability to serve its customers in the event of natural disasters.

Fuel Cells

Hydrogen fuel cell buses currently are less widely deployed than BEBs. This technology uses on-board liquid hydrogen as fuel, and tailpipe emissions include only water vapor and warm air. Lifecycle emissions depend on the type of power used to generate the hydrogen, but in many cases it is generated using clean, renewable energy sources.

Hydrogen fuel is still comparatively expensive and distribution networks are limited. Hydrogen cost ranges from $5–$8/kilogram at the three California transit fueling sites, which is approximately $0.71–$1.14/mile (compared to a diesel fuel cost of approximately $0.67 per mile). As more buses are deployed, the increased fuel demand is expected to lower the price of hydrogen on a per-mile basis and lead to a more robust distribution network.[5] The fuel cell vehicles themselves also are at least as expensive as BEBs. The Orange County Transportation Authority (OCTA) announced in February that it

[5] https://cafcp.org/sites/default/files/CHBC-CaFCP-Fuel-Cell-Electric-Bus-Fact-Sheet.pdf.

will purchase 10 fuel cell buses for approximately $12 million.[6] The National Renewable Energy Laboratory cites an industry goal of reducing the average cost of a fuel cell bus to approximately $1 million in coming years. Maintenance costs for fuel cell buses also have preliminarily been shown to be higher than for diesel or CNG buses at this stage of technological development.[7]

The advantages of a fuel cell bus are that it can be operated more like a diesel bus than a BEB, as it relates to fueling and operating range. Hydrogen bus refueling can be done in a matter of minutes at a refueling station, providing operational efficiency and reducing the space impacts associated with BEB charging. Hydrogen buses are reporting operating ranges of between 280 and 530 miles between refueling, which is also comparable to a traditional diesel bus.[8] Buses with these ranges could serve all of TriMet's existing routes.

While some OEMs are offering fuel cell passenger cars, fuel cells are more ideally suited for large vehicles that need to refuel quickly and store a large amount of on-board energy. For example, long-haul trucking operations may be more suited to fuel cells than battery technology. While some transit agencies are purchasing fuel cell buses, more agencies by far are purchasing BEBs. Alameda-Contra Costa Transit District (AC Transit); SunLine Transit Agency in Palm Springs; and the University of California, Irvine have purchased hydrogen fuel cell buses.

Renewable Natural Gas (RNG)

While CNG is in relatively widespread use as an alternative fuel for transit buses and produces significantly less particulate pollution, it does not produce a notable reduction in carbon dioxide ($CO_{2)}$ compared to diesel and produces significantly more carbon monoxide. In terms of point source pollution, CNG and RNG are identical. However, the benefit of RNG as an alternative fuel can be seen in a lifecycle carbon intensity comparison. RNG, or biomethane, is sourced from gases released by decomposing organic matter such as can be found in landfills, wastewater facilities and agricultural waste. If left uncaptured, this matter decomposes to release methane into the atmosphere, which has

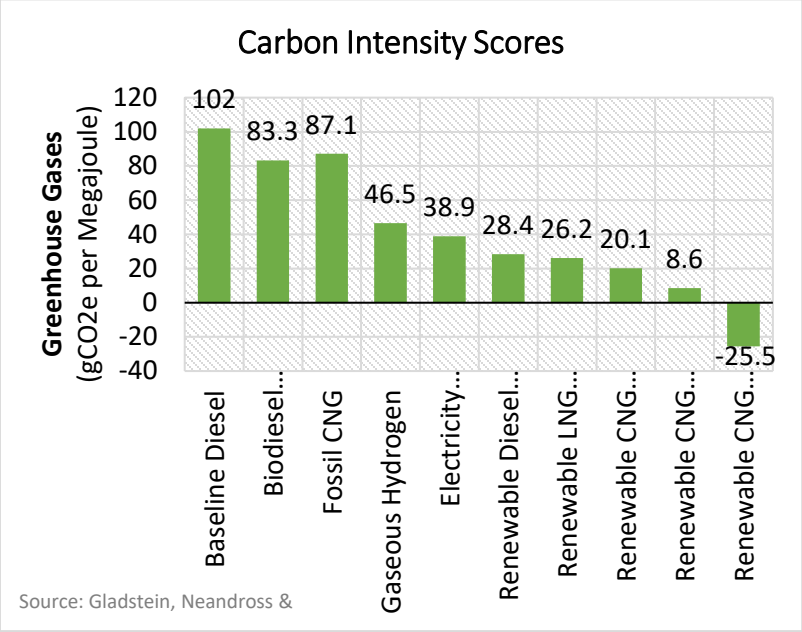


Figure 1. Comparative Carbon Intensity Scores. Source: https://www.trilliumcng.com/en/fueling-solutions/renewable-natural-gas

[6] https://www.ocregister.com/2018/02/07/octa-to-purchase-10-hydrogen-fuel-electric-buses-at-cost-of-about-12-million/.

[7] https://www.nrel.gov/docs/fy18osti/70075.pdf.

[8] http://www.gppq.fct.pt/h2020/_docs/brochuras/fch-ju/20121029%20urban%20buses,%20alternative%20powertrains%20for%20europe%20-%20final%20report_0.pdf.

been found to have 20–25 times the atmospheric warming effect as does CO_2. Capturing RNG generated by anaerobic digestion, or other means, eliminates almost all harmful emissions and can provide dramatic benefits to the environment. In fact, capturing methane and converting it to RNG can have an overall net negative carbon impact, depending on the source, as shown in the comparative carbon intensity scores in Figure 1. For this reason, it is considered in this evaluation among non-diesel fuel sources.

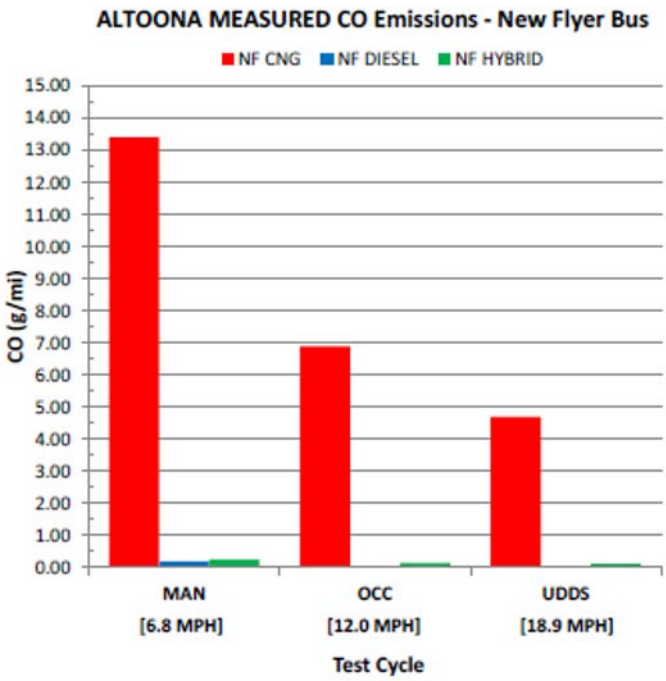


Figure 2. Altoona Measured CO Emissions - New Flyer Bus. Source: https://mjbradley.com/sites/default/files/CNG%20Diesel%20Hybrid%20Comparison%20FINAL%2005nov13.pdf

However, while RNG can have a net negative lifecycle carbon intensity score, it also may not, depending on the source of the methane gas, as shown in Figure 1. And, while particulate and nitrogen oxides (NO_x) pollution with RNG is much reduced, like CNG, carbon monoxide emissions are actually much higher, as shown in Figure 2.

The cost per gallon equivalent for RNG is roughly comparable to the per-gallon cost of diesel, but it can vary by location. Clean Energy Fuels is offering RNG fuel, branded as “Redeem” to transit agencies in California, such as LA Metro and Santa Monica’s Big Blue Bus. It is not yet being provided in Oregon, but an arrangement with Clean Energy Fuels may be possible.

Table 1 below summarizes the key considerations for BEB, fuel cell and RNG buses in relation to existing diesel buses.

Table 1. Comparison of zero or near zero emission technologies

Technology	Cost Relative to Diesel	Emissions Relative to Diesel	Operational Impacts	Status of Deployment in the U.S. Today
Battery-Electric Buses (BEB)	Higher in initial years	Lower	Significant	Peer agencies experience
Fuel Cell Buses	Higher overall	Lower	Minimal	Limited
Renewable Natural Gas (RNG) Buses	Similar	Lower	None	Peer agencies experience

Preferred Technology

After extensive evaluation of available and developing technologies, TriMet's near-term preference is for depot-based charging BEBs. There are several reasons for this choice. Non-diesel fuel cell buses are somewhat less cost effective at this stage of technological development than BEBs, with fuel cell bus vehicle costs at least as much as BEBs but fuel and maintenance costs significantly more than diesel or CNG buses. BEBs, on the other hand, have lower fuel and maintenance costs than diesel or CNG buses, which can help to offset the higher vehicle purchase prices compared to diesel or CNG.

RNG is not preferred over BEBs at this time; however, further exploration of this option is warranted. While CNG buses are currently less costly than BEBs, CNG maintenance costs are projected to be higher than BEBs, they have point source emissions and there are still questions that need to be addressed regarding the supply and characterization of RNG carbon impacts.

Hydrogen, like RNG, appears to hold some promise for meeting the agency's needs, if technological advances and energy supply issues can be addressed. While these technologies are not TriMet's preferred approach at this time, the agency fully intends to continue to investigate the long-term potential of integrating these technologies into its fleet over the coming years. This may include seeking grant funding for acquisition of test vehicles and associated fueling equipment.[9]

Between depot-charging and on-route opportunity charging BEB technologies, depot charging is the preferred agency technology. Depot-charging buses can charge at bus depots with minimal operational impacts. While plugging in buses to charge overnight is a change from the current practice of refueling buses in a matter of minutes and then parking them, the essential experience of being able to send buses out for a full block of service without the need for refueling until they return to the depot would be similar to diesel buses. In addition, eliminating the need for on-route charging equipment will reduce more expensive daytime charging, allow for greater agency flexibility to adjust routes over time and avoid the neighborhood impacts of installing opportunity chargers.

In addition, depot-charging buses are more cost effective at this time than on-route opportunity charging buses, due primarily to the lower cost of charging equipment. Lastly, depot-charging technology would be compatible with more of the existing TriMet service profile. According to an analysis of agency routes, comparing the expected range for BEBs and route lengths, it is estimated that 59 percent of existing service blocks can be served by depot-based charging compared to only 38 percent for opportunity charging technology. It is generally expected that depot-charging technology will improve over the coming years and be sufficient to accommodate virtually all of TriMet routes.

National and International BEB Experience

Internationally, there are almost 400,000 BEBs deployed with approximately 99 percent of those located in China. Within the U.S., at least 38 transit agencies have some experience with BEBs – most with fewer than 10 buses. Within the U.S., most transit agencies with BEBs are in the process of testing the technology and evaluating the desirability of a longer-term commitment to them.

A handful of transit agencies in the U.S. have committed to purchasing only BEBs. Notably, Antelope Valley Transportation Authority in Southern California is anticipating a full transition in 2018, LA Metro

[9] TriMet has determined that due to training, staffing, parts management and infrastructure needs, it would be inefficient and costly to have buses using more than two fuel types at any one maintenance facility. Therefore, the agency intends to house the initial BEB fleet at its Powell Operations Facility.

aims to have a fully electrified fleet by the year 2030 and King County Metro in Washington has committed to a full transition to BEBs but is still testing a number of different OEMs before beginning to purchase BEBs exclusively.

Current Battery Electric Bus Initiative

TriMet is experimenting with on-route opportunity charging with a pilot project deploying five BEBs on Line 62 slated for 2019. TriMet's BEB pilot project is funded jointly by the FTA, TriMet and a partnership with PGE. Some of the project objectives include eliminating vehicle emissions, reducing noise, reducing costs and training the workforce. The pilot will involve training for operators, maintenance team and first responders, as well as a year of revenue service data collection and monitoring. The pilot will use both on-route charging and depot charging to provide the broadest experience. Under a pilot project approved by the Oregon Public Utility Commission (PUC), PGE is assisting by installing, maintaining and designing the necessary charging infrastructure.

Chapter 4: Net Present Value Analysis of Transitioning to a BEB Fleet

A detailed lifecycle cost model was developed to understand the fiscal impact of transitioning to a new BEB fleet. This model evaluates all categories of costs (or credits) that TriMet is projected to experience when purchasing and operating BEBs. The factors included in the analysis are vehicle purchase costs, including assumptions about future price changes due to economies of scale and technology, as well as maintenance, fuel use, electricity use, facility upgrades, charging infrastructure and Clean Fuel Credits. The model also addresses social costs including emissions and noise. All of these costs are calculated for each bus in the transition scenario at each year to measure the full cost of each scenario. The model then compares those costs with an equivalent diesel bus fleet purchase and operations plan.

TriMet replaces buses, on average, at 16 years of age. Each bus in the fleet will reach its retirement age and be replaced with a new bus over the course of an average 16-year lifecycle. Thus, this lifecycle cost model examined a 16-year time period.

The bus purchases in the model are all based on TriMet's Fleet Plan from November 2017.[10] That plan outlines projected fleet replacement needs and fleet growth through 2027. Beyond that point, the model assumes the total fleet grows by 14 buses annually, reflecting historical growth rates.[11] The purchases each year are assigned to replace retiring vehicles and meet the target fleet growth. In the model, diesel buses and BEBs both have a lifetime of 16 years, matching current TriMet experience with diesel buses. As noted earlier, for the lifecycle costs to meet acceptable thresholds for a full conversion to BEBs, TriMet will need to see evidence that suggests such lifecycles are achievable.

The model assigns each bus to one of TriMet's operating facilities. All purchases are assigned to Powell, Center, Merlo, or a new facility that is expected in the coming years. This allows the model to include different service profiles and operating characteristics at the different facilities. It also enables planning for the facilities' capacity levels. Preliminary engineering work at the Powell facility indicates that converting an operating garage to house BEBs results in a capacity reduction of about 17 percent due to space needed for charging equipment and new directional ingress and egress. Anticipating these

[10] Note: Only 40-foot buses are considered as part of this analysis.

[11] To smooth out annual budgets in the lifecycle cost model, occasionally bus lifetimes may be extended as long as 17 years to offset "lumpy" fluctuations in purchase needs.

capacity losses will allow TriMet to plan its facility space to accommodate all of the BEBs for the proposed pilot period.

Cost modeling required making projections concerning many future conditions that involve a number of uncertain variables. The analysis reviewed relevant research findings, manufacturer claims, peer agency experiences and TriMet's own experiences, as well as conducted scenario testing to understand the implications of various assumptions. Initially, the potential conditions were framed as representing optimistic, pessimistic and moderate scenarios. However, because financial planning for multiple scenarios is not practical, after discussions with stakeholders, the model conditions were merged into a single, highest-confidence model scenario.

The key measures that serve as inputs into the highest-confidence model scenario are described below, along with the logic behind their selection.

Vehicle Purchase Costs
Vehicle purchase prices are a crucial variable and a source of significant future uncertainty.

- The base year purchase price of BEBs using depot -based charging is $1,008,794.[12] This is based on averaging quotes from New Flyer and King County Metro's experience with Proterra. Note that this price is "fully loaded" to include vehicle acquisition, warranties, parts, training and after-market features.

- The purchase price of depot-charging BEBs declines relative to equivalent diesel buses (with improvements in technology and economies of scale) and then increases (due to normal inflation) in line with the average of two different scenarios from the California Air Resources Board.[13] Figure 3 below illustrates this trend over the study period.

- The base year purchase price of diesel buses is $532,019. This is based on TriMet's cost for new buses being added in Fiscal Year 2019. Note that this price is also "fully loaded" to include vehicle acquisition, warranties, parts, training and after-market features.

- The purchase price of diesel buses grows by approximately $17,894 annually, in year of expenditure dollars, due largely to inflation. This is based on the average trend of new bus deliveries over the period 2001-2015 as reported in the American Public Transportation Association's 2015 Public Transportation Fact Book. Figure 3 below illustrates this trend over the study period.

- Total costs for both diesel and BEBs also include two types of special equipment requirements particular to TriMet. All new buses require an operator protective enclosure costing $5,000, and all fleet expansion buses (as opposed to replacement buses) require a package of equipment costing approximately $25,000.

[12] Dollar figures are in 2018 dollars unless otherwise noted. Base BEB cost assumptions are based on preliminary quotes for manufacturers and range from approximately $930,000 to approximately $1,087,000.

[13] California Air Resources Board. "5th Innovative Clean Transit Working Group Meeting." June 26, 2017.

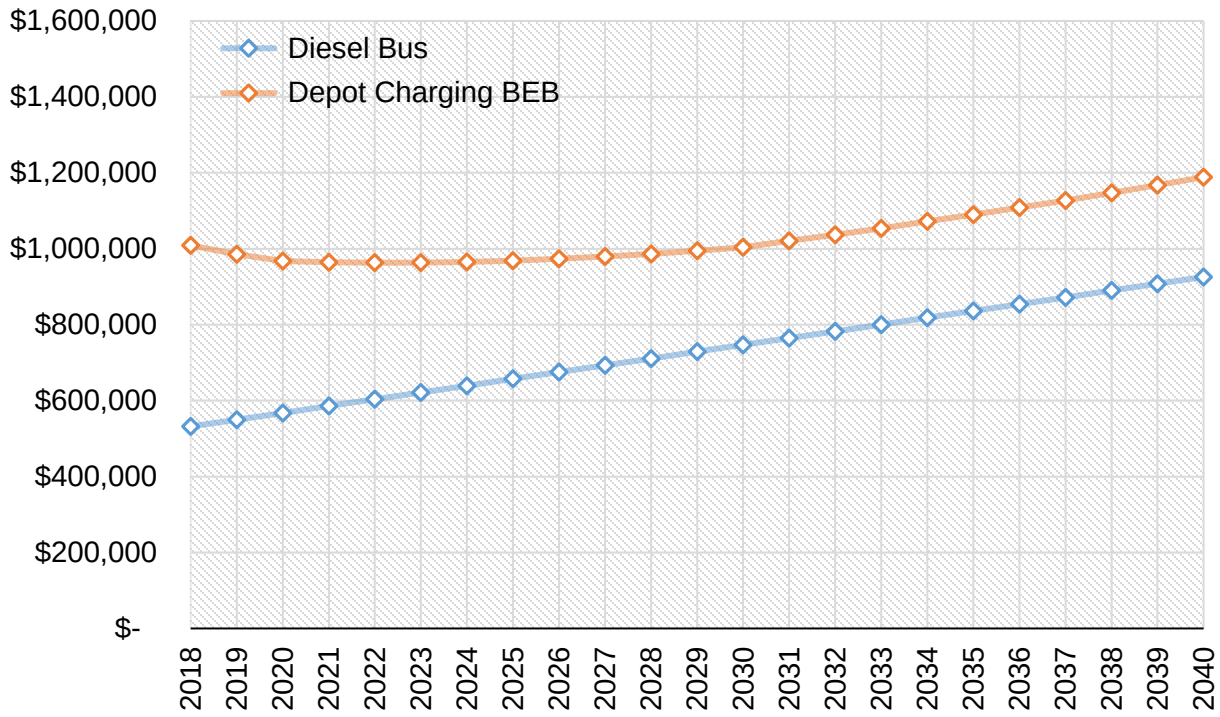


Figure 3. Projected purchases prices for diesel buses and BEBs using depot-based charging.

Maintenance Costs

- The base year cost of diesel bus maintenance is $1.82 per mile based on TriMet's current experience.

- The cost of BEB maintenance is estimated to be 20 percent lower than equivalent diesel buses. Manufacturers highlight that BEBs have fewer parts to maintain and do not require oil and liquid fuels. Savings as large as $151,000 over 12 years have been claimed. Despite these optimistic claims, TriMet seeks to balance its expectations based on experience from other agencies operating electric buses. Due to this technology being relatively new to U.S. transit agencies, full lifecycle maintenance cost trends are not yet available, so a moderate assumption is prudent.

- Actual mileage per bus is determined based on the average of each bus's operating facility.

- Charging equipment also requires maintenance. Based on the King County Metro's Feasibility of Achieving a Carbon-Neutral or Zero-Emission Fleet study,[14] this is estimated at $200 annually for a depot charger in the base year.

Fuel Costs

- The base year price of diesel fuel is $1.95 per gallon based on TriMet's current experience.[15]

[14] https://kingcounty.gov/~/media/elected/executive/constantine/news/documents/Zero_Emission_Fleet.ashx.

[15] Source: TriMet Financial Analyst Timothy Kea.

- The price of diesel fuel is projected to grow by 2 percent annually (inclusive of 1.34 percent inflation). Although there is research suggesting that the price of diesel fuel could grow at faster rates in the future,[16] the 2 percent growth trend aligns with TriMet experience. A faster rate of growth would reflect significant policy or economic shifts. [17]

- Actual gallons of fuel used are determined based on the bus's per-bus average for each operating facility.[18]

Electricity Costs

- For electricity costs that depend on vehicle usage, 2.362 kilowatt hour (kWh) of energy is used per mile. This is based on King County research that is in line with preliminary analysis related to TriMet's BEB pilot.

- Actual mileage per bus is determined based on the average of each bus's operating facility.

- For electricity costs that depend on the peak power draw of facilities, each depot charger is assumed to draw 110 kW. This is the worst case manufacturer specification from Proterra,[19] though manufacturer claims are generally optimistic.

- Pricing of electricity would be provided under PGE's Schedule 85 rate structure. This was confirmed in discussions with PGE. This rate structure applies to large nonresidential customers drawing power in the range of 201 kW to 4,000 kW. The power needs of BEB charging are estimated to fall in this range. The pricing under this schedule varies with the share of charging occurring during PGE's peak period (between 6 a.m. and 10 p.m.). Based on service schedules and the differential pricing, our analysis assumes that 25 percent of charging occurs during the 6 a.m. to 10 p.m. window, and the majority would occur overnight.

Facility Upgrades

- Facility upgrade costs were estimated by developing preliminary engineering plans for the existing TriMet bus depots. These plans considered pavement restriping, electrical wiring, power service and adding a substation.[20] For the planned new bus facility, costing assumes the facility upgrade cost per bus matches the average of the three existing bus bases.

- Facility upgrade costs assume that upgrades are deployed to one-third of a bus facility at a time. Thus, one-third of the facility will be upgraded for the first one-third of its fleet. Facility upgrade costs continue in one-third units as the BEB fleet grows at each bus facility.

[16] Source: National Renewable Energy Laboratory, 2017.

[17] Policy changes, such as federal carbon caps or taxes, could dramatically change the long-range cost of diesel fuel, making it significantly more expensive. Such changes would narrow the gap between the NPV of BEBs versus diesel buses.

[18] Source: September 2017 Bus Maintenance Report.

[19] Source: Catalyst 40-foot bus performance specifications.

[20] Initial facility costs could be reduced if the PUC were to approve a docket expanding on the rule it approved for TriMet's initial five BEBs test and allowing PGE to design, install and maintain charging facilities.

Charger Infrastructure

- The base price for each depot charger is $68,909 to purchase and install. This is based on research from the King County Metro feasibility study and confirmed by manufacturers.[21]

- Based on manufacturer specifications, depot chargers can accommodate two BEBs and have the same lifetime as the associated buses.

Clean Fuel Credits

The Oregon Department of Environmental Quality (DEQ) established a Clean Fuel Credit program that provides credits for BEBs that can be sold in a market. (Its policy currently runs through 2025, beyond which credit distribution is assumed to be static.) The actual value of the credits is subject to market forces.

- The model assumes a value of $100[22] per credit. This approximates the value of similar credits offered in California at the time of writing. While this represents an increase over the current value of the credits in Oregon, it is considered to be a realistic projection of future performance.

Finance Assumptions

The model made the following assumptions regarding finance. All analyses use 2018 dollars, and a discount rate of 3 percent is used to adjust future costs for time value. Second, specific growth rates are assumed for certain categories of costs based on market indexes or TriMet experience: materials and services grow at 3 percent annually and labor costs grow at 1 percent annually. General inflation uses a 10-year average consumer price index value of 1.34 percent. Finally, all financial outputs are presented in constant 2018 dollars.

The overall results of the TriMet fleet replacement net present value (NPV) model through the year 2055 are summarized in Table 2 below.

[21] For purposes of this analysis it is assumed that TriMet will install, own and maintain charging infrastructure. For the purchase of TriMet's first five on-route opportunity charging BEBs, the PUC approved Order No. 18-054, allowing PGE to install, own and maintain the charging infrastructure. If this approach were available for the full implementation of the BEB plan, TriMet's up front capital costs would be reduced significantly.

[22] Source: Approximate current value in California.

Table 2. Comparison of modeled fleet replacement NPV categories between diesel buses and BEB scenarios

	Diesel Fleet Replacement	BEB Fleet Replacement
NPV to TriMet		
Fuel Use	$189,311,600	$40,957,864
Electricity Use	$351,369	$60,394,841
Maintenance	$979,770,749	$829,111,721
Vehicle Purchase	$678,704,440	$877,366,717
Charger Infrastructure	$872,718	$24,432,563
Clean Fuel Credits	-$606,777	-$83,293,920
Facility Upgrades	$226,207	$30,578,032
Total	**$1,848,630,307**	**$1,779,547,818**
Social NPVs		
Emissions (Tailpipe)	$118,967,159	$27,158,828
Emissions (Power)	$169,545	$22,419,826[23]
Noise[24]	$33,183,247	$23,115,102
Total	**$152,319,951**	**$72,693,757**

Under both scenarios, the total of all lifecycle NPVs to TriMet for replacing, expanding and operating its fleet is approximately $1.8 billion. The NPV of choosing the BEB fleet option saves TriMet approximately $69.1 million, or 3.7 percent of the total cost through the year 2055, in 2018 dollars.

Choosing the BEB fleet option also reduces social costs, with a NPV approximately $79.6 million, related to emissions and noise reductions. These benefits accrue to members of the general public and cannot be monetized by TriMet. While some value of emissions reductions are reflected in state emissions credits, the overall contribution that converting to BEBs makes toward meeting climate goals is not a financial resource that TriMet can use to offset the initial cost of purchasing these vehicles and charging infrastructure.

This model also allows us to understand how the NPV is generated over time. Figures 4 and 5 below show that BEB fleet costs are greatest at the beginning of the bus lifecycle when vehicles and infrastructure are being acquired. In the later years, BEB costs related to operations and maintenance are significantly less than diesel buses. In other words, while BEBs cost somewhat more up front than equivalent diesel buses, the benefits in reduced maintenance and operating costs offset the up-front costs in the long term.

Even though the transition to BEBs is expected to save money in the long term, in the short term it requires additional funding sources to facilitate the transition.

As will be noted in the following sections of this report, with an allocation of Statewide Transportation Investment Funds, TriMet is in a position to move forward with a pilot phase of BEB conversion and an aspirational goal of full fleet conversion. However, to achieve the full fleet conversion, significant additional resources will need to be identified beyond those currently available to the agency.

[23] This NPV is based on PGE's current generating portfolio, which includes the coal plant at Boardman. As PGE transitions to a lower-carbon emissions generation portfolio, the social NPV of moving to BEBs will increase above this figure.

[24] A noise reduction of 51 percent is estimated overall.

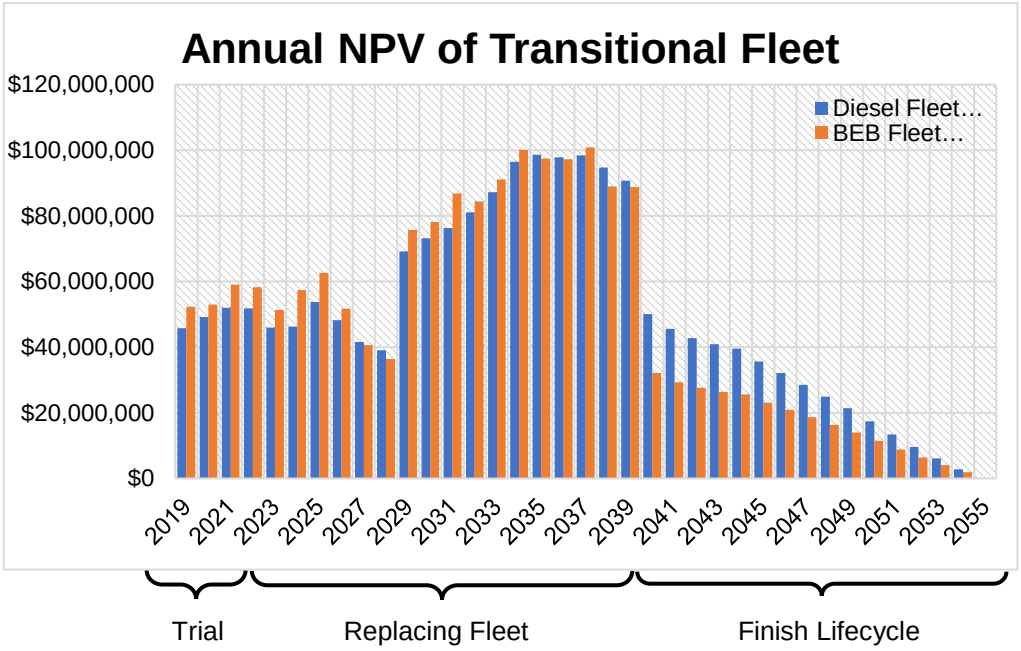


Figure 4. Annual NPV of the transitional fleet

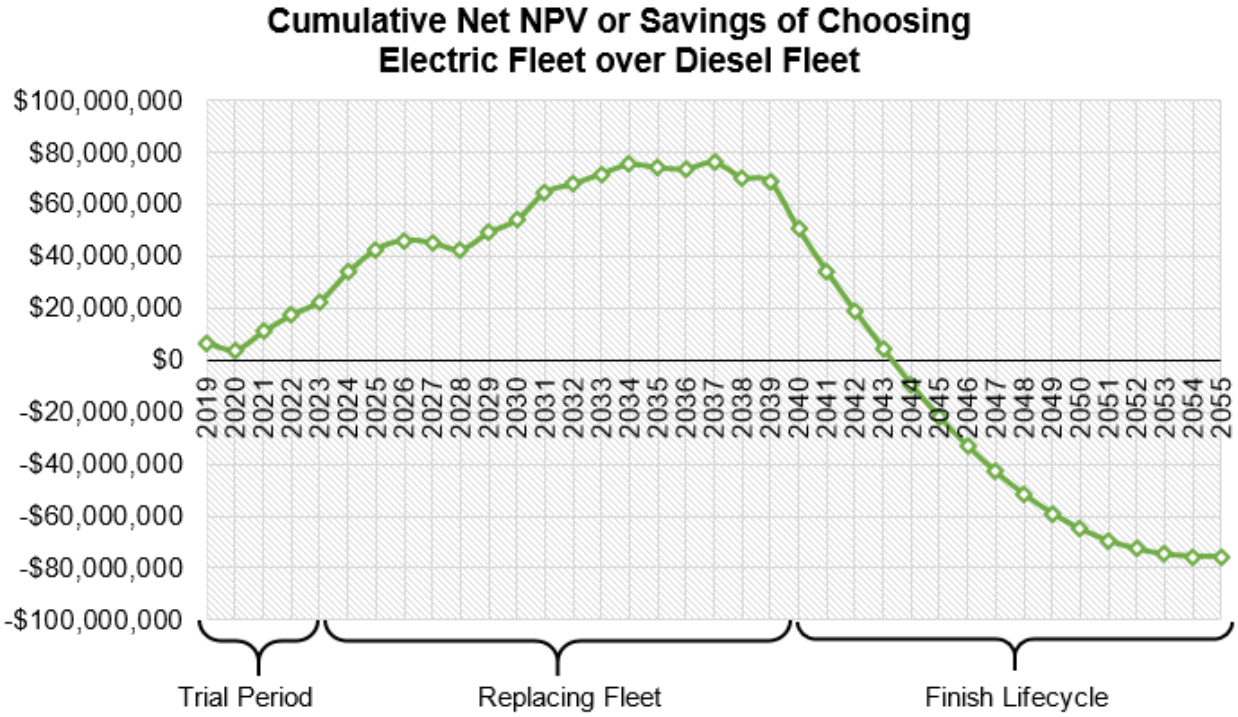


Figure 5. Cumulative NPV or savings of choosing electrical buses over diesel buses for the transitional fleet

Social Costs

Social costs related to emissions were calculated for both tailpipe emissions from diesel buses and from power generation for BEBs. This analysis evaluated the value of the CO_2 and NO_x produced. The social cost per ton of CO_2 is $44.75, while the social cost per ton of NO_x is $8,335.[25] Forty-foot diesel buses emit 2,444 grams of CO_2 per mile and 16.64 grams of NO_x per mile.[26] Thus, a social cost per diesel bus mile can be calculated. Similarly, PGE reports emission rates per megawatt-hour (MWh) of power generated. They report 0.000391 tons of NO_x per MWh and 0.554017 tons of CO_2 per MWh. These statistics can be combined with the energy use per mile to generate a range of social costs per BEB mile.

Social costs related to noise impacts were calculated based on the miles driven for each type of vehicle. The noise costs of diesel buses are 7.6 cents per mile, while the noise costs of BEBs are 4.6 cents per mile.[27] A comparison of total costs of the diesel and BEB transition scenarios, including social costs, are shown in Figure 6 below.

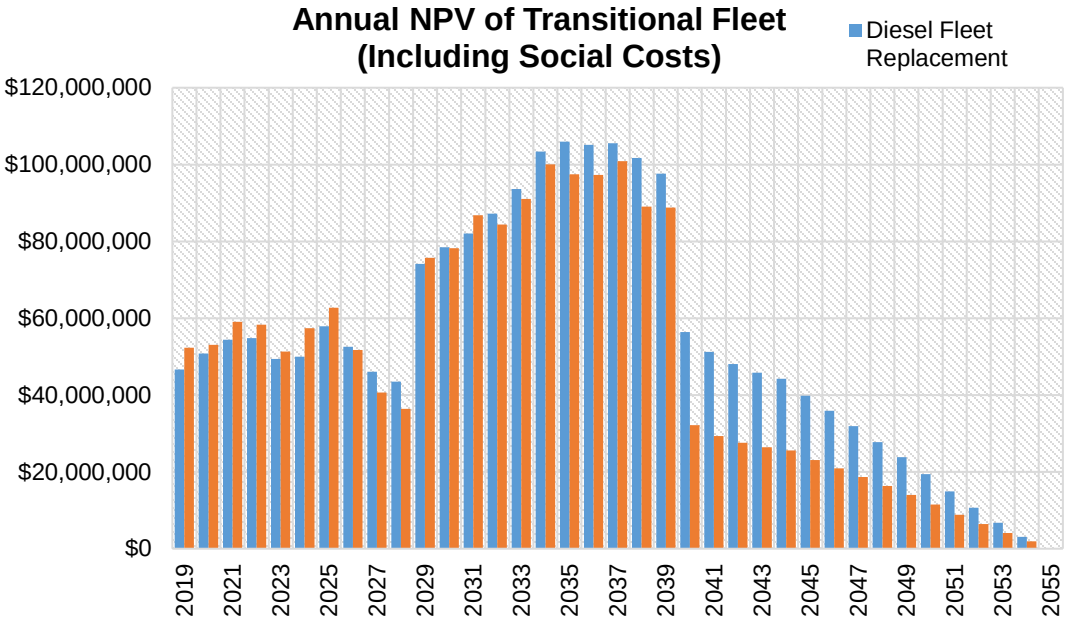


Figure 6. Annual NPV of the transitional fleet, including social costs

Chapter 5: Proposed Implementation Strategy

In order to calculate the year of expenditure costs for converting to a non-diesel fleet, it was necessary to develop a proposed implementation strategy, defining an implementation rate for the purposes of modeling. Based on the findings of the industry review, bus charging type analysis and NPV calculation, TriMet developed the following proposed implementation strategy.

[25] U.S. Environmental Protection Agency.

[26] EMFAC Web Database, California Environmental Protection Agency, Air Resources Board, https://www.arb.ca.gov/emfac/2014/.

[27] Transportation Cost and Benefit Analysis II, Victoria Transport Policy Institute (VTPI), December 2015. Available at: www.vtpi.org/tca/tca0511.pdf.

Trial Period
Because of the uncertainties associated with the current technology, and in an effort to capture the benefits of improving technologies and innovation, TriMet is suggesting a two-step approach to converting to a non-diesel fleet. The first phase will be to incrementally purchase a 65 BEB test fleet over the next four years. The second phase will be to evaluate the performance, cost and reliability of the test fleet and make a determination over the test period whether to either ramp up, maintain or discontinue purchases of BEBs to pursue some other technology altogether. Assuming the BEBs are performing adequately, TriMet would purchase 20 additional BEBs in 2023 as well.

Full Implementation
Assuming successful outcomes during the four-year trial and the identification of new funding needed after the initial STIF allocation, TriMet would discontinue diesel bus purchases in 2023. Following such a strategy, no diesel buses would remain in the TriMet fleet by 2040. A graph of the fleet conversion progression is show in Figure 7.

TriMet's five year BEB purchase plan:

Fiscal Year	No. of BEBs ordered
2019	10[28]
2020	10
2021	20
2022	20
2023	20
Total	80[29]

Trial Phase

1st Year Transition

[28] FTA has approved a Low-No grant to TriMet for the purchase of five depot-based BEBs. In addition, TriMet proposes to purchase an additional 10 BEBs in FY 2019 using STIF funds.

[29] Total BEBs ordered or in use in FY 2023 will be 90 after including the five FTA-funded on-route BEBs approved in FY 2016.

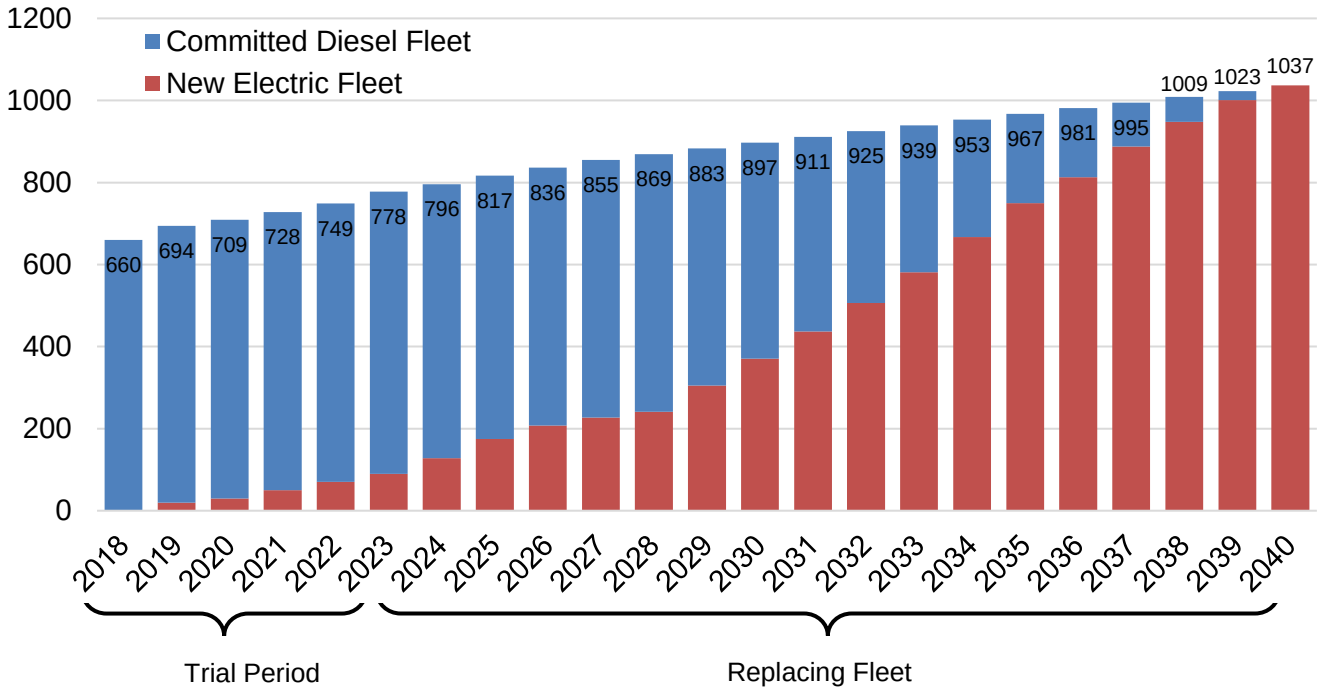


Figure 7. Planned progression of electric fleet to replace diesel fleet by end of 2040. Note: Actual completion of fleet conversion could occur in calendar year 2041 or 2042 depending on manufacturer lead time for construction and delivery of buses.

Long-Term Considerations

During the time required to make the transition to a full BEB or non-diesel fleet, policy, technology and economic considerations are expected to evolve. The following are considerations that will inform either the transition or impact the timeline of such a transition.

- With current battery technology and TriMet's current bus service schedules, it is estimated that approximately 59 percent of bus routes are compatible with depot-charging BEB technology (assuming a "real-world" range of 150 miles). Depot-charging technology will need to improve to accommodate all of TriMet's routes. Some manufacturers already advertise longer ranges and on-the-ground testing over time will evolve the agency's battery range assumptions.

- Future purchase prices of BEBs are uncertain. Some experts argue that prices could decline more than projected in the California Air Resources Board (CARB) model used for this analysis. If purchase prices do not decline at least as much as currently projected in the CARB innovation curve, continued purchase of BEBs may not be feasible. On the other hand, if innovation and economies of scale reduce BEB purchase costs more than projected in the CARB model, less additional funding would be needed to achieve full conversion.[30]

[30] Reducing capital costs do not necessarily speed up the conversion to non-diesel buses because, to manage its bus replacement cycle, TriMet tries to have 1/16th of its bus fleet "age out" each year.

- BEB technology must prove reliable for TriMet's operational needs. If the buses do not perform up to expectations, a full fleet transition may be premature.

- Fuel and maintenance cost savings are currently assumed. If future electricity costs are greater than expected or maintenance costs cannot be reduced to assumed levels, alternative technologies will be explored.

- Although BEBs should eventually cost less than equivalent diesel buses due to lower maintenance and operating costs, TriMet does not have the resources to pay the up-front costs of converting the entire fleet to BEBs. Additional funding, beyond HB 2017, will be needed to support a full transition to BEBs.

- Changes to state and national policies and credit programs may support or detract from BEB viability. Tax credit programs such as Clean Fuel Credits must continue with at least the existing credit value for a transition to BEBs to be viable for TriMet. Policies that increase diesel prices but do not help finance BEB costs, while affecting the NPV calculation, do not make the transition more affordable.

TriMet will continue to monitor and explore alternatives such as hydrogen and RNG during the BEB trial period. If these technologies prove more attractive in terms of cost, emissions, reliability and customer service than BEBs, TriMet may move to pilot those technologies as well. Pilot testing of other technologies will occur at a garage other than Powell, which will have reached its two-fuel type limit with the combined diesel and BEB fleet based there.[31]

Title VI and Equity Considerations

TriMet's commitment to Title VI and equity can be seen across our agency, the transportation system we manage and the community we serve. It is embedded in the policies and practices we develop and implement.

TriMet has established standards and policies for evaluating and addressing equity considerations as set forth in the FTA's Circular 4702.1B. [32] These standards and policies assist in guiding the equitable development and delivery of service in support of TriMet's mission to provide valued transit service that is safe, dependable and easy to use. They also provide benchmarks to ensure that service design and operations practices do not result in discrimination on the basis of race, color or national origin, or place undue burdens on low-income populations. They establish a basis for monitoring and analysis of service delivery, availability and the distribution of amenities and vehicles to determine whether any disparate impacts are evident. In some cases, TriMet has adopted policies that exceed the federal requirements to ensure that its practices meet community expectations regarding equitable allocation of services.

In Oregon and across the U.S., low-income families and people of color are more likely to live in neighborhoods that have high concentrations of air pollution and, as a result, are at higher risk for

[31] TriMet has determined that it cannot support more than two fuel types at any single maintenance facility due to the need for parts, training, equipment and fueling infrastructure. Since diesel buses will remain in service at all TriMet garages for some years to come, each garage will have the capability of housing one alternative fuel bus type.

[32] https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Title_VI_FINAL.pdf.

chronic disease and premature death.[33] In alignment with TriMet's commitment to Title VI and equity, one strategy that TriMet can use to help address these impacts is to deploy non-polluting buses to routes that serve minority and low-income areas.

Historically, TriMet's goal for equitably assigning buses has been to ensure that the average age of vehicles that serve minority and low-income populations is no more than the average age of vehicles on routes in non-minority and higher income areas. However, in adopting this plan, TriMet intends to go beyond its historical practices and instead, prioritize the deployment of non-diesel buses to routes serving low-income and minority communities.

In anticipation of TriMet's plan to transition to zero-emission bus technology, staff has developed strategy to prioritize the deployment of non-diesel vehicles throughout the service area utilizing Title VI and environmental justice principles. Decisions about where to deploy BEBs will need to reflect technical and physical feasibility, such as achievable bus range and availability of charging facilities. Locating the initial BEB trial at the Powell Operations Facility will facilitate this effort because the garage already houses many routes serving low-income and minority neighborhoods. TriMet is in the process of upgrading the Powell facility and is incorporating BEB charging infrastructure into the design of these improvements.

Assuming that the initial BEB trial is successful and funding for a full conversion of TriMet's fleet to BEBs is found, TriMet's strategy is to locate BEBs at the Powell facility until that garage has reached capacity (approximately 300 buses) and then deploy BEBs out of other garages. In addition, if no alternative fuel source, such as CNG or hydrogen, proves attractive, the next facility to house BEBs is likely to be TriMet's new maintenance facility, currently being planned for northeast Portland. It is too early to determine which of the two remaining maintenance facilities, Merlo or Center Street, would be the next to receive BEBs. In any case, regardless of which garage is selected as a BEB base, TriMet will prioritize deployment of BEBs to the routes that serve low-income and minority populations and where characteristics route are consistent with the technology.

Chapter 6: Fiscal Analysis of Transitioning to a BEB Fleet

In evaluating the lifecycle costs of diesel buses versus BEB vehicles, it is appropriate to discount all future costs to current dollars. In looking at the year-by-year funding requirements for the purchase of a BEB fleet, it is appropriate to instead look at cost figures in year of expenditure dollars. The following funding requirements take into consideration all of the factors used in the lifecycle analysis: the costs of vehicle purchase, maintenance savings, tax credits and charging infrastructure, converted to year of expenditure figures to better understand the annual funding necessary to successfully accomplish the fleet conversion.

For purposes of this analysis, TriMet is assuming that the purchase of diesel replacement and expansion buses is already funded from existing resources such as the employer payroll tax, STIF and federal formula funds. Therefore, it is the net additional cost of BEBs that is of interest. Using a year of expenditure approach yields the net additional costs of BEB conversion in Table 3.

[33] http://nationalequityatlas.org/indicators/Air_pollution%3A_Unequal_burden.

Table 3. Net BEB premium over equivalent diesel cost in year of expenditure dollars

	Fiscal Year	No. of BEBs Purchased	Equivalent Diesel Bus	Electric Bus	BEB Premium
Phase I	2019	10	$ 5,453,195	$ 19,879,663	$ 14,426,469
	2020	10	$ 5,589,525	$ 10,678,295	$ 5,088,770
	2021	20	$ 11,458,525	$ 21,644,643	$ 10,186,118
	2022	20	$ 11,744,989	$ 21,995,276	$ 10,250,288
Phase II	2023	20	$ 12,038,613	$ 22,383,126	$ 10,344,513
	2024	62	$ 38,252,694	$ 82,071,597	$ 43,818,903
	2025	5	$ 3,162,017	$ 4,186,189	$ 1,024,172
	2026	5	$ 3,241,067	$ 2,625,698	$ (615,369)
	2027	60	$ 39,865,130	$ 81,813,220	$ 41,948,091
	2028	75	$ 51,077,197	$ 89,707,272	$ 38,630,074
	2029	65	$ 45,373,577	$ 97,289,085	$ 51,915,508
	2030	69	$ 49,369,942	$ 83,132,537	$ 33,762,594
	2031	82	$ 60,138,314	$ 129,121,996	$ 68,983,683
	2032	55	$ 41,345,091	$ 65,190,287	$ 23,845,197
	2033	62	$ 47,772,373	$ 75,075,126	$ 27,302,753
	2034	69	$ 54,495,179	$ 116,249,405	$ 61,754,227
	2035	66	$ 53,428,968	$ 82,956,784	$ 29,527,816
	2036	61	$ 50,615,852	$ 75,622,236	$ 25,006,383
	2037	62	$ 52,731,761	$ 102,006,781	$ 49,275,020
	2038	41	$ 35,742,778	$ 42,654,209	$ 6,911,431
	2039	5	$ 4,467,847	$ (21,731,350)	$ (26,199,198)
	2040	5	$ 4,579,543	$ (23,675,627)	$ (28,255,170)

As shown in Table 3, the annual average incremental additional cost of the BEB strategy is about $10 million per year for the period FY 2019 to FY 2023. After that point, the incremental costs increase dramatically due to the larger bus purchases programed for FY 2023 to FY 2027.[34] In those years, the average annual incremental additional cost is approximately $20 million. From FY 2028 to FY 2031, the annual incremental premium jumps to nearly $50 million per year on average.

As noted previously, to pursue a full conversion strategy, significant additional resources would need to be identified or costs would have to decline dramatically.

To begin the conversion process and respond to the legislative direction in HB 2017 (Keep Oregon Moving Act), TriMet approached the STIF advisory committee with the request to allocate a portion of the new regional funding to the Phase I BEB trial and beyond. The advisory committee agreed to consider this request and, subsequently, TriMet included the option of allocating STIF funds to a BEB strategy in its community outreach and engagement process for HB 2017. TriMet anticipates that the STIF committee will allocate both ongoing and one-time STIF resources over the initial five years of the new funding as the agency ramps up expanded services. TriMet suggested the allocation of $5 million in ongoing funding and $28 million in one-time funds. Combined, these resources are sufficient to meet

[34] TriMet's bus replacement schedule shows five buses needed in 2025 and 2026 due to the fact that there are five buses in TriMet's existing fleet that will be reaching 16 years of age in those two years. In all likelihood, TriMet will smooth out bus purchases over these four years, purchasing approximately 30 replacement buses per year in 2024 through 2027. In either case, the average annual premium for BEBs over this period is approximately $20 million per year.

the BEB cost premium for the Phase I trial period and the first year of full fleet conversion in FY 2023. Given current cost projections, this would allow for the purchase of a total 80 BEBs and associated charging infrastructure in addition to the 10 BEBs funded through FTA Low-No grants. After FY 2023, TriMet would have $5 million in ongoing STIF resources to address the premium costs of a full conversion to BEBs; however, additional resources would be needed to address the unfunded portion of the premium.

As of the writing of this report, the STIF advisory committee has made a preliminary allocation of these ongoing and one-time funds. Successful allocation to the BEB trial program will require approval by both the TriMet Board of Directors and the Oregon Transportation Commission (OTC).

TriMet has been successful in securing two federal Low-No grants for the purchase of a total 10 BEBs and associated charging infrastructure. While TriMet will continue to pursue additional grants, these resources are not of a scale to address the bulk of the non-diesel conversion strategy. There are a number of potential sources of funding for the full conversion of the fleet.

- **Carbon cap and invest resources:** If the Oregon Legislature moves forward with a carbon cap and invest program, it could allocate resources in the form of cash or monetizable credits to TriMet to offset BEB premium costs. In addition, it is anticipated that a portion of the new resources generated under a cap and invest bill will fall under the restrictions of Article IX, Section 3 of the Oregon Constitution, requiring that all taxes or fees on motor vehicles or fuel must be used for roads. The state and region could make a policy decision to replace un-flexed federal dollars used for roads with these new cap and invest resources and flex more federal resources to alternative modes, including BEB conversion.

- **Flexible federal transportation funds:** Flexible federal transportation funds are allocated to the Oregon Department of Transportation and a portion of those funds are sub-allocated to the Portland metropolitan region, where the Joint Policy Advisory Committee on Transportation (JPACT) and Metro set funding priorities.

- **Expanded tax credits:** State or federal tax credits that can be earned by virtue of BEB investments that reduce carbon emissions could generate revenue that the agency can use to make the BEB investments. Currently, Oregon has a modest tax credit, which could be expanded. The federal government has stopped issuing renewable identification numbers (RIN) credits, which, if reinstated, could provide additional resources.

There are two policy changes that TriMet believes would help facilitate the full conversion of its diesel fleet to non-diesel.

- **Utility partnerships:** In February 2018, the PUC issued Order No. 18-054, adopting a multi-party stipulation that authorized PGE to undertake a number of initiatives to advance the electrification of transportation. One element of that order allowed PGE to partner with TriMet in the design, installation and maintenance of charging infrastructure for five BEBs using on-route opportunity charging. This approach allowed TriMet to focus its time and resources on its area of expertise, the purchase of the BEBS, rather than on the charging infrastructure, an area outside TriMet's expertise. This approach resulted in the purchase of one additional bus and much more efficient and effective implementation of the new technology. TriMet would encourage the PUC and other policy makers to expand the pilot program contained in Order No.

18-054 to allow TriMet, PGE and other utilities to partner in similar ways on full-scale BEB infrastructure.

- **Bonding STIF resources:** Oregon Department of Transportation's (ODOT) current position is that STIF funds cannot be bonded because, although they are allocated based on a formula, the use of the funds depends on periodic plan approval by both the local STIF advisory committee and the OTC. The inability to bond STIF resources reduces TriMet's ability to effectively use these funds to support the BEB strategy. Given the fact that capital costs for BEB conversion occur up front, but benefits in reduced maintenance and fuel costs occur in later years, bonding for BEBs would appear to be an ideal opportunity to more closely align the costs and benefits of the conversion strategy. TriMet would encourage ODOT and the OTC to reconsider their interpretation and allow the bonding of STIF resources, just as they allow the bonding of their own gas tax revenues.

Conclusion

Global climate change is one of the most important environmental and economic challenges of our times. The impacts of unchecked carbon emissions are almost incalculably large. It is imperative that public entities like TriMet take steps not only to reduce their own carbon emissions but to provide leadership in this effort to help advance technological innovation and broader adoption of carbon emissions reduction strategies. Given imperative advances in technology and funding from HB 2017, TriMet can project conversion of its diesel fleet to alternative fuel by the year 2040 or before.

Successful passage of HB 2017, the Keep Oregon Moving Act, provides the region with the opportunity to pursue the combined strategy of substantially expanding transit service while beginning the conversion to a non-diesel bus fleet. Funding from HB 2017 is projected to be sufficient to both expand service hours and support the purchase of a test fleet of BEBs and associated charging infrastructure, plus one year of conversion over the next five years.

This analysis highlights that converting to BEBs has significant benefits in reduced air and noise pollution and, over the very long run, potential net savings due to lower costs of maintenance, operations and fuel. In the short term, however, BEBs and charging infrastructure cost significantly more than traditional diesel buses. These costs are incurred up front, but the savings are realized over many years of operation, with a "breakeven point" occurring years in the future.

TriMet cannot fully convert to a non-diesel fleet with current revenues. With an allocation of HB 2017 funds, TriMet can begin the conversion process, but completing it will require either significant additional resources starting in 2022 or a reduction in costs from innovation or new technologies beyond that currently projected by industry experts.

The analyses regarding technology and trends in the industry lead us to conclude that BEB conversion is the least-cost/least-risk approach to moving TriMet to a non-diesel fleet at this time. However, other technologies and options may also hold promise, and TriMet, in recommending a BEB strategy, is not foreclosing other options. Hydrogen fuel cell technology appears to be advancing to the stage where hydrogen powered buses would be feasible. Renewable natural gas also appears to be worth examining as an option.

TriMet is proposing to take its conversion strategy one step further, through the adoption of a strategy to convert its so-called “non-revenue vehicle” fleet to renewable energy sources. TriMet has approximately 300 vehicles, in addition to its trains and buses, including pool cars, supervisory vehicles, utility trucks and specialized vehicles. Not all of these vehicles are suitable for conversion to either battery electric or CNG. However, of the approximately 250 that are, TriMet plans to move forward with a strategy that would convert those vehicles by FY 2040 or before.

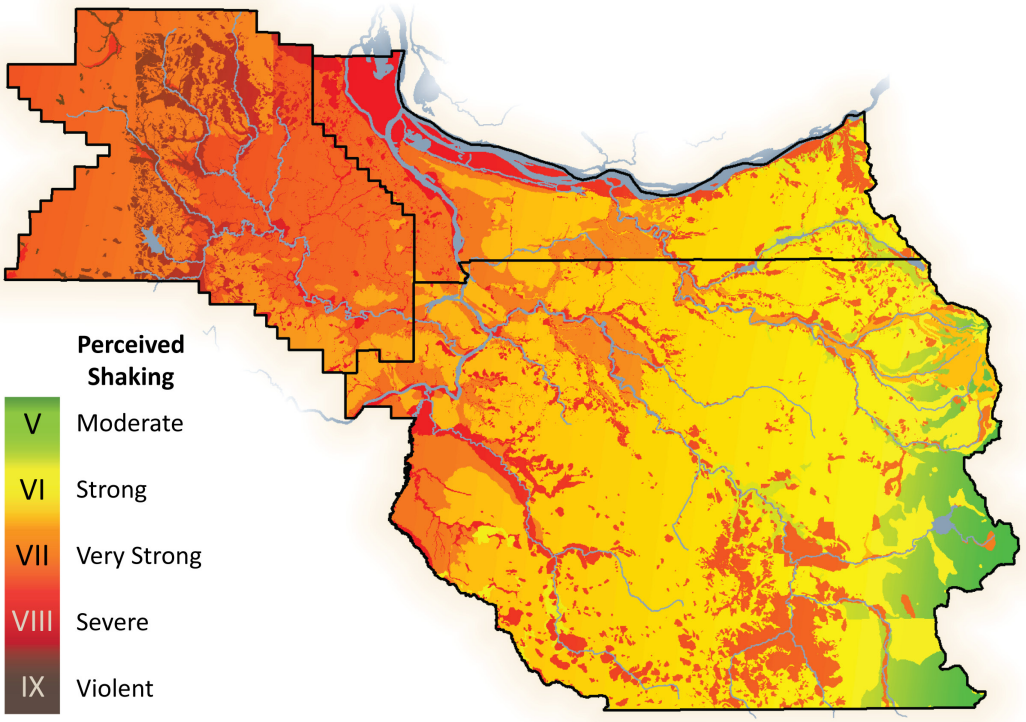
Equity is an important consideration in pursuing any conversion strategy. Low-income and minority neighborhoods often experience greater levels of air pollution from a variety of sources, both transportation and non-transportation related, than other areas. Strategic deployment of a BEB fleet to routes serving vulnerable communities can help reduce emissions in those neighborhoods.

State of Oregon
Oregon Department of Geology and Mineral Industries
Brad Avy, State Geologist

OPEN-FILE REPORT O-18-02

EARTHQUAKE REGIONAL IMPACT ANALYSIS FOR CLACKAMAS, MULTNOMAH, AND WASHINGTON COUNTIES, OREGON

by John M. Bauer[1], William J. Burns[1], and Ian P. Madin[1]



2018

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Cover Image: Perceived shaking for a simulated magnitude 9.0 Cascadia Subduction Zone earthquake in Clackamas, Multnomah, and Washington Counties, Oregon, using updated National Earthquake Hazard Reduction Program site classifications and bedrock ground motion data developed for the 2013 Oregon Resilience Plan. See Appendix E, Plate 6.

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GEOGRAPHIC INFORMATION SYSTEM (GIS) DATA

See the digital publication folder for files.
File geodatabase is Esri® version 10.1 format. Metadata is embedded in the geodatabase and is also provided as separate .xml format files.

Metadata in .xml file format:
Each feature class, table, and raster listed below has an associated, standalone xml file containing metadata in the Federal Geographic Data Committee Content Standard for Digital Geospatial Metadata format.

RDPO_Earthquake_Impact_Analysis_Phase1.gdb:

Feature dataset: *Phase1*

Feature classes:

Building_Footprints
Electrical_Transmission_Structures
Emergency_Transportation_Routes
Jurisdictions
Neighborhood_Units
Population_and_Building_Density

Tables:

Loss_Jurisdiction_CSZ_M9p0_dry
Loss_Jurisdiction_CSZ_M9p0_wet
Loss_Jurisdiction_PHF_M6p8_dry
Loss_Jurisdiction_PHF_M6p8_wet
Loss_Neighborhood_Unit_CSZ_M9p0_dry
Loss_Neighborhood_Unit_CSZ_M9p0_wet
Loss_Neighborhood_Unit_PHF_M6p8_dry
Loss_Neighborhood_Unit_PHF_M6p8_wet

RDPO_GroundMotion_GroundFailure_Phase1.gdb:

Feature class:

PHF_M6p8_bedrock_groundmotion

Rasters:

CSZ_M9p0_pga_site
CSZ_M9p0_pgv_site
CSZ_M9p0_sa03_site
CSZ_M9p0_sa10_site
CSZ_M9p0_PGD_landslide_dry
CSZ_M9p0_PGD_landslide_wet
CSZ_M9p0_PGD_liquefaction_wet
CSZ_M9p0_Prob_landslide_dry
CSZ_M9p0_Prob_landslide_wet
CSZ_M9p0_Prob_liquefaction_wet
PHF_M6p8_pga_site
PHF_M6p8_pgv_site
PHF_M6p8_sa03_site
PHF_M6p8_sa10_site
PHF_M6p8_PGD_landslide_dry
PHF_M6p8_PGD_landslide_wet
PHF_M6p8_PGD_liquefaction_wet
PHF_M6p8_Prob_landslide_dry
PHF_M6p8_Prob_landslide_wet
PHF_M6p8_Prob_liquefaction_wet

EXECUTIVE SUMMARY

This report was prepared for the Regional Disaster Preparedness Organization (RDPO), with funding provided by the Urban Areas Security Initiative Program. The report provides damage and casualty estimates to buildings, people, and key infrastructure sectors resulting from a major earthquake in the Portland metropolitan region by using updated local geologic information and recent advances in loss estimation methods. Damage and casualty estimates are tabulated at county, jurisdiction, and neighborhood levels, providing actionable information for further use in emergency planning, earthquake mitigation, public awareness, and post-earthquake response and recovery.

The RDPO is a bi-state partnership of local and regional government agencies, non-governmental organizations, and private-sector stakeholders representing the Portland metropolitan region that collaborate to increase the region's resiliency to disasters. The region spans Clackamas, Columbia, Multnomah, and Washington Counties in Oregon and Clark County in Washington. In 2016 the RDPO Steering Committee identified a need for updated, region-wide, detailed loss estimates from a major earthquake and engaged the Oregon Department of Geology and Mineral Industries (DOGAMI) to conduct this study. Previously, earthquake damage estimates in large portions of the Portland metropolitan region were limited to studies conducted in the 1990s, when understanding of the Cascadia Subduction Zone (CSZ) risk was nascent. Since then, advances have occurred in several areas, including loss estimation tool capabilities, subduction zone science, and local geologic mapping in the Portland metropolitan region. The RDPO commissioned this study to harness such advances, thereby enabling local, regional, state, and federal planners and policy makers to apply the results in their efforts to mitigate risk and building seismic resilience and to prepare for response and recovery. DOGAMI and RDPO divided the project into two phases, with the first phase focused on methodology refinement and application of those methods to evaluate impact of a major earthquake in Clackamas, Multnomah, and Washington Counties (Oregon). Phase 2 will apply the same methods in Columbia County, Oregon, and Clark County, Washington.

The Portland metropolitan region is vulnerable to regional and local earthquakes. We modeled damage for two earthquake scenarios: a magnitude 9.0 CSZ earthquake, and a magnitude 6.8 Portland Hills fault earthquake, a local crustal fault situated at the foot of the Tualatin Mountains. In order to better understand the range of possible losses, our analysis quantified impacts during saturated and dry soil conditions—the former are more likely to have earthquake-induced landslides and liquefaction; the latter may have some earthquake-induced landslides, but little occurrence of liquefaction. We derived our damage estimates primarily from Hazus®, a geographic information system (GIS)-based tool and set of methods for loss estimation from natural hazards. Hazus is developed and supported by the Federal Emergency Management Agency (FEMA).

Our project consisted of several major efforts:

- **Building and infrastructure databases**: completion of a region-wide building footprint database, a building database containing detailed descriptions of each building, and an electric power transmission structure database
- **Geotechnical mapping updates:** earthquake-induced landslide susceptibility, liquefaction susceptibility, and soil classification, using recently published high-resolution geologic mapping
- **Ground motion and ground deformation updates:** local ground motion and ground failure data for two earthquake scenarios using the geotechnical mapping updates
- **Earthquake damage estimates:** quantifying impacts to buildings and the people that occupy them, to the region's designated emergency transportation routes, and to the electrical grid

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A GIS database containing building footprints, population density grids, detailed casualty, debris, and building loss estimates by jurisdiction and neighborhood, key infrastructure sectors with loss estimates, and updated ground motion and ground deformation data accompanies this report. A separately published report describes the geologic mapping updates for the three-county area, consisting of National Earthquake Hazards Reduction Program (NEHRP) soil types, and earthquake-induced landslide and liquefaction susceptibility.

A Cascadia Subduction Zone (CSZ) magnitude 9.0 earthquake will have a severe impact on the three-county area, with building repair costs amounting to between 23.5 and 36.7 billion dollars (9% and 14% of the total building replacement cost, **Table ES-1**). Although damage estimates vary widely throughout the study area, no community will be unharmed. Depending on the time of day an earthquake occurs, casualties may be in the thousands or low tens of thousands. The earthquake will generate several millions of tons of debris from damaged buildings. Damage and casualty estimates resulting from a magnitude 6.8 Portland Hills fault earthquake are more than twice compared to a CSZ earthquake, primarily because of the Portland Hills fault location below densely populated and heavily developed areas (**Table ES-1**). However, the likelihood of a Portland Hills fault earthquake is considerably less than a Cascadia Subduction Zone earthquake.

Table ES-1. Loss estimate summary for two earthquake scenarios in the Portland metropolitan area. Lower value: dry soil conditions. Upper value: saturated soil conditions.

County	U.S. Census Population Estimate (2010)	Number of Buildings	Building Value ($ Billion)	Building Repair Cost ($ Billion)	Building Loss Ratio	Debris (Millions of Tons)	Long-Term Displaced Population (Thousands)	Total Casualties*	
								Daytime Scenario (Thousands)	Nighttime Scenario (Thousands)
Cascadia Subduction Zone magnitude 9.0 earthquake									
Clackamas	375,992	179,164	62.4	3.2–4.6	5%–7%	1.7–2.1	1.9–10.1	2.0–2.8	0.5–1.1
Multnomah	735,334	255,577	114.0	13.3–20.5	12%–18%	7.7–10.4	9.7–37.5	11.4–16.7	2.8–5.6
Washington	529,710	181,111	82.7	7.0–11.6	8%–14%	3.4–4.8	5.2–37.7	4.9–7.7	1.1–3.7
Total	1,641,036	615,852	259.1	23.5–36.7	9%–14%	12.8–17.3	16.8–85.3	18.3–27.2	4.4–10.4
Portland Hills fault magnitude 6.8 earthquake									
Clackamas	375,992	179,164	62.4	12.9–16.4	21%–26%	4.9–6.0	25.2–50.8	8.9–10.9	3.3–5.2
Multnomah	735,334	255,577	114.0	32.3–42.7	28%–37%	15.7–19.3	50.8–120	28.9–36.3	9.3–15.3
Washington	529,710	181,111	82.7	15.4–24.3	19%–29%	6.0–8.6	19.6–86.0	10.0–15.8	3.2–8.5
Total	1,641,036	615,852	259.1	60.6–83.4	23%–32%	26.6–33.9	95.6–257	47.8–63.0	15.8–29.0

* Casualty estimates include minor injuries, injuries requiring hospitalization, and fatalities.

The damage estimates are significantly higher than those given in previously published studies for the area, primarily due to usage of an updated building inventory that more accurately reflects the region's building code history with respect to seismic resiliency, and usage of updated soils and liquefaction susceptibility data.

This study addressed a major need for consistent, updated earthquake damage estimates in the Portland metropolitan region. The data are intended not as an end in themselves, but as a platform for counties, jurisdictions, and communities to better understand their needs to prepare for, respond to, and recover from a major earthquake. We conclude our report with recommendations supported by findings in this study that can reduce the region's vulnerability, shorten recovery time, and improve emergency operations.

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1.0 INTRODUCTION

1.1 Overview

Casualty and loss estimates for a modeled earthquake provide planners with actionable data for pre-earthquake preparations and mitigation and for post-earthquake recovery efforts. The Regional Disaster Preparedness Organization (RDPO), a bi-state partnership of local and regional government agencies, non-governmental organizations, and private-sector stakeholders representing the Portland Metropolitan Region, collaborate to increase the region's resiliency to disasters, including earthquakes. The Portland Metropolitan Region spans Clackamas, Columbia, Multnomah, and Washington Counties in Oregon, and Clark County in Washington (**Figure 1-1**).

Figure 1-1. Regional Disaster Preparedness Organization counties, spanning Oregon and Washington. Phase 1 study area in tan, proposed Phase 2 study area in lavender. County seats shown as dots.



One of RDPO's guiding principles is ensuring equity and fairness in adopting regional policies, and from an earthquake planning perspective, that principle requires loss estimates that are developed using consistent methods and data across the region. Prior to this study, loss estimates from earthquakes in the Portland Metropolitan Region were derived from several studies, each done at different times, using different datasets (Wang, 1998; Hofmeister and others, 2003; FEMA, 2004; Tetra Tech, 2016a). Technologies and data available for earthquake impact analysis have improved since these studies. RDPO requested that Oregon Department of Geology and Mineral Industries (DOGAMI) develop—using the best tools and methods, updated local geological data, and detailed building and infrastructure data—updated loss estimates from a major earthquake for the five-county RDPO area.

We divided the project into two phases. **Phase 1** focused on methodology refinement and application of those methods to evaluate impact of a major earthquake in **Clackamas**, **Multnomah**, and **Washington Counties** (Oregon)—the "study area." Phase 2 will apply the same methods in Columbia County, Oregon, and Clark County, Washington. This report documents our Phase 1 work.

The three-county study area is home to 44% of Oregon's total population. It continues to experience significant growth, with population increasing from 1.45 million people in 2000, to 1.64 million people in 2010, to 1.78 million people in 2016 (Portland State University Population Research Center, 2016, https://www.pdx.edu/prc/population-reports-estimates). By 2030, the study area's total population is projected at 2.10 million people (Oregon Office of Economic Analysis, 2013, http://www.oregon.gov/das/OEA/Pages/forecastdemographic.aspx). The area hosts 894,000 jobs, or 50% of all jobs in Oregon, with total annual wages estimated at $50.5 billion (Oregon Employment Department, 2016). The area includes an infrastructure hub that houses all of Oregon's major liquid fuel port terminals, and Port of Portland facilities that include the state's largest airport. Most of the population in the study area is concentrated in cities (76%), but all three counties contain large tracts of unincorporated suburban development. All three counties have broad areas of dispersed rural development.

Geology in the 3,076-square-mile study area varies widely, influenced by local and regional processes (Evarts and others, 2009). It includes Columbia River basalts, alluvial deposits, volcanic outcrops, loess deposits, dredge and fill material placed on top of former riverine wetlands, and large areas of fine-grained to coarse-grained Missoula flood deposits (Ma and others, 2012). The geological diversity creates significant local variations in earthquake ground motion and in ground failure from earthquake-induced landslides and liquefaction.

1.2 Earthquake Scenarios and Earthquake Loss Estimation

An earthquake scenario tells the story of a defined earthquake and its potential impacts to a community, presenting narratives and data that can help planners and community members better understand the earthquake and plan for the future (Earthquake Engineering Research Institute [EERI], 2006). Scenarios use the best scientific information available on fault placement, rupture frequency, and earthquake magnitude. Because the loss estimate data are used for planning purposes, scenarios incorporate the upper end of predicted magnitude when modeling a specific earthquake. Full earthquake scenario exercises incorporate experts from multiple backgrounds and responsibilities, such as transportation and utilities. Past examples include the Seattle Fault (EERI, 2005) and the Wasatch Fault (EERI, 2015) scenarios.

Our study is more limited in scope compared to the two example scenarios; we focus on damage to buildings and the people that occupy them, and to two key infrastructure sectors. In this report, our use of the term *scenario* refers to a specific combination of a particular earthquake and one or more additional variables. In order to provide planners a more complete picture of the range of potential impacts from a large earthquake, we modeled two distinct earthquakes: a Cascadia Subduction Zone and a Portland Hills fault. Each earthquake was modeled with a *wet* (saturated) and a *dry* soil condition, and each earthquake was modeled at two different times of the day, at "2 AM" and at "2 PM."

In western Oregon and Washington, soil moisture conditions vary widely throughout the calendar year. Soil moisture conditions influence the likelihood of an earthquake-triggered landslide or liquefaction. An earthquake occurring during wet (saturated) soil conditions is much more likely to induce landslides and liquefaction. Some earthquake-induced landslides may occur in dry soil conditions, but liquefaction is much less likely.

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Throughout a typical day, people move between various buildings such as residences, schools, work facilities, and commercial facilities. Some buildings, due to their basic structural system, are more likely to sustain significant damage from an earthquake and, thus, depending on how many people are occupying the building at the time of the earthquake, cause more casualties.

Past earthquakes along the 600-mile Cascadia Subduction Zone fault (**Figure 1-1**) have occurred at highly variable intervals, from decades to centuries, and have ranged widely in magnitude (Oregon Seismic Safety Policy Advisory Commission [OSSPAC], 2013). At least 40 large-magnitude earthquakes have occurred along the fault in the past 10,000 years. The most recent earthquake, estimated at magnitude 9.0, occurred on January 26, 1700 A.D. Studies of the geologic record suggest that a Cascadia Subduction Zone earthquake of magnitude 9.0 has a 10% to 14% chance of occurring within the next 50 years (Petersen and others, 2002; Goldfinger and others, 2012). For the central and northern Oregon coast, recent research suggests the chance of occurrence within the next 50 years may be 15% to 20% (Goldfinger and others, 2017).

Although the Cascadia Subduction Zone fault has garnered significant attention, active local crustal faults should also be evaluated in an earthquake impact analysis. Wong and others (2001) concluded that the Portland Hills fault (**Figure 1-2**) might be seismogenic, with evidence suggesting two ruptures in the past 15,000 years (Liberty and others, 2003). Other active crustal faults exist in the Portland Metropolitan Region, but a rupture on the Portland Hills fault would be the most impactful, given its position directly underneath downtown Portland and the population centers of Clackamas County.

Hazus is a nationally applicable standardized methodology that contains models for estimating potential losses from earthquakes, floods, and hurricanes. Hazus uses geographic information system (GIS) technology to estimate physical, economic, and social impacts of disasters (FEMA, 2011). FEMA developed the earthquake model in cooperation with the National Institute of Building Sciences (Schneider and Schauer, 2006). Hazus damage and loss functions for generic model building types are considered to be reliable predictors of earthquake effects for large groups of buildings (FEMA, 2010). However, good estimates require accurate, updated data inputs.

The first Hazus-based study conducted in Oregon used a magnitude 8.5 model of a Cascadia Subduction Zone earthquake as it was understood at the time (Wang, 1998). The study was intended to provide an overall initial understanding of potential earthquake impacts across Oregon. Further, the Hazus tool at that time did not incorporate liquefaction or landslide information. Subsequent Hazus-based studies were limited to portions of the study area. The City of Portland had two Hazus-based studies (FEMA, 2004; Tetra Tech, 2016a), and Clackamas County had one Hazus-based study (Hofmeister and others, 2003). However, no studies have been conducted for Multnomah County (excluding the City of Portland) and Washington County since Wang (1998).

All previous Hazus-based earthquake studies in the study area were conducted at the census tract level—a spatial unit designated by the U.S. Census Bureau (https://www.census.gov/geo/reference/gtc/gtc_ct.html) that was chosen in the formative days of Hazus tool development out of computational necessity, but one that oversimplifies the building, seismic, and geologic heterogeneity within the census tract (Price and others, 2010). In the past five years, advances in Hazus tools and methods have enabled modeling earthquake damage using detailed data that incorporate local geologic variations and individual building seismic design characteristics. The advancements in the tools and methods provide more accurate loss estimates and permit analysis at a finer, neighborhood-scale level, rather than at the coarser census tract level. The updated methods require that considerable effort be expended on dataset development, including building and infrastructure inventory and local geological data. In Section 2, we provide background on the asset development, which includes all buildings and key infrastructure

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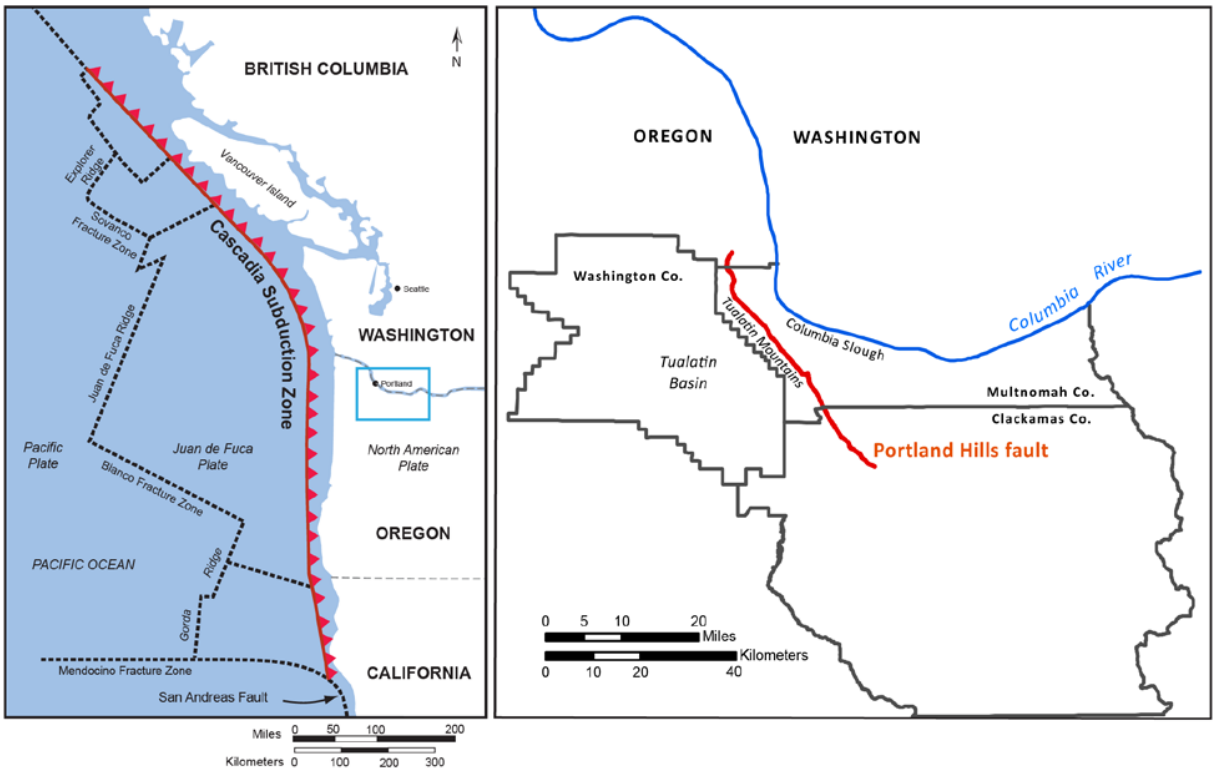
sectors in the study area. Further background on the key infrastructure sectors is in the following subsections.

Figure 1-2. Cascadia Subduction Zone fault (left) and Portland Hills fault (right) locations. Blue rectangle in left figure is shown in right figure.



1.2.1 Critical Infrastructure Sectors

The Cities of Eugene and Springfield Multi-Jurisdictional Natural Hazards Mitigation Plan (2014) identified three critical infrastructure sectors fundamental to the operation, maintenance, and restoration of all other infrastructure sectors—namely, electricity, transportation, and fossil fuels. Given the challenges of enumerating the numerous interdependencies among various sectors and of quantifying potential earthquake damage to the components of those sectors, we determined that by limiting our analysis to the key sectors identified in that plan, we could establish a basis upon which to build future infrastructure studies and interdependencies.

In the Portland Metropolitan Region, fossil fuel supply seismic resiliency has been analyzed by Wang and others (2013), with a focus on the Critical Energy Infrastructure (CEI) Hub in northwest Portland. Tetra Tech (2016b) quantified damage estimates to the CEI Hub's fuel storage structures for a Cascadia Subduction Zone and for a Portland Hills fault earthquake scenario, and DOGAMI provided a substantive review of the report. We did not see a need to revisit damage estimates to the nonbuilding structures contained in the CEI Hub. Nonbuilding structures include water towers, storage tanks, piers, dams, and carports, and where human occupancy is incidental (FEMA, 2012b).

A Hazus-based study of the City of Portland (FEMA, 2004) included an analysis of an earthquake impact to electric substations and the transportation network. Although it used best available liquefaction and landslide data, the study was limited to the City of Portland, and its spatial data were not made available for further analysis.

1.2.1.1 Electric Power Transmission

Electric power infrastructure consists of power generation and distribution, including dams, substations, transmission network, and local transformers. Within the network, substation components are typically the most likely to fail given strong ground motion (Fujisaki and others, 2014). Transmission structures (towers and poles) generally perform well under strong ground motion but can fail due to lateral movement from liquefaction or earthquake-induced landslides (Good and others, 2009). Hazus provides a simplified damage model from ground motion and ground failure for substations as a whole unit, but the model may be overly conservative (Kongar and others, 2014), and a more accurate model should consider individual substation components.

From our literature review we determined that our project should 1) provide updated ground motion and ground failure data for local utilities to better quantify their substation seismic resiliency, and 2) address the risk to the transmission network between substations by quantifying potential ground failure at the transmission structures. An example of earthquake-induced ground failure impact on a transmission structure is shown in **Figure 1-3**. Our approach builds on the previous exposure analysis of electric transmission structures to mapped landslides established by Burns and others (2011, 2013).

Figure 1-3. Example of ground failure underneath a transmission tower, 1999 İzmit earthquake (Turkey). Photographic credit: University of California, Irvine Consortium of University for Research in Earthquake Engineering Archives.



1.2.1.2 Emergency Transportation Routes

Functioning transportation networks are essential for emergency response and post-earthquake recovery. Regional planners have identified a subset of arterials in the study area as routes essential for providing emergency services. Understanding which routes may be impacted from an earthquake can permit planners to consider alternative routes or how to distribute services in a more dispersed manner. An example of earthquake-induced ground failure impact on a surface road is shown in **Figure 1-4**. A complete analysis would include a seismic analysis of the bridges and overpasses used by the emergency transportation routes, but such an analysis requires detailed field-gathered information (e.g., Wang, 2017) and was beyond the scope of this project.

Figure 1-4. Damaged road due to liquefaction-induced lateral spreading, 2001 Nisqually, Washington earthquake. Photographic credit: DOGAMI Archives.



1.3 Study Limitations

Hazus-based risk analyses often include damage estimates to various assets such as buildings, buried utilities, above ground utilities, and essential facilities. Such analyses typically use the inventory data that accompany Hazus. Out of necessity, the Hazus inventory data are constructed from readily available nationwide datasets, and often capture a portion of the non-building assets in an area. Users can supplant the inventory with more detailed information, but at significant development cost. Given the constraints on time and budget for this project, and the challenges of obtaining more detailed and accurate local data, we limited our analysis to buildings and the people that occupy them, and the two key infrastructure sectors previously discussed. Specifically, we did not analyze earthquake impacts to communication networks or towers, storage tanks, dams, levees, hazardous material facilities, and buried utilities conveying natural gas, potable water, oil, stormwater, and wastewater.

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We did not identify or individually analyze specific buildings that may be considered essential or critical facilities. As discussed in the Recommendations section (Section 7), we maintain that the identification of such facilities should be community driven, and that an earthquake impact analysis of such facilities should be done by using the Rapid Visual Screening method (FEMA, 2015a) rather than a Hazus-based method using generic building models.

The Critical Energy Infrastructure (CEI) Hub along the Willamette River in northwest Portland was not analyzed in this report. A recent analysis conducted by Tetra Tech (2016b) provided a detailed damage assessment of the infrastructure from the same earthquake scenarios we used for this study. We did not include the hub's nonbuilding structures, such as oil tanks, in our building database.

Our economic loss estimates were limited to the direct cost of repairing a damaged building or replacing a severely damaged building with an equivalent structure. Our model assumes standard labor and material costs and availability of capital and credit. It does not factor in any demand surge. We did not model income losses such as wage and rental income, as we maintain that the impacts of a regional earthquake will fundamentally alter the local economy, rendering the basic assumptions used in the current Hazus model moot.

Our study focused on loss to buildings, which includes damage from earthquake-induced landslides and liquefaction. We did not quantify permanent loss of use, and thus value, of the land due to the ground failure. Such loss of use can add to the overall indirect economic loss.

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2.0 ASSET DATABASE DEVELOPMENT

In this study we limited our analysis, and thus our asset database, to three components: buildings and the people occupying them, the electric power transmission infrastructure, and emergency transportation routes. A building is defined as a structure containing a roof and walls and occupied by people. Nonbuilding structures include water towers, storage tanks, piers, dams, and carports, and where human occupancy is incidental (FEMA, 2012b). We excluded nonbuilding structures from our building database. The electrical transmission network is limited to the towers and poles that supply power to the distribution substations (Appendix E, **Plate 1**). The surface transportation network is limited to a subset of highways, arterials, and roads identified as Emergency Transportation Routes (Appendix E, **Plate 10**).

2.1 Building Database

A Hazus-compatible building database contains a record for each distinct building, with each record containing required information for estimating damage to the structure and potential harm to the building's occupants (**Table 2-1**). Information associated with the building record, commonly referred to as attributes in a GIS context, is populated primarily from county assessor records or, where better data are available, from other ancillary datasets. Examples of such datasets are provided in **Table 10-1**.

Table 2-1. Building information required by Hazus earthquake model.

Hazus Attribute	Example	Purpose
Location of building	latitude, longitude	Extract ground motion and ground deformation data
Building usage	Single-family Residential; Retail Commercial	Repair/replacement cost; Number of people per building
Building material	wood; steel	Response to ground motion; debris
Year built	1968	Seismic design level: response to ground motion
Number of stories	2	Response to ground motion
Square footage	2250	Repair/replacement cost; debris
Daytime occupancy[+]	2.1	Casualty estimate
Nighttime occupancy[+]	3.4	Casualty estimate

[+]Daytime and nighttime occupancy amounts at the individual building level are based on proration of aggregated population data using the building's square footage, thus are typically fractional.

2.1.1 Building Footprint Development

A building footprint is a GIS polygon representation outlining the shape of the building. It defines a record in the building database. The building footprint establishes the location of the building, thereby placing the building relative to a natural hazard.

Because building footprints define the building record, our first task was to complete a building footprint database for the study area. Building footprints were obtained from Metro Regional Land Information System (http://rlisdiscovery.oregonmetro.gov/, downloaded February 2016) and from two DOGAMI publications (Burns and others, 2011, 2013). Large portions of western Washington County and southwestern Clackamas County had no building footprint data. In these areas we digitized building footprints following the methods described by Mickelson and Burns (2012, Section 3.2.3). Where lidar

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data were not present, we used 2016 orthoimagery from the National Agricultural Imagery Program (https://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/index). Our digitization effort included removing obsolete building footprints (teardowns) and modifying existing building footprints where additions had been made or other digitization errors were noted.

We did not digitize structures less than 400 square feet in area, as such features are assumed to be non-building structures, such as kiosks, or are not reasonable to model within Hazus, such as portable storage sheds. Structures obtained from previous digitization efforts that were less than 400 square feet were retained in the building footprint database but were attributed as not modeled.

Nonbuilding structures include developments such as water towers, billboards, docks, dams, piers, and hoop houses. Outlines of such structures are often included in a building footprint database. Our study focuses on estimating damage from an earthquake to buildings and the people that reside in them. Many of the nonbuilding structures have no damage model or an overly simplified damage model within the Hazus framework. We identified such structures using orthoimagery and tax lot database queries, and we attributed them as not modeled.

Floating structures such as houseboats do not directly experience seismic shaking. We identified such structures using orthoimagery, attributed them as floating structures, and excluded them from our analysis. As with nonbuilding structures, we retained the building footprint of floating structures in the database. We note that floating structures may be damaged from seismic seiches (Jones and others, 2008).

In the building footprint database obtained from Metro RLIS, building complexes that contain two or more distinct, contiguous buildings were commonly digitized as a single building. Such buildings typically occur in downtown areas and can be identified by several methods, including their spanning multiple tax lots with unique owners, and distinct building heights derived from lidar elevation models. Seismic design level, building usage, and construction material can vary between such contiguous buildings, each of which can influence the damage estimate. We determined that dividing such polygons into individual buildings would result in a more accurate representation of the built infrastructure. Orthoimagery and street-level imagery further clarified whether a building footprint needed further partition. Building footprints digitized as part of this project factored in the guidelines for contiguous buildings.

Although parking garages are by definition nonbuilding structures, Hazus considers them as buildings in its occupancy class library (FEMA, 2011, Table 3.2). We retained that modest inconsistency in our building database by including parking garages in our damage assessment.

2.1.2 Assessor Database Processing

County assessor databases form the basis for assigning Hazus-required information for individual buildings, as the databases have information for most to all of the tax lots in the study area. We obtained detailed tabular data from the three county assessor offices. We used the tax lot spatial data from the Metro RLIS database to associate assessor tabular data with specific buildings, and we extracted information from the assessor tabular data to assign values to the appropriate attributes (**Table 2-1**). For example, Oregon Administrative Rules (OAR 150-308.215) require that county assessors assign a 3-digit property code for all tax lots in Oregon. We constructed a reference table to translate the tax lot property code into one of 36 Hazus occupancy classes, and we assigned that value to the particular buildings occupying that particular tax lot.

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Assessor tabular data provided direct or easily-derived information for the following attributes: year built, square footage, number of stories, and building usage. None of the three county assessor databases had consistent information on building type (e.g., wood, steel).

2.1.3 Usage of Ancillary Data

We used a supersedence paradigm, overriding the assessor-derived data with more accurate data where available (Appendix A, Section **10.1**). For example, Lewis (2007) provided detailed information on square footage and building type for public buildings, such as schools, in Oregon. Other examples include the Metro RLIS spatial data on single-family and multi-family residential buildings, and the locations of educational, fire, and police buildings. Appendix A, Section **10.1** provides a complete list of other datasets used to populate the building database.

2.1.4 Building Type

The Hazus building type attribute specifies the basic structural system of a building. For example, a steel-framed building can be categorized as a steel light frame or a steel moment frame. The Hazus Advanced Engineering Building Module (AEBM) tool provides building damage functions for 36 generic building types (FEMA, 2010), and the FEMA Rapid Visual Screening handbook (FEMA, 2015a) provides qualitative descriptions of each building type. We classified all buildings in the study area into one of the 36 generic building types. Although Hazus AEBM permits one to create a unique performance model for individual buildings, such an effort was well outside of this project's scope, given its three-county scale.

We could not find any information in any of the three county assessor databases that provided consistent information on the building's primary construction material. Building types for a portion of the buildings were available from several sources, and we incorporated these into our building database. Lewis (2007) provided building types for public schools, fire, and police buildings. The most valuable dataset was the Metro Area Disaster GIS (MADGIS) database (Metro, 1998), with 40,000 buildings spread across all counties in the study area, categorized into Hazus-compatible building types.

For buildings that had no information on their primary construction material, we assigned a value based on the building's occupancy class, year built, and number of stories. We used an in-house tool that implements the statistical distributions listed in Tables 3.A1–3.A10 of the Hazus Earthquake Technical Manual (FEMA, 2011).

2.1.5 Building Replacement Value

We used the RSMeans valuation method for estimating a building's replacement cost (Charest, 2017), multiplying the building square footage by a standard cost per square foot. We used values from Hazus SQL database tables ([dbo].[hzReplacementCost] and [dbo].[hzRes1ReplCost]) that incorporated the RSMeans valuation to compute the replacement cost. We made no inflation or regional adjustments to the tabular data, for the following reasons. The Hazus tables were based on 2014 RSMeans national values. Because the Consumer Price Index difference between 2014 and 2017 was minimal, we made no further adjustment. The RSMeans location factor adjusts for regional differences in labor and material costs. Portland area's location factor of 0.98 for residential construction (Charest, 2017) was, for simplicity, rounded to 1.0, and thus we did not adjust cost; the commercial construction location factor at 1.0 also resulted in no adjustment.

Building replacement cost is not the same as a property's assessed value. For analysis purposes, we assume repair or replacement costs to damaged structures will be charged at standard construction rates and are independent of a building's age or the land on which the building is placed. Assessed value

takes into account the land's value, which may fluctuate greatly depending on real estate markets, and for improvements, assessors typically factor in the building's depreciation into the assessed value.

An abnormal shortage of skilled labor or materials can occur after a large-scale disaster. Demand surge is a process resulting in a higher cost to repair building damage after large disasters than to repair the same damage after a small disaster (Olsen and Porter, 2011). Adjusting repair/replacement costs due to a likely demand surge was beyond the scope of this project.

2.1.6 Design Level Assignment

The design level assignment in the Hazus-MH earthquake model allows a user to specify, for the given building type, its seismic performance level. Oregon initially adopted seismic building codes in the mid-1970s (Judson, 2012). The established benchmark years of code enforcement are used in determining a "design level" for individual buildings. The design level attributes (pre-code, low-code, moderate-code, and high-code) are then used in the Hazus earthquake model to determine what damage functions are applied to a given building. The year built and the year of the most recent seismic retrofit are the main considerations for an individual design level attribute. We used the benchmark years listed in **Table 10-2** to assign a design level to each building. We are not aware of any building codes adopted at the local or county level that supersede, from a seismic design perspective, building codes established by the Oregon Building Codes Division.

In the past 20 years, many property owners, including private, public, and institutional, have implemented building seismic retrofits—modifications that improve building's seismic resilience. Ideally, we would obtain and incorporate such information into our database, instead of assigning a seismic design level based on the structure's original year of construction. However, such information was not available in any centralized, usable form from any of the county's permitting or assessor offices. The City Club of Portland's analysis (2017) identified a lack of reliable data, in part because permits are not often filed with seismic upgrades, or the seismic upgrades to a building may be part of a larger renovation. We found only one source of data for such information—the Unreinforced Masonry Building database maintained by the City of Portland (2017). Buildings identified as upgraded, 290 total, were assigned Reinforced Masonry (RM1), moderate code building type and design level values, respectively. The dataset was limited to the City of Portland. City Club of Portland's report (2017) found no other source of data for identifying locations of unreinforced masonry buildings in the region.

2.1.7 Daytime and Nighttime Population

In order to calculate casualties and displaced persons, we estimated the number of people occupying each building under two commonly implemented temporal scenarios: daytime and nighttime, commonly referred in a Hazus context as a "2 PM" and a "2 AM" scenario. The nighttime population assignment assumes that at least 95% of the people are in their primary residences and that nonresidential buildings have some level of occupancy, depending on their function. Fire stations, for example, are occupied by a nighttime shift. The daytime scenario assumes a typical weekday in a school year, with population distributed across schools, work facilities, and homes. The population assignments are primary driven by U.S. Census population data, the building's specific usage (i.e., its Hazus-designated occupancy class), and the building's square footage. We did not implement a "5 PM" scenario, as that requires assumptions on road occupancy and bridge failure models, and an evaluation of bridge and overpass seismic design performance was beyond the scope of this project.

For assigning permanent resident population quantities to residential buildings, we pro-rated the U.S. Census Bureau 2010 permanent population value for a given U.S. Census Bureau-defined census block group across the residential buildings, excepting the RES4 (hotel/motel) type, on a square footage

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basis. We determined that the census block geometries are often imprecise relative to building footprints, creating frequent scenarios where a census block has one or more residential buildings and zero permanent residents, or zero residential buildings and one or more permanent residents. The census block group's geometries are generally along arterials or physiographic features. Although pro-rating at the census tract was a possible alternative, we decided the finer resolution of the census block group provided the best estimate of residential building occupancy, one that reflected varying demographics within a larger census tract. We retained a *permanent resident* population field, and we populated the *nighttime population* for residential buildings by multiplying the permanent resident population by 0.95—slightly less than the 99% suggested by FEMA (2011, Table 13.2), and one that accounts for night shift employment and recreational and business travel.

For daytime population in nonresidential buildings, we considered the suggested peak population density numbers published in the Hazus Tsunami Model Technical Guidance (FEMA, 2017c, Table 3.14), but we observed that the daytime population was at least 3 times the permanent population of the study area. We determined that such a ratio was unreasonably high, as we assume that at least 75% of the working population in the study area reside within the study area. Instead, we computed people-per-square-footage (ppsf) values by using the estimated commercial, industrial, and educational population estimates by Census Tract in the Hazus SQL database table [dbo].[hzDemographicsT], and our own building stock square footage summaries, and then used the ppsf values and the individual building's square footage to assign people per building.

We assigned daytime populations for residential buildings and nighttime populations for nonresidential buildings by using the Day to Night ratios provided by FEMA (2017c, Table 3.14).

Permanent resident figures per residential building were based on the April 1, 2010 U.S. Census numbers and the 2010 U.S. Census Block Group boundaries. The study area has seen significant growth since then, with the most recent estimate (July 1, 2016 Certified Population Estimates, Portland State University Population Research Center, https://www.pdx.edu/prc/population-reports-estimates) showing an 8.4% increase from 2010. Several jurisdictions have had boundary adjustments via annexations since 2010. Planners may wish to adjust the displaced population and nighttime casualty estimates using the percentages shown in **Table 2-2**. Given the larger uncertainty with the daytime population assignments compared to nighttime population assignments, we do not recommend adjusting daytime casualty numbers.

Table 2-2. Population changes in the study area, 2010 to 2016. Limited to cities with 2010 population of 20,000 or more people and with no to minimal annexations between 2010 and 2016. Certified Population Estimate: Portland State University Population Research Center.

County or Jurisdiction	2010 U.S. Census Population	Certified Population Estimate July 1, 2016	Percentage Increase
Study Area	1,641,036	1,779,245	8.4%
Clackamas County	375,992	404,980	7.7%
Multnomah County	735,334	790,670	7.5%
Washington County	529,710	583,595	10.2%
Portland	583,776	627,395	7.5%
Gresham	105,594	108,150	2.4%
Lake Oswego	36,619	37,425	2.2%
Oregon City	31,859	34,240	7.5%
Tualatin	26,054	26,840	3.0%
West Linn	25,109	25,615	2.0%

2.2 Electric Power Transmission

We constructed a transmission pole and tower point file database from several data sources, including Burns and others (2011, 2013), spatial data obtained from Portland General Electric Company (PGE, written communication, 2016), and where large gaps occurred, from our own digitization. Gaps in the transmission network were highlighted using the transmission line corridors and substations dataset downloaded from the Homeland Infrastructure Foundation-Level Data (HIFLD; U.S. Department of Homeland Security, 2017). The linear corridor data were used as a backdrop to digitize additional poles and towers, following the method established by Burns and others (2011). We did not distinguish between the type of structure (e.g., lattice tower or wood) or the voltage carried on the wires. To keep the problem tractable, we limited our analysis to the high-voltage network from power generation facilities up to the neighborhood distribution substations.

We identified a total of 18,098 poles and tower locations. The transmission network is incomplete, however, as we did not complete digitization of poles and towers in portions of North Portland, and data were not made available from the local utility. Electric power transmission distribution in North Portland is typically conveyed on single poles, which are difficult to distinguish using lidar-derived imagery or orthoimagery.

2.3 Emergency Transportation Routes

We obtained a GIS shapefile representing the Metro Emergency Transportation Routes (ETR) from Portland Bureau of Emergency Management (L. Bruno, written communication, 2017). Though the Metro Data Resource Center has not maintained the dataset for at least 10 years (S. Erickson, written communication, 2017), it is still considered operative at the regional level. The ETR extends into all five counties within the RPDO (**Figure 1-1**), but our analysis was limited to our three-county study area (Appendix E, **Plate 10**). Multiple transportation agencies have responsibility for various components of the ETR, and as outlined in a 2005 Memorandum of Understanding (Emergency Transportation Route Post-Earthquake Damage Assessment and Coordination Portland, Oregon/Vancouver, Washington Regional Area; State of Oregon Misc. Contracts & Agreements No. 21,273):

> (Terms of Agreement #1): ODOT, WSDOT and Agencies have identified the ETR. […] The ETR have been identified as "critical infrastructure" by the parties to the Memorandum of Understanding. ODOT, WSDOT and Agencies would give their jurisdictional ETR the highest priority for assessment of road and bridge conditions during an earthquake emergency […]
> (Exhibit A, I. Purpose [p. 8]): An Emergency Transportation Route or ETR is defined as a route needed during a major regional emergency or disaster to move response resources such as personnel, supplies, and equipment to heavily damaged areas.

The road network consists of GIS polylines placed at the road centerline and includes highway ramp and detailed highway intersection information. For our analysis purposes, polylines are not as useful as polygons, as we need to quantify the amount of ground deformation to a road that has some width. In order to prepare the road network for analysis, we first buffered the road centerlines by 50 foot, and then we dissolved the geometries. This typically generalizes highway areas, such as the I-5 corridor, into a single polygon. The dissolved polygon file was then manually edited to create a segment/node model,

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with segments beginning and ending at intersections. However, major intersections, such as the I-5—I-205 intersection, were treated as a single segment instead of a node. We identified 238 road segments and gave each a unique key for analysis purposes.

3.0 NATURAL HAZARD DATA DEVELOPMENT

3.1 Bedrock Ground Motion

The Hazus model requires four descriptors of ground motion at a building's location: peak ground acceleration (pga), peak ground velocity (pgv), spectral acceleration at 1.0 second (sa10), and spectral acceleration at 0.3 second (sa03). Peak ground acceleration and peak ground velocity are the largest acceleration and velocity that can be expected at a particular site due to an earthquake. Peak ground acceleration is a widely used measure of ground shaking for a range of geotechnical and structural engineering applications. Spectral acceleration definitions and usage are given by the U.S. Geological Survey (USGS) at https://earthquake.usgs.gov/hazards/learn/technical.php.

For the Cascadia Subduction Zone magnitude 9.0 earthquake, Madin and Burns (2013) obtained synthetic bedrock ground motions from Arthur Frankel (USGS, written communication, 2012); we used the same bedrock ground motion data for this project. Bedrock ground motions for a synthetic Portland Hills fault magnitude 6.8 earthquake (firm rock conditions, V_{s30} = 760 m/s) were provided by Arthur Frankel (written communication, 2016) of the USGS at 0.01 degree intervals and are included in the accompanying geodatabase.

3.2 Site Ground Motion

The intensity of ground shaking during an earthquake depends on the geotechnical properties of the soil or bedrock at a particular site. The National Earthquake Hazard Reduction Program (NEHRP) provisions (FEMA, 2015b) specify, for each ground motion descriptor, level of bedrock ground motion, and NEHRP soil classification, a multiplication factor for calculating the ground motion at the surface (also known as the site) where buildings and infrastructure are placed. The NEHRP soil classification for a site is based on the average shear wave velocity within 30 meters of the ground surface. NEHRP classifications and general descriptions of the bedrock and soil material are as follows:

- site class A—hard rock
- site class B—rock
- site class C—very dense soil and soft rock
- site class D—stiff soil
- site class E— soft soil
- site class F—soils susceptible to potential failure

For our site ground motion data, we used updated NEHRP soil classification mapping that we completed as part of this project (Appleby and others, in preparation). Sites classified as "F" were, for amplification purposes, reclassified as "E". This is a conservative but commonly implemented assumption for loss estimation purposes. We overlaid the bedrock ground motion data with the NEHRP soil classification polygons, and we applied the appropriate amplification to derive the site ground motion. Further details on the site ground motion dataset development are provided in Appendix B.

The site ground motion from the synthetic earthquakes in our two scenarios differ dramatically across the study area, with the Portland Hills fault exhibiting significantly higher ground motion proximal to the fault (Appendix E, **Plate 5**). The technical descriptions of earthquake ground motion, such as depicted on Plates 4 and 5 (Appendix E), can be challenging to interpret, so we developed damage potential maps using the Modified Mercalli Intensity (MMI) scale (Appendix E, Plates 6 and 7). The MMI scale is an empirical scale that describes the building damage and felt effects experienced from ground shaking in an earthquake. For the MMI categories, we used our site peak ground velocity ground motion data and the relationships used by USGS ShakeMap products (Wald and others, 2006, Figure 2.5).

What is not depicted in such maps is the duration of the earthquake. A local crustal fault will likely result in strong ground motion for up to 60 seconds, whereas a megathrust earthquake typically results in strong ground motion for 3 to 5 minutes. The Hazus building damage model uses the magnitude of the earthquake as a surrogate for duration, categorizing the earthquake as short, medium, or long duration (FEMA, 2011, Section 5.4), with a longer duration producing more building damage for a given ground motion. The Cascadia Subduction Zone magnitude 9.0 earthquake was modeled in Hazus as long duration, and the Portland Hills fault magnitude 6.8 earthquake was modeled in Hazus as medium duration.

3.3 Liquefaction and Landslide Susceptibility

For our Hazus building damage model, we provided a liquefaction and landslide susceptibility value for each building record, thereby allowing the Hazus model to calculate the amount of ground deformation and probability of ground deformation. The Hazus building loss model incorporates that calculated information into its overall building damage estimate.

A Hazus-based liquefaction susceptibility rating for each building record was obtained by using a simple overlay of the liquefaction susceptibility polygons developed for this project (Appleby and others, in preparation). Because the liquefaction susceptibility polygons are at a coarser scale relative to the building footprints, we determined that assigning the liquefaction susceptibility value at the building centroid was sufficient.

We developed a high-resolution, 10-foot Hazus-based landslide susceptibility grid for this project (Appleby and others, in preparation), following the methods specified in the Hazus®-MH 2.1 Technical manual, Earthquake model (FEMA, 2011, Chapter 4), for both a wet (saturated) and a dry scenario. We calculated landslide susceptibility zonal statistics for each building footprint by using the Esri® Spatial Analyst Zonal Statistics as Table tool. The arithmetic mean of the landslide susceptibility, rounded to the nearest integer, was then assigned to the building record. Such an assignment more accurately captures the earthquake-induced landslide hazard across the entire building footprint area, compared to a simple building centroid sampling approach (**Figure 3-1**).

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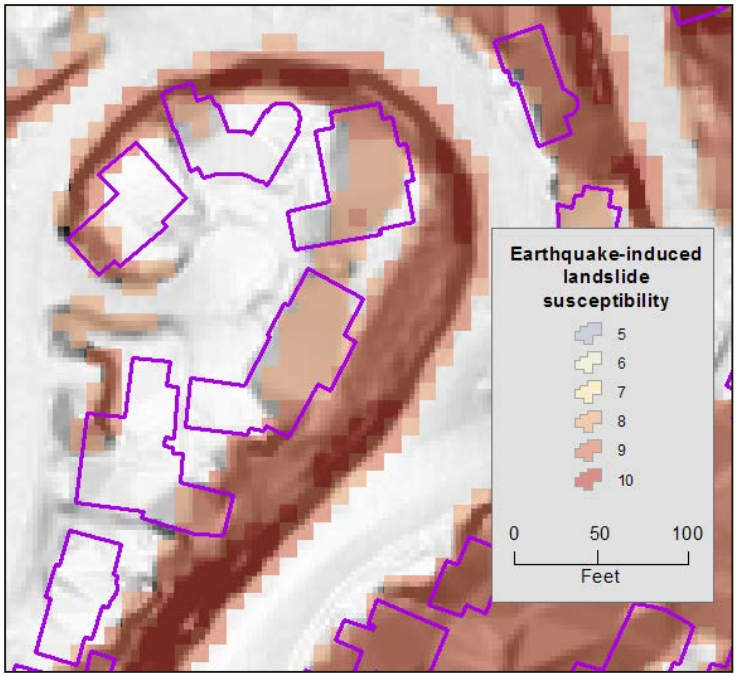
Figure 3-1. Example: Capturing the variability of landslide susceptibility within building footprints (magenta polygons). Landslide susceptibility values use the Hazus landslide susceptibility 0 through 10 scale. Areas of no shading: minimal to no landslide susceptibility. Earthquake-induced landslide susceptibility data from Appleby and others (in preparation).



Liquefaction requires saturated soil conditions. Hazus permits a user to specify, on a per-building basis, the depth of the water table, and adjusts the ground failure estimates accordingly. However, there currently exists no region-wide groundwater mapping information. Water tables vary significantly throughout the year, and even if such information were available, the use of an average water table level could significantly underestimate liquefaction occurrence during peak moisture conditions. We were aware of a regional groundwater study (Snyder, 2008) but noted that it covered only a portion of the study area. We chose to mimic the "wet" (saturated soil) and "dry" landslide scenarios by setting water depth to two distinct values: 0 feet and 1,000 feet, respectively. Thus, each of the two synthetic earthquakes was run with "wet" and "dry" soil moisture conditions, for a total of four unique scenarios.

3.4 Permanent Ground Deformation

Permanent ground deformation (PGD) data include an estimate of the amount of lateral spreading due to liquefaction and ground failure due to earthquake-induced landslide, along with a probability of their occurrences. We provided the liquefaction and landslide susceptibility data from Appleby and others (in preparation) and the site ground motion data for both earthquakes developed in Section **3.2** as input to the tool developed by Sharifi-Mood and others (M. Sharifi-Mood, M. J. Olsen, D. T. Gillens, and I. P. Madin, Complementary ground motion, ground deformation, and damage potential maps for deterministic scenarios of Cascadia Subduction Zone earthquake events, manuscript in preparation). The tool implements the methods for ground deformation estimation described by Madin and Burns (2013, Section 4), and provides raster grids describing the PGD amount and probability of occurrence, using the Hazus ground deformation models described in the Hazus-MH 2.1 Technical manual (FEMA, 2011).

Because the tool is currently constrained to calculating liquefaction lateral spreading at a fixed water depth, we generated liquefaction ground deformation (lateral spreading) data for only the "wet" (saturated soil) scenario. We calculated earthquake-induced landslide ground failure data for both wet and dry soil condition. The PGD and probability of occurrence data are in the accompanying geodatabase. Further details on the dataset development are documented in Appendix B, Section **11.2**.

To quantify impacts to infrastructure, we combined the grids from the two ground failure mechanisms, obtaining the maximum PGD and maximum probability of occurrence across the area for a given earthquake and soil moisture scenario. Although liquefaction and landslide are two distinct physical mechanisms, the specific cause of the ground failure is not important for our key infrastructure sector analysis purposes.

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4.0 LOSS ESTIMATION METHODS

4.1 Impacts to Buildings and People

4.1.1 Building Repair Cost and Casualties

We used the Hazus Advanced Engineering Building Module (AEBM) (FEMA, 2010) included in Hazus-MH v4.0 to calculate individual building repair costs and casualties and to obtain parameters needed to calculate debris and displaced population. Although the AEBM permits a user to specify unique building profiles, including adjusted individual capacity curve or fragility curve parameters, we instead used the generic building profiles provided in the Hazus SQL database table [dbo].[eqAebmProfile]. The particular AEBM profile for an individual building in the building database is constructed from its occupancy class, building type, and seismic design level. The building's square footage, replacement cost, daytime occupants, and nighttime occupants were also supplied to the Hazus AEBM model.

The Hazus AEBM model was run for a given user-supplied seismic scenario, with site ground motions supplied in polygon form. The model returns a building repair cost and casualty estimate for each building, along with five probability of damage state (PDS) values, each, for the structural, nonstructural drift, and nonstructural acceleration components. We used the PDS values to calculate debris and displaced population and to estimate the total number of red-tagged and yellow-tagged buildings.

The Hazus AEBM model first calculates a building's structural and nonstructural probability of damage state values from the ground motion and liquefaction/landslide data provided to the model. It then uses the PDS values to calculate casualties, based on the number of user-specified people occupying the building and the building type. The methodology is based on the assumption of a strong correlation between building damage and number and severity of casualties (FEMA, 2011). Casualties are classified into four levels (**Table 4-1**). Levels 2 and 3 are generally interpreted as "injuries requiring hospitalization."

Table 4-1. Hazus casualty level descriptions (taken from FEMA, 2011). The broad description of each category is shown in boldface.

Injury Severity Level	Injury Level Description
Level 1: **Minor Injuries**	Injuries requiring basic medical aid that could be administered by paraprofessionals. These types of injuries would require bandages or observation. Some examples are: a sprain, a severe cut requiring stitches, a minor burn (first degree or second degree on a small part of the body), or a bump on the head without loss of consciousness. Injuries of lesser severity that could be self-treated are not estimated by Hazus.
Level 2: **Injuries Requiring Hospitalization**	Injuries requiring a greater degree of medical care and use of medical technology such as x-rays or surgery, but not expected to progress to a life threatening status. Some examples are third degree burns or second degree burns over large parts of the body, a bump on the head that causes loss of consciousness, fractured bone, dehydration, or exposure.
Level 3: **Life-Threatening Injuries**	Injuries that pose an immediate life-threatening condition if not treated adequately and expeditiously. Some examples are: uncontrolled bleeding, punctured organ, other internal injuries, spinal column injuries, or crush syndrome.
Level 4: **Deaths**	Instantaneously killed or mortally injured.

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4.1.2 Building Debris Estimation

The Hazus AEBM does not provide a debris estimate for a damaged building. We manually calculated debris by first calculating the total weight of each building, in tons, using the total square footage of the building, the type of building (e.g., steel frame or wood frame), and the per-square-footage weight estimates listed in the Hazus SQL database table [dbo].[eqDebrisAnalParms]. Debris was then calculated based on the methods outlined in the Hazus Earthquake Technical Manual (FEMA, 2011, Equation 12-3), by using the structural and nonstructural drift probability of damage states obtained for the individual building from the Hazus AEBM.

The debris estimate is limited to buildings. We did not estimate debris tonnage from landslides, damaged bridges, buckled roads, sand and silt ejecta caused by liquefaction (Villemure and others, 2012), or damaged nonbuilding structures.

4.1.3 Displaced Population and Shelter Needs

Unlike the Hazus General Building Stock tool, Hazus AEBM does not calculate displaced households or displaced population. We adapted the methods outlined in the Hazus Earthquake Technical Manual (FEMA, 2011, Chapter 14), but instead of calculating displaced households we calculated displaced population. Displaced population is more direct to calculate given the methods discussed previously for assigning people, and not households, to distinct multi-family and single-family residential buildings (Section **2.1.7**). We followed the guidance provided by FEMA (2011, Table 14.1) that was based on the work of Perkins and Chuaqui (1998), but we altered the weight factor for multi-family residential building type, W_{MFE}, by setting it to zero. The displaced population then becomes a simple computation: the number of permanent residents in the building times the building's probability of *complete* structural damage state, with the latter factor directly obtained from the Hazus AEBM output.

We equated the red tag term used in a post-earthquake building safety evaluation context (ATC, 1989) with the Hazus "complete" structural damage state, following the guidance of FEMA (2010, Table 6.1). Similarly, yellow tag was associated with "extensive" damage state, and green tag with buildings in a none, slight, or moderate damage state. We recognize that alternate mappings of Hazus damage states or repair costs to ATC-20 tag levels exist (e.g., MMI Engineering [2012] presents two such definitions).

The Hazus displaced population computation assumes the building has been categorized into one of the three ATC-20 tags. In practice, the post-earthquake building inspection process is estimated to take weeks, if not months (EERI, 2015; p. 25). Thus, what is being computed is an estimation of *post*-inspection, longer-term displaced population. Our summary tables use the term *Long-term Displaced Population* to emphasize the point.

The topic of displaced population and shelter needs is involved, and estimates can vary throughout the response and recovery phases based on numerous factors, including psychological, sociological, and economic considerations. For example, some portion of the population may occupy a damaged building until it is officially inspected and red tagged, at which point they must vacate. An owner of a moderately damaged (green-tagged) apartment building may decide to replace the structure rather than repair it. For this project, we provide detailed information on permanent residents per building damage state, thereby allowing a basis from which to estimate Day 1, Day 7, and Day 30 displaced population and shelter needs (Appendix C, **Table 12-4** through **Table 12-7**). A portion of the displaced population may need long-term publicly provided shelter while residences are repaired or replaced (FEMA, 2011, Section 14.3). We determined that the ethnic, racial, and income level factors listed in Hazus Earthquake Technical Manual (FEMA, 2011, Equation 14.2) were too assumption-laden, and thus we did not calculate shelter requirements with such factors. For reference purposes, past Hazus runs for a Cascadia

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Subduction Zone earthquake that used these assumptions calculated the portion of displaced population needing temporary shelter/housing solutions between 20% and 30% (Wang, 1998; Hofmeister and others, 2003; EERI, 2015, p. 34).

4.1.4 Aggregation Unit

Although the inputs into the Hazus model are individual buildings with occupants, loss estimates from the model are statistically meaningful only at an aggregated level. As Pinter and others (2016) emphasized, Hazus-calculated damages are estimates appropriate for comparison and planning purposes, particularly when pooled among a group of structures. Hazus-calculated damages are not appropriate for individual building analysis. We considered various aggregation units, including city neighborhoods and fire districts. Several jurisdictions in the study area have well-defined neighborhoods, but most do not. Further, unincorporated areas have no formal or usable neighborhood definitions. For example, we considered fire districts in unincorporated areas, but we determined they were too coarse to be useful for community level planning.

We chose the census block group (CBG), a U.S. Census Bureau-designated geographical unit that is between the census tract and the census block, as the basic mapping aggregation unit for damage estimates. Census block groups typically have between 600 and 3,000 people, but the number of buildings can vary widely, depending on the type of buildings and the number of multi-family residential structures within a CBG. Where warranted, we combined contiguous CBGs to create a larger unit encompassing at least 300 buildings. The process resulted in reducing the study area's 1,041 CBGs into 876 *neighborhood units.*

To provide a larger-scale perspective across the study area, we also aggregated loss at the jurisdictional level, with all buildings associated with a particular city, designated community, or unincorporated county. The jurisdiction layer combined city jurisdictional boundaries published by Metro RLIS (Metro, 2016), along with hamlet and village designations by Clackamas County (2017). Given the City of Portland's size relative to surrounding cities, we used the Portland Bureau of Emergency Management's (PBEM) Risk Reporting Areas (Tetra Tech, 2016a, Section 4.4, Table 4.4) as subdivisions for aggregation. All buildings not associated with a jurisdiction were designated as unincorporated.

4.1.5 Seismic Design Level Improvement Modeling Exercise

Most of the buildings in the study area were constructed with minimal consideration given to seismic resilience (**Table 10-3**). Seismic retrofits to more vulnerable buildings can reduce damage to the building and casualties to the building occupants when an earthquake occurs. Our Hazus model can be used to generate an overall benefit estimate for seismic retrofitting. Levi and others (2015) performed such an analysis for Israeli building inventory, where at least 25% of the building inventory was designed with minimal resistance to earthquakes.

We ran two alternative loss scenarios, wherein we upwardly adjusted seismic design levels within our building database. For the moderate scenario, all buildings with a seismic design level of pre code or low code were updated to moderate code, and all unreinforced masonry buildings were altered to RM1 (reinforced masonry) building type. Buildings with high code were left unchanged. For the high scenario, the seismic design level was set to high code for all buildings, with all unreinforced masonry buildings altered to RM1 (reinforced masonry) building type. We then ran Hazus AEBM, using the same ground motion, liquefaction/landslide susceptibility, and building population occupancy, and tabulated loss estimates (see Section 5.3.1). Our analysis was limited to the Cascadia Subduction Zone earthquake scenario, and run for both wet (saturated) and dry soil conditions.

4.2 Electric Power Transmission

Using the ground deformation estimates, we calculated the mean lateral spread within a 10-meter buffer of each transmission structure for the Cascadia Subduction Zone earthquake and Portland Hills fault earthquake, for wet (saturated) and dry soil moisture conditions. The mean permanent ground deformation at each point was then classified into three categories: less than 1 meter, 1 to 2 meters, and greater than 2 meters. For all points with greater than 1-meter permanent ground deformation, the probability of occurrence is between 20% and 30% (Appendix E, **Plate 13**).

4.3 Emergency Transportation Routes

The Hazus tool provides an analysis of linear features such as roads, but we determined it inadequately captures the range of variability of permanent ground deformation throughout the length of the segment. Currently, the tool samples only at the linear feature segment's endpoints and at its midpoint. We take a conservative approach in our evaluation of earthquake impact on surface transportation by considering the possibility of permanent ground deformation across the entire length of the road segment. A road segment is considered failed if any portion of that road segment exceeds an amount of ground deformation and a probability of occurrence.

Ground deformation and probability estimates were available in a 10-foot raster grid format (Section **3.4**). We combined the landslide and liquefaction PGD grids using Esri Spatial Analyst Cell Statistics function to obtain the maximum value per pixel. For our analysis purposes, the mechanism of the ground failure is not relevant; the amount and probability of lateral spread is of primary concern. Following the methods outlined by Mahalingam and others (2015), we then generated a new grid based on focal statistics of the ground deformation within a 100-foot window (10 pixel × 10 pixel; a pixel is 10 ft). Inclusion of surrounding areas adjacent to the road segment is a more conservative approach, because we wanted to include potential landslides slightly distant from the road. We then classified the maximum value of the ground deformation within each road segment into four bins, using Esri Spatial Analyst Zonal Statistics as Table tool: less than 0.5 meters, 0.5 to 1.0 meters, 1.0 to 2.0 meters, and greater than 2.0 meters. The process was repeated for the CSZ dry soil conditions scenario and the PHF wet (saturated) and dry soil conditions scenarios, with the results stored in the accompanying geodatabase. Appendix E, Plates 10 and 11 represent the impacts of ground failure per segment under a Cascadia Subduction Zone earthquake, given the two soil moisture scenarios. For another perspective, Appendix E, **Plate 12** highlights the maximum potential permanent ground deformation at specific locations throughout the segment.

4.4 Model Limitations

Our damage estimates were primarily derived from the Hazus AEBM. Limitations and uncertainties are inherent in any loss estimation methodology. They arise in part from incomplete scientific knowledge concerning earthquakes and their effects on buildings and facilities.

4.4.1 Geological Models

An actual earthquake may vary significantly in ground motion and site amplification compared to the synthetic data we provided the model in this study. Our analysis used the best available information for a subduction zone fault and a local crustal fault. We used the upper bound for the earthquake magnitude, recognizing that an actual earthquake may rupture on only a portion of its fault. Further, the

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NEHRP site classification is a simplification of complex surficial geology, and local site amplification effects within a given NEHRP site class may be at significant variance with the standard ground motion amplification model.

We did not model damage from aftershocks. Wein and others (2017) presented scenario examples and the consequences of such earthquakes. The impact of aftershocks on slightly damaged buildings has be modeled in a Hazus context (Seligson and others, 2015), but we did not have aftershock scenarios available, nor was such modeling within the scope of our project.

Although our loss model includes the impact of earthquake-induced landslides on buildings, we do not model the impact of large landslide flows on structures downhill from the source. Such flow can wreak significant damage to buildings and people (Daniell and others, 2017), but such modeling capability is not available with existing tools.

4.4.2 Building Damage Models

Limitations and uncertainties also result from the approximations and simplifications that are necessary for comprehensive analyses. Although we gave extensive effort to correctly attributing each of the 615,852 individual buildings in this study, we recognize that misclassifications are present, and we made statistical distribution assumptions on building type when attribution information was not otherwise available.

We used the generic building damage models provided by the Hazus tool. These models simplify the vast variability present in existing building construction, such as vertical irregularities, plan irregularities, usage of cripple walls, hybrid construction techniques, and pounding from adjacent buildings (FEMA, 2015b). The Hazus AEBM allows a user to specify individual building-specific parameters, but it is not possible to conduct a study at this regional scale that incorporates such detail. The Hazus generic building damage model captures the *average* building response to an earthquake—the primary reason we present loss estimates not at the individual building level but at a minimum aggregation unit (Section **4.1.4**).

The duration of a subduction zone earthquake is significantly longer than for other types of earthquakes, including those generated from local crustal faults. Although the Hazus tool provides a method to distinguish short, medium, and long shaking duration (FEMA, 2011, Equation 5-10), the damage functions are expert- and model-driven. The most recent long-duration earthquake to impact the United States was Alaska's Good Friday earthquake in 1964, which was approximately 4.5 minutes long. Post-earthquake damage assessment protocols were not in place at the time. Hazus modelers do not have USA-construction-based empirical data for long-duration earthquakes from which to calibrate the model. The current Hazus model may be underestimating the damage to tall buildings and other large structures in response to great subduction zone earthquakes. Gomberg and others (2017) have identified this as an important research need.

In **Tables 12.8** through **Table 12.11**, we present Hazus damages and casualty estimates as single value. Such representations can be misleading, as they suggest a high level of precision that is not warranted, in part by the uncertainties of the data that were provided to the Hazus model (Remo and Pinter, 2012). One reason we chose to model both wet (saturated) and dry soil condition scenarios for a given earthquake is to better communicate our damage estimates as a range of values (**Table ES-1**).

4.4.3 Casualty Estimates

Casualty estimates are dependent on several assumptions and may underestimate the true impact from an earthquake. Daytime occupancy values use people-per-square-footage assumptions, which may be reasonable in the aggregate, but building occupancy density can vary significantly across businesses that

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are grouped for our modeling purposes into a fixed classification, such as "Commercial-Retail." Running Hazus with a large number of alternate point-in-time population models may assist in better understanding the uncertainty in daytime casualties (FEMA, 2012a, Section 3.4).

In the Hazus AEBM, the casualty calculations do not include injuries to people outside of and proximal to a building. During strong ground motion, fascias can fall off buildings, masonry walls can collapse, and windows can shatter, sending shards of glass down to the pavement. Other casualties, such as from heart attacks, loss of power to medical devices such as respirators, electrocutions, collapsing bridges, exposure to released hazardous materials, and car accidents are not quantified in the Hazus model. Further, we did not model fire following earthquake, which can result in additional casualties.

4.4.4 Other Model Limitations

Fires typically follow a major earthquake and are exacerbated by compromised transportation networks and broken buried utilities. Fire following earthquake can be a major contributor to building loss and displaced population (Scawthorn and others, 2005). Early versions of the Hazus tool modeled "fire following earthquake" as an induced damage; however, due to significant bugs producing erroneous damage estimates, the option had been disabled in recent versions of the tool. The Hazus v4.2 release (FEMA, 2018) restored the Fire Following functionality, but the tool release was not available in time for this project, which used Hazus v4.0.

Several other sources may contribute to road damage, none of which we modeled in this project, and thus may lead to an underestimate of road damage. Our road damage model does not include debris generated by taller buildings that may block road access, or a road cordoned off due to a proximal building that is in danger of collapse (City Club of Portland, 2017). Our Hazus-based landslide ground deformation model does not incorporate deposits from distant earthquake-induced landslides that may block road access.

Past Hazus-based studies typically attached standardized reports generated by the Hazus tool that summarize casualties and losses in a convenient format. Such reports are currently available only with Hazus analyses using General Building Stock data, which are modeled at the census tract level. Users analyzing loss on a per-building basis, such as what we have done in this study, cannot obtain such summary reports from Hazus; thus, none are attached to this report. Instead, we present such information as tables in Appendices A and C, in graphical form in Appendix E, and in electronic form in the accompanying GIS database (Appendix D).

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5.0 RESULTS

5.1 Population and Building Density

We developed a 20-acre hexagonal grid, then overlaid the grid on our building database, totaling the number of individual buildings, the number of residential buildings, and the number of permanent residents associated with the buildings within each hexagonal cell. Cells with no buildings were removed from the dataset. Cells with at least one building yet no permanent residents frequently occur in commercial/industrial corridors or predominantly agricultural areas (Appendix E, Plates 1–3). The hexagon layer provides a convenient overlay to explore population and building exposure relative to a particular natural hazard. The layer can also be useful in focusing the areas of building loss or casualties in neighborhood units with large tracts of undeveloped areas.

5.2 Building Statistics

Single-family residential buildings dominate the building inventory in all three counties (**Figure 5-1**). Wood frame construction dominates the residential buildings (**Table 5-1**). The number of masonry buildings in **Table 5-1** is due primarily to the Hazus building type statistical distribution described in Section **2.1.4**. **Table 10-8** in Appendix A contains a complete breakdown of building type for all generalized building use categories.

Figure 5-1. Building primary usage statistics by county. Tabular summary is in Table 10-7. Single-family residential combines Hazus occupancy classes RES1 and RES2 (manufactured housing). Institutional combines Hazus occupancy classes REL1, GOV1, GOV2, EDU1, and EDU2. Commercial combines all Hazus COM occupancy classes and RES4. Multi-family residential combines Hazus occupancy classes RES3, RES5, and RES6.

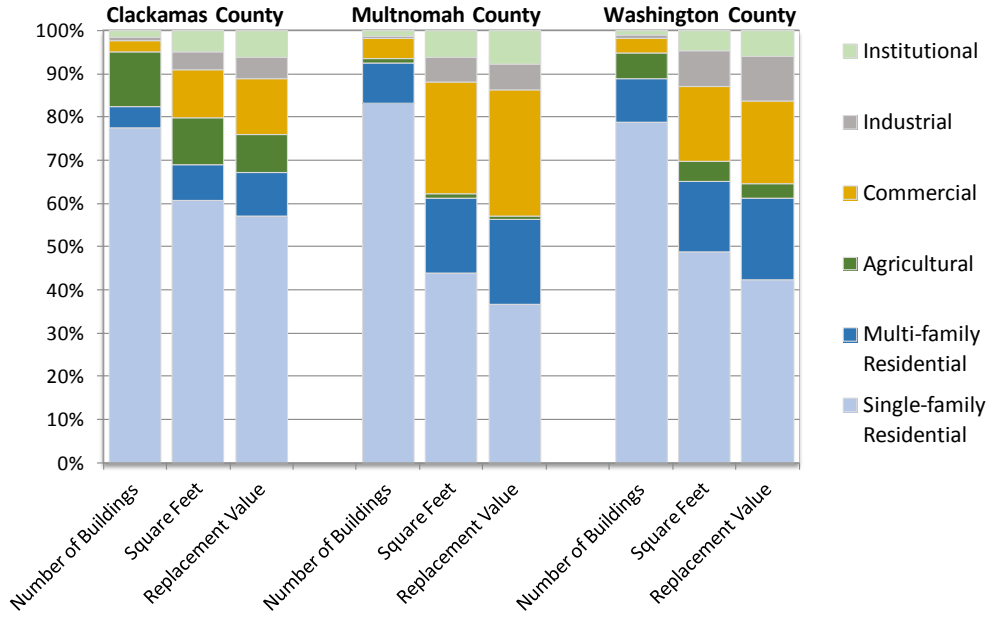

Table 5-1. Residential buildings by building type.

Occupancy Type	Building Type	Number of Buildings	Building Percent	Square Footage (Thousand)	Square Footage Percent	Permanent Residents	Permanent Residents Percent
Single-Family Residential	Wood	471,926	95.5%	914,096	96.7%	1,182,770	96.3%
	Manufactured Housing	16,852	3.4%	20,966	2.2%	32,969	2.7%
	Reinforced Masonry	3,549	0.7%	7,349	0.8%	9,321	0.8%
	Unreinforced Masonry	1,455	0.3%	2,298	0.2%	3,277	0.3%
	Other	138	0.0%	377	0.0%	581	0.0%
Multi-Family Residential	Wood	47,055	91.1%	204,253	73.0%	316,575	76.8%
	Reinforced Masonry	1,331	2.6%	16,026	5.7%	24,203	5.9%
	Unreinforced Masonry	403	0.8%	5,380	1.9%	8,139	2.0%
	Steel	1,636	3.2%	22,913	8.2%	24,051	5.8%
	Concrete*	1,206	2.3%	31,277	11.2%	39,150	9.5%

*Concrete includes the precast concrete building type.

Building occupancy within the different building types varies significantly between the daytime and nighttime scenario (**Table 5-2**). In the 2 AM scenario, most (87%) of the population is within wood frame construction. The daytime and nighttime occupancy models assume people from outlying counties commute into the study area; thus, daytime occupancy totals are generally higher than permanent resident population totals.

Table 5-2. Occupancy by building type.

Building Type	Number of Buildings	"2 PM" Daytime Occupancy	Daytime Percent	"2 AM" Nighttime Occupancy	Night Time Percent	Permanent Residents	Percent
Concrete	8,599	314,378	19%	60,383	4%	35,679	2%
Manufactured Housing	17,295	11,221	1%	31,387	2%	32,969	2%
Precast Concrete	6,603	195,438	12%	12,539	1%	3,811	0%
Reinforced Masonry	16,125	205,964	12%	43,218	3%	33,525	2%
Steel	16,487	213,478	13%	49,246	3%	24,291	1%
Unreinforced Masonry	5,092	52,271	3%	13,766	1%	11,416	1%
Wood	545,651	697,336	41%	1,442,287	87%	1,499,345	91%
All building types	615,852	1,690,086		1,652,825		1,641,036	

5.3 Building Damage, Casualties, and Displaced Population

We tabulated the impacts to buildings and people at the county and jurisdictional level (Appendix C, **Table 12-8** through **Table 12-11**) and at the neighborhood unit level for all earthquake scenarios. Jurisdictional and neighborhood unit level summaries are available in tabular form in the accompanying GIS database. Building damage results were also expressed as a *loss ratio*—the total repair cost estimate for all buildings in a given spatial unit divided by the total replacement cost for all buildings. Building debris tonnage was summarized at the given spatial unit. Casualties were summarized for the given spatial unit at the individual casualty level, and a total casualty level for daytime and nighttime was calculated. The tables in the GIS database enable one to express graphically the damage estimates in any

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number of ways, such as displaying Level 2 casualties per 10,000 people. For demonstration purposes, we present the total injuries requiring hospitalization per neighborhood unit, daytime scenario, CSZ earthquake with saturated soil conditions, in Appendix E, Plates 14–16.

Damage estimates vary widely across the study area, depending on local geology, soil moisture conditions, type of building stock, and distance from the fault. In the Cascadia Subduction Zone scenario, damage is generally greater in the western portion of the study area than in the eastern portion. Yet local geology variations can result in significant damage even well east of the Willamette River, such as the neighborhood of North Troutdale (Appendix E, **Plate 15**).

The 9% ("dry" soil conditions) to 14% ("wet") overall estimated loss from a CSZ magnitude 9.0 earthquake includes all buildings in the study area (**Table 12-8** and **Table 12-9**). The damage is not equally distributed across all building uses or building types, as seen in the referenced tables. Many high-value commercial and industrial buildings exist on areas of high to very high liquefaction hazard. The average loss ratio for wood-framed single-family residential buildings ranges from 2% to 7% (for "dry" and "wet" soil conditions, respectively; **Table 5-3**).

Although the timing of an earthquake has no impact on building damage or displaced population, more people will experience casualties during a workday earthquake scenario than if the earthquake occurred at night (Appendix C, **Table 12-8** through **Table 12-11**). During the daytime scenario, most people are occupying non-wood structures (**Table 5-2**), which typically fare worse in an earthquake than wood-frame construction.

Even though a Portland Hills fault earthquake is of shorter duration than a CSZ earthquake, its placement relative to significant assets in the region would result in much higher damage overall (Appendix C, **Table 12-10** and **Table 12-11**). At distances beyond 15 miles from the Portland Hills fault zone, damages from a Cascadia Subduction Zone scenario generally exceed a Portland Hills fault scenario, which can be visualized by comparing the ground motion data in Appendix E, Plates 4 and 5.

Soil moisture conditions significantly influence loss estimates, with overall building loss ratios of 9% versus 14% for the Cascadia earthquake between the "dry" soil conditions and "wet" (saturated) soil conditions (Appendix C, **Table 12-8** and **Table 12-9**). The large percentage of buildings in moderately liquefiable zones, such as the Tualatin Basin in Washington County, combined with the high-value buildings in very high liquefiable zones in the Columbia Slough, downtown Portland near the Willamette River, and the northwest industrial area of Portland account for much of the increase in the wet scenario loss.

Several smaller jurisdictions exhibit higher or lower loss ratios compared to other jurisdictions, due to unique situations. Johnson City in Clackamas County is almost exclusively composed of manufactured housing—a building type that experiences significantly more damage for a given ground motion than does a wood frame house (Kircher and others, 1997). The city of Barlow in Clackamas County is situated entirely on soft soils (Section **3.2**) that amplify the ground motion, on potentially liquefiable soils, and much of its building value is contained in four storage facilities constructed of a more fragile building type compared to wood-frame construction. Although the City of Sandy's boundaries span multiple soil types and liquefaction susceptibility categories, nearly all of its assets are on firm, non-liquefiable soils, and thus its loss ratio is comparatively low (1%, **Table 12-8**).

Building damage is higher in non–single-family residential structures (**Table 5-3**). Single-family residential is dominated by light-frame wood construction (**Table 5-1**), the most resilient of the 36 generic building types available in the Hazus AEBM. Multi-family residential is a mixture of wood frame construction and less resilient building types. "Single-family residential: manufactured housing" was broken out to highlight its relative seismic vulnerability.

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Table 5-3. Damage to buildings by building category and by earthquake scenario.

		Cascadia Subduction Zone Magnitude 9.0 Earthquake				Portland Hills Fault Magnitude 6.8 Earthquake			
		"Dry" Conditions		"Wet" (Saturated) Conditions		"Dry" Conditions		"Wet" (Saturated) Conditions	
Building Category	Building Value ($ Million)	Building Repair Cost ($ Million)	Loss Ratio	Building Repair Cost ($ Million)	Loss Ratio	Building Repair Cost ($ Million)	Loss Ratio	Building Repair Cost ($ Million)	Loss Ratio
Agricultural	9,263	947	10%	1,347	15%	1,271	14%	1,796	19%
Commercial	57,134	10,381	18%	14,133	25%	22,240	39%	27,326	48%
Industrial	18,485	3,651	20%	4,888	26%	6,578	36%	8,216	44%
Institutional	17,609	2,438	14%	3,114	18%	5,871	33%	7,089	40%
Multi-family residential	44,391	3,288	7%	5,621	13%	10,118	23%	14,423	32%
Single-family residential	111,408	2,695	2%	7,421	7%	14,234	13%	24,254	22%
Single-family residential: manufactured housing	879	158	18%	186	21%	257	29%	307	35%
Total	259,169	23,558	9%	36,710	14%	60,569	23%	83,411	32%

Institutional combines Hazus occupancy classes REL1, GOV1, GOV2, EDU1, and EDU2. Commercial combines all Hazus COM occupancy classes and RES4. Multi-family residential combines Hazus occupancy classes RES3, RES5, and RES6.

The Hazus AEBM model estimates each building's probability of being in one of five damage states: *None*, *Slight*, *Moderate*, *Extensive*, and *Complete*. The five individual probabilities sum to 1.0. General descriptions for the structural damage states of 16 common building types are provided by FEMA (2011, Section 5.3); **Figure 5-2** shows an example. We obtained the total number of buildings in a particular spatial unit by summarizing all buildings' individual structural probability of damage state values, per the guidance provided by FEMA (2017a). The data in Appendix C, **Table 12-3** can be used to estimate the number of red-tagged and yellow-tagged buildings, and the number of buildings needing structural inspection after an earthquake. In addition, we summarized all permanent residents per building damage state, by generalized building types: single family residential (excluding manufactured housing); single family residential in manufactured housing, and multi-family residential.

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Figure 5-2. Example damage state descriptions for a light-frame wood building (FEMA, 2010). The "None" damage state is not provided.

Damage State		Description
	**Slight**	Small plaster cracks at corners of door and window openings and wall-ceiling intersections; small cracks in masonry chimneys and masonry veneers. Small cracks are assumed to be visible with a maximum width of less than 1/8 inch (cracks wider than 1/8 inch are referred to as "large" cracks).
	**Moderate**	Large plaster or gypsum-board cracks at corners of door and window openings; small diagonal cracks across shear wall panels exhibited by small cracks in stucco and gypsum wall panels; large cracks in brick chimneys; toppling of tall masonry chimneys.
	**Extensive**	Large diagonal cracks across shear wall panels or large cracks at plywood joints; permanent lateral movement of floors and roof; toppling of most brick chimneys; cracks in foundations; splitting of wood sill plates and/or slippage of structure over foundations.
	**Complete**	Structure may have large permanent lateral displacement or be in imminent danger of collapse due to cripple wall failure or failure of the lateral load resisting system; some structures may slip and fall off the foundation; large foundation cracks. Three percent of the total area of buildings with Complete damage is expected to be collapsed, on average.

5.3.1 Seismic Design Level Improvement Exercise

Modeling adjustments to the building inventory seismic design level results in much lower amounts across all categories of loss (**Table 5-4**), although the effect is muted in the "wet" (saturated) soil condition scenario. The Hazus building damage model assumes damage due to ground shaking is independent of damage due to ground failure (FEMA, 2011, Section 5.6.3). In the Hazus model, improved seismic design levels will reduce damage estimates from ground shaking but not from ground failure. In our study area, more than half of the building inventory is situated on sites with a moderate or higher liquefaction susceptibility rating (**Table 10-5**). Thus, the reduction in loss in the "wet" (saturated) soil conditions is muted, due primarily to liquefaction probability being incorporated into the damage estimate. The reduction in loss estimates is more dramatic in the "dry" soil conditions scenario, where liquefaction and earthquake-induced landslide impacts are minimal.

Table 5-4. Seismic design level improvement exercise, Cascadia Subduction Zone magnitude 9.0 earthquake. See Section 4.1.5 for scenario definitions.

	"Dry" Soil Conditions			"Wet" (Saturated) Soil Conditions		
Seismic Design Level Scenario	**Unchanged**	**Moderate**	**High**	**Unchanged**	**Moderate**	**High**
Building Repair Cost ($ million)	23,558	6,466	4,230	36,710	20,988	18,979
Building Loss Ratio	9%	2%	2%	14%	8%	7%
Debris (thousands of tons)	12,794	2,512	1,304	17,292	8,148	7,121
Long-term Displaced Population	16,852	2,438	1,664	85,211	72,329	71,617
Casualties — Daytime Scenario						
Total Casualties	18,286	2,032	987	27,175	12,606	11,711
Level 1 Casualties	13,342	1,681	839	19,489	9,005	8,281
Level 2 Casualties	3,518	278	118	5,454	2,567	2,431
Level 3 Casualties	484	25	10	758	352	340
Level 4 Casualties	942	48	20	1,473	682	659
Casualties — Nighttime Scenario						
Total Casualties	4,334	902	596	10,400	7,259	6,989
Level 1 Casualties	3,338	775	525	7,838	5,484	5,262
Level 2 Casualties	739	106	60	1,979	1,404	1,364
Level 3 Casualties	87	7	4	203	131	129
Level 4 Casualties	169	14	7	380	240	235

Loss estimates for unchanged scenario are taken from **Table 12-8** and **Table 12-9**, and provided for reference. Casualty Level definitions are provided in **Table 4-1**. Total building replacement costs used for building loss ratio taken from **Table 5-3**.

5.4 Electric Power Transmission

Of the 18,098 poles and towers in our database, 921 (5%) have a 20% to 30% chance of experiencing between 1 and 2 meters of ground deformation, and 2,203 (12%) have a 20% to 30% chance of experiencing more than 1 meter during a Cascadia magnitude 9.0 earthquake with "wet" (saturated) soil conditions (Appendix E, **Plate 13**). In the "dry" soil conditions, only 6 poles and towers have a 20% to 30% chance of experiencing between 1 and 2 meters of ground deformation, with none experiencing more than 2 meters of deformation. In the "dry" soil conditions scenario, permanent ground deformation is due exclusively to earthquake-induced landslides. In the "wet" (saturated) soil conditions scenario, liquefaction is a significant contributor to permanent ground deformation proximal to the power pole or tower.

Similar potential impact is observed for the Portland Hills fault magnitude 6.8 earthquake scenario. Of the 18,098 poles and towers in our database, 2,367 (13%) have a 20% to 30% chance of experiencing between 1 and 2 meters of ground deformation, and 3,687 (20%) have a 20% to 30% chance of experiencing more than 1 meter during "wet" (saturated) soil conditions. In the "dry" soil conditions scenario, 100 (0.5%) poles and towers have a 20% to 30% chance of experiencing between 1 and 2 meters of ground deformation, and 8 poles and towers have a 20% to 30% chance of experiencing more than 2 meters.

5.5 Emergency Transportation Routes

In the Cascadia magnitude 9.0 earthquake, "wet" (saturated) scenario, most (177 out of 238, or 74%) route segments will have a 20% to 30% chance of experiencing significant ground deformation along some portion of the segment (Appendix E, **Plate 10**). Although the regional post-earthquake road conditions significantly improve under the "dry" soil conditions scenario, (Appendix E, **Plate 11**), several road segments (6 out of 238, or 3%) may still be impacted. In the "dry" soil conditions scenario, the road segments that have a chance of failure are due to their placement on 1) existing landslides, 2) areas of elevated landslide susceptibility based on slope and geology, or 3) fill material that includes a significant slope proximal to the road segment. The 20% to 30% probability of failure on a per segment basis may sound modest when taken in isolation, but when individual location probabilities of failure are combined in a binomial distribution statistical method (probability of failure = $(1 - p)^n$), the overall failure estimate for the segment can increase significantly.

For mapping and planning purposes, we categorized road segments into distinct bins, even though only a fraction of a given road segment may experience significant ground deformation. An example of this effect can be observed in Washington County, where emergency transportation routes commonly cross alluvial deposits that may fail due to liquefaction (inset map in Appendix E, **Plate 12**). Although only a portion of the road may be impacted by ground failure, the road segment is considered impassable in its entirety until repairs are made. **Plate 12** (Appendix E) shows the portions of the segments that may experience significant ground failure in a Cascadia magnitude 9.0 earthquake.

For a Portland Hills fault magnitude 6.8 earthquake, 66 out of 238 (28%), and 205 of 238 (95%) of segments have a 20% to 30% chance of experiencing significant ground deformation along some portion of the segment, in the "dry" and "wet" soil condition scenarios, respectively. The increase in percentage compared to the CSZ can be explained by the significant difference in ground motion between the two earthquake scenarios (Plates 4 and 5).

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6.0 DISCUSSION

This study is the first conducted in the three-county area that provides damage estimates at levels useful for both regional and local planning. It presents loss estimates as a range for two building occupancy scenarios and two soil moisture scenarios. By doing so, planners can get a better sense of the range of damages and casualties that may occur with a major earthquake: Which areas may have experienced more damage, given the potential for liquefaction and local site amplification? Where were people when the earthquake occurred? How many casualties might that produce?

A magnitude 9.0 Cascadia Subduction Zone earthquake will result in significant damage to buildings, with concomitant casualties, throughout the three-county area. Transportation networks may be severely impaired, compromising emergency response. Millions of tons of debris will need removal to staging areas for sorting and eventual permanent disposal. Hundreds of thousands of buildings will need timely safety inspections, and thousands to tens of thousands of people will need to find other permanent housing arrangements. In comparison, a magnitude 6.8 Portland Hills fault earthquake will be devastating, primarily due to its position relative to the study area's major assets and population centers, with losses more than double those from a magnitude 9.0 Cascadia Subduction Zone earthquake.

6.1 Earthquake Impacts

6.1.1 Geographic Variations

Damage and casualty estimates vary widely throughout the three-county area. Primary reasons for the variation include the seismology, local geology, and building development history. In a Cascadia Subduction Zone earthquake, ground motion will be less in eastern part of the study area compared to the western part. Local geological characteristics can produce significant variations in ground motion (Appendix E, Plates 4 and 5). Such variation should not be interpreted to suggest that some areas within the three counties are unaffected. The City of Sandy, for example, has a relatively low building loss ratio, at 1% (Appendix C, **Table 12-9**), yet the Cascadia earthquake is estimated to generate $12 million in damage within the city boundaries.

6.1.2 Casualties

For both the Cascadia Subduction Zone earthquake and the Portland Hills fault earthquake, and in both "dry" and "wet" (saturated) soil condition scenarios, casualty estimates for a daytime earthquake are at least double in quantity compared to a nighttime earthquake. During nighttime most, but not all, of the population are in more resilient wood-frame construction (**Table 5-1**, **Table 5-2**), while during the daytime, much of the population is dispersed among non-wood frame construction buildings, such as offices, schools, and factories. This temporal pattern has been observed in past earthquakes, most recently in Christchurch, New Zealand, where two earthquakes struck, one at 4:35 AM on September 4, 2010, and one at 12:51 PM on February 22, 2011 (EERI, 2011). No deaths occurred from the early morning earthquake, whereas the afternoon earthquake resulted in the deaths of 185 people.

We emphasize that our daytime building occupancy model used as a basis for generating daytime casualty numbers is a simplification of the dynamic and complex human environment, but it is still useful for planning purposes. Post-earthquake emergency operations can be enhanced by having an awareness of the types of population shifts between buildings throughout the day and week, and the seismic resiliency of those buildings.

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6.1.3 Building Damage Inspection and Displaced Population

After a major earthquake, at least 200,000 buildings in the Portland Metropolitan Region will need timely ATC-20-based safety inspection by qualified personnel (ATC, 1989). Our estimate includes all buildings with slight to complete damage (Appendix C, **Table 12-3**), following the quantification method outlined by EERI (2015), which assumed a rate of four to five buildings per day per inspector. Assuming a goal of completing the task in 30 days, our results identify a need for 1,600 to 2,000 certified inspectors for a Cascadia Subduction Zone magnitude 9.0 earthquake. A Portland Hills fault earthquake would require twice the number of inspectors. Many out-of-area inspectors can be brought into an affected area after an earthquake, as discussed in the Oregon Resilience Plan (OSSPAC, 2013, Section 2). Inspection may displace some portion of building occupants who assumed buildings were structurally sound. In other cases, inspection may restore confidence in the building's structural integrity. We can only speculate on such dynamics, but we can provide permanent resident occupancy counts per building damage state (Appendix C, **Table 12-4** through **Table 12-7**).

6.1.4 Debris

Debris removal will require local staging areas for storing, sorting, and eventual transfer to a permanent disposal location. Assuming 25 tons per truckload, 400,000 to 680,000 truckloads of building debris would be generated by a Cascadia Subduction Zone earthquake ("wet" [saturated] soil scenario). We did not estimate other types of debris, such as buckled roads, collapsed overpasses, and landslide flows. Identifying staging areas is partly a GIS exercise that uses the debris-per-neighborhood estimates supplied with this report, along with information on potential long-term compromises to the local transportation network such as bridge collapse. In addition, debris staging site selection should be informed by other emergency or recovery planning efforts that may identify the same areas for other operational needs.

6.1.5 Infrastructure

Our emergency transportation route analysis graphically shows the likelihood of a fragmented emergency transportation route network, one where distribution of goods and services may be significantly affected. It is intended to inform the planning process, emphasizing the need for adaptability and consideration of alternative routes. Our analysis did not consider other potential route blockages, such as collapsed buildings and failed bridges and overpasses. Engineering judgment from transportation sectors can be applied to determine which segments may be quickly restored and which segments may be out for longer periods. Together, such information and perspectives can be used as a basis for establishing, prior to an earthquake, local points of distribution, including food, water, and fuel for emergency operations.

Portions of the electric distribution network may be significantly impacted due to ground failure compromising the integrity of transmission structures. As with the emergency transportation route analysis, our work is intended to inform the planning process. Engineering judgment from electrical utilities sectors can be applied to determine if some areas will be impacted for longer durations, and if additional capacity or redundancy is warranted. During the Christchurch, New Zealand, earthquake sequences of 2010-2011, electric poles and towers generally fared well in the presence of liquefaction (Kwasinksi and others, 2014).

6.1.6 Alternative Earthquake Scenarios

For planning purposes, we chose to model an earthquake at the upper end of its estimated potential energy release. The Cascadia Subduction Zone magnitude 9.0 earthquake scenario assumes a full margin rupture. Partial ruptures along the CSZ have been inferred from the geologic record, with the most frequent occurrences along the southern portion of the CSZ (summarized by Priest and others, 2014). The Oregon State University Hazard Explorer for Lifelines Program maintains a web-GIS tool that displays a full CSZ rupture and three partial rupture CSZ scenarios (http://ohelp.oregonstate.edu/). We obtained the same synthetic bedrock ground motion data used in the OHELP tool from A. Frankel (written communication, 2016) of the USGS. In the Portland Metropolitan Region, the synthetic CSZ magnitude 8.7 bedrock ground motion data averages about 85% of CSZ 9.0 bedrock ground motion data, and the synthetic CSZ magnitude 8.4 bedrock ground motion, with its northern rupture extent west of Waldport, Oregon, is about 40% of the full rupture CSZ magnitude 9.0 earthquake.

Damage estimates do not scale linearly with bedrock ground motion, and one should not assume damage from a CSZ magnitude 8.4 earthquake would be 40% of the CSZ magnitude 9.0 earthquake damage estimate. Yet significant damage could still occur in the study area, primarily due to the seismic site effect where the bedrock ground motion is strongly amplified by soft soils (Section **3.2**). The most dramatic consequence of the seismic site effect observed to date is from the 1985 Mexico City earthquake, where a relatively distant rupture produced devastating building damage within the historic lakebed (Singh and others, 1988). Future studies could quantify the influence of the site effect on damage estimates across lower magnitude CSZ earthquake scenarios.

The Portland Hills fault was modeled at the upper end of its estimated magnitude range (M 6.8); it could rupture at lower magnitude. Buildings above the rupture zone will likely experience the same damage as estimated in this report. Buildings more distant from the rupture zone but situated on softer soils would experience more damage than nearby buildings situated on stiffer soils. The Portland Hills fault is part of a fault zone that includes the Oatfield fault and the East Bank fault (Wong and others, 2001). Other seismogenic faults exist in the study area (Personius and others, 2003; USGS Quaternary Fault and Fold Database: https://earthquake.usgs.gov/hazards/qfaults/). Again, buildings above the fault will experience the most damage, but buildings distant from the fault situated on soft soils may be significantly damaged.

6.2 Seismic Design Level Improvements

Our seismic design level improvement modeling exercise (Section 5.3.1) provides strong support to the suggestion that seismic upgrades to buildings, or replacement of older buildings, can significantly reduce loss and casualties. Levi and others (2015) provided a case for a wide-scale retrofitting program to poor quality buildings throughout Israel, by using Hazus-generated loss estimates based on existing building inventory and a hypothetically retrofitted building inventory. The study assumed an average estimate of US$100/per square meter (US$9.30 per square foot) to upgrade older buildings to limit extensive or complete damage. Yet any proposed improvement should take site-specific conditions into account. In the “wet” (saturated) soil scenario, ground failure due to liquefaction reduces the benefits of retrofitting, as seismic upgrades do little to prevent foundation rupture, but mitigation techniques such as compaction grouting can minimize the ground failure impact, albeit at additional cost.

We urge caution in interpreting the results of **Table 5-4**. Although it offers a hypothetical upper bound of what could be achieved from seismic retrofitting, it should not be used to support the proposed retrofitting or replacement of a particular building. A building-specific analysis incorporates individual

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characteristics of the structure, specifying parameters such as its yield point (FEMA, 2010). We used generic building type models in our Hazus AEBM (Section **2.1.4**), which in the particular case, may over- or underestimate the loss (Lu and others, 2017). Further, the exercise did not incorporate building foundation depth or other local site conditions that may mitigate the effects of ground failure from liquefaction. In the Moderate scenario, our modeling exercise assumed a retrofit brings buildings up to moderate or high seismic design standards. In practice, the decision to retrofit or replace an older structure is complex (Williams and others, 2009; City Club of Portland, 2017; Paxton and others, 2017), and one that we cannot address directly in this report.

6.3 Comparison with Previous Studies

Wang (1998), using an early version of Hazus, quantified the impact of a magnitude 8.5 Cascadia Subduction Zone earthquake scenario across the state of Oregon, reporting losses by individual county. Liquefaction and landslide information were not regionally available, nor was it possible to incorporate such information in the Hazus model at that time. Hofmeister and others (2003) used Hazus to estimate impact of a magnitude 6.8 Portland Hills fault and a magnitude 9.0 Cascadia Subduction Zone earthquake scenario to buildings and bridges in Clackamas County, Oregon. The study incorporated building data from the Metro (1998) inventory, and updated soil classification and liquefaction and landslide susceptibility. Local building data were aggregated into the Hazus-MH model's General Building Stock (GBS) inventory, a census track-based unit, with loss estimates derived at the GBS level. Excluding building content, the building repair cost, expressed as a percentage of the building replacement cost, was 13.3% for the Portland Hills fault and 3.4% for the Cascadia Subduction zone earthquake. More recently, Tetra Tech (2016a) updated General Building Stock inventory data for the City of Portland, using ground motion and ground failure data from Madin and Burns (2013), and estimated loss ratios of 4.3% for a Cascadia Subduction Zone scenario and 14.3% for a Portland Hills fault magnitude 6.5 scenario, using USGS ShakeMap data.

Our building loss ratio estimates of 9% to 14% for a Cascadia Subduction Zone magnitude 9.0 earthquake, and 23% to 32% for a Portland Hills fault magnitude 6.8 earthquake are higher than the loss ratios published in the aforementioned studies. We account for this increase due to several factors. The largest contributor to the difference is the method by which the two Hazus tools (General Building Stock [GBS] and Advanced Engineering Building Module [AEBM]) factor the probability of ground failure from liquefaction or from earthquake-induced landslide into the building damage model. In the GBS model, the Hazus tool distributes the ground failure probability across the Moderate, Extensive, and Complete damage states (FEMA, 2011, Equation 5-16), with most of the ground failure probability assigned to the Moderate and Extensive states and a small (<10%) portion assigned to the Complete state. In the AEBM model, the Hazus tool assigns the ground failure probability in its entirety to the Complete damage state. The effect is that AEBM-derived building loss, casualty, and debris estimates will be larger than GBS-derived estimates when all other model inputs are equal, local geological conditions are set to moderate or higher liquefaction and/or landslide susceptibility levels, and sufficient ground motion is present to induce landslides or liquefaction.

Other contributors to the difference are as follows. In our AEBM building database, our seismic design levels (Section **10.1**) were more conservative than the seismic design level distributions embedded within the GBS database, sometimes referred to as the default Hazus mapping scheme. Our review of that scheme suggested it was primarily based on California benchmark years and thus overly optimistic, as California building codes through the twentieth century were more stringent than Oregon

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building codes (Olson, 2003; Judson, 2012, FEMA, 2017c, Table 3.5). Although it is possible to alter the Hazus mapping scheme in the General Building Stock (e.g., Seligson, 2008), to our knowledge, such manipulations were not done in the aforementioned GBS-based studies. A higher level of seismic design assignment to building inventory will result in reduced loss estimates (**Table 5-4**).

Within large portions of the developed areas in the study area, our updated liquefaction susceptibility ratings were higher than the liquefaction susceptibility ratings used in the aforementioned studies (primarily Mabey and others, 1997). Appleby and others (in preparation), using the guidelines provided by FEMA (2011, Table 4.10), classified large areas containing high-value building assets with a Very High and High rating compared to the rating of High and Moderate assigned by Mabey and others (1997), particularly in the Columbia Slough, northwest industrial Portland, and eastern downtown Portland. A large portion of the developed area in Washington County was assigned a Moderate liquefaction rating by Appleby and others, which also contributed to the increased loss estimates observed in our study.

We could not directly compare our loss estimates to the losses published by FEMA (2017b), due to their usage of a probabilistic model that did not include a 500-year earthquake, which most closely resembles the Cascadia Subduction Zone scenario modeled in our study. Their debris estimate for the state of Oregon (2.1 to 21.6 million tons) is smaller than our estimate of 12 to 17 million tons, after adjusting for our study's area. (We assume our study includes about 44% of the building assets in the state, based on the area's population ratio compared to the state of Oregon.) The FEMA report used the GBS model and a simplified NEHRP "D" assignment. To our knowledge, the study did not incorporate any liquefaction susceptibility data. Further, default Hazus building inventories, such as were used in the FEMA study, commonly underestimate the square footage for nonresidential buildings, which are generally more sensitive to ground motion. Although that study provided a good nationwide comparative perspective on earthquake hazards, it is too generalized to use for county loss estimation purposes.

We examined the geological updates and the updated ground motions within the Critical Energy Infrastructure (CEI) Hub, and we compared them to the datasets used by Tetra Tech (2016b). Although some increases were observed in the updated ground motion data, we determined that the changes were not large enough to significantly alter the overall damage estimates and recommendations made in the Tetra Tech study. We note that the Hazus GBS tool was not used to generate the damage estimates in that study; damage estimates to the infrastructure were obtained from a Hazus tool that incorporates the ground failure in a manner equivalent to the Hazus AEBM.

Our Portland Hills fault results are similar to what was estimated for a magnitude 7.0 Wasatch fault earthquake in the Salt Lake City area (EERI, 2015, p. 26). The Salt Lake City area has approximately 775,000 buildings, compared to 616,000 buildings in our study area. The two faults have significant assets constructed on top of, and near to, the fault. Both areas have major assets on moderate to high liquefaction potential soils. The key difference between the two faults is the frequency of occurrence—at least 22 large earthquakes have ruptured along the central segments of the Wasatch Fault in the past 6,000 years, whereas evidence suggests the Portland Hills fault has had two ruptures in the past 15,000 years (Liberty and others, 2003).

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7.0 RECOMMENDATIONS

This study provides detailed, actionable earthquake loss estimation data for the Portland metropolitan region at a range of scales. Communities, counties, businesses, non-governmental organizations, and regional agencies can use the accompanying data to better plan for, respond to, and recover from a major earthquake. Many of these recommendations build upon those listed in the Oregon Resilience Plan (OSSPAC, 2013). Planning for, responding to, and recovering from a major earthquake is a multi-faceted, multi-disciplinary effort. The scope of this project was limited to estimating damage to buildings and the people that occupy them, and to two key infrastructure sectors. Our recommendations below are directly supported by the findings in this study, and they should not be considered comprehensive.

Our recommendations build on the efforts done to date by agencies, institutions, businesses, and private homeowners to improve the region's seismic resilience. The Oregon Seismic Rehabilitation Grant Program, in place since 2007, has funded upgrades to more than 50 schools and emergency service buildings (http://www.oregongeology.org/sub/projects/rvs/). Bonneville Power Administration has identified seismic vulnerability of its transmission system and has taken several actions to improve its resiliency (Scruggs, 2014). Modifications to the Oregon statewide building code have, through time, increased the seismic resiliency of newer construction (Judson, 2012). The City of Portland's current building code requires owners of unreinforced masonry buildings to seismically retrofit their buildings on the basis of certain triggers (PBEM, 2017). The Great Oregon Shakeout program, managed by Oregon Office of Emergency Management, has more than 580,000 participants, elevating public awareness of the earthquake hazard; the program suggests actions individuals can take to minimize casualties and preparation for post-earthquake disruption of services.

Planning

We encourage regional and local planners, each who have their own questions and needs, to explore the accompanying GIS data. Static maps, such as in Appendix E, Plates 14–16, are just one representation of the loss estimates. We suggest that a primary value of the database is the spatial component: in addition to asking how many or how much, we can ask *where*—where might we expect casualties to be higher, given the time of day of the earthquake? Where can we plan staging areas for debris? At the same time, we caution against over-interpreting the loss estimates, as the data and methods used in this project contain large uncertainties.

Casualty estimates supplied in this report can be used to compare with the region's existing medical facility capacity, including trained, available personnel. The spatial nature of the data supplied with this report can be used to better understand the potential demands on specific facilities, and to quantify emergency care coordination needs at a regional level.

Counties and jurisdictions updating their natural hazard mitigation plans (NHMPs) can use the earthquake damage estimates provided in this report.

Recovery

Hundreds of thousands of buildings in the study area will need safety inspections after a major earthquake. The state can sponsor annual Applied Technology Council (ATC)-20 training to qualified engineers, and negotiate mutual aid agreements with other neighboring states. Timely inspection of damaged buildings will reduce pressure on temporary shelters.

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Resiliency: Buildings

The majority of buildings in the study area do not meet current seismic building code standards, although the buildings did meet code standards in place at time of construction. The state and counties can consider incentives and other options that encourage building owners to seismically upgrade their buildings. Such upgrades will reduce casualties and building repair costs and will minimize potential loss of businesses and workforce housing. Jurisdictions can consider triggers that require seismic upgrades, such as a major building renovation.

Resiliency: Infrastructure Improvements

We cannot overstate the need for a secure, regional liquid fuel supply that supports emergency response and recovery. The emergency transportation route analysis provided in this study suggests the need to identify strategically placed local fuel points of distribution. We encourage counties to work with the Oregon Department of Energy in implementing the Oregon Fuel Action Plan (ODOE, 2017), specifically, identifying priority lifeline routes and fuel points of distribution.

Electric utilities can use this study's updated ground motions and ground failure to evaluate the potential threat to their infrastructure, such as substations. Electric system resiliency analysis can incorporate the transmission structure information provided in our geodatabase to determine if additional capacity or redundancy is needed.

Resiliency: Essential and Critical Facilities

Our project did not explicitly identify or evaluate essential facilities, such as fire stations, in the study area. We encourage all communities and planners to clearly define such facilities and evaluate their seismic resilience by using the updated ground motion and ground failure data accompanying this report along with updated Rapid Visual Screening surveys (FEMA, 2015a; Lewis, 2007). Such facilities include emergency shelters and community points of distribution.

Enhanced Emergency Management Tools

Building footprints developed for this project can be incorporated into regional and statewide databases. Location and number of buildings, especially on larger rural lots, are essential information during emergency operations such as wildfire fighting.

A rapid earthquake loss assessment tool could be developed for Oregon by building on methods established in this study and other research such as that of Erdik and others (2011). Each earthquake presents scientists with new information. The synthetic earthquake ground motion data used for this project is the best estimate available from a full rupture subduction zone and a local crustal fault earthquake. In practice, the magnitude and location of an earthquake and the ground motions and ground deformation will likely vary from what was anticipated. In addition to the Portland Hills fault, several other active local crustal faults, such as the Gales Creek fault zone, exist in the study area (Personius and others, 2003). The USGS ShakeMap program (https://earthquake.usgs.gov/data/shakemap/) provides near-real-time maps of ground motion data following significant earthquakes. Having a building database and tools in place to estimate response to a particular earthquake with its own unique ground motions can provide emergency planners with a rapid post-earthquake assessment of the situation.

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Database Improvements

County and city databases could be improved with information on seismic retrofits and upgrades to individual buildings. Currently, such information is not readily available for analysis or to potential buyers of a property. At present, only one jurisdiction in the study area maintains the basics of such a database (City of Portland [2017], Unreinforced Masonry buildings).

Public Awareness

The technical information contained in this report can be used to develop practical tools and materials aimed at increasing public awareness of regional earthquake risks and encouraging preparedness actions. Examples of such tools include the Seattle and King County Ready disaster preparedness website, https://hazardready.org/seattle/ (which incorporates other natural hazards), and the report developed by the Utah Chapter of the Earthquake Engineering Research Institute describing the Wasatch Fault in Salt Lake City (EERI, 2015). Public awareness efforts should strive to reach underserved communities and communities whose primary language is other than English, as well as community members with disabilities and access or functional needs.

Future Studies

Our study was primarily focused on direct physical impacts from a major earthquake, including building repair or replacement costs. It did not consider other direct and indirect economic losses, such as lost wages. We recommend incorporating the detailed loss information from this report into a more sophisticated economic analysis, one that factors in other items such as availability of investment capital and a trained labor force, and willingness of businesses to return to the area after a damaging earthquake.

We aggregated loss data at census block groups, which is often the same aggregation unit used when social vulnerability indices are constructed (e.g., Toké and others, 2015). Schmidtlein and others (2011) compared census tract Hazus-based earthquake loss estimates with their social vulnerability indices. A similar type of an analysis could be conducted in our study area at the census block group level.

The methods developed for this project could facilitate similar earthquake impact analyses for other urbanized areas of Oregon that have known earthquake hazards, such as Klamath Falls/Altamont, Salem/Keizer, Albany/Corvallis, and Eugene/Springfield.

Although our analysis focused on impacts from an earthquake, the underlying building database can be used to quantify potential loss due to other natural hazards, such as floods, landslides, or wildfires.

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10.0 APPENDIX A: BUILDING DATABASE DEVELOPMENT

10.1 Building Database Data Sources

Table 10.1 lists the several data sources used for constructing the building asset database. The table is organized as follows: the most general data source for a particular attribute is listed first, then, where available, the source of more specific and accurate data. For example, the Regional Land Information System tax lot database had an Oregon Department of Revenue-based Property Class designation assigned to each tax lot. A lookup table provided a Hazus-based occupancy class mapping for most Property Class values. All buildings on the tax lot are given that occupancy class assignment. If better information on occupancy class was available, such as the Metro Fire/Police/School/Hospital spatial dataset, we updated the attribute with that information. More detailed datasets are typically restricted to a small subset of the buildings.

The Year Built attribute is not directly consumed by Hazus AEBM, but this attribute is used to establish the seismic design level (Section **10.2**).

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Table 10-1. Data sources used in construction of the building database. Table uses Hazus occupancy class names (FEMA, 2011, Table 3.2).

Dataset Owner/Distributor	Dataset	Date of Publication or Acquisition	Occupancy Class	Year Built	Square Footage	Number of Stories	Building Type	Summarization Unit	Notes
Metro, Portland, Oregon	Regional Land Information System: Tax Lots	February 2016	✓						Spatial association of building footprint with assessor tabular information.
Clackamas County Assessor, Oregon City, Oregon	Clackamas County Assessor Database (tabular)	June 2016	✓	✓	✓	✓	(RES2)+		Detailed information on individual structures. Square footage available only for residential properties.
Multnomah County Assessor, Portland, Oregon	Multnomah County Assessor Database (tabular)	March 2016	✓	✓	✓	✓	(RES2)+		Detailed information on individual structures.
Washington County Assessor, Hillsboro, Oregon	Washington County Assessor Database (tabular)	March 2016	✓	✓	✓	✓	(RES2)+		Detailed information on individual structures. Square footage not available for governmental or institutional buildings. Year Built information variable.
Oregon Dept. of Geology and Mineral Industries	Building footprint digitization	December 2016	✓						Assigned occupancy class during heads-up digitization with NAIP and oblique imagery. Limited to building footprint digitized for this project.
Metro, Portland, Oregon	Metro Area Disaster GIS (MADGIS) Database	1999					✓		Building construction type based on field visits and identification for ~40,000 non-single family residential buildings.
Metro, Portland, Oregon	Multi-family housing inventory	February 2017	✓				✓		Refined the distinction between single-family and multi-family residential buildings.
City of Portland	Unreinforced Masonry Building Database	January 2017		✓			✓		Includes information on seismic retrofits to URMs. Limited to City of Portland. https://www.portlandoregon.gov/bds/70767
Oregon Employment Department	North American Industry Classification System (NAICS)	September 2016	✓						Refinement of occupancy class designation for commercial and industrial buildings, building on methods described by Wein and others (2013). Data obtained under terms of a confidentiality agreement; information from dataset can be shared only in aggregate, non-individually identifiable, form.
Metro, Portland, Oregon	Regional Land Information System: Fire, Police, School, Hospital Buildings	February 2016	✓						Refinement of occupancy class designation for educational and certain governmental buildings.
Oregon Dept. of Geology and Mineral Industries	Oregon Statewide Seismic Needs Assessment (Lewis, 2007)	2007	✓	✓	✓	✓	✓		Most detailed information; limited to 777 public schools and government agency buildings.
Metro, Portland, Oregon	Regional Land Information System: Building footprints	February 2016			✓				Combined with other building footprint databases; see Section 2.1.1.
Oregon Dept. of Geology and Mineral Industries	Building footprints (Burns and others, 2011, 2013)	2011, 2013			✓				Previously digitized building footprints for portions of Multnomah and Clackamas counties.
City of Portland	Development Capacity Analysis GIS Model (City of Portland, 2012)	October 2012				✓			Established number of stories attribute for buildings in City of Portland. Used to establish building height to number of stories relationship for buildings where number of stories data were not available.
Oregon Dept. of Geology and Mineral Industries	Lidar compilation: bare earth and highest hit models	2009–2014			✓	✓			Used for building footprint (BF) development in areas where no BFs existed, and to refine existing BF database. Building height derived from lidar elevation models (highest_hit minus the bare_earth) and converted to Number of Stories using relationships established by analysis of data from City of Portland Development Capacity Analysis GIS Model. Lidar acquisition dates vary, depending on area. https://gis.dogami.oregon.gov/lidarviewer/
Metro, Portland, Oregon	Regional Land Information System: County and City Boundaries	February 2016						✓	Building spatial associations with particular jurisdictions and counties, including county unincorporated areas.
Tetra Tech, Portland, Oregon	City of Portland Risk Reporting Areas (Tetra Tech, 2016a)	September 2016						✓	Building spatial associations with one of nine Risk Reporting Areas within the City of Portland.
U.S. Census Bureau	2010 Census Block Groups	April 2010						✓	U.S. Census Block Group (CBG) 2010 boundaries, with contiguous CBGs combined by DOGAMI where needed, to establish neighborhood units. Buildings spatially associated with neighborhood units. Population numbers used to assign residential building population. https://www.census.gov/geo/reference/gtc/gtc_bg.html

+RES2 (Single-Family Manufactured Housing) available from Assessor records and, by definition, a Manufactured House building type.

10.2 Seismic Design Level Assignments

We assigned a Hazus seismic design level based on the building's construction year and type. Seismic design codes have evolved with time, with more stringent requirements developing as the natural hazard threat is better understood. We interpreted the relevant state building code histories as described by Judson (2012), Oregon Building Code Division (2002, 2010), and Business Oregon (2015) and developed a seismic design level categorization table (**Table 10-2**). The design level assignment is one of the parameters used by the Hazus tool to derive a damage estimate. Once the seismic design level was assigned to each building, we summarized the number of buildings, square footage, and replacement cost per seismic design level (**Table 10-3**). We did not have sufficient information to further classify buildings into the Hazus-supported Low-Special, Moderate-Special, and High-Special seismic design levels.

Table 10-2. Oregon seismic design level benchmark years.

Building Type	Year Built	Design Level	Basis
Single Family Dwelling (includes Duplexes)	prior to 1976	Pre Code	Interpretation of Judson (2012)
	1976 – 1991	Low Code	
	1992 – 2003	Moderate Code	
	2004 – present	High Code	
Manufactured Housing	prior to 2003	Pre Code	Interpretation of Oregon Manufactured Dwelling Special Codes (Oregon Building Codes Division, 2002)
	2003 – 2010	Low Code	
	2011 – present	Moderate Code	Interpretation of Oregon Manufactured Dwelling Special Codes Update (Oregon Building Codes Division, 2010)
All other buildings	prior to 1976	Pre Code	Interpretation of Oregon Benefit-Cost Analysis Tool (Business Oregon, 2015, p. 24)
	1976 – 1990	Low Code	
	1991 – present	Moderate Code	

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Table 10-3. Building statistics by seismic design level, per county.

County	Seismic Design Level	Number of Buildings	Building Percent	Square Footage (Thousand)	Square Footage Percent	Building Value ($ Million)	Building Cost Percent
Clackamas	Pre Code	89,647	50%	202,323	42%	24,922	40%
	Low Code	43,530	24%	146,754	30%	19,523	31%
	Moderate Code	30,638	17%	88,682	18%	11,550	19%
	High Code	15,349	9%	48,363	10%	6,394	10%
Multnomah	Pre Code	184,704	72%	489,280	60%	67,497	59%
	Low Code	28,280	11%	111,783	14%	15,884	14%
	Moderate Code	26,383	10%	101,405	13%	14,248	12%
	High Code	16,210	6%	107,620	13%	16,418	14%
Washington	Pre Code	55,806	31%	145,812	24%	19,341	23%
	Low Code	46,556	26%	215,049	36%	31,128	38%
	Moderate Code	55,092	30%	147,174	24%	18,728	23%
	High Code	23,657	13%	94,936	16%	13,534	16%
Total Study Area	Pre Code	330,157	54%	837,415	44%	111,760	43%
	Low Code	118,366	19%	473,586	25%	66,535	26%
	Moderate Code	112,113	18%	337,261	18%	44,526	17%
	High Code	55,216	9%	250,918	13%	36,347	14%

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10.3 Buildings by Geological Classification

To better understand the potential influence of local geology on the damage estimates, we summarized building information by National Earthquake Hazards Reduction Program (NEHRP) site classification and landslide and liquefaction susceptibility.

The NEHRP site classification bins a soil column's average shear wave velocity (V_{s30}), measured between 0 (surface) and 30 meters depth, into one of six categories. The site classification can be used to estimate the amplification of bedrock ground motion that may be experienced at the surface during an earthquake. Lower ratings, such as "B" and "C," minimally amplify the bedrock ground motion. Softer soil columns with lower V_{s30} values experience more surface ground motion due to the soil column's amplifying the bedrock ground motion. NEHRP site class "F" is assigned to soil columns primarily composed of fill material or certain types of clays or peat. For building seismic design purposes, such soils generally require site-specific investigations. For Hazus modeling purposes, we take a conservative approach by reclassifying NEHRP site class "F" into NEHRP site class "E"—the classification with the highest site amplification (Section **11.1**). Summary statistics in **Table 10-4** show that while a relatively small percentage of buildings are placed on NEHRP Site Classification "E" and "F" soils, their proportional building value in Multnomah County is large.

Table 10-4. Building statistics by NEHRP site classification, per county.

County	NEHRP Site Classification	Number of Buildings	Building Percent	Square Footage (Thousand)	Square Footage Percent	Building Value ($ Million)	Building Value Percent
Clackamas	B	367	0%	746	0%	84	0%
	C	109,012	61%	278,528	57%	35,172	56%
	D	58,301	33%	178,653	37%	23,616	38%
	E, F	11,484	6%	28,195	6%	3,518	6%
Multnomah	B	32	0%	63	0%	8	0%
	C	118,487	46%	251,404	31%	32,828	29%
	D	126,550	50%	403,956	50%	58,160	51%
	E, F	10,508	4%	154,665	19%	23,050	20%
Washington	C	21,724	12%	63,586	11%	8,484	10%
	D	154,153	85%	525,041	87%	72,507	88%
	E, F	5,234	3%	14,343	2%	1,741	2%
Total Study Area	B	399	0%	808	0%	92	0%
	C	249,223	40%	593,519	31%	76,483	30%
	D	339,004	55%	1,107,651	58%	154,284	60%
	E, F	27,226	4%	197,202	10%	28,310	11%

The liquefaction and earthquake-induced landslide susceptibility rating is a description of a site's characteristics; it is *not* descriptive of an earthquake-induced landslide or liquefaction occurrence for a particular earthquake scenario. The susceptibility ratings are a generalization of the Hazus-based classifications, obtained from Appleby and others (in preparation), with the groupings listed at the bottom of each table (**Table 10-5** and **Table 10-6**). In all three counties, relatively few buildings are in high landslide susceptibility areas. In Washington County, at least 80% of the building value is on moderate liquefaction susceptibility soils.

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Table 10-5. Building statistics by Hazus-based liquefaction susceptibility rating, per county.

County	Liquefaction Susceptibility	Number of Buildings	Building Percent	Square Footage (Thousand)	Square Footage Percent	Building Value ($ Million)	Building Value Percent
Clackamas	None to Low	113,010	63%	288,505	59%	36,392	58%
	Moderate	58,905	33%	179,466	37%	23,738	38%
	High	746	0%	2,279	0%	276	0%
	Very High	6,503	4%	15,873	3%	1,984	3%
Multnomah	None to Low	118,909	47%	252,600	31%	32,990	29%
	Moderate	115,200	45%	377,721	47%	54,990	48%
	High	13,713	5%	34,224	4%	4,295	4%
	Very High	7,755	3%	145,543	18%	21,772	19%
Washington	None to Low	23,685	13%	67,804	11%	8,964	11%
	Moderate	149,053	82%	510,591	85%	70,625	85%
	High	6,005	3%	17,204	3%	2,239	3%
	Very High	2,368	1%	7,371	1%	903	1%
Total Study Area	None to Low	255,604	42%	608,909	32%	78,346	30%
	Moderate	323,158	52%	1,067,777	56%	149,354	58%
	High	20,464	3%	53,707	3%	6,810	3%
	Very High	16,626	3%	168,787	9%	24,659	10%

Hazus-based liquefaction scale mapping: 0–2: none to low; 3: moderate; 4: high; 5: very high.

Table 10-6. Building statistics by Hazus-based earthquake-induced landslide susceptibility rating, per county.

County	Landslide Susceptibility	Number of Buildings	Building Percent	Square Footage (Thousand)	Square Footage Percent	Building Value ($ Million)	Building Value Percent
Clackamas	Low	161,505	90%	440,935	91%	56,485	91%
	Moderate	14,582	8%	37,445	8%	4,890	8%
	High to Very High	3,077	2%	7,742	2%	1,015	2%
Multnomah	Low	224,754	88%	614,891	76%	84,347	74%
	Moderate	23,638	9%	167,945	21%	25,449	22%
	High to Very High	7,185	3%	27,251	3%	4,250	4%
Washington	Low	164,795	91%	548,657	91%	75,370	91%
	Moderate	13,364	7%	44,242	7%	6,012	7%
	High to Very High	2,952	2%	10,071	2%	1,351	2%
Total Study Area	Low	551,054	89%	1,604,483	84%	216,202	83%
	Moderate	51,584	8%	249,632	13%	36,351	14%
	High to Very High	13,214	2%	45,064	2%	6,616	3%

Hazus-based landslide scale mapping: 0–5: none to low; 6–7: moderate; 8–10: high to very high.

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10.4 Buildings by Primary Usage

We summarized the number of buildings on a generalized Hazus occupancy class basis, which is a classification of a building's dominant use (**Table 10-7**). In the case of mixed-use buildings, such as retail stores on the first floor and residential quarters on the upper floors, we assigned the occupancy class based on the largest square foot usage.

Table 10-7. Buildings statistics by primary usage, per county.

County	Building Use	Number of Buildings	Building Percent	Square Footage (Thousand)	Square Footage Percent	Building Value ($ Million)	Building Value Percent
Clackamas	Agricultural	22,768	13%	52,063	11%	5,541	9%
	Commercial	4,593	3%	54,616	11%	7,929	13%
	Industrial	1,573	1%	20,621	4%	3,063	5%
	Institutional	2,558	1%	23,264	5%	3,940	6%
	Multi-family Residential	8,959	5%	40,880	8%	6,293	10%
	Single-family Residential	138,713	77%	294,677	61%	35,624	57%
Multnomah	Agricultural	2,540	1%	8,146	1%	867	1%
	Commercial	11,544	5%	210,231	26%	33,390	29%
	Industrial	1,685	1%	45,292	6%	6,874	6%
	Institutional	3,094	1%	50,145	6%	8,812	8%
	Multi-family Residential	24,197	9%	140,585	17%	22,428	20%
	Single-family Residential	212,517	83%	355,689	44%	41,675	37%
Washington	Agricultural	10,753	6%	26,823	4%	2,855	3%
	Commercial	5,863	3%	104,377	17%	15,815	19%
	Industrial	1,399	1%	50,567	8%	8,548	10%
	Institutional	1,931	1%	28,098	5%	4,856	6%
	Multi-family Residential	18,475	10%	98,385	16%	15,671	19%
	Single-family Residential	142,690	79%	294,721	49%	34,987	42%

Commercial includes the Hazus RES4 class. Institutional combines the Hazus GOV1, GOV2, EDU1, EDU2, and REL1 classes. Single-family residential combine the Hazus RES1 and RES2 classes.

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10.5 Building Type by Primary Usage

We summarized the number of buildings by their generalized basic structural system (in Hazus, referred to as the building type), by generalized occupancy class (**Table 10-8**). Although several ancillary datasets informed our assignments (Section **2.1.4**), most (563,583 out of 615,852, or 92%) were based on the statistical distributions listed in the Hazus Earthquake Technical Manual (FEMA, 2011, Tables 3.A1–3.A.10).

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Table 10-8. Building type by generalized building use.

Building Use	Building Type	Number of Buildings	Building Percent	Square Footage (Thousand)	Square Footage Percent	Cost ($ Million)	Cost Percent
Agricultural	Concrete	1,650	5%	4,032	5%	429	5%
	Precast Concrete	2,921	8%	7,130	8%	759	8%
	Reinforced Masonry	4,327	12%	10,973	13%	1,168	13%
	Steel	8,772	24%	20,635	24%	2,196	24%
	Trailers	365	1%	588	1%	63	1%
	Unreinforced Masonry	1,097	3%	2,896	3%	308	3%
	Wood	16,929	47%	40,778	47%	4,340	47%
Commercial	Concrete	3,530	16%	78,946	21%	13,635	24%
	Precast Concrete	2,304	10%	82,355	22%	10,624	19%
	Reinforced Masonry	4,660	21%	58,567	16%	8,729	15%
	Steel	3,143	14%	74,659	20%	12,263	21%
	Trailers	7	0%	36	0%	7	0%
	Unreinforced Masonry	1,654	8%	14,842	4%	2,271	4%
	Wood	6,702	30%	59,819	16%	9,606	17%
Industrial	Concrete	579	12%	17,557	15%	2,840	15%
	Precast Concrete	904	19%	40,200	35%	6,557	35%
	Reinforced Masonry	569	12%	13,527	12%	2,332	13%
	Steel	1,649	35%	33,406	29%	5,206	28%
	Trailers	51	1%	179	0%	21	0%
	Unreinforced Masonry	155	3%	1,939	2%	259	1%
	Wood	750	16%	9,672	8%	1,270	7%
Institutional	Concrete	1,685	22%	29,392	29%	5,130	29%
	Precast Concrete	347	5%	7,989	8%	1,337	8%
	Reinforced Masonry	1,689	22%	21,678	21%	3,751	21%
	Steel	1,225	16%	14,277	14%	2,483	14%
	Trailers	9	0%	30	0%	5	0%
	Unreinforced Masonry	328	4%	4,861	5%	853	5%
	Wood	2,300	30%	23,279	23%	4,050	23%
Multi-Family Residential	Concrete	1,091	2%	28,476	10%	5,114	12%
	Precast Concrete	115	0%	2,801	1%	509	1%
	Reinforced Masonry	1,331	3%	16,026	6%	2,876	6%
	Steel	1,636	3%	22,913	8%	4,011	9%
	Unreinforced Masonry	403	1%	5,380	2%	947	2%
	Wood	47,055	91%	204,253	73%	30,934	70%
Single-Family Residential	Other	138	0%	377	0%	44	0%
	Reinforced Masonry	3,549	1%	7,349	1%	893	1%
	Unreinforced Masonry	1,455	0%	2,298	0%	268	0%
	Wood	471,926	99%	914,096	99%	110,199	99%
Single-Family Res. – Manuf. Housing		16,852	100%	20,966	100%	882	100%

Commercial combines all Hazus COM occupancy classes and RES4. Institutional combines Hazus occupancy classes REL1, GOV1, EDU1, and EDU2. Multi-family residential is limited to RES3, RES5, and RES6 types. Single-Family Residential – Manuf. Housing is the Hazus occupancy class RES2, and is broken out separately, given the building type's heightened sensitivity to ground shaking.

11.0 APPENDIX B: SITE GROUND MOTION AND GROUND DEFORMATION MAP DEVELOPMENT

11.1 Site Ground Motion Maps

We converted the bedrock ground motion data referenced in Section 3.1 to a 30-foot grid limited in extent to the three-county study area. For the Portland Hills fault magnitude 6.8 earthquake, we used the Nearest Neighbor tool in the Esri Spatial Analyst. For the Cascadia Subduction Zone magnitude 9.0 earthquake, we used the bedrock data published by Madin and Burns (2013). The NEHRP site classification polygons from Appleby and others (in preparation) were converted to a 30-foot grid. Sites classified as NEHRP "F" were re-assigned to NEHRP "E," a conservative and commonly implemented assumption for loss estimation purposes.

We used the revised F_a, F_v, and F_{PGA} site coefficients as published by FEMA (2015b, Tables 11.4-1, 11.4-2, 11.8-1) to derive site ground motion. For completeness, we include the NEHRP "A" class (V_{s30} > 1,500 m/s), even though such stiff material is not present in the study area. We note the coefficients are identical to what is used by the Hazus 4.0 model for probabilistic and arbitrary earthquake events available in the Hazus SQL database tables as:

[dbo].[eqPGASoilAmpFact],
[dbo].[eqPGVSoilAmpFact] ,
[dbo].[eqSa03SoilAmpFact] , and
[dbo].[eqSa10SoilAmpFact].

The coefficients applied directly will result in a non-monotonic site amplification function. To overcome the problem, we implemented the straight-line interpolation guidance given by FEMA (2015b) for intermediate values, and we added a *y*-intercept to the amplification function and adjusted the slope factor, so that the end point of the interval matches the specified amplification. We note the Hazus tool implements a similar piecewise linear function for probabilistic and arbitrary earthquakes. The functions listed in **Table 11-1** through **Table 11-4** were then implemented using the Esri Spatial Analyst raster calculator as a series of conditional statements.

For Hazus purposes, the raster data were converted to the requisite polygon data format by first discretizing the continuous site ground motion data into integer *percent g* bins, then converting the integer raster data to polygon format. The pgv was rounded to the nearest integer inches/second category, and then converted to polygon format.

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Table 11-1. Site amplification coefficients for peak ground acceleration (pga, in g).

	Site Multiplication Coefficients NEHRP Site Classification					Piecewise Linear Representation NEHRP Site Classification				
pga_bedrock	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**
0.0–0.1	0.8	0.9	1.3	1.6	2.4	0.8*x + 0	0.9*x + 0	1.3*x + 0	1.6*x + 0	2.4*x + 0
0.1–0.2	0.8	0.9	1.2	1.4	1.9	0.8*x + 0	0.9*x + 0	1.1*x + 0.02	1.2*x + 0.04	1.4*x + 0.1
0.2–0.3	0.8	0.9	1.2	1.3	1.6	0.8*x + 0	0.9*x + 0	1.2*x + 0	1.1*x + 0..06	1.0*x + 0.18
0.3–0.4	0.8	0.9	1.2	1.2	1.4	0.8*x + 0	0.9*x + 0	1.2*x + 0	0.9*x + 0.12	0.8*x + 0.24
0.4–0.5	0.8	0.9	1.2	1.1	1.2	0.8*x + 0	0.9*x + 0	1.2*x + 0	0.7*x + 0.2	0.4*x + 0.4
> 0.5	0.8	0.9	1.2	1.1	1.2	0.8*x + 0	0.9*x + 0	1.2*x + 0	1.1*x + 0	1.1*x + 0.05

Table 11-2. Site amplification coefficients for peak ground velocity (pgv, in inches/second).

	Site Multiplication Coefficients NEHRP Site Classification					Piecewise Linear Representation NEHRP Site Classification				
pgv_bedrock	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**
0–3.75	0.8	1.0	1.7	2.4	3.5	0.8*x + 0	1.0*x + 0	1.7*x + 0	2.4*x + 0	3.5*x + 0
3.75–7.5	0.8	1.0	1.6	2.0	3.2	0.8*x + 0	1.0*x + 0	1.5*x + 0.75	1.6*x + 3	2.9*x + 2.25
7.5–11.25	0.8	1.0	1.5	1.8	2.8	0.8*x + 0	1.0*x + 0	1.3*x + 2.25	1.4*x + 4.5	2.0*x + 9.0
11.25–15	0.8	1.0	1.4	1.6	2.4	0.8*x + 0	1.0*x + 0	1.1*x + 4.5	1.0*x + 9	1.2*x + 18
15–18.75	0.8	1.0	1.3	1.5	2.0	0.8*x + 0	1.0*x + 0	0.9*x + 7.5	1.1*x + 7.5	0.4*x + 30
> 18.75	0.8	1.0	1.3	1.5	2.0	0.8*x + 0	1.0*x + 0	1.3*x + 0	1.5*x + 0	2.0*x + 0

Table 11-3. Site amplification coefficients for spectral acceleration at 0.3 second (sa03, in g).

	Site Multiplication Coefficients NEHRP Site Classification					Piecewise Linear Representation NEHRP Site Classification				
sa03_bedrock	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**
0–0.25	0.8	0.9	1.3	1.6	2.4	0.8*x + 0	0.9*x + 0	1.3*x + 0	1.6*x + 0	2.4*x + 0
0.25–0.50	0.8	0.9	1.3	1.4	1.7	0.8*x + 0	0.9*x + 0	1.3*x + 0	1.2*x + 0.1	1.0*x + 0.35
0.50–0.75	0.8	0.9	1.2	1.2	1.3	0.8*x + 0	0.9*x + 0	1.0*x + 0.15	0.8*x + 0.3	0.5*x + 0.6
0.75–1.00	0.8	0.9	1.2	1.1	1.1	0.8*x + 0	0.9*x + 0	1.2*x + 0	0.8*x + 0.3	0.5*x + 0.6
1.00–1.25	0.8	0.9	1.2	1.0	0.9	0.8*x + 0	0.9*x + 0	1.2*x + 0	0.6*x + 0.5	1.0*x + 1
> 1.25	0.8	0.9	1.2	1.0	0.9	0.8*x + 0	0.9*x + 0	1.2*x + 0	1.0*x + 0	0.9*x + 0

Table 11-4. Site amplification coefficients for spectral acceleration at 1.0 second (sa10, in g).

	Site Multiplication Coefficients NEHRP Site Classification					Piecewise Linear Representation NEHRP Site Classification				
sa10_bedrock	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**
0–0.1	0.8	0.8	1.5	2.4	4.2	0.8*x + 0	0.8*x + 0	1.5*x + 0	2.4*x + 0	4.2*x + 0
0.1–0.2	0.8	0.8	1.5	2.2	3.3	0.8*x + 0	0.8*x + 0	1.5*x + 0	2.0*x + 0.04	2.4*x + 0.18
0.2–0.3	0.8	0.8	1.5	2.0	2.8	0.8*x + 0	0.8*x + 0	1.5*x + 0	1.6*x + 0.12	1.8*x + 0.3
0.3–0.4	0.8	0.8	1.5	1.9	2.4	0.8*x + 0	0.8*x + 0	1.5*x + 0	1.6*x + 0.12	1.2*x + 0.48
0.4–0.5	0.8	0.8	1.5	1.8	2.2	0.8*x + 0	0.8*x + 0	1.5*x + 0	1.4*x + 0.2	1.4*x + 0.4
> 0.5	0.8	0.8	1.4	1.7	2.0	0.8*x + 0	0.8*x + 0	1.4*x + 0.05	1.7*x + 0.05	2.0*x + 0.1

11.2 Ground Deformation Maps

We provided the liquefaction and landslide susceptibility data from Appleby and others (in preparation) and the site peak ground acceleration data for both earthquake scenarios developed in Section 3.2 as input to the tool developed by Sharifi-Mood and others (in preparation). The tool implements the methods for permanent ground deformation (PGD) estimation described by Madin and Burns (2013, Section 4), which implemented the Hazus ground failure models described in the Hazus Earthquake Technical Manual (FEMA, 2011). The tool generates raster grids describing the amount and probability of PGD resulting from liquefaction lateral spreading and earthquake-induced landslides. The tool is currently limited to modeling lateral spread from liquefaction in "wet" (saturated) soil conditions. For earthquake-induced landslide modeling, it implements the WET portion of Table 4.15 in the Hazus Earthquake Technical Manual (FEMA, 2011). For liquefaction, it assumes a water depth of 5.0 feet. The tool provides PGD and probability of occurrence estimates for liquefaction lateral spreading and for earthquake-induced landslides. The data are provided in the accompanying geodatabase for the CSZ and the Portland Hills fault simulated earthquakes.

To aid in interpretation, Appendix E, Plates 8 and 9 combine the PGD and probability occurrence from the two mechanisms (earthquake-induced landslides and lateral spread resulting from liquefaction). For a given raster cell, the plates represent the maximum PGD and maximum probability from the two mechanisms.

Our "dry" soil conditions scenario assumes non-saturated soils, thus ground failure due to liquefaction does not occur. However, earthquake-induced landslides may still occur, depending on the ground shaking intensity and local geologic conditions (FEMA, 2011, Table 4.15(A)). To overcome the current limitation of the tool, we developed a "dry" soil conditions scenario ground failure model due to earthquake-induced landslides as follows. As part of a statewide multi-hazard risk assessment effort for Oregon, we developed a lookup table method for rapid loss estimation from a Cascadia Subduction Zone earthquake (Bauer, 2016). All combinations of ground motion, at discrete intervals, and all combinations of liquefaction and landslide susceptibility values, were run through the Hazus model. Building loss ratios, along with ground failure probabilities and lateral spread amount, were captured in a lookup table. Of the four site ground motion parameters (Section **11.1**), the Hazus ground failure model uses only the site peak ground acceleration. A Hazus-based ground failure layer can then be created by associating the local landslide susceptibility rating and the site peak ground acceleration with the lookup table. We repeated the lookup table process for the Portland Hills fault "dry" soil conditions scenario.

The "dry" soil conditions scenario ground failure and probability values are included in the accompanying geodatabase. The lookup table method used the discretized peak ground acceleration (pga) intervals described in Section **11.1** and while it is not as continuous as what is available via the tool developed by Sharifi-Mood and others (in preparation), we determined it is a reasonable representation of the Hazus ground failure model for earthquake-induced landslides in the "dry" soil conditions scenario.

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12.0 APPENDIX C: BUILDING DAMAGE ASSESSMENT AND IMPACTS TO OCCUPANTS

12.1 Number of Buildings by Damage State

We summarized the number of buildings in each damage state, by county (**Table 12-1**), using the structural damage states (StrPDS) obtained from the Hazus AEBM output. The quantification of buildings in each damage state follows the methods discussed by FEMA (2017a). The information can inform the planning process for post-earthquake building inspection needs.

Table 12-1. Number of buildings per damage state, by county and by earthquake and soil moisture scenario. Numbers for buildings in the None damage state are not included.

		Cascadia Subduction Zone Magnitude 9.0 Earthquake				Portland Hills Fault Magnitude 6.8 Earthquake			
County (Number of Buildings)	**Building Damage State**	**"Dry" Soil**	**Building Percent**	**"Wet" Saturated Soil**	**Building Percent**	**"Dry" Soil**	**Building Percent**	**"Wet" Saturated Soil**	**Building Percent**
Clackamas (179,164)	Slight	34,145	19%	33,133	18%	46,152	26%	42,988	24%
	Moderate	15,936	9%	15,386	9%	47,122	26%	43,417	24%
	Extensive	5,390	3%	5,228	3%	22,526	13%	20,761	12%
	Complete	2,265	1%	6,267	3%	12,898	7%	24,008	13%
Multnomah (255,577)	Slight	54,660	21%	52,362	20%	72,471	28%	64,772	25%
	Moderate	25,194	10%	23,946	9%	69,876	27%	61,556	24%
	Extensive	7,478	3%	7,017	3%	28,338	11%	25,590	10%
	Complete	3,536	1%	13,039	5%	14,843	6%	39,970	16%
Washington (181,111)	Slight	44,673	25%	41,807	23%	57,184	32%	49,602	27%
	Moderate	20,381	11%	19,012	11%	44,766	25%	38,807	21%
	Extensive	6,303	3%	5,892	3%	15,892	9%	14,519	8%
	Complete	2,784	2%	14,026	8%	6,492	4%	28,194	16%
Study Area Total (615,852)	Slight	133,478	22%	127,301	21%	175,807	29%	157,363	26%
	Moderate	61,512	10%	58,344	9%	161,765	26%	143,781	23%
	Extensive	19,171	3%	18,137	3%	66,756	11%	60,870	10%
	Complete	8,585	1%	33,331	5%	34,233	6%	92,171	15%
Total number of damaged buildings		232,811	38%	237,113	39%	438,560	71%	454,185	74%

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12.2 Number of Collapsed Buildings

We used the collapse percentage rates listed in the Hazus Earthquake Technical Manual (FEMA, 2011, Table 13.8), together with probability of Complete structural damage state from the Hazus AEBM output, to estimate the number of collapsed buildings by county and earthquake scenario (**Table 12-2**). The casualty calculations built into Hazus AEBM factor in an assumption that a percentage of completely damaged buildings will collapse, which varies based on building type. For example, the Hazus methods estimate 15% of completely damaged unreinforced masonry buildings will collapse, whereas completely damaged manufactured housing and single family wood frame construction buildings have only a 3% chance of collapse.

Table 12-2. Collapsed buildings by county and by earthquake and soil moisture conditions

		Cascadia Subduction Zone Magnitude 9.0 Earthquake		Portland Hills Fault Magnitude 6.8 Earthquake	
County	Total Number of Buildings	"Dry" Soils	"Wet" (Saturated) Soils	"Dry" Soil	"Wet" (Saturated) Soils
Clackamas	179,164	158	313	666	1,066
Multnomah	255,577	302	677	1,001	1,876
Washington	181,111	209	619	387	1,155
Total	615,852	668	1,609	2,054	4,097

12.3 Permanent Residents by Building Damage State

We assigned permanent residents to individual residential buildings based on the building's square footage, the total square footage of residential buildings for a census block group, and the U.S. Census 2010 population amount for that census block group (Section **2.1.7**). Using the Hazus AEBM output, we multiplied the individual building's permanent residential population by each structural probability of damage state. Summary statistics by county and earthquake scenario are provided in **Table 12-3**. Note the figures in the Complete state are the same as the long-term displaced population figures in **Table 12-4** through **Table 12-7**. The Hazus Complete damage state equates to the ATC-20 red-tag designation (ATC, 1989), and the Extensive damage state equates to the ATC-20 yellow-tag designation. All other building damage states are considered green-tagged (FEMA, 2010, Table 6.1). Qualitative descriptions of the building damage states as relates to the characteristics of the building, per building type (such as Steel Moment Frame), are provided by FEMA (2011, Section 5.3).

Table 12-3. Permanent residents per building damage state, by county and by earthquake and soil moisture conditions scenario.Numbers for permanent residents occupying buildings in the None damage state are not included.

		Cascadia Subduction Zone Magnitude 9.0 Earthquake		Portland Hills Fault Magnitude 6.8 Earthquake	
County	Building Damage State	"Dry" Soil	"Wet" (Saturated) Soil	"Dry" Soil	"Wet" (Saturated) Soil
Clackamas	Slight	75,828	73,670	101,881	94,448
	Moderate	31,559	30,471	105,523	96,722
	Extensive	6,644	6,580	47,996	44,065
	Complete	1,931	10,093	25,152	50,802
Multnomah	Slight	158,506	151,736	203,333	182,865
	Moderate	84,462	79,688	190,409	167,696
	Extensive	24,258	22,643	81,131	72,394
	Complete	9,736	37,461	50,842	120,124
Washington	Slight	133,418	125,169	168,428	145,320
	Moderate	66,488	62,313	137,364	118,446
	Extensive	16,055	15,165	48,269	43,868
	Complete	5,185	37,657	19,582	86,010
Total	Slight	367,752	350,575	473,642	422,632
	Moderate	182,509	172,471	433,296	382,865
	Extensive	46,957	44,387	177,396	160,328
	Complete	16,852	85,211	95,577	256,936

We recognize that planning for short-term and long-term shelter needs throughout the response and recovery phases is a complex task requiring many assumptions, but at its base the planning requires underlying data on demographics as relates to predicted building damage. **Table 12-4** through **Table 12-7** quantify the number of buildings and permanent residents by generalized occupancy, per county and per building damage state, for the four earthquake scenarios.

Table 12-4. Buildings and permanent residents per building damage state for Cascadia Subduction Zone magnitude 9.0 earthquake, "dry" soil conditions. Dash (—): not applicable

							Number of Buildings								Number of Permanent Residents								
							Slight Damage		Moderate Damage		Extensive Damage		Complete Damage			Slight Damage		Moderate Damage		Extensive Damage		Complete Damage	
Building Category	Total Number of Buildings	Building Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Number of Collapsed Buildings	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Total	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Clackamas County																							
Agricultural	22,768	52,063	5,541	465	8%	78	3,882	17%	3,276	14%	1,818	8%	992	4%	—	—	—	—	—	—	—	—	—
Commercial	4,593	54,616	7,929	927	12%	24	823	18%	894	19%	544	12%	248	5%	—	—	—	—	—	—	—	—	—
Industrial	1,573	20,621	3,063	396	13%	11	246	16%	372	24%	278	18%	145	9%	—	—	—	—	—	—	—	—	—
Institutional	2,558	23,264	3,940	391	10%	17	448	17%	530	21%	335	13%	162	6%	—	—	—	—	—	—	—	—	—
Multi-family residential	8,959	40,880	6,293	305	5%	3	1,964	22%	975	11%	190	2%	50	1%	55,042	13,571	25%	9,036	16%	1,965	4%	563	1%
Single-family residential	132,641	286,514	35,282	672	2%	9	25,687	19%	8,226	6%	1,002	1%	167	0%	309,744	60,191	19%	19,412	6%	2,477	1%	501	0%
Manufactured housing	6,072	8,163	343	51	15%	15	1,096	18%	1,662	27%	1,223	20%	502	8%	11,206	2,067	18%	3,111	28%	2,202	20%	868	8%
Multnomah County																							
Agricultural	2,540	8,146	867	114	13%	16	455	18%	403	16%	252	10%	188	7%	—	—	—	—	—	—	—	—	—
Commercial	11,544	210,231	33,390	7,144	21%	158	1,878	16%	2,387	21%	1,915	17%	1,433	12%	—	—	—	—	—	—	—	—	—
Industrial	1,685	45,292	6,874	1,905	28%	39	204	12%	341	20%	374	22%	398	24%	—	—	—	—	—	—	—	—	—
Institutional	3,094	50,145	8,812	1,257	14%	25	555	18%	664	21%	438	14%	229	7%	—	—	—	—	—	—	—	—	—
Multi-family residential	24,197	140,585	22,428	1,829	8%	22	5,078	21%	2,539	10%	655	3%	248	1%	215,232	46,355	22%	39,385	18%	15,311	7%	7,328	3%
Single-family residential	206,322	348,436	41,371	1,034	2%	23	45,563	22%	16,840	8%	2,203	1%	373	0%	507,022	110,112	22%	40,851	8%	5,648	1%	1,126	0%
Manufactured housing	6,195	7,253	304	57	19%	20	927	15%	2,020	33%	1,641	26%	667	11%	13,080	2,039	16%	4,226	32%	3,299	25%	1,282	10%
Washington County																							
Agricultural	10,753	26,823	2,855	368	13%	76	2,305	21%	1,808	17%	1,120	10%	884	8%	—	—	—	—	—	—	—	—	—
Commercial	5,863	104,377	15,815	2,310	15%	47	1,083	18%	1,321	23%	948	16%	460	8%	—	—	—	—	—	—	—	—	—
Industrial	1,399	50,567	8,548	1,350	16%	13	234	17%	341	24%	276	20%	143	10%	—	—	—	—	—	—	—	—	—
Institutional	1,931	28,098	4,856	790	16%	21	333	17%	438	23%	338	18%	189	10%	—	—	—	—	—	—	—	—	—
Multi-family residential	18,475	98,385	15,671	1,155	7%	20	4,588	25%	2,754	15%	811	4%	305	2%	141,844	35,337	25%	29,225	21%	8,879	6%	3,169	2%
Single-family residential	138,117	289,198	34,755	990	3%	18	35,281	26%	12,139	9%	1,637	1%	308	0%	379,323	96,542	25%	34,321	9%	4,916	1%	1,047	0%
Manufactured housing	4,573	5,523	232	49	21%	15	850	19%	1,582	35%	1,173	26%	495	11%	8,543	1,539	18%	2,943	34%	2,260	26%	969	11%
Study Area (All Three Counties)																							
Agricultural	36,061	87,033	9,263	947	10%	170	6,642	18%	5,487	15%	3,190	9%	2,063	6%	—	—	—	—	—	—	—	—	—
Commercial	22,000	369,224	57,134	10,381	18%	229	3,783	17%	4,603	21%	3,407	15%	2,141	10%	—	—	—	—	—	—	—	—	—
Industrial	4,657	116,480	18,485	3,651	20%	63	683	15%	1,054	23%	928	20%	685	15%	—	—	—	—	—	—	—	—	—
Institutional	7,583	101,507	17,609	2,438	14%	62	1,336	18%	1,632	22%	1,112	15%	580	8%	—	—	—	—	—	—	—	—	—
Multi-family residential	51,631	279,849	44,391	3,288	7%	45	11,630	23%	6,267	12%	1,656	3%	604	1%	412,118	95,262	23%	77,646	19%	26,155	6%	11,060	3%
Single-family residential	477,080	924,147	111,408	2,695	2%	50	106,532	22%	37,205	8%	4,843	1%	848	0%	1,196,089	266,845	22%	94,583	8%	13,041	1%	2,674	0%
Manufactured housing	16,840	20,940	879	158	18%	50	2,872	17%	5,263	31%	4,036	24%	1,664	10%	32,829	5,645	17%	10,280	31%	7,762	24%	3,119	10%
Total	615,852	1,899,180	259,169	23,558	9%	668	133,478	22%	61,512	10%	19,171	3%	8,585	1%	1,641,036	367,752	22%	182,509	11%	46,957	3%	16,852	1%

Number of buildings estimates are derived using the Hazus Advanced Engineering Building Module (AEBM) structural probability of damage states (FEMA, 2010).

Institutional combines Hazus occupancy classes REL1, GOV1, GOV2, EDU1, and EDU2. Commercial combines all Hazus COM occupancy classes and RES4. Multi-family residential combines the Hazus occupancy classes RES3, RES5, and RES6 categories.

Permanent resident values are based on U.S. Census 2010 population data. Permanent residents are assigned only to buildings designated as Hazus occupancy class RES1, RES2, RES3, RES5, and RES6.

Manufactured housing building category is limited to Hazus occupancy class RES2, and does not include modular construction that may be present in other Hazus occupancy classes.

Table 12-5. Buildings and permanent residents per building damage state for Cascadia Subduction Zone magnitude 9.0 earthquake, "wet" (saturated) soil conditions. Dash (—): not applicable

							Number of Buildings								Number of Permanent Residents								
							Slight Damage		Moderate Damage		Extensive Damage		Complete Damage			Slight Damage		Moderate Damage		Extensive Damage		Complete Damage	
Building Category	Total Number of Buildings	Building Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Number of Collapsed Buildings	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Total	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Clackamas County																							
Agricultural	22,768	52,063	5,541	598	11%	114	3,747	16%	3,159	14%	1,733	8%	1,570	7%	—	—	—	—	—	—	—	—	—
Commercial	4,593	54,616	7,929	1,124	14%	34	801	17%	864	19%	516	11%	367	8%	—	—	—	—	—	—	—	—	—
Industrial	1,573	20,621	3,063	476	16%	15	240	15%	360	23%	263	17%	188	12%	—	—	—	—	—	—	—	—	—
Institutional	2,558	23,264	3,940	461	12%	23	437	17%	511	20%	314	12%	229	9%	—	—	—	—	—	—	—	—	—
Multi-family residential	8,959	40,880	6,293	426	7%	9	1,919	21%	946	11%	186	2%	223	2%	55,042	13,269	24%	8,746	16%	1,906	3%	1,663	3%
Single-family residential	132,641	286,514	35,282	1,431	4%	99	24,909	19%	7,924	6%	1,038	1%	3,075	2%	309,744	58,361	19%	18,680	6%	2,548	1%	7,377	2%
Manufactured housing	6,072	8,163	343	57	17%	18	1,080	18%	1,622	27%	1,177	19%	614	10%	11,206	2,040	18%	3,045	27%	2,126	19%	1,053	9%
Multnomah County																							
Agricultural	2,540	8,146	867	191	22%	30	408	16%	358	14%	219	9%	408	16%	—	—	—	—	—	—	—	—	—
Commercial	11,544	210,231	33,390	9,977	30%	226	1,747	15%	2,196	19%	1,713	15%	2,150	19%	—	—	—	—	—	—	—	—	—
Industrial	1,685	45,292	6,874	2,613	38%	53	183	11%	300	18%	317	19%	542	32%	—	—	—	—	—	—	—	—	—
Institutional	3,094	50,145	8,812	1,614	18%	37	530	17%	628	20%	406	13%	364	12%	—	—	—	—	—	—	—	—	—
Multi-family residential	24,197	140,585	22,428	3,180	14%	56	4,868	20%	2,408	10%	621	3%	1,109	5%	215,232	44,050	20%	36,542	17%	13,911	6%	17,065	8%
Single-family residential	206,322	348,436	41,371	2,846	7%	247	43,729	21%	16,126	8%	2,217	1%	7,543	4%	507,022	105,712	21%	39,101	8%	5,664	1%	18,591	4%
Manufactured housing	6,195	7,253	304	68	22%	28	896	14%	1,930	31%	1,523	25%	924	15%	13,080	1,974	15%	4,044	31%	3,068	23%	1,806	14%
Washington County																							
Agricultural	10,753	26,823	2,855	558	20%	123	2,126	20%	1,657	15%	1,016	9%	1,601	15%	—	—	—	—	—	—	—	—	—
Commercial	5,863	104,377	15,815	3,031	19%	76	1,016	17%	1,242	21%	891	15%	784	13%	—	—	—	—	—	—	—	—	—
Industrial	1,399	50,567	8,548	1,799	21%	21	218	16%	318	23%	257	18%	225	16%	—	—	—	—	—	—	—	—	—
Institutional	1,931	28,098	4,856	1,039	21%	31	312	16%	410	21%	315	16%	298	15%	—	—	—	—	—	—	—	—	—
Multi-family residential	18,475	98,385	15,671	2,016	13%	59	4,319	23%	2,592	14%	766	4%	1,367	7%	141,844	33,289	23%	27,529	19%	8,377	6%	11,319	8%
Single-family residential	138,117	289,198	34,755	3,144	9%	287	33,018	24%	11,313	8%	1,556	1%	8,993	7%	379,323	90,437	24%	32,039	8%	4,695	1%	24,858	7%
Manufactured housing	4,573	5,523	232	61	26%	23	798	17%	1,480	32%	1,089	24%	758	17%	8,543	1,442	17%	2,745	32%	2,092	24%	1,480	17%
Study Area (All Three Counties)																							
Agricultural	36,061	87,033	9,263	1,347	15%	268	6,281	17%	5,174	14%	2,969	8%	3,579	10%	—	—	—	—	—	—	—	—	—
Commercial	22,000	369,224	57,134	14,133	25%	337	3,564	16%	4,302	20%	3,121	14%	3,301	15%	—	—	—	—	—	—	—	—	—
Industrial	4,657	116,480	18,485	4,888	26%	89	641	14%	979	21%	837	18%	955	21%	—	—	—	—	—	—	—	—	—
Institutional	7,583	101,507	17,609	3,114	18%	91	1,278	17%	1,549	20%	1,036	14%	891	12%	—	—	—	—	—	—	—	—	—
Multi-family residential	51,631	279,849	44,391	5,621	13%	124	11,106	22%	5,946	12%	1,573	3%	2,698	5%	412,118	90,608	22%	72,818	18%	24,195	6%	30,047	7%
Single-family residential	477,080	924,147	111,408	7,421	7%	632	101,656	21%	35,363	7%	4,812	1%	19,611	4%	1,196,089	254,510	21%	89,820	8%	12,906	1%	50,826	4%
Manufactured housing	16,840	20,940	879	186	21%	69	2,774	16%	5,031	30%	3,789	22%	2,296	14%	32,829	5,457	17%	9,833	30%	7,286	22%	4,338	13%
Total	615,852	1,899,180	259,169	36,710	14%	1,609	127,301	21%	58,344	9%	18,137	3%	33,331	5%	1,641,036	350,575	21%	172,471	11%	44,387	3%	85,211	5%

Number of buildings estimates are derived using the Hazus Advanced Engineering Building Module (AEBM) structural probability of damage states (FEMA, 2010).

Institutional combines Hazus occupancy classes REL1, GOV1, GOV2, EDU1, and EDU2. Commercial combines all Hazus COM occupancy classes and RES4. Multi-family residential combines the Hazus occupancy classes RES3, RES5, and RES6 categories.

Permanent resident values are based on U.S. Census 2010 population data. Permanent residents are assigned only to buildings designated as Hazus occupancy class RES1, RES2, RES3, RES5, and RES6.

Manufactured housing building category is limited to Hazus occupancy class RES2, and does not include modular construction that may be present in other Hazus occupancy classes.

Table 12-6. Buildings and permanent residents per building damage state for Portland Hills fault magnitude 6.8 earthquake, "dry" soil conditions. Dash (—): not applicable

							Number of Buildings								Number of Permanent Residents								
							Slight Damage		Moderate Damage		Extensive Damage		Complete Damage			Slight Damage		Moderate Damage		Extensive Damage		Complete Damage	
Building Category	Total Number of Buildings	Building Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Number of Collapsed Buildings	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Total	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Clackamas County																							
Agricultural	22,768	52,063	5,541	787	14%	145	4,935	22%	4,949	22%	2,794	12%	1,718	8%	—	—	—	—	—	—	—	—	—
Commercial	4,593	54,616	7,929	3,054	39%	111	641	14%	1,042	23%	933	20%	1,096	24%	—	—	—	—	—	—	—	—	—
Industrial	1,573	20,621	3,063	1,141	37%	37	191	12%	342	22%	342	22%	438	28%	—	—	—	—	—	—	—	—	—
Institutional	2,558	23,264	3,940	1,339	34%	58	360	14%	579	23%	514	20%	573	22%	—	—	—	—	—	—	—	—	—
Multi-family residential	8,959	40,880	6,293	1,483	24%	33	2,269	25%	2,742	31%	1,360	15%	723	8%	55,042	12,101	22%	17,230	31%	9,877	18%	6,365	12%
Single-family residential	132,641	286,514	35,282	4,975	14%	219	37,211	28%	36,264	27%	14,899	11%	6,267	5%	309,744	88,733	29%	85,978	28%	34,980	11%	15,010	5%
Manufactured housing	6,072	8,163	343	142	41%	63	545	9%	1,205	20%	1,683	28%	2,083	34%	11,206	1,047	9%	2,315	21%	3,139	28%	3,778	34%
Multnomah County																							
Agricultural	2,540	8,146	867	175	20%	27	476	19%	463	18%	272	11%	313	12%	—	—	—	—	—	—	—	—	—
Commercial	11,544	210,231	33,390	14,269	43%	400	1,614	14%	2,374	21%	2,237	19%	3,470	30%	—	—	—	—	—	—	—	—	—
Industrial	1,685	45,292	6,874	3,025	44%	76	156	9%	272	16%	337	20%	724	43%	—	—	—	—	—	—	—	—	—
Institutional	3,094	50,145	8,812	3,274	37%	75	496	16%	687	22%	565	18%	683	22%	—	—	—	—	—	—	—	—	—
Multi-family residential	24,197	140,585	22,428	5,805	26%	102	6,897	29%	5,714	24%	2,338	10%	1,501	6%	215,232	48,640	23%	48,949	23%	29,097	14%	31,396	15%
Single-family residential	206,322	348,436	41,371	5,677	14%	298	61,845	30%	58,400	28%	21,082	10%	7,363	4%	507,022	152,533	30%	137,314	27%	48,933	10%	17,893	4%
Manufactured housing	6,195	7,253	304	63	21%	24	987	16%	1,966	32%	1,508	24%	789	13%	13,080	2,160	17%	4,145	32%	3,101	24%	1,553	12%
Washington County																							
Agricultural	10,753	26,823	2,855	309	11%	51	2,526	23%	2,057	19%	1,011	9%	593	6%	—	—	—	—	—	—	—	—	—
Commercial	5,863	104,377	15,815	4,917	31%	100	1,062	18%	1,537	26%	1,245	21%	937	16%	—	—	—	—	—	—	—	—	—
Industrial	1,399	50,567	8,548	2,412	28%	22	225	16%	357	26%	317	23%	216	15%	—	—	—	—	—	—	—	—	—
Institutional	1,931	28,098	4,856	1,258	26%	34	342	18%	490	25%	396	21%	316	16%	—	—	—	—	—	—	—	—	—
Multi-family residential	18,475	98,385	15,671	2,831	18%	55	5,664	31%	5,085	28%	2,085	11%	1,016	6%	141,844	38,908	27%	41,465	29%	19,438	14%	10,404	7%
Single-family residential	138,117	289,198	34,755	3,582	10%	109	46,643	34%	33,685	24%	9,504	7%	2,888	2%	379,323	128,109	34%	92,956	25%	26,404	7%	8,275	2%
Manufactured housing	4,573	5,523	232	52	23%	16	722	16%	1,556	34%	1,335	29%	527	12%	8,543	1,411	17%	2,943	34%	2,427	28%	903	11%
Study Area (All Three Counties)																							
Agricultural	36,061	87,033	9,263	1,271	14%	222	7,937	22%	7,469	21%	4,076	11%	2,624	7%	—	—	—	—	—	—	—	—	—
Commercial	22,000	369,224	57,134	22,240	39%	611	3,317	15%	4,953	23%	4,415	20%	5,503	25%	—	—	—	—	—	—	—	—	—
Industrial	4,657	116,480	18,485	6,578	36%	135	571	12%	971	21%	996	21%	1,377	30%	—	—	—	—	—	—	—	—	—
Institutional	7,583	101,507	17,609	5,871	33%	167	1,198	16%	1,756	23%	1,475	19%	1,572	21%	—	—	—	—	—	—	—	—	—
Multi-family residential	51,631	279,849	44,391	10,118	23%	190	14,831	29%	13,541	26%	5,784	11%	3,241	6%	412,118	99,648	24%	107,645	26%	58,413	14%	48,165	12%
Single-family residential	477,080	924,147	111,408	14,234	13%	626	145,699	31%	128,349	27%	45,485	10%	16,518	3%	1,196,089	369,376	31%	316,249	26%	110,317	9%	41,177	3%
Manufactured housing	16,840	20,940	879	257	29%	102	2,254	13%	4,726	28%	4,526	27%	3,399	20%	32,829	4,618	14%	9,403	29%	8,666	26%	6,234	19%
Total	615,852	1,899,180	259,169	60,569	23%	2,054	175,807	29%	161,765	26%	66,756	11%	34,233	6%	1,641,036	473,642	29%	433,296	26%	177,396	11%	95,577	6%

Number of buildings estimates are derived using the Hazus Advanced Engineering Building Module (AEBM) structural probability of damage states (FEMA, 2010).

Institutional combines Hazus occupancy classes REL1, GOV1, GOV2, EDU1, and EDU2. Commercial combines all Hazus COM occupancy classes and RES4. Multi-family residential combines the Hazus occupancy classes RES3, RES5, and RES6 categories.

Permanent resident values are based on U.S. Census 2010 population data. Permanent residents are assigned only to buildings designated as Hazus occupancy class RES1, RES2, RES3, RES5, and RES6.

Manufactured housing building category is limited to Hazus occupancy class RES2, and does not include modular construction that may be present in other Hazus occupancy classes.

Table 12-7. Buildings and permanent residents per building damage state for Portland Hills fault magnitude 6.8 earthquake, "wet" (saturated) soil conditions. Dash (—): not applicable.

							Number of Buildings								Number of Permanent Residents								
							Slight Damage		Moderate Damage		Extensive Damage		Complete Damage			Slight Damage		Moderate Damage		Extensive Damage		Complete Damage	
Building Category	Total Number of Buildings	Building Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Number of Collapsed Buildings	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Total	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Clackamas County																							
Agricultural	22,768	52,063	5,541	1,009	18%	204	4,691	21%	4,671	21%	2,624	12%	2,678	12%	—	—	—	—	—	—	—	—	—
Commercial	4,593	54,616	7,929	3,578	45%	134	589	13%	936	20%	826	18%	1,401	30%	—	—	—	—	—	—	—	—	—
Industrial	1,573	20,621	3,063	1,332	44%	46	176	11%	308	20%	301	19%	541	34%	—	—	—	—	—	—	—	—	—
Institutional	2,558	23,264	3,940	1,520	39%	71	336	13%	529	21%	464	18%	719	28%	—	—	—	—	—	—	—	—	—
Multi-family residential	8,959	40,880	6,293	1,879	30%	57	2,083	23%	2,482	28%	1,229	14%	1,425	16%	55,042	11,141	20%	15,542	28%	8,861	16%	10,644	19%
Single-family residential	132,641	286,514	35,282	6,890	20%	482	34,598	26%	33,393	25%	13,819	10%	14,830	11%	309,744	82,316	27%	79,066	26%	32,402	10%	35,761	12%
Manufactured housing	6,072	8,163	343	158	46%	72	516	9%	1,099	18%	1,498	25%	2,414	40%	11,206	991	9%	2,114	19%	2,803	25%	4,397	39%
Multnomah County																							
Agricultural	2,540	8,146	867	262	30%	44	413	16%	388	15%	221	9%	577	23%	—	—	—	—	—	—	—	—	—
Commercial	11,544	210,231	33,390	17,324	52%	489	1,427	12%	2,064	18%	1,927	17%	4,464	39%	—	—	—	—	—	—	—	—	—
Industrial	1,685	45,292	6,874	3,614	53%	89	135	8%	231	14%	279	17%	863	51%	—	—	—	—	—	—	—	—	—
Institutional	3,094	50,145	8,812	3,862	44%	95	450	15%	610	20%	497	16%	922	30%	—	—	—	—	—	—	—	—	—
Multi-family residential	24,197	140,585	22,428	7,857	35%	183	6,207	26%	5,009	21%	2,075	9%	3,764	16%	215,232	44,235	21%	42,709	20%	24,932	12%	50,070	23%
Single-family residential	206,322	348,436	41,371	9,750	24%	941	55,202	27%	51,428	25%	19,246	9%	28,205	14%	507,022	136,577	27%	121,130	24%	44,695	9%	67,697	13%
Manufactured housing	6,195	7,253	304	79	26%	35	937	15%	1,827	29%	1,344	22%	1,174	19%	13,080	2,053	16%	3,857	29%	2,767	21%	2,357	18%
Washington County																							
Agricultural	10,753	26,823	2,855	525	18%	104	2,309	21%	1,858	17%	914	8%	1,386	13%	—	—	—	—	—	—	—	—	—
Commercial	5,863	104,377	15,815	6,424	41%	157	922	16%	1,328	23%	1,085	19%	1,580	27%	—	—	—	—	—	—	—	—	—
Industrial	1,399	50,567	8,548	3,270	38%	36	198	14%	312	22%	278	20%	355	25%	—	—	—	—	—	—	—	—	—
Institutional	1,931	28,098	4,856	1,707	35%	52	300	16%	426	22%	346	18%	514	27%	—	—	—	—	—	—	—	—	—
Multi-family residential	18,475	98,385	15,671	4,687	30%	142	4,846	26%	4,372	24%	1,876	10%	3,418	19%	141,844	33,220	23%	35,496	25%	17,208	12%	28,812	20%
Single-family residential	138,117	289,198	34,755	7,614	22%	637	40,371	29%	29,117	21%	8,833	6%	20,009	14%	379,323	110,815	29%	80,303	21%	24,493	6%	55,551	15%
Manufactured housing	4,573	5,523	232	70	30%	28	656	14%	1,394	30%	1,188	26%	932	20%	8,543	1,285	15%	2,647	31%	2,168	25%	1,647	19%
Study Area (All Three Counties)																							
Agricultural	36,061	87,033	9,263	1,796	19%	352	7,413	21%	6,916	19%	3,758	10%	4,641	13%	—	—	—	—	—	—	—	—	—
Commercial	22,000	369,224	57,134	27,326	48%	780	2,938	13%	4,328	20%	3,838	17%	7,445	34%	—	—	—	—	—	—	—	—	—
Industrial	4,657	116,480	18,485	8,216	44%	171	510	11%	850	18%	858	18%	1,759	38%	—	—	—	—	—	—	—	—	—
Institutional	7,583	101,507	17,609	7,089	40%	217	1,086	14%	1,566	21%	1,307	17%	2,155	28%	—	—	—	—	—	—	—	—	—
Multi-family residential	51,631	279,849	44,391	14,423	32%	383	13,136	25%	11,863	23%	5,180	10%	8,607	17%	412,118	88,596	21%	93,747	23%	51,000	12%	89,526	22%
Single-family residential	477,080	924,147	111,408	24,254	22%	2,059	130,171	27%	113,938	24%	41,899	9%	63,043	13%	1,196,089	329,708	28%	280,500	23%	101,590	8%	159,009	13%
Manufactured housing	16,840	20,940	879	307	35%	136	2,109	13%	4,320	26%	4,030	24%	4,520	27%	32,829	4,329	13%	8,618	26%	7,737	24%	8,401	26%
Total	615,852	1,899,180	259,169	83,411	32%	4,097	157,363	26%	143,781	23%	60,870	10%	92,171	15%	1,641,036	422,632	26%	382,865	23%	160,328	10%	256,936	16%

Number of buildings estimates are derived using the Hazus Advanced Engineering Building Module (AEBM) structural probability of damage states (FEMA, 2010).

Institutional combines Hazus occupancy classes REL1, GOV1, GOV2, EDU1, and EDU2. Commercial combines all Hazus COM occupancy classes and RES4. Multi-family residential combines the Hazus occupancy classes RES3, RES5, and RES6 categories.

Permanent resident values are based on U.S. Census 2010 population data. Permanent residents are assigned only to buildings designated as Hazus occupancy class RES1, RES2, RES3, RES5, and RES6.

Manufactured housing building category is limited to Hazus occupancy class RES2, and does not include modular construction that may be present in other Hazus occupancy classes.

12.4 Loss Estimates by Jurisdiction

Table 12-8 through **Table 12-11** provide county-level and jurisdictional level building inventory and building loss estimates, along with casualty estimate for the daytime and nighttime earthquake scenarios. The jurisdictional data are available electronically in the accompanying geodatabase. Casualty and displaced population estimates are based on 2010 U.S. Census data and Hazus population distribution models across business types (Section **2.1.7**). The estimates for jurisdictions include all buildings within their 2016 jurisdictional boundaries, as defined by the Metro (2016) Regional Land Information System city boundary layer, dated February 2016.

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Table 12-8. Loss estimates by jurisdiction, Cascadia Subduction Zone magnitude 9.0 earthquake, "dry" soil conditions.

	U.S. Census Population 2010	Number of Buildings	Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Debris (Thousands of Tons)	Long-Term Displaced Population	Casualties: Daytime Scenario					Casualties: Nighttime Scenario				
									Total	Level 1	Level 2	Level 3	Level 4	Total	Level 1	Level 2	Level 3	Level 4
Study area total	1,641,036	615,852	1,899,180	259,169	23,558	9%	12,794	16,852	18,286	13,342	3,518	484	942	4,334	3,338	739	87	169
Clackamas County																		
Clackamas County total	375,992	179,164	486,122	62,390	3,207	5%	1,671	1,931	2,034	1,530	368	46	90	461	373	70	7	12
Barlow	135	60	124	15	4	29%	2	1	3	2	1	0	0	1	0	0	0	0
Canby	15,829	5,559	14,978	1,890	58	3%	34	78	38	31	6	1	1	14	12	2	0	0
Estacada	2,695	1,309	3,361	448	23	5%	17	12	29	22	5	1	2	3	3	0	0	0
Gladstone	11,497	4,022	8,749	1,129	51	5%	27	63	48	35	9	1	3	13	10	2	0	0
Happy Valley	13,903	5,856	19,882	2,692	59	2%	28	8	41	31	7	1	2	5	4	1	0	0
Johnson City	566	275	249	11	3	33%	5	88	2	2	0	0	0	9	7	2	0	0
Lake Oswego	36,619	13,770	47,252	6,805	337	5%	134	220	174	132	31	4	8	50	39	8	1	2
Milwaukie	20,291	7,891	21,596	2,890	295	10%	162	93	294	218	56	7	14	34	27	5	1	1
Molalla	8,108	3,176	6,827	854	21	2%	11	8	12	9	2	0	0	3	3	0	0	0
Molalla Prairie Hamlet	—	4,165	10,102	1,137	62	5%	38	8	19	15	3	0	1	3	2	0	0	0
Mulino Hamlet	—	2,021	4,178	491	41	8%	22	10	20	14	4	1	1	3	2	0	0	0
Oregon City	31,859	12,641	31,984	4,190	277	7%	148	102	258	187	50	7	14	38	30	6	1	1
Rivergrove	289	196	539	70	2	3%	0	1	0	0	0	0	0	0	0	0	0	0
Sandy	9,570	3,734	8,551	1,077	11	1%	5	4	5	4	1	0	0	2	2	0	0	0
Stafford Hamlet	—	1,206	3,543	477	23	5%	10	6	21	15	4	1	1	1	1	0	0	0
The Villages at Mt Hood	—	3,795	7,268	886	18	2%	7	7	5	4	1	0	0	3	2	0	0	0
West Linn	25,109	9,170	28,162	3,817	117	3%	39	96	68	51	13	2	4	19	16	3	0	0
Wilsonville	19,509	5,492	31,168	4,410	291	7%	155	147	199	155	34	4	7	38	30	6	1	1
Clackamas County Jurisdictions total[+]	195,979	84,338	248,512	33,289	1,695	5%	844	952	1,238	926	225	29	57	238	191	36	4	7
Clackamas County Unincorporated total	—	94,481	240,494	29,470	1,539	5%	854	1,006	778	594	137	16	31	216	176	32	3	5
Multnomah County																		
Multnomah County total	735,334	255,577	810,087	114,046	13,340	12%	7,724	9,736	11,418	8,231	2,248	318	621	2,762	2,085	493	62	122
Fairview	8,920	2,611	7,976	1,061	24	2%	12	71	10	8	1	0	0	11	9	2	0	0
Gresham	105,594	29,043	83,478	11,160	314	3%	143	399	235	181	39	5	9	81	68	11	1	1
Maywood Park	752	339	627	74	3	4%	1	1	4	3	1	0	0	0	0	0	0	0
Portland (by Bureau of Emergency Management Risk Reporting Areas):																		
Airport	—	284	12,971	1,898	678	36%	439	6	452	308	97	16	31	64	44	13	2	4
Central City	—	2,809	108,884	18,436	3,952	21%	2,615	3,535	3,333	2,373	666	99	195	1,054	771	201	28	54
Central Northeast Neighborhoods	—	19,883	47,310	6,226	741	12%	372	434	575	432	109	12	22	121	94	21	2	4
East Portland Neighborhood Office	—	46,301	114,853	15,359	758	5%	388	658	543	416	96	11	20	182	147	28	3	5
Neighbors West/Northwest	—	7,663	50,308	7,320	1,685	23%	1,043	1,414	1,588	1,123	328	47	91	318	230	62	9	17
North Portland Neighborhood Services	—	25,468	87,894	12,076	2,331	19%	1,292	794	2,039	1,472	408	54	105	268	204	48	6	11
Northeast Coalition	—	22,178	52,444	6,994	434	6%	235	342	520	374	100	15	31	96	75	15	2	4
Southeast Uplift Neighborhood Program	—	57,291	124,011	16,652	1,134	7%	603	978	991	721	187	28	55	278	217	45	5	11
Southwest Neighborhoods	—	24,288	72,458	10,945	952	9%	418	712	966	698	186	28	55	228	175	39	5	9
Portland (total)	583,776	206,165	671,134	95,906	12,666	13%	7,405	8,872	11,008	7,917	2,177	310	604	2,610	1,958	472	61	119
Troutdale	15,962	5,161	13,481	1,730	77	4%	39	12	56	43	10	1	2	8	6	1	0	0
Wood Village	3,878	1,194	3,507	408	9	2%	6	55	5	5	1	0	0	9	7	1	0	0
Multnomah County Jurisdictions total[+]	718,882	244,513	780,203	110,339	13,092	12%	7,606	9,410	11,319	8,157	2,230	316	616	2,720	2,050	487	62	121
Multnomah County Unincorporated total	—	11,053	29,359	3,614	249	7%	117	335	95	70	18	2	5	44	36	7	1	1
Washington County																		
Washington County total	529,710	181,111	602,970	82,732	7,011	8%	3,399	5,185	4,834	3,581	903	119	231	1,110	881	176	18	35
Banks	1,777	646	1,491	194	20	10%	10	7	37	27	7	1	2	3	2	1	0	0
Beaverton	89,803	24,005	96,327	13,813	1,230	9%	548	1,227	845	635	154	19	37	223	175	36	4	8
Cornelius	11,869	3,517	7,844	963	80	8%	36	118	57	44	10	1	2	21	18	3	0	0
Durham	1,351	399	1,887	277	20	7%	6	24	5	4	1	0	0	4	3	1	0	0
Forest Grove	21,083	7,267	19,462	2,617	303	12%	159	492	381	272	76	11	22	74	58	12	1	2
Gaston*	637	312	618	79	8	10%	4	4	9	7	2	0	1	1	1	0	0	0
Hillsboro	91,611	26,846	116,113	17,603	1,810	10%	946	938	1,339	983	253	35	68	262	203	44	5	10
King City	3,111	1,610	3,702	494	33	7%	11	44	8	6	1	0	0	8	6	1	0	0
North Plains	1,947	952	2,602	328	38	12%	24	7	38	27	8	1	2	3	2	0	0	0
Sherwood	18,194	5,873	17,792	2,335	140	6%	87	27	132	97	25	3	7	12	10	2	0	0
Tigard	48,035	16,004	62,578	8,490	756	9%	405	329	448	337	82	10	19	85	68	13	1	2
Tualatin	26,054	7,535	41,411	5,751	521	9%	290	147	381	291	67	8	15	65	51	11	1	2
Washington County Jurisdictions total[+]	315,472	94,966	371,828	52,943	4,958	9%	2,526	3,361	3,680	2,728	686	90	175	760	598	123	13	26
Washington County Unincorporated total	—	86,501	228,783	29,512	2,025	7%	847	1,788	1,178	868	222	30	58	357	287	54	5	10

[+] The jurisdiction is associated with the county it occupies most by area. Figures are for the entire jurisdiction and may include building data from neighboring counties. Summaries by all jurisdictions and unincorporated area for a given county will vary slightly with the county total.

[*] Gaston census numbers are for entire jurisdiction. Gaston loss figures limited to buildings and residences in Washington County and do not include buildings, casualties, debris, and displaced population in Yamhill County.

Casualty level definitions are provided in **Table 4-1** and are based on U.S. Census 2010 population figures.

Table 12-9. Loss estimates by jurisdiction, Cascadia Subduction Zone magnitude 9.0 earthquake, "wet" (saturated) soil conditions.

	U.S. Census Population 2010	Number of Buildings	Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Debris (Thousands of Tons)	Long-Term Displaced Population	Casualties: Daytime Scenario					Casualties: Nighttime Scenario				
									Total	Level 1	Level 2	Level 3	Level 4	Total	Level 1	Level 2	Level 3	Level 4
Study area total	1,641,036	615,852	1,899,180	259,169	36,710	14%	17,292	85,211	27,175	19,489	5,454	758	1,473	10,400	7,838	1,979	203	380
Clackamas County																		
Clackamas County total	375,992	179,164	486,122	62,390	4,573	7%	2,092	10,093	2,757	2,038	523	67	129	1,115	866	202	17	30
Barlow	135	60	124	15	7	47%	3	28	5	4	1	0	0	3	2	1	0	0
Canby	15,829	5,559	14,978	1,890	61	3%	36	159	40	33	6	1	1	20	16	3	0	0
Estacada	2,695	1,309	3,361	448	27	6%	18	27	33	24	6	1	2	5	4	1	0	0
Gladstone	11,497	4,022	8,749	1,129	69	6%	32	235	61	44	12	2	3	26	21	5	0	1
Happy Valley	13,903	5,856	19,882	2,692	75	3%	32	89	50	38	9	1	2	11	9	2	0	0
Johnson City	566	275	249	11	4	35%	5	97	3	2	0	0	0	9	7	2	0	0
Lake Oswego	36,619	13,770	47,252	6,805	523	8%	184	1,207	258	191	49	6	12	130	99	24	2	4
Milwaukie	20,291	7,891	21,596	2,890	394	14%	193	830	380	278	74	10	19	92	71	17	1	3
Molalla	8,108	3,176	6,827	854	21	2%	11	8	12	9	2	0	0	3	3	0	0	0
Molalla Prairie Hamlet	—	4,165	10,102	1,137	83	7%	45	133	29	22	6	1	1	12	10	2	0	0
Mulino Hamlet	—	2,021	4,178	491	70	14%	32	151	28	20	6	1	2	14	10	3	0	0
Oregon City	31,859	12,641	31,984	4,190	342	8%	170	307	318	228	63	9	18	57	44	10	1	2
Rivergrove	289	196	539	70	8	12%	2	40	1	1	0	0	0	3	3	1	0	0
Sandy	9,570	3,734	8,551	1,077	12	1%	5	6	5	4	1	0	0	2	2	0	0	0
Stafford Hamlet	—	1,206	3,543	477	36	8%	14	68	33	23	7	1	2	6	5	1	0	0
The Villages at Mt Hood	—	3,795	7,268	886	67	8%	21	411	15	11	3	0	1	34	26	7	0	1
West Linn	25,109	9,170	28,162	3,817	209	5%	64	797	99	73	19	3	5	72	56	13	1	2
Wilsonville	19,509	5,492	31,168	4,410	423	10%	196	894	315	235	59	7	14	100	77	19	2	3
Clackamas County Jurisdictions total[+]	195,979	84,338	248,512	33,289	2,429	7%	1,063	5,488	1,686	1,239	322	43	82	601	465	109	9	17
Clackamas County Unincorporated total	—	94,481	240,494	29,470	2,180	7%	1,060	4,652	1,058	793	197	23	45	508	397	91	7	13
Multnomah County																		
Multnomah County total	735,334	255,577	810,087	114,046	20,489	18%	10,395	37,461	16,660	11,824	3,397	487	950	5,558	4,126	1,072	124	236
Fairview	8,920	2,611	7,976	1,061	58	6%	29	335	51	36	11	2	3	32	25	6	0	1
Gresham	105,594	29,043	83,478	11,160	726	7%	279	4,244	549	400	107	14	27	382	296	72	5	10
Maywood Park	752	339	627	74	3	4%	1	2	5	3	1	0	0	0	0	0	0	0
Portland (by Bureau of Emergency Management Risk Reporting Areas):																		
Airport	—	284	12,971	1,898	983	52%	565	14	694	470	151	25	48	118	82	25	4	8
Central City	—	2,809	108,884	18,436	5,672	31%	3,369	7,422	4,419	3,102	907	138	271	1,591	1,142	317	45	88
Central Northeast Neighborhoods	—	19,883	47,310	6,226	979	16%	459	1,177	758	562	148	17	31	203	154	38	4	7
East Portland Neighborhood Office	—	46,301	114,853	15,359	1,212	8%	576	1,204	964	705	188	24	47	289	223	50	5	10
Neighbors West/Northwest	—	7,663	50,308	7,320	2,419	33%	1,285	4,073	2,039	1,430	428	62	120	566	411	114	14	28
North Portland Neighborhood Services	—	25,468	87,894	12,076	3,581	30%	1,770	3,972	3,126	2,224	645	88	169	611	455	119	13	24
Northeast Coalition	—	22,178	52,444	6,994	641	9%	308	1,920	697	494	139	21	42	230	175	43	4	8
Southeast Uplift Neighborhood Program	—	57,291	124,011	16,652	1,676	10%	786	5,492	1,431	1,023	284	42	82	656	499	122	12	23
Southwest Neighborhoods	—	24,288	72,458	10,945	1,785	16%	658	5,352	1,518	1,084	304	44	86	666	500	128	13	24
Portland (total)	583,776	206,165	671,134	95,906	18,947	20%	9,776	30,627	15,645	11,095	3,194	459	896	4,930	3,641	955	115	220
Troutdale	15,962	5,161	13,481	1,730	169	10%	83	245	188	130	40	6	12	35	27	7	1	1
Wood Village	3,878	1,194	3,507	408	9	2%	6	55	5	5	1	0	0	9	7	1	0	0
Multnomah County Jurisdictions total[+]	718,882	244,513	780,203	110,339	19,911	18%	10,175	35,507	16,444	11,668	3,354	482	939	5,389	3,996	1,040	121	232
Multnomah County Unincorporated total	—	11,053	29,359	3,614	565	16%	216	1,891	204	148	41	5	10	164	127	31	2	4
Washington County																		
Washington County total	529,710	181,111	602,970	82,732	11,648	14%	4,805	37,657	7,758	5,627	1,534	204	394	3,727	2,846	705	63	113
Banks	1,777	646	1,491	194	35	18%	15	113	56	40	11	1	3	11	9	2	0	0
Beaverton	89,803	24,005	96,327	13,813	1,943	14%	751	6,267	1,313	964	254	33	63	633	481	119	12	22
Cornelius	11,869	3,517	7,844	963	159	17%	62	1,089	119	89	23	2	5	94	73	18	1	2
Durham	1,351	399	1,887	277	33	12%	9	94	10	7	2	0	0	9	7	2	0	0
Forest Grove	21,083	7,267	19,462	2,617	496	19%	223	2,238	596	418	124	19	36	216	165	41	4	6
Gaston*	637	312	618	79	9	12%	5	17	10	7	2	0	1	3	2	1	0	0
Hillsboro	91,611	26,846	116,113	17,603	2,884	16%	1,280	7,124	2,186	1,564	439	62	121	800	602	154	16	29
King City	3,111	1,610	3,702	494	56	11%	17	195	15	11	3	0	1	20	15	4	0	1
North Plains	1,947	952	2,602	328	61	19%	32	157	56	39	12	2	4	15	11	3	0	0
Sherwood	18,194	5,873	17,792	2,335	217	9%	113	534	209	149	42	6	12	54	41	10	1	2
Tigard	48,035	16,004	62,578	8,490	1,087	13%	516	2,306	672	494	130	17	32	248	191	46	4	7
Tualatin	26,054	7,535	41,411	5,751	732	13%	362	1,030	549	409	104	12	24	144	110	27	3	5
Washington County Jurisdictions total[+]	315,472	94,966	371,828	52,943	7,712	15%	3,383	21,164	5,792	4,191	1,146	155	300	2,247	1,707	425	40	74
Washington County Unincorporated total	—	86,501	228,783	29,512	3,913	13%	1,395	16,509	1,992	1,451	394	50	96	1,491	1,146	282	22	40

[+] The jurisdiction is associated with the county it occupies most by area. Figures are for the entire jurisdiction and may include building data from neighboring counties. Summaries by all jurisdictions and unincorporated area for a given county will vary slightly with the county total.

* Gaston census numbers are for entire jurisdiction. Gaston loss figures limited to buildings and residences in Washington County and do not include buildings, casualties, debris, and displaced population in Yamhill County.

Casualty level definitions are provided in **Table 4-1** and are based on U.S. Census 2010 population figures.

Table 12-10. Loss estimates by jurisdiction, Portland Hills fault magnitude 6.8 earthquake, "dry" soil conditions.

	U.S. Census Population 2010	Number of Buildings	Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Debris (Thousands of Tons)	Long-Term Displaced Population	Casualties: Daytime Scenario					Casualties: Nighttime Scenario				
									Total	Level 1	Level 2	Level 3	Level 4	Total	Level 1	Level 2	Level 3	Level 4
Study area total	1,641,036	615,852	1,899,180	259,169	60,569	23%	26,600	95,577	47,853	33,774	9,820	1,442	2,817	15,802	11,957	2,888	328	629
Clackamas County																		
Clackamas County total	375,992	179,164	486,122	62,390	12,922	21%	4,960	25,152	8,881	6,340	1,804	251	486	3,245	2,538	567	50	91
Barlow	135	60	124	15	4	29%	2	2	3	2	1	0	0	1	1	0	0	0
Canby	15,829	5,559	14,978	1,890	159	8%	76	202	109	83	19	2	5	41	34	6	0	1
Estacada	2,695	1,309	3,361	448	42	9%	27	25	55	40	10	2	3	6	5	1	0	0
Gladstone	11,497	4,022	8,749	1,129	437	39%	139	1,816	351	244	74	11	22	197	153	36	3	5
Happy Valley	13,903	5,856	19,882	2,692	243	9%	79	118	179	128	36	5	10	30	24	4	0	1
Johnson City	566	275	249	11	9	82%	11	319	7	5	1	0	0	25	19	5	0	0
Lake Oswego	36,619	13,770	47,252	6,805	1,877	28%	552	3,243	965	691	194	27	53	418	323	74	7	14
Milwaukie	20,291	7,891	21,596	2,890	1,341	46%	542	2,459	1,427	1,002	302	42	82	326	252	59	6	10
Molalla	8,108	3,176	6,827	854	37	4%	16	17	17	13	2	0	1	7	6	1	0	0
Molalla Prairie Hamlet	—	4,165	10,102	1,137	63	6%	33	13	15	11	2	0	1	5	4	1	0	0
Mulino Hamlet	—	2,021	4,178	491	96	19%	43	81	39	27	8	1	3	13	10	2	0	0
Oregon City	31,859	12,641	31,984	4,190	1,319	31%	496	2,983	1,286	896	269	41	80	383	297	68	6	11
Rivergrove	289	196	539	70	8	11%	1	11	1	0	0	0	0	2	1	0	0	0
Sandy	9,570	3,734	8,551	1,077	20	2%	8	4	8	7	1	0	0	3	3	0	0	0
Stafford Hamlet	—	1,206	3,543	477	118	25%	38	112	94	64	20	3	7	15	12	2	0	0
The Villages at Mt Hood	—	3,795	7,268	886	11	1%	3	2	1	1	0	0	0	2	1	0	0	0
West Linn	25,109	9,170	28,162	3,817	899	24%	251	1,679	493	343	103	16	32	216	171	37	3	6
Wilsonville	19,509	5,492	31,168	4,410	406	9%	196	181	255	199	43	5	9	50	40	8	1	1
Clackamas County Jurisdictions total[+]	195,979	84,338	248,512	33,289	7,088	21%	2,513	13,269	5,305	3,756	1,085	158	307	1,737	1,356	303	27	51
Clackamas County Unincorporated total	—	94,481	240,494	29,470	5,895	20%	2,491	12,036	3,582	2,590	720	93	179	1,500	1,177	262	22	39
Multnomah County																		
Multnomah County total	735,334	255,577	810,087	114,046	32,287	28%	15,658	50,842	28,915	20,159	6,032	920	1,805	9,346	6,918	1,773	223	432
Fairview	8,920	2,611	7,976	1,061	30	3%	12	39	13	11	2	0	0	9	8	1	0	0
Gresham	105,594	29,043	83,478	11,160	459	4%	165	314	216	176	32	3	6	103	89	12	1	1
Maywood Park	752	339	627	74	6	8%	2	6	4	3	1	0	0	2	1	0	0	0
Portland (by Bureau of Emergency Management Risk Reporting Areas):																		
Airport	—	284	12,971	1,898	655	35%	411	7	415	286		14	27	57	40	12	2	4
Central City	—	2,809	108,884	18,436	9,989	54%	5,895	13,914	8,942	6,159	1,897	298	588	3,069	2,175	627	90	177
Central Northeast Neighborhoods	—	19,883	47,310	6,226	1,210	19%	535	1,261	913	672	177	22	42	282	220	48	5	10
East Portland Neighborhood Office	—	46,301	114,853	15,359	1,316	9%	549	1,652	776	592	136	16	31	383	314	56	4	8
Neighbors West/Northwest	—	7,663	50,308	7,320	3,786	52%	1,939	6,932	3,392	2,339	728	110	215	1,129	795	233	34	66
North Portland Neighborhood Services	—	25,468	87,894	12,076	4,192	35%	2,023	3,739	3,864	2,727	802	114	221	725	554	131	14	27
Northeast Coalition	—	22,178	52,444	6,994	1,472	21%	639	2,520	1,737	1,200	362	59	116	459	352	80	9	17
Southeast Uplift Neighborhood Program	—	57,291	124,011	16,652	4,296	26%	1,804	10,538	4,082	2,840	848	133	262	1,586	1,211	284	31	60
Southwest Neighborhoods	—	24,288	72,458	10,945	4,129	38%	1,435	8,545	4,276	2,948	903	143	281	1,383	1,032	262	30	58
Portland (total)	583,776	206,165	671,134	95,906	31,046	32%	15,230	49,106	28,396	19,763	5,942	908	1,783	9,074	6,693	1,733	220	427
Troutdale	15,962	5,161	13,481	1,730	67	4%	29	11	35	27	6	1	1	8	7	1	0	0
Wood Village	3,878	1,194	3,507	408	10	2%	4	12	3	3	0	0	0	4	4	1	0	0
Multnomah County Jurisdictions total[+]	718,882	244,513	780,203	110,339	31,618	29%	15,442	49,488	28,667	19,982	5,982	912	1,790	9,200	6,803	1,748	221	428
Multnomah County Unincorporated total	—	11,053	29,359	3,614	636	18%	205	1,320	181	132	35	5	9	142	112	25	2	4
Washington County																		
Washington County total	529,710	181,111	602,970	82,732	15,360	19%	5,982	19,582	10,056	7,275	1,984	271	526	3,211	2,501	547	56	106
Banks	1,777	646	1,491	194	12	6%	5	4	16	12	3	0	1	2	1	0	0	0
Beaverton	89,803	24,005	96,327	13,813	3,510	25%	1,310	5,597	2,721	1,961	546	73	141	787	605	138	15	28
Cornelius	11,869	3,517	7,844	963	52	5%	20	37	22	18	3	0	0	13	11	1	0	0
Durham	1,351	399	1,887	277	47	17%	13	63	12	9	2	0	0	8	7	1	0	0
Forest Grove	21,083	7,267	19,462	2,617	127	5%	61	115	84	66	13	1	3	28	24	4	0	0
Gaston*	637	312	618	79	2	3%	1	1	2	1	0	0	0	0	0	0	0	0
Hillsboro	91,611	26,846	116,113	17,603	3,320	19%	1,476	2,116	2,255	1,625	444	63	122	533	406	94	11	22
King City	3,111	1,610	3,702	494	55	11%	17	78	12	9	2	0	1	14	11	2	0	0
North Plains	1,947	952	2,602	328	53	16%	28	20	44	31	9	1	3	6	4	1	0	0
Sherwood	18,194	5,873	17,792	2,335	148	6%	80	34	98	74	17	2	4	16	13	2	0	0
Tigard	48,035	16,004	62,578	8,490	1,873	22%	870	1,404	1,180	859	233	30	58	272	215	45	4	8
Tualatin	26,054	7,535	41,411	5,751	956	17%	453	432	672	504	125	15	28	134	105	22	2	4
Washington County Jurisdictions total[+]	315,472	94,966	371,828	52,943	10,156	19%	4,335	9,902	7,117	5,170	1,398	187	362	1,812	1,404	311	34	64
Washington County Unincorporated total	—	86,501	228,783	29,512	5,176	18%	1,614	9,563	3,000	2,144	601	86	168	1,410	1,105	239	23	43

[+] The jurisdiction is associated with the county it occupies most by area. Figures are for the entire jurisdiction and may include building data from neighboring counties. Summaries by all jurisdictions and unincorporated area for a given county will vary slightly with the county total.

[*] Gaston census numbers are for entire jurisdiction. Gaston loss figures limited to buildings and residences in Washington County and do not include buildings, casualties, debris, and displaced population in Yamhill County.

Casualty level definitions are provided in **Table 4-1** and are based on U.S. Census 2010 population figures.

Table 12-11. Loss estimates by jurisdiction, Portland Hills fault magnitude 6.8 earthquake, "wet" (saturated) soil conditions.

	U.S. Census Population 2010	Number of Buildings	Square Footage (Thousand)	Building Value ($ Million)	Building Repair Cost ($ Million)	Building Loss Ratio	Debris (Thousands of Tons)	Long-Term Displaced Population	Casualties: Daytime Scenario					Casualties: Nighttime Scenario				
									Total	Level 1	Level 2	Level 3	Level 4	Total	Level 1	Level 2	Level 3	Level 4
Study area total	1,641,036	615,852	1,899,180	259,169	83,411	32%	33,905	256,936	62,977	44,290	13,114	1,891	3,682	29,038	21,830	5,598	563	1,046
Clackamas County																		
Clackamas County total	375,992	179,164	486,122	62,390	16,367	26%	5,990	50,802	10,912	7,768	2,244	307	593	5,232	4,032	973	81	146
Barlow	135	60	124	15	7	48%	3	31	5	3	1	0	0	3	2	1	0	0
Canby	15,829	5,559	14,978	1,890	231	12%	103	874	172	127	32	4	8	93	74	16	1	2
Estacada	2,695	1,309	3,361	448	74	17%	39	197	105	73	22	3	7	21	16	4	0	1
Gladstone	11,497	4,022	8,749	1,129	504	45%	157	2,656	394	275	83	12	24	258	199	48	4	7
Happy Valley	13,903	5,856	19,882	2,692	318	12%	100	552	217	154	44	6	13	65	51	11	1	2
Johnson City	566	275	249	11	9	85%	11	330	7	6	1	0	0	26	20	5	0	1
Lake Oswego	36,619	13,770	47,252	6,805	2,377	35%	685	6,391	1,194	853	243	33	65	659	504	123	11	21
Milwaukie	20,291	7,891	21,596	2,890	1,598	55%	615	5,456	1,595	1,122	338	46	89	546	418	104	9	16
Molalla	8,108	3,176	6,827	854	37	4%	16	17	17	13	2	0	1	7	6	1	0	0
Molalla Prairie Hamlet	—	4,165	10,102	1,137	88	8%	42	149	28	21	5	1	1	15	12	3	0	0
Mulino Hamlet	—	2,021	4,178	491	142	29%	58	319	55	38	12	2	4	30	24	6	0	1
Oregon City	31,859	12,641	31,984	4,190	1,422	34%	525	3,827	1,364	950	286	43	85	448	346	82	7	13
Rivergrove	289	196	539	70	20	29%	5	94	3	2	1	0	0	8	6	2	0	0
Sandy	9,570	3,734	8,551	1,077	21	2%	8	16	9	7	1	0	0	4	4	0	0	0
Stafford Hamlet	—	1,206	3,543	477	151	32%	47	274	123	83	27	5	9	27	21	5	0	1
The Villages at Mt Hood	—	3,795	7,268	886	42	5%	12	240	8	6	2	0	0	20	15	4	0	0
West Linn	25,109	9,170	28,162	3,817	1,093	29%	304	3,457	566	395	118	18	35	347	270	63	5	9
Wilsonville	19,509	5,492	31,168	4,410	681	15%	283	1,616	505	371	98	12	24	173	131	33	3	6
Clackamas County Jurisdictions total[+]	195,979	84,338	248,512	33,289	8,816	26%	3,013	26,497	6,368	4,500	1,315	188	364	2,750	2,118	510	44	78
Clackamas County Unincorporated total	—	94,481	240,494	29,470	7,602	26%	3,024	24,307	4,555	3,276	930	120	229	2,462	1,900	459	37	67
Multnomah County																		
Multnomah County total	735,334	255,577	810,087	114,046	42,747	37%	19,270	120,124	36,278	25,244	7,643	1,146	1,146	15,302	11,333	3,001	335	633
Fairview	8,920	2,611	7,976	1,061	65	6%	29	305	54	38	11	2	3	30	24	5	0	1
Gresham	105,594	29,043	83,478	11,160	1,114	10%	376	6,734	694	510	135	17	33	604	468	113	8	15
Maywood Park	752	339	627	74	8	10%	3	24	7	4	1	0	0	3	2	0	0	0
Portland (by Bureau of Emergency Management Risk Reporting Areas):																		
Airport	—	284	12,971	1,898	1,016	54%	569	19	700	476	152	24	48	116	81	24	4	7
Central City	—	2,809	108,884	18,436	11,593	63%	6,534	17,698	9,845	6,767	2,099	329	650	3,565	2,519	734	105	207
Central Northeast Neighborhoods	—	19,883	47,310	6,226	1,721	28%	714	4,289	1,284	935	257	32	60	552	421	103	10	18
East Portland Neighborhood Office	—	46,301	114,853	15,359	2,193	14%	881	6,597	1,563	1,136	308	41	79	855	664	153	14	25
Neighbors West/Northwest	—	7,663	50,308	7,320	4,513	62%	2,154	10,830	3,724	2,567	801	121	235	1,453	1,032	301	41	79
North Portland Neighborhood Services	—	25,468	87,894	12,076	5,587	46%	2,524	12,934	5,009	3,523	1,051	148	287	1,511	1,139	293	28	51
Northeast Coalition	—	22,178	52,444	6,994	2,200	31%	885	9,004	2,306	1,591	488	77	151	982	743	187	18	33
Southeast Uplift Neighborhood Program	—	57,291	124,011	16,652	6,046	36%	2,365	29,189	5,402	3,757	1,136	172	337	3,050	2,307	585	56	103
Southwest Neighborhoods	—	24,288	72,458	10,945	5,434	50%	1,809	18,570	5,108	3,531	1,084	166	327	2,220	1,654	435	45	85
Portland (total)	583,776	206,165	671,134	95,906	40,304	42%	18,436	109,130	34,942	24,283	7,375	1,110	2,173	14,304	10,561	2,815	320	608
Troutdale	15,962	5,161	13,481	1,730	167	10%	77	281	174	120	37	6	11	39	30	7	1	1
Wood Village	3,878	1,194	3,507	408	10	2%	4	12	3	3	0	0	0	4	4	1	0	0
Multnomah County Jurisdictions total[+]	718,882	244,513	780,203	110,339	41,667	38%	18,925	116,486	35,874	24,958	7,560	1,135	2,221	14,985	11,089	2,941	330	625
Multnomah County Unincorporated total	—	11,053	29,359	3,614	1,030	28%	329	3,505	320	230	65	9	16	306	236	58	4	8
Washington County																		
Washington County total	529,710	181,111	602,970	82,732	24,297	29%	8,645	86,010	15,787	11,279	3,226	437	844	8,503	6,465	1,624	147	267
Banks	1,777	646	1,491	194	27	14%	10	104	35	26	7	1	2	10	8	2	0	0
Beaverton	89,803	24,005	96,327	13,813	5,201	38%	1,775	19,130	3,850	2,751	790	105	203	1,861	1,404	357	35	65
Cornelius	11,869	3,517	7,844	963	125	13%	45	894	80	60	15	2	3	77	60	14	1	2
Durham	1,351	399	1,887	277	84	30%	23	277	26	19	5	1	1	24	19	5	0	1
Forest Grove	21,083	7,267	19,462	2,617	259	10%	107	1,242	236	170	47	7	13	122	94	23	2	3
Gaston*	637	312	618	79	4	5%	2	6	3	2	1	0	0	1	1	0	0	0
Hillsboro	91,611	26,846	116,113	17,603	5,269	30%	2,063	12,836	3,771	2,663	778	112	219	1,476	1,104	287	30	56
King City	3,111	1,610	3,702	494	105	21%	30	412	28	21	5	1	1	41	31	8	1	1
North Plains	1,947	952	2,602	328	92	28%	41	266	73	51	15	2	5	25	20	5	0	1
Sherwood	18,194	5,873	17,792	2,335	295	13%	130	963	250	177	51	7	15	91	70	17	1	3
Tigard	48,035	16,004	62,578	8,490	2,783	33%	1,164	7,409	1,814	1,299	371	49	95	755	578	143	12	22
Tualatin	26,054	7,535	41,411	5,751	1,469	26%	619	2,782	1,072	785	211	26	50	343	261	65	6	12
Washington County Jurisdictions total[+]	315,472	94,966	371,828	52,943	15,713	30%	6,010	46,320	11,239	8,024	2,297	313	605	4,827	3,649	925	89	164
Washington County Unincorporated total	—	86,501	228,783	29,512	8,584	29%	2,603	39,822	4,621	3,302	946	127	246	3,707	2,839	706	59	104

[+] The jurisdiction is associated with the county it occupies most by area. Figures are for the entire jurisdiction and may include building data from neighboring counties. Summaries by all jurisdictions and unincorporated area for a given county will vary slightly with the county total.

[*] Gaston census numbers are for entire jurisdiction. Gaston loss figures limited to buildings and residences in Washington County and do not include buildings, casualties, debris, and displaced population in Yamhill County.

Casualty level definitions are provided in **Table 4-1** and are based on U.S. Census 2010 population figures.

13.0 APPENDIX D: GEOGRAPHIC INFORMATION SYSTEM (GIS) DATABASE

The GIS data included with this publication are partitioned into two ArcGIS version 10.1 file geodatabases. Earthquake loss estimates and impact assessment data are contained in RDPO_ Earthquake_Impact_Analysis_Phase1.gdb. Loss estimates for a particular earthquake scenario are contained in independent tables and can be joined to the appropriate polygon dataset to graphically represent impacts. Ground motion and ground deformation data are contained in RDPO_GroundMotion_GroundFailure_Phase1.gdb.

RDPO_Earthquake_Impact_Analysis_Phase1.gdb:

Feature Dataset Phase1:

Building_Footprints	Outlines of buildings and other non-building structures.
Electrical_Transmission_Structures	Pointfile containing locations of electrical transmission poles and towers, and an estimate of permanent ground deformation at the location for all four earthquake scenarios.
Emergency_Transportation_Routes	Buffered and segmented version of the Metro area Emergency Transportation Routes, and a categorization, per segment, of the impact of permanent ground deformation on the segment, for all four earthquake scenarios.
Jurisdictions	Cities, villages, hamlets, and unincorporated areas, and summary statistics for number of buildings, square footage, replacement cost, and population estimates. Contains **Jurisdiction** attribute for joining to loss estimate tables.
Neighborhood_Units	Neighborhood units (876 total), and summary statistics for number of buildings, square footage, replacement cost, and population estimates. Contains **NUID** attribute for joining to loss estimate tables.
Population_and_Building_Density	20-acre hexagonal grid with summary statistics for number of buildings, number of residential buildings, and permanent residents per hexagonal cell. All cells contain at least one building.

Tables with building loss, casualty, and displaced population estimates for a given scenario

Loss estimates by jurisdiction

Tables can be joined to the Jurisdictions *feature class using* **Jurisdiction** *attribute*

Loss_Jurisdiction_CSZ_M9p0_dry	Scenario: Cascadia Subduction Zone M 9.0, “dry” soil conditions
Loss_Jurisdiction_CSZ_M9p0_wet	Scenario: Cascadia Subduction Zone M 9.0, “wet” (saturated) soil conditions
Loss_Jurisdiction_PHF_M6p8_dry	Scenario: Portland Hills fault M 6.8, “dry” soil conditions
Loss_Jurisdiction_PHF_M6p8_wet	Scenario: Portland Hills fault M 6.8, “wet” (saturated) soil conditions

Loss estimates by neighborhood unit

Tables can be joined to the Neighborhood_Units *feature class using the* **NUID** *attribute*

Loss_Neighborhood_Unit_CSZ_M9p0_dry	Scenario: Cascadia Subduction Zone M 9.0, “dry” soil conditions
Loss_Neighborhood_Unit_CSZ_M9p0_wet	Scenario: Cascadia Subduction Zone M 9.0, “wet” (saturated) soil conditions
Loss_Neighborhood_Unit_PHF_M6p8_dry	Scenario: Portland Hills fault M 6.8, “dry” soil conditions
Loss_Neighborhood_Unit_PHF_M6p8_wet	Scenario: Portland Hills fault M 6.8, “wet” (saturated) soil conditions

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RDPO_GroundMotion_GroundFailure_Phase1.gdb:

Synthetic Cascadia Subduction Zone magnitude 9.0 earthquake

Site ground motion (rasters)

CSZ_M9p0_pga_site	Site peak ground acceleration, in g (standard gravity).
CSZ_M9p0_pgv_site	Site peak ground velocity, in centimeters per second.
CSZ_M9p0_sa03_site	Site spectral acceleration at 0.3 sec, in g (standard gravity).
CSZ_M9p0_sa10_site	Site spectral acceleration at 1.0 sec, in g (standard gravity).

Permanent Ground Deformation (PGD) (rasters)

Each PGD raster is accompanied with a probability (Prob) raster

CSZ_M9p0_PGD_landslide_dry	Permanent ground deformation due to earthquake-induced landslide under wet (or saturated) soil conditions, in centimeters.
CSZ_M9p0_Prob_landslide_dry	Probability of earthquake-induced landslide under wet (or saturated) soil conditions. In percent.
CSZ_M9p0_PGD_landslide_wet	Permanent ground deformation due to earthquake-induced landslide under wet (or saturated) soil conditions, in centimeters.
CSZ_M9p0_Prob_landslide_wet	Probability of earthquake-induced landslide under wet (or saturated) soil conditions. In percent.
CSZ_M9p0_PGD_liquefaction_wet	Permanent ground deformation due to liquefaction lateral spreading. Liquefaction assumes wet (or saturated) soil conditions, in centimeters.
CSZ_M9p0_Prob_liquefaction_wet	Probability of liquefaction under wet (or saturated) soil conditions. In percent.

Synthetic Portland Hills fault magnitude 6.8 earthquake

Bedrock ground motion

PHF_M6p8_bedrock_groundmotion	Pointfile with descriptors of bedrock ground motion (pga, pgv, sa03, sa10)

Site ground motion (rasters)

PHF_M6p8_pga_site	Site peak ground acceleration, in g (standard gravity).
PHF_M6p8_pgv_site	Site peak ground velocity, in centimeters per second.
PHF_M6p8_sa03_site	Site spectral acceleration at 0.3 sec, in g (standard gravity).
PHF_M6p8_sa10_site	Site spectral acceleration at 1.0 sec, in g (standard gravity).

Permanent Ground Deformation (PGD) (rasters)

Each PGD raster is accompanied with a probability (Prob) raster

PHF_M6p8_PGD_landslide_dry	Permanent ground deformation due to earthquake-induced landslide under wet (or saturated) soil conditions, in centimeters.
PHF_M6p8_Prob_landslide_dry	Probability of earthquake-induced landslide under wet (or saturated) soil conditions. In percent.
PHF_M6p8_PGD_landslide_wet	Permanent ground deformation due to earthquake-induced landslide under wet (or saturated) soil conditions, in centimeters.
PHF_M6p8_Prob_landslide_wet	Probability of earthquake-induced landslide under wet (or saturated) soil conditions. In percent.
PHF_M6p8_PGD_liquefaction_wet	Permanent ground deformation due to liquefaction lateral spreading. Liquefaction assumes wet (or saturated) soil conditions, in centimeters.
PHF_M6p8_Prob_liquefaction_wet	Probability of liquefaction under wet (or saturated) soil conditions. In percent.

14.0 APPENDIX E: MAP PLATES

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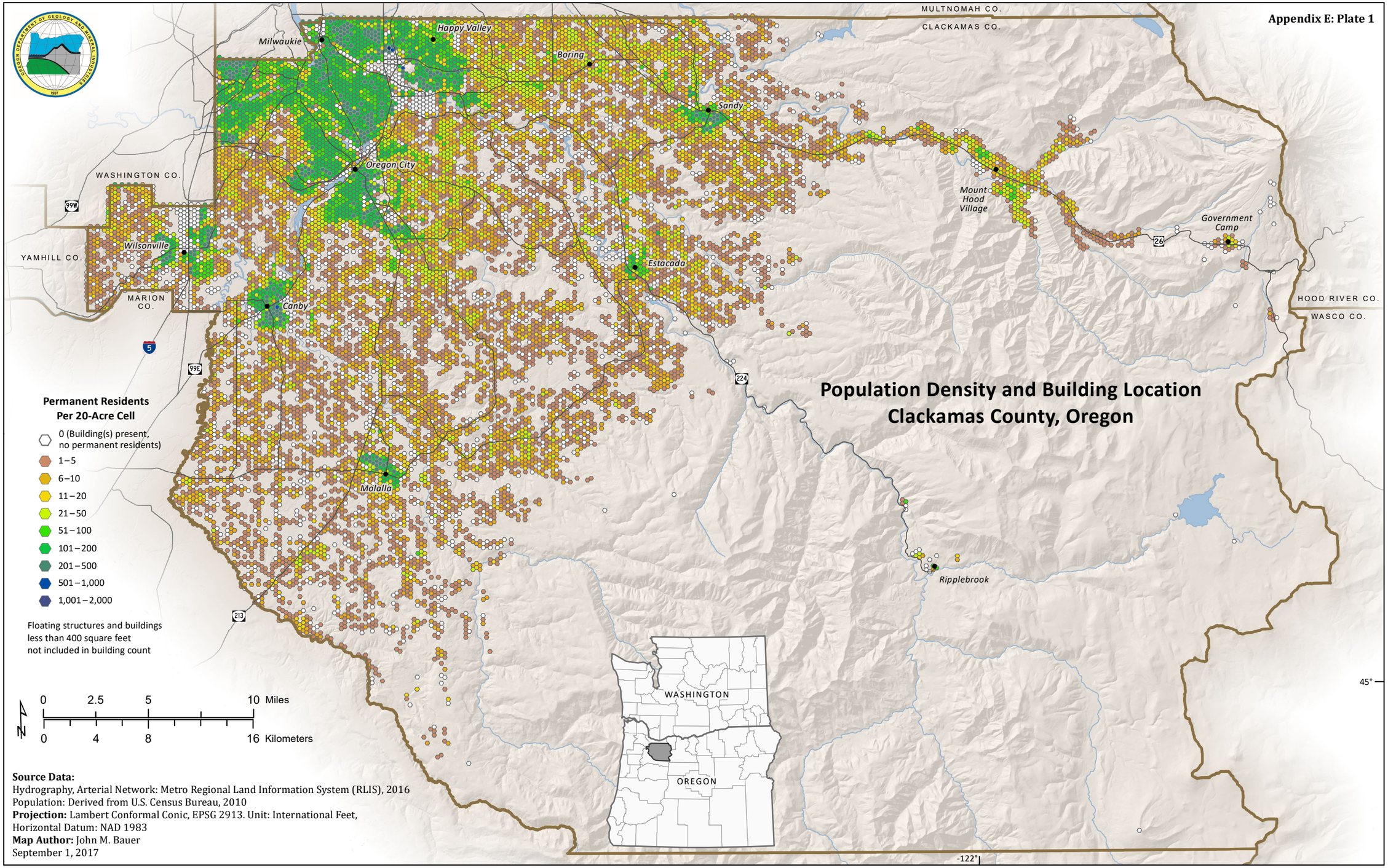
Appendix E: Plate 1

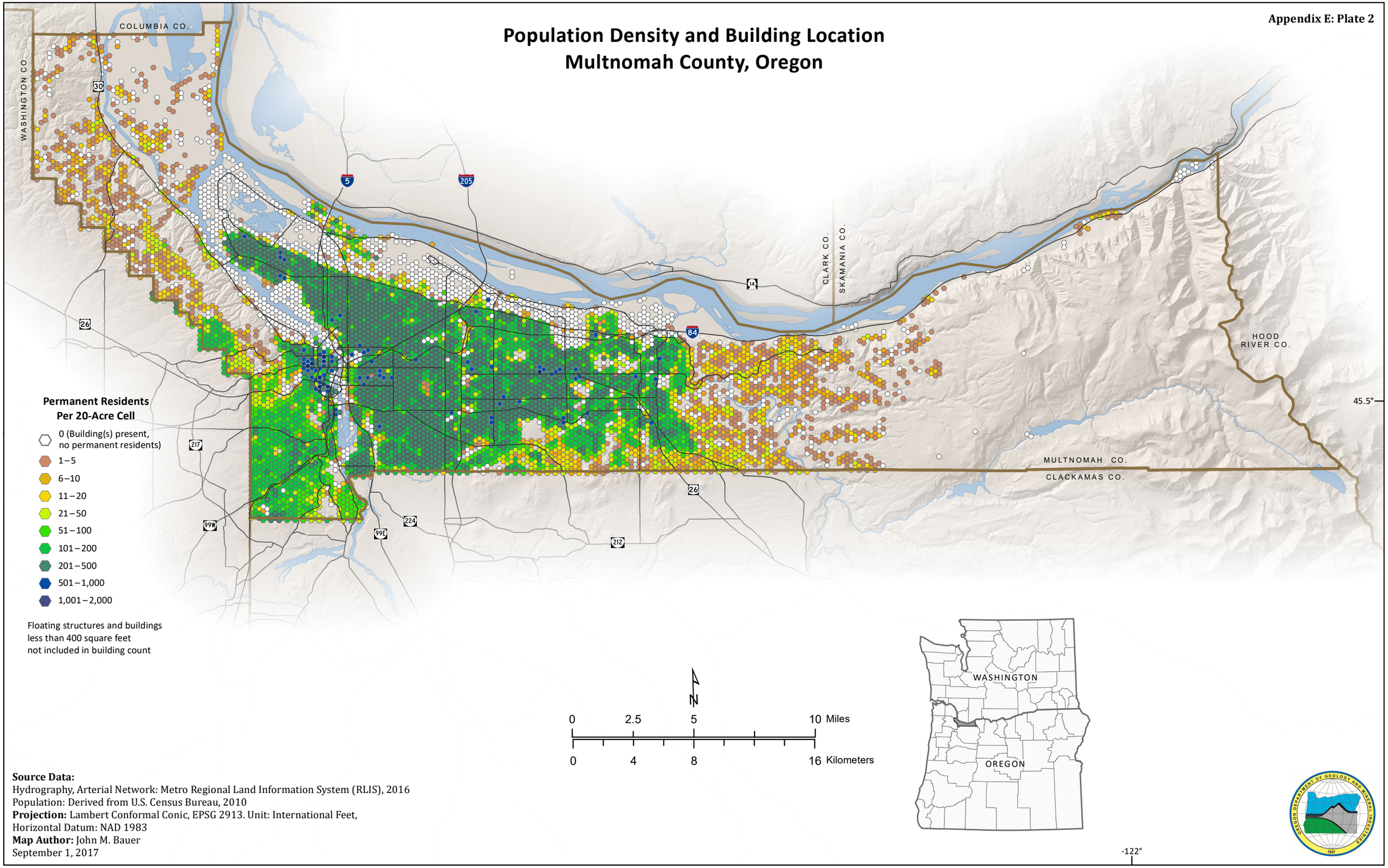
Population Density and Building Location
Clackamas County, Oregon



Source Data:
Hydrography, Arterial Network: Metro Regional Land Information System (RLIS), 2016
Population: Derived from U.S. Census Bureau, 2010
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet,
Horizontal Datum: NAD 1983
Map Author: John M. Bauer
September 1, 2017

Appendix E: Plate 2

Population Density and Building Location
Multnomah County, Oregon



Source Data:
Hydrography, Arterial Network: Metro Regional Land Information System (RLIS), 2016
Population: Derived from U.S. Census Bureau, 2010
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet,
Horizontal Datum: NAD 1983
Map Author: John M. Bauer
September 1, 2017

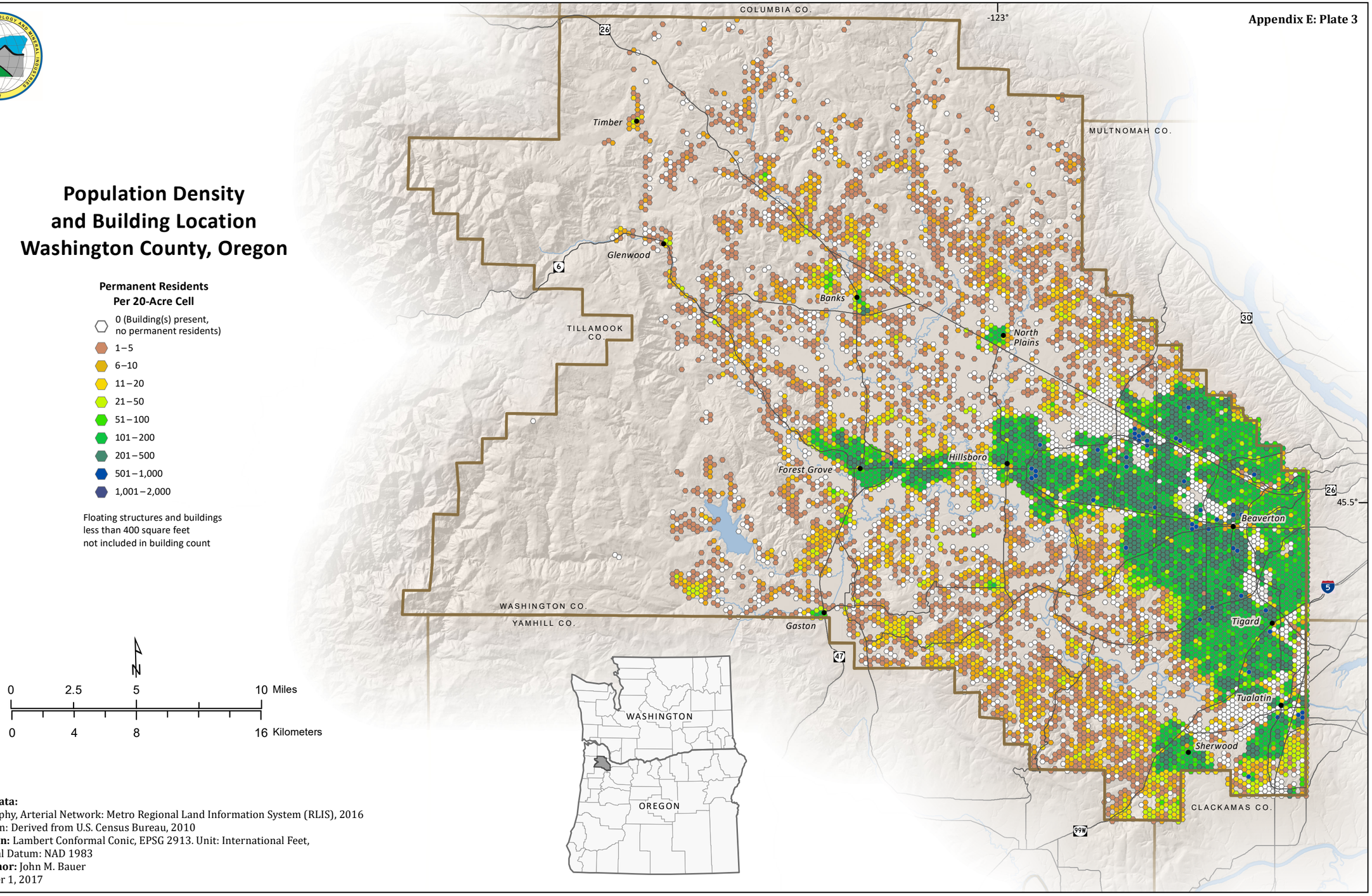
Appendix E: Plate 3

Population Density and Building Location Washington County, Oregon

Permanent Residents Per 20-Acre Cell

- 0 (Building(s) present, no permanent residents)
- 1–5
- 6–10
- 11–20
- 21–50
- 51–100
- 101–200
- 201–500
- 501–1,000
- 1,001–2,000

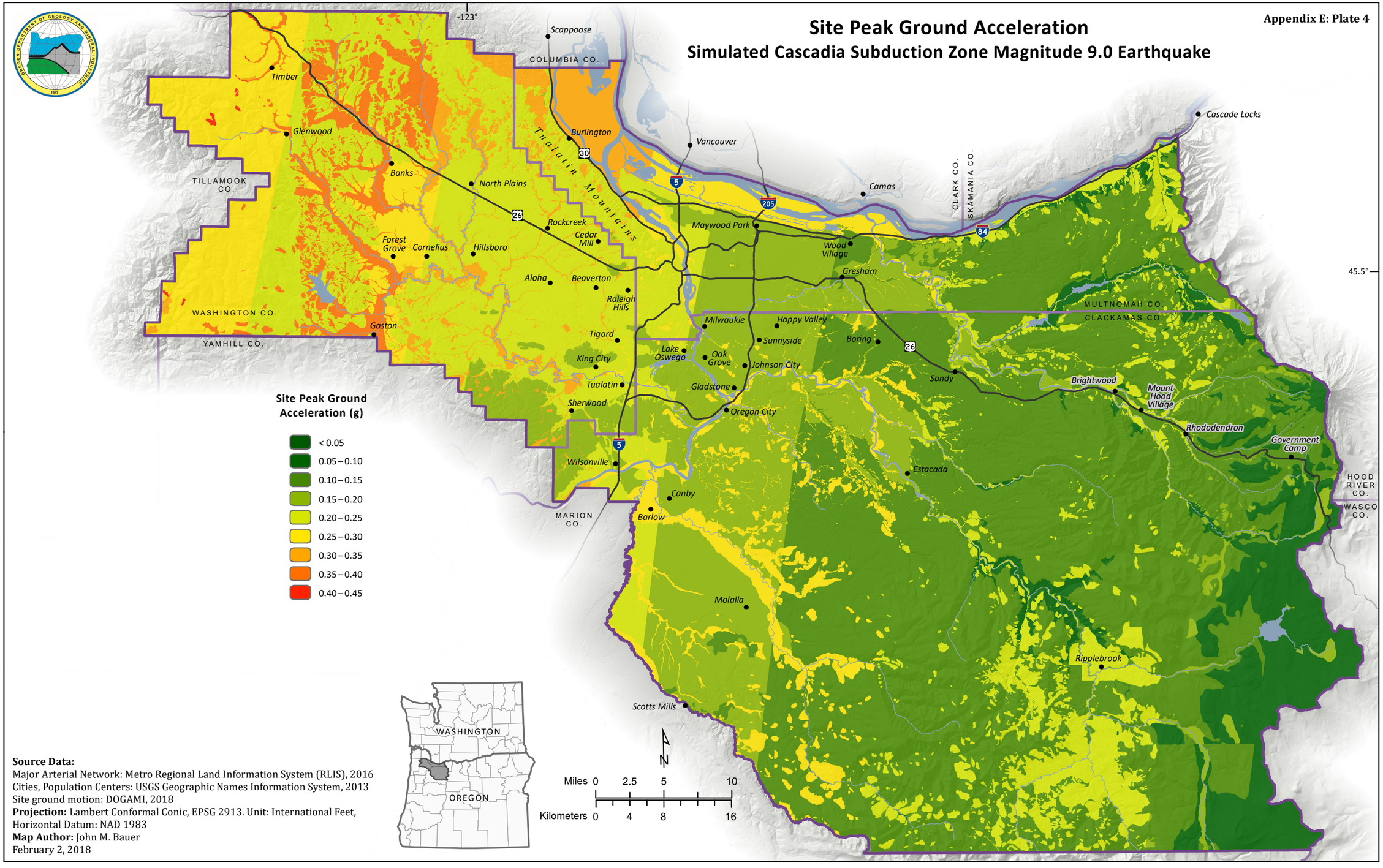
Floating structures and buildings less than 400 square feet not included in building count



Source Data:
Hydrography, Arterial Network: Metro Regional Land Information System (RLIS), 2016
Population: Derived from U.S. Census Bureau, 2010
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
September 1, 2017

Appendix E: Plate 4

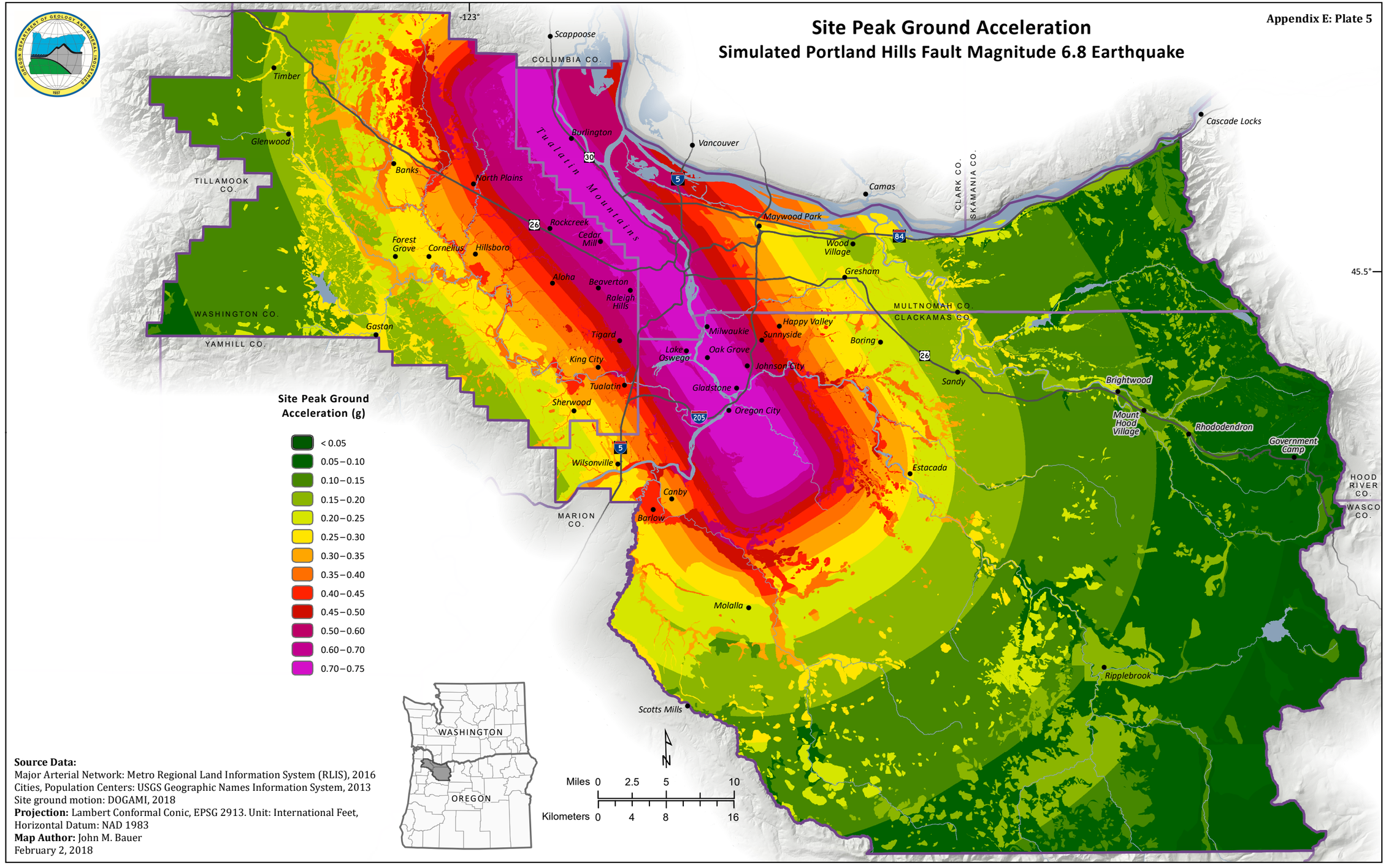
Site Peak Ground Acceleration
Simulated Cascadia Subduction Zone Magnitude 9.0 Earthquake



Source Data:
Major Arterial Network: Metro Regional Land Information System (RLIS), 2016
Cities, Population Centers: USGS Geographic Names Information System, 2013
Site ground motion: DOGAMI, 2018
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 2, 2018

Appendix E: Plate 5

Site Peak Ground Acceleration
Simulated Portland Hills Fault Magnitude 6.8 Earthquake

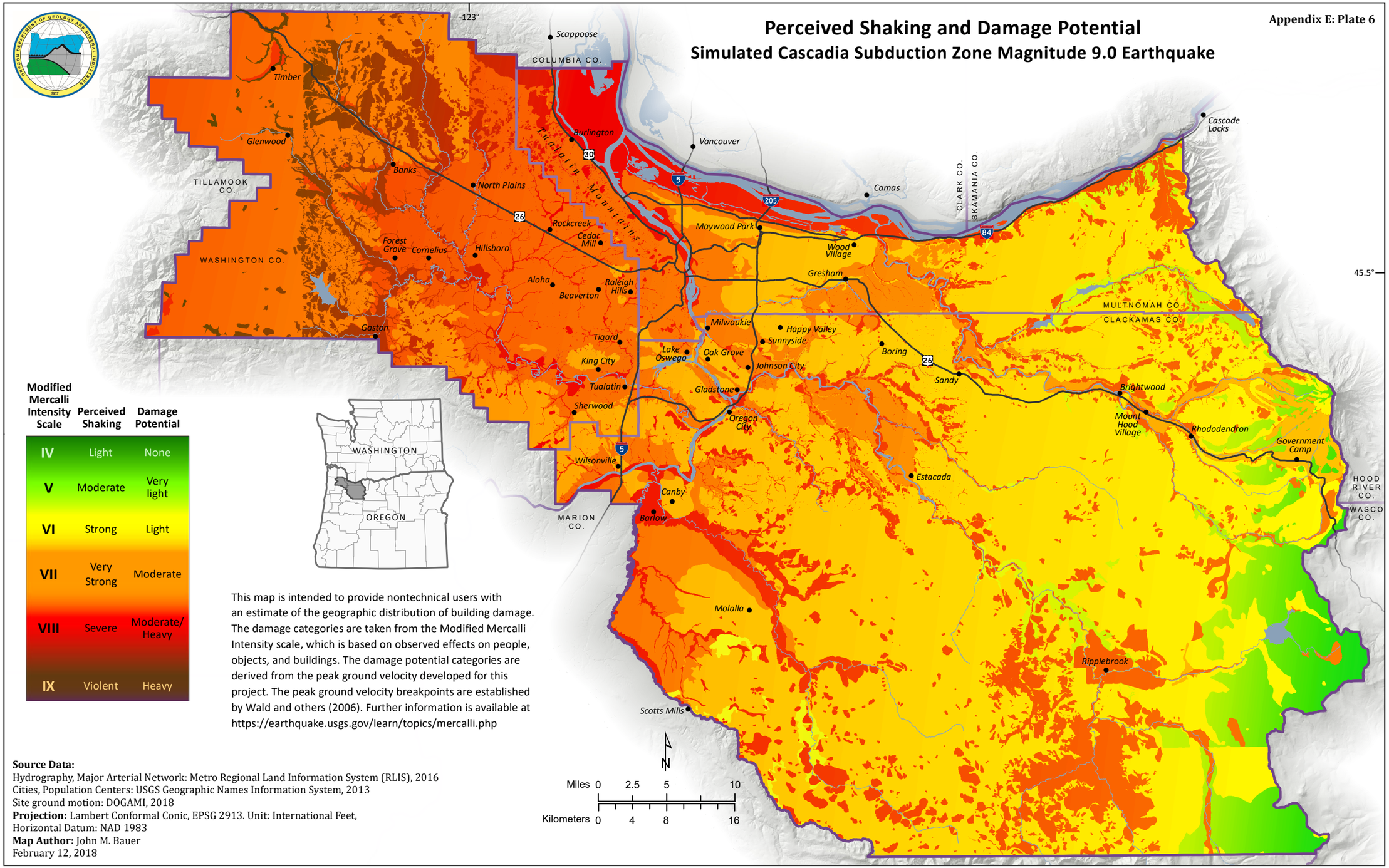


Source Data:
Major Arterial Network: Metro Regional Land Information System (RLIS), 2016
Cities, Population Centers: USGS Geographic Names Information System, 2013
Site ground motion: DOGAMI, 2018
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 2, 2018

Appendix E: Plate 6

Perceived Shaking and Damage Potential

Simulated Cascadia Subduction Zone Magnitude 9.0 Earthquake



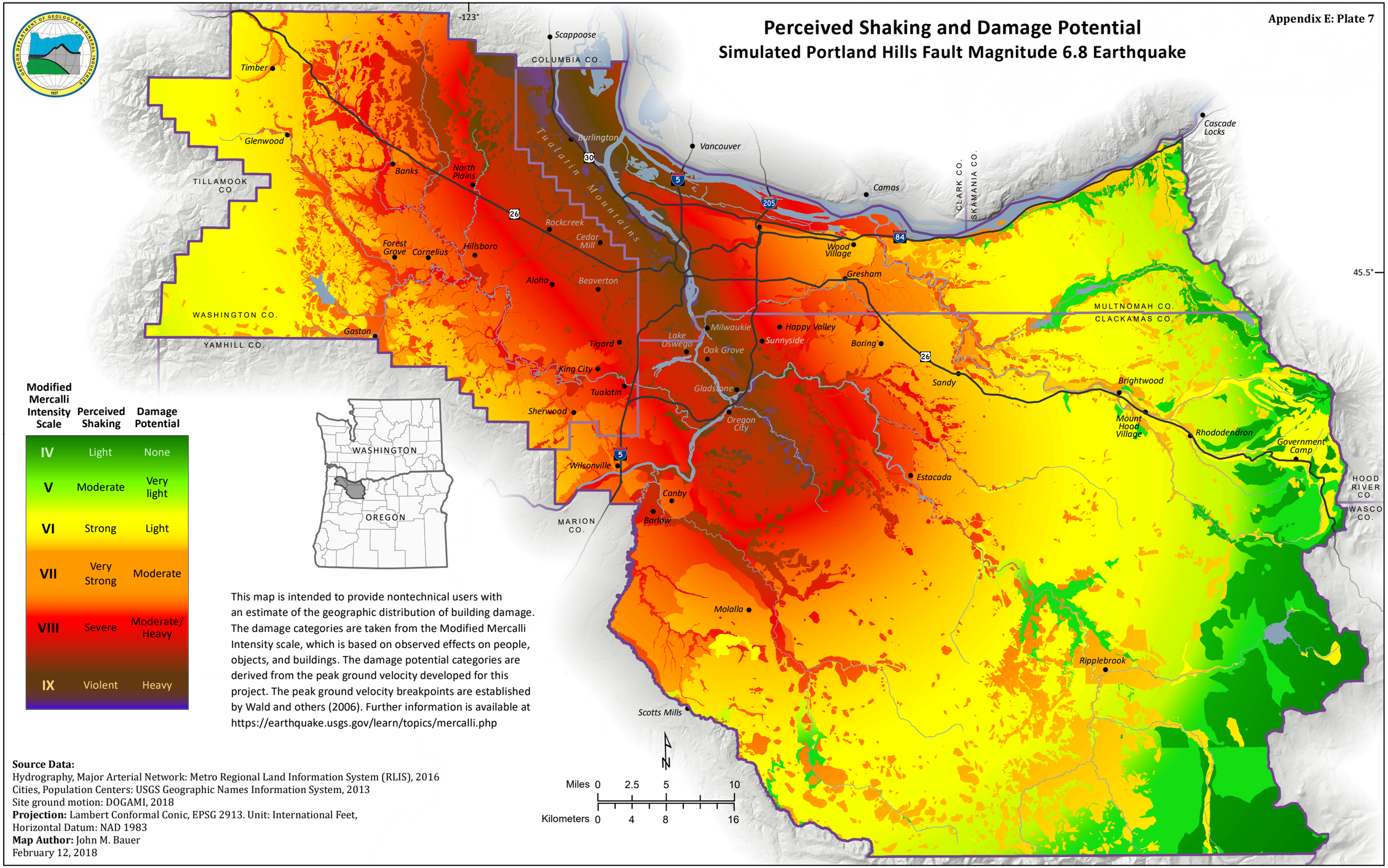
This map is intended to provide nontechnical users with an estimate of the geographic distribution of building damage. The damage categories are taken from the Modified Mercalli Intensity scale, which is based on observed effects on people, objects, and buildings. The damage potential categories are derived from the peak ground velocity developed for this project. The peak ground velocity breakpoints are established by Wald and others (2006). Further information is available at https://earthquake.usgs.gov/learn/topics/mercalli.php

Source Data:
Hydrography, Major Arterial Network: Metro Regional Land Information System (RLIS), 2016
Cities, Population Centers: USGS Geographic Names Information System, 2013
Site ground motion: DOGAMI, 2018
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet,
Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 12, 2018

Appendix E: Plate 7

Perceived Shaking and Damage Potential

Simulated Portland Hills Fault Magnitude 6.8 Earthquake



Modified Mercalli Intensity Scale	Perceived Shaking	Damage Potential
IV	Light	None
V	Moderate	Very light
VI	Strong	Light
VII	Very Strong	Moderate
VIII	Severe	Moderate/ Heavy
IX	Violent	Heavy

This map is intended to provide nontechnical users with an estimate of the geographic distribution of building damage. The damage categories are taken from the Modified Mercalli Intensity scale, which is based on observed effects on people, objects, and buildings. The damage potential categories are derived from the peak ground velocity developed for this project. The peak ground velocity breakpoints are established by Wald and others (2006). Further information is available at https://earthquake.usgs.gov/learn/topics/mercalli.php

Source Data:
Hydrography, Major Arterial Network: Metro Regional Land Information System (RLIS), 2016
Cities, Population Centers: USGS Geographic Names Information System, 2013
Site ground motion: DOGAMI, 2018
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet,
Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 12, 2018

Appendix E: Plate 8

Potential Permanent Ground Deformation Due to Earthquake-Induced Landslides or Liquefaction Lateral Spreading

Cascadia Subduction Zone Magnitude 9.0 Earthquake

Wet (Saturated) Soil Scenario

-123°

45.5°

Scappoose
COLUMBIA CO.
Timber
Glenwood
Burlington
Cascade Locks
Banks
TILLAMOOK CO.
North Plains
Camas
CLARK CO.
SKAMANIA CO.
Forest Grove
Hillsboro
Cedar Mill
Wood Village
Gresham
Aloha
MULTNOMAH CO.
CLACKAMAS CO.
WASHINGTON CO.
Gaston
YAMHILL CO.
Milwaukie
Sunnyside
Boring
Tigard
Lake Oswego
King City
Sandy
Tualatin
Oregon City
Sherwood
Rhododendron
Government Camp
Wilsonville
Estacada
HOOD RIVER CO.
WASCO CO.
Canby
MARION CO.
Molalla

Permanent Ground Deformation

- None
- Low (0–10 cm; 0–4 inches)
- Moderate (10–30 cm; 4–12 inches)
- High (30–100 cm; 12–39 inches)
- Very High (100–1180 cm; 39–173 inches)



N

Miles 0 2.5 5 10

Kilometers 0 4 8 16

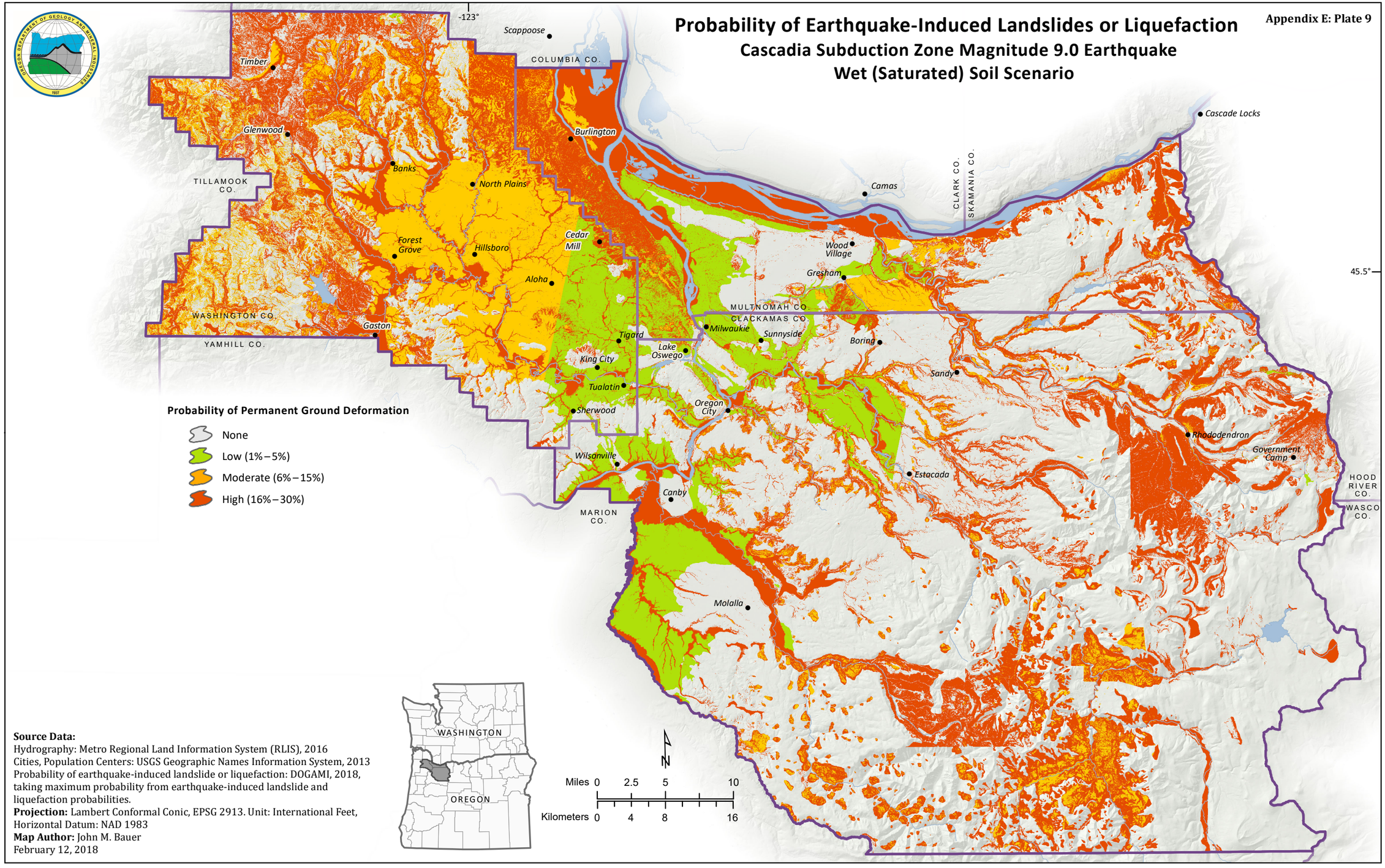
Source Data:
Hydrography: Metro Regional Land Information System (RLIS), 2016
Cities, Population Centers: USGS Geographic Names Information System, 2013
Probability of earthquake-induced landslide or liquefaction: DOGAMI, 2018, taking maximum ground deformation from earthquake-induced landslide and liquefaction lateral spreading.
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 12, 2018

Probability of Earthquake-Induced Landslides or Liquefaction

Cascadia Subduction Zone Magnitude 9.0 Earthquake

Wet (Saturated) Soil Scenario

Appendix E: Plate 9



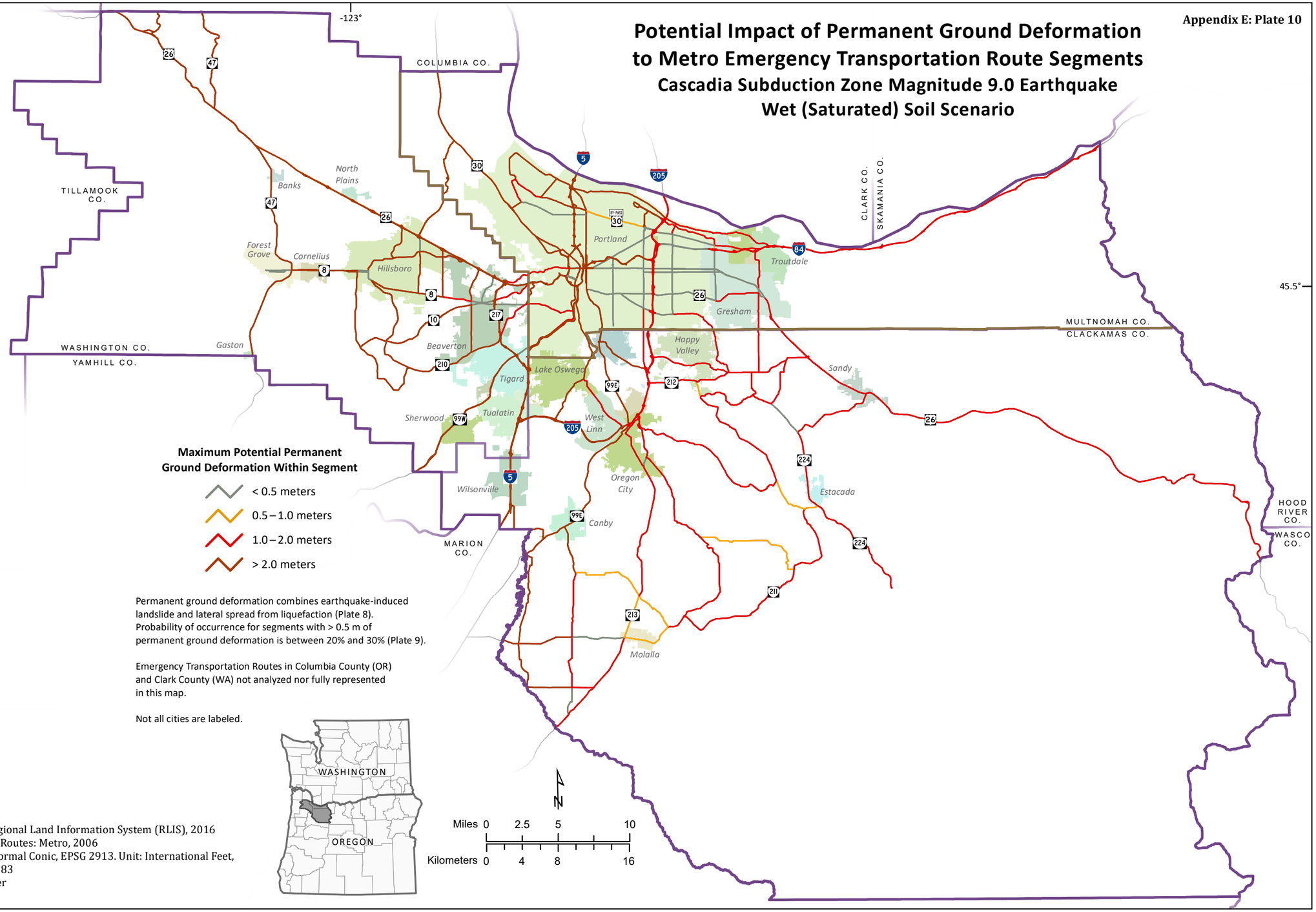
Source Data:
Hydrography: Metro Regional Land Information System (RLIS), 2016
Cities, Population Centers: USGS Geographic Names Information System, 2013
Probability of earthquake-induced landslide or liquefaction: DOGAMI, 2018, taking maximum probability from earthquake-induced landslide and liquefaction probabilities.
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 12, 2018

Appendix E: Plate 10

Potential Impact of Permanent Ground Deformation to Metro Emergency Transportation Route Segments

Cascadia Subduction Zone Magnitude 9.0 Earthquake

Wet (Saturated) Soil Scenario



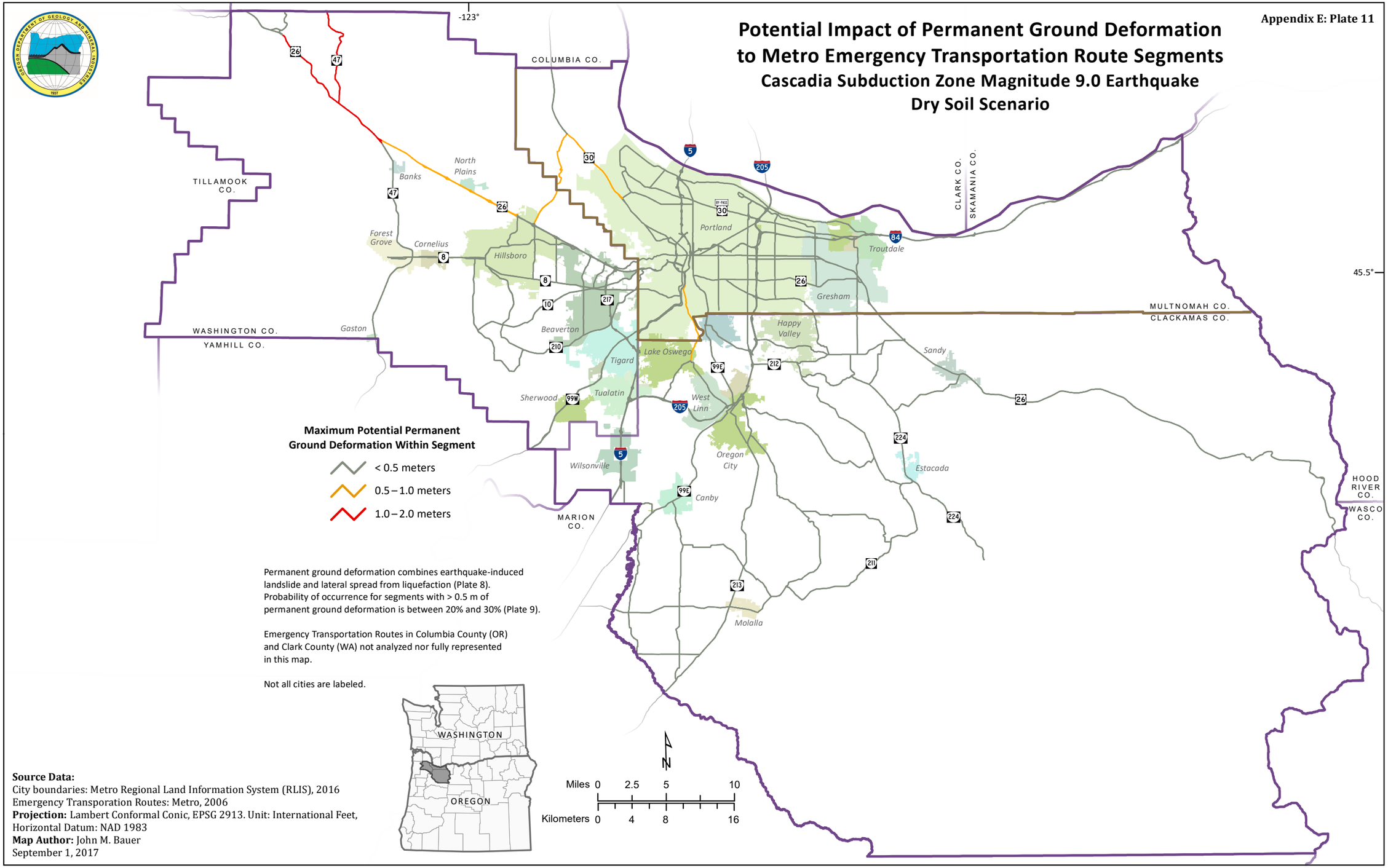
Source Data:
City boundaries: Metro Regional Land Information System (RLIS), 2016
Emergency Transporation Routes: Metro, 2006
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
September 1, 2017

Appendix E: Plate 11

Potential Impact of Permanent Ground Deformation to Metro Emergency Transportation Route Segments

Cascadia Subduction Zone Magnitude 9.0 Earthquake

Dry Soil Scenario



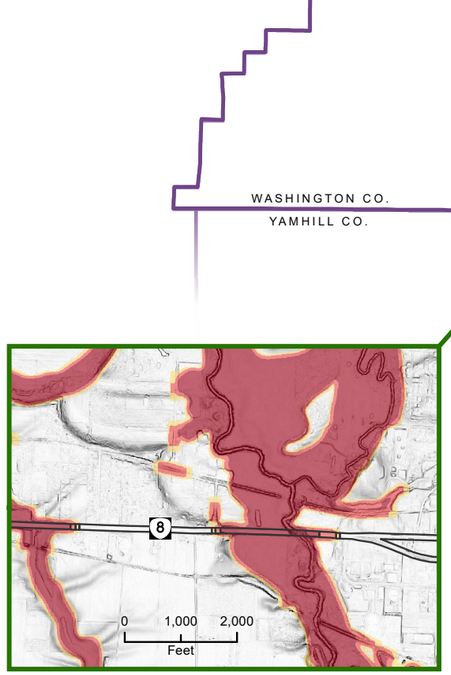
Source Data:
City boundaries: Metro Regional Land Information System (RLIS), 2016
Emergency Transporation Routes: Metro, 2006
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
September 1, 2017

Appendix E: Plate 12

Potential Impact of Permanent Ground Deformation to Metro Emergency Transportation Routes

Cascadia Subduction Zone Magnitude 9.0 Earthquake

Wet (Saturated) Soil Scenario



Closeup, Oregon Highway 8, showing potential permanent ground deformation (same color scale as main map)



Miles 0 2.5 5 10

Kilometers 0 4 8 16

Potential Permanent Ground Deformation

- < 0.5 meters
- 0.5 – 1.0 meters
- 1.0 – 2.0 meters
- > 2.0 meters

Permanent ground deformation takes the maximum of earthquake-induced landslide and lateral spread from liquefaction (Plate 8).

Probability of occurrence for road areas with > 0.5 m permanent ground deformation is between 20% and 30% (Plate 9).

Emergency Transportation Routes in Columbia County (OR) and Clark County (WA) not analyzed nor fully represented in this map.

Highway labels are placed on areas with minimal to no ground deformation (< 0.5 m).

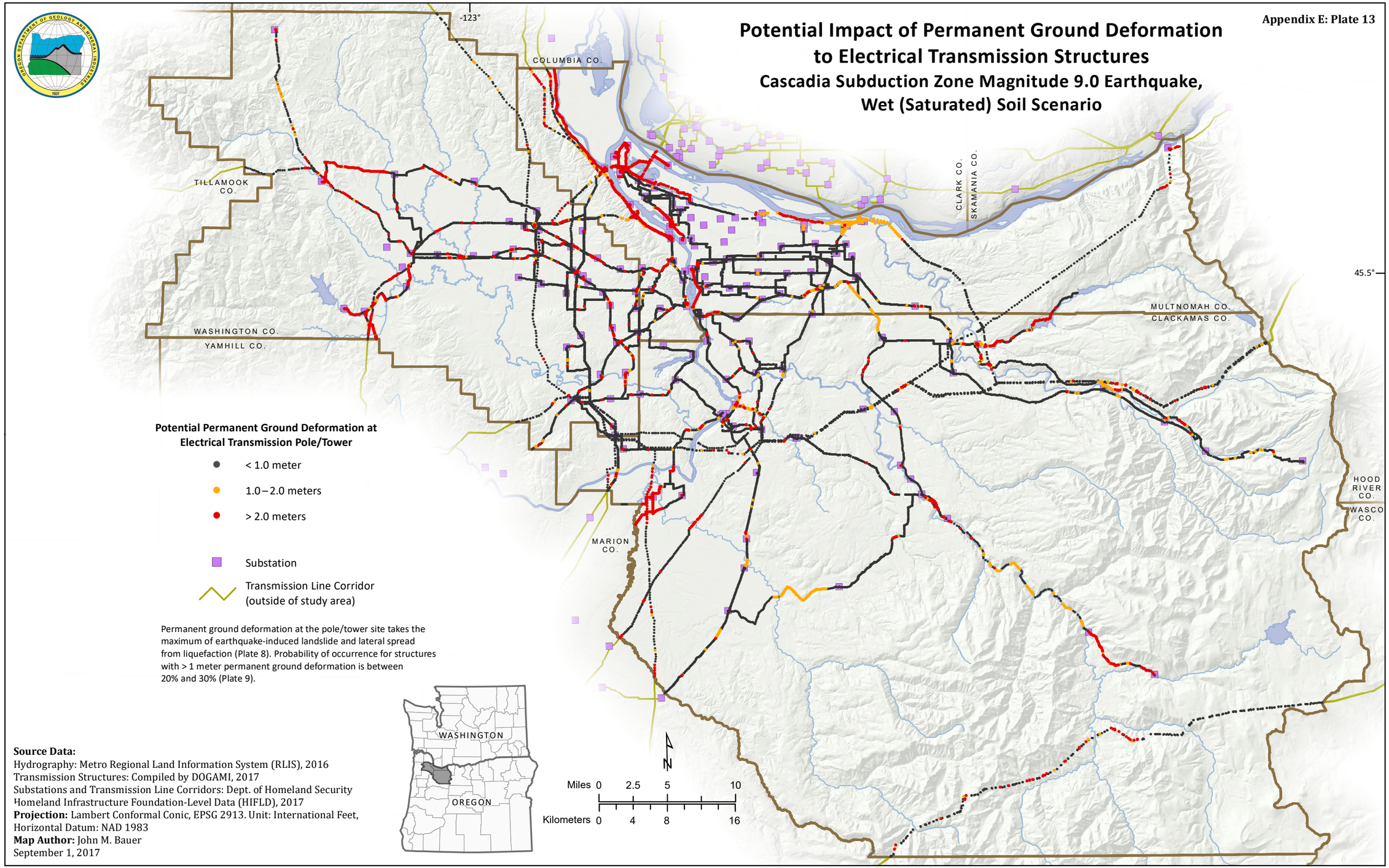
Not all cities are labeled.

Source Data:
Emergency Transporation Routes: Metro, 2006
Cities: Metro Regional Land Information System (RLIS), May 2017
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet.
Horizontal Datum: NAD 1983
Map Author: John M. Bauer
September 1, 2017

Appendix E: Plate 13

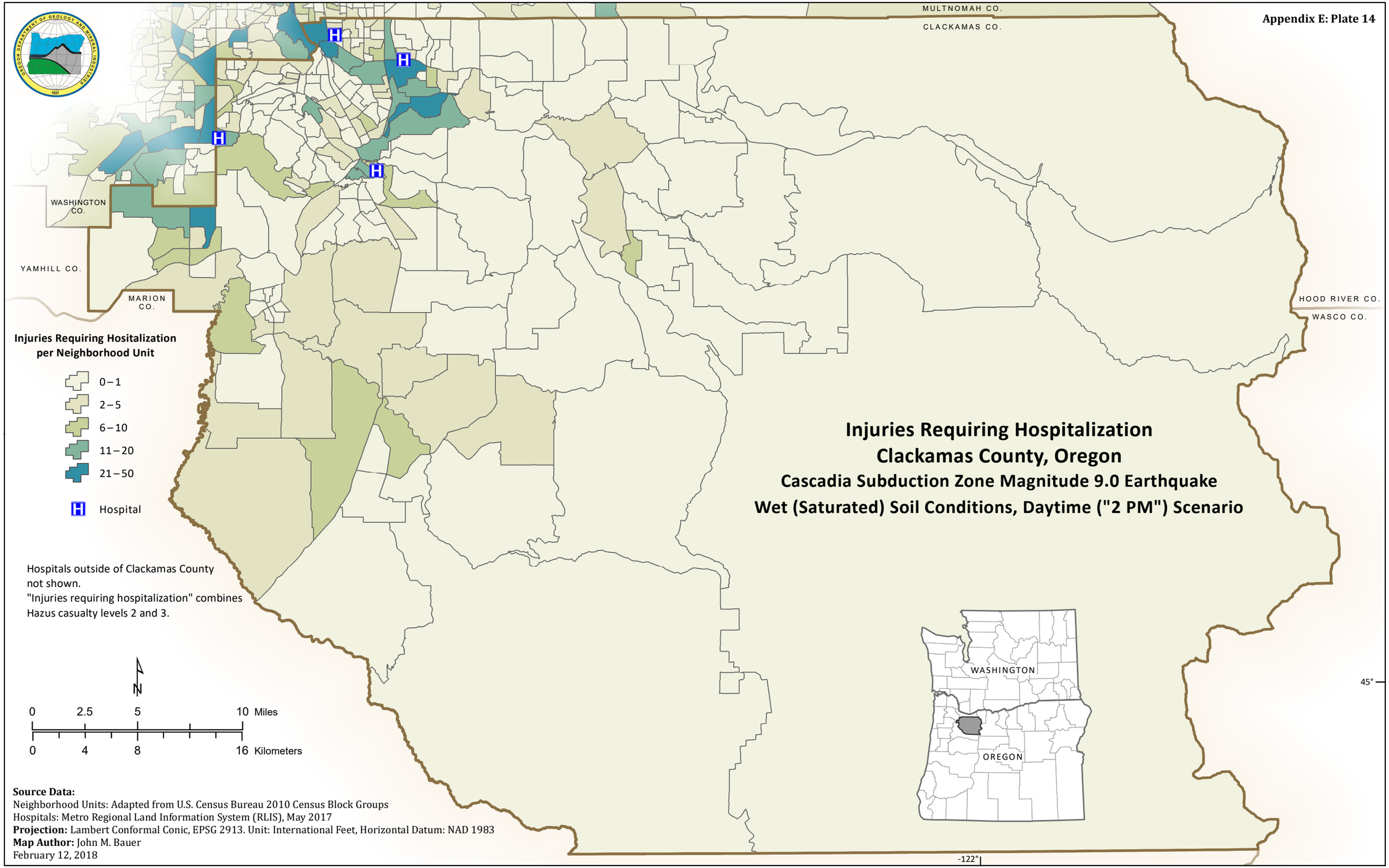
Potential Impact of Permanent Ground Deformation to Electrical Transmission Structures

Cascadia Subduction Zone Magnitude 9.0 Earthquake, Wet (Saturated) Soil Scenario



Source Data:
Hydrography: Metro Regional Land Information System (RLIS), 2016
Transmission Structures: Compiled by DOGAMI, 2017
Substations and Transmission Line Corridors: Dept. of Homeland Security Homeland Infrastructure Foundation-Level Data (HIFLD), 2017
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
September 1, 2017

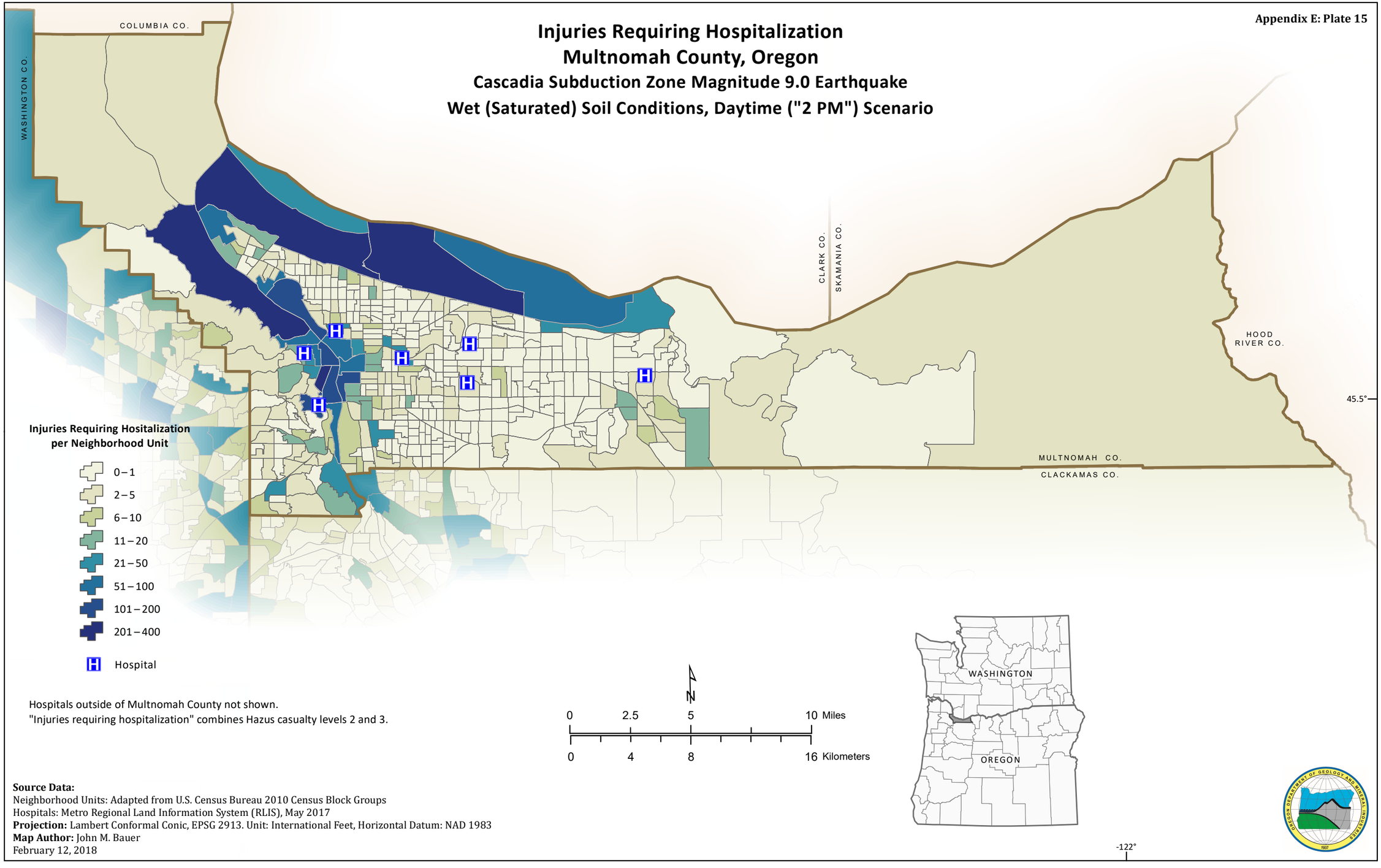
Appendix E: Plate 14



Source Data:
Neighborhood Units: Adapted from U.S. Census Bureau 2010 Census Block Groups
Hospitals: Metro Regional Land Information System (RLIS), May 2017
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 12, 2018

Appendix E: Plate 15

Injuries Requiring Hospitalization
Multnomah County, Oregon
Cascadia Subduction Zone Magnitude 9.0 Earthquake
Wet (Saturated) Soil Conditions, Daytime ("2 PM") Scenario

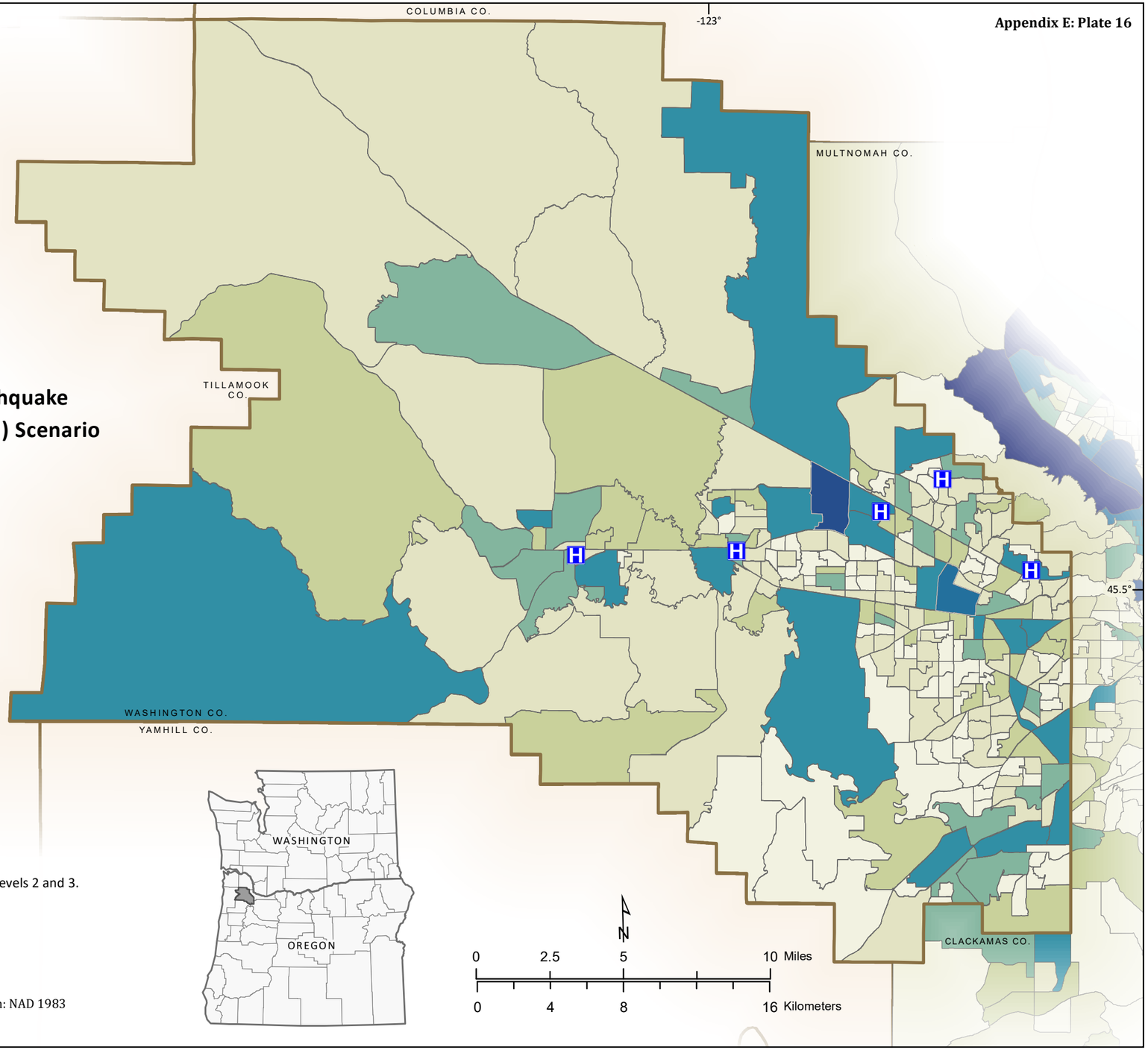


Hospitals outside of Multnomah County not shown.
"Injuries requiring hospitalization" combines Hazus casualty levels 2 and 3.

Source Data:
Neighborhood Units: Adapted from U.S. Census Bureau 2010 Census Block Groups
Hospitals: Metro Regional Land Information System (RLIS), May 2017
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 12, 2018

Appendix E: Plate 16

Injuries Requiring Hospitalization
Washington County, Oregon
Cascadia Subduction Zone Magnitude 9.0 Earthquake
Wet (Saturated) Soil Conditions, Daytime ("2 PM") Scenario



Injuries Requiring Hositalization per Neighborhood Unit

- 0 – 1
- 2 – 5
- 6 – 10
- 11 – 20
- 21 – 50
- 51 – 100
- 101 – 200
- H Hospital

Hospitals outside of Washington County not shown.
"Injuries requiring hospitalization" combines Hazus casualty levels 2 and 3.

Source Data:
Neighborhood Units: Adapted from U.S. Census Bureau 2010 Census Block Groups
Hospitals: Metro Regional Land Information System (RLIS), May 2017
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet, Horizontal Datum: NAD 1983
Map Author: John M. Bauer
February 12, 2018

NW Natural

2018 Integrated Resource Plan

LC-71

UG-170911



Compression at Miller Station Study

Mist was originally built with 80,000 Dth/day of maximum deliverability in 1989, which grew to 190,000 Dth/day by 2000. The core portion of Mist has now grown to 305,000 Dth/day, and future Mist recalls of course will increase that amount until it equals all of the existing Mist deliverability. Two reciprocating compressors (the "recips") were part of the original facility design in the 1980s, and two large turbine compressors (the "turbines") were added in the late 1990s and early 2000s, respectively. The recips are inefficiently sized now for the flow conditions and operations at Mist. The result is overuse of the turbines, which causes additional maintenance cost due to excessive use and deformations. NW Natural will conduct a study to determine the best solutions for compressor operations at Miller Station. The study is to be completed in 2019, and if necessary, the first phase of compressor replacement could start as early as 2020. It is estimated the study would have a total cost of $600,000.

6.2. PORTLAND LNG PLANT PROJECTS

The Portland LNG plant (also referred to as "Gasco") was constructed by Chicago Bridge and Iron and commissioned in 1969. As a resource specifically used for peak shaving, NW Natural requires high availability and reliability from Gasco. The facility and its major process components were designed for a nominal 25- to 30-year life, and it is now almost 50 years old.

Several mechanical and operational issues have been identified within the facility, and an in-depth engineering, economic, and alternatives analysis is underway. Contingent on the results of this analysis, NW Natural will identify and move forward with the best combination of solutions to address the issues. Two potentially significant issues — the facility's liquefaction system and cold box heat exchangers — are described below.

NW Natural retained an engineering consultant to study the existing liquefaction and pretreatment systems. This study is still in progress, and along with internal analysis by NW Natural, will identify which refurbishment and/or replacement options are best for the plant. The consultant's liquefaction study is expected to run through 2018 at a total cost of $850,000. Contingent on the results of this study and internal analysis, NW Natural will proceed with refurbishment or replacement of the liquefaction and associated system.

The other significant issue identified at Portland LNG is that the facility's cold box heat exchangers — original to the plant — no longer function reliably. The cold box was not designed to process current pipeline deliveries with their higher concentration of NGLs (as mentioned in Section 4.4), which condense in unintended parts of the heat exchanger. This causes the production rate to decrease, fouls the liquid separation system, and periodically requires a complete shutdown and blow down to clear the system, leading to downtime in the liquefaction process. Contingent on the results of the internal evaluation of the facility, NW Natural may have to replace the pretreatment system with a modern system designed to process current gas streams, and replace the cold box, associated appurtenances and instrumentation, boil off compressors, and glycol system heat exchangers. It is estimated that these replacements could have a total cost of roughly $40 million.

compressors which causes additional maintenance cost due to excessive use and deformations.
- Study to be completed in 2019. First phase of compressor replacement will take place in 2020 and 2021.
- $600,000 in 2019.

Instrument and Controls Upgrade (Phase 2)
- Upgrade flow computers at Miller Station and the I/W wells. This involves replacing 37 total systems.
- Current systems are at end-of-life.
- Planning and execution phases will both be in 2019.
- Estimated cost $200,000 (out of a total estimated cost of $1.1 million).

2.2 PORTLAND LNG PLANT PROJECTS[2]

This section discusses NW Natural's plan for capital projects at the Portland LNG plant (this facility also is referred to as "Gasco"). The Portland LNG projects are typically performed within the facility boundaries. They encompass the replacement of mechanical process equipment used for the liquefaction, vaporization, or storage of LNG.

Fire and Gas System
Additional gas and fire sensors were added throughout the facility in 2017. This was based on the result of a third-party study.
- Installed a high resolution articulated camera on top of the tank to monitor the relief stacks.
- Installed new relief stacks, which direct venting upward instead of horizontal.
- $360,000

Replace Piping Insulation
Removed and replaced deteriorated insulation on part of the liquefaction piping system in 2017.
- $326,000

Replace H-6 Vaporizer
Replaced H-6 vaporizer and associated control system in 2017.
- $2.8 million

Replace Mole Sieve
Replaced pretreatment system mole sieve in 2017.
- $105,000

[2] Estimated or actual costs related to Portland LNG projects do not include construction overhead (COH).

Process Instrumentation
Installed two gas chromatographs and combination CO_2 moisture analyzer in 2017.

- $220,000

Cold Box Cleaning
Dust has settled in sections of the cold box causing periodic plugging which requires system shutdowns.

- Purge and clean cold box internal aluminum heat exchangers in 2018.
- The cold box will be purged with gas to push particulate out of the system.
- Estimated cost $150,000

Note that the cold box is the core of the liquefaction process at Portland LNG and critical to the entire plant.

Tank Impoundment
Design and construct a liner to be installed in T-1 impoundment area in 2018. This liner will separate contaminated ground water from comingling with rain water. This will reduce total contaminated ground water in the impoundment, enabling the discharge of clean water into the Willamette River.

- Estimated cost $5.5 million

Liquefaction System Study
Retained a consulting engineering company to study the existing LNG plant's liquefaction and pretreatment systems. The study will clarify what replacement and refurbishment options are suitable for the facility.

- Estimated cost $850,000
- Results of this study may lead to other capital projects in ensuing years such as:
    - Replace H-7 vaporizer controls (estimated cost $2 million).
    - Replace liquefaction and associated system (very roughly estimated cost $40 million).
    - Tank seismic study (estimated cost $300,000).
    - Cyber security and control building (estimated cost $5 million).

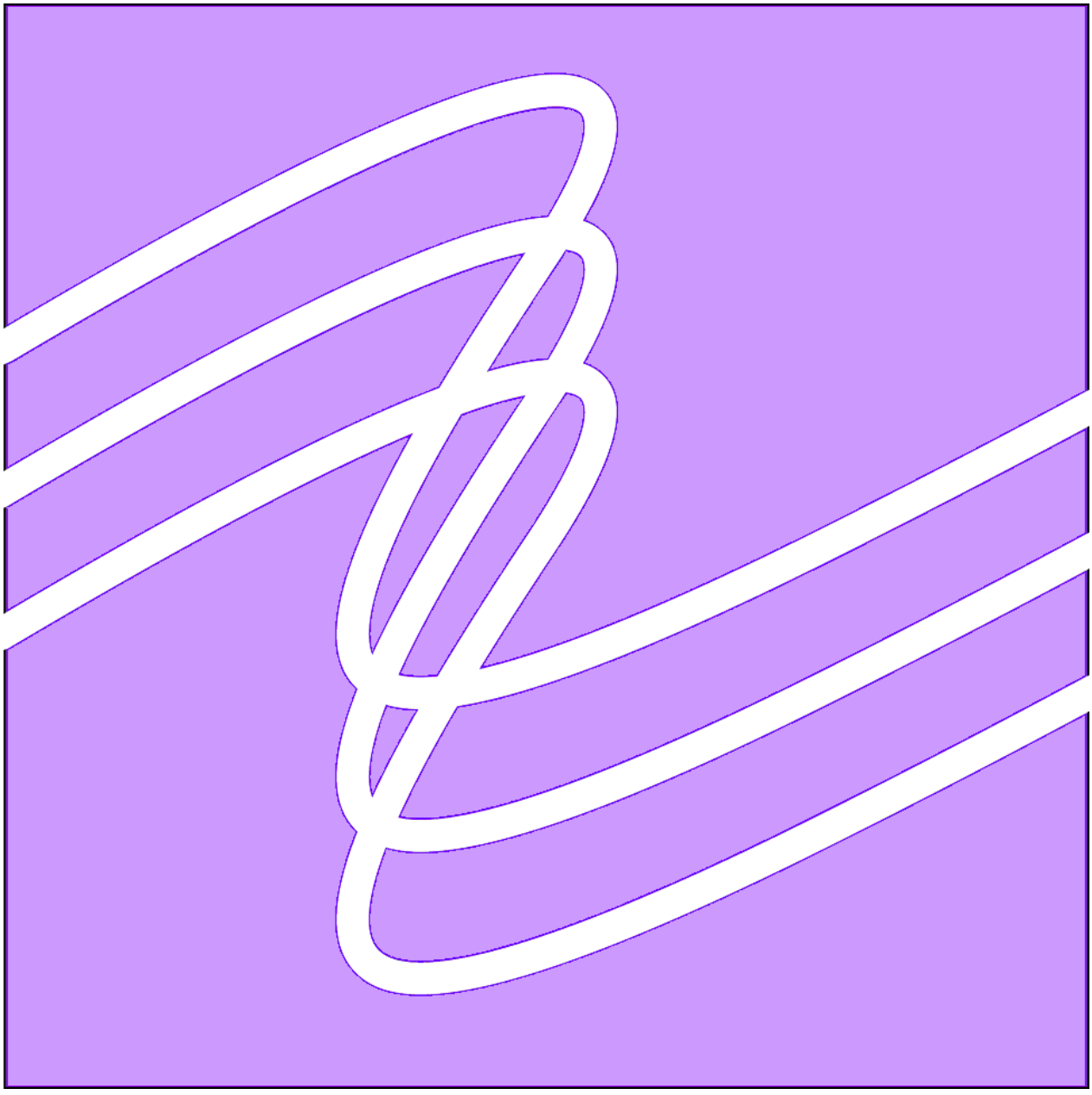
2.3 NEWPORT LNG PLANT PROJECTS[3]

This section discusses NW Natural's plan for capital projects at the Newport LNG facility. The Newport LNG projects are typically performed within the facility boundaries. They encompass the replacement of mechanical process equipment used for the liquefaction, vaporization, or storage of LNG.

[3] Estimated or actual costs related to Newport LNG projects do not include construction overhead (COH).

OREGON FREIGHT PLAN

Adopted June 15, 2011 (Revised November 17, 2017)



An Element of the Oregon Transportation Plan

THE OREGON DEPARTMENT OF TRANSPORTATION

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https://www.oregon.gov/ODOT/Planning/Pages/Plans.aspx

To obtain additional copies of this plan contact:

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Michael Montero
Brock Nelson
Mike Noonan
John Porter
Bob Russell
Tom Zelenka

Oregon Freight Plan

AN ELEMENT
OF THE OREGON
TRANSPORTATION PLAN

Prepared By
Cambridge Systematics Inc.
And
ODOT Freight Mobility Unit
Adopted
June 15, 2011

Amended
November 17, 2017
Prepared By
ODOT Freight Planning Unit
and
WSP

Oregon Department
of Transportation

Transportation
Development Division Planning Section

Oregon Freight Plan

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Executive Summary

Executive Summary

INTRODUCTION

Preserving and enhancing the efficiency of Oregon's freight system is essential to supporting economic development and the quality of life in Oregon. Whether it is carrying goods from Oregon manufacturers, farmers and other producers to markets, or delivering goods to homes and workplaces, the movement of freight supports the daily functioning of the state's businesses and residents. In 2008, manufacturing, agriculture, construction and retail trade (freight-dependent industries) provided 700,000 jobs and generated $29 billion of personal income.[1] Transportation and warehousing accounted for another 70,000 jobs and $3.2 billion of personal income.

This plan provides a roadmap for the Oregon Department of Transportation (ODOT), other state and local agencies, tribal governments and the private sector to work together to preserve and enhance the state's freight system. Implementation of the OFP will ensure a future freight system that supports diverse industrial sectors, including both traditional resource-based industries (like agriculture and forestry) and the modern high-tech sectors. It will be a system that ensures the safety of its users, connects businesses with their supply chains and global markets and provides steady employment while incorporating stewardship of natural resources.



[1] U.S. Bureau of Economic Analysis, Regional Economic Accounts, State Economic Profiles.

Oregon Transportation Plan Vision

> *By 2030, Oregon's transportation system supports people, places and the economy. We travel easily, safely and securely, and so do goods, services and information. Efficient vehicles powered by renewable fuels move all transportation modes. Community design supports walking, bicycling, travel by car and transit wherever appropriate. Our air and water are dramatically cleaner, and community sensitive and sustainable transportation solutions characterize everything we do.*
>
> *Oregonians and visitors have real transportation choices and transfer easily between air, rail, motor vehicles, bicycles and public transportation while goods flow just in time through interconnected highway, rail, marine, pipeline and air networks. Our communities and economies – large and small, urban and rural, coastal and mountain, industrial and agricultural – are connected to the rest of Oregon, the Pacific Northwest and the world. Land use, economic activities and transportation support each other in environmentally responsible ways.*
>
> *We excel in using new technologies to improve safety and mobility. We maximize the use of existing facilities across traditional jurisdictions and add capacity strategically. Public/private partnerships respond to Oregonians' needs across all transportation modes. Transportation system benefits and burdens are distributed fairly, and Oregonians are confident transportation dollars are being spent wisely. By 2030, Oregonians fully appreciate the role transportation plays in their daily lives and in the region's economy. Because of this public confidence, Oregonians support innovative, adequate and reliable funding for transportation.*

The OFP is a multimodal topic plan as required by the 2006 *Oregon Transportation Plan* (OTP). The OTP Vision defines the kind of transportation future we want to build and the outcomes we want to achieve. As an element of the OTP, the OFP will implement the OTP Vision.

The OTP includes a general discussion of freight in its identification of goals, policies and strategies for the state's multimodal transportation system and calls for the development of strategies and actions to implement the freight goals and policies of the OTP.[2] The OFP focuses more specifically on the economic benefits that a strong freight transportation system will support.

[2] The *Oregon Transportation Plan* is available online at: https://www.oregon.gov/ODOT/Planning/Pages/Plans.aspx

Oregon Freight Plan Vision

By 2035, Oregon benefits from a reliable, multimodal freight transportation system that supports its quality of life. This multimodal freight transportation system supports a healthy economy by safely and efficiently moving goods within Oregon, regionally, nationally and internationally. The quality, dependability and efficiency of Oregon's multimodal freight transportation system encourage businesses to remain in and move to Oregon, providing jobs in a diverse set of industries.

PURPOSE STATEMENT

A Freight Plan Steering Committee of freight industry and public sector stakeholders guided the development of the *Oregon Freight Plan (OFP)*. The committee developed the following purpose statement that helps focus the OFP vision:

The purpose of the Oregon Freight Plan is to improve freight connections to local, Native American, state, regional, national and global markets in order to increase trade-related jobs and income for workers and businesses.

To achieve the purpose statement, the *Oregon Freight Plan*:

- Supports identifying, prioritizing and facilitating investments in Oregon's highway, rail, marine, air and pipeline transport infrastructure to advance a safe, seamless multimodal and interconnected freight system;
- Identifies institutional and organizational barriers to an efficient and effective freight transportation system in Oregon, and develops strategies for addressing issues associated with overcoming these barriers; and
- Adopts strategies for implementation of OTP goals and policies related to the maintenance and improvement of the freight transportation system.

PLAN DEVELOPMENT

The OFP was developed with the involvement of a diverse group of organizations and stakeholders, including the Oregon Transportation Commission (OTC); the OFP Steering Committee; the Oregon Freight Advisory Committee (OFAC); other freight transportation, industry, land use and environmental experts; tribal governments; regional and local governments; and

other stakeholders. The process by which the OFP was developed is described in more detail in Chapter 1.

The OFP is informed by a series of topical technical papers developed in coordination with the Working Groups and Steering Committee during 2009 and 2010.

Using this technical input and with the guidance of the Steering Committee and Working Groups, the OFP was developed to:

- Describe the economic structure of the state's freight industries and the freight infrastructure that supports these industries and movements;
- Analyze impacts of potential changes in commodity flows, the economy and other factors on the freight system;
- Discuss possible implications of climate change on freight movements;
- Present options for financing the state freight system and for evaluating the relative importance of undertaking specific improvements that would enhance freight movement; and
- Present strategies for ensuring a safe, efficient and sustainable freight transportation system.

THE OREGON ECONOMY

Understanding the structure of the Oregon economy and how it will grow and change in the future is critical for understanding the needs of the state's freight transportation system because:

- The industries that comprise the economy and their supply chain and logistics systems determine the type of freight services that will be required.
- The growth of the overall economy and specific industry sectors will determine future freight demand and the growth rate for modal services.
- The relative economic growth by region will determine where freight modes will experience demand and where new connections to the freight system will be required.

Two key indicators of the future health of the Oregon economy, Gross State Product (GSP) and employment are projected to grow over the next 25 years. Oregon's GSP, a measure of the value added to products and services by all Oregon businesses and industries, is projected to top $310 billion,[3] by 2035

[3] Real GSP in year 2000 dollars.

growing by 121 percent.[4] Total non-farm employment in Oregon is projected to grow to 2.19 million jobs by 2035, an increase of 34 percent from 2009. Slower growth in employment as compared to GSP is an indication of a shift in the Oregon economy to higher value products and increasing labor productivity. This means that demand for freight transportation may grow faster than employment and come from different industrial sectors than it has in the past.

The Oregon Office of Economic Analysis (OEA) estimates that Oregon is the ninth most trade-dependent state in the nation.[5] The ranking illustrates the importance of export-oriented sectors, such as computer and electronics manufacturing, logistics and distribution, and processed foods to the Oregon economy.



Freight transportation demand is not only driven by the needs of Oregon's businesses. Growth and changes in the age and incomes of the state's population also determine consumer demands that must be supported by the freight system. Oregon's population is projected to grow approximately 34 percent between 2009 and 2035.[6]

4 Data from the Oregon Office of Economic Analysis (OEA), IHS Global Insight November 2009 data.

5 Oregon Business magazine: https://www.oregonbusiness.com/

6 The U.S. Census Bureau's projection to 2030 and Oregon's Office of Economic Analysis projection to 2030 differ by only 1.5 percent or about 57,000 people.

FREIGHT TRANSPORTATION DEMAND AND NEEDS OF OREGON INDUSTRIES

Analysis identified eight industries that represent freight-dependent industries that contribute significantly to Oregon's economy:

- High value product industries:
  - 1) Computer and electronics manufacturing; and
  - 2) Wholesale trade, footwear, apparel and recreation products.
- General manufacturing industries:
  - 3) Metals manufacturing;
  - 4) Machinery manufacturing;
  - 5) Food manufacturing; and
  - 6) Transportation equipment manufacturing.
- Natural resource-dependent industries:
  - 7) Agriculture, forestry, and fishing; and
  - 8) Wood and paper manufacturing.

In addition to these industries, the OFP analysis also identified the transportation, logistics and distribution industry as a critical freight-dependent industry cluster.

The growth of these industries, their products and the supplies they require explains the mix of commodities that will be shipped in the Oregon freight system, the modes that will experience growth in demand and the freight corridors that will see the most growth in freight traffic. A larger population will also increase demand for consumer goods.

Observations about anticipated future modal freight demand in Oregon include the following:

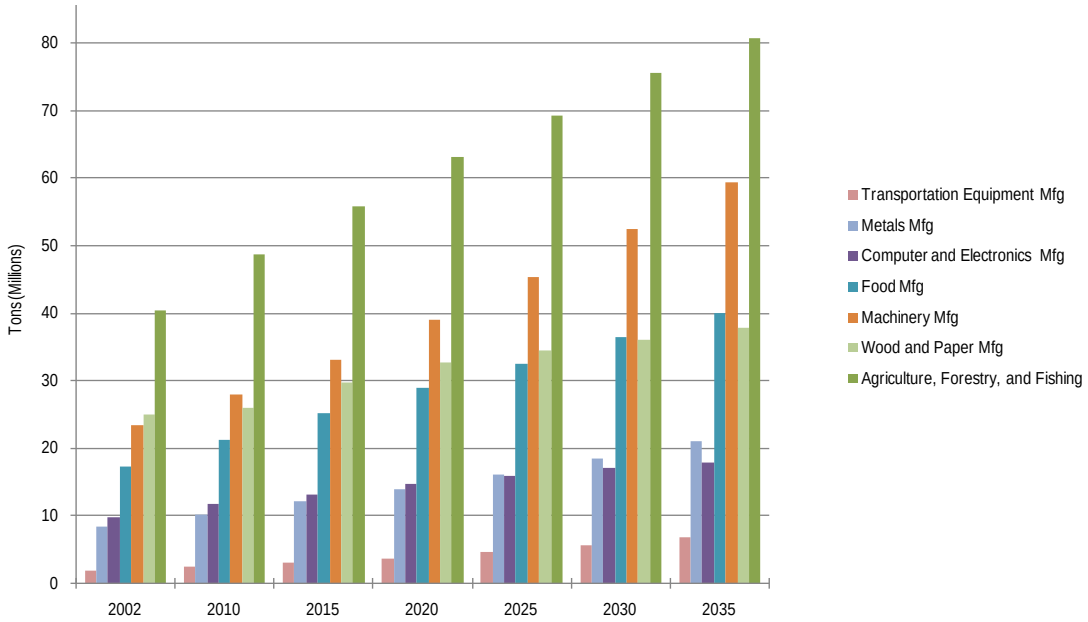
- The value of freight movements shows a steeper increase in value than tonnage as the economy continues its shift to higher value products.
- Trucking will continue to be the dominant mode for freight transport reflecting the shift towards higher value products, greater time sensitivity in product movements, and the ability of trucks to reach all parts of the state. This will create increasing demand on the state's highways and local roads, and metropolitan congestion will become an increasing concern for key industries.

- High level of rail demand from growth in consumer goods that are shipped by long haul intermodal and bulk commodity shipments through the state's seaports may create capacity issues. This could affect important industries in the state, such as the wood product and transportation equipment manufacturing industries, and may cause highway maintenance issues if these products are diverted to trucking.
- Substantial increase in airfreight is expected and will require improved access to major cargo airports.

Figure ES.1 highlights the anticipated growth in tonnage shipments of key industries. The industries currently responsible for the highest tonnage of shipments (agriculture, forestry and fishing; machinery manufacturing; and, food manufacturing) are expected to experience the highest growth.

Figure ES.0.1 Key Oregon Industries – Projected Growth of Related Commodity Tonnage with Oregon Origin*

2002 to 2035



Source: Oregon Commodity Flow Forecast data, October 2009.

*Retail trade and wholesale trade were not included in the tonnage overview.

While tonnage is a better indicator of the impact that product shipments have on the state's freight system, the value of shipments is an important indicator of the impact that an industry's shipments have on the economy. Viewed from this perspective, computer and electronics manufacturing contributes most to the value of shipments and is expected to continue to experience high growth. The major categories of freight-dependent industry sectors have their own unique

transportation and logistics requirements, and a well-functioning freight system will need to meet all of these needs.

A survey for the OFP of shippers and carriers identified a number of critical issues:

- Highway congestion on major freight corridors, particularly within the Portland area and on major connector routes to airports, seaports, and freight terminals, affect many Oregon industries adding costs and uncertainty to shipments.
- Growing rail congestion on mainlines and at terminals and declining shortline services could limit the ability of the state to fully realize the potential of its rail system.
- Necessary road and bridge size and weight restrictions makes it critical to ensure that there is connectivity and redundancy in corridors that experience relatively high volumes of permitted truck loads. Lack of highway system redundancy, in certain major freight corridors, makes the state's freight system vulnerable to disruptions caused by weather, the need to move nondivisible loads in key corridors and congestion/safety related delays.
- Lack of rural highway infrastructure or motor carrier services to support rural shippers remains a critical issue in certain parts of the state where natural resource-based shipments occur.
- Lack of designated truck routes and maintenance of truck routes, particularly off the state highway system, can create gaps in the freight system and limit access via "last mile" connections to major freight terminals.
- Increased demand for urban and waterfront industrial land supply to support freight-dependent industries, such as wood and paper manufacturing, may conflict with residential and commercial developments in the same real estate markets. A focused effort to protect industrial land throughout the state is important to maintain Oregon industry competitiveness and viability.

THE FREIGHT SYSTEMS

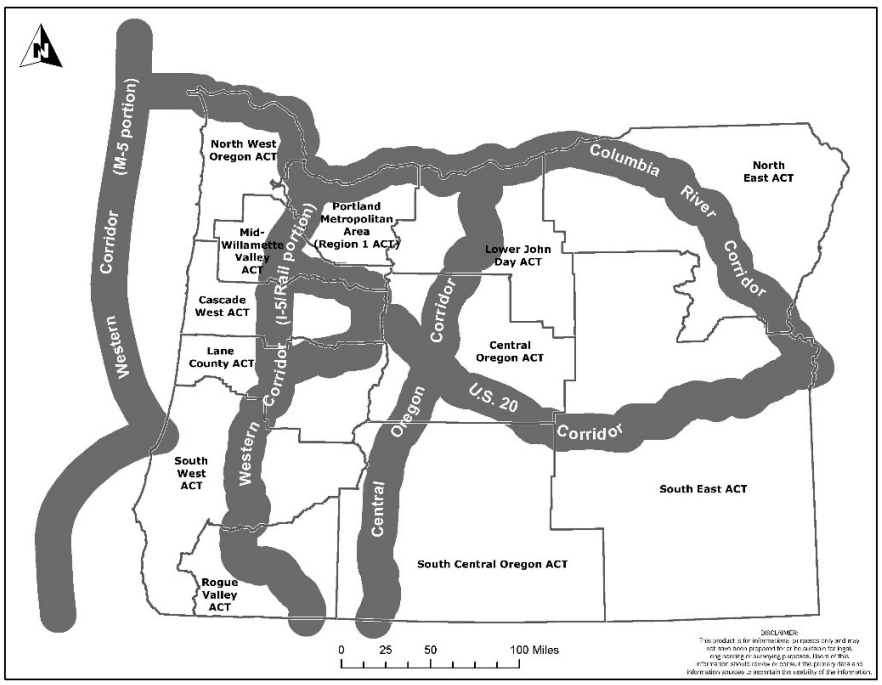
Freight mobility in Oregon is provided by a multimodal network that includes highways, local roads, rail, air, marine and pipeline operations. The transportation system includes the following infrastructure:

- 7,441 miles of state highways,
- 4,664 miles of other state roads,
- 26,861 miles of county roads,
- 10,011 miles of city roads,

- 38,666 miles of other government-owned roads,
- 2,086 miles of privately-owned route miles of rail track,
- 314 miles of publicly-owned rail track,
- 1,126 miles of Class I carrier operated rail track,
- 1,274 miles of Class III shortline-operated railroad track,
- 18 Class I railyards,
- Five deep-draft marine ports,
- Four shallow-draft marine ports,
- Numerous private marine terminals,
- 31 Category I, II, and III airports, and
- Nine pipelines to move petroleum and natural gas.

To ensure a long-term competitive advantage for Oregon freight-dependent industries, the OFP identifies a strategic network of multimodal freight corridors. This system has been developed with a focus on the strategic routes and modes used by the important freight-dependent industries to support their supply and distribution chains. The OFP defines multimodal corridors that include these strategic routes based on the value and tonnage of freight carried and connections to centers of economic activity. Figure ES.2 illustrates these corridors described in Chapter 4.

Figure ES.0.2 Freight Strategic Corridors in Oregon



FREIGHT AND CLIMATE CHANGE

According to the EPA, transportation sources account for one-third of carbon dioxide emissions which contribute to global climate change.[7] Research and policy have historically focused on reducing GHG emissions from passenger vehicles. However, freight sources are increasingly being considered due to their contribution to carbon dioxide, nitrogen oxides, sulfur dioxide and particulate matter emissions. The Transportation Research Board found that the conveyance of freight—via rail, commercial trucks, ships, boats and pipelines—accounts for 38 percent of all transportation-related carbon dioxide emissions[8] or 12 percent of all man-made sources. Thus, addressing freight emissions and efficiency has the potential for long-term effects on GHG emissions and public health parameters.

7 EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006, Table 2-14

8 "Potential Impacts of Climate Change on U.S. Transportation" (TRB 290), Table B-2

FUNDING

Federal, state and local governments provide much of the funding for freight transportation system improvements including highways, airports and certain marine port facilities. The private sector provides funding for those elements of the transportation system that are privately owned and operated, including marine terminals, pipelines and rail lines. Governments and the private sector sometimes work together in public-private partnerships to fund freight transportation improvements.

The state has shown foresight in the development of an array of multimodal funding sources, many of which involve partnerships with federal, local and private sources and across a number of different state agencies to leverage all available funding. For example, the Multimodal Transportation Fund (also known as *Connect*Oregon) is a model program that has supported numerous non-highway freight investments and that other states have sought to emulate.

The OFP presents a number of potential funding opportunities that should be explored. These include:

- Existing federal funding and financing programs that Oregon could take greater advantage of, such as:
  - CFR Title 23, Section 129 loans,
  - Transportation Infrastructure Finance and Innovation Act (TIFIA) credit assistance, and
  - Grant Anticipation Revenue Vehicles (GARVEE) bonds.
- State funding sources such as:
  - *Connect*Oregon,
  - Oregon Jobs and Transportation Act (JTA),
  - Oregon Transportation Improvement Acts (OTIAs), and
  - Public-private partnerships.

Chapter 6 discusses these funding sources in detail along with a number of other potential alternatives that would need to be authorized at the federal level and looks towards potential changes and opportunities for funding freight projects through programs that may be incorporated in reauthorized federal surface transportation funding legislation. Chapter 9 discusses the funding sources that were included in the Fixing America's Surface Transportation (FAST) Act.

ISSUES AND STRATEGIES

Analysis and outreach efforts supporting the development of the *Oregon Freight Plan* have identified a number of issues that need to be addressed in order to ensure that Oregon has an efficient and sustainable freight transportation system that continues to support economic growth. These issues are summarized below.

- Issue 1. A clearly defined, multimodal "Strategic Freight System," is essential in order to focus freight system improvements, maintenance and protection on the freight corridors that play the most critical role in supporting the state's economy. Currently, this does not exist.
- Issue 2. Capacity constraints, congestion, unreliability, and geometric deficiencies in key highway, rail, air and marine freight corridors cause inefficiencies in statewide freight movement.
- Issue 3. Congestion and unreliable travel time on roads to access major intermodal facilities can cause disruptions to freight movement and industry supply chains.
- Issue 4. Improvements to the efficiency, reliability and safety of long-haul freight corridors require collaboration between Oregon and neighboring states in the region.
- Issue 5. Changes to the physical dimensions of a highway may either accommodate or restrict permitted loads throughout the entire state and can cause connectivity issues to key businesses and freight generating activities.
- Issue 6. Freight needs to be able to move throughout the state in a manner that is as safe as possible. Its movement may impact safety in Oregon communities and to the environment.
- Issue 7. Industrial land supply for freight-dependent land uses may be insufficient to meet future demand. Lack of necessary land use protections may threaten the viability of freight transportation systems.
- Issue 8. Freight emissions include pollutants such as GHGs and particulate matter that contribute to climate change and health risk concerns.
- Issue 9. National Environmental Policy Act (NEPA) review procedures and permitting requirements for freight projects involve complexities that, if overlooked, can result in negative impacts to project development and implementation cycles.
- Issue 10. New and emerging safety, security and environmental regulations, though beneficial, can be confusing to shippers and carriers and be expensive to implement.

- Issue 11. The freight system in Oregon lacks system redundancy in several key locations. This leaves it vulnerable to disruptions that threaten freight system continuity, especially during emergencies.
- Issue 12. Lack of a sustained source of statewide freight funding decreases the ability of the public sector to plan for long- and medium-term freight needs in a comprehensive manner.
- Issue 13. Limited availability of state transportation funds means that use of existing sources of funding must be effectively optimized.
- Issue 14. The lack of a continuous federal freight funding source makes it very challenging for Oregon to implement the ongoing planning and programming of freight projects. Those projects that are of regional or national significance should be eligible for federal participation and funding.
- Issue 15. The economic importance of freight is not always understood or appreciated by the public.

For each freight issue, Chapter 8 details strategies and actions that Oregon can use to implement the plan.

Plan Implementation

Implementation of the OFP strategies and actions will build on the planning framework established in the OTP and other modal and topic plans. This will include working with a variety of public agencies and private sector stakeholders through existing and new partnerships. Implementation of some of the strategies and actions can be accomplished in the short-term while others will require commitments over the longer term. Some may require legislative action or action by other governmental entities. Implementation will occur in phases and will require coordination with efforts to update other plans such as the modal and topic plans as well as regional and local transportation system plans. Funding availability will be critical to implementing many of the strategies and associated actions.

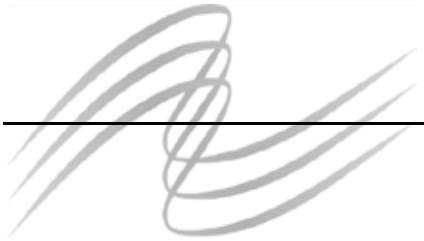
Some implementation actions can start soon after the plan is adopted. These include the following:

- Develop an Implementation Plan using the OTP key initiatives and *Oregon Freight Plan* purpose statement to provide a framework.
- Continue discussions to update Oregon's transportation finance structure with stakeholders and the public.
- Develop performance measures and analytical tools for plan implementation.

- Seek freight stakeholder input on bottlenecks or choke points on the Strategic Freight System.
- Communicate the bottlenecks or choke point locations to infrastructure owners.



Introduction



1.0 Introduction

1.1 OVERVIEW OF THE PLAN

Preserving and enhancing the efficiency of Oregon's freight system is essential to supporting economic development, prosperity and the quality of life in Oregon. Whether it is carrying goods from Oregon manufacturers, farmers and other producers to markets, or delivering goods to homes and stores for consumption, the movement of freight supports the daily functioning of the state's businesses and residents. In 2008 freight-dependent industries like manufacturing, agriculture, construction and retail provided 700,000 jobs and generated $29 billion of personal income.[9] Transportation and warehousing accounted for another 70,000 jobs and $3.2 billion of personal income.

Anticipated growth in Oregon's population, freight volumes and resulting congestion highlight the need to plan for transportation system improvements to meet requirements of shippers, carriers and other freight system stakeholders. Oregon's population is forecast to increase from 3.4 million people in 2000 to 5.2 million by 2035.[10] In 2008, roughly 389 million tons of freight worth about $242 billion moved on Oregon's transportation system.[11] These values are projected to grow to 651 million tons of freight worth $554 billion by 2035, even after taking the impacts of the recent recession into account.[12,13] This growth will increase infrastructure and capacity needs and impact industries, communities and the natural environment.

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9 U.S. Bureau of Economic Analysis, Regional Economic Accounts, State Economic Profiles.

10 Oregon Office of Economic Analysis Forecasts of Oregon's County Populations and Components of Change, 2000-2040. Release: April 2004. Website: https://www.oregon.gov/das/OEA/Pages/forecastdemographic.aspx

11 These values do not include freight movements that do not have an Oregon origin or destination.

12 Oregon Commodity Flow Forecast data. Prepared by Parsons Brinckerhoff using FAF2 commodity flow data, October 2009.

13 At the time of the OFP adoption by the OTC in 2011, Oregon was still recovering from the 2009 recession. The plan and data presented within the plan take into account the expected impacts of the 2009 recession on future freight growth. However, growth values are best estimates. Chapter 7 discusses general impacts on freight under several scenarios, including higher and lower than expected growth.

The *Oregon Freight Plan* (OFP) expresses a 25-year vision of a freight system that supports diverse industrial sectors, including both traditional resource-based industries (like agriculture and forestry) as well as the modern high-tech sectors. The freight system connects Oregon to the rest of the global supply chain while at the same time ensuring that all regions of the state have access to quality transportation services. It is a system that ensures the safety of its users while maintaining a sustainable future – socially sustainable, providing for the physical needs of the residents of the state; economically sustainable, providing steady employment and financing the transportation system; and, environmentally sustainable, incorporating stewardship of natural resources.

The OFP brings together issues affecting all freight-related modes of transportation and proposes strategies to maximize the effectiveness of the multimodal freight system. The OFP:

- Describes the economic effect of the state's freight-dependent industries, and the freight infrastructure that supports these industries and movements;
- Analyzes impacts of potential changes in commodity flows, the economy and other factors of the freight system;
- Discusses possible implications of climate change on freight movements;
- Presents options for financing the state freight system and for evaluating the relative importance of undertaking specific improvements that would enhance freight movement; and
- Presents strategies for creating and improving a safe, efficient and sustainable freight transportation system.

As a statewide plan adopted by the Oregon Transportation Commission (OTC), it will guide the Oregon Department of Transportation's (ODOT) freight-related actions and investments and guide freight planning in state, regional and local plans.



Oregon Transportation Plan Vision

> *By 2030, Oregon's transportation system supports people, places and the economy. We travel easily, safely and securely, and so do goods, services and information. Efficient vehicles powered by renewable fuels move all transportation modes. Community design supports walking, bicycling, travel by car and transit wherever appropriate. Our air and water are dramatically cleaner, and community sensitive and sustainable transportation solutions characterize everything we do.*
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> *Oregonians and visitors have real transportation choices and transfer easily between air, rail, motor vehicles, bicycles and public transportation while goods flow just in time through interconnected highway, rail, marine, pipeline and air networks. Our communities and economies – large and small, urban and rural, coastal and mountain, industrial and agricultural – are connected to the rest of Oregon, the Pacific Northwest and the world. Land use, economic activities and transportation support each other in environmentally responsible ways.*
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> *We excel in using new technologies to improve safety and mobility. We maximize the use of existing facilities across traditional jurisdictions and add capacity strategically. Public/private partnerships respond to Oregonians' needs across all transportation modes. Transportation system benefits and burdens are distributed fairly, and Oregonians are confident transportation dollars are being spent wisely. By 2030, Oregonians fully appreciate the role transportation plays in their daily lives and in the region's economy. Because of this public confidence, Oregonians support innovative, adequate and reliable funding for transportation.*

The OFP is a multimodal topic plan as required by the 2006 *Oregon Transportation Plan* (OTP). The OTP Vision defines the kind of transportation future we want to build and the outcomes we want to achieve. As an element of the OTP, the OFP will implement the OTP Vision.

The OTP includes a general discussion of freight and calls for the development of the OFP to further its freight goals and policies.[14] The OFP focuses on the economic benefits that a strong freight transportation system will support.

[14] The *Oregon Transportation Plan* is available online at: https://www.oregon.gov/ODOT/Planning/Pages/Plans.aspx

Oregon Freight Plan Vision

By 2035, Oregon benefits from a reliable, multimodal freight transportation system that supports its quality of life. This multimodal freight transportation system supports a healthy economy by safely and efficiently moving goods within Oregon, regionally, nationally and internationally. The quality, dependability and efficiency of Oregon's multimodal freight transportation system encourage businesses to remain in and move to Oregon, providing jobs in a diverse set of industries.

Oregon Freight Plan Initiation and Development

Over the last 20 years, ODOT and other state agencies have addressed freight in statewide multimodal, modal and topical transportation plans, including the 2006 *Oregon Transportation Plan* (OTP). The OTP includes a general discussion of freight in its identification of goals, policies and strategies for the state's multimodal transportation system. The OTP recommends that other multimodal, modal/topic and system plans further define the OTP's broad goals, policies, strategies and investment scenarios.[15] The OFP responds to this recommendation by taking freight planning in the state to the next level. It is the first plan at the state level focused entirely on the improvement of the freight system. The OFP builds on efforts of the OTC, the Oregon Freight Advisory Committee (OFAC), the state's ports, shippers, railroads and other public and private stakeholders.

Oregon's Freight Plan Purpose and Implementation Statements

A Freight Plan Steering Committee (See Appendix A) of executive-level industry and public sector stakeholders guided the development of the OFP. The committee developed the following purpose statement for the Plan that focuses the OFP vision:

The purpose of the Oregon Freight Plan is to improve freight connections to local, Native American, state, regional, national and global markets in order to increase trade-related jobs and income for Oregon workers and businesses.

[15] Volume 1 of the OTP contains detailed information on OTP goals, policies, strategies and investment scenarios.

To achieve the state's freight planning goals, the *Oregon Freight Plan*:

- Supports identifying, prioritizing and facilitating investments in Oregon's highway, rail, marine, air and pipeline transport infrastructure to further a safe, seamless multimodal and interconnected freight system;
- Identifies institutional and organizational barriers to an efficient and effective freight transportation system in Oregon, and develops strategies for addressing issues associated with overcoming these barriers; and
- Adopts strategies for implementation of OTP goals and policies related to the maintenance and improvement of the freight transportation system.

As the guiding statement for the *Oregon Freight Plan* process, the purpose statement recognizes that freight system efficiency supports the competitiveness of the state's industries by providing more efficient access to domestic and international markets. Market competitive industries contribute to economic growth across the state. Finally, the OFP furthers the goals of the OTP, including the development of strategies to make freight movements more efficient and to lessen the impact on Oregon's communities and natural environment.

Freight Impacts

Development of the OFP required input by private and public stakeholders as a result of the vast impact of freight on communities, regions and the state. Public sector stakeholders rely on freight to support local, regional and state industries; provide jobs to constituents; and maintain a high standard of living. Private sector stakeholders rely on freight movements to and from various markets in an efficient and affordable manner. In turn, public and private stakeholders decisions affect the freight system and surrounding communities. The relationships between public and private sector actions and the freight system are briefly summarized in Figure 1.1.



Figure 1.1 Stakeholder Roles and Relationships

	How Stakeholders Impact Freight
Local Government	· Design and maintain local roads · Route of truck traffic through local communities · Make land use decisions that impact where freight-dependent industries are located and that impact how freight will interact with the community · Develop a local vision for portions of highways that also serve significant local needs · Work with railroads, trucking firms, shipping lines and others on the mitigation of impacts to the environment and communities
Regional Agencies and Groups (includes MPOs and ACTs)	· Support statewide decision-making by prioritizing and supporting selection of necessary regional transportation and freight projects · Consider local/regional transportation and freight issues if they impact the state system · Recommend (ACTs) or direct (MPOs) projects in their area or jurisdiction to receive federal funds
Port Authorities (Marine and Airports)	· Improve freight efficiency by managing and maintaining key intermodal freight facilities such as ports and airports, which improves economic opportunity and quality of life in the region and state. Ports and airports rely on the surface transportation infrastructure provided by railroads and road authorities to move goods.

State Agencies	· Plan for statewide improvements in the transportation and freight system · Design, construct, operate and maintain multimodal state facilities
Tribal Governments	· Consult with Tribal governments throughout the statewide and metropolitan planning and programming processes (23 USC 134 and 23 USC 135)
Private Sector	· Creates economic demand that generates freight traffic · Select modes and distribution patterns which will impact freight system efficiency, local/regional/state economies, environment and other critical factors

Source: Prepared by Cambridge Systematics, Inc. for the Oregon Freight Plan

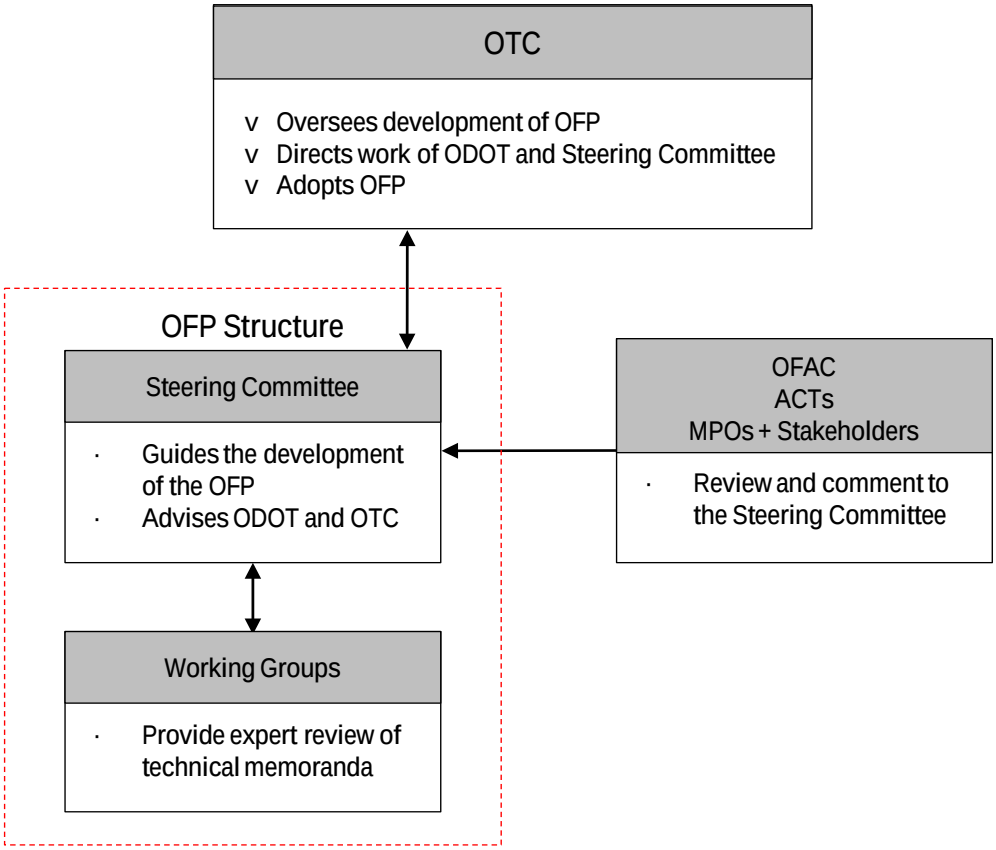
As a result of different levels of government jurisdiction over freight infrastructure, conflicts can arise. For example, a local community's decision to develop a pedestrian oriented streetscape that does not adequately support truck traffic impacts the efficiency and the quality of the regional and state freight system. This makes communication and cooperation among stakeholder groups essential.

Plan Development[16]

The Oregon Transportation Commission, OFP Steering Committee, other freight transportation, industry, land use and environmental experts, regional and local governments and other stakeholders were involved in the development of the *Oregon Freight Plan* (Figure 1.2). Groups included the following:

[16] Information on the consultation process associated with the 2017 amendment can be found in Appendix A.

Figure 1.2 Stakeholder Groups Involved in the Development of the OFP[17,18]



- The Oregon Transportation Commission. The OTC, a five-member commission appointed by the Governor, establishes state transportation policy and is responsible for guiding the planning and management of Oregon's transportation system. This includes adoption of the OFP as a component of the OTP. The OTC played a leadership role in the development of the freight plan by convening the OFP Steering Committee, monitoring plan progress and providing input on plan content, strategies and decisions. A commissioner chaired the Steering Committee.
- The Freight Plan Steering Committee. The Steering Committee, which included executive-level freight, industry, community and transportation professionals from around the state, provided overall direction to ODOT for development of the OFP, its contents and its strategies. Appendix A provides a list of Steering Committee members.

[17] See text below and Appendix E – Glossary for an explanation of acronyms.

[18] Information on the consultation process associated with the 2017 amendment can be found in Appendix A.

- Freight Plan Working Groups. Three Working Groups provided expert review of the technical memoranda prepared by consultants. Lists of Working Group members are provided in Appendix A.
- The Oregon Freight Advisory Committee. The OFAC is a multimodal advisory committee made up of shippers, carriers, intermodal operators and public agency representatives created by the state legislature to advise the OTC and ODOT about freight issues and high priority freight projects. OFAC work was instrumental to the development of this OFP. Several of the OFAC members were members of the OFP Steering Committee and Working groups. In addition, the OFAC discussed updates to the status of the freight plan at its quarterly meetings.
- Oregon Area Commissions on Transportation. The ACTs are advisory bodies of local and regional officials and other stakeholders chartered by the OTC; the 11 ACTs cover all parts of Oregon except the Portland Metro area and Hood River County. They provide comment on transportation plans and play an important advisory role in the State Transportation Improvement Program (STIP) in establishing area project priorities. Information and studies completed by the ACTs were consulted during the creation of this plan. Appendix B provides a list of ACTs.
- Oregon Metropolitan Planning Organizations. MPOs are responsible for planning, programming and coordinating federal transportation investments in Oregon's largest urbanized areas. Appendix B provides a map of MPOs in Oregon.
- Topical Technical Papers. The OFP has been informed by a series of topical technical papers developed in coordination with the Working Groups and Steering Committee during 2009 and 2010.

1.2 POLICY AND LEGAL CONTEXT OF THE PLAN

Consistency with Oregon Statewide Transportation Plans

Oregon Transportation Plan and Statewide Modal and Topic Plans

The OFP is one of several statewide transportation plans that further define and implement the OTP's goals, policies, strategies and investment scenarios. The freight plan helps the OTC fulfill its responsibilities under Oregon Revised Statute (ORS) 184.619(1). Appendix C details how the Oregon Freight Plan meets consistency and other requirements for multimodal, modal and topic plans, as specified in the OTP.

In addition to helping define and implement the OTP, the freight plan complements and helps to implement various statewide modal/topic plans,

including the Aviation Plan, Highway Plan, Ports Strategic Plan, Rail Plan and Transportation Safety Action Plan. See Figure 1.3.

Federal Requirements

Federal Regulations

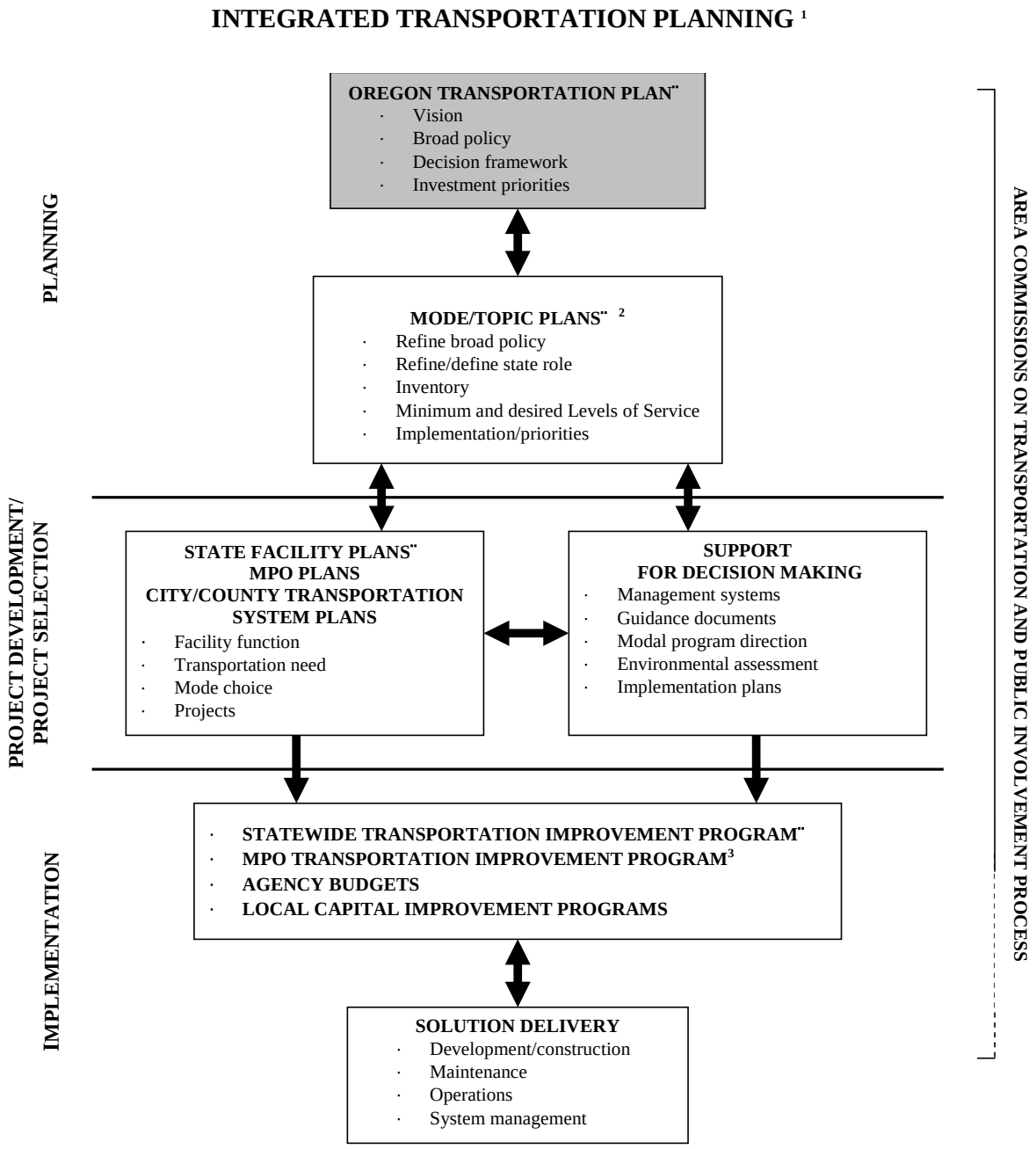
Like the OTP, the *Oregon Freight Plan* is required to comply with federal requirements. This includes:

- The planning regulations stipulated in the federal Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU);
- The Passenger Rail Investment and Improvement Act (PRIIA) of 2008; and
- The Federal Aviation Administration (FAA) policy and guidance for aviation system planning.

Appendix C provides a detailed discussion of relevant federal legislation and requirements that apply to the *Oregon Freight Plan* and describes how the OFP maintains consistency with these requirements.[19]

[19] Chapter 9 details how the plan is consistent with MAP-21and the FAST Act.

Figure 1.3 Relationship of Integrated Transportation Planning to the OTP and Statewide, Regional and Local Transportation Plans



¨ Oregon Transportation Commission action.
1. Influenced by the Transportation Planning Rule.
2. Aviation, Bicycle/Pedestrian, Freight, Highway, Public Transportation, Rail, Transportation Safety Action.
3. MPO TIPs must be included in ODOT's STIP without modification. To ensure state priorities are considered, ODOT must be involved in the MPO planning project selection process.

Source: Prepared by ODOT

Oregon State Requirements

The Land Conservation and Development Commission (LCDC) has adopted 19 statewide land use planning goals that express Oregon's goals on land use, transportation, economic development and related topics. To implement Goal 12, Transportation, the LCDC adopted the Transportation Planning Rule (TPR), which requires ODOT to prepare a state transportation system plan (TSP) that identifies a system of transportation facilities and services adequate to meet identified state transportation needs. The *Oregon Freight Plan* is part of the state TSP. Regional and local transportation plans, in turn, must be consistent with the state TSP. This requirement extends the *Oregon Freight Plan's* influence to local and regional freight planning.

To facilitate coordination of land use planning activities among various governmental entities, Oregon statutes require that state agencies prepare coordination programs. ODOT's coordination program establishes procedures that ODOT uses to ensure compliance with statewide planning goals in a manner compatible with acknowledged city, county and regional comprehensive plans. Appendix C provides *Oregon Freight Plan* findings of compliance with the State Agency Coordination Program and statewide planning goals.

Oregon Transportation Commission Public Involvement Policy

To assist in meeting state and federal public participation requirements for statewide planning processes and the STIP development, the OTC has adopted a public involvement policy for the commission and ODOT activities.

The public involvement process for the *Oregon Freight Pl*an was consistent with the OTC's public involvement policy and included periodic briefings and discussions at OTC meetings, *Oregon Freight Plan* Steering Committee and Working Group meetings, quarterly updates at OFAC meetings, newsletters on the freight plan website, meetings with stakeholder groups and interested parties to solicit comments and coordination internally within ODOT and with other governmental agencies. Further information on the public involvement process for the plan can be found in Appendix D.

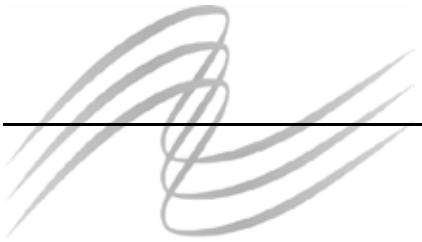
1.3 SUMMARY OF OREGON FREIGHT PLAN CONTENTS

Plan Chapters

This OFP is organized into an executive summary and nine chapters:

- **Executive Summary.** Major findings and recommendations of the plan;
- **Chapter 1 – Introduction.** Background and overview of the OFP, including its development, the plan structure, planning compliance and public involvement;
- **Chapter 2 – Economy and Freight Demand.** Oregon's current economic structure, including major industry sectors and key goods-dependent industries and anticipated economic trends and forecasts; this is followed by an overview of commodity flows in Oregon, including weight, value, mode splits and specific freight corridors;
- **Chapter 3 – Oregon Industries and Freight Movement.** Key industries in Oregon, their contribution to statewide economic output and jobs, and their needs, issues and opportunities as they relate to the freight plan;
- **Chapter 4 – Freight Systems.** Oregon's multimodal freight network, methodology of strategic system selection and corridor connectivity;
- **Chapter 5 – Freight and Climate Change.** Discussion about the impact of climate change on freight, Oregon's actions to mitigate greenhouse gases from freight and potential additional methods to reduce freight impact on greenhouse gases;
- **Chapter 6 – Funding.** Comparison of funding resources to funding needs, and identification of opportunities for closing the funding gap;
- **Chapter 7 – Alternative Scenarios.** Overview of the impact on freight and goods movement when taking alternative economic and policy scenarios into consideration; and
- **Chapter 8 – Freight Issues and Strategies.** Recommended policy, investment, operational and institutional strategies to maintain and improve freight mobility in Oregon and further the goals of the plan.
- **Chapter 9 – Federal Compliance.** Brings the Oregon Freight Plan into compliance with the federal FAST Act.

Economy and Freight Demand



2.0 Economy and Freight Demand

2.1 INTRODUCTION

Economic growth and the composition of Oregon's economy is an important driver of freight transportation demand. This chapter describes the state's economy and factors that may affect future growth patterns, followed by a discussion of current and expected freight demand on the state's transportation network.

This chapter is divided into the following sections:

- Summary of major Oregon economic and demographic trends and the relationship between these trends and freight demand;
- Freight demand on Oregon's freight network; and
- Freight demand by Area Commissions on Transportation (ACTs).

2.2 OREGON'S ECONOMY

A review of the Oregon economy – in terms of Gross State Product (GSP), employment, population growth and industry trends – is critical to understanding future demand and use of the state's freight system.

Oregon's GSP and Employment

In the long term, Oregon's GSP and employment are projected to grow. The focus of this plan is on long term trends while acknowledging near term fluctuations in growth rates. GSP, as a measure of the value added to products and services by all Oregon businesses and industries, is a broad indicator of the level and strength of economic activity in a state. Oregon's GSP was $162 billion[20] in 2008, making it the 26th largest economy among U.S. states.

Figure 2.1 shows the trend in Oregon GSP from 1990 to 2035. By 2035, Oregon's GSP is projected to top $310 billion,[21] growing by 121 percent at an

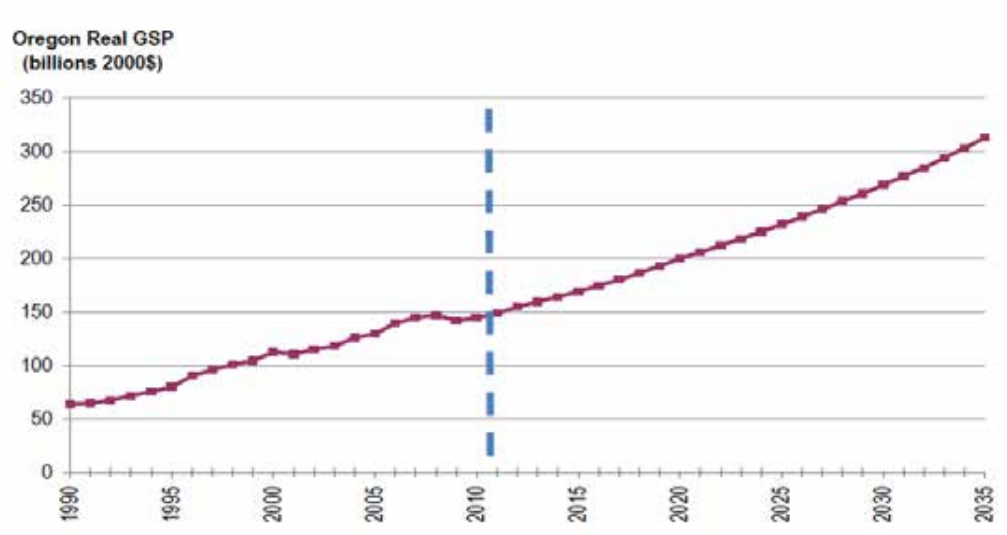
[20] Figure 2.1 shows inflation-adjusted numbers; hence the $162 billion GSP in 2008 becomes $147 billion in the comparison graphic.

[21] Real GSP in year 2000 dollars.

average rate of 3.1 percent between these years.[22] In comparison, the output of the U.S. economy (US GDP) is expected to grow by about 90 percent by 2035 (around 2.6 percent annually).

Figure 2.1 Oregon Real Gross State Product, 1990 to 2035

In Billions of Constant 2000 Dollars



Source: Oregon Office of Economic Analysis, IHS Global Insight November 2009.

* Blue line indicates the present.

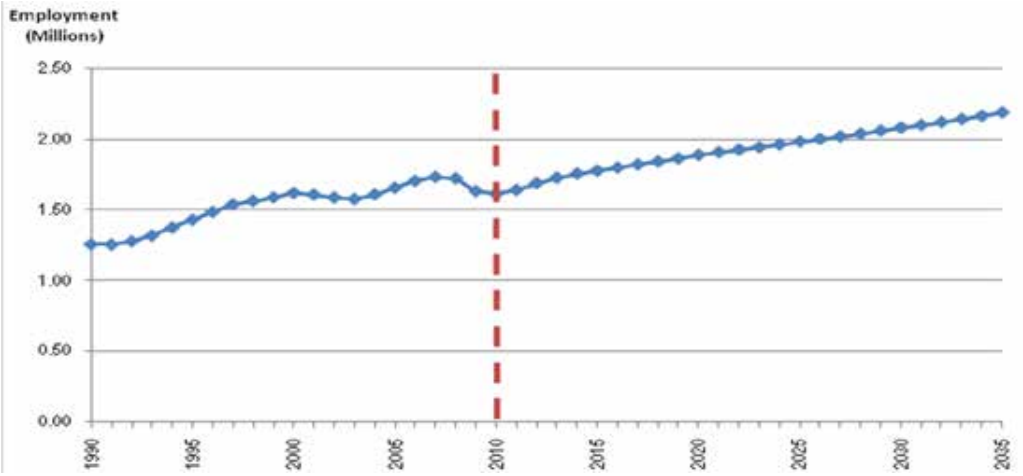
Employment is another key indicator of economic health. Oregon's total nonfarm employment was about 1.69 million in 2009, which is a slight decline from the previous year as a result of the 2008 recession (See Figure 2.2). Total nonfarm employment is projected to grow to 2.19 million in 2035, an increase of 33 percent from 2009. The Oregon Office of Economic Analysis (OEA) forecasts that employment growth between 2009 and 2015 (forecasted to increase 9.3 percent during this time period)[23] will be slower than in the mid 1990s, but greater than the growth rate for the nation as a whole.

[22] Data from the Oregon Office of Economic Analysis, IHS Global Insight November 2009 data.

[23] Oregon Office of Economic Analysis, Oregon Economic and Revenue Forecast, September 2010.

Figure 2.2 Oregon Employment, 1990 to 2035

Millions of Jobs



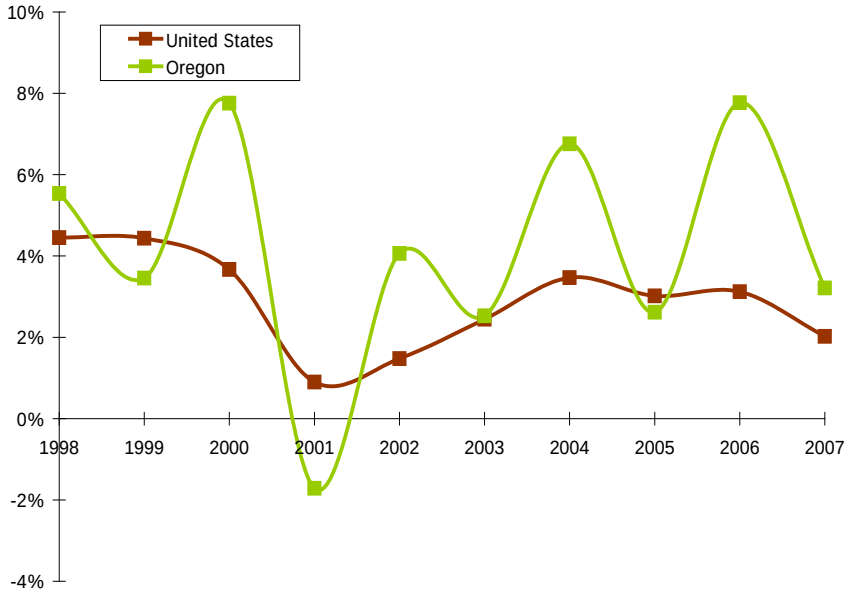
Source: Oregon Office of Economic Analysis, IHS Global Insight November 2009.

Oregon's Pronounced Economic Cycles

Oregon's economic growth rates fluctuate substantially because of the concentration of value in a few industries and the State's dependence on trade as indicated in Figure 2.3. In six of the ten years depicted, Oregon grew more rapidly than the United States as a whole, and in two of the last ten years, it grew at about the national average. In the other two years, Oregon's rate was lower than the national rate.



Figure 2.3 U.S. and Oregon Annual Real GSP Growth Rates, 1998 to 2007



Source: U.S. Bureau of Economic Analysis, U.S. Department of Commerce

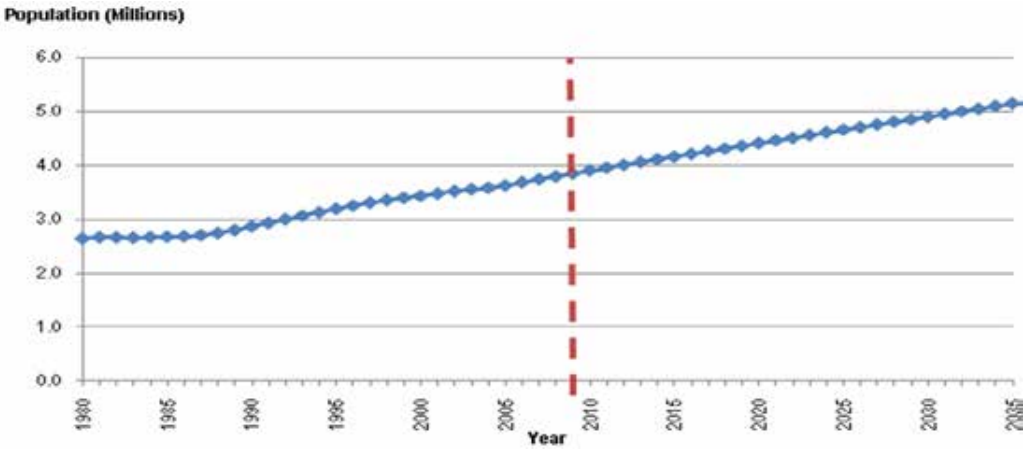
Oregon's Growing and Aging Population

Population growth is another key indicator that can help predict long-term economic growth. Figure 2.4 shows that the population of Oregon is projected to grow to approximately five million by 2035.[24] Except for the Oregon coastal communities, all Oregon regions are projected to grow by 33 percent or more by 2035. The Greater Portland Metropolitan Statistical Area is projected to increase 47 percent.[25] Oregon population growth will be driven by in-migration of working age adults attracted by job opportunities in the state, and relatively lower-cost housing compared to California and the Southwest. The 2035 Oregon population is expected to include fewer children under 19, more adults aged 20 to 65, and a sharp increase in the number of residents over age 65. A growing population suggests increased consumption of goods, fueling economic growth.

[24] The U.S. Census Bureau's projection to 2030 and the Oregon's Office of Economic Analysis, 2009 projection to 2030 differ by only 1.5 percent or about 57,000 people.

[25] Oregon Office of Economic Analysis, "Oregon Economic and Revenue Forecast," May 2009.

Figure 2.4 Oregon Population, 1980 to 2035



Source: Oregon Office of Economic Analysis, IHS Global Insight November 2009.

Oregon's Productivity

The productivity of Oregon businesses and industries is forecast to remain relatively high, which creates a competitive advantage for Oregon in both domestic and international markets. Factors that impact productivity include workforce education, workers compensation rates and energy prices.

- 87 percent of Oregon residents have completed a high school or equivalent degree, ranking the state 19th in the nation; 26 percent have a Bachelor's degree or higher, ranking the state 24th; and 10 percent have completed an advanced degree, ranking the state 16th.[26]
- Oregon ranked 39th in workers compensation rates.[27]
- Oregon ranks 20th in the nation for total energy prices. Oregon spends 18.23 nominal dollars per million British Thermal Units (BTU).[28] In terms of diesel prices to power the majority of trucks and trains, Oregon also has relatively high costs. Oregon's cost per gallon of diesel was $4.29 per gallon in April of 2011, which was the seventh highest average price for diesel in the nation.[29]

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26 Source: U.S. Census Bureau, 2004, at http://www.statemaster.com/index.php.

27 Oregon Department of Consumer and Business Services, Biannual Report, at https://www4.cbs.state.or.us/ex/imd/reports/.

28 Source: U.S. Energy Information Administration (EIA) (document no longer online)

29 American Automobile Association (AAA). Daily Fuel Gauge Report, April 26th, 2011.

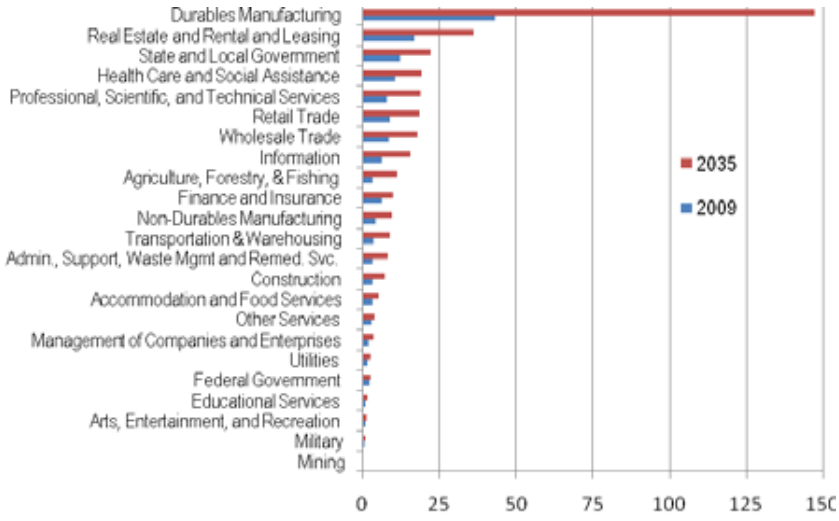
Transformation of Oregon's Economy

Oregon's economy will continue to change from a resource-based economy to a high-value-added manufacturing and service economy. As shown in Figure 2.5, Oregon's top private sector industries in 2009 in terms of real GSP include durables manufacturing, real estate and rental/leasing, health care and social assistance, retail trade and wholesale trade. The manufacturing sector alone accounted for 34 percent of the state's GSP in 2009.

The OEA anticipates strong GSP growth in manufacturing. This comes as a result of increased production of high-value products such as those manufactured by the computer and electronics industry. Offshore sales and productivity gains should also contribute to the expected growth in manufacturing. Figure 2.5 compares the estimated real GSP by industry sector in 2009 with the projected real GSP by industry in 2035. The data show continued strength in professional, scientific and technical services, retail trade, wholesale trade, transportation and warehousing and other sectors.

Figure 2.5 Real GSP by Oregon Industry Sector, 2009 and 2035

In Billions of 2000 Dollars



Source: Oregon Office of Economic Analysis, IHS Global Insight November 2009.

Oregon's resource-based industries – comprised primarily of the agricultural, forestry and fishing sector – contributed approximately 3 percent to GSP. Wood products manufacturing is the second largest manufacturing subsector but accounts for only a small portion of total manufacturing value and GSP.

Oregon's Dependency on Trade and Freight Transportation

The OEA estimates that Oregon is the ninth most trade-dependent state in the nation.[30] The ranking illustrates the importance of export-oriented sectors, such as computer and electronics manufacturing, logistics and distribution and processed foods to the Oregon economy. As shown in Table 2.1 below, manufactured products, such as computers and electronics, have medium to high dependency on highway, railroad, and water/marine transportation, and for some types of products, on air transportation. While professional and technical services are generally low freight dependent, they are predominately dependent on air freight when utilizing freight options.

Table 2.1 Oregon Transportation Dependency Rating of Oregon's Top Industries

Industry Sector	Highway	Railroad	Water/ Marine	Air	Pipeline
Agriculture, Forestry and Fishing;	High	High (except fishing)	Medium	Low (except Fishing)	Low
Computer and Electronics Manufacturing;	High	Medium	Medium	High	Low
Food Manufacturing;	High	Medium	Medium	Low	Low
Machinery Manufacturing and Metals Manufacturing;	High	High	High	Medium	Low
Wood and Paper Manufacturing;	High	High	High	Low	Low
Retail Trade;	High	Medium (Except long distance)	Medium	Low	Low
Services and Other.	Low	Low	Low	Low	Low

Source: Cambridge Systematics with data from Parsons Brinckerhoff, "Relationship of Freight Transportation to Economic Development."

For Oregon businesses to grow, they must be able to ship goods quickly and effectively to U.S. and international markets. To retain or gain market share, Oregon businesses must be cost-competitive in both producing and shipping their goods to market. The same is true for raw materials, components and other inputs

[30] Oregon Business: https://www.oregonbusiness.com

transported to Oregon manufacturing and processing facilities. Many manufacturing businesses and other industries have adopted the just-in-time inventory strategy to reduce inventory and associated carrying costs, which requires a high degree of flexibility by suppliers. Just-in-time inventory strategies also make shipments more time-sensitive as a result of decreased inventories at production locations. In turn, reduced congestion and low travel time variability is important to facilitate businesses using the just-in-time model.

Another trend that impacts the retail trade industry is the sustained increase in online retailing, or business-to-consumer shopping. In the U.S., online retailing is forecasted to grow by 10 percent annually through 2014, with its share of total U.S. retail sales increasing from 6 percent in 2009 to 8 percent in 2014.[31] This will result in an increase in the volume of small package deliveries to homes by carriers, such as UPS, FedEx and the U.S. Postal Service. As a result of these and other trends, the future of Oregon's economy will be highly dependent on dependable, flexible and affordable freight transportation services.

2.3 FREIGHT DEMAND OVERVIEW - OREGON

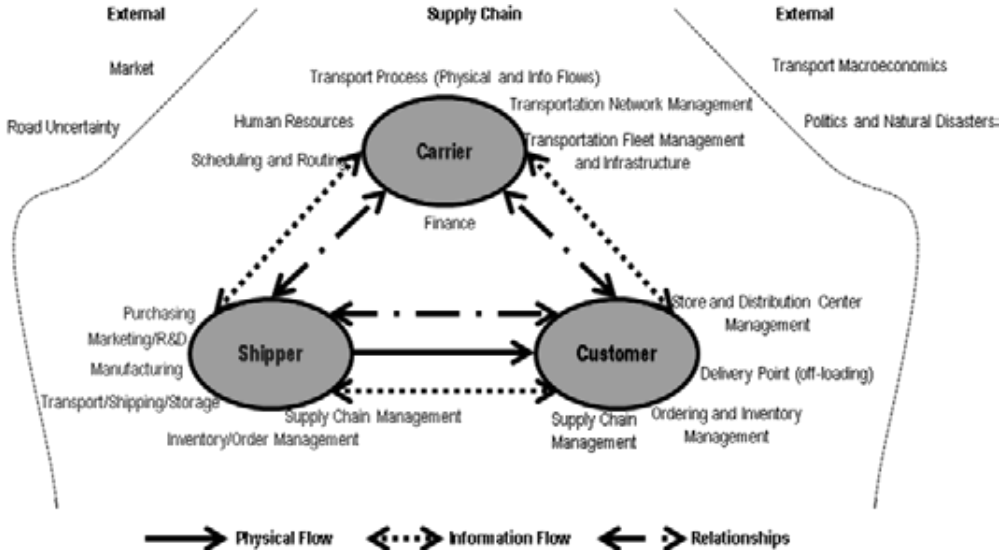
Freight demand and the transportation modes chosen to accommodate this demand are driven by the characteristics of the economy that were discussed in Section 2.2. Industry growth or decline, shifting population patterns and factors such as shifting international trade and logistics patterns all influence freight demand patterns.

Where, when, how often and why businesses make freight movements is largely dependent on industry supply chains. Every shipper, carrier and customer makes decisions frequently that will affect how goods move in Oregon and thus how the surrounding environment will be impacted by freight. Figure 2.6 below highlights the complexity of variables that each player in supply chains needs to consider, in addition to outside uncertainties such as the market, transport macroeconomics, disasters and others. In this figure, the shippers, carriers and customers are shown to be the three main actors in the supply chain process. The variables directly surrounding each actor in the supply chain process (as shown in the same color font as the actor) are considerations that may impact the supply chain process, specific to that actor. External variables that may impact the supply chain process are shown in the periphery of Figure 2.6 including variables such as the market, politics and macroeconomics. Both actor-specific and external variables have an impact on the supply chain and how freight moves in Oregon.

[31] Forrester Research, Inc. Reported in Tech Crunch, March 8, 2010, at https://techcrunch.com/2010/03/08/forrester-forecast-online-retail-sales-will-grow-to-250-billion-by-2014/.

A state's commodity flow profile is, therefore, a reflection of a state's socioeconomic and population profile as well as the industries and businesses that make up the state's economy. This section will present data and observations concerning the impact of future freight demand on policy and the statewide multimodal transportation system.

Figure 2.6 Supply Chain Nodes and Internal/External Factors that Create Uncertainty of Freight Movements



Source: Diagram concept and much of the content taken from "Establishing a Transport Operation Focused Uncertainty Model for the Supply Chain" Rodrigues et al, 14th International Annual EuROMA Conference, Ankara, June 2007. Diagram content was adjusted to focus on key contributors in the supply chain for the purposes of this freight plan.

Oregon GSP and employment growth signal an increase in demand for the freight system in general. In addition, a larger population will consume more food, clothing, housing, and other household goods, increasing freight demand. As a result of these economic and demographic forecasts, the Oregon Commodity Flow Forecast estimates significant increases in total freight traffic in Oregon, as shown in Table 2.2.[32]

[32] Oregon Commodity Flow Forecast data, October 2009: http://library.state.or.us/repository/2010/201010251112531/index.pdf

Table 2.2 Oregon Freight Tons and Value, All Modes[33]

2002, 2010 and 2035

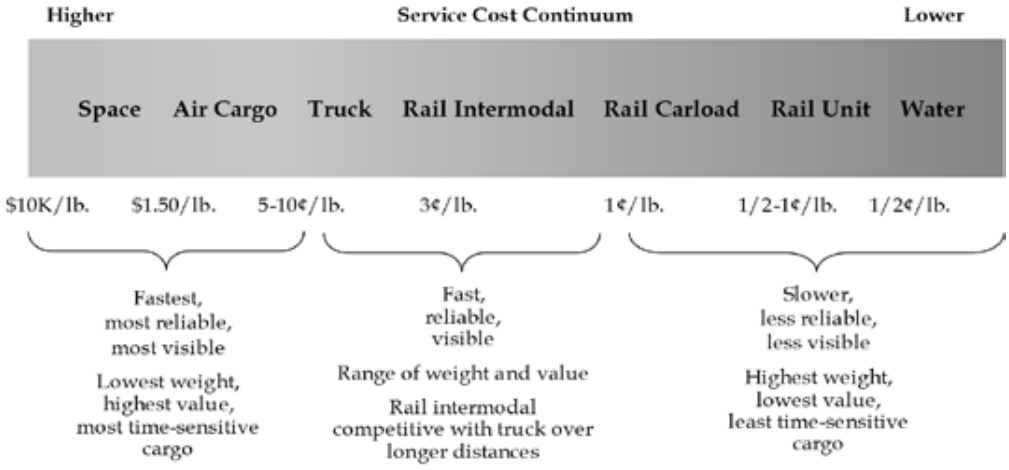
	2002	2010	2035	2002 to 2035 % Growth
Weight (millions of tons)	347	403	651	88%
Value (billions of $)	213	253	554	161%

Source: Oregon Commodity Flow Forecast data, October 2009.

Freight Demand by Mode

A number of factors influence mode selection by industry and commodity. Cost of service and accessibility are key criteria when selecting mode for transport of goods. Figure 2.7 below shows the type of cargo that certain modes tend to transport. For instance, water and non-intermodal rail modes tend to ship high weight, lower value products that are not time sensitive. Heavy commodities such as gravel and lumber tend to use rail and barge. Therefore, businesses that require lower cost transportation service and are able to deal with slower shipments turn to barge and rail carload or unit trains. On the other hand, trucks generally ship lighter goods that are of higher value and more time-sensitive. Truck and intermodal rail are faster and more reliable than options with lower service costs. Finally, air cargo is used to ship the most time-sensitive and highest value cargo. The air mode represents a small but increasingly important share of total freight movements.

Figure 2.7 Freight Transportation Service Spectrum



Source: Freight Rail Bottom Line Report AASHTO.

[33] The values in this table do not include freight movements that do not have an Oregon origin or destination.

As shown in Table 2.3, all major transportation modes – air, pipeline, rail, truck and water – will see growing volumes of freight, with truck volumes growing the most in terms of total weight and value. The projected 88 percent increase in freight tonnage moving into, out of and within Oregon will place additional demands on the Oregon freight system. This number does not take into account the impact of "through" tonnage, which is also growing. As a comparison, the United States freight system is expecting a 93 percent increase in total tonnage between 2002 and 2035, with a compound annual growth rate (CAGR) of 2.0 percent.[34] Oregon's expected CAGR for tonnage moving into, out of and within Oregon is 1.9 percent, average for the nation.

Table 2.3 Oregon Freight Demand by Weight/Value (All Modes)[35]

2002, 2010 and 2035

Mode	Weight (Millions of Tons)				Value (Billions of Dollars)			
	2002	2010	2035	2002-2035 % Growth	2002	2010	2035	2002-2035 % Growth
Air	0.22	0.27	0.75	236%	12	17	56	349%
Pipeline	14	13	17	28%	3	3	4	37%
Rail	39	47	64	65%	16	17	27	76%
Truck	259	294	508	96%	159	185	406	155%
Water	35	48	60	73%	22	32	61	171%
Total	347	403	651	88%	213	253	554	161%

Source: Oregon Commodity Flow Forecast data, October 2009.

Other important observations can be made from Table 2.3:

- The value of freight movements shows a steeper increase than tonnage. The value of freight moved into, out of and within Oregon is expected to increase 161 percent between 2002 and 2035, substantially higher than the 88 percent increase in tonnage. The 2002 to 2035 CAGR of total tonnage is at 1.9 percent, while the CAGR of value of all commodities shipped is 2.9 percent. Machinery manufacturing is one of the fastest increasing commodities by value during this time period and is a high-value product, which is a likely contributor to the high increases in value moved on Oregon's freight system. This increase in higher-value commodities on the

[34] FHWA, "Freight Facts and Figures 2009," based on FAF2 data, https://ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/09factsfigures/table2_1.htm.

[35] Table does not include commodities traveling through Oregon, without an Oregon origin or destination.

freight system implies a greater reliance on truck and air cargo and the growing importance of reliability, urban mobility and access to airports and international cargo handling facilities.

- Trucking will continue to be a dominant mode for freight transport. Although Table 2.3 shows that tonnage/value movements by rail, air and water are expected to increase substantially on a percentage basis between 2002 and 2035, truck tonnages will continue to increase the most in absolute terms (total tonnage and value). Table 2.3 also shows that truck tonnage will increase at a more rapid rate than all other modes, except air travel, which represents a small but important share of overall freight demand. Increasing truck traffic places further demands on the system and requires substantial investment in maintenance of the existing highway and road network. The growth of truck share reflects the shift towards higher value products and greater time sensitivity in product movements. With truck traffic anticipated to rise substantially in the future, roadway congestion issues, transport reliability and road access issues will be exacerbated. Roadway issues are therefore anticipated to become an even greater focus of future freight planning in Oregon.
- High rail demand may create capacity issues. The 64 percent increase in rail tonnage moving into, out of and within Oregon will create capacity issues on major corridors, especially around Portland and along the Columbia River Gorge.[36] Capacity issues will impact all industries that utilize freight rail, including the lumber and transportation equipment industries. Failure to address capacity issues may result in increased diversion of commodities to other modes[37].
- A substantial increase in airfreight by tonnage is expected. Airfreight demand in Oregon is expected to increase sharply as a result of projected increases in the high-value-manufacturing (i.e., computer and electronics products) and professional service industries. The expected 240 percent increase in airfreight between 2002 and 2035 will require improved access to airports as freight demand grows. Improving access will make it easier and more efficient for trucks to get to airports to pick up and unload cargo. Capacity for the cargo airports (primarily Portland International) is not expected to be an issue during the planning period.

[36] It should be noted that the data on rail tonnages does not include data on through movements that have neither an origin nor a destination within the state. Through tonnage and value were not available in the commodity flow data. However, through movements are discussed further in Section 4.5 of this plan

[37] Failure to address rail capacity issues will also impact efforts to increase passenger rail options.

Commodity Movements and Freight Demand

Different modes are responsible for moving key commodities into, out of and within Oregon. For example, marine vessels are often used to carry heavy, low-value items, within states or between regions. Airfreight often carries low-weight, high-value goods to markets all across the world. Table 2.4 highlights the major commodities carried into, out of and within Oregon by mode in 2002 and the expected yearly growth rate of tonnage and value between 2002 and 2035.

Table 2.4 Top Commodities by Mode (Into, Out of and Within Oregon)

Compound Annual Growth Rate (CAGR) 2002 to 2035

	Top Commodities (Tonnage)	CAGR % 02-35	Top Commodities (Value)	CAGR % 02-35
Truck Freight	Clay, concrete, glass, stone	1.6%	Miscellaneous freight shipments	3.6%
	Farm products	1.9%	Non-electrical machinery	4.0%
	Lumber or wood products	0.7%	Food and kindred products	2.5%
	Petroleum, natural gas and other petroleum-based products[38]	2.3%	Electrical machinery	3.4%
	Forest products	-0.1%	Apparel/finished textile products	-0.8%
Rail Freight	Lumber or wood products	1.1%	Lumber or wood products	1.1%
	Chemicals or allied products	1.2%	Transportation equipment	2.5%
	Farm products	0.1%	Pulp, paper or allied products	1.4%
	Pulp, paper or allied products	1.4%	Miscellaneous mixed shipments	1.4%
	Miscellaneous mixed shipments	1.4%	Chemicals or allied products	1.2%
Water/ Marine Freight	Clay, concrete, glass, stone	1.2%	Non-electrical machinery	5.1%
	Farm products	2.1%	Chemicals or allied products	2.3%
	Chemicals or allied products	2.3%	Transportation equipment	0.0%
	Petroleum, natural gas and other petroleum-based products	0.4%	Farm products	2.1%
	Forest products	-1.6%	Petroleum, natural gas and other petroleum-based products	0.4%
Air Freight	Electrical machinery	4.8%	Electrical machinery	4.8%
	Food and kindred products	3.6%	Chemicals or allied products	3.6%
	Fabricated metal products	-0.7%	Misc. manufactured products	3.9%
	Chemicals or allied products	3.6%	Transportation equipment	5.7%
	Fresh fish	2.3%	Precision instruments	6.1%

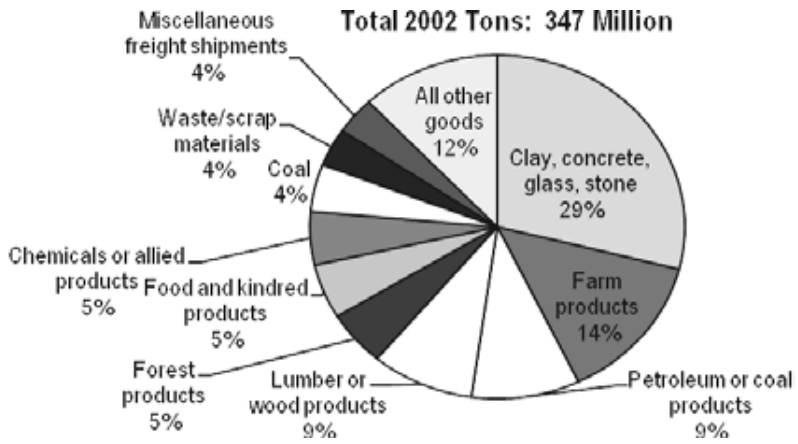
[38] This commodity group includes some coal products as well.

Source: Oregon Commodity Flow Forecast data, October 2009.

While commodity group classifications used in the OFP provide sufficient detail about the types of goods moving on Oregon's freight system, the classifications used are summaries of many specific commodities. An example of commodity classification group summarization is "concrete/glass/clay/stone." The amount of tons moving on Oregon's system, for the group as a whole is known, but the percentage of tons moving for each commodity of concrete, glass, clay or stone is not known.[39] The analysis of commodity movements represents estimates based on best available data. It is important to make a note of this before attempting to understand the commodity flow data in Chapter 2 and 3. Appendix F presents detailed information on which commodities make up each commodity group.

Figures 2.6 to 2.11 present an overview of the top commodities that used the freight system in 2002, by tonnage and value, compared to those that will be using the freight system in 2035.

Figure 2.8 Breakdown of Commodity Shipments – Weight, All Modes, In/Out/Intra – 2002



Source Oregon Commodity Flow Forecast data, October 2009.

[39] The commodity of glass is rarely or never shipped by marine freight modes, although the analysis indicates that a certain percentage of the commodity group of "clay / concrete / glass / stone "is moved by ship.

Figure 2.9 Breakdown of Commodity Shipments – Weight, All Modes, In/Out/Intra – 2035

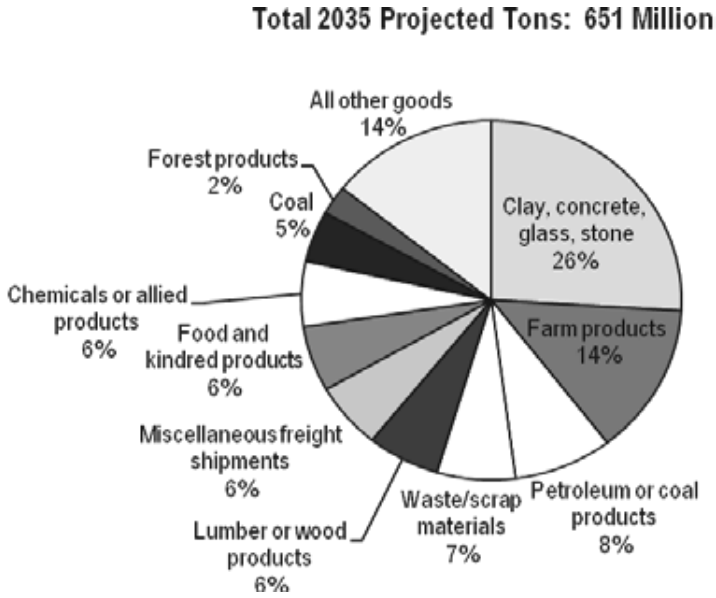
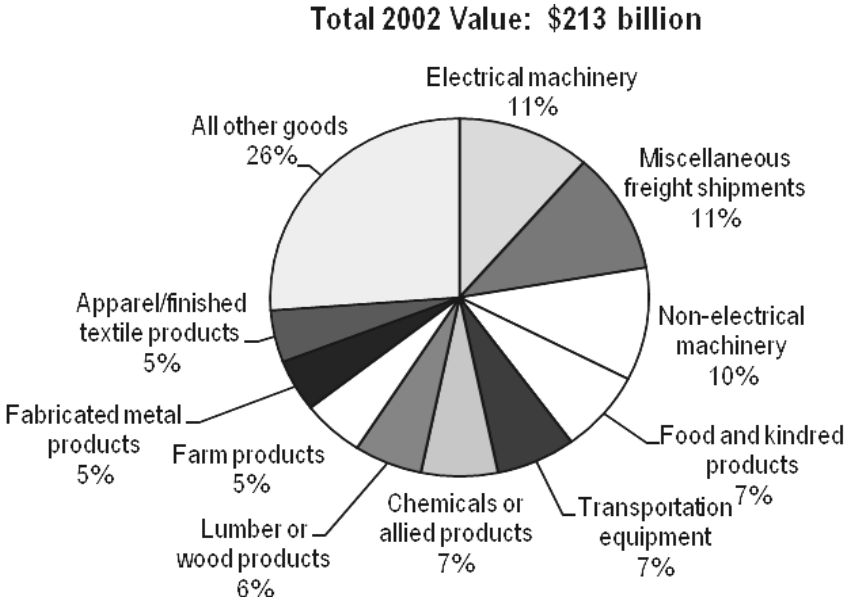
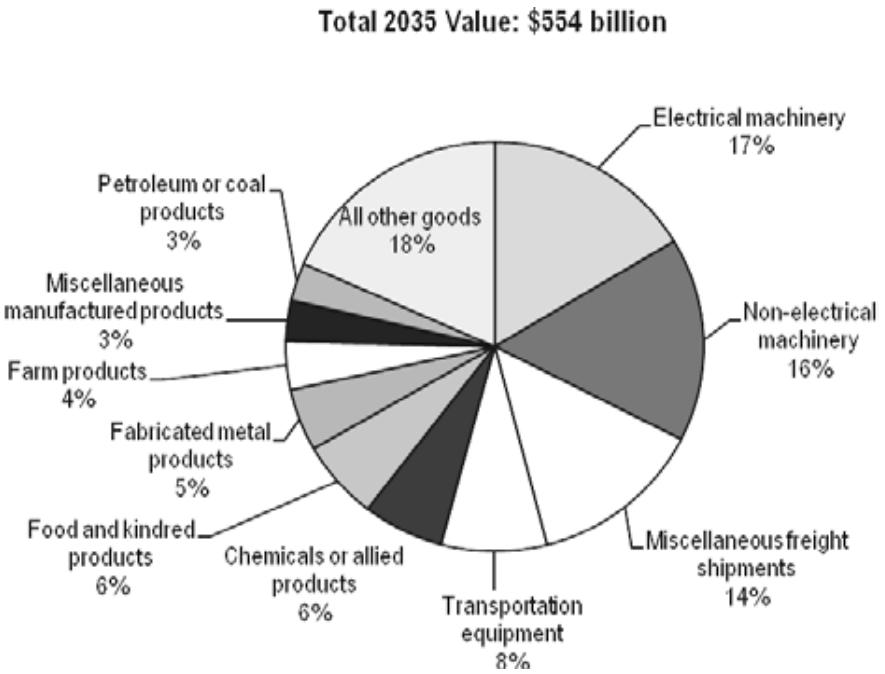


Figure 2.10 Breakdown of Commodity Shipments – Value, All Modes, In/Out/Intra – 2002



Source Oregon Commodity Flow Forecast data, October 2009.

Figure 2.11 Breakdown of Commodity Shipments - Value, All Modes, In/Out/Intra – 2035



Source: Oregon Commodity Flow Forecast data, October 2009. Values derived from tons on a $/ton basis per commodity, as defined in Oregon Commodity Flow Forecast, October 2009: http://library.state.or.us/repository/2010/201010251112531/index.pdf .

The information in Table 2.4 and Figures 2.6 – 2.11 has the following implications for freight transportation in Oregon:

- Oregon will see continued growth in heavy goods movement.[40] Shipments of heavy commodities such as clay, concrete, glass and stone commodities and lumber products will continue to increase. Since a number of these heavy commodities depend on rail, for example lumber, a steady demand for rail traffic should persist. This will require the public sector to work with private

[40] Oregon's permitting system for truck loads that exceed standard limits can be broken into three general components: 1) trucks moving divisible loads may carry up to 105,000 pounds but axle weights must be standard, comply with Oregon's bridge formula, and be of standard widths and heights; 2) trucks moving nondivisible loads up to 98,000 pounds may have slightly higher than standard axle weights, must not exceed 12 feet in width and 13 feet, 6 inches in height and must meet the bridge formula; and 3) trucks moving nondivisible loads exceeding 98,000 pounds, with widths greater than 12 feet and height greater than 13 feet, 6 inches (very small percentage of trucks that require a permit). These latter trucks may exceed axle weights but usually do not exceed the bridge formula.

sector railroad companies to ensure adequate supply of rail infrastructure. Keeping a share of heavy goods, such as farm products, on rail can reduce the maintenance costs of Oregon roads and, therefore, should be considered in planning for future investments. Trucks are critical to moving heavy goods throughout Oregon. The location of industries that require permitted loads may change over time; the monitoring of where clusters of industries that require permitted loads are locating will reduce disruptions in the flow of goods.

- The lumber or wood products industry is by far the biggest user of the rail system in Oregon excluding through rail shipments. Rail infrastructure in the regions where lumber or wood products are picked up will need to be able to handle the increased demand for rail freight to move these goods.
- Several commodities will continue to rely on timely delivery through airfreight. Some of the commodities produced in Oregon, including electrical machinery (includes computer products and computer-related goods), fresh fish and precision instruments, are expected to continue to increase their demand for airfreight in order to deliver their high-value (electronics) and perishable (fish) goods to market. It will be critical to ensure the industries that produce these commodities have adequate access to airports and that bottlenecks between production facilities and the airport are minimized.
- Machinery will continue to be moved by truck, air and marine modes. As the machinery manufacturing industry is one of the largest contributors to manufacturing GSP in Oregon, it is critical that this industry have adequate airport access. For machinery exported or imported by water, it is critical that trucks are able to make timely and reliable deliveries to or from port facilities.
- Transportation equipment movements will continue to increase. This commodity will continue to increase for both truck and rail. It will be the top commodity by value moved on rail in 2035. On truck, it will increase in terms of value, after machinery and miscellaneous freight shipments.
- Farm products, chemicals and clay, concrete, glass and stone will continue to dominate goods moved by water. It is important to have adequate connections from point of production to ports for these commodities in order to meet the expected demand for water movements. Adequate access and routing to and from ports for trucks, including those requiring permits, as well as the consideration of additional rail service may be necessary to facilitate movement of these heavier goods to and from ports.

Freight Demand – By Direction

Inbound, internal and outbound movements are all expected to grow at a moderate rate through 2035. Table 2.5 below shows expected tonnages for 2010 and 2035, as well as baseline tonnages for 2002 by direction of movement.

Through traffic exists on Oregon highways, railways, waterways and pipelines. Through traffic for each mode is discussed in further detail in Chapter 4.

Table 2.5 Oregon Commodity Flow Tonnage by Direction, 2002 to 2035

In Thousand Tons

Direction	Year			Growth Rate 2002-2035
	2002	2010	2035	
Inbound	86,365	101,157	131,957	1.30%
Internal	197,993	223,356	364,482	1.90%
Outbound	62,533	78,909	154,644	2.80%

Source: Oregon Commodity Flow Forecast data, October 2009.

Table 2.6 highlights the top commodities by tons and value moving into, out of and within Oregon in 2002 and 2035.

Table 2.6 Top Commodities by Direction, 2002*

	Top commodities (tonnage)	CAGR % 02-35	Top commodities (value)	CAGR % 02-35
Inbound Shipments	Clay, concrete, glass, stone	1.2%	Electrical machinery	4.8%
	Petroleum, natural gas and other petroleum-based products	1.0%	Non-electrical machinery	4.8%
	Farm products	-0.7%	Transportation equipment	1.7%
	Chemicals or allied products	1.3%	Miscellaneous freight shipments	3.0%
	Lumber or wood products	0.5%	Chemicals or allied products	1.6%
	Crude petroleum, natural gas	1.7%	Apparel/finished textile products	-1.3%
	Food and kindred products	1.0%	Food and kindred products	1.0%
	Coal **	1.4%	Fabricated metal products	1.9%
Outbound Shipments	Lumber or wood products	1.1%	Chemicals or allied products	3.0%
	Farm products	3.0%	Electrical machinery	3.3%
	Chemicals or allied products	3.0%	Miscellaneous freight shipments	4.4%
	Food and kindred products	3.5%	Lumber or wood products	1.2%
	Petroleum, natural gas and other petroleum-based products	2.3%	Food and kindred products	3.6%
	Pulp, paper or allied products	1.5%	Non-electrical machinery	4.0%
	Clay, concrete, glass, stone	3.9%	Transportation equipment	5.2%
	Miscellaneous freight shipments	4.4%	Pulp, paper or allied products	1.6%
Internal Shipments	Clay, concrete, glass, stone	1.6%	Miscellaneous freight shipments	3.5%
	Farm products	2.0%	Food and kindred products	2.1%
	Petroleum, natural gas and other petroleum-based products	1.7%	Non-electrical machinery	3.9%
	Forest products	-0.1%	Farm products	2.0%
	Coal **	2.1%	Electrical machinery	3.0%
	Lumber or wood products	0.5%	Petroleum, natural gas and other petroleum-based products	1.7%
	Waste/scrap materials	3.3%	Lumber or wood products	0.5%
	Food and kindred products	2.1%	Fabricated metal products	3.3%

Source: Oregon Commodity Flow Forecast data, October 2009.

* Compound Annual Growth Rate (CAGR) % 02-35 in the figure represents the compound annual growth rate projections per commodity between 2002 and 2035.

** CAGR is based on analysis of historic trends. Closure or changing the type of fuel used in Portland General Electric's Boardman coal plant that is currently being negotiated will result in a significant reduction in coal shipments.

Information in Tables 2.5 and 2.6 has the following implications:

- Outbound tonnage, compared to inbound and internal, will grow fastest. Table 2.5 shows the amount of freight originating in Oregon is expected to exceed the amount of freight coming into Oregon by 2035. This is a change from 2002, where inbound tonnage exceeded outbound tonnage by nearly 24 million tons. Directional imbalances in freight flows could impact service levels for certain modes and need to be monitored as an issue for the freight community. Outbound tonnage for all modes is expected to grow at a CAGR of 2.8 percent between 2002 and 2035, while inbound and internal movements are expected to increase annually at 1.3 percent and 1.9 percent, respectively. This reflects relative growth in Oregon's export-oriented commodities that are critical to overall economic growth, including chemicals or allied products, lumber or wood products, machinery and transportation equipment. As a result, it will be critical to continue to maintain and improve connections between Oregon and the rest of the world for all modes in order to be able to support this expected increase in exports.
- Internal freight movements will remain substantial. The movement of goods within Oregon (more than 364 million tons in 2035) will remain higher than both inbound and outbound shipments combined, indicating that transportation connections within and between cities and industries need to be maintained and potentially enhanced to meet this growth. Internal freight movements in Oregon are dominated by the truck mode to an even greater degree than trucking dominates overall freight movement.[41] As noted in the Oregon Rail Study, changes in Class I business models over the last decade and the general economics of rail and truck transportation have tended to limit the use of rail as a mode alternative for internal freight movements in Oregon. Given the high level of anticipated growth in internal freight movements, strategies should be examined to encourage shorter haul freight rail movements where there is measurable public benefit (such as reduction of highway investment and maintenance needs) and where the economics of freight rail can be made competitive with trucking.
- Many important inputs for Oregon industries will continue to be imported. Strong continued growth of inbound machinery shipments by value will most likely be production inputs for the computer and electronics sector, a major export area for the state. It will be critical to Oregon industries to make sure that the transportation system supports reliable and timely service to get these goods into the state.

[41] According to the Oregon Commodity Flow Forecast, 2002, 98.3 percent of all intra-Oregon tons moved and 99.1 percent of intra-Oregon value moved by truck. For all in, out and intra movements in 2002, trucks moved 74.7 percent of total tonnage and 74.8 percent of total value.

- A major driver in the growth in commodities supporting personal consumption is population growth. The expected growth rate of Oregon's population is similar to the expected growth rate of inbound and internal shipments of staple commodities, including food, fuels and construction-related commodities (clay/concrete/glass/stone).

2.4 FREIGHT DEMAND OVERVIEW – OREGON AREA COMMISSIONS ON TRANSPORTATION (ACTS)

So far, this chapter has highlighted key statewide trends in freight demand. Another perspective from which to analyze freight demand is that of Area Commissions on Transportation, advisory bodies chartered by the Oregon Transportation Commission. ACTs address all aspects of transportation (road, marine, air and transportation safety) with a primary focus on the state transportation system. ACTs consider regional and local transportation issues if they affect the state system, and they work with other local organizations dealing with transportation-related issues.[42,43] Oregon ACTs are shown in Figure 2.12.

Figure 2.12 Oregon Area Commissions on Transportation (ACTs)[44]



42 https://www.oregon.gov/ODOT/Get-Involved/Pages/Area_Commissions.aspx.

43 ACTs play an important advisory role in the development of the Statewide Transportation Improvement Program, which schedules funded transportation projects. ACTs establish a public process for area project selection priorities for the STIP. Through that process and following adopted project eligibility criteria, they prioritize transportation problems and solutions, and recommend projects in their area to be included in the STIP.

44 Since the OFP was originally adopted in 2011, the Region 1 ACT was created to cover area noted as the Portland Metropolitan Area.

Northwest ACT

Table 2.7 Northwest ACT Shares by Commodity Group 2010 – 2035, by Tons, Value and Growth Rate

	Value				Tons			
	Region Share - 2010	CAGR	25 Year Percent Change	Region Share - 2030	Region Share - 2010	CAGR	25 Year Percent Change	Region Share – 2030
Machinery, Instruments, Transportation Equipment, Metals	54%	1.7%	52%	54%	6%	0.6%	17%	4%
Food or Kindred Products	12%	1.3%	37%	10%	10%	0.8%	23%	8%
Petroleum, Coal, Chemicals	8%	2.1%	68%	9%	15%	2.4%	81%	18%
Pulp or Paper Products	4%	2.2%	72%	5%	2%	1.5%	43%	2%
Other/Miscellaneous	12%	1.9%	60%	12%	1%	2.1%	69%	2%
Forest or Wood Products	9%	1.9%	61%	9%	41%	2.1%	67%	45%
Clay, Minerals, Stone	1%	0.4%	10%	1%	25%	1.1%	33%	21%

The Northwest ACT includes Clatsop, Columbia, Tillamook and approximately two-thirds of Washington County. About 165,000 people currently reside in this area, representing 4 percent of Oregon's total population. Population centers include Astoria, St. Helens and Tillamook. Table 2.7 lists Northwest ACT commodity flow shares and forecast growth rates. The Machinery, Instruments, Transportation Equipment and Metals group represents the largest share (54 percent) of the Northwest ACT but only a six percent share in terms of tonnage in 2010. This pattern is expected to continue into the future, with value forecast to increase about 52 percent over 25 years at a Compound Annual Growth Rate (CAGR) of 1.7 percent. The next largest commodity group produced by value is Food or Kindred Products, with a CAGR of 1.3 percent over the next 25 years.

Forest or Wood Products represents the largest share of the Northwest ACT production in terms of tonnage, but a fairly small share in terms of value. Commodity production for this group is expected to increase from 61 to 67 percent in terms of tonnage and value, increasing at a CAGR of 1.9 percent by value and 2.1 percent by tonnage.

Growth by tonnage in the Petroleum, Coal and Chemical group is expected to be larger than the other commodity groups, although this group represents a fairly small share of regional production and is subject to variation in production levels

due to economic conditions.[45] The Paper and Pulp Products group's regional share of production is similarly affected by economic conditions, meaning production levels and growth depend on the overall strength of the economy. When the economy expands or contracts, commodity production varies more for these two groups than the other five groups in the Northwest ACT. The Northwest ACT's top exported commodities are in the Machinery, Instruments, Transportation Equipment and Metals, Forest or Wood Products, and Food or Kindred Products groups. [46]

Portland Metro Area[47]

Table 2.8 Portland Metro Area Shares by Commodity Group 2010 – 2035, by Tons, Value and Growth Rates

	Value				Tons			
	Region Share - 2010	CAGR	25 Year Percent Change	Region Share - 2035	Region Share - 2010	CAGR	25 Year Percent Change	Region Share – 2035
Machinery, Instruments, Transportation Equipment, Metals	60%	1.40%	42%	57%	10%	1%	28%	8%
Food or Kindred Products	10%	1%	27%	8%	15%	1%	29%	13%
Petroleum, Coal, Chemicals	8%	2.40%	80%	10%	22%	2.80%	99%	29%
Pulp or Paper Products	6%	2.40%	80%	7%	4%	2.10%	68%	4%
Other/Miscellaneous	13%	2.20%	72%	15%	3%	1.90%	60%	3%
Forest or Wood Products	2%	2%	63%	2%	23%	2.10%	67%	25%
Clay, Minerals, stone	1%	0.60%	17%	1%	23%	0.80%	22%	18%

The Portland Metro Area contains the majority of Oregon's population, representing about 40 percent of statewide population. This area includes about one-third of Washington County, Multnomah, Hood River and Clackamas Counties. A large amount of commodity production for the state comes from the Portland Metro area. Table 2.8 lists the Portland Metro Area commodity production shares and forecast growth rates. In 2010, Machinery, Instruments,

45 More information on economic uncertainty can be found in Chapter 7

46 More detail on ACT export patterns can be found in Chapter 7

47 Since the original adoption of the OFP in 2011, jurisdictions in the Portland Metro Area and Hood River County formed the Region 1 ACT.

Transportation Equipment and Metals production represents the largest share of the area commodity production in terms of value (60 percent), and a relatively small share in terms of tonnage (10 percent). This share of total area production is expected to continue into the future, with the value expected to increase over 40 percent over the next 25 years, increasing at a CAGR of 1.4 percent by value and 1 percent by tonnage.

In 2010, the Petroleum, Coal, and Chemicals group, Pulp or Paper Products, and Other Miscellaneous Goods groups represented over 25 percent of the total value of commodity production in the area in terms of value (29 percent by tonnage.) These three commodity groups are expected to grow at rates higher than other commodity groups. However, production levels within these three categories vary significantly depending on economic conditions. The Petroleum, Coal and Chemical group tonnage is expected to nearly double over the next 25 years.

Many of the commodities produced are consumed within the area. Exported commodities include the Machinery, Instruments, and Transportation Equipment and Metals, Pulp or Paper Products, and the Petroleum, Coal and Chemicals groups.

North East ACT

Table 2.9 North East ACT Shares by Commodity Group 2010 – 2035, by Tons, Value and Growth Rates

	Value				Tons			
	Region Share - 2010	CAGR	25 Year Percent Change	Region Share - 2035	Region Share - 2010	CAGR	25 Year Percent Change	Region Share – 2035
Machinery, Instruments, Transportation Equipment, Metals	26%	1.40%	42%	25%	2%	1.30%	37%	2%
Food or Kindred Products	43%	1.60%	49%	43%	26%	1.80%	55%	22%
Petroleum, Coal, Chemicals	9%	2.80%	102%	12%	17%	3.90%	159%	24%
Pulp or Paper Products	1%	3.30%	124%	1%	0%	1.70%	54%	0%
Other/Miscellaneous	13%	-0.50%	-11%	7%	1%	1.10%	33%	1%
Forest or Wood Products	7%	3.20%	119%	11%	33%	2.70%	95%	35%
Clay, Minerals, Stone	1%	1.60%	48%	1%	21%	1.60%	49%	17%

The North East ACT is predominantly rural. This ACT includes Morrow, Umatilla, Union, Wallowa and Baker Counties. Population centers for the ACT

include Hermiston, Pendleton, LaGrande and Baker City. Table 2.9 lists the North East ACT commodity production shares and forecast growth rates. In 2010, Food or Kindred Products was the principal commodity, making up over 40 percent of the regional production in terms of value and over 25 percent by tonnage. The amount of production is expected to increase by 49 percent by value and 55 percent by tonnage over the next 25 years. Machinery, Instruments, Transportation Equipment and Metals is the next largest commodity group in terms of value but is quite low in tonnage. In 2010, the Other Miscellaneous Goods group represented 13 percent of ACT commodity production by value, only 1 percent by tons. Tonnage for this commodity group is expected to increase about 30 percent over the next 25 years, but decrease more than 10 percent in terms of value, dropping to about half the current share of regional production.

The fastest growing commodity groups for the North East ACT are the Petroleum, Coal and Chemicals group, Pulp or Paper Products, and Forest or Wood Products. All three groups are expected to at least double their share of regional production by value over the next 25 years. Growth for the Petroleum, Coal and Chemical group by tons is quite high – 159 percent higher in 2035 and growing to nearly one quarter of the region's commodity production in terms of tonnage. However, production levels within this category vary significantly depending on economic conditions.

The North East ACT's top exported commodities include Food or Kindred Products, Petroleum, Coal and Chemicals, Machinery, Instruments, Transportation Equipment and Metals, and Forest or Wood Products.

South Central ACT

Table 2.10 South Central ACT Shares by Commodity Group 2010 – 2035, by Tons, Value and Growth Rate

	Value				Tons			
	Region Share - 2010	CAGR	25 Year Percent Change	Region Share - 2030	Region Share - 2010	CAGR	25 Year Percent Change	Region Share – 2030
Machinery, Instruments, Transportation Equipment, Metals	35%	-0.80%	-18%	27%	2%	-2.30%	-44%	1%
Food or Kindred Products	17%	0.10%	3%	16%	11%	-0.70%	-16%	8%
Petroleum, Coal, Chemicals	11%	3.10%	113%	21%	24%	2.30%	76%	33%
Pulp or Paper Products	3%	0.30%	8%	3%	1%	1.40%	42%	1%
Other/Miscellaneous	16%	0.20%	5%	16%	1%	2.60%	88%	2%
Forest or Wood Products	16%	0.50%	12%	17%	47%	0.70%	19%	45%
Clay, Minerals, Stone	1%	-0.10%	-2%	1%	14%	-0.40%	-9%	10%

The South Central ACT is predominantly rural and includes Klamath and Lake Counties. Population centers include Klamath Falls and Lakeview. Table 2.10 lists the South Central ACT commodity production shares and forecast growth rates. The Machinery, Instruments, Transportation Equipment and Metals group is the largest commodity group produced in the South Central ACT. This group represents over one-third of the commodity production by value. Production is expected to decline in this group over the next 25 years but will remain a major commodity group for the region.

The Petroleum, Coal and Chemicals group makes up about 10 percent of commodity production by value and nearly one-fourth of production by tons. This commodity group is expected to grow at a fairly high rate, resulting in an expected increasing share of regional production. Production levels within this category and Forest or Wood Products vary significantly depending on economic conditions. Most of the other commodity groups' production shares are expected to remain the same over time. Other Miscellaneous Goods are expected to grow in terms of tonnage, but the share remains quite small for the area.

The South Central ACT's exported commodities include Forest or Wood Products, Petroleum, Coal and Chemicals, and Food or Kindred Products.

Rogue Valley ACT

Table 2.11 Rogue Valley ACT Shares by Commodity Group 2010 – 2035, by Tons, Value and Growth Rates

	Value				Tons			
	Region Share - 2010	CAGR	25 Year Percent Change	Region Share - 2030	Region Share - 2010	CAGR	25 Year Percent Change	Region Share – 2030
Machinery, Instruments, Transportation Equipment, Metals	40%	0.60%	15%	35%	3%	0.10%	1%	3%
Food or Kindred Products	11%	0.90%	25%	11%	8%	1.10%	31%	8%
Petroleum, Coal, Chemicals	8%	2.60%	92%	11%	16%	2.80%	98%	22%
Pulp or Paper Products	6%	1.10%	32%	6%	1%	1.20%	34%	1%
Other/Miscellaneous	23%	1.50%	44%	25%	2%	0.80%	21%	2%
Forest or Wood Products	12%	0.80%	22%	11%	53%	0.70%	19%	46%
Clay, Minerals, Stone	1%	0.50%	12%	1%	16%	1.60%	48%	18%

The Rogue Valley ACT includes Josephine and Jackson Counties located on the California-Oregon border and includes the population centers of the Rogue Valley MPO (Medford vicinity) and Grants Pass. Table 2.11 lists the Rogue Valley ACT commodity production shares and forecast growth rates. The largest commodity group is Machinery, Instruments, Transportation Equipment and Metals in terms of value, and Forest or Wood Products in terms of tons. Neither group is expected to grow particularly fast over the next 25 years, which results in a decline in their share of total ACT commodity production. The Petroleum, Coal and Chemicals group is expected to nearly double over the next 25 years both in terms of value and tons. Production levels within this category and Machinery, Instruments, Transportation Equipment and Metal vary significantly depending on economic conditions.

The Other Miscellaneous Goods group is expected to grow in terms of value over the next 25 years, increasing its share of ACT commodity production to about one-fourth of the total. The Food and Kindred Products share of ACT production will remain stable over time, but increase more than 25 percent over the next 25 years. The Clay, Minerals and Stone group is not expected to increase production share much in terms of value. However, in terms of tons production the group is expected to increase nearly 50 percent over the next 25 years.

The Rogue Valley ACT's exported commodities include Machinery, Instruments, Transportation Equipment and Metals, Forest or Wood Products, Food or Kindred Products, and Pulp or Paper Products.

Lower John Day ACT

Table 2.12 Lower John Day ACT Shares by Commodity Group 2010 – 2035, by Tons, Value and Growth Rates

	Value				Tons			
	Region Share - 2010	CAGR	25 Year Percent Change	Region Share - 2030	Region Share - 2010	CAGR	25 Year Percent Change	Region Share – 2030
Machinery, Instruments, Transportation Equipment, Metals	29%	4.10%	172%	48%	4%	1.10%	32%	4%
Food or Kindred Products	27%	0.50%	12%	18%	15%	0.40%	10%	14%
Petroleum, Coal, Chemicals	14%	2.60%	89%	16%	29%	1.30%	37%	33%
Pulp or Paper Products	3%	2%	66%	3%	1%	3.10%	114%	2%
Other/Miscellaneous	17%	-0.70%	-16%	9%	2%	-2.30%	-43%	1%
Forest or Wood Products	9%	-0.20%	-5%	5%	31%	0.70%	18%	30%
Clay, Minerals, Stone	2%	-1.20%	-27%	1%	17%	0.60%	15%	16%

The Lower John Day ACT includes Wasco, Sherman, Gilliam and Wheeler Counties. Less than 1 percent of the state's population resides within this ACT. Table 2.12 lists the Lower John Day ACT commodity production shares and forecast growth rates. The Machinery, Instruments, Transportation Equipment and Metals group and Food and Kindred Products group represent the major commodities produced within this ACT. Together they make up over half the commodity production for the area. The Food and Kindred Products group is expected to grow modestly in the future. Growth is expected for Machinery, Instruments and Transportation Equipment, with production more than doubling over the next 25 years. This commodity group is subject to varying levels of production depending on economic conditions.

Other Miscellaneous Goods, Forest or Wood Products, and Clay, Minerals, and Stone commodity production are expected to decline over the next 25 years in terms of value. A decline in terms of tons is expected only for Other

Miscellaneous Goods; tonnage increases modestly for the other two commodity groups.

Lower John Day ACT's exported commodities include Petroleum, Coal and Chemicals, Food or Kindred Products, and Machinery, Instruments, Transportation Equipment and Metals.

Central Oregon ACT

Table 2.13 Central Oregon ACT Shares by Commodity Group 2010 – 2035, by Tons, Value and Growth Rates

	Value				Tons			
	Region Share - 2010	CAGR	25 Year Percent Change	Region Share - 2030	Region Share - 2010	CAGR	25 Year Percent Change	Region Share – 2030
Machinery, Instruments, Transportation Equipment, Metals	45%	1%	28%	40%	3%	0.40%	9%	2%
Food or Kindred Products	12%	1.40%	40%	12%	8%	1.70%	53%	7%
Petroleum, Coal, Chemicals	7%	3.40%	130%	12%	16%	3%	109%	21%
Pulp or Paper Products	2%	1.60%	48%	2%	1%	1.10%	30%	1%
Other/Miscellaneous	16%	1.20%	34%	15%	2%	1.70%	53%	2%
Forest or Wood Products	16%	2%	66%	18%	53%	1.90%	58%	52%
Clay, Minerals, Stone	1%	0.40%	10%	1%	17%	1.30%	40%	15%

The Central Oregon ACT includes the counties of Jefferson, Deschutes and Crook. About 6 percent of Oregon's population resides within this ACT, and it includes the Bend MPO. Table 2.13 lists the ACT's commodity production shares and forecast growth rates. Machinery, Instruments, Transportation Equipment and Metals is the largest commodity production group for this ACT, making up nearly half the commodities produced in terms of value. Forest or Wood Products is the largest commodity group in terms of tons. The Machinery, Instruments, Transportation Equipment and Metals group is expected to grow modestly over the next 25 years, resulting in a small reduction in the share of regional commodity production. The Forest or Wood Products group is expected to increase over 50 percent over the next 25 years both in terms of value and tons.

The Petroleum, Coal and Chemicals group represents less than 10 percent of the total commodity production in the ACT, but the forecast growth rate is relatively high. The share of total commodity production in terms of value and tons is expected to more than double over the next 25 years. This commodity group and the Machinery, Instruments, Transportation Equipment and Metals group vary in the level of production depending on economic conditions.

Central Oregon ACT exports include Machinery, Instruments, Transportation Equipment and Metals, Forest or Wood Products, Food or Kindred Products, and Petroleum, Coal and Chemicals.

Mid Willamette Valley ACT

Table 2.14 Mid Willamette Valley ACT Shares by Commodity Group 2010 – 2035, by Tons, Value and Growth Rates

	Value				Tons			
	Region Share - 2010	CAGR	25 Year Percent Change	Region Share - 2030	Region Share - 2010	CAGR	25 Year Percent Change	Region Share – 2030
Machinery, Instruments, Transportation Equipment, Metals	42%	1.50%	45%	41%	3%	0.90%	24%	2%
Food or Kindred Products	22%	1%	29%	19%	15%	1%	30%	12%
Petroleum, Coal, Chemicals	10%	2.40%	83%	12%	15%	2.60%	91%	17%
Pulp or Paper Products	5%	1.60%	50%	5%	2%	1.50%	44%	2%
Other/Miscellaneous	11%	2.40%	82%	14%	4%	1.90%	61%	3%
Forest or Wood Products	8%	2%	66%	8%	39%	2.10%	69%	40%
Clay, Minerals, Stone	1%	1.70%	51%	1%	22%	2.40%	81%	24%

The Mid Willamette Valley ACT includes Marion, Yamhill and Polk Counties. About 12 percent of the state's population resides in this ACT, and it includes the state capital of Salem. Table 2.14 lists the ACT's commodity production share and forecast growth rates. The Machinery, Instruments, Transportation Equipment and Metals group makes up the largest share of commodity production by value for this ACT. Growth is forecast to be modest, but the share of production is expected to be stable. The level of production varies, depending on economic condition.

The Food and Kindred Products group represents the next largest commodity production share with modest growth and a stable share expected. The Petroleum, Coal, and Chemicals group and Other Miscellaneous Goods group are expected to grow significantly, over 80 percent over the next 25 years. This results in their commodity share increasing a little in the future. The Forest or Wood Products, Petroleum, Coal and Chemicals, and Clay, Minerals and Stone commodity groups are expected to grow at a CAGR rate greater than 2 percent over the next 25 years in terms of tonnage.

The Mid Willamette Valley ACT's exports include Machinery, Instruments, Transportation Equipment and Metals, Food or Kindred Products, Petroleum, Coal and Chemicals, and Pulp or Paper Products.

Cascades West ACT

Table 2.15 Cascades West ACT Shares by Commodity Group 2010 – 2035, by Tons, Value and Growth Rates

	Value				Tons			
	Region Share - 2010	CAGR	25 Year Percent Change	Region Share - 2030	Region Share - 2010	CAGR	25 Year Percent Change	Region Share – 2030
Machinery, Instruments, Transportation Equipment, Metals	66%	0.80%	23%	66%	5%	0.50%	13%	4%
Food or Kindred Products	10%	0.10%	2%	8%	10%	0.10%	3%	7%
Petroleum, Coal, Chemicals	5%	1.80%	56%	7%	13%	1.90%	58%	15%
Pulp or Paper Products	4%	0.30%	7%	3%	3%	0%	0%	2%
Other/Miscellaneous	8%	1.20%	34%	9%	1%	-0.40%	-9%	1%
Forest or Wood Products	6%	1.20%	36%	7%	45%	1.40%	40%	46%
Clay, Minerals, Stone	1%	0.90%	25%	1%	23%	1.50%	45%	25%

The Cascades West ACT includes Lincoln, Benton and Linn Counties. About 6 percent of the state's population resides within this ACT, and it includes the Corvallis MPO. Table 2.15 lists the ACT's commodity shares and forecast growth rates. The Machinery, Instruments, Transportation Equipment and Metals group is the major commodity production group by value, over 60 percent of the area total production. Growth is forecast to be modest for this group within the Cascades West ACT. Production is expected to increase slightly more than 20

percent over the next 25 years with regional production share remaining the same over time. Production levels vary significantly depending on economic conditions.

Food and Kindred Products is the next largest commodity production group, making up about 10 percent of ACT production with growth expected to be flat into the future. The Petroleum, Coal and Chemicals group is expected to grow over the next 25 years at CAGR rates close to 2 percent. However, this commodity group has a fairly small share of ACT production and will increase in share modestly in the future. The Forest or Wood Products group represents a large share of commodity production in terms of tons, with an expected increase of 40 percent over the next 25 years.

The Cascades West ACT's exports include Machinery, Instruments, Transportation Equipment and Metals, Petroleum, Coal and Chemicals, Food or Kindred Products, and Pulp or Paper Products.

South West ACT

Table 2.16 South West ACT Shares by Commodity Group 2010 – 2035, by Tons, Value and Growth Rates

	Value				Tons			
	Region Share - 2010	CAGR	25 Year Percent Change	Region Share - 2030	Region Share - 2010	CAGR	25 Year Percent Change	Region Share – 2030
Machinery, Instruments, Transportation Equipment, Metals	28%	1%	30%	29%	1%	0.30%	9%	1%
Food or Kindred Products	17%	0.30%	7%	15%	6%	0.80%	21%	6%
Petroleum, Coal, Chemicals	6%	2.90%	104%	11%	10%	2.40%	81%	13%
Pulp or Paper Products	8%	-1.10%	-25%	5%	2%	-1.10%	-25%	1%
Other/Miscellaneous	15%	0.50%	13%	13%	1%	1.80%	56%	1%
Forest or Wood Products	25%	1.20%	34%	26%	66%	0.90%	26%	64%
Clay, Minerals, Stone	1%	-0.10%	-3%	1%	14%	1.10%	31%	14%

The South West ACT includes Douglas, Coos and Curry Counties. Just over 4 percent of the state's population resides in this ACT. Table 2.16 lists the ACT's commodity shares and forecast growth rates. The Machinery, Instruments,

Transportation Equipment and Metals, and Forest or Wood Products groups make up just over half of the ACT commodity production in terms of value. The Machinery, Instruments, Transportation Equipment and Metals group represents a very low share by tons, while the Forest or Wood Products group makes up a very large share of commodity production by tons. Both commodity groups are expected to grow modestly over the next 25 years in the South West ACT, and their share will remain stable.

The Petroleum, Coal, and Chemicals group is expected to more than double in terms of value over the next 25 years, increasing the production share from 6 percent to more than 10 percent. Tonnage for this commodity group is expected to increase as well, but not quite to the same extent. The ACT's production of Pulp or Paper Products is expected to decline in the future. The forecast CAGR is negative, resulting in an expected 25 percent decrease in commodity production for this group in terms of value and tons.

This ACT's commodity production occurs in areas subject to variation due to economic conditions, including the Machinery, Instruments, Transportation Equipment and Metals, Petroleum, Coal and Chemicals, and Forest or Wood Products groups. The South West ACT's exports include these three commodity groups and also Food or Kindred Products.

South East ACT

Table 2.17 South East ACT Shares by Commodity Group 2010 – 2035, by Tons, Value and Growth Rates

	Value				Tons			
	Region Share - 2010	CAGR	25 Year Percent Change	Region Share - 2030	Region Share - 2010	CAGR	25 Year Percent Change	Region Share – 2030
Machinery, Instruments, Transportation Equipment, Metals	9%	2.70%	93%	12%	1%	0.50%	14%	0%
Food or Kindred Products	45%	1%	27%	38%	25%	1%	29%	20%
Petroleum, Coal, Chemicals	12%	2.60%	88%	15%	27%	2.60%	90%	31%
Pulp or Paper Products	4%	-0.90%	-21%	2%	1%	-0.90%	-20%	0%
Other/Miscellaneous	22%	2.10%	67%	25%	1%	2.50%	84%	1%
Forest or Wood Products	8%	1.60%	49%	8%	28%	1.90%	61%	28%
Clay, Minerals, Stone	0%	1.90%	60%	0%	18%	2.40%	79%	20%

The South East ACT area is predominantly rural, including Grant, Harney and Malheur Counties. Population centers for the ACT include Ontario and Burns. Table 2.17 lists the South East ACT's commodity production shares and forecast growth rates. Food and Kindred Products are the principal commodity produced, making up over 40 percent of the regional production in terms of value and 25 percent by tons. The amount of production is expected to grow at a moderate pace, resulting in a reduced share of the ACT's commodity production.

Growth is expected for the Machinery, Instruments, Transportation Equipment and Metals group, Petroleum, Coal and Chemicals group, and Other Miscellaneous Goods group. All three groups are expected to grow at CAGRs greater than 2 percent. The commodity production shares by value for these three groups together increase from 43 percent to 52 percent over 25 years. The Clay, Minerals and Stone group represents a very small share of commodity production by value, but nearly 20 percent in terms of tons. This share by tons is expected to increase nearly 80 percent over the next 25 years. Pulp or Paper Products are expected to decline in the future. This commodity group represents a small share of production, which is forecast to decline about 20 percent over the next 25 years.

The South East ACT's exports include Food or Kindred Products, Petroleum, Coal or Chemicals, and Forest or Wood Products. Commodities produced within these categories are subject to less variation due to economic conditions than commodities in other ACTs within Oregon.

Lane County ACT

Table 2.18 Lane County ACT Shares by Commodity Group 2010 – 2035, by Tons, Value and Growth Rates

	Value				Tons			
	Region Share - 2010	CAGR	25 Year Percent Change	Region Share - 2030	Region Share - 2010	CAGR	25 Year Percent Change	Region Share – 2030
Machinery, Instruments, Transportation Equipment, Metals	54%	1.70%	52%	54%	6%	0.60%	17%	4%
Food or Kindred Products	12%	1.30%	37%	10%	10%	0.80%	23%	8%
Petroleum, Coal, Chemicals	8%	2.10%	68%	9%	15%	2.40%	81%	18%
Pulp or Paper Products	4%	2.20%	72%	5%	2%	1.50%	43%	2%
Other/Miscellaneous	12%	1.90%	60%	12%	1%	2.10%	69%	2%
Forest or Wood Products	9%	1.90%	61%	9%	41%	2.10%	67%	45%
Clay, Minerals, Stone	1%	0.40%	10%	1%	25%	1.10%	33%	21%

The Lane County ACT is a mix of rural and urban activity. Over 8 percent of the state's population resides in this county, and it includes the Eugene/Springfield MPO. Table 2.18 lists the Lane County ACT commodity production shares and forecast growth rates. The Machinery, Instruments, Transportation Equipment and Metals group makes up over 50 percent of the share of commodity production by value, only 6 percent by tons. Production within this group is expected to increase over 50 percent over the next 25 years. The Food or Kindred Products group and Other Miscellaneous Goods make up nearly one-fourth of commodity production for the Lane County ACT by value. The Food or Kindred Products group is expected to increase somewhat modestly over the next 25 years with the regional share of production declining a small amount.

The Forest or Wood Products group is expected to grow at a CAGR of nearly 2 percent over the next 25 years, increasing more than 60 percent in terms of value. Commodities in this group are heavy, making up over 40 percent of the region's commodity production by tons. The Petroleum, Coal and Chemicals group

makes up about 8 percent of the area commodity production by value, 15 percent by tons, and is expected to increase more than 80 percent over the next 25 years.

Lane County ACT exports include Machinery, Instruments, Transportation Equipment and Metals and Petroleum, Coal and Chemicals, which vary significantly depending on economic conditions. Pulp or Paper Products, Forest or Wood Products, and Food or Kindred Products are also exported from this area.

2.5 CONCLUSION

Generally, Oregon's economy is expected to grow and increase the demand for freight, despite the recent setbacks witnessed during the recession. This is assumed to be the most likely direction that the economy will take in the future. However, it is possible that significant changes, such as faster or slower than expected economic growth, may occur in coming years, which would have significant impacts on freight demand. Chapter 7 discusses potential impacts on Oregon freight demand if alternate scenarios were to occur.

Oregon Industries and Freight Movement

3.0 Oregon Industries and Freight Movement

3.1 INTRODUCTION

A state's economy and industry structure – its major businesses, their suppliers, the markets they serve and their growth prospects – have a direct impact on the condition and performance of its freight transportation system. Understanding how Oregon industries rely on transportation is critical to developing a system which meets user needs. Such a system supports industry competitiveness and ensures a healthy Oregon economy in the future.

In order to better understand the relationship between industry needs and the freight transportation system, data analyses, in-depth interviews with Oregon businesses, industry stakeholders and American companies that use Oregon's multimodal transportation network were completed. Results of this process include:

- Identification of key Oregon industries;
- Analysis of the impact of key industry supply chain operations on Oregon's freight transportation system; and
- Understanding of the critical issues that companies in these key industries encounter when moving their products on the Oregon freight system.

Several major Oregon industry groups were analyzed, as listed in Table 3.1. These industries were selected for a number of reasons:

- They are the largest sectors in Oregon based on a number of economic measures (contribution to state gross domestic product, contribution to state employment, overall payroll ranking); and/or
- They have substantial transportation system requirements and are highly freight dependent; and/or
- A sizable portion of their production costs consist of transportation costs.

Table 3.1 Key Oregon Industries Profiled in this Chapter

Industry Title (NAICS code[48])	2009 Employment*	2009 Share of Total Employment
Agriculture, Forestry, Fishing, (111)	48,700**	3.0%
Computer and Electronics Manufacturing (334)	35,500	2.5%
Food Manufacturing (311)	23,700	1.0%
Machinery Manufacturing (333),	9,700	0.6%
Metals Manufacturing (331 & 332),	22,000	1.0%
Transportation Equipment Manufacturing (336)	10,000	0.6%
Wood and Paper Manufacturing (321)	20,900	1.0%
Wholesale Trade (42)	75,500	5.0%
Retail Trade (44)	183,600	11.0%
Services and All Others (5)***	1,224,100	74.0%
Total Non-Farm Employment	1,653,700	100.0%

*Oregon Employment Department "Current Employment Statistics 2009" https://www.qualityinfo.org/ed-ceest/

** Oregon Employment Department "Covered Employment and Wages 2009" This number also represents employment for Hunting, Mining and Logging.

***The 'Services and All Others' category includes a wide range of industries, but primarily includes service-sector industries, such as financial activities, government, real estate and educational and health services, which generate limited freight transportation demand and are thus less dependent on freight services.

3.2 INDUSTRY CONTRIBUTION TO OREGON'S ECONOMY

The contribution of the key industries to Oregon's economy will be discussed in terms of 1) output and Oregon GSP share, 2) contribution to employment and 3) anticipated industry growth.

Output and Oregon Gross State Product (GSP) Share

Table 3.2 below describes industry contribution to total Oregon GSP and total Oregon manufacturing GSP of each of the key industries. As is true of much of the U.S. economy, the majority of Oregon GSP is concentrated in service sector industries that are not generally dependent on freight transportation services.

[48] North American Industry Classification System (NAICS): See Appendix F.

However, the key freight-dependent industries highlighted in Table 3.2 provide many of the products that Oregon trades with other parts of the U.S. and the world and therefore represent a particularly important component of the state's economy.

Table 3.2 Industry Contribution to GSP

Industry Sector*	2008 GSP (in Millions)	Percentage of Total Manufacturing GSP	Percentage of Total GSP
Agriculture, Forestry & Fishing	$3,984	N/A	2.50%
Computer & Electronics Manufacturing	$15,211	50.40%	9.40%
Food Manufacturing	$2,669	8.80%	1.70%
Machinery Manufacturing	$1,288	4.30%	0.80%
Metals Manufacturing	$2,569	8.50%	1.60%
Transportation Equipment Manufacturing	$941	3.10%	0.60%
Wood and Paper Manufacturing	$3,302	10.90%	2.00%
Wholesale Trade	$10,514	N/A	6.50%
Retail Trade	$8,691	N/A	5.40%
Service and All Others*	$112,404	14.00%	69.50%
2008 Oregon Total GSP (in Millions: 2008)	$161,573	100%	100%

Source: State of Oregon Office of Economic Analysis (OEA) Data and 2006 Annual Survey of Manufactures.

* The 'Services and All Others' category, which includes the remaining 69.5 percent of GSP, includes a wide range of industries, but primarily includes service-sector industries, such as financial activities, government, real estate and educational and health services, which generate limited freight transportation demand and are thus less dependent on freight services. The 14 percent of total manufacturing GSP in the "Service and Others" Industry Sector includes apparel, chemical, plastics/furniture manufacturing and others.

Several observations can be drawn from the data in Tables 3.1 and 3.2:

- Oregon is a state that relies heavily on the manufacturing sector. Table 3.2 shows that a significant percentage of total state GSP comes from the manufacturing sector. According to the Bureau of Economic Analysis (BEA), 18.7 percent of Oregon's total GSP comes from the manufacturing sector; comparatively, only 11.6 percent of the U.S. total GDP and 9.9 percent of the State of Washington's GSP come from the manufacturing sector.[49] Oregon's

[49] Bureau of Economic Analysis: Regional Economic Accounts at: https://www.bea.gov/regional/index.htm.

heavy dependence on the manufacturing sector leaves the state vulnerable as a result of cheaper labor in overseas manufacturing. However, current forecasts predict increases in Oregon manufacturing GSP (both in terms of actual value and as a percentage of total GSP), especially in durables manufacturing.[50] Due to the state's heavy reliance on this industry, it is important that businesses in the manufacturing industry are well served by the transportation system to keep costs low and remain competitive in the global economy.

- Computer and electronics manufacturing is a major contributor to total state GSP and state manufacturing GSP (in 2008, more than 50 percent of state manufacturing GSP came from computer and electronics manufacturing). In the past several decades, Oregon has seen a strong increase in high-technology companies and their contribution to GSP. As the state succeeds in attracting more computer and electronics manufacturing firms, which have high-value-added product content and require higher than average skilled workers, Oregon's manufacturing GSP (actual value and share of total GSP) is expected to increase in the future. High-tech companies have high or medium dependence on all modes of transport except pipeline, as well as complex international supply chains. It will be important as volumes increase for the state to enhance freight mobility on these modes, particularly truck and air, and facilitate better connections between modes to satisfy the needs of this critical industry group.[51]
- Industries in decentralized locations are important contributors to the Oregon economy. Agriculture, forestry and fishing, and wood and paper manufacturing are critical components of Oregon's economy, particularly where employment and rural economic vitality are concerned. These industries rely on having multimodal transportation access and tend to be distributed in remote and rural areas. Bulk commodities, such as wood products, are often trucked to reload facilities and transferred into rail containers, railcars or ocean containers for movement to destinations across the U.S. and the world. Rural production areas are not always served by multiple modes of transportation (i.e., barge and rail), thereby restricting modal choice. Transportation costs for these sectors usually make up a large percentage of the cost of goods, so constrained access or mobility can drive up operating costs. To ensure the support of these basic industries, multimodal access and mobility must be preserved and improved, when viable.

50 State of Oregon Office of Economic Analysis (OEA) data 2008

51 See Table 2.1 in Chapter 2 for more detail.

Anticipated Industry Growth in Freight Shipments

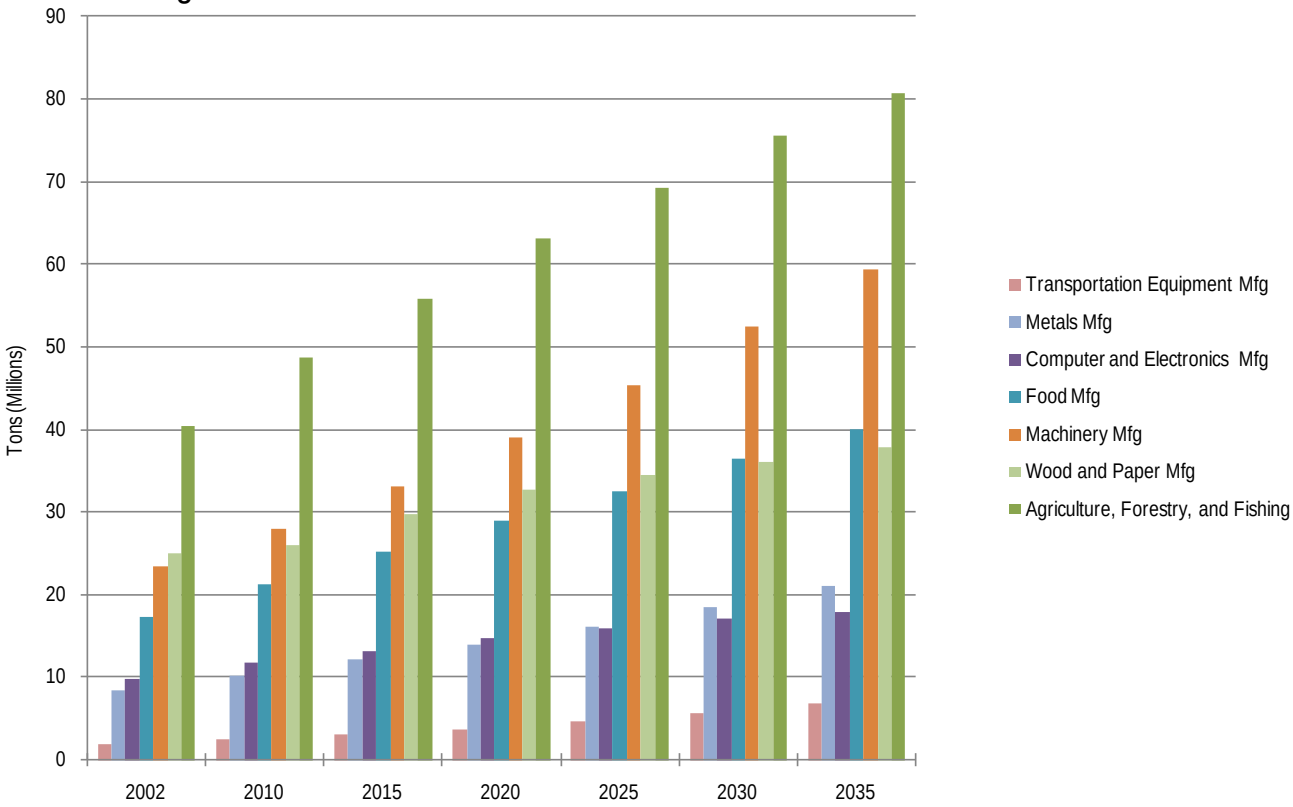


Figure 3.1 highlights the anticipated growth in tonnage shipments of key industries. The commodities that make up these industries can be found in Appendix F. The data shows that there are moderate to high-growth industries and slower-growth industries in terms of tonnage movements. High-growth industries include the following:

- Agriculture, Forestry and Fishing. Shipments related to this sector are expected to grow at a high rate of around 2.1 percent annually through 2035.
- Computer and Electronics Manufacturing. The volumes of commodity movements associated with the computer and electronics manufacturing industry are expected to grow at a steady pace, about 1.9 percent annually through 2035.[52]
- Food Manufacturing. Movements related to food manufacturing are expected to increase at a high annual rate of around 2.6 percent by 2035.
- Machinery Manufacturing. Shipments of machinery manufacturing outputs are expected to continue to increase substantially through 2035, with an expected annual growth rate of around 2.9 percent.
- Metals Manufacturing. Movements related to metals manufacturing are expected to grow at a fast pace of around 2.9 percent through 2035.
- Transportation Equipment Manufacturing. The volume of movements of transportation equipment manufacturing-related commodities is expected to grow at a very high rate – around 4 percent annually through 2035.
- Wood and Paper Manufacturing. Movements are expected to increase modestly at 1.3 percent annually through 2035.

[52] Oregon Commodity Flow Forecast, October 2009.

Figure 3.1 Key Oregon Freight Dependent Industries – Projected Growth of Related Commodity Tonnage with Oregon Origin[53,54] 2002 to 2035



Source: Oregon Commodity Flow Forecast data, October 2009.

53 Retail trade and wholesale trade were not included in the tonnage overview because tonnage conversion data are not available for these industries.

54 Tonnage does not translate into the value of goods or economic output. Thus, the growth rate of Agriculture, Forestry and Fishing does not indicate that jobs in this sector are going to increase at the same rate. The only growth that this graph shows is the growth in tonnage.

Implications of Industry Growth for the Freight System

Implications for Oregon freight transportation can be drawn from the data in Figure 3.1:

- High growth in volume of goods will occur in the computers and electronics manufacturing industry. The growth in economic importance (and increased freight tonnage in support of this growth) of computer and electronics manufacturing and the industry's reliance on air and trucking and complex global supply chains will result in an increasing need to strengthen the intermodal connections between these modes and focus efforts on improving overall system reliability.
- Many of Oregon's resource-based industries will still play an important role in the state's economy and a critical role in the economies of many rural and coastal areas. However, the Class I railroad business model currently focuses on long haul freight movements. This consolidation of service and the unprofitable nature of some carload movements have resulted in reduced rail service to some of Oregon's resource-based industries that move their railcar cargo in small lots. Oregon grain shippers struggle to obtain competitive pricing, for example, from Class I railroads because of their low volumes and relatively short hauls. Grain growers usually move goods from rural Oregon, east of the Cascades, to grain export facilities on the Columbia River and the Puget Sound. The change in Class I railroad operations makes rail a less viable option to move goods from the field to these export facilities. Shifting these commodities to trucks has both a cost and competitiveness impact for these sectors and has potential implications for road maintenance and congestion. As a result, ensuring transportation access and routes that can handle heavier loads is particularly important to these industries.

3.3 INDUSTRY LOCATION AND CLUSTERING

While many of Oregon's industries are located near Portland and around the I-5 corridor, many others, especially Oregon's traditional resource-based industries, are located in rural areas throughout the state. Industry site location can be influenced strongly by the nature of the products that are grown, processed or manufactured, domestic or international trade orientation, and the type of transportation modes required.

High-Value Industries

The computer and electronics manufacturing industry is clustered almost entirely within the Portland metropolitan area and Willamette region. In general, this urban clustering provides the following benefits to these industries, which help them be successful:

- Access to transportation infrastructure that facilitates exports (including airports, highways and rail), which is critical to these export-heavy industries;
- Availability and relatively low cost of utilities and land on the urban fringe; and
- Ability for companies to draw on a pool of highly-skilled employees (such as engineers and computer technicians) from the Portland metropolitan region.

Firms within high value-added manufacturing industries, such as machinery manufacturing, are relatively mobile and tend to locate near places with access to ports and relatively congestion-free highway corridors. However, larger manufacturers tend to be stationary due to the investment and infrastructure required to sustain their production sites.

Green technology is a sector that Oregon seeks to promote and develop. Wind turbine farms have clustered along the Columbia River Gorge and central and eastern Oregon, where strong wind currents combine with sparsely-populated land to facilitate installation of wind farms. Oregon is also becoming a hub for solar power manufacturing. Solar energy firms are located in urban areas, including Hillsboro, Gresham, Salem and Eugene, where plentiful higher-skilled labor and large land parcels are available.



Companies in the wholesale trade, footwear, apparel and recreation products sectors are predominantly located in the Portland metro region because of easy access to maritime, air, truck and rail transportation. These industries also have a strong import orientation, which makes access to various modes critical.

General Manufacturing Companies

General manufacturing companies are located across Oregon, with many concentrated in the Portland and Salem urban areas. Metals manufacturers are clustered in the northwest portion of the state, in particular in the Portland metro and upper Willamette Valley areas. Most food manufacturers are located in the western half of the state, with a heavy concentration around Portland and Salem. There are also some clusters in eastern Oregon near the Columbia River. Outside of these urban clusters, this industry is somewhat more dispersed than others

because location decisions tend to be driven by proximity to cheaper, inexpensive land, rail corridors and raw materials (e.g., agricultural inputs).

Natural Resource-Dependent Industries

Natural resource-dependent industries tend to be located in the state's rural areas. Fishing companies are naturally located on the coast near their supply source, though they generally have sales offices in the Portland region.

Wood manufacturers are based in mountainous areas, largely west of the Cascade Range close to where timber is harvested to reduce transportation costs, which make up a high percentage of the products' total market price. Clusters of wood and paper mills and production facilities are located throughout the Portland metro area and upper Willamette Valley and in coastal, southwest and central Oregon.

The agriculture sector tends to be fixed by location but is also relatively dispersed throughout the state, depending on the type of resource. Most farms and agricultural reload and processing facilities are spread throughout the upper Willamette Valley, and western, central, eastern and southern Oregon, where land is rich and abundant. Within this diverse industry cluster, specific industries tend to cluster in certain regions. For example:

- Many of Oregon's vineyards are located in the Willamette Valley, as well the Columbia River, Umpqua, Rogue and Applegate Valleys because of the nature of the soil and climate; and
- Growers of nursery stock and trees used in residential and commercial landscaping are highly concentrated in the Willamette Valley,

Transportation and Logistics Service Companies

Service companies, such as those in the transportation, logistics and distribution sector, serve domestic and international shippers all across Oregon and therefore operate where their customers are located.

3.4 INDUSTRY TRANSPORTATION SYSTEM AND SERVICE REQUIREMENTS, ISSUES AND OPPORTUNITIES

High-Value Industries

High-value industries are characterized by complex, long-distance supply chains that require materials from all over the world. In turn, many of the products produced by these high-value industries are also sold globally. As a result, these

industries are dependent on smooth functioning marine and air transport. Domestic shipments of high-value industries move by truck and, to a lesser extent, on rail, and reliability on these modes is critical. Companies that manufacture high-value products have the following transportation requirements:

- Access to international air cargo service at Portland International Airport (PDX). Since the majority of the finished products in this sector are high value, time sensitive and/or relatively small, they utilize airfreight to international and out-of-state domestic customers. Therefore, having adequate, reliable and direct international air carrier service at Portland International Airport is important; otherwise, products must be trucked to Seattle-Tacoma International Airport or San Francisco International Airport, which may increase costs and transit time. In addition, to satisfy promised delivery dates to their customers, technology firms must be able to access Portland International Airport in a reliable and consistent manner via the road and highway network to meet airfreight deadlines.
- Dependable transit times to and from the Port of Portland. Raw materials and components required by these industries for production often arrive from Europe and Asia by ship. Ensuring these goods can move quickly through the Port of Portland and over the surface transportation system is of utmost importance to the just-in-time manufacturing processes of this industry cluster.
- Supply chain consistency and reliability. Predictable supply chains are essential to manage the complexity of materials arriving from all over the world and to mitigate the risk of business interruption. High-value industries are less price-sensitive than other industries when it comes to transportation costs and are more concerned about transportation service reliability.
- Access to regions of new industry development. Green energy businesses are branching out to rural parts of the state to develop infrastructure such as wind farms. Growth in the wind industry will depend on having sufficient transportation to rural locations and planned wind farm facilities for delivering the heavy and large wind turbine components.

General Manufacturing Industries

Food and metals manufacturers depend on having low-priced transportation options, supply chain consistency and reliability, transportation modal choice, and access to fast, refrigerated transportation modes to ship perishable goods. A supply of industrial land near major markets is also essential to keep transportation costs down for these industries.

Supply chain consistency and reliability are essential to companies in the wholesale trade, footwear, apparel and recreation equipment industries. They are

less transportation price-sensitive than firms in some other industry clusters, such as agriculture and forest products.

Resource-Dependent Industries

Wood and paper manufacturers rely heavily on trucks, Class I rail and shortline rail to get their goods to market and on barges for shipment of raw materials. Though wood and paper manufacturers source many inputs from Oregon and the Pacific Northwest, they also ship to and from many international locations, using marine ports on the Pacific, Gulf and Atlantic coasts, as well as several international land border gateways with Canada.

Overall, resource-dependent industries receive a high percentage of value-added from transportation, which means that the overall direct effect of freight investments on them is high. Some of the critical transportation system needs of these industries include the following:

- Supply chain dependability. These industries rely on a steady flow of raw materials to function. Therefore, fast and reliable transportation is critical, in particular if the commodity being shipped is perishable.
- Modal choice. Resource-dependent shippers need modal flexibility, depending upon the products being transported, so having access to all modes – shortlines, Class I railroads and intermodal facilities, barge, ocean transport, air service (for certain exported perishable agricultural products) and truck – is very important.
- Access to the nation's marine and land border crossing/gateways. These industries make use of ports on all three coasts of the U.S., as well as several land border gateways with Canada like Blaine, Washington, to import raw materials and export finished goods.
- Widespread truck network. These industries rely on trucking for many trips that are less than 500 miles in length, to and from locations all around the Oregon and bordering states.
- Special equipment and designated routes for trucks that require permits. Some agricultural products and fish are highly perishable, so access to refrigerated equipment in all modes (rail, truck, air and barge) is essential. Some products like mining and construction materials are heavy, so having an adequate number of over-dimensional truck routes across the state facilitates safe, timely and cost-effective transportation of heavy loads.

Transportation and Logistics Service

Companies in the transportation, logistics, distribution and warehousing industry require consistent transit times to ensure customer satisfaction and on-time

delivery of manufacturing inputs and finished products, access to all modes of transport and smooth connections between transportation modes.

Critical Industry Issues

A survey for the OFP of shippers and carriers identified a number of critical issues.

High-Value Industries

Several issues can adversely affect the critical transportation functions of high-value industries, including the following:

- Highway congestion issues within the Portland area and around Portland International Airport. Congestion and bottlenecks on highways leading to/from Portland International Airport can result in cost and transit time reliability issues for industries dependent on air freight.
- Limited direct international air freight service at Portland International Airport and ocean carrier service at Port of Portland. The availability of air cargo service and marine cargo service is volatile. The addition or removal of a single flight at Portland International Airport may have far-reaching impacts on supply chains throughout the region. For example, airlines may determine to remove service because of market conditions or add service to a new market which might reduce travel time and cost for Oregon businesses significantly. This type of change in freight carriers and destinations impact distribution patterns and costs for those industries reliant on air freight to get goods to lucrative overseas markets. A similar situation exists at Portland's marine terminals.
- Permitted load truck standards and regulations. Size and weight permitting is necessary to protect transportation infrastructure from excessive wear, especially from those trucks that have significantly higher weights per axle. Highways are designed to specific national or state standards, which are exceeded by trucks that require permits. These trucks are a low percentage of truck movements; however, industries clustered in certain areas can benefit from or need access to trucks that require permits. For example, the wind industry requires transportation of wind turbines, which are heavy and overdimensional. A well-functioning and user-friendly permitting system requires knowing where these movements are concentrated and understanding the logistics patterns and common routes of these industries. It may be possible to offer more permitting opportunities or to selectively upgrade roads, bridges and tunnels to accommodate permitted loads. In some cases, it may also be cost-effective for the state to assist shortline railroads with track upgrades to maintain adequate service for the shipment of heavy loads.

- Weather-related delays. Some major corridors are often affected by weather-related road closures including I-5, I-84, I-205, U.S. 26, U.S. 30 and facilities over the Siskiyou Pass.

General Manufacturing Industries

Companies in these sectors are impacted by the following challenges:

- Growing transportation delays from increasing highway congestion and lack of highway system redundancy. Shippers report negative impacts from increasing congestion on highways in Oregon and on bridges in metro Portland. Also reported was lack of adequate highway system redundancy that would enable the motor carriers to route around traffic bottlenecks.
- Growing rail congestion and general rail issues. Some shippers noted in interviews that local Class I railroad yards are congested, particularly around Portland. Periodic rail equipment shortages make rail a less attractive option for some shippers, which can lead companies to use trucks instead of rail. This, in turn, increases transport costs. Most shippers are limited to one Class I railroad, which can limit options for service and competition for pricing.[55] Other challenges exist, including the Class I railroads' current pricing structure which favors more efficient longer trains traveling long distances. Shippers requiring short-haul moves or those with insufficient cargo volume sometimes are priced out of the rail market. Access to rail is limited in certain rural areas where shippers would like to use rail. Some stretches of shortline track are deteriorating or unable to handle heavier loads.
- Bridge restrictions. These restrictions are critical to keeping bridges safe for a long period of time and for reducing damage to bridge infrastructure, as damage prevention saves money for repairs. These restrictions do, however, impact routing choices for some general manufacturing companies with heavy loads, such as food or beverage products. Oregon has replaced or repaired hundreds of bridges with Oregon Transportation Investment Act III Bridge Program funds.[56] Oregon, unlike most other states, has taken the initiative to ensure that critical bridges necessary for efficient freight movements are capable of handling heavier loads. Still, it is important to get a clear picture of route and logistics patterns for major industries and to consider upgrading any industry-critical bridges that require work.

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55 "Oregon Freight Rail System." Prepared by Parsons Brinckerhoff for the Oregon Rail Study, April 2010.

56 Background Brief: Legislative Committee Services: Bridges. State of Oregon at https://www.oregonlegislature.gov/lpro/Publications/BB2014Bridges.pdf

- Increased demand for industrial land supply on waterfronts and in urban areas. As a result of increased maritime trade to support marine-dependent industries, such as wood and paper manufacturing, the demand for waterfront terminal facilities and waterfront industrial land supply will increase. However, pressure exists to convert industrial land to other uses, such as residential or commercial land. The Metro Regional Freight Plan 2035, suggests that "industrial sanctuaries should continue to be considered a unique and protected land use" in the Metro region.[57] A focused effort to protect industrial land throughout the state is important to maintain Oregon industry competitiveness and viability.
- Ocean carrier and direct international air freight service schedules at the Port of Portland. At times, limitations in port calls or flight schedules can cause companies to use alternate gateways such as the Puget Sound ports of Seattle-Tacoma, or San Francisco-Oakland, which increase costs and transit times.

Resource-Dependent Industries

Companies in this sector are impacted by the following challenges:

- Congestion on major freight corridors. In interviews, shippers reported that increasing congestion is a major concern, especially in Oregon's urban areas and on the Columbia River Crossing I-5 Bridge.
- Lack of highway system redundancy. There are few roads connecting the Oregon coast and coastal range to major population centers in Oregon including the Willamette Valley and beyond the state, as well as to the Port of Portland and Portland International Airport. Because road and highway system redundancy is lacking, companies in the forestry and fisheries industries that harvest and process products off the Oregon coast and in the coastal range face supply chain disruptions when winter weather-related events like flooding, landslides and downed trees cause road closures, or increased summer traffic slows down driving speeds.
- Lack of motor carriers to support rural shippers. Shippers in some rural areas reported having difficulty procuring sufficient empty trucks during certain times of the year. Access to adequate motor carrier service is often limited when motor carriers are resistant to serve rural areas because there often is no return cargo to create a revenue paying round-trip. Therefore, trucks either return empty or motor carriers charge higher rates than for their urban customers.

[57] The Metro "Regional Freight Plan 2035," which was released in June 2010, also brings this up as a key finding.

- Truck permitting issues and diminished routing choices. Shippers mentioned that restrictions and rules for permitting heavy and over-dimensional vehicles are somewhat cumbersome; this includes restrictions concerning, for example:
  - Location of pilot car for some loads: some are required in front, others in back, others both;
  - Restrictions on transporting during certain times of day;
  - Restrictions on transporting during certain weather conditions; and
  - Restrictions against holiday moves.

  Permitting regulations allow heavy and over-dimensional loads while balancing the needs of public safety and road users. Good connectivity of routes available to permitted loads is important to industries, as reduced transit time lowers costs and increases competitiveness.
- Challenges with rail service. Forestry shippers lack nearby rail access in certain rural areas where timber harvesting and processing occur. Grain growers have not been able to consistently attain dependable and affordable rail service. In addition, inadequate maintenance and insufficient capacity on some shortline railroads can negatively affect shippers.

Service Companies

Companies in this sector are primarily challenged with growing congestion, in particular in and around the Portland metropolitan region. Decreasing direct commercial airline flights as a result of systemwide capacity reductions may have an impact on Portland competitiveness in the service and other industries sector.

Freight Systems



4.0 Freight Systems

4.1 INTRODUCTION

The previous chapters provide background on the economy, freight demand and critical freight dependent industries and their supply chains. This chapter focuses on describing the freight transportation system and its importance to the industries that use the system. The chapter is divided into the following sections:

- Freight System Overview. This section provides an overview of the multimodal freight system in Oregon, with a focus on truck, rail, marine and aviation, and the connectivity between these modes.
- Strategic Freight Network Selection Methodology and Description. This section provides a system description of how the freight dependent industries of Oregon use major multimodal corridors that support the Oregon economy. The information is used to define a list of strategic freight corridors by industries for the entire state.
- Connectivity. This section provides a description of system elements (roads, rail lines, marine facilities, airports and pipelines) that help connect centers of economic activity for freight-dependent industries with strategic freight corridors.

4.2 FREIGHT SYSTEM OVERVIEW

Freight mobility in Oregon is provided by a multimodal network that includes highways, local roads, rail, air, marine and pipeline operations. The freight system is also part of the National Defense System. According to the 2006 OTP and ODOT's Rail Division, Oregon's transportation system is made up of the following infrastructure:

- 7,441 miles of state highways.
- 4,664 miles of other state roads; 26,861 miles of county roads; 10,011 miles of city roads; 38,666 miles of other government-owned roads. These roads help connect Oregon industries, businesses, population centers and other freight-generating facilities to the major freight transportation corridors.
- 2,086 miles of privately-owned route miles of rail track; 314 miles of publicly-owned track; 1,126 miles of Class I carrier-operated track; 1,274 miles of Class III shortline-operated track; and, 4 miles of switching railroad

track (included in the shortline total).[58] This includes two major transcontinental railroads: The Burlington Northern Santa Fe (BNSF) Railway and the Union Pacific (UP).

- 18 Class I railyards and nine facilities that have the capacity to load and unload unit trains.
- Five deep-draft and four shallow-draft marine port locations.
- Two marine highways.
- 97 public-use airports.
- Nine pipelines to move petroleum and natural gas.

Road/Highway System[59]

The north/south Interstate 5 and east/west Interstate 84 corridors carry the majority of freight traffic in Oregon. These facilities provide Oregon with freight system connections with national and international destinations. I-5 forms part of an international freight corridor connecting Oregon with California and Mexico to the south and Washington and Canada to the north, while I-84 provides connection to the east including Idaho, Utah and other states.

Several state highways offer important opportunities for freight movement because of their location and connectivity to a variety of markets. Large sections of the state, where no interstates are nearby, rely on state highways to import and export goods. Within major urban areas, the complex road network of arterials and connectors is critical for freight movement. Local arterial roadways that lead to marine facilities or other modal terminals are designated by the Federal Highway Administration as Intermodal Connectors on the National Highway System.



The 1999 *Oregon Highway Plan* establishes long-range policies and investment strategies for the state highway system. These policies include the designation of a system of freight routes. The OHP freight routes provide for highway freight

[58] Oregon DOT Rail Division.

[59] Please see Chapter 9 for discussion of National Highway Freight Network established under Map-21 and the FAST Act.

through movements and connectivity across the state. Many of the OHP freight routes serve as connectors between the coast or specific communities and the interstate system. The strategies and action items identified in Chapter 8 of the OFP should be used with the OHP policies and investment strategies when planning for freight on the state highway system.[60]

Rail System

Oregon's rail network is predominated by two Class I railroads: the UP and the BNSF Railroads. Oregon's rail system consists of a total of 2,400 route miles of track. The two Class I railroads account for 1,126 miles of track, and the remainder is shared by 21 shortline railroads (Class III railroads). Portland & Western Railroad and Central Oregon & Pacific Railroad have the most track mileage for non-Class I railroads in the state, with the former at 286 track miles and the latter at 241 miles.

Oregon's entire rail network is part of the national rail network since all tracks connect to a Class I railroad. The Oregon network is concentrated in the western part of the state, where forest products industry, agricultural producers and population centers rely on the movement of significant freight volumes. The five main lines, or principal routes, that provide mobility throughout Oregon and connect Oregon to the national network are:

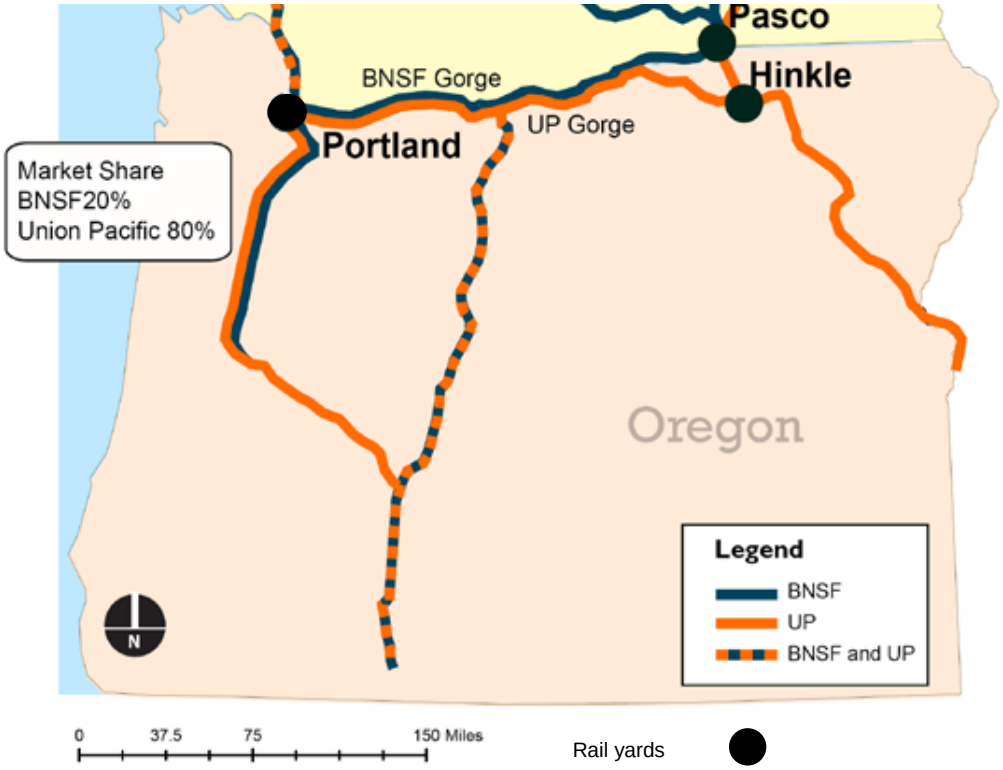
- BNSF Railway (shared by Union Pacific Railroad), northward to Seattle and Canada and eastward to the northern tier states via a crossing of the Columbia River between Portland and Vancouver, Washington;
- Union Pacific Railroad, northward to Spokane, Washington, and Canada via the Hinkle Yard (near Umatilla);
- Union Pacific Railroad, eastward toward the intermountain states and central tier states via La Grande;
- BNSF Railway, crossing the Columbia River into Oregon via Vancouver and Wishram, Washington, and going southward to California through Bend and Klamath Falls; and
- Union Pacific Railroad, southward from Portland to California via Eugene and Klamath Falls.

Figure 4.1 provides an overview of where these Class I corridors are located. The Hinkle and Pasco rail yards, along with the yards in Portland, are important hubs

[60] Oregon Highway Plan, https://www.oregon.gov/ODOT/Planning/Documents/OHP.pdf

for rail freight traffic moving through Oregon. For further details, see Oregon Rail Study 2010[61]

Figure 4.1 BNSF and UP Class I Rail Corridors in Oregon



Source: Oregon Rail Study 2010, ODOT.

One factor that could impact freight rail capacity in Oregon is the potential increase in passenger service. As passenger trains increase, tracks could become increasingly congested, which could affect freight rail efficiency. To preserve efficient movement of goods and people in the future, it will be important to make rail improvements so that both freight and passenger capacity needs are met.

Marine System

Oregon's marine freight network is comprised of several waterways and numerous ports. Oregon's waterways serve a large portion of the state through water access to the Pacific Ocean, the Columbia River and Snake River. In

[61] ODOT's website: https://www.oregon.gov/ODOT/RPTD/RPTD%20Document%20Library/Oregon-Rail-Study-2010.pdf

August 2010, two major Oregon marine corridors (the Columbia/Willamette/Snake River corridor from the Pacific Ocean to Lewiston, Idaho and the north-south corridor on the Pacific Ocean along Oregon's coast) were designated by the U.S. DOT's Marine Administration as marine highways. Marine highways are eligible for federal funding for improvements and are selected because they will be able to relieve congested truck and rail corridors. The Columbia and Willamette Rivers and the Pacific Coast routes were named M-84 and M-5, respectively.



M-84 connects the ocean Port of Astoria and Oregon's major deep draft port (Portland) with Lewiston, Idaho, and all ports on the Columbia River between the two. In addition, the Pacific Coast Ports of Coos Bay and Newport offer marine outlets for goods moving to and from the central and southern coastal regions of the state. In total, 23 Oregon port districts operate along the Pacific Coast and the Columbia River system, five of which are identified as deep-draft freight terminals: Coos Bay-North Bend and Newport along the coast; Astoria and St. Helens along the Columbia River; and Portland along the Columbia and Willamette Rivers. Shallow-draft freight terminals serve shippers on the Columbia River at The Dalles, Arlington, Boardman (Morrow) and Umatilla. In addition to port districts, the marine system serves many terminals that are entirely owned and operated by private sector entities.

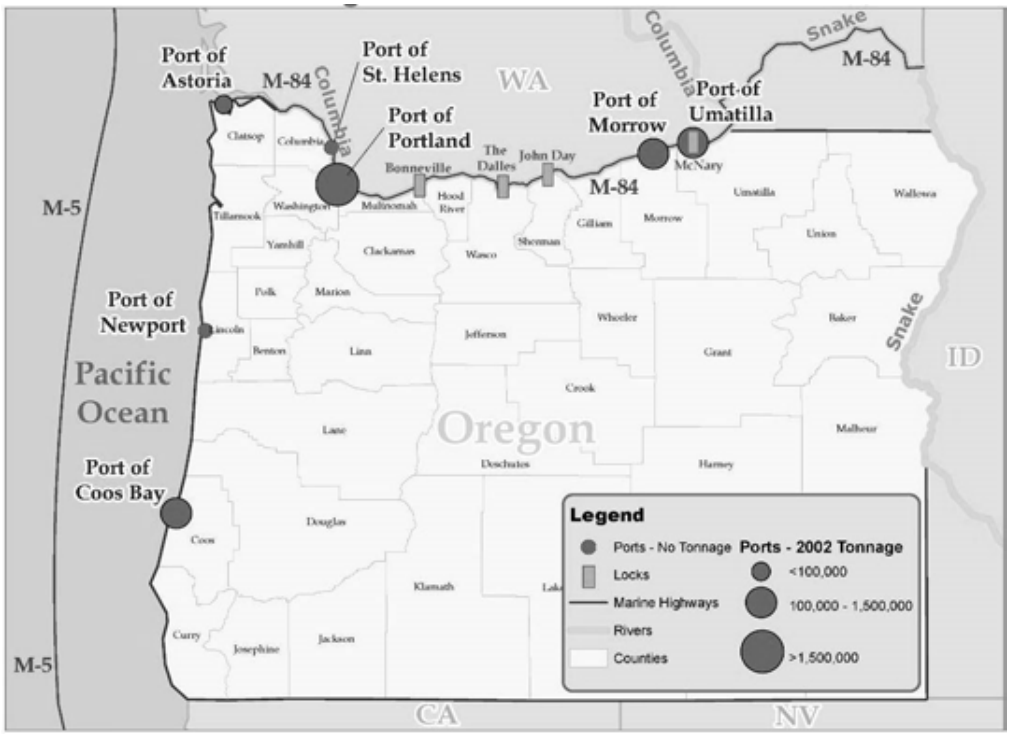
The Portland harbor, located at the confluence of the navigable portion of the Columbia and Willamette Rivers, handles the majority of marine freight in Oregon.[62] The Columbia River's 43-foot channel depth gives Portland access to Pacific Rim trade. From ports to the east of Portland, barges bring agricultural, wood and other products to Portland's marine terminal facilities. Portland harbor constitutes a 12-mile stretch of the Willamette River and two miles along the Columbia River located within Portland's northern industrial districts.

Several locks were built in Oregon. The major locks on the Columbia River are located at McNary Dam, The Dalles Dam, Bonneville Dam and John Day Dam. Channel and jetty maintenance, improvements, dredging and operational locks are all necessary to increase freight throughput and decrease delay and costs for marine freight. Repair and maintenance of jetties on the coast and the jetty on the Columbia River are necessary to protect navigational channels and marinas. Investments in navigational aids are necessary to improve safety and efficiency

[62] Parsons Brinckerhoff Ports 2010: A New Strategic Business Plan for Oregon's Statewide Port System December 2009.

on the marine freight network. Figure 4.2 highlights Oregon ports that move a substantial amount of goods, as well as locks and marine highways.

Figure 4.2 Oregon Ports, Locks and Marine Highways



Source: Produced by Cambridge Systematics, Inc for the Oregon Freight Plan.

Aviation System

The *Oregon Aviation Plan* (2007) includes 97 public-use airports in the state's airport system. The Portland International Airport (PDX), operated by the Port of Portland, handles the majority of the airfreight movements in the state. Despite the dominance of Portland International Airport, other regional airports in Oregon provide capacity for the movement of airfreight.

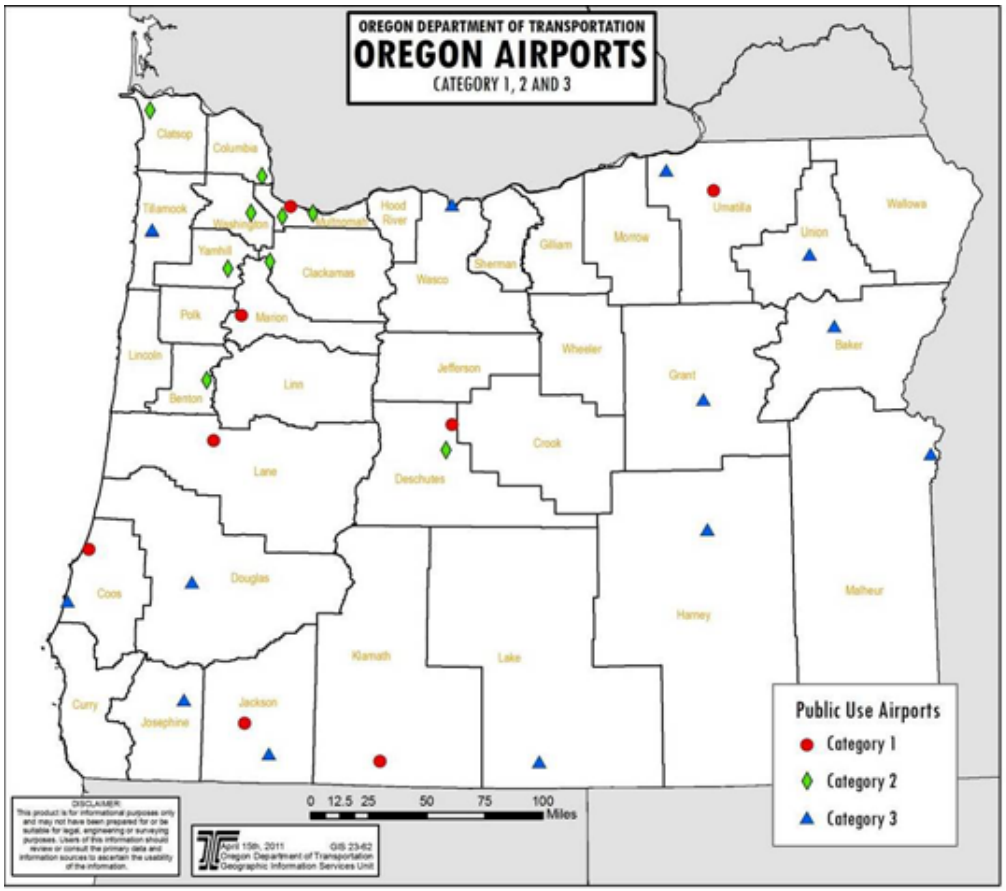
The OAP contains a recommended system of airport classification as shown in Table 4.1. The classification system contains five categories:

1. **Category I –** commercial service airports;
2. **Category II –** urban general aviation airports;
3. **Category III –** regional general aviation airports;
4. **Category IV –** local general aviation airports; and
5. **Category V –** remote access/emergency service airports.

Of the five categories, measurable air cargo shipment volumes are only expected at Category I, II and III airports. These airports are identified in Figure 4.3.

See the OAP and the *Technical Memorandum: Inventory of Oregon Freight Infrastructure*.[63,64]

Figure 4.3 Oregon Category I, II and III Airports



63 https://www.oregon.gov/aviation/Pages/docs/system_plan/2007_oregon_system_plan_details.aspx

64 http://library.state.or.us/repository/2010/201010251124211/index.pdf

Table 4.1 Oregon Aviation Plan Classified Airports

Classification	Airport (Location)*
Category I: Commercial Service Airports	· Eastern Oregon Regional Airport (Pendleton) · Eugene Airport – Mahlon Sweet Field · Klamath Falls International Airport · Portland International Airport · Redmond Municipal Airport – Roberts Field · Rogue Valley International Airport (Medford) · Salem Municipal Airport - McNary Field (Salem) · Southwest Oregon Regional Airport (North Bend)
Category II: Urban General Aviation Airports	· Astoria Regional Airport · Aurora State Airport · Bend Municipal Airport · Corvallis Municipal Airport · McMinnville Municipal Airport · Newport Municipal Airport · Portland Downtown Heliport · Portland – Hillsboro Airport · Portland – Troutdale Airport · Scappoose Industrial Airpark
Category III: Regional General Aviation Airports	· Ashland Municipal Airport – Sumner Park Field · Baker City Municipal Airport · Bandon State Airport · Burns Municipal Airport · Columbia Gorge Regional (The Dalles) · Grant County Regional Airport - Ogilvie Field (John Day) · Grants Pass Airport · Hermiston Municipal Airport · LaGrande /Union County Airport · Lake County Airport (Lakeview) · Ontario Municipal Airport · Roseburg Regional Airport · Tillamook Airport

Source: *Oregon Aviation Plan* 2007, Table 4.2, p. 4-12.

*Note: Location is shown when the airport name does not clearly identify the location of the airport.

Pipeline System



Pipelines are an important part of the multimodal freight network and are responsible for delivering petroleum and related products throughout Oregon. The largest pipelines in the state tend to parallel major freight corridors, such as I-5, I-84 and U.S. 97. The pipeline system in Oregon is completely owned by private companies. The private ownership of this system limits the amount of public information available regarding system capacity and planning.

Pipelines in Oregon carry two primary commodities:

1. **Natural Gas.** There are more than 17,000 miles of natural gas pipeline in Oregon. These lines supply five gas utilities that provide power to households, businesses and industrial users.[65] Oregon does not have any proven gas reserves, so all natural gas must be imported to the state.
2. **Refined Petroleum Products.** Over 300 miles of petroleum product pipelines in Oregon supply the state with gasoline, diesel, jet fuel and other refined petroleum products.[66] Oregon has no petroleum refineries so like natural gas, all of its petroleum must be imported. Oregon is especially reliant on the Olympic Pipeline, which connects Puget Sound refineries to distribution terminals in Portland.

Although the pipeline system is privately owned and operated, it does interact with the rest of the state's transportation network. Petroleum product pipelines, for instance, create demand for truck transportation at their termini since fuel products must be shipped from the terminal to their final destination. If Oregon's pipeline systems reach capacity in the future and no new ones are built, these shipments would have to be made by truck, with potential negative impacts such as infrastructure wear and tear and increased roadway congestion.[67]

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65 American Gas Association, The Natural Gas Industry in Oregon

66 ODOT, Oregon Transportation Plan: Transportation Needs Analysis Summary Report 2005 -2030, July 14, 2005.

67 According to the *Oregon Transportation Plan: Needs Analysis Summary Report 2005*, current and near-term capacity of petroleum pipeline is adequate. However,

4.3 STRATEGIC FREIGHT NETWORK SELECTION METHODOLOGY AND DESCRIPTION

Chapters 2 and 3 summarize the importance of freight-dependent industries to Oregon. These chapters provide background information on factors that drive freight transportation demand in Oregon: the economy, critical freight-dependent industries and their supply chains. The importance of freight-dependent industries to the Oregon economy is highlighted by their contribution to total Oregon GSP (total GSP was $161.5 billion in 2008),[68] total Oregon manufacturing GSP and employment.[69]

To ensure a long-term competitive advantage for Oregon freight-dependent industries, it is necessary to define the elements of the transportation system used by these industries. This analysis highlights the strategic routes for each freight-dependent industry.

The approach to defining the strategic freight network included the following steps:

1. A set of eight important freight-dependent industries was identified by using information contained in Chapters 2 and 3. The Oregon Statewide Integrated Model (SWIM) was used to identify regional commodity production and consumption for each industry.
2. SWIM was used to identify corridors used to transport commodities for each industry. Each corridor focuses on the major state highways in the corridor and includes all non-highway transportation modes such as rail, marine, aviation and pipelines.
3. For each industry, the corridors that carry the largest value and tonnage of freight are considered to be strategic for those industries. In turn, all of the major truck, rail, marine and airport facilities in these strategic corridors are considered to be part of the strategic freight system.
4. In addition to ensuring that corridors serving freight-dependent industries are part of the strategic system, the system was defined to include corridors that carry the majority of freight for each ACT in the state. This ensures that the economies of each of the state's regions are connected to the strategic freight system.

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capacity issues are expected, which may require barges and trucks to transport petroleum. The report also states that natural gas pipelines will require additional improvements to meet future demand, which the natural gas industry should be able to handle over the next 20 years.

68 IHS Global Insight – U.S. Regional Service, Oregon Data: November 2009.

69 Reference Chapter 3 Source: Oregon Office of Economic Analysis, November 2009.

5. Once these strategic routes were defined based on industry needs, corridors were identified that provide connections between centers of industry activity and the strategic backbone corridors.

The following sections present more detail on how this industry-level view of freight flows in the state was used to define the strategic freight network. Additional data on Oregon commodity flows can be found in the *Oregon Commodity Flow Forecast, October 2009*.[70]

Freight Industries Strategic Network Methodology

Based on the data summarized in Chapters 2 and 3, the following freight-dependent industries were analyzed to determine which corridors they use to transport goods to markets and receive supplies:

- Agriculture, Forestry and Fishing;
- Computer and Electronics Manufacturing;
- Food Manufacturing;
- Machinery Manufacturing and Metals Manufacturing;
- Wholesale Trade;
- Wood and Paper Manufacturing;
- Retail Trade;
- Services and All Other.

Each industry was analyzed and represented in terms of the value of freight moved and tonnage[71].

Figures 4.4 through 4.11 show average daily statewide corridor flow by value and tonnage for year 2010 for each of the eight freight-dependent industry groups.[72] The maps are intended to illustrate the broad, multimodal corridors over which industry moves its goods. The maps use the state highway system (and the corridors are often referenced in terms of the principal state highway route in the corridor) to represent all modes of flow. The non-highway freight flows actually move along the modal facility closest to the major highway in the corridor.

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70 http://library.state.or.us/repository/2010/201010251112531/index.pdf

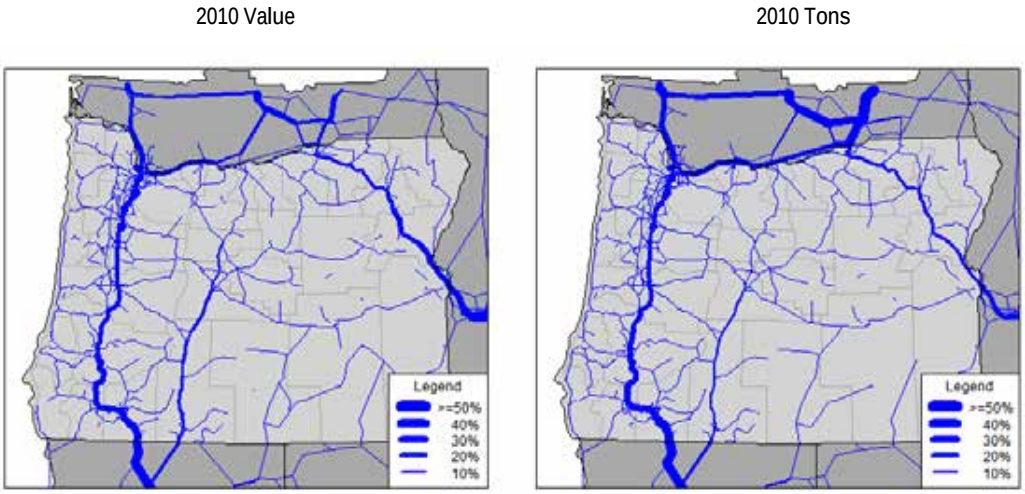
71 Information produced by SWIM for the OFP reference scenario was used to estimate flows by industry.

72 Flow rates outside the state of Oregon represent Oregon activity and do not reflect actual calibrated freight movements.

In Figures 4.4 through 4.12 flows beyond the Oregon borders are illustrative and do not represent all flows on those facilities.

Agriculture, Forestry and Fishing

Figure 4.4 Estimated Agriculture, Forestry and Fishing Industry Output Flows by Value and Tonnage, 2010

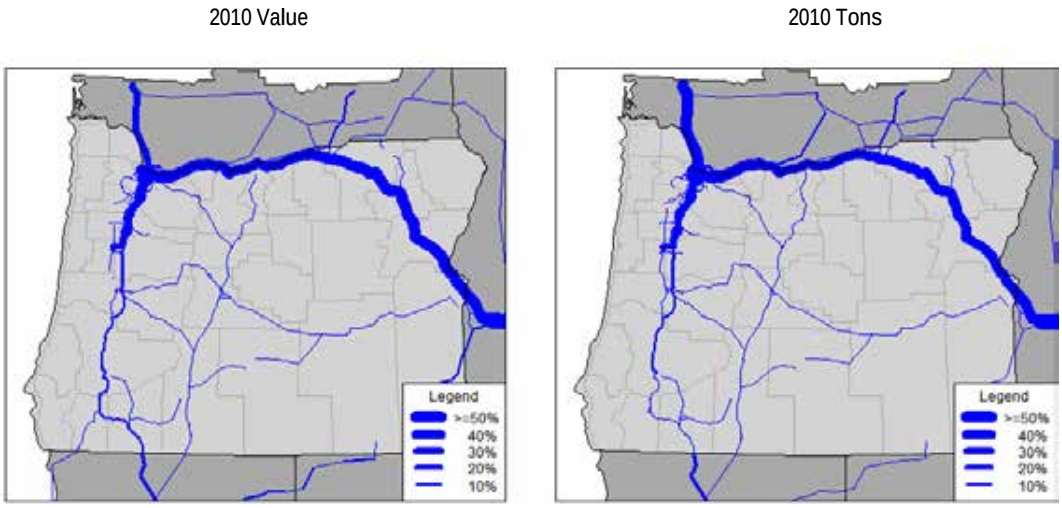


Source: Prepared by ODOT, 2010.

Figure 4.4 presents product flows for the Agriculture, Forestry and Fishing industry group. Goods shipped by industries classified within this group include logs and other wood in the rough and wood products, agricultural products, and fish and wildlife products.

Computer and Electronics Manufacturing

Figure 4.5 Estimated Computer and Electronics Manufacturing Industry Output Flows by Value and Tonnage 2010

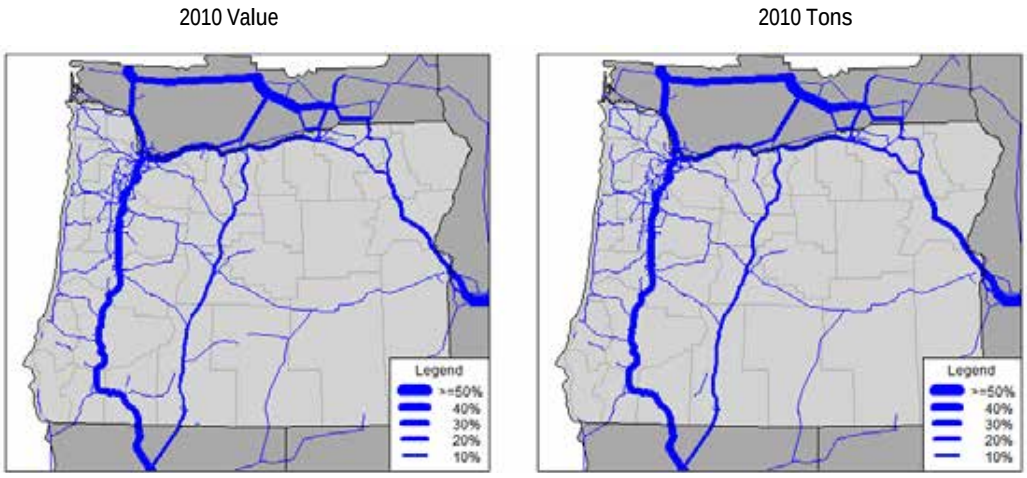


Source: Prepared by ODOT, 2010.

Figure 4.5 shows freight flows for the products of the Computer and Electronics Manufacturing sector. This industry group produces a mix of computer and electronics-related goods and is characterized as a high-value, low weight commodity. Commodity flow is predominantly from outside the state and flows from the north in the I-5 corridor to the Willamette Valley. There are flows east of Portland in the I-84 corridor towards the eastern states. Some of these flows head north into Washington State via the U.S. 97 corridor and the I-82 corridor.

Food Manufacturing

Figure 4.6 Estimated Food Manufacturing Industry Output Flows by Value and Tonnage 2010



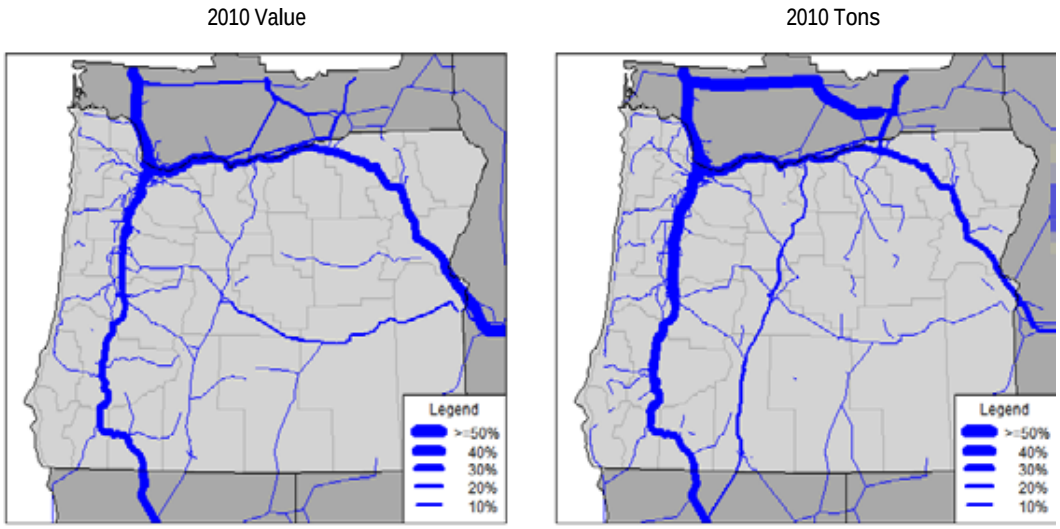
Source: Prepared by ODOT, 2010.

Figure 4.6 presents corridor flows for the products of the Food Manufacturing and Kindred Products industry group. Commodities within this category include live animals and fish, cereal grains, animal feed, meat, seafood, milled grain products, alcoholic beverages and tobacco products. This group represents a wide range of products in terms of value and weight and a mid-range value per unit weight.

Production of these agricultural and food products occurs primarily in the eastern and central areas of the state, as well as in the northwest Willamette Valley to Astoria. The flow maps reveal that the north-south I-5 corridor, particularly in the Willamette Valley area carries many of the food products in Oregon. However, considerable food manufacturing traffic moves in the I-5 corridor and the U.S. 97 corridor to California and Washington and in the I-84 corridor to the Idaho border.

Machinery Manufacturing and Metals Manufacturing

Figure 4.7 Estimated Machinery/Metals Manufacturing Industry Output Flows by Value and Tonnage 2010



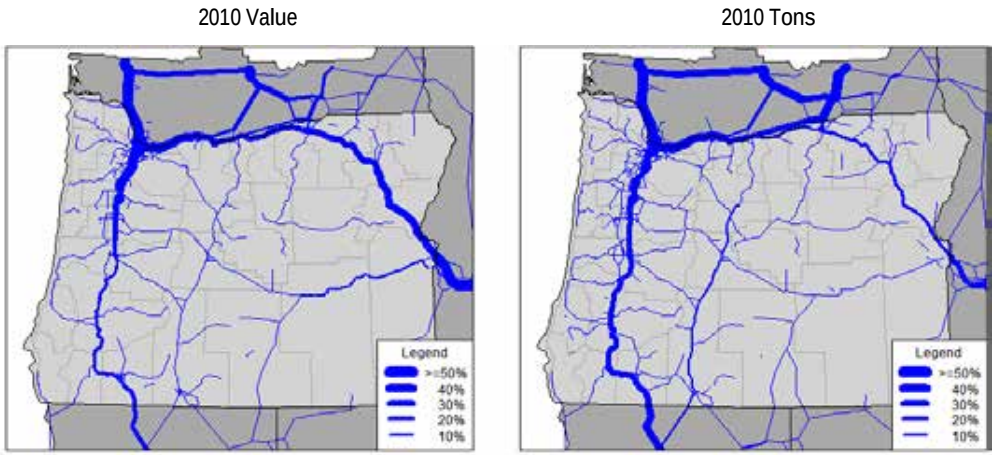
Source: Prepared by ODOT, 2010.

Figure 4.7 shows corridor flows for the products of the Machinery and Metals Manufacturing industry group. Goods within this category include base metal in primary or semi-finished form, articles of base metal, machinery, electronic and other electrical equipment, motorized and other vehicles (including parts), transportation equipment, and precision instruments and apparatus.

The machinery and metals companies producing the flows shown above are predominantly located in the urban areas of the Willamette Valley, with some located in Bend, Astoria and Medford. Their products are primarily trucked to Washington and eastern states. Products of the Machinery and Metals Manufacturing industry group tend to be higher in value and lower in weight. By value goods predominantly move in the I-5 corridor and in the I-84 corridor. The heavier goods movement within this industry group tends to flow in the Willamette Valley I-5 corridor and north of Portland.

Wholesale Trade

Figure 4.8 Estimated Wholesale Trade Industry Output Flows by Value and Tonnage – 2010

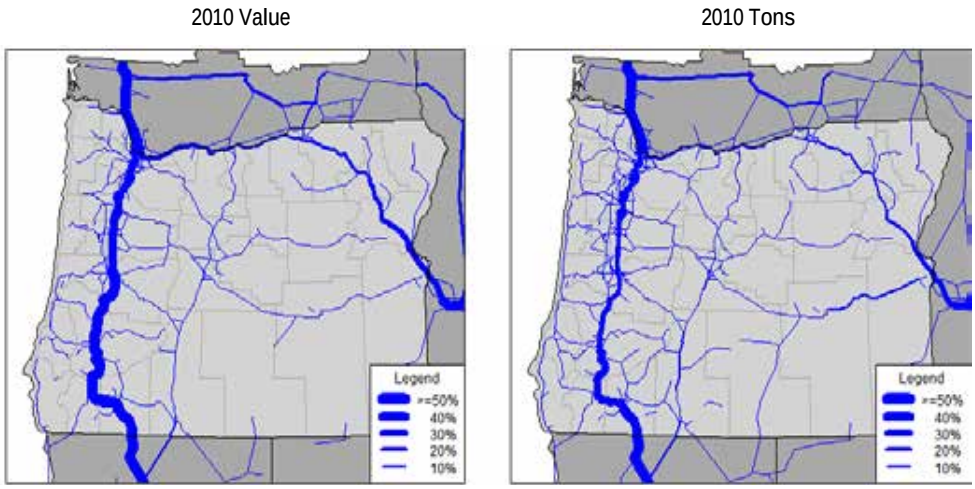


Source: Prepared by ODOT, 2010.

Wholesale Trade products make use of many freight system corridors, as shown in Figure 4.8. However, these goods move primarily on the northern I-5 corridor and on the I-84 corridor. The majority of Wholesale Trade value moves along the I-84 corridor and stays in the northern section of the state. The majority of tonnage moves on I-5.

Wood and Paper Manufacturing

Figure 4.9 Estimated Wood and Paper Manufacturing Industry Output Flows by Value and Tonnage 2010

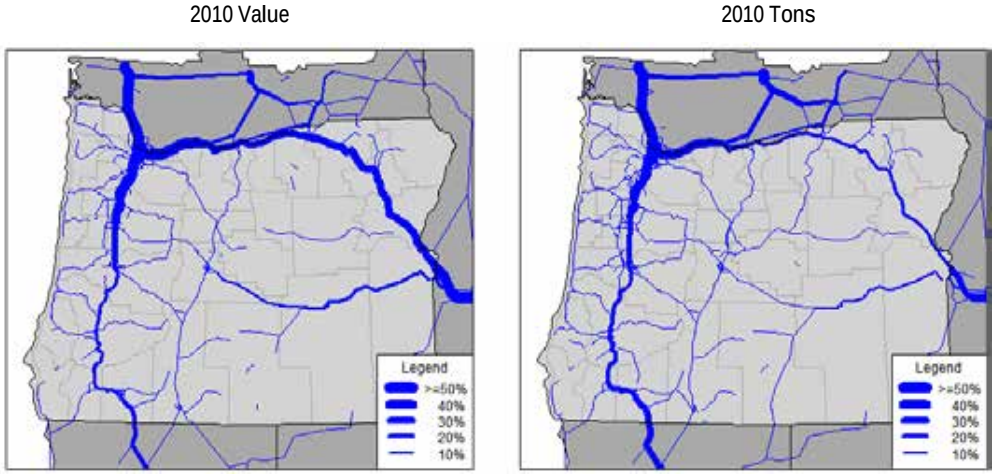


Source: Prepared by ODOT, 2010.

Figure 4.9 presents corridor flows for the Wood and Paper Manufacturing industry group. Industry production in this group includes newsprint, paperboard, paper or paperboard products and printed products. Western Oregon is a heavy production area for these products. Truck flows of this industry group are concentrated along the I-5 corridor and move down to California and up to Washington State.

Retail Trade

Figure 4.10 Estimated Retail Trade Industry Flows by Value and Tonnage 2010

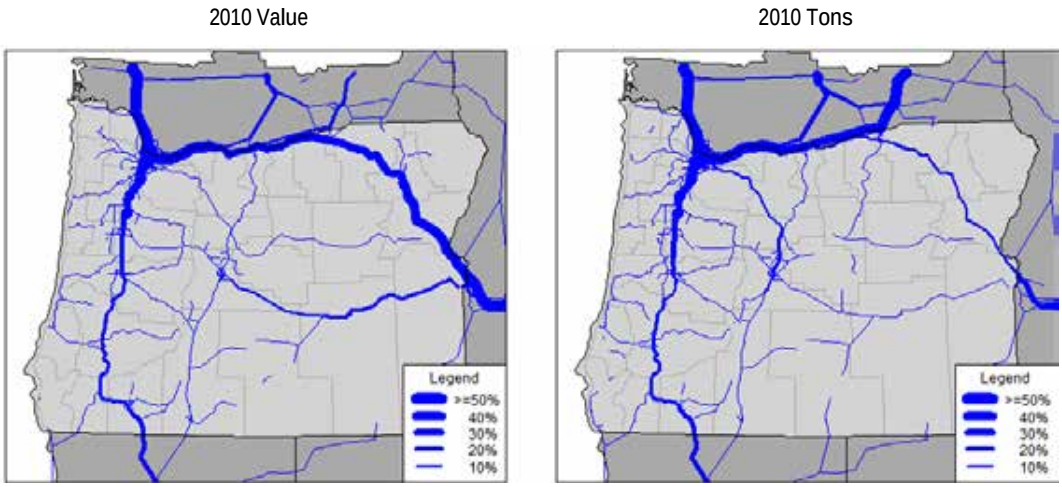


Source: Prepared by ODOT, 2010.

Figure 4.10 shows corridor flows for the Retail Trade industry group. The largest proportion of Retail Trade products by value move in the I-5 and I-84 corridors. A substantial amount of Retail Trade products in value also moves on the U.S. 20 corridor, especially in the eastern one-half of that corridor. In terms of tonnage, the majority of retail goods move in the area around Portland and on I-5 between Portland and Seattle. This highlights the movement of retail goods between major population centers such as Salem, Portland and Seattle.

Services and Other

Figure 4.11 Estimated Services and All Other Industry Flows by Value and Tonnage 2010



Source: Prepared by ODOT, 2010.

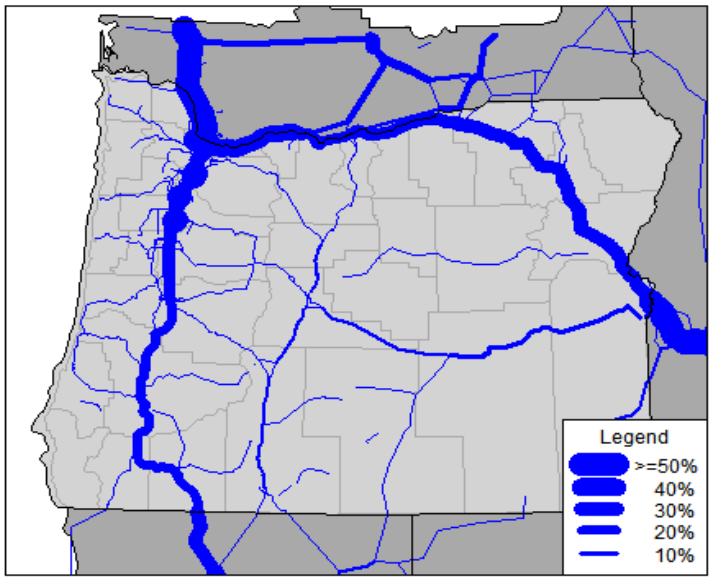
Figure 4.11 presents corridor flows for the Services and All Other industry group. Goods produced within this industry include textiles, leather, articles of textiles or leather, furniture, mattresses and miscellaneous manufactured products.

More Service and Other flows are concentrated in the northern section of the I-5 corridor. There is a notable high-value flow of this industry's output on I-84. Lower value flows occur within the southern one-half of the I-5 corridor. Large lower-value flows are forecast for this commodity group on the entire I-5 corridor, especially the southern portion.

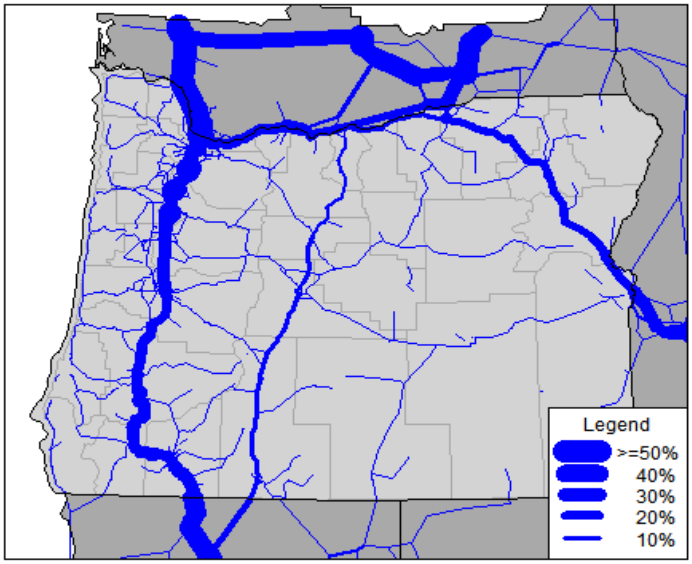
Summarizing Freight-Industry Freight Flows and Defining the Strategic System

Figure 4.12 Total Statewide Industry Output Flows by Value and Tonnage 2010, All Modes

2010 Value



2010 Tons



Source: Prepared by ODOT, 2010.

Figure 4.12 depicts the total flows for all industries. Tables 4.2 and 4.3 highlight how each industry utilizes the major corridors. This information is important in defining the strategic freight network, as the corridors that carry high levels of goods for each industry are critical to the state's economic health and to the businesses utilizing these corridors. Table 4.2 shows the percentage of total value of products shipped by each industry in each major corridor, and Table 4.3 shows the percentage of ton-miles of shipments by each industry in each corridor.

Table 4.2 Industry Output Flows by Percent of Value, per Corridor

Corridor	Total	Computer & Electronics	Wholesale Trade	Machinery & Metals	Retail Trade	Wood & Paper	Agriculture Forestry & Fishing	Food Mfg	Services & Other
I-84	49%	67%	46%	44%	44%	22%	29%	34%	46%
I-5	30%	21%	28%	34%	30%	52%	33%	35%	27%
U.S. 20	6%	4%	7%	8%	9%	7%	6%	3%	11%
U.S. 97	4%	1%	5%	4%	4%	5%	11%	13%	4%
U.S. 26	2%	1%	2%	2%	2%	3%	3%	2%	3%
All other corridors[73]	9%	6%	12%	8%	11%	11%	18%	13%	9%

Table 4.3 Industry Output Flows by Percent of Total Ton-Miles, per Corridor

Corridor	Total	Computer & Electronics	Wholesale Trade	Machinery & Metals	Retail Trade	Wood & Paper	Agriculture Forestry & Fishing	Food Mfg	Services & Other
I-5	37%	24%	37%	38%	37%	45%	35%	35%	34%
I-84	32%	63%	33%	37%	34%	18%	30%	34%	35%
U.S. 97	9%	1%	8%	9%	6%	7%	9%	15%	8%
U.S. 20	5%	4%	5%	2%	7%	8%	5%	2%	7%
U.S. 26	3%	2%	3%	3%	3%	5%	3%	2%	5%
All other corridors	23%	6%	14%	11%	11%	17%	18%	12%	11%

Source: Prepared by ODOT, 2010.

[73] Other corridors analyzed included I-82, I-205, I-405, US30, US101, US199, US395, OR6, OR11, OR18, OR22, OR34, OR58, OR99, OR126, OR140, OR204, OR207, and OR217.

From the data in these tables and figures, it becomes apparent that the I-5 and I-84 corridors are the dominant corridors in terms of tonnage and value. This includes all modes that travel along this corridor. In addition, the U.S. 97 and U.S. 20 corridors carry moderate freight volumes but are critical because they provide redundancy in the freight system. U.S. 97 and U.S. 20 act as secondary north-south and east-west cross-state highways, respectively. Tables 4.2 and 4.3 illustrate that the I-5 and I-84 corridors carry the largest share of freight for each of the state's freight-dependent industries. The tables also show that the U.S. 20 corridor is a significant secondary corridor for most industries particularly in terms of tonnage shipped over relatively long distances. The U.S. 97 corridor carries relatively high-value products in the Agriculture, Forestry and Fishing industry group and the Food Manufacturing industry group.

Based on this analysis, the following four corridors are strategic in terms of their significance to major freight-dependent industries:

1. Western corridor (I-5),
2. Columbia River corridor (I-84),
3. U.S. 20 corridor, and[74]
4. Central Oregon corridor (U.S. 97).

The next section of this chapter describes how these and other corridors provide critical connections to centers of freight-dependent economic activity in the state.

4.4 CONNECTIVITY

Connectivity in this section refers to the ability of the freight network to safely and efficiently move goods between important components of the Oregon freight network. This includes connectivity between major highways and intermodal facilities such as airports or marine ports, between all regions of the state, and between key industries and the freight network. Connectivity is critical because it allows businesses and industries to move their goods throughout Oregon and beyond in a cost-effective manner. Four multimodal corridors were selected as major corridors whose connectivity is vital to the state economy.

[74] U.S. 26 is also significant to Oregon industries from Portland to Idaho. However, U.S. 20 carries more freight by industry (see tables on previous page), and it also acts as an important highway for remote areas in southeastern and south central Oregon with little other east-west highway access. Selecting both would not be warranted, as they run parallel to each other for much of eastern and central Oregon.

Strategic Freight Corridors and Connectivity

Western Corridor

The Western Corridor is a split corridor with several components: Marine Highway 5 (M-5), north-south Interstate 5 (I-5) and all parallel truck/rail facilities that connect Oregon with the rest of the nation. M-5 is a designated marine highway in the Pacific Ocean that connects Oregon with other West Coast ports, from Canada to Mexico. I-5 truck and rail facilities connect the three largest population centers of Portland, Eugene and Salem and are the state's primary arteries for truck and rail freight shipments. Together, this Western Corridor connects Oregon with the national freight transportation system via several truck, rail, seaport and airport facilities, including I-84, U.S. 30, U.S. 20 and U.S. 199; Class I and shortline railroads; marine facilities at Astoria, Coos Bay and the Port of Portland; and air facilities at Portland International Airport. These connections are critical for the movement of the majority of goods produced throughout Oregon and on the I-5 corridor.

The Western Corridor contains some of the major intermodal facilities in the state, which move both heavy and valuable goods to markets around the world. Important intermodal infrastructure on the I-5 corridor includes the Portland International Airport, the Port of Portland, the Port of Astoria and the Port of Coos Bay. These features are illustrated in Table 4.4.

Table 4.4 Western Corridor Freight Facilities, by ACT

ACTs	Facilities Providing Connectivity*	Other Freight Facilities
Portland Metro Region and ODOT Region 1	· I-84, I-205, I-405 · U.S. 30, U.S. 26, OR 99W · OR 6	Class I rail: BNSF and UP Shortline rail: Oregon Pacific Railroad, Portland & Western Railroad, Portland Terminal, Peninsula Terminal Major Commercial Ports: Port of Portland Categories I, II and III Airports: Portland International Airport, Portland – Hillsboro Airport, Portland –Troutdale Airport
Northwest Oregon ACT	· U.S. 101, U.S. 30, U.S. 26, OR. 99W · OR 6	Shortline rail: Port of Tillamook Bay Railroad, Portland & Western Railroad Major Commercial Ports: Port of Astoria Categories I, II and III Airports: Astoria Regional Airport, Tillamook Airport
Mid-Willamette Valley ACT	· U.S. 101 · OR 22, OR 99W, OR 18	Class I rail: BNSF and UP Shortline rail: Hampton Railway, Willamette Pacific Railroad, Portland Western Railroad, Willamette Valley Railway, Albany Eastern Railroad Categories I, II and III Airports: Aurora State Airport, Salem McNary Field Airport, McMinnville Municipal Airport
Cascades West ACT and Lane County	· U.S. 20, U.S. 101 · OR 99W, OR 58, OR 126	Class I rail: BNSF and UP Shortline rail: Willamette Pacific Railroad, Albany and Eastern Railroad, Central Oregon & Pacific Railroad, Coos Bay Rail Link, Albany Eastern Railroad Categories I, II and III Airports: Corvallis Municipal Airport, Eugene Airport/Mahlon Sweet Field, Newport Municipal Airport
South West ACT	· U.S. 101 · OR 126, OR 42, OR 38	Shortline rail: Central Oregon & Pacific Railroad, Coos Bay Rail Link, Longview, Portland & Northern Railway Major Commercial Ports: Port of Coos Bay Categories I, II and III Airports: Bandon State Airport, Roseburg Regional Airport, Southwest Oregon Regional Airport
Rogue Valley ACT	· U.S. 199 · OR 227, OR 140	Shortline rail: Central Oregon & Pacific Railroad, WCTU Railway Categories I, II and III Airports: Ashland Municipal Airport, Grants Pass Airport, Rogue Valley International-Medford Airport

*Connector facilities in this context do not include NHS intermodal connectors or other critical local roads mentioned in earlier chapters.

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Columbia River Corridor

The Columbia River Corridor, including Interstate 84 (I-84) and Marine Highway 84 (M-84), is the primary link between western Oregon (including Portland) and the east and is one of the few transportation corridors in North America where truck, barge and rail transportation run parallel to one another. Eventually, I-84 links with I-80 in Utah, which connects to the large freight hub of Chicago. For most goods originating in the Portland and Willamette Valley region, I-84 is the route used to move goods to the Midwest and beyond. As a result, this is a heavily used freight corridor that is essential to the Oregon economy. Within Oregon, this corridor connects with Portland, the I-5 corridor, Portland International Airport, the Port of Portland and other ports on the Columbia River. In addition to the interstate, Oregon's major rail corridor that connects Portland and other West Coast cities with the Midwest runs along the Columbia River. Both Union Pacific and BNSF operate service that connects Portland with destinations in states to the east of Oregon. Noteworthy is the dependence of the computers and electronics manufacturing industry on the I-84 corridor; this is a high growth industry that makes up a large part of Oregon's expected future growth.

Table 4.5 Columbia River Corridor Freight Facilities, by ACT

ACTs	Facilities Providing Connectivity	Other Freight Facilities
Portland Metropolitan Region and ODOT Region 1	See Information in Table 4.4	
Lower John Day ACT	· U.S. 26, U.S. 97, U.S. 197	Class I rail: BNSF and UP Shortline rail: Mount Hood Railroad, Palouse River Coulee City Railroad Categories I, II and III Airports: Columbia River Gorge Regional Airport
North East ACT	· I-82 · U.S. 26 · OR 204, OR 82, OR 11	Class I rail: BNSF and UP Shortline rail: Palouse River Coulee City Railroad, Wallowa Union Railroad, Idaho Northern Pacific Railroad Major Commercial Port: Port of Umatilla, Port of Morrow Categories I, II and III Airports: Baker City Municipal Airport, Eastern Oregon Regional Airport, Hermiston Municipal Airport and La Grande/Union County Airport

Central Oregon Corridor

This corridor is a major north-south corridor connecting central Oregon with markets in Washington State and California. The largest city in central Oregon is Bend, a metropolitan area with nearly 88,000 residents, which is connected by U.S. 97 to I-84. U.S. 97 is the only major north-south freight route east of the Cascades and acts as a relief highway to support I-5 in case of incidents on that interstate.

- In addition to the highway, a major BNSF and UP rail corridor runs parallel to U.S. 97; it is the major rail line that connects Oregon with California. The U.S. 97 corridor, similar to U.S. 20, connects a large portion of central Oregon that would have insufficient connectivity to major markets such as Portland and the interstate network without its existence. Businesses located in the South Central Oregon ACT and the Central Oregon ACT benefit from the connections to I-84 and California that this route provides. It also provides efficient access to U.S. 20, which allows businesses to move goods to I-5 and to the east.

Table 4.6 Central Oregon Corridor Freight Facilities, by ACT

ACTs	Facilities Providing Connectivity	Other Freight Facilities
Lower John Day ACT	See Information in Table 4.5	
Central Oregon ACT	· U.S. 20, U.S. 26, U.S. 197	Class I rail: BNSF and UP Shortline rail: City of Prineville Railway Categories I, II and III Airports: Redmond Municipal Airport, Bend Municipal Airport
South Central Oregon ACT	· U.S. 20 · OR 58, OR 140	Class I rail: BNSF and UP Shortline rail: The Klamath Northern Railway, Lake Railway Major Commercial Port: Port of Umatilla, Port of Morrow Categories I, II and III Airports: Klamath Falls Airport, Lake County Airport

U.S. 20 Corridor

This is a major east-west connector corridor that runs through the middle of the state, from the Idaho border all the way to Newport on Oregon's Pacific Coast. The route ties together several important cities from Boise, Idaho to Bend. Further routes on OR 22 and OR 126 provide freight routes to Salem and

Eugene. One issue to consider with this route is that 53-foot trailers are currently not allowed between the U.S. 20/OR 22 junction and Sweet Home and between Newport and Corvallis. Trucks currently rely on OR 22, OR 126 and other routes to travel this area. The corridor concept allows the parallel facilities to carry the corridor traffic. In general, east-west connectivity in Oregon can be improved, especially between I-5 and U.S. 97.

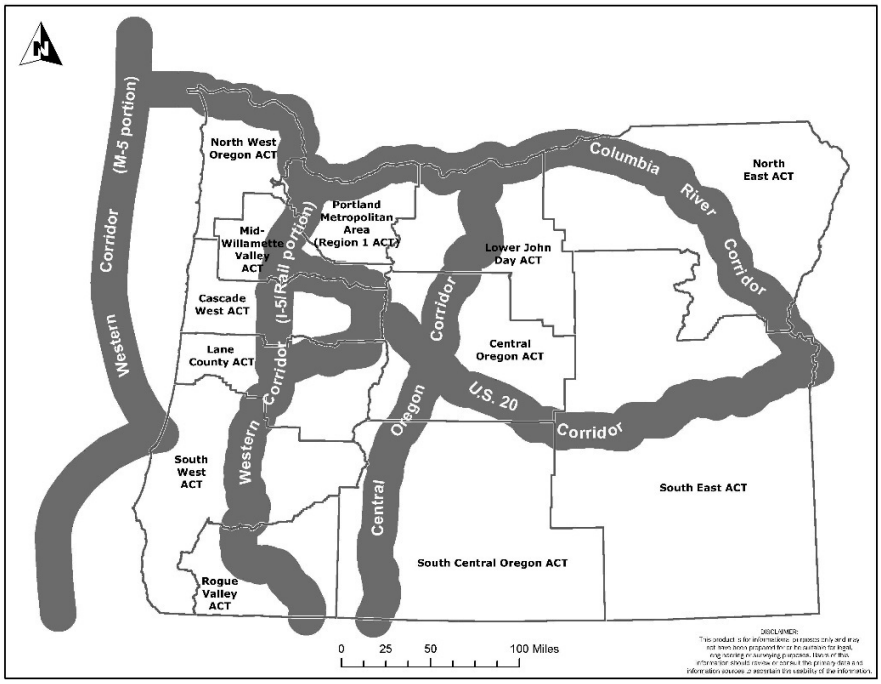
In essence, U.S. 20 acts as the major east-west highway for central and eastern Oregon – interstates only exist in the northern and western sections of the state. No major rail corridors run parallel to U.S. 20. At the Idaho border, however, a Class I railroad intersects with U.S. 20; Class I railroads also intersect U.S. 20 in Bend and near Corvallis. Within Oregon, U.S. 20 connects the north-south corridors of U.S. 97, U.S. 395 and I-5. This is illustrated in Table 4.7. U.S. 20 is a major mover of agricultural products in the central and eastern one-half of the state. In the western one-half, the U.S. 20 Corridor is important to companies producing forest/wood products and clay/mineral/stone – 15 percent of the shipments from the former and 20 percent of the latter utilize U.S. 20.

This route is important in terms of connectivity because it connects a major area (Central Oregon) with two major interstates (I-84 and I-5). It also connects the freight-dependent industries in Bend with cities to the east and the I-5 Corridor to the west. Without this facility, businesses located near U.S. 20 in the South East Oregon ACT or Central Oregon ACT might struggle to compete because of high travel times and transportation costs to get goods to market. See Figure 4.13.

Table 4.7 U.S. 20 Corridor Freight Facilities, by ACT

ACTs	Facilities Providing Connectivity	Other Freight Facilities
South East ACT	· I-84 · U.S. 95, U.S. 26, U.S. 395	Class I rail: UP Shortline rail: The Wyoming Colorado Railroad Categories I, II and III Airports: Ontario Municipal Airport, Burns Municipal Airport, Grant County Regional Airport
Central Oregon ACT	See information in Table 4.6	
Cascades West ACT	See information in Table 4.4	

Figure 4.13 Freight Industries Strategic Corridors in Oregon



Source: Prepared by ODOT for the OFP

In summary, these corridors, when viewed as a system, provide cross-state or cross-regional access to the majority of the state. All of the roadways in Figure 4.12 above also have parallel Class I railroads except U.S. 20. Since the majority of the population in the state lives along the I-5 Corridor, a significant amount of inbound freight needs to be moved there. U.S. 20 and U.S. 97 connect remote, rural places with routes that connect with Portland; this allows goods to be moved to major markets. For further detail on important intermodal connectors in these corridors, a list of the official NHS Intermodal Connectors is available from FHWA.[75]

4.5 FREIGHT THROUGH MOVEMENTS

The Western Corridor and Central Oregon Corridor serve as the main north-south connections through Oregon between Washington and California. To the east the Columbia River Corridor is the main connection between Oregon and Idaho and eastern states. Goods move from the east and the Pacific through

75 FHWA Website : https://www.fhwa.dot.gov/planning/national_highway_system/intermodal_connectors/

Oregon's ports and to destinations outside of Oregon. As a result, significant "through" traffic exists on Oregon highways, railways, waterways and pipelines.

Truck Through Traffic

Oregon is a bridge state between Washington and California for numerous trucks traveling each day destined for locations outside of the state. Table 4.8 shows that about 2400 through-trucks cross the southern end of the Western Corridor, while about 3100 through-trucks cross the corridor from the north. Some of these trucks are likely eastbound within the Columbia Corridor. About 2100 through-trucks cross into the Columbia Corridor from Washington State in the vicinity of I-82, while about 2700 through-trucks cross the Oregon/Idaho border on an average day. About 600 to 800 through-trucks cross the border at the southern end of the Central Oregon Corridor a day. The through routes are varied and depend on their final destination outside of Oregon. The U.S. 20 Corridor does not appear to be a significant corridor for through-truck traffic. While these trucks have limited direct economic impact on Oregon, they contribute to congestion and environmental concerns in the state. These trucks also pay the Oregon weight mile tax.

Table 4.8 Average Annual Daily Through-Trucks Crossing Oregon Borders

Corridor Name	Through Trucks Entering or Exiting Corridor
Western Corridor	2400 – 3100
Columbia River Corridor	2100 – 2700
Central Oregon Corridor	600 – 800
U.S. 20 Corridor	not a significant through-trip corridor

Source: ODOT, 2009

Rail Through Traffic

Rail through movements make up the largest share of rail carloads, at over 600,000 carloads.[76] These are loads with rail origins outside of Oregon and rail movements through Oregon, during which time tracks in Oregon are used. This does not include shipments that come into Oregon ports and are transloaded to rail. Rail through movements mainly travel in the Western, Central Oregon and Columbia River Corridors.

[76] Carload Waybill, 2008: https://www.stb.gov/stb/industry/econ_waybill.html

Marine Through Traffic

For marine traffic, through movements refer to those commodities that are transferred on or off of ships or barges at Oregon ports, but have neither an Oregon origin nor destination. Many of these goods (especially bulk) arrive at the Portland harbor by rail and are loaded onto ships. The 2009 Oregon Commodity Flow Forecast (CFF) estimates that rail moved 565,000 tons of goods from locations outside of Oregon to the Port of Portland in 2010. This is only a small percentage of the total commodity volume that moves from outside of Oregon to the Portland area; the CFF estimates this volume to be 19 million tons in 2010. The CFF estimates that Portland harbor will move a total volume of 227,000 tons of marine imports to areas outside of Oregon in 2010.

Pipeline Through Traffic

The 2009 Oregon Commodity Flow Forecast shows that a significant amount of natural gas product moves through Oregon for use in other states. The total 2002 volume of natural gas that moved through Oregon was 13.7 million tons compared to 4.7 million tons imported to Oregon in 2002.



Freight and Climate Change

5.0 Freight and Climate Change

According to the U.S. Environmental Protection Agency (EPA), transportation sources account for one-third of carbon dioxide emissions which contribute to global climate change.[77] Research and policy have historically focused on reducing Green House Gas (GHG) emissions from passenger vehicles. However, freight sources are increasingly being considered due to their contribution to carbon dioxide, nitrogen oxides, sulfur dioxide and particulate matter emissions. The Transportation Research Board (TRB) found that the conveyance of freight—via rail, commercial trucks, ships, boats and pipelines—accounts for 38 percent of all transportation-related carbon dioxide emissions[78] or 12 percent of all man-made sources. Thus, addressing freight emissions and efficiency has the potential for long-term effects on GHG emissions and public health parameters.

The freight sector can take a number of actions to reduce the GHGs it produces. Low-cost, high-payoff actions that offer benefits for the freight sector are particularly attractive.

This chapter analyzes trends, actions and current policy as it relates to the freight sector and GHG emissions in the following sections:

- The Oregon policy context, summarizing relevant policies recently adopted in Oregon that are contributing to the GHG and climate change discussion;
- Technological and regulatory trends affecting freight GHG emissions and infrastructure;
- Potential opportunities to reduce GHG emissions from freight; and
- Impacts of climate change on freight.

Further details are contained in Freight and Climate Change: Background Paper for the *Oregon Freight Plan.*

5.1 THE OREGON POLICY CONTEXT

The State of Oregon is already actively combating climate change through targeted programs and policies, regulations and legislative initiatives, inter-agency coordination and collaboration with other western states. Some of these policies are related to freight and can be grouped into four areas:

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77 EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006, Table 2-14

78 "Potential Impacts of Climate Change on U.S. Transportation" (TRB 290), Table B-2

- Legislative initiatives. Several statutes addressing climate change and GHG emissions have been implemented in Oregon. These laws include provisions aimed at reducing GHG emissions from transportation. In 2007 the Oregon Legislature passed the Climate Change Integration Act, establishing the Oregon Global Warming Commission and setting statewide greenhouse gas reduction goals which call for reducing Oregon's emissions 10 percent below 1990 levels by 2020 and 25 percent below 1990 by 2050. Chapter 865 Oregon Laws 2009 requires Portland Metro to develop transportation and land use scenarios designed to reduce greenhouse gas emissions while accommodating population and economic growth. Enacted during the 2010 Special Session, Chapter 85 Oregon Laws 2010 directs ODOT and the Oregon Department of Land Conservation and Development (DLCD) to develop a state-level strategy to reduce greenhouse gas emissions from transportation, develop a toolkit to assist local governments and metropolitan planning organizations in reducing greenhouse gases from transportation, and develop guidelines for scenario planning. As part of this process, the Land Conservation and Development Commission (LCDC) will set transportation-related greenhouse gas reduction targets for light-duty vehicles in major metropolitan areas.

  The statutes address freight emissions by regulating shipboard engine usage in ports and setting minimum requirements for the amount of biodiesel contained in diesel fuel sold in Oregon.

- Funding programs. *Connect*Oregon I, II and III are lottery-backed bond funded programs exclusively dedicated to non-highway modes. As such, they improve or preserve modal alternatives that may reduce GHG emissions, as compared to trucking. There are also tax credits available through the Oregon Department of Energy to encourage reduced fuel use and through the Oregon Department of Environmental Quality to promote truck engine replacement.

- Partnerships. Oregon participates in a variety of partnerships with other western states and nonprofits to advance its GHG reduction goals. The Western Climate Initiative, a partnership of western states and Canadian provinces that cooperate on climate change issues, is exploring a regional target for GHG emissions reduction, as well as a market-based, cap-and-trade system. Oregon is also active in the Climate Registry, the International Carbon Action Partnership and the Climate Trust.

5.2 TRENDS AFFECTING FREIGHT GHG EMISSIONS

A number of technological innovations and regulatory actions are affecting freight-sector GHG emissions. This section highlights some of these technological trends by mode as well as some of the major regulatory actions that will impact GHG emissions from the freight sector in the future.

New Technologies

Freight engine and vehicle technologies continue to improve fuel efficiency and reduce GHG emissions per ton-mile. Table 5.1 provides estimates of the changes in GHG per ton-mile that could be achieved as the freight vehicle fleet is replaced.

Table 5.1 Range of Near-Term GHG per Ton-Mile Emissions for Freight Modes by Technology

Technology Option	Description	Emissions (g CO_2e/Ton-Mile)[79]		Percentage Reduction in GHG/Ton-Mile from Existing Fleet	
		Low	High	Low	High
Heavy-Duty Diesel Trucks					
Existing	Existing truck fleet (2008)	313			
New	New truck	310	310	1%	1%
Best available	Best available new truck, aerodynamic and weight reduction only	266	282	10%	15%
	Best available new truck, engine improvements only	284	287	8%	9%
	Best available new truck, combined	242	259	17%	23%
Rail					
Existing	Existing rail fleet (2008)	28			
New	New locomotive	27	27	3%	3%
	New locomotive, Tier 4-compliant	27	27	2%	2%
Best available	Best available new locomotive	25	25	12%	12%
	Best available new locomotive and cars	22	23	16%	21%
Marine					
Existing	Existing domestic marine fleet	54			
New	New engine	53	53	1%	2%
	New engine, Tier 4-compliant	53	55	-1%	1%
Best available	Best available engine (diesel-electric)	43	49	10%	20%
	Best available propeller (nozzle or winglets)	51	52	4%	5%
	Best available technology, combined	41	47	13%	25%
Air					

[79] This unit is grams of CO_2e per each mile traveled per ton.

Technology Option	Description	Emissions (g CO_2e/Ton-Mile)[79]		Percentage Reduction in GHG/Ton-Mile from Existing Fleet	
		Low	High	Low	High
Existing	Existing commercial aircraft fleet	1,472			
New	New commercial aircraft	1,407	1,407	4%	4%
Best available	Best available commercial aircraft	1,178	1,178	20%	20%

Sources: Cambridge Systematics analysis of Annual Energy Outlook, 2009; U.S. DOT Report to Congress Transportation's Role in Reducing U.S. Greenhouse Gas Emissions, 2010; U.S. EPA RIA for Diesel Engines less than 30L; Boeing; and General Electric.

The following technological trends by mode can impact GHG emissions from freight sources:

- Trucks. Heavy-duty truck[80] fuel efficiency can be improved through a variety of options, including aerodynamic improvements, weight reduction and engine improvements such as electrified accessory systems. Evidence suggests a combination of the best available new truck technologies, along with engine improvements, weight reduction and aerodynamic enhancements, could achieve an overall truck GHG reduction of 17 to 23 percent per ton-mile per truck.[81]
- Rail. Rail locomotives have demonstrated improved fuel economy over the past few decades mostly because the development of larger, more powerful line-haul locomotives results in fewer locomotives required per train. Other railroad technological and operational improvements also contributed to this trend. The combination of best available new locomotives and lightweight aluminum railcars could potentially lead to a 16 to 21 percent reduction in freight rail GHGs per ton-mile over the existing fleet. However, locomotives typically remain in service for 30 to 40 years, so it will likely take many decades before these new technologies penetrate the market completely.
- Marine diesel. GHG emissions are hard to track over time, because it is hard to differentiate between domestic and international sources. However, various technologies can help reduce GHG emissions from water sources, including diesel-electric engines, propeller nozzles and winglets and shore power systems. The combination of these and other technologies could yield GHG emissions per ton-mile improvements in the 13 to 25 percent range.

80 As used in this report, the term 'heavy duty truck' refers to Class 8 tractor-trailer combination trucks (Class 8: gross weight greater than 33,000 lbs.).

81 Freight and Climate Change: Background Paper for the Oregon Freight Plan, 2010, ODOT.

- Aircraft. GHG emissions from aircraft continue to improve because air carriers have strong incentives to cut operating costs and increase payload capacity with fuel-efficient aircraft. On average, a new jet is 4 percent more fuel efficient than the existing fleet while the best available new aircraft can be up to 20 percent more fuel efficient. However, like locomotives, commercial and cargo aircraft have very long service lives (up to 40 years or so), so it will take a long time before the best new technologies completely penetrate the fleet.

Regulatory Changes

Several states are phasing in new regulations to reduce GHG emissions from truck, locomotive and marine diesel engines. For example, California has a truck idling law, which restricts idling to five minutes for all trucks within the state's border. In Oregon, Chapter 754 Oregon Laws 2009 requires DEQ to form a workgroup and study idling regulations. Direct federal regulation of truck GHG emissions and/or fuel economy is also a possibility.

- Trucks. The 2007 Energy Independence and Security Act gave the U.S. DOT authority to regulate fuel consumption in medium- and heavy-duty trucks, starting with the 2016 model year.[82]
- Rail and marine. New locomotives and remanufactured line-haul locomotive and heavy-duty engines, including those used in marine vessels, will be subject to stricter U.S. EPA emissions requirements beginning in 2012.[83]
- Aircraft. Aircraft GHG emissions are currently not regulated, but the International Civil Aviation Organization does promulgate standards which control jet engine emissions of nitrogen oxides (NO_x), which is a GHG at altitude.[84] This has led to world-wide improvements in both engines and fuels used in aircrafts.

5.3 POTENTIAL ACTIONS TO REDUCE FREIGHT-RELATED GHG EMISSIONS

Several opportunities exist to reduce transportation-related GHG emissions from freight movements in Oregon beyond technology and regulatory strategies. In this section, two general categories of GHG reduction strategies are described:

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82 Energy Independence and Security Act: https://www.congress.gov/bill/110th-congress/house-bill/6

83 EPA Website: https://www.epa.gov/vehicles-and-engines.

84 International Civil Aviation Society Website: https://icao.int/about-icao/Pages/default.aspx

- Operations improvements and education; and
- Mode shift.

Operations Improvements and Education

Many states, including Oregon, have realized environmental and economic benefits through the implementation of promising new freight operations and education ideas. These include three possible methods to reduce GHG emissions from freight:

- Port operations and equipment improvements. Ports and intermodal terminals are major freight nodes. The presence of numerous mobile and stationary emissions sources at these facilities can often turn them into hot spots for emissions of GHG and other pollutants. This is particularly true because port equipment (e.g., drayage trucks and shunting locomotives) tends to be older and more polluting. A number of operational strategies can reduce emissions at ports. These include various strategies using computerized information systems to help spread port truck traffic into off-peak periods (reducing congestion and associated fuel usage), making more efficient use of trucking equipment in order to reduce empty trips, using electric and alternative fuel powered equipment within the marine terminals to reduce emissions from fossil fuels and using electronic tracking systems to more efficiently manage port-related trucking fleets to reduce trips and operations in congested conditions.
- Idling reduction strategies. Long-duration idling of trucks and trains in the U.S. consumes more than 1 billion gallons of diesel fuel annually and produces 11 million tons of CO_2, along with other emissions.[85] This estimate does not take into consideration short-term idling or marine vessel idling, which also contribute to freight GHG emissions. For each mode, several strategies can be implemented to reduce idling-related GHG emissions:
  - *Trucks.* Trucks tend to idle significantly at intermodal stations and at ports. Many of the strategies for reducing GHG emissions at ports are strategies that can be employed to reduce truck idling. Truck stop electrification and auxiliary power unit (APU) installations can create reductions in GHG emissions from idling of parked trucks. Efforts to electrify trucks stops are well underway in Oregon but could be expanded to increase emissions reductions benefits.
  - *Rail.* Emissions from locomotives can be reduced with newer locomotive technology, such as Genset locomotives. This technology uses multiple smaller engines to better match power output to demand and uses up to

[85] EPA Website: https://www.epa.gov/air-pollution-transportation

37 percent less fuel than older locomotives.[86] Another strategy is to use idling limit devices, which automatically turn off a locomotive's engine if it is idle for a certain period.

- *Marine.* One solution is to install shore power systems that provide electricity to the ships while docking. This would result in less fuel consumed by the ships, which equates to lower GHG emissions.

· Improved driving and routing efficiency. Vehicle driving and routing efficiency improvements are important to reducing GHGs from the freight sector. Methods to improve operations efficiency include:

- *Virtual weigh stations.* These utilize technology, such as weigh-in-motion (WIM) devices, to detect truck weight without requiring that the driver stop at an actual weigh station. This reduces idling and fuel consumption that would occur in the weigh station. Oregon currently utilizes WIM devices throughout the state.
- *Speed reduction.* Freight operators will generally go as fast as the speed limits allow. While this may make sense from a time perspective, fuel economy usually decreases rapidly at speeds above 60 miles per hour.[87] The current maximum truck speed limit in Oregon is 55 miles per hour.
- *Driver training efforts.* Driver training programs can be used to educate truck drivers on "eco-driving" techniques to reduce emissions and save fuel, such as effective trip planning, use of cruise control, avoiding rapid acceleration, and deceleration and up shifting as soon as practicable. This strategy is often implemented by freight carriers themselves, as they result in fuel cost savings and cost reduction for carriers.
- *Signal optimization and signage.* Adjusting signal timing to optimize traffic flow on busy truck routes and improving signage near marine and intermodal facilities can improve emissions by freight. These are effective strategies to reduce freight emissions by reducing idling at signals and subsequent acceleration after the stop.



- *Congestion relief and bottleneck mitigation.* Congestion on roadways requires trucks to accelerate and idle more frequently, increasing truck emissions. In fact, a 2010 study by Portland State University found that fluctuations in speed during congestion on freight routes in the

[86] Union Pacific Railroad Website: https://www.uprr.com/newsinfo/releases/environment/2009/0611_genset.shtml

[87] U.S. EPA Fuel Economy Guide: https://www.fueleconomy.gov/feg/driveHabits.jsp

Portland Metropolitan Area correlated to increased emissions compared to free-flow conditions—a 50% increase in carbon dioxide, 65% rise in nitrogen oxides, 49% more sulfur dioxide and 13% rise in particulate matter.[88] Thus, addressing congestion has the potential for long-term effects on GHG emissions and public health parameters. However, it is important to consider the impacts of induced travel demand from passenger vehicles when considering an increase in capacity or improving traffic flow.[89] Improved transit also may help reduce congestion on major truck routes, thereby potentially contributing to reduced truck emissions.

Mode Shift

As shown in Figure 5.1, moving cargo by air has by far the highest GHG emissions per ton-mile of freight moved on average, more than four times those of truck. Trucking, in turn, emits GHGs at more than five times the rate of marine or rail modes on average.

It follows, then, that shifting freight to modes with lower emission rates can reduce GHG emissions. The major mode shifts that could result in reduced energy usage and GHG emissions reductions include the following:

- Truck to rail;
- Truck to short-sea shipping; and
- Air cargo to truck.

These mode shifts are not easy to implement in practice. Trucks offer flexibility and time savings that make it difficult for other modes to compete. In addition, the limited locations of rail infrastructure and remote locations of certain industries make many goods dependent on truck movements. However, some commodities in certain locations may see benefits from mode shifts to more energy efficient modes. To make sure a project is economically viable, an economic analysis should be completed prior to public sector investments that are intended to cause a mode shift.

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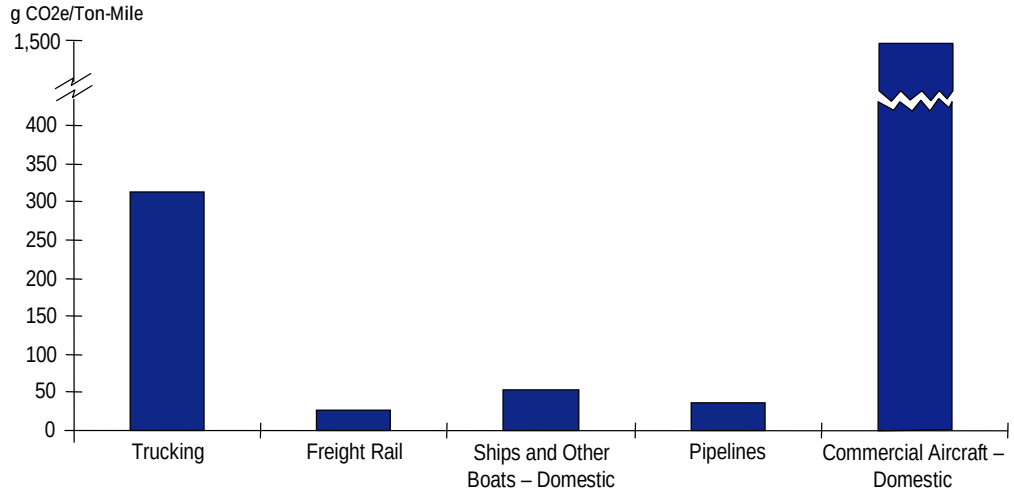
88 Wheeler and Figiliozzi, Portland State University, Multi-Criteria Trucking—Freeway Performance Measures in Congested Corridors, August 2010

89 Induced travel demand refers to the concept that increasing roadway capacity and reducing congestion will result in additional vehicle traffic as a result of mode choice decisions. For example, a commuter who might have selected transit with congested roadways may instead select to drive, therefore increasing emissions. This generally does not apply to trucks. However, when implementing congestion mitigation measures, it is important to consider all system users.

Figure 5.1 Average GHG Emissions per Freight Ton-Mile by Freight Transportation Mode in the United States 2006



Source: U.S. EPA, 2008, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 to 2006*; and Bureau of Transportation Statistics, National Transportation Statistics.

The following are examples of potential mode shift opportunities from truck to rail:

- Shipments arriving via water to the Port of Portland. The Port has on-dock rail and easy access to inland barges, so drayage emissions for transfers from ocean-going ships to rail or barge at Portland would be minimal, preserving the GHG benefits of rail and barge movements even within Oregon. However, there may still be a relatively high financial cost to the transfer that could discourage shippers. In addition, not all commodities are amenable to on-dock rail.
- Shipments moving between locations directly on the rail or waterway network. Where drayage moves are very short at both ends, it may be beneficial from both a financial and a GHG emissions point of view to shift to rail or water.

The following are examples of potential mode shifts from truck to short-sea shipping in Oregon:

- Container feeder service to Puget Sound. About one-half of the containers that arrive or depart the Columbia/Snake region by sea do so through Portland's Terminal 6,[90] but the remainder are sent by truck or rail to the

[90] Container service at Portland's Terminal 6 continued through 2014 as it had at the time this plan was adopted in 2011. However, by mid-2016, all container service had been discontinued.

Puget Sound's Ports of Seattle and Tacoma. Short-sea service has been suggested as a way to take some of those containers off the highways; however, the water route is almost double the distance of the overland route. Moreover, containers traveling down the Columbia by barge would need to be transshipped to an ocean-going barge to make the trip, adding significantly to the costs of such a move.[91]

- Coastal service to California. Coastal service to southern California could preserve some of the cost advantages of water transport due to the length of the haul. It could be most appropriate for movement of bulk agricultural and forest products from the Columbia River or southern Oregon. However, a suitable backhaul would also need to be found to make barge movement economically viable.
- Solid waste shipments. More than 500,000 tons of Portland area waste are trucked annually to the Columbia Ridge Landfill 140 miles east of Portland. Construction of a barge dock near the landfill could permit the waste to be sent by barge instead. It could also open up the possibility of taking waste by water from other areas, such as Seattle and California.[92] Rail service from Portland to the landfill with Oregon waste is also a possibility that should be explored to reduce emissions.

The public sector can play a role in encouraging the shifting of freight to less energy-intensive modes of transport. Possible strategies include investing in the rail and marine transportation systems, pricing and other incentives.

5.4 IMPACTS OF CLIMATE CHANGE ON FREIGHT

Climate change may have an impact on the freight sector in the following ways:

- Extreme temperatures. Climate change is expected to lead to an increase in the frequency of very hot days. As the number of very hot days rises, stress will increase on infrastructure. Infrastructure design changes may be required, pavement may wear faster and railroad tracks may be negatively impacted as a result of hotter weather. More information on the impact of extreme temperatures can be found in Freight and Climate Change: Background Paper for the Oregon Freight Plan.
- Changes in stream flow. The Northwest will experience major changes in stream flow patterns due primarily to changes in the timing of spring snowmelt in the mountains and an increase in winter precipitation falling as

[91] Center for Economic Development Education and Research (CEDER), 2005, *Columbia Snake River System and Oregon Coastal Cargo Ports Marine Transportation System Study*, prepared by Pacific Northwest Waterways Association, June 2005.

[92] Ibid.

rain instead of snow. In addition to earlier stream flow peaks, this will result in considerably lower summertime flows. A 30 percent reduction in warm season (April through September) runoff on the western slopes of the Cascades is projected by 2050. The marine freight system will be impacted by both higher and lower levels of stream flow; barge travel can be restricted as a result of either condition. During periods of low water levels, tonnage carried per barge may be limited.

- Increase in heavy precipitation. Between 1958 and 2007, there has been a 12 percent increase in days with very heavy precipitation in the Northwest; this trend is expected to continue.[93] In addition, increased winter rainfall instead of snowfall is expected to lead to more winter flooding on the west side of the Cascades. Increased heavy rainfall events may require redesign of stormwater management facilities for all transportation facilities. In addition, increased severe weather is correlated with increases in accidents and delays, impacting both freight safety and mobility.
- Sea level rise and coastal erosion. Global sea levels are projected to rise as little as 8 inches and as much as 4 feet by the end of this century. More southwesterly winter wind patterns, combined with higher sea levels, could accelerate erosion along the Pacific coast. Coastal port facilities and the roads and railways that serve them may be impacted by rising sea levels. Coastal areas may also become more vulnerable to surges from strong coastal storms, as these surges will now be overlaid onto higher water levels.
- Impacts to agriculture and forestry. Climate change also will impact demand for freight services by affecting agriculture and forestry production in Oregon. In the short run, high-elevation forests on the west side of the Cascades are expected to grow faster due to milder conditions, but in the long run all forests are projected to see decreased growth due to summertime soil moisture deficits. Agricultural production is likely to be negatively impacted by decreasing irrigation supplies during the summer growing season as well as increasing pests and weeds.

The likely impacts of climate change can be addressed in part through improved planning. The planning process should incorporate an understanding of expected future changes. For instance, future infrastructure might not be planned for locations such as floodplains and tsunami hazard zones. When designing new infrastructure, project managers will need to switch from designing with standards developed for historic climate trends to designing for future and uncertain climate projections. Operations are more easily adapted to a changing climate, but conditions should be monitored to plan for future operations in an effective manner rather than relying on past information.

93 Cambridge Systematics, Inc., 2007, *Cross Border Short-Sea Shipping Study: Phase II*, prepared for the International Mobility and Trade Corridor (IMTC) Project, January 2007.

Oregon has taken initial steps towards exploring climate change adaptation issues in *A Framework for Addressing Rapid Climate Change* (2008).[94] The Oregon Climate Change Research Institute administered by Oregon State University and the Oregon University System is charged with assessing the most current state of the science of the likely effects of climate change in Oregon every two years with the first report in December 2010.

In addition, in partnership with the Institute, the University of Oregon Climate Leadership Initiative is leading climate preparedness planning projects in regions throughout the state, including examinations of the impacts to built infrastructure such as transportation.[95]



94 Governor's Climate Change Integration Group, 2008, *A Framework for Addressing Rapid Climate Change: Final Report to the Governor*, State of Oregon, January 2008.

95 The Resource Innovations Group Website: http://www.theresourceinnovationgroup.org/.

Funding

6.0 Funding

6.1 INTRODUCTION

Federal, state and local governments provide much of the funding for freight transportation system improvements including highways, airports and certain marine port facilities. The private sector provides funding for those elements of the transportation system that are privately owned and operated, including marine terminals, pipelines and rail lines. Governments and the private sector sometimes work together in public-private partnerships to fund freight transportation improvements. In order to ensure that freight transportation system needs are adequately funded, states are actively seeking new methods and sources of project funding and finance. These include a wide variety of federal grant and loan programs, expanded user-pay programs and further development of partnering arrangements between the public- and private-sector investors.

The following topics are covered in this chapter:

- Public-sector funding for transportation in Oregon, along with how this funding is distributed to meet transportation needs;
- Summary of transportation funding needs as forecasted in the 2006 OTP; and
- Review of selected existing and potential initiatives for helping to fill the gap between funding needs and anticipated revenues.[96]

6.2 ODOT'S TRANSPORTATION FUNDS

It is anticipated that ODOT will receive $5.16 billion in funding during the 2009 to 2011 biennium.[97] Roughly 20 percent of this funding ($1.03 billion) is from federal government sources, as shown in Figure 6.1. The other 80 percent ($4.13 billion) is from state sources. These include a tax on motor fuels (19 percent), weight-mile tax (12 percent), driver and vehicle licenses and fees (12 percent) and other state and local sources (16 percent). A very small amount of revenue is derived from tolls (0.2 percent).

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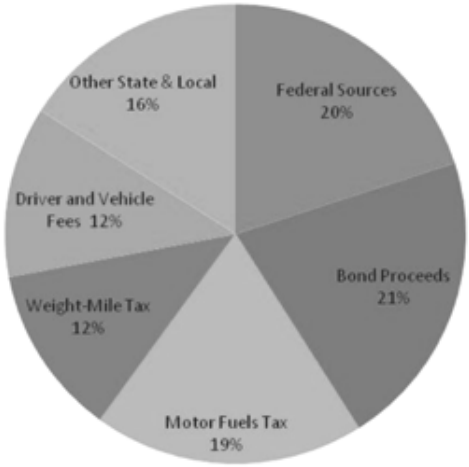
96 Chapter 9, Section 9.6 includes updated information regarding funding related to the FAST Act as well as Freight Investment Plan.

97 Oregon Department of Transportation Budget Booklet 2009-2011: http://library.state.or.us/repository/2010/201002171155453/ODOT_COMM_docs_BudgetBooklet_09-11.pdf

The single largest category of state funding (21 percent or $1.065 billion) is from the sale of bonds through programs such as the Oregon Transportation Investment Act and *Connect*Oregon. Bonds sold through these programs are repaid from revenues generated by various sources such as lottery revenues, weight-mile taxes, fuel taxes and vehicle license, registration and title fees.

Figure 6.1 ODOT's Revenue Sources – 2009 to 2011



Source: ODOT Budget Booklet 2009 to 2011.

Oregon has a constitutionally dedicated Highway Fund that requires all taxes levied on motor vehicle fuel and ownership, operation or use to be used exclusively for construction, reconstruction, improvement, repair, maintenance, operation and use of public highways, roads, streets and roadside rest areas. Oregon's constitution also requires that the legislature ensure that cars and trucks pay their fair and proportionate share of state motor vehicle taxes described above. This latter provision is unique among states and is accomplished by completion of a comprehensive cost allocation study every two years that includes a report to the legislature for appropriate action.

The share of funding from various sources, as shown in Figure 6.1, is likely to change in the future. Federal, state and local sources, including bond proceeds and vehicle taxes and fees, are all subject to fluctuation. The next 20 years are anticipated to see dramatic improvements in the fuel efficiency of vehicles. As these new vehicles replace the current vehicle fleet, large reductions in fuel consumption are possible. This will translate into a decrease in the amount of revenue derived from fuel taxes, even as vehicle miles traveled are projected to increase.[98]

[98] The Oregon Road User Fee task force researched possible alternatives to the fuel tax in their November 2007 report. Their findings show that many of the potential

About 16 percent of ODOT's total revenue is "passed through" to Oregon cities, counties and other agencies, as shown in Table 6.1. Per biennium, cities receive roughly $300 million and counties, roughly $450 million. These funds are derived from the state fuel tax, weight mile tax and licensing fees. Other state agencies, such as Oregon Parks and Recreation Department, Oregon Department of Aviation, and the Oregon State Marine Board, receive roughly $77 million. ODOT acts as a tax collector for these other agencies. ODOT itself is receiving approximately $4.3 billion for its 2009 to 2011 operating budget, from a total of $5.16 billion in revenue for the state.

Table 6.1 Distribution of ODOT's Pass-Through Revenue – 2009 to 2011

Recipient	Pass-Through Revenue
Cities	$ 303 Million
Counties	$ 452 Million
Other State Agencies	$ 77 Million
Total 2009-2011 Biennium	$ 832 Million

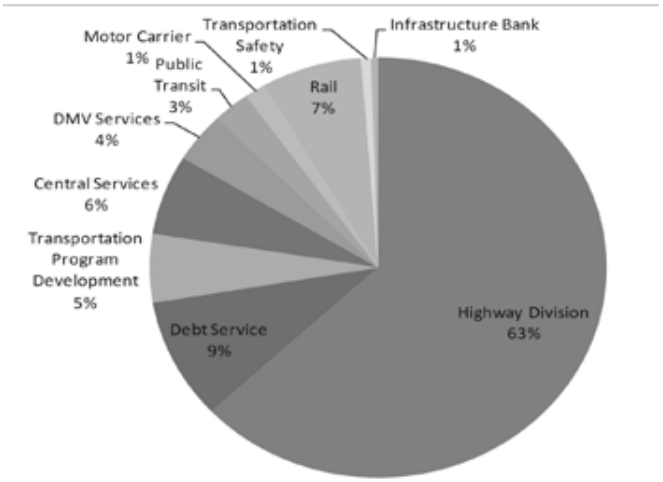
Source: Prepared by ODOT 2009

6.3 ODOT'S TRANSPORTATION BUDGET

Incoming revenues are used to support a wide variety of state and local transportation system needs. For the years 2009 to 2011, the Highway Division uses the largest portion ($2.63 billion or 63 percent), as shown in Figure 6.2 below, for programs such as the bridge program ($670 million), the highway maintenance and preservation programs ($789 million combined) and the highway modernization program ($348 million). The remaining 37 percent of expenses include debt servicing ($389 million or 9 percent) and the rail program ($296 million or 7 percent) and other smaller programs.

alternatives to the fuel tax are "not quite ready for broad scale implementation on a local, state, or national basis" (http://www.myorego.org/wp-content/uploads/2017/07/RUFPP_finalreport.pdf).

Figure 6.2 ODOT's Expenses 2009 to 2011



Source: ODOT Budget Booklet 2009 to 2011.

Table 6.3 summarizes 2030 transportation need forecasts from the 2006 OTP. By most estimates, trends such as a growing statewide population, industry activity and employment mean that the needs for the transportation system will likely grow in the future.

6.4 FREIGHT-SPECIFIC FUNDING OPPORTUNITIES

A variety of sources are necessary to fund Oregon freight projects, as shown in Table 6.2. These diverse funding sources are able to improve and maintain the freight system in many ways. However, as indicated in the table, the available revenue sources are not freight specific. Additionally, recent funding available for transportation in Oregon has been insufficient to meet all of the state's transportation needs. Public freight projects are funded from the same sources as all other public sector transportation programs.

To better understand why revenue sources are insufficient, funding needs and the impact of not meeting the state's freight funding needs are discussed in this section. The OFP does not develop specific freight funding needs forecasts. Instead, it relies on work completed for the OTP, the OHP and existing modal plans to develop a picture of future needs for selected components of the freight transportation system and funding gaps associated with these needs.

Table 6.2 Revenue Sources and Challenge for Freight Infrastructure

Freight Infrastructure	Revenue Sources	Challenges
Airports	Federal Airport and Airway Trust Fund	Programs are not freight specific
	Federal Airport Improvement Program	
	*Connect*Oregon funding	Program is not permanent and may fund non-freight programs
Connector Roads	Federal funds for connectors on the National Highway System	Connector projects compete for funding with freight and passenger projects on other local roads and highways; funding is insufficient to meet needs
	State funds for connectors that are state highways	
	Local funds for connectors that are local roads	
Highways (including bridges)	Federal and state (including OTIA and JTA) programs*	Programs are not freight specific
Natural gas and petroleum pipelines	Gas/petroleum companies' private funding	Private-sector priorities may differ from state priorities
Ports and waterways	Private-sector companies	Private-sector priorities may differ from state priorities
	Federal Inland Waterways Trust Fund and Harbor Maintenance Trust Fund	Funding is dependent on Congressional appropriations
	State business development programs	Programs are not freight specific
	*Connect*Oregon funding	Program is not permanent and may fund non-freight programs
Railroads (Class I and shortlines)	Private-sector companies	Private-sector priorities may differ from state priorities
	Federal Railroad Administration (FRA) programs	Programs are not freight specific
	*Connect*Oregon funding	Program is not permanent
Truck/rail transfer facilities	Private-sector companies	Private-sector priorities may differ from state priorities
	Federal and state business development (including brownfield) programs	Programs are not freight specific
	*Connect*Oregon state funding	Program is not permanent and may fund non-freight programs

* OTIA – Oregon Transportation Investment Act (2001, 2002 and 2003); JTA – Jobs and Transportation Act (2009).

Funding Needs as Identified in the OTP

The 2006 OTP identified feasible transportation needs of publicly and privately owned components of state, regional and local transportation systems from 2005

to 2030. These are summarized in Table 6.3. Though these are not freight-specific needs, they refer to components of the transportation system that are important for the movement of freight – the highways, intermodal connectors and other infrastructure that support efficient freight movement.

Table 6.3 OTP Investment Needs for Freight-Related Components of the Transportation System, 2005 to 2030[99]

Investment Needs	Current Annual Expenditures (in Millions Dollars)	Average Annual Realistic Needs* (in Millions Dollars)	Annual Gap (in Millions Dollars)	Forecasted Annual Growth Rate (Percentage)
State highway-related needs	787	1,278	491	1.4 (freight highway travel)
Intermodal connectors	n.a	11.3	n.a	1.35 (total highway travel)
Air freight and passenger				
Portland Intl	44.4	115.3	70.9	2.62 (freight tons)
Major modernization**	13.9	15.1	1.2	
Other airports	10.7	47.4	36.7	
Ports and waterways	51.3	56.2	4.9	0.97 (deep draft freight) 0.29 (shallow draft freight)
Natural gas and petroleum pipelines	n.a	n.a	n.a	n.a
Private rail facilities	More than 6.7	18.8	n.a	1.83 (freight tons)

Source: Oregon Transportation Plan, p. 83.

* "Realistic needs" referred to the amount of funding that would maintain the transportation system at a slightly more optimal level than 2005 levels, would replace infrastructure and equipment on a sensible and logical life cycle, and would bring facilities up to standard or add capacity in a prudent and practical way. The OFP references "realistic needs" in place of the OTP's "feasible needs".

** Needs identified for eight airports other than Portland International Airport where growth is expected to exceed capacity.

This assessment documents gaps in many of the investment categories. For example, state highway-related needs (including maintenance and capital improvements) are forecasted to face an annual shortfall of $491 million every year between 2005 and 2030.

[99] Freight transportation needs and revenues are further described in Chapter 9.

Potential Impacts of Not Meeting State Needs

With these modal needs and gaps in mind, the OTP also provides an investment scenario analysis. The goal of this analysis was to gauge the response of Oregon's transportation infrastructure to three hypothetical scenarios. The scenarios reflected the needs of publicly-supported transportation infrastructure and services, though they did include limited information on funding for freight rail. Briefly, the three scenarios were defined as follows:

- Level 1. The impacts of "flat funding" on the state's transportation system, where inflation causes a 40 to 50 percent loss in purchasing power by 2030;
- Level 2. A situation where transportation funding, while not providing for major capacity enhancements, keeps up with inflation and results in maintaining current performance levels on existing facilities and services; and
- Level 3. Funding that expands facilities and services including making major investments in new infrastructure, maintains the system at a slightly more optimal level than current levels, replaces infrastructure and equipment on a reasonable life cycle, and brings facilities up to standard or adds capacity in a reasonable way.

The OTP's analysis of these different levels of funding, which are assumed to be applicable for the OFP, suggested the following results including possible freight-related impacts:

Table 6.4 OTP Funding Levels and Impacts

Results of Funding	Freight-Related Impacts
Level 1	
This level of funding could be devastating to Oregon's economy.	· The ability to get to places by all forms of transportation would decline because of declining infrastructure conditions and services and lack of funding for projects that relieve congestion. · Deterioration of the state and local road and bridge system could not be avoided and would increase user costs. If bridges deteriorated to the point of load limits, then commerce would be interrupted. · Traffic congestion would hurt the local, state, regional and national economy because of longer travel times, reduced market areas, the need for duplicate inventories at more locations and the need for additional delivery fleet and drivers. · Reduction of intercity bus, rail freight, aviation and ports all would leave rural communities at an economic disadvantage. · Failure of the jetties at the mouth of the Columbia could leave Columbia River ports, including the Port of Portland, without access to ocean shipping. This would be devastating to industries dependent on ocean shipping and to Oregon's transportation and

Results of Funding	Freight-Related Impacts
	warehousing industry.
Level 2	
This level of funding would preserve existing facilities and services and keep up with inflation, at an estimated rate of 3.2 percent annually. Investments that kept up with inflation would keep existing facilities and services at their current performance levels to the extent possible. Funding at this level thus would avoid economic disaster but would not result in a competitive advantage for Oregon businesses.	· Rail freight shipping costs would be reduced by elimination of some bottlenecks. Preservation of rail services would assist job retention in rural areas and outside the Willamette Valley. · Funding would prevent further cutbacks of shortline rail service and maintain rural air service, maintaining rural access to freight and passenger services. · Ports would have the opportunity to deepen channels, protect jetties, and address truck and rail congestion around marine terminals. But the economy would not grow to full potential because congestion at truck, rail and port facilities would prevent expansion and efficient handling of growing amounts of cargo. · Some congestion would be addressed through improvements to bottlenecks and through more aggressive implementation of operational improvements, such as Intelligent Transportation Systems (ITS). · Major capacity needs for roads and highways would still go unaddressed. Road users would continue to experience rising costs from increased travel delay due to congestion. Freight accessibility would be lessened by lack of capacity-adding projects. The inability of local areas to expand arterial roads would hurt their development opportunities.
Level 3	
This level of funding would mean that major investments would enable feasible needs to be met over the OTP planning period, resulting in positive impacts on Oregon's economy.	· Statewide mobility would be enhanced by system-wide improvements. · Development of expanded road, transit, intercity passenger service, rail freight and airports would occur throughout the state. · Rural areas would be better able to retain air and rail services and related jobs. · Improved rail freight, marine port facilities and airports would enhance the economy in urban and rural areas. Truck congestion would not be eliminated, but it would no longer be a threat to the economy.

Following the results of this scenario analysis, the OTP recommended Oregon use traditional and new revenue sources to move toward funding at Level 3, using incremental steps over time.

Why Oregon Needs to Look for a Way to Close the Funding Gap

The OTP Investment Scenarios illustrate some of the potential dangers of continuing to under-invest in the state's freight transportation system. In

addition, other looming challenges will impact the performance of the state's freight transportation system and create a strong case for finding additional funding sources. Among these challenges are the following:

- Increasing wear and tear on the transportation infrastructure as Oregon's population and the economy grow;
- More congestion and crashes with growth in traffic volumes;
- Greater global competition, rising fuel prices and the need to have efficient, reliable and affordable freight transportation options so Oregon businesses can compete favorably with businesses in other states and nations;
- Global warming, greenhouse gas reduction and various other environmental issues and concerns;
- Community livability and land use issues and concerns; and
- Security issues and concerns.

These and other challenges suggest a compelling need to expand existing programs for financing freight transportation improvements, and to identify and implement new funding and finance sources, where feasible.

6.5 OPPORTUNITIES FOR ADDRESSING THE FUNDING GAP

Additional private- and public-sector funding is needed to address freight financing issues. Private-sector companies will continue to make transportation investments based on a variety of considerations to help maintain and improve their competitiveness regionally, nationally and internationally. Market conditions are a primary factor in private-sector decision-making, so efforts to strengthen economies at all geographic levels are critical to private-sector investments in the freight transportation system.

Private-sector companies also will continue to pay specific fees that governments, port authorities and other entities will use for a variety of purposes including freight infrastructure improvements. Opportunities may exist for enhancing existing fee structures or implementing additional fees to help reduce the funding gap. Federal, state and local governments, including port authorities, may identify ways to broaden or improve existing or establish new, freight financing programs. The following discussion summarizes some of the private- and public-sector opportunities for addressing the funding gap through user fees and government programs.

User Fees

Freight shippers and carriers currently pay user fees such as federal, state and local fuel taxes. In a few states, including Oregon, trucking companies pay a weight-distance tax based on mileage driven for various weight classifications of truck configurations. Shippers and carriers for other modes pay user fees specific to their type of freight haulage. Any Oregon-specific fees that do not produce transportation system improvements that would offset the costs to businesses that pay the fees could result in reduced competitiveness of Oregon businesses. In the most extreme case, businesses could choose to move to other states where costs are lower.

Airport and Port Fees

Airports and port authorities generate revenues in a variety of ways including grants, loans, tariffs, taxes and user fees. User fees for airports include passenger facility charges, aircraft registration fees, landing fees, terminal and gate lease fees, and parking fees. Most of these fees relate to passenger usage of airport facilities. User fees for port facilities include berthing fees, security fees, fees related to servicing vessels and fees for loading and unloading cargo. Fees may be dedicated to specific projects whereby the fees are used to repay the project costs.

Container Fees

Container fees represent a type of user fee sometimes used to help repay project-specific costs. These fees on import and export container movements at U.S. ports represent a potentially large source of revenue. Although the use of container fees or other direct user fees present promising opportunities to address the freight transportation funding gap, several institutional and operational challenges must be addressed before these strategies can be effectively implemented more broadly. There may be significant institutional resistance to levying new container or user fees or diverting existing user fees to fund freight transportation improvements. The private sector freight community, for instance, will want assurances that efficiency and reliability gains are proportional to the user fees that will be collected.

The regional, national and international nature of freight shipments also presents a challenge. Freight movements often affect the transportation systems of multiple states and metropolitan planning organizations, and it is critical to ensure that costs and benefits of container fees or other direct user fees are allocated appropriately across jurisdictional boundaries. Container fees rely on non-discretionary traffic levels that may not be generated through one state's infrastructure. A regional or national approach may be necessary.

Infrastructure Surcharges

Infrastructure surcharges are special assessments that governments or businesses impose on taxpayers or customers to help pay for infrastructure improvements. Numerous utilities have assessed surcharges on their customers in order to recoup the costs of infrastructure investments such as pipelines and related equipment and facilities.

Similar types of surcharges may be used to pay for transportation improvements. An example would be a surcharge placed on the number of employees at businesses in a taxing district such as a county or city (see the Special Districts discussion below). Revenues generated from the surcharge would be used to help pay for transportation improvements within the taxing district. Another type of surcharge might be a fee on tonnage of cargo shipped through a terminal or other freight facility. Surcharges could be targeted to pay for transportation improvements that benefit the payers of the surcharge.

Special Districts

According to the 2007 U.S. Census of Governments, special district governments are "all organized local entities (other than counties, municipalities, townships or school districts) authorized by state law to provide only one or a limited number of designated functions, and with sufficient administrative and fiscal autonomy to qualify as separate governments, known by a variety of titles, including districts, authorities, boards and commissions."[100] A freight special district would focus on freight-related functions such as the provision of infrastructure to support freight movements. Special districts typically are financed through taxes on district properties, other taxes, special assessments, grants or loans from governmental entities, or fees for services imposed on property owners or service users within the district's boundaries. However, getting voters to approve increased taxes or fees associated with special districts would be a challenge, as higher taxes are rarely popular.

Oregon statutes authorize 28 types of special districts, including several that finance activities that may support freight improvements.[101] These include port districts,[102] road assessment districts and special road districts. Some states authorize local transportation improvement districts to identify planning, funding and other resources for local transportation projects, usually associated with roadway improvements. In Oregon, local improvement districts serve this purpose.

100 https://www.census.gov/govs/definitions/index.html#s.

101 http://landru.leg.state.or.us/ors/198.html.

102 Legally in Oregon port districts are municipal corporations, like cities and counties.

Tolls

Tolling is a form of financing where transportation system users pay for using specific roads, bridges, tunnels or other facilities. The only tolled facilities in Oregon currently are two tolled bridges that together contribute 0.2 percent of the state's transportation revenue:

1. The Bridge of the Gods, operated by the Port of Cascade Locks and connecting Cascade Locks, Oregon, to Stevenson, Washington; and
2. The Hood River Bridge, operated by the Port of Hood River and connecting Hood River, Oregon, to White Salmon, Washington.

Both of these facilities are locally owned and operated. However, Oregon could consider other types of toll facilities including turnpikes and priced lanes. Many other states have instituted tolled facilities that are under either state or private operation.[103] Similar arrangements may be possible in Oregon in the future. For example, the I-5 Columbia River Crossing project's Tolling Study Committee reviewed the potential of several different tolling scenarios to help fund the project.[104] In addition, ODOT's Office of Innovative Partnerships and Alternative Funding has investigated the feasibility of several highway projects, where tolls are one of the potential funding mechanisms.[105] Tolls, though, increase costs to freight providers and have an impact on the economy as a result of increased transportation costs.

Congestion Pricing

Congestion pricing, closely related to tolls, involves offering incentives to use transportation facilities in off-peak hours or charging extra to use them during peak hours. Prices can vary based on a fixed schedule, or they can be dynamic, meaning that rates change depending on the level of congestion that exists at a particular time. A fixed-rate, off-peak congestion pricing strategy is currently being used to mitigate congestion and improve air quality as part of the Ports of Los Angeles and Long Beach PierPASS program. Use of congestion pricing strategies at freight facilities or corridors could represent a potential source of revenue to offset freight infrastructure investments. Though most commonly

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[103] For more information on toll facility ownership in other states see: http://www.financingtransportation.org/funding_financing/funding/state_funding/tolls.aspx

[104] Columbia River Tolling Study Website: https://web.archive.org/web/20111019064836/http://tolling.columbiarivercrossing.org/.

[105] A series of tolling reports and white papers prepared for ODOT is available at https://web.archive.org/web/20100531214646/http://www.oregon.gov/ODOT/TD/TP/Tolling_Background.shtml.

used as a congestion mitigation tool, surplus revenue from congestion pricing programs could be used to support other freight improvements. However, this option is unlikely and would be politically difficult.

Selected Federal Opportunities

A number of financing mechanisms at the federal level represent existing and potential opportunities for funding freight transportation system improvements in Oregon. Several such mechanisms are summarized briefly below. It is important to note that while the programs presented below create opportunities for financing of critical transportation programs in Oregon, these options do come at a cost in the form of debt service. As a result, when these options are considered for funding transportation projects, it is necessary to weigh the implications and future costs of these alternatives.

Build American Bonds

Build American Bonds (BAB) are tax credit bonds that provide federally-subsidized debt financing to reduce borrowing costs for transportation investments. Authorized by the American Recovery and Reinvestment Act of 2009,[106] BABs allow state or local governments issuing bonds to elect to make the bond interest taxable in exchange for a federal interest subsidy. Bond proceeds must be used for governmental purposes, which include transportation investments.

In the spring of 2010, the State of Oregon completed the sale of $580 million of new bonds, 93 percent of which were BABs.Revenues from the sale will be used to fund projects identified through the Oregon Transportation Investment Act III program. Financing via BABs is reported to have enabled the state to save $56 million in financing costs. The BAB program expired on December 31, 2010, and has not been re-authorized.

CFR Title 23, Section 129 Loans

Section 129 of the Code of Federal Regulations Title 23 allows federal-aid highway apportionments to fund direct loans to projects with dedicated revenue streams. Dedicated revenues may include tolls, excise taxes, sales taxes, property taxes, motor vehicle taxes and other beneficiary fees. Proceeds from Section 129

[106] The American Recovery and Reinvestment Act of 2009, also known as the Recovery Act, utilized $787 billion to reduce unemployment and spur economic growth in the wake of the recession at this time. This bill included funding for transportation construction and maintenance projects.

loans can fund the costs of engineering, right-of-way acquisition and physical construction.

Any federal-aid highway project is a potential candidate for a Section 129 loan provided that the recipients pledge revenues from a dedicated source to repayment of the loan. Loans can be in any amount of up to 80 percent of the project cost, provided that a state has sufficient obligation authority to fund the loan.

Use of Section 129 loans for project financing has been very limited. One reason for this is that the Transportation Infrastructure Finance and Innovation Act program (described below) is generally available for the same kinds of projects that would likely use Section 129 loans. However, for projects that do not fit the profile of TIFIA projects, Section 129 loans remain a good alternative.

Transportation Infrastructure Finance and Innovation Act

The Transportation Infrastructure Finance and Innovation Act (TIFIA) of 1998 is a federal program through which the U.S. DOT provides credit assistance in the form of direct loans, loan guarantees and credit assistance to major surface transportation projects with dedicated revenue streams. In 2005, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) opened the TIFIA program to freight projects. Several states have received TIFIA credits for projects that could be significant to freight, such as the Maryland Intercounty Connector and the Reno Rail Corridor in Nevada.

TIFIA has provided credit assistance to state DOTs, transit operators, special authorities, local governments and private entities undertaking highway, transit, rail and intermodal improvements. Rather than providing grant funding, TIFIA provides projects with supplemental or subordinate debt in order to leverage available federal resources. As of March 2009, the TIFIA program had provided $5.8 billion in credit assistance, leveraging projects with a construction value of $21.8 billion nationally.[107]

Oregon has not yet taken advantage of the TIFIA program. This may be a consideration for ODOT in coming years, in particular, to fund those projects occurring on the Strategic Freight System.

Grant Anticipation Revenue Vehicles Bonds

Grant Anticipation Revenue Vehicles or "GARVEE" is the name given to the process where states utilize bond or other debt instrument financing mechanisms

[107] http://www.financingtransportation.org/funding_financing/financing/credit_assistance/tifia.aspx.

involving the payment of future federal-aid highway funds to retire debt. Therefore, GARVEE bonds are backed by a pledge of future federal-aid from the U.S. DOT. GARVEEs generate upfront funding for major capital projects that a state would likely be unable to construct in the near term using traditional funding approaches. Bond-related costs eligible for federal-aid reimbursement include interest payments, retirement of principal and any other cost incidental to the sale of an eligible bond issue. States, political subdivisions and public authorities have issued GARVEE debt, including Oregon neighbors California and Idaho.

Looking Ahead to the Future Surface Transportation Reauthorization[108]

Individual states can help influence federal policy by making freight funding and finance a top priority in their discussions with congressional representatives. The last surface transportation authorization in 2005, SAFETEA-LU, created several new opportunities for freight funding and finance. Early indications are that the future of surface transportation funding legislation will include an even greater focus on freight. Ongoing state agency coordination with Oregon's congressional delegation is critical in showing support for maintaining and expanding current programs for funding freight projects, as well as identifying potential new sources of freight funding in federal transportation and other legislation.

State and Multimodal Opportunities

At the state level, state gas taxes and a variety of fees have been used in support of freight infrastructure and other improvements. In recent years, these have been extended by other programs, such as the Oregon Transportation Investment Act, which has been instrumental in providing funding to fix or replace bridges important for truck freight movements. OTIA also has provided funding for road modernization improvements, preservation and maintenance.

More recently, the *Connect*Oregon program and the Jobs and Transportation Act have established funding for freight projects on and off roads. The following discussion summarizes opportunities associated with these and other selected state and multimodal programs.

[108] Chapter 9, Section 9.6, includes updated information regarding funding related to the Fast Act as well as a Freight Investment Plan.

Oregon Multimodal Transportation Fund



The Multimodal Transportation Fund (also known as *Connect*Oregon) is a lottery-backed bond program that generates revenues to invest in air, marine, rail and transit infrastructure. Public road and highway projects that are eligible for funding through the State Highway Trust Fund are not eligible for funding through the Multimodal Transportation Fund. The *Connect*Oregon program received $100 million in the 2005 legislative session and another $100 million in the 2007 legislative session. In 2009, the Oregon Jobs and Transportation Act (JTA) authorized another $100 million for *Connect*Oregon. It is not a dedicated program, and each bond sale must be authorized by the state legislature. Proceeds from the Oregon State Lottery are used to pay back the bonds issued for the *Connect*Oregon program.

Establishing dedicated funding for *Connect*Oregon would help to provide a steady stream of funding that supports multimodal freight efficiency and mobility goals. Dedicated funding also might promote more cohesive statewide and regional freight planning, as regional governments could devote more time to working with their neighboring regions and the state to define projects that best support the movement of freight.

Oregon Jobs and Transportation Act

The Oregon Jobs and Transportation Act (JTA), enacted by the 2009 Oregon Legislature, represents an important source of new financing for investments in Oregon's transportation infrastructure. The legislation includes funding to relieve key bottlenecks, improve existing facilities and address safety concerns and deferred maintenance for roads and bridges.[109] Further, the JTA authorizes a third round of *Connect*Oregon funding, along with funding for city streets and county roads. Thirty-seven highway projects are to receive funding for addressing bottlenecks or improving safety; many of these projects are on major freight routes. Roadway improvements are financed through revenues generated by increases in various fees and in gasoline and diesel taxes. An estimated 40,000 jobs are expected to be created over 10 years through expenditures associated directly or indirectly with the JTA.

[109] https://www.oregon.gov/odot/pages/jta.aspx.

Public-Private Partnerships

Public-private partnerships (PPP) help accelerate development of critical transportation infrastructure, thereby, realizing benefits before the public or private sectors could do so on their own. From a goods movement perspective, rail PPP arrangements have thus far been the focus of many transportation PPP projects, possibly because of the frequent interaction between private railroads and government agencies. However, other types of projects also make potential PPPs, such as the development of intermodal centers or tolled/priced facilities.

ODOT's Office of Innovative Partnerships and Alternative Funding offers a unique support system to plan, fund and implement PPPs. In the past, the office has played a role in projects which brought together public and private partners, including the Road User Fee Pilot Program and Oregon's Solar Highway project. This office may be able to facilitate the development of freight-related projects using a combination of public and private sources of funding.

Implications for Future Freight Funding

While assumed values such as growth rates, the inflation rate and the like have changed since estimates and forecasts were made for the OTP, the general trends have not changed much. OTIA, *Connect*Oregon and the JTA have resulted in significant new state revenues to improve freight and passenger transportation facilities, but a major funding gap remains. Continuation of existing funding sources such as *Connect*Oregon and the creation of new state funding sources would help reduce the gap and support Oregon's economy. A similar effect may occur if reauthorization of federal surface transportation funding legislation or other freight-related federal legislation results in extending existing, and providing new, freight funding programs. Ongoing comparisons of freight funding needs to available revenues in relation to Oregon's economy and the demand for goods movement will be important to decision-makers when developing legislative proposals.

Alternative Scenarios

7.0 Alternative Scenarios

The strategies recommended to support the development of the Oregon freight system described in Chapter 8 are based on analysis of several possible future economic and policy scenarios. The Reference Case (discussed below) portrays the future Oregon freight system based on current expectations. It assumes economic conditions and policy directions that seem to be most likely in the future. Recognizing, however, that the future is sure to be different from what we can now foresee, the broad-brush implications for Oregon's freight system under a range of other plausible economic and policy conditions were also considered.

In order to understand the implications of different future economic scenarios for freight, Oregon's Statewide Integrated Model (SWIM2) was used to evaluate the spatial dimension of future economic and population growth and the commodity flow and travel patterns stemming from this future demand. The alternative scenarios presented below were selected using expert input from the Steering Committee and data from the Oregon Office of Economic Analysis. As a result of continued economic volatility, it is important to continue to monitor changes in economic projections and incorporate new economic data into future plans.

This chapter provides an overview of the modeling methods and results conducted by ODOT modeling staff. For more detail on the modeling results of the analysis, see Oregon Freight Plan *Modeling Analysis Technical Memorandum* on ODOT's website.[110]

7.1 Reference Case and Alternative Scenarios

The first step in analyzing the impact of alternative future scenarios on the freight system is to define the scenarios that need to be modeled, aside from a Reference Case which will serve as the baseline. Multiple factors could change economic conditions and markedly affect the demand for transportation, especially freight transportation. However, regardless of the future economic scenario, it is likely that the primary factors that will impact freight demand will be changing energy prices, greenhouse gas regulations, evolving business and carrier logistics strategies, international competition for resources, and state and national tax and transportation policies. Federal and state economic policies, U.S. trade programs and natural resource policies and legislation also will have a significant impact. The following scenarios were selected for analysis:

[110] ODOT website: https://www.oregon.gov/ODOT/Planning/Pages/Guidance.aspx

- Reference Case,
- Optimistic Scenario,
- Pessimistic Scenario,
- High Transportation Cost Scenario, and
- National Transportation Policy and Funding Shortfall Scenario (not a modeling scenario).

The Reference Case is consistent with the OTP, but uses the current economic forecast for Oregon. The five modeling analysis scenarios reflect different assumptions about future population, economic growth, land use and transportation trends. Alternative scenarios are generally considered less likely to occur than the OFP Reference Case. The alternative scenarios provide a framework to test the flexibility of OFP strategies in the event that the future is significantly different from that anticipated in the Reference Case. They also help evaluate possible unintended consequences of OFP strategies. More detail about these scenarios and how they were developed is presented below.

Despite expected economic growth under all scenarios; there are major differences in the levels of economic growth. If the Pessimistic Scenario were to become reality instead of the Optimistic Scenario, for example, Oregon's economy and freight system would feel the impacts. As previously noted, it is also important to recognize that the scenarios presented above are not all-encompassing. Future economic conditions, industry composition, and freight demand levels may differ substantially from those presented here. It is important, therefore, to monitor economic and policy developments for possible reevaluation of freight strategies in Oregon, and to feed this information on changing conditions back into the planning process.

The Reference Case

The Reference Case, or the business-as-usual scenario, highlights future freight movements consistent with current laws, most recent state economic forecasts, land use patterns and transportation system investments.[111] It is considered the most realistic future scenario with current information and has several key assumptions, including the following:

- Oregon's economy will grow as forecasted by the OEA, while the rest of the world economy will grow at rates consistent with national forecasts.
- Employment figures and forecasts are consistent with OEA values from March 2009.

[111] An example of another statewide scenario analysis can be found in the *Oregon Transportation Plan*, adopted September 20, 2006.

- Commodity flows are consistent with the data in the Oregon Commodity Flow Forecast, October 2009.
- Urban growth boundaries maintain 20-year land supplies.
- Transportation system maintenance, preservation and improvement assumptions are consistent with the current Statewide Transportation Improvement Program, Metropolitan Transportation Improvement Programs and local capital improvement plans. Longer-term investment assumptions are consistent with the OTP and transportation system plans.
- Transportation costs remain stable.
- The economy will suffer no major shocks over the next 25 years; it will grow at a stable rate and follow a similar pattern of long-run activity observed over the past 20 years. The dampening effects of the current recession are accounted for.

Many of the assumptions in the Reference Case include information discussed in the previous sections of this chapter, including the following:

- Oregon's population will grow and age,
- Consumption will increase with the increase in population,
- Workforce productivity will remain competitive, and
- Trade will increase.

In addition, the Reference Case assumes that there will be no major changes in statewide and metropolitan land use beyond those reflected in the local and state plans. Zoning decisions within urban growth boundaries are assumed to drive the location of businesses and major freight facilities, such as distribution centers, warehouses and terminals. Consistent with the OTP, the Reference Case assumes no major changes in national and Oregon transportation policies and funding programs.

Alternative Future #1: Optimistic Scenario

This alternative examines the condition and performance of the Oregon freight system, assuming that Oregon's total economy and population grow more rapidly than projected in the Reference Case.

The factors that might lead to higher economic and population growth in the state include the following:

- Improved productivity across a range of Oregon industries as a result of the introduction of new technologies,
- Changes in the value of the dollar that increase national and global demand for Oregon products,

- Changes in energy or transportation costs that make Oregon industries significantly more cost-competitive in national and global markets, and
- Climate changes that favor economic activity and settlement in Oregon.

Alternative Future #2: Pessimistic Scenario

This alternative examines the condition and performance of the Oregon freight system assuming that Oregon's total economy and population grow slower than projected in the Reference Case.

The factors that might lead to lower economic and population growth in the state include the following:

- Unfavorable trade policies;
- Slower gains in manufacturing productivity;
- Higher inflation rate, higher interest rates;
- Lower investment by companies in research and development or less technology innovation;
- Lower domestic and/or global consumption, leading to a decrease in exports of Oregon goods to trading partners; and
- Global wage equalization, which would raise the cost of imported goods and decrease the purchasing power of Oregon residents and their ability to consume goods.

Alternative Future #3: High Transportation Cost Scenario

This alternative examines the condition and performance of the Oregon freight system. It builds off the Pessimistic Scenario and adds the assumption that transportation costs are three times higher than projected in the Reference Case. This case assumes that the transportation cost increase is applied globally and does not put Oregon at an economic disadvantage.

The factors that might lead to considerably higher transport costs in Oregon include:

- High fuel cost for a variety of reasons;
- Global energy demand that outpaces supply, forcing higher prices;
- Greenhouse gas emissions regulations and/or carbon pricing regulations that force petroleum prices up and accelerate a shift to nonpetroleum energy sources (e.g., biofuels, hydroelectric, nuclear, etc.); and
- Fuel shortages caused by war or political crises.

Alternative Future #4: National Transportation Policy and Federal Funding Shortfall Scenario

This scenario is a policy scenario based on the modeled Reference Scenario. The alternative examines the condition and performance of the Oregon multimodal freight system assuming that national transportation policies in the future are significantly different from those of recent federal surface transportation programs. This alternative is the result of a policy analysis process and not a specific SWIM2 model run.

The factors that might lead to a change in national transportation policies affecting Oregon include:

- Greater devolution of highway funding responsibility to states and local governments;
- Declining federal and state revenue yields from motor fuel taxes;
- Shift from motor fuel taxes to state and local vehicle miles traveled (VMT) user fees because of national policies to "de-carbonize" transportation fuels;
- Failure to achieve national consensus on necessary investment in freight transportation facilities to support domestic and national trade;
- Preoccupation with metropolitan congestion at the expense of investments in interstate/global trade freight transportation services and facilities; and

Under the low funding levels examined in this scenario, a major shortfall in federal aid for highways will occur. Potentially, this shortfall in funding would have to be covered by increased taxes or other revenues. A shift in capital, maintenance and operations funding priorities may also be required under this scenario.

7.2 MODELING RESULTS

The results of running the SWIM2 model for each of the four analysis scenarios provided insight on how freight would be impacted when taking each of these alternate futures into consideration. This section contains a brief description of highlights from the modeling results. For a complete review of the modeling results, see Oregon Freight Plan *Modeling Analysis Technical Memorandum* on ODOT's website.[112] This technical memorandum provides substantial detail about the modeling analysis and results. Significant findings that relate to freight demand include the following:

[112] ODOT website: http://www.oregon.gov/ODOT/Planning/Pages/Guidance.aspx

Increased freight flows. Regardless of which scenario occurs in reality, Oregon is expected to see significant increases in freight flows in the future. The modeling results only highlight potential deviations from the Reference Case. Even under the Pessimistic Scenario described, freight demand will continue to increase and require a suitable freight network to move goods into, out of, within and through Oregon.

Highest freight demand under Optimistic Scenario. The Optimistic Scenario, which anticipates a period of higher than expected growth in the economy, will result in increased levels of freight demand. Freight demand will increase 21 percent more in terms of tonnage and 18 percent more in terms of value under the Optimistic Scenario when compared with the Reference Case. Under the Pessimistic Scenario, total freight demand will decrease when compared with the Reference Case. Value of goods moved could decrease by 22 percent while tonnage may decrease 26 percent. The High Transportation Cost Scenario creates results similar to the Pessimistic Scenario.

Less industry diversity make regions susceptible to economic risk. Some regions have dominant industries, making them more susceptible to economic risk associated with these industries. This is evident for the dominant urban industry of Machinery, Instruments, Transportation Equipment and Metals, and the Eastern Oregon dominance of Food or Kindred Products.

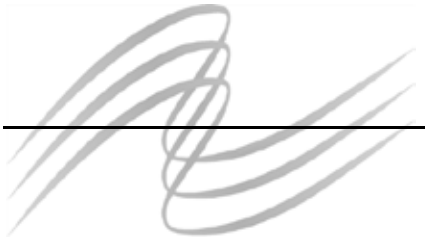
7.3 CONCLUSION

Using the Oregon Commodity Flow Forecast, October 2009, under all modeled scenarios, Oregon's economy and key industries will continue to grow, albeit at different rates. Many of Oregon's major freight dependent industries, such as Food Manufacturing, and Computers and Electronics are more susceptible to economic volatility because they are exported while Wholesale Trade and others are less susceptible. As a result of this relative stability in major Oregon industries, the OFP strategies can be expected to be applicable over the life of the plan. However, Oregon depends on federal funding for transportation system investment and maintenance. A reduction in federal funds, as described in Alternative Future #4, would be troubling for the freight system and Oregon's economy. In this case, core strategies discussed in Chapter 8 that focus on operations improvements would become even more relevant, as operations improvements require less investment to achieve travel time improvements and other benefits. As a result, where appropriate, operations improvements may be a method to keep freight moving effectively during times of reduced federal investment.

The primary indicators are derived from the assumptions that define the Reference Case and are listed here.

- Economic growth changes significantly. It is essential to continually evaluate economic growth, both past and future projections presented by the OEA. If actual and projected Oregon GSP and employment figures deviate significantly from those presented in this freight plan, reevaluation may be required.
- Long-term investment in the transportation system changes significantly. If investment in the transportation system increases or decreases substantially from what is presented in the OTP, re-evaluation may be required.
- Transportation costs increase or decrease significantly. If a large increase or decrease in freight provider transportation costs occurs over the long term, reevaluation may be required.
- Consumption and trade activity decreases over the long term. If total consumer consumption decreases over the long term (either as a result of declining population or for economic reasons), re-evaluation may be required. In addition, if trade activity decreases substantially, this would change some of the assumptions made.
- Projected demographics change significantly. Currently, Oregon's population is expected to age and increase. If forecasts change, re-evaluation may be required.

Freight Issues and Strategies



8.0 Freight Issues and Strategies

8.1 PURPOSE OF ISSUES AND STRATEGIES

Analysis and outreach efforts supporting the development of the OFP have identified a number of issues that need to be addressed in order to ensure that Oregon has an efficient and sustainable freight transportation system that continues to support economic growth and livability of Oregon communities. This chapter presents these issues and formulates strategies that ODOT, tribal governments and other governmental agencies and jurisdictions can implement in order to realize the state's freight transportation goals.

These strategies would do the following:

- Define a strategic freight system and establish a process for updating the definition of the system;
- Describe how the strategic system should be preserved;
- Periodically revisit existing processes and criteria for determining critical investment needs for the freight system;[113]
- Describe how ODOT can work with partner agencies and other states, local agencies and the private sector to ensure a coordinated approach to freight transportation system planning;
- Establish procedures to ensure the system operates safely and efficiently;
- Identify actions that can be taken to coordinate land use and freight transportation planning decisions;
- Describe how regulatory programs can be coordinated with freight transportation needs; and



[113] Section 9.5 evaluates freight mobility issues and includes strategies to address those issues as required by the FAST Act.

- Describe approaches to addressing long-term funding needs for the freight transportation system.

8.2 STRATEGY METHODOLOGY

Methodology to Create the OFP Issues and Strategies

The issues and strategies presented in this chapter were developed with input from two primary sources:

- Analysis described in a series of technical memoranda on freight transportation topics. Experts within the stakeholder community who participated in a series of Working Groups and the OFP Steering Committee reviewed these technical memoranda. The technical memoranda also provided extensive data that were used in subsequent analyses included in the preceding chapters of this plan. The technical memoranda prepared to support the OFP can be found in Freight Plan Publications on the ODOT website.[114]
- Discussions with the OFP Steering Committee. As described in Chapter 1, the OFP Steering Committee included executive-level freight industry, community and transportation professionals from around the state. The Steering Committee received all of the technical memoranda and then spent a number of meetings discussing issues and formulating strategies based on the technical information and their own expertise.

8.3 OFP ISSUES AND STRATEGIES

Freight Issue #1: *A clearly defined, multimodal "Strategic Freight System," is essential in order to focus freight system improvements, maintenance and protection on the freight corridors that play the most critical role in supporting the state's economy. Currently, this does not exist.*

Strategy 1.1:

Establish a Strategic Freight System building on the system defined by the commodity flows of Oregon's major industries. This system should include those elements of the transportation infrastructure that best support the state's key industries. This system should be multimodal, when viable, and exist in both urban and rural areas as appropriate.

[114] Contact the ODOT Freight Planning Unit to obtain copies of the technical memos. [115] Refer to Chapter 9.3 for updated performance measures required by the FAST Act.

- Action 1.1.1. Monitor and maintain freight systems identified in modal plans. Update modal plans to meet identified strategic needs and incorporate analysis of current economy and economic forecasts periodically.
- Action 1.1.2. Use the methodology resulting from this plan to update the definition of the strategic freight infrastructure system. The methodology includes both quantifiable and qualitative data elements.
- Action 1.1.3. Develop performance measures and gather necessary data on an ongoing basis to support continued updating of identified freight routes as Oregon's economy evolves and the state reacts to changing economic conditions.[115]

Strategy 1.2:

Support freight access to the Strategic Freight System. This includes proactively protecting and preserving corridors designated as strategic.

- Action 1.2.1. Preserve freight facilities included as part of the Strategic Freight System from changes that would significantly reduce the ability of these facilities to operate as efficient components of the freight system unless alternate facilities are identified or a safety-related need arises.
- Action 1.2.2. When a change of use or classification of any facility on the Strategic Freight System is considered, seek to ensure that continuity of the Strategic Freight System is maintained.

Strategy 1.3:

Improve understanding of the economic benefits of freight improvement projects or programs to Oregon's residents and businesses. This means understanding both the direct benefits and secondary benefits such as induced job growth.

- Action 1.3.1. Develop mechanisms to measure the potential benefits of freight projects or programs. Measures should include quantifiable economic benefit as well as non-quantifiable benefits such as improvements to public health, safety and quality of life.
- Action 1.3.2. Establish mechanisms to measure appropriate comparative economic returns of different freight projects or programs. When multiple projects are reviewed, provide decision makers with information regarding return on investments.

[115] Refer to Chapter 9.3 for updated performance measures required by the FAST Act.

- Action 1.3.3. Use relevant freight benefit and freight mobility measures during project prioritization and selection. Use the economic benefit and economic return information to support freight projects to achieve project funding during the selection process.

Freight Issue #2: *Capacity constraints, congestion, unreliability and geometric deficiencies in key highway, rail, air and marine freight corridors cause inefficiencies in statewide freight movement.*

Strategy 2.1:

Define and establish criteria to identify freight constraints and deficiencies.

- Action 2.1.1. Create quantitative definitions for the types of constraints existing on the Oregon transportation system: capacity-related congestion points, operational chokepoints, deficient infrastructure conditions or geometry and weather-related closures. Define these constraints and deficiencies at a corridor level. Base performance and prioritization criteria on multiple factors, including delay, value of cargo and industries affected, degree of weather-related impacts, availability of alternate routes and OHP mobility standards.[116]

Strategy 2.2:

Develop a process for identifying, measuring and monitoring system constraints and deficiencies.

- Action 2.2.1. Develop and use performance measures/factors to identify corridor performance constraints, system deficiencies and affected industries. Apply the criteria to identify system constraints on an ongoing basis. Base performance measures on research conducted by ODOT and reported in "Freight Performance Measures: Approach Analysis."[117,118]

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[116] Chapter 9, Section 9.5, summarized the Freight Highway Bottlenecks Project that identified and prioritized truck delay areas in response to this strategy and FAST Act requirements.

[117] Starr McMullen and Christopher Monsere, "Freight Performance Measures: Approach Analysis," prepared for the Oregon Department of Transportation and the Oregon Transportation Research and Education Consortium (OTREC), May 2010.
https://www.oregon.gov/ODOT/Programs/ResearchDocuments/Freight_Perform ance_Measures.pdf

Strategy 2.3:

Identify and rank freight bottlenecks, corridor constraints or chokepoints, in particular those located on the strategic system. Update the ranked list periodically.[119]

- Action 2.3.1. Create a set of freight planning guidelines to use for developing transportation system plans. Recommend the adoption of ranking and prioritization procedures for evaluating freight system performance as part of TSPs. In the guidelines, recommend that the TSPs detail how plans will eliminate or significantly reduce bottlenecks and constraints.
- Action 2.3.2. Prioritize freight system needs on a regular basis. This list should include all modes and be flexible enough to be adaptable to different funding sources.

Strategy 2.4:

Coordinate freight improvements and system management plans on corridors comprising the Strategic Freight System with the intent to improve supply chain performance.

- Action 2.4.1. Define freight improvement projects specifically as those projects that support goods movement efficiency, using quantitative criteria as defined in Action 2.1.1.[120]

Strategy 2.5:

Enhance Intelligent Transportation Systems (ITS) applications (such as traveler information programs and transportation demand management systems) that are effective and useful to freight. Prioritize strategic



118 Chapter 9, Section 9.3, implements required performance measures and monitoring.

119 Chapter 9, Section 9.5, summarizes the Freight Highway Bottlenecks Project that identified and prioritized bottlenecks in response to this strategy and the FAST Act.

120 Refer to Chapter 9 for the freight investment plan required by the FAST Act.

locations for ITS applications. This should include intermodal connector facilities.

- Action 2.5.1. Evaluate the effectiveness of existing programs and explore opportunities to expand the programs to new facilities, in particular those that are part of the Strategic Freight System.
- Action 2.5.2. Target key intermodal connectors as well as possible alternate routes to those intermodal connectors that tend to be congested.
- Action 2.5.3. Interview freight users (motor carriers, private fleets and shippers) to determine types of travel information most useful to them and identify best methods of delivery. Conduct demonstrations of public-private information sharing partnerships linking public Traffic Management Centers (TMC)/Trip Check systems to private dispatch and scheduling systems.
- Action 2.5.4. Coordinate with local Transportation Demand Management (TDM) programs on or near congested freight corridors to reduce discretionary auto trips**.**

Strategy 2.6:

In order to increase modal alternatives on key freight corridors in the strategic system, encourage development of carload transload/consolidation facilities where there is market support for such facilities.

- Action 2.6.1. Since railroad business models have evolved to emphasize efficiency through unit train and expedited service models (for intermodal trains) that benefit shippers who can consolidate loads, consider developing programs to help shippers develop transload/consolidation facilities where there is market support for such facilities. Build this strategy on a compelling public benefits analysis and demonstration of potential market feasibility.

Freight Issue #3: *Congestion and unreliable travel time on roads to access major intermodal facilities can cause disruptions to freight movement and industry supply chains.*

Strategy 3.1:

Establish a procedure for monitoring the mobility, infrastructure conditions, and performance of intermodal connector roads on the National Highway System and other last-mile connections to important freight generation sites.

- Action 3.1.1. Develop and maintain measures monitoring intermodal connection performance at key intermodal facilities in terms of traffic volumes, delays and infrastructure conditions.

Strategy 3.2:

Partner with local government agencies and tribal governments to identify intermodal connectors that provide "last mile" connectivity to freight-generating businesses or locations and are not currently classified as NHS Connectors. Use this information to update the NHS connector list, when requested by the federal government, and to establish an additional list of secondary connector routes as appropriate. Highlight the importance to local governments of the role they have in making the freight system function effectively for businesses across the state.[121]

- Action 3.2.1. Working with local and regional jurisdictions, develop guidance documents for local agencies that identify how to define and designate local freight connectors.
- Action 3.2.2. Compile a list of local freight connectors once they have been identified by local and regional jurisdictions and tribal governments.
- Action 3.2.3. Request local governments to document how they have addressed last mile local freight connector needs in their TSPs.

Strategy 3.3:

Encourage inclusion of connector roads in local transportation system plans.

- Action 3.3.1. Review TSP guidelines and make recommendations about identifying connector roads including any NHS



[121] Chapter 9, Section 9.5, summarizes the Oregon Freight Intermodal Connector System Study that identified intermodal connectors in response to this strategy and the FAST Act.

and non-NHS, local freight connectors or secondary freight routes in the local TSP process. Place special emphasis on those facilities that serve as important links to businesses, industrial lands and freight generators of statewide economic importance.

Freight Issue #4: *Improvements to the efficiency, reliability and safety of long-haul freight corridors require collaboration between Oregon and neighboring states.*

Strategy 4.1:

Prioritize efforts to create and maintain strategic relationships with multistate coalitions and freight groups in neighboring states to identify freight transportation issues, concerns and needs of mutual interest. Continue to advocate for multistate planning opportunities. Work with trading partners and freight destinations and origins on identifying supply chain issues that affect whole industries.

- Action 4.1.1. Take a strong role in supporting the activities of established multistate coalitions as well as coordinating freight initiatives with transportation agencies in California, Idaho, Nevada and Washington. Build strong ties with Washington State and seek opportunities to work on cross-border planning initiatives, rail issues and capacity issues in the Columbia River Gorge and on the Columbia River Crossing. Build relationships with major trading partners to identify freight supply chain issues.
- Action 4.1.2 Coordinate with neighboring states to reduce discretionary auto trips in congested interstate corridors at peak hours.

Freight Issue #5: *Changes to the physical dimensions of a highway may either accommodate or restrict permitted loads throughout the entire state and can cause connectivity issues to key businesses and freight generating activities.*

Strategy 5.1:

Monitor, preserve and improve highway freight facilities that accommodate truckloads requiring a permit.

- Action 5.1.1. Preserve the ability of highway facilities and locations that are utilized by heavy and over-dimensional trucks to accommodate these loads. Identify freight mobility needs and avoid loss of physical capacity for these trips unless an existing feasible route is identified. If a conflicting policy limits the application of this action, seek to balance the transportation needs of all highway users while managing the statewide transportation system.[122]
- Action 5.1.2 Target highway facilities and locations that are utilized by heavy and over-dimensional loads for improvements through a systematic process that identifies centers of economic activity for industries generating these loads and the corridors in which they operate. Create connections between the motor carrier permitted load routes and project selection processes.
- Action 5.1.3 When applying Actions 5.1.1 and 5.1.2, engage in early public outreach to the affected communities, local governments, shippers of oversize and over-weight loads and motor carriers.

Strategy 5.2:

Identify routes that have length, weight, or height restrictions and include these routes, as appropriate, in the state's assessment of needed highway improvements.[123]



- Action 5.2.1. Use a data-driven process to identify highway improvement needs and to conduct an economic analysis of over-size, over-weight truck corridor improvement needs. Some criteria that could be considered as part of this identification and assessment process include:

[122] Oregon Revised Statutes (ORS) 366.215 stipulates that the Oregon Transportation Commission (OTC) may not permanently reduce the vehicle-carrying capacity of an identified freight route when altering, relocating, changing, or realigning a state highway unless safety or access considerations require the reduction. Local governments may apply to the OTC for an exemption to prohibitions to reductions in capacity.

[123] Chapter 9, Section 9.5, summarizes the needs related to highway over-dimensional load pinch points in response to this strategy and the FAST Act.

- The number of requests for permits on the route.
- Input from stakeholders and periodic shipper surveys to identify latent demand for commodity shipments requiring over-size, over-weight truck configurations.
- Analysis of corridor-level data and forecasts to determine where demand for over-size, over-weight loads is likely to increase.
- Analysis of emergency preparedness plans as certain events will require viable routes to deploy larger and heavier trucks that require a permit.

Strategy 5.3:

Consider targeting financial support to strategic non-highway modal infrastructure such as shortline rail and barge for shipment of nondivisible loads.

· Action 5.3.1. Identify other transportation modal options, including shortline rail service or barge, in each of the key corridors that need to be protected for over-size and over-weight commodity movements, as well as the "last mile" connections to industrial and freight–generating land uses. If rail or barge infrastructure is available, consider targeting financial support into upgrading or maintaining the infrastructure as an alternative to truck transportation.

In all cases, the state's participation in supporting infrastructure owned by private entities should only be contemplated if there is significant public interest or economic incentive to do so. Subsidies to the private sector should only be provided where there is an acceptable business plan for ongoing operation and maintenance of facilities and where a public benefit is clearly documented. Identified matching funds should also be considered as a necessary condition for state investment in private modal services.

Freight Issue 6: *Freight needs to be able to move throughout the state in a manner that is as safe as possible. Its movement may impact safety in Oregon communities and risk to the environment.*

Strategy 6.1:

Partner with local, statewide, tribal and federal partners to monitor and manage the safety performance of the statewide freight system.

- Action 6.1.1. Work with the ODOT Motor Carrier Transportation Division, Rail Division and other programs within state agencies to advance freight issues for consideration in safety plans. This should include continued monitoring of locations on state highways for high incidence of truck-involved crashes to identify any emerging safety issues and continued evaluation of rail grade crossing safety through the Oregon Operation Lifesaver program.
- Action 6.1.2. Continue leveraging the knowledge and support on safety matters offered by federal public agencies as well as private-sector freight partners.
- Action 6.1.3. Review programs and manuals offered by the state to include the most recent technological and operational freight and logistics developments.
- Action 6.1.4. Review existing hazardous transportation routes to determine whether their location is optimal to provide mobility while minimizing potential impacts to the environment and communities.

Strategy 6.2:

Use state-of-the-art crash statistics and data tracking methods to monitor the safety performance of the system and to track system performance over time.

- Action 6.2.1. The state will develop and use up-to-date local and national freight related crash data. Adjust the data types if necessary to respond to changes in logistics supply chains or transportation modes.

Strategy 6.3:

Build freight safety considerations into the system monitoring, project selection and prioritization processes.

Freight Issue #7: *Industrial land supply for freight-dependent land uses may be insufficient to meet future demand. Lack of necessary land use protections may threaten the viability of freight transportation systems.*

Strategy 7.1:

Work to better integrate freight into the land use planning process and to protect the existing supply of industrial (freight-dependent) land uses and freight terminals.

§ Action 7.1.1. Support better integration of freight into the regional and local land use planning processes. Encourage local governments to integrate industrial land use planning into comprehensive plans and all other plans and actions relating to land use controls.

§ Action 7.1.2 Work with regional and local land use planning agencies to protect existing industrial land from encroachment from incompatible land uses. This could be accomplished by including industrial-zoned lands adjacent to freight facilities (including such facilities as intermodal yards, freight terminals, marine and others) for future freight expansion. Encourage the development of buffers between freight facilities and incompatible uses. Transportation infrastructure connecting to terminals, ports, airports, and other freight-generating land uses should be included in these discussions.

§ Action 7.1.3 Work with local and regional governments to encourage that properties designated as industrial lands in a comprehensive plan are reasonably developable. Land selected for industrial uses should not have significant constraints that would make it unduly difficult or costly to develop.

§ Action 7.1.4 Encourage the development of freight transportation facilities and other industrial land uses at brownfield locations.

Strategy 7.2:

Work with local and regional agencies and tribal governments to develop best practices for integrating freight generating land uses into the urban fabric in a manner that minimizes the impact on surrounding communities and the environment.

· Action 7.2.1. Support local and regional land use agency efforts to create a set of freight generating land use design standards including information to educate private sector developers and public sector planners. Distribute the standards to potential developers of freight-dependent businesses and local land use planners. Support adoption of strategies such as Cargo-Oriented Development (COD)[124] and Smart Industrial Growth in local and regional plans.

[124] See Appendix E – Glossary for definition of Cargo-Oriented Development.

Freight Issue #8: *Freight emissions include pollutants such as greenhouse gases and particulate matter that contribute to climate change and health risk concerns.*

Strategy 8.1:

Research strategies to reduce pollutants and greenhouse gas emissions from freight sources that are active within Oregon, focus on strategies that have been implemented with success in regions that have similarities to Oregon.

- Action 8.1.1. Build on work completed in the OFP to research methods for emissions reduction. These methods may include behavioral changes, technology improvements or methods that increase the efficiency of freight supply chains.
- Action 8.1.2. Work in coordination with private sector freight stakeholders to identify the most cost-effective approaches to address climate change impacts from freight, in particular those strategies that also support and benefit shippers.

Strategy 8.2:

Consider climate change impacts in freight transportation planning activities.

- Action 8.2.1. Incorporate methods of considering greenhouse gas impacts in freight transportation planning and decision-making processes.
- Action 8.2.2. Support congestion relief and idling reduction activities such as weigh-in-motion technology and the provision of electricity at truck stops for parked trucks.

Freight Issue #9: *National Environmental Policy Act (NEPA) review procedures and permitting requirements for freight projects involve complexities that, if overlooked, can result in negative impacts to project development and implementation cycles.*

Strategy 9.1:

Reduce inefficiencies in the NEPA process as well as other environmental permitting processes by considering actions that encourage early consultation with federal, state, and local agencies.[125]

- Action 9.1.1. Review the state's natural resource and environmental permitting program for highway projects and assess its potential applicability for freight transportation projects for other modes. For all environmental review and NEPA projects, engage the necessary internal and external agency stakeholders early in the planning process in order to secure the required permits and speed project delivery. Work with resource agencies to arrange for concurrent reviews wherever possible.

Freight Issue #10: *New and emerging safety, security, and environmental regulations, though beneficial, can be confusing to shippers and carriers and be expensive to implement.*

Strategy 10.1:

Work with shippers, carriers and terminal operators to increase the knowledge of the costs, consequences and requirements of new safety, security and environmental regulations.

Freight Issue #11: *The freight system in Oregon lacks system redundancy in several key locations. This leaves it vulnerable to disruptions that threaten freight system continuity, especially during emergencies.*

Strategy 11.1:

Create a statewide emergency management plan that identifies critical vulnerable points from a freight mobility perspective and places where there is a lack of

[125] To review major transportation projects, ODOT and federal and state natural resource-related agencies use the Collaborative Environmental and Transportation Agreement for Streamlining (CETAS) process. CETAS relies on its agency representatives working together early in project development to collaboratively solve problems, potentially resulting in quicker permitting decisions than the traditional environmental review process.

system redundancy. Create freight movement emergency plans for disruptions at these locations that include information about possible alternatives routes.

- Action 11.1.1. Create an emergency transportation system map that includes alternative route identification as well as transportation modal alternative information. The map should be flexible enough to be used when single transportation components are compromised or when entire portions of the system have suffered a disruption.
- Action 11.1.2. Identify and track those places where disruptions would be most acutely felt. This includes those places where there are no, or few, parallel route options, so a disruption means a lack of connectivity. This also means places that tend to be subject to natural or weather-related disruptions including mountain passes, single-lane infrastructure, rail tracks that tend to be affected by heavy rains and snows, and inland waterway passages that are heavily influenced by water levels and drought.
- Action 11.1.3. Create plans that facilitate the movement of goods on alternative routes.

Strategy 11.2:

Develop and maintain transportation models that account for freight logistics and routing behavior in order to evaluate effects of disruptions on freight movement at the state, regional and urban levels.

Strategy 11.3:

Retain critical existing redundancy elements (for example, rail lines currently not in use, but parallel to a highway facility). Infrastructure that is currently under-utilized may become the primary link in the case of serious disruption on the primary facility.

Freight Issue #12: *Lack of a sustained source of statewide freight funding decreases the ability of the public sector to plan for long- and medium-term freight needs in a comprehensive manner.*

Strategy 12.1:

Work with elected officials, carriers, shippers and other stakeholders to study the potential for, and implications of, a statewide freight fund. The fund would have a selective, criteria-driven process to prioritize and fund projects in all modes of freight transportation. The process would be needs-based and focus on projects located on the Strategic Freight System.

Strategy 12.2:

On a regular basis, create a package of statewide freight improvements that best support efficient statewide freight movement. Share this statewide package with local and regional governments and agencies to assist them in selecting projects to forward through the multimodal transportation improvement selection processes.

Strategy 12.3:

Advocate establishing sources of funding for improvements on intermodal connectors.

· Action 12.3.1. Explore establishing mechanisms to maintain and improve intermodal connectors, focusing on publicly owned infrastructure such as the roads and railways that connect private intermodal warehouse/industrial facilities. This could include options for those problem intermodal connectors that are not NHS designees or for supplementing the funds available through the NHS program. Funding could be provided through an existing or new state funding source.

Freight Issue #13: *Limited availability of state transportation funds means that use of existing sources of funding must be effectively optimized.*

Strategy 13.1:

Before embarking on capital improvement projects, explore lower cost solutions, including operational upgrades or institutional changes, consistent with least cost planning principles.

· Action 13.1.1. Investigate freight operational upgrades or institutional changes prior to engaging in a capital improvement project, particularly during times of significant economic hardship.

Strategy 13.2:

When a public benefit can be achieved, work together with private sector multimodal freight stakeholders to pool resources and optimize funding efficiencies. This may include investing in transportation improvements that are multimodal and privately owned, and include improvements to all freight modal infrastructures.

- Action 13.2.1. Develop the tools necessary to incorporate the breadth of transportation modes into the state transportation planning process. Develop an understanding of criteria such as multimodal transportation performance measures, costs and benefits for all transportation modes if they are to be considered as part of the transportation planning process.

Strategy 13.3:

Seek projects to advance as potential public-private partnerships through the planning and programming process.

- Action 13.3.1. Actively pursue public-private partnerships, where appropriate, and use capabilities already developed to help manage them, such as the Office of Innovative Partnerships Program.

Freight Issue #14: *The lack of a continuous federal freight funding source makes it very challenging for Oregon to implement the ongoing planning and programming of freight projects. Those projects that are of regional or national significance should be eligible for federal participation and funding.*

Strategy 14.1:

Work through Oregon's congressional delegation to urge the federal government to develop a coherent national freight strategy.[126]

- Action 14.1.1. Work toward influencing national policy by stressing the urgency of freight funding and financing in discussions with congressional representatives.

Strategy 14.2:

Work with partner states to identify projects that are of national significance to elevate to the federal level for funding consideration.[127]

[126] Chapter 9 describes the steps taken in the FAST Act and with the National Highway Freight Program to develop a national freight strategy and funding source.

[127] Section 9.6 lists projects in an investment plan that describes how formula freight funding will be expended and matched during federal fiscal years 2016-2020.

- Action 14.2.1. Continue to work with partner agencies and other states to identify projects that are important to regional and statewide economies and also important at the national scale. State or local contributions may also be needed for these projects to the extent that they benefit the state or local communities.

Freight Issue #15: *The economic importance of freight is not always understood or appreciated by the public.*

Strategy 15.1:

Continue to create opportunities for positive interaction between freight industry representatives and community stakeholders, including long-range planning or other community planning activities.

- Action 15.1.1. Continue to include shippers, carriers and private-sector developers in regional and statewide outreach efforts and on advisory groups such as the one created for this OFP to promote an understanding of the needs of freight-related businesses.
- Action 15.1.2. Explore additional opportunities for promoting the understanding of freight issues, such as the participation of ODOT freight staff, carriers and shippers in Area Commission on Transportation meetings.
- Action 15.1.3. Educate the public about the importance of statewide freight issues through increased coverage on the ODOT website and through other forums.

8.4 IMPLEMENTATION

Implementation of the OFP strategies and actions will build on the planning framework established in the OTP and other modal and topic plans. This will include working with a variety of public agencies and private sector stakeholders through existing and new partnerships. Implementation of some of the strategies and actions can be accomplished in the short term while others will require commitments over the longer term. Some may require legislative action or action by other governmental entities. Implementation will occur in phases and will require coordination with efforts to update other plans such as the modal and topic plans as well as regional and local transportation system plans. Funding availability will be important to implementing many of the strategies and associated actions.

OTP Key Initiatives

The OTP implementation identifies a set of Key Initiatives that provide implementation guidance for the OTP and the modal and topic plans. These key initiatives include directions related to system optimization, integration of transportation modes, integration of transportation, land use, the environment and the economy, and the need to make strategic investments using a sustainable funding structure.

The purpose of the key initiatives is to frame plan implementation, along with updating the modal/topic plans, not to override the direction of the goals and policies. Implementation of the OFP will be consistent with all OTP Key Initiatives and advance several of them. These are the OTP Key Initiatives:

- Maintain the existing transportation system to maximize the value of the assets. If funds are not available to maintain the system, develop a triage method for investing available funds.
- Optimize system capacity and safety through information technology and other methods.
- Integrate transportation, land use, economic development and the environment.
- Integrate the transportation system across jurisdictions, ownerships and modes.
- Create a sustainable funding plan for Oregon transportation.
- Invest strategically in capacity enhancements.



Implementation Steps

Implementation of the OFP will require coordination between and within governments, agencies, and the private sector, integration of the OFP strategies into subsequent planning efforts and public involvement in discussions of freight needs.

Coordination

Implementation will require involvement and coordination among a variety of ODOT business units. This includes the ODOT modal divisions and the Transportation Development Division. The involvement of ODOT Region staff will be critical to the implementation of some strategies and actions.

Implementation also will require involvement and coordination with other state agencies such as the Department of Aviation, Business Development Department, Department of Land Conservation and Development and various resource and other agencies as well as the Federal Highway Administration, Federal Aviation Administration and other federal modal administrations and agencies.

Coordination with transportation and other agencies in neighboring states can further implementation of several strategies and actions.

Planning

Oregon's statutes and administrative rules promote planning consistency among state, regional and local governments. The Transportation Planning Rule (TPR) requires state, regional and local governments to address goods movement issues in the development of transportation system plans. The TPR also requires regional and local government transportation system plans to be consistent with the state transportation system plan. Since the OFP is part of the state transportation system plan, its strategies will provide guidance to regional and local freight planning and system management.

The OFP supports several elements of planning and system management including:

- State transportation facility plans such as specific area plans, interchange area management plans, expressway management plans and corridor plans;
- Regional and local transportation system plans developed through MPO, city or county processes;
- Plans developed by tribal governments;
- Plans developed by ports or special districts; and
- System management by ODOT, other state agencies, MPOs, cities and counties that may include management of roadway pavement, bridges, safety, operations, maintenance, congestion and public transportation.

Public Involvement

Public involvement and coordination will be critical to OFP implementation. This will include seeking input from a variety of community and freight stakeholders, such as the Oregon Freight Advisory



Committee as well as other tribal, state, regional and local advisory committees.

Input from various public agencies and freight stakeholders will help guide preparation of a more detailed analysis of the work needed to implement specific OFP strategies and actions. Completion of the analysis is expected to result in a guidance document identifying short-term priorities, medium-term priorities and long-term priorities, similar to the way these are identified in the OTP Implementation Work Program. Implementation of OFP priorities will need to be consistent with implementation of priorities in the OTP work program as well as other planning work programs.

Steps Following Plan Adoption

Some implementation actions can start soon after the OFP is adopted.[128] These include the following:

- Develop an Implementation Plan using the OTP Key Initiatives and Freight Plan purpose statement to provide a framework.
- Continue discussions to update Oregon's transportation finance structure with stakeholders and the public.
- Develop performance measures and analytical tools for plan implementation.
- Develop freight stakeholder input on bottlenecks or choke points on the Strategic Freight System.
- Communicate the bottlenecks or choke point locations to infrastructure owners and stewards.

[128] Refer to Chapter 9 for an update on implementation activities related to system needs, performance, network designations, and funding.

Federal Compliance

9.0 Federal Compliance

9.1 BACKGROUND

Moving Ahead for Progress in the 21st Century Act, or MAP-21[129], was signed into law on July 6, 2012. Among other things, it contained a number of provisions related to freight and performance management. It required the U.S. Department of Transportation (USDOT) to establish a national freight network to help states strategically direct resources toward improved freight system performance. It also required the USDOT to develop a National Freight Strategic Plan. It continued the Projects of National and Regional Significance program and, in order to encourage investment in freight projects, allowed for reduced non-federal matching share for freight projects.

MAP-21 encouraged each state to develop a comprehensive state freight plan that would:

- identify significant freight system trends, needs and issues;
- include freight policies, strategies and performance measures to guide the state's investment decisions;
- improve the ability of the state to meet national freight goals;
- consider innovative technologies and operational strategies, including intelligent transportation systems, that improve the safety and efficiency of freight movement;
- describe improvements that may be required to reduce or impede the deterioration, where travel by heavy vehicles is projected to substantially deteriorate the condition of roadways; and
- inventory facilities with freight mobility issues, such as truck bottlenecks, and identify strategies to address those mobility issues.

MAP-21 also encouraged each state to establish a freight advisory committee containing a representative cross section of public- and private-sector freight stakeholders.

The Oregon Freight Plan (OFP) was developed in parallel with MAP-21 and is consistent with much of the impetus behind the law. However, the OFP was adopted prior to the finalization of MAP-21. Additionally, on December 4, 2015,

[129] Public Law No. 112-114

President Barack Obama signed the Fixing America's Surface Transportation (FAST) Act into law.

The FAST Act builds on MAP-21's freight requirements. At a national level, it clarified and amended the national freight network and planning requirements. It brings a greater focus on multimodal freight planning by establishing a National Multimodal Freight Policy (NMFP) and requiring the creation of a National Multimodal Freight Network (NMFN). It requires the USDOT to establish both an interim and final network.

It also established a new funding program, the National Highway Freight Program (NHFP), and provided formula funds over Federal FY 2016 to 2020 for states to invest in freight projects on the National Highway Freight Network (NHFN).

The FAST Act further requires that states develop a freight plan that comprehensively covers short- and long-term freight planning activities and investments. The plan must:

- Cover a five-year forecast period
- Be fiscally constrained
- Include a freight investment plan with a list of priority projects
- Describe how the state will invest and match its NHFP funds.

The FAST Act continues to encourage states to form freight advisory committees and clarifies their role. It requires the USDOT to develop new tools to support an outcome-oriented, performance-based approach to evaluating proposed projects, and continues the requirement to report on the NHFN's condition and performance.

This chapter has been developed to meet the federal freight provisions under MAP-21 and FAST Act. The FAST Act lists 10 required elements that all state freight plans must address.[130] Many of these requirements (including freight trends, needs and issues, policies, strategies, innovative technologies and State of Good Repair) are addressed in the previous chapters of the OFP, the Oregon Transportation Plan (OTP), and other modal/topic policy plans. This chapter will cover the outstanding requirements that relate to:

- Freight-related performance measures
- Designation of critical rural and urban freight corridors

[130] 49 U.S.C. 70202: State freight plans

- A description of how the OFP will improve the State's ability to meet the NMFP goals and the NHFP goals
- An inventory of facilities with freight mobility issues and a description of the strategies the State is employing to address those issues
- Consideration of any significant congestion or delay caused by freight movements and strategies to mitigate those impacts
- A freight investment plan
- A description of the consultation with the Oregon Freight Advisory Committee (OFAC)

These requirements and how the plan addresses them are detailed in the sections that follow. The extensive consultation used to develop both the original plan and this chapter is detailed in a revised Appendix A.

9.2 COMPARISON WITH NATIONAL FREIGHT GOALS

The FAST Act established the NMFP, which includes national goals to guide decision-making. The NHFP also includes goals to guide investment in freight. While one is geared to drive decision-making for all modes and the other focused on highway investments, there is a great deal of similarity in their goals.

The national highway freight program goals are—

1. *To invest in infrastructure improvements and to implement operational improvements on the highways of the United States that—*
    a. *strengthen the contribution of the National Highway Freight Network to the economic competitiveness of the United States;*
    b. *reduce congestion and bottlenecks on the National Highway Freight Network;*
    c. *reduce the cost of freight transportation;*
    d. *improve the year-round reliability of freight transportation; and*
    e. *increase productivity, particularly for domestic industries and businesses that create high-value jobs;*
2. *To improve the safety, security, efficiency, and resiliency of freight transportation in rural and urban areas;*
3. *To improve the state of good repair of the National Highway Freight Network;*
4. *To use innovation and advanced technology to improve the safety, efficiency, and reliability of the National Highway Freight Network;*
5. *To improve the efficiency and productivity of the National Highway Freight Network;*
6. *To improve the flexibility of States to support multi-State corridor planning and the creation of multi-State organizations to increase the ability of States to address highway freight connectivity; and*
7. *To reduce the environmental impacts of freight movement on the National Highway Freight Network.*

Source: 23 U.S.C. 167: National highway freight program

The national multimodal freight policy goals are:

1. *To identify infrastructure improvements, policies, and operational innovations that—*
    a. *strengthen the contribution of the National Multimodal Freight Network to the economic competitiveness of the United States;*
    b. *reduce congestion and eliminate bottlenecks on the National Multimodal Freight Network; and*
    c. *increase productivity, particularly for domestic industries and businesses that create high-value jobs;*
2. *To improve the safety, security, efficiency, and resiliency of multimodal freight transportation;*
3. *To achieve and maintain a state of good repair on the National Multimodal Freight Network;*
4. *To use innovation and advanced technology to improve the safety, efficiency, and reliability of the National Multimodal Freight Network;*
5. *To improve the economic efficiency and productivity of the National Multimodal Freight Network;*
6. *To improve the reliability of freight transportation;*
7. *To improve the short- and long-distance movement of goods that—*
    a. *travel across rural areas between population centers;*
    b. *travel between rural areas and population centers; and*
    c. *travel from the Nation's ports, airports, and gateways to the National Multimodal Freight Network;*
8. *To improve the flexibility of States to support multi-State corridor planning and the creation of multi-State organizations to increase the ability of States to address multimodal freight connectivity;*
9. *To reduce the adverse environmental impacts of freight movement on the National Multimodal Freight Network; and*
10. *To pursue the goals described in this subsection in a manner that is not burdensome to State and local governments.*

Source: 49 U.S.C. 70101 (b)

Appendix G contains a matrix that cross-references the national goals to the specific Oregon state plan policies, strategies and actions. In general, there is strong correlation and connection between the OFP strategies and the actions and the goals outlined in the NHFP and NMFP. Additionally, the OFP is one of several statewide transportation plans that implement the OTP's goals and define

the state's multimodal transportation system.[131] Several of these other statewide plans, including the Oregon State Rail Plan and the OTP, have numerous connections to the federal goals as further set forth, below.

In keeping with the national goals, the OFP purpose statement strongly connects the reliability, safety and efficiency of the multimodal freight system with economic competitiveness. This plan and the OTP contain numerous strategies and actions related to increasing economic competitiveness, and addressing reliability and safety. In addition, OFP implementation strategies include the recently completed inventory of needs for all modes, including the recent freight highway delay areas and intermodal connectors studies, along with similar inventories for other freight modes. These inventories of mobility issues are further discussed in Section 5 of this chapter (Freight Mobility Issues), which outlines specific areas of need that are critical to the strategic freight system.

Preserving and maintaining a state of good repair is a foundational element of the OFP. Numerous actions and strategies address this goal, relying on data processes to identify the most critical areas on the strategic freight system. The plan also recognizes the importance of multi-state and multi-agency coordination to improve freight system efficiency. Further, the OFP underscores the impact of the freight system on the environment and provides many actions to reduce this impact.

Security is a key topic in the OTP. Strategy 5.2.1 addresses the need for security plans for all transportation modes. Strategy 5.2.4 specifically addresses the potential impact of security measures on managing transportation facilities to minimize delays in the movement of people, goods and services. The OFP also has several actions related to improving connections between urban and rural areas.

While goals directed to using innovation and technology are less abundant in the OFP, technology is a strong theme, consistent with the national freight goals. The OFP outlines several key strategies and actions directed at implementing advanced technology to improve freight system efficiencies. And the OFP's focus on cost-effectiveness and use of the best opportunities available to maximize system efficiency encourages the use of innovative technologies to achieve these goals. ODOT has completed many ITS projects that benefit truck freight. The State will continue to capitalize on opportunities for using innovation and technology to develop applications such as Oregon's Green Light Program. Over the course of the last 15 years, Green Light has saved operators of commercial vehicles some 1.5 million hours of travel time and $180 million in operating costs as they cleared Oregon weigh stations without having to slow or

[131] The relationship between the OFP, the OTP and the various statewide modal and topic plans is further explained in Section 1.2.

stop. In addition, the increase in operational capacity afforded by Green Light has reduced the need to build new weigh station facilities or expand existing ones.

The strategies and actions outlined in the OFP and the OTP formalize Oregon's commitment to multimodal freight system improvement by helping define system needs. Nearly every strategy and action in the OFP supports multiple national freight goals. Extensive implementation efforts have led to the identification of critical areas of need and will provide Oregon with the information necessary to meet to the OFP and national freight goals.

More detail on how the specific strategies and actions in Oregon plans line up with the federal freight goals is contained in Appendix G.

9.3 PERFORMANCE MEASURES

MAP-21 established seven national performance goals and a performance management system. It required the Federal Highway Administration (FHWA), in consultation with the states, to establish measures and required each state to establish performance targets in the following areas:

- Pavement condition on the Interstate System and on the remainder of the National Highway System (NHS)
- Performance of the Interstate System and the remainder of the NHS
- Bridge condition on the NHS
- Fatalities and serious injuries—both number and rate per vehicle mile traveled (VMT)—on all public roads
- Traffic congestion
- On-road mobile source emissions
- Freight movement on the Interstate System

The FAST Act continued this program with some limited adjustments. If the USDOT Administrator determines that a state has failed to make significant progress toward meeting its freight performance targets within two years after establishing the targets, the state must describe the actions it will take to achieve these targets in its next performance report to USDOT.[132]

USDOT has established national performance measures in response to the requirements of MAP-21 and the FAST Act.[133] The performance measure to

[132] FAST Act § 1116; 23 U.S.C. 167(j)

[133] 23 CFR Part 490 – Subpart F

assess freight movement on the Interstate is Percentage of the Interstate System Mileage providing for Reliable Truck Travel Times, or Truck Travel Time Reliability (TTTR) Index (the Freight Reliability measure). This measure is calculated using the National Performance Management Research Data Set (NPMRDS), which was developed by the FHWA to provide a comprehensive picture of travel times throughout the National Highway System, for both passenger vehicles and trucks. It is a ratio of the median to the 95th percentile travel time and is calculated for each segment throughout the state system for five time periods. The worst time period for each segment is selected and then an average developed for the entire system based on the segment length.

In addition to this federally required performance measure, Oregon will track and report on three safety performance indicators. All three of these indicators are included as part of the Oregon Transportation Safety Action Plan and are currently measured and reported through the ODOT Safety Division and the Rail and Public Transit Division. These indicators are:

- Large truck at-fault crashes: number of large truck at-fault crashes per million VMT[134]
- Rail crossing incidents: number of highway-railroad at-grade incidents
- Derailment incidents: number of train derailments caused by human error, track, or equipment.

ODOT will continue to work with the OFAC to evaluate and explore other potential freight performance measures and indicators that may help inform future system needs and priorities.

9.4 FREIGHT NETWORK DESIGNATIONS

Existing Federal Networks

The FAST Act requires FHWA to establish a NHFN. This network is the focus of funding under the NHFP and the FASTLANE Grants program. The NHFN consists of four subsystems:

1. The Primary Highway Freight System (PHFS)
2. Portions of the Interstate System that are not part of the PHFS
3. Critical Rural Freight Corridors (CRFCs), and
4. Critical Urban Freight Corridors (CUFCs)[135]

[134] Trucks with five or more axles are commonly considered large.

[135] 23 U.S.C. 167(c)

The FAST Act limited the PHFS to 41,518 centerline miles nation-wide. FHWA designated these in October 2015. Including the portions of the interstate system that are not part of the PHFS, the current NHFN for Oregon is shown in Figure 9.1. The State is responsible for designating CRFCs. The FAST Act allows states to designate CUFCs, in consultation with metropolitan planning organizations (MPOs), for urbanized areas with populations more than 50,000, but less than 500,000. MPOs may designate CUFCs, in consultation with the state, in urbanized areas with populations of 500,000 or more. The federal legislation allows Oregon to designate 155 miles as CRFC and 77 miles of CUFC. Once designated, ODOT can ask FHWA to remove or add segments within the total mileage limit. The rules also provide a mechanism for state mileage to increase over time.

Adding mileage to the NHFN allows the state to expand the facilities it can strategically direct federal resources toward. ODOT has worked with stakeholders to develop recommended CUFCs and CRFCs, which are discussed later in this section.

Figure 9.1 Existing National Highway Freight Network in Oregon



The FAST Act also required the USDOT to develop a National Freight Strategic Plan within two years of enactment that would identify and assess the demands on, and the condition and performance of, the nation's multimodal freight system. The draft plan, released in early 2016, identified barriers and opportunities as well as best practices for improving multimodal freight network performance. It also contained strategies for mitigating the impacts of freight on communities and for improving multistate and multimodal connectivity.

The FAST Act required the USDOT to establish a NMFN to inform stakeholders where major freight flows occur and where special attention to freight issues may be most warranted. The NMFN will include the following elements:

- The NHFN
- The Class 1 railroads as well as other freight rail systems
- U.S. public ports
- U.S. inland and intra-coastal waterways
- The Great Lakes, the St. Lawrence Seaway, and coastal and ocean domestic freight routes
- The 50 largest U.S. airports by landed weight
- Other strategic freight assets, including intermodal facilities

In May 2016, USDOT released an interim NMFN for comment. ODOT provided comments and asked that a number of facilities be added.

Beyond that, FAST Act allows the addition of up to 20% of mileage to the NMFN. Designation on the NMFN is not required for freight funding under the Act. Further, the State of Oregon and others are seeking clarification as to the process for identifying and apportioning between modes. Finally, these designations are not required to be part of the state freight plan under the FAST Act. Therefore, this section does not contain recommended additions to the NMFN, but ODOT will consider additional designations as a part of future processes.

State Networks

Chapter 4 describes the freight networks for all modes in Oregon. It examined commodity flows and identified a network of highways and other modal facilities that provide critical connections to centers of freight-dependent economic activity in the state. The designated Strategic Freight Corridors comprise four primary (trunk) corridors and multimodal connecting routes:

- The Western Corridor (I-5);
- Columbia River Corridor (I-84);
- U.S. 20 Corridor; and
- The Central Oregon corridor (U.S. 97).

The Strategic Freight Corridors are shown in Figure 4.13.

OHP Freight Routes

The Oregon Highway Plan (OHP) contains policies and actions to balance the need for efficient movement of goods and support of the economy with the movement of other modes. In order to facilitate efficient and reliable interstate, intrastate and regional truck movement, the OHP designated a freight system: the State Highway Freight System.[136] This system comprises interstate highways and certain statewide, regional and district highways, the majority of which are on the NHS, and includes routes that carry significant tonnage of freight by truck and serve as the primary interstate and intrastate highway freight connection to ports, intermodal terminals, and urban areas. The State Highway Freight System designation does not guarantee additional state investment in these routes. However, the OHP outlines special management strategies that are available.[137]

The 2003 Oregon Legislature adopted changes to Oregon Revised Statutes (ORS) 366.215. In order to protect the routes that are necessary for the movement of freight, it limited the situations in which the state could reduce the carrying capacity (defined as the horizontal or vertical clearance) on these routes. Oregon Administrative Rule (OAR) 731-012-0010 implements ORS 366.215 and details the review of potential reductions of vertical and horizontal clearance and the process for stakeholder involvement. The Reduction Review Routes where the Department will apply the rule are depicted in Figure 10c of the OHP.

Critical Urban Freight Corridors

CUFCs must be a public road in an urbanized area (more than 50,000 population) that either:

- Connects an intermodal facility to the PHFS, the Interstate System, or an intermodal freight facility;
- Is located within a corridor on the PHFS and provide an alternative highway option important to goods movement;
- Serves a major freight generator, logistic center or manufacturing and warehouse industrial land; or
- Is important to freight movement within the region as determined by the MPO or the state.

The FHWA encourages the consideration of first or last mile connector routes from high-volume freight corridors to freight-intensive land and key freight facilities, including ports, rail terminals and other industrially zoned land.

136 1999 OHP (including amendments November 1999 through May 2015), Figure 10

137 1999 OHP, p. 61

Based upon federal legislation, USDOT allotted 77 miles to Oregon for CUFCs. As a result of the limited mileage, USDOT encourages states to focus strategically on segments in which improvement projects in need of federal funding are anticipated in the near term.

The recommended designations are listed in Appendix H.

Critical Rural Freight Corridors

Based upon federal legislation, USDOT has allocated 155 miles to Oregon for CRFCs. CRFCs must be a public road that is not within an urbanized area and meets one or more of the following criteria:

- Is a rural principal arterial roadway with a minimum of 25% of the annual average daily traffic of the road measured in passenger vehicle equivalent units from trucks
- Provides access to energy exploration, development, installation, or production areas
- Connects the PHFS or the Interstate System to facilities that handle more than:
  - 50,000 20-foot equivalent units per year; or
  - 500,000 tons per year of bulk commodities;
- Provides access to a grain elevator, an agricultural facility, a mining facility, a forestry facility, or an intermodal facility
- Connects to an international port of entry
- Provides access to significant air, rail, water, or other freight facilities
- Is a corridor that is vital to improving the efficient movement of freight that is important to the state's economy

ODOT developed the list of potential segments based on the inventories of need that are further described in the next section of this chapter. Locations outside of urbanized areas and not already on the NHFN were considered from the following inventories:

1. Freight Highway Delay Areas
2. Freight Intermodal Connectors – Tier 1
3. Highway Over-dimension Load Pinch Points – High Priority
4. Regional Highway System Needs
5. Seismic Bridges – Phase 1 & 2 Unfunded
6. Seismic Landslides – Phase 1 Tier 1 Selection

ODOT then considered state designations. Segments that are on the following routes were prioritized as follows:

1. OFP Strategic Freight System
2. OHP Freight Routes
3. Seismic Phase 1 & 2 Routes
4. ORS 366.215 Reduction Review Routes

The CRFC designations are listed in Appendix H.

9.5 FREIGHT MOBILITY ISSUES

The OFP identifies "significant freight system trends, needs and issues with respect to the State" as required by the FAST Act. The OFP and the OTP contain numerous strategies and actions to address those needs. In 2011, the OFP incorporated a strategic implementation initiative 2.3, which directs the state to "identify and rank freight bottlenecks…in particular those located on the strategic system. Update the ranked list periodically."[138] The FAST Act also calls for an "inventory of facilities with freight mobility issues, such as bottlenecks, within the State, and for those facilities that are State owned or operated, a description of the strategies the State is employing to address those freight mobility issues."

This section describes the inventories of facilities with freight mobility issues, particularly bottlenecks, and generally outlines the strategies in the OFP and OTP that address the needs identified in those inventories.

Freight Needs

Highway Freight Needs

Freight Highway Delay Areas: Studies of existing freight highway conditions in Oregon identified that congestion from bottlenecks is a major issue, impacting Oregon's economy with variations in travel time reliability and rising travel costs. The 2017 Freight Highway Bottlenecks Project (FHBP) was initiated to identify locations on Oregon's highway network that were experiencing significant freight truck delay, unreliability and increased transportation costs. The FHBP looked at a variety of key measureable indicators to identify locations on the state freight highway network, specifically those routes identified as ORS 366.215 restriction review routes. The project identified areas that imposed higher than usual transportation costs on the freight user. The FHBP identified

[138] ODOT, 2011 Oregon Freight Plan

where impacts are felt but does not diagnose the cause of the freight delay area or prescribe the solution.

Indicators were primarily elements such as:

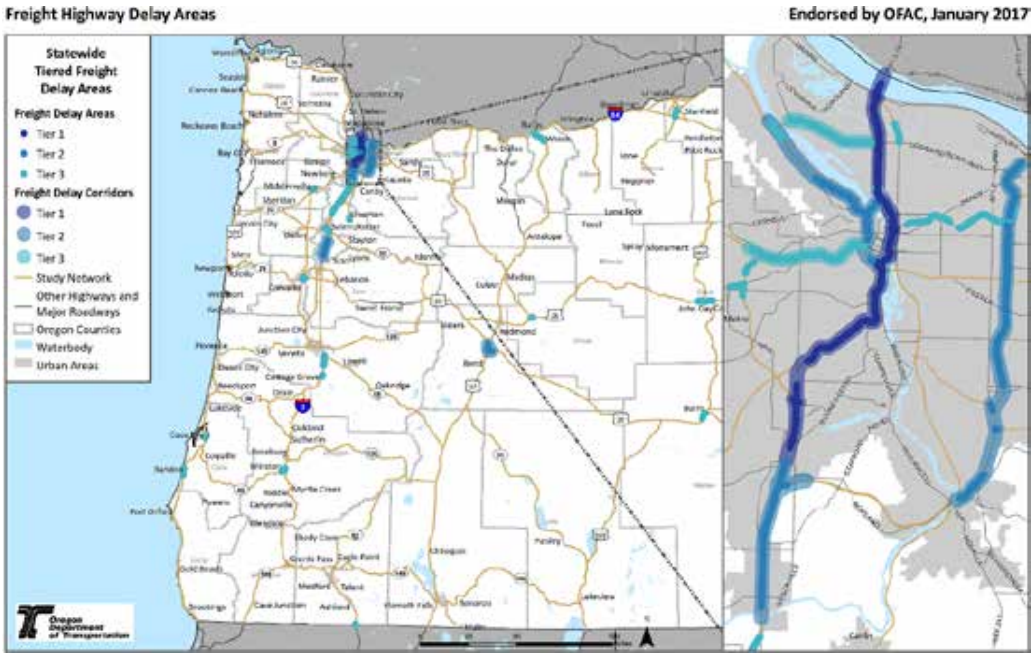
- Delay – The annual hours of delay that trucks accumulate on each segment.
- Unreliability – The unreliability of shipment travel times.
- Geometric Issues – Percent grade, degree curvature or shoulders.
- Volume – Volume-to-capacity ratio and percentage of travel in congested conditions.
- Incident-Related – Frequency, and clearance times, of various collision types.
- Cost – Transportation delay costs, inventory delay costs, and unreliability costs.

This project was supported by a significant stakeholder process, which included the Project Management Team (PMT), the Technical Advisory Committee (TAC) and OFAC, as well as ODOT regional managers and staff.

There were clear series of delay areas, particularly in the Portland metro area, that should be considered as corridors rather than individual delay areas. This reflects the cumulative impact that longer segments have on freight movements. It also acknowledges the need to consider the entire corridor when developing solutions.

Tiers were established to identify the severity of the problem. The total transportation costs, along with the freight designation on the corridor or segment, were key factors used to determine the tiers for the delay areas and corridors. The final tiered freight highway delay area map is presented in Figure 9.2. These tiers, together with costs, available funding, feasibility and other factors, can help inform decision-makers when considering project investments.

Figure 9.2 Freight Highway Delay Areas



Intermodal Connectors: The 2017 Oregon Freight Intermodal Connector System (OFICS) study was developed by ODOT to help implement strategies in the OFP related to identification of connectors that provide "last mile" connectivity to freight locations that are not currently classified as NHS connectors.[139] NHS connectors are the public roads leading to major intermodal terminals. Although they account for less than 1% of NHS mileage, NHS connectors are key conduits for the timely and reliable delivery of goods. [140]

NHS intermodal connectors that primarily service freight terminals are designated as NHS freight intermodal connectors. Marine terminals, truck-rail facilities, pipeline terminals, and airports are the primary types of intermodal freight facilities operating in Oregon. The OFICS study identified additional freight intermodal connectors in the state besides the existing designated NHS freight intermodal connectors.

Intermodal connectors are important because they are critical components of the state and national intermodal freight system that enable more efficient use of all

139 OFP Strategy 3.2.

140 Intermodal connectors are roads that provide access between major intermodal facilities and the other four subsystems making up the National Highway System. https://www.fhwa.dot.gov/planning/national_highway_system/intermodal_connectors/

freight modes. These intermodal connectors serve as the first and last mile for many of the state's manufacturing and industrial businesses. In order for Oregon to remain competitive, the connectors must be able to efficiently move raw materials, partially assembled products and finished goods to and from all areas of the state for national and international markets.

In order to identify intermodal connectors beyond the existing NHS Intermodal Connectors, it was necessary to locate intermodal terminals/businesses (ITB) first. Freight intermodal terminals are defined as facilities, which provide for the transfer of freight from one mode to another. The study identified approximately 200 ITBs. A majority of these are in Portland, the Willamette Valley and along the Columbia River. After the ITB were identified, the new intermodal connectors were located by identifying the public street segments that connect to the closest state highway. The full list of intermodal connectors, including those currently designated as NHS freight intermodal connectors, is in Appendix I.

The intermodal connectors were tiered. Tier 1 connectors are considered primary intermodal connectors and meet all of the NHS intermodal connector criteria for volume of traffic and need. Tier 2 roads are secondary intermodal connectors, which generally serve an important state need. They must be a public road that serves as a primary access between an intermodal terminal and a state highway or NHS connector and carry a certain amount of truck traffic or serves significant intermodal terminal or air cargo business. The Tier 3 minor intermodal connectors serve more of a regional need. They serve fewer than 50 trucks a day in each direction and typically serve only one smaller ITB.

Over-Dimensional Load Pinch Points: The 2016 Highway Over-dimensional Load Pinch Points (HOLPP) study was developed by ODOT to help implement strategies in the OFP pertaining to the efficient movement of over-dimensional (OD) loads. The study identified highway pinch points that restrict the movement of OD loads. OD load pinch points are due to height, width, weight or length constraints, and can include low overpasses, narrow roadways or intersections, sharp curves, weight-restricted bridges, bridges with low overhead clearance, sign bridges, tunnels and other features.

The study prioritized pinch points based on the degree to which resolving a pinch point would open up an entire corridor for OD loads. The study identified 381 pinch points statewide, with 92 of them classified as high-priority pinch points and 289 low-priority pinch points.

Seismic: ODOT undertook an analysis of the seismic resiliency of the Oregon Highway System to address OFP strategies that called for creation of a statewide emergency management plan that identifies critical vulnerable points from a freight mobility perspective. That analysis identified key lifeline routes and established a strategic program to prioritize and systematically retrofit all seismically vulnerable bridges and address unstable slopes on key lifeline routes.

This would allow for rescue and recovery following a major earthquake. Seismic resiliency is critical to freight mobility.[141]

The top-priority bridge and landslide locations identified through this effort are listed in Appendix I. These include the Phase 1 and 2 bridges and the High-Priority Phase 1 and 2 landslides. More information is contained in the 2014 Seismic Plus Report.

Regional Needs to Address Freight Impacts: The FAST Act also requires states to identify areas where freight may be creating performance issues for other users, such as mobility, reliability, and safety. ODOT regions helped prepare a list of these freight issues based upon past planning actions and operational knowledge. Projects include climbing and through lanes, pavement condition, intersection widening, additional or longer turning lanes, truck parking, shoulder improvements, grade separation and signage.

The full list of regional highway system needs identified by ODOT region staff related to freight impacts is contained in Appendix I.

Non-Highway Freight Needs

Chapter 4 provides an overview of the multimodal freight transportation network and systems that support industries that depend on efficient freight movement. This section provides an inventory of the non-highway facilities and components of the multimodal freight system that have demonstrated freight mobility issues. Specifically, this section includes needs inventories for facilities associated with the rail and marine systems[142] that contribute to the state's multimodal freight transportation network.

Rail: The 2014 Oregon State Rail Plan (SRP) contains a description of the key needs and opportunities for freight rail, including the physical needs of the freight rail system relating to capacity constraints and bottlenecks. ODOT's Rail and Public Transit Division and Freight Planning Program used information from the needs assessment conducted for the SRP and identified facilities with current freight mobility issues. The improvements to address capacity constraints and bottlenecks on the mainline rail network include siding and track upgrades, signal system upgrades, and speed increases. For the Class III railroads (short lines) in Oregon, needs include track upgrades to serve increased train weight and speed, infrastructure improvements such as bridge upgrades, and consideration of the carload volume and vulnerability of short-line railroads to

[141] ODOT, Oregon Highways Seismic Report, October 2014.

[142] Aviation needs are currently being updated as part of the Aviation Plan and were not available at time of publication. Access to airports was addressed as part of the OFICS study.

abandonment. Generally, freight rail system preservation priorities include maintenance of rail functionality to current operating standards, preservation or improvements of critical bridge, tunnel or other structures, maintenance of rail lines serving key intermodal terminals and that provide significant economic value, and protection of critical rail infrastructure from seismic vulnerability. The prioritized list of rail facilities with freight mobility issues in Oregon is contained in Appendix J.

Marine: Marine system components of the freight transportation network include marine highways, marine ports, and intermodal terminals. System preservation priorities include maintenance and improvement of marine highway channel depth, preservation of docks and piers to support cargo activity or deep draft shipping, maintenance of intermodal connections to port facilities (e.g., rail or highway), preservation of equipment, and improvements that address seismic resilience. Enhancement priorities beyond system preservation include improvements to deep water ports, intermodal connections, port operations, port accessibility, and port safety. ODOT Freight Planning Program staff coordinated with the Oregon Public Ports Association, the Oregon Business Development Department, and marine port district representatives to develop a prioritized list of marine facilities with freight mobility issues. The marine transportation system needs list is contained in Appendix J.

Strategies to Address Freight Needs

Chapter 8 lists a number of actions and strategies to address freight system needs. Strategies that are relevant to the identified mobility issues above include preserving freight facilities; reducing capacity constraints, congestion, unreliability and geometric deficiencies in all modes; and improving safety. There are specific actions and strategies targeted to improving the efficiency, reliability and safety of long-haul freight corridors and preserving capacity for over-dimensional loads. Finally, the OFP recognizes the significant funding needs for addressing freight issues, and includes strategies and actions geared toward maximizing and leveraging funding for freight, including establishing a statewide freight fund.

The OTP includes policies and strategies that will guide freight related investment. Under Goal 1, Mobility and Accessibility, Policy 1.1 calls for an integrated transportation system with modal choices and related strategies and specifically mentions individual freight modes. Goal 2, Management of the System, Policy 2.1, calls for improving transportation capacity and operational efficiency. Related strategies include incident management and reducing bottlenecks and geometric constraints. Under Goal 3, Economic Vitality, Policy 3.1 addresses creating an integrated efficient and reliable freight system. It includes developing strategies around innovative technology; addressing barriers to efficient truck movements; giving priority to projects on identified freight

routes; and supporting strategic investment in marine, air cargo and pipeline transportation.

The OHP contains policies and associated actions to consider a broad range of intelligent transportation system (ITS) solutions: improving safety, reducing conflicts between rail and highways, improving the efficient movement of freight, and managing congestion through managing access and using transportation demand management (TDM) techniques.

Prioritization is needed because limited funding prohibits the ability to address all of the freight needs at once; most inventories are tiered or prioritized in some way. However, the planning and scheduling of transportation improvements is complex and involves a variety of funding sources, scheduling issues and jurisdictional interests. Additionally, there are multiple lists of needs that represent a variety of modes, issues and prioritization processes. While investments should generally be focused on addressing higher tier or priority needs, investment in projects that address lower tier needs may be justified depending on opportunities to leverage public or private funds, readiness, benefits, costs and other factors.

9.6 FREIGHT INVESTMENT PLAN

Purpose and Requirements

The FAST Act instituted a new requirement for state freight plans to include a freight investment plan. The plan must list priority projects and describe how funds made available to carry out Section 167 of Title 23 (the National Highway Freight Program[143]) would be invested and matched over a five year period. The freight investment plan must be fiscally constrained.[144] In addition, these federal funds may be obligated for projects on the NHFN, which is described in greater detail in Section 9.4 of this chapter and consists of the PHFS, portions of the interstate system not designated as part of the PHFS, CUFCs, and CRFCs.

It is anticipated that ODOT will receive approximately $75.7 million in federal formula freight funds for federal fiscal years 2016-2020 authorized and allocated by USDOT via the FAST Act. Such funds have been authorized by Congress

[143] 23 U.S.C. 167: https://www.gpo.gov/fdsys/pkg/USCODE-2015-title23/html/USCODE-2015-title23-chap1-sec167.htm

[144] 49 U.S.C. 70202(c)(2) states "the freight investment plan component of a freight plan shall include a project, or an identified phase of a project, only if funding for completion of the project can reasonably be anticipated to be available for the project within the time period identified in the freight investment plan."

through fiscal year 2020 with an annual allocation to the states delineated for fiscal years 2016-2020.

Table 9.1 represents the state investment plan for freight funds from the FAST Act. Projects listed in the freight investment plan are expected to contribute to the efficient movement of freight on the NHFN and may address one or more of the following: development phase activities, construction and rehabilitation of facilities, property and equipment acquisition, operational improvements, ITS, environmental and community impacts of freight movement, transportation system and work zone management systems, and several additional issues listed in the NHFP.

Investment Plan

Table 9.1 FAST Act Formula Freight Funds Investment Plan (federal fiscal year 2016–2020)

Project Name	Freight Funds	Freight Funds Match	Phase	Work Type	Fed Fiscal Year	Project Total
I-205 Stafford Rd - OR99E - Planning	$2,305,500.00	$194,500.00	Planning	Modernization	2016	$2,500,000.00
I-5 Delaney Rd to Albany - Third lane	$2,766,600.00	$233,400.00	Preliminary Engineering	Modernization	2017	$3,000,000.00
I-5 Kuebler Blvd to Delaney Rd Widening	$4,607,311.20	$388,688.80	Preliminary Engineering	Modernization	2017	$4,996,000.00
	$16,630,295.00	$1,402,989.54	Right of Way	Modernization	2018	$18,033,284.54
I-5 Roberts Mtn-S Umpqua R Paving & Climbing Lane	$6,455,400.00	$544,600.00	Construction	Preservation	2018	$22,139,516.00*
I-205 corridor bottleneck project Powell Blvd to I-84	$15,500,000.00	$1,307,633.92	Construction	Operations	2019	$16,807,633.92
I-205 active traffic management project	$15,200,000.00	$1,282,324.88	Construction	Operations	2019	$16,482,324.88
Total	$70,289,386.20					

Note: Federal freight fund total shown in Table 9.1 is an estimate subject to annual federal authorization and is not a guaranteed amount for programming. Additional details on project funding are included in Oregon's Statewide Transportation Improvement Program. Remaining National Highway Freight Program funds allocated in 2020 that are not shown in Table 9.1 will go towards projects planned for fiscal years 2021 and 2022.

**Project total shown is for all project phases.*

Appendix A – Stakeholder Consultation

Freight Plan Steering Committee and Working Group members for the development of the 2011 OFP are listed below. Following that is an overview of the stakeholder process for the 2017 amendment.

A.1 Freight Plan Steering Committee

- Dave Lohman, OTC Commissioner
- Mike Burton, Director - Affiliated Tribes of NW Indians
- Scott Cantonwine, President and CEO - Cascade Warehouse
- Mike Card, President, Combined Transport
- Gary Cardwell, Divisional Vice President - Northwest Containers, Inc.
- Peter Kratz, Executive Vice President of Operations - Harry & David's
- David Kronsteiner, Port Commission President, Int'l Port of Coos Bay
- Susie Lahsene, Manager, Transportation and Land Use Policy - Port of Portland
- Robin McArthur, Director of Planning and Development, Metro
- Linda Modrell, County Commissioner - Benton County
- Mike Montero, Partner - Montero & Associates
- Brock A. Nelson, Director of Public Affairs - Union Pacific Railroad
- Mike Noonan, President - Oregon Wheat Grower's League
- John Porter, President - AAA Oregon-Idaho
- Bob Russell, President - Oregon Trucking Associations
- Tom Zelenka, Vice President, Environmental and Public Affairs - Schnitzer Steel Industries, Inc.

A.2 Freight Infrastructure and Traffic Issues Working Group

- Mike Montero, Partner - Montero & Associates
- Bob Russell, President - Oregon Trucking Associations
- Kim B. Puzey, General Manager - Port of Umatilla
- Dan Clem, Director - Oregon Department of Aviation
- Terry Finn, Director of Government Affairs - BNSF Railway
- Steve Bates, Vice President -Redmond Heavy Hauling
- Jon Oshel, County Road Program Manager - Association of Oregon Counties
- Terry Tallman, Judge – Morrow County
- Joel Halloran, Senior Transportation Manager - Fred Meyers Inc.
- Ric Young, District Manager - ODOT

A.3 Policy and Process Working Group

- Linda Modrell, County Commissioner - Benton County
- Susie Lahsene, Manager, Transportation and Land Use Policy - Port of Portland
- Steve Greenwood, Environmental and Public Policy Consultant - Oregon Solutions
- Glenn Vanselow, Executive Director - Pacific NW Waterways Association
- Dan Lovelady, Manager - City of Prineville Railroad
- Robin McArthur, Director of Planning and Development - Metro
- Richard W. Schmid, Transportation Program Director - Mid-Willamette Valley Council of Governments (COG)
- Rob Hallyburton, Planning Services Division Manager – DLCD
- Nick Fortey, Traffic Safety Engineer - FHWA Oregon Division
- Erik Havig, Region 2 Planning Manager - ODOT

A.4 Freight and the Economy Working Group

- Mike Burton, Director - Affiliated Tribes of NW Indians
- Martin Callery, Director of Communications & Freight Mobility - International Port of Coos Bay
- Gary Cardwell, Divisional Vice President - Northwest Containers, Inc.
- Tammy Dennee, Executive Director - Oregon Wheat Growers League
- Monte Grove, Region 5 Manager - ODOT
- Dave Harlan, Ports Program Manager – Business Oregon
- Shirley Kalkhoven, Mayor - City of Nehalem
- Peter Kratz, Executive VP Operations - Harry & David’s
- Carrie Novick, Airport Manager - Redmond Municipal Airport
- Jonathan Schlueter, Executive Director - Westside Economic Alliance
- Brad Winters, Commissioner - South Central Oregon ACT

The Oregon Freight Advisory Committee served as the primary advisory committee during the development of the 2017 OFP amendment. A number of stakeholder and advisory groups were consulted as part of the 2017 amendment. The following is a description of those groups and processes.

A.5 Oregon Freight Advisory Committee (2017)

- David Anzur - Anzur Logistics, LLC
- Wayne Bauer – WH Pacific and Westside Economic Alliance
- Jonathon Berndt - Expeditors Portland
- Gary Cardwell - Northwest Container Services
- Martin Callery - Citizen at large
- Timothy Collins - Metro
- Kevin Downing - Oregon Department of Environmental Quality
- Scott Drumm - Port of Portland
- Michael Eliason - Association of Oregon Counties
- Terry Fasel - Oregon Department of Agriculture
- Kristal Fiser - United Parcel Service
- Nick Fortey - Federal Highway Administration
- Greg Gilmer - NORPAC
- Jerry Grossnickle - Bernert Barge Lines, Inc.
- Dave Harlan - Oregon Business Development Department
- Brodie Harvey - Knife River Corporation
- Salvador Hernandez - Oregon State University
- Robert Hillier - City of Portland Bureau of Transportation
- Jana Jarvis - Oregon Trucking Associations
- Susie Lahsene - Port of Portland
- Mark Landauer - Oregon Public Ports Association
- Michael Montero - Montero & Associations, LLC
- Scott Parkinson - ARG Transportation Services
- Deena Platman - DKS Associates
- Mike Quilty - Rogue Valley Metropolitan Planning Organization
- Jeff Stone - Oregon Association of Nurseries
- Mitch Swecker - Oregon Department of Aviation
- Colleen Weatherford - Burlington Northern Santa Fe Railway
- Lonny Welter - Columbia County Road Department

A.6 Critical Rural Freight Corridor (CRFC) Working Group

ODOT established the Working Group to provide review and advice on the Critical Rural Freight Corridor (CRFC) designation process. The group met twice in spring 2017 to review the federal requirements, proposed criteria and evaluation. It endorsed the recommended list of CRFCs at its final meeting. The group included the following members:

- Martin Callery - Oregon Freight Advisory Committee (OFAC)
- Mike Eliason - Association of Oregon Counties

- Tom Fellows - Umatilla County
- Thomas Gennarelli - Roseburg Forest Products
- Kevin Haugh - Portland & Western (Genessee & Wyoming)
- Gary Neal - Port of Morrow
- Bob Russell - Oregon Trucking Association
- Diane Schyler - Lowes
- Mitch Swecker - Oregon Department of Aviation
- Pia Welch - FedEx

A.7 Consultation with MPOs regarding Critical Urban Freight Corridors (CUFCs)

ODOT provided information about the FAST Act requirements for designation of CUFCs to the metropolitan planning organizations (MPOs) at a meeting and distributed fact sheets in the fall of 2016. ODOT consulted with Metro several times as Metro developed its recommendation.[1] ODOT hosted a meeting in winter 2017 of all of the MPOs, at which it reviewed the FAST Act requirements, obtained input on potential criteria for designation and discussed MPO proposed route designations. Based on feedback from the MPOs, ODOT assigned mileage targets to each MPO based primarily on OHP Freight Route miles. It then worked individually with the various MPOs to finalize their recommendations.

A.8 Freight Highway Bottleneck Project Technical Advisory Committee (TAC)

This group met three times to provide input and guidance to the Freight Highway Bottleneck Project. It provided input on the approach and results, and endorsed the tiered bottleneck list at its final meeting. Membership was as follows:

- Emily Ackland - Association of Oregon Counties
- Steve Akre - OIA Global Logistics
- Steve Bates - V. Van Dyke Incorporated
- Shelly Boshart Davis - Boshart Trucking
- Martin Callery – OFAC
- Scott Drumm - Port of Portland
- Charlie Every - Every Trucking
- Jeremy Foreman – Walmart
- Nick Fortey - FHWA

[1] Under the FAST Act, MPOs in urban areas with populations of 500,000 or more may designate CUFCs, in consultation with the state.

- Chuck Ireland - Ireland Trucking
- Don McGinn -McGinn Brothers Trucking
- Amy Ramsdell - ODOT Motor Carrier Division
- Bud Reiff – Metro
- Bob Russell - Oregon Trucking Association
- Diane Schyler - Lowes

A.9 Oregon Freight Intermodal Connector System Technical Advisory Committee (OFICS TAC)

The OFICS TAC met throughout the course of the OFICS study to provide advice and guidance on methodology, review results and make recommendations. The group included the following members:

- Shelly Boshart Davis - Boshart Trucking
- Martin Callery - OFAC
- Kelly Clarke - Central Lane MPO
- Mike Eliason - Union Pacific Railroad
- Jeremy Foreman - Walmart
- Nick Fortey - FHWA
- Phil Healy - Port of Portland
- Bob Hillier - City of Portland
- Jim Irvin - Portland & Western Railroad Inc
- Karl MacNair - City of Medford
- Gary Neal - Port of Morrow
- Bob Russell - Oregon Trucking Association
- Matt Wiederholt - City of Prineville Railway

A.10 Highway Over-dimension Load Pinch Points (HOLPP) Study

The primary source of data for the HOLPP study came from ODOT maintenance district staff as they coordinate the daily routing of over-dimension (OD) loads with the Motor Carrier Transportation Division.

A.11 Marine Needs Inventory

ODOT consulted with the Oregon Business Development Department and Oregon Public Ports Association (OPPA) to develop the list of marine needs. In January 2017, a questionnaire was distributed through the OPPA that provided an opportunity for port districts and other marine transportation stakeholders to submit information about specific facilities with freight mobility

issues or that are forecast to have issues or constraints in the near future. Responses included information drawn from port district Strategic Business Plans and Capital Facilities Plans. The questionnaire responses, combined with the expertise of agency staff, led to the development of the marine transportation needs list, which was shared with the OFAC in June 2017.

A.12 Rail Needs Inventory

ODOT staff received input from the Oregon Rail Advisory Committee and subsequently presented the list to OFAC. OFAC members provided feedback to help refine the description of needs for both the marine and rail transportation systems and it is expected that comments received during the public review period may also be incorporated into the needs lists, as appropriate.

Appendix B – ACTs and MPOs

B.1 ACTs

Area Commissions on Transportation (ACT) are advisory bodies chartered by the Oregon Transportation Commission. ACTs address all aspects of transportation (surface, marine, air, and transportation safety) with primary focus on the state transportation system.

B.1.1 Oregon ACTs

- Northwest Oregon ACT
- Mid-Willamette Valley ACT
- Lane ACT
- Cascades West ACT
- South West ACT
- Rogue Valley ACT
- Lower John Day ACT
- Central Oregon ACT
- South Central Oregon ACT
- North East ACT
- South East ACT

The Portland metropolitan region elected not to establish an ACT for the urban portion of Multnomah, Washington and Clackamas counties that is governed by Metro. Outside Metro's boundaries, ODOT works with various county coordinating committees to coordinate transportation project planning and construction.

B.2 MPOs

Metropolitan Planning Organizations are responsible for planning, programming and coordination of federal highway and transit investments in urbanized areas.

The six Oregon MPOs are:

- Portland Metropolitan Planning Organization
- Salem/Keizer Metropolitan Planning Organization
- Eugene/Springfield Metropolitan Planning Organization
- Rogue Valley Metropolitan Planning Organization
- Corvallis Area Metropolitan Planning Organization
- Bend Area Metropolitan Planning Organization

Appendix C – Consistency Analysis

C.1 OFP Consistency with the OTP and Statewide Mode and Topic Plans

The Oregon Freight Plan (OFP) is a multimodal topic plan called for in the 2006 Oregon Transportation Plan (OTP). The OTP requires mode and topic plans to show consistency with the OTP, which along with mode and topic plans comprises the state transportation system plan (see Figure 1.3). The discussion below shows how the OFP is consistent with the OTP and the following statewide mode and topic plans: 1999 Oregon Highway Plan, 2001 Oregon Rail Plan, 2004 Oregon Transportation Safety Action Plan, 2007 Oregon Aviation Plan, and 2010 Oregon Statewide Port Strategic Plan.

C.2 Oregon Transportation Plan

The 2006 Oregon Transportation Plan identifies seven goals:

- Mobility and Accessibility,
- Management of the System,
- Economic Vitality,
- Sustainability,
- Safety and Security,
- Funding the Transportation System, and
- Coordination, Communication, and Cooperation.

The OTP develops policies and strategies to further define each goal. A number of these policies and strategies address freight or goods movement. The OFP builds on this discussion by identifying strategies and actions that further define policies and strategies in the OTP. Together, the OFP strategies and actions address all seven OTP goals and many of its policies and strategies. Table C-1 provides a crosswalk between OFP strategies and selected OTP policies and strategies. For several OFP strategies, more than one OTP policy or strategy applies. Similarly, several OTP policies or strategies apply to multiple OFP strategies. The table establishes consistency between strategies in the OFP and selected strategies and policies in the OTP.

Table 9-2 OFP Strategies and Selected OTP Policies and Strategies

Oregon Transportation Plan (OTP)	Oregon Freight Plan (OFP)
Policy 1.1 – Development of an Integrated Multimodal System	Strategy 3.2 Strategy 3.3 Strategy 4.1 Strategy 13.1
Policy 1.2 – Equity, Efficiency and Travel Choices	No freight Plan Strategy. The State will apply the applicable OTP strategies.
Policy 1.3 – Relationship of Interurban and Urban Mobility	No freight Plan Strategy. The State will apply the applicable OTP strategies.
Policy 2.1 – Capacity and Operational Efficiency	Strategy 2.4 Strategy 2.5 Strategy 6.1 Strategy 6.2 Strategy 11.1 Strategy 11.2 Strategy 11.3
Policy 2.2 – Management of Assets	Strategy 5.3 Strategy 10.1
Policy 3.1 – An Integrated and Efficient Freight System	Strategy 1.1 Strategy 1.2 Strategy 2.1 Strategy 2.2 Strategy 2.3 Strategy 2.6 Strategy 3.1 Strategy 5.1 Strategy 5.2 Strategy 5.3 Strategy 6.1 Strategy 7.1 Strategy 7.2 Strategy 11.1 Strategy 11.2 Strategy 11.3
Policy 3.2 – Moving People to Support Economic Vitality	No freight Plan Strategy. The State will apply the applicable OTP strategies.

Oregon Transportation Plan (OTP)	Oregon Freight Plan (OFP)
Policy 3.3 – Downtowns and Economic Development	No freight Plan Strategy. The State will apply the applicable OTP strategies.
Policy 3.4 – Development of the Transportation Industry	Strategy 8.1 Strategy 8.2
Policy 4.1 – Environmentally Responsible Transportation System	Strategy 8.1 Strategy 8.2 Strategy 9.1
Policy 4.2 – Energy Supply	No freight Plan Strategy. The State will apply the applicable OTP strategies.
Policy 4.3 – Creating Communities	No freight Plan Strategy. The State will apply the applicable OTP strategies.
Policy 5.1 – Safety	Strategy 6.1 Strategy 6.2 Strategy 6.3 Strategy 10.1

Oregon Transportation Plan (OTP)	Oregon Freight Plan (OFP)
Policy 5.2 – Security	Strategy 10.1 Strategy 11.1 Strategy 11.2 Strategy 11.3
Policy 6.1 – Funding Structure	Strategy 12.1 Strategy 12.2 Strategy 12.3
Policy 6.2 – Achievement of State and Local Goals	Strategy 1.1 Strategy 1.2 Strategy 2.1 Strategy 2.2 Strategy 2.3 Strategy 12.1 Strategy 12.2 Strategy 12.3 Strategy 13.2 Strategy 13.3
Policy 6.3 – Public Acceptability and Understanding	Strategy 15.1
Policy 6.4 – Beneficiary Responsibilities	Strategy 12.3
Policy 6.5 – Triage in the Event of Insufficient Revenue	Strategy 13.2 Strategy 13.3
Policy 7.1 – A Coordinated Transportation System	Strategy 14.1 Strategy 14.2
Policy 7.2 – Public/Private Partnerships	Strategy 13.2 Strategy 13.3
Policy 7.3 – Public Involvement and Consultation	Strategy 15.1
Policy 7.4 – Environmental Justice	No freight Plan Strategy. The State will apply the applicable OTP strategies.

C.3 Oregon Highway Plan

The 1999 Oregon Highway Plan (OHP) and subsequent amendments to the plan reference five goals and a number of policies and actions for each goal. The goals are System Definition, System Management, Access Management, Travel Alternatives, and Scenic and Environmental Resources. The OFP identifies Strategies and Actions that further define policies and actions for four of the five OHP goals. Specifically, Strategies within OFP address the OHP goals as follows: System Definition (OFP Strategies 1.1, 1.2, 2.2, 6.1, 6.2, 6.3, 11.1, 12.1), System Management (OFP Strategies 2.5, 4.1, 13.2, 13.3, and 15.1), Travel Alternatives (OFP Strategies 2.1, 2.2, 2.3, 3.1, 3.2, 5.1, 5.2, 5.3 12.1, 12.2 and 12.3), and Scenic and Environmental Resources (OFP Strategies 8.1, 8.2 and 9.1).

C.4 Oregon Rail Plan

The 2001 Oregon Rail Plan (ORP) references four policies and several actions for each policy. The policies are as follows:

- Policy 1: Increase economic opportunities for the State by having a viable rail system,
- Policy 2: Strengthen the retention of local rail service where feasible,
- Policy 3: Protect abandoned rights-of-way for alternative or future use; and
- Policy 4: Integrate rail freight considerations into the States land use planning process.

The OFP identifies strategies that further define actions for all ORP policies.

C.5 Oregon Transportation Safety Action Plan

The 2004 Oregon Transportation Safety Action Plan (OTSAP) reinforces OTP safety goals, policies, and actions through 69 actions. Two actions address truck safety; five actions address rail safety, and one action addresses navigational conflicts. The OFP discusses safety in various issues, strategies and actions of the Chapter 8 “Freight Issues and Strategies” including:

Freight Issue #4: Improvements to the efficiency, reliability and safety of long-haul freight corridors require collaboration between Oregon and neighboring states.

Freight Issue #6: Freight needs to be able to move throughout the state in a manner that is as safe as possible. Its movement may impact safety in Oregon communities and risk to the environment.

Freight Issue #10: New and emerging safety, security, and environmental regulations, though beneficial, can be confusing to shippers and carriers and be expensive to implement.

The strategy and action for Issue #4 primarily focuses on coordinating freight initiatives, multistate coalitions, and freight groups in neighboring states. Strategies and actions in Issue #6 concern the safe movement of goods and future actions to monitor and enhance freight safety considerations throughout Oregon’s planning efforts. The strategy for Issue #10 focuses on understanding the costs, unintended consequences, and requirements of new safety, security, and

environmental regulations. These strategies and actions are peripherally related to freight-related actions in the OTSAP.

C.6 Oregon Aviation Plan

The 2007 Oregon Aviation Plan (OAP) identifies 15 policies intended to guide state-level aviation related actions and to provide assistance to local airport sponsors, Oregon Department of Aviation staff, and the State Aviation Board with future decisions regarding the state's aviation system. Various actions are identified for each OAP policy. The OFP identifies 9 strategies that correspond to 6 of the OAP's 15 policies. OAP policies and corresponding actions further defined by OFP strategies include Preservation (OFP Strategy 13.1), Protection (OFP Strategy 7.1), Safety (OFP Strategies 6.1, 6.2, 11.1, 11.3), Intermodal Accessibility (OFP Strategies 1.1,1.2), Funding (OFP Strategy 12.1), and Advocacy and Technical Assistance (OFP Strategy 2.3, 15.1).

C.7 Oregon Statewide Port Strategic Plan

The purpose of the 2010 Oregon Statewide Port Strategic Plan, also known as *A New Strategic Business Plan for Oregon's Statewide Port System*, is to

> *"Define the State of Oregon's future role, interest and investment in the statewide port system based on a realistic assessment of port markets, and economic and business development opportunities. It will identify infrastructure, equipment, administrative, regulatory and governance needs of the ports, and also identify ways that Oregon's port system can best serve the interest of the State of Oregon and its residents."*

The strategic plan defines the framework for a new business relationship between the Oregon Business Development Department (OBDD) and each Oregon port. The plan recommends a number of changes to Oregon's state government institutional structure as it relates to ports, a change in how the ports and state agencies interact and coordinate, a new centralized infrastructure finance program, and a new marine transportation modal program. Regarding the later, the plan recommends the creation of a Marine Transportation Mode Program within state government. One of the responsibilities of program staff would be to prepare a Marine Transportation Modal Plan similar to modal plans noted above for freight, highway, rail, and air. The port strategic plan includes a set of goals and objectives but does not include policies, strategies, and actions similar to those noted above for mode and topic plans.

C.8 OFP Compliance with Federal and State Regulations

The Oregon Freight Plan is required to comply with various federal and state regulations. At the Federal level, requirements include those in the Safe, Accountable, Flexible Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and the Code of Federal Regulations. Other freight-related requirements at the Federal level include those stipulated in the Passenger Rail Investment and Improvement Act of 2008, and Federal Aviation Administration policy and guidance for aviation system planning.

At the state level, the OFP is an element of the statewide transportation plan, and is subject to requirements that apply to the statewide planning process. This includes meeting requirements of the State Agency Coordination (SAC) agreement and with statewide land use planning goals, particularly Goal 12, and the Transportation Planning Rule (TPR).

OFP compliance with Federal and state regulations is discussed in more detail below.

C.9 Federal Planning Regulations

C.9.1 SAFETEA-LU and the Code of Federal Regulations

SAFETEA-LU, in Section 6001.135, requires states to develop statewide transportation plans. In developing these plans, states are required to conduct a transportation planning process that addresses a number of considerations, several of which are freight related as follows:

- Increase the accessibility and mobility of people and freight; and
- Enhance the integration and connectivity of the transportation system, across and between modes throughout the State, for people and freight.

Additionally, SAFETEA-LU requires that various groups are provided with a reasonable opportunity to comment on the proposed plan. Included in these groups are freight shippers and providers of freight transportation services.

The Code of Federal Regulations implements SAFETEA-LU provisions for statewide planning in Title 23, Part 450, which includes freight-related planning requirements identical to those stated above for SAFETEA-LU.

Neither SAFETEA-LU nor the Code of Federal Regulations requires the development of a statewide stand-alone freight or goods movement transportation plan. As an element of the statewide transportation plan, however, the Oregon Freight Plan is required to meet the above federal regulations.

> *FINDING: Accessibility and mobility of freight, along with integration and connectivity of the transportation system, are discussed in numerous parts of the OFP, including various strategies and actions in Chapter 8. See the OFP discussion on plan consistency for more detail. The public involvement process for the plan has provided opportunities for freight shippers and providers of freight transportation services to provide comments on the proposed OFP. The Oregon Freight Advisory Committee, comprised of shippers, transportation providers, and other freight stakeholders, is among the groups providing comments on the plan.*
>
> *The OFP is in compliance with and supportive of federal transportation planning regulations as stated in SAFETEA-LU and the Code of Federal Regulations.*

C.9.2 MAP-21 and the FAST Act

Moving Ahead for Progress in the 21st Century Act, or MAP-21,[1] was signed into law on July 6, 2012. Among other things, it contained a number of provisions related to freight and performance management. MAP-21 encouraged each state to develop a comprehensive state freight plan. The Oregon Freight Plan (OFP) was developed in parallel with MAP-21 and is consistent with much of the impetus behind the law. However, the OFP was adopted prior to the finalization of MAP-21.

Additionally, on December 4, 2015, President Barack Obama signed the Fixing America's Surface Transportation (FAST) Act into law. The FAST Act builds on MAP-21's freight requirements. At a national level, it clarified and amended the national freight network and planning requirements. It brings a greater focus on multimodal freight planning by establishing a National Multimodal Freight Policy (NMFP) and requiring the creation of a National Multimodal Freight Network (NMFN). It requires the USDOT to establish both an interim and final network.

It also established a new funding program, the National Highway Freight Program (NHFP), and provided formula funds over Federal FY 2016 to 2020 for states to invest in freight projects on the National Highway Freight Network (NHFN). The FAST Act further requires that states develop a freight plan that comprehensively covers short- and long-term freight planning activities and investments.[2] The plan must:

- Cover a five-year forecast period;
- Be fiscally constrained;
- Include a freight investment plan with a list of priority projects; and
- Describe how the state will invest and match its NHFP funds.

> *FINDING: ODOT developed Chapter 9 Federal Compliance, to meet the federal freight provisions under MAP-21 and FAST Act. Section 9.1 describes the federal requirements and the rest of the Chapter (sections 9.2-9.6) details how those requirements were met. Chapter 9 was adopted by the OTC in November 2017.*
>
> *The OFP is in compliance with and supportive of federal transportation planning regulations as stated in MAP-21 and the FAST Act.*

C.9.3 Passenger Rail Investment and Improvement Act of 2008

The PRIIA of 2008 includes a provision that states may prepare and maintain a State rail plan in accordance with provisions of the PRIIA of 2008. The purposes of such a plan would be to:

- *Set forth State policy involving freight and passenger rail transportation, including commuter rail operations, in the State.*

[1] Public Law No. 112-114.

[2] 49 U.S.C. 70202: State freight plans.

- *Establish the period covered by the State rail plan.*
- *Present priorities and strategies to enhance rail service in the State that benefits the public.*
- *Serve as the basis for Federal and State rail investments within the State.*

The State of Oregon has prepared several state rail plans, the most recent of which is the 2001 Oregon Rail Plan. In 2010 an Oregon Rail Study was conducted and an update of the Oregon Rail Plan is scheduled to begin in 2011.

> *FINDING: Various strategies and actions in the OFP are consistent with the existing rail plan policies and actions, as shown in the OFP discussion on plan consistency. As an effort separate from the Oregon Rail Plan, the OFP is not subject to provisions in the PRIIA of 2008.*

C.9.4 Federal Aviation Policy and Guidance for Aviation System Planning

The Federal Aviation Administration coordinates and partners with airport authorities on various planning activities. This includes the provision of funding for planning activities, such as the preparation of statewide aviation plans addressing the mobility of people and freight, funding needs, and a variety of other topics. In Oregon, coordination occurs primarily through the Oregon Department of Aviation. The 2007 Oregon Aviation Plan is the latest statewide aviation plan.

> *FINDING: Various strategies and actions in the OFP are consistent with the existing aviation plan policies and actions, as shown in the OFP discussion on plan consistency. The OFP is an effort separate from the Oregon Aviation Plan.*

C.10 Oregon State Planning Regulations

C.10.1 State Agency Coordination Agreement

ODOT's State Agency Coordination (SAC) Agreement requires that the Oregon Transportation Commission (OTC) adopt findings of fact when adopting long-range policy plans (OAR 731-015). Pursuant to these requirements, the following findings support OTC adoption of the Oregon Freight Plan (OFP). The SAC program describes what agencies will do to comply with Oregon's land use planning program. Specifically, it describes how an agency will meet its obligations under ORS 197.180 to carry out its programs affecting land use in compliance with the statewide planning goals and in a manner compatible with acknowledged comprehensive plans.

C.10.2 Coordination Procedures for Adopting Final Modal Systems Plans, OAR 731-015-0055

(1) Except in the case of minor amendments, the Department shall involve DLCD, metropolitan planning organizations, and interested cities, counties, state and federal agencies, special districts and other parties in the development or amendment of a modal systems plan. This involvement

may take the form of mailings, meeting, or other means that the Department determines are appropriate for the circumstances. The Department shall hold at least one public meeting on the plan prior to adoption.

FINDING: The development of the OFP used an open and ongoing public and agency involvement process which included the Department of Land Conservation and Development (DLCD), the metropolitan planning organizations (MPOs), Area Commissions on Transportation (ACTs), cities, counties, state and federal agencies, stakeholder interest groups, and interested citizens.

(2) The Department shall evaluate and write draft findings of compliance with all applicable statewide planning goals.

FINDING: The OFP discussion below on "Oregon's Statewide Planning Goals" contains draft findings of compliance.

(3) If the draft plan identifies new facilities which would affect identifiable geographic areas, the Department shall meet with the planning representatives of affected cities, counties and metropolitan planning organization to identify compatibility issues and the means of resolving them. These may include:

(a) Changing the draft plan to eliminate the conflicts;

(b) Working with the affected local governments to amend their comprehensive plans to eliminate the conflicts; or

(c) Identifying the new facilities as proposals which are contingent on the resolution of the conflicts prior to the completion of the transportation planning program for the proposed new facilities.

FINDING: The draft OFP does not identify new facilities.

(4) The Department shall present to the Transportation Commission the draft plan, findings of compatibility for new facilities affecting identifiable geographic areas, and findings of compliance with all applicable statewide planning goals.

FINDING: The draft findings were presented to the Commission for review at the December 15, 2010 OTC meeting.

(5) The Transportation Commission, when it adopts a final modal systems plan, shall adopt findings of compatibility for new facilities affecting identifiable geographic areas and findings of compliance with all applicable statewide planning goals.

FINDING: Final findings were presented at the June 15, 2011 OTC meeting for Commission consideration for adoption. The OFP does not identify any new facilities.

(6) The Department shall provide copies of the adopted final modal systems plan and findings to DLCD, the metropolitan planning organizations, and others who request to receive a copy.

FINDING: The final Oregon Freight Plan and final findings will be available on the OFP web page and will be distributed to DLCD, the metropolitan planning organizations, and others who request a copy following adoption.

C.11 Oregon's Statewide Planning Goals

The State of Oregon has established 19 statewide planning goals to guide state, local and regional land use planning. The goals express the state's policies on land use and related topics. The findings are based on the content of the Oregon Freight Plan (OFP). Included in the OFP are background information, issues, strategies, and actions. The OFP policies are expressed by the strategies and actions. The discussion for Goal 12 includes findings of compliance with the applicable provisions of the Transportation Planning Rule (TPR), OAR 660-012.

1. **Citizen Involvement** - Goal 1 calls for "the opportunity for citizens to be involved in all phases of the planning process." The purpose of Goal 1 (OAR 660-015-0000(1)) is "To provide a citizen involvement program that ensures the opportunity for citizens to be involved in all phases of the planning process."

   FINDING: The development and review of the OFP provided a variety of opportunities for citizen involvement as described in the "Plan Development" section of Chapter 1. OFP Strategy 15.1 and associated actions support Goal 1 by calling for ongoing interaction between freight industry representatives and community stakeholders in long-range planning and other community planning activities.

   > *OFP Strategy 15.1: Continue to create opportunities for positive interaction between freight industry representatives and community stakeholders, including long-range planning or other community planning activities.*

   The OFP is in compliance with and supportive of Goal 1, Citizen Involvement.

2. **Land Use Planning** - The purpose of Goal 2 (OAR 660-015-0000(2)) is "To establish a land use planning process and policy framework as a basis for all decisions and actions related to use of land and to assure an adequate factual base for such decisions and actions." Goal 2 outlines the basic procedures of Oregon's statewide planning program.

FINDING: OFP Strategy 7.1 and Action 7.1.1 address the integration of freight into the land use planning process. This includes protecting industrial (freight-dependent) land uses and freight terminals.

> *Strategy 7.2: Work with local and regional agencies and tribal governments to develop best practices for integrating freight land uses into the urban fabric in a manner that minimizes the impact on surrounding communities and the natural environment.*

The OFP is in compliance with and supportive of Goal 2, Land Use Planning.

3. **Agricultural Lands** - The purpose of Goal 3 (OAR 660-015-0000(3)) is "To preserve and maintain agricultural lands." It requires counties to inventory such lands and to "preserve and maintain" them through exclusive farm use (EFU) zoning (per ORS Chapter 215).

FINDING: The OFP does not plan for uses on EFU lands. Oregon agricultural goods move by barge, rail, ship, truck, and airplane. The OFP includes a number of strategies and actions supporting development and improvement of a multimodal transportation system for the movement of agricultural goods as well as other commodities. Strategy 1.1 below is an example of OFP policy support pertaining to a multimodal transportation system.

> *Strategy 1.1: Establish a Strategic Freight System building on the system defined by the commodity flows of Oregon's major industries. This system should include those elements of the transportation infrastructure that best support the state's key industries. This system should be multimodal, when viable, and exist in both urban and rural areas as appropriate.*

The OFP is in compliance with and supportive of Goal 3, Agricultural Lands.

4. **Forest Lands** – The purpose of Goal 4 (OAR 660-015-0000(4)) is "To conserve forest lands by maintaining the forest land base and to protect the state's forest economy by making possible economically efficient forest practices that assure the continuous growing and harvesting of forest tree species as the leading use on forest land consistent with sound management of soil, air, water, and fish and wildlife resources and to provide for recreational opportunities and agriculture."

FINDING: The OFP does not propose specific uses to be located on forest lands. Oregon forest products move primarily by barge, rail, ship, and truck. The OFP includes a number of strategies and actions supporting development and improvement of a multimodal transportation system for the movement of timber products as well as other commodities. Strategy 1.1 below is an example of OFP policy support pertaining to a multimodal transportation system.

> *Strategy 1.1: Establish a Strategic Freight System building on the system defined by the commodity flows of Oregon's major industries. This system should include those elements of the transportation infrastructure that best support the state's key industries. This system should be multimodal, when viable, and exist in both urban and rural areas as appropriate.*

The OFP is in compliance with and supportive of Goal 4, Forest Lands.

5. **Open Spaces, Scenic and Historic Areas, and Natural Resources** - The purpose of Goal 5 (OAR 660-015-0000(5)) is "To protect natural resources and conserve scenic and historic areas and open spaces." Goal 5 encompasses 12 different types of resources, including wildlife habitats, mineral resources, wetlands, and waterways.

FINDING: The OFP does not plan for specific uses that would be located on lands protected by Goal 5. In Strategy 7.1 and Action 7.1.1, the OFP recognizes the need to protect the existing supply of industrial land and preserve undeveloped land adjacent to freight facilities. Action 7.1.1 also calls for comprehensive plans to include actions to prevent the encroachment of incompatible land uses. The uses may include lands protected by Goal 5.

> *OTP Action 7.1.1: Support better integration of freight into the regional and local land use planning processes. Encourage local governments to integrate industrial land use planning into comprehensive plans and all other plans and actions relating to land use controls.*

The OFP is in compliance with and supportive of Goal 5, Open Spaces, Scenic and Historic Areas, and Natural Resources

6. **Air, Water and Land Resources Quality** - The purpose of Goal 6 (OAR 660-015-0000(6)) is "To maintain and improve the quality of the air, water and land resources of the state."

FINDING: The OFP addresses Goal 6 primarily through Strategy 8.1, 8.2, and associated actions, which deal with climate change and pollutants from freight emissions, as shown below.

> *Strategy 8.1: Research strategies to reduce pollutants and greenhouse gas emissions from freight sources that are active within Oregon. Focus on strategies that have been implemented with success in regions that have similarities to Oregon.*
>
> *Action 8.1.1: Build on work completed in the OFP to research methods for emissions reduction. These methods can include*

behavioral changes, technology improvements or methods that increase the efficiency of freight supply chains.

Action 8.1.2: Work in coordination with private sector freight stakeholders to identify the most cost-effective approaches to address climate change impacts from freight, in particular those strategies that also support and benefit shippers.

Strategy 8.2: Consider climate change impacts in freight transportation planning activities.

Action 8.2.1: Incorporate methods of considering greenhouse gas impacts in freight transportation planning and decision-making processes.

Action 8.2.2: Support congestion relief and idling reduction activities such as weigh-in-motion technology and the provision of electricity at truck stops for parked trucks.

The OFP is in compliance with and supportive of Goal 6, Air, Water and Land Resources Quality.

7. **Areas Subject to Natural Disasters and Hazards** - The purpose of Goal 7 (OAR 660- 015-0000(7)) is "To protect people and property from natural hazards." This goal deals with development in places subject to natural hazards such as floods or landslides.

FINDING: While the OFP does not specifically address natural hazards, it recognizes the need for transportation system redundancy when disruptions occur, for example, during emergencies. Natural hazards may be a cause of such disruptions. Strategies 11.1 and associated actions address the need to identify critical locations that are vulnerable from a freight mobility perspective, and the identification of alternative routes where disruptions would be most acutely experienced.

Strategy 11.1: Create a statewide emergency management plan that identifies critical vulnerable points from a freight mobility perspective and places where there is a lack of system redundancy. Create freight movement emergency plans for disruptions at these locations that include information about possible alternative routes.

Action 11.1.1: Create an emergency transportation system map that includes alternative route identification as well as transportation modal alternative information. The map should be flexible enough to be used when single transportation components

are compromised or when entire portions of the system have suffered a disruption.

Action 11.1.2: Identify and track those places where disruptions would be most acutely felt. This includes those places where there are no, or few, parallel route options, so a disruption means a lack of connectivity. This also means places that tend to be subject to natural or weather-related disruptions including mountain passes, single-lane infrastructure, rail tracks that tend to be affected by heavy rains and snows, and inland waterway passages that are heavily influenced by water levels and drought.

Action 11.1.3: Create plans that facilitate the movement of goods on alternative routes.

The OFP is in compliance with and supportive of Goal 7, Areas Subject to Natural Disasters and Hazards.

8. **Recreational Needs** - The purpose of Goal 8 (OAR 660-015-0000(8)) is "To satisfy the recreational needs of the citizens of the state and visitors and, where appropriate, to provide for the siting of necessary recreational facilities including destination resorts." This goal calls for each community to evaluate its areas and facilities for recreation and develop plans to deal with the projected demand for them.

FINDING: The OFP does not address Goal 8, Recreational Needs.

9. **Economic Development** - The purpose of Goal 9 (OAR 660-015-0000(9)) is "To provide adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare, and prosperity of Oregon's citizens." This goal calls for diversification and improvement of the economy. Under this goal communities are required to inventory commercial and industrial lands, project future needs for such lands, and plan and zone enough land to meet those needs.

FINDING: The OFP includes several strategies and actions that recognize the importance of an efficient transportation system for helping Oregon businesses to more effectively compete in the world economy. This includes helping increase the public's understanding of freight's economic importance. Several of these policies and actions are as follows.

Action 1.1.1: Monitor and maintain freight systems identified in modal plans. Update modal plans to meet identified strategic needs and incorporate analysis of current economy and economic forecasts periodically.

Action 1.1.3: Develop performance measures and gather necessary data on an ongoing basis to support continued updating of identified freight routes as the Oregon's economy evolves and the state reacts to changing economic conditions.

Strategy 7.1: Work to better integrate freight into the land use planning process and to protect the existing supply of industrial (freight-dependent) land uses and freight terminals.

Strategy 15.1: Continue to create opportunities for positive interaction between freight industry representatives and community stakeholders, including long-range planning or other community planning activities.

The OFP is in compliance with and supportive of Goal 9, Economic Development.

10. **Housing** - The purpose of Goal 10 (OAR 660-015-0000(10)) is "To provide for the housing needs of citizens of the state." This goal specifies that each city inventory its buildable residential lands, project future needs for such lands, and plan and zone enough buildable land to meet those needs.

FINDING: The OFP does not address Goal 10, Housing.

11. **Public Facilities and Services** - Goal 11 calls for efficient planning of public services such as sewer, water, law enforcement and fire protection. The stated purpose of Goal 11 (OAR 660- 015-0000(11)) is "To plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development."

FINDING: The OFP does not include project proposals for public facilities and services as addressed in Goal 11. The OTP does, however, include a strategy for better integrating freight into the land use planning process. This could include integration with planning for public facilities and services.

Strategy 7.1: Support better integration of freight into the regional and local land use planning process. Encourage local governments to integrate industrial land use planning into comprehensive plans and all other plans and actions relating to land use controls.

The OFP is in compliance with and supportive of Goal 9, Economic Development.

12. **Transportation** - The purpose of Goal 12 (OAR 660-015-0000(12)) is "To provide a safe, convenient and economic transportation system."

FINDING: The OFP addresses the provision of a safe, convenient, and economic freight transportation system through a number of OFP strategies and actions. The OFP does not include project proposals for specific transportation improvements.

> *Administrative Rule 660-012, also known as the Transportation Planning Rule (TPR), implements Goal 12, Transportation. Much of the TPR applies to regional and local transportation planning, planning for transportation facilities, or planning for people movements. One of the purposes of the TPR is specifically freight related:*
>
> *(1)(d): Facilitate the safe, efficient and economic flow of freight and other goods and services within regions and throughout the state through a variety of modes including road, air, rail and marine transportation.*

The following discussion shows how the OFP addresses applicable sections of the TPR.

> *Section 660-012-0015 calls for the preparation and coordination of Transportation System Plans. This includes the preparation and coordination of a state Transportation System Plan (TSP). The OTP and statewide mode and topic plans comprise the statewide TSP. The Oregon Freight Plan is a multimodal topic plan that is an element of the state TSP.*
>
> *Section 660-012-0030 calls for determining transportation needs, including needs for movement of goods and services to support industrial and commercial development. Chapter 6 of the OFP addresses freight-related funding needs as developed for the 2006 OTP. The OFP also addresses needs in terms of freight demand, as discussed in Chapter 2.*

The OFP is in compliance with and supportive of Goal 12, Transportation, including applicable sections of the Transportation Planning Rule.

13. **Energy Conservation** - Goal 13 declares that "land and uses developed on the land shall be managed and controlled so as to maximize the conservation of all forms of energy, based upon sound economic principles." The purpose of Goal 13 (OAR 660-015- 0000(13)) is "To conserve energy."

FINDING: The OFP does not specifically address Goal 13. The OFP does, however, discuss reducing freight-related greenhouse gas (GHG) emissions and adverse climate change impacts, which may result in reduced energy consumption

for goods movement. The following OFP strategies and actions address GHG emissions and climate change impacts.

> *Strategy 8.1: Research strategies to reduce pollutants and greenhouse gas emissions from freight sources that are active within Oregon. Focus on strategies that have been implemented with success in regions that have similarities to Oregon.*
>
> *Action 8.1.1: Build on work completed in the OFP to research methods for emissions reduction. These methods can include behavioral changes, technology improvements or methods that increase the efficiency of freight supply chains.*
>
> *Action 8.1.2: Work in coordination with private sector freight stakeholders to identify the most cost-effective approaches to address climate change impacts from freight, in particular those strategies that also support and benefit shippers.*
>
> *Strategy 8.2: Consider climate change impacts in freight transportation planning activities.*
>
> *Action 8.2.1: Incorporate methods of considering greenhouse gas impacts in freight transportation planning and decision-making processes.*
>
> *Action 8.2.2: Support congestion relief and idling reduction activities such as weigh-in-motion technology and the provision of electricity at truck stops for parked trucks.*

The OFP is in compliance with and supportive of Goal 13, Energy Conservation.

14. **Urbanization** – *The purpose of Goal 14 (*OAR 660-015-0000(14)) is "To provide for an orderly and efficient transition from rural to urban land use, to accommodate urban population and urban employment inside urban growth boundaries, to ensure efficient use of land, and to provide for livable communities."

FINDING: The OFP does not address Goal 14, Urbanization.

15. **Willamette Greenway** - Goal 15 sets forth procedures for administering the 300 miles of greenway that protects the Willamette River. The purpose of Goal 15 (OAR 660-015-0005) is "To protect, conserve, enhance and maintain the natural, scenic, historical, agricultural, economic and recreational qualities of lands along the Willamette River as the Willamette River Greenway."

FINDING: The OFP does not address Goal 15, Willamette Greenway.

16. **Estuarine Resources** - The purpose of Goal 16 (OAR 660-016-0010(1)) is "To recognize and protect the unique environmental, economic, and social values of each estuary and associated wetlands; and to protect, maintain, where appropriate develop, and where appropriate restore the long-term environmental, economic, and social values, diversity and benefits of Oregon's estuaries."

    FINDING: The OFP does not address Goal 16, Estuarine Resources.

17. **Coastal Shorelands** - The purpose of Goal 17 (OAR 660-017-0010(2)) is "To conserve, protect, where appropriate, develop and where appropriate restore the resources and benefits of all coastal shorelands, recognizing their value for protection and maintenance of water quality, fish and wildlife habitat, water-dependent uses, economic resources and recreation and aesthetics. The management of these shoreland areas shall be compatible with the characteristics of the adjacent coastal waters; and to reduce the hazard to human life and property, and the adverse effects upon water quality and fish and wildlife habitat, resulting from the use and enjoyment of Oregon's coastal shorelands."

    FINDING: The OFP does not address Goal 17, Coastal Shorelands.

18. **Beaches and Dunes** - The purpose of Goal 18 (OAR 660-015-0010(3)) is "To conserve, protect, where appropriate develop, and where appropriate restore the resources and benefits of coastal beach and dune areas; and to reduce the hazard to human life and property from natural or man induced actions associated with these areas." Goal 18 sets planning standards for development on various types of dunes. It prohibits residential development on beaches and active foredunes, but allows other types of development if they meet key criteria.

    FINDING: The OFP does not address Goal 18, Beaches and Dunes.

19. **Ocean Resources** - The purpose of Goal 19 (OAR 660-015-0000(19)) is "To conserve marine resources and ecological functions for the purpose of providing long-term ecological, economic, and social value and benefits to future generations." It deals with matters such as dumping of dredge spoils and discharging of waste products into the open sea.

    FINDING: The OFP does not address Goal 19, Ocean Resources.

C.12 Conclusion

Based on the findings in this appendix, the Oregon Freight Plan complies with the applicable statewide planning goals.

Appendix D – Public Involvement Process

D.1 Outreach Strategy Goal

The Oregon Freight Plan Outreach Strategy has four primary purposes. First, to share the draft Oregon Freight Plan (OFP) with stakeholders and citizens in order to gain their ideas, concerns and comments and incorporate, as appropriate. Second, to coordinate plan elements with federal, state and local government partners. Third, to document compliance with federal and state public involvement requirements. Fourth, to publicize plan contents and information about the value of freight operations, services and infrastructure to Oregon businesses and citizens.

D.2 Outreach Strategy Timetable

Timeline	Outreach Activity
Nov. 2010	Create stakeholder communication loops through electronic media
Nov. 2010	Prepare public meeting materials—executive summary, freight fact sheets, visual displays, and power point presentation
Nov.-Dec. 2010	Organize two public meetings in each ODOT region coordinating with Metropolitan Planning Organizations and Area Commissions on Transportation; Craft multiple avenues to receive comments
Dec. 2010	Update Freight Plan website—post draft Oregon Freight Plan (OFP) upon Oregon Transportation Commission approval; use multiple social media avenues to point people to the draft plan on the website
Dec. 2010-Feb. 2011	Communicate with stakeholders and the public through electronic media
Dec. 2010	Send hard copy of plan by mail to stakeholders that do not have reliable access to computer service
Dec. 2010 – Feb. 2011	Media news releases- Work with statewide, local and foreign language media outlets to announce availability of draft Oregon Freight Plan for comment and to advertise public meetings
Jan. – Feb. 2011	Conduct public meetings in coordination with Metropolitan Planning Organizations (MPOs), Area Commissions on Transportation (ACTs), and local officials
Jan. – May 2011	Perform interagency consultation and coordination
Feb. - April 2011	ODOT staff and consultants review and respond to public comments; Share comments and responses with Freight Plan Steering Committee; Develop recommendations to revise Freight Plan based on comments
May 2011	Submit comment summaries, responses and plan revision recommendations to the Oregon Transportation Commission
June 2011	Oregon Transportation Commission action to adopt Oregon Freight Plan
July 2011	Implement Oregon Freight Plan
Summer/Fall 2016	Prepare and distribute informational materials regarding amendment to Oregon Freight Advisory Committee (OFAC), MPOs, ACTs and other stakeholders through electronic media and briefings
Winter/Spring 2017	Hold meetings with MPOs, Working Group and OFAC to obtain input on amendment.
July 2017	Oregon Transportation Commission briefing on amendment
July-Sept. 2017	Public Comment Period on amendment, including public hearing at September Oregon Transportation

Timeline	Outreach Activity
	Commission meeting
Sept.-Oct. 2017	ODOT staff and consultants review and respond to public comments, share comments and responses with OFAC; develop recommendations to revise amendment based on comments
Nov. 2017	Oregon Transportation Commission action to adopt Oregon Freight Plan amendment

D.3 Outreach Authorities, Policies and Requirements

The Oregon Freight Plan is a topic plan under the statewide Oregon Transportation Plan that must be developed in accordance with state and federal laws, administrative rules, Oregon Transportation Commission policies and Oregon Department of Transportation (ODOT) guidance. Below is a brief description of public involvement policies and regulations followed during development of the Oregon Freight Plan.

Under ODOT policies (Oregon Transportation Plan, Public Involvement and Consultation – Policy 7.3 and Public Involvement Policy, Oregon Transportation Commission-11), the Department must develop statewide transportation plans in consultation and cooperation with affected state and federal agencies, local jurisdictions, transportation system owners, advisory committees and other stakeholders. These policies further call for holding at least two public meetings in each of ODOT's five regions, providing a minimum of 45 days for public comment, and compels the Oregon Transportation Commission to consider and respond to written comments prior to plan adoption.

The *Oregon Transportation Planning Rule (OAR 660-012)* links the Oregon Freight Plan as a component of transportation system plans that identify a network of facilities and services to meet overall transportation needs. In turn, transportation system plans must be compatible with acknowledged local comprehensive plans. Further, under the rule governing *Coordination Procedures for Adopting the Final Modal System Plan* (*OAR 731-015-055),* an evaluation and findings of compliance with applicable statewide planning goals is required. Finally, federal *Title IV* requirements to evaluate the plan's impact on and proactively seek involvement from minority, disadvantaged and low income groups as well as *SAFETEA-LU engagement requirements* must be documented. The ODOT Freight Mobility Unit relied upon guidance provided in the *Public Involvement Policy Resources Handbook for Statewide Planning and STIP Development, ODOT Planning Section, August 2009* in performing outreach activities.

D.4 Outreach Activity Framework

- Post draft Oregon Freight Plan on ODOT Freight Plan website
- Notify stakeholders of draft Oregon Freight Plan availability; publicize comment process
- Use ODOT Freight Plan website, electronic media and news releases—including foreign language media outlets—to advertise public meetings and encourage public comment
- Hold at least two meetings in each ODOT region in consultation with Metropolitan Planning Organizations, Area Commissions on Transportation and local officials

- Confirm public meeting rooms are ADA accessible; Offer interpreters at public meetings upon advance request
- Record and respond to each comment received; Review comments and responses with Freight Plan Steering Committee; Recommend plan revisions, as appropriate
- Perform internal ODOT consistency review with the Oregon Transportation Plan
- Work with DLCD to evaluate and write draft findings of compliance with Statewide Planning Goals
- Retain public meeting sign-in sheets and cards designed to document compliance with federal Title IV and SAFETEA-LU requirements
- Report compliance with state and federal regulations
- Implement Oregon Freight Plan upon final OTC adoption
- Amend and update, as necessary

Appendix E – Glossary of Freight Transportation Terms

The definitions below are intended to provide clarification on freight-specific terms used throughout the Oregon Freight Plan (OFP). Many of the definitions used here were taken from the FHWA.[1]

Barge – The cargo-carrying vehicle that inland water carriers primarily use. Basic barges have open tops, but there are covered barges for both dry and liquid cargoes.

Bottleneck – A section of a highway or rail network that experiences operational problems such as congestion. Bottlenecks may result from factors such as reduced roadway width or steep freeway grades that can slow trucks.

Bulk shipments – Cargo that is unbound as loaded; it is without count in a loose unpackaged form. Examples of bulk cargo include coal, grain, and petroleum products.

Capacity – The physical facilities, personnel and process available to meet the product of service needs of the customers. Capacity generally refers to the maximum output or producing ability of a machine, a person, a process, a factory, a product, or a service.

Cargo-oriented development (COD) – The development of manufacturing and distribution businesses in select locations that benefit from access to multiple types of freight transportation, proximity to complimentary businesses, and a large local industrial workforce.

Carrier – An organization engaged in transporting goods for hire.

Class I railroad – A large freight railroad company having annual carrier operating revenues of $250 million or more.

Class II railroad – A (regional) mid-sized freight-hauling railroad having annual carrier operating revenues between $20 million and $250 million.

Class III railroad – A (local or shortline) small-scale freight hauling railroad with an annual operating revenue of less than $20 million.

Commodity – An Item that is traded in commerce. The term usually implies an undifferentiated product competing primarily on price and availability.

Commodity flow – the movement of commodities within a region or between regions.

Container – A "box"' typically ten to forty feet long, which is used primarily for ocean freight shipment. For travel to and from ports, containers are loaded onto truck chassis' or on railroad flatcars.

[1] FHWA website: https://ops.fhwa.dot.gov/freight/fpd/glossary/index.htm#u

Critical Rural Freight Corridors (CRFCs) – These are public roads not in an urbanized area that provide access and connection to the PHFS and the interstate with other important ports, public transportation facilities, or other intermodal freight facilities.

Critical Urban Freight Corridors (CUFCs) – These are public roads in urbanized areas (more than 50,000 population), which provide access and connection to the PHFS and the interstate with other ports, public transportation facilities, or other intermodal transportation facilities.

Distribution center (DC) – The warehouse facility that holds inventory from manufacturing pending distribution to the appropriate stores.

Dock – A space used or receiving merchandise at a freight terminal.

Drayage – Transporting of rail or ocean freight by truck to an intermediate or final destination; typically a charge for pickup/delivery of goods moving short distances (e.g., from marine terminal to warehouse).

Durables – Generally, any goods whose continuous serviceability is likely to exceed three years.

Freight Highway Bottlenecks Project (FHBP) – Initiated by ODOT to identify locations on Oregon's highway network that were experiencing significant freight truck delay, unreliability and increased transportation costs.

Freight movements – The transportation of goods between particular locations.

GSP – Gross State Product, a measure of the value added to products and services by all businesses within the state

GPS – Global Positioning System, is a radio navigation system that allows land, sea, and airborne users to determine their exact location, velocity, and time 24 hours a day, in all weather conditions, anywhere in the world.

Highway Over-dimensional Load Pinch Points Study (HOLPP Study) – A study developed by ODOT to identify highway "pinch points" or facilities that restrict movement of over-dimensional (OD) loads due to height, length, width, or weight constraints.

Hub – A common connection point for devices in a network. Referenced for a transportation network as in "hub and spoke" which is common in the airline and trucking industry.

Intermodal – Transferring from mode to another or between two modes.

Intermodal connectors – The links that facilitate transfers between modes, such as local roads between a designated freight route and a port or rail reload facility.

Intermodal terminal – A location where links between different transportation modes and networks connect. Using more than one mode of transportation in moving persons and goods. For example, a shipment moved over 1,000 miles could travel by truck for one portion of the trip, and then transfer to rail at a designated terminal.

Inventory – The number of units and/or value of the stock of good a company holds.

Just-in-Time (JIT) – Cargo or components that must be at a destination at the exact time needed. The container or vehicle is the movable warehouse.

Last Mile (Connectors) – The local streets that connect a designated freight route with a freight generating or receiving facility.

Line haul – The movement of freight over the road/rail from origin terminal to destination terminal, usually over long distances.

Lock – A channel where the water rises and falls to allow boats to travel a dammed river.

Logistics – All activities involved in the management of product movement; delivering the right product from the right origin to the right destination, with the right quality and quantity, at the right schedule and price.

Multimodal trip – Employing various modes of transport within a single trip.

National Freight Strategic Plan (NFSP) – Established by the U.S. Department of Transportation under MAP-21 requirements, the intent of the NFSP is to describe the existing U.S. freight transportation system and future demands on it, identify major corridors and gateways, assess barriers to improving the system, and specify best practices for enhancing it.

National Highway Freight Network (NHFN) – Established by the U.S. Department of Transportation under MAP-21 requirements, the NHFN comprises four subsystems of roadways intended to help states strategically direct resources toward improving performance of highway portions of the U.S. freight transportation system: the PHFS, portions of the interstate system not part of the PHFS, CRFCs and CUFCs.

National Highway Freight Program (NHFP) – Established by the FAST Act, the NHFP provides $6.3 billion in formula funds over five years for states to invest in freight projects on the NHFN.

National Multimodal Freight Network (NMFN) – Building upon the NHFN created by MAP-21, the FAST Act required the creation of an interim and final NMFN to bring greater focus on multimodal freight planning for the U.S.

National Multimodal Freight Policy (NMFP) – Established by the FAST Act, the NMFP sets national goals to guide decision-making to ensure the safe, efficient and reliable movement of freight in the U.S.

North American Industry Classification System (NAICS) – standard used by Federal statistical agencies in classifying business establishments.

Node – A fixed point in a firm's logistics system where goods come to rest; includes plants, warehouses, supply sources, and markets.

Nondivisible load – A load which is unable to be divided into smaller parts- like a piece of equipment or a steel beam.

Oregon Freight Plan (OFP) – Developed in parallel with MAP-21 and adopted in 2011 as an element of the Oregon Transportation Plan, the OFP is a resource designed to guide freight-related operation, maintenance and investment decisions.

Oregon Freight Advisory Committee (OFAC) – Formalized in 2001 through the passage of House Bill 3364 (now ORS 366.212), the OFAC advises the director of the Oregon Department of Transportation and the Oregon Transportation Commission on issues, policies and programs that impact multimodal freight mobility in the state.

Oregon Freight Intermodal Connector System (OFICS) Study– Identified additional freight intermodal connectors in the state besides the existing designated National Highway System freight intermodal connectors.

On-dock rail – Direct shipside rail service. Includes the ability to load and unload containers/breakbulk directly from rail car to vessel.

Primary Highway Freight System (PHFS) –The network of highways identified as the most critical highway portions of the U.S. freight transportation system determined by measurable and objective national data. The network consists of 41,518 centerlines miles, including 37,436 centerline miles of interstate and 4,082 centerline miles of non-interstate roads.

Rail carload – Quantity of freight (in tons) required to fill a railcar; amount normally required to qualify for a carload rate.

Rail mainline – The principal artery of a railway system.

Reliability – Refers to the degree of certainty and predictability in travel times on the transportation system. Reliable transportation systems offer some assurance of attaining a given destination within a reasonable range of an expected time. An unreliable transportation system is subject to unexpected delays, increasing costs for system users.

Shipper – An entity that prepares goods for shipment, by packaging, labeling, and arranging for transit, or who coordinates the transport of goods.

Short-sea shipping – Also known as coastal or coastwise shipping, describes marine shipping operations between ports along a single coast or involving a short sea crossing.

Shunting – Sorting rail cars into complete train sets.

State Highway Freight System – Freight system designated by the Oregon Highway Plan to facilitate efficient and reliable interstate, intrastate and regional truck movement. This system comprises interstate highways and certain statewide, regional and district highways, and includes routes that carry significant tonnage of freight by truck and serve as the primary interstate and intrastate highway freight connection to ports, intermodal terminals, and urban areas.

Supply Chain – Starting with unprocessed raw materials and ending with final customer using the finished goods.

Throughput – Total amount of freight imported or exported through a seaport measured in tons or TEUs.

"Through" tonnage – The amount (by weight) of goods transported that have neither an origin nor a destination within the state or region.

Ton-mile – A measure of output for freight transportation; reflects weight of shipment and the distance it is hauled; a multiplication of tons hauled by the distance traveled.

Transit time – The total time that elapses between a shipment's delivery and pickup.

Transloading - Transferring bulk shipments from the vehicle/container of one mode to that of another at a terminal interchange point.

Truck Travel Time Reliability Index (TTTR Index) – National performance measure established by the U.S. Department of Transportation to assess freight movement on interstate highways.

Truckload (TL) – Quantity of freight required to fill a truck, or at a minimum, the amount required to qualify for a truckload rate.

Rail unit trains – A train of a specified number of railcars handling a single commodity type which remain as a unit for a designated destination or until a change in routing is made.

Vehicle Miles Traveled (VMT) – A measurement of miles traveled by vehicles within a specified region for a specified time period..

Warehouse – Storage place for commodities. Principal warehouse activities include receipt of commodity, storage, shipment and order picking.

Winglets – Blade tip devices attached to the back doors of tractor-trailers that reduce drag, and improve fuel efficiency of heavy trucks in this context.

Appendix F – Commodity to NAICS Bridge

The table below is meant to highlight the commodities[1] used in production by certain industries, the volume results of which are presented in OFP Figure 3.1.

Table 9-3. Commodity to NAICS Table

Commodity	NAICS Industry Code (Manufacturing in NAICS3, Others in NAICS2)	Percent Distribution
Farm products	Agriculture, Forestry, Fishing (11)	79.8%
	Food Manufacturing (311)	17.9%
	Beverage and Tobacco Product Manufacturing (312)	0.2%
	Textile Mills (313)	1.7%
	Chemical manufacturing (325)	0.4%
Forest Products	Agriculture, Forestry, Fishing (11)	20.8%
	Textile Mills (313)	20.8%
	Chemical manufacturing (325)	58.3%
Fresh Fish	Agriculture, Forestry, Fishing (11)	100.0%
Metallic Ores	Mining, Quarrying, and Oil and Gas Extraction (211 & 212)	79.2%
	Nonmetallic Mineral Product Manufacturing (327)	1.4%
	Primary Metal Manufacturing (331)	19.4%
Coal	Mining, Quarrying, and Oil and Gas Extraction (211 & 212)	85.7%
	Petroleum and Coal Products Manufacturing (324)	14.3%
Crude Petroleum, Natural Gas	Mining, Quarrying, and Oil and Gas Extraction (211 & 212)	8.8%
	Petroleum and Coal Products Manufacturing (324)	91.2%
Nonmetallic Ores, Minerals	Mining, Quarrying, and Oil and Gas Extraction (211 & 212)	66.7%
	Beverage and Tobacco Product Manufacturing (312)	2.0%
	Chemical manufacturing (325)	7.1%
	Nonmetallic Mineral Product Manufacturing (327)	2.0%
	Primary Metal Manufacturing (331)	1.0%
	Fabricated Metal Product Manufacturing (332)	9.1%
	Computer and Electronic Product Manufacturing (334)	5.1%
	Miscellaneous Manufacturing (339)	7.1%
Ordnance or Accessories	Fabricated Metal Product Manufacturing (332)	79.5%
	Machinery Manufacturing (333)	11.5%
	Computer and Electronic Product Manufacturing (334)	1.3%
	Transportation Equipment Manufacturing (336)	7.7%
Food and Kindred Products	Agriculture, Forestry, Fishing (11)	14.6%
	Food Manufacturing (311)	76.6%
	Beverage and Tobacco Product Manufacturing (312)	4.8%
	Textile Mills (313)	0.2%
	Chemical manufacturing (325)	3.9%
Tobacco Products	Beverage and Tobacco Product Manufacturing (312)	100.0%

[1] Commodities are classified according to the Standard Transportation Commodity Code.

Commodity	NAICS Industry Code (Manufacturing in NAICS3, Others in NAICS2)	Percent Distribution
Textile Mill Products	Agriculture, Forestry, Fishing (11)	0.5%
	Textile Mills (313)	67.5%
	Textile Product Mills (314)	17.4%
	Paper Manufacturing (322)	2.6%
	Chemical manufacturing (325)	6.3%
	Plastics and Rubber Products Manufacturing (326)	5.0%
	Machinery Manufacturing (333)	0.2%
	Furniture and Related Product Manufacturing (337)	0.5%
Apparel/Finished Textile Products	Textile Mills (313)	3.5%
	Textile Product Mills (314)	1.4%
	Apparel Manufacturing (315)	62.3%
	Leather and Allied Product Manufacturing (316)	6.3%
	Wood Product Manufacturing (321)	0.4%
	Paper Manufacturing (322)	4.2%
	Plastics and Rubber Products Manufacturing (326)	1.8%
	Fabricated Metal Product Manufacturing (332)	3.9%
	Machinery Manufacturing (333)	4.9%
	Transportation Equipment Manufacturing (336)	7.4%
	Miscellaneous Manufacturing (339)	3.9%
Lumber or Wood Products	Agriculture, Forestry, Fishing (11)	15.3%
	Textile Product Mills (314)	0.4%
	Wood Product Manufacturing (321)	66.0%
	Chemical manufacturing (325)	0.4%
	Fabricated Metal Product Manufacturing (332)	1.5%
	Computer and Electronic Product Manufacturing (334)	4.2%
	Furniture and Related Product Manufacturing (337)	12.2%
Furniture or Fixtures	Apparel Manufacturing (315)	1.0%
	Leather and Allied Product Manufacturing (316)	2.0%
	Plastics and Rubber Products Manufacturing (326)	29.6%
	Nonmetallic Mineral Product Manufacturing (327)	4.1%
	Fabricated Metal Product Manufacturing (332)	1.0%
	Computer and Electronic Product Manufacturing (334)	28.6%
	Transportation Equipment Manufacturing (336)	22.4%
	Furniture and Related Product Manufacturing (337)	1.0%
	Miscellaneous Manufacturing (339)	10.2%
Pulp, Paper or Allied Products	Leather and Allied Product Manufacturing (316)	1.3%
	Paper Manufacturing (322)	60.5%
	Printing and Related Support Activities (323)	8.4%
	Petroleum and Coal Products Manufacturing (324)	1.3%
	Chemical manufacturing (325)	8.4%
	Plastics and Rubber Products Manufacturing (326)	2.1%
	Nonmetallic Mineral Product Manufacturing (327)	7.1%
	Computer and Electronic Product Manufacturing (334)	5.5%
	Transportation Equipment Manufacturing (336)	1.7%
	Miscellaneous Manufacturing (339)	3.4%
	Publishing Industries (except internet) (511)	0.4%

Commodity	NAICS Industry Code (Manufacturing in NAICS3, Others in NAICS2)	Percent Distribution
Printed matter	Printing and Related Support Activities (323)	7.0%
	Chemical manufacturing (325)	51.2%
	Machinery Manufacturing (333)	20.9%
	Transportation Equipment Manufacturing (336)	1.2%
	Publishing Industries (except internet) (511)	19.8%
Chemicals or Allied Products	Mining, Quarrying, and Oil and Gas Extraction (211 & 212)	25.6%
	Food Manufacturing (311)	4.8%
	Leather and Allied Product Manufacturing (316)	0.1%
	Paper Manufacturing (322)	0.7%
	Petroleum and Coal Products Manufacturing (324)	2.3%
	Chemical manufacturing (325)	61.1%
	Nonmetallic Mineral Product Manufacturing (327)	1.8%
	Primary Metal Manufacturing (331)	0.6%
	Electrical Equipment, Appliance, and Component Manufacturing (335)	2.8%
	Miscellaneous Manufacturing (339)	0.1%
Petroleum, natural gas and other petroleum-based products	Mining, Quarrying, and Oil and Gas Extraction (211 & 212)	4.2%
	Paper Manufacturing (322)	29.2%
	Petroleum and Coal Products Manufacturing (324)	25.0%
	Chemical manufacturing (325)	31.3%
	Nonmetallic Mineral Product Manufacturing (327)	10.4%
Rubber/Plastics Products	Food Manufacturing (311)	0.4%
	Textile Mills (313)	8.3%
	Leather and Allied Product Manufacturing (316)	21.4%
	Paper Manufacturing (322)	0.7%
	Plastics and Rubber Products Manufacturing (326)	20.3%
	Machinery Manufacturing (333)	14.1%
	Computer and Electronic Product Manufacturing (334)	22.8%
	Electrical Equipment, Appliance, and Component Manufacturing (335)	10.5%
	Transportation Equipment Manufacturing (336)	0.7%
	Miscellaneous Manufacturing (339)	0.7%
Leather or Leather Products	Leather and Allied Product Manufacturing (316)	100.0%
Clay, Concrete, Glass, Stone	Mining, Quarrying, and Oil and Gas Extraction (211 & 212)	4.0%
	Textile Mills (313)	1.8%
	Textile Product Mills (314)	0.4%
	Nonmetallic Mineral Product Manufacturing (327)	65.2%
	Fabricated Metal Product Manufacturing (332)	2.6%
	Machinery Manufacturing (333)	13.7%
	Computer and Electronic Product Manufacturing (334)	8.8%
	Electrical Equipment, Appliance, and Component Manufacturing (335)	3.1%
	Miscellaneous Manufacturing (339)	0.4%

Commodity	NAICS Industry Code (Manufacturing in NAICS3, Others in NAICS2)	Percent Distribution
Primary Metal Products	Paper Manufacturing (322)	0.7%
	Petroleum and Coal Products Manufacturing (324)	34.5%
	Primary Metal Manufacturing (331)	36.7%
	Fabricated Metal Product Manufacturing (332)	20.3%
	Machinery Manufacturing (333)	6.8%
	Computer and Electronic Product Manufacturing (334)	0.2%
	Electrical Equipment, Appliance, and Component Manufacturing (335)	0.2%
	Transportation Equipment Manufacturing (336)	0.7%
Fabricated Metal Products	Textile Product Mills (314)	1.0%
	Printing and Related Support Activities (323)	0.4%
	Nonmetallic Mineral Product Manufacturing (327)	0.2%
	Primary Metal Manufacturing (331)	1.6%
	Fabricated Metal Product Manufacturing (332)	60.1%
	Machinery Manufacturing (333)	27.9%
	Computer and Electronic Product Manufacturing (334)	5.3%
	Electrical Equipment, Appliance, and Component Manufacturing (335)	1.4%
	Transportation Equipment Manufacturing (336)	0.8%
	Furniture and Related Product Manufacturing (337)	0.8%
	Miscellaneous Manufacturing (339)	0.4%
Non-electrical Machinery	Textile Product Mills (314)	6.7%
	Leather and Allied Product Manufacturing (316)	0.1%
	Paper Manufacturing (322)	0.3%
	Chemical manufacturing (325)	0.9%
	Primary Metal Manufacturing (331)	0.6%
	Fabricated Metal Product Manufacturing (332)	11.4%
	Machinery Manufacturing (333)	55.3%
	Computer and Electronic Product Manufacturing (334)	14.6%
	Electrical Equipment, Appliance, and Component Manufacturing (335)	2.5%
	Transportation Equipment Manufacturing (336)	6.9%
	Furniture and Related Product Manufacturing (337)	0.1%
	Miscellaneous Manufacturing (339)	0.6%
Electrical Machinery	Leather and Allied Product Manufacturing (316)	0.5%
	Printing and Related Support Activities (323)	0.3%
	Chemical manufacturing (325)	0.3%
	Nonmetallic Mineral Product Manufacturing (327)	0.3%
	Fabricated Metal Product Manufacturing (332)	0.8%
	Machinery Manufacturing (333)	7.7%
	Computer and Electronic Product Manufacturing (334)	48.1%
	Electrical Equipment, Appliance, and Component Manufacturing (335)	39.8%
	Transportation Equipment Manufacturing (336)	2.2%
Transportation Equipment	Textile Mills (313)	1.4%
	Wood Product Manufacturing (321)	0.7%
	Paper Manufacturing (322)	0.7%
	Fabricated Metal Product Manufacturing (332)	4.3%
	Machinery Manufacturing (333)	2.8%
	Computer and Electronic Product Manufacturing (334)	0.7%
	Transportation Equipment Manufacturing (336)	89.4%

Commodity	NAICS Industry Code (Manufacturing in NAICS3, Others in NAICS2)	Percent Distribution
Precision instruments	Paper Manufacturing (322)	8.1%
	Chemical manufacturing (325)	27.3%
	Primary Metal Manufacturing (331)	1.0%
	Fabricated Metal Product Manufacturing (332)	17.2%
	Machinery Manufacturing (333)	10.1%
	Computer and Electronic Product Manufacturing (334)	21.2%
	Electrical Equipment, Appliance, and Component Manufacturing (335)	1.0%
	Furniture and Related Product Manufacturing (337)	1.0%
	Miscellaneous Manufacturing (339)	13.1%
Misc. Manufactured Products	Textile Product Mills (314)	0.6%
	Leather and Allied Product Manufacturing (316)	24.5%
	Wood Product Manufacturing (321)	0.6%
	Paper Manufacturing (322)	3.2%
	Chemical manufacturing (325)	1.9%
	Plastics and Rubber Products Manufacturing (326)	1.9%
	Nonmetallic Mineral Product Manufacturing (327)	0.6%
	Fabricated Metal Product Manufacturing (332)	1.9%
	Machinery Manufacturing (333)	11.6%
	Furniture and Related Product Manufacturing (337)	0.6%
	Miscellaneous Manufacturing (339)	52.3%
Waste/Scrap Materials	Agriculture, Forestry, Fishing (11)	8.3%
	Textile Mills (313)	22.2%
	Petroleum and Coal Products Manufacturing (324)	5.6%
	Chemical manufacturing (325)	11.1%
	Nonmetallic Mineral Product Manufacturing (327)	25.0%
	Primary Metal Manufacturing (331)	19.4%
	Machinery Manufacturing (333)	8.3%
Miscellaneous Freight Shipments		
	Textile Product Mills (314)	8.1%
	Fabricated Metal Product Manufacturing (332)	1.0%
	Machinery Manufacturing (333)	90.9%

Appendix G – Oregon Plan Implementation Support for Federal Freight Goals

National Multimodal Freight Policy Goals 49 USC 70101	OFP strategy and action that satisfies	National Highway Freight Program Goals 23 USC 167	OFP strategy and action that satisfies
1. To identify infrastructure improvements, policies, and operational innovations that: a) Strengthen the contribution of the National Multimodal Freight Network to the economic competitiveness of the United States; b) Reduce congestion and eliminate bottlenecks on the National Multimodal Freight Network; and c) Increase productivity, particularly for domestic industries and businesses that create high-value jobs	Action 1.1.1 Action 1.1.2 Action 1.1.3 Action 1.3.2 Action 2.1.1 Action 2.2.1 Action 2.3.1 Action 2.4.1 Action 2.5.2 Action 4.1.2 Action 5.1.2 Action 8.2.2 Action 11.1.3 Action 12.3.1 Strategy 2.3	1. To invest in infrastructure improvements and to implement operational improvements on the highways of the United States that: a) Strengthen the contribution of the National Highway Freight Network to the economic competitiveness of the United States; b) Reduce congestion and bottlenecks on the National Highway Freight Network; c) Reduce the cost of freight transportation; d) Improve the year-round reliability of freight transportation; and e) Increase productivity, particularly for domestic industries and businesses that create high-value jobs	Action 1.1.1 Action 1.1.2 Action 1.1.3 Action 1.3.2 Action 2.1.1 Action 2.2.1 Action 2.3.1 Action 2.4.1 Action 2.5.2 Action 4.1.2 Action 5.1.2 Action 8.2.2 Action 11.1.3 Action 12.3.1 Strategy 2.3
2. To improve the safety, security, efficiency, and resiliency of multimodal freight transportation	Action 2.1.1 Action 5.2.1 Action 6.1.1 Action 6.1.2 Action 6.2.1 Action 11.1.1 Strategy 6.1 Strategy 11.1 Strategy 11.3	2. To improve the safety, security, efficiency, and resiliency of freight transportation in rural and urban areas	Action 2.1.1 Action 5.2.1 Action 6.1.1 Action 6.1.2 Action 6.2.1 Action 11.1.1 Strategy 6.1 Strategy 11.1 Strategy 11.3
3. To achieve and maintain a state of good repair on the National Multimodal Freight Network	Action 1.2.1 Action 2.1.1 Action 5.2.1 Action 6.1.1 Action 7.1.2 Action 12.3.1 Strategy 1.2 Strategy 5.1 Strategy 5.2	3. To improve the state of good repair of the National Highway Freight Network	Action 1.2.1 Action 2.1.1 Action 5.2.1 Action 6.1.1 Action 7.1.2 Action 12.3.1 Strategy 1.2 Strategy 5.1 Strategy 5.2
4. To use innovation and advanced technology to improve the safety, efficiency, and reliability of the National Multimodal Freight Network	Action 6.1.3 Action 8.2.2 Strategy 2.5	4. To use innovation and advanced technology to improve the safety, efficiency, and reliability of the National Highway Freight Network	Action 6.1.3 Action 8.2.2 Strategy 2.5

National Multimodal Freight Policy Goals 49 USC 70101	OFP strategy and action that satisfies	National Highway Freight Program Goals 23 USC 167	OFP strategy and action that satisfies
5. To improve the economic efficiency and productivity of the National Multimodal Freight Network	Action 1.1.1 Action 1.1.2 Action 1.1.3 Action 1.3.2 Action 2.1.1 Action 2.4.1 Action 2.5.2 Action 4.1.2 Action 5.1.1 Action 5.1.2 Action 12.3.1 Strategy 5.3	5. To improve the efficiency and productivity of the National Highway Freight Network	Action 1.1.1 Action 1.1.2 Action 1.1.3 Action 1.3.2 Action 2.1.1 Action 2.4.1 Action 2.5.2 Action 4.1.2 Action 5.1.1 Action 5.1.2 Action 12.3.1 Strategy 5.3
6. To improve the reliability of freight transportation	Action 2.1.1		
7. To improve the short- and long-distance movement of goods that- a) Travel across rural areas between population centers; b) Travel between rural areas and population centers; and c) Travel from the Nation's ports, airports, and gateways to the National Multimodal Freight Network	Action 1.1.1 Action 1.1.2 Action 1.1.3 Action 2.5.2 Action 3.1.1 Action 3.2.2 Action 3.2.3 Action 3.3.1 Action 5.2.1 Action 5.3.1 Action 6.1.4 Action 7.1.2 Action 11.1.3 Action 12.3.1 Strategy 3.1		
8. To improve the flexibility of States to support multi-State corridor planning and the creation of multi-State organizations to increase the ability of States to address multimodal freight connectivity	Action 3.2.1 Action 3.2.2 Action 4.1.1 Action 4.1.2 Action 14.2.1 Strategy 2.4 Strategy 3.3 Strategy 4.1	6. To improve the flexibility of States to support multi-State corridor planning and the creation of multi-state organizations to increase the ability of States to address highway freight connectivity	Action 4.1.1 Action 4.1.2 Action 14.2.1 Strategy 2.4 Strategy 4.1
9. To reduce the adverse environmental impacts of freight movement on the National Multimodal Freight Network	Action 2.5.4 Action 2.6.1 Action 4.1.2 Action 6.1.4 Action 8.1.1 Action 8.1.2 Action 8.2.1 Strategy 2.6 Strategy 8.1 Strategy 8.2	7. To reduce the environmental impacts of freight movement on the National Highway Freight Network	Action 2.5.4 Action 2.6.1 Action 4.1.2 Action 6.1.4 Action 8.1.1 Action 8.1.2 Action 8.2.1 Strategy 2.6 Strategy 8.1 Strategy 8.2

National Multimodal Freight Policy Goals 49 USC 70101	OFP strategy and action that satisfies	National Highway Freight Program Goals 23 USC 167	OFP strategy and action that satisfies
10. To pursue the goals described in this subsection in a manner that is not burdensome to State and local governments	Action 1.3.1 Action 1.3.2 Action 2.3.1 Action 2.5.4 Action 3.2.1 Action 3.2.2 Action 3.2.3 Action 3.3.1		

Appendix H – Critical Freight Corridors

Table 9-4. Critical Rural Freight Corridors

State	Route[1]	Start Point	End Point	Length (Miles)	Description of Importance (Other Comments)
OR	U.S. 97	84.00	84.50	0.50	Guardrail too close to travel lane with frequent strikes by trucks.
OR	U.S. 97	118.25	118.75	0.50	Trans-shipment facility located 1/2 mile east of U.S. 97 on O'Neil Highway. O'Neil Highway Junction with U.S. 97 has exceeded statewide average crash rates. The 2015 crash rate was two times the statewide average. A closer review of the crash data suggested that it is concentrated at the intersection of U.S. 97 and O'Neil Highway. Side street approaches must wait for gaps in highway traffic. The volume-to-capacity ratio was over 1.0, which is significantly above the 0.70 to 0.75 standard for this area and causes delay to freight movement.
OR	U.S. 97	124.40	133.39	8.99	During the 10 years between 2009 and 2013, 12 serious injury and fatal crashes occurred on U.S. 97 between Bend and Redmond. Many of these were lane departure crashes, sometimes resulting in high-speed head on collisions. In addition, there are a number of driveways on U.S. 97 between Bend and Redmond, and as traffic volumes grow, there are fewer gaps in traffic to facilitate motorists entering and exiting the highway at driveways. These conflicting movements can result in crashes, and probably are responsible for the many of the 25 rear end crashes reported between 2009 and 2013. Significant delay to freight and passenger vehicles associated with crashes.
OR	U.S. 97	155.00	156.00	1.00	Highway U.S. 97 is the main north-south transportation corridor through Central Oregon and a critical part of the state's transportation system. Demand continues to increase along U.S. 97, with average traffic rates of over 12,000 vehicles per day. Safety is a concern due to limited passing opportunities, leading to lengthy following times that sometimes result in drivers making passing maneuvers with high speeds and limited sight distances.
OR	U.S. 97	173.70	172.70	1.00	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement. Widen roadway to extend existing passing lanes from 1 mile to 2 miles.
OR	U.S. 97	192.20	193.20	1.00	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement. Widen roadway to extend existing passing lanes from 1 mile to 2 miles.

[1] Routes without mile start and end points in this table are intermodal connectors

State	Route[1]	Start Point	End Point	Length (Miles)	Description of Importance (Other Comments)
OR	U.S. 97	200.40	199.30	1.10	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement. Widen roadway to extend existing passing lanes from 1 mile to 2 miles.
OR	U.S. 97	211.10	212.10	1.00	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement. Widen roadway to extend existing passing lanes from 1 mile to 2 miles.
OR	U.S. 97	220.90	221.90	1.00	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement. Widen roadway to extend existing passing lanes from 1 mile to 2 miles.
OR	U.S. 97	237.00	239.00	2.00	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement. Widen roadway to extend existing passing lanes from 1 mile to 2 miles.
OR	U.S. 97	244.20	244.70	0.50	Wide/Long
OR	U.S. 97	256.50	255.40	1.10	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement. Widen roadway to extend existing passing lanes from 1 mile to 2 miles.
OR	U.S. 97	259.32	262.77	3.45	Rockfall location above the highway
OR	U.S. 97	264.00	266.91	2.91	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement. Widen roadway to extend existing passing lanes from 1 mile to 2 miles. Rockfall location above highway at south end of segment.
OR	U.S. 97	272.69	272.89	0.20	Vertical Clearance
OR	U.S. 97	280.40	281.80	1.40	Wide/Long
OR	U.S. 730	168.20	168.30	0.10	Wide/Long
OR	U.S. 730	184.77	184.97	0.20	Wide/Long
OR	U.S. 730	197.65	198.10	0.45	Wide/Long
OR	U.S. 395	1.57	1.77	0.20	Two pinch points
OR	U.S. 395	0.00	0.50	0.50	Wide/Long
OR	U.S. 30	21.38	21.58	0.20	Vulnerable seismic bridge
OR	U.S. 30	36.30	37.15	0.85	Narrow bridge regional need/seismic bridge/wide/long pinch point/seismic landslide
OR	U.S. 30	40.64	40.84	0.20	Vulnerable seismic bridge
OR	U.S. 30	52.95	53.15	0.20	Vulnerable seismic bridge
OR	U.S. 30	55.20	55.40	0.20	Potentially Vulnerable seismic bridge

State	Route[1]	Start Point	End Point	Length (Miles)	Description of Importance (Other Comments)
OR	U.S. 30	60.80	61.25	0.45	Two vulnerable seismic bridges
OR	U.S. 30	70.50	71.00	0.50	Vulnerable seismic bridge
OR	U.S. 30	77.10	77.40	0.30	Vulnerable seismic bridge
OR	U.S. 30	82.50	83.00	0.50	Vulnerable seismic bridge and wide/long pinch point
OR	U.S. 30	85.25	86.50	1.25	Three vulnerable seismic bridges
OR	U.S. 30	92.40	92.65	0.25	Potentially Vulnerable seismic bridge
OR	U.S. 30	94.00	99.00	5.00	Downtown Astoria heavy truck volumes on Commercial Street creates operational and safety problems; John Day Bridge to Astoria City Limits/high truck volumes creates safety and mobility problems for non-freight traffic.
OR	U.S. 30	72.50	73.00	0.50	Vulnerable seismic bridge
OR	U.S. 26	57.30	54.30	3.00	Existing truck climbing lane ends before crest of the hill. Slow trucks impede/disrupt laminar flow. Extend climbing lane.
OR	U.S. 26	18.00	19.00	1.00	Freight delay area at junction with OR 126 and OR 370
OR	U.S. 26	18.00	21.00	3.00	Elsie, near junction with OR 103, area freight activity conflicts with uncontrolled roadside environment
OR	U.S. 26	21.93	22.13	0.20	Vertical Clearance
OR	U.S. 20	18.70	21.00	2.30	Narrow shoulders on steep grade in Horse Ridge fails to provide a safe recovery zone for vehicles which crash or spin out. Lack of operating room makes vehicle recovery difficult and leads to significant delays to freight movement.
OR	U.S. 20	127.75	131.75	4.00	Freight delay area
OR	U.S. 20	193.70	201.00	7.30	Curves and narrow spots restrict over-dimension loads between Burns and Vale. U.S. 20 is the paired route to I-84 and frequently is used for over-dimensional loads when work is occurring on I-84.
OR	U.S. 20	202.70	210.45	7.75	Curves and narrow spots restrict over-dimension loads between Burns and Vale. U.S. 20 is the paired route to I-84 and frequently is used for over-dimensional loads when work is occurring on I-84.
OR	U.S. 20	211.88	214.10	2.22	Curves and narrow spots restrict over-dimension loads between Burns and Vale. U.S. 20 is the paired route to I-84 and frequently is used for over-dimensional loads when work is occurring on I-84.
OR	U.S. 20	216.20	216.90	0.70	Curves and narrow spots restrict over-dimension loads between Burns and Vale. U.S. 20 is the paired route to I-84 and frequently is used for over-dimensional loads when work is occurring on I-84.
OR	U.S. 20	258.00	258.20	0.20	High accident intersection at Cairo Junction makes through freight and local agricultural freight movements dangerous.
OR	U.S. 20	266.30	266.50	0.20	Vertical Clearance
OR	U.S. 20	30.47	30.67	0.20	Vertical Clearance
OR	U.S. 199	28.75	29.00	0.25	Vertical Clearance

State	Route[1]	Start Point	End Point	Length (Miles)	Description of Importance (Other Comments)
OR	U.S. 101	0.00	3.71	3.71	Wide/Long, Vertical Clearance
OR	U.S. 101	63.90	64.70	0.80	Wide/Long
OR	U.S. 101	196.83	197.03	0.20	Vulnerable seismic bridge
OR	U.S. 101	202.62	202.82	0.20	Vulnerable seismic bridge
OR	U.S. 101	211.10	213.25	2.15	Three vulnerable seismic bridges
OR	U.S. 101	223.11	223.31	0.20	Vulnerable seismic bridge
OR	U.S. 101	229.33	229.53	0.20	Vulnerable seismic bridge
OR	U.S. 101	232.70	236.40	3.70	Incorporates pinch point, intermodal connectors, and seismic bridges in Coos Bay/North Bend
OR	U.S. 101	238.30	239.80	1.50	Incorporates pinch point, bottleneck, intermodal connectors, and seismic bridges in Coos Bay/North Bend
OR	U.S. 101	241.50	244.31	2.81	Incorporates pinch point and seismic bridges in Coos Bay/North Bend
OR	R3T1P03			3.14	Congestion, roadway designation upgrade, impacts from train movements
OR	OR 99W	20.00	23.00	3.00	Newberg-Dundee Bypass - unfunded project phases
OR	OR 99W	24.20	24.50	0.30	Vulnerable seismic bridge
OR	OR 99W	27.00	31.00	4.00	Newberg-Dundee Bypass - unfunded project phases
OR	OR 99W	34.05	34.25	0.20	Wide/Long, Vertical Clearance
OR	OR 99W	40.90	41.20	0.30	Wide/Long, Vertical Clearance
OR	OR 99E	28.90	29.70	0.80	Vertical Clearance
OR	OR 99E	24.55	24.80	0.20	Wide/Long, Vertical Clearance
OR	OR 7	50.45	50.65	0.20	Wide/Long, Vertical Clearance
OR	OR 6	0.42	0.62	0.20	Vertical Clearance
OR	OR5P			0.38	Pavement condition improvement, congestion relief
OR	OR 58	14.30	14.66	0.36	Multiple roll-over and other crashes at this location. Many have involved freight trucks, some carrying hazardous materials. Trestle crossing is at an oblique angle and is too narrow. Tight/blind corners on both sides.
OR	OR 58	23.30	23.80	0.50	Rockfall location above the highway
OR	OR 58	31.64	32.38	0.74	There are only a few passing lanes on OR 58. The problem will be compounded if ODOT implements a lane reduction in Oakridge.
OR	OR 58	37.26	38.47	1.21	There are only a few passing lanes on OR 58. The problem will be compounded if ODOT implements a lane reduction in Oakridge.
OR	OR 58	44.10	44.80	0.70	Two landslide locations below the highway.
OR	OR 58	49.03	50.45	1.42	Steep terrain along this segment causes trucks and RVs to slow. This in turn causes other driver to make risky passing maneuvers.

State	Route[1]	Start Point	End Point	Length (Miles)	Description of Importance (Other Comments)
OR	OR 58	55.50	56.05	0.55	The chain-up area becomes congested with commercial vehicles which spill into the travel lane, causing a safety concern and a mobility issue.
OR	OR4P_2			0.22	Pavement condition improvement, wider roadway, improved safety at rail crossing, improved turning movements for one-way portion, improved pedestrian facilities
OR	OR4P_1			0.16	Pavement condition improvement, wider roadway, improved safety at rail crossing, improved turning movements for one-way portion, improved pedestrian facilities
OR	OR 47	83.60	83.85	0.25	Vertical Clearance
OR	OR 47	86.25	86.50	0.25	Wide/Long
OR	OR 42	38.00	45.00	7.00	Tight curves result in truck turnovers on OR 42
OR	OR 42	73.20	76.70	3.50	
OR	OR 39	3.30	3.70	0.40	Wide/Long, Vertical Clearance
OR	OR 38	4.00	4.20	0.20	Vulnerable seismic bridge
OR	OR 38	5.66	5.86	0.20	Vulnerable seismic bridge
OR	OR 38	13.14	13.34	0.20	Vulnerable seismic bridge
OR	OR 38	16.25	16.60	0.35	Vulnerable seismic bridge
OR	OR 38	28.18	28.38	0.20	Vulnerable seismic bridge
OR	OR 38	56.35	56.70	0.35	Vulnerable seismic bridge
OR	OR 35	72.66	76.86	4.20	Wide/Long
OR	OR 34	56.17	56.79	0.62	
OR	OR 34	0.17	1.50	1.33	
OR	OR 331	4.34	4.54	0.20	Wide/Long
OR	OR2P			2.93	
OR	OR22P			1.72	Pavement condition improvement, congestion relief, improved pedestrian facilities, turning movement improvement for safety
OR	OR 22	0.20	0.40	0.20	Wide/Long
OR	OR 214	38.50	38.70	0.20	Wide/Long
OR	OR 201	30.00	31.83	1.83	High accident intersection at OR 201/SW 18th and OR 201 at Railroad Avenue (OR 201 connects U.S. 20 to I-84 and is on the I-84 paired route for over-dimensional loads) is a safety issue. Additionally, this location is a key transportation pinch point that complicates industrial development in the adjacent vacant lands.
OR	OR1P			0.33	
OR	OR 18	-0.22	0.20	0.42	Vulnerable seismic bridge
OR	OR 18	3.90	4.05	0.15	Vulnerable seismic bridge

State	Route[1]	Start Point	End Point	Length (Miles)	Description of Importance (Other Comments)
OR	OR 18	5.30	6.50	1.20	Two vulnerable seismic bridges and a wide/long pinch point
OR	OR 18	18.65	18.95	0.30	Vulnerable seismic bridge
OR	OR 18	21.45	21.65	0.20	Vulnerable seismic bridge
OR	OR 18	23.67	23.87	0.20	Vulnerable seismic bridge and wide/long pinch point
OR	OR 18	27.15	30.40	3.25	Four seismic bridges
OR	OR 18	33.60	33.85	0.25	Two seismic bridges
OR	OR 18	36.00	38.00	2.00	Two vulnerable seismic bridges
OR	OR 18	44.00	46.40	2.40	Five seismic bridges
OR	OR 18	51.30	51.80	0.50	Two seismic bridges and a heavy load pinch point
OR	OR 140	18.10	18.30	0.20	Wide/Long
OR	OR 138	17.85	18.05	0.20	Wide/Long, Vertical Clearance
OR	OR 138	12.30	12.45	0.15	Wide/Long
OR	OR 126	3.00	3.20	0.20	Wide/Long, Vertical Clearance
OR	OR 126	0.22	0.32	0.10	Wide/Long
OR	OR 126	18.09	18.29	0.20	Wide/Long
OR	OR 11	0.01	0.21	0.20	Vertical Clearance
OR	OR 11	19.52	19.72	0.20	Vertical Clearance

Table 9-5. Critical Urban Freight Corridors

State	Route	Start Point	End Point	Length (Miles)	Description of Importance (Other Comments)
OR	OR 99E	OR 34 Interchange	Albany City Limits	1.68	This is a first/last segment linking industrial and distribution facilities to I-5. Segment is on the NHS. Lack of pedestrian facilities create safety concerns and opportunities for conflict with fast moving traffic and freight. Sidewalk infill projects as in the AAMPO RTP constrained project list will facilitate safe freight travel.
OR	Albany Ave SE	Old Salem Rd NE	OR 99E / Albany	0.30	Albany Ave SE and Old Salem Rd is a first/last segment connecting manufacturing and freight logistics facilities. It is also within a corridor of a route on the PHFS and is an alternate route.
OR	Old Salem Rd NE (At RR Trestle, junction with Century Drive)	South of I-5 MP 236	North of I-5 MP 235	0.30	Albany Ave SE and Old Salem Rd is a first/last segment connecting manufacturing and freight logistics facilities. It is also within a corridor of a route on the PHFS and is an alternate route.
OR	U.S. 20	Willamette River	North Albany Rd.	0.50	This is a first/last segment on U.S. 20 between Albany's urban downtown and the Coast. This segment is on an NHS route.
OR	U.S. 97	Bend north City Limits (MP 133.39)	Empire Ave (MP 135.46)	2.07	Important segment of the U.S. 97 Statewide freight corridor on the north end of Bend that connects U.S. 97 to the City's largest industrial area on Empire Ave. This area experiences congestion, delay and safety issues.
OR	Empire Avenue	U.S. 20 Connection	U.S. 97 NB ramps	0.25	Important freight corridor that connects U.S. 20 and U.S. 97 to the largest concentration of industrial land in Bend. This is a key first/last mile connection to distribution and industrial facilities.
OR	U.S. 20	Cooley Road (MP 17.40)	U.S. 97 SB on-ramp at Division (MP 19.76)	2.36	Important segment of the U.S. 20 Statewide freight corridor. Important connection to distribution and industrial facilities along Empire Ave in Bend. Additionally, there will be significant land use development (light industrial and mixed employment) along this highway segment.
OR	U.S. 20	Webster Street (MP 20.19)	Greenwood Ave (MP 20.99)	0.80	Important segment of the U.S. 20 Statewide freight corridor that experiences congestion and delay.

State	Route	Start Point	End Point	Length (Miles)	Description of Importance (Other Comments)
OR	U.S. 20	3rd Street (MP 0.51)	8th Street (MP 0.94)	0.43	Important segment of the U.S. 20 Statewide freight corridor that experiences congestion and delay.
OR	U.S. 20	Old Bend-Redmond Highway intersection (MP 16.70)	Old Bend-Redmond Highway intersection (MP 16.79)	0.09	Important segment of the U.S. 20 Statewide freight corridor that experiences safety and congestion issues.
OR	Randy Pape Beltline	Prairie Road	Delta Hwy	3.60	Supports regional mobility, freight movement and access to the NHFS.
OR	OR 126	I-5	OR 126 WB off-ramp	1.30	Supports regional mobility, freight movement and access to the NHFS.
OR	OR 126 at 52nd Ave	West of 52nd Ave	East of 52nd Ave	0.20	Supports regional mobility, freight movement and access to the NHFS.
OR	42nd St (Springfield)	OR126	Rail line	1.10	Connects Lane Forest Product to NHS.
OR	OR 126 at Mohawk Blvd	West of OR126 WB on/off-ramp	East of OR126 EB on/off-ramp	0.40	Supports freight movement and access to the NHFS.
OR	OR 99 (Franklin Blvd) in Goshen	Franklin Blvd north of 30th Ave (at point of its east/west alignment)	I-5 NB off ramp at MP 188	1.20	Supports industrial land in Goshen and access to the NHFS.
OR	Eugene Airport	Airport Rd between Old Airport Rd and OR 99	Airport Rd between Old Airport Rd and OR 99	0.60	Connects Mahlon Sweet Municipal Airport to NHS. Currently a NHS Intermodal Connector and identified as a proposed Tier 1 Intermodal Connector in the ODOT Intermodal Connector Study.
OR	Eugene Airport	Green Hill Rd/Northrop Rd between Airport Rd and Lockheed Rd, Lockheed Dr between Greenhill Rd/Northrop Rd and the Passenger Terminal	Green Hill Rd/Northrop Rd between Airport Rd and Lockheed Rd, Lockheed Dr between Greenhill Rd/Northrop Rd and the Passenger Terminal	0.80	Connects Mahlon Sweet Municipal Airport to NHS. Currently a NHS Intermodal Connector and identified as a proposed Tier 1 Intermodal Connector in the ODOT Intermodal Connector Study.
OR	Irving Rd/Prairie Rd	OR 99 to Prairie on Irving; Irving Rd to OR 99 on Prairie	OR 99 to Prairie on Irving; Irving Rd to OR 99 on Prairie	1.50	Connects Kinder Morgan Eugene, Lane Forest Products, Jerry Brown Co. and Paktech intermodal facilities to the NHS. Identified as a proposed Tier 2 Intermodal Connector in the ODOT Intermodal Connector Study.

State	Route	Start Point	End Point	Length (Miles)	Description of Importance (Other Comments)
OR	U.S. 20/OR 34 Interchange with OR 99W over Marys River	U.S. 20/OR 34 Inter Change over Mary's River	U.S. 20/OR 34 Interchange over Marys River	0.10	Add an off ramp to the existing interchange for eastbound traffic turning to south OR 99W. The Interchange is on FAU system and is a major missing link on the existing Freight Routes.
OR	U.S. 20/OR 34 (Philomath Blvd)	35th Street	Separation point of U.S. 20/OR 34 west of Philomath	4.50	The link is in FAU and is a major Freight Route for lumber trucks. Improve intersections and install dedicated truck signal (ITS).
OR	OR 199	MP 0.69	MP 4.29	3.60	Freight corridor serving industrial/commercial areas with connection to I-5. This project is ODOT RTP # 510, Key 20104 and is currently in the TIP. Grind out existing pavement and replace with asphalt. Note: Project 510 extends from MP 0.69 in Grants Pass, west along OR 199 to MP 6.92.
OR	Table Rock Road	Table Rock Road	Vilas Road	0.10	Freight corridor that connects major industrial area to OR62, a connector to I-5. This project is Central Point RTP # 219, widen and add turn lanes.
OR	OR 62	OR 62	Dahlia Terrace	0.50	Freight route that connects industrial/commercial area to OR 62, a connector to I-5. This project is Eagle Point RTP # 339, Urban upgrade (collector) with bike lanes and sidewalks.
OR	North Phoenix/Foothills Road	Dry Creek	Vilas Road	1.10	Identified as a regional priority as an alternative North/South route to I-5. Provides a connection from the south valley to OR 140. Identified by ODOT as part of a resiliency plan in case of a major disaster (i.e. Cascadia quake.) This project is Jackson County RTP # 859. Widen to rural major collector standards.
OR	North Phoenix/Foothills Road	Vilas Road	Corey Road	1.70	Identified as a regional priority as an alternative North/South route to I-5. Provides a connection from the south valley to OR 140. Identified by ODOT as part of a resiliency plan in case of a major disaster (i.e. Cascadia quake.) This project is Jackson County RTP # 860. Widen to rural major collector standards.

State	Route	Start Point	End Point	Length (Miles)	Description of Importance (Other Comments)
OR	North Phoenix/Foothills Road	McAndrews	Delta Waters	1.30	Identified as a regional priority as an alternative North/South route to I-5. Provides a connection from the south valley to OR 140. Identified by ODOT as part of a resiliency plan in case of a major disaster (i.e. Cascadia quake.) This project is the City of Medford RTP # 5043. Widen to 3 lanes with bike lanes and sidewalks.
OR	OR 99	OR 99	I-5	0.50	Freight corridor serving industrial areas with connection to I-5. This project is ODOT project RTP #951. Realigns and widens Bear Creek Bridge, adds turn lanes to S.Valley View Rd.
OR	Salem Rivercrossing aka "3rd Bridge"	Liberty St	Wallace Rd	1.13	Proposed bridge will provide a route for freight movement between I-5, the Willamette Valley and the Oregon Coast that does not go through downtown Salem, reducing travel time.
OR	OR 22E	I-5	25th St	1.18	OR 22 is designated as an Oregon Highway Plan Freight Route and intersects with I-5 in Salem. OR 22 is also one of the major routes for freight between central Oregon, the Willamette Valley and the Oregon Coast. Part of this segment is identified as a corridor with high freight delay (#57 in the Freight Highway Bottlenecks List as part of the Oregon Freight Plan). ODOT has completed a Facility Plan that includes recommendations along OR 22E part of the proposed CUFC segment.
OR	Center St Bridge	Commercial St	Murlark Dr	0.70	The Center St bridge provides the main freight route between the Willamette Valley and the Oregon Coast. OR 22 is designated as an Oregon Highway Plan Freight Route. The SKATS MPO is funding a study by ODOT to determine the seismic upgrades (and the cost) needed on this regional and statewide significant bridge.
OR	25th St	OR 22E	Madrona Av	0.84	Connects a major industrial area (Fairview Industrial) and the airport (which includes industrial uses as well as air freight trans-shipment) to OR 22E, which then connects to the Primary Highway Freight System (PHFS).

State	Route	Start Point	End Point	Length (Miles)	Description of Importance (Other Comments)
OR	McGilchrist St	12th St	25th St	1.00	Provides access to the surrounding industrial area, which is an enterprise and electronic commerce zone. Adding capacity and providing complete facilities is a high priority for the city of Salem, which is in the process of completing a street design for McGilchrist Street; the draft FY 2018-2023 SKATS TIP includes $3.6 million of federal and local match funds for right-of-way purchasing in 2018.
OR	Kuebler Blvd	I-5	Aumsville Hwy	2.12	Connects a major industrial area (Fairview Industrial) and a major logistic and industrial area (Mill Creek Corporate Center – a 500+ acre major logistic area and the largest "shovel ready" industrial site on I-5) to the Primary Highway Freight System (PHFS).
OR	Cordon Rd/OR 22E Interchange	Aumsville Hwy	Gaffin Rd	0.97	Proposed interchange will provide access to traffic from/to central Oregon and the Mill Creek Corporate Center, a 500+ acre major logistic area and the "largest shovel ready" industrial site on I-5 between Seattle and Sacramento. OR 22 is designated as an Oregon Highway Plan Freight Route. OR 22 is also one of the major routes for freight between central Oregon, the Willamette Valley and the Oregon Coast. Also, would provide a bypass to the OR 22E / I-5 interchange to reduce travel distance.
OR	Cordon Rd	Gaffin Rd	State St	1.34	Provides for an alternate route around Salem if I-5 is closed. Also, provides connections to central Marion County (via Hazelgreen Rd and Silverton Rd) and central Oregon (via proposed OR 22E/Cordon Rd interchange).
OR	OR 217	U.S. 26	I-5	7.20	On Regional Freight Network as a Main Roadway Route and is on the NHS. Included on an earlier draft of National Multimodal Freight Network. Origins and destinations of freight; corridor that MPO and state identify as important.

State	Route	Start Point	End Point	Length (Miles)	Description of Importance (Other Comments)
OR	U.S. 26 (Sunset Hwy.)	I-405	Brookwood Parkway	12.70	On Regional Freight Network as a Main Roadway Route, is on the NHS, and connects to the region's high tech industries. Included on an earlier draft of National Multimodal Freight Network. Origins and destinations of freight; volume, value and strategic importance of freight; economic factors, including balance of trade.
OR	U.S. 30	NW Kittridge	St. Johns Bridge	2.80	U.S. 30 is on the National Highway System (NHS). U.S. 30 is the main freight highway to energy pipelines and installations. Access to seaports and pipelines; intermodal links that promote connectivity; access to energy installation and production areas.
OR	NW Kittridge Road	NW Front Ave	U.S. 30	0.20	Access to seaports and pipelines; Intermodal links that promote connectivity; access to energy installation and production areas.
OR	NW 26th Drive	NW Front Ave	Terminal 2 Access	0.10	Terminal 2 has direct ship to rail transfers and ships forest products, steel and bulk cargo. Economic factors including balance of trade; Volume, value, tonnage, and strategic importance of freight; Inland intermodal facilities, and first and last mile facilities
OR	OR 99E	SE Holgate Blvd.	SE Harold St	0.80	On Regional Freight Network as a Main Roadway Route and is on the NHS. Important connection to Brooklyn Rail Yard and other intermodal connections. Intermodal link that promotes connectivity; major distribution centers and first/last mile links; corridor that MPO and State of Oregon identify as important.
OR	OR 212/224	I-205	SE Foster Road	5.70	On Regional Freight Network as a Main Roadway Route and is on the NHS. Key last mile connection to distribution and industrial facilities along OR 212. Origins and destinations of freight; major distribution centers and first/last mile links; corridor that MPO and State of Oregon identify as important.

State	Route	Start Point	End Point	Length (Miles)	Description of Importance (Other Comments)
OR	NE Alderwood Road	NE Cornfoot Road	NE Columbia Blvd.	0.40	On Regional Freight Network as a road connector route. Provides freight connectivity to Portland International Airport and air cargo facility. Volume, value and strategic importance of freight; access to Portland International Airport and air cargo facility; intermodal link that promotes connectivity.
OR	Marine Drive	I-84 (west end of frontage road)	Sundial Road	1.00	Connects a major freight route and interstate highway (I-84) to major a distribution center and Troutdale Airport. Origins and destinations of freight; distribution centers and first/last mile links.
OR	238th/242nd/Hogan Road	I-84	Burnside Road	2.80	On Regional Freight Network as a road connector route and is on the NHS. Provides key north/south freight connection between U.S. 26 and I-84, Troutdale Airport, and key distribution centers in the Columbia Corridor. Intermodal link that promotes connectivity; origins and destinations of freight; corridor that MPO identifies as important.
OR	Boones Ferry Road/ Basalt Creek	Grahams Ferry Road	I-5 via Boones Ferry Road	1.00	

Appendix I – Highway Inventories of Need

Table 9-6. Freight Highway Delay Areas

Route	Beg MP	End MP[1]	City/County	ODOT Region	Needs	Tier
I-405	0.0	0.8	Portland	1	Delay and unreliability at I-5 interchange	1
I-5	292.9	290.2	Tigard/Lake Oswego	1	Delay and unreliability at OR 217	1
I-5	294.1	297.3	Portland	1	Delay and unreliability at SW Multnomah Blvd	1
I-5	297.3	300.2	Portland	1	Delay and unreliability at I-405 interchange	1
I-5	299.3	299.5	Portland	1	Delay and unreliability at I-405 interchange	1
I-5	299.6	301.6	Portland	1	Delay and unreliability at the Marquam Bridge	1
I-5	302.3	303.1 (Connection 001TO)	Portland	1	Delay and unreliability at Eliot (between I-405 and I-84)	1
I-5	302.7	304.7	Portland	1	Delay and unreliability at Boise (between U.S. 30B and I-405)	1
I-5	302.7	0.5 (I-84)	Portland	1	Delay and unreliability at Eliot (between I-405 and about 0.5 mi. onto I-84)	1
I-5	304.5	305.4	Portland	1	Delay and unreliability at Boise (between U.S. 30B and I-405)	1
I-5	305.3	306.5	Portland	1	Delay and unreliability between OR 99E and U.S. 30B	1
I-5	306.2	307.4	Portland	1	Delay and unreliability between OR 99E and U.S. 30B	1
I-5	307.2	308.0	Portland	1	Delay and unreliability at the Interstate Bridge	1
OR 217	7.0	7.5	Tigard/Lake Oswego	1	Delay and unreliability at I-5 interchange	1
OR 99E	6.03	6.5	Portland	1	Delay and unreliability at I-5 interchange	1

[1] Beginning and ending mile points indicate the approximate location of freight delay but do not indicate the direction of delay and may not include the cause of delay. More details can be found in Freight Highway Bottlenecks Project Final Report, March 14, 2017, prepared for ODOT by WSP.

Route	Beg MP	End MP[1]	City/County	ODOT Region	Needs	Tier
SW Kelly Ave	0.0	0.2	Portland	1	Delay at I-5 access	1
I-205	0.5	0.0	Tualatin	1	Delay and unreliability at I-5 interchange	2
I-205	9.3	10.7	Clackamas County	1	Delay and unreliability at OR 213	2
I-205	14.6	18.1	Clackamas County	1	Unreliability on I-205 at Sunnyside	2
I-205	18.1	21.4	Portland	1	Delay and unreliability south of I-84	2
I-205	21.3	24.3	Portland	1	Delay and unreliability north of I-84	2
I-405	0.8	1.0	Portland	1	Delay and unreliability at SW Broadway	2
I-405	1.9	2.9	Portland	1	Delay and unreliability through downtown Portland	2
I-405	2.5	2.7	Portland	1	Delay and unreliability through downtown Portland	2
I-405	2.8	3.7	Portland	1	Delay and unreliability at the Fremont Bridge	2
I-5	283.5	289.7	Tualatin/Wilsonville	1	Unreliability on I-5 south of I-205 to Wilsonville	2
OR 212	4.9	5.0	Clackamas County	1	Delay at I-205 interchange	2
OR 224	4.13	4.4	Clackamas County	1	Delay at OR 213 interchange	2
U.S. 30	0.9	1.3	Portland	1	Delay and unreliability at the I-405 interchange	2
U.S. 30	0.95	1.3	Portland	1	Delay and unreliability at the I-405 interchange	2
U.S. 30	1.6	1.9	Portland	1	Delay and unreliability at NW Industrial	2
U.S. 30	2.0	3.9	Portland	1	Delay at BNSF Lake Yard	2
I-84	1.0	3.0	Portland	1	Delay and unreliability at NE 33rd Avenue	3
I-84	3.4	6.3	Portland	1	Delay and unreliability west of I-205	3
OR 217	0.4	1.0	Beaverton	1	Unreliability on OR 217 in Beaverton	3
OR 217	1.4	2.0	Beaverton	1	Delay on OR 217 at SW Canyon Rd interchange	3
OR 8	2.9	3.5	Beaverton	1	Delay at OR 217	3
OR 99E	-4.6	-3.8	Portland	1	Delay east of I-5	3
U.S. 26	68.8	71.5	Beaverton	1	Delay and unreliability at OR 217	3
U.S. 26	71.5	73.9	Portland	1	Delay at Washington Park	3

Route	Beg MP	End MP[1]	City/County	ODOT Region	Needs	Tier
U.S. 30	0.1	0.4	Portland	1	Delay at U.S. 30B (St. Johns Bridge - ramp north of bridge)	3
U.S. 30	0.1	0.5	Portland	1	Delay at U.S. 30B (St. Johns Bridge - ramp south of bridge)	3
U.S. 30B	1.3	3.0	Portland	1	Delay at University Park	3
U.S. 30B	3.0	5.1	Portland	1	Delay at Arbor Lodge	3
I-5	240.7	241.8	Marion County	2	Delay and unreliability on I-5 south of Salem	2
I-5	242.5	243.7	Linn County/Marion County	2	Unreliability on I-5 south of Salem	2
I-5	244.4	248.6	Marion County	2	Unreliability on I-5 south of Salem	2
Ferry St. SE	5.3	5.5	Salem	2	Delay on Ferry St. SE in Salem	3
I-5	177.1	178.3	Lane County	2	Unreliability on I-5 near Saginaw	3
I-5	182.9	188.4	Lane County	2	Unreliability on I-5 near Goshen/OR 58 interchange	3
I-5	263.2	282.3	Marion County	2	Unreliability on I-5 south of Wilsonville	3
OR 214	49.4	50.6	Silverton	2	Delay on OR 214 in Silverton	3
OR 22	1.2	7.9 (OR-22/ OR-99E)	Salem	2	Delay on OR 22 west of I-5 in Salem	3
OR 34	1.2	56.1[2]	Corvallis/Linn County	2	Delay in Corvallis near the Van Buren Bridge and to the south and east on OR 34	3
OR 99E	4.7	4.9	Salem	2	Delay on OR 99E in Salem	3
OR 99W	34.8	37.0	McMinnville	2	Delay on OR 99W in McMinnville	3
I-5	0.0	0.9	Jackson County	3	Delay on I-5 near the border with California	3
OR 42	73.4	76.2	Winston	3	Delay at Dillard/Winston connection to I-5	3
U.S. 101	239.1	239.5	Coos Bay	3	Delay on U.S. 101 at Bunker Hill	3
U.S. 101	273.9	277.5	Bandon	3	Delay on U.S. 101 through Bandon	3
U.S. 20/U.S. 97 Business Route	17.9	2.6	Bend	4	Delay and unreliability on U.S. 20/U.S. 97 Business Route north of downtown Bend and on U.S. 20 east of downtown Bend	2
U.S. 26	18.3	18.7	Crook County	4	Delay on U.S. 26 at Prineville/OR 126	3

[2] The length of this need is approximately two miles but looks longer based on MP due to changes in route name.

Route	Beg MP	End MP[1]	City/County	ODOT Region	Needs	Tier
U.S. 97	-0.2	7.5	Sherman County	4	Delay at Biggs Junction/I-84 interchange and to the south on U.S. 97	3
OR 207	8.7	12.6	Hermiston	5	Delay north of I-84 interchange in Hermiston*	3
U.S. 20	128.1	131.5	Burns	5	Delay on U.S. 20 at Hines/Burns	3
U.S. 26	154.0	162.3	Grant County	5	Delay on U.S. 26 at John Day/Mt. Vernon	3

*Delay may have been due to construction project during 2015 when data was captured.

Table 9-7. Freight Intermodal Connectors

Intermodal Connector Roads	Connecting Highway or Intermodal Connector	City/County	ODOT Region	Needs[3]	Tier
Front Avenue between Kittridge Avenue and 61st Street, 61st Street between Culebra Avenue and Front Avenue, Culebra Avenue between Balboa Avenue and 61st Street.	U.S. 30	Portland	1	Poor pavement condition (2015 data)	1
Front Avenue between Kittridge and Nicolai, Nicolai Street between Yeon Avenue and Front Street.	U.S. 30	Portland	1	Poor pavement condition (2015 data)	1
Interstate Avenue between Going Street and Larrabee Avenue, Russell Street between Interstate Avenue and Rail Facility, Going Street between Basin and I-5 , Larrabee Avenue between Broadway Street and Interstate Avenue.	I-5, U.S. 30	Portland	1	Congestion relief, reduced mixing of traffic, poor pavement condition (2015 data), intersection improvements	1
Terminal 5 Access Road between Lombard Street and Terminal 5.	OR13P	Portland	1	Impacts of train movements, poor pavement condition (2015 data)	1
U.S. 30 BY between U.S. 30 and Ivanhoe St, Ivanhoe St between U.S. 30 BY and N Saint Louis, N Saint Louis between Lombard Blvd and Ivanhoe St, Burgard St and Lombard St between Columbia Blvd and N Saint Louis, Lombard St and Marine Dr between Columbia Blvd and Hwy 120, Hwy 120 between beginning (now Portland Rd) and I-5 connection, Columbia Blvd between I-5 and Lombard St, OR99E between Columbia Blvd and I-5, Columbia Way between Columbia Blvd and leg of Hwy 120.	I-5	Portland	1	Bridge issues, congestion, queueing, impacts of train movements, safety, weight restrictions, height restrictions, interchange improvements, mixing with traffic, poor pavement condition between I-5 and NE Lombard (2015 data)	1
North Pacific Gateway Boulevard between North Marine Drive and Terminal 6.	OR13P	Portland	1	Poor pavement condition (2015 data)	1
North Terminal Road between Lombard Street and Terminal 4.	OR13P	Portland	1	Poor pavement condition (2015 data)	1
Going Street between Basin Street and I-5 (See Albina Yards UP Portland).	I-5	Portland	1	Intersection improvements, poor pavement condition OR 99W to I-5 (2015 data)	1

[3] Where information was not available, cell was left blank.

Intermodal Connector Roads	Connecting Highway or Intermodal Connector	City/County	ODOT Region	Needs[3]	Tier
Greely Avenue between I-5 connection to Going Street.	I-5	Portland	1	Intersection improvements	1
Port Access Road between Yeon Street and Front Avenue (NW 26th Dr).	U.S. 30	Portland	1	Poor pavement condition (2015 data)	1
Holgate Boulevard between McLoughlin Boulevard, OR 99E and UPRR Track.	OR 99E	Portland	1	Queueing outside of the gate and poor pavement condition (2015 data)	1
Columbia Boulevard between U.S. 30 (Killingsworth Street) and I-5, U.S. 30 BY (Killingsworth St) between Columbia Blvd and I-205 connection.	I-5, I-205	Portland	1	Congestion, turning movement, poor pavement condition (2015 data) on Columbia Blvd from 82nd Ave to NE Killingsworth (U.S. 30 BY)	1
47th Avenue between Columbia Boulevard and Cornfoot Road, Cornfoot Road between 47th and Alderwood Road, Alderwood Road between Cornfoot Road and 82nd Avenue, Airtrans Road between Cornfoot Road and Air Freight Terminals.	OR8A	Portland	1	Expansion constraints, poor pavement on Cornfoot Rd, 47th Ave and Airtrans Way (2015 data), needs sidewalks and bike lanes	1
82nd Avenue between Airport Way and Columbia Boulevard.	OR8A	Portland	1	Congestion, safety	1
Airport Way between I-205 and Portland International Airport Terminal.	I-205	Portland	1	Congestion, safety	1
Balboa Avenue between Culebra Avenue and U.S. 30.	I-205	Portland	1	Poor pavement condition (2015 data)	1
North Rivergate Blvd	OR13P_02	Portland	1		1
North Leadbetter Road to North Marine Drive.	OR13P_02	Portland	1		1
Northeast Alderwood Road between NE Columbia Blvd and NE Cornfoot Rd.	OR8A	Portland	1		1
Northwest Street Helens Road to NW Yeon Ave (U.S. 30).	U.S. 30	Portland	1		2
Northwest Doane Avenue Between NW St Helens Rd (U.S. 30) and Front Ave.	OR10L	Portland	1		2
North River Street to North Albina Avenue to North Loring Street to N Lewis Avenue to North Tillamook Street.	OR 99W	Portland	1		2
Thunderbird Way to N. Crosby Ave.	OR12R_01	Portland	1		2

Intermodal Connector Roads	Connecting Highway or Intermodal Connector	City/County	ODOT Region	Needs[3]	Tier
Southeast Mailwell Drive to Southeast Main Street.	OR 99E	Milwaukie	1	Pavement condition improvement, congestion relief, more truck parking,	2
North Force Avenue.	OR13P	Portland	1	Pavement condition improvement, congestion relief, safety issues	2
N. Bybee Lake Rd	OR13P_02	Portland	1		2
Northeast Sundial Road to Northwest Marine Drive to NE Marine Dr to NE 223rd Ave.	I-84	Fairview	1		3
North Port Center Way	OR23P_01	Portland	1		3
Southeast Capps Road to Southeast 130th Avenue.	OR 224	Clackamas	1		3
Southwest Wood Street.	OR 219	Hillsboro	1		3
Northwest Commercial Street to Northwest Glencoe Road.	U.S. 36	North Plains	1		3
N. Columbia Frontage Rd. to N. Peninsular Avenue	OR13P_02	Portland	1		3
NE Marx Dr. to NE 87th Ave.	OR8A_01	Portland	1		3
N. Suttle Rd.	OR 120	Portland	1	Poor pavement (Google Streetview Mar 2017)	3
Lockheed Drive between Passenger Terminal and Nortrup Dr. Nortrup Dr between Lockheed Dr and Airport Rd, Airport Rd between Lockheed Dr and OR 99.	OR 99	Eugene	2		1
Garfield Street between 7th Avenue and Cross Street, Cross Street between Garfield Street and Cleveland Street, Cleveland Street between Cross and Roosevelt, Roosevelt Boulevard between Cleveland Street and OR 99.	OR 99	Eugene	2		1
Hamburg Street between U.S. 101 and Industry Street, Industry Street between Hamburg Street and Portway Street, Portway Street between U.S. 101 and Pier 1.	U.S. 101	Astoria	2	Poor pavement on Portway St south of Gateway Ave, Industry St and Hamburg Ave (2015 data)	1
25th Street Southeast.	OR 22	Salem	2		2
Southeast Marine Scenic Drive.	U.S. 101	Newport	2		2

Intermodal Connector Roads	Connecting Highway or Intermodal Connector	City/County	ODOT Region	Needs[3]	Tier
Dike Road to Rockcrest Street.	U.S. 30	Rainier	2	Congestion, turning movements	2
SW Altree Ln to Bay Blvd, SE Butler Bridge Rd to NW 1st St to NW A St to W Highway 20.	U.S. 20	Toledo	2	Congestion, truck length restrictions, safety improvements, signage improvements, pedestrian issues	2
Kallunki Road to Quincy Mayger Road to Beaver Falls Road to Northwest 5th Street to Nehalem Street.	U.S. 30	Clatskanie	2		2
Prairie Road and Irving Road between OR99.	OR 99	Eugene	2		2
Salem Industrial Drive Northeast to Cherry Avenue.	OR 99E BUS	Salem	2		2
Southwest Scoggins Valley Road.	OR 47	Washington County	2		2
Tongue Point Road to Old Columbia River Highway to Maritime Road.	U.S. 30	Astoria	2	Pavement condition	3
Westport Ferry Road.	U.S. 30	Clatskanie	2		3
Northwest 13th Street.	OR 104	Warrenton	2		3
Old Portland Road to Millard Road.	U.S. 30	St. Helens	2		3
E Street.	U.S. 30	Columbia City	2		3
Crabtree Drive to Cold Springs Road.	OR 226	Crabtree	2		3
Oak Street Northeast to Butteville Road to Ehlen Road Northeast.	I-5	Donald	2		3
Foch Street to Roosevelt Boulevard.	OR17R	Eugene	2		3
Brooklake Road Northwest.	I-5	Brooks	2		3
West 1st Avenue.	OR 99	Junction City	2	Congestion, truck parking, impacts from train movements	3
Milliron Road.	OR 99	Junction City	2		3
Industrial Way.	U.S. 20	Lebanon	2	Survey response completed - no issues identified	3
North 15th Street to College Street to North 19th Street.	U.S. 20	Philomath	2		3
Fayetteville Drive.	OR 99E	Shedd	2		3
1st Street to Boston Mill Road.	OR 99E	Shedd	2		3
B Street to Young Street.	OR 99E	Woodburn	2		3

Intermodal Connector Roads	Connecting Highway or Intermodal Connector	City/County	ODOT Region	Needs[3]	Tier
Northeast Sunset Street.	OR 47	Banks	2		3
Green Hill Road	OR 126	Eugene	2		3
Pine Street and Biddle Road between I-5 (Hwy 001) and OR 62 (Hwy 22), Airport Road between Biddle Road and Biddle Road.	I-5, OR 62	Medford	3	Poor pavement Airport Rd and Terminal Loop (2015 data)	1
Transpacific Pkwy between U.S. 101 and Jordan Cove Road, Jordan Cove Road between Transpacific Parkway and Private Road.	U.S. 101	North Bend	3	Congestion relief, improved pedestrian facilities, turning movement improvement for safety, poor pavement midsection of Transpacific Highway (2015 data)	1
California Avenue between Sherman Avenue U.S. 101 and the Dock Facility.	U.S. 101	North Bend	3	Poor pavement condition (2015 data), wider roadway, improved safety at rail crossing, improved turning movements for one-way portion, improved pedestrian facilities	1
Sheridan Avenue between U.S. 101 Port Facility.	U.S. 101	North Bend	3	Poor pavement condition (2015 data), wider roadway, improved safety at rail crossing, improved turning movements for one-way portion, improved pedestrian facilities	1
Newport Avenue between U.S. 101 and Edwards Street, Mullen Street between U.S. 101 and the Nickle and Chip Terminals, Edwards Street between U.S. 101 and Newport Avenue.	U.S. 101	Coos Bay	3	Poor pavement condition (2015 data), congestion relief	1
Trans Pacific Parkway to Jordan Cove Road.	OR22P	North Bend	3	Congestion, roadway designation upgrade, impacts from train movements	1
Airport Way to West Airport Way to Maple Leaf Street to Maple Street to Virginia Avenue.	OR 540	North Bend	3	Pavement condition, safety, striping, mixing with bike traffic	2
14th Street to Avenue G.	OR 140	White City	3		2

Intermodal Connector Roads	Connecting Highway or Intermodal Connector	City/County	ODOT Region	Needs[3]	Tier
6th Street to Avenue C to 7th Street to Antelope Road.	OR 140	White City	3		2
Sage Road.	OR 238	Medford	3	Congestion, overpass with no bike lanes or sidewalks	2
South Cedar Point Road.	OR 42	Coquille	3		2
Lower Harbor Road.	U.S. 101	Brookings	3	Congestion, safety, signage, mixing with traffic	3
Boat Basin Road.	OR 540	Coos Bay	3	Survey response completed - no issues identified	3
Dock Road to Harbor Drive.	U.S. 101	Port Orford	3	Pavement condition, roadway width, parking, striping, signage, turning movements, mixing with pedestrians	3
Avenue F to 8th Street.	OR 140	White City	3		3
5th Street.	OR 140	White City	3		3
Pacific Avenue.	OR 140	White City	3		3
South Fir Street to Barnett Road.	OR 99	Medford	3	Impacts from train movements	3
South Stage Road.	OR 99	Medford	3		3
North River Road to Classick Drive to Depot Street.	I-5	Rogue River	3		3
Northeast Beacon Drive.	U.S. 199	Grants Pass	3		3
Southeast M Street.	U.S. 199	Grants Pass	3		3
Hauser Depot Road.	U.S. 101	North Bend	3		3
East Hall Avenue.	U.S. 101	Coos Bay	3		3
Airport Way to Joe Wright Road to Washburn Way.	OR 140/ U.S. 97	Klamath Falls	4	Congestion, shoulder and roadway width, safety, signage, turning movements, impacts from train movements, not designed for truck traffic.	2
Southeast Veterans Way to Southeast Airport Way.	U.S. 97	Redmond	4		2
Northwest Bus Evans Lane.	U.S. 26	Prineville	4		2
Port Island Road.	I-84	Arlington	4		3

Intermodal Connector Roads	Connecting Highway or Intermodal Connector	City/County	ODOT Region	Needs[3]	Tier
Bargeway Lane.	I-84	Biggs Junction	4		3
Bargeway Road to Webber Street.	U.S. 30	The Dalles	4		3
Northwest Lamonta Road to Northwest Gumpert Road.	U.S. 26	Prineville	4		3
Memorial Drive	OR 140	Klamath Falls	4		3
Boardman-Irrigon Road (Ullman to Coyote State Road), Ullman Boulevard (Boardman Road to Port Facility), Marine Drive (Ullman to Tier 3 Access Road), connection, Laurel Road (Boardman-Irrigon Road to I-84 connection).	I-84	Boardman	5		1
Airport Road.	U.S. 30	Pendleton	5	Survey response completed - no issues identified	2
Roxbury Road to Beach Access Road to Launch Lane to Bud Draper Lane	U.S. 730	Umatilla	5	Pavement condition	2
Olson Road to Columbia Avenue Northeast.	OR2P	Boardman	5		2
Rail Loop Drive to Lewis and Clark Drive to Columbia Boulevard to Dewey West	OR2P	Boardman	5		2
Patterson Ferry Road.	U.S. 730	Irrigon	5		3

Table 9-8. High-Priority Over-Dimensional Load Pinch Points

Route	Beg MP	End MP	County	Region	Needs
I-205	11.05	11.05	Clackamas	1	Wide/Long
I-205	18.61	18.61	Multnomah	1	Vertical Clearance
I-405	0.95	0.95	Multnomah	1	Wide/Long
I-405	3.20	3.20	Multnomah	1	Vertical Clearance
I-405	3.84	3.84	Multnomah	1	Wide/Long
I-5	295.042	295.042	Multnomah	1	Vertical Clearance, Heavy Loads
I-5	303.93	303.93	Multnomah	1	Wide/Long
I-5	304.48	304.48	Multnomah	1	Wide/Long
I-5	306.86	306.86	Multnomah	1	Wide/Long, Vertical Clearance
I-5	308.18	308.18	Multnomah	1	Vertical Clearance
I-84	0.20	0.20	Multnomah	1	Wide/Long
I-84	6.74	6.74	Multnomah	1	Vertical Clearance
I-84	24.99	24.99	Multnomah	1	Vertical Clearance
I-84	46.35	46.35	Hood River	1	Vertical Clearance
OR 217	1.50	1.50	Washington	1	Wide/Long
OR 217	3.82	3.82	Multnomah	1	Vertical Clearance
OR 35	72.70	73.30	Hood River	1	Wide/Long
OR 99E	1.55	1.55	Clackamas	1	Wide/Long
OR 99W	12.20	12.20	Multnomah	1	Heavy Loads
U.S. 26	17.55	17.55	Clackamas	1	Vertical Clearance
U.S. 26	62.45	62.45	Multnomah	1	Vertical Clearance
U.S. 30	1.04	1.04	Multnomah	1	Vertical Clearance
I-105	0.90	0.90	Lane	2	Wide/Long
I-105	3.36	3.36	Lane	2	Wide/Long
I-105	3.72	3.72	Lane	2	Wide/Long
I-105	3.78	3.78	Lane	2	Wide/Long
I-5	184.24	184.24	Lane	2	Vertical Clearance
OR 126	3.10	3.10	Lane	2	Wide/Long, Vertical Clearance
OR 126	11.43	11.43	Lane	2	Wide/Long
OR 18	6.25	6.25	Lincoln	2	Wide/Long
OR 18	23.77	23.77	Polk	2	Wide/Long
OR 18	51.77	51.77	Yamhill	2	Heavy Loads
OR 214	38.60	38.60	Marion	2	Wide/Long

Route	Beg MP	End MP	County	Region	Needs
OR 22	0.33	0.33	Polk	2	Wide/Long
OR 22	5.01	5.01	Marion	2	Vertical Clearance
OR 34	0.13	0.13	Linn/Benton	2	Vertical Clearance, Heavy Loads
OR 47	83.72	83.72	Washington	2	Vertical Clearance
OR 47	86.34	86.34	Washington	2	Wide/Long
OR 6	0.53	0.53	Tillamook	2	Vertical Clearance
OR 99E	24.67	24.67	Marion	2	Wide/Long, Vertical Clearance
OR 99E	29.09	29.09	Linn/Lane	2	Vertical Clearance
OR 99W	17.82	17.82	Yamhill	2	Vertical Clearance
OR 99W	34.15	34.15	Yamhill	2	Wide/Long, Vertical Clearance
OR 99W	41.00	41.00	Yamhill	2	Wide/Long, Vertical Clearance
U.S. 101	0.00	3.71	Clatsop	2	Wide/Long, Vertical Clearance
U.S. 101	64.22	64.22	Tillamook	2	Wide/Long
U.S. 20	10.44	10.44	Linn/Benton	2	Vertical Clearance
U.S. 20	30.57	30.57	Linn	2	Vertical Clearance
U.S. 20	23.38*	23.38*	Lincoln	2	Heavy Loads
U.S. 30	36.48	36.48	Columbia	2	Wide/Long
U.S. 30	48.67	48.67	Columbia	2	Vertical Clearance
U.S. 30	82.84	82.84	Clatsop	2	Wide/Long
I-5	119.18	119.18	Douglas	3	Vertical Clearance
I-5	124.17	124.17	Douglas	3	Wide/Long
I-5	125.08	125.08	Douglas	3	Vertical Clearance
I-5	136.51	136.51	Douglas	3	Wide/Long
I-5	139.12	139.12	Douglas	3	Wide/Long
OR 138	12.36	12.36	Douglas	3	Wide/Long
OR 138	17.95	17.95	Douglas	3	Wide/Long, Vertical Clearance
OR 140	-4.52	-4.52	Jackson	3	Wide/Long
OR 140	-1.16	-1.16	Jackson	3	Wide/Long
OR 140	-0.20	-0.20	Jackson	3	Wide/Long
U.S. 101	236.28	236.28	Coos	3	Vertical Clearance
U.S. 101	238.40	238.40	Coos	3	Vertical Clearance
U.S. 101	244.31	244.31	Coos	3	Vertical Clearance
U.S. 199	0.22	0.22	Josephine	3	Vertical Clearance
U.S. 199	28.85	28.85	Josephine	3	Vertical Clearance

Route	Beg MP	End MP	County	Region	Needs
OR 140	18.23	18.23	Klamath	4	Wide/Long
OR 39	3.44	3.44	Klamath	4	Wide/Long, Vertical Clearance
OR 126	0.22	0.22	Deschutes	4	Wide/Long
OR 126	18.19	18.19	Crook	4	Wide/Long
U.S. 26	22.03	22.03	Crook	4	Vertical Clearance
U.S. 395	0.00	0.50	Lake	4	Wide/Long
U.S. 97	134.93	134.93	Deschutes	4	Vertical Clearance
U.S. 97	244.20	244.70	Klamath	4	Wide/Long
U.S. 97	272.79	272.79	Klamath	4	Vertical Clearance
U.S. 97	280.40	281.80	Klamath	4	Wide/Long
I-82	10.61	10.61	Umatilla	5	Wide/Long
I-84	187.24	187.24	Umatilla	5	Vertical Clearance
I-84	347.84	347.84	Baker	5	Vertical Clearance
I-84	376.98	376.98	Malhuer	5	Vertical Clearance
OR 11	0.14	0.14	Umatilla	5	Vertical Clearance
OR 11	19.62	19.62	Umatilla	5	Vertical Clearance
OR 207	11.45	11.45	Umatilla	5	Wide/Long, Vertical Clearance
OR 331	4.44	4.44	Umatilla	5	Wide/Long
OR 7	50.56	50.56	Baker	5	Wide/Long, Vertical Clearance
U.S. 20	266.40	266.40	Malhuer	5	Vertical Clearance
U.S. 395	1.66	1.66	Umatilla	5	Vertical Clearance
U.S. 395	1.68	1.68	Umatilla	5	Wide/Long
U.S. 730	168.23	168.23	Morrow	5	Wide/Long
U.S. 730	184.87	184.87	Umatilla	5	Wide/Long
U.S. 730	197.65	198.10	Umatilla	5	Wide/Long

*Pinch point addressed through the completion of the Pioneer Mountain - Eddyville highway alignment project.

Table 9-9. Phase 1 and 2 Seismic Bridges

Bridge No.	Bridge Name	Route	Mile Point	County	ODOT Region	Needs
09743B	Hwy 64 SB Conn to Hwy 1 SB over Hwy 1	I-205	1.04	Washington	1	Retrofit
09740	Hwy 64 NB over Prosperity Park Road	I-205	2.08	Clackamas	1	Retrofit
09740A	Hwy 64 SB over Prosperity Park Road	I-205	2.10	Clackamas	1	Retrofit
09738A	Hwy 64 SB over Borland Road	I-205	3.81	Clackamas	1	Rehab+
09738	Hwy 64 NB over Borland Road	I-205	3.82	Clackamas	1	Rehab+
09737A	Tualatin River, Hwy 64 SB	I-205	4.08	Clackamas	1	Retrofit
09737	Tualatin River, Hwy 64 NB	I-205	4.10	Clackamas	1	Retrofit
09735	Hwy 64 NB over Woodbine Road	I-205	5.14	Clackamas	1	Rehab+
09735A	Hwy 64 SB over Woodbine Road	I-205	5.19	Clackamas	1	Rehab+
09734	Hwy 64 NB over Blankenship Road	I-205	5.84	Clackamas	1	Retrofit
09734A	Hwy 64 SB over Blankenship Road	I-205	5.90	Clackamas	1	Retrofit
09728	Hwy 64 NB over 10th Street (West Linn)	I-205	6.40	Clackamas	1	Retrofit
09728A	Hwy 64 SB over 10th Street (West Linn)	I-205	6.42	Clackamas	1	Retrofit
13514D	Hwy 64 over Hwy 2 WB Conn to Hwy 64 SB	I-205	6.64	Clackamas	1	Rehab+
09403	Willamette R & Hwys 1E & 3, Hwy 64 (Geo Abernethy)	I-205	9.03	Clackamas	1	Rehab+
09702	Hwy 64 over Main St (Oregon City)	I-205	9.51	Clackamas	1	Retrofit
N8837B	Clackamas River, Hwy 64 NB (Park Place)	I-205	10.72	Clackamas	1	Retrofit
S8837A	Clackamas River, Hwy 64 SB (Park Place)	I-205	10.72	Clackamas	1	Retrofit
09717	Hwy 64 NB over UPRR	I-205	13.76	Clackamas	1	Retrofit
09717A	Hwy 64 SB over UPRR	I-205	13.76	Clackamas	1	Retrofit
09711	Hwy 64 NB over SE 92nd Ave	I-205	16.80	Multnomah	1	Retrofit
09711A	Hwy 64 SB over SE 92nd Ave	I-205	16.80	Multnomah	1	Retrofit
13541	Johnson Cr & Mt Scott Blvd (Flavel St), Hwy 64 NB	I-205	17.22	Multnomah	1	Retrofit
13541A	Johnson Cr & Mt Scott Blvd (Flavel St), Hwy 64 SB	I-205	17.22	Multnomah	1	Retrofit
13540	Hwy 64 NB over Portland Traction RR (Abandoned)	I-205	17.43	Multnomah	1	Retrofit
13540A	Hwy 64 SB over Portland Traction RR (Abandoned)	I-205	17.43	Multnomah	1	Retrofit
13538	Hwy 64 NB over SE Woodstock Blvd & SE Foster Rd	I-205	17.80	Multnomah	1	Rehab+
13538A	Hwy 64 SB over SE Woodstock Blvd & SE Foster Rd	I-205	17.80	Multnomah	1	Rehab+

Bridge No.	Bridge Name	Route	Mile Point	County	ODOT Region	Needs
13537	Hwy 64 over SE Harold St	I-205	18.11	Multnomah	1	Retrofit
13531	Hwy 64 over Hwy 26 (SE Powell Blvd)	I-205	19.12	Multnomah	1	Retrofit
16302	Hwy 64 over MAX LRT	I-205	19.82	Multnomah	1	Retrofit
13516A	Hwy 64 over Hwy 2	I-205	21.57	Multnomah	1	Retrofit
13514I	Hwy 64 NB over Light Rail	I-205	22.24	Multnomah	1	Retrofit
13514C	Hwy 64 over Hwy 64 SB Conn to Hwy 2 EB	I-205	22.71	Multnomah	1	Rehab+
16055A	Columbia Slough & NE Alderwood Rd, Hwy 64 SB	I-205	24.27	Multnomah	1	Retrofit
16055	Columbia Slough & NE Alderwood Rd., Hwy 64 NB	I-205	24.34	Multnomah	1	Retrofit
13507A	Hwy 64 SB over NE Airport Way	I-205	24.67	Multnomah	1	Retrofit
13507	Hwy 64 NB over NE Airport Way	I-205	24.75	Multnomah	1	Retrofit
09555	Columbia River N Channel, Hwy 64 (Glenn Jackson)	I-205	26.32	Multnomah	1	Rehab+
08591F	Hwy 1 NB Conn to Hwy 61 NB over Conns	I-405	0.48	Multnomah	1	Retrofit
08591E	Hwy 61SB Conn to Hwy 1 SB over SW Water Ave	I-405	0.53	Multnomah	1	Rehab+
08591A	Hwy 61 SB to Hwy 1 NB over Hwy 1 (W Marquam Int)	I-405	1.07	Multnomah	1	Retrofit
09254E	Hwy 61 NB Conn #2 to Hwy 47 WB over Hwy 61 & Conns	I-405	1.57	Multnomah	1	Rehab+
09268N	Hwy 61 NB over City Streets	I-405	2.84	Multnomah	1	Rehab+
09268S	Hwy 61 SB over City Streets	I-405	2.84	Multnomah	1	Rehab+
09268	Hwy 61 over NW Front Ave & RR (W Fremont Approach)	I-405	3.10	Multnomah	1	Retrofit
09268W	Hwy 61 SB Conn to Hwy 2W WB	I-405	3.24	Multnomah	1	Rehab+
08958G	Ivy St Conn to Hwy 61 SB over Hwy1 (E Fremont Int)	I-405	3.29	Multnomah	1	Retrofit
02529	Willamette River, Hwy 61 (Fremont)	I-405	3.32	Multnomah	1	Retrofit
08958	Hwy 61 over City Streets (E Fremont Approach)	I-405	3.58	Multnomah	1	Retrofit
08958B	Hwy 61 over City Strs & RR (E Fremont Bridge Appr)	I-405	3.72	Multnomah	1	Rehab+
08958D	Hwy 61 NB to Hwy 1 SB over Strs (E Fremont Intchg)	I-405	3.77	Multnomah	1	Retrofit
08958H	Hwy61 NB Conn to Hwy1 NB over Hwy1 (E Fremont Int)	I-405	3.88	Multnomah	1	Rehab+

Bridge No.	Bridge Name	Route	Mile Point	County	ODOT Region	Needs
08958I	Hwy1 SB Conn to Hwy61 SB over Conn (E Fremont Int)	I-405	3.88	Multnomah	1	Retrofit
08958F	Hwy 61 NB Conn (Kerby) over Hwy 1 (E Fremont Int)	I-405	3.89	Multnomah	1	Retrofit
02254A	Willamette River, Hwy 1 (Boone Bridge)	I-5	283.11	Clackamas	1	Retrofit
09743C	Hwy 1 NB Conn to Hwy 64 NB over Hwy 1 SB Conn	I-5	288.48	Washington	1	Retrofit
09743	Hwy 1 NB over Hwy 1 SB Conn to Hwy 64 NB	I-5	288.51	Washington	1	Retrofit
09743A	Hwy 1 SB over Hwy 1 SB Conn to Hwy 64 NB	I-5	288.51	Washington	1	Retrofit
07494B	Beaver Dam Creek (Nyberg Creek), Hwy 1 SB	I-5	289.38	Washington	1	Reconstruct
07494C	Beaver Dam Creek (Nyberg Creek), Hwy 1 NB	I-5	289.38	Washington	1	Reconstruct
08882	Hwy 1 over N Columbia Blvd & UPRR	I-5	305.92	Multnomah	1	Retrofit
08883	Columbia Slough & Hwy 1 Conn, Hwy 1	I-5	306.27	Multnomah	1	Retrofit
09316A	Hwy 1 over N Victory Blvd	I-5	306.70	Multnomah	1	Retrofit
16526	Oregon Slough & N Jantzen Dr, Hwy 1 & 120	I-5	307.59	Multnomah	1	Retrofit
13514F	Hwy 2 WB over Hwy 2 WB Conns to Hwy 64	I-84	6.94	Multnomah	1	Retrofit
07043A	Hwy 2 over NE 122nd Ave	I-84	10.08	Multnomah	1	Retrofit
07044A	Hwy 2 over NE 148th Ave	I-84	11.43	Multnomah	1	Retrofit
07088A	Hwy 2 over NE 162nd Ave	I-84	12.13	Multnomah	1	Retrofit
07089A	Hwy 2 over NE 181st Ave	I-84	13.03	Multnomah	1	Rehab+
06945	Hwy 2 EB over Conn #2 (Jordan Rd)	I-84	17.82	Multnomah	1	Reconstruct
06945A	Hwy 2 WB over Conn #2 (Jordan Rd)	I-84	17.82	Multnomah	1	Reconstruct
02176	Hwy 2 WB over Hwy 100 & UPRR (Dodson)	I-84	35.12	Multnomah	1	Reconstruct
02176A	Hwy 2 EB over Hwy 100 & UPRR (Dodson)	I-84	35.12	Multnomah	1	Rehab+
08692	Hwy 2 over Conn to Warrendale	I-84	37.12	Multnomah	1	Retrofit
02193B	McCord Creek, Hwy 2 EB	I-84	37.83	Multnomah	1	Retrofit
02194A	Moffett Creek, Hwy 2 WB	I-84	38.98	Multnomah	1	Reconstruct
02062A	Tanner Creek, Hwy 2 WB	I-84	40.14	Multnomah	1	Rehab+
02062B	Tanner Creek, Hwy 2 EB	I-84	40.14	Multnomah	1	Retrofit
06924	Hwy 2 over Bonneville Dam Conn	I-84	40.27	Multnomah	1	Retrofit
09382	Eagle Creek Viaduct, Hwy 2 WB	I-84	41.31	Multnomah	1	Rehab+

Bridge No.	Bridge Name	Route	Mile Point	County	ODOT Region	Needs
02063	Eagle Creek, Hwy 2 EB	I-84	41.55	Multnomah	1	Rehab+
09377	Ruckel Creek & UPRR, Hwy 2	I-84	41.96	Multnomah	1	Rehab+
08609	Hwy 2 over Hwy 100 EB	I-84	43.66	Hood River	1	Retrofit
08610	Hwy 2 EB over Moody St (Cascade Locks)	I-84	43.93	Hood River	1	Retrofit
08610W	Hwy 2 WB over Moody St (Cascade Locks)	I-84	43.93	Hood River	1	Retrofit
08611	Hwy 2 EB over Hazel St (Cascade Locks)	I-84	44.40	Hood River	1	Retrofit
08611W	Hwy 2 WB over Hazel St (Cascade Locks)	I-84	44.40	Hood River	1	Retrofit
07403A	Herman Creek, Hwy 2	I-84	46.10	Hood River	1	Retrofit
08623	Hwy 2 over Herman Creek Conn	I-84	47.31	Hood River	1	Retrofit
08604	Hwy 2 over Conn (Wyeth Intchg)	I-84	50.99	Hood River	1	Retrofit
08534	Hwy 2 over Conn Viento Intchg	I-84	56.04	Hood River	1	Retrofit
07496	Hwy 2 WB overJaymar Rd (Westcliff Dr)	I-84	63.02	Hood River	1	Retrofit
07496A	Hwy 2 EB over Jaymar Rd (Westcliff Dr)	I-84	63.02	Hood River	1	Retrofit
02443	Hwy 2 WB over UPRR	I-84	63.41	Hood River	1	Rehab+
08662	Hwy 2 EB over UPRR	I-84	63.41	Hood River	1	Retrofit
02444	Hood River, Hwy 2 EB	I-84	64.15	Hood River	1	Rehab+
02444A	Hood River, Hwy 2 WB	I-84	64.15	Hood River	1	Retrofit
09519	Hwy 1W over Hwy 144	OR99W	8.65	Washington	1	Retrofit
02532	Hwy 1W over PNWR (Tigard)	OR99W	9.21	Washington	1	Reconstruct
02533	Fanno Creek, Hwy 1W	OR99W	9.37	Washington	1	Reconstruct
01417N	Tualatin River, Hwy 1W NB	OR99W	12.18	Washington	1	Rehab+
01417S	Tualatin River, Hwy 1W SB	OR99W	12.20	Washington	1	Reconstruct
01578	Rock Creek, OR 99W SB (Onion Flat)	OR99W	13.82	Washington	1	Reconstruct
01578A	Rock Creek, OR 99W NB (Onion Flat)	OR99W	13.83	Washington	1	Retrofit
09268B	Hwy 2W EB Conn to Hwy 61 SB	U.S. 30	1.24	Multnomah	1	Rehab+
09268A	NB Hwy 61 Conn to Hwy 2W WB	U.S. 30	1.26	Multnomah	1	Rehab+
09268E	Hwy 2W EB Conn to Hwy 61 NB	U.S. 30	1.46	Multnomah	1	Rehab+
01740	McCarty Creek, Hwy 2W	U.S. 30	13.19	Multnomah	1	Retrofit
07861A	Martin Creek, Hwy 1 NB	I-5	169.58	Lane	2	Retrofit
07865A	Hwy 1 over Taylor Ave	I-5	173.40	Lane	2	Rehab+
07864A	Hwy 1 over 16th Street (Landess Rd)	I-5	173.84	Lane	2	Retrofit
07830	Hwy 1 SB over OP&ERR (Abandoned)	I-5	174.41	Lane	2	Retrofit
07830A	Hwy 1 NB over OP&ERR (Abandoned)	I-5	174.41	Lane	2	Retrofit

Bridge No.	Bridge Name	Route	Mile Point	County	ODOT Region	Needs
07833A	Hwy 1 SB over Row River Rd (Cottage Grove)	I-5	174.74	Lane	2	Retrofit
07833B	Hwy 1 NB over Row River Rd (Cottage Grove)	I-5	174.74	Lane	2	Retrofit
07828A	Creek, Hwy 1 NB at MP 175.84	I-5	175.84	Lane	2	Rehab+
07828B	Creek, Hwy 1 SB at MP 175.84	I-5	175.84	Lane	2	Retrofit
07793A	Brown Creek, Hwy 1 NB	I-5	177.89	Lane	2	Retrofit
07743B	Tunnel Mill Race, Hwy 1 NB	I-5	180.49	Lane	2	Retrofit
07740A	Hill Creek, Hwy 1 SB	I-5	182.63	Lane	2	Retrofit
07740C	Hill Creek Hwy 001KR NB at MP 182.63	I-5	182.63	Lane	2	Retrofit
07738A	Old Lane Creek (Hill Slough), Hwy 1 SB	I-5	183.04	Lane	2	Retrofit
07738D	Old Lane Creek (Hill Slough), Hwy 1 NB	I-5	183.04	Lane	2	Retrofit
07736A	Camas Swale, Hwy 1 NB	I-5	185.46	Lane	2	Retrofit
08870	Hwy 1 over Hwy 225 Conn (McVay Access)	I-5	190.76	Lane	2	Retrofit
08180N	McKenzie Oflow, Hwy 1 NB at MP 196.19	I-5	196.19	Lane	2	Retrofit
08180S	McKenzie Oflow, Hwy 1 SB at MP 196.19	I-5	196.19	Lane	2	Rehab+
08178N	McKenzie Oflow, Hwy 1 NB at MP 196.69	I-5	196.69	Lane	2	Retrofit
08178S	McKenzie Oflow, Hwy 1 SB at MP 196.69	I-5	196.69	Lane	2	Retrofit
08171N	Muddy Creek, Hwy 1 NB	I-5	200.50	Lane	2	Retrofit
08171S	Muddy Creek, Hwy 1 SB	I-5	200.50	Lane	2	Retrofit
08251N	Small Creek, Hwy 1 NB at MP 205.34	I-5	205.34	Linn	2	Retrofit
08251S	Small Creek, Hwy 1 SB at MP 205.34	I-5	205.34	Linn	2	Retrofit
08246N	Muddy Creek, Hwy 1 NB	I-5	210.39	Linn	2	Retrofit
08246S	Muddy Creek, Hwy 1 SB	I-5	210.39	Linn	2	Rehab+
08245N	Little Muddy Creek, Hwy 1 NB	I-5	210.92	Linn	2	Retrofit
08245S	Little Muddy Creek, Hwy 1 SB	I-5	210.92	Linn	2	Retrofit
08241N	Courtney Creek, Hwy 1 NB	I-5	216.97	Linn	2	Retrofit
08241S	Courtney Creek, Hwy 1 SB	I-5	216.97	Linn	2	Retrofit
08240N	Courtney Creek Oflow, Hwy 1 NB	I-5	217.20	Linn	2	Retrofit
08240S	Courtney Creek Oflow, Hwy 1 SB	I-5	217.20	Linn	2	Retrofit
08239N	Sodom Ditch Oflow, Hwy 1 NB	I-5	217.39	Linn	2	Retrofit
08239S	Sodom Ditch Oflow, Hwy 1 SB	I-5	217.39	Linn	2	Retrofit
08238N	Calapooia Oflow, Hwy 1 NB at MP 217.85	I-5	217.85	Linn	2	Retrofit
08238S	Calapooia Oflow, Hwy 1 SB at MP 217.85	I-5	217.85	Linn	2	Retrofit

Bridge No.	Bridge Name	Route	Mile Point	County	ODOT Region	Needs
08236N	Calapooia River, Hwy 1 NB	I-5	218.79	Linn	2	Rehab+
08236S	Calapooia River, Hwy 1 SB	I-5	218.79	Linn	2	Rehab+
08235N	Calapooia Oflow, Hwy 1 NB at MP 220.04	I-5	220.04	Linn	2	Rehab+
08235S	Calapooia Oflow, Hwy 1 SB at MP 220.04	I-5	220.04	Linn	2	Rehab+
08234N	Sodom Ditch Oflow, Hwy 1 NB	I-5	220.37	Linn	2	Rehab+
08234S	Sodom Ditch Oflow, Hwy 1 SB	I-5	220.37	Linn	2	Rehab+
08232N	Butte Creek, Hwy 1 NB	I-5	222.42	Linn	2	Rehab+
08232S	Butte Creek, Hwy 1 SB	I-5	222.42	Linn	2	Rehab+
08227N	Oak Creek, Hwy 1 NB	I-5	230.48	Linn	2	Rehab+
08227S	Oak Creek, Hwy 1 SB	I-5	230.48	Linn	2	Rehab+
08226N	Hwy 1 NB over AERC (Tallman Branch)	I-5	230.86	Linn	2	Rehab+
08226S	Hwy 1 SB over AERC (Tallman Branch)	I-5	230.86	Linn	2	Rehab+
08225N	Albany Ditch, Hwy 1 NB	I-5	231.55	Linn	2	Retrofit
08225S	Albany Ditch, Hwy 1 SB	I-5	231.55	Linn	2	Retrofit
08222N	Cox Creek, Hwy 1 NB	I-5	233.65	Linn	2	Rehab+
08222S	Cox Creek, Hwy 1 SB	I-5	233.65	Linn	2	Rehab+
08221B	Hwy 1 NB over Hwy 58 NB (North Albany Intchg)	I-5	234.16	Linn	2	Rehab+
08221D	Hwy 1 SB over Hwy 58 NB (North Albany Intchg)	I-5	234.16	Linn	2	Retrofit
08221A	Hwy 1 NB over Knox Butte Rd (North Albany Intchg)	I-5	234.23	Linn	2	Rehab+
08221C	Hwy 1 SB over Knox Butte Rd (North Albany Intchg)	I-5	234.23	Linn	2	Rehab+
08218A	Hwy 1 NB over Murder Creek Rd	I-5	235.67	Linn	2	Rehab+
08218B	Hwy 1 SB over Murder Creek Rd	I-5	235.67	Linn	2	Rehab+
08217	Murder Creek, Hwy 1 SB	I-5	235.71	Linn	2	Retrofit
08124	Santiam Oflow No 4, Hwy 1 SB at MP 240.42	I-5	240.42	Linn	2	Rehab+
08123D	Santiam River, Hwy 1 SB	I-5	240.66	Marion/Linn	2	Retrofit
08122	Santiam Oflow No 3, Hwy 1 SB at MP 241.12	I-5	241.12	Marion	2	Rehab+
17352	Santiam Oflow No 3, Hwy 1 NB at MP 241.12	I-5	241.12	Marion	2	Rehab+
08121	Santiam Oflow No 2, Hwy 1 SB at MP 241.35	I-5	241.35	Marion	2	Rehab+

Bridge No.	Bridge Name	Route	Mile Point	County	ODOT Region	Needs
17351	Santiam Oflow No 2, Hwy 1 NB at MP 241.35	I-5	241.35	Marion	2	Rehab+
16161	Hwy 1 NB over Hwy 1E NB (Commercial St SE)	I-5	249.35	Marion	2	Retrofit
07524B	Hwy 1 SB over Hwy 1E NB (Commercial St SE)	I-5	249.38	Marion	2	Rehab+
07854C	Hwy 1 over UPRR Main Line	I-5	259.10	Marion	2	Rehab+
07855C	Hwy 1 NB over Hwy 72 NB	I-5	259.95	Marion	2	Retrofit
07855D	Hwy 1 SB over Hwy 72 NB	I-5	259.95	Marion	2	Retrofit
16086	Labish Bottom, Hwy 1 NB	I-5	261.12	Marion	2	Retrofit
16086A	Labish Bottom, Hwy 1 SB	I-5	261.12	Marion	2	Retrofit
07799A	Hwy 1 NB over Fellers Road NE	I-5	276.40	Marion	2	Retrofit
07799B	Hwy 1 SB over Fellers Road NE	I-5	276.40	Marion	2	Retrofit
07796A	Hwy 1 NB over Ehlen Road NE	I-5	278.67	Marion	2	Retrofit
07796B	Hwy 1 SB over Ehlen Road NE	I-5	278.67	Marion	2	Retrofit
07795A	Hwy 1 NB over Arndt Road NE	I-5	280.67	Marion	2	Retrofit
07795B	Hwy 1 SB over Arndt Road NE	I-5	280.67	Marion	2	Retrofit
13491	Hwy 39 over Hwy 9	OR18	0.04	Lincoln	2	Retrofit
04190	Bear Creek, Hwy 39	OR18	3.96	Lincoln	2	Reconstruct
01211A	Slick Rock Creek, Hwy 39	OR18	5.34	Lincoln	2	Reconstruct
04192	Salmon River, Hwy 39	OR18	6.23	Lincoln	2	Reconstruct
04573	Rogue River, Hwy 39	OR18	18.78	Polk	2	Reconstruct
01612A	South Yamhill River, Hwy 39 at MP 21.55	OR18	21.55	Polk	2	Reconstruct
00745	South Yamhill River, Hwy 39 at MP 23.77	OR18	23.77	Polk	2	Reconstruct
08320	South Yamhill River & Hwy 157, Hwy 39 at MP 27.17	OR18	27.17	Polk	2	Rehab+
08321	Hwy 39 over Hwy 30	OR18	27.28	Polk	2	Rehab+
0M022	Culvert, Hwy 39 at MP 28.38	OR18	28.38	Polk	2	Retrofit
08060	Mill Creek, Hwy 39	OR18	30.38	Yamhill	2	Rehab+
08063	South Yamhill River, Hwy 39 at MP 33.64	OR18	33.64	Yamhill	2	Rehab+
08064	Hwy 39 over Hwy 157 EB	OR18	33.82	Yamhill	2	Rehab+
03114	Deer Creek, Hwy 39	OR18	36.06	Yamhill	2	Reconstruct
02404A	Muddy Creek, Hwy 39	OR18	37.98	Yamhill	2	Retrofit
08950	Hwy 39 EB Conn to Hwy 1W over Hwy 39 WB	OR18	44.06	Yamhill	2	Rehab+
08688	Hwy 39 over WPRR	OR18	44.79	Yamhill	2	Retrofit

Bridge No.	Bridge Name	Route	Mile Point	County	ODOT Region	Needs
08490	South Yamhill River, Hwy 39 at MP 45.63	OR18	45.63	Yamhill	2	Rehab+
08492	Yamhill River Oflow, Hwy 39	OR18	45.76	Yamhill	2	Rehab+
08013	Hwy 39 over Hwy 150	OR18	51.38	Yamhill	2	Retrofit
08003	Yamhill River, Hwy 39 (Dayton)	OR18	51.57	Yamhill	2	Rehab+
08951	Hwy 483 McMinnville Spur over Hwy 39	OR483	46.35	Yamhill	2	Rehab+
02054A	Chehalem Creek, Hwy 1W	OR99W	24.29	Yamhill	2	Retrofit
07224	Drainage Ditch, Hwy 9 at MP 66.36	U.S. 101	66.36	Tillamook	2	Reconstruct
07147	Trask River, Hwy 9	U.S. 101	67.98	Tillamook	2	Reconstruct
04642A	South Prairie Creek, Hwy 9	U.S. 101	68.45	Tillamook	2	Reconstruct
04643A	Anderson Creek, Hwy 9	U.S. 101	68.67	Tillamook	2	Reconstruct
07181	Fawcett Creek, Hwy 9	U.S. 101	71.18	Tillamook	2	Reconstruct
00877	Simmons Creek, Hwy 9	U.S. 101	71.85	Tillamook	2	Retrofit
04654	Beaver Creek, Hwy 9 at MP 79.61	U.S. 101	79.61	Tillamook	2	Reconstruct
02762	Beaver Creek, Hwy 9 at MP 80.32	U.S. 101	80.32	Tillamook	2	Reconstruct
00555B	Big Nestucca River, Hwy 9 (Condor)	U.S. 101	84.08	Tillamook	2	Retrofit
04660A	Three Rivers, Hwy 9	U.S. 101	85.01	Tillamook	2	Reconstruct
00870	Clear Creek, Hwy 9	U.S. 101	88.68	Tillamook	2	Reconstruct
02508A	Little Nestucca River, Hwy 9	U.S. 101	91.79	Tillamook	2	Retrofit
13490	Neskowin Creek, Hwy 9	U.S. 101	98.94	Tillamook	2	Retrofit
09463	Salmon River, Hwy 9	U.S. 101	104.70	Lincoln	2	Retrofit
00922A	Devils Lake Outlet, Hwy 9 (D River)	U.S. 101	114.88	Lincoln	2	Reconstruct
00924A	Schooner Creek, Hwy 9	U.S. 101	118.17	Lincoln	2	Reconstruct
00925A	Drift Creek, Hwy 9	U.S. 101	119.27	Lincoln	2	Reconstruct
09906	Siletz River, Hwy 9	U.S. 101	120.16	Lincoln	2	Retrofit
04141A	Sijota Creek & Golf Access, Hwy 9	U.S. 101	121.61	Lincoln	2	Retrofit
04143A	Fogarty Creek, Hwy 9	U.S. 101	125.19	Lincoln	2	Rehab+
02459	Depoe Bay, Hwy 9	U.S. 101	127.61	Lincoln	2	Reconstruct
00982	Siltcoos River, Hwy 9	U.S. 101	196.93	Lane	2	Reconstruct
02670A	South Fork Scappoose River, Hwy 2W	U.S. 30	21.48	Columbia	2	Retrofit
00338A	Tide Creek, Hwy 2W	U.S. 30	36.47	Columbia	2	Retrofit
00191A	Goble Creek, Hwy 2W	U.S. 30	40.74	Columbia	2	Rehab+
00146A	Beaver Creek, Hwy 2W	U.S. 30	53.05	Columbia	2	Retrofit
07722	Lost Creek, Hwy 2W	U.S. 30	55.29	Columbia	2	Retrofit
07715	Hwy 2W over Swedetown County Rd	U.S. 30	60.82	Columbia	2	Rehab+

Bridge No.	Bridge Name	Route	Mile Point	County	ODOT Region	Needs
07519	Clatskanie River, Hwy 2W	U.S. 30	61.21	Columbia	2	Rehab+
00185A	Plympton Creek, Hwy 2W	U.S. 30	70.71	Clatsop	2	Retrofit
09598	Hwy 2W Conn over Hwy 2W (Wauna Intchg)	U.S. 30	72.75	Clatsop	2	Rehab+
00921	Gnat Creek, Hwy 2W	U.S. 30	77.25	Clatsop	2	Reconstruct
07417	Big Creek, Hwy 2W	U.S. 30	82.52	Clatsop	2	Retrofit
09546	Ferris Creek, Hwy 2W	U.S. 30	85.27	Clatsop	2	Retrofit
09544	Bear Creek, Hwy 2W	U.S. 30	86.21	Clatsop	2	Retrofit
09543	Marys Creek, Hwy 2W	U.S. 30	86.43	Clatsop	2	Retrofit
01827B	John Day River, Hwy 2W	U.S. 30	92.50	Clatsop	2	Rehab+
09260A	Hwy 1 over Hwy 273 at MP 4.63	I-5	4.63	Jackson	3	Rehab+
09259	Hwy 1 SB over Hwy 273	I-5	5.32	Jackson	3	Rehab+
09259A	Hwy 1 NB over Hwy 273	I-5	5.36	Jackson	3	Rehab+
08746N	Hwy 1 NB over Crowson Rd	I-5	13.29	Jackson	3	Retrofit
08746S	Hwy 1 SB over Crowson Rd	I-5	13.29	Jackson	3	Rehab+
08891N	Bear Creek, Hwy 1 NB at MP 22.42	I-5	22.42	Jackson	3	Retrofit
08891S	Bear Creek, Hwy 1 SB at MP 22.42	I-5	22.42	Jackson	3	Retrofit
08890N	Bear Creek, Hwy 1 NB at MP 23.07	I-5	23.07	Jackson	3	Retrofit
08890S	Bear Creek, Hwy 1 SB at MP 23.07	I-5	23.07	Jackson	3	Retrofit
08851	Hwy 1 over McAndrews Rd	I-5	29.64	Jackson	3	Retrofit
08771N	Bear Creek, Hwy 1 NB at MP 30.69	I-5	30.69	Jackson	3	Retrofit
08771S	Bear Creek, Hwy 1 SB at MP 30.69	I-5	30.69	Jackson	3	Retrofit
0M220	Griffin Creek, Hwy 1	I-5	34.28	Jackson	3	Retrofit
0M221	Jackson Creek, Hwy 1	I-5	35.24	Jackson	3	Retrofit
08383N	Hwy 1 NB over Hwy 60	I-5	45.47	Jackson	3	Rehab+
08383S	Hwy 1 SB over Hwy 60	I-5	45.47	Jackson	3	Rehab+
08381N	Rogue River, Hwy 1 NB (Homestead)	I-5	45.61	Jackson	3	Rehab+
08381S	Rogue River, Hwy 1 SB (Homestead)	I-5	45.61	Jackson	3	Rehab+
08378	Ward Creek, Hwy 1	I-5	48.71	Jackson	3	Retrofit
08377	Hwy 1 over Depot St	I-5	48.82	Jackson	3	Rehab+
08376	Evans Creek, Hwy 1	I-5	49.07	Jackson	3	Rehab+
08375	Creek & County Rd + CORP, Hwy 1 at MP 49.46	I-5	49.46	Jackson	3	Rehab+
08335N	Hwy 1 NB over Foothill Blvd	I-5	54.10	Josephine	3	Rehab+

Bridge No.	Bridge Name	Route	Mile Point	County	ODOT Region	Needs
08335S	Hwy 1 SB over Foothill Blvd	I-5	54.10	Josephine	3	Rehab+
08333	Hwy 1 over Foothill Blvd	I-5	55.40	Josephine	3	Rehab+
08338	Hwy 1 over Hillcrest Dr	I-5	57.50	Josephine	3	Rehab+
08501	Hwy 1 over Hwy 25 NB	I-5	58.06	Josephine	3	Retrofit
08500	Hwy 1 over Scoville Rd	I-5	58.18	Josephine	3	Retrofit
08094N	Jumpoff Joe Creek, Hwy 1 NB	I-5	65.74	Josephine	3	Retrofit
08094S	Jumpoff Joe Creek, Hwy 1 SB	I-5	65.74	Josephine	3	Retrofit
08093B	Monument Dr. (Jumpoff Joe Conn) Over Hwy 001	I-5	66.22	Josephine	3	Rehab+
09439	Hwy 1 NB & Conn over Sunny Valley Rd	I-5	71.39	Josephine	3	Retrofit
09439A	Hwy 1 SB & Conn over Sunny Valley Rd	I-5	71.39	Josephine	3	Retrofit
09440	Hwy 1 NB over Leland Rd	I-5	71.93	Josephine	3	Retrofit
09440A	Hwy 1 SB over Leland Rd	I-5	71.93	Josephine	3	Retrofit
09339	Hwy 1 over S Wolf Creek Conn	I-5	76.03	Josephine	3	Retrofit
09337	Hwy 1 over N Wolf Creek Conn	I-5	76.60	Josephine	3	Retrofit
09352	Hwy 1 NB & Conn over Conn (Glendale Intchg)	I-5	80.76	Douglas	3	Retrofit
09352A	Hwy 1 SB & Conn over Conn (Glendale Intchg)	I-5	80.80	Douglas	3	Retrofit
06784	Swamp Creek, Hwy 1	I-5	82.34	Douglas	3	Retrofit
06785	Woodford Creek, Hwy 1	I-5	83.08	Douglas	3	Retrofit
07324	Hwy 1 over First St (Canyonville)	I-5	98.51	Douglas	3	Retrofit
07952A	Hwy 1 SB over CORP (Weaver)	I-5	107.52	Douglas	3	Rehab+
07950	Hwy 1 over Myrtle Creek Conn (Myrtle Creek Intchg)	I-5	108.31	Douglas	3	Retrofit
07841A	S Umpqua R & CORP & Cnty Rd, Hwy1 SB (Booth Ranch)	I-5	112.57	Douglas	3	Retrofit
07839	Hwy 1 SB over Clarks Branch Rd Conn #2	I-5	113.44	Douglas	3	Rehab+
07839A	Hwy 1 NB over Clarks Branch Rd Conn #2	I-5	113.44	Douglas	3	Retrofit
07804N	Hwy 1 over Speedway Rd	I-5	120.03	Douglas	3	Retrofit
07670A	Hwy 1 over Portland Ave (Fairgrounds Intchg)	I-5	123.01	Douglas	3	Rehab+
07669A	Hwy 1 & Conn over Harvard Ave	I-5	124.15	Douglas	3	Retrofit
07668A	Hwy 1 over Bellows St	I-5	124.22	Douglas	3	Rehab+
07668B	Hwy 1 Conn over Bellows St	I-5	124.24	Douglas	3	Retrofit
07404	South Umpqua River, Hwy 1 SB (Vets)	I-5	124.54	Douglas	3	Retrofit

Bridge No.	Bridge Name	Route	Mile Point	County	ODOT Region	Needs
07404A	South Umpqua River, Hwy 1 NB (Vets)	I-5	124.54	Douglas	3	Retrofit
07663A	N Umpqua R & CORP & Co Rd, Hwy 1 SB (Winchester)	I-5	128.92	Douglas	3	Retrofit
07663C	N Umpqua R & CORP & Co Rd, Hwy 1 NB (Winchester)	I-5	128.92	Douglas	3	Rehab+
07629A	Hwy 1 SB over Wilbur-Umpqua Rd	I-5	132.00	Douglas	3	Retrofit
07718	Culvert, Hwy 1 at MP 132.28	I-5	132.28	Douglas	3	Retrofit
07627A	Hwy 1 SB over Rogers Rd Conn	I-5	133.25	Douglas	3	Retrofit
07627B	Hwy 1 NB over Rogers Rd Conn	I-5	133.25	Douglas	3	Retrofit
07644A	Hwy 1 over Rice Hill Frtg Rd	I-5	148.21	Douglas	3	Rehab+
07641	Yoncalla Creek, Hwy 1 Conn	I-5	149.71	Douglas	3	Retrofit
07640	Hwy 1 NB over CORP (Yoncalla)	I-5	150.76	Douglas	3	Retrofit
07640A	Hwy 1 SB over CORP (Yoncalla)	I-5	150.79	Douglas	3	Retrofit
07567A	Elk Creek, Hwy 1 SB	I-5	156.03	Douglas	3	Rehab+
07567B	Elk Creek, Hwy 1 NB	I-5	156.03	Douglas	3	Rehab+
07572A	Curtis Creek, Hwy 001 SB at MP 156.49	I-5	156.49	Douglas	3	Retrofit
07594A	Hwy 1 over Scotts Valley Conn	I-5	159.28	Douglas	3	Retrofit
07569A	Hwy 1 over Buck Creek Rd	I-5	162.06	Douglas	3	Retrofit
01683	Koepke Slough, Hwy 45	OR38	4.11	Douglas	3	Reconstruct
01685A	Dean Creek, Hwy 45	OR38	5.76	Douglas	3	Retrofit
01688A	Mill Creek, Hwy 45	OR38	13.24	Douglas	3	Retrofit
01318	Umpqua River, Hwy 45 (Scottsburg)	OR38	16.43	Douglas	3	Reconstruct
01697	Paradise Creek, Hwy 45	OR38	28.28	Douglas	3	Reconstruct
07471B	Pass Creek, Hwy 45	OR38	56.45	Douglas	3	Retrofit
01602	Tahkenitch Creek, Hwy 9	U.S. 101	202.72	Douglas	3	Reconstruct
01822	Umpqua River & McIntosh Slough, Hwy 9	U.S. 101	211.11	Douglas	3	Rehab+
00983	Scholfield Creek, Hwy 9	U.S. 101	212.27	Douglas	3	Rehab+
09559	Hwy 9 over Ranch Rd	U.S. 101	213.23	Douglas	3	Retrofit
00949A	Tenmile Creek & CBRL, Hwy 9 & Frtg Rd (Lakeside)	U.S. 101	223.21	Coos	3	Retrofit
07493	North Slough, Hwy 9	U.S. 101	229.43	Coos	3	Retrofit
01950	Hwy 9 over CBRL (North Bend)	U.S. 101	234.76	Coos	3	Reconstruct
02478C	Coalbank Slough, Hwy 9	U.S. 101	239.20	Coos	3	Retrofit
03166B	Shinglehouse Slough, Hwy 9 SB	U.S. 101	241.81	Coos	3	Retrofit
06514A	Shinglehouse Slough, Hwy 9 NB	U.S. 101	241.81	Coos	3	Retrofit

Bridge No.	Bridge Name	Route	Mile Point	County	ODOT Region	Needs
07392	Rock Creek, Hwy 2	I-84	69.62	Wasco	4	Rehab+
07552A	Hwy 2 over Rowena Conn	I-84	76.64	Wasco	4	Rehab+
08775	Hwy 2 over Hwy 292 at MP 84.15	I-84	84.15	Wasco	4	Retrofit
08603	Hwy 2 EB over UPRR	I-84	84.28	Wasco	4	Retrofit
08603W	Hwy 2 WB over UPRR	I-84	84.28	Wasco	4	Retrofit
08924	Hwy 2 WB over UPRR (Big Eddy WB)	I-84	89.89	Wasco	4	Retrofit
08923	Hwy 2 over UPRR (WB Celilo)	I-84	95.76	Wasco	4	Retrofit
08933	Hwy 2 over UPRR (W Celilo Junction)	I-84	96.04	Wasco	4	Rehab+
08934	Hwy 2 over Hwy 301	I-84	97.14	Wasco	4	Retrofit
08831	Hwy 2 over UPRR	I-84	97.45	Wasco	4	Retrofit
00332C	Deschutes River, Hwy 2	I-84	99.85	Wasco	4	Retrofit
01750B	Fulton Canyon, Hwy 2 EB	I-84	101.68	Sherman	4	Retrofit
W1750B	Fulton Canyon, Hwy 2 WB	I-84	101.68	Sherman	4	Retrofit
02133A	Spanish Hollow Creek, Hwy 2	I-84	104.76	Sherman	4	Retrofit
00849A	Columbia River, Hwy 42 (Biggs Rapids, Sam Hill)	U.S. 97	-0.43	Sherman	4	Rehab+

Table 9-10. High-Priority Phase 1 and 2 Seismic Landslide Locations

Route	Begin MP	End MP	Mid MP	County	ODOT Region	Need Type
I-5	294.17	294.18	294.18	Multnomah	1	Fill Failure Below
I-5			297.55	Multnomah	1	Landslide Above
I-5			298.50	Multnomah	1	Landslide Below
I-5	298.44	298.60	298.52	Multnomah	1	Landslide Above
I-84	30.06	30.08	30.07	Multnomah	1	Fill Failure Below
I-84	32.36	32.37	32.37	Multnomah	1	Fill Failure Below
I-84	37.66	37.79	37.72	Multnomah	1	Rockfall Above
I-84	38.49	38.53	38.51	Multnomah	1	Fill Failure Below
I-84	47.90	48.10	48.00	Hood River	1	Landslide Below
U.S. 30	11.90	11.92	11.91	Multnomah	1	Fill Failure Below
U.S. 30	17.92	17.94	17.93	Multnomah	1	Fill Failure Below
U.S. 30	18.16	18.20	18.18	Multnomah	1	Fill Failure Below
OR 18	13.60	13.74	13.67	Tillamook	2	Fill Failure Below
OR 18	14.25	14.28	14.26	Tillamook	2	Landslide Below
OR 18	17.20	17.28	17.24	Polk	2	Fill Failure Below
OR 58			23.36	Lane	2	Rockfall Above
OR 58			25.95	Lane	2	Landslide Below
OR 58			44.30	Lane	2	Landslide Below
OR 58			44.70	Lane	2	Landslide Below
OR 58			56.00	Lane	2	Rockfall Above
U.S. 101	69.61	69.63	69.62	Tillamook	2	Landslide Below
U.S. 101	81.05	81.06	81.06	Tillamook	2	Fill Failure Below
U.S. 101	83.20	83.24	83.22	Tillamook	2	Landslide Above
U.S. 101	87.83	87.91	87.87	Tillamook	2	Fill Failure Below
U.S. 101	99.52	99.56	99.54	Tillamook	2	Fill Failure Below
U.S. 101	102.19	102.20	102.20	Tillamook	2	Fill Failure Below
U.S. 101	102.91	102.93	102.92	Lincoln	2	Landslide Above
U.S. 101	133.07	133.27	133.17	Lincoln	2	Landslide Both
U.S. 101	133.53	133.57	133.55	Lincoln	2	Landslide Both
U.S. 101	134.88	134.89	134.88	Lincoln	2	Landslide Below
U.S. 101	135.26	135.30	135.28	Lincoln	2	Landslide Below
U.S. 101	135.35	135.39	135.37	Lincoln	2	Landslide Below
U.S. 101	135.80	136.26	136.03	Lincoln	2	Landslide Both

Route	Begin MP	End MP	Mid MP	County	ODOT Region	Need Type
U.S. 101	136.04	136.26	136.15	Lincoln	2	Landslide Both
U.S. 101	191.29	191.35	191.32	Lane	2	Landslide Below
U.S. 101	197.27	197.29	197.28	Lane	2	Fill Failure Below
U.S. 101	198.53	198.57	198.55	Lane	2	Fill Failure Below
U.S. 30	36.20	36.22	36.21	Columbia	2	Fill Failure Both
U.S. 30	37.01	37.15	37.09	Columbia	2	Fill Failure Below
U.S. 30	41.39	41.47	41.43	Columbia	2	Rockfall Above
U.S. 30	44.13	44.17	44.15	Columbia	2	Fill Failure Below
U.S. 30	46.01	46.07	46.04	Columbia	2	Fill Failure Below
U.S. 30	46.49	46.59	46.54	Columbia	2	Rockfall Above
U.S. 30	46.72	46.76	46.74	Columbia	2	Fill Failure Below
U.S. 30	60.25	60.31	60.28	Columbia	2	Fill Failure Both
U.S. 30	63.09	63.25	63.17	Columbia	2	Rockfall Above
U.S. 30	69.25	69.29	69.27	Columbia	2	Landslide Above
U.S. 30	81.04	81.14	81.09	Clatsop	2	Fill Failure Below
U.S. 30	87.63	87.73	87.68	Clatsop	2	Fill Failure Below
U.S. 30	88.49	88.53	88.51	Clatsop	2	Fill Failure Below
U.S. 30	88.97	89.03	89.00	Clatsop	2	Landslide Both
U.S. 30	91.65	91.79	91.72	Clatsop	2	Fill Failure Below
U.S. 30	93.46	93.52	93.49	Clatsop	2	Fill Failure Below
U.S. 30	94.11	94.15	94.13	Clatsop	2	Fill Failure Below
U.S. 30	94.17	94.25	94.21	Clatsop	2	Landslide Below
U.S. 30	94.31	94.39	94.35	Clatsop	2	Landslide Below
U.S. 30	94.57	94.59	94.58	Clatsop	2	Landslide Below
U.S. 30	95.58	95.60	95.59	Clatsop	2	Landslide Below
U.S. 30	95.67	95.71	95.69	Clatsop	2	Landslide Below
U.S. 30	96.91	96.95	96.93	Clatsop	2	Landslide Below
I-5			4.00	Jackson	3	Rockfall Above
I-5			7.00	Jackson	3	Rockfall Above
I-5			9.50	Jackson	3	Landslide Below
I-5			9.50	Jackson	3	Rockfall Above
I-5	112.84	112.88	112.86	Douglas	3	Landslide Above
I-5	140.59	140.61	140.60	Douglas	3	Landslide Below
I-5	141.12	141.13	141.12	Douglas	3	Fill Failure Below

Route	Begin MP	End MP	Mid MP	County	ODOT Region	Need Type
I-5	141.65	141.74	141.70	Douglas	3	Landslide Below
I-5	142.65	142.81	142.73	Douglas	3	Landslide Above
I-5	161.16	161.22	161.19	Douglas	3	Rockfall Above
OR 38	1.32	1.35	1.34	Douglas	3	Fill Failure Below
OR 38	1.53	1.55	1.54	Douglas	3	Fill Failure Below
OR 38	2.33	2.35	2.34	Douglas	3	Fill Failure Below
OR 38	2.47	2.53	2.50	Douglas	3	Fill Failure Below
OR 38	3.67	3.68	3.68	Douglas	3	Fill Failure Below
OR 38	4.06	4.07	4.07	Douglas	3	Fill Failure Below
OR 38	4.09	4.10	4.10	Douglas	3	Fill Failure Below
OR 38	4.12	4.13	4.13	Douglas	3	Fill Failure Below
OR 38	17.83	18.37	18.10	Douglas	3	Landslide Above
OR 38	19.32	19.33	19.33	Douglas	3	Fill Failure Below
OR 38	26.93	26.97	26.95	Douglas	3	Rockfall Above
OR 38	27.80	27.82	27.81	Douglas	3	Fill Failure Below
OR 38	31.16	31.20	31.18	Douglas	3	Fill Failure Below
OR 38	31.27	31.29	31.28	Douglas	3	Fill Failure Below
OR 38	31.39	31.43	31.41	Douglas	3	Fill Failure Below
OR 38	32.43	32.47	32.45	Douglas	3	Fill Failure Below
OR 38	44.37	44.39	44.38	Douglas	3	Fill Failure Below
U.S. 101	199.44	199.46	199.45	Douglas	3	Fill Failure Below
U.S. 101	205.26	205.29	205.28	Douglas	3	Fill Failure Below
U.S. 101	205.44	205.46	205.45	Douglas	3	Fill Failure Below
U.S. 101	213.26	213.28	213.27	Douglas	3	Fill Failure Below
U.S. 101	217.62	217.65	217.64	Douglas	3	Fill Failure Below
U.S. 101	220.43	220.51	220.47	Douglas	3	Fill Failure Below
U.S. 101	220.84	220.86	220.85	Coos	3	Fill Failure Below
U.S. 101	244.45	244.49	244.47	Coos	3	Fill Failure Below
I-84	74.76	74.84	74.80	Wasco	4	Rockfall Above
I-84	74.90	75.06	74.98	Wasco	4	Rockfall Above
I-84	75.09	75.19	75.14	Wasco	4	Rockfall Above
I-84	90.47	90.71	90.59	Wasco	4	Rockfall Above
I-84	91.14	91.34	91.24	Wasco	4	Rockfall Above
I-84	92.57	93.95	93.26	Wasco	4	Rockfall Above

Route	Begin MP	End MP	Mid MP	County	ODOT Region	Need Type
U.S. 97	0.71	0.85	0.78	Sherman	4	Rockfall Above
U.S. 97	0.86	1.07	0.96	Sherman	4	Rockfall Above
U.S. 97	76.35	76.39	76.37	Jefferson	4	Landslide Above
U.S. 97	259.32	259.48	259.40	Klamath	4	Rockfall Above
U.S. 97	260.39	260.53	260.46	Klamath	4	Rockfall Above
U.S. 97	260.61	261.25	260.93	Klamath	4	Rockfall Above
U.S. 97	261.45	262.25	261.85	Klamath	4	Rockfall Above
U.S. 97	262.26	262.56	262.41	Klamath	4	Rockfall Above
U.S. 97	262.57	262.77	262.67	Klamath	4	Rockfall Above
U.S. 97	265.68	266.46	266.07	Klamath	4	Rockfall Above
U.S. 97	266.59	266.91	266.75	Klamath	4	Rockfall Above

Table 9-11. Freight Impacts on Highways

Route	Beg MP[4]	End MP	City/County	ODOT Region	Needs (Facilities - Mobility Issues)
I-205 NB	2.90	9.50	Clackamas County	1	Trucks bound for Clackamas Industrial Area and points north exacerbate bottleneck between Stafford and Oregon City.
I-205 NB	6.80	7.80	Clackamas County	1	Slow climbing trucks disrupt laminar traffic flow.
I-205 NB/ U.S. 30 BY WB	10.90	11.20	Portland	1	Grade and geometry of I-205 off-ramp plus signal on U.S. 30 BY challenges trucks to maintain speed.
I-205 NB/ U.S. 30 BY WB	23.60	23.90	Portland	1	Grade and geometry of I-205 off-ramp plus signal on U.S. 30 BY challenges trucks to maintain speed.
I-205 SB (and I-205 NB)	6.60	9.00	Clackamas County	1	Slow climbing trucks disrupt laminar traffic flow.
I-405/U.S. 30	2.60	2.90	Portland	1	Heavy truck volume from industrial NW Portland makes this short interchange interval very dangerous for weaving.
I-5 NB	294.20	295.50	Portland	1	Existing truck climbing lane ends before crest of the hill. Slow trucks impede/disrupt laminar flow.
I-5 NB	307.40	308.30	Portland	1	Extremely high truck volumes, poor ramp geometry, inadequate interchange spacing, narrow lanes, lack of shoulders, vertical curves all facilitate conflicts (safety, mobility and operational) between trucks and other users.
I-5 NB Off	300.70	301.00	Portland	1	Water Avenue exit is affected by at-grade rail in the Central Eastside, causing dangerous backups onto freeway with speed differential danger.
I-5 SB	296.60	299.60	Portland	1	Flow trucks on curving ascent disrupts even flow of traffic.
I-5 SB	301.90	302.60	Portland	1	Lane drop and weaving section with high truck volumes creates extremely high crash rate with mobility impacts.

[4] Beginning and ending mile points indicate the approximate location of the need but do not indicate the direction of the need.

Route	Beg MP[4]	End MP	City/County	ODOT Region	Needs (Facilities - Mobility Issues)
I-84 EB frontage	16.90	17.40	Troutdale	1	Overflow truck stop parking impacts frontage road and sometimes main line, causing safety risks and sometimes mobility problems.
I-84 EB frontage	49.30	49.60	Hood River County	1	Trucks park in a gravel shoulder of the interstate, creating a safety risk.
I-84 WB	53.90	54.50	Hood River County	1	Weigh station located in clear zone presents a safety risk; trucks merging also pose an operational risk.
OR 212	5.00	8.20	Clackamas County	1	Truck volume contributes to local congestion. Growth in distribution industry expected.
OR 217	0.00	7.52	Washington County	1	Trucks carrying hazardous materials must avoid Vista Ridge Tunnels.
OR 281	0.00	0.50	Hood River	1	Truck route on a steep city street is disruptive to car traffic and local businesses.
OR 281	1.60	2.00	Hood River County	1	Curve radius requires lane departure for trucks, with mobility and safety risks to other users.
U.S. 26 (Powell)	5.80	10.00	Portland	1	Compatibility between high truck volumes and other modes on this "main street" facility in Portland.
U.S. 26 WB (Mt. Hood)	54.30	57.30	Clackamas County	1	Existing truck climbing lane ends before crest of the hill. Slow trucks impede/disrupt laminar flow.
U.S. 26 WB (Sunset)	70.30	73.30	Portland	1	Slow climbing trucks disrupt laminar traffic flow.
U.S. 30 BY	0.50	1.20	Portland	1	Narrow lanes and vertical grade cause trucks to slow relative to car traffic on the bridge and also, risk to cyclists using the right lane on the bridge (St. Johns Bridge).
U.S. 30 BY	1.30	5.30	Portland	1	Compatibility between high truck volumes and other modes on this "main street" facility in Portland.
OR 99E	3.00	5.60	Albany	2	Manufacturing facilities create high freight volumes in the area.
I-5	233.00	238.00	Linn County	2	Truck movement causes delay and congestion.
I-5	245.00	250.00	Marion County	2	South Salem Hills, esp. SB/Heavy freight vehicle volumes creates impediment to non-freight vehicles.

Route	Beg MP[4]	End MP	City/County	ODOT Region	Needs (Facilities - Mobility Issues)
I-5	263.20	263.80	Marion County	2	Brooklake Interchange/outdated interchange design and heavy freight volumes creates safety issues with all vehicles entering/exiting I-5 and increases the potential for all vehicles to backup onto I-5.
I-5	278.50	278.80	Marion County	2	Aurora Donald Interchange/outdated interchange design and heavy freight volumes creates safety issues with all vehicles entering/exiting I-5 and increases the potential for all vehicles to backup onto I-5.
OR 58	14.30	14.66	Lane County	2	Multiple roll-over and other crashes at this location. Many have involved freight trucks, some carrying hazardous materials. Trestle crossing is at an oblique angle and is too narrow. Tight/blind corners on both sides.
OR 58	31.64	32.38	Lane County	2	There are only a few passing lanes on OR 58. The problem will be compounded if ODOT implements a lane reduction in Oakridge.
OR 58	37.26	38.47	Lane County	2	There are only a few passing lanes on OR 58. The problem will be compounded if ODOT implements a lane reduction in Oakridge.
OR 58	49.03	50.45	Lane County	2	Steep terrain along this segment causes trucks and RVs to slow. This in turn causes other driver to make risky passing maneuvers.
OR 58	55.60	55.60	Lane County	2	The chain-up area becomes congested with commercial vehicles which spill into the travel lane, causing a safety concern and a mobility issue.
U.S. 101	39.90	43.00	Tillamook County	2	Manzanita to Neakahnie Mountain/freight vehicles are impediments to non-freight vehicles.
U.S. 26	18.00	21.00	Clatsop County	2	Elsie area/freight activity conflicts with uncontrolled roadside environment.

Route	Beg MP[4]	End MP	City/County	ODOT Region	Needs (Facilities - Mobility Issues)
U.S. 20/ OR 34	53.00	55.60	Corvallis	2	Log trucks and other heavy freight cause delays at signalized intersections near OSU – including 15th St., 26 Street, 35th St. and 53rd.
U.S. 30	36.30	36.60	Columbia County	2	Tide Creek Bridge/narrow bridge creates safety hazard for freight and non-freight vehicles.
U.S. 30	48.00	49.00	Rainier	2	Lewis and Clark interchange/low clearance and heavy truck volumes.
U.S. 30	94.00	98.50	Astoria	2	Downtown Astoria/heavy truck volumes on Commercial Street creates operational and safety problems.
U.S. 30	98.00	99.00	Astoria	2	John Day Bridge to Astoria City Limits/high truck volumes create safety and mobility problems for non-freight traffic.
I-5	16.70	16.70	Ashland	3	Mountain Avenue vertical height does not meet ODOT or trucking standards, requiring truck detours.
I-5	27.00	30.00	Medford	3	Medford Viaduct has narrow shoulders that are insufficient for vehicles to pull over onto in the event of a breakdown or crash, creating through lane blockage. Emergency Vehicle access restricted as a result.
I-5	68.90	71.30	Josephine County	3	Sexton Summit: Curves and slow trucks leads to quick deceleration; steep grades create congestion due to significant speed reductions by trucks. Safety/Operational problems due to these speed reductions and speed differentials between lanes.
I-5	72.00	75.80	Josephine County	3	Smith Hill: Curves and slow trucks leads to quick deceleration. Steep grades create congestion due to significant speed reductions by trucks. Safety/Operational problems due to these speed reductions and speed differentials between lanes.

Route	Beg MP[4]	End MP	City/County	ODOT Region	Needs (Facilities - Mobility Issues)
I-5	77.70	80.80	Josephine/Douglas County	3	Stage Rd Pass: Curves and slow trucks leads to quick deceleration. Steep grades create congestion due to significant speed reductions by trucks. Safety/Operational problems due to these speed reductions and speed differentials between lanes.
I-5	88.40	95.40	Douglas County	3	Canyon Creek Pass: Curves and slow trucks leads to quick deceleration. Steep grades create congestion due to significant speed reductions by trucks. Safety/Operational problems due to these speed reductions and speed differentials between lanes.
I-5	119.00	125.00	Roseburg	3	Congestion partially due to high truck % and weaving from closely spaced interchanges.
OR 140	-6.42	0.00	White City	3	Road built to narrow county standards. Jurisdiction transferred to ODOT.
OR 42	38.00	45.00	Coos County	3	Tight curves result in truck turnovers on OR 42.
OR 42	Various	various	Coos County	3	Lack of westbound passing lanes leads to crashes as people seek areas to maneuver (pass) trucks.
U.S. 199, OR 99, OR 238	Junction	Junction	Grants Pass	3	Intersection of highways creates confusion, capacity constraints and is difficult for freight to traverse.
OR 370 & U.S. 97	118.25	118.75	Redmond	4	Trans-shipment facility located 0.5 mile east of U.S. 97 on O'Neil Highway. O'Neil Highway Junction with U.S. 97 has exceeded statewide average crash rates. The 2015 crash rate was two times the statewide average. A closer review of the crash data suggested that it is concentrated at the intersection of U.S. 97 and O'Neil Highway. Side street approaches must wait for gaps in highway traffic. The volume-to-capacity ratio was over 1.0, which is significantly above the 0.70 to 0.75 standard for this area and causes delay to freight movement.
U.S. 20	13.22	103.02	Deschutes/Lake/ Harney County	4	Superload route with limited pull-outs. Freight and passenger vehicles delayed up to 20 minutes waiting for superloads to clear area.

Route	Beg MP[4]	End MP	City/County	ODOT Region	Needs (Facilities - Mobility Issues)
U.S. 20	18.70	21.00	Deschutes County	4	Narrow shoulders on steep grade in Horse Ridge fails to provide a safe recovery zone for vehicles which crash or spin out. Lack of operating room makes vehicle recovery difficult and leads to significant delays to freight movement.
U.S. 97	0.20	4.07	Sherman County	4	This section of highway is south of Biggs Junction. It is approximately 4 miles long and has rock walls, steep banks, sharp curves, narrow shoulders and guardrails.
U.S. 97	84.00	84.50	Jefferson County	4	Guardrail too close to travel lane with frequent strikes by trucks.
U.S. 97	124.40	133.39	Deschutes County	4	During the 10 years between 2009 and 2013, 12 serious injury and fatal crashes occurred on U.S. 97 between Bend and Redmond. Many of these were lane departure crashes, sometimes resulting in high-speed head on collisions. In addition, there are a number of driveways on U.S. 97 between Bend and Redmond, and as traffic volumes grow, there are fewer gaps in traffic to facilitate motorists entering and exiting the highway at driveways. These conflicting movements can result in crashes, and probably are responsible for the many of the 25 rear end crashes reported between 2009 and 2013. Significant delay to freight and passenger vehicles associated with crashes.
U.S. 97	155.00	156.00	Deschutes County	4	Highway U.S. 97 is the main north-south transportation corridor through Central Oregon and a critical part of the state's transportation system. Demand continues to increase along U.S. 97, with average traffic rates of over 12,000 vehicles per day. Safety is a concern due to limited passing opportunities, leading to lengthy following times that sometimes result in drivers making passing maneuvers with high speeds and limited sight distances.

Route	Beg MP[4]	End MP	City/County	ODOT Region	Needs (Facilities - Mobility Issues)
U.S. 97	172.70	173.70	Klamath County	4	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement.
U.S. 97	192.20	193.20	Klamath County	4	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement.
U.S. 97	199.30	200.40	Klamath County	4	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement.
U.S. 97	211.10	212.10	Klamath County	4	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement.
U.S. 97	220.90	221.90	Klamath County	4	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement.
U.S. 97	237.00	239.00	Klamath County	4	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement.
U.S. 97	255.40	256.50	Klamath County	4	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement.
U.S. 97	264.00	265.10	Klamath County	4	Primarily a 2-lane highway with lack of passing opportunities resulting in platooning of traffic, unsafe passing, which contributes to crashes, and delay of freight movement.

Route	Beg MP[4]	End MP	City/County	ODOT Region	Needs (Facilities - Mobility Issues)
I-82	0.00	10.00	Umatilla County	5	Motorist rely on cameras and weather reporting stations to provide real time information during winter travel. When trucks are able to access real time information, they are able to make decisions about proceeding in the corridor or installing chains before entering into an area with inclement weather. Access to real time information allows them to avoid getting trapped in or contributing to an incident on the freeway.
I-82	1.00	1.00	Umatilla	5	Proximity of Port of Entry to I-82 EB off ramp creates truck stacking that blocks Hwy 2 and backs traffic up the I-82 EB off ramps onto the freeway.
I-84	160.00	378.00	Morrow/Umatilla/Union/Baker/ Malheur County	5	There are a number of bridges crossing over the freeway that create vertical clearance issues by having less than 17' 6".
I-84	160.00	378.00	Morrow/Umatilla/Union/Baker/ Malheur County	5	Motorists rely on cameras and weather reporting stations to provide real time information during winter travel. When trucks are able to access real time information, they are able to make decisions about proceeding in the corridor or installing chains before entering into an area with inclement weather. Access to real time information allows them to avoid getting trapped in or contributing to an incident on the freeway.
I-84	165.00	165.00	Boardman	5	WB interchange ramp congestion during peak usage with traffic backing onto interstate.
I-84	188.00	188.00	Stanfield/Echo	5	Interchange congestion during winter events and peak agricultural harvest traffic.
I-84	205.00	207.00	Umatilla County	5	The westbound grade between MP 205 and 207 is steep, dropping truck speeds and creating localized congestion on the freeway and safety issues. There is a large differential in speed between commercial traffic and light vehicles.

Route	Beg MP[4]	End MP	City/County	ODOT Region	Needs (Facilities - Mobility Issues)
I-84	209.00	210.00	Pendleton	5	The grade between MP 209 and 210 is steep, dropping truck speeds and creating localized congestion between the two interchange ramps that many locals use to access different parts of Pendleton. There is a large differential in speed between commercial traffic and light vehicles.
I-84	209.00	209.00	Pendleton	5	The U.S. 395/I-84 Interchange ramps no longer meet intersection function criteria. Traffic backs up the ramps to the freeway regularly. This affects the primary entrance to Pendleton's commercial district.
I-84	213.00	216.00	Umatilla County	5	Winter congestion/truck stacking blocking through traffic during winter events on freeway mainline. Highest District 12 priority for congestion.
I-84	216.00	252.00	Umatilla/Union County	5	Commercial vehicles failing to comply with chain restriction and resultant spin outs frequently closes the freeway.
I-84	268.00	268.00	Union County	5	Lack of chain sorting/compliance enforcement allows unchained commercial vehicles to proceed into Ladd Canyon, leading to spin out related closures in the winter.
I-84	374.00	378.00	Malheur County	5	During winter freeway closures, the Ontario area becomes congested as trucks run out of space to park. Traffic backs ups and blocks the freeway lanes preventing people from exiting during closures.
OR 201	30.00	30.00	Ontario	5	High accident intersection at OR 201/SW 18th and OR 201 @ RR Avenue (OR 201 connects U.S. 20 to I-84 and is on the I-84 paired route for over-dimensional loads) is a safety issue. Additionally, this location is a key transportation pinch point that complicates industrial development in the adjacent vacant lands.

Route	Beg MP[4]	End MP	City/County	ODOT Region	Needs (Facilities - Mobility Issues)
OR 237	17.20	28.80	Union County	5	Closures in Ladd Canyon due to weather related crashes, unchained trucks or visibility interrupts all travel in NE Oregon as there are no alternate routes available for freeway traffic.
OR 78	26.80	27.00	Harney County	5	When using this route as an alternate to I-84 during freeway construction projects, super loads back up traffic and have difficulty finding places to park or stage on this route.
OR 78	90.90	91.10	Malheur County	5	When using this route as an alternate to I-84 during freeway construction projects, super loads back up traffic and have difficulty finding places to park or stage on this route.
U.S. 20	193.74	216.87	Malheur County	5	Curves and narrow spots restrict over-dimension loads between Burns and Vale. Hwy 7 is the paired route to I-84 and frequently is used for over-dimensional loads when work is occurring on I-84.
U.S. 20	258.00	258.00	Malheur County	5	High accident intersection at Cairo Junction makes through freight and local agricultural freight movements dangerous.
U.S. 95	0.00	0.20	Malheur County	5	When using this route as an alternate to I-84 during freeway construction projects, super loads back up traffic and have difficulty finding places to park or stage on this route.

Appendix J – Non-Highway Inventories of Need

Table 9-12. Marine

Location	ODOT Region	Needs
Port of Portland	1	Grade separations: Marine Drive at BNSF Ford/Ramsey Lead in Rivergate. UPRR Kenton Line grade separations and double tracking from North Portland to Troutdale.
Port of Portland	1	Willamette River Channel Deepening of the portion of the Willamette River with deep draft infrastructure to -43 feet to take advantage of the Columbia River's controlling depth.
Port of Portland	1	Bonneville Rail Yard Build Out: Construct two interior yard tracks and complete the double track lead from Barnes Yard to add rail staging capacity for South Rivergate.
Port of Portland	1	Terminal 2: Terminal 2 Yard and Rail Improvements to increase rail and yard operating efficiencies at T2, reconstruct rail and yard pavement.
Port of Portland	1	Terminal 4 Pier 1 Site Preparation: Remove Berths 405 and 408, the grain leg platform and tower, and the grain elevator in the Pier 1 area of T4. This will facilitate redevelopment of approximately 30 acres of marine industrial property in the Portland Harbor.
Port of Portland	1	Terminal 4: T4 Capacity Expansion and Modernization needed to allow increase in rail capacity at T4, includes second entrance, rail at Berth 410-411, a third rail lead to Barnes Yard, and replacement of Lombard Bridge.
Port of Portland	1	Time Oil Road Reconstruction to provide improved access to the South Rivergate Industrial Area.
Portland	1	BNSF Columbia River Rail Bridge: change from swing span to lift span and align lift span location with I-5 Bridge high span and wide span to align barge traffic between the two bridges, reduce I-5 Bridge lifts needed for barge traffic, and reduce marine impacts to I-5 highway traffic.
Port of Portland	1	Marine Drive Interchange at Interstate 5: This interchange is an existing constraint and will need to be redesigned with or without a larger Columbia River Crossing project. This is a key bottleneck for access to and from Rivergate, the largest industrial district in Oregon. Possible solution is westbound Marine Drive to northbound I-5 flyover ramp.
Port of Portland	1	Cathedral Park Quiet Zone to address rail switching noise by improving multiple public rail crossings in the St. Johns Cathedral Park area.
Port of Portland	1	Terminal 6 Development Project includes additional scour protection, T6 entrance overcrossing, two new PPMX cranes, electrical upgrades, yard gantry cranes, and 6,800 and 8,500 departure tracks. Necessary to expand capacity to 1 million TEUs.
Port of Hood River	1	Replacement of Hood River Interstate Bridge.
Lower Columbia River	2	Lower Columbia River shipping channel: Anchorage deepening to allow loaded ships to anchor while waiting to time their arrival at the Columbia River Bar.
Lower Columbia River	2	Lower Columbia River shipping channel: Stern buoys for Lower Columbia River anchorages.
Port of Astoria	2	Major repairs needed at all port shipping docks.

Location	ODOT Region	Needs
Port of Newport	2	Port Dock 5 Pier Access, located at 210 Bay Blvd., Newport, OR. The sole connector between the commercial fishing fleet and shoreside services is via a 75-year-old access pier. Recent preliminary engineering study has shown that this critical infrastructure connector is in danger of failing and needs reconstruction.
Port of St. Helens	2	Portland & Western rail improvements - sidings, track improvements.
Port of St. Helens	2	Port Westward dock improvements and water system improvements.
Lower Columbia River	2	Jetties at the mouth of the Columbia River.*
Port of Astoria	2	Rail and truck access at Tongue Point.
Port of Newport	2	International Terminal Shipping Facility, located at 1510 Bay Blvd., Newport, OR. Construction of a laydown facility to consolidate imports and exports using U.S. 20/U.S. 101 and the Federal Marine Highway system. There is a demand for logging/wood products exports and waste paper imports from barges and handysized vessels onto the state highway system.
Port of Toledo	2	Boat yard expansion and upgrade.
Port of Newport	2	Channel deepening.*
Port of Astoria	2	Pier 3 (east) rebuild: Resurface docks and adjoining lay-down areas.
Port of Newport	2	Add new hoist to support commercial fishing fleet.
Port of St. Helens	2	Columbia City at-grade rail crossings with U.S. 30 and industrial site developments.
Port of Astoria	2	Stormwater management of all port pier structures: Expansion of new stormwater treatment facility, address future stormwater management and DEQ requirements.
Port of Astoria	2	Improve terminal lights and security fencing.
Port of Toledo	2	Intermodal rail connection improvement.
Port of Toledo	2	Additional transient and permanent moorage on the Downtown Waterfront.
Oregon International Port of Coos Bay	3	Coos Bay Rail Link improvements to bridges, spurs, tracks, transload sidings, at grade crossings and tunnels are needed to create or improve multi-modal business opportunities.
Oregon International Port of Coos Bay	3	Charleston boatyard (dock, travel lift etc.) improvements that include the Marine Ways.
Oregon International Port of Coos Bay	3	Oregon Gateway: North Spit improvements (ocean outfall, access roads etc.) to accommodate a multi-modal marine facility to handle bulk cargo, containers and an LNG export facility.
Oregon International Port of Coos Bay	3	Federal channel widening and deepening to accommodate larger ships and ensure safer operations.*
Oregon International Port of Coos Bay	3	Charleston dock replacements.
Port of Morrow	5	Current Port facilities need additional rail trackage to utilize transload opportunities - rail improvements in East Beach area.
Port of Morrow	5	Barge Terminals need additional expansion, both new and existing to accommodate multi cargo use, or dedicated new use.

Location	ODOT Region	Needs
Port of Morrow	5	Additional mainline access will be needed: Port of Morrow West Beach area does not have rail intermodal access because of constraints related to siding access and the only way to add rail to 4 Barge terminal locations is to have another mainline access.
Port of Morrow	5	Interconnecting roads need priority for freight.
Port of Umatilla	5	Rail access improvements to existing industrial lands and to U.S. Army Depot lands.
Port of Morrow	5	Access improvements.

*Federal agencies are responsible for maintenance and enhancements of federal channels and jetties

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Table 9-13. Rail

Line Segment	Start	End	Miles	Operator	Owner	ODOT Region	Description of Need/Freight Mobility Issue with the Facility
Lakeview Branch	Lakeview	Alturas	55.5	Lake Railway	Lake County	4	Small rail and restricted-weight bridges preclude moving standard 286K GVW railcars critical for new industrial development; tie condition generally poor. The county acquired it 30 years ago to keep it from being abandoned.
Coos Bay Branch	W. Eugene	Coquille	133.4	Coos Bay Rail Link	Port of Coos Bay	3	This 100-year-old line is dealing with a significant backlog of deferred maintenance on tunnels, bridges and track, and an inadequate traffic base. Preservation of rail service is essential to support economic development at the Port of Coos Bay and south coast.
Astoria Branch	Port Westward	Wauna	15.7	Portland & Western	Portland & Western	2	Rail on this segment requires upgrading for efficient, long-term usage of this line in support of industrial development in Columbia and Clatsop counties. A hand-cranked drawbridge over the Clatskanie River needs to be electrified.
Union Pacific (Kenton line)	MP 0.32	MP 1.0	0.68	Union Pacific	Union Pacific	1	When long freight trains are navigating two 6 mph curves just north of the Steel Bridge, other trains, including passenger trains, can be delayed. Straightening track and easing curvature would permit more optimum speeds. This location has long been recognized as a significant Portland-area bottleneck.
Union Pacific (Kenton line)	Peninsula Jct.	Peninsula Jct.	0.5	Union Pacific	Union Pacific	1	Track upgrades and signal work is necessary at Peninsula Jct., for which preliminary plans, funded by a federal ARRA grant, were completed.
Fallbridge Subdivision	S. Lake Yard	N. Lake Yard	1.5	Burlington Northern Santa Fe	Burlington Northern Santa Fe	1	Install remotely controlled power switches and signals at both ends of Portland's Lake Yard to expedite ability of freight trains to arrive and depart the facility, reducing delays and interference between passenger and freight trains.
Fallbridge Subdivision	Willbridge	Willbridge	0.5	Burlington Northern Santa Fe	Burlington Northern Santa Fe	1	Using ARRA funding, ODOT completed 30% plans for replacing 10 mph crossovers at this junction with 30 mph crossovers for improving fluidity and reducing delays for passenger and freight trains.

Line Segment	Start	End	Miles	Operator	Owner	ODOT Region	Description of Need/Freight Mobility Issue with the Facility
Oregon Trunk Subdivision	Bend	Chemult	67.8	Burlington Northern Santa Fe	Burlington Northern Santa Fe	4	Between Bend and Chemult is "dark territory" with no signal system, whereas north of Bend has block signals. Ultimately installation of Centralized Traffic Control from the Columbia River to Chemult will significantly increase the capacity of this line.
Brooklyn Subdivision	Eugene	Eugene	0.5	Union Pacific/AMTRAK	Union Pacific/City	2	The ability to house state-supported Cascades passenger trains at Eugene's passenger depot between runs by building a layover track there (instead of moving trains to UP's freight yard as is current practice) would reduce operating costs and improve on-time performance. A federal ARRA grant has permitted ODOT to complete 30% preliminary plans and NEPA work for this two-phase project.
Brooklyn Subdivision	Brooks MP 725.8	Brooks MP 727.6	1.8	Union Pacific/AMTRAK	Union Pacific	2	Build 8,950-foot controlled siding between Quinaby Road and Tacoma Street crossings at Brooks to facilitate more efficient movement of freight and passenger trains between Salem and Portland. Siding will cross Brooklake Road at MP 726.9.
Astoria Branch	Wauna	Tongue Point	23.2	Portland & Western	Portland & Western	2	This segment has not been operated since the fall of 2005 and requires a tie program and surfacing to reopen. To efficiently carry 286K cars and significant volumes smaller rail must be replaced and hand-cranked drawbridges at Blind Slough and John Day River automated with electric motors. ODOT owns the right of way from Linnton to Tongue Point.
Dallas Branch	OR 99W	Dallas	4.3	Portland & Western	Union Pacific	2	The western 4 miles of this line serving the industrial section of Dallas has seen no traffic for several years, yet availability of rail is cited by the city in marketing the district. To resume service a tie and surfacing program would be necessary; longer term, the smaller rail would need to be replaced.
Klamath Northern Railway	Gilchrist	Gilchrist Jct.	11.0	Klamath Northern Railway	Klamath Northern Railway	4	Although KNOR handles 286K shipments, a significant portion of the railroad's trackage is comprised of small rail generally considered to be inadequate for safely carrying 286K.

Line Segment	Start	End	Miles	Operator	Owner	ODOT Region	Description of Need/Freight Mobility Issue with the Facility
Gateway Subdivision	Bieber Line Jct.	Bieber Line Jct.	0.5	Burlington Northern Santa Fe/Union Pacific	Burlington Northern Santa Fe/Union Pacific	4	This project signalizes and remotely controls the junction switch in Klamath Falls where BNSF trains leave/enter Union Pacific's line, eliminating the need to stop and manually handle switches there, thus reducing train delays. BNSF trains operate over UP for 74 miles from Klamath Falls to Chemult where the junction between the two railroads already is signalized and remotely controlled.
Woodburn-Stayton Line	Silverton	Stayton	21.0	Willamette Valley Railway	Union Pacific	2	Short line Willamette Valley Railway leases this 31-mile line, but has not operated the 21 miles from Silverton to Stayton since January of 2012. There is some unrepaired flood damage and there are bridge issues and some concern about tie condition. This segment is at risk of eventual abandonment, although there are customers along the disused track that would like to have service.
Weston Branch	Spofford	Weston	19.0	Palouse River & Coulee City	Union Pacific	5	Short line Palouse River & Coulee City Railroad operates this line which begins in Walla Walla, WA and passes through Milton-Freewater en route to Weston. In 2012, PCC's parent said they were considering abandoning this line from Spofford, 2 miles south of the state line, to Weston. The line is laid with light rail and has poor tie condition as well.
Joseph Branch	Elgin	Joseph	63.0	Wallowa Union Railroad Authority	Wallowa & Union Counties	5	This line has no freight traffic but does host sporadic seasonal tourist trains and a rail pedal car operation. However, these activities do not generate revenue sufficient to sustain the long-term maintenance needs of the railroad, so the line is slowly deteriorating.
Oregon Eastern Division	MP 20.2	MP 26.2	6.0	Wyoming Colorado	Wyoming Colorado	5	Replace 75-lb. rail with heavier rail to increase carrying capacity of entire line to GVW of 286,000.
Oregon Trunk Subdivision	Moody	Gateway	89.0	Burlington Northern Santa Fe	Burlington Northern Santa Fe	4	Vertical clearance in 5 tunnels between the Columbia River and Madras preclude passage of double-stack containers.

Line Segment	Start	End	Miles	Operator	Owner	ODOT Region	Description of Need/Freight Mobility Issue with the Facility
Fort Hill Line	Willamina	Fort Hill	5.30	Portland & Western	Hampton Railway	2	The Hampton Railway is operated by PNWR under a haulage agreement, but there has been no active customers on the line since 2013; thus, it is at risk of abandonment. Hampton Railway is a subsidiary of Hampton Lumber Co.
Railcars Fleet Modification	N/A	N/A	N/A	Northwest Container Services	Northwest Container Services	1	Increase loading capacity of 23 five-platform double-stack intermodal cars from 115,300 lbs. per well to 120,500 lbs. per well by reducing their length from 312 feet to approximately 270 feet each.
Brooklyn Subdivision	North end Brooklyn Yard	North end Brooklyn Yard		Union Pacific	Union Pacific		Trains entering and exiting Brooklyn Intermodal Terminal have to navigate a series of hand throw switches at north end of the yard.
Rogue Valley Terminal (RVT) Railroad	White City	White City	9.5	Rogue Valley Terminal Railroad	Rogue Valley Terminal Railroad	3	Although RVT handles 286,000 lb. shipments, a significant portion of the railroad's trackage is comprised of small rail generally considered to be inadequate for safely carrying 286,000 lbs. on this first/last mile rail delivery facility.
Union Station Track 6	Fremont Bridge	Steele Bridge	1.0	Burlington Northern Santa Fe/Union Pacific	Burlington Northern Santa Fe/Union Pacific	1	Add Track 6 to increase rail car storage capacity at Union Station. Move freight from Track 4 to Track 5 and Track 6.

EXECUTIVE ORDER NO. 17-21

ACCELERATING ZERO EMISSION VEHICLE ADOPTION IN OREGON TO REDUCE GREENHOUSE GAS EMISSIONS AND ADDRESS CLIMATE CHANGE

WHEREAS, climate change presents a significant threat to our livelihoods, economic security, environment, health, and well-being.

WHEREAS, there has been an increase in extreme weather events, including more frequent and intense heat waves and wildfires. According to the Oregon Climate Change Research Institute and other regional studies, the best available science indicates Oregon is at risk of serious impacts to its natural resources due to climate change.

- Water resources are being affected by decreased winter snowpack, changes to seasonal runoff patterns, decreased precipitation in Eastern Oregon, and increased intensity and occurrence of flooding.
- Agricultural resources are being affected by increases in temperatures.
- Ocean acidification is increasing and there are changes in ocean currents.
- Significant parts of the Oregon coastal region, stretching 363 miles, will be impacted by an expected rise in sea level up to 1 to 4 feet by 2100, incurring billions of dollars of damages and losses to roadways and structures.
- Climate change impacts threaten the State's agricultural, fishing, timber, recreation, and tourism industries, thereby threatening the livelihood of the State's residents and an important source of Gross State Product for the state.

WHEREAS, climate-related pollution from transportation and other emissions is projected to create $1.1 billion in health costs for Oregon families to bear by 2040, including asthma, heart disease, stroke, and cancer; and internal combustion engines burning fossil-based fuels are the largest contributor of greenhouse gas emissions in Oregon, with the transportation sector accounting for 37 percent of greenhouse gas emissions and light-duty vehicles alone accounting for 25 percent of greenhouse gas emissions, all while the state's transportation sector related greenhouse gas emissions continue to grow.

WHEREAS, Oregon is committed to meeting the international Paris Agreement targets to reduce greenhouse gas emissions by 26 to 28 percent below 2005 levels by 2025.

WHEREAS, Oregon has adopted goals to reduce greenhouse gas emissions to 10 percent below 1990 levels by 2020 and at least 75 percent below 1990 levels by 2050 as described in ORS 468A.20.

WHEREAS, greater transition of internal combustion engines to zero emission vehicles, like electric cars, buses, and trucks, play a key role in helping Oregon achieve its climate change goals, improving the health of Oregon communities, and encouraging clean energy job development.

WHEREAS, zero emission vehicles provide multiple benefits to Oregonians, including operating quietly and cleanly; allowing home refueling; lowering operating, maintenance, and fuel costs; and reducing pollutants such as carbon dioxide and black carbon emitted through diesel combustion.

WHEREAS, emissions associated with the combustion of fossil fuels have a negative health impact for Oregonians and, in particular, communities located close to major highways, and the use of zero emission vehicles can have immediate positive impacts on local air quality and public health.

WHEREAS, the median Oregon household spends four to five percent of its income on transportation fuel costs, and Oregon businesses and residents could benefit from the lower costs of zero emission vehicle operation and maintenance and the diversification of our transportation fuels, including electricity, which can help offset price volatility and political instability associated with petroleum fuels.

WHEREAS, the development of a robust clean energy economy includes the sales of electric vehicles, chargers, and other equipment as well as the installation and maintenance of charging equipment that will encourage clean energy job development at a local level.

WHEREAS, Oregon is a member of the following organizations and coalitions that have zero emission vehicle goals and commitments:

- The International Zero Emission Vehicle Alliance has committed that all new light-duty vehicle sales will have an electric powertrain as soon as possible and no later than 2050.

- The Pacific Coast Collaborative established and supports the West Coast Electric Fleets initiative to expand the use of electric vehicles in fleets and the West Coast Green Highway to provide resources for zero emission vehicles on Interstate-5.

- The Zero Emission Vehicle Multi-State Memorandum of Understanding has an Action Plan Goal of a minimum of 25 percent of new light-duty state fleet purchases and leases for applicable uses, to the extent available, will be zero emission vehicles by 2025.

NOW, THEREFORE, IT IS HEREBY DIRECTED AND ORDERED:

1. **Definition.** For purposes of this Executive Order, "state agency" shall be defined as any agency within the Executive Department as defined in ORS 174.112, other than the Oregon Secretary of State, Oregon State Treasury, Oregon Department of Justice, and Oregon Bureau of Labor and Industries.

2. **Statement of Policy and Establishing Statewide Goal.** It is the policy of the State of Oregon to establish an aggressive timeline to achieve a ***statewide goal of 50,000 or more registered and operating electric vehicles by 2020.*** This short-term goal will ensure the state is on track to meet ambitious long-term goals described above. There are currently approximately 16,000 electric vehicles registered in Oregon and establishing this new state goal will focus state agencies and partners in transitioning public and private fleets to electric vehicles to achieve multiple climate change goals and commitments. Strategies outlined in this executive order will close cost gaps, infrastructure gaps, and information gaps to help accelerate the transition toward electric vehicles.

3. **Oregon State Agencies Leading by Example with Increased Use of Electric Vehicles.**

   A. State Electric Vehicle Chargers to Support the State Goal. The Department of Administrative Services (DAS) and the Oregon Department of Energy (ODOE) are directed to develop a plan and estimated budget through 2025 to install electric vehicle chargers for the operation of state agency owned electric vehicles, public charging at

state facilities, and state employee charging. The number and placement of electric vehicle chargers will be designed to provide sufficient charging infrastructure necessary for the state to achieve the fleet conversion goals of the Pacific Coast Collaborative West Coast Electric Fleet initiative described above.

B. Electric Vehicle Policy for State Parking Lots to Support the State Goal. DAS is directed to add electric vehicle charging as a priority criteria for parking lot waitlists, add electric vehicle charging capacity for employee and public visitor parking lots, develop contracts for the procurement and installation of charging infrastructure, and incorporate electric vehicle charging as a tenant improvement for state-leased buildings.

C. Long-term Return on Investment of Electric Vehicles to Support the State Goal. DAS, in cooperation with ODOE, is directed to develop a tool to calculate the long-term return on investment and life-cycle costs of electric vehicles using costs and savings including but not limited to vehicles purchase, fuel, and maintenance. This tool will inform state agencies of potential cost savings for greater state agency fleet conversion toward zero emission vehicles to achieve the state goal established in Section 2. In addition, DAS is directed to develop a "Low-Emission Vehicle First" policy, to encourage state employees to first use electric vehicles or other low-emission vehicles in the state fleet.

D. Bulk Electric Vehicle Purchases to Support the State Goal. DAS and ODOE are directed to improve the use of the West Coast Electric Fleets initiative for electric vehicle bulk procurement to reduce costs for electric vehicle purchases.

E. Enabling Electric Vehicle Purchases and Infrastructure to Support the State Goal. DAS, in cooperation with all state agencies, is directed to inform and support legislative changes that would enable increased charging infrastructure and state agency electric vehicle purchases.

4. Increasing Oregonians' Access to Electric Vehicles.

A. Electric Vehicle Rebate Programs Designed to Achieve the State Goal. The Oregon Department of Environmental Quality (DEQ) is directed to

conduct rulemaking for the electric vehicle rebate programs, established in HB 2017 (2017), to encourage Oregonians to purchase or lease electric vehicles such that these rebate programs are designed to achieve the state goal established in Section 2. As part of the rulemaking, DEQ is directed to develop strategies to help ensure Oregonians are informed about the opportunities to reduce the costs of electric vehicle purchases and leases through the Electric Vehicle Rebate program, in addition to robust outreach to low-income communities and organizations through the Charge Ahead Rebate program.

B. Clean Fuels Program Designed to Achieve the State Goal. DEQ is directed to conduct rulemaking for the Clean Fuels Program to support greater electric vehicle adoption, in cooperation with the Oregon Public Utility Commission (PUC), such that the program is designed to support innovative solutions in the evolving electric vehicle market and achieve the state goal established in Section 2. DEQ is directed to develop a method to aggregate and monetize all eligible electric vehicle credits in the Clean Fuels Program to assist in achieving the state goal.

C. Zero Emission Vehicle Regulation Designed to Achieve State Goal. Today, DEQ's zero emission vehicle regulation requires car manufacturers to sell six to eight percent electric vehicles for new light-duty sales by 2025. DEQ is directed to work with the Environmental Quality Commission to maintain consistency with California's zero emission vehicle regulation, including efforts to ramp up regulatory requirements. DEQ is directed to participate in federal assessments of vehicle emissions standards and work with the Department of Justice to take appropriate steps to retain California's exemption for vehicle standards that are more protective of air quality under the federal Clean Air Act Section 209.

D. Consumer Engagement in Transportation Electrification Plans to Achieve the State Goal. PUC, with input from interested stakeholders, is directed to implement the transportation electrification program, established in SB 1547 (2015), to support consumer engagement in the investor-owned utilities' transportation electrification plans such that the transportation electrification program is designed to achieve the state goal established in Section 2. Wherever possible, the PUC is directed to

encourage programs that support greater electric vehicle adoption in moderate- and low-income communities.

5. **Increasing Oregonians' Access to Electric Vehicle Charging Infrastructure.**

   A. Leveraging Volkswagen Mitigation Fund to Support the State Goal. DEQ, in cooperation with Oregon Department of Transportation (ODOT), ODOE, and Oregon Health Authority Public Health Division, is directed to engage interested stakeholders and receive public comments to inform development of a plan to leverage up to 15 percent of the Volkswagen Mitigation Fund to support vehicle electrification. This plan will use part of Oregon's share of the Volkswagen Diesel Settlement (Appendix D), consistent with the limitations on the use of such funds, to develop and maintain electric vehicle charging stations with a focus on connecting rural communities, low-income communities, and Oregonians living in multi-family homes, while complementing the Electric Vehicle Rebate Program and Charge Ahead Rebate Program that were established in HB 2017 (2017).

   B. Leveraging Volkswagen Zero Emission Vehicle Fund to Support the State Goal. ODOT, in cooperation with ODOE, DEQ, PUC, and local governments, is directed to facilitate the application process for fund deployment of the Volkswagen "Electrify America" investments and projects under the Zero Emission Vehicle Fund, which are developed in accordance with the Volkswagen Diesel Settlement (Appendix C). In addition, these agencies will develop proposals for future 30-month investment periods for the Volkswagen "Electrify America" Zero Emission Vehicle Investment Plans to achieve the state goal established in Section 2.

   C. Charging Infrastructure in Transportation Electrification Plans to Achieve the State Goal. PUC, with input from interested stakeholders, is directed to implement the transportation electrification program, established in SB 1547 (2015), to support electric vehicle charging in the investor-owned utilities' transportation electrification plans such that the transportation electrification program is designed to achieve the state goal established in Section 2. Wherever possible, the PUC is directed to

encourage programs that support greater electric vehicle adoption in moderate- and low-income communities.

D. Electric Vehicle Ready Building Construction to Achieve the State Goal. The appropriate advisory board(s) and the Department of Business and Consumer Services Building Codes Divisions (BCD) are directed to conduct code amendment of the state building code to require that parking structures for all newly constructed residential and commercial buildings are ready to support the installation of at least a level 2 EV charger by October 1, 2022. BCD may establish limited specific exemptions related to types of parking lots, such as temporary parking lots.

6. Providing Partners with Information on Electric Vehicle Use and Functionality.

A. Assisting School Districts to Support the State Goal. ODOE, working with ODOT, PUC, DEQ, and the Department of Education, is directed to develop tools and provide information to assist school districts in making decisions about zero emission vehicle bus options when replacing school buses.

B. Assisting Transit Agencies to Support the State Goal. ODOT, working with ODOE, PUC, and DEQ, is directed to develop tools, information, and best practices to assist transit agencies when making decisions about zero emission vehicle bus technology adoption in transit fleets for their transit districts. In addition, ODOT, working with ODOE, DEQ, and Oregon Health Authority Public Health Division, is directed to engage with transit agencies and interested stakeholders to assess how zero emission vehicle technologies can help to reduce lifecycle emissions, improve public health, and save costs in the heavy-duty sector, including through the accelerated transition to zero-emission buses.

C. Assisting Consumer Owned Utilities to Support the State EV Goal. ODOE is directed to engage with consumer and public-owned utilities to enable increased electric vehicle adoption in their service territories and provide technical assistance on strategies to accommodate increased

loads on their electric systems in order to achieve the state goal established in Section 2.

D. Assisting Investor Owned Utilities to Support the State EV Goal. PUC, in collaboration with utilities and stakeholders, is directed to oversee development of strategies to encourage continuous improvement of the investor-owned utilities' transportation electrification plans, established pursuant to SB 1547 (2015), to achieve the state goal established in Section 2.

7. **Celebrating Achievements by Recognizing Businesses and Organizations that Lead Oregon in Electric Vehicle Adoption.**

A. Establishing Governor's Awards for Automobile Dealerships. ODOE is directed to design and establish "Governor's Awards" for automobile dealerships to encourage sales of electric vehicles, such as highest annual electric vehicle sales and highest percentage per capita of electric vehicle sales in a year.

B. Establishing Governor's Awards for Businesses or Organizations. ODOE is directed to design and establish "Governor's Awards" that recognize businesses and organizations which support increased electric vehicle adoption, such as through installing charging infrastructure and converting fleets to electric vehicles.

8. **Implementation.** The implementation of this Executive Order shall be coordinated through a Zero Emission Vehicle Working Group, which will also identify any structural barriers or barriers to information sharing that may slow the progress of any directive in this Executive Order. The Zero Emission Vehicle Working Group will review directives in this Executive Order, seek input from interested stakeholders, and recommend opportunities to provide equitable access to clean energy by removing barriers to electric vehicles and electric vehicle chargers to the Governor and state agencies. The Zero-Emission Vehicle Agency Working Group shall include the following agencies: DAS, ODOE, OPUC, ODOT, and DEQ. ODOE will lead a collaborative effort through this interagency working group to develop goals, metrics, and other indicators of progress and will establish a website to share information about the directives in this Executive Order with the public. Agencies shall implement each directive in

this Executive Order using their existing internal processes and established rulemaking procedures, including recommendations from any boards. This Executive Order is intended to be consistent with obligations under federal and state law and shall be interpreted as to not violate any requirement of federal or state law.

9. The Governor encourages the Secretary of State, the State Treasurer, the Attorney General, and the Commissioner of the Bureau of Labor and Industries to adopt policies and practices to accelerate zero emission vehicle adoption consistent with measures in this Executive Order. DAS and ODOE are directed to assist the above-mentioned officials and entities of state government in accomplishing these objectives as they may request.

Done at Portland, Oregon, this 6th day of November, 2017.

Kate Brown
Kate Brown
GOVERNOR

ATTEST:

Dennis Richardson
Dennis Richardson
SECRETARY OF STATE

Oregon Fuel Action Plan



Plan, Prepare, Respond, & Recover From Severe Fuel Shortages

OREGON DEPARTMENT OF ENERGY

OREGON FUEL ACTION PLAN

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OREGON FUEL ACTION PLAN



AUTHORITY

GOVERNOR'S AUTHORITY

Oregon Revised Statute (ORS) 401 – grants the Governor of Oregon broad authority to protect the public by declaring a State of Emergency regardless of the cause. An emergency declaration gives the governor authority to control emergency operations in the affected area and to:

- Suspend provisions of any order or rule of any state agency
- Use and employ state personnel, equipment, and facilities
- Direct supplemental services and equipment

In the event the Governor is not available to perform the emergency powers described in ORS 401, the authority is next delegated to the Secretary of State, and then to the State Treasurer.

ORS 401.188 – additional powers granted to the governor during a declared emergency are outlined in the "Management of Resources." The governor may issue, amend, and enforce rules and orders to "Control, restrict, and regulate the use, sale or distribution of food, ***fuel***, clothing, and other commodities, materials, goods and services."

OREGON DEPARTMENT OF ENERGY AUTHORITY

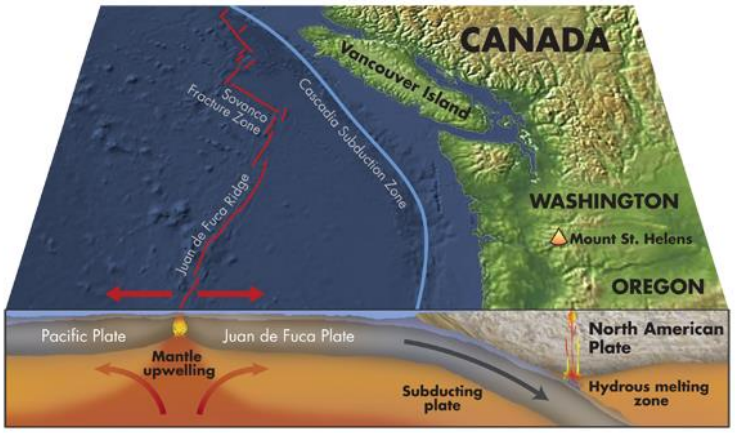
ORS 176.750-820 – authorizes the Oregon Department of Energy (ODOE) to develop and maintain a statewide contingency plan in response to petroleum shortages that impact Oregon. This includes providing adequate fuel supplies to maintain emergency services, transportation, and the operation of the economy to ensure the health, safety, and welfare of the residents of the State of Oregon while an emergency exists.

Emergency Support Functions (ESF) – There are 18 critical lifelines and services that, if disrupted, could threaten the health and safety of Oregonians. These critical lifelines and services are called Emergency Support Functions or ESFs. Each ESF sector has a designated lead state agency and federal agency. ODOE, along with the Oregon Public Utility Commission (PUC) is the designated Primary State Agency for ESF 12: Energy. ODOE is the lead for the petroleum sector. PUC is the lead for the electricity and natural gas sectors. ODOE works closely with the lead federal agency for ESF 12, the U.S. Department of Energy

(USDOE) to ensure the federal plans integrate and align with state strategies in preparation for responding to and recovering from fuel disruptions with potential impacts to Oregon.

PLANNING BASIS: WORST CASE SCENARIO

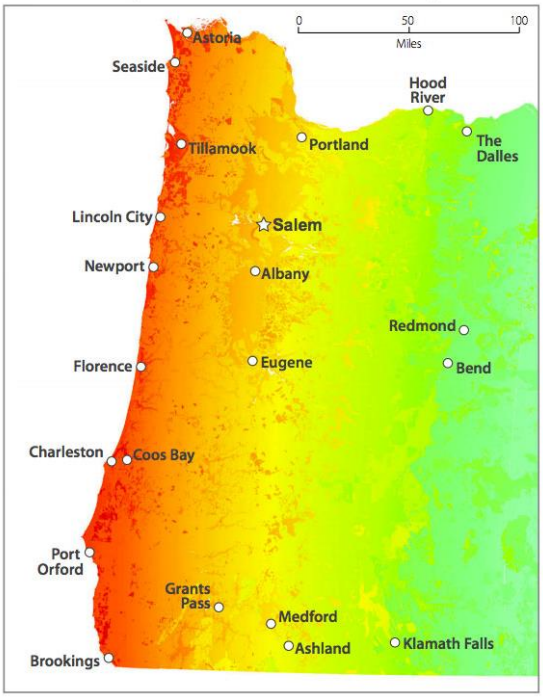
The Pacific Northwest region's most likely catastrophic event is the 9.0 Cascadia Subduction Zone (CSZ) earthquake and tsunami. Expected impacts include ground shaking for 4 – 6 minutes causing massive critical infrastructure damage along with a tsunami reaching some parts of the Oregon coast within 15 minutes of the quake.



The Federal Emergency Management Agency (FEMA) anticipates up to 25,000 fatalities, tens of thousands of people in need of shelter, and $30+ billion in economic losses.

Oregon counties in the high impact areas along the coast include: Clatsop, Tillamook, Lincoln, Lane, Douglas, Coos, and Curry counties. Mid-range impacted areas include the Portland metropolitan area with Washington, Multnomah, and Clackamas counties. Additional counties west of the Cascades in the mid-range impact areas include: Columbia, Yamhill, Polk, Marion, Benton, Linn, Jackson, and Josephine counties.

ShakeMap for SIMULATED M9 Cascadia earthquake



This event would devastate the region's petroleum supply and distribution system. Oregon can expect to lose most of the normal incoming supply of fuel. The Oregon Department of Geology and Mineral Industries (DOGAMI) 2013 Seismic Study found that the region's refineries and petroleum distribution terminals are expected to sustain moderate to significant damage. The facilities will have tank farm failures, marine dock failures, pipeline system breaks, hazardous material spills, fires, and structural damages onsite. Restoring the region's petroleum infrastructure would likely take months if not longer. In addition, the Olympic Pipeline that transports the majority of gasoline, diesel, and jet fuel to Oregon is projected to suffer as many as 250 breaks and 82 leaks.

ODOE has no regulatory authority to require its private sector partners to make seismic upgrades to their fuel tank farms, pipeline systems, marine docks, or other facilities. However, ODOE is responsible for ensuring the state can respond to a catastrophic event whenever it may happen and is prepared to address the impacts to the fuel infrastructure in its current state with all of its vulnerabilities.

The Oregon Fuel Action Plan was developed to address this need. It is designed to bring bulk fuel supplies into the state from outside the region to support the state's ongoing emergency response and recovery efforts until the regional infrastructure can be restored.

PLAN STRUCTURE

ODOE developed and maintains the Oregon Fuel Action Plan, which:

- Identifies ODOE's decision-making structure and authority to implement Oregon's Fuel Action Plan to provide adequate fuel supplies to emergency and essential service providers in Oregon in the event of a severe/long-term fuel disruption and shortage in the region.

- Identifies timelines for initiating and completing ODOE's nine priority missions called "Actions" to protect public health and safety and restore critical lifeline services during emergencies impacting the region's petroleum supply and distribution system.

- Provides mission analysis for completing each of the nine Actions. This includes identifying: key objectives and tasks; facts and assumptions; constraints and limitations; and gaps/information needed to complete the mission.

- Provides procedures for ODOE Agency Operations Center (AOC) activation and response positions to complete each mission. Each response position procedure includes key objectives, a checklist of tasks, guidance to accomplish objectives and tasks, and reference materials as appropriate.

- Identifies approved priority users and provides a structure and guidelines to request, justify, and receive emergency fuel to support mission critical functions to save lives, protect public health and safety, and restore critical lifelines and services.

- Aligns and integrates with federal, state, and county emergency response plans. This includes:

    - Federal Response Plan
    - Federal ESF 12: Energy Annex
    - State of Oregon Emergency Operations Plan
    - Cascadia Playbook
    - State ESF 12: Energy Annex
    - County emergency response plans
    - Tribal emergency response plans

- Identifies strategies to address all levels of fuel shortages and disruptions impacting Oregon.

PLAN ASSUMPTIONS

The Oregon Fuel Action Plan assumes that all state, local, and tribal organizations with emergency authorities and responsibilities to save lives, protect public health and safety, and restore critical lifeline

services have developed or are in the process of developing agency emergency response plans and strategies for responding to a catastrophic earthquake and tsunami. This includes:

- **ESF Primary State Agencies** – Designated ESF Primary State Agencies in Oregon have emergency response plans identifying all mission critical functions for its sector of responsibility. This includes a general understanding of the amount of fuel needed to perform identified missions.

  ESF 1: Transportation – Assess fuel needs to restore access and repair highways, roads, bridges, rail lines, and tunnels to support the transportation of goods and services and to perform other mission critical functions. *ESF Primary State Agency: ODOT.*

  ESF 2: Communications – Assess fuel needs to repair damaged communications systems and to perform other mission critical functions. *ESF Primary State Agencies: OPUC and Oregon Emergency Management (OEM).*

  ESF 3: Public Works – Assess fuel needs for debris removal from critical highways and for restoration of damaged public systems including: 1) highways, 2) water, sanitary sewage, and storm water systems, and 3) dams, levees, and other water control structures. *ESF Primary State Agency: ODOT.*

  ESF 4: Firefighting – Assess fuel needs for fire suppression, mobilizing Urban Search and Rescue Teams, and to perform other mission critical functions. *ESF Primary State Agency: Oregon State Fire Marshall (OSFM).*

  ESF 5: Information and Planning – Assess fuel needs to conduct a rapid needs assessment of the impacted areas and to perform other mission critical functions. *ESF Primary State Agency: OEM.*

  ESF 6: Mass Care – Assess fuel needs to identify and establish viable shelters and mass care facilities in the impacted areas and to perform other mission critical functions. *ESF Primary State Agency: Oregon Department of Human Services (DHS).*

  ESF 7: Resource Support – Assess fuel needs to deliver emergency relief supplies to impacted areas and to perform other mission critical functions. *ESF Primary State Agency: Oregon Department of Administrative Services.*

  ESF 8: Health and Medical – Assess fuel needs to mobilize professional/reserve medical personnel and supplies to impacted areas to triage and stabilize the wounded in impacted areas, perform casualty clearing/staging, and other mission critical functions. *ESF Primary State Agency: Oregon Heath Authority (OHA).*

  ESF 9: Search and Rescue – Assess fuel needs to deploy teams into impacted areas, transport injured individuals recovered from the scene, and to perform other mission critical functions. *ESF Primary State Agency: OSFM and OEM.*

  ESF 10: Hazardous Materials – Assess fuel needs to identify and deploy teams to contain oil and other hazardous materials spills from impacted areas and to perform other mission critical functions. *ESF Primary State Agencies: OSFM and Oregon Department of Environmental Quality.*

  ESF 11: Food and Water – Assess fuel needs to deliver food and water to shelters and isolated communities and to perform other mission critical functions. *ESF Primary State Agencies: Oregon Department of Agriculture and DHS.*

ESF 12: Energy – Assess fuel needs to assess and restore the petroleum, natural gas, and electricity supply and distribution systems and to perform other mission critical functions. *ESF Primary State Agencies: ODOE and OPUC.*

Note: ODOE is responsible for the petroleum sector. OPUC is responsible for the electricity and natural gas sectors.

ESF 13: Military Support – Assess fuel needs for the Oregon National Guard's air and ground response in support of civilian authorities. This includes the mission critical functions of all ESF Primary State Agencies and Oregon counties as appropriate. *ESF Primary State Agency: Oregon Military Department.*

ESF 14: Public Information – Assess fuel needs for the Public Information Sector to communicate emergency information to the news media and the public as appropriate. *ESF Primary State Agency: OEM.*

ESF 15: Volunteers & Donations – Assess fuel needs for the Red Cross and other non-profit agencies to provide shelter, roadway assistance, donations management, establish blood bank capabilities in impacted areas and to perform other mission critical functions. *ESF Primary State Agency: OEM.*

ESF 16: Law Enforcement – Assess fuel needs to protect life and property, provide traffic and crowd control, provide security for responders and critical facilities, and to perform other mission critical functions. *ESF Primary State Agency: Oregon State Police.*

ESF 17: Animal Protection – Assess fuel needs to provide veterinary medical care, animal sheltering, animal carcass disposal and to perform other mission critical functions. *ESF Primary State Agency: OHA.*

ESF 18: Business and Industry – Assess fuel needs for the Business and Industry Sector as appropriate. *ESF Primary State Agency: OEM.*

- **County Emergency Management Agencies** – County emergency management agencies have emergency response plans identifying mission critical functions for the county and a general approximation of the fuel needed to perform identified missions. This includes the cities, special districts, and regional governments within county borders. County plans should have a fuel annex or section in their plans that identifies:
  - Priority tier 1 roads the county will restore to support fuel deliveries and other disaster relief commodities.
  - Fuel Points of Distribution (FPOD) to receive emergency bulk fuel supplies.
  - Methods to deliver the fuel from the designated FPODs to critical facilities and to the emergency responders in the field.
- **Federally-Recognized Tribes** – Tribes have emergency response plans identifying the mission critical functions of the tribe. This includes a general approximation of the amount of fuel needed to perform identified missions.



OREGON PETROLEUM INFRASTRUCTURE

Oregon does not have refining capabilities and imports 100 percent of the refined petroleum products used in the state. That is an estimated three billion gallons of fuel each year or roughly 250 million gallons each month.

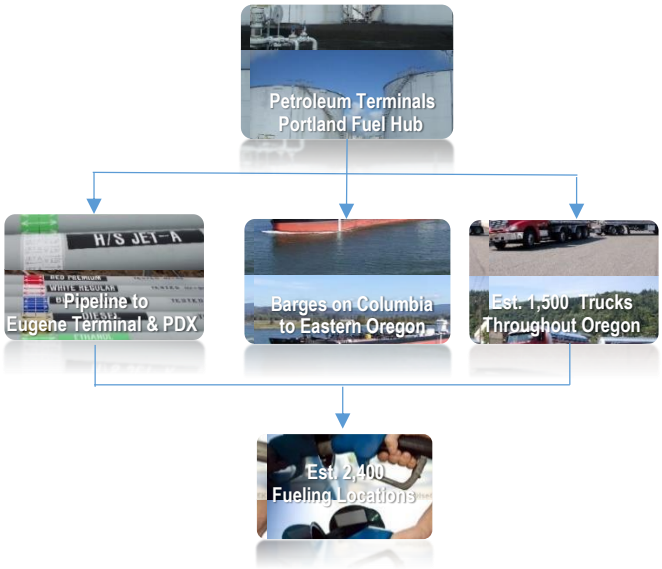
Gasoline & Diesel Supply and Distribution System

More than 90 percent of the refined petroleum product used in Oregon come from four refineries located in the Puget Sound area of Washington State. Product is transported from the refineries in Washington to Oregon via the 400 mile Olympic Pipeline (est. 90 percent) and barges (est. 10 percent) entering the state at the Port of Portland where seven petroleum distribution terminals are located in what is called the Portland Fuel Hub.

Oregon receives the remaining less than 10 percent of the state's refined petroleum products from refineries in Salt Lake City, Utah and the California Bay Area. From Salt Lake City, the refineries transport product via Tesoro's Salt Lake Products Pipeline System to a distribution terminal in Pasco, Washington. From the Pasco facility, fuel is trucked into Oregon to service eastern Oregon communities. California Bay Area refineries supply minimal quantities of fuel to a Chico, California terminal and then product is trucked into Oregon to supply southern Oregon communities.

Portland Distribution Terminals (Fuel Hub) – From the Portland Fuel Hub, product is distributed throughout Oregon by:

- Two Pipelines – Kinder Morgan's pipelines link petroleum terminals in the Portland Fuel Hub with the petroleum distribution terminal in Eugene, Oregon and provide jet fuel to the Portland International Airport.
- Barges – Product is loaded onto barges from the BP, Chevron, and Phillips 66 marine docks and delivered up the Columbia River to Pasco to service eastern Oregon communities.



- Tanker Trucks – an estimated 1,500 tanker trucks deliver fuel throughout the state to about 2,400 fueling locations.

Jet Fuel and Aviation Gas Supply & Distribution System

Oregon imports about 15 million gallons of jet fuel each month (about 180 million gallons of jet fuel annually) from the refineries in Washington State. An estimated 90 percent of the jet fuel is transported via the Olympic Pipeline to the petroleum distribution terminals located at the Port of Portland Fuel Hub. The remaining estimated 10 percent of the jet fuel is transported by ship or barge directly to the Port of Portland.



From the Fuel Hub, the Kinder Morgan Pipeline transports the bulk of the jet fuel to the Portland International Airport. Jet fuel is delivered by truck to other airports and air fields in the state from the Fuel Hub.

Oregon also imports up to 170,000 gallons of aviation gasoline (AVGAS) each month (just over two million gallons annually) from Canada and Texas. AVGAS is transported by rail to the Chevron and Kinder Morgan terminals in the Fuel Hub then trucked to airports and airfields throughout Oregon.

Constraints and Limitations

The petroleum industry exercises a "just in time" business strategy. Refineries and distribution terminals maintain adequate supplies to meet expected demands under normal conditions. Because of this, a significant increase in demand regardless of the cause will likely result in a fuel disruption or shortage.

Crude Supply in Alaska – At any given time, there is less than one week of crude oil available at the Alaska Terminal that supplies Washington's four refineries.

Refineries in Washington – Refineries located in the Puget Sound area of Washington State also have about a one week supply of product on hand. These refineries have been operating above 90 percent capacity for decades. The refineries have no plans to increase capacity and cannot accommodate a dramatic demand increase.

Portland Petroleum Distribution Terminals – The seven terminals located in the Fuel Hub in Portland are on a six-day refueling cycle. At any given time, the Fuel Hub has only a one week supply of refined gasoline and diesel reserves on hand.

Retail Service Stations – Depending on the storage capacity and refueling cycles, retail service stations throughout the state have about a two to three day supply on site.

PETROLEUM SECTOR INTERDEPENDENCIES

The rapid recovery of the region's petroleum supply and distribution system is heavily dependent on other critical lifeline services. The fuel sector is reliant on other ESFs to gain situational awareness; conduct damage assessment; obtain and transport fuel to priority users; and support recovery operations in the aftermath of a Cascadia earthquake. These interdependencies include:

ESF 1: Transportation – Viable roads, highways, bridges, and waterways are essential to supporting fuel deliveries to priority users.

ESF 2: Communications – Viable communications are essential to ODOE's ability to: 1) assess impacts to the petroleum supply and distribution system; 2) work with USDOE and petroleum industry partners to obtain fuel from outside the region and transport it into Oregon; 3) facilitate emergency fuel requests and deliveries to priority users; 4) provide fuel sector situational awareness to key federal, state, and local emergency response agencies and other critical stakeholders; and 5) provide emergency information and instructions regarding critical fuel conservation measures to the news media and public.

ESF 12: Energy (Electricity) – Operators at the petroleum terminals need electricity to conduct damage assessments to the facilities, tanks, equipment, and systems. Power is essential to getting the fuel out of the storage tanks into delivery trucks. Electricity is also needed at designated fuel distribution points and emergency fueling locations for responders to fuel up their response vehicles. Electric power is also required for pipeline operation.

ABOUT FUEL ALLOCATION

Because there are no refineries in the state, Oregon is extremely vulnerable to fuel disruptions and shortages. The purpose of fuel allocation is to help alleviate shortages and hardships for priority users who save lives and restore critical infrastructure during severe and long-term fuel disruptions. Criteria for allocating fuel include:

1. Governor's Emergency Declaration.
2. Emergency and essential service providers unable to obtain fuel at any price.
3. Market forces, voluntary fuel conservation, and/or mandatory fuel conservation measures fail to provide for adequate and equitable distribution of fuel.

Set-Aside Volume: Non-Catastrophic Events *(Viable Fuel Infrastructure)* - If fuel allocation becomes necessary, ODOE would administer the state's Fuel Allocation Program. The first step is to designate the Set-Aside Volume. The Set-Aside Volume is the amount of fuel ODOE will request from the state's petroleum industry partners (oil companies) to designate solely to support Oregon's response and recovery efforts.

The Set-Aside Volume Percentage will be no larger than what is expected to be required to meet emergency supply needs based on the amount of fuel already in the state in storage and the amount estimated to enter the state from the prime suppliers each month.

Set-Aside Percentages Monthly Fuel volume from Oregon Supplies	
Motor Gasoline	up to 5 percent
Middle distillate (diesel & heating oil)	up to 4 percent
Jet Fuel	up to 5 percent
Aviation Gasoline	up to 5 percent

The Fuel Allocation Program is designed to: 1) interfere minimally with the market, 2) make no attempt to reduce or inhibit the market price of fuels, and 3) ensure all fuel delivered through the program is purchased at the market price, and whenever possible, through the usual supplier. ***Note:*** *Refer to Appendix H for details.*

Set-Aside Volume: Cascadia Subduction Zone Earthquake *(Fuel Infrastructure Devastated)* – Experts anticipate severe damage to the region's petroleum supply and distribution system from a catastrophic earthquake. This would likely shut down the operations of the region's refineries, pipelines, and petroleum distribution terminals for months. ODOE would work with the oil companies, USDOE, FEMA, and the military to identify and deliver an alternate fuel supply from outside of the region to support the state's emergency response and recovery efforts. No set-aside volume would be implemented. ODOE would initially allocate **ALL** of the fuel brought into Oregon to the state's emergency and essential service providers to save lives, protect public health and safety, and to restore critical infrastructure and lifeline services.

FUEL ALLOCATION STRUCTURE

Allocating fuel is a huge undertaking. Oregon has nearly 120 state agencies with varying degrees of emergency response duties and capabilities. The state has 36 counties with more than 240 cities. Each jurisdiction has its own emergency and essential service providers. ODOE would easily be overwhelmed if we were to receive fuel requests from all of these entities individually.



As a result, ODOE streamlined its process and designed a structure for fuel allocation. Those who qualify for emergency fuel fall under three categories. Our priority users include:

- 18 ESF Primary State Agencies
- 36 County Emergency Management Agencies
- 9 Federally-Recognized Tribes

All fuel requests will be filtered through one of these pre-approved priority users.

MAINTAINING OREGON FUEL ACTION PLAN READINESS

ODOE will work with industry, federal, state, local, and tribal emergency response organizations to ensure a collaborative and seamless response to a long-term or severe fuel shortage or disruption with potential impacts to the State of Oregon.

Training – Training is essential to maintain program readiness to protect public health and safety in the event of a Cascadia Subduction Zone earthquake and tsunami or other disaster scenario impacting Oregon's fuel supply and distribution system. ODOE will work with industry, federal, state, and local emergency response organizations to coordinate, implement, and participate in workshops, drills, tabletops, and exercises as needed to ensure program readiness.

Plan Review and Update - ODOE will review and update the Oregon Fuel Action Plan annually or as needed. Revisions will include lessons learned from drills and exercises. ODOE will coordinate reviews and revisions with industry, federal, state, local, and tribal emergency response organizations.

Public Outreach – ODOE will also work to improve public awareness of and confidence in the Oregon Fuel Action Plan by providing information on ODOE's web page, giving presentations about the program, and producing materials to be distributed to the news media and made available at libraries, schools, hospitals, and other locations as appropriate.

FOR MORE INFORMATION

For more information about the Oregon Fuel Action Plan, contact the Oregon Department of Energy's Nuclear Safety & Energy Emergency Preparedness Division at 503-378-4040 or the agency's Energy Emergency Preparedness Manager at 503-932-4428.

Oregon Fuel Action Plan: Nine Priority Actions

Action 1	Action 2	Action 3	Action 4	Action 5	Action 6	Action 7	Action 8	Action 9
Notification Activation and Authorities	**Public Information**	**Damage Assessment**	**Assess Fuel Needs & Determine Priorities**	**Outside Assistance: Fuel Supply**	**Fuel Conservation Measures**	**Temporary Waivers**	**Fuel Allocation**	**Recovery**
Initial Notifications Activate ODOE AOC Succession & Authorities	ODOE Fuel Emergency Outlook Web Page Public Information Campaign – social media News conferences Telephone Information Center	Assess impacts to petroleum infrastructure Estimate timeline for repairs Provide fuel sector info & status updates	Assess fuel availability in Oregon Assess 18 state ESFs, counties, and tribal fuel needs Determine state & regional fuel priorities Governor's Disaster Cabinet	National Fuel Task Force Identify & obtain fuel source Identify viable fuel delivery options into Oregon Identify viable options for dispensing fuel	Issue voluntary fuel conservation measures Issue mandatory fuel conservation measures	Obtain temporary environmental, operational, and safety waivers as needed to ensure the timely delivery of fuel	Review & approve/deny fuel requests (ESF Primary State Agencies, counties & tribes) Allocate fuel to approved state agencies, counties & tribes Odd/Even Fuel Allocation ***Fuel Request Form Provided***	Allocate fuel to support recovery activities State Recovery Coordinating Team - SRF 6 Governor's Recovery Cabinet Terminate fuel recovery activities as appropriate

ACTION 1

Notification, Activation, and Authorities

0 – 12 HOURS TO INITIATE - ESTIMATED COMPLETION 96 HOURS	
Mission Analysis	
Objectives/Tasks • Assess availability of ODOE staff. • Determine lines of succession and authorities. • Assess ODOE facility conditions. • Activate the ODOE Agency Operations Center (AOC) if possible, or relocate to state-designated alternative location. • Make initial notifications.	**Facts/Assumptions** • Significant ground shaking (5 + minutes). • Significant damage to region's communications systems. • ODOE response structure disrupted due to personnel injuries and loss of life. • ODOE facility integrity breached disrupting operations. Implement Continuity of Operations Plan (COOP).
Constraints/Limitations ➢ ODOE facility not seismically sound – building may not be habitable in the aftermath of a significant earthquake. ➢ Notifications may be limited to amateur radio, satellite phone, texting and social media with most communications systems down (phone lines, internet, emails, etc.).	**Gaps/Requests for Information** *Prior to Event:* ➢ Develop lines of succession and authorities. ➢ Designate alternate facility - ODOE (COOP). ➢ Identify viable communications for making initial notifications (texting, social media tools, satellite phones, etc.) ➢ Identify ODOE or other volunteer Amateur Radio Emergency Services (ARES) operators to support agency communications. *After an Event:* • Identify ODOE personnel able to respond.
ODOE Response Positions: ➢ ODOE Assistant Director, Nuclear Safety and Energy Emergency Preparedness Division ➢ ODOE Emergency Preparedness Manager ➢ ODOE Duty Officer(s) ➢ AOC Manager ➢ AOC Facilities Specialist ➢ Other Responders as Appropriate **Procedures**: Procedures for ODOE AOC activation and response positions are included in Appendix J of this Plan. Each response position procedure includes key objectives, checklist of tasks, guidance to accomplish objectives and tasks, and reference materials as appropriate.	
Note: ODOE NSEEP Division staff have pre-approved access to and can respond from the following facilities: 1. Oregon State Emergency Coordination Center (ECC) at the Anderson Readiness Center. 2. Washington State Emergency Operations Center (EOC) at Camp Murray.	

Task 1: Assess the availability of ODOE staff.

Note: *In the event of a CSZ earthquake, significant ground shaking (5+ minutes) is considered the initial notification.*

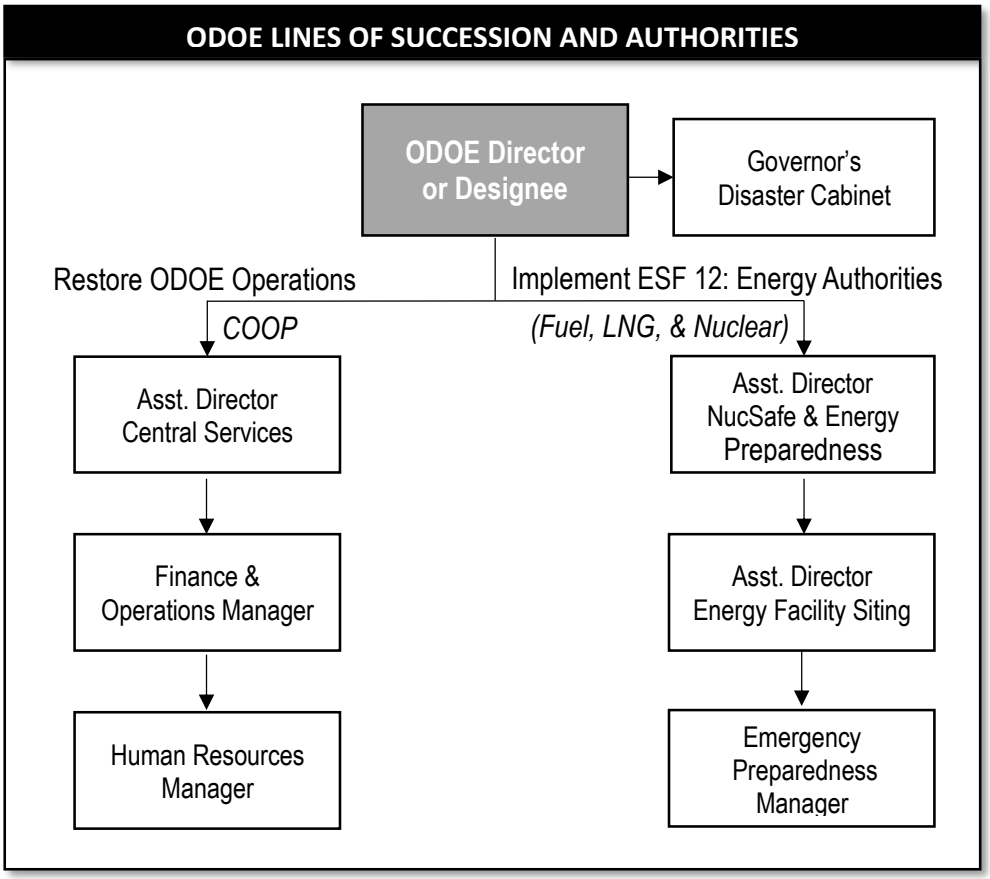
a. ODOE Duty Officer notifies the Assistant Director of NSEEP Division, the Emergency Preparedness Manager, and NSEEP Division staff.

b. The Assistant Director of NSEEP Division or Emergency Preparedness Manager will notify the ODOE Director and Executive Management Team.

c. ODOE's Executive Management Team notifies respective division staff.

Task 2: Determine and activate ODOE lines of succession and authorities.

a. The ODOE Director or authorized designee will implement the agency lines of succession as follows:



Note: *The line of succession is subject to change at the discretion of the ODOE Director or designee.*

b. Exercise authorities and implement the Oregon Fuel Action Plan in response to a state declared emergency resulting in a severe or long-term petroleum shortage with potential impacts to the health and safety of Oregonians. ODOE authorities include:

- ORS 176.750-785 - Energy Resources Emergency Powers authorizes ODOE to develop and maintain a statewide contingency plan in response to petroleum shortages or disruptions that impact the state. This includes the state's Fuel Allocation Program.

- ORS 469.080 - gives the ODOE Director subpoena power to obtain information from producers, suppliers and consumers of energy resources in Oregon on the status of their operations, damage assessments, fuel supply availability, estimated repair times, and overall recovery efforts.

- ORS 469.090 – authorizes the ODOE Director to keep confidential if requested by the provider any information that is proprietary in nature.

Task 3: Assess ODOE facility conditions.

a. ODOE's Assistant Director of the Central Services Division will work with the building owner/manager and others as appropriate to assess the severity of the damages to the building.

b. Upon completion of the damage assessment, determine the status of the facility's condition and make a recommendation to ODOE's Executive Management Team. Assessment and recommendations include:

- ODOE personnel are safe to re-enter the building.

- Only essential ODOE personnel may re-enter the building. ODOE's Executive Management Team identifies essential personnel to perform critical functions as appropriate. This is dependent on the nature of the facility damage, event conditions, and other pertinent factors as appropriate.

- ODOE facility is closed until further notice and personnel are not to re-enter the building. Instruct ODOE staff to standby for further instructions.

c. If ODOE facility is not structurally sound, ODOE's Assistant Director of the Central Services Division will initiate the agency's COOP as appropriate.

Task 4: Begin ODOE AOC Activation *(ODOE or COOP facility)***.**

a. The Assistant Director of the NSEEP Division, Emergency Preparedness Manager, or authorized designee will activate the ODOE AOC to monitor impacts to Oregon's petroleum supply and distribution system. NSEEP Division Responders include:

- Assistant Director of NSEEP Division
- Emergency Preparedness Manager
- ODOE Duty Officer

b. Upon activation, the following responders will report to the ODOE AOC or to the COOP location as directed depending on event conditions. This includes:

- ODOE Director
- Petroleum Event Manager
- Fuel Supply Assessor
- Petroleum Industry Liaison
- County Liaisons
- State Agency Liaison *(reports to the OR ECC upon activation)*
- Federal Agency Liaison
- Public Information Officer (PIO)
- Social Media Liaison
- AOC Manager
- AOC Facilities Specialist
- *Other response positions as appropriate*

Appendix I: ODOE AOC Response Structure Chart

Note: *Multiple positions can be filled by one individual with approval by the Assistant Director of NSEEP or the Emergency Preparedness Manager.*

c. Upon Activation of the OR ECC, ODOE will send the State Agency Liaison to the OR ECC to serve as the Primary State Agency representative for ESF 12: Energy *(specific to the petroleum sector)*.

Note: *For large scale events requiring a joint federal-state response, a Joint Field Office (JFO) may be established. ODOE will respond to the Oregon ECC or the JFO as appropriate.*

Task 5: Make initial notifications.

a. The ODOE Director or authorized designee will notify the governor of the emergency situation resulting in a severe or long-term fuel disruption with potential impacts to the health and safety of Oregonians. This includes:

- Advising the Governor that an executive order *(Appendix F: Fuel Executive Order)* may need to be issued authorizing ODOE to implement the strategies in the Oregon Fuel Action Plan in response to the fuel emergency.

b. The ODOE Director or authorized designee will notify the legislative branches of the emergency situation resulting in a severe or long-term fuel disruption with potential impacts to the health and safety of Oregonians as appropriate. This includes:

- Senate Leadership
- House Leadership

c. Notify the Oregon Emergency Response System (OERS) to inform OERS about ODOE AOC activation status.

d. Notify the Oregon Military Department (OMD) and request OMD contact Department of Defense's (DOD) Defense Logistics Agency (DLA) to activate the Federal Emergency Management Agency's (FEMA) fuel purchasing contract authorizing DLA to purchase bulk fuel to support Oregon's emergency response and recovery activities.

   Note: FEMA contracts with the Department of Defense (DOD) for fuel support during presidential declared disasters to meet civilian and government fuel needs. DOD's Defense Logistics Agency has the capability to purchase bulk fuel and trucks to deliver the fuel to FEMA designated locations. The bulk fuel can be further re-deployed to the impacted communities as directed by FEMA in coordination with state authorities as needed. This includes delivering bulk fuel to existing tanks as well as refuel fleet vehicles and first responder vehicles such as ambulances and fire trucks. In response to Hurricane Sandy, the Defense Logistics Agency purchased 12 million gallons of gasoline and 12 million gallons of diesel fuel. The agency has 260 fuel trucks on contract for fuel distribution.

e. Notify USDOE, the Federal ESF 12: Energy Primary Agency. Notifications include:

   - USDOE Headquarters Duty Officer about the emergency in Oregon and to request information and situation awareness on the impacts to the region's petroleum supply and distribution system.

   - USDOE Region X Field Office in Richland, WA to request USDOE presence and support in Oregon in response to the emergency.

f. Notify the U.S. Coast Guard (USCG) at Sector Columbia River to request initial information on waterway and fuel terminal conditions.

g. Notify the Washington Emergency Management Agency (WA EMD) regarding ODOE AOC activation status and to share initial emergency information between Oregon and Washington regarding impacts to the region's petroleum supply and distribution system.

ACTION 2

Public Information

8 - 24 HOURS TO INITIATE - ESTIMATED COMPLETION 180+ DAYS	
ODOE Mission Analysis	
Objectives/Tasks • Develop and disseminate Oregon fuel sector information to federal, state, local, tribal, and industry emergency response partners. • Participate in the Oregon Joint Information Center news briefings to provide fuel sector information to the news media and the public. • Monitor national, regional, and local news media and social media outlets to identify and address misinformation, rumors, and concerns. • Coordinate with USDOE and the State of Washington to ensure consistent fuel messaging prior to an Oregon Fuel Sector Information release to the Public	**Facts/Assumptions** • Significant damage to the region's communications Infrastructure: - No landlines. - Limited internet or wireless services. • Limited power to charge cell phones or other communication devices. • Communications companies' response structure disrupted due to personnel Injuries and loss of life resulting in significant delays in restoring communication systems.
Constraints/Limitations • Fuel and viable transportation routes required for restoring communications towers and systems. ➢ Power required to sustain communications systems needed to get information out to the news media and public.	**Gaps/Requests for Information** *Prior to Event* ➢ Identify and test all primary and backup communication methods to provide fuel sector information to stakeholders. ➢ Identify and train ODOE employees interested in getting certified to operate Amateur Radio during emergencies. *After an Event* ➢ Use backup communication methods (satellite phones, texting, amateur radio, social media) to provide fuel sector information to all stakeholders until normal communications channels are restored.
ODOE Response Positions: ➢ Petroleum Event Manager ➢ PIO ➢ Deputy PIO ➢ Social Media Liaison ➢ News Center Manager ➢ Telephone Information Manager ➢ Phone Team Operators ➢ Other Response Positions as Appropriate	

Procedures: Procedures for ODOE AOC response positions are included in Appendix J of this plan. Each response position procedure includes key objectives, checklist of tasks, guidance on how to accomplish objectives and tasks, and reference materials as appropriate.
Note: Boilerplate news releases, fuel conservation tips, news media information packet, and other fuel sector information exist on file in the procedures of the ODOE PIO Team for use and can be modified as appropriate to address different event situations and conditions.

Task 1: Develop and widely disseminate news releases, situation reports, or other messages on Oregon fuel sector information to provide situation awareness to a broad audience. This includes
:

- Governor
- Legislative leadership
- Federal, state, and local emergency response partners
- Federally-Recognized Tribes
- Petroleum industry partners
- News media
- Public
- Other stakeholders as appropriate

Information to be developed for dissemination includes:

- Oregon's fuel supply outlook
- Event impacts to the region's petroleum infrastructure
- ODOE's actions and decisions in response to the fuel shortage/disruption
- Fuel Conservation Measures recommended for the public
- Fuel allocation for emergency services, essential services, and public
- Warnings against price gouging, topping off tanks or hoarding of fuel
- Tips on conserving fuel
- Links to petroleum industry, federal, state, and local websites with information on the region's energy infrastructure
- Other information as appropriate

Task 2: Participate in the Oregon Joint Information Center (JIC) briefings and news conferences to provide fuel sector information.

a. Develop key messages, rehearse walk-through, and participate in JIC briefings and news conferences.

b. Compile news media kits. These include, but are not limited to brochures, factsheets, and other pre-printed materials that provide general information about Oregon's petroleum supply and distribution system under normal conditions. The kits also include news releases with event conditions, supply disruption status, recommendations for voluntary and emergency conservation measures, information on state decisions and actions in response to the fuel event, and industry actions taken to restore the petroleum infrastructure.

Task 3: Monitor national, regional, and local news media and social media outlets to identify and address misinformation, rumors, and concerns involving Oregon's fuel outlook. This includes, but is not limited to:

a. Requesting Virtual Operations Support Teams (VOST) support from OEM to:

- Monitor trends and rumors involving the region's fuel supply and distribution system as well as other fuel sector information.
- Monitor social media for information involving public concerns and other fuel sector information.
- Gain situational awareness in the impacted communities.
- Reinforce official sources for fuel sector information.

b. Monitoring fuel via VOST at the following sites:

- t: https://twitter.com/OregonVOST
- f: https://www.facebook.com/OregonVOST
- i: https://instagram.com/oregonvost
- w: http://oregonvost.com/about/

Note: VOST provides communication support through internet connected social media devises (Twitter, Facebook, and other messaging devises).

Task 4: Coordinate fuel sector information and messages with USDOE and Washington State's public information officers as appropriate to ensure consistent messages are released to the public, news media, and social media outlets.

Task 5: Establish and maintain Emergency Fuel Outlook Page on the ODOE website when internet and wireless access becomes available**.**

Task 6: Implement Public Information Campaign to reduce fuel consumption and to encourage motorists to practice responsible driving and vehicle maintenance to save on fuel.

Note: *See also voluntary and mandatory fuel conservation measures in Action 6.*

Task 7: Establish and operate the ODOE Telephone Information Center when communications systems are restored**.** When activated, the Telephone Information Center call-in number is 1-800-906-9701. Telephone Information Center Operators are trained to:

a. Receive and address public questions and concerns regarding Oregon's fuel situation and what ODOE is doing in response to the shortage/disruption in supply.

b. Provide information on Oregon's fuel outlook, ODOE's actions and decisions in response to the fuel shortage/disruption, Fuel Conservation Measures recommended for the public, and fuel allocation, as well as warnings against price gouging, topping off tanks or hoarding of fuel, and other information as appropriate.

c. Receive and address media inquiries, clarify misinformation and rumors, and reiterate state actions and decisions in response to the fuel supply shortage/disruption.

d. Direct the public and media to the Emergency Fuel Outlook page on ODOE's Website for more information.

ACTION 3

Damage Assessment

8 – 24 HOURS TO INITIATE - ESTIMATED COMPLETION 21 DAYS

ODOE Mission Analysis

Objectives/Tasks

- Assess state, regional, and national impacts to the petroleum supply and distribution system.
- Assess estimated timelines for repairs.
- Provide petroleum sector situation awareness and status updates.

Facts/Assumptions

Significant damage to the region's:

- Communications systems.
- Transportation infrastructure.
- Power infrastructure.
- Petroleum response structure disrupted due to personnel injuries and loss of life.

Constraints/Limitations

Refinery, Terminal, and Pipeline Interdependencies:

- Viable roads and bridges to provide access to facilities and pipeline systems.
- ➢ Power to conduct engineering assessments on facilities, equipment, and systems.
- ➢ Communication to report the status of facility conditions and to request assistance.
- ➢ An overwhelming number of requests for aerial assessments requiring coordination.

Gaps/Requests for Information

Prior to Event

- ➢ Identify potential assistance needed by the Portland and Eugene terminals and pipeline operators to gain access to facilities, assess damages, and mitigate problems to restore operations. This includes, but is not limited to:
  - Viable roads
  - Generators
  - Communications
  - Security
  - Water
  - Access to state/federal staging area

After the Event

- ➢ Identify actual state assistance needed by the Portland and Eugene terminals & pipeline operators to restore Oregon's petroleum infrastructure.

ODOE Response Positions:

- ➢ Petroleum Event Manager
- ➢ Fuel Supply Assessor
- ➢ Petroleum Industry Liaison
- ➢ Federal Agency Liaison
- ➢ State Agency ESF Liaison
- ➢ Other Response Positions as Appropriate

Procedures: Procedures for ODOE AOC response positions are included in Appendix J of this plan. Each response position procedure includes key objectives, checklist of tasks, guidance on how to accomplish objectives and tasks, and reference materials as appropriate.

Notes: Petroleum and Eugene Terminals - Once operators have access to their facilities, adequate power, and communications, an estimated 72 hours is required to complete damage assessments to facilities, equipment and systems.

Olympic Pipeline Company – Pipeline operators also estimate 72 hours to assess damages before repairs are made. Prior to restarting the line, pipeline personnel must walk the entire 400 mile line to ensure pipeline integrity. The portion of the pipeline that impacts Oregon runs 299 miles from Blaine, Washington to the Portland Fuel Hub.

Task 1: Establish and maintain communications and work with the Portland & Eugene petroleum distribution terminals to:

a. Support terminals as appropriate to ensure safe conditions onsite.

b. Identify, request, and facilitate the delivery of state and/or federal assistance needed by petroleum terminal operators to conduct damage assessments. This includes, but is not limited to:

ESF 1: Transportation – Work with the Oregon Department of Transportation (ODOT) to:

- Identify lifeline roadways, bridges, and tunnels to the terminals.
- Provide transportation of company responders to the terminals.

ESF 2: Communications – Work with the Oregon Public Utility Commission (OPUC) and Oregon Emergency Management (OEM) to:

- Establish communications between ODOE and the terminals.
- Coordinate the provision of temporary communications capabilities to the terminals.

ESF 3: Public Works – Work with ODOT to:

- Assist the terminals to stabilize hazardous infrastructure and systems to prevent additional injuries and/or damages.
- Develop strategies for the provision of potable water to the terminals.

ESF 5: Information and Planning – Work with OEM to:

- Provide oil companies access to federal-state staging areas to deliver personnel, equipment, and resources from outside our region to support the restoration of the terminals and the petroleum infrastructure.

ESF 10: Hazardous Materials – Work with the Oregon State Fire Marshall's Office (OSFM) and the Oregon Department of Environmental Quality (DEQ) to:

- Assist terminals to contain oil spills and hazardous material spills onsite.

ESF 12: Energy – Work with PUC to:

- Ensure utility companies make power restoration a priority to the Portland Fuel Hub and Eugene Terminal to ensure timely damage assessment at the terminals.
- Ensure generators are provided to the terminals to support initial damage assessment activities until power can be restored to the Portland Fuel Hub and Eugene terminal.

ESF 13: Military Support – Work with the Oregon Military Department (OMD) to:

- Secure aerial surveillance to assess impacts to the region's petroleum supply and distribution system. This includes the refineries, pipelines, and fuel terminals in Portland and Eugene, and the Willamette and Columbia River shipping channels.
- Obtain and deliver generators to the terminals.
- Build temporary roads to provide operators access to the terminals.

Note: ODOE will develop pre-scripted missions under Annex E of this plan for the fuel sector. The pre-scripted missions will identify the type and level of support the agency will require from federal and military agencies to accomplish the actions and objectives of the Oregon Fuel Action Plan.

ESF 16: Law Enforcement – Work with Oregon State Police (OSP) to:

- Provide security at the Portland Fuel Hub and the Eugene terminal.

c. Receive and review with petroleum terminal managers' damage assessment findings. This includes, but is not limited to:

- Fuel Supply (unleaded, diesel, jet fuel, and aviation gas)
- Tank Farms
- Pipeline Systems
- Containment Areas
- Marine Docks
- Loading Racks
- Other as appropriate

Note: In the aftermath of a Cascadia Subduction Zone earthquake, ODOE will likely rely on USDOE to gather initial damage assessment data on Oregon and the region's petroleum supply and distribution system. USDOE will have communications capabilities and access to the petroleum industry at the corporate level.

d. Confirm with petroleum terminal managers the estimated timeline for repairs to the damages to the terminals, equipment, systems, and operations.

Note: Seismic vulnerability studies by the Oregon Department of Geology and Mineral Industries (DOGAMI) and the U.S. Department of Homeland Security (DHS) show that the Portland Fuel Hub would be devastated from earthquake impacts and may likely be shut down for more than three months if not longer as a result of a Cascadia Subduction Zone earthquake.

e. Provide damage assessment findings, estimated timeline for repairs, and status updates on petroleum terminal response activities in Command and General Staff Briefings, Governor's Disaster Cabinet Briefings, OR ECC briefings, situation reports, news releases, news conferences, and other forums as appropriate.

Task 2: Establish and maintain communications and work with pipeline companies to:

a. Receive and review with pipeline operators damage assessments to pipelines for line breaks, product leaks, and destruction to the pressure stations' equipment and systems located throughout the pipeline.

- Olympic Pipeline Company – connects refineries in the Puget Sound area of Washington State to the Portland Fuel Hub.
- Kinder Morgan Pipeline – connects the Portland Fuel Hub to the Portland International Airport and to the Eugene terminal.

b. Confirm with pipeline operators the estimated timeline for repairs to the damaged pipeline equipment and systems.

Note: DOGAMI and FEMA seismic vulnerability studies show that the Pacific Northwest liquid fuel pipelines may likely be shut down more than three months if not longer as a result of a Cascadia Subduction Zone earthquake.

c. Confirm with pipeline operators the estimated timeline for pipeline inspectors to walk the entire line prior to restarting.

d. Provide damage assessment findings, estimated timeline for repairs, and status updates on pipeline response activities in Command and General Staff Briefings, Governor's Disaster Cabinet Briefings, OR ECC briefings, situation reports, news releases, news conferences, and other forums as appropriate.

Task 3: Establish Communications and work with refineries located in the Puget Sound area to:

a. Receive and review with refinery operators damage assessments to the refinery facilities and impacts to the region's fuel supply.

b. Confirm with refinery operators the estimated timeline for repairs to the damaged facilities, equipment, and systems.

Note: FEMA seismic vulnerability studies show that the refineries in Washington may likely sustain moderate to significant damage and remain shut down for more than three months if not longer as a result of a Cascadia Subduction Zone earthquake.

c. Provide damage assessment findings, estimated timeline for repairs, and status updates on refinery response activities in Command and General Staff Briefings, Governor's Disaster Cabinet Briefings, OR ECC briefings, Situation Reports, news releases, news conferences, and other forums as appropriate.

Task 4: Establish and maintain communications with the oil companies (corporate offices), USDOE and Washington Department of Commerce (WDOC) State Energy Office to:

a. Receive and review with industry, USDOE, and WDOC the regional and national energy sector impacts as a result of the CSZ earthquake.

b. Receive and review with industry, USDOE, and WDOC the regional and national fuel availability to support Oregon and Washington emergency response efforts.

c. Begin collaborating with USDOE and WDOC to obtain bulk fuel supplies and to coordinate the logistics for fuel delivery into Oregon and Washington from outside of the region to support emergency response efforts.

Note: USDOE, FEMA, and other federal agencies and military would convene a National Fuel Task Force, which includes the petroleum industry to coordinate obtaining bulk fuel supplies and coordinating logistics to deliver fuel to the impacted states. *See Action 5 for more details.*

d. Provide information on available fuel supplies and strategies to obtain fuel from outside of the region into Oregon and Washington in Command and General Staff Briefings, Governor Disaster Cabinet briefings, OR ECC briefings, Situation Reports, news releases, news conferences, and other forums as appropriate.

Task 5: Establish and maintain communications and work with USCG to:

a. Receive and review with USCG damage assessments to marine docks, bridges, and other structures obstructing fuel deliveries along the Willamette and Columbia Rivers.

Note: According to DHS earthquake studies it will take at least three weeks to assess damages along the Willamette and Columbia Rivers and months to reopen the river system and shipping channels as a result of jetty failures, dike system failures, collapsed bridges and structures, and vessels running aground.

b. Confirm with USCG the estimated timeline for repairs to marine docks, bridges and other structures as well as river debris removal to clear the Willamette and Columbia Rivers to support fuel transports by barge or tanker vessels.

c. Provide damage assessment findings, estimated timelines for repairs and debris removal, and status updates in Command and General Staff Briefings, Governor's Disaster Cabinet briefings, OR ECC briefings, Situation Reports, news releases, news conferences, and other forums as appropriate.

Task 6: Establish and maintain communications and work with DHS Infrastructure Security to:

a. Notify Oregon's Department of Homeland Security (DHS) Protective Security Advisor to request bulk fuel supplies on the Special Event and Domestic Incident Tracker to initiate the process for securing bulk fuel supplies to Oregon from outside of the region.

Note: Once Oregon's request is in the DHS queue, ODOE will need to follow up by completing a FEMA resource request form to complete the resource request process.

b. Confirm the federal Incident Support Base (ISB) for the event.

Note: Pre-designated federal Incident Support Bases for a Cascadia Subduction Zone earthquake include: 1) Redmond Airport, 2) Klamath Falls Airport, and 3) Boise, Idaho. Refer to Appendix B.

c. Receive and review with the Protective Security Advisor damage assessments to other critical infrastructure with the potential to impede access and delivery of bulk fuel supplies to Oregon.

Note: Oregon has its own designated Protective Security Advisor from DHS to assist the state with identifying and resolving critical infrastructure security concerns during emergencies. Oregon's Protective Security Advisor will respond to the Oregon ECC, JFO, or other alternate state response location as appropriate.

d. Confirm with the Protective Security Advisor the estimated timeline needed to resolve critical infrastructure concerns with the potential to impede access and delivery of bulk fuel supplies to Oregon.

e. Provide critical infrastructure concerns with the potential to impede access and delivery of bulk fuel supplies to Oregon and possible resolutions in the Command and General Staff Briefings, Governor's Disaster Cabinet briefings, OR ECC briefings, Situation Reports, news releases, news conferences, and other forums as appropriate.

Task 7: Establish and maintain communications and work with ODOT to:

a. Receive and review with ODOT damage assessments to the state's priority lifeline routes to support fuel deliveries and other disaster relief commodities.

b. Receive and review damage assessments to the rail system to support fuel deliveries and other disaster relief commodities.

c. Confirm with ODOT the estimated timeline for repairs to the state's priority lifeline routes and rail systems to support fuel deliveries and other disaster relief supplies by road and by rail.

Task 8: Establish and maintain communications and work with Oregon Department of Aviation (Aviation) to:

a. Receive and review with Aviation damage assessments to the airports and air fields in the state to support fuel deliveries and other disaster relief commodities.

b. Confirm with Aviation the estimated timeline for repairs to the airports and air fields to support fuel deliveries and other disaster relief supplies by road and by rail.

Task 9: Establish and maintain communications and work with Oregon Emergency Management (OEM) to:

a. Receive and review with OEM damage assessments to the pre-designated State Staging Areas (SSA) and Forward Staging Areas (FSA) to support fuel deliveries and other disaster relief commodities.

Note: Refer to Appendix B.

b. Confirm with OEM the approved SSAs and FSAs to support fuel deliveries and other disaster relief supplies closer to the impacted areas.

ACTION 4

Assess Fuel Needs and Determine Priorities

24 - 76 HOURS TO INITIATE - ESTIMATED COMPLETION 21 DAYS

ODOE Mission Analysis

Objectives/Tasks

- Assess fuel supply availability in Oregon to support initial mission critical functions.
- Work with ESF Primary State Agencies, county emergency management agencies, and federally-recognized tribes to assess fuel needs to conduct mission critical functions.
- Prioritize statewide fuel needs.

Facts/Assumptions

Significant damage to region's:

- Communications systems.
- Transportation infrastructure.
- Power infrastructure.
- State, county, and tribal response structures disrupted due to personnel injuries and loss of life.

Constraints/Limitations

- ➢ Timely and comprehensive assessments are contingent on the quality and level of fuel assessments completed by each lead state agency, county, and tribal government prior to a Cascadia Subduction Zone earthquake and tsunami.
- ➢ Viable road access to/from pre-identified fuel stockpiles and power to access fuel supply at fuel sites within the counties and communities.
- ➢ Communications capabilities required to convey fuel needs and priorities to ODOE.

Gaps/Requests for Information

Prior to Event

ODOE will work with ESF Primary State Agencies, county emergency management agencies, and federally-recognized tribes to identify:

- Available in-state fuel supplies and storage capacity within each ESF sector, county, and tribal land.
- ➢ Personnel, equipment, and resources requiring fuel to perform mission critical functions for each sector, community, and tribe. This includes having a general understanding of fuel required and systems interdependencies.

After an Event

- ➢ Secure Governor emergency declaration to authorize state, local, and tribal emergency response organizations to use available in-state fuel (gasoline, diesel, jet fuel, and aviation gas) supplies to perform initial mission critical functions.
- ➢ Prioritize statewide fuel needs.

ODOE Response Positions:

- ➢ ODOE Director
- ➢ Petroleum Event Manager
- ➢ Fuel Allocation Coordinator
- ➢ State Agency ESF Liaison
- ➢ County Liaison Manager
- ➢ County Liaison(s): Regions 1 – 5 *(as needed)*
- ➢ Tribal Liaison
- ➢ Other Response Positions as Appropriate

Procedures: Procedures for ODOE AOC response positions are included in Appendix J of this plan. Each response position procedure includes key objectives, checklist of tasks, guidance on how to accomplish objectives and tasks, and reference materials as appropriate.

Task 1: Review ODOE's fuel database of above and underground fuel storage tanks in the state by county and city.

Note: The database lists owner/operator names, type of fuel site (motor pool, public works yard, card lock, airport, or other) physical address, latitude and longitude locations, number of tanks on site, tank size, fuel type and backup power capabilities (generator or generator connection installed on site). ODOE compiled the fuel information from DEQ, OSFM, and ODA fuel databases and then modified the data to support fuel allocation strategies.

Task 2: Work with state, county, and tribal emergency response organizations to assess existing fuel supply availability in Oregon to support initial life safety and other mission critical functions. This includes determining the duration the supplies are expected to last.

Note*:** Planning basis approximates ***3 weeks before bulk fuel supplies can be delivered to local communities after a catastrophic earthquake.

a. ESF Primary State Agencies:

- Work with OMD, Oregon Department of Aviation (Aviation), and Oregon Department of Forestry (ODF) to assess viable supplies of jet fuel and aviation gasoline at airports and air fields in the state. Determine how long the fuel supply will last until it runs out.

  Note: Refer to Annex E in OMD's Air Coordination Plan for baseline data.

- Work with the Oregon Department of Administrative Services (DAS) to assess viable supplies of unleaded gasoline and diesel fuel at state motor pools and state agency fleets.

- Work with ODOT to assess viable supplies of unleaded gasoline and diesel at ODOT District Fleet fueling locations.

- Work with the Oregon Department of Corrections (ODOC) to assess viable supplies of unleaded gasoline and diesel fuel at state prisons and penitentiaries.

- Work with OEM to assess viable supplies of unleaded gasoline and diesel fuel with private industry partners including mega grocery chains with fueling capabilities and mass transit companies to assess viable supplies of diesel to support state mission critical functions.

- Work with other state agencies as needed.

b. County Emergency Management Agencies

- Work with county emergency management agencies to assess viable supplies of unleaded gasoline and diesel fuel to support initial local mission critical functions.

c. Federally- Recognized Tribes

- Work with tribal emergency response personnel to assess viable supplies of unleaded gasoline and diesel fuel to support initial tribal mission critical functions.

Task 3: Work with the Oregon Department of Justice (ODOJ) and OEM to ensure a Governor's emergency declaration provides state, county, and tribal emergency responders' authority to purchase and use existing fuel supplies at market price to support initial mission critical functions.

a. Instruct ESF Primary State Agencies, county emergency management agencies, and federally-recognized tribes to use existing in-state fuel supplies to conduct initial life-saving functions until bulk fuel supplies can be secured and delivered from outside of the region.

Task 4: Assess Statewide Fuel Needs - Work with ESF Primary State Agencies to assess fuel needs to support mission critical functions for each sector to save lives and restore critical lifelines and services.

18 ESF SECTORS AND STATE PRIMARY AGENCIES

a. ESF 1: Transportation - Work with ODOT to assess fuel needs to restore access and repair highways, roads, bridges, rail lines, and tunnels to support the transportation of goods and services and to perform other mission critical functions.

b. ESF 2: Communications – Work with the OPUC and OEM to assess fuel needs to repair damaged communications systems and to perform other mission critical functions.

c. ESF 3: Public Works – Work with ODOT to assess fuel needs for debris removal to establish viable routes to the impacted areas and to perform other mission critical functions.

d. ESF 4: Firefighting – Work with OSFM to assess fuel needs for fire suppression, mobilizing Urban Search and Rescue Teams, and to perform other mission critical functions.

e. ESF 5: Information and Planning – Work with OEM to assess fuel needs to conduct a rapid needs assessment of the impacted areas and to perform other mission critical functions.

f. ESF 6: Mass Care – Work with the Oregon Department of Human Services (DHS) to assess fuel needs to identify viable shelters and mass care facilities and establish operations of these facilities in the impacted areas and to perform other mission critical functions.

g. ESF 7: Resource Support – Work with DAS to assess fuel needs to deliver emergency relief supplies to impacted areas and to perform other mission critical functions.

h. ESF 8: Health and Medical – Work with Oregon Heath Authority (OHA) to assess fuel needs to mobilize professional/reserve medical personnel and supplies to impacted areas to triage and stabilize the wounded in impacted areas, perform casualty clearing/staging, and other mission critical functions.

i. ESF 9: Search and Rescue – Work with OSFM to assess fuel needs to deploy teams into impacted areas, transport injured individuals recovered from the scene, and to perform other mission critical functions.

j. ESF 10: Hazardous Materials – Work with OSFM and DEQ to assess fuel needs to identify and deploy teams to contain oil and other hazardous materials spills from impacted areas and to perform other mission critical functions.

k. ESF 11: Food and Water – Work with ODA and DHS to assess fuel needs to deliver food and water to shelters and isolated communities and to perform other mission critical functions.

l. ESF 12: Energy – Work with OPUC to assess fuel needs to assess and restore the natural gas and electricity supply and distribution systems and to perform other mission critical functions.

   Note: ODOE is lead for the petroleum sector. OPUC is lead for the electricity and natural gas sectors.

m. ESF 13: Military Support – Work with OMD to assess fuel needs for the Oregon National Guard's air and ground response in support of civilian authorities. This includes the mission critical functions of all ESF Primary State Agencies and Oregon counties as appropriate.

n. ESF 14: Public Information – Work with OEM to assess fuel needs for the Public Information Sector as appropriate.

o. ESF 15: Volunteers & Donations – Work with OEM to assess fuel needs for the Red Cross and other non-profit agencies to provide shelter, roadway assistance, donation management, establishing blood bank capabilities in impacted areas and to perform other mission critical functions.

p. ESF 16: Law Enforcement – Work with OSP to assess fuel needs to protect life and property, provide traffic and crowd control, provide security for responders and critical facilities, and to perform other mission critical functions.

q. ESF 17: Animal Protection – Work with DHS to assess fuel needs to provide veterinary medical care, animal sheltering, animal carcass disposal and to perform other mission critical functions.

r. ESF 18: Business and Industry – Work with OEM to assess fuel needs for the Business and Industry Sector as appropriate.

Note: ODOE's State Agency Liaison will work with ESF Primary State Agencies to ensure fuel assessments are complete. ODOE will work with and rely on the expertise and assessments of each ESF Primary State Agency to determine fuel needs for their respective sector(s).

Task 5: Assess County Fuel Needs - Work with county emergency management agencies to assess local fuel needs to support mission critical functions to save lives and restore critical lifelines and services.

a. Region 1: Clackamas, Hood River, Multnomah, and Washington

b. Region 2: Benton, Clatsop, Columbia, Lane, Lincoln, Linn, Marion, Polk, Tillamook and Yamhill

c. Region 3: Coos, Curry, Douglass, Jackson, and Josephine Counties

d. Region 4: Crook, Deschutes, Gilliam, Jefferson, Klamath, Lake, Sherman, Wasco, and Wheeler

e. Region 5: Baker, Grant, Harney, Malheur, Morrow, Umatilla, Union, and Wallowa

Note: ODOE AOC will assign a County Liaison to assist each region's counties to ensure fuel assessments are complete. ODOE will work with and rely on the expertise and assessments of each county emergency management agency to determine fuel needs for their respective jurisdictions.

Task 6: Work with county emergency management agencies to integrate the use of biofuels to support mission critical functions or to sustain regions not directly affected by earthquake and tsunami impacts.

Note: ODOE recognizes that biofuels cannot replace conventional fuel. The goal of integrating biofuels into the state's emergency response and recovery efforts is to allow eastern Oregon and other parts of the state that are not directly impacted by quake impacts to sustain community functions with ethanol or biodiesel until the region's petroleum supply and distribution system is restored.

a. Work with Sequential Biodiesel to allocate biodiesel to support mission critical functions for counties in Region 2: Benton, Clatsop, Columbia, Lane, Lincoln, Linn, Marion, Polk, Tillamook and Yamhill.

b. Work with Pacific Ethanol to allocate ethanol to support mission critical functions for counties in Region 5: Baker, Grant, Harney, Malheur, Morrow, Umatilla, Union, and Wallowa.

Note: Counties must have access to flex cars to be fueled by ethanol.

Task 7: Work with the Federally-Recognized Tribes to assess tribal fuel needs to support mission critical functions to save lives and restore critical lifelines and services. This includes:

- Burns Paiute Tribe
- Confederated Tribes of the Coos, Lower Umpqua and Siuslaw
- Confederated Tribes of the Grand Ronde
- Confederated Tribes of the Siletz
- Confederated Tribes of the Umatilla Indian Reservation

- Confederated Tribes of the Warm Springs Reservation
- Coquille Indian Tribe
- Cow Creek Band of Umpqua Tribe of Indians
- Klamath Tribes

Task 8: Work with the Governor's Disaster Cabinet to prioritize fuel needs in preparation for fuel allocations.

a. As fuel assessments are completed by ESF Primary State Agencies, county emergency management agencies, and the federally-recognized tribes, establish a fuels priority list in preparation for fuel allocations.

Note: Initial bulk fuel supplies delivered into Oregon by federal and military agencies may not meet all of the state's fuel needs to emergency response activities. Establishing priorities for fuel allocation becomes a responsibility of the Governor's Disaster Cabinet. ODOE's Director is a member of the Governor's Disaster Cabinet.

Task 8: Provide Action 4 status reports in Command and General Staff Briefings, Governor Disaster Cabinet briefings, OR ECC briefings, Situation Reports, news releases, news conferences, and other forums as appropriate. This includes:

- Current in-state fuel availability and outlook
- State, county, and tribal fuel needs assessment status
- Status of the Governor's Disaster Task Force in establishing statewide fuel priorities

ACTION 5

Outside Assistance: Fuel Supply

12 - 24 HOURS TO INITIATE - ESTIMATED COMPLETION 180+ DAYS

ODOE Mission Analysis

Objectives/Tasks

Request the activation and represent Oregon on the nationally convened Fuel Task Force to:

- Coordinate the request, delivery, and estimated time of arrival of bulk fuel supplies into Oregon from outside of the region with federal, military, and industry partners to support state's response and recovery effort.
- Verify the pre-designated federal Incident Support Base (ISB) in Oregon for receiving bulk fuel supplies.
- Verify State Staging Areas (SSA) and Forward Staging Areas (FSA) in Oregon in preparation for moving bulk fuel supplies from the federal ISB closer to the impacted areas.

Facts/Assumptions

Aging petroleum infrastructure in the Pacific Northwest not designed to withstand catastrophic seismic impacts resulting in significant damage:

- Refineries located in Washington inoperable.
- 299 mile Olympic Pipeline, Kinder Morgan Pipeline to the Eugene terminal and Portland International Airport inoperable.
- Petroleum terminals in the Portland Fuel Hub inoperable (includes marine docks).
- Transportation infrastructure unable to support product movement.
- Significant fuel supply loss from the Portland Fuel Hub located on liquefiable soils.

Constraints/Limitations

- Anti-trust laws and proprietary business practices under normal conditions prevent oil companies from collaborating without facilitation from government agencies. A national forum like the Fuel Task Force allows oil companies to coordinate their response to a catastrophic event to restore the region's fuel infrastructure and provide bulk fuel supplies to impacted states.
- "Just-in-Time" strategy for fuel deliveries limit the amount of reserves on hand at all U.S. refineries and terminals.
- ➢ U.S. refineries operating at near capacity limit the capability to meet sudden increase in demand.
- ➢ No easily accessible alternate source of refined product in Oregon.

Gaps/Requests for Information

Prior to Event

- ➢ Conduct fuel workshops, tabletop drills and full scale functional exercises to improve coordination and integration of federal, military, state, and industry emergency response and procedures to ensure a seamless, collaborative response to fuel emergencies in Oregon.
- ➢ Improve overall understanding of the roles, responsibilities, and capabilities of industry, federal agencies, and military branches providing bulk fuel supplies to Oregon.
- ➢ Improve overall understanding of options and logistics required for transporting, storing, and dispensing of fuel by air, water, rail and roads from the federal ISB to the SSAs, FSAs, and county FPODs.

After an Event

- ➢ Represent Oregon on the national Fuel Task Force to secure bulk fuel supplies from outside of the region into Oregon to support the state's response and recovery effort.

ODOE Response Positions:

- Petroleum Event Manager
- Fuel Allocation Coordinator
- Fuel Supply Assessor
- State Agency ESF Liaison
- Federal Agency Liaison
- Petroleum Industry Liaison
- Other ODOE Response Positions as Appropriate

Procedures: Procedures for ODOE AOC response positions are included in Appendix J of this plan. Each response position procedure includes key objectives, checklist of tasks, guidance on how to accomplish objectives and tasks, and reference materials as appropriate.

NOTES

Federal and state seismic vulnerability studies show the petroleum infrastructure in the Pacific Northwest will be ***inoperable for at least three months*** if not longer:

Task 1: Work with the Protective Security Advisor to assess the status of ODOE's initial bulk fuel supply request via DHS's Special Event and Domestic Incident Tracker. This includes:

a. Complete and submit a federal resource request form for bulk fuel supplies to FEMA.

b. Provide a copy of the resource request to USDOE ESF 12 Liaison and the DHS Protective Security Advisor.

Note: ODOE's initial request for bulk fuel supplies was verbally communicated to the Protective Security Advisor in Action 3 of this plan. A federal resource request form must then be completed and submitted for record keeping to ensure timely federal reimbursements.

Task 2: Coordinate with the USDOE ESF 12 Liaison at the Oregon ECC or JFO to request the activation of a national Fuel Task Force.

Note: USDOE may activate a national Fuel Task Force without prompting from ODOE or the Washington Department of Commerce. Fuel Task Force members include: USDOE, FEMA, DOD, Maritime Administration, USNORTHCOM, petroleum industry partners, impacted states, and other as appropriate.

For events not requiring the activation of a national Fuel Task Force, ODOE will work with USDOE and petroleum industry partners to accomplish the tasks identified in Action 5 as appropriate.

Task 3: Upon activation, coordinate with the Fuel Task Force to secure bulk fuel supplies from outside of the region into Oregon to support the state's emergency response and recovery activities. This includes:

a. Inform the Fuel Task Force about the status of ODOE's initial bulk fuel supplies request to Oregon's Protective Security Advisor via DHS's Special Event and Domestic Incident Tracter to ensure continuity and timely follow through and delivery of Oregon's bulk fuel supply request.

b. Identify and secure source of bulk fuel supplies to support Oregon's emergency response and recovery effort.

c. Assess and determine viable transportation modes and responsible military, federal agency(s), and/or company(s) to support bulk fuel deliveries to Oregon to the authorized federal Incident Support Base.

- Air – Identify type of aircraft(s), availability, and capacity.
- Waterway - Identify viable marine docks and vessels (tankers/ships/barges) availability, and capacity.
- Rail – Determine availability and capacity.
- Pipeline – Viable alternate or temporary pipelines and capacity.
- Land – Viable transportation routes.

d. Coordinate all logistics and resources (personnel, equipment, and systems) needed to transport bulk fuel supplies to Oregon to the confirmed federal Incident Support Base or other authorized location.

Task 4: Coordinate with the Fuel Task Force to prepare and deliver bulk fuel supplies from the federal Incident Support Base to authorized State Staging Areas and Forward Staging Areas closer to the impacted areas. This includes:

a. Assessing and determining viable transportation modes and responsible military, federal agency(s), and/or company(s) to support fuel deliveries.

- Air – Identify type of aircraft(s), availability, and capacity.
- Waterway - Identify viable marine docks and vessels (tankers/ships/barges) availability, and capacity.
- Rail – Determine availability and capacity.
- Pipeline – Viable alternate or temporary pipelines and capacity.
- Land – Viable transportation routes.

b. Coordinate with OEM to verify authorized State Staging Areas and Forward Staging Areas for transporting bulk fuel supplies closer to the impacted areas.

c. Coordinate with the county emergency management agencies to verify pre-designated FPODs within their respective communities for receiving bulk fuel supplies from the federal and state staging areas.

Task 5: Coordinate with the Fuel Task Force to identify maritime response operations, assets and capabilities to support bulk fuel and other disaster relief supply deliveries to Oregon. This includes:

a. Waterway and port facility restoration on the Columbia River and along the Oregon Coastline.

b. Availability of maritime vessels to support deliveries of bulk fuel and other disaster relief supplies to viable and/or temporary ports on the Columbia River and along the Oregon Coastline.

c. Lifting the Jones Act to allow foreign ships to deliver bulk fuel supplies to viable and/or temporary ports along the Oregon Coastline.

Note: During Superstorm Sandy, the Maritime Administration lifted the Jones Act to allow 11 foreign vessels to deliver 115 million gallons of fuel from the U.S. Gulf Coast to the ports of New York and New Jersey.

Task 6: Coordinate with the Fuel Task Force to identify, obtain, and coordinate the implementation of all necessary federal environmental, transportation, and other waivers to ensure timely delivery of fuel and other disaster relief commodities into Oregon. This includes:

c. Working with Oregon state agencies to ensure all state equivalent waivers are identified, obtained and implemented to prevent delays in the delivery of emergency supplies and services in the state.

Note: See Action 7 and Appendix G for more details on Oregon waivers required to ensure timely fuel deliveries.

Task 7: Coordinate with the Fuel Task Force to develop regional fuel priorities for Oregon and Washington if needed.

a. Compare prioritized fuel list from the Governor's Disaster Cabinet with the regional priorities recommended by the Fuel Task Force to ensure consistency.

b. If discrepancies are found, resolve the differences with members of the Governor's Disaster Cabinet prior to implementing fuel allocations.

Task 8: Coordinate damage assessment and estimate repair and restoration timelines to the region's fuel supply and distribution system.

Task 9: Provide Action 5 status reports in Command and General Staff Briefings, Governor's Disaster Cabinet briefings, OR ECC briefings, Situation Reports, news releases, news conferences, and other forums as appropriate. This includes:

- Fuel Task Force priorities, actions, and decisions.
- Details about the status of bulk fuel supply deliveries into Oregon from all viable transportation modes.
- Status of federal and state fuel waivers to ensure timely deliveries.
- Regional fuel priorities.

ACTION 6

Fuel Conservation Measures

24 - 48 HOURS TO INITIATE - ESTIMATED COMPLETION 180+ DAYS	
ODOE Mission Analysis	
Objectives/Tasks Reduce Fuel Consumption: • Recommend voluntary fuel conservation measures for Oregonians. • Require mandatory fuel conservation measures for government agencies and all political subdivisions.	**Facts/Assumptions** • Significant fuel supply loss from the Portland Fuel Hub. • Significant reduction in demand for fuel due to widespread damage to highways, roads and bridges.
Constraints/Limitations • Mandatory fuel conservation measures require Governor Emergency Declaration. • No enforcement capability to require mandatory fuel conservation measures for the public.	**Gaps/Requests for Information** *Prior to Event* ➢ ODOE will develop performance measures to evaluate the success of fuel conservation measures to reduce demand on fuel. *After an Event* ➢ ODOE will assess the success of the fuel conservation measures to reduce demand on fuel.
ODOE Response Positions: ➢ Petroleum Event Manager ➢ PIO ➢ Fuel Allocation Coordinator ➢ Fuel Supply Assessor ➢ Odd/Even Fuel Administrator ➢ State Agency ESF Liaison ➢ County Liaison Manager ➢ Tribal Liaison ➢ Other Response Positions as Appropriate **Procedures**: Procedures for ODOE AOC response positions are included in Appendix J of this plan. Each response position procedure includes key objectives, checklist of tasks, guidance on how to accomplish objectives and tasks, and reference materials as appropriate.	
Note: In general and unless otherwise instructed, fuel conservation measures will remain in effect throughout the duration of the emergency and recovery phases of an event. The goal of fuel conservation measures is two-fold. First, it allows for the gradual drawdown of the limited supplies on hand. Second, it reduces panic, prevents fuel hoarding, and prevents price gouging at the gasoline pumps. In addition, fuel conservation measures reassure Oregon citizens that the state is taking the necessary steps to mitigate the impending or actual supply shortage situation.	

Task 1: Recommend voluntary fuel conservation measures to reduce driving during fuel shortages and disruptions.

a. Implement public information campaign to encourage commuters to practice responsible

driving and vehicle maintenance to save on fuel. This includes the following fuel saving tips:

- Slow down and watch speed.
- Consolidate trips.
- Accelerate and brake smoothly.
- Reduce idling.
- Check tire pressure.
- Travel light.
- Minimize use of heater and air conditioning.
- Close windows at high speeds.
- Choose the right oil.
- Be kind to your vehicle.
- Other fuel saving tips as appropriate.

b. GAS PRICE REPORTER WEBSITE/TOLL FREE NUMBER – Request the Oregon Department of Justice (ODOJ) establish and manage the "Gas Price Reporter Website" and a 1-800 number to enable Oregonians to report evidence suggesting unlawful conduct in gasoline pricing at www.doj.state.or.us. The Attorney General investigates and prosecutes individuals and companies that unlawfully fix the price of gasoline in Oregon.

c. RIDE SHARE PROGRAM **-** Initiate emergency rideshare program to save fuel by improving the attractiveness of car and vanpools.

d. MASS TRANSIT PROGRAM - Assist local agencies in expanding new transit service, reducing transit fare and instituting or expanding free transit fare zones.

e. BICYCLE PROGRAM **-** Encourage commuters who live within bicycling distance of their places of employment to use their bicycles. For this program to be successful, local governments and employers may need to provide more bicycle racks or secured parking areas for employees. Temporary bicycle lanes may be created to encourage cycling and to accommodate increases in the number of cyclists.

f. FLEXIBLE WORK HOURS - Encourage the use of flexible work hours for both short and long-term demand reduction, improvement in fuel efficiency, and reduction in traffic congestion.

g. THERMOSTAT SETTINGS **-** Set thermostats higher in the summer and lower in the winter to reduce the amount of fuel used for heating or air conditioning.

Task 2: Recommend mandatory fuel conservation measures for All Levels of Government and Political Subdivisions in Oregon. This includes, but is not limited to:

a. ELIMINATE NON-ESSENTIAL DRIVING - Reduce or eliminate all non-essential government and commercial vehicle use.

b. STRICTLY ENFORCING SPEED LIMITS - Intensified speed limit enforcement by eliminating the use of warnings.

c. INTENSIFY FLEXIBLE WORK HOUR PROGRAMS - Programs include, but are not limited to the following:

- Staggered work hours
- Flextime
- Four-day work week
- Parking facility limitations

d. MANDATORY VEHICLE TIRE PRESSURE INSPECTION

Note: Implementing mandatory fuel conservation measures requires a Governor's Emergency Declaration.

Task 8: Provide Action 6 status reports in Command and General Staff Briefings, Governor's Disaster Cabinet briefings, OR ECC briefings, Situation Reports, news releases, news conferences, and other forums as appropriate. This includes:

- Voluntary fuel conservation measures considered or issued for the public.
- Mandatory fuel conservation measures considered or issued to all levels of government and political subdivisions.
- Impacts of voluntary and mandatory fuel conservation measures issued, if any.

ACTION 7

Temporary Waivers

24 – 48 HOURS TO INITIATE - ESTIMATED COMPLETION 180+ DAYS	
ODOE Mission Analysis	
Objectives/Tasks Ensure access and timely movement of fuel to support emergency activities • Obtain Governor's Emergency Declaration. • Obtain Governor's executive order giving ODOE authority to implement the Oregon Fuel Action Plan. • Obtain all fuel waivers needed to ensure timely fuel deliveries in Oregon.	**Facts/Assumptions** • Significant fuel supply loss from the Portland Fuel Hub. • Significant damage to region's petroleum infrastructure. • Atypical supply and distribution systems will be created to support Oregon's response and recovery activities. • Bulk fuel supplies will be transported into Oregon from greater distances.
Constraints/Limitations • Waivers require Governor's Emergency Declaration. • Waivers may require presidential approval. ➢ Waivers may require coordination with multiple Oregon state agencies, federal agencies, the military, and other states in the region. ➢ Waivers are temporary and require review for extensions.	**Gaps/Requests for Information** *Prior to Event* ➢ Draft executive order for the governor to sign giving ODOE authority to implement the Oregon Fuel Action Plan. ➢ Draft a menu and boilerplate waivers of all potential waivers needed to ensure fuel deliveries within and into Oregon without delays during an emergency *After an Event* • Obtain and disseminate copies of emergency declarations, executive orders, and waivers.
ODOE AOC Response Positions: ➢ ODOE Director ➢ Petroleum Event Manager ➢ Fuel Supply Assessor ➢ Fuel Allocation Coordinator ➢ State Agency ESF Liaison ➢ Federal Agency Liaison ➢ Petroleum Industry Liaison ➢ Other Response Positions as Appropriate **Procedures**: Procedures for ODOE AOC response positions are included in Appendix J of this plan. Each response position procedure includes key objectives, checklist of tasks, guidance on how to accomplish objectives and tasks, and reference materials as appropriate.	
***Note*:** ODOE will work directly with the Oregon Department of Justice to obtain and issue all necessary waivers to support timely fuel deliveries and the transportation of other disaster relief supplies on Oregon highways, roads, and bridges.	

Task 1: Obtain Governor's Emergency Declaration.

a. Obtain from OEM a copy of the Governor's Emergency Declaration as a result of a catastrophic event under ORS 401.

b. For emergencies impacting the fuel sector ONLY, ODOE's Director may advise the Governor to declare an ENERGY emergency declaration under ORS 176.785.

c. Provide a copy of the Governor's Emergency or Energy Declaration to 1) petroleum industry partners, 2) federal agencies as appropriate, 3) western states, 4) ESF Primary State Agencies, 5) county emergency management agencies, 6) federally-recognized tribes, and 7) other stakeholders as appropriate.

Task 2: Obtain temporary waivers (Emergency Declaration Required).

a. Work with the appropriate federal and/or state agencies to complete waiver request forms to obtain all necessary waivers to ensure timely deliveries of fuel to support emergency and recovery activities in Oregon.

Note: The oil industry operates under various regulations to ensure safe operations, environmental quality, and fair market competition. These same regulations could also impede the rapid restoration of the petroleum supply and distribution system in the aftermath of an emergency resulting in a long-term or severe fuel shortage. Lifting environmental and safety requirements temporarily after a catastrophic event could ensure timely deliveries of fuel and other disaster relief supplies into impacted communities.

- Biofuel Blending – Oregon requires a minimum amount of biofuels to be blended into all gasoline and/or diesel sold within the state. This requirement could impede fuel supplies from states without biofuel blending requirements from entering the disaster area.

- Clean Fuel Supply - Producers and importers of fossil-based transportation fuels are required to comply with the Oregon Clean Fuel Standards to reduce the overall carbon content of fuel used in Oregon. This requirement could impede fuel supplies coming from states with lesser standards from entering the disaster area.

- Dealer License – Oregon requires a carrier to pay a fee and obtain a Distributor's License to transport motor fuel within the state. Temporarily waiving this fee and license requirement may help speed fuel into the disaster area.

- Diesel Fuel Penalty - The federal government imposes 24.4 cents per gallon tax on diesel fuel sold for on road use. Meanwhile dyed diesel fuel used for farming purposes and home heating are not subject to the tax. If the dyed diesel fuel was used for on road purposes, the federal government would require that use to be reported and the tax paid accordingly. Temporarily waiving this penalty would allow use of available supplies of dyed diesel fuel for emergency use.

- Driver Qualification, Load, and Inspection – Federal and state laws set standards for a driver's physical fitness, level of fatigue, fluency in English, cargo and cargo inspection,

and vehicle maintenance and repairs. Temporarily waiving these requirements may be necessary to increase the pool of available drivers.

- Hazmat Specifications – Federal and state laws set strict specifications on the types of vehicles that can carry gasoline, which includes shipping papers and placarding. Temporarily waiving these specifications may be necessary if there is a shortage of available fuel carrying vehicles.

- Hours of Service – Federal and state laws set standards on how many hours a truck driver can be on duty and drive in a given day and week. Temporarily waiving these standards may be necessary to get needed fuel delivered.

- Importer/Exporter License - State law requires fuel importers and exporters to pay a fee and obtain a license from the state to move fuel across state lines. Without these licenses, the fuel merchant cannot legally buy gasoline from one state and move it to another. Temporarily waiving this fee and license requirement may be necessary to bring fuel from nearby states into the disaster area.

- International Registration/International Fuel Tax Agreement - The International Registration Plan (IRP) is an agreement among states of the U.S, the District of Columbia, and the provinces of Canada providing for payment of commercial motor carrier registration fees. To operate in multiple states or provinces, motor carriers must register in their base jurisdiction (state or province). The International Fuel Tax Agreement (IFTA) is an agreement among states to report fuel taxes by interstate motor carriers. Temporarily waiving this requirement may be necessary to bring fuel from Canada or nearby states into the disaster area.

- Jones Act - The Merchant Marine Act (Jones Act) prohibits foreign-built, foreign-owned, or foreign-flagged vessels from carrying goods and commodities between U.S. ports. To get adequate fuel supplies into the disaster area without delays, foreign vessels may need to be used to deliver fuel between U.S. ports.

- Oxygenated Fuel Emergency – State law requires the use of oxygenated fuels during winter months in certain designated areas that are not meeting carbon monoxide (CO) ambient air quality standards. Temporarily waiving this requirement may be needed to use fuel in the disaster area that would otherwise not be permitted.

- Reid Vapor Pressure (RVP) – RVP is a common measure of the volatility of gasoline. Many states allow a variance, up to 1 lb. RVP from current standards for gasoline blended with ethanol. This requirement could impede fuel supplies from other states without RVP requirements from entering into the disaster area.

- Ultra Low Sulfur Diesel – Federal and state law require a cleaner fuel with a maximum 15 parts per million sulfur specification for vehicles and equipment. Temporarily waiving this requirement may be necessary if fuel that doesn't meet these requirements is otherwise available.

- Vapor Recovery and Fuel Transfer, Loading and Storage Waivers – Federal and state law require fuel terminal loading and unloading systems and tank trucks that transport fuels to use specified vapor recovery equipment and comply with other vapor control requirements. Vapor recovery requirements vary from state to state. Some states also establish vapor control requirements to various fuel transfer, loading and storage operations. Temporarily waiving this requirement may be necessary to deliver some fuel into the disaster area.

- Vessel Movement Control – The U.S. Coast Guard has authority to control vessel traffic through the enactment of safety and security zones. Delivery of fuel by water may necessitate implementing such zones.

- Weight Limits - All states set weight restrictions on the maximum weights allowable for trucks that travel on roadways. Temporarily modifying these restrictions may be necessary for emergency delivery of fuel.

Note: Refer to Appendix G for more details about specific fuel waivers and the federal and state agencies responsible for lifting the waivers.

b. Provide a copy of the waiver(s) obtained to 1) petroleum industry partners, 2) federal agencies as appropriate, 3) western states, 4) ESF Primary State Agencies, 5) county emergency management agencies, 6) federally-recognized tribes, and 7) Other stakeholders as appropriate.

Task 3: Work with lead federal and state agencies to monitor waivers issued and evaluate the need for an extension of the temporary waivers as appropriate.

a. Work with the appropriate lead federal and/or state agencies to complete the approval process for extending all necessary waivers to ensure continued timely deliveries of fuel to support emergency and recovery activities in Oregon.

Note: Fuel waivers are usually effective for a period of 20-30 calendar days from the date of the emergency declaration and require extensions if the emergency situation persists.

Task 4: Work with lead federal and state agencies to terminate temporary waivers lifted in response to the emergency and reinstate all federal and state requirements as appropriate.

Task 5: Provide Action 7 status reports in JFO Command and General Staff Briefings, OR ECC briefings, Situation Reports, news releases, news conferences, and other forums as appropriate. This includes:

- Temporary waivers issued
- Temporary waivers extended
- Temporary waivers deactivated

ACTION 8

Fuel Allocation

72 HOURS TO INITIATE - ESTIMATED COMPLETION 180+ DAYS	
ODOE Mission Analysis	
Objectives/Tasks • Implement and Manage Oregon's Fuel Allocation Program. • Receive, review, and approve/deny emergency fuel requests from pre-approved priority fuel users. This includes: ESF Primary State Agencies, county emergency management agencies, and federally-recognized tribes. • Allocate fuel to pre-approved priority fuel users as needed. • Identify and implement pre-scripted missions involving fuel requiring federal and military assistance. • Implement Odd/Even Fuel Allocation as appropriate.	**Facts/Assumptions** Significate damage to: • Region's communications systems. • Region's power infrastructure. • Region's transportation infrastructure (highways, roads, bridges, waterway systems, and rail). • Portland Fuel Hub (terminal facilities, pipeline systems, tank farms, and marine docks). • Eugene terminal. • Region's pipeline systems: - 230 mile Olympic Pipeline. - Kinder Morgan Pipeline to the Eugene terminal and to the Portland International Airport.
Constraints/Limitations • Criteria for initiating fuel allocation: - Governor's Emergency Declaration. - State, county, and tribal emergency responders unable to get fuel at any price. - Anticipated long-term/severe supply shortage or disruption. • Obtaining necessary federal and state regulatory waivers to support timely deliveries of fuel and other disaster relief supplies. • Fuel deliveries largely dependent on factors beyond ODOE's control: - Significant loss of normal incoming fuel supply post-quake. - Securing bulk fuel supplies from outside of the region to Oregon takes time (est. 1 – 3 weeks). - Viable telecommunications to coordinate the allocation of fuel to priority users. - Viable transportation modes to deliver bulk fuel supplies from the federal ISB to SSAs, FSAs, and FPODs in the impacted areas. - Limited power or backup power capabilities to dispense fuel.	**Gaps/Requests for Information** *Prior to Event* ➢ ESF Primary State Agencies, county emergency management agencies, and federally-recognized tribes responsible for identifying: ➢ Mission critical functions for each agency and sector/area of responsibility and the fuel needed to perform identified missions. ➢ Priority life line routes to receive fuel. ➢ Pre-designated FPODs to receive fuel. ➢ Strategies to move fuel from the FPODs to critical facilities in the community and to emergency responders in the field. ➢ Identify and confirm pre-designated federal ISBs, SSAs, and FSAs in Oregon. *After an Event* ➢ Assess fuel needs, review fuel requests, and facilitate fuel deliveries to pre-approved priority fuel users to pre-designated FPODs as appropriate. ➢ Implement pre-scripted missions seeking federal and military assistance to deliver fuel. ➢ Implement Odd/Even Fuel Allocation for the public as appropriate.

ODOE AOC Response Positions:

- ODOE Director
- Petroleum Event Manager
- Fuel Allocation Coordinator
- Fuel Supply Assessor
- Federal Agency Liaison
- Petroleum Industry Liaison
- State Agency ESF Liaison
- County Liaison Manager
- County Liaison(s): Regions 1 – 5 *(as needed)*
- Tribal Liaison
- Other Response Positions as Appropriate

Procedures: Procedures for ODOE AOC response positions are included in Appendix J of this plan. Each response position procedure includes key objectives, checklist of tasks, guidance on how to accomplish objectives and tasks, and reference materials as appropriate.

ABOUT THE FUEL ALLOCATION PROGRAM

IMPLEMENTATION CRITERIA

- Governor's Emergency Declaration.
- Emergency and essential service providers unable to obtain fuel at any price.
- Market forces, voluntary fuel conservation, and/or mandatory fuel conservation measures fail to provide for adequate and equitable distribution of fuel.

GOAL

- Interfere minimally with the market.
- Make no attempt to reduce or inhibit the market price of fuels.
- Ensure all fuel delivered through the program will be purchased at the market price, and whenever possible, through the usual supplier.

STRUCTURE

Ensure adequate fuel supplies to save lives, protect public health and safety, and to restore critical lifelines and services. Those who qualify for emergency fuel supplies fall under three categories:

- 18 ESF Primary State Agencies
- 36 county emergency management agencies
- 9 federally-recognized tribes

All emergency fuel requests will be filtered through one of these pre-approved priority fuel users.

ASSUMPTIONS

- ESF Primary State Agencies, county emergency management agencies, and federally-recognized tribes completed identifying mission critical functions and fuel required to complete missions prior to a catastrophic event.
- County priority lifeline routes identified that connect to ODOT's state priority lifeline routes.
- Counties pre-designated FPODs along priority lifeline routes within their communities to receive emergency bulk fuel supplies.
- Bulk fuel supplies requested by ODOE have arrived at the designated federal Incident Support Base awaiting fuel allocation direction from ODOE to pre-designated fueling locations for use by pre-approved priority fuel users.

ODOE's fuel allocation structure is a GUIDELINE. Severe or long-term fuel disruptions and shortages are largely dependent on event conditions, the availability of fuel, and the state's priorities.

FUEL REIMBURSEMENTS

ODOE will not provide funding or administer the disbursement of funds to priority users for fuel allocation. Payment for fuel is the responsibility of the recipients.

Federal Reimbursements – An Oregon State Declared Emergency will trigger financial assistance through FEMA's Public Assistance Cost Share Program under the Stafford Act of 1988. Under the federal cost share program, FEMA is responsible for covering 75 percent while state, county, and tribes are responsible for covering 25 percent of the costs. FEMA Guidance defines eligibility and cost recovery procedures for compliance.

Task 1: Implement and manage Oregon Fuel Allocation Program and Process Fuel Requests.

a. Receive and review Fuel Request Forms from ESF Primary State Agencies, county emergency management agencies, and federally-recognized tribes.

Note: State agencies, counties, and tribes are to use the Fuel Request Form in Appendix A to apply for emergency fuel. Incomplete forms will be returned to the requesting organization.

b. Validate authenticity of each application to ensure fuel requests are submitted by an approved ESF Primary State Agency, county emergency management agency or federally-recognized tribe.

c. Compare requests with established fuel priorities and cross check requests with other applications to eliminate duplicate requests.

Note: The Governor's Disaster Cabinet may establish statewide fuel priorities that could impact which fuel requests from state agencies, counties, and tribes are approved. Refer to Action 4 for more information about establishing statewide fuel priorities.

d. Process Fuel Request Form as appropriate.

- ☐ Approve Emergency Fuel Request.
- ☐ Approve with Conditions – ODOE will work with ESF Primary State Agencies, county emergency management agencies, and federally-recognized tribes to meet identified conditions to complete the fuel requests for approval as appropriate. Upon meeting identified conditions for fuel request approval, ODOE will facilitate fuel orders and deliveries for approved requests.
- ☐ Approve Pending Additional Information – ODOE will work with ESF Primary State Agencies, county emergency management agencies, and federally-recognized tribes to obtain additional information to complete the fuel requests for approval as appropriate. Upon obtaining the additional information for fuel request approval, ODOE will facilitate fuel orders and deliveries for approved requests.

- Deny Emergency Fuel Request *(provide reason)*

  - Request met through mutual aid
  - Duplicate request
  - Request fails to meet mission critical priorities *(can be appealed)*
  - Unavailability of fuel *(request remains active for reconsideration when fuel becomes available)*
  - Unable to get fuel to requested location *(request remains active for reconsideration when a viable fueling location is identified)*

- Appeals Process – ESF Primary State Agencies, county emergency management agencies, and federally-recognized tribes can appeal a fuel request denial by completing the Appeals section of the Fuel Request Form. This involves providing a justification for "how" the fuel request does meet mission critical priorities. The appeal will be submitted to the Governor's Disaster Cabinet for consideration. After re-evaluating the fuel request, the Governor's Disaster Cabinet can:

  - Approve the appeal for requesting emergency fuel
  - Approve the appeal with conditions
  - Approve the appeal pending additional information
  - Deny the appeal for requesting emergency fuel

- ODOE will assist ESF Primary State Agencies, county emergency management agencies, and federally-recognized tribes in completing the Fuel Request Form, appeals process, and monitor fuel requests through to completion.

Task 2: **INITIAL RESPONSE - Process approved Fuel Request Forms and facilitate orders and deliveries to ESF Primary State Agencies, county emergency management agencies and federally-recognized tribes as appropriate.**

a. Review and confirm with approved state agency, county, or tribe on the pre-designated locations to receive emergency bulk fuel supplies from Appendixes B and D. If the pre-designated locations are not viable post-quake, ODOE will work with state, county, and tribes to designate alternate locations to stage, deliver, and receive bulk fuel supplies.

   Note: ODOE maintains a Statewide Fuel Database on all above and understand fuel storage tanks. ODOE's Statewide Fuel Database is a compilation of fuel data from DEQ, OSFM, and ODA that was modified to meet specific fuel allocation program needs and eliminates duplications and streamlines the information from the three existing databases.

b. Coordinate initial movement of fuel by air with other state ESF Primary State Agencies moving other disaster relief commodities into the impacted areas. This includes, but is not limited to:

   - ESF 1: Transportation – ODOT/Aviation
   - ESF 6: Mass Care – DHS
   - ESF 7: Resource Support – DAS
   - ESF 8: Health & Medical – OHA

- ESF 11: Food & Water – DHS
- ESF 13: Military Support – OMD

Note: Coordination is critical during the initial response phase due to the limited number of initial viable locations within the impacted areas that can receive fuel and other disaster relief supplies.

c. Coordinate with federal and state ESF 7: Logistics Management and Resource Support teams to determine viable air transportation modes to deliver bulk fuel supplies to confirmed designated fuel locations. This includes identifying:

- Type of aircraft(s), availability, and capacity
- Responsible military branch(s), federal agency(s) and/or petroleum industry company(s) transporting bulk fuel supplies
- Delivery Type
  - Single Delivery: Specify estimated time of arrival
  - Multiple Deliveries: Specify delivery schedule

Note: The lead Federal ESF 7 agencies include: DHS, FEMA, and the General Services Administration (GSA) to provide a centralized management for the role of the National Logistics Coordinator and management of resource support requirements to support impacted states. Oregon's ESF Primary Agency for ESF 7 is DAS supported by OMD, OEM, and other state agencies.

d. Work with ESF Primary State Agencies, county emergency management agencies, and federally-recognized tribes to document and track all bulk fuel supply orders and deliveries to State Staging Areas, Forward Staging Areas and Fuel Points of Distribution throughout the duration of the emergency. This includes:

- Monitoring delivery schedules, date and time of deliveries, and the type and amount of fuel delivered.
- Identifying the responsible military branch(s), federal agency(s) and/or petroleum industry company(s) delivering the bulk fuel supplies.
- Modifying fuel deliveries as appropriate.

Task 3: SUSTAINED RESPONSE **Process approved Fuel Request Forms and facilitate orders and deliveries to state agencies, counties, and tribes as other transportation modes become available.**

Note: While delivering disaster relief supplies by air initially is essential, restoring overland transportation, rail, and waterway routes is critical to achieve a sustained response.

a. **STATE PRIORITY LIFELINE ROUTES** – Work with ODOT to assess the viability of the state pre-designated priority lifeline routes and estimate timeline for repairs for Oregon (Appendix C).

- Upon ODOTs approval of state's priority lifeline routes for use, coordinate with ODOT and PUC to send out fuel trucks with road, utility, and communications crews to repair and restore:

  - Designated state priority lifeline routes
  - Powerlines and substations along state priority lifeline routes
  - Communications towers and systems along state priority lifeline routes.

- Coordinate with ODOT and PUC to identify and confirm public/private partners to do this work and designate start points (State Staging Areas, ODOT district yards, or other location) for fuel trucks and work crews to congregate prior to deployment.

  Note: Coordinate with federal and state ESF 7: Logistics Management and Resource Support teams as appropriate.

b. **COUNTY PRIORITY LIFELINE ROUTES** – Work with county emergency management agencies to confirm the viability of county pre-designated priority lifeline routes (Appendix D) linking to the state's priority lifeline routes. This includes:

- Estimating the timeline for repairs and operation to support fuel deliveries as well as other disaster relief supplies.

- Coordinate with the counties to request resource support from state and federal ESF 7 logistic and resource support teams to ensure county pre-designated priority lifeline routes are restored to support fuel deliveries and other disaster relief supplies to their FPODs and CPODs.

- Review and confirm pre-designated FPODs to receive emergency bulk fuel supplies from Appendix D. If the pre-designated FPODs are not viable post-quake, work with ODOE to designate alternate FPODs.

  Note: More FPODs may become viable to receive bulk fuel supplies as more county priority lifeline routes are restored.

c. **RAIL** – Work with ODOT's Rail Division to determine the timeline for restoring rail lines and consider the viability of using rail cars to store and deliver fuel closer to the impacted areas to support emergency response activities. If this option is determined viable:

- Coordinate with ODOT, state and federal ESF 7: Logistics Management and Resource Support teams, and well as the rail industry to determine:

  - Number of available railcars
  - Rail yards that might serve as staging areas
  - Security and access control
  - Other logistics as appropriate

Note: The U.S. DHS Study titled "Columbia River Basin Petroleum and Refined-Products Supplies: Disruptions and Mitigations under CSZ Earthquake Scenario" states that rail might

be the fastest way to bring fuel into the affected area. The study notes that this solution is limited to the availability of tanker railcars and viability of the track.

d. **WATERWAY** – Work with DEQ and USCG Sector Columbia River to determine the timeline for restoring waterway routes and consider the viability of using barges trapped upriver from Portland on the Columbia River upriver to store, deliver, and offload fuel to support emergency response activities.

- Coordinate with DEQ, USCG, U.S. Army Corp of Engineers, state and federal ESF 7: Logistics Management and Resource Support teams, as well as the barge companies to determine:

  - Number of available barges and fuel storage capacity
  - Viable marine docks
  - Security and access control
  - Other logistics as appropriate

Note: The U.S. DHS Study estimates it would take about two weeks to assess conditions on the lower Columbia and Willamette Rivers and clear the waterway for shallow-draft vessels.

BARGE COMPANIES ON THE COLUMBIA RIVER		
Tidewater	8 Barges	264,000 Barrels (Combined Capacity)
Olympic Tug & Barge Element of Harley Marine	1 Barge *(Portland)*	14,000 Barrel Capacity
1 Barrel = 42 gallons		

e. Work with ESF Primary State Agencies, county emergency management agencies, and federally-recognized tribes to document and track all bulk fuel supply orders and deliveries to SSAs, FSAs, and FPODs throughout the duration of the emergency. This includes:

- Monitoring delivery schedules, date and time of deliveries, and the type and amount of fuel delivered.
- Identifying the responsible military branch(s), federal agency(s) and/or petroleum industry company(s) delivering the bulk fuel supplies.
- Modifying fuel deliveries as appropriate.

Task 4: Coordinate and assess the need for requesting maritime assets to support fuel deliveries and other disaster relief supplies to the Oregon coast to support emergency response activities. This includes:

a. Working with lead state agencies, coastal counties, and federally-recognized tribes along the coast to identify resource needs to support emergency response activities along the Oregon Coast. This includes, but is not limited to:

- Providing shelter and housing
- Delivering bulk fuel supplies and establishing temporary fueling locations

- Providing emergency power
- Delivering food, water, medicine, and medical supplies
- Transporting personnel, vehicles, equipment, and other disaster relief assistance

b. Coordinate with federal and state ESF 7: Logistics Management and Resource Support teams to request maritime assistance to the communities along the Oregon Coast based on identified need. This includes:

- Completing the appropriate federal resource request forms to request maritime assets.
- Identifying destinations (locations) and estimated time of arrival of maritime assets approved to respond to the Oregon Coast.
- Identifying the Maritime Administration's expectations of state and county responsibilities in anticipation and preparation of the arrival of maritime assets.

c. Work with ESF Primary State Agencies, county emergency management agencies, and federally-recognized tribes to document and track all maritime requests, orders and deliveries to approved destinations along the Oregon Coast throughout the duration of the emergency. This includes:

- Monitoring date and time of arrivals and deliveries and the type of assistance provided.
- Identifying the number and type of maritime assets that responded.

Task 6: Identify and implement pre-scripted missions as appropriate from Appendix E for requesting federal and military support to accomplish Action 8 fuel allocation objectives and tasks.

Task 7: Implement fuel allocation for Oregon citizens.

a. Implement the Odd/Even Fuel Allocation Program for the public to alleviate potentially long lines at retail service stations. This measure is designed to:

- Help space purchases of gasoline and aid in its equitable distribution.
- Provide a psychological benefit by reducing uncertainty regarding fuel availability.
- Encourage the conservation of fuel by causing trips to be better planned.
- Minimize waiting lines (may also reduce consumption by saving fuel that is used while idling).

Under this plan, gasoline may be purchased or sold only in accordance with the following procedures.

ODD/EVEN FUEL ALLOCATION MEASURE *Compliance rests with service station personnel*		
ODD Days of the Month	**EVEN Days of the Month**	**SUNDAYS, HOLIDAYS, & 31ST of Any Month**
Vehicles with license plates: • Ending w/odd numbers	Vehicles with license plates: • Ending w/even numbers	**Everyone** can purchase fuel on

• Ending w/letters A-M	• Ending w/letters N-Z	Sundays, legal holidays, or the 31st of any month.
***EXEMPTIONS*:** The following vehicles are exempted from the odd/even gasoline purchase plan, but will wait their turn in line at any gasoline station: Common carriers, including taxis, rental vehicles, commercially licensed vehicles, or private vehicles used for designated commercial purposes.		

b. Implement Fuel Limit Purchase Requirement for the public in conjunction with the Odd/Even Fuel Allocation Measure, depending on the severity of the fuel shortage situation. Under this plan, gasoline may be purchased or sold only in accordance with the following procedures.

FUEL LIMIT PERCHASE REQUIREMENT *Compliance rests with service station personnel*	
MIMIMUM **Fuel Purchase Requirement**	**MAXIMUM** **Fuel Purchase Requirement**
Minimize gasoline lines by discouraging the making of frequent but small gasoline purchases by consumers. This measure also discourages tank topping.	Ensures some gasoline will be available to motorists located or traveling through the state. Limiting the amount of gasoline purchased by motorists in one visit will help prevent supplies from running out prematurely at a particular retailer.
***NOTE*:** ODOE will set the minimum and maximum purchase quantity as appropriate. Retailers may lower the set amount at their discretion due to market forces.	

c. Implement the Limited Hours of Operation measure if the fuel shortage situation continues to worsen. Under this plan, gasoline may be purchased or sold only in accordance with the following procedures.

LIMITED HOURS OF OPERATION *Compliance rests with service station personnel*		
PERCENTAGE **of Hours Rule**	**DESIGNATED** **Days Rule**	**SUNDAY CLOSINGS ,** **W/PERCENTAGE Rule**
Order retail gasoline and diesel outlets to reduce hours of weekly operation by a fixed percentage of normal operating hours	Order retail gasoline and diesel outlets to close for business on specified days of the week. Pre-designated emergency fueling locations for priority users are exempt.	Order retail gasoline and diesel outlets to not operate on Sundays of any week and to reduce hours of normal operation on other weekdays.
***NOTE*:** If any of the three rules are ordered, stations will post the hours of operation visibly upon the premises for all motorists to see.		

d. Implement additional fuel allocation measures as appropriate.

Task 8: Provide Action 8 status reports in JFO Command and General Staff Briefings, OR ECC briefings, Situation Reports, news releases, news conferences, and other forums as appropriate. This includes:

- Availability of fuel in-state to support initial life-saving functions.

- Availability of bulk fuel supplies from outside of the region to be brought into Oregon to support the state's emergency response and recovery activities.

- Status of fuel allocations, processing of requests, facilitating and delivering of bulk fuel supplies to approved state, county, and tribal emergency responders.

- Viability of transportation routes to support fuel deliveries including air, overland, rail and waterway routes.

- Odd/Even Fuel Allocation Program for the public.

ACTION 9

Recovery

14-30 DAYS TO INITIATE - ESTIMATED COMPLETION 180+ DAYS	
ODOE Mission Analysis	
Objectives/Tasks • Assess need and allocate fuel to support state, county, and tribal recovery activities. • Serve on Coordinating Team - State Recovery Function (SRF) 6: Infrastructure Systems. • Participate on the Governor's Recovery Cabinet. • Terminate Oregon Fuel Action Plan as state, county, and tribal emergency responders are able to purchase fuel at normal fueling outlets. • Ensure ongoing Oregon Fuel Action Plan readiness.	**Facts/Assumptions** • Critical lifelines and services largely restored to the region as repairs are made to the state's: ➢ Communications systems. ➢ Transportation infrastructure. ➢ Power infrastructure. ➢ Petroleum Infrastructure. • State, county, and tribal emergency responders are mostly able to purchase fuel from "normal" fueling outlets.
Constraints/Limitations • Transition from Response Phase to the Recovery Phase presents new decision-making structure, which can create confusion. This includes: ➢ Going from 18 ESFs to 7 State Recovery Functions (SRF). ➢ Designated "Coordinating Agency" to lead SRFs. ➢ Coordinating Agency may not have actual authority/expertise over SRF and must rely on the 18 ESF Primary State Agencies for decision-making and implementation of SRF activities. ➢ Creates additional layer requiring coordination.	**Gaps/Requests for Information** *Prior to Event* ➢ Primary State RSF Agencies, county emergency management agencies, and federally-recognized tribes identify critical recovery functions and fuel needs for these activities. *After an Event* ➢ Assess timeline and industry's capability to restore the region's petroleum supply and distribution system back to pre-emergency conditions or to a "new normal." ➢ Coordinate with Primary State RSF Agencies, counties, and tribes to verify fuel needs to support recovery activities. ➢ Continue fuel allocations to support recovery activities as appropriate.
ODOE AOC Response Positions: ➢ Petroleum Event Manager ➢ Fuel Allocation Coordinator ➢ Fuel Supply Assessor ➢ Petroleum Industry Liaison ➢ Federal Agency Liaison ➢ State Agency Liaison ➢ County Liaison Manager ➢ Tribal Liaison ➢ PIO ➢ Other Response Positions as Appropriate	

Procedures: Procedures for ODOE AOC response positions are included in Appendix J of this plan. Each response position procedure includes key objectives, checklist of tasks, guidance on how to accomplish objectives and tasks, and reference materials as appropriate.
***Note*:** Recovering the state's fuel supply and distribution system to pre-emergency conditions or to the approved new normal infrastructure for the region will take months to years. Upon deactivation of the ODOE AOC, State ECC, and/or JFO, ODOE's Energy Emergency Preparedness Manager will lead ongoing fuel recovery activities for the agency as appropriate.

Task 1: Assess need and allocate fuel to support local, tribal and State Recovery Functions (SFRs).

a. Work with the Coordinating Agency(s) to assess fuel needs to support seven State Recovery Functions. This includes:

SRF 1: Community Planning and Capacity Building	
Coordinating Agency	Oregon Department of Land Conservation and Development (DLCD)
Primary Agencies	DLCD and OEM
Federal Coordinating Agency	FEMA
Related ESFs	ESF 5 – Information and Planning ESF 7 – Resource Support ESF 14 – Public Information ESF 15 – Volunteers and Donations

SRF 2: Economic Recovery	
Coordinating Agency	Business Oregon
Primary Agencies	Business Oregon Oregon Department of Consumer and Business Services (DCBS)
Federal Coordinating Agency	Department of Commerce
Related ESFs	ESF 18 – Business and Industry

SRF 3: Health Services	
Coordinating Agency	OHA
Primary Agencies	OHA
Federal Coordinating Agency	Department of Health and Human Services
Related ESFs	ESF 8 – Health and Medical ESF 17 – Agriculture and Animal Protection

SRF 4: Social Services	
Coordinating Agency	DHS
Primary Agencies	DHS
Federal Coordinating Agency	Department of Health and Human Services
Related ESFs	ESF 6 – Mass Care ESF 11 – Food and Water

SRF 5: Disaster Housing	
Coordinating Agency	Oregon Housing and Community Services (OHCS)

Primary Agencies	OHCS
Federal Coordinating Agency	Department of Housing and Urban Development
Related ESFs	ESF 6 – Mass Care

SRF 6: Infrastructure Systems	
Coordinating Team	DAS, ODOE, ODOT, & OPUC
Primary Agencies	DAS, ODOE, ODOT, & OPUC
Federal Coordinating Agency	U.S. Army Corps of Engineers
Related ESFs	ESF 1 – Transportation ESF 2 – Communications ESF 3 – Public Works ESF 12 – Energy

SRF 7: Natural and Cultural Resources	
Coordinating Agency	DEQ
Primary Agencies	Oregon Department of Fish and Wildlife ODA ODF Oregon Parks and Recreation Department Oregon Water Resources Department
Federal Coordinating Agency	Department of the Interior
Related ESFs	ESF 3 – Public Works ESF 10 – Hazardous Materials ESF 12 – Energy ESF 17 – Agriculture and Animal Protection

b. Work with the OEM Local Disaster Recovery Manager, SRF agencies, county emergency management agencies, and federally-recognized tribes to assess fuel needs to support state, county, and tribal recovery activities.

Note: Assessing fuel needs of state, county, and tribal emergency responders is ongoing and will overlap and continue from the emergency response phase into the recovery phase.

c. Facilitate the allocation of fuel to support SRFs, county, and tribal recovery activities as needed.

Note: Allocating fuel to state, county, and tribal emergency responders is ongoing and will overlap and continue from the emergency response phase into the recovery phase.

Task 2: Serve on the Coordinating Team for SRF 6: Infrastructure Systems.

a. Coordinate with SRF Coordinating Agencies to prioritize fuel requests and allocations to support state, county, and tribal recovery activities as appropriate

.

b. Advise SRF Coordinating Agencies on alternate fuel supplies, delivery systems, and refueling locations in support of recovery efforts as appropriate.

c. Provide status updates to the SRF Coordinating Agencies on the petroleum industry's recovery efforts to ensure timely restoration of fuel supply levels, infrastructure, and delivery systems back to pre-emergency conditions.

d. Provide status updates to the SRF Coordinating Agencies on voluntary and mandatory fuel conservation measures and other strategies implemented by ODOE to reduce fuel consumption during the Recovery Phase.

Task 3: Participate on the Governor's Recovery Cabinet as needed.

a. Identify priorities and provide technical expertise on the region's petroleum supply and distribution system recovery activities.

***Note*:** ODOE Director or authorized designee is a member of the Governor's Recovery Cabinet

Task 4: Provide Action 9 status reports in Governor's Recovery Cabinet briefings, OR ECC briefings, Situation Reports, news releases, news conferences, and other forums as appropriate. This includes, but is not limited to:

- ODOE fuel priorities, actions, and decisions during the Recovery Phase.
- Petroleum industry recovery priorities and activities, status of repairs, and proposed infrastructure changes and modifications.
- SRF, county, and tribal fuel needs, priority delivery routes, FPODs for recovery activities.
- Temporary waivers, fuel conservation measures and other institutional controls implemented for the Recovery Phase.

Task 5: Terminate fuel recovery activities as appropriate.

a. Terminate Fuel Allocation Program when state, county, and tribal emergency responders are able to obtain fuel at retail service stations and other refueling outlets. This includes terminating:

- Fuel Set-Aside Volume if implemented.
- Fuel deliveries to the federal ISB, SSAs, FSAs, FPODs, and other temporary emergency fueling locations.
- Odd/Even Fuel Allocation for Oregonians as appropriate.

b. Work with lead federal and state agencies to terminate temporary waivers lifted in response to the emergency and reinstate all federal and state requirements as appropriate.

Note: Refer to Action 7 and Appendix G for details.

c. Terminate voluntary fuel conservation measures for the public and mandatory fuel conservation measures for all levels of government and political subdivisions.

Note: Refer to Actions 6 for details.

d. Terminate the Public Information Campaign providing tips to motorists on conserving fuel.

Note: Refer to Action 2 for details.

e. Work with ODOJ to terminate the Gas Price Reporter Website and a 1-800 number for Oregonians to report evidence suggesting unlawful conduct in gasoline pricing.

Note: Refer to Action 6 for details.

f. Deactivate ODOE AOC.

Task 6: Ensure Oregon Fuel Action Plan Program Readiness.

a. Plan Review and Update **–** Review and update the Oregon Fuel Action Plan following each activation, drill/exercise, or at least annually to include lessons learned and improvements identified from responding to actual events, drills, and exercises.

b. Training – Coordinate, implement, and participate in regional, statewide, and local drills and exercises involving ESF 12: Energy specific to the petroleum sector.

c. Maintain Regional/National/International Fuel Outlook – Serve as the Oregon State Liaison to the Western States, USDOE, and the National Association of State Energy Officials on the petroleum sector. This includes participating on:

- Quarterly conference calls to address energy issues of concern and interest
- Annual energy sector meetings, conferences, workshops, or seminars
- Online training and presentations on the energy sector
- Western States Regional Energy Exercise
- Other activities as appropriate

d. Public Information and Outreach – Conduct public information program for Oregonians to increase awareness of and confidence in the Oregon Fuel Action Plan.

APPENDIX A
Fuel Request Form



Appendix A includes a Fuel Request Form for Oregon's emergency and essential services providers. This includes the 18 ESF Primary State Agencies, 36 county emergency management agencies, and the 9 federally-recognized tribes. All fuel requests will be filtered through one of these pre-approved priority fuel users.

To prepare state, county, and tribal emergency response organizations to request emergency bulk fuel supplies and to complete Fuel Request Forms when needed, ODOE worked with the states' priority fuel users to complete the necessary work prior to an emergency event. This includes:

- Mission Critical Functions - Identifying mission critical functions requiring fuel for each of the state's 18 ESF sectors, 36 counties, and 9 federally-recognized tribes.

- ODOE Fuel Database – Even with the activation and support of a National Fuel Task Force to secure and deliver bulk fuel supplies to Oregon, time is needed to bring fuel from outside of the region to support Oregon's response and recovery activities. State, county, and tribal organizations should know the location and amount of fuel available within their jurisdictions to support initial life-saving functions and begin restoring critical lifeline services. Without roads to deliver supply, the fuel within each

jurisdiction will be used to support the initial response until an alternate supply can be brought in from outside of the region to sustain response activities.

ODOE developed a Fuel Database to support fuel delivery strategies in Oregon following a CSZ event. The ODOE Fuel Database provides information about in-state fuel stockpiles to be used by emergency and essential service providers at the state, county, and tribal levels to conduct initial life safety missions until ODOE can bring in bulk fuel supplies to the state from outside of the region. The ODOE Fuel Database was provided to the state's 36 county emergency management agencies. ODOE will update this database every few years or as resources allow.

Note: ODOE collected fuel data from DEQ, OSFM and ODA to develop the ODOE Fuel Database. These three agencies collect data from the state's suppliers annually for the different requirements and laws governing their organization's authorities and responsibilities. DEQ's data is specific to the underground fuel storage tanks, OSFM's data is specific to aboveground fuel storage tanks. ODA's data was a combination of both aboveground and underground fuel storage tanks in Oregon and was used to cross reference DEQ and OSFM's data. ODOE eliminated all duplicate and nonessential data to support fuel allocation strategies and added additional information to support fuel delivery strategies.

- County Data Request - To ensure timely delivery of bulk fuel supplies to the impacted areas after a catastrophic earthquake and tsunami, ODOE requested the following data from county emergency management agencies.

  - 24/7 Primary and Backup Communications Contact Information and Capabilities

  - Preliminary County Lifeline Routes – Pre-designate priority lifeline routes within the county to be restored to support fuel deliveries into the local communities. County priority lifeline routes should connect to ODOT's priority lifeline routes for the state.

  - Preliminary Fuel Points of Distribution – Pre-designate Fuel Points of Distribution (FPOD) along county designated priority lifeline routes to receive the emergency fuel supply within each ESF sector, county, and tribal reservation.

    Note: Federal, state, and local emergency responders may share the same FPODs. Make sure a method is in place to: 1) identify specific agencies, 2) document fuel use, and 3) record payment for reimbursement purposes.

- County Authority - Identify county authority to commandeer fuel from county stockpiles to perform life safety functions following a catastrophic earthquake and tsunami.

  Note: Authority varies by county. ODOE will work with ODOJ to clarify county authority. Some counties in a state declared emergency, already have the authority to acquire the necessary resource to conduct emergency response activities. For example:

  Marion County Code 2.35.070 Acquisition of Resources - The board of county commissioners is authorized to extend government authority to nongovernmental resources (i.e., personnel, equipment) which may support regular government forces during an emergency and may enter into agreements

with other public and private agencies for use of resources. When real or personal property is taken under power granted by this section, the owner of the property shall be entitled to reasonable compensation. Marion County Code is available at the following link: http://www.codepublishing.com/OR/MarionCounty/html/MarionCounty02/MarionCounty0235.html

Long-Term Fuel Planning Goals

ODOE is responsible for getting bulk fuel supplies to the counties. It's the responsibility of the county in coordination with their respective cities' to develop a plan or method to deliver the fuel to community's critical facilities and emergency responders in the field.

- County Fuel Distribution Plans – ODOE will work with county emergency management agencies as appropriate to develop a county fuel distribution plan identifying strategies for delivering fuel to the community's critical facilities and emergency responders in the field.

- Federally-Recognized Tribes Fuel Distribution Plans – ODOE will work with the tribes as appropriate to develop a fuel distribution plans identifying strategies for delivering fuel to the tribe's critical facilities and emergency responders on tribal land to save lives and restore critical lifelines and services.

  Note: If a tribe decides not to receive fuel directly on tribal lands, the tribe can work with its host county to ensure the county fuel distribution plan identifies strategies for delivering fuel to tribal responders and critical facilities on tribal lands. The federally-recognized tribes can also go directly to FEMA to request emergency fuel supplies and to coordinate fuel deliveries onto tribal lands.

Fuel Request Form

All sections must be completed to ensure timely processing of fuel requests

OREGON DEPARTMENT OF ENERGY

1. DATE/TIME: _____/_____**AM/PM** ☐ Initial ☐ Update	**2. IDENTIFY PRIORITY USER**: *Check appropriate box* ☐ ESF Primary State Agency ☐ County Emergency Management Agency ☐ Federally-Recognized Tribal Government
3. NAME OF ESF PRIMARY STATE AGENCY *(include ESF #)*, **COUNTY, OR TRIBE**:	
4. REQUESTER NAME/TITLE:	**5. REQUESTER CONTACT INFORMATION:** Email: Work: Mobile: Satellite: Other:
6. REASON FOR FUEL REQUEST:	
7. FUEL TYPE AND QUANTITY ☐ Unleaded Gasoline _____gallons ☐ Diesel _____gallons ☐ Jet Fuel _____gallons ☐ Aviation Gas _____gallons ☐ Propane _____gallons ☐ Other: _____ _____gallons	**8. FUEL DELIVERY SCHEDULE:** ☐ One Time Delivery (*Specify when needed*): Date:_____ Time:_____ am/pm ☐ Recurring Deliveries Start Date:_____ Time:_____ am/pm Specify preferred schedule *(daily, every other day, etc)*:

***NOTE**: Ability to meet fuel requests is determined by event conditions, availability of fuel, access to impacted areas, and state/regional response priorities.*

9. FUEL POINTS OF DISTRIBUTION (FPOD)

FPOD 1	
Name/Type of FPOD *(airport, public works, motor pool, other)* **Address:**	**FPOD Contact Information (24/7)**: Name/Title: Mobile: Work: Email:

FPOD Fuel Type/Storage Capacity *(Minimum 5,000 gal)*		**FPOD Backup Power**
☐ Unleaded Gasoline	_____gallons	☐ Generator onsite
☐ Diesel	_____gallons	☐ Connection installed onsite to hook-up to generator
☐ Jet Fuel	_____gallons	☐ None: If none, manual pump onsite? Y / N
☐ Aviation Gas	_____gallons	**FPOD Restricted Access**
☐ Propane	_____gallons	☐ Perimeter fencing
☐ Other: _____	_____gallons	☐ Security staff: 24/7? Y / N If no, list hours _____
		☐ Other: _____

FPOD Accommodations to Receive Fuel Deliveries

☐ Fixed Wing
☐ Rotary Wing
☐ Road: If yes, is FPOD located on county designated priority lifeline route? Y / N
☐ Rail
☐ Waterway

Additional Comments:

FPOD 2

Name/Type of FPOD *(airport, public works, motor pool, other)*	**FPOD Contact Information (24/7):**
Address:	Name/Title: Mobile: Work: Email:

FPOD Fuel Type/Storage Capacity *(Minimum 5,000 gal)*		**FPOD Backup Power**
☐ Unleaded Gasoline	_____gallons	☐ Generator onsite
☐ Diesel	_____gallons	☐ Connection installed onsite to hook-up to generator
☐ Jet Fuel	_____gallons	☐ None: If none, manual pump onsite? Y / N
☐ Aviation Gas	_____gallons	**FPOD Restricted Access**
☐ Propane	_____gallons	☐ Perimeter fencing
☐ Other: _____	_____gallons	☐ Security staff: 24/7? Y / N If no, list hours _____
		☐ Other: _____

FPOD Accommodations to Receive Fuel Deliveries

☐ Fixed Wing
☐ Rotary Wing
☐ Road: If yes, is FPOD located on county designated priority lifeline route? Y / N
☐ Rail
☐ Waterway

Additional Comments:

For additional FPODs, duplicate and complete page 3 of the Fuel Request Form as needed

FPOD ____

Name/Type of FPOD *(airport, public works, motor pool, other)*	**FPOD Contact Information (24/7):**
Address:	Name/Title: Mobile: Work: Email:

FPOD Fuel Type/Storage Capacity *(Minimum 5,000 gal)*

- ☐ Unleaded Gasoline _____gallons
- ☐ Diesel _____gallons
- ☐ Jet Fuel _____gallons
- ☐ Aviation Gas _____gallons
- ☐ Propane _____gallons
- ☐ Other: _____ _____gallons

FPOD Backup Power

- ☐ Generator onsite
- ☐ Connection installed onsite to hook-up to generator
- ☐ None: If none, manual pump onsite? Y / N

FPOD Restricted Access

- ☐ Perimeter fencing
- ☐ Security staff: 24/7? Y / N If no, list hours _____
- ☐ Other: _____

FPOD Accommodations to Receive Fuel Deliveries

- ☐ Fixed Wing
- ☐ Rotary Wing
- ☐ Road: If yes, is FPOD located on county designated priority lifeline route? Y / N
- ☐ Rail
- ☐ Waterway

Additional Comments:

APPENDIX B

Federal Incident Support Bases and State Staging Areas






Appendix B identifies proposed federal Incident Support Bases (ISBs) in response to a catastrophic even in Oregon. Federal ISBs are temporary locations outside of the impacted area for receiving and staging resources (supplies, equipment, and teams) that may be provided to state and local governments during incidents involving large numbers of commodities or response teams.

Proposed Forward Staging Areas (FSA) are also identified. FSAs are "mini" ISBs where commodities and resources would essentially flow from the federal ISBs outside of the impacted area to FSAs within or closer to the impacted areas.

The state of Oregon has also identified proposed State Staging Areas (SSAs) to support the state's response and recovery activities in the aftermath of a catastrophic event. SSAs are locations established where resources can be placed while awaiting a tactical assignment.

Bulk fuel supplies requested by ODOE will be delivered to federal staging areas prior to deployment to state designated locations to support ODOE's fuel allocation program into the impacted areas.

All federal and state staging areas will need to be vetted and validated prior to finalization.

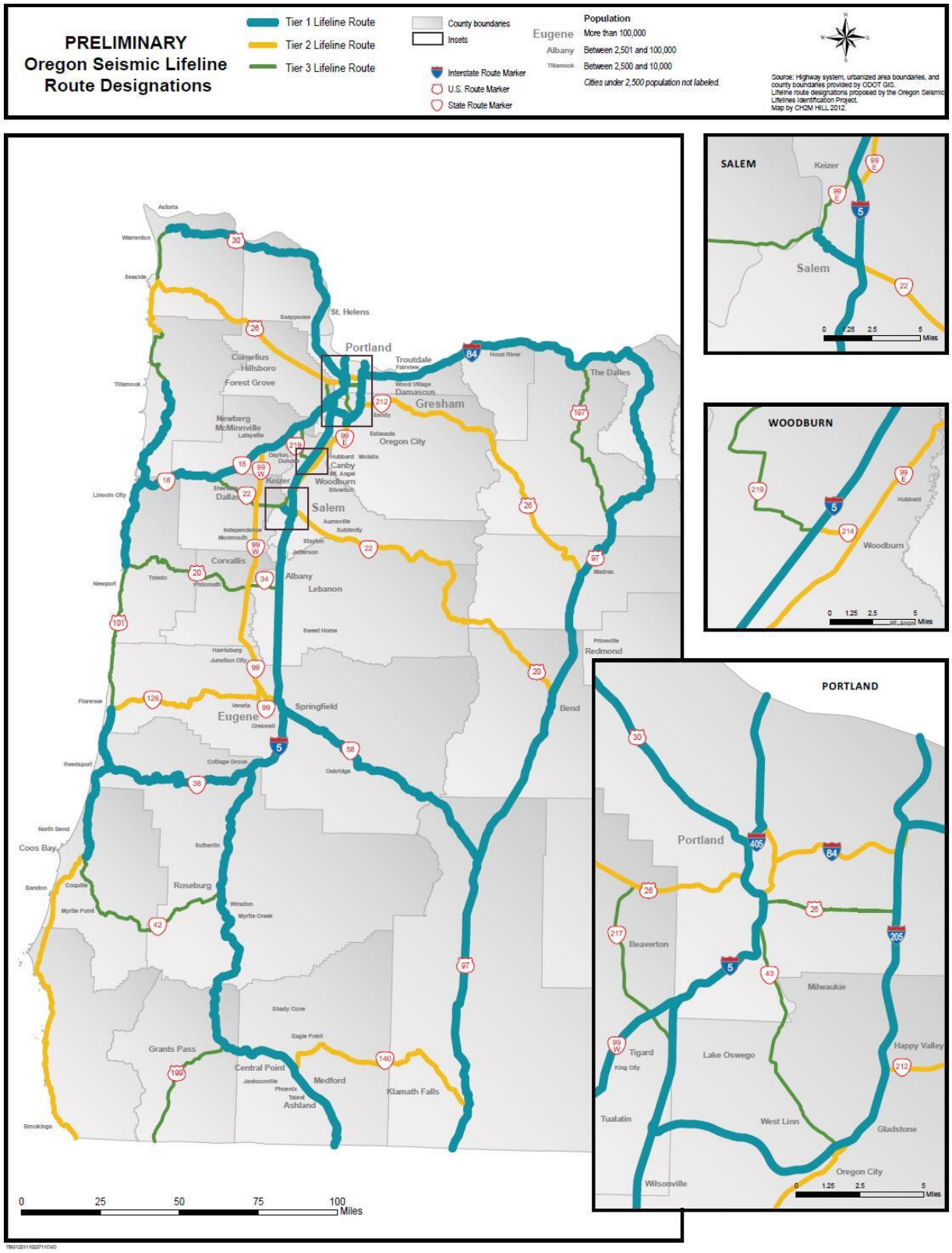
Incident Support Bases (ISB), Forward Staging Areas (FSA) and State Staging Areas (SSA)
This product is for informational purposes, and may not be suitable for legal, engineering or surveying purposes. This information or data is provided with the understanding that conclusions drawn from such information are the responsibility of the user.
DPS 3/06/17
DRAFT
TO BE VETTED AND VALIDATED BEFORE FINALIZING
Incident Support Bases
Forward Staging Areas
State Staging Areas
Oregon County Boundaries
Boise Air Terminal/Gowen Field
Pendleton Airport
Portland International Airport
Hillsboro Airport
McNary Field
Redmond Airport
Corvallis Airport
Mahlon Sweet Field (Eugene Airport)
Newport Airport
Astoria Airport
Southwest Oregon Regional Airport (Coos Bay)
Bandon Airport
Rogue Valley International Airport
Klamath Falls Airport

APPENDIX C
State Lifeline Routes



Appendix C includes the Oregon Department of Transportation's (ODOT) priority lifeline routes, which identifies the most critical highways to be restored following a major earthquake to support emergency response and recovery activities in the state. A functioning statewide transportation network is critical to ODOE's ability to deliver fuel to the state's emergency and essential services providers.

Lifeline Routes


PRELIMINARY
Oregon Seismic Lifeline
Route Designations
Tier 1 Lifeline Route
Tier 2 Lifeline Route
Tier 3 Lifeline Route
County boundaries
Insets
Interstate Route Marker
U.S. Route Marker
State Route Marker
Eugene
Albany
Tillamook
Population
More than 100,000
Between 2,501 and 100,000
Between 2,500 and 10,000
Cities under 2,500 population not labeled.
Source: Highway system, urbanized area boundaries, and county boundaries provided by ODOT GIS.
Lifeline route designations proposed by the Oregon Seismic Lifelines Identification Project.
Map by CH2M HILL 2012.
Portland
Salem
Eugene
Springfield
Bend
Medford
Ashland
Grants Pass
Roseburg
Coos Bay
Klamath Falls
Albany
Corvallis
Lebanon
Woodburn
Gresham
Beaverton
Tigard
Lake Oswego
Milwaukie
Happy Valley
Tualatin
West Linn
Gladstone
Oregon City
Wilsonville
Hillsboro
Forest Grove
Newberg
McMinnville
Canby
Dallas
Keizer
Redmond
Prineville
The Dalles
Hood River
Troutdale
Central Point
Ashland
Coquille
Reedsport
Florence
Newport
Lincoln City
Tillamook
Seaside
Astoria
Warrenton
St. Helens
Scappoose
Sandy
Estacada
Molalla
Silverton
Stayton
Sublimity
Aumsville
Sweet Home
Harrisburg
Junction City
Monmouth
Independence
Philomath
Toledo
Veneta
Creswell
Cottage Grove
Oakridge
Sutherlin
Winston
Myrtle Creek
Myrtle Point
Bandon
North Bend
Brookings
Shady Cove
Eagle Point
Jacksonville
Phoenix
Talent
Madras
Culver
Metolius
Black Butte Ranch
Sisters
Camp Sherman
Redmond Municipal Airport
Crooked River Ranch
Terrebonne
Tumalo
Powell Butte
Alfalfa
Bend Municipal Airport
Deschutes River Woods
Sunriver
La Pine
Crescent
Crescent Lake
Gilchrist
Chemult
Diamond Lake
Idleyld Park
Glide
Elkton
Drain
Yoncalla
Scottsburg
Reedsport
Gardiner
Winchester Bay
Lakeside
Coos Bay
North Bend
Bandon
Coquille
Myrtle Point
Powers
Agness
Gold Beach
Brookings
Port Orford
Langlois
Sixes
Cape Blanco
Cape Blanco State Park
Pistol River
Gold Beach Municipal Airport
Illahe
Agness
Rogue River
Shady Cove
Eagle Point
Jacksonville
Phoenix
Talent
Ashland
Central Point
Medford
Grants Pass
Rogue River
Gold Hill
Merlin
Galice
Wolf Creek
Glendale
Azalea
Canyonville
Riddle
Tri City
Myrtle Creek
Winston
Roseburg
Sutherlin
Oakland
Drain
Elkton

APPENDIX D

County Lifeline Routes and FPODs



Appendix D provides information on the priority lifeline routes and pre-designated Fuel Points of Distribution (FPODs) for each of Oregon's 36 counties. County designated priority lifeline routes should connect with state priority lifeline routes to support deliveries of fuel and other disaster relief commodities like food, water, and medical supplies.

WORK IN PROGRESS

ODOE is working with all counties to designate priority lifeline routes and FPODs to support fuel deliveries to the communities prior to an emergency as county resources allow. As the counties complete this work, ODOE will include the information in future revisions of the Oregon Fuel Action Plan.

Appendix D provides Marion County as an example.

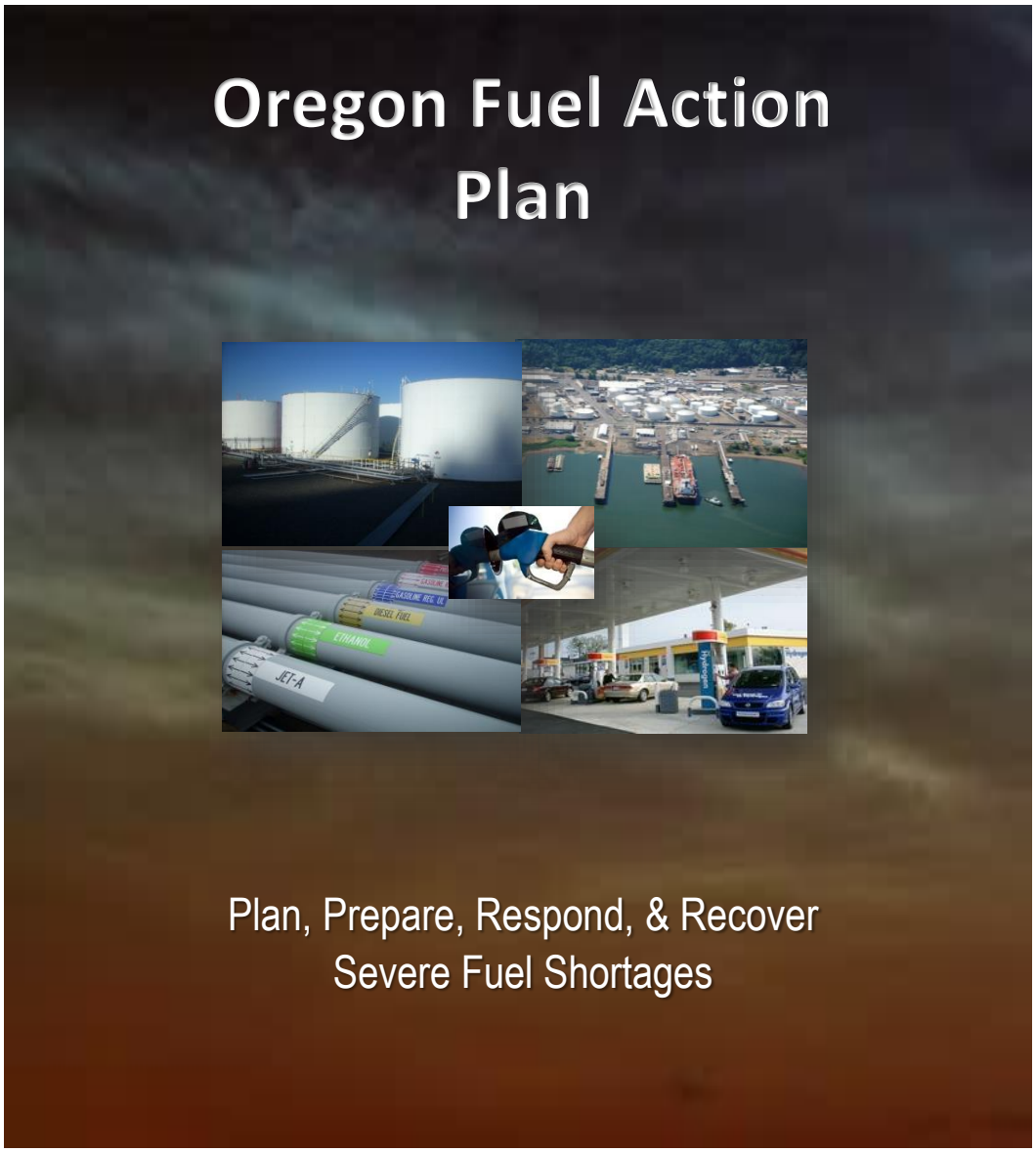
APPENDIX E
ESF 12 Fuel Pre-Drafted Mission Assignments



APPENDIX E – WORK IN PROGRESS

ODOE is developing Pre-Drafted Mission Assignments for ESF 12 specific to the fuel sector. The Pre-Drafted Mission Assignments will identify and describe the type and level of support the agency will require from federal and military agencies to accomplish the missions and objectives identified in the Oregon Fuel Action Plan.

APPENDIX F
Fuel Executive Order



OREGON DEPARTMENT OF ENERGY

Appendix F is the Fuel Executive Order to be signed by the Governor authorizing ODOE to implement the strategies in the Oregon Fuel Action Plan when a severe and/or long term fuel shortage or disruption exists. The purpose is to maintain emergency services, productivity and work to ensure the health, safety, and welfare of the residents of the State of Oregon while the emergency exists.

EXECUTIVE ORDER NO. ## - ##

PROCLAMATION OF A STATE OF EMERGENCY DUE TO CASCADIA SUBDUCTION ZONE EARTHQUAKE AND RESULTING THREAT TO FUEL RESOURCES IN THE STATE OF OREGON

Pursuant to ORS 401.165(1), I find that a state of emergency now exists in Oregon after the recent earthquake along the Cascadia Subduction Zone. Because this earthquake constitutes a "natural event or circumstance" that now "threatens widespread loss of life, injury to person or property, human suffering or financial loss," the present circumstances qualify as an emergency as defined under ORS chapter 401. Under this chapter, my authority as Governor is to "reduce the vulnerability of the State…resulting from emergencies" like that which we are now facing here in Oregon. ORS 401.032.

Furthermore, the recent earthquake's destruction specifically constitutes an "energy emergency" that has presented a serious threat to our fuel resources that are critical to support Oregon's "essential services and transportation." ORS 176.809(2). [Because of the significant damage caused by the earthquake at _____.] Therefore, because the supply and distribution of Oregon's fuel resources are specifically threatened, the "health, safety and welfare of the people of Oregon" is now at risk with regard to the state's fuel resources. ORS 176.785.

As Governor, pursuant to ORS 401.168, I have "complete authority over all executive agencies of state government and the right to exercise…all police powers vested in the state by the Oregon Constitution," and my authority includes suspending provisions of "any order or rule of any state agency" if I determine that compliance with the rule would impact the "mitigation of the effects of the emergency." Thus, I now exercise my power during the present emergency to delegate authority to the Oregon Department of Energy (ODOE) to address the present threat to the fuel supply in the State of Oregon. ORS 401.035, 176.785. I trust that the ODOE will be able to help maintain emergency services, productivity, and work to ensure the health, safety, and welfare of the residents of the State of Oregon while the emergency exists.

IT IS HEREBY DIRECTED AND ORDERED:

1. The ODOE shall coordinate and implement the Oregon Fuel Action Plan in response to the emergency that now impacts the State of Oregon in order to address the current issues surrounding the supply and distribution of fuel resources. ORS 401.168, 401.236.

2. The ODOE is authorized to allocate and control all fuel stockpiles throughout the State of Oregon consistent with the Oregon Fuel Action Plan. ORS 401.168, 401.188.

3. The determination of an emergency is statewide and will continue until I proclaim that the state of emergency no longer exists, or when the threat of an emergency has passed. ORS 401.204(1).

Done at _____, Oregon, this ____ day of _____, _____.

_____
Kate Brown
GOVENOR

ATTEST:

_____
Jeanne Atkins
SECRETARY OF STATE

APPENDIX G

Fuel Waivers



ODOE has identified waivers that may be lifted temporarily during state declared emergencies to ensure adequate fuel supplies are delivered without delays to support the state's emergency response and recovery activities. Appendix G lists the potential fuel waivers and provides a description of both the federal and state regulations that would need to be waived to ensure timely fuel deliveries and the deliveries of other disaster relief supplies into the impacted areas of the state.

ODOE will work with lead federal and state agencies as appropriate to develop boilerplate waivers to be included in Appendix G of the Oregon Fuel Action Plan to ensure the timely execution of fuel waivers if and when needed to save lives, protect public health and safety, and to restore critical lifelines and services in Oregon.

FUEL WAIVERS

The oil industry operates under various regulations to ensure safe operations, environmental quality, and fair market competition. These same regulations could also impede the rapid restoration of the petroleum supply and distribution system in the aftermath of an emergency resulting in a long-term or severe fuel shortage.

As the lead agency over ESF 12 responsible for the petroleum sector, ODOE will work with the appropriate federal and state agencies to temporarily waive safety, environmental, and fair market regulations as appropriate. The goal is to ensure the rapid recovery of the petroleum infrastructure in the Pacific Northwest region and provide adequate fuel supplies to the state's emergency and essential services providers to save lives and restore the state's critical lifeline services to citizens.

The following is a list of potential waivers ODOE will consider requesting during an incident. ODOE will coordinate all waivers with the U.S. Department of Energy as the lead federal agency over ESF 12.

ULSD WAIVER

Issue: Ultra Low Sulfur Diesel is a cleaner fuel with a maximum 15 parts per million sulfur specification required by EPA for vehicles and equipment. During an emergency, lifting this requirement would allow distributors to get available fuel into the affected area regardless of the sulfur content.

Waiver Needed: 40 CFR 80.510 and 80.520 set standards for Ultra Low Sulfur Diesel. ORS 646.922(1) restricts the sale or offer for sale of diesel fuel unless the diesel fuel contains at least 5 percent biodiesel by volume or other renewable diesel with at least 5 percent renewable component by volume by retail dealers, nonretail dealers, or wholesale dealers.

ODOE Action: Work with the Environmental Protection Agency (EPA) and the Oregon Department of Environmental Quality (DEQ) to ensure this waiver is obtained to ensure any available fuel can be used in the affected area during a declared emergency if appropriate. This waiver would allow the use of high sulfur heating oil in model year 2006 and older vehicles, generators, and home heating oil during an emergency.

VAPOR RECOVERY AND FUEL TRANSFER, LOADING AND STORAGE WAIVERS

Issue: Fuel terminal loading and unloading systems and tank trucks that transport fuels are required to use specified vapor recovery equipment and comply with other vapor control requirements. Vapor recovery requirements differ from state to state. All state vapor recovery requirements are submitted to EPA for review and approval. During an emergency, lifting the vapor recovery requirement would allow fuel to get from bulk gasoline terminals to local fueling outlets without vapor recovery requirements by whatever transport means possible.

Waiver Needed: 40 CFR Part 60 Subpart XX and Part 63 Subparts R, Y, and BBBBBB set the standards for loading at bulk gasoline terminals, pipeline breakout stations, and marine tank vessel loading operations. ORS 468A.025 establishes areas of the state and prescribes the degree of air pollution or air contamination that may be permitted for such areas. OAR 340-232-0080 through 340-232-0150 establish volatile organic compounds control requirements applicable to various fuel transfer, loading and storage operations. OAR 340-244-0232 establishes the limitations and management practice for hazardous air pollutants and volatile organic compounds emitted from the loading of gasoline storage tanks and gasoline

dispensing facilities, and OAR 340-244-0239 requires each owner to maintain their equipment and records accordingly. These rules apply differently based on the location of the facilities or activities in the state. ORS 468A.045 prohibits certain activities to be carried out without a permit including that no person shall increase in volume or strength discharges or emissions from any air contamination source for which a permit is required…in excess of...emission specified under an existing permit.

ODOE Action: Work with EPA and DEQ to obtain Vapor Recovery and Fuel Transfer, Loading, and Storage Waivers, as necessary, during a declared emergency if appropriate to ensure fuel can be transported from refineries to bulk gasoline terminals to local fueling outlets if compliant transport means are not available or feasible.

CLEAN FUEL SUPPLY WAIVER

Issue: Producers and importers of fossil-based transportation fuels are required to comply with the Oregon Clean Fuel Standards to reduce the overall carbon content of fuel used in Oregon. During an emergency, clean fuels may not be available in sufficient quantity to comply with the standards. The standards do not impose any direct limit on the type of fuel that may be provided for use at any time and so providing any necessary fuels during an emergency would not itself be a violation of the standards. But application of the standard would create an economic disincentive to fuel suppliers if they are unable to comply due to an emergency that reduces the supply of clean fuels.

Waiver Needed: OAR 340-253-2000(1)(a) authorizes DEQ to grant an emergency deferral of the standards if there is a shortage of clean fuels available due to a natural disaster.

ODOE Action: Work with DEQ to obtain an Emergency Deferral of the Clean Fuels Standards.

OXYGENATED FUEL EMERGENCY WAIVER

Issue: DEQ rules require the use of oxygenated fuels during winter months in certain designated areas that are not meeting carbon monoxide (CO) ambient air quality standards. Although no areas are currently designated and required to use such fuels, the requirements remain in effect as a contingency plan option in the event that any such areas slip back into noncompliance with CO standards. Given that newer car engines are very effective at controlling such emissions, this is not anticipated to occur.

Waiver Needed: In the event that any area again becomes subject to the requirement to use oxygenated fuels in winter months, OAR 340-258-0270 authorizes DEQ to grant a waiver of such requirements in an emergency that is outside of the control of fuel suppliers.

ODOE Action: Work with DEQ to obtain an Oxygenated Fuel Emergency Waiver, if necessary, during a declared emergency.

DRIVER QUALIFICATION, LOAD, AND INSPECTION WAIVER

Background: The U.S. Department of Transportation's (USDOT) Pipeline & Hazardous Materials Safety Administration (PHMSA) sets general standards for vehicle labeling, record keeping, operator qualifications, and other requirements for transporting commodities across the country. PHMSA also requires transporters to follow all applicable state requirements.

Issue: PHMSA has certain rules requiring a driver's physical fitness, level of fatigue, fluency in English, thorough inspection of cargo, ensuring lighting and cargo standards, and vehicle maintenance and repairs are met. During an emergency, lifting the driver qualification, load, and inspection waiver would allow fuel supplies to be delivered into the disaster area fewer delays.

Waiver Needed: 49 CFR Parts 391-3 and 396 set driver standards, load standards, and inspection standards. ORS 818.400(b) requires any vehicle or combination of vehicles to stop and submit to any enforcement of commercial vehicle, weight, size, load, conformation, or equipment regulation when directed by proper authority.

ODOE Action: Work with PHMSA and the Oregon Department of Transportation (ODOT) to obtain a Driver Qualification, Load, and Inspection Waiver during a declared emergency if appropriate to ensure fuel and other relief supplies are delivered into the disaster area with fewer delays.

HOURS OF SERVICE WAIVER

Issue: PHMSA sets standards on how many hours a truck driver can be on duty and drive in a given day and week. There are also certain rest time requirements between on duty periods. Some states have hours of service requirements that are more stringent than PHMSA's. These requirements may hinder the effort to get as many relief commodities into the disaster area as possible with fewer delays.

Waiver Needed: 49 CFR Part 395 sets hours of service regulations. ORS 825.252 limits the hours that drivers or operators of motor vehicles may remain on duty, as well as the required number of hours released from duty, in order to protect and safeguard the health and safety of all employees, passengers, and the public. ORS 825.254 limits the movement of vehicles on particular days of the week and limits the movement of vehicles subject to regulation under the same section.

ODOE Action: Work with PHMSA and ODOT to obtain federal and state Hours of Service Waivers during a declared emergency if appropriate to ensure timely deliveries of emergency relief supplies and fuel into the disaster area with fewer delays.

WEIGHT LIMITS WAIVER

Issue: All states set weight restrictions on the maximum weights allowable for trucks that travel on roadways. Weight restrictions vary from state to state. Most states require fuel tankers to be filled at levels below their capacity.

Waiver Needed: ORS 818.010 establishes maximum allowable weight limitations for trucks. ORS 825.450(1) requires that ODOT shall issue a receipt stating the combined weight of each vehicle…or combination of vehicles.

ODOE Action: Work with ODOT to obtain a Weight Limits Waiver and set temporary limits for trucks carrying emergency relief supplies to ensure timely deliveries of fuel into the disaster area with fewer delays.

HAZMAT SPECIFICATIONS WAIVER

Issue: PHMSA sets strict specifications on the types of vehicles that can carry gasoline. There are also requirements related to shipping papers and placarding. To get adequate fuel supplies into the disaster

area with fewer delays, vehicles that are designed to carry gasoline and diesel fuel, even if they do not meet the strict hazmat specifications may need to be used to deliver fuel.

Waiver Needed: 49 CFR Parts 173.242 and 172 Subparts C, D, F, and I govern vehicle specifications and other shipping standards for tank trucks. ORS 825.258 applies the rules for the transportation of hazardous waste, material and PCB to anyone who transports, or causes to be transported, any hazardous material. ORS 825.260 allows for the impoundment of vehicles unlawfully transporting hazardous wastes or substances.

ODOE Action: Work with PHMSA and ODOT to obtain a Hazmat Specifications Waivers during a declared emergency if appropriate to ensure adequate fuel supplies are delivered into the disaster area.

JONES ACT WAIVER

Issue: The Merchant Marine Act (Jones Act) prohibits foreign-built, foreign-owned, or foreign-flagged vessels from carrying goods and commodities between U.S. ports. To get adequate fuel supplies into the disaster area, foreign vessels may need to be used to deliver fuel between U.S. ports. This waiver can be granted automatically on request of the Secretary of the Department of Defense (DOD) or the Secretary of the Department of Homeland Security (DHS) if considered necessary in the interest of national defense.

Waiver Needed: 46 USC 551 codifies the restriction on non-U.S. flagged vessels delivering disaster relief supplies including fuel between U.S. ports.

ODOE Action: Work with USDOE to obtain a Jones Act Waiver through DOD and/or DHS during a declared emergency if appropriate to ensure that non-U.S. flagged vessels are allowed to deliver adequate fuel supplies into U.S. ports near the disaster area.

DIESEL FUEL PENALTY WAIVER

Issue: The Internal Revenue Service (IRS) imposes 24.4 cents per gallon tax on diesel fuel sold for on road use. Meanwhile dyed diesel fuel used for farming purposes and home heating are not subject to the tax. If the dyed diesel fuel was used for on road purposes, the IRS would require that use to be reported and the tax paid accordingly. During an emergency, lifting the Diesel Fuel Penalty requirement would allow as much transportation fuel into the market as possible to make up for the supply shortages.

Waiver Needed: Publication 510 governs the Internal Revenue Code for excise taxes. ORS 465.104 requires that the seller of a petroleum product withdrawn from a bulk facility shall collect from the person who orders the withdrawal a fee. In addition, any person who imports petroleum products in a cargo tank or a barge for delivery into a storage tank in the state shall pay a petroleum products delivery fee to the Department of Revenue for each delivery. ORS 465.106 requires that the State Fire Marshall establish the amount of the fee as necessary for the state's oil, hazardous material and hazardous substance emergency response program. ORS 465.111 requires that the Oregon Department of Revenue (ODOR) collects these fees.

ODOE Action: Work with USDOE and ODOR to obtain a Diesel Fuel Penalty Waiver during a declared emergency if appropriate to ensure as much transportation fuel into the market by removing the tax requirement that may impede bringing dyed fuel into the transportation mix.

VESSEL MOVEMENT CONTROL WAIVER

Issue: The U.S. Coast Guard has authority to control vessel traffic through the enactment of safety and security zones. Delivery of fuel by water may necessitate implementing such zones.

Waiver Needed: Captain of the Port Order waiver under the Ports and Waterways Safety Act (33USC1221 et seq.).

ODOE Action: Work with USDOE to obtain a Vessel Movement Control Waiver through the USCG and DHS to provide exclusive access to ports in the disaster area to those bringing fuel and other relief supplies.

RVP WAIVER

Issue: Reid Vapor Pressure (RVP) is a common measure of the volatility of gasoline. Many states allow a variance, up to 1 lb. RVP from current standards for gasoline blended with ethanol. This requirement could impede fuel supplies from other states without RVP requirements from entering into the disaster area.

Waiver Needed: ORS 646.913(3)(d) requires that the Oregon Department of Agriculture (ODA) adopt standards that require that gasoline blended with ethanol…complies with or is produced from a gasoline base stock that complies with current standards.

ODOE Action: Work with ODA and DEQ to obtain a RVP Waiver during a declared emergency if appropriate to ensure as much transportation fuel into the disaster area to make up for shortages.

BIOFUEL BLENDING WAIVER

Issue: Many states require a minimum amount of biofuels to be blended into all gasoline and/or diesel sold within the state. This requirement could impede fuel supplies from other states without biofuel blending requirements from entering into the disaster area.

Waiver Needed: ORS 646.913(1) prohibits the sale of gasoline unless the gasoline contains 10 percent ethanol by volume, and ORS 646.922 limits the sale of diesel fuel based on the biodiesel content by volume.

ODOE Action: Work with DEQ to obtain a Biofuel Blending Waiver during a declared emergency if appropriate to ensure fuel supplies that do not contain the specified volume of biofuels can be delivered and sold in Oregon.

DEALER LICENSE WAIVER

Issue: Many states require a carrier to pay a fee and obtain a Distributor's License to transport motor fuel within the state. During an emergency, this requirement could impede carriers without a Distributor's License from delivering fuel supplies into the disaster area.

Waiver Needed: ORS 319.030 requires that no dealer shall sell, use or distribute any motor vehicle fuel until the dealer has secured a dealer's license as described in ORS 319.040 under the application for and issuance of dealer's license.

ODOE Action: Work with ODOT to obtain a Distributor License Waiver during a declared emergency if appropriate to ensure that fees and license requirements are lifted to allow all drivers and trucks available within the state and/or those from across state lines to deliver fuel into the disaster area.

IMPORTER/EXPORTER LICENSE WAIVER

Issue: State revenue departments require fuel importers and exporters to pay a fee and obtain a license from the state to move fuel across state lines. Without these licenses, the fuel merchant cannot legally buy gasoline from one state and move it to another. During an emergency, this requirement could impede fuel importers and exporters from delivering fuel supplies into the disaster area.

Waiver Needed: ORS 319.275 states that a person shall not accept or receive motor vehicle or aircraft fuel in this state from a person who imports motor vehicle or aircraft fuel who does not hold a valid motor vehicle fuel dealer license in this state…the purchaser or receiver shall be liable for all taxes, interest and penalties contained in ORS 319.010 to 319.430.

ODOE Action: Work with Oregon Department of Revenue (ODOR) to obtain an Importer/Exporter License Waiver during a declared emergency if appropriate to ensure that fees and license requirements are lifted to allow merchants to deliver fuel across state lines without being properly licensed and registered.

IRP/IFTA WAIVER

Issue: The International Registration Plan (IRP) is an agreement among states of the U.S, the District of Columbia, and the provinces of Canada providing for payment of commercial motor carrier registration fees. To operate in multiple states or provinces, motor carriers must register in their base jurisdiction (state or province). The International Fuel Tax Agreement (IFTA) is an agreement among states to report fuel taxes by interstate motor carriers. During an emergency, this requirement could impede fuel deliveries into the disaster area.

Waiver Needed: ORS 825.555 permits the ODOT to enter into international fuel tax agreements with jurisdictions outside of the state to provide for the cooperation and assistance among member jurisdictions in the administration and collection of taxes, such as the IFTA. Section 6 gives ODOT authority to adopt rules establishing an annual fee under IFTA. ORS 826.007 allows ODOT to enter into agreements with…representatives of any jurisdiction that issues out-of-state registration to provide for proportional registration of vehicles and for the apportionment of registration fees and other fixed fees and taxes on vehicles proportionally registered in this state and the other jurisdiction. Fees, in regard to the IRP, are designated under ORS 826.019, which allows the ODOT to collect a fee from each applicant for proportional registration under Chapter 826.

ODOE Action: Work with ODOT and USDOE to obtain an IRP/IFTA Waiver during a declared emergency if appropriate to ensure that fees and fuel tax reporting requirements are lifted to allow fuel deliveries into the disaster area from the Canadian provinces.

APPENDIX H
Response to Non-Catastrophic Events



Response to Non-Catastrophic Events *(Viable Fuel Infrastructure)*

The response strategies in the Oregon Fuel Action Plan are designed to be implemented for a variety of fuel shortage situations, not only catastrophic earthquake events. In any given year, Oregon experiences a variety of fuel supply disruptions. Many are minor and limited in scope and resolved quickly by the petroleum industry. However, if these disruptions extend over wide areas and last more than several hours they could potentially impact public health and safety.

As a result, the Oregon Department of Energy will implement the Oregon Fuel Action Plan as appropriate to monitor events, provide situational awareness, and respond to fuel shortage situations as the event conditions require.

Threats to the Petroleum Infrastructure

- *Severe Weather Conditions* – Winter storms, drought (fires), floods, wind storms, and freezing rain could stress the fuel supply and distribution system as sudden or unexpected surges in demand cannot be met by actual or expected supply levels. Delays in fuel deliveries could also occur due to road closures or heavy traffic.

- *Special Events* – Major sporting events, festivals, and other events that draws hundreds of thousands of visitors to Oregon could also stress the fuel supply and distribution system.

- *Energy Infrastructure Events* – Unanticipated refinery, terminal, and pipeline shutdowns, extended power outages, and equipment and system failures could result in the reduction of supply and disrupt fuel distribution.

- *National Security Events* – Acts of terrorism, cyber attacks, and sabotage could result in the physical destruction of the petroleum infrastructure, increasing demand for fuels, and also

reducing the fuel supplies available to the United States and the Pacific Northwest.

- *Political Factors* – Oil embargos, war, and the mobilization of defense resources could create a sudden surge in demand. These events could also reduce the fuel supplies available to the United States and the Pacific Northwest.

- *Market Related Events* – A sharp, sudden escalation in the price of fuel could result from a curtailment of supplies and stocks.

Fuel Set-Aside Plan

ODOE is in the process of updating the state's Fuel Set-Aside Plan. The National Association of State Energy Officials (NASEO) is currently developing a template plan to provide guidance and assistance to the states as they update or revise their fuel curtailment plans. ODOE will await the completion of NASEO's guidance prior to finalizing Oregon's Fuel Set-Aside Plan.

EXAMPLE – LIMITED Activation of Oregon Fuel Action Plan

Solar Eclipse

ESF 12: Fuel Sector Planning

BACKGROUND

The August 21, 2017 eclipse wil be the first total solar eclipse in the continental U.S. in 38 years. A partial eclipse can be seen anywhere in the United States. However, the path of totality, where the moon will completely block the sun, will stretch across 12 states including Oregon. The solar eclipse is expected to attract viewers from around the globe. The Oregon Coast is the first easily-accessible place in the United States where the eclipse will be visible. Central and eastern Oregon are considered by subject matter experts as the best sites in the nation to view totality due to the dry weather, clear skies, and low levels of light pollution.

LOCATION

- The 60-mile wide eclipse path of totality will impact a 337.8 mile distance across the state of Oregon, and continue eastward along a path across the United States.
- The path of totality will cross 16 Oregon counties: Baker, Benton, Clackmas, Crook, Deschutes, Grant, Jefferson, Lincoln, Linn, Malheur, Marion, Polk, Tillamook, Wasco, Wheeler, and Yamhill.
- The eclipse is expected to last from 9:00 am to 11:45 am. Totality will occur for approximately 2 minutes at about 10:15 am.

STATE PLANNING ASSUMPTIONS

As a planning tool, Oregon Emergency Management assumed a statewide visitor population of approximately one million people into Oregon to observe the event. This is in addition to Oregon's estimated four million residents, representing a short-term surge of 25 percent in state population. This increased population will likely concentrate along the path of totality from the coast to the border with Idaho, with increases in lodging, transportation, and other effects to be felt statewide.

The population assumptions were extrapolated from figures provided by local communities and industry groups reporting that lodging at hotels and campsites along the path of totality as well as those near major highway connections are at or above capacity. It is further assumed that these visitors will primarily travel by personal vehicles.

POTENTIAL IMPACTS

- Increases in traffic, causing congestion
- Strain on public safety services
- Shortages in fuel

FUEL MESSAGES

- All fuel messages, in general, result in a surge or run on fuel. Messages advising motorists NOT to top off tanks or hoard fuel warns people that there might be a shortage on fuel or a distribution problem. Messages telling people to prepare and fuel up for a solar eclipse or other event also lets people know there might be a supply or distribution problem. Fuel messages tend to create concern, which is what we're trying to prevent.

- The petroleum industry's "just-in-time" business strategy does not accommodate fueling behaviors that are out of the "norm." This includes topping off tanks and hoarding of fuel. These actions put undue stress on an already tight supply system.

- The petroleum industry is extremely resilient and addresses supply and distribution problems routinely without government intervention. Companies are taking the necessary steps to prepare for the solar eclipse.

- ODOE will not allocate fuel for this scheduled short-term event. The purpose of fuel allocation is to help alleviate shortages and hardships for priority users who save lives and restore critical infrastructure during severe and long-term fuel disruptions. Criteria for allocating fuel include:

  1. Governor's Emergency Declaration.
  2. Emergency and essential service providers unable to obtain fuel at any price.

  However, ODOE will work with industry to monitor and resolve potential supply and distribution issues before, during, and after the solar eclipse.

- Messages preparing out-of-state visitors to have a fuel plan, which includes fueling up prior to entering into Oregon's path of totality could be helpful to lessen the strain on in-state supply, though these messages could also prompt Oregonians to be concerned about fuel supplies and top off themselves.

- All public safety agencies along the path of totality *(law enforcement, fire service, EMS, park rangers, etc.)* should fuel up in preparation for the solar eclipse to protect public health and welfare. This is consistent with what public safety agencies routinely do to prepare for holidays and special events.

OREGON DEPARTMENT OF ENERGY (ODOE) ACTIONS

Preparing for the Event

- Work with petroleum industry partners to increase awareness of the solar eclipse and potential impacts on fuel. This allows the companies' time to apply industry planning strategies for special events to meet anticipated increases in demand. Strategies include:

  - Increase Supply – A planned event allows industry time to gradually maximize supply volumes beyond summer stocks to meet anticipated demands.

- Modify Delivery Schedule – Increase the schedule for fuel deliveries from once every four days to delivering fuel every day and a half.

- Prepare Distribution System – Marketers and jobbers operate at 40 percent capacity routinely. To meet anticipated increases in demand, marketers and jobbers have the ability to ramp up to 100 percent capacity to make more frequent fuel deliveries into communities along the path of totality.

Note: BP, Chevron, Kinder Morgan, Phillips 66, Shell, and the Western State's Petroleum Association provided ODOE with the information on industry strategies for special event planning.

- Coordinate with the Oregon Department of Justice (ODOJ) to activate the agency's "Price Gouging" website to allow citizens to report suspected case of inflated fuel prices. ODOJ will investigate reported cases as appropriate.

Response for the Event

- **Activate "Control Cell"** – Designated ODOE responders will monitor the fuel outlook before, during, and after the Solar Eclipse on August 21, 2017. The tentative schedule includes:

  - Wednesday, August 16 - Sunday, August 20 – From ODOE's office in Salem, monitor the fuel supply and distribution system as visitors are traveling into Oregon communities along the path of totality.

  - Monday, August 21 - Tuesday, August 22 – Respond to Oregon State Emergency Coordination Center (ECC) to monitor and respond to potential fuel supply and distribution concerns.

  - Wednesday, August 23 and following days – From ODOE's office in Salem, monitor the fuel supply and distribution system as visitors are traveling from Oregon communities.

1. Track Fuel Outlook ✓ Work with industry to monitor potential fuel supply, scheduling, and distribution problems. ✓ Work with 16 counties to monitor potential fuel shortages along the path of totality. ✓ Report ESF 12 fuel priorities, actions and decisions at Oregon ECC briefings, and in daily Situation Reports and Incident Action Plans.
2. Participate in the Oregon ECC Joint Information System to Provide Fuel Sector Information ✓ Fuel outlook ✓ ODOE actions in response to the solar eclipse ✓ Industry strategies to meet increases in fuel demand ✓ ODOJ's Price Gouging Website ✓ Oregon's fuel supply and distribution system
3. Activate Price Gouging Website ✓ Request ODOJ activate the agency's Price Gouging Website to allow citizens to report suspected cases of inflated fuel prices.

4. Secure Hours of Service Waiver

- ✓ Request ODOT temporarily lift the Hours of Service requirement for fuel haulers delivering supply to communities in the path of totality as a result of severe traffic congestion.

- Wednesday, August 23 – Continue monitoring the fuel situation from ODOE's office in Salem if necessary.

ODOE AUTHORITY

ORS 176.750-785 – authorizes ODOE to develop and maintain a statewide contingency plan in response to petroleum shortages that impact Oregon. This includes providing adequate fuel supplies to maintain emergency services, transportation, and the operation of the economy to ensure the health, safety, and welfare of the residents of the State of Oregon while an emergency exists.

FOR MORE INFORMATION

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APPENDIX I

Primary and Backup Communications Phone Directory



ODOE's ability to implement the Oregon Fuel Action Plan and strategies to provide adequate fuel supplies to the state's emergency and essential services providers is heavily dependent on the agency's ability to communicate with industry, federal, state, county, and tribal emergency response partners. ODOE's Primary and Backup Communications Phone Directory identifies 24/7 primary and backup communications contact information for each agency, organization, and jurisdiction that has a role in securing, delivering, and/or receiving emergency fuel supplies. The goal is to save lives, protect public health and safety, and to restore critical lifelines and services in Oregon after an emergency.

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APPENDIX J

ODOE Emergency Response Procedures



Procedures for ODOE agency operations for the Oregon Fuel Action Plan are included in this appendix. This includes:

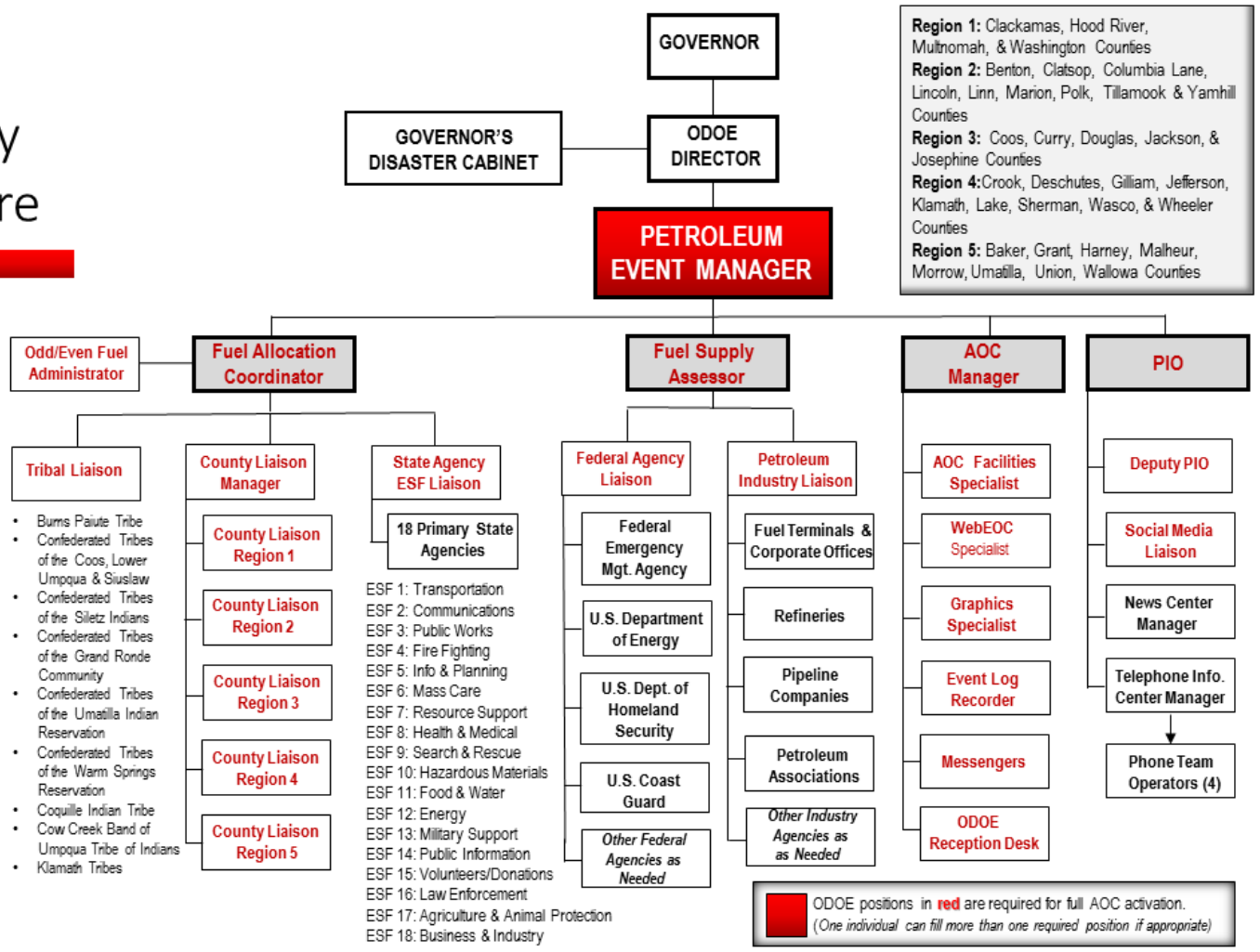
- ODOE Duty Officer Procedures
- ODOE AOC Emergency Response Organizational Chart
- ODOE AOC Activation Procedures
- ODOE AOC Response Position Procedures. Each response position procedure includes key objectives, checklists of tasks, guidance to accomplish objectives and tasks, and applicable reference materials.

Appendix J

ODOE Emergency Response Structure

- 24/7 Response Capabilities
- ODOE Agency Operations Center activation requires staff from all agency divisions to support shift changes

ODOE Agency Operations Center (AOC)



2017 Marine Cargo Forecast and Rail Capacity Analysis

Final Report

August 2017

Prepared for
Washington Public Ports Association
and
Freight Mobility Strategic Investment Board

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Executive Summary

Overview

Washington sits astride a great international trade route that links our state to the world's economy. The investments that have been made to maintain and strengthen this asset pay substantial dividends in terms of supply-chain efficiencies, shipping rates and access to emerging markets. In concert with the state's transportation system, our ports provide:

- Family wage jobs, especially in industrial and agricultural sectors.
- Transport of commercial goods at substantially reduced cost.
- Cost-effective access to global markets.

The purpose of the *2017 Marine Cargo Forecast* is to assess the expected flow of waterborne cargo through Washington's port system and to evaluate the distribution of cargo through the state's transportation network, including waterways, rail lines, roads, and pipelines. The study includes forecasts of trade by commodity and cargo type from 2015 through 2035.

These forecasts are unconstrained, which means they assume that the infrastructure needed to move the cargo will be in place in time to meet the demand. However, they do provide a qualitative assessment of these factors because meeting demand will inevitably require upgrades and investment, particularly in rail capacity.

The Washington Public Ports Association (WPPA) has been involved in similar forecasting efforts since 1975, on approximately a five year basis. These reports are used as planning tools within the port community and related industries. They also alert state and local policymakers, as well as the public, to potential opportunities and constraints. The Freight Mobility Strategic Investment Board is a co-sponsor of the project.

Economic opportunities on the Pacific Rim

The first section of the report assesses the prospects for the world economy with an emphasis on the state's principal trading partners in Asia. The state's dependence on Asia is difficult to overstate. Consider the following:

- 97 percent of containers imported through Washington ports come from Asia.
- 90 percent of containers exported through the state go to Asia.

This report analyzes each region or country to identify factors impacting those areas in the short term. That information is used to make long-term projections, and to inform cargo forecasts up to the year 2035. While economic recovery from the Great Recession has been slow, the Pacific Rim continues to grow faster than most of the world.

China is especially critical to Washington, as it is to other West Coast states. For most commodities, its importance has surpassed all other Asian countries. China's economy is expected to continue growing and will soon be second only to the United States.

Washington's chief domestic trading partners, Alaska and Hawaii, are also included in the macroeconomic overview section of the report. Alaska's economy is driven by the petroleum industry and the federal government. Hawaii's is led by the tourism industry, but has a more diversified economy than Alaska. Both states are projected to grow slowly during the forecast period.

Trade opportunities in the Evergreen State

Washington ports handle a diversified range of cargoes, and the future should bring growth opportunities to the various cargo groups. Highlights of the forecast include the following:

Containers face stiff competition. International container traffic peaked in 2007 then fell sharply during the Great Recession. Volumes have since recovered some of the lost ground, but competing ports in British Columbia have gained market share at our expense. International container volumes are projected to grow, but the rate of growth will depend on the ability of local ports to compete with other regions. Growth in domestic containers (i.e. Alaska and Hawaii) is likely to be slow.

Fully assembled autos are projected to grow steadily. Auto imports dropped sharply during the great recession, and volumes have still not fully recovered. From their current level of 500,000 units, imports are projected to grow by an additional 100,000 to 250,000 units by 2035. Exports of automobiles were negligible until 2008. Since then, they have been as high as 160,000, and are projected to grow to between 320,000 and 420,000 in 2035.

Log exports are likely to level off. In the last decade log exports have grown to levels not seen in years. This sudden jump in exports has ended, but volumes remain substantially higher than they were a decade ago. Future growth is projected to be slow under the reference and high forecasts, and flat under the low. Imports of logs dropped by 75% from their peak in 2005, and are projected to remain essentially flat.

Breakbulk cargo volumes are likely to grow slowly. Metal, forest products and other breakbulk cargo will grow slowly due to containerization and structural changes in the industries that produce these cargoes. Much of the expansion will occur as ports diversify.

Grain shipments are projected to continue growing. Grain shipments saw strong growth over the past 15 years, and this growth is projected to continue. The deepening of the Columbia River Channel led to major investments in export terminals on the river, and they are well-positioned to serve the increasing demand from Asia.

Dry bulk trends will continue. Alumina has greatly decreased in importance to the region, but other commodities have increased. On the export side, potash and soda ash accounted for most of the growth, while exports of other commodities such as petroleum coke moved in steady volumes. On the import side, key commodities include building materials, fertilizer, and chemicals. Slow growth is projected for most of these commodities.

Liquid bulk will shift source. Crude by rail has replaced a share of crude from Alaska, and will likely continue to be an important source. Crude is also received by pipeline from Canada. As crude oil production decreases in Alaska, northwest refineries will replace Alaskan crude oil with a combination of rail, pipeline, and foreign waterborne sources. In addition, shipments of crude oil from the northwest will increase if proposed new shipping terminals are constructed.

Transportation: moving goods to market over road, rail and water

An efficient transportation system that integrates road, rail, and water, and air transportation is essential to meeting our state's present and future trade opportunities. This report focuses in depth on the waterborne transportation system, as well as the road and rail systems that serve the waterborne transportation system. Air transportation is not examined in this report, as there is a limited volume of waterborne cargo that moves to or from Washington marine terminals by air.

Road

Road, highway, and on-terminal truck transport is critical to Washington's ports. Heavy, midsize, and light trucks play important roles in cargo movement and goods distribution. Trucks overall comprise a relatively small portion of total road and highway traffic in the urban regions of the state. While truck traffic is expected to grow between now and 2035, auto traffic will increase even faster. In light of this competition for limited road capacity, the challenge will be to protect the functionality and reliability of the road system for truck transport. Road capacity development will be critical for continued economic growth.

Rail

Trade prosperity in our state is directly linked to the level of rail capacity serving our ports, and the amount of cargo moving to our ports by rail is forecast to increase. If several proposed new marine terminals are constructed the associated growth in rail traffic could be tremendous, but even without those projects port-related rail volumes will grow. In order to meet future demand, it is likely that additional capacity will be needed in various locations.

The state rail system consists of the mainline system and a number of short-line operations. The mainline system is the primary inland transportation component for large-volume import and export cargo moving through our ports. The short-line network consists of many small local railroads, many of which evolved as the state's rail network experienced system-wide contractions, and low-density feeder lines were abandoned by mainline operators.

Washington's mainline rail system is comprised of two competing railroads: the Burlington Northern Santa Fe (BNSF) and the Union Pacific (UP). Both operators have invested significantly in improvements and upgrades to their mainline systems, including new locomotives, new traffic control systems and substantial mainline rail bed improvements.

In general, the key mainlines are able to accommodate existing levels of traffic, and improvements made over the past decade have increased capacity. In particular, a number of projects described in previous Marine Cargo Forecasts were either constructed or are under construction, which has helped to eliminate many of the key capacity constraints. The mainline railroads have demonstrated that they are very good at adding capacity in a relatively short timeframe, if they are able to anticipate the need. State and local governments can facilitate the investments these railroads make by helping with permitting and other local issues.

Waterways

In addition to road and rail transportation, our state's waterways are critically important to international and domestic trade. The Columbia-Snake River navigation system allows Washington-grown agricultural products to move from farm to market, and creates price competition between modes of transportation. Puget Sound and the Washington Coast are vital to domestic barge trade as well as international trade.

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The Columbia River deepening project has greatly benefitted shippers who use Washington and Oregon ports along the Lower Columbia by creating transportation cost savings. The recent investments in expanded capacity at grain terminals along the river are proof of the importance of this project.

From harbors in Puget Sound to dams on the Snake River, our waterways are integral to Washington's economy. Future challenges related to channel deepening, maintenance dredging and potential dam breaching must be addressed to preserve the viability of the system.

Challenges on the horizon

Washington's public ports provide economic security, opportunity and diversity to our local communities, to the state as a whole, and to the surrounding region. If we invest wisely in transportation and port infrastructure, trade will continue to flow through the state and deliver tremendous opportunity in the next two decades and beyond.

Every ship that calls in Washington provides greater choices and better prices for consumers, but it also creates opportunities for all Washingtonians: farmers who must move their crops to markets overseas; manufacturers who rely on inbound shipments for parts and materials; and countless innovators who ship their high-demand products cheaply and efficiently around the world.

Our ability to cultivate new opportunities will depend on the investments made today and tomorrow. Much of the cargo received at Washington ports is discretionary, and can move through alternative gateways; in order to preserve the shipping options available local producers, we must compete aggressively to preserve and expand access to trade routes.

Competition is especially fierce from ports in Southern California and British Columbia, as well as ports on the East and Gulf Coast. Southern California is especially attractive to shippers due to its large population base, and British Columbia has been able to offer a low-cost alternative to ports in the Pacific Northwest.

The key to maintaining and expanding our place in the global economy is to continue investing in our transportation infrastructure – beginning with an efficient, cost-effective rail system. Our state's participation in trade brings with it thousands of jobs and greater collective wealth, but it also requires investment. If we make wise choices now, our state stands to benefit from the growth on the horizon for Washington's port transportation system.

Chapter 1
Overview

Purpose

The purpose of the *2017 Marine Cargo Forecast* is to assess the expected flow of waterborne cargo through Washington's port system and to evaluate the distribution of cargo through the state's transportation network, including waterways, rail lines, roads, and pipelines. The study includes forecasts of trade by commodity and cargo type from 2015 through 2035.

These forecasts are unconstrained, which means they assume that the infrastructure needed to move the cargo will be in place in time to meet the demand. However, they do provide a qualitative assessment of these factors because meeting demand will inevitably require upgrades and investment, particularly in rail capacity.

The Washington Public Ports Association (WPPA) has been involved in similar forecasting efforts since 1975, an approximately a five year basis. These reports are used as planning tools within the port community and related industries. They also alert state and local policymakers, as well as the public, to potential opportunities and constraints. This year the Freight Mobility Strategic Investment Board is the co-sponsor of the project.

Methodology

The macroeconomic overview of various geographic regions is based on short-term analyses supplied by IHS Markit. These were supplemented with population growth comparisons based on data from the IMF, World Bank, USDA, and OECD. Trends and forecast data for GDP growth were based on information from the USDA.

The commodity forecasts were based on a variety of sources, depending on the handling group and commodities included. The initial basis for all of the projections was trade forecasts produced by IHS Markit, which served as the "reference" cases for most commodities. Low case and high case forecasts were then developed using additional sources.

These forecasts are **unconstrained**, which means they assume that the infrastructure needed to handle the projected volumes will be available when needed. The **high case** for each handling type includes cargo volumes related to projects that are currently in the permitting process, such as the Millennium Bulk Terminal in Longview, the Northwest Innovation Works methanol plant in Kalama, and the Vancouver Energy terminal in Vancouver, among others.

The Pacific Northwest was divided into four regions, and cargo projections were developed for each. These regions include:

- PSRC – this region includes marine terminals in King, Pierce, Snohomish, and Kitsap County, the counties included in the Puget Sound Regional Council, or PSRC.
- Puget Sound / Other Washington – this includes all ports and marine terminals on Puget Sound that are not in the PSRC region, as well as those on the Washington coast and in the Strait of Juan de Fuca.
- Lower Columbia Washington – this includes all marine terminals on the Washington side of the Columbia River, from Vancouver to the mouth of the river.

- Lower Columbia Oregon – this includes all marine terminals on the Oregon side of the Columbia River, from Portland to the mouth of the river, including those on the Willamette River.

Organization

Chapter 2 provides background on the economy in key trading regions for the Pacific Northwest.

Chapter 3 provides forecasts for waterborne cargo moving through deep-draft marine terminals.

Chapter 4 includes a description of inland navigation on the Columbia-Snake River system, and provides forecast of waterborne cargo movements on the system.

Chapter 5 provides analysis of the inland transportation modes used by marine cargo.

Chapter 6 provides an analysis of the capacity of the mainline rail system in Washington, and includes the results of the detailed rail traffic simulation model created for this analysis.

Chapter 7 provides an overview of port access issues, as well as details on the participating ports.

Acronyms and Abbreviations

Africa: World region that includes all countries in Africa.

ATCS: A system of railroad equipment designed to ensure safety by monitoring locomotive and train locations.

BNSF: BNSF Railway.

Breakbulk: Cargo that must be loaded individually, and not in containers nor in bulk.

CAGR: Compound annual growth rate.

Capesize: Vessels which are too large to pass through the Panama Canal or Suez Canal, and therefore travel around the Cape of Good Hope or Cape Horn.

CBR: Crude by rail.

China: World region that includes mainline China, Hong Kong, and Macao.

Coastwise traffic: Domestic waterborne traffic carried over the ocean, (e.g. Alaska to Puget Sound, or Columbia River to California).

DBEDT: Hawaii Department of Business, Economic Development & Tourism.

DDGS: Distiller's dried grains with solubles.

DPU: Distributed power unit (DPU) is a locomotive capable of remote-control operation in conjunction with locomotive units at the train's head end. DPUs are placed in the middle or at the rear of heavy trains (such as coal, grain, and soda ash).

Dry bulk: Free–flowing solids (such as grain) that are poured into the hold of a vessel.

Eastern Europe: World region that includes Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Georgia, Hungary, Kosovo, Latvia, Lithuania, Macedonia, Moldova, Montenegro, Poland, Romania, Russian Federation, Serbia, Slovak Republic, Slovenia, Ukraine, and former Soviet republics.

Eurozone: The geographic and economic region that consists of all the European Union countries that have fully incorporated the euro as their national currency.

FRA: Federal Railroad Administration.

GDP: Gross domestic product (GDP) is the monetary value of all the finished goods and services produced within a country's borders in a specific time period.

GDP per capita: Gross domestic product divided by population.

Grade crossing: Location where a road intersects railroad tracks.

Great Recession: The economic downturn that started with the collapse of the housing market in December 2007, and which officially ended in June 2009.

IANA: Intermodal Association of North America.

IHS Markit: Consulting firm that provides industry and trade forecasts and analysis.

IMF: The International Monetary Fund (IMF) is an organization of 189 countries, working to foster global monetary cooperation, secure financial stability, facilitate international trade, promote high employment and sustainable economic growth, and reduce poverty around the world.

Internal traffic: Vessel movements (origin and destination) which take place solely on inland waterways. An inland waterway is one that is geographically located within the boundaries of the contiguous 48 states or within the boundaries of the State of Alaska. Puget Sound is one such inland waterway, as is the Columbia/Snake River system.

Indian Sub-Continent: World region that includes Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka.

Latin America / Caribbean: World region that includes Mexico, all countries in Central America, all countries in South America, and all countries in the Caribbean.

Liquid Bulk: Free-flowing liquid cargoes that are poured into holds of tankers. Examples include crude oil, petroleum products, certain chemicals, and liquefied natural gas.

Lower Columbia Oregon: Port region on the Columbia River in Oregon, from Portland to Astoria. It includes the Ports of Portland, St. Helens, and Astoria.

Lower Columbia Washington: Port region on the Columbia River in Washington, from Vancouver to the mouth of the river. It includes the Ports of Vancouver, Kalama, and Longview.

Main line rail: Track that is used for through trains or is the principal artery of the system from which branch lines, yards, sidings and spurs are connected. It is also referred to as "mainline" rail.

Metric ton: 2204.6 pounds.

Middle East: World region that includes Bahrain, Iraq, Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, and Yemen.

MRL: Montana Rail Link.

Oceania: World region that includes Australia and New Zealand, as well as Pacific island nations not included in Southeast Asia or the Indian Sub-Continent.

OECD: Organization for Economic Co-operation and Development.

Other Northeast Asia: World region that includes Japan, South Korea, North Korea, Taiwan, and Mongolia.

Other Puget Sound / Washington Coast: Port region which includes all Washington deep-draft ports not included in Lower Columbia Washington or PSRC regions.

PADD: Petroleum Administration for Defense Districts (PADDs) are five regions of the United States which are used to analyze the movement of crude oil and petroleum products throughout the nation.

PNW: Pacific Northwest (PNW) is the region that includes Washington and Oregon. Idaho is also included in some usage.

PSRC: Port region encompassing the same counties as the Puget Sound Regional Council region (King, Pierce, Snohomish, and Kitsap Counties). It includes the Ports of Tacoma, Seattle, and Everett.

RTC: Rail Traffic Controller (RTC) is a computer program that simulates the movement of trains through rail networks.

Shortline railroad: A small or mid-sized railroad company that operates over a relatively short distance relative to larger, national railroad networks. These typically fall under the FRA Class II and Class III designations.

Southeast Asia: World region that includes Brunei, Burma, Cambodia, East Timor, Indonesia, Laos, Malaysia, Papua New Guinea, Philippines, Singapore, Thailand, and Vietnam.

Subdivision: Most railroads identify each main line segment between crew change points as one subdivision.

TEU: Twenty-foot equivalent unit.

UP: Union Pacific Railroad.

USDA: U.S. Department of Agriculture.

Western Europe: World region that includes Andorra, Austria, Belgium, Channel Islands, Denmark, Faeroe Islands, Finland, France, Germany, Greece, Greenland, Iceland, Ireland, Isle of Man, Italy, Liechtenstein, Luxembourg, Malta, Monaco, Netherlands, Norway, Portugal, San Marino, Spain, Sweden, Switzerland, and the United Kingdom.

World Bank: The International Bank for Reconstruction and Development (World Bank) is an international financial institution that offers loans to middle-income developing countries.

Chapter 2
International Macroeconomic Overview

Introduction

The following chapter serves as a background discussion of the key trading partner regions for Pacific Northwest ports. The chapter begins with overviews of the trends in waterborne trade between Pacific Northwest ports and both international and domestic regions. This is followed by detailed discussions of each of the trading regions, which include summaries of the major key demographic and economic projections for the regions.

For this discussion, "Pacific Northwest" (or "PNW") includes all ports in Washington, as well as Oregon ports located on the Columbia River.

Several sources were used to produce the macroeconomic overview. IHS Markit provided short-term analyses of the economies of various geographic regions. These were supplemented with population growth comparisons based on data from the IMF, World Bank, USDA, and OECD. Of these sources, only the OECD and World Bank project population beyond 2030. GDP growth comparisons were based on information from the USDA, which produces forecasts for the most comprehensive list of countries; however, these run only through the year 2030.

Key Observations

- Long-term world GDP growth of 3.0%.
- Most of Pacific Northwest waterborne trade is with Asia.
- Asia accounts for majority of container trade.
- China has become the biggest partner.
- China's per capita income is projected to grow quickly, while population stabilizes.
- Other Northeast Asia is a key market.
- Southeast Asia is smaller, but growing in importance.
- Latin America is a non-containerized partner, with a growing population.
- Africa is growing, but waterborne trade with Pacific Northwest is limited.
- Alaska is dependent on the declining production of crude oil, the largest sector of Alaska's economy. Growth prospects are not strong, unless the proposed gas pipeline is built.
- Hawaii GDP grew at approximately 2.0% per year over the past 15 years (higher than average U.S. growth of 1.6% per year), and long-term forecast growth is similar. Economy is based on tourism and government, particularly military.

Trading Regions

International Trading Partner Regions

Since 2000, two-thirds or more of the waterborne tonnage moving through Pacific Northwest ports has been related to trade with Asia. During this period, the most important change is that China has nearly overtaken the rest of Northeast Asia as the largest trading region for Pacific Northwest ports.

Table 2-1: Countries Included by Trade Region

Africa	**Middle East**	**Other Northeast Asia**	**Southeast Asia**
All of Africa	Bahrain	Japan	Brunei
	Iraq	South Korea	Burma
Canada	Iran	North Korea	Cambodia
Canada	Israel	Taiwan	East Timor
	Jordan	Mongolia	Indonesia
China	Kuwait		Laos
China	Lebanon	**Indian Sub-Continent**	Malaysia
Hong Kong	Oman	Afghanistan	Papua New Guinea
Macao	Qatar	Bangladesh	Philippines
	Saudi Arabia	Bhutan	Singapore
Europe	Syria	India	Thailand
All of Western and Eastern	Turkey	Maldives	Vietnam
Europe, including Russia	United Arab Emirates	Nepal	
	Yemen	Pakistan	
Latin America & Caribbean		Sri Lanka	
Mexico	**Oceania**		
All of Central America	Australia		
All of South America	New Zealand		
All of Caribbean	Pacific island nations		
	(excl Southeast Asia and		
	Indian Sub-Continent)		

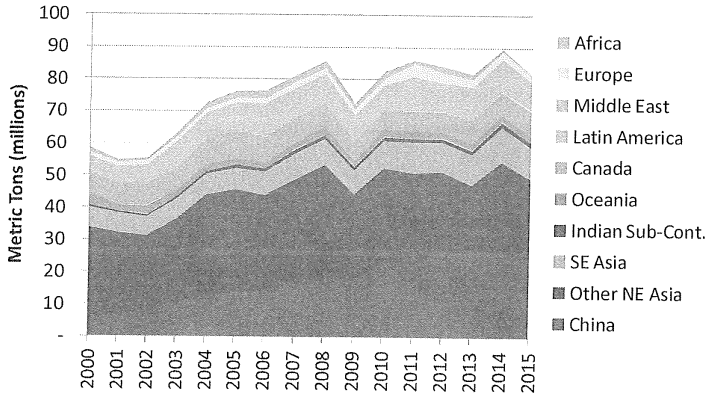
The share of trade moving between the Pacific Northwest and China grew from less than 10% in 2000 to more than 29% in 2015, while the share moving to and from other Northeast Asia dropped from more than 48% to 31%. During this period PNW-China trade grew from 5.5 million metric tons to 24.1 million metric tons, while PNW-Other Northeast Asia trade fell from 28.3 million metric tons to 25.6 million metric tons (see Figure 2-1).

Southeast Asia's share of Pacific Northwest waterborne trade grew slowly over the last 15 years, increasing from 10.8% in 2000 to 11.7% in 2015, but the total tonnage carried in this trade grew from 6.3 million metric tons to 9.5 million metric tons.

Canada and Latin America account for most of the remaining trade. Between 2000 and 2015, Canada's share of waterborne tonnage fell from 10.3% to 9.2%, while Latin America's grew from 6.9% to 8.2%. Despite the decline in market share, PNW-Canada waterborne tonnage grew from 6.0 million metric tons in 2000 to 7.5 million metric tons in 2015, while the PNW-Latin America trade grew from 4.0 million metric tons in 2000 to 6.7 million metric tons in 2015.

No other region accounted for more than 3% of Pacific Northwest tonnage in 2015. Total Pacific Northwest waterborne trade grew for the Middle East (from 1.4 million metric tons to 2.4 million metric tons), Europe (from 1.2 million metric tons to 2.0 million metric tons), and the Indian Sub-Continent (from 0.7 million metric tons to 1.6 million metric tons). Total Pacific Northwest waterborne trade fell for Oceania (from 3.9 million metric tons to 2.3 million metric tons) and for Africa (from 1.3 million metric tons to 0.2 million metric tons).

Figure 2-1: PNW Waterborne Trading Partners – Total Trade



Source: BST Associates using WISERTrade data

For containerized trade, eastern Asia (i.e. China, Other Northeast Asia, and Southeast Asia) represents the key trading area for Pacific Northwest ports. From 2000 through 2015, eastern Asia accounted for between 88.6% and 94.2% of Pacific Northwest containerized trade[1].

During this period China became the largest container market for the Pacific Northwest, as measured in full international TEU. China's share of PNW container trade grew from 34.5% in 2000 to 51.6% in 2015, while Other Northeast Asia's share fell from 45.5% to 27.9% and Southeast Asia's share fell from 13.3% to 9.2%.

The total volume of full containers moving between China and the Pacific Northwest grew from 628,000 TEU in 2000 to as much as 1.27 million TEU in 2012, but declined to 1.13 million TEU in 2015. Container volume between the PNW and Other Northeast Asia grew from 828,000 in 2000 to a peak of 912,000 in 2005, but declined to 612,000 in 2015. Container volume between the PNW and Southeast Asia grew from 242,000 in 2000 to a peak of 280,000 in 2005, but dropped to 201,000 in 2015 (see Figure 2-2).

The remaining world regions currently account for a limited share of Pacific Northwest container trade, but container volumes with many of these regions grew between 2000 and 2015. For example:

- Trade with the Indian Sub-Continent grew from 33,000 TEU to 55,000 TEU
- Oceania grew from 25,000 TEU to 30,000 TEU
- Latin America grew from 23,000 TEU to 52,000 TEU,
- Middle East grew from 11,000 TEU to 38,000 TEU, and
- Europe grew from 27,000 TEU to 67,000 TEU.

[1] Container volume is measured in twenty-foot equivalent units, or "TEU".

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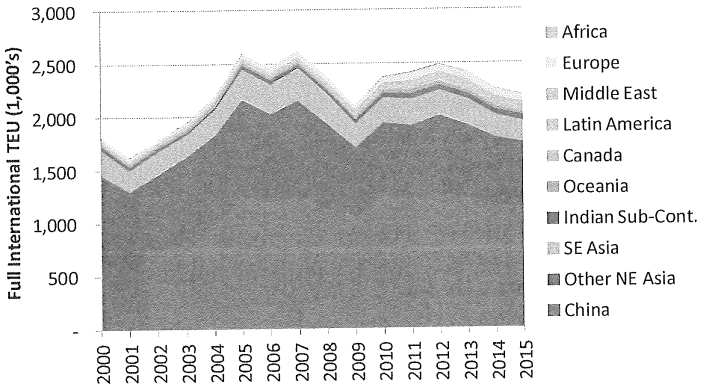
Figure 2-2: Pacific Northwest International Containerized Trade



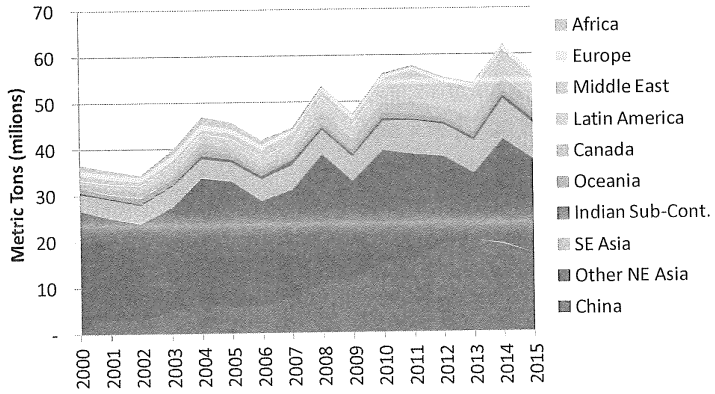
Source: BST Associates using PIERS data

Eastern Asia (i.e. China, Other Northeast Asia, and Southeast Asia) also accounts for most of the non-containerized cargo moving through Pacific Northwest ports. From 2000 through 2015, eastern Asia's share of Pacific Northwest non-containerized cargo averaged 81.0%.

Latin America and Canada are the largest non-Asian trading partners (for non-containerized trade). Latin America's share grew from 1.7% in 2000 to 6.6% in 2015, and reached as high 9.3% in 2013. Canada's share grew from 3.2% in 2000 to 5.4% in 2015, reaching as high as 6.3% in 2013.

Total non-containerized tonnage grew for each trading partner region, with the exceptions of Other Northeast Asia and Africa. Non-containerized trade with China jumped from 1.1 million metric tons in 2000 to more than 19.0 million metric tons from 2012 through 2014, before falling to 16.9 million metric tons in 2015 (due primarily to a short-term drop in grain exports in 2015). Non-containerized trade with Southeast Asia grew from 3.8 million metric tons in 2000 to 7.9 million metric tons in 2015. In contrast, non-containerized trade between the PNW and Other Northeast Asia dropped from 25.6 million metric tons in 2000 to 20.3 million metric tons in 2015 (see Figure 2-3).

Figure 2-3: Pacific Northwest International Non-Containerized Trade



Source: BST Associates using WISERTrade data

Table 2-2 summarizes the shifting market shares for Pacific Northwest waterborne trade, by world region.

Table 2-2: Summary of Pacific Northwest Trade Share by World Region

	Containerized (% of TEU)		Non-Containerized (% of Metric Tons)		Total (% of Metric Tons)	
Region	2000	2015	2000	2015	2000	2015
China	34.5%	51.6%	2.9%	30.2%	9.4%	29.4%
Other Northeast Asia	45.5%	27.9%	69.8%	36.1%	48.2%	31.2%
Southeast Asia	13.3%	9.2%	10.5%	14.0%	10.8%	11.7%
Indian Sub-Cont.	1.8%	2.5%	0.9%	1.4%	1.2%	1.9%
Oceania	1.4%	1.3%	2.4%	2.1%	6.6%	2.8%
Canada	0.0%	0.1%	3.2%	5.4%	10.3%	9.2%
Latin America	1.2%	2.4%	1.7%	6.6%	6.9%	8.2%
Middle East	0.6%	1.7%	2.9%	2.2%	2.4%	3.0%
Europe	1.5%	3.0%	2.5%	1.7%	2.0%	2.5%
Africa	0.2%	0.3%	3.2%	0.2%	2.2%	0.2%

Source: BST Associates using WISERTrade data

World Economic Trends

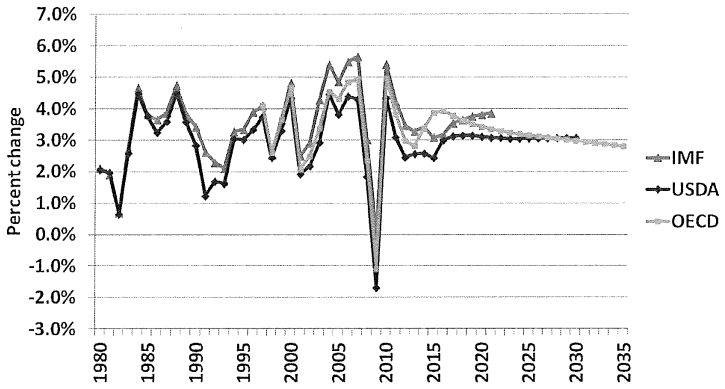
World gross domestic product (GDP) grew at average annual rate of 3.5% per year from 1980 through 2015, according to data from the International Monetary Fund (IMF). During the 1980's, annual GDP growth averaged 3.2%, an average that was weighed down by very slow growth from 1980 through 1982. The year 1982 was especially bad for the world economy, with GDP growth of less than 0.7%. In contrast, annual growth did not drop below 3.6% from 1984 through 1989, and reached as high as 4.7% in both 1984 and 1988.

During the 1990's annual growth in GDP averaged 3.1%. Overall, the decade witnessed steadier growth than the 1980's, with minimum annual growth of 2.1% and maximum of 4.1%.

For most of the 2000's, world GDP growth was substantially higher than during the previous decades, due in large part to growth in China. GDP growth averaged 4.3% from 2000 through 2008, and only dropped below 3.0% in 2001 and 2002. In contrast, GDP growth in both 2006 and 2007 was higher than 5.5%. In 2009 the world economy fell into the deepest recession in decades, and world GDP growth actually fell into negative territory. However, world GDP growth returned in 2010, and has been 3.0% or higher in each year since.

Over the short term (i.e. 2016 through 2021), the IMF is projecting that world GDP growth will average 3.6% per year. In the longer run, both the USDA and OECD project that world GDP growth will average approximately 3.0% per year (see Figure 2-4).

Figure 2-4: GDP Growth - World

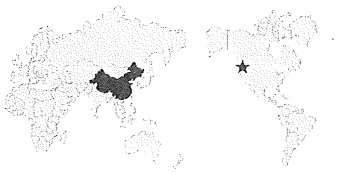


Source: IMF, USDA, OECD

Regional Growth

The following sections describe key economic factors for each of the world regions, including data on population growth, GDP growth, and other factors. GDP figures are presented in 2010 dollars, as developed by the USDA. [2]

China



China has developed into the most important market for Pacific Northwest waterborne trade over the past several decades, and is likely to grow in importance. A huge population base with rising per-capita income represents a key opportunity for the Pacific Northwest.

Chinese economic growth has been slowing from the high levels seen during the past two decades. GDP was projected to be 6.5% in 2016, which, while low by recent Chinese standards, is substantially higher than world average. According to IHS Markit, this moderation means China will be less of a growth engine for Asia and the rest of the world in the coming years. This will be particularly true for commodity and energy-intensive sectors because more of China's growth will come from services than from industry and construction.

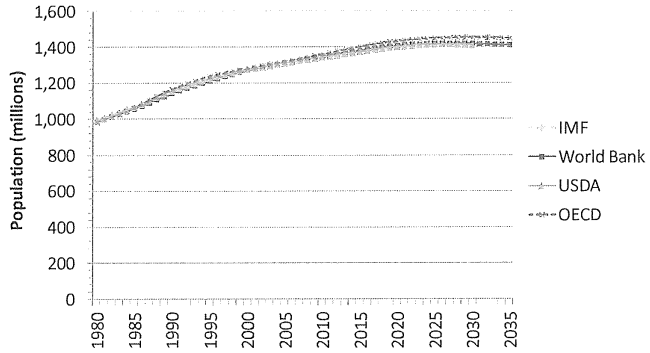
According to IHS Markit, future risk in China is tied to the government's response to changing economic conditions. Until the market-driven correction of the Chinese stock market in mid-2015, it appeared that Chinese policy embraced structural reforms at a modest pace. However, the government's response to the stock market correction raised questions about the Chinese leadership's comfort level with true market outcomes in the economy, and it is unclear how this will play out over time.

China's population reached one billion people in 1980, and has continued to grow since then. It took just seven years for China to add another 100 million people, and six years to add the next 100 million. Since reaching 1.2 billion in 1993, however, China's population growth has slowed. It took ten years (until 2003) to add the next 100 million people, and the population is not projected to reach 1.4 billion until 2016 or 2017.

Multiple sources project that 1.4 billion represents the peak of China's population, and that by the late 2020's the population will actually start to decline slowly (see Figure 2-5).

[2] USDA developed these figures using data from World Bank World Development Indicators, International Financial Statistics of the IMF, IHS Markit, and Oxford Economic Forecasting, as well as estimated and projected values developed by the USDA Economic Research Service, all converted to a 2010 base year.

Figure 2-5: Population Growth - China

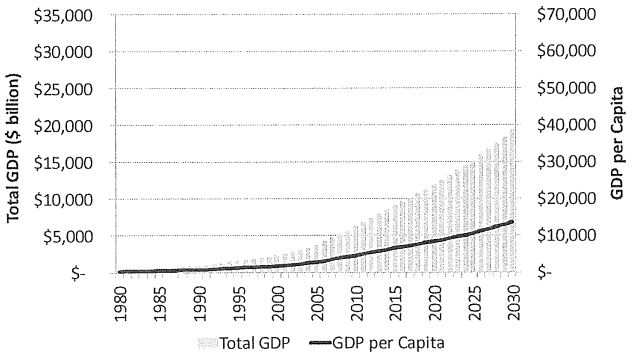


Source: IMF, World Bank, USDA, OECD

Total GDP for China doubled approximately every five years, between 1980 and 2010. Over the entire 30 year period, China's GDP jumped from $396 billion to $6.297 trillion (measured in 2010 US dollars). On a per capita basis, GDP grew from $398 per person to $4,684 per person.

GDP growth in China, which had been averaging between close to 10% per year, began to slow after 2010. From 2015 through 2030 it is projected to average approximately 5.0% per year, which is substantially higher than the world average (see Figure 2-6).

Figure 2-6: GDP Growth - China



Source: USDA

Because GDP is forecast to grow faster than population, however, per capita GDP should continue to rise. Between 2010 and 2015 per capita GDP in China grew from $4,684 to $6,603; it is projected to reach $8,478 by 2020, $10,733 by 2025, and $13,696 by 2030 (as measured in 2010 dollars). This increased buying power makes China a growing opportunity for trade with the Pacific Northwest.

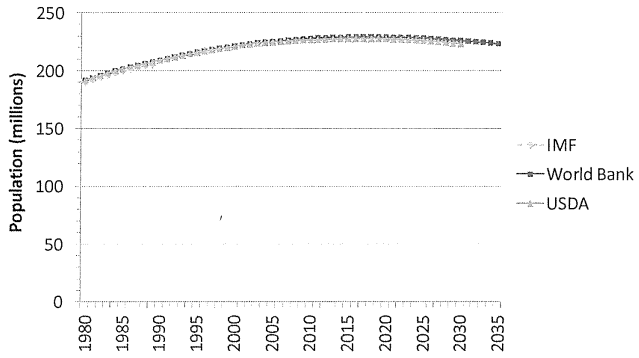
Other Northeast Asia



Northeast Asia (excluding China) was the largest waterborne trading region for Pacific Northwest ports in 2015, as it has been for decades. Although total trade volume between the PNW and Other Northeast Asia (i.e. Japan, South Korea, North Korea, Taiwan, and Mongolia) is likely to be surpassed by that between the PNW and China, the region will continue to be a critical trading partner.

A major reason for trade volume with China overtaking that of Other Northeast Asia is that the population of Other Northeast Asia has apparently peaked, and is projected to begin a slow decline. As illustrated in Figure 2-7, the population of the region has peaked at approximately 229 million, and is projected to begin declining slowly; between 2025 and 2035 it is projected to drop by approximately 0.5% per year. The population of Other Northeast Asia is currently approximately one-sixth of that of China, down from approximately one-fifth in 1980.

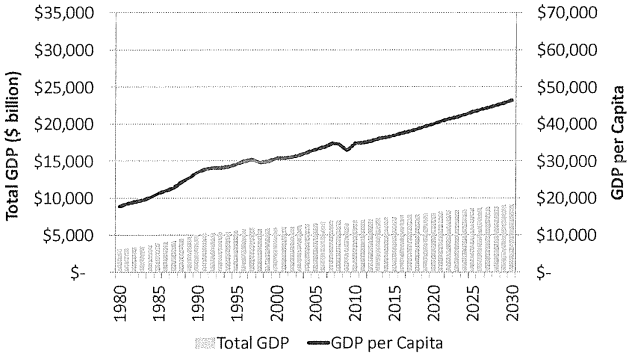
Figure 2-7: Population Growth – Other NE Asia



Source: IMF, USDA, OECD

GDP growth in Other Northeast Asia averaged 5.0% per year during the 1980's, but dropped to just 1.8% per year during the 1990's and to 1.4% during the 2000's. The regional economy slowed even more between 2010 and 2015, dropping to an average of 1.2% per year (see Figure 2-8).

Figure 2-8: GDP Growth – Other Northeast Asia



Source: USDA

Total regional GDP grew by approximately $2.0 trillion between 1980 and 1990 (from $3.1 trillion to $5.1 trillion), but by only $1.0 trillion between 1990 and 2000, and by less than $1.0 trillion between 2000 and 2010. Regional GDP growth is projected to continue averaging approximately $1.0 billion per year from 2010 through 2020, as well as from 2020 through 2030.

GDP per capita grew from $17,900 in 1980 to $36,900 in 2015, and is projected to grow to $46,500 by 2030.

In 1980 Japan accounted for more than 90% of regional GDP, followed by South Korea (5%) and Taiwan (2%). In 2015, Japan's share of regional GDP dropped to approximately 76%, while Korea's grew to 17% and Taiwan 7%. By 2030 Japan is projected to account for 71% of regional GDP, Korea 21%, and Taiwan 7%.

Southeast Asia

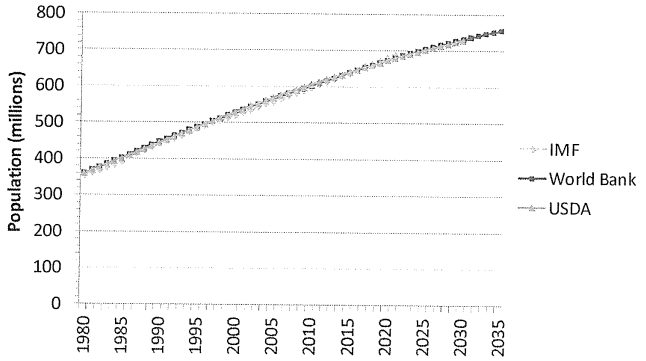


According to IHS Markit, ineffectual macroeconomic policies and political scandals in Southeast Asia[3] are negatively impacting regional economies. Several currencies fell to post-Asian-crisis lows in 2015, while external demand floundered. The mounting threat is that without adequate stimulus or reform, domestic demand in the region will suffer, further weighing on growth.

Despite the current problems, Southeast Asia has the potential to become a more important trading partner for the Pacific Northwest. It is currently the third-largest market for Washington ports, and projected population growth and GDP per capita mean that there will be more people with more money to spend on imported goods.

The population of Southeast Asia grew by 75% between 1980 and 2015, from approximately 358 million in 1980 to 640 million in 2015 (see Figure 2-9). This growth in population (281 million) was higher than the total population of Other Northeast Asia (excluding China). Despite an expected slowdown in the growth rate, the population of Southeast Asia is projected to reach 757 million by 2035. This increase of 117 million people is roughly equivalent to one-third of the current U.S. population.

Figure 2-9: Population Growth – Southeast Asia



Source: IMF, USDA, OECD

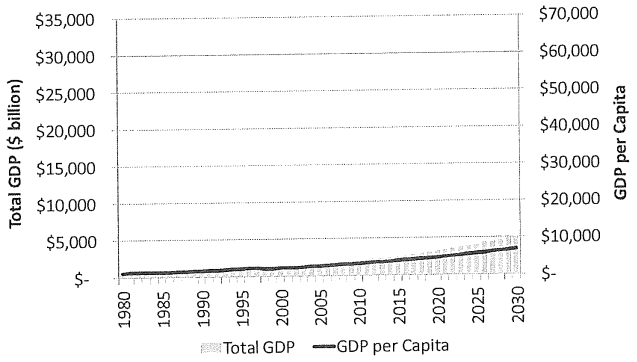
Total GDP for Southeast Asia is substantially lower than that of Other Northeast Asia, but is growing at a much faster rate. In 1980, the GDP of Southeast Asia was $439 billion, which was only 14% of Other Northeast Asia's GDP. By 2015, GDP in Southeast Asia had increased to nearly $2.6 trillion, which was equivalent to 34% Other Northeast Asia's GDP. By 2030 Southeast Asia is projected to reach approximately $5.1 trillion, or nearly 56% that of Other Northeast Asia.

GDP growth has outpaced population growth in Southeast Asia, which means that GDP per capita has also increased. Between 1980 and 2015, per capita GDP jumped from $1,214 to $2,986; by 2030 it is projected to reach $6,951 (see Figure 2-10). The increasing per capita GDP makes Southeast Asia an increasingly important trading region for the Pacific Northwest. As discussed above, Southeast Asia saw its share of Pacific Northwest waterborne trade grow from 10.8% in

[3] Southeast Asia includes: Brunei, Burma, Cambodia, East Timor, Indonesia, Laos, Malaysia, Papua New Guinea, Philippines, Singapore, Thailand, and Vietnam

2000 to 11.7% in 2015, while waterborne tonnage grew from 6.3 million metric tons to 9.5 million metric tons.

Figure 2-10: GDP Growth – Southeast Asia



Source: USDA

Indonesia has long been the largest economy of the region, and consistently accounted for approximately 38% of regional GDP between 1980 and 2015. The Philippines had the second largest economy in 1980, but has dropped to fifth. Thailand is now the second largest, followed by Malaysia and Singapore. Combined, these top five economies account for nearly 87% of regional output. By 2030 this share is projected to drop only slightly, to 84%.

Indian Sub-Continent



The Indian Sub-Continent accounts for a limited share of Pacific Northwest waterborne trade, but this share grew from 1.2% in 2000 to 1.9% in 2015. Total tonnage also grew during this period, increasing from 0.7 million metric tons to nearly 1.6 million metric tons. With a population that continues to grow by 100 million people every four to five years, the region represents an opportunity for increased trade with the Pacific Northwest.

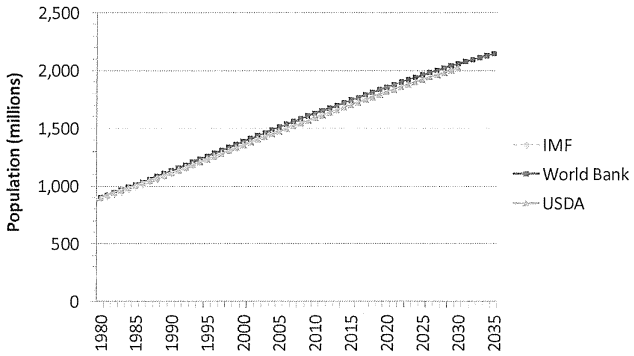
IHS Markit is not optimistic about the short-term prospects for economic growth in the Indian Sub-Continent region. India, which had been a brighter spot in Asia, appears to not have the ability to meaningfully lift growth. In the long run, however, population growth and increasing per-capita GDP may lead to additional demand for imported commodities.

The population of the Indian Sub-Continent surpassed the combined population of China and Other Northeast Asia around the year 2010, and that gap is projected to grow over the next several decades.

The population of the Indian Sub-Continent grew from approximately 900 million in 1980 to 1.1 billion in 1990, climbed past 1.3 billion in 2000, and reached 1.6 billion in 2010. By 2015 in was greater than 1.7 million. Although the rate of growth is projected to slow slightly, the addition of 100 million people every four to five years will result in a population greater than 2.1 billion by 2035 (see Figure 2-11).

Indian has by far the largest share of the sub-continent's population. India's 1.3 billion people accounted for 75% of the total in 2015. By 2035, India's projected population of 1.6 billion will still account for nearly 75% of the total.

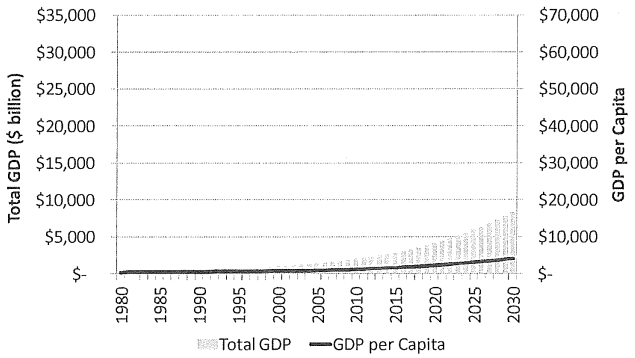
Figure 2-11: Population Growth – Indian Sub Continent



Source: IMF, USDA, OECD

From 1980 through 2000, the total GDP for the Indian Sub-Continent was approximately 85% the size of Southeast Asia's. Beginning in 2000, however, the Indian Sub-Continents began to grow more quickly, and by 2009 the region's output was larger than that of Southeast Asia; by 2015 this margin had grown to more than 11%. This trend is projected to continue, with the region's economy projected to be 64% larger than that of Southeast Asia by 2030 (see Figure 2-11).

Figure 2-12: GDP Growth – Indian Sub-Continent



Source: USDA

Despite the growth in total GDP, the fast expansion of the Indian Sub-Continent's population means that per capita GDP will lag behind that of its neighbors. Per capita GDP was only one-third that of Southeast Asia's from 1980 through 2000. By 2015 it reached 42% of Southeast Asia's, and by 2030 is projected to reach 59%, or $4,137 per person.

India's economy is projected to grow faster than that of the rest of the sub-continent. In 2015, India accounted for 83% of regional GDP, and is projected to account for 87% in 2030. Per capita GDP in India was $1,889 in 2015, compared to a regional average of $1,673. In 2030 India is projected to have per capita GDP of $4,976, compared to a regional average of $4,137.

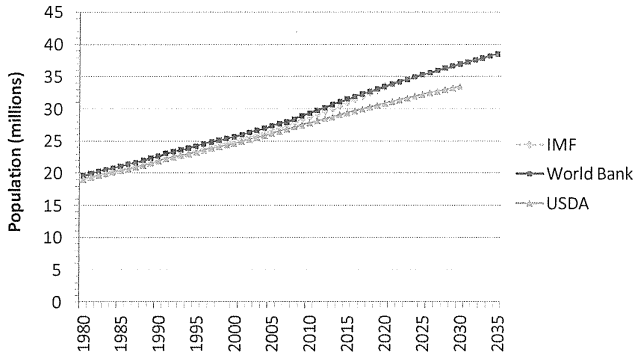
Oceania



Oceania accounts for approximately 10% of Pacific Northwest waterborne tonnage, a share that remained relatively stable between 2000 and 2015.

Oceania has the smallest population of the regions included in this analysis: the 31 million in Oceania in 2015 is equivalent to just 2.2% of China's population and 1.8% of the Indian Sub-Continent's population. As illustrated in Figure 2-13, Oceania is projected to add approximately 8 million people between 2015 and 2035.

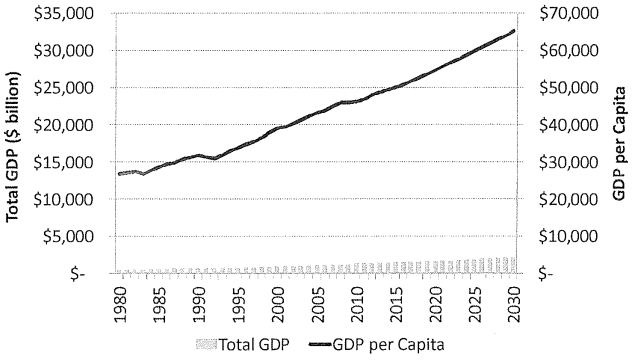
Figure 2-13: Population Growth – Oceania



Source: IMF, USDA, OECD

GDP per capita in Oceania is nearly the same as in the United States, while the population is approximately 9% as large. With similar growth rates, per capita GDP in Oceania is projected to remain roughly equivalent to that of the U.S. through 2030 (see Figure 2-14).

Figure 2-14: GDP Growth – Oceania



Source: USDA

Canada

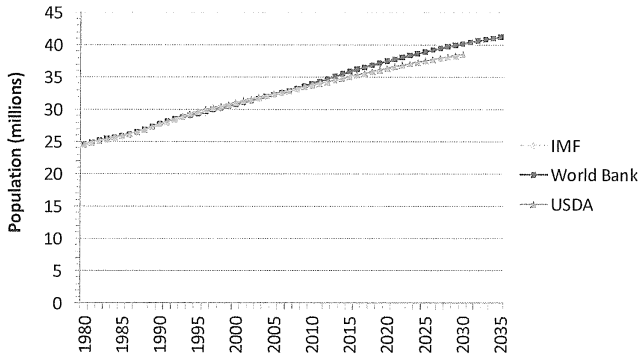


For Pacific Northwest ports, Canada is the largest waterborne trading region outside of Asia. Canada's share of PNW waterborne trade dropped from 10.3% in 2000 to 9.2% in 2015, but total tonnage grew from 6.0 million metric tons to 7.5 million metric tons over the same period.

Canada's population has been approximately 11% the size of the U.S. population for a number of decades, and this is projected to continue through 2035. The population of Canada grew by approximately 11 million between 1980 and 2015, rising from 24.5 million to 35.6 million. During the same period the population of the United States grew from 229.5 million to 323.8 million.

As illustrated in Figure 2-15, over the next 20 years the population of Canada is projected to grow by another 5.6 million, to 43.6 million.

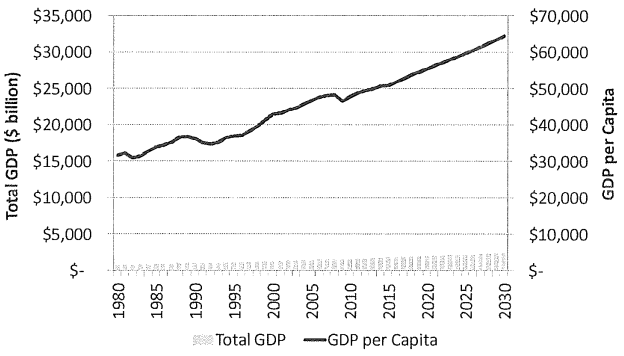
Figure 2-15: Population Growth – Canada



Source: IMF, USDA, OECD

In 2015, GDP per capita in Canada ($51,000) was nearly the same as that in the United States ($51,800). This similarity is projected continue from 2015 through 2030, with Canada's 2030 GDP per capita of $64,500 only slightly lower than the U.S. average of $67,100 (see Figure 2-16).

Figure 2-16: GDP Growth – Canada



Source: USDA

Latin America/Caribbean



Latin America accounted for 8.2% of Pacific Northwest waterborne tonnage in 2000, up from 6.9% in 2000. With income growing faster than population the region could grow in importance for the Pacific Northwest, but political and economic problems will need to be solved for the region to meet its potential.

According to analysis from IHS Markit, political and economic problems in Brazil are dragging down regional growth, and the outlook for Brazil is not very encouraging. The end of the supercycle of high commodity prices and cheap credit has raised the importance of ongoing structural economic problems in the region. Argentina, Brazil, and Venezuela have been hit especially hard.

Despite these problems, IHS is relatively positive about the long-term prospects for Latin America. The macroeconomic fundamental conditions have improved substantially. For example, fiscal policies are being implemented to reduce fiscal deficits and public debt, and flexible exchange-rate regimes have translated into relative exchange-rate stability. Most of the countries enjoy positive trade balances and some of them even post current-account surpluses. Latin American economies are well positioned to continue on the path of moderate growth, provided the rest of the world does not fall again into recession.

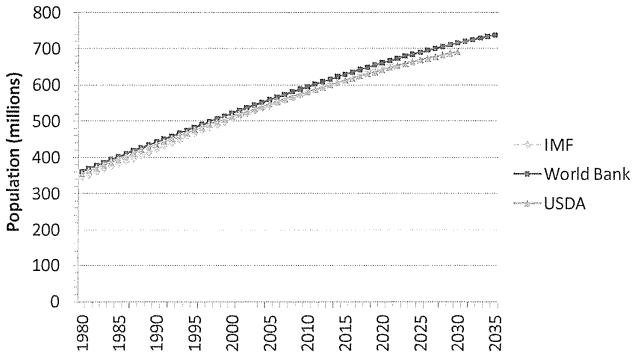
The outlook for Mexico's economy is one of cautious optimism, due to its linkages with the U.S. economy. Acceleration of economic growth in the United States will continue to lift the speed of Mexican economic growth.

The region encompassing Latin American and the Caribbean saw its population grow by 75% between 1990 and 2015. Over this period the population grew from 353 million to 619 million, an increase of more than 266 million.

Despite the rate of growth starting to slow, the population is expected to add another 118 million people between 2015 and 2035 (see Figure 2-17).

With approximately 205 million people, Brazil has the region's largest population, accounting for approximately one-third of the regional total. Mexico's population of 127 million is the next largest, with approximately one-fifth of the total. More than half of the regional population is in Brazil or Mexico.

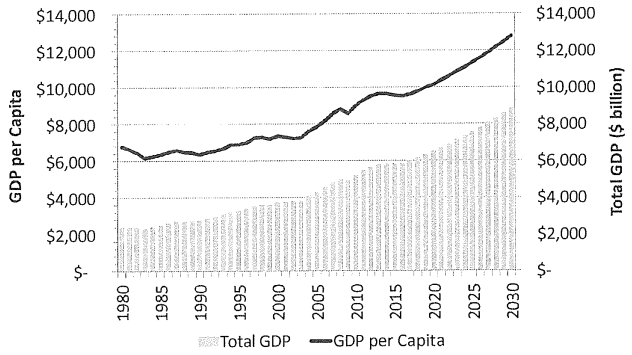
Figure 2-17: Population Growth – Latin America/ Caribbean



Source: IMF, USDA, OECD

Regional GDP is projected to grow faster than population over the long run, which will lead to increasing per capita GDP (see Figure 2-18).

Figure 2-18: GDP Growth – Latin America/Caribbean



Source: USDA

Middle East



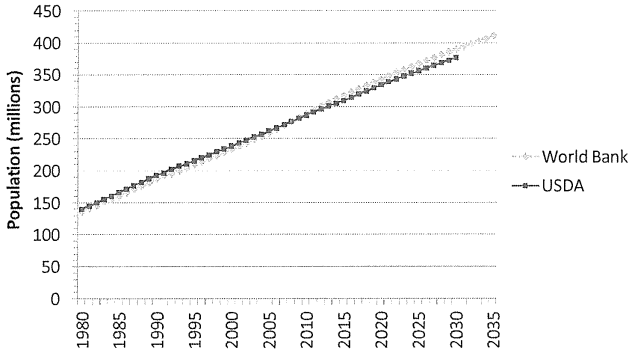
The Middle East is a relatively small waterborne trading partner for Pacific Northwest ports, accounting for approximately 3.0% of waterborne tonnage in 2015.

According to IHS Markit, low oil prices will limit economic growth in the Middle East[4]. Oil prices were projected to grow from approximately $30 per barrel in 2015 to $49 per barrel in 2017, but there is further downside risk to the outlook. Prices for other commodities have also fallen (including metals, minerals, and agricultural products), and projected global growth of 3% could lead to soft world demand for oil. Political instability is also a major concern, with conflicts in Syria, Yemen, and Libya, and threats from the Islamic State across the Middle East.

The population of the Middle East grew steadily between 1980 and 2015, adding an average of 25 million people every five years, to a total of approximately 315 million in 2015. The population is projected to continue growing at approximately the same pace and to reach approximately 410 million in 2035 (see Figure 2-19).

Iran and Turkey are the largest countries in the region, each with a population of approximately 80 million in 2015. These two countries accounted for more than half of the regional population in 2015, and are projected to continue to account for approximately half through 2035.

Figure 2-19: Population Growth – Middle East

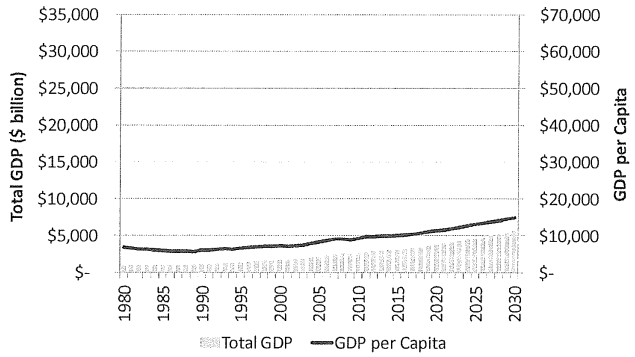


Source: IMF, USDA, OECD

Total GDP of the Middle East grew from approximately $1.0 trillion 1980 to $3.2 trillion in 2015, and is expected to grow to $5.7 trillion in 2030. GDP per capita grew much more slowly than total GDP. While total GDP grew by 330% between 1980 and 2015, GDP per capita only grew by 150% (see Figure 2-20).

[4] Middle East includes: Bahrain, Iraq, Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, and Yemen.

Figure 2-20: GDP Growth – Middle East



Source: USDA

Europe



Europe is a relatively small trading region for Pacific Northwest ports, accounting for 2.5% of waterborne trade in 2015. However, this represented an increase over the 2.0% share in 2000, and total waterborne tonnage grew from nearly 1.2 million metric tons in 2000 to 2.0 million metric tons in 2015. Because GDP per capita is also relatively high in Europe, especially Western Europe, the region presents some potential for trade growth with the Pacific Northwest.

According to IHS Markit, global growth concerns and financial market weakness are currently hampering Eurozone economic activity. This is in spite of several positive factors, including low oil and commodity prices, a competitive euro, increased European Central Bank (ECB) stimulus, and more growth-oriented fiscal policies in a number of countries. Economic growth for the region has averaged 2% or less for several years, and growth of 1.7% to 1.8% was projected for 2016 and 2017.

The impact on Pacific Northwest waterborne trade due to Britain exiting the European Union is likely to be quite limited. As illustrated above, Europe in total accounts for less than 3% of total Pacific Northwest waterborne tonnage, and approximately 3% of waterborne traffic.

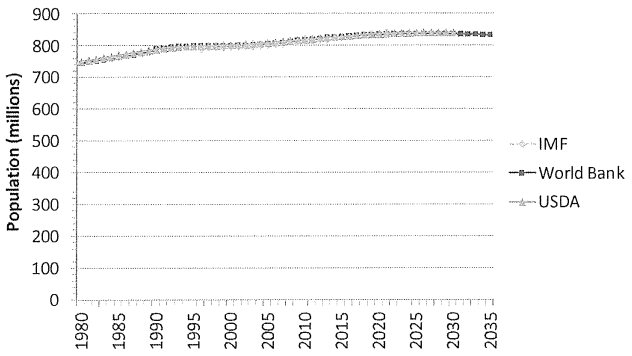
Central European economies are doing better than the Eurozone, and prospects are good for continued strong growth.

As illustrated in Figure 2-21, Europe's population has essentially reached its peak, and will eventually experience a slow decline.

The region's population grew at less than 0.5% per year between 1980 and 2015, while growing from approximately 746 million to 827 million. The population is projected to grow by a total of 1.4% between 2015 and 2027 (i.e. an additional 12 million people), but then start to decline.

Europe's projected population in 2035 is approximately 832 million, an increase of less than six million from 2015, and a decrease of more than six million from its peak in 2027.

Figure 2-21: Population Growth – Europe



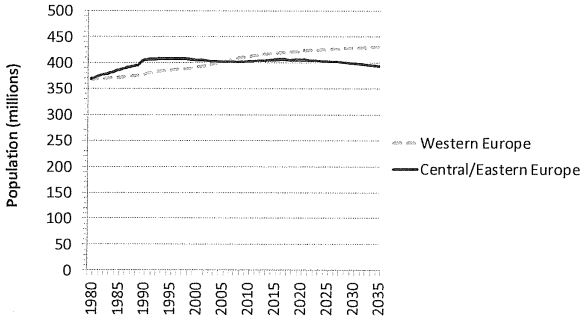
Source: IMF, USDA, OECD

Population growth trends are much different in Western Europe than in Central/Eastern Europe. As illustrated in Figure 2-22, the population of Central/Eastern Europe has been falling since approximately 1995, and is expected to continue to decline. After topping out at 408 million in

1993-1995, the region's population dropped to 402 million in 2007, but recovered to 406 million in 2015. By 2035, however, the population is projected to drop to 393 million.

In contrast, the population of Western Europe grew from 368 million in 1980 to 418 million in 2015, and is projected to reach 430 million by 2035. The population of Western Europe surpassed that of Central/Eastern Europe in 2006, and continues to grow larger.

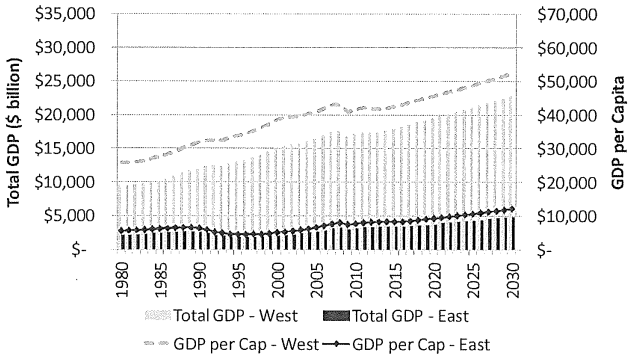
Figure 2-22: Population Growth – Europe Sub-Regions



Source: World Bank

In 2015 the economy of Western Europe was more than 6.25 times larger than that of Central/Eastern Europe, as measured by total GDP. By 2030 this ratio is expected to decrease but still be large, with the GDP of Western Europe 4.65 times larger than that of Central/Eastern Europe (see Figure 2-23).

Figure 2-23: GDP Growth – Europe



Source: USDA

Africa



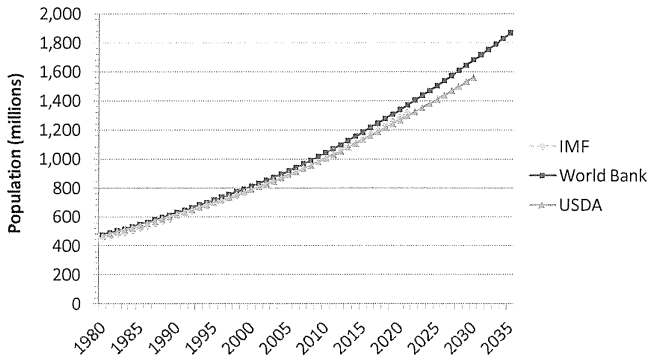
Africa is a very small market for waterborne trade with Pacific Northwest ports, and this is not likely to change substantially over the next 20 years. Africa accounted for just 0.2% of total Pacific Northwest waterborne tonnage in 2015, down from 2.2% in 2000. Total tonnage grew from 1.3 million metric tons in 2000 to 3.2 million metric tons in 2006, but dropped to only 0.2 million metric tons in 2015.

According to IHS Markit, political instability and regional conflicts in North Africa jeopardize the regional growth outlook. In Sub-Saharan Africa, low prices for commodities produced in the region have hampered growth. In recent years China has been especially involved in Africa, and has made substantial investments in infrastructure. The slowing of China's economy will decrease the demand for commodities, however, and may also limit how much China invests in the region. Across the region, exports of primary commodities account for more than 90% of total exports.

Africa is the only world region where population growth is not projected to slow over time. Between 1980 and 1985 the population of Africa grew by approximately 71 million people. Between 2010 and 2015 the five-year growth was nearly twice as high, with 135 million people added to the population, and from 2030 to 2035 the population is forecast to jump by 248 million (see Figure 2-24).

By 2035 the population of Africa may reach nearly 1.9 billion people, making it larger than any region except the Indian Sub-Continent. The increase in population in Africa is also projected to be much greater than in other regions. Africa's 20-year projected population increase is 716 million, compared with 420 million for the Indian Sub-Continent, 118 million for Latin America, and only 44 million for China.

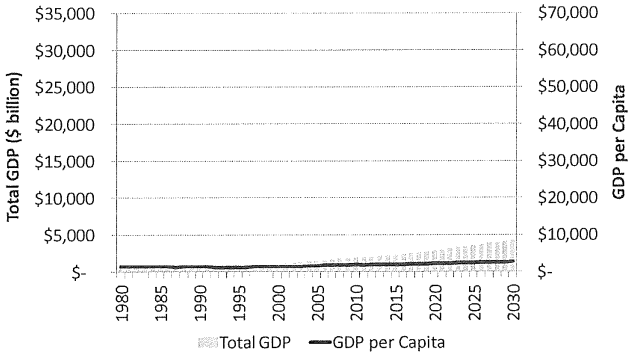
Figure 2-24: Population Growth – Africa



Source: IMF, USDA, OECD

The fast-growing population will limit how fast per-capita GDP grows. Over the long run (i.e. 2015 through 2030), GDP is only projected to grow from $2,000 per capita to $2,800 per capita (see Figure 2-25).

Figure 2-25: GDP Growth – Africa



Source: USDA

Summary of International Trends

The United States has been the world's largest economy for many decades, and is likely to continue to be so. The biggest changes have occurred in the rankings of the next largest economies.

In 2000, the second, third and fourth largest economies were Japan, Germany and France, while China was the fifth largest. By 2015 China had surpassed Japan as the second-largest economy, followed by Japan, Germany and France. India was not in the top 10 in 2000 but ranked as the world's seventh-largest economy in 2015, despite its relatively low per capita GDP (see Table 2-3).

By 2030, India is projected to have the third-largest economy, following the United States and China. Japan is projected to be the fourth-largest, followed by Germany, the United Kingdom, and France.

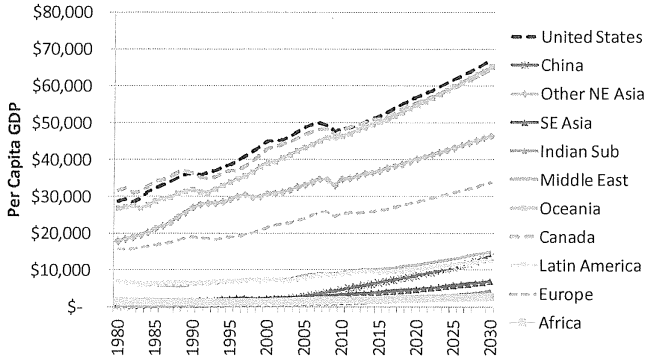
Table 2-3: Country GDP Rank: Top Ten in Real U.S. Dollar Terms

2000	2015	2030
United States	United States	United States
Japan	China	China
Germany	Japan	India
France	Germany	Japan
China	France	Germany
Italy	United Kingdom	United Kingdom
United Kingdom	India	France
Brazil	Brazil	Brazil
Canada	Italy	Canada
Spain	Canada	Italy

Source: USDA

Despite having what is now the world's second-largest economy, China's GDP per-capita is still relatively low. GDP per capita in China is lower than all regions except Africa, the Indian Sub-Continent, and Southeast Asia. It is rising fast, however, and by 2030 is projected to also be higher than that of Latin America and nearly as high as that of the Middle East (see Figure 2-26 and Table 2-4).

Figure 2-26: Per Capita GDP Growth by Region



Source: IMF, USDA, OECD

Table 2-4: Summary of GDP per Capita (in 2010 dollars)

Region	2000	2005	2010	2015	2020	2025	2030
China	$1,870	$2,860	$4,680	$6,600	$8,480	$10,730	$13,700
Other Northeast Asia	$30,760	$33,090	$34,770	$36,920	$40,170	$43,250	$46,490
Southeast Asia	$2,310	$2,720	$3,310	$3,990	$4,820	$5,830	$6,950
Indian Sub-Continent	$780	$980	$1,310	$1,670	$2,280	$3,120	$4,140
Middle East	$7,390	$8,390	$9,360	$10,150	$11,420	$13,100	$14,970
Oceania	$39,070	$43,300	$46,370	$50,150	$54,850	$59,900	$65,250
Western Europe	$38,500	$40,950	$41,630	$42,550	$45,670	$48,850	$52,370
Eastern Europe	$5,050	$6,600	$7,710	$8,230	$9,290	$10,610	$12,130
Latin America /Carib.	$7,360	$7,870	$9,020	$9,550	$10,170	$11,350	$12,800
Africa	$1,470	$1,690	$1,930	$2,030	$2,270	$2,540	$2,790
Canada	$42,980	$46,790	$47,810	$50,980	$55,510	$59,660	$64,470

Source: USDA

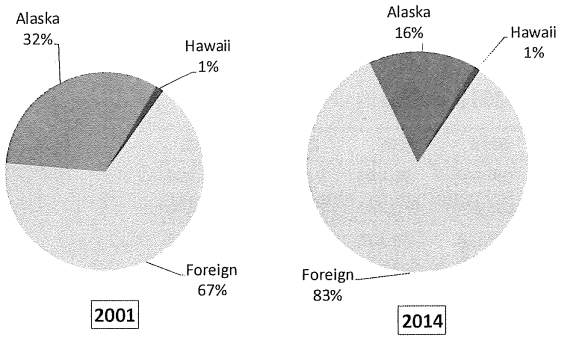
Alaska and Hawaii

A substantial portion of Pacific Northwest waterborne cargo moves to and from domestic locations, primarily Alaska and Hawaii. In 2001, domestic trade accounted for approximately one-third of Pacific Northwest waterborne cargo; by 2014 (most recent year for which data is available) this share had dropped to approximately one-sixth (see Figure 2-27).

As measured in tonnage, Alaska accounted for most of the domestic trade. Crude oil accounted for most of this tonnage, and as crude oil production has dropped in Alaska, so has Alaska's share of Pacific Northwest waterborne trade declined. Alaska accounted for 32% of this trade in 2001, but only 16% in 2014.

Hawaii has consistently accounted for approximately 1% of Pacific Northwest waterborne trade.

Figure 2-27: Relative Size of PNW Foreign and Domestic Trade



Source: U.S. Army Corps of Engineers data

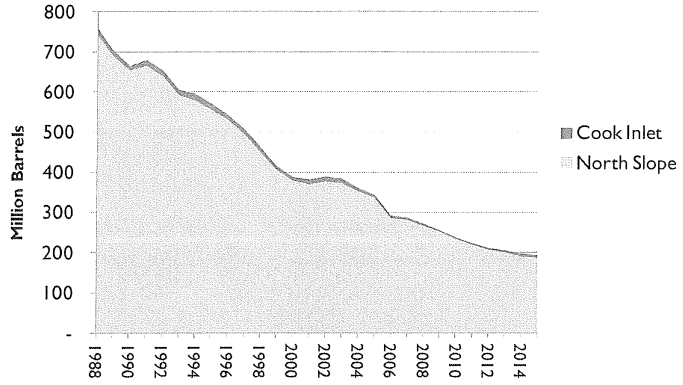
The following sections describe the economy of Alaska and Hawaii, and discuss the implications for waterborne trade with the Pacific Northwest.

Alaska

The economy of Alaska consists of three relatively equal parts: oil production, government (largely funded by oil revenues), and everything else (tourism, fisheries, other sectors). The decline in oil production and oil prices has significantly impacted the Alaskan economy. Future trade volumes are expected to decline and then stabilize.

As shown in Figure 2-28, production of oil in Alaska has been in decline since the peak year of 1988. Statewide production in that year totaled nearly 760 million barrels; by 2001 it had dropped to half of that volume (i.e. 382 million barrels), and by 2015 it had fallen in half again (i.e. to 193 million barrels). Alaskan oil production will continue to decline, unless large new oil discoveries are made.

Figure 2-28: Alaska Historic Oil Production



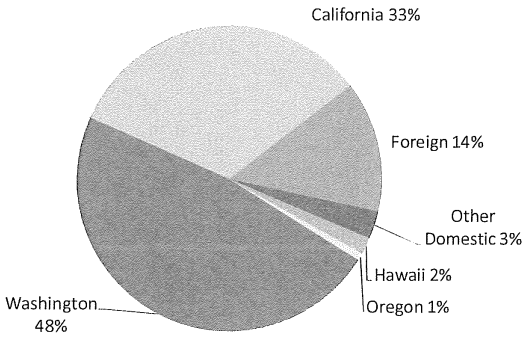
Source: Alaska Division of Oil and Gas

Approximately 97% of Alaska's oil is produced on the North Slope, with a small volume also produced in Cook Inlet. All of the North Slope oil is transported on the Trans-Alaska Pipeline. The pipeline requires a minimum amount of oil to continue functioning, and as North Slope production continues to decline, the risk of reaching this minimum increasing. Although there is some uncertainty around the minimum volume that is technically possible for the line to transport, this limit could be reached by 2026, according to the U.S. Energy Information Administration.

With declining production of crude oil (the largest sector of Alaska's economy), growth prospects are not strong. One mega-project that has been discussed and planned for decades is a new pipeline that would transport natural gas from the North Slope. The financial feasibility of this line is uncertain, however, and the prospects of it being constructed have been declining due to lower gas prices and to increasing domestic and world competition. In addition, the State of Alaska is one of the primary owners of the project, but low oil prices have created major budget problems for the State.

Washington is Alaska's primary waterborne trading partner. As shown in Figure 2-29, Washington accounted for nearly half of all waterborne cargo tonnage moving to and from Alaska from 2001 through 2014. California accounted for one-third, followed by foreign trade (14%), Hawaii (2%) and Oregon (1%). All other trading partners accounted for a total of 3% of Alaska waterborne trade.

Figure 2-29: Alaska Waterborne Trading Partners



Source: U.S. Army Corps of Engineers, 2001 through 2014

The largest share of waterborne tonnage shipped from Alaska is crude oil. Crude oil accounts for a large share of the tonnage shipped from Alaska to Washington, as well as most of the tonnage shipped from Alaska to California.

Oregon receives fertilizer from Alaska, as well as building products.

Fish is the other key product type shipped from Alaska to domestic destinations, and most of this fish moves through ports on Puget Sound. Fish is also shipped directly to foreign customers.

Coal is also shipped from Alaska to foreign destinations. Coal volumes vary widely from year to year, depending on foreign exchange rates, overseas demand, and other factors.

Waterborne cargo moving to Alaska includes essentially everything needed to live there, including food, consumer goods, building materials, and petroleum products. Most of these goods are shipped from Puget Sound.

Hawaii

Hawaii's gross domestic product grew from $53.4 billion in 2000 to $70.5 billion in 2014 (in real 2009 dollars) or at approximately 2.0% per year. This was higher than average U.S. GDP growth rate of 1.6% per year (from 2000 through 2015). The Hawaii Department of Business, Economic Development & Tourism (DBEDT) expects that real GDP will grow at approximately 2.3% per year through 2019.[5]

The two leading drivers of the Hawaiian economy are tourism (accounting for approximately 16.7% of Hawaii's GDP in 2014) and government (accounting for approximately 21.6% of Hawaii's GDP in 2015 [6]).

- In 2015, Hawaii had 8.6 million visitors, who stayed a total of 78 million days (9 days per visitor on average). Spending by visitors averaged approximately $1,800 per trip. DBEDT projects that visitation could increase by 1.9% per year through 2019, and at 0.9% per year through 2030.

[5] Source: Hawaii DBEDT Quarterly Statistical and Economic Report, Q2 2016

[6] Source: Bloomberg Government Study, Impact of Defense Spending: A State-by-State Analysis, 2011

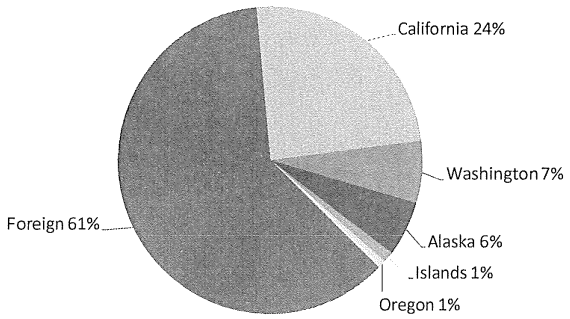
- The military is a key part of the economy of Hawaii; this includes the economic impact of active military and their families, as well as defense contracting, base operations, and capital expenditures. The largest military presence is centered in and near Joint Base Pearl Harbor–Hickam, where the Pacific operations of both the Navy and Air Force Pacific are headquartered. In 2014 there were 115,360 Hawaii residents associated with the active duty military, including 51,045 service members and 64,315 family members.[7]

Hawaii's population (1.43 million residents in 2015) grew at an average rate of 1.1% per year between 2000 and 2015. DBEDT estimates that the population could reach 1.66 million by 2035.[8]

The number of people employed in Hawaii grew at an average rate of 1.2% per year from 2000 through 2014. This rate was significantly higher than the U.S. average employment growth rate of 0.8% per year. DBEDT projects that the number of employed persons could pass 1 million in 2035. The unemployment rate in Hawaii has remained below 5.0% since 2013, down from a peak of 7.2% in 2009.

Hawaii's waterborne trade was relatively stable between 2001 and 2014, averaging approximately 13.2 million metric tons per year. This included 11.6 million metric tons of inbound cargo and 1.5 million metric tons of outbound cargo. As illustrated in Figure 2-30, the majority of Hawaii's off-island trade is with foreign countries (dominated by imports of crude petroleum, petroleum products, sand and gravel, and scrap metal et al.). California accounts for the next largest share (24%); this is primarily consumer products. Washington is the next largest trading partner (7%); this tonnage consists of consumer products and building products. Alaska (primarily crude oil) accounts for 6%, while and Oregon and non-Hawaiian Islands account for 1% each.[9]

Figure 2-30: Hawaiian Trade Partners (average tons from 2001 to 2014)



Source: U.S. Army Corps of Engineers State-to-State database

[7] Source: Hawaii Databook, Table 10.11 Department of Defense Military Personnel and Dependents, data for 2014.

[8] Source: Data accessed from U.S. Bureau of Economic Analysis

[9] Source: U.S. Army Corps of Engineers State-to-State databases; includes inbound and outbound cargo, excludes trade between Hawaiian Islands.

Chapter 3
Marine Cargo Forecast

Introduction

This chapter provides the forecasts for waterborne cargo moving through deep draft marine terminals in Washington, as well as portions of Oregon. The forecasts include cargo moving through all public and private marine terminals in the region. These forecasts are also divided into four port sub-regions:

- Lower Columbia Washington,
- Lower Columbia Oregon,
- PSRC[10], and
- Other Puget Sound / Washington Coast.

The forecasts are organized by cargo handling type, including:

- Containers,
- Breakbulk,
- Neobulk,
- Dry bulk, and
- Liquid bulk.

Key Observations

- Containers
  - Ports in British Columba have been taking market share..
  - Direct East Coast service and Southern California ports also compete with PNW ports.
  - Transloading is increasing.
  - Ships are getting bigger, which impacts other parts of the transportation system.
- Breakbulk / Neobulk
  - Exports are projected to grow faster than imports.
  - Log Exports - demand spiked for a few years, due to China suddenly buying. China will continue to grow (more slowly), while Japan will decrease.
  - Log Imports - little change is projected under any scenario. Essentially all log imports are from Canada.
  - Auto Imports - under the reference case the PNW only reaches the peak volume of 2006-2007 in the outer years. Under the high forecast the historical peak is reached approximately halfway through the forecast period.
  - Auto exports are projected to grow strongly.

[10] PSRC is the Puget Sound Regional Council counties: King, Snohomish, Pierce, and Kitsap. It includes the Ports of Seattle, Tacoma, and Everett, as well as private facilities located in the region.

- Grain and oilseeds
  - The last fifteen years have seen strong growth; this is projected to continue under reference case, with even higher growth rates under the high forecast.
  - Significant export capacity has been added on the Columbia River, and the deepening of the navigation channel has attracted new grain export volumes.
- Other Dry Bulks
  - Imports - alumina has significantly decreased in importance. Most imports are now construction-related (i.e. gypsum, limestone, cement), in addition to fertilizers and chemicals. Future growth is tied closely to construction spending.
  - Exports - soda ash and potash account for most tonnage, all which currently moves through terminals on the Columbia River. Petroleum coke is steady, and is tied to refinery production. Other commodities include scrap metal and ores.
- Liquid Bulks
  - Crude oil accounts for the majority of tonnage. Waterborne volume is projected to be flat or to decrease slightly, unless crude-by-rail terminals are built.

Methodology

The forecasts were based on a variety of sources, depending on the handling group and commodities included. The initial basis for all of the projections was trade forecasts produced by IHS Markit. The IHS forecasts served as the "reference" cases for most commodities. Low case and high case forecasts were then developed using additional sources.

These forecasts are **unconstrained**, which means they assume that the infrastructure needed to handle the projected volumes will be available when needed. This includes capacity at marine terminals as well as on the rail system and other related infrastructure.

The **high case** for each handling type includes cargo volumes related to projects that are currently in the permitting process, such as the Millennium Bulk Terminal in Longview, the Northwest Innovation Works methanol plant in Kalama, and the Vancouver Energy terminal in Vancouver, among others. The **reference case** and **low case** growth projections do not include these volumes.

The Pacific Northwest was divided into four regions, and cargo projections were developed for each. These regions include:

- PSRC – this region includes marine terminals in King, Pierce, Snohomish, and Kitsap County, the counties included in the Puget Sound Regional Council, or PSRC.
- Puget Sound / Other Washington – this includes all ports and marine terminals on Puget Sound that are not in the PSRC region, as well as those on the Washington coast and in the Strait of Juan de Fuca.
- Lower Columbia Washington – this includes all marine terminals on the Washington side of the Columbia River, from Vancouver to the mouth of the river.
- Lower Columbia Oregon – this includes all marine terminals on the Oregon side of the Columbia River, from Portland to the mouth of the river, including those on the Willamette River.

Containers

The Pacific Northwest container trade is centered in Seattle and Tacoma. The Port of Seattle and Port of Tacoma recently merged their container operations under the Northwest Seaport Alliance (NWSA). The container terminals in Seattle are now referred to as the North Harbor, and the facilities in Tacoma are referred to as the South Harbor. In this document, forecasts for these facilities are included in the PSRC region.

Portland has also historically been a smaller player in the container trade, but lost most of its container service in 2015. Portland is working to secure a new container line. In addition, several other ports (such as Everett) handle relatively small numbers of containers

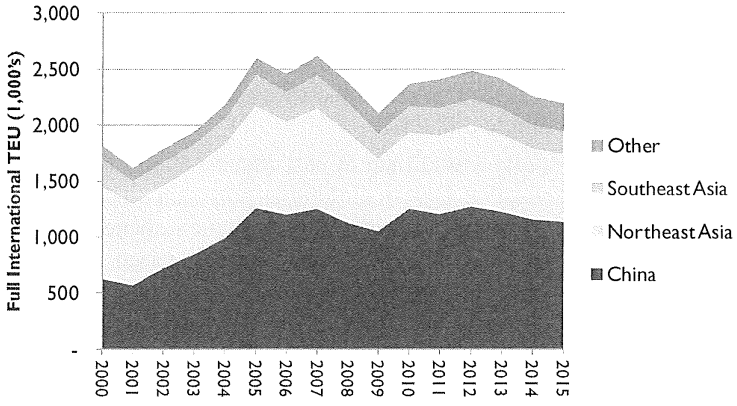
Container Trends and Forecast

Pacific Northwest container traffic increased sharply between 2001 and 2005, growing from 2.9 million TEU to nearly 4.1 million TEU (including full and empty imports, exports, and domestic containers). After remaining at the 4.1 million TEU level through 2006, volumes dropped sharply during the recession, falling to less than 3.3 million TEU in 2009. Although container volumes recovered somewhat in 2010, annual volumes were approximately 3.7 million TEU or less from 2010 through 2015.

International container traffic that moves through ports in the U.S. Pacific Northwest has long been dominated by trade with Asia. China, Other Northeast Asia, and Southeast Asia accounted for 93% of all full international containers in 2000 and 89% of full international containers in 2015 (see Figure 3-1).

The biggest change that occurred over this period was the increasing importance of China. The share of Pacific Northwest container trade accounted for by China grew from 34% in 2000 to 52% in 2015, while volume grew from approximately 630,000 TEU to 1.13 million TEU (full international containers). In contrast, Northeast Asia's share of container trade fell from to 45% to 28%, and volume dropped from 830,000 TEU to 610,000 TEU (full international containers). Southeast Asia's share also fell, from 13% to 9%, while volume dropped from 240,000 TEU to 201,000 (full international containers). All other regions accounted for 11% of international container traffic in 2015, which was an increase from the 7% share in 2000.

Figure 3-1: PNW International Container Trade Partners



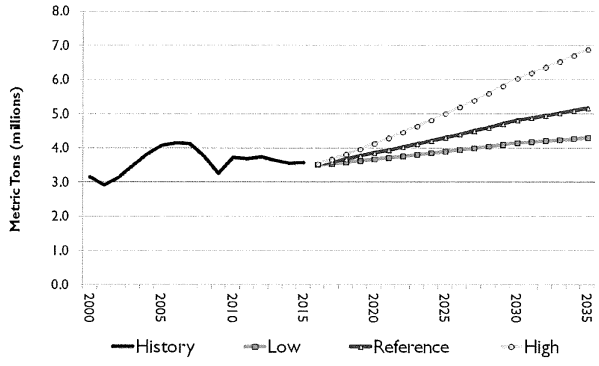
Between 2000 and 2015, container volume grew at an annual rate of 0.9%. The forecast growth rates range from 0.9% (low) to 3.3% (high). The reference growth rate is 1.9% per year (see Figure 3-2).

One key factor that will impact future growth is competition from British Columbia ports (as discussed below). The U.S. Pacific Northwest has lost a large portion of its intermodal traffic to ports in British Columbia over the past decade, and, if this trend continues, container traffic growth will tend toward the low rate.

On the other hand, the share of container traffic that is transloaded from ocean containers into domestic containers and trailers is increasing. While this trend is occurring at ports in the U.S. Pacific Northwest, customs regulations essentially prevent the transloading of U.S.-bound cargo that moves through ports in British Columbia.

Finally, slow economic growth is projected for both Alaska and Hawaii, which will limit growth in Pacific Northwest domestic container trade.

Figure 3-2: Pacific Northwest Container Forecast (Million TEU)



Source: BST Associates, IHS Markit

Import container traffic grew at an average annual rate of 2.3% between 2000 and 2015. The reference growth rate for 2015 through 2035 is slightly lower, at 2.1%. The low growth rate is projected to average 1.2% per year and the high rate 4.3% per year (see Table 3-1).

Export container traffic growth was slow between 2000 and 2015, averaging just 0.1% per year. Future growth is expected to be stronger, ranging between 1.4% per year (low) and 3.0% (high). The reference growth rate is 2.2% per year.

Combined, international container trade averaged 1.1% growth per year between 2000 and 2015. Future growth in international container trade is projected to range between 1.3% per year (low) and 3.7% (high), with a reference growth rate of 2.2%.

These projected growth rates are substantially lower than in past Marine Cargo Forecasts. The main reason for these lower rates is the success that British Columbia ports have had in capturing U.S.-bound intermodal traffic. The Fairview Terminal in Prince Rupert, which opened in 2007, has been able to offer shippers faster ocean transit times and lower rail rates for cargo moving to the U.S. Midwest. Also, cargo moving through ports in British Columbia is not subject to the Harbor Maintenance Tax while cargo moving the U.S. ports is subject to the tax, providing shippers with additional savings. This combination of factors has allowed British Columbia to capture a substantial share of cargo that would have moved through the U.S. Pacific Northwest.

Domestic container traffic includes cargo shipped to and from Alaska and Hawaii. Most cargo shipped by water to Alaska originates at ports on Puget Sound, primarily Seattle and Tacoma. The Pacific Northwest is also one of three main sources of cargo for Hawaii (along with Southern California and Northern California. Seattle and Tacoma are the center of the Pacific Northwest - Hawaii trade, but some of this traffic also moves through the Columbia River.

As described above, growth in domestic container traffic is projected to be relatively slow, due to slow economic growth in both Alaska and Hawaii. From 2000 through 2015, domestic container cargo grew at 0.1% per year, on average. Future growth is projected to range between -0.5% and 1.7%, with a reference growth rate of 0.6%.

The overwhelming majority of Pacific Northwest container traffic will continue to move through ports in the PSRC region, primarily Seattle and Tacoma. Most of the container traffic that had moved through Portland shifted to Seattle and Tacoma; if Portland is able to attract a new carrier some of this traffic could shift back to Portland, otherwise it will continue to move through Seattle and Tacoma. In addition, limited volumes of container traffic will likely continue to move through other ports in the Pacific Northwest.

Table 3-1: Container Trade by Type (Million TEU)

		History				Forecast				Compound Annual Growth Rate	
Region	Case	2000	2005	2010	2015	2020	2025	2030	2035	2000-2015	2015-2035
Imports	Low	1.0	1.6	1.6	1.5	1.6	1.7	1.8	1.8	2.3%	1.2%
	Reference					1.7	1.9	2.1	2.2		2.1%
	High					1.9	2.4	2.9	3.4		4.3%
Exports	Low	1.3	1.6	1.3	1.3	1.3	1.5	1.6	1.8	0.1%	1.4%
	Reference					1.3	1.6	1.9	2.1		2.2%
	High					1.4	1.7	2.1	2.4		3.0%
Total International	Low	2.4	3.2	2.9	2.8	2.9	3.2	3.4	3.6	1.1%	1.3%
	Reference					3.1	3.5	4.0	4.3		2.2%
	High					3.3	4.1	5.0	5.8		3.7%
Domestic	Low	0.8	0.9	0.8	0.8	0.7	0.7	0.7	0.7	0.1%	-0.5%
	Reference					0.8	0.8	0.8	0.9		0.6%
	High					0.8	0.9	1.0	1.1		1.7%
Total	Low	3.1	4.1	3.7	3.6	3.7	3.9	4.1	4.3	0.9%	0.9%
	Reference					3.9	4.3	4.8	5.2		1.9%
	High					4.1	5.0	6.0	6.9		3.3%

Source: BST Associates, IHS Markit

Key Issues for Container Traffic

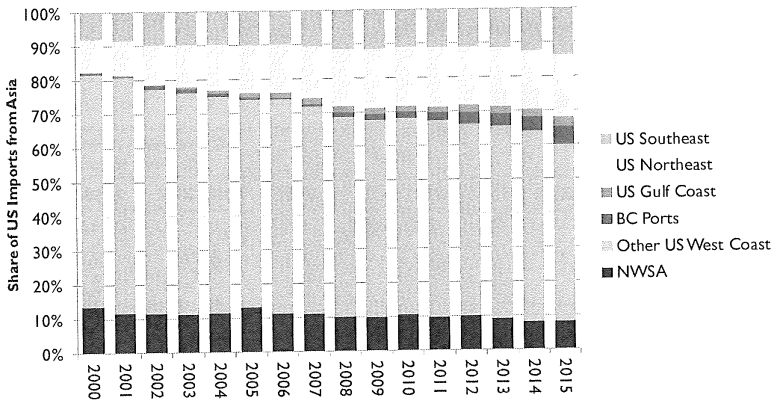
As described above, nearly all of the international container traffic that moves through the Pacific Northwest is moving from or to Asia. Ports in the Pacific Northwest face competition from several other port regions for cargo moving to and from inland points. West Coast ports handle the majority of containerized cargo that moves from Asia to the United States, but the U.S. West Coast market share has declined steadily since 2000, as ports on the East Coast, Gulf Coast, and British Columbia have attracted Asian cargo bound for inland U.S. destinations.

Between 2000 and 2015, the share of U.S.-Asia containerized imports that moved through U.S. West Coast ports declined from 82% to 60%. The share of Asian imports moving through the Northwest Seaport Alliance ports dropped from 14% in 2000 to 8% in 2015. The rest of the U.S. West Coast also saw a declining market share for Asian imports; from 2000 through 2015, U.S. West Coast market share declined from 68% in 2000 to 52% (see Figure 3-3).

As discussed above, ports in British Columbia (i.e. Prince Rupert and Vancouver) have taken a significant portion of the Asian import traffic bound for the U.S. In 2000, ports in British Columbia handled essentially no U.S.-bound container traffic, but by 2015 their share had grown to 5%.

The share of Asian import traffic moving through ports in the Northeast grew from 10% in 2000 to 18% in 2015, and the share moving through ports in the Southeast grew from 8% to 14% over the same period. Gulf Coast ports also gained market share, growing from 0% to 3%.

Figure 3-3: Share of Import Containers from Asia (Million TEU)



Source: PIERS data

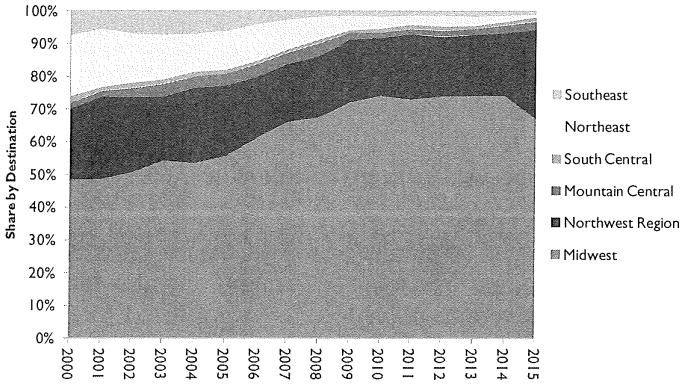
The Midwest has become increasingly important as a destination for containers imported through the Pacific Northwest, while other regions have become less important. The main reason for this shift is that importers have increasingly chosen to serve East Coast markets using all-water shipping routes via the Panama Canal, rather than shipping through West Coast ports.

Figure 3-4 illustrates trends in the shipment by rail of containers imported through the Pacific Northwest. Shipments to the Midwest accounted for 67% of these movements in 2015, up from 47% in 2000. At the same time, the share moving to the Northeast dropped from more than 18% in 2000 to 1% in 2015.

The share of import ocean containers shipped by rail from the Pacific Northwest to other Pacific Northwest destinations jumped in 2015, due to the loss of container service in Portland. Much of the container traffic that had moved through Portland shifted to Puget Sound ports, and a substantial share of these import containers were shipped by rail to Portland.

All other destinations (combined) accounted for 4% to 5% of import container traffic from 2009 through 2015, compared with 14% in 2000.

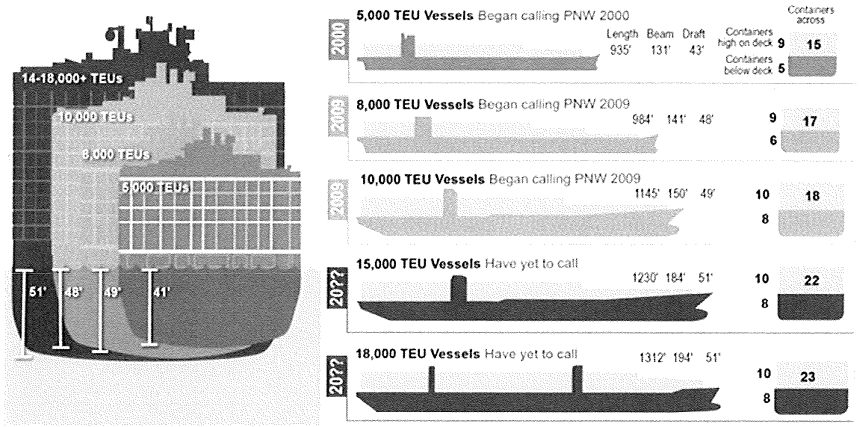
Figure 3-4: Pacific Northwest Originating Intermodal Traffic (Ocean Containers) by Destination



Source: Intermodal Association of North America (IANA) data

The size of container ships calling at container terminals in the Pacific Northwest has been increasing rapidly and is expected to continue to increase in the future. As shown in Figure 3-5, 5,000 TEU vessels began calling Pacific Northwest ports in 2000, followed by 8,000 TEU and 10,000 TEU vessels in 2009. The Benjamin Franklin, CMA-CGM's 18,000 TEU vessel, called at Terminal 18 on February 29, 2016. This vessel is 1,310 feet long and has a beam of 177 feet.

Figure 3-5: Evolution of Container Ships



Source: Mercator International[11]

The increasing size of container ships is a key factor that is negatively impacting Portland's ability to attract a new container carrier. As shown in Figure 3-5, the 8,000 to 10,000 TEU vessels that began calling the Pacific Northwest in 2009 have drafts of 48 feet or more when fully loaded. The Columbia River navigation channel, however, is maintained to a depth of 43 feet. Other types of ships (such as bulk carriers that move grain) have not seen such an increase in size, and are generally not limited by the 43-foot channel.

[11] Mercator International, *Seaport Alliance Strategic Business Plan*, May 16, 2015

The adoption of larger vessels has led to a reduction in the number of ports at which a ship calls on each voyage, which means that more containers are handled during each vessel call. This has increased the pressure on ports to improve terminal capacity and throughput. In order to accommodate the larger vessels, significant investments will be required in port infrastructure, including:

- Longer berths,
- Larger container cranes,
- Increased water depth in channels and alongside berths (51 feet or more), and
- Additional on-dock rail to quickly move cargo off dock.

The consolidation of shipping lines into fewer and larger alliances gives the carriers significant leverage in negotiating with ports, due to the amount of cargo they control. It also limits any individual carrier's reliance on any particular port or terminal.

Breakbulk/Neobulk Cargo

Pacific Northwest breakbulk and neobulk cargo includes forest products, machinery, metal products, and autos.

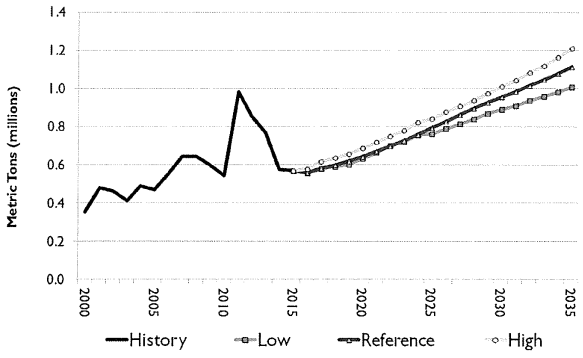
Breakbulk Exports

Breakbulk exports consist primarily of forest products, including lumber, pulp and paper. These grew from approximately 350,000 metric tons in 2000 to 600,000 metric tons in 2010, or at an average rate of 3.2% per year. In 2011 there was a surge of exports, consisting of forest products and machinery/equipment. The surge subsided in 2014, when breakbulk exports fell back to 600,000 metric tons (see Figure 3-6).

Pacific Northwest breakbulk export volumes are expected to increase from 2015 to 2035 as follows:

- Low case: reaching 1.0 million metric tons (2.9% per year growth),
- Reference case: reaching 1.1 million metric tons (3.4% per year growth),
- High case: reaching 1.2 million metric tons (3.9% per year growth).

Figure 3-6: Pacific Northwest Breakbulk Exports (1,000 Metric Tons)



Source: BST Associates, IHS Markit

Breakbulk Imports

Breakbulk imports are dominated by iron and steel, such as coil, bars, pipe, rail and other products. Most of these products are used by local/regional firms as inputs to manufacturing and construction. A small portion is also shipped by rail to the Midwest and beyond. The Lower Columbia River (on both sides of the river) and Central Puget Sound have extensive industry clusters of construction and manufacturing firms that use imported steel.

In addition to steel, other breakbulk imports include forest products and machinery/equipment.

A strong U.S. dollar is expected to accelerate imports in the next few years. However, growth in imports of iron and steel will be tempered to some degree by import duties.

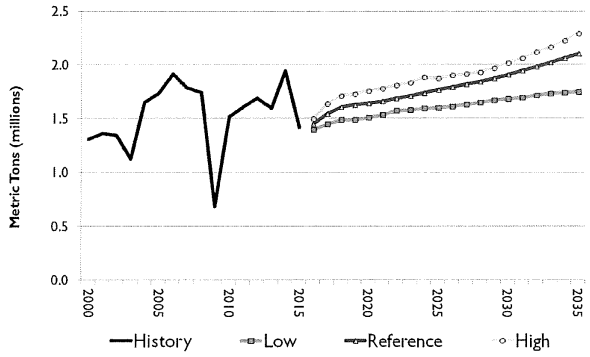
Breakbulk imports increased at an average annual rate of 0.5% between 2000 and 2015, growing from 1.3 million metric tons to 1.4 million metric tons. Volumes peaked in 2005 but then collapsed in 2009 as a result of the Great Recession. However, volumes rebounded in 2010, peaking

in 2014 at nearly 1.9 million metric tons before declining to 1.4 million metric tons in 2015 (see Figure 3-7).

Pacific Northwest breakbulk import volumes are projected to increase to the following levels between 2015 and 2035:

- Low case: reaching 1.8 million metric tons (1.1% per year growth),
- Reference case: reaching 2.1 million metric tons (2.0% per year growth),
- High case: reaching 2.3 million metric tons (2.4% per year growth).

Figure 3-7: Pacific Northwest Breakbulk Imports (1,000 Metric Tons)



Source: BST Associates, IHS Markit

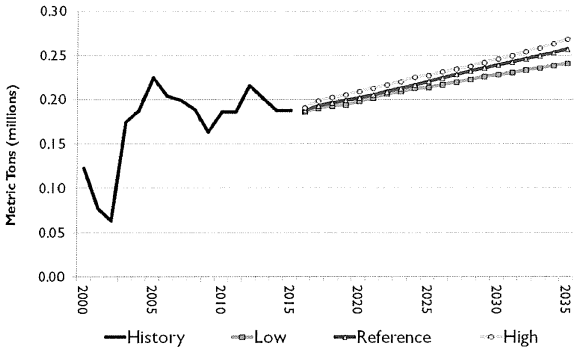
Domestic Coastwise Traffic

Coastwise breakbulk traffic consists mainly of shipments of forest products (lumber and other building products) to California, Alaska and Hawaii. Coastwise traffic increased from 120,000 metric tons in 2000 to 190,000 metric tons in 2015 (see Figure 3-8).

Volumes of coastwise breakbulk shipments are projected to increase to the following levels between 2015 and 2035:

- Low case: reaching 240,000 metric tons (1.3% per year growth),
- Reference case: reaching 260,000 metric tons (1.7% per year growth),
- High case: reaching 270,000 metric tons (1.9% per year growth).

Figure 3-8: Pacific Northwest Breakbulk Coastwise Shipments (1,000 Metric Tons)



Source: BST Associates, IHS Markit

Summary

As shown in Table 3-2, total breakbulk cargoes (including exports, imports and coastwise shipments) are projected to grow as follows from 2015 through 2035:

- Low case: reaching 3.0 million metric tons (1.6% per year growth),
- Reference case: reaching 3.5 million metric tons (2.4% per year growth),
- High case: reaching 3.8 million metric tons (2.8% per year growth).

Table 3-2: Breakbulk Export, Import and Coastwise Shipment Forecasts (Million Metric Tons)

		History				Forecast				Compound Annual Growth Rate	
Direction	**Case**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2000-2015**	**2015-2035**
Exports	Low	0.35	0.47	0.54	0.57	0.63	0.76	0.89	1.01	3.2%	2.9%
	Reference					0.64	0.79	0.96	1.11		3.4%
	High					0.69	0.84	1.01	1.21		3.9%
Imports	Low	1.31	1.74	1.51	1.42	1.51	1.60	1.68	1.75	0.5%	1.1%
	Reference					1.64	1.77	1.91	2.10		2.0%
	High					1.76	1.87	2.02	2.29		2.4%
Coastwise Shipments	Low	0.12	0.22	0.19	0.19	0.20	0.22	0.23	0.24	2.9%	1.3%
	Reference					0.20	0.22	0.24	0.26		1.7%
	High					0.21	0.23	0.25	0.27		1.9%
Total	Low	1.78	2.43	2.24	2.17	2.34	2.58	2.80	3.00	1.3%	1.6%
	Reference					2.49	2.78	3.11	3.48		2.4%
	High					2.66	2.94	3.28	3.77		2.8%

Source: BST Associates, IHS Markit

Logs

Log Exports

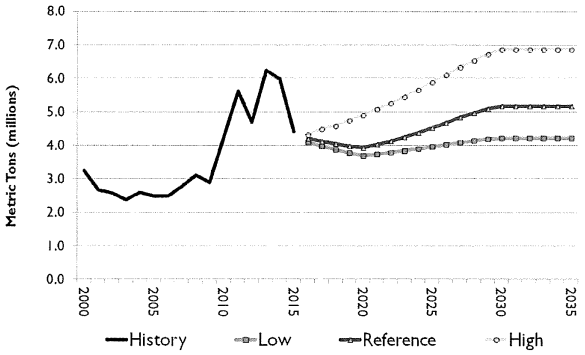
From 2000 to 2009, log exports remained relatively stable, ranging from 2.5 million metric tons to 3.0 million metric tons per year. There was rapid growth from 2010 to 2013/14, when log exports increased to 6.0 million tons, largely due to increased exports to China. However, exports fell in 2015 to 4.4 million tons (see Figure 3-9).

The forecast low and reference cases assume that Chinese demand continues to grow, but at a slower pace than in recent years; the high case assumes that demand from China increases. All growth scenarios assume that Japanese demand declines due to increasing domestic timber harvests in Japan.

Pacific Northwest log export volumes are projected to increase from 2015 to 2035 as follows:

- Low case: reaching 4.2 million metric tons (-0.2% per year growth),
- Reference case: reaching 5.2 million metric tons (0.8% per year growth),
- Low case: reaching 6.9 million metric tons (2.2% per year growth).

Figure 3-9: Pacific Northwest Log Exports (1,000 Metric Tons)



Source: BST Associates, IHS Markit

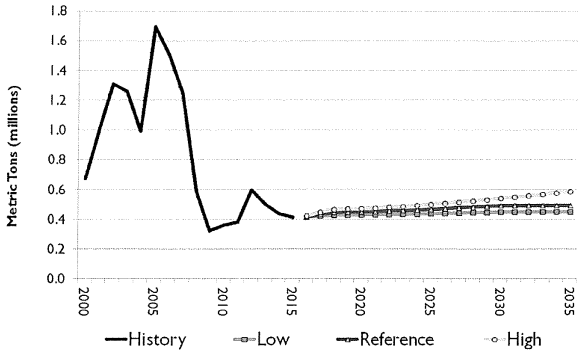
Log Imports

Some Pacific Northwest mills source logs from Canada, depending upon availability and price. Waterborne imports of logs grew steadily from 700,000 metric tons in 2000 to 1.7 million metric tons in 2005 as domestic sources dwindled. After 2005, import volumes began to decline, and ranged from 300,000 metric tons to 600,000 metric tons between 2008 and 2015 (see Figure 3-10)

Pacific Northwest log import volumes are expected to increase from 400,000 metric tons in 2015 to the following levels in 2035:

- Low case: 450,000 metric tons (0.5% per year growth),
- Reference case: 500,000 metric tons (0.9% per year growth),
- High case: 600,000 metric tons (1.8% per year growth).

Figure 3-10: Pacific Northwest Log Imports (1,000 Metric Tons)



Source: BST Associates, IHS Markit

Domestic Coastwise Traffic

Coastwise traffic is domestic waterborne traffic carried over the ocean, (e.g. Alaska to Puget Sound, or Columbia River to California). Coastwise log traffic steadily declined from approximately 400,000 metric tons per year from 2001 through 2004 to less than 50,000 metric tons in 2013, and to approximately 3,000 metric tons in 2014. Coastwise log traffic is not projected to grow significantly during the forecast period.

Internal traffic is vessel movements (origin and destination) which take place solely on inland waterways. An inland waterway is one that is geographically located within the boundaries of the contiguous 48 states or within the boundaries of the State of Alaska. Puget Sound is one such inland waterway, as is the Columbia/Snake River system. There is a substantial volume of internal movements of logs on Puget Sound, such as log shipments from the Olympic Peninsula to La Conner for distribution to local mills. However, this cargo forecast focuses on coastwise and international traffic and, as a result, internal shipments and receipts are not included.

Summary

Total log traffic grew from 4.2 million metric tons in 2000 to 4.8 million metric tons in 2015, or at an average annual rate of 1.0%. As shown in table 3-3, log traffic is projected to increase to the following levels in 2035:

- Low case: 4.7 million metric tons (-0.1% per year growth),
- Reference case: 5.7 million metric tons (0.8% per year growth),
- High case: 7.5 million metric tons (2.2% per year growth).

Table 3-3: Log Export and Import Forecasts
(Million Metric Tons)

		History				Forecast				Compound Annual Growth Rate	
Region	**Case**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2000-2015**	**2015-2035**
Exports	Low	3.2	2.5	4.2	4.4	3.7	4.0	4.2	4.2	2.1%	-0.2%
	Reference					3.9	4.5	5.2	5.2		0.8%
	High					4.9	5.9	6.9	6.9		2.2%
Imports	Low	0.7	1.7	0.4	0.4	0.4	0.4	0.5	0.5	-3.2%	0.5%
	Reference					0.5	0.5	0.5	0.5		0.9%
	High					0.5	0.5	0.5	0.6		1.8%
Total	Low	4.2	4.5	4.7	4.8	4.1	4.4	4.7	4.7	1.0%	-0.1%
	Reference					4.4	5.0	5.7	5.7		0.8%
	High					5.4	6.4	7.5	7.5		2.2%

Source: BST Associates, IHS Markit
Note: total traffic includes coastwise traffic

Automobiles

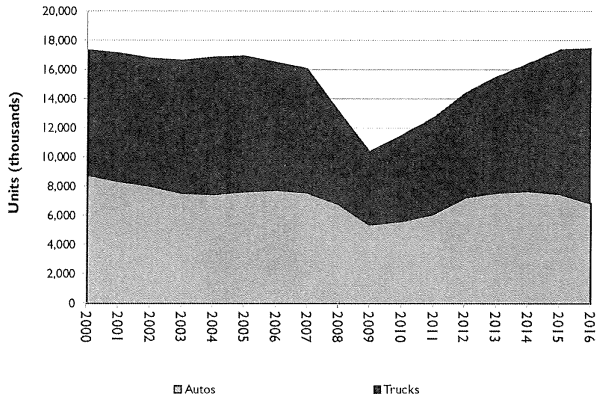
Pacific Northwest ports have long been major players in the automobile import trade, and in recent years have also begun to serve the export trade. The following sections provide an analysis of U.S. auto sales and production, as well as forecasts of Pacific Northwest auto imports and exports.

Imports

Sales of autos in the U.S. averaged 16 to 17 million units from 2000 to 2007, until the Great Recession drove sales to a low of 10.4 million units in 2009 (a drop of nearly 40%). Restructuring of the auto industry and gradual recovery of the economy led to a rebound in sales. Auto sales reached 16.5 million units in 2014, and exceeded 17 million units in both 2015 and 2016 (see Figure 3-11).

The type of vehicle sold in the U.S. has changed dramatically since 2000. In 2000, the market was evenly split between autos and trucks. Driven largely by low fuel prices, sales of trucks (including SUV's) surged during 2016, and now represent 61% of passenger vehicle sales in the U.S.

Figure 3-11: U.S. Auto Sales Trends
(1,000 Units)



Source: U.S Bureau of Economic Analysis

In the U.S., the market share of foreign vehicles grew from approximately 17% in 2000 to a peak of 26% in 2009; for the past five years imports have leveled off at 21% to 22% of U.S. sales. A growing share of these vehicles is manufactured in Mexico, which has now surpassed Japan as the second largest exporter to the U.S. Canada remains the largest exporter to the U.S., with export volumes that have remained relatively stable.

IHS expects that the U.S. auto market is reaching maturity, with sales momentum slowed due to rising interest rates, as well as to the impact of legislated content (safety and environmental requirements) on prices. In addition, increased urbanization is reducing the need for vehicles. Other trends include electrification and hybrids, automated driving and shared mobility services.

Global light vehicle production is expected to grow at the following annual rates between 2015 and 2021:

- Chinese production – 4.0 % per year between 2015 and 2021,
- South Asian production – 6.4 % per year between 2015 and 2021,

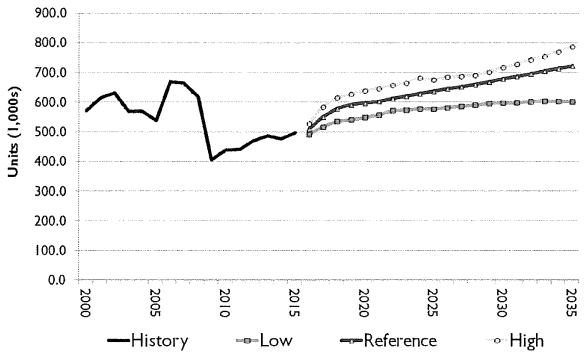
- EU production – 1.6 % per year between 2015 and 2021, and
- North American production – 1.1 % per year between 2015 and 2021.

Auto imports moving through Pacific Northwest ports ranged from 550,000 units to 650,000 units between 2000 and 2008. During the Great Recession, import volumes declined to 400,000 units in 2009, but grew back to approximately 500,000 units in 2015 (see Figure 3-12)

Between 2015 and 2035, Pacific Northwest auto import volumes are expected to increase from 500,000 units to:

- Low case: 601,000 units (1.0% per year growth),
- Reference case: 723,000 units (1.9% per year growth),
- High case: 756,000 units (2.3% per year growth).

Figure 3-12: Pacific Northwest Auto Imports (1,000 Units)



Source: BST Associates, IHS Markit

Exports

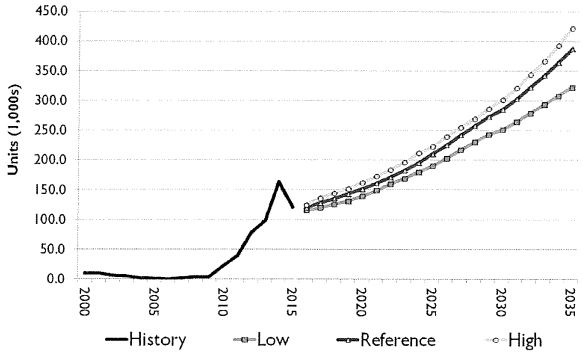
Exports of U.S. autos across all ports and border crossings increased rapidly between 2000 and 2015, growing at an annual rate of 11.4%. Emerging markets in China, India, Brazil, Eastern Europe and South Africa drove much of this growth.

Between 2000 and 2015, auto exports moving via Pacific Northwest ports increased at an annual rate of 23.0%, due mainly to shipments from Grays Harbor and Portland to China (see Figure 3-13).

Between 2015 and 2035, Pacific Northwest auto export volumes are expected to increase from 121,000 units to:

- Low case: 322,000 units (5.0% per year growth),
- Reference case: 387,000 units (6.0% per year growth),
- High case: 422,000 units (6.5% per year growth).

Figure 3-13: Pacific Northwest Auto Exports (1,000 Units)



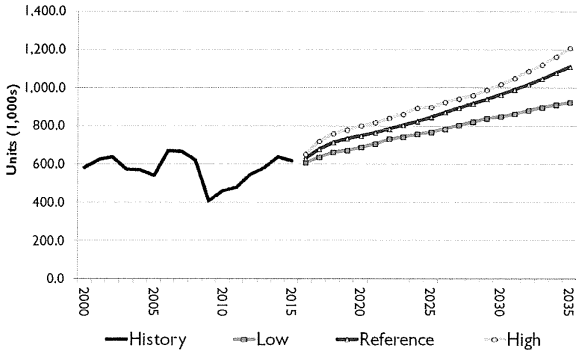
Source: BST Associates, IHS Markit

Summary

Pacific Northwest auto import and export volumes are expected to increase from 616,000 units in 2015 to the following volumes in 2035 as follows:

- Low case: 923,000 units (2.0% per year growth),
- Reference case: 1.1 million units (3.0% per year growth),
- High case: 1.2 million units (3.4% per year growth) (see Figure 3-14 and Table 3-4).

Figure 3-14: Pacific Northwest Auto Imports & Exports (1,000 Units)



Source: BST Associates, IHS Markit

Table 3-4: Pacific Northwest Waterborne Auto Forecast by Direction (1,000 Metric Tons and 1,000 Units)

		History				Forecast				Compound Annual Growth Rate	
Region	Case	2000	2005	2010	2015	2020	2025	2030	2035	2000-2015	2015-2035
	Low					549	577	597	601		1.0%
Import units (1,000)	Reference	571	538	438	496	597	637	678	723	-0.9%	1.9%
	High					638	675	717	787		2.3%
	Low					813	855	885	890		1.0%
Imports (1,000 MT)	Reference	743	817	643	736	885	944	1,005	1,070	-0.1%	1.9%
	High					946	1,000	1,062	1,165		2.3%
	Low					139	191	251	322		5.0%
Exports (1,000)	Reference	11	1	23	121	152	210	285	387	17.6%	6.0%
	High					162	223	302	422		6.5%
	Low					292	398	524	669		5.0%
Exports (1,000 MT)	Reference	16	4	65	252	317	440	595	804	20.1%	6.0%
	High					339	466	628	876		6.4%
	Low					688	767	849	923		2.0%
Total (1,000 units)	Reference	582	539	461	616	748	847	964	1,110	0.4%	3.0%
	High					800	898	1,018	1,208		3.4%
	Low					1,105	1,253	1,409	1,560		2.3%
Total (1,000 MTs)	Reference	760	820	708	988	1,202	1,383	1,599	1,874	1.8%	3.3%
	High					1,286	1,466	1,690	2,041		3.7%

Source: BST Associates, IHS Markit

Summary of Breakbulk and Neobulk Cargoes by Region

Breakbulk and neobulk volumes are summarized by region in Table 3-5. The differential rates of growth are caused by the differences in product mix and direction of trade.

The Lower Columbia Oregon region has lost breakbulk cargo to Lower Columbia Washington and to Northern California; between 2000 and 2015 the region's volume dropped from 1.24 million metric tons 1.05 million metric tons. This drop was partially offset by increased log exports from Astoria, and by coastwise shipments from Rainier, Oregon to Hawaii. Between 2015 and 2035, projected growth in breakbulk and neobulk cargo for the Lower Columbia Oregon region is:

- Low case: 1.4 million metric tons (1.3% per year growth),
- Reference case: 1.6 million metric tons (2.2% per year growth),
- High case: 1.9 million metric tons (3.0% per year growth).

The shift of breakbulk cargo from Lower Columbia Oregon contributed to growth in Lower Columbia Washington, where breakbulk/neobulk volumes rose from 2.5 million metric tons in 2000 to 3.9 million metric tons in 2015. Between 2015 and 2035, projected growth in breakbulk/neobulk volume in the Lower Columbia Washington is:

- Low case: 4.2 million metric tons (0.4% per year growth),
- Reference case: 5.1 million metric tons (1.3% per year growth),
- High case: 6.3 million metric tons (2.4% per year growth).

In the PSRC region, breakbulk/neobulk volumes saw little change over the past 15 years, with 1.57 million metric tons in 2000 and 1.60 million metric tons in 2015. Between 2015 and 2035, projected growth in breakbulk/neobulk volume in the PSRC region is:

- Low case: 2.1 million metric tons (1.3% per year growth),
- Reference case: 2.4 million metric tons (2.0% per year growth),
- High case: 2.8 million metric tons (2.8% per year growth).

Breakbulk/neobulk volumes moving through the Other Puget Sound / Washington Coast region were also essentially flat, with 1.45 million metric tons in 2000 and 1.42 million metric tons in 2015. Between 2015 and 2035, projected growth in breakbulk/neobulk volume in the Other Puget Sound / Washington Coast region is:

- Low case: 1.7 million metric tons (0.7% per year growth),
- Reference case: 2.0 million metric tons (1.6% per year growth),
- High case: 2.4 million metric tons (2.7% per year growth).

Table 3-5: Pacific Northwest Breakbulk/Neobulk Forecast by Region (1,000,000 Metric Tons)

		History				Forecast				Compound Annual Growth Rate	
Region	**Case**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2000-2015**	**2015-2035**
Lower Columbia Oregon	Low	1.24	1.63	1.40	1.05	1.06	1.17	1.28	1.36	-1.1%	1.3%
	Reference					1.14	1.30	1.48	1.63		2.2%
	High					1.28	1.47	1.68	1.88		3.0%
Lower Columbia Washington	Low	2.47	2.57	3.27	3.92	3.61	3.87	4.12	4.20	3.1%	0.4%
	Reference					3.87	4.35	4.89	5.08		1.3%
	High					4.55	5.25	5.98	6.25		2.4%
PSRC	Low	1.57	1.98	1.73	1.60	1.63	1.80	1.96	2.07	0.2%	1.3%
	Reference					1.72	1.96	2.21	2.40		2.0%
	High					1.91	2.20	2.51	2.76		2.8%
Other Puget Sound/ Washington Coast	Low	1.45	1.58	1.25	1.42	1.30	1.43	1.56	1.65	-0.1%	0.7%
	Reference					1.39	1.60	1.84	1.96		1.6%
	High					1.62	1.92	2.26	2.43		2.7%
Total	Low	6.73	7.75	7.65	7.99	7.60	8.26	8.92	9.27	1.2%	0.7%
	Reference					8.12	9.21	10.42	11.07		1.6%
	High					9.36	10.84	12.43	13.32		2.6%

Source: BST Associates, IHS Markit

Grain and Oilseeds

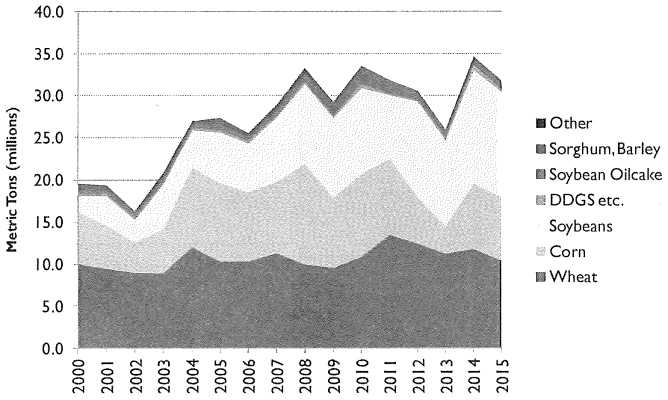
Overview

Grain terminals handle a variety of grains, oilseeds, and related products. These include wheat, corn, barley, soybeans, grain sorghum, and some animal feeds such as beet pulp pellets and DDGS[12].

Exports of grain and oilseeds through Pacific Northwest ports grew from less than 20 million metric tons in 2000 to nearly 35 million metric tons in 2015. Volumes fluctuate from year to year, depending on annual harvest and other factors, but the long-term trend has been one of strong growth (see Figure 3-15)

Wheat, corn, and soybeans account for most of the grain and oilseed volume. Wheat volumes in 2015 were essentially the same as in 2000 (approximately 10.0 million metric tons), but ranged from a low of 9.0 million metric tons to a high of 13.4 million metric tons. Over the same period corn exports grew from 6.2 million to 7.6 million metric tons, and ranged from 3.2 million to 12.0 million metric tons. Soybeans grew from 1.8 million to 12.5 million metric tons, with growth occurring in most years. In fact, between 2010 and 2015 soybean exports dropped to less than 10.0 million metric tons in only one year (i.e. 7.6 million metric tons in 2011).

Figure 3-15: Pacific Northwest Grain and Oilseed Trends)



Source: BST Associates, WISERTrade

Wheat is primarily used for human consumption, as opposed to the coarse grains (corn, barley, sorghum), which are primarily used as animal feed. Demand for human food is less affected by changes in personal income than demand for animal feed, but currency exchange rates do have a strong impact on wheat sales. Competition for wheat exports is intense, particularly with Canada and Australia, among other countries.

In the Pacific Northwest, nearly all wheat and barley exports are handled through ports on the Columbia River. Much of the wheat exported through the Pacific Northwest is grown in the Great Plains, but the ports also handle substantial volumes of wheat grown in Eastern Washington,

[12] DDGS is distiller's dried grains with solubles, the nutrient rich co-product of ethanol production used as a feed ingredient.

Oregon, Idaho, Montana, and Utah. Export sales are critical to farmers in the Pacific Northwest, where 85% to 90% of Washington wheat and 90% of Oregon wheat is sold for export.

Competition is intense in the world coarse grain market, and Washington exporters vie for sales against Brazil, Argentina, and others. Washington ports also face competition from other U.S. port regions, specifically ports on the Gulf of Mexico.

Soybeans are used both for animal feed and for human consumption. The export markets are large and growing, particularly in China. As with other crops, there is strong international competition (mainly from Brazil and Argentina).

Completion of the Columbia River navigation channel deepening project has encouraged significant investments in capacity expansions at grain terminals on the river. These investments have increased annual export capacity from approximately 21 million metric tons to more than 37 million metric tons. These capacity improvements allowed the total volume of grain to jump to a new record of 25 million metric tons in 2014. Terminal improvement projects included:

- Portland - annual throughput capacity of the Columbia Grain Terminal was increased by 2 million metric tons (from approximately 5 million metric tons to 7 million metric tons).
- Vancouver - throughput capacity of the United Grain Terminal also increased by 2 million metric tons (from 4 to 6 million metric tons).
- In Kalama, both export terminals completed projects that increased combined annual capacity from approximately 10 million metric tons to more than 14 million metric tons.
- In Longview, a new terminal was constructed, with annual throughput capacity of 8 million metric tons.

One potential competitive threat to Pacific Northwest ports is future use of larger vessels at U.S. Gulf ports and at South American ports. New locks at the Panama Canal can handle vessels with maximum draft of 60 feet, and the Corps of Engineers is studying the potential to deepen the Mississippi River channel to 50 feet upstream to Baton Rouge. Depending on the origin of the grain (i.e. how far it is grown from the river system) the increased efficiency of the larger vessels could attract a larger share of the grain exports.

Another competitive threat is grain loaded into containers. Although the volume of this type of movement is still small relative to bulk shipments, it does provide shippers with additional options. Grain can be loaded into containers near the farming areas if empty containers are available, or it can be shipped by rail to the vicinity of container ports (such as Los Angeles / Long Beach), where empty containers are available for transloading.

Shifts in trade and consumption patterns have created opportunities for additional growth in grain and oilseed exports for Pacific Northwest ports. For example, the rising number of middle class households in China is expected to increase the demand for exports from the PNW. Changes in Canada's system for sales and distribution of grain have also led to increasing volumes of Canadian grain exported through Columbia River ports.

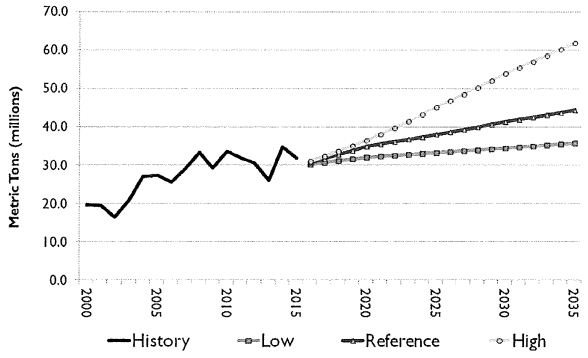
Changes in domestic consumption of corn may also create opportunity for increased exports. An estimated 40% of U.S. corn production is now used to make ethanol production, but demand for ethanol could decrease due to increasing U.S. production of oil, freeing more of the crop for export.

Forecast

Pacific Northwest grain exports grew at an average annual rate of 3.3% between 2000 and 2015. Future growth is projected to range from a low of 0.6% per year to a high of 3.4% per year, with a reference rate of 1.7% (see Figure 3-16)

Corn exports are forecast to grow strongly over the next twenty years, especially if less corn is used domestically in ethanol production. Wheat and soybean exports are also projected to continue growing.

Figure 3-16: Pacific Northwest Grain and Oilseed Forecast (1,000 Metric Tons)



Source: BST Associates, IHS Markit

Regional Forecast

Most of the growth over the past 15 years occurred in the Lower Columbia River Washington region, where volumes doubled. Total tonnage grew from 9.8 million to 19.9 million metric tons, or at an average annual rate of 4.9%, and the region accounted for nearly two-thirds of Pacific Northwest exports. As discussed above, significant new capacity was added to grain terminals in the region, and this investment appears to be paying off. Future growth is projected to range between 0.4% and 3.1% per year, with a reference rate of 2.3% (see Table 3-6).

Lower Columbia Oregon saw a drop in grain exports between 2000 and 2015, although 2015 was an outlier year. Future growth is projected to range between 1.2% and 3.9% per year, with a reference growth rate of 3.9%.

Between 2000 and 2015, grain exports through the PSRC region increased from 5.3 million to 7.0 million metric tons, or at an average annual rate of 1.9%. However, during that period the volume reached nearly 12 million metric tons in some years. Future growth is projected to range between 0.8% and 3.8% per year, with a reference growth rate of 2.0% per year.

Other Puget Sound / Washington Coast ports handled almost no grain exports in 2000, but handled 1.6 million metric tons in 2015. This jump is attributable to the construction of the new AGP export terminal in Aberdeen. Future growth is projected to range between -0.1% and 3.2% per year, with a reference rate of 0.7%.

Table 3-6: Grain Exports by Region (Million Metric Tons)

		History				Forecast				Compound Annual Growth Rate	
Region	**Case**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2000-2015**	**2015-2035**
Lower Columbia Oregon	Low	4.5	5.2	6.1	3.4	4.2	4.3	4.3	4.4	-1.9%	1.2%
	Reference					4.5	4.8	5.1	5.3		2.3%
	High					4.6	5.6	6.5	7.3		3.9%
Lower Columbia Washington	Low	9.8	10.9	14.6	19.9	19.3	20.0	20.8	21.6	4.9%	0.4%
	Reference					21.0	22.9	25.0	26.8		1.5%
	High					21.9	27.1	32.2	36.9		3.1%
PSRC	Low	5.3	10.8	11.8	7.0	7.1	7.5	7.9	8.3	1.9%	0.8%
	Reference					7.8	8.7	9.6	10.4		2.0%
	High					8.2	10.4	12.6	14.7		3.8%
Other Puget Sound/ Washington Coast	Low	0.1	0.5	1.0	1.6	1.4	1.4	1.5	1.5	24.0%	-0.1%
	Reference					1.5	1.6	1.7	1.8		0.7%
	High					1.6	2.0	2.5	2.9		3.2%
Total	Low	19.6	27.4	33.6	31.9	32.1	33.2	34.4	35.8	3.3%	0.6%
	Reference					34.9	38.0	41.3	44.3		1.7%
	High					36.4	45.1	53.9	61.8		3.4%

Source: BST Associates

Dry Bulk Cargoes (Excluding Grain)

Overview

This section examines dry bulk cargo, excluding grains, oilseeds, and related products.

Imports

Alumina once accounted for most dry bulk import tonnage in the Pacific Northwest. For decades the region was home to ten aluminum smelters, but this number has now dropped to only two, and the closure of most of the smelters has significantly reduced imports of alumina. Dry bulk imports are now dominated by construction-related commodities, such as gypsum, limestone, and cement. Fertilizers and chemicals account for most of the remaining import tonnage.

Import tonnage of dry bulks fell from approximately 8.0 million metric tons in 2000 to 7.0 million metric tons in 2015, or a decline of 0.9% per year. Most of this decline occurred between 2007 and 2009, when import tonnage dropped to less than 4.4 million metric tons during the recession. After several years of slow growth imports have recovered strongly.

Future growth rates for import dry bulks are tied closely to projections of construction spending. The reference growth rate averages 1.8% per year from 2015 through 2035, the high growth rate averages 2.1%, and the low rate averages 0.7%. It should be noted that there will likely be one or more economic recessions over the forecast period, and during the oscillations of the economic cycle import volumes may deviate from these growth rates in any given year. Over the long run, however, these growth rates represent the projected annual average growth (see Figure 3-17)

Figure 3-17: Pacific Northwest Other Dry Bulk Imports Forecast (1,000 Metric Tons)



Source: BST Associates, IHS Markit

Exports

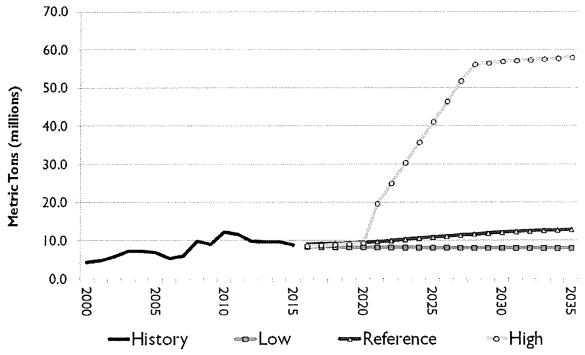
Dry bulk export commodities include minerals, scrap metal, petroleum coke, and hay pellets. Two minerals, potash and soda ash, account for more than two-thirds of dry bulk export tonnage. Soda ash mined in Wyoming has been exported through Portland for decades, while exports of potash (primarily from Saskatchewan) began in the mid-2000's. Other minerals, such as bentonite clay and sulfur, account for less than 4% of export dry bulk tonnage. Copper concentrates from Montana are exported via the Port of Vancouver.

Most of the remaining export dry bulk tonnage consists of petroleum coke and scrap metal. Petroleum coke is produced in steady volumes by the petroleum refineries on northern Puget Sound, and accounts for approximately 14% of export dry bulk tonnage. Scrap metal also accounts for 14% of export tonnage. Wood chips accounted for 14% of export tonnage in 2000, but dropped to just 2% of tonnage in 2015.

Between 2000 and 2015, dry bulk exports volumes grew at an annual rate of 5.0%. Much of this growth was due to the start-up of potash exports, which did not exist in 2000. Soda ash volumes also grew also over that time. From 2015 through 2035, the reference growth rate is projected to average 1.9% per year (see Figure 3-18)

The high case forecast growth rate is 10.2% per year; based on the assumption that coal will begin to be exported through the U.S. Pacific Northwest. The high case assumes that the Millennium Bulk Terminal in Longview is constructed and operates at maximum volume (i.e. 44 million metric tons per year.)

Figure 3-18: Pacific Northwest Other Dry Bulk Exports Forecast (1,000 Metric Tons)



Source: BST Associates, IHS Markit

Regional Forecast

More than half of dry bulk import tonnage moves through ports in the PSRC region. The region is home to a number of plants that manufacture construction materials, including cement plants, wallboard plants, and concrete batch plants. Key commodities include gypsum, limestone, sand and gravel, and scrap metal. Dry bulk imports moving through ports in the PSRC region are projected to grow from 3.9 million metric tons in 2015 to 6.3 million metric tons under the reference forecast, and to range between 5.0 million metric tons and 6.6 million metric tons. The rate of growth over twenty years is 2.5% per year under the reference forecast, 1.2% under the low forecast, and 2.7% under the high forecast (see Table 3-7).

Lower Columbia Oregon ports handle approximately one-quarter of import dry bulks. Growth was slow between 2000 and 2015, averaging 0.1% per year. From 2015 through 2035 the reference growth rate is 0.3%, with a low rate of -0.7% and a high rate of 0.7%. As with the PSRC region, the primary commodities are construction-related, including gypsum, limestone, and cement. Fertilizer accounts for most of the remaining tonnage.

Dry bulks import volumes are relatively limited in both the Lower Columbia Washington and Other Puget Sound / Washington Coast region, and the volumes of imports dropped in both regions

between 2000 and 2015. For the Lower Columbia Washington ports the main source of the decline was alumina, which dropped sharply as smelters closed. Fertilizer and chemicals account for most of the tonnage now, and both saw increasing volumes between 2000 and 2015. For Other Puget Sound / Washington Coast ports, the main source of the declining tonnage was limestone and aggregates. Future growth for Lower Columbia Washington is projected to range between 1.1% and 2.6% per year, with a reference growth rate of 2.2%. Growth in Other Puget Sound / Washington Coast is projected to range between -0.2% and 0.7% per year, with a reference growth rate of 0.2%.

For the entire region, dry bulk imports are projected to grow at an average annual rate of 1.8% under the reference case, 0.7% under the low case and 2.1% under the high case.

Table 3-7: Dry Bulk Imports by Region (Million Metric Tons)

		History				Forecast				Compound Annual Growth Rate	
Region	**Case**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2000-2015**	**2015-2035**
Lower Columbia Oregon	Low	1.9	2.1	1.2	1.9	1.6	1.6	1.6	1.7	0.1%	-0.7%
	Reference					1.7	1.8	1.9	2.0		0.3%
	High					1.8	1.9	2.1	2.2		0.7%
Lower Columbia Washington	Low	0.9	0.6	0.8	0.7	0.9	0.9	0.9	0.9	-1.6%	1.1%
	Reference					0.9	1.0	1.1	1.1		2.2%
	High					1.0	1.0	1.1	1.2		2.6%
PSRC	Low	4.7	4.6	2.2	3.9	4.3	4.5	4.7	5.0	-1.2%	1.2%
	Reference					4.7	5.3	5.9	6.3		2.5%
	High					4.9	5.5	6.2	6.6		2.7%
Other Puget Sound/ Washington Coast	Low	0.5	0.1	0.4	0.4	0.4	0.4	0.4	0.4	-0.8%	-0.2%
	Reference					0.5	0.5	0.4	0.4		0.2%
	High					0.4	0.4	0.5	0.5		0.7%
Total	Low	8.0	7.5	4.6	7.0	7.2	7.4	7.7	8.0	-0.9%	0.7%
	Reference					7.7	8.5	9.4	9.9		1.8%
	High					8.1	8.9	9.9	10.5		2.1%

Source: BST Associates, IHS Markit

Most dry bulk exports move through the Lower Columbia region, especially the Lower Columbia Oregon. Combined, the Lower Columbia Oregon and Lower Columbia Washington regions accounted for 85% of dry bulk exports in 2015, and tonnage more than doubled between 2000 and 2015. Portland accounts for the largest share of these movements, due to the high volumes of potash and soda ash exports.

Export tonnage increased by an average of 5.8% per year in the Lower Columbia Oregon between 2000 and 2015. Future growth is projected to range between -0.3% and 2.3%, with a reference growth rate of 1.8% per year. In the Lower Columbia Washington region the projected low and reference growth rates are similar to those for Oregon. The high rate, however, is much higher, due to the inclusion of Millennium Bulk Terminal coal exports (see Table 3-8).

The PSRC region saw declining dry bulk exports between 2000 and 2015, due almost entirely to a fall in wood chip exports. Volumes dropped by an average of -2.9% per year between 2000 and 2015. With wood chips gone and not expected to return, the different commodity mix results in projected growth rates ranging between 0.2% and 5.0% per year, with a reference growth rate of 3.2% per year.

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Other dry bulk exports doubled in volume through ports in the Other Puget Sound / Washington Coast region between 2000 and 2015, although the total volume handled is much smaller than through the Columbia River. Growth averaged 4.9% per year between 2000 and 2015, but is forecasted to slow between 2015 and 2035. Future growth is projected to range between -0.1% and 1.9%, with a reference growth rate of 1.4%.

For the region as a whole, the reference growth rate for dry bulk exports is 1.9% per year, the low rate is -0.2% and the high growth rate is 10.6%. The large jump between the reference and high growth rates is due to the inclusion of Millennium Bulk Terminal coal in the high forecast.

Table 3-8: Dry Bulk Exports by Region (Million Metric Tons)

		History				Forecast				Compound Annual Growth Rate	
Region	**Case**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2000-2015**	**2015-2035**
Lower Columbia Oregon	Low	2.0	3.3	5.4	4.6	4.4	4.3	4.3	4.3	5.8%	-0.3%
	Reference					4.8	5.5	6.2	6.6		1.8%
	High					5.0	5.9	6.7	7.2		2.3%
Lower Columbia Washington	Low	1.1	1.5	1.5	1.8	1.7	1.7	1.7	1.7	3.1%	-0.2%
	Reference					1.9	2.2	2.4	2.5		1.8%
	High					7.0	46.4	46.8	47.1		17.8%
PSRC	Low	0.9	1.2	1.2	0.6	0.6	0.6	0.6	0.6	-2.9%	0.2%
	Reference					0.7	0.8	1.0	1.0		3.2%
	High					0.7	1.0	1.3	1.5		5.0%
Other Puget Sound/ Washington Coast	Low	0.3	0.1	0.2	0.6	0.6	0.6	0.6	0.6	4.9%	-0.1%
	Reference					0.6	0.7	0.7	0.8		1.4%
	High					0.6	0.7	0.8	0.9		1.9%
Total	Low	4.2	6.1	8.3	7.5	7.3	7.2	7.1	7.1	3.9%	-0.2%
	Reference					8.0	9.2	10.3	10.9		1.9%
	High					13.3	54.0	55.7	56.6		10.6%

Source: BST Associates, IHS Markit

Liquid Bulks

Waterborne liquid bulk traffic in the Pacific Northwest is dominated by crude oil and refined petroleum products. A variety of other liquid commodities (e.g. animal fats, vegetable oils, chemicals, and fertilizers) are also handled, but in much smaller volumes.

Crude Oil

Five refineries on Puget Sound receive crude oil by water: two at Cherry Point near Ferndale, two at March Point near Anacortes, and a smaller facility in Tacoma. Puget Sound refineries have the capacity to process approximately 631,700 barrels of crude oil per day; incremental improvements to these facilities increased production capacity by an average of 0.6% per year between 1995 and 2015.[13] However, the amount of crude oil actually processed has remained relatively constant at approximately 560,000 barrels per day.[14] (See Table 3-9).

Table 3-9: Puget Sound Refinery Capacity (barrels per day)

Area	1995	2015	CAGR 1995-2015
Tacoma	44,300	40,700	-0.4%
Anacortes	236,500	265,000	0.6%
Ferndale	284,000	326,000	0.7%
Total	564,800	631,700	0.6%

Source: U.S. Energy Information Administration

As shown in Table 3-10, Washington refineries receive crude oil via seven different combinations of sources and modes of transportation.

Table 3-10: Puget Sound Crude Oil Sources and Routes

Source and Type of Crude	#	Route	Estimated Loading in 2015
Alaska (Alaska North Slope or (ANS))[10]	1	by tanker to the refineries	250,000 bbls/day or 45%, down from 90% in 2003 and expected to continue to decline.
Canadian crude from Alberta (heavy, medium and light)	2	by Trans Mountain Mainline Pipeline to Abbotsford, BC and then by Kinder Morgan's Puget Sound pipeline system to the refineries	140,000 bbls per day or 25% from 2011 to 2015, up from 10% in 2003
	3	by Trans Mountain Mainline Pipeline to the Westridge Terminal in Burnaby BC and then by barge to the refineries	
	4	by rail to refineries in Puget Sound	
Inland U.S., mostly Bakken (mainly light shale crude)	5	by rail to refineries in Puget Sound	140,000 bbls per day or 25%, up from 2% in 2011
	6	by rail to marine transload terminals and then by barge to Puget Sound	
Overseas imports from Latin America, the Middle East, and other global sources (a mix of heavy, medium and light)	7	by tanker to the refineries	30,000 bbls per day or 5%, down from 19% in 2011

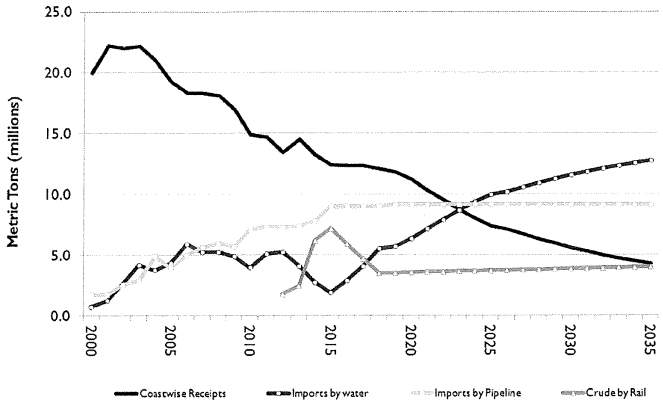
Source: Ian Goodman & Brigid Rowan

[13] Source: U.S. Energy Information Administration (EIA) refinery capacity reports.

[14] Source: Ian Goodman & Brigid Rowan, Technical Appendix to Expert Testimony on the Need for the Vancouver Energy Distribution Terminal: Market Analysis, May 13, 2016

Washington refineries have historically relied primarily on crude oil from Alaska, but as illustrated in Figure 3-19, crude oil receipts from Alaska peaked in 2003 and 2004, and have steadily declined since then. Forecasts by the Alaska State Department of Revenue and the U.S. Energy Information Administration (EIA) both project continued declines in crude oil production in Alaska. This continued decline in Alaskan crude oil is causing refineries to seek new sources and routes.

Figure 3-19: Pacific Northwest Crude Oil Receipts by Source: Reference Case (Million Metric Tons)



Source: BST Associates, IHS Markit

Canada is one alternative source of crude oil for the refineries. Canadian crude is received via pipeline, vessel (barge and tanker), and rail. The Trans Mountain Pipeline (owned by Kinder Morgan) connects oil fields in Alberta to the Westridge Terminal in Burnaby, B.C. An extension of this pipeline reaches the Washington refineries at Cherry Point and March Point. The Canadian Government recently granted Kinder Morgan a permit to expand the capacity of the Trans Mountain Pipeline from 300,000 barrels per day to 890,000 barrels per day[15]. Construction is expected to be completed by the end of 2019. However, the capacity of the extension to Washington refineries (approximately 180,000 barrels per day) will not be increased under this plan.

Canadian crude oil can also be shipped by water from the Westridge Terminal to Washington refineries, although the amount available depends on the level of demand for this same crude oil in Asia.

Canadian crude oil is also shipped by rail to Puget Sound refineries. In 2014 and 2015, regional receipts of crude by rail ("CBR") from Canada were an estimated at 3.4 million barrels per year.[16]

Domestic oil from the Lower 48 states is another alternative source of crude oil for the refineries. Most of this crude oil is originates in North Dakota (PADD 2[17]) and Utah (PADD 4), and is shipped to Washington by rail. The first CBR shipments to Washington were received in 2011, when approximately 250 carloads were received. The volume jumped to more than 80,000 carloads in 2015, including some receipts from Canada.

[15] There are 157 conditions that need to be met to construct the pipeline expansion.

[16] CBR volumes are based on data from EIA and the California Energy Commission.

[17] The United States is divided into five Petroleum Administration for Defense Districts, or PADDs

Most of the CBR was shipped directly to refineries in Washington, but a portion was also shipped by rail to a terminal on the Columbia River near Clatskanie, Oregon and then barged to Puget Sound. Shipments through this Oregon terminal peaked in 2014 at 9,151 railcars, and then fell to 1,345 railcars in 2015. This decline was due to completion of rail unloading facilities at four of the five Puget Sound refineries (The Shell refinery near Anacortes is the only refinery without a rail unloading facility. Shell was planning such a facility, but decided not to complete the environmental impact study for the project.)

Use of CBR by Washington refineries depends on the price and availability of oil. Inland U.S. oil is typically pegged to the West Texas Intermediate crude oil price and foreign oil is pegged to the Brent oil index. From 2011 to 2015, as the crude oil production rose in the U.S. (especially North Dakota), the price for domestic oil dropped. The difference in price between North Dakota oil and international oil was as much as $13 to $25 per barrel, driving up demand from the Washington refineries. Since 2015, however, the price differential has dropped significantly.

Availability of North Dakota oil will be impacted by pipeline construction. As new lines are completed that connect North Dakota oil fields to the existing pipeline system, more of the oil will be shipped by pipeline. For the most part these pipelines run to the Gulf Coast and East Coast; they do not connect to the West Coast. The shift to pipeline will not end CBR shipments to the Pacific Northwest, but the share of oil transported by rail to the refineries will decline.

The Washington refineries can also receive crude oil by tanker from foreign sources other than Canada. As noted above, these other foreign sources currently account for 5% of the supply, down from 19% in 2011.

Under the reference case, the modal split in 2035 is projected to be:

- Vessel from Alaska: 14%
- Pipeline from Canada: 30%
- Vessel from foreign sources (including Canada): 42%
- Rail: 13%

In addition to the rail unloading facilities at Washington refineries, a number of terminals have been proposed to transfer oil from rail to vessel.[18]. These include:

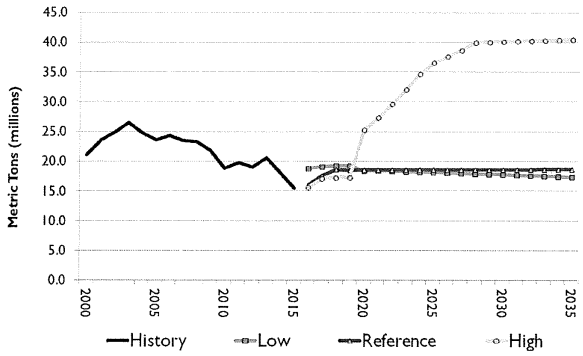
- Vancouver Energy Terminal (Port of Vancouver) – capacity of 360,000 barrels of crude oil per day, under review.
- Westway Terminal (Port of Grays Harbor) – 23,000 barrels of crude oil per day, under review.
- Global Partners (Port of St Helens at Port Westward) – capacity of 30,000 barrels of crude oil per day.
- Imperium Terminal (Port of Grays Harbor) – capacity of 14,000 barrels of crude oil per day.
- Arc Logistics (Portland) – capacity of 14,000 barrels of crude oil per day.
- NuStar Terminal (Port of Vancouver) – capacity of 41,000 barrels of crude oil per day.

[18] Included at the time of the forecasts.

These proposed rail-to-vessel terminals could supply domestic markets (notably California) as well as foreign markets, since export of U.S. crude oil was legalized in 2016. The high cast forecast includes these terminals, while the reference and low cases do not.

As shown in Figure 3-20, crude oil receipts are expected to remain relatively stable under the low and reference cases, with volumes averaging around 19 million metric tons per year through the end of the forecast period. The loss of Alaskan crude is fully offset by foreign sources arriving by water (barges and tankers). Under the high case scenario, crude oil used by refineries is projected to reach 21 million tons per year while crude oil moving through rail-to-vessel terminals is projected to reach the planned capacity of 25 million tons in 2025, and then to remain at that level through 2035.

Figure 3-20: Pacific Northwest Crude Oil Receipts and Shipments[19] (Million Metric Tons)



Source: BST Associates, IHS Markit

Refined Petroleum Products

Puget Sound refineries supply 90% approximately of the refined petroleum products consumed in Washington and Oregon; the remaining 10% moves by pipeline from other states, primarily Utah and Montana. As shown in Table 3-11, the Seattle and Portland areas generate most of the demand for refined products, and account for 46% and 25%, respectively[20]. Other communities account for the remaining demand.

[19] Includes domestic and foreign sources of crude oil.

[20] U.S. Department of Homeland Security National Protection and Programs Directorate Office of Cyber and Infrastructure Analysis Columbia River Basin Petroleum and Refined-Product Supplies: Disruptions and Mitigations under Cascadia Subduction Zone Earthquake, Scenario, July 2016

Table 3-11: Average Refined Product Demand in Washington and Oregon

Demand Region	Barrels per Day (1,000's)	Percent of Market
Seattle	216.9	46%
Portland	117.88	25%
Eugene	47.15	10%
Moses Lake	9.43	2%
Kennewick-Richland	42.43	9%
Spokane	37.72	8%
Total	**471.51**	100%

Source: U.S. Department of Homeland Security

Washington and Oregon have a total of four pipelines that carry refined petroleum products. These include:

- Olympic Pipeline,
- Tesoro Pipeline,
- Yellowstone Pipeline, and
- Kinder Morgan Pipeline.

Of these, the Olympic Pipeline is the most important. This line runs from the refineries on Puget Sound as far south as Portland, and has distribution terminals located at Bayview (Mount Vernon), Seattle, Renton, Sea-Tac, Tacoma, Spanaway, Olympia, and Vancouver in Washington, as well as Linnton and Portland in Oregon. This line carries gasoline, diesel fuel and jet fuel, and has annual throughput capacity of approximately 4.6 billion gallons. This pipeline carries a relatively large share of the refined products shipped to the Portland area.

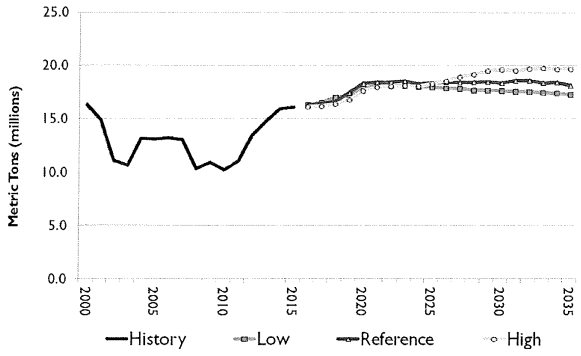
The Tesoro Pipeline runs from refineries near Salt Lake City to Pasco, with an extension from Pasco to Spokane. The Yellowstone Pipeline runs from Billings, Montana to Spokane and Moses Lake. The Kinder Morgan Pipeline runs from Portland to Eugene, and supplies virtually all of the gasoline used in the Willamette Valley.

Some of the petroleum products from the Puget Sound refineries are shipped by water to Alaska, California, and British Columbia, as well as to other domestic and foreign destinations. In 2000, 16.3 million metric tons of refined products was shipped or received by water. Volumes were higher in 2000 and 2001 while the Olympic Pipeline was out of service. After the pipeline was repaired the volume moving by water dropped to approximately 10 to 13 million metric tons for several years, but climbed back to 16 million metric tons again in 2015. The recent increase in volume was due to growth in shipments of refined products to British Columbia and other foreign destinations.

As shown in Figure 3-21, between 2015 and 2035, waterborne shipments and receipts of refined products are projected to grow to:

- Low case: 17.3 million metric tons (0.5% per year growth),
- Reference case: 18.1 million metric tons (0.8% per year growth),
- High case: 19.7 million metric tons (1.4% per year growth).

Figure 3-21: Pacific Northwest Refined Product Shipments & Receipts (Million Metric Tons)



Source: BST Associates, IHS Markit

Other Liquid Bulks

Other liquid bulks include animal fats, vegetable oils, chemicals, fertilizers, and methanol.

Animal fats and vegetable oils

Animal fats and vegetable oils are used as ingredients for animal feed, and as inputs to biodiesel production, among other uses. Shipments and receipts of animal fats and vegetable oils averaged less than 100,000 metric tons between 2000 and 2015, and ranged from a low of 19,600 metric tons in 2015 to a high of 123,000 metric tons in 2008. Projected growth of these products from 2015 through 2035 is:

- Low case: 22,000 metric tons (0.5% per year growth),
- Reference case: 38,000 metric tons (4.4% per year growth),
- High case: 53,000 metric tons (6.9% per year growth).

Chemicals and fertilizers

Chemicals and fertilizers include caustic soda and sodium hydroxide (used in the forest products industry), benzene and toluene (used in the chemical industry), and nitrogenous fertilizers (used in the agricultural industry), among others. Shipments and receipts of chemicals and fertilizers declined between 2000 and 2015, ranging from a low of 414,000 tons in 2012 and a high of 880,000 tons in 2002. Projected growth of these products from 2015 through 2035 is:

- Low case: 426,000 metric tons (-1.9% per year growth),
- Reference case: 850,000 metric tons (2.7% per year growth),
- High case: 1.3 million metric tons (5.5% per year growth).

Methanol

Methanol plants are proposed at the Port of Kalama and the Port of St. Helens. Methanol is a primary input to manufacturing plastics and other products, and demand is strong in Asia. Methanol is currently produced in China using crude oil and coal as feedstocks. The methanol manufactured at the Port of Kalama and Port of St. Helens would use natural gas as a feedstock, which is relatively clean when compared to oil and coal, and is relatively abundant in North America. Each of the

plants would produce approximately 10,000 metric tons of methanol per day (or approximately 3.4 million metric tons per year, per plant). It is assumed that the plants would begin construction in 2018 and production in 2021 (at 1.8 million metric tons) and then ramp up to full production by 2024.

The methanol plants should have minimal impacts on road and rail infrastructure. The primary input, natural gas, is transported via pipeline. The finished product will be piped a short distance from the plant to the dock.

Summary of Liquid Bulks

Table 3-12 summarizes historical trends and projected growth rates for the different liquid bulk commodities.

Table 3-12: Pacific Northwest Waterborne Liquid Bulk Traffic by Category (Million Metric Tons)

		History				Forecast				Compound Annual Growth Rate	
Region	**Case**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2000-2015**	**2015-2035**
Crude Oil	Low	21.1	23.6	18.8	15.5	18.4	18.1	17.8	17.4	-2.0%	0.6%
	Reference	21.1	23.6	18.8	15.5	18.6	18.6	18.6	18.7		1.0%
	High	21.1	23.6	18.8	15.5	25.3	36.6	40.1	40.4		4.9%
Petroleum Products	Low	16.3	13.1	10.2	16.1	17.9	18.0	17.6	17.3	-0.1%	0.4%
	Reference	16.3	13.1	10.2	16.1	18.3	18.4	18.4	18.1		0.6%
	High	16.3	13.1	10.2	16.1	17.6	18.3	19.6	19.7		1.0%
Animal Fats & Vegetable Oils	Low	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-6.3%	0.6%
	Reference	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0		3.3%
	High	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1		5.1%
Chemicals & Fertilizers	Low	0.7	0.7	0.6	0.6	0.3	0.4	0.4	0.4	-1.8%	-1.5%
	Reference	0.7	0.7	0.6	0.6	0.7	0.7	0.9	0.9		2.0%
	High	0.7	0.7	0.6	0.6	1.0	1.1	1.3	1.3		4.1%
Methanol	Low	-	-	-	-	-	-	-	-	NM	NM
	Reference	-	-	-	-	-	-	-	-		NM
	High	-	-	-	-	-	6.8	6.8	6.8		NM
Total	Low	38.1	37.5	29.7	32.1	36.6	36.5	35.8	35.1	-1.1%	0.4%
	Reference	38.1	37.5	29.7	32.1	37.6	37.8	37.9	37.7		0.8%
	High	38.1	37.5	29.7	32.1	43.9	62.9	67.9	68.3		3.8%

Source: BST Associates, IHS Markit

Regional Forecast

Regional splits for liquid bulk volumes are presented in Table 3-13.

The Lower Columbia Oregon region experienced a decline in liquid bulks between 2000 and 2015, with volumes dropping from 7.3 million metric tons in 2000 to 3.4 million metric tons in 2015. The volume in 2000 was much higher than in other years, due to the Olympic Pipeline being out of service and a shift from pipeline to vessel. This temporary shift ended after the pipeline was repaired and put back into services. Between 2015 and 2035, liquid bulk volumes in the Lower Columbia Oregon are projected to grow to:

- Low case: 3.0 million metric tons (-0.6% per year growth),

- Reference case: 3.9 million metric tons (0.8% per year growth),
- High case scenario (includes methanol at St Helens, and CBR at Portland and St Helens): reaching 8.0 million metric tons (4.4% per year growth).

Liquid bulk traffic in the Lower Columbia Washington region ranged between 250,000 metric tons and 650,000 metric tons from 2000 through 2015. Between 2015 and 2035, liquid bulk volumes in the Lower Columbia Washington are projected to grow to:

- Low case: 289,000 metric tons (-1.5% per year growth),
- Reference case: 570,000 metric tons (1.9% per year growth),
- High case (includes CBR at Vancouver and methanol at Kalama): 20.0 million metric tons (21.7% per year growth).

The PSRC region's liquid bulk traffic increased from 2.4 million metric tons in 2000 to 3.5 million metric tons in 2015, or at an average annual growth rate of 2.6%. Between 2015 and 2035, liquid bulk volume in the PSRC region is projected to grow to:

- Low case: 4.5 million metric tons (1.3% per year growth),
- Reference case: 4.6 million metric tons (1.5% per year growth),
- High case: 4.9 million metric tons (1.7% per year growth).

Liquid bulk volumes in the Other Puget Sound / Washington Coast region dropped from 28.2 million metric tons in 2000 to 24.9 million metric tons in 2015 due to falling crude oil receipts from Alaska. Between 2015 and 2035, liquid bulk volume in the Other Puget Sound / Washington Coast region is projected to increase to:

- Low case: 27.4 million metric tons (0.5% per year growth),
- Reference case: 28.6 million metric tons (0.7% per year growth),
- High case (includes CBR at Grays Harbor): 35.4 million metric tons (1.8% per year growth).

Table 3-13: Pacific Northwest Waterborne Liquid Bulk Traffic by Region (Million Metric Tons)

		History				Forecast				Compound Annual Growth Rate	
Region	Case	2000	2005	2010	2015	2020	2025	2030	2035	2000-2015	2015-2035
Lower Columbia Oregon	Low	7.3	4.0	2.3	3.4	2.9	3.0	3.0	3.0		-0.6%
	Reference	7.3	4.0	2.3	3.4	3.5	3.6	3.8	3.9	-5.0%	0.8%
	High	7.3	4.0	2.3	3.4	5.8	7.7	7.9	8.0		4.4%
Lower Columbia Washington	Low	0.3	0.6	0.7	0.4	0.2	0.3	0.3	0.3		-1.5%
	Reference	0.3	0.6	0.7	0.4	0.5	0.5	0.6	0.6	1.3%	1.9%
	High	0.3	0.6	0.7	0.4	8.6	17.8	20.0	20.0		21.7%
PSRC	Low	2.4	3.2	3.2	3.5	4.5	4.5	4.5	4.5		1.3%
	Reference	2.4	3.2	3.2	3.5	4.6	4.6	4.6	4.6	2.6%	1.5%
	High	2.4	3.2	3.2	3.5	4.5	4.6	4.8	4.9		1.7%
Other Puget Sound/ Washington Coast	Low	28.2	29.7	23.5	24.9	29.0	28.7	28.1	27.4		0.5%
	Reference	28.2	29.7	23.5	24.9	29.1	29.0	29.0	28.6	-0.8%	0.7%
	High	28.2	29.7	23.5	24.9	28.6	32.7	35.1	35.4		1.8%
Total	Low	38.1	37.5	29.7	32.1	36.6	36.5	35.8	35.1		0.4%
	Reference	38.1	37.5	29.7	32.1	37.6	37.8	37.9	37.7	-1.1%	0.8%
	High	38.1	37.5	29.7	32.1	43.9	62.9	67.9	68.3		3.8%

Source: BST Associates, IHS Markit

Chapter 4
Inland Navigation System

Introduction

The Columbia/Snake River System is one of the most important waterway systems in the United States. It begins at the mouth of the Columbia River and extends 465 miles to Lewiston, Idaho, at the confluence of the Snake and Clearwater Rivers. The deep draft portion of the navigation system is 43 feet deep and 600 wide, and runs 105 miles from the mouth of the Columbia River to Portland and Vancouver. Other ports along the deep draft channel include Longview, Kalama, and Woodland in Washington, and Astoria and St. Helens in Oregon.

The inland navigation system extends 360 miles along the Columbia River from Vancouver to Pasco, and along the Snake River from Pasco to Lewiston, Idaho, and along the last several miles of the Clearwater River in Lewiston. The system includes four locks and dams on the Columbia River and four locks and dams on the Snake River. The system is maintained to a minimum depth of 14 feet.

The deep draft and shallow draft channels are both critical portions of the river transportation system. A large volume of the grain and other products exported through the deep draft ports is shipped by barge to the export terminals, while fertilizer and other commodities are imported by ship and then barged upriver.

Key Findings

- The inland navigation system is critical to the success of grain farmers in the Pacific Northwest, allowing them to compete on world markets. Barge grain volumes have held steady in recent years, averaging approximately 4 million metric tons per year.
- Loss of container service at Portland eliminated most barge movements of export containers. The cargo carried in these containers primarily included pulp and paper, hay, and lentils. Most this containerized cargo is now trucked to Seattle and Tacoma for export.
- Volumes of forest products (wood chips, logs, etc.) and aggregates (sand and gravel) have been steady, and are projected grow slowly.
- Volumes of municipal solid waste (i.e. garbage) have grown.
- Volumes of petroleum products dropped substantially between 2000 and 2015, due in part to closure of the Port of Wilma oil storage terminal.
- Loss of the inland navigation due to dam breaching would negatively impact roads and rail lines in the region.

Description of the Columbia-Snake River Navigation System

The deep draft portion of the Columbia River was maintained at an authorized depth of 40 feet for decades, beginning in the 1970's. In the late 1980's, several Columbia River ports joined together to request the Congress to direct the Corps of Engineers to study navigation in the river. The initial study began in 1989, and the record of decision authorizing a deepening of the channel to 43 feet was finally signed in 2004. Deepening began in 2006, and was completed in 2010.

Since the deepening was completed, public and private entities have invested more than $1 billion in improvements to marine terminals and other infrastructure in order to maximize the utilization of the improved system.[21]. These improvements have included:

- Construction of the first new grain terminal built in the U.S. in 25 years,
- Expansion of the largest export grain terminal on the West Coast of the U.S.,
- Construction of the first new grain barge on the Columbia River since 2011, and
- Purchase of the largest drydock in the U.S.

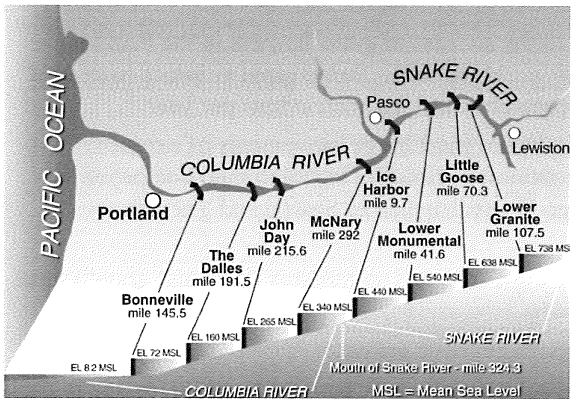
Several improvements are being considered for the system, including:

- Methanol plants at the Port of Kalama and the Port of St Helens,
- A crude oil terminal at the Port of Vancouver, and
- A coal terminal in Longview, among others.

There are eight dams and navigational locks in the Columbia and Snake River that facilitate barge traffic movements. The Columbia River locks are located at the Bonneville, The Dalles, John Day and McNary Dams. The Snake River locks are located at Ice Harbor, Lower Monumental, Little Goose and Lower Granite Dams.

Most Washington inland ports are located in the McNary, Lower Granite, and Little Goose pools. Port facilities in Pasco and Walla Walla are located in the McNary pool, port facilities at Clarkston and Wilma are in the Lower Granite pool, and the port facilities at Almota and Central Ferry are located in the Little Goose pool.

Figure 4-1: Map of Columbia-Snake River Navigation System



Source: Pacific Northwest Waterways Association

All upriver locks have upper and lower miter sills (i.e., the chamber wall under water at each end of the lock channel) of 15 feet. The existence of these locks and authorized maintenance of the river pools at a 14-foot depth allows for low cost transportation of local and regionally produced commodities.

The river system has typically been managed to approximately 4 to 5 feet above minimum pool depending on the pool, in order to maintain a minimum 14-foot depth within the channel. However,

[21] Source: Impacts of Channel Deepening on the Columbia River, by ECONorthwest for the Pacific Northwest Waterways Association, June 2015.

the consideration of dam breaching or flow augmentation alternatives to enhance salmon revitalization efforts places these operating systems in jeopardy, because the locks would become "stranded" above lower than minimum required levels.

The barge system has evolved to take maximum advantage of the authorized minimum pool characteristics. "Jumbo" grain barges capable of carrying 3,600 tons of grain have become the mainstay of the wheat export fleet and are the largest vessels on the river system, drawing 13.5 feet. Container and other barges typically have a draft of 10 to 11 feet. Larger tugs typically push four barges and have a draft of 11 to 12 feet.

Access to the inland navigation system is a critical component of the success of the deep draft navigation system, and offers a low cost alternative to rail transportation. In addition to the transportation benefits, the dam system also provides irrigation, power generation, flood control, and recreational facilities.

Cargo Trends

Columbia River Inland Navigation Cargo Trends

Grain moving downstream continues to be the lifeblood of the barging system on the Columbia/Snake River System, accounting for 56%[22] of all commodity tonnage moving on the Columbia River section of the system (as measured at the Bonneville Lock and Dam). Approximately 90% of the wheat grown in Washington and Oregon is exported, and approximately 40% of all wheat shipped from Lower Columbia export terminals arrives by barge. The inland navigation system is a critical asset that allows regional grain shippers to compete in world markets.

Upbound movements of petroleum products are also key, accounting for an average of 20% of cargo movements at Bonneville. Other commodities, such as crude materials (logs and wood chips, among other products), and other products (chemicals and fertilizer, manufactured products and garbage) make up the remainder.

As shown in Figure 4-1 and Table 4-1, overall traffic growth on the Columbia River section of the Columbia/Snake River inland navigation system is projected to grow under all three scenarios. Between 2015 and 2035 the volume is projected to grow to:

- Low case: 6.63 million metric tons (0.2% per year growth),
- Reference case: 7.59 million metric tons (0.9% per year growth),
- High case: 8.84 million metric tons (1.7% per year growth).

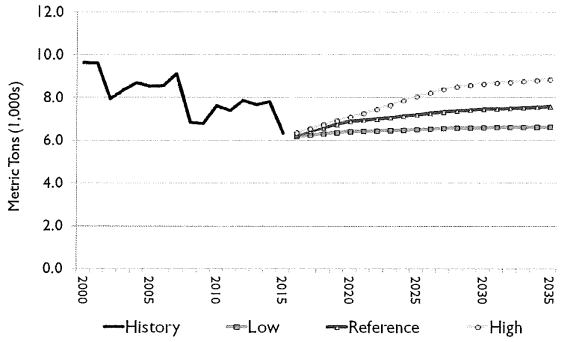
While the projected rates of growth are relatively low, they represent steady demand for barge transportation. Millions of tons of cargo is moved by barge, and includes some of the main commodities produced in the inland Northwest.

It should also be noted 2015 tonnage was relatively low (i.e. 3.4 million metric tons), due to low harvest volumes in 2015. Initial reports for 2016 indicate that grain volumes were closer to the recent average of 4.4 million metric tons.

Loss of the barge system would force existing cargo traffic onto the rail and road system. The impact on the road system would likely be substantial as traffic shifted from existing routes to new ones, especially if these new routes were not built for heavy truck traffic. The additional shipping could also cost local farmers a portion of their potential sales.

[22] Average value calculated for the period 2000 to 2015.

Figure 4-2: Columbia River Waterborne Traffic above Bonneville Lock (Million Metric Tons)



Source: BST Associates, U.S. Army Corp of Engineers, IHS Markit

Cargo Forecast by Commodity Group

Forecasts for major commodity groups are described in the following section. These forecasts are summarized in Table 4-1.

Food and farm products

The food and farm product category consists almost entirely of grain. Between 2000 and 2015, the volume of grain moving by barge on the river declined as new, high-capacity rail loading facilities came online in Montana and Washington. However, the volume of grain shipped by barge has stabilized in recent years at an average of approximately 4 million metric tons per year.

Wheat is the primary grain crop transported by barge. Harvested volumes can vary widely from year to year, but the long-term trend in the region (i.e. Washington, Oregon, and Idaho) is one of slow growth in wheat production. At the same time that production has increased, the acreage dedicated to wheat production has slowly declined, which shows that yield per acre has trended upward.

The reference case projects that barged volumes of grain will remain at approximately this level over the long run. Under the low case scenario, volumes in 2035 are projected to be 3.8 million metric tons, and under the high growth scenario 2035 volumes are projected to be 5.2 million metric tons.

Other food products (frozen potatoes, onions, peas and lentils) and farm products (hay and animal feeds) generally move in containers on barge, but the decline and subsequent loss of container service in Portland essentially eliminated this type of move. These products are now transported by truck, rail or truck-rail combination directly to the Northwest Seaport Alliance container terminals. As production of peas and lentils increases the volumes may reach the level where shipment via bulk ship (rather than containers) is feasible, which in turn could lead to additional traffic for the barge system. However, this opportunity was not included in this forecast.

Crude materials

Crude materials are primarily composed of wood chips, logs, other forest products and sand and gravel. Between 2000 and 2015, the annual volumes in this category ranged from 1.2 million

metric tons to 1.5 million metric tons. The exception was 2009, when volumes dropped to 700,000 metric tons during the great recession.

By 2035, the volume of crude materials is projected to grow to between 1.4 million metric tons (low case) and 1.6 million metric tons (high case).

Petroleum products

Petroleum products shipped upriver to Pasco and Wilma represents the second largest cargo group transiting Bonneville Locks. These products include gasoline, residual fuel oil, and distillate fuels. Between 2005 and 2015 the volume of petroleum products declined significantly, due partially due to the closure in 2012 of a petroleum terminal at the Port of Wilma.

According to the U.S. Department of Homeland Security,[23] the Kennewick-Richland area has daily demand for approximately 42,430 barrels of refined petroleum products, representing 9% of the Washington and Oregon market. Many of the communities in this area are located along the inland navigation channel and have barge terminals capable of handling petroleum products. Petroleum products are shipped to the area by barge from terminals in Vancouver and Portland, as well as via pipeline (from Salt Lake City), truck, and rail.

Consumption of petroleum products is projected to decline on a per capita basis during the forecast period, resulting in a further decline in barged petroleum products. Volumes in 2035 are projected to range from 994,000 metric tons under the low case to 1.1 million metric tons under the high case, as compared to 1.2 million metric tons in 2015.

The market for petroleum products is extremely competitive, however, and the share shipped by barge could increase relative to that moved by pipeline. In addition, the U.S. Department of Homeland Security evaluated options to provide petroleum products in the event of a catastrophic earthquake affecting oil-related terminals in the Lower Columbia and Puget Sound. One of the options for responding to such an event would be to barge petroleum products down river from Pasco"[24] While neither of these potential changes was included in the forecast, they demonstrate how the barge system increases the robustness of the regional transportation system.

Other Cargoes

Other cargoes declined from 693,000 metric tons in 2000 to 475,000 metric tons in 2015. The mix of commodities in this catchall category has changed over the past fifteen years:

- Chemicals and fertilizers declined from 151,000 metric tons in 2000 to 57,000 metric tons in 2007, but grew back to 137,000 metric tons in 2015.
- Primary manufactured products (mainly pulp and paper products from upriver mills) were barged in containers to Portland, until Portland lost its container business. The volume of primary manufactured products moving by barge fell from 305,000 metric tons in 2000 to none in 2015.
- Equipment and machinery increased from 22,000 metric tons in 2000 to 51,000 in 2015. This includes products manufactured upriver (such as cranes manufactured by Lampson in Pasco) as well as products moving upriver for construction projects (such as power generation equipment and oil equipment, others).

[23] U.S. Department of Homeland Security, July 2016

[24] Ibid, page 21.

- Waste materials barged upriver to landfills increased from 213,000 metric tons in 2000 to 288,000 metric tons in 2015.

The loss of some manufactured products was partially offset by gains in others. Under the low case scenario, other cargoes are projected to decline to 422,000 metric tons by 2035. Under the reference case the volume is projected to grow to 672,000 metric tons, and under the high it is projected to grow to 866,000 metric tons.

As shown in Table 4-1, inland navigation traffic on the Columbia River dropped between 2000 and 2015, but is projected to grow, albeit slowly, from 2015 through 2035. There are several reasons for this:

- As discussed above, 2015 saw a relatively low grain harvest, which impacted the historical growth rate for food and farm products. As noted, however, it appears that grain volumes recovered in 2016, indicating that the volume of grain is not declining.
- The volume of crude materials dropped between 2000 and 2010, but grew slowly between 2010 and 2015. This slow growth is projected to continue.
- The volume of "Other" commodities also dropped between 2000 and 2010, but grew between 2010 and 2015. As with crude materials, this slow growth is projected to continue.
- The one major barge commodity projected to continue declining between 2015 and 2035 is petroleum products.

Table 4-1: Columbia River Waterborne Traffic by Category (1,000 Metric Tons)

		History				Forecast				Compound Annual Growth Rate	
Commodity Group	**Case**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2000-2015**	**2015-2035**
Petroleum Products	Low	1,766	1,738	1,587	1,186	1,047	1,020	1,006	994	-2.6%	-0.9%
	Reference					1,053	1,050	1,049	1,057		-0.6%
	High					1,091	1,099	1,090	1,122		-0.3%
Crude Materials	Low	1,358	1,593	1,222	1,282	1,284	1,312	1,350	1,391	-0.4%	0.4%
	Reference					1,324	1,382	1,462	1,552		1.0%
	High					1,332	1,403	1,501	1,612		1.2%
Food and Farm Products	Low	5,812	4,696	4,454	3,391	3,672	3,764	3,819	3,824	-3.5%	0.6%
	Reference					3,970	4,172	4,292	4,306		1.2%
	High					4,025	4,806	5,196	5,241		2.2%
Other	Low	693	488	356	475	414	418	425	422	-2.5%	-0.6%
	Reference					539	601	663	672		1.7%
	High					643	747	853	866		3.0%
Total	Low	9,629	8,515	7,618	6,334	6,417	6,514	6,600	6,631	-2.8%	0.2%
	Reference					6,887	7,205	7,467	7,587		0.9%
	High					7,091	8,055	8,640	8,841		1.7%

Source: BST Associates, IHS Markit

Snake River Cargo Trends

Grain accounts for 72%[25] of all commodity tonnage moving on the Snake River, as measured at the Ice Harbor Lock and Dam. Crude materials (logs and wood chips, among other products), and other products (chemicals and fertilizer, manufactured products and garbage) make up the remainder. Upbound movements of petroleum products ended in 2012.

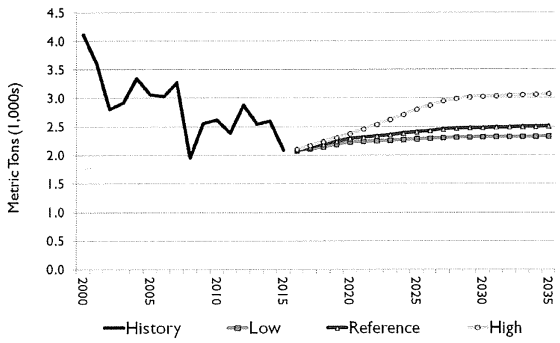
The volume of cargo moving through the Ice Harbor Locks accounts for approximately 34%[26] of the volume moving through Bonneville Locks. The same factors impacting Columbia River barge volumes also impact Snake River barge volumes, including a shift of some grain from barge to rail, and the loss of container service at Portland.

As discussed above, volumes in 2015 were lower than average, due in large part to a below-average grain harvest. As shown in Figure 4-3 and Table 4-2, barge traffic on the Snake River is projected grow from approximately 1.2 million metric tons in 2015 to:

- Low case: 2.3 million metric tons (0.6% per year growth),
- Reference case: 2.5 million metric tons (0.9% per year growth),
- High case: 3.1 million metric tons (2.0% per year growth).

As is the case for barge traffic on the Columbia River, while the projected rates of growth on the Snake River are relatively low, they represent steady demand for barge transportation. Under the reference case, traffic levels return to the average post-recession level (i.e. 2009 through 2015), and under the high case they grow beyond this level. Under the low case the volume does not return to the post-recession level.

Figure 4-3: Snake River Waterborne traffic above Ice Harbor Lock (Million Metric Tons)



Source: BST Associates, U.S. Army Corp of Engineers, IHS Markit

Cargo Forecast by Commodity Group

Food and farm products

The grain volume of 1.8 million metric tons in 2015 was lower than in prior years; volumes averaged approximately 2.3 million metric tons from 2010 through 2015. In 2035, the volume

[25] Average value calculated for the period 2000 to 2015.

[26] Average value calculated for the period 2010 to 2015

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under the reference case is projected to remain at approximately 2.3 million metric tons. Volumes are projected to decline to 2.0 million metric tons under the low case, and to grow to 2.7 million metric tons under the high case.

Other food products and farm products (peas, lentils, hay and animal feeds) declined due to the loss of container service in Portland, since these commodities are shipped in containers. These commodities are not likely to return to barge in large volumes unless container service at Portland resumes.

Crude materials

The crude materials category includes wood chips, logs, other forest products, and sand and gravel. From 2000 through 2015, the volume of crude materials moving through the Ice Harbor Locks ranged between 130,000 metric tons and 370,000 metric. In 2015 they totaled 220,000 metric tons.

By 2035, the volume of crude materials is projected to grow to 239,000 metric tons under the low case and 294,000 metric tons under the high case.

Petroleum products

The petroleum distribution facility at the Port of Wilma historically handled most Snake River barge movements of petroleum products (e.g. gasoline, residual fuel oil, and distillate fuels), but that facility closed in 2012. The forecast assumes that shipments of petroleum products do not re-start.

Other Cargoes

The "Other Cargoes" category includes a mix of commodities, such as chemicals, fertilizers, primary manufactured products, equipment, and machinery. Because a large share of this cargo is containerized, loss of container service caused the volume of "Other Cargoes" to drop from 223,000 metric tons in 2000 to 18,000 metric tons in 2015. Changes to specific commodities included:

- Chemicals and fertilizers dropped from 37,000 metric tons in 2000 to 4,700 metric tons in 2008, but increased to 11,000 metric tons in 2015.
- Primary manufactured products (mostly pulp and paper products from upriver mills) disappeared completely in 2015.
- Equipment and machinery increased from 6,300 metric tons in 2000 to 7,200 in 2015. This category includes products manufactured upriver as well as project cargo shipped upriver for construction projects (e.g. power generation equipment and oil field equipment).

Barge volumes in this category account for a limited share of cargo moved on the Snake River, and are not projected to increase substantially by 2035. Under the low case, the volume is projected to decline further, while under the reference and high case scenarios, volumes are projected to grow slowly. Even under the high scenario (i.e. 3.5% average annual growth), the volume barged in 2035 is projected to be less than 17% of the volume moved in 2000.

As shown in Table 4-2, barge traffic on the Snake River dropped between 2000 and 2015, but is projected to grow, albeit slowly, from 2015 through 2035. The main reasons for this are:

- Grain now accounts for nearly 90% of barge tonnage on the Snake River, and grain volumes are projected to grow.
- The 2015 grain harvest was below average, which led to lower grain volumes in 2015.

- Most other commodities in the Food and Farm Products category are containerized, and barge container movements have essentially disappeared.

Table 4-2: Snake River Waterborne Traffic by Category (1,000 Metric Tons)

		History				Forecast				Compound Annual Growth Rate	
Commodity Group	Case	2000	2005	2010	2015	2020	2025	2030	2035	2000-2015	2015-2035
Petroleum Products	Low	70	94	34	-	-	-	-	-	-100.0%	NM
	Reference					-	-	-	-		NM
	High					-	-	-	-		NM
Crude Materials	Low	370	286	202	220	220	225	232	239	-3.4%	0.4%
	Reference					234	244	259	275		1.1%
	High					243	256	273	294		1.5%
Food and Farm Products	Low	3,441	2,642	2,338	1,846	1,999	2,049	2,079	2,082	-4.1%	0.6%
	Reference					2,039	2,143	2,205	2,212		0.9%
	High					2,108	2,517	2,722	2,745		2.0%
Other	Low	223	35	40	18	9	10	11	11	-15.4%	-2.4%
	Reference					18	20	23	23		1.2%
	High					28	31	35	36		3.5%
Total	Low	4,105	3,057	2,613	2,084	2,228	2,284	2,321	2,332	-4.4%	0.6%
	Reference					2,292	2,407	2,486	2,509		0.9%
	High					2,379	2,803	3,030	3,075		2.0%

Source: BST Associates, IHS Markit

River Barging As an Integrated System

The Columbia/Snake River inland navigation system is part of a larger integrated and interdependent system. This larger system includes farmers and manufacturers, barge carriers, ocean shipping lines, deep-draft marine terminals, railroads, and trucks. Each of these plays an important role in the functioning of the entire system.

Wheat and barley farmers in the Pacific Northwest have a number of upriver terminals in Idaho, Oregon or Washington through which they can ship their grain. The routing choice depends on the needs of the buyer, the location of the farm field, membership in a famer's co-op, relative inland freight costs, and various other competitive factors.

Some grain is also trucked to these upriver terminals from as far away Montana, the Dakotas and even as far away as Minnesota. Typically, these long-distance moves are a backhaul cargo, with the front haul comprising shipment of forest products and vegetables from Walla Walla, the Tri-Cities or Lewiston to the Midwest.

One example of how the system is interdependent is the impact that loss of container service at Portland had on the barge carriers. Barges were used to move containers down river to Portland, where they were loaded onto container ships for export. Without container service at Portland, these containers are now trucked to Seattle and Tacoma, rather than moving by barge.

Cargo movements by barge on the Columbia and Snake rivers must be analyzed within the context of a total "transportation system" that involves three important elements.

- Combined domestic and import/export barge movements. A typical barge tow includes one towboat pushing four barges, each of which may carry different commodities. Some

of these commodities move in international trade (imports and exports), and some move in domestic trade (shipments that are purely of an intrastate or interstate nature).

- Combined barge activity from Oregon, Washington and Idaho. There are no commodity groups that involve movements of either import/export cargo or domestic cargo solely between upriver Washington ports and deepwater Washington ports on the Lower Columbia River. Rather, every cargo category is characterized by products that:
  - are produced in more than one state,
  - are shipped through upriver ports in more than one state, and
  - move through deepwater ports in both Oregon and Washington.

  For example, wheat is grown in Idaho, Washington and Oregon, is loaded onto barge at upriver terminal in all three states, and is exported through deepwater terminals in both Washington and Oregon.
- Barge terminals in one state serve customers in many states. For example, cargo moving through terminals in Wilma and Clarkston (in Washington) may originate in Washington, Idaho, or other states.

On a single round trip, a towboat may transport barges carrying a variety of cargoes to and from upriver ports in Washington, Oregon and Idaho. With this type of integrated operation, both the frequency of service and the rates charged depend on the combined total of all products moving, whether in international or domestic trade. While grain is the most important commodity moved, no individual commodity by itself determines either the frequency of barge service or the rates charged.

Impacts of Dam Breaching

Proposals to breach the dams on the lower Snake River could have a serious and negative impact on barge transportation on the Columbia River. While the goal of dam breaching is to enhance the survival of various endangered fish species, the impact on the fish is uncertain. What is certain is that dam breaching would negatively impact shippers, with higher transportation costs and lower levels of service.

Transportation System Impacts

The current Snake River barge system is very efficient for moving cargo. The barge system provides shippers with an alternative to shipping by rail, imposes price competition on the railroads, and supplies sufficient capacity to absorb substantial fluctuations in grain shipments, especially during peak export months and years.

The major components of the existing barge transportation system include:

- Barge terminals and river elevators,
- Access roads to the barge terminals and river elevators,
- Navigation channel,
- Barge fleet, and
- Export elevators.

If the Snake River dams were breached, much of the grain (and other commodities) that is now barged on the Snake River could be expected to shift to barge terminals in the McNary pool

(between Pasco and Umatilla). Elimination of barge transportation on the lower Snake River would cause grain to be moved farther by truck, and would result in a less efficient system.

All parts of the regional transportation system would be impacted by dam breaching. The mainline rail system, shortline rail system, and state and county roads would all see an increase in volumes. Without additional investment in the road and rail system this could lead to capacity constraints.

The shortline railroads in the region do not necessarily have the capacity to handle greatly increased volumes. These shortlines typically generate enough revenue to only cover operating costs, and not enough to pay for capacity improvements. In order to transport substantially more grain, they may require grants or other public assistance to help pay for capacity expansion. Without expanded rail capacity, Washington farmers might face higher shipping costs, making Washington grain less competitive on world markets.

Grain elevators served by rail may also require substantial capital improvements if they are to handle the grain that now moves by barge. One of the main issues at rail-served elevators is the capacity of their rail tracks. When many of these elevators were built it was common to include enough track to handle three cars. However, in order to get the best rates from railroads, elevators must now be able to accommodate a minimum of 25 or 26 cars. As with improvements to the shortline system, grant funding or other financial assistance may be needed to pay for these upgrades. In addition, many of the existing rail-served elevators have seen little use in years, and the condition of their equipment is unknown.

The highway system will also face increased costs, due to shifting transportation patterns. Roads that were not designed and constructed to handle large volumes of truck traffic can be expected to face increased maintenance and reconstruction costs. It is unlikely that state and local governments would be able to quickly respond if the dams were breached.

Rate Impacts

Competition between barge and rail prevents either from charging monopoly rates for their service. Breaching the Snake River dams, however, would decrease competition and would likely lead to higher rates.

According to the National Corn Growers Association, "it has been demonstrated numerous times that areas throughout the country that do not have access to barge transportation have higher rail rates." The Tennessee Valley Authority examined the effect of barge transportation on rail rates on the upper Mississippi River, and concluded that "the continued availability of water transport appears to have a significant impact on the pricing behavior of other surface transportation modes - at least when these modes are reasonably close to the river. In particular, there is a large body of economic literature, which suggests that available barge transportation effectively constrains railroad pricing for the transportation of commodities that are appropriately moved by barge. These barge-constrained rail prices have come to be called 'water-compelled' rates."

Since Washington farmers sell into world markets, they have little ability to raise their selling price to recover additional transportation costs.

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Chapter 5
Modal Shares and Corridors

Introduction

Waterborne shipments and receipts in Washington are dependent on a comprehensive array of land-side transportation modes. These land-side modes, including truck, rail, and pipeline, as well as barge transportation, move cargo to and from marine terminals.

This chapter describes the modes of transportation used to move each commodity group to and from marine terminals. While this chapter looks at each mode separately, all of the modes function as parts of an integrated system. Air cargo is not included in this analysis, because the volume of marine cargo that is also moved by air is very small.

The land transportation network continues to serve as the lifeline that links industrial plants, farms and forests with cities and ports, and connects products with both local and distant markets. A large percentage of the Washington State economy is inextricably linked, either directly or indirectly, to offshore domestic commerce and international trade. As a result, the efficient performance of the highway, rail and waterways systems are of critical importance for moving freight to and from the ports.

Key Findings

- Waterborne cargo depends on a well-functioning inland transportation system.
- All inland modes are important, including road, rail, pipeline, and inland navigation.
- The inland mode of transportation varies by commodity group.
- Rail baseline volumes are projected to grow steadily, but have the possibility to increase substantially (due mainly to the ultimate fate of proposed coal and crude oil terminals).

Table 5-1: Summary of Transportation Modes

	Waterborne Shipments				Waterborne Receipts			
Commodity	Truck	Rail	Pipeline	Barge	Truck	Rail	Pipeline	Barge
Containers	✓	✓			✓	✓		
Autos		✓			✓	✓		
Logs	✓			✓				
Crude oil		✓				✓	✓	
Other liquid bulk			✓	✓	✓			
Breakbulk	✓	✓			✓	✓		
Grain		✓		✓				
Other dry bulk	✓	✓		✓	✓	✓		✓

Existing Cargo Throughput

As shown in Table 5-2, foreign waterborne traffic (i.e. imports and exports) increased by nearly 50% between 2000 and 2014, (the last year available), growing from 61.6 million metric tons to 90.3 million metric tons. Most of the growth was due to increasing exports, which grew by 24.9 million metric tons; imports grew by 3.8 million metric tons during the same period.

Domestic coastwise traffic dropped by approximately one-third between 2000 and 2014, falling from 41.3 million metric tons to 26.6 million metric tons. (Coastwise traffic includes waterborne movements that enter or leave the internal waters of Puget Sound, as well as movements into and out of the Columbia River system. It mainly includes traffic moving to and from Hawaii, Alaska, and California, but also includes some intra-Northwest moves.) Most of the drop in coastwise traffic was due to declining receipts of crude oil from Alaska. Coastwise receipts fell from 28.9 million metric tons to 16.2 million metric tons, while coastwise shipments dropped from 12.4 million to 10.4 million metric tons

Internal waterborne traffic includes movements of cargo entirely within the internal waters of Puget Sound or the Columbia River system. Only internal shipments (and not receipts) are presented in Table 5-2, in order to avoid double-counting. Internal shipments fell from 20.6 million to 13.3 million metric tons between 2000 and 2014. Declining log and woodchip movements account for a portion of the drop, but the biggest drop was in movements of liquid bulks. It should be noted that both internal and coastwise shipments of liquid bulks were unusually high in 2000 and 2001, due to a temporary shift of petroleum products out of the damaged Olympic Pipeline and onto vessels.

Table 5-2: Waterborne Commerce in Washington (including Lower Columbia Oregon) (Million Metric Tons)

	Foreign			Domestic Coastwise			Internal
Case	Shipping	Receiving	Total	Shipping	Receiving	Total	Shipments
2000	39.3	22.3	61.6	12.4	28.9	41.3	20.6
2001	39.3	19.3	58.6	11.2	29.7	41.0	16.5
2002	37.2	21.9	59.0	8.8	28.0	36.8	15.0
2003	40.7	23.5	64.2	9.3	27.0	36.3	15.0
2004	49.0	26.4	75.4	10.5	26.9	37.3	16.2
2005	49.2	31.1	80.4	10.0	26.4	36.3	15.9
2006	48.7	33.3	82.0	10.4	24.3	34.7	14.7
2007	54.2	31.5	85.7	10.1	24.5	34.6	15.6
2008	59.2	28.2	87.4	8.4	22.5	30.9	13.2
2009	52.7	21.7	74.4	7.9	21.3	29.2	10.5
2010	60.0	24.3	84.3	8.0	19.1	27.0	11.1
2011	62.0	26.2	88.2	7.6	18.4	26.0	11.8
2012	60.3	27.0	87.3	8.7	17.3	26.0	12.7
2013	56.2	25.7	81.9	9.4	17.8	27.1	13.5
2014	64.2	26.1	90.3	10.4	16.2	26.6	13.3
CAGR 2000-2014	3.6%	1.1%	2.8%	-1.3%	-4.0%	-3.1%	-3.1%

Source: BST Associates, using data from the U.S. Army Corps of Engineers

Domestic traffic primarily includes coastwise trade with Alaska, Hawaii and Southern California, but also includes internal traffic (such as grain barged down the Snake and Columbia Rivers), and local traffic[27] (i.e., traffic within a single harbor).

[27] Please note that local traffic is not included in the remaining sections of this report.

Modal Distribution of Freight

Imports through Washington ports move to their final destination and exports arrive at marine terminals through several modes of transport including rail, truck, barge/raft or direct movement into a plant (or distribution facility) for consumption.

- Rail transport is the preferred mode for large volumes of cargo moving at least 500 miles, such as containers imported from China and destined for Chicago. Rail is also efficient for moving large volumes of heavier cargo on shorter routes, such as petroleum coke movements from Ferndale to Longview, or alumina shipments from Longview to Wenatchee.
- Truck transport is more likely for cargoes moving within the state or region.
- Barge transport is used on the inland navigation system on the Columbia and Snake Rivers, and accounts for a substantial portion of the grain exported via ports on the Lower Columbia River. Barge transport also connects Puget Sound ports with shippers on the Olympic Peninsula and in British Columbia; logs are frequently barged or rafted from one port to another for export or for use in local mills.
- Commodities may be transferred directly from vessel into a plant. For example, imports of limestone, gypsum, salt and other like products often move directly into a manufacturing plant for processing into cement, sheetrock, chemicals or other products.

The following analysis of modal distribution focuses on the first movement of a commodity after offloading from a vessel (for inbound cargo), or on the last mode of transport prior to loading on a vessel (for outbound cargo). For commodities offloaded directly into waterfront plants for manufacturing, it is not feasible to track the final destinations of the manufactured products. For example, imports of gypsum can be traced to a manufacturing plant, but the final destination of the wallboard made from the gypsum cannot be tracked using available databases. This is also true for commodities that are moved through a central distribution facility and later are transported to market.

Modal Split by Handling Group

Containers

Containers have different modal splits, depending on whether they are imports, exports, or domestic moves. In 2015, an estimated 75% of containerized imports moved by rail, either in ocean containers or transloaded into domestic containers. Ocean containers on rail accounted for 49% of imports, transloaded containers accounted for 27%, and local distribution by truck accounted for 24%. Under the reference case and the low case the truck share is projected to grow to 34% by 2035, while under the high case it is projected to grow to 29%. Under all three cases the share of ocean containers loaded directly to rail continues to decrease, while the share of transloaded containers grows.

It is critical to note that only a portion of the import containers shipped by rail are loaded directly onto rail at marine terminals. For the remainder, trucks are used to dray the containers from port terminals to railroad intermodal yards or transload facilities. In Seattle, especially, this means that port container traffic must use city streets to reach container yards.

Export containers are more likely to move by truck than by rail; in 2015 approximately 25% of export containers arrived by rail and 75% by truck. These shares are not projected to change substantially between 2015 and 2035.

Domestic waterborne containers move to and from the port terminals almost entirely by truck.

Combining imports, exports, and domestic moves, approximately 40% of containers move by rail and 60% by truck.

Automobiles

Approximately 20% of the automobiles imported through the Pacific Northwest remain in the region and are distributed by truck. The remaining 80% is shipped inland by rail.

Export automobiles are essentially 100% moved by rail.

Crude Oil

All waterborne inbound crude oil (foreign imports and coastwise receipts) moves directly into refineries for processing. Most of the refineries are also able to receive crude oil by pipeline from Canada, and in the past five years they have also begun to receive oil by rail. Over the next 20 years, waterborne receipts will likely continue to account for most of the crude oil processed by the refineries, although as production in Alaska declines it will be replaced by foreign oil.

Alaska's share of refinery inputs dropped from 90% in 2003 to 45% in 2015, and is projected to decline to just 14% in 2035. The share of refinery inputs received by water from other foreign sources dropped from 19% in 2011 to 5% in 2015, due mainly to advent of crude receipts by rail. However, as new pipelines absorb much of the domestic crude oil that currently moves by rail, foreign waterborne receipts will grow in importance for Washington refineries; by 2035 they are expected to account for 42% of refinery inputs. Receipts by rail are projected to account for 12% to 13% of refinery inputs in 2035. The pipeline from Canada currently accounts for the remaining 30% of refinery inputs, and this is projected to continue through 2035.

Shipments of crude oil by water from Pacific Northwest ports occurred in very limited quantities prior to the Bakken oil boom and the crude by rail revolution. Over the past few years, however, a number of terminals in the Pacific Northwest have been constructed or re-purposed to ship crude oil outbound. These terminals have been used to move U.S.-produced oil to U.S. refineries in California and Washington, but in the future they may be used to export crude oil to foreign destinations.

All of the oil now shipped outbound by water from the Pacific Northwest arrives at the marine terminals by rail, and this will likely still be the case in the future. With a number of new oil shipping terminals now in the permitting phase, the biggest unknown factor is how much more oil will arrive by rail for shipment by water. The largest of these proposed terminals is the Vancouver Energy project in Vancouver, Washington; smaller terminals have been proposed for Grays Harbor and elsewhere. Under the high growth forecast scenario these new terminals could increase rail receipts from 7.4 million metric tons in 2014 to 30.1 million metric tons in 2030.

The uncertainty over these crude oil shipping terminals is one of the two main areas of uncertainty in the 2017 Marine Cargo Forecast (the other is coal).

Other Liquid Bulks

Most of the petroleum products manufactured at Washington refineries moves by pipeline (approximately 47%) or water (approximately 42%). Of the remainder, approximately 10% moves by truck and the remainder by rail. These modal shares are projected to remain relatively stable through 2035.

Most liquid fertilizer is imported, and approximately 13% of this is shipped to inland river or coastal destinations by barge. The remainder moves by truck or rail.

Other liquid bulk products move by truck or rail, or directly into plants.

Logs

Logs are primarily moved by truck, with a small share transported by barge or raft. Trucks account for an estimated 95% of logs, and barge/raft the remaining 5%.

Breakbulk

Breakbulk cargo is moved by truck and rail. Trucks account for an estimated 70% of breakbulk cargo and rail 30%.

Grain

Grain exports move to shipping terminals by rail or by barge. In total, approximately 89% of grain exports moved by rail in 2015, and 11% moved by barge.

All of the grain exported through the PSRC region and the Other Puget Sound/Washington Coast region is moved by rail, while grain exported through the Columbia River moves by rail or barge.

Wheat is the most dependent on barge transportation, and the barge system on the Columbia/Snake River System is critical to the wheat farmers in the Pacific Northwest. Essentially all wheat exports move through terminals on the Lower Columbia River, and none through Puget Sound or coastal ports. As discussed in Chapter 3, barge grain volumes (primarily wheat) on the have averaged approximately 4 million tons (average over the period 2005 to 2015), and are projected to range from 3.8 million to 5.2 million metric tons in 2035.

In 2035, 100% of the grain moving through the PSRC region and the Other Puget Sound/Washington Coast region will continue to move by rail. On the Lower Columbia River, rail currently accounts for 85% of exports and barge 15%; these shares are projected to remain relatively constant through 2035. Because export terminals on the Oregon side of the river mainly handled wheat, the barge share of total exports is higher than on the Washington side of the river. Oregon exports are approximately 61% rail and 39% barge currently, and over time the rail share is projected to grow to approximately 65%. On the Washington Columbia River the inland split is currently 89% rail and 11% barge, which is projected to remain relatively constant.

Dry Bulk Imports

Dry bulk imports are moved inland by rail, barge, and truck, but most moves directly into manufacturing plants. For example:

- Gypsum moves directly into wallboard plants
- Limestone moves directly into cement manufacturing plants

Aluminum ore moves directly into the aluminum smelter in Ferndale (in the Other Puget Sound / Washington Coast region), and by rail to the Wenatchee smelter. However, the Wenatchee smelter may be permanently closing, in which case 100% of aluminum ore would move directly in the plant in Ferndale.

Portland cement moves directly into concrete batch plants, and is also moved to inland batch plants by truck and by rail.

Aggregates and sands also move directly into concrete batch plants, or are shipped to inland destinations by truck or rail.

Scrap steel and steel slag moves directly into steel mills, or is trucked to mills.

Dry bulk fertilizer is transported inland by barge, rail and truck.

Dry Bulk Exports

Dry bulk commodities exported through Pacific Northwest ports move almost entirely by rail. The two largest commodities, in terms of tonnage, are potash and soda ash. Potash is shipped by rail from Saskatchewan to ports on the Columbia River, and soda ash is shipped by rail from Wyoming, also to the Columbia River. Together, these two commodities account for two-thirds of dry bulk exports.

Petroleum coke accounts for approximately 14% dry bulk exports, and moves by rail and by truck. This product is manufactured at oil refineries on northern Puget Sound, and then moved to Anacortes by truck or to Longview by rail. Approximately 70% is moved by rail and 30% by truck.

Scrap also accounted for 14% of dry bulk exports in 2015; it moves by truck, rail and barge.

Other commodities that move in relatively small volumes include bentonite clay (rail) and wood chips (barge).

Overall, rail accounts for approximately 90% of dry bulk exports, while barge and truck each account for 5% or less.

The major question hanging over future dry bulk modal splits is what happens with coal exports. Coal is not currently exported through terminals in Washington or Oregon. Coal is included in the high forecast, however, and this forecast assumes that the Millennium Bulk Terminal in Longview is constructed and operates at full capacity (44 million metric tons per year). All of the coal would move by rail. To provide a sense of the scale of the potential coal exports, total dry bulk exports are currently approximately 7.5 million metric tons per year, while current grain exports are 32 million metric tons.

Chapter 6
Rail System Capacity

Introduction and Background

MainLine Management Inc. (MLM) was retained by BST Associates (BST) to assist in the preparation of the 2017 Marine Cargo Forecast Update and Rail Capacity Study. MLM and BST have previously jointly completed similar studies in 2004, 2009 and 2011.

The following chapter presents a summarized version of the rail capacity analysis. A more detailed version is presented in a separate document as *Appendix A*.

The current analysis differs from previous ones in the use of a rail simulation model. The previous studies used a "static analysis" of each line segment and corridor, rather than a rail simulation model. For the current analysis, a computer model of the mainline rail system in Washington State was created, using the Rail Traffic Controller (RTC) simulation software. RTC is the standard analysis program used by all Class I railroads in North America to analyze rail operations and capacity under various operating protocols, train volumes and infrastructure design. To a large extent, the mainline system in Washington is essentially the BNSF Railway (BNSF) network.

The rail capacity analysis included five scenarios, beginning with current conditions (in 2016), and continuing in five-year increments from 2020 through 2035. For the 2020 through 2030 analyses, MLM added capacity improvements to the simulated rail system as needed, in order to maintain traffic movement. The 2035 results were based on a static analysis, rather than a model simulation. The five cases analyzed were:

1. Base case of current operations and infrastructure (early 2016).
2. Growth case of train volumes at 2020 with infrastructure and capacity improvements as identified.
3. Growth case of train volumes at 2025 with infrastructure and capacity improvements as identified.
4. Growth case of train volumes at 2030 with infrastructure and capacity improvements as identified.
5. Growth case of train volumes at 2035 with infrastructure and capacity improvements as identified.

All train types were modeled, including international cargo, domestic cargo, and passenger trains. International train volumes were based on the Marine Cargo Forecast results, described in previous chapters. Domestic train volumes were based on current conditions and anticipated growth factors. Passenger train volumes were based on existing conditions and planned additions, including new passenger train service from WSDOT the will begin in fall of 2017. Passenger train volumes do not include any additional trains that may be added through Sound Transit 3.

BST Associates developed three growth scenarios (i.e. reference case, low case, and high case) for each cargo type. MLM used the reference growth case for the 2020 simulation, and the high case for the 2025, 2030, and 2035 analyses. The high case was used in the 2025 – 2035 analyses in order to understand the potential impact on rail capacity of large increases in rail traffic. The high

cases also include the rail traffic that would be generated by several planned new marine terminals, including coal export facilities and crude oil transfer facilities.

The following chapter describes the methodologies and findings from each of the cases studied. A more detailed version of the rail capacity analysis is provided in *Appendix A*; this appendix provides a more complete discussion of the analyses performed and the results.

MLM does not represent that the capacity improvements and/or operational adjustments it introduced into the various simulation cases are requirements that BNSF would likely employ as growth in train volumes occurs. MLM introduced infrastructure and operational enhancements in a manner that it believes is reasonable given the significant growth in train volumes that were tested. The modifications were included to satisfy the ability of the model to successfully complete specific simulations with performance results that reasonably compared to previous case results.

MLM believes that BNSF, as it has done in the past, will invest in infrastructure improvements and make operational adjustments as demand requires and that best fits their strategies. The improvements that BNSF might make may be different than those MLM introduced into the model over the course of the simulation analyses. BNSF reviewed the draft analysis, and elected to not endorse or refute the results.

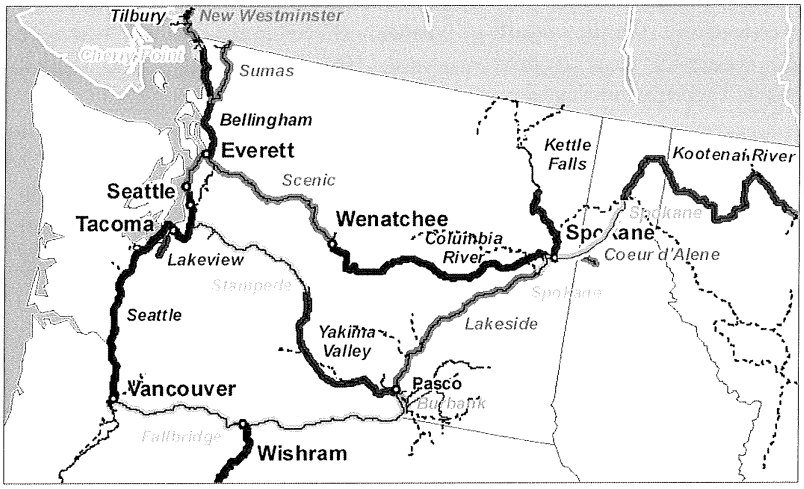
Key Findings

- The mainline system in the Pacific Northwest does not currently experience significant delays.
- As projected rail traffic grows, capacity on the region's rail system can likely be maintained through a combination of infrastructure improvements (such as additional track) and operating procedures.
- In order to accommodate high-case traffic growth in the out years, the height of the Stampede Pass Tunnel will likely need to be increased to allow for double-stack traffic and auto carriers.
- In order to accommodate high-case traffic growth in the out years, the Sandpoint (Lake Pend Oreille) and Pasco (Columbia River) bridges will likely need to be expanded two tracks
- Terminals are more likely to experience delays than are mainline track segments. (Modeling terminal operations was not part of scope of work for this project, and may require further research).

Model Network and Route Description

This section provides a description of the rail network used in the rail capacity analysis. Figure 5-1 below displays BNSF's rail network in the Pacific Northwest, with subdivision names and key stations included for reference. The subdivision names are used below when describing the results of the rail capacity analysis.

Figure 6-1: BNSF Pacific Northwest Mainline Rail Network



Source: BNSF

Sandpoint Junction to Spokane

This section of railroad is part of the Spokane Subdivision. The line between Spokane and Sandpoint, Idaho, experiences high levels of traffic because it handles a large share of BNSF traffic moving between the Pacific Northwest and the Midwest (e.g. Chicago) and the Southeast (e.g. Memphis). In addition to BNSF trains, the Montana Rail Link (MRL) main line connects to the BNSF main line at Sandpoint Junction. BNSF dispatches the route between Sandpoint and Spokane.

Spokane to Pasco

Just west of Spokane (at Latah Junction) the BNSF main line splits into two routes. The southern route is the BNSF Lakeside Subdivision, which runs between Spokane and Pasco. The northern route is the Columbia River Subdivision which runs between Spokane and Wenatchee. The Lakeside Subdivision is heavily utilized by manifest trains, unit bulk trains, intermodal/container trains moving to and from Portland, and two daily Amtrak trains.

Pasco to Vancouver

The BNSF Fallbridge Subdivision runs between Pasco and Vancouver, WA, following the north bank of the Columbia River. In order to handle an increased number of heavy unit trains (such as grain and oil trains), BNSF has begun to operate loaded unit trains westbound on the Fallbridge Subdivision, while sending the eastbound empty trains via other routes. The Fallbridge Subdivision also handles two daily Amtrak trains that run between Portland and Spokane, as well as all BNSF trains moving between the Pacific Northwest and California. The California trains use the Fallbridge Subdivision as far as Wishram, where the trains turn south and run towards California.

Vancouver to Seattle

The BNSF Seattle Subdivision runs between Vancouver and Seattle. From Vancouver to Tacoma, Union Pacific (UP) trains operate over the BNSF line via trackage rights, and the Seattle

Subdivision also hosts multiple Amtrak movements. BNSF controls train movements on the Subdivision. Between Tacoma and Seattle, UP exits the BNSF trackage and runs on its own route to Black River Junction, approximately 10 miles south of Seattle. BNSF and UP share trackage between Black River and Argo, where UP exits to their own yard. BNSF also hosts Sound Transit commuter rail operations between Tacoma and Seattle.

Seattle to Everett

The BNSF Scenic Subdivision runs along Puget Sound from Seattle to Everett. In addition to BNSF traffic, this subdivision hosts multiple Amtrak trains and weekday Sound Transit commuter trains. Most of this subdivision includes multiple main tracks, but there are two very short single track sections.

Everett to Canadian Border

The Bellingham Subdivision runs between Everett and the Canadian border at Blaine. This subdivision is a single track railroad with sidings. All BNSF unit trains that move to or from Canadian locations use this line, as well as manifest trains that handle local Vancouver BC traffic and traffic interchanged with Canadian railroads. Two pairs of round trip Seattle-Vancouver Amtrak trains also use the line.

The Sumas Subdivision provides an alternate route for BNSF Canadian traffic. The Sumas Subdivision diverges from the Bellingham Subdivision at Burlington, WA. This line handles one train per day in each direction, as well as handling local on line traffic and interchange traffic from Canadian Pacific at Sumas.

Everett to Wenatchee, Wenatchee to Spokane

The BNSF Scenic Subdivision runs from Seattle through Everett, and then runs east-west between Everett and Wenatchee. The BNSF Columbia River Subdivision runs between Wenatchee and Latah Junction, near Spokane.

The Scenic Subdivision features relatively steep 2.2% grades on both sides of Stevens Pass, and an eight-mile tunnel at the summit. These heavy grades restrict the operation of loaded unit trains over the route.

Auburn to Ellensburg, Ellensburg to Pasco

The Stampede Subdivision runs between Auburn and Ellensburg, and the Yakima Valley Subdivision runs between Ellensburg and SP&S Junction, near Pasco. BNSF operates the combined Stampede and Yakima Valley Subdivisions as an eastbound directional railroad. Currently there are no through trains that run from Pasco to Auburn.

The Stampede Subdivision features a 2.2% grade on both sides of Stampede Pass, and a two-mile tunnel at the summit of the pass. The tunnel is not tall enough to allow double-stacked containers and some other types of freight cars, so the route is currently restricted to lower-profile cars.

Methodology

Model Simulation

To meet the goals of the study, computer model simulation was utilized to determine the impact of existing and projected future rail operations within BNSF's Pacific Northwest rail network. Model simulation is an important tool in providing data for analytical studies in complex rail environments. All simulations were performed with the Rail Traffic Controller (RTC) model. RTC is used by all Class 1 railways in North America and has been accepted as the primary tool utilized in rail simulation analysis.

Analyses Performed

The RTC model creates a large amount of data as it performs the simulations. This data is analyzed to determine where conflicts occur, or how operations change as infrastructure or rail traffic levels are modified.

Delay Analysis

MLM utilized the data to develop two major analysis applications involving delay. The RTC model defines delay as time that a train must wait because the route it needs to take is unavailable.

The first analysis MLM performed was to estimate minutes of delay for each 10 train miles operated (referred to as "D/10"), within each network segment. The D/10 measurement allows comparison between cases that have differing number of trains and track configurations.

The second type of analysis performed was to locate delays that exceeded 30 minutes (referred to as "D>30"). Based upon MLM's experience with railroad operations, there are always going to be some delays in a railway network. However, some delays indicate problem areas, which is why D>30 delays are evaluated.

MLM ran each scenario over a three day period. The results of the D/10 and D>30 models were averaged over all three analysis days of the simulations.

With the data that RTC collects for each train movement, average velocity over a designated line segment can be calculated. This can be done for all freight operations on a line segment, or it can be broken down by train type.

Train Volumes

The model creates an output file that records every train that passes through every node of the network. MLM has developed an analysis that allows any specific node to be queried to find out all the trains that pass through the node, what time the train arrived and departed the node, and how fast the train was operating at the node.

This information was used to develop train volumes at locations through the PNW rail network. On many line segments, this involved analyzing multiple locations because of junctions or major industries, which alter the train counts from one location to the next. The train counts were recorded so that volume changes could be compared with delay results. Train volumes for each scenario are shown in Table 5-1 at the end of this memo.

Grade Crossing Analysis

MLM was also asked to supply model results to the team completing a separate analysis of grade crossing conflicts. The Road-Rail Conflict Study is being conducted by a team led by The

Transpo Group, under contract to the Joint Transportation Committee (JTC) of the Washington State Legislature.

The Transpo team provided MLM with a list of grade crossing locations for which data was required. MLM analyzed how often and for how long these grade crossings were occupied by rail movements. To do this, nodes were included in the model network that represented the location of the various crossings being studied. The model records when the head end of a train enters each node and when the rear end of that train departs the node.

All nodes associated with the specified crossings were analyzed to develop this information for the simulations; in some cases, this meant two or more nodes had to be analyzed for a single crossing because multiple tracks ran through the crossing. In the Base Case analysis, there were approximately 190 nodes that were analyzed to include all the crossings that were provided for analysis.

Analysis Segments

In this study, analysis was performed by subdivision. For each simulation, an analysis of delay and grade crossing occupancy was made for eleven segments on the network. A list of the specific locations is contained in *Appendix A*.

Data Sources

Data from BNSF was not available for use in the rail simulation analysis, so MLM used other sources, including data from previous analyses, to create a rail operating plan for the current analysis. One of the sources used to create the operating plan was 2012 data from BNSF's signal system provided to MLM for an earlier analysis.

The second source that MLM utilized was a list of all active trains on BNSF's rail system for one day in November 2013 and then another list for one day in February 2016. The lists included every active train symbol running on BNSF's northern corridor on those days.

Another source that was used in previous analyses was a monitoring website called ATCS Monitor. ATCS stands for Advanced Train Control System, which is a method used by railroads to dispatch and monitor their train operations. ATCS Monitor was developed by radio enthusiasts who determined that the signals sent between dispatching centers and wayside signals could be captured and decoded to understand how a rail line was being dispatched. While ATCS Monitor data was not available for the current study, ATCS Monitor data from earlier studies was extremely helpful in determining timing of trains, as well as developing estimated schedules.

Schedule Development

After the ATCS Monitor data had been recorded and analyzed, patterns were documented for traffic along line segments. MLM understands that the train identifications may not be exact; however they create a very good representation of the traffic that moves over each line segment.

Train departure times were estimated based on BNSF documents from Portland/Vancouver, and observed ATCS Monitor departures from Seattle/Tacoma, Pasco and Spokane. Once manifest and intermodal trains had been assigned, the unit trains were added to the appropriate sections based on the operating plan.

Results and Analysis of Scenarios

The following sections of this report briefly describe the results and the capacity analysis of the simulations.

Train Volume Growth and Track Improvements

Train Volume Growth

This section reviews how growth was calculated for various commodities for the simulations. Growth for international containers, domestic intermodal, vehicles, manifest, grain, oil, and coal were calculated using various methodologies. As noted above, all train types were modeled, including international cargo, domestic cargo, and passenger trains. International train volumes were based on the Marine Cargo Forecast results, described in previous chapters. Domestic train volumes were based on current conditions and anticipated growth factors. Passenger train volumes were based on existing conditions and planned additions.

A detailed discussion on train volume growth methodologies is contained in *Appendix A*.

Track Improvements by Simulation

Track improvements were added to the model in all of the simulations, based on areas of congestion that were observed after analyzing the simulation outputs. Track improvements that were included in the Base P5 Case were in addition to the track configuration used in the Base Case. A list of the improvements included in the Base P5 case (2020) can be found in *Appendix A*. Similarly, a list of improvements included in the Base P10 (2025) and the Base P15 (2030) simulation cases is contained in *Appendix A*.

Segment Results and Analysis

The following sections of the report briefly address the capacity findings from each of the simulations. A brief summary of the findings and MLM's conclusions starts each simulation's Results and Analysis section.

Base Case Analysis Results

Base Case Conclusions

The Base Case conditions indicate that BNSF does not currently have capacity issues on most of line segments in the PNW. Between terminals, trains ran efficiently for the most part. The terminals in the PNW appear to be a larger concern for rail capacity in the PNW.

It should be noted that the scope of the project did not include detailed simulation of operations within the terminals, so delays that were found in the Base Case are likely an understatement of actual delays occurring at terminals in actual operations.

Grade Crossing Occupancy Analysis

A grade crossing analysis was performed for each simulation case, the results of which are included in a separate spreadsheet.

A list of all trains that operated through the crossings was also provided by line segment. The simulation day, train identification number, train length and train type were provided in the list, along with the entrance, clearing and total occupancy times.

Line Segment Capacity Observations

The following section briefly reviews the capacity observations by line segment (and by terminal where it is integral to the operation) for the Base Case.

Spokane Subdivision

The Spokane Subdivision (Sandpoint to Irvin) operated **well below** estimated sustainable capacity, with a D/10 calculation of 1.6 minutes of delay per 10 miles operated. Hauser Terminal also operated **well below** estimated sustainable capacity, at 6.2 minutes of delay per 10 miles. Hauser operations were simplified (in the simulation) and likely do not represent the full range of potential delays that can occur in a major terminal. Freight train velocity on the Spokane Subdivision was 32.3 miles per hour on average.

Spokane Terminal and Lakeside Subdivision

Spokane Terminal (Irvin to Latah Junction, Latah Junction to Lakeside Junction, Lakeside Junction to Sunset Junction) operated **well below** estimated sustainable capacity, at 4.3 minutes of delay per 10 miles operated.

The Lakeside Subdivision (Lakeside Junction to Glade) also operated **well below** estimated sustainable capacity, with 2.5 minutes of delay per 10 miles operated. The new segments of second main track that BNSF installed in 2014/2015 alleviated locations that experienced notable delays in previous analyses. Average velocity for freight traffic on the route was 30.9 mph.

Pasco Terminal and Fallbridge Subdivision

Pasco Terminal (Glade to SP&S Junction) operated **within** estimated sustainable capacity, with 11.7 minutes of delay per 10 miles operated. Pasco is a major classification yard for BNSF, which means many trains terminate and originate at the terminal. At the same time, a very high percentage of empty unit trains and all loaded unit trains passed through the terminal.

The Fallbridge Subdivision (SP&S Junction to McLoughlin) operated **well below** estimated sustainable capacity, with 3.9 minutes of delay per 10 miles operated. However, the subdivision had the highest number of delays exceeding 30 minutes (23.7/day). Single track meets and overtakes were the main contributor to the delays. Velocity also showed that the subdivision operated relatively efficiently, with freight traffic operating at an average of 30.3 mph.

Vancouver Terminal

In past analyses, Vancouver Terminal (McLoughlin to Portland, Columbia River Bridge to Felida) operated approaching or at estimated sustainable capacity. In the current analysis, Vancouver Terminal operated **well below** estimated sustainable capacity, with 9.3 minutes of delay per 10 miles operated. There were three major changes that facilitated this improvement: "east bypass" route, an additional single track connection between the Seattle and Fallbridge subdivisions, and the new connection to the Port of Vancouver.

Seattle Subdivision

The Seattle Subdivision (Felida to Nelson Bennett) operated **well below** estimated sustainable capacity, with 0.9 minutes of delay per 10 miles. Areas of minor congestion occurred around Kalama and Longview, where trains diverge to large industrial facilities. Average freight train velocity for the subdivision was 32.2 mph, indicating the subdivision operated efficiently throughout the analysis.

Seattle Tacoma (SeaTac) Terminal

The SeaTac Terminal (Nelson Bennett Tunnel to MP 8, Scenic Sub) operated **well below** estimated sustainable capacity, with 5.3 minutes of delay per 10 miles operated. While the overall number is very good, there were times when the terminal became congested. Sound Transit Commuter operations between Everett and King Street Station and King Street Station and Tacoma/Lakewood caused much of the congestion.

Scenic Subdivision (West)

The Scenic Subdivision extends between Seattle (MP 0) and Wenatchee. However, for purposes of this analysis, it was divided into west and east segments. The Scenic Subdivision West extended from MP 8 to MP 28 (MP 8 to Mukilteo). It operated **well below** estimated sustainable capacity, with 1.5 minutes of delay per 10 miles operated.

A portion of the Scenic Subdivision was included in the SeaTac Terminal analysis segment. Most of the freight trains that experienced delays because of Sound Transit commuter trains were delayed in the SeaTac portion of the subdivision.

Bellingham Subdivision and Everett Terminal

Everett Terminal (MP 28 Scenic Subdivision to Bridge 38, Bridge 38 to PA Junction, Everett Junction to PA Junction) operated **within** estimated sustainable capacity, at 19.3 minutes of delay per 10 miles operated. The Everett passenger station, shared by Sound Transit and Amtrak, is located on a single track segment of the Scenic Subdivision between Everett Junction and PA Junction. When these trains were operating, freight trains could not leave Delta Yard without delaying the passenger trains. Additionally, limited capacity on the Bellingham Subdivision led to yard delays.

The Bellingham Subdivision operated **within** estimated sustainable capacity, at 6.8 minutes of delay per 10 miles operated. This was the highest D/10 statistic for any of the line segments that were studied. Amtrak trains also delayed trains along the Bellingham Sub, as did single track meets of opposing freight trains. The average freight velocity on the Bellingham Subdivision was 20.7 mph. This is notably lower than the velocities on other subdivisions.

Scenic Subdivision (East) and Columbia River Subdivision

The Scenic Subdivision East (PA Junction to Wenatchee) and the Columbia River Subdivision (Wenatchee to Latah Junction) were included in the analysis; however the simulation was not as detailed as other segments of the railroad. This was done to expedite each simulation at the request of the client.

The Scenic Subdivision East operated **within** estimated sustainable capacity, at 6.4 minutes of delay per 10 miles operated, while the Columbia River Subdivision operated **well below** estimated sustainable capacity, at 1.7 minutes of delay per 10 miles operated. Scenic Subdivision trains averaged a velocity of 20.5 mph, reflecting the slow track speed and delay issues attendant with the grades, curves and the Cascade Tunnel. Average velocity of trains on the Columbia River Subdivision was 36.5 mph, reflecting how efficiently the subdivision operated under the traffic levels that were included in the analysis.

Stampede Subdivision and Yakima Valley Subdivision

The Stampede Subdivision (Auburn to Ellensburg) and the Yakima Valley Subdivision (Ellensburg to SP&S Junction) both operated **well below** estimated sustainable capacity, at 1.0 minutes of delay per 10 miles operated. Similar to the Scenic (east) and Columbia River Subs, the

Stampede and Yakima Valley Subs were not simulated with the same level of detail as other subdivisions. Again, this was done at the client's request to expedite the analyses. The Stampede and Yakima Valley Subs operated most trains in an eastbound direction. The average velocity of trains using these subdivisions was 30 mph.

Base Case Plus 5 Years (Base P5) Analysis Results

Base P5 Conclusions

Based on the results of the simulations through Base P5 (2020), MLM believes BNSF has sufficient line segment capacity to accommodate the growth projected for five years. This projection excludes coal trains serving the proposed Millennium Bulk Terminal in Longview and oil trains serving the proposed Vancouver Energy terminal in Vancouver.

In the opinion of MLM, the greatest concern for rail capacity in the PNW in this time frame is BNSF's terminals, especially Hauser, Pasco, and Everett. Additionally, there are intermittent constraints in the Seattle/Tacoma terminal. Detailed terminal operations, however, were not within the scope of the WPPA 2017 study analysis.

As mentioned, the Base P5 simulation did not include large unit train growth projects such as Millennium coal trains and Vancouver Energy oil trains. These projects were included in the Base P10 and Base P15 simulations, however, and the results are noted in descriptions of those simulations.

There were similar impacts between freight and passenger trains between Seattle and Tacoma as in the Base Case.

Base P5 Grade Crossing Occupancy Analysis and Train Volumes

Additional grade crossing information related to the Base P5 simulation has been included in spreadsheet. This is in addition to the Base Case spreadsheet that describes grade crossing occupancies for that simulation. Train volumes are shown in Table 5-1 below.

Base P5 Line Segment Capacity Observations

Spokane Subdivision

The Spokane Subdivision operated **well below** estimated sustainable capacity, at 1.9 minutes of delay per 10 miles operated (1.6 minutes of delay in the Base Case). Infrastructure improvements mitigated the growth in traffic on the line segment. Hauser Terminal also operated **well below** estimated sustainable capacity, at 4.4 minutes of delay per 10 miles (6.2 minutes of delay in the Base Case). Simplified terminal operations (in the model) likely understated the actual amount of delay. Freight train velocity on the Spokane Subdivision was 32.0 miles per hour on average (32.3 mph in Base Case).

Spokane Terminal and Lakeside Subdivision

Spokane Terminal also operated **well below** estimated sustainable capacity, at 3.8 minutes of delay per 10 miles operated (4.3 minutes in Base Case).

The Lakeside Subdivision also operated **well below** estimated sustainable capacity, with 3.3 minutes of delay per 10 miles operated (2.5 minutes in Base Case). Train volume growth was responsible for the increase in delay. Average velocity for freight traffic on the route was 29.5 mph (30.9 mph in Base Case).

Pasco Terminal and Fallbridge Subdivision

Pasco Terminal operated **within** estimated sustainable capacity, with 14.8 minutes of delay per 10 miles operated (11.7 minutes in Base Case). Congestion caused by growth around the single track Columbia River Bridge impacted Pasco's delay minutes.

The Fallbridge Subdivision operated **well below** estimated sustainable capacity, with 3.5 minutes of delay per 10 miles operated (3.9 minutes in the Base Case). Rerouting eastbound traffic from the Fallbridge Subdivision to the Stampede Subdivision accounted for the improvement in delay. Velocity also showed that the subdivision operated relatively efficiently, with freight traffic operating at an average of 31.3 mph (30.3 mph in Base Case).

Vancouver Terminal

Vancouver Terminal operated **well below** estimated sustainable capacity, with 7.5 minutes of delay per 10 miles operated (9.3 minutes in Base Case). Some new infrastructure on the Seattle Subdivision north of the terminal assisted with the improved delay.

Seattle Subdivision

The Seattle Subdivision operated **well below** estimated sustainable capacity, with 1.5 minutes of delay per 10 miles (0.9 minutes in Base Case). The two main tracks over the entire length of the subdivision minimized delays. Most of the delays exceeding 30 minutes continued to occur between Longview and Kalama, where large numbers of trains enter or leave the main line. One other location that experienced repetitive delay was at Nisqually Junction, where the BNSF Seattle Subdivision and the new Amtrak route between Tacoma and Nisqually (i.e. Point Defiance Bypass) converge. Average freight train velocity for the subdivision was 32.2 mph (32.2 mph in Base Case), indicating that the subdivision continued to operate efficiently.

Seattle Tacoma (SeaTac) Terminal

The SeaTac Terminal operated **well below** estimated sustainable capacity, with 6.7 minutes of delay per 10 miles operated (5.3 minutes in Base Case). Passenger operations were once again a contributor to the delays. As discussed in the Base Case analysis, Sound Transit Commuter operations between Everett and King Street Station and King Street Station and Tacoma/Lakewood caused much of the congestion.

Scenic Subdivision West

The Scenic Subdivision West operated **well below** estimated sustainable capacity, with 1.3 minutes of delay per 10 miles operated (1.5 minutes in Base Case). No improvements were included in the Base P5 case in this segment.

Bellingham Subdivision and Everett Terminal

Everett Terminal operated **within** estimated sustainable capacity, at 19.5 minutes of delay per 10 miles operated (19.3 minutes in Base Case). This number remained very close to the boundary between **within** and **at or approaching** estimated sustainable capacity (>20 minutes of delay per 10 miles). As in the Base Case, passenger operations on single track were responsible for many of the delays. A short single track section at Mukilteo also caused delays that led to this Base P5 analysis result.

The Bellingham Subdivision operated **well below** estimated sustainable capacity, at 3.8 minutes of delay per 10 miles operated (6.8 minutes in Base Case). Train mix and reroutes of

traffic through the terminal were responsible for the improvement. The average freight velocity on the Bellingham Subdivision was 23.6 mph (20.7 mph in Base Case).

Scenic Subdivision (East) and Columbia River Subdivision

The Scenic Subdivision East operated **within** estimated sustainable capacity, at 4.3 minutes of delay per 10 miles operated (6.4 minutes in Base Case), while the Columbia River Subdivision operated **well below** estimated sustainable capacity, at 1.6 minutes of delay per 10 miles operated (1.7 minutes in Base Case). Velocity for trains on the Scenic Subdivision averaged 22.0 mph (20.5 mph in the Base Case), while velocity for trains on the Columbia River Subdivision averaged 36.7 mph (36.5 mph in Base Case).

Stampede Subdivision and Yakima Valley Subdivision

The Stampede Subdivision and the Yakima Valley Subdivision both operated **well below** estimated sustainable capacity, at 0.5 minutes of delay per 10 miles operated. Since most of the trains operated in an easterly direction, there were minimal meets that caused delays. The average velocity of trains using these subdivisions was 30.7 mph (30.0 mph in the Base Case).

Base Case Plus 10 Years (Base P10) Analysis Results

Base P10 Conclusions

The Base P10 simulation showed that the projected growth trains over the 10 year time frame will create congestion if no line segment infrastructure improvements are constructed. However, with infrastructure improvements (such as those added in the simulation), each of the major line segments operated efficiently. MLM placed improvements at locations where the simulation indicated they were needed; BNSF will perform their own analyses and may make improvements in locations that are different from MLM's. However, MLM is confident that BNSF will address the capacity issues as they arise when the traffic actually materializes.

Base P10 Train Volumes and Grade Crossing Occupancy Analysis

There was a notable increase in train volumes on certain line segments in the Base P10 (2025) simulation compared to the Base P5 simulation totals. These major increases represent the inclusion of growth as projected in the Marine Cargo Forecast, as well as growth associated with large unit train projects such as Millennium Bulk Terminal coal trains and Vancouver Energy oil trains. For each loaded train that was added for those projects, there was a corresponding empty train that had to be added as well. Some of the line segments, such as the Lakeside and Spokane Subdivisions, handled both the loaded and empty movements. Other line segments, such as the Fallbridge or Stampede/Yakima Valley Subdivisions, only handled either the loaded or the empty movement, but not both. Train volumes are shown by line segment in Table 5-1 below.

Additional grade crossing information related to the Base P10 simulation has been included in spreadsheet.

Base P10 Line Segment Capacity Observations

The following section briefly reviews the capacity observations by line segment (and by terminal where it is integral to the operation) for the Base P10 simulation.

Spokane Subdivision

The Spokane Subdivision operated **well below** estimated sustainable capacity, at 1.4 minutes of delay per 10 miles operated (1.6 in the Base Case, 1.9 in Base P5). Additional infrastructure that

completed the second main track across the entire subdivision (except for the Sandpoint Bridge) accounted for the improvement even with increased train volumes. Hauser Terminal also operated **well below** estimated sustainable capacity, at 4.5 minutes of delay per 10 miles (6.2 in the Base Case, 4.4 in Base P5), although again, MLM suspects the delays are understated because of simplified terminal operations (in the model). Freight train velocity on the Spokane Subdivision was 32.9 miles per hour on average (32.3 mph in Base Case, 32.0 in Base P5).

Spokane Terminal and Lakeside Subdivision

Spokane Terminal also operated **well below** estimated sustainable capacity, at 5.2 minutes of delay per 10 miles operated (4.3 in Base Case, 3.8 in Base P5). Trains accessing multiple junctions within the terminal accounted for most of the increased delay.

The Lakeside Subdivision also operated **well below** estimated sustainable capacity, with 3.9 minutes of delay per 10 miles operated (2.5 in Base Case, 3.3 in Base P5). This subdivision experienced growth of 20 trains per day, and only the inclusion of large additional sections of second main track kept delay at the levels that were developed. Average velocity for freight traffic on the route was 28.1 mph (30.9 in Base Case, 29.5 in Base P5).

Pasco Terminal and Fallbridge Subdivision

Pasco Terminal operated **within** estimated sustainable capacity, with 16.4 minutes of delay per 10 miles operated (11.7 in Base Case, 14.8 in Base P5). The Columbia River Bridge at Pasco remained a concern in the Base P10 simulation. BNSF routing protocol will likely have all westbound loaded unit trains running from Pasco to Vancouver via the Fallbridge Subdivision, and most or all eastbound unit empties returning to Pasco via the Yakima Valley Subdivision. These two subdivisions converge at SP&S Junction, which is just west of the Columbia River Bridge. Therefore, all projected unit train growth, whether it is coal, oil or grain, will cross this bridge twice; once when loaded, and then again when empty.

The Fallbridge Subdivision operated **well below** estimated sustainable capacity, with 3.7 minutes of delay per 10 miles operated (3.9 in the Base Case, 3.5 in Base P5). Some capacity improvements and additional rerouting of eastbound traffic to the Stampede Subdivision contributed to this result. A slight decrease in velocity also reflected the increased train movements, with freight traffic operating at an average of 30.6 mph (30.3 in Base Case, 31.3 in Base P5).

Vancouver Terminal

Vancouver Terminal operated **within** estimated sustainable capacity, with 11.4 minutes of delay per 10 miles operated (9.3 in Base Case, 7.5 in Base P5). The increase in delay minutes reflects the impact of additional train movements through the terminal.

Seattle Subdivision

The Seattle Subdivision operated **well below** estimated sustainable capacity, with 0.8 minutes of delay per 10 miles (0.9 in Base Case, 1.5 in Base P5). The two main tracks over the entire length of the subdivision again minimized delays. There were very few delays that exceeded 30 minutes on the Seattle Subdivision during the Base P10 simulation. Where they did occur was generally in the vicinity of Kalama and Longview. Average velocity for freight train on the subdivision was 30.0 mph (32.2 in Base Case, 32.2 in Base P5).

Seattle Tacoma (SeaTac) Terminal

The SeaTac Terminal operated **well below** estimated sustainable capacity, with 6.1 minutes of delay per 10 miles operated (5.3 in Base Case, 6.7 in Base P5). As has been observed in all the previous simulations, passenger operations were once again a major contributor to the delays.

Scenic Subdivision (West)

The Scenic Subdivision West operated **well below** estimated sustainable capacity, with 3.9 minutes of delay per 10 miles operated (1.5 in Base Case, 1.3 in Base P5). Increased growth train volumes accounted for the increase in the delay statistic.

Bellingham Subdivision and Everett Terminal

Everett Terminal operated **within** estimated sustainable capacity, at 15.4 minutes of delay per 10 miles operated (19.3 in Base Case, 19.5 in Base P5). The improvement was because some trains were rerouted through the west side of the terminal rather than passing through or stopping in Delta Yard.

The Bellingham Subdivision operated **within** estimated sustainable capacity, at 4.6 minutes of delay per 10 miles operated (6.8 in Base Case, 3.8 in Base P5). Infrastructure improvements and rerouting trains through Everett were responsible for the delay improvement. The average freight velocity on the Bellingham Subdivision was 23.1 mph (20.7 in Base Case, 23.6 in Base P5).

Scenic Subdivision (East) and Columbia River Subdivision

The Scenic Subdivision East operated **within** estimated sustainable capacity, at 6.3 minutes of delay per 10 miles operated (6.4 in Base Case, 4.3 in Base P5), while the Columbia River Subdivision operated **well below** estimated sustainable capacity, at 1.7 minutes of delay per 10 miles operated (1.7 in Base Case, 1.6 in Base P5). Scenic Subdivision trains averaged a velocity of 20.4 mph (20.5 in the Base Case, 22.0 in Base P5), and Columbia River Subdivision trains averaged velocity of 35.8 mph (36.5 in Base Case, 36.7 in Base P5).

Stampede Subdivision and Yakima Valley Subdivision

The Stampede Subdivision and the Yakima Valley Subdivision both operated **well below** estimated sustainable capacity, at 1.8 minutes of delay per 10 miles operated (1.0 in Base Case, 0.5 in Base P5). Even with a large increase in train volumes, the directional nature of the route allowed trains to move with minimal delay. Most of the delays accumulated near SP&S Junction (near Pasco) for trains waiting to move through Pasco Yard. The average velocity of trains using these subdivisions was 28.7 mph (30.0 in the Base Case, 30.7 in Base P5).

Base Case Plus 15 Years (Base P15) Analysis Results

Base P15 Conclusions

Traffic growth associated with the Base P15 simulation was significant. In order to mitigate congestion on the PNW rail network caused by the new trains, MLM was forced to add infrastructure and operating modifications to the model. Major modifications were made to the Lakeside and Fallbridge Subdivisions, as well as improvements to the signal system and increased tunnel height on the Stampede and Yakima Valley Subdivisions. Beyond the physical improvements, operating changes were also required to maintain a fluid railroad network at the projected train volumes.

The largest of these operating changes was the rerouting of trains to the Stampede/Yakima Valley Subdivisions. In previous simulations, only empty unit trains used this route to return to Pasco and then east. In the Base P15 simulation, MLM had to assume that manifest trains destined for Pasco and Spokane from Everett, Seattle and Tacoma would use the route, in addition to empty unit trains. Also, some intermodal trains from Portland and Tacoma were rerouted via the Stampede/Yakima Valley Subdivisions to Pasco prior to proceeding east.

Many of the Everett, Seattle and Tacoma manifest trains that previously had moved to Pasco via the Seattle and Fallbridge Subs were reassigned to the Stampede Pass to minimize the amount of eastbound traffic using the Fallbridge route.

MLM made the assumption that, should the projected high-case train volumes materialize, BNSF would increase the height of the Stampede Pass tunnels to allow international and domestic double-stack trains to operate via that route. Clearance for that type of traffic would also allow manifest trains containing auto carriers to operate via the route. With infrastructure improvements and the operational modifications, MLM believes BNSF will have enough line segment capacity to accommodate traffic into the 2030 time frame.

The operating modifications that rerouted many of the trains are discussed in *Appendix A*. Train volumes by line segment are shown in Table 5-1 below. Additional grade crossing information related to the Base P15 simulation has been included in the spreadsheet.

Base P15 Line Segment Capacity Observations

The following section of the memo briefly reviews the capacity observations by line segment and terminal for the Base P15 simulation.

Spokane Subdivision

The Spokane Subdivision operated **well below** estimated sustainable capacity, at 2.8 minutes of delay per 10 miles operated (1.6 BC, 1.9 P5, 1.4 P10). No additional infrastructure was added in the P15 simulation. Additional train counts over the route were responsible for the delay increase. Hauser Terminal also operated **well below** estimated sustainable capacity, at 7.5 minutes of delay per 10 miles (6.2 BC, 4.4 P5, 4.5 P10), although it is likely these numbers are understated. Freight train velocity on the Spokane Subdivision was 29.8 miles per hour on average (32.3 mph BC, 32.0 P5, 32.9 P10).

Spokane Terminal and Lakeside Subdivision

Spokane Terminal also operated **well below** estimated sustainable capacity, at 4.4 minutes of delay per 10 miles operated (4.3 BC, 3.8 P5, 5.2 P10). The model included a new connection between UP and BNSF lines near Cheney, which improved traffic flows even under the train volume increases in the P15 simulation.

The Lakeside Subdivision also operated **well below** estimated sustainable capacity, with 0.4 minutes of delay per 10 miles operated (2.5 BC, 3.3 P5, 3.9 P10). Completing the addition of a second main track across the subdivision was responsible for the improvement in train delay. Average velocity for freight traffic on the route was 36.1 mph (30.9 BC, 29.5 P5, 28.1 P10).

Pasco Terminal and Fallbridge Sub.

Pasco Terminal operated **above** estimated sustainable capacity, with 26.2 minutes of delay per 10 miles operated (11.7 BC, 14.8 P5, 16.4 P10). This is a notable increase from the P10 delay statistics; MLM is concerned that, at this level of delay, it is likely that the terminal would not be

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capable of operating for long periods without experiencing delays that potentially could affect all movements through Pasco. The single track bridge over the Columbia River and the coal spraying track were mainly responsible for the delay increase.

The Fallbridge Subdivision (SP&S Junction to McLoughlin) operated **well below** estimated sustainable capacity, with 2.3 minutes of delay per 10 miles operated (3.9 BC, 3.5 P5, 3.7 P10). The average velocity of trains between Vancouver and Pasco improved due to reducing the number of eastbound trains on the subdivision. The only eastbound trains left on the subdivision were Amtrak and trains moving to/from the south at Wishram. Freight traffic operated at an average of 33.2 mph (30.3 BC, 31.3 P5, 30.6 P10), which was notably higher than previous cases.

Vancouver Terminal

Vancouver Terminal operated **within** estimated sustainable capacity, with 12.5 minutes of delay per 10 miles operated (9.3 BC, 7.5 P5, 11.4 P10). The increase in delay minutes reflects the impact of the additional loaded coal and grain trains that had to move through the terminal between the Fallbridge and Seattle Subdivisions, and additional UP grain and intermodal trains that passed through the terminal.

Seattle Subdivision

The Seattle Subdivision operated **well below** estimated sustainable capacity, with 1.1 minutes of delay per 10 miles (0.9 BC, 1.5 P5, 0.8 P10). Average freight train velocity for the subdivision was 27.7 mph (32.2 BC, 32.2 P5, 30.0 P10). The decrease in velocity reflects the increased unit traffic that was added to the route, which generally runs at a reduced velocity compared to manifest or intermodal operations.

Seattle Tacoma (SeaTac) Terminal

The SeaTac Terminal operated **well below** estimated sustainable capacity, with 7.9 minutes of delay per 10 miles operated (5.3 BC, 6.7 P5, 6.1 P10). Delays associated with passenger trains between Seattle and TR Junction in Tacoma continued to contribute to terminal freight congestion.

Scenic Subdivision (West)

The Scenic Subdivision West operated **well below** estimated sustainable capacity, with 2.7 minutes of delay per 10 miles operated (1.5 BC, 1.3 P5, 3.9 P10).

Bellingham Subdivision and Everett Terminal

Everett Terminal operated **approaching or at** estimated sustainable capacity, at 22.0 minutes of delay per 10 miles operated (19.3 BC, 19.5 P5, 15.4 P10). Passenger trains continued to create terminal delays, as did restricted capacity on the Bellingham Subdivision and on the Scenic Subdivision (East). Trains were frequently held in the yard until capacity north or east of the terminal became available.

The Bellingham Subdivision operated **within** estimated sustainable capacity, at 5.6 minutes of delay per 10 miles operated (6.8 BC, 3.8 P5, 4.6 P10). Additional traffic to/from British Columbia contributed to the increase in delay on the subdivision and within Everett Terminal. The average freight velocity on the Bellingham Subdivision was 22.4 mph (20.7 BC, 23.6 P5, 23.1 P10).

Scenic Subdivision (East) and Columbia River Subdivision

The Scenic Subdivision East operated **within** estimated sustainable capacity, at 5.0 minutes of delay per 10 miles operated (6.4 BC, 4.3 P5, 6.3 P10), while the Columbia River Subdivision

operated **well below** estimated sustainable capacity, at 2.0 minutes of delay per 10 miles operated (1.7 BC, 1.6 P5, 1.7 P10). Trains on the Scenic Subdivision averaged velocity of 21.3 mph (20.5 BC, 22.0 P5, 20.4 P10), and trains on the Columbia River Subdivision averaged 35.6 mph (36.5 BC, 36.7 P5, 35.8 P10).

Stampede Subdivision and Yakima Valley Subdivision

The Stampede Subdivision and the Yakima Valley Subdivision both operated **well below** estimated sustainable capacity, at 1.8 minutes of delay per 10 miles operated (1.0 BC, 0.5 P5, 1.8 P10). An upgraded signal system was added to the subdivision to accommodate the projected number of trains. Congestion near SP&S junction continued to be the main cause of delay on the subdivision. The average velocity of trains using these subdivisions was 28.6 mph (30.0 BC, 30.7 P5, 28.7 P10).

Base P20 (2035) Static Analysis

In addition to the four simulation analyses discussed above, MLM utilized the 'High' growth projection developed by in the Marine Cargo Forecast to estimate train volumes in 2035, over the various segments of the network previously described. Since a model simulation analysis was not performed for the segments, MLM did not attempt to identify potential capacity improvements that might be necessary to accommodate train volume growth. A general discussion of the impacts that the train volume growth contained in the 2035 Static Analysis is contained in *Appendix A*.

Also, since a model simulation analysis was not performed for the P20 analysis, specific road/rail crossing conflict information was not developed.

The table below recaps the estimated train volumes for all the simulation cases and the 2035 Static Analysis.

Table 6-1: Three Day Average Train Volume Summary, Through Base P20

Location	Subdivision	Milepost	Trains per Day				
			Base Case	Base P5 (2020)	Base P10 (2025)	Base P15 (2030)	Base P20 (2035)
E. Spokane	Spokane	63	66	69	93	111	119
Lind	Lakeside	91	42	46	66	88	93
Plymouth	Fallbridge	190	38	38	47	51	54
McLoughlin	Fallbridge	14	42	42	52	58	61
Ridgefield	Seattle	122	59	64	79	93	100
Vader	Seattle	77	51	56	71	85	91
East Olympia	Seattle	35	46	52	66	81	87
SeaTac Terminal (Puyallup)		~32X	60	66	82	95	99
SeaTac Terminal (Spokane Street)		~2X	68	79	85	90	94
SeaTac Terminal (Broad Street)		~2	53	58	65	70	74
Mukilteo	Scenic	28	42	47	53	59	62
Marysville	Bellingham	38	26	25	28	31	31
Bow	Bellingham	79	20	20	22	25	25
Border	Bellingham	117	15	16	17	20	20
Monroe	Scenic	1770	23	23	28	26	28
Harrington	Columbia River	1527	24	23	28	25	27
Ravensdale	Stampede	91	6	9	20	40	42
Yakima	Yakima Valley	90	8	11	23	41	43

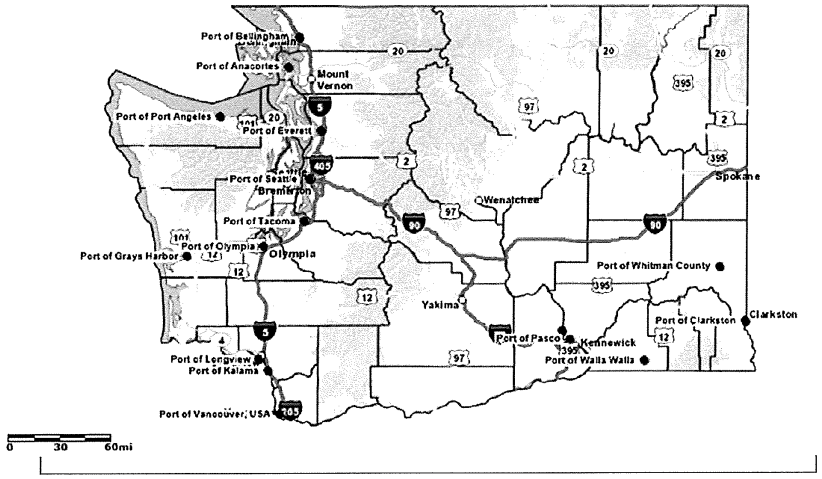
Source: Mainline Management

Chapter 7
Port Infrastructure and Access

Introduction and Background

A summary of each of the 16 participating ports was prepared to enhance this year's Marine Cargo Forecast and to get a better understanding of current and future infrastructure needs. To accomplish this, the 16 partner Ports were interviewed and the findings were summarized into a Port Profile for each of the participating Ports. This detailed summary of each of the 16 ports can be found in *Appendix B*:

Figure 7-1: Participating Ports



It should be noted that although this sample of ports represents both large and small, urban and rural ports, the ports self-selected to participate in this study by providing funding for the 2017 Marine Cargo Forecast.

The participating ports included:

- Anacortes
- Bellingham
- Benton
- Clarkston
- Everett
- Grays Harbor
- Kalama
- Longview
- Olympia
- Pasco
- Port Angeles

- Seattle (Northwest Seaport Alliance)
- Tacoma (Northwest Seaport Alliance)
- Vancouver, USA
- Walla Walla
- Whitman County

Initial Findings

- In general, the ports are trying to grow their traditional lines of business, versus expand into new areas.
- Containers, bulk and breakbulk remain the areas of concentration.
- There are local access/ congestion issues that will require infrastructure improvements to meet future growth.
- There are many port or port related projects that lack full funding to implement the project

Port Summaries

Each Port summary has been tailored to local characteristics. The individual port summaries collected the following information:

- A short overview of the Port
- Description of existing facilities – public and private
- Description of future facilities – public and private
- Description of cargo
  - Opportunities
  - Threats
  - Modal share
- Overview of port access
  - Current projects
  - Future projects
- Discussion of other issues
- Description of access
  - Truck
  - Rail
  - Barge
  - Pipeline
- Future cargo activities
- List of new terminals
- Identification of access challenges/ projects
- Other challenges/ issues
- Maps
    - Location and Access

The intent of the summaries is to (1) provide a current overview of the current public and private port facilities, (2) to identify future port projects, and (3) to identify port access projects and issues.

For example, Bellingham harbor has an array of public and private terminals.

Table 7-1: Example of Public and Private Terminal Summary for the Bellingham Harbor

Public/ Private	Terminal Name	Owner	Operator	City/ Area	Purpose
Public	Bellingham Shipping Terminal	Port of Bellingham	Port of Bellingham	Bellingham	General cargo, logs, bulks
Private	BP Cherry Point Refinery north dock	British Petroleum	British Petroleum	Cherry Point	Crude oil unloading
Private	BP Cherry Point Refinery south dock	British Petroleum	British Petroleum	Cherry Point	Petroleum product loading
Private	Gateway Pacific	SSA	SSA	Cherry Point	Exports of coal, mineral bulks, grain
Private	Intalco Company Aluminum Wharf	Intalco	Intalco	Cherry Point	Alumina receipts
Private	Conoco Phillips Ferndale Refinery	Conoco Phillips	Conoco Phillips	Cherry Point	Crude oil receipts and petroleum product shipments
Private	Bellingham Cold Storage	Bellingham Cold Storage	Bellingham Cold Storage	Bellingham	Fish/seafood

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Example of a Port Summary – Grays Harbor

Overview

The Port of Grays Harbor is Washington's only deep-water port on the Pacific Coast. Centrally located between Seattle and Portland, the Port has highway access via the four-lane highway from Interstate 5 and rail service provided by Puget Sound & Pacific with connections to Burlington Northern Santa Fe and Union Pacific. The continuous rail loop throughout the marine terminal complex is designed to handle and store unit-trains as well as smaller sets of rail cars. Specializing in heavy-lift, roll-on/roll-off, autos, wheeled vehicles, project cargoes, liquid bulks and bulk cargoes; the Port of Grays Harbor efficiently handles a multitude of diverse cargoes from breakbulk and agricultural products to liquid bulk. Located within Foreign Trade Zone 173 are over 110,000 square feet of covered, secured on-dock warehouse space and adjacent paved cargo yard dockside available for short and long term storage.

Table 7-2: Existing Terminals – Grays Harbor

Terminal Name	Owner	Operator	City/ Area	Purpose
Terminal 1	Port of Grays Harbor	REG Grays Harbor and Westway Terminal	Hoquiam	Liquid bulk
Terminal 2	Port of Grays Harbor	AGP	Aberdeen	Grain and grain products
Terminal 3	Port of Grays Harbor	Willis Enterprises	Hoquiam	Wood chips
Terminal 4	Port of Grays Harbor	PLS, Pasha	Aberdeen	Autos, Ro-ro, logs, general cargo
Sierra Pacific Marine Terminal	Sierra Pacific	Sierra Pacific Ind.	Aberdeen	Lumber, logs and wood chips
Terminal 1	Port of Grays Harbor	REG Grays Harbor and Westway Terminal	Hoquiam	Liquid bulk
Terminal 2	Port of Grays Harbor	AGP	Aberdeen	Grain and grain products

Rail Service

Rail Service is available through both BNSF and UPRR, via Genesee & Wyoming's Puget Sound and Pacific Railroad. The Port of Grays Harbor's marine terminal rail system features more than 50,000 ft. of rail. This provides two continuous loop tracks serving terminals 1, 2 and 4 and the cargo storage facilities. Utilizing this unique state-of-the-art rail infrastructure, unit trains can be continuously loaded or unloaded at AGP storage silos or Pasha Automotive Services processing center.

Highway Access

Interstate 5 via Hwy 101 and US 12

Barge Facilities

Terminal 3 wood chip loading facility and Sierra Pacific for logs, lumber and wood chip loading.

Table 7-3: Future Terminals – Grays Harbor

Terminal Name	Owner	Operator	City/ Area	Purpose
Terminal 1	Port of Grays Harbor	Westway Terminals	Hoquiam	Liquid bulk – crude oil storage
Terminal 3	Port of Grays Harbor		Hoquiam	Existing pier with adjacent uplands (150 acres) planned for dry bulk storage and vessel loading. Site needs rail realignment to allow for unit train receiving and handling. Dry bulk storage facility and ship loader to facilitate the transfer of dry bulk from unit trains to storage and then delivery to vessel. New rail alignment is needed to mitigate impact of unit train traffic on local freight service roads.

Future cargo opportunities

- New Cargo types include: Inbound automotive, liquid bulks and dry bulks
- Anticipate a gradual recovery from 2014 peak with average 8% year over year growth.
- It is anticipated that the new cargo will follow the current modal splits: 75% rail and 25% truck

Existing Access Routes

- Truck – US101, US12 and SR8
- Rail – BNSF 80%, UP 20%
- Barge – Columbia River and Puget Sound
- Pipeline – N/A

Access Issues

- Truck – US12 in East Aberdeen
- Rail – BNSF Junction (Centralia)
- Barge – N/A
- Pipeline – N/A

Access Projects

Current Access Projects include:

- East Aberdeen Mobility Project
  - The freight community is actively seeking funding for Pre design study. Once completed PE, ROW and Construction funds will be sought.
  - Strategic Partners – WSDOT, City of Aberdeen, PSAP railroad, Port of Grays Harbor, Grays Harbor Council of Governments and Grays Harbor County.
  - Co-lead/ project sponsor – City of Aberdeen
  - Current funding gap – $500,000 for pre-engineering study.
  - Total estimated project cost – $22 million

- Past Federal Funding – Alternatives Analysis was funded through STP. No other federal grants initiated to date.
- Key reports/studies that document access project: East Aberdeen Mobility Project Preferred Alternative Selection Report. Project also documented in the Southwest Washington RTPO Regional Transportation Plan and WSDOT 2014 Freight Mobility Plan.
- Project is at the local level and will be integrated into the RTPO TIP as funds become available.
- Project will be integrated into the STIP when federal funds are secured.

Other Issues

No other critical issues were identified

Table 7-4: Grays Harbor Historical Cargo Statistics (metric tons)

Year	Metric Tons
2011	1,233,845
2012	1,850,465
2013	2,384,242
2014	2,628,515
2015	2,203,943

Figure 7-2: Location of Port Facilities – Grays Harbor

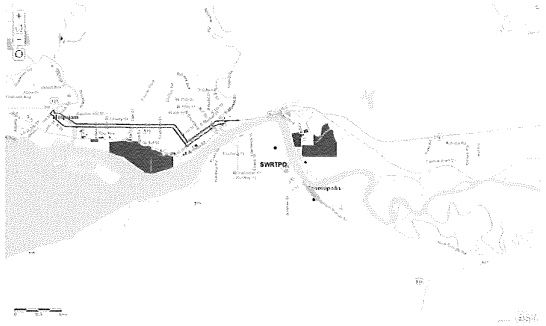
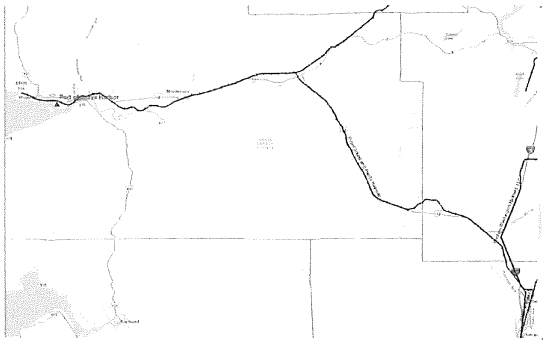


Figure 7-3: Location of Rail Lines – Grays Harbor



Themes Gathered from Interviews

Based upon the interviews the following themes emerged:

Cargo facilities

The ports in Washington state are actively preparing for the future. This includes planning for modernization of aging terminals and facilities, converting aging facilities for use in new lines of businesses, building brand new facilities, and expanding existing facilities to meet anticipated cargo growth.

Port Road and Rail Access- (First and Last Mile issues)

Road and Rail access issues can be segmented into three main categories

- Road access to port facilities through urbanized areas
- Road access to new facilities through rural areas
- Road / rail grade crossing conflicts

Adequate, well maintained road access is important to all of Washington's ports. Without uncongested road access, the port cannot meet customer and community expectations as economic engines for their communities. Most of the sixteen ports interviewed reported that they work in concert with their local jurisdictions to ensure the first and last mile roadways are adequate to meet the needs of their supply chains. Challenges occur when local land use plans or patterns encroach near the ports. This is especially noticeable where the same access routes are used by both local and port traffic. This can be further exacerbated in smaller urbanized areas such as Clarkston and Grays Harbor where retail and port traffic share the same routes. In larger cities like Seattle, the expansive needs of a larger city with its diverse population and businesses provide additional stresses on access and mobility issues.

The development of new facilities put additional pressures on mobility and access. Notable examples include the greenfield developments at Barlow Point in Longview and Kalama Methanol Manufacturing and Exporting Facility (KMMEF) in Kalama. Each of these projects has unique access challenges because of their additional traffic demands on local roads. In some cases, local roads have the capacity to meet future needs. In other cases, such as Barlow Point, new intersections may have to be built and current intersection expanded. Furthermore, capacity of the roads may need to be expanded with additional turning lanes to improve the flow of traffic as growth occurs.

Road and rail grade crossings continue to be an area of conflict within and near ports. Multiple studies are currently underway to help communities and states prioritize crossing improvements. In Washington State the Joint Transportation Committee (JTC) completed a Road-Rail Conflict Study called *The Prioritization of Prominent Road-Rail Conflicts in Washington State*. This project developed a systems-based approach for prioritizing and addressing at-grade crossing impacts and needs on a statewide basis. The 2017 Legislature has directed the Freight Mobility Strategic Investment Board to update the Road-Rail Conflict study using data from the 2017 Marine Cargo Forecast.

A second study is being conducted by the Transportation Research Board (TRB) of the National Science Academies, NHRCP 25-50: *Prioritization Procedure for Proposed Road-Rail*

Grade Separation Projects along Specific Rail Corridors[28]. The TRB study is developing a comprehensive set of criteria that balance economic and social benefits and costs. The goal is to provide a model that can be used by local jurisdictions to prioritize grade crossing separation project investments along a rail corridor.

First and Last mile rail issues were less apparent in the responses to the interviews than expected. This may be due to recent investments by railroads, both mainline and short-lines, that have greatly improved rail access to the ports. Interestingly, large rail projects that have traditionally appeared on rail project lists such as Bullfrog Junction in Tacoma, the Bi-directional running through the Columbia Gorge, the crowning of Stampede Pass were not mentioned as needs by the ports. This may be due to the way the information was gathered for this forecast. Port participants may have interpreted the questions about access to be literally "at the Port gates".

Dredging

Dredging is an issue for Ports throughout the state. Dredging is necessary on an on-going basis to maintain authorized water depth in navigation channels, connecting channels, and marine terminal berths. In some cases, dredging is also needed to deepen channels and marine terminals to handle larger vessels.

Dredging is paid for by different entities, depending upon where it is performed. Dredging is a federal responsibility when it comes to the operation and maintenance of federal navigation channels, which are significant components of the supply chain in the Pacific Northwest. Deepening projects are considered an improvement, and thus are cost-shared by the federal government with local sponsors. Dredging alongside marine terminal berths and in marinas is the sole responsibility of the local port.

Funding for continued maintenance dredging is a concern for most ports throughout the region, while funding and permitting for deepening projects is more localized. For example, several ports in the Puget Sound need to deepen access channels and marine terminal berths in order to accommodate the next generation of container ships. On the Lower Columbia River, water depth alongside marine terminals is matched to the depth of the deepened navigation channel, so maintenance of the existing channel is a continuing concern.

Examples of Project Types

Modernization of Aging Facilities

Container facilities preparing for "Big ships"

Northwest Seaport Alliance - Seattle Harbor Terminal 5

The NWSA is planning to modernize the 172-acre Terminal 5 to make it ready for mega ships. This includes upgrading the power, dock and berth "understructure to allow a future operator to acquire and install super-post -Panamax cranes on this modernized terminal. This is the last terminal in the north harbor upgrading in order to install the super-post- Panamax cranes. The upgrade is part of the Alliance's long-term growth strategy to move 3.5 million TEU's annually through the north harbor.

[28] http://leg.wa.gov/JTC/Pages/Road-Rail-Study.aspx

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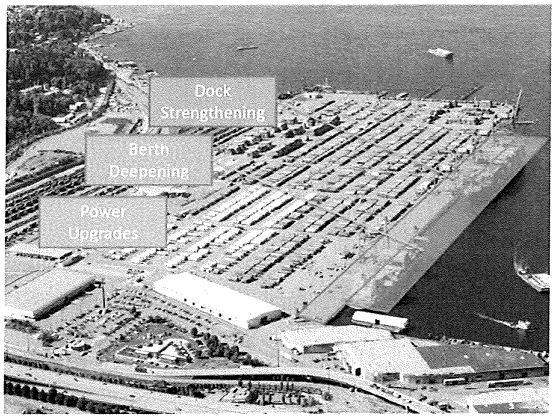
Figure 7-4: Aerial View of Terminal 5



Northwest Seaport Alliance - Tacoma Harbor Terminal 4 Modernization

Terminal 4, part of the Husky Container Terminal, has become outdated in the face of modern containerized ship building trends. With wharfs constructed at odd alignments and cranes unable to handle increasingly larger ships, Terminal 4 needs improvements. The Port began phased improvements of the container terminal by upgrading the adjacent Terminal 3 in 2014. The second phase involves the removal of contaminated sediment under the Terminal 4 Pier; construction is currently underway. The final phase, for which the Port is seeking federal funds, would reconstruct the Terminal 4 pier, aligning it with the neighboring Pier 3 to create one contiguous 2,960-foot-long pier structure capable of simultaneously berthing two ultra-large container ships. The new pier structure will also be designed to accommodate modern 24-container wide, 100-guage cranes needed to work larger vessels.

The planned $113 million upgrades to Terminal 4 will allow the Husky Container Terminal to increase the size of ships it can handle. Today, the terminal can serve ships that carry 6,500 Twenty Foot Equivalent Unit (TEU) containers. After the improvements, the terminal will be able to handle 18,000 TEU vessels with the new cranes, increasing cargo throughput capacity across the pier from about 767,000 TEUs annually to an estimated 1.3 million TEUs. It is the increased throughput that will create the demand for new family wage jobs in the region. This project will be completed in 2018.

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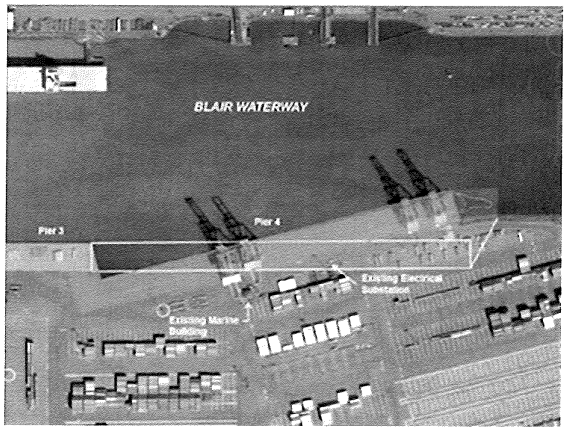
Figure 7-5: Aerial View of Terminal 4

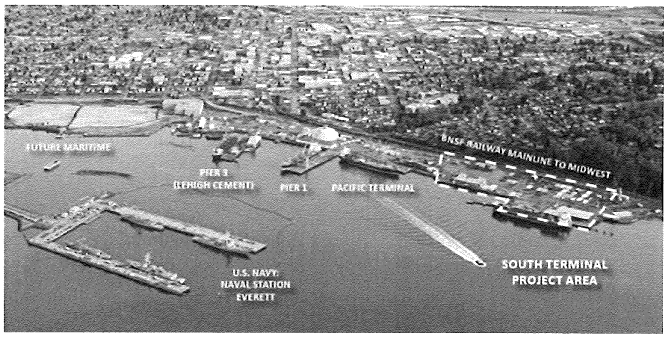


Port of Everett - South Terminal Intermodal Modernization

The Port of Everett's South Terminal Intermodal Modernization project will redevelop their south terminal to meet current and future multi-modal freight shipping needs of the region and nation.

This project allows the Port to efficiently and safely serve larger vessels that are currently being chartered by eight shipping lines, in particular Panamax class ships carrying containerized aerospace cargo. Notably, the Port of Everett serves as an extension of the aerospace manufacturing process, and plays a critical role in the just-in-time-delivery schedule. It transports **all** of the oversized parts for the 747, 767 (military and commercial), 777, K-C46 Tanker and soon to be 777X airplane programs. It also serves as a backup facility for the 787 Dreamliner program.

Figure 7-6: Aerial View of the Port of Everett



This project is necessary for the Port to meet the heavier containers being used to transport the airplane parts for the new Boeing 777X program and other breakbulk export cargoes that utilize port facilities. The wharf strengthening is needed for the intermodal transfer of goods from ship to shore, and the rail infrastructure is needed to stage the cargo for transport to the inland states without creating congestion on the BNSF mainline to the Midwest. This project has been fully funded and will begin construction in the fall of 2017.

Modernization of Non-Container facilities

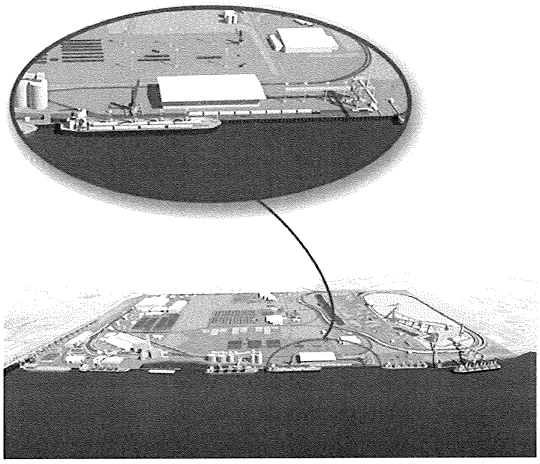
Ports reinvest in infrastructure to remain competitive

Port of Longview – Multi-Cargo Modernization

The Port of Longview's $31.4 million Multi-Cargo Modernization project will reinvigorate two general cargo docks into a premiere west coast heavy-lift and bulk cargo handling facility. This project is vital to strengthening local infrastructure that moves cargo in support of international trade for the benefit of our local, regional and national economies.

The project will rehabilitate and modernize 1,500 lineal feet of Berth 6 & 7 bulk and breakbulk cargo facilities to optimize increased cargo handling omni-dock operations. The terminal improvements include installation of a dual wastewater and stormwater collection system, strengthening decking and piling to withstand dual pick, breakbulk heavy loads, upgrading on-dock rail systems, and deepening the berths to take advantage of the recently deepened federal navigation channel.

Figure 7-7: Port of Longview Modernization



Conversion of Aging Facilities to New Lines of Business

Ports increase economic vitality through new opportunities

Port of Port Angeles - Marine Trades Industrial Park

The Marine Trades Industrial Park or (MTIP) includes existing businesses west of Cedar Street and south of Marine Drive and the former K-Ply site, all located along the industrial portion of the Port Angeles waterfront. Currently the Port is in Phase 1 of the master planning process to identify projected land and infrastructure needs to accommodate projected growth based on interviews with owners of existing key businesses and Port staff. The master plan developed as part of Phase 1 of the master planning effort will identify alternatives for future development of the entire Marine Trades Area (MTA). The MTA is an approximately 77-acre area along the Port Angeles waterfront that includes Terminals 1 and 3. The boundary includes the "K-Ply Site", an 18-acre parcel at the east end of the MTA that was recently the site of a soil contamination cleanup project. Cleanup was

completed in late spring of 2016, and the site is now ready for development as the Marine Trades Industrial Park (MTIP).

The MTA includes several existing businesses, including Westport Marine, Platypus Marine, Vigor Industrial, and a few smaller businesses that are either marine-related or general commercial in nature. These businesses have communicated to the Port that one of their top priorities is the development of a new boat wash down facility that will enhance their existing operations and attract new business to the Port. Currently, the Port is studying this requested improvement.

First and Last Mile Access Challenges

Road access to port facilities through urbanized areas

Northwest Seaport Alliance - Seattle Harbor Terminal 5 Access Improvements

One example of road access challenges is truck access to the modernized NWSA North Harbor Terminal 5. In the redevelopment of T-5 to a modern terminal that can handle up to 18,000 TEU ships, the port realizes that the current road access to T-5 must be improved. In their Environmental Impact Study, three alternatives were evaluated:

- Alt 1- no action 647K TEUs / yr.- 70% trucked off dock
- Alt 2 -1.3 M TEUs / yr. -50% trucked off dock 650K TEUs
- Alt 3 -1.7 M TEUs /yr. – 50% trucked off dock 850K TEUs

The port is studying proposed mitigation options for anticipated increases in truck traffic to and from the terminal. Alternatives include the closure of the Terminal 5 leg of the 5-legged intersection and upgrading signals to rail yards on Lower Spokane St & East Marginal Way.

More on the project can be found at http://www.portseattle.org/Environmental/Environmental-Documents/SEPA-NEPA/Pages/default.aspx

Port of Clarkston – Access Improvements

In smaller urbanized areas, such as Clarkston, ports continue to have road access issues. The Port of Clarkston identified three road access challenges to get trucks to and from their terminals:

- Highway 12 Bridge into Idaho is a major chokepoint for freight (AP1)
- Congestion North (at 4 way stop) at 5th St and Fair St. This is the intersection in front of Walmart and Costco. (AP2)
- 5th and Bridge Street- at this intersection there are continuous conflicts between transit buses and truck traffic traveling to the ports terminals.
- 6th St. in Clarkston is a challenge for log trucks (AP4)

All four access points are outside of the port's ownership, so the port must rely on local and state agencies to prioritize these projects and fund solutions.

Road Access to New Port Facilities through Rural Areas

Port of Kalama – Access Improvements

- Kalama Methanol Manufacturing and Exporting Facility (KMMEF)

Rural areas have many of the same challenges as urban areas. In the Port of Kalama, the development of the Kalama Methanol Manufacturing and Exporting Facility (KMMEF) has

prompted the port to evaluate road access issues near the site. They are examining access issues for both the construction, and post construction periods.

Road Access and Modal Conflicts

Port of Grays Harbor – East Aberdeen Mobility Project

In Aberdeen, traffic congestion caused by Port of Grays Harbor rail traffic closes off access to a main retail hub for up to 30 minutes, multiple times per day. The community and the port are jointly working on solutions to this access challenge. Known as The East Aberdeen Mobility Project (formerly Wishkah Mall Access), one identified solution is the construction of a grade separation over the PSAP railroad tracks to allow separation of rail and road.

Future Modal Conflicts

Port Longview – Barlow Point

The Port of Longview is in the final planning process for the development of 280 acres of greenfield properties along the Columbia River. Initial master plans show that road and rail investments will need to be made to ensure good road and rail access to the property. The final design of these access improvements will be dependent on the final customer and their respective use of the property.

Port Infrastructure Project List for 16 Participating Ports

The development of the list of port related projects began with the interviews of the 16 participating ports during the summer of 2016. This effort was integrated with the FMSIB / WSDOT effort to prepare a prioritized project list required under FAST Act for distribution of the National Highway Freight Program formula money.

Due to the specific planning processes identified in FAST ACT, Cities, counties, and ports were to coordinate with MPOs and RTPOs before submitting projects to the 2016 list. This is a new, and different process for many Washington ports. Although, some of the ports are very active in their local transportation planning organizations, many are not. Thus, not all port projects were included in the lists that were submitted to WSDOT from their respective planning organizations.

To help with this change in the planning process, the consultant team provided guidance to each port on how to get their projects into the WAFAC list. Most were successful; however, for a variety of reasons, some projects failed to get onto the WAFAC list.

There is continuous work underway to better communicate the process, and ensure that the process continues to evolve and improve over time. The project list included in this study (*Appendix B*) is a combination of (a) projects that ports self-submitted,(b) port related projects that are on the WAFAC list and (c) projects submitted by parties other than ports (e.g. local governmental agencies ,cities and counties). It is the intent of this study to be as inclusive as possible when identifying projects that are important to ports that participated in this study.

Table 7-5: Summary of Port Infrastructure Projects

Port	Road	Rail	New Terminal Facilities	Terminal Modernization	Terminal Infrastructure	Dock	Dredging	Bus. Park Infrastructure	Buildings	Prop. Purchases	ITS	Grade Separations	Studies - Feasibility	Studies - Road/ Rail	Summary
Anacortes							1								1
Bellingham							1								1
Benton		1													1
Clarkston	2														2
Everett	1			3											4
Grays Harbor			2									1			3
Kalama	4		1			1	2	2	1	1					12
Longview	3	2	1	3											9
Multi -Col River Ports							1								1
NWSA	3	5			1		2				1				12
Olympia		1					1						1		3
Pasco		1							1			1			3
Port Angeles	1		1		1				1				3		7
Seattle	16	1									2	2			21
Tacoma	7	1									1	1		1	11
Vancouver	3	1			1							1			6
Walla Walla	1														1
WPPA - Statewide														1	1
Total Projects	41	13	5	6	3	1	8	2	3	1	4	6	4	2	99

Funding Challenges

Most of the project on the Port Infrastructure Project list lack full funding. There are always many more project needs than available dollars. As has been the case for many years, there are many more good projects that need funding than funds available. To try to focus federal investments into projects that align with Federal and State priorities, the Fixing America's Surface Transportation (FAST) Act, passed in December 2015, provides a structured project identification process. It is recommended that ports become educated on the process, and actively engage as soon as possible.

At the federal level, progress has been made through the enactment of the FAST Act to provide states and local officials with guidance on federal funding priorities. This includes the planning requirements as detailed above regarding State Freight Plans and state Freight Advisory Committees. The result of the FAST Act is that the key criteria for accessing Federal funds is that projects align with state and federal priorities, not just a local priority. This may put additional pressure on smaller ports and communities that have traditionally had a hard time competing at the national level. There are two avenues to federal funding under the National Highway Freight Program: formula money allocated to the state and then assigned to projects within the state and FASTLANE discretionary grants.

National Highway Freight Formula Program Eligibility

The FAST Act established the National Highway Freight Program, which provides states with formula funding to be used for projects on the National Highway Freight Network. Washington State expects to receive about $20 million per year from 2016 to 2020. Funds apportioned to the State for the national highway freight program may be obligated to carry out one or more of the following:

i. Development phase activities, including planning, feasibility analysis, revenue forecasting, environmental review, preliminary engineering and design work, and other preconstruction activities.
ii. Construction, reconstruction, rehabilitation, acquisition of real property (including land relating to the project and improvements to land), construction contingencies, acquisition of equipment, and operational improvements directly relating to improving system performance.
iii. Intelligent transportation systems and other technology to improve the flow of freight, including intelligent freight transportation systems.
iv. Efforts to reduce the environmental impacts of freight movement.
v. Environmental and community mitigation for freight movement.
vi. Railway-highway grade separation.
vii. Geometric improvements to interchanges and ramps.
viii. Truck-only lanes.
ix. Climbing and runaway truck lanes.
x. Adding or widening of shoulders.
xi. Truck parking facilities eligible for funding under section 1401 of MAP-21 (23 U.S. Code §137).
xii. Real-time traffic, truck parking, roadway condition, and multimodal transportation information systems.
xiii. Electronic screening and credentialing systems for vehicles, including weigh-in-motion truck inspection technologies.
xiv. Traffic signal optimization, including synchronized and adaptive signals.
xv. Work zone management and information systems.
xvi. Highway ramp metering.
xvii. Electronic cargo and border security technologies that improve truck freight movement.
xviii. Intelligent transportation systems that would increase truck freight efficiencies inside the boundaries of intermodal facilities.
xix. Additional road capacity to address highway freight bottlenecks.
xx. Physical separation of passenger vehicles from commercial motor freight.
xxi. Enhancement of the resiliency of critical highway infrastructure, including highway infrastructure that supports national energy security, to improve the flow of freight.
xxii. A highway or bridge project, other than a project described in clauses (i) through (xxi), to improve the flow of freight on the National Highway Freight Network.

xxiii. Any other surface transportation project to improve the flow of freight into and out of a facility, including projects (i) within the boundaries of public or private freight rail or water facilities (including ports); and (ii) that provide surface transportation infrastructure necessary to facilitate direct intermodal interchange, transfer, and access into or out of the facility.

National Highway Freight Program Project Screening

Projects published on this list are required to meet the following screening requirements:

- **Network Screening**: Projects are required to be located on the National Highway Freight Network, which is currently in development (the Primary Highway Freight System and remainder of Interstate system have been established; Critical Urban and Rural Freight Corridors are to be designated by September). A state may obligate apportioned funds for projects on any component of the National Highway Freight Network. Projects that do not meet these requirements will not advance to the next screening for consideration.
- **Regional Screening**: Projects are required to be supported by the regional transportation planning organization. If a project is not in a current regional plan, a letter from the metropolitan or regional planning organization must be submitted with the project. Tribal projects may be submitted directly to WSDOT; regional coordination is encouraged. Projects that do not meet these requirements will not advance to the next screening for consideration.
- **Scheduling Screening**: Projects are required to identify the scheduled year that funding is expected to be used. The program is funded through FY2020 under the FAST Act, and projects must be scheduled no later than June 30, 2020, to become eligible for funding. For construction projects, this is the year for construction. If projects are not ready for construction, the scheduled year for development phase activities should be provided. Projects scheduled beyond June 30, 2020 will be considered long-range investments without identified federal funding.
- **Funding Screening**: Projects are required to demonstrate fiscal constraint and quantify the gap in current funding. Fund sources and commitments must be identified and documented as part of the submission. Updated project costs were to be provided in state FY2017 dollars. Projects that did not meet these requirements were not considered.

National Highway Freight Program Project Prioritization

The prioritized project list was delivered to the legislature for funding consideration. Submitted projects were prioritized based on readiness. WAFAC categorized projects eligible to use formula funding, based on three tiers.

- Tier 1 will be composed of screened projects that are scheduled July 2016 to June 2018.
- Tier 2 will be composed of screened projects that are scheduled July 2018 to June 2020.
- Tier 3 will be composed of screened projects that are scheduled July 2020 to June 2035.

Specifically, federal funding available under FASTLANE discretionary grants must align with the following requirements:

Nationally Significant Freight & Highway Projects Program Requirements

The FAST Act also established the Nationally Significant Freight & Highway Projects Program, administered as the INFRA (Infrastructure for Rebuilding America) grant program. Eligible project costs include:

1) development phase activities, including planning, feasibility analysis, revenue forecasting, environmental review, preliminary engineering and design work, and other preconstruction activities; and
2) construction, reconstruction, rehabilitation, acquisition of real property (including land related to the project and improvements to the land), environmental mitigation, construction contingencies, acquisition of equipment, and operational improvements directly related to improving system performance.

The US Secretary of Transportation may select a project for funding under this section only if the Secretary determines that:

1) the project will generate national or regional economic, mobility, or safety benefits;
2) the project will be cost effective;
3) the project will contribute to the accomplishment of one or more of the national goals described under section 150 of Title 23, United States Code;
4) the project is based on the results of preliminary engineering;
5) with respect to related non-Federal financial commitments:
   - one or more stable and dependable sources of funding and financing are available to construct, maintain, and operate the project; and
   - contingency amounts are available to cover unanticipated cost increases;
6) the project cannot be easily and efficiently completed without other Federal funding or
7) financial assistance available to the project sponsor; and
8) the project is reasonably expected to begin construction not later than 18 months after thedate of obligation of funds for the project.

Nationally Significant Freight & Highway Projects Program Screening

Projects published on this freight grant list will need to meet the following criteria:

Network Screening: Eligible projects include the following only:

- Highway freight projects on the National Highway Freight Network;
- Highway or bridge projects carried on the National Highway System;
- Railway-highway grade crossing or grade separation projects; or
- Freight intermodal or rail projects.

Regional Screening: Projects are required to be supported by the regional transportation planning organization. If a project is not in a current regional plan, a letter from the metropolitan or regional planning organization must be submitted with the project. Tribal projects may be submitted directly to WSDOT; regional coordination is encouraged.

Funding Screening: Projects must be reasonably expected to begin construction not later than 18 months after the date of obligation of funding. The estimated end date of the final Notice of

Funding Opportunity for the INFRA grant program has a projected latest date of spring 2020; the program is funded at approximately $900 million per year.

Minimum project costs for large projects is $100 million; the funding gap is required to be at least $25 million. For small projects, less than $100 million, the funding gap is required to be at least $5 million.

Projects are required to demonstrate availability of sufficient funds (Federal, state, local, and private), less the grant request, to cover at least 40 percent of total project costs (INFRA grants may be used for up to 60 percent of the future eligible project costs, and total federal assistance may be up to 80 percent of project costs). Fund sources and commitments must be identified and documented as part of the submission. Updated project costs should be provided in state FY2017 dollars.

Summary

As detailed in the Port Infrastructure Project list, ports in Washington have a multitude of investment needs. Finding funding for these investments will continue to be a challenge because local port and communities do not have the resources to fully self-fund these improvements. With the need to find outside funding for port projects, it has become mandatory that ports actively participate in their local and regional planning organizations and planning processes. The FAST Act requires listing of projects in these broad-based regional and state planning activities to be eligible for new federal funding.

Prior to the FAST Act, Washington ports could independently do their planning under the Washington State Growth Management Act. With the enactment of FAST Act at the federal level, it is no longer a choice to participate in regional transportation planning efforts if a port is interested in pursuing federal funding for a port or port-related project in the future.

Table 7-6: Summary of Port Infrastructure Projects

Proj #	Port Priority	WSDOT No.	Project Name	Location Description	Latitude / Longitude	Brief Description	Improve Type	Port District	Project Owner	Submitting Authority	Ref.	PE Year	ROW Year	Const. Year	Project Cost / Funding Gap	% Gap
1	high		Pier 2 Export Initiative	Anacortes	48.521944 / 122.612778	The Port's primary bulk cargo facility, Pier 2 will require dredging to deepen its draft from -36.5' MLLW to -45 MLLW to accommodate larger, Panamax sized vessels and retain shipping and family-wage jobs. This project will complete the following five items: 1. Relocation of the facility's manufacturing and storage structure 2. Purchase and operation of a new mobile bulk shiploader 3. Repairs to the Pier's bulkhead wall 4. Relocation/reinstallation of the existing breasting dolphins 5. Berth deepening to allow larger ships to berth at the Pier and leave fully loaded	Dredging/ Terminal Infrastructure	Anacortes	Port of Anacortes	Port of Anacortes		2017	N/A	2017-2018	$11,801,200 / $6,767,305	57%
2			Squalicum Waterway Maintenance Dredging	Bellingham		The USACE has not performed maintenance dredging in the Squalicum Waterway since 2004, and heavy sedimentation has since caused a navigation hazard which threatens continued use of the waterway by commercial vessels loading and off-loading cargo. Commercial vessels have recently grounded in the Squalicum Waterway and the Puget Sound Pilots Association has warned about this navigation hazard. Cargo vessels operating in the Squalicum Waterway are currently limited by tidal restrictions. The need for maintenance dredging grows increasingly urgent to protect the over 2,000 jobs and hundreds of millions of dollars in gross annual revenue which rely on a maintained federal navigation channel.	Dredging	Bellingham	US Army Corp of Engineers/ Port of Bellingham	Port of Bellingham		2017	N/A	2018-2019	/ $750,000	
3	1		Richland Inland Port	Richland		The City of Richland and the Port of Benton have commissioned a joint Rail Master Plan to assess the feasibility of an inland container port. The Richland Inland Port will provide a transportation option to Eastern Washington agricultural exporters that face long dray operations to reach ports in Seattle and Tacoma. This project includes rail and road improvements and will have multiple phases. The rail serves both class I railroads.	Rail	Benton	Port of Benton & City of Richland	Port of Benton	-	2018 Phase 1 Tie replacement, Phase 2 Rail upgrades, Phase 3 Track resurfacing	N/A	2018 Phase 1 Tie replacement, 2018 Phase 2 Rail upgrades, 2019 Phase 3 Track resurfacing	$2.9m (phase 1), Rail upgrade taking rail from 90# to 136# $4.8m (phase 2), Track resurfacing $705k (phase 3) / $000,000	100%

Proj #	Port Priority	WSDOT No.	Project Name	Location Description	Latitude / Longitude	Brief Description	Improve Type	Port District	Project Owner	Submitting Authority	Ref.	PE Year	ROW Year	Const. Year	Project Cost / Funding Gap	% Gap
4	1	68	Bridge and 2nd Street Intersecti on	Intersection of Bridge Street, 2nd Street, and Diagonal Street	46.420297 / -177.042639	Road widening and realignment of the 5-point intersection; adding lanes to reduce congestion	Road	Clarkston	City of Clarkston	Lewis Clark Valley MPO	LCVMPO Long Range Transport ation Plan	2020	2021	2022	$916,000 / $732,800	80%
5	2	73	Southway Bridge	Fleshman Way from the abutment of the bridge to the midpoint of the bridge.	46.396805 / -117.043785	Design and Reconstruction of the Southway Bridge; mill through asphalt pavement, membrane, and reconstruct delaminated localized areas of the deck surface, followed by a Polymer Concrete (PPC) overlay	Road	Clarkston	Asotin County, City of Clarkston, City of Lewiston, Nez Perce County	Lewis Clark Valley MPO	LCVMPO Long Range Transport ation Plan	2020		2021	$2,113,350 / $1,690,680	80%
6		25	South Terminal Moderniz ation Project II	Everett, Washington	47.975418 / -122.25645	Strengthen the remaining 560 feet of the South Terminal, install 700 feet of crane rail to support two 100-ft gauge gantry cranes, and construct a double rail siding to support the cargo operations.	Terminal Moderniza tion	Everett	Port of Everett	PSRC		July 2016-July 2017	N/A	2017-2018	$50,100,000 / $000	0%
7		56	South Terminal Moderniz ation Project Yard and Wharf Improve ments	Everett, Washington	47.98513 / -122.216745	The Port of Everett is modernizing its seaport to meet 21st century shipping needs. This project would invest in utilities, expansion of on-dock rail, and a new fender system to support an expanded South Terminal.	Terminal Moderniza tion	Everett	Port of Everett	PSRC		July 2016-Decem ber 2020	N/A	2021	$30,200,000 / $30,200,000	100%
8		34	EMVD/ SR 529 Interchan ge Improve ments	East Marine View Dr. (SR 529 off-ramp to SR 529 on ramp)	48.011328 / -122.090388	Correct the height restriction with East Marine View Drive	Terminal Moderniza tion	Everett	City of Everett	PSRC	Letter	2018	2019	2019	$2,246,000 / $1,980,000	88%
9		72	West Marine View Drive (Highway 529) Bulkhead Rebuild	Everett, Washington	47.981997 / -122.215143	Rebuild aging bulkhead that is supporting the Southbound lanes of SR529 (West Marine View Dr.), which accesses both Naval Station Everett and the Port of Everett.	Road	Everett	Port of Everett	PSRC		60% design in 2016	N/A	TBD	$1,700,000 / $1,700,000	100%
10	1		Terminal 1- Port of Grays Harbor	Hoquiam	46.966756 / -123.856341	Liquid bulk – Terminal 1 operates as a barge and bulk liquid terminal. Adjacent property is available for development.	New Terminal Facility	Grays Harbor	Port of Grays Harbor							

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11	2		Terminal 3- Port of Grays Harbor	Hoquiam	46.970163 / -123.912272	Existing pier with adjacent uplands (150 acres) planned for dry bulk storage and vessel loading. Site needs rail realignment to allow for unit train receiving and handling. Dry bulk storage facility and ship loader to facilitate the transfer of dry bulk from unit trains to storage and then delivery to vessel. New rail alignment is needed to mitigate impact of unit train traffic on local freight service roads.	New Terminal Facility	Grays Harbor	Port of Grays Harbor							
12	3	67	East Aberdeen Mobility Project (formerly-Wishkah Mall Access)	US 12 (E. Wishkah St.), Fleet St to S Harbor St.	46.977217 / -123.809013	Grade separation, access control, pedestrian safety improvements	Grade Separation	Grays Harbor	City of Aberdeen WSDOT	SWRTPO	http://www.cwcog.org/documents/2040RTPFINALck11-4-15.pdf	2018			$30,000,000 / $30,000,000	100%
13		23	Kalama Methanol Manufacturing and Exporting Facility (KMMEF) - Dock	The Port would construct the proposed export dock at approximately River Mile (RM) 72 of the Columbia River Navigation Channel.	46.045522 / -122.876473	The new export dock is designed to accommodate both the existing fleet and future generations of methanol carriers. The dock would generally be 530 feet long and 36 feet wide and would be designed to accommodate vessels ranging in size from 45,000 deadweight tonnage (DWT) to 127,000 DWT, measuring from 600 to 900 feet in length, and 106 to 152 feet in width. The dock would consist of a transition platform, trestle, and turning platform. From the access trestle, the berth face of the dock would extend approximately 530 feet downstream, and would consist of an approximately 100- by 54-foot transition platform, a 370- by 36-foot berth trestle, and a 104- by 112-foot turning platform.	Dock	Kalama	Port of Kalama	SWRTPO				2017-2019	$21,500,000 / $10,750,000	50%
14		7	Improvements to Tradewinds and East Wind Roads required to support the development of the Kalama Methanol Manufacturing and Exporting Facility	Local roads accessing the facility off Tradewinds Road at I-5 exit 32	46.047835 / -122.864165	Improvement to local roads to include: Road "A" will be a new, 680-foot long road that will provide access to Air Liquide, an existing Port tenant, and to the Port's wastewater treatment plant. The new road will also provide emergency response access to the methanol plant. Road "A" is needed because the existing access road will be taken out of service to accommodate the new methanol plant footprint. Road "B" will be a 3,100-foot long improvement to an existing gravel road that today is not capable of handling general road or bike traffic.	Road	Kalama	Port of Kalama	SWRTPO				2017-2019	$1,200,000 / $700,000	58%

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15		70	Oak Street Overpass Modification	Access / Egress to I-5 Exit 30 Overpass	46.018465 / -122.849933	Access / Egress to Overpass	Road	Kalama	Port of Kalama	SWRTPO		2019	2020	2021	$1,000,000 / $1,000,000	100%
16		10	Spencer Creek Business Park- Pre-loading Site	Spencer Creek Business Park - I-5 exit 32	46.043838 / -122.851913	Pre-loading required for building construction	Business Park Infrastructure	Kalama	Port of Kalama	SWRTPO				2016-2017	$1,400,000 / $1,400,000	100%
17		26	Spencer Creek Business Park - Installation of floating Light Industrial Dock, in support larger freight movement	Spencer Creek Business Park - I-5 exit 32	46.044144 / -122.848279	Installation of floating light industrial dock, in support larger freight movement	Business Park Infrastructure	Kalama	Port of Kalama	SWRTPO				2017-2021	$20,000,000 / $20,000,000	100%
18		46	Spencer Creek Business Park - Road and Utility Improvements to the Business Park	Spencer Creek Business Park - I-5 exit 32	46.04409 / -122.846211	Utilities and Roads	Road	Kalama	Port of Kalama	SWRTPO				2018-2019	$12,000,000 / $12,000,000	100%
19		18	Spencer Creek Business Park- Enhance Surface Streets	Access to light industrial businesses east of I-5 exit 32	46.043838 / -122.851913	Surface Street Enhancements	Road	Kalama	Port of Kalama	SWRTPO				2017	$5,000,000 / $5,000,000	100%
20		13	Property Purchases	Port of Kalama - Central Port	46.026112 / -122859868	Waterfront Industrial Property (Central Port)	Property Purchases	Kalama	Port of Kalama	SWRTPO				2017-2021	$3,000,000 / $3,000,000	100%
21		14	Deep Water Terminal Berth Dredging	Columbia River in Kalama	45.98508 / -122.836151	Dredge deep water berth to maintain access for grain terminal export	Dredging	Kalama	Port of Kalama	SWRTPO				2017-2021	$3,750,000 / $3,750,000	100%

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22		8	Dredge Spoils Disposal Sites	Lower Columbia River-Portland to Astoria	46.049147 / -122.873901	Property purchase	Dredging	Kalama	Port of Kalama	SWRTPO				2017-2021	$1,000,000 / $1,000,000	100%
23		21	Kalama River Industrial Park - Building Construction	Kalama River Industrial Park	46.034114 / -122.868274	Light Industrial building construction	Buildings	Kalama	Port of Kalama	SWRTPO				2017	$8,000,000 / $8,000,000	100%
24			Kalama Methanol Manufacturing and Exporting Facility (KMMEF) - Infrastructure Improvements	Tradewinds Road at I-5 exit 32		Construction of a Fire Loop to support fire suppression at the facility as well as adding security infrastructure. The project will also add a well and make storm water system enhancements. This is a phased project.	Terminal Infrastructure	Kalama	Port of Kalama	SWRTPO				2017-2019	$23,000,000 / $23,000,000	100%
25	1	59	Port of Longview Industrial Rail Corridor (IRC) Expansion Project	Expansion of existing industrial rail corridor into the Port. Rail is south/southwest of SR432. From approximately Lat 46.109996/ Long -122.904654 to Lat 46.110770/Long -122.935767	46.11077 / -122.935767	The Project consist of expansion of its existing industrial rail corridor by adding one to two additional through tracks into the Port with up to four sidings to accommodate current and future growth and market demand. The running tracks will be approximately 9,500-ft and the sidings up to 7,500-ft.	Rail	Longview	Port of Longview	CWCOG		2016	2017	2018	$35,000,000 / $30,000,000	86%
26	2	110	Barlow Point Terminal Development	Barlow Point Property located adjacent to SR 432 at approximately Lat 46.14983/Long -123.02504	46.14983 / -123.02504	Port terminal development on 285+ acres. Site is considered a "green field" development; no previous development has occurred. Project would include dock structures, utility backbone, roadways, storm water systems, etc. on the site to support 1 to 3 future private terminal developments.	New Terminal Facility	Longview	Port of Longview	CWCOG		2017		2021	$227,000,000 / $227,000,000	100%
27	3	61	Barlow Point Terminal Railway Entry Development	Rail development from the end of the BNSF line adjacent to SR432 at approximately: Lat 46.146479/Long -123.002307	46.146479 / -123.002307	New rail infrastructure development from the terminus of the BNSF Reynolds Lead into the Barlow Point property; to include two inbound and two outbound tracks. Project is to provide rail backbone to the property for future private terminal development.	Rail	Longview	Port of Longview	CWCOG		2016	2018	2019	$43,000,000 / $43,000,000	100%
28	4	38	Barlow Point Terminal Entry Road Development	On SR432 at approximately: Lat 46.148879/Long 123.011405	46.148879 / -123.011405	Develop Barlow Point terminal entrance off of SR432. Project is to provide safe entrance/exit for future private terminal development.	Road	Longview	Port of Longview	CWCOG		2016	2018	2019	$4,000,000 / $4,000,000	100%

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29		43	Industrial Way / Oregon Way Intersection Project	Project is located on State Route (SR) 432, a designated National Highway System (NHS) route.		Project is located at the intersection of Industrial Way (State Route (SR) 432) and SR 433, a critical connection of two Highways of Statewide Significance that support significant passenger and freight truck movement. Intersection is currently operating close to Level of Service (LOS) E and is projected to fail (LOS F) in 2040.	Road	Longview	Cowlitz County	CWCOG	2016-2019 RTIP/STIP	2016	2018	2020	$95,000,000 / $7,559,304	8%
30		40	SR 432 Corridor Improvements - Phase II	The project is located on SR 432 between MP 7.04, California Way and SR 432 Intersection, and MP 7.62, SR 432 off-ramp; and on SR 411 at MP 0.03, SR 432 on-ramp.	46.115836 / -122.931154	This project will relieve congestion, increase capacity, and improve safety on the SR 432 Corridor at two locations: SR 432 / SR 411 interchange off-ramp and on-ramp; and SR 432 / California Way intersection. This corridor is critical to the economic vitality of the region and the state, providing access to intermodal businesses and the Port of Longview. The SR 432/ SR 411 interchange improvements will increase capacity and safety by constructing a second left turn lane from the westbound SR 432 off-ramp to SR 411/3rd Avenue, and improve efficiency and increase safety for eastbound traffic by realigning the eastbound on-ramp to SR 432. Improvements to the SR 432 / California Way intersection will eliminate closely spaced, offset intersections by realigning California Way to create a single four-legged intersection at SR 432 / Industrial Way / California Way. Eliminating the offset will result in more efficient signal operation and turning movements, reducing travel time and congestion. Realignment of California Way will require right-of-way acquisition of 4 parcels and relocation of three existing businesses. Two existing railroad crossings will be widened to accommodate the new alignment.	Road	Longview	City of Longview	CWCOG: Longview-Kelso-Rainier MPO	http://industrialoregonway.org/wp-content/uploads/2015/08/SR_432_FINAL%20Concept%20Development%20Report_Combined.pdf	2017	2017	2020	$9,500,000 / $5,320,000	56%
31		53	Berth 4 Terminal Redevelopment Project (including rail infrastructure support)	Berth 4 at Port proper south/southwest of SR432 at approximately Lat 46.105980/Long -122.952933	46.10598 / -122.952933	Redevelopment of the Berth 4 facilities into a leased terminal. Project development will be in coordination with private development. Project may include storage, dock construction, and rail infrastructure improvements.	Terminal Modernization	Longview	Port of Longview	CWCOG		2018		2019	$20,000,000 / $20,000,000	100%
32		54	Bridgeview Terminal (Berth 1/2) Project	Berth1/2 at Port proper south/southwest of SR 432; immediately upstream of SR433 at approximately Lat 46.1071/Long -122.95624	46.1071 / -122.95624	Redevelopment of the Berth 1 and Berth 2 facilities into one leased terminal. Project development will be in coordination with private development. Project may include storage, dock construction, and rail infrastructure improvements.	Terminal Modernization	Longview	Port of Longview	CWCOG		2017		2018	$20,000,000 / $20,000,000	100%

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33		45	Port of Longview Multi-Cargo Modernization Project (Berth 6/7)	Berth 6/7 within the Port of Longview Proper (i.e South of SR 433 Bridge) Lat 46.0625/Long -122.5726	46.10598 / -122.5726	Project will rehabilitate and modernize 1500 lineal feet of Berth 6 & 7 bulk and breakbulk cargo facilities to optimize increased cargo handling omni-dock operations. The terminal improvements include installation of a dual wastewater and storm water collection system, strengthening decking and piling to withstand dual pick, breakbulk heavy loads, upgrading on-dock rail systems, and deepening the berths to take advantage of the recently deepened federal navigation channel.	Terminal Modernization	Longview	Port of Longview	CWCOG		2017		2018	$31,400,000 / $10,000,000	32%
34		65	Dredge Material Management Plan	The Columbia River deep draft federal navigation channel (FNC) is 43 feet deep and generally 600 feet wide, from the Mouth of Columbia River, River Mile (RM) 3 to Vancouver, WA, RM 105.5.		The scope of this project is to complete a management plan of sufficient detail to ensure unimpeded maintenance of the 43-foot Columbia River federal navigation channel for the next 20 years. Other federal and non-federal dredging within the related geographic area will be considered to the extent that placement from these sources affects placement capacity for the 43-foot channel. The Sponsor Ports in Washington on the Columbia River (Port of Longview, Port of Kalama, Port of Woodland, and Port of Vancouver) are responsible for aiding the USACE in this process, conducting a joint SEPA/NEPA evaluation, as well as securing dredge material placement sites (easements and property) within the 20-year Plan's timeframe.	Dredging	Longview, Kalama, Vancouver	USACE/Washington State Sponsor Ports; and Oregon Sponsor Port, Port of Portland.	CWCOG & SWRTPO			2019	2019	$50,000,000 / $50,000,000	100%
35	1	20	Blair Hylebos Rail Improvements	Port of Tacoma MIC, Blair Hylebos Peninsula	47.261478 / -122.372383	Track improvements specific to future dry bulk export terminal requirements and connection to arrival/departure track infrastructure and direct mainline infrastructure.	Rail	NWSA	Northwest Seaport Alliance	PSRC	Letter of Support	2016	2017	2017	$7,000,000 / $3,000,000	43%
36	high		Gateway Project - SR 509/167	King & Pierce Counties		Construction of new four lane alignment on SR 167 between SR 509 in Tacoma and SR 161 in Puyallup. This project will also widen SR 509 between SR 516 and 28th/24th Ave. South and add toll lanes.	Road	NWSA	WSDOT	PSRC				2020	$1,463,000,000 / $130,000,000	9%
37	high	66	Terminal 5 Improvements	Terminal 5 is located in the Duwamish MIC, north of the West Seattle Bridge on the west side of the west Duwamish Waterway, and just east of Harbor Avenue in West Seattle.	47.577535 / -122.36572	The completed project will upgrade the terminal's dock and power supply to accommodate larger cranes, additional refrigerated container storage and future shorepower, and increase the depth of the berth to accommodate larger ships. The grant requested portion of this project includes truck gate, ITS and intersection improvements in the S. Spokane St/East Marginal Way/Hanford corridor, container movement and power supply improvements to facilitate truck access and minimize traffic impacts.	Terminal Modernization	NWSA	Northwest Seaport Alliance	PSRC	Letter of Support	2017-18		2019	$275,000,000 / $100,000,000	36%

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38	high	58	Arrival/Departure Tracks	Port of Tacoma MIC	47.250659 / -122.370225	In order to increase cargo velocity through terminals, it is necessary to arrive and depart longer trains of 8,000' intact. This project would extend a number of SR-509 rail corridor tracks 1,300' east, construct a new rail bridge across Wapato Creek, and relocate utilities. This phase provides two track connections from existing support yard to future Bulk Export facility and connects the easterly end of the existing Pierce County Terminal Intermodal Yard to the SR-509 corridor arrival and departure tracks.	Rail	NWSA	Northwest Seaport Alliance	PSRC	Letter of Support	2018-2019			$45,000,000 / $30,000,000	67%
39		15	Terminal 5 Access Improvements	Terminal 5 is located in the Duwamish MIC, north of the West Seattle Bridge on the west side of the west Duwamish Waterway, and just east of Harbor Avenue in West Seattle.	47.572539 / -122.360767	The project includes truck gate, ITS and intersection improvements in the S. Spokane St/East Marginal Way/Hanford corridor to facilitate truck access and minimize traffic impacts.	Road	NWSA	Northwest Seaport Alliance	PSRC	Letter of Support, may include components of RCP 5350, 5348	2017	2017	2018	$5,000,000 / $4,000,000	80%
40		24	Duwamish Rail Corridor Project	Seattle, Duwamish MIC, existing rail lines on the south side of Spokane Street from Terminals 5 and 18 through the south end of Argo Yard	47.570799 / -122.34887	Create improved direct rail access from the Port marine terminals T-5 and T-18 to UP and BNSF mainlines	Rail	NWSA	Northwest Seaport Alliance	PSRC	Letter of Support	2019-2020			$16,000,000 / $16,000,000	100%
41	high	60	T-5 Rail Improvements	Terminal 5 is located in the Duwamish MIC, north of the West Seattle Bridge on the west side of the west Duwamish Waterway, and just east of Harbor Avenue in West Seattle.	47.575302 / -122.369349	Intermodal Yard and Rail Enhancements	Rail	NWSA	Northwest Seaport Alliance	PSRC	Letter of Support	2018-2019			$40,000,000 / $40,000,000	100%
42		17	Terminal 18 Truck Access Improvements	Terminal 18 is located in the Duwamish MIC, north of S. Spokane St on the east side of Harbor Island in Seattle	47.571808 / -122.347902	This project will reconfigure the southern edge of the NWSA's Terminal 18, and adjacent public right-of-way, to relocate the terminal truck entrance's security check and optical character recognition equipment. It will increase the capacity of the security check and eliminate truck queues on public streets.	Road	NWSA	Northwest Seaport Alliance	PSRC	Letter of Support	2017		2018	$5,000,000 / $5,000,000	100%

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43		12	Port Community Technology System	NWSA facilities, Seattle Duwamish MICs	47.593262 / -122.340519	Implement an electronic platform that allows for the secure exchange of information between the NWSA and private, as well as public, sector stakeholders to improve the efficiency of the NWSA-related supply chain. This will cover NWSA terminals, trucks, rail and waterways; and their interactions with each other.	ITS	NWSA	Northwest Seaport Alliance	PSRC	Letter of Support	2016	NA	2017-18	$10,000,000 / $3,000,000	30%
44		62	North Intermodal Yard Alignment	Port of Tacoma MIC, General Central Peninsula	47.266808 / -122.409118	Align North and South Intermodal Yards	Rail	NWSA	Northwest Seaport Alliance	PSRC	Letter of Support	2019-2020		2020	$50,000,000 / $45,000,000	90%
45	medium		Seattle Dredging	Seattle			Dredging	NWSA	NWSA	NWSA		2018-2021		2022	$72,000,000 / $72,000,000	100%
46			Tacoma Dredging	Tacoma			Dredging	NWSA	NWSA	NWSA		2023-2024		2025-2026	N/A / N/A	100%
47			Port of Olympia Master Plan	Olympia		The port of Olympia will undertake a Master Planning effort that seeks to identify facility and asset improvements designed to retain and increase marine terminal business opportunities in the future. Wharf strengthening, dock reconstruction and terminal optimization among other improvements will be reviewed and prioritized.	Study	Olympia	Port of Olympia	Port of Olympia		2018				
48			Maintenance Dredging - Turning Basin	Olympia		Work with the ACOE to perform maintenance dredging to achieve Congressionally-mandated 30 foot channel depth.	Dredging	Olympia	Port of Olympia	Port of Olympia						
49				Olympia			Rail	Olympia								
50	1	31	Big Pasco Intermodal Rail Reconstruction	Big Pasco Industrial Park, Pasco, WA Tracks 416, 420, 419, and 452	46.215356 / -119.062015	Reconstruct 12,300 LF of WWII Port-owned rail actively used for intermodal transloading	Rail	Pasco	Port of Pasco	Benton/Frankl in MPO	Letter of Support	2017	Complete	2018	$1,700,000 / $1,300,000	76%
51	2		New Port Industrial Park	Big Pasco Industrial Park, Pasco, WA	46.210064 / -119.076622	Land purchase and infrastructure for new Potential food processing/ cold storage/ logistics park	Buildings	Pasco	Port of Pasco							
52	3		BNSF grade xing at SR 397 and A st	SR 397 South of "A" Street	46.132509 / -119.043607	Replace grade crossing with grade separation to improve safety and freight mobility into BNSF unit train yard and the Port of Pasco intermodal facility	Grade Separation	Pasco	Port of Pasco							
53			Terminal 1 Warehouse reconstructions	Port Angeles		Warehouse reconstruction/ modernization	Buildings	Port Angeles	Port of Port Angeles							

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54			Barge Facility	Port Angeles		Feasibility study will compare transportation costs of barging versus trucking or air. Project anticipates enhancement of existing sheet pile bulkhead to support a barge loading facility.	Feasibility study for New Terminal Facility	Port Angeles	Port of Port Angeles							
55			Terminal 3 Expansion	Port Angeles	48.125216 / -123.44065	Expansion of the Port's main cargo pier to allow larger vessels to call including oil tankers, cruise ships and log vessels.	Feasibility study for New Terminal Facility	Port Angeles	Port of Port Angeles							
56			Terminal 7 Redevelopment	Port Angeles	48.128438 / -123.45915	Redevelopment of aging timber pier to support vessel berthing and cargo handling.	Feasibility Study for Terminal Modernization	Port Angeles	Port of Port Angeles							
57			Marine Trades Industrial Park	Port Angeles		Upland development and surface transportation improvements to support ship building and repair at an 18 acre waterfront industrial property. This project will also include nearby property acquisition to provide new supply and support services to maximize water dependent uses.	New Terminal Facility	Port Angeles	Port of Port Angeles							
58			New Road Accessing T3 (Marine Dr to T3)	Port Angeles	48.123988 / -123.446411	Improved road access to Terminal 3	Road	Port Angeles	Port of Port Angeles							
59			Waterfront Stormwater Improvement Project	Port Angeles		Installation of new stormwater conveyance and treatment infrastructure to allow for continuation of industrial activity along the waterfront.	Terminal Infrastructure	Port Angeles	Port of Port Angeles							
60	1	91	Terminal 91 Uplands Access	TBD betw Dravus & Halladay Sts, east of Thorndyke, along 20th and/or 21st Aves W.	47.642041 / -122.382638	Rehabilitation of existing avenues to support industrial land uses in the T-91 Uplands	Road	Seattle	POS/City of Seattle	PSRC	Letter of Support	2020		2021	$10,000,000 / $10,000,000	100%
61	high	52	S Lander St Grade Separation	Duwamish Manufacturing Industrial Center, 1st Ave S - 4th Ave S	47.579828 / -122.332047	Construct a grade separation to replace an at-grade crossing over active BNSF railroad tracks	Grade Separation	Seattle	City of Seattle	PSRC	T2040 ID: #5254	2017	N/A	2018	$140,000,000 / $000	0%
62	medium	76	4th Ave S ITS Implementation	Duwamish Manufacturing Industrial Center, SR 519 / Edgar Martinez Dr S - S Lander St	47.589548 / -122.329063	Provide adaptive traffic signalization for optimized freight operations	ITS	Seattle	City of Seattle	PSRC	Letter of Support	2019	N/A	2020	$2,500,000 / $2,500,000	100%

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63	high	84	S Atlantic St / SR 519 / Edgar Martinez Dr S Corridor ITS Implementation	Alaskan Way to 4th Ave S	47.59241 / -122.333508	Provide adaptive signal control for optimized freight operations following Alaskan Way Viaduct Replacement project	ITS	Seattle	City of Seattle	PSRC	Letter of Support	2020	N/A	2020	$5,000,000 / $5,000,000	100%
64	high	32	S Hanford Railroad Crossing Rehabilitation	Duwamish Manufacturing Industrial Center, E Marginal Way - Colorado Ave S	47.573772 / -122.36657	Reinforce active rail crossings with concrete grade crossing systems	Rail	Seattle	City of Seattle	PSRC	Letter of Support	2019	N/A	2019	$2,000,000 / $1,800,000	90%
65	high	83	W Emerson St Freight Safety Improvements	Ballard Interbay Manufacturing Industrial Center, 15th Ave W - 19th Ave W	47.653951 / -122.378065	Redesign and construct interchange improvements to reduce modal conflicts	Road	Seattle	City of Seattle	PSRC	Letter of Support	2019	2021	2024	$4,800,000 / $4,800,000	100%
66	high	79	Ballard Bridge Seismic Improvements	Ballard Interbay Manufacturing Industrial Center, NW 50th St - W Emerson St / W Nickerson St	47.659377 / -122.376014	Ensure seismic resiliency for existing structure on regionally significant freight route facility	Road	Seattle	City of Seattle	PSRC	Letter of Support	2019	N/A	2020	$8,800,000 / $3,500,000	40%
67	high	90	E Marginal Way / S Hanford Street Intersection Improvements	E Marginal Way / S Hanford Street Intersection	47.575582 / -122.340025	Upgrade the signal, lengthen the northbound right-turn lane, improve the railroad crossing pavement, and evaluate the need for railroad crossing gates. The project also includes rebuilding the intersection and its approaches to Heavy Haul route requirements	Road	Seattle	City of Seattle	PSRC	Letter of Support	2017	N/A	2020	$8,600,000 / $8,600,000	100%
68	high	105	E Marginal Way Reconstruction and Safety Enhancements	Duwamish Manufacturing Industrial Center, S Atlantic St - Diagonal Way S	47.56232 / -122.339277	Reconstruct to heavy haul standards, add advanced traffic management systems, and incorporate separated bicycle and pedestrian facilities while maintaining freight efficiency	Road	Seattle	City of Seattle	PSRC	Letter of Support	2017	2018	2020	$60,000,000 / $55,000,000	92%
69	high	9	Nickerson St Reconstruction	Ballard Interbay Manufacturing Industrial Center, 15th Ave W - 13th Ave W	47.655159 / -122.374777	Replace damaged/failing concrete panels for maritime industry access route	Road	Seattle	City of Seattle	PSRC	Letter of Support	2017	N/A	2017	$12,500,000 / $1,400,000	11%
70	medium	29	6th Ave S / Industrial Way Intersection Reconstruction	Duwamish Manufacturing Industrial Center, 6th Ave S & S Industrial Way	47.566147 / -122.325575	Replace damaged/failing concrete panels and enhance intersection design	Road	Seattle	City of Seattle	PSRC	Letter of Support	2018	N/A	2018	$1,000,000 / $800,000	80%

Proj #	Port Priority	WSDOT No.	Project Name	Location Description	Latitude / Longitude	Brief Description	Improve Type	Port District	Project Owner	Submitting Authority	Ref.	PE Year	ROW Year	Const. Year	Project Cost / Funding Gap	% Gap
71	medium	71	Duwamish Local Freight Access Improvements	S Holden St / 5th Ave S / S Kenyon St / 8th Ave S	47.534132 / -122.328123	Reconstruct roadway with drainage, curb, sidewalks and landscaping. Coincides with Seattle Public Utilities drainage substation project	Road	Seattle	City of Seattle	PSRC	Letter of Support	2017	2018	2020	$1,300,000 / $1,300,000	100%
72	medium	27	Lower Spokane St Freight-Only Lanes Pilot	Chelan Ave - Airport Way S	47.571414 / -122.328033	Pilot project to design, implement, and evaluate freight-only lanes on the corridor	Road	Seattle	City of Seattle	PSRC	Letter of Support	2019	N/A	2019	$450,000 / $300,000	67%
73	medium	80	S Atlantic St Reconstruction	Duwamish Manufacturing Industrial Center, Alaskan Way S - 1st Ave S	47.590324 / -122.335671	Replace damaged/failing concrete panels	Road	Seattle	City of Seattle	PSRC	Letter of Support	2025	N/A	2025	$3,700,000 / $3,700,000	100%
74	high	30	SR 519 / Edgar Martinez Dr S Freight Operations Improvements	Duwamish Manufacturing Industrial Center, 1st Ave S - 4th Ave S	47.590401 / -122.334137	Reconstruct intersections for optimized freight operations	Road	Seattle	City of Seattle	PSRC	Letter of Support	2019	N/A	2019	$900,000 / $900,000	100%
75	medium	108	SODO Rail Corridor Grade Separation	BNSF RR Crossings in SODO	47.58498 / -122.337431	Improve access to manufacturing and industrial center and Port of Seattle facilities. May include non-motorized grade separation to increase safety and reduce modal conflicts	Grade Separation	Seattle	City of Seattle	PSRC	T2040 ID: 5252	2025	2027	2030	$145,000,000 / $145,000,000	100%
76	long term	103	1st Ave S Viaduct Replacement	Duwamish Manufacturing Industrial Center, Class I mainline and UP Argo Yard	47.564231 / -122.32944	Replace viaduct structure spanning Class I railroad and UP Argo Yard at the end of its useful life, increasing vertical clearance and optimizing yard operations	Road	Seattle	City of Seattle	PSRC	Letter of Support	2020	N/A	2030	$55,000,000 / $55,000,000	100%
77	long term	104	4th Ave S Viaduct Replacement	Duwamish Manufacturing Industrial Center, Class I mainline and UP Argo Yard	47.560835 / -122.32944	Replace viaduct structure spanning Class I railroad and UP Argo Yard at the end of its useful life, increasing vertical clearance and optimizing yard operations	Road	Seattle	City of Seattle	PSRC	Letter of Support	2020	N/A	2030	$55,000,000 / $55,000,000	100%
78	long term	113	Ballard Bridge Replacement	Ballard Interbay Manufacturing Industrial Center, NW 50th St - W Emerson St / W Nickerson St	47.658598 / -122.376146	Replace structure to increase capacity and improve access	Road	Seattle	City of Seattle	PSRC	Letter of Support	2020	2030	2035	$520,000,000 / $518,000,000	100%
79	long term	85	E Marginal Ave S / 8th Ave S / S Myrtle St Intersection Improvements	E Marginal Ave S / 8th Ave S / S Myrtle St Intersection	47.539425 / -122.322549	Improve intersection geometry, revise signalization, upgrade drainage, rehabilitate pavement at railroad tracks, and install streetscaping	Road	Seattle	City of Seattle	PSRC	Letter of Support	2019	N/A	2020	$5,600,000 / $5,100,000	91%

Proj #	Port Priority	WSDOT No.	Project Name	Location Description	Latitude / Longitude	Brief Description	Improve Type	Port District	Project Owner	Submitting Authority	Ref.	PE Year	ROW Year	Const. Year	Project Cost / Funding Gap	% Gap
80	long term	95	W Galer St Interchange Ramp	Ballard Interbay Manufacturing Industrial Center, Alaskan Way W - Magnolia Bridge	47.633218 / -122.378848	Construct additional ramp to improve access over BNSF mainline tracks and storage yard	Road	Seattle	City of Seattle	PSRC	Letter of Support	2025	2027	2030	$23,000,000 / $23,000,000	100%
61	high	52	S Lander St Grade Separation	Duwamish Manufacturing Industrial Center, 1st Ave S - 4th Ave S	47.579828 / -122.332047	Construct a grade separation to replace an at-grade crossing over active BNSF railroad tracks	Grade Separation	Seattle	City of Seattle	PSRC	T2040 ID: #5254	2017	N/A	2018	$140,000,000 / $000	0%
62	medium	76	4th Ave S ITS Implementation	Duwamish Manufacturing Industrial Center, SR 519 / Edgar Martinez Dr S - S Lander St	47.589548 / -122.329063	Provide adaptive traffic signalization for optimized freight operations	ITS	Seattle	City of Seattle	PSRC	Letter of Support	2019	N/A	2020	$2,500,000 / $2,500,000	100%
63	high	84	S Atlantic St / SR 519 / Edgar Martinez Dr S Corridor ITS Implementation	Alaskan Way to 4th Ave S	47.59241 / -122.333508	Provide adaptive signal control for optimized freight operations following Alaskan Way Viaduct Replacement project	ITS	Seattle	City of Seattle	PSRC	Letter of Support	2020	N/A	2020	$5,000,000 / $5,000,000	100%
64	high	32	S Hanford Railroad Crossing Rehabilitation	Duwamish Manufacturing Industrial Center, E Marginal Way - Colorado Ave S	47.573772 / -122.36657	Reinforce active rail crossings with concrete grade crossing systems	Rail	Seattle	City of Seattle	PSRC	Letter of Support	2019	N/A	2019	$2,000,000 / $1,800,000	90%
65	high	83	W Emerson St Freight Safety Improvements	Ballard Interbay Manufacturing Industrial Center, 15th Ave W - 19th Ave W	47.653951 / -122.378065	Redesign and construct interchange improvements to reduce modal conflicts	Road	Seattle	City of Seattle	PSRC	Letter of Support	2019	2021	2024	$4,800,000 / $4,800,000	100%
81		37	Tideflats Area ITS backbone	Generally corresponding to the Regionally-designated Port of Tacoma Manufacturing and Industrial Center.	47.251308 / -122.425811	ITS improvements consistent with near-term ITS improvements identified in the 2016 Tacoma Tideflats Emergency Response Plan	ITS	Tacoma	City of Tacoma	City of Tacoma	Exempt	2017	2018	2019	$3,700,000 / $3,700,000	100%
82	medium	75	8th St E/54th Ave E Intersection Improvements	8th St E/54th Ave E Intersection	47.249967 / -122.356776	Add westbound left turn lane and reconstruct eastbound approach to a 3-lane roadway.	Road	Tacoma	City of Fife	PSRC	PSRC Project 4639	2017	2018	2020	$2,880,000 / $2,000,000	69%

Proj #	Port Priority	WSDOT No.	Project Name	Location Description	Latitude / Longitude	Brief Description	Improve Type	Port District	Project Owner	Submitting Authority	Ref.	PE Year	ROW Year	Const. Year	Project Cost / Funding Gap	% Gap
83	high	63	I-5 and 54th Ave E Interchange Improvement Project	I-5/54th Ave E I-5 Interchange and nearby streets	47.240773 / -122.357048	Rebuild I-5 Interchange and nearby intersections.	Road	Tacoma	City of Fife	PSRC	PSRC Project 4639	2017	2018	2020	$53,000,000 / $50,000,000	94%
84	medium	11	Pacific Highway E/54th Ave E Intersection Improvements	Pacific Highway E/54th Ave E intersection	47.243097 / -122.356966	Construct a 2nd westbound left-lane turn lane, new signal poles, illumination and other intersection improvements.	Road	Tacoma	City of Fife	PSRC	PSRC Project 4639	2015	2015	2017	$2,800,000 / $2,000,000	71%
85	high	89	Portland Avenue	Portland Avenue from I-5 to Lincoln	47.244413 / -122.412105	Upgrade Pavement, rehabilitate bridge deck, install signal at SR-509 ramp terminal	Road	Tacoma	City of Tacoma	City of Tacoma	Exempt	2018	2019	2020	$8,200,000 / $8,100,000	99%
86	high	55	POT Road Interchange Modification - Phase III	Northbound ramps at I-5/POT Road Interchange and new 34th Avenue E bridge	47.241122 / -122.385694	New 34th Avenue E bridge over I-5, reconstruct northbound I-5 exit and entrance ramp connectors with POT Road, 20th St E improvements, and two new signal installations (Phase 3).	Road	Tacoma	City of Fife	PSRC	PSRC Project 4639	2009	2014	2019	$27,500,000 / $21,000,000	76%
87	high	109	Puyallup Bridge Rehabilitation (F16C, F16D, F16E)	Puyallup Avenue/Ells Street, beginning in vicinity of Portland Avenue/bridge segment F16C, to vicinity of Milwaukee Way/bridge segment F16E	47.240997 / -122.400308	Bridge Replacement. Note the Puyallup River Bridge is made of 6 segments. This project includes segments F16C, D, E and F16.	Road	Tacoma	City of Tacoma	City of Tacoma	State Freight Mobility Plan Reference Project 230	2019	2020	2021	$150,000,000 / $150,000,000	100%
88	high	47	Taylor Way Rehabilitation	Taylor Way from the Fife/Tacoma City border to E. 11th St./Alexander Ave.	47.266156 / -122.375527	Reconstruct roadway to heavy haul standards, remove/upgrade rail crossings, widen SR509/Taylor Way intersection, install fiber/ITS/ signal improvements, new sidewalks, lighting/curb ramps, channelization	Road	Tacoma	City of Tacoma	City of Tacoma	Exempt	2017	2018	2019	$21,385,540 / $13,473,740	63%
89	high	3	Tideflats Area Transportation Study Update	Generally corresponding to the Regionally-designated Port of Tacoma Manufacturing and Industrial Center.	47.255174 / -122.426859	Building on prior planning studies such as the Tideflats Area Transportation Study and the Tideflats Area ITS Architecture Plan, develop a prioritized list of capital investments.	Road / Rail Study	Tacoma	City of Tacoma	City of Tacoma	Exempt			2017	$400,000 / $400,000	100%
90			Puyallup River Rail Bridge	BNSF Crossing of Puyallup River	47.2442 / -122.4067											
91			54th /Fife - Allow UP to expand yard	Fife, WA			Grade Separation	Tacoma	City of Fife							

Proj #	Port Priority	WSDOT No.	Project Name	Location Description	Latitude / Longitude	Brief Description	Improve Type	Port District	Project Owner	Submitting Authority	Ref.	PE Year	ROW Year	Const. Year	Project Cost / Funding Gap	% Gap
92			Terminal 5 – On-Terminal Grade separation	Vancouver	45.647921 / -122.726243	Grade separation over rail to provide unimpeded truck access to the terminal over the rail	Grade Separation	Vancouver	Port of Vancouver, USA							
93			NW 32nd Avenue Industrial Corridor	Vancouver		Port access is improved through the creation of a north-south arterial extension, replacement for the Fruit Valley Road/BNSF railroad bridge and capacity improvements at Fruit Valley Road and 78th Street.	Road	Vancouver	Port of Vancouver, USA							
94			Terminal 5 West	Vancouver	45.650504 / -122.7295	– The port is seeking to develop its Terminal 5 west site for a future tenant. Development includes filling T-5 west to bring it above the floodplain so that it is useable as a marine industrial site	New Terminal Facility	Vancouver	Port of Vancouver, USA							
95			SR-501 Widening	Vancouver		Widening of SR-501 from two to four lanes from where Mill Plain and 4th Plain meet west to the flushing channel are important to the port. As freight volumes at the Port of Vancouver increase, and in order to speed development of Columbia Gateway, widening this critical freight route in necessary to support both the growth of freight traffic as well as providing critical safety improvements in the corridor.	Road	Vancouver	WSDOT							
96			Port of Vancouver USA North Wye Connection	Vancouver	45.650726 / -122.729898		Rail	Vancouver	Port of Vancouver, USA							
97	high		I-5 Columbia River Bridge	Vancouver/Portland, OR		The I5 Columbia River Bridge project is a bridge reconstruction project that would link the states of Washington and Oregon. The project proposes to replace the existing two highway spans on Interstate 5 (I-5) across the Columbia River with two new spans, along with new interchanges on both the Oregon and Washington sides of the river. The project focuses on a five mile segment of the I-5 corridor, beginning at State Route 500 in northern Vancouver and extending to just north of Columbia Boulevard in north Portland. The project's stated intent is to improve safety, reduce traffic congestion, increase mobility of motorists, freight traffic, and to mitigate seismic risks.	Road	Vancouver	WSDOT/ODOT						$3,300,000,000 / $000	

Proj #	Port Priority	WSDOT No.	Project Name	Location Description	Latitude / Longitude	Brief Description	Improve Type	Port District	Project Owner	Submitting Authority	Ref.	PE Year	ROW Year	Const. Year	Project Cost / Funding Gap	% Gap
98	1		US 12/ Wallula to Frenchtown - Build new highway	US 12, MP 304.17 - 328.16	46.064442 / -118.276654	Build new highway. This project will construct the next section of a four-lane, limited access divided highway on US 12 from Nine Mile Hill to Frenchtown vicinity to reduce the risk of collisions and improve economic vitality.	Road	Walla Walla	WSDOT		Walla Walla Valley Sub-Regional Transportation Planning Organization			2019	$384,807,000 / $216,000,000	56%
99			Washington State Freight Optimization Strategy	N/A		By employing dynamic modeling tools and by leveraging both private and public sector supply chain data sets Washington State will develop a Statewide Freight Transportation Network Optimization Strategy that will ensure infrastructure investments are meeting performance objectives such as increased economic vitality and reduced transportation costs.	Study	WPPA - Statewide	Multi-Jurisdictional	WPPA					$750,000 / $750,000	100%

Task 2 – Illustrative Compliance Scenarios

Final Report

May 9, 2017

Submitted to:
Oregon Department of Environmental Quality

Submitted by:
Jeff Rosenfeld, ICF

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Background

The objective of Task 2 of ICF's contract with Oregon DEQ is to update the 2014 illustrative compliance scenarios, develop new 2017 illustrative compliance scenarios to represent the available compliance options from 2016-2025, and create a Scenario Adjustment Tool (SAT) so DEQ can perform minor periodic update to the scenarios. This report presents the methodology and results for the 2017 illustrative compliance scenarios.

Introduction

In 2014, ICF developed four compliance scenarios based on two fuel scenarios (alternative vehicle technologies vs biofuel blending) and two different diesel baselines (B2 vs B5). Table 1 below shows the compliance scenario matrix.

Compliance Scenarios	Scenario 1 – Advanced Vehicle Technology	Scenario 2 – Higher Biofuel Blending
B2 Diesel Baseline (2010)	1 – B2	2 – B2
B5 Diesel Baseline (2015)	1 – B5	2 – B5

Table 1. 2014 Compliance Scenarios

The 2017 Illustrative Compliance Scenarios build on the 2014 scenarios. Since DEQ moved forward with a B5 baseline, for the rest of the report we will remove the B2 and B5 nomenclature and call the scenarios – Scenario 1 and Scenario 2. The underlying premise of each scenario remains the same where Scenario 1 relies on advanced vehicle technologies (e.g. plug-in electric vehicles (PEVs), natural gas vehicles (NGVs), and heavy-duty hybrid electric vehicles (HEVs)) and Scenario 2 relies on a higher blending of biofuels.

Also added to this analysis is Scenario 3. Unlike Scenarios 1 and 2 which look at the minimal avenues to compliance (total credits balancing total deficits) over the ten year compliance period, Scenario 3 looks past 2025 to 2026 and 2027 where a 10% carbon intensity reduction is maintained. Scenario 3 also limits credit banking in the early and uses a hybridized approach towards the potential across alternative fuels to contribute to carbon intensity reductions and generation of credits.

VISION Modeling

ICF updated the Oregon VISION model with the AEO2016 Base Case VISION model projections for values including annual vehicle sales and new vehicle fuel economy. This updated model was used for the 2017 Illustrative Compliance scenarios. Consistent with the previous analysis, US sales projections for light- (autos and trucks separately), medium-, and heavy-duty vehicles were scaled based on the latest 10 years (2006-2015) of Oregon's

proportion of US sales. Table 2 below shows Oregon's portion of US sales based on the updated AEO2016 projections.

Vehicle Class	10yr Average of Oregon Portion of AEO2016 US Sales
Light-Duty Autos	1.08%
Light-Duty Trucks	0.93%
Medium-Duty Trucks (Class 3-6)	2.35%
Heavy-Duty Trucks (Class 7-8)	1.36%

Table 2. Oregon Portion of US Sales by Vehicle Class

The VISION model utilizes national data to determine vehicle life expectancy and annual vehicle miles traveled (VMT) that ultimately combine with the Oregon fleet projections to determine fuel consumption. This data may not be consistent with Oregon's vehicle fleet and resulting projections for diesel fuel are consistently low due to the high volume of pass through truck traffic. Calibration of the model is required to match historical Oregon fuel consumption with VISION results. The VISION model was calibrated by scaling it to actual VMT so that approximate historical fuel consumption match as closely as possible.

The figures below show the results from calibrating the light-duty gasoline consumption and heavy-duty diesel consumption with a vehicle miles traveled (VMT) scaling factors of 1.01 and 1.66, respectively. The figures also includes the adjusted fuel consumption projections from the updated 2014 illustrative compliance scenarios for comparison.

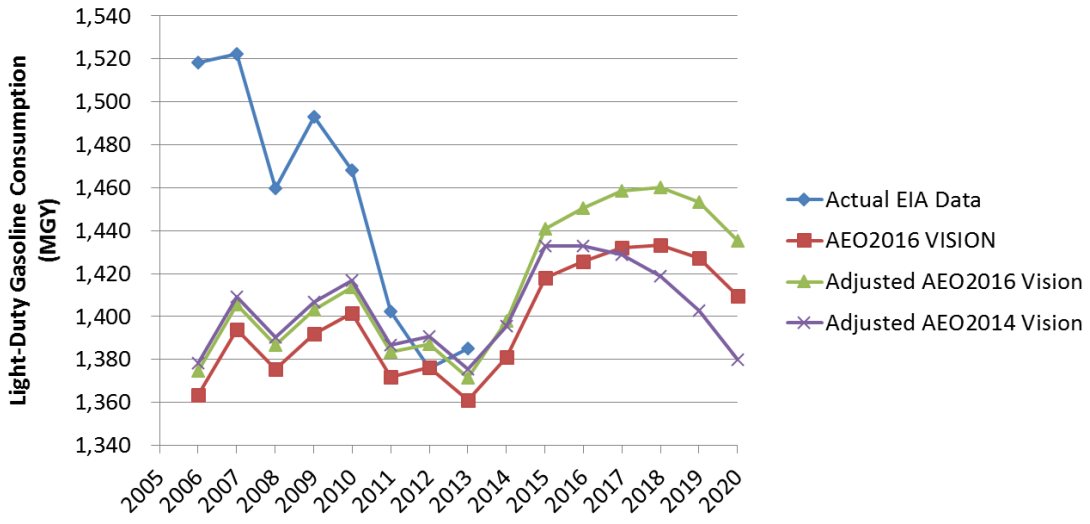

Figure 1 Actual Oregon and VISION Projected Light-Duty Gasoline Consumption

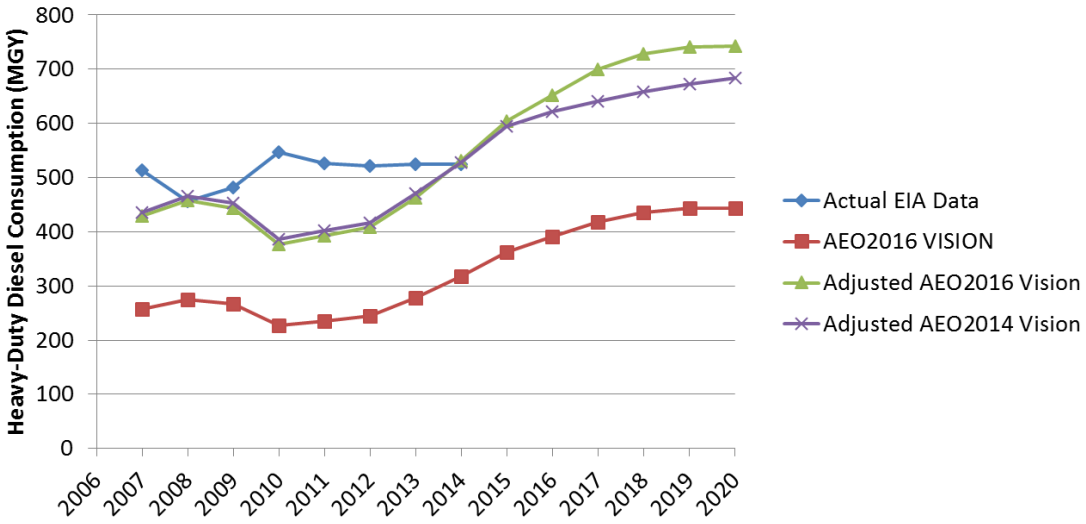

Figure 2 Actual Oregon and VISION Projected Heavy-Duty Diesel Consumption

Figures 1 and 2 above show that AEO2016 has more aggressive sales projections for light, medium and heavy duty vehicles than AEO2014 resulting in increased projected fuel consumption.

Clean Fuels Standards

The gasoline and diesel standards for 2016-2025 are shown in the table below.

Fuel	Gasoline Standard (gCO2e/MJ)	Diesel Standard (gCO2e/MJ)
2016	98.37	99.39
2017	98.13	99.14
2018	97.63	98.64
2019	97.14	98.15
2020	96.15	97.15
2021	95.17	96.15
2022	93.69	94.66
2023	92.21	93.16
2024	90.73	91.67
2025	88.76	89.68
2026[1]	*88.76*	*89.68*
2027	*88.76*	*89.68*

Table 3. Gasoline and Diesel Standards

Vehicle Populations

PEV Vehicle Populations – Zero Emission Vehicle (ZEV) Mandate

The California Air Resources Board recently published an Advanced Clean Cars Midterm Review[2]. In this review ARB developed three compliance scenarios for California and for Section 177 (S177) ZEV States, states that are administering the California ZEV requirements pursuant to section 177 of the federal Clean Air Act. There are currently nine (9) S177 states: Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont.

Table 4 compares the total plug-in electric vehicle (PEV), battery electric vehicle (BEV) and plug-in hybrid electric vehicle (PHEV) sales from 2011-2016 as tracked by ZEV Fact sales dashboard[3].

[1] For Scenario 3, it is assumed that the 2025 standard of a 10% carbon intensity reduction remains in place.
[2] https://www.arb.ca.gov/msprog/acc/acc-mtr.htm
[3] http://www.zevfacts.com/sales-dashboard.html

State	Total PEV Sales	BEV Sales	PHEV Sales
CT	4,903	1,832	3,070
ME	1,134	203	931
MD	7,863	2,892	4,971
MA	8,467	3,262	5,205
NJ	10,946	3,991	6,955
NY	19,274	5,497	13,777
OR	10,825	6,600	4,225
RI	841	236	605
VT	1,521	305	1,216
OR % of S177 States	16.5%	26.6%	10.3%

Table 4. 2011-2016 ZEV Sales from ZEV Facts for S177 States

The results from the three scenarios developed by ARB for the S177 States are shown in Table 5 below. The names of the scenarios are Mid Range, Low Tech and High Tech.

Year	Mid Range Scenario		Low Tech Scenario		High Tech Scenario	
	BEV Sales	PHEV Sales	BEV Sales	PHEV Sales	BEV Sales	PHEV Sales
2018	9,863	58,654	3,075	27,860	8,703	45,498
2019	18,743	72,614	7,375	36,767	17,712	59,598
2020	29,505	92,374	13,702	65,734	29,320	72,356
2021	39,078	105,304	9,962	73,569	41,810	81,066
2022	42,699	109,491	14,391	88,042	44,891	90,212
2023	48,698	119,000	16,862	98,286	52,327	97,958
2024	54,081	127,766	19,208	108,163	60,452	105,116
2025	59,200	136,668	21,548	118,308	68,891	112,311

Table 5. ARB Forecasted Annual PEVs Sales for S177 States

The Low Tech Scenario assumes a lower percentage of auto makers are making only ZEVs than the High Tech Scenario resulting the Low Tech Scenario relying heavily on PHEVs and increased used of banked credits. Since over 16% of total S177 PEV sales have occurred in Oregon but over 26% of BEV sales have been in Oregon, ICF made the assumption to apply Oregon's share of current PEV sales to the High Tech Scenario to forecast Oregon's PEV sales from the ZEV Mandate.

Table 6 below shows Oregon forecasted PEV sales and their percentage of forecast light-duty vehicle sales. For Scenario 3, ICF forecasted 2026 and 2027 sales assuming a similar increase in annual sales as from 2024 to 2025.

Year	Oregon PEV Forecast		% of Light-Duty Vehicle Sales
	BEV Sales	PHEV Sales	
2018	1,432	7,488	5%
2019	2,915	9,809	7%
2020	4,825	11,908	10%
2021	6,881	13,342	12%
2022	7,388	14,847	13%
2023	8,612	16,122	15%
2024	9,949	17,300	16%
2025	11,338	18,484	17%
2026[4]	*12,921*	*19,749*	*19%*
2027	*14,724*	*21,101*	*21%*

Table 6. Oregon Forecasted Annual PEVs Sales Resulting from the ZEV Mandate

ICF assumed that there will be a 50/50 split between PHEV10 and PHEV40. An important update from AEO2016 that will have an effect on the scenarios is an update to the percent vehicle miles traveled (VMT) that PHEV40 operate in all electric mode. In AEO2014 the all-electric mile VMT was 54% but AEO2016 has an updated value of 62%. Each PHEV40 will now consume 15% more electricity and 17% less gasoline.

Medium- and Heavy-Duty Vehicle Populations

In Scenario 1, the assumption is made that HEVs achieve 10% sales penetration and natural gas 6.5% sales penetration in the medium- and heavy-duty markets by 2025. The business as usual (BAU) case and Scenario 2 do not included medium- and heavy-duty HEVs. Scenario 3 increases the sales penetration of HEVs from 10 to 12% and natural gas vehicles from 6.5% to 8% in the medium- and heavy-duty markets from 2025 to 2027.

Additional Electric Vehicles

Credits from other sources of electricity including transit buses, forklifts and fixed guideway were also included in the scenarios. The credits included were using a similar methodology to the Task 3 Additional Electrification report, but instead of a 2015 baseline, the credits were calculated using a 2012 baseline for technologies using a fuel displacement credit calculation methodology for forklifts and fixed guideway.

For Scenarios 1 and 2, the conservative assumption was made of 100 electric transit buses in Oregon in 2025 and linear interpolation from 5 transit buses this year and an estimated 15 total electric transit buses in 2018. For Scenario 3, a more aggressive assumption was made of 150

[4] ICF forecasted values for 2026 and 2027. Values 2018 – 2025 are based on the Advanced Clean Cars Midterm Review.

electric transit buses by 2022 and continuing that growth till 2027 where there would be 320 total electric transit buses.

Table 7 below includes the credits generated from transit buses starting in 2017 (using an EER of 2.7 in 2017 and 4.2 from 2018+), credits from fixed guideway starting in 2018 and credits from forklifts in 2019.

Year	Transit Buses – Scenarios 1/2	Transit Buses – Scenario 3	Forklifts	Fixed Guideway	Scenario 1/2 Total	Scenario 3 Total
2017	265	265			265	265
2018	1,583	1,583		18,741	20,324	20,324
2019	2,829	5,134	81,196	18,847	102,872	105,177
2020	4,028	8,572	90,311	18,792	113,131	117,675
2021	5,190	11,907	91,922	18,732	115,844	122,561
2022	6,270	14,928	92,813	18,509	117,591	126,250
2023	7,295	17,896	93,639	18,272	119,205	129,807
2024	8,266	20,713	94,438	18,028	120,732	133,179
2025	9,201	23,188	94,374	17,605	121,181	135,167
2026	N/A	26,316	99,224	17,845	N/A	143,386
2027	N/A	29,445	104,289	18,088	N/A	151,821

Table 7. Annual and Total Credit Generation Potential from Fixed Additional Electricity

Fuel Availability

Carbon Intensity

Table 8 on the following page shows the carbon intensities and gasoline and diesel fuel standards utilized for the 2017 illustrative compliance scenarios which are consistent with the carbon intensities utilized for the updated 2014 illustrative compliance scenarios.

Fuel	Carbon Intensity (gCO2e/MJ)
Gasoline Blendstock	100.77
ULSD	101.65
NW Corn Ethanol	53.81
MW Corn Ethanol	69.89
Low CI Corn Ethanol	57.58
Sugarcane Ethanol	51.04
MW Soybean BD	58.25
NW Canola BD	57.84
NW Yellow Grease BD	18.12
Waste Oil RD	19.25
NW Tallow BD	37.93
Tallow RD	19.25
CNG	79.93
Electricity	120.27
RNG (CNG)	40.00
Corn Oil BD	36.89
Sorghum Ethanol	75.00

Table 8. Oregon Clean Fuel Program Carbon Intensities

Assumptions for Fuels that Substitute for Gasoline

For ethanol, there is corn ethanol production capacity of over 200 million gallons per year within the Pacific Northwest Region consisting of Oregon, Washington and Idaho. These producers fall into the category of NW corn ethanol with carbon intensities ranging from 53.81-54.00 g/MJ. In the scenarios below, the total volume of NW corn ethanol consumed never exceeds 103 MGY so there is ample supply in the region.

For renewable natural gas (RNG), the limitation for consumption in Oregon is dependent on demand and not supply. There is sufficient supply from landfills, wastewater treatment plants and other sources like waste feedstock digesters in the U.S. to achieve demand. In 2016, RNG generated over 188 million D3 RINs[5] which are equivalent to approximately 114 million diesel gallon equivalents (DGE). California consumed 87 million DGEs of that volume leaving almost 30 million DGEs available to generate CFP credits in Oregon.

Table 9 below presents the assumptions for fuels that substitute for gasoline.

[5] https://www.epa.gov/fuels-registration-reporting-and-compliance-help/2016-renewable-fuel-standard-data

Fuel	Assumption
Corn Ethanol, NW	Pacific Ethanol Columbia has a production capacity of 40 MGPY and all of it would stay in Oregon.
Corn/Sorghum Ethanol, Low CI	An additional 160 MGPY of capacity exists in the Pacific NW region in addition to the Pacific Ethanol Columbia facility and up to 150 MGPY of low CI corn ethanol would be available to Oregon.
Corn Ethanol, MW	The balance of ethanol needed will be MW corn.
Sugarcane Ethanol	Up to 50 million gallons per year of sugarcane ethanol would be available to Oregon.
Cellulosic Ethanol	Will be consumed if necessary to meet the standard.
Electricity	For Scenario 1, all PHEVs to be PHEV40s.
Renewable Natural Gas (RNG)	For Scenario 1, up to 90% of natural gas consumption could be from RNG. For Scenario 2, up to 99% could be from RNG.
Natural Gas	The balance of natural gas consumed will be fossil.
Propane	Maximum of 1% of total natural gas consumption.

Table 3. Fuels That Substitute for Gasoline

Assumptions for Fuels that Substitute for Diesel

For biodiesel, the national biodiesel production capacity is in excess of 2.3 billion gallons per year[6]. In 2016, 1.568 billion gallons of biodiesel were produced, with approximately 10% from canola oil, 10% from corn oil, 10% from animal fat or tallow and 12.6% from waste grease or used cooking oil[7].

Table 10 presents the assumptions for fuels that substitute for diesel.

[6] https://www.eia.gov/biofuels/biodiesel/production/biodiesel.pdf
[7] https://www.eia.gov/biofuels/biodiesel/production/table3.pdf

Fuel	Assumption
Canola Oil Biodiesel	Maintain the current canola portion of biodiesel consumption of 77%.
Waste Grease/UCO Biodiesel	Maintain the current waste grease/used cooking oil portion of biodiesel consumption of 11%.
Soy Biodiesel	Will be the balance biodiesel after accounting for the other feedstocks.
Corn Oil Biodiesel	Will be consumed if necessary to meet the standard.
Renewable Diesel	A conservative assumption was made to remain at a an average statewide 2% blend with a maximum of 10 million gallons per year from tallow and the balance from waste oil
Renewable Natural Gas (RNG)	Up to 90% of natural gas consumption could be from RNG.
Natural Gas	The balance of natural gas consumed will be fossil.
Propane	Maximum of 1% of total natural gas consumption.

Table 4. Fuels That Substitute for Diesel

Overview of Compliance Scenarios

Based on the assumptions described above for the fuels available and vehicle populations, ICF developed two compliance scenarios that achieve compliance with the Clean Fuels Program by balancing the cumulative deficits and credits over the 10 year compliance period. Scenario 3 is a hybrid of Scenario 1 (advanced technology) and Scenario 2 (high biofuels) that minimizes early banking of credits while looking at the compliance requirements for 2026 and 2027 and looks at the potential of all technologies and fuels to contribute without the constraint of balancing total deficits and total credits at the end of 2025.

Table 11 summarizes the assumptions for each scenario.

Maximums for Scenario Assumptions	2017 Scenario 1 (Advanced Technology)	2017 Scenario 2 (High Biofuels)	2017 Scenario 3 (Hybrid)
Ethanol: • Max ethanol blend is E15 • NW Corn - 40 MGPY max • Low CI Corn - 150 MGPY max • Sugarcane - 50 MGPY max • Max 85% of FFV miles on E85	• Maintained E10 blend rate • 40 MGPY of NW corn • Balance from low CI corn ethanol (max 102 MGPY) • No sugarcane ethanol	• Maintained E10 blend rate • 40 MGPY of NW Corn • Low CI corn ethanol when needed • No sugarcane ethanol	• Maintained E10 blend rate • 40 MGPY of NW corn • Balance from low CI corn ethanol (max 102 MGPY) • Starting in 2024, 50 MGY of sugarcane ethanol • Ramped up E85 consumption by 5% per year starting in 2023, ending with 25% FFV VMT from E85 in 2027
Biodiesel (BD): • Max BD blend is B10 • Waste Oil BD – 50 MGPY max Renewable Diesel (RD): • Max RD blend is R5 • Tallow RD - 10 MGPY max • Waste Oil RD - 50 MGPY max	• Increased BD blend from 5% to 9% from 2017 to 2025 • Maintained canola/soy/used oil ratios until 2018 • Increase waste oil BD to 15 MGPY in 2018, max 30 MGPY in 2025 • RD maintained at 2% • 10 MGPY from tallow and balance waste oil	• Increased BD blend from 5% to 10% from 2017 to 2020 • Increased waste oil BD to 25 MGPY in 2017 up to 50 MGPY in 2022 • RD maintained at 2% then increased to 3% blend till 2025 • 10 MGPY from tallow and balance waste oil till 2021	• Increased BD blend from 5% to 10% from 2019 to 2025 • Increased waste oil BD to 25 MGY in 2021 up to 50 MGY in 2027 • RD increased from 2% to 5% of diesel pool from 2020 to 2025 • 10 MGY from tallow and balance from waste oil
Natural Gas (NG):	• The NG MD and HD new vehicle market share was increased steadily from 2017 (1%) till 2022 (6.5%) and staying constant resulting in 5% of diesel pool consumption being NG in 2025 • By 2019, 90% of NG from biogas	• BAU vehicle market share • By 2019, 100% of NG from biogas, 11.1 MGPY in 2025	• The NG MD and HD new vehicle market share was increased steadily from 2017 (1%) till 2027 (8%) resulting in 6% of diesel pool consumption being NG in 2027 • By 2019, 90% of NG from biogas
Advanced Vehicles: • Achieves ZEV compliance • BAU vehicle populations in 2025: ▪ 70,000 BEVs ▪ 62,000 PHEV10 • 62,000 PHEV40 163,000 PEVs in ZEV compliance years	• All PHEVs are PHEV40 • MD-HD HEV sales increased to 10% market share by 2025	Same as BAU	• All PHEVs are PHEV40 • MD-HD HEV sales increased to 10% market share by 2025 and 12% by 2027

Table 5. Overview of 2017 Illustrative Compliance Scenarios

2016 Clean Fuels Program Data

ICF used actual information reported to DEQ for 2016 for the following:

- The biodiesel feedstock breakdown is currently 77% canola, 12% soy and 11% used cooking oil. This information was used to establish the assumptions of what carbon intensities were used to calculate compliance with the standards.
- The percentage of fuel being imported as B5 or E10 was 12.5% and 1.8%, respectively, in 2016. Since DEQ established default B5 and E10 carbon intensities, there is a slight difference in credit generation due to the use of different carbon intensities of the ethanol and biodiesel portions of the finished fuels. For the ethanol portion of the default E10, the carbon intensity is 69.89 versus 58.58 for a typical low CI corn. Similarly, for the biodiesel portion of the default B5, the carbon intensity is 58.25 versus 57.84 for a typical

NW canola biodiesel. Using the B5/E10 carbon intensities typically results in less credits than by specifying the actual biodiesel/ethanol used.

To test the potential impact of this, ICF ran Scenario 2 (higher biofuels) using the current volume of finished B5/E10 as reported to DEQ in 2016 and another run if the B5/E10 were reported with their typical biodiesel/ethanol. This resulted in less than a 0.2% difference in the generation of credits so it is not a critical issue impacting credit generation.

Results

Credits and Deficits

For each scenario, a table and a figure are presented. The tables show the annual credits and deficits generated and cumulative (banked) credits and the cumulative credits and deficits in last column. The figures show the same information but in a stacked bar chart. Each colored stacked bar represents credits generated from low carbon fuels; the stacked bars are grouped by biofuels for blending at the bottom and advanced vehicle technologies at the top. The blue line represents the deficits from forecasted gasoline blendstock and ultra-low sulfur diesel (ULSD) consumption. When the bars in years 2016-2021 exceed the blue line, annual credits exceed annual deficits and banked credits are generated for future compliance. When the bars fall short of the blue line in years 2022-2025, banked credits are used to meet annual compliance. The black credit bank line was added to Scenario 3 to highlight the size of the credit bank.

Scenario 1: Advanced Technologies

	Fuel	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2025
Deficits (Millions)	Gasoline	-0.39	-0.42	-0.51	-0.58	-0.73	-0.87	-1.08	-1.28	-1.46	-1.70	-9.01
	Diesel	-0.21	-0.30	-0.37	-0.43	-0.56	-0.68	-0.86	-1.04	-1.21	-1.42	-7.15
Credits (Millions)	Gasoline subs	0.51	0.59	0.64	0.70	0.76	0.83	0.89	0.95	1.01	1.06	7.98
	Diesel subs	0.27	0.53	0.65	0.85	0.89	0.94	1.00	1.03	1.03	1.05	8.21
Balance		0.18	0.40	0.41	0.53	0.35	0.21	-0.05	-0.33	-0.63	-1.02	
Banked (net)		0.18	0.58	0.99	1.52	1.88	2.09	2.04	1.70	1.07	0.05	

Table 6. Credits and Deficits: Banking in Scenario 1

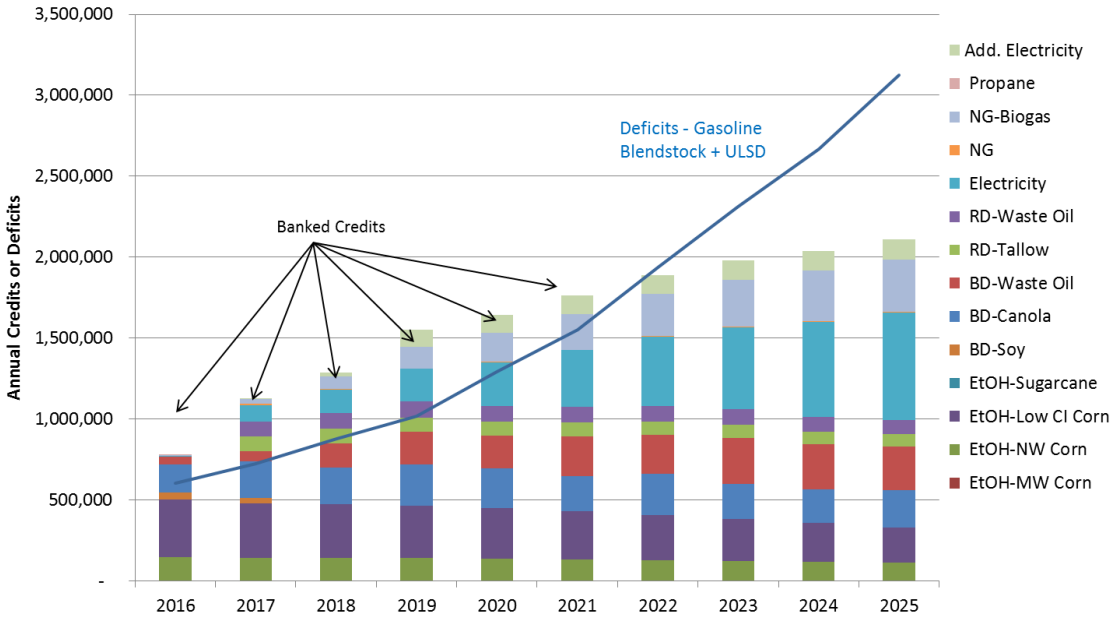

Figure 3. Balance of Credits and Deficits in Scenario 1

Scenario 2: High Biofuels

	Fuel	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2025
Deficits (Millions)	Gasoline	-0.39	-0.43	-0.51	-0.58	-0.73	-0.87	-1.08	-1.28	-1.47	-1.71	-9.06
	Diesel	-0.21	-0.30	-0.37	-0.44	-0.57	-0.69	-0.87	-1.04	-1.22	-1.47	-7.18
Credits (Millions)	Gasoline subs	0.51	0.62	0.65	0.69	0.73	0.78	0.83	0.87	0.91	0.94	7.52
	Diesel subs	0.27	0.62	0.73	0.85	0.93	0.95	1.11	1.13	1.11	1.07	8.76
Balance		0.18	0.51	0.50	0.52	0.36	0.16	-0.02	-0.33	-0.68	-1.17	
Banked (net)		0.18	0.69	1.19	1.71	2.07	2.24	2.22	1.89	1.22	0.05	

Table 7. Credits and Deficits: Banking in Scenario 2

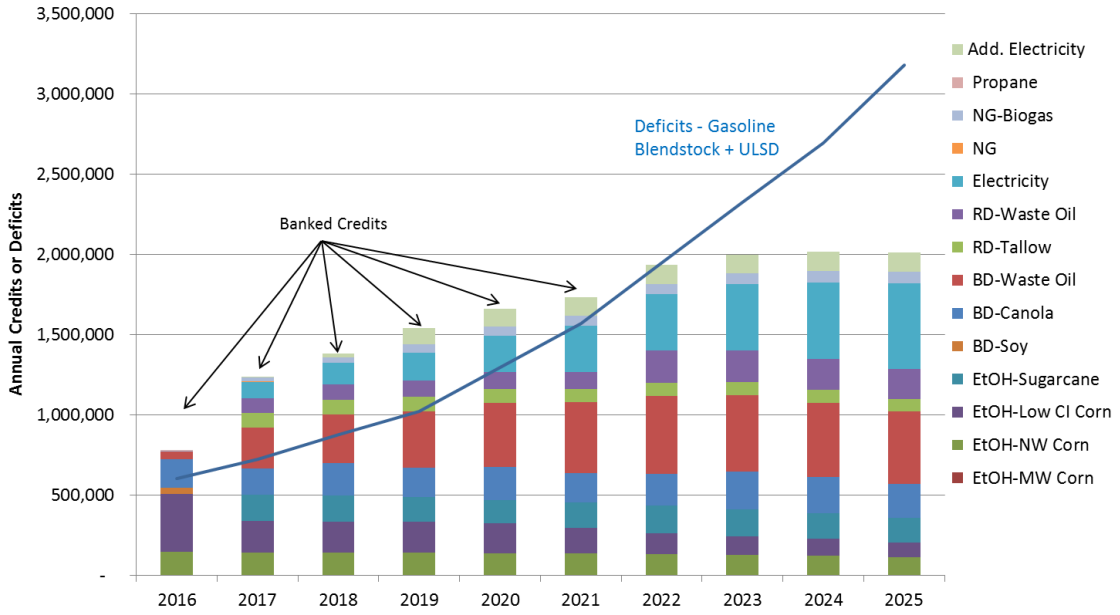

Figure 4. Balance of Credits and Deficits in Scenario 2

Scenario 3: Hybrid

	Fuel	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2025	2026	2027
Deficits (Millions)	Gasoline	-0.39	-0.42	-0.51	-0.58	-0.73	-0.87	-1.08	-1.27	-1.45	-1.68	-8.98	-1.63	-1.57
	Diesel	-0.21	-0.30	-0.37	-0.44	-0.56	-0.68	-0.84	-1.00	-1.17	-1.36	-6.94	-1.36	-1.35
Credits (Millions)	Gasoline subs	0.51	0.59	0.63	0.70	0.76	0.83	0.89	0.97	1.07	1.14	8.07	1.25	1.37
	Diesel subs	0.27	0.47	0.53	0.72	0.87	1.04	1.21	1.28	1.29	1.42	9.10	1.47	1.52
Balance		0.18	0.33	0.28	0.39	0.34	0.32	0.17	-0.03	-0.26	-0.49		-0.27	-0.04
Banked (net)		0.18	0.51	0.79	1.19	1.53	1.85	2.03	1.99	1.74	1.25		0.98	0.95

Table 8. Credits and Deficits: Banking in Scenario 3

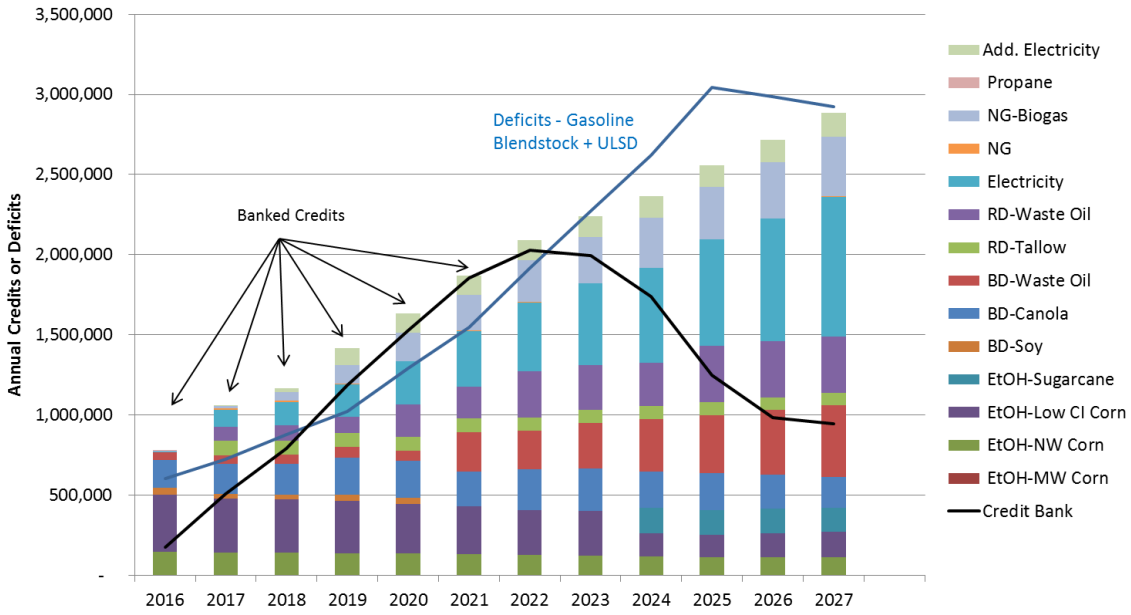

Figure 5. Balance of Credits and Deficits in Scenario 3

Fuel Volumes

Ethanol Volumes

Tables 15, 16 and 17 below identify the volumes of ethanol, broken down by feedstock, for Scenarios 1, 2, and 3.

Ethanol – Scenario 1										
Feedstocks	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Corn, MW	0	0	0	0	0	0	0	0	0	0
Corn, NW	40	40	40	40	40	40	40	40	40	40
Corn, Low CI	102	103	103	102	100	98	95	92	89	86
Sugarcane	0	0	0	0	0	0	0	0	0	0
Sorghum	0	0	0	0	0	0	0	0	0	0
Total	142	143	143	142	140	138	135	132	129	126
% EtOH in Gasoline	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
% FFVs VMT on E85	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table 9. Ethanol Volumes (in millions of Gallons) in Scenario 1

Ethanol – Scenario 2										
Feedstocks	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Corn, MW	0	0	0	0	0	0	0	0	0	0
Corn, NW	40	40	40	40	40	40	40	40	40	40
Corn, Low CI	102	60	60	60	60	53	46	43	40	37
Sugarcane	0	43	43	42	41	45	49	50	50	50
Sorghum	0	0	0	0	0	0	0	0	0	0
Total	142	143	143	142	141	138	136	133	130	127
% EtOH in Gasoline	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
% FFVs VMT on E85	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table 10. Ethanol Volumes (in millions of Gallons) in Scenario 2

Ethanol – Scenario 3												
Feedstocks	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Corn, MW	0	0	0	0	0	0	0	0	0	0	0	0
Corn, NW	40	40	40	40	40	40	40	40	40	40	40	40
Corn, Low CI	102	103	103	102	100	98	95	99	53	57	60	63
Sugarcane	0	0	0	0	0	0	0	0	50	50	50	50
Sorghum	0	0	0	0	0	0	0	0	0	0	0	0
Total	142	143	143	142	140	138	135	139	143	147	150	153
% EtOH in Gasoline	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
% FFVs VMT on E85	0%	0%	0%	0%	0%	0%	0%	5%	10%	15%	20%	25%
Volume of E85								8.8	18	26	35	44

Table 11. Ethanol Volumes (in millions of Gallons) in Scenario 3

Each gasoline refueling station dispenses approximately 1.5 million gallons of gasoline per year. If an E85 pump were added to an existing station and it dispenses 0.5 million gallons per year, 18 E85 pumps would be needed in 2023, 35 in 2024, 53 in 2025, 71 in 2026 and 88 in 2027. Currently there are five (5) E85 stations in Oregon[8].

Biodiesel Volumes

Tables 18, 19 and 20 below identify the volumes of biodiesel, broken down by feedstock, for Scenarios 1, 2, and 3.

Biodiesel - Scenario 1										
Feedstocks	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Soy	5	7	0	0	0	0	0	0	0	0
Canola	34	43	44	50	50	45	55	49	49	58
Waste Oil	5	6	15	20	20	25	25	30	30	30
Total	44	56	59	70	70	70	80	79	79	88
Biodiesel Blend %	5%	6%	6%	7%	7%	7%	8%	8%	8%	9%

Table 12. Biodiesel Volumes (in millions of Gallons) in Scenario 1

[8] http://www.afdc.energy.gov/locator/stations/

Biodiesel – Scenario 2										
Feedstocks	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Soy	5	0	0	0	0	0	0	0	0	0
Canola	34	32	39	36	42	37	43	53	53	53
Waste Oil	5	25	30	35	40	45	50	50	50	50
Total	44	57	69	71	82	82	93	103	103	103
Biodiesel Blend %	5%	6%	7%	7%	8%	8%	9%	10%	10%	10%

Table 13. Biodiesel Volumes (in millions of Gallons) in Scenario 2

Biodiesel – Scenario 3												
Feedstocks	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Soy	5	6	6	7	7	0	0	0	0	0	0	0
Canola	34	36	38	46	46	45	55	59	54	58	53	47
Waste Oil	5	5	5	7	7	25	25	30	35	40	45	50
Total	44	47	49	60	60	70	80	89	89	98	98	97
Biodiesel Blend %	5%	5%	5%	6%	6%	7%	8%	9%	9%	10%	10%	10%

Table 14. Biodiesel Volumes (in millions of Gallons) in Scenario 3

Renewable Diesel Volumes

Tables 21, 22 and 23 below identify the volumes of renewable diesel, broken down by feedstock, for Scenarios 1, 2, and 3.

Renewable Diesel – Scenario 1										
Feedstocks	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Tallow	10	10	10	10	10	10	10	10	10	10
Waste Oil	7	9	9	10	10	10	10	10	9	9
Total	17	19	19	20	20	20	20	20	19	19
RD Blend %	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%

Table 15. Renewable Diesel Volumes (in millions of Gallons) in Scenario 1

Renewable Diesel – Scenario 2										
Feedstocks	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Tallow	10	10	10	10	10	10	10	10	10	10
Waste Oil	7	9	10	10	10	10	21	21	21	21
Total	17	19	20	20	20	20	31	31	31	31
RD Blend %	2%	2%	2%	2%	2%	2%	3%	3%	3%	3%

Table 16. Renewable Diesel Volumes (in millions of Gallons) in Scenario 2

Renewable Diesel – Scenario 3												
Feedstocks	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Tallow	10	10	10	10	10	10	10	10	10	10	10	10
Waste Oil	7	9	9	10	20	20	30	29	29	38	38	38
Total	17	19	19	20	30	30	40	39	39	48	48	48
RD Blend %	2%	2%	2%	2%	3%	3%	4%	4%	4%	5%	5%	5%

Table 17. Renewable Diesel Volumes (in millions of Gallons) in Scenario 3

Natural Gas/LPG

Tables 24, 25 and 26 below show the natural gas/LPG and biogas consumption in million DGE where market share was increased to achieve 5% diesel pool consumption of natural gas/LPG/biogas in 2025.

Natural Gas – Scenario 1										
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
NG/LPG	4	5	4	2	3	4	5	5	6	6
Biogas	0	5	11	20	26	34	41	47	52	57
Total	4	9	15	22	29	37	45	52	58	63

Table 18. Natural Gas/LPG Volumes (in millions of DGE) in Scenario 1

Natural Gas – Scenario 2										
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
NG/LPG	2	2	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Biogas	2	2	4	7	8	8	9	10	11	11
Total	3	4	6	7	8	9	9	10	11	11

Table 19. Natural Gas/LPG Volumes (in millions of DGE) in Scenario 2

Natural Gas – Scenario 3												
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
NG/LPG	4	7	8	5	3	4	5	5	6	6	7	7
Biogas	0	2	8	16	26	34	41	47	52	57	60	65
Total	4	9	15	22	29	37	45	52	58	63	67	72

Table 20. Natural Gas/LPG Volumes (in millions of DGE) in Scenario 3

Electricity

Table 27 below shows the electricity consumption from BEVs and PHEVs in million GGE for Scenarios 1, 2, and 3.

Electricity												
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Scenario 1	3.1	4.0	5.6	7.8	10.6	14.0	17.6	21.4	25.6	29.9		
Scenario 2	3.1	4.0	5.1	6.8	9.0	11.7	14.5	17.5	20.7	24.0		
Scenario 3	3.1	4.0	5.6	7.8	10.6	14.0	17.6	21.4	25.6	29.9	34.5	39.3

Table 21. Electricity Consumption (in millions of GGE) in Scenarios 1 and 2

GHG Emission Reductions

Table 28 shows the annual full lifecycle GHG emissions in million metric tons from transportation fuels from 2016 to 2025 and cumulatively over the compliance period from 2016 to 2025. These emissions include all stages of the fuel lifecycle that are incorporated in the carbon intensity values.

GHG Emissions											
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2025
BAU	28.87	29.85	30.48	30.75	30.71	30.56	30.38	30.09	29.76	29.42	300.87
Scenario 1	28.59	29.47	30.00	30.12	30.04	29.80	29.50	29.14	28.76	28.32	293.73
Scenario 2	28.58	29.36	29.89	30.12	29.99	29.80	29.42	29.07	28.73	28.39	293.34
Scenario 3	28.59	29.54	30.12	30.27	30.05	29.69	29.29	28.85	28.39	27.80	292.59

Table 22. Annual GHG Emissions (million metric tons)

Table 29 shows the actual and percent GHG reductions annually from 2016 to 2025 and cumulatively over the compliance period from 2016 to 2025.

GHG Reductions from the BAU											
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2025
Scenario 1	0.28	0.38	0.48	0.62	0.68	0.76	0.87	0.95	1.01	1.11	7.14
Scenario 1	1.0%	1.3%	1.6%	2.0%	2.2%	2.5%	2.9%	3.2%	3.4%	3.8%	2.4%
Scenario 2	0.29	0.49	0.59	0.63	0.72	0.76	0.96	1.03	1.03	1.03	7.53
Scenario 2	1.0%	1.6%	1.9%	2.1%	2.4%	2.5%	3.2%	3.4%	3.5%	3.5%	2.5%
Scenario 3	0.28	0.31	0.36	0.48	0.66	0.87	1.09	1.24	1.37	1.62	8.28
Scenario 3	1.0%	1.0%	1.2%	1.6%	2.1%	2.8%	3.6%	4.1%	4.6%	5.5%	2.8%

Table 23. GHG Emissions Reductions from the BAU (million metric tons and Percent)

The reductions in Table 29 are compared to the BAU (which includes the ZEV Program and increased light-duty fuel economy standards) and only represent those reductions that would be directly attributed to the Clean Fuels Program. Both of the baseline scenarios achieved similar cumulative reductions which were expected since the compliance period was looking to achieve the same carbon intensity reductions. The updated 2014 illustrative compliance scenarios achieved cumulative reductions of 2.9% and 3.0 for Scenarios 1-B5 and 2-B5, respectively. The reduction in cumulative emissions (Scenarios 1 and 2) attributable to the Clean Fuels Program is due to the increased contribution of the ZEV Mandate (mainly from the AEO2016 increase of PHEV eVMT) towards compliance which is also included in the BAU case and the inclusion of additional electricity credit generation.

Conclusions

The following are key highlights from the 2017 Updated Illustrative Compliance Scenarios:

- Over-compliance in the early years of the program reduces the need for new infrastructure (e.g. E85, liquid fuel storage), international biofuels (i.e. imported RD) and reduces compliance costs. Credits can be banked and used later and do not lose their compliance value. Banking credits when the standard is lower reduces compliance costs and eases compliance in later years. In the scenarios, between 20-42% of the credits are banked annually in years 1-5, which is lower that what was seen in the CA LCFS (35-59% annual credits banked in years 1-5). 13-15% of total credits required for compliance in the Oregon program were banked in these scenarios.
- The Clean Fuels Program can be achieved through a diverse fuel supply. All of the scenarios required a combination of ethanol, biodiesel and renewable diesel from various feedstocks, electricity, natural gas, renewable natural gas, and propane for compliance.
- Eight (8) years of overlap between the post-2017 Zero Emission Vehicle (ZEV) Program eases the burden of compliance. The ZEV Program generates between 17-21% of the cumulative credits (an increase from 14-17% in the updated 2014 illustrative compliance scenarios) needed over the compliance period.
- Renewable natural gas is a key fuel for Clean Fuels Standard compliance. In the advanced technology scenarios, renewable natural gas generated 11% of the credits necessary for compliance.
- Without blend limitations and infrastructure requirements, renewable diesel, even in small volumes, is necessary for compliance, but Scenario 2 only moderately strayed from a 2% renewable diesel blend reaching a maximum of 31 MGPY. Scenario 3 reaches a 5% blend rate, but only in 2025.
- The results of Scenario 3 show that through a combined approach of Scenarios 1 and 2 there is potential for meeting the 2016 – 2025 CFP requirements without exhausting the bank of credits and to nearly reach annual credit generation and deficit generation parity in 2027.

Petroleum Overview

At the national level, consumption of each petroleum product is assumed to equal "product supplied." Product supplied measures the disappearance of petroleum products from primary sources, i.e., refineries, natural gas-processing plants, blending plants, pipelines, and bulk terminals. In general, product supplied of each product in any given period is computed as follows: field production, plus refinery production, plus imports, plus unaccounted-for crude oil minus stock change, minus crude oil losses, minus refinery inputs, and minus exports.

Data on state-level product supplied by sector are not available. The methods of estimating consumption by state and sector are discussed in the individual subsections.

The petroleum products included in the State Energy Data System (SEDS) are explained in this section. For 10 of these products, the means of estimating their consumption by state is described in individual sections. The 10 petroleum products are

- asphalt and road oil
- aviation gasoline
- distillate fuel oil
- hydrocarbon gas liquids
- jet fuel
- kerosene
- lubricants
- motor gasoline
- petroleum coke
- residual fuel oil

The remaining products are described in the section "Other Petroleum Products" and include the following:

- crude oil, including lease condensate
- miscellaneous petroleum products
- petrochemical feedstocks, naphtha less than 401˚F
- petrochemical feedstocks, other oils equal to or greater than 401˚F
- petrochemical feedstocks, still gas
- special naphthas
- still gas
- waxes
- unfinished oils
- motor gasoline blending components
- aviation gasoline blending components

The last petroleum documentation section, "Petroleum Summaries," describes how the petroleum products are combined for each major end-use sector's estimated consumption.

Additional notes

1. SEDS assumes U.S. consumption of each petroleum product equals its total product supplied. Occasionally, product supplied for some petroleum products can have negative values (see Energy Information Administration (EIA) *Petroleum Supply Annual* Explanatory Notes, http://www.eia.gov/petroleum/supply/monthly/pdf/psmnotes.pdf). No attempt is made to adjust for negative product supplied values in SEDS.
2. Beginning in the 2016 SEDS data cycle, "hydrocarbon gas liquids" (which covers normal butane, butylene, ethane, ethylene, isobutane, isobutylene, natural gasoline (pentanes plus), propane, and propylene) replaces "liquefied petroleum gases" (which includes all hydrocarbon gas liquids except natural gasoline) as a petroleum product. The definition of "other petroleum products" is revised to exclude petroleum coke and natural gasoline (formerly pentanes plus). Petroleum coke is reported as a separate product and natural gasoline is included in hydrocarbon gas liquids.

Table TN4.1 summarizes the petroleum products' end-use assignments in SEDS. Shown in this table are the first four letters of the seven-letter variable names used to identify all energy sources. The first two letters identify the petroleum product and the next two letters identify the end-use sector. For example, the table shows that the aviation gasoline estimated to be consumed by the transportation sector is all aviation gasoline consumed, and

Table TN4.1. Summary of petroleum products in the State Energy Data System

Petroleum products	Residential sector estimated consumption (RC)		Commercial sector estimated consumption (CC)		Industrial sector estimated consumption (IC)		Transportation sector estimated consumption (AC)		Electric power sector estimated consumption (EI)		Total sector estimated consumption (TC)
Asphalt and road oil (AR)					ARIC					=	ARTC
					+						+
Aviation gasoline (AV)							AVAC			=	AVTC
							+				+
Distillate fuel oil (DF)	DFRC	+	DFCC	+	DFIC	+	DFAC	+	DFEI	=	DFTC
	+		+		+		+		+		+
Hydrocarbon gas liquids (HL)	HLRC	+	HLCC	+	HLIC	+	HLAC			=	HLTC
	+		+		+		+				+
Jet fuel (JF)							JFAC	+	JFEU	=	JFTC
							+		+		+
Kerosene (KS)	KSRC	+	KSCC	+	KSIC					=	KSTC
			+		+						+
Lubricants (LU)					LUIC	+	LUAC			=	LUTC
					+		+				+
Motor gasoline (MG)			MGCC	+	MGIC	+	MGAC			=	MGTC
			+		+		+				+
Residual fuel oil (RF)			RFCC	+	RFIC	+	RFAC	+	RFEI	=	RFTC
			+		+				+		+
Petroleum coke (PC)			PCCC	+	PCIC	+			PCEI	=	PCTC
					+						+
Other petroleum products (OP)					OPIC					=	OPTC
Total petroleum (PA)	PARC	+	PACC	+	PAIC	+	PAAC	+	PAEI	=	PATC

that there is some estimated consumption of lubricants in the industrial and transportation sectors, while distillate fuel oil is consumed in every sector.

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Asphalt and Road Oil

Physical units

There are no state-level consumption data for asphalt and road oil available. Before 2009, state-level sales data are used to apportion national-level consumption numbers to the states. From 2009 forward, state-level production of hot-mix asphalt and warm-mix asphalt, excluding reclaimed asphalt pavement, are used to allocate national-level consumption to the states.

The asphalt and road oil sales and production data are in short tons, while the consumption data are in thousand barrels. Because the tonnage data are used only to apportion the U.S. consumption data to the states, they do not need to be converted into thousand barrels.

The five data series that are used to estimate consumption of asphalt and road oil are (where "ZZ" in the variable name represents the two-letter state code that differs for each state)

ASINPZZ = asphalt sold for use in the industrial sector of each state, in short tons (through 2008);

ASPRPZZ = asphalt (hot-mix and warm-mix) production excluding reclaimed asphalt pavement in each state, in short tons (for 2009 forward);

ASTCPUS = asphalt total consumption in the United States, in thousand barrels (includes road oil from 1983 forward);

RDINPZZ = road oil sold for use in the industrial sector of each state, in short tons (through 1982); and

RDTCPUS = road oil total consumption in the United States, in thousand barrels (through 1982).

Consumption of all asphalt and road oil is assigned to the industrial sector because asphalt and roal oil are mostly used in construction activity. ASTCPUS represents total U.S. consumption of asphalt, and RDTCPUS represents total U.S. consumption of road oil. Both are the "product supplied" data series in the publication *Petroleum Supply Annual,* published by the U.S. Energy Information Administration (EIA). Beginning in 1983, asphalt product supplied includes road oil, and RDTCPUS is entered as zero in SEDS.

Before 2009, state-level asphalt sales data are used to allocate the U.S. consumption value to the states. ASINPZZ represents all asphalt sold as paving products, as roofing products, and for all other uses. RDINPZZ represents all sales of road oil. These data are collected and published by the Department of Interior (1960–1977), EIA (1978–1980), and the Asphalt Institute (1981–2008). Values for RDINPZZ for 1981 and 1982 are estimated as described under "Additional Notes" in this section. Beginning with 1983 data, when road oil is included in asphalt product supplied data, RDINPZZ is entered as zero in SEDS.

To calculate state consumption estimates of asphalt, total sales of asphalt and road oil in the United States to the industrial sector are first calculated as the sum of the state data:

ASINPUS = ΣASINPZZ
RDINPUS = ΣRDINPZZ

Each state's consumption of asphalt in the industrial sector (ASICPZZ) is calculated to be in proportion to each state's sales:

ASICPZZ = (ASINPZZ / ASINPUS) * ASTCPUS
ASICPUS = ΣASICPZZ
RDICPZZ = (RDINPZZ / RDINPUS) * RDTCPUS
RDICPUS = ΣRDICPZZ

Beginning in 2009, state-level asphalt sales data are no longer available from the Asphalt Institute. To estimate state-level consumption, state-level production of hot-mix asphalt and warm-mix asphalt (HMA/WMA) excluding reclaimed asphalt pavement (RAP), ASPRPZZ, is used to allocate U.S. consumption to the states. These data are collected by the National Asphalt Pavement Association (NAPA). HMA/WMA is used by the paving industry and contains about 5% asphalt binder, the petroleum product measured in SEDS. The use of recycled materials reduces the need of asphalt binder. Hence RAP tonnage is removed from HMA/WMA tonnage to derive the state allocators. While estimates of HMA/WMA tonnage are available from the source for all states, RAP estimates are withheld for some states and are estimated in SEDS.

ASPRPUS = ΣASPRPZZ

Each state's consumption of asphalt in the industrial sector (ASICPZZ) is calculated to be in proportion to each state's HMA/WMA production:

ASICPZZ = (ASPRPZZ / ASPRPUS) * ASTCPUS
ASICPUS = ΣASICPZZ

Because all asphalt and road oil are assumed to be used in the industrial sector, their total consumption in each state equals the industrial sector consumption:

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ASTCPZZ = ASICPZZ
RDTCPZZ = RDICPZZ

Asphalt and road oil consumption are added together:

ARICPZZ = ASICPZZ + RDICPZZ
ARICPUS = ΣARICPZZ
ARTCPZZ = ASTCPZZ + RDTCPZZ
ARTCPUS = ΣARTCPZZ

British thermal units (Btu)

Asphalt and road oil have a heat content value of about 6.636 million Btu per barrel. This factor is applied to convert asphalt and road oil estimated consumption from physical units to Btu:

ARICBZZ = ARICPZZ * 6.636
ARICBUS = ΣARICBZZ

Because all asphalt and road oil are assumed to be used by the industrial sector, total asphalt and road oil consumption in each state and in the United States is assumed to equal the industrial sector consumption:

ARTCBZZ = ARICBZZ
ARTCBUS = ARICBUS

Additional notes

The federal government stopped collecting asphalt and road oil sales data after 1980. For 1981 through 2008, the source for these numbers was the Asphalt Institute. When companies did not respond to the voluntary survey, the Asphalt Institute did not estimate quantities to compensate for the nonresponse. This could cause large fluctuation in sales from year to year for some states.

For most years through 2008, asphalt and road oil sales data for Maryland and the District of Columbia are published combined to avoid disclosure of proprietary data. Before being entered into SEDS, the combined data are allocated to each state based on their reported sales in 1974. In this allocation procedure 99.4% is allocated to Maryland and 0.6% to the District of Columbia.

The EIA report series "Sales of Asphalt," and predecessor reports, which are the source for road oil sales by state (RDINPZZ) in SEDS for 1960 through 1980, was discontinued after the 1980 report. For 1981 and 1982, state estimates of road oil sales were created by first converting the annual total U.S. road oil product supplied data into short tons (one short ton contains 5.5 barrels of road oil). Then, the U.S. total road oil product supplied, in short tons, was disaggregated to each state in proportion to the state's share of total U.S. asphalt sales as reported in the Asphalt Institute's *Report on Sales of Asphalt in the U.S.*

For 2009 forward, production data from NAPA are used as state allocators.

Data sources

ASINPZZ — Asphalt sold to the industrial sector by state.

- 1960 through 1977: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Sales of Asphalt," the specific tables are
  - 1960 through 1962: Table 6.
  - 1963 through 1977: Table 5.
- 1978 through 1980: EIA, *Energy Data Reports*, "Sales of Asphalt," Table 2.
- 1981 through 1986: The Asphalt Institute, *Asphalt Usage 1987 United States and Canada*, Table B.
- 1987 and 1988: The Asphalt Institute, *Asphalt Usage 1988 United States and Canada*, Tables A and B for state data. *Asphalt Usage 1989 United States and Canada*, page 2 for revised U.S. totals. The Asphalt Institute did not publish corresponding revised state data but did advise EIA on an estimation procedure to adjust 19 state values to sum to the revised U.S. totals.
- 1989 through 1997: The Asphalt Institute, *Asphalt Usage United States and Canada*, table titled "U.S. Asphalt Usage."
- 1998 and 1999: The Asphalt Institute, *Asphalt Usage United States and Canada*, table titled "1998 vs. 1999 U.S. Asphalt Usage." 1998 data for Delaware, New Hampshire, Rhode Island, and Vermont are repeated for 1999 because nonresponse to the survey caused those states data for 1999 to be more than 75% lower than their 1998 values.
- 2000 through 2008: The Asphalt Institute, http://www.asphaltinstitute.org/, *Asphalt Usage Survey for the United States and Canada*, table titled "U.S. Asphalt Usage."

ASPRPZZ — Hot-mix asphalt and warm-mix asphalt production excluding reclaimed asphalt pavement by state.

- 2009 forward: National Asphalt Pavement Association, *Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt*

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Usage, http://www.asphaltpavement.org/recycling.

ASTCPUS — Asphalt total consumption in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

RDINPZZ — Road oil sold to the industrial sector by state (through 1982).

- 1960 through 1977: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Sales of Asphalt." The specific tables are
  - 1960 through 1962: Table 6.
  - 1963 through 1977: Table 5.
- 1978 through 1980: EIA, *Energy Data Reports*, "Sales of Asphalt," Table 2.
- 1981 and 1982: EIA estimates. (See explanation in "Additional Notes" on page 32.)

RDTCPUS — Road oil total consumption in the United States (through 1982).

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 2.

Aviation Gasoline

Physical units

The three data series used to estimate consumption of aviation gasoline are

AVMIPZZ	=	aviation gasoline issued to the military in each state, in thousand barrels;
AVNMMZZ	=	aviation gasoline sold to nonmilitary users in each state, in thousand gallons; and
AVTCPUS	=	aviation gasoline total consumption in the United States, in thousand barrels.

The U.S. Department of Transportation, Federal Highway Administration publishes the nonmilitary aviation gasoline sales data by state (AVNMMZZ) in *Highway Statistics*.

AVMIPZZ is the issues of aviation gasoline to the military in each state and is obtained from the U.S. Department of Defense, Defense Logistics Agency.

Total U.S. consumption of aviation gasoline (AVTCPUS) is the product supplied data series in the publication *Petroleum Supply Annual,* published by the U.S. Energy Information Administration (EIA).

The state-level data series are summed to provide totals for the United States:

AVMIPUS = ΣAVMIPZZ
AVNMMUS = ΣAVNMMZZ

The state sales of nonmilitary aviation gasoline data are converted from thousand gallons to thousand barrels (42 gallons = 1 barrel):

AVNMPZZ = AVNMMZZ / 42

The U.S. nonmilitary sales is the sum of the states' sales:

AVNMPUS = ΣAVNMPZZ

The total sales of aviation gasoline is estimated as the sum of nonmilitary sales and military issues:

AVTTPZZ = AVNMPZZ + AVMIPZZ
AVTTPUS = ΣAVTTPZZ

All aviation gasoline is assumed to be used by the transportation sector. An estimate of aviation gasoline consumption by the transportation sector

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by state (AVACPZZ) is calculated by assuming that each state consumes aviation gasoline in proportion to the amount sold to that state:

AVACPZZ = (AVTTPZZ / AVTTPUS) * AVTCPUS
AVACPUS = ΣAVACPZZ

Total aviation gasoline consumption in each state, AVTCPZZ, equals the transportation sector consumption in each state:

AVTCPZZ = AVACPZZ

British thermal units (Btu)

Aviation gasoline has a heat content value of about 5.048 million Btu per barrel. This factor is applied to convert aviation gasoline estimated consumption from physical units to Btu:

AVACBZZ = AVACPZZ * 5.048
AVACBUS = ΣAVACBZZ

Because all aviation gasoline is assumed to be used for transportation, aviation gasoline total consumption in each state and in the United States equals the transportation sector consumption:

AVTCBZZ = AVACBZZ
AVTCBUS = ΣAVTCBZZ

Additional note

In 2015, the Federal Highway Administration revised its methods of estimating aviation gasoline use. Estimates from 2015 forward are not compatible with data before 2015.

Data sources

AVMIPZZ — Aviation fuel issued to the military in the United States by state.

- 1960 through 1974: No data are available. The 1977 data are used for each year.
- 1975 and 1976: No consistent data series are available. The 1977 data are used for both years.
- 1977 through 1988: U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center, Defense Energy Information System, military retail issues based on fiscal year data. The District of Columbia issues are assumed to be zero; therefore, values reported for the District of Columbia are added to Maryland.
- 1989 and 1990: U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center. State data for the fiscal year from two databases are summed: Defense Fuel Automated Management System (military wholesale issues) and Into-Plane Database (military purchases from commercial airports). Into-plane values reported for the District of Columbia are added to Virginia.
- 1991 through 2003: U.S. Department of Defense, Defense Logistics Agency, Defense Energy Supply Center. State data for the calendar year from two databases are summed: Defense Fuel Automated Management System (military wholesale issues) and Into-Plane Database (military purchases from commercial airports). Into-plane values reported for the District of Columbia are added to Virginia.
- 2004 forward: U.S. Department of Defense, Defense Logistics Agency Energy. State data for product 130, Aviation Gasoline, Grade 100LL, by calendar year were used.

AVNMMZZ — Aviation gasoline sold to nonmilitary users by state.

- 1960 through 1964: U.S. Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table G-24.
- 1965 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, http://www.fhwa.dot.gov/policyinformation/statistics.cfm, Table G-24 (1965), Table MF-24 (1966 through 2006), and Table 8.4.3 (2007 forward).

AVTCPUS — Aviation gasoline total consumption in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

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Distillate Fuel Oil

Physical units

Because state-level and end-use consumption data for distillate fuel oil (except for that consumed by the electric power sector) are not available, sales of distillate fuel oil into or within each state, published by the U.S. Energy Information Administration (EIA) in the *Fuel Oil and Kerosene Sales Report,* are used to estimate distillate fuel oil consumption. The following variable names have been assigned to the sales series, in thousand barrels ("ZZ" in the variable names represents the two-letter state code that differs for each state):

DFBKPZZ = distillate fuel oil sales for vessel bunkering use (i.e., the fueling of commercial or private boats, such as pleasure craft, fishing boats, tugboats, and ocean-going vessels, including vessels operated by oil companies, and fueling for other marine purposes), excluding that sold to the military;

DFCMPZZ = distillate fuel oil sales to commercial establishments for space heating, water heating, and cooking;

DFIBPZZ = distillate fuel oil sales to industrial establishments for space heating and for other industrial use (i.e., for all uses to mines, smelters, plants engaged in producing manufactured products, in processing goods, and in assembling), including farm use;

DFMIPZZ = distillate fuel oil sales to the military, for all uses;

DFOCPZZ = distillate fuel oil sales for oil company use, including all fuel oil, crude oil, or acid sludge used as fuel at refineries, by pipelines, or in field operations;

DFOFPZZ = distillate fuel oil sales as diesel fuel for off-highway use in construction (i.e., earthmoving equipment, cranes, stationary generators, air compressors, etc.) and for off-highway uses other than construction (i.e., logging);

DFONPZZ = distillate fuel oil sales as diesel fuel for on-highway use (i.e., as engine fuel for trucks, buses, and automobiles);

DFOTPZZ = distillate fuel oil sales for all other uses not identified in other sales categories;

DFRRPZZ = distillate fuel oil sales to the railroads for use in fueling trains, operating railroad equipment, space heating of buildings, and other operations; and

DFRSPZZ = distillate fuel oil sales to the residential sector for space heating, water heating, and cooking, excluding farm houses.

Three additional data series are used in calculating distillate fuel oil consumption estimates:

DKEIPZZ = distillate fuel oil (including kerosene-type jet fuel before 2001) consumed by the electric power sector, in thousand barrels;

JKEUPZZ = kerosene-type jet fuel consumed by electric utilities, in thousand barrels (through 1982); and

DFTCPUS = distillate fuel oil total consumption in the United States, in thousand barrels.

Distillate fuel oil consumed by the electric power sector is collected by EIA on Form EIA-923, "Power Plant Operations Report," and predecessor forms. (See Note 4 at the end of this distillate fuel oil section for further information on changes in this series' data definitions.) Before 2001, the data series DKEIPZZ includes kerosene-type jet fuel consumed at electric utilities that is identified as JKEUPZZ. The kerosene-type jet fuel is subtracted from the distillate fuel oil data and accounted for in the jet fuel data described in a following section of this documentation. Data for kerosene-type jet fuel consumed by electric utilities are available for 1972 through 1982 only. Consumption in all other years is assumed to be zero. From 2001 forward, jet fuel consumed by the electric power sector is grouped under waste/other oil and is not accounted for in SEDS. DKEIPZZ is continued to be used to represent distillate fuel oil consumed by the electric power sector.

Total consumption of distillate fuel oil in the United States, DFTCPUS, is the product supplied series in the EIA publication *Petroleum Supply Annual*. From 2011 forward, product supplied of distillate fuel oil includes all biodiesel blended into distillate fuel oil. Before 2011, only the portion of biodiesel that was reported as refinery and blender net input was included.

All of the state-level data series listed above are summed to provide totals for the United States.

Next, the variables are combined as closely as possible into the major end-use sectors used in SEDS. The residential sector sales and the commercial sector sales contain only DFRSPZZ and DFCMPZZ, respectively.

The sales of distillate fuel oil to the industrial sector for each state, DFINPZZ, is the sum of the distillate fuel oil sales for industrial use, including industrial space heating and farm use (DFIBPZZ), for oil company use (DFOCPZZ),

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for off-highway use (DFOFPZZ), and for all other uses (DFOTPZZ). Data for DFOTPZZ are available through 1994. Starting in 1995, consumption is assumed to be zero:

DFINPZZ = DFIBPZZ + DFOCPZZ + DFOFPZZ + DFOTPZZ
DFINPUS = ΣDFINPZZ

The sales of distillate fuel oil to the transportation sector for each state, DFTRPZZ, is the sum of the distillate fuel oil sales for vessel bunkering, military use, railroad use, and the diesel fuel used on-highway:

DFTRPZZ = DFBKPZZ + DFMIPZZ + DFRRPZZ + DFONPZZ
DFTRPUS = ΣDFTRPZZ

Sales of distillate fuel oil to the residential, commercial, industrial, and transportation sectors are added to create a subtotal of sales to all sectors other than the electric utility sector, DFNDPZZ:

DFNDPZZ = DFRSPZZ + DFCMPZZ + DFINPZZ + DFTRPZZ
DFNDPUS = ΣDFNDPZZ

For 2001 forward, consumption of distillate fuel oil by the electric power sector (DFEIPZZ) is the same as the input series DKEIPZZ:

DFEIPZZ = DKEIPZZ

Before 2001, DFEIPZZ is calculated by subtracting the kerosene-type jet fuel consumed by electric utilities from DKEIPZZ:

DFEIPZZ = DKEIPZZ - JKEUPZZ

For all years, the U.S. total for this data series is summed:

DFEIPUS = ΣDFEIPZZ

The estimated U.S. distillate fuel oil consumption by all sectors other than the electric power sector, DFNCPUS, is calculated by subtracting the distillate fuel oil consumption by the electric power sector from the total U.S. distillate fuel oil consumption:

DFNCPUS = DFTCPUS - DFEIPUS

This U.S. subtotal of distillate fuel oil consumption by the four end-use sectors, DFNCPUS, is apportioned to the states by use of the end-use sectors' state-level sales data. The assumption is made that each state consumes distillate fuel oil in proportion to the amount of sales to that state:

DFNCPZZ = (DFNDPZZ / DFNDPUS) * DFNCPUS

The end-use sectors' subtotal for each state, DFNCPZZ, is further divided into estimates for the four end-use sectors in proportion to each sector's sales. The estimated residential sector consumption in each state, DFRCPZZ, is calculated:

DFRCPZZ = (DFRSPZZ / DFNDPZZ) * DFNCPZZ
DFRCPUS = ΣDFRCPZZ

The commercial sector's estimated consumption in each state, DFCCPZZ, is calculated:

DFCCPZZ = (DFCMPZZ / DFNDPZZ) * DFNCPZZ
DFCCPUS = ΣDFCCPZZ

The industrial sector's estimated consumption in each state, DFICPZZ, is calculated:

DFICPZZ = (DFINPZZ / DFNDPZZ) * DFNCPZZ
DFICPUS = ΣDFICPZZ

The transportation sector's estimated consumption in each state, DFACPZZ, is calculated:

DFACPZZ = (DFTRPZZ / DFNDPZZ) * DFNCPZZ
DFACPUS = ΣDFACPZZ

Total state distillate fuel oil consumption is the sum of the end-use sectors' consumption subtotal and the electric power sector consumption:

DFTCPZZ = DFNCPZZ + DFEIPZZ

British thermal units (Btu)

The factor for converting distillate fuel oil from physical unit values to Btu, DFTCKUS, is calculated annually for 1994 forward by EIA as a consumption-weighted average of the heat contents of three categories of distillate fuel oil based on its sulfur content. DFTCKUS is shown in Table B1 on page 179. For 1960 through 1993, a fixed factor of 5.825 million Btu per barrel is used:

DFTCKUS = factor for converting distillate fuel oil from physical units to Btu.

This factor is applied to convert distillate fuel oil estimated consumption

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for the five consuming sectors from physical units to Btu as shown in the following example:

DFRCBZZ = DFRCPZZ * DFTCKUS

Total Btu consumption of distillate fuel oil is the sum of the consumption by the end-use sectors and for electricity generation:

DFTCBZZ = DFRCBZZ + DFCCBZZ + DFICBZZ + DFACBZZ + DFEIBZZ

The U.S. Btu consumption estimates are calculated as the sum of all the states' data.

In the SEDS consumption tables, "Estimates of Energy Consumption by the Electric Power Sector," the data used in the column headed "Distillate" is the variable DKEIP, which includes keorsene-type jet fuel before 2001, in physical units. The Btu variable, DKEIB, is calculated as follows (See page 58 for description of JKEUB):

DKEIBZZ	=	DFEIBZZ	for 2001 forward
DKEIBZZ	=	DFEIBZZ + JKEUBZZ	before 2001
DKEIBUS	=	ΣDKEIBZZ	

Additional notes

1. "Deliveries" data are actually called "shipments" in the source document for 1960 and 1961; "consumption" for 1962 through 1966; "shipments" for 1967; "sales" from 1968 through 1978; "deliveries" for 1979 through 1987; and "sales" for 1988 forward.
2. State data for the variables DFONPZZ (on-highway use), DFOFPZZ (off-highway use), and DFOTPZZ (other) for 1967 are unavailable from published sources. These three variables compose the miscellaneous use category for distillate fuel oil, which is known for all years by state. State estimates of DFONPZZ and DFOFPZZ for 1967 were developed by dividing the 1966 values for DFONPZZ and DFOFPZZ by the 1966 total miscellaneous use for each state and applying these percentages to the 1967 total miscellaneous use for each state. The 1967 state estimates for DFOTPZZ are the remainder of the 1967 miscellaneous category after DFONPZZ and DFOFPZZ have been subtracted.
3. In 1979, EIA implemented a new survey form, EIA-172, to obtain deliveries of fuel oil and kerosene data and updated the list of respondents. (A detailed explanation is published in the *Energy Data Report,* "Deliveries of Fuel Oil and Kerosene in 1979.") In this survey form, certain end-use categories were redefined—in many cases to collect more disaggregated data. The reclassifications resulted in some end-use categories that were no longer comparable with those in previous surveys. Where discontinuities occurred, estimates for the pre-1979 years have been made in the State Energy Data System (SEDS) to conform with the 1979 fuel oil deliveries classifications. The pre-1979 deliveries estimates are not published in this report, but are used in SEDS to disaggregate the known U.S. total product supplied (consumption) into state and major end-use sector consumption estimates.

   For distillate fuel oil deliveries in 1979, the end-use categories called "residential," "commercial," "industrial," and "farm" are available. The pre-1979 deliveries categories are called "heating" and "industrial" (which included farm use). While the pre-1979 categories individually are not continuous with the 1979 categories, their subtotals are related. That is, a general comparison can be made between the sum of residential, commercial, industrial, and farm deliveries in 1979 and the sum of heating and industrial deliveries in the pre-1979 years. Therefore, the following method was applied to present a comparable series for distillate fuel oil delivered to the residential, commercial, and industrial sectors:
   - For each of the pre-1979 years, a subtotal was created for each state by adding each state's heating and industrial deliveries categories. A comparable 1979 subtotal was created by adding each state's residential, commercial, industrial, and farm deliveries categories.
   - Residential, commercial, and industrial (including farm) shares of the subtotal in 1979 were calculated for each state.
   - These 1979 end-use shares were then applied to each pre-1979 subtotal of distillate fuel oil deliveries in each state to create state estimates of end-use deliveries for 1960 through 1978.

   The 1980 through 1982 distillate fuel oil deliveries data are based on the same survey as that used for 1979; therefore, the 1980 through 1982 data are directly comparable to 1979 data.

   In 1984, EIA again updated the list of respondents for this survey, and the Form EIA-172 became the Form EIA-821, "Annual Fuel Oil and Kerosene Sales Report." EIA did not conduct a fuel oil and kerosene deliveries survey for 1983. The 1983 estimates in SEDS are based on 1984 data obtained from the Form EIA-821. Statistical procedures and methodologies used for the Form EIA-821 differ from those used in previous years. Therefore, the 1983 and forward sales data may not be directly comparable to the pre-1983 data. (In the source document, the deliveries data for 1983 forward are reported in thousand gallons. These

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data are first converted to thousand barrels before being entered into SEDS.)

Some of the No. 2 diesel fuel reported as sold to the commercial and industrial sectors, DFCMPZZ and DFINPZZ, on the EIA forms may also be included in the on-highway data, DFONPZZ, obtained from the Federal Highway Administration. Included in the commercial sector is some diesel fuel consumed by government vehicles and school buses, and included in the industrial sector is some diesel fuel consumed by fleets of trucks. Because the specific quantities involved are unknown, SEDS reflects the diesel fuel consumption as reported in the EIA *Petroleum Marketing Monthly* and no attempt has been made to adjust the end-use reporting.

4. The data on fuel oil consumed by the electric power sector for all years and states are actual fuel oil consumption numbers collected from electric power plants on Form EIA-923, "Power Plant Operations Report," and predecessor forms. Due to changes in fuel oil reporting classifications on the predecessor forms over the years, it is not possible to develop a thoroughly consistent series for all years. However, over time, data more accurately disaggregating fuel oil into distillate fuel oil and residual fuel oil have become available. For 1960 through 1969, only data on total fuel oil consumed at electric utilities by state are available. For 1970 through 1979, fuel oil consumed by plant type (internal combustion and gas turbine plants combined and steam plants) by state are available. For 1980 through 2000, data on consumption of light fuel oil at all plant types combined and consumption of heavy fuel oil at all plant types combined are available by state. For 2001 forward, data on consumption of distillate fuel oil and residual fuel oil are available. In SEDS, the following assumptions have been made:
   - 1960 through 1969—state estimates of fuel oil consumption by plant type have been created for each year by applying the shares of steam plants (primarily residual fuel oil) and internal combustion and gas turbine plants (primarily distillate fuel oil plus small amounts of jet kerosene) by state in 1970 to each year's total fuel oil consumption at electric utilities for 1960 through 1969.
   - 1970 through 1979—fuel oil consumed by steam plants is assumed to equal residual fuel oil consumption, and fuel oil consumed by internal combustion and gas turbine plants is assumed to equal distillate fuel oil plus jet kerosene consumption.
   - 1980 through 2000—total heavy oil consumption at all plant types is assumed to equal residual fuel oil consumption, and total light oil consumption at all plant types is assumed to equal distillate fuel oil plus jet kerosene consumption.

   The data series thus derived for SEDS for residual fuel oil and distillate fuel oil consumption by the electric power sector is considered to be actual consumption by the electric power for each state and each year.

Data sources

DFBKPZZ — Distillate fuel oil sales for vessel bunkering use by state, excluding that sold to the military.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are
  - 1960 and 1961: Table 17.
  - 1962 and 1963: Table 16.
  - 1964 and 1965: Table 15.
  - 1966 through 1975: Table 11.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 11.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A12.
- 1984 through 1987: EIA, *Petroleum Marketing Monthly*, also at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VVB_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VVB_Mgal_a.htm.

DFCMPZZ — Distillate fuel oil sales to the commercial sector for space heating, water heating, and cooking.

- 1960 through 1978: EIA estimates based on statistics of commercial sector deliveries of distillate fuel oil from the EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene in 1979," Table 1. State ratios based on 1979 commercial sector deliveries were applied to each state's sum of heating plus industrial (including farm use) deliveries categories from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 3, on page 37.)
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and

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Kerosene," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A12.
- 1984 through 1987: EIA, *Petroleum Marketing Monthly*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VCS_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VCS_Mgal_a.htm.

DFIBPZZ — Distillate fuel oil sales to industrial establishments for space heating and for other industrial use, including farm use by state.

- 1960 through 1978: EIA estimates based on statistics of industrial sector deliveries of distillate fuel oil from the EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene in 1979," Table 1. State ratios based on 1979 industrial sector deliveries were applied to each state's sum of heating plus industrial (including farm use) deliveries categories from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 3, on page 37.)
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A12.
- 1984 through 1987: EIA, *Petroleum Marketing Monthly*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_vin_Mgal_a.htm and http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VFM_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VFM_Mgal_a.htm and http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VFM_Mgal_a.htm.

DFMIPZZ — Distillate fuel oil sales to the military for all uses by state.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are
  - 1960 and 1961: Table 18.
  - 1962 and 1963: Table 17.
  - 1964 and 1965: Table 16.
  - 1966 through 1975: Table 12.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 12.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A12.
- 1984 through 1987: EIA, *Petroleum Marketing Monthly*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VMI_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VMI_Mgal_a.htm.

DFOCPZZ — Distillate fuel oil sales for use by oil companies by state.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are
  - 1960 and 1961: Table 14.
  - 1962 and 1963: Table 13.
  - 1964 and 1965: Table 12.
  - 1966 through 1975: Table 9.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 9.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A12.

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- 1984 through 1987: EIA, *Petroleum Marketing Monthly*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VOC_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VOC_Mgal_a.htm.

DFOFPZZ — Distillate fuel oil sales as diesel fuel for off-highway use by state.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are
  - 1960 through 1962: Table 19.
  - 1963 and 1964: Table 18.
  - 1965 through 1967: Table 17.
  - 1968 through 1975: Table 14.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 14.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A12.
- 1984 through 1987: EIA, *Petroleum Marketing Monthly*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD2D_VHF_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD2D_VHF_Mgal_a.htm.

DFONPZZ — Distillate fuel oil sales as diesel fuel for on-highway use by state.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are
  - 1960 through 1962: Table 19.
  - 1963 and 1964: Table 18.
  - 1965 through 1967: Table 17.
  - 1968 through 1975: Table 14.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 14.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A12.
- 1984 through 1987: EIA, *Petroleum Marketing Monthly*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD2D_VHN_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD2D_VHN_Mgal_a.htm.

DFOTPZZ — Distillate fuel oil sales for all other uses not identified in other sales categories.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are
  - 1960 through 1962: Table 19.
  - 1963 and 1964: Table 18.
  - 1965 through 1967: Table 17.
  - 1968 through 1975: Table 14.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 14.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A12.
- 1984 through 1987: EIA, *Petroleum Marketing Monthly,* also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VOE_Mgal_a.htm.
- 1988 through 1994: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VOE_Mgal_a.htm.

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- 1995 forward: Series discontinued; no data available. Values are assumed to be zero.

DFRRPZZ — Distillate fuel oil sales for use by railroads by state.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are
  - 1960 and 1961: Table 16.
  - 1962 and 1963: Table 15.
  - 1964 and 1965: Table 14.
  - 1966 through 1975: Table 10.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 10.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A12.
- 1984 through 1987: EIA, *Petroleum Marketing Monthly*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VRR_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VRR_Mgal_a.htm.

DFRSPZZ — Distillate fuel oil sales to the residential sector for space heating, water heating, and cooking.

- 1960 through 1978: EIA estimates based on statistics of residential sector deliveries of distillate fuel oil from the EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene in 1979," Table 1. State ratios based on 1979 residential sector deliveries were applied to each state's sum of heating plus industrial (including farm use) deliveries categories from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 3, on page 37.)
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 4.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A12.
- 1984 through 1987: EIA, *Petroleum Marketing Monthly*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VRS_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821dst_a_EPD0_VRS_Mgal_a.htm.

DFTCKUS — Factor for converting distillate fuel oil from physical units to Btu.

- 1960 through 1993: EIA adopted the Bureau of Mines thermal conversion factor of 5.825 million Btu per barrel, from the Bureau of Mines internal memorandum "Bureau of Mines Standard Average Heating Value of Various Fuels, Adopted January 3, 1950."
- 1994 forward: EIA calculates the national annual average thermal conversion factor, which includes biodiesel blended into distillate fuel oil, by using heat content values of three sulfur-content categories of distillate fuel oil, weighted by quantity consumed. See Appendix B Table B1 on page 179.

DFTCPUS — Distillate fuel oil total consumption in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

DKEIPZZ — Distillate fuel oil consumed by the electric power sector, including kerosene-type jet fuel before 2001.

- EIA, Form EIA-923, "Power Plant Operations Report," and predecessor forms. The following assumptions have been made:
  - 1960 through 1969: Only total fuel oil consumed at electric utilities by state is available. State estimates of distillate fuel oil consumption were created for each year by applying the shares of internal

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combustion and gas turbine plants (primarily distillate fuel oil plus small amounts of jet fuel) by state from 1970 to each year's total fuel oil consumption at electric utilities for 1960 through 1969.
- 1970 through 1979: Fuel oil consumed by plant type by state is available. Fuel oil consumed by internal combustion and gas turbine plants combined is assumed to equal distillate and jet fuel consumption.
- 1980 through 2000: Consumption of light fuel oil at all plant types by state is available. This is assumed to equal distillate and jet kerosene consumption.
- 2001 forward: Consumption of distillate fuel oil is available.

JKEUPZZ — Kerosene-type jet fuel consumed by the electric utility sector (through 1982). (See data sources for JKEUPZZ under "Jet Fuel" on page 59.)

Hydrocarbon Gas Liquids (1960–2009)

Hydrocarbon gas liquids (HGL) cover natural gas liquids (ethane, propane, normal butane, isobutane, and natural gasoline) and refinery olefins (ethylene, propylene, butylene, and isobutylene). Refinery olefins are olefins produced at refineries and do not include olefins produced by the manufacturing industries. The State Energy Data System (SEDS) assumes that, except for propane, all other HGL products are consumed only by the industrial sector.

Historically, SEDS produced consumption estimates for liquefied petroleum gases (LPG), which included ethane/ethylene, isobutane/isobutylene, normal butane/butylene, propane/propylene, butane-propane mixtures, and ethane-propane mixtures. Pentanes plus (natural gasoline) and three other former products (natural gasoline, plant condensate, and unfractionated streams) were covered in "other petroleum products."

In mid-2010s, the U.S. Energy Information Administration (EIA) began using hydrocarbon gas liquids to describe the nine products and separated the refinery olefins from the natural gas liquids in its product supplied data for 2010 forward. SEDS adopted the HGL definition and applied new estimation methodologies for the individual HGL products for 2010 forward (see page 51). For 1960 through 2009, SEDS assumes HGL consumption to be the sum of LPG and pentanes plus (natural gasoline) consumption. The term "LPG" is no longer used after 2009.

Liquefied petroleum gases (LPG)

Physical units

For 1960 through 2007, the following data series on LPG sales in thousand gallons are used in SEDS to estimate LPG consumption by state.

LGCBMZZ = LPG sold for internal combustion engine fuel use. Included are sales for use in highway vehicles, forklifts, industrial tractors, and for use in oil field drilling, and production equipment, etc.;

LGHCMZZ = LPG sold for residential and commercial use. Included are sales for nonfarm private households for space heating, cooking, water heating, and other household uses, such as clothes drying and incineration. Also included are sales to nonmanufacturing organizations, such as motels, restaurants, retail stores, laundries, and other service enterprises, primarily for use in space heating, water heating, and cooking; and

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LGTTPZZ = LPG total sales for all uses.

Data before 1984 were available from the Bureau of Mines reports, U.S. Energy Information Administration (EIA) reports, or were estimated by EIA. From 1984 through 2007, data were extracted from American Petroleum Institute's (API) *Sales of Natural Gas Liquids and Liquefied Refinery Gases*. Withheld state-level sales data are first estimated by EIA by using previous year's data and ensuring all subtotals match the source document.

The U.S. totals for each of these state-level data series are calculated as the sum of the state values.

Total U.S. consumption of LPG is the product supplied data series in EIA *Petroleum Supply Annual*:

LGTCPUS = LPG total consumption in the United States, in thousand barrels (through 2009).

Another variable is used in SEDS to estimate LPG consumption by the transportation sector:

LGTRSUS = the transportation sector share of LPG internal combustion engine sales (through 2009).

Its computation is described in detail in Note 2 on page 45.

Similarly, variables are used in SEDS to estimate LPG consumption by the residential and commercial sectors:

LGRCSZZ = the residential sector share of LPG residential and commercial sales (through 2009); and

LGCCSZZ = the commercial sector share of LPG residential and commercial sales (through 2009).

Their computation is described in detail in Note 3 on page 45.

Because the LPG sales data are in gallons, they must be converted to barrels (42 U.S. gallons per U.S. barrel) to be comparable to total consumption estimates. The formulas for calculating state sales data are

LGCBPZZ = LGCBMZZ / 42
LGCBPUS = ΣLGCBPZZ
LGHCPZZ = LGHCMZZ / 42
LGHCPUS = ΣLGHCPZZ

It is also assumed that LPG sales to the residential and commercial sectors are equal to the consumption in those sectors. LPG consumption by the residential sector is estimated to be the residential share of propane sales for the residential and commercial sectors:

LGRCPZZ = LGHCPZZ * LGRCSZZ

LPG consumption by the commercial sector is estimated to be the commercial share of propane sales for the residential and commercial sectors:

LGCCPZZ = LGHCPZZ * LGCCSZZ

LPG consumption by the transportation sector is estimated to be the transportation share of the sales for internal combustion engine fuel:

LGACPZZ = LGCBPZZ * LGTRSUS

An estimate of each state's total LPG consumption (LGTCPZZ) is made by allocating the U.S. total consumption to the states in proportion to each state's share of the U.S. total sales:

LGTCPZZ = (LGTTPZZ / LGTTPUS) * LGTCPUS

Industrial sector consumption (LGICPZZ) for each state is the difference between the state's total LPG consumption and the sum of its residential, commercial, and transportation sectors' consumption:

LGICPZZ = LGTCPZZ- (LGACPZZ + LGCCPZZ + LGRCPZZ)

U.S. totals for the four end-use sector consumption estimates are calculated as the sums of the state estimates.

For 2008 and 2009, the API report only covers sales of propane (including propylene). A new methodology is developed to estimate state-level propane consumption and all other LPG consumption. For propane consumption, API's state shares of propane sales are applied to the U.S. propane product supplied published in EIA's *Petroleum Supply Annual* (PSA).

In SEDS, it is assumed that LPG consumed by the residential, commercial, and transportation sectors and for internal combustion fuel is solely propane. The propane consumption for the residential and consumption sectors and for internal combustion engine fuel use are assigned to LGHCMZZ and LGCBMZZ respectively. The same methodology used for 1960 through 2007 to derive LPG consumption for the residential, commercial, and transportation sectors is maintained:

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LGCBPZZ = LGCBMZZ / 42
LGHCPZZ = LGHCMZZ / 42
LGRCPZZ = LGHCPZZ * LGRCSZZ
LGCCPZZ = LGHCPZZ * LGCCSZZ
LGACPZZ = LGCBPZZ * LGTRSUS

LPG consumption for the industrial sector, LGICP, is estimated by summing the estimates for the four components:

- Propane — State-level industrial consumption is calculated by subtracting residential, commercial, and transportation sector consumption from total propane consumption.
- Ethane — Data on ethane feed slate capacity of ethylene steam crackers published by the *Oil and Gas Journal* (OGJ) are used to compute a set of state-level preliminary ethane demand, using an ethylene yield factor of 0.8 and a conversion factor of 16.85 barrels per metric ton. Ethane estimates for the two largest consuming states, Louisiana and Texas (where most, if not all, flexible crackers are located), are further adjusted so that the sum of all states' ethane consumption matches the U.S. ethane product supplied published in PSA.
- Normal butane (n-butane) consumed by steam crackers is estimated using data on n-butane feed slate capacity from OGJ and applied them to the U.S. ethylene feed slate demand for n-butane, also available from OGJ. N-butane for other uses, defined as U.S. n-butane total product supplied less ethylene feed slate demand, is allocated to Texas.
- Isobutane — The U.S. product supplied of isobutane is allocated to Texas.

N-butane and isobutane used in gasoline blending and alkylation at the refineries are accounted for in intermediate product processing and not considered end-use consumption.

U.S. totals for the four end-use sector consumption estimates are calculated as the sums of the state estimates.

Total LPG consumption, LGTCP, is the sum of the four end-use sectors' LPG consumption:

LGTCPZZ = LGACPZZ + LGCCPZZ + LGICPZZ + LGRCPZZ

British thermal units (Btu)

The Btu consumption of LPG for the United States, LGTCBUS, is extracted from EIA's *Annual Energy Review* and *Monthly Energy Review*. It is calculated by multiplying total physical unit consumption (LGTCPUS) with an average conversion factor for LPG. The factor for converting LPG from physical unit values to Btu, LGTCKUS, is calculated annually for 1967 through 2009 by EIA as a consumption-weighted average of the heat contents of the component products (ethane, propane, normal butane, and isobutane) as shown in Appendix B, beginning on page 197. For 1960 through 1966, EIA adopted the 1967 calculated average heat content of 3.810 million Btu per barrel.

LGTCBUS = LPG total consumption in the United States, in billion Btu (through 2009); and
LGTCKUS = Factor for converting U.S. consumption of LPG from physical units to Btu (through 2009).

Because the residential, commercial, and transportation sectors consume mainly propane, it is more appropriate to use the heat content of propane (3.841 million Btu per barrel) to convert LPG consumption for these three sectors into Btu:

LGACBZZ = LGACPZZ * 3.841
LGCCBZZ = LGCCPZZ * 3.841
LGRCBZZ = LGRCPZZ * 3.841

The U.S. totals for the three sectors are the sum of the state estimates.

Industrial sector consumption for the United States is calculated by subtracting the three sectors' consumption estimates from the total:

LGICBUS = LGTCBUS - (LGACBUS + LGCCBUS + LGRCBUS)

Industrial sector consumption for each state is estimated by allocating the U.S. industrial consumption to the states in proportion to the physical unit share:

LGICBZZ = (LGICPZZ / LGICPUS) * LGICBUS

Total estimated consumption of LPG is the sum of the end-use consumption estimates:

LGTCBZZ = LGACBZZ + LGCCBZZ + LGICBZZ + LGRCBZZ

The average conversion factor for industrial consumption of LPG, LGICKUS, is calculated for use in the price computation:

LGICKUS = LGICBUS / LGICPUS

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Additional notes

1. Sales data for Maryland and the District of Columbia (D.C.) are combined in the source documents through 2009. Sales data are published in six categories through 2007. The percentages shown in Table TN4.2 are applied to disaggregate the state data in each of the sectors for these years. For 2008 and 2009, the same percentages for the residential and commercial, and internal combustion engine fuel shown in Table TN4.2 are applied to the combined Maryland and D.C. sales for those sales categories. The percentages for the remaining categories are combined using the 2007 data for those categories, resulting in 99.79% for Maryland and 0.21% for D.C. These percentages are applied to the remaining volumes of the combined Maryland and D.C. sales.
2. Sales of LPG for internal combustion engine fuel use are divided between the transportation sector and the industrial sector by using LGTRSUS, the transportation sector's share of internal combustion engine use. LGTRSUS is estimated from data on "special fuels used on highways," a category that includes only LPG and diesel fuel. The special fuels data are published by the U.S. Department of Transportation, Federal Highway Administration (see MGSFPZZ on page 71). The quantity of LPG included in special fuels is estimated each year. LGTRSUS is then derived by dividing the quantity of LPG included in special fuels used on highways by the quantity of LPG sold for internal combustion engine use. This U.S. factor is applied to the internal combustion engine use of each state. LGTRSUS values are shown in Table TN4.3.
3. The shares of propane used by the residential (LGRCS) and commercial (LGCCS) sectors for each state are based on propane sales data in the API report for 2003 through 2009. The average shares of 2003 through 2008 are applied to the earlier years. Data for LPG sold for residential and commercial use are then split into the two end-use sectors using these two variables.
4. LPG sales data by state and end-use categories for 1960 through 1982 are from EIA's "Sales of Liquefied Petroleum Gases and Ethane." In 1979, EIA modified the LPG sales survey, Form EIA-174, and changed the list of respondents. Because of the updated sampling frame, the 1979 through 1982 sales data may not be directly comparable to the pre-1979 sales when a different estimation procedure was used. Explanation of the discontinuities caused by the change in the 1979 sampling frame are provided in EIA's *Energy Data Report,* "Sales of Liquefied Petroleum Gases and Ethane in 1979." Because of the change in survey techniques used for measuring LPG sales, many states' data were withheld from publication in the 1979 through 1982 LPG sales reports to avoid disclosure of company-level data. The consumption estimates in SEDS use all data published in the 1979 through 1982 LPG sales reports and estimates prepared by EIA's Office of Oil and Gas for data that were withheld from publication. (See Note 5 following for estimation procedures.) Some end-use categories changed in 1979 due to redefinition of the classifications. One of these changes, for example, occurred with LPG sold to farms for household heating and cooking. Before 1979 these sales were reported as part of the residential and commercial category, while in 1979 they were counted in the farm use category that goes into the industrial sector in SEDS. No attempt has been made to adjust for this type of inconsistency. The Form EIA-174 was cancelled after collection of 1982 data. The 1983 LPG consumption estimates are based on the assumption that LPG end-use sector demand in 1983 occurred in the same proportion as 1982 sector demand within each state; i.e., the 1983 LPG product supplied figure was allocated to the states by using the distribution of volumes consumed for 1982.

Table TN4.2. Percentages used to disaggregate Maryland and D.C. combined LPG sales data, 1960 through 2007

Sales Category	Maryland	D.C.
Residential and commercial	99.9%	0.1%
Internal combustion engine fuel	98.9%	1.1%
Industrial	99.4%	0.6%
Chemical	100.0%	0.0%
Utility gas	100.0%	0.0%
Miscellaneous	100.0%	0.0%

5. The following procedures were used to estimate the state end-use sales that were withheld from publication in the 1979-1982 LPG sales reports:
   - For each year, missing state total sales were estimated by allocating the sum of the missing state sales within each Petroleum Administration for Defense (PAD) district to the individual states, in proportion to the sum of the known end-use sales for those states.
   - Missing PAD district end-use totals for 1979 and 1980 were obtained by using the 1980 and 1981 sales reports. Missing PAD district chemical sales were estimated by allocating the total missing volume of chemical sales to the PAD district in proportion to the number of chemical plants in each PAD district. The remaining PAD district end-use totals were obtained by subtraction. For 1981 and 1982, no PAD district estimations were necessary because all PAD district end-use totals are known.
   - The published data and the estimated state and PAD district end-use totals were used to estimate missing state end-use

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Table TN4.3. Transportation sector share of LPG internal combustion engine use, 1960 through 2009

Year	LGTRSUS	Year	LGTRSUS	Year	LGTRSUS
1960	0.229	1977	0.478	1994	0.734
1961	0.258	1978	0.594	1995	0.416
1962	0.266	1979	0.536	1996	0.337
1963	0.273	1980	0.380	1997	0.278
1964	0.259	1981	0.671	1998	0.592
1965	0.290	1982	0.579	1999	0.364
1966	0.325	1983	0.578	2000	0.215
1967	0.368	1984	0.631	2001	0.204
1968	0.389	1985	0.440	2002	0.325
1969	0.341	1986	0.456	2003	0.403
1970	0.363	1987	0.375	2004	0.365
1971	0.423	1988	0.437	2005	0.513
1972	0.392	1989	0.428	2006	0.496
1973	0.384	1990	0.471	2007	0.370
1974	0.381	1991	0.426	2008	0.796
1975	0.406	1992	0.425	2009	0.629
1976	0.440	1993	0.443		

sales volumes within a PAD district: missing state end-use sector values were estimated by allocating the missing volume for the state approximately proportional to the PAD district end-use sector totals.

6. Before 1979, state data for chemical use of LPG were withheld from publication, although they were included in the U.S. total in the tables in EIA's "Sales of Liquefied Petroleum Gases and Ethane" reports. Beginning in 1979, state-level chemical use data were published in the LPG sales reports, but data for several states were withheld. Estimates for the withheld data for chemical use sales for 1979 and 1980 were created by using the estimation procedure described in Note 5 on page 45. Then the published and the estimated state data for 1979 were used to create state shares of the total U.S. chemical use sales. These percentage shares (shown in Table TN4.4) were applied to the total U.S. LPG chemical use sales in 1960 through 1978 to create state chemical use estimates. The chemical use estimates were added to the states' total LPG sales series, LGTTPZZ.
7. For 1984 through 2007, the American Petroleum Institute (API), the Gas Processors Association, and the National LP-Gas Association jointly sponsored an LPG sales survey. The results are published in the API's report *Sales of Natural Gas Liquids and Liquefied Refinery Gases*.

Table TN4.4. State shares of the total U.S. LPG sold for chemical use, 1960 through 1978

State	Percent	State	Percent
Alabama	0.000	Montana	0.000
Alaska	0.589	Nebraska	0.000
Arizona	0.000	Nevada	0.000
Arkansas	0.000	New Hampshire	0.000
California	2.667	New Jersey	2.040
Colorado	0.232	New Mexico	0.603
Connecticut	0.053	New York	0.000
Delaware	0.811	North Carolina	0.327
District of Columbia	0.000	North Dakota	0.000
Florida	0.000	Ohio	1.103
Georgia	0.699	Oklahoma	0.309
Hawaii	0.000	Oregon	0.000
Idaho	0.000	Pennsylvania	0.354
Illinois	7.066	Rhode Island	0.000
Indiana	0.243	South Carolina	0.021
Iowa	0.900	South Dakota	0.000
Kansas	0.451	Tennessee	0.000
Kentucky	2.548	Texas	57.425
Louisiana	20.566	Utah	0.000
Maine	0.012	Vermont	0.000
Maryland	0.050	Virginia	0.025
Massachusetts	0.009	Washington	0.000
Michigan	0.151	West Virginia	0.286
Minnesota	0.000	Wisconsin	0.000
Mississippi	0.315	Wyoming	0.091
Missouri	0.054	United States	100.000

These data include sales of natural gasoline (pentanes plus); the natural gasoline data were removed by EIA before use in SEDS.

For 1997 through 2007, API incorporated additional imports and exports data in their estimates. Those trade data are also removed by EIA before use in SEDS.

Data sources

LGCBMZZ — LPG sold for internal combustion engine use by state (through 2009). Note: Data for Maryland and the District of Columbia are combined for all years. The method for disaggregating the data is explained in Note 1, on page 45.

- 1960 through 1967: U.S. Department of the Interior, Bureau of Mines,

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Mineral Industry Surveys, "Shipments of Liquefied Petroleum Gases and Ethane." The specific tables are
  - 1960 and 1961: Table 5 (data called "Shipments").
  - 1962 through 1966: Table 2 (data called "Consumption").
  - 1967: Table 2 (data called "Shipments").
- 1968 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Sales of Liquefied Petroleum Gases and Ethane," Table 2.
- 1976 through 1980: EIA, *Energy Data Reports*, "Sales of Liquefied Petroleum Gases and Ethane," Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, "Sales of Liquefied Petroleum Gases and Ethane," Table 3.
- 1983: EIA estimates.

Note: For 1984 through 2009, some data are adjusted and estimated by EIA. (See explanation in Note 7 on page 46.)

- 1984 through 1988: American Petroleum Institute, *1990 Sales of Natural Gas Liquids and Liquefied Refinery Gases*, pages 24 through 33.
- 1989 through 1991: American Petroleum Institute, *1992 Sales of Natural Gas Liquids and Liquefied Refinery Gases*, pages 4, 5, 18, and 19.
- 1992 through 2007: American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table 3.
- 2008 and 2009: EIA estimates based on propane sold for internal combustion engine use by state, published by the American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table B.

LGCCSZZ — Commercial sector share of residential and commercial sales of LPG (through 2009).

- 1960 through 2002: EIA estimates based on the residential and commercial shares of propane used by the residential and commercial sectors published by the American Petroleum Institute.
- 2003 through 2007: American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table 3.
- 2008 and 2009: American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table B.

LGHCMZZ — LPG sold for residential and commercial use by state (through 2009). Note: Data for Maryland and the District of Columbia are combined for all years. The method for disaggregating the data is explained in Note 1, on page 45.

- 1960 through 1967: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Liquefied Petroleum Gases and Ethane." The specific tables are
  - 1960 and 1961: Table 5 (data called "Shipments").
  - 1962 through 1966: Table 2 (data called "Consumption").
  - 1967: Table 2 (data called "Shipments").
- 1968 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Sales of Liquefied Petroleum Gases and Ethane," Table 2.
- 1976 through 1980: EIA, *Energy Data Reports*, "Sales of Liquefied Petroleum Gases and Ethane," Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, "Sales of Liquefied Petroleum Gases and Ethane," Table 3.
- 1983: EIA estimates.

Note: For 1984 through 2009, some data are adjusted and estimated by EIA. (See explanation in Note 7, on page 46).

- 1984 through 1988: American Petroleum Institute, *1990 Sales of Natural Gas Liquids and Liquefied Refinery Gases*, pages 24 through 33.
- 1989 through 1991: American Petroleum Institute, *1992 Sales of Natural Gas Liquids and Liquefied Refinery Gases*, pages 4, 5, 18, and 19.
- 1992 through 2007: American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table 3.
- 2008 and 2009: EIA estimates based on propane sold for residential and commercial use by state, published by the American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table B.

LGICPZZ — LPG consumed by the industrial sector (through 2009).

- 1960 through 2007: Calculated in SEDS.
- 2008 and 2009: Estimated by EIA, based on U.S. product supplied, EIA *Petroleum Supply Annual* and data on ethylene feed slate capacity and normal butane demand from the *Oil and Gas Journal*.

LGRCSZZ — Residential sector share of residential and commercial sales of LPG (through 2009).

- 1960 through 2002: EIA estimates based on the residential and commercial shares of propane used by the residential and commercial sectors published by the American Petroleum Institute.

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- 2003 through 2007: American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table 3.
- 2008 and 2009: American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table B.

LGTCBUS — LPG total consumption in the United States, in billion Btu (through 2009).

- 1960 through 1972: EIA, *Annual Energy Review*, Table 5.12.
- 1973 through 2009: EIA, *Monthly Energy Review*, Table 3.6.

LGTCKUS — Factor for converting LPG from physical units to Btu (through 2009).

- 1960 through 1966: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Crude Petroleum and Petroleum Products, 1956," Table 4 footnote, constant value of 4.011 million Btu per barrel.
- 1967 through 2009: Calculated annually by EIA as a weighted average by multiplying the quantity consumed of each of the component products by each product's conversion factor and dividing the sum of those heat contents by the sum of the quantities consumed. The component products are ethane (including ethylene), propane (including propylene), normal butane (including butylene), butane-propane mixtures, ethane-propane mixtures, and isobutane. Their heat content conversion factors are listed in Appendix B beginning on page 179. Quantities consumed are from
  - 1967 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
  - 1981 through 2009: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied."
  - The specific tables are
    - 1981 through 2004: Table 2.
    - 2005 through 2009: Table 1.

LGTCPUS — LPG total consumption in the United States (through 2009).

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*. "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 through 2009: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 through 2009: Table 1.

LGTRSUS — The transportation sector share of LPG internal combustion engine sales (through 2009).

- EIA estimates based on the LPG portion of the special fuels used on highways published by the U.S. Department of Transportation, Federal Highway Administration (variable MGSFPUS in SEDS), as a percentage of the LPG sold for internal combustion engine use published by the American Petroleum Institute (variable LGCBMUS in SEDS). For an explanation of the estimation method, see Note 2, on page 45.

LGTTPZZ — LPG total sales for all uses by state (through 2009).

Note: Data for Maryland and the District of Columbia are combined for all years. The method for disaggregating the data is explained in Note 1, on page 45.

- 1960 through 1967: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Liquefied Petroleum Gases and Ethane." The specific tables are
  - 1960 and 1961: Table 5 (data called "Shipments").
  - 1962 through 1966: Table 2 (data called "Consumption").
  - 1967: Table 2 (data called "Shipments").
- 1968 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Sales of Liquefied Petroleum Gases and Ethane," Table 2.
- 1976 through 1980: EIA, *Energy Data Reports*, "Sales of Liquefied Petroleum Gases and Ethane," Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, "Sales of Liquefied Petroleum Gases and Ethane," Table 3.
- 1983: EIA estimates.

Note: For 1984 through 2009, some data are adjusted and estimated by EIA. (See explanation in Note 7, on page 46).

- 1984 through 1988: American Petroleum Institute, *1990 Sales of Natural Gas Liquids and Liquefied Refinery Gases*, pages 24 through 33.
- 1989 through 1991: American Petroleum Institute, *1992 Sales of Natural*

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Gas Liquids and Liquefied Refinery Gases, pages 4, 5, 18, and 19.

- 1992 through 2007: American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table 3.
- 2008 and 2009: EIA estimates based on propane sold for internal combustion engine use by state, published by the American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table B.

Natural gasoline (formerly pentanes plus)

Before 2010, natural gasoline (formerly called pentanes plus) consumption is assumed to be equal to historical pentanes plus consumption, which included historical natural gasoline, plant condensate, pentanes plus, and unfractionated streams.

NATCPUS	=	historical natural gasoline (including isopentane) total consumption in the United States, in thousand barrels (through 1983);
PLTCPUS	=	plant condensate total consumption in the United States, in thousand barrels (through 1983);
PPTCPUS	=	pentanes plus (natural gasoline) total consumption in the United States, in thousand barrels (1984 through 2009); and
USTCPUS	=	unfractionated streams total consumption in the United States, in thousand barrels (through 1983).

All natural gasoline consumption is assumed to be in the industrial sector. This section covers natural gasoline consumption for 1960 through 2009.

For 2010 forward, SEDS reports natural gasoline (pentanes plus) as a HGL product. See Hydrocarbon Gas Liquids (2010 Forward).

Physical units

Natural gasoline (formerly pentanes plus) is used mainly as petrochemical feedstocks in the same way as naphtha. All natural gasoline consumption is assumed to be in the industrial sector.

Historical natural gasoline (including isopentane), plant condensate, and unfractionated streams are discontinued from the source after 1983. Beginning in 1984, historical natural gasoline and plant condensate are reported together as a new product, pentanes plus; and unfractionated streams are discontinued because its components are reported separately as liquefied petroleum gases. These products are used mostly as petrochemical feedstocks.

To allocate the U.S. consumption of these products to the states, the state shares of capacity of steam crackers using napthas (FNCASZZ) are used. The method of estimation of FNCASZZ is discussed on page 84.

Historical natural gasoline (including isopentane) state and U.S. consumption are estimated:

```
NATCPZZ  =  NATCPUS * FNCASZZ
NAICPZZ  =  NATCPZZ
NAICPUS  =  NATCPUS
```

Pentanes plus (natural gasoline) state and U.S. consumption are estimated:

```
PPTCPZZ  =  PPTCPUS * FNCASZZ
PPICPZZ  =  PPTCPZZ
PPICPUS  =  PPTCPUS
```

Plant condensate state and U.S. consumption are estimated:

```
PLTCPZZ  =  PLTCPUS * FNCASZZ
PLICPZZ  =  PLTCPZZ
PLICPUS  =  PLTCPUS
```

Unfractionated streams state and U.S. consumption are estimated:

```
USTCPZZ  =  USTCPUS * FNCASZZ
USICPZZ  =  USTCPZZ
USICPUS  =  USTCPUS
```

British thermal units (Btu)

Btu estimates for the four historical natural gasoline (pentanes plus) products are developed by multiplying each individual product's estimated consumption in physical units by its respective approximate heat content conversion factor. The calculations performed to estimate total Btu consumption and industrial use Btu consumption by state and for the United States are

```
NATCBZZ  =  NATCPZZ * 4.638
NATCBUS  =  ΣNATCBZZ
NAICBZZ  =  NATCBZZ
NAICBUS  =  NATCBUS
PLTCBZZ  =  PLTCPZZ * 5.418
PLTCBUS  =  ΣPLTCBZZ
PLICBZZ  =  PLTCBZZ
PLICBUS  =  PLTCBUS
```


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PPTCBZZ = PPTCPZZ * 4.638
PPTCBUS = ΣPPTCBZZ
PPICBZZ = PPTCBZZ
PPICBUS = PPTCBUS
USTCBZZ = USTCPZZ * 5.418
USTCBUS = ΣUSTCBZZ
USICBZZ = USTCBZZ
USICBUS = USTCBUS

Additional note

Before the 2010 cycle, natural gasoline (pentanes plus) was allocated to the states in proportion to the value of shipments or value added in the manufacture of industrial organic chemicals from the Economic Censuses collected by the U.S. Census Bureau. Organic chemical manufacturing was used because state-level data for petrochemical manufacturing were not available. This resulted in the allocation of petrochemical feedstocks to more than 25 states, most of which did not produce petrochemicals. The steam cracker capacity shares, while requiring estimations, are better allocators.

Data sources

NATCPUS — Natural gasoline total consumption in the United States (through 1983).

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys. "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 through 1983: EIA, *Petroleum Supply Annual*, Table 2.

PLTCPUS — Plant condensate total consumption in the United States (through 1983).

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys. "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 through 1983: EIA, *Petroleum Supply Annual*, Table 2.

PPTCPUS — Pentanes plus (natural gasoline) total consumption in the United States.

- 1960 through 1983: Data were reported separately as natural gasoline, isopentane, and plant condensate.
- 1984 through 2009: EIA, *Petroleum Supply Annual*, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1984 through 2004: Table 2.
  - 2005 through 2009: Table 1.

USTCPUS — Unfractionated streams total consumption in the United States (through 1983).

- 1960 through 1978: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1, included in "Plant Condensate."
- 1979 and 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 through 1983: EIA, *Petroleum Supply Annual*, Table 2, column titled "Products Supplied."

Hydrocarbon gas liquids (HGL)

Before 2010, HGL consumption is defined as the sum of LPG and pentanes plus (natural gasoline). Because pentanes plus is only used in the industrial sector, HGL consumption in the other end-use sectors is equal to LPG consumption:

HLRCPZZ = LGRCPZZ
HLCCPZZ = LGCCPZZ
HLACPZZ = LGACPZZ

HLRCBZZ = LGRCBZZ
HLCCBZZ = LGCCBZZ
HLACBZZ = LGACBZZ

Before 1984, industrial sector HGL consumption is equal to:

HLICPZZ = LGICPZZ + NATCPZZ + PLTCPZZ + USTCPZZ
HLICBZZ = LGICBZZ + NATCBZZ + PLTCBZZ + USTCBZZ

For 1984 through 2009, industrial sector HGL consumption is equal to:

HLICPZZ = LGICPZZ + PPICPZZ
HLICBZZ = LGICBZZ + PPICBZZ

Total HGL consumption is the sum of the end-use consumption estimates:

HLTCPZZ = HLACPZZ + HLCCPZZ + HLICPZZ + HLRCPZZ
HLTCBZZ = HLACBZZ + HLCCBZZ + HLICBZZ + HLRCBZZ

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Total U.S. HGL consumption in physical unit is the sum of the product supplied of LPG and pentanes plus:

Before 1984:

HLTCPUS = LGTCPUS + NATCPUS + PLTCPUS + USTCPUS

For 1984 through 2009:

HLTCPUS = LGTCPUS + PPTCPUS

The U.S. totals for all other HL consumption series are calculated as the sum of the state values.

Hydrocarbon Gas Liquids (2010 Forward)

Hydrocarbon gas liquids (HGL) cover natural gas liquids (ethane, propane, normal butane, isobutane, and natural gasoline) and refinery olefins (ethylene, propylene, butylene, and isobutylene). Refinery olefins are olefins produced at refineries and do not include olefins produced by the manufacturing industries. The State Energy Data System (SEDS) assumes that, except for propane, all other HGL products are consumed only by the industrial sector.

For 2010 forward, the U.S. Energy Information Administration (EIA) publishes U.S. products supplied data for total HGL and the nine HGL products, which are used to define U.S. consumption in SEDS:

- HLTCPUS = hydrocarbon gas liquids total consumption in the United States, in thousand barrels;
- BQTCPUS = normal butane total consumption in the United States, in thousand barrels;
- BYTCPUS = butylene from refineries total consumption in the United States, in thousand barrels;
- EQTCPUS = ethane total consumption in the United States, in thousand barrels;
- EYTCPUS = ethylene from refineries total consumption in the United States, in thousand barrels;
- IQTCPUS = isobutane total consumption in the United States, in thousand barrels;
- IYTCPUS = isobutylene from refineries total consumption in the United States, in thousand barrels;
- PPTCPUS = natural gasoline (pentanes plus) total consumption in the United States, in thousand barrels;
- PQTCPUS = propane total consumption in the United States, in thousand barrels; and
- PYTCPUS = propylene from refineries total consumption in the United States, in thousand barrels.

Natural gasoline (pentanes plus), which was included in "other petroleum products" through 2015 SEDS reports, is included here in HGL.

SEDS estimates state-level HGL consumption using a combination of EIA estimates, American Petroleum Institute's (API) *Sales of Natural Gas Liquids and Liquefied Refinery Gases* (for 2010 through 2016), Propane Education & Research Council's (PERC) *Retail Propane Sales Report* (for 2017), and *Oil and Gas Journal* (OGJ) ethylene steam cracker capacity data.

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Residential sector

Physical units

SEDS assumes all residential sector HGL consumption to be equal to residential propane consumption.

PQRCPZZ = propane consumed by the residential sector, in thousand barrels.

For 2010 through 2016, propane consumed by the residential sector is derived from API's *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, sales of odorized propane for the residential sector and sales for retailers. For 2017, propane consumed by the residential sector is derived from PERC's *Retail Propane Sales Report*, sales of odorized propane for the residential sector and for cylinder markets. Sales data are reported in gallons and are converted to barrels (42 U.S. gallons per U.S. barrel) for total SEDS residential propane consumption estimates.

Residential sector HGL consumption in each state, HLRCPZZ, equals residential propane consumption:

HLRCPZZ = PQRCPZZ

The U.S. totals for the state data series are calculated as the sum of the state values.

Commercial sector

Physical units

SEDS assumes all commercial sector HGL consumption to be equal to commercial propane consumption.

PQCCPZZ = propane consumed by the commercial sector, in thousand barrels.

Propane consumed by the commercial sector is derived from sales of odorized propane for the commercial sector reported in the API report (2010-2016) or the PERC report (2017). Sales data are reported in gallons and are converted to barrels (42 U.S. gallons per U.S. barrel) for total SEDS commercial consumption estimates.

Commercial sector HGL consumption in each state, HLCCPZZ, equals commercial propane consumption:

HLCCPZZ = PQCCPZZ

The U.S. totals for the state data series are calculated as the sum of the state values.

Industrial sector

For 2010 forward, industrial sector consumption is developed for nine HGL components: normal butane, butylene, ethane, ethylene, isobutane, isobutylene, natural gasoline (pentanes plus), propane, and propylene.

Propane physical units

Beginning in 2010, a new methodology is developed to estimate the consumption of propane in the United States by the industrial sector and allocation to the states.

PQICPZZ = propane consumed by the industrial sector, in thousand barrels.

Propane consumed by the industrial sector is defined by two categories: other odorized industrial propane and industrial propane for chemical use. To calculate other odorized industrial propane consumption, SEDS subtracts the sum of residential, commercial, and transportation sectors' propane consumption for each state from the state's total odorized propane sales, available in the API report (2010-2016) or the PERC report (2017). To calculate industrial propane for chemical use for the United States, U.S. total odorized propane sales are subtracted from U.S. total propane consumption. SEDS uses propane chemical feedstock capacity of ethylene steam crackers from OGJ (2010-2014) or estimated by EIA (2015 forward) to allocate consumption to states. The sum of other odorized industrial propane consumption and industrial propane consumption for chemical use is equal to SEDS total industrial propane consumption. Data originally reported in gallons are converted to barrels (42 U.S. gallons per U.S. barrel) for total SEDS industrial consumption estimates.

Other HGL physical units

SEDS assumes all other HGL products (normal butane, butylene, ethane, ethylene, isobutane, isobutylene, natural gasoline, and propylene) are consumed only by the industrial sector.

BQTCPZZ = normal butane total consumption, in thousand barrels;
BYTCPZZ = butylene from refineries total consumption, in thousand barrels;
EQTCPZZ = ethane total consumption, in thousand barrels;

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EYTCPZZ = ethylene from refineries total consumption, in thousand barrels;
IQTCPZZ = isobutane total consumption, in thousand barrels;
IYTCPZZ = isobutylene from refineries total consumption, in thousand barrels;
PPTCPZZ = natural gasoline (pentanes plus) total consumption, in thousand barrels; and
PYTCPZZ = propylene from refineries total consumption, in thousand barrels.

State-level estimates for other HGL products are derived by applying state shares estimated by EIA to the U.S. product supplied for each HGL type.

For normal butane, SEDS estimates state allocations using capacities from *Oil and Gas Journal* (OGJ) ethylene crackers feed slates for n-butane, scaled to total U.S. normal butane product supplied from EIA's *Petroleum Supply Annual* (PSA). All consumption is assumed to be in Louisiana and Texas.

For butylene, SEDS estimates state allocations using SEDS naphtha feedstock capacity shares, based on OGJ data, scaled to total U.S. butylene product supplied from PSA. All consumption is assumed to be in Louisiana and Texas.

For ethane, SEDS estimates state allocations using ethane feedstock plant nameplate capacities from OGJ (2010-2014) or compiled by EIA (2015 forward) for plants in Illinois, Iowa, and Kentucky. Capacities from those three states is subtracted from total U.S. ethane product supplied from PSA and the remainder is allocated to Louisiana and Texas using their ethane feedstock capacity shares.

For ethylene, SEDS estimates state allocations using total U.S. ethylene product supplied from PSA and allocated proportionally to states based on SEDS ethane consumption estimates.

For isobutane, SEDS assumes all U.S. consumption is in Texas.

For isobutylene, SEDS estimates state allocations using SEDS naphtha feedstock capacity shares, based on OGJ data, scaled to total U.S. isobutylene product supplied from PSA. All consumption is assumed to be in Louisiana and Texas.

For natural gasoline, SEDS estimates state allocations using SEDS naphtha feedstock capacity shares, based on OGJ data, scaled to total U.S. natural gasoline product supplied from PSA. All consumption is assumed to be in Louisiana and Texas.

For propylene, SEDS estimates state allocations using EIA estimated plant production capacities of products using propylene as feedstock, scaled to total U.S. propylene product supplied from PSA. All consumption is assumed to be in California, Illinois, Kentucky, Louisiana, New Jersey, Ohio, Pennsylvania, Texas, and West Virginia.

Industrial sector consumption by state for each of the other HGL products is equal to its total consumption. For example,

BQICPZZ = BQTCPZZ

Total industrial HGL consumption for each state is equal to:

HLICPZZ = BQICPZZ + BYICPZZ + EQICPZZ + EYICPZZ + IQICPZZ + IYICPZZ + PPICPZZ + PQICPZZ + PYICPZZ

The U.S. totals for the state data series are calculated as the sum of the state values.

Transportation sector

Physical units

SEDS assumes all transportation sector HGL consumption to be equal to transportation propane consumption.

Beginning in 2010, a new methodology is developed to estimate the consumption of propane in the United States by the transportation sector and allocation to the states:

PQACPZZ = propane consumed by the transportation sector, in thousand barrels.

Total U.S. consumption of propane in the United States by the transportation sector, in British thermal units (Btu), comes from the U.S. Energy Information Administration's (EIA) *Annual Energy Outlook*, Table 37, "Transportation Sector Energy Use by Fuel Type Within a Mode." The Btu consumption values are converted to barrels using propane's heat content of 3.841 million Btu per barrel.

For 2010 through 2016, SEDS assumes that 65% of propane is consumed by fleet vehicles, including all medium-duty and heavy-duty vehicles and some light-duty vehicles. The remaining 35% is consumed by other light-duty vehicles.

To allocate medium-duty and heavy-duty vehicles to the states, SEDS uses propane consumption data from Form EIA-886 "Annual Survey of Alternative

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Fueled Vehicles" to calculate state shares. For light-duty vehicles, SEDS uses the U.S. Department of Transportation, Federal Highway Administration publication, *Highway Statistics*, Table VM-2, "Vehicle-miles of travel, by functional system" to calculate state shares. Lastly, the state allocations for the two categories are summed together to calculate the final state consumption.

For 2017, to allocate the U.S. consumption of propane by the transportation sector to the states, SEDS uses unpublished propane autogas sales data from PERC to compute state shares.

Transportation sector HGL consumption in each state, HLACPZZ, equals transportation propane consumption:

HLACPZZ = PQACPZZ

The U.S. totals for the state data series are calculated as the sum of the state values.

Total

Physical units

Total HGL consumption is the sum of the end-use consumption estimates:

HLTCPZZ = HLACPZZ + HLCCPZZ + HLICPZZ + HLRCPZZ

Total propane consumption is also calculated:

PQTCPZZ = PQACPZZ + PQCCPZZ + PQICPZZ + PQRCPZZ

All sectors

British thermal units (Btu)

Btu estimates for each of the nine HGL products in this group are developed by multiplying the estimated consumption of each individual product in physical units by its respective heat content conversion factor. The calculations performed to estimate residential, commercial, industrial, and total propane Btu consumption, and industrial and total other HGL Btu consumption by state and for the United States are

BQICBZZ = BQICPZZ * 4.353
BQICBUS = ΣBQICBZZ
BQTCBZZ = BQTCPZZ * 4.353
BQTCBUS = ΣBQTCBZZ
BYICBZZ = BYICPZZ * 4.377
BYICBUS = ΣBYICBZZ
BYTCBZZ = BYTCPZZ * 4.377
BYTCBUS = ΣBYTCBZZ
EQICBZZ = EQICPZZ * 2.783
EQICBUS = ΣEQICBZZ
EQTCBZZ = EQTCPZZ * 2.783
EQTCBUS = ΣEQTCBZZ
EYICBZZ = EYICPZZ * 2.436
EYICBUS = ΣEYICBZZ
EYTCBZZ = EYTCPZZ * 2.436
EYTCBUS = ΣEYTCBZZ
IQICBZZ = IQICPZZ * 4.183
IQICBUS = ΣIQICBZZ
IQTCBZZ = IQTCPZZ * 4.183
IQTCBUS = ΣIQTCBZZ
IYICBZZ = IYICPZZ * 4.355
IYICBUS = ΣIYICBZZ
IYTCBZZ = IYTCPZZ * 4.355
IYTCBUS = ΣIYTCBZZ
PPICBZZ = PPICPZZ * 4.638
PPICBUS = ΣPPICBZZ
PPTCBZZ = PPTCPZZ * 4.638
PPTCBUS = ΣPPTCBZZ
PQACBZZ = PQACPZZ * 3.841
PQACBUS = ΣPQACBZZ
PQCCBZZ = PQCCPZZ * 3.841
PQCCBUS = ΣPQCCBZZ
PQICBZZ = PQICPZZ * 3.841
PQICBUS = ΣPQICBZZ
PQRCBZZ = PQRCPZZ * 3.841
PQRCBUS = ΣPQRCBZZ
PYICBZZ = PYICPZZ * 3.835
PYICBUS = ΣPYICBZZ
PYTCBZZ = PYTCPZZ * 3.835
PYTCBUS = ΣPYTCBZZ

Estimated consumption of HGL in Btu is the sum of the Btu consumption of each product by the corresponding sector. The state and U.S. totals are calculated:

HLACBZZ = PQACBZZ

HLACBUS = ΣHLACBZZ
HLCCBZZ = PQCCBZZ
HLCCBUS = ΣHLCCBZZ
HLICBZZ = BQICBZZ + BYICBZZ + EQICBZZ + EYICBZZ + IQICBZZ + IYICBZZ + PPICBZZ + PQICBZZ + PYICBZZ
HLICBUS = ΣHLICBZZ
HLRCBZZ = PQRCBZZ
HLRCBUS = ΣHLRCBZZ

Total HGL and propane consumption in Btu are the sum of the sectors:

PQTCBZZ = PQACBZZ + PQCCBZZ + PQICBZZ + PQRCBZZ
PQTCBUS = ΣPQTCBZZ

HLTCBZZ = HLACBZZ + HLCCBZZ + HLICBZZ + HLRCBZZ
HLTCBUS = ΣHLTCBZZ

Additional calculations

HGL products other than propane are combined for use in the estimation of prices and expenditures. They include normal butane, butylene, ethane, ethylene, isobutane, isobutylene, natural gasoline, and propylene. The variables are calculated in Btu, for each state and the United States:

OHICBZZ = BQICBZZ + BYICBZZ + EQICBZZ + EYICBZZ + IQICBZZ + IYICBZZ + PPICBZZ + PYICBZZ
OHICBUS = ΣOHICBZZ

The average factor for converting hydrocarbon gas liquids consumed by the industrial sector from physical units to Btu is calculated as

HLICKZZ = HLICBZZ / HLICPZZ
HLICKUS = HLICBUS / HLICPUS

HLTCKZZ = HLTCBZZ / HLTCPZZ
HLTCKUS = HLTCBUS / HLTCPUS

Data sources

BQTCPUS — Normal butane total consumption in the United States.
BQTCPZZ — Normal butane total consumption by state.

- 2010 forward: Estimated using EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied," Table 1 and ethylene crackers feed slates for n-butane from the *Oil and Gas Journal*. For 2015, information on n-butane feed slate capacity of ethylene steam crackers are no longer available from OGJ. The 2014 volumes are used for 2015 forward.

BYTCPUS — Butylene from refineries total consumption in the United States.
BYTCPZZ — Butylene from refineries total consumption by state.

- 2010 forward: Estimated using EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied," Table 1 and state's share of U.S. capacity of steam crackers using naphtha as feedstocks (FNCAS):
  - 2010 through 2014: *Oil and Gas Journal*, specific issues focusing on ethylene production, table on "International Survey of Ethylene from Steam Crackers."
  - 2015 forward: EIA estimation, based on data available from the *Oil and Gas Journal*.

EQTCPUS — Ethane total consumption in the United States.
EQTCPZZ — Ethane total consumption by state.

- 2010 forward: Estimated using EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied," Table 1, and data on ethane feedstock capacity of ethylene steam crackers estimated by EIA.

EYTCPUS — Ethylene from refineries total consumption in the United States.
EYTCPZZ — Ethylene from refineries total consumption by state.

- 2010 forward: Estimated using EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied," Table 1, and data on ethane feedstock capacity of ethylene steam crackers estimated by EIA.

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HLTCPUS — Hydrocarbon gas liquids total consumption in the United States.

- 2010 forward: Estimated using EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied," Table 1.

IQTCPUS — Isobutane total consumption in the United States.
IQTCPZZ — Isobutane total consumption by state.

- 2010 forward: Estimated using EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied," Table 1.

IYTCPUS — Isobutylene from refineries total consumption in the United States.
IYTCPZZ — Isobutylene from refineries total consumption by state.

- 2010 forward: Estimated using EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied," Table 1 and state's share of U.S. capacity of steam crackers using naphtha as feedstocks (FNCAS):
  - 2010 through 2014: *Oil and Gas Journal*, specific issues focusing on ethylene production, table on "International Survey of Ethylene from Steam Crackers."
  - 2015 forward: EIA estimation, based on data available from the *Oil and Gas Journal*.

PPTCPUS — Natural gasoline (pentanes plus) total consumption in the United States.
PPTCPZZ — Natural gasoline (pentanes plus) total consumption by state.

- 2010 forward: Estimated using EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied," Table 1 and state's share of U.S. capacity of steam crackers using naphtha as feedstocks (FNCAS):
  - 2010 through 2014: *Oil and Gas Journal*, specific issues focusing on ethylene production, table on "International Survey of Ethylene from Steam Crackers."
  - 2015 forward: EIA estimation, based on data available from the *Oil and Gas Journal*.

PQACPUS — Propane consumed by the transportation sector, United States.

- 2010 forward: EIA, *Annual Energy Outlook*, http://www.eia.gov/outlooks/aeo/tables_ref.php, Table 37, "Transportation Sector Energy Use by Fuel Type Within a Mode" and historical estimates.

PQACPZZ — Propane consumed by the transportation sector by state.

- 2010 through 2016: State allocators estimated using Form EIA-886, http://www.eia.gov/renewable/afv/users.php?fs=a&ufueltype=LPG, Annual "Survey of Alternative Fueled Vehicles," and Federal Highway Administration, *Highway Statistics*, http://www.fhwa.dot.gov/policyinformation/statistics.cfm, Table VM-2.
- 2017 forward: State allocators estimated using the Propane Education & Research Council, *Retail Propane Sales Report*.

PQCCPZZ — Propane consumed by the commercial sector by state.

- 2010 through 2016: Odorized propane sold for the commercial sector by state, published by the American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table C.
- 2017 forward: Odorized propane sold for the commercial sector by state, published by the Propane Education & Research Council, *Retail Propane Sales Report*.

PQICPZZ — Propane consumed by the industrial sector by state.

- 2010 forward: Estimated using EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied," Table 1 and data on propane feedstock capacity of ethylene steam crackers estimated by EIA.
  - 2010 through 2016: Estimated using total odorized propane by state, published by the American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table C.
  - 2017 forward: Estimated using total odorized propane by state,

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published by the Propane Education & Research Council, *Retail Propane Sales Report*.

PQRCPZZ — Propane consumed by the residential sector by state.

- 2010 through 2016: Odorized propane sold for the residential sector and sales for retailers by state, published by the American Petroleum Institute, *Sales of Natural Gas Liquids and Liquefied Refinery Gases*, Table C.
- 2017 forward: Odorized propane sold for the residential sector and for cylinder markets by state, published by the Propane Education & Research Council, *Retail Propane Sales Report*.

PQTCPUS — Propane total consumption in the United States.

- 2010 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied," Table 1.

PYTCPUS — Propylene from refineries total consumption in the United States.
PYTCPZZ — Propylene from refineries total consumption by state.

- 2010 forward: Estimated using EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied," Table 1.

Jet Fuel

Jet fuel is used primarily for transportation, although small amounts of kerosene-type jet fuel are also used in the electric power sector. There are two types of jet fuel with different heat contents, kerosene-type jet fuel (JK) and naphtha-type jet fuel (JN), which are added in the State Energy Data System (SEDS) to give total jet fuel (JF). Beginning in 2005, naphtha-type jet fuel is included in "Miscellaneous Petroleum Products" in the data source, and is assigned a zero value in SEDS.

Kerosene-type jet fuel

Physical units

Data series used to calculate kerosene-type jet fuel consumption estimates are ("ZZ" in the variable name represents the two-letter state code that differs for each state)

JKTCPUS	=	kerosene-type jet fuel total consumption, in thousand barrels;
JKEUPZZ	=	the electric utility sector consumption of kerosene-type jet fuel in each state, in thousand barrels (through 1982); and
JKTTPZZ	=	kerosene-type jet fuel total sold, in thousand gallons.

Total U.S. consumption of kerosene-type jet fuel, JKTCPUS, is the product supplied data series in the publication *Petroleum Supply Annual,* published by the U.S. Energy Information Administration (EIA).

Kerosene-type jet fuel consumed by electric utilities, JKEUPZZ, is published by EIA in the *Cost and Quality of Fuels for Electric Utility Plants*. These data are available for 1972 through 1982 only. Consumption from 1983 forward is assumed to be zero in SEDS. Beginning in 2001, jet fuel used for power generation is included in waste/other oil in the source data file. Data for waste/other oil are not processed in SEDS because waste oil is not primary energy—consumption of the petroleum products that produced the waste oil has already been accounted for. As such, a small volume of jet fuel used for power generation is included in the transportation sector consumption.

Kerosene-type jet fuel total sold, JKTTPZZ, was collected by the Ethyl Corporation, Petroleum Chemicals Division, for 1960 through 1983, and is collected by EIA for 1984 forward. The Ethyl Corporation data are sales to commercial users and are used to represent total sales based on the assumption that there is little military use of kerosene-type jet fuel during

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1960 through 1983. (See Note 1 in the "Additional Notes" section for the source reference for this assumption.) EIA data for 1984 forward include commercial and military sales. Data for 1984 through 1993 are taken from the EIA *Petroleum Marketing Annual* (PMA). Data for 1994 forward are taken from unpublished data in thousand gallons and are available in thousand gallons per day in PMA (through 2009) and on the EIA website. Before 1994, withheld data are estimated by using averages of published months to fill in withheld months; subtracting published states from published PAD district totals; and assigning values based on previous years' quantities. Beginning in 1994, withheld data are estimated using historical growth rates or state shares. They include Arizona (2009), Connecticut (2011), Delaware (1995, 1997, 1998, and 2013–2017), Hawaii (2002–2004 and 2008–2011), Iowa (2010), Nevada (2010 and 2011), New Hampshire (2009), Oregon (2002–2004 and 2008), Rhode Island (2011 and 2012), Tennessee (2010), and Vermont (2009 and 2012). Kerosene-type jet fuel sales in the District of Columbia are assumed to be zero (1994–2017).

U.S. totals for the two state data series are calculated as the sum of the state data.

Most kerosene-type jet fuel is used by the transportation sector. The transportation sector consumption for the United States (JKACPUS) is estimated as the difference between the total kerosene-type jet fuel consumed and the electric utility consumption:

JKACPUS = JKTCPUS - JKEUPUS

It is assumed that kerosene-type jet fuel consumption in each state is in proportion to the amount sold in each state:

JKACPZZ = (JKTTPZZ / JKTTPUS) * JKACPUS

Total kerosene-type jet fuel by state is estimated as

JKTCPZZ = JKACPZZ + JKEUPZZ

British thermal units (Btu)

Kerosene-type jet fuel has a heat content value of about 5.670 million Btu per barrel. This factor is applied to convert kerosene-type jet fuel from physical units to Btu:

JKACBZZ = JKACPZZ * 5.670
JKACBUS = ΣJKACBZZ
JKEUBZZ = JKEUPZZ * 5.670
JKEUBUS = ΣJKEUBZZ
JKTCBZZ = JKTCPZZ * 5.670
JKTCBUS = ΣJKTCBZZ

Additional notes

1. An assumption is made that kerosene-type jet fuel use by the military in 1960 through 1983 is negligible. This assumption is based on product definitions from the American Petroleum Institute's *Standard Definitions for Petroleum Statistics,* Technical Report No. 1, Third Edition (1981), page 13, which states that kerosene-type jet fuel is used primarily by commercial aircraft engines.
2. Ethyl Corporation jet fuel sales to commercial users by state include some sales data that were improperly allocated between the states of Illinois and Indiana for 1960 through 1973. To adjust for this error, the average relative proportions of Illinois and Indiana sales from 1974 through 1978 were applied to the sum of the Illinois and Indiana sales in 1960 through 1973. From 1974 through 1983, sales data were correctly allocated.
3. Jet fuel sales in Illinois decreased sharply from 1984 forward, while sales in Indiana increased by about the same amount. It is possible that jet fuel for use at Chicago, Illinois, airports may have been purchased in Indiana. The same anomaly may have happened between New York and New Jersey beginning in 1981, when jet fuel for consumption at New York City airports may have been purchased in New Jersey. This is an inherent problem when using sales data as an indication of consumption, and no attempt has been made to adjust the numbers.
4. Before 1964, kerosene-type jet fuel was included in the total kerosene product supplied data in the source, the U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 2, "Salient Statistics of the Major Refined Petroleum Products in the United States." Table TN4.5 summarizes the derivation of kerosene and jet fuel consumption estimates (columns 4 and 5) from data published in the source (columns 1, 2,and 3) for 1960 through 1963. For 1964 and years following, kerosene and kerosene-type jet fuel are reported separately in the source documents.
5. Kerosene-type jet fuel consumed by electric utilities, JKEUPZZ, is published in the EIA *Cost and Quality of Fuels for Electric Utility Plants*. These data are available for 1972 through 1982 only. Consumption in all other years is assumed to be zero. State-level data for 1972 through 1974 are not available. The percentage of each state's consumption

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Table TN4.5. Estimate of U.S. consumption of kerosene and jet fuel for 1960 through 1963 (Thousand barrels)

Year	(1) Kerosene demand, including commercial jet fuel	(2) Jet fuel demand, military use only	(3) Sales of kerosene for commercial jet fuel use	(4) Estimated kerosene consumption (1) – (3)	(5) Estimated total jet fuel consumption (2) + (3)
1960	132,499	102,803	33,159	99,340	135,962
1961	144,435	104,436	47,187	97,248	151,623
1962	164,167	112,401	66,134	98,033	178,535
1963	172,212	115,237	75,236	96,976	190,473

of the total U.S. consumption in 1975 was used to apportion the 1972 through 1974 national data to the states.

Data sources

JKEUPZZ — Kerosene-type jet fuel consumed by electric utilities by state (through 1982).

- 1960 through 1971: No data available. Values are assumed to be zero.
- 1972 through 1974: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Sales of Fuel Oil and Kerosene," Table 15 footnote for U.S. value. These data were apportioned to the states by using the 1975 state proportions of the 1975 U.S. total from the source below.
- 1975 through 1979: Office of Electric Power Regulation, Federal Energy Regulatory Commission, *Annual Summary of Cost and Quality of Electric Utility Plant Fuels*, "Fuel Oil Deliveries for Combustion Turbine and Internal Combustion Units."
- 1980 through 1982: EIA, *Cost and Quality of Fuel for Electric Utility Plants*, Table 30.

JKTTPZZ — Kerosene-type jet fuel total sold by state.

- 1960 through 1983: Ethyl Corporation, Petroleum Chemicals Division, *Yearly Report of Gasoline Sales by States*, "Aviation Turbine Fuel Sales."
- 1984 and 1985: EIA, *Petroleum Marketing Annual 1985*, Volume2.
  - 1984: Table A6.
  - 1985: Table 34.
- 1986 through 1988: EIA, *Petroleum Marketing Annual*, Table 46.
- 1989 through 1993: EIA, *Petroleum Marketing Annual*, Table 48.
- 1994 forward: Unpublished data in thousand gallons from Form EIA-782C, "Monthly Report of Prime Supplier Sales of Petroleum Products Sold for Local Consumption." Data published in thousand gallons per day in EIA, *Petroleum Marketing Annual*, http://www.eia.gov/oil_gas/petroleum/data_publications/petroleum_marketing_annual/pma_historical.html and on the Prime Supplier Sales Volumes website at http://www.eia.gov/dnav/pet/pet_cons_prim_a_EPJK_P00_Mgalpd_a.htm.
  - 1994 through 2006: Table 49.
  - 2007 through 2009: Table 46.
  - 2010 forward: Web table only, at http://www.eia.gov/dnav/pet/pet_cons_prim_a_EPJK_P00_Mgalpd_a.htm.

JKTCPUS — Kerosene-type jet fuel total consumption in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

Naphtha-type jet fuel

Physical units

Two data series are used to estimate naphtha-type jet fuel consumption:

JNTCPUS = naphtha-type jet fuel total consumption, in thousand barrels; and

JNMIPZZ = naphtha-type jet fuel issued to the military in each state, in thousand barrels.

Total U.S. consumption of naphtha-type jet fuel, JNTCPUS, is the product supplied data series in the publication *Petroleum Supply Annual,* published by EIA. Beginning in 2005, it is included in "Miscellaneous Petroleum Products," and is assigned a zero value in SEDS.

It is assumed that all naphtha-type jet fuel is used in military aircraft engines. (See the Additional Notes at the end of this section for the source reference for this assumption.) Data on naphtha-type jet fuel issued to the military in each state, JNMIPZZ, are from the U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center.

The total U.S. military issues is the sum of the state data:

JNMIPUS = ΣJNMIPZZ

An estimate of naphtha-type jet fuel consumption by state, JNTCPZZ, is calculated by assuming that each state consumes naphtha-type jet fuel in proportion to the amount issued to the military in that state:

JNTCPZZ = (JNMIPZZ / JNMIPUS) * JNTCPUS

All naphtha-type jet fuel is assumed to be used for transportation purposes so the transportation consumption equals the estimated total consumption for each state and for the United States:

JNACPZZ = JNTCPZZ
JNACPUS = JNTCPUS

British thermal units (Btu)

Naphtha-type jet fuel has a heat content value of about 5.355 million Btu per barrel. This factor is applied to convert naphtha-type jet fuel from physical units to Btu:

JNTCBZZ = JNTCPZZ * 5.355
JNTCBUS = ΣJNTCBZZ

Naphtha-type jet fuel consumed in the transportation sector is equal to total consumption.

JNACBZZ = JNTCBZZ
JNACBUS = JNTCBUS

Additional notes

1. An assumption is made that the naphtha-type jet fuel is for military use only. This assumption is based on product definitions from the American Petroleum Institute's *Standard Definitions for Petroleum Statistics*, Technical Report No. 1, Third Edition (1981), page 13, which states that naphtha-type jet fuel is used primarily by military aircraft engines.
2. Data on naphtha-type jet fuel issued to the military for each state (JNMIPZZ) are obtained from the U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center. There are no data available for 1960 through 1974, and the data available for 1975 and 1976 are not consistent; therefore, the 1977 values are used for 1960 through 1976 in SEDS. The data are reported by fiscal year for 1977 through 1988 and are taken from the Defense Energy Information System. For 1989 and 1990, fiscal-year data from two databases, Defense Fuel Automated Management System and the Into-Plane Database, are summed. For 1991 and 1992, data from the same two databases, reported by calendar year, are used.
3. Because total naphtha-type jet fuel product supplied is assumed to be zero beginning in 2005, naphtha-type jet fuel issued to the military is also assumed to be zero for 2005 forward.

Data sources

JNMIPZZ — Naphtha-type jet fuel issued to the military in the United States.

- 1960 through 1974: No data are available. The 1977 data are used for each year.
- 1975 and 1976: No consistent data series are available. The 1977 data are used for both years.
- 1977 through 1987: The U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center, Defense Energy Information System, military retail issues based on fiscal year data. The District of Columbia issues are assumed to be zero; therefore, values reported for the District of Columbia are added to Maryland.
- 1988: U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center, average of 1987 data (see source above) and 1989 data (see source below).
- 1989 and 1990: U.S. Department of Defense, Defense Logistics Agency, Defense Fuel Supply Center, Defense Fuel Automated Management System, military wholesale issues based on fiscal year data.

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- 1991 through 2004: U.S. Department of Defense, Defense Logistics Agency, Defense Energy Supply Center. State data for the calendar year from two databases are summed: Defense Fuel Automated Management System (military wholesale issues) and Into-Plane Database (military purchases from commercial airports). Into-plane values reported for the District of Columbia are added to Virginia.
- 2005 forward: Value entered in SEDS as zero.

JNTCPUS — Naphtha-type jet fuel total consumption in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Data not reported separately. Volumes are included in "Miscellaneous Products" in the *Petroleum Supply Annual*, Table 1. Value entered in SEDS as zero.

Jet fuel totals

Physical units

The following calculations are used to provide total jet fuel consumption estimates by end use in physical units:

JFACPZZ = JKACPZZ + JNACPZZ
JFACPUS = ΣJFACPZZ
JFEUPZZ = JKEUPZZ
JFEUPUS = JKEUPUS
JFTCPZZ = JFACPZZ + JFEUPZZ
JFTCPUS = ΣJFTCPZZ

British thermal units (Btu)

The following calculations are used to provide total jet fuel consumption estimates by end use in Btu:

JFACBZZ = JKACBZZ + JNACBZZ
JFACBUS = ΣJFACBZZ
JFEUBZZ = JKEUBZZ
JFEUBUS = JKEUBUS
JFTCBZZ = JFACBZZ + JFEUBZZ
JFTCBUS = ΣJFTCBZZ

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Kerosene

Physical units

Because state-level and end-use consumption data for kerosene are not available, four data series published by the U.S. Energy Information Administration (EIA) representing sales of kerosene into or within each state are used to estimate kerosene consumption. The fifth data series, the U.S. total consumption, is the product supplied series from the EIA *Petroleum Supply Annual*. The sales series are used to apportion the known U.S. total consumption into state-level estimates of end-use consumption. The following variable names have been assigned to the five data series ("ZZ" in the variable names represents the two-letter state code that differs for each state):

KSCMPZZ = kerosene sold to the commercial sector, in thousand barrels;
KSIHPZZ = kerosene sold to the industrial sector, in thousand barrels;
KSOTPZZ = kerosene sold for all other uses, including farm use, in thousand barrels;
KSRSPZZ = kerosene sold to the residential sector, in thousand barrels; and
KSTCPUS = kerosene total consumption in the United States, in thousand barrels.

U.S. sales totals for each of the four state-level series are created by summing the state values.

The variables are combined as closely as possible into the major end-use sectors used in SEDS. The residential and commercial sectors contain only KSRSPZZ and KSCMPZZ, respectively.

The sales of kerosene to the industrial sector, KSINPZZ, for each state is the sum of kerosene sold for industrial heating and processing (KSIHPZZ) and kerosene sold for all other uses (KSOTPZZ), including farm use. Sales of kerosene to the industrial sector are calculated:

KSINPZZ = KSOTPZZ + KSIHPZZ
KSINPUS = ΣKSINPZZ

Total sales of kerosene in each state is the sum of these three sectors' sales:

KSTTPZZ = KSRSPZZ + KSCMPZZ + KSINPZZ
KSTTPUS = ΣKSTTPZZ

An estimate of each state's total consumption of kerosene is made by disaggregating the U.S. total consumption to the states in proportion to each state's sales share of the U.S. total sales:

KSTCPZZ = (KSTTPZZ / KSTTPUS) * KSTCPUS

Each state's residential sector sales percentage of total sales is applied to the state's estimated total consumption to create estimated residential sector consumption for the state, KSRCPZZ:

KSRCPZZ = (KSRSPZZ / KSTTPZZ) * KSTCPZZ

The commercial sector's estimated consumption in each state, KSCCPZZ, is calculated:

KSCCPZZ = (KSCMPZZ / KSTTPZZ) * KSTCPZZ

The industrial sector's estimated consumption in each state, KSICPZZ, is calculated:

KSICPZZ = (KSINPZZ / KSTTPZZ) * KSTCPZZ

U.S. totals for the three sectors' consumption estimates are the sums of the states' estimated consumption.

Data on kerosene consumed by the electric power sector are not separately available before 2003. Beginning in 2003, kerosene used for power generation is included in waste/other oil in the source data file. Data for waste/other oil are not processed in SEDS because waste oil is not primary energ—consumption of the petroleum products that produced the waste oil has already been accounted for. While kerosene consumption by the electric power sector is not separately shown, there is no underestimation of total kerosene consumption because U.S. product supplied covers all uses and sales of kerosene to the industrial sector cover the electric power sector.

British thermal units (Btu)

Kerosene has a heat content value of about 5.670 million Btu per barrel. This factor is applied to convert kerosene estimated consumption from physical units to Btu:

KSRCBZZ = KSRCPZZ * 5.670
KSCCBZZ = KSCCPZZ * 5.670
KSICBZZ = KSICPZZ * 5.670

Total estimated consumption of kerosene in Btu is the sum of the end-use

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consumption estimates:

KSTCBZZ = KSRCBZZ + KSCCBZZ + KSICBZZ

The U.S. Btu consumption estimates for the three consuming sectors and the U.S. total are calculated as the sum of the state-level data.

Additional notes

1. See Note 4 at the end of the "Kerosene-type jet fuel" section on page 58 for comments concerning the inclusion of kerosene-type jet fuel with the kerosene total product supplied before 1964 in the source documents.
2. "Sales" data are actually called "shipments" in the source documents for 1960 and 1961; "consumption" for 1962 through 1966; "shipments" for 1967; "sales" from 1968 through 1978; "deliveries" for 1979 through 1983; and "sales" for 1984 forward.
3. In 1979, EIA implemented a new survey form, EIA-172, to obtain deliveries of fuel oil and kerosene data and updated the list of respondents. (A detailed explanation is published in the *Energy Data Report* "Deliveries of Fuel Oil and Kerosene in 1979.") In this survey form, certain end-use categories were redefined—in many cases, to collect more disaggregated data. The reclassifications resulted in some end-use categories that were no longer comparable with those in previous surveys. Where discontinuities occurred, estimates for the pre-1979 years have been made in SEDS to conform with the 1979 kerosene deliveries classifications. The pre-1979 deliveries estimates are not published in this report but are used in SEDS to disaggregate the known U.S. total product supplied (consumption) into state and major end-use sector consumption estimates.

   For kerosene deliveries in 1979, the end-use categories called "residential," "commercial," and "industrial" are available. The pre-1979 deliveries category called "heating" is related to the sum of "residential," "commercial," and "industrial" in 1979. Therefore, the following method was applied to present a comparable series for kerosene delivered to the residential, commercial, and industrial sectors:
   - A 1979 subtotal for heating was created by summing each state's residential, commercial, and industrial deliveries categories, thereby creating a comparable deliveries subtotal for all years.
   - Residential, commercial, and industrial shares of the heating subtotal in 1979 were calculated for each state.
   - These 1979 end-use shares were then applied to each pre-1979 heating subtotal in each state to create state estimates of end-use deliveries for 1960 through 1978.

   The 1980 through 1982 kerosene deliveries data are based on the same survey as that used for 1979; therefore, the 1980 through 1982 data are directly comparable to 1979 data.
4. In 1984, EIA again updated the list of respondents for this survey, and the Form EIA-172 became the Form EIA-821, "Annual Fuel Oil and Kerosene Sales Report." EIA did not conduct a fuel oil and kerosene sales survey for 1983. The 1983 estimates in SEDS are based on 1984 data obtained from the Form EIA-821. Statistical procedures and methodologies used for the Form EIA-821 differ from those used in previous years and are described in the July 1985 issue of the EIA, *Petroleum Marketing Monthly*. Therefore, the 1983 and forward sales data may not be directly comparable to the pre-1983 data. (In the source document, the sales data for 1983 forward are reported in thousand gallons. These data were first converted to thousand barrels before being entered into SEDS.)
5. In 1975 through 1977, the industrial sector consumption of kerosene includes small quantities of kerosene-type jet fuel that were produced as jet fuel and sold as kerosene.

Data sources

KSCMPZZ — Kerosene sold to the commercial sector.

- 1960 through 1978: EIA estimates based on statistics of commercial sector deliveries of kerosene from the EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene, in 1979," Table 3. State ratios based on 1979 commercial sector deliveries were applied to each state's heating deliveries category from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 3.)
- 1979 and 1980: EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene," Table 3.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 6.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are
  - 1983: July 1985 issue, Table A14.
  - 1984: July 1986 issue, Table A4, subsequently revised in the EIA, Petroleum Navigator, http://www.eia.gov/dnav/pet/pet_cons_821ker_a_EPPK_VCS_Mgal_a.htm.
  - 1985 and 1986: July 1987 issue, Table A6.

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  - 1987: June 1988 issue, Table A6.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, http://www.eia.gov/dnav/pet/pet_cons_821ker_a_EPPK_VCS_Mgal_a.htm, select Excel file labeled "Download Series History."

KSIHPZZ — Kerosene sold to the industrial sector.

- 1960 through 1978: EIA estimates based on statistics of industrial sector deliveries of kerosene from the EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene in 1979," Table 3. State ratios based on 1979 industrial sector deliveries were applied to each state's heating deliveries category from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 3, on page 63.)
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 3.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 6.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are
  - 1983: July 1985 issue, Table A14.
  - 1984: July 1986 issue, Table A4, subsequently revised in the EIA, Petroleum Navigator, http://www.eia.gov/dnav/pet/pet_cons_821ker_a_EPPK_vin_Mgal_a.htm.
  - 1985 and 1986: July 1987 issue, Table A6.
  - 1987: June 1988 issue, Table A6.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, http://www.eia.gov/dnav/pet/pet_cons_821ker_a_EPPK_vin_Mgal_a.htm, select Excel file labeled "Download Series History."

KSOTPZZ — Kerosene sold for all other uses, including farm use.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are
  - 1960 and 1961: Table 10.
  - 1962 and 1963: Table 9.
  - 1964 and 1965: Table 8.
  - 1966 through 1975: Table 5.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 5.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene." Calculated as the sum of kerosene delivered for farm and other use from Table 3.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 6.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are
  - 1983: July 1985 issue, Table A14.
  - 1984: July 1986 issue, Table A4, subsequently revised in the EIA, Petroleum Navigator, http://www.eia.gov/dnav/pet/pet_cons_821ker_a_EPPK_VOE_Mgal_a.htm and http://www.eia.gov/dnav/pet/pet_cons_821ker_a_EPPK_VFM_Mgal_a.htm.
  - 1985 and 1986: July 1987 issue, Table A6.
  - 1987: June 1988 issue, Table A6.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, http://www.eia.gov/dnav/pet/pet_cons_821ker_a_EPPK_VOE_Mgal_a.htm and http://www.eia.gov/dnav/pet/pet_cons_821ker_a_EPPK_VFM_Mgal_a.htm, select Excel file labeled "Download Series History."

KSRSPZZ — Kerosene sold to the residential sector.

- 1960 through 1978: EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene in 1979," Table 3. State ratios based on 1979 residential sector deliveries were applied to each state's heating deliveries category from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 3, on page 63.)
- 1979 and 1980: EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene," Table 3.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 6.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are
  - 1983: July 1985 issue, Table A14.
  - 1984: July 1986 issue, Table A4, subsequently revised in the EIA, Petroleum Navigator, http://www.eia.gov/dnav/pet/pet_cons_821ker_a_EPPK_VRS_Mgal_a.htm.

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  - 1985 and 1986: July 1987 issue, Table A6.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, http://www.eia.gov/dnav/pet/pet_cons_821ker_a_EPPK_VRS_Mgal_a.htm, select Excel file labeled "Download Series History."

KSTCPUS — Kerosene total consumption in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*. "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

Lubricants

Physical units

For 1960 through 2009, three data series are used to estimate state consumption of lubricants. The two state-level sales data series are used to apportion the U.S. total consumption data to the states and the end-use sectors within the states. ("ZZ" in the variable names represents the two-letter state code that differs for each state):

LUINPZZ	=	lubricants sold to the industrial sector, in thousand barrels;
LUTRPZZ	=	lubricants sold to the transportation sector, in thousand barrels; and
LUTCPUS	=	lubricants total consumption in the United States, in thousand barrels.

Data for the first two variables are developed from the U.S. Census Bureau reports "Sales of Lubricating and Industrial Oils and Greases" in the *Current Industrial Reports* series. These series were discontinued in 1977 and the method of estimation for 1978 forward is explained in Note 1 at the end of this "Lubricants" section. The third variable for lubricants is the product supplied data series in the U.S. Energy Information Administration's (EIA) *Petroleum Supply Annual.* The first two variables are used for apportioning the third into state total consumption and state end-use consumption estimates.

Total sales of lubricants for each state, LUTTPZZ, is created by adding the industrial and transportation sales:

LUTTPZZ = LUINPZZ + LUTRPZZ

U.S. sales totals are calculated by summing the state sales data.

Each state's proportion of total U.S. sales is used to calculate each state's estimated consumption of lubricants:

LUTCPZZ = (LUTTPZZ / LUTTPUS) * LUTCPUS

Each state's estimated total consumption of lubricants is further divided into end-use estimates in proportion to that state's sales by sector as a portion of total sales in the state. Lubricants consumed by state for industrial use, LUICPZZ, and for transportation use, LUACPZZ, are calculated:

LUICPZZ = (LUINPZZ / LUTTPZZ) * LUTCPZZ
LUACPZZ = (LUTRPZZ / LUTTPZZ) * LUTCPZZ

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The consumption of lubricants in the United States by these two end-use sectors is created by summing the state estimates.

Beginning in 2010, a new methodology is developed to estimate the consumption of lubricants in the United States for the industrial and transportation sectors and allocation to the states.

LUACPZZ = lubricants consumed by the transportation sector, in thousand barrels;
LUACPUS = lubricants consumed by the transportation sector, United States, in thousand barrels;
LUICPZZ = lubricants consumed by the industrial sector, in thousand barrels;
LUICPUS = lubricants consumed by the industrial sector, United States, in thousand barrels; and
LUTCPUS = lubricants total consumption in the United States, in thousand barrels.

Using data from Kline & Company, Inc. on finished lubricant demand for three market segments (industrial, consumer total, and commercial total) and two additional product types covered in the industrial market segment (marine and railroad), shares are compiled for the industrial sector and for the four categories in the transportation sector Table TN4.6.

The shares are applied to U.S. total lubricant consumption to derive U.S. lubricant consumption for the industrial sector, LUICPUS, and for the four transportation categories, which sum to LUACPUS.

State allocators for the consumption of lubricants by the industrial sector are estimated using the use table of the latest benchmark input-output (I-O) accounts and real state gross domestic product (GDP) by industry, both published by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA). One of the commodities in the I-O accounts is "other petroleum and coal products manufacturing" (North American Industry Classification System, NAICS, code 324190), which is mostly lubricants. First, SEDS compiles lubricant input per dollar output for 25 industries in the agriculture, mining, construction, and manufacturing sectors using the benchmark I-O accounts use table. Then, the industrial inputs are multiplied by the real state GDP for the 25 industries. Lastly, the products are summed to the state level and are used to derive state shares for lubricant consumption by the industrial sector.

Table TN4.6. Shares of finished lubricant demand for five product categories, 2010 forward

Year	Industrial	Consumer Total	Commercial Total	Marine	Railroad
2010	46.8%	26.9%	22.0%	3.2%	1.2%
2011	46.2%	27.2%	22.2%	3.3%	1.2%
2012	46.6%	27.1%	22.0%	3.1%	1.2%
2013	46.6%	27.0%	22.0%	3.1%	1.2%
2014	46.7%	27.0%	22.1%	3.1%	1.2%
2015	46.6%	27.0%	22.1%	3.0%	1.2%
2016	46.7%	27.0%	22.0%	3.0%	1.2%
2017	46.8%	26.9%	22.1%	3.0%	1.2%

State-level consumption of lubricants by the industrial sector, LUICPZZ, is calculated by applying the state allocators to the U.S. consumption.

State allocators for the consumption of lubricants for each of the four categories in the transportation sector are derived using the following SEDS data series:

- Motor gasoline consumption by the transportation sector (MGTRP) to allocate U.S. consumer total demand to the states
- Distillate fuel oil sales as diesel fuel for on-highway use (DFONP) to allocate U.S. commercial total demand to the states
- Distillate and residual fuel oil sales for vessel bunkering use (DFBKP and RFBKP) to allocate U.S. marine demand to the states
- Distillate fuel oil sales for railroad use (DFRRP) to allocate U.S. railroad demand to the states

State-level consumption of lubricants by the transportation sector, LUACPZZ, is the sum of the four data series.

British thermal units (Btu)

Lubricants have a heat content value of about 6.065 million Btu per barrel. This factor is applied to convert lubricants estimated consumption from physical units to Btu:

LUICBZZ = LUICPZZ * 6.065
LUACBZZ = LUACPZZ * 6.065

The state total consumption in Btu is the sum of the two sectors' consumption in Btu:

LUTCBZZ = LUICBZZ + LUACBZZ

The U.S. sector and total consumption estimates in Btu are calculated as the sum of the state data.

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Table TN4.7. Lubricants sales data used in consumption estimates, 1960 through 2009

Year of sales data	Year of consumption estimates
1960	1960 and 1961
1962	1962 through 1964
1965	1965 and 1966
1967	1967 and 1968
1969	1969 and 1970
1971	1971 and 1972
1973	1973 and 1974
1975	1975 and 1976
1977	1977 through 2009

Additional notes

1. The lubricants sales data (LUINPZZ and LUTRPZZ) were published about every other year by the U.S. Census Bureau until the discontinuation of the series after 1977. Each year's sales data have been used to calculate that year's and at least one other year's consumption estimates. Table TN4.7 specifies which years of consumption estimates depend on which years of the sales data.
2. The sales data from the source document for LUINPZZ and LUTRPZZ are available in incompatible units. The industrial series, LUINPZZ, is oils and greases sold for industrial lubricating and other uses measured in thousand gallons. The transportation series, LUTRPZZ, is oils and greases sold for automotive and aviation uses measured in thousand pounds. Before use in SEDS, these were converted to thousand barrels by dividing the oil data by 42 gallons per barrel and dividing the greases data by 300 pounds per barrel. In the source document, some state data are not published to avoid disclosing figures for individual companies. The undisclosed data were entered as zero in SEDS.

Data sources

LUACPZZ — Lubricants consumed by the transportation sector by state.

- 2010 forward: Estimated by EIA using state allocators derived from selected SEDS consumption series.

LUACPUS — Lubricants consumed by the transportation sector, United States.

- 2010 forward: Estimated by EIA based on Kline & Company data on finished lubricant demand for consumer total, commercial total, marine, and railroad use.

LUICPZZ — Lubricants consumed by the industrial sector by state.

- 2010 forward: Estimated by EIA using state allocators derived from U.S. Department of Commerce, Bureau of Economic Analysis, 2012 benchmark input-output accounts and real State Gross Domestic Products by Industry in chained (2012) dollars.

LUICPUS — Lubricants consumed by the industrial sector, United States.

- 2010 forward: Estimated by EIA based on Kline & Company data on finished lubricant demand for industrial (less marine and railroad) use.

LUINPZZ — Lubricants sold to the industrial sector by state (through 2009). Calculated from

- U.S. Department of Commerce, Census Bureau, *Current Industrial Reports*, "Sales of Lubricating and Industrial Oils and Greases," for 1960, 1962, 1965, 1967, 1969, 1971, 1973, 1975, and 1977. (See explanation in Notes 1 and 2, on page 67.)

LUTCPUS — Lubricants total consumption in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

LUTRPZZ — Lubricants sold to the transportation sector by state (through 2009). Calculated from

- U.S. Department of Commerce, Census Bureau, *Current Industrial Reports*, "Sales of Lubricating and Industrial Oils and Greases," for 1960, 1962, 1965, 1967, 1969, 1971, 1973, 1975, and 1977. (See explanation in Notes 1 and 2, on page 67.)

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Motor Gasoline

Physical units

Twelve data series are used to estimate the state end-use consumption of motor gasoline. Eleven of the series are from the U.S. Department of Transportation, Federal Highway Administration publication, *Highway Statistics*, and represent sales of motor gasoline. The sales data are categorized as sales for highway and non-highway use:

- **Highway use** sales data (MGMFP) are from the Highway Statistics Table 8.4.2 (previously Table MF-21); however, they are reduced by the amount of highway "special fuels" (MGSFP) used in each state each year as reported on Table 8.4.2. Special fuels are primarily diesel fuels, not motor gasoline, and are included in the transportation sector of distillate fuel oil and other energy sources.
- **Non-highway use** sales are further subdivided into sales for: (1) state, county, and municipal non-highway use of motor fuel (MGPNP) from Table 8.4.2, and (2) private and commercial use. Data for the components of private and commercial non-highway use are reported in Table 8.4.3 (previously Table MF-24):
  - agricultural use (MGAGP)
  - industrial and commercial use (MGIYP)
  - construction use (MGCUP)
  - marine use (MGMRP), through 2014
  - boating use (MGBTP), 2015 forward
  - lawn and garden use (MGLGP), 2015 forward
  - recreational vehicle use (MGRVP), 2015 forward
  - miscellaneous use (MGMSP)

Another component of the private and commercial non-highway series is aviation gasoline (AVNMM), which is discussed under the "Aviation Gasoline" section of this documentation.

The twelfth motor gasoline data series (MGTCPUS) is the total U.S. consumption of motor gasoline published in the product supplied series in the U. S. Energy Information Administration publication *Petroleum Supply Annual*. It includes fuel ethanol blended into motor gasoline. Before 1993, motor gasoline product supplied was underreported because the reporting system was not collecting all fuel ethanol blending and there was a misreporting of motor gasoline blending components that were blended into finished motor gasoline. To adjust for the underreporting, fuel ethanol consumption was added to total energy consumption by end-use before 1993 (see Section 7).

The twelve motor gasoline data series are ("ZZ" in the variable names represent the two-letter state code that differs for each state)

MGAGPZZ	=	motor gasoline sold for agricultural use in each state, in thousand gallons;
MGBTPZZ	=	motor gasoline sold for boating use in each state, in thousand gallons;
MGCUPZZ	=	motor gasoline sold for construction use in each state, in thousand gallons;
MGIYPZZ	=	motor gasoline sold for industrial and commercial use in each state, in thousand gallons;
MGLGPZZ	=	motor gasoline sold for lawn and garden use in each state, in thousand gallons;
MGMFPZZ	=	motor fuel sold for highway use in each state, in thousand gallons;
MGMRPZZ	=	motor gasoline sold for marine use in each state, in thousand gallons (through 2014);
MGMSPZZ	=	motor gasoline sold for miscellaneous and unclassified uses in each state, in thousand gallons;
MGPNPZZ	=	motor fuel sold for public non-highway use in each state, in thousand gallons;
MGRVPZZ	=	motor gasoline sold for recreational vehicle use in each state, in thousand gallons;
MGSFPZZ	=	special fuels (primarily diesel fuel with small amounts of liquefied petroleum gases) sold in each state, in thousand gallons; and
MGTCPUS	=	motor gasoline total consumption in the United States, in thousand barrels.

U.S. totals for the eleven state-level series named above are calculated as the sum of the state data.

The transportation sector accounts for most of the motor gasoline sales. Before 2015, sales to the transportation sector is estimated to be the sum of motor fuel sales for marine use and for highway use (minus the sales of special fuels, which are primarily diesel fuels and are accounted for in the transportation sector of distillate fuel oil). Sales of motor gasoline to the transportation sector in each state (MGTRPZZ) is calculated:

MGTRPZZ = MGMFPZZ + MGMRPZZ - MGSFPZZ

Beginning in 2015, marine use is no longer available to calculate MGTRPZZ and two new sales categories, boating use (MGBTP) and recreational vehicle

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use (MGRVP), are now included in the definition of transportation sector sales:

MGTRPZZ = MGMFPZZ + MGBTPZZ + MGRVPZZ - MGSFPZZ

Before 2015, two sales data series are added to estimate motor gasoline sales to the commercial sector: miscellaneous (including unclassified) and public non-highway sales. Sales of motor gasoline to the commercial sector in each state (MGCMPZZ) is calculated:

MGCMPZZ = MGMSPZZ + MGPNPZZ

Beginning in 2015, a new sales category, lawn and garden use (MGLGP), is allocated to commercial sector sales:

MGCMPZZ = MGMSPZZ + MGPNPZZ + MGLGPZZ

Sales of motor gasoline for use in the industrial sector in each state (MGINPZZ) is calculated as the sum of the sales for agricultural use, for construction use, and for industrial and commercial use:

MGINPZZ = MGAGPZZ + MGCUPZZ + MGIYPZZ

Total sales of motor gasoline in each state (MGTTPZZ) is calculated as the sum of the sales to the major sectors:

MGTTPZZ = MGCMPZZ + MGINPZZ + MGTRPZZ

U.S. totals for the three end-use sectors' sales and for total sales are calculated as the sum of the states' sales.

The motor gasoline sales data for the three end-use sectors in each state are used to apportion the U.S. total consumption of motor gasoline to the states and to the major end-use sectors within each state.

Total consumption of motor gasoline in each state (MGTCPZZ) is calculated according to each state's share of the total sales:

MGTCPZZ = (MGTTPZZ / MGTTPUS) * MGTCPUS

The commercial sector estimated consumption of motor gasoline (MGCCPZZ) is calculated:

MGCCPZZ = (MGCMPZZ / MGTTPZZ) * MGTCPZZ

The industrial sector estimated consumption (MGICPZZ) is calculated:

MGICPZZ = (MGINPZZ / MGTTPZZ) * MGTCPZZ

The transportation sector estimated consumption (MGACPZZ) is calculated:

MGACPZZ = (MGTRPZZ / MGTTPZZ) * MGTCPZZ

The consumption of motor gasoline by major end-use sector in the United States is estimated by summing the states' estimated consumption.

British thermal units (Btu)

A national factor, MGTCKUS, is used to convert motor gasoline consumption from physical units to British thermal units for each state. A constant heat content of 5.253 million Btu per barrel is used for 1960 through 1992. Beginning in 1993, an annual average factor is calculated by EIA. The factors, listed in Table B1 on page 179, are used for each state:

MGCCBZZ = MGCCPZZ * MGTCKUS
MGICBZZ = MGICPZZ * MGTCKUS
MGACBZZ = MGACPZZ * MGTCKUS

Total Btu consumption of motor gasoline is the sum of the consumption by the commercial, industrial, and transportation sectors.

MGTCBZZ = MGCCBZZ + MGICBZZ + MGACBZZ

The U.S.-level Btu consumption estimates are calculated by summing the state data.

Additional note

In 2015, the Federal Highway Administration revised its methods of estimating non-highway use of motor gasoline. (See Off-Highway and Public-Use Gasoline Consumption Estimation Models used in the Federal Highway Administration.) Estimates from 2015 forward are not compatible with data before 2015.

Additional calculations

To assist data users in the analysis of consumption of renewable energy sources, which include fuel ethanol, versus non-renewable energy sources, which include motor gasoline, a new data series, motor gasoline excluding fuel ethanol, is created for each state and the United States: Before 1993, fuel ethanol was not included in the motor gasoline data series from the source:

MMTCB = MGTCB

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From 1993 forward

MMTCB = MGTCB - EMTCB

EMTCB is fuel ethanol minus denaturant. See discussion on fuel ethanol in Section 5, "Renewable Energy."

Motor gasoline excluding fuel ethanol is used only in the tables showing energy consumption by source. For consumption by end-use sector, motor gasoline is defined as the product consumed by the end-users, that is, including fuel ethanol.

Data sources

MGAGPZZ — Motor gasoline sold for agricultural use by state.

- 1960 through 1964: U.S. Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table G-24.
- 1965 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, http://www.fhwa.dot.gov/policyinformation/statistics.cfm, Table G-24 in 1965, Table MF-24 (1966 through 2006), and Table 8.4.3 (2007 forward).

MGBTPZZ — Motor gasoline sold for boating use by state.

- 2015 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, http://www.fhwa.dot.gov/policyinformation/statistics.cfm, Table 8.4.3.

MGCUPZZ — Motor gasoline sold for construction use by state.

- 1960 through 1964: U.S. Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table G-24.
- 1965 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, http://www.fhwa.dot.gov/policyinformation/statistics.cfm, Table G-24 in 1965, Table MF-24 (1966 through 2006), and Table 8.4.3 (2007 forward).

MGIYPZZ — Motor gasoline sold for industrial and commercial use by state.

- 1960 through 1964: U.S. Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table G-24.
- 1965 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, http://www.fhwa.dot.gov/policyinformation/statistics.cfm, Table G-24 in 1965, Table MF-24 (1966 through 2006), and Table 8.4.3 (2007 forward).

MGLGPZZ — Motor gasoline sold for lawn and garden use by state.

- 2015 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, http://www.fhwa.dot.gov/policyinformation/statistics.cfm, Table 8.4.3.

MGMFPZZ — Motor fuel sold for highway use by state.

- 1960 through 1995: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, Table MF-221 gives revised U.S. totals. State revisions can be calculated by adding data from Tables MF-225 and MF-226.
- 1996 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, http://www.fhwa.dot.gov/policyinformation/statistics.cfm, Table MF-21 (1996 through 2006) and Table 8.4.2 (2007 forward).

MGMRPZZ — Motor gasoline sold for marine use by state.

- 1960 through 1964: U.S. Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table G-24.
- 1965 through 2014: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, http://www.fhwa.dot.gov/policyinformation/statistics.cfm, Table G-24 in 1965, Table MF-24 (1966 through 2006), and Table 8.4.3 (2007 through 2014).

MGMSPZZ — Motor gasoline sold for miscellaneous uses by state.

- 1960 through 1964: U.S. Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table G-24. Sum of the "Miscellaneous" column plus the "Unclassified" column minus the "Total Classified" column.
- 1965: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, Table G-24. Sum of the "Miscellaneous" column plus the "Unclassified" column minus the "Total Classified" column.
- 1966 through 1981: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, http://www.fhwa.dot.gov/policyinformation/statistics.cfm, Table MF-24, sum of the "Miscellaneous" and the "Unclassified" columns.

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- 1982 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, http://www.fhwa.dot.gov/policyinformation/statistics.cfm, Table MF-24 (1982 through 2006) and Table 8.4.3 (2007 forward), the "Miscellaneous" column.

MGPNPZZ — Motor fuel sold for public non-highway use by state.

- 1960 through 1964: U.S. Department of Commerce, Bureau of Public Roads, *Highway Statistics*, Table G-21.
- 1985, 1987, and 1992: Unpublished revised state data comparable to the U.S. values published in *Highway Statistics Summary to 1995*, Table 221.
- 1965 through 1984, 1986, 1988 through 1991, and 1993 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* http://www.fhwa.dot.gov/policyinformation/statistics.cfm, Table G-21 in 1965, Table MF-21 (1996 through 2006), and Table 8.4.2 (2007 forward).

MGRVPZZ — Motor gasoline sold for recreational vehicle use by state.

- 2015 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, http://www.fhwa.dot.gov/policyinformation/statistics.cfm, Table 8.4.3.

MGSFPZZ — Special fuels sales by state (primarily diesel fuel with small amounts of liquefied petroleum gases).

- 1960 through 1995: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics, Summary to 1995*, Table MF-225.
- 1996 forward: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics*, http://www.fhwa.dot.gov/policyinformation/statistics.cfm, Table MF-21 (1996 through 2006) and Table 8.4.2 (2007 forward).

MGTCKUS — Factor for converting motor gasoline from physical units to Btu.

- 1960 through 1992: EIA adopted the Bureau of Mines thermal conversion factor of 5.253 million Btu per barrel for "Gasoline, Motor Fuel" as published by the Texas Eastern Transmission Corporation in Appendix V of *Competition and Growth in American Energy Markets 1947-1985*, a 1968 release of historical and projected statistics. The factor excludes oxygenates.
- 1993 forward: EIA calculates the national annual average thermal conversion factor, which includes fuel ethanol blended into motor gasoline (shown in Appendix B Table B1 on page 179). For 1993-2006, it also includes methyl tertiary butyl ether (MTBE) and other oxygenates blended into motor gasoline.

MGTCPUS — Motor gasoline total consumption in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*. "Petroleum Statement, Annual," Table 1.

  For 1960 through 1963, motor gasoline was combined with aviation gasoline and published as "gasoline" in the source table. Table 19 in the "Petroleum Statement, Annual" titled "Salient Statistics of Aviation Gasoline" provided separate data for aviation gasoline for those years. The aviation gasoline data from the second table were subtracted from the gasoline data in the first table to derive the motor gasoline consumption series used in SEDS.
- 1976 through 1980: EIA, *Energy Data Reports*. "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

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Petroleum Coke

Physical units

Seven data series are used to estimate the consumption of petroleum coke. Five are measures of petroleum coke consumption and two are indicators of industrial activity used to apportion U.S. industrial petroleum coke consumption to the states. ("ZZ" in the variable name represents the two-letter state code that differs for each state):

PCTCPUS	=	petroleum coke total consumption in the United States, in thousand barrels;
PCEIMZZ	=	petroleum coke consumed by the electric power sector in each state, in thousand short tons;
PCC3MZZ	=	petroleum coke consumed for combined-heat-and-power in the commercial sector in each state, in thousand short tons;
PCI3MZZ	=	petroleum coke consumed for combined-heat-and-power in the industrial sector in each state, in thousand short tons;
PCRFPZZ	=	petroleum coke used at refineries as both catalytic and marketable coke in each state, or group of states, or Petroleum Administration for Defense (PAD) district, in thousand barrels;
CTCAPZZ	=	catalytic cracking charge capacity of petroleum refineries in each state, in barrels per calendar day (1960 through 1979) and barrels per stream day (1980 forward); and
AICAPZZ	=	aluminum ingot production capacity in each state, in short tons.

The total consumption of petroleum coke in the United States (PCTCPUS) is the product supplied series from the U.S. Energy Information Administration (EIA) *Petroleum Supply Annual*.

Information on the amount of petroleum coke consumed for the purpose of generating electricity is available from Form EIA-923, "Power Plant Operations Report," and predecessor forms. For the electric power sector (PCEIM), these data are available for 1970 forward. Before 1970, consumption is assumed to be zero. For 1989 forward, the electric power sector includes petroleum coke consumed by electric utilities and independent power producers whose primary business is to sell electricity or electricity and heat. Quantities of petroleum coke used by commercial (PCC3M) and industrial (PCI3M) facilities in combined-heat-and-power units are also available and are included in the commercial and industrial sectors, respectively.

The data for petroleum coke used to generate electricity are in thousand short tons and are converted into thousand barrels in the State Energy Data System (SEDS) by applying a conversion factor of five barrels per short ton, and the U.S. value is the sum of the state data:

PCEIPZZ = PCEIMZZ * 5
PCEIPUS = ΣPCEIPZZ
PCCCPZZ = PCC3MZZ * 5
PCCCPUS = ΣPCCCPZZ
PCI3PZZ = PCI3MZZ * 5
PCI3PUS = ΣPCI3PZZ

To estimate U.S. industrial consumption of petroleum coke, U.S. electric power and commercial consumption are subtracted from the total U.S. petroleum coke product supplied:

PCICPUS = PCTCPUS - PCEIPUS - PCCCPUS

In addition to combined-heat-and-power generation, petroleum coke is used in the industrial sector as catalyst coke at refineries in a process for increasing the yield of gasoline from crude oil (catalytic cracking) and for other industrial uses (mainly for conversion into electrodes that are consumed in the production of aluminum).

Through 2012, state-level estimates of the refinery consumption of petroleum coke are calculated by assuming that each state consumes petroleum coke in proportion to the catalytic cracking charge capacity (CTCAPZZ) of the refineries in the state. The U.S. total for the state-level data allocating series is calculated by summing the state data.

CTCAPUS = ΣCTCAPZZ

Petroleum coke consumed by refineries for 1960 through 1980 is available for some states while quantities for other states are grouped (G1 through G7 as indicated by GZ in the following formulas). The group quantities are allocated to the states within each group in proportion to each state's portion of the group's catalytic cracking charge capacity. For 1981 forward, PAD district data (P1 through P5 as indicated by PZ in the following formulas) are allocated in the same way to the states within each district:

PCRFPZZ = PCRFPZZ, or
PCRFPZZ = (CTCAPZZ / CTCAPGZ) * PCRFPGZ (1 through 7), or

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PCRFPZZ = (CTCAPZZ / CTCAPPZ) * PCRFPPZ (1 through 5)
PCRFPUS = ΣPCRFPZZ

Beginning in 2013, SEDS incorporates unpublished state-level refinery fuel consumption data that satisfied two statistical disclosure rules – that there are at least three refineries not of the same company in the state and that no one refinery uses more than 60% of the particular fuel. For petroleum coke, data for eight to nine states are usable. They are subtracted from the PAD district data, and the remainders are allocated to the remaining states using CTCAPZZ.

U.S. petroleum coke used at combined-heat-and-power plants (PCI3PUS) and at refineries (PCRFPUS) are subtracted from the U.S. industrial sector consumption to derive U.S. consumption of petroleum coke for all other industrial uses:

PCOCPUS = PCICPUS - PCI3PUS - PCRFPUS

State-level estimates of petroleum coke consumed by other industrial users, mainly aluminum production, are assumed to be in proportion to each state's aluminum ingot production capacity (AICAPZZ). For 1993 forward, state-level aluminum production capacity is adjusted to account for under-utilization of the plants. Although AICAPZZ is measured in short tons, it is not converted to thousand barrels because it is used only as a state-level allocator. The U.S. total is calculated as the sum of the state data and other industrial use of petroleum coke is allocated to the states as follows:

AICAPUS = ΣAICAPZZ
PCOCPZZ = (AICAPZZ / AICAPUS) * PCOCPUS

Industrial sector petroleum coke consumption by state is the sum of combined-heat-and-power industrial use, consumption at refineries, and all other industrial uses:

PCICPZZ = PCI3PZZ + PCRFPZZ + PCOCPZZ

Total petroleum coke consumption by state is the sum of commercial, industrial, and electric power sector use:

PCTCPZZ = PCCCPZZ + PCICPZZ + PCEIPZZ

British thermal units (Btu)

Two series are used to convert petroleum coke from physical unit values to Btu:

PCCTKUS = factor for converting catalyst petroleum coke from physical units to Btu; and
PCMKKUS = factor for converting marketable petroleum coke from physical units to Btu.

For 2004 forward, PCCTKUS adopts a fixed value of 6.287 million Btu per barrel and PCMKKUS adopts a fixed value of 5.719 million Btu per barrel. For 1960 through 2003, a fixed factor of 6.024 million Btu per barrel is used for both series. See explanation in Appendix B.

These factors are applied to convert estimated petroleum coke consumption from physical units to Btu by state:

PCCCBZZ = PCCCPZZ * PCMKKUS
PCI3BZZ = PCI3PZZ * PCMKKUS
PCOCBZZ = PCOCPZZ * PCMKKUS
PCRFBZZ = PCRFPZZ * PCCTKUS
PCEIBZZ = PCEIPZZ * PCMKKUS

Petroleum coke consumed in the industrial sector is the sum of

PCICBZZ = PCI3BZZ + PCRFBZZ + PCOCBZZ

Total Btu consumption of petroleum coke is the sum of the consumption by the end-use sectors and for electricity generation:

PCTCBZZ = PCCCBZZ + PCICBZZ + PCEIBZZ

The U.S. totals are the sum of the states' values.

Additional notes

The source for petroleum coke used at refineries, PCRFPUS and PCRFPGZ, is the EIA *Petroleum Supply Annual* and predecessor reports. For 1960 through 1980, the data are provided in thousand short tons. For consistency with later years' data, the 1960 through 1980 data are first converted into thousand barrels before being used in SEDS. For 1960 through 1967, the data are published for Texas and New Mexico and for groups of other states. For 1968 through 1980, the data are given for 19 individual states with the remaining states are combined into seven groups. The data for 1960 through 1967 are disaggregated into the 19 states and seven groups used for the later years, before being entered into SEDS, by using the proportions of the 1968 data, which was published in both formats. For 1981 forward, the data are published by PAD districts only. For 2013 forward, unpublished state-level data that

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satisfied statistical disclosure rules are incorporated in SEDS.

Data sources

AICAPZZ — Aluminum ingot production capacity in each state.

- 1960 through 1973: American Bureau of Metal Statistics, *Year Book*.
- 1974 through 1994: American Bureau of Metal Statistics, *Non-Ferrous Metal Data*, table titled "Aluminum Ingot Production Capacity." Note: Capacities for individual plants owned by one company have been withheld since 1986. The company's total capacity has been apportioned to the individual plants on the basis of their proportional capacities in 1985.
- 1995 forward: U.S. Department of the Interior, U.S. Geological Survey, *Minerals Yearbook*.

CTCAPZZ — Catalytic cracking charge capacity of petroleum refineries by state.

- 1960: Data are unavailable from published reports. The 1961 values are used for 1960.
- 1961 through 1963: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Refineries in the United States." The specific tables are
  - 1961 and 1962: Table 7, under "Cracking Capacity" column heading "Charge."
  - 1963: Table 6, under "Catalytic-Cracking Capacity" column heading "Charge."
- 1964 through 1976: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Refineries in the United States and Puerto Rico," Table 2, all entries next to "Cat. Ck." summed by state.
- 1977: EIA, *Energy Data Reports*, "Petroleum Refineries in the United States and Puerto Rico," Table 2, all entries next to "Cat. Ck." summed by state.
- 1978: EIA, *Energy Data Reports*, "Petroleum Refineries in the United States and U.S. Territories," Table 2, all entries next to "Cat. Ck." summed by state.
- 1979 and 1980: EIA, *Energy Data Reports*, "Petroleum Refineries in the United States and U.S. Territories." The specific tables are
  - 1979: Table 2, sum of "Catalytic Cracking" columns, "Fresh" and "Recycle."
  - 1980: Table 1, sum of "Catalytic Cracking (fresh)" and "Catalytic Cracking (recycle)" columns.
- 1981 through 2004: EIA, *Petroleum Supply Annual*, sum of "Catalytic Cracking (Fresh)" and "Catalytic Cracking (Recycled)" columns in the following tables:
  - 1981 through 1983: Table 1.
  - 1984: Table 30.
  - 1985 through 1989: Table 29.
  - 1989 through 1994: Table 36.
  - 1995: Data series became biannual. 1994 data used for 1995.
  - 1996: Table 36.
  - 1997: 1996 data used for 1997.
  - 1998 through 2004: Table 36, http://www.eia.gov/petroleum/supply/annual/volume1/.
- 2005 forward: EIA, *Refinery Capacity Report*, Table1, http://www.eia.gov/petroleum/refinerycapacity/.

PCC3MZZ — Petroleum coke consumed for combined-heat-and-power in the commercial sector by state.

- 1960 through 1988: No data available. Values are assumed to be zero.
- 1989 forward: EIA, Form EIA-923, "Power Plant Operations Report," and predecessor forms.

PCCTKUS — Factor for converting petroleum coke, catalyst coke from physical units to Btu.

- 1960 through 2003: EIA adopted the Bureau of Mines thermal conversion factor of 6.024 million Btu per barrel, from the Bureau of Mines internal memorandum "Bureau of Mines Standard Average Heating Value of Various Fuels, Adopted January 3, 1950."
- 2004 forward: Assumed by EIA to be 6.287 million Btu per barrel or equal to the thermal conversion factor for residual fuel oil.

PCEIMZZ — Petroleum coke consumed by the electric power sector by state.

- 1960 through 1969: No data available. Values are assumed to be zero.
- 1970 forward: EIA, Form EIA-923, "Power Plant Operations Report," and predecessor forms.

PCI3MZZ — Petroleum coke consumed for combined-heat-and-power in the industrial sector by state.

- 1960 through 1988: No data available. Values are assumed to be zero.

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- 1989 forward: EIA, Form EIA-923, "Power Plant Operations Report," and predecessor forms.

PCMKKUS — Factor for converting petroleum coke, marketable coke from physical units to Btu.

- 1960 through 2003: EIA adopted the Bureau of Mines thermal conversion factor of 6.024 million Btu per barrel, from the Bureau of Mines internal memorandum "Bureau of Mines Standard Average Heating Value of Various Fuels, Adopted January 3, 1950."
- 2004 forward: EIA adopts the thermal conversion factor of 5.719 million Btu per barrel, calculated by dividing 28,595,925 Btu per short ton for petroleum coke (from U.S. Department of Energy, Argonne National Laboratory, "The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation Model" (GREET), version GREET1_ October 2013) by 5.0 barrels per short ton (as given in the Bureau of Mines Form 6-1300-M and successor EIA forms).

PCRFPZZ, PCRFPGZ, or PCRFPPZ — Petroleum coke consumed at refineries (both catalyst and marketable) by state or groups of states.

- 1960: No data available. The 1961 value is used for 1960.
- 1961 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual." The specific tables are
  - 1961 and 1962: Table 18.
  - 1962 through 1966: Table 19.
  - 1967: Table 18.
  - 1968: Table 19.
  - 1969 through 1972: Table 18.
  - 1973 and 1974: Table 21.
  - 1975: Table 22.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual." The specific tables are
  - 1976: Table 22.
  - 1977: Table 21.
  - 1978 through 1980: Table 20.
- 1981 through 2004: EIA, *Petroleum Supply Annual*. The specific tables are
  - 1981 and 1982: Table 17.
  - 1983: Table 15.
  - 1984: Table 44.
  - 1985: Table 43.
  - 1986 through 1988: Table 38.
  - 1989 through 1992: Table 45.
  - 1995 and 1997: Table 36.
    1993 and 1994, 1996, and 1998 through 2004: http://www.eia.gov/petroleum/supply/annual/volume1/, Table 47.
- 2005 forward: EIA, *Refinery Capacity Report*, Table 12 (2006-2008), Table 12a (2009), and Table 10a (2010 forward), http://www.eia.gov/petroleum/refinerycapacity/. Also available at http://www.eia.gov/dnav/pet/pet_pnp_capfuel_a_(na)_8FPP0_Mbbl_a.htm.

PCTCPUS — Petroleum coke total consumption in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*. "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Report*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

Residual Fuel Oil

Physical units

Because state-level end-use consumption data for residual fuel oil (with the exception of electric power sector data) are not available, sales of residual fuel oil into or within each state, published by the U.S. Energy Information Administration (EIA) in the *Fuel Oil and Kerosene Sales Report*, are used to estimate residual fuel oil consumption. The following variable names have been assigned to the sales series, in thousand barrels ("ZZ" in the following variable names represents the two-letter state code that differs for each state):

RFBKPZZ = residual fuel oil sold for vessel bunkering use (i.e., the fueling of commercial or private boats, such as pleasure craft, fishing boats, tugboats, and ocean-going vessels, including vessels operated by oil companies, and fueling for other marine purposes), excluding sales to the military;

RFCMPZZ = residual fuel oil sold to the commercial sector;

RFIBPZZ = residual fuel oil sold to industrial establishments for space heating and for other industrial use (i.e., for all uses to mines, smelters, plants engaged in producing manufactured products, in processing goods, and in assembling);

RFMIPZZ = residual fuel oil sold to the military, regardless of use;

RFMSPZZ = residual fuel oil sold for all other uses not identified in other sales categories;

RFOCPZZ = residual fuel oil sold for oil company use, including all fuel oil, crude oil, or acid sludge used as fuel at refineries, by pipelines, or in field operations; and

RFRRPZZ = residual fuel oil sold to the railroads for use in fueling trains, operating railroad equipment, space heating of buildings, and other operations.

Two other data series that represent consumption of residual fuel oil are

RFEIPZZ = residual fuel oil consumed by the electric power sector in each state, in thousand barrels; and

RFTCPUS = residual fuel oil total supplied in the United States, in thousand barrels.

Residual fuel oil consumed by the electric power sector (RFEIPZZ) is collected by EIA on Form EIA-923, "Power Plant Operations Report," and predecessor forms. (See Note 3 at the end of this residual fuel oil section for further information on changes in this series' data definitions.)

Total U.S. consumption of residual fuel oil, RFTCPUS, is the product supplied series in EIA's publication *Petroleum Supply Annual*.

All state-level data series listed above are summed to provide totals for the United States.

The data series are then combined as closely as possible into the major end-use sectors used in the State Energy Data System (SEDS). No residual fuel oil is sold to the residential sector. Residual fuel oil sales to the commercial sector is the RFCMPZZ series.

The sales of residual fuel oil to the industrial sector in each state, RFINPZZ, is the sum of the residual fuel oil sold for industrial use, including industrial heating and processing (RFIBPZZ), for oil company use (RFOCPZZ), and for all other uses (RFMSPZZ):

RFINPZZ = RFIBPZZ + RFOCPZZ + RFMSPZZ
RFINPUS = ΣRFINPZZ

The sales of residual fuel oil to the transportation sector in each state, RFTRPZZ, is the sum of the residual fuel oil sales for vessel bunkering (RFBKPZZ), military use (RFMIPZZ), and railroad use (RFRRPZZ):

RFTRPZZ = RFBKPZZ + RFMIPZZ + RFRRPZZ
RFTRPUS = ΣRFTRPZZ

Sales of residual fuel oil to the commercial, industrial, and transportation sectors are added to create a subtotal of sales to all sectors other than the electric power sector (RFNDPZZ):

RFNDPZZ = RFCMPZZ + RFINPZZ + RFTRPZZ
RFNDPUS = ΣRFNDPZZ

The estimated residual fuel oil consumption for the United States by all sectors other than the electric power sector (RFNCPUS) is calculated by subtracting the total residual fuel oil consumption for the electric power sector from the total U.S. residual fuel oil consumption:

RFNCPUS = RFTCPUS - RFEIPUS

This U.S. subtotal of residual fuel oil consumption by the end-use sectors combined (RFNCPUS) is apportioned to the states by using the states' end-

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use sector sales data. The assumption is made that each state consumes residual fuel oil in proportion to the amount sold in that state:

RFNCPZZ = (RFNDPZZ / RFNDPUS) * RFNCPUS

The end-use sectors' subtotal for each state is further divided into estimates for each sector in proportion to each sector's sales. The estimated commercial sector consumption in each state, RFCCPZZ, is calculated:

RFCCPZZ = (RFCMPZZ / RFNDPZZ) * RFNCPZZ

The industrial sector's estimated consumption in each state, RFICPZZ, is calculated:

RFICPZZ = (RFINPZZ / RFNDPZZ) * RFNCPZZ

The transportation sector's estimated consumption in each state, RFACPZZ, is calculated:

RFACPZZ = (RFTRPZZ / RFNDPZZ) * RFNCPZZ

The consumption of residual fuel oil in the United States by the major end-use sectors is estimated by adding the states' estimated consumption.

Total state residual fuel oil consumption is the sum of the end-use sectors' consumption subtotal and the electric power sector consumption:

RFTCPZZ = RFNCPZZ + RFEIPZZ

British thermal units (Btu)

Residual fuel oil has a heat content value of about 6.287 million Btu per barrel. This factor is applied to convert residual fuel oil estimated consumption from physical units to Btu as shown in the following example:

RFCCBZZ = RFCCPZZ * 6.287

Total Btu consumption of residual fuel oil is the sum of the consumption by the end-use sectors and for electricity generation:

RFTCBZZ = RFCCBZZ + RFICBZZ + RFACBZZ + RFEIBZZ

The U.S.-level Btu consumption estimates are calculated as the sum of the states' Btu consumption.

Additional notes

1. "Sales" data are actually called "shipments" in the source documents for 1960 and 1961; "consumption" for 1962 through 1966; "shipments" for 1967; "sales" from 1968 through 1978; "deliveries" for 1979 through 1983; and "sales" for 1984 forward.
2. In 1979, EIA implemented a new survey form, EIA-172, to obtain deliveries of fuel oil and kerosene data and updated the list of respondents. (A detailed explanation is published in the *Energy Data Report,*"Deliveries of Fuel Oil and Kerosene in 1979.") In the new survey form, certain end-use categories were redefined—in many cases, to collect more disaggregated data. The reclassifications resulted in some end-use categories that were no longer comparable with those in previous surveys. Where discontinuities occurred, estimates for the pre-1979 years have been made in SEDS to conform with the 1979 fuel oil deliveries classifications. The pre-1979 deliveries estimates are not published in this report but are used in SEDS to disaggregate the known U.S. total product supplied (consumption) into state and major end-use sector consumption estimates.

   For residual fuel oil deliveries in 1979, the end-use categories "commercial" and "industrial" are available. The pre-1979 deliveries categories are called "heating" and "industrial." While the pre-1979 categories individually are not continuous with the 1979 categories, their subtotals are related. That is, a general comparison can be made between the sum of commercial and industrial deliveries in 1979 and the sum of heating and industrial deliveries in the pre-1979 years. Therefore, the following method was applied to present a comparable series for residual fuel oil delivered to the commercial and industrial sectors:
   - For each of the pre-1979 years, a subtotal was created for each state by adding each state's heating and industrial deliveries categories. A comparable 1979 subtotal was created by adding each state's commercial and industrial deliveries categories.
   - Commercial and industrial shares of the subtotal in 1979 were calculated for each state.
   - These 1979 end-use shares were then applied to each pre-1979 subtotal of residual fuel oil deliveries in each state to create state estimates of end-use deliveries for 1960 through 1978.

   The 1980 through 1982 residual fuel oil deliveries data are based on the same survey as that used for 1979; therefore, the 1980 through 1982 data are directly comparable to 1979 data.

   In 1984, EIA again updated the list of respondents for this survey, and the Form EIA-172 became the Form EIA-821, "Annual Fuel Oil and Kerosene Sales Report." EIA did not conduct a fuel oil and kerosene sales survey

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for 1983. The 1983 estimates in SEDS are based on 1984 data obtained from the Form EIA-821. Statistical procedures and methodologies used for the Form EIA-821 differ from those used in previous years. Therefore, the 1983 and forward sales data may not be directly comparable to the pre-1983 data. (In the source document, the sales data for 1983 forward are reported in thousand gallons. These data were first converted to thousand barrels before being entered into SEDS.)

3. The data on fuel oil consumed by the electric power sector for all years and states are actual fuel oil consumption numbers collected from electric power plants on Form EIA-923, "Power Plant Operations Report," and predecessor forms. Due to changes in fuel oil reporting classifications on the predecessor forms over the years, it is not possible to develop a thoroughly consistent series for all years. However, over time, data more accurately disaggregating fuel oil into distillate fuel oil and residual fuel oil have become available. For 1960 through 1969, only data on total fuel oil consumed at electric utilities by state are available. For 1970 through 1979, fuel oil consumed by plant type (internal combustion and gas turbine plants combined and steam plants) by state are available. For 1980 through 2000, data on consumption of light oil at all plant types combined and consumption of heavy oil at all plant types combined are available by state. For 2001 forward, data on consumption of distillate fuel oil and residual fuel oil are available. In SEDS, the following assumptions have been made:
   - 1960 through 1969—state estimates of fuel oil consumption by plant type have been created for each year by applying the shares of steam plants (primarily residual fuel oil) and internal combustion and gas turbine plants (primarily distillate fuel oil plus small amounts of jet kerosene) by state in 1970 to each year's total fuel oil consumption at electric utilities for 1960 through 1969.
   - 1970 through 1979—fuel oil consumed by steam plants is assumed to equal residual fuel oil consumption, and fuel oil consumed by internal combustion and gas turbine plants is assumed to equal distillate fuel oil plus jet kerosene consumption.
   - 1980 through 2000—total heavy oil consumption at all plant types is assumed to equal residual fuel oil consumption, and total light oil consumption at all plant types is assumed to equal distillate fuel oil plus jet kerosene consumption.

   The data series thus derived for SEDS for residual fuel oil and distillate fuel oil consumption by the electric power sector is considered to be actual consumption by the electric power sector for each state and each year.

Data sources

RFBKPZZ — Residual fuel oil sold for vessel bunkering use by state.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are
  - 1960 and 1961: Table 17.
  - 1962 and 1963: Table 16.
  - 1964 and 1965: Table 15.
  - 1966 through 1975: Table 11.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 11.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 5.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A13.
- 1984 through 1987: EIA, *Petroleum Marketing Monthly*, also available at http://www.eia.gov/dnav/pet/pet_cons_821rsd_a_EPPR_VVB_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821rsd_a_EPPR_VVB_Mgal_a.htm.

RFCMPZZ— Residual fuel oil sold to the commercial sector.

- 1960 through 1978: EIA estimates based on statistics of commercial sector deliveries of residual fuel oil from the EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene in 1979," Table 2. State ratios based on 1979 commercial sector deliveries were applied to each state's sum of heating plus industrial deliveries categories from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 2, on page 77.)
- 1979 and 1980: EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene," Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 5.

Notes: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS. Data for Hawaii in 1986 through 1990 reflect unpublished revisions from an EIA internal memorandum from the Office of Oil and Gas to the

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Office of Energy Markets and End Use, "Revising Historical Petroleum Data," February 26, 1993.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A13.
- 1984 through 1987: EIA, *Petroleum Marketing Monthly*, also available at http://www.eia.gov/dnav/pet/pet_cons_821rsd_a_EPPR_VCS_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821rsd_a_EPPR_VCS_Mgal_a.htm.

RFEIPZZ — Residual fuel oil consumed by the electric power sector.

- EIA, Form EIA-923, "Power Plant Operations Report," and predecessor forms. The following assumptions have been made:
  - 1960 through 1969: Only total fuel oil consumed at electric utilities by state is available. State estimates of residual fuel oil consumption were created for each year by applying the shares of steam plants (primarily residual fuel oil) by state from 1970 to each year's total fuel oil consumption at electric utilities for 1960 through 1969.
  - 1970 through 1979: Fuel oil consumed by plant type by state is available. Fuel oil consumed by steam plants is assumed to equal residual fuel oil consumption.
  - 1980 through 2000: Consumption of heavy fuel at all plant types by state is available. This is assumed to equal residual fuel oil consumption.
  - 2001 forward: Consumption of residual fuel oil is available.

RFIBPZZ — Residual fuel oil sold to industrial establishments for heating and for other industrial use.

- 1960 through 1978: EIA, estimates based on statistics of industrial sector deliveries of residual fuel from the EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene in 1979," Table 2. State ratios based on 1979 industrial sector deliveries were applied to each state's sum of heating plus industrial deliveries categories from the fuel oil deliveries reports for each year 1960 through 1978. (See explanation in Note 2, on page 77.)
- 1979 and 1980: EIA, *Energy Data Report*, "Deliveries of Fuel Oil and Kerosene," Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 5.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A13.
- 1984 through 1987: EIA, *Petroleum Marketing Monthly*, also available at http://www.eia.gov/dnav/pet/pet_cons_821rsd_a_EPPR_vin_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821rsd_a_EPPR_vin_Mgal_a.htm.

RFMIPZZ — Residual fuel oil sold to the military regardless of use by state.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are
  - 1960 and 1961: Table 18.
  - 1962 and 1963: Table 17.
  - 1964 and 1965: Table 16.
  - 1966 through 1975: Table 12.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 12.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 5.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A13.
- 1984 through 1987: EIA, *Petroleum Marketing Monthly*, also available at http://www.eia.gov/dnav/pet/pet_cons_821rsd_a_EPPR_VMI_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821rsd_a_EPPR_VMI_Mgal_a.htm.

RFMSPZZ — Residual fuel oil sold for miscellaneous uses by state.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are
  - 1960 through 1962: Table 19.
  - 1963 and 1964: Table 18.
  - 1965 through 1967: Table 17.
  - 1968 through 1975: Table 14.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and

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Kerosene," Table 14.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 2, column "Other."
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 5, column "All Other."

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS. The data series is titled "All Other."

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A13.
- 1984 through 1987: EIA, *Petroleum Marketing Monthly*, also available at http://www.eia.gov/dnav/pet/pet_cons_821rsd_a_EPPR_VOE_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821rsd_a_EPPR_VOE_Mgal_a.htm.

RFOCPZZ — Residual fuel oil sold for use by oil companies by state.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are
  - 1960 and 1961: Table 14.
  - 1962 and 1963: Table 13.
  - 1964 and 1965: Table 12.
  - 1966 through 1975: Table 9.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 9.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 5.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983: EIA, *Petroleum Marketing Monthly*, July 1985 issue, Table A13.
- 1984 through 1987: EIA, *Petoleum Marketing Monthly*, also available at http://www.eia.gov/dnav/pet/pet_cons_821rsd_a_EPPR_VOC_Mgal_a.htm.
- 1988 forward: EIA, *Fuel Oil and Kerosene Sales*, also available at http://www.eia.gov/dnav/pet/pet_cons_821rsd_a_EPPR_VOC_Mgal_a.htm.

RFRRPZZ — Residual fuel oil sold for use by railroads by state.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Shipments of Fuel Oil and Kerosene." The specific tables are
  - 1960 and 1961: Table 16.
  - 1962 and 1963: Table 15.
  - 1964 and 1965: Table 14.
  - 1966 through 1975: Table 10.
- 1976 through 1978: EIA, *Energy Data Reports*, "Sales of Fuel Oil and Kerosene," Table 10.
- 1979 and 1980: EIA, *Energy Data Reports*, "Deliveries of Fuel Oil and Kerosene," Table 2.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 5.

Note: Data for 1983 forward are published in thousand gallons. They are converted to thousand barrels by dividing by 42 before being entered into SEDS.

- 1983 through 1987: EIA, *Petroleum Marketing Monthly*. The specific tables are
  - 1983: July 1985 issue, Table A13.
  - 1984 and 1985: July 1986 issue, Table A3.
  - 1986 and 1987: June 1988 issue, Table A5.
- 1988 and 1989: EIA, *Fuel Oil and Kerosene Sales 1989*, Table 5.
- 1990 forward: Series discontinued. Volumes are included with "All Other" data (in SEDS).

RFTCPUS — Residual fuel oil total consumption in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

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Other Petroleum Products

"Other petroleum products" (OP) is the sum of 11 petroleum products. These products, in thousand barrels, are

ABTCPUS = aviation gasoline blending components total consumption in the United States;
COTCPZZ = crude oil (including lease condensate) total consumption in each state;
FNTCPUS = petrochemical feedstocks, naphtha less than 401°F, total consumption in the United States;
FOTCPUS = petrochemical feedstocks, other oils equal to or greater than 401°F, total consumption in the United States;
FSTCPUS = petrochemical feedstocks, still gas, total consumption in the United States (through 1985);
MBTCPUS = motor gasoline blending components total consumption in the United States;
MSTCPUS = miscellaneous petroleum products total consumption in the United States;
SGTCPUS = still gas total consumption in the United States;
SNTCPUS = special naphthas total consumption in the United States;
UOTCPUS = unfinished oils total consumption in the United States; and
WXTCPUS = waxes total consumption in the United States.

It is assumed that all of the products in "other petroleum products" are used by the industrial sector. State estimates are created for other petroleum products by using the following six variables to allocate the products to the states:

COCAPZZ = atmospheric crude oil distillation operable capacity (operating capacity before 2013) at refineries in each state as of January 1 of the following year, adjusted with information on new, shutdown, and reactivated refineries during the year, in barrels per calendar day;
FNCASZZ = state's share of U.S. capacity of steam crackers using naphtha as feedstocks;
FOCASZZ = state's share of U.S. capacity of steam crackers using other oils as feedstocks;
OCVAVZZ = value of shipments (value added before 2001) for the industrial organic chemical manufacturing industry in each state, in million dollars;
PIVAVZZ = value of shipments (value added before 2001) for the paint and coating manufacturing industry in each state, in million dollars; and
CGVAVZZ = value of shipments (value added before 2001) for the corrugated and solid fiber box manufacturing industry in each state, in million dollars.

Value of shipments and value added are two measures of manufacturing activity, both from the Department of Commerce *Economic Census* (previously, *Census of Manufactures*) reports. Value of shipments is a close approximation of gross output, adjusted for inventory changes. Value added excludes the cost of materials from gross output. Before 2001, value added data were used to allocate the national consumption of selected petroleum products to the states. From 2001 forward, value of shipments data are used instead. The change was made because gross output is considered a better indicator of consumption of fuel and feedstock than value added.

Crude oil

Crude oil is normally processed in refineries to produce petroleum products and rarely used directly (as energy consumption). Before 1983, crude oil burned on leases and by pipelines as fuel was reported as either distillate or residual fuel oil and was included in product supplied for those products. For 1983 through 2009, crude oil used directly in petroleum industry operations was reported as product supplied in the U.S. Energy Information Administration's (EIA) *Petroleum Supply Annual*. Beginning in 2010, crude oil product supplied, and therefore consumption, is assumed equal to zero.

Physical units

State estimates for crude oil consumed in petroleum industry operations are the data series COTCPZZ. The U.S. total for this data series is summed:

COTCPUS = ΣCOTCPZZ

Industrial consumption equals total consumption of crude oil:

COICPZZ = COTCPZZ
COICPUS = COTCPUS

British thermal units (Btu)

Crude oil has a heat content value of about 5.800 million Btu per barrel. The calculations performed to estimate total Btu consumption and industrial use

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Btu consumption by state and for the United States are

COTCBZZ = COTCPZZ * 5.800
COTCBUS = ΣCOTCBZZ
COICBZZ = COTCBZZ
COICBUS = COTCBUS

Data source

COTCPZZ — Crude oil consumed in petroleum industry operations by state.

- 1960 through 1982: Crude oil used directly was included in distillate and residual fuel oil product supplied when reported to the U. S. Energy Information Administration. Zeros are entered for all years.
- 1983 through 2009: Data are available for Petroleum Administration for Defense (PAD) districts, not by state. State estimates are calculated by allocating all crude oil consumption to the six states (Alaska, California, Colorado, Louisiana, Texas, and Utah) that reported distillate and residual fuel oils consumed by pipeline and leases in 1982. (Data on pipeline and lease consumption of fuels are not available after 1982.) Each state's 1982 ratio of distillate and residual fuel oils consumed by pipeline and leases to its respective 1982 PAD district total consumption of those fuels is calculated. This ratio is then applied to the 1983 forward PAD district totals of crude oil product supplied. The 1982 ratios are taken from the Form EIA-90, "Crude Oil Stocks Report," and the crude oil product supplied data are taken from the EIA *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/. The specific tables are
  - 1983 through 1988: Tables 2 and 4 through 8.
  - 1989 through 2004: Tables 2, 4, 6, 8, 10, and 12.
  - 2005 through 2009: Tables 1, 3, 5, 7, 9, and 11.
- 2010 forward: Zeroes are entered for all years.

Aviation gasoline blending components; petrochemical feedstocks, still gas; motor gasoline blending components; still gas; and unfinished oils

Physical units

The five petroleum products in this category are consumed as refinery fuels. Beginning in 1986, still gas for petrochemical feedstocks and still gas for other uses are reported together in the source document. State consumption estimates of these products are created in proportion to each state's crude oil operable capacity at refineries (COCAPZZ). Before 2013, operating capacity was used. Occasionally, consumption for aviation gasoline blending components and unfinished oils will be negative. This can occur when such products have entered the primary supply channels with their production not having been reported (e.g., streams returned to refineries from petrochemical plants). The U.S. total for this variable is summed:

COCAPUS = ΣCOCAPZZ

Aviation gasoline blending components state and U.S. consumption are estimated:

ABTCPZZ = (COCAPZZ / COCAPUS) * ABTCPUS
ABICPZZ = ABTCPZZ
ABICPUS = ABTCPUS

Petrochemical feedstocks, still gas, state and U.S. consumption are estimated:

FSTCPZZ = (COCAPZZ / COCAPUS) * FSTCPUS
FSICPZZ = FSTCPZZ
FSICPUS = FSTCPUS

Motor gasoline blending components state and U.S. consumption are estimated:

MBTCPZZ = (COCAPZZ / COCAPUS) * MBTCPUS
MBICPZZ = MBTCPZZ
MBICPUS = MBTCPUS

Still gas state and U.S. consumption are estimated:

SGTCPZZ = (COCAPZZ / COCAPUS) * SGTCPUS
SGICPZZ = SGTCPZZ
SGICPUS = SGTCPUS

Unfinished oils state and U.S. consumption are estimated:

UOTCPZZ = (COCAPZZ / COCAPUS) * UOTCPUS
UOICPZZ = UOTCPZZ
UOICPUS = UOTCPUS

British thermal units (Btu)

Btu estimates for five products in this group are developed by multiplying

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the estimated consumption of each individual product in physical units by its respective heat content conversion factor. The calculations performed to estimate total Btu consumption and industrial use Btu consumption by state and for the United States are

ABTCBZZ	=	ABTCPZZ * 5.048
ABTCBUS	=	ΣABTCBZZ
ABICBZZ	=	ABTCBZZ
ABICBUS	=	ABTCBUS
FSTCBZZ	=	FSTCPZZ * 6.000
FSTCBUS	=	ΣFSTCBZZ
FSICBZZ	=	FSTCBZZ
FSICBUS	=	FSTCBUS
MBTCBZZ	=	MBTCPZZ * MBTCKUS
MBTCBUS	=	ΣMBTCBZZ
MBICBZZ	=	MBTCBZZ
MBICBUS	=	MBTCBUS
SGTCBZZ	=	SGTCPZZ * 6.000
SGTCBUS	=	ΣSGTCBZZ
SGICBZZ	=	SGTCBZZ
SGICBUS	=	SGTCBUS
UOTCBZZ	=	UOTCPZZ * 5.825
UOTCBUS	=	ΣUOTCBZZ
UOICBZZ	=	UOTCBZZ
UOICBUS	=	UOTCBUS

The factor for converting motor gasoline blending components from physical unit values to Btu, MBTCKUS, is fixed at 5.253 million Btu per barrel for 1960 through 2006, and at 5.222 million Btu per barrel for 2007 forward:

MBTCKUS	=	factor for converting motor gasoline blending components from physical units to Btu.

Data sources

ABTCPUS — Aviation gasoline blending components total consumption in the United States.

- 1960 through 1980: No data available. Values are assumed to be zero.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

COCAPZZ — Atmospheric crude oil distillation operable capacity (operating capacity before 2013) at refineries by state as of January 1 of the following year.

- 1960: U.S. Department of the Interior, Bureau of Mines, Petroleum Refineries, Including Cracking Plants, in the United States, Table 3.
- 1961 through 1963: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, "Petroleum Refineries in the United States." The specific tables are
  - 1961 and 1962: Table 3.
  - 1963: Table 1.
- 1964 through 1976: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, "Petroleum Refineries in the United States and Puerto Rico," Table 1.
- 1977: EIA, *Energy Data Reports*, "Petroleum Refineries in the United States and Puerto Rico," Table 1.
- 1978 through 1980: EIA, *Energy Data Reports*, "Petroleum Refineries in the United States and U.S. Territories," Table 1.
- 1981 through 2004: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/. The specific tables are
  - 1981 through 1983: Table 1.
  - 1984: Table 30.
  - 1985 through 1988: Table 29.
  - 1989 through 1994: Table 36.
  - 1995: Unpublished data based on Form EIA-810.
  - 1996 through 2004: Table 36.
- 2005 forward: EIA, *Refinery Capacity Report*, http://www.eia.gov/petroleum/refinerycapacity/, Table 1, supplemented with Table 11 data from 2011 forward.

FSTCPUS — Petrochemical feedstocks, still gas, total consumption in the United States (through 1985).

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, Petroleum Statement, Annual," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 14.
- 1983 through 1985: EIA, *Petroleum Supply Annual*, Table 12.

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MBTCPUS — Motor gasoline blending components total consumption in the United States.

- 1960 through 1980: No data available. Values are assumed to be zero.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

MBTCKUS — Factor for converting motor gasoline blending components from physical units to Btu.

- 1960 through 2006: EIA adopted the Bureau of Mines thermal conversion factor of 5.253 million Btu per barrel, from the Bureau of Mines internal memorandum "Bureau of Mines Standard Average Heating Value of Various Fuels, Adopted January 3, 1950."
- 2007 forward: EIA adopted the thermal conversion factor of 5.222 million Btu per barrel (124,340 Btu per gallon) for gasoline blendstock from U.S. Department of Energy, Argonne National Laboratory, "The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation Model" (GREET), version GREET1_2013, October 2013.

SGTCPUS — Still gas total consumption in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 and 1982: EIA, *Petroleum Supply Annual*, Table 14.
- 1983 through 1985: EIA, *Petroleum Supply Annual*, Table 12.
- 1986 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1986 through 2004: Table 2.
  - 2005 forward: Table 1.

UOTCPUS — Unfinished oils total consumption in the United States.

- 1960 through 1980: No data available. Values assumed to be zero.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

Petrochemical feedstocks, naphtha less than 401°F; and petrochemical feedstocks, other oils equal to or greater than 401°F

Physical units

Petrochemical feedstocks, naphtha and other oils, are consumed by the chemical industry in producing petrochemical "building blocks" (such as ethylene) that, in turn, are converted to such products as synthetic fibers, synthetic rubber, and plastics.

The chemical industry produces petrochemicals such as ethylene and propylene by steam cracking. To allocate the U.S. consumption of petrochemical feedstocks to the states, information on nameplate capacity and the share of naphtha and other oils in the feedstock mixture for all steam cracker plants producing ethylene is collected from various issues of the *Oil and Gas Journal* to derive the state shares of capacity of steam crackers using naphtha (FNCASZZ) and those using other oils (FOCASZZ). Based on the data collected for 1997 through 1999, 2002, 2004, 2008, and for 2010 forward, Texas and Louisiana are the only two states that use naphtha and other oils as feedstocks in their steam crackers. The shares for the interim years are interpolated using the compound annual growth rates of the years with data, and the shares for 1997 are used for the earlier years.

For 2015 forward, information on nameplate capacity and the share of naphthas and other oils in the feedstock mixture for steam cracker plants producing ethylene is not available from the *Oil and Gas Journal*. The 2014 values are used for 2015 forward.

Petrochemical feedstocks, naphtha less than 401°F, state and U.S. consumption are estimated:

FNTCPZZ = FNTCPUS * FNCASZZ
FNICPZZ = FNTCPZZ
FNICPUS = FNTCPUS

Petrochemical feedstocks, other oils equal to or greater than 401°F, state and U.S. consumption are estimated:

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FOTCPZZ = FOTCPUS * FOCASZZ
FOICPZZ = FOTCPZZ
FOICPUS = FOTCPUS

British thermal units (Btu)

Btu estimates for the six petroleum products in this group are developed by multiplying each individual product's estimated consumption in physical units by its respective approximate heat content conversion factor. The calculations performed to estimate total Btu consumption and industrial use Btu consumption by state and for the United States are

FNTCBZZ = FNTCPZZ * 5.248
FNTCBUS = ΣFNTCBZZ
FNICBZZ = FNTCBZZ
FNICBUS = FNTCBUS
FOTCBZZ = FOTCPZZ * 5.825
FOTCBUS = ΣFOTCBZZ
FOICBZZ = FOTCBZZ
FOICBUS = FOTCBUS

Additional note

Before the 2010 cycle, the two products were allocated to the states in proportion to the value of shipments or value added in the manufacture of industrial organic chemicals from the Economic Censuses collected by the U.S. Census Bureau. Organic chemical manufacturing was used because state-level data for petrochemical manufacturing were not available. This resulted in the allocation of petrochemical feedstocks to more than 25 states, most of which did not produce petrochemicals. The steam cracker capacity shares, while requiring estimations, are better allocators.

Data sources

FNCASZZ — State's share of U.S. capacity of steam crackers using naphtha as feedstocks.

- 1960 through 1996: The share for 1997 is used.
- 1997 through 1999, 2002, 2004, 2008, and 2010 through 2014: *Oil and Gas Journal*, specific issues focusing on ethylene production, table on "International Survey of Ethylene from Steam Crackers."
- 2000, 2001, 2003, 2007, 2009, 2015 forward: EIA estimation, based on data available from the *Oil and Gas Journal*.

FNTCPUS — Petrochemical feedstocks, naphtha less than 401°F, total consumption in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
  - 1981 forward: EIA, *Petroleum Supply Annual*, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

FOCASZZ — State's share of U.S. capacity of steam crackers using other oils as feedstocks.

- 1960 through 1996: The share for 1997 is used.
- 1997 through 1999, 2002, 2004, 2008, and 2010 through 2014: *Oil and Gas Journal*, specific issues focusing on ethylene production, table on "International Survey of Ethylene from Steam Crackers."
- 2000, 2001, 2003, 2007, 2009, 2015 forward: EIA estimation, based on data available from the *Oil and Gas Journal*.

FOTCPUS — Petrochemical feedstocks, other oils equal to or greater than 401°F, total consumption in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

Miscellaneous petroleum products

Physical units

Miscellaneous products include all finished products not classified elsewhere (e.g., petrolatum, lube refining byproducts (aromatic extracts and tars), absorption oils, ram-jet fuel, petroleum rocket fuels, synthetic natural gas feed

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stocks, and specialty oils). It is assumed that the chief consuming industry for this product line is the organic chemical industry.

State estimates for these products are created in proportion to the value of shipments (value added before 2001) in the manufacture of industrial organic chemicals in each state (OCVAVZZ).

The U.S. total for the data series used to apportion these products to the states is summed:

OCVAVUS = ΣOCVAVZZ

Miscellaneous petroleum products state and U.S. consumption are estimated:

MSTCPZZ = (OCVAVZZ / OCVAVUS) * MSTCPUS
MSICPZZ = MSTCPZZ
MSICPUS = MSTCPUS

British thermal units (Btu)

EIA uses an average heat content value of 5.796 million Btu per barrel for miscellaneous petroleum products. The calculations performed to estimate total Btu consumption and industrial use Btu consumption by state and for the United States are

MSTCBZZ = MSTCPZZ * 5.796
MSTCBUS = ΣMSTCBZZ

Miscellaneous petroleum products consumed in the industrial sector is equal to total consumption.

MSICBZZ = MSTCBZZ
MSICBUS = MSTCBUS

Data sources

MSTCPUS — Miscellaneous petroleum products consumed in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, Mineral Industry Surveys, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1. Naphtha-type jet fuel volumes (JNTCPUS) are included in "Miscellaneous Products" in the *Petroleum Supply Annual*, Table 1.

OCVAVZZ — Value of shipments for the industrial organic chemicals manufacturing industry by state.

Note: Value added before 2001.

- 1960 through 1970: U.S. Department of Commerce, *1967 Census of Manufactures*, Volume II, Part 2, Standard Industrial Classification (SIC) 2818. The 1963 state data are used for the years 1960 through 1965, and the 1967 state data are used for 1966 through 1970.
- 1971 through 1980: U.S. Department of Commerce, *1977 Census of Manufactures*, Industry Series, SIC 2869. The 1972 state data are used for 1971 through 1975, and the 1977 state data are used for 1976 through 1980.
- 1981 through 1985: U.S. Department of Commerce, *1987 Census of Manufactures* (Final Report), Industry Series, SIC 2869. The 1982 state data are used for 1981 through 1985.
- 1986 through 1995: U.S. Department of Commerce, *1992 Census of Manufactures* (Final Report), Industry Series, SIC 2869. The 1987 state data are used for 1986 through 1990, and the 1992 state data are used for 1991 through 1995.
- 1996 through 2000: U.S. Department of Commerce, *1997 Economic Census, Manufacturing, Industry Series*, EC97M-3251A for North American Industry Classification System (NAICS) 325110 "Petrochemical Manufacturing" and EC97M-3251G for NAICS 325119 "All Other Basic Inorganic Chemical Manufacturing." The value added by manufacture for both categories are summed to create a data series generally comparable to the SIC 2869 used previously at http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml.
- 2001 forward: U.S. Department of Commerce, *Economic Census*, Manufacturing, Geographic Area Series, column titled "Value of shipments" data for NAICS series 325110, 325120, and 325199 shown in the datasets at http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml. See Additional Note 2 on page 89 for the methodology used to estimated withheld values.
  - 2001 through 2005: 2002 *Economic Census*.
  - 2006 through 2012: 2007 *Economic Census*.

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– 2013 forward: 2012 *Economic Census.*

Special naphthas

Physical units

Special naphthas are used as paint and varnish thinners and dry cleaning liquids or solvents. This petroleum product is allocated to the states in proportion to the value of shipments (value added before 2001) in the manufacture of paints and allied products in each state (PIVAVZZ).

The U.S. total for the apportioning data series is calculated:

PIVAVUS = ΣPIVAVZZ

Special naphthas state and U.S. consumption are estimated:

SNTCPZZ = (PIVAVZZ / PIVAVUS) * SNTCPUS
SNICPZZ = SNTCPZZ
SNICPUS = SNTCPUS

British thermal units (Btu)

Special naphthas have a heat content value of about 5.248 million Btu per barrel. This factor is applied to convert special naphthas estimated consumption from physical units to Btu by state and the United States is the sum of the states:

SNTCBZZ = SNTCPZZ * 5.248
SNTCBUS = ΣSNTCBZZ

Special naphthas consumed in the industrial sector is equal to total consumption.

SNICBZZ = SNTCBZZ
SNICBUS = SNTCBUS

Data sources

PIVAVZZ — Value of shipments for the paint and coating manufacturing industry by state.

Note: Value added before 2001.

- 1960 through 1970: U.S. Department of Commerce, *1967 Census of Manufactures*, Volume II, Part 2, SIC 2851. The 1963 state data are used for the years 1960 through 1965, and the 1967 state data are used for 1966 through 1970.
- 1971 through 1980: U.S. Department of Commerce, *1977 Census of Manufactures*, Industry Series, SIC 2851. The 1972 state data are used for 1971 through 1975, and the 1977 state data are used for 1976 through 1980.
- 1981 through 1985: U.S. Department of Commerce, *1987 Census of Manufactures* (Final Report), Industry Series, SIC 2851. The 1982 state data are used for the years 1981 through 1985.
- 1986 through 1995: U.S. Department of Commerce, *1992 Census of Manufactures* (Final Report), Industry Series, SIC 2851. The 1987 state data are used for the years 1986 through 1990, and the 1992 state data are used for 1991 through 1995.
- 1996 through 2000: U.S. Department of Commerce, *1997 Economic Census, Manufacturing, Industry Series*, EC97M-3255A for NAICS 325510 "Paint and Coating Manufacturing," at http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml.
- 2001 forward: U.S. Department of Commerce, *Economic Census*, Manufacturing, Geographic Area Series, column titled "Value of shipments" data for NAICS series 325510 shown in the data sets at http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml. See Additional Note 2 on page 89 for the methodology used to estimated withheld values.
  - 2001 through 2005: 2002 *Economic Census.*
  - 2006 through 2012: 2007 *Economic Census.*
  - 2013 forward: 2012 *Economic Census.*

SNTCPUS — Special naphthas total consumption in the United States.

- 1960 through 1963: Data included in motor gasoline.
- 1964 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

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Waxes

Physical units

Because petroleum waxes are very cost-effective moisture and gas barriers, food packaging is the largest market for petroleum waxes in the United States, accounting for more than 50% of petroleum wax consumption. Therefore, waxes are allocated to the states in proportion to the value of shipments (value added before 2001) in the manufacture of corrugated and solid fiber boxes (CGVAVZZ).

The U.S. total for this variable is summed:

CGVAVUS = ΣCGVAVZZ

State and U.S. consumption are estimated:

WXTCPZZ = (CGVAVZZ / CGVAVUS) * WXTCPUS
WXICPZZ = WXTCPZZ
WXICPUS = WXTCPUS

British thermal units (Btu)

Waxes have a heat content value of about 5.537 million Btu per barrel. This factor is applied to convert the estimated consumption of waxes from physical units to Btu by state and the United States is the sum of the states:

WXTCBZZ = WXTCPZZ * 5.537
WXTCBUS = ΣWXTCBZZ

Wax consumption in the industrial sector is equal to total consumption.

WXICBZZ = WXTCBZZ
WXICBUS = WXTCBUS

Data sources

CGVAVZZ — Value of shipments for the solid fiber box manufacturing industry by state.

Note: Value added before 2001. Before 1992, this series was value added for the sanitary food container manufacturing industry.

- 1960 through 1965: U.S. Department of Commerce, *1963 Census of Manufactures*, Volume II, Part 1, SIC 2654. The 1963 state data are used for the years 1960 through 1965.
- 1966 through 1970: U.S. Department of Commerce, *1967 Census of Manufactures*, Volume II, Part 2, SIC 2654. The 1967 state data are used for 1966 through 1970.
- 1971 through 1980: U.S. Department of Commerce, *1977 Census of Manufactures*, Industry Series, SIC 2654. The 1972 state data are used for 1971 through 1975, and the 1977 state data are used for 1976 through 1980.
- 1981 through 1990: U.S. Department of Commerce, *1982 Census of Manufactures* (Final Report), Industry Series, SIC 2654. The 1982 state data are used for 1981 through 1990.
- 1991 through 1995: U.S. Department of Commerce, *1992 Census of Manufactures* (Final Report), Industry Series, SIC 2653. The 1992 state data are used for 1991 through 1995.
- 1996 through 2000: U.S. Department of Commerce, *1997 Economic Census, Manufacturing, Industry Series*, EC97M-3222A for NAICS 322211 "Corrugated and Solid Fiber Box Manufacturing" at http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml.
- 2001 forward: U.S. Department of Commerce, Economic Census, Manufacturing, Geographic Area Series, column titled "Value of shipments" data for NAICS series 322211 shown in the data sets at http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml. See Additional Note 2 on page 89 for the methodology used to estimated withheld values.
  - 2001 through 2005: 2002 *Economic Census.*
  - 2006 through 2012: 2007 *Economic Census.*
  - 2013 forward: 2012 *Economic Census.*

WXTCPUS — Waxes total consumption in the United States.

- 1960 through 1975: U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Petroleum Statement, Annual," Table 1.
- 1976 through 1980: EIA, *Energy Data Reports*, "Petroleum Statement, Annual," Table 1.
- 1981 forward: EIA, *Petroleum Supply Annual*, http://www.eia.gov/petroleum/supply/annual/volume1/, table on U.S. Supply, Disposition, and Ending Stocks of Crude Oil and Petroleum Products, column titled "Products Supplied." The specific tables are
  - 1981 through 2004: Table 2.
  - 2005 forward: Table 1.

Total other petroleum products

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Physical units

Total other petroleum products is the sum of the 11 "other petroleum products." All of these products are consumed by the industrial sector. State and U.S. industrial use of these other petroleum products are calculated:

OPICPZZ = ABICPZZ + COICPZZ + FNICPZZ + FOICPZZ + FSICPZZ + MBICPZZ + MSICPZZ + SGICPZZ + SNICPZZ + UOICPZZ + WXICPZZ

OPICPUS = ΣOPICPZZ

Total consumption of these products is calculated:

OPTCPZZ = ABTCPZZ + COTCPZZ + FNTCPZZ + FOTCPZZ + FSTCPZZ + MBTCPZZ + MSTCPZZ + SGTCPZZ + SNTCPZZ + UOTCPZZ + WXTCPZZ

OPTCPUS = ABTCPUS + COTCPUS + FNTCPUS + FOTCPUS + FSTCPUS + MBTCPUS + MSTCPUS + SGTCPUS + SNTCPUS + UOTCPUS + WXTCPUS

British thermal units (Btu)

Estimated consumption of all 11 "other petroleum products" in Btu is the sum of the Btu consumption of each product by the industrial sector. The state and U.S. totals are calculated:

OPICBZZ = ABICBZZ + COICBZZ + FNICBZZ + FOICBZZ + FSICBZZ + MBICBZZ + MSICBZZ + SGICBZZ + SNICBZZ + UOICBZZ + WXICBZZ

OPICBUS = ΣOPICBZZ

State and U.S. total consumption of these products is calculated:

OPTCBZZ = ABTCBZZ + COTCBZZ + FNTCBZZ + FOTCBZZ + FSTCBZZ + MBTCBZZ + MSTCBZZ + SGTCBZZ + SNTCBZZ + UOTCBZZ + WXTCBZZ

OPTCBUS = ΣOPTCBZZ

Additional notes

1. The data for "value added" and "value of shipments" that are used to allocate some of the other petroleum products are from the U.S. Department of Commerce, Census Bureau, *Census of Manufactures* or *Economic Census* reports. For all years, several states' data were withheld from publication to avoid disclosing operations of individual companies. The total withheld data was apportioned to the withheld states on the basis of those states' proportional values in the previous census. In the 1992 *Census of Manufactures*, the total withheld value was apportioned to states with withheld data in proportion to the number of employees in that industry in each state. Beginning with the 1997 *Economic Census*, the published report tables do not list any states that have withheld data. Detailed data tables from "American FactFinder" on the U.S. Census Bureau website, http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml, are used to obtain the list of states with data withheld and the number of employees.
2. In 1982, all respondents to the *Census of Manufactures* survey were requested to report their inventories at cost or market before accounting adjustments for "last in, first out" cost. This is a change from prior years in which respondents were permitted to value their inventories by using any generally accepted accounting valuation method. So, data for value added by manufacture after 1982 are not comparable to the prior years' data.

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Petroleum Aggregates

This section describes the method of estimating consumption by the major end-use sectors within the states for all petroleum data series. Table TN4.1 indicates which petroleum products are consumed in each of the five major end-use sectors. In the preceding portions of this section, end-use consumption estimates have been derived for each petroleum product. These petroleum product subtotals are now summed, in physical units of thousand barrels and in Btu, to create estimated end-use consumption for all petroleum products.

Residential sector

Petroleum products consumed by the residential sector are: distillate fuel oil (DF); kerosene (KS); and hydrocarbon gas liquids (HL). For the residential sector, the state and U.S. totals in physical units are

PARCPZZ = DFRCPZZ + HLRCPZZ + KSRCPZZ
PARCPUS = ΣPARCPZZ

State and U.S. totals in Btu are

PARCBZZ = DFRCBZZ + HLRCBZZ + KSRCBZZ
PARCBUS = ΣPARCBZZ

Commercial sector

The commercial sector's use of petroleum products includes: distillate fuel oil (DF); kerosene (KS); hydrocarbon gas liquids (HL); motor gasoline (MG); and residual fuel oil (RF). In physical units, the state and the U.S. totals for the commercial sector are calculated:

PACCPZZ = DFCCPZZ + HLCCPZZ + KSCCPZZ + MGCCPZZ + PCCCPZZ + RFCCPZZ
PACCPUS = ΣPACCPZZ

State and U.S. totals in Btu are

PACCBZZ = DFCCBZZ + HLCCBZZ + KSCCBZZ + MGCCBZZ + PCCCBZZ + RFCCBZZ
PACCBUS = ΣPACCBZZ

Industrial sector

Petroleum used in the industrial sector includes: asphalt and road oil (AR); distillate fuel oil (DF); kerosene (KS); hydrocarbon gas liquids (HL); lubricants (LU); motor gasoline (MG); petroleum coke (PC); residual fuel oil (RF); and the 11 products that are already summed in the "other petroleum products" (OP) subtotal. The state and U.S. total estimates in physical units are

PAICPZZ = ARICPZZ + DFICPZZ + HLICPZZ + KSICPZZ + LUICPZZ + MGICPZZ + OPICPZZ + PCICPZZ + RFICPZZ
PAICPUS = ΣPAICPZZ

State and U.S. totals in Btu are

PAICBZZ = ARICBZZ + DFICBZZ + HLICBZZ + KSICBZZ LUICBZZ + MGICBZZ + OPICBZZ + PCICBZZ + RFICBZZ
PAICBUS = ΣPAICBZZ

Transportation sector

Petroleum products used in the transportation sector are: aviation gasoline (AV); distillate fuel oil (DF); jet fuel (JF); hydrocarbon gas liquids (HL); lubricants (LU); motor gasoline (MG); and residual fuel oil (RF). The state and U.S. totals in physical units are

PAACPZZ = AVACPZZ + DFACPZZ + HLACPZZ + JFACPZZ + LUACPZZ + MGACPZZ + RFACPZZ
PAACPUS = ΣPAACPZZ

State and U.S. totals in Btu are

PAACBZZ = AVACBZZ + DFACBZZ + HLACBZZ + JFACBZZ + LUACBZZ + MGACBZZ + RFACBZZ
PAACBUS = ΣPAACBZZ

Electric power sector

Petroleum products consumed by the electric power sector are: distillate fuel oil (DF), jet fuel (JF), petroleum coke (PC), and residual fuel oil (RF). In physical units, the state and U.S. totals are

PAEIPZZ = DFEIPZZ + JFEUPZZ + PCEIPZZ + RFEIPZZ
PAEIPUS = ΣPAEIPZZ

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State and U.S. totals in Btu are

PAEIBZZ = DFEIBZZ + JFEUBZZ + PCEIBZZ + RFEIBZZ
PAEIBUS = ΣPAEIBZZ

Total consumption of petroleum products

Total consumption of all petroleum products is the sum of all of the individual product totals. The state and U.S. physical unit totals are

PATCPZZ = ARTCPZZ + AVTCPZZ + DFTCPZZ + HLTCPZZ + JFTCPZZ + KSTCPZZ + LUTCPZZ + MGTCPZZ + OPTCPZZ + PCTCPZZ + RFTCPZZ
PATCPUS = ARTCPUS + AVTCPUS + DFTCPUS + HLTCPUS + JFTCPUS + KSTCPUS + LUTCPUS + MGTCPUS + OPTCPUS + PCTCPUS + RFTCPUS

State and U.S. totals in Btu are

PATCBZZ = ARTCBZZ + AVTCBZZ + DFTCBZZ + HLTCBZZ + JFTCBZZ + KSTCBZZ + LUTCBZZ + MGTCBZZ + OPTCBZZ + PCTCBZZ + RFTCBZZ
PATCBUS = ΣPATCBZZ

Additional calculations

A few petroleum products are combined for display in the "Other Petroleum" column in tables on total energy consumption and industrial sector energy consumption. They include asphalt and road oil, aviation gasoline (total energy only), kerosene, lubricants, petroleum coke, and the 11 petroleum products described in the "other petroleum products" section of the Technical Notes. The variables are calculated in physical unit and Btu, for each state and the United States:

P1TCP = ARTCP + AVTCP + KSTCP + LUTCP + OPTCP + PCTCP
P1TCB = ARTCB + AVTCB + KSTCB + LUTCB + OPTCB + PCTCB
P1ICP = ARICP + KSICP + LUICP + OPICP + PCICP
P1ICB = ARICB + KSICB + LUICB + OPICB + PCICB

Total petroleum typically reflects motor gasoline including fuel ethanol. To assist data users in the analysis of consumption of renewable energy sources, which include fuel ethanol, versus non-renewable energy sources, which include petroleum products and other fossil fuels, a new data series, total petroleum excluding fuel ethanol, is created for each state and the United States:

From 1993 forward

PMTCB = PATCB - EMTCB

Before 1993, fuel ethanol was not included in the motor gasoline data series from the source:

PMTCB = PATCB

Total petroleum excluding fuel ethanol is used only in the tables showing energy consumption by source. For consumption by end-use sector, total petroleum includes fuel ethanol, as it is included in motor gasoline as it is consumed by the end-users.

Conversion factors for all petroleum products consumed by each sector, as well as data for the residential and commercial sectors combined, are calculated for use in EIA's *Annual Energy Review* and *Monthly Energy Review*.

PARCKUS = PARCBUS / PARCPUS
PACCKUS = PACCBUS / PACCPUS
PAICKUS = PAICBUS / PAICPUS
PAACKUS = PAACBUS / PAACPUS
PAEIKUS = PAEIBUS / PAEIPUS
PATCKUS = PATCBUS / PATCPUS

Consumption of all petroleum products by the residential and commercial sectors combined, in physical units, in Btu, and the average conversion factor, are calculated:

PAHCPUS = PARCPUS + PACCPUS
PAHCBUS = PARCBUS + PACCBUS
PAHCKUS = PAHCBUS / PAHCPUS

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Fossil Fuel Terminal Zoning Amendments

Discussion Draft

Comments Due by July 27, 2016

City of Portland
Bureau of Planning and Sustainability
June 2016

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.

How to Comment

The Fossil Fuel Terminal Zoning Amendments project would help implement new policy direction on fossil fuel distribution and storage facilities through changes to the Zoning Code. This proposal would restrict the development of new bulk fossil fuel terminals. However, proposed code changes would not inhibit improvements to existing terminals; they would instead accommodate seismic upgrades, access to greener fuels and capacity for regional growth.

Please submit comments or questions on the Discussion Draft by July 27, 2016.

Send comments to …

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Write: **City of Portland Bureau of Planning and Sustainability**
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1900 SW 4th Ave, Suite 7100, Portland, OR 97201
or
Call: **503-823-4551**

Next Steps

Proposed Draft: Based on *Discussion Draft* feedback, a *Proposed Draft* will be published in early August 2016 for Planning and Sustainability Commission (PSC) consideration. At this time, Portlanders will be invited to submit public testimony to the PSC in writing or in person, at a public hearing scheduled for September 13, 2016. The Commission may amend the proposal and will subsequently vote to recommend the changes and draft plan to Portland City Council. This is called the *Recommended Draft*.

Recommended Draft: City Council will hold an additional public hearing and take formal public testimony on the Recommended Draft. The City Council may amend the Recommended Draft before they vote to adopt the code changes. This will likely occur in December 2016.

The Bureau of Planning and Sustainability is committed to providing equal access to information and hearings. If you need special accommodation, please call 503-823-7700, the City's TTY at 503-823-6868, or the Oregon Relay Service at 1-800-735-2900.

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1. Introduction

In recent years, the rapid development of fossil fuel resources in the Western United States and Canada has prompted many proposals in the Pacific Northwest for large new fuel terminals and infrastructure projects. In early 2015, a proposal by Pembina for a propane terminal in Portland drew substantial public opposition, and Mayor Charlie Hales withdrew a proposal for a zoning amendment that the development would have required. In November 2015, Portland City Council adopted Resolution 37168 calling for opposition to expansion of fossil fuel infrastructure, while supporting infrastructure improvements to existing facilities. In June 2016, City Council adopted the 2035 Comprehensive Plan, which included Policy 6.48 to limit fossil fuel distribution and storage facilities to those needed to serve the regional market. This code-change project begins to implement the policy direction in the resolution by limiting new fossil fuel infrastructure.

Project summary

The Fossil Fuel Terminal Zoning Amendments project would restrict the development of large new Bulk Fossil Fuel Terminals, while providing for expansion at existing terminals and moderately sized new terminal development to accommodate the fuel needs of the region's growing population.

Proposed zoning code amendments:

- Identify "Bulk Fossil Fuel Terminals" as a regulated land use, characterized by marine, railroad, or pipeline transport access and storage capacity exceeding 150,000 barrels.
- Set storage capacity limits that allow for new terminal development large enough to accommodate forecast growth and prohibit development of larger terminals.
- Allow existing terminals to expand, particularly to support seismic upgrades and access to greener fuels.

Why is this important?

Fossil fuel distribution policy – New policy directions adopted by City Council in November 2015 and proposed in the 2035 Comprehensive Plan would limit fossil fuel distribution and storage facilities to those serving the regional market. City Council adopted these policies after holding public hearings and hearing testimony from hundreds of Portlanders.

Climate action goals – Fossil fuels are major contributors to climate change and pollution. The rapid development of fossil fuel resources in the Western United States and Canada has prompted many recent proposals for new export terminals in the Pacific Northwest. The City's Climate Action Plan seeks to reduce greenhouse gas emissions, however, and fossil fuels are the largest source of emissions.

Public safety and environmental protection – Several recent accidents involving fossil fuel distribution across the nation and in Oregon highlight public safety risks in cities and environmental risks along rivers.

Oregon's industrial and distribution center – Portland is Oregon's largest, most diverse distribution hub, and existing Portland petroleum terminals serve more than 90 percent of the statewide market. Proposed code changes would continue Portland's significant role by supporting existing facilities.

Project scope and timing

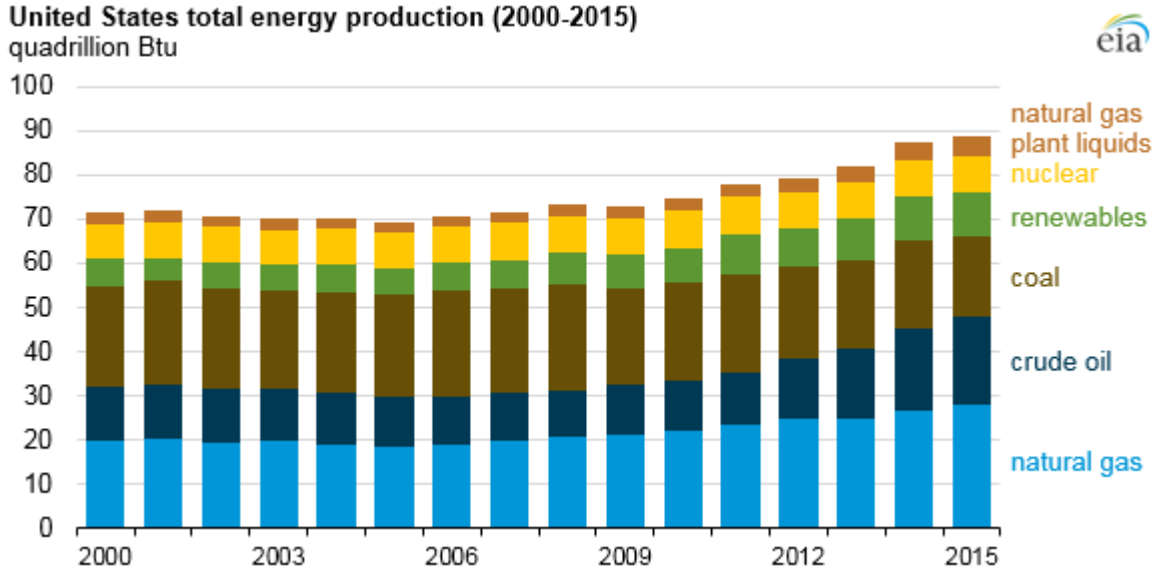
The energy distribution market in the Pacific Northwest is changing. Production of crude oil and natural gas, particularly from North Dakota, has substantially increased in the U.S. since 2009, as shown in Figure 1. In turn, several large new fuel distribution terminals have been proposed in the Pacific Northwest to access West Coast and export markets, as shown in Figure 2. Similar trends have occurred in Alberta and British Columbia.

This project is proposing a prompt, focused response to these market changes. Draft code amendments are being prepared for adoption by the end of 2016 to restrict development of large new fossil fuel terminals. The proposed size standards are sufficient to accommodate the fuel needs of the growing region, while restricting development of large new terminals that would conflict with City and State objectives on climate change and public safety.

Where are Portland's existing bulk fossil fuel terminals?

Portland's industrial districts are Oregon's largest seaport, rail hub, and truck distribution center. The Northwest Industrial District in Portland is also the end of the Olympic Pipeline, which supplies most of Oregon's petroleum fuels from Puget Sound refineries. The ten petroleum terminals located there are the gateway distribution facilities serving Oregon and Southern Washington markets. Additionally, NW Natural's GasCo terminal there provides peak-consumption storage of natural gas for much of the regional market. In Northwest Portland, these "tank farm" storage facilities have direct access to pipeline, deep-water port, railroad, and truck route infrastructure.

Figure 1. Increasing U.S. energy production



Source: U.S. Energy Information Administration, 2016

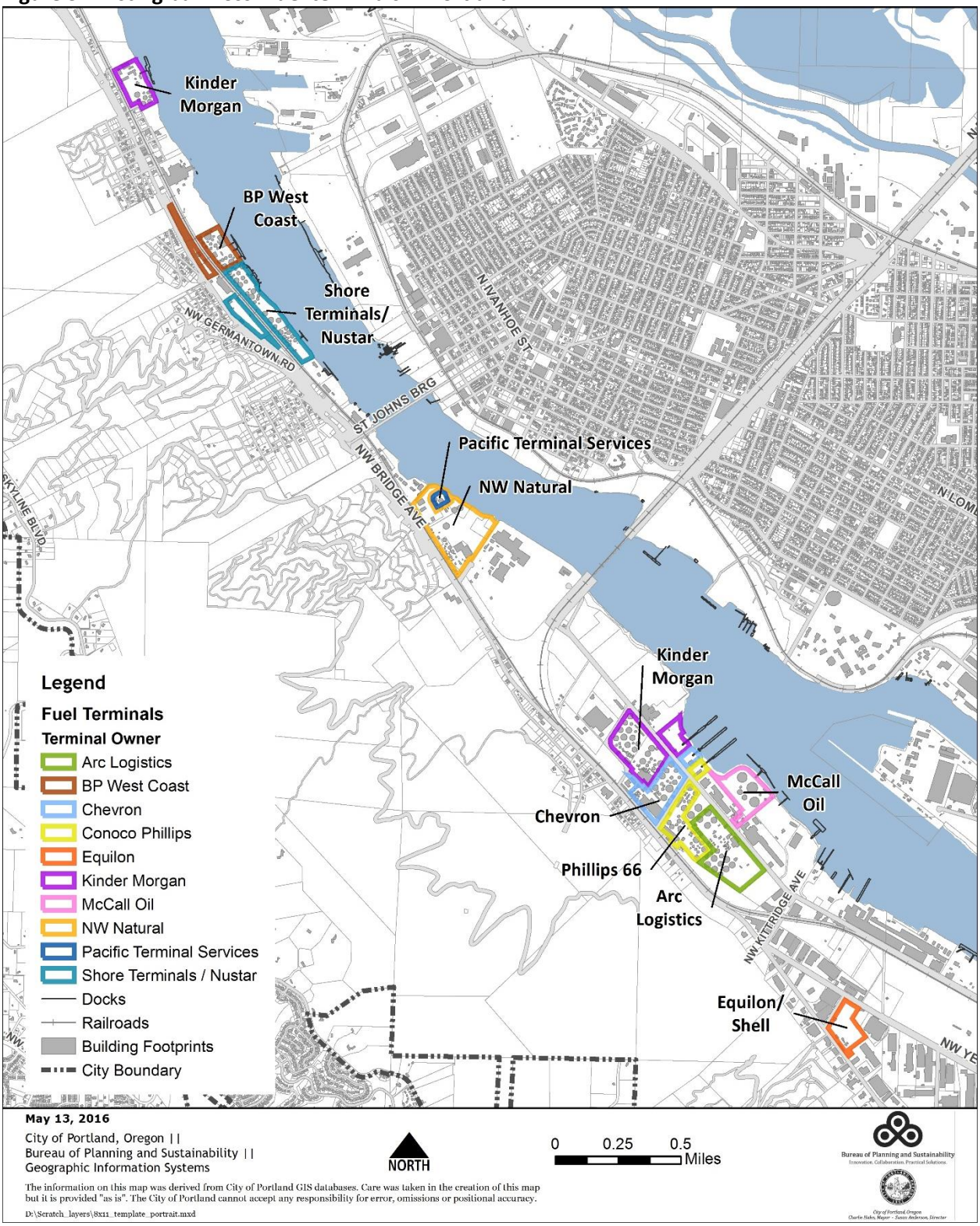
Figure 2. Examples of recent fossil terminal proposals in the Pacific Northwest

Operator	*Facility type*	*Location*	*Proposed new storage capacity*
Petroleum fuels			barrels
Vancouver Energy	Crude oil terminal	Vancouver WA	2,160,000
Imperium Renewables	Biofuels terminal	Grays Harbor WA	720,000
Gaseous fuels			gallons
Oregon LNG terminal	New LNG terminal	Warrenton OR	84,000,000
Jordan Cove LNG	New LNG terminal	Coos Bay OR	84,000,000
Pembina	Propane terminal	Portland	35,000,000
Haven Energy	Propane terminal	Longview WA	23,000,000
Coal			Stockpile acres
Millennium Bulk Terminal	Coal terminal	Longview WA	~20
Ambre Energy	Coal transload facility	St. Helens OR	no storage
Gateway Pacific Terminal	Coal terminal	Bellingham WA	80



Five petroleum terminals are located in the Willbridge area of NW Portland.

Figure 3. Existing bulk fossil fuel terminals in Portland



What's in this report?

This *Discussion Draft* is a roughly 80-percent draft of the project proposals, consisting of code change concepts instead of specific code language. The audience is the general public, including stakeholders, inter-governmental partners, implementers, and other interested parties. Project stakeholders include property owners, businesses, employees, residents, neighbors, business district and neighborhood associations, underrepresented and underserved groups, environmental groups and other community groups. Implementers include the real estate industry, development review staff and others who use the zoning code.

Your feedback on the Discussion Draft will help staff develop a Proposed Draft for the Planning and Sustainability Commission to consider.

This report consists of seven parts:

- **Section 1** introduces the project.
- **Section 2** describes how the proposed code changes implement City policies in Resolution 37168 and the 2035 Comprehensive Plan.
- **Section 3** summarizes public and stakeholder involvement activities that have helped shape and inform this project.
- **Section 4** describes background conditions that inform the proposed zoning concepts.
- **Section 5** describes the analysis of proposed zoning concepts, including related policy directions, implementation issues and rationale.

2. Policy direction

Section 2 describes how the proposed code changes implement relevant City policies in Resolution 37168 and the Comprehensive Plan and comply with federal limitations on interstate commerce.

City of Portland Fossil Fuel Resolution 37168

> BE IT RESOLVED, that the City Council will actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways; and

The proposed zoning code changes are a key implementation action of Resolution 37168, adopted November 2015. Addressing the overall direction of the resolution to oppose expansion of fossil fuel distribution and storage infrastructure, this project proposes size standards that restrict development of large new fossil fuel terminals.

> BE IT FURTHER RESOLVED, that this Resolution does not restrict:
> 1. improvements in the safety, or efficiency, seismic resilience, or operations of existing infrastructure;
> 2. the provision of service directly to end users;
> 3. development of emergency backup capacity;
> 4. infrastructure that enables recovery or re-processing of used petroleum products; or
> 5. infrastructure that will accelerate the transition to non-fossil fuel energy sources; and

The project exempts existing terminals so that the new restrictions do not hinder or increase costs of these safety improvements (such as seismic retrofits) or new infrastructure that accelerates transition to non-fossil fuel energy (such as new tanks for blending biofuels with fossil fuels). The project does not propose restrictions on fossil fuel retailers (such as gasoline filling stations) or smaller regional distributors that receive and deliver fossil fuels exclusively by truck. The proposed code changes do not include size limits that would preclude development of emergency backup capacity. The proposed definition exempts the recovery or reprocessing of used petroleum products.

> BE IT FURTHER RESOLVED, that City bureaus are directed to examine existing laws, including those related to public health, safety, building, electrical, nuisance, and fire codes, and develop recommendations to address fossil fuels that strengthen public health and safety; and

The resolution broadly addresses fossil fuel infrastructure. The zoning code regulates land use patterns and development of fossil fuel distribution facilities on parcels. Zoning does not regulate the quantity of products handled (throughput) on developed sites or their destination (such as exports). Additional amendments to building, fire, and energy codes would need to be addressed in future projects.

> BE IT FURTHER RESOLVED, that the Bureau of Planning and Sustainability is directed to develop proposed code changes for Council consideration to advance the policies set forth in this Resolution; and

The proposed project will specifically implement this provision of the resolution.

> BE IT FURTHER RESOLVED, that prior to any further Council action, the mayor shall schedule (1) a work session to review any proposed code changes and (2) an executive session to review the legal considerations of any proposed code changes; and

The proposed project will implement this process requirement of the resolution.

> BE IT FURTHER RESOLVED, that the Bureau of Planning & Sustainability shall undertake an analysis of the economic impacts of any proposed Code changes to advance the policies set forth in this resolution, with a particular focus on potential impacts to local blue-collar jobs; and

This report includes summary analysis of economic impacts in Section 4, specifically addressing impacts on middle-wage blue collar jobs. The proposed code changes would allow for expansion at existing terminals and moderately sized new terminal development to accommodate regional demand and resulting forecast job growth.

> BE IT FURTHER RESOLVED, that the City and applicable bureaus shall seek and identify opportunities to invest in Portland's 'human infrastructure' by supporting programs to retrain our workforce as the city transitions to a clean energy economy; and

This provision of the resolution is expected to be implemented as a future action.

> BE IT FURTHER RESOLVED, that the City shall consult with its Tribal Government Partners, the State of Oregon, local governments, and other key stakeholder including labor, business, environment, neighborhoods and communities of color in advancing this policy;

The proposed project has sought input from and will continue to reach out to the entities identified above to implement this process requirement of the resolution.

Guiding principles of the 2035 Comprehensive Plan

The Comprehensive Plan sets five Guiding Principles, which encourage balanced, integrated multi-disciplinary approaches that must comply with the Plan. This project is consistent with the Guiding Principles because it promotes major benefits to human health and safety, environmental health and resilience and a balanced approach that integrates economic prosperity and equity.

Economic prosperity

> *Guiding Principle: Support a low-carbon economy and foster employment growth, quality education and training, competitiveness, and equitably-distributed household prosperity.*

Balanced approach - The proposed code changes would provide for expansion at existing fuel terminals and moderately sized new terminal development, accommodating regional demand for fuels and resulting forecast job growth and tax revenue. The proposed code restrictions on large new fossil fuel

terminals would also limit potential financial risks from a major accident involving fossil fuel infrastructure.

Human health

> *Guiding Principle:* Avoid or minimize negative health impacts and improve opportunities for Portlanders to lead healthy, active lives.

Major benefit – The proposed code changes would reduce the scale of low, but potentially catastrophic, safety risks associated with the growth of fossil fuel infrastructure, including oil train derailments, explosive accidents at LNG (liquefied natural gas) and LPG (liquefied petroleum gas) facilities, and seismic risks of tank farms. Fossil fuel emissions and coal dust are also significant sources of air pollution associated with respiratory disorders.

Environmental health

> *Guiding Principle: Weave nature into the city and foster a healthy environment that sustains people, neighborhoods, and wildlife. Recognize the intrinsic value of nature and sustain the ecosystem services of Portland's air, water, and land.*

Major benefit – The human health benefits described above also extend to environmental health. The proposed code changes would reduce the scale of environmental health risks associated with the growth of fossil fuel infrastructure, including oil train derailments along the Columbia River, LNG and LPG facilities in riparian areas, and seismic risks of tank farms along the Willamette River. Fossil fuel emissions are also a significant source of air pollution.

Equity

> *Guiding Principle: Promote equity and environmental justice by reducing disparities, minimizing burdens, extending community benefits, increasing the amount of affordable housing, affirmatively furthering fair housing, proactively fighting displacement, and improving socio-economic opportunities for under-served and under-represented populations. Intentionally engage under-served and under-represented populations in decisions that affect them. Specifically recognize, address, and prevent repetition of the injustices suffered by communities of color throughout Portland's history.*

Balanced approach - The proposed code changes would provide for expansion at existing fuel terminals and moderately sized new terminal development, accommodating regional demand for fossil fuels and associated middle-wage, industrial job growth that disproportionately benefits workers of color. Accommodating regional demand could also reduce regressive impacts of increasing fuel costs.

Resilience

> *Guiding Principle: Reduce risk and improve the ability of individuals, communities, economic systems, and the natural and built environments to withstand, recover from, and adapt to changes from natural hazards, human-made disasters, climate change, and economic shifts*.

Major benefit – The proposed code changes would restrict development of large new fossil fuel terminals that would conflict with City and State objectives on climate change and public safety. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, substituting these fuels for higher-carbon fuels does not begin to approach the goal of an 80% reduction in carbon emissions by 2050 established in Portland's Climate Action Plan or the State's 75% goal.

2035 Comprehensive Plan policies specifically implemented in this project

The proposed zoning changes in the project are implementing the following specific policies.

Overall project direction: Fossil fuel distribution

> *Policy 6.48 Fossil fuel distribution. Limit fossil fuel distribution and storage facilities to those necessary to serve the regional market.*

The proposed code changes would implement Policy 6.48 by restricting development of large new fossil fuel distribution terminals while accommodating forecast regional growth.

Related policy directions

> *Policy 4.81 Disaster-resilient development. Encourage development and site-management approaches that reduce the risks and impacts of natural disasters or other major disturbances and that improve the ability of people, wildlife, natural systems, and property to withstand and recover from such events.*
>
> *Policy 4.82 Portland Harbor facilities. Reduce natural hazard risks to critical public and private energy and transportation facilities in the Portland Harbor.*

Policies 4.81 and 4.82 are met by not restricting expansion or hindering safety or efficiency improvements at existing terminals. Incremental expansion at existing terminals provides an important pathway for safety improvements, providing financial return to cover improvement costs.

> *Policy 6.2 Diverse and expanding economy. Align plans and investments to maintain the diversity of Portland's economy and status as Oregon's largest job center with growth across all sectors (commercial, industrial, creative, and institutional) and across all parts of the city.*
>
> *Policy 6.5 Economic resilience. Improve Portland's economic resilience to impacts from climate change and natural disasters through a strong local economy and equitable opportunities for prosperity.*
>
> *Policy 6.6 Low-carbon and renewable energy economy. Align plans and investments with efforts to improve energy efficiency and reduce lifecycle carbon emissions from business operations. Promote employment opportunities associated with the production of renewable energy, energy efficiency projects, waste reduction, production of more durable goods, and recycling.*

The proposed code changes are consistent with Policies 6.2, 6.5, and 6.6, providing for incremental fossil fuel growth as part of a diverse, expanding economy and restricting development of large new fossil fuel terminals that conflict with resilience and climate action goals.

Existing Comprehensive Plan policies specifically implemented in this project

The 2035 Comprehensive Plan was adopted in June 2016 and is not expected to take effect until early 2018. In the meantime, the existing Comprehensive Plan is in effect.

> 7.6 Energy Efficient Transportation. Provide opportunities for non-auto transportation including alternative vehicles, buses, light rail, bikeways, and walkways. The City shall promote the reduction of gasoline and diesel use by conventional buses, autos and trucks by increasing fuel efficiency and by promoting the use of alternative fuels.
>
> 7.8 Energy Supply. The City shall promote conservation as the energy resource of first choice. The City shall also support environmentally acceptable, sustainable energy sources, especially renewable resources such as solar, wind, hydroelectric, geothermal, biomass (wood, farm and municipal waste), cogeneration, and district heating and cooling.

The proposed code changes are consistent with Policies 7.6 and 7.8, promoting the use of alternative energy sources by restricting development of large new fossil fuel terminals.

2015 Climate Action Plan

> Goal: Reduce local carbon emissions 80 percent from 1990 levels by 2050, with an interim goal of 40 percent by 2030.

As described in Section 4, lower-carbon fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, but they do not approach the goal of an 80% reduction in carbon emissions by 2050 in Portland's Climate Action Plan or the State's 75% goal. Investments in major infrastructure typically take decades to recoup, and the transition to renewables needs to go much faster than that to stabilize global emissions. The proposed code changes are consistent with the 80% goal of the Climate Action Plan by restricting development of large new fossil fuel terminals.

Federal jurisdiction on regulation of interstate commerce

Federal law restricts local regulatory authority over interstate commerce in various ways. The Proposed code changes would allow for expansion at existing terminals and moderately sized new terminal development, and they will not constrain interstate commerce or create a protectionist advantage to Oregon residents or businesses. Most of the existing fuel terminals are operated by international or national companies that are not headquartered in Oregon.

3. Public and stakeholder involvement

Section 3 summarizes public and stakeholder involvement activities that have helped shape and inform this project. These activities are further explained in Appendix A of this report.

What have we heard leading up to this project?

Public hearings at the Planning and Sustainability Commission and City Council on the Pembina terminal development proposal in 2014 and Resolution 37168 in 2015 drew testimony from hundreds of people. The overall theme of that testimony was strong objection to the Pembina project and support for the fossil fuel resolution. Primary reasons included the neighborhood safety and health risks and inconsistency with the City's climate action objectives. The Resolution also drew letters with strong opposition from state and regional business associations.

Following adoption of the Resolution in November 2015, City Council added the related Policy 6.48 on fossil fuel distribution to the draft 2035 Comprehensive Plan, reflecting the recently adopted policy direction in the Resolution. Public involvement in the Comprehensive Plan included public hearings in April 2016 on City Council amendments and thousands of comments on the 2035 Comprehensive Plan over the previous 8 years. The proposed code amendments are consistent with several sustainability-related policies in the Plan. Addressing issues with policy tradeoffs, the 2035 Comprehensive Plan calls for a balanced, integrated approach to implement multiple goals. As described in Section 2, the proposed code amendments provide major benefits toward implementing three of the Plan's five guiding principles and a balanced approach that integrates the other two guiding principles.

Public involvement activities in this project

Public involvement in concept development for the project consisted primarily of four stakeholder focus groups, which were held in June 2016 to review preliminary code concepts and help identify and understand potential implementation issues. The focus groups highlighted the range of stakeholder perspectives and interests concerning the proposed zoning changes. Figure 4 summarizes the themes of issues raised in the focus groups. Other outreach activities have included meetings with interagency partners, terminal operators, and other interested stakeholders. These activities and what we heard in them are further described in the appendix of this report.

Inter-governmental coordination

An In-House Draft Report was circulated to inter-bureau partners in June 2016, and their comments have helped to shape and inform the Discussion Draft, particularly addressing code administration and legal limitations. Bureau of Planning and Sustainability staff will continue to meet with inter-governmental partners to refine responses to implementation issues.

Figure 4. Summary themes of stakeholder focus group comments

TOPIC	FUEL TERMINAL REPRESENTATIVES	ENVIRONMENTAL AND HEALTH ORGANIZATIONS	STATE AND REGIONAL BUSINESS ORGANIZATIONS	NEIGHBORHOOD AND EQUITY ORGANIZATIONS
Key issues	▸ We've operated safely for decades. We meet the federal/state low-carbon fuel standards. ▸ Difficult to participate: very quick process; emotionally driven; antitrust restrictions. ▸ Unintended impacts: harder to meet clean fuel standards; more trucks on road; costs to rest of the state.	▸ Looking for strong, model code. Expect community backlash if expectations not met. ▸ Safety needs to be integral with climate - Mosier oil train wreck; terminals in liquefaction soils. ▸ Include disaster risks in economic analysis. Bonding or insurance for worst case.	▸ Resolution requires more research on economic impacts, etc. ▸ How will the code hold up in 5 years? ▸ What is the goal? If climate or safety, zoning tool is not the right fit. ▸ Portland is not an economic island. Statewide impact. ▸ Big political decision. Don't rush it.	▸ Safety and pollution are our priority. Look closely at seismic and explosion risks. ▸ A reasonable expectation for growth is smart. ▸ This is aggressive. Without LNG, won't China burn more coal? ▸ Rail safety in the Gorge is also a key issue that this can't resolve.
New land use category	▸ If unclear, permit staff could be pressured - unpredictable results. ▸ Use federal West Coast PADD 5 "region."	▸ Regulate both existing and new facilities. ▸ New code must effectively implement the policy.	▸ Need clear definitions: region, export, end user. ▸ Do not make terminals non-conforming or an ambiguous limited use.	▸ Why allow it in IG2? ▸ A new export terminal in contaminated harbor is unlikely.
Definition of fossil fuels	▸ Natural gas considered a low carbon fuel by State, so why included here? ▸ Tomorrow's cleaner fuels won't meet today's definitions.	▸ Excluding methanol undermines policy. ▸ If end use is mostly fuel, then limit it. ▸ One new LNG tank is a big risk. So is coal.	▸ Federal and state are going a different direction, requiring cleaner fossil fuels. Why restrict cleaner fuels at cross purposes?	▸ Make way for bio-diesel as a cleaner fuel. ▸ Methanol not a fuel in Oregon - overreaching. ▸ Fuels are okay if they have no emissions.
Terminal development restrictions	▸ Some sites are already built-out. ▸ Our non-contiguous sites are connected by pipelines. ▸ Can't comment on size.	▸ Most prefer Option A. ▸ Caution about Commerce Clause. ▸ 1% annual growth metric is too high.	▸ Don't come at sideways. Unclear rationales will lead to appeals. ▸ Size limits would put region on "import diet." ▸ Dated, low forecast.	▸ Option C preferred. ▸ Allow for modest growth of LNG and oil; not coal. ▸ Review size limits every few years.

4. Background conditions

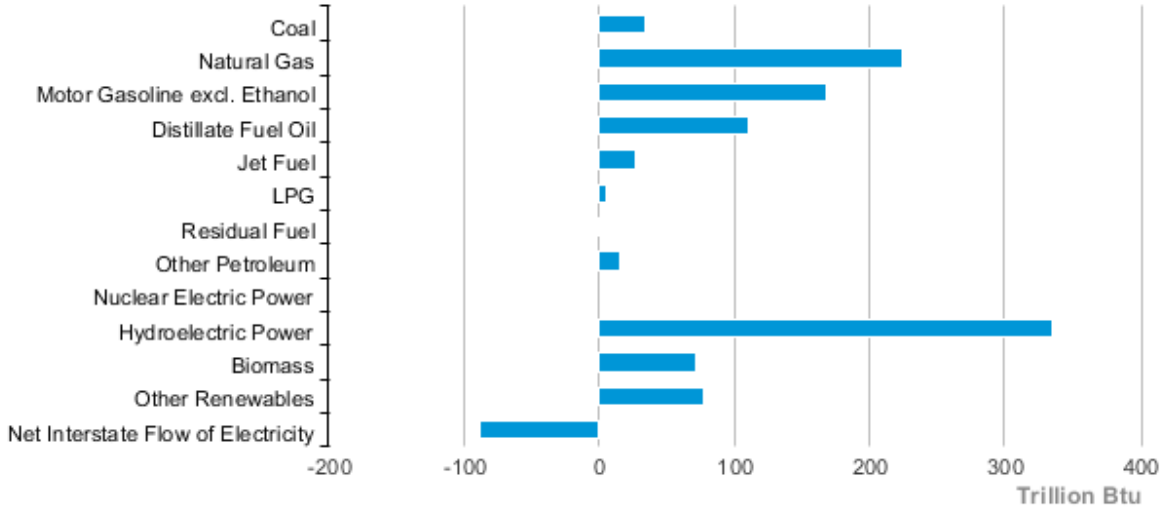
This section of the report describes background conditions that inform the proposed zoning concepts. Topics include access to energy, impacts on the economy, climate change impacts, and health and safety impacts of draft zoning code changes. Background information on changing energy markets in the Pacific Northwest and Portland's existing fossil fuel terminals is included in the Section 1. Legal and policy background information is presented in Section 2.

Access to energy

Energy consumption in Oregon

Oregon residents and businesses rely on fossil fuel distribution and storage facilities to meet their energy consumption needs. Estimated state energy consumption by fossil fuels and other sources are shown in Figure 5. Residents and businesses in much of Southern Washington also rely on Portland terminals for access to fuels.

Figure 5. Oregon energy consumption estimates, 2014



eia Source: Energy Information Administration, State Energy Data System

Five refineries in the Puget Sound area supply nearly all of the petroleum fuels consumed in Oregon, delivered primarily through the Olympic Pipeline that terminates at the cluster of 10 petroleum terminals in Northwest Portland. From there, petroleum products are delivered to Oregon and Southern Washington markets via truck, pipeline and barge. NW Natural supplies natural gas to its Western Oregon market area and operates peak-consumption storage terminals in Northwest Portland

and Newport. Thus, fossil fuel terminals in Portland are a primary statewide distribution hub location for transportation fuels and natural gas.

Figure 6. Estimated storage capacity at existing and proposed fuel terminals

Operator	*Facility type*	*Location*	*Site acres*	*Storage capacity*	*New Storage capacity*
Petroleum fuels					
Existing Portland terminals				bbls	2035 forecast
Chevron	Petroleum terminal	NW Portland	21	1,600,000	352,000
Kinder Morgan Willbridge	Petroleum terminal	NW Portland	33	1,551,000	342,000
Arc Logistics	Asphalt/crude oil	NW Portland	39	1,466,000	323,000
NuStar	Petroleum terminal	NW Portland	22	1,191,000	262,000
McCall Oil	Petroleum terminal	NW Portland	19	930,000	205,000
Conoco Phillips	Petroleum terminal	NW Portland	21	760,000	167,000
BP West Coast	Petroleum terminal	NW Portland	18	601,500	132,000
Kinder Morgan Linnton	Petroleum terminal	NW Portland	13	420,000	92,000
Equilon/Shell	Petroleum terminal	NW Portland	38	400,000	88,000
Pacific Terminal Services	Petroleum terminal	NW Portland	2	275,000	61,000
Recently proposed new terminals or reinvestment in Pacific NW				bbls	Proposal
Vancouver Energy	Crude oil terminal	Vancouver WA	47	NA	2,160,000
Imperium Renewables	Biofuels terminal	Grays Harbor WA	11	NA	720,000
NuStar	Petroleum terminal	Vancouver WA	19	775,000	Reuse tanks
Gaseous fuels					
Existing Portland terminals				LNG gal	2035 forecast
NW Natural GasCo	LNG plant/terminal	NW Portland	41	7,000,000	3,200,000
Recently proposed natural gas terminals/storage in Pacific NW				LNG gal	Proposal
Oregon LNG terminal	New LNG terminal	Warrenton OR	96	NA	84,000,000
Jordan Cove LNG	New LNG terminal	Coos Bay OR	400	NA	84,000,000
NW Natural North Mist	Gas reservoir storage	Mist OR	2,644	NA	2.5 Bcf gas
Other recent proposals (now inactive) for gaseous fuel terminals				LPG gal	Proposal
Pembina	Propane terminal	Portland	38	NA	34,000,000
Haven Energy	Propane terminal	Longview WA	24	NA	23,000,000
NW Innovation	Methanol plant	Kalama WA	83	NA	67,000,000
Coal					
Existing Portland terminals					
None					
Recently proposed coal terminals in Pacific NW					Stockpile acres
Millennium Bulk Terminal	Coal terminal	Longview WA	100	NA	~20
Ambre Energy	Coal transload facility	St. Helens OR		NA	no storage
Gateway Pacific Terminal	Coal terminal	Bellingham WA	334	NA	80

Terminology: bbls = barrels, Dth = decatherms, LNG = liquified natural gas, LPG = liquified propane gas, Bcf = billion cubic feet, AAG = average annual growth.

Sources: Oregon DEQ for petroleum tank data. NW Natural 2014 Integrated Resource Plan for existing capacity and forecast at 1.9% AAG. BST, Portland Harbor Forecast (2012) for petroleum terminals at 1.0% AAG.

Size of recently proposed terminals and expected growth at existing terminals

There is a wide margin between the size of recently proposed crude oil, coal, and LNG terminals proposed in the Pacific Northwest and the scale of expected growth of existing Portland fuel terminals that generally serve the regional market area, as shown in Figure 6. Proposed code changes for terminal size limitations within that margin would allow for expansion at existing terminals and moderately sized new terminal development to meet market area consumption needs, as described in Section 5.

Liquid bulk cargo in Portland Harbor is projected to expand at a range of 0.5% to 1.0% average annual growth (AAG) to 2040 (BST Associates, 2012), providing an estimate of market expansion needs for petroleum fuels. The 1.9% average annual growth forecast to 2034 (NW Natural 2014 Integrated Resource Plan) provides an estimate of market expansion needs for natural gas distribution facilities. Contradictory stakeholder comments were received that these growth projections are too high, too low, and could change substantially with market innovations. To address this uncertainty, code commentary will be proposed to consider future adjustments in storage capacity size limitations as needed to accommodate market changes over time.

Impacts of draft code changes on the economy

Jobs and wages at Portland's fuel terminals

In 2014, the 11 existing fuel terminals in Portland shown in Figure 3 provided approximately 280 jobs at their sites and supported an estimated 720 total jobs in the metropolitan area. The annual payroll at those terminals was $23 million, which supported total personal income of $92 million in the metropolitan area.

BPS calculated these supported employment and income estimates from the induced and indirect impacts from metropolitan area purchases by these firms and their employees. For example, the jobs of the Longshore Union workers who unload fuels from tankers at these fuel terminals are not counted as direct jobs at the terminal sites. The multipliers used for these calculations were estimated from the average employment and income effects of marine terminals in Portland (Martin Associates, 2012). The job and wage estimates were calculated from Quarterly Census of Employment and Wages (QCEW) data.

Portland's industrial area jobs have an important urban equity role in that they consist primarily of middle-wage jobs that do not require 4-year college degrees, which the overall economy has been losing since 2000. In contrast, jobs in commercial districts are concentrated primarily in low- and high-wage quartiles (fourths) of overall city employment. Middle-wage job growth supports the "income self-sufficiency" objectives of the Portland Plan and 2035 Comprehensive Plan (Policy 6.28) to expand access to self-sufficient wage levels.

Long-term job growth to 2035 is estimated at 1.6% average annual growth in the warehousing, transportation and utilities sector in Portland's 2016 Economic Opportunities Analysis and Metro's 2014 Urban Growth Report. Applying this growth rate to Portland's existing fuel terminals, approximately 110 net new permanent jobs is expected between 2014 and 2035, which is the equivalent of about four new terminals at their current average size. The total metropolitan area job impact of this fuel terminal expansion would be approximately 290 new jobs by 2035. If fuel terminal job growth occurred at a slower 1.0% average annual rate, matching the forecast growth of liquid bulk cargo volumes in Portland Harbor, approximately 65 net new terminal jobs would be generated by 2035, supporting a total 170

new jobs in the metro area. Pembina's proposed propane terminal in 2014 was estimated to create 30 to 40 new permanent jobs and 600-800 temporary construction jobs.

The Proposed code changes would allow for expansion at existing terminals and moderately sized new terminal development to accommodate regional demand and resulting job growth.

Tax revenues of new terminals

State and local revenues from income and property taxes vary widely by facility. For example, property taxes on the depreciated improvements value of existing fuel terminals is much lower than new construction. If fuel terminals added 110 net new direct jobs by 2035 and the resulting state and local tax revenues is typical of businesses and developed facilities in Portland's Working Harbor (Martin Associates, 2016), the estimated new state and local tax revenues in fiscal year 2035 (in 2015 dollars) are $1.6 million. In contrast, the proposed $500 million Pembina project was estimated to generate approximately $12 million in annual property tax revenue, reflecting the increased improvements value and property taxes of new construction.

The Proposed code changes would allow for expansion at existing terminals and moderately sized new terminal development and resulting state and local tax revenue. However, prohibiting large scale new terminals such as Pembina could result in similar levels of foregone property taxes.

Growth opportunities in fossil fuel distribution

The most recent cargo forecast for Portland Harbor in 2012 projected 1.0% AAG in liquid bulk tonnage to 2040 as a high scenario and 0.5% AAG as a low scenario (BST Associates, 2012). Based on this forecast, ECONorthwest (2012) estimated no additional land need for new liquid bulk terminals. Since 2012, several new fuel terminals have been proposed in the Pacific Northwest, as shown in Figure 2.

Updating the liquid bulk forecast at this point would be challenging for several reasons. Most of the recent fuel terminal proposals have since been abandoned or appear to be dormant. Policy and permitting uncertainty complicate the development feasibility of new terminals and transportation infrastructure. Crude oil prices have fallen sharply in 2015 and 2016, reducing the current market potential for major investments. Expanding global industrial product markets after the Great Recession slowed substantially in 2015. And energy distribution markets could change abruptly with continuing product innovations and location shifts in global production.

In the long term, Portland has competitive advantages for accommodating energy terminal development as a Pacific Rim gateway location to growing Asian markets, the Columbia River's low-gradient railroad access for heavy cargo through the Cascades, and Oregon's freight infrastructure hub. On the other hand, Portland's industrial land supply for continuing growth is limited, and expanding cargo markets for autos, grain and dry bulks are competing for current growth capacity.

Other economic impacts

Energy infrastructure and terminal investments appear to have low but potentially catastrophic risks of major accidents, as described below. Examples include seismic resilience of petroleum terminals in the event of a Cascadia Subduction Zone earthquake, oil train derailments, explosions at LNG (liquefied natural gas) and LPG (liquefied petroleum gas, such as propane) facilities, and others.

Clean Energy is a target industry in the City of Portland. An emerging cluster of Portland area business activity in solar and wind energy manufacturing, green building development, and other fields of sustainable urban innovation presents long-term business growth opportunities. Substantial local investment in fossil fuel infrastructure and large new terminals could hinder local growth momentum in Clean Energy industries.

Climate change impacts of draft code changes

Climate impact of fossil fuels

Fossil fuels are major contributors to climate change and pollution, as described in Portland's 2015 Climate Action Plan. Greenhouse gas emissions from the burning of fossil fuels and land use changes, including deforestation, are the primary causes of climate change. The Intergovernmental Panel on Climate Change's most recent report documents the overwhelming evidence that human activities have been the major driver of recent warming of the Earth's surface, and that climate change and its consequences will continue into the future (IPCC, 2013).

The magnitude of future climate impacts depends largely on the trajectory of future global greenhouse gas emissions. Greenhouse gas emissions from human activities have continued to rise in recent decades, reaching the highest rates in human history between 2000 and 2010 (IPCC, 2014). About half of all carbon dioxide emissions, the most prevalent greenhouse gas, between 1750 and 2010 occurred in the last 40 years. The energy, industry and transportation sectors have dominated these emissions increases. On the current trajectory, global transportation emissions will double by 2050.

Transition to "renewable" and "clean" fuels

The U.S. Environmental Protection Agency (USEPA) implements the federal Renewable Fuel Standard (RFS) that requires transportation fuel sold in the U.S. to contain a minimum volume of renewable fuels. The RFS originated with the Energy Policy Act of 2005 and was expanded and extended by the Energy Independence and Security Act of 2007 (EISA). Similarly, ODEQ implements the Oregon Clean Fuel Program. ODEQ describes "clean fuel" as a fuel with a lower carbon intensity than that of the fuel it replaces.

Examples of "clean fuels" in Oregon's program include most types of ethanol, biodiesel, natural gas, biogas, electricity, propane and hydrogen. The Oregon Clean Fuel Standard sets 2015 as a baseline that represents 10 percent ethanol blended with gasoline and 5 percent biodiesel blended with diesel. The rule also requires a 10 percent reduction in average carbon intensity from 2015 levels by 2025.

Terminal representatives and business stakeholders urged that proposed zoning code changes not create a disincentive or barrier to compliance with these federal and state rules, which may require additional tank capacity to implement. Environmental and public health organization representatives pointed out that City Resolution 37168 addresses fossil fuels generally, including lower-carbon fossil fuels like natural gas and propane. The proposed fuel terminal size limits and exemption for existing terminals are specifically intended to not hinder compliance with the renewable and clean fuel standards, as described in Section 5.

Velocity of transition to non-fossil fuel energy

Portland's Climate Action Plan sets a goal for an 80% reduction in greenhouse gas emissions by 2050. Oregon's climate action goals similarly call for 75% reduction by 2050. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, they don't begin to approach the 80% reduction that the City is striving for or the State's 75% goal. ODEQ estimates that the greenhouse gas emissions reduction from switching from gasoline to compressed natural gas, for example, is 18%; for propane, it is 15%. The lower-carbon fossil fuels do have appeal as a bridge to widespread use of renewable energy, but investments in major infrastructure typically take decades to recoup, and the transition to renewables needs to go much faster than that to stabilize global emissions.

During recent hearings and analysis on Resolution 37168 and the Pembina terminal proposal, the question of whether to differentiate between fossil fuels with different carbon content was widely discussed. In the lead up to the resolution, an option was proposed that would oppose new coal and oil infrastructure but allow for other fossil fuels that could show a likely net decrease in carbon emissions. City Council decided not to apply this option in the resolution.

Health, safety, and environmental impacts of draft code changes

Seismic resilience and liquefaction soils

The 2035 Comprehensive Plan sets policy direction (4.75 and 4.76) to encourage disaster-resilient development and specifically to reduce natural hazard risks to critical energy and transportation infrastructure in Portland Harbor.

The 2016 Critical Energy Infrastructure Hub Study underway by the Portland Bureau of Emergency Management includes a literature review and modeled risks of structural damage to critical infrastructure from earthquakes, floods, landslides, volcanic activity, wildfire, and other sources. Along with petroleum and natural gas infrastructure, the study is also assessing infrastructure risks to emergency services, transportation, electricity, potable water, and waste water. The study area includes the Northwest and Linnton industrial areas. PBEM has identified significant seismic risks at the fuel terminals from a major Cascadia Subduction Zone earthquake because of their location in a filled riverfront plateau area with high susceptibility location for soil liquefaction.

The project exempts existing terminals so that the new restrictions do not hinder or increase costs of safety improvements such as seismic retrofits. Future amendments to building and fire codes to improve seismic safety of fossil fuel infrastructure may also be adopted to implement Resolution 37168.

Safety of liquefied gas terminals

Liquified natural gas (LNG) and liquefied petroleum gas (LPG, such as propane) facilities pose safety risks from potential explosions and fire. The Pembina propane terminal, which was proposed in 2014 at the Port of Portland Terminal 6, is an apt case study. The Pembina terminal would have required environmental zoning code amendments that did not move forward.

The issue of safety risks was discussed extensively during review of the proposed Pembina terminal, and a quantitative risk assessment study was prepared to inform that review process (Det Norske Veritas (U.S.A.), Inc., 2015). The study estimated the risk from flammable releases, such as jet fires, pool fire, flash fire, vapor cloud explosions, fireball and Boiling Liquid Expanding Vapor Explosion (BLEVE). The risk

was presented as individual risk in the form of location-specific risk contours extending outward from the proposed facilities, and as societal risk in the form of potential loss of life and cumulative frequency of various accidents. The highest offsite risk level was found to be 1 fatality in 1,000 years in areas directly north and south of facility. The nearest residential zones are located beyond the risk level contour of one 1 fatality in 100 million years. The cumulative societal risk was estimated at 1 statistical fatality every 38 years. The study also include various facility design and siting recommendations to mitigate identified risks.

Another risk assessment (Northwest Citizen Science Initiative, 2015) on the Pembina project was presented by environmental groups and neighbors, including the Hayden Island Neighborhood Association. The analysis identifies additional sources of risk from BLEVE cascades, terrorist events, and magnitude 9 earthquakes. The authors recommend not locating a propane terminal within 10 miles of the Portland/Vancouver urban area.

Public safety risks from a new LNG or LPG facility are estimated to be very low relative to other urban hazards, although possible impacts could be catastrophic. The proposed code amendments are expected to reduce public safety risks by prohibiting development of large new LNG or LPG facilities.

Oil train accidents

On June 3, 2016 an oil train traveling through the Columbia River Gorge partially derailed in Mosier en route to Tacoma. The 16-car derailment resulted in a 1,000-barrel spill and fires that lasted nearly a day. Small amounts of oil reportedly reached the river, and nearby drinking water and wastewater facilities in Mosier were affected.

An Associated Press analysis of accident records found that 26 oil-train derailments or fires have occurred nationally in the last decade. The national geography of increasing oil extraction in the inland Great Plains states and refineries concentrated on the coasts is contributing to this trend. Risk of how often such derailments are likely to occur in the Columbia Gorge is disputed, with one estimate as high as one every 30 months.

Preliminary reporting on the cause of the Mosier derailment pointed to failed bolts in the track that are difficult to detect. Union Pacific reported that improvements are underway to replace bolts on 530 miles of curved track nationwide. Railroad safety is regulated at the federal level and monitored by the Federal Railroad Administration. A recent Government Accounting Office report has identified challenges and delays in implementing some federal rail safety regulations.

The proposed code amendments could incrementally reduce rail accident risks by limiting development of large new fossil fuel terminals at a West Coast rail hub location. However, restricting the location of new petroleum terminals in the City of Portland is not expected to substantially affect the volume of petroleum cargo transported by rail to Puget Sound refineries. The Portland/Vancouver area is a rail hub location, where West Coast rail lines running north-south intersect the low gradient east-west rail corridor along both sides of the Columbia River. Roughly half of the east-west rail cargo destined for the Seattle-Tacoma area, in addition to Oregon-bound rail cargo, moves through the Portland metropolitan area. Derailment risk within Portland is reduced by the numerous siding destinations and congestion of the "Portland Triangle" area where UP and BNSF lines come together. However, derailment risks to natural resources, especially along rivers, and to rural communities appear to be significant.

5. Code concepts and analysis

This section of the report describes the proposed zoning change concepts by topic area, including the related policy directions, implementation issues, and rationale for the proposed zoning changes. Specific code changes are not included in this report, but will be part of the Proposed Draft, which is scheduled to be completed in August 2016 and discussed by the Planning and Sustainability Commission in September 2016.

1. **Types of distribution and storage facilities to be regulated**

Policy direction:

- City Council Resolution 37168 (adopted November 2015) calls for opposing expansion of infrastructure for transportation and storage of fossil fuels, subject to various exceptions, including safety improvements, service to end users, and infrastructure that accelerates transition to non-fossil fuel energy.
- 2035 Comprehensive Plan Policy 6.48 Fossil Fuel Infrastructure (adopted June 2016, not effective until 2018) also calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market.

Preliminary code concepts:

- Limit development of new Bulk Fossil Fuel Terminals as a regulated land use.
- Bulk Fossil Fuel Terminals are engaged in freight movement or wholesaling of fossil fuels at facilities that are characterized by having (1) marine, pipeline or railroad transport access and (2) either transloading facilities for transferring a shipment between transport modes (such as from rail to ship) or bulk storage facilities exceeding 150,000 barrels (or 6.3 million gallons or equivalent) of fossil fuels. Examples include petroleum terminals, liquid natural gas terminals, and coal terminals. Functionally, these terminals are typically regional gateway facilities, where fossil fuels enter and exit the region, but the use classification is intended to be clearly identifiable and not rely on a definition of region.
- Exceptions that are not Bulk Fossil Fuel Terminals:
    - Retail sales of fossil fuels, such as gasoline or propane filling stations;
    - Distributors, wholesalers, and industrial service uses that receive and deliver fossil fuels exclusively by truck;
    - End-user facilities that store fossil fuels for primary use at or near the site, such as manufacturing, agriculture, and airports;
    - Uses that recover or reprocess used petroleum products;
    - Waste-related uses that transfer or store solid or liquid wastes, such as landfills.

Implementation issues:

- Definition of region – Portland is a regional distribution hub for energy and other products, and this zoning change is not intended to restrict energy access to the growing region. However, the regional market area of Bulk Fossil Fuel Terminals varies by product and is difficult to define. Portland's 10 petroleum terminals generally serve Oregon and Southern Washington. This

market area substantially exceeds the Portland metropolitan area, which is often colloquially referred to as the region. Some terminal representatives pointed out that the federal government's 5-state West Coast PADD 5 region is generally their regional market area. BDS staff commented that zoning does not regulate the target market (destination) of wholesale products, and the zoning code does not define region. Business organization representatives commented that the energy markets and related market areas are likely to change over time. Therefore, the proposed land use incorporates the concept of a regional market into the size limits, and a zoning definition of region is not proposed here.

- End users – Resolution 37168 lists a specific exception to not restrict service directly to end users. At a small scale, services to end users include retail gasoline filling stations, natural gas access lines in street right-of-way to residential and business customers, and heating oil tanks at home sites. Larger scale end users with fossil fuel storage and access infrastructure also include manufacturers, jet fuel facilities at the PDX Airport, vessel fuel facilities on Portland Harbor, and others, where use fossil fuels as an input. Again, the limits on new facilities are sized to apply only to larger distribution facilities.

- Interpretation of use category – Terminal and business representatives commented that ambiguity in the use description could result in conflicting expectations, pressured interpretations, appeals, and inconsistent code implementation. While underlying policy accommodates regional access and exceptions that may be difficult to clearly define, the land use designation is proposed to be defined by clear and objective size thresholds and marine/railroad/pipeline access.

2. **Definition of fossil fuels**

Policy direction: City Council Resolution 37168 applies to fossil fuel infrastructure and storage generally and does not distinguish among types or carbon intensity of fossil fuels.

Preliminary code concept:

- Definition of fossil fuels: petroleum products (such as crude oil and gasoline), coal, and gaseous fuels (such as natural gas and propane) that are made from decayed plants and animals that lived millions of years ago and are used primarily as a source of energy.
- Exclusion of non-fuel products – Petrochemicals that are used primarily for non-fuel products are excluded, such as plastics, lubricants, fertilizer, roofing, and paints.
- Methanol is included as a fossil fuel. Development of methanol storage and transportation facilities would be limited similarly to LNG and LPG terminals.
- Denatured ethanol and similar fuel additives and biodiesel/renewable diesel with less than 5% fossil fuel content are not fossil fuels.
- Biogas from wastewater treatment plants, anaerobic digesters, landfills and other sources is not a fossil fuel.

Implementation issues:

- Definition of fossil fuels – Definitions of fossil fuels vary by source. Here are some examples.

- Oregon Department of Environmental Quality (ODEQ) – Fossil fuels: fuels such as oil, natural gas, and coal that are made from decayed plants and animals that lived millions of years ago. These fuels are made of hydrogen and carbon (hydrocarbons).
- U.S. Environmental Protection Agency (USEPA), 40 C.F.R. § 60.41 - Fossil fuel means natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such materials for the purpose of creating useful heat.
- Oregon Department of Energy Administrative Rule, OAR 345-001-0010 - "Fossil fuel" means natural gas, petroleum, coal and any form of solid, liquid or gaseous fuel derived from such materials that serves as useful energy.

- Renewable and clean fuel standards – As described in Section 4, USEPA implements the federal Renewable Fuel Standard (RFS) that requires transportation fuel sold in the U.S. to contain a minimum volume of renewable fuels. Similarly, ODEQ implements the Oregon Clean Fuel Program. ODEQ identifies examples of "clean fuels" in Oregon as most types of ethanol, biodiesel, natural gas, biogas, electricity, propane and hydrogen. Terminal representatives and business stakeholders urged that proposed zoning code changes not create a disincentive or barrier to compliance with these federal and state rules, which may require additional tank capacity to implement. Environmental and public health organization representatives pointed out that City Resolution 37168 addresses fossil fuels generally, including clean fuels. The proposed fuel terminal size limits and exemption for existing terminals will allow more than enough supply to comply with the renewable and clean fuel standards.

- *Methanol – Large methanol plants have recently been proposed in Tacoma, Kalama, and St. Helens. Methanol plants tend to have structural similarities to LNG and LPG terminals, including large-scale and gas pipeline access, and they can have similar safety and climate impacts. Stakeholder focus groups were asked whether any* special inclusions, such as methanol, should be considered. Most people commenting noted that methanol is primarily used in the production of plastics and other non-fuel uses. Views differed among environmental organizations commenting. Some noted that excluding it undermines the policy. The draft code concept proposes to prepare code amendments that limit development of large methanol plants similarly to LNG or LPG terminals.

- *Denatured ethanol* – A terminal operator pointed out that "pure" ethanol made from corn or other non-fossil source is required by the Alcohol and Tobacco Tax and Trade Bureau to be denatured in order to be transported to the site. Denatured ethanol typically contains up to 5% methanol, so that it is toxic and undrinkable. Storage of denatured ethanol is proposed to be exempted. In other words, denatured ethanol tanks would not be counted as part of the maximum storage capacity of fossil fuel terminals.

- Biogas products from landfills – BES staff commented that biogas from landfills and other sources are not fossil fuels and should not be restricted by the proposed zoning changes. The proposed description of fossil fuel terminals specifically excludes waste-related uses, such as landfills, which are regulated as a separate land use in the zoning code. Also, the proposed

definition of fossil fuels, described as being made from decayed plants and animals that lived millions of years ago, would not include biogas from a landfill.

3. Exemption of existing facilities

Policy direction:

- City Council Resolution 37168 includes various exemptions to not restrict safety or efficiency improvements, service to end users, emergency backup capacity, infrastructure for recovery or re-processing of used petroleum products, or infrastructure that will accelerate the transition to non-fossil fuel energy sources.
- 2035 Comprehensive Plan Policies 4.75 and 4.76 call for encouraging disaster-resilient development and reducing natural hazard risks to critical energy and transportation infrastructure in Portland Harbor.

Preliminary code concept:

- Bulk Fossil Fuel Terminals that were established before the effective date of these regulations, including the existing facilities identified in Figure 1, are allowed. Limitations on development of Bulk Fossil Fuel Terminals do not apply to these sites. Proposed code changes would not inhibit improvements at these existing facilities, including seismic upgrades, infrastructure for greener fuels, and expansion.
- Off-site (non-contiguous) expansion of existing facilities is subject to the proposed limitations on development of Bulk Fossil Fuel Terminals.
- Recognize that some existing terminal sites span both sides of streets, interconnected by pipelines within the street right-of-way.

Implementation issues:

- Non-conforming use status can be a disincentive for desired improvements. Zoning regulates new development. In contrast, existing development is "grandfathered in," meaning that preexisting uses can continue to operate and expand, subject to limitations. Significant improvements to non-conforming uses generally require a "non-conforming situation review." This discretionary public review process could add significantly to the cost and uncertainty of investments at fossil fuel terminals. The proposed limitation of fossil fuel terminal development would exempt existing facilities, in order to avoid the need for a non-conforming review and a resulting disincentive for seismic, efficiency, and clean fuel investments on existing facilities, consistent with policy direction in Resolution 37168 and the Comprehensive Plan.

- Divergent stakeholder views – Stakeholder focus group participants generally urged that existing fuel terminals should not be changed to a non-conforming use. Reasons ranged from providing a critical product to not discouraging desired improvements on existing facilities. However, comments from environmental and public health organizations generally supported restricting expansion of existing terminals, while some participants cautioned about political and legal tradeoffs of making the existing fuel terminals non-conforming.

4. **Approach for limiting new storage facilities**

Policy direction: Limit fossil fuels distribution and storage facilities to those necessary to serve the regional market.

Preliminary code concept:

- Classify Bulk Fossil Fuel Terminals as a limited use in the Heavy Industrial (IH) zone and a prohibited use in all other base zones.
- *Limit the total capacity of storage facilities at new Bulk Fossil Fuel Terminals. Applying no size limits on existing terminals (see map). Maximum size limits of new* Bulk Fossil Fuel Terminals:

Fossil Fuel Type	**Maximum Storage Capacity**
Petroleum	*500,000 barrels*
Liquefied Natural Gas (LNG)	*7,000,000 gallons*
Other Liquified Gas Fuels	*7,000,000 gallons*
Coal	*Prohibited*

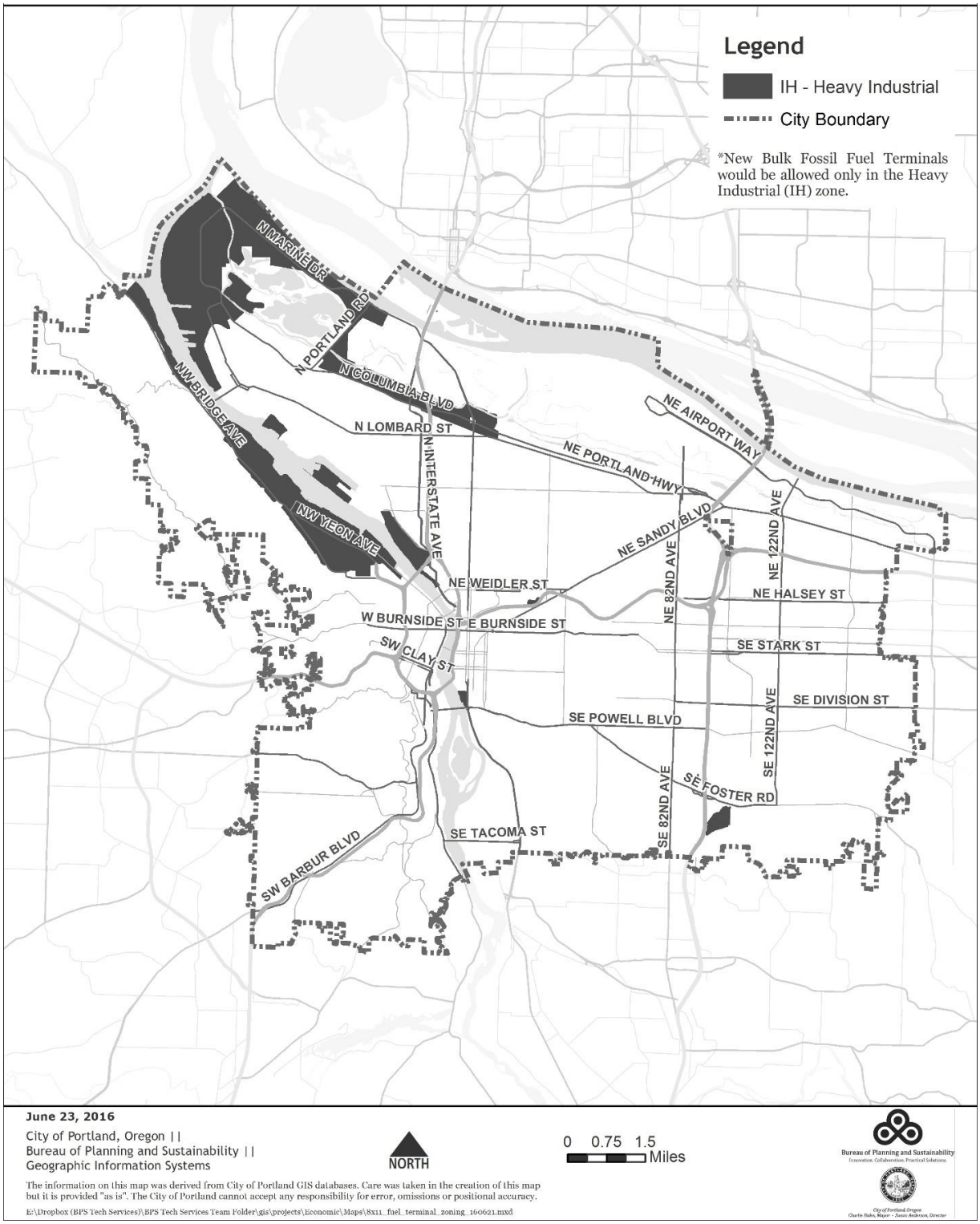
Implementation issues:

- Potential federal restrictions – Federal law restricts local regulatory authority over interstate commerce in various ways. The Proposed code changes would allow for expansion at existing terminals and moderately sized new terminal development, which will not constrain interstate commerce or create a protectionist advantage to Oregon residents or businesses. Most of the existing fuel terminals are operated by international or national companies that are not headquartered in Oregon.

- Providing regional market access to fuels – The fossil fuels consumed in Oregon are not extracted or refined in the state. As a result, fossil fuel terminals provide a needed service in distributing fuels to the growing population of the regional market area. Figure 6 in Section 4 indicates a wide margin between the size of recently proposed crude oil, coal, and LNG terminals proposed in the Pacific Northwest and the scale of expected growth by existing Portland fuel terminals that serve the regional market area. Proposed terminal size limitations within that margin would allow for expansion at existing terminals and moderately sized new terminal development to meet market area consumption needs.

- Balanced, integrated policy approach – The proposed limitations on fossil fuel distribution entail tradeoffs among public goals for environmental protection, public health and safety, meeting energy needs, and economic prosperity, as described in Section 4. The Comprehensive Plan calls for a balanced, integrated approach in land use regulations to meet these public objectives, as described in Section 2. The proposed size standards provide for significant environmental and safety benefits in limiting development of large new fossil fuel terminals, while providing for moderate expansion of fuel terminals to adequately meet regional energy needs and accommodate resulting economic benefits.

Figure 7. Fossil fuel terminal limitation area



The code concepts of this report are being published for public review and comments through July 27. Next steps will include discussions with community groups and preparation of code language to refine these code concepts in response to what we hear. A Proposed Draft is scheduled to be completed by mid-August 2016.

Appendix A: Stakeholder focus group results

Public involvement in the concept development for the Fossil Fuel Terminal Zoning Project consisted primarily of four stakeholder focus groups as well as meetings with fuel terminals and other individuals or organizations. The focus groups were held in June 2016. The purpose of the focus groups was to help identify and understand the issues that should help shape the preliminary zoning code being considered by this project. The focus groups also helped to expeditiously reach out to a broad range of stakeholders. While their perspectives and interests are shared on some topics, they diverge on other topics.

In addition to the stakeholder focus groups, BPS staff met with several fuel terminals to explain the proposal, answer questions, and discuss their individual concerns. This was needed because antitrust regulations constrained discussion about certain topics, for example supply chains, in the presence of representatives from other fuel terminals. Primarily, the terminal operators explained their operations and facilities, many of which differed substantially from other terminals.

Who participated?

Figure 8 lists the participants of the four focus groups conducted. Ten to twelve participants were invited to each meeting, although not everyone was able to attend. The first focus group consisted of fuel terminal representatives who have a direct stake in the proposed regulations. The second group was environmental and public health organizations, some of whom advocated for the resolution before City Council and have community safety and sustainability in mind. The third group were state and regional business and government organizations. Their interest was to protect the state economy by testing the proposal against economic realities. The fourth group was neighborhood and equity community organizations whose interests were to protect neighborhoods adjacent to the terminals and underserved communities who may rely on terminals for employment. Additionally, the Mayor's Office invited input from Native communities and tribal governments.

What discussion questions were asked?

The focus groups were provided background materials describing the preliminary code change concepts about two weeks before the focus group meetings. BPS staffed prompted the focus group across four topics:

1. Issues that should shape the project
2. Types of distribution and storage facilities to be regulated
3. Definition of fossil fuels
4. Zoning approach for limiting new storage facilities

In addition to specific questions within each topic, participants were invited to share any general and wrap-up comments during the focus group.

Figure 8. Stakeholder Focus Group Participants, June 2016.

STAKEHOLDER	DATE	ATTENDEES
Fuel terminal representatives	Thursday, June 02, 2016	Gilbert Betancourt, Phillips 66 Nick Giotta, Phillips 66 Stephanie Williams, Phillip 66 Andrew Holbrook, Kinder Morgan Shanna Brownstein, Northwest Natural Kevin Jones, McCall Oil Pamela Brady, BP West Coast Jerry Henderson, Chevron Kevin Buffum, Pacific Terminal Services Steve Kober, NuStar Will Rassmussen, WSPA Frank Holmes, WSPA Chris West, Pac/West and Arc Terminals Nathan Eggers, Arc Terminals Jerome Jackson, NuStar Rob Hill, NuStar Zach Klonoski, Mayor's Office
Environmental and health organizations	Tuesday, June 07, 2016	Regna Merritt, Ore. Physicians for Social Responsibility Trish Weber, Center for Sustainable Economy Meredith Connolly, Climate Solutions Kristen Sheeran, Climate Solutions Nick Caleb, 350PDX/CSE Bob Salinger, Audubon Society Dan Serren, Columbia Riverkeeper Adriana Voss-Andreae, 350PDX Micah Meskel, Portland Audobon
State and regional business organizations	Thursday, June 09, 2016	Jana Jarvis, Oregon Trucking Association Greg Theisen, Port of Portland Ellen Wax, Working Waterfront Jay Clemens, Associated Oregon Industries Mark Landauer, Oregon Public Ports Association Marion Haynes, Portland Business Alliance Corky Collier, Columbia Corridor Association Kelly Ross, NAIOP Shanna Brownstein, Northwest Natural Emerald Bogue, Port of Portland Susan Lahsene, Port of Portland Phil Grillo, Davis Wright Tremaine
Neighborhood and equity organizations	Tuesday, June 14, 2016	Jeff Geisler, Hayden Island Neighborhood Association John Bradley, Northwest District Association Travis Argue, UA Local 290 Willy Myers, Columbia Pacific Building Trades

What we heard

For each topic area, the results of the focus groups are summarized in Figure 4 of Section 3. That table summarizes the main themes and concerns raised during the focus groups.

Key issues

Fuel terminal representatives objected to this policy direction in general. They discussed their safe operating history and commitment to implement the federal and state standards for renewable and clean fuels. There were challenges to participating in the conversation, but they agreed to work cooperatively on this project to get the code right. For example, anti-trust laws precluded the group from engaging in certain conversations because it would involve disclosing information about their supply chains and could be considered collusion in court of law. This group was concerned with the fast timeline and felt the policies should be discussed first.

They also felt the process was emotionally driven, not having considered the unintended consequences. For example, with renewable and clean fuel standards constantly in flux, they felt that zoning rules could make it more difficult to meet these standards. Restricting growth here in Portland at the end of the Olympic Pipeline could put more trucks on the road, instead of more efficient pipeline or rail transportation. The group asserted that there could also be significant economic impacts on the rest of the state, given that 95% of Oregon's fuel passes through Portland first. Lastly, fuel terminal representatives expressed concern for additional administrative burdens that a new land use category would bring. For example, what steps would be necessary for these firms to demonstrate that they were existing operations prior to the new zoning rules? Additionally, they warned that their site configuration may pose a challenge to effective zoning rules, as they are often non-contiguous operations connected by interconnected pipelines.

The environmental and public health organizations felt the policy direction was less aggressive toward fossil fuels than what the City Council resolution had proclaimed. They felt the resolution sought to outright prohibit new development and expansion on existing facilities. Because of this, they cautioned about community backlash if this proposal did not meet expectations. In this vein, they highlighted that Portland will be the first city to fully implement this type of policy, so the project could be an opportunity to set a strong precedent and model code for other cities. This group also felt that resident health and safety was also a top priority. They noted the seismic risks posed by fuel terminal tank farms that lie on liquefaction zones as well as the June 2016 oil train wreck in Mosier. For these reasons, they felt Portland Bureau of Emergency Management (PBEM) and other environmental justice groups should be involved in safety considerations. Lastly, the group felt the economic impact statement should include more than the impact on jobs. It should also consider the risks of economic and financial damages from a natural disaster. Members of this focus group offered to provide technical analysis on the impacts that the proposed options could have on the environment and public health and safety. Some noted that risks should be accounted for through bonding or insurance requirements under worst-case scenarios.

State and regional business organizations felt that this undertaking requires more research. The resolution set required tasks, including an economic impact analysis and an examination of relevant laws, and they felt these tasks should be completed before laying the groundwork through code development. They felt the marine cargo forecast for liquid bulks of 1% growth is outdated and too low. (Note, an opposite reaction was expressed by environmental and health organization representatives who felt this figure was too high.) Similarly, they feared that the code may not hold up well in five years

because of constantly changing energy markets. For example, in five years Portland could be shipping cleaner fuels to the Midwest. Some members expressed concern that the zoning code may not be the right tool to achieve some of the GHG (greenhouse gas) reduction and public safety goals that this resolution aimed to achieve. If the goal is public safety, then the City should require or create incentives for seismic upgrades. They stated that, if the goal is to reduce greenhouse gases, then prohibiting the export of cleaner-burning fuels, such as LNG (liquefied natural gas), may have the opposite intended effect. Lastly, the group asserted the important role that Portland's fuel terminal facilities play in rest of the state economy. They warned of political and economic repercussions that these decisions could have. They shared the view with fuel terminal representatives that this is a big political decision—the timeline is too short and the process should not be rushed.

Neighborhood and equity community organizations communicated that safety, pollution and accidental releases were their top priority when considering zoning for fuel terminals. They wanted a close examination of the seismic and explosion risks associated with fuel terminals. For example, which terminals are in liquefaction zones? Where are the storage tanks located in relation to neighborhoods? They sought honesty about the risks posed to the Linnton neighborhood specifically. Rail safety in the Columbia Gorge was also a key issue. The June 2016 incident in Mosier highlighted the risks. A potential solution they offered would be more pipelines, but they are difficult to get built. This group recognized the difficulty in managing competing values. They felt a reasonable expectation of growth is a smart idea. One participant described the proposal as aggressive, adding that by prohibiting LNG export terminals, global export destinations like China may end up burning dirtier fuels, such as coal. They felt this also meant Portland would forego export profits.

New land use category

Fuel terminal representatives were concerned for the clarity of the rules. They felt that the definition of "bulk terminal" is very important to be clear. If the definition was open to interpretation, then permit staff could be pressured. They warned that creating "bulk fuel terminal" as a specifically regulated use could lead to unpredictable results. This group was also concerned with the definition of "region." They were unsure if off-shore distribution was the issue, advocating for using the federally recognized West Coast region (PADD 5) as the definition of "regional market." PADD 5 includes Oregon, Washington, California, Nevada, Arizona, Alaska and Hawaii.

Environmental and public health organizations wanted to see the regulation go beyond new facilities and also look at limits on expansion at existing facilities. They felt the City Council resolution was clear and unambiguous about opposing expansion of fossil fuel infrastructure, which includes expansions at existing sites. They emphasized the importance for getting the right definition of "bulk terminal" and the associated size limit (or prohibition)—these must be correct in order to effectively implement the policy. Some members questioned whether seismic upgrades at existing facilities could be allowed but expansions prohibited. This group also urged the inclusion of PBEM's work on hazards in liquefaction zones in this project.

State and regional business organizations echoed the concerns for clear and correct definitions that the fossil fuel representatives posed. "Region," "export," "end user," and "fossil fuel" are all important terms to get right. They also were strongly opposed to making existing facilities non-conforming uses, as well as making them limited uses with unclear exceptions. This would expose projects to discretionary land use actions, which is costly and unpredictable, and hence risky. It would likely make improvements that the community values, such as seismic upgrades, more difficult to attain.

Neighborhood and equity community organizations were skeptical that a new export terminal would be proposed in the Portland area in the wake of Pembina. They felt that Superfund sites were too expensive to acquire and build on. The group also wondered whether a new zone for fossil fuels ought to be created instead of a land use. They questioned why it ought to be allowed in IG2.

Definition of fossil fuels

Fuel terminal representatives were primarily concerned with the long-term applicability of the proposed rules. Energy markets and new technologies are constantly in flux, and it is difficult to know what the size requirements might be for newer—perhaps cleaner—fuels, particularly blended fuels. This group sought clarification for what "green fuels" meant. They noted that the proposed inclusion of LNG among city-regulated fossil fuels is inconsistent with the State of Oregon's inclusion of LNG as a "clean fuel." They called for periodic review of the rules when tomorrow's cleaner fuels become known, as they may not meet today's definitions. They cautioned about unintended consequences of placing restrictions on fossil fuel terminals, such as potentially putting more trucks on the road by restricting growth at facilities with pipeline, marine and rail access. This may result in considerably more GHG emissions. They also felt that methanol should not be included in the list of regulated fuels because it is used more as a value-added commodity than a fuel. They shared this last viewpoint with most other focus groups, except the environmental and health organizations.

Environmental and public health organizations looked to the intent of the City Council resolution and noted that it included propane, methanol, natural gas and other low-carbon fuels. At the same time, they agreed that code changes should provide flexibility to meet Oregon's low carbon fuel standard. They noted that methanol is currently being used as a fuel, so excluding it undermines the policy. The group sought clarification on how to address non-fuels. Some suggested that the GHG emissions of these input commodities should help ground their use. Others thought that the proportions (e.g., in blended fuels) should be considered—if the product is mostly used as a fossil fuel, then it should be regulated and restricted. Lastly, they highlighted how even one new LNG tank in Portland is a major safety issue. Although not explosive, coal also poses a significant risk, especially in transportation. Because of these risks, they believed that the resolution should be implemented through health and safety standards.

State and regional business organizations expressed frustration that while the federal and state government are going one direction requiring cleaner-burning fuels, the City of Portland appears to be choosing to restrict distribution of these cleaner fuels in another policy direction. Some members thought the City could try to incentivize a higher blend of renewables, and others warned of the disincentives that could discourage investment—disincentives should limit GHG emissions, not seismic upgrades.

Neighborhood and equity community organizations thought that restricting methanol exports would be an overreach. They said it is not being used as a fuel in the United States, and instead it is a value-added product used in manufacturing of plastics and other goods. Including methanol would negatively impact the manufacturing sector that requires it as an input, and it could open the door to regulating other non-fuel commodities, such as paints and asphalt. In general, they felt that if we can make certain fuels cleaner burning, then it poses minimal threat. They asserted that, since there is no clear transitional path away from our dependency on fossil fuels, we should make way for cleaner alternatives, such as blended bio-diesel.

Terminal development restrictions

Fuel terminal representatives were concerned with potential restrictions precluding development on certain site configurations, which have some peculiarities. For example, where two existing tank farms are non-contiguous (e.g., at Willbridge) and are connected by facility pipelines, they should be allowed an option for expansion. Additionally, some sites may already be built out and cannot accommodate the new growth that is expected. This group could not comment on facility size and anticipated growth, because of anti-trust laws, but they noted that it is critically important. For this reason, they could not provide feedback on the implementation options presented.

Environmental and public health organizations generally preferred Option A. However, some recognized the legal challenges posed by federal restrictions. They wondered if health and human safety risks may provide a defensible rationale. Some members also noted that while prohibiting all new facilities and making existing facilities non-conforming uses might be more legally defensible, it is much less politically feasible. Finally, some members of this group were skeptical of the 1% annual growth forecast for liquid bulks. They felt this was too high, which is contrary to what the state and regional business organization representatives stated.

State and regional business organizations criticized the approach to implementing the City Council resolution. They felt that zoning to regulate tank size approaches the problem sideways, and the unclear rationale could lead to appeals and legal challenges. One participant advocated to prohibit exports more directly, rather than a sideways approach. They cautioned that tank size limits could essentially put the region on an "import diet," even if the intent of the limit is to reduce throughput. They did not think this proposal accounted for these unintended impacts. Docked ships in the harbor may need an LNG tank to power their facilities and improve air quality, for example. They also noted that there are economic advantages and efficiency gains to being a bigger facility, and placing restrictions on size will have consequences that we don't want—lower wages for example. Lastly, they felt the 1% annual growth forecast for liquid bulks was outdated—an updated forecast would be higher. This was the opposite of what environmental and public health organizations stated.

Neighborhood and equity community organizations generally preferred Option C, calling it a realistic proposal that allows for some growth but doesn't restrict it too much. While the group was fairly resolute that coal is not a good alternative, they recognized that LNG is a cleaner-burning fuel. However, since the facilities in the region are already at capacity, Option C would allow for some wiggle room for the region's growth. They felt it would allow the "invisible hand" to guide the market more easily. They recommended that the City review the size limits every few years as the market changes.

Fossil Fuel Terminal Zoning Amendments
Preliminary Code-Change Concepts, May 16, 2016

Project summary

The Fossil Fuel Terminal Zoning Amendments project would help implement new policy direction on fossil fuel distribution and storage facilities through changes to the Zoning Code. This proposal would restrict the development of *new* bulk fossil fuel terminals. However, proposed code changes would not inhibit *improvements to existing terminals*; they would instead accommodate seismic upgrades, access to greener fuels and capacity for regional growth.

Code change concepts

1. New land use type - Identify "Bulk Fossil Fuel Terminals" as a specifically regulated land use.
    - Use characteristics: These establishments are engaged in interregional transport and bulk storage of fossil fuels. Terminal activities may also include fuel blending, regional distribution, and wholesaling. Typical facilities have interregional freight access via ship, barge, pipeline or railroad to transport fuels to or from the site, and they have bulk storage scaled for large quantities to serve regional or larger markets. There is minimal on-site sales activity with the customer present. Regional market area varies by product and typically includes Oregon and southern Washington. This definition is intended to include the 11 bulk fossil fuel terminals in NW Portland shown on the table and map below, while not applying to the dozens of smaller fuel distributors in Portland.
    - Definition of fossil fuels: crude oil and refined petroleum products (such as gasoline), natural gas and related gaseous fuels (such as propane), and coal. Petroleum or gaseous products used primarily as raw materials to make other products such as plastics, fertilizer, paint, or other non-fuel products are not included.
        - *How should methanol be classified?* For example, methanol is used primarily for manufacture of plastics and other products, but sometimes is used as a fuel.
    - Examples: crude oil terminals, petroleum products terminals, natural gas terminals, propane terminals, and coal terminals.
    - Exceptions: gasoline stations and other retail sales of fossil fuels, fuel distributors that transport fuels exclusively by trucks, and manufacturers that utilize fossil fuels as an input.

2. Limits on new terminals
    - Proposed code changes would apply to new terminals added after the effective date of the code changes. The code changes are not intended to make existing terminals non-conforming or create an impediment to improvements at existing terminals. Here are three potential options.
        - *Option A: Prohibit new bulk fossil fuel terminals.* This option will not regulate development at existing terminals. It could limit competition among terminals and could preclude new facilities for innovative greener fuels.
        - *Option B: Prohibit new fossil fuel "marine" terminals. Marine terminals would include all fossil fuel export terminals.* This option would allow new terminals with access to pipelines and rail, but preclude river access for barges and tankers.
        - *Option C: Limit the size of storage facilities at new bulk fossil fuel terminal (no size limits on existing terminals). Size limits could vary by fossil fuel type (see table).*

Potential Size Limits for New Terminals

Fossil Fuel Type	**Maximum Storage Capacity**
Petroleum	*500,000 barrels*
Liquefied Natural Gas (LNG)	*7,000,000 gallons*
Liquefied Propane Gas (LPG)	*7,000,000 gallons*
Coal	*Prohibited*
Other	

New storage capacity for larger volumes would be prohibited. The capacity limits could be set to effectively preclude the range of recently proposed fossil fuel terminals in the Pacific Northwest, but would allow for growth at existing terminals. Size examples are shown on the table below.

Code implementation issues

- Project timing – This project is expected to be completed by the end of 2016. The timing provides for a prompt response to the changing fossil fuel distribution market and rapid development of fossil fuels in the Western U.S. and Canada. The fast timeline also limits the potential scope of the project.
- Others?

Code-concept questions for discussion

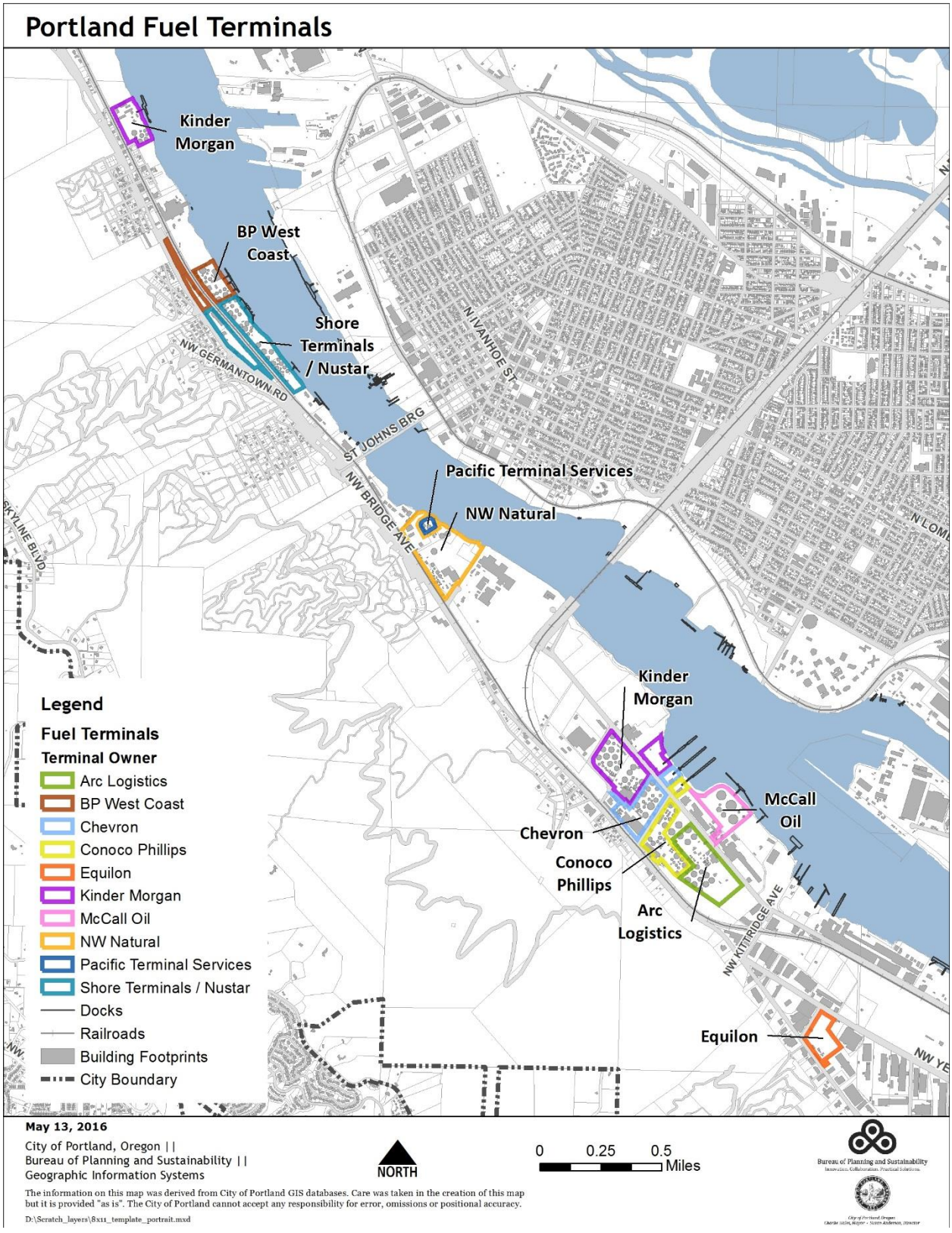
1. What issues need to be addressed for this code change to be appropriate and effective? Examples might be special circumstances or locations, unforeseen impacts, fairness considerations, or other concerns.
2. How should fossil fuels be defined in the zoning code? - The proposed code concept specifies fossil fuels by type, including petroleum products (e.g., gasoline), coal, and natural gas and related gaseous fuels (e.g., propane). Petrochemicals used primarily for non-fuel products are excluded, such as plastics, lubricants, fertilizer, roofing, and paints. Should any special inclusions be considered, such as methanol?
3. What zoning approach for limiting terminal storage capacity makes most sense? Option A prohibits all new terminals. Option B only prohibits new marine terminals. Option C allows for new terminals but limits their storage capacity. Do you prefer one of these options or another approach?

Estimated storage capacity at existing and proposed bulk fossil fuel terminals

Operator	*Facility type*	*Location*	*Site acres*	*Existing Storage*	*New Storage capacity*
Petroleum fuels					
Existing Portland terminals				bbls	2035 forecast (1% AAG)
Chevron	Petroleum terminal	NW Portland	21	1,600,000	352,000
Kinder Morgan Willbridge	Petroleum terminal	NW Portland	33	1,551,000	342,000
Arc Logistics	Asphalt/crude oil	NW Portland	39	1,466,000	323,000
NuStar	Petroleum terminal	NW Portland	22	1,191,000	262,000
McCall Oil	Petroleum terminal	NW Portland	19	930,000	205,000
Conoco Phillips	Petroleum terminal	NW Portland	21	760,000	167,000
BP West Coast	Petroleum terminal	NW Portland	18	601,500	132,000
Kinder Morgan Linnton	Petroleum terminal	NW Portland	13	420,000	92,000
Equilon/Shell	Petroleum terminal	NW Portland	38	400,000	88,000
Pacific Terminal Services	Petroleum terminal	NW Portland	2	275,000	61,000
Recently proposed new terminals or reinvestment in Pacific NW				bbls	Proposal
Vancouver Energy	Crude oil terminal	Vancouver WA	47	NA	2,160,000
Imperium Renewables	Biofuels terminal	Grays Harbor WA	11	NA	720,000
NuStar	Petroleum terminal	Vancouver WA	19	775,000	Reuse tanks
Gaseous fuels					
Existing Portland terminals				LNG gal	2035 forecast (1.9% AAG)
NW Natural GasCo	LNG plant/terminal	NW Portland	41	7,000,000	3,200,000
Recently proposed natural gas terminals/storage in Pacific NW				LNG gal	Proposal
Oregon LNG terminal	New LNG terminal	Warrenton OR	96	NA	84,000,000
Jordan Cove LNG	New LNG terminal	Coos Bay OR	400	NA	84,000,000
NW Natural North Mist	Gas reservoir storage	Mist OR	2,644	NA	2.5 Bcf gas
Other recent proposals (now inactive) for gaseous fuel terminals				LPG gal	Proposal
Pembina	Propane terminal	Portland	38	NA	35,000,000
Haven Energy	Propane terminal	Longview WA	24	NA	23,000,000
NW Innovation	Methanol plant	Kalama WA	83	NA	67,000,000
Coal					
Existing Portland terminals					
None					
Recently proposed coal terminals in Pacific NW					Stockpile acres
Millennium Bulk Terminal	Coal terminal	Longview WA	100	NA	~20
Ambre Energy	Coal transload facility	St. Helens OR		NA	no storage
Gateway Pacific Terminal	Coal terminal	Bellingham WA	334	NA	80

Terminology: bbls = barrels, Dth = decatherms, LNG = liquified natural gas, LPG = liquified propane gas, Bcf = billion cubic feet, AAG = average annual growth.

Sources: Oregon DEQ for petroleum tank data. NW Natural 2014 Integrated Resource Plan for existing capacity and forecast. BST, Portland Harbor Forecast (2012) for petroleum terminals.


Portland Fuel Terminals
Kinder Morgan
BP West Coast
Shore Terminals / Nustar
Pacific Terminal Services
NW Natural
Kinder Morgan
McCall Oil
Chevron
Conoco Phillips
Arc Logistics
Equilon
NW GERMANTOWN RD
N IVANHOE ST
ST JOHNS BRG
NW BRIDGE AVE
SKYLINE BLVD
NW KITTRIDGE AVE
Legend
Fuel Terminals
Terminal Owner
Arc Logistics
BP West Coast
Chevron
Conoco Phillips
Equilon
Kinder Morgan
McCall Oil
NW Natural
Pacific Terminal Services
Shore Terminals / Nustar
Docks
Railroads
Building Footprints
City Boundary
May 13, 2016
City of Portland, Oregon | |
Bureau of Planning and Sustainability | |
Geographic Information Systems
NORTH
0 0.25 0.5 Miles
The information on this map was derived from City of Portland GIS databases. Care was taken in the creation of this map but it is provided "as is". The City of Portland cannot accept any responsibility for error, omissions or positional accuracy.
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Bureau of Planning and Sustainability

RESOLUTION No. 37168 As Amended

Oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways (Resolution)

WHEREAS, the rapid development of fossil fuel resources in the western U.S. and Canada has resulted in numerous facility and infrastructure projects proposed to transport coal, diluted bitumen, natural gas, propane or other fossil fuels through the West Coast; and

WHEREAS, fossil fuels pose risks to safety, health, and livability, including mobility of people, other freight, and other commercial vehicles; and

WHEREAS, fossil fuel infrastructure poses considerable risks in the event of a major earthquake; and

WHEREAS, the extraction and combustion of fossil fuels are significant sources of greenhouse gas emissions and major contributors to climate change and pollution; and

WHEREAS, coal contains toxic heavy metals, including mercury, arsenic and lead, and exposure to these toxic heavy metals is linked to cancer, birth defects and other health problems; and

WHEREAS, transportation of coal using open top rail cars results in significant volumes of materials escaping during transit, exposing communities to toxic heavy metals in coal dust and particulates at levels potentially harmful to adjacent communities, workers, wildlife and nature; and

WHEREAS, crude oil, including oil derived from the Bakken shale reservoir, is known to be volatile, highly flammable and to contain elevated levels of benzene, a potent carcinogen; and

WHEREAS, extraction of fossil fuels through fracking and tar sands processing, which has become widespread throughout the Western United States and Canada, has damaging impacts to human and environmental health and fracking increases the potential for earthquakes; and

WHEREAS, transporting crude oil, coal and other fossil fuels into Oregon involves traversing challenging mountain passes, areas laced with significant earthquake faults and numerous older unsafe bridges lacking appropriate infrastructure maintenance or upgrades, significantly increasing the risks of serious accidents; and

WHEREAS, given the record of crude oil and coal or other fossil fuel transport accidents, such as Lac Mégantic in 2013, the 1999 Bellingham pipeline leak or a coal train derailment, an event could have catastrophic effects if it occurred in any of Oregon's populated areas; and

WHEREAS, the risks posed by the transportation of fossil fuels through the Columbia Gorge are inconsistent with the Gorge's designation as a National Scenic Area; and

WHEREAS, historically, when environmental accidents do occur, litigation over damages is drawn out over years, deflecting blame while undercutting timely assistance to affected communities; and

WHEREAS, tribal communities in Oregon and Washington have expressed concerns about the safety risks of fossil fuel infrastructure and the related threats to human health, cultural heritage, and environmental quality; and

WHEREAS, economic opportunities presented by expanding fossil fuel infrastructure are modest, with few jobs and little value added when compared to the related environmental costs; and

WHEREAS, local, regional and global economies are transitioning to low-carbon energy sources, and West Coast businesses are leaders in providing energy efficiency and renewable energy technologies and services; and

WHEREAS, the future of the fossil fuel industry is questionable given global action to reduce greenhouse gas emissions; and

WHEREAS, climate change, if unchecked, will continue impact human health, natural systems, and infrastructure, creating new costs for individuals, businesses, and governments; and

WHEREAS, the City's *2015 Climate Action Plan* (adopted by Resolution 37135) identifies the need to establish a "fossil fuel export policy that considers lifecycle emissions, safety, economics, neighborhood livability and environmental impacts" (*Climate Action Plan*, action 3G, page 69); and

WHEREAS, the City and Multnomah County, working together with many individuals, and community and business partners, have reduced local carbon emissions 14 percent since 1990 while adding population and jobs; on a per person basis, carbon emissions have decreased 35 percent since 1990; and

WHEREAS, the *2015 Climate Action Plan* commits the City to continue to advance policy and programs to reduce local fossil fuel use both in the City's own operations and through community-wide initiatives; and

WHEREAS, in September 2015, the Council added fossil fuel companies to the City's Corporate Securities Do-Not-Buy List, committing the City to hold no financial stake in the 200 largest fossil fuel firms. Resolution 37153; and

WHEREAS, 27 Oregon and Washington communities have passed resolutions addressing fossil fuel transport and export, and hundreds of public officials, including the governors of Oregon and Washington, state and federal agencies, tribes, health organizations, religious leaders and other community leaders, have recognized the harms presented by fossil fuels to the environment and Northwest communities; and

WHEREAS, in 2012, the Council expressed opposition to coal trains traveling through Portland until a programmatic, comprehensive and area-wide Environmental Impact Statement and comprehensive Health Impact Assessment are completed. Resolutions 36959 and 36962; and

WHEREAS, the City is continuing to work with utilities to reduce coal and other fossil fuels in Portland's electricity supply;

NOW, THEREFORE, BE IT RESOLVED, that the City Council will actively oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways; and

BE IT FURTHER RESOLVED, that this Resolution does not restrict:

1. improvements in the safety, or efficiency, seismic resilience, or operations of existing infrastructure;
2. the provision of service directly to end users;
3. development of emergency backup capacity;
4. infrastructure that enables recovery or re-processing of used petroleum products; or
5. infrastructure that will accelerate the transition to non-fossil fuel energy sources; and

BE IT FURTHER RESOLVED, that City bureaus are directed to examine existing laws, including those related to public health, safety, building, electrical, nuisance, and fire codes, and develop recommendations to address fossil fuels that strengthen public health and safety; and

BE IT FURTHER RESOLVED, that the Bureau of Planning and Sustainability is directed to develop proposed code changes for Council consideration to advance the policies set forth in this Resolution; and

BE IT FURTHER RESOLVED, that prior to any further Council action, the mayor shall schedule (1) a work session to review any proposed code changes and (2) an executive session to review the legal considerations of any proposed code changes; and

BE IT FURTHER RESOLVED, that the Bureau of Planning & Sustainability shall undertake an analysis of the economic impacts of any proposed Code changes to advance the policies set forth in this resolution, with a particular focus on potential impacts to local blue-collar jobs; and

BE IT FURTHER RESOLVED, that the City and applicable bureaus shall seek and identify opportunities to invest in Portland's 'human infrastructure' by supporting programs to retrain our workforce as the city transitions to a clean energy economy; and

BE IT FURTHER RESOLVED, that the City shall consult with its Tribal Government Partners, the State of Oregon, local governments, and other key stakeholder including labor, business, environment, neighborhoods and communities of color in advancing this policy; and

BE IT FURTHER RESOLVED, notwithstanding anything in this resolution, the Council will exercise its duty as a quasi-judicial land use decision making body in an impartial manner consistent with City Code and Oregon law.

BE IT FURTHER RESOLVED, this resolution is binding City policy.

Adopted by the Council: NOV 12 2015

Mayor Charlie Hales
Prepared by: M. Armstrong, BPS
Date Prepared: October 23, 2015

Mary Hull Caballero
Auditor of the City of Portland
By
Deputy

~~1157~~ 1179

Agenda No.
RESOLUTION NO. 37168 As Amended

Title

Oppose expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways (Resolution)

INTRODUCED BY Commissioner/Auditor: **Charlie Hales / Amanda Fritz**	CLERK USE: DATE FILED OCT 27 2015
COMMISSIONER APPROVAL Mayor—Finance and Administration - Hales Position 1/Utilities - Fritz Position 2/Works - Fish Position 3/Affairs - Saltzman Position 4/Safety - Novick	Mary Hull Caballero Auditor of the City of Portland By: _____ Deputy
BUREAU APPROVAL Bureau: BPS Bureau Head: Susan Anderson	**ACTION TAKEN:** NOV 04 2015 **CONTINUED TO** NOV 12 2015 2 P.M. TIME CERTAIN
Prepared by: Michael Armstrong Date Prepared: October 23, 2015	
Impact Statement Completed ☒ Amends Budget ☐	
Portland Policy Document If "Yes" requires City Policy paragraph stated in document. Yes ☒ No ☐	
City Auditor Office Approval: required for Code Ordinances	
City Attorney Approval: required for contract, code. easement, franchise, charter, Comp Plan	
Council Meeting Date: **November 4, 2015**	

AGENDA
TIME CERTAIN ☒ **Start time: 2:00 pm** **Total amount of time needed: 2 hours** **(for presentation, testimony and discussion)**
CONSENT ☐
REGULAR ☒ **Total amount of time needed: 2 hours** **(for presentation, testimony and discussion)**

FOUR-FIFTHS AGENDA	COMMISSIONERS VOTED AS FOLLOWS:	YEAS	NAYS
1. Fritz	1. Fritz	✓	
2. Fish	2. Fish	✓	
3. Saltzman	3. Saltzman	✓	
4. Novick	4. Novick	✓	
Hales	Hales	✓	

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The next full-margin rupture of the Cascadia subduction zone will spell the worst natural disaster in the history of the continent.

Illustration by Christoph Niemann; Map by Ziggymaj / Getty

0:00 / 43:20

Audio: Listen to this article.

When the 2011 earthquake and tsunami struck Tohoku, Japan, Chris Goldfinger was two hundred miles away, in the city of Kashiwa, at an international

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entered the eights, and a three-minute quake is in the high eights. By four minutes, an earthquake has hit magnitude 9.0.

When Goldfinger looked at his watch, it was quarter to three. The conference was wrapping up for the day. He was thinking about sushi. The speaker at the lectern was wondering if he should carry on with his talk. The earthquake was not particularly strong. Then it ticked past the sixty-second mark, making it longer than the others that week. The shaking intensified. The seats in the conference room were small plastic desks with wheels. Goldfinger, who is tall and solidly built, thought, No way am I crouching under one of those for cover. At a minute and a half, everyone in the room got up and went outside.

It was March. There was a chill in the air, and snow flurries, but no snow on the ground. Nor, from the feel of it, was there ground on the ground. The earth snapped and popped and rippled. It was, Goldfinger thought, like driving through rocky terrain in a vehicle with no shocks, if both the vehicle and the terrain were also on a raft in high seas. The quake passed the two-minute mark. The trees, still hung with the

previous autumn's dead leaves, were making a strange rattling sound. The flagpole atop the building he and his colleagues had just vacated was whipping through an arc of forty degrees. The building itself was base-isolated, a seismic-safety technology in which the body of a structure rests on movable bearings rather than directly on its foundation. Goldfinger lurched over to take a look. The base was lurching, too, back and forth a foot at a time, digging a trench in the yard. He thought better of it, and lurched away. His watch swept past the three-minute mark and kept going.

Oh, shit, Goldfinger thought, although not in dread, at first: in amazement. For

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Almost immediately, though, it became extremely uncool, because Goldfinger and every other seismologist standing outside in Kashiwa knew what was coming. One of them pulled out a cell phone and started streaming videos from the Japanese broadcasting station NHK, shot by helicopters that had flown out to sea soon after the shaking started. Thirty minutes after Goldfinger first stepped outside, he watched the tsunami roll in, in real time, on a two-inch screen.

In the end, the magnitude-9.0 Tohoku earthquake and subsequent tsunami killed more than eighteen thousand people, devastated northeast Japan, triggered the meltdown at the Fukushima power plant, and cost an estimated two hundred and twenty billion dollars. The shaking earlier in the week turned out to be the foreshocks of the largest earthquake in the nation's recorded history. But for Chris Goldfinger, a paleoseismologist at Oregon State University and one of the world's leading experts on a little-known fault line, the main quake was itself a kind of foreshock: a preview of another earthquake still to come.

Most people in the United States know just one fault line by name: the San Andreas, which runs nearly the length of California and is perpetually rumored to be on the verge of unleashing "the big one." That rumor is misleading, no matter what the San Andreas ever does. Every fault line has an upper limit to its potency, determined by its length and width, and by how far it can slip. For the San Andreas, one of the most extensively studied and best understood fault lines in the world, that upper limit is roughly an 8.2—a powerful earthquake, but, because the Richter scale is logarithmic, only six per cent as strong as the 2011 event in Japan.

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harmless, and all but undetectable. Occasionally, at the borders where they meet, it is not.

VIDEO FROM THE NEW YORKER

Throwing Shade Through Crosswords

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in Seattle. Your left hand represents an oceanic plate called Juan de Fuca, ninety thousand square miles in size. The place where they meet is the Cascadia subduction zone. Now slide your left hand under your right one. That is what the Juan de Fuca plate is doing: slipping steadily beneath North America. When you try it, your right hand will slide up your left arm, as if you were pushing up your sleeve. That is what North America is not doing. It is stuck, wedged tight against the surface of the other plate.

Without moving your hands, curl your right knuckles up, so that they point toward the ceiling. Under pressure from Juan de Fuca, the stuck edge of North America is bulging upward and compressing eastward, at the rate of, respectively, three to four millimetres and thirty to forty millimetres a year. It can do so for quite some time, because, as continent stuff goes, it is young, made of rock that is still relatively elastic. (Rocks, like us, get stiffer as they age.) But it cannot do so indefinitely. There is a backstop—the craton, that ancient unbudgeable mass at the center of the continent—and, sooner or later, North America will rebound like a spring. If, on that occasion, only the southern

part of the Cascadia subduction zone gives way—your first two fingers, say—the magnitude of the resulting quake will be somewhere between 8.0 and 8.6. *That's* the big one. If the entire zone gives way at once, an event that seismologists call a full-margin rupture, the magnitude will be somewhere between 8.7 and 9.2. That's the very big one.

Flick your right fingers outward, forcefully, so that your hand flattens back down again. When the next very big earthquake hits, the northwest edge of the continent, from California to Canada and the continental shelf to the Cascades, will drop by as much as

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Washington, Idaho, and Alaska, says, "Our operating assumption is that everything west of Interstate 5 will be toast."

In the Pacific Northwest, the area of impact will cover* some hundred and forty thousand square miles, including Seattle, Tacoma, Portland, Eugene, Salem (the capital city of Oregon), Olympia (the capital of Washington), and some seven million people. When the next full-margin rupture happens, that region will suffer the worst natural disaster in the history of North America. Roughly three thousand people died in San Francisco's 1906 earthquake. Almost two thousand died in Hurricane Katrina. Almost three hundred died in Hurricane Sandy. FEMA projects that nearly thirteen thousand people will die in the Cascadia earthquake and tsunami. Another twenty-seven thousand will be injured, and the agency expects that it will need to provide shelter for a million displaced people, and food and water for another two and a half million. "This is one time that I'm hoping all the science is wrong, and it won't happen for another thousand years," Murphy says.

In fact, the science is robust, and one of the chief scientists behind it is Chris Goldfinger. Thanks to work done by him and his colleagues, we now know that the odds of the big Cascadia earthquake happening in the next fifty years are roughly one in three. The odds of the very big one are roughly one in ten. Even those numbers do not fully reflect the danger—or, more to the point, how unprepared the Pacific Northwest is to face it. The truly worrisome figures in this story are these: Thirty years ago, no one knew that the Cascadia subduction zone had ever produced a major earthquake. Forty-five years ago, no one even knew it existed.

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find: vast, cheap, temperate, fertile, and, to all appearances, remarkably benign.

A century and a half elapsed before anyone had any inkling that the Pacific Northwest was not a quiet place but a place in a long period of quiet. It took another fifty years to uncover and interpret the region's seismic history. Geology, as even geologists will tell you, is not normally the sexiest of disciplines; it hunkers down with earthly stuff while the glory accrues to the human and the cosmic—to genetics, neuroscience, physics. But, sooner or later, every field has its field day, and the discovery of the Cascadia subduction zone stands as one of the greatest scientific detective stories of our time.

The first clue came from geography. Almost all of the world's most powerful earthquakes occur in the Ring of Fire, the volcanically and seismically volatile swath of the Pacific that runs from New Zealand up through Indonesia and Japan, across the ocean to Alaska, and down the west coast of the Americas to Chile. Japan, 2011, magnitude 9.0; Indonesia, 2004, magnitude 9.1; Alaska, 1964, magnitude 9.2; Chile, 1960, magnitude 9.5—not until the late nineteen-sixties, with the rise of the theory of

plate tectonics, could geologists explain this pattern. The Ring of Fire, it turns out, is really a ring of subduction zones. Nearly all the earthquakes in the region are caused by continental plates getting stuck on oceanic plates—as North America is stuck on Juan de Fuca—and then getting abruptly unstuck. And nearly all the volcanoes are caused by the oceanic plates sliding deep beneath the continental ones, eventually reaching temperatures and pressures so extreme that they melt the rock above them.

The Pacific Northwest sits squarely within the Ring of Fire. Off its coast, an oceanic plate is slipping beneath a continental one. Inland, the Cascade volcanoes mark the line

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Whether the Cascadia subduction zone had ever broken its entire silence.

In the late nineteen-eighties, Brian Atwater, a geologist with the United States Geological Survey, and a graduate student named David Yamaguchi found the answer, and another major clue in the Cascadia puzzle. Their discovery is best illustrated in a place called the ghost forest, a grove of western red cedars on the banks of the Copalis River, near the Washington coast. When I paddled out to it last summer, with Atwater and Yamaguchi, it was easy to see how it got its name. The cedars are spread out across a low salt marsh on a wide northern bend in the river, long dead but still standing. Leafless, branchless, barkless, they are reduced to their trunks and worn to a smooth silver-gray, as if they had always carried their own tombstones inside them.

What killed the trees in the ghost forest was saltwater. It had long been assumed that they died slowly, as the sea level around them gradually rose and submerged their roots. But, by 1987, Atwater, who had found in soil layers evidence of sudden land subsidence along the Washington coast, suspected that that was backward—that the trees had died quickly when the ground beneath them plummeted. To find out, he teamed up with

Yamaguchi, a specialist in dendrochronology, the study of growth-ring patterns in trees. Yamaguchi took samples of the cedars and found that they had died simultaneously: in tree after tree, the final rings dated to the summer of 1699. Since trees do not grow in the winter, he and Atwater concluded that sometime between August of 1699 and May of 1700 an earthquake had caused the land to drop and killed the cedars. That time frame predated by more than a hundred years the written history of the Pacific Northwest—and so, by rights, the detective story should have ended there.

But it did not. If you travel five thousand miles due west from the ghost forest, you

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Finally, in a 1996 article in *Nature*, a seismologist named Kenji Satake and three colleagues, drawing on the work of Atwater and Yamaguchi, matched that orphan to its parent—and thereby filled in the blanks in the Cascadia story with uncanny specificity. At approximately nine o' clock at night on January 26, 1700, a magnitude-9.0 earthquake struck the Pacific Northwest, causing sudden land subsidence, drowning coastal forests, and, out in the ocean, lifting up a wave half the length of a continent. It took roughly fifteen minutes for the Eastern half of that wave to strike the Northwest coast. It took ten hours for the other half to cross the ocean. It reached Japan on January 27, 1700: by the local calendar, the eighth day of the twelfth month of the twelfth year of Genroku.

A Deadly Conspiracy in Buenos Aires?
By Dexter Filkins

Back-Yard Bird Talk
By Roz Chast

A More Perfect Union
By Art Spiegelman

Briefly Review

Once scientists had reconstructed the 1700 earthquake, certain previously overlooked accounts also came to seem like clues. In 1964, Chief Louis Nookmis, of the Huu-ay-aht First Nation, in British Columbia, told a story, passed down through seven

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On average, the midpoint of that range was 1701.

It does not speak well of European-Americans that such stories counted as evidence for a proposition only after that proposition had been proved. Still, the reconstruction of the Cascadia earthquake of 1700 is one of those rare natural puzzles whose pieces fit together as tectonic plates do not: perfectly. It is wonderful science. It was wonderful *for* science. And it was terrible news for the millions of inhabitants of the Pacific Northwest. As Goldfinger put it, "In the late eighties and early nineties, the paradigm shifted to 'uh-oh.' "

Goldfinger told me this in his lab at Oregon State, a low prefab building that a passing English major might reasonably mistake for the maintenance department. Inside the lab is a walk-in freezer. Inside the freezer are floor-to-ceiling racks filled with cryptically labelled tubes, four inches in diameter and five feet long. Each tube contains a core sample of the seafloor. Each sample contains the history, written in seafloorese, of the past ten thousand years. During subduction-zone earthquakes, torrents of land

rush off the continental slope, leaving a permanent deposit on the bottom of the ocean. By counting the number and the size of deposits in each sample, then comparing their extent and consistency along the length of the Cascadia subduction zone, Goldfinger and his colleagues were able to determine how much of the zone has ruptured, how often, and how drastically.

Thanks to that work, we now know that the Pacific Northwest has experienced forty-one subduction-zone earthquakes in the past ten thousand years. If you divide ten thousand by forty-one, you get two hundred and forty-three, which is Cascadia's

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what the region was prepared to withstand. The same will hold true in the Pacific Northwest—but here the discrepancy is enormous. "The science part is fun," Goldfinger says. "And I love doing it. But the gap between what we know and what we should do about it is getting bigger and bigger, and the action really needs to turn to responding. Otherwise, we're going to be hammered. I've been through one of these massive earthquakes in the most seismically prepared nation on earth. If that was Portland"—Goldfinger finished the sentence with a shake of his head before he finished it with words. "Let's just say I would rather not be here."

The first sign that the Cascadia earthquake has begun will be a compressional wave, radiating outward from the fault line. Compressional waves are fast-moving, high-frequency waves, audible to dogs and certain other animals but experienced by humans only as a sudden jolt. They are not very harmful, but they are potentially very useful, since they travel fast enough to be detected by sensors thirty to ninety seconds ahead of other seismic waves. That is enough time for earthquake early-warning systems, such as those in use throughout Japan, to automatically perform a variety of

lifesaving functions: shutting down railways and power plants, opening elevators and firehouse doors, alerting hospitals to halt surgeries, and triggering alarms so that the general public can take cover. The Pacific Northwest has no early-warning system. When the Cascadia earthquake begins, there will be, instead, a cacophony of barking dogs and a long, suspended, what-was-that moment before the surface waves arrive. Surface waves are slower, lower-frequency waves that move the ground both up and down and side to side: the shaking, starting in earnest.

Soon after that shaking begins, the electrical grid will fail, likely everywhere west of the

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foundations, together with the rest of the Northwest, jolt westward. Unmoored on the undulating ground, the homes will begin to collapse.

Across the region, other, larger structures will also start to fail. Until 1974, the state of Oregon had no seismic code, and few places in the Pacific Northwest had one appropriate to a magnitude-9.0 earthquake until 1994. The vast majority of buildings in the region were constructed before then. Ian Madin, who directs the Oregon Department of Geology and Mineral Industries (DOGAMI), estimates that seventy-five per cent of all structures in the state are not designed to withstand a major Cascadia quake. FEMA calculates that, across the region, something on the order of a million buildings—more than three thousand of them schools—will collapse or be compromised in the earthquake. So will half of all highway bridges, fifteen of the seventeen bridges spanning Portland's two rivers, and two-thirds of railways and airports; also, one-third of all fire stations, half of all police stations, and two-thirds of all hospitals.

Certain disasters stem from many small problems conspiring to cause one very large problem. For want of a nail, the war was lost; for fifteen independently insignificant errors, the jetliner was lost. Subduction-zone earthquakes operate on the opposite principle: one enormous problem causes many other enormous problems. The shaking from the Cascadia quake will set off landslides throughout the region—up to thirty thousand of them in Seattle alone, the city's emergency-management office estimates. It will also induce a process called liquefaction, whereby seemingly solid ground starts behaving like a liquid, to the detriment of anything on top of it. Fifteen per cent of Seattle is built on liquefiable land, including seventeen day-care centers and the homes

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begin.

Among natural disasters, tsunamis may be the closest to being completely unsurvivable. The only likely way to outlive one is not to be there when it happens: to steer clear of the vulnerable area in the first place, or get yourself to high ground as fast as possible. For the seventy-one thousand people who live in Cascadia's inundation zone, that will mean evacuating in the narrow window after one disaster ends and before another begins. They will be notified to do so only by the earthquake itself—"a vibrate-alert system," Kevin Cupples, the city planner for the town of Seaside, Oregon, jokes—and they are urged to leave on foot, since the earthquake will render roads impassable. Depending on location, they will have between ten and thirty minutes to get out. That time line does not allow for finding a flashlight, tending to an earthquake injury, hesitating amid the ruins of a home, searching for loved ones, or being a Good Samaritan. "When that tsunami is coming, you run," Jay Wilson, the chair of the Oregon Seismic Safety Policy Advisory Commission (OSSPAC), says. "You protect yourself, you don't turn around, you don't go back to save anybody. You run for your life."

The time to save people from a tsunami is before it happens, but the region has not yet taken serious steps toward doing so. Hotels and businesses are not required to post evacuation routes or to provide employees with evacuation training. In Oregon, it has been illegal since 1995 to build hospitals, schools, firehouses, and police stations in the inundation zone, but those which are already in it can stay, and any other new construction is permissible: energy facilities, hotels, retirement homes. In those cases, builders are required only to consult with DOGAMI about evacuation plans. "So you come in and sit down," Ian Madin says. "And I say, 'That's a stupid idea.' And you say, 'Thanks. Now we've consulted.' "

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beaches are the hardest place to evacuate from."

Those who cannot get out of the inundation zone under their own power will quickly be overtaken by a greater one. A grown man is knocked over by ankle-deep water moving at 6.7 miles an hour. The tsunami will be moving more than twice that fast when it arrives. Its height will vary with the contours of the coast, from twenty feet to more than a hundred feet. It will not look like a Hokusai-style wave, rising up from the surface of the sea and breaking from above. It will look like the whole ocean, elevated, overtaking land. Nor will it be made only of water—not once it reaches the shore. It will be a five-story deluge of pickup trucks and doorframes and cinder blocks and fishing boats and utility poles and everything else that once constituted the coastal towns of the Pacific Northwest.

To see the full scale of the devastation when that tsunami recedes, you would need to be in the international space station. The inundation zone will be scoured of structures from California to Canada. The earthquake will have wrought its worst havoc west of

the Cascades but caused damage as far away as Sacramento, California—as distant from the worst-hit areas as Fort Wayne, Indiana, is from New York. FEMA expects to coördinate search-and-rescue operations across a hundred thousand square miles and in the waters off four hundred and fifty-three miles of coastline. As for casualties: the figures I cited earlier—twenty-seven thousand injured, almost thirteen thousand dead—are based on the agency's official planning scenario, which has the earthquake striking at 9:41 A.M. on February 6th. If, instead, it strikes in the summer, when the beaches are full, those numbers could be off by a horrifying margin.

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How much all this will cost is anyone's guess; FEMA puts every number on its relief-and-recovery plan except a price. But whatever the ultimate figure—and even though U.S. taxpayers will cover seventy-five to a hundred per cent of the damage, as happens in declared disasters—the economy of the Pacific Northwest will collapse. Crippled by a lack of basic services, businesses will fail or move away. Many residents will flee as well. OSSPAC predicts a mass-displacement event and a long-term population downturn. Chris Goldfinger didn't want to be there when it happened. But, by many metrics, it will be as bad or worse to be there afterward.

On the face of it, earthquakes seem to present us with problems of space: the way we live along fault lines, in brick buildings, in homes made valuable by their proximity to the sea. But, covertly, they also present us with problems of time. The earth is 4.5 billion years old, but we are a young species, relatively speaking, with an average individual allotment of three score years and ten. The brevity of our lives breeds a kind of temporal parochialism—an ignorance of or an indifference to those planetary gears which turn more slowly than our own.

This problem is bidirectional. The Cascadia subduction zone remained hidden from us for so long because we could not see deep enough into the past. It poses a danger to us today because we have not thought deeply enough about the future. That is no longer a problem of information; we now understand very well what the Cascadia fault line will someday do. Nor is it a problem of imagination. If you are so inclined, you can watch an earthquake destroy much of the West Coast this summer in Brad Peyton's "San Andreas," while, in neighboring theatres, the world threatens to succumb to Armageddon by other means: viruses, robots, resource scarcity, zombies, aliens, plague. As those movies attest, we excel at imagining future scenarios, including awful ones.

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profoundly vulnerable to natural disaster.

The last person I met with in the Pacific Northwest was Doug Dougherty, the superintendent of schools for Seaside, which lies almost entirely within the tsunami-inundation zone. Of the four schools that Dougherty oversees, with a total student population of sixteen hundred, one is relatively safe. The others sit five to fifteen feet above sea level. When the tsunami comes, they will be as much as forty-five feet below it.

In 2009, Dougherty told me, he found some land for sale outside the inundation zone, and proposed building a new K-12 campus there. Four years later, to foot the hundred-and-twenty-eight-million-dollar bill, the district put up a bond measure. The tax increase for residents amounted to two dollars and sixteen cents per thousand dollars of property value. The measure failed by sixty-two per cent. Dougherty tried seeking help from Oregon's congressional delegation but came up empty. The state makes money available for seismic upgrades, but buildings within the inundation zone cannot apply. At present, all Dougherty can do is make sure that his students know how to evacuate.

Some of them, however, will not be able to do so. At an elementary school in the community of Gearhart, the children will be trapped. "They can't make it out from that school," Dougherty said. "They have no place to go." On one side lies the ocean; on the other, a wide, roadless bog. When the tsunami comes, the only place to go in Gearhart is a small ridge just behind the school. At its tallest, it is forty-five feet high—lower than the expected wave in a full-margin earthquake. For now, the route to the ridge is marked by signs that say "Temporary Tsunami Assembly Area." I asked Dougherty about the state's long-range plan. "There is no long-range plan," he said.

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Kathryn Schulz joined The New Yorker as a staff writer in 2015. In 2016, she won the Pulitzer Prize for feature writing and a National Magazine Award for "The Really Big One," her story on the seismic risk in the Pacific Northwest. *Read more »*

Video

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Port of Portland Commodity Flow Forecast

Final Project Presentation

presented to

Port of Portland and Stakeholders

presented by

Cambridge Systematics, Inc.

Michael J. Fischer

March 31, 2015

Transportation leadership you can trust.

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Agenda

- Macro-Economic Context
- Data Methodology
- Summary of Base Year Data
- Summary of Future Year Data
- Summary of Written Tasks

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Macro-economic Context

Portland's Economy is Supported by Three Goods Movement Functions



International Trade. This is done primarily through the Port of Portland and Port of Vancouver, including marine terminals and the Portland International Airport. It provides access to Pacific Rim trading partners.



Domestic Trade. Local consumer base relies on industries across the country. The region also supports population centers in other domestic regions. Warehouse and DCs support this function.



Local Deliveries. As a large population center, the region relies on local goods movement to provide consumer products, food, and parcels to residents and businesses.

Commodity flows associated with the study area reflect all three goods movement functions.

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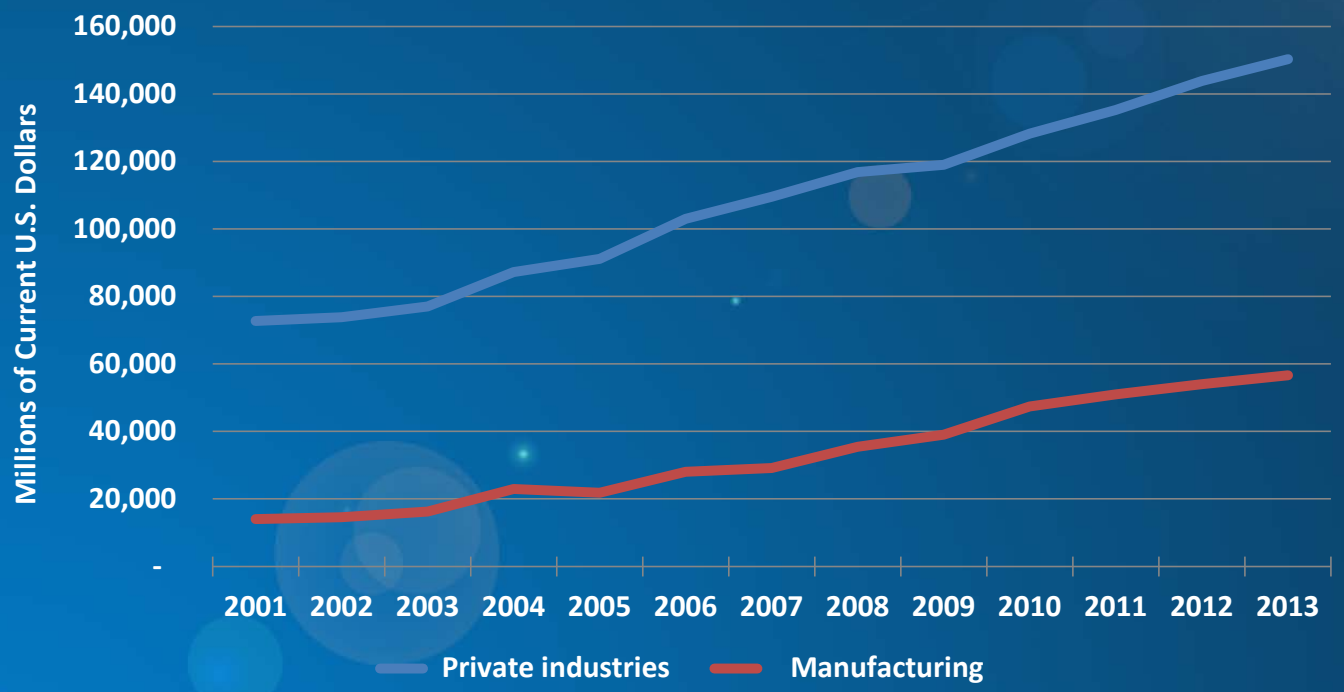
GDP of Industries in Portland Region



Source: Bureau of Economic Analysis.

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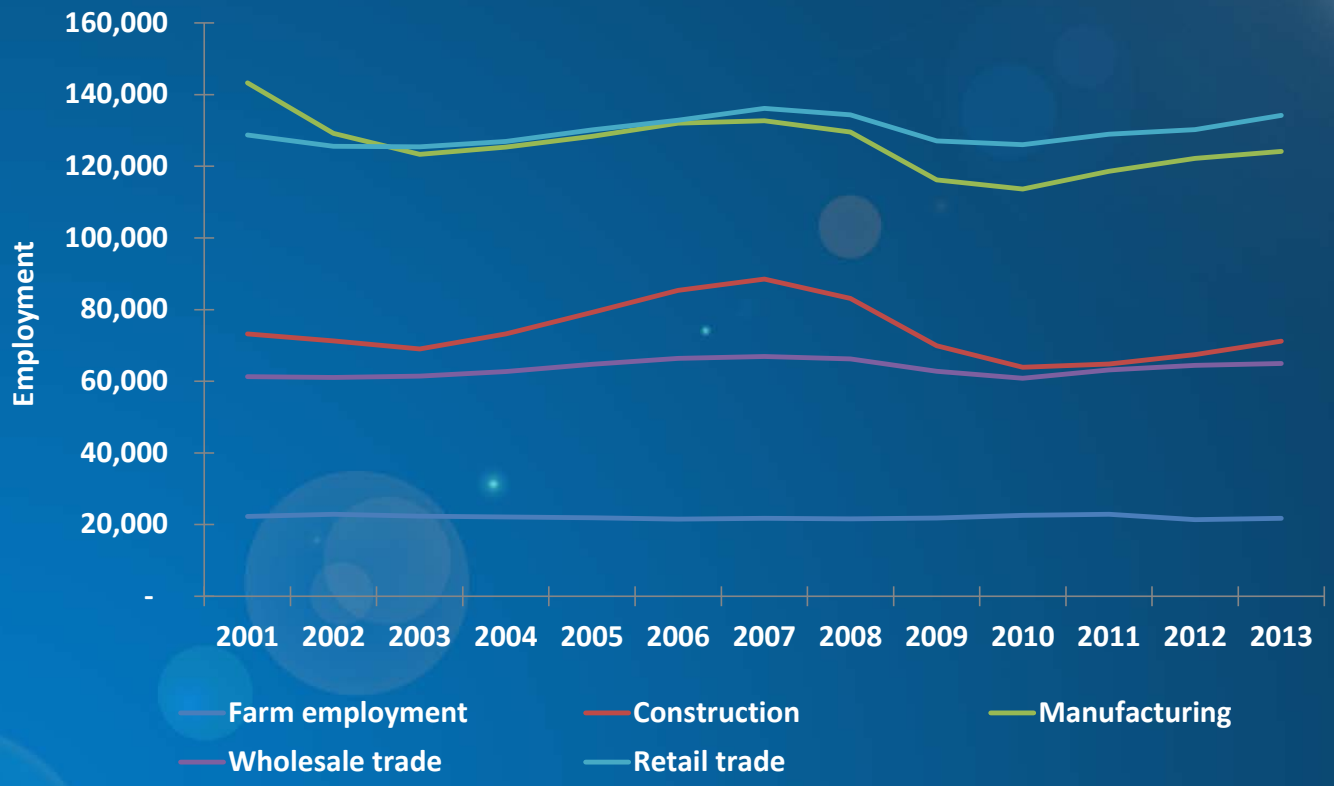
Employment of Industries in Portland Region



Source: Bureau of Economic Analysis.

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Portland's Key Industries Have Changed Overtime

1. Forest Products. Traditionally most important in the region. Currently experiencing domestic declines, but increased overseas import.
2. Manufacturing. High-tech electronics is becoming a highly significant sector.
3. Agriculture. Traditionally a very important industry in the region. Significant shares of agriculture products are exported to Asia.
4. Energy. Energy dependence in the region is shifting from hydroelectric power to other renewable energy sources and natural gas, which creates changes in demand in the future both in terms of commodities and mode.
5. Waste and Scrap. Dramatic increases of exports to China in past decade. Waste and scrap is believed to be the most important industry in the U.S. currently.

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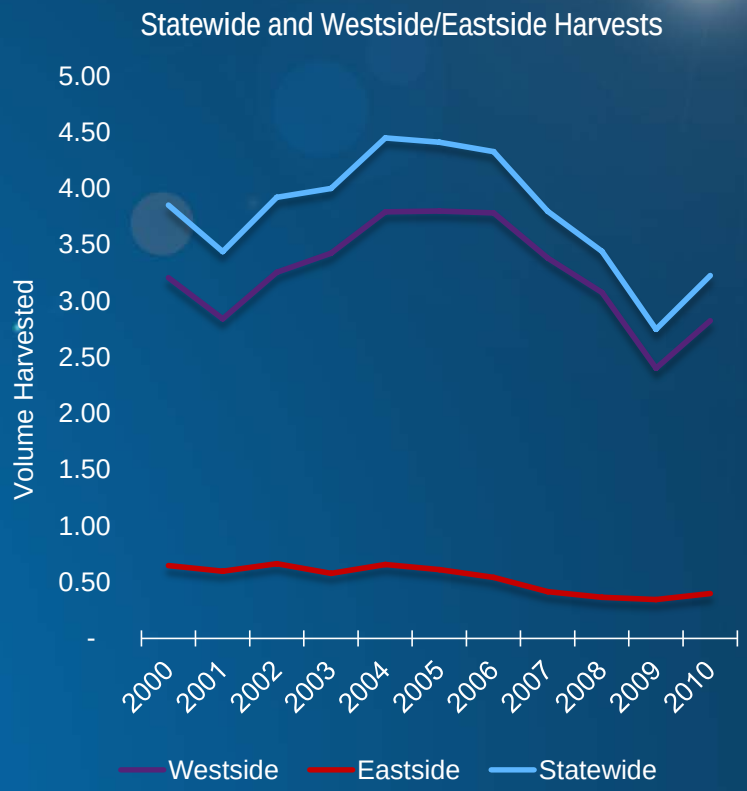
Forest Products Industry

- In 2010, Oregon lumber and wood production is the highest in the country. It also is a mid-ranking state in terms of paper production.
- Most forest products comes from West Oregon (Lane and Davis Counties).
- Timber production and jobs in these industries has declined, due to reduction of logging on Federal lands.
- The movement of forest products is dependent on U.S. housing and construction markets, and increasingly on exports to China.



Source: Oregon Department of Forestry.

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Manufacturing – Hi-Tech

- Hi-tech manufacturing drives growth in manufacturing activities in Portland, especially from Intel's semi-conductor production.
- Oregon has the highest concentration of manufacturing in the country based on relative contribution to GDP
- Large recent capital investments means even more high-tech manufacturing activity in the future.

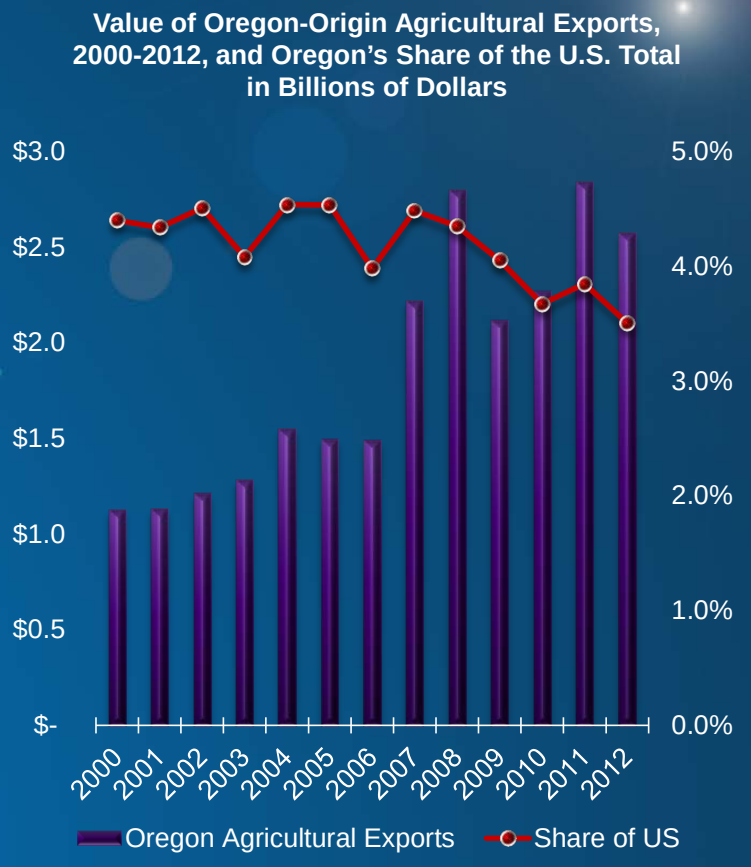
Oregon GDP in Computers and Electronics and Oregon's Share of the U.S. Total in Billions of Dollars



Source: Bureau of Economic Analysis.

Agriculture

- Oregon's main crops include wheat, hay, nursery products, apples. Wheat farms are concentrated in Umatilla County.
- Oregon agriculture has been rising steadily, but is eroding in terms of total U.S. shares.
- Oregon-origin exports account for 4% total U.S. exports, mostly destined to Asia.
- Food production also is important in Oregon, growing by 17 percent between 2000 and 2010. However, It remained stagnant since 2005.

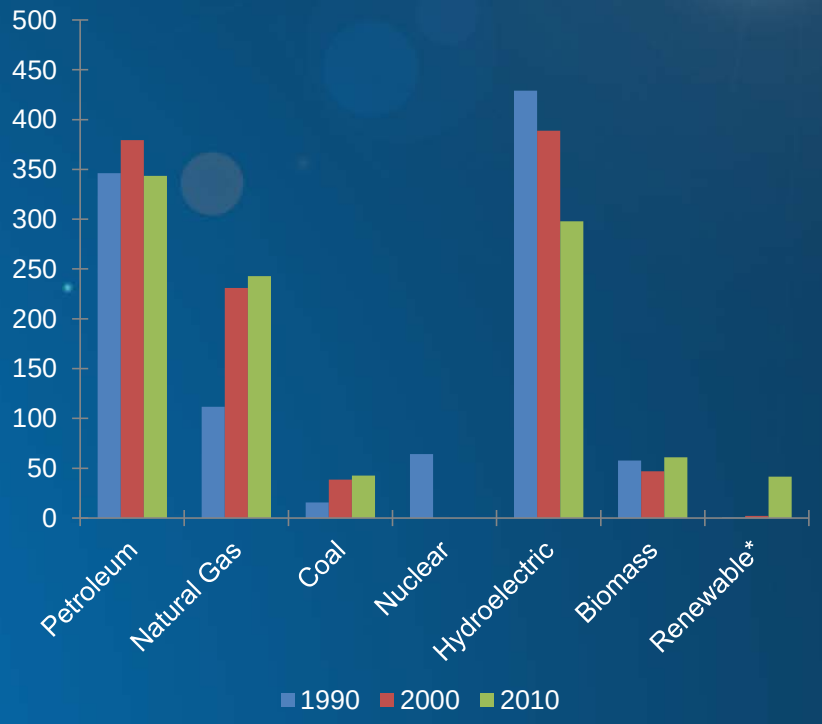


Source: WISERTrade.

Energy

- Oregon energy consumption changed considerably since 2000, where energy consumption actually declined even though population increased.
- About one-third of electricity comes from hydro power, and as the hydroelectricity has declined in use, it is replaced by renewable and natural gas.

Oregon Energy Consumption by Source, 1990, 2000, and 2010 in Trillions of BTUs



Source: U.S. EIA.

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Waste and Scrap

- A fast growing export sector in recent decades due to demand in China for:
  - » Waste scrap metal
  - » Waste paper/cardboard
  - » Waste plastics
- Shredded scrap material comes via rail and truck to the Port of Vancouver. The tonnage of the shredded scrap material has increase dramatically in recent years.
- In the future, though continued demand are expected from China, the market can be volatile.

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Data Methodology

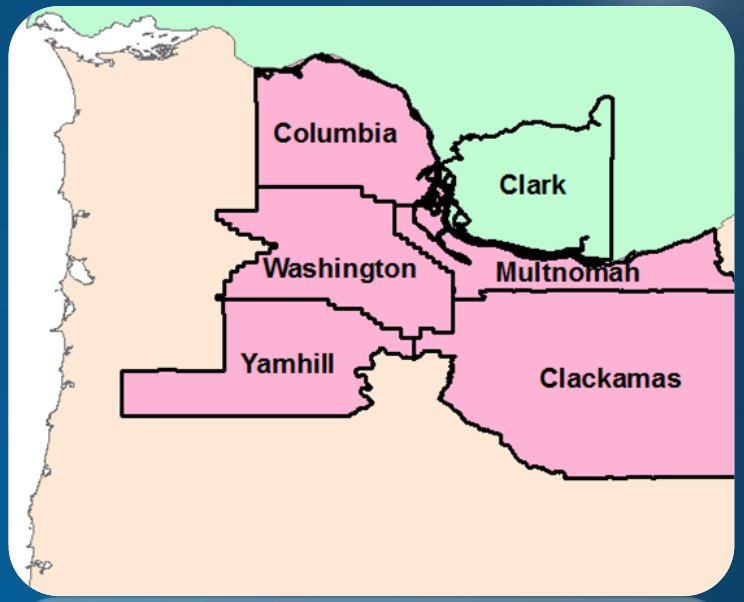
Overview of the Project

Overall Purpose

Develop a commodity flow database with future forecast for the Portland-Vancouver Region using baseline FAF data.

Study Area

Consists of the Counties of Columbia, Washington, Multnomah, Yamhill and Clackamas in Oregon, and Clark in Washington.



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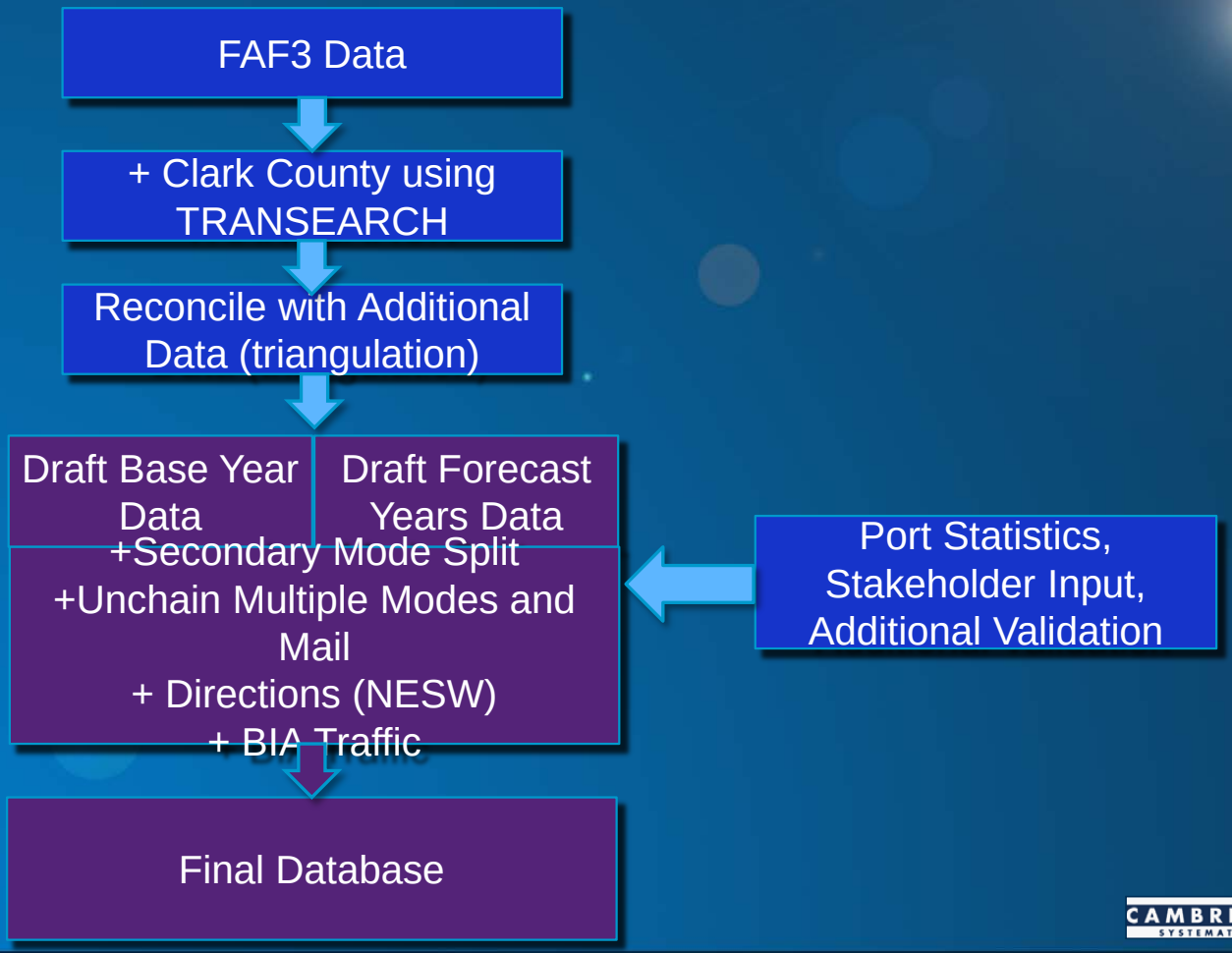
Overall Methodology



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Secondary Mode Split (for International Movements)

Goal: Split foreign ocean modes and air modes into domestic modes.
- Results in double-counting, but can toggle on/off depending on purpose.



FAF Database

Foreign Mode	Domestic Mode	Inbound	Outbound	Intra	Total
Water	Truck		100		100
Total			**100**		**100**

Our Database

Mode	Inbound	Outbound	Intra	Total
Ocean	100			100
Truck		100		100
Total	**100**	**100**		**200**

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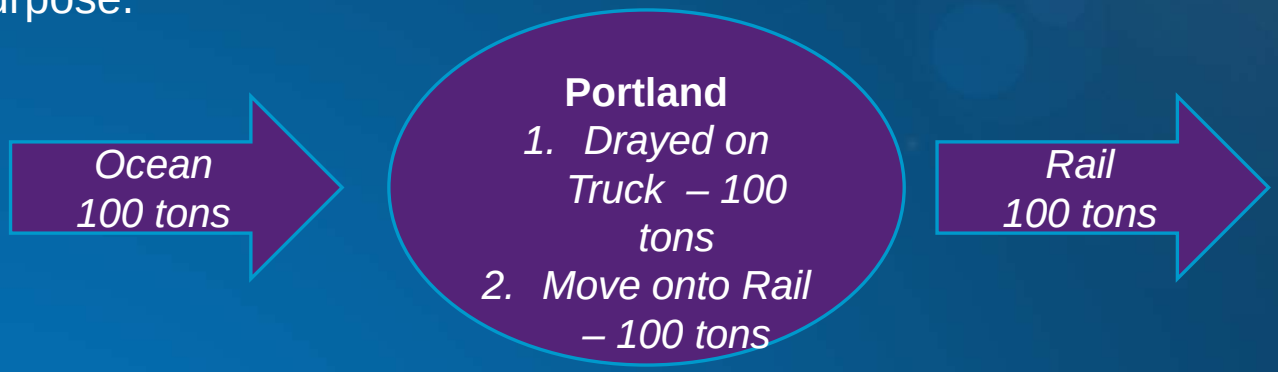
Secondary Mode Split (for International Movements) – Cont'd

Goal: Split foreign ocean modes and air modes into domestic modes.
- Results in double-counting, but can toggle on/off depending on purpose.



FAF Database

Foreign Mode	Domestic Mode	Inbound	Outbound	Intra	Total
Water	Multiple Modes		100		100
Total			**100**		**100**

Our Database

Mode	Inbound	Outbound	Intra	Total
Ocean	100			100
Truck			100	100
Rail		100		100
Total	**100**	**100**	**100**	**300**

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Unchaining Multiple Modes and Mail

- Data used:
  - » Barge – USACE
  - » Intermodal and Drayage – TRANSEARCH and STB Waybill
  - » Air – FAA

Unchain Multiple Modes and Mail

Goal: Split multiple modes in study area into its sub-modes.
- Results in double- counting in some cases. Hard coded in database.



FAF Database

Mode	Intra	Inbound	Outbound	Through	Total
Mixed Mode				20	20
Total				**20**	**20**

Our Database

Mode	Intra	Inbound	Outbound	Through	Total
Truck		20			20
Rail			20		20
Total		**20**	**20**		**40**

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Unchain Multiple Modes and Mail – Cont'd

Goal: Split multiple modes in study area into its sub-modes.
- Results in double- counting in some cases. Hard coded in database.



FAF Database

Mode	Intra	Inbound	Outbound	Through	Total
Mixed Mode		30			30
Total		**30**			**30**

Our Database

Mode	Intra	Inbound	Outbound	Through	Total
Water		30			30
Total		**30**			**30**

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Summary of Base Year Data (2007)

Adjustments to Base Year Volumes

- Auto imports. Flows were reassigned so that total rail volumes matched the ports' statistics, with destination assigned in proportion to the volumes in the 2007 Carload Waybill Sample.
- Waste/Scrap. Base year calculated and adjusted using local municipal and industrial waste and scrap material volumes.
- Multiple other commodity groups checked with calculations from local data sources (such as pipeline flows using Kinder Morgan data). Original FAF3 volumes retains after comparison.

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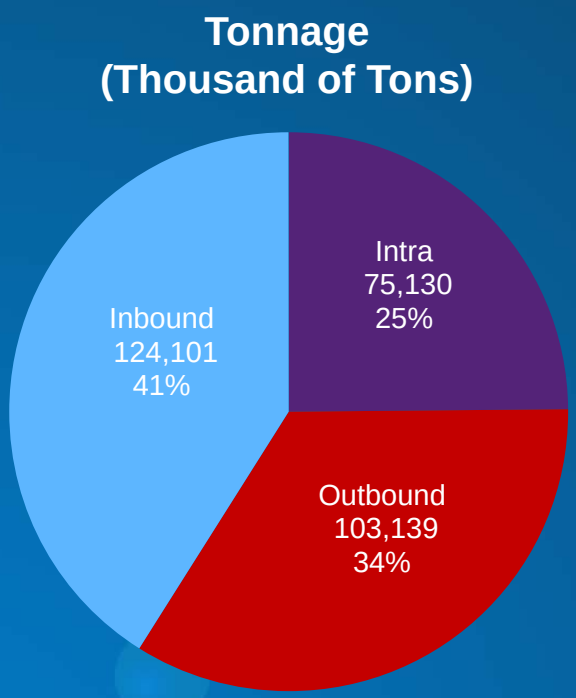
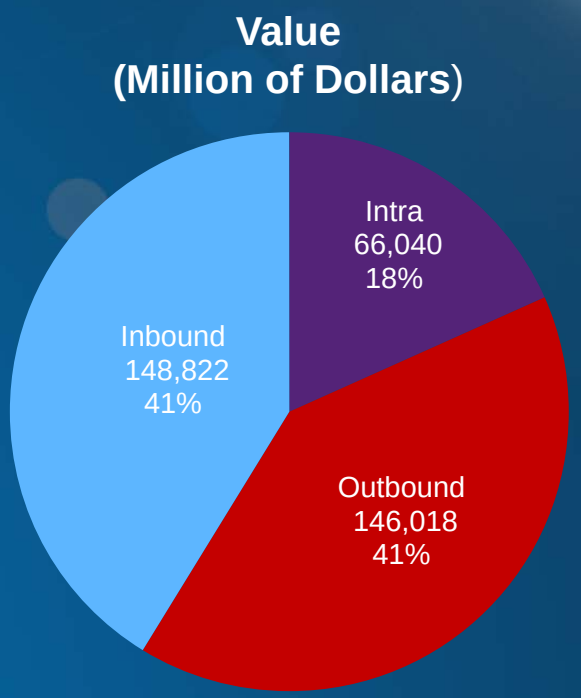
Flows by Direction*





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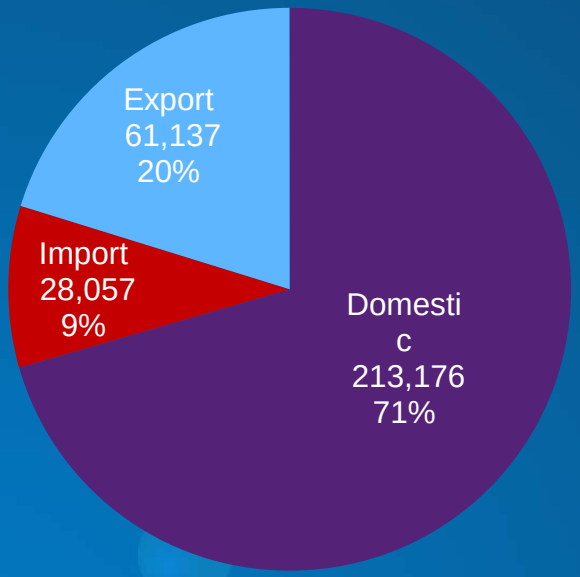
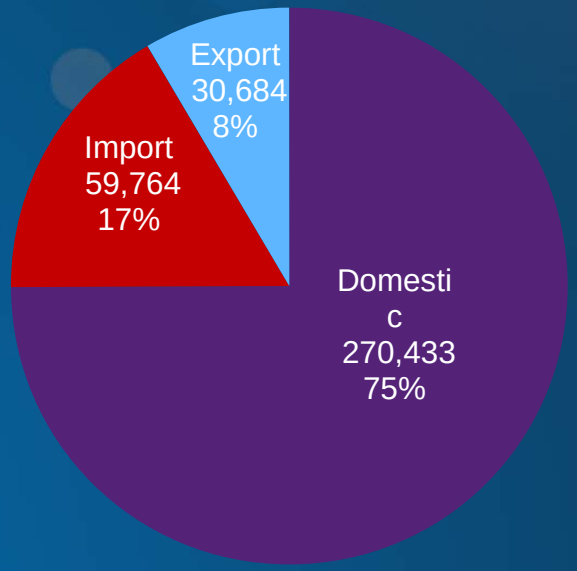
Flows by Trade Type

Tonnage
(Thousands of Tons)



Value
(Million of Dollars)



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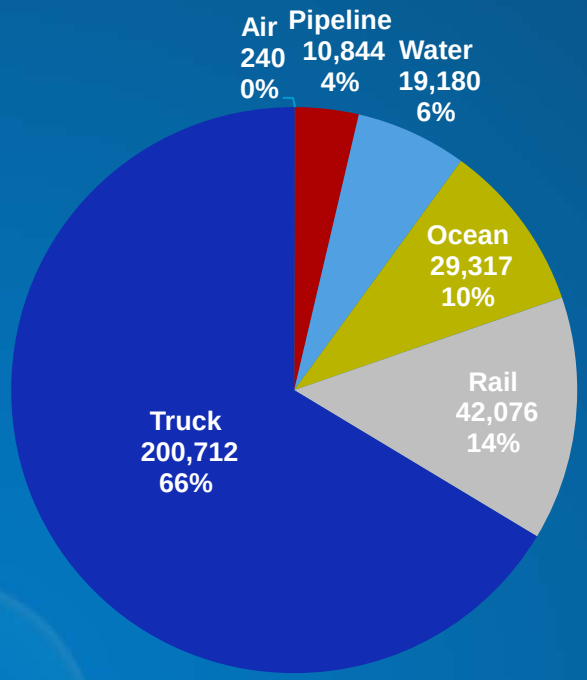
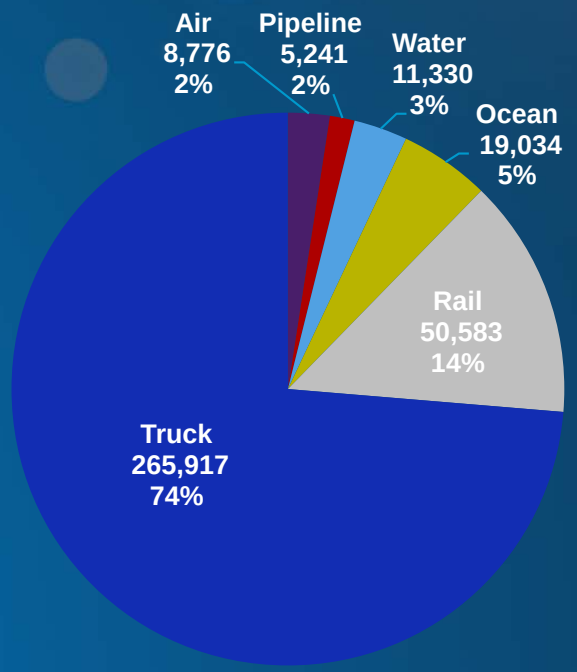
Flows by Mode

Tonnage (Thousands of Tons)



Value (Million of Dollars)



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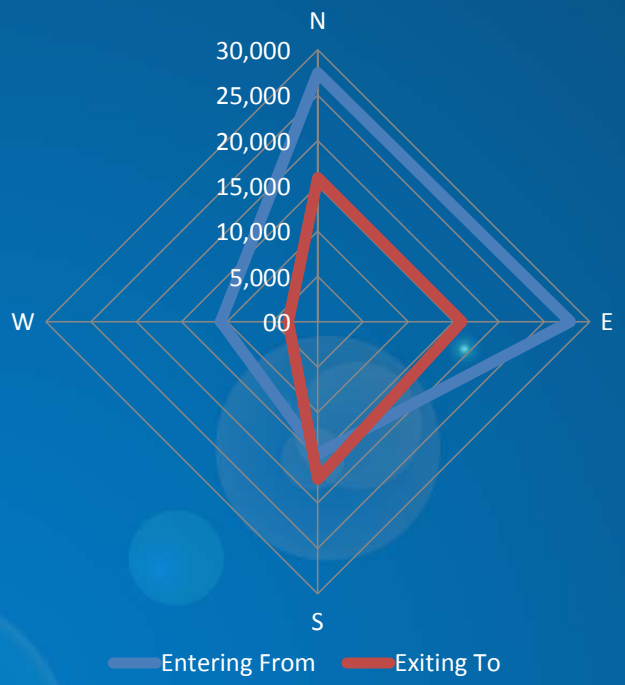
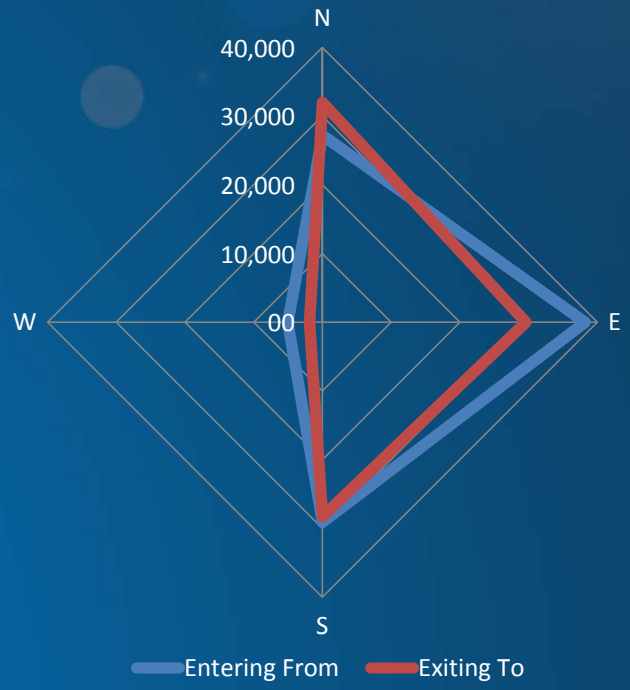
Domestic Flows by Direction (NESW)

Tonnage
(Thousand of Tons)



Value
(Million of Dollars



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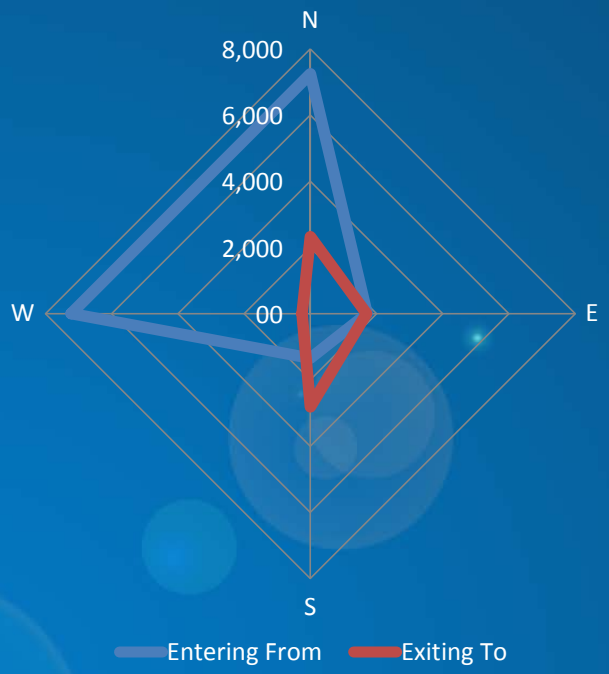
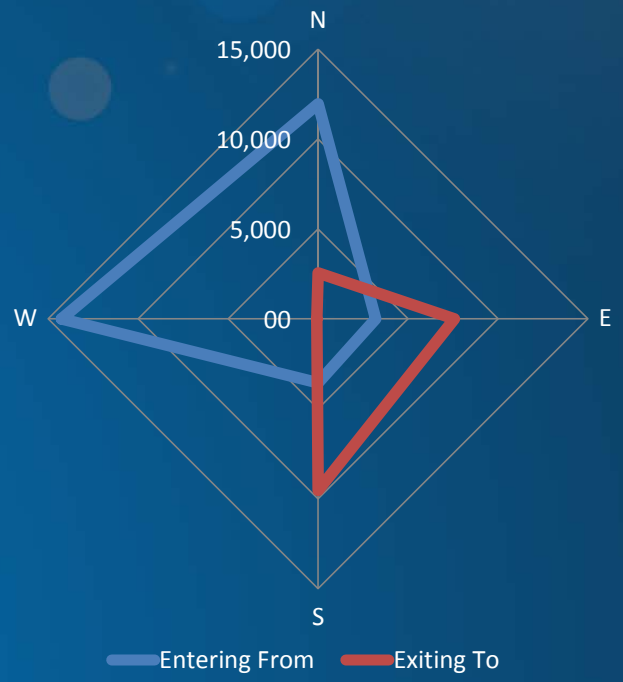
Import Flows by Direction (NESW)

Tonnage
(Thousands of Tons)



Value
(Million of Dollars)



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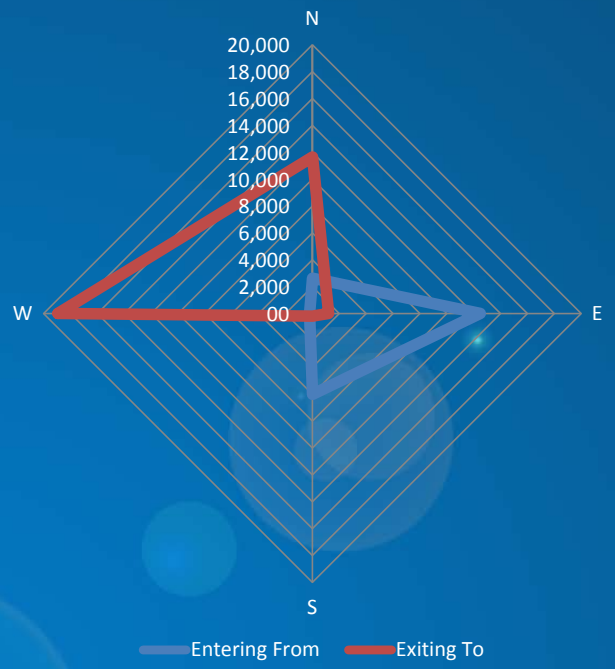
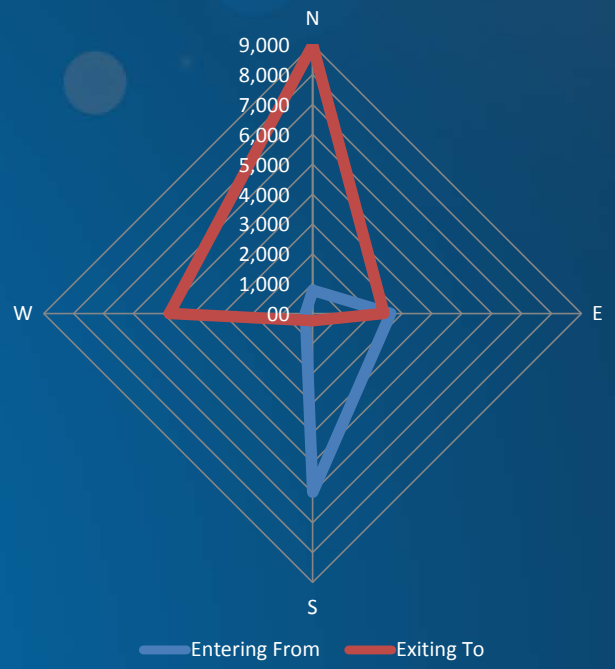
Export Flow by Direction (NESW)

Tonnage (Thousands of Tons)



Value (Million of Dollars)



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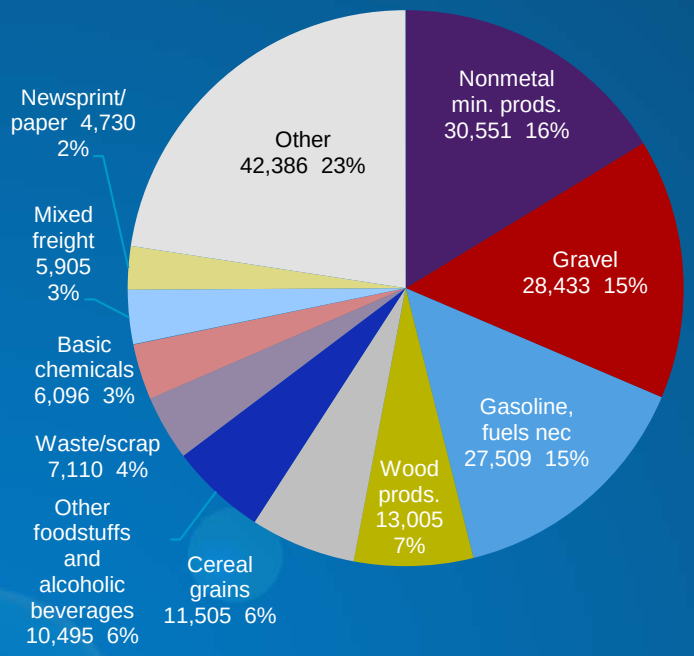
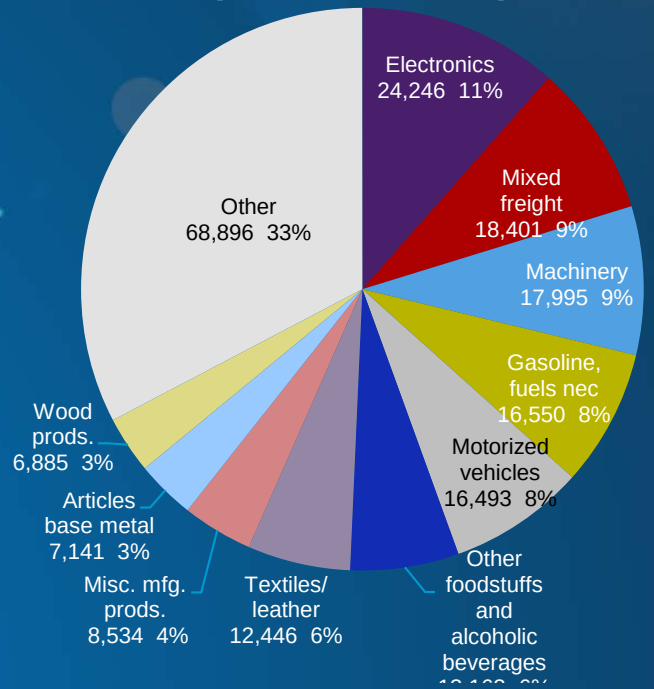
Top Domestic Commodities

Tonnage (Thousand of Tons)



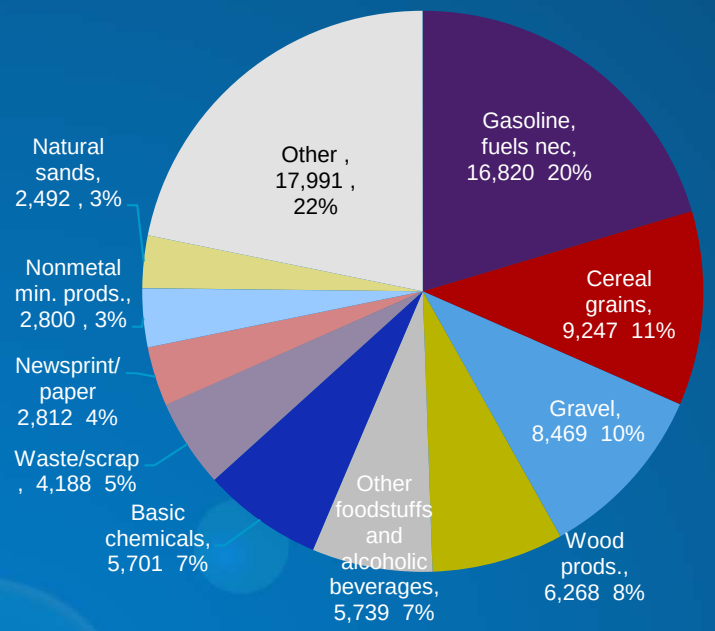
Value (Million Dollars)



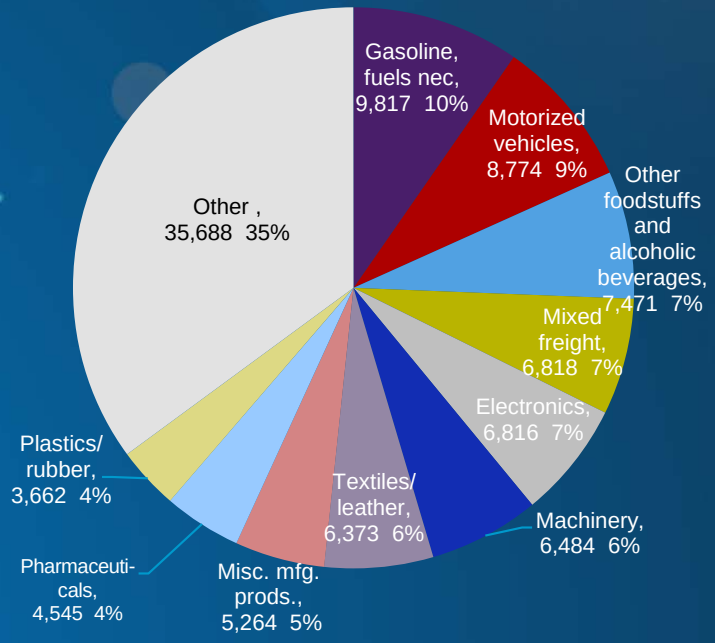
CAMBRIDGE SYSTEMATICS

Top Domestic Commodities – Inbound

Tonnage (Thousand of Tons)



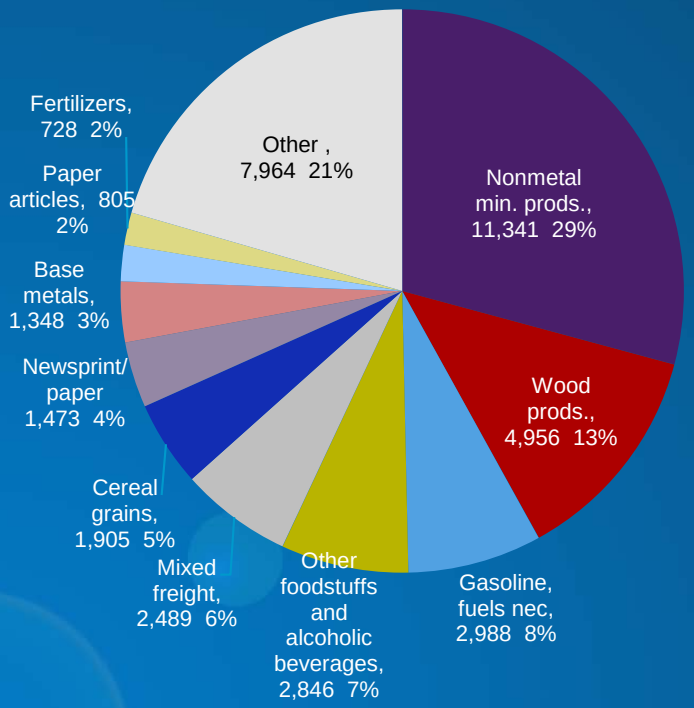
Value (Million of Dollars)



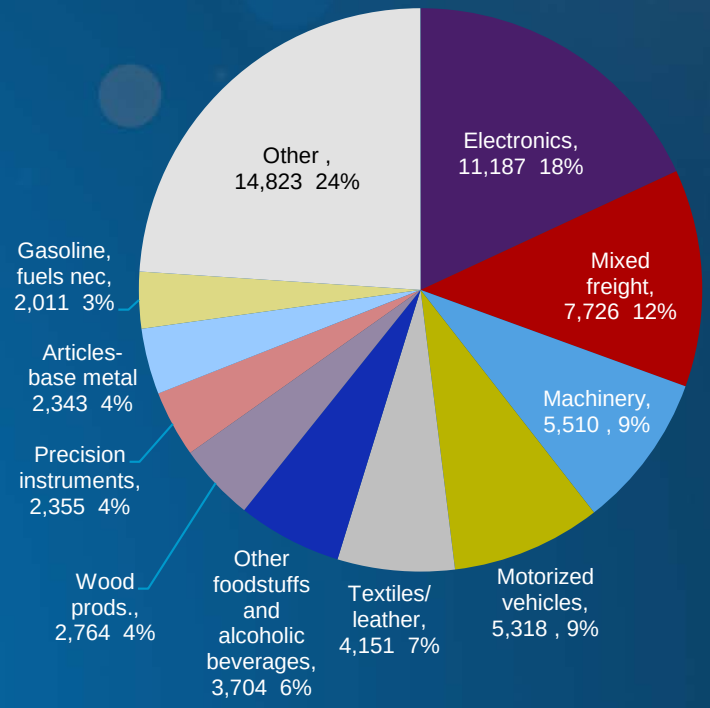
CAMBRIDGE SYSTEMATICS

Top Domestic Commodities – Outbound

Tonnage (Thousands of Tons)



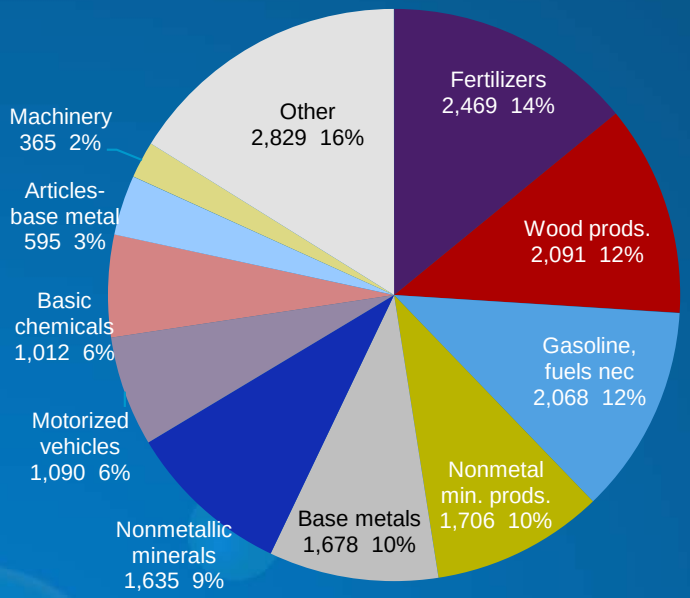
Value (Millions of Dollars)



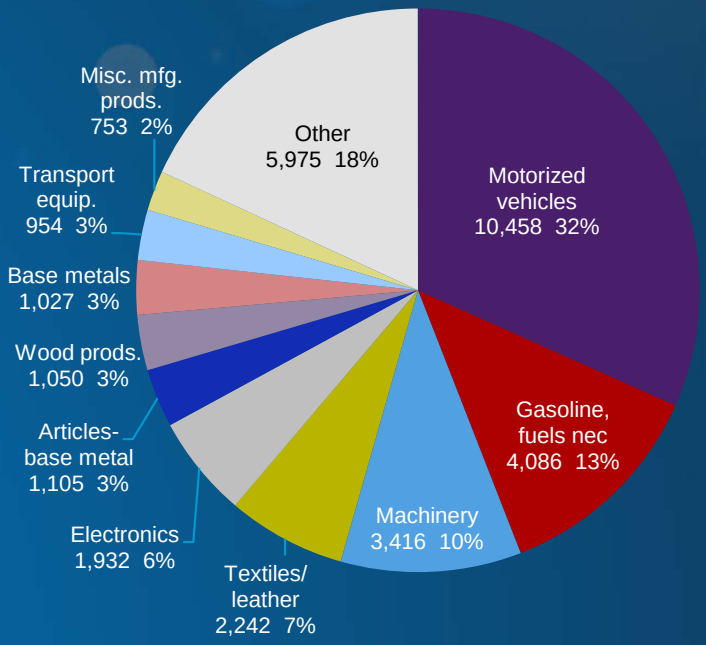
CAMBRIDGE SYSTEMATICS

Top Import Commodities

Tonnage
(Thousands of Tons)

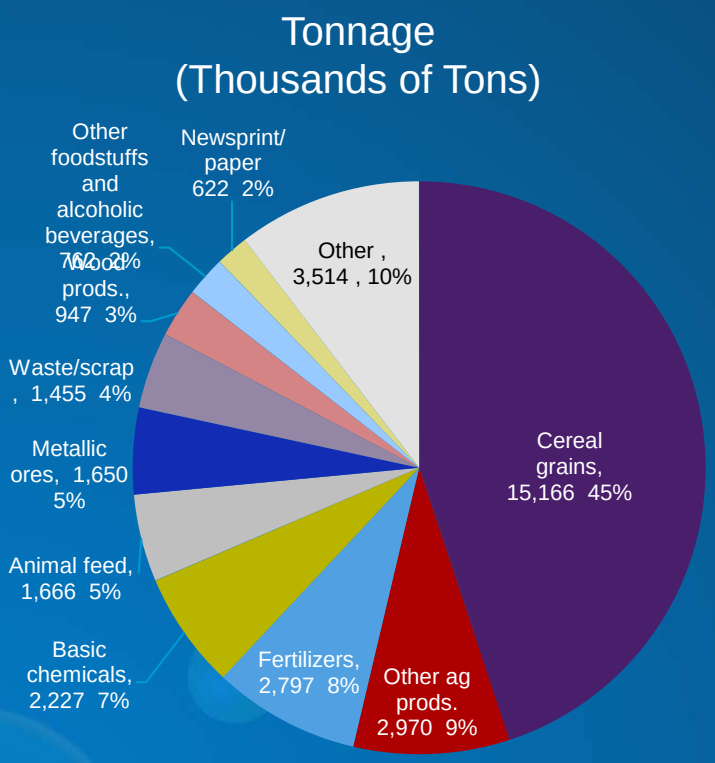


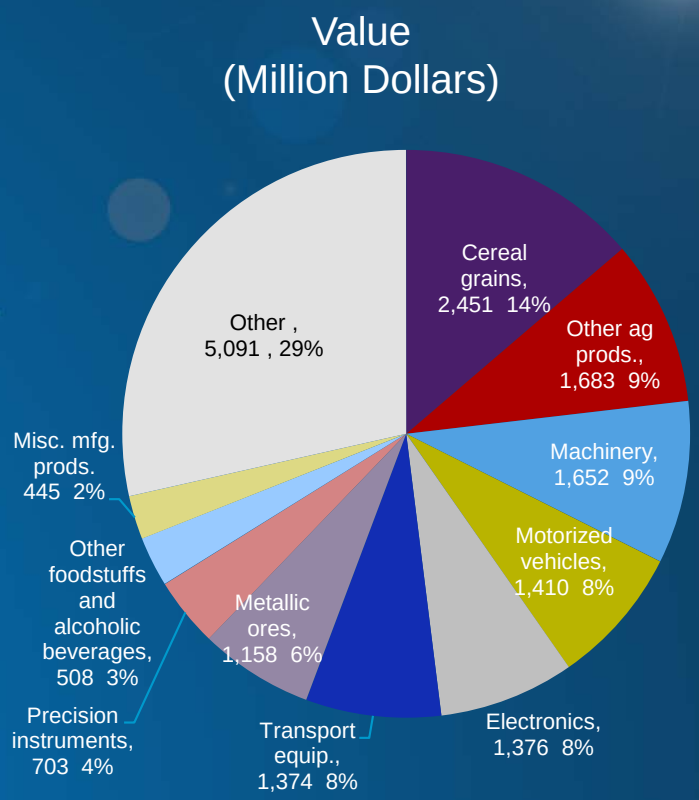
Value
(Millions of Dollars)



CAMBRIDGE SYSTEMATICS

Top Export Commodities



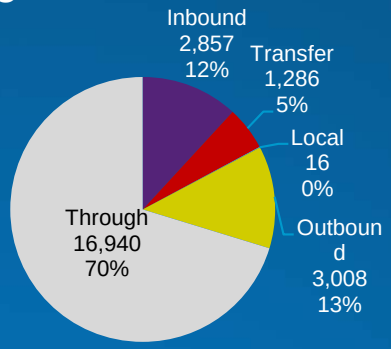


CAMBRIDGE SYSTEMATICS

Bridge Influence Area Flows

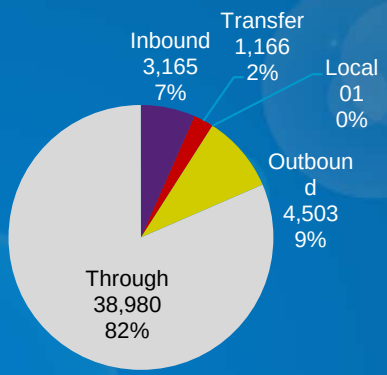
Tonnage (ktons)

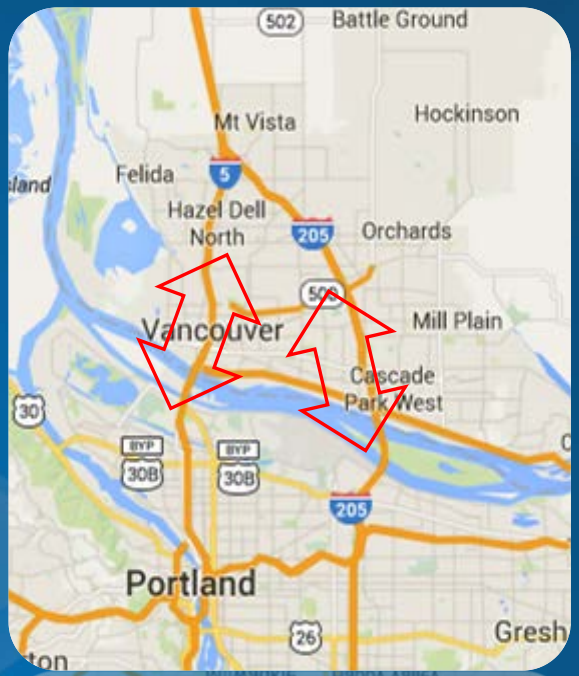
I-5



Value ($M)

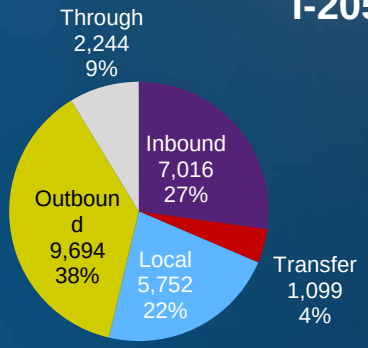
I-5





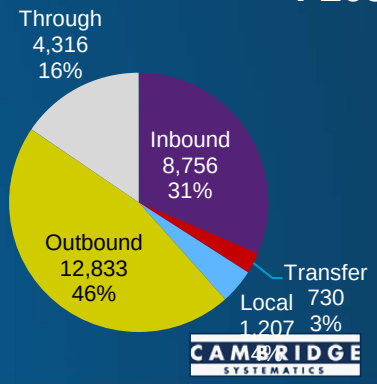
Tonnage (ktons)

I-205



Value ($M)

I-205



CAMBRIDGE SYSTEMATICS

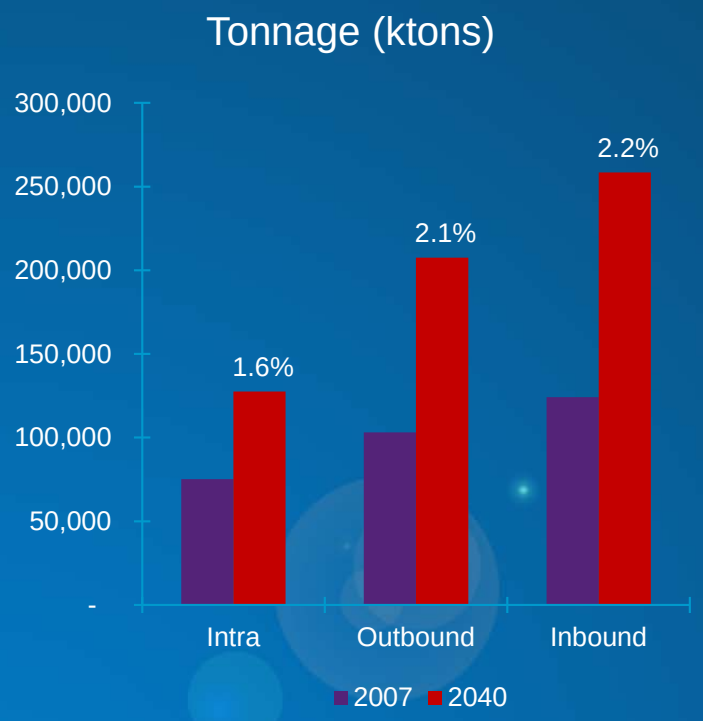
Future Year Data

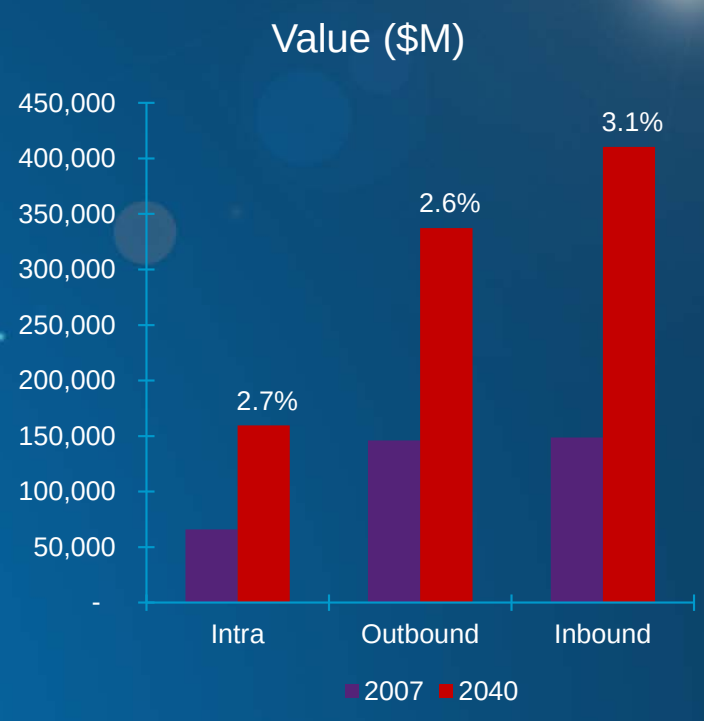
Adjustments to Future Volumes

- Cereal Grain. Existing FAF forecasts for originated grain could not be supported. Grain tons were forecasted using IHS production forecasts.
- Auto imports. Flows were reassigned so that total rail volumes matched the ports' statistics, with destination assigned in proportion to the volumes in the 2007 Carload Waybill Sample.
- Non-metallic mineral products. FAF3 growth is unrealistically high. Growth rates adjusted using HIS forecast rates based on the most recent County Business Forecasts.
- Precision Instruments. FAF3 growth unrealistically high. Growth rates adjusted based on most recent version of County Business Forecasts.

CAMBRIDGE SYSTEMATICS

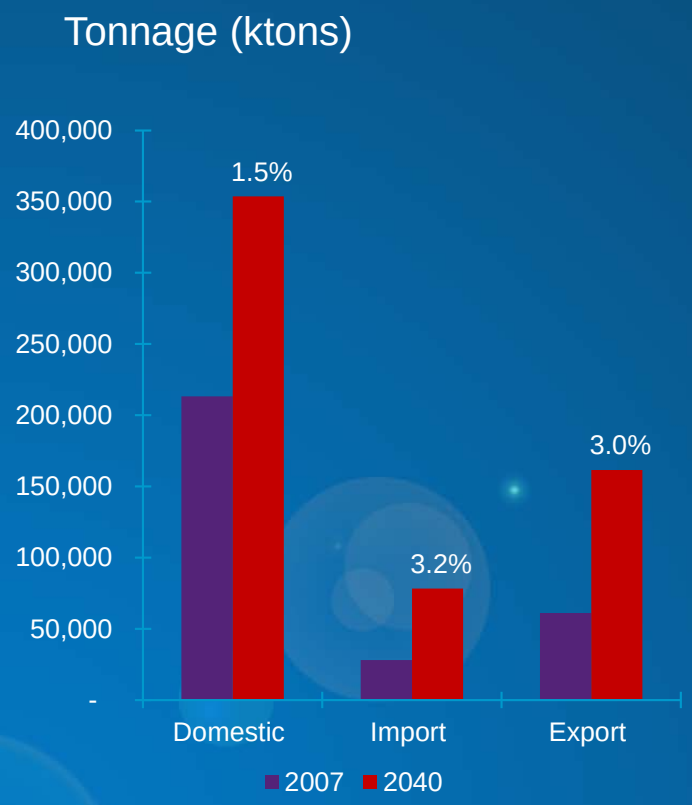
Growth of Flows by Direction*

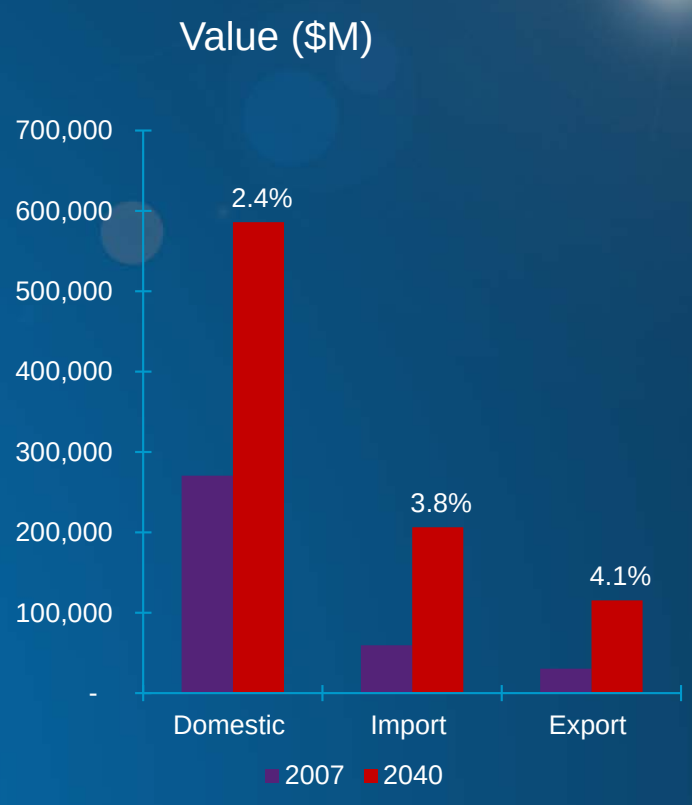




CAMBRIDGE SYSTEMATICS

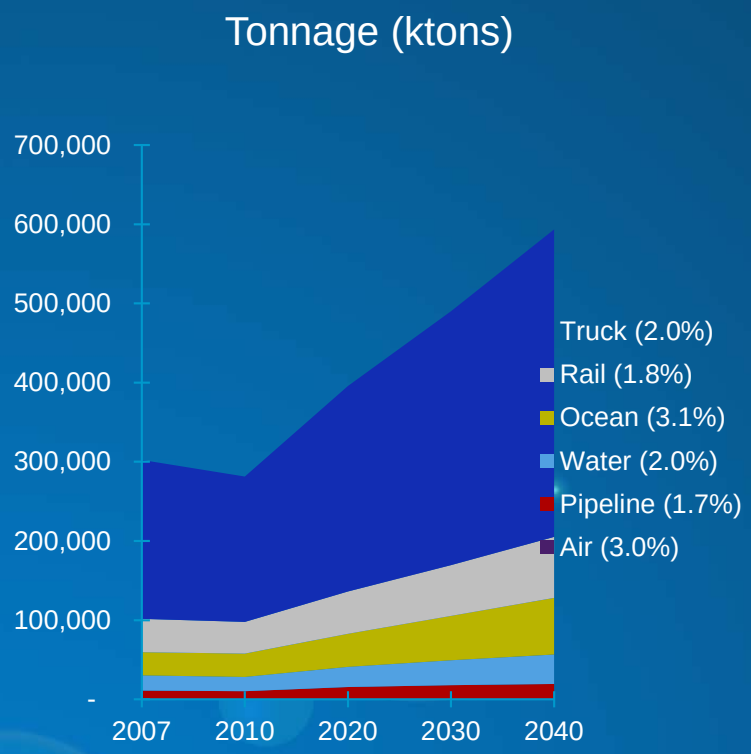
Growth of Flows by Trade Type

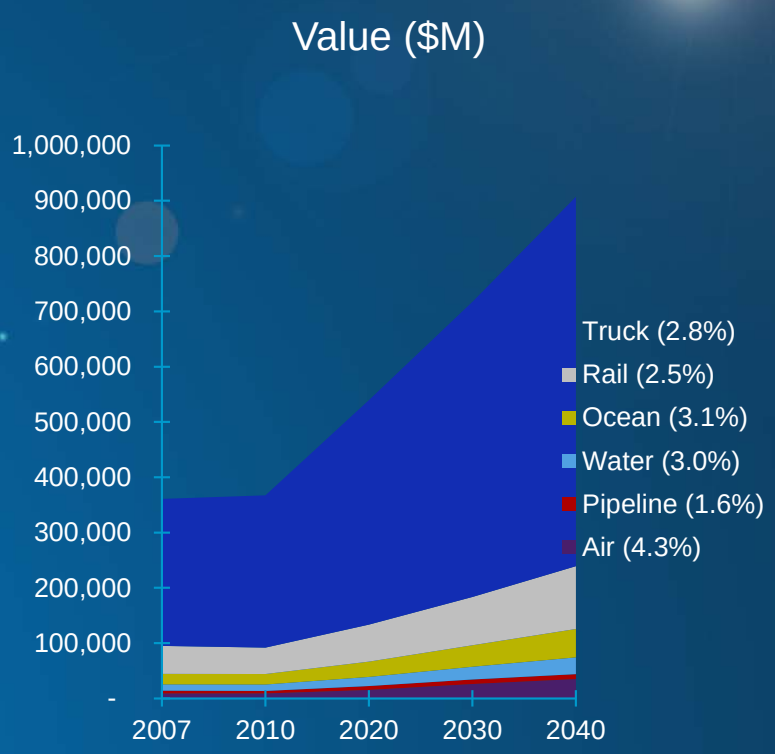




CAMBRIDGE SYSTEMATICS

Growth of Flows by Mode





CAMBRIDGE SYSTEMATICS

Growth of Domestic Flows by Direction (NSEW)

Tonnage (ktons)

Entering from	2007	2040	CAGR	Exiting to	2007	2040	CAGR
N	27,440	47,797	1.7%	**N**	15,882	25,875	1.5%
E	27,855	51,492	1.9%	**E**	15,866	23,923	1.3%
S	14,564	27,340	1.9%	**S**	17,378	22,829	0.8%
W	10,691	17,398	1.5%	**W**	3,246	4,251	0.8%

Value ($M)

Entering from	2007	2040	CAGR	Exiting to	2007	2040	CAGR
N	27,203	69,427	2.9%	N	31,985	67,532	2.3%
E	38,215	91,976	2.7%	E	29,614	52,973	1.8%
S	29,125	62,443	2.3%	S	28,279	53,980	2.0%
W	5,024	9,555	2.0%	W	1,883	3,717	2.1%

CAMBRIDGE SYSTEMATICS

Growth of Import Flows by Direction (NSEW)

Tonnage (ktons)

Entering From	2007	2040	CAGR	Exiting To	2007	2040	CAGR
N	7,243	19,511	3.0%	N	2,325	6,961	3.4%
E	1,716	5,562	3.6%	E	1,700	3,487	2.2%
S	1,342	4,922	4.0%	S	2,812	7,377	3.0%
W	7,225	18,748	2.9%	W	247	478	2.0%

Value ($M)

Entering From	00	00	CAGR	Exiting To	00	00	CAGR
N	11,946	44,924	4.1%	N	2,550	11,017	4.5%
E	3,196	18,226	5.4%	E	7,575	9,754	0.8%
S	3,553	17,659	5.0%	S	9,529	32,371	3.8%
W	14,264	36,711	2.9%	W	73	288	4.2%

CAMBRIDGE SYSTEMATICS

Growth of Export Flows by Direction (NSEW)

Tonnage (ktons)

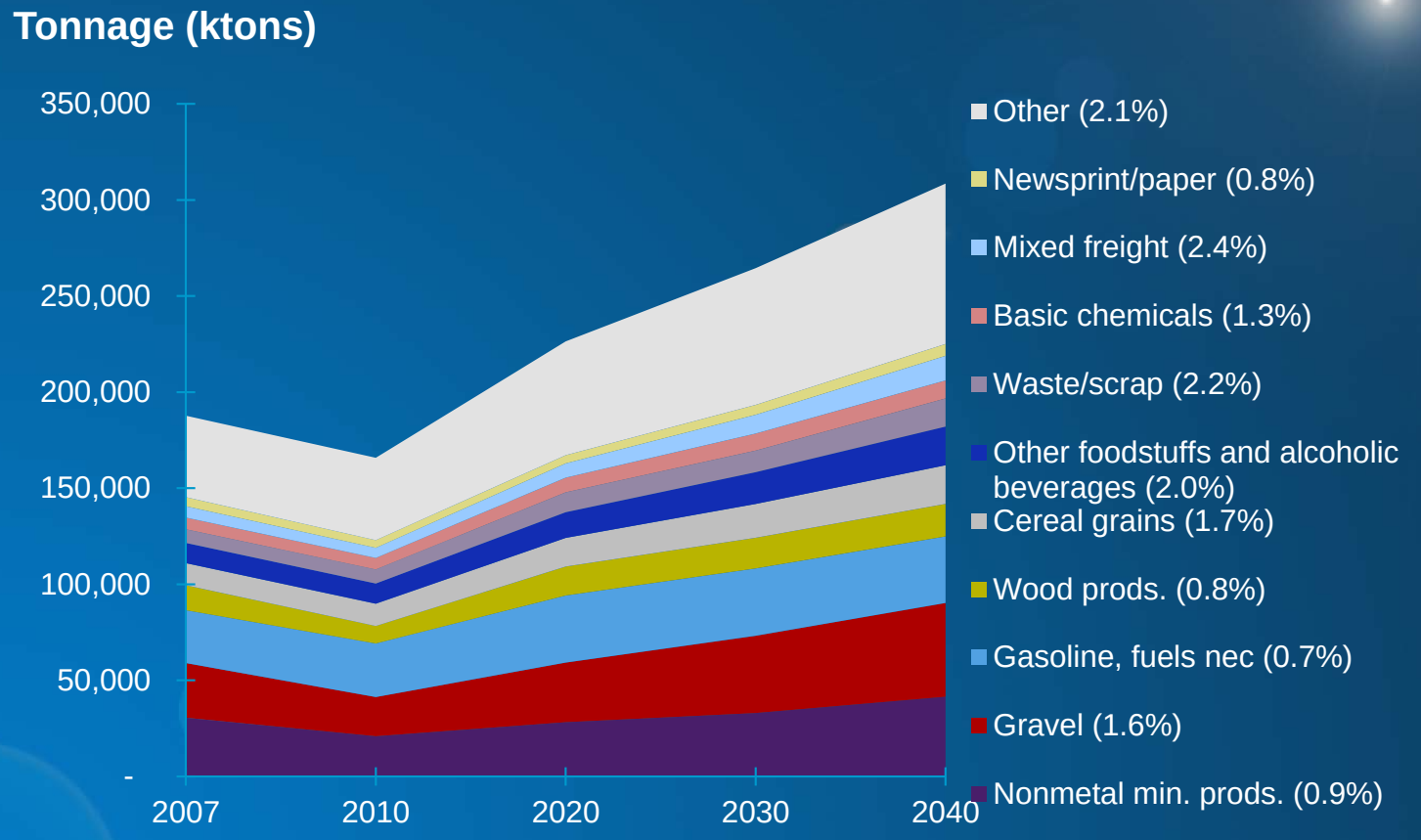
Entering From	2007	2040	CAGR	Exiting To	2007	2040	CAGR
N	2,635	6,447	2.7%	N	11,642	37,624	3.6%
E	12,484	26,765	2.3%	E	1,201	3,706	3.5%
S	6,023	19,545	3.6%	S	197	831	4.5%
W	209	862	4.4%	W	18,937	44,084	2.6%

Value ($M)

Entering From	00	00	CAGR	Exiting To	00	00	CAGR
N	778	2,618	3.7%	N	8,991	33,593	4.1%
E	2,618	8,079	3.5%	E	2,392	8,201	3.8%
S	5,986	23,881	4.3%	S	243	1,128	4.8%
W	235	957	4.4%	W	4,794	17,410	4.0%

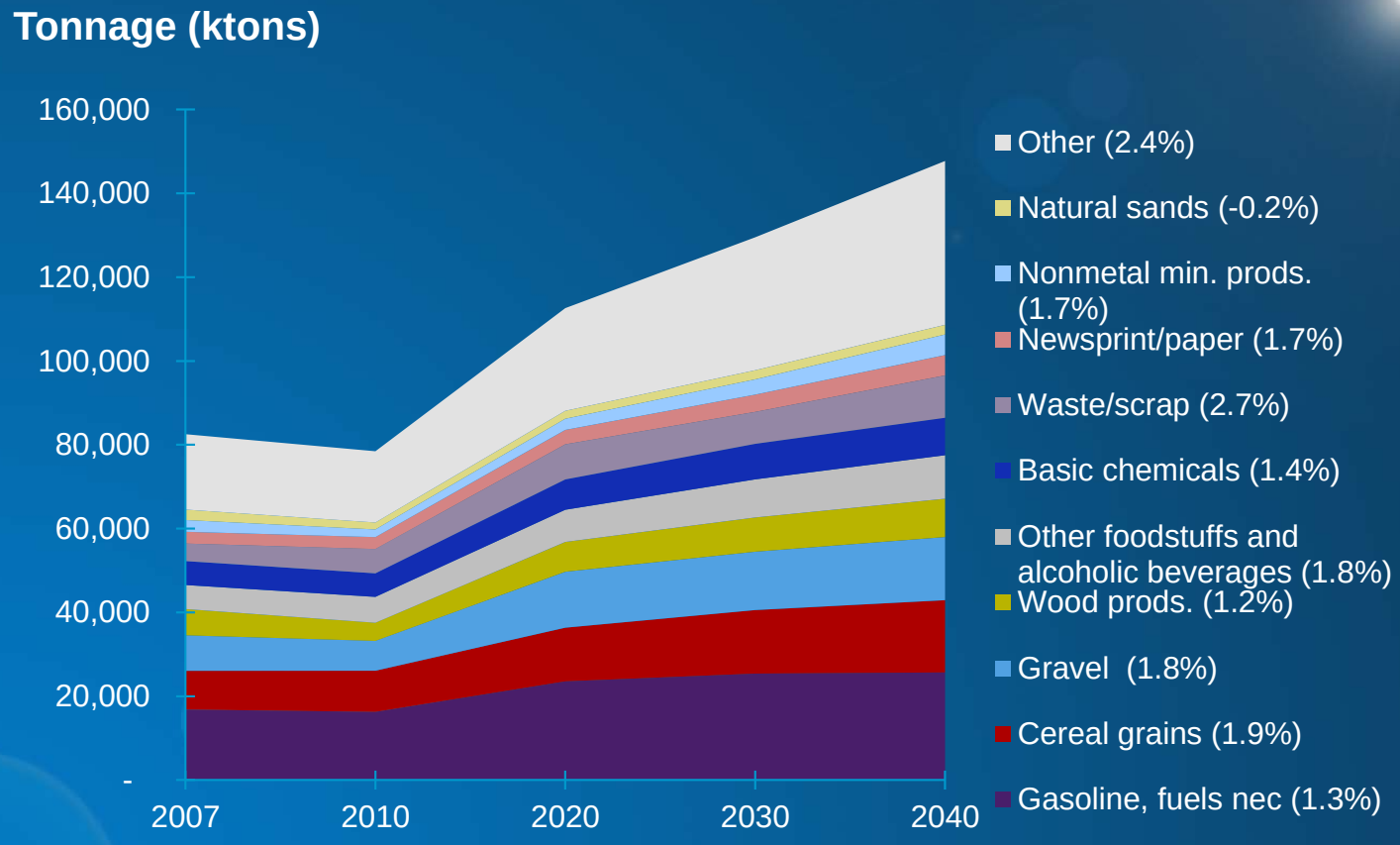
CAMBRIDGE SYSTEMATICS

Growth of Top Domestic Commodities – Tonnage



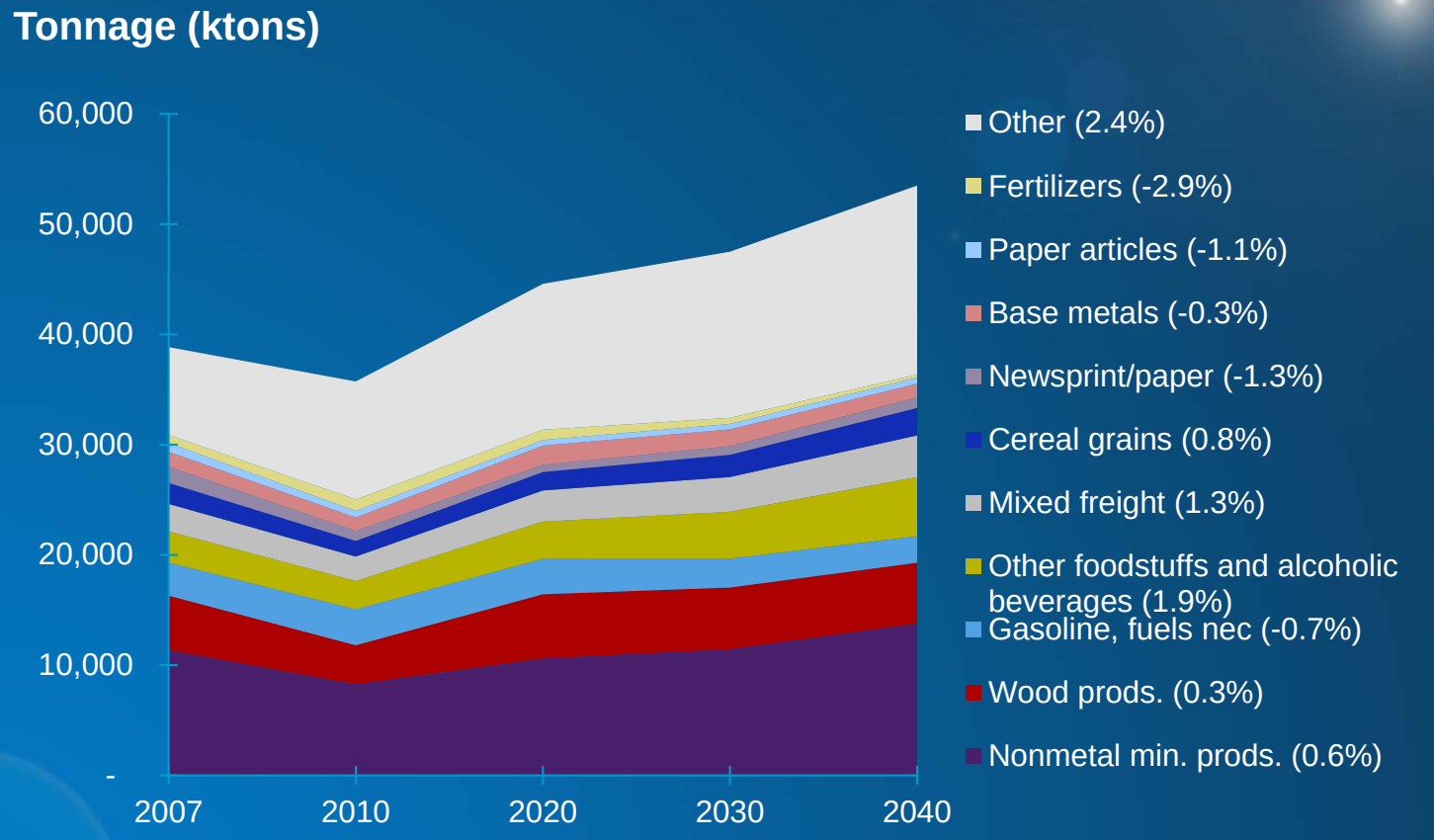
CAMBRIDGE SYSTEMATICS

Growth of Top Domestic Commodities – Inbound by Tonnage



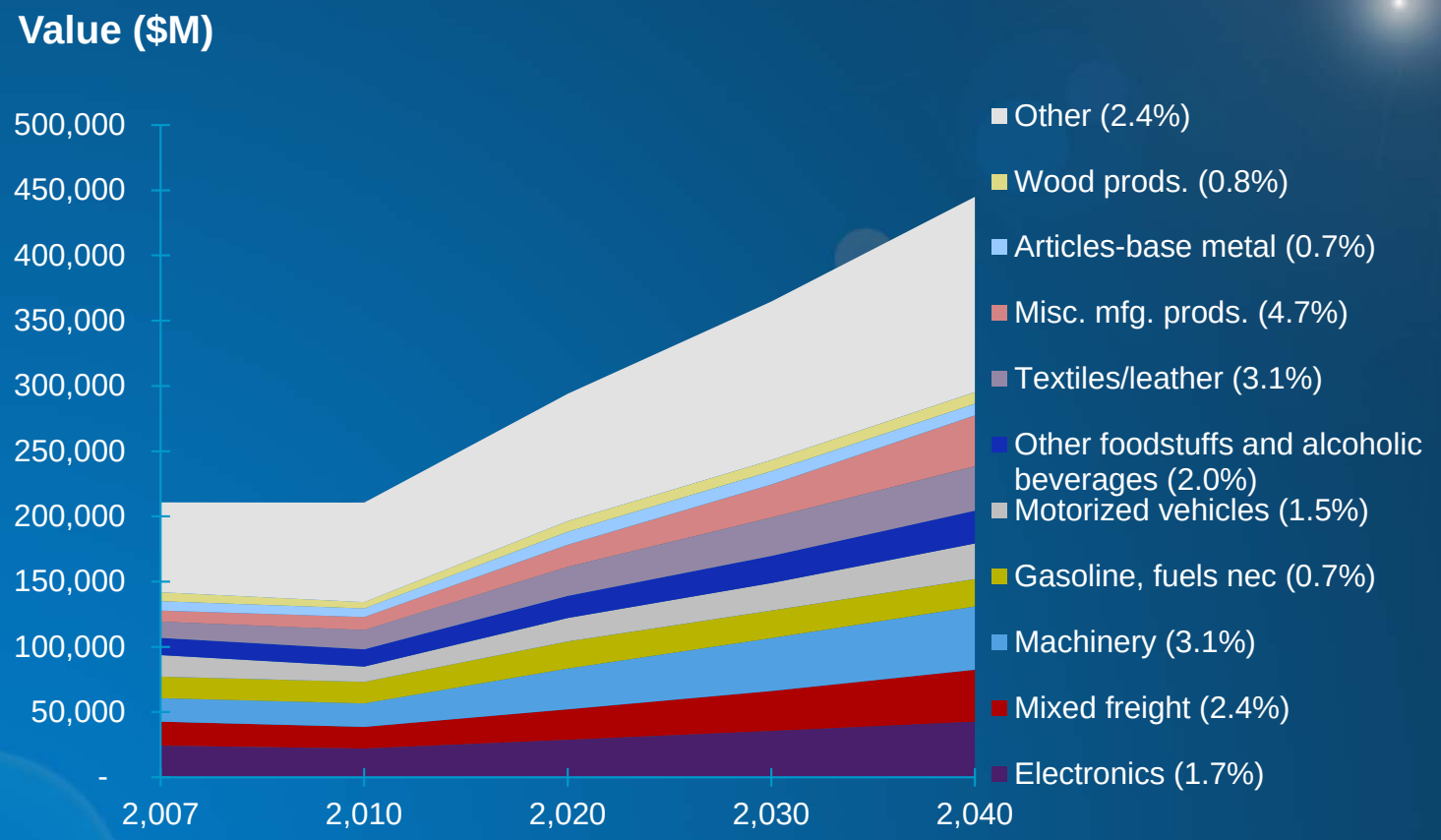
CAMBRIDGE SYSTEMATICS

Growth of Top Domestic Commodities – Outbound by Tonnage



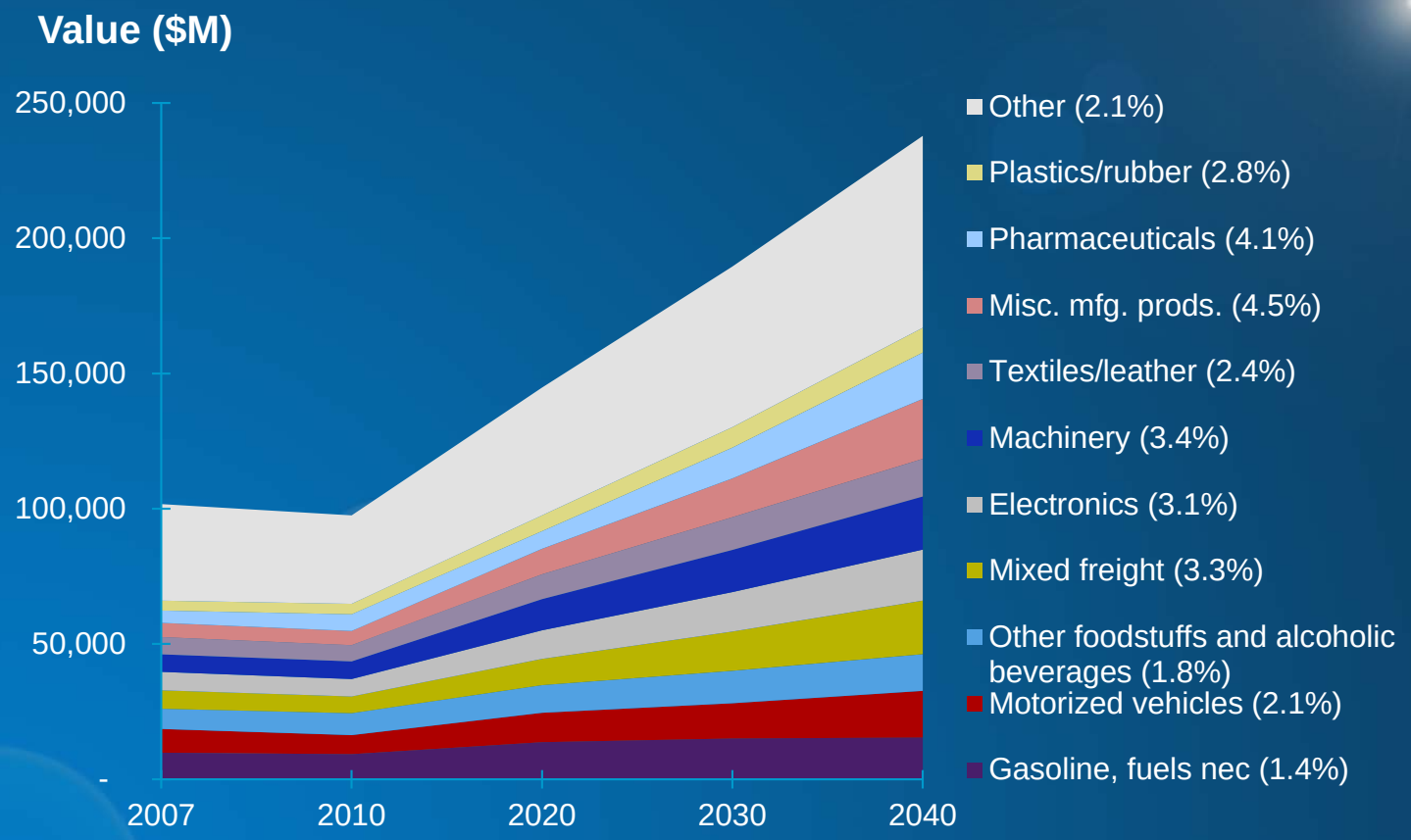
CAMBRIDGE SYSTEMATICS

Growth of Top Domestic Commodities – Value



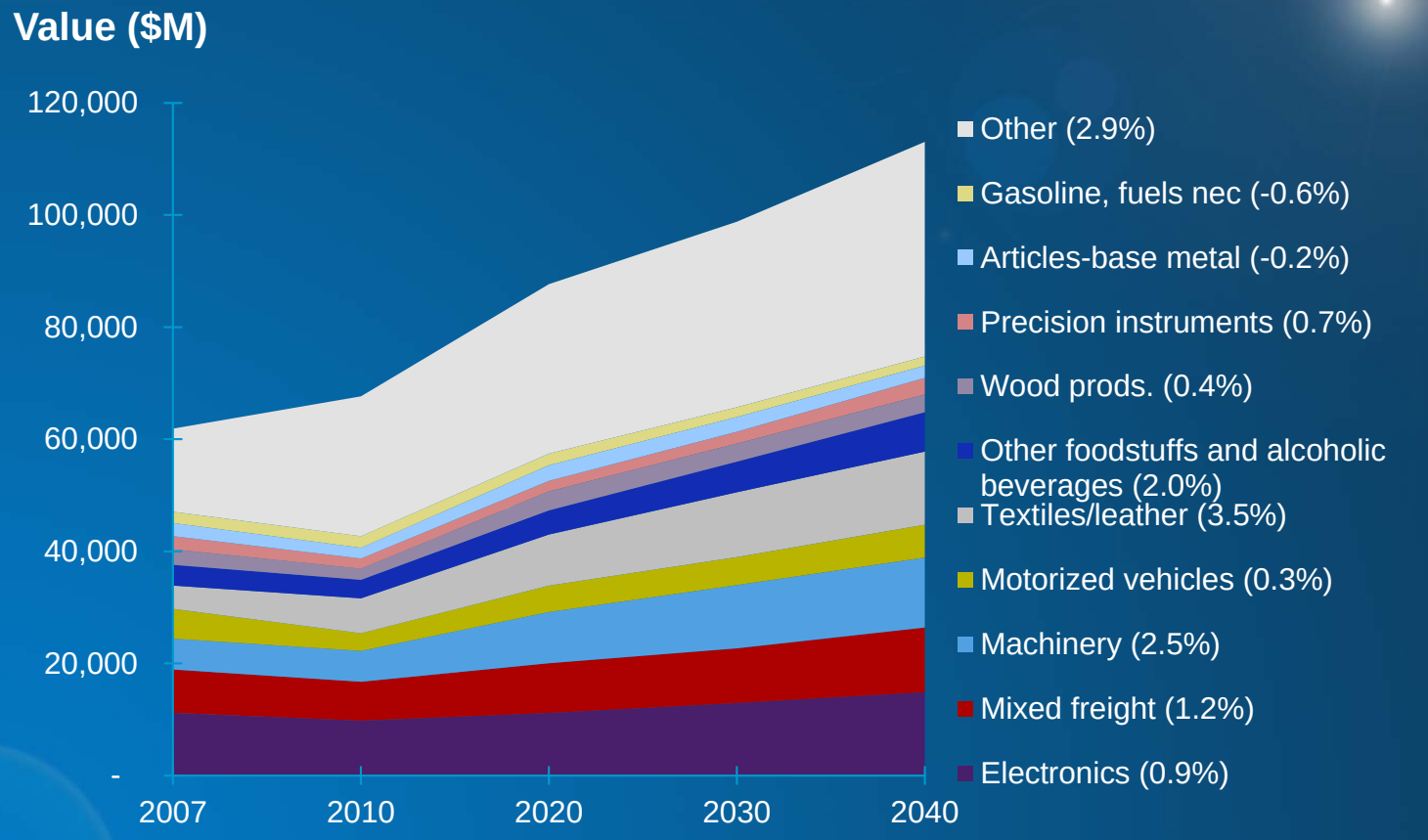
CAMBRIDGE SYSTEMATICS

Growth of Top Domestic Commodities – Inbound by Value



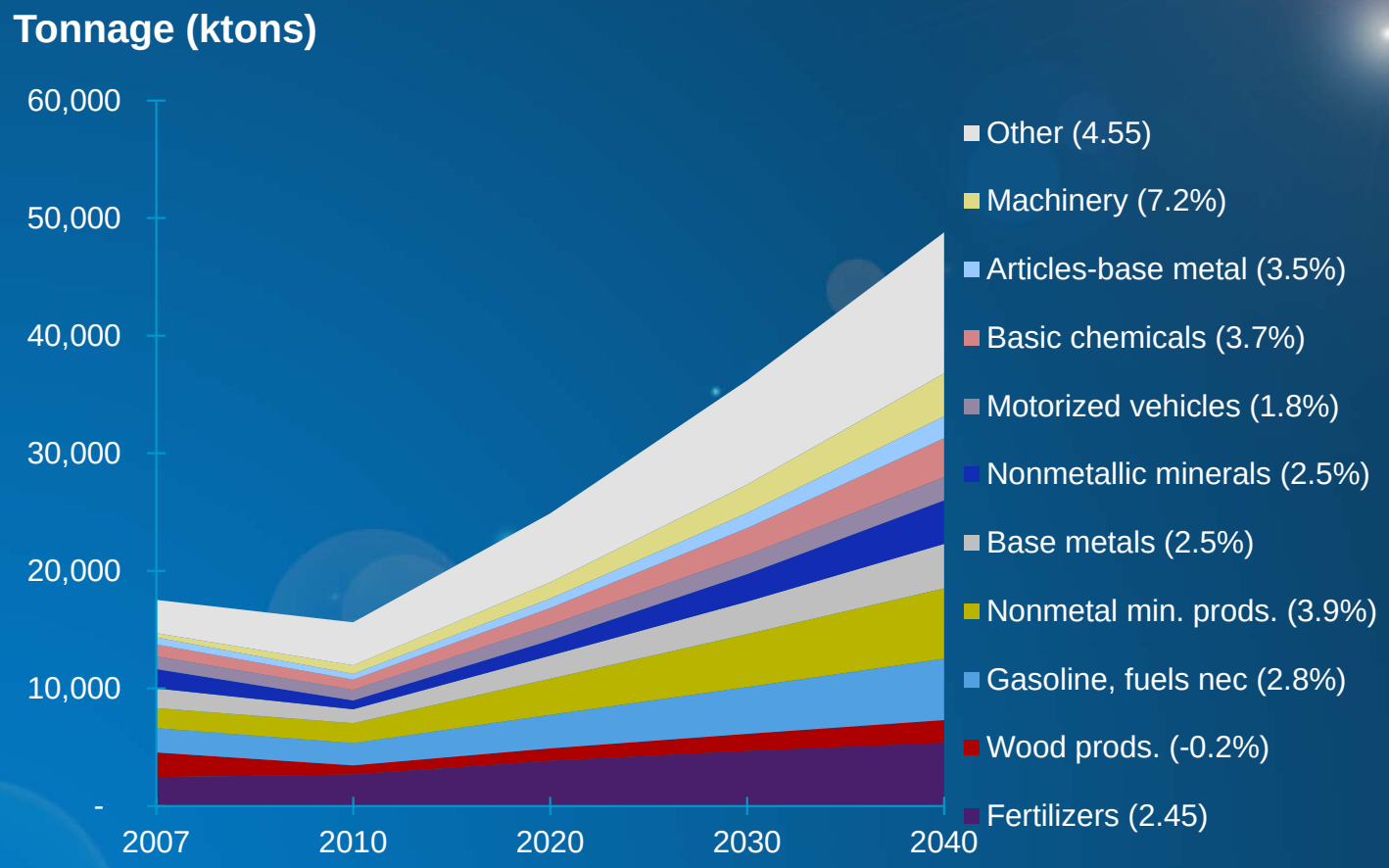
CAMBRIDGE SYSTEMATICS

Growth of Top Domestic Commodities – Outbound by Value



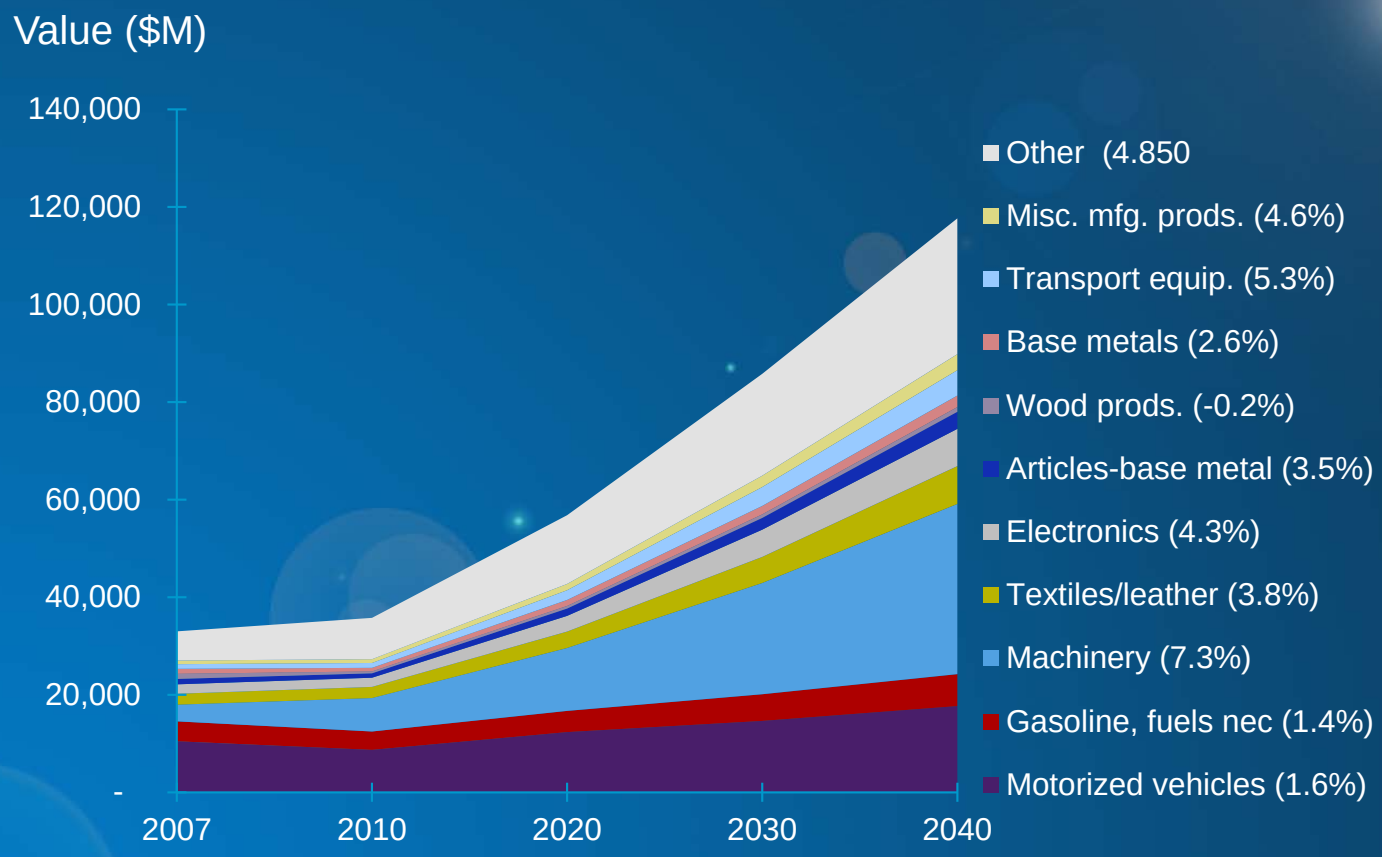
CAMBRIDGE SYSTEMATICS

Growth of Top Import Commodities – Tonnage



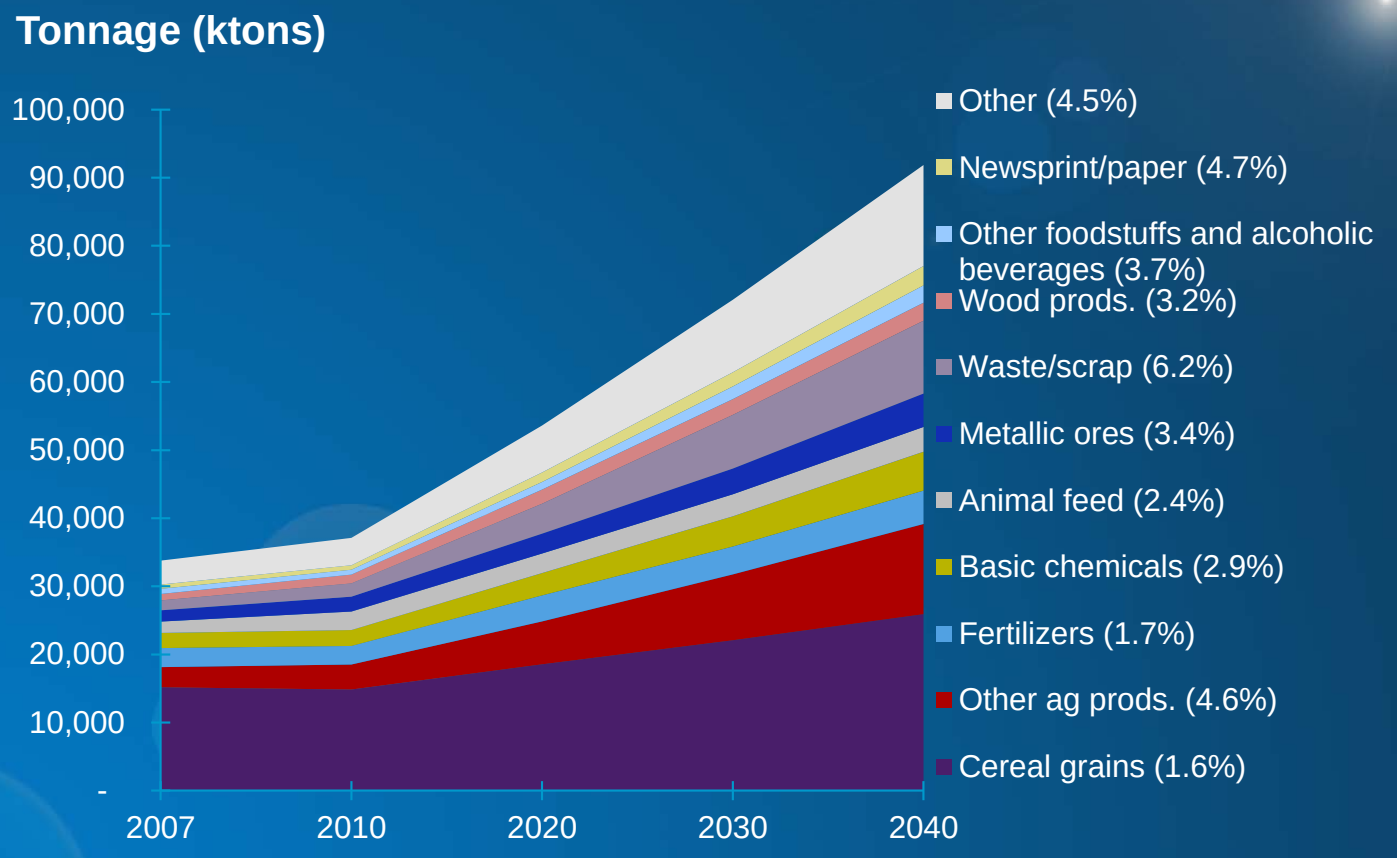
CAMBRIDGE SYSTEMATICS

Growth of Top Import Commodities – Value



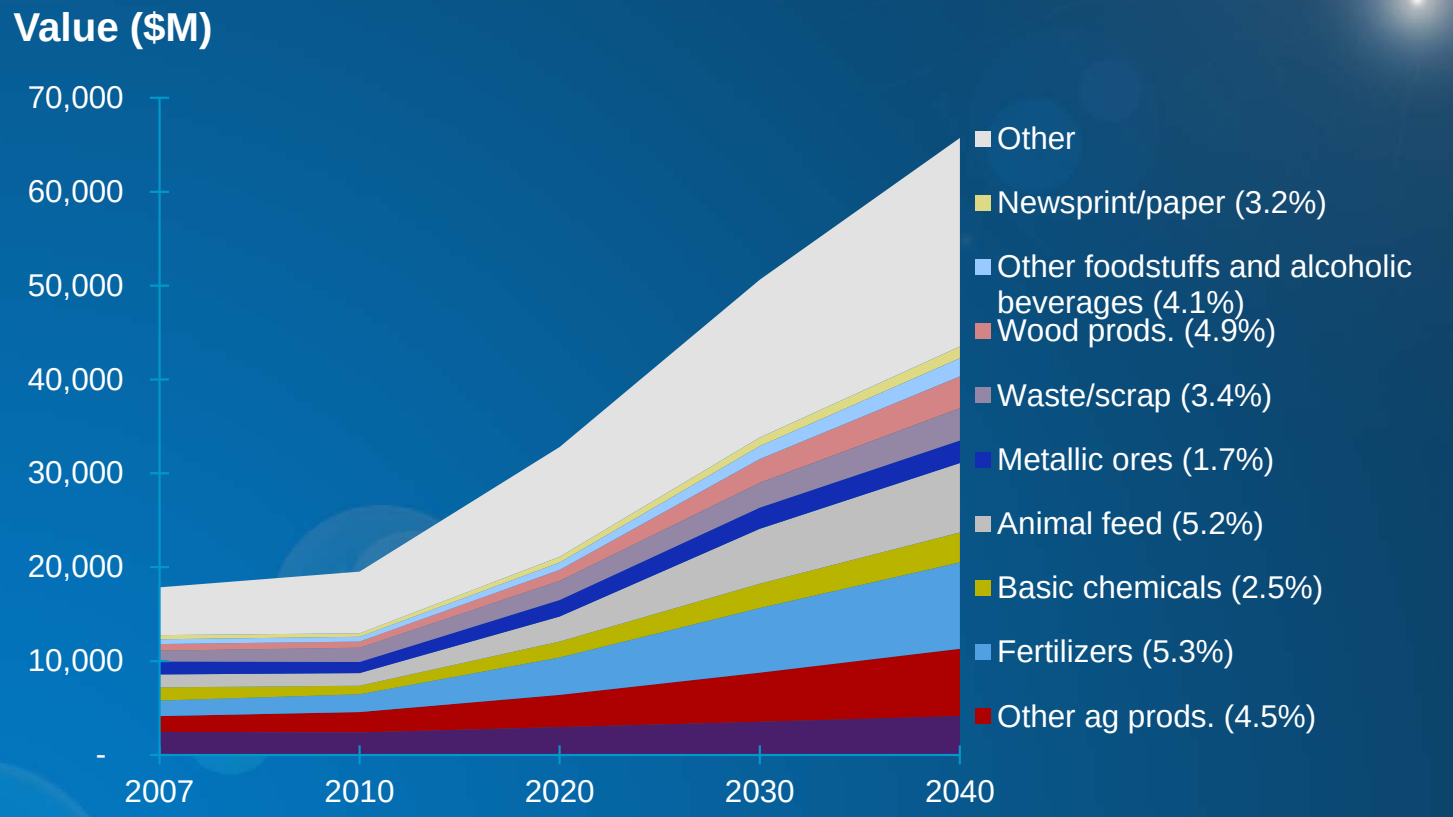
CAMBRIDGE SYSTEMATICS

Growth of Top Export Commodities – Tonnage



CAMBRIDGE SYSTEMATICS

Growth of Top Export Commodities – Value



CAMBRIDGE SYSTEMATICS

Summary of Written Tasks

Task F and H: Factors Specific to Top Commodity Groups for Growth and Mode

- Cereal Grains. Rail Congestion and barge congestion will have biggest impact on growth. Product likely to continue to move on rail.
- Waste and Scrap. Biggest driver of export will be price on the international market. Metallic scrap usually arrive by multiple modes to be exported by vessel. Non-metallic scrap arrives in trucks usually to be exported in containers. Shifts in modes can occur depending on demand.
- Non-Metallic Mineral Products. Domestic oil and gas production will drive imports of such products as barite. This will likely to continue move on rail, depending on rail pricing. Diversion of short haul movements to truck is also likely.
- Gasoline and Fuels. Future volume will be determined by success/failure of domestic extraction and refining of oil, and growth of alternative fuels (e.g., natural gas).

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Task F and H: Factors Specific to Top Commodity Groups (Cont'd)

- Precision Instrument. This time sensitive commodity can be affected by delays on roadways and rail. Air transportation can be increasingly utilized in the future in addition to road and rail.
- Machinery. Movement will grow at the pace of local and U.S. economy but can be affected by outsourcing/reshoring of production. Traditionally break-bulk moved by truck, it can be increasingly moved on intermodal rail.
- Electronics. Volumes will growth with the economy, as well as outsourcing/reshoring trends. Intermodal trucking/rail will continue, with potential increases in air shares for more time sensitive electronics.
- Motorized Vehicles. Future imports will largely be driven by domestic demand, while exports by foreign demand. Trucking/rail will continue as dominant mode of transpo

Task G: Trends/Changed in Transportation Technologies

1. Conversion of shipment from pipeline to rail (e.g., crude by rail)
2. Increase of LTL shipments of fast moving consumer goods
3. Increase in transloading of imported goods from international containers to domestic containers (40ft to 53ft containers)
4. Increased exportation of minerals and bulk products such as copper ore, LNG, and coal
5. Conversion of fuel used in freight from diesel to LNG
6. Adoption of electric vehicles for freight movements
7. Continued concern of freight movement security
8. Continued pressure to reduce health/environmental impacts from freight
9. Environmental pressure to increase fuel mileage in all vehicles

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Task I. Strength and Weakness of the Portland Region

Strengths	Weaknesses
• Natural advantage of Columbia River to assist in moving bulk products • Port of Portland's capacity and transfer of bulk products • Solid base and good incentive of attracting high value manufacturers • Class I and shortlines offer good modal alternative for BCOs • Port of Vancouver pipeline facility, heavy lift cranes, and other specialized facilities enable movement of gasoline, clean energy products, and other niche products.	• Increasing highway and local congestion • Limited direct airfreight service at PDX • Modal choice restricted for products sources from remote areas (e.g. ag products) • Lack of highway redundancy • Cumbersome OSOW permitting process • Few roads across coastal range, especially affecting fish and seafood
Opportunities	**Threats**
• Clustering of hi-tech sectors provide synergies and attract economy of scale and human capital. • Large dry cargo market can create possibility to attract further service if ag products, footwear/apparel shippers can cluster with hi-tech to form a strong cargo base.	• Dwindling containerized ocean carrier service can reduce competitiveness • Scarcity of industrial land for logistics • Failure to replace the Columbia River Crossing I-5 bridge that affects reliability and mobility

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Task J: Global Trends that Can Affect Freight Flows

- Re-shoring of Manufacturing to the U.S.
- BCOs distribution strategy shift from “push” to “pull” supply chains, and the increase of ecommerce
- Increase use of Mega Vessels
- Changing Asian demand for raw materials
- Changing demand for recycled products

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Task K: Potential Methodologies for Transshipment

1. TRANSEARCH approach to estimating warehouse and distribution center commodity flows as applied to the Portland – Vancouver regional commodity flow database

2. Transload secondary trip estimation methodology for the
   San Pedro Bay ports' PortTAM

3. CMAP mesoscale supply chain model

CAMBRIDGE SYSTEMATICS

Thank You

working for clean rivers

The Bureau of Environmental Services works with Portland residents and businesses to protect water quality, public health, and the environment through wastewater collection and treatment, sewer construction and maintenance, stormwater management, and stream and watershed restoration.



PHOTO COURTESY OF TRIMET

The Streamlining Agreement benefits the City of Portland and other local governments as well. The streamlining team worked with TriMet on permits for the Tilikum Light Rail Bridge across the Willamette River (above) and helped Multnomah County with permits for replacing the Sellwood Bridge.

City of Portland Streamlining Agreement

Building a collaborative process that encourages efficient and effective communication among multiple government agencies and City of Portland project teams to secure timely, responsive and non-conflicting decisions from agencies overseeing environmental permits and other authorizations

Early in 2003, Portland entered into an agreement with NOAA Fisheries, the U.S. Army Corps of Engineers (Corps) and the U.S. Fish and Wildlife Service (USFWS) to streamline stream restoration, capital improvement and other city projects that trigger Endangered Species Act requirements. It was the nation's first streamlining agreement between federal agencies and a municipal government.

The agreement brought into focus the many regulations that affect the city's work and the need for better coordination with more state and federal regulatory programs. As a result, the agreement expanded to include Oregon's state departments of Lands (DSL), Environmental Quality (DEQ) and Fish and Wildlife (ODFW) and the city's Bureau of Development Services (BDS).

The Streamlining Agreement has served Portland well. It improves working relationships with city project managers and permitting agencies, speeds project reviews, and helps keep projects on schedule and on budget. The program has issued more than 168 federal, state and local environmental permits since 2003 for nearly 60 city projects.

At a Glance

The streamlining agreement:

- Ensures timely construction and implementation of city projects
- Improves coordination, communication and agreement on permit applications and consultations
- Ensures permitted activities protect both listed and non-listed species
- Creates opportunities for overlapping jurisdictions to collaborate on key shared decisions

ENVIRONMENTAL SERVICES
CITY OF PORTLAND
working for clean rivers

Nick Fish, Commissioner
Dean Marriott, Director

OCTOBER 2014

City of Portland Streamlining Agreement

Many Projects Benefit from Streamlining

The Streamlining Agreement has benefited several Portland city bureaus and other local governments. The team helped Portland Fire & Rescue gain permits for its new Station 21 at the Hawthorne Bridge and the Bureau of Transportation replace the North Vancouver Avenue Bridge. Other examples include:

Streamlining Team Members

TEAM CHAIR

Mike Reed, Water Resources Program Manager and fisheries biologist with Environmental Services

CITY OF PORTLAND

- Bureau of Development Services (BDS)

STATE AGENCIES

- Department of Environmental Quality (DEQ)
- Department of Fish and Wildlife (ODFW)
- Department of State Lands (DSL)

FEDERAL AGENCIES

- U.S. Army Corps of Engineers (Corps)
- National Marine Fisheries Service (NMFS)
- U.S. Fish and Wildlife Service (USFWS)

City bureaus and local governments that have worked with the streamlining team include:

- Fire & Rescue
- Water
- Transportation
- Environmental Services
- TriMet
- Parks & Recreation
- Portland Development Commission
- Planning and Sustainability

Portland Water Bureau

The Water Bureau worked with the streamlining team on several projects addressing pipe construction and habitat conservation efforts in the Bull Run watershed, including:

Sandy River Conduit Crossing Project

This project involved burying water pipes below river and stream crossings to reduce their vulnerability to natural and man-made hazards. The Department of Homeland Security provided funding.

Sandy River and the Bull Run Habitat Conservation Plan

This project constructed a fish ladder in Alder Creek, a tributary to the middle Sandy River, to improve fish passage for coho and steelhead at an impassable waterfall.

Post-project reviews found the streamlining process created a forum to provide information and obtain feedback, allowed minor design adjustments that minimized impacts to resources, and recommended the continued use of the process—especially for large, complex projects.



PHOTOS COURTESY OF THE WATER BUREAU

Projects included burying pipes to reduce vulnerability like these crossing the Sandy River on a 115- year-old steel truss bridge.



The fish ladder on Alder Creek improves fish passage.

"Pre-application meetings give the Corps and other agencies time to voice their concerns with project designs and discuss permit issues at an early step of the project. It is much easier to address and avoid issues earlier rather than later and try to force a project fit."

James A. Holm, U.S. Army Corps of Engineers



TriMet/Federal Transit Administration

Tilikum (Portland-Milwaukie) Light Rail Bridge Project

The 7.3-mile light rail extension to Milwaukie includes a new bridge over the Willamette River and crossings over Crystal Springs, Johnson Creek and four other streams along its route. The crossings created nearshore impacts from in-water piers and abutments requiring mitigation of the lost shallow-water habitat. Streamlining team member agencies reviewed and permitted projects to restore beaches and banks and replace a Crystal Springs Creek culvert to improve fish passage.

Multiple meetings with staff from TriMet, Environmental Services, Portland Parks & Recreation and the streamlining team helped ensure the project designs met agency concerns and expectations.

"The City of Portland's streamlining team meetings are very useful and important from our agency's perspective. The sooner that we can provide guidance in the planning process the better. Early interaction and communication will result in a more effective permitting process."

Michael V. McCabe, formerly of the Oregon Department of State Lands

Bureau of Environmental Services

Guilds Lake/Willamette River Sanitary Sewer Pressure Line Repair Project

In 2004, Environmental Services discovered that erosion had exposed two parallel sanitary sewer lines – one 20-inch line and one 30-inch line – at the bottom of the Willamette River. The bureau had to protect the pipes to avoid a line break that would release raw sewage into the river. The pipes are located in the Portland Harbor Superfund site and were in an area where the DEQ planned to construct a sediment cap. Funding for sediment cap construction was due to expire in 2005.

Early communication between the agencies and project team and the level of trust and commitment by the streamlining team helped the project receive all federal, state and local permits in about two months, which for such a complex project was a very short time. Agencies recognized the urgency of the situation and the city's project manager did an excellent job communicating and incorporating project design features to address multiple regulatory concerns and issues.

PROGRAM HISTORY AND MILESTONES

2001
Portland Mayor Vera Katz introduces her vision for a partnership with federal agencies to help the city address multiple regulatory requirements in a more coordinated, efficient manner.

2002
The city and federal agencies agree to participate in a streamlining process for Endangered Species Act (ESA) Section 7 consultations.

FEBRUARY 2003
City of Portland, the Corps, NMFS and USFWS sign an agreement to streamline ESA Section 7 consultations.

FEBRUARY 2006
Oregon Governor Ted Kulongoski and **Portland Mayor Tom Potter** invite **State** agencies to participate.

NOVEMBER 2006
Portland's **Bureau of Development Services** joins the streamlining team.

SEPTEMBER 2009
Five-year status report presented to **Mayor Sam Adams and City Council**. Participants agree to continue the program.

APRIL 2013
State Land Board presents the streamlining team with the **2012 Land Board Partnership Award**.

JUNE 2014
The **Hatfield School of Government's Center for Public Studies** conducts a third-party review of the streamlining team process and endorses the city's streamlining program.

Center for Public Service endorses City of Portland Streamlining Process

In 2014, the Hatfield School of Government's Center for Public Service (CPS) assessed the permit streamlining program. CPS reviewed program reports and documents; met with the team's chair; and interviewed team members, city project managers, consultants and city leaders about the program.

The assessment found the streamlining process:

- Fosters constructive relationships (among the most important benefits of the process)
- Builds trust through collaborative relationships between city project managers and regulators
- Ensures compliance with city, state and federal environmental regulations
- Builds and maintains consistency in messaging and decision-making
- Leads to final project designs that meet expectations and concerns
- Reduces permit processing time

The Hatfield School of Government Center for Public Service assessment of the streamlining team process found there were time and cost savings through process efficiency, consistent regulatory decisions and opportunities for constructive relationships with regulators.

LOOKING AHEAD

The Hatfield School of Government's Center for Public Service has endorsed the Streamlining Agreement and recommended that the streamlining team:

- Continue the collaborative and voluntary nature of the process, the consistency and efficiency of the team process, and continue building relationships
- Develop outreach to inform senior leaders of participating agencies about the value of the process
- Continue to assess and improve the streamlining process
- Explore exporting the process to other jurisdictions

The full report is available by contacting Streamlining Team Chair Mike Reed.

City of Portland Streamlining Team received 2012 Land Board Partnership Award



Citing ten years of collaborative work, the State Land Board honored the streamlining team on April 9, 2013 with the 2012 Land Board Partnership Award, which recognizes exemplary partnerships with the board and Department of State Lands.

Governor John Kitzhaber, chair of the Land Board, praised the Streamlining Team members for their "**...cooperative, multi-agency approach to waterway permitting. Their work results in a more streamlined process, less time spent on resolving issues, and better outcomes for applicants and the regulatory agencies.**"

At the award ceremony: *(from left to right) State Treasurer Ted Wheeler, Secretary of State Kate Brown, James Holm (Corps), Kathy Roberts (USFWS), Mike McCabe (DSL), Governor John Kitzhaber, Mike Reed (BES, Chair), Liz Ruther (ODFW), Christy Fellas (NMFS), Ben Meyer (NMFS), Corey Saxon (DEQ).*

FOR MORE INFORMATION

To learn more about the streamlining team, obtain copies of the Hatfield assessment or other reports, contact Mike Reed, City of Portland Streamlining Team Chair, at 503-823-3399 or Michael.Reed@portlandoregon.gov

ENVIRONMENTAL SERVICES
CITY OF PORTLAND
working for clean rivers

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Task 3 – Updated Compliance Scenarios

Final Report

August 2014

Prepared for
Oregon Department of Environmental Quality
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ICF conducted this work under contract with the Oregon Department of Environmental Quality. The fuel volumes presented in this document are meant to be illustrative of compliance with a proposed Clean Fuels Program in Oregon. ICF developed the compliance scenarios in a manner consistent with our scope of work with Oregon DEQ, and as we do in all of our work, we strive to provide information and projections consistent with standard practices in a professional manner. These compliance scenarios, however, should not be confused with ICF market forecasts. These compliance scenarios reflect the fuel volumes that could be delivered to Oregon to comply with a Clean Fuels Program based on our understanding of transportation fuel availability today and projected transportation fuel availability. ICF makes no warranties express or implied (including without limitation any warranties or merchantability or fitness for a particular purpose), as to this material. Specifically but without limitation, ICF makes no warranty or guarantee regarding the accuracy of these scenarios or that such work products will be accepted by any legal or regulatory body.

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Abbreviations and Acronyms

AEO	Department of Energy Annual Energy Outlook
B2	2% by volume blend of biodiesel with diesel
B5	5% by volume blend of biodiesel with diesel
B10	10% by volume blend of biodiesel with diesel
BAU	Business As Usual
BD	Biodiesel
BEV	Battery Electric Vehicle
CAFE	Corporate average fuel economy
CARB	California Air Resources Board
CFP	Clean Fuels Program
CNG	Compressed Natural Gas
DGE	Diesel Gallon Equivalent
E85	85% by volume ethanol blend with gasoline
E10	10% by volume ethanol blend with gasoline
EIA	Energy Information Administration
EPA	US Environmental Protection Agency
FCV	Fuel cell vehicle
FFV	Flex-fuel vehicle
GGE	Gasoline Gallon Equivalent
HEV	Hybrid Electric Vehicle
HDV	Heavy-duty vehicle
ICE	Internal combustion engine
ILUC	Indirect Land Use Change
LCFS	Low Carbon Fuel Standard
LDV	Light-duty vehicle
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
MDV	Medium-duty vehicle
NGV	Natural gas vehicle
MGPY	Millions of Gallons Per Year
ODOT	Oregon Depart of Transportation
PEV	Plug-In Electric Vehicles
PHEV	Plug-In Hybrid Electric Vehicles
PHEV10	PHEV with 10 miles equivalent all electric range
PHEV40	PHEV with 40 miles equivalent all electric range
RD	Renewable Diesel
US DOE	United States Department of Energy
VMT	Vehicle Miles Traveled
ZEV	Zero Emission Vehicle

Executive Summary

The clean fuel standard in Oregon, implemented by the Clean Fuels Program, requires a 10% reduction in carbon intensity from the gasoline and diesel baselines over a ten year period. In addition to carbon intensity reduction, the Clean Fuels Program helps Oregon reduce its consumption of traditional petroleum fuels. Potential fuels that could be used to achieve the standard are ethanol, biodiesel, hydrogen, electricity, natural gas, propane, and biogas. The Clean Fuels Program is designed as a performance-based standard using flexible market-based mechanisms that allow regulated parties to select the most cost-effective pathways to achieve compliance. In general, fuels that have a lower carbon intensity than gasoline or diesel generate credits. Regulated parties, such as refiners, have the option of producing or blending low carbon fuels, or purchasing credits from other fuel providers, including, but not limited to biofuel producers, natural gas infrastructure providers, electric utilities, and hydrogen producers.

As part of Oregon Department of Environmental Quality's (DEQ) original rulemaking and advisory committee process in 2010, technical analysis was performed by TIAX LLC to develop an Oregon specific business-as-usual (BAU) and compliance scenarios for a Clean Fuels Standard. As part of the previous analysis, assumptions were made around the composition of the vehicle fleet, carbon intensities, and availability of low carbon fuels for compliance both in Oregon and out-of-state. Four years later there is a greater understanding of the vehicles and fuels that could be available and new regulations and developments that will affect Oregon's fleet composition and fuel consumption.

This report is the final phase of the process to update the Clean Fuels Program compliance scenarios. The previous report detailed the updated BAU case and this report describes in detail the methodology used to develop the four compliance scenarios, available fuels and technologies and the resulting compliance scenarios. Compliance scenarios for the Clean Fuels Standard are compared against the updated BAU to determine incremental fuels required to achieve the scenarios.

ICF, in consultation with Oregon DEQ, developed four compliance scenarios based on two fuel scenarios (alternative vehicle technologies vs biofuel blending) and two different diesel baselines (B2 vs B5). Table 1 below shows the compliance scenario matrix.

Table 1. Compliance Scenarios

Compliance Scenarios	Scenario 1 – Advanced Vehicle Technology	Scenario 2 – Higher Biofuel Blending
B2 Diesel Baseline (2010)	1 – B2	2 – B2
B5 Diesel Baseline (2015)	1 – B5	2 – B5

The key highlights of the CFP compliance scenarios include:

- **Over-compliance in the early years of the program (2016-2021) is critical**. Credits can be banked and traded later and do not lose their value. Banking credits when the standard is lower reduces compliance costs and eases compliance in later years.
- **The Clean Fuels Standard can be achieved through a diverse fuel supply.** All of the scenarios required a combination of ethanol, biodiesel and renewable diesel from various feedstocks, electricity, natural gas, renewable natural gas, and propane for compliance. In addition, none of the analyzed compliance scenarios required the use of cellulosic ethanol.
- **Eight (8) years of overlap between the post-2017 Zero Emission Vehicle (ZEV) Program eases the burden of compliance**. The ZEV Program generates almost 15% of the cumulative credits needed over the compliance period. California only overlaps three (3) years with the post-2017 ZEV Program which limits the contribution electric and fuel cell vehicles can have towards compliance in their LCFS.
- **A B5 baseline compared to a B2 baseline results in greater greenhouse gas (GHG) emission reductions**. The B5 baseline scenarios generate more deficits than the B2 baseline scenarios and therefore require more credits for compliance. This results in an increased consumption of biodiesel and renewable diesel and lower cumulative GHG emissions over the compliance period.
- **Renewable natural gas is a key fuel for Clean Fuels Standard compliance**. In the advanced technology scenarios, renewable natural gas generated just as many credits as electricity and about one-third the amount credits generated from ethanol or biodiesel. In addition, Oregon has significant in-state potential for renewable natural gas production.
- **Renewable Diesel, even only in small volumes, is needed for compliance**. Renewable diesel does not require additional distribution or refueling infrastructure and there are no blend limitations.

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1 Introduction

The clean fuel standard in Oregon, implemented by the Clean Fuels Program (CFP), requires a 10% reduction in carbon intensity from the gasoline and diesel baselines over a ten year period. In addition to carbon intensity reduction, the Clean Fuels Program helps Oregon reduce its consumption of traditional petroleum fuels. Potential fuels that could be used to achieve the standards are ethanol, biodiesel, hydrogen, electricity, natural gas, propane, and biogas. Task 3 developed updated compliance scenarios. Compliance scenarios for the Clean Fuels Standard are being compared against the updated BAU to determine incremental fuels required to achieve the scenarios.

As part of Oregon DEQ's original rulemaking and advisory committee process in 2010, technical analysis was performed by TIAX LLC to develop an Oregon specific BAU and compliance scenarios for a Clean Fuels Standard. The VISION model was used to quantify the amount of fuels, infrastructure, and investment required for the BAU scenario. VISION is a fleet sales and turnover model developed by Argonne National Laboratory that can be used to quantify future energy consumption and GHG emissions based on overall fleet characteristics and composition. It is important to understand the fleet composition when considering alternative fuel consumption. Many alternative fuels including E85 (blended ethanol and gasoline with 85% by volume ethanol), electricity and natural gas require new vehicles to be purchased or converted and maximum consumption of these fuels is constrained by the population of these vehicles within the fleet.

As part of the previous analysis, assumptions were made around the composition of the vehicle fleet, carbon intensities, and availability of low carbon fuels for compliance both in Oregon and out-of-state. Four years later there is a greater understanding of the vehicles and fuels that could be available and new regulations and developments that will affect Oregon's fleet composition and fuel consumption. The latest available version of the VISION model, "VISION 2013 AEO Base Case,"[1] was used to develop the updated BAU scenario and the compliance scenarios. After completing BAU case, ICF and DEQ agreed on the assumptions to update the compliance scenarios. The following document details the methodology for developing the compliance scenarios.

[1] http://www.transportation.anl.gov/modeling_simulation/VISION/

2 Methodology: Scenario Development

ICF developed four (4) Clean Fuels Program compliance scenarios based upon input and discussion with Oregon DEQ. The following subsections review the methodology for developing the compliance scenarios and compliance schedules.

2.1 Compliance Scenarios and Clean Fuels Compliance Schedules

Compliance Scenarios

From a broad perspective, there are two ways to deploy alternative fuels that will help comply with a Clean Fuels Program. Firstly, biofuels can be blended into conventional gasoline or diesel for consumption in the existing vehicle fleet. Secondly, advanced vehicle technologies can be deployed, which consume alternative fuels such as natural gas, electricity, or hydrogen. Compliance with a Clean Fuels Program will require a diverse mix of all of these alternative fuels. Due to constraints on how quickly the vehicle fleet can be turned over, biofuel blending will likely be a major form of compliance until advanced vehicle technologies are deployed in significant numbers.

ICF developed two fuel scenarios – Scenario 1 and Scenario 2 – to capture the potential market responses to achieve compliance with a Clean Fuels Program. Scenario 1 reflects a market that is more dependent on advanced vehicle technologies than Scenario 2 and puts less pressure on advanced biofuels and biofuel blending for compliance. ICF will account for a variety of market developments in the compliance scenarios including the immediate availability of lower carbon biofuels such as biodiesel from waste greases, and animal fats; renewable diesel from tallow; and ethanol from sorghum and lower carbon intensity corn. Although cellulosic biofuels have been produced at a slower-than-expected rate, these lower carbon biofuels are available to California in significant quantities today and supply is forecasted to increase dramatically over the next several years.

Apart from biofuels, increasing natural gas supplies and lower fuel pricing than diesel have renewed interest in natural gas in the transportation sector. The use of low carbon biomethane (also referred to biogas and renewable natural gas) from waste sources including landfills and wastewater treatment plants in natural gas vehicles is projected to be a major compliance pathway. Biomethane is currently consumed in large volumes in California for LCFS compliance and EPA has qualified biomethane from landfills and other sources to generate cellulosic renewable identification numbers (RINs).

The Oregon Renewable Fuel Standard biodiesel blend mandate was 2% by volume (B2) in 2010 and increased to 5% (B5) in April 2011. The previous Clean Fuels Program analysis included a B2 diesel baseline. ICF will analyze the effects of compliance with a B2 compared to a B5 diesel baseline for both Scenarios as shown in the table below. Before DEQ selects a baseline and compliance schedule for the regulation, it is important to understand the implications. A B2 diesel is consistent with when the regulation was conceived in 2009 and analysis was performed in 2010 and allows for built-in credit generation from the B2 to B5 blend levels that are currently mandated. A B5 diesel baseline is consistent with the regulatory landscape in 2015 when the compliance schedule would begin in 2016.

Table 2. Compliance Scenarios

Compliance Scenarios	Scenario 1 – Advanced Vehicle Technology	Scenario 2 – Higher Biofuel Blending
B2 Diesel Baseline (2010)	1 – B2	2 – B2
B5 Diesel Baseline (2015)	1 – B5	2 – B5

Development of Compliance Schedules

The Oregon Clean Fuels Program is proposing using a similar percent reduction compliance schedule for the 10 year period as the California LCFS. To develop the actual numerical compliance schedule carbon intensities, ICF needed to develop baseline carbon intensity values for gasoline containing 10% by volume ethanol (E10), B2 and B5. Table 3 below shows the development of the baseline carbon intensities for E10, B2 and B5. Table 4 and Figure 1 show the compliance schedule for E10, B2 and B5 using the baseline carbon intensities in Table 3.

Table 3. Baseline Carbon Intensity Calculation

Baseline Fuels	Carbon Intensities (gCO2e/MJ)	Biofuel by Volume (%)	Biofuel by Energy (%)	Baseline Carbon Intensity (gCO2e/MJ)
Gasoline Pool – E10	Gasoline Blendstock – 89.40 Midwest Corn Ethanol – 88.02	10%	6.7%	89.31
Diesel Pool – B2	ULSD – 89.00 Biodiesel – 47.70[2]	2.27%	2.1%	88.13
Diesel Pool – B5	ULSD – 89.00 Biodiesel – 47.70[2]	5%	4.6%	87.09

[2] Weighted average of soybean, canola and used oil biodiesel based on individual carbon intensities of 50.19, 68.91 and 10.28 gCO2e/MJ and 2013 reported consumption volumes for the first six months of 13.66 million gallons, 4.37 million gallons and 3.39 million gallons for soybean, canola and used oil biodiesel, respectively.

Table 4. Gasoline and Diesel Compliance Schedules

Compliance Year	Percent Reductions	Gasoline Compliance Schedule	B2 Baseline Diesel Compliance Schedule	B5 Baseline Diesel Compliance Schedule
2015	-	89.31	88.13	87.09
2016	0.25%	89.08	87.91	86.87
2017	0.50%	88.86	87.69	86.65
2018	1.0%	88.41	87.25	86.22
2019	1.50%	87.97	86.81	85.78
2020	2.50%	87.08	85.93	84.91
2021	3.50%	86.18	85.05	84.04
2022	5.00%	84.84	83.73	82.73
2023	6.50%	83.50	82.40	81.43
2024	8.0%	82.16	81.08	80.12
2025	10.0%	80.38	79.32	78.38

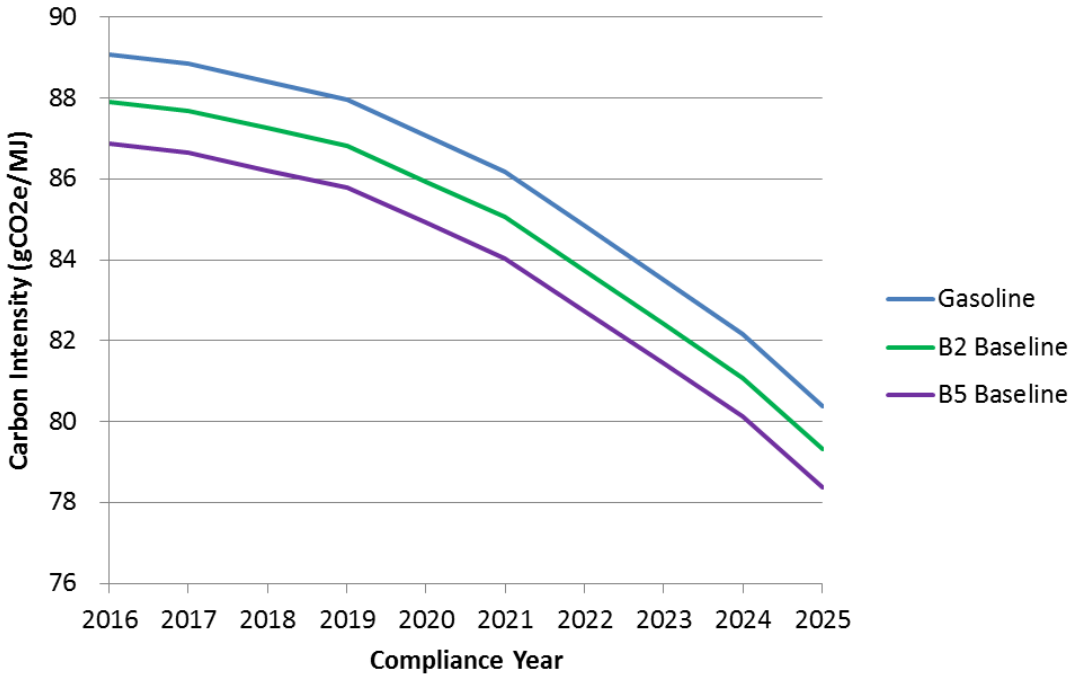

Figure 1. Gasoline and Diesel Compliance Schedules

2.2 Compliance Options Considered

ICF considered a variety of low carbon fuels to develop representative CFP compliance scenarios. Furthermore, to determine the balance of deficits and credits in each compliance scenario, ICF made various assumptions regarding how vehicles and fuels will be used in the near-term future towards CFP compliance. These are distinguished between fuels that substitute for gasoline (the gasoline pool) and fuels that substitute for diesel (the diesel pool).

Fuels that Substitute for Gasoline

ICF assumed that ethanol would continue to be blended into gasoline at a rate of 10 percent by volume, consistent with today's reformulated gasoline requirements. ICF limited the blending of ethanol with gasoline at a maximum of 15 percent by volume based on EPA's recently issued waiver for E15 in vehicle model years (MY) 2001 or newer. In addition, ICF included the potential of E85 consumption in flex-fuel vehicles (FFVs) if significant low carbon ethanol consumption is required for compliance. Although there is no E15 consumed in Oregon today – and very little generally in the United States – E15 could be consumed in meaningful quantities in Oregon as a result of drivers such as LCFS and the RFS2.

ICF considered the following pathways for ethanol production:

- **Corn, MW**: Corn from conventional processes is typically sourced from the Midwest. Corn has been and continues to be the most common feedstock for ethanol consumed in Oregon. Nearly 200 million gallons of corn ethanol are currently consumed in Oregon to meet the state's E10 requirement.
- **Corn, Boardman, OR**: The Boardman, OR ethanol facility currently produces 26 million gallons of corn ethanol per year. We assumed the same pathway carbon intensity from the 2010 plus the proposed CARB indirect land use change (ILUC) values.
- **Corn, low carbon intensity**: There is significant potential to lower the carbon intensity of corn ethanol through a variety of measures. For the purposes of this report, ICF assumed a lower limit of 46 g/MJ for what we term low carbon intensity corn ethanol (not including ILUC). There has already been a shift towards more efficient corn ethanol production as a result of the California LCFS, with many new lower carbon pathways submitted to and approved by CARB. The MW corn carbon intensity will exceed the gasoline standard in 2019 and ICF assumes by 2019 only ethanol meeting the standard will be consumed within Oregon with low carbon intensity corn will make up the balance of ethanol consumed in Oregon to meet the state's E10 requirement.
- **Corn, Sorghum**: There is a shift occurring towards lower carbon intensity feedstocks for ethanol production including grain and sweet sorghum as a result of the California LCFS. Based on the volumes of current applications submitted to CARB, ICF assumes that upwards of 100 million gallons per year of sorghum or other low carbon intensity feedstock ethanol will be available to Oregon by 2019 when the MW corn carbon intensity exceeds the gasoline standard.
- **Sugarcane**: Most sugarcane ethanol is produced in Brazil and shipped via tanker to the United States. In some cases, hydrous ethanol is shipped to a country in the Caribbean Basin Initiative (CBI); the excess water is subsequently removed and the anhydrous ethanol is shipped to the US. This step was more common when the US had a tariff on sugarcane ethanol imported directly from Brazil; the interim step allowed importers to avoid paying the tariff. For the sake of reference, the United

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States imported 500 million gallons of sugarcane ethanol in 2012. ICF assumes that up to 50 million gallons per year of sugarcane ethanol could be consumed in Oregon.

- **Cellulosic**: Cellulosic ethanol refers generally to ethanol produced from wood, grasses, or other lignocelluosic materials.

Although ethanol from various feedstocks is the primary substitute for gasoline today, ICF also considered the following fuels that substitute for gasoline:

- **Electricity** used in plug -in electric vehicles (PEVs), including plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs), stands to play an important role towards compliance, particularly in later years of the regulation as the Zero Emission Vehicle (ZEV) Program takes full effect. In each of the compliance scenarios, a minimum number of PEVs was deployed to be consistent with business as usual case. For Scenario 1, ICF also considered the potential for all PHEVs in the BAU to be PHEV40s and not a split between PHEV10 and PHEV40.
- **Natural gas** has significant potential to displace gasoline consumption in medium-duty and light heavy-duty vehicles.
- **Biogas** has the potential to displace natural gas consumption and create significant reductions in carbon intensity. It is assumed that up to 47 million diesel gallon equivalents of biogas, comparable to Oregon in-state feedstock potential, could be consumed.

The table below shows the carbon intensity values used for fuels that substitute for gasoline. Unless otherwise noted, the carbon intensity values were taken directly from 2010 analysis with updates for CARB proposed ILUC values tables.

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Table 5. Carbon Intensity Values for Fuels that Substitute for Gasoline

Fuel / Feedstock	Pathway Carbon Intensity (gCO2e/MJ)	ILUC (gCO2e/MJ)[a]	Updated CI (gCO2e/MJ)
Ethanol, MW Corn	64.82	23.20	88.02
Ethanol, Boardman	56.99	23.20	80.19
Ethanol, Low CI Corn	46.00	23.20	69.20
Ethanol, Sorghum	46.00	23.20	69.20
Ethanol, Sugarcane	26.44	26.50	52.94
Ethanol, Cellulosic[b]	18.22	2.5	20.72
Natural Gas (CNG/LNG) and Propane[c]	71.41	-	71.41
Biogas, multiple sources[d]	25.00	-	25.00
Electricity, marginal [e]	45.58	-	45.58

[a] ILUC values are proposed CARB values presented on March 11, 2014

[b] The average of previous Oregon pathways for ethanol from farmed trees and wheatstraw

[c] Assumes propane is mainly from natural gas liquids

[d] Representative of California LCFS applications for biogas used as CNG or LNG

[e] Includes the energy economy ratio (EER) of 3.4 for electric vehicles

Fuels that Substitute for Diesel

The fuel volumes in the compliance scenarios represent a combination of ICF research and previous project experience which includes input provided by the National Biodiesel Board (NBB). In the development of the compliance scenarios, we considered the following feedstocks for biodiesel:

- **Soybean oil**: Soybean oil is the largest single feedstock for biodiesel production in the United States. It is a well-established crop with a robust commodity market. While most soybeans are grown in the Midwest and a significant amount of biodiesel production capacity exists in the Midwest, Oregon biodiesel capacity can also utilize soybean oil. Soybean oil biodiesel is used as the balance biodiesel to make up necessary volumes to achieve desired blend levels.
- **Waste Grease/Used Oil**: Waste grease is a significant feedstock at Oregon production facilities. As a waste feedstock, waste grease has a low carbon intensity. The production process for biodiesel from waste grease is generally more energy intensive than for vegetable oils because there is generally a higher free fatty acid content. This requires an additional acid-catalyzed esterification reaction, thereby increasing the energy inputs. For the compliance scenarios, waste grease is assumed to remain constant at 15.8% of all biodiesel consumed based on the first 6 months of data from 2013.
- **Canola oil**: Canola oil is similar to soybean oil as a feedstock; it is more prominent feedstock in the European Union (referred to there as rapeseed). In North America, canola production historically exists primarily in Canada and northern states of the US and is a significant feedstock for Oregon

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based biodiesel production. For the compliance scenarios, canola oil is assumed to remain constant at 20.4% of all biodiesel consumed based on the first 6 months of data from 2013.

- **Corn oil**: Corn oil is a byproduct of corn ethanol production and generally requires retrofitting an ethanol plant. It is a feedstock with significant growth potential for the biodiesel industry. Corn oil extraction is a relatively new commodity for the majority of ethanol production facilities, but represents another high-value co-product. Anecdotal evidence indicates that the majority of corn ethanol facilities in the US will have installed equipment to extract corn oil by the end of 2013. Corn oil biodiesel will be used as needed for the compliance scenarios.

ICF also considered the following alternative fuels:

- **Renewable diesel**: Like biodiesel, there are multiple feedstocks that can be used to produce renewable diesel, including palm oil, canola (or rapeseed) oil, jatropha oil, camelina oil, soy oil, waste greases, and animal fats (i.e., tallow). ICF considered renewable diesel produced from tallow and waste oil; this pathway is largely based on the availability of renewable diesel produced by Neste Oil in its Singapore production plant using its renewable diesel production process. A conservative assumption was made that maximum renewable diesel would be an average statewide 2% blend with a maximum of 10 million gallons per year from tallow and the balance from waste oil.
- **Natural gas**: ICF considered the potential for natural gas – compressed, liquefied, and biogas – in heavy-duty applications such as short-, medium-, and long-haul trucks, refuse haulers, and transit buses. It is assumed that up to 47 million diesel gallon equivalents of biogas, comparable to Oregon in-state feedstock potential, could be consumed. For Scenario 1, it is assumed that medium and heavy duty CNG vehicle sales increase to the point where 10% of diesel pool fuel consumption in 2025 is a combination of natural gas, biogas and LPG.
- **Propane** has potential to displace diesel consumption in medium-duty and light heavy-duty vehicles in niche applications. It is assumed that propane consumption will reach a maximum of 1% of total natural gas consumption. Since it is assumed that fossil fuel natural gas and propane have the same carbon intensity, the quantities of each fuel summing to the total are fungible.
- **Hybrid-Electric Vehicles (HEVs)**: HEVs do not consume alternative fuels; they do reduce the quantity of diesel consumed. In Scenario 1, the assumption is made that HEVs achieve 10% sales penetration in the medium- and heavy-duty markets. The BAU case and Scenario 2 do not included medium- and heavy-duty HEVs.

The table below includes the carbon intensity values used to determine the balance of deficits and credits in each scenario. Unless otherwise noted, the carbon intensity values were taken directly from 2010 analysis with updates for CARB proposed ILUC values tables.

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Table 6. Carbon Intensity Values for Fuels that Substitute for Diesel

Fuel / Feedstock	Pathway Carbon Intensity (gCO2e/MJ)	ILUC (gCO2e/MJ)[a]	Updated CI (gCO2e/MJ)
Biodiesel, soy oil	19.99	30.20	50.19
Biodiesel, waste grease	10.28	-	10.28
Biodiesel, corn oil	4.00	-	4.00
Biodiesel, canola oil	27.31	41.60	68.91
Renewable diesel, tallow	16.85	-	16.85
Renewable diesel, waste oil	10.28	-	10.28
Natural Gas and Propane [b]	79.34	-	79.34
Biogas, landfill [c]	27.78	-	27.78

[a] ILUC values are proposed CARB values presented on March 11, 2014

[b] Assumes propane is mainly from natural gas liquids; includes the EER of 0.9 for spark ignition CNG vehicles

[c] Representative of California LCFS applications for biogas used as CNG or LNG; includes the EER of 0.9 for spark ignition CNG vehicles

3 Overview of Compliance Scenarios

Based on the alternative fuels available for each compliance scenario and two diesel baselines described in Section 2, ICF developed four (4) different scenarios that achieve compliance with the Clean Fuels Program by balancing the cumulative deficits and credits over the 10 year compliance period.

Table 7. Overview of Clean Fuels Program Compliance Scenarios

Scenario	Ethanol	Biodiesel (BD) / Renewable Diesel (RD)	Natural Gas	Advanced Vehicles (PEVs / MD-HD HEVs)
Scenario 1-B2	Maintained E10 blend rate 50 million gallons per year (MGPY) of sugarcane ethanol for all years 100 MGPY of sorghum and balance ethanol required from low CI corn in 2019 when MW corn greater than standard	Maintained BD blend at 5% and canola/soy/used oil ratios RD at 1% in 2021 and increases to 2% by 2025; between 5-10 MGPY from tallow, balance waste oil	Natural gas vehicle market share increased till 10% diesel pool consumption is natural gas (18% market share in 2025) By 2019, 50% of natural gas from biogas (46 MGPY in 2025)	All PHEVs are PHEV40 MD-HD HEV sales increased to 10% market share by 2025
Scenario 1-B5	Same as Scenario 1-B2	BD blend to 6% in 2023 and 7% in 2025; maintained canola/soy/used oil RD 2% from 2016-2025 with 10 MGPY from tallow and balance waste oil	Same as Scenario 1-B2	Same as Scenario 1-B2
Scenario 2-B2	Same as Scenario 1-B2	Biodiesel blend to 6% in 2021 up to 8.9% in 2025; maintained canola/soy/used oil RD 2% from 2016-2025 with 10 MGPY from tallow and balance waste oil	By 2019, 100% of natural gas from biogas (12 MGPY in 2025)	Same as BAU
Scenario 2-B5	Same as Scenario 1-B2	BD blend to 6% in 2019 up to 10% in 2021; maintained canola/soy/used oil till 2020, capped canola at 10 MGPY and (2020) and waste oil at 30 MGPY (2023) RD 2% from 2016-2025 with 10 MGPY from tallow and balance waste oil	Same as Scenario 2-B2	Same as BAU
Assumptions for All Scenarios	Maximum ethanol blend is E15 FFVs 85% of miles on E85 Maximums for ethanol: Sorghum-100 MGPY; Low CI Corn-150 MGPY; Sugarcane- 50 MGPY			Achieves ZEV compliance BAU vehicle populations: 90,000 BEVs in 2025; 61,000 PHEV10 in 2025; 62,000 PHEV40 in 2025

3.1 Compliance Scenarios 1-B2 and 1-B5

Summary Overview of Compliance Scenarios 1-B2 and 1-B5

Figure 2 and Figure 3 on the following page show the annual credits and deficits generated for Scenarios 1-B2 and 1-B5. Each colored stacked bar represents credits generated from low carbon fuels; the blue line represents the deficits from forecasted gasoline blendstock and ultra-low sulfur diesel (ULSD) consumption. When the bars in years 2016-2021 exceed the blue line, annual credits exceed annual deficits and banked credits are generated for future compliance. When the bars fall short of the blue line in years 2022-2025, banked credits are required to meet annual compliance. The stacked bars are grouped by biofuels for blending at the bottom and advanced vehicle technologies at the top. Table 8 and Table 9 below show the annual deficits and credits generated and cumulative (banked) credits.

Table 8. Credits and Deficits: Banking in Scenario 1-B2

Fuel		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Deficits (Millions)	Gasoline	-0.05	-0.08	-0.14	-0.20	-0.32	-0.43	-0.59	-0.75	-0.89	-1.08
	Diesel	-0.11	-0.13	-0.18	-0.22	-0.31	-0.40	-0.53	-0.65	-0.78	-0.93
Credits (Millions)	Gasoline Subs	0.22	0.23	0.25	0.57	0.60	0.63	0.64	0.66	0.68	0.68
	Diesel Subs	0.21	0.22	0.24	0.29	0.32	0.41	0.43	0.48	0.49	0.53
Balance		0.28	0.24	0.17	0.44	0.28	0.20	-0.05	-0.26	-0.49	-0.79
Banked (Net)		0.28	0.51	0.68	1.12	1.40	1.60	1.55	1.29	0.80	0.00

Table 9. Credits and Deficits: Banking in Scenario 1-B5

Fuel		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Deficits (Millions)	Gasoline	-0.05	-0.08	-0.14	-0.20	-0.32	-0.43	-0.59	-0.75	-0.89	-1.08
	Diesel	-0.21	-0.23	-0.28	-0.32	-0.41	-0.50	-0.62	-0.74	-0.85	-1.00
Credits (Millions)	Gasoline Subs	0.22	0.23	0.25	0.57	0.60	0.63	0.64	0.66	0.68	0.68
	Diesel Subs	0.33	0.34	0.36	0.42	0.44	0.46	0.49	0.54	0.56	0.59
Balance		0.30	0.26	0.19	0.46	0.31	0.16	-0.09	-0.29	-0.50	-0.81
Banked (Net)		0.30	0.56	0.75	1.22	1.53	1.69	1.60	1.31	0.81	0.00

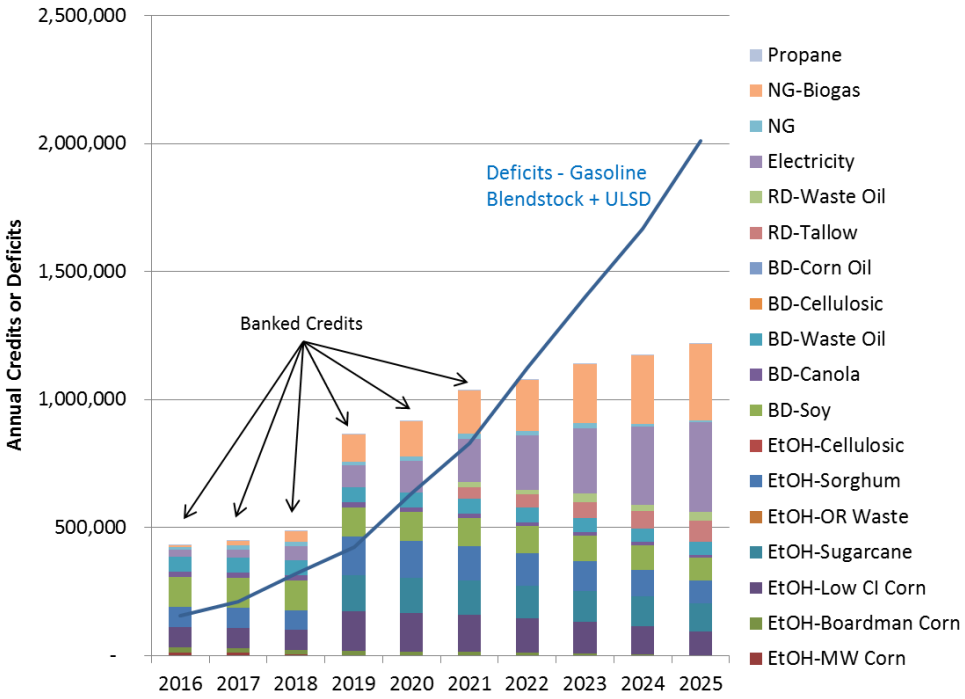

Figure 2. Balance of Credits and Deficits in Scenario 1-B2

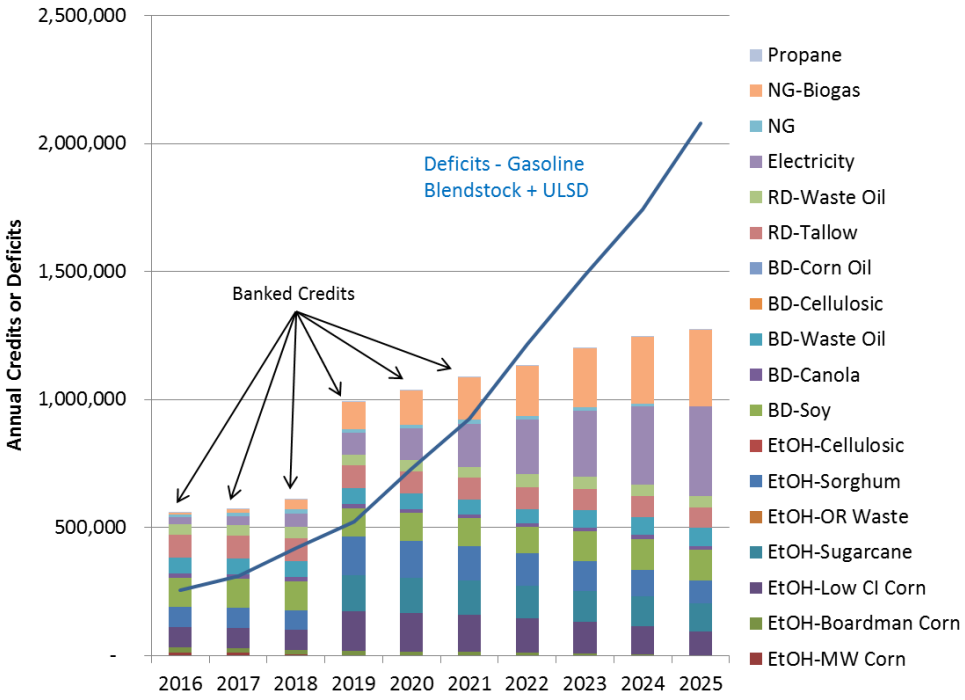

Figure 3. Balance of Credits and Deficits in Scenario 1-B5

In Scenario 1-B2, gasoline and diesel generate a similar number of deficits while in Scenario 1-B5 diesel generates almost 1 million more deficits than gasoline.

Fleet Changes from the BAU

Two fleet changes occurred between the BAU and Scenario 1 (both 1-B2 and 1-B5). In the light-duty fleet, all PHEVs are PHEV40s compare to the 50/50 split between PHEV10 and PHEV40 in the BAU. Figure 4 below shows the Scenario 1 light-duty vehicle fleet.

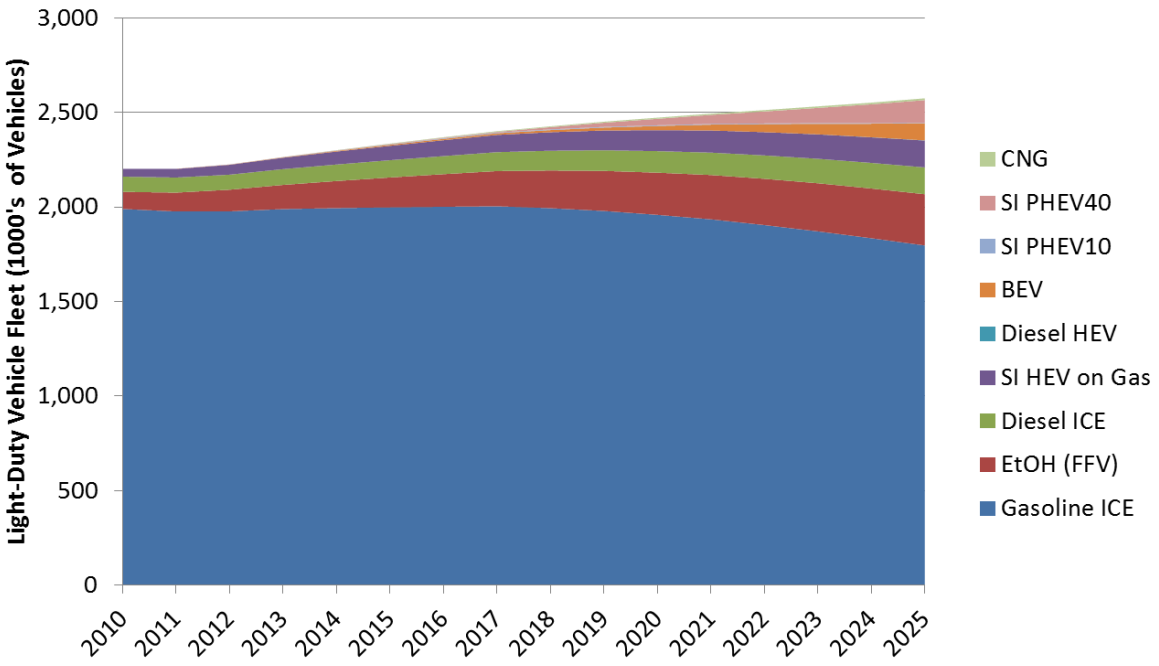

Figure 4. Scenario 1 Light-Duty Vehicle Fleet

The medium- and heavy-duty market shares for HEVs and natural gas/LPG vehicles were increased in Scenario 1 over the BAU case. The natural gas vehicle market shares were increased to achieve 10% diesel pool fuel consumption from natural gas/LPG. This assumption resulted in 18% market share of natural gas/LPG vehicles in 2025. The medium- and heavy-duty market shares for HEVs were increased to 10% by 2025. Figure 5 below shows the resulting Scenario 1 medium- and heavy-duty vehicle fleet.

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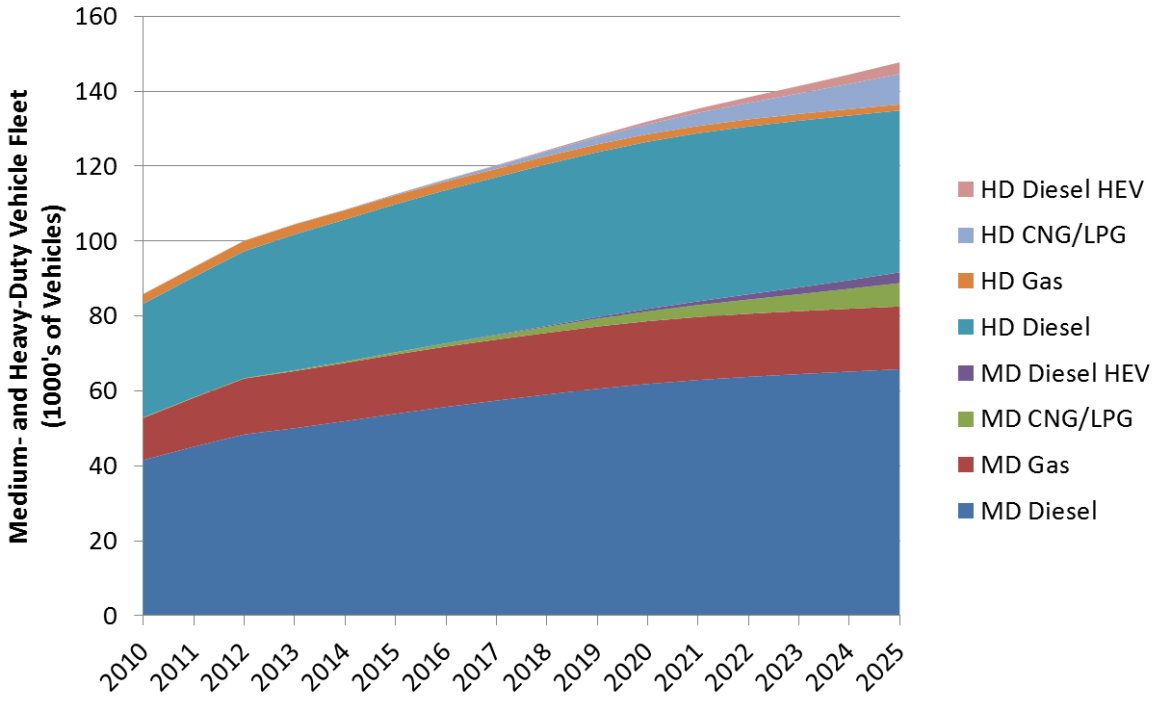

Figure 5. Scenario 1 Medium- and Heavy-Duty Fleet

Ethanol and Biofuels that Substitute for Gasoline

Table 10 below identifies the volumes of ethanol, broken down by feedstock, for both Scenarios 1-B2 and 1-B5. The ethanol volumes and feedstocks between 1-B2 and 1-B5 are identical.

Table 10. Ethanol Volumes (in million gallons) in Scenario 1

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Corn, MW	135.14	142.19	147.62	0	0	0	0	0	0	0
Corn, Boardman	26	26	26	26	26	26	26	26	26	26
Low CI Corn	50	50	50	102.18	104.72	106.05	106.86	106.38	104.56	102.26
Sugarcane	0	0	0	50	50	50	50	50	50	50
Sorghum	50	50	50	100	100	100	100	100	100	100
Total	261.14	268.19	273.62	278.18	280.72	282.05	282.86	282.38	280.56	278.26
% EtOH in Gasoline	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

Scenarios 1-B2 and 1-B5 consume very similar volumes of ethanol to the BAU case since all cases maintain a 10% ethanol blend. Scenarios 1-B2 and 1-B5 cease to consume MW corn ethanol by 2019 since the carbon intensity of MW Corn exceeds the standard in that year and every subsequent year.

Biodiesel

Table 11 and Table 12 below show the volumes of biodiesel, by feedstock, consumed in Scenarios 1-B2 and 1-B5.

Table 11. Biodiesel Volumes (in million gallons) in Scenario 1-B2

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Soy	24.48	24.77	24.98	25.09	25.05	24.98	24.91	24.71	24.42	24.13
Canola	7.83	7.93	7.99	8.02	8.01	7.99	7.97	7.90	7.81	7.72
Waste Oil	6.07	6.14	6.20	6.22	6.21	6.20	6.18	6.13	6.06	5.98
Total	38.38	38.84	39.17	39.33	39.27	39.16	39.06	38.74	38.28	37.83
% BD in ULSD	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%

Table 12. Biodiesel Volumes (in million gallons) in Scenario 1-B5

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Soy	24.50	24.80	25.01	25.12	25.08	24.99	24.92	29.68	31.79	33.83
Canola	7.84	7.93	8.00	8.03	8.02	8.00	7.97	9.49	10.17	10.82
Waste Oil	6.08	6.15	6.20	6.23	6.22	6.20	6.18	7.36	7.88	8.39
Total	38.42	38.89	39.21	39.38	39.32	39.19	39.08	46.54	49.84	53.04
% BD in ULSD	5%	5%	5%	5%	5%	5%	5%	6%	6.5%	7%

Scenario 1-B5 requires an increase from statewide average B5 to 6% biodiesel in 2023 and up to 7% in 2020. This results in a cumulative increase of over 35 million gallons of biodiesel between 2023 and 2025.

Renewable Diesel

Table 13 and Table 14 below show the volumes of renewable diesel, by feedstock, consumed in Scenarios 1-B2 and 1-B5.

Table 13. Renewable Diesel Volumes (in million gallons) in Scenario 1-B2

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Tallow	0	0	0	0	0	5	6	7	8	10
Waste Oil	0	0	0	0	0	2.19	1.89	3.67	2.54	3.89
Total	0	0	0	0	0	7.19	7.89	10.67	10.54	13.89
% RD in ULSD	0%	0%	0%	0%	0%	1%	1.1%	1.5%	1.5%	2%

Table 14. Renewable Diesel Volumes (in million gallons) in Scenario 1-B5

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Tallow	10	10	10	10	10	10	10	10	10	10
Waste Oil	4.11	4.28	4.40	4.46	4.44	4.39	5.48	5.36	5.18	5.01
Total	14.11	14.28	14.40	14.46	14.44	14.39	15.48	15.36	15.18	15.01
% RD in ULSD	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%

Scenario 1-B5 requires an increase to 2% renewable diesel throughout the program while Scenario 1-B2 only requires small volumes in the later years. This results in a cumulative increase of almost 100 million gallons of renewable diesel during the 10 year compliance period of the program.

Natural Gas/LPG

Table 15 below shows the natural gas/LPG and biogas consumption in million DGE where market share was increased to achieve 10% diesel pool consumption of natural gas/LPG/biogas in 2025. The vehicle penetrations and assumptions were the same for natural gas/LPG/biogas in Scenarios 1-B2 and 1-B5.

Table 15. Natural Gas/LGP Consumption (in million DGE) in Scenarios 1-B2 and 1-B5

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Natural Gas/LPG	8.11	11.79	15.25	14.11	18.52	23.26	28.28	33.80	39.94	46.62
Biogas	0.90	2.08	5.08	14.11	18.52	23.26	28.28	33.80	39.94	46.62
Total	9.01	13.87	20.34	28.22	37.04	46.53	56.55	67.61	79.87	93.24

Electricity

Table 16 below shows the electricity consumption from BEVs and PHEVs in million GGE.

Table 16. Electricity Consumption (in million GGE) in Scenarios 1-B2 and 1-B5

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total	1.51	1.85	3.17	4.99	7.39	10.24	13.40	16.87	20.76	25.12

3.2 Compliance Scenarios 2-B2 and 2-B5

Summary Overview of Compliance Scenarios 2-B2 and 2-B5

Figure 6 and Figure 7 on the following page show the annual credits and deficits generated for Scenarios 2-B2 and 2-B5. Each colored stacked bar represents credits generated from low carbon fuels; the blue line represents the deficits from forecasted gasoline blendstock and ultra-low sulfur diesel (ULSD) consumption. When the bars in years 2016-2021 exceed the blue line, annual credits exceed annual deficits and banked credits are generated for future compliance. When the bars fall short of the blue line in years 2022-2025, banked credits are required to meet annual compliance. The stacked bars are grouped by biofuels for blending at the bottom and advanced vehicle technologies at the top. Table 17 and Table 18 below show the annual deficits and credits generated and cumulative (banked) credits.

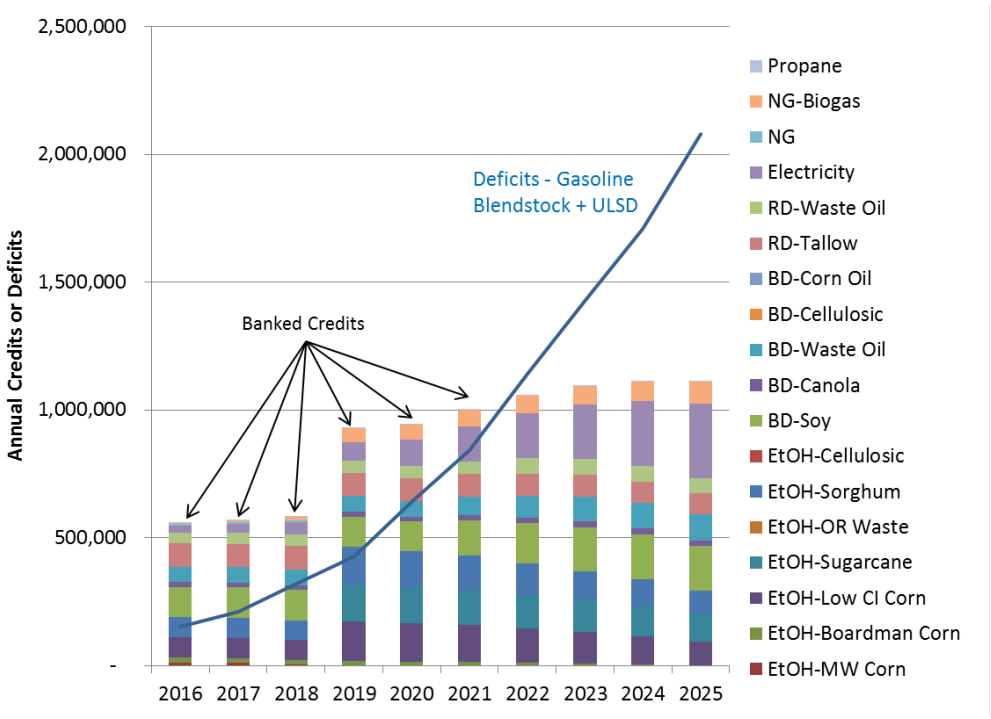

Figure 6. Balance of Credits and Deficits in Scenario 2-B2

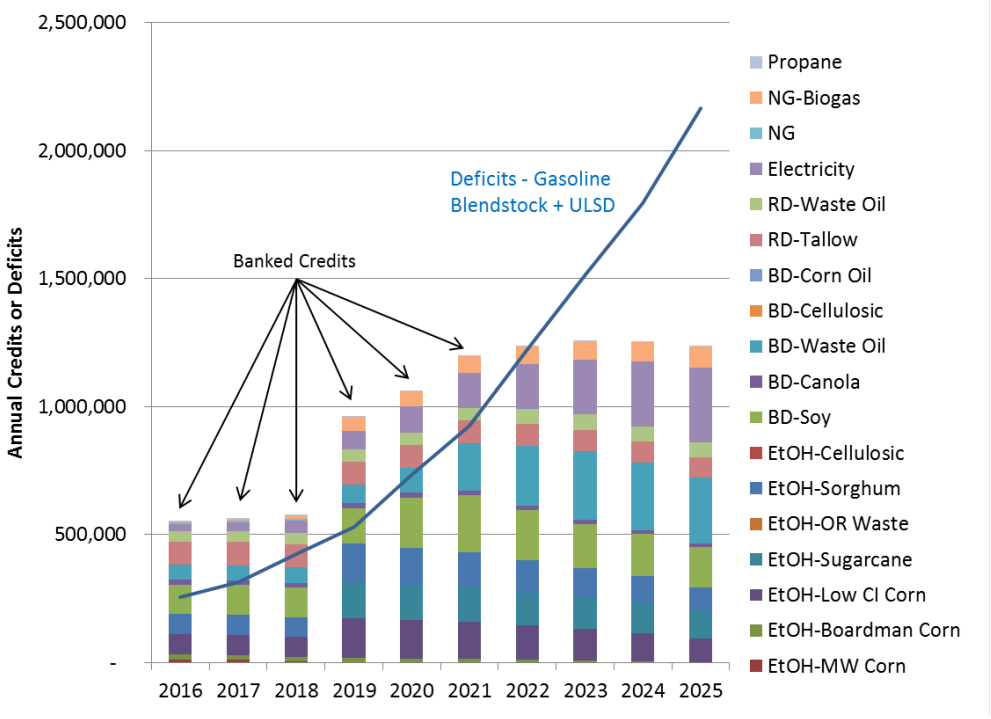

Figure 7. Balance of Credits and Deficits in Scenario 2-B5

Table 17. Credits and Deficits: Banking in Scenario 2-B2

Fuel		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Deficits (Millions)	Gasoline	-0.05	-0.08	-0.14	-0.20	-0.32	-0.43	-0.60	-0.75	-0.90	-1.09
	Diesel	-0.11	-0.13	-0.18	-0.23	-0.32	-0.41	-0.54	-0.68	-0.81	-0.99
Credits (Millions)	Gasoline Subs	0.22	0.23	0.24	0.56	0.58	0.60	0.61	0.62	0.63	0.63
	Diesel Subs	0.33	0.34	0.34	0.36	0.36	0.40	0.44	0.47	0.48	0.49
Balance		0.40	0.36	0.26	0.50	0.31	0.16	-0.09	-0.34	-0.60	-0.97
Banked (Net)		0.40	0.76	1.03	1.53	1.83	1.99	1.91	1.57	0.97	0.00

Table 18. Credits and Deficits: Banking in Scenario 2-B5

Fuel		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Deficits (Millions)	Gasoline	-0.05	-0.08	-0.14	-0.20	-0.32	-0.43	-0.60	-0.75	-0.90	-1.09
	Diesel	-0.21	-0.24	-0.28	-0.33	-0.41	-0.49	-0.63	-0.76	-0.90	-1.08
Credits (Millions)	Gasoline Subs	0.22	0.23	0.24	0.56	0.58	0.60	0.61	0.62	0.63	0.63
	Diesel Subs	0.33	0.33	0.34	0.39	0.48	0.59	0.62	0.63	0.62	0.61
Balance		0.29	0.25	0.15	0.43	0.33	0.27	0.01	-0.26	-0.54	-0.93
Banked (Net)		0.29	0.54	0.69	1.12	1.45	1.72	1.73	1.47	0.93	0.00

In Scenario 2-B2, gasoline and diesel generate similar numbers of deficits while in Scenario 2-B5, diesel generates almost 1 million more deficits than gasoline.

Fleet Changes from the BAU

There are no fleet changes between Scenarios 2-B2 and 2-B5 and the BAU.

Ethanol and Biofuels that Substitute for Gasoline

Table 19 below identifies the volumes of ethanol, broken down by feedstock, for both Scenarios 2-B2 and 2-B5. The ethanol volumes and feedstocks between 2-B2 and 2-B5 are identical.

Table 19. Ethanol Volumes (in million gallons) in Scenario 2

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Corn, MW	135.15	142.21	147.72	0	0	0	0	0	0	0
Corn, Boardman	26	26	26	26	26	26	26	26	26	26
Low CI Corn	50	50	50	102.36	104.99	106.44	107.36	107.02	105.34	103.18
Sugarcane	0	0	0	50	50	50	50	50	50	50
Sorghum	50	50	50	100	100	100	100	100	100	100
Total	261.15	268.21	273.72	278.36	280.99	282.44	283.36	283.02	281.34	279.18
% EtOH in Gasoline	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

Scenarios 2-B2 and 2-B5 consume the same volumes of ethanol to the BAU case since all cases maintain a 10% ethanol blend. Scenarios 2-B2 and 2-B5 cease to consume MW corn ethanol by 2019 since the carbon intensity of MW Corn exceeds the compliance in that year and every subsequent year. By 2025, there is a slight increase in ethanol consumption over Scenarios 1-B2 and 1-B5 since they include only PHEV40s and not PHEV10s which results in a slight increase in E10 consumption.

Biodiesel

Table 20 and Table 21 below show the volumes of biodiesel, by feedstock, consumed in Scenarios 2-B2 and 2-B5.

Table 20. Biodiesel Volumes (in million gallons) in Scenario 2-B2

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Soy	24.64	25.06	25.43	25.75	25.96	31.41	37.01	42.55	45.39	48.30
Canola	7.88	8.01	8.13	8.24	8.30	10.05	11.84	13.61	14.52	15.45
Waste Oil	6.11	6.21	6.31	6.39	6.44	7.79	9.18	10.55	11.26	11.98
Total	38.63	39.28	39.87	40.37	40.70	49.25	58.02	66.71	71.17	75.73
% BD in ULSD	5%	5%	5%	5%	5%	6%	7%	8%	8.5%	9%

Table 21. Biodiesel Volumes (in million gallons) in Scenario 2-B5

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Soy	24.64	25.06	25.43	30.92	44.94	52.33	47.47	43.51	43.83	44.21
Canola	7.88	8.01	8.13	9.89	10	10	10	10	10	10
Waste Oil	6.11	6.21	6.31	7.67	10.32	20	25.6	30	30	30
Total	38.63	39.28	39.87	48.48	65.27	82.33	83.07	83.51	83.83	84.21
% BD in ULSD	5%	5%	5%	6%	8%	10%	10%	10%	10%	10%

Scenario 2-B2 requires an increase from statewide average B5 to 6% biodiesel in 2021 and up to 9% in 2020 and Scenario 2-B5 requires an increase from B5 to B6 in 2019 and up to 10% in 2021. This results in a cumulative increase of almost 130 million gallons of biodiesel between Scenarios 2-B5 and 2-B2.

Renewable Diesel

Table 22 below shows the volumes of renewable diesel, by feedstock, consumed in Scenarios 2-B2 and 2-B5.

Table 22. Renewable Diesel Volumes (in million gallons) in Scenario 2-B2 and 2-B5

Feedstocks	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Tallow	10	10	10	10	10	10	10	10	10	10
Waste Oil	4.18	4.42	4.64	4.82	4.94	5.07	6.41	6.51	6.58	6.66
Total	14.18	14.42	14.64	14.82	14.94	15.07	16.41	16.51	16.58	16.66
% RD in ULSD	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%

Scenarios 2-B2 and 2-B5 increase to 2% renewable diesel throughout the program resulting in 154 million gallons of renewable diesel consumption throughout the program.

Natural Gas/LPG

Table 23 below shows the natural gas/LPG and biogas consumption in million DGE where market share was increased to achieve 10% diesel pool consumption of natural gas/LPG/biogas in 2025. The vehicle penetrations and assumptions were the same for natural gas/LPG/biogas in Scenarios 2-B2 and 2-B5.

Table 23. Natural Gas/LGP Consumption (in million DGE) in Scenarios 2-B2 and 2-B5

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Natural Gas/LPG	4.51	5.38	6.20	6.99	7.77	8.52	9.36	10.13	10.94	12.22
Biogas	4.06	4.57	4.65	0.07	0.08	0.09	0.09	0.10	0.11	0.12
Total	0.45	0.81	1.55	6.92	7.70	8.43	9.27	10.03	10.83	12.10

Electricity

Table 24 below shows the electricity consumption from BEVs and PHEVs in million GGE.

Table 24. Electricity Consumption (in million GGE) in Scenarios 2-B2 and 2-B5

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total	1.51	1.85	2.80	4.20	6.12	8.44	11.07	13.97	17.24	20.93

The fleet change between Scenario 1 and 2 where all PHEVs are PEHV40 resulted in 4.2 million GGE of increased electricity consumption in 2025 in Scenario 1.

3.3 Greenhouse Gas Reductions

Table 25 shows the annual GHG emissions in million metric tons from transportation fuels from 2015 to 2025. Table 26 shows the percent GHG reductions annually from 2016 to 2025 and cumulatively over the compliance period from 2016 to 2025.

Table 25. Annual GHG Emissions (million metric tons)

Scenario	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
BAU	23.93	24.12	24.22	24.24	24.22	24.10	23.96	23.81	23.62	23.39	23.19
1-B2	23.92	23.95	24.04	24.03	23.64	23.48	23.21	23.00	22.71	22.41	22.09
1-B5	23.92	23.82	23.90	23.90	23.50	23.34	23.14	22.94	22.63	22.32	22.01
2-B2	23.92	23.83	23.92	23.94	23.58	23.45	23.26	23.06	22.81	22.56	22.32
2-B5	23.92	23.83	23.92	23.94	23.53	23.31	23.03	22.85	22.62	22.39	22.18

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Table 26. GHG Emissions Reductions from the BAU (Percent)

Scenario	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2015
1-B2	0.7%	0.7%	0.9%	2.4%	2.6%	3.1%	3.4%	3.8%	4.2%	4.7%	**2.6%**
1-B5	1.3%	1.3%	1.4%	2.9%	3.2%	3.4%	3.7%	4.2%	4.6%	5.1%	**3.1%**
2-B2	1.2%	1.2%	1.3%	2.6%	2.7%	2.9%	3.2%	3.4%	3.6%	3.7%	**2.6%**
2-B5	1.2%	1.2%	1.3%	2.8%	3.3%	3.9%	4.1%	4.2%	4.3%	4.4%	**3.0%**

The reductions in Table 26 are compared to the BAU (which includes the ZEV Program and increased light-duty fuel economy standards) and only represent those reductions that would be directly attributed to the Clean Fuels Program. As expected, the scenarios with the B5 baseline achieved more cumulative reductions than the B2 scenarios. Additionally, both of the B2 baseline scenarios and the B5 baseline scenarios achieved similar cumulative reductions which were expected since the compliance period was looking to achieve the same carbon intensity reductions. The advanced vehicle technology scenarios are reducing more emissions annually at the end of the program compared to the blending scenarios due to displacing diesel with natural gas and biogas and reducing consumption of diesel from medium- and heavy-duty hybrids.

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The Oregon Resilience Plan

Reducing Risk and Improving Recovery for the Next Cascadia Earthquake and Tsunami

Report to the
77th Legislative Assembly

from
Oregon Seismic Safety Policy
Advisory Commission (OSSPAC)



Salem, Oregon
February 2013

Cover Page graphic is designed by Deb Schueller with Oregon Department of Geology and Mineral Industries (DOGAMI)

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*Retired from the commission in June 2012.

Project Team and Acknowledgments

On behalf of my fellow OSSPAC Commissioners, I want to thank several individuals whose vision and support have made our resilience planning work possible. First and foremost, we thank our colleague Rep. Deborah Boone, who introduced House Resolution 3 and won the unanimous support of her colleagues on April 18, 2011. We are also grateful to Governor John Kitzhaber, who encouraged OSSPAC's efforts on resilience, and to President Barack Obama's Senior Director for Resilience Richard Reed, who took the time to express his support for the preparation of Oregon's resilience plan.

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We owe the creation of the *Oregon Resilience Plan* to diligent efforts by our eight Task Groups and the capable leadership and project management performed by our Task Group leaders, who may not have fully realized the magnitude of the project when they agreed to serve:

Earthquake and Tsunami Scenario Task Group: ***Ian Madin*** (Chair), Bill Burns, Art Frankel, Chris Goldfinger, Matthew Mabey, George Priest, Yumei Wang, and Ivan Wong.

Business and Work Force Task Group: ***Susan Steward*** (Co-Chair), ***Gerry Williams*** (Co-Chair), Lori Chamberlain, Patrick Estenes, Kelley Okolita, Patrick Slabe, Bert Sorio, Jeffrey Soulages, Rick Van Dyke, and Bryce Ward.

Coastal Communities Task Group: ***Jay Wilson*** (Co-Chair), ***Jay Raskin*** (Co-Chair), Jacque Betz, Rep. Deborah Boone, Josh Bruce, Charlie Davis, Sue Graves, Dave Harlan, Jeffrey Hepler, Maggie Kirby, Sen. Jeff Kruse, Margo Lalich, Jack Lenox, Gary Milliman, Sam Steidel, Wayne Stinson, and Laren Woolley.

Critical Buildings Task Group: ***Ed Quesenberry*** (Co-Chair), ***Trent Nagele*** (Co-Chair), Andre Barbosa, David Bugni, Ed Dennis, Kimberly Dills, Shane Downing, Shelly Duquette, Jennifer Eggers, Joe Gehlen, Tonya Halog, Robert Johnson, Kevin Kaplan, Amit Kumar, Dominic Matteri, Anne Monnier, Willy Paul, Josh Richards, Tim Rippey, Richard Rogers, Terry Shugrue, Jason Thompson, Mark Tobin, Jim Weston, Michael Wieber, and Edward Wolf.

Transportation Task Group: ***Bruce Johnson*** (Chair), Martin Callery, Lieutenant Meredith Condon, Chris Corich, Peter Duskica, Greg Ek-Collins, Herb Florer, Doug Grafe, Elsie Hamner, Chuck Hutto, Doug Kirkpatrick, Jeff Langstrom, Lee Lazaro, Mark Libby, Matt Maass, Nason McCullough, Bob Melbo, Curran Mohney, Lucy Moore, Nancy Murphy, Albert Nako, David Neys, David Olongiagh, Jeff Olson, Jon Oshel, Tom Peterson, Craig Shike, Craig Totten, Tom Wharton, John Wilson, and Holly Winston.

Energy Task Group: ***JR Gonzalez*** (Co-Chair), ***Stan Watters*** (Co-Chair), Heide Caswell, Rick Carter, Brian Doherty, Michael Dougherty, Del Draper, Dave Ford, Debbie Guerra, Teresa Hagins, Marion Haynes, Leon Kempner, Jr., Brian Knight, Lori Koho, Christy Munro, Bruce Paskett, Robbie Roberts, Dave Stuckey, Jack Vranish, Yumei Wang, Tashiana Wanger, and Grant M. Yoshihara.

Information and Communications Task Group: ***Mike Mumaw*** (Chair), Rick Carter, Michael Dougherty, Walter Duddington, JR Gonzalez, Alexis Kwasinki, Devon Lumbard, Kelley Stember, Alex Tang, Yumei Wang, Stan Watters, and Geoffery Williams.

Water and Waste Water Task Group: ***Mike Stuhr*** (Co-Chair), ***Mark Knudson*** (Co-Chair), Don Ballantyne, Steve Behrandt, James Bela, Andy Braun, Scott Burns, Mel Damewood, Jim Doane, Michael Doane, Tom Hickmann, Gary Irwin, Gwynn Johnson, Jeff Leighton, Arturo Leon, Ian Madin, Jim Male, Jim Newell, Bob Patterson, Sherry Patterson, Todd Perimon, Brad Phelps, Jeff Rubin, Rob Schab, Ken Schlegel, Brian Stahl, and Jeffrey H. Winchester.

Dr. Kyra L. Nourse compiled and edited the *Oregon Resilience Plan*, with assistance from my OSSPAC colleagues Dr. Althea Rizzo, Jay Wilson, Ian Madin, Bev Hall and from Edward Wolf. We are grateful to FEMA for financial support, through a grant administered by Oregon Emergency Management, for the technical editing of the plan.

The Port of Portland hosted our workshops on January 26, 2012 and October 5, 2012 in its headquarter building. We want to thank Michelle Walker for her planning and coordination to make the workshops successful. Cascadia Region Earthquake Workgroup (CREW) provided their endorsement for our resilience planning efforts, and also helped sponsor our January 26, 2012 workshop. We want to thank Cale Ash (then President of CREW) and John Schelling (Washington State Emergency Management) for their participation and for sharing their resilience planning experience with us.

On a personal note, I wish to thank my colleagues at Degenkolb Engineers, particularly Chris Poland in San Francisco and Stacy Bartoletti in Seattle, for their inspiration on resilience, and colleagues in our Portland office including Liz Francis and Karla Richards who helped me to manage my resilience plan responsibilities without leaving my other professional obligations too far behind.

Finally, I want to acknowledge the leadership of OSSPAC's Vice Chair Jay Wilson, who has in every respect been a full partner in the vision and execution of the *Oregon Resilience Plan*, and who is a great champion for resilience.

Many other individuals have generously shared their expertise and perspective with us during the creation of this plan. OSSPAC bears the sole responsibility for any errors or omissions it contains.



Kent Yu, Ph.D.

Chairman, Oregon Seismic Safety Policy Advisory Commission

Portland, Oregon

January 2013

Foreword

"If we cannot control the volatile tides of change, we can learn to build better boats."

—Andrew Zolli and Ann Marie Healy, *Resilience: Why Things Bounce Back* (2012)

For more than 300 years, a massive geological fault off America's northwest coast has lain dormant. Well into that interval, Meriwether Lewis and William Clark journeyed to the mouth of the Columbia River and returned to Washington, D.C. to tell the new United States about what came to be known as the Oregon Country. Tens of thousands of settlers crossed the Oregon Trail to establish communities throughout the Willamette Valley, in coastal valleys, and beside natural harbors. With the provisional government established in 1843 followed by statehood in 1859, the modern history of Oregon began. Industries rose and fell, cities and towns grew . . . and still the fault lay silent.

Not until the 1980s did scientists recognize the Cascadia subduction zone as an active fault that poses a major geological hazard to Oregon. A decade later, the state's building codes were updated to address this newly revealed earthquake threat to the built environment.

Since that time, scientists have documented a long history of earthquakes and tsunamis on the Cascadia subduction zone, and state and local officials have urged Oregonians to prepare for the next one. In 1999, the state's Department of Geology and Mineral Industries published a preliminary statewide damage and loss study identifying the dire consequences of a Cascadia earthquake and tsunami for Oregon's infrastructure and for public safety.

One official who took that warning seriously was Senator Peter Courtney, Oregon's unchallenged champion of earthquake safety and advocate for measures to protect students who attend unsafe schools. His legislative efforts over more than a decade launched a statewide assessment of schools and emergency response facilities, and established a state grant program to help fund seismic upgrades to hazardous schools and other critical facilities. Other than California, no state has done as much—yet the hazard surpasses the commitments Oregon has made to date.

In early 2011, we suggested in the pages of *The Oregonian* that Oregon should take new steps to make itself resilient to a big earthquake. Less than two months later, the Tohoku earthquake and tsunami disaster in Japan provided the occasion for Representative Deborah Boone to introduce a House Resolution calling on Oregon to plan for the impacts of a Cascadia earthquake and tsunami here.

House Resolution 3 directed Oregon Seismic Safety Policy Advisory Commission to lead the planning effort. Chairman Kent Yu, Ph.D., has skillfully guided more than 150 volunteer professionals, including noted experts, to develop a landmark report on Oregon's priorities to survive and bounce back from a magnitude 9.0 Cascadia earthquake and tsunami.

The authors of this *Oregon Resilience Plan* set out to help Oregonians know what to expect from the state's infrastructure should that disaster strike this year, and to propose the level of infrastructure reliability that a resilient state should provide. The plan's recommendations highlight ways to close the gap that separates expected and desired performance.

Business leaders engaged in this resilience planning effort have indicated that in a major disaster, interruptions of infrastructure services lasting longer than two weeks will put their enterprises at risk. Yet, under present conditions, we can expect some interruptions to last much longer, in some cases from 18 to 36 months or more. The state, in tandem with the private sector, has much to do to improve the reliability of basic services. Citizens, too, need to plan to be self-sufficient for far longer than the 72-hour period commonly advised for disaster preparedness.

The most recent Cascadia earthquake struck at around 9:00 p.m. on a late January evening; the next could shake a mid-July morning when hundreds of thousands of Oregonians and visitors are enjoying coastal beaches and towns. No one can predict the next time the Cascadia fault will rupture, and *today* is just as likely as fifty years from now. If we begin now, it is possible to prevent that natural disaster from causing a statewide catastrophe. Now is the time to have a plan. Now is the time to close Oregon's resilience gap.

The Oregon Resilience Plan maps a path of policy and investment priorities for the next fifty years. The recommendations offer Oregon's Legislative Assembly and Governor immediate steps to begin a journey along that path. The plan and its recommendations build on the solid foundation laid over the past quarter century by some of Oregon's top scientists, engineers, and policymakers.

As we wrote two years ago, adopting and implementing such a plan can show "Oregon at its best, tackling a risk with imagination and resourcefulness while sharing the knowledge gained."

YUMEI WANG, JAY RASKIN, AND EDWARD WOLF
Portland, Oregon

November 2012

Yumei Wang, Jay Raskin, and Edward Wolf are the co-authors of "Oregon should make itself resilient for a big quake," *The Sunday Oregonian*, January 9, 2011.

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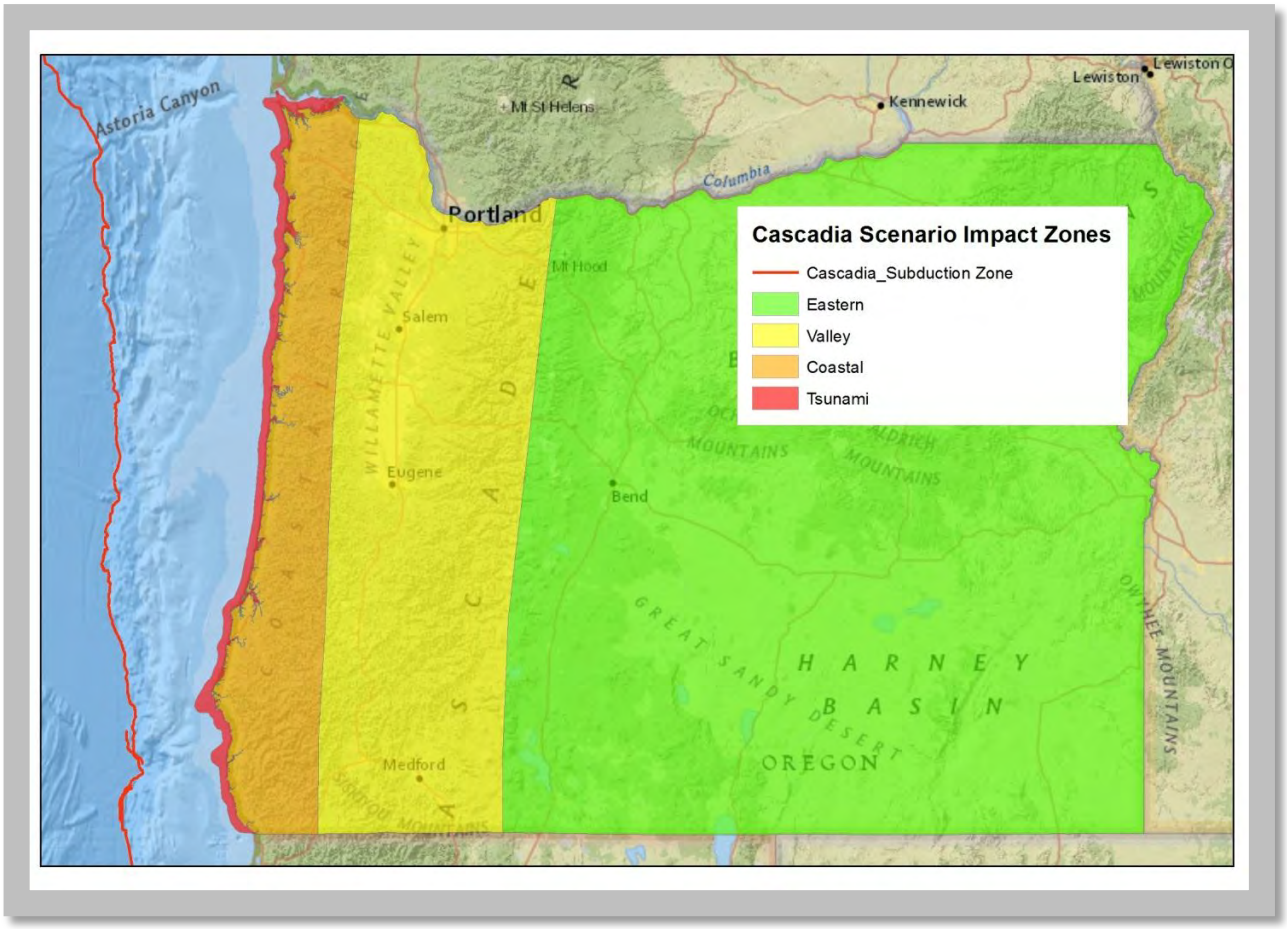
Executive Summary

Very large earthquakes will occur in Oregon's future, and our state's infrastructure will remain poorly prepared to meet the threat unless we take action now to start building the necessary resilience. This is the central finding of the *Oregon Resilience Plan* requested by Oregon's 76th Legislative Assembly.



Impact zones for the magnitude 9.0 Cascadia earthquake scenario. Damage will be extreme in the Tsunami zone, heavy in the Coastal zone, moderate in the Valley zone, and light in the Eastern zone.

About the Plan

House Resolution 3, adopted in April 2011, directed the Oregon Seismic Safety Policy Advisory Commission (OSSPAC) "to lead and coordinate preparation of an Oregon Resilience Plan that reviews policy options, summarizes relevant reports and studies by state agencies, and makes recommendations on policy direction to protect lives and keep commerce flowing during and after a Cascadia earthquake and tsunami." OSSPAC assembled eight task groups, comprising volunteer subject-matter experts from government, universities, the private sector, and the general public. An Advisory Group of public- and private-sector leaders oversaw the Task Groups' work, assembled in the portfolio of chapters that make up the plan.

OSSPAC offered the following definition of the seismic resilience goal:

> "Oregon citizens will not only be protected from life-threatening physical harm, but because of risk reduction measures and pre-disaster planning, communities will recover more quickly and with less continuing vulnerability following a Cascadia subduction zone earthquake and tsunami."

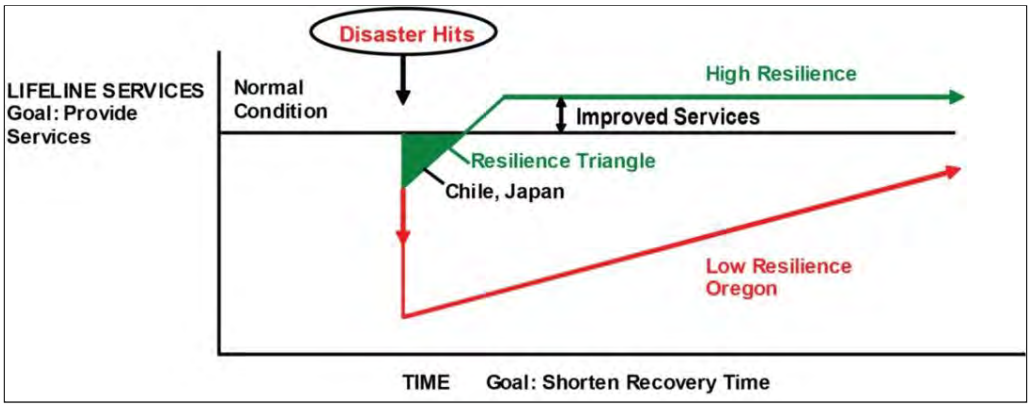
Each group was charged with three tasks for four affected zones (tsunami, coastal/earthquake only, valley, and central/eastern Oregon):

1. Determine the **likely impacts** of a magnitude 9.0 Cascadia earthquake and tsunami on its assigned sector, and estimate the time required to restore functions in that sector if the earthquake were to strike under present conditions;

2. Define **acceptable timeframes** to restore functions after a future Cascadia earthquake to fulfill expected resilient performance; and

3. Recommend **changes in practice and policies** that, if implemented during the next 50 years, will allow Oregon to reach the desired resilience targets.

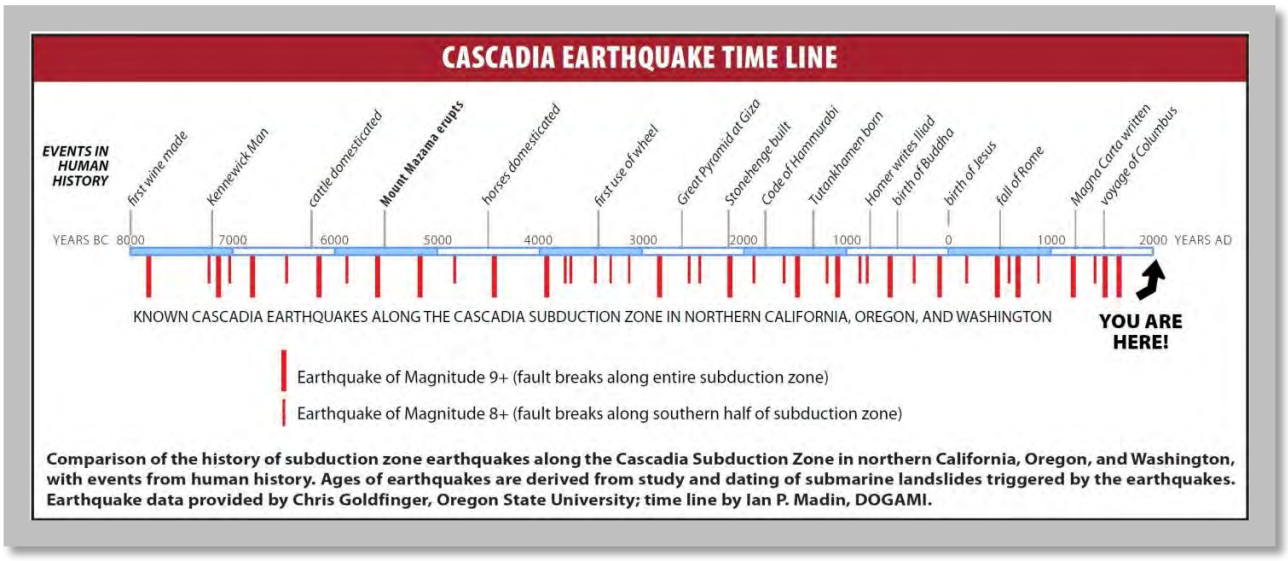
The purpose of the analysis is to identify steps needed to eliminate the gap separating current performance from resilient performance, and to initiate that work through capital investment, new incentives, and policy changes so that the inevitable natural disaster of a Cascadia earthquake and tsunami will not deliver a catastrophic blow to Oregon's economy and communities.



The basic principle of the resilience triangle is that the smaller the triangle, the higher the resilience. Higher resilience requires minimal reductions in critical lifeline services after a disaster, speedy recovery of those services, and an overall improved service level as a result of rebuilding damaged systems and implementing better systems. The resilience triangle diagram indicates that Chile and Japan have high levels of earthquake resilience. At the current stage, Oregon's infrastructure has low resilience and is expected to have significant loss of sector services and a slow recovery time. Source: Resilience Triangle by Wang, Bartlett, and Miles (2012)

Overview of the Task Groups

The **Cascadia Earthquake Scenario Task Group** (Chapter One) reviewed current scientific research to develop a detailed description of the likely physical effects of a great (magnitude 9.0) Cascadia subduction zone earthquake and tsunami, providing a scenario that other task groups used to assess impacts on their respective sectors.



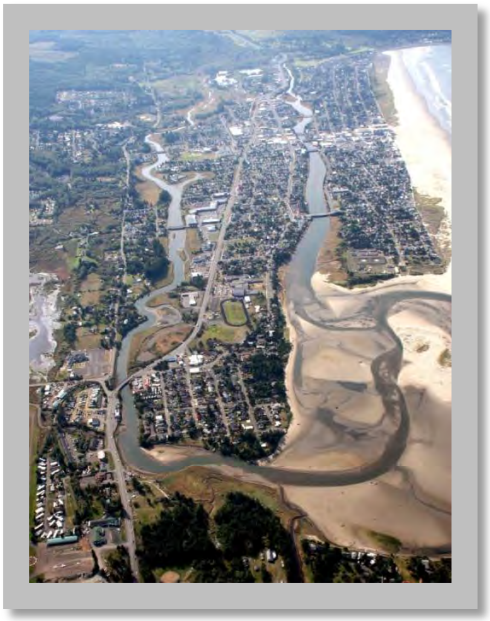
This timeline compares the 10,000-year-long history of Cascadia earthquakes to events in human history.

The **Business and Workforce Continuity Task Group** (Chapter Two) sought to assess the workplace integrity, workforce mobility, and building systems performance – along with customer viability – needed to allow Oregon's businesses to remain in operation following a Cascadia earthquake and tsunami and to drive a self-sustaining economic recovery.

The **Coastal Communities Task Group** (Chapter Three) addressed the unique risks faced by Oregon's coast, the region of the state that will experience a devastating combination of tsunami inundation and physical damage from extreme ground shaking due to proximity to the subduction zone fault.



Critical Facilities in the Tsunami Zone – Minamisanriku, March 14, 2011. Because their hospital, emergency operation center, and other government and community service facilities were located in the tsunami inundation zone, the surviving community lost nearly all of its capacity to respond and implement recovery efforts. Source: Asia Air Survey Co., Ltd.



Tsunami Vulnerability: City of Seaside with 83% of its population, 89% of its employees and almost 100% of its critical facilities in the tsunami inundation zone. Source: Horning Geosciences

The **Critical and Essential Buildings Task Group** (Chapter Four) examined the main classes of public and private structures considered critical to resilience in the event of a scenario earthquake, and sought to characterize the gap between expected seismic performance (current state) and desired seismic resilience (target state). The group also assessed buildings deemed vital to community resilience, and addressed the special challenges posed by unreinforced masonry (URM) and non-ductile concrete structures.



Many of existing public and private buildings such as the State Capitol Building were built prior to our knowledge of the Cascadia subduction earthquake. They are not seismically safe, and pose significant life-safety threat to the building occupants. Photo Source: http://en.wikipedia.org/wiki/File:Oregon_State_Capitol_1.jpg

The **Transportation Task Group** (Chapter Five) assessed the seismic integrity of Oregon's multi-modal transportation system, including bridges and highways, rail, airports, water ports, and public transit systems, examined the special considerations pertaining to the Columbia and Willamette River navigation channels, and characterized the work deemed necessary to restore and maintain transportation lifelines after a Cascadia earthquake and tsunami. The group's scope included interdependence of transportation networks with other lifeline systems.



The approach (foreground) to the 1966 Astoria-Megler Bridge that spans the Columbia River has major structural deficiencies that could lead to a collapse following an earthquake. Damaged bridge sections could block waterway access to the Critical Energy Infrastructure Hub. (DOGAMI photo)

The **Energy Task Group** (Chapter Six) investigated the seismic deficiencies of Oregon's energy storage and transmission infrastructure, with a special emphasis on the vulnerability of the state's critical energy infrastructure (CEI) hub, a six-mile stretch of the lower Willamette River where key liquid fuel and natural gas storage and transmission facilities and electricity transmission facilities are concentrated.



Left: Site map of the Critical Energy Infrastructure (CEI) Hub on the western bank of the Lower Willamette River area in NW Portland, Oregon. The CEI Hub, outlined in red, stretches for six miles. (Google Earth) Right: Oil terminals in the CEI Hub. (DOGAMI photo)

The **Information and Communications Task Group** (Chapter Seven) examined the inherent vulnerabilities of Oregon's information and communications systems and the consequences of service disruptions for the resilience of other sectors and systems. The group explored the implications of co-location of communications infrastructure with other vulnerable physical infrastructure (*e.g.,* bridges), and specified the conditions needed to accomplish phased restoration of service following a Cascadia earthquake and tsunami.



Left: These high voltage electrical transmission towers are built on a river bank in the Critical Energy Infrastructure (CEI) Hub susceptible to lateral spreading. (DOGAMI photo) Right: Structural damage to a high voltage transmission tower located at a river crossing in 2010 Chile earthquake (ASCE Technical Council on Lifeline Earthquake Engineering – TCLEE)

The **Water and Wastewater Task Group** (Chapter Eight) reviewed vulnerabilities of the pipelines, treatment plants, and pump stations that make up Oregon's water and wastewater systems, and discussed the interventions needed to increase the resilience of under-engineered and antiquated infrastructure at potential failure points. The group proposed a phased approach to restoration of water services after a Cascadia earthquake and tsunami, beginning with a backbone water and wastewater system capable of supplying critical community needs.

Key Findings

Oregon is far from resilient to the impacts of a great Cascadia earthquake and tsunami today. Available studies estimate fatalities ranging from 1,250 to more than 10,000 due to the combined effects of earthquake and tsunami, tens of thousands of buildings destroyed or damaged so extensively that they will require months to years of repair, tens of thousands of displaced households, more than $30 billion in direct and indirect economic losses (close to one-fifth of Oregon's gross state product), and more than one million dump truck loads of debris.

A particular vulnerability is Oregon's liquid fuel supply. Oregon depends on liquid fuels transported into the state from Washington State, which is also vulnerable to a Cascadia earthquake and tsunami. Once here, fuels are stored temporarily at Oregon's critical energy infrastructure hub, a six-mile stretch of the

lower Willamette River where industrial facilities occupy liquefiable riverside soils. Disrupting the transportation, storage, and distribution of liquid fuels would rapidly disrupt most, if not all, sectors of the economy critical to emergency response and economic recovery.

Business continuity planning typically assumes a period of two weeks to be the longest disruption of essential services (*i.e.*, utilities, communications, etc.) that a business can withstand, and service disruptions lasting for one month or longer can be enough to force a business to close, relocate, or leave the state entirely. Analysis in the *Oregon Resilience Plan* reveals the following timeframes for service recovery under present conditions:

Critical Service	Zone	Estimated Time to Restore Service
Electricity	Valley	1 to 3 months
Electricity	Coast	3 to 6 months
Police and fire stations	Valley	2 to 4 months
Drinking water and sewer	Valley	1 month to 1 year
Drinking water and sewer	Coast	1 to 3 years
Top-priority highways (partial restoration)	Valley	6 to 12 months
Healthcare facilities	Valley	18 months
Healthcare facilities	Coast	3 years

Resilience gaps of this magnitude reveal a harsh truth: a policy of business as usual implies a post-earthquake future that could consist of decades of economic and population decline – in effect, a "lost generation" that will devastate our state and ripple beyond Oregon to affect the regional and national economy.

- After the February 27, 2010 M8.8 Maule Earthquake, Chile was able to restore 90% communication services and 95% power supply within two weeks, and re-start commercial flights after ten days.
- After the March 11, 2011 M9.0 Tohoku Earthquake, Japan was able to restore more than 90% power supply in ten days, 90% telephone lines in two weeks, and 90% cellular base stations in 19 days.



Recommendations

Based on the findings in this *Oregon Resilience Plan*, OSSPAC recommends that Oregon start now on a sustained program to reduce our vulnerability and shorten our recovery time to achieve resilience before the next Cascadia earthquake inevitably strikes our state.

OSSPAC urges systematic efforts to assess Oregon's buildings, lifelines, and social systems, and to develop a sustained program of replacement, retrofit, and redesign to make Oregon resilient.

Sector-by-sector findings and detailed recommendations are presented in each chapter of the *Oregon Resilience Plan*. Overarching priorities, illustrated with examples selected from the chapters, include new efforts to:

1. Undertake **comprehensive assessments** of the key structures and systems that underpin Oregon's economy, including

    a. Completing a statewide inventory of critical buildings (those needed for emergency response and the provision of basic services to communities) in both public and private sectors (Chapter Four);
    b. Completing an updated inventory of the local agency, transit, port, and rail assets that assure access to school buildings and hospitals and could be used during emergencies (Chapter Five);
    c. Charging the Oregon Public Utility Commission to define criteria for seismic vulnerability assessments that will be applied by operating companies in the energy and information and communications sectors (Chapters Six and Seven); and
    d. Requiring all water and wastewater agencies to complete a seismic risk assessment and mitigation plan as part of periodic updates to facility plans (Chapter Eight).

2. Launch a sustained **program of capital investment** in Oregon's public structures, including

    a. Fully funding Oregon's Seismic Rehabilitation Grants Program for K-12 schools, community colleges, and emergency response facilities (Chapters Two and Four);
    b. Seismically upgrading lifeline transportation routes into and out of major business centers statewide by 2030 (Chapter Five); and
    c. Establishing a State Resilience Office to provide leadership, resources, advocacy, and expertise in implementing statewide resilience plans (Chapter Four).

3. Craft a **package of incentives** to engage Oregon's private sector in efforts to advance seismic resilience, including

    a. Developing a seismic rating system for new buildings to incentivize construction of buildings more resilient than building code compliance requires and to communicate seismic risk to the public (Chapters Two and Four);
    b. Tasking the Oregon Public Utilities Commission to provide oversight for seismic preparedness of the energy providers currently under its jurisdiction (Chapter Six); and

c. Working with the hospitality industry to develop plans to assist visitors following a major earthquake and tsunami and to plan strategies to rebuild the tourism industry (Chapter Three).

4. **Update Oregon's public policies**, including

   a. Revising individual preparedness communications to specify preparation from the old standard of 72 hours to a minimum of two weeks, and possibly more (Chapters Two and Three);
   b. Developing a policy and standards for installation of temporary bridges following earthquake disruption (Chapter Five); and
   c. Adopting a two-tiered ratings system that indicates the number of hours/days that a citizen in a community can expect to wait before major relief arrives, and the number of days/months that a citizen can expect to wait before the community itself achieves 90 percent restoration of roads and municipal services (Chapter Two).

These and other recommendations may be refined and implemented via a combination of new legislation, regulations, administrative rules, budget priorities, and in consultation with private sector leaders as appropriate.

Looking Ahead

This *Oregon Resilience Plan* emphasizes the resilient physical infrastructure needed to support business and community continuity. The policy recommendations presented here, if implemented over the next 50 years, will enhance our infrastructure resilience, help preserve our communities, and protect our state economy.

This is a timeframe much longer than typical of government planning efforts. To affirm Oregon's commitment, OSSPAC needs to work with the Joint Ways & Means Committee of Oregon's Legislative Assembly to track and report on progress toward seismic resilience at the beginning of each legislative session, to keep the 50-year goal in view.

Local Oregon communities can use the framework and gap-analysis methodology developed by the *Oregon Resilience Plan* to conduct more refined assessments that consider local seismic and tsunami hazards, and develop community-specific recommendations to meet their response and recovery needs.

A Cascadia earthquake and tsunami will affect both Oregon and Washington. Both states share common challenges, among them the interstate bridges and the Columbia River navigation channel as well as the regional power grid and liquid fuel supply. In particular, Oregon gets almost one hundred percent of its liquid fuel from suppliers in Washington, delivered via pipeline and river. We believe that it would be beneficial for both states to work together at a regional level to address the common challenge of resilience to a region-wide seismic event.

OSSPAC recommends expanding future resilience planning efforts to include:

1. Community-level planning
2. Human resilience
3. Civic infrastructure
4. Joint regional planning with Washington State

With resilient physical infrastructure, a healthy population, and functioning government and civic infrastructure to provide services to those in need, Oregon will be ready to withstand a Cascadia earthquake and tsunami, and to expedite response and recovery efforts quickly.

NOTE: This Executive Summary selects from the large number of detailed recommendations in the chapters of the *Oregon Resilience Plan*. The full report is available online at the Oregon Office of Emergency Management website: http://www.oregon.gov/OMD/OEM/Pages/index.aspx

1. Cascadia: Oregon's Greatest Natural Threat

Introduction

When, not if, the next great Cascadia subduction zone earthquake strikes the Pacific Northwest, Oregon will face the greatest challenge in its history. Oregon's buildings, transportation network, utilities, and population are simply not prepared for such an event. Were it to occur today, thousands of Oregonians would die, and economic losses would be at least $32 billion. In their current state, our buildings and lifelines (transportation, energy, telecommunications, and water/wastewater systems) would be damaged so severely that it would take three months to a year to restore full service in the western valleys, more than a year in the hardest-hit coastal areas, and many years in the coastal communities inundated by the tsunami. Experience from past disasters has shown that businesses will move or fail if services cannot be restored in one month; so Oregon faces a very real threat of permanent population loss and long-term economic decline.

We cannot avoid the future earthquake, but we can choose either a future in which the earthquake results in grim damage and losses and a society diminished for a generation, or a future in which the earthquake is a manageable disaster without lasting impact. We need to start preparing now by assessing the vulnerability of our buildings, lifelines, and social systems, and then developing and implementing a sustained program of replacement, retrofit, and redesign to make Oregon resilient to the next great earthquake. We know how to engineer buildings, roads, and power lines to withstand this earthquake; the hard part will be to find the will, commitment, and persistence needed to transform our state.

The Oregon legislature recognized the scale of this problem when it passed House Resolution 3 in 2011 (see Appendix I for details of House Resolution 3), noting the likely impact of a Cascadia earthquake and the need for a plan to move the state towards resilience to that event. The Oregon Seismic Safety Policy Advisory Commission (OSSPAC) was charged with developing a resilience plan, which is described in this report. The report summarizes the science of Cascadia subduction zone earthquakes and estimates their impacts; it then provides detailed analysis of the current vulnerability of our buildings and business community, and our transportation, energy, communication, and water/wastewater systems. The report defines the performance targets that each sector must meet to achieve adequate resilience, and provides detailed recommendations for the actions required to meet those targets over the next 50 years.

How OSSPAC Developed This Plan

House Resolution 3 passed by the 2011 legislature directed OSSPAC to "lead and coordinate preparation of an Oregon Resilience Plan that reviews policy options, summarizes relevant reports and studies by state agencies and makes recommendations on policy direction to protect lives and keep commerce

flowing during and after a Cascadia earthquake and tsunami". To meet this challenge OSSPAC first defined what resilience would mean for Oregon:

Oregon citizens will not only be protected from life-threatening physical harm, but because of risk reduction measures and pre-disaster planning, communities will recover more quickly and with less continuing vulnerability following a Cascadia subduction zone earthquake and tsunami.

OSSPAC identified existing and ongoing earthquake resilience planning from San Francisco, California (SPUR, 2009) and the State of Washington (Washington Seismic Safety Committee, 2012) as good models to follow. These studies outlined an approach that included estimating the current earthquake vulnerability of systems and structures, defining the performance standards that structures and systems would need to meet over fifty years in order to be sufficiently resilient, and then identifying changes in practice and policy that would help attain those performance standards. One difference for the Oregon Resilience Plan was that it needed to encompass the entire state unlike the City of San Francisco study, and that it focused on the Cascadia earthquake threat, unlike the Washington study which considered multiple earthquake scenarios.

To complete the plan without funding and on a one-year schedule, OSSPAC chose to tap into volunteer expertise from Oregon's academic, professional, governmental and public communities. Over one hundred volunteer experts drawn from a broad section of Oregon society were organized into eight work groups to survey the following parts of the problem:

- Cascadia Earthquake Scenario
- Business and Workforce
- Coastal Communities
- Critical and Essential Buildings
- Energy
- Transportation
- Information and Communications
- Water and Wastewater

The purpose of the task group assigned to the Cascadia Earthquake Scenario was to develop a detailed description of the likely physical effects throughout Oregon of a major Cascadia subduction earthquake so that the other groups could assess the impact on their respective sectors. Each of the remaining seven groups focused on one of the sectors of society or parts of the built environment listed above. The Coastal Task Group was included to recognize the unique risk along the coast: this region will experience a combination of tsunami damage and damage from extreme shaking.

Each group was charged with three primary tasks: First, determine the likely impact of the scenario earthquake on the assigned sector and estimate the time required to restore functions in that sector if

the earthquake were to happen under current conditions. Second, define performance targets for the sector. The targets represent the desired timeframes for restoring functions in a future Cascadia earthquake—in other words, the timeframes within which functions must be restored if Oregon is to be resilient. Finally, provide a series of recommendations to OSSPAC for changes in practice and policy that, if implemented, would ensure that Oregon reaches the desired resilience targets over the next 50 years.

The products from the various task groups were reviewed by an advisory group of subject matter experts to ensure that the material was accurate, complete, and up-to-date. OSSPAC then reviewed the recommendations and selected and endorsed those that the commission felt offered the most effective way to achieve resilience to a great Cascadia disaster.

Great Earthquakes on the Cascadia Subduction Zone

For the last twenty-five years, the scientific community has been aware of the possibility that a great earthquake caused by the Cascadia subduction zone could strike the Pacific Northwest. Now, after decades of research and recent great earthquakes in Sumatra, Chile, and Japan, awareness of this threat is widespread in Oregon, and we know enough to paint a picture of what Oregon might look like after such an earthquake. Oregon is a geologic mirror image of northern Japan (see Figure 1.1). In both places, the Pacific Ocean floor is sliding beneath the adjacent continents along giant faults called subduction zones. The scientific understanding of the Cascadia threat makes it clear that very large earthquakes will occur in Oregon's future, and that our societal and physical structures are poorly prepared to meet the threat unless we take action now to start building the necessary resilience.

What Are Subduction Zone Earthquakes?

The surface of the earth is broken into dozens of tectonic plates—continent-sized slabs of rigid rock that slowly slide across the more pliant mantle of the earth beneath. Moving at speeds of a few inches per year, the plates can pull apart, slide past each other, or collide head on. Where an oceanic and a continental plate collide, a subduction zone forms, as one plate is forced beneath the other, deep into the softer rock of the mantle. A great arc of subduction zones surrounds the Pacific Ocean, producing what geologists call the "Ring of Fire." In Japan, the ocean floor of the Pacific Plate moves towards the west, sliding beneath the Eurasian Plate that supports the islands of Japan. The Pacific Northwest is a geologic mirror image of Japan, with the Pacific Ocean floor moving towards the east, sliding beneath Oregon, Washington, and Northern California along a 600-mile fault called the Cascadia subduction zone.

In Japan, there has never been any doubt that great subduction earthquakes are possible: Japan's long written history has recorded many such events, with the 2011 Tohoku earthquake being the most recent and one of the most powerful and destructive. In that earthquake, a section of the Pacific Ocean floor measuring 300 miles long and 125 miles wide lurched as much as 100 feet down the subduction zone, causing a great magnitude 9.0 earthquake. The eastern edge of the Eurasian Plate, which had been slowly bending for centuries under the relentless pressure of subduction, snapped back during the

earthquake, displacing trillions of tons of seawater and triggering a catastrophic tsunami. The release of the bent Eurasian Plate caused land along the coast of Japan to permanently sink several feet, and the strong shaking from the earthquake caused widespread landslides on steep slopes (both on land and undersea) and widespread liquefaction of soft sediments on land.

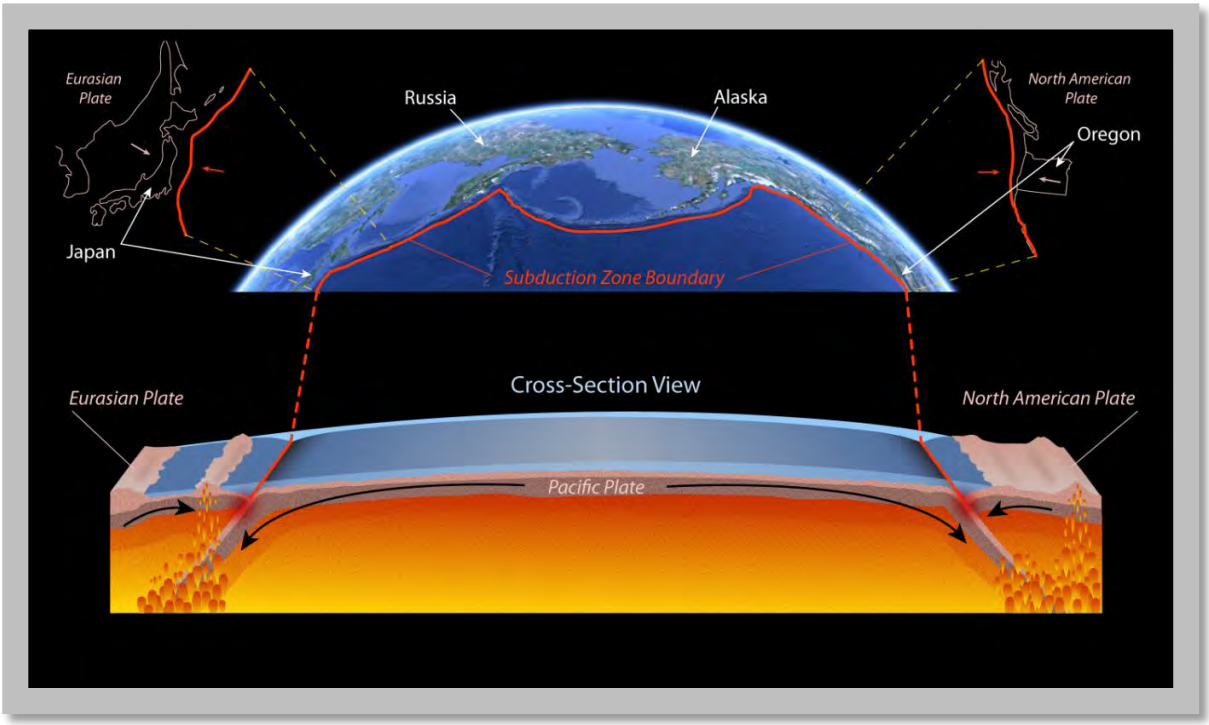


Figure 1.1: Oregon is a geologic mirror-image of Northern Japan. In both places, the Pacific Ocean floor is sliding beneath the adjacent continents along giant faults called subduction zones (Source: Graphic by Dan Coe, DOGAMI).

In 1984, when seismologists first proposed that Cascadia might produce similar earthquakes, there was considerable doubt. Research since then has confirmed that Cascadia has a long history of great subduction earthquakes and that energy for the next great earthquake is currently building along the fault. Geologic studies (see Figure 1.2) have uncovered evidence of the coastal subsidence, tsunamis, landslides, and liquefaction that were produced by past Cascadia earthquakes, and ultra-sensitive GPS measurements show that the Oregon coast is moving eastward a few inches per year along with the Pacific Ocean floor, motion that will be abruptly reversed during the next great subduction earthquake. There is no scientific doubt that another great subduction earthquake will strike the Pacific Northwest; the questions now are how soon, how large, and how destructive that earthquake will be.

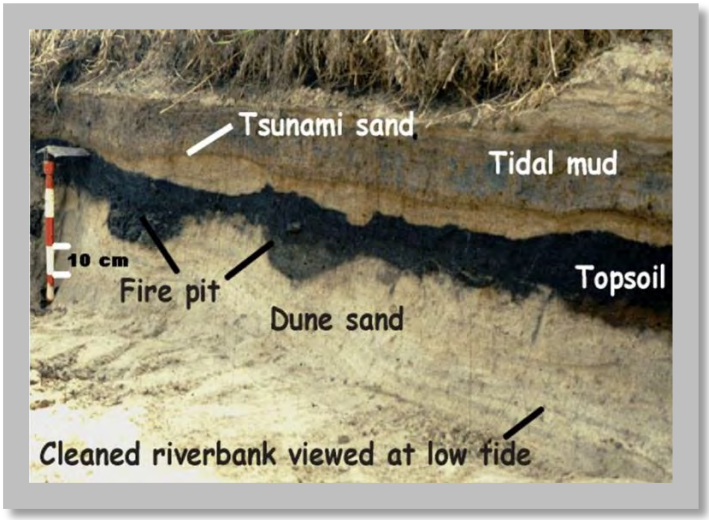


Figure 1.2: This photo (Source: Brian Atwater, USGS) shows a riverbank from the Salmon River estuary where Native American firepots were found in a forest soil that subsided in the 1700 AD earthquake and was buried by tsunami sand and tidal mud.

Geologists have assembled a ten thousand year record of past Cascadia earthquakes (see Figure 1.3) by studying sediments in coastal marshes and on the ocean floor. This record shows that past earthquakes have occurred at highly variable intervals and can range widely in size and in which parts of the Pacific Northwest they affect. About half of the past earthquakes have been very large (estimated magnitude 8.3 to 8.6) and centered on the southern Oregon coast, while the other half have been great (estimated magnitude 8.7 to 9.3) and extending from northern California to British Columbia. The most recent event occurred on January 26, 1700 AD, and was a great earthquake with a magnitude of 9.0. The time interval between previous earthquakes has varied from a few decades to many centuries, but most of the past intervals have been shorter than the 313 years since the last event. It is simply not scientifically feasible to predict, or even estimate, when the next Cascadia earthquake will occur, but the calculated odds that a Cascadia earthquake will occur in the next 50 years range from 7-15 percent for a great earthquake affecting the entire Pacific Northwest to about 37 percent for a very large earthquake affecting southern Oregon and northern California. The likelihood of a M 9 Cascadia earthquake during our lifetimes and the consequences of such an earthquake are both so great that it is prudent to consider this type of earthquake when designing new structures or retrofit of existing structures, evaluating the seismic safety of existing structures, or planning emergency response and preparedness.

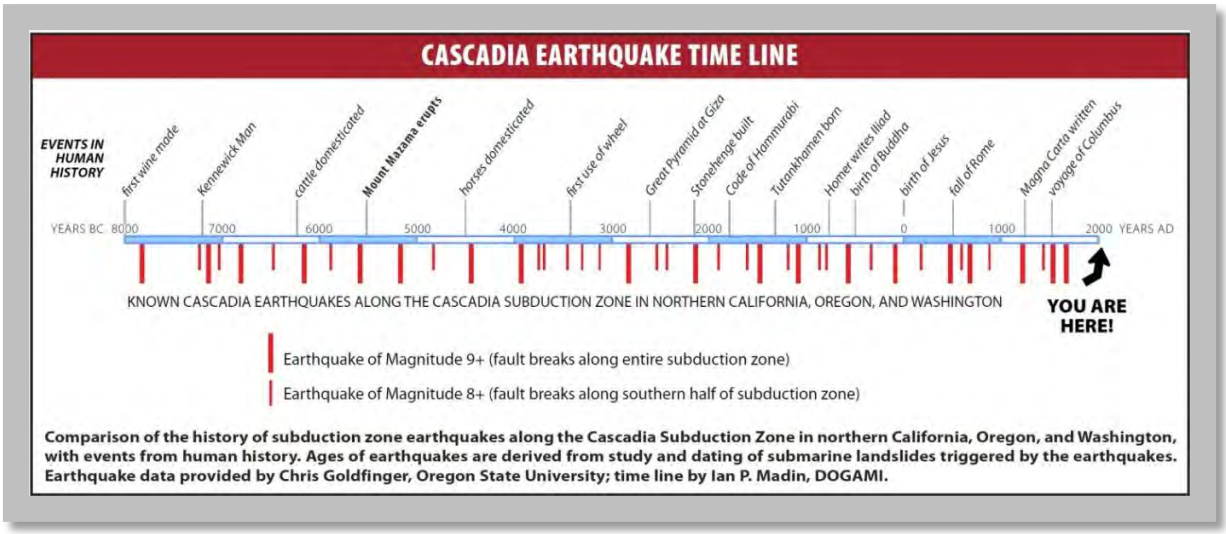


Figure 1.3: This timeline compares the 10,000-year-long history of Cascadia earthquakes to events in human history.

Resilience Plan Earthquake Scenario

For the purpose of this resilience planning effort, we chose to look at the effects of a great earthquake of magnitude 9.0, because it is a very real possibility that would affect all of Oregon and is directly comparable to the 2011 Tohoku earthquake, the effects of which are all too well known. Using the latest models from the United States Geological Survey (USGS), we simulated the strong shaking that is likely to occur during the region's next magnitude 9.0 event. The simulated shaking map was then used to estimate the amount of ground failure due to liquefaction and landsliding that would result from such an earthquake. For the tsunami, we used a model of the inundation from a magnitude 9.0 event. This model, which was produced by the Oregon Department of Geology and Mineral Industries (DOGAMI), was applied to maps of the coast to show which areas and facilities would be inundated. The tsunami models also provided estimates of the permanent coastal subsidence that would accompany the earthquake and tsunami. These maps of simulated earthquake effects were used to evaluate the likely performance of Oregon's critical buildings and infrastructure.

The simulation shows that Oregon would experience shaking very similar to the shaking that northern Japan endured in 2011. As indicated in Figure 1.4, areas along Oregon's coast would experience severe to violent shaking, while cities along the I-5 corridor would experience strong or very strong shaking. East of the Cascades, shaking would be light to moderate. In all areas, the strong shaking would last from two to four minutes.

This expected pattern of damage led OSSPAC to evaluate the state in four distinct zones (see Figure 1.5):

- The Tsunami Zone, where severe shaking and tsunami inundation would cause near total damage, and threaten the lives of thousands of residents.

- The Coastal Zone, where severe shaking and damage to transportation systems would severely disrupt and isolate communities and where the major challenge after the earthquake would be to keep the population sheltered, fed and healthy.
- The Valley Zone, where widespread moderate damage would severely disrupt daily life and commerce and where restoring services to business and residents would be the main priority.
- The Eastern zone where light damage would allow rapid restoration of services and functions, and where communities would become critical hubs for the movement of response recovery and restoration personnel and materials for the rest of the state.

The results of the ground failure simulation (see Figure 1.6) suggest that large areas of western Oregon would be severely affected. Strong shaking causes ground failure in two ways. Along rivers, lakes, and the coast, where there are deposits of loose water-saturated sand, shaking causes the sand to liquefy, and the weakened soil readily settles or spreads. On steep slopes with weak soil and rock, or in areas of existing landslides, the shaking can cause new or renewed landslide movement, with very damaging results. Ground failure can cause severe damage to buildings and is particularly damaging to lifelines, which by their nature must often cross wide areas of affected ground.

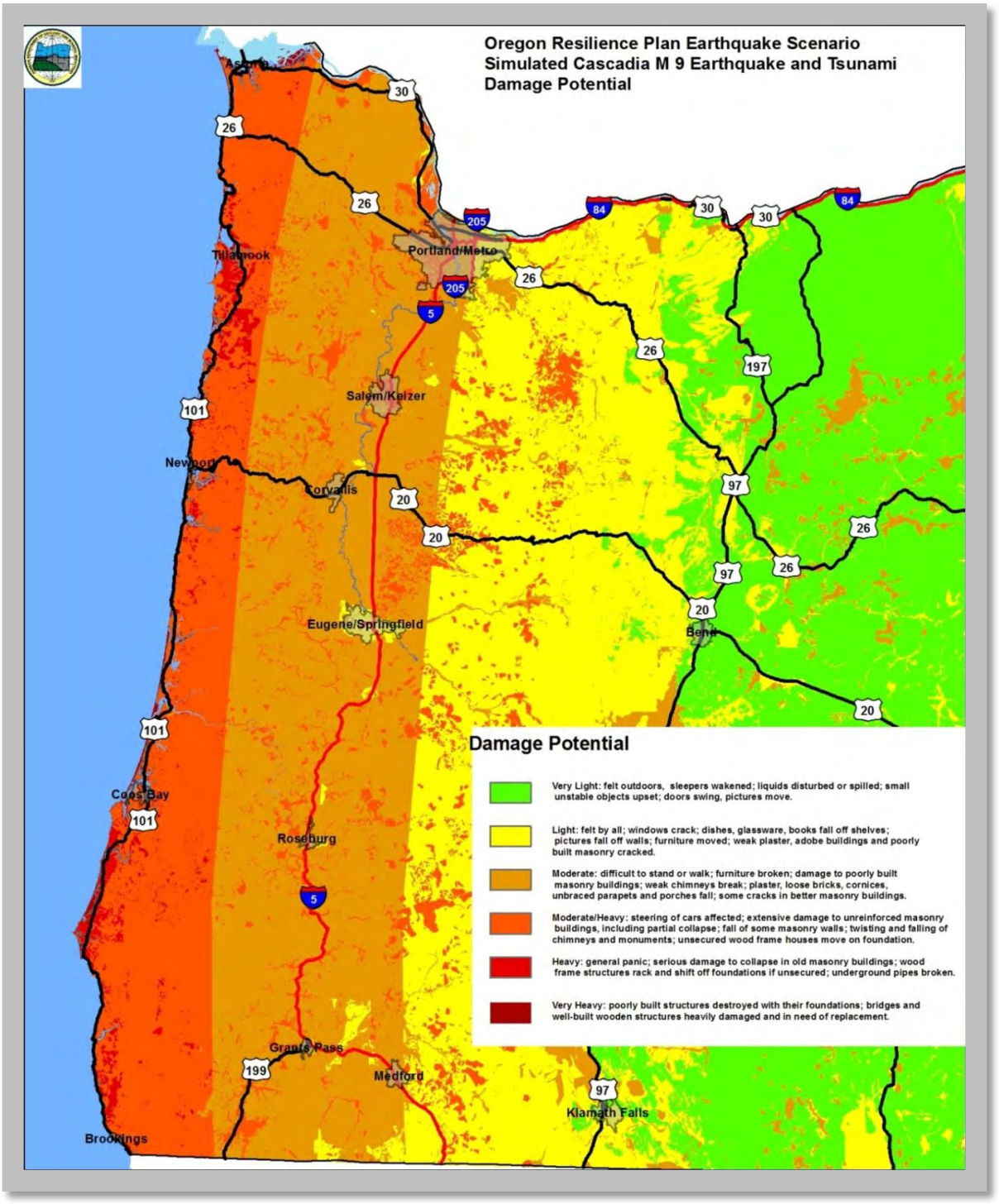


Figure 1.4: Simulated shaking for the magnitude 9.0 Cascadia scenario.

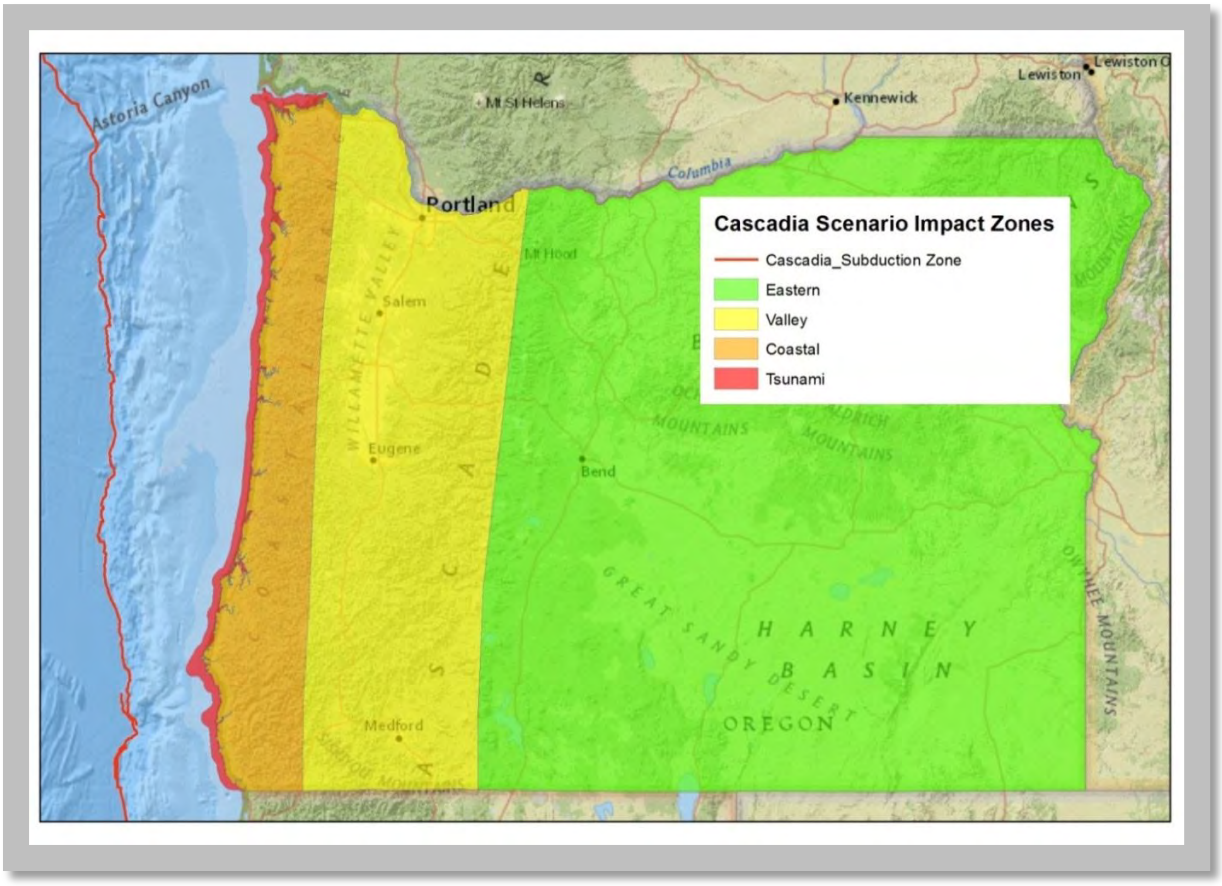


Figure 1.5: Impact zones for the magnitude 9.0 Cascadia earthquake scenario. Damage will be extreme in the Tsunami zone, heavy in the Coastal zone, moderate in the Valley zone, and light in the Eastern zone.

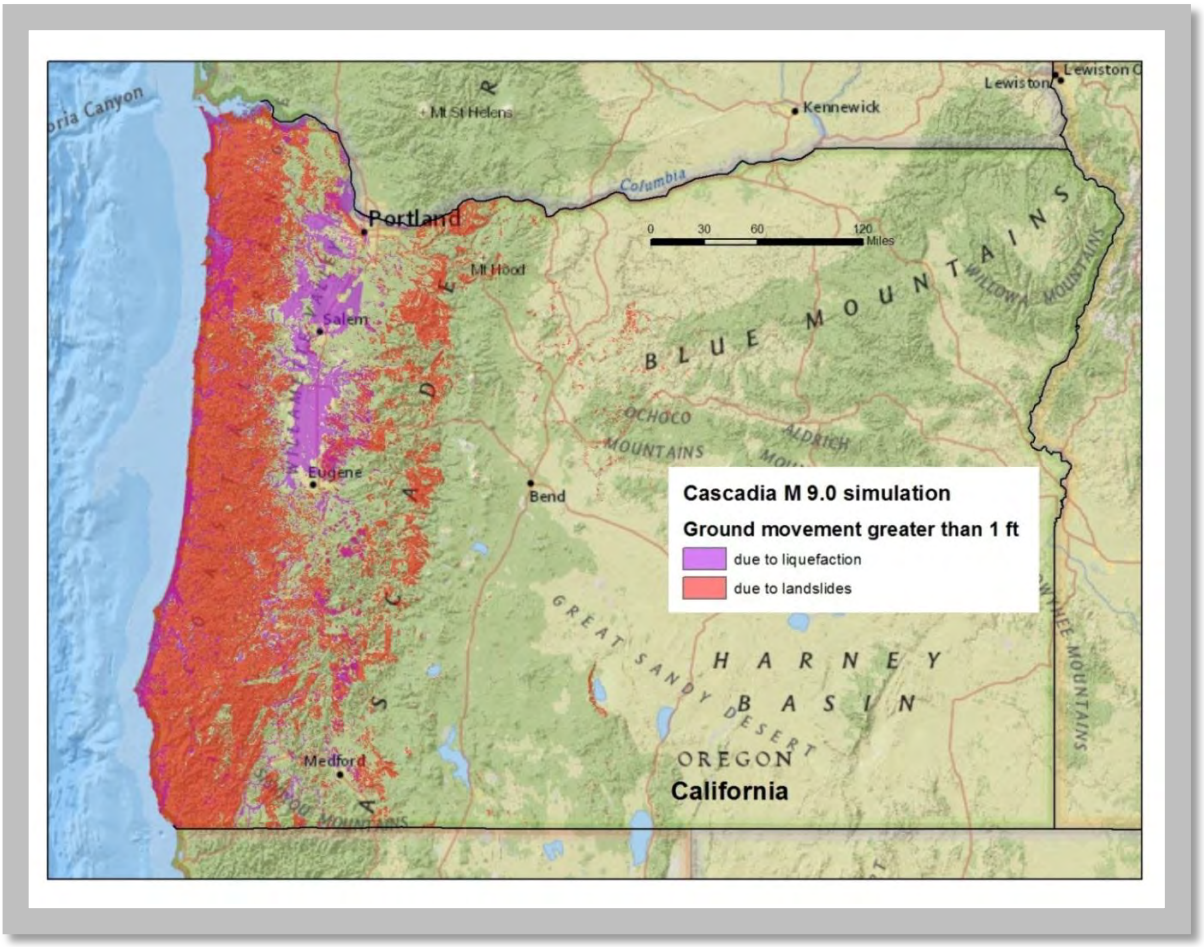


Figure 1.6: Ground failure and movement for the magnitude 9.0 Cascadia earthquake scenario. Colored areas could experience more than one foot of ground movement due to earthquake-induced landslides in steep areas and liquefaction failure in lowlands. Both forms of ground failure can cause severe damage.

The amount of tsunami inundation that would be experienced along the coast due to the scenario magnitude 9.0 earthquake is quite variable and depends on local topography. Large parts of many low-lying communities, such as Warrenton, Seaside, Rockaway Beach, and Neskowin (see Figure 1.7), will be inundated.

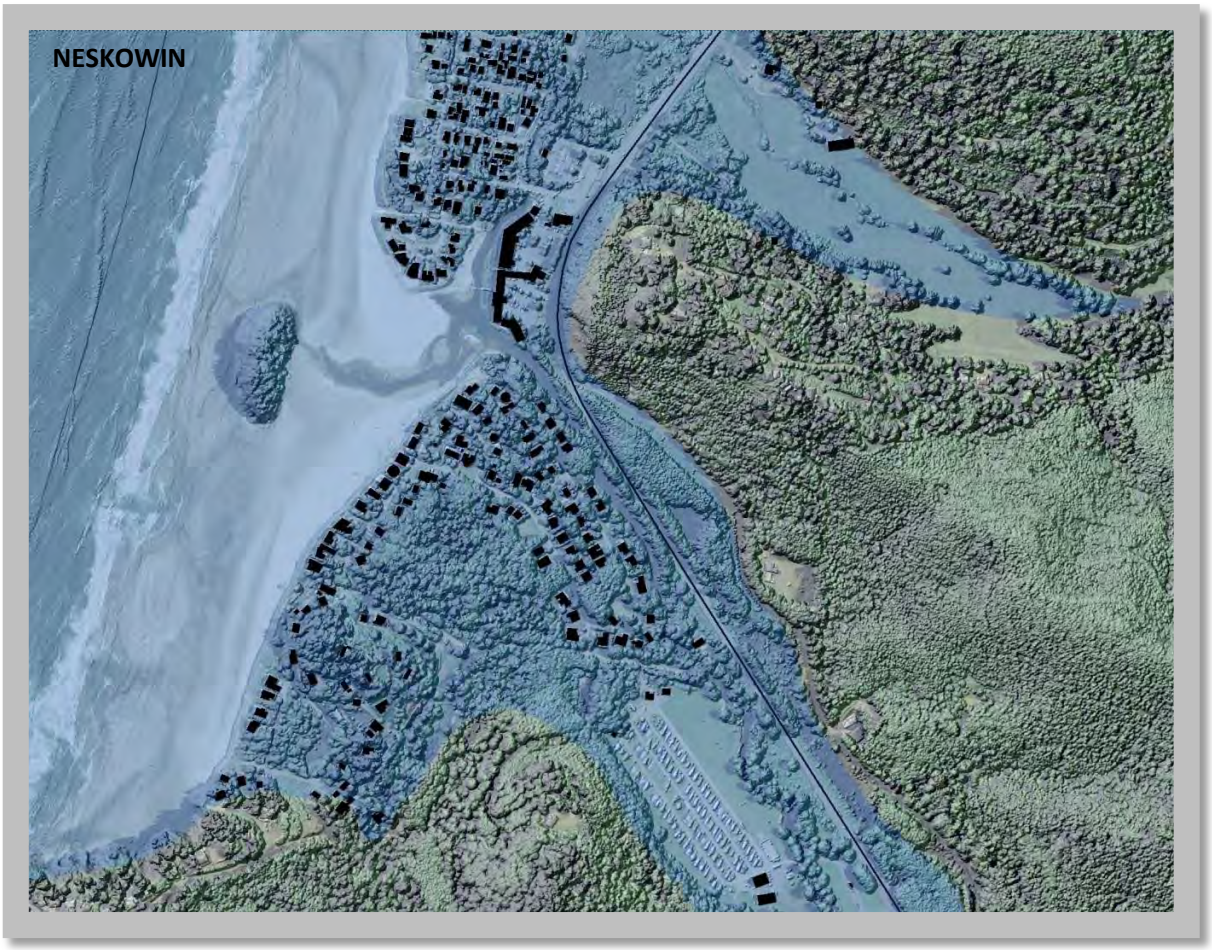


Figure 1.7: Estimated inundation of Neskowin due to the tsunami from the scenario magnitude 9.0 Cascadia earthquake. This tsunami map is based on the SB 379 regulatory inundation line.

The same large scale bending of the tectonic plates that causes the tsunami will also cause immediate and permanent subsidence in many parts of the coast. As indicated in Figure 1.8, the amount that the land will drop varies from place to place, with as much as 5 to 6 feet possible near Astoria, and even more possible at Brookings.

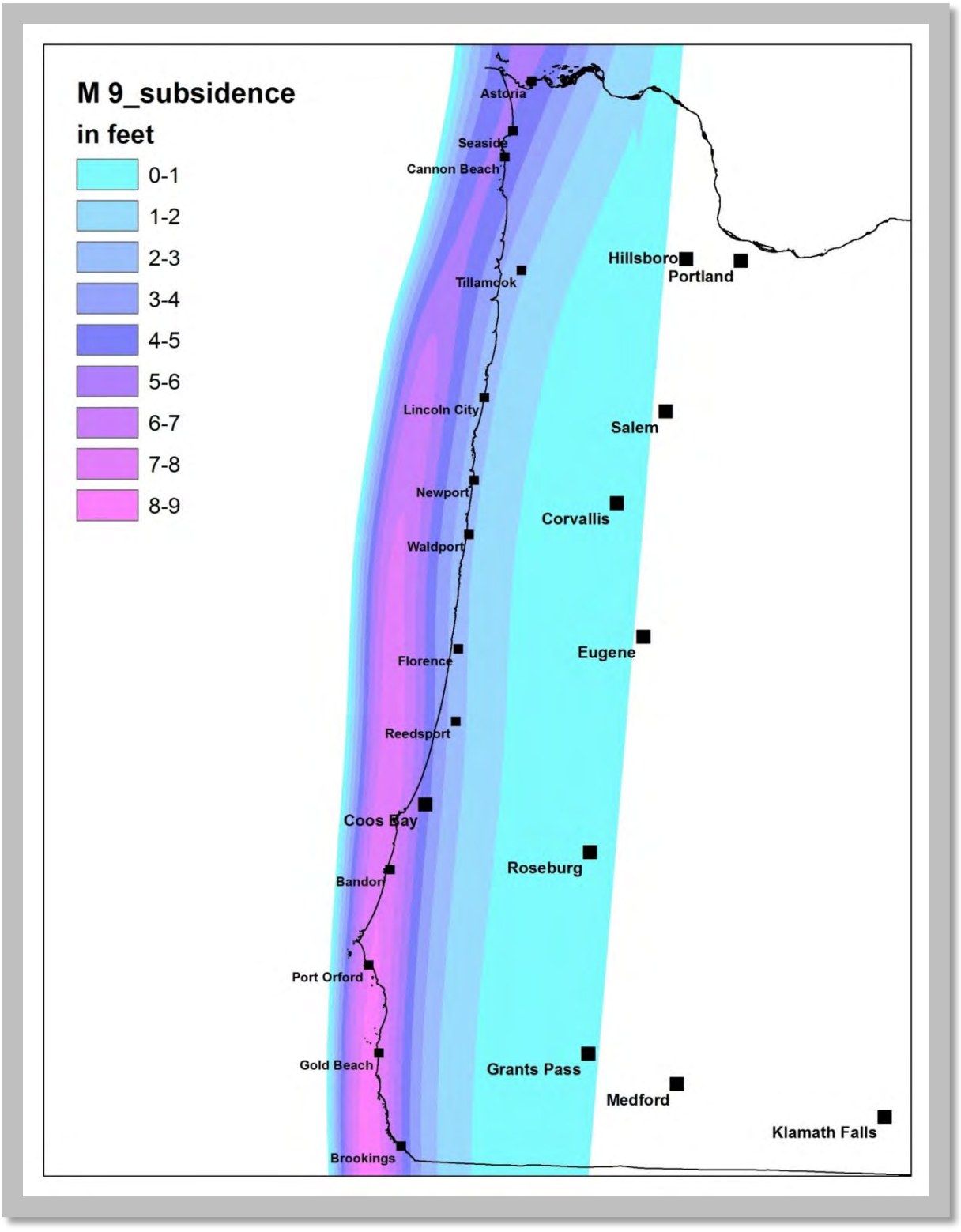


Figure 1.8: Estimated permanent land subsidence from the scenario magnitude 9.0 earthquake for the Oregon Coast. Subsidence would occur during the earthquake.

Oregon's Infrastructure and Risk

The estimated impacts of a Cascadia subduction earthquake in Oregon are catastrophic. This is partly due to the sheer size and power of a magnitude 9.0 earthquake, but it is also the result of the inherent vulnerability of our buildings and lifelines. In 1974, Oregon adopted a statewide building code that mandated some seismic resistance for new construction. Prior to that date, the majority of buildings in Oregon had been designed without regard to earthquake forces. In 1993, Oregon's building codes were changed to require designs that would accommodate shaking from a Cascadia subduction zone earthquake, almost doubling the earthquake forces used in earlier codes. This means that the majority of buildings in Oregon have not been designed to resist the shaking from a magnitude 9.0 Cascadia earthquake. This widespread vulnerability of Oregon's buildings is grimly illustrated in the *Statewide Seismic Needs Assessment* completed by the Oregon Department of Geology and Mineral Industries (DOGAMI) in 2007. This study surveyed public schools and public safety buildings (police and fire stations, hospitals, and emergency operation centers) in Oregon and assessed their potential for collapse in a major earthquake. Almost half of the 2,193 public school buildings examined had a high or very high potential for collapse, as did almost a quarter of the public safety buildings. Of the 2,567 highway bridges in the Oregon Department of Transportation (ODOT) system, 982 were built without seismic considerations, and of the rest, only 409 were designed specifically with consideration of Cascadia subduction zone earthquakes. The list goes on: old, brittle iron water pipes in the Portland water system, century-old bridges over the Willamette River, and highways and power transmission lines that traverse landslide-prone terrain. The core of our vulnerability to a Cascadia earthquake is not the earthquake alone, but the inadequacy of our built environment.

The experience of the Tohoku earthquake shows that few structures are likely to survive in the tsunami inundation zone. In Oregon, the USGS estimates that almost 1,900 businesses employing nearly 15,000 people are located in the scenario inundation zone. The inundation zone also contains almost 10,500 housing units with a total population of just over 22,000. This exposure to the extreme hazard posed by the tsunami is unavoidable.

Another major factor that amplifies the effects of a Cascadia earthquake is the interdependency of our lifeline systems, coupled with the wide geographic spread of a Cascadia disaster. Unlike a severe storm, a Cascadia subduction earthquake would simultaneously damage power, natural gas, and petroleum lines, roads and bridges, water and sewer systems, critical buildings, and communications over large parts of three states (i.e., California, Oregon and Washington). Restoration of communication service would require that electric power be restored, which would require that roads and bridges be repaired, which in turn would require that the petroleum delivery and distribution system be repaired. These interdependencies between lifeline systems would be made even more difficult by the broad geographic extent of the damage. The nearest undamaged urban areas from which assistance could be organized would be Spokane, Washington, Boise, Idaho, and Redding, California. Virtually all of the resources required for the recovery of lifeline systems would have to come from outside the affected states.

Estimated Impacts

The scenario Cascadia earthquake would be an unprecedented catastrophe for Oregon and for the United States. It would impact every aspect of life for all Oregonians and for the residents of northern California, Washington, and British Columbia. The effects of a Cascadia subduction earthquake will be greatest on the coast, which is right next to the subduction zone fault, and will diminish as one goes inland. This, in combination with Oregon's mountainous geography, divides the state into four impact zones: within the tsunami zone, damage will be nearly complete. In the coastal zone, shaking will be severe, liquefaction and landsliding will be widespread and severe, and damage will be severe. In the valley zone, shaking will be strong, liquefaction and landsliding will be common but less severe, and moderate damage will be widespread. In the eastern zone, shaking will be mild, landslides and liquefaction sporadic, and damage generally light.

The impacts of a great subduction earthquake on Oregon are impossible to predict accurately, but several studies have estimated damage and casualties, and those estimates give a sense for how far-reaching a disaster the next great earthquake will be. Estimated consequences include:

- Earthquake deaths ranging from 650 to 5,000, with another 600 to 5,000 deaths due to the tsunami.
- 24,000 buildings completely destroyed, and another 85,000 with extensive damage requiring months to years of repair.
- Approximately $32 billion in economic losses.
- 27,600 displaced households.
- Almost 10 million tons of debris (1 million dump truck loads).

These high levels of damage and loss reflect both the great size of the earthquake and the fact that many buildings, roads, bridges, and utility networks were designed before Oregon's building codes and practices recognized any significant earthquake threats, and most were designed before codes began to take great subduction earthquakes into account. Lifeline systems, such as highways and pipelines, are particularly vulnerable to ground failure, which will be widespread in the next great earthquake. As a result, the vulnerability analyses done for this plan are grim. For example, if the earthquake were to happen tomorrow, the estimated time to restore function would be:

- One to three years to restore drinking water and sewer service in the coastal zone.
- One month to one year to restore water and sewer in the valley zone.
- Six to twelve months to restore partial function of the top-priority highways in the valley zone.
- Two to four months to restore police and fire stations in the valley zone.
- Eighteen months to restore healthcare facilities in the valley zone, three years or more in the coastal zone.

- One to three months to restore electricity service in the valley zone.
- Three to six months to restore electricity service in the coastal zone.

These estimates of the time it will take to restore the functions necessary to maintain our population and economy are sobering, particularly when coupled with the likelihood that businesses will start to leave the state if services are not restored within one month. If we pursue a policy of "business as usual," our future after the next Cascadia earthquake will include decades-worth of declining economy and population. We can only avoid this future and achieve resilience by starting now on a sustained program to reduce our vulnerability and decrease our recovery time before the next earthquake inevitably occurs.



Recommendations

The Cascadia Scenario workgroup prepared a description of the likely effects of a magnitude 9 subduction earthquake for the other workgroups to use in their evaluations. The scenario used the best currently available data, and well-established methods, but still provides an estimate that has a lot of uncertainty and little detail. For an improved understanding of the threat posed by Cascadia earthquakes, we recommend that the state:

- ► Support Oregon universities and state agencies to carry out research into the effects of future Cascadia subduction earthquakes and tsunamis on Oregon's landscape, population, buildings and lifelines;
- ► Support Oregon universities and state agencies in preparing more detailed and accurate estimates of damage and loss in Oregon from future Cascadia subduction earthquakes and tsunamis; and
- ► Provide ready access to the best available Cascadia earthquake information for emergency responders and planners, architects and engineers, and the general public.
- ► In order to ensure that design of future structures, retrofit of existing structures, seismic vulnerability evaluations and preparedness planning will provide adequate resilience, we also recommend that all of these efforts use, as a minimum, the ground motion parameters provided by the most current version of the International Building Code, which reflect the most current USGS seismic hazard maps.

Reference

1. DOGAMI (2007), *Statewide Seismic Needs Assessment Using Rapid Visual Screening (RVS)*. For detailed information, see http://www.oregongeology.com/sub/projects/rvs/default.htm#overview

2. Oregon Department of Transportation (2009), *Seismic Vulnerability of Oregon State Highway Bridges: Mitigation Strategies to Reduce Major Mobility Risks*. For detailed information, see ftp://ftp.odot.state.or.us/Bridge/bridge_website_chittirat/2009_Seismic_Vulnerability_final.pdf.

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4. Washington Seismic Safety Committee (2012). *Resilient Washington State: A Framework for Minimizing Loss and Improving Statewide Recovery after an Earthquake*. November. See http://www.emd.wa.gov/about/SeismicSafetyCommittee.shtml

2. Business and Workforce Continuity

Introduction

We know from experience of previous disasters such as hurricanes and earthquakes that a large proportion of the businesses affected by these natural cataclysms will not survive. Nevertheless, it is our mission to make Oregon's businesses and workforce more resilient against the threat posed by a megathrust Cascadia earthquake. The key to business survivability begins with the survivability of the buildings that house the businesses (see Figure 2.1). Few businesses can survive without a domicile for more than a month. Experience tells us that if a business cannot reoccupy its offices within a month, it will either relocate, or dissolve.

Reoccupation of a business's workspace depends on three principal factors: the building's structure must be safe; the workforce must be able to get to the workplace; and, the building's mechanical and utility systems must be up and running. In addition, it is essential that the business's customers survive the catastrophe. This is of particular concern when a business's customers are other businesses that may be housed in buildings that do not survive. A 2011 Cascadia earthquake study by the Federal Emergency Management Agency estimated that only about 20 percent of the buildings in the Metro Region would escape damage, while 80 percent would suffer damage ranging from slight damage to a complete loss (see Figure 2.2).

Statewide, about 27 percent of commercial buildings would survive without damage and about 22 percent would suffer slight damage. The remaining buildings, which would suffer moderate (31%) or extensive (16%) damage, or be completely destroyed (4%), will not be immediately inhabitable for commercial purposes.



Figure 2.1: Windham, N.Y., September 1, 2011 -- A shop on Main Street in Windham proclaims their victory over the destruction from Hurricane Irene. The town suffered damage to homes and businesses and was included in the disaster declaration by President Obama on 9/3/11. (Source: FEMA Photo/Judith Grafe)

Commercial	None	Slight	Moderate	Extensive	Complete	Total
Metro Region	6,759	10,106	12,270	4,647	461	34,242
Outside Metro	14,333	7,596	11,878	7,904	3,072	44,785
Total	21,092	17,702	24,148	12,551	3,533	79,027

Figure 2.2: Analytical Baseline Study for the Cascadia Earthquake and Tsunami (Source: FEMA, November 18, 2011)

Evaluation of the Scenario Earthquake's Economic Impact

A magnitude 9.0 Cascadia subduction earthquake has the potential to inflict tens (and maybe even hundreds) of billions of dollars in damage to existing property and infrastructure, but the costs of the event are not limited to these billions of dollars in replacement costs. While damaged infrastructure is removed, repaired, or replaced, normal economic activity will be interrupted. Some firms may be forced to shut down or move. Some people may migrate out of the state. These spillover disruptions may permanently change the trajectory of the regional economy, imposing damages that dwarf those inflicted directly by the event.

Preparing now and creating a more resilient Oregon is essential to reducing these costs and preserving the health of our communities and our economy. Resilience will reduce the deaths and injuries that such an event will inevitably cause. Resilience will minimize the damage to our homes and office buildings, to our roads and bridges, to our energy and telecommunications transmission systems, and to our water and wastewater systems. In short, resilience will minimize the disruptions to our economy, our community, and ourselves.

Every large natural disaster is unpredictable, not only in its timing, but in its effects. We cannot say precisely how large the damages associated with a Cascadia event will be, nor forecast in detail what will be damaged, nor foresee how the loss of buildings, roads, utility infrastructure, and other elements will ripple through the economy. As best, we can draw on economic theory and the experiences from previous disasters to assess the potential effects of such an event.

HOW DO NATURAL DISASTERS AFFECT REGIONAL ECONOMIES?

Fundamentally, natural disasters break things. They break houses and buildings. They break roads and bridges. They break pipelines and transmission lines. They break water pipes and treatment plants. When things break, people and the economy suffer.

Direct Damage

What disasters break is expensive to repair. Economists use the term *direct damage* to refer to damage that disasters inflict on buildings, infrastructure, inventories, natural resources, and people (Pelling, Oezerdem, and Barakat, 2002). When news articles report that a disaster inflicted $300 billion in damages, they are reporting an estimate of the direct damage inflicted by the event. They are reporting the expected amount of money needed to replace what has been lost.

Indirect Damage

When things break, they can no longer be used to support economic activity. If key port infrastructure breaks, the port must shut down. If a bridge breaks, workers may not be able to get to work and firms may not be able to ship or receive goods. If the internet or telecommunications networks fail, firms may lose customers. If oil spills into rivers, river dependent industries, such as fishing or recreation, may be disrupted. Economists use the term *indirect damage* to refer to the loss of economic activity that results from the inability to use what breaks (Pelling, Oezerdem, and Barakat, 2002).



Figure 2.3: Branford, Conn., August 31, 2011 -- A gas station on Route 95 is closed due to loss of power from Hurricane Irene. (Source: Jocelyn Augustino/FEMA)

Thus, the benefits of greater resilience can be assessed along two lines: First, greater resilience means fewer things break, so Oregonians will need to spend less money on cleaning up, repairing, or replacing

what has been lost. Second, when fewer things break, there is less potential for extensive interruption of the economy (see Figure 2.3).

GREATER RESILIENCE MEANS LESS DIRECT DAMAGE FROM THE EVENT

Spending on resilience today means spending less on recovery later. For an event as large as a magnitude 9.0 Cascadia subduction zone earthquake, such avoided costs may be substantial. For instance, the recent earthquake in Sendai, Japan inflicted approximately $300 billion in damage, the 1995 Kobe earthquake inflicted $200 billion in damage, hurricane Katrina inflicted approximately $160 billion in damage, and the 1994 Northridge earthquake inflicted nearly $100 billion in damage (see *The Economist* online, 2011. "Natural Disasters: Counting the Costs"). For context, Katrina's direct damages equaled nearly two-thirds of total personal income in Louisiana and Mississippi in 2006 and the Northridge quake inflicted damages equal to approximately 25 percent of the Los Angeles metro area's personal income in 1994 (US Bureau of Economic Analysis, Regional Economic Accounts). By extension, if a Cascadia earthquake only inflicts damage proportionate to Hurricane Katrina, it might cost Oregon approximately $100 billion to repair what was lost.[1]

Ultimately, we cannot know precisely how much damage an earthquake in Oregon will inflict. The precise amount of initial damage will depend on the magnitude of the earthquake, the value of property and infrastructure in Oregon, and what we do to protect our property and infrastructure before the event occurs. We do know that recovery is unlikely to come cheaply.

While some (and hopefully much) of the money required to fund recovery will come from outside the region (for example, from insurance payments or the federal government), recovery will still require substantial local resources from both the private and public sectors. Money spent repairing something the region already had is money that cannot be spent pursuing other priorities. Furthermore, some of what Oregon will lose to the earthquake cannot be replaced. The direct damage estimates described above do not include damages to human health and other hard-to-value items, such as historical or culturally significant items.

GREATER RESILIENCE MEANS FEWER INTERRUPTIONS OF NORMAL ECONOMIC ACTIVITY

Disasters Depress Normal Economic Activity

Ultimately, the direct costs of a Cascadia subduction zone earthquake are likely to pale in comparison to the indirect costs. The interruption of normal economic activity could generate costs so substantial that the region may never fully recover.

In 2011, Oregon's economy produced nearly $195 billion in goods and services (US Bureau of Economic Analysis, Regional Economic Accounts). The state's firms and agencies employed over 2.2 million people who earned over $104 billion in compensation (Bureau of Economic Analysis, Regional Economic Accounts). While these workers produced goods and services in a wide variety of industries (including

[1] Oregon's 2011 total personal income was $145 billion.

agriculture, logging, wood products manufacturing, computer and electronics manufacturing, metals manufacturing, company management, and tourism), every industry depends on various factors that could be disrupted by a Cascadia event.

For a regional economy to operate smoothly, several conditions must be met:

(1) Raw materials (food, water, energy, information, and other commodities) and imported goods and services must be available and able to reach households and firms.

(2) Households must be able to provide workers to firms (and government) and they must be able to consume the goods and services that are made available by local producers. In other words, households must have their basic needs satisfied, and they must have the resources to consume.

(3) Firms must be able to combine raw materials, workers, and equipment to transform the available inputs into finished products.

(4) Finished products must be available to customers, inside and outside of the region.

These basic relationships are illustrated in Figure 2.4; however, a severe natural disaster would likely affect each of these areas and break the key infrastructure that connects them. For example, a severe natural disaster could:

(1) Directly damage raw materials or inventories of imported goods.

(2) Damage the roads, bridges, pipes, or utility lines used to transport such goods to households and firms.

(3) Damage houses and households and limit both their ability to provide workers to firms and their ability to consume goods and services produced by local firms.

(4) Damage the buildings and equipment owned by firms, making production impossible.

(5) Damage the infrastructure used to transport finished products to customers (households or other firms).

If any of these (or many other possible) impacts occur, Oregon's economic output will suffer. Oregon's employers simply cannot produce and sell their goods and services if they lack the space in which to carry out production, if inputs cannot reach them, or if their outputs cannot get to their customers. When firms cannot produce and sell their goods and services, they stop contributing to the regional economy, and they may be unable to survive if the interruption lasts too long.

Firms may also struggle due to disruptions in consumption. Seventy percent of Oregon's workers work in industries that primarily serve customers in Oregon (that is, they work in the local as opposed to the traded sector). (For additional information about the distinctions between the traded and local sectors,

see Ward, Thoma, Moore, and Tapogna, 2012). Local sector firms will suffer if Oregonians (both households and firms) do not have money to spend, either because they have lost their sources of income or because they are spending their incomes on repairing or replacing what was lost. Local sector firms could also suffer if people or firms chose to leave the region entirely. Thus, even if local sector workers and firms are fully capable of continuing to produce, they could suffer because their customers have disappeared.

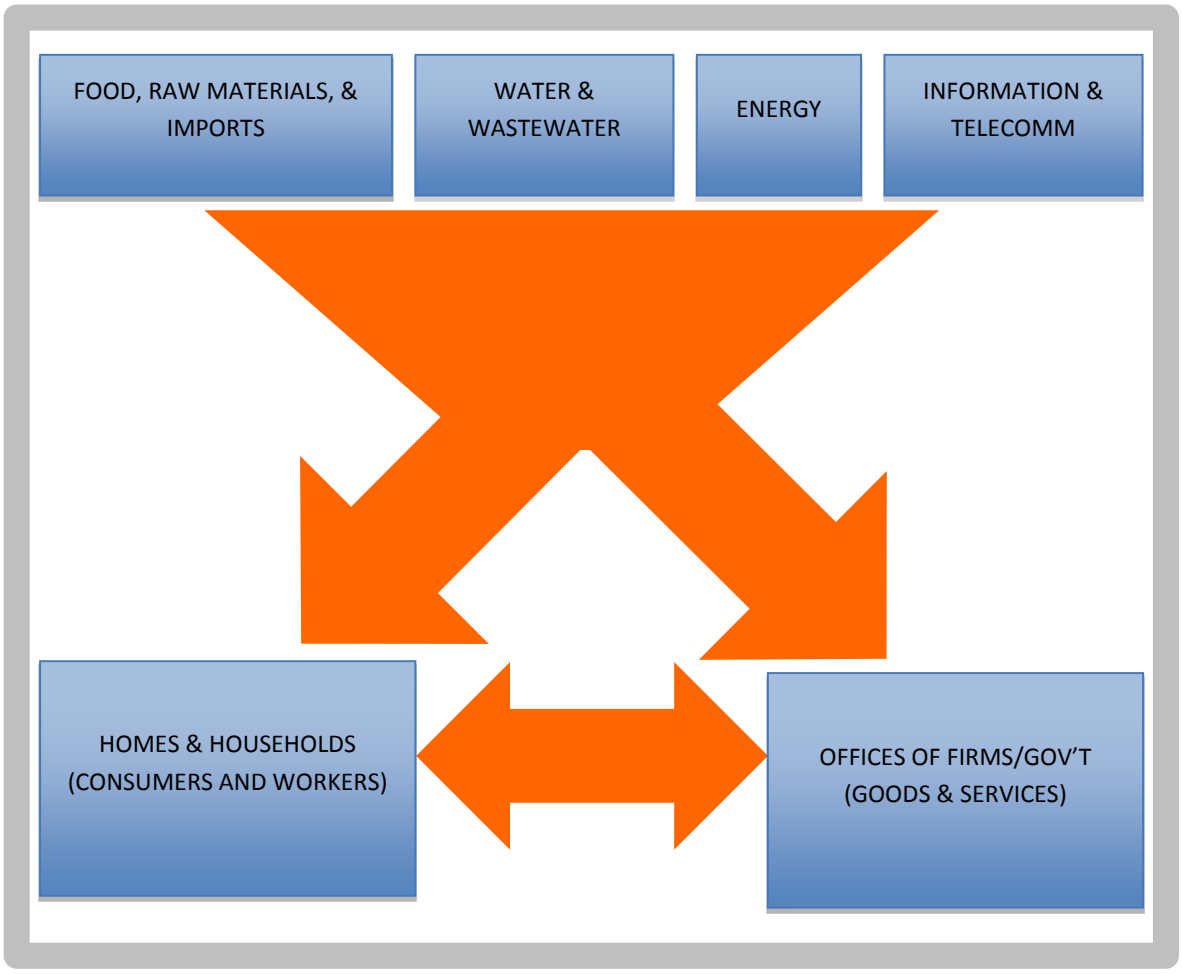

Figure 2.4: Core Economic Relationships That May Be Affected By Natural Disasters

A Disaster's Indirect Effects Are Felt over Both the Short and the Long Run

When people imagine the economic effects of a natural disaster, they typically imagine the disruptions that occur in the immediate aftermath of the event. Economists refer to these initial disruptions as the

short-run effects of the disaster[2] (Cavallo and Noy, 2010). During this period (which may last a few years), normal economic activity may be severely inhibited as resources are diverted toward cleanup and recovery efforts. The literature that examines the short-run effects of natural disasters finds that the event will depress economic outcomes for a few years, but that areas with "a better educated population, better governance, and more direct access to reconstruction resources will fare better in the disaster's aftermath" (see Noy, 2011).

Unfortunately, the effects of a natural disaster may not be limited to the time it takes to clean up and rebuild. Disasters may permanently shift the trajectory of the economy. In other words, the disaster may have long-run effects.[3]

Some economists argue that economies are resilient and generally return to "as before" conditions within a few years[4] (see DuPont and Noy, 2012). However, recent evidence suggests that disasters may have larger long-run consequences than previously thought (see DuPont and Noy, 2012; Lynham, Noy, and Page, 2012; and Coffman and Noy, 2012). Specifically, economist Ilan Noy and various co-authors have examined the long-run regional effects of the 1995 Kobe earthquake, the 1960 tsunami in Hilo, Hawaii, and the 1992 hurricane in Kauai, Hawaii (DuPont and Noy, 2012; Coffman and Noy, 2012; Lynham, Noy, and Page, 2012). In each case, these studies found that the disaster caused outcomes to deteriorate from what they likely would have been in the absence of the disaster; however, how the disaster adversely affected long-run outcomes differs across these three events.

Kobe (DuPont and Noy, 2012): The Kobe earthquake inflicted nearly $200 billion in damage (in 2010 dollars). The quake severely damaged Kobe's port–a significant source of local economic activity–as well as 80 percent of its shoe factories, 50 percent of its sake breweries, and half of its markets. While many sectors recovered to pre-earthquake levels, several sectors of Kobe's economy remain significantly below these levels. Port capacity recovered to 98 percent of pre-earthquake levels, but the number of ships handled peaked at 87.7 percent of pre-earthquake levels. Mining and manufacturing activity has only reached 81.3 percent of pre-earthquake levels. Shoe production remains at 60 percent of pre-earthquake levels. Sake breweries ship less than 50 percent of their pre-earthquake levels. Department store sales remain at only 75 percent of pre-earthquake levels.

While such changes could reflect other trends and not the influence of the earthquake, a careful analysis, which compared Kobe and its surrounding areas to parts of Japan not severely affected by the earthquake – finds evidence that the earthquake had lasting effects on local output. While output per

[2] The short run effects are generally those that occur within the first three years of the event, and long run effects are generally those occurring beyond five years.

[3] Economic theory does not provide a clear expectation for the direction or magnitude of long run effects. Cavallo et al. (2010) summarize the competing theories.

[4] This position was effectively summarized by John Stuart Mill in 1872 when he stated, "…what has so often excited wonder, the great rapidity with which countries recover from a state of devastation; the disappearance, in a short time, of all traces of the mischiefs done by earthquakes, floods, hurricanes, and the ravages of war. An enemy lays waste to a country . . . and yet in a few years after, everything is much as it was before."(Mill, 1872). Many economists espoused similar sentiments in the wake of the recent 2010 Tohoku earthquake.

capita initially spiked with recovery efforts, it fell as recovery efforts waned. In 2010, output per person was 13 percent lower than it likely would have been in the absence of the earthquake. For context, if Oregon were to experience a 13 percent decline in output per capita, output would fall by over $6,200 per person, and Oregon's output per capita would fall from 9th to 23rd among all states.

Hilo (Lynham, Noy, and Page, 2012): In 1960, a tsunami generated by the magnitude 9.5 Valdivia earthquake in Chile (the largest earthquake ever recorded) struck Hilo, Hawaii. This tsunami killed 61 people and inundated 600 acres, completely destroying half of the buildings in the inundation zone. An analysis that compared the affected area to other Hawaiian islands that were not significantly affected by the tsunami found that, 15 years after the event, Hilo was short of people, firms, and jobs.

Fifteen years after the tsunami, Hilo's population was nine percent below the levels it likely would have achieved in the absence of the tsunami. The total number of establishments remained depressed and unemployment remained elevated–33 percent higher than expected. Finally, sugar, the island's most important industry, remained depressed following the tsunami.

Kauai (Coffman and Noy, 2012): In 1992, Hurricane Iniki struck Kauai (but largely missed the other Hawaiian islands). While the hurricane did not cause significant mortality, it did severely damage local infrastructure. The loss of infrastructure appears to have had significant long-term consequences. Twenty years after the event, population and employment on Kauai remain well below (15 percent) the levels expected in the absence of the hurricane.

Combined, these three studies suggest that disasters can substantially disrupt long-run economic performance. Thus, greater resilience may help Oregon avoid large long-run consequences such as severe losses to output per capita (such as occurred in Kobe) or population and employment (such as occurred in Hilo and Kauai). This is not inconsistent with how regional economists expect regions to respond to non-natural economic disasters. Frequently, when regional economies suffer adverse regional shocks, the economy shrinks and then grows from the new lower base at the same rate as before—never catching up to where it would have been in the absence of the shock (Blanchard, Katz, Hall, and Eichengreen, 1992).



Figure 2.5: Carrollton, New Orleans, LA, 9-17-05 -- Small business owners are planning on returning to New Orleans. After three weeks many areas are still without power and utilities. (Source: MARVIN NAUMAN/FEMA photo)

Natural Disasters Do Not Uniformly Affect Residents

The above discussion focuses on the effects of natural disasters on aggregate measures of economic activity (such as output per capita) but ignores potentially important distributional consequences of disasters. Even if the disaster produced no adverse effect on aggregate outcomes, the avoided distributional effects may be sufficient to justify investments in greater resilience. Disasters affect incumbent residents and they are the ones whose homes are damaged, whose jobs may be lost, and whose businesses may close. Even if the economy recovers, those who benefit from the recovery may be different from those who lost during the destruction. Evidence shows that poorer residents are particularly likely to suffer following a natural disaster because they lack access to resources to help them absorb the adverse shock (Sawada and Shimizutani, 2008).

RESILIENCE AND REGIONAL ECONOMIES

In sum, greater resilience may benefit Oregonians in three major ways. First, greater resilience means less stuff will break, so Oregonians will spend less money later removing, repairing, or replacing items damaged by the event. Second, less breakage means smaller interruptions to normal economic activities in both the short and long run. Finally, greater resilience means fewer losses to the incumbent residents–particularly the poor who suffer the most when disasters strike.

While we cannot say with certainty how large such benefits may be, experiences with previous disasters suggest that the adverse consequences of disasters (and thus the benefits of greater resilience) may be large. Direct damages may reach into the hundreds of billions of dollars (amounts equal to half or more of Oregon's annual output). If damages are similar in magnitude to those inflicted by Hurricane Katrina, Oregonians will need to work for almost a year (at normal levels) to replace what the disaster destroys. Indirect damages are very difficult to estimate. When the disaster breaks things, what is broken can no longer be used to support the economy. As a result, the damage inflicted by the disaster may ripple through the economy reducing population, output, income, and employment over both the short and long run (Figure 2.5). Several recent case studies suggest that, in the 15 years following a major disaster, outcomes (population, employment, or income) fall 10-15 percent below levels they might otherwise have reached in the absence of the disaster.

Business Workforce Interdependency

Businesses and the business workforce do not exist in a vacuum. Without a government and a system of laws and enforcement of commercial instruments (such as contracts), a strong banking system to provide access to capital, and a transportation network to bring in and distribute raw materials and manufactured goods, businesses cannot thrive. Even businesses whose products are "intellectual capital," such as consultants, and personal services companies such as barbers or physical therapists, require strong information, communications, and municipal utility infrastructure to function successfully.

Figure 2.6 depicts some of the interdependencies of business, government, the public (both workforce and customers), banking, transportation, public and private infrastructure, and the healthcare sector. This figure is specifically intended to reflect the relationships following a major catastrophe and to serve as a guide for recovery. With the possible exception of the healthcare sector, the relationships depicted are also applicable to the interdependency of everyday commerce. The one notable omission is the education sector, which is a subset of both government (public schools) and business (private schools). Schools are likely to become major refugee and triage centers in the immediate aftermath of a Cascadia earthquake and tsunami, but from the standpoint of business recovery, schools are primarily important as a place where workers' children can spend their days, thus freeing up parents to return to work.

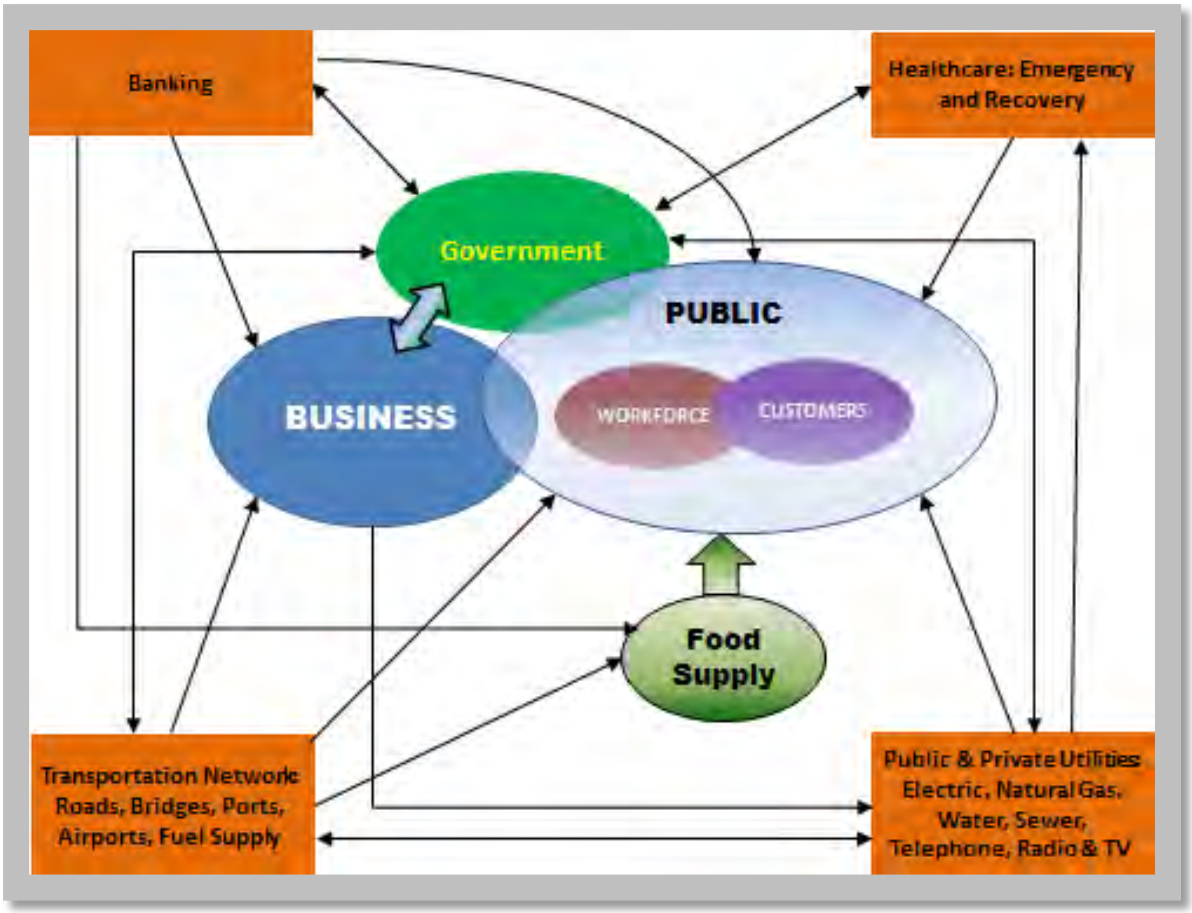

Figure 2.6: Business Workforce Interdependency

Some relationships, such as business interdependency with the healthcare sector are imputed through the business/workforce/public-to-healthcare relationship. In other words, to the extent that businesses rely on a healthy workforce and customers, who in turn rely on the healthcare sector for health-related services, the business sector relies on the healthcare sector through a sort of transitive property.

Recommendations

- **Rehabilitate or Replace vulnerable Oregon public schools**
  - *Finding*: The Department of Geology and Mineral Industries 2007 report assessed more than 1,100 public education buildings in Oregon at a high or very high risk of collapse in a major seismic event. Parents cannot return to work after a major seismic event if their children are unable to attend school.

- *Action Needed*: The State of Oregon shall establish (in addition to the General Obligation bond-funded Seismic Rehabilitation Grants Program) a statewide sinking or reserve fund, outside of the Oregon Emergency Management department budget, to fully fund the Seismic Rehabilitation Grant Program for public education facilities.

GOVERNMENT

Government, in addition to enforcing contracts and other commercial instruments, also provides security so that businesses can operate free from fear of being looted or robbed. Government's security mission also extends to the public (see Figure 2.7). In the aftermath of Hurricane Katrina, looting of non-essential[5] items by some members of the public was well documented. Some shop owners resorted to defending their property with personal firearms. Similar acts were documented when Hurricane Andrew devastated South Florida in 1992 and caused some homeowners to be without power for weeks.[6]

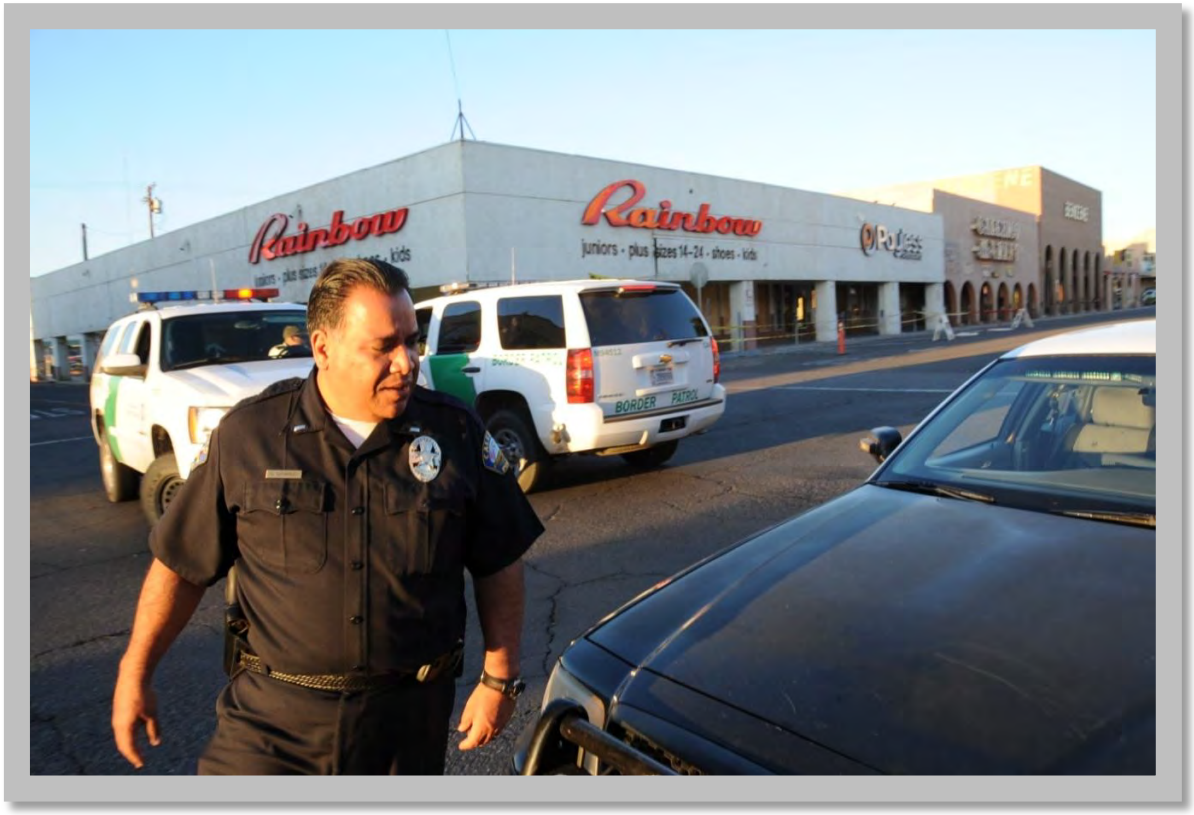

Figure 2.7: Calexico, Calif., April 6, 2010 -- Calexico Police Lt. Gonzalo Gerrado and US Border Patrol agents patrol the damaged businesses and public facilities to mitigate looting and theft. A magnitude 7.2 earthquake rocked the city on Easter leaving many facilities, roads, and public buildings closed, broken, and exposed. (Source: Adam DuBrowa/FEMA)

[5] By "non-essential" we mean non-food, or non-food preparation items such as gas or charcoal grilles, fuel, and so on. Looting of entertainment devices, such as TV's and X-Boxes, furniture, and so on were well documented, as was the lack of police presence in the immediate aftermath of the hurricane.

[6] Within Miami-Dade County more than 25,500 homes were actually destroyed and another 100,000 plus were damaged.

Hurricane damage and devastation differs from the expected impacts of a Cascadia subduction zone earthquake in that much of the damage resulting from hurricanes such as Katrina and Andrew is to smaller wood frame buildings, a type of construction typically used for single-family homes. After Katrina, for example, much of the central business core of New Orleans either survived or was quickly re-inhabitable, but much of the housing stock was destroyed. Similarly, Hurricane Andrew destroyed 63,000 homes leaving 175,000 to 250,000 people homeless (Dorschner 1992). We expect most wood-frame homes to survive a Cascadia earthquake, but we expect power and the other private and public utilities to be down in some neighborhoods for several weeks or months.

Security in the central business districts of the state is likely to be more easily accomplished than in some residential neighborhoods. The main commercial areas of the state – Portland, Eugene-Springfield, Salem, and to some extent, Albany, Corvallis, Grants Pass, and Medford – are relatively small compared to the residential areas of the cities and their suburbs. For example, in the City of Portland, the downtown commercial core[7] makes up less than seven tenths of one percent of Portland's 145.4 square miles (376.6 square KM) of area. The remaining area is largely residential neighborhoods, local or neighborhood commercial areas[8], parks and industrial areas (principally in northwest, north and northeast Portland). Keeping the neighborhoods secure is expected to be a major challenge for the Portland Police Bureau and, more likely than not, National Guard troops.

Continuity of government following a Cascadia event will depend on the immediate functionality of critical and essential facilities, such as police, fire, emergency operations and critical care centers.



Recommendations

- **Assess seismic performance of critical and essential public buildings**
  - *Finding*: The seismic vulnerability of critical and essential public buildings throughout Oregon has not been fully assessed.
  - *Action Needed*: The State of Oregon shall direct local jurisdictions to determine the seismic resilience of all critical and essential public buildings.

[7] The commercial core here is the area west of the Willamette River extending to the I-405 freeway, about 13 city blocks, and south from Union Station to Portland State University and I-405. This area also includes the RiverPlace and Pearl District neighborhoods and the Old Town/China Town Districts.

[8] These commercial districts include the Hawthorne District, the Broadway District, the Albina District, the Lloyd District, The Goose Hollow, Multnomah Village, Interstate Avenue, MLK, St. Johns, and so on. These areas include a significant inventory of mostly service businesses, restaurants, theaters, and in the case of the Lloyd District, a major shopping mall.

FOOD SUPPLY

Given that businesses cannot survive without their workforces or their customers, and given that people cannot survive for long without food, the food supply is inexorably linked to the survival of businesses. It is unlikely that a large proportion of the population currently stores more than a few days' worth of food—and probably stores even less water—in their homes. It is almost certain that a Cascadia subduction zone earthquake will cause all private and public utilities to fail; this means there will be no municipal water or sewer service, no electricity, no telephone, and no television, radio, or internet. Without power, local grocery stores will be unable to keep frozen foods frozen or fresh meats and dairy cold enough to prevent spoiling. It is likely that most of the food in the grocery stores will be distributed (as opposed to sold) to the public because the store's registers will not work without power and there would be no sense in letting frozen foods, meats, and dairy products spoil in the store.

Because stores are routinely resupplied several times each week, the amount of food actually held in an individual store is probably no more than what is required to supply the surrounding neighborhood for a few days. In particular, fresh fruits, vegetables, and dairy products are typically replenished several times a week, so the quantities kept in stock are not large. With supplies already limited, a related concern is that people will hoard food out of fear that stores will run out completely. In the near term, such hoarding will exacerbate the erosion of the food supply.



Figure 2.8: Brooklyn, N.Y., Dec. 4, 2012 -- Local Red Hook business, Cornell Paper and Box Company, continues cleanup of boxes at the warehouse that was flooded during Hurricane Sandy. (Source: Jocelyn Augustino/FEMA)

Once the food supply at local grocery stores is exhausted, the government will have to set up food distribution centers to support the population until local grocery stores regain electrical power and municipal services and can be resupplied. That resupply activity also requires the transportation and distribution network to be functioning (see Figure 2.8). Transportation lifelines have to be open for trucks to deliver the food, and truckers have to know where the lifeline routes are located and which bridges have been seismically braced and are safe to use following the earthquake. The transportation of supplies by truck is further dependent on the fuel supply. Currently, Oregon's liquid fuel supply is severely constrained. The main liquid fuel depot in the Portland Metro area is a "tank farm" located in Northwest Portland, adjacent to Highway 30, built on soils that are highly susceptible to liquefaction.

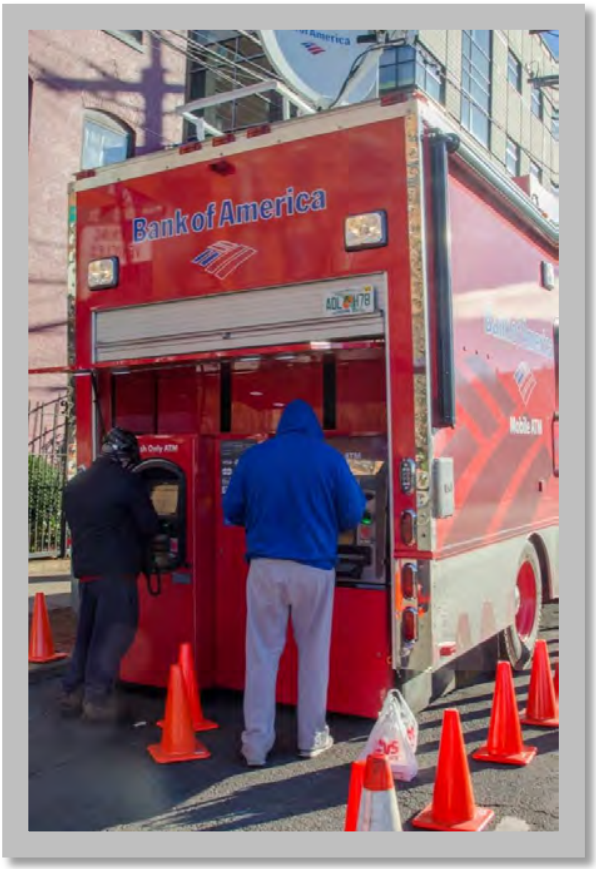

Figure 2.9: Hoboken, N.J., Nov. 3, 2012 -- Bank of America and other banks have set up mobile ATMs for survivors of Hurricane Sandy to get cash to spend at stores that are open for cash customers. (Source: Photo by Liz Roll/FEMA)

Finally, the resupply of food is dependent on a functioning banking system. All commercial transactions at grocery stores involve a debit or credit card issued from a bank (or the Oregon Trail cards issued by the state), a check (which is nearly always scanned to prevent fraud), or cash. Even after electrical power is restored and communications between stores and banks re-established, the banks themselves have to be functioning in order to assure the stores that transactions will result in actual payment (see Figure 2.9). Even cash purchases will require banks to have cash to distribute, and the banks' own information systems have to be functioning in order for them to distribute cash to their customers via bank teller or ATM network.

Recommendations

► **Strengthen transportation lifelines**

- *Finding*: Transportation has been identified as a major linkage in the business recovery chain. Inability to access office buildings due to failed bridges will have a devastating effect on business recovery efforts.

- *Action Needed*: The Oregon Department of Transportation (ODOT) shall identify and repair major lifeline routes in and out of major business centers statewide. Prioritize and seismically upgrade these lifelines by 2030. The state must also arrange for alternate modes of transportation in and out of the major population areas in Oregon.

PUBLIC & PRIVATE UTILITIES, INFRASTRUCTURE AND TRANSPORTATION

In Figure 2.6 above, the transportation network is shown as a separate sector from the utilities and infrastructure sector, but these sectors have strong interdependencies. Utilities cannot be repaired if roads and bridges are impassable. Likewise, the communication infrastructure is interdependent with the transportation network. If communications systems are down, repair crews have no way of knowing where they are needed most.

It is axiomatic that workers need a functioning transportation system in order to get to the workplace; one only needs to look at rush hour traffic, on a bad day, across the Interstate Bridge linking Vancouver, Washington and Portland, Oregon to observe an example of how the transportation network affects the workplace. On December 14, 2007, the City of Portland allowed contractors working on separate projects[9] to close all but one lane of SW 4th and SW 6th Avenue on or near SW Harrison Street, near the southern end of downtown. All traffic traveling north through the downtown core from the I-405 freeway, Barbur Boulevard, and SW 1st Avenue[10] were squeezed down to two traffic lanes on 4th and 6th Avenues and two northbound lanes of Naito Parkway. The result was gridlock, with cars taking more than an hour to move through downtown.[11] What happened that night, similar to many other December nights that year, illustrates what can be expected following a Cascadia earthquake, with many roads impassable and many bridges closed. The challenge of getting the workforce home after a Cascadia event that occurs during the workday may be dwarfed by the challenge of getting the workforce back to work.

The Willamette River bisects all of Oregon's major commercial centers: Portland, Salem, Eugene, Corvallis, and Albany. In Portland, nine bridges—the St. Johns, Fremont, Broadway, Steel, Burnside, Morrison, Hawthorne, Ross Island, and Sellwood—were all built before modern seismic codes were in force. Multnomah County bridge engineers have stated that they do not expect their bridges to collapse into the river; however none are expected to be passable prior to inspection in the event of a Cascadia earthquake. What this means is that many of the workers in the downtown core of Portland will not be able to get home if they live east of the river. The west side Highway 26 tunnels, built in the 1960s, may not be passable following a Cascadia earthquake. Highway 26 is a major transportation artery between Portland and its west side suburbs (though the tunnels can be circumvented via SW Jefferson Street).

[9] On SW 4th Avenue it was the Cyan Apartment Project and on SW 6th it was the Portland State University Student Recreation Center.
[10] SW 1st Avenue's northbound lane ends at SW Harrison and traffic heading north has to either go east to Naito Parkway or west to SW 4th, SW 2nd Avenue (and 3rd) was abandoned when the South Auditorium Urban Renewal Development was built in the 1960's.
[11] A snowstorm at the time contributed to traffic slowing, but this condition would mirror the problems we would face in the aftermath of a Cascadia earthquake.



Figure 2.10: Sea Bright, N.J., Jan. 25, 2013 -- Some businesses have permanently relocated to higher ground after being destroyed by Hurricane Sandy. (Source: Photo by Liz Roll/FEMA)

Before a business can reopen following a Cascadia earthquake, the building it occupies has to be certified to be structurally safe, it has to be served by municipal and private utilities, and the communications infrastructure must be operating. A business that cannot reopen within a month of a major earthquake or other disaster resulting in extended service disruption will likely never reopen at its previous location (see Figure 2.10). Potable water, sewage systems, heating (natural gas or electric), and ventilating systems must be operable before workers can reoccupy a business. To a lesser extent, but nevertheless important in our ever more technologically oriented business environment, the communications infrastructure must be re-established before businesses can be re-established. These requirements set the performance benchmarks for the transportation and utility infrastructure sectors.

Recommendations

► **Improve seismic performance of infrastructure for rapid community recovery**

- *Finding*: Business and community cannot recover within two to four weeks due to inadequate seismic performance of infrastructure.

- *Action Needed*: Upgrade existing infrastructure and increase seismic design standards for new infrastructure over the next 50 years to enable business and community recovery within two to four weeks.

Considerations for Different Sectors

As with all state economies, there are multiple business sectors in Oregon, and a Cascadia earthquake will affect each differently. A manufacturer, for example, could sustain significant damage to machines and equipment used to make products and suffer from the lack of raw materials in the immediate aftermath of the earthquake prior to repair of roads and bridges. In addition, even if the manufacturer is able to resume production quickly, the firm may not be able to ship products to market because the transportation system may not be available.

Service providers come in all shapes and sizes, from small consulting practices to large medical clinics. These will be affected differently by a Cascadia earthquake depending on the service they provide and the customer base. Companies that provide consulting services within the locality or region may not have a customer base for some time into the recovery. Others, like doctors' offices for example, will be pressed into service during the immediate recovery period and most likely for some months. However, it is also unknown how those services will be reimbursed or how liability for "bad outcomes" will be dealt with. It is our assessment that small service businesses like sundry shops will not survive in the central business cores that suffer significant damage, particularly those businesses dependent on sales to building occupants who may not return to their place of employment for some time (see Figure 2.11).

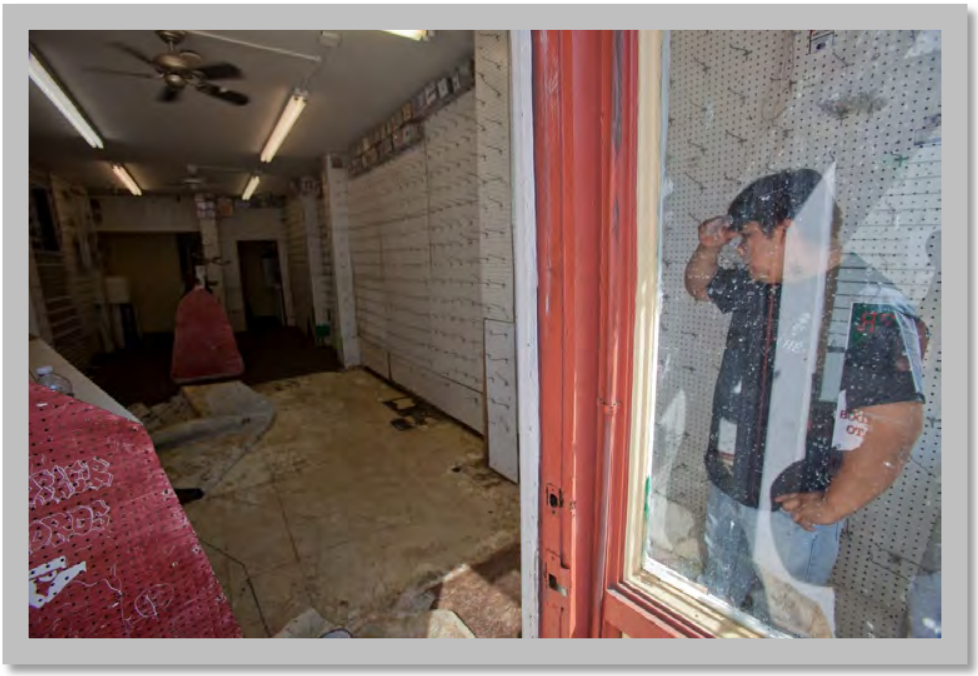

Figure 2.11: Bound Brook, N.J., August 30, 2011 -- Business owner, Brijo Garcia returns to clean up his internet store after Hurricane Irene swept through the Bound Brook area. (Source: Andrea Booher/FEMA)

Even though the goal is to have businesses up and running in two to four weeks, it seems unlikely that most customers will be making anything beyond the most essential purchases. Clothing stores, tailors, and other retail stores will suffer a prolonged period of depressed sales. These types of businesses should prepare for a Cascadia earthquake by building capital sufficient to help the business endure a prolonged disruption.

Some retail businesses, such as home repair,[12] plumbing supply, hardware, lumberyards and so on, will likely see their sales skyrocket during the immediate aftermath of a Cascadia earthquake. One problem facing homeowners who suffer earthquake-related damage to their homes will be finding construction contractors to repair the damage (assuming they cannot repair it on their own). Hurricane Andrew in 1992 drew hundreds of contractors to South Florida from as far away as Portland, Oregon. Many of the contractors in South Florida were there to repair roofs damaged in the Hurricane's high winds; an earthquake will cause different types of structural damage that will require more sophisticated contractors and likely require the services of structural engineers (see Figure 2.12). However, the potential exists for unlicensed contractors to enter the region affected by a Cascadia earthquake, and local building officials and the police will have to be aware of this potential problem.

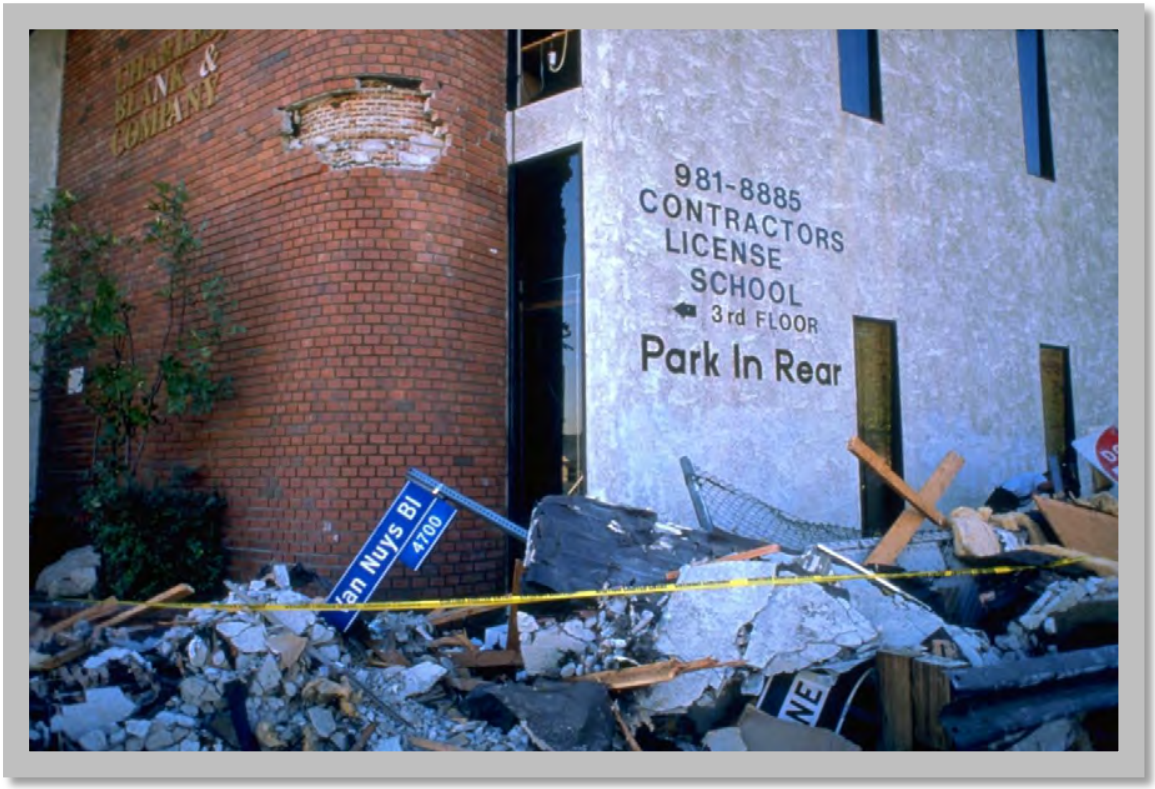

Figure 2.12: Northridge Earthquake, Calif., January 17, 1994 -- Approximately 114,000 residential and commercial structures were damaged and 72 deaths were attributed to the earthquake. Damage costs were estimated at $25 billion. (Source: FEMA News Photo)

[12] Companies like Home Depot and Lowes, for example

Businesses that offer services outside the affected region[13] are likely to be the least affected by a Cascadia earthquake. The demand for their services may not suffer, and their recovery will be more closely linked to the public infrastructure recovery discussed above. Once they can reoccupy their buildings or offices, they will be able to resume work.

A large portion of Oregon's Willamette Valley remains in agricultural production. Other than damage to equipment, many of these types of businesses will suffer minimal impact to their operations from a Cascadia earthquake. The notable exceptions are agricultural businesses located at or near the Oregon Coast. Some of these businesses suffered significant losses in the 2007 flooding and windstorms; losses from a major tsunami are likely to be much greater. For further discussion of the special challenges facing coastal enterprises, see Chapter Three.



Recommendations

- **Plan for business continuity**
  - *Finding*: Although there are numerous resources for business continuity planning, we are unaware of evidence that the majority of businesses in Oregon have a business continuity plan.
  - *Action Needed*: Assess hazards that could impact business; develop business continuity/ continuity of operations plan; partner with public sector to assess public/private building stock pre-event and help with post-event recovery. Business and building owners should be encouraged to review their business continuity plans and level of seismic vulnerability with respect to the Cascadia earthquake and to seismically upgrade their buildings. Employees must be trained to be their own first responders.

- **Expand emergency operation efforts to support private business for rapid resumption**
  - *Finding:* To date, the State has not included the private sector in its Emergency Operation Centers (EOC).
  - *Action Needed:* Encourage all Emergency Operation Centers to pursue public/private partnerships to enhance communication and coordination with the private sector after a major seismic event.

Cascadia Earthquake Aftermath

In the initial aftermath of a Cascadia earthquake, escaping the building safely will be the highest priority for businesses and their workers (Figure 2.13). Making workplaces safe before the event, as discussed in the previous section, will increase the chances that building occupants can exit unharmed. Several considerations need to be addressed by businesses in preparing for the immediate aftermath of a Cascadia subduction zone earthquake.

[13] Examples of these types of firms would be attorneys with overseas clients, accounting firms, architects and engineers that have a significant amount of their business outside the region, software developers, advertising agencies, and so on.

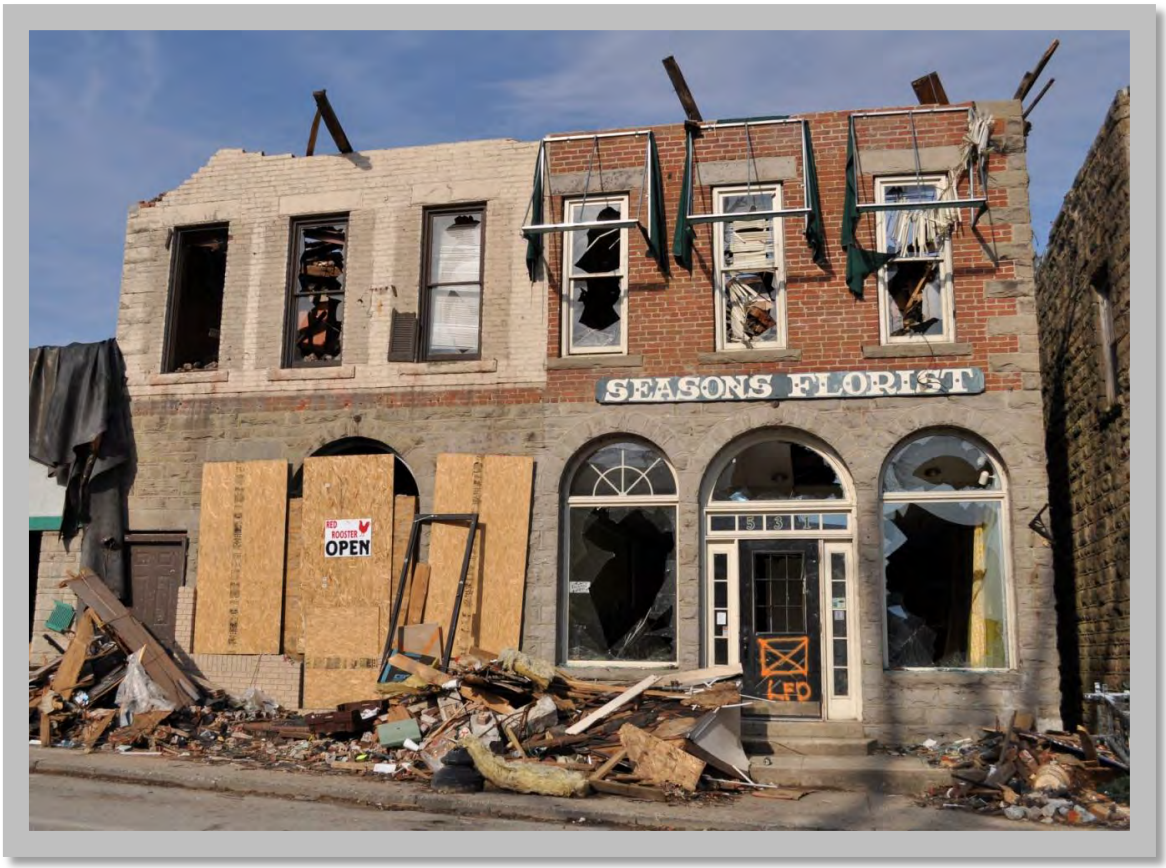

Figure 2.13: West Liberty, Ky., March 19, 2012 -- Destroyed buildings, many with historical significance, line the streets of downtown West Liberty. FEMA is working with Commonwealth and local officials to remove debris and demolish buildings that cannot be saved. (Source: Photo by Marilee Caliendo/FEMA)

If a Cascadia earthquake occurs during the workday (a one in three chance), workers will be in their offices or industrial plants during the event. In areas of the state where the Willamette River bisects the cities—Portland, Salem, Albany, Corvallis/Lebanon, and Eugene/Springfield—it is possible that a large number of workers will be trapped on the "wrong side" of the river. This will be a particular concern in Portland, where none of the ten bridges that currently carry automobile traffic is likely to be cleared by local officials to allow auto traffic for up to 72 hours, even if the bridge appears to have sustained no damage. The most recently constructed Willamette River bridge in Portland is the Fremont Bridge, built in 1976. Some renovations have been performed on the Broadway, Morrison, and Hawthorne Bridges in recent years, but the Multnomah County Bridge Division maintains that these upgrades have only brought the bridges up to level where those bridges were reinforced so that they will not collapse. The Sellwood Bridge is currently being reconstructed to modern seismic standards by Multnomah County and a new light rail bridge is currently being constructed by Tri-Met between the State-owned Marquam and Ross Island Bridges. The Marquam Bridge was opened in October 1964, and has had some seismic strengthening done since, but it is not expected to be immediately usable following a Cascadia earthquake, and may require some repairs before re-opening. The Ross Island Bridge is second only to

the existing Sellwood Bridge as the most unsafe bridge crossing the Willamette River in Portland due to unstable foundation on the east side, and is unlikely to be usable following a Cascadia earthquake.

It is likely that many of the workers in Portland's downtown core who live on the east side of the Willamette River would be forced to shelter in their office buildings, if those structures are safe enough for that purpose. In absence of that, local downtown parks and open spaces would be natural shelter and triage sites.

Buildings that do survive and are capable of sheltering-in workers will face significant challenges related to building security and liability. Most large buildings in downtown Portland have a large number of tenants, and it is unlikely that any one person in a building knows all of the building occupants by sight. This means that there is a distinct possibility that someone who does not work a particular building may end up sheltering-in there. Building owners will have to provide first for the security of their tenants.



Figure 2.14: Mt. Olive, N.J., Nov. 12, 2012 -- After almost two weeks without power in the town of Mt. Olive, shop owners want to let people know the power has been restored and the mall is open for business. (Source: Photo by Sharon Karr)

A second concern for building owners is health and sanitary conditions (Figure 2.14). It is unlikely that water and sewer systems will work in the immediate aftermath of a Cascadia earthquake. Persons sheltering in a downtown office building will not be able to use or will have limited use of its

bathrooms.[14] Sheltering –in is probably only going to be acceptable for one night, and only if an earthquake strikes in the mid to late afternoon on a short rainy or snowing winter day. If an earthquake strikes during a summer workday, when daylight extends well past 9 PM, it is likely that most workers will try to find some way to get home, even those who work on the opposite side of the river from where they live. Nevertheless, businesses in Oregon's river-bisected cities need to plan for the possibility that people could have to shelter-in for several days, even if that possibility seems remote.



Recommendations

- **Communicate gaps between current and target relief and resilience ratings**
  - *Finding*: The impact of a Cascadia earthquake and tsunami will be severe, especially for coastal communities. Earthquake ground shaking will damage buildings and infrastructure and disrupt lifelines. In addition, there will be near total destruction in the tsunami inundation areas that will result in large displacements of residents and visitors. Based on current expected levels of service disruption, the standard recommendation for the public to be prepared for 72 hours should be revised to at least two weeks or longer.

  - *Action Needed*: With an overall goal to increase awareness, a dual ratings system is proposed to give citizens information about the status of emergency preparedness and resilience efforts in their communities.

    - Adoption of a two-level ratings system. The first level would indicate the time period that citizens should anticipate relying on emergency supplies. The second level would indicate the time anticipated necessary for 90 percent restoration of roads and services.
    - The rating system should follow the four zones proposed by the Oregon Resilience Plan: tsunami zone, coastal earthquake only, valley, and eastern zone. Standards and methodology need be developed for the system to be consistent across zones, and applicable at the community level.

Cascadia Earthquake Business Planning

BUSINESS STRATEGIES RELATED TO BUILDING STRUCTURES

One of the primary goals of pursuing disaster resilience in Oregon is to expedite building re-occupancy and restore public/private services such as transportation and power back to a 90% level within two to four weeks. Following a damaging earthquake the buildings occupied by businesses will need to be evaluated for the extent of damage and level of occupancy using the three-tiered Applied Technology Council (ATC)-20 methodology (see Figure 2.15):

[14] Even flush valve toilets will function by gravity, and it is possible that some facilities can remain open for urination, but without water service, actual flushing to push fecal matter down the toilet will not happen, and toilet facilities will quickly become clogged and unsanitary.

- Green-Tagged: Structures that survived the earthquake and are immediately available for occupancy (as noted above, statewide this is about 27 percent of all commercial buildings).

- Yellow-Tagged: Structures that survived with limited access but require structural repair prior to re-occupancy (about 67 percent of all commercial buildings fall into this category). The time to re-occupy will depend on several factors including location, damage to infrastructure in the surrounding area, and the extent of damage to the building.

- Red-Tagged: Structures that have collapsed or are otherwise unsafe for occupancy due to damage (in the case of collapse, the building and its contents would be a complete loss). About 5 percent of all commercial buildings will fall into this category.

For pre-earthquake business planning with respect to business operations[15]:

Businesses in Green-Tagged buildings will need to have municipal and public utilities restored to the building within two to four weeks or tenant businesses may move their operations elsewhere, at least temporarily. Building owner-occupied businesses are probably less likely to relocate, but still will find it hard to survive much more than one month of inactivity due to their inability to get to their buildings. In addition, building owner-occupied businesses, particularly small businesses, probably have a large share of their net worth tied up in their buildings. This means that they are disproportionately likely to suffer losses from fire, or from burglary and looting, following a Cascadia earthquake. For businesses in Green-Tagged buildings, the business strategy following a Cascadia earthquake would be to back up intellectual capital off-site, and retrieve important documents or equipment following the event, as soon as it is safe to re-enter the building. Of course, this will be limited to the things that can be carried out by hand. If possible, a business may need to plan to set up shop temporarily in a building, such as a residence, which has not been damaged and is situated in a location the key business personnel can reach, continue minimal business operations if possible, and monitor reconstruction of transportation, infrastructure and utilities so that the business can re-occupy the building as soon as practicable.

For businesses in Yellow-Tagged buildings, restoring municipal services is less critical because it is likely to take several months to a year before these buildings will be structurally repaired to the extent required to allow reoccupation. Business strategy in these buildings will be to move to another location as soon as they can access the building and move business-related intellectual capital and equipment out. This will likely have to occur within one month for the reasons cited above, and moving will require at least some transportation lifelines to be open.

[15] Here we separate "Business Operations Strategy" from other Business responsibilities such as making the business as safe as possible and caring for workers housed in the business's building.



Figure 2.15: Northridge Earthquake, Califonira, January 17, 1994 – Post-earthquake damage assessment teams coordinate between inspections to business buildings. (Source: Photo by Andrea Booher/FEMA News Photo)

For businesses in Red-Tagged buildings, restoring municipal services is irrelevant because the buildings and their contents will be a complete loss. Following earthquakes in California, businesses located in Red-Tagged buildings were not allowed to re-enter to retrieve equipment or intellectual capital, even if they agreed to hold the government harmless should the building collapse when they were inside. Businesses that occupy buildings unlikely to survive a seismic event in a condition that can be reoccupied need to have their intellectual capital backed up off-site and should be insured against a seismic event.

Recommendations



► **Institutionalize post-earthquake assessment inspection process**

- *Finding*: The State of Oregon has only a passive approach to training and registering certified structural inspectors and certified plan examiners as Applied Technology Council (ATC)-20 post-earthquake damage assessment inspectors and no formal process for deployment.

- *Action Needed*: State shall sponsor annual ATC-20 trainings at no cost to qualified engineers and certified plan examiners and indemnify all trained ATC-20 inspectors. The state must negotiate mutual aid agreements with professional associations and our neighboring states to increase ATC-20 certification and disaster response capacity.

► **Develop seismic rating system for buildings to promote resilience**

- *Finding*: Oregon does not have a seismic rating system for the expected performance of buildings subject to earthquake ground motions.

- *Action Needed*: State should develop a seismic rating system modeled after Structural Engineers Association of Northern California rating system. The objective of this system is (1) to make buildings more resilient and usable after a Cascadia event and (2) to help communicate seismic risk to the general public.

► **Incentivize seismic upgrade of existing buildings**

- *Finding:* The majority of buildings in Oregon were built before the code change of 1994 and thus do not meet current seismic building code standards. Seismic upgrading of these buildings is expensive and is typically only done when there is a change-in-use of the building, or when the buildings are substantially modified. If only a small portion of these buildings will be seismically upgraded over the next fifty years, then the potential loss of the business and workforce housing in these buildings will seriously impact the recovery of the economy following the Cascadia earthquake.

- *Action Needed:* The State should consider incentives and other options to encourage building owners to seismically upgrade their buildings.

► **Reduce community vulnerability from unreinforced masonry (URM) buildings/non-ductile concrete buildings**

- *Finding*: The Historic Preservation League of Oregon (HPLO) estimates there are between 5,000 and 10,000 unreinforced masonry (URM) buildings in Oregon.

- *Action Needed*: State shall adopt the findings and recommendations in the 2012 HPLO Special Report, *Resilient Masonry Buildings*, and extend the recommendations to all non-ductile concrete buildings.

BUSINESS STRATEGIES FOR COASTAL COMMUNITIES

The Oregon Coast can anticipate that a Cascadia subduction zone earthquake offshore will generate a tsunami similar to the March 2011 Tohoku earthquake in Japan. The Department of Geology and Mineral Industries has published numerous inundation maps that show whole communities including, for example, downtown areas of Cannon Beach and Seaside as being prone to complete inundation. Likewise, low-lying areas including Lincoln City, Neskowin, Rockaway, Tillamook, and Bandon will be inundated. Businesses in these tsunami inundation zones will be wiped out even more completely than businesses housed in Red-Tagged Buildings discussed above.



Figure 2.16: New Orleans, La., October 9, 2005 - This souvenir shop is open for business in New Orleans despite the sidewalk being blocked by crushed vehicles and debris leftover from Hurricanes Katrina and Rita. (Source: Robert Kaufmann/FEMA)

Businesses located in tsunami inundation zones should consider the business strategies outlined for businesses housed in Red-Tagged buildings. A high proportion of the businesses in Oregon's coastal communities cater to the tourist industry (see Figure 2.16). Most of these firms are small (or very small) businesses that would not be expected to survive following a tsunami. Even if a business had sufficient capital to relocate, it is unlikely that the tourist industry will recover rapidly enough to support business start-up. Local authorities may need to keep tourists out of the inundation zones, for safety reasons, for months or years after a tsunami.

In the event of a tsunami similar to the Tohoku event, coastal business owners' first concern will be personal survival, not business survival. Oregon's coastal communities face resilience challenges so unique that they are addressed in detail in Chapter Three.

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3. Coastal Communities

Because the coast will suffer the worst consequences of this inevitable Pacific Northwest catastrophe, we emphasize the following main actions in the next 50 years:

- Protecting lives requires consistent and relentless education and outreach based on up-to-date physical and social science.
- Investing in hazard mitigation is necessary to reduce, relocate, and avoid exposure of vital community assets to tsunami devastation.
- Strengthening of critical facilities in the earthquake-only zone must occur so that they will be available when communities need them most.
- Planning for reconstruction and recovery must be done now to provide a strategic vision for restoring the economy and livability of the Oregon coast.

Introduction

Of the Oregon Resilience Plan's eight task groups, the Coastal Task Group was the only one focused geographically on a single sub-region of the state. This group looked at the resilience of the coastal counties in the face of both the Cascadia earthquake and the resulting tsunami. To facilitate this assessment, the group divided the coastal area into the tsunami zone and the remaining earthquake-only zone. The group also recognized that almost all coastal communities have a necessary relationship with the Pacific Ocean or a connected marine environment, such as a bay or estuary. This proximity not only defines these communities, but is the basis of much of their economies, whether they are dependent on a port, recreation, or tourism. Tourism has the additional effect of bringing large numbers of second-homeowners and visitors to the coast, which means that coastal areas have a variable daily population that equals or exceeds the resident population.

The coastal region's built environment, including roads, bridges, and ports, is nestled into the coastline's natural environments of estuaries, wetlands, headlands, mountains, and beaches. It is this dependent relationship with the Pacific Ocean that creates so much of the inherent vulnerability that we now face with a Cascadia earthquake and tsunami (see Figure 3.1).

All of these communities will be affected by the earthquake. The vulnerabilities of these communities to the tsunami vary, with the northern coastal communities of Cannon Beach, Seaside, and Warrenton having the most concentrated exposure to inundation. The Coastal Task Group focused its attention on land use planning and other social factors and relied on the results and conclusions of the other task groups, which were sector based.

The tsunami creates a greater challenge for coastal communities. It is both more destructive than the earthquake and will make mitigation and reconstruction efforts more difficult. Achieving (within a 50 year timeframe) the goal of restoring 90 percent of service within two to four weeks of the earthquake and tsunami will be a greater challenge for the coast than it will be for the rest of the state.



Figure 3.1: Tsunami Vulnerability: City of Seaside with 83% of its population, 89% of its employees and almost 100% of its critical facilities in the tsunami inundation zone. (Source: Horning Geosciences)

Earthquake and Tsunami Zones

The coastal area covers the majority of the seven coastal counties of Clatsop, Tillamook, Lincoln, Lane, Douglas, Coos, and Curry, reaching up to the summit of the Coast Range. The Coastal Task Group divided the coastal area into two zones: the tsunami inundation zone and the earthquake-only zone. The relationship between these two zones will define the local and regional capacity for resilience in the context of the Cascadia event. The post-disaster welfare of the earthquake-only zone of each community is dependent on which critical and essential facilities are located inside the tsunami inundation zone. Each coastal community's capacity to respond, direct relief efforts, and begin recovery will depend on how much it relies on its tsunami-affected area (see Figure 3.2). Communities that have not successfully relocated or created redundancies for important facilities, such as emergency service facilities, energy and water facilities, and vital businesses, will have a severely diminished response and recovery capacity.

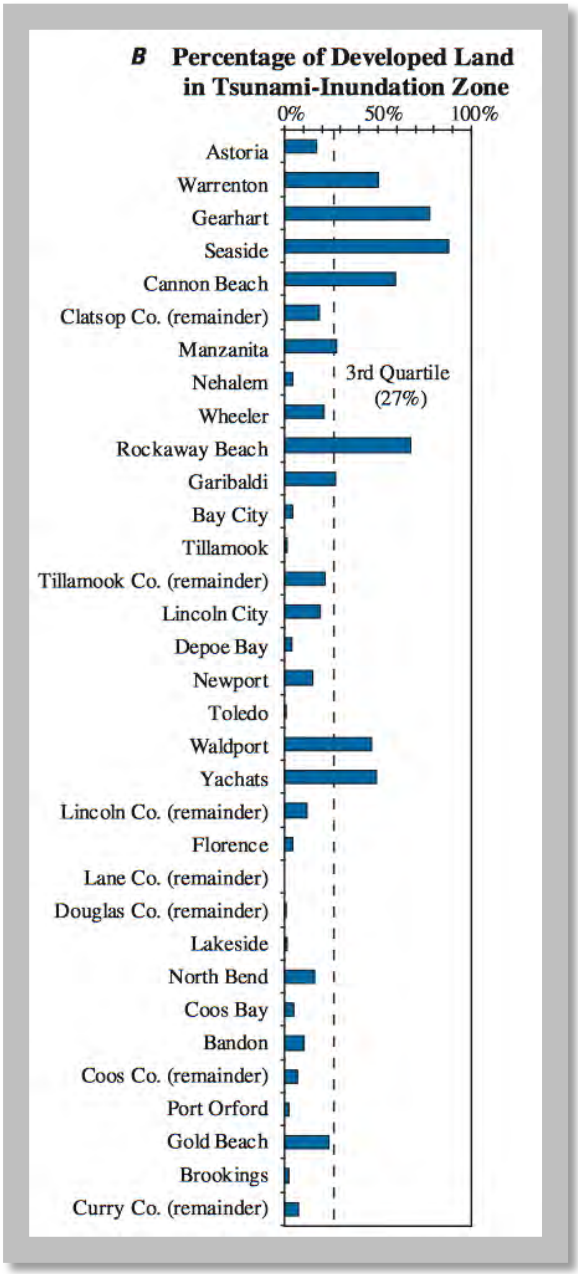
TSUNAMI ZONE

The tsunami zone is defined by inundation mapping, which was produced by the Oregon Department of Geology and Mineral Industries (DOGAMI), primarily based on the earlier mapping defining the state's tsunami inundation line and established by Senate Bill 379 in 1995. DOGAMI is currently finishing up a more accurate tsunami inundation mapping study that will be finished in 2014. Due to its proximity to the fault, the tsunami zone will be subject to among the strongest earthquake motions to be generated during a Cascadia subduction event. It will then be subject to multiple tsunami inundations generated by the earthquake, inundations which will continue for up to 24 hours after the earthquake. The tsunami will further damage buildings, bridges, roads, and utility infrastructure, and will obliterate nearly all wood frame buildings. Even steel and reinforced concrete buildings that survive the earthquake and tsunami may be damaged beyond repair. The existing utilities will be severely damaged or destroyed. The tsunami zone will also have areas of coastal subsidence—places that had been dry land above the tidal zone before the earthquake, but that, having sunk three to six feet during the earthquake, are afterwards inundated daily during high tides or seasonally by variable high tides.

The vulnerability of coastal communities to tsunami hazards varies, with the most concentrated exposure being on the northern Oregon coast (as indicated in Figure 3.3). Within the tsunami inundation zone, practically all of the 22,000 permanent residents—along with an equal or greater number of second-homeowners—who survive the tsunami will be instantly displaced (Wood, 2007). The visitor population presents a great challenge, because visitors tend to congregate in the tsunami inundation zone and have the least knowledge of where and how to evacuate. Moreover, those that survive will put extreme pressure on local relief efforts, which must provide for their initial welfare.



Figure 3.2: Critical Facilities in the Tsunami Zone – Minamisanriku, March 14, 2011. Because their hospital, emergency operation center, and other government and community service facilities were located in the tsunami inundation zone, the surviving community lost nearly all of its capacity to respond and implement recovery efforts. (Source: Asia Air Survey Co., Ltd.)



Numbers in Tsunami Inundation Zone	
Residents	22,000
Households	10,000
Percent of coastal counties	4%
Employees	14,800
Businesses	1,800
Percent of coastal counties	6%
Oregon State Parks – Coastal (Annual average daily attendance)	53,700

Figure and numbers from Nate Wood Variations in City Exposure and Sensitivity to Tsunami Hazards in Oregon, USGS 2007

Figure 3.3: Oregon Coast Tsunami Exposure of People and Places. Wood, Nathan: 2007, Variations in City Exposure and Sensitivity to Tsunami Hazards in Oregon. (Source: US Geological Survey)

EARTHQUAKE-ONLY ZONE

The earthquake-only zone is the area outside of the tsunami zone. It includes portions of communities that will have tsunami inundations in their lowland areas, and communities that are completely outside of the inundation zone. Again, the proximity to the fault means that damage to roads and infrastructure from the magnitude 9.0 earthquake scenario will be greater here than in the valley. Minutes of strong ground shaking will concentrate damage in areas subject to ground failures such as liquefaction, lateral spreading, differential settlement, and landslides. The coast and Coast Range are particularly at risk from these effects of the earthquake.

Well-built wood frame buildings will withstand the shaking fairly well. Unreinforced masonry (URM) and under-reinforced concrete buildings will suffer significant damage. Unfortunately, this includes a number of government buildings and essential facilities in the coastal zone. Because subduction zone earthquakes generate long-period seismic waves and because the duration of the shaking is so long, certain structures, such as bridges, may resonate, amplifying shaking impacts.

Following the Cascadia Event

Following the Cascadia event, the coastal communities will be cut off from the rest of state and from each other. The coastal area's transportation system, electrical power transmission and distribution grid, and natural gas service will be fragmented and offline, with long-term setbacks to water and wastewater services. Reliable communications will be similarly affected. Because so many of these connecting systems are single lines with little or no redundancy, any break or damage requiring repair or replacement will compromise the service capacity of the entire line.

The loss of roads and bridges that run north and south will make travel up and down the coast and into the valley difficult, if not impossible, due to the lack of alternate routes in many areas. Reestablishing the roads and utility infrastructure will be a challenge, and the difficulties will be exacerbated in the tsunami inundation area by its more complete destruction. Even businesses outside of the tsunami inundation may not recover from the likely collapse of a tourist-based economy during the phased and complicated recovery and reconstruction period.

Based on the resilience targets provided by the Transportation, Energy, Communications, and Water/Wastewater task groups, current timelines for the restoration of services to 90-percent-operational levels will take a minimum of one to three years, and often over three years in the earthquake-only zone. Restoration in the tsunami zone will take even longer than that (see Figure 3.4). The most critical infrastructure is the road and highway system. Without functioning road systems, none of the infrastructure can be accessed to begin repairs.

The tsunami will also create an enormous amount of debris that needs to be gathered, sorted, and managed. The recent experience of Japan, with a similar mountainous coastline, has shown that debris management competes with shelter and reconstruction needs for the same flat land that is often in the inundation zone.



Figure 3.4: Hurricane Katrina Storm Surge – Electric Facility. Replacement of coastal power infrastructure based on 2012 capabilities may take one to three years for the Earthquake-only zone. (Source: FEMA.gov)

PREPAREDNESS AND POST DISASTER RELIEF

Emergency preparedness education and training helps people react appropriately during a disaster. Preparedness can also provide the foundation for initial disaster relief efforts at the personal, household, and community levels. Surviving the earthquake and then evacuating the tsunami zone is just the beginning of achieving life safety in the following hours, days, and even weeks (see Figure 3.5). Properly anticipating and managing relief efforts will have a significant impact on resilience.

Relief efforts need to consider other populations in addition to residents. The coast attracts a large number of second-homeowners and visitors. Data from the 2007 United States Geological Survey (USGS) study by Wood (2007) showed that the resident population in the coast's tsunami inundation area numbered around 22,000. Not included in this count was the population of second-homeowners and visitors, which in many coastal communities equals or exceeds the number of full-time residents. To arrive at a general estimate of the number of visitors to the coast, Wood looked at the number of visitors to Oregon's coastal state parks and found that the annual average daily attendance is 53,700 people. This is more than double the number of permanent residents at risk, and it does not include hotel visitors. The visiting population is generally located in the tsunami inundation zone and typically has low levels of knowledge about tsunami hazards and evacuation routes. The large population of visitors will also be difficult to house and feed adequately following the earthquake and tsunami. An essential task during the relief period will be transporting these people from the coastal areas to their own homes or to shelters further inland. Reducing the loss of life among residents and visitors is critical to insuring that people will come back to help with reconstruction and recovery.

Recommendations



► **Improve earthquake/tsunami education efforts.**

- Teach an earthquake/tsunami curriculum to Oregon's school children.
- Provide information about Cascadia earthquakes and tsunami in all hotels, motels, and short-term rentals. This should include information about tsunami evacuation routes.
- Require that all businesses over a certain size and located in tsunami inundation zones have tsunami evacuation plans.

► **Improve tsunami evacuation efforts.**

- Create tsunami evacuation modeling for each coastal community as a base level to estimate the likely fatality level. Models can be used to test improvements in evacuation measures and determine whether the improvements will reduce fatality levels.
- Improve tsunami evacuation measures by further developing existing evacuation routes, creating new evacuation routes, bettering education and signage about evacuation routes, and creating vertical evacuation structures or buildings.

► **Improve relief efforts to account for residents in the tsunami inundation areas and the visitor population.**

- Develop plans to provide shelter, water, and food for residents and visitors.
- Develop plans for getting visitors back to their own homes.

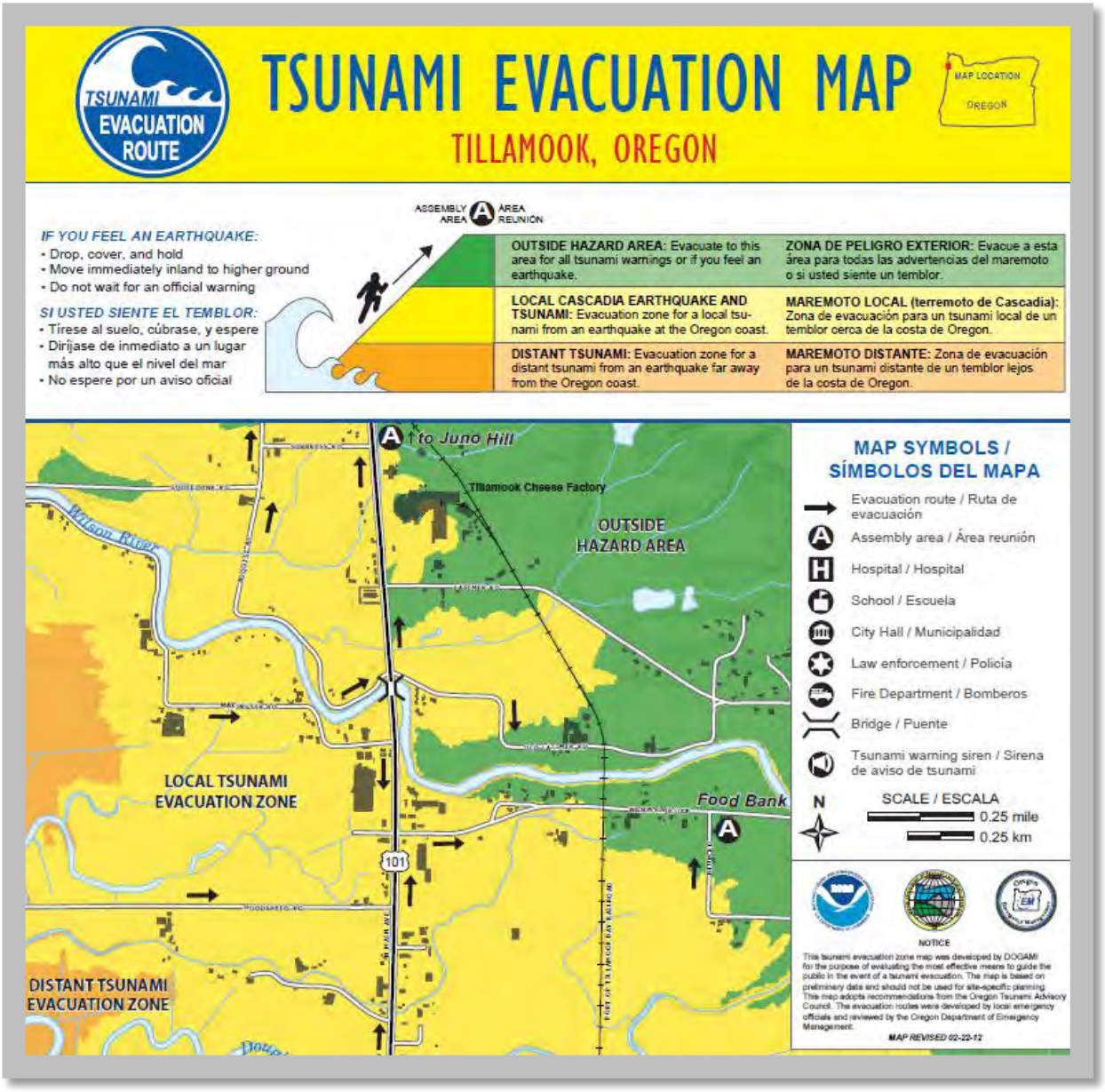


Figure 3.5: Tsunami Evacuation Map for the City of Tillamook, Oregon. (Source: Oregon Department of Geology and Mineral Industries, 2012)

Coastal Zone Targets

The goal for the coastal zone—like that of the other zones of the state—is 90-percent recovery in a two- to four-week period. This goal is based on the amount of stress businesses can take before they go out of business or relocate. While this goal should be the target for all of Oregon, it will be difficult to achieve in both the tsunami zone and the earthquake-only zone of the coast, with the tsunami zone presenting particularly significant obstacles. Consequently, it will likely either take longer to achieve this goal on the coast than it will in the other regions of the state, or it will require the application of substantial resources. Some coastal communities will have to reconstruct their economic districts—either substantially or completely. Alternate strategies need to be considered, and the expectations of coastal residents and businesses must be addressed with the realities of the state of preparedness.

PROTECTING BUILDINGS AND INFRASTRUCTURE

The first obstacle is the anticipated level of destruction of buildings and infrastructure within the tsunami zone. The solutions to protecting them include:

- Creating tsunami resistant seawalls. This solution has been tried in Japan, and it works provided that the wall is designed for the earthquake/tsunami that actually occurs. The failure of these structures in the 2011 Tohoku earthquake and tsunami was primarily due to their having been designed for a smaller event. They are very costly and would cut off the communities from the ocean, disrupting the main economic basis of many coastal communities. Moreover, this solution does not address such things as port facilities, which need direct access to the ocean.
- Constructing tsunami resistant buildings and infrastructure. This type of solution is typically used for port facilities, roads and bridges, and other essential buildings or infrastructure. It is very expensive and would be done in critical cases where other options do not exist. This solution does not address existing buildings and infrastructure.
- Relocating. While it is theoretically possible to relocate communities, in reality this rarely happens, even following major earthquakes and tsunamis. A more likely scenario is relocating essential buildings and functions outside of the tsunami zone as a mitigation strategy. In this way, police stations, fire stations, government offices, hospitals, public works, and similar critical facilities can, over time, be shifted outside of the tsunami zone. In addition, some thought can be given to the relocation of businesses and residences.

As Wood's study shows, the vulnerabilities of communities within the tsunami zone vary, so the solutions must vary accordingly (Wood 2007). Mitigation proposals should be developed that include actual mitigation projects—such as relocation—as well as more land-use related solutions that look at rebuilding communities after the earthquake and tsunami so that they are tsunami-ready for future events.

The target goal in earthquake-only areas of the coast also presents challenges. First, much of the essential infrastructure runs through both the tsunami zone and the non-tsunami earthquake zone.

Second, the geology of the coast means that there will be high levels of damage to these systems. Because these areas are lightly populated compared to the urban areas of the valley, strengthening them will tend to be a lower priority (from an economic standpoint) than projects that target the valley.



Recommendations

- **Use relocation strategies to meet target goals on a community basis as part of overall mitigation planning.**
- **Use tsunami resistant buildings as vertical evacuation structures to insure the safety of people in the inundation zone where other options are limited.**
- **Use tsunami resistant infrastructure for critical transportation, port facilities, and utilities.**
- **Ensure that critical transportation links to the valley and along the coast survive the earthquake so that coastal communities are not cut off from relief and recovery efforts.**

Government/Essential Facility Continuity

Given the high level of destruction in the tsunami zone, it is important that government buildings, essential facilities, and schools continue in operation following the earthquake and tsunami. Experience from the Tohoku earthquake/tsunami in Japan and other natural disasters in the U.S. and other countries has shown that where government continuity has been disrupted, post-disaster recovery times have been greatly increased. In addition to continuity of governments within the coastal zones, the capacity to communicate with state government offices must be firmly established.



Recommendations

- **Upgrade, or replace with buildings that meet or exceed current seismic codes, all government buildings, schools, and essential facilities located in the earthquake-only zone.**
- **Make all government buildings, schools, and essential facilities located within tsunami zones more resilient by adopting one of the following strategies:**
  - Relocate the facility outside of the tsunami zone.
  - Build the facility with reinforced concrete to resist tsunami loads. (If such a strategy is adopted, consider using the facility as a tsunami vertical evacuation refuge (TVER).

- Upgrade the facility to meet seismic life-safety standards, and create a backup facility outside of the tsunami zone.

Land Use

This resilience planning effort encourages a comprehensive, risk-based approach to reducing exposure and vulnerability to all natural hazards that potentially affect our coastal communities. Options and recommendations within this section should be helpful in assisting communities move forward in these important efforts. However, if a community needs to relocate a specific facility (for example, a hospital, fire station, police station, emergency response center, or school) in the short term to reduce tsunami risk, then utilizing a more strategic approach may be necessary and appropriate.

The need for pre-disaster relocation of government buildings, schools, and essential facilities has the potential to raise land-use issues. In some communities, such as Cannon Beach and Seaside, existing business areas may become part of new tidal zones after a Cascadia subduction earthquake as a result of subsidence. In some situations, such as the Seaside School District's relocation effort, sufficient existing land is not available inside the urban growth boundary for relocation, so it is necessary to collaborate with stakeholders to look at other appropriate sites. In other cases, such as the Waldport High School project, relocation can be accommodated within the existing urban growth boundary. In the Waldport case, it was necessary to maintain the vacated site as open space due to the requirements of FEMA funding, which assisted substantially in the relocation effort. FEMA funding can be very helpful in the development and implementation of community relocation strategies; however, there are situations in which these funds are not available or maintaining vacated sites as open space is not workable for a community. In these cases, transitioning to a more resilient community may dictate that the vacated site not be removed from the community's tax base, but instead be considered for (and used to help fund) the development of low-risk uses or uses which include appropriate and adequate protection or mitigation for seismic and tsunami risks.

The economies of most coastal communities are based on their proximity to the ocean. Ports, by their very nature, will always be in tsunami zones. Similarly, towns such as Cannon Beach and Seaside exist due to their close proximity to the ocean. Rethinking how ports can return and tourism can rebound following a Cascadia event will require an inspired strategy on the part of coastal communities and the state. (It should be noted that Oregon's coastal ports were built to support fishing and logging, and in many places, these industries are no longer the economic motors they were when the port facilities were built.) In addition, future development within the tsunami zone should seek to reduce risk. One hopeful sign is that 50 percent of growth since 2000 and 2010 census in coastal communities has been outside the tsunami zone (Personal communication with Wood, 2012).

SENATE BILL 379 TSUNAMI INUNDATION ZONE

In the mid 1990's, Senate Bill 379 directed the Department of Geology and Mineral Industries (DOGAMI) and its board to adopt a tsunami inundation line, and established requirements and restrictions for

certain development within the identified inundation zone. These requirements are found within ORS 455.446-447 and are administered within the Oregon Building Code. DOGAMI is currently remapping the Oregon coast for tsunami hazards. This new analysis is more comprehensive and uses updated methodology developed as a result of analysis of recent tsunami events and further Cascadia earthquake and tsunami research. The DOGAMI Board will soon review this new work to determine how this information should be used for purposes of administering the development restrictions of ORS 455.446-447. This updated mapping, and associated requirements as indicated, will be important considerations for local governments' comprehensive planning efforts and the development of implementation measures as required by Oregon Statewide Planning Goal 7, 17 and 18 (see http://www.oregon.gov/lcd/pages/goals.aspx for details).

OREGON DEPARTMENT OF LAND CONSERVATION AND DEVELOPMENT (DLCD) AND ITS COASTAL MANAGEMENT PROGRAM (OCMP)

Statewide Planning Goal 7 requires local governments to adopt comprehensive plans (inventories, policies, and implementing measures) to reduce risk to people and property from natural hazards and to address concerns about life safety, lifelines, economic viability, and infrastructure. Natural hazards include earthquakes and related hazards, tsunamis, and coastal erosion. DLCD is the agency charged with the responsibility of assisting local governments and local communities in addressing and planning for these hazards.

DLCD is charged with working with DOGAMI and local governments to address the implications of the updated tsunami inundation zone mapping for community development and comprehensive planning. This includes assisting local governments to develop adequate adaptation planning responses in anticipation of a major tsunami event. As part of this effort, DLCD has clarified specific policies that identify the tools that communities can use when adjustments to urban growth boundaries are required, or comprehensive long-term resilience planning is needed. These include:

- Urban growth boundary adjustments to address tsunami risk. Urban growth boundary expansions may be needed to allow for relocation of some community facilities due to tsunami hazard risks—if land is not suitable within the boundary. These would be strategic measures for a single purpose and would be subject to existing urban growth boundary requirements.
- Urban reserves. Communities may use a more comprehensive risk-based approach to reducing exposure and vulnerability to all natural hazards that may affect a community. This approach would be a longer-term effort and would help in situations where land-use zones would no longer be tenable or desirable following the event. Urban reserve work could include planning areas outside the urban growth boundary in preparation for pre- and post-disaster land-use efforts. This comprehensive approach could also help define what associated rezoning efforts would be needed inside the urban growth boundary.
- Community land use tsunami preparation. DLCD has placed a priority on supporting community land use tsunami preparation and on providing tools to help communities become more

resilient to this catastrophic hazard. In order to provide this assistance, the DLCD will partner with a qualified consultant to develop an array of best practices and tools which are tailored to the comprehensive plans of coastal local governments and statewide planning goals. This work will require comprehensive research, creative thinking, and compilation of an extensive set of resilience options, including a range of both land use incentive and regulation tools. This effort anticipates the development of a set of comprehensive tsunami resilience tools, which include such things as a tsunami hazard overlay zone and other land use related tsunami resilience provisions.



Recommendations

- **Encourage coastal communities to adopt the latest version of tsunami maps and analysis and to include these within local comprehensive plans.**
- **Work with local communities to develop comprehensive plans and policies related to becoming more resilient to tsunamis; such plans and polices should direct and authorize associated implementation actions.**
- **Encourage communities to develop a tsunami hazard overlay zone and other tsunami resilience provisions related to land use, which could be adopted and used within local land use codes.**
  - The code language could include options for incentives, requirements, and best practices for assisting communities to become more resilient to tsunamis.
  - Guidance materials could include options such as incentives and regulations related to allowed uses in inundation zone areas, tsunami evacuation route requirements, use requirements for vacated areas, and mitigation measures for development within inundation areas.
- **Support local government consideration of ORS 455.446-447 requirements (as potentially amended) for minimum requirements within local comprehensive plans and implementing ordinances.**
- **Support local government efforts to apply best practices and the tools developed by the Oregon Department of Land Conservation and Development (DLCD), when revising coastal communities' comprehensive plans to increase resilience to Cascadia type events.**
- **Support local governments as they review their respective urban growth boundaries to identify key community facilities which may need to be relocated to address substantial tsunami risk. Work with communities to develop local land use policies and strategies to address future relocation of these facilities.**
- **Encourage communities to consider strategies to increase the tsunami resilience of those parts of the community that cannot be relocated.**

- These strategies could include such things as the development of structures of such size and bulk that, if appropriate for the area, a vertical evacuation structure could be included as the top component.
- These strategies may need to include revision of zoning codes to allow suitable building height provisions for these structures.

Reconstruction

LARGE-SCALE DEBRIS REMOVAL

Requirements and plans for the removal of debris must be developed on a county and community level per discussion with U.S. Army Corps of Engineers before the Cascadia event. Given the terrain of the Oregon coast, available land for such purposes will be at a premium, and the need to dispose of debris may conflict with other vital needs during relief and recovery efforts. Moreover, both the debris and its removal will have long-lasting environmental impacts. Planning for recycling and reuse of this debris must be put into place before the event to reduce landfill and environmental impacts.

The U.S. Army Corps of Engineers has indicated that local governments should identify land for response and recovery efforts as part of their planning work *before* a Cascadia subduction zone event. This essential planning will expedite debris removal activities after the earthquake and tsunami. In addition, a viable transportation system must be put in place in order for the Corps of Engineers to get the necessary heavy equipment into place. Local jurisdictions can facilitate this effort by making arrangements in advance with existing local heavy equipment operators. These plans need to include both staging areas for the heavy equipment and areas for collection and sorting of the debris.

It should be noted that there are no landfill areas on the coast, and the local transfer station areas will be quickly overloaded following the event.



Recommendations

- ► **Develop and implement debris management programs for the recovery period following a Cascadia subduction zone earthquake and tsunami.**
- ► **Look at alternative strategies to reduce environmental impacts of debris for coastal communities.**
- ► **Develop a tool box of creative methods to recycle and reuse debris.**

COASTAL ECONOMIC RESILIENCE

Tourism

The impact of the earthquake and tsunami on coastal businesses will be severe and long-lasting. The impact on tourism will be felt with the loss of substantial numbers of buildings and businesses. Even those that remain will not have basic services, and the road system will be down, so that even if these services could be provided locally, there would be no way for visitors to travel into the area. The state park system will be damaged, and there will be changes in the beaches and estuaries as the tides re-equilibrate to the subsidence along the coast. Recreational opportunities will become limited. In addition, the positive image that people have of the Oregon coast will be damaged if there are widespread fatalities.

Plans should be developed for reestablishing tourism following the disaster (Figure 3.6). These arrangements should include coordinated recovery plans to provide an adequate workforce so that the number of visitors will not put a strain on the surviving infrastructure. Following the disaster, visitors must be protected and provided for in such a way that they understand that the coastal communities did all they could to assist them and that this understanding leads visitors to feel an attachment to the coastal communities and a desire to help them rebuild.

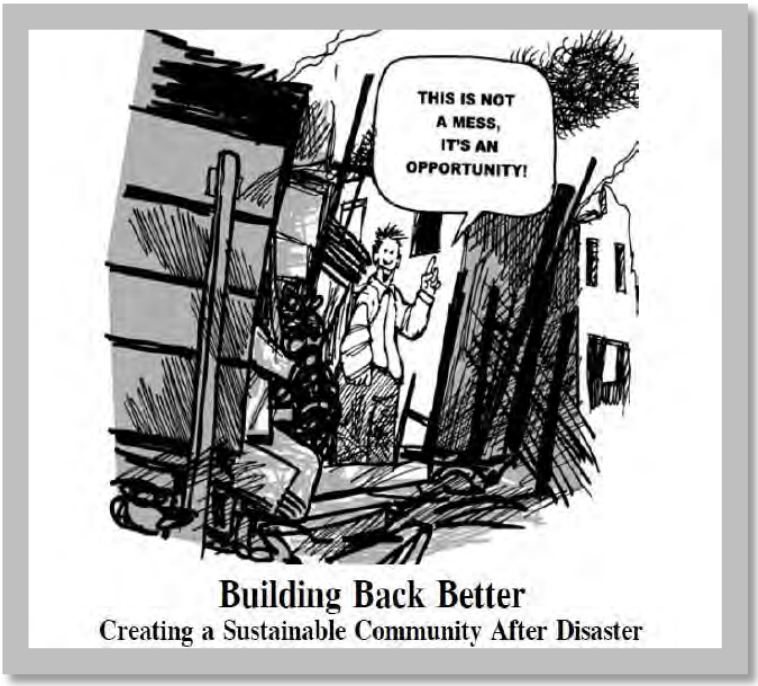


Figure 3.6: Building Back Better
(Source: www.colorado.edu/hazards)

Other Industries

- The logging industry will sustain major damage to its logging road system and will have difficulty transporting its products to market.
- The ports will sustain major damage so that goods and services will not be able to enter or leave until the ports are repaired.
- The fishing fleets may be severely damaged if they are in port when the tsunami arrives.

The Local Population

Even businesses that are not involved in tourism will be impacted by the loss of residents from the tsunami zones; and residents in earthquake-only zones will be forced to leave the area due to loss of jobs and loss of access to schools and medical facilities (see Figure 3.7). Many of the retirees who bring substantial money into the coastal communities may opt to relocate out of the area, putting further strain on coastal communities. The loss of the workforce will make it difficult for the businesses that remain to find sufficient help. For governments seeking to replace damaged infrastructure, the resulting reduction in the tax base will make recovery efforts more difficult. This problem will also hamper the efforts of the utilities providers, as demand for services will substantially decrease.



Recommendations

- **Require the state to do an assessment to determine an accurate level of coastal business operation following the Cascadia subduction zone event as a base case for recovery efforts.**
- **Require the Oregon Tourism Commission to work with the coastal hospitality industry and communities to develop plans for taking care of visitors following the Cascadia event and plan strategies for rebuilding the tourism industry after the event.**
- **Modify the use of room taxes to develop funding for mitigation efforts directly related to the evacuation of visitors to high ground, the provision of relief for visitors, and the development of mitigation and post-disaster recovery efforts. This could also include the creation of emergency funds.**
- **Develop economic incentives for recycling/reuse of post-disaster debris.**
- **Develop re-insurance or group insurance for the coastal zone to provide lower cost insurance to help with recovery efforts.**

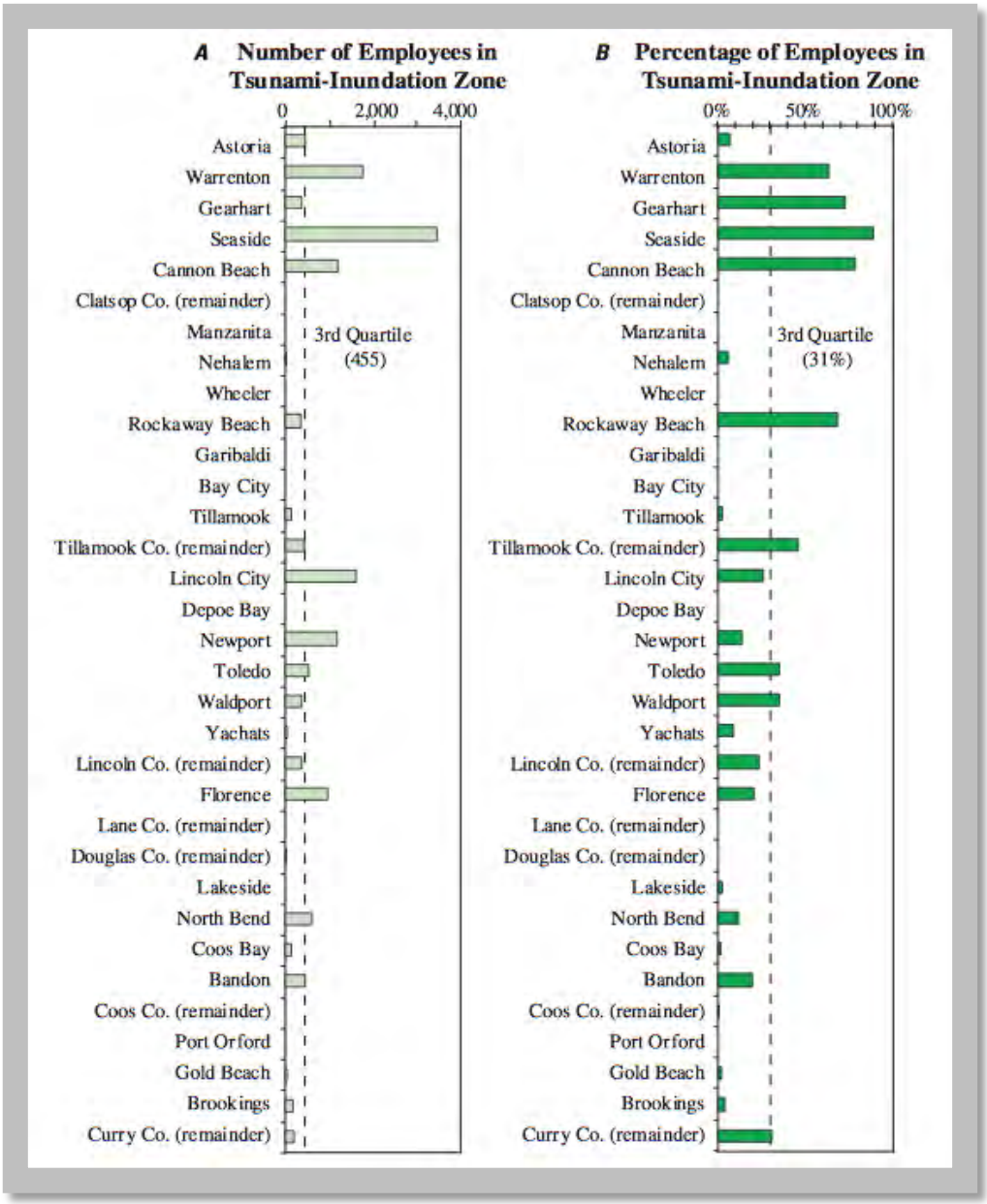


Figure 3.7: Number and Percentage of Employees in the Tsunami Inundation Zone. Wood, Nathan: 2007, Variations in City Exposure and Sensitivity to Tsunami Hazards in Oregon. (Source: US Geological Survey)

Disaster Resilience and Sustainability

Mitigation will be a primary tool in the creation of disaster resilience within Oregon's coastal areas. Solutions that are currently thought of as *sustainable development* should be studied as part of these mitigation and post-disaster recovery plans (see Figure 3.8). One of the main reasons that Japan and Chile got back up and running from their most recent earthquakes (i.e., the 2010 M8.8 Maule Earthquake and the 2011 M9.0 Tohoku Earthquake) was that they have redundant service systems. Sustainable solutions can help provide this redundancy. Given the expected problems of energy delivery following a Cascadia event, coastal communities should explore alternatives to the statewide utility grid and, to the extent possible, work towards greater self-sufficiency. Current localized energy generation options include:

- Wave, wind, and solar as models for economic growth, improved emergency self-reliance, and less dependency on a tourism-based economy.
- The proposed energy generation plant, if it is accepted, for a Coos Bay LNG facility. This plant could have value after a Cascadia subduction zone event if it is located outside of the tsunami zone.
- Investment early in infrastructure redundancy and alternative local sources of energy for areas that will someday need to be rebuilt and relocated due to catastrophic earthquake and tsunami damage. Such investment can have dual benefits: minimizing disaster-related downtime and encouraging sustainable community development. *(Example:* The Smart Grid concept http://www.smartgrid.gov/ to invest in alternative local/regional electricity generation and distribution.)



Figure 3.8: Disaster Resilience is a Critical Component of Community Sustainability. (Source: Public Entity Risk Institute)

HAZARD MITIGATION: PRE-DISASTER RISK REDUCTION

Natural hazard mitigation plans are required at the state, county, and city levels in order for these jurisdictions to be eligible for post-disaster FEMA grants. These plans acknowledge local and regional natural hazards and assess the related vulnerability of the community to determine the community's acceptable level of risk.

A tiered approach to mitigation should be developed:

- Top tier mitigation efforts should prioritize strengthening life-safety capacity during a worst-case-scenario event. Examples include finishing all mapping, hardening evacuation routes, increasing capacity to aid visitors, improving consistent signage, designating earthquake-resistant shelters, and stocking community emergency provisions sufficient to last for one month. This would also include strengthening existing critical facilities that are already outside of the tsunami zone.
- Tier two mitigation efforts should be to relocate critical infrastructure outside of the tsunami zone so that it is operational or repairable immediately following a Cascadia subduction zone event and is therefore able to provide emergency services (rather than being destroyed, abandoned, and useless).

Coastal hazard mitigation plans should have action items that are specific to a Cascadia subduction zone event. Such action items should call for prioritized mitigation projects to improve life safety and avoid damage or reduce exposure from the tsunami and earthquake.

PLANNING FOR RECONSTRUCTION AND RECOVERY

For legacy facilities that are too problematic to relocate, such as electric substations or wastewater treatment plants, pre-disaster recovery planning will allow community decision makers to outline goals, objectives, and strategies for realizing the more resilient and sustainable public and private sector arrangements that are to be implemented during post-disaster long-term recovery. There has been some concern expressed by utility providers about how these improvements will impact ratepayers.

Economic resilience must really address the number of local businesses that are located in the tsunami zone and the extent to which these businesses depend on services that are in (or move through) the tsunami zone. The tourism-based businesses that survive may have reduced demand following the Cascadia subduction zone event, but lodging, food, and commercial businesses can provide invaluable benefits to their communities by maintaining the capacity to operate.

Example: Timebank Concept from Lyttelton, New Zealand. *This isolated coastal community is using a concept they started called Timebank as a way to barter professional, skilled, and volunteer services to do earthquake recovery for community projects. This is a great model (at the small-community scale) for sharing the community's internal resources and a very practical model for Oregon's highly self-reliant coastal communities, especially those with a strong sense of place. (http://www.lyttelton.net.nz/earthquake/lyttelton-timebank)*

Recovery planning now is really about rebuilding for the *subsequent* Cascadia subduction zone event. While it may not provide any risk-reduction benefits now, it will substantially minimize uncertainty, deliberation, conflict, and delay by getting a very complicated and bureaucratic process moving forward in accordance with whatever vision the community adopts. The great importance of this recovery visioning process was revealed during a tsunami recovery workshop at Cannon Beach in 2006 (see http://csc.uoregon.edu/opdr/recovery/cannonbeachpilot). Coos, Curry, Douglas and Lane counties have already participated in a recovery planning process for southwestern Oregon. This process was facilitated by the Oregon Partnership for Disaster Resilience and funded by FEMA.

Having witnessed other subduction zone events during the past eight years (2004 Indian Ocean, 2009 American Samoa, 2010 Chile, and 2011 Japan)—events that are similar to what is expected from a Cascadia subduction zone earthquake and tsunami—Oregon's coastal communities are taking stronger steps towards planning for this inevitability. With the imperative of the Oregon Resilience Plan, it is critical that limited federal, state, and local capital be wisely invested in a manner that looks forward to sustainable objectives, with an emphasis on local resources, rather than doubling down on older systems that have heavy dependencies on services delivered from out of the area.

Relief and Resilience Ratings

The initial analysis of the current state of preparedness that was done to establish baselines for resilience targets has confirmed that our levels of preparedness are low (see Figure 3.9). This analysis has also revealed the timeframes within which people in Oregon can expect relief efforts to reach them following a Cascadia subduction zone earthquake and tsunami. Relief efforts of any size will clearly need to come from outside of the area, but the transportation systems—whether travel is by highway, air, or sea—are expected to be severely impacted. The difficulties associated with delivering aid are most acute for the coastal zone, but they could also be an issue for rural areas in the valley.

Information about the likely timeframes involved in delivering aid should be disseminated to citizens and communities to allow them to plan accordingly. The standard recommendation is for people to prepare to be self-sufficient for 72 hours following a natural disaster of this kind. This standard should be raised (see Figures 3.10 and 3.11). In the tsunami zone, preparation involves evacuating to high ground. Because homes and businesses will be lost, the preparation of residents also needs to include survival kits containing some sort of shelter (protection from the elements), food and water, and any other items that the individual will need while living in temporary shelters, whether located on the coast or in other areas). Visitors in the tsunami zone will not have made these preparations and will be relying on the help of residents and communities. People in the earthquake-only zone are expected to fare better, because they will likely still have their homes—although a certain percentage of those homes will be so damaged by the earthquake that they can no longer be occupied.

Coastal communities are beginning to make preparations. For example, several communities are creating stockpiles of emergency supplies outside of the tsunami zone. Communities and citizens need

some level of transparency in order to keep track of their own level of preparation for emergency response and progress towards achieving resilience.



Recommendations

- **Adopt a two-tiered rating system that gives (1) the number of hours/days that a citizen in a community can expect to wait before major relief arrives and (2) the number of days/months that a citizen can expect to wait before the community itself achieves 90-percent restoration of roads and services.**
  - The rating system should adopt the zones established by the resilience report: tsunami zone, coastal earthquake-only zone, valley zone, and eastern zone.
  - Standards and methodology must be developed to ensure that the rating system is consistent.
  - Communities and counties should use these standards and methodology to develop standards for cities and unincorporated areas.

The goal of this two-tiered rating system is to provide information at any given time about what citizens should expect, and to serve both as the basis for a community's resilience targets and as a means of measuring how close the community is to meeting them. Because the resilience report sets a 50-year target for achieving statewide resilience, a mechanism is needed to track progress and provide pressure to meet the target.

	RELIEF	RESILIENCE
Eastern	72 hours	1 to 3 years
Valley	72 hours	1 to 3 years
Coast (Earthquake Only)	1-2 Weeks	3 years +
Tsunami Zone	1-2 Weeks	3 years +

Figure 3.9: Existing Relief/Resilience Ratings

	RELIEF	RESILIENCE
Eastern	72 hours	2 weeks
Valley	72 hours	2 to 4 weeks
Coast (Earthquake Only)	72 hours	2 to 4 weeks
Tsunami Zone	72 hours	2-4 weeks

Figure 3.10: 50-Year Target Relief/Resilience Ratings

Coastal Service Restoration

50-Year Estimates for Roads/Bridges and Critical Facilities

ODOT Roads & Bridges		Event Occurs	0 – 24 hours	1 – 3 days	3 – 7 days	1 week – 1 month	1 – 3 months	3 – 6 months	6 – 12 months	1 – 3 years	3+ years
Coast - EQ Only Zone											
State Hwy System	Tier 1									60%	90%
	Tier 2										60%
	Tier 3										60%
	Other										60%
Coast - Tsunami Zone											
State Hwy System	Tier 1										60%
	Tier 2										60%
	Tier 3										60%
	Other										60%

50 Year Targets

Minimal: (A minimum level of service is restored, primarily for the use of emergency responders, repair crews, and vehicles transporting food and other critical supplies.)

Functional: (Although service is not yet restored to full capacity, it is sufficient to get the economy moving again—e.g. some truck/freight traffic can be accommodated. There may be fewer lanes in use, some weight restrictions, and lower speed limits.)

Operational: (Restoration is up to 90% of capacity: A full level of service has been restored and is sufficient to allow people to commute to school and to work.)

60% - ESTIMATED TIME FOR RECOVERY TO 60% OPERATIONAL

90% - ESTIMATED TIME FOR RECOVERY TO 90% OPERATIONAL

Figure 3.11: 50-Year Estimates for Roads/Bridges and Critical Facilities

Current 2012 Conditions for Critical Facilities in the Earthquake-Only Zone

Critical Facilities	Event Occurs	Phase 1 (hours)			Phase 2 (Days)		Phase 3 (Months)		
		4	24	72	30	60	4	18	36+
Coast - EQ Only Zone									
Emergency Operation Centers								X	
Police Stations									X
Fire Stations									X
Healthcare Facilities								X	X*
Primary Schools K-8								X	
Secondary/High Schools								X	
Emergency Shelters								X	
	Target in 50 Years								
X	Current Capability								

Figure 3.12: Current Conditions for Critical Facilities in the Earthquake-Only Zone

Disaster Resilience in Action:

- Waldport High School is the first FEMA tsunami acquisition project in the country. Lincoln County School District secured a bond to rebuild a new high school on the hill above the city.
- As of December 19, 2012, the Seaside School Board approved a resolution to authorize the superintendent to hire an architect to begin designing a new school campus, which would be constructed above the tsunami inundation zone. A long-anticipated bond measure to support this effort is expected to be on the ballot in May 2013.
- As of December 12, 2012, the Cannon Beach City Council agreed to acquire 55 acres to expand the city limits for a new school site above the tsunami inundation zone.

References

1. Wood, N. (2007). *Variations in City Exposure and Sensitivity to Tsunami Hazards in Oregon. US Geological Survey Scientific Investigations Report 2007-5283.*

2. Wood. N. (2012). Personal Communications

4. Critical and Essential Buildings

Introduction

Building safety and functionality will be critical both during and after a magnitude 9.0 Cascadia subduction zone seismic event. Oregon's buildings must be able to withstand the intense ground shaking without devastating loss of life, damage to infrastructure, or significant disruption to our communities and economy. Because of this, the Critical Buildings Task Group was assigned the task of reviewing the status of buildings in critical sectors and considering how they may be affected by a Cascadia subduction zone event. Buildings in these critical sectors include those that are necessary for the immediate response to the event—such as emergency operations centers, hospitals, police and fire stations, and emergency shelters—and buildings that are necessary for the provision of basic services to communities as they begin to restore functions and return to normal life—for example, schools, housing, certain retail stores, and banks. The group reviewed one additional building category: vulnerable buildings. These are unreinforced masonry and non-ductile concrete structures that have shown time and again in past earthquakes that they pose a very significant and direct threat to life safety.

While the task group acknowledges that there are many other buildings and sectors that could also be considered vital to resilience, the group decided to limit the study to those buildings that we believe are most critical to resilience in the case of an earthquake scenario. Buildings and structures that are directly associated with and critical to the functionality of communications, utilities, ports, water supply, wastewater, and fuel storage have been evaluated separately by other task groups; the assessments and recommendations of these task groups are provided elsewhere in this report.

To assess the overall seismic resilience of critical and essential buildings in the state of Oregon, the work group considered the gap between the building-performance goal needed for seismic resilience (target state) and the expected seismic performance of the buildings as they are today (current state). Most of the building sectors that are critical to the response to a seismic event are recognized by the current building code. Oregon's current seismic design standard for new buildings, the Oregon Structural Specialty Code (OSSC), classifies buildings according to four distinct occupancy categories based on their relative importance to life safety in the event of a natural disaster (see Figure 4.1). Occupancy Categories III and IV are structures that have large assembly areas (such as schools), or that are deemed essential to emergency response (such as hospitals, police and fire stations, and emergency operations centers). Buildings that fall under these Category III or IV classifications were obvious components of the Critical Buildings data set used in our evaluation. Under current code, occupancy category type III buildings are designed for a 25-percent higher seismic load than Category I and II buildings. Category IV buildings are designed for a 50-percent higher load.

Our group also looked beyond the building code to buildings that have functions that we believe are vital to the seismic resilience of the state as a whole. Supermarkets, pharmacies, some big-box retail stores, and banks comprise a subset of buildings that will be relied upon heavily following a disaster. The importance of having an ample supply of basic provisions—such as food, water, medical supplies, and money—in affected areas after a natural disaster has been underscored by many previous events, including Hurricane Katrina and the 2011 Tohoku earthquake and tsunami in Japan. If buildings that house these resources are not seismically resilient, the ability of the community to recover after the event will be adversely affected. For these reasons, the community's large retail buildings and bank buildings have been classified as critical buildings in this study.

TABLE 1604.5
OCCUPANCY CATEGORY OF BUILDINGS AND OTHER STRUCTURES

OCCUPANCY CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Occupancy Categories I, III and IV
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: • Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. • Buildings and other structures containing elementary school, secondary school or day care facilities with an occupant load greater than 250. • Buildings and other structures containing adult education facilities, such as colleges and universities, with an occupant load greater than 500. • Group I-2 occupancies with an occupant load of 50 or more resident patients but not having surgery or emergency treatment facilities. • Group I-3 occupancies. • Any other occupancy with an occupant load greater than 5,000[a]. • Power-generating stations, water treatment facilities for potable water, waste water treatment facilities and other public utility facilities not included in Occupancy Category IV. • Buildings and other structures not included in Occupancy Category IV containing sufficient quantities of toxic or explosive substances to be dangerous to the public if released.
IV	Buildings and other structures designated as essential facilities, including but not limited to: • Group I-2 occupancies having surgery or emergency treatment facilities. • Fire, rescue, ambulance and police stations and emergency vehicle garages. • Designated earthquake, hurricane or other emergency shelters. • Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. • Power-generating stations and other public utility facilities required as emergency backup facilities for Occupancy Category IV structures. • Structures containing highly toxic materials as defined by Section 307 where the quantity of the material exceeds the maximum allowable quantities of Table 307.1(2). • Aviation control towers, air traffic control centers and emergency aircraft hangars. • Buildings and other structures having critical national defense functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.1.1 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

Figure 4.1: Oregon Structural Specialty Code, Table 1604.5

Past earthquakes have brought to light the dangerous nature of unreinforced masonry (URM) and non-ductile concrete structures. Because of their tendency to sustain excessive damage or even collapse in

moderate earthquakes, these buildings pose the greatest threat to life safety of any other building type in the state of Oregon. This, along with the fact that URM and non-ductile concrete buildings can be found in all occupancy categories, was the main reason that our task group included these vulnerable buildings in our study of critical buildings.

Building Data and Analysis

After identifying the building sectors, the task group went on to identify data sources for the existing building stock that could be used for assessment of the buildings' seismic resilience. Two sources were used:

- The *2007 Statewide Seismic Needs Assessment: Implementation of Oregon 2005 Senate Bill 2 Relating to Public Safety, Earthquakes, and Seismic Rehabilitation of Public Buildings* (Open File Report 07-020) prepared by the Oregon Department of Geology and Mineral Industries (DOGAMI), hereafter referred to as the 2007 SSNA.
- The Hazus Earthquake Model developed by the Department of Homeland Security and FEMA, hereafter referred to as FEMA Hazus.

The 2007 SSNA is an assessment of existing hospitals, police and fire stations, emergency operations centers, and K-12 schools throughout Oregon. This assessment was conducted using a rapid screening method developed by FEMA to identify potential seismic hazards. The report provides evaluations of each facility, which were visited by screeners to establish a Rapid Visual Screening (RVS) score based on the FEMA 154 methodology. The data was compiled by DOGAMI, and the resulting scores were then reviewed by the structural engineers in our task group, who, in the case of emergency operation centers, police stations, fire stations, and acute care hospitals, reviewed the screening for every building and converted the RVS scores to *expected recovery* scores. These scores were then placed into the overall *Critical Building Target States of Recovery Matrix* shown in Figure 4.2. A similar procedure was also used for schools, but because of the number of school buildings, only about 10 percent of the total school building stock was reviewed directly. Additionally, the task group took into consideration tsunami inundation, liquefaction, and landslides, which were not a part of the DOGAMI study.

To assess residential buildings, community retail centers, banks, critical government facilities, and vulnerable buildings, data for expected damage estimates based on a Cascadia subduction zone event were extracted from the FEMA Hazus model, and an analysis was performed to develop *expected recovery* scores, which were then added to the overall matrix shown in Figure 4.3. Unlike the 2007 SSNA data, which looked at each individual building, the FEMA Hazus model utilizes a complex series of statistical analyses to predict damage estimates. This involves making predictions about the quantity, size, and construction of buildings in various sectors based on census data, and then calculating an expected performance for these buildings using additional statistical models. While this is a useful tool for looking at large populations of buildings, the outcomes do not correlate directly to any specific buildings. Because more detailed reports were not available, this data was used to establish *expected*

recovery scores; these are subject to a larger variation in expected results and should not be viewed with same level of reliability as those in Figure 4.2. Recovery scores developed from the 2007 SSNA report have been separated from the scores developed through the use of FEMA Hazus due to the differences between the two sources.

Target States of Recovery

With recovery scores established, the next step was to determine the recovery state that should be targeted in planning the path to statewide seismic resilience. The recovery state is the average time that should be needed to repair a building in a given sector and restore most of its functionality. For the Phase 1 target states, which are measured in hours, there is not much differentiation in the building performance, though it should be realized that just evaluating buildings, particularly in the areas most severely affected, may take several days. Buildings with Phase 2 response times are expected to require some repairs, but generally should not sustain major damage to the primary structures. Phase 3 buildings are expected to sustain significant damage, likely requiring many months to a year or more to repair. The worst building performance—expected of structures in the 18 month and 36+ month categories—will likely be at, or near, a complete loss. Many buildings can be reconstructed in 18 months with sufficient resources; the remaining collapsed buildings will likely require 36+ months.

The determination of target states was based mostly on assessing the relative importance of each of the occupancy types to the response and recovery effort after the seismic event. Buildings that house first responders or provide emergency functions are the most vital to the response effort and will need to be functional immediately after the seismic event occurs. Schools in the affected areas need to provide a level of life-safety protection for the children and adults in them during the earthquake, but could be out of service for up to 60 days without significant impacts on resilience. The exceptions are those schools designated as emergency shelters for displaced citizens after the event occurs. The availability of food, water, medical supplies, and money will also be critical to the speed of recovery of the communities affected by the seismic event. Consequently, retail centers, pharmacies, and banks will have to be able to return to normal operation in a reasonable amount of time. All of these considerations informed the development of the *target recovery* scores for each building class that are reflected in Figures 4.2 and 4.3. Note that a specific target state was not determined for vulnerable buildings. This is because the use and function of these structures varies widely. Instead, the recovery state should either match the building's occupancy category, if the building is used for a critical function, or upgrade criteria should be established based on the needs of the facility—but these criteria should not be less than life safety.

With both expected and target recovery states identified and tabulated for each building class by seismic region, the gaps between expected and target building performance can easily be seen.

Table 1. Target States of Recovery for Oregon's Buildings
Based on 2007 DOGAMI SSNA and Independent Structural Engineering Review

Infrastructure Cluster Facilities	Event Occurs	Phase 1 (hours)			Phase 2 (Days)		Phase 3 (Months)		
		4	24	72	30	60	4	18	36+
Emergency Operations Centers (Coastal)	■							X	
Emergency Operations Centers (Valley)	■						X		
Emergency Operations Centers (Eastern)	■				X				
Police Stations (Coastal)	■								X
Police Stations (Valley)	■						X		
Police Stations (Eastern)	■				X				
Fire Stations (Coastal)	■								X
Fire Stations (Valley)	■					X			
Fire Stations (Eastern)	■			X					
Healthcare Facilities (Coastal)	■							X	
Healthcare Facilities (Valley)	■						X		
Healthcare Facilities (Eastern)	■			X					
Healthcare Facilities[1] (Coastal)	■								X
Healthcare Facilities[1] (Valley)	■							X	
Healthcare Facilities[1] (Eastern)	■				X				
Primary/K-8 (Coastal)					■	■[2]		X	
Primary/K-8 Centers (Valley)					■	■[2]		X	
Primary/K-8 (Eastern)					X	■[2]			
Secondary/High School (Coastal)					■	■[2]		X	
Secondary/High School (Valley)					■	■[2]		X	
Secondary/High School (Eastern)					X	■[2]			
Emergency Sheltering (Coastal)				■				X	
Emergency Sheltering (Valley)				■				X	
Emergency Sheltering (Eastern)				■	X				

[1] Analysis includes consideration of nonstructural components

[2] Range recognizes preference for shorter time frame, but acknowledges a longer period can be tolerable.

■ **Target State** **X** **Estimated Current State**

Figure 4.2: Target States of Recovery for Oregon's Buildings Based on 2007 DOGAMI SSNA and Independent Structural Engineering Review

Table 2. Target States of Recovery For Oregon's Buildings Based on FEMA HAZUS Loss Estimations

Infrastructure Cluster Facilities	Event Occurs	Phase 1 (hours)			Phase 2 (Days)		Phase 3 (Months)		
		4	24	72	30	60	4	18	36+
Critical Government Facilities (Coastal)[1]							X		
Critical Government Facilities (Valley) [1]					X				
Critical Government Facilities (Eastern) [1]	X								
Residential Housing (Coastal)					X[2]				
Residential Housing (Valley)				X[2]					
Residential Housing (Eastern)	X								
Community Retail Centers (Coastal)							X		
Community Retail Centers (Valley)					X				
Community Retail Centers (Eastern)	X								
Financial/Banking (Coastal)						X			
Financial/Banking (Valley)					X				
Financial/Banking (Eastern)	X								
Vulnerable Buildings (Coastal)									X
Vulnerable Buildings (Valley)								X	
Vulnerable Buildings (Eastern)					X				

[1] See the *Critical Government Facilities* section (below) for a definition of this building type.

[2] Average underestimates expected performance of older houses, which are vulnerable to several structural deficiencies.

Target State **X Estimated Current State**

Figure 4.3: Target States of Recovery For Oregon's Buildings Based on FEMA HAZUS Loss Estimations

While the gaps between the target state and the estimated current state may appear large, it was our task to look beyond them and formulate a 50-year plan for closing these gaps. The Critical Buildings Task Group has therefore developed an extensive list of recommended actions that, if followed, provide a framework for achieving this objective. These recommendations, along with a proposed implementation timeline, can be found in the *Conclusions and Recommendations* section at the end of this chapter. As the building stock continues to age and the likelihood of the next Cascadia subduction zone event continues to grow, the gaps that we have identified will only continue to get larger. We cannot underscore enough the importance of taking immediate action so that the movement to an acceptable level of seismic resilience in the most essential and vital buildings in our state can begin.

Assessment of Current Building Performance: A Sector by Sector Review

EMERGENCY OPERATIONS CENTERS, POLICE AND FIRE STATIONS

Introduction

In 2005, the Oregon Department of Geology and Mineral Industries (DOGAMI) published a report titled *Statewide Seismic Needs Assessment: Implementation of Oregon 2005 Senate Bill 2 Relating to Public Safety, Earthquakes, and Seismic Rehabilitation of Public Buildings, Report to the Seventy-Fourth Oregon Legislative Assembly*. This report catalogued the vast majority, if not all, of the emergency operations centers, police stations, and fire stations within Oregon. Of the sources of data collected, 82 emergency operations centers, 109 police stations (which includes city police, state police, and county sheriff), and 595 fire stations (which includes city and rural fire protection districts) provided enough information for the Critical Buildings Task Group to reasonably assess the state of seismic resilience of each of these buildings.

Most of the buildings considered by the task group are one- or two-stories tall and are constructed from reinforced masonry or wood. The median building age is approaching 40 years. Despite the good performance record of wood structures during earthquakes, the age of these buildings and the low level of seismic design used prior to 1995 places the older structures at risk. Additionally, a number of buildings located in the coastal region are at risk of earthquake-caused tsunami inundation or large ground displacements due to either liquefaction or landslides. A number of buildings in the valley region are also at risk of significant movement due to liquefaction or landslides resulting from an earthquake. All of these factors increase the level of risk for many buildings exposed to the effects produced by a Cascadia subduction zone event.

Estimated State of Recovery

The expected state of recovery of these buildings ranges from a few buildings remaining fully functional during and immediately following a Cascadia subduction zone event, to many other buildings requiring three or more years for repair before they are deemed fully functional or are demolished. Of particular concern are the buildings along the Oregon coast, where 82 percent of the emergency operations centers, 86 percent of the police stations, and 67 percent of the fire stations will most likely take 18 months or more to resume normal operations. The buildings within the valley zone are also problematic, with 27 percent of the emergency operations centers, 38 percent of the police stations, and 31 percent of the fire stations likely to sustain damage to the extent that 18 months or more will most likely be required to resume normal operations. Therefore, instead of being able to withstand and operate during and after a Cascadia subduction zone seismic event, which is what we should expect of buildings performing these vital life-safety functions, it is anticipated that a significant percentage of the buildings that house these types of essential services will not be functional for some time after the event. Of significant concern is the longer recovery time anticipated for many of the critical buildings that are located along the coast and in portions of the valley.

Target State of Recovery

The importance of emergency operations centers, police stations, and fire stations to the post-earthquake response and recovery is widely recognized. Building codes have required for some time that these facilities be designed to a higher standard, with the intent that they will remain operational after a major earthquake. The public also recognizes that these facilities are the centers for first response, and there is consequently a general expectation that they will remain functional after the disaster. For these reasons, the target state of recovery for these facilities must be *Event Occurs* as indicated in the recovery matrix, Figure 4.2.

Sector Specific Recommendations and Conclusions

To our knowledge, a mandatory program with a formal mechanism to identify deficient structures and require their upgrade with a firm timeline does not currently exist. ORS 455.400 requires seismic rehabilitation of publicly-operated emergency operations centers, police stations and fire stations by 2022, but with the caveat of being, "subject to available funding." As a result, it appears to have had only limited effect in this and other essential and critical building sectors. Typically, the impetus to evaluate these types of buildings to determine their seismic-resisting capability is motivated at the local level, often by the public agency itself. Once the evaluation has been completed, a determination can be made about whether a particular building or group of buildings requires seismic rehabilitation. The agency will then submit a request to the voters within that community to support a general obligation bond to accomplish the needed work. This was recently done within the city of Portland, where a general obligation bond was passed in 1998 to rehabilitate the city's fire stations (See Figure 4.4). The last fire station rehabilitation was completed in 2012.

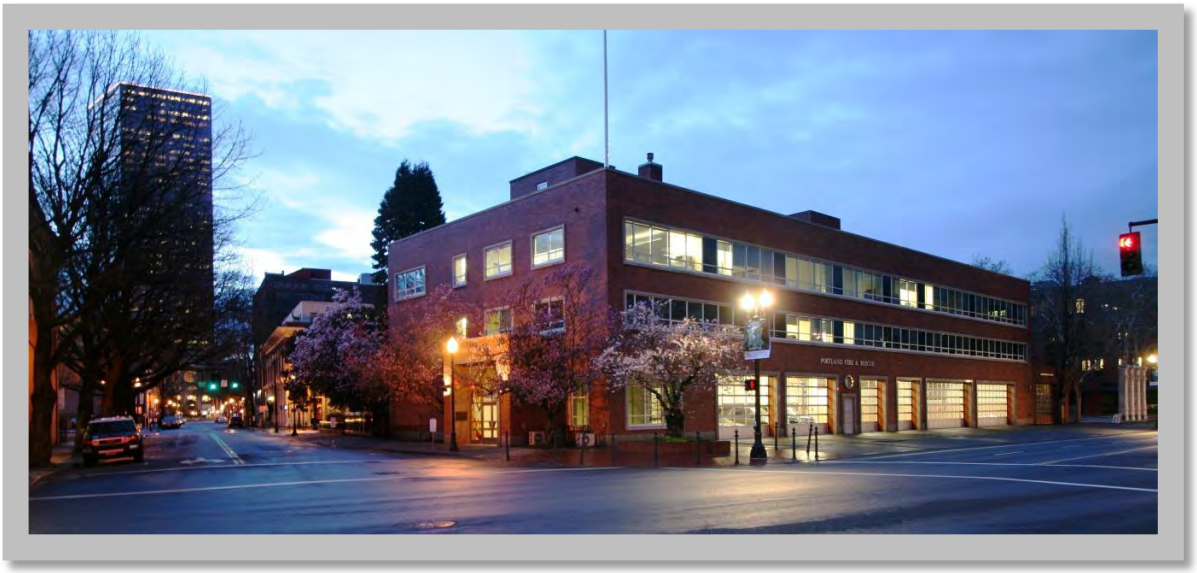


Figure 4.4: Some cities in Oregon have already started seismic rehabilitation program to strengthen the fire stations that are susceptible to serious damage in an earthquake. Fire Station #1, the largest in Portland, was retrofitted in 2009. It should now be in working order after an earthquake, serving downtown Portland. (Source: Peck Smiley Ettlin Architects)

Financing methods for the rehabilitation of public buildings are much more limited than the opportunities that exist for privately-owned buildings. As a result, general obligation bonds, or some variation thereof, are likely to be the primary method to finance the seismic upgrading of these critical facilities. Oregon Senate Bill 3 and 5 (2005) provided for the establishment and funding of a grant program for emergency services buildings to assist with upgrades of these facilities, but funding to date for this program has been limited. Public buildings ultimately must be financed, either substantially or completely, with public funds. This can only happen by implementing a broad program of education to inform the voters of the risks associated with these seismic hazards and the impact that those risks, if unmitigated, will have on their communities when the Cascadia subduction zone event occurs.

In addition to the types of public buildings discussed above, other types of critical government facilities exist, including, but not limited to, city halls, public safety answering points (PSAPs, usually termed 911 Centers), and jails. The 2007 SSNA report did not collect data on these types of facilities, and to our knowledge, no publicly-available data exists about them within Oregon, except for broad statistical data which can be inferred from the FEMA Hazus data discussed in the *Critical Government Facilities* section of this chapter (see below). Consequently, no specific, data-driven recommendations regarding the seismic resilience of these other critical government facilities have been provided as part of this report.

EDUCATION FACILITIES

Introduction

Public school facilities make up a special category of Oregon's public infrastructure. Oregon has 1,355 K-12 public schools organized in 197 school districts that are overseen by independent elected local school boards. Combined, these schools have a total of over 2,000 buildings of various structural types, sizes, and vintages, including numerous buildings that are more than a century old.

Schools are among the most heavily used public buildings in Oregon and one of a few classes of buildings whose occupants' presence is compulsory. In 2010, the Western States Seismic Policy Council (WSSPC) adopted a policy recommendation that states, "Children have the right to be safe in school buildings during earthquakes" (WSSPC, 2010). Based on the findings of the Critical Buildings Task Group, the state of Oregon is far from meeting this ideal of student safety today.

The 2007 Statewide Seismic Needs Assessment (SSNA) employed the FEMA 154 Rapid Visual Screening (RVS) methodology to characterize the structural performance of buildings by placing them into one of four broad categories of collapse potential. Of the full sample of 2,018 K-12 educational facilities assessed using the FEMA 154 methodology, 12 percent rated Very High, 35 percent rated High, 23 percent rated Moderate, and 30 percent rated Low collapse potential (Lewis, 2007). The assessment focused on school facilities constructed before 1994, although some more recent buildings were included. Of the buildings assessed, roughly 80 percent were built before Oregon first adopted a statewide building code in 1971, and 60 percent are more than 50 years old. The assessment revealed

that inadequate or non-existent seismic design is pervasive in every region of Oregon, and that seismic retrofit investment at the school district level has been limited.

Schools are typically large, complex buildings with plan irregularities that will be sources of poor seismic performance. Many schools are campuses that are comprised of multiple buildings of varying sizes and construction dates, and often varied construction materials. Primary, K-8, and high schools generally consist of one- or two-story wood-frame or concrete masonry unit (CMU) and concrete buildings with flexible roof diaphragms. One- to three-story lightly-reinforced concrete buildings braced by concrete shear walls, concrete tilt-up buildings, and unreinforced masonry (URM) buildings are also common.



Figure 4.5: The previous Molalla High School building, a three-story unreinforced masonry structure, was damaged from the M5 .6 Scotts Mills, Oregon earthquake in 1993. It happened during spring break, when the school was empty, which prevented serious injuries. The district took the opportunity to forecast future needs and decided not to rebuild at the same location. Molalla High School is now housed on a larger campus with a stronger, more spacious building. Many URM schools and other buildings in Oregon could suffer a similar fate in future earthquakes. Communities can act now to plan how and when to rehabilitate or replace these aging, potentially dangerous facilities. (Source: DOGAMI)

The building stock of Oregon's K-12 schools possesses seismic vulnerabilities that are common to the specific building types of which it consists. Unreinforced masonry (URM) buildings historically perform poorly in seismic events and are the most dangerous existing building type in the school building stock (See Figure 4.5). Many 1930s-era multistory schools rely on lightly-reinforced concrete shear walls that are historically poor performers as well. Wood framed schools should perform well provided they are well constructed, even though many of them pre-date building codes. These wood buildings may possess deficiencies, including weak or missing roof-to-wall connections, and weak or missing anchorage of walls to foundations—all of which could contribute to poor seismic performance. Concrete tilt-up buildings have also proven to perform poorly in earthquakes. Newer tilt-up buildings have been improved by code changes adopted following the 1994 Northridge earthquake in California, but older tilt-up buildings, and even CMU buildings, may remain vulnerable due to poor connections between heavy rigid walls and flexible roofs. Modular classrooms may also be vulnerable, because they may have insufficient connections to their foundations. In addition, many schools contain unsecured and inadequately braced nonstructural components that may present falling hazards during a seismic event (See Figure 4.6).



Figure 4.6: Pendant light fixtures failed in this elementary school library during the 1983 M6.5 Coalinga, California earthquake. If the room had been occupied, this could have caused injuries. Bracing nonstructural elements in homes, schools, and offices can often be done easily and relatively inexpensively. (Source: NOAA/NGDC, Earthquake Engineering Research Institute)

Estimated State of Recovery

The 2,377 educational facility records in the 2007 SSNA were too numerous to be analyzed individually by members of the educational facilities subgroup. Our analysis and results are based on a random sample of approximately 300 records (224 primary school buildings and 79 secondary school buildings) that were selected as representative of the broader data set. We classified the building records into the appropriate geographic seismic zone (coast, valley, and eastern) and verified that we had assembled an adequate sample size for each zone.

Our analysis revealed that in a Cascadia subduction zone earthquake scenario, pervasive structural vulnerabilities would likely result in recovery durations of 18 months or longer for primary and secondary schools in the seismic zones of the coast and valley. Primary and secondary schools in the eastern seismic zone are expected to have recovery times of 60 days or less, mainly due to the minimal level of ground motion expected in that geographical area.

Target States of Recovery

Giving consideration to the prioritized needs of the entire community for resilience and recovery, returning children to school within 30 days is preferred. However, it was also the opinion of the task group that a disruption of the public education system for up to 60 days could be tolerated without having a major impact on communities and students. This determination was based on several considerations:

- School buildings will not initially be as critical to the recovery as most other critical buildings included in our study. The exception to this would be those schools that are needed as emergency shelters, and as such, should have a target state of recovery of 72 hours.
- Teacher/employee contracts can be adjusted to accommodate a 2 month stoppage of work more readily than employee contracts in many private businesses.
- Temporary facilities, including portable buildings and large buildings that are undamaged after the event, can be employed to serve some of the more immediate needs of education until full recovery is achieved.

Discussion and Sector Specific Recommendations

Oregon's K-12 educational facilities have been the focus of seismic rehabilitation policy efforts for more than a decade. In 2001, legislation (ORS 455.400) directed that, subject to available funding, K-12 educational facilities with seismic deficiencies should be rehabilitated to a life-safety performance level by 2032. In 2002, Oregon voters adopted ballot measures amending Oregon's constitution with Articles XI-M and XI-N, provisions that allow the state to issue general obligation bonds for the purpose of seismic retrofits to existing schools and emergency response facilities. In 2005, a series of bills (Senate Bills 2, 3, 4, and 5) directed DOGAMI to organize and conduct the *Statewide Seismic Needs Assessment*,

directed Oregon Emergency Management to establish a seismic rehabilitation grants program, and allowed the Department of Administrative Services and the Oregon State Treasurer to issue bonds to finance seismic rehabilitation.

In 2007, Senate Bill 1 provided funding to establish and staff the seismic rehabilitation grants program. The first opportunity to authorize a bond sale for an inaugural round of seismic retrofit grants came in the 2009-2011 biennium. The legislative assembly authorized $30 million for seismic grants, divided equally between the program for K-12 schools and the companion program for emergency response facilities. The first round of K-12 grants directed $5.6 million to projects at twelve schools in eight school districts in the spring of 2010. As the recession deepened, the governor chose to rescind $7.5 million of the original authorization for the program, limiting additional granting during 2009-2011. Three additional seismic grants were awarded to K-12 schools (including two URM buildings) in early 2011. These grants marked the end of the first funded cycle of the program.

On the final day of the 2011 legislative session, the legislature authorized $7.5 million in new seismic grants for K-12 schools during the 2011-2013 biennium. These grants, announced in Fall 2011 and funded by a bond sale in July 2012, directed $7.2 million to seven K-12 schools. To date, the Seismic Rehabilitation Grants Program has funded retrofit projects at 22 schools, about 2 percent of the need documented by the *Statewide Seismic Needs Assessment*.

During the short 2012 session of the legislative assembly, legislators passed Senate Bill 1566. The bill directs the state's Department of Education, which communicates with parents about student achievement and school performance via an annual report card, to inform the public in that report that a database of seismic ratings exists and to provide a web link to the ratings. Further, the bill asks school districts to advise DOGAMI when they rebuild or renovate schools, so that the state can share information about the upgrades. The first reports submitted by individual school districts are now posted on the DOGAMI website, although the agency has no funding to integrate information from the reports in an update of the statewide database itself.

Given both the limited impact that existing policies have had on restoring resilience in Oregon's schools and the uneven success that Oregon school districts have had passing local capital bond measures for school rehabilitation and construction in recent years, an evaluation of Oregon's approach to characterizing and addressing the seismic vulnerability of school facilities is in order. Past outreach using the results of the *Statewide Seismic Needs Assessment* has emphasized the threat to life safety and the possibility of mass casualties in collapsed school buildings. By contrast, the gap analysis we have performed as part of this resilience study focuses on quantifying the state's ability to resume public education after a region-wide Cascadia subduction zone earthquake, given what is known about the condition of the state's school facilities. With the anticipated level of damage to those facilities, the disruption of public education could extend considerably beyond a full school year, particularly in the coast and valley regions—a factor that could impede Oregon's economic and social recovery for years after the Cascadia subduction zone earthquake.

HEALTHCARE FACILITIES

Introduction

There are 60, mostly privately-owned, healthcare facilities within the state of Oregon, with the majority of the buildings being over 40 years old. Each healthcare facility is comprised of either a single building or multiple buildings that form a campus. Roughly 180 structures within all of the 60 healthcare facilities serve critical healthcare functions. There are additional buildings within each healthcare facility's campus that have not been included in this study because they do not serve acute care needs and are not considered essential.

In essential healthcare buildings, the most prevalent construction material is concrete, with approximately 70 percent of concrete structures relying on concrete shear walls to resist lateral loads and the remaining structures relying on concrete moment frames. The second most prevalent construction material is steel: approximately an equal distribution using steel braced frames and steel moment frames to resist lateral loads. Reinforced masonry and wood are seen more often in the smaller structures located in the coastal or eastern zones.

The most notable structural lateral-system vulnerabilities found within healthcare facilities are the non-ductile concrete and non-ductile steel frame buildings. These building structures were typically constructed before the increased seismic risk in Oregon was well understood in the early 1990's, and before substantial code changes were made to require more robust connections that are better able to resist seismic forces.

Independent of the type of lateral system, two very notable structural irregularities that typically create problems were found in many of the healthcare buildings. The first is a horizontal irregularity in the footprint of the building. Seismically, the most reliable shape for a floor plan of a building is a square or a rectangle. The least reliable shapes are T, E, L, and X configurations or variations of these. In association with these irregular shapes, many problems occur at parts of the structure called *reentrant* or *interior* corners, which do not occur in a rectangular floor plan. The second notable structural irregularity is a vertical irregularity, which occurs when the building steps back in plane as the floor levels increase.

Historically, performance of healthcare facilities around the world has been extensively affected by nonstructural damage. The ability of a healthcare facility to function is greatly dependent on the nonstructural items within that facility. The building's structure may perform very well during the expected earthquake, but the hospital might not be functional after such an event due to nonstructural damage alone. Nonstructural vulnerabilities typically includes lack of proper anchorage of mechanical, electrical, and medical equipment and lack of proper bracing of ceilings, pipes, ductwork, electrical elements, medical gas such as oxygen, and other critical service lines. Healthcare facilities are often campuses made up of multiple buildings, which include those that provide healthcare and often a central utility plant (CUP) or a central building that contains a large number of pieces of essential equipment (such as boilers and air handling units) that support the rest of the campus. Although this

central building may not provide healthcare directly, it is considered a vulnerability, because damage to its structure and contents can have a great impact on the entire campus' utilities and ability to function.

Estimated State of Recovery

Currently, essential healthcare facilities in Oregon are not expected to perform well during a Cascadia subduction zone seismic event. The facilities on the coast and in the valley will likely take over three years to recover to an operational state. Some facilities in eastern Oregon will take approximately 30 days to recover to an operational state.

Target State of Recovery

Essential healthcare facilities are critical for the life safety of the entire population and must be capable of surviving the expected Cascadia subduction zone seismic event. This survival requires that the buildings remain completely functional during the event and be available to respond to emergency needs immediately following the earthquake and any aftershocks that may occur. For these reasons, the target state of recovery for these facilities must be *Event Occurs* as shown in the Recovery Matrix.

Sector Specific Recommendations

As outlined in the 2011 Oregon Revised Statutes (ORS 672.107), *significant structures* must be designed under direct supervision of a licensed structural engineer. Hospitals and other major medical facilities that have surgery and emergency treatment areas are considered *significant structures* or *essential facilities* according to ORS 455.447. Standby power generating equipment for essential facilities is also considered *essential* and is covered under ORS 672.107. However, buildings that contain the balance of equipment required to keep these vital facilities functional are not considered *essential*, and therefore are typically designed to a lesser seismic standard. In order for critical healthcare facilities to be truly resilient, all buildings that provide mechanical, electrical, and plumbing service to the buildings must be designed to the same standard. This shift will require revisions to the building code and an expanded definition of *essential facility*.

In 2001, legislation (ORS 455.400) directed that, subject to available funding, acute inpatient care facilities that are determined to pose an "undue risk to life" should be rehabilitated to a life-safety performance level by 2022. Currently, to our knowledge, most of the deficient acute care facilities in the state have not been upgraded in accordance with this legislation. By having the "subject to available funding clause" in the statute language, the legislation does not provide a mandate and therefore is not proving to be effective in addressing the problem. A more effective mandate should include specific measures that would give private healthcare systems incentives, whether tax credits or some other vehicle, to make seismic improvements.

A facility's buildings and internal infrastructure are not the only factors to take into consideration when assessing the facility's ability to operate without interruption after the expected Cascadia subduction zone seismic event. Healthcare facilities are also dependent on the city for their water, on distribution-center buildings for supplies, and on roadways for the delivery of supplies, to name only a few things.

Healthcare facilities do not have control over any of these components. It is therefore recommended that healthcare facilities maintain a minimum thirty-day supply of all items that come from external sources; this should include water, fuel, and medical supplies.

EMERGENCY SHELTERING

Shelter as an essential part of disaster recovery and resilience, and the need for it is great. Many facilities throughout the state are listed as designated emergency shelters by local jurisdictions and the state Office of Emergency Management. The most common buildings on these lists are schools and churches, followed by other miscellaneous buildings (including community centers) that have the capacity to hold large numbers of occupants. The expected and target states of recovery for school buildings can be found in the *Education Facilities* section of this chapter (above). As with all building sectors, the performance of churches and other facilities in a Cascadia subduction zone event will be a function of the building's vintage, construction type, and geographical location. In general, the expected and target states for churches should, at a minimum, match those of school facilities with similar construction.

Discussion of recommendations for buildings designated as emergency shelters can be found in the *Conclusions and Recommendations* section at the end of this chapter.

CRITICAL GOVERNMENT FACILITIES

Introduction

Critical government facilities are those buildings that are necessary to the continuing operation of essential services following a significant event. The most obvious of these—police stations, fire stations, and emergency operations centers (EOC)—are addressed separately in this report. Other services, however, which may include some limited administrative functions and essential health services, and certain structures, such as correctional facilities and even the maintenance buildings that are needed for repairing roads and utilities following the earthquake, are also necessary. Compiling a specific list of these services and their associated facilities was beyond the scope of this report—but in many ways, such a list was not necessary to get a general overview of how these facilities may perform.

Estimated State of Recovery

Data for general government facilities was available from the FEMA Hazus damage estimates and was reviewed to determine the resilience scores included in the resilience matrix. The statistical analysis from Hazus was based on an estimated 2,357 government buildings located throughout the state—this estimate represents the total number of government buildings, not all of which are critical to statewide resilience. We assumed that both the non-critical buildings and the remaining critical buildings (those not included in the assessment of police, fire, and EOC facilities) will generally behave in a similar manner. We were therefore able to determine with reasonable certainty the level of performance that can be expected.

The construction types anticipated by Hazus statistics are primarily steel and concrete prior to 1950, with about 20 percent of the inventory being shared between wood and unreinforced masonry (URM). These construction types change for construction periods between 1950 and 1970. The post-1970 distribution still anticipates concrete and steel, as well as some wood, but much more prevalent is reinforced concrete masonry (CMU), which is now estimated to comprise about 25 percent of the building stock.



Figure 4.7: Several states have rehabilitated their state capitol buildings. The Utah State Capitol was seismically retrofitted with base isolation to protect visitors and occupants and preserve historic fabric in the building. (Source: State of Utah)

Target State of Recovery

The target states of recovery for these facilities will vary depending on the facility. An average target state was estimated to be 30 days, although the task group recognized that some buildings may need to be immediately serviceable (correctional institutions, for instance), while other critical functions may not be immediately needed and could wait several weeks before coming back into service. It will be necessary for the state and local governments to determine which functions are critical for resilience and then inventory and evaluate the associated facilities, before eventually prioritizing and upgrading the deficient structures.

RESIDENTIAL HOUSING

Introduction

Following an earthquake, people must have shelter—it is one of the basic elements required for resilience. In some cases, such as when a person's residence has been damaged and is not safe to occupy or when people are temporarily unable to reach their homes, this need may be met by emergency shelters. Emergency shelters, however, cannot provide for everyone. For a large segment of the population, primary residences must serve as shelters, although in many cases, they will be without power and running water. In the absence of such residential shelters, the humanitarian needs of the population following a large earthquake grow tremendously. Post-earthquake response can also be impeded if emergency responders must first devote time to finding shelter and safety for their own families before they are available to help others.

In the state of Oregon, single-family residential homes make up the largest portion of residences, and therefore, potential shelters. The U.S. Census data for 2010 place the number of residential dwelling units in Oregon at approximately 1.6 million. FEMA's Hazus program, which was used for this review, estimates that there are approximately 960,000 single-family homes; this is generally consistent with similar census estimates.

Construction of single-family homes is almost entirely of light wood framing. Historically, these buildings have generally performed well in seismic events. One- and two-story wood frame buildings are relatively light-weight compared to other structures, and will usually see larger forces from a design-level wind storm than from a significant earthquake, since seismic forces are (in part) a function of the structure's weight.

However, the details of a wood frame structure's construction have a lot to do with its ability to withstand earthquakes, and certain common vulnerabilities make these buildings susceptible to earthquake damage, particularly if they were built before 1976. One of the most common deficiencies is a lack of adequate anchorage between the upper wood frame structure and the concrete foundation or basement walls. Another common deficiency can result in the failure of cripple walls, which are short wood framed wall segments that typically extend from a foundation to the floor above. Frequently, these lack proper connections and can easily rotate in a manner similar to a hinge, allowing the building to shift laterally off of its foundation (see Figure 4.8). In older structures, unreinforced masonry chimneys can fall and cause additional structural damage.

Multifamily housing is also at risk. Depending on construction type and size, these buildings will typically have more seismic risk compared to single-family homes. Construction of multifamily buildings ranges from light wood frame construction, unreinforced masonry, to steel and concrete. The apartment buildings built of unreinforced masonry apartment buildings are particularly vulnerable.



Figure 4.8: This residential building shifted on its foundation after the 1989 M 7.1 Loma Prieta, California earthquake. (Source: NOAA/NGDC, C. Stover, U.S. Geological Survey)

Estimated State of Recovery

Using statistical data from FEMA's HAZUS program, the task group reviewed estimated damage data for single-family residences. The average estimated recovery duration for residences on the coast was less than 30 days, which may be low considering the intensity and duration of ground shaking that will likely result from a Cascadia subduction zone event in this area. In the valley, the estimated recovery duration is 72 hours, which again may underestimate the damage. The eastern zone is expected to have negligible damage (again based on the Hazus estimates). These results are compared with a target state of recovery of 30 days, which is based on the need for shelter as an essential part of disaster recovery and resilience.

The recovery time of multifamily housing was not reviewed by the task group. Recovery time for smaller light wood framed buildings will be similar to single family homes. Larger buildings of other construction types will have longer recovery times. The loss of low income multifamily housing will affect economic recovery.

Sector Specific Recommendations

Improving existing structures will require significant education of homeowners, who need to understand the risks, the potential costs, and the steps necessary to evaluate and correct deficiencies. Additionally, common structural deficiencies should be noted during home inspections at the time of purchase. It is

likely that homeowners will bear the majority of the expenses for upgrading deficient structures; however, financial incentives, such as tax credits and low interest loans, might be considered to encourage improvements if future evaluations, based on more complete data, show unacceptable damage estimates.

Outreach should seek to provide education and resources for homeowners. A number of such tools are already available, though not widely known. FEMA provides a number of publications on their website for homeowners, such as FEMA-530 Earthquake Safety Guide for Homeowners. The City of Portland has also created a guide, Brochure #12-*Residential Seismic Strengthening – Methods to Reduce Potential Earthquake Damage* and provided additional information on the Bureau of Development Services website at www.portlandoregon.gov/bds.

COMMUNITY RETAIL CENTERS AND BANKS

Introduction

There are thousands of community retail centers and banks within the state of Oregon. These types of facilities have been deemed critical buildings because of their importance to the post-disaster recovery of communities throughout the state. The most important of the many community retail buildings in the state are large supermarket and pharmacy chain stores, which have large inventories of supplies that will be in high demand following a disaster. Many of these large chains have remote storage and distribution centers that will be of equal importance for supplying goods to damaged communities. Banks also have an important role in Oregon's seismic resilience, as they will be critical to processing vital financial transactions for businesses and consumers as they recover from the disaster. Although many banks have emergency response plans in place, if the buildings they are housed in perform poorly during an earthquake, overall resilience will be compromised.

FEMA's Hazus analysis includes a wide variety of commercial buildings, including some overlap with other structures evaluated separately in this report using different analysis methods. However, part of this large group of commercial buildings includes wholesale and retail buildings and banks, which were reviewed to estimate the resilience of these structures. A specific estimate of building quantities for this subset was not available, but the statistical analysis considered their construction types, general age, and historical performance. The number of retail and bank buildings in each county was assumed to be proportional to the overall distribution of commercial buildings.

Structural Vulnerabilities

The construction types anticipated statistically by Hazus for retail buildings vary with the building's age. Prior to 1950, wood, steel, concrete, concrete masonry (CMU), and even unreinforced masonry (URM) were common. As construction practices changed, buildings shifted toward larger stores, and the post-1970 Hazus statistics reflect this, with greater use of CMU and concrete, including precast (or tilt-up) construction which began to see much wider use after 1970. Statistics for bank buildings also reflect

some similar shifts in construction, moving away from steel and unreinforced masonry after 1950 and toward more wood frame, CMU, and concrete construction.

Today, most big-box stores, supermarkets, distribution warehouses, and pharmacies are housed in concrete masonry (CMU) or tilt-up concrete structures with light-framed wood or steel roofs. Buildings of this type that were constructed prior to 1995 have historically not performed well in earthquakes. The seismic vulnerabilities of these buildings were highlighted in the aftermath of the 1994 Northridge earthquake. The most prominent structural failure in this building type has been the connection between the light framed roof and the relatively heavy exterior walls, which led to partial or full roof collapse (see Figure 4.9). Building code provisions for the design and construction of the roof/wall connections were enhanced following the Northridge earthquake, with requirements for a higher degree of resistance being incorporated in the 1997 UBC and subsequent building codes. As a result, buildings of this type that were built after approximately 1995 should have a higher degree of resilience than those built prior to that year.



Figure 4.9: Several tilt-up concrete panels of this construction material supply store in Concepcion fell away from the building, causing the roof framing to collapse after the M 8.8 February 27, 2010 Maule Chile earthquake. (Source: Kent Yu, Degenkolb Engineers)

Banks are different from big-box stores in that they are housed in a multitude of structures, including stand-alone one-story wood framed buildings, unreinforced masonry or non-ductile concrete buildings, and steel and concrete high-rise buildings. The seismic performance of these buildings will vary based on their location, vintage, and construction type; however, structural vulnerabilities are present to some degree in a large percentage of the existing building stock.

During an earthquake, many existing community retail and bank structures could also suffer extensive damage to nonstructural elements and components within the buildings. Nonstructural elements include, but are not limited to, mechanical, electrical, and plumbing systems and associated equipment, lighting fixtures, suspended ceiling and soffit systems, and unsecured storage racks and display shelving. These elements can be a falling hazard during a seismic event, impeding occupants from safely exiting the building, disrupting the operation of the facility, and extending the time it will take to restore the building to normal operation.

One unique aspect of retail and bank buildings is that they are almost exclusively privately owned. This makes establishing and enforcing building seismic upgrade requirements and mandates for these occupancies particularly difficult.

Estimated State of Recovery

The expected average time of recovery to normal operation for community retail big-box, supermarket, and pharmacy buildings after a Cascadian subduction zone seismic event is four months for Oregon's coastal region and 30 days for the valley region. The recovery duration for these types of buildings in eastern Oregon is expected to be nominal, mainly due to their distance from the earthquake source.

The recovery time for bank buildings after the Cascadia subduction zone seismic event is estimated at 60 days for Oregon's coastal region and 30 days for the valley region. As in the case of the community retail centers, the recovery duration for banks in eastern Oregon is expected to be nominal.

A critical aspect of the resilience of this building class is the degree to which the business' ancillary facilities, provided they are not located within the high seismic hazard zone, can provide support to and replacement of the functions of the damaged facilities. While this aspect was not considered in our analysis, it is possible that the actual impact of the Cascadia subduction zone event on the functionality of these buildings could be lessened if protocols are in place to replace their functions remotely. Additionally, it should be noted that the efficiency of the distribution of goods, services, and medical prescriptions to the general public has increased with the advent of one-stop-shop, big-box retailers that typically occupy newer tilt-up concrete or masonry (CMU) structures that have been designed and built to more stringent seismic code requirements. It is likely, however, that after the Cascadia subduction zone seismic event, the inventory in these facilities will be quickly depleted, so overall seismic resilience will depend upon the condition of ancillary facilities, including distribution warehouses, data centers, roads, bridges, and highways.

Target State of Recovery

The suggested statewide target state of recovery for community retail centers and banks is 30 days. This timeframe is primarily due to the importance of having goods, services, and medical prescriptions available to the general public after a significant seismic event. The assumption behind this target is that facilities in areas unaffected by the earthquake will be able to fill the needs of the public remotely until the damaged buildings can be repaired. This target state is also consistent with both the performance expectations behind code provisions for new buildings of this occupancy category and the recommendations of the Business Continuity Task Group that took part in the development of Oregon's resilience plan.

Sector Specific Recommendations

As community retail centers and banks are normally privately owned, the ability to mandate building upgrades with public funding is minimal. Therefore, seismic upgrades of deficient existing buildings will most likely need to be incentivized through tax credits or other similar means. Mandates, tax credits, and other incentives (whether singly or in combination) should also be developed to require or strongly encourage the building owners and tenants to properly brace and anchor deficient nonstructural elements within their buildings, as it is anticipated that nonstructural damage resulting from the Cascadia subduction zone earthquake will have a significant impact on the seismic resilience of these building types.

For the existing building stock in this sector, the redundancy of critical business continuity elements, such as distribution of goods and data, remote accessibility and support, and availability of personnel, should be assessed by each company. This redundancy is vital to achieving the 30-day target state of recovery over the entire state of Oregon.

Finally, improving awareness—both within businesses and among the general public—of the seismic vulnerabilities of the existing community retail centers and banks is critical to moving toward a more resilient Oregon. Developing a seismic resilience rating for existing retail and bank building stock could serve as an effective tool for these businesses as they select buildings to lease or prioritize buildings for upgrades. As part of this rating program, common seismic vulnerabilities could be explained in layman's terms, in an effort to improve public awareness and understanding of Oregon's current seismic resilience status.

VULNERABLE BUILDINGS

Introduction

For the purposes of this evaluation, vulnerable buildings are defined as unreinforced masonry (URM) and non-ductile concrete structures. These building types are classified as critical buildings in this study because they represent the most significant threat to life-safety and historically exhibit extremely poor performance in seismic events (see Figures 4.10 to 4.12). URM buildings are constructed with clay brick, hollow clay tiles, or concrete block, with little or no reinforcement. Most of these buildings in Oregon

were originally built prior to 1940, and the majority has undergone no seismic improvements since they were constructed. Non-ductile concrete buildings have been historically susceptible to extreme damage in moderate to severe seismic events and have very little steel reinforcement. These buildings range in age from 40 to 100 years and are generally one to five stories in height. These vulnerable buildings represent a building *type* rather than an occupancy *use* and, as such, they can be found in many occupancy uses, including essential facilities (such as fire and police stations), retail centers, restaurants, residential buildings, and commercial office buildings.



Figure 4.10: Christchurch Cathedral of the Blessed Sacrament, New Zealand after the M 7.0 September 3, 2010 Darfield earthquake [Source: NOAA/NGDC, Steve Taylor (Ray White)]



Figure 4.11: The fourth-story wall of this unreinforced masonry building on Bluxome Street in San Francisco collapsed onto the street, killing five people in their cars, during the M7.1 October 18, 1989 Loma Prieta, California earthquake. (Source: NOAA/NGDC, E.V. Leyendecker, U.S. Geological Survey)



Figure 4.12: This non-ductile concrete frame medical building collapsed during the 1994 M6.8 Northridge, California earthquake. (Source: NOAA/NGDC, J. Dewey, U.S. Geological Survey)

Estimated State of Recovery

Based on the limited information available for these types of buildings throughout the state (other than those that were already addressed in the other occupancy use categories discussed above), recovery timelines were estimated based on FEMA Hazus data provided by the Oregon Department of Geology and Mineral Industries (DOGAMI). Categories included URM buildings only; specific data was not available for non-ductile concrete structures. Hazus software operates through a geographic information system (GIS) to display earthquake hazard information, inventory data, and estimated losses, which approximate building damage from a particular seismic event. The Hazus data used for this study was based on a Cascadia subduction zone earthquake as well as the age and construction type of the buildings. In addition, the Hazus data assumes that all structures were designed prior to the incorporation of seismic provisions in the building code.

As expected, the data in Figure 4.3 indicates that most of these buildings will experience either significant structural damage or partial to total collapse. Accordingly, most of the vulnerable building stock in the coastal and valley regions will require major repairs or wholesale replacement. Buildings in eastern Oregon will experience ground shaking levels similar to or greater than those that URM buildings experienced during two previous Oregon earthquakes: Scotts Mills and Klamath Falls. Because the Cascadia subduction zone earthquake will likely be of much longer duration than these two previous events, it has the potential to cause even more damage. For this reason, the expected recovery duration for vulnerable buildings in eastern Oregon was determined to be 30 days.

It should be noted that these recovery times are based on a Cascadia subduction zone earthquake, which may not result in the highest possible ground shaking intensities in some parts of the valley and eastern Oregon, but would likely have a longer duration. Other hazards, such as soil liquefaction, landslides, and tsunamis, were considered in the projected states of recovery. DOGAMI's recent studies indicate that soil hazards exist in all three regions of the state, and many coastal regions are located in a tsunami inundation zone, which increases the vulnerability of these buildings.

Because hard data related to nonstructural components in vulnerable buildings was not readily available, the performance of these components was not a consideration in determining the recovery scores. It is likely, however, that the damage to the primary structure of these buildings will override that of nonstructural components in terms of effect on resilience.

Target State of Recovery

As mentioned above, vulnerable buildings can be found in many different building occupancy uses. Consequently, the reader should refer to the *Target State of Recovery* discussions in the occupancy-based sections of this chapter to develop an understanding of the gap between the projected and recommended performance of these buildings.

Codes, Past Legislation, and Funding Sources

A few jurisdictions have adopted code language mandating seismic upgrades for these types of buildings (primarily URMs) to varying degrees. For legislation, or funding sources, refer to each sector-specific section of this chapter and to the following recommendations.



Recommendations

Recommendations are provided below for Oregon's critical and vulnerable structures with the goal of achieving a resilient state. In making these recommendations, the task group recognized that not all buildings are critical and necessary to achieve resilience. Many buildings are expected to perform reasonably close to their target states in the eastern part of the state, where the seismic design category is low. Residential buildings are expected to perform reasonably well, although older homes need to be tied to their foundations and older multi-family buildings are at risk.

Leadership and resources are needed for adopting standards and policies, evaluating and inventorying buildings, and rehabilitating structures. Creating a State Resilience Office that could outline the steps required for creating seismic resilience, should be a priority. This Office can take into consideration the gaps between existing and target states of recovery and critical building functions. It can also coordinate with resiliency efforts in the other sectors (such as transportation, energy, etc.)

It is imperative, however, that implementation and funding for seismic resilience not be delayed while we wait for a full inventory, definition, and budgeting of the problem. More than enough is already known to begin making strides toward resilience. Whether the journey before us is a thousand miles or ten thousand miles, we should start moving forward now; additional inventories and studies should be made as we progress along the way.

IMMEDIATE ACTIONS

► **Establish a State Resilience Office**

- *Finding*: The State does not currently have person or office to provide the resources and leadership necessary for coordinating and implementing a statewide seismic resilience plan.
- *Recommended*: Establish and fund a State Resilience Office(r) to provide leadership, resources, advocacy, and expertise in implementing a statewide resilience plan.

► **Prioritize Education**

- *Finding*: There is a great need for education and awareness of the impact of a Cascadia subduction zone event, and how to prepare Oregon to be resilient to that impact.
- *Recommended*: Programs should be encouraged and implemented to provide a broad range of education, public awareness, and public relations regarding Cascadia subduction zone risks and State resilience.

► **Complete an Inventory of Critical Buildings**

- *Finding*: A complete statewide inventory of critical buildings does not exist, but is needed for future planning, assessment and upgrading of critical building structures.
- *Recommended*: An inventory, compiled within five years, should include an initial seismic screening of each building and updates to the existing inventory. More detailed evaluations should be completed for those buildings identified by the initial screening to be the most susceptible to damage from an earthquake.

► **Include Inspection in Emergency Response**

- *Finding*: There will be immediate demand for safety inspections of critical buildings (both public and private) following a Cascadia earthquake.
- *Recommended*: Strengthen the existing database of ATC-20 certified post-earthquake inspectors, establish procedures for their engagement and response following an event, and strengthen Good Samaritan laws to protect them. Expand database and training for ATC-45 of certified post flood and wind inspectors.

SUSTAINED ACTIONS

► **Prioritize Essential Facilities**

- *Finding*: The estimated current state of hospitals, Emergency Operation Centers, fire and police stations falls significantly short of the target state need for these facilities to be immediately available following the CSZ event.

- *Recommended*: Hospitals should be upgraded within 15 years of completing an inventory and seismic evaluations. Emergency Operation Centers, fire and police stations should be upgraded within 20 years if the building is a URM or non-ductile concrete structure, or 30 years if it is of other construction. Non-structural elements in these buildings should also be upgraded within the same timeframes, and ORS 455.400 should be strengthened and updated for consistency with these recommendations. Create publicly accessible database that shows annual seismic performance data for essential facilities.

► **Fully Fund the Seismic Retrofit of K-12 Schools**

- *Finding*: The current average estimated state of recovery for K-12 school facilities in the Coast and Valley regions of Oregon falls significantly short of the recommended target state, despite an existing statute directing seismic retrofit by January 1, 2032.

- *Recommended*: Fully fund state investment in seismic retrofit of schools; prioritize the replacement of structure types that present the greatest hazard to their occupants in a seismic event; promote ASCE- 31 (or equivalent) engineering assessment of existing school facilities; and update the state's database of public school facilities on a regular basis.

► **Expand the Passive Trigger Seismic Strengthening Program**

- *Finding:* The existing building code includes triggers that require building upgrade for a change of occupancy or increase in structural loads, but does not go far enough, allowing major building upgrades to deficient structures without requiring seismic strengthening.

- *Recommended:* Encourage local jurisdictions to adopt the triggers for seismic upgrade to include changes in the level of occupancy risk, major building renovations, and re-roof of URM and non-ductile concrete buildings. Give seismic upgrades the highest priority for non-conforming upgrades, and allow them to be phased over 10 years if needed.

► **Accelerate the Retirement or Full Upgrade of Vulnerable Buildings**

- *Finding:* Unreinforced Masonry (URM) and non-ductile concrete buildings are generally the most dangerous types of buildings in an earthquake, and should not be allowed to remain in service indefinitely unless they are fully upgraded.

- *Recommended:* Initially, the danger of URM and non-ductile concrete buildings should be disclosed at the time of building sale or lease. Through market pressures and upgrades triggered by other building repairs and changes, upgrades can be made to many of these structures.

► **Improve Plan Review and Construction Oversight**

- *Finding*: Structural plan reviews are often performed by individuals who would not otherwise be qualified to provide the design being reviewed. Special inspections and structural observations are not currently required by code for certain structure types and structural elements important for resilience.

- *Recommended*: Require a licensed design professional or structural engineer provide plan reviews for critical buildings (Cat. 3 & 4) reciprocal with the licensing required to provide the design. Strengthen state building code to expand Special Inspections and Structural Observations to include special inspections and structural observations for most commercial structures, critical non-structural components, and wall connections in tilt-up and CMU buildings with light framed roofs and floors.

► **Introduce an Earthquake Performance Rating System**

- *Finding*: Public knowledge of the seismic safety of the buildings they own, live in, and work in is often limited, or misinformed, especially in comparison with public awareness of other hazards.

- *Recommended*: Encourage and promote a voluntary, standardized rating system for the expected earthquake performance of buildings, similar to the LEED rating used for green buildings. The system should be easily understood and readily available to anyone with an interest or stake in the building.

► **Incorporate Resilience into Performance-Based Design**

- *Finding*: Many new buildings will be constructed over the next 50 years, but current code is only intended to protect the life safety of occupants, not ensure resilient performance.

- *Recommended*: Adopt incentives to encourage owners to build to performance standards that exceed the “code minimum." Support research aimed at better tools and criteria for performance based design.

► **Encourage seismic retrofit of existing homes and multi-family buildings.**

- *Finding:* Many residential homes built before 1976 have vulnerabilities to earthquakes and the damage may result in them being unusable or in need of costly repairs. Many older multi-family buildings are at risk as well.

- *Recommended:* Adopt seismic retrofit programs and incentives to encourage homeowners to tie their older homes to their foundations, and encourage the seismic retrofit of multi-family buildings.

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5. Seismic Rehabilitation Task Force created by Senate Bill 1057 (1996). *Seismic Rehabilitation of Existing Buildings in Oregon*. Report to the Sixty-Ninth Oregon Legislative Assembly, September 30, 1996, p.38, item C, and Appendix E.

5. Transportation

Introduction

Emergency response, access to critical buildings, the restoration of utilities, and the reopening of businesses all depend on the transportation network. The resilience of the transportation network is considered a key factor for re-establishing other lifelines after a major Cascadia subduction zone earthquake.

To assess the status of the various modes of transportation and determine appropriate levels of resilience, a task group consisting of representatives of each mode of transportation, including highways, rail, airports, water ports, and transit, along with representatives of local agencies, met in person monthly and worked extensively outside these meetings to develop and collect data and formulate a plan that will help increase the survivability of citizens and critical features of the built environment.

GOALS

The overall resilience goal for the transportation network is first to facilitate immediate emergency response, including permitting personnel to access critical areas and allowing the delivery of supplies, and second to restore general mobility within specified time periods for various areas of the state. In order to establish specific resilience goals in support of this larger objective, the task group assessed the transportation network in four geographical areas:

- The tsunami inundation zone along the coast (based on DOGAMI maps).
- The coastal zone (the area outside of the tsunami zone, from the Oregon coastline to the summit of the Coast Range).
- The Willamette Valley zone (from the summit of the Coast Range to the summit of the Cascades).
- The central Oregon zone (east of the Cascades summit).

In addition, the task group established resilience targets for transportation facilities. These targets align with a phased, three-tiered approach to the restoration of the transportation network. The main factors in forming this approach were the need to optimize post-earthquake response for our state and the need to establish priorities for making future investments to achieve the targets. Similar to the Oregon Seismic Lifeline Routes identification project, the task group prioritized highways into three tiers: Tier 1 is a small backbone system that allows access to all vulnerable regions, major population centers, and areas considered vital for rescue and recovery operations. Tier 2 is a larger network that provides access to most urban areas and restores major commercial operations. Tier 3 is a more complete transportation network.

Resilience targets were further established at three levels:

- **Minimal.** A minimum level of service is restored, primarily for the use of emergency responders, repair crews, and vehicles transporting food and other critical supplies.
- **Functional.** Although service is not yet restored to full capacity, it is sufficient to get the economy moving again—for example, some truck/freight traffic can be accommodated. There may be fewer lanes in use, some weight restrictions, and lower speed limits.
- **Operational.** Restoration is up to 90 percent of capacity: A full level of service has been restored and is sufficient to allow people to commute to school and to work.

THE TASK GROUP'S OBJECTIVES

In developing a resilience plan for transportation, the task group's objectives were to:

- Summarize the state of our knowledge about the seismic ground shaking and tsunami inundation risks of various transportation modes.
- Estimate the ability of each mode to recover following a major earthquake.
- Develop recommendations for strategically focused retrofit solutions. For example, one of the recommended solutions proposed in the plan includes a program of prioritized investments over a 50-year period to achieve the desired level of operation after a major Cascadia subduction zone event. (The plan considers all modes of transportation to maximize both access to and the utility of the network, while minimizing the level of investment.)

THE TRANSPORTATION SYSTEM'S ROLE IN STATEWIDE RESILIENCE

A resilient transportation network is critical for re-establishing other lifelines, such as water, electricity, fuel, communication, and natural gas, after the earthquake. For example, a resilient transportation system allows repair crews to access and reconnect water pipes and power lines more quickly, and it provides access to much needed fuel and supplies.

Given the transportation system's current state of vulnerability to ground shaking and tsunami inundation, initial damage from a Cascadia subduction zone earthquake is expected to be devastating to the parts of the system located along the coast and in western Oregon. The resulting lack of mobility will have direct impacts that severely limit rescue operations, inspection of critical infrastructure, restoration activities, and the state's ability to restore services leading to recovery. The widespread damage and lack of access to many parts of western Oregon will be partially mitigated by disaster preparedness planning, but that effort will be hampered by the lack of access to disaster areas after the event, which could limit the ability of emergency responders to save lives, facilitate evacuation, and manage critical infrastructure.

To collect and develop the information used for this report, the members of the Transportation Task Group consulted transportation providers and collected data on potential infrastructure damage and the

state of preparation and availability of trained, experienced personnel to manage transportation systems in the aftermath of a major earthquake. Keeping in mind that the core objective of the plan is to better support both immediate statewide post-earthquake/tsunami response and longer-term recovery and construction, the task group considered both emergency response actions and various ways to improve the resilience of the transportation network. This included strengthening or armoring existing systems, adding new facilities that will withstand seismic loads and motions, moving facilities out of tsunami inundation zones, and identifying alternate means to provide service. Resilient transportation systems planning must address all facets of the problem in order to provide for effective and efficient movement of goods and people after a large seismic event—an event that is expected to cause widespread damage to the built environment as well as significant reconfiguration of the natural environment.

THE TASK GROUP'S APPROACH

The task group's general approach in developing the transportation section of the Oregon's resilience plan was to use existing emergency operations or response plans and any existing programs for strengthening facilities and other assets within the various modes. The task group used existing plans for strengthening and armoring transportation systems. This chapter includes a section on each mode, covering response for life safety and recovery, and a section on strengthening and armoring options. The task group also considered the interdependencies among the various modes and the relevance of these interdependencies for response, recovery, and strengthening. Finally, a summary of known gaps in available data and a list of recommendations are provided to identify next steps in the transportation sector. These recommendations reflect the need to determine the most cost effective solutions to reduce interruptions in service and increase mobility immediately after an event and during long term recovery. An example of a fully developed assessment of a mode, including retrofitting recommendations and cost estimates, is provided in the 2012 Oregon Seismic Lifeline Routes identification project and ODOT Seismic Options Report.

Assessment of Transportation Performance

When a large earthquake is triggered within the Cascadia subduction zone, the result will be widespread disruption of the transportation system. This disruption will make rescue operations in many areas difficult, if not impossible, and will have an immediate, disruptive impact on the economy. The majority of bridges and other transportation infrastructure in western Oregon are susceptible to serious damage in a major seismic event, because they were built before modern seismic codes were in place. Dozens of unstable slopes and pre-existing deep slides are expected to fail under the extended three minutes or more of shaking that will accompany a large Cascadia event, further impacting our mobility by closing roads.

Modern seismic codes were developed in the late 1980s and early 1990s. The extended period of strong shaking from a Cascadia subduction zone event will damage many masonry and other structures built prior to modern seismic codes. Homes, hospitals, businesses, schools, and other critical structures that

have not been seismically retrofitted may collapse or be severely damaged, killing or injuring many people. The injured will need immediate attention, but may be stranded due to the lack of mobility.

Our knowledge of the locations of faults and the geological history of major events in Oregon is very recent. Although Oregon has low seismicity in comparison to California and Washington, there is potential for less frequent—but much larger and more damaging—earthquakes than the crustal earthquakes that have occurred regularly in those states. Oregon has not yet seen the effect of a large damaging earthquake, and ODOT has so far expended minimal resources on seismic retrofitting. As a result, much of Oregon's highway system will not be usable immediately after a major seismic event.

Because the impacts will be widespread, a Cascadia earthquake and tsunami have the potential to cause unparalleled economic and human catastrophe for the state of Oregon. The issue is *when* not *if* the state will have a major damaging seismic event. The question is whether we will be effectively prepared to rescue our citizens and recover economically without the use of a continuous connected transportation system. Aftershocks and movement of historic slides will complicate rescue and extend recovery times.

The task group recognized that failure of a major dam would lead to additional impacts to transportation that were not explicitly considered in our study. Like much of our other infrastructure, it is assumed that most of the power generation and flood control dams in Oregon were constructed prior to consideration of modern seismic provisions. Well-constructed dams have fared well in other subduction zone events, however, so failure may not be likely in Oregon. Damage to spillway gates, on the other hand, may lead to unexpected water release, and the resultant flooding would compound damage from a Cascadia subduction zone event.

Highway Transportation

Because most of Oregon's highways were constructed before design codes considered the potential Cascadia subduction zone effects, many bridges and unstable slopes are vulnerable to severe damage. The chart below shows the age-related vulnerability of Oregon's bridges.

Resilience targets for mobility on highways vary from zone to zone and from tier to tier within the same zone. For example, a Tier 1 route in central Oregon is expected to be resilient within three days, whereas a Tier 3 route may take up to four weeks. Similarly, a Tier 1 route within the coastal zone is expected to become resilient within seven days, whereas a Tier 3 may take up to three months or more. The detailed range of targets is shown in the tables titled *Oregon Transportation Resilience Status* in Figure 5.22.

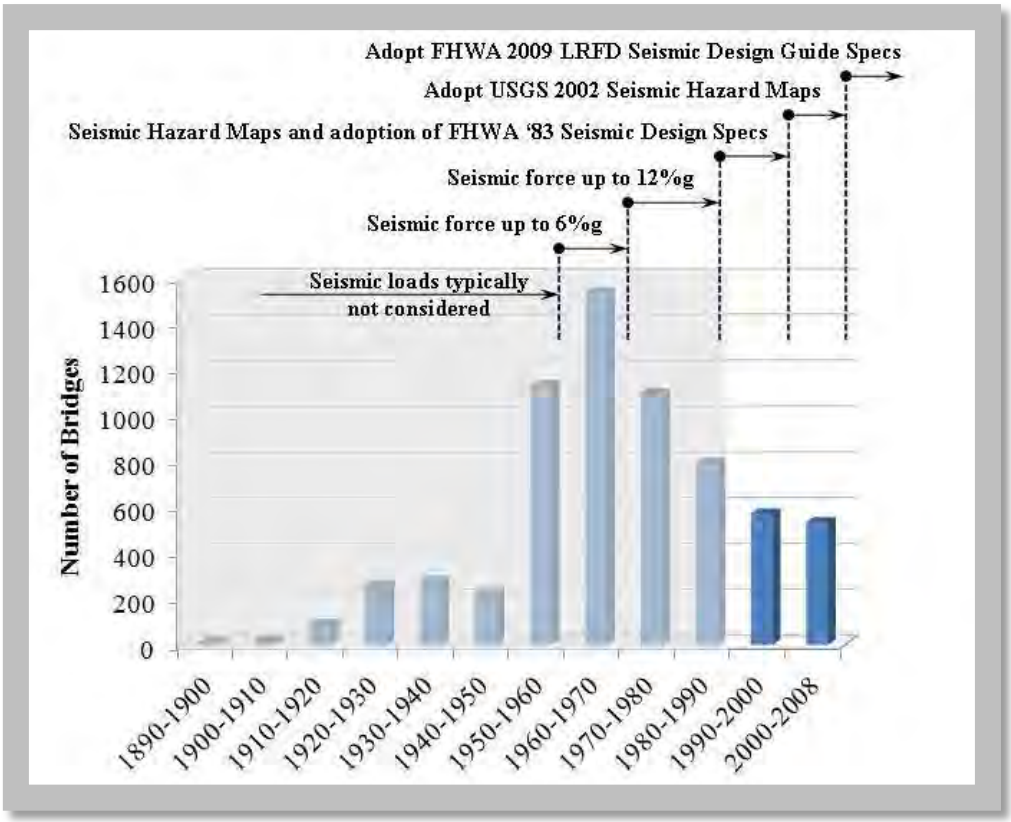
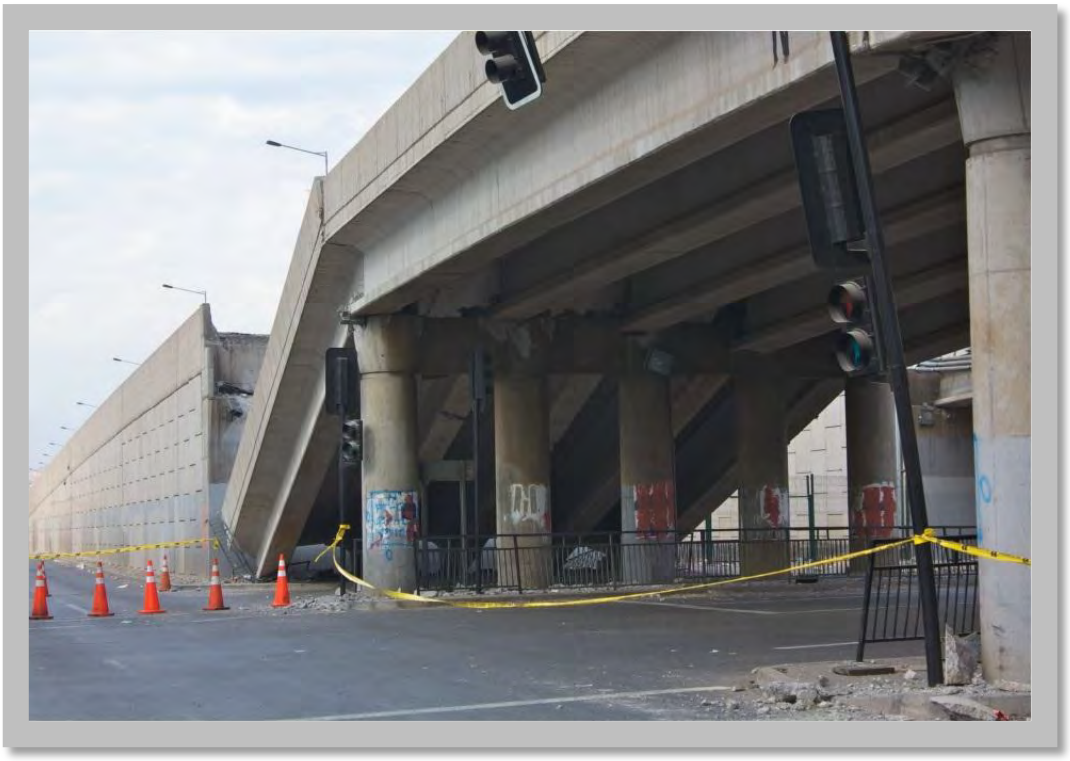


Figure 5.1: Oregon Bridge Seismic Design History (Source: Peter Dusicka, PSU)

The vulnerabilities of Oregon's bridges are complex and differ from bridge to bridge and from site to site. Some bridges are prone to more than one type of seismic deficiency, and a few may need to be replaced. ODOT has already conducted research and investigation to develop the best approach for mitigating the problem. Worldwide experience has shown that, while we are not knowledgeable enough to predict the exact time that an earthquake will strike, we can be proactive to save lives and speed up the recovery process.

The following photos and diagrams describe some of the most common vulnerabilities of highway bridges and one of the possible retrofits to mitigate that type of failure.



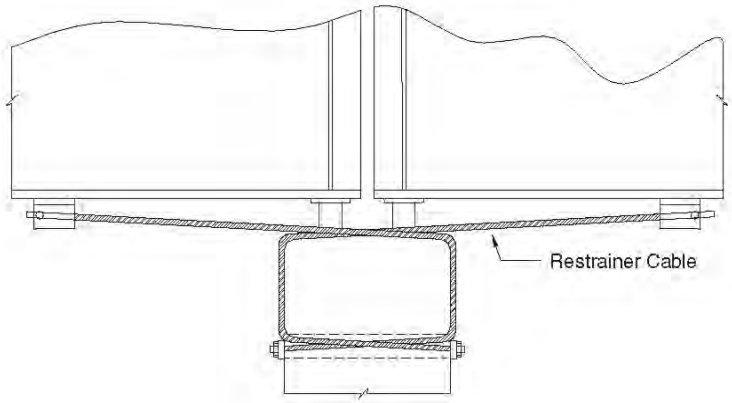


Figure 5.2: Restrainer cables will prevent bridge superstructure fall-off. (Photo Source: Flickr.com)



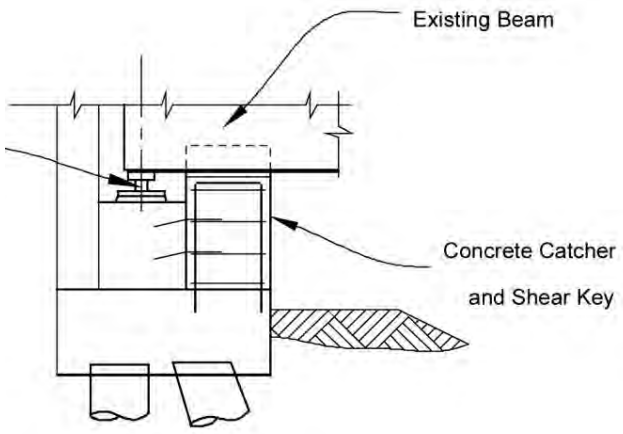
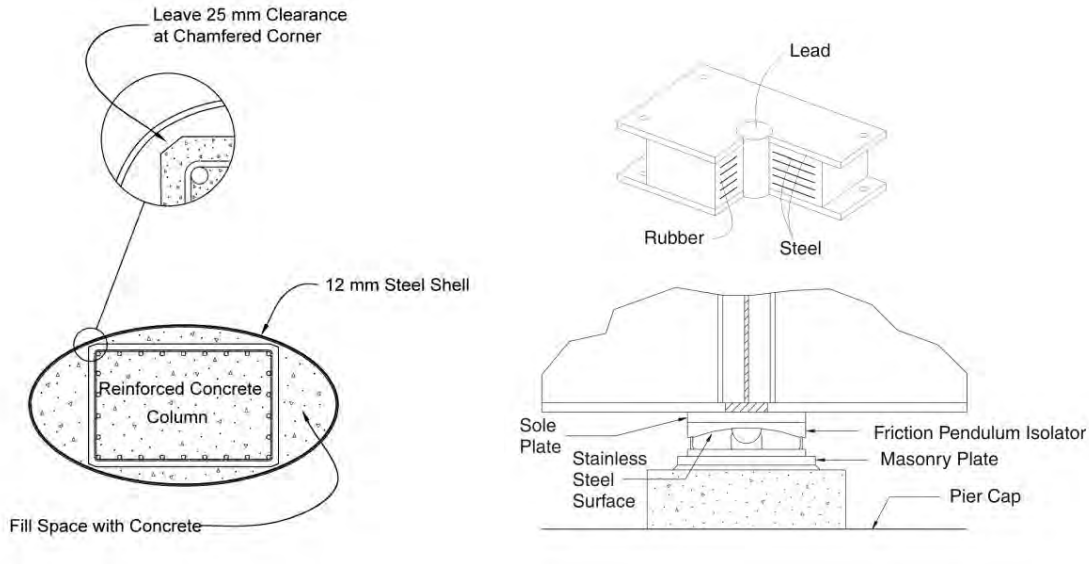


Figure 5.3: Shear Keys will restrain the superstructure transversally during an earthquake. (Photo Source: www.fhwa.dot.gov)





a) Steel Shell Casing **b) Isolation Bearings**

Figure 5.4: Preventing the Column Damage by: a) Steel Shell Casing and b) Isolation Bearing (Photo Source: ace-mrl.engin.umich.edu)



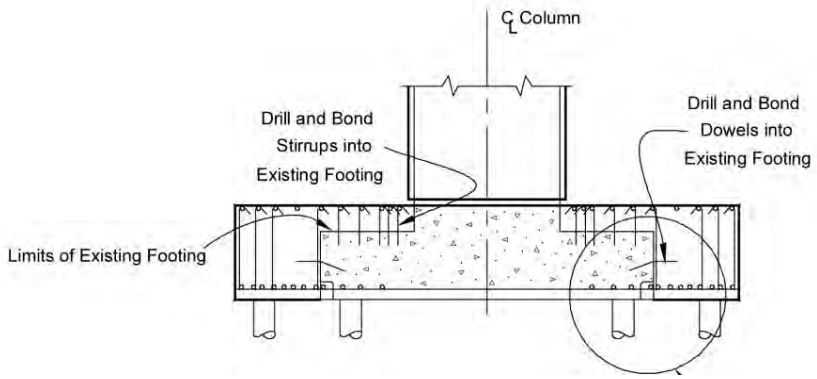


Figure 5.5: Strengthening the foundation or soil mitigation will prevent the damage to the bridge substructure due to liquefaction and lateral spreading (Photo Source: www.fhwa.dot.gov)

LOSS OF MOBILITY AFTER A MAJOR SEISMIC EVENT: BRIDGES

The combination of very strong and prolonged ground shaking, followed closely by a powerful and damaging tsunami—and by multiple strong aftershocks in the succeeding days and months—makes the Cascadia subduction zone earthquake the most dangerous natural hazard for Oregon, especially for Oregon's coastal communities. The ground shaking will cause destruction of buildings and roads, downed power lines, blocked streets, ruptured gas lines (resulting in explosions and fires), and broken water and sewer lines, creating a largely uninhabitable environment in many areas.

Oregon, or even the entire nation, has never witnessed a disaster of this magnitude in modern history; therefore, we can only speculate about how this event will impact Oregonians. Unlike other crises, such as a highway crash or a house fire, in which fire trucks and ambulances will arrive within a few minutes to rescue people in need, the situation after a Cascadia subduction zone earthquake will involve disruptions of emergency services along with everything else. There will not be enough firefighters to assist every household or business, nor enough medical staff to help every injured person, nor enough police officers to go door to door reminding people to be calm and quickly move to higher ground to avoid the oncoming tsunami. In order to gain some insight into what would happen after a major

Cascadia subduction zone earthquake, we can look at a very similar situation elsewhere: the earthquake and tsunami in Japan on March 11, 2011 (see Figure 5. 6).



Figure 5.6: Before and after the March 11, 2011 earthquake and tsunami in Japan (Source: cbsnews.com)

Coastal Area Impacts

Assuming most of our citizens have a basic understanding about the effects of a subduction earthquake, a massive movement of people away from the coast is expected. Acknowledging that no immediate help will be available, many people will try to drive away from shore and out of reach of the tsunami—but, our transportation network will not be able to handle this huge, confused and panicked traffic. Coastal residents have been advised to get away from the shore on foot, but tourists and commercial travelers are not likely to know that.

For most of Oregon's coastal cities, U.S. 101 serves as the main route to other destinations. Unfortunately, after a Cascadia subduction zone earthquake, most of this route will be impassable. Most bridges carrying U.S. 101 were not designed for seismic loading and will suffer major damage under the expected ground shaking. Many other bridges, if they survive the shaking itself, will be washed away by

the tsunami. In addition to the bridge damage, many highway segments are expected to become heavily damaged and impassible due to landslides. The latest assessment of state-owned bridges in Oregon shows that of 135 total bridges carrying U.S. 101, 56 bridges are expected to collapse, and 42 bridges will be heavily damaged. Some of these bridges are signature bridges and registered as historic.

East-West Corridor Impacts

East-west corridors between the coast and the Willamette Valley are the next tier of alternatives for people escaping from the disaster zone and for emergency crews responding to impacted areas. Unfortunately, the bridges on these corridors are also vulnerable to ground shaking, landslides, and liquefaction of supporting soils, so it is likely that these segments will not all be passable. The overall condition of bridges on these routes is moderately better than those carrying U.S. 101; however, there are many weak links along these routes that will make them impassable as well.

Route	Total No. of	Bridges	Heavily
U.S. 30 (Hwy 92)	27	6	3
U.S. 26 (Hwy 47)	52	3	10
OR 99W & OR 18 (Hwy 91 & Hwy 39)	35	5	4
OR 34 & U.S. 20 (Hwy 210 & Hwy 33)	42	7	3
OR 569 & OR 126 (Hwy 62 & Hwy 69)	50	9	9
OR 38 (Hwy 45)	19	1	3
OR 42 (Hwy 35)	47	23	5

Figure 5. 7: Vulnerability of Bridges on East-West Corridors (Source: ODOT – Bridge Section)

Because of the terrain these highways were built on, many of them lack options for detouring traffic around a bridge that collapses. The situation can become even more critical if the earthquake strikes during winter, when many of the state's secondary routes experience seasonal closure. Figure 5.7 shows the results of an inventory and damage assessment of state bridges located along the major routes connecting U.S. 101 to Interstate 5, when subjected to a Cascadia subduction zone event.

Interstate 5 and Mid-Willamette Valley Impacts

Interstate 5 (I-5) will also have some major problems after a Cascadia subduction zone earthquake. With the majority of bridges on I-5 built just before the modern seismic design specifications were developed, the most important segment of Oregon's transportation network may be fragmented, with some areas not operational after such an earthquake, depending upon the intensity and epicenter of the quake and its aftershocks. During the recent Oregon Transportation Investment Act (OTIA) program, ODOT was

able to replace many deficient structures along this route; however, the main criterion for the selection of these bridges was the need to support current truck load requirements, and not necessarily to meet current seismic standards. Thus, several bridges that already have been identified as vulnerable to earthquake shaking are still in active service. From a total of 348 bridges carrying both northbound and southbound traffic, five bridges are expected to collapse and 19 bridges to be heavily damaged during the Cascadia subduction zone event.

Interstate 5 is expected to be the main corridor of traffic flow after the Cascadia subduction zone event. Because of its location and capacity, and because U.S. 101 is expected to be impassable, I-5 will become the critical backbone route for emergency response after the earthquake. To the extent I-5 is operable, emergency support can be staged along the corridor, and responders will be able to reach the coastal cities either through the east-west corridors (once these corridors become accessible) or by other means.

Interstate 5 becomes an even more important route during the statewide recovery effort. Many scientists believe that the Cascadia subduction zone event will be a mirror image of the 2011 Tohoku earthquake that hit Japan. This means that most of our coastal cities will be heavily damaged, and restoring their previous living environment will not be an easy task. Along with extensive building damage, many ports and airports in these cities will also be heavily damaged and most likely will not be operational immediately after the event. This puts more emphasis on the need for a resilient transportation network. Because we expect that the initial help for impacted coastal areas will come first from cities along I-5 and later from the rest of the state and entire Northwest region, we have identified I-5 as the most vital route for post-earthquake recovery.

Central Oregon U.S. 97 and Highways through the Cascades

In the event that Interstate 5 is not operational, particularly in areas without viable detours, U.S. 97 will be a critical facility for ongoing interstate commerce and for staging response and recovery efforts. Redmond Municipal Airport is a staging site for federal emergency response in Oregon. East-west corridors through the Cascades provide access to the more vulnerable parts of the state and are therefore a necessary part of the response and recovery system. Because there is far less likelihood of damage to facilities in these areas, they will be relied upon extensively after a Cascadia subduction zone event.

LOSS OF MOBILITY AFTER A MAJOR SEISMIC EVENT: LANDSLIDES & ROCKFALLS

Slope failures are as common to earthquakes as structural collapse, liquefaction, and ground deformation. Strong ground shaking from a Cascadia subduction zone event will trigger countless new slope failures and activate existing landslides. Reactivation of the known landslides alone will be catastrophic during the ensuing seismic emergency. Additional failure of weak slopes and embankments or reactivation of previously unknown landslides will further compound the catastrophe. Not only will the landslides occur during and soon after the main earthquake, strong aftershocks will also affect other landslides and slopes that will become more prone to failure in the ensuing months. Landslides will

continue to impede rescue and relief efforts long after the shaking has stopped. Figure 5.8 shows one of the common vulnerabilities of unstable slopes.

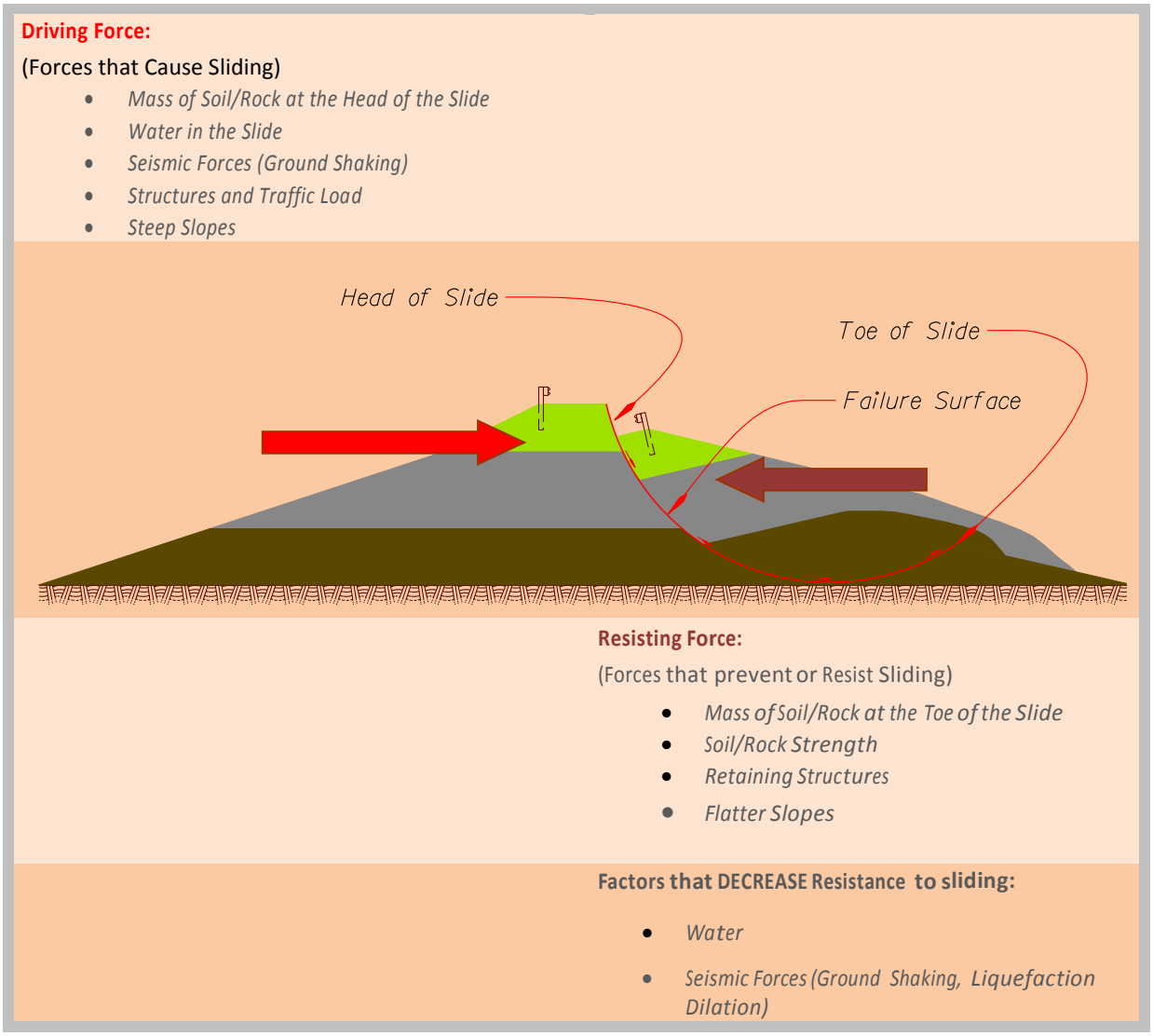


Figure 5. 8: Design Approach for Slide Mitigation (Source: ODOT – Geo-Environmental Section)

Landslides are one of the most significant secondary effects of earthquakes and, apart from the primary earthquake itself, one of the leading immediate causes of earthquake-related deaths worldwide. Currently, there are about 1,700 known landslides that directly affect the highway system between the Willamette Valley and the Oregon coast. Undoubtedly, western Oregon will be overwhelmed by the landslides that will accompany a Cascadia subduction zone earthquake. Landslides will affect all phases of the disaster, triggering a variety of consequences, including:

- Immediate injury or loss of life during the seismic event, as in the case of:
    - Motorists struck by rockfall or landslides/slide debris originating from slopes above the road.
    - Motorists striking materials in the roadway.
    - Motorists driving into collapsed roadways.
    - Motorists pushed off the roadway by landslides.
    - Vehicles or persons buried under slide debris.
- Immediate damage to the transportation infrastructure (resulting from numerous small to average-sized landslides and very large landslides), which becomes:
    - An impediment to tsunami evacuation.
    - An obstruction to rescue and evacuation efforts.
    - A hindrance both to recovery in the immediate aftermath and to long-term economic recovery.
- Long-term highway closures due to landslides.
- Ongoing landslides from weakened slopes.
- Disruption of utilities that share highway right-of-way.
- Long-term mitigation of very large landslides that will impede repairs to bridges and other facilities.
- Massive consumption and shortages of fuel and other material resources used in landslide repair work.

Steep slopes, weak soil and rock, heavy rainfall, and high groundwater are all conditions that can lead to slope failure and are widespread throughout the state, particularly in the western half. Almost every highway in western Oregon is affected in some way by landslides. Where the listed conditions exist, slopes are at a much higher risk of failure during an earthquake. The greatest hazards, however, are the existing known landslides and the existing slides that are yet to be discovered. Recent research by the U.S. Geological Survey (USGS) has shown that seismogenic landslides (that is, new slides initiated by earthquakes) tend to move a few inches to a few feet, while existing slides reactivated by earthquakes are more likely to move several yards. Highways traversing mountainous terrain will be the most disrupted; however, routes in low-lying areas, such as the Willamette Valley, will also be affected by liquefaction and lateral spreading, which can result in the failure of otherwise stable embankments and fills.

The following photos and diagrams describe some of the most common slope failure modes and one of the possible mitigation strategies for that type of failure.



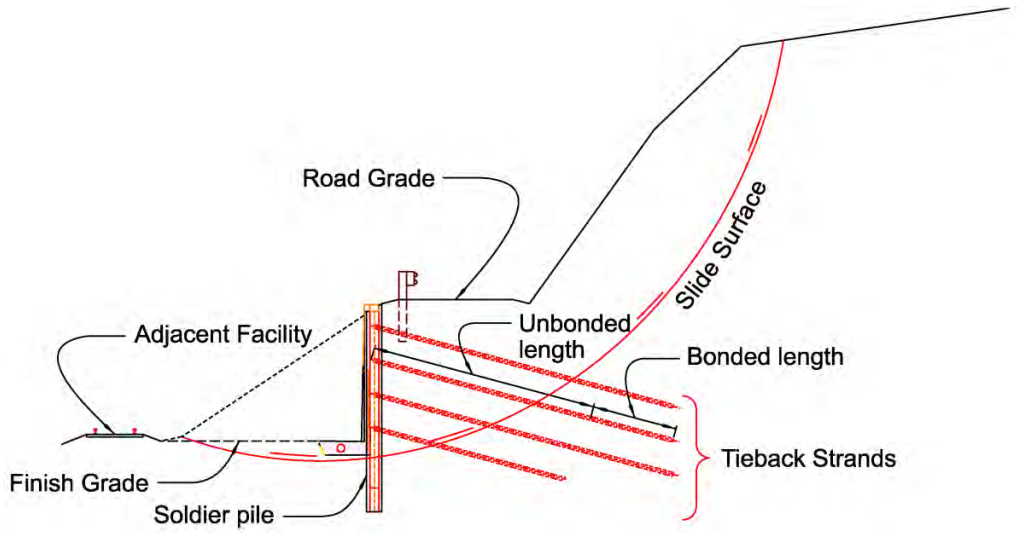


Figure 5.9: Structural mitigation of a landslide – Constructing a retaining wall (Source: ODOT – Geo-Environmental Section)



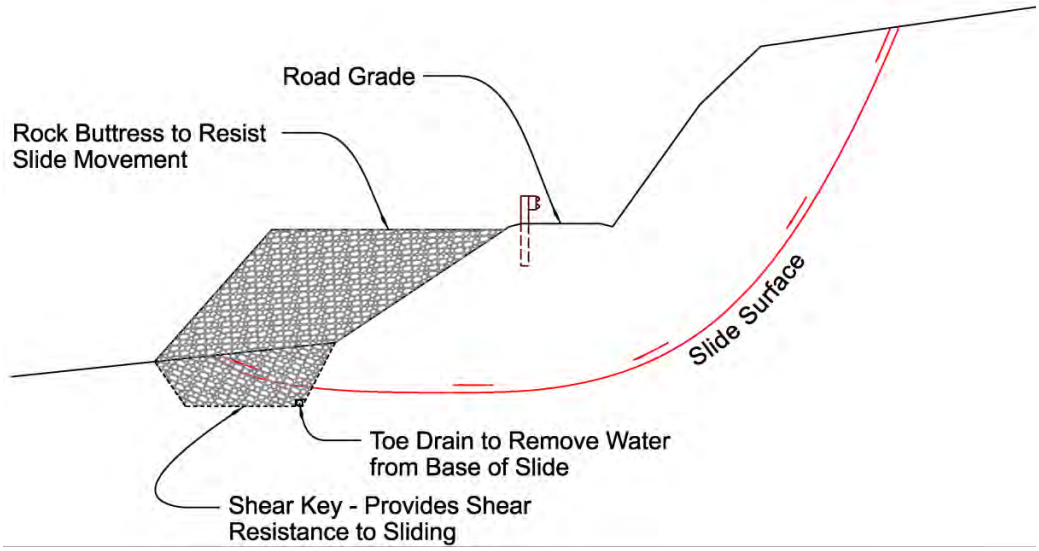


Figure 5.10: Stabilizing a landslide by constructing a shear key and buttress (Source: ODOT – Geo-Environmental Section)



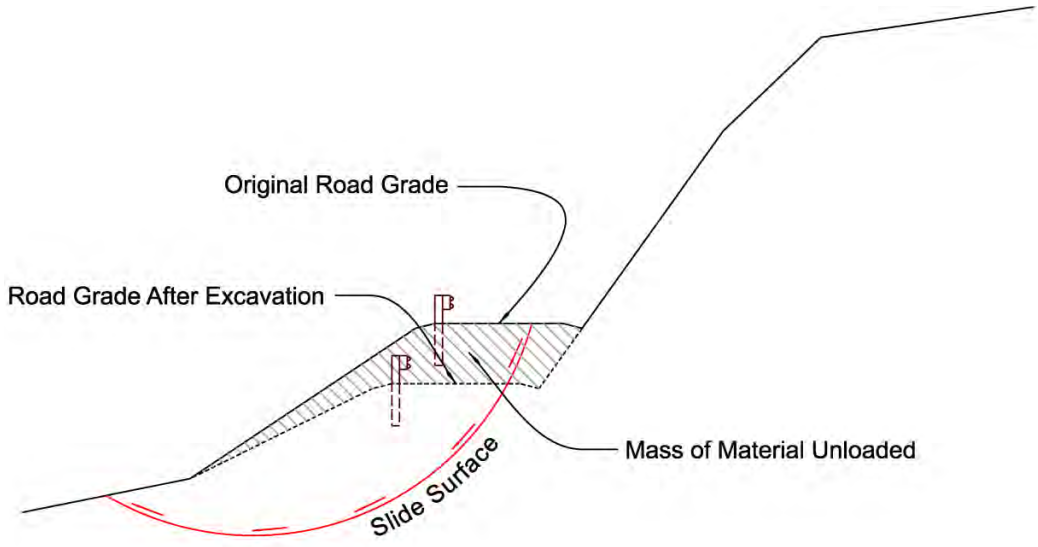


Figure 5.11: Stabilizing a landslide by the "unloading" method. (Source: ODOT – Geo-Environmental Section)



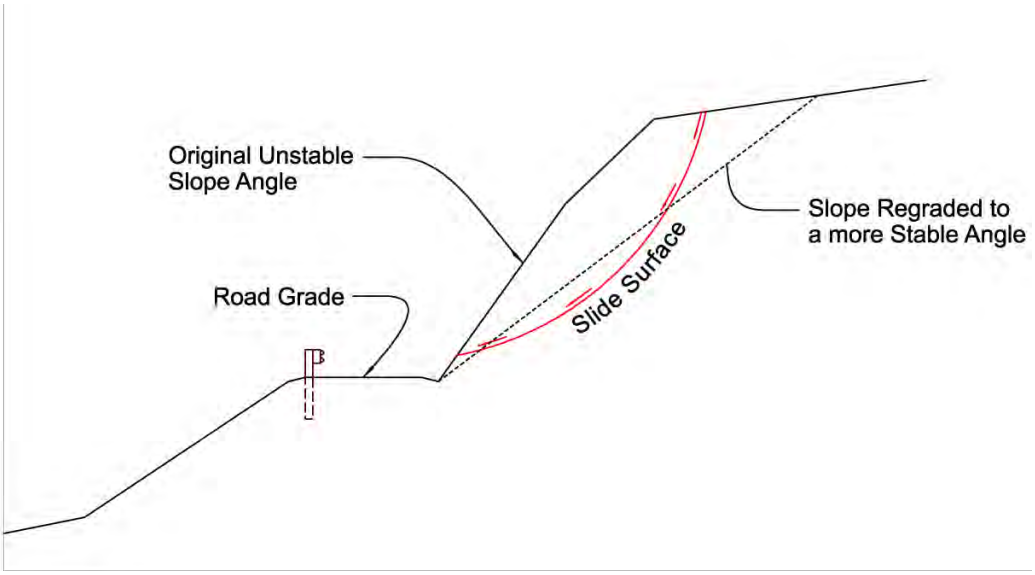


Figure 5.12: Flattening the slope decreases the "driving force" of an active slide (Source: ODOT – Geo-Environmental Section)



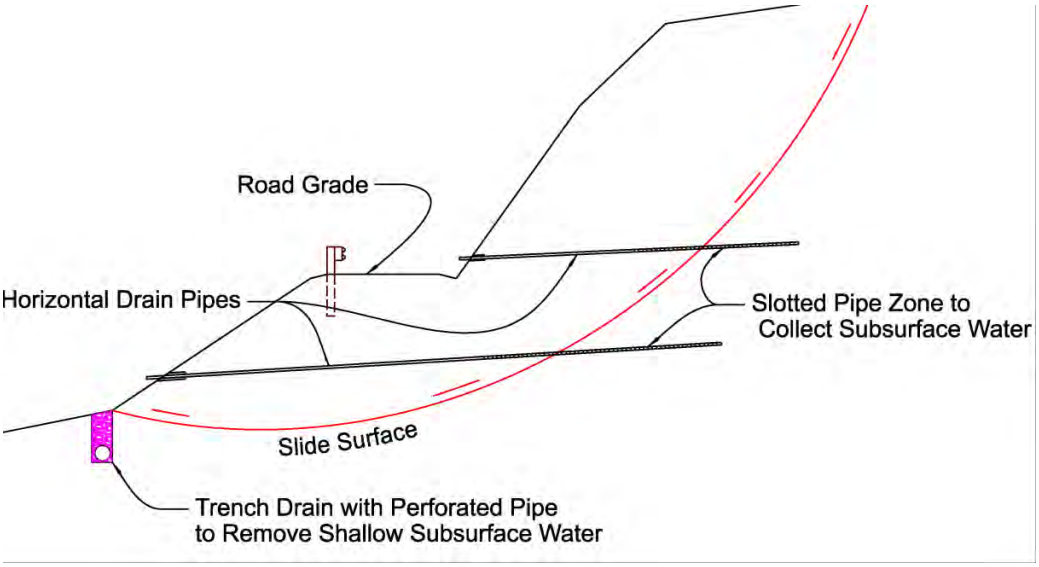


Figure 5.13: Drainage is one of the most cost-effective methods for landslide mitigation (Source: ODOT – Geo-Environmental Section)

Coastal Area: Impacts from Landslides and Rockfalls

As most residents of coastal Oregon know, there are numerous service disruptions on U.S. 101 every year from active landslides and rockfalls. It is a challenge for the agency just to keep this route functioning during normal winter weather. The results that strong ground shaking and the accompanying tsunami from a Cascadia subduction zone earthquake will have on this route are almost unimaginable, considering the large number of unstable slopes that will be affected by these forces.

Currently, 526 known unstable slopes directly affect U.S. 101. Many of these slides will fail catastrophically during the primary earthquake, while many others will fail during or soon after the tsunami. Slopes that do not immediately fail during the primary seismic event will be destabilized to varying degrees and may fail soon after, either during strong aftershocks or else at some time during the rescue and recovery efforts. Not only will coastal residents have to contend with the primary effects of the Cascadia subduction zone earthquake, but their evacuation, rescue, and recovery will be further hindered by landslides and rockfalls. Their escape from the tsunami may be blocked by failed slopes, and many could also become landslide victims.

East-West Corridor Impacts from Landslides and Rockfalls

If we take the hazard posed by landslides and rockfalls into account, the east-west routes connecting U.S. 101 to Interstate 5 are only marginally better than U.S. 101 itself. These routes traverse very steep terrain that is underlain by generally weak materials. In addition, the Oregon Coast Range experiences very high rainfall each year, which further serves to weaken slopes and embankments. A high number of landslides occur in this area on an annual basis, and a very high number should be expected during a Cascadia subduction zone event, solely on the basis of the geologic conditions.

What makes these routes particularly vulnerable is the existence of very large landslides along them. These existing slides are expected to have the highest amounts of displacement during an earthquake. Whole mountainsides can move tens of yards vertically and horizontally, taking the entire roadway with them. These landslides have the capacity to close roads for several weeks while efforts are made to reconstruct roadways or build detours around the slides. Recent LiDAR technology, where available, has led to the discovery of many of these large, sometimes ancient, landslides. In some cases, the slides were previously known, as they have had some effect on the highway in the past. In other cases, highways traverse enormous landslide features that were not known to exist and have been inactive since their initial failure. It has been theorized that many of the known large, ancient landslides in the Oregon Coast Range and the Columbia River Gorge are the result of past Cascadia subduction zone events.

Interstate 5 and Mid-Willamette Valley: Impacts from Landslides and Rockfalls

Interstate 5 and other highways in the Willamette Valley are not without their own landslide and rockfall vulnerabilities. Many fills and embankments were either constructed of or on liquefiable soils in areas with high groundwater, making them particularly susceptible to earthquakes. Interstate 5 also traverses

mountainous terrain in the southern part of the state, and unfavorable geology contributes to ongoing slope instability along I-5 in the Portland area.

In all, there are 49 known landslide and rockfall areas along I-5. Other unstable areas are suspected. In the event of a Cascadia subduction zone earthquake, therefore, the most important route in the state will not be without problems. Many of the slides through the Willamette Valley are minor and can be readily mitigated. Most of the slides in the Portland area have been treated, but some could result in lengthy repairs and service disruption. For the Portland area, adequate detours exist in areas that are not as vulnerable to landslides, but delays will occur. The greatest concern for this route is the mountainous areas of southern Oregon. Unfavorable geology—in terms of geologic structure, materials, and groundwater—has formed some very large, complex landslides in this area. These slides have the capacity to cut this route off on the southern end for many weeks while repairs take place or detours are constructed.

Rail Transportation

Rail lines are generally privately owned businesses, not public entities. Detailed vulnerability assessments of this part of Oregon's infrastructure have not been conducted, although generalizations can be drawn about its possible performance based on experience in other regions where major earthquakes and tsunamis have occurred. Funding for such detailed studies may be problematic due to the private ownership status of railroads.



Figure 5.14: Landslide damage on the UPRR between Chemult and Eugene
(Source: ODOT – Rail Division)

Trunk Lines

- California State Line to Klamath Falls
    - UPRR: Several miles of dredged fill, one highway overpass, two tunnels in California
    - BNSF: Two major bridges, one highway overpass
- Klamath Falls to Chemult
    - UPRR/BNSF: One major bridge, five highway overpasses
- Chemult to Redmond
    - BNSF: Two major bridges, five highway overpasses
- Redmond to OT Junction (BNSF); OT Junction to Troutdale (UPRR)
    - Seven major bridges, three tunnels, twenty-three highway overpasses
- Chemult to Eugene
    - UPRR: Fourteen major bridges, twenty-one tunnels, seven highway overpasses, six snow and rock sheds
    - Major historical landslide
- Eugene to Portland
    - UPRR: Fifteen major bridges, thirty-two highway overpasses
- Portland Terminal Area (Troutdale to Portland (UPRR); Vancouver, WA, to Portland (BNSF))
    - Four major bridges, forty-two highway overpasses

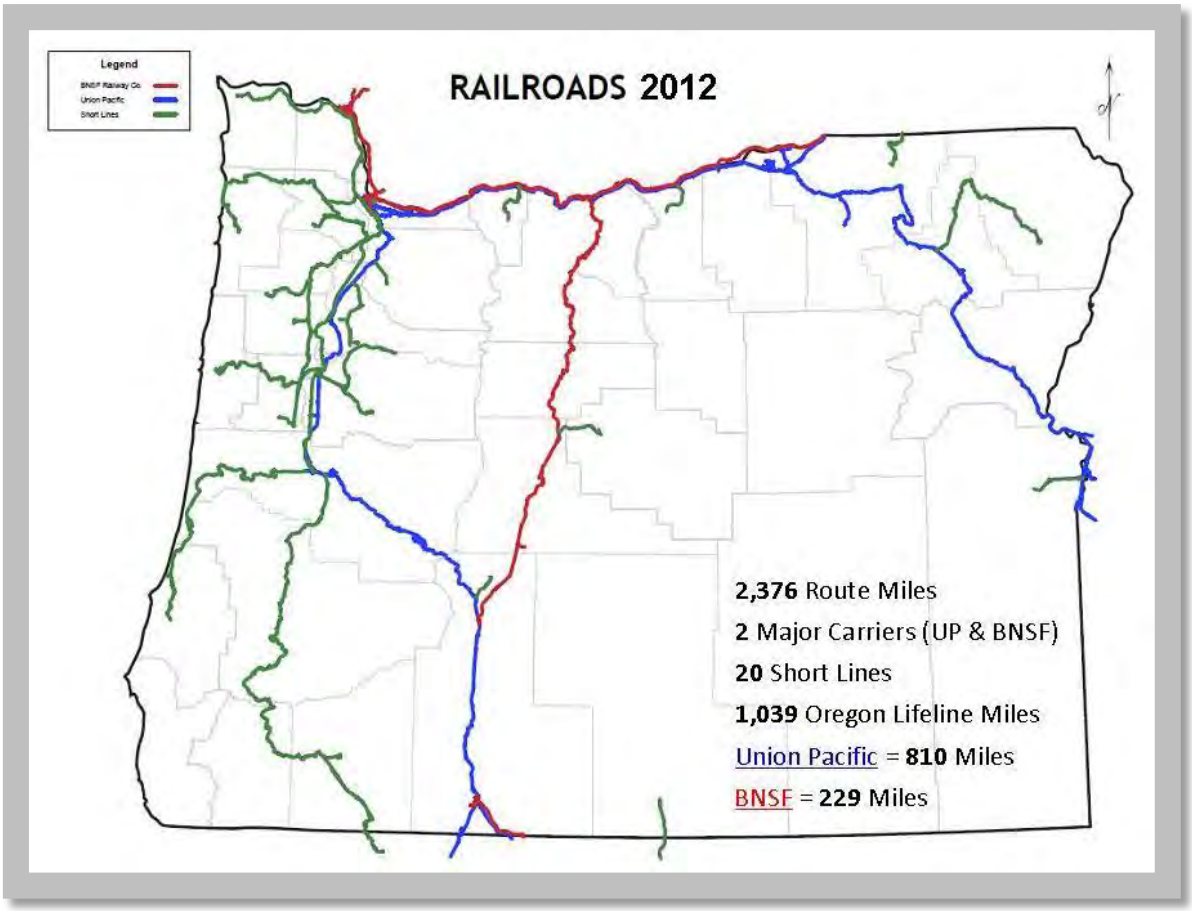


Figure 5.15: Railroad Corridors (Source: ODOT – Rail Division)

Detours for Trunk Lines

- Siskiyou Line (California to Eugene): Steep grades, twenty-four major bridges, eleven tunnels, twenty highway overpasses
- Oregon Electric Line (Eugene to Tigard): Fifteen major bridges, seven highway overpasses
- West Side District (Albany to Tigard): Fifteen major bridges, two highway overpasses
- Tigard to Willsburg Junction and connection with UPRR Trunkline: Three major bridges, three highway overpasses

Coastal Branch Lines

- Coos Bay Rail Link: Forty-nine major bridges, eight highway overpasses, nine tunnels
- Astoria District: One tunnel, six highway overpasses
- Albany to Toledo: Forty major bridges, one tunnel, three highway overpasses

Air Transportation

The state of Oregon has an extensive aviation system that provides valuable transportation options for the public, ranging from small airports in remote regions of the state to large commercial service airports. Ninety-seven public-use airports provide support to the economic health and vitality of Oregon and contribute to the quality of life for its citizens and visitors.

- Fifty-seven public-use airports are partially supported by FAA and included in the National Plan of Integrated Airport System (NPIAS).
- Sixteen public-use airports are either owned by other municipalities or are privately owned.
- Over 400 private airports and landing strips are located within Oregon.

The 2007 Oregon Aviation Plan established five categories of airports, based on the definitions outlined within the National Plan of Integrated Airports System (NPIAS), the design criteria outlined by the Airport Reference Code (ARC), and the facilities inventory.

CATEGORY I: COMMERCIAL SERVICE AIRPORTS
These airports support some level of scheduled commercial airline service in addition to a full range of general aviation aircraft. This includes both domestic and international destinations.

CATEGORY II: URBAN GENERAL AVIATION AIRPORTS
These airports support all general aviation aircraft and accommodate corporate aviation activity including business jets, helicopters, and other general aviation activity. The primary users are business related and service a large geographic region, or they experience high levels of general aviation activity.

CATEGORY III: REGIONAL GENERAL AVIATION AIRPORTS
These airports support most twin and single engine aircraft, may accommodate occasional business jets, and support regional transportation needs.

CATEGORY IV: LOCAL GENERAL AVIATION AIRPORTS
These airports primarily support single engine, general aviation aircraft, but are capable of accommodating smaller twin-engine general aviation aircraft. They also support local air transportation needs and special use aviation activities.

CATEGORY V: REMOTE ACCESS AND EMERGENCY SERVICE AIRPORTS
These airports primarily support single-engine, general aviation aircraft, special use aviation activities, and access to remote areas; or they provide emergency service access.

The following list identifies airports within each category that have the potential to maintain or quickly restore operational functions after a major earthquake. The Transportation Task Group arranged these 29 airports into a tier system to indicate the priorities for making future investments. Tier 1 (T1) is comprised of the essential airports that will allow access to major population centers and areas

considered vital for both rescue operations and economic restoration. Tier 2 (T2) is a larger network of airports that provide access to most rural areas and will be needed to restore major commercial operations. Tier 3 (T3) airports will provide economic and commercial restoration to the entire region after a Cascadia subduction zone event.

Category I	Category II	Category III	Category IV	Category V
*Redmond (T1)	Scappoose (T2)	Tillamook (T2)	Mulino State (T3)	Independence State (T3)
PDX (T1)	Troutdale (T3)	Roseburg (T1)	Albany (T3)	Siletz Bay State (T2)
Salem (T1)	Hillsboro (T2)	Bandon State (T2)	Lebanon (T3)	Cape Blanco State (T2)
Eugene (T1)	Portland Heliport (T3)	Grants Pass (T3)	Florence (T3)	
Rogue Valley Medford (T1)	Aurora State (T3)		Creswell (T3)	
Klamath Falls (T1)	McMinnville (T3)		Cottage Grove State (T3)	
	Newport (T2)		Myrtle Creek (T3)	
	Corvallis (T3)		Brookings (T2)	

*Primary emergency response airport for FEMA Region X: Redmond municipal airport, centrally located in central Oregon, is ideally situated to be the primary FEMA emergency response airport.

Figure 5.16: Oregon Airports (Source: Oregon Department of Aviation)

The Portland International Airport (PDX) is one of Oregon's vital transportation network links. As the state's major airport, PDX will play a key role in re-establishing our economy by facilitating the movement of people, goods, and services after a major statewide emergency event. Other airports in Oregon will also play a vital role during the post-disaster emergency response and initial recovery phase. During the emergency response, for example, displaced residents, injured people, and the elderly may need to be evacuated by means of airports; and airports will also provide a staging area for needed supplies (such as water, food, medical supplies, and materials for temporary housing). Until highway and rail transportation can be fully restored, air transportation, along with ships off the coast, will be the lifelines for Oregon's citizens.



Figure 5.17: An aerial view of Port of Portland (Source: Port of Portland)

As described previously in this chapter, after a Cascadia subduction zone event, 29 airports have the potential for minimal damage, and operational service could be restored within a short timeframe. However, without a complete vulnerability assessment of these 29 airports, we cannot be certain which airports would be operational after an earthquake of magnitude 9.0. Based on Oregon Department of Geology and Mineral Industries (DOGAMI) tsunami inundation maps, we can predict with reasonable accuracy which airports would survive a tsunami. After studying these maps, we concluded that 8 out of 15 coastal airports will not survive due to the inundation of ocean water and debris. In the absence of a complete vulnerability assessment, our assumption is that seven of the coastal airports may survive a tsunami, but we do not know if they will survive an earthquake. Those seven airports are Tillamook, Siletz Bay State, Newport, Florence, Bandon State, Cape Blanco State, and Brookings.

Note: We did not consider the eastern airports in this particular scenario, as those airports are expected to sustain little to no damage during a subduction zone earthquake.

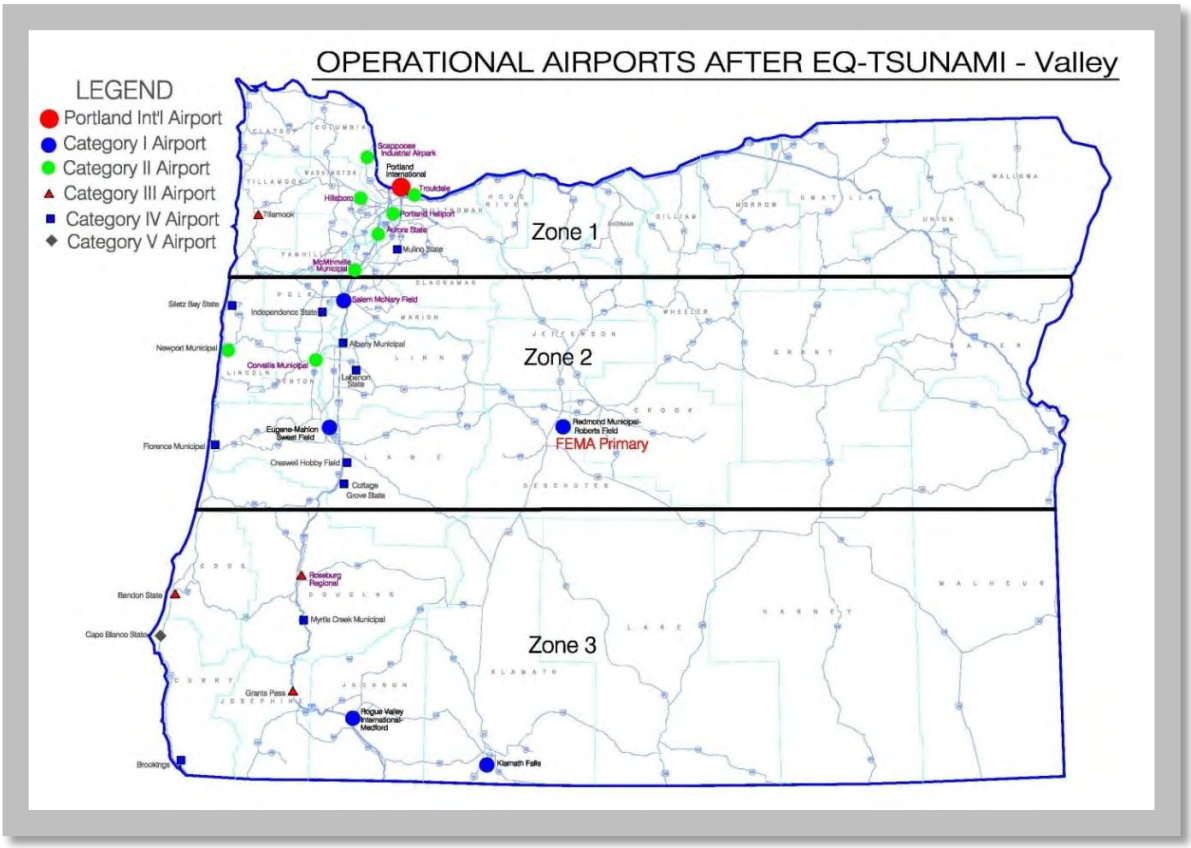


Figure 5.18: Emergency service zones served by air transportation (Source: Oregon Department of Aviation)

Columbia and Willamette Navigation Channels

The Columbia and Willamette Rivers are important transportation corridors for the states of Oregon and Washington. The lower Columbia (Pacific Ocean to Portland) and lower Willamette Rivers are deep draft channels and are critical for connecting transpacific trade to the region and the state. The mid-Columbia and Snake Rivers (Portland to Lewiston, Idaho) are shallow draft, inland waterways along which significant cargo can be moved from the east to the Portland region. Multiple dams and locks are necessary for the operation of this river route. Redundancy does not exist for these dams and locks—a cause for concern because the river channels may be obstructed when bridges collapse during a significant earthquake. A Cascadian event could significantly impact the river system and shipping channels. The jetty at the month of the Columbia is susceptible to severe damage from significant seismic event and tsunami. Failure of the jetties would significantly impact the channel. The channel depth at the mouth would likely be severely constrained due to sands migrating in from the beaches adjacent to the jetties. Additionally, the navigability of the Columbia River Bar would be difficult and unsafe for many vessels.

Critical factors affecting marine terminal viability include the condition of navigation channels immediately following a seismic event and how quickly and successfully resources can be deployed to

assess and clear navigation channels of silt and structural obstructions. Shipping channels would be constrained as a result of lateral spreading of the channel banks, which will shift sediment into the channel. In addition, the pile dike systems along the river, which are intended to prevent sediments from migrating into the channel, are susceptible to failure during a major seismic event. Significant failures could dramatically impact the hydrology of the Columbia River. Depending on the seismic impact, deep-draft ships that are in transit in the waterway could become stuck due to a sudden shifting of material. This shift would cause the navigation channel to become shallower, cutting off navigation by other vessels and endangering the ships themselves. Additionally, structures that collapse into the navigation channel would need to be removed to allow ships to pass safely. Initially, shallow-draft barges may be the only viable option to move material and goods to and from marine terminals; or ship calls will be diverted to other, unaffected ports and regions. Marine terminals near the coast will also be exposed to the effects of tsunami waves, which could severely impact dock structures and support facilities. Timely restoration of the channel to resume current shipping operations is dependent upon the availability of dredges and federal funding authorizations.

In preparation for a Cascadia subduction zone event, dredging capabilities and resources should be identified and plans developed to assess and acquire services to ensure that the Columbia River navigation channel is cleared of sediment and returned to a minimal, and ultimately full, level of service. Pre-event analysis should be considered to identify which areas are likely to be most vulnerable to large-volume sediment movement during a Cascadia subduction zone event. Such analysis will help facilitate planning and ensure that resources will be dispatched to the areas of highest vulnerability. Following a Cascadia subduction zone event, hydrographic resources will need to be deployed to assess the condition of the navigation channel along its entire length and identify segments that need urgent dredging to re-establish river navigation of deep-draft ships. Disposal sites should be identified at strategic locations to align with dredging capabilities.

An assessment of contracting resources capable of accomplishing dredging in the region should be developed and agreements should be considered to establish who will have first rights to those construction resources. Such an assessment should also include the creation of an inventory of dredging resources and capabilities. It is expected that USACE will manage dredging activities and direct resources to areas of highest priority and need. Advance coordination with environmental permitting and regulatory agencies should be considered to ensure that dredging and placement do not violate statutory requirements.

RIVER PORTS

The vulnerability of marine terminals and navigable waterways to the effects of a major seismic event is highly variable and depends on many factors. There are several major elements associated with a marine terminal that have different—but interdependent—risks.

Some of the major elements of marine terminals that are critical to maintaining functional operation include dock structures; berths; dock-side equipment associated with material loading and unloading;

intermodal systems serving the marine terminals, including rail, roads, and bridges; the land on which the terminals were developed and its associated geotechnical characteristics; levee structures that protect marine commercial districts and, in some cases, aviation facilities; and river channels that provide passage for deep-draft vessels. These elements should be analyzed both individually and as parts of an overall system that serves marine cargo operations.

Dock structures are comprised of a wide array of systems of differing ages and with varying abilities to withstand seismic impacts. Their capacity to survive a great earthquake is dependent not only on the materials and methods used to construct them, but on their age, their condition, and the stability of the land beneath and surrounding them. For example, many marine facilities were constructed on fill material placed over historic wetlands. Such material is generally fine and granular in nature and susceptible to liquefaction if provisions are not made to resist such forces or relieve the pore pressure resulting from a high water table and seismic shaking. A structurally sound dock structure must also be supported by stable adjoining land. As has been noted in seismic events worldwide, lateral spreading (caused by seismically induced liquefaction) of the land adjacent to dock structures has contributed significantly to their damage profile. Stabilizing the adjoining land to resist lateral spreading minimizes the damage to the dock, reduces the sloughing of soil into the berth prism, and allows for a faster return to service of the dock and loading equipment.

The integrity of intermodal connections to other transportation systems, including rail, roads, and bridges, is critical to the functionality and viability of marine ports. The integrity and operability of the regional power grid and on-site generation capabilities are also critical to marine terminal operations. These elements are addressed in other sections of this report, but are noted here to emphasize the overall integration of the system that serves marine terminals.

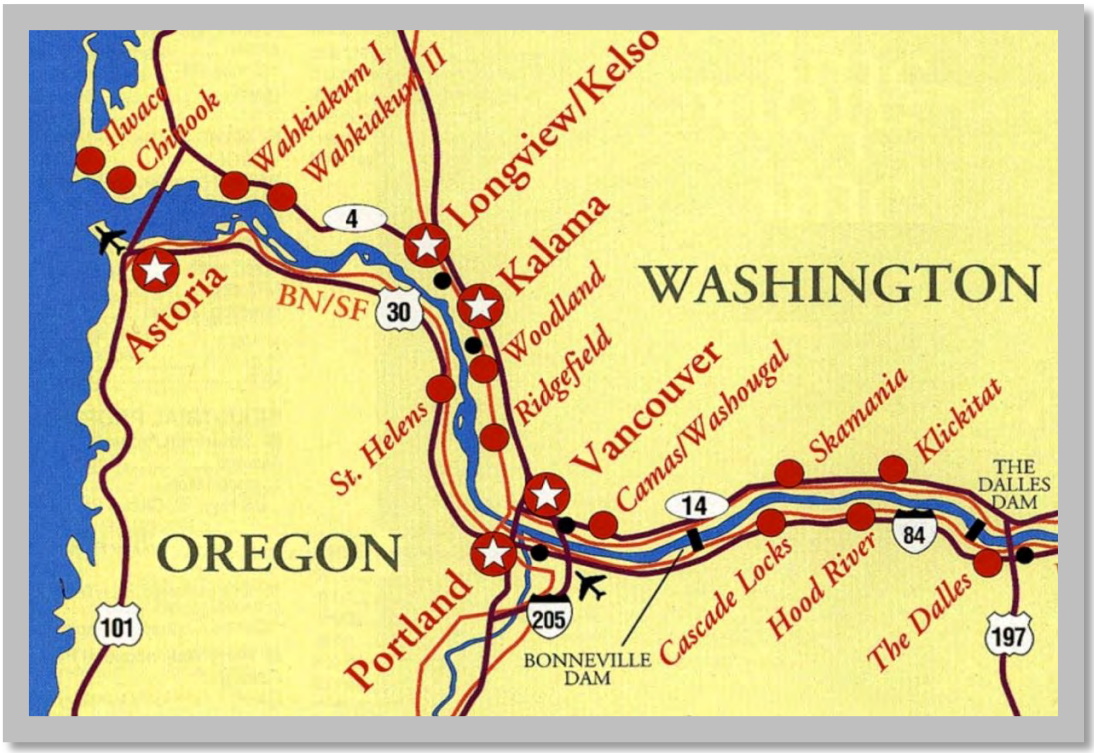


Figure 5.19: Columbia River Channel and port (Source: Port of Portland)

COASTAL INLET JETTIES

The tsunami generated by a Cascadia earthquake measuring magnitude 8–9 could range in height from 5 to 30 feet along the present shore face. In addition, co-seismic subsidence (caused by the release of built-up strain in the tectonic plates) may induce immediate lowering of the coastal margin by 2 to 8 feet (Atwater and Hemphill-Haley, 1997). In other words, the elevation of the shoreline is expected to drop during the earthquake and just before the first tsunami waves arrive.

The effect of a tsunami of this size on the coastal inlet jetties of the Pacific Northwest would be significant and transient: the overland flow of the tsunami is likely to destabilize the roots of all the jetties by eroding the morphology along the jetty roots, which may be flanked by the overland flow. Immediate repairs would be needed to re-secure the jetty roots. The seaward ends of the jetties could be affected by significant, severe scour due to the volume of water transported into and out of the inlet in response to the tsunami's passage and residual circulation. A significant volume of sediment may be mobilized and deposited within the inlet.

Violent shaking during the earthquake is also likely to destabilize many jetty areas having a side slope steeper than 1V:2H. Liquefaction of the jetty foundation may occur and initiate jetty settlement and toe failure. If vertical co-subsidence occurs with the Cascadia subduction zone earthquake, the long-term effects on the jetties of the lowering of the existing land margin by two to eight feet may be more profound than the earthquake and tsunami. Jetty freeboard could be significantly reduced and depth-

limited wave height would be significantly increased. This effect would significantly increase the rate of jetty degradation and expose the landward areas of each jetty to increased wave loading and overtopping. Jetties that were in a good state of repair (or recently rehabbed) would be more resistant to earthquake related damages as opposed to jetties that were in a condition of deferred repair.

Following such an event, a triage approach would be implemented at USACE coastal navigation projects to assess the condition of jetties, inlets, and navigation channels. High tonnage, deep-draft projects would be given higher priority than shallow-draft, low tonnage projects. Estimates for channel shoaling (required dredging) and jetty damage (required repairs) would be developed, and, if available, resources would be mobilized to re-establish a minimum level of functionality for the navigation infrastructure.

Immediate response for high priority coastal navigation projects (within our ability to respond) would be to secure the jetty roots, if these areas were breached. A breached jetty root can lead to reformation of the inlet's channel and loss of navigation. Rapid placement of stone/rip-rap along the breached jetty (at the root) would be executed, sufficient to stop tidal flow through the breached area. If required, the navigation channel may be dredged in affected areas to make it navigable again. In the long term, the affected jetties may require expedited maintenance to address damage.

COASTAL PORTS

Coastal ports in Oregon are essential for the economies of the coastal communities and will be critical for disaster response and subsequent economic recovery. Unfortunately, they are also at risk for catastrophic damage in the event of a Cascadia subduction zone earthquake and subsequent tsunami. Elements of port infrastructure that should be considered priorities include jetty/breakwater structures protecting entrances, navigation channels, docks and piers, slips, pier-side equipment, structures, and transportation linkage with rail, air, and highway.

The vulnerability of jetties and breakwaters to the potential actions of an earthquake and tsunami should be analyzed further, along with the potential effects that vertical shifting, silting, debris, and obstruction could have on channel depths. Necessary reinforcement of jetties and breakwaters is essential to maintain port entrances, as is continuing maintenance-dredging of channels.

Dock and pier structures will be exposed to severe damage due to surging currents, debris impacts, possible tsunami inundation, and liquefaction (where piers are built on fill material). Reinforcement of pier and shore-side bulkheads, which could limit damage and allow for faster recovery of port operations, should be considered a priority.

Due to their locations, the intermodal connections of most coastal ports are critical for port functions. It is necessary that Oregon prepare for and mitigate against damage to rail links, bridges, highways, adjacent airports, power supplies, and communications. Critical equipment and structures will also need to be identified and reinforced for use as maritime disaster response command centers and subsequent recovery and rebuilding efforts.

Waterborne rescue and recovery operations may have to be provided through coastal ports; this may be the only viable option for many of Oregon's coastal communities if highway corridors fail. So even though the infrastructure of many coastal ports may be devastated, their very locations will have to serve as landing sites for waterborne support (from barge, amphibious, and shipping operations). Temporary facilities provided by barges and cranes may be used to restore makeshift docks quickly for rescue and recovery operations, as was experienced in Haiti. Functionality for commerce would take longer.

Transportation resilience planning and preparation for coastal ports is critical to minimize post-event casualties, speed rescue, and allow for the economic recovery of the Oregon coast. In addition to supporting rescue and recovery operations after the earthquake and tsunami, coastal ports should serve as recovery hubs from which transportation reconstruction can reach out along the coast while transportation corridors between coastal and inland areas are being restored.

Public Transit Services

Five public transit regions correspond to ODOT highway regions. Within these regions are approximately 113 significant public transit agencies and several dozen more subcontractors who provide various forms of publicly-funded transportation service, including demand response, intercity service, and alternative transportation options. The role played by public transit service has proven to be critical during the initial response to and recovery from other major natural disasters, earthquakes included. It should therefore be considered a major component of our disaster preparedness plan.

Oregon has a full spectrum of transit providers, ranging in size from very large to very small, and extending geographically from large urban centers, such as Portland, to small coastal communities and remote rural eastern Oregon towns. Transit services in some form are provided in all 35 Oregon counties and to nine federally-recognized Indian tribal communities. About 128.5 million one-way rides are provided for Oregon residents and visitors each year. Public transit buses and smaller vehicles log 52.1 million miles of travel each year, providing over three million total annual hours of public transit operating service statewide.

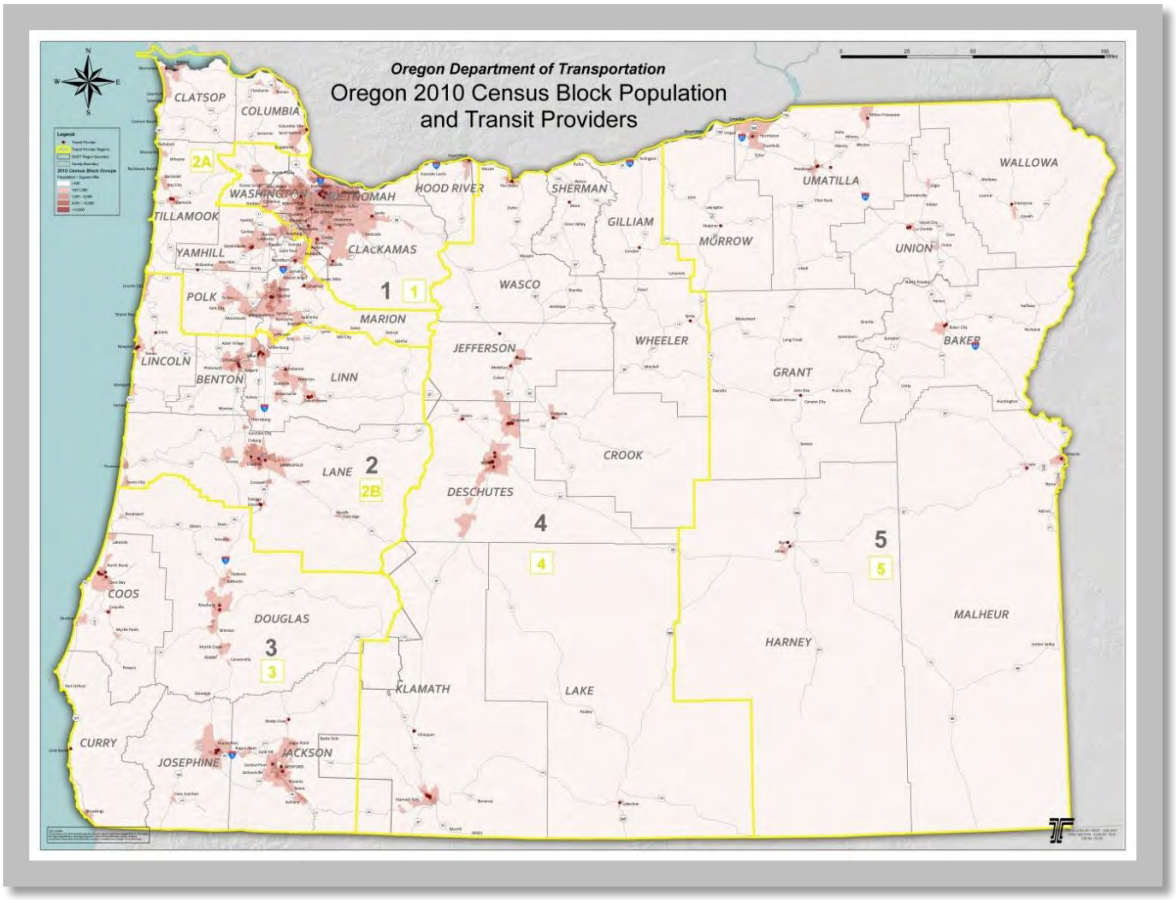


Figure 5.20: Oregon 2010 Census Block Population and Transit Providers (Source: ODOT Public Transit & GIS Technical Services)

Tri-Met, Lane Transit District (LTD), and Salem-Keizer Transit are the three largest transit agencies in the state. These are large, sophisticated agencies with their own extensive emergency management planning, incident command and response systems, and business recovery/resilience plans and procedures in place, all of which have been developed cooperatively with other public agencies and first responders in their respective areas. Additional systems, designated as small urban systems by the Federal Transit Administration and including the Rogue Valley area, Bend-Redmond, Corvallis, Albany, Grants Pass, and the Tri-Cities area, also have varying levels of detailed local emergency planning and recovery plans in place.

The remaining public transit agencies are rural or small town systems with often minimal resources in place to conduct significant planning and very few financial resources to invest in resilience following a catastrophic natural disaster. Excluding Tri-Met, LTD, and Salem-Keizer, the remaining 110 transit agencies share over $107 million in federal and state grants awarded through ODOT, with approximately two-thirds of available funding going towards simply maintaining daily or weekly operations and one-third toward capital expenditures (primarily replacement buses).

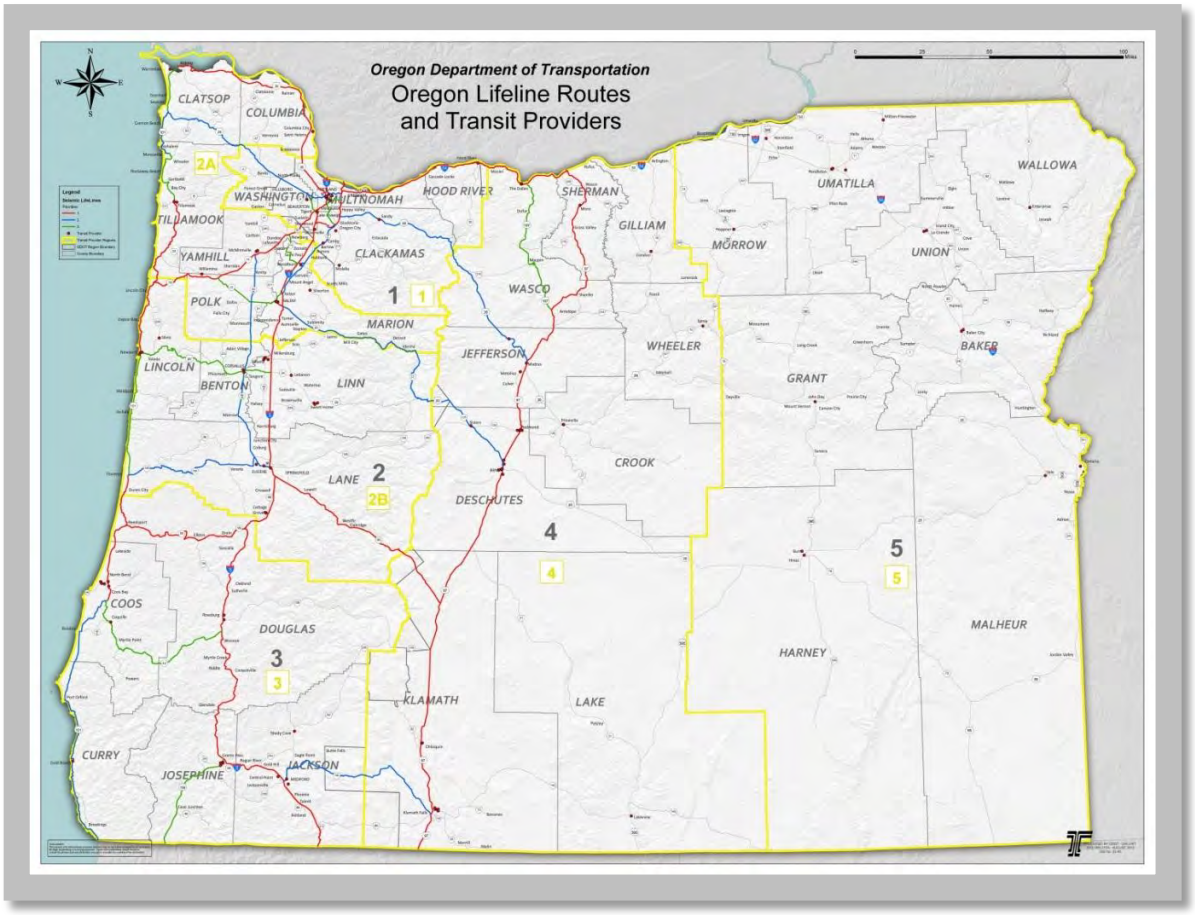


Figure 5.21: Oregon Transit Providers (Source: ODOT Public Transit & GIS Technical Services)

Transit agencies could play an important role in helping Oregon recover from a major natural disaster. Oregon transit agencies are positioned to serve the major state population centers. Public transit buses, in conjunction with school district buses, may be able to assist with emergency evacuation—either before the event, in the case of predictable natural disasters, or after the event, in situations such as a great earthquake, in which people must be transported out of an impacted area. Public transit buses could also be used to transport emergency workers or supplies to and from affected areas; to transport workers to recovery-related jobs when private automobile traffic is constrained due to road conditions and fuel supplies; and to transport seniors, persons with disabilities, and injured citizens to and from medical treatment appointments or to places where they can shop for food and other necessities.

Combining buses purchased through ODOT with those buses purchased directly by the larger urban agencies, over 1,500 buses and transit vehicles are currently deployed across the state; adding district school bus fleets would increase that number by several thousand. Most transit buses are equipped with wheelchair lifts, which, during emergency relief efforts, could also be useful in transporting and deploying both emergency personnel and their accompanying supplies and gear.

Transit providers are generally located on Oregon's lifeline routes. While this means that transit agencies are well placed to be able to assist with response and recovery activities, it also means that the transit system is dependent on local roads and highways and cannot respond if roads are impassable. Once roadways are cleared for minimum critical vehicle travel, public transit vehicles may be deployed by emergency command for the purposes of evacuating residents and transporting relief personnel.

Depending on the scale and location of the Cascadia subduction zone event and the resulting direction of tsunami wave generation, some coastal transit facilities, such as Columbia County CC-Rider, Sunset Empire Transit District, Tillamook County Transportation District, Lincoln County Transportation District, and Coos Bay Area Transit, may be inundated by the tsunami and consequently unable to respond. The ability of non-coastal transit agencies to assist coastal transit agencies is dependent on whether highways connecting the Willamette Valley to the coast remain passable. In particular, landslide risks may impair transit's ability to respond. Region 2 has the highest landslide risk (that is, this region has more historical landslide sites).

The importance of the human factor in recovery activities following a major emergency is often under-rated. Public transit is dependent on drivers, mechanics, dispatchers, and supervisors all working together to maintain and support daily operations. Some transit drivers are volunteers. Personnel must first be able to get to central agency locations, where both vehicle and communication assets must be operable, in order to provide public services. This also means there must be a way for these men and women to know that their families and loved ones are safe while they return to work. Although some emergency response personnel, such as firefighters and National Guard troops, do have commercial driver's licenses, they are generally not accustomed to driving buses, nor are they necessarily familiar with local streets and routes. Most importantly, drivers for demand-response transit services know where the vulnerable populations in their communities reside, which can be critical to saving lives in the hours and days immediately following a catastrophic event.

In summary, for public transit service restoration, short-term resilience is largely dependent on at least three primary factors:

- The condition and accessibility of the repaired roadway and (in coastal and valley areas) the bridge system.
- The ability of transit agency drivers, mechanics, dispatchers, and other key staff to respond following a catastrophic event.
- The status and availability of fuel supplies.

Longer-term resilience will also depend largely on the availability and prioritization of expenditure of public relief funds in the impacted areas. Certainly, without federal and state financial assistance, few of our local transit agencies would have the internal financial resources to finance major infrastructure rebuilds. These factors are difficult to forecast accurately given both the predicated severity of the

natural event upon which the resilience assessment is based and the competing demands for public funds which would follow.

Local Roads and Streets

For many communities, the local road and street system provides the only access to many critical facilities following a disaster event. These facilities include hospitals, fire stations, and locations where temporary food and housing are to be provided. Local roads and streets can also provide detours around failed state highway system facilities. One of the observations made after the recent subduction zone earthquake in Chile was that the local road and bridge system tended to survive better than the state system. This was because the local roads tended to be straighter and wider, which resulted in larger roadway cuts and fills. As a result, many of the local roads and streets were used as detours for damaged state highway roadways and bridges. On the other hand, because many local roads and streets are narrow, with very sharp curves, they cannot safely accommodate a high volume of traffic.

In addition to local roads and streets, Oregon has thousands of miles of forest roads, and it may be possible to use these for low-volume, temporary local detours in the event of a major disaster. Many of these forest roads are privately owned and will also be subject to significant damage in a Cascadia subduction zone earthquake. Nonetheless, such local-road detours will likely serve emergency responders, repair crews, and vehicles transporting food and other critical supplies, and will therefore play an important role as recovery efforts progress and a minimum level of service is restored.

Resilience Gap Analysis Summary

Where possible, the gap analysis is based on an engineering evaluation of vulnerability and seismic resistance. Where engineering or other technical studies have not been completed, the analysis is subjective, based on generalizations of leading indicators, such as year of construction, seismic code at the time of design and construction, assessment of current conditions, and comparison with performance of similar facilities in subduction zone earthquakes in other areas of the world. Where detailed studies have not been completed, recommendations are included for further studies to fill the gap.

The current state of Oregon's transportation systems and the anticipated time to restore service after a Cascadia subduction zone event is represented in the figure shown below. The table also provides targets for the relative time needed to restore service if the system were strengthened or retrofitted.

Oregon Transportation Resiliency Status

***Key to the Table**

TARGETS TO ACHIEVE DIFFERENT LEVELS OF RECOVERY:	
Minimal: (A minimum level of service is restored, primarily for the use of emergency responders, repair crews, and vehicles transporting food and other critical supplies.)	R
Functional: (Although service is not yet restored to full capacity, it is sufficient to get the economy moving again—e.g. some truck/freight traffic can be accommodated. There may be fewer lanes in use, some weight restrictions, and lower speed limits.)	Y
Operational: (Restoration is up to 90% of capacity: A full level of service has been restored and is sufficient to allow people to commute to school and to work.)	G
ESTIMATED TIME FOR RECOVERY TO **60%** OPERATIONAL GIVEN CURRENT CONDITIONS:	S
ESTIMATED TIME FOR RECOVERY TO **90%** OPERATIONAL GIVEN CURRENT CONDITIONS:	X

Comparison of Target States and Estimated Time for Recovery

Infrastructure Facilities	*Event Occurs*	*0 – 24 hours*	*1 – 3 days*	*3 – 7 days*	*1 – 4 weeks*	*1 – 3 months*	*3 – 6 months*	*6 – 12 months*	*1 – 3 years*	*3+ years*
Central Oregon Zone										
►OREGON STATE HIGHWAY SYSTEM										
State Highway System - Tier 1 SLR [1)]			R	Y	G			S	X	
Roadways			R	Y	G/S		X			
Bridges			R	Y	G		S	X		
Landslides			R	Y	G			S	X	
State Highway System - Tier 2 SLR			R		Y	G			S	X
Roadways			R		Y	G/S		X		
Bridges			R		Y	G		S	X	
Landslides			R		Y	G			S	X
State Highway System - Tier 3 SLR				R		Y	G		S	X
Roadways				R		Y	G/S		X	
Bridges				R		Y	G		S	X
Landslides				R		Y	G		S	X
State Highway System - Other Routes					R		Y	G	S	X
Roadways					R		Y	G	X	
Bridges					R		Y	G	S	X
Landslides					R		Y	G	S	X
►AIRPORTS & AIR TRANSPORTATION										
Tier I - Oregon Airports System										
Redmond Municipal Roberts Field Airport - FEMA		R	S		Y	G	X			
Klamath Falls Airport		R	S		Y	G	X			
FAA Facility			R	Y	G					
►OREGON RAIL TRANSPORTATION										
UPRR										
CA/OR State Line to Bieber Line Jct. (Klamath Falls)			Y	G	S	X				

Infrastructure Facilities	*Event Occurs*	*0 – 24 hours*	*1 – 3 days*	*3 – 7 days*	*1 – 4 weeks*	*1 – 3 months*	*3 – 6 months*	*6 – 12 months*	*1 – 3 years*	*3+ years*
Bieber Ln Jct. (Klamath Falls) to Chemult (Shared			Y	G	S	X				
Chemult to Eugene					Y	G	S	X		
BNSF										
CA/OR State Line to Bieber Line Jct. (Klamath Falls)		G	S	X						
Chemult to Redmond		G	S	X						
Redmond to O.T. Jct. (connection with UP at Columbia			Y	G	S	X				
►OREGON PUBLIC TRANSIT										
Admin & Maintenance Facilities [2)]						R	Y	G	S	X
Local Area Paratransit On-Demand Service (critical				R	Y	S	G	X		
Local Area Paratransit On-Demand Service (full						R	Y	G	S	X
Local Roadway Fixed Route Service (emergency				R	Y	S	G	X		
Local Roadway Fixed Route Service (regular						R	Y	G	S	X
Intercity & Commuter Bus [4)]						R	Y	G	S	X
Willamette Valley Zone										
►OREGON STATE HIGHWAY SYSTEM										
State Highway System - Tier 1 SLR [1)]			R	Y	G			S	X	
Roadways			R	Y	G		S	X		
Bridges			R	Y	G			S	X	
Landslides			R	Y	G			S	X	
State Highway System - Tier 2 SLR			R		Y	G			S	X
Roadways			R		Y	G	S	X		
Bridges			R		Y	G			S	X
Landslides			R		Y	G			S	X
State Highway System - Tier 3 SLR				R		Y	G		S	X
Roadways				R		Y	G	S	X	
Bridges				R		Y	G		S	X
Landslides				R		Y	G		S	X
State Highway System - Other Routes					R		Y	G	S	X
Roadways					R		Y	G	S	X
Bridges					R		Y	G	S	X
Landslides					R		Y	G	S	X
►AIRPORTS & AIR TRANSPORTATION[5)]										
Tier I - Oregon Airports System										
Portland International Airport (PDX) (Tier 1)		R			Y	S		G	X	
Salem McNary Field		R			Y	S		G	X	
Eugene Mahlon Sweet Filed		R			Y	S		G	X	
Rogue Valley International Medford		R			Y	S		G	X	
Roseburg Regional Airport		R			Y	S		G	X	
Tier III Oregon General Aviation Airport System										
Troutdale			R		S	Y		G		X
Portland Heliport			R		S	Y		G		X
Aurora State			R		S	Y		G		X
McMinnville Municipal			R		S	Y		G		X
Corvallis			R		S	Y		G		X

Infrastructure Facilities	*Event Occurs*	*0 – 24 hours*	*1 – 3 days*	*3 – 7 days*	*1 – 4 weeks*	*1 – 3 months*	*3 – 6 months*	*6 – 12 months*	*1 – 3 years*	*3+ years*
Grants Pass			R		S	Y		G		X
Mulino State			R		S	Y		G		X
Albany Municipal			R		S	Y		G		X
Lebanon State			R		S	Y		G		X
Creswell Municipal			R		S	Y		G		X
Cottage Grove State			R		S	Y		G		X
Myrtle Creek			R		S	Y		G		X
Independence State Airport			R		S	Y		G		X
FAA Facility				R	Y	G	X			
►PORTS & WATER TRANSPORTATION										
Port of Portland Terminals			R			Y		G/S		X
►OREGON RAIL TRANSPORTATION										
UPRR										
O.T. Jct. to Troutdale			G	S	X					
Troutdale to Portland via Graham Line			Y	G	S	X				
Troutdale to Portland via Kenton Line			Y	G	S	X				
Eugene to Portland				Y	G	S	X			
BNSF										
Vancouver, WA to Portland					Y	G	S	X		
Portland & Western										
WES Commuter Rail, Wilsonville-Beaverton					Y	G	S	X		
►OREGON PUBLIC TRANSIT										
Admin & Maintenance Facilities [2)]						R	Y	G	S	X
Local Area Paratransit On-Demand Service (critical					R	Y	S	G	X	
Local Area Paratransit On-Demand Service (full						R	Y	G	S	X
Local Roadway Fixed Route Service (emergency				R	Y	S	G	X		
Local Roadway Fixed Route Service (regular						R	Y	G	S	X
Intercity & Commuter Bus [4)]						R	Y	G	S	X
Coastal Zone (Outside Tsunami Area)										
►OREGON STATE HIGHWAY SYSTEM										
State Highway System - Tier 1 SLR [1)]			R		Y			G	S	X
Roadways			R		Y			G/S	X	
Bridges			R		Y			G	S	X
Landslides			R		Y			G	S	X
State Highway System - Tier 2 SLR				R		Y		G	S	X
Roadways				R		Y		G	S	X
Bridges				R		Y		G	S	X
Landslides				R		Y		G	S	X
State Highway System - Tier 3 SLR					R		Y		G	S/X
Roadways					R		Y		G/S	X
Bridges					R		Y		G	S/X
Landslides					R		Y		G	S/X
State Highway System - Other Routes							R		Y	S/X
Roadways							R		Y/S	X

Infrastructure Facilities	*Event Occurs*	*0 – 24 hours*	*1 – 3 days*	*3 – 7 days*	*1 – 4 weeks*	*1 – 3 months*	*3 – 6 months*	*6 – 12 months*	*1 – 3 years*	*3+ years*
Bridges							R		Y	S/X
Landslides							R		Y	S/X
►**AIRPORTS & AIR TRANSPORTATION** [5)]										
Tier II Oregon General Aviation Airport System										
Hillsboro Airport			R			Y	S		G	X
Newport Municipal Airport		R			Y		S	G		X
Scappoose Industrial Airpark Airport			R			Y	S		G	X
Tillamook Airport		R			Y		S	G		X
Bandon State Airport			R			Y	S		G	X
Brookings Airport			R			Y	S		G	X
Siletz Bay State Airport			R			Y	S		G	X
Cape Blanco State Airport		R			Y		S	G		X
Tier III Oregon General Aviation Airport System										
Florence Municipal Airport						R		Y	S	G/X
FAA Facility			R			Y	S		G	X
►**OREGON RAIL TRANSPORTATION** [6)]										
Coos Bay Rail Link										
Eugene to Cushman (Siuslaw River near Florence)					Y	G	S	X		
Portland & Western										
Albany to Toledo					Y	G	S	X		
Willbridge (N.W. Portland) to Wauna				Y	G		S	X		
►**OREGON PUBLIC TRANSIT**										
Admin & Maintenance Facilities [2)]						R	Y	G	S	X
Local Area Paratransit On-Demand Service (critical					R	Y	S	G	X	
Local Area Paratransit On-Demand Service (full						R	Y	G	S	X
Local Roadway Fixed Route Service (emergency					R	Y	S	G	X	
Local Roadway Fixed Route Service (regular						R	Y	G	S	X
Intercity & Commuter Bus [4)]						R	Y	G	S	X
Tsunami Inundation Zone										
►**OREGON STATE HIGHWAY SYSTEM**										
State Highway System - Tier 1 SLR [1)]				R		Y			G	S/X
Roadways				R		Y			G	S/X
Bridges				R		Y			G	S/X
Landslides				R		Y			G	S/X
State Highway System - Tier 2 SLR					R		Y		G	S/X
Roadways					R		Y		G	S/X
Bridges					R		Y		G	S/X
Landslides					R		Y		G	S/X
State Highway System - Tier 3 SLR						R		Y		S/X
Roadways						R		Y		S/X
Bridges						R		Y		S/X
Landslides						R		Y		S/X
State Highway System - Other Routes							R		Y	S/X
Roadways							R		Y	S/X

Infrastructure Facilities	*Event Occurs*	*0 – 24 hours*	*1 – 3 days*	*3 – 7 days*	*1 – 4 weeks*	*1 – 3 months*	*3 – 6 months*	*6 – 12 months*	*1 – 3 years*	*3+ years*
Bridges							R		Y	S/X
Landslides							R		Y	S/X
►**AIRPORTS & AIR TRANSPORTATION** [7)]										
Category I - Commercial Service Airports										
Southwest Oregon Regional Airport						R				X
Category II - Urban General Aviation Airports										
Astoria Regional Airport						R				X
Category IV - Local General Aviation Airports										
Seaside Municipal Airport									R	X
Gold Beach Municipal Airport									R	X
Category V - Remote Access/Emergency Service										
Nehalem Bay State Airport									R	X
Pacific City State Airport									R	X
Wakonda Beach State Airport									R	X
FAA Facility										
►**PORTS & WATER TRANSPORTATION**										
Port of Astoria					R	Y	S	G	X	
Gateway Piers					R	Y	S		G/X	
Tongue Point					R	Y	S	G/X		
Mooring Basins				R	Y		S	G	X	
Boatyard				R	Y		S	G	X	
Channels				R	Y	S		G	X	
►**OREGON RAIL TRANSPORTATION** [6)]										
Coos Bay Rail Link										
Cushman (Siuslaw R. near Florence) to Coos Bay &							Y	G	S	X
Portland & Western										
Wauna to Tongue Point/Astoria						Y	G	S	X	
►**OREGON PUBLIC TRANSIT**										
Admin & Maintenance Facilities [2)]							R	Y	G	S/X
Local Area Paratransit On-Demand Service (critical						R	Y	S	G	X
Local Area Paratransit On-Demand Service (full							R	Y	G	S/X
Local Roadway Fixed Route Service (emergency						R	Y	S	G	X
Local Roadway Fixed Route Service (regular							R	Y	G	S/X
Intercity & Commuter Bus [4)]							R	Y	G	S/X

TABLE NOTES:

1) SLR = Seismic Lifeline Routes (See Maps on Figure 5. 23 and 5. 24)

2) While temporary facilities can be used as an interim measure, it is anticipated that the prioritization of public relief funds would tend to push reconstruction of permanent transit facilities out into longer timeframes.

3) Critical needs evacuation and emergency usage of transit rolling stock would be at the direction of emergency operations center personnel.

4) Restoration of regular on-demand, fixed route, and intercity bus service is contingent on the extent of earthquake and tsunami damage, and on our ability to repair roads and bridges in all tiers of the state highway system and local roads.
5) Minimal level of service may indicate a heliport option only.
6) On these line segments, normal traffic is one train each way daily; consequently, restoration of minimal service means the same as functional.
7) Minimal level of service indicates the heliport option only. Due to the airport's proximity to the Pacific Ocean and elevation, the airport may be subject to relocation after the tsunami event.

Figure 5.22 – The current state of Oregon's transportation systems and the anticipated time to restore service after a Cascadia subduction zone event

HIGHWAY TRANSPORTATION

Sizable investments are needed to allow the highway system to be usable shortly after a major event. The total estimated cost to repair all seismically deficient bridges and unstable slopes is in the hundreds of millions of dollars; however, options exist for phased retrofitting that will provide the maximum degree of mobility with reasonable investments. The manner and timing of funding will influence how and where Oregon is prepared for rescue and recovery.

Analysis suggests that the longer the state delays increasing its investment in bridge and slope strengthening, the greater the cost and potential adverse effects an earthquake will have on the state's economy. If risks related to bridges and slopes are left unaddressed, the odds grow every day that we will be unprepared for an increasingly likely major earthquake. Oregon should therefore develop an investment package to begin a strategic retrofitting and replacement program for the state's bridges and unstable slopes. Securing both the interstate system in vulnerable areas and other key lifeline routes is the first priority, followed by critical city and county connector routes.

The strategic investment plan should be implemented in three tiers that build on each other. The Tier 1 routes listed in Figure 5. 23 (Phase 1 and then Phase 2) are considered top priorities for ensuring the greatest return on investment to support rescue and recovery operations. Strengthening Tiers 2 and 3 (Figure 5. 24) would follow as funding becomes available. This strategy anticipates that ODOT will continue bridge retrofits and slope strengthening in combination with other projects, even as it shifts to a more strategic, corridor-based approach to maximize potential future investments in seismic retrofitting.

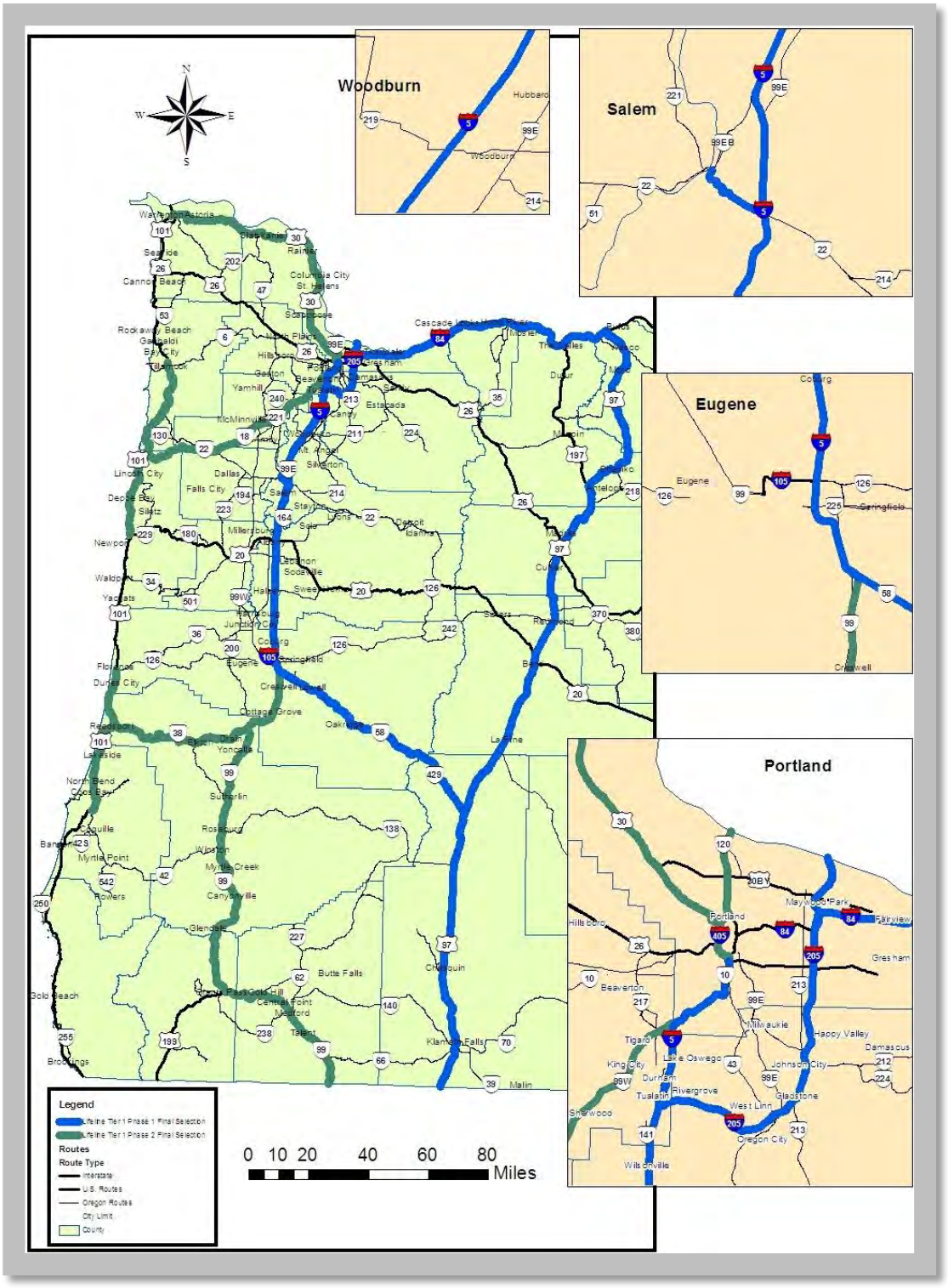


Figure 5.23 –Map of Seismic Options Program: Tier 1 Routes (Source: ODOT – Bridge Section)

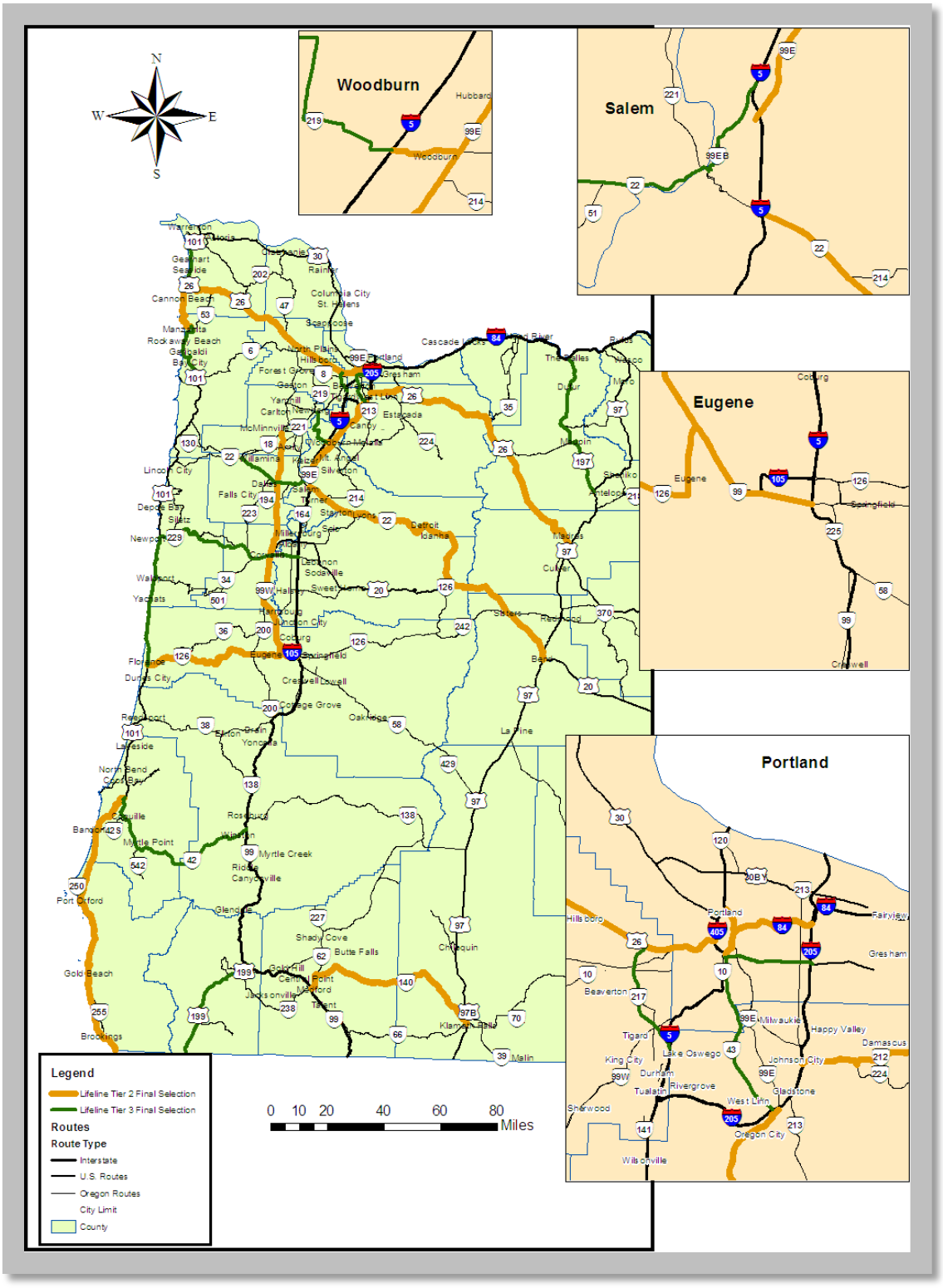


Figure 5.24 –Map of Seismic Options Program: Tier 2 & 3 Routes (Source: ODOT – Bridge Section)

RAIL TRANSPORTATION

A detailed vulnerability study and gap analysis should be done to identify strengthening and retrofit needs.

AIR TRANSPORTATION

A detailed vulnerability study and gap analysis should be done to identify strengthening and retrofit needs.

RIVER PORTS

A detailed vulnerability study and gap analysis should be done to identify strengthening and retrofit needs.

COASTAL PORTS

A detailed vulnerability study and gap analysis should be done to identify strengthening and retrofit needs.

PUBLIC TRANSIT SERVICES

A strategic investment strategy for public transit needs to start with the allocation of funds for gathering information, planning, and building collaboration with local and regional emergency planners. Specific projects for tactical hardening or relocation of certain transit structures and facilities may prove to be a valuable off-shoot of this effort, but in order to prioritize those and other potential expenditures, we first need to inventory and gather basic information about all transit resources in the four impact zones:

- An updated inventory of transit assets (buses, vans, fuel supplies, communications equipment, and repair facilities)—both those inside and those outside of the areas expected to be affected by the disaster—will be helpful. This should also include private carriers and school districts that may be of use in emergency response and recovery.
- An inventory of the assets of each facility, including general description, footprint, construction type, year built, and generator facilities, can provide a first-cut at seismic vulnerability estimation for those facilities that have not yet completed seismic assessments for a Cascadia-level event.
- Public transit needs to be included in emergency response preparations. As was recently revealed by Japan's Tohoku earthquake and the resulting tsunami impacts in Curry County and Del Norte County, transit agencies had not been at the table in emergency preparedness planning. A county-by-county assessment of transit's inclusion, role, and assigned activities for emergency preparedness should be conducted, and, where lack of involvement is indicated, inclusion and involvement should be formally encouraged.
- Assessment of the locations and needs of vulnerable and at-risk clients in all impact areas should be a priority. The lack of such information was a major factor in a number of deaths associated with Hurricane Katrina, many of which were potentially preventable. This is something each

local provider can do, with perhaps some general guidance and consistency of format provided at a statewide level.

- Transit agencies need to assess and prepare an inventory of routes, making note of the risk and vulnerability of both current transit routes and alternate routes; the inventory should identify alternate routes ahead of the actual event.
- Local transit providers should develop an emergency human resources plan that identifies:
    - Who their critical personnel are.
    - Where they live.
    - Full contact information.
    - Who is and who is not likely to be able to respond following an emergency.
    - Contingency plans for resuming at least minimal service using available and alternate personnel.
- Two aspects of preparedness should be considered for public transit: resilience planning and emergency response functions. These may include different roles for transit agencies, and they may entail different performance expectations. These differing roles and responsibilities need to be defined. The existence of mutual aid agreements with other local agencies and with nearby transit agencies should be identified; and, if do not exist, they should be encouraged as a means of building and sustaining collaboration and resilience.

LOCAL ROADS AND STREETS

As the strategic investment plan is implemented on the state highway system, certain elements of the local road and street system must also be retrofitted:

- In a few locations, critical emergency service facilities are separated from the state lifeline system by a substandard bridge. These bridges need to be retrofitted at the same time as the nearby state highway.
- Local road and street detours should be retrofitted wherever either of the following conditions exist:
    - The local road detour can be retrofitted for much less money than a retrofit on the section of state highway or bridge.
    - The local road detour can provide a substantially reduced time to restore the lifeline corridor to the minimal level of service for the use of emergency responders, repair crews, and vehicles transporting food and other critical supplies.

URBAN AREAS TRANSPORTATION

This chapter focuses mainly on statewide mobility between major hubs, cities, and towns. It is recognized, however, that travel within urban areas is also very important for rescue and recovery.

Large urban areas have critical needs for transportation resilience due to the relatively high volume of needs of a large population and the relatively high impact urban areas have on the state's economy.

Urban areas, such as Portland Metro, Eugene, Salem, Bend, Grants Pass, and Medford, face a large geographic barrier in the Columbia, Willamette, Deschutes, and Rogue Rivers and Bear Creek. These weak links in the urban transportation network create a potential for longer-term impacts because of the amount of time it is likely to take to restore traffic over large river bridges and to address problems caused by liquefiable soils along the river banks.

Most cities have established emergency response plans that identify critical facilities such as hospitals, fire stations, law enforcement facilities, schools, and emergency supply depots. Critical utility facilities, energy sources, and fuel depots are also needed for economic recovery. Access to these areas will be necessary to facilitate recovery, but specific modes and routes to provide this have not been identified in this study. This work is needed before a comprehensive plan for resilience can be finalized.

Transportation Interdependency Assessment

The Transportation Task Group determined that significant vulnerabilities exist for all transportation modes in western and central Oregon. While the desired approach is to raise the level of resilience of each mode by means of improvements programmed over a fifty-year timeframe, this may not be feasible due to the extremely high cost. The purpose of the interdependency effort was to select a multimodal transportation system that would provide the highest level of mobility to the largest area or to the highest population centers for the least cost.

The Transportation Task Group considered recommendations that would lead to a plan of measured improvements in ten-year increments that would include the most effective system of interconnected modes. The focus of this effort is to establish the resilience of portions of a transportation system—comprised of various modes—that would provide the greatest benefit for short-term rescue and longer-term economic recovery. To this end, the task group selected a minimum network of highway routes, termed a *backbone system*, and then supplemented it with other modes to provide statewide connectivity at what was perceived to be the lowest retrofit cost. The backbone system was identified as:

- I-5, from I-84 (Portland) to OR 58
- I-84, from I-5 (Portland) to U.S. 97
- U.S. 97, from I-84 to the California border
- OR 58, from I-5 to U.S. 97

Two alternate, interim transportation systems were assumed. The overall philosophy driving the selection process of the first system was that the movement of goods and people is likeliest, or most easily assured, along U.S. 97 (from both the north and the south and along the BNSF railroad line from

Klamath Falls), which also provides access to the Redmond airport in central Oregon. This assumption is supported by the low vulnerability of the highway, railroad line, and airport in comparison to routes and sites in western Oregon. The Redmond Municipal Airport was considered a key to short term mobility, because it would likely be available immediately following a Cascadia subduction zone earthquake. The Redmond airport should not need much investment to remain fully operational, although no specific study has been conducted to confirm this assumption. From the Redmond airport, goods and people would be easily distributed, by means of fixed-wing aircrafts, to Class 1 and commercial airports along the I-5 corridor. The task group considered this approach to be a high priority due to the high efficiency of fixed-wing aircrafts for moving people and freight. Goods and people would then access coastal areas by helicopter (a flight lasting approximately one half-hour each way). Airports in remote and coastal areas that can handle helicopters were identified as the second highest or moderate priority, with the resilience of the local roads and streets that provide access to those airports rated as equally important.

An alternate or redundant interim transportation system would serve Oregon from the west from ships, some anchored off shore for as long as needed. Goods and people would have access to the ships either through selected coastal ports hardened for use shortly after an event or by helicopter. Mobility from the ports to major population centers along the coast and inland would be achieved via hardened portions of U.S. 101 and selected local roads and streets.

The backbone highway system and seven airports are considered high priorities and should be made resilient within 10 years. The high-priority airports include:

- Redmond
- Portland International
- Salem
- Eugene
- Roseburg
- Medford
- Klamath Falls

Tier-1, Phase-2 Highway Lifeline Routes include segments of the coast highway (U.S. 101) and three highway segments connecting U.S. 101 to I-5. These segments should be considered moderate priorities as part of the multimodal transportation system. Airports designated as moderate priorities (to be hardened within 20 years) include:

- Scappoose/Hillsboro (one of these)
- Tillamook
- Siletz Bay (Lincoln City)

- Newport
- Florence
- Cape Blanco
- Brookings

North Bend and Astoria airports are very vulnerable, because they are both likely to be under water following a Cascadia subduction zone earthquake and tsunami. Both airports, however, may be potential recovery hubs due to the presence of the Coast Guard there. Unless the North Bend and Astoria/Warrenton facilities are completely destroyed, the Coast Guard intends to establish field facilities (tents/trailers) and begin operating those facilities as soon as possible after the event. (Airfields, which are unusable by fixed wing airplanes, may still be completely functional for helicopters as soon as the water recedes).

RAIL LINES

The task group considered the utility of rail lines in order to provide some redundancy to the basic backbone system, although nearly all the rail infrastructure predates modern seismic engineering standards. Rail lines into Redmond are considered a high priority, because Redmond is the hub for air transportation. The high priority mainline from Klamath Falls to Chemult is shared by BNSF Railway (formerly the Burlington Northern and Santa Fe Railroad) and UP (Union Pacific Railroad). The high priority BNSF mainline continues from Chemult to the Columbia River just west of Biggs. The UP mainline along the south side of the Columbia River from Portland to Idaho is also considered to be a high priority. The UP mainline from Chemult to Eugene and paralleling I-5 all the way to Portland is considered a moderate priority, because it is assumed that the cost of making the section through the Cascade Range resilient is very high.

All rail routes from the Willamette Valley to the coast are moderate to low priorities due to their vulnerabilities. The Coos Bay line could be functional to Reedsport after a Cascadia subduction zone event; but it is unlikely to be functional all the way to Coos Bay. The Tillamook line has been out of service since December 2007, with no plan for repairs. In general, short-line routes do not look very resilient, as they have not been built to current standards. There is very little rail redundancy outside of the Willamette Valley.

COASTAL AND RIVER PORTS

River and coastal ports are considered to be both part of a redundant system (in relation to the basic backbone system) and, in some cases, the primary access for specific areas. The task group considered it important to take into account the capabilities of the maritime industries, the Navy/Marine Corps, and the Coast Guard to bring in supplies by sea and distribute them to the state via air. The task group noted that this was done very effectively in Haiti.

River Ports

The Port of Portland has a very large capacity for handling supplies and is considered to be a major focus for restoring the economy after a seismic event. This port will be doing selective strengthening in the near future. The following upriver ports could provide significant supply links, although their levels of vulnerability and the vulnerability of the intervening locks still need to be confirmed:

- Arlington
- Morrow
- The Dalles
- Cascade Locks
- Umatilla

In addition, it was noted that the Port of St. Helens has a significant commodities capacity.

Locks are not designed to current seismic standards. In addition, seismic standards for locks are lower than for other structures. Seismic resistance is not an element of current evaluations conducted on river locks.

The overall plan needs to include a resilience evaluation of the Columbia River channel:

- An event could modify the channel's shape such that some larger vessels may not be able to navigate the river following an event.
- Dredging will likely be needed to restore the shipping channel following an event.
- Bridge failures could block the river for a period of time.
- The failure of dams or locks could block river navigation for an extended period of time.
- Elevation changes, subsidence, and other morphological changes could result in permanent changes to channels.

Coastal Ports

Coastal ports may be a significant lifeline for selected communities along U.S. 101. Immediately after a Cascadia subduction zone event, the coastal ports are not expected to be usable without some level of reconstruction. A detailed study is needed to determine whether there are practical ways to harden coastal ports so that they can be quickly restored and rendered operational. There is a study underway concerning identification of potential beach landing sites for naval vessels that would not require port facilities. The most practical solution may be to stockpile key resources at coastal locations. Such resources would include:

- Bailey bridges.
- Floating docks.

- Dredging equipment.

The task group recognized that storage of resources can be expensive, and consideration of deterioration and maintenance may lower the desirability of this option. Maintaining contingency contracts with local contractors who have the ability to repair structures or install temporary structures is considered a best practice.

Key roads are also needed to support port activity. Most of these connections are local agency routes that are considered to be the same level of priority as the coastal ports.

OTHER CONSIDERATIONS

- One of the issues that arose as the task group considered interdependencies is the lack of direct correlation between the modes. For example, air and water transport generally have definite take-off and landing points, although helicopters and beach landing craft can significantly extend the range of those modes to nonconventional landing areas. The highway system, on the other hand, has innumerable connections and no prescribed end points.
- Focusing simply on hardening the Phase 1 routes of OSLR Tier 1 will not ensure highway access to many coastal communities. If coastal communities are served primarily by air after an event, we would still need to consider local route resilience to make the most of the air corridors.
- The overall plan needs to take into consideration the potential for partial or complete failure of dams. Potential impacts and consequences of a failure could be extremely serious for rescue and recovery.

Alternate Routes

Selected local agencies were asked to assess the condition of their roads and streets in order to propose local bypasses (alternate routes) for the designated lifeline routes of the state highway system. The objective was to identify the places where the use of the local highway may be a more cost effective or practical means of making the transportation network resilient. Some examples are listed below.

- Klamath County proposed an 11-mile bypass of U.S. 97. This segment avoids the rockfall area north of Klamath Falls. Although this rockfall risk would be critical during an earthquake, the fallen rocks could be moved quickly out of the way shortly after the event. Moreover, the proposed bypass has liquefaction risk. The main north-south railroad is also next to the slide area. Because this railroad segment will be a Tier 1 facility, protection measures need to be planned. Such a protection scheme will likely protect both the highway and the railroad.
- Astoria suggested a route that runs parallel to U.S. 101 and bypasses Young's Bay Bridge. This parallel route has a few smaller bridges, would cost less to retrofit, and is at a higher elevation (no tsunami threat).

- Tillamook County noted an alternate route that parallels U.S. 101. This county route has small bridges and one major bridge, which is scheduled to be replaced in 2015. Connections to the airport and hospital would also need to be added.
- Albany suggested alternate north-south and east-west routes. The east-west route also connects to the hospital.
- Portland proposed priority local routes to hospitals, their lifeline routes on arterials connecting to the state highway lifeline routes, and connections to fuel depots.

Several other proposed local alternative routes are included in the ***Local Agency Alternatives to State Highway Lifeline Routes (http://www.oregon.gov/ODOT/HWY/BRIDGE/docs/laashlr.pdf)***, a supplement to this Report. These routes will be studied at a later time as possible alternatives to state highway lifeline routes.

Public Transit

As noted earlier in this chapter, public transit agencies could play an important role in helping Oregon recover from a major natural disaster. The overall plan should therefore include funds to inventory public transit facilities and rolling stock (both inside and outside the projected impact areas) and to coordinate the integration of public transit into local and regional emergency relief and business recovery planning, including the development of mutual aid agreements where appropriate.

TRANSPORTATION INTERDEPENDENCY SUMMARY

The task group determined that no single transportation mode can be feasibly retrofitted to provide adequate mobility after a major Cascadia event for all areas of the state. A plan for strengthening particular components of each mode—to provide a combination of highway, air, rail, water ports, and local access roads—was developed that offers a cost effective strategy to increase mobility in incremental steps.



Recommendations

Recommendations for improving the resilience of transportation are based on the assumption that incremental improvements will be made over a 50-year timeframe. Phased investments to improve mobility are envisioned in order of priority and were chosen to best leverage cross modal improvements that will facilitate movement of goods and people on a multimodal transportation system. The recommended approach is to establish redundancy by routing people, supplies, and services from the east by air from Redmond Municipal Airport to hardened airports in the Willamette Valley, and by highway along I-84 and OR 58 to I-5 in the Willamette Valley to areas accessible by highways, and then by helicopter to isolated areas. Concurrently, people, supplies, and services would be able to travel from the sea through selected ports and then along portions of U.S. 101 or by helicopter to isolated areas.

Recommendations are presented for short-term goals and long-term goals.

SHORT-TERM RECOMMENDATIONS

- **Complete an updated inventory of local agency transit, port, and rail assets (such as service buildings, buses, vans, fuel supplies, communications equipment, repair facilities, and human resources, including identifying the needs of vulnerable and at-risk clients), assuring access to school buildings and hospitals, which could be used during emergencies.**
- **Complete a statewide evaluation, assessment, and gap analysis of:**
  - Local agency roads and streets, including public transit. (Define the roles of local agencies, transit, port, and railroads in resilience planning and assessment of alternate routes.)
  - Coastal and river port facilities, including jetties and breakwaters, the Columbia River channel (103.5 miles long, 43 feet deep, 600 feet wide), the levee system, dams and locks, port entrance channels, pile dikes, and specifically, Port of Portland facilities (including access to and the vulnerability of the four terminals that are interdependent with two rail lines, the river barge system, and two interstate highways) and the liquefaction vulnerability at Portland International Airport (PDX).
  - Railroads—specifically, the UPRR (Willamette Valley) and BNSF (Central Oregon) trunk north-south rail lines and three railroad short lines (Astoria District, Albany-Toledo, and CBRL) with access to coastal communities.
  - Ninety-seven public-use airports.
- **Encourage Federal agencies, such as USCG and the Corps of Engineers, to complete an assessment and gap analysis of Federal facilities that support transportation resilient planning.**
- **Develop a mitigation policy and retrofit plan for the assets and service facilities of vulnerable bridges, including all co-located utilities (such as power, communication, gas, water, and wastewater lines); rockfalls and unstable slopes; the 29 airports listed in the airport section of Chapter 5; river and coastal ports; the Columbia River channel, including emergency re-dredging options; local roads, streets, and transit; rail (on a corridor basis along the critical trunk and regional segments); and intermodal connections. Identify Redmond Municipal Airport (Roberts Field) as a key distribution point for other airports, and harden it as necessary so it will be operational after a major event; identify coastal and river ports or heliports as redundant access from ships stationed off shore for medical facilities and delivery of supplies from out of state, and the Columbia River as a priority with continued dredging. Encourage the development of formal cooperative assistance agreements with local agencies, nearby transit providers, rail providers, ports, and highway agencies.**
- **Continue to refine and gain consensus for the strategy contained in the interdependency section of Chapter 5 to optimize the recommendations for an incremental program for achieving resilience in western Oregon and to provide service to coastal areas and other potentially isolated areas with a combination of air, ports, regional rail, and highway segments, including**

consideration of the following airports and water transportation as the redundant first line of operational sites supporting lifeline highways:

- Redmond Municipal Airport
- Portland International Airport
- Salem Airport
- Eugene Airport
- Roseburg Airport
- Medford Airport
- Klamath Falls Airport
- Scappoose/Hillsboro Airport (one of these)
- Tillamook Airport
- Siletz Bay Airport (Lincoln City)
- Newport Airport
- Florence Airport
- Cape Blanco Airport
- Brookings Airport
- Selected Coastal and River Ports
- Columbia River Channel

► **Enhance the proposed Highway Lifeline Maps by considering the use of highway segments owned by cities and counties to provide access to critical facilities. Prioritize local routes to provide access to population centers and critical facilities from the identified Tier-1 routes. When developing projects for seismic retrofit of highway facilities, consider whether a local agency roadway may offer a more cost effective alternative for all or part of a lifeline route.**

LONG-TERM RECOMMENDATIONS

► **Enhance design and maintenance standards and requirements for bridges and unstable slopes, transit, rail, ports, and airfields based on the priority of a lifeline route.**

► **Develop a temporary bridge installation policy and standards, including an assessment of the number of temporary bridges or amount of temporary bridge materials to stockpile for emergency use. Coordinate with the DOTs of neighboring states to create an inventory of (portable, temporary) Bailey bridges that includes notes on their locations and transportation methods. Consider procurement of additional temporary bridge materials.**

► **Support research on retrofit methods and strategies for Cascadia subduction zone earthquake loads. Support research on tsunami effects, and develop a design policy for tsunami loads.**

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6. Energy

Introduction

The Pacific Northwest has a high likelihood of a magnitude 9.0 earthquake on the Cascadia subduction zone, which would produce minutes of strong ground shaking, coastal subsidence, landslides, liquefaction, lateral spreads, and a coastal tsunami. Seismic provisions in Oregon's building codes were first explicitly adopted in 1993. In contrast, Oregon's critical energy infrastructure (CEI) is not governed by a uniform set of design and construction codes. Much of the existing CEI has been constructed with seismic design deficiencies. To minimize extensive direct earthquake damage, indirect losses, and possible ripple effects, substantial improvements to the critical energy infrastructure are necessary.

GOAL

The goal of the Energy Task Group is to provide policy recommendations to the state legislature to make Oregon's critical energy infrastructure more resilient against a Cascadia subduction zone earthquake and tsunami within 50 years.

WHAT DOES BEING RESILIENT MEAN

The Oregon Seismic Safety Policy Advisory Commission (OSSPAC) has defined resilience as follows: "*Oregon citizens will not only be protected from life-threatening physical harm, but...because of risk reduction measures and pre-disaster planning, communities will recover more quickly and with less continuing vulnerability following a Cascadia subduction earthquake and tsunam*i."

SCENARIO

Because the impacts of the scenario M9.0 subduction zone earthquake and tsunami will vary depending on location, the steering committee recommended that, for the purposes of this study, the state be divided into separate regions. In addition to the tsunami, significant levels of shaking are expected, which will lessen in intensity the further one is from the coast.

The Energy Task Group adopted the following impact regions within Oregon, as recommended by the steering committee for all sectors:

- Coast/Tsunami Region: This is the part of the Oregon coast that is in or adjacent to the projected tsunami inundation zone.
- Coast/Seismic Region (earthquake-only): This is the part of the Oregon coast that is outside the tsunami inundation zone, but likely to experience peak ground acceleration (g) from .3 to .45.
- Willamette Valley Region: This region is likely to experience peak ground acceleration (g) from .15 to .3.

- Eastern Oregon Region: This region is likely to experience peak ground acceleration (g) from .01 to .15.

HISTORY

Over the course of the past five years, the Oregon Department of Geology and Mineral Industries (DOGAMI), the Oregon Public Utility Commission (OPUC), and the Oregon Department of Energy (ODOE) have been promoting awareness of the seismic vulnerabilities of Oregon's critical energy infrastructure by communicating with local, state, and federal government officials, energy operators, Oregon citizens, and the media through high profile activities, such as the following:

- April 2, 2007—Conducted a full-day leadership forum and workshop on the seismic readiness of critical energy infrastructure. This event was held at the OPUC's Main Hearing Room. The goal was to promote the importance of seismic vulnerability studies of critical energy infrastructures to utilities' executives and senior engineers, bringing together speakers from across the United States with expert knowledge on seismic readiness. The workshop addressed four critical areas:
    - Cascadia earthquake hazards and risk
    - Critical energy infrastructure vulnerability to earthquake damage
    - State-of-practice lifeline seismic vulnerability studies and application
    - Case studies of vulnerability studies by BPA and Pacific Gas and Electric (PG&E)
- August 21, 2007—The OSSPAC chairman sent a letter (based on input from DOGAMI and the OPUC) to Governor Kulongoski and members of the legislative assembly. The letter, which emphasized the urgent need to ensure the reliability of energy in earthquakes, addressed several key points:
    - Restoration of electricity and gas after a localized earthquake event are likely to be addressed relatively quickly, depending on the level of damage, with support for response coming from the region and potentially from across state borders.
    - Because of the potentially catastrophic impacts to critical energy infrastructures, the restoration of the energy sector after a Cascadia subduction zone earthquake is expected to take much longer should it occur today. The initial and immediate response, such as obtaining emergency generators for critical facilities, will likely require assistance from the Oregon National Guard and from other states.
    - The critical element of educating Oregonians on their level of responsibility should ideally be done in cooperation with the other West Coast states and the Canadian province of British Columbia so that everyone affected will be receiving the same information on how to be self-sustaining. Without exception, everyone on the West Coast will be assuming more responsibility (public, private, personal), so the better informed and educated people are, the more responsive everyone will be when the need to help each other arises.

- The letter also recommended that the governor take three immediate actions:
  - Oregon needs to mobilize on vulnerability assessments of pre-disaster inventories and systems.
  - Oregon needs to form cooperative agreements (by a specified timeframe) with other states before the earthquake disaster. These states should include Idaho, Utah, and others east of Oregon. Agreements should include the Oregon PUC. Note that making arrangements after the disaster would be inefficient. It is appropriate to acknowledge that the natural gas and electric IOUs and many COUs already have mutual aid agreements in place with other operators, some well outside the potentially affected areas.
  - Proactive education is needed for families and individuals; this should include instructions to be self-sustaining for weeks or months (not days). Without personal preparedness, local and state agencies and private companies alike will not have the personnel/staff they need to meet the multitude of demands involved in emergency response.
- August 26, 2009—ODOE, DOGAMI, and OPUC, via a hazard mitigation grant, conducted a Seismic Event Tabletop Exercise with most energy and fuel operators in the northwest industrial area of Portland (on the Willamette River). About five miles of the riverfront in this area near the St. Johns Bridge includes a concentration of critically important infrastructure on very poor soils that are highly susceptible to earthquake-induced permanent ground deformation. The purpose of the exercise was to promote awareness and resilience of critical energy infrastructures in Oregon. The outcomes were used to better understand the risk associated with earthquake hazards, and findings were shared with city and state leaders. One result of the exercise was to increase the urgency of taking immediate pre-disaster mitigation steps, preparing to take additional steps in the future, and improving planning for future disasters. Another result was a proposal to advance the seismic portion of the OPUC safety and reliability audits by specifying requirements for seismic vulnerability assessments. This work provided the basis for the Energy Assurance Plan Grant with NASEO.

- January 04, 2010—ODOE in partnership with OPUC and DOGAMI (Team) applied for the Energy Assurance Program (EAP) Initiative sponsored by the National Association of State Energy Offices (NASEO). The grant program required completion of the EAP within three years. The Oregon EAP was completed this past June (Wang et al., 2012). The main goal of establishing an Energy Assurance Plan for Oregon was to help all stakeholders make the state of Oregon resilient against any major incident, catastrophic or otherwise, so that Oregon will not go for long periods of time without the proper energy supply to meet its needs. In the application process, the Team identified the Cascadia subduction zone earthquake as the most severe catastrophic event Oregon will experience. With this perspective, the Team focused its attention

on the most vulnerable energy area in our state, which was identified in the Hazard Mitigation Grant Tabletop Exercise, addressed above.

The Energy Assurance Plan and Oregon's Critical Energy Infrastructure Hub

The Energy Assurance Plan (EAP) (Wang et al., 2012) has become the main plan for our state, and even though it is focused primarily in the NW Industrial area of Portland along the Willamette river (CEI Hub), its findings and recommendations are applicable throughout the state's western region. It is also appropriate to acknowledge that the EAP work has been the driving force behind the Energy Task Group in its pursuit of policy recommendations to make our critical energy infrastructures resilient against a Cascadia subduction zone earthquake. Six magnitude 5.0 or greater earthquakes have occurred within the Portland metropolitan area in the past 150 years. The Cascadia subduction zone has produced more than 40 large magnitude earthquakes in the past 10,000 years. The most recent, which occurred on January 26, 1700, was an estimated magnitude 9.0. These occurrences and extensive scientific understanding of seismic processes indicate that it is highly likely that a Cascadia subduction zone earthquake will strike the region again.



Figure 6.1: Fuel tank farms and marine terminals along the Willamette River's edge near US Highway 30. For geographic reference to Figures 29 and 31, note the three parallel water inlets (Basemap: Google Earth)

Oregon's critical energy infrastructure hub (CEI Hub) covers a six-mile stretch on the lower Willamette River between the southern tip of Sauvie Island and the Fremont Bridge on U.S. Highway 30. This relatively small area in Portland is the site of liquid fuel, natural gas, and electrical infrastructure and facilities; it is also an area with significant seismic hazard. The energy sector facilities in the CEI Hub include:

- All of Oregon's major liquid fuel port terminals.
- Liquid fuel transmission pipelines and transfer stations.
- Natural gas transmission pipelines.
- A liquefied natural gas storage facility.
- High voltage electric substations and transmission lines.
- Electrical substations for local distribution.

More than 90 percent of Oregon's refined petroleum products come from the Puget Sound area of Washington State. Oregon imports the liquid fuel by pipeline and marine vessels; it passes through the CEI Hub before it is distributed throughout Oregon to the end users. (One large consumer is the Portland International Airport.) In addition, a portion of the state's natural gas fuel supply passes through the CEI Hub; and a high voltage electrical transmission corridor both crosses the area and supplies power to it.



Figure 6.2: Site Map of the Critical Energy Infrastructure (CEI) Hub on the western bank of the Lower Willamette River area in NW Portland, Oregon. The CEI Hub, outlined in red, stretches for six miles. (Google Earth)



Figure 6.3: Oil Terminals in the CEI Hub. (DOGAMI photo)

EARTHQUAKE RISK STUDY FOR THE CRITICAL ENERGY INFRASTRUCTURE HUB

The Oregon Department of Geology and Mineral Industries (DOGAMI) conducted an earthquake risk study on Oregon's CEI Hub as part of the Oregon Energy Assurance Project (EAP) with the Oregon Department of Energy (ODOE) and Public Utility Commission of Oregon (OPUC). The study focuses on a large-magnitude Cascadia earthquake, which, because of widespread shaking and vulnerable infrastructure, poses a high risk to the health and safety of Oregonians and the region's economy. The study identifies and defines the CEI Hub area, assesses the seismic hazards, and identifies the vulnerabilities of the petroleum (liquid fuel), natural gas, and electrical energy facilities in the CEI Hub.

Oregon's Natural Hazards

Oregon has numerous natural hazards. These range from high probability (fires) to low probability (volcanic eruptions). Earthquakes are considered to have a moderate probability because earthquakes in Oregon are rare. The earthquake vulnerability score for Oregon, however, is very high because a portion of Oregon's existing infrastructure has been designed and constructed without seismic resistance considerations. The earthquake consequence score is also very high because damage will likely be widespread and, in many places, severe. Finally, the earthquake overall risk score is very high because when a major earthquake occurs, it may result in loss of life, economic damages, and long-term impacts.

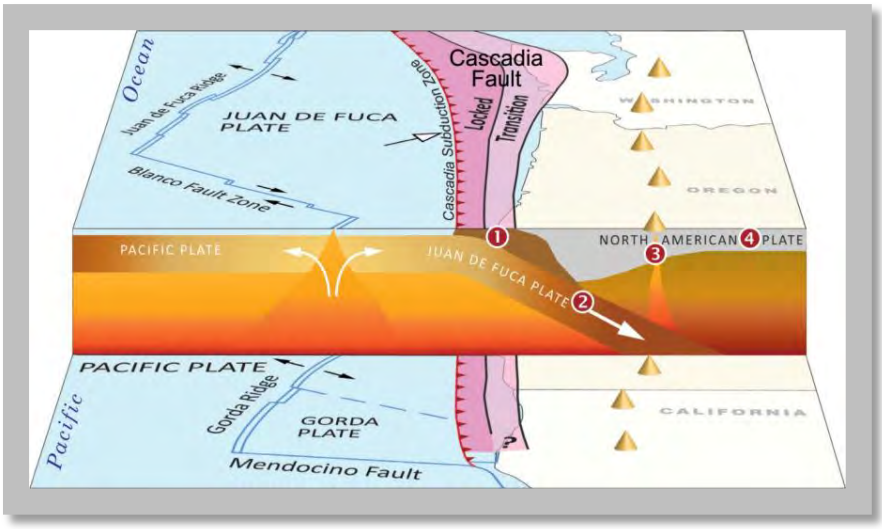


Figure 6.4: Cascadia seismic source is Oregon's most threatening fault and can produce a magnitude 9 earthquake and accompanying coastal tsunami waves. (Source: DOGAMI)

Potential Effects of an Earthquake

A portion of Oregon's electricity and natural gas infrastructure, as well as a majority of its fuel oil infrastructure, is concentrated in the CEI Hub. A magnitude 8 or 9 Cascadia subduction zone earthquake would impact the CEI Hub with:

- Ground shaking
- Liquefaction (a phenomenon in which a water-saturated soil, such as sand, softens and loses strength during strong earthquake ground shaking)
- Lateral spreading (where layers of soil at the surface of the land permanently move laterally due to earthquake shaking)
- Landslides
- Co-seismic settlement (where the ground surface is permanently lowered due to seismic shaking)
- Bearing capacity failures (when the foundation soil cannot support the structure it is intended to support)

In addition, secondary seismic hazards could be initiated. These include:

- Seiches (waves that oscillate in water bodies; such waves are often initiated by ground shaking)
- Fire
- Hazardous material releases (including by sloshing of liquid agitated by ground shaking)

- Tsunamis (Tsunami waves are expected to damage coastal areas, including ports along the coast and Columbia River mouth, but are not expected to cause significant damage in Portland's waterways.)

Liquefaction and lateral spreading hazards are of primary concern to the oil terminals that handle Oregon's liquid fuel supply. The CEI Hub is adjacent to the Willamette River and has extensive deposits of highly liquefiable soils. These soils (made of sands, silts, gravels, and clays) have been deposited both by natural river activity and by human activities, such as the hydraulic placement of material dredged from the river or debris deposited as landfill. For this reason, DOGAMI performed ground deformation analyses to better understand the nature of the hazard and the possible mitigation that will be needed to address it. A section on the deformation analyses is included in this study.

Energy Facilities in the CEI Hub

DOGAMI staff and others visited all relevant energy companies with facilities in the CEI Hub. DOGAMI and ODOE staff conducted site visits at these petroleum facilities: BP, Chevron, ConocoPhillips, KinderMorgan (KM) fuel terminals and pipeline, McCall Oil, Nustar, and Shell. The liquid fuel facilities often include transmission and distribution pipelines, piers or wharves, tank farms, loading racks, control buildings, electrical distribution equipment, and many other components. The liquid fuel transmission system includes gate stations and transmission and distribution pipes at the Columbia and Willamette river crossings. DOGAMI and OPUC staff also conducted site visits of natural gas and electrical facilities owned by NW Natural, Portland General Electric, and the Bonneville Power Administration (BPA).

General Findings

The CEI Hub facilities have infrastructure that ranges from about 100-years–old and built to no or very antiquated standards to new infrastructure built to the current state-of-practice standards. Because of the wide range of ages and associated construction practices, the seismic vulnerability of the facilities also spans a wide range. Based on visual observations, engineering judgment, and information from facility operators, major seismic vulnerabilities exist in the CEI Hub. The vast majority of the facilities are constructed on soils susceptible to liquefaction. Some critically important structures appear to be susceptible to significant damage in a major earthquake, while structures that were installed more recently are expected to have better seismic performance. In addition, DOGAMI discovered that older building codes and practices did not adequately address many non-building structures that exist in the CEI Hub, such as tanks, pipes, and piers. Current building codes do not adequately address the seismic deficiencies in existing CEI Hub facilities.

Sector Specific Findings

- Liquid Fuel
    - *Liquid fuel pipeline:* The CEI Hub's petroleum facilities receive liquid fuel via two methods: 1) the liquid fuel transmission pipeline and 2) marine vessels. The

transportation method and amounts vary due to product demand, transportation costs, weather, and other conditions. The liquid fuel pipeline was largely constructed in the 1960s when the regional seismic hazards were unknown and state-of-practice construction techniques did not include any reference to seismic standards. The regional seismic hazards are now known to be significant, and the soils at the river crossings are known to be susceptible to liquefaction and lateral spreading. The 1960s vintage pipeline design did not consider ground movements from lateral spreading at river crossings or other earthquake-induced stresses on the pipelines that may cause damage and multiple breaks. A break in the pipe would have a significant impact on all of the petrochemical facilities in the CEI Hub and could result in a statewide fuel shortage.

- *Liquid fuel supply:* Liquefaction vulnerabilities are known to have been addressed in the case of only three existing tanks. The tank farms in the fuel terminals of the CEI Hub have on average a three- to five-day supply of regular unleaded gasoline and diesel fuel. Premium gasoline is subject to daily delivery and is heavily dependent on whether the intercompany pipeline on Front Avenue is operational. If the supply chain is disrupted by pipe breaks north of the CEI Hub and by closure of the shipping channel to the west, fuel would quickly become scarce. Options to transport fuel from the east and south and by air are very limited.

- *Shipping channel:* The navigational channel from the mouth of the Columbia River to the lower Willamette River is used by marine vessels to transport fuel. The mouth of the Columbia River is expected to have tsunami damage, and the channel is expected to experience slope failure, which would close the channel to traffic. It is possible that bridges and other overhead river crossings would also be damaged and could temporarily block the waterway. Closure of the shipping channel would prevent marine vessels from delivering either liquid fuel or emergency response and recovery equipment.

- *Marine terminals:* All of the port facilities in the CEI Hub have significant seismic risks due to liquefaction, lateral spreading, and seiches. Some older piers were constructed without any seismic protection, have deteriorated, and are likely to fail even in a moderate earthquake. If oil products are released and contaminate the navigable waterway, the waterway may be closed to river traffic, thus impeding emergency response activities as well as the supply chain. The local capacity to fight fires and clean up hazardous material spills is limited.

- *Portland International Airport (PDX):* PDX airport receives 100 percent of its liquid fuels from a terminal in the CEI Hub. The airport has a limited on-site fuel supply. If the pipeline between the CEI Hub and the airport fails, then the airport would likely experience a shortfall, and operations would be impacted.



Figure 6.5 Lateral timber bracing for steel plumb piles in the CEI Hub is considered inadequate by California's MOTEMS standards. (DOGAMI photo)



Figure 6.6: An example of a damaged pier in the 2010 Chile earthquake (ASCE Technical Council on Lifeline Earthquake Engineering – TCLEE, 2010)



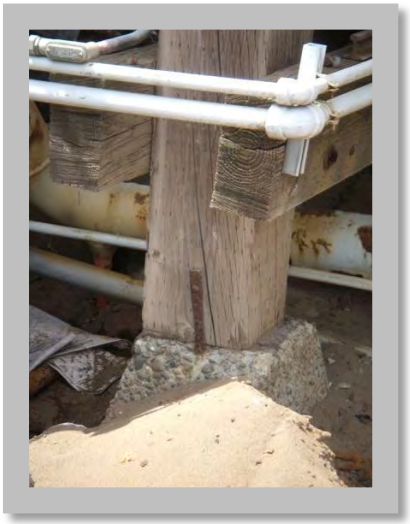


Figure 6.7 and 6.8: This under-designed oil terminal pier foundation (left) in area with high susceptibility for liquefaction and lateral spreading in the CEI Hub and the poor timber-to-concrete oil terminal pier connection and exposed rebar foundation (right) in the CEI Hub are considered inadequate (Source: DOGAMI photo)



Figure 6.9: The connection on this pier in the CEI Hub appears to have deteriorated due to a split in the timber beam. This type of damage suggests that the condition of the structure may not be routinely monitored and maintained and that the overall pier is seismically vulnerable (Source: DOGAMI photo)



Figure 6.10: The approach (foreground) to the 1966 Astoria-Megler Bridge that spans the Columbia River has major structural deficiencies that could lead to a collapse following an earthquake. Damaged bridge sections could block waterway access to the CEI Hub. (DOGAMI photo)

- Natural Gas. Oregon's largest natural gas service provider receives the majority of its natural gas from pipelines that cross under the Columbia River near St. Helens, Sauvie Island, and also between Washougal, Washington, and Troutdale, Oregon. One of the natural gas pipelines crosses under the Multnomah Channel near the gate station at the southern end of Sauvie Island. The soils at these river crossings are subject to liquefaction and lateral spreading, and the pipes are of 1960s vintage. However, natural gas pipelines constructed after the mid-1950s have been found to perform very well during significant seismic events. Oregon's largest natural gas

supplier has the strategic advantage of on-system storage (within the company's service territory), which would allow the company to provide natural gas service to unaffected customers while any damaged natural gas pipelines supplying the area are being restored.

- Electricity
    - Electrical facilities and systems have significant seismic risk due to ground shaking and ground failure, including liquefaction and lateral spreading. Seismically vulnerable facilities include substations and transmission lines in the CEI Hub as well as facilities outside of the CEI Hub, including power plants, substations, and transmission lines, all of which are important for distribution. Major vulnerabilities in the CEI Hub include the control buildings, transformers, and other electrical equipment in yards at the substations, and transmission towers near the Willamette River. Damage is likely to occur to both the transmission system and the distribution system in the CEI Hub. Damage to the electrical grid will likely result in a blackout in the CEI Hub and elsewhere.

Findings of the Bonneville Power Administration

Bonneville Power Administration (BPA) has conducted a comprehensive seismic vulnerability study of their system and has had a long-term seismic mitigation program in place since 1993. This program includes:

- Investment protection (e.g. anchoring transformers).
- Power system recovery of critical paths (e.g. hardening of equipment at one of multiple bays within a major substation).

The first phase of BPA's mitigation program includes bracing and restraining critical equipment and seismically upgrading critical building facilities west of the Cascade Range. Seismic strengthening in the substation yard would typically include: anchoring high-voltage power transformers, bracing transformer conservators and radiators, replacing seismically vulnerable live tank circuit breakers with more robust dead tank circuit breakers, adding damping systems to existing live tank circuit breakers, hardening transformer bushing storage facilities, and replacing rigid bus connections with flexible bus. These mitigation techniques will improve the reliability of seismic performance. Additional phases of the seismic mitigation program will include facilities east of the Cascade Range.

BPA has a critical 115 kV and 230 kV high voltage transmission river-crossing in the CEI Hub as well as a substation. At the substation in the CEI Hub, some of the high-voltage equipment had been anchored and braced to withstand earthquake motions. BPA is in the process of conducting seismic strengthening of the control building and equipment inside the control building (for example, bracing computer floors, control cabinets, battery racks, ceilings, and pipes) and additional mitigation in the yard. BPA has conducted subsurface, liquefaction and lateral spreading analyses at one of the transmission tower sites at the Willamette River crossing and has concluded that severe ground movement (up to 25 feet)

towards the river channel is possible. Until mitigated, it is likely that at least two transmission towers would experience extensive damage, be inoperable, and require repair or replacement; and power lines could temporarily block river traffic, including the pathway to the oil terminals. The BPA transmission towers at the Willamette River crossing are scheduled to be seismically analyzed, to have a seismic mitigation design completed in 2013, and to be mitigated by 2014.

Recent unpublished BPA Cascadia earthquake scenario studies of the existing transmission line system indicate that BPA's main grid would require between 7 and 51 days for completion of emergency damage repairs to the transmission line system (Oregon and Washington) after a magnitude 9.0 Cascadia earthquake. This scenario assumes many ideal conditions (for example, that BPA employees and contractor resources are immediately available, all roads and bridges are passable, and sufficient fuel is available), which is optimistic.



Figure 6.11 and 6.12: Left: These high voltage electrical transmission towers are built on a river bank in the CEI Hub susceptible to lateral spreading. (DOGAMI photo) Right: Structural damage to a high voltage transmission tower located at a river crossing in 2010 Chile earthquake. (ASCE Technical Council on Lifeline Earthquake Engineering – TCLEE)

Impacts to Oregon

Based on visual observations, engineering judgment, limited analyses, information from the facility operators, city records, and available literature, significant seismic risk exists in the CEI Hub. Some critically important structures appear to be susceptible to substantial damage in a major earthquake—with catastrophic consequences. Breaks in liquid fuel and natural gas transmission pipes are possible. Damage to liquid fuel, natural gas, and electrical facilities in the CEI Hub is also possible. The waterway may be closed as a result of the damage and may need to be cleaned up before it can be reopened.

Due to the existing seismic hazards, the vulnerability of the exposed infrastructure, and the potential consequences of an earthquake given both these factors, Cascadia earthquakes pose substantial risk to the CEI Hub and to Oregon. Not only are the energy sector facilities in the CEI Hub dependent on other sectors and systems in Oregon, including transportation and communication, they are interdependent

upon each other. A major Cascadia earthquake and tsunami would likely produce impacts larger than any event the state has previously faced. Western Oregon may face a temporary electrical blackout, isolated natural gas service outages, and liquid fuel shortages. Mitigating the risk that a future major Cascadia earthquake poses to the energy sector can lessen energy infrastructure damage and enable faster recovery of services to support other critical lifeline services.

OPERATOR EFFORTS TO PREPARE FOR A CASCADIA SUBDUCTION ZONE EVENT

For decades, the energy sector has recognized the need to prepare its systems for seismic events and other disasters that could have an impact on customers, and energy operators have made progress toward improving their resilience to a major seismic event. Operators are constantly updating and replacing their energy infrastructure, and in the process of replacement, they upgrade the new facilities to current design standards.

Energy providers comply with federal standards and regulations related to the siting, design, construction, and safe operation of infrastructure to make sure that risks, such as earthquakes, are evaluated and addressed as necessary to ensure the safe and reliable operation of the electrical grid and interstate and intrastate natural gas pipelines. At the state level, the providers of those utilities regulated by the Public Utility Commission of Oregon meet on a regular basis to provide updates to regulators regarding their preparations for disasters and response and to continually evaluate how they can improve and strengthen energy systems.

Within the energy sector, the operators improve their approach to building resilient systems by participating in professional organizations that set the industry's standards and address risk evaluation. Further benefits are gained from interaction with companies that have experienced low frequency, high impact events, such as earthquakes, because these companies are able to share tactics that proved to be beneficial in preparing and recovering from such events. Moreover, the operators have entered into mutual aid agreements with other energy providers outside the region. Such agreements will make it possible to mobilize significant quantities of skilled personnel and materials to support the response to a major natural forces disaster. Finally, on an ongoing basis, the operators have built internal planning processes to ensure an orderly and effective response to any event that significantly disrupts business operations. These actions are significant and have made the energy sector better prepared to respond to major events today than it was previously.

Over the past 25 years, NW Natural has implemented an aggressive, enhanced pipeline safety program to replace older infrastructure that may not be as resilient to a Cascadia subduction zone event. The company completed the replacement of all cast iron pipe in 2000 and will complete the replacement of its bare steel piping infrastructure in the near future. The current underground piping systems have a high level of ductility (flexibility) which allows the pipe to perform well in a seismic event. Since 2002, the company has implemented new Integrity Management Programs for its transmission and distribution systems to address threats (including seismic events) to the safe and reliable operation of the pipelines.

Expected Service Restoration Time Frames

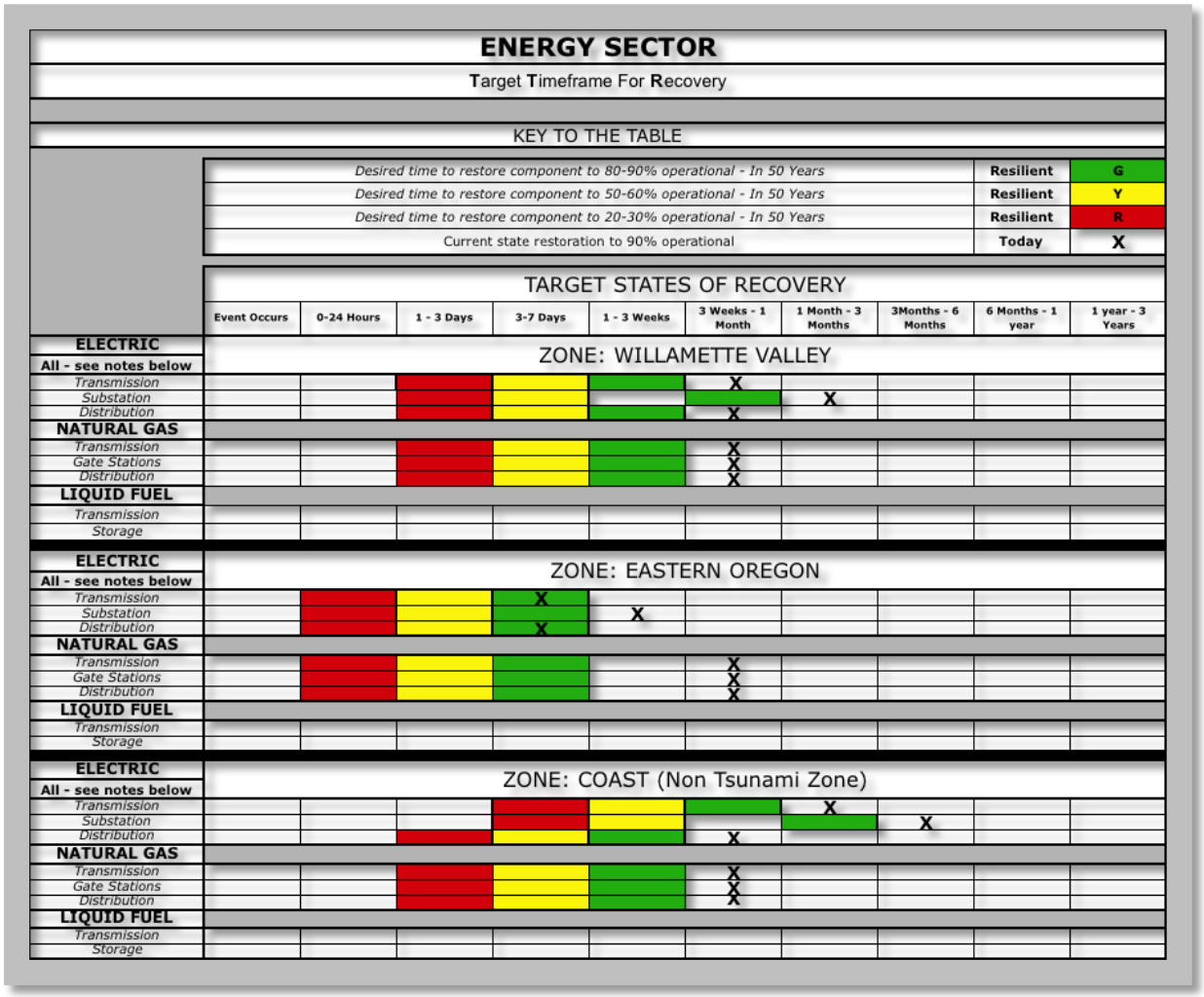
The expected service restoration time frames (see Figure 6.13) are based on the assumption that roads and telecommunications are functioning so as to support restoration of the energy infrastructure. In areas where service restoration is impractical, the service provider is not expected to meet the restoration timeframes. Establishing target timeframes for the tsunami inundation zone, beyond a minimal level of capability to support response, is not practical. For that reason the tsunami inundation region is not depicted in the matrix presented below. A large amount of planning and prioritizing will need to be undertaken to identify which areas will be rebuilt first.



Recommendations

- **The Oregon Public Utility Commission (OPUC) should provide oversight for the seismic preparedness of those energy providers that are currently jurisdictional.**
- **Develop regulatory oversight for energy sector companies that are not regulated by the OPUC and create engagement in seismic mitigation efforts for those companies, including appropriate cost recovery for such oversight function.**
- **The state should provide immunity of liability, in statute, for those seismic vulnerabilities that are identified by the operators during their seismic vulnerability assessments.**
- **To identify vulnerabilities of operator-defined Critical Energy Infrastructure (CEI) facilities, energy sector companies should conduct seismic vulnerability assessments. Operators should then develop plans to mitigate the seismic risks associated with the identified CEI vulnerabilities.**
- **Energy sector companies should institutionalize long-term seismic mitigation programs and should work with the appropriate oversight authority to further improve the resilience and operational reliability of their Critical Energy Infrastructure (CEI) facilities.**
- **Form a public-private partnership with the objective of reducing the state's vulnerability to seismic events by evaluating the diversification of locations for the storage of liquid fuels and identification of new liquid fuel energy corridors (new locations to be defined).**
- **The state of Oregon should require that, in emergency situations, liquid fuel wholesale and retail operators provide both access to and alternate means of delivering fuels to the end users.**
- **Evaluate the options for improving power supply to coastal areas located outside of the tsunami inundation zone.**
- **Utilize the Oregon Office of Emergency Management's public-private sector position to help ensure coordinated planning, information sharing, and interoperability among critical organizations and agencies. The position will also ensure that work being performed by this entity and its partners helps provide public education and outreach to local, county, and state agencies and organizations.**

► **The state of Oregon should provide statutory authority for a prescriptive waiver of routine permitting requirements and processes for the design, construction, and restoration of energy infrastructure and subsequent actions, if it is determined that the waiver is in the public interest and is necessary to address an actual or impending emergency caused by a natural or manmade disaster.**



Restoration Status Assumptions - Cascadia Subduction Zone Earthquake

1- Transportation routes including roads, airports, bridges, etc. will be available for energy provider use to perform assessments, deliver materials and rebuild infrastructure as required.

2- All fuel needs will be available to support energy provider restoration operations.

3- For areas dependent upon third party electric transmission providers, restoration times assume their system will be available to support restoration efforts.

4- Interstate gas transmission pipelines will be able to provide service in advance of the restoration times for local distribution.

5- Roseburg / Medford areas are included with Willamette Valley for evaluation purposes.

6- The % of restoration references it to customers who are able to take natural gas or electric service delivery.

7- Communication systems will be available for energy provider's use.

8- For Pacific Power the coastal service territory includes a combination of tsunami and non-tsunami prone areas. Where facilities provider service to non-tsunami prone areas pass through or reside in tsunami impact areas, the estimated impact of tsunami on these facilities is included in restoration times.

9- The State of Oregon has provided statutory relief and/ or waiver from typical permitting requirements and processes associated with the design, construction and/ or restoration of the energy infrastructure.

10- The bulk of generation is outside of the Willamitte Valley , so the focus is on the Transmission.

Figure 6.13: Energy Sector Target Timeframe for Recovery

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7. Information and Communications

Introduction

Oregon's information and communication systems are especially vulnerable to damage resulting from a Cascadia subduction zone earthquake. Some of the inherent seismic vulnerabilities of the systems include the following:

- The systems are highly dependent on other resources—such as power and transportation as well as skilled staff—to remain operational and to complete needed repairs.
- The systems are financially dependent on consistent revenue streams to fund ongoing operations, maintenance, and debt service obligations.
- Essential facilities, including central offices and towers, are often located in areas that make them vulnerable to damage from liquefaction of alluvial soils and landslides.
- Many facilities were designed and constructed before the seismic design standards that reflect the current state of knowledge of regional seismicity were established.

THE EXISTING STATE

If it were to occur today, a Cascadia subduction zone earthquake would result in catastrophic impacts to the information and communications systems throughout western Oregon:

The Oregon coast would most likely experience strong ground shaking for over three minutes. Facilities within the tsunami inundation zones would be extensively damaged; in many cases, they would not be repairable. Facilities outside of the tsunami zone would be heavily damaged, disrupting current levels of service for periods measured in months. Cabling that runs through conduits supported on or in transportation bridges is likely to be damaged or severed completely when the bridges fail.

The Coast Range would experience strong to moderate ground shaking. Well-engineered structures may perform well, but older structures are likely to fail. Major impacts to the systems in the Coast Range include the high potential for landslides and the failure of bridges that support cables across geological features.

The Willamette Valley would experience moderate ground shaking. Well-engineered structures may perform well, but many older structures would likely fail, including central offices and buildings supporting antennas. One of the major impacts in the central valley, especially in the Portland Metro area, would be from liquefaction: extensive alluvial and fill deposits along rivers would lose strength, lose bearing capacity, and move towards riverbanks. Liquefaction could adversely impact buried utilities as well as antenna towers and buildings.



Figure 7.1: San Francisco – Oakland Bay Bridge after the 1989 Loma Prieta earthquake. An example of bridge failures that could impact utility conduits supported by or integrated into the bridge. Source: U.S. Department of Transportation. (Source: USGS website http://earthquake.usgs.gov/earthquakes/states/events/1989_10_18.php)

THE SYSTEM'S COMPONENTS

The Information and Communication Technology Task Group focused on wireless and wired communications and information systems that provide services to businesses, municipalities, and individuals. For the purpose of this resilience plan, system components include:

- **Central Offices.** A switching unit, installed in a telephone system serving the general public, having the necessary equipment and operating arrangements for terminating and interconnecting lines and trunks (McGraw-Hill, 2003). Central offices include the following types:
    - *Tandem office:* A telephone office that makes connections between local offices in an area where there is such a high density of local offices that it would be uneconomical to make direct connections between them (McGraw-Hill, 2003).
    - *Local office:* A telephone central office, which terminates subscriber lines and makes connections with other central offices, usually equipped to serve 10,000 main telephones of its immediate community (McGraw-Hill, 2003).
    - *End office:* A telephone central office that connects directly to the customer (Answers.com).
- **Remote Terminals.** A remote terminal is generally any type of switching or routing equipment that is located outside of the traditional telephone central office. Most are linked by fiber optic cable either directly to the central office or to a SONET (Synchronous Optical NETwork). Some older remote terminals are linked by T1s back to the central office over copper pairs.



Figure 7.2: The overhead lighting fixtures in a Central Office failed during an earthquake. Note the equipment in the background was supported by "jiffy poles" after the earthquake. Mexico City earthquake, 1985. (Source: Alex Tang)

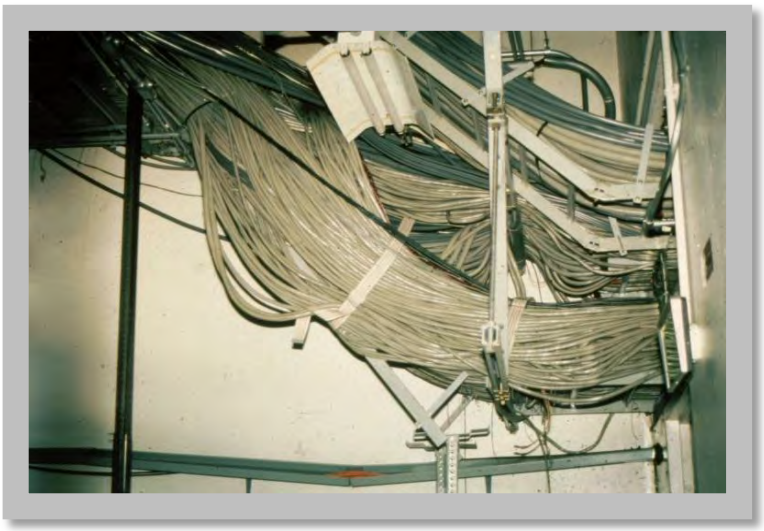

Figure 7.3: Overloaded cable rack failed in relatively minor (M=5.8), Whittier Narrow earthquake, California, 1987. (Source: Alex Tang)



Figure 7.4: Telecom equipment and HVAC ducting failure. It is hard to tell which was the main cause of failure; it has several combinations, inadequate anchoring, un-braced duct supports, etc. Mexico City earthquake, 1985. (Source: Alex Tang)

- **Internet Exchange Points (IX or IXP).** A physical infrastructure through which Internet service providers (ISPs) exchange Internet traffic between their networks (autonomous systems). At these exchange points, major carriers accept traffic from each other and agree to carry one another's packets to their downstream destination points without charge. (Answers.com)
- **Submarine Cable Landings** (Answers.com)
    - *Submarine cable landing station:* This may or may not be required, depending on whether, for example, the submarine cable requires power to power submarine repeaters or amplifiers.
    - *Submarine cable termination station:* This is the point at which the submarine cable connects into the land-based infrastructure or network. A cable termination station may be the same facility as the cable landing station, or it may be many miles away.
- **Antennas.** These may be:
    - Mounted on buildings owned by the communications provider or on leased space on another building.
    - Tower mounted.
    - Satellite antennas (for system up/down links and not the satellite service of an end user).
    - Transmitter antennas for broadcast radio and TV.

- **Cables.** These may be:
    - Underground.
    - Inducted, conduit, buried plant (underground cable vaults).
    - Buried.
    - Aerial cable (overhead/above ground).
- **Outside Plants.** Examples include:
    - Splice cases.
    - Repeaters (that may require power).

Resilience Goal, Objectives, and Scope

Goal

The goal of this plan is to provide recommendations that, if implemented, would ensure that within 50 years the information and communication systems in the state of Oregon are made resilient against a magnitude 9.0 Cascadia subduction earthquake and tsunami.

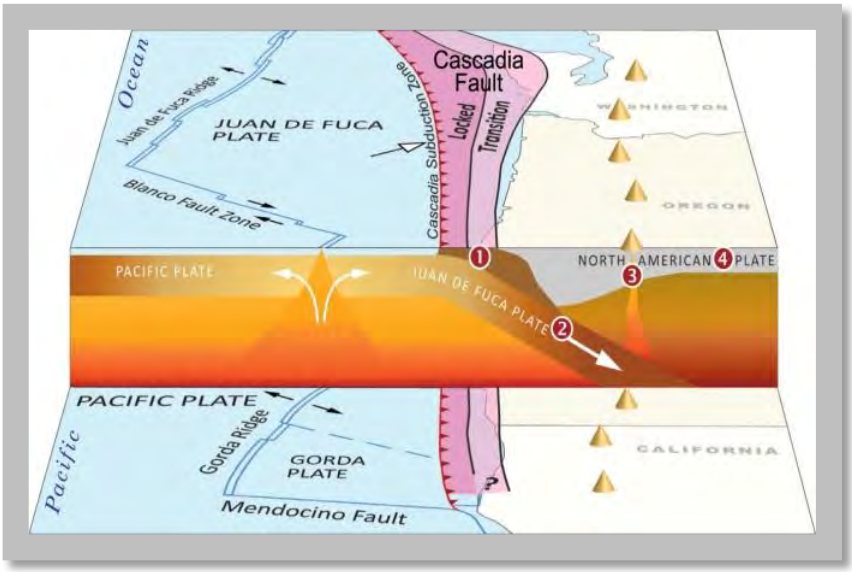

Figure 7.5: Cascadia seismic source is Oregon's most threatening fault and can produce a magnitude 9 earthquake and accompanying coastal tsunami waves. (Source: DOGAMI)

The resilience goal for the information and communication systems is to provide for immediate emergency communications followed by phased restoration, within specified time periods, for various areas of the state. In order to establish resilience goals, the information and communication systems were assessed in four geographical areas:

- The tsunami inundation zone along the coast. This area was defined using Oregon Department of Geology and Mineral Resources (DOGAMI) maps.
- The part of the coast that is not susceptible to tsunami (from the Oregon coastline to the Coast Range summit).
- The valley (from the summit of the Coast Range to the summit of the Cascades).
- Eastern/Central Oregon.

Objectives and Targets

The task group viewed performance capability (for the purposes of recovery) across all information and telecommunications systems that support voice and data communications. The restoration objectives are based on the assumption that all other lifelines, such as roads and electricity, are functioning at a level that will support restoration of the information and communications infrastructure. In areas where the *customer* is not ready to accept service, then the service provider is not expected to meet these restoration timeframes. In the early phases of recovery, achieving these capabilities may require the use of temporary contingencies (such as mobile cellular towers) while more permanent repairs and installations are being done.

Establishing target timeframes for the tsunami inundation zone, beyond a minimal level of capability to support response, is not practical. A large amount of planning and prioritizing will need to be undertaken to identify which areas will be rebuilt first. These will then be the areas in which the information and communications systems will be re-established first.

Resilience targets for information and communications systems were established for three levels to assist in establishing priorities for resilience and restoration activities and projects:

- **Minimal.** A minimum level of service is restored, primarily for the use of emergency responders and repair crews and in support of critical health and human services (mass care). The estimated capability at this level is 20–30 percent. In the early phases of recovery, achieving these capabilities may require the use of temporary contingencies (such as mobile cellular towers) while more permanent repairs and installations are being done.
- **Functional.** Although service is not yet restored to full pre-event capacity, it is sufficient to get the economy moving again (such as for business uses, including credit card transactions and banking). Limits may be placed on uses that take up a lot of capacity, such as streaming video. The estimated capability at this level is 50–60 percent.
- **Operational.** Restoration is up to at least 90 percent of capacity. A full level of service has been restored and is sufficient to allow people to use the system for non-essential activities, such as entertainment. The estimated capability at this level is 80–90 percent.

The attached table (see Figure 7.16) reflects the target capabilities for each zone across all information and communications systems. This approach permits greater flexibility in how the systems are

recovered, which may change with the continuous changes in technology (that is, the systems may become less dependent on large towers).

WHAT DOES BEING RESILIENT MEAN

To understand what resilience means in the context of information and communication technology, the task group referred first to the definition of resilience that was adopted for the resilience report as a whole: "Oregon citizens will not only be protected from life-threatening physical harm, but...because of risk reduction measures and pre-disaster planning, communities will recover more quickly and with less continuing vulnerability following a Cascadia subduction earthquake and tsunami." The task group then looked at Oregon's position on the *resilience triangle* and at the characteristics of resilient systems.

The Resilience Triangle

The basic principle of the resilience triangle is that the smaller the triangle, the higher the resilience. Higher resilience requires minimal reductions in critical lifeline services after a disaster, speedy recovery of those services, and an overall improved service level as a result of rebuilding damaged systems and implementing better systems. The resilience triangle diagram indicates that Chile and Japan have high levels of earthquake resilience—this reflects Chile's performance after a magnitude 8.8 earthquake in 2010 (ASCE TCLEE, 2010) and Japan's performance after a magnitude 9.0 earthquake in 2011 (Nojima, 2012) (notwithstanding Japan's nuclear energy issues). At the current stage, Oregon's infrastructure has low resilience and is expected to have significant loss of sector services and a slow recovery time.

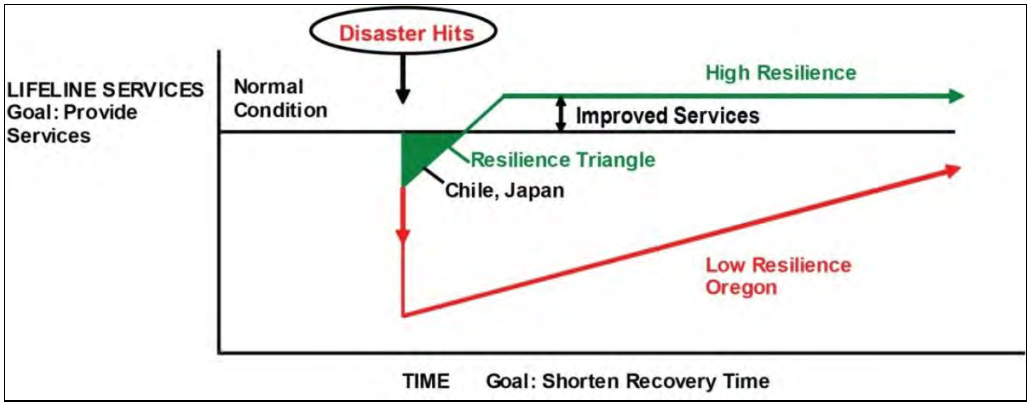

Figure 7.6: Resilience Triangle (Wang, Bartlett, and Miles, 2012)

Characteristics of Resilient Systems

Based on research conducted after disasters around the world, some basic system characteristics have been identified that enable communications and information technology systems to be resilient. Resilient systems tend to be:

- Decentralized.
- Meshed or integrated.

- Built to withstand the potential hazard, but without an expectation of 100-percent survivability.
- Capable of recovering (within two to four weeks of the event) whichever components of the system did not survive.
- Able to handle a surge in demand through system performance levels or implementation of controls.
- Upgraded by means of continuous hardening of vulnerable components within the system.

Plan Development

PLANNING CONSIDERATIONS

The task group took into consideration the following items during the development of the plan:

- Resilience planning needs to address the capacity of the system. In major events, landline and wireless telecommunications can be quickly overwhelmed by demand, even if they are 100-percent operational.
- Wireless communications technology is evolving rapidly and the technology that influences planning decisions and recommendations today may not be in existence 25 to 50 years from now.
- Hardline and wireless communication systems typically install their new technology into existing infrastructure (i.e., buildings, power poles, towers, vaults, and conduits). This means that 21st century technology may be housed in, or mounted on, a structure built in the early to mid-1900s.
- The resilience plan should consider business continuity recommendations for the companies that provide communication, information, or telecommunications services and systems, especially to customers who perform critical services and other functions related to life safety.
- Wireless communication systems include antennas installed on leased space on buildings that the communications providers do not own or control. The locations of the buildings, relative to the coverage and demand requirements, are the key factors in the placement decisions, not the resilience of the structures or their location outside of the known hazard areas.
- Restoration of aerial (overhead) telecommunication wires is secondary to the restoration of aerial (overhead) power lines.
- Lifeline interdependence is a key factor that governs the final resilience plan.



Figure 7.7: Cellular Base Station tower failure. This site is installed on the roof of an apartment building, which is not designed for critical infrastructure facility. Pisco, Peru earthquake, 2007. (Source: Alex Tang)

INTERDEPENDENCIES

Information and communications systems have several connections with other resilience planning task groups that directly impact their resilience and ability to recover:

- **Buildings**
    - Structural integrity of buildings housing system components as well as business services and call centers.
    - Structural integrity of buildings with wireless system antennas mounted on them.
- **Transportation**
    - Transportation routes typically include utility easements for overhead and underground information and communication systems.
    - Access to system facilities after an earthquake is essential for restoration as well as for maintaining emergency power systems.
    - Bridges convey utilities, as well as vehicles, over geological barriers.

- **Utilities**
    - Because information and communications systems share common easements with other utilities, coordination is required to achieve restoration.
    - Overhead utilities share common infrastructure (such as poles); coordination will therefore be required to achieve restoration.
    - Information and communications systems are dependent on other utilities to provide and restore their services (such as electricity).
- **Energy**
    - Electrical power is needed to run the equipment.
    - Fuel is needed for emergency generators and to supply the vehicles used for emergency response and repair work.
- **Business Resilience**. Information and communication service providers need to be resilient so that they are able to restore service quickly to their customers.



Figure 7.8: Circuit Boards pulled out and fan to get some air cooling due to failure of the air conditioning unit. Fortunately, the site had power and they could open windows to allow cool air to come in. Izmit (Kocaeli) earthquake, Turkey, 1999. (Source: Alex Tang)

Assessment of Performance

GENERAL ASSESSMENT

A complete, detailed assessment of all the telecommunications and information systems in Oregon is not possible without detailed systems data from all the service providers. From a system-wide

perspective, however, a general assessment can be made based on information that is generally available. This information includes:

- Design standards and age of structures relative to the expected performances of buildings, towers, and other structures in the tsunami inundation zone.
- Design standards and age of structures relative to the expected performances of buildings, towers, and other structures and taking into account the relative levels of shaking expected at varying distances from the subduction zone.
- Expected performances of bridges that are an integral part of the hardwire infrastructure.
- Potential impacts that landslides and liquefaction will have on the towers, poles, buried utilities, buildings, and bridges that convey cable across rivers and ravines.
- The capabilities analyses of other sectors, particularly the electrical utilities, which have similarities with portions of the information and communications systems and are an integral part of maintaining and re-establishing information and communications capabilities.
- Capabilities and capacity—including resources (material and technical resources), mutual aid programs, spares, tools, and equipment—after a major disaster.



Figure 7.9: Inadequate anchorage and poor overhead bracing details resulted in equipment toppling. Mexico City earthquake, 1985. (Source: Alex Tang)

It should also be noted that even if a structure (building or tower) were to survive an event, damage to improperly secured equipment can result in the loss of operational capability.

Depending on the general availability of the equipment (off-the-shelf versus specifically designed and manufactured), it could take longer to replace or repair the equipment than it does to repair or replace the building.

ASSESSMENT BY ZONE

Using the general assessment criteria, the task group did an assessment of performance capabilities for each of the four geographic areas (see also the attached figure in Figure 7.16):

Zone 1: Coast—Tsunami Zone

All communications and information technology infrastructure within the tsunami inundation zone will sustain major damage or be destroyed. The ability to operate any equipment that survives both the earthquake and the tsunami will depend on the availability of electrical power and whether crews are able to access the equipment in order to perform maintenance and repairs.

- **Buildings.** All buildings in the inundation area will be destroyed or heavily damaged.
    - Few buildings are built to current seismic code and even fewer are built to the critical facility level (which is designed to increase the chances that the structure will be usable after the earthquake).
    - Those structures not destroyed by the earthquake will be inundated by the tsunami waves.
- **Equipment**. Equipment in buildings.
    - Existing standards for communications and information technology do not appear to address the protection of equipment from damage during large seismic events.
    - Improperly secured equipment can be damaged or destroyed even if the structure that houses it survives both the seismic shaking and the tsunami waves.
- **Towers.** Antenna towers in the inundation zone have the same probabilities of being damaged and destroyed as the buildings.
    - A number of the towers and antennas are located on existing buildings and will be only as reliable as the buildings they are on.
    - Even if towers are free standing and reinforced to withstand the shaking and the tsunami waves, the equipment on the towers must be positioned above the inundation height of the tsunami wave and properly secured to avoid damage from the shaking.
    - Free standing towers without properly constructed foundations could fail due to liquefaction.
- **Aerial Cables.** Overhead lines that survive the scenario earthquake will be destroyed by the tsunami wave (with the possible exception of those on the outer most edges of the inundation area).
    - Cross arms, connectors, and insulators that are designed to break away in high winds to reduce the potential damage to the utility poles could also give way during the seismic event.
    - Liquefaction can cause utility poles to lean or topple.

- Debris in the tsunami inundation waves will have significant impacts on utility poles and lines.

- **Underground Lines**. Depending on the amount of liquefaction and shearing forces, the earthquake could be just as devastating to the underground utilities as to the overhead lines. While the tsunami wave may have little direct impact on buried lines, the failure of utility vaults, salt water inundation of underground conduits, and loss of terminal posts will be just as disruptive as the physical loss of the lines.
    - Breaks in the underground lines are hard to locate unless there is some obviously related disturbance of the ground or activity in the vicinity of the break.

Zone 2: Coast—Earthquake-Only Zone

Only structures built to withstand the expected level of shaking are likely to be usable after the earthquake. Even these structures, however, will have limited functional capability if they are without utilities and there is no way to access them.



Figure 7.10: Cell site collapsed with the commercial building collapse. Chi Chi earthquake, Taiwan, 1999. (Source: Alex Tang)

- **Buildings**.
    - Few buildings are built to current seismic code and even fewer are built to the critical facility level (which is designed to increase the chances that the structure will be usable after the earthquake).
    - The tsunami, failure of bridges, and landslides can isolate facilities that survive the shaking, further limiting their use.

- **Equipment.** Equipment that is not properly secured for the expected level of shaking or protected from cascading events (such as the sprinkler system going off) could be damaged and require an extended period of time for repair or replacement.
    - Existing standards for communications and information technology do not appear to address the protection of equipment from damage during large seismic events.
    - Improperly secured equipment can be damaged or destroyed even if the structure that houses it survives.
- **Towers.** Antenna towers are likely to be damaged both by shaking during the scenario earthquake and by liquefaction. Towers located in the Coast Range are also prone to possible impacts from landslides.
    - Even if towers are free standing and reinforced to withstand the shaking, the equipment on the towers must be properly secured to avoid damage from the shaking.
    - Surviving towers will not be usable unless power and other utilities are available.
    - Connectivity between towers or between towers and landline networks may be disrupted as microwave dishes move, underground cables are severed by landslides, and utility lines break when the bridges they span fail.
- **Aerial Cables**. Overhead lines will be prone to failure during the expected shaking of the scenario event due to the lateral forces on the lines and poles as well as liquefaction and landslides.
    - Cross arms, connectors, and insulators that are designed to break away in high winds to reduce the potential damage to the utility poles could also give way during the seismic event.
    - Liquefaction can cause utility poles to lean or topple.
    - Landslides can damage or destroy utility poles located on steep slopes.
- **Underground Lines.** Depending on the amount of liquefaction and shearing forces, the earthquake can be just as devastating to the underground utilities as to the overhead lines.
    - Breaks in the underground lines are hard to locate unless there is some obviously related disturbance of the ground or activity in the vicinity of the break.
    - Underground lines can be severed by landslides and by the failure of the bridges that support them across geological features such as rivers and ravines.

Zone 3: Valley

Only structures built to withstand the expected levels of shaking are likely to be usable after the earthquake. Even these structures, however, will have limited functional capability if they are without utilities and there is no way to access them.

- **Buildings.** While the expected shaking in the valley during this scenario earthquake will not be as great as on the coast, a significant number of buildings in the valley were built prior to current seismic code.
    - Very few buildings associated with information and communications technology have been built to the critical facility level (which is designed to increase the chances that the structure will be usable after the earthquake).
    - While the structural components of a building may survive the earthquake, failure of nonstructural components, including windows, HVAC systems, lighting, and plumbing, can render the facility unusable for an extended period of time.
- **Equipment.** Equipment that is not properly secured for the expected level of shaking or protected from cascading events (such as the sprinkler system going off) could be damaged and require an extended period of time for repair or replacement.
    - Existing standards for communications and information technology do not appear to address the protection of equipment from damage during large seismic events.
    - Improperly secured equipment can be damaged or destroyed even if the structure that houses it survives.

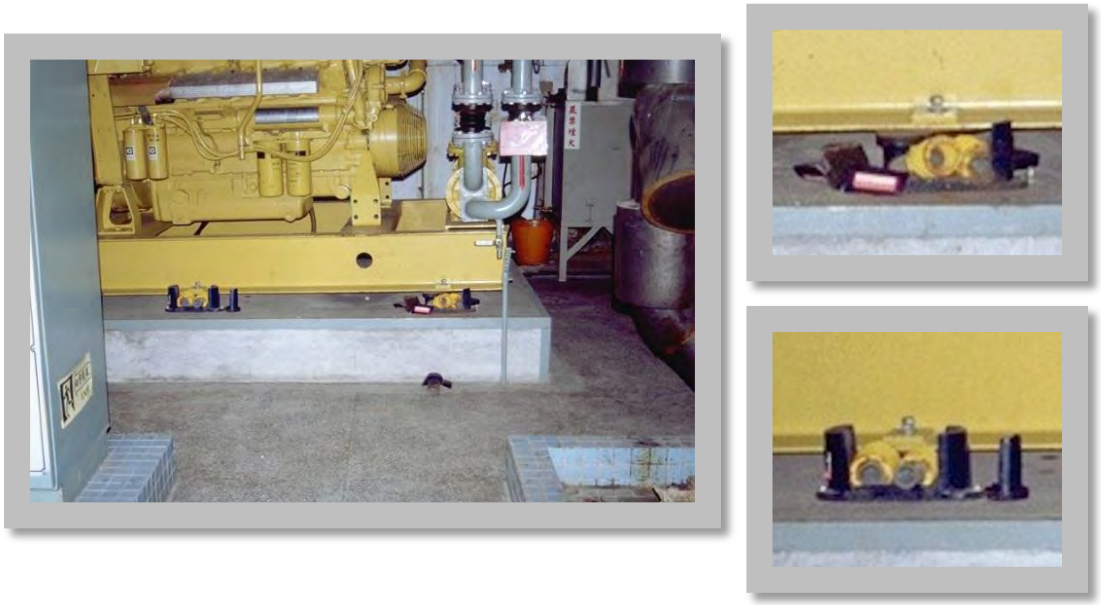

Figure 7.11a and 7.11b: Close-up of the two vibration isolation units. The cause of the failure was due to lack of details to limit the generator displacement during the strong shaking.

Figure 7.11: Backup generator failure - the vibration isolators of this unit all failed after the earthquake. Chi Chi earthquake, Taiwan, 1999. (Source: Alex Tang)

- **Towers**. Antenna towers may be damaged by the shaking during the scenario earthquake as well as by liquefaction. Towers located in the Coast Range and West Hills could also be damaged by landslides.

  - A number of the towers and antennas are located on existing buildings and will be only as reliable as the buildings they are on.
  - Even if towers are free standing and reinforced to withstand the shaking, the equipment on the towers will need to be properly secured to avoid damage from the shaking.
  - Surviving towers will not be usable unless power and other utilities are available.
  - Connectivity between towers or between towers and landline networks may be disrupted as microwave antennas move, underground cables are severed by landslides, and utility lines break when the bridges they span fail.

- **Aerial Cables**. While the damage is expected to be less severe in this zone than on the coast, overhead lines could fail during the expected shaking of the scenario event due both to the prolonged lateral forces on the lines and poles and to liquefaction and landslides.
  - Cross arms, connectors, and insulators that are designed to break away in high winds to reduce the potential damage to the utility poles could also give way during the seismic event.
  - Liquefaction can cause utility poles to lean or topple.
  - Landslides can damage or destroy utility poles located on steep slopes.
- **Underground Lines**. Depending on the amount of liquefaction and shearing forces, the earthquake can be just as devastating to the underground utilities as to the overhead lines.
  - Breaks in the underground lines are hard to locate unless there is some obviously related disturbance of the ground or activity in the vicinity of the break.
  - Underground lines can be severed by landslides and by the failure of the bridges that support them across geological features such as rivers and ravines.

Zone 4: Eastern Oregon

In this zone, capabilities will be more dependent on the availability of power than damage or physical loss of structures and equipment.

- **Buildings.** Older and poorly built structures (for example, unreinforced brick buildings) that are located in areas identified in the scenario earthquake as likely to sustain moderate and moderate-to-heavy damage will sustain damage and could partially collapse.
  - Very few buildings associated with information and communications technology have been built to the critical facility level (which is designed to increase the chances that the structure will be usable after the earthquake).
  - While the structural components of a building may survive the earthquake, failure of nonstructural components, including windows, HVAC systems, lighting, and plumbing, can render the facility unusable for an extended period of time.

- **Equipment.** Equipment that is not properly secured for the expected level of shaking or protected from cascading events (such as the sprinkler system going off) could be damaged and require an extended period of time to repair or replace.



Figure 7.12: The battery rack is designed to resist lateral force with very light cross bracing. The batteries, however, were not secured on the rack and fell, resulting in reserve power failure San Fernando earthquake, California, 1971. (Source: Alex Tang)

  - Existing standards for communications and information technology do not appear to address protection of equipment from damage during large seismic events.
  - Improperly secured equipment can be damaged or destroyed even if the structure that houses it survives.

- **Towers.** Antenna towers may be damaged by the shaking during the scenario earthquake as well as by landslides if the towers are located on steep slopes.
  - A number of the towers and antennas are located on existing buildings and will be only as reliable as the building they are on.
  - Even if towers are free standing and reinforced to withstand the shaking, the equipment on the towers must be properly secured to avoid damage from the shaking.
  - Surviving towers will not be usable unless power and other utilities are available.

- **Aerial Cables.** Overhead lines could fail in areas that experience higher levels of shaking due both to the prolonged lateral forces on the lines and poles and to landslides that are triggered by the earthquake.
  - Cross arms, connectors, and insulators that are designed to break away in high winds to reduce the potential damage to the utility poles could also give way during the seismic event.

- Landslides can damage or destroy utility poles located on steep slopes.

- **Underground Lines**. Underground lines are likely to be the least impacted in this zone.
  - Breaks in the underground lines are hard to locate unless there is some obviously related disturbance of the ground or activity in the vicinity of the break.
  - Underground lines can be severed by landslides and by the failure of the bridges that support them across geological features such as rivers and ravines.

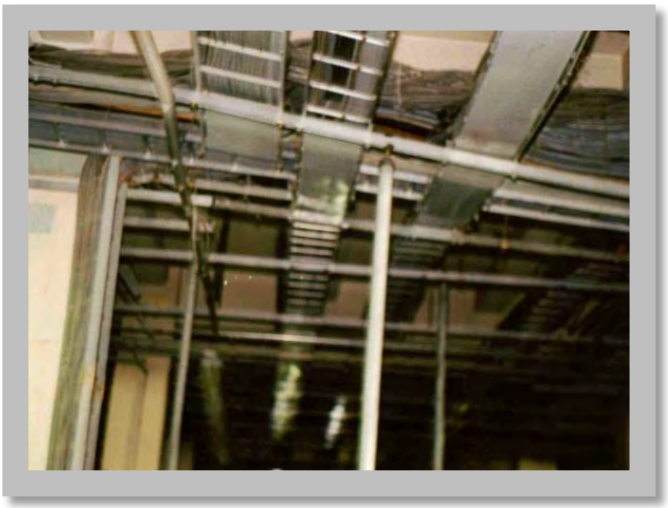

Figure 7.13: Super structure of cable racks failed due to lack of detailing and in many cases, overload. Whittier Narrow earthquake, California, 1987. (Source: Alex Tang)



Figure 7.14: Upgraded Central Office with bracings damaged, Northridge Earthquake, California, 1994. (Source: Alex Tang)

Target Timeframes for Recovery

Performance capability for recovery purposes is viewed across all information and telecommunications systems that support voice and data communications. The restoration objectives are based on the assumption that all other lifelines, such as roads and electricity, are functioning at a level that will support restoration of the information and communications infrastructure. In areas where the *customer* is not ready to accept service, the service provider is not expected to meet these restoration timeframes.

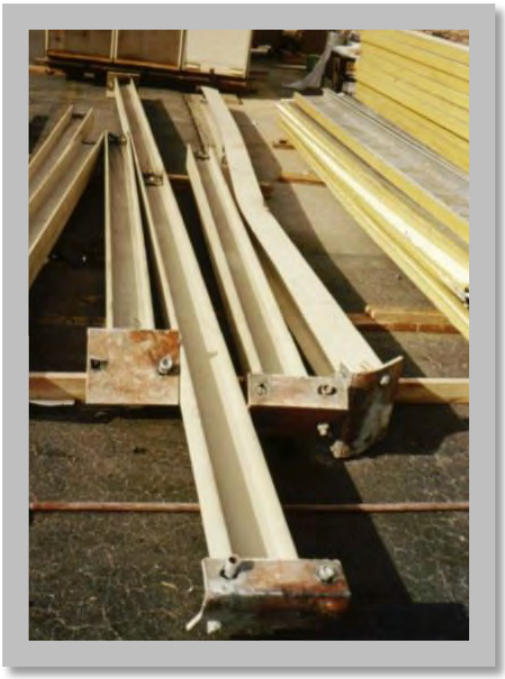

Figure 7.15 – Collection of damaged bracing beams removed from Central Office. Northridge earthquake, California, 1994. (Source: Alex Tang)

Establishing target timeframes for the tsunami inundation zone, beyond a minimal level of capability to support response, is not practical. A large amount of planning and prioritizing will need to be undertaken to identify which areas will be rebuilt first. These will then be the areas in which the information and communications systems will be re-established first.

KEY TO THE TABLE

Target Timeframe for recovery:

Operational: Restoration is up to 90% of capacity: A full level of service has been restored and is sufficient to allow people to use the system for non-essential activities (such as entertainment). 80%–90%

Functional: Although service is not yet restored to full pre-event capacity, it is sufficient to get the economy moving again (e.g. business uses for credit cards and banking). Limits may be placed on uses that take up a lot of capacity (such as streaming video). 50%–60%

Minimal[1]**:** A minimum level of service is restored, primarily for the use of emergency responders, repair crews, and in support of critical health and human services (mass care). 20%–30%

Estimated time, under current conditions, for system-wide recovery to be at (or 90% of) pre-event capacity

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1. In the early phases of recovery, achieving these capabilities may require the use of temporary contingencies (such as mobile cellular towers) while more permanent repairs and installations are being done.

TARGET STATES OF RECOVERY:

INFORMATION AND COMMUNICATIONS TECHNOLOGY SECTOR

	Event occurs	0–24 hours	1–3 days	3–7 days	1–2 weeks	1–3 months	3–6 months	6 months –1 year	1–3 years	3 + years
ZONE 1: COAST—TSUNAMI ZONE				R						
Buildings (includes central offices, internet exchange points, and cable landings)										
• Repair								×		
• Replace									×	
Equipment in Buildings and on Towers									×	
Towers									×	
Underground Lines									×	
Overhead Lines									×	
ZONE 2: COAST—EARTHQUAKE-ONLY ZONE			R		Y	G				

(To be continued on next page)

	Event occurs	0–24 hours	1–3 days	3–7 days	1–2 weeks	1–3 months	3–6 months	6 months –1 year	**1–3 years**	3 + years
Buildings										
• Repair								×		
• Replace									×	
Equipment in Buildings								×		
Towers								×		
Underground Lines							×			
Overhead Lines							×			
ZONE 3: VALLEY		R		Y	G					
Buildings										
• Repair								×		
• Replace									×	
Equipment in Buildings						×				
Towers						×				
Underground Lines						×				
Overhead Lines					×					
ZONE 4: EASTERN OREGON	R		Y	G						
Buildings										
• Repair						×				
• Replace								×		
Equipment in Buildings					×					
Towers				×						
Underground Lines				×						
Overhead Lines				×						
	Event occurs	**0–24 hours**	**1–3 days**	**3–7 days**	**1–2 weeks**	**1–3 months**	**3–6 months**	**6 months–1 year**	**1–3 years**	**3 + years**

Figure 7.16– Target States of Recovery: Information and Communications Technology Sector

Resilience Gap Analysis Summary

The table in Figure 7.16 shows significant difference between the current capabilities of the system and the target capabilities, especially at the coast and in the valley. As the threat of a magnitude 9.0 subduction zone earthquake is recognized and new design and building standards are adopted and implemented in response to it, new construction of information and communications infrastructure will be more likely to achieve the resilience targets. Without changes in policy and other incentives,

however, we do not foresee any significant changes in the performance capabilities of existing system components.

- Companies in this sector should institutionalize long-term seismic mitigation programs and should work with the appropriate agencies and stakeholders to achieve timely and effective mitigation to ensure that their facilities are resilient and their operations reliable.
    - Require that central offices, Internet exchanges, remote terminals, and submarine cable landings be built or retrofitted to meet the *critical facility* standard.
    - Include within site development and zoning codes the requirement that information and communications technology structures be built to withstand the potential impacts of a scenario earthquake and tsunami. This should include:
        - Limitations on building in tsunami inundation areas.
        - Limitations on construction of antenna towers on buildings that do not meet the critical facility standard.
        - Accounting for potential liquefaction and slope instability when constructing towers, buildings, underground utilities, and overhead lines.
    - Adopt clear, statewide uniform standards, like the NEBS (Network Equipment-Building System), for the adequate performance and bracing of information and telecommunications equipment that must withstand the scenario event, and establish a mechanism for reliable enforcement.
    - Establish a hardened backbone for information and telecommunications systems in conjunction with the ODOT's hardening of primary transportation routes.
- Companies in this sector should work with the state of Oregon to build Oregon's seismic resilience to a Cascadia earthquake.
    - Adopt pro-active practices and a risk management approach to help achieve seismic resilience.
    - Encourage a culture of awareness and preparedness in relation to the seismic vulnerability of the energy sector, and stress the need to conduct long-range energy planning.
- Create an ongoing marketing and education program for Oregon to craft the resilience message for the public. This is to bring about a cultural shift toward preparing for the catastrophic Cascadia subduction zone earthquake and to learn the cost of becoming prepared.
    - Create a public information officer position (for the state) and assign to it responsibility for this marketing and education program.
    - Involve all types of media in promoting this new culture of preparedness.
- Recommend the state and municipalities should include system resilience criteria in their requests for proposals when contracting for telecommunications and information services.



Recommendations

As demonstrated in Chile (ASCE TCLEE, 2010), resilience can be achieved within a 50-year period without unrealistic amounts of new investment. Companies in this sector should be encouraged to institutionalize long-term seismic mitigation programs and to work with the appropriate agencies and stakeholders to achieve timely and effective mitigation to ensure that their facilities are resilient and their operations reliable. Towards that end, the task group proposed the following recommendations for consideration:

- **Information and communications companies should conduct seismic vulnerability assessments (SVA) on all of their infrastructure facilities, and they should work with the appropriate agencies and stakeholders to achieve timely completion of the assessments to understand existing vulnerabilities.**
  - The Public Utility Commission of Oregon (OPUC) is the proper oversight authority for all telecommunications utilities that are subject to the OPUC's Oregon Administrative Rules.
  - The OPUC may need to define the criteria for seismic vulnerability assessments.
  - The OPUC should review the results of the seismic vulnerability assessments and the systems' resilience to other natural disasters (within the scope of their mission).
  - The implementation of this recommendation could also involve the participation of the Oregon Department of Geology and Mineral Industries (DOGAMI), the Building Codes Division, and the Oregon Seismic Safety Policy Advisory Commission (OSSPAC).
- **Provide liability waiver language in statute for vulnerabilities identified in the seismic vulnerability assessments that are above operators' current normal operations.**
- **Companies in this sector should institutionalize long-term seismic mitigation programs.**
- **Utilize the Oregon Office of Emergency Management's public-private sector position to help ensure coordinated planning, information sharing, and interoperability among critical organizations and agencies. The position will also ensure that work being performed by this entity and its partners helps provide public education and outreach to local, county, and state agencies and organizations.**
- **The state of Oregon should provide statutory authority for a prescriptive waiver of routine permitting requirements and processes for the design, construction, and restoration of communication and information infrastructure, if it is determined that the waiver is in the public interest and is necessary to address an actual or impending emergency (and subsequent actions) caused by a natural or manmade disaster.**

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3. ASCE TCLEE (2011). *Preliminary Report on the 27 February 2010 Mw 8.8 Offshore Maule, Chile Earthquake*. Technical Council on Lifeline Earthquake Engineering (TCLEE), American Society of Civil Engineers.

4. Wang, Y., Bartlett, S.F., and Miles, S.B. (2012). *Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub*. Final Report to Oregon Department of Energy & Oregon Public Utility Commission. Oregon Department of Geology and Mineral Industries, August. The full EAP report is accessible at http://www.oregon.gov/puc/docs/DOGAMICEIHubreport-8-1-12-R1.pdf.

8. Water and Wastewater Systems

Introduction

Oregon's water and wastewater systems are especially vulnerable to damage resulting from a Cascadia subduction zone earthquake. Some of the inherent seismic vulnerabilities of water and wastewater systems include:

- The systems tend to be large and complex, consisting of a combination of pipeline networks serving large areas and concentrated facilities (such as treatment plants and pump stations), with numerous potential points of failure.
- The systems are highly dependent on other resources—such as power, transportation, chemicals, and skilled staff—to remain operational and to complete needed repairs.
- The systems are financially dependent on consistent revenue streams to fund ongoing operations, maintenance, and debt service obligations.
- Essential facilities, such as intakes, treatment plants, pump stations, and outfalls, are often located near rivers and lakes and are vulnerable to damage from liquefaction of alluvial soils.
- Many critical facilities, such as reservoirs, pump stations, and treatment plants, were designed and constructed before the adoption of seismic design standards that reflect the current state of knowledge of regional seismicity.
- Pipeline networks include extensive use of non-ductile (inflexible) materials, such as concrete and cast-iron pipe, which tend to fail during strong ground motion.
- Pipelines are especially vulnerable to failure from permanent ground deformation (resulting from liquefaction and landslides), because the deformation causes *push-on* pipe joints to separate.
- Water and sewer pipelines tend to be prone to failure at connections to aboveground structures, such as reservoirs, treatment plants, pump stations, and service connections to homes.
- Water from leaks and breaks in water pipelines and private plumbing systems will cause collateral damage, drain available water storage, and contribute to loss of water supply and pressure, which will in turn result in a loss of fire protection capability.
- The performance of gravity sanitation and storm sewers depends on accurate grades and slopes, which are disrupted by ground displacement resulting from liquefaction.
- Failures of storm sewers can contribute to localized flooding during even minor rain events, resulting in collateral damage.

THE EXISTING STATE

If it were to occur today, a Cascadia subduction zone earthquake would result in catastrophic impacts to existing water and wastewater systems throughout western Oregon. The Oregon coast would most likely experience strong ground shaking for over three minutes. Facilities within the tsunami inundation zone would be extensively damaged; in many cases, these facilities would not be repairable. Facilities outside of the tsunami zone would be heavily damaged, with total loss of water and wastewater services for periods measured in months and, in some cases, years.

The Willamette Valley would experience moderate ground shaking. Well-engineered structures may perform well, but many older structures would likely fail, including treatment facilities, reservoirs, and pump stations. One of the major impacts to large population centers would be from liquefaction: extensive alluvial and fill deposits along rivers would lose strength, lose bearing capacity, and move towards riverbanks. Old cast iron water pipelines buried in the liquefied soil would snap, and modern pipelines constructed of ductile iron and PVC would likely pull apart at joints, resulting in a total loss of water pressure throughout communities. Large drainage structures along riverbanks in liquefiable areas would likely move, severing connecting piping and rendering the structures useless. Examples of the type of damage likely to occur are illustrated in Figures 8.1–8.7.



Figure 8.1: Tank piping separated, Northridge earthquake, California, 1994 (Source: Los Angeles Department of Water and Power)



Figure 8.2: Tank buckling, Northridge earthquake, California, 1994 (Source: Photo by Don Ballantyne)



Figure 8.3: Wire wrapped concrete tank burst in Purisima Hills, Loma Prieta earthquake, California, 1989 (Source: Photo by Don Ballantyne)



Figure 8.4: Welded steel pipe failed in compression, San Fernando (Sylmar) earthquake, California, 1971(Source: Photo Source Unknown)



Figure 8.5: Pipelines separated, Great Hanshin earthquake, Kobe, Japan, 1995 (Source: Kobe Water Department)



Figure 8.6: Water well and treatment facility in tsunami inundation area, Tohoku earthquake, Japan, 2011 (Source: Photo Source Unknown)

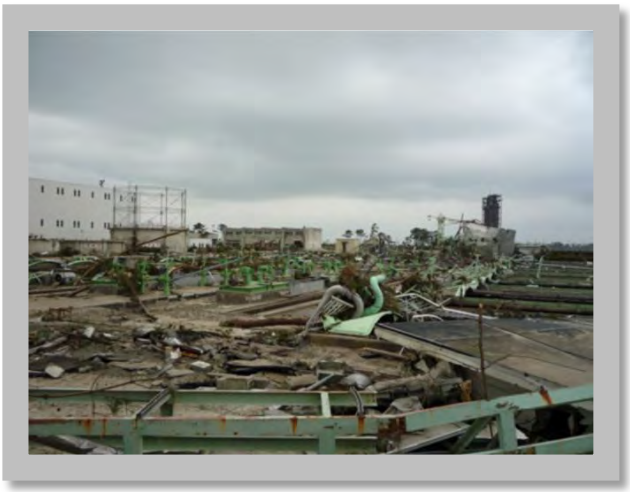


Figure 8.7: Minami Gamou Wastewater Treatment Plant impacted by tsunamis, Tohoku earthquake, Sendai, Japan, 2011 (Source: Photo by Don Ballantyne)

Water for Fire Suppression

In the current state of readiness, existing water systems would experience extensive leaks and breaks in water supply pipelines. These leaks, coupled with loss of water supply facilities, such as treatment plants and pump stations, would drain the water systems. This loss of volume and pressure would critically limit the availability of water supply for conventional urban firefighting: fire hydrants would be rendered useless, and many fire sprinkler systems would be inoperable (even those sprinkler systems that remain intact).

Urban and suburban firefighting strategies would resemble those commonly used in rural areas: water for fire suppression would only be available from lakes, rivers, streams, swimming pools, and any surviving local water storage reservoirs. Fire engines would draft from these sites and rely on tankers to move water to fires. The combination of transportation infrastructure damage, compromised emergency communications systems, and high emergency incident volumes, would limit the ability of fire departments to respond to individual incidents. Fire departments would have to identify, assess, and prioritize responses and would focus on life safety and containment rather than trying to extinguish every fire. Photos of previous earthquake-relate fire events are shown in Figures 8.8–8.10.



Figure 8.8: Fire in the Marina District required a fireboat to pump water for suppression, Loma Prieta earthquake, San Francisco, 1989. Over 100 pipeline failures occurred within the immediate area. (Source: Photo Source Unknown)

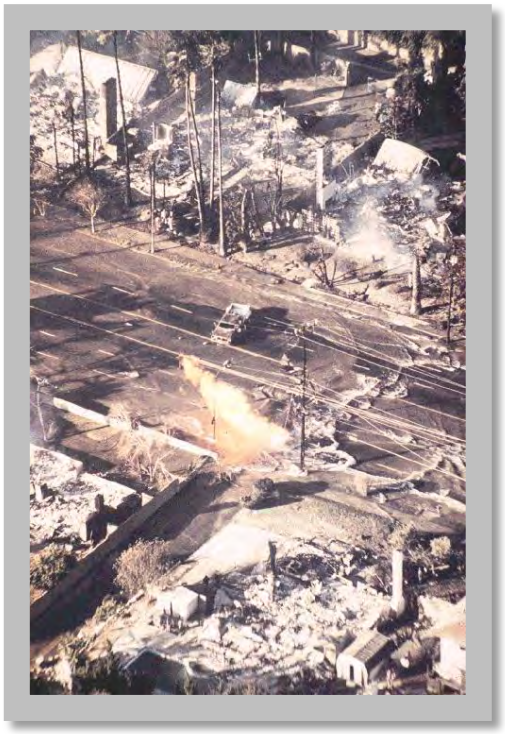


Figure 8.9: Fire from a gas line explosion on Balboa Boulevard, Northridge earthquake, California, 1994 (Source: Photo Source Unknown)

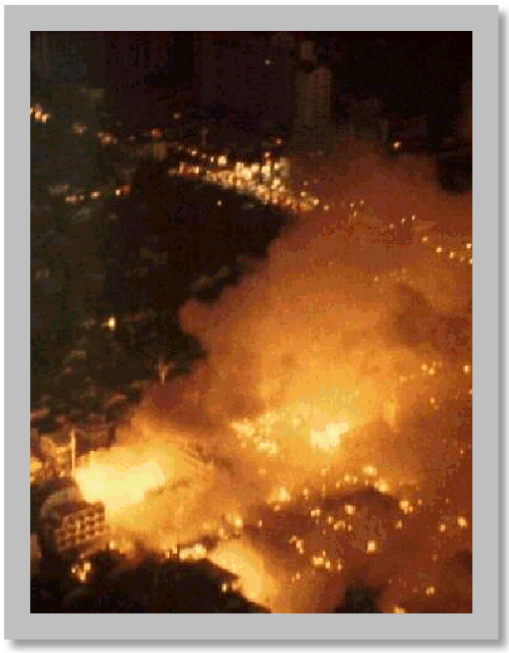


Figure 8.10: Conflagration resulting from water system failures, Great Hanshin earthquake, Kobe, Japan, 1995 (Source: Photo Source Unknown)

Potable Water Supplies

In the current state of readiness, water utilities would be unable to provide water from the existing distribution system. Communities would rely on emergency supplies for the first one to two weeks, depending on location and on the condition of transportation infrastructure. Some areas would have *no* water supplies during that time. Water for healthcare facilities such as hospitals would be severely restricted. Emergency water supplies would meet only subsistence needs (for example, direct consumption and very limited bathing). For the first one to two months, water would be delivered via tankers to smaller tanks and bladders distributed throughout the community. People would wait in line to fill their containers and then carry the water home. Some water would come from portable water

treatment units provided by the military, equipment suppliers, and foreign countries; however, the quantity of water supplied from those resources would be small compared to demands. Photos of water distribution following other earthquakes are presented in Figures 8.11–8.13.



Figure 8.11: Water distributed by tank truck, Northridge earthquake, Los Angeles, 1994 (Source: Photo by Don Ballantyne)



Figure 8.12: Temporary water treatment plant, Haiti earthquake, 2010 (Source: Photo by Don Ballantyne)



Figure 8.13: People waiting for water, Haiti earthquake, Port Au Prince, 2010 (Source: Photo by Don Ballantyne)

Manufacturing facilities, hotels, restaurants, and even office buildings that depend on water would be closed. Within several weeks of the event, a few restaurants might reopen using paper plates, but in many locations, water for use in bathrooms, dish washing, and laundry could be delayed for months.

A month following the earthquake, water supplies, treatment facilities, and transmission systems would begin to come online and replace the portable treatment units. People would still need to carry water from distribution points to their homes and businesses. In the hardest hit areas—the Oregon coast and areas with liquefiable soils—it may take six months to a year or more for water services to be restored to individual homes and businesses.

Wastewater Facilities

Sewers and pump stations in liquefiable areas would be heavily damaged. Large pump stations along rivers would likely settle or tilt, shearing off connecting piping. Sewage would overflow into nearby bodies of water. In areas distant from water bodies, raw sewage would likely flow into gutters and ditches, making its way through the surface water drainage system. In many cases, sewage would likely back up into homes and businesses. Because there would be little water available to flush toilets, sewage flows would be small, except in areas served with combined sewers. In many cases, people would attempt to use toilets in their houses and flush with a bucket of water. Because there would not be enough water to move the solids effectively downstream, sewers would plug within the first few weeks.

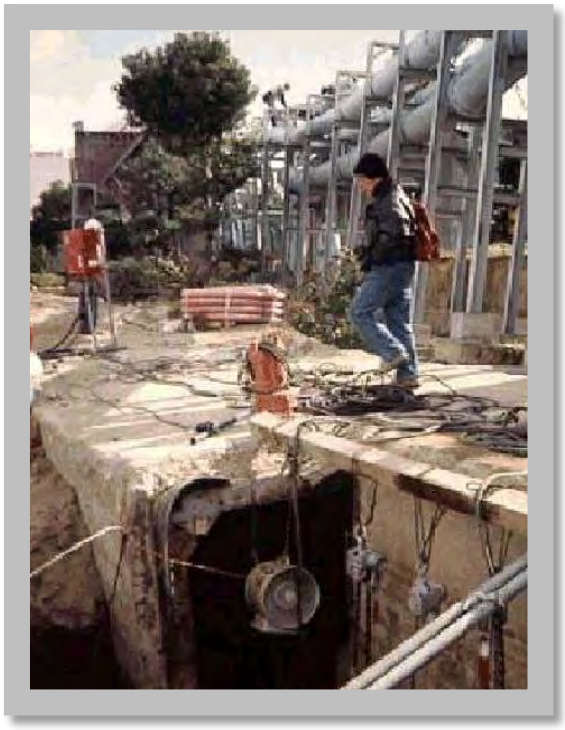


Figure 8.14: Damage from liquefaction/lateral spreading at Higashinada WWTP, Kobe, Japan, 1995. (Source: Photo by Don Ballantyne)



Figure 8.15: Damage from liquefaction/lateral spreading at Higashinada WWTP, Kobe, Japan, 1995 (Source: Photo by Don Ballantyne)



Figure 8.16: Sewer line that floated to the surface as a result of liquefaction, Dagupan, Philippines, 1990. (Source: Photo by Don Ballantyne)

In areas where the potable water system is still functioning, wastewater would be generated and discharged into rivers, streams, and lakes. Rivers would quickly become polluted with wastewater solids, as they were prior to the advent of treatment plants in the first half of the twentieth century. Water treatment plants that draw raw water from contaminated rivers would likely become compromised or would require extraordinary measures, such as operating at very low treatment rates and high dosing rates for treatment chemicals.

In many locations it would take a year before the sewage collections system is functioning and three years before major trunk lines and treatment plants are fully restored to their pre-earthquake functionality. In these situations, people would likely turn to using chemical toilets, available in limited numbers, and latrines.

Water and Wastewater Resilience Planning

Re-establishing water and wastewater service will be a crucial element in the overall recovery of communities after a Cascadia subduction zone earthquake. Water for fire suppression, first aid, emergency response, and community use, as well as water for normal health and hygiene, will be required soon after the event. Functioning wastewater systems that help protect the community from sewage contamination, health hazards, and disease outbreaks will be essential.

The time required to re-establish water and wastewater services will depend largely on the pre-event condition of the systems, the actual intensity and duration of the event, the size and complexity of the systems, and the availability of staff and the financial and material resources needed to complete

repairs. In addition, damage to other infrastructure, such as the transportation, communications, fuel, and power systems, may control the time required to restore water and wastewater infrastructure.

The Oregon Resilience Plan's Water and Wastewater Task Group included participation by various industry professionals, including representatives from academia, municipalities, special districts, and consultants. Communities participating in the planning effort are summarized in Figure 8.17. These utilities represent about five percent of the population of coastal communities and about 40 percent of the population of western Oregon.

System / Community	Sector
City of Portland	Water & Wastewater
Tualatin Valley Water District	Water
City of Bend	Water
City of Gresham	Water
City of Pendleton	Water
City of Salem	Water & Wastewater
Clean Water Services	Wastewater
Coos Bay - North Bend Water Board	Water
Eugene Water & Electric Board	Water
Rivergrove Water District	Water

Figure 8.17: Water and Wastewater Systems Participating in the Water and Wastewater Task Group

The Water and Wastewater Task Group also included experts from three universities, consulting engineers who specialize in water and wastewater facilities, and the representatives of a fire and emergency response agency. The task group met monthly from February 2012 through August 2012, building on existing information and on group members' working knowledge of existing systems to assess the performance of existing systems and estimate the time required to restore water and wastewater service to the populations affected by the scenario earthquake.

RESILIENCE GOALS, OBJECTIVES, AND SCOPE

First, the Water and Wastewater Task Group identified performance goals for the time required to restore water and wastewater service to affected communities. This effort consisted of developing a phased approach to water system upgrades before a Cascadia subduction zone earthquake and recovery after, defining categories or groups of functional characteristics of systems, and identifying resilience goals for each category.

A Phased Approach

Given the size and inherent vulnerability of most water and wastewater systems, it was assumed that costs of seismic mitigation would exceed the resources of most providers' 50-year capital improvement

programs. Therefore, to provide water to critical areas and establish wastewater service to protect public health and safety as soon as possible following the seismic event, a phased approach to system recovery was developed. The phased approach is built upon having hardened backbone elements of the water and wastewater systems. The backbone system would consist of key supply, treatment, transmission, distribution, and collection elements that, over the 50-year timeframe, have been upgraded, retrofitted, or rebuilt to withstand a Cascadia subduction zone earthquake.

The backbone water system would be capable of supplying key community needs, including fire suppression, health and emergency response, and community drinking water distribution points, while damage to the larger (non-backbone) system is being addressed. The backbone wastewater system would protect the community from health hazards and minimize environmental impacts associated with raw sewage as larger repair and response efforts are underway. Identification of a community's backbone water and wastewater systems would become essential to maximizing the effectiveness of investments in resilience and ultimately to expediting recovery efforts following a Cascadia subduction zone earthquake.

The proposed approach—each community establishes a backbone water system—does not alleviate critical water and wastewater concerns following a Cascadia subduction zone earthquake. Large portions of the water distribution system will remain vulnerable and presumably inoperable. In addition, vulnerabilities of the wastewater collection and treatment system will likely result in raw sewage discharges to receiving waters and public health risks in affected communities.

Functional Categories of Water and Wastewater Systems

Using the professional judgment of group members, the Water and Wastewater Task Group established categories of water and wastewater infrastructure based on functional characteristics of the systems. These categories also reflected the proposed backbone structure to accommodate phased recovery of the systems. The categories of system functions are described below.

Domestic Water Supply

- **Potable water available at supply source (water treatment plants, wells, impoundments).** This category represents the initial point of the finished water supply system. Given the age, geotechnical vulnerability, and complexity of many treatment plants, a phased recovery was assumed and would be dedicated to seismically hardening the treatment processes. Communities with more resilient storage may consider longer recovery timeframes for the supply source, as they could rely on stored water in lieu of producing more treated water.
- **Main transmission facilities, pipes, pump stations, and reservoirs operational.** This category refers to the backbone system discussed above. The intent is to be able to convey water from resilient storage and treatment plants to key distribution points as soon as possible following the event. Manual operation of valves—to isolate the backbone system from damaged areas of the system and minimize water loss—accounts for some of the delay in implementation.

- **Water supply to critical facilities available.** This category assumes critical facilities will be nearly fully operational due to on-site water storage or the capacity of the local supply. Critical facilities, such as hospitals and first-aid facilities, command and control centers, and industries essential to recovery and restoration efforts, should be identified for individual communities.
- **Water for fire suppression at key supply points**. Thorough planning efforts, involving fire officials and emergency responders, should identify key supply points for reliable access to water for fire suppression. These areas should be included in the backbone system.
- **Water for fire suppression at fire hydrants.** Water will be available at fire hydrants when leaks and breaks in the distribution system have been repaired. Communities in heavily damaged areas will likely not be able to rely on fire hydrants until the majority of the distribution system is operational. Until that benchmark can be reached, communities would have to rely on the key fire-suppression supply points and fire-suppression strategies described above.
- **Water available at community distribution centers/points.** As in the case of fire hydrants, the distribution of water to individual homes and neighborhoods may not be possible given damage to the distribution system. If community distribution centers/points are provided at strategic locations along the hardened backbone, people can have access to potable water soon after the event. Such issues as the logistics of staffing and setting up a distribution center and of identifying containers were also considered during the development of the target recovery timeframes for this category.
- **Distribution system operational.** In order to provide water throughout the community (including fire hydrants), the distribution system would need to be operational. Through vulnerability assessment, material stockpiles, supply identification, and workforce planning, communities would be able to target anticipated repairs as part of their comprehensive response and recovery efforts.

Wastewater Systems

- **Threats to public health and safety controlled.** Minimizing the threat to public health and safety must be a top priority. Through vulnerability assessment and system planning, communities can identify key lift stations, river crossings, and components that could pose serious threats to public health and safety and can plan response efforts accordingly.
- **Raw sewage contained and routed away from population**. Closely tied to threats to public health and safety, the intent of this category is to make sure raw sewage can be routed away from the population. A key factor in establishing the target timeframes for this category is the anticipated availability of the workforce, equipment, and back-up power.
- **Treatment plants operational to meet regulatory requirements**. When establishing the target timeframes for these components, the task group considered the typical proximity of wastewater treatment plants to rivers and liquefiable soils. Based on historical events, it was

assumed that treatment plants would at first be operating at lower regulatory requirements given the emergency situation. As repairs are made, the treatment plants would resume meeting applicable discharge requirements.

- **Major trunk lines and pump stations operational.** Through assessment of vulnerability and back-up power capability, communities can identify the key pump stations that will be needed to maintain the functionality of the major trunk lines. As treatment plants return to normal operation, the available storage in the trunk lines can be utilized to store raw sewage as needed to minimize threats to public health and safety and route raw sewage away from the population.
- **Collection system operational.** As repairs to key pump stations, trunk lines, and treatment plants are completed, the available work force, equipment, and resources can be focused on repairing the collection systems that serve individual neighborhoods. Damage to and limited functionality of collection systems should be addressed as part of the comprehensive response and recovery efforts. Community sanitary collection centers and community education efforts should be considered.

WATER AND WASTEWATER RECOVERY GOALS

Recovery goals were established for each functional category for water and wastewater systems. Due to the unique characteristics of various regions of the state, recovery goals were developed for each of three geographic regions: the Oregon coast, the Willamette Valley, and eastern Oregon.

The proposed target recovery times were developed based on the considerations described above, using input from a range of water and wastewater professionals participating in the Oregon Resilience Plan effort, and based on input from the Business Task Group. In general, the recovery goals established by the professionals who participated in the Water and Wastewater Task Group were longer than the two-week goal identified by the Business Task Group. These longer goals were based on the professional judgment of the Water and Wastewater Task Group and took into account the consideration that a goal of two weeks would require replacement of essentially all existing water and wastewater system infrastructure. Finally, the intended objectives of the Business Task Group's goal for a two-week recovery were generally met by the proposed phased approach of a seismically hardened backbone for water and wastewater systems.

The proposed target recovery times are based on typical water and wastewater systems in the specified geographic zone. Estimates of recovery times assume the typical system has implemented comprehensive resilience improvements, including upgrades to its backbone system, over the 50-year planning horizon. It is further assumed that the resilient backbone is capable of withstanding the anticipated impact of a Cascadia subduction zone earthquake with minimal damage. It is recommended that those responsible for individual systems establish their own target recovery goals as part of a system-specific assessment to reflect the particular configuration of the individual system and the needs of the community it serves.

Recovery tables were developed for each of three geographic zones of the state, with performance goals established for each functional category within each zone. These tables include the following:

- Table in Figure 8.18: *Coastal.* This includes the parts of the Coast that are not in tsunami inundation zones and extends as far as the Coast Range.
- Table in Figure 8.19: *Valley.* This includes the Willamette Valley and the western-flank of the Cascades, including major population centers in the state.
- Table in Figure 8.20: *Eastern.* This includes all areas east of the summit of the Cascades.

As shown in the tables, the performance goals for recovery times vary widely within the state. In particular, the target recovery times for the Coastal zone are significantly longer than those of the Valley and Eastern zones. This difference is due in part to the following considerations:

- Coastal communities are physically closer to the fault than the communities in the Valley and Eastern zones and will therefore experience greater physical damage, more disruption, and longer recovery times. Achieving target recovery times similar to those of the other zones will require greater effort and expenditure by coastal communities.
- The population density of the Coastal zone is far lower than that of the Valley zone; therefore, the per capita cost of repairs will likely be far higher for coastal communities. Similarly, the per capita cost for the Eastern zone is expected to be lower given the lower anticipated damage for that zone.
- Coastal communities have fewer resources (in terms of number of residents, available equipment, consultants, and contractors) to aid with the recovery process and help restore systems. The competing priorities of the population and economic centers of the state will also affect the speed at which coastal communities are able to recover. Mobilization of assistance from other jurisdictions will take additional time and be affected by interdependencies with other essential services, including transportation, energy, and communications.

KEY TO THE TABLE

TARGET TIMEFRAME FOR RECOVERY:

Desired time to restore component to 80–90% operational — G

Desired time to restore component to 50–60% operational — Y

Desired time to restore component to 20–30% operational — R

Current State (90% operational) — X

TARGET STATES OF RECOVERY: WATER & WASTEWATER SECTOR (COAST)

	Event occurs	0–24 hours	1–3 days	3–7 days	1–2 weeks	2 weeks – 1 month	1–3 months	3–6 months	6 months–1 year	1–3 years	3 + years
Domestic Water Supply											
Potable water available at supply source (WTP, wells, impoundment)				R		Y		G		X	
Main transmission facilities, pipes, pump stations, and reservoirs (backbone) operational			R	Y	G					X	
Water supply to critical facilities available				R		Y		G		X	
Water for fire suppression—at key supply points			R		Y			G		X	
Water for fire suppression—at fire hydrants						R	Y	G		X	
Water available at community distribution centers/points				R	Y	G	X				
Distribution system operational					R		Y	G			X

(To be continued on next page)

KEY TO THE TABLE

TARGET TIMEFRAME FOR RECOVERY:

Desired time to restore component to 80–90% operational

Desired time to restore component to 50–60% operational

Desired time to restore component to 20–30% operational

Current State (90% operational)

G
Y
R
X

	Event occurs	0–24 hours	1–3 days	3–7 days	1–2 weeks	2 weeks – 1 month	1–3 months	3–6 months	6 months–1 year	1–3 years	3 + years
Wastewater Systems											
Threats to public health & safety controlled				R	Y		G			X	
Raw sewage contained & routed away from population				R	Y			G		X	
Treatment plants operational to meet regulatory requirements							R		Y	G	X
Major trunk lines and pump stations operational						R		Y	G		X
Collection system operational								R	Y	G	X
	Event occurs	**0–24 hours**	**1–3 days**	**3–7 days**	**1–2 weeks**	**2 weeks – 1 month**	**1–3 months**	**3–6 months**	**6 months–1 year**	**1–3 years**	**3 + years**

Figure 8.18: Water & Wastewater Sector: Coastal (Non-Tsunami) Zone

KEY TO THE TABLE

TARGET TIMEFRAME FOR RECOVERY:

Desired time to restore component to 80–90% operational — G

Desired time to restore component to 50–60% operational — Y

Desired time to restore component to 20–30% operational — R

Current state (90% operational) — X

TARGET STATES OF RECOVERY: WATER & WASTEWATER SECTOR (VALLEY)

	Event occurs	0–24 hours	1–3 days	3–7 days	1–2 weeks	2 weeks–1 month	1–3 months	3–6 months	6 months –1 year	1–3 years	3 + years
Domestic Water Supply											
Potable water available at supply source (WTP, wells, impoundment)		R	Y		G			X			
Main transmission facilities, pipes, pump stations, and reservoirs (backbone) operational		G					X				
Water supply to critical facilities available		Y	G				X				
Water for fire suppression—at key supply points		G		X							
Water for fire suppression—at fire hydrants				R	Y	G			X		
Water available at community distribution centers/points			Y	G	X						
Distribution system operational			R	Y	G				X		

(To be continued on next page)

KEY TO THE TABLE

TARGET TIMEFRAME FOR RECOVERY:

Desired time to restore component to 80–90% operational — G

Desired time to restore component to 50–60% operational — Y

Desired time to restore component to 20–30% operational — R

Current state (90% operational) — ×

	Event occurs	0–24 hours	1–3 days	3–7 days	1–2 weeks	2 weeks–1 month	1–3 months	3–6 months	6 months –1 year	1–3 years	3 + years
Wastewater Systems											
Threats to public health & safety controlled			R	Y		G			X		
Raw sewage contained & routed away from population		R		Y			G		X		
Treatment plants operational to meet regulatory requirements					R			Y	G		X
Major trunk lines and pump stations operational					R		Y	G			X
Collection system operational							R	Y	G	X	
	Event occurs	**0–24 hours**	**1–3 days**	**3–7 days**	**1–2 weeks**	**2 weeks–1 month**	**1–3 months**	**3–6 months**	**6 months –1 year**	**1–3 years**	**3 + years**

Figure 8.19: Water & Wastewater Sector: Valley Zone

KEY TO THE TABLE

TARGET TIMEFRAME FOR RECOVERY:

Desired time to restore component to 80–90% operational	G
Desired time to restore component to 50–60% operational	Y
Desired time to restore component to 20–30% operational	R
Current state (90% operational)	✕

TARGET STATES OF RECOVERY: WATER & WASTEWATER SECTOR (CENTRAL/EASTERN OREGON)

	Event occurs	0–24 hours	1–3 days	3–7 days	1–2 weeks	2 weeks–1 month	1–3 month	3–6 months	6 months –1 year	1–3 years	3 + years
Domestic Water Supply											
Potable water available at supply source (WTP, wells, impoundment)		X									
Main transmission facilities, pipes, pump stations, and reservoirs (backbone) operational		X									
Water supply to critical facilities available		X									
Water for fire suppression—at key supply points		X									
Water for fire suppression—at fire hydrants		X									
Water available at community distribution centers/points		X									
Distribution system operational		X									

(To be continued on next page)

KEY TO THE TABLE

TARGET TIMEFRAME FOR RECOVERY:

Desired time to restore component to 80–90% operational — G

Desired time to restore component to 50–60% operational — Y

Desired time to restore component to 20–30% operational — R

Current state (90% operational) — ×

	Event occurs	0–24 hours	1–3 days	3–7 days	1–2 weeks	2 weeks–1 month	1–3 month	3–6 months	6 months –1 year	1–3 years	3 + years
Wastewater Systems											
Threats to public health & safety controlled		X									
Raw sewage contained & routed away from population		X									
Treatment plants operational to meet regulatory requirements		X									
Major trunk lines and pump stations operational		X									
Collection system operational		X									
	Event occurs	0–24 hours	1–3 days	3–7 days	1–2 weeks	2 weeks–1 month	1–3 months	3–6 months	6 months–1 year	1–3 years	3 + years

Figure 8.20: Water & Wastewater Sector: Central / Eastern Zone

Assessment of System Performance

The Water and Wastewater Task Group used available data, experience from other similar events, and professional judgment to estimate the performance of existing water and wastewater systems in response to a Cascadia subduction zone earthquake. The task group developed estimates of pipeline failure rates and facility failures and identified other likely failure mechanisms. From these assessments, the task group estimated the recovery times for the existing systems of the water and wastewater

facilities in the coastal and valley zones. This approach and resulting recovery times for existing systems are presented below.

ESTIMATES OF PIPELINE FAILURES

Water Distribution Systems

The process used to predict the performance of water distribution systems included a preliminary inventory of types of pipeline material for six water systems (Portland Water Bureau, Eugene Water and Electric Board, City of Gresham, Tualatin Valley Water District, Coos Bay - North Bend, and Salem). After assembling the available information on pipe lengths and materials, the task group superimposed these distribution systems onto maps of the scenario magnitude 9.0 Cascadia subduction zone earthquake showing peak ground acceleration, liquefaction potential (displacement), and landslide potential. The task group then used empirical data from the American Lifeline Alliance to predict the number of breaks and leaks for typical distribution systems. Figure 8.21 provides a summary of results for the participating utilities. The damage to those systems was assumed generally to represent the degree of damage to all the systems on the coast and in the Willamette Valley.

Characteristic	Estimate
Total Length of Pipe (miles)	4,592
Total Number of Breaks (number)	2,656
Total Number of Leaks (number)	941
Total Number of Services (number)	385,600
Service Line Breaks—Utility Side (2%)	7,712
Service Line Breaks—Customer Side (5%)	19,280

Figure 8.21: Estimate of Water Pipeline Breaks & Leaks for Participating Utilities

Wastewater Collection Systems

There is no comprehensive guideline for wastewater collection system collapses in response to a seismic event. Experience indicates the following general relationships:

- The ratio for sewer pipe collapses to water pipeline breaks and leaks is about 1:10 (in other words, one sewer pipe collapse for every 10 water pipeline breaks and leaks).
- Each collapse requires replacement of about 100 feet of pipe, and one manhole is required for every 400 feet of collapsed pipe (in other words, one manhole replacement is needed for every four sewer collapses).

Based on these assumptions, it was projected that the participating utilities would experience a total of about 360 sewer collapses and about 90 manholes replacements as a result of a Cascadia subduction zone earthquake.

Assessment of Water and Wastewater Structures

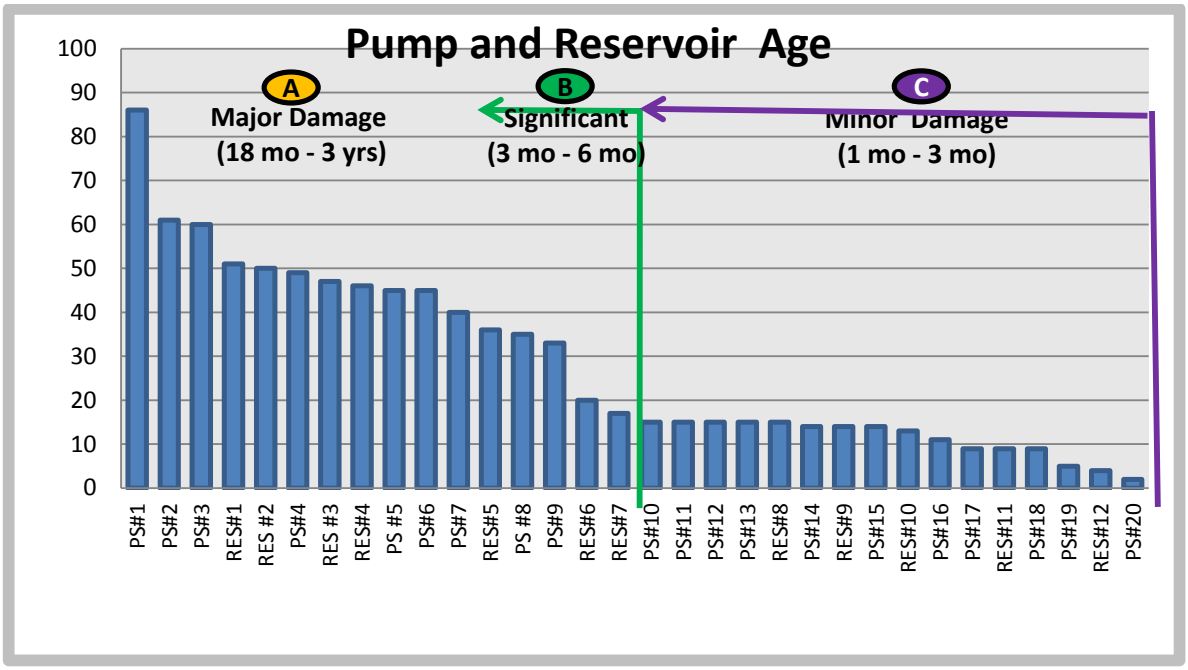
Participating utilities also compiled available data on the construction and age of critical water and wastewater facilities, such as treatment plants, pump stations, and reservoirs. To identify the degree and severity of likely failures of existing facilities, the task group compared the age distribution of existing facilities to the building code seismic requirements that were in effect at the time the facilities were constructed. Figure 8.22 is an example of the typical output that the task group used to estimate (for each utility) the damage that facilities may experience.

Based on this preliminary assessment, the following general observations were made regarding existing key structures:

- Reservoirs and Tanks
    - Nearly all reservoirs and tanks are likely to experience some damage at the connection between the buried pipe system and the reservoir structure.
    - 33 percent of total tankage was built before 1960 and had no lateral force requirements—these tanks will most likely fail and release contents.
    - 30 percent of total tankage was built between 1960 and 1970 and had only a .06 gravity lateral force requirement—tanks that are near the epicenter will most likely fail and release contents.
    - 12 percent of total tankage was built between 1970 and 1990 and had only a .12 gravity lateral force requirement—tanks that are close to the epicenter will most likely fail and release contents.
    - 12 percent of total tankage was built between 1990 and 2000 and had somewhat more stringent lateral force requirement—these tanks will most likely suffer some damage, but may not release contents.
    - 13 percent of total tankage was built after 2000 and had stringent lateral force requirements—these tanks will most likely remain intact.
- Pump Stations
    - Nearly all pump stations are likely to experience some damage at the connection between the buried pipe system and pump station structure.
    - 13 percent of pump stations were built before 1960 and had no lateral force requirements—these stations will likely fail structurally and mechanically.

  - 22 percent of pump stations were built between 1960 and 1970 and had only a .06 gravity lateral force requirement—these stations will likely fail structurally and mechanically if located near the epicenter.
  - 12 percent of pump stations were built between 1970 and 1990 and had only a .12 gravity lateral force requirement—these stations will likely fail structurally and mechanically if located close to the epicenter.
  - 31 percent of pump stations were built between 1990 and 2000 and had somewhat more stringent lateral force requirement—these stations will most likely suffer some damage, but may be usable after repairs.
  - 19 percent of pump stations were built between 2000 and 2009 and incorporated stringent lateral force requirements—these stations are likely to remain intact and functional.
  - 3 percent of pump stations were built after 2009. They meet current code and are most likely to remain intact and be functional.

- Treatment Plants
  - Water and wastewater treatments will generally respond in similar ways.
  - Treatment plants built on liquefiable soils without special design for liquefiable soils are likely to suffer catastrophic damage due to foundation failures.
  - The identification of and mitigation for liquefaction generally did not become standard practice until the late 1990's.



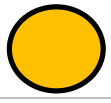
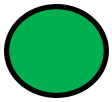
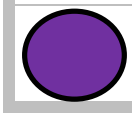
Performance Group	Seismic Retrofit Date	Expected Performance Level	Description of Expected Performance	Approximate Restoration Time
	Pre-1975	Collapse Prevention	*Major Structural Damage *Structure on verge of collapse *Replacement necessary	18 months to 3 years
	1975–1993	Life Safety	*Significant structural and nonstructural damage *Repair possible but replacement may be more economical	3 to 6 months
	1994–Present	Immediate Occupancy, Life Safety	*Minor to moderate structural and nonstructural damage *Repairs needed	1 to 3 months

Figure 8.22: Example of Facility Age Distribution and Building Code Requirements

ADDITIONAL FACTORS

In addition to pipeline failures and the age of facilities, the task group considered other factors when preparing estimates of damage and resulting times to restore water and wastewater services; these factors included seismic hazards, interdependencies, and historical performance.

Anticipated Seismic Hazards

A number of seismic hazards other than shaking and ground motion are associated with a Cascadia subduction zone earthquake.

- *Liquefaction:* Liquefaction occurs when shaking during the seismic event causes a temporary increase in ground water pressure—the result is a loss of soil bearing capacity. Liquefaction can cause structures to settle and pipe connections to shear. The probability of liquefaction occurring is medium to high in the Valley as well as in portions of the Coast. In the Valley, areas such as those near Forest Grove, McMinnville, Albany, Woodburn, and along the Columbia River, have the highest risk of liquefaction. Along the coast, areas such as Astoria, Tillamook, Waldport, Florence, and Coos Bay have the highest risk of liquefaction.
- *Landslides:* The likelihood of permanent ground deformation due to landslides is high to very high for the Coastal and generally low for the Valley and Eastern zones.
- *Lateral spreading:* Displacement of soil structure can cause shearing of pipes and settlement of structures.
- *Shaking:* Sudden ground motion can cause liquids in a tank or reservoir to slosh and impose forces on a tank wall beyond its design capacity. An unanchored tank may rock, breaking connecting piping. As sloshing continues, rocking may cause the tank to buckle or burst. (Barnett, E.A., Weaver, C.S., et al. 2005)
- *Tsunami inundation:* Target recovery times and current recovery times were not established for those portions of the coastal zone that are in the inundation zone.

Interdependencies

A utility provider's ability to respond after the earthquake and restore water and wastewater service to the community will be impacted by the anticipated performance of other areas of the community.

- *Transportation Corridors.* The availability of transportation corridors, including bridges, highways, and rail lines, will impact the ability of repair and response crews to access damaged portions of the system and transport the materials they need to make repairs.
- *Energy and Fuels.* The region is expected to experience widespread electrical power outages and shortages of fuels as a result of a Cascadia subduction zone earthquake. This lack of critical resources will severely limit operation of pump systems and back-up generators; it will also limit the ability of utility providers to transport goods and employees.
- *Supply Chain.* Linked closely with transportation corridors, the ability to locate, purchase, and transport repair materials will impact recovery timeframes.
- *Work Force Availability.* Anticipated damage to community infrastructure, including homes and neighborhoods, will impact the ability of repair and response crews to mobilize. Personal injury and care of family members and dependents will be a high priority for many.

Historical Performance

When estimating recovery times, the task group considered the impacts of recent seismic events in other locations as well as the recovery efforts that followed.

- *Christchurch, New Zealand* (The Stronger Christchurch Infrastructure Rebuild Team, 2012). Water supply was re-established to 70 percent of households within one week. The wastewater treatment plant was badly damaged, although it continued to operate at reduced capacity. As a temporary measure, the effluent pumped into the ocean was not treated to the usual level.
- *Tohoku, Japan* (Floyd, 2012). In the 2011 Tohoku earthquake, 90 percent of people evacuated effectively; although around 20,000 people died or are missing. 200,000 people were in the inundation zone at the time of the earthquake.
- *Haiti.* (Ballantyne, 2012). Before the earthquake, over 50 percent of Port-au-Prince residents had no water service and only 10–12 percent had piped connections with intermittent service. After the earthquake, distribution networks were non-functional for most of the city. The primary water issue is distribution. Sewage collection networks were non-existent in the city before the earthquake and became a major problem in the contamination of fresh water and resulting disease outbreaks.

Estimated Recovery Timeframes for Existing Systems

Estimates of recovery times were developed for each of the three geographic zones of the state, with performance estimates made for each functional category within each zone. The resulting estimates of recovery times for existing systems, without resilience upgrades, are summarized in Figures 8.18, 8.19 and 8.20.

RESILIENCE GAP ANALYSIS SUMMARY

As indicated in Figures 8.18 and 8.19, existing water and wastewater systems are generally not able to meet the target recovery goals. This section presents notable gaps between performance goals and estimated recovery times for existing systems and summarizes typical seismic improvements needed to achieve the performance goals. Due to the distance between the epicenter of the earthquake and the facilities, damage within the Eastern zone (Figure 8.20) was not considered of sufficient consequence to warrant further analysis at this time.

PERFORMANCE GAPS

The water and wastewater sector tables for the Coastal and Valley zones (Figures 8.18 and 8.19) reveal significant gaps between the desired performance goals and anticipated performance of existing facilities. In general, performance of water systems in the Valley will be gauged based on availability of water at critical facilities (such as hospitals), which will establish the degree of mitigation necessary. In the Coastal zone, the need for fire flows at key supply points tends to establish the critical degree of

mitigation necessary. For both Coastal and Valley wastewater systems, the need to contain raw sewage overflows and control threats to public health tends to establish the degree of mitigation necessary.

It is important to recognize that the identified gaps reflect anticipated goals and performance for a typical system. In fact, each community or system must conduct its own seismic assessment of the existing facilities, determine what expectations the governing board and the community have for post-earthquake performance of the system, and develop a plan to achieve those expectations.

General observations regarding performance gaps and potential mitigation strategies that may be required to bridge these gaps are summarized below. Assumptions behind these observations are summarized in Figure 8.23.

In reviewing the proposed mitigation scenarios, seismically induced liquefaction stands out as a common vulnerability of critical facilities, because nearly all water and wastewater treatment plants are built near rivers. These facilities were built at times when seismically induced liquefaction was not well understood. Mitigation of seismically induced liquefaction at many of these plants may not be possible in a practical sense, because it would require reconstruction of existing foundations of large treatment structures while the existing facilities remain in operation. Effective mitigation of this critical and widespread vulnerability may require rebuilding these plants on more stable soils.

Water Systems

Notable performance gaps include:

- Water supply at critical facilities (90 percent level) will require one to three years on the Coast and one to three months in the Valley.
- Water supply for fire suppression at key supply points (90 percent level) will require one to three years on the Coast and three to seven days in the Valley.

For typical systems, potential improvements needed to achieve performance goals in the Coastal zone include:

- Hardening transmission facilities (river crossings, bridges, landslide areas, etc.) where possible.
- Replacing existing transmission facilities where hardening is impractical or impossible.
- Installing additional line valves to isolate damaged sections.
- Stockpiling critical replacement parts.
- Hardening valve and other control facilities.
- Providing for vacuum relief valves where needed to prevent pipeline collapse.
- Installing earthquake shutoff valves at appropriate locations.

- Replacing vulnerable pump stations built before 1970; hardening (as needed) pump stations that were built after 1970 so that they meet current standards.
- Replacing flow control equipment when it reaches the end of its current economic life.
- Rebuilding and redesigning transitions between soft piping, such as mains and hard piping at tanks and pump stations.
- Replacing 20 to 30 percent of the transmission systems using more earthquake resistant design standards and more earthquake resistant materials.
- Replacing 20 to 30 percent of the distribution systems using more earthquake resistant design standards and more earthquake resistant materials.
- Replacing tankage built before 1960 with earthquake resistant designs.
- Hardening tankage built after 1960 so that it meets current codes.
- Incorporating seismic resilience objectives into future capital improvement projects.

For typical systems, potential improvements needed to achieve performance goals in the Valley zone include (dates provide only general guidance):

- Hardening existing transmission facilities (river crossings, bridges, liquefaction, landslide areas, etc.) where possible.
- Replacing existing vulnerable transmission facilities where hardening is impractical or impossible.
- Installing additional line valves to isolate damaged sections.
- Stockpiling critical replacement pieces.
- Hardening valve and other control facilities.
- Providing for vacuum relief valves where needed to prevent pipeline collapse.
- Installing earthquake shutoff valves at appropriate locations, such as selected storage facilities and areas of the distribution system that are highly vulnerable.
- Replacing pump stations built before 1970; hardening pump stations built after 1970 so that they meet current standards.
- Replacing flow control equipment when it reaches the end of its current economic life.
- Rebuilding and redesigning transitions between soft piping, such as mains and hard piping at tanks and pump stations.
- Replacing 80 to 90 percent of the transmission facilities using more earthquake resistant materials.

- Replacing 20 to 30 percent of the distribution systems using more earthquake resistant design standards and more earthquake resistant materials.
- Replacing tankage built before 1960 with tankage of earthquake resistant design.
- Hardening tankage built after 1960 so that it meets current code.
- Incorporating seismic resilience objectives into future capital improvement projects.

Wastewater Systems

Notable performance gaps include the following:

- Threats to public health and safety are expected to exist for one to three years on the Coast and six months to a year in the Valley.
- Less than 90 percent of the raw sewage is expected to be contained or routed away from the population centers for one to three years on the Coast and for six months to a year in the Valley.

Research is required to develop sewer designs that will be resistant to permanent ground deformation resulting from a Cascadia subduction zone earthquake.

For typical systems, potential improvements needed to achieve performance goals in the Coastal zone include:

- In liquefiable soils, replacing 50 to 60 percent of the collection system with more earthquake resistant materials.
- In liquefiable soils, replacing 50 to 60 percent of the trunk lines with more earthquake resistant materials.
- Relocating or seismically upgrading wastewater treatment plants built before 2000 and all treatment plants built in areas subject to liquefaction.
- Rebuilding or seismically hardening pump stations built before 2000.
- Providing for emergency power and emergency treatment chemicals.
- Incorporating seismic resilience objectives into future capital improvement projects.

For typical systems, potential improvements needed to achieve performance goals in the Valley zone include:

- In liquefiable soils, replacing 50 to 60 percent of the collection system with more earthquake resistant materials.
- In liquefiable soils, replacing 80 to 90 percent of the trunk lines with more earthquake resistant materials.

- Relocating or seismically upgrading wastewater treatment plants built before 2000 and all treatment plants built in areas subject to liquefaction.
- Upgrading or seismically hardening pump stations built before 2000.
- Providing for emergency power and emergency treatment chemicals.
- Incorporating seismic resilience objectives into future capital improvement projects.

Number	Assumption
1	Recovery tables for the Coast and Valley represent an accurate assessment of what the impact of a magnitude 9.0 Cascadia earthquake on the resource would be should the earthquake occur now; sector tables also represents a consensus regarding the timeframes desired to make Oregon more resilient in 2063 should the same scenario occur then.
2	In the absence of other vulnerability studies, analysis of the facilities of Eugene Water & Electric Board (EWEB) is indicative of performance of similar facilities in the Willamette Valley.
3	Segregation of Coastal, Valley and Eastern responses is appropriate for this level of discussion.
4	Availability of other components of the infrastructure, such as electric power and chemicals, will not be a factor in achieving the desired 2063 restoration timeframes. That is, the water and wastewater industry needs to plan to be resilient without other infrastructure, such as power, telecommunications, and banking. Another assumption is there will be limited availability of construction materials, contractors, chemical deliveries, financial resources, and so forth.
5	Time-block brackets in the columns on the two tables represent the timeframe for the desired availability. Infrastructure will be available sometime in the time block, but this will most likely be toward the end of the bracketed time rather than beginning. For example, the first column is labeled *0–24 hours*. It is unlikely that resources will be available one minute or one hour or even 12 hours after the primary shaking stops; it is more likely that resources will be available near the end of the first 24 hours after the event. The expectation of timeframes needs to be clearly communicated to emergency services, hospitals, and other first responders.
6	In many instances, the three time targets (20–30%, 50–60%, and 80–90% operational) make little difference in the development of resilience scenarios; many of the facilities likely to be damaged cannot be repaired in the time difference given between blocks, because there will not be enough skilled human resources in the region to repair mains or fix treatment plants.
7	Mitigation of external vulnerabilities, such as liquefaction, landslides, and fires at buildings on adjacent properties, is a part of the gap analysis.
8	The gap will be closed (more or less) using the economic resources linearly (1/50 per year), with the most effective mitigation—focused on the system's backbone—taking place first.
9	The information presented in this report outlines the additional resources needed and not the replacement of infrastructure that would naturally take place as infrastructure wears out or exceeds its practical or economic life.
10	With the exception of the pipes, the damage estimates, recovery timeframes, and required expenses are the same for both wastewater treatment systems and water systems; for example, if it takes a month to fix a water pump station, it will take a month to fix a similarly damaged wastewater lift station.
11	Discharge of raw sewage is permissible during the initial period of a declared emergency, but compliance with most applicable discharge regulations will be required after the emergency period ends.
12	80 percent availability means that 80 percent of a given system will be available, not that 80 percent of the system capacity will be available.
13	The members of the task group expect that the material in this report will be communicated with stakeholders, such as elected officials and the public at large. It is hoped that agreement can be reached concerning stakeholders' expectations and the resources needed to fulfill those expectations. Negotiation to balance expectations and resources must take place.

Figure 8.23: Assumptions Related to Performance Gaps and Proposed Seismic Mitigation Improvements



Recommendations

- **Begin aggressive public information efforts to re-set public expectations for a realistic response time. Local governments should consider using local and state planning processes and tools to integrate seismic resilience into their community development and hazard preparation policies.**
  - The old guideline of having a 72-hour emergency survival kit falls far short of the anticipated needs given the extensive impacts of a Cascadia subduction zone earthquake. Even if basic supplies could be readily and broadly dispersed, it would likely take more than three days to achieve that dispersal, and emergency supplies would still fall short of what many people need to avoid deteriorating health (for example, medications, medical equipment, and ongoing healthcare support). There is clear value in members of the public having robust emergency supplies. In many areas, subsistence levels of food and water may be available within a week, but the public should be advised that response will take much more than 72 hours, and recovery times will likely be measured in months. This is especially important in coastal communities where response times could be measured in weeks, and recovery times could be measured in years.
  - The majority of jurisdictions in Oregon maintain local hazard mitigation plans, which can incorporate hazard identification, vulnerability and risk assessments, and mitigation strategies of public facilities and services. *Oregon's Statewide Planning Goals and Guidelines*, especially Goal 7 (Areas Subject to Natural Hazards) and Goal 11 (Public Facilities and Services), provides an opportunity through the Comprehensive Plan process to address the vulnerabilities of water and wastewater systems and devise policies and implementing measures to reduce risk.

- **Public agencies should be advised that the Oregon Water/Wastewater Agency Response Network (ORWARN) is a vital resource and membership is recommended.**

  ORWARN consists of member utilities and cities that provide mutual-aid response following an emergency. It is recommended that all water and wastewater service providers in the state join. This applies to agencies from both sides of the Cascades, because agencies from eastern Oregon will potentially become vital service providers to their counterparts on the coast and in the valley.

- **Service providers from all sectors should be required to have a seismic response plan that includes resources normally provided by a functioning infrastructure.**

  Communities are highly dependent on multiple service providers. These providers need comprehensive emergency response and recovery plans in order for their staff and related resources (contractors, consultants) to address seismic events. Non-infrastructure resources, such as emergency supplies of food and water, communications (including satellite phones), and sister-agency relationships, are vital resources for meeting emergency response and recovery

requirements. Event planning and training at the community level are important tools for building these response networks.

- **Service providers from all sectors are advised to plan for and support employee preparedness.**

  Previous events have demonstrated that the availability of employees can become a limiting factor in timely response and recovery of vital services following an event. To minimize delays in response and recovery, critical service agencies should provide their employees with the information and training they require to ensure that their families are safe and cared for. Employees have primary responsibility for their own and their families' preparedness; employers should clearly communicate preparedness expectations, but should also provide as much support as practical.

- **Water-related industry associations and manufacturers should be strongly encouraged to evaluate the need for seismic design standards for pipelines.**

  Industry associations, such as the American Water Works Association and the Water Environment Federation, currently do not have seismic standards for the design of pipelines. These associations should be encouraged to develop such standards and to educate their members on the availability and application of the standards.

- **Service providers for all essential sectors should be encouraged to develop business continuity plans.**

  In light of the highly interdependent nature of essential service sectors, all essential service providers should be encouraged to coordinate with other service providers to assure availability of essential services following an event. For example, water providers will need access to mapping of other buried utilities to complete repairs of water pipelines. Each essential service provider also needs to be prepared to sustain and maintain its workforce to avoid creating impediments to other service providers. This may include resources such as on-call contracts/agreements with contractors, consultants, and suppliers of other essential resources (for example, fuel suppliers, material suppliers, and equipment suppliers) to establish priorities and commitments following events.

- **Seismic vulnerability criteria should be incorporated into overall capital improvement project planning and asset management priorities.**

  Investing in infrastructure solely for improved seismic resilience may be too costly in many cases; however, a phased implementation of improvements can provide multiple benefits (improved capacity, better reliability, and reduced operation and maintenance costs). Service providers are encouraged to take advantage of planned renewal and replacement projects as opportunities to improve seismic resilience at relatively limited incremental cost.

Water-Specific Recommendations

- **Require water systems to complete a seismic risk assessment and mitigation plan as part of the existing requirement for five-year updates to water system master plans.**

  It is assumed that the Oregon Health Authority (OHA) would add this requirement to existing requirements for water system master plans. The required seismic risk assessment would identify and assess the likelihood and consequences of seismic failures. The resulting seismic assessment and mitigation plan would be subject to review and verification of documentation as part of the routine water system survey performed by OHA. The risk assessment should include a process for establishing target recovery goals for the area served. Seismic criteria may be based on hazard vulnerability analyses, building codes, and the findings of the Oregon Department of Geology and Mineral Industries (DOGAMI), because not all systems in Oregon (for example, those in eastern and central Oregon) may need to plan for a Cascadia subduction zone earthquake.

- **Encourage firefighting agencies and water providers to establish joint standards for use in planning the firefighting response to a large seismic event.**

  Water providers, fire departments, and emergency managers should lead their communities in establishing realistic standards and clear, mutually adopted expectations for water supply and firefighting priorities in the aftermath of a Cascadia subduction zone earthquake. This would result in joint fire and water decisions on strategies such as seismic valves and auxiliary water supply points. Rather than mandating a one-size-fits-all standard, the resulting solutions should be community-specific.

- **Water providers should be required to identify and coordinate key water supply points as part of periodic updates to water system master plans.**

  Water providers, in coordination with emergency response agencies and transportation agencies, should plan for key water supply and distribution points for firefighting as well as supply points for public distribution of emergency supplies. In many cases, minor investments in system infrastructure may be required to maximize the effectiveness, safety, and security of these supply points.

- **The Oregon Health Authority (OHA) should be encouraged to include a seismic design requirement as part of routine design review of water system improvements.**

  OHA currently provides review and approval of proposed designs of water system improvements. OHA review should include verification that seismic considerations have been incorporated into the design of proposed projects. It is not intended that OHA would verify the adequacy of the design; rather, OHA would simply confirm that seismic criteria were incorporated in the design. The goal of this recommendation is to ensure that seismic considerations are incorporated into designs for critical facilities. A review might include checking for items such as flexible connections to tanks, use of restrained joints, and consideration of geologic hazards. This additional verification is especially

important for pipelines, because there are currently no seismic standards for pipeline design (in contrast, the building code establishes seismic design requirements for structures).

► **Encourage the Oregon Department of Environmental Quality (DEQ) and the Oregon Health Authority (OHA) to establish goals and expectations for post-earthquake regulatory compliance and applicable standards.**

DEQ and OHA should work with utilities to establish acceptable practices and operational standards for use during emergency conditions. For example, will it be acceptable to discharge into waters of the state the chlorinated water from main breaks and main repairs? The agencies should also work together to:

- Identify and address potential analytical laboratory capacity limitations.
- Identify potential regulatory and laboratory strategies.
- Provide training to utilities on resulting recommendations.

Wastewater-Specific Recommendations

► **Require wastewater agencies to complete a seismic risk assessment and mitigation plan as part of periodic updates to facility plans.**

It is assumed that the Oregon Department of Environmental Quality (DEQ) would add this requirement to existing requirements for facility plans. The required seismic risk assessment would identify and assess the likelihood and consequences of seismic failures. The resulting seismic assessment and mitigation plan would be subject to review and verification of documentation as part of the routine assessments conducted by DEQ. The risk assessment should include a process for establishing target recovery goals for the area served. Seismic criteria may be based on hazard vulnerability analyses, building codes, and the findings of the Oregon Department of Geology and Mineral Industries (DOGAMI), because not all systems in Oregon (for example, eastern and central Oregon) may need to plan for a Cascadia subduction zone.

► **Wastewater agencies should be encouraged to conduct more complete characterizations of the impacts of estimated recovery times for seismic events.**

In preparing this report, the Water and Wastewater Task Group found that data on the anticipated performance of Oregon's wastewater systems in response to a seismic event is limited. Once additional information becomes available as a result of implementing the preceding recommendation, it is further recommended that this resilience plan be updated accordingly.

► **Encourage the Oregon Department of Environmental Quality (DEQ) to identify and coordinate with wastewater agencies on expectations for the levels of service, regulatory compliance, and applicable standards to be used following a major seismic event.**

DEQ should work with utilities to establish acceptable practices and operational standards for use during emergency conditions. For example, will it be acceptable to discharge raw sewage to receiving water following a disaster declaration? DEQ should also attempt to:

- Identify and address potential analytical laboratory capacity limitations.
- Identify potential regulatory and laboratory strategies.
- Provide training to utilities on resulting recommendations.

► **Encourage public health and wastewater agencies to coordinate and establish agreements for the use of temporary sanitary services (portable toilets) immediately after a seismic event.**

There are currently no clear lines of authority or defined responsibilities for temporary, emergency sanitation services such as portable toilets. To the extent possible, this should be pre-established by public health and wastewater service providers.

► **Encourage public health, water, and wastewater agencies to plan for significant water quality impacts to the Willamette and Columbia rivers downstream from Portland.**

It is likely that there will be extensive impacts due to potential failure of pipes at river crossings, leaking from fuel storage tanks, and other contamination and untreated discharges. This could result in significant adverse impacts on water supply for downstream communities that draw water from the Columbia River.

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9. Looking Ahead

This *Oregon Resilience Plan* focuses on Oregon's physical infrastructure, with a special emphasis on business and community continuity following a Cascadia earthquake and tsunami. Because the state's physical infrastructure supplies the foundation for community resilience, we believe that the recommendations proposed here, if implemented over the next 50 years, will enhance our infrastructure, strengthen our communities, and support the growth of the state's economy.

This is a timeframe much longer than typical of government planning efforts, but the *Oregon Resilience Plan* is intended to inform and underpin statewide policies. To affirm Oregon's commitment to sustained action, OSSPAC needs to work with the Joint Ways & Means Committee of Oregon's Legislative Assembly to track and report on progress toward seismic resilience at the beginning of each legislative session, to keep the 50-year goal in view.

Because the level of economic development and the condition of infrastructure varies among Oregon communities, we suggest that local communities use the framework and the gap-analysis methodology presented in this report to conduct more refined assessments of local seismic and tsunami hazards, and develop community-specific recommendations to meet their unique response and recovery needs.

A Cascadia earthquake and tsunami will affect both Oregon and Washington. Both states share common challenges, among them the interstate bridges and the Columbia River navigation channel as well as the regional power grid and liquid fuel supply. In particular, Oregon gets almost one hundred percent of its liquid fuel from suppliers in Washington, delivered via pipeline and river. We believe that it would be beneficial for both states to work together at a regional level to address the common challenge of resilience to a region-wide seismic event. The "Resilient Washington State" initiative, completed this year by the Seismic Safety Committee of Washington State's Emergency Management Division, supplies an opportunity to begin.

The challenges of resilience are not limited to disaster preparedness; they are being recognized in many areas that require foresight and the coordination of public and private sector efforts. We encourage a broader public conversation that will bring other state agencies, businesses, and interest groups to the table for an exploration of resilience with respect to natural hazards, land use, climate change, and other topics characterized by systems interdependencies and long-time horizons. We have much to learn from one another about this new way of thinking.

This planning effort, with its emphasis on seismic resilience, is OSSPAC's first attempt to consider seismic risk from a perspective other than emergency preparedness and response. The report, compiled entirely by volunteers who contributed their skills and expertise, is less comprehensive than we might have wished, due to the limited time and resources available for the task. OSSPAC intends to monitor events around the world, and to update and augment the report as we are able to do so. We already recognize

the need to expand the planning effort in the future to include the following areas: (1) local community planning, (2) human resilience, (3) civic infrastructure, and (4) joint regional planning with Washington State.

The *Oregon Resilience Plan* is fundamentally about people—about preserving our communities and workforce to help businesses bounce back quickly from a natural disaster, so that the energies of commerce can propel recovery. Infrastructure investment will certainly lay a solid foundation to make timely recovery possible. However, human resilience supported by Oregon's civic infrastructure (community- based, non-governmental, and faith-based organizations) is needed to achieve full community resilience.

From natural disasters around the world, we have learned that civic infrastructure is especially critical during the first weeks after a disaster, before organized government assistance can be delivered. We believe that civic organizations, too, need to conduct seismic vulnerability assessment and to develop mitigation plans to ensure that expected services will be delivered.

On the topic of human resilience, we recognize the paramount importance of public health. We urge a commitment to the education and outreach necessary to keep the state's population as healthy as possible, so that the citizens themselves are ready physically and mentally to withstand disasters of any form.

Personal preparedness is a cornerstone of human resilience. Private and nonprofit sector leaders including the American Red Cross, drawing on experience with disaster response and recovery in many settings, emphasize a need to design and deliver training that reaches all students and educators in Oregon's K-12 schools, all local government employees, and all employees and guests of Oregon's tourism industry. The state, along with business leaders, must do more to support and facilitate these efforts. Everyone will play a role in disaster response and recovery; training must reach beyond those public and private sector employees who have essential response duties.

A resilient physical infrastructure, a healthy population, and a robust government and civic infrastructure to provide services to those in need will equip Oregon to withstand a Cascadia earthquake and tsunami, and to expedite response and recovery efforts. With determination, we can achieve that goal.

Appendix I HR-3 and Supporting Documentation

Enrolled

House Resolution 3

Sponsored by Representative BOONE; Representatives COWAN, KRIEGER, ROBLAN, WITT, Senators COURTNEY, JOHNSON, KRUSE, VERGER, WHITSETT

Whereas Oregon is known to be seismically active, with geological faults creating earthquake hazards in most of the state, including its most highly populated counties; and

Whereas the most serious risks linked to earthquakes in Oregon are associated with the Cascadia fault, recognized as one of the world's most dangerous faults and capable of generating megathrust earthquakes at least 1,000 times more powerful than the magnitude 6.8 Nisqually, Washington, earthquake of February 2001 and producing associated tsunamis capable of affecting extensive areas of the Oregon coast; and

Whereas geological evidence documents about 41 earthquakes of magnitude 8 and larger on sections of the Cascadia fault during the last 10,000 years, yielding an average interval between events of about 240 years; and

Whereas the most recent megathrust earthquake on the Cascadia fault, estimated to be about magnitude 9, occurred on January 26, 1700; and

Whereas many of the earthquakes on the Cascadia fault have been separated by intervals shorter than the time elapsed since the most recent Cascadia earthquake; and

Whereas an earthquake of magnitude 8 or larger and its associated tsunami would have devastating impacts to coastal communities and throughout western Oregon, causing thousands of casualties and premature deaths and inflicting tens of billions of dollars in physical damage that would have crippling impacts on the state's economy; and

Whereas policies now in place are insufficient to protect citizens and businesses in Oregon from the ground shaking and waves associated with a Cascadia megathrust earthquake and to ensure a smooth economic recovery after that event; now, therefore,

Be It Resolved by the House of Representatives of the State of Oregon:

That concern for the protection of life and the resumption of commerce should guide the State of Oregon in the development and implementation of resilience policies that address the risks posed by a Cascadia megathrust earthquake and tsunami; and be it further

Resolved, That Oregon's most forward-thinking policies and programs to advance resilience to earthquakes include the Seismic Rehabilitation Grant Program, fully enacted with general obligation bond funding by the 75th Legislative Assembly in 2009; and be it further

Resolved, That the strengthening of collapse-prone public structures, including, but not limited to, K-12 schools, community colleges and public safety facilities, should be recognized by the Governor and Legislative Assembly as top investment priorities in this state's capital budget; and be it further

Resolved, That seismic improvements to K-12 schools, community colleges and public safety facilities funded by Seismic Rehabilitation Grants should be recognized with placards affixed to the reinforced structures; and be it further

Resolved, That this state's investment in Seismic Rehabilitation Grants and in other programs and resources to accomplish seismic upgrades of public buildings should be expanded to the extent fiscal prudence allows; and be it further

Resolved, That this state should make investments in additional evacuation options for Oregon coastal communities that cannot ensure adequate protection of their residents and visitors from tsunamis because of distance from safe ground; and be it further

Resolved, That this state should make investments necessary to establish a Critical Transportation Infrastructure providing reliable lifelines for emergency response and economic recovery in the aftermath of a Cascadia earthquake and tsunami; and be it further

Resolved, That this state should make investments necessary to establish a Critical Energy Infrastructure comprising transmission networks for electricity, liquid fuels and natural gas hardened to withstand a Cascadia earthquake and tsunami; and be it further

Resolved, That seismic resilience should be viewed as a necessary complement to environmental sustainability and endorsed as a priority by the Governor and the Legislative Assembly; and be it further

Resolved, That the Seismic Safety Policy Advisory Commission should lead and coordinate preparation of an Oregon Resilience Plan that reviews policy options, summarizes relevant reports and studies by state agencies and makes recommendations on policy direction to protect lives and keep commerce flowing during and after a Cascadia earthquake and tsunami; and be it further

Resolved, That the commission should enlist the participation of the Governor's public safety advisor, state agencies, commissions and other advisory bodies, as needed, to assemble an integrated view of current state capabilities and gaps in resilience planning; and be it further

Resolved, That the Oregon Resilience Plan and recommendations should be delivered to the Legislative Assembly no later than February 28, 2013, so that the inevitable natural disaster of a Cascadia megathrust earthquake and tsunami does not cause an unprecedented catastrophe for the State of Oregon.

Adopted by House April 18, 2011

Ramona Kenady Line, Chief Clerk of House

Bruce Hanna, Speaker of House

Arnie Roblan, Speaker of House

NATIONAL SECURITY STAFF
WASHINGTON, D.C. 20504

December 7, 2011

Kent Yu, PhD
Chairman, Oregon Seismic Safety Policy Advisory Commission
P.O.Box 14370
Salem, OR
97309 5062

Dr. Yu:

On Tuesday, November 8, 2011 I had the pleasure of spending time with the working session of the National Earthquake Hazard Reduction Program (NHERP) Advisory Committee. There, I was honored to meet Deborah Boone, Oregon State Representative and sponsor of Oregon House Resolution 3, which directs the creation of an Oregon Resilience Plan to prepare for the statewide impacts of a Cascadia earthquake and tsunami. I would like to wholeheartedly applaud Representative Boone, yourself, and the rest of the Oregon Seismic Safety Policy Advisory Commission on this initiative..

President Obama's top priority is the safety and security of the American people. I thank you for your leadership and your ongoing contribution to our Nation's resilience.

Sincerely,

Richard Reed
Special Assistant to the President for
National Security Affairs and
Senior Director for Resilience

Deborah Boone
State Representative
HD 32

900 Court Street NE
Salem, OR 97301
503-986-1432

October 17, 2011

Richard A. Reed
Senior Director for Resilience Policy
National Security Council
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear Mr. Reed,

I am writing in regard to your responsibility for implementation of Presidential Policy Directive 8 on National Preparedness. According to that Directive, "*Each national planning framework shall include guidance to support corresponding planning for State, local, tribal, and territorial governments.*"

During the November 2011 meeting of the NEHRP Advisory Committee on Earthquake Hazard Reduction, I have asked Advisory Committee member Yumei Wang to share with you a copy of Oregon House Resolution 3, which I sponsored and my colleagues adopted unanimously in Oregon's House of Representatives on April 18, 2011.

H.R. 3 directs our state Seismic Safety Policy Advisory Commission (OSSPAC), on which I serve, to prepare an Oregon Resilience Plan to make recommendations on policy direction to protect lives and keep commerce flowing during and after the next Cascadia earthquake and tsunami expected to strike our state.

This is the first step Oregon will take to prepare comprehensively for the statewide impacts of a Cascadia earthquake and tsunami, and the only example of state legislation to initiate seismic resilience planning of which I am aware. Our intent is to address, to the extent feasible, the five mission areas identified in PPD-8: prevention, protection, mitigation, response, and recovery.

I would like to request your endorsement in writing of Oregon's resilience planning efforts, as a State initiative consistent with the intent of PPD-8 and worthy of support in its development and implementation by all branches and agencies of Oregon's state government and by appropriate

federal agencies.

Your letter to OSSPAC Chairman Dr. Kent Yu (address below) endorsing Oregon's resilience planning commitment will provide timely encouragement as we begin to engage the state's leadership in preparing the Oregon Resilience Plan during the next several months.

Thank you for your dedication to national preparedness and resilience.

Sincerely,

Rep. Deborah Boone

Cc: Kent Yu, Ph.D
Chairman
Oregon Seismic Safety Policy Advisory Commission (OSSPAC)
Attn: Beverly Hall
Oregon Emergency Management
P.O. Box 14370
Salem, OR 97309-5062

Encl.: H.R. 3 enrolled

JOHN A. KITZHABER, MD
Governor

January 4, 2012

Kent Yu, Ph.D, Chair
Oregon Seismic Safety Policy Advisory Commission
P.O. Box 14370
Salem, OR 97309

Dear Dr. Yu,

The Oregon Seismic Safety Policy Advisory Commission (OSSPAC) has a challenging mission to educate the public about our seismic risks and inform diverse policy decisions. Through OSSPAC's dedicated efforts, though, the State of Oregon and its citizens have become increasingly aware that we live in an earthquake-prone region.

This month will mark the 312th anniversary of the last major earthquake and resulting tsunami from the Cascadia Subduction Zone that sits off Oregon's coast. Throughout this year, OSSPAC will be drafting an Oregon Resilience Plan to help us better prepare for the next major earthquake and tsunami.

A focused resiliency effort can better prepare us for catastrophic disasters as well as help us weather our more common emergencies like storms, floods and fires. OSSPAC has had wide participation from state agencies, local governments, businesses and non-profits and I encourage their continued engagement on this critical effort.

Thank you for all of OSSPAC's efforts to date and for continuing to be a powerful voice for a more prepared and resilient Oregon.

Sincerely,

John A. Kitzhaber, M.D.
Governor

JAK/CS/ap

254 STATE CAPITOL, SALEM OR 97301-4047 (503) 373-3111 FAX (503) 378-4863
WWW.OREGON.GOV

CASCADIA REGION
EARTHQUAKE WORKGROUP
CREW
AHEAD OF THE WAVE

A RESOLUTION requesting that the Cascadia Region Earthquake Workgroup endorse Oregon State and Oregon Seismic Safety Policy Advisory Council in creating a more resilient state through their resiliency planning efforts in support of 2011 Oregon House Resolution 3 (Oregon Resiliency Planning).

WHEREAS, a Cascadia Subduction Zone generated earthquake and tsunami poses significant risk to life, property, the environment, and the regional economy, and

WHEREAS, the Cascadia Region Earthquake Workgroup, has a vision of a disaster resilient region, and

WHEREAS, the Cascadia Subduction Zone represents a common hazard in the Pacific Northwest and the shared risk that affect the Cascadia Region; and

WHEREAS, the Cascadia Region Earthquake Workgroup supports efforts to reduce vulnerability,

NOW THEREFORE,

BE IT RESOLVED BY THE BOARD OF DIRECTORS THAT:

The Cascadia Region Earthquake Workgroup is supportive of the goals and objectives identified in 2011 Oregon House Resolution #3; and

Resolved, that the Cascadia Region Earthquake Workgroup will provide support similar to that provided to Washington State Seismic Safety Committee's Resilient Washington State Initiative; and

Resolved, that the Cascadia Region Earthquake Workgroup will help promote the findings of resilience planning efforts from the Pacific Northwest to further reduce identified risks and improve seismic resilience.

Adopted by the Cascadia Region Earthquake Workgroup Board of Directors this 25th day of January, 2012, and signed by me in authentication of its adoption this 25th day of January, 2012.

President of the Cascadia Region Earthquake Workgroup

Appendix II January 26, 2012 workshop

Oregon
John A. Kitzhaber, MD, Governor

Seismic Safety Policy Advisory Commission
Oregon Emergency Management
Mailing Address: PO Box 14370
Salem, OR 97309-5062
Phone: (503) 378-2911
Fax: (503) 373-7833

Oregon Resilience Planning Overview

Background

A Cascadia earthquake and tsunami has the potential to cause an unparalleled economic and human catastrophe for the State of Oregon because its impacts are region-wide. Over 40 great earthquakes of magnitude 8 and larger have struck Western Oregon during the last 10,000 years. The current calculation of a 37% conditional probability that a Cascadia earthquake will strike Oregon within the next 50 years means that it is now prudent to understand and take steps to mitigate this risk to our economy and to our businesses, homes, and communities.

In April 2011, the Oregon House of Representatives unanimously passed House Resolution 3 (sponsored by Rep. Deborah Boone, D-Cannon Beach), which directs Oregon Seismic Safety Policy Advisory Commission (OSSPAC) to "lead and coordinate preparation of an Oregon Resilience Plan that . . . makes recommendations on policy direction to protect lives and keep commerce flowing during and after a Cascadia (megathrust) earthquake and tsunami." The Plan and recommendations are due to be delivered to the Oregon Legislative Assembly by February 28, 2013.

Richard A. Reed, President Obama's Senior Director for Resilience Policy, and Oregon Governor John Kitzhaber have acknowledged our resilience planning efforts and have provided their endorsement.

Resilience

Resilience as defined in House Resolution 3 means that Oregon citizens will not only be protected from life-threatening physical harm, but that because of risk reduction measures and pre-disaster planning, communities will recover more quickly and with less continuing vulnerability following a Cascadia Subduction earthquake and tsunami. OSSPAC defines the Cascadia earthquake to be a Magnitude 9.0 Cascadia Subduction earthquake with an average recurrence of once every 500 years.

To achieve the goal of rapid recovery, we need arrangements in place for government continuity, resilient physical infrastructure, and business/economic continuity. Resilient physical infrastructure is the foundation.

Resilience Planning Objective and Methodology

Oregon Seismic Safety Policy Advisory Commission (OSSPAC) will lead and coordinate with government agencies, academia, business and professional communities to develop a comprehensive 50-year resiliency plan so that the state will become a resilient state by 2062. It will work with various government agencies and advisory bodies to collect available studies and reports and develop data as appropriate to:

- assess **conditions** of existing critical facilities and lifeline systems,
- evaluate **effectiveness** of current design and construction practices relative to earthquake resilience,
- develop **desired performance targets** (in terms of usability and timeframe required for the restoration of services) to meet resilience goals, and
- prepare **recommendations** for statewide policies and actions to achieve the desired performance targets.

We will utilize concepts and ideas developed for San Francisco by the San Francisco Planning + Urban Research Association (SPUR) and by the Resilient Washington State initiative in our neighbor to the north, and apply them to a statewide level. The final SPUR documents for the Resilient City project in San Francisco can be found at http://www.spur.org/resilient_city.

To promote communication with the general public and policy makers, we will strive to use language appropriate for a general audience and minimize use of highly specialized technical vocabulary when developing the resilience plan.

Resilience Planning Organizational Structure

Oregon Seismic Safety Policy Advisory Commission (OSSPAC) will be leading and coordinating the preparation of the plan through its Resilient Oregon Steering Committee. OSSPAC Steering Committee consists of five commissioners as follows:

Kent Yu (Chair, Public member/Structural)
Jay Wilson (vice Chair, Public member/local government)
Althea Rizzo (OEM, State Earthquake/Tsunami Manager)
Ian Madin (DOGAMI)
Stan Watters (Public member/Utilities)

As a state commission with limited staff and resources at its command, OSSPAC must depend on voluntary assistance from Oregon's government agencies, academic, business, and professional communities to complete this task. OSSPAC has assembled one Advisory Panel and eight task work groups that represent a broad cross section of contributors, including policy advisors, government officials, emergency/business continuity managers, professors, engineers, scientists, business representatives, sustainability practitioners and others.

Advisory Panel

OSSPAC will seek strategic advice from the Advisory Panel throughout the development of the resilience plan. Its makeup is also intended to augment OSSPAC's overall capabilities and broaden OSSPAC representation from government, legislature, geographic region, and business.

The Advisory Panel currently consists of

Cameron Smith (Public Safety Advisor to the Governor)
The Hon. Peter Courtney/Ryan Mann (Oregon Legislature)
JR Gonzalez (Oregon PUC)
Bruce Johnson (ODOT)
Ed Dennis (Oregon Dept. of Education)
Yumei Wang (NEHRP)
Onno Husing (Oregon Coastal Zone Management Assn.)
Nate Wood, Ph.D. (USGS)
Scott Ashford, Ph.D. (OSU)
Chris Goldfinger, Ph.D. (OSU)
Andre LeDuc (U of O)
Jeff Soulages (Intel)
Edward Wolf (Oregon citizen)
Leon Kempner (Regional/Bonneville Power Administration)
Don Lewis (DOGAMI)
Jean O'Connor (Oregon Health Authority)

Eight Task Groups

OSSPAC Steering Committee has established eight task groups to address the state's critical facilities and its energy, water/wastewater, transportation, and telecommunications systems, mitigate tsunami risk, and enhance business continuity. The state's Department of Geology and Mineral Industries (DOGAMI) will support our work with mapped depictions of Cascadia earthquake scenarios based on the best available science.

Eight task groups are listed below:

1. Magnitude 9.0 Earthquake/Tsunami Scenario led by Ian Madin (OSSPAC/DOGAMI)
2. Critical/Essential Buildings led by Ed Quesenberry and Trent Nagele (SEAO)
3. Energy led by Stan Watters (OSSPAC/Port of Portland) and JR Gonzalez (PUC)
4. Telecommunications led by Althea Rizzo (OSSPAC/OEM) and Mike Mumaw (OSSPAC/Beaverton)
5. Transportation (Highways + Bridges/Ports/Railroads) led by Bruce Johnson (ODOT)
6. Tsunami Risk Mitigation led by Jay Wilson and Jay Raskin
7. Water and Waste Water System led by Mike Stuhr (PWB) and Mark Knudson (TVWD)
8. Business Continuity led by Susan Steward (OSSPAC/BOMA) and Gerry Williams (OSSPAC)

Magnitude 9.0 Earthquake/Tsunami Scenario Group will develop:

- Ground shaking intensity maps
- Tsunami Inundation maps
- Landslide and liquefaction maps

All other task groups will utilize the various maps developed to generate their resiliency plans. The task group makeup is expected to vary from one group to another due to the difference of the sectors. However, we expect each group to have at least one emergency manager, one engineer, and one business representative.

The Critical Building Task Group will address:

- Emergency Operations Centers
- Education facilities (K-12, College and University);
- Healthcare facilities (Hospitals and MOBs)
- Police and Fire Stations
- Critical government administration/services facilities
- Emergency sheltering facilities
- Community retail centers
- Financial/banking buildings
- Residential housing
- Vulnerable buildings (Un-reinforced masonry buildings and non-ductile concrete buildings)

The Energy Task Group will address the systems listed below:

- Electricity
- Natural Gas
- Liquid Fuel
- Alternative Energy – Solar, Wind and others
- Dams

The Telecommunications Task Group will address the systems listed below:

- Communication Network and Database
- Telecommunication Infrastructure

The Transportation Task Group will address the systems listed below:

- Bridges (owned by ODOT, Counties, or Cities)
- Airports and river and sea ports
- Railroads
- Mass Transit (Trimet)
- Columbia River

Tsunami Risk Mitigation Group will address the following:

- Tsunami evacuation
- Zoning and land use policy
- Critical facilities
- Re-building community
- Debris management

The Water and Wastewater Task Group will address the systems listed below:

- Drinking water storage, transmission, and distribution systems
- Wastewater collection systems and treatment plants

Interdependency issues among different lifeline sectors will be addressed through coordination of the steering committee and collaboration of Group leaders at a regular monthly meeting.

January 26, 2012 Kickoff Workshop

We will kick off the Oregon resiliency planning effort on January 26, 2012 (the 312th anniversary of the most recent Cascadia earthquake) at the Port of Portland.

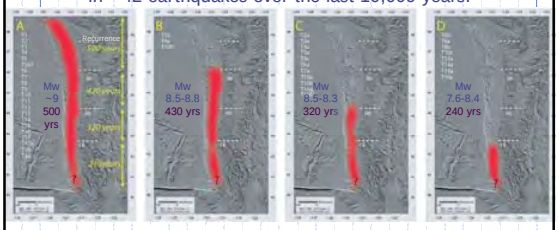
We anticipate that the participants will get an overview of House Resolution 3 and the roadmap of the Oregon resilience plan, and learn about what Washington has accomplished with its Resilient Washington State initiative. During the breakout sessions, the leaders of each task group will facilitate and lead the discussion of the scope of their group, and work with their participants to develop action plans and schedules. Each task group will assign a designated participant to take notes, and the OSSPAC steering committee will assemble a final document based on information submitted by all workgroups. A second workshop will be scheduled in the fall of 2012 for each group to report their progress.

Oregon Resilience Planning Workshop

January 26,2012
Port of Portland

Cascadia Subduction Zone Earthquakes

Turbidites show how much of the subduction zone ruptured in ~42 earthquakes over the last 10,000 years.



(Modified from Goldfinger et al. (in press) by adding magnitude estimates and some labels)

- 20 earthquakes ruptured all of the subduction zone.
- 2 to 3 earthquakes ruptured three quarters of subduction zone
- 19 earthquakes ruptured the southern half or quarter of the subduction zone

Acknowledgment

- Port of Portland for providing meeting venue
- CREW for sponsoring lunch
- Degenkolb for sponsoring morning coffee

Cascadia Earthquake Hazards and Risk





PACIFIC NORTHWEST

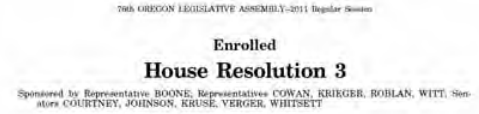
- Cascadia Subduction Zone
- 1994 – Oregon Building Code w/Seismic Design Provisions
- Interval 500 yrs for M9.0
- M9 on 1/26/1709

Seismic Concerns

- Progressive Government and community
- Unclear building performance
- Different standards for performance among different lifeline sectors
- Lack of inter-sector coordination
- Limited understanding by political leadership and the public of the potential performance of buildings and lifelines

January 26 Resilent Oregon kickoff by Kent Yu

House Resolution 3



76th OREGON LEGISLATIVE ASSEMBLY--2011 Regular Session

Enrolled

House Resolution 3

Sponsored by Representative BOONE, Representatives COWAN, KRIEGER, ROBLAN, WITT, Senators COURTNEY, JOHNSON, KRUSE, VERGER, WHITSETT

- Protect citizens and businesses from shaking and tsunami
- Ensure rapid economic recovery

OSSPAC Mission

Broad Political Support

- Richard A. Reed, President Obama's Senior Director for Resilience Policy
- Oregon Governor John Kitzhaber
- State Agencies
- CREW, SEAO, ASCE, AIA
- Oregon businesses and local government
- Academia
- Neighbors, Friends and Colleagues

OSSPAC

- 18 members appointed by Governor
- Six representatives of government (Bldg Codes, DOGAMI, DLCD, OEM, ODOT, DOE)
- Six representatives of public interest (Legislature, Red Cross etc.)
- Six representatives of industry and stakeholders (Struct., Banking, local govern., multi-family, Bldg Owner, Utilities)
- The mission of OSSPAC is to increase or improve:
  1) earthquake awareness, education and preparedness;
  2) earthquake risk information;
  3) the earthquake safety of buildings and lifelines;
  4) geoscience and technical information; and
  5) emergency pre-disaster planning, response and recovery efforts
- http://www.oregon.gov/OMD/OEM/osspac/osspac.shtml

Agenda

Time	Event	Presenter
9:00 a.m.	Greeting and Introduction	Kent Yu, OSSPAC Chair Cale Ash, CREW President
9:20 a.m.	Introduction into Resiliency Planning in Oregon	General Caldwell/OR OEM, Rep. Deb Boone
9:40 a.m.	OSSPAC Mission Summary of House Resolution 3	Kent Yu
10:00 a.m.	Framework for Oregon Disaster Resiliency Plan	Kent Yu Jay Wilson, OSSPAC Vice-Chair
10:45 a.m.	BREAK	
11:00 a.m.	Washington State Disaster Resiliency Plan	John Schalling, WA EMD
11:30 a.m.	Orientation of Task Force Break out groups	Althea Rizzo, OR OEM Jay Wilson
12:00 a.m.	LUNCH	Pick up lunches
12:20 p.m.	Task Group Work Sessions	Facilitated by Task Group leads
2:45 p.m.	BREAK	
3:00 p.m.	Task Group Briefings (5 minutes per group)	Presented by Task Group leads
3:45 p.m.	Next steps	Kent Yu
4:00 p.m.	End Workshop	

Oregon's Seismic Safety Legislation

- 2001 law "life safety" in schools by 2032
- 2002 Ballot Measure 15 amended Constitution: allows bonds to fix schools
- 2005 4 Bills (2007 schools report on web)
- 2007 Funds & staff establish grant program
- 2009 Seismic Retrofit Grant program
  - $30 M ($15M schools, $15M emergency response facilities)
- 2011 Cascadia Resilience Planning

Y.Wang

January 26 Resilent Oregon kickoff by Kent Yu

House Resolution 3

- Directs (OSSPAC) to "lead and coordinate preparation of an Oregon Resilience Plan that . . . makes recommendations on policy direction to protect lives and keep commerce flowing during and after a Cascadia (megathrust) earthquake and tsunami."
- The Plan and recommendations to be delivered to the Oregon Legislative Assembly by February 28, 2013.

Resilience Planning Objective and Methodology

HR3 Resilience Definition

- Protect Citizens from physical life-threatening harm (from Earthquake and Tsunami)
- Community recover rapidly with less vulnerability through mitigation and pre-disaster planning
- Cascadia Earthquake is M9.0 with average 500 years return.

Resilience Planning Objective

- Look at 50-year time window
- Develop a comprehensive plan so that state is resilient by 2062
- Utilize concepts and ideas by SF Planning +Urban Research Association and from Resilient Washington Initative

HR 3 Resilience Definition

- To Achieve Rapid Recovery, Require Government Continuity, Resilient Physical Infrastructure, Business Continuity
- Resilient Physical Infrastructure is the foundation

How Much Damage Can a City Endure?







Chile - 2010



New Zealand - 2011

The Resilient City

- A Resilient City can take "the Punch" of an event and through preparedness and the impromptu response of those affected, and recover quickly.
- Goal: Save the people, their neighborhoods, their cultural heritage and their local economy
- Resilience is sustainable

Transparent Hazard Definitions for the Region

Category	Hazard Level
Routine	Likely to occur routinely in the region (**50/50**)
Expected	Reasonably expected to occur once during the useful life of a structure or system **(10/50, 500)**
Extreme	Reasonably be expected to occur on a nearby fault **(2/50, 2500)**

SPUR Approach:

- Define concept of ***resilience*** in the context of disaster planning and recovery
- Establish ***performance goals*** for the "expected" earthquake that supports the definition of resilience
- Define transparent ***performance measures*** that help reach the performance goals
- Make ***Recommendations*** for new buildings, existing buildings and lifelines

Transparent Performance Measures for Buildings

Category	Performance Standard
Category A	***Safe and operational***: Essential facilities such as hospitals and emergency operations centers
Category B	***Safe and usable during repair***: "shelter-in-place" residential buildings and buildings needed for emergency operations
Category C	***Safe and usable after repair***: current minimum design standard for new, non-essential buildings
Category D	***Safe but not repairable***: below standard for new, non-essential buildings. Often used as a performance goal for existing buildings undergoing voluntary rehabilitation
Category E	***Unsafe – partial or complete collapse***: damage that will lead to casualties in the event of the "expected" earthquake - the killer buildings

Performance Goals for the "Expected" Earthquake

Phase	Time Frame	Condition of the built environment
I	1 to 7 days	Initial response and staging for reconstruction
II	7 to 60 days	Workforce housing restored – ongoing social needs met
III	2 to 36 months	Long term reconstruction

Lifelines and workforce are the key elements

Seismic Performance
Life Safe and Operational



Seismic Performance
Life Safe and Usable During Repair





Seismic Performance
Unsafe (Collapse)



Seismic Performance
Life Safe and Useable after Repair





Transparent Performance Measures for Lifelines

Category	Performance Standard
Category I	Resume 100% service within 4 hours
Category II	Resume 90% service within 72 hours
	95% within 30 days
	100% within 4 months
Category III	Resume 90% service within 72 hours
	95% within 30 days
	100% within 3 years

Seismic Performance
Life Safe but not repairable





Target States of Recovery for Building & Infrastructure

Phase	Time Frame	Focus of Attention
I	1 to 7 days	Initial response and staging for reconstruction

EOC's,
City Buildings,
Hospitals,
Police and Fire Stations,
Shelters



Building Category A: "Safe and Operational"
Life Line Category I: "Resume essential service in 4 hours"

Target States of Recovery for Building & Infrastructure

Phase	Time Frame	Focus of Attention
II	7 to 30 days	Workforce housing restored – ongoing social needs met

Residential structures,

Schools,

Community retail centers,

Doctors offices



Building Category B: "Safe and usable while being repaired"

Life Line Category II: "Resume 100% workforce service within 4 months"

Oregon Resilience Planning Organizational Structure

Target States of Recovery for Building & Infrastructure

Phase	Time Frame	Focus of Attention
III	2 to 36 months	Long term reconstruction

Industrial Buildings

Commercial buildings

Historic buildings



Building Category C: "Safe and usable after repair"

Life Line Category III: "Resume 100% commercial service within 36 months"

Overall Structure

- OSSPAC
- OSSPAC Steering Committee
- Advisory Panel
- Eight Workgroups

Oregon Resilience Planning Steps

- assess **conditions** of existing critical facilities and lifeline systems,
- evaluate **effectiveness** of current design and construction practices relative to earthquake resilience,
- develop **desired performance targets** (in terms of usability and timeframe required for the restoration of services) to meet resilience goals, and
- prepare **recommendations** for statewide policies and actions to achieve the desired performance targets.
- Recommendations will be prepared in plain, layman language.

OSSPAC Steering Committee

- Kent Yu (Chair, Public member/Structural)
- Jay Wilson (vice Chair, Public member/local government)
- Althea Rizzo (OEM, State Earthquake/Tsunami Manager)
- Ian Madin (DOGAMI)
- Stan Watters (Public member/Utilities)

Advisory Panel

- Cameron Smith (Public Safety Advisor to the Governor)
- The Hon. Peter Courtney/Ryan Mann (Oregon Legislature)
- JR Gonzalez (Oregon PUC)
- Bruce Johnson (ODOT)
- Ed Dennis (Oregon Dept. of Education)
- Yumei Wang (NEHRP)
- Onno Husing (Oregon Coastal Zone Management Assn.)
- Nate Wood, Ph.D. (USGS)
- Scott Ashford, Ph.D. (OSU)

Earthquake/Tsunami Group

- Led by Ian Madin (DOGAMI)
- Magnitude 9.0 Earthquake/Tsunami Scenario Group will develop:
  1) Ground shaking intensity maps
  2) Tsunami Inundation maps
  3) Landslide and liquefaction maps

Advisory Panel (continued)

- Chris Goldfinger, Ph.D. (OSU)
- Andre LeDuc (U of O)
- Jeff Soulages (Intel)
- Edward Wolf (Oregon citizen)
- Leon Kempner (Regional/Bonneville Power Administration)
- Don Lewis (DOGAMI)
- Jean O'Connor (Oregon Health Authority)

Strong Shaking and Tsunami

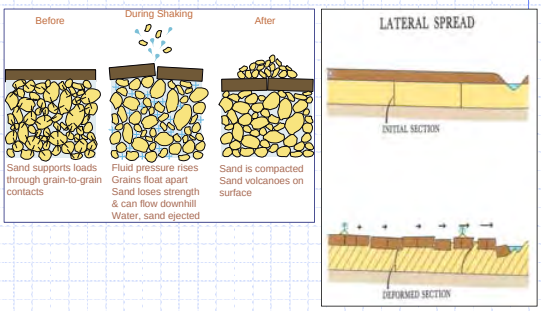
- Strong Ground Shaking (M9 w/ 3 min shaking)
- Tsunami within 25 minutes



Eight Workgroups

- Magnitude 9.0 Earthquake/Tsunami Scenario
- Critical/Essential Buildings
- Energy
- Telecommunications
- Transportation
- Tsunami Risk Mitigation
- Water and Waste Water Systems
- Business Continuity

Liquefaction & Lateral Spreading



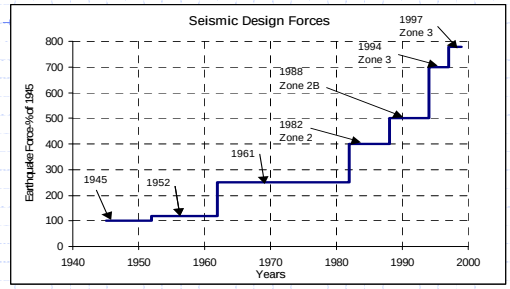
Liquefaction



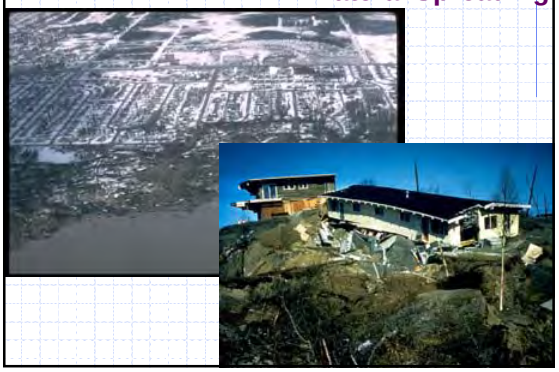


Source: EERI, 2001

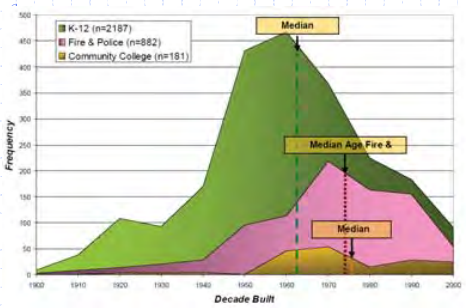
Lateral Load: Increased Seismic



Lateral Spreading



Oregon Education and Emergency Facilities



Critical Building Group

- Led by by Ed Quesenberry and Trent Nagele (SEAO)
- The Critical Building Task Group will address the buildings listed below:
  - Emergency Operations Centers
  - Education facilities (K-12, College and University);
  - Healthcare facilities (Hospitals and MOBs)
  - Police and Fire Stations
  - Critical government administration/services facilities
  - Emergency sheltering facilities
  - Community retail centers
  - Financial/banking Buildings
  - Residential Housing
  - Killer buildings (URM and non-ductile RC buildings)

URMs and Non-ductile Concrete









Energy Group

- Led by Stan Watters (OSSPAC/Port of Portland) and JR Gonzalez (PUC)
- The Energy Task Group will address the systems listed below:
  - Electricity
  - Natural Gas
  - Liquid Fuel
  - Alternate Energy – Solar, Wind and others
  - Dams

Transportation Group

- Led by Bruce Johnson (ODOT)
- The Transportation Task Group will address the systems listed below:
  - Bridges (owned by ODOT, Counties or Cities)
  - Airports and Seaports
  - Railroads
  - Mass Transit (Trimet)
  - Columbia River

Energy: Liquid Fuel, Electrical Systems





(Credit: Yumei Wang)

Tsunami Risk Mitigation Group

- Led by Jay Wilson/Jay Raskin
- Tsunami Risk Mitigation Group will address the following:
  - Tsunami evacuation
  - Zoning and Land use policy
  - Critical facilities
  - Re-building community
  - Debris management

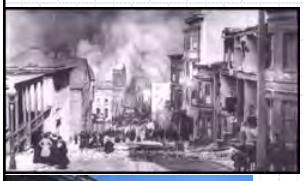
Telecommunications Group

- Led by Mike Mumaw (OSSPAC/Beaverton) and Althea Rizzo (OSSPAC/OEM)
- The Telecommunication Task Group will address the systems listed below:
  - Communication Network and Database
  - Telecommunication Infrastructure

Water and Waste Water Group

- Led by Mike Stuhr (PWB) and Mark Knudson (TVWD)
- The Water and Wastewater Task Group will address the systems listed below:
  - Water storage, transmission, and distribution systems
  - Wastewater collection systems and treatment plants

Water and Wastewater







Project Schedule

Business Continuity Group

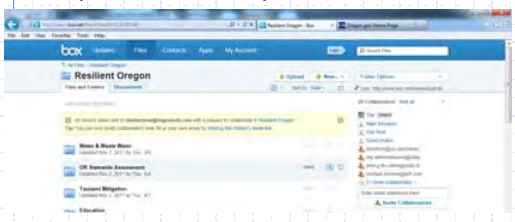
- Led by Susan Stewart (BOMA) and Gerry Williams (OSSPAC)
- Goals:
  - Raise Earthquake/Tsunami Awareness
  - Gauge Earthquake/Tsunami Preparedness
  - Gather input/ideas from Business for other workgroups to improve resilience plan

Project Schedule

- 100% Completion on February 2013
- 90% completion in December
- 75% completion in September 2012 (2nd Workshop)
- 45% completion in June 2012
- 15% completion in March 2012
- Kickoff workshop in January 2012 (Today)
- Initial Planning (11/2011 thru 1/12)

Oregon Resilience Planning Platform

- Virtual team with modern communication
- Online collaboration platforms (Box, Dropbox, Evernote…)



Next Steps

January 26 Resilent Oregon kickoff by Kent Yu

Next Steps

- Apply for funding in February 2012
- Special OSSPAC on February 21, 2012
- Invite Group Leaders to OSSPAC Meeting to discuss inter-dependency issues.

Reach Out

Thank You

January 26 Resilent Oregon kickoff by Kent Yu

Resiliency Planning Task Groups Work Session Orientation

January 26, 2012

Jay Wilson
OSSPAC, Vice Chair

QuickTime™ and a decompressor are needed to see this picture.

Oregon Seismic Safety Policy Advisory Commission

Resiliency Planning Task Groups Work Session Orientation

- How will the "final" document be synthesized and condensed from the work products produced from each group?
- A professional writer will work with each committee to develop the final report that will synthesize all of the different parts to form a unified document.

OSSPAC

Resiliency Planning Task Groups Work Session Orientation

- Work sessions will be facilitated by team leads.
- Each group will have topics to initiate discussion at this breakout session.
-
- Session will be about 2 hours long.

OSSPAC

Resiliency Planning Task Groups Work Session Orientation

- Will there be a uniform work product format that each group will be working from?
- OSSPAC Steering Committee will develop a template of specific issues that each committee must address as part of their work.
- The template will be used to maintain consistency of mission and format between committees.
- Mid year will be a 50% deadline.

OSSPAC

Task Groups and Leads

MAGNITUDE 9.0 EARTHQUAKE/TSUNAMI SCENARIO
led by Ian Madin (OSSPAC/DOGAMI)

CRITICAL/ESSENTIAL BUILDINGS
led by Ed Quesenberry and Trent Nagele (SEAO)

ENERGY
led by Stan Watters (Port of Portland) and JR Gonzalez (PUC)

TELECOMMUNICATIONS
led by Althea Rizzo (OEM) and Mike Mumaw (Beaverton)

TRANSPORTATION (HIGHWAYS + BRIDGES/PORTS/RAILROADS)
led by Bruce Johnson (ODOT)

TSUNAMI RISK MITIGATION
led by Jay Wilson/Jay Raskin

WATER AND WASTE WATER SYSTEM
led by Mike Stuhr (PWB) and Mark Knudson (TVWD)

BUSINESS CONTINUITY
led by Susan Steward (BOMA) and Gerry Williams (OSSPAC)

OSSPAC

Resiliency Planning Task Groups Work Session Orientation

- Will we have access to administrative resources or other (State?) personnel to assist?
- There is no current funding for this effort. FEMA is going to be approached for assistance, but for now, each committee will be responsible for handling these responsibility as volunteers.

OSSPAC

Resiliency Planning Task Groups Work Session Orientation

- Are there funds/budget available? - Not yet.
- Other resources available and/or funds for reimbursable expenses (communication/conferencing, mailing, printing, travel, etc.) Kent Yu to investigate ways to obtain funding for reimbursement.
- Each committee will be directed to keep track of reimbursable expenses in the event that funding is found.

OSSPAC

Assigned Workgroups
Business Roundtable

led by Susan Steward (BOMA) and Gerry Williams (OSSPAC)

Angell,	Townsend
Chamberlain,	Lori
Dodier,	John E.
Haapala,	Kurt
Herrenbruck,	Greg
Hynes,	Pat
O'Connor,	Jean
Reuter,	Scott
Sakamoto,	Ruby
Schamma,	Danny R.
Schwinghammer,	Michael
Shugrue,	Terry
Soulages,	Jeffery R.
Steidel,	Sam
Trimpler,	Sally
Van Dyke,	Rick
Ward,	Bryce
Weston,	Jim
Rodgers,	Mathew

OSSPAC

Box.net management

- Each Committee will have their own folder on Box.net.
- Each Committee will be responsible for maintaining the contents of their folder and keeping everything up to date.

OSSPAC

Assigned Workgroups
Critical/Essential Buildings

led by Ed Quesenberry and Trent Nagele (SEAO)

Barbosa, André R.	
Bugni,	David
Duquette,	Shelley
Eggers,	Jennifer
Gehlen,	Joe
Johnson, Robert	
Kaplan,	Kevin
Monnier, Anne	
Richards, Josh	
Rippey,	Tim
Rogers,	Richard S.
Wolf,	Edward
Halog,	Tonya
Kumar,	Amit

OSSPAC

Resiliency Planning Task Groups Work Session Orientation

Oregon Public Meeting Law

Task Group leads should work closely with OSSPAC staff to meet State Requirements for proper notification of public meetings.

http://www.oregon.gov/OMD/OEM/osspac/osspac.shtml

ORS regarding public notice states "a reasonable time" of notice must be given, and special meetings just have to give at least 24 hours' notice.

A Bill was recently passed regarding posting all public meeting notices on The State's new "Transparency" state website.
It lists all boards and commissions and all meetings. See link below.

http://www.oregon.gov/transparency/PublicMeetingNotices.shtml#Meeting_List_View

OSSPAC

Assigned Workgroups
Energy

led by Stan Watters (Port of Portland) and JR Gonzalez (PUC)

Carter,	Rick
Ford,	Dave
Gonzales,	JR
Guerra,	Debbie
Wang,	Yumei
Watters, Stan	
Kempner Jr.,	Leon
Ridenhour,	Randy
Vranish,	Jack
Wilson,	Zamora
Karney,	Joe
Kuehnel, Andrea	
Plechinger,	John

OSSPAC

Assigned Workgroups
Telecommunications

led by Althea Rizzo (OEM) and Mike Mumaw (Beaverton)

Lumbard,	Devon
Rizzo,	Althea
Stember,	Kelley

OSSPAC

Assigned Workgroups
Water and Waste Water

led by Mike Stuhr (PWB) and Mark Knudson (TVWD)

Ballantyne,	Don
Damewood,	Mel
Doane,	James
Knudson,	Mark
Leon,	Arturo
Newell,	Jim
Patterson,	Sherry
Perimon,	Todd
Phelps,	Brad
Schab,	Rob
Stahl,	Brian

OSSPAC

Assigned Workgroups
Transportation and Highways

led by Bruce Johnson (ODOT)

Ashford,	Scott
EK-Collins,	Greg
Libby,	Mark
Merlo,	Carmen
Nako,	Albert
Totten,	Craig
Mabey,	Matthew

OSSPAC

Assigned Workgroups
Tsunami Risk Mitigation

led by Jay Wilson (OSSPAC) and Jay Raskin (AIA)

Boone,	Debbie
Howard,	Michael
Lucker,	Stephen
Raskin,	Jay
Wilson,	Jay

OSSPAC

The Resilient Washington State Initiative

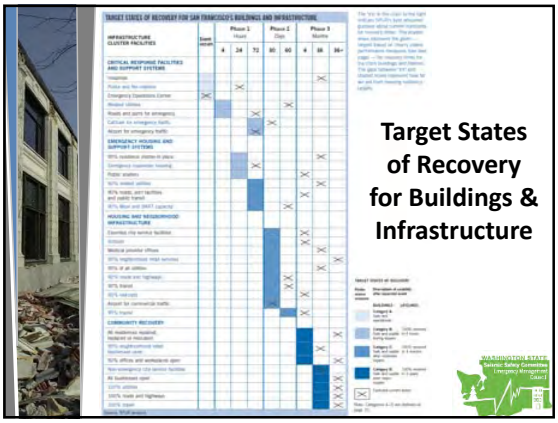
OSSPAC Meeting
January 26, 2012

Background

- The Resilient Washington State Initiative project is based upon the San Francisco Urban Planning and Research Association (SPUR) Report, entitled "*The Resilient City*", which examines the current state of resilience to a scenario quake in San Francisco.
- Initial report includes 4 major policy sections - Defining Resilience, The Dilemma of Existing Buildings, Building it Right the First Time, and Lifelines.
- Three subsequent reports released during the course of the RWS project.

Presentation Overview

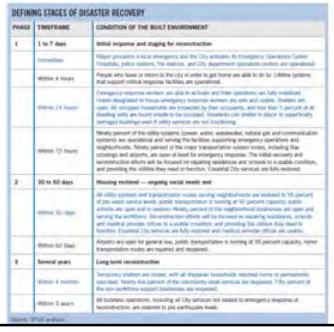
- Project Background
- "The Resilient Washington State Initiative"
- Project Approach & Preliminary Results
- A few early lessons learned… some considerations for Oregon



Target States of Recovery for Buildings & Infrastructure

So, what is the "Resilient Washington State Initiative"?

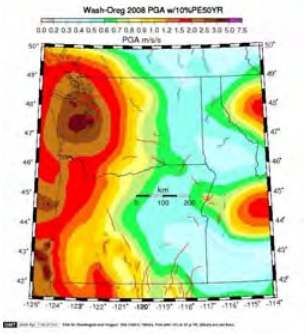
Incorporate Transparent Performance Measures



Resilient Washington State

- *Purpose* - Provide a framework for improving Washington's resilience when earthquakes occur.
  - Framework includes more effective seismic mitigation policies and recommendations for legislation and policy changes to improve and enhance statewide seismic safety.
- *Timeframe* – Goal of making the state resilient in 50 years.
  - Implementation plan by short-, mid-, long-term

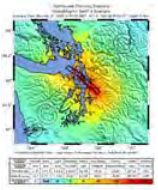
Resilient Washington State



Resilient Washington State

Earthquake Hazard:

- Not possible to define single EQ scenario at a State level.
- Identified a suite of scenarios from the 20 scenario earthquakes developed in 2009 by personnel from the WA EMD, WA DNR, USGS, and FEMA for use in planning efforts.



So, what *IS* resilience?

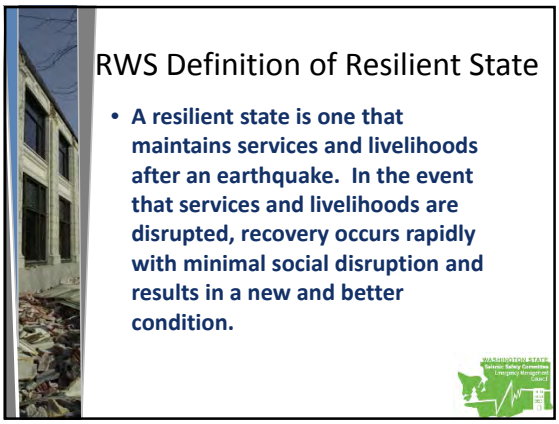
Resilient Washington State

Earthquake Hazard:

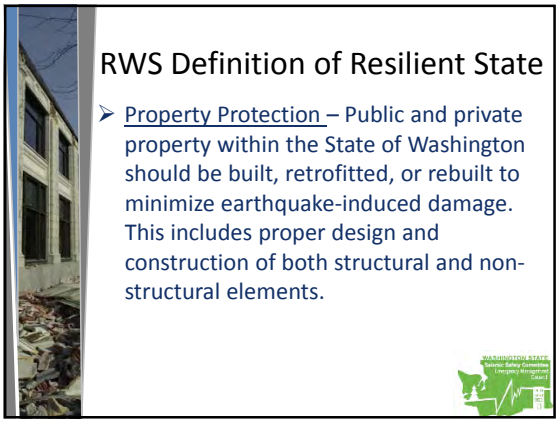
- M7.2 Seattle Fault, M7.4 Southern Whidbey Island Fault, M7.1 Tacoma Fault, M7.3 Saddle Mountain Fault, M6.8 Cle Elum Fault, and M9.0 Cascadia.
- Scenarios define geographic area of impact.
- Consider Ground Motions consistent with USGS 10/50 PGA maps.

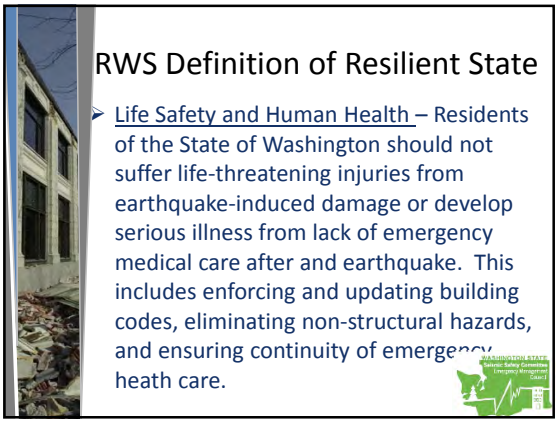
Defining Resilience

- SPUR uses engineering standards –how many building demolitions (or infrastructure failures), and how long a recovery time for various levels of EQ.
- Resilience as a disaster, but not a catastrophe.
- Ability to recover – govern, lifelines to resume in short time frame, people stay in homes, resume normal living routine in weeks and return to new "normal" in few years.

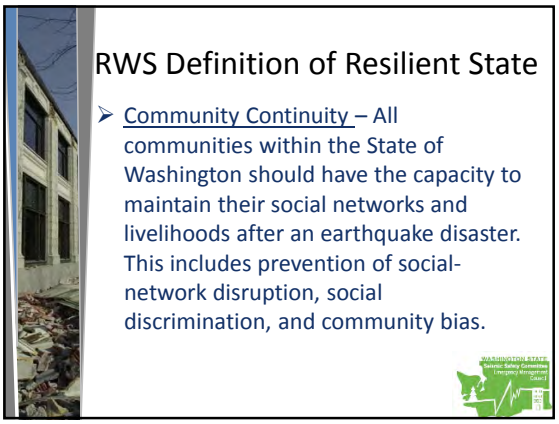

RWS Definition of Resilient State
• A resilient state is one that maintains services and livelihoods after an earthquake. In the event that services and livelihoods are disrupted, recovery occurs rapidly with minimal social disruption and results in a new and better condition.


RWS Definition of Resilient State
➢ Environmental Protection – The natural resources and ecosystems of Washington State should be managed in such a way as to minimize earthquake-induced damage. This includes the use of proper growth management, accident response capacity, and industrial safety measures.


RWS Definition of Resilient State
➢ Property Protection – Public and private property within the State of Washington should be built, retrofitted, or rebuilt to minimize earthquake-induced damage. This includes proper design and construction of both structural and non-structural elements.


RWS Definition of Resilient State
➢ Life Safety and Human Health – Residents of the State of Washington should not suffer life-threatening injuries from earthquake-induced damage or develop serious illness from lack of emergency medical care after and earthquake. This includes enforcing and updating building codes, eliminating non-structural hazards, and ensuring continuity of emergency
heath care.


RWS Definition of Resilient State
➢ Economic Security – Residents and businesses within the State of Washington should have access to income opportunities to meet basic needs before and soon after an earthquake. This includes sufficient employment opportunities, market access, distribution capacity, and supplier access.


RWS Definition of Resilient State
➢ Community Continuity – All communities within the State of Washington should have the capacity to maintain their social networks and livelihoods after an earthquake disaster. This includes prevention of social-network disruption, social discrimination, and community bias.

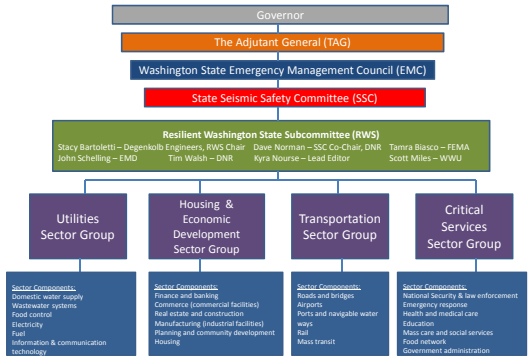
Overall Project Approach

- Established RWS Subcommittee under WA SSC



- Reviewed existing information and incorporated new data from the USGS/ DNR/EMD Scenario Catalog Project as a starting point.
- Hosted a workshop engaging key stakeholders and local jurisdictions in the process.
  - A truly Resilient State is made up of Resilient cities, counties, & tribes - local jurisdictions can adopt this approach (i.e. San Francisco model) at a smaller scale.

Resilient Washington State – Organizational Structure



Overall Project Approach (cont.)

- Conducted an online survey of subject matter experts to help identify current capabilities
- Established formal Sector Groups with subject matter expert co-leads to facilitate information gathering from key partners and obtain buy in.
  - Sector Groups work independently using common guidance
- Hosted a follow-up workshop to deconflict results and review interdependencies
- RWS Subcommittee provides report

Resilient Washington State

Objectives of Sector Groups:

- Evaluate the current condition Sector and assess how quickly they can be restored.
- Develop targets for the desired restoration time frame.
- Define the vulnerabilities and key interdependencies.
- Prepare recommendations for statewide action to achieve desired targets.

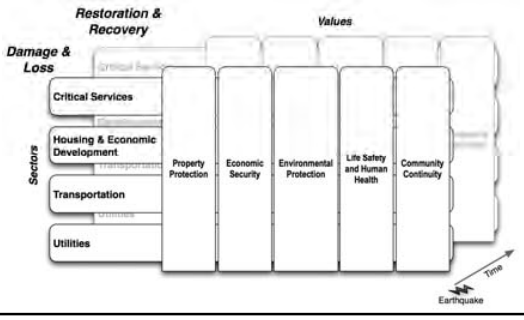
Resilient Washington State Sectors

- Critical services
- Housing and economic development
- Transportation
- Utilities

*Each **sector** is comprise of multiple* possible ***components***

*Each **sector** has different **restoration** capacity & targets with respect to each RWS **value***

Sectors, Values, and Restoration





Resilient Washington State

Process and Timing:

- 2009 – RWS Committee Formed
- 2010 – RWS Committee Developed Framework
- 9/17/2010 – Stakeholder Workshop to form Sector Groups
- 12/2/2011 – Concluding Workshop
- Q1 2012 – Draft Report
- Q2 2012 – Final Report

- Questions?

A few early lessons learned:

- Planning for multiple scenarios at a state level is TOUGH!
  - Consider examining one at a time
  - Leverage FEMA-State Cascadia planning process & data
- Tables as tools, not products
  - Consider having a starting draft and have the experts 'tell you where you're wrong' to keep out of the weeds
- Mitigation vs. Response
  - Interconnected, but what is your goal? Which one is the priority for your planning?

So, what does 'being resilient' mean to Oregon?

Registration for Jan 26, 2012 Workshop

	Lname	Fname	Affiliation
1	Angell	Townsend	Reed College
2	Ashford	Scott	OSU
3	Ballantyne	Donald	Degenkolb Engineers
4	Barbosa	André R.	OSU
5	Barrett	Denise A.	Portland Bureau of Emergency Management
6	Behrandt	Steve	City of Portland - BES
7	Bela	James	Oregon Earthquake Awareness
8	Boone	Deborah	Oregon House of Representatives
9	Bugni	David	David Bugni & Associates
10	CARTER	Rick	Oregon Public Utility Commission
11	Caswell	Heide	PacifiCorp
12	Chamberlain	Lori	Oregon Bankers Association
13	Damewood	Mel	Eugene Water & Electric Board
14	Dennis	Ed	OR Dept of Education
15	Dills	Kimberly	OHA/CDC
16	Doane	James	Public member
17	Dodier	John E.	Portland VA Medical Center
18	Downing	Shane	OR Army National Guard
19	Duquette	Shelley	City of Portland
20	Eggers	Jennifer	Degenkolb Engineers
21	EK-Collins	Greg	Oregon Department of Transportation
22	Estenes	Patrick	The Standard Insurance Company
23	Ford	Dave	Portland General Electric
24	Gehlen	Joe	Kramer Gehlen
25	Gonzale	JR	PUC
26	Guerra	Debbie	Pacific Power
27	Haapala	Kurt	AIA President
28	Halog	Tonya	J.G. Pierson
29	Herrenbruck	Greg	New Seasons Market
30	Howard	Michael	Oregon Partnership for Disaster Resilience
31	Hynes	Pat	Knife River Prestress Division
32	Johnson	Robert	Johnson Broderick Engineering, LLC
33	Kaplan	Kevin	VLMK
34	Karney	Joe	NW Natural
35	Kempner Jr.	Leon	Bonneville Power Administration
36	Knudson	Mark	Tualatin Valley Water District
37	Kuehnel	Andrea	NW Natural
38	Kumar	Amit	City of Portland BDS
39	Le Duc	Andre	UO
40	Leon	Arturo	Oregon State University
41	Libby	Mark	HDR Engineering, Inc.
42	Lucker	Steve	Oregon Dept. of Land Conservation and Development
43	Lumbard	Devon	Degenkolb Engineers
44	Maass	Matthew	Oregon Dept of Aviation
45	Mabey	Matthew	Oregon Dept. of Transportation
46	Madin	Ian	DOGAMI/OSSPAC
47	Male	James	University of Portland
48	Merlo	Carmen	Portland Bureau of Emergency Management
49	Monnier	Anne	KPFF Consulting Engineers
50	Mumaw	Michael	OSSPAC/ City of Beaverton Emergency management
51	Nagele	Trent	VLMK
52	Nako	Albert	Oregon Department of Transportation - Bridge Section
53	Newell	Jim	Degenkolb
54	O'Connor	Jean	Oregon Heath Division
55	Patterson	Sherry	Board Member, Rivergrove Water District, Lake Grove FD

56	Paul	Willy	Kaiser Permanente
57	Perimon	Todd	AECOM
58	Phelps	Brad	CH2M
59	Plechinger	John	Pacific Power
60	Pyrch	Allison	American Society of Civil Engineers Technical Committee on Lifeline Earthquake Enginee
61	Quesenberry	Ed	Equilibrium Engineers LLC
62	Raskin	Jay	Ecola Architects, PC
63	Reuter	Scott	Oregon VOAD
64	Richards	Josh	KPFF
65	Ridenhour	Randy	Bonneville Power Administration
66	Rippey	Tim	TM Rippey Consulting Engineers
67	Rizzo	Althea	Oregon Emergency Management
68	Rodgers	Mathew	OSU Emergency Management
69	Rogers	Richard S.	Oregon Building Codes Division
70	Schab	Rob	Coos Bay/North Bend Water Board
71	Schamma	Danny R.	Liberty Northwest
72	Schwinghammer	Michael	Wells Fargo
73	Shugrue	Terry	Turner
74	Soulages	Jeffery R.	Intel
75	Spangler	Matthew	DLCD/OCMP
76	Stahl	Brian R.	City of Gresham, OR
77	Steidel	Sam	Cannon Beach
78	Stember	Kelley	Sprint Nextel
79	Steward	Susan	BOMA Oregon
80	Stuhr	Michael	Portland Water Bureau
81	Subramanian	Laxman	Standard Insurance Company
82	Thompson	Jason	KPFF
83	Totten	Craig	KPFF CONSULTING ENGINEERS
84	Trimpler	Sally	Bank of America
85	Van Dyke	Rick	Cambia Health Solution
86	Vranish	Jack	PacifiCorp
87	Wang	Yumei	DOGAMI (NEHRP)
88	Ward	Bryce	Econorthwest
89	Watters	Stan	Port of Portland
90	Weston	Jim	PeaceHealth Sacred Heart
91	Wieber	Michael	NW Seismic Retrofit
92	Williams, Jr.	Gerald H.	Construction Research, Inc.
93	Wilson	Zamora	NW Natural
94	Wilson	Jay	Vice-Chair, OSSPAC
95	Winchester	Jeffery R.	City of Salem
96	Wolf	Edward	Member, Advisory Committee on Long-Term Facilities Planning, Portland Public Schools
97	Woolley	laren	DLCD/OCMP
98	Yu	Kent	Chair, OSSPAC

Did not attend but expressed interest

Johnson	Gwynn R.	Portland State University
Swecker	Mitch	Director, Oregon Department of Aviation
Cruz	Tony	Worksafe Technologies
Newnam	Al	Ore. Dept. of Community Colleges and Workforce Development
Little	Christie	
Sieck	Cliff	Hewlett Packard Co.
MCCULLOUGH	NASON J.	CH2M HILL
Ianni	Francisco	Director of Preparedness, American Red Cross

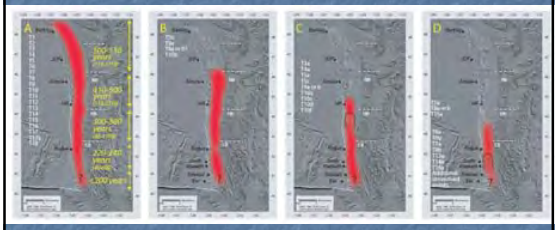
contact for interest

Floyd	Anita	CenturyLink
Trullinger	Ron	CenturyLink

Cooley	Doug	Comcast
Mulder	Joe	Comcast
Willer	Renee	Frontier Communications
Murray	Cathy	Integra Telecom
Wolf	Brant	Oregon Telecommunications Association

Appendix III October 5, 2012 Workshop

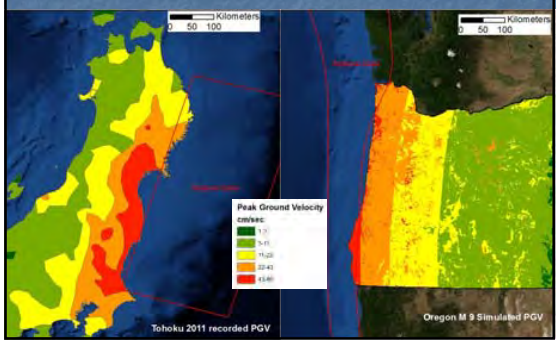
Past Cascadia earthquakes vary widely in location and size.



19 events | 4 events | 9 events | 10 events

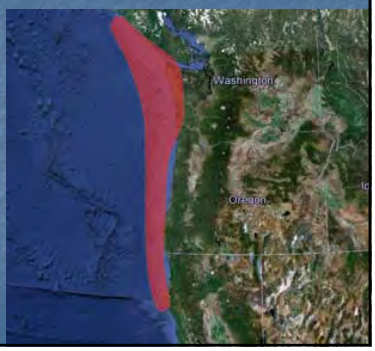
Data from USGS Professional Paper 1661-f

The simulated M 9 PGV values used for the resilience plan assessments are broadly comparable to values recorded in the 2011 Tohoku earthquake.

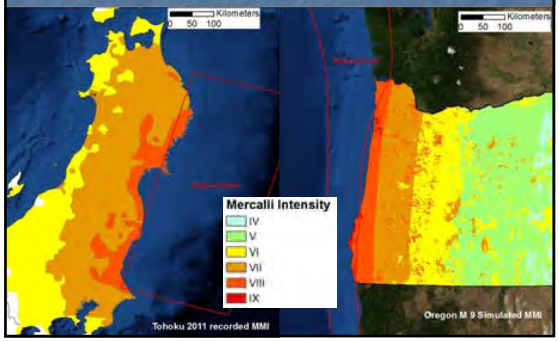


The Plan scenario was based on a full-margin rupture of magnitude 9. Maps were prepared for:

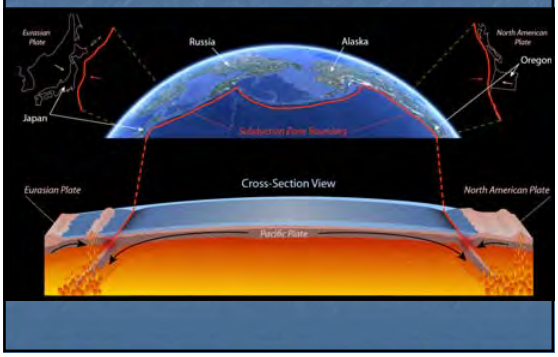
- Peak Ground Acceleration
- Peak Ground Velocity
- Landslide Probability
- Landslide Deformation
- Liquefaction Probability
- Liquefaction Displacement
- Tsunami inundation
- Co-Seismic subsidence
- Mercalli Intensity



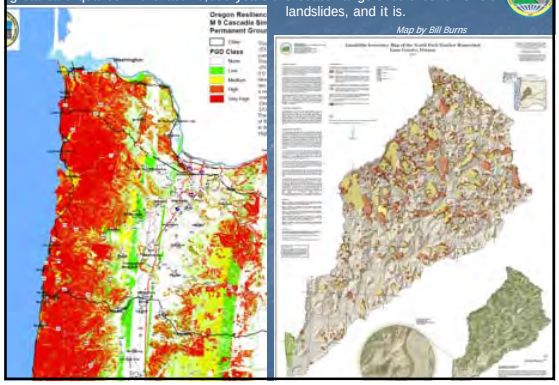
The simulated M 9 MMI values used for the resilience plan assessments are also broadly comparable to values recorded in the 2011 Tohoku earthquake.



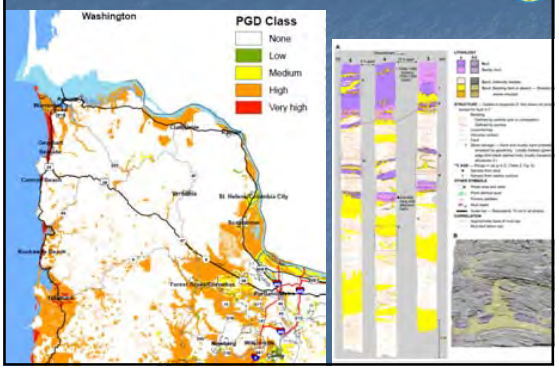
Oregon is a geologic mirror-image of Northern Japan. In both places, the Pacific Ocean floor is sliding beneath the adjacent continents along giant faults called subduction zones. *(Graphic by Dan Coe, DOGAMI)*

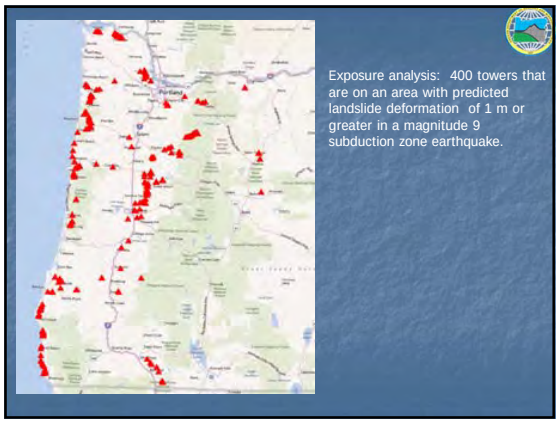


The M 9 landslide model shows high landslide susceptibility, so with over 40 great earthquakes in the last 10,000 years the Coast Range should be full of old landslides, and it is.



The model also predicts high levels of liquefaction and liquefaction ground deformation, and again the geologic record agrees.



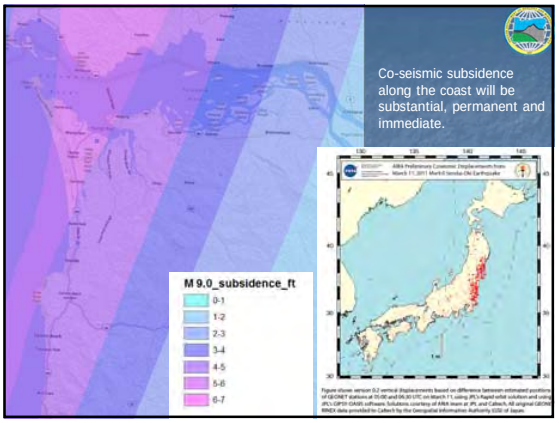


Exposure analysis: 400 towers that are on an area with predicted landslide deformation of 1 m or greater in a magnitude 9 subduction zone earthquake.

Modeled Tsunami inundation at Rockaway Beach. Inundation depends strongly on the size of the earthquake.

SB 379 Model | "M" model | "XXL " Model





Co-seismic subsidence along the coast will be substantial, permanent and immediate.

October 5 Tsunami presentation by Ian Madin

Business/Community Continuity

Business/Community Continuity

Transportation and Utilities*

Transportation (highways, rail, light rail, bus, ports and airports: 7

Utility systems (potable and wastewater, natural gas, oil, electric power and communications: 6

Highway kilometers: 11,289

Bridges: 3,057

Pipe: 511,182

*Hazus-MH: Earthquake Event Report. Print Date: April 12, 2012

Business/Community Continuity

1,425,000 BUILDINGS (Oregon)*

Total Residential: 1,296,750

Total Commercial: 128,250

*Hazus-MH: Earthquake Event Report. Print Date: April 12, 2012

Business/Community Continuity

Total Office SF

Northwest Commercial Building Stock Assessment
Prepared for the Northwest Energy Efficiency Alliance. December 1, 2009

Size (1,000 sf)	Office %	# of Buildings	Percentage
< 5	8.5	7,759	43.4
5 – 19	20.10	7,057	39.5
20 – 49	13	1,695	9.5
50 – 99	12	730	4.1
100 – 499	34.70	528	3.0
>/= 500	11.7	107	.6
Total	100	17,876	100

Business/Community Continuity

Essential Facilities*

Hospitals: 1,124

Schools: 1,574

Fire Stations: 334

Police Stations: 273

Emergency Operations Centers: 8

Dams: 680

High hazard dams: 108

Hazardous materials sites: 829

*Hazus-MH: Earthquake Event Report. Print Date: April 12, 2012

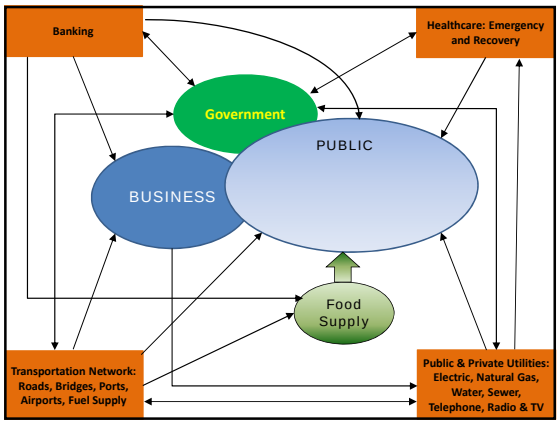
Business/Community Continuity

Commercial Building Damage

Earthquake Hazard Report: April 9, 2012

Commercial	None	Slight	Moderate	Extensive	Complete	Total
Metro Region	6,759	10,106	12,270	4,647	461	34,242
Outside Metro	14,333	7,596	11,878	7,904	3,072	44,785
Total	21,092	17,702	24,148	12,551	3,533	79,027

October 5 business community presentation by Susan Steward and Gerry Williams



Business/Community Continuity

The State does not have policies that assure a level of resiliency, emergency response and recovery are in place and actively maintained for the state, county, city and businesses.

Recommendations:

- Require all county and city Emergency Operations Centers (EOC) to establish a Business BEOC function, web site and staff position that are coordinated at the State level by the State's BEOC function to provide local support to businesses for resiliency, response and recovery activities.
- Require all state, county, and city departments have annual reviews/exercises of Continuity of Operations Plans (COOP) in place.
- Offer eBRP toolkit at no cost to businesses larger than 10,000 square feet or 25 number of employees. This information must be available to the private sector, upon request at no charge.
- Offer training for all communities, prioritizing communities in a high-risk area *(Oregon Coast, etc.)*.
- Require all business licensed in Oregon to certify during the licensing process that they have emergency response and business continuity plans.
- Establish a state program to provide for ATC 20 Certified inspectors. State assumes cost/risk/liability for state sponsored/trained inspectors. State also provides liability protection for business owners from contractor's erroneous good faith estimates.
- Require business certifications for out of state business coming to provide recovery support.

Business/Community Continuity

The Business /Community Continuity Sub-Committee (BCC) approached the 50 year preparedness goal for businesses and workforce by dividing the effort into three main areas:

- Resiliency – what can be done now to help businesses prepare for, recover from and remain in Oregon at the state, county, city and business levels after an event?
- Emergency Response – what can the state, county, city and the businesses do to respond to an event to minimize the impact to businesses' physical assets, supporting infrastructure and workforce; allowing business to resume activity in the shortest possible time?
- Recovery - what can the state, county, city and the businesses do to facilitate their economic recovery?

Business/Community Continuity

Uncertainty about how businesses will respond during an earthquake.

Recommendations:

- Identify all buildings greater than 10,000 square feet that they expect will survive a major event. State will create and maintain a public database of all critical buildings, locations of emergency shelters, etc. Included in the database will be the status of risk areas including stable electrical power, reliable communications; logistics: rail, airport, roadways, water ways; water & sanitation; and waste disposal.
- Provide resources to help building owners seismically upgrade their asset(s). State to act as a "clearing house" for seismic funding options including: tax reduction incentives; federal and state grants, or low interest loans; state to ensure a timely business recovery loan process. (Consider resources such as the Small Business Administration disaster loans for businesses following an event).
- Work with the Building Codes Division (BCD) to require all buildings greater than 50,000 square feet to have gas piping to be equipped with a gas shutoff valve.

Business/Community Continuity

Sub-Committee Findings

- The State does not have policies that assure a level of resiliency, emergency response and recovery are in place and actively maintained for the state, county, city and businesses
- Uncertainty about how businesses will respond during an earthquake
- The State needs to align its resiliency, emergency response and recovery plans with the Department of Homeland Security's Critical Infrastructure Sectors to assure coordination planning/response for natural disasters and terrorist attacks

Business/Community Continuity

The State needs to align its resiliency, emergency response and recovery plans with the Department of Homeland Security's Critical Infrastructure Sectors to assure coordination planning/response for natural disasters and terrorist attacks.

Recommendations:

- Use the 18 Critical Infrastructure Sectors: Food & Agriculture; Banking & Finance; Chemical, Commercial Facilities; Communications; Critical Manufacturing; Dams; Defense Industrial Base; Emergency Services; Energy; Government Facilities; Healthcare & Public Health; Information Technology; National Monuments & Icons; Nuclear Reactors; Materials & Waste; Postal & Shipping; Transportation Systems; and Water, to list all related companies in Oregon and require them to certify they have emergency response and business continuity plans in place and are exercises or used annually.
- State to use the Business EOC (BEOC) function to coordinate the command, control and communications (C3) of the listed companies for providing evidence of certification, exercising and event response. Require all critical infrastructure companies to register with their local BEOC's and provide business and emergency contact information of their senior operations personnel.
- Legislature to mandate that cities throughout Oregon provide a risk assessment of their major lifelines, develop clear instructions for citizens how to evacuate the city, and develop a plan to transport workers and emergency supplies necessary for recovery.

Oregon Resilience Plan
Coastal Resilience Workgroup

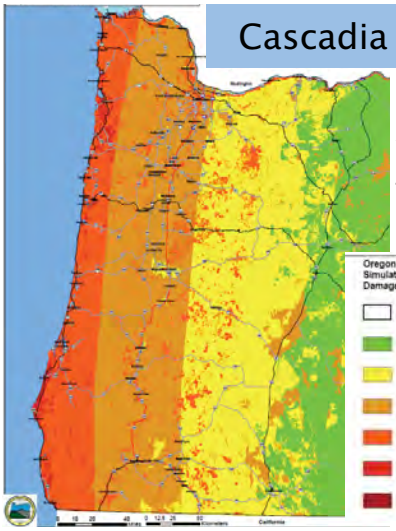
Advisory Panel Meeting
October 5, 2012

Jay Wilson
OSSPAC, Vice Chair



Oregon Seismic Safety Policy Advisory Commission

Cascadia Planning Map

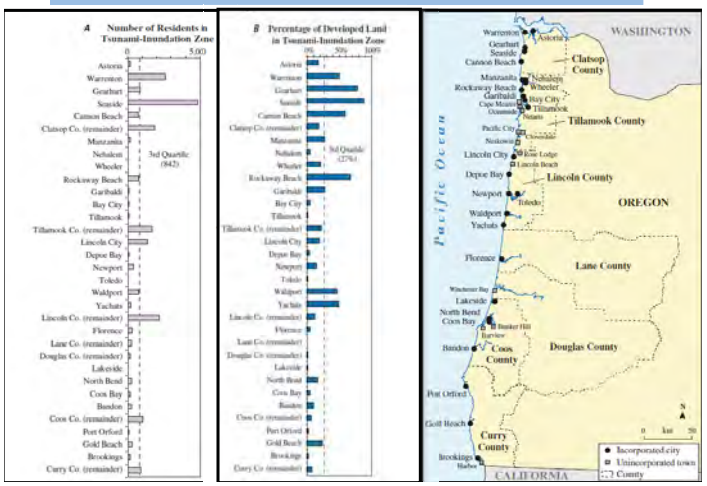


Planning Zones
1. Central Oregon
2. I-5/Willamette Valley
3. Coast EQ Affected Zone
4. Coast Tsunami-Affected Zone

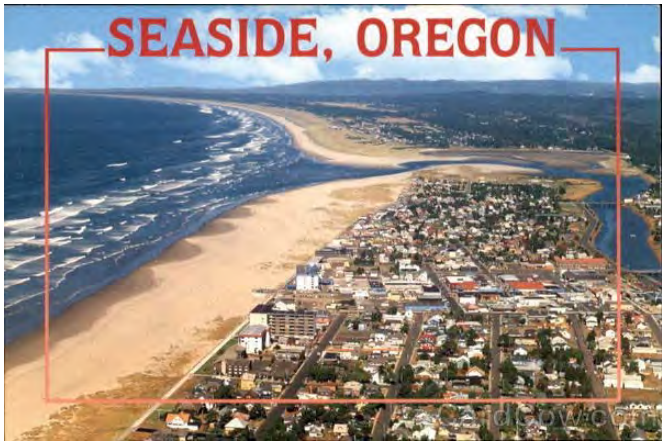
Coast –Most Significant Issues

- **Comprehensive Approach for Life Safety**
  - Evacuation and shelter for people displaced
  - Short-term and long-term housing
- **Target for 90% Restoration of Services in Two Weeks – Reasonable? Possible?**
  - Greatest immediate and long-term needs for assistance in the State (per capita).
  - Interdependency between Tsunami and EQ Zones
  - Weather-dependent capabilities?
- **Mitigation, Recovery and Reconstruction**
  - Land use guidance for community relocations
  - Return of Community Economic Base
- **Debris Management**

Tsunami Life Safety



Tsunami Destination



Tsunami Destination - Depot Bay



Tsunami Destination - Newport



Tsunami Destination - Florence



Tsunami Destination - Winchester Bay



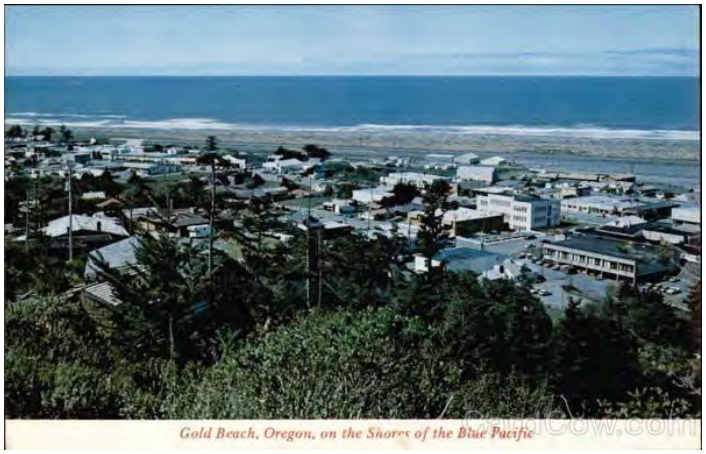
Tsunami Destination - North Bend



Tsunami Destination



Tsunami Destination - Gold Beach



Earthquake vs. Tsunami Zone

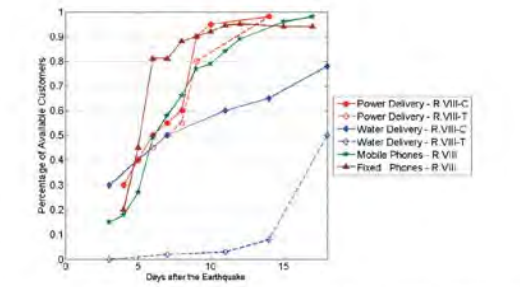


Minamisanriku Tsunami Zone - Zero Capacity

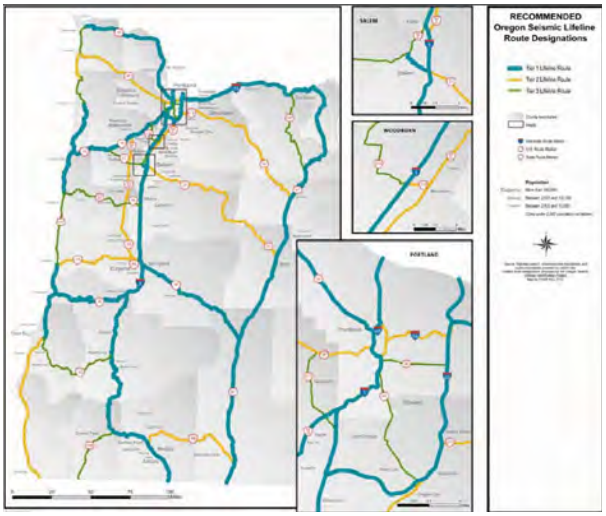


Most Significant Issues

- Expected Recovery Timeline of 90% Services?



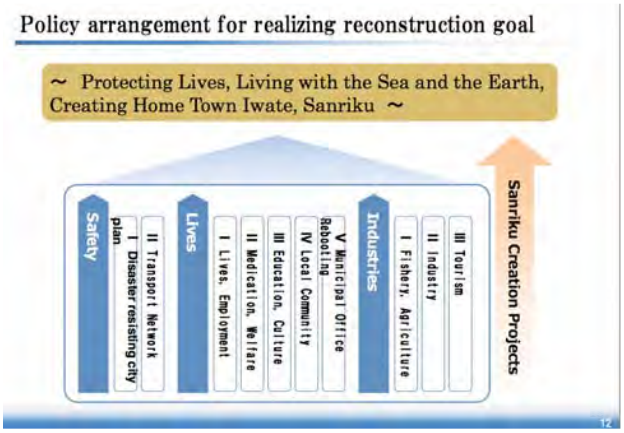
Empirical restoration times for power delivery, water distribution, and telecommunications. The letters C and T indicated the cities of Concepción and Talcahuano, respectively. Both cities are in Region VIII, whose capital is Concepción.



Debris Management



Reconstruction and Recovery



Relationship Between Sustainability and Disaster Resilience



Source: Public Entity Research workgroup OSSPAC

ENERGY TASK GROUP



Electric
Natural Gas
Liquid Fuel











The Risks by Sector



- Liquid Fuels Delivery Systems
  - the liquid fuel transmission pipeline
    - Liquid fuel pipeline was largely constructed in the 1960s when the regional seismic hazards were unknown and state-of-practice construction techniques at that time did not include any reference to seismic standards
  - marine vessels
- Storage – The bulk in tank Farms

Earthquake/Tsunami Scenario

- 4 Distinct Regions
  - Coastal Tsunami
  - Coastal Non-Tsunami
  - Valley
  - Eastern Oregon
- Oregon's critical energy infrastructure (CEI) are not governed by a uniform set of design and construction codes
  - Much of the existing CEI has been constructed with severe seismic design deficiencies
  - New critical infrastructure is often constructed without adequate seismic provisions
  - To minimize extensive direct earthquake damage, substantial improvements to the CEI are necessary

The Risks by Sector



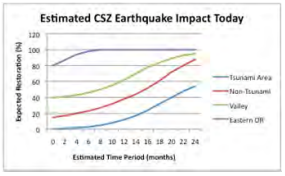


- Shipping channel
  - The navigational channel from the Columbia River mouth to the lower Willamette River is used to transport fuel by marine vessels
  - The Columbia River mouth is expected to have tsunami damage and the channel is expected to experience slope failure, which would close the channel to traffic
  - It is possible that bridges and other river crossings, such as buried gas pipelines and electrical crossings, would be damaged and temporarily block the waterway
    - The regional seismic hazards are now known to be significant and the soils at the river crossings are susceptible to liquefaction and lateral spreading
  - Closure of the shipping channel would prevent marine vessels from delivering liquid fuel as well as emergency response and recovery equipment from being delivered

CSZ Resiliency - Today

The Four Regions

- Tsunami Impacted Coastal areas
- Tsunami Not-Impacted Coastal areas
- Valley
- Eastern Oregon



Recovery Timeframe Graphical Representation

Impact of a CSZ earthquake today for each of the 4 regions, with the exception of Eastern Oregon, would be catastrophic!

The Risks by Sector



- Marine terminals
  - All of the port facilities in the CEI Hub have significant seismic risks due to liquefaction, lateral spreading, and seiches
  - Some older piers were constructed without any seismic protection, have deteriorated, and are likely to fail in even a moderate earthquake
  - If oil products are released and contaminant the navigable waterway, the waterway may be closed to river traffic thus impeding emergency response activities as well as the supply chain
  - The local capacity to fight fires and clean hazardous material spills is limited.



The Risks by Sector



- Fuel supply
  - Only three existing tanks are known to have addressed liquefaction vulnerabilities
  - The fuel terminals in the CEI Hub on average have a three to five day supply in the tank farms for regular unleaded gasoline and diesel fuel
  - Premium gasoline is subject to the daily delivery and heavily dependent on whether the intercompany pipeline on Front Avenue is operational
  - If the supply chain is disrupted by pipe breaks north of the CEI Hub and closure of the shipping channel to the west, fuel would quickly become scarce
  - Options to transport fuel from the east and south and by air are very limited.

The Risks by Sector



- Electricity
  - The bulk of the electrical networks were not built to withstand moderate to significant earthquakes
  - Electrical facilities and systems have significant seismic risk due to ground shaking and ground failure, including liquefaction and lateral spreading
  - Seismically vulnerable facilities include substations, Switch Stations, transmission lines, power plants, and key distribution substations
- CSZ damage to the western electrical grid will likely result in grid blackout
- BPA is the only transmission operator that has taken seismic vulnerability seriously

The Risks by Sector



- Portland International Airport (PDX)
  - PDX airport receives 100 percent of their liquid fuels from a terminal in the CEI Hub
  - PDX has a limited on-site fuel supply
  - If the pipeline between the CEI Hub and PDX fails, then PDX would likely experience a shortfall and operations would be impacted.

Impacts to Oregon

- Based on visual observations, engineering judgment, limited analyses, and limited information from the facility operators, and available literature, significant seismic risk exists in the CEI
- Some critically important structures appear to be susceptible to significant damage in a major earthquake with catastrophic consequences
- Multiple liquid fuel transmission pipe breaks and natural gas transmission pipe breaks are possible
- Damage to liquid fuel, natural gas, and electrical facilities will occur.
- The waterway would likely be closed and require clean up.

The Risks by Sector



- Natural Gas
  - Oregon's largest natural gas service provider receives the majority of their natural gas from pipelines that cross under the Columbia River both near Sauvie Island and also between Washougal, Washington and Troutdale, Oregon
  - One of the natural gas pipelines crosses under the Willamette River at Multnomah Channel near their gate station at the southern end of Sauvie Island
  - The soils at these river crossings are subject to liquefaction and lateral spreading
  - The natural gas company's storage capacity is limited and pipe breaks could lead to a natural gas shortfall in the state as well as explosions or fires.

Impacts to Oregon

- Due to a combination of the existing seismic hazards, vulnerability of the exposed infrastructure and potential consequences, Cascadia earthquakes pose substantial risk to the CEI in Oregon
- Not only are the energy sector facilities dependent on other sectors and systems, including transportation and communication, they are interdependent upon each other
- A major Cascadia earthquake and tsunami would likely produce an unprecedented catastrophe much larger than any disaster the state has faced.
- Western Oregon will likely face an electrical blackout, extended natural gas service outages, liquid fuel shortage, as well as damage and losses in the tens of billions of dollars in a future major Cascadia earthquake
- Preparing for a catastrophic disaster to become more resilient is needed to improve personal safety and security, and safeguard communities and businesses.

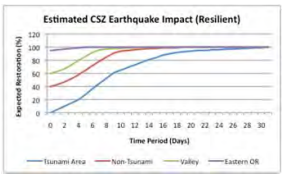
Recommendations

- Energy sector companies should conduct ***Seismic Vulnerability Assessments*** on all of their systems or facilities, and should work with the appropriate local, state, tribal and federal government agencies and stakeholders to achieve timely completion of the assessments to understand existing vulnerabilities.
- Energy sector companies should institutionalize long-term ***seismic mitigation programs;*** and should work with the appropriate local, state, tribal and federal government agencies and stakeholders to achieve timely and effective mitigation to ensure facility resilience and operational reliability.

CSZ Resiliency in 50 years

The Four Regions

- Tsunami Impacted Coastal areas
- Tsunami Not-Impacted Coastal areas
- Valley
- Eastern Oregon



Recommendations

- The State of Oregon's ***Homeland Security Council or OPUC*** should be given the authority to review the vulnerability and resilience of the energy sector to earthquakes and other natural disasters within the scope of their mission.
- Energy sector companies and the State of Oregon should ***build Oregon's seismic resilience*** to a Cascadia earthquake.
  - Adopting pro-active practices and a risk management approach will help achieve seismic resilience. Encouraging a culture of awareness and preparedness concerning the seismic vulnerability of the energy sector including long range energy planning should be conducted.

Policy Recommendations

- Legislature establish a new regulatory authority with oversight authority on seismic resiliency of Critical Energy Infrastructures
  - Oregon Homeland Security Council (Oregon Revised Statute ORS 401.109)
  - Oregon Public Utility Commission
- Mandate all energy service providers complete Seismic Vulnerability Assessments (VA) and long-term Mitigation Plans by February 28, 2015, and report back to the Overseeing Authority.
- Mandate all energy service providers implement the top 10% findings from the VA by February 28, 2025, and provide annual performance reports to Overseeing Authority
  - The remaining 90% be incorporated in the normal operations & maintenance, and capital projects plan, with the goal of achieving resiliency by February 28, 2065.
- Mandate all energy service providers provide annual performance reports to Overseeing Authority.

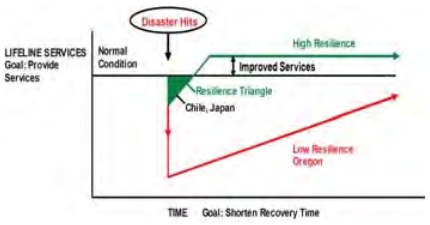
Electric Specific Recommendation

- Perform an Oregon regional electrical systems study within 1 year (feb 28, 2014)
  - It can be done independent of IOUs and COUs
  - Independent of infrastructure ownership
  - Provide broad reliability picture of the electrical systems
  - It can be shared in 1 year

(This has been done for the New Madrid earthquake area by US DOE's Argonne National Lab.)

Resilience Triangle (modified from MCEER)

Multidisciplinary Center for Earthquake Engineering Research



RESILIENT OREGON Workshop

October 5, 2012

TRANSPORTATION Assessment

Resilient OREGON Workshop

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Highway Transportation

- Majority of Highway bridges built well before Seismic Specifications were available
- Landslides and Rockfalls make our highways even more vulnerable
- ODOT has performed a initial assessment of state owned bridges and landslide inventory West of Cascades
- A Draft of Highway Lifelines has been proposed, along with a mitigation plan

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Transportation Workgroup

- Highway Transportation
- Rail Transportation
- Air Transportation
- Water Transportation (River and Ocean Ports)
- Public Transit Services
- Local Agency Representatives
- Consultants
- Academia

Resilient OREGON Workshop

October 5, 2012



Highway Transportation

- The Highway Lifeline Maps and Seismic Options Report presented to OTC (06/21/2012)
- Highway assessment shows 3+ years needed to restore 90% capacity on Western OR
- 1-3 years restoring 60% capacity of Tier 1 Routes
- Accessing the damaged structures becomes an issue

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Transportation Workgroup

- Monthly meetings (in person, phone, or i-Link)
- Multimode Transportation Workshop (Sep. 17)
- Draft Report sent out on October 1st
  - *Resiliency Target: Minimal, Functional, and Operational
- Appendix "A"
  - * Highways, Rail, Airports, Ports, Public Transit
- Appendix "B"
  - * Local Transportation System

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October 5, 2012

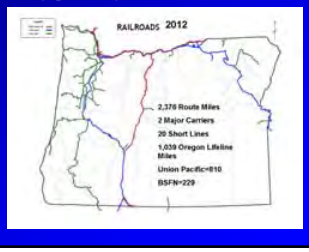


October 5 Transportation presentation by
Bruce Johnson and Albert Nako

Resilient OREGON Workshop
October 5, 2012

Rail Transportation

- Rail lines are generally privately owned
- Older bridges
- Landslides
- Liquefaction
- Tunnels
- No redundancy (long detours)



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Public Transit

- 5 – public transit regions in Oregon
- Public transit buses & school district buses can assist on emergency evacuation
- Coastal Transit facilities may have their own problems
- Factors controlling the resiliency
  - * Road Conditions
  - * The ability of drivers to respond
  - * Availability of fuel supplies

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Air Transportation

- 97 public-use airports in Oregon
- Redmond – FEMA Primary
- 57 – partially supported by FAA
- 28 – state owned (ODA)
- 16 – other municipalities
- >400 – private owned
- Runways – an issue



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Local Roads and Streets

- On the same condition as State Highways
- Cities & Counties identified alternative Routes
  - * Can be retrofitted for less $$
  - * Can be restored much quicker for Emergency Resp.
- A few cities (Portland, Albany) have identified local lifelines connecting to hospitals and emergency centers

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Water Transportation

- **River Ports**
- Docks – at risk
- Liquefaction
- Navigation Channel
- Major river crossings
- Dams & Locks



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Interdependency Assessment

- Supplement a highway "backbone" system with other modes to provide a statewide connectivity at the perceived lowest retrofit cost
- The highway backbone system:
  - * I-5, from I-84 (Portland) to OR58
  - * I-84, from I-5 (Portland) to US97
  - * US97, from I-84 to the CA Border, and
  - * OR58, from I-5 to US97

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Interdependency Assessment

- High priority Airports:
  - * Redmond – FEMA
  - * Portland International
  - * Salem
  - * Eugene
  - * Roseburg
  - * Medford
  - * Klamath Falls

These airports should be made resilient within 10 years

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Interdependency Assessment

- Ports considered part of Multimode Transportation System:
  - * Port of Portland
  - * The Dalles
  - * Hood River
  - * Cascade Locks
  - * Boardman

The overall plan needs to include a resiliency evaluation of the Columbia River channel

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Recommendations

- Perform selective vulnerability assessments in priority order for each transportation mode
- Identify local lifeline routes and detour routes for higher redundancy
- Develop mitigation strategies for other transportation modes, similar to highway's
- Further refine the Interdependency Strategy to ensure a statewide connectivity

OREGON RESILIENCY PLANNING

Critical/Essential Buildings

Ed Quesenberry (Co-chair)
Trent Nagele (Co-chair)
Amit Kumar
Andre Barbosa
Anne Monnier
David Bugni
Dominic Matteri
Ed Dennis
Edward Wolf
Jason Thompson
Jennifer Eggers
Jim Weston
Joe Gehlen
Josh Richards
Kevin Kaplan
Kimberly Dills
Mark Tobin
Michael Wieber
Richard Rogers
Robert Johnson
Shane Downing
Shelly Duquette
Terry Shugrue
Tim Rippey
Tonya Halog
Willy Paul

CRITICAL/ESSENTIAL BUILDINGS

- **Hospitals (60 facilities)**
- **Police/Fire Stations (109 police, 595 fire)**
- **Emergency Operations Centers (82)**
- **K-12 Schools (2,377 facilities)**
- **Emergency Sheltering Facilities**
- **Community Retail Centers and Banks**
- **Single Family Residential (960,000 est.)**
- **URM and Non Ductile Conc. Bldgs (40,000+ est.)**
- **Critical Government Facilities**

TABLE 1 ASSESSMENT APPROACH

2007 DOGAMI Statewide Structural Needs Assessment (SSNA)

- **Rapid Visual Screening (FEMA 154)**
- **Each building evaluated individually**
- **Screening factors include type of structure, age, occupancy, soil type, vertical irregularity, plan irregularity**

TABLE 1 ASSESSMENT APPROACH

2007 SSNA Data Set

- **Engineering Review, and conversion to Recovery Score**
  - Emergency Operations
  - Police and Fire Stations
  - Healthcare Facilities
  - K-12 Schools
  - Emergency Sheltering*

TABLE 2 ASSESSMENT APPROACH

FEMA HAZUS Model

- **Statistical analysis based on census data**
- **Estimates quantity, size, type and age of structures**
- **Statistically determines expected damage for estimated building set**

TABLE 2 ASSESSMENT APPROACH

FEMA HAZUS Model

- **Converted damage estimates to Recovery Score**
  - Residential Housing
  - Community Retail Centers and Banks
  - Vulnerable Buildings*
  - Critical Government Facilities

FINDINGS

Table 1 – 2007 SSNA

EOC, Police & Fire Stations

Table 1. Target States of Recovery For Oregon's Buildings Based on DOGAMI Assessments and Engineering Review

Infrastructure Cluster Facilities	Event Occurs	Phase 1 (hours)			Phase 2 (Days)		Phase 3 (Months)		
		4	24	72	30	60	4	18	36+
Emergency Operations Centers (Coastal)								X	
Emergency Operations Centers (Valley)							X		
Emergency Operations Centers (Eastern)					X				
Police Stations (Coastal)									X
Police Stations (Valley)							X		
Police Stations (Eastern)					X				
Fire Stations (Coastal)									X
Fire Stations (Valley)						X			
Fire Stations (Eastern)				X					

Target State X Current State (approx.)

FINDINGS

Table 2 – FEMA Hazus

Retail Centers, Banking Institutions

Table 2. Target States of Recovery For Oregon's Buildings Based on FEMA HAZUS Loss Estimations

Infrastructure Cluster Facilities	Event Occurs	Phase 1 (hours)			Phase 2 (Days)		Phase 3 (Months)		
		4	24	72	30	60	4	18	36+
Community Retail Centers (Coastal)							X		
Community Retail Centers (Valley)					X				
Community Retail Centers (Eastern)	X								
Financial/Banking (Coastal)						X			
Financial/Banking (Valley)					X				
Financial/Banking (Eastern)	X								

Target State X Current State (approx.)

FINDINGS

Table 1 – 2007 SSNA

Healthcare Facilities

Table 1. Target States of Recovery For Oregon's Buildings Based on DOGAMI Assessments and Engineering Review

Infrastructure Cluster Facilities	Event Occurs	Phase 1 (hours)			Phase 2 (Days)		Phase 3 (Months)		
		4	24	72	30	60	4	18	36+
Healthcare Facilities (Statewide)								X	
Healthcare Facilities (Coastal)								X	
Healthcare Facilities (Valley)								X	
Healthcare Facilities (Eastern)				X					
Healthcare Facilities* (Statewide)									X
Healthcare Facilities* (Coastal)									X
Healthcare Facilities* (Valley)									X
Healthcare Facilities* (Eastern)					X				

Target State X Current State (approx.)

* Includes consideration of non-structural components

FINDINGS

Table 2 – FEMA Hazus

Residential Housing and Vulnerable Bldgs

Table 2. Target States of Recovery For Oregon's Buildings Based on FEMA HAZUS Loss Estimations

Infrastructure Cluster Facilities	Event Occurs	Phase 1 (hours)			Phase 2 (Days)		Phase 3 (Months)		
		4	24	72	30	60	4	18	36+
Residential Housing (Coastal)					X				
Residential Housing (Valley)		X							
Residential Housing (Eastern)	X								
Vulnerable Buildings									X
Vulnerable Buildings								X	
Vulnerable Buildings					X				

Target State X Current State (approx.)

FINDINGS

Table 1 – 2007 SSNA

Schools and Emergency Sheltering

Table 1. Target States of Recovery For Oregon's Buildings Based on DOGAMI Assessments and Engineering Review

Infrastructure Cluster Facilities	Event Occurs	Phase 1 (hours)			Phase 2 (Days)		Phase 3 (Months)		
		4	24	72	30	60	4	18	36+
Primary/ K-8 (Coastal)								X	
Primary/ K-8 Centers (Valley)								X	
Primary/ K-8 (Eastern)					X				
Secondary/High School (Coastal)								X	
Secondary/High School (Valley)								X	
Secondary/High School (Eastern)					X				
Emergency Sheltering (Coastal)								X	
Emergency Sheltering (Valley)								X	
Emergency Sheltering (Eastern)					X				

Target State X Current State (approx.)

FINDINGS

Table 2 – FEMA Hazus

Critical Government Facilities

Table 2. Target States of Recovery For Oregon's Buildings Based on FEMA HAZUS Loss Estimations

Infrastructure Cluster Facilities	Event Occurs	Phase 1 (hours)			Phase 2 (Days)		Phase 3 (Months)		
		4	24	72	30	60	4	18	36+
Critical Government Facilities (Coastal)							X		
Critical Government Facilities (Valley)					X				
Critical Government Facilities (Eastern)	X								

Target State X Current State (approx.)

RECOMMENDATIONS

4.4.1 Existing Buildings

- **Exempt Buildings (4.4.1.1)**
  - One and two-family dwellings
  - Buildings in low seismic hazard area
  - Exempt buildings
- **Building Inventory (4.4.1.2)**

RECOMMENDATIONS

4.4.1 Existing Buildings

- **Upgrade Nonstructural Elements of Essential and Hazardous Facilities (4.4.1.5)**
- **Passive Trigger Seismic Strengthening Program (4.4.1.6)**
- **Require Disclosure of URM and Non-ductile Concrete Building's Seismic Resistance (4.4.1.8)**
- **Limitation of Liability (4.4.1.9)**

RECOMMENDATIONS

4.4.1 Existing Buildings

- **Mandatory Seismic Strengthening (4.4.1.3)**
  - URM and Non-ductile Concrete Buildings
    - Essential Facilities within 20 years
    - All others within 30 years
  - Hospitals within 15 years
  - EOC, Police, Fire within 30 years (non URM)
  - Buildings damaged by Earthquakes

RECOMMENDATIONS

4.4.2 New Buildings

- **Siting (4.4.2.1)**
- **Incentives for Performance Based Design (4.4.2.2)**
- **Permit Review of Significant Structures by Licensed Structural Engineers (4.4.2.3)**
- **Expand certain Special Inspections and Structural Observations (4.4.2.4)**

RECOMMENDATIONS

4.4.1 Existing Buildings

- **K-12 Schools (4.4.1.4)**
  - Expand seismic rehab grant program
  - Prioritize replacement of URM's
  - Require ASCE-31 seismic assessments
  - Database of school seismic assessments
  - Statewide plan to resume education

RECOMMENDATIONS

4.4.3 State Office of the Structural Engineer

- **Establish a lead agency for implementing and coordinating statewide seismic/structural resilience policy.**
- **Advocacy and education**
- **Assist other state agencies**
- **Research**
- **Develop administrative rules and standards**

RECOMMENDATIONS

.

- **4.4.3 Earthquake Performance Rating System**
  - Voluntary
  - Applicable to all building types, new and old
- **4.4.5 Education**
  - Public awareness
  - Education in schools
  - Contractor education

RECOMMENDATIONS

.

- **4.4.6 Timeline**
  - Now is the time to get started!
- **4.4.7 Emergency Response**
  - Database of post-earthquake inspectors
  - Establish protocols for volunteers
  - Strengthen Good Samaritan laws

THANK YOU!

CRITICAL BUILDINGS TASK GROUP

Ed Quesenberry (Co-chair)
Trent Nagele (Co-chair)
Amit Kumar
Andre Barbosa
Anne Monnier
David Bugni
Dominic Matteri
Ed Dennis
Edward Wolf
Jason Thompson
Jennifer Eggers
Jim Weston
Joe Gehlen
Josh Richards
Kevin Kaplan
Kimberly Dills
Mark Tobin
Michael Wieber
Richard Rogers
Robert Johnson
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Shelly Duquette
Terry Shugrue
Tim Rippey
Tonya Halog
Willy Paul

INFORMATION AND COMMUNICATIONS TECHNOLOGY

Oregon Resilience Plan Workshop

October 5, 2012

Information and Communications Technology

- In the early phases of recovery achieving these capabilities may require the use of temporary/interim contingencies (i.e., mobile cellular towers) while more permanent repairs and installations are being done.
- Establishing target timeframes for the tsunami inundation zone, beyond a minimal level of capability to support response, is not practical. A large amount of planning and prioritizing will need to be undertaken to identify which areas will be rebuilt first. These will then be the areas in which the information and communications systems will be re-established first.

Information and Communications Technology

KEY TO THE TABLE

Target Timeframe for recovery:

Operational: *Restoration is up to 90% of capacity: A full level of service has been restored and is sufficient to allow people to use for non-essential needs like entertainment. 80%-90%*

Functional: *Although service is not yet restored to full pre-event capacity, it is sufficient to get the economy moving again (e.g. business uses for credit cards and banking). Limits may be placed on uses that take up a lot of capacity like streaming video. 50% - 60%*

Minimal: *A minimum level of service is restored, primarily for the use of emergency responders, repair crews, and in support of critical health and human services (mass care) 20% – 30%*

Estimated time, under current conditions, for system wide recovery to be at or 90% of pre-event capacity

G

Y

R

×

Information and Communications Technology

TARGET STATES OF RECOVERY: INFORMATION AND COMMUNICATIONS TECHNOLOGY SECTOR

	Event occurs	0–24 hours	1–3 days	3–7 days	1 week–2 weeks	1 month – 3 month	3 month – 6 month	6 month -1 year	1 year–3 years	3 + years
ZONE 1 – COAST/TSUNAMI ZONE				R						
Buildings (includes Central Offices, Internet Exchange Points, and Cable Landings)									×	
Equipment in Buildings and on towers									×	
Towers									×	
Underground Lines									×	
Overhead Lines									×	

Information and Communications Technology

Planning Notes:

- Performance Capability for the purpose of recovery is viewed across all information and telecommunications systems supporting voice and data communications.
- The restoration objectives are based on an assumption that all other lifelines, such as roads and electricity, are functioning at a level that will support restoration of the information and communications infrastructure.
- In areas where the "customer" is not ready to accept service, then the service provider is not expected to meet established restoration timeframes.

Information and Communications Technology

TARGET STATES OF RECOVERY: INFORMATION AND COMMUNICATIONS TECHNOLOGY SECTOR

	Event occurs	0–24 hours	1–3 days	3–7 days	1 week–2 weeks	1 month – 3 month	3 month – 6 month	6 month - 1 year	1 year–3 years	3 + years
ZONE 2 – COAST/ NON-TSUNAMI ZONE			R	Y	G					
Buildings								×		
Equipment in Buildings								×		
Towers								×		
Underground Lines							×			
Overhead Lines							×			

Information and Communications Technology

TARGET STATES OF RECOVERY:
INFORMATION AND COMMUNICATIONS TECHNOLOGY SECTOR

	Event occurs	0–24 hours	1–3 days	3–7 days	1 week– 2 weeks	1 month – 3 month	3 month – 6 month	6 month - 1 year	1 year– 3 years	3 + years
ZONE 3 – VALLEY		R	Y	G						
Buildings						×				
Equipment in Buildings						×				
Towers						×				
Underground Lines						×				
Overhead Lines					×					

Recommendations

- Include in site development and zoning codes the requirement for Information and Communications technology structures to be built to withstand the potential impacts of a scenario earthquake and tsunami.
  - This should include limitations on building in tsunami inundation areas, construction of antenna towers on buildings that do not meet the critical facility standard and accounting for potential of liquefaction and slope instability when construction towers, buildings, underground utilities and overhead lines.

Information and Communications Technology

TARGET STATES OF RECOVERY:
INFORMATION AND COMMUNICATIONS TECHNOLOGY SECTOR

	Event occurs	0–24 hours	1–3 days	3–7 days	1 week– 2 weeks	1 month – 3 month	3 month – 6 month	6 month - 1 year	1 year– 3 years	3 + years
ZONE 4 – EASTERN OREGON	R	Y	G							
Buildings					×					
Equipment in Buildings					×					
Towers				×						
Underground Lines				×						
Overhead Lines				×						

Recommendations

- Adopt clear statewide uniform standards, like the NEBS (Network Equipment-Building System), for the adequate performance and bracing of information and telecommunications equipment need to withstand the scenario event and establish a mechanism for reliable enforcement.
- In conjunction with the ODOT's hardening of primary transportation routes, establish a hardened backbone for information and telecommunications systems

Recommendations

Recommended changes in practice that would make the sector compliant in 50 years.

- Establish oversight authority to a State entity that would be responsible for overseeing the resilience of the information and telecommunications industry operating and/or providing services in Oregon.
- Require Central Offices, Internet Exchanges, remote terminals and submarine cable landings to be built to or retrofitted to the "critical facility" standard.

Suggested Policy Changes

~~Three~~ Four suggested policy changes to enable those changes in practice?

1. Legislature establish a new regulatory authority to the Oregon Homeland Security Council (Oregon Revised Statute ORS 401.109) on seismic information and communication resiliency and security issues in cooperation with other relevant authorities.

Suggested Policy Changes

2. Mandate that information and communication service providers complete Seismic Vulnerability Assessments and long-term Mitigation Plans by February 28, 2014, and report to Oregon Homeland Security Council (Oregon Revised Statute ORS 401.109) and other relevant authorities.

Suggested Policy Changes

3. Mandate the information and communication service providers harden all Priority Paths (to achieve a resilient backbone) by February 28, 2018, and provide annual performance reports to Oregon Homeland Security Council (ORS 401.109) and other relevant authorities.
4. Mandate the information and communication service providers harden systems to the performance target restoration objectives by February 28, 2023, and provide annual performance reports to Oregon Homeland Security Council (ORS 401.109) and other relevant authorities.

QUESTIONS



Water/ Wastewater Committee

Resilience Workshop
5 October, 2012

Water & Wastewater Sector Table – Valley Zone

KEY TO THE TABLE

TARGET TIMEFRAME FOR RECOVERY:

Desired time to restore component to 80-90% operational — G
Desired time to restore component to 50-60% operational — Y
Desired time to restore component to 20-30% operational — R

TARGET STATES OF RECOVERY: WATER & WASTE WATER SECTOR

	Event occurs	0–24 hours	1–3 days	3–7 days	1 week– 2 weeks	2 weeks– 1 month	1 month – 3 month	3 month – 6 month	6 month -1 year	1 year– 3 years	3 + years
Domestic water supply											
Potable water available at supply source. (WTP, wells, impoundment)		R	Y		G			X			
Main transmission facilities, pipes, pump stations, and reservoirs ("backbone") operational		G					X				
Water supply to critical facilities available.		Y	G				X				
Water for fire suppression – at key supply points.		G		X							
Water for fire suppression – at fire hydrants.				R	Y	G			X		
Water available at community distribution centers/points			Y	G	X						
Distribution system operational			R	Y	G				X		
Wastewater systems											
Threats to public health & safety controlled.			R	Y		G			X		
Raw sewage contained & routed away from population		R		Y			G		X		

Water and Wastewater Systems Participating in the W&WW Work Group

System / Community	Sector
City of Portland	Water & Wastewater
Tualatin Valley Water District	Water
City of Bend	Water
City of Gresham	Water
City of Pendleton	Water
City of Salem	Water & Wastewater
Clean Water Services	Wastewater
Coos Bay – North Bend Water Board	Water

Water & Wastewater Sector Table – Central / Eastern Zone

KEY TO THE TABLE

TARGET TIMEFRAME FOR RECOVERY:

Desired time to restore component to 80-90% operational — G
Desired time to restore component to 50-60% operational — Y
Desired time to restore component to 20-30% operational — R

TARGET STATES OF RECOVERY: WATER & WASTE WATER SECTOR

	Event occurs	0–24 hours	1–3 days	3–7 days	1 week– 2 weeks	2 weeks– 1 month	1 month – 3 month	3 month – 6 month	6 month -1 year	1 year– 3 years	3 + years
Domestic water supply											
Potable water available at supply source. (WTP, wells, impoundment)		X									
Main transmission facilities, pipes, pump stations, and reservoirs ("backbone") operational		X									
Water supply to critical facilities available.		X									
Water for fire suppression – at key supply points.		X									
Water for fire suppression – at fire hydrants.		X									
Water available at community distribution centers/points		X									
Distribution system operational		X									
Wastewater systems											
Threats to public health & safety controlled.		X									
Raw sewage contained & routed away from population		X									

Water & Wastewater Sector Table – Coast (Non Tsunami) Zone

KEY TO THE TABLE

TARGET TIMEFRAME FOR RECOVERY:

Desired time to restore component to 80-90% operational — G
Desired time to restore component to 50-60% operational — Y
Desired time to restore component to 20-30% operational — R

TARGET STATES OF RECOVERY: WATER & WASTE WATER SECTOR

	Event occurs	0–24 hours	1–3 days	3–7 days	1 week– 2 weeks	2 weeks– 1 month	1 month – 3 month	3 month – 6 month	6 month -1 year	1 year– 3 years	3 + years
Domestic water supply											
Potable water available at supply source. (WTP, wells, impoundment)				R		Y		G		X	
Main transmission facilities, pipes, pump stations, and reservoirs ("backbone") operational			R	Y	G					X	
Water supply to critical facilities available.				R		Y		G		X	
Water for fire suppression – at key supply points.			R		Y			G		X	
Water for fire suppression – at fire hydrants.						R	Y	G		X	
Water available at community distribution centers/points				R	Y	G	X				
Distribution system operational					R		Y	G			X
Wastewater systems											
Threats to public health & safety controlled.				R	Y		G			X	
Raw sewage contained & routed away from population				R	Y			G		X	
Treatment plants operational to meet regulatory requirements							R		Y	G	X
Major trunk lines and pump stations operational						R		Y	G		X
Collection system operational								R	Y	G	X
	Event occurs	0–24 hours	1–3 days	3–7 days	1 week– 2 weeks	2 weeks– 1 month	1 month – 3 month	3 month – 6 month	6 month -1 year	1 year– 3 years	3 + years

Estimate of Water Pipeline Breaks & Leaks for Participating Utilities

Characteristic	Estimate
Total Length of Pipe (miles)	4,592
Total Number of Breaks (number)	2,656
Total Number of Leaks (number)	941
Total Number of Services (number)	385,600
Service Line Breaks – Utility Side (2%)	7,712
Service Line Breaks – Customer Side (5%)	19,280

Why so vulnerable?

- Large, complex systems, above and below ground
- Highly dependent on other, vulnerable resources
  - Energy, transportation, chemicals
- Essential facilities in low lying areas along lakes, rivers, coastlines
  - Vulnerable to liquefaction
- Old facilities designed before reasonable seismic criteria in place
- Use of non-ductile materials vulnerable to ground motion
- Collection/distribution systems connections to above ground facilities

Major Recommendations

- General Recommendations
  - Public information campaign to "reset" expectations.
  - ORWARN is a vital resource. W/WW utilities should belong
  - Seismic response plans
  - Employee preparedness plans
  - Seismic design standards for pipelines
  - Business continuity plans
  - Seismic vulnerability criteria should be incorporated in all capital improvement planning

Closing the Gap – Water Systems

- Harden transmission facilities (bridges, river crossings, landslide areas)
- Install additional isolation valves
- Replace vulnerable pump stations built before 1970. Harden those built after
- Rebuild/redesign transitions between in-ground piping and above ground structures
- Replace 20-30% of transmission system piping (Coastal)
  - 80-90% (Valley)
- Replace 20-30% of distribution system piping (Coastal)(Valley)
- Replace tankage built before 1960.
- Harden tankage built after 1960.
- Incorporate seismic resiliency objectives in all future capital projects

Major Recommendations

- Water Specific
  - OHA to require seismic risk assessment as part of master plans
  - Encourage firefighters and water utilities to develop joint earthquake response plans
  - Identify and coordinate key water supply points
  - OHA to require seismic design considerations as part of routine design review
  - DEQ and OHA to establish goals and expectation for compliance following an event

Closing the Gap – Wastewater Systems

- Liquefiable soils, replace 50-60% of collection systems (Coastal and Valley
  - 50-60% for trunk lines (Coastal)
  - 80-90% for trunk lines (Valley)
- Relocate or seismically upgrade treatment plants built before 2000
  - And all plants in liquefaction zones
- Rebuild or seismically harden pump stations built before 2000
- Provide for emergency power and chem supply
- Incorporate seismic resiliency into future capital improvement projects

Major Recommendations

- Wastewater Specific
  - DEQ to require a seismic risk assessment as part of periodic update of facililty plans
  - Wastewater agencies encourage to conduct more complete characterization of the impacts of estimated recovery times for seismic events
  - DEQ to coordinate with wastewater agencies on expectations for levels of service, compliance and standards following a major seismic event
  - Establish agreements for temporary sanitary services after an event
  - Encourage all agencies to plan for significant water quality impacts to Willamette and Columbia Rivers

October 5, 2012 Resilient Oregon Workshop
Sign-in Sheet

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Oregon State Energy Assurance Plan













Oregon Department of Energy
Oregon Public Utility Commission

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Acknowledgements

A number of Oregon State agencies work together with industry to help ensure Oregon has an adequate supply of reliable and affordable energy. This Oregon State Energy Assurance Plan reflects our collective efforts towards meeting that goal.

The Oregon Department of Energy (ODOE) maintains this plan as well as the Oregon Petroleum Contingency Plan. The Oregon Public Utility Commission (OPUC) maintains the Electricity and Natural Gas Emergency Response Plans. These responsibilities are explained more fully in Chapter 6 of this plan.

There are three key additions from previous versions of this plan. First, ODOE staff is evaluating the integration of renewable resources into emergency response planning. Second, OPUC staff guided the work of contractors to begin assessing whether smart grid technologies can be integrated into the state's response strategies to energy emergencies. And third, staff from the Oregon Department of Geology and Mineral Industries conducted a seismic vulnerability assessment of the state's critical energy hub located in an eight mile area along the water front in Northwest Portland. This included conducting onsite inspections of fuel terminals, substations, and natural gas facilities and systems. These findings, once complete, will assist ODOE and OPUC to better understand the risk associated with earthquake hazards, modify emergency response plans and procedures for energy emergencies, and determine mitigation measures as appropriate for the energy sectors.



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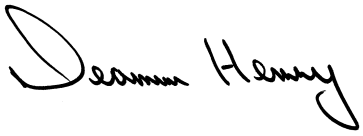

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Executive Summary

OREGON STATE ENERGY ASSURANCE PLAN

In the aftermath of the 1970s fuel crisis, the U.S. Department of Energy (USDOE) began working with state energy offices under the State Energy Program to coordinate and facilitate energy emergency planning activities. As the designated State Energy Office, the Oregon Department of Energy (ODOE) was responsible for developing and maintaining the State Energy Emergency Plan under the State Energy Program. ODOE was required to review and update the State Energy Emergency Plan annually for submission to USDOE as the state energy Plan of Record.

The September 2009 Oregon Energy Emergency Response Plan was revised and renamed the Oregon State Energy Assurance Plan as a result of a grant awarded to ODOE by the USDOE's Office of Electricity Delivery and Energy Reliability (DOE/OE) to enhance state government energy assurance resiliency. As a result, new information was added to the state's 2009 plan. This includes information on seismic vulnerabilities and earthquake impacts on the critical energy infrastructure in Oregon from a magnitude 9 Cascadia Subduction Zone earthquake.

Furthermore, the state is considering the integration of new energy portfolios like alternative fuels as well as smart grid technologies into Oregon's response strategies to energy emergencies to improve energy assurance resiliency.

"Resiliency" is defined as the ability of a critical infrastructure to absorb, adapt to, and/or rapidly recover from a potentially severe and disruptive event. "Critical infrastructure" involves energy lifelines that, if disrupted, could significantly impact public health and safety, the economy, and/or national security. Any prolonged interruption of the supply of basic energy - whether it is petroleum products, electricity, or natural gas - could do considerable harm. As a result, improving energy assurance and resiliency in Oregon's energy infrastructure is intended to help mitigate the impacts of an energy supply interruption and help the state return to normal conditions as quickly as possible, regardless of the cause of the interruption.

Oregon's energy assurance and resiliency planning takes into account four key components. This includes: 1) understanding the energy infrastructure, Oregon's Energy Profile, and system interdependencies, 2) assessing potential risks and hazards threatening the state's critical energy infrastructure and considering short and long-term mitigation measures to reduce risk and vulnerability, 3) developing effective plans and procedures to help minimize the impacts of an energy supply interruption and rapidly restore the energy infrastructure should an emergency occur, and 4) increase public awareness.

The Oregon State Energy Assurance Plan is designed to provide an overview of the first three components to help achieve the fourth component, which is to increase general awareness of the energy infrastructure, risks to the state energy lifelines, and the state's approach to restore fuel, power, and natural gas should an emergency occur.

As mentioned on the “Acknowledgements” page, work on Smart Grid technologies, integrating renewables into emergency response planning, and earthquake vulnerability assessments are not yet completed. In addition, workshops and exercises will be conducted to provide additional insight. It will be through these studies and activities that recommendations for mitigation measures to reduce risk and vulnerability will eventually be developed and then vetted.

The Oregon State Energy Assurance Plan is not an emergency response plan. It is instead an introduction to how Oregon prepares for, responds to, and recovers from energy emergencies. This will eventually include actions and considerations to reduce risk before an emergency occurs. Energy emergency response plans are much more detailed and provide procedures and checklists prescribing how decision-makers and emergency responders are to:

- accomplish pre-identified tasks and objectives to make emergency notifications
- monitor and assess the severity of an energy emergency
- issue protective actions and decisions
- provide situation awareness reports
- provide emergency information to the news media and the public
- activate, staff, and operate an Emergency Operations Center
- other critical tasks to effectively recover from energy emergencies and restore the energy infrastructure.

Energy sector-specific emergency response plans for fuel, natural gas, and electricity are developed and maintained by ODOE and the Oregon Public Utility Commission (OPUC). ODOE developed and maintains the Oregon Petroleum Contingency Plan, which includes the state’s Fuel Allocation Program. OPUC developed and maintains the Natural Gas Emergency Response Plan and the Electricity Emergency Response Plan.

The Oregon State Energy Assurance Plan complies with the National Association of State Energy Officials (NASEO) guidelines, the NASEO Energy Assurance Planning Framework, the National Response Framework, the National Infrastructure Protection Plan, and the National Incident Management System. The Oregon Energy Assurance Plan is also consistent with the Oregon Emergency Management Plan and Oregon Revised Statute (ORS) 401 to "coordinate the activities of all public and private organizations providing emergency services within this state."

ODOE will review and update the Oregon State Energy Assurance Plan annually or as needed to reflect changing response trends and strategies and to incorporate lessons learned from exercises or response to actual energy emergencies.

OREGON STATE ENERGY ASSURANCE PLAN

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CHAPTER 1

Introduction

OREGON STATE ENERGY ASSURANCE PLAN

INTRODUCTION

In 2009, Oregon and other states throughout the nation received American Recovery and Reinvestment Act (ARRA) funding from DOE/OE. The purpose of this funding was to enable the states to create or update their energy assurance plans to facilitate recovery from disruptions to the energy supply and enhance reliability.

Energy assurance for state and local governments is a major element of improving the nation's energy sector resiliency. It involves a large array of activities that fall into three main phases: planning and preparedness, mitigation and response, and education and outreach.

Planning and Preparedness involves understanding the energy infrastructure and identifying key assets; designing and updating energy emergency response plans; training personnel; and conducting exercises that test the effectiveness of response plans.

Mitigation and Response includes monitoring events that may affect energy supplies; assessing the severity of disruptions; providing situational awareness; coordinating restoration efforts; and tracking recoveries.

Education and Outreach includes communicating and coordinating with key stakeholders; increasing public awareness; and forming partnerships across sectors and jurisdictions.

OREGON STATE ENERGY ASSURANCE PLAN APPROACH AND FORMAT

Chapter 1: Introduction - This Chapter provides an overview of the format of the plan.

Chapter 2: Energy Infrastructure Overview – This chapter provides a brief overview of the energy infrastructure in the United States. In order to effectively plan, prepare for, respond to, and recover from energy emergencies, it is imperative to first understand how the petroleum, natural gas, and electricity supply and distribution systems work and how they are interdependent.

Chapter 3: Oregon Energy Profile – This chapter describes the conventional energy sources generated, imported, and consumed in Oregon. Understanding Oregon's energy profile can assist emergency planners and decision-makers in identifying vulnerabilities to the state's energy supply and distribution systems.

Chapter 4: Potential Role of Energy Efficiency and Renewable Energy Resources in Energy Assurance Planning in Oregon – This chapter profiles the renewable energy resources within the state. This chapter also examines the possibility of incorporating these resources when more traditional sources of energy are in short supply. This includes bringing new applications such as Smart Grid technology into the state's energy assurance planning to lower risk and improve energy assurance and resiliency in Oregon.

Chapter 5: Types of Energy Emergencies – This chapter explains the types of hazards in the Pacific Northwest that can impact Oregon's critical energy infrastructure. Having a clear understanding of the hazards that could impact the state's energy resources helps emergency planners and decision-makers better identify mitigation measures to reduce the risk and vulnerabilities.

Chapter 6: Overview of Energy Sector-Specific Emergency Response Plans – This chapter provides an overview of how the state prepares for and responds to fuel, electricity, natural gas, and liquefied natural gas emergencies in Oregon. Despite energy assurance efforts, emergencies impacting our energy resources will occur. Understanding roles and responsibilities, what resources are available, what actions are to be taken and how emergency information will be provided is essential to a rapid recovery.

Chapter 7: Ensuring Program Readiness – This chapter provides an overview of the activities ODOE and OPUC conduct to ensure decision-makers and emergency responders are prepared to implement the energy sector-specific emergency response plans.

Appendices – This section provides reference materials and supporting documents to the Oregon State Energy Assurance Plan.

The ARRA initiative cited the State Energy Assurance Guidelines as a model to guide Oregon's update of the Oregon State Energy Assurance Plan. These Guidelines were developed by NASEO in collaboration with the National Association of Regulatory Utility Commissioners (NARUC) and funded by DOE/OE.

Chapter 2

Energy Infrastructure Overview

OREGON STATE ENERGY ASSURANCE PLAN

INTRODUCTION

Energy is the essential force powering business, manufacturing, and the transportation of goods and services to serve the American and world economies. Energy supply and demand plays an increasingly vital role in our national security and the economic output of our nation. It is not surprising that the United States spends over 500 billion dollars annually on energy. Given the importance of their reliable and secure operations, understanding the behavior of energy infrastructures - particularly when stressed - is crucial.

The nation's energy infrastructure consists of thousands of miles of electricity lines and oil and natural gas pipelines and other resources that are geographically dispersed and connected in all 50 states and territories.

- About 204,000 miles of long-distance transmission lines move power from region to region.
- Two million miles of oil pipelines in the United States are the principal mode for transporting oil and petroleum products such as gasoline. They account for about 66 percent of domestic product movement and are an efficient way to move petroleum and petroleum products.
- Virtually all natural gas in the United States is moved via pipeline.

ENERGY SECTOR PROFILE AND ASSETS

The energy sector includes widely dispersed assets related to three key energy resources: petroleum, electric power, and natural gas.

Petroleum	Electricity	Natural Gas
Crude Oil • Onshore/Offshore Fields • Terminals • Transport (tanker vessels & pipelines) • Storage Petroleum Processing Facilities • Refineries • Terminals • Transport (tanker vessels & pipelines) • Storage Distribution • Pipelines • Barges and Tanker Vessels • Trucks Control Systems Petroleum Markets	Generation • Fossil Fuel Power Plants (coal – gas – oil) • Nuclear Power Plants • Hydroelectric Dams • Renewable Energy Transmission • Substations • Lines • Control Centers Distribution • Substations • Lines • Control Centers Control Systems Electricity Markets	Production • Onshore fields • Offshore fields Processing Transport (pipelines) Distribution (pipelines) Storage Liquefied Natural Gas Facilities Control Systems Gas Markets

Petroleum and natural gas share similarities in methods of extraction, fuel cycles, and transport, but the facilities and commodities are separately regulated and have multiple stakeholders and trade associations. Energy assets and critical infrastructure components are owned by private, federal, state and local entities, and by some energy consumers, such as large industries and financial institutions (often for backup power purposes).

PETROLEUM SUPPLY AND DISTRIBUTION SYSTEM

The petroleum portion of the energy sector includes the production, transportation, and storage of crude oil; the processing of crude oil into petroleum products; the distribution and storage of petroleum products; and sophisticated control systems to coordinate storage and transportation.

Pipelines are critical for the gathering, transmission, and distribution of petroleum. The oversight of pipeline security is the responsibility of Department of Homeland Security's Transportation Security Administration (TSA). The petroleum supply and distribution system include:

Onshore and offshore fields - U.S. crude oil production is concentrated onshore and offshore along the Texas-Louisiana Gulf Coast, extending inland through west Texas, Oklahoma, and eastern Kansas. There are also significant oil fields in Alaska along the central North Slope and the California coastline.

The U.S. also imports nearly 60 percent of the petroleum used in the nation from Canada, Mexico, the Middle East, South America, and Africa.

Crude Oil Drilling, Gathering, and Processing – This sector of the petroleum industry includes a large number of facilities, such as wellheads, gas and oil separation plants, compressor stations, water treatment units, etc., for both onshore and offshore areas.

Import Marine Terminals – Crude oil is received into the United States at import terminals, which usually consist of a berth or port facility for the tankers, unloading facilities, storage facilities, and a system of pipelines to move the crude.

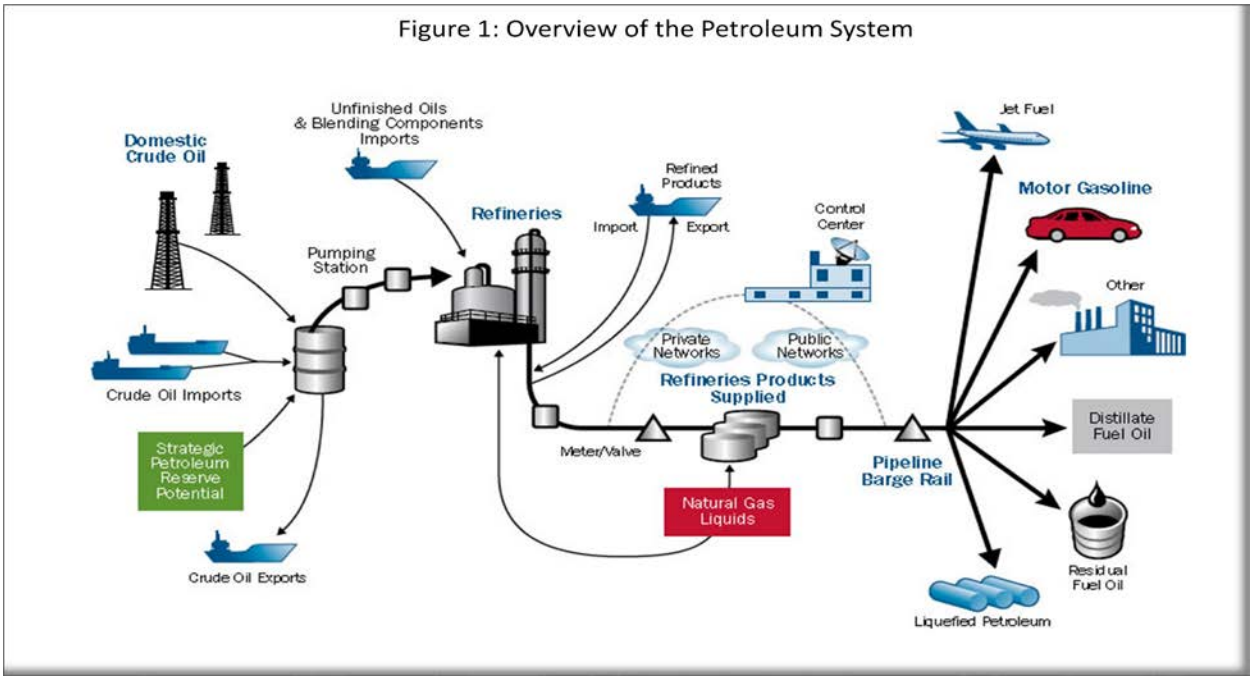
Crude Oil Transport – Privately owned pipelines transport most of the crude oil in the United States. Waterborne transportation modes, including ocean tankers and barges, are also used.

Crude Oil Storage – Import terminals always incorporate storage facilities. In addition, the Strategic Petroleum Reserve has huge underground salt caverns along the coastline of the Gulf of Mexico. The reserve has the capacity to hold 727 million barrels and is the world's largest supply of emergency crude oil.

Refineries – Refineries process crude oil into petroleum products such as gasoline, diesel fuel, jet fuel, and home heating oil. The Gulf Coast has more than twice the crude oil refining capacity of any other U.S. region.

Petroleum Product Transport – Petroleum products are mainly transported by pipeline, tanker, barge, railroad tank cars and trucks. The products are shipped to terminals for temporary storage before transport to smaller petroleum delivery stations in market areas.

Figure 1: Overview of the Petroleum System



Petroleum Product Storage – Petroleum products are stored both above and below ground in tank farms and storage fields to minimize unwanted fluctuations in pipeline throughput and product delivery. As an example, DOE's Northeast Home Heating Oil Reserve stores two million barrels of home heating oil at commercial terminals in the Northeast. This oil is intended for distribution during severe heating-oil supply disruptions in that part of the country.

Petroleum Control Systems - Control systems like the Supervisory Control and Data Acquisition (SCADA), continuously monitor, transmit, and process pipeline data. This includes flow rate, pressure, and speed. The SCADA systems monitor and control pumping stations and track terminal inventories. SCADA gathers information, such as where a leak on a pipeline has occurred, and transfers the information back to a central site. This alerts the home station that the leak has occurred, analyzes its importance, and displays the information in a logical and organized fashion.

In an energy emergency, Strategic Petroleum Reserve oil could be distributed by competitive sale. Decisions to withdraw crude oil from the reserve are made by the President under the authorities of the Energy Policy and Conservation Act.

ELECTRICITY SUPPLY, GENERATION, TRANSMISSION, AND DISTRIBUTION SYSTEM

The electricity portion of the energy sector includes the generation, transmission, and distribution of electricity. The use of electricity is universal, spanning all sectors of the U.S. economy. Electricity system facilities are dispersed throughout the North American continent. Although most assets are privately owned, no single organization represents the interests of the entire sector.

The North American Electric Reliability Corporation (NERC), through its eight Regional Reliability Councils, provides a platform for ensuring reliable, adequate, and secure supplies of electricity through coordination with many asset owners. NERC develops and enforces mandatory reliability standards for the bulk electric power system in the United States, Canada, and a portion of Baja Mexico.

Electricity generation from the burning of fossil fuels - - coal, natural gas, and oil - - provides more than 70 percent of the electricity generated in the United States. Virtually all coal is mined domestically and then transported to power plants by rail and barge. Natural gas and oil are transported to power plants by pipeline.

Additional sources of electricity generation include nuclear and hydropower. Renewable energy sources including solar, wind, and geothermal account for a small but growing percentage of national electricity generation.

Electricity transmission, distribution, and control systems include:

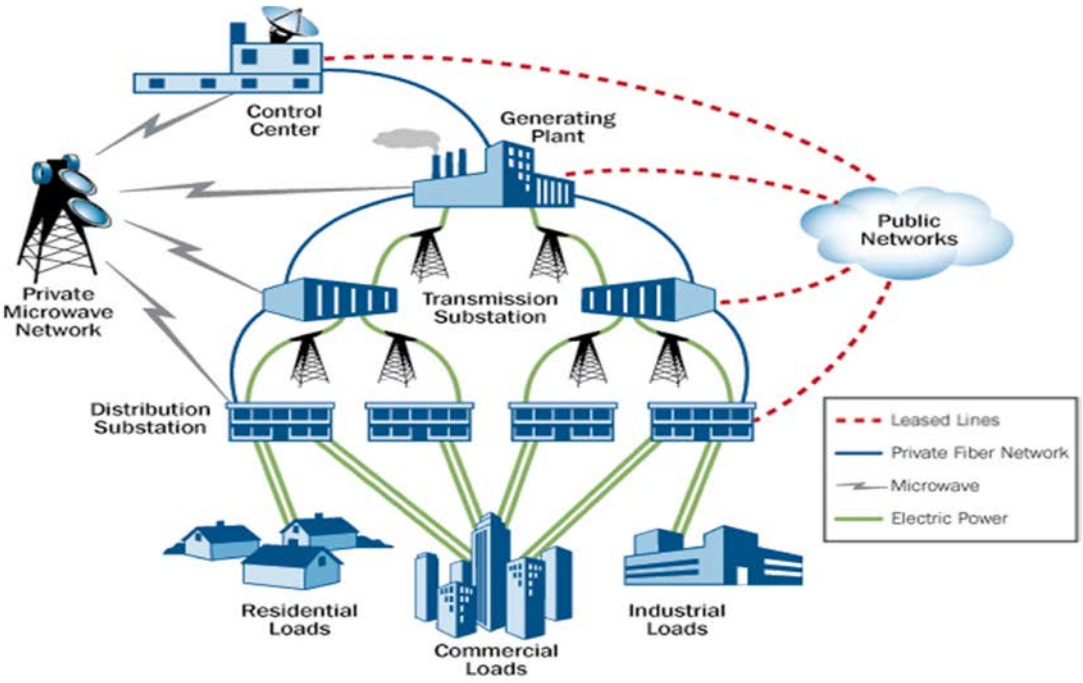
Transmission Lines - Transmission lines serve two primary purposes: They move electricity from generation sites to customers and they interconnect systems. Voltages in the transmission system are high, which makes it possible to carry electric power efficiently over long distances and deliver it to substations near customers.

Transmission and Distribution Substations - Substations are located at the ends of transmission lines. A transmission substation located near a power plant uses large transformers to increase the voltage to higher levels. At the other end of the transmission line, a substation uses transformers to step transmission voltages back down so the electricity can be distributed to customers.

Control Centers - Control centers have sophisticated monitoring and control systems and are staffed by operators 24 hours per day, 365 days per year. These operators are responsible for several key functions, including balancing power generation and demand; monitoring flows over transmission lines to avoid overloading; planning and configuring the system to operate reliably; maintaining system stability; preparing for emergencies; and placing equipment out of and back into service for maintenance and emergencies.

Distribution Lines - Distribution lines carry electricity from substations to end users.
Control Systems like SCADA monitor the flow of electricity from generators through transmission and distribution lines. These electronic systems enable efficient operation and management of electric systems through the use of automated data collection and equipment control.

Figure 2: Overview of the Electricity System



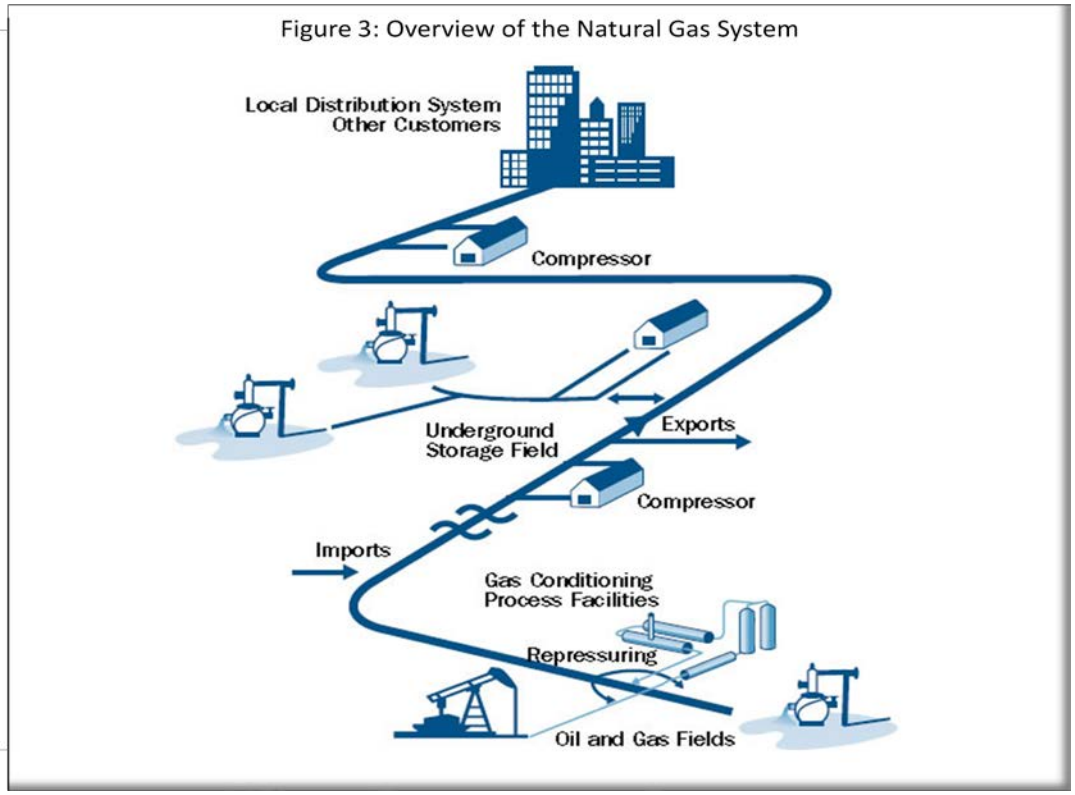
NATURAL GAS PRODUCTION, PROCESSING, TRANSPORT, AND DISTRIBUTION SYSTEM

The natural gas portion of the Energy Sector includes the production, processing, transportation, distribution, and storage of natural gas; liquefied natural gas (LNG) facilities; and gas control systems

Natural Gas Production – The Gulf of Mexico and Texas are the largest gas-producing regions in the United States. The two regions account for almost half of all U.S. natural gas production. Other key sources of natural gas are the Rocky Mountains and New Mexico. The U.S. also imports significant quantities from Canada.

Natural Gas Processing – Natural gas processing consists of separating all of the various hydrocarbons and fluids from the pure natural gas to produce pipeline-quality dry natural gas. Most U.S. natural gas processing plants are located near production facilities in the Southwest and Rocky Mountain States. The natural gas extracted from a well is transported to a processing plant through a network of gathering pipelines.

Figure 3: Overview of the Natural Gas System



Natural Gas Transportation – The interstate natural gas pipeline network transports natural gas from processing plants in producing regions to areas with high natural gas demands, particularly large urban areas. Compression stations along the pipeline transmission route keep the gas moving at the desired pressure.

Natural Gas Distribution – Local distribution companies typically transport natural gas from interstate pipeline delivery points to end users through thousands of miles of distribution pipe. Delivery points for local distribution companies are often termed city gates, especially for large municipal areas, and are important market centers for the pricing of natural gas.

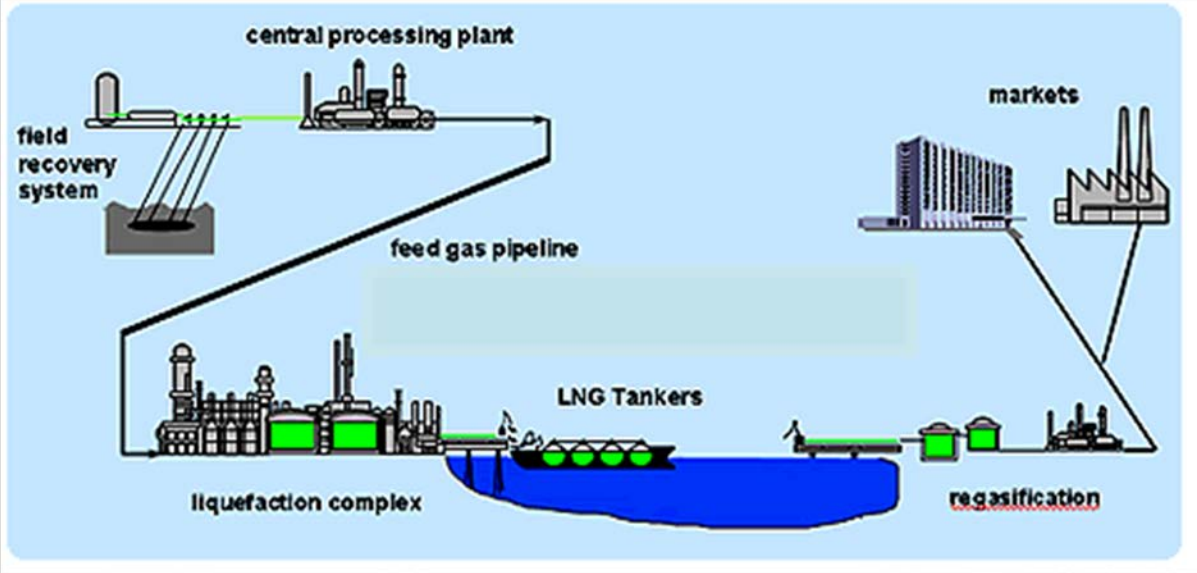
Natural Gas Storage – Gas is typically stored underground and under pressure as an efficient way to balance discrepancies between supply input and market demand. Three types of facilities are used for underground gas storage: depleted reservoirs in oil and/or gas fields, aquifers, and salt caverns. Facilities serving the interstate market are subject to Federal Energy Regulatory Commission (FERC) regulations; otherwise they are State-regulated. Most working gas held in storage facilities is held under lease with shippers, local distribution companies, or end users who own the gas.

Gas Market Centers - Currently, 37 natural gas market centers operate in the United States and Canada. These centers provide gas shippers with many of the physical capabilities and administrative support services formerly handled by interstate pipeline companies as bundled sales services. These centers have developed new and unique Internet-based access to gas trading platforms and capacity release programs; provide title transfer services between parties that buy, sell, or move their gas through the centers; and offer connections with other pipelines and access to storage services. These markets and their information systems are critical components of the natural gas infrastructure.

LIQUEFIED NATURAL GAS SUPPLY AND DISTRIBUTION SYSTEM

LNG is natural gas cooled to approximately -260° Fahrenheit at normal air pressure. It is odorless, non-toxic, non-corrosive and less dense than water. Essentially, it is the same natural gas more than 63 million Americans use to heat and cool their homes, only in a liquid state.

Figure 4: LNG Supply and Distribution Chain



The conversion of natural gas into liquid is called liquefaction and is achieved through refrigeration. Liquefaction reduces the volume of natural gas by approximately 600 times, making it more economical to transport and store. Upon reaching its destination, LNG is stored as a liquid before being warmed back into a gas and sent out via pipelines as natural gas.

LNG is not new. It has been successfully transported and used for almost 100 years. But, LNG is likely to play an increasingly critical role in diversifying the nation's energy mix with our country's changing energy climate. LNG alone cannot meet the growing demand for natural gas. However, LNG is a key component of our nation's three-pronged natural gas supply mix which includes domestic production, Canadian imports, and LNG.

LNG currently accounts for only two percent our natural gas consumption – less than one percent of the energy our nation uses. LNG is predominantly imported from Trinidad and Tobago and from Algeria. Indonesia, Malaysia, and Qatar are also the leading exporters of LNG. Russia and Iran have huge reserves of natural gas.

It does take a long time to invest in and establish a LNG supply chain. This includes building terminals to liquefy the gas, building ships to transport LNG to the United States and building LNG terminals and pipelines to gasify LNG and distribute to domestic markets. There are nine existing LNG import terminals in the United States. Several dozen others are at various stages of the regulatory siting process or have been approved, and are either under construction or waiting for market conditions to change before construction begins.

ENERGY SECTOR INTERDEPENDENCIES

Our national and economic security rest upon a foundation of highly interdependent critical infrastructures. Critical infrastructures are those systems and assets vital to the United States that the destruction of such systems and assets would have a debilitating impact on national security, the economy, public health or safety, or any combination of those conditions.

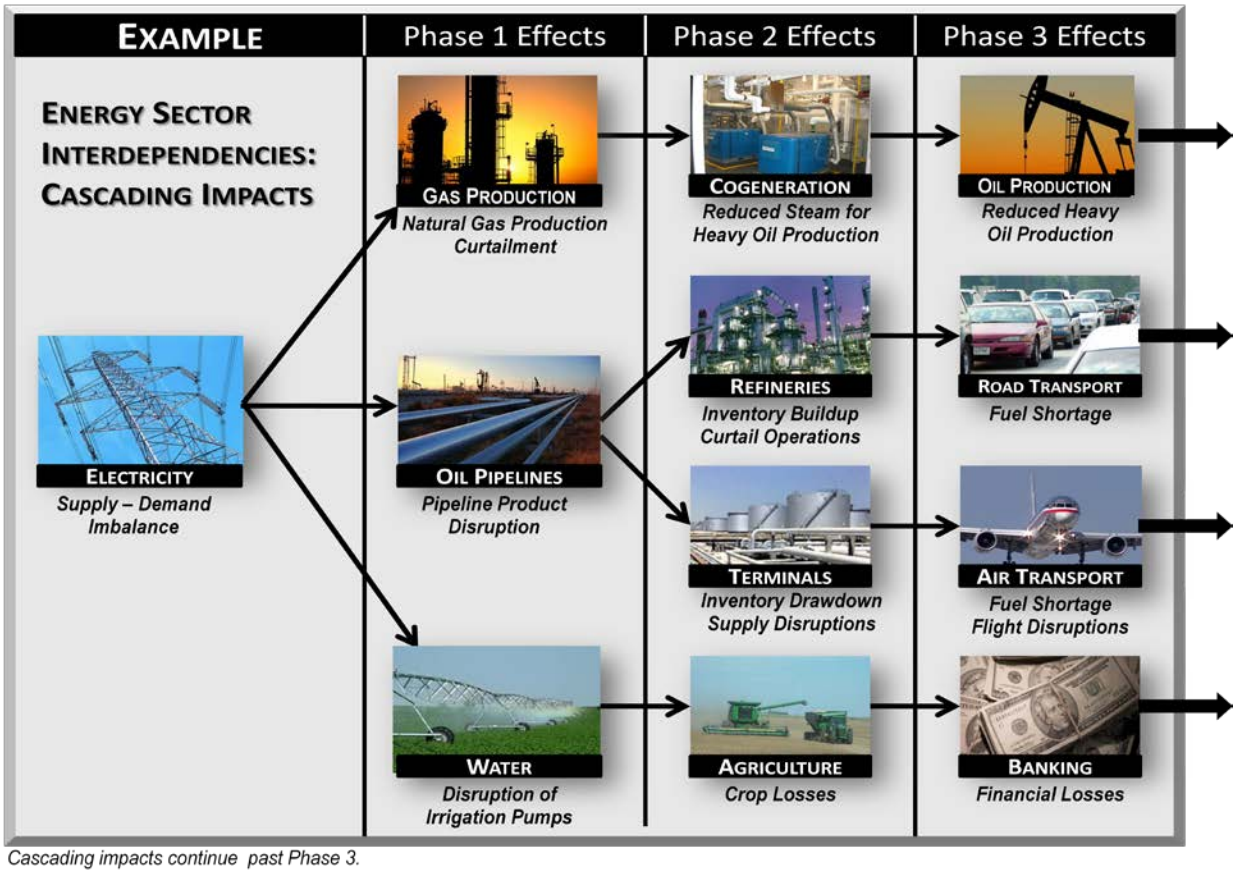
Critical infrastructures cover a large number of sectors. They include the electric power grid; oil and natural gas production, transportation, and distribution systems; telecommunications and information systems; water systems; transportation networks; the banking and finance industry; agriculture and food systems; and public health networks.

An interdependency is a two-way relationship between infrastructures where the operation of each infrastructure is influenced by the other. For example, the electricity infrastructure includes a nationwide power grid of long-distance transmission lines that move electricity from region to region, as well as the local distribution lines that carry electricity to homes and businesses. Much of our electricity originates at coal-fired power plants. These power plants require a dependable transportation infrastructure to deliver the coal necessary for the production of electricity.

Electricity is also required for petroleum refinery and distribution terminal operations. A power failure can shut-down the movement of fuel through pipelines. Gasoline and diesel are required by utility vehicles which are often needed to get workers to the field to restore power to the electrical grid. Telecommunication networks often use sophisticated computerized control and information systems, which rely on electricity.

Figure 5 gives an example of the interdependencies within the three energy sectors and potential cascading effects should one energy sector experience problems.

FIGURE 5



Cascading impacts continue past Phase 3.

Understanding the operational characteristics, complexity, magnitude, and scope of the nation's critical infrastructure will assist emergency managers and decision-makers to better protect the nation's critical infrastructures. Also, should an emergency occur, they will be better prepared to respond to, and recover from energy emergencies.

Chapter 3

Oregon Energy Profile

OREGON STATE ENERGY ASSURANCE PLAN

INTRODUCTION

Energy consumption in Oregon continues to increase according to DOE's Energy Information Agency (EIA). The most current EIA data (2008) shows that total Oregon energy use (petroleum, electricity, natural gas) was 1,105 trillion British thermal units (Btu), up from 707 trillion Btu in 2003. That ranks Oregon, on a per capita basis, 38th in the country in energy consumption.

Oregon only produces about one-third of the energy it uses. Of Oregon's 414.8 trillion Btu produced, most of that is classified as renewable energy, with the majority of that being hydroelectricity.

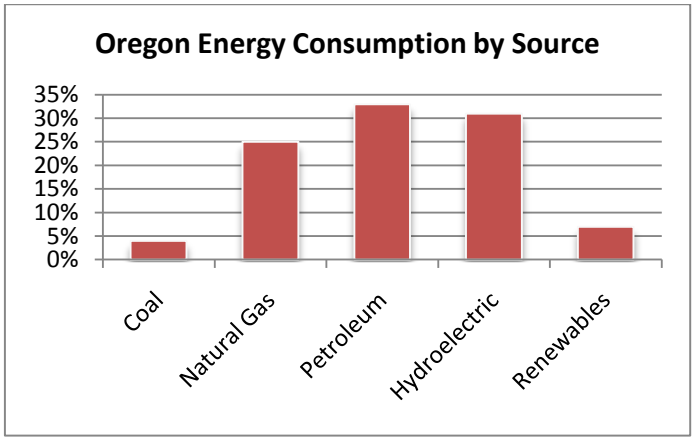


Figure 6: Illustrates the source of energy consumed in Oregon in 2008. About one-third of the energy used is petroleum.

The transportation sector uses the most energy in Oregon, followed by the industrial, residential and commercial sectors. Within the transportation sector, gasoline use made up 57 percent of that transportation energy in 2008.

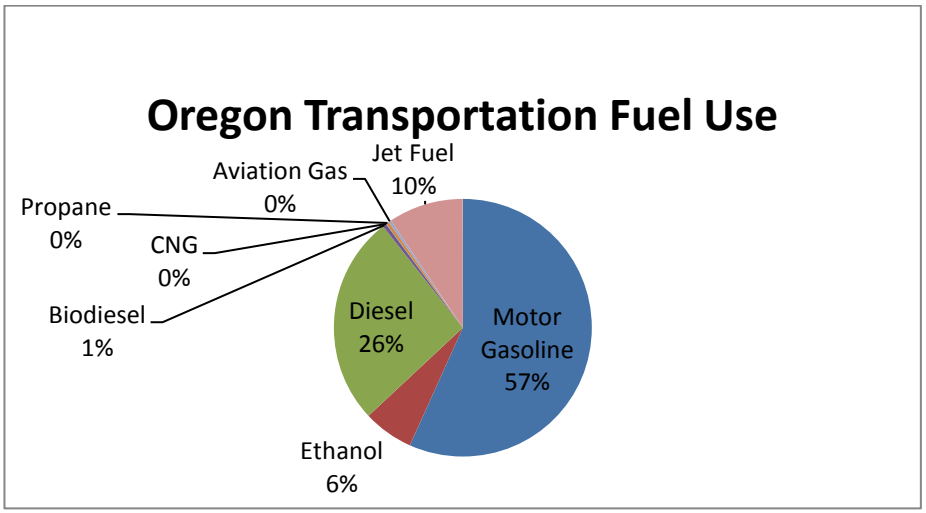


Figure 7: Gasoline makes up the bulk of Oregon's transportation fuel use.

OREGON ENERGY SUPPLY AND DEMAND

PETROLEUM

Unlike other Western states, Oregon does not have crude oil resources or refineries. Oregon imports 100 percent of its petroleum. Oregon, along with Alaska, Arizona, California, Hawaii, Nevada, and Washington form a nearly self-contained system of petroleum production and consumption, referred to by the federal government as Petroleum Administration Defense District Five (PADD V). Although the system is relatively stable, a major disruption in any part of the supply and distribution chain could create a severe and prolonged petroleum shortage, and/or significant price volatility.

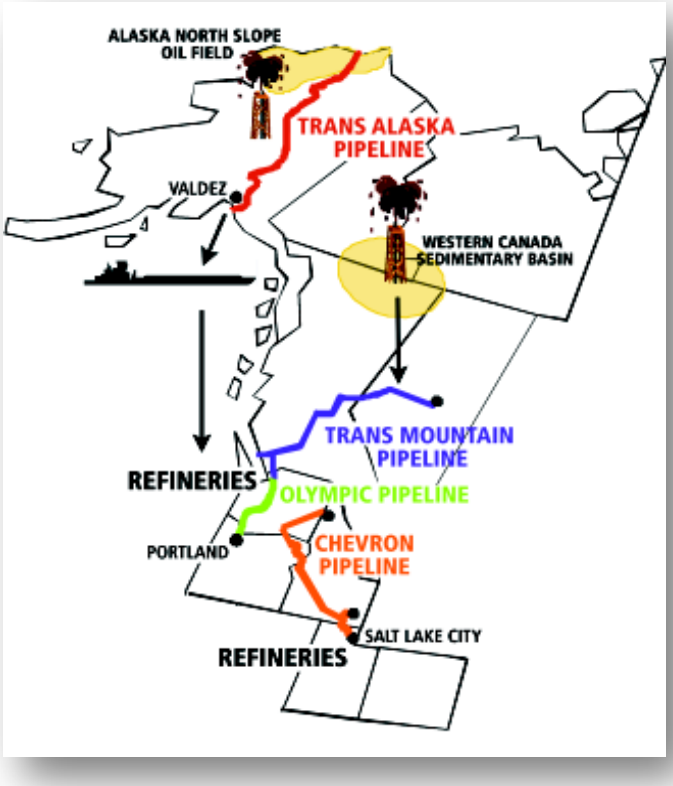


Figure 8: Illustrates Oregon's petroleum supply system. The majority of the crude oil comes from Alaska and Canada.

Figure 8 shows the major sources of Oregon's petroleum products. More than 80 percent of the crude oil eventually used in Oregon originates in the Alaska North Slope oil fields. The Trans Alaska Pipeline transports crude oil 800 miles from the oil fields on the state's northern coast to the Valdez terminal on its southern coast. From there, barges and tankers ship the crude oil to four refineries in the Puget Sound area of Washington and other destinations.

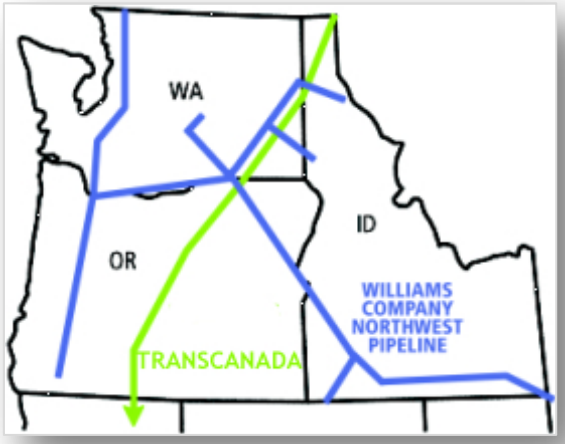
The Western Canada Sedimentary Basin is another significant source of crude oil for the refineries and for Oregon. The remaining crude, less than five percent, comes from the continental U.S., Mexico, Indonesia or the Middle East.

The Puget Sound refineries provide more than 90 percent of Oregon's refined petroleum products. The Washington refineries transport their products to Oregon and Washington markets via the Olympic Pipeline and barges.

Refineries in Salt Lake City and British Columbia provide remaining refined petroleum products to Oregon. Under normal conditions, only minor amounts arrive on tanker ships from California and the Pacific Rim countries of Indonesia, South Korea and Japan.

The bulk of Oregon's oil enters through the Port of Portland and is distributed statewide by tanker trucks, Columbia River barge service and the Kinder Morgan pipeline, which extends to Eugene. Some specialty petroleum products (jet fuel, lubricants, ultra-low sulfur diesel) enter Oregon on tankers from California Bay Area refineries.

In northeastern Oregon, petroleum products enter by truck or rail from Pasco, Washington. The Pasco delivery station receives refined product from a pipeline that starts in Salt Lake City, travels through southern Idaho and crosses through northeastern Oregon along Interstate 84. Pasco also receives petroleum product from barges that travel up the Columbia River from Portland. In southeastern and southern Oregon, a portion of petroleum products is trucked from Idaho and northern California respectively.



NATURAL GAS

Oregon imports 100 percent of its natural gas. Oregon receives natural gas from British Columbia, Alberta, Wyoming, Colorado and New Mexico. Two connected interstate pipelines deliver the natural gas.

Figure 9: Two natural gas pipelines currently serve Oregon customers. The Williams Company pipeline and the Gas Transmission Northwest (GTN) pipeline owned by the TransCanada Corporation bring product from the Rocky Mountains and Canada.

The Williams Company's Northwest Pipeline brings natural gas to Portland from British Columbia and the Rocky Mountain region of the U.S. British Columbia gas enters the U.S. near Sumas, Washington and roughly follows Interstate 5. Gas from the Rockies comes into Oregon near Ontario. One lateral pipeline transports gas from Washougal, Washington to the Portland area and another from the Willamette Valley to Grants Pass (not shown in Figure 9).

Natural gas from Alberta arrives in a Gas Transmission Northwest (GTN) pipeline. It enters the U.S. near Kingsgate, Idaho, and moves through eastern Oregon, leaving the state near Malin, before traveling on to California and Nevada. A lateral line (also not shown in Figure 9) transports natural gas from Klamath Falls to Medford. The GTN pipeline is owned by TransCanada and connects with the Williams Northwest pipeline at Stanfield, Oregon.

Three natural gas utilities serve Oregon:

- Northwest Natural serves about 80 percent of Oregon's retail customers, including Portland, the Willamette Valley and the coast.

- Avista Corporation serves parts of southern Oregon and La Grande.

- Cascade Natural Gas serves parts of central and eastern Oregon.

Northwest Natural receives natural gas from the Williams' pipeline. Northwest Natural owns underground gas storage facilities in Mist, Oregon and LNG storage facilities in Newport and Portland. Northwest Natural also has contracts to use LNG storage at Plymouth, Washington and underground storage at Jackson Prairie, Washington.

Avista obtains natural gas from the Williams Company's Grants Pass lateral as well as TransCanada's GTN pipeline and the Medford lateral. Cascade customers from Madras to Chemult receive natural gas from TransCanada's GTN pipeline. The Williams Northwest pipeline serves Cascade customers from Umatilla to Ontario. Cascade and Avista either own or have contracts to use natural gas storage facilities.

ADDITIONAL NATURAL GAS PIPELINES

The Ruby Pipeline, approved by FERC and currently under construction, will transport domestic natural gas 675 miles across four states from Opal, Wyoming to the existing Gas Transmission Northwest (GTN) pipeline near Malin, Oregon.

The Palomar Pipeline was proposed to link the GTN Pipeline near Madras, Oregon to the Williams Northwest Pipeline near Molalla, Oregon and a second phase from Molalla to a previously proposed LNG terminal called Bradwood Landing. Due to the bankruptcy of Bradwood Landing LNG along with changing market forces, the Palomar Pipeline is on hold.

According to the Northwest Gas Association (NGWA), the Pacific Northwest is home to more than 48,000 miles of natural gas transmission and distribution pipelines. NGWA expects natural gas demand to grow an average of about one percent per year.

PIPELINE REGULATION

The Federal Energy Regulatory Commission regulates siting of interstate natural gas pipelines as well as prices for the use of pipelines. The Oregon Energy Facility Siting Council (EFSC) sites large in-state pipelines.

OPUC regulates the rates Oregon's natural gas utilities charge their retail customers. Wholesale natural gas prices are not regulated. Many industrial customers buy directly from the wholesale market.

Retail natural gas rates generally include pass-through of the wholesale cost of natural gas to retail customers. OPUC sets retail rates so utility companies have the opportunity to earn a fair rate of return on their investments.

Natural gas utilities must prepare integrated resource plans for OPUC. These plans outline contracts to meet natural gas demand, proposed pipeline expansions, new storage facilities, and energy conservation budgets and programs.

LNG

As part of the current and future energy mix, the U.S. is looking to import natural gas, which when produced overseas, must be super-cooled and liquefied for ocean transport. It is expensive to liquefy, transport, and then convert to a gas again (regasify). Shipments of foreign LNG are currently being received at terminals along the eastern seaboard and in the Gulf of Mexico.



Figure 10: Northwest Natural Gas LNG Facility in Portland

In Oregon, there are two existing LNG storage facilities, owned and operated by Northwest Natural Gas. The above-ground facilities are located at the Port of Portland and Newport. Both facilities receive their supply through transmission pipelines and natural gas resources in Canada.

These facilities are used during peak load hours to ensure consistent delivery of power to customers.

There are also two proposals to build LNG import terminals in Oregon. Jordan Cove, located near Coos Bay, received FERC approval in December 2009. Oregon LNG proposed near Warrenton is currently making its way through the FERC process. Either or both projects, if built, would receive LNG from ocean going vessels, temporarily store it, and then regasify it before sending it out by pipeline to homes, businesses, electrical generating plants and industries in the Pacific Northwest as well as other parts of the Western United States. The earliest either terminal could be in operation is 2014.

JORDAN COVE ENERGY PROJECT

Jordan Cove Energy Project (JCEP) has proposed an LNG export terminal on an approximately 400 acre site located on the bay side of the North Spit of Coos Bay, Oregon. JCEP would include a marine receiving terminal, two full containment 160,000 cubic meter LNG storage tanks, and facilities to support ship berthing and cargo loading. Also proposed onsite is the South Dunes Power Plant. The 340 megawatt natural gas fired power plant's primary purpose is to provide power to the JCEP facility. However, the plant does have the capacity to provide power to the local electric grid.

Figure 11: Illustration of the Jordan Cove LNG export terminal upon completion.



JCEP could export up to one billion cubic feet per day of natural gas. The LNG terminal would be capable of loading LNG ships up to 148,000 cubic meters (m^3). The natural gas pipelines would consist of the existing NW Natural/Coos County Pipeline and a new, approximately 223-mile-long natural gas pipeline. The Pacific Connector Gas Pipeline is proposed by Williams' Northwest Pipeline Corporation, Pacific Gas and Electric Company, and Fort Chicago Energy Partners LP.

OREGON LNG

Oregon LNG proposed an LNG peak-shaving, liquefaction, and export facility located on the Skipanon Peninsula in Warrenton, Oregon. The approximately 96 acre site is owned by Oregon Department of State Lands and leased to the Port of Astoria. The Port has in turn leased the land to Oregon LNG for 65 years.

The Oregon LNG Project would include a marine receiving terminal, two full containment 160,000 cubic meter LNG storage tanks, and facilities to support ship berthing and cargo loading.

Oregon LNG's peak-shaving capacity is projected at 0.5 billion cubic feet of natural gas per day with an export capacity at 1.3 billion cubic feet of natural gas per day.



Figure 12: Illustration of the Oregon LNG import-export terminal upon completion

Product could also be transported from an 86-mile pipeline that would connect the terminal to the existing Williams Northwest interstate natural gas pipeline in Woodland, Washington. The LNG terminal would be capable of loading LNG ships up to 260,000 m^3.

ELECTRICITY

Oregon's fuel mix varies based on hydroelectric conditions, with natural gas typically filling the void in years when hydroelectric conditions are poor. Still, hydro and coal make up the bulk of Oregon's electricity supply. Natural gas provides between seven and 15 percent of Oregon's electricity.

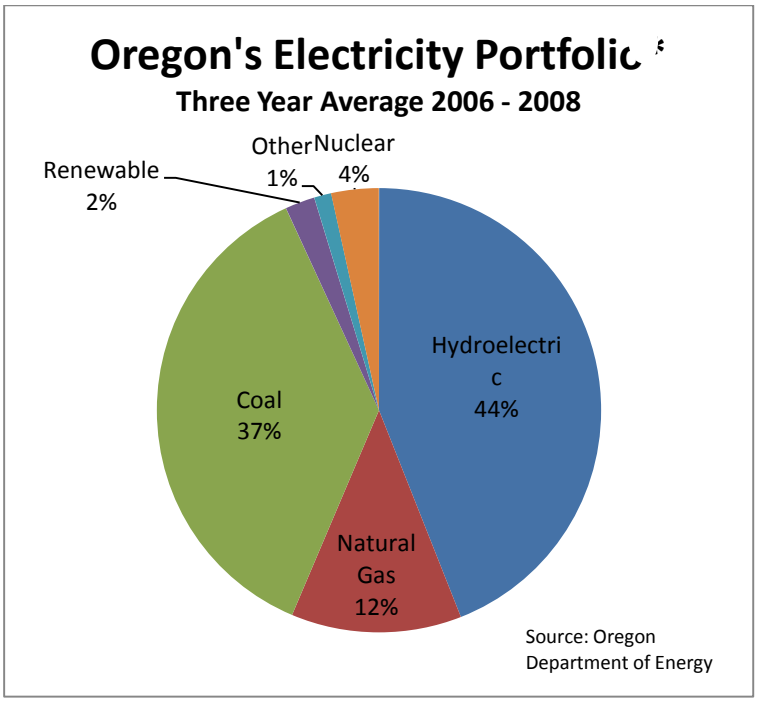


Figure 13: Where Oregon gets its electricity. Oregon's 2006-2008 fuel mix shows that electricity comes mainly from hydropower plus instate and out-of-state coal.

Hydropower comes primarily from large dams on the Columbia and Snake River systems.

Coal power comes from Portland General Electric's (PGE) Boardman plant in northeast Oregon and from plants in Utah, Wyoming, and Montana.

A number of natural gas-fired power plants in Oregon are located in the northeast part of the state near Hermiston and Boardman. Other plants are located in Clatskanie and Klamath Falls.

The implementation of Renewable Portfolio Standards, which require a certain percentage of electricity generation from renewable resources – both in Oregon and other states – has helped spur the development of wind energy. Northeast Oregon has seen the addition of several thousand wind turbines in the past decade, with more being added. Despite this growth, it still provides only a small amount of Oregon's electricity.

Nuclear power comes to Oregon's consumer-owned utilities through the Bonneville Power Administration (BPA) from the Columbia Generating Station near Richland, Washington.

ELECTRICITY TRANSMISSION

Nationwide, new construction to increase electrical energy transmission has lagged over the past 25 years, while the demand for energy has continued to increase. The American Society of Civil Engineers reports that, "The transmission and distribution system of the United States has become congested because growth in electricity demand and investment in new generation facilities have not been matched by investment in new transmission facilities."

Regionally, a number of studies indicate that the electric transmission system in the western United States is inadequate to meet future energy demands and load allocations. There is already a lack of capacity in the existing electric transmission grid and energy generation from renewable sources - - geothermal, wind, solar, wave, biomass - - is increasing the need to expand transmission capacity.

Since many of these renewable energy sources are located in remote areas far away from existing transmission grids and are often located away from high-use, urban and industrial areas where demand is greatest, pressure to develop new transmission capacity is mounting.

Forecasts of future energy demands in Oregon over the next 20 years range from an increase of as much as 45 percent over current demands according to PGE to approximately a 30 percent increase over current demand by the Northwest Power and Conservation Council. While the rate of demand is variable from different sources, there is agreement that demand for energy will increase in the region. Demand is expected to increase for a variety of reasons including home electronics, the development of electric vehicles, and in some areas, the expansion of health care facilities for the elderly.

ORS 469.470 authorizes EFSC to oversee the development of electric transmission lines that are equal to, or greater than, 230 kV; longer than 10 miles in length; and routed across more than one political subdivision in the state.

There are three electric transmission projects currently proposed in Oregon that are making their way through the regulatory processes.

- Big Eddy-Knight Transmission Line, proposed by BPA is a 500-kilovolt line from The Dalles, Oregon to a proposed new substation four miles northwest of Goldendale, Washington.

- Boardman to Hemingway would bring a single circuit 500-kilovolt (kV) transmission line approximately 298 miles to connect the power plant near Boardman, Oregon and the planned Hemingway substation near Murphy, Idaho.

- PGE proposed to construct Cascade Crossing, a single and double circuit 500-kilovolt (kV) transmission line 210 miles from Boardman to Salem. The proposal includes three new substations, and potential upgrade of portions of the transmission system in the Willamette Valley.

Another BPA project, which would have run a 70 mile-long 500-kilovolt transmission line from Castle Rock, Washington to a new substation near BPA's existing Troutdale Substation, is on hold.

U.S. Energy Information Administration

The U.S. Energy Information Administration (EIA) website includes information on Oregon's energy supply and demand from 1960 through 2010. The State Energy Data Systems (SEDS) can be accessed at www.eia.gov. EIA is the statistical and analytical agency within the U.S. Department of Energy (USDOE). EIA collects, analyzes, and disseminates independent energy information to promote sound policymaking, efficient markets, and public understanding of energy and its interaction with the economy and the environment.

The USDOE Organization Act of 1977 established EIA as the primary federal government authority on energy statistics and analysis. EIA conducts a comprehensive data collection program that covers the full spectrum of energy sources, end users, and energy flows; generates short- and long-term domestic and international energy projections; and performs informative energy analyses. EIA disseminates its data products, analyses, reports, and services to customers and stakeholders primarily through its website and the customer contact center. EIA programs cover data on coal, petroleum, natural gas, electric, renewable and nuclear energy.

Information on electricity consumption can also be found on ODOE's website at http://cms.oregon.gov/energy/pages/oregons_electric_power_mix.aspx.

Chapter 4

Potential Role of Renewable Resources in Energy Assurance Planning in Oregon

OREGON STATE ENERGY ASSURANCE PLAN

INTRODUCTION

Oregon has significant renewable energy resources. For decades, Oregonians have benefited from hydropower generated by dams on the Columbia River and elsewhere in the state. In recent years, we have seen tremendous growth primarily in northeast Oregon in harnessing wind energy – although it still generates only a small percentage of our electricity.

Across the state, other opportunities exist for developing renewable energy resources, such as solar, geothermal, wave and biomass. The production and use of alternative fuels is also increasing. The state is actively recruiting these industries and encouraging technology innovation, manufacturing, and installation.

Renewable energy resources will not replace conventional energy resources, such as coal, oil and natural gas – at least not in the near future. But renewable energy resources may provide some assistance in the event of an energy shortage or emergency.

The most promising of the renewable energy resources to assist emergency responders are alternative fuels such as biofuels. These could potentially be used to fuel emergency vehicles when conventional gasoline and diesel are unavailable or in short supply.

Also promising is not a resource – but a technology – to make more efficient use of both conventional and renewable energy resources, called Smart Grid.

These are explained in greater detail later in this chapter.

OREGON RENEWABLE RESOURCE PORTFOLIO

Oregon's abundant supply of renewable energy resources can reduce the state's dependence on conventional energy. This includes hydropower, wind, solar, geothermal, wave, biomass and alternative fuels. All renewable energy sources can be used to generate electricity. Solar, geothermal and biomass also can supply heat. In addition, biomass can be used to fuel vehicles.

HYDROPOWER



As mentioned in Chapter 3, hydropower provides more than 40 percent of Oregon's electricity. BPA markets power from 31 hydropower facilities in the Northwest, 14 of which are located in Oregon. These facilities account for 82 percent of all power marketed by BPA.

Figure 14: The Dalles Dam in the Columbia River Gorge

Hydropower also provides 26 percent and five percent of the electricity for Oregon's two major investor-owned power providers, PGE and Pacific Power, respectively.

WIND ENERGY

Most of Oregon's wind development takes place primarily in the central and eastern Columbia River area and in northeastern Oregon, which includes Sherman, Gilliam, Morrow and Umatilla counties.

Oregon added the most wind capacity - 175 megawatt (MW) - of any state in the country during the third quarter of 2010, according to a report issued by the American Wind Energy Association. Current operational wind projects offer a total capacity of nearly 2,100 MW. Projects approved and awaiting construction make up about another 3,000 MW. Oregon is also home to the North American headquarters of wind turbine manufacturer Vestas and wind farm developer and operator Iberdrola Renewables.



Figure 15: Wind turbines in Eastern Oregon

Wind farm proposals of 105 MW and above go through Oregon's EFSC process. Developers of less than 105 MW may also choose to go through EFSC, or through the local county land-use process.

SOLAR ENERGY

Solar energy is Oregon's largest potential renewable energy resource. There are three primary ways in which this energy is harvested: as direct light into buildings for light and heat; to heat water using roof-mounted collectors; and to convert sunlight to electricity using photovoltaics (PV). Each solar harvesting approach is unique with its own technology and market constraints.

The residential Solar Electricity PV market experienced significant growth in Oregon in 2010 with more than 1,000 tax credits issued compared to 400 credits in 2009.



Figure 16: Solar panels on the roof of the Oregon State Capitol

Many factors are attributed to the expansion in the residential PV market in Oregon. The combination of state and federal tax credits with cash incentives offered by the Energy Trust of Oregon has greatly reduced the expense of these systems. Long-term support for PV installations within the state has allowed the local industry to expand, mature and streamline costs. The presence of large PV manufacturing facilities in the state, such as SolarWorld, has also raised the profile of the technology.

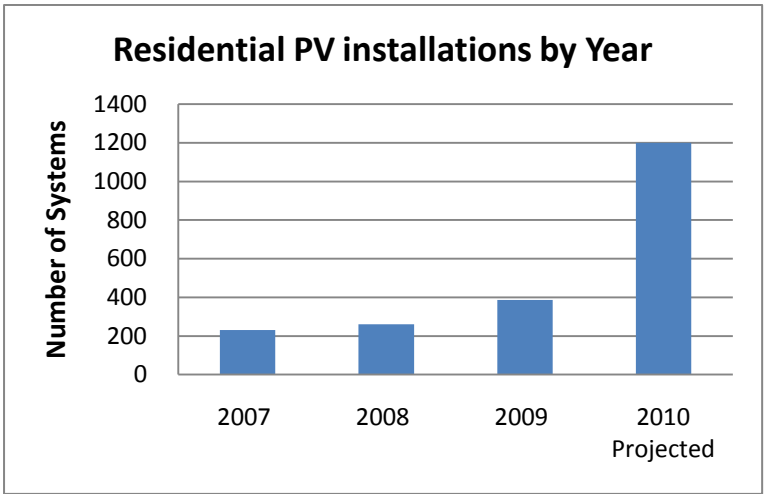


Figure 17: Installation of residential solar electric systems has increased in Oregon.

However, the primary factor increasing the number of PV systems installed in the state is declining system cost. Another factor increasing the number of residential PV systems installed in Oregon have been bulk purchasing agreements organized by cities and neighborhood associations. These efforts commonly known as "solarize" programs have been organized in Portland, Beaverton, Salem and Pendleton. Many more communities throughout the state are considering similar programs that are likely to be launched in 2011.

GEOTHERMAL ENERGY

Geothermal energy comes from the heat of the earth. It has a small environmental footprint, the ability to produce energy consistently around the clock, and emits little or no greenhouse gases. Geothermal energy is used in Oregon to dry agricultural products, for aquaculture

(raising fish), for space heating, to heat greenhouses, and to heat swimming pools at a number of spas and resorts.

Figure 18: Oregon hot spring near Alvord Desert



Oregon homes and businesses use geothermal energy for heat. The first commercial electric facility came online in 2012. The main barrier for development of geothermal electricity generation in Oregon is the cost and risk of drilling. The state Department of Geology and Mineral Industries (DOGAMI) is conducting a detailed survey of the Great Basin (southeastern) part of the state to fine-tune knowledge of sub-surface opportunities and relieve some of the risk of "dry holes."

ARRA awards will assist Oregon to research technology to extract energy from geothermal systems that may not have enough water; test innovative exploration and drilling techniques in south central Oregon; and develop technologies to identify fault lines. ARRA funding will also assist Oregon in developing a national geothermal data system focusing on high heat flow areas in the Cascades, central Oregon, southeast Oregon and parts of northeast Oregon. These are the locations where geothermal resources are most likely to be found.

WAVE ENERGY

Oregon's coastline has steady winds, strong waves and access to transmission networks—the three key ingredients for a successful ocean wave energy program. Wave power is the transport of energy by ocean waves, and the capture of that energy for electricity generation, water desalination, or the pumping of water into reservoirs.

The non-profit Oregon Wave Energy Trust funds independent research and development under the state's Oregon Innovation Council, fostering growth and evaluation of wave energy development potential on Oregon's shores.



Figure 19: Strong winds and waves on the Oregon Coast

Ocean Power Technologies recently selected Oregon for the first commercial-scale facility of its type in North America, which will generate approximately 1.5 MW of electricity off the Oregon coastal community of Reedsport.

As recognition of the state's leading position in this industry, Oregon was recently chosen by DOE/OE to host one of only two National Marine Renewable Energy Centers in the country to facilitate technology development, inform regulatory and policy decisions, and close key knowledge gaps.

BIOMASS FOR ELECTRICITY AND HEAT GENERATION

Biomass has long been a significant contributor to Oregon's energy mix. For decades, Oregon has been using these resources to provide fuel for the generation of electricity, production of heat, and manufacturing of fuels. Oregon has large amounts of biomass resources, which includes agricultural residues and waste, forest slash and mill residuals.

Biomass is used in Oregon to produce thermal heat for the forest products industry, heat and electricity at wastewater treatment facilities, and wood pellets that heat homes, schools and hospitals. The Oregon pellet manufacturing industry is a national leader in producing high quality engineered fuels.



Figure 20: Biomass in the form of wood chips

There are currently more than 45 industrial facilities that use woody biomass for energy production. These include electricity and heat produced at forest products industries such as lumber and paper mills. The energy is used to generate electricity, provide heat for drying kilns, or generate steam used for industrial process applications. Lower value materials are used as chipped fuel in industrial boilers to generate heat and electricity throughout the state.

A growing area of the bioenergy sector is in the production and use of biogas. Biogas is produced through the breakdown of biomass into methane that is used to produce electricity. Methane produced in the wastewater treatment process is captured and used to produce heat and electricity in at least 29 wastewater treatment facilities around the state.



Figure 21: Dairy operation in Oregon

Building on the early work by the Port of Tillamook Bay and various dairy operations, a number of projects are under construction and development to use manure and other agricultural wastes to generate electricity. These facilities address a waste management challenge while also generating renewable energy and reducing greenhouse gas emissions.

Landfills are another source of renewable energy from biogas. Landfills in Oregon have installed methane capture systems and use the gas to produce electricity and where possible, capture the heat for thermal applications such as food processing or heating greenhouses.

Biofuels

INTRODUCTION

Not only can plant and waste products be used to produce heat and electricity, biomass can also be used to produce alternative fuels or "biofuels." Biofuels provide opportunities for Oregon to become less dependent on fossil fuels.

Biofuels account for a growing part of the United States' and Oregon's transportation fuel mix. As a result of the 2007 Renewable Fuel Standard legislation passed in Oregon, more than one hundred retail stations in Oregon offer alternative fuels. Approximately 150 million gallons of biofuels are consumed each year in Oregon. Currently, about 40 million gallons per year are produced in Oregon.

TYPES OF BIOFUELS

Ethanol and biodiesel are the only two biofuels used in Oregon and in the Pacific Northwest, because both have defined product standards for modern motors.

ETHANOL

Ethanol is the most widely used biofuel in the United States. Nearly all of the current domestic ethanol production involves fermenting the starch fraction of corn, with 1 bushel of corn producing at least 2.8 gallons of ethanol.



Figure 22: Midwest Ethanol production facility

Ethanol is an alcohol that burns cleanly, producing fewer smog-forming carbon monoxide, nitrogen oxide, and greenhouse gas emissions than gasoline. Ethanol can also be produced locally.

Unfortunately, ethanol has only two-thirds of the energy of gasoline per gallon. This results in lower gas mileage. Ethanol cannot be transported through conventional oil pipelines along with gasoline, because it picks up excess water and impurities. As a result, ethanol needs to be transported by rail, trucks, or barges, which is more expensive and complicated than sending it down a pipeline. The greatest limit on ethanol is the availability of sugar and starch feedstocks.

ETHANOL AVAILABILITY IN OREGON

The state's first ethanol facility is located in Boardman. Pacific Ethanol began operations in October 2007 and produces 40 million gallons per year. Pacific Ethanol relies on corn imported by rail from the Midwest for producing Ethanol. Currently in Oregon, only blends of up to 10 percent (E-10) and 85 percent (E-85) ethanol can be sold. These are the only blends that meet Oregon-required American Society for Testing and Materials standards.

Ethanol is usually blended with gasoline and any gasoline engine can burn blends that contain low percentages of ethanol. However engines need some modifications to use fuel blends containing more than E10. The auto industry is making "flex-fuel" vehicles, which are capable of burning both regular gasoline and gasoline ethanol blends of up to E85.

OREGON ETHANOL FUELING LOCATIONS

There are a limited number of ethanol fueling locations in the state. Currently, motorists can fuel up with E10 and E85 in Aurora, Eugene, Milwaukie, Portland, and Salem.

BIODIESEL

Biodiesel is an alternative or additive to standard diesel fuel that is made from biological ingredients instead of petroleum (or crude oil). Biodiesel can be produced by combining any kind of oil or fat, including waste vegetable oils, virgin vegetable oils and animal fats with an alcohol (commonly methanol). It is non-toxic, renewable, and biodegradable**.** Because biodiesel essentially comes from plants and animals, the sources can be replenished through farming and recycling.



Figure 23: Oregon retail biodiesel fueling station

One of the great advantages of biodiesel is that it can be used in existing engines, vehicles and infrastructure with practically no changes. Biodiesel can be pumped, stored and burned just like petroleum diesel fuel, and can be used pure (B100) or in blends with petroleum diesel fuel in any proportion.

Blends are indicated by B##, which correspond to the percentage of biodiesel in the blended fuel. For example, a 20 percent blend of biodiesel with 80 percent diesel fuel is called B20. When biodiesel is first used in a vehicle, it may release fuel tank deposits which can lead to fuel filter plugging. After this initial period, a user can switch between biodiesel and petroleum diesel whenever needed or desired, without modification. Certain older vehicles built before 1993 may require replacement of fuel lines which contain natural rubber, as biodiesel can cause these lines to swell or crack.

Also, in some engines, there can be slight decrease in fuel economy and power**.** On average, there is about a 10 percent reduction in power - it takes about 1.1 gallons of biodiesel to equal 1 gallon of standard diesel. Other drawbacks include availability and cost.

BIODIESEL AVAILABILITY IN OREGON

Oregon uses 720 million gallons of diesel annually and about 11 million gallons per year of biodiesel. The state's largest producer of biodiesel, SeQuential Pacific Biodiesel, which is located in Salem, is capable of producing five million gallons annually. SeQuential opened at the end of 2008. In March 2010, the plant reached 82 percent capacity. At near capacity SeQuential still produces less than half of the biodiesel consumed in Oregon. The state imports more than 50 percent of its soy-based biodiesel from large producers from the Midwest. About 90 percent of the biodiesel produced in Oregon is processed from waste vegetable oil from restaurants.

OREGON BIODIESEL FUELING LOCATIONS



Figure 24: Biodiesel sold at the pump

There are certainly more fueling options for biodiesel in Oregon. Currently, motorists can fuel up with B5, B20, B99, and B99.9 blends at fueling locations in the cities of Astoria, Bend, Central Point, Coburg, Corvallis, Eugene, Gresham, Hillsboro, McMinnville, Medford, Mt. Angel, Lakeview, Phoenix, Portland, Salem, The Dalles, Terrebonne, Tigard, and Woodburn.

PROJECTED BIOMASS PRODUCTION CAPABILITY IN OREGON

Even though Oregon's biomass industry is a diverse and growing industry, the industry's future will rely on crop production. The average acre used for wheat or grass seed production can yield about 100 gallons of biodiesel if planted with canola or camelina.

Biodiesel or ethanol facilities that produce more than six billion British Thermal Units (BTUs) per day are subject to the State of Oregon siting process managed by EFSC. Six billion BTUs is equivalent to 18.6 million gallons per year of biodiesel or 28.8 million gallons per year of ethanol.

Table 4:1 summarizes the current known bioenergy facilities in the state. There are other facilities in Oregon that are small in scale and production or are not included in the data set. This information was gathered using surveys administered by ODOE.

TABLE 4:1 OREGON BIOENERGY FACILITIES			
TYPE OF FACILITY	**# OF FACILITIES**	**ANNUAL PRODUCTION**	**BIOMASS UTILIZED**
WOODY BIOMASS: Electric generating stations, steam plants, and co-generation facilities	>45	Electric Capacity of 238 MW plus unknown steam use for process and heat energy	>3.4 million tons of forest slash, mill residuals, pulping liquor, urban wood and yard debris
PELLET MANUFACTURERS	9	Approximately 550,000 tons of pellets capacity	802,000 tons of sawdust and wood residuals
ETHANOL & BIODIESEL	9	Approximately 36 million gallons of ethanol and over 4 million gallons of biodiesel	Current feedstock include corn, agricultural wastes, canola, and yellow grease
BIOGAS: Anaerobic digestion, not including wastewater treatment	3	Approximately 1.8 MW	>17 million gallons of manure and other wastes
BIOMASS HEATING: Schools, public buildings, other facilities	>5	Heat for buildings	Approx. 400 tons of wood chips or pellets
LANDFILL GAS	>4	>14 MW	Methane collection from landfill

There are also a number of facilities in the planning or construction phase. Table 4:2 contains a summary of planned facilities in Oregon.

TABLE 4:2 BIOENERGY FACILITIES PROPOSED IN OREGON			
TYPE OF FACILITY	**# OF FACILITIES**	**ANNUAL PRODUCTION**	**BIOMASS UTILIZED**
WOODY BIOMASS : Electric generating stations, steam plants, and co-generation facilities	~12	Electric Capacity of over 150 MW plus unknown steam use for process and heat energy	>1 million tons of forest slash, mill residuals, pulping liquor, urban wood and yard debris
PELLET MANUFACTURERS	2-3	Over 100,000 tons of pellets capacity	100,000 tons of sawdust and wood residuals
ETHANOL & BIODIESEL	2-3	Approximately 30 million gallons of ethanol and over 4 million gallons of biodiesel	Current feedstock include corn, agricultural wastes, canola, and yellow grease
BIOGAS: Anaerobic digestion, not including wastewater treatment	6	>6 MWh	>1 million gallons of manure and other wastes
BIOMASS HEATING: Schools, public buildings, other facilities	~8	Heat for buildings	Approximately 1,200 tons of wood chips or pellets

These numbers are estimates based on projects that have begun construction or permitting, have applied for state incentives or have expressed an interest in moving forward. These estimates will change as new projects will emerge and current projects may be postponed.

OREGON BIOMASS FEEDSTOCK GROWTH POTENTIAL

Based on estimates from biomass inventory and assessment studies conducted during the past decade, a range of 424-to-524 million gallons of gasoline-equivalent biofuel and other alternative transportation fuels could be produced each year from Oregon biomass feedstocks. This represents approximately 20-to-24.6 percent of Oregon's consumption of gasoline and diesel (2.172 billion gallons as of 2008).

If only waste sources of biomass were used, and no crops, 182-to-282 million gallons of gasoline-equivalent biofuels and compressed natural gas could be made from biomass waste in Oregon. This represents approximately 8-to-13 percent of Oregon's current consumption of gasoline and diesel.

TABLE 4:3
FUEL PRODUCTION FROM AVAILABLE OREGON BIOMASS

SOURCE	POTENTIAL FUEL VOLUME PRODUCED (millions of gallons of gasoline equivalent/yr)
FUEL FROM WASTE	
1. Forest residue	58 to 132 *(dependent on price paid)*
2. Agricultural residue (corn and wheat only)	13 to 32 *(dependent on price paid)*
3. Urban wood waste	11 to 19 *(dependent on price paid)*
4. Mill residues	1
5. Orchard and vineyard prunings	6
6. Grass straw residue	33
7. Greenwaste	18
8. Mixed Waste Paper	41
9. Biogas	0[1]
Total Fuel from Waste	182 to 282
FUEL FROM CROPS	
Expiring Conservation Reserve Program planted to biofuel feedstock	239
Existing crops	13
Total Fuel from Crops	252
TOTAL	**424** to **524**

INTEGRATING BIOFUELS INTO ENERGY EMERGENCY RESPONSE STRATEGIES

Both ethanol and biodiesel are renewable source of energy. Both can be produced domestically and can contribute to the lowering of U.S. and Oregon dependence on imported oil, increasing our energy security.

ODOE is in the process of inventorying all ethanol and biodiesel production facilities in the state. This includes information on the volume and storage capacities. While ODOE has information on larger biodiesel and ethanol producers in the state (producing more than 18.6 million gallons per year of biodiesel or 28.8 million gallons per year of ethanol), because of the state energy facility siting process, little is known about the small and seasonal biofuel producers in Oregon.

The goal of this data collection is to assist ODOE emergency planners and decision-makers in determining whether adequate resources are available in state to rely on ethanol and biodiesel for fueling emergency vehicles during fuel disruptions when conventional gasoline and diesel are unavailable.

Also, many critical facilities (hospitals) use diesel powered generators on-site for backup power in case normal electric service is interrupted. The ability of these facilities to continue operations depends on the capacity of the on-site generators and the available fuel supply. If adequate biofuels are accessible, diesel powered generators may be supplemented with alternative fuels to provide additional capacity and/or extend the fuel supply. This enables critical facilities equipped with backup generators to maintain normal or near normal operations for longer periods in case of a serious or extended power outage.

Renewable energy resources can add value to the entire emergency response effort by providing additional reliability and resiliency.

LOW CARBON FUEL STANDARD

The Oregon Legislature's adoption of House Bill 2186 in 2009 provides industry the incentive to build the necessary infrastructure to support an increase in biofuels production or at the very least increase imports into Oregon to meet demand. The Oregon Department of Environmental Quality (DEQ) is responsible for implementing the carbon fuel standard for transportation fuels. Oregon's standard would reduce the average amount of greenhouse gas emissions per unit of fuel energy by 10 percent from 2010 to 2020.

DEQ is in the process of setting up a registration system to start collecting data on biofuels in the first half of 2013. This includes collecting information on: 1) companies importing biofuels to Oregon; 2) types and volumes of biofuels imported into Oregon; 3) where the biofuels originate and end users; 4) how biofuels are transported; and 5) carbon intensity. This data collection will allow DEQ to establish a biofuels baseline before it develop a reduction program

and allows ODOE to determine if adequate alternative fuels exist to supplement emergency response strategies.

ESTABLISHED BIOFUEL FLEETS IN OREGON

Many large government fleets in Oregon already use alternative fuels. This includes the City of Portland, Multnomah County, and the State of Oregon. The City of Portland has used B-20 in many of their diesel vehicles since 2004.

In 2006, the Portland Water Bureau (PWB) began using B99 (99 percent biodiesel, 1 percent diesel) in its city-owned, diesel-powered vehicles and equipment from spring through fall and B50 (50 percent biodiesel, 50 percent diesel) in the winter. The biodiesel used by PWB is locally produced. The city's partners in the effort, Oregon-based Star Oil and SeQuential Pacific Biodiesel, blend and distribute the fuel, while regional farmers (from Oregon, Washington, Idaho, and Montana) grow the seed crops that eventually become the feedstock for B99. PWB's approximately 144 vehicles, ranging from backhoes and forklifts to dump trucks and tractors, run on B99.

Since 2002, Multnomah County has used biodiesel for its fleet. Multnomah County reported no capital costs, engine modifications, or changes to infrastructure have been required. Also, no significant performance issues have been experienced. Continued use is expected.

In 2003, the Oregon Department of Administrative Services (DAS) began replacing the state's fleet vehicles with flex cars, compressed natural gas vehicles, and hybrids. DAS currently uses B20 for diesel vehicles at state motor pools and E85 for flex cars.

Since 2004, the Oregon Department of Transportation (ODOT) committed to replacing its older fleet with hybrid vehicles in their sedans and dump and bucket trucks. ODOT also replaced its older light fleet with diesel engine vehicles using biodiesel. ODOT's fleet currently has 59 E85 vehicles and added two plug in hybrid electric vehicles. In addition, 24 percent of the ODOT fleet currently uses B-20 bio diesel and plans to reach 30 percent use by 2012. The department is also continuing to expand its use of ethanol with E10 and E85.

Smart Grid Technologies

INTRODUCTION

The term "smart grid" refers to a modernization of the electricity infrastructure to maintain a reliable and secure system that can meet future growth. It is characterized by a two-way flow of electricity and information that creates an automated, widely-distributed electricity network. It will monitor, protect, and automatically optimize the operation of its interconnected elements. This includes energy generators; the high-voltage transmission network and distribution system; industrial users and commercial building automation systems; energy storage installations; and residential consumers with their thermostats, electric vehicles, appliances, and other household devices.

Smart grid will incorporate information technology, sensors, and distributed computing to collect and analyze data to deliver real-time information. This information will be used to instantly match electricity demand with supply from all available sources, incorporating both traditional generation and wind, solar and electricity storage. The smart grid will enable a "just in time" balance of supply and demand at the device level.

SMART GRID BENEFITS

Potential smart grid benefits are numerous and are summarized below.

POWER RELIABILITY AND QUALITY – The smart grid provides a reliable power supply with fewer and briefer outages and higher quality power through the use of digital information, automated control, and autonomous systems. The smart grid is resilient, but when an outage does occur, it recovers faster in emergencies and limits the extent of outages.

SAFETY AND CYBER SECURITY BENEFITS - The smart grid continuously monitors itself to detect unsafe or vulnerable situations that could detract from its high reliability and safe operation. Cyber security features would need to be built into all systems and operations, including physical plant monitoring, and access control for confidentiality, integrity, and privacy protection of customer data.

ENERGY EFFICIENCY BENEFITS - The smart grid is more efficient, reducing energy consumption, peak demand, and energy losses in transmission and distribution systems. Such efficiencies can help to defer the construction of new centralized generation plants to meet electricity demand.

ENVIRONMENTAL AND CONSERVATION BENEFITS - A smart grid will aid in reducing greenhouse gases and other emissions by managing the network to access efficient and low-emission energy sources, reliably integrating variable renewable energy sources, and enabling the replacement of gasoline-powered vehicles with plug-in electric vehicles.

DIRECT FINANCIAL BENEFITS - While smart grid developments require capital investment, programs would be designed so that benefits outweigh costs over a suitable time period. Customers will have pricing choices and access to energy information to manage energy use for financial benefit. Entrepreneurs will accelerate technology introduction into the energy generation, distribution, and storage markets.

INTEGRATION OF RENEWABLE ENERGY RESOURCES - Smart grid enables the integration of variable renewable energy resources, such as wind, hydro, and solar energy, to supply power to the grid when the energy is available. Traditionally, the problem with some sources of renewable energy, particularly wind and solar energy, has been that they may supply power intermittently causing rapid power fluctuations on the grid. When the variable energy resource is not available, other sources must be ready to meet demand. Alternatively, to maintain system reliability, demand must be reduced to match the available supply.

The smart grid will enable a variable energy supply and maintain system reliability by monitoring and predicting variable supply resources. It will be able to automatically bring in other power supply resources to meet demand, or reduce load to match the supply. The smart grid will use sensors and dynamic line rating systems to enhance the visibility and monitoring of the transmission grid, and to maintain and potentially improve its reliability in the presence of large variable sources of electricity. Modern computing applications will receive and analyze real time information and perform modeling, decision-making, and control actions. Instead of control devices operating independently based on local measurements, networked smart grid applications will analyze data from multiple devices, allowing broader and more coordinated operations that adapt to actual situations and stabilize the grid.

The smart grid also enables the ability to address transmission congestion created by insufficient transmission capacity. By managing congestion, the smart grid can ensure that remotely located wind generation is not constrained from reaching load centers.

SELF-HEALING POWER GRID - "self-healing" means that the grid detects problems in real time, isolates the problem, and keeps the grid operating. Currently, power grids may experience cascading failures in emergency situations where outages are poorly contained. The technologies for containing cascading failures continue to dramatically improve. The smart grid may improve the evaluation of power system behavior in real time; prepare the power system to withstand credible combinations of contingencies; prevent wide-area blackouts; and accommodate fast recovery from emergency to normal conditions. The smart grid will utilize fast-simulation and modeling tools to gather information, make decisions and control actions. The tools will be located in a combination of central and widely distributed positions.

In an emergency outage situation, the self-healing smart grid provides the capability to isolate the problem areas while keeping the rest of the grid operating and avoiding cascading failures. The problem areas can be repaired and restored with minimal impact on the wider area.

SMART GRID APPLICATIONS

The following applications of smart grid are examples of how smart grid technology can be used. A smart grid must be *designed* to run desired applications. Potential smart grid deployments include:

DISTRIBUTION GRID MANAGEMENT: Distribution power systems consist of hundreds of distribution feeders and thousands of distribution transformers that supply millions of customers. They also contain a large number of locally and remotely controllable devices. Distribution power systems are large and complex systems to control. Basic modernization that includes distribution automation and control systems as well as smart grid technologies will enable distribution systems to be more fully automated, capable of self-healing, and optimized to reduce losses.

OUTAGE MANAGEMENT AND RECOVERY: Smart grid technologies can significantly enhance outage detection, providing near instantaneous detection, a capability not currently available to distribution system operators. Information will be available on when and where outages have occurred, and will contribute to determining causes of outages. Recovery time will be minimized and outages will have reduced impacts on consumers.

VOLTAGE OPTIMIZATION-CONSERVATION: Many loads operate more efficiently at lower voltage. With voltage optimization, voltages are optimized to loads, so that they operate as efficiently as possible with minimal disruptions. Smart grid equipment on the system, such as distributed sensors, control capacitors, and regulators will provide capabilities to optimize voltage. Advanced metering will provide voltage information on the consumer premises.

DEMAND RESPONSE: With peak demand pricing, advanced metering infrastructure, energy management capability, and smart appliances, consumers can take advantage of "prices to devices." This concept enables consumers to take control of their electricity use when prices rise during peak demand periods. Consumers will pre-program their energy management systems or smart appliances to operate within selected price and performance levels. When high prices arrive, the system reacts automatically as directed by the consumer, by turning equipment down, stopping operation of certain functions or not operating at all.

SMART GRID TECHNOLOGIES RESEARCH IN OREGON

Oregon recognizes that the use of smart grid applications can enable a more rapid restoration of power after outages and help build resiliency, enhance reliability and security, and reduce risk and vulnerability. Applying smart grid technologies into the energy infrastructure in Oregon is in the initial planning stages.

Oregon is researching a variety of smart grid technologies that could possibly be used to improve the resiliency of its electric delivery infrastructure and support the deployment and penetration of renewable resources. The goal is that during power outages, Oregon's electric utilities could implement smart grid applications to accomplish the intelligent routing of electricity to serve customers in a prioritized manner.

Oregon's electric distribution feeders provide service in only one direction, from the substation (source) to the customer (load). Most feeders also contain switches that allow certain customers or segments of feeders to be transferred to a different feeder during outage conditions. This switching process is manual and causes customers to be "dropped" momentarily and then "picked up" by the second feeder. Traditionally, such operations are often limited since there is usually insufficient time to analyze whether the second feeder has the capacity to serve additional electric demand. Since the number of protective devices on any given feeder has been historically limited by economic considerations, the strategy often results in the curtailment of service to customers that are served by unaffected equipment.

Smart grid can augment the manual process that is in use in Oregon today with one that is high-speed and to some degree, automatic (Distribution Automation or DA). DA provides an automated response to feeder line faults by using an analytical assessment, direct automatic feeder sectionalizing and restoration. After the system detects a line fault, it determines its location, and opens the nearest available switches during a tripped state of the fault-clearing recloser or breaker. This automatically isolates the faulted segment from the rest of the feeder. Afterward, the system automatically closes switches to restore power to unfaulted distribution feeder segments. This sequence of events is considered to be self-healing since it occurs automatically. The validation process, which confirms the faulted distribution feeder segment, is a critical step and must precede any automatic restoration.

NEXT STEPS FOR SMART GRID INTEGRATION

It is clear that smart grid technologies could improve electric reliability, reduce customers' cost of outages, reduce electric production costs, reduce system losses and associated financial benefits to utilities and consumers. However, it will take time and is not without its costs.

Oregon is in the process of developing uniform integration standards and policies for smart grid considerations. OPUC first consulted with the states of California, Colorado, Illinois, New York, Texas, and the District of Columbia, to research different approaches to applying smart grid technologies around the country. In the fall of 2010, OPUC drafted a Smart Grid Straw Proposal and initiated discussions with the utilities in the state. Based on feedback from the utilities as well as input received at public meetings and workshops, OPUC established guidelines for developing "Utility Smart Grid Plans." OPUC guidelines recommend utilities address the following issues in their respective Smart Grid Plans.

- Access, Control, and Use of Customer Information
- Opt in, Opt out, or Mandatory Program Participation
- Treatment of Obsolescence Risk
- Utility Energy Management in Customer's Home or Business

On May 25, 2011, commissioners issued an interim Order to develop a process for staff and utilities to gather necessary information to establish planning guidelines and make policy decisions on smart grid. For copies of the guidelines and to track smart grid progress in Oregon, go to OPUC's website at www.oregon.gov/PUC/.

OPUC and state utility operators actively support current standards and guidelines of the North American Electrical Reliability Corporation involving Critical Infrastructure Protection and Cyber Security Safeguards. OPUC also conducts annual audits of investor owned energy utilities to ensure cyber security issues and concerns are addressed and resolved.

NEXT STEPS FOR INTEGRATING RENEWABLE RESOURCES

The role of renewable resources in emergency planning is not yet clear. Renewable resources provide significant benefits by reducing the environmental footprint of electricity and fuel production. Renewable energy developments are also considered a sustainable long-term investment in a naturally-replenished resource rather than a finite one. Of particular interest in emergency planning, renewable resources may be scalable. They may be available as small-scale distributed generation rather than central power developments far from communities in need. Also, the fuel (the renewable resource) would continue to be available when roads and traditional supply routes are not. In these roles, renewable energy generators may provide energy emergency managers with an opportunity to provide power to emergency services when needed during an event.

The first step to support the integration of renewable resources into the electrical grid is to ensure that transmission capacity exists and balancing can be managed. BPA, which owns and operates three-quarters of the Pacific Northwest's high-voltage transmission, plays a vital role in facilitating the integration of renewable resources into the region's transmission system. With wind generation reaching an all-time peak of 3,006 megawatts in February 2011 and anticipated 5,000 to 6,000 megawatts by 2013, BPA and other utilities have project proposals underway to increase load capacity. Not only will there be an increasing volume of new renewable generation dispersed across the state, but the variability of the energy production requires significant attention to balancing – unlike conventional power developments where dispatchable power is predictable and controlled.

RW Beck completed the Oregon Distributed Energy Resiliency Study to assist the state to identify opportunities to improve energy resilience through the design and integration of distributed renewable energy investments into the existing energy network. This study considers how new technologies, including renewable energy resources, could provide local energy generation to communities and emergency service providers during energy emergencies when their energy network supply may possibly be disrupted. See Appendix K in this plan to review the executive summery. The complete study is posted on ODOE's webpage at www.oregon.gov/ENERGY.

CYBER SECURITY

As Oregon's smart grid investments and initiatives increase, cyber security, a key component of energy assurance, will become more crucial. Because smart grid relies on information communication, cyber vulnerabilities can equate to smart grid vulnerabilities, which in turn lead to vulnerabilities in the entire energy supply system.

Cyber security falls under Emergency Support Function (ESF) 2, the communications sector. In Oregon, OPUC and Oregon Emergency Management are the primary state agencies responsible for planning, preparedness, response, and recovery from cyber security breaches in the state.

Cyber security includes preventing damage to, unauthorized use of, or exploitation of electronic information and communications systems and the information contained therein to ensure confidentiality, integrity, and availability. Cyber security also includes restoring electronic information and communications systems in the event of a terrorist attack or natural disaster.

Oregon will consider a cyber security strategy that takes into account information on impacts, vulnerabilities, and threats to produce a risk assessment. This includes addressing deliberate attacks, such as those launched by disgruntled employees, industrial espionage, and terrorists as well as preventing inadvertent compromises of the information infrastructure due to user errors, equipment failures, and natural disasters.

Chapter 5

Types of Energy Emergencies

OREGON STATE ENERGY ASSURANCE PLAN

INTRODUCTION

During any given year, Oregon faces a variety of energy supply disruptions. When these disruptions are limited in scope, and addressed quickly by energy providers, they are barely newsworthy. If, however, these disruptions extend over wide areas and last more than several hours they may become “energy emergencies” requiring the intervention of government agencies.

The term "energy" includes producing, refining, transporting, generating, transmitting, conserving, building, distributing, and maintaining energy systems and system components. "Energy resources" includes electricity, natural gas, gasoline and middle distillates, coal, wood fuels, geothermal sources, and any other resource yielding energy.

CHARACTERISTICS OF ENERGY EMERGENCIES

In general, an energy emergency exists whenever supplies of fuels or electricity are inadequate to meet demand. Shortages and disruptions can result from many factors. Threats to the energy infrastructure include:

- SEVERE WEATHER CONDITIONS: Winter storms, wind storms, drought, and heat waves could stress the energy system as sudden or unexpected surges in demand cannot be met by actual or expected supply levels. Wind storms and freezing rain can also disrupt electrical supply and distribution and hamper transportation.

- NATURAL DISASTERS: Floods, earthquakes, and tsunami conditions could reduce supply, disrupt distribution, and cause physical destruction of energy systems and/or components. A severe earthquake is likely the Pacific Northwest’s most catastrophic event and is examined more fully in this chapter.

- ENERGY INFRASTRUCTURE EVENTS —Spikes in demand during peak energy use, unanticipated power plant or refinery shutdowns, transmission system congestion, and equipment and system failures could result in the reduction of supply and disrupt distribution.

- NATIONAL SECURITY EVENTS: Acts of terrorism, cyber attacks, and sabotage could result in the physical destruction of energy systems and/or components, increase demand for fuels, and also reduce the fuel supplies available to the United States.

- POLITICAL FACTORS — Oil embargos, war, and the mobilization of defense resources could create a sudden surge in demand. These events could also reduce the fuel supplies available to the United States.

- MARKET RELATED EVENTS – A sharp, sudden escalation in the price of energy products could result from a curtailment of supplies and stocks. These conditions could reduce demand for conventional energy resources.

ENERGY INFRASTRUCTURE PROTECTION

Protecting the critical energy infrastructure is the shared responsibility of the private sector and local, state, and the federal government. "Critical" infrastructure is infrastructure that, if disrupted, would significantly impact public health and safety, the economy, and/or national security. Any prolonged interruption of the supply of basic energy - whether it is petroleum, electricity, or natural gas products - could pose considerable harm to Oregonians, our environment, and the state's economy.

FEDERAL, STATE, LOCAL, AND PRIVATE INDUSTRY PARTNERSHIPS

No single government agency, industry group, or company can secure the entire energy infrastructure from every hazard or threat. Collaboration at all levels is essential to securing an interdependent infrastructure that is owned, operated, hosted, and regulated by many entities.

The state is partnering with DOE/OE and the private sector to coordinate critical energy infrastructure protection and resiliency efforts. This includes mitigating energy emergencies, identifying Oregon's critical energy infrastructure, and protecting the state's energy assets. USDOE recognizes the major role Oregon and other states play in developing policy and practices to protect energy assets within and beyond their borders as well as a states' central role in preparing for and responding to energy shortages, disruptions, and emergencies.

As the lead federal agency, USDOE has established liaisons with state agencies in each state responsible for preventing and responding to energy disruptions. The overall goal is to have a robust, resilient energy infrastructure in which continuity of business and services is maintained through secure and reliable information sharing, effective risk management programs, coordinated response capabilities, and trusted relationships between public and private partners at all levels of industry and government.

Earthquakes

OREGON STATE ENERGY ASSURANCE PLAN

INTRODUCTION

The Portland metropolitan area and surrounding vicinity has been the most seismically active region in Oregon. Six earthquakes of magnitude 5 or higher have occurred within the greater Portland area within the last 150 years, including a 5.6 magnitude earthquake near Scotts Mills in 1993 and two 6.0 magnitude earthquakes near Klamath Falls later that same year. These occurrences and an extensive geologic record of seismic activity indicate that Oregon will someday experience a catastrophic earthquake. Oregon Department of Geology and Mineral Industries (DOGAMI) is collaborating with ODOE and OPUC on earthquake risk studies to the energy sector and various reports on this topic will be available in the future.

OREGON CRITICAL ENERGY INFRASTRUCTURE HUB

A concentration of Oregon's critical energy infrastructure is located in the heart of the high seismic hazard area along an eight mile stretch of the lower reach of the Willamette River in northwest Portland. This includes marine oil terminals, fuel tank farms, liquefied natural gas, natural gas, and power transmission systems. This Critical Energy Infrastructure Hub (CEI Hub) for the state sits on top of very poor soils that are highly susceptible to earthquake-induced permanent ground deformation.

More than 90 percent of Oregon's refined petroleum products come from four refineries located in the Puget Sound area of Washington State. The refineries transport product to Oregon by pipeline and marine vessels. Product enters the state at the CEI Hub before this fuel is distributed throughout Oregon to the end user, which includes the Portland International Airport. In addition, critical high voltage transmission lines and distribution substations sit at the river crossing in the CEI Hub. Liquid fuel and natural gas pipelines and transfer stations are also located at the CEI Hub.

TYPES OF EARTHQUAKES

DOGAMI confirms that Oregon and the city of Portland face danger from two types of earthquakes. They include Crustal earthquakes and the Cascadia Subduction Zone earthquakes. Both types could produce widespread damage and have potentially significant consequences.

CRUSTAL EARTHQUAKES

Crustal earthquakes are produced by shallow faults as deep as 15 miles below the surface. The Portland Hills Fault falls under this category of crustal earthquakes. The Portland Hills Fault runs from north of Forest Park, goes along the foot of Portland's West Hills and beneath Portland State University, then crosses the Willamette River and heads southeast to Milwaukie. The Portland Hills Fault can result in an earthquake of magnitude 7 and intense shaking.



Figure 25: Portland Hills Fault runs from north of Forest Park and along the Portland West Hills and crosses the Willamette River

The duration of the event would be 20-30 seconds, but the ground shaking and damage can be intense because of the fault's proximity and local soil conditions.

CASCADIA SUBDUCTION ZONE

The Pacific Northwest's extreme disaster is a magnitude 9 earthquake on the Cascadia Subduction Zone, which would produce minutes of strong ground shaking, coastal subsidence, landslides, liquefaction, lateral spreads, and a coastal tsunami. Much of Oregon's infrastructure has not been designed to tolerate these extreme conditions.

The Pacific Northwest sits on a convergent continental boundary, where two tectonic plates are colliding. This boundary is called the Cascadia Subduction Zone. The Cascadia Subduction Zone is a 600 mile-long fault where the Juan de Fuca and North American plates converge and the heavier Juan de Fuca Plate plunges, or subducts, beneath the as it heads eastward. The two plates are converging at a rate of about one to two inches per year, which causes stress to accumulate. Earthquakes are caused by the abrupt release of this slowly accumulated stress.

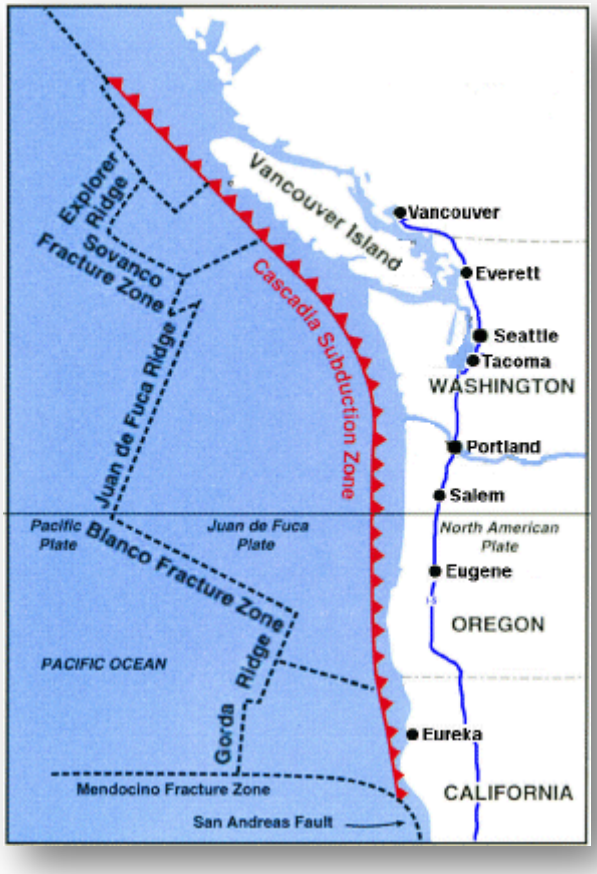


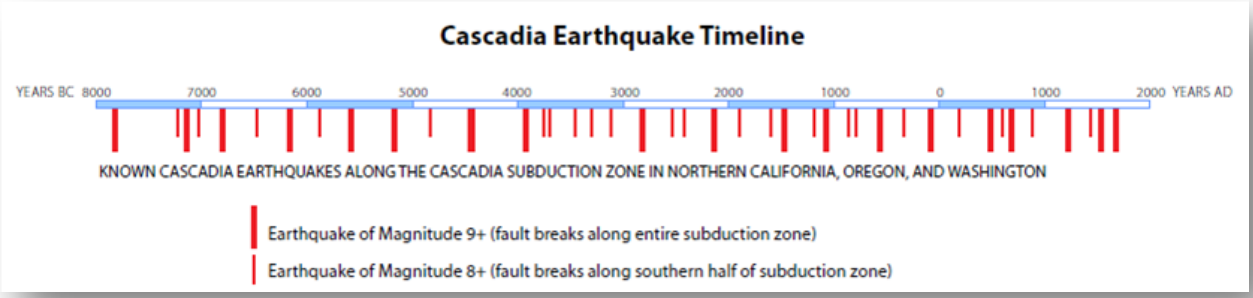
Figure 26: 600 mile-long Cascadia Subduction Zone Fault

The fault runs parallel to the coasts of British Columbia, Washington, Oregon and northern California. Evidence shows that the plates are sticking as they pass each other, building up tremendous pressure that could be unleashed in a magnitude 9 earthquake.

Similar subduction zones have produced the two largest recorded earthquakes in the world. This includes a magnitude 9.5 quake on the coast of Chile in 1960 and a magnitude 9.2 quake in southern Alaska in 1964.

No quakes of that size have been measured in Oregon's brief recorded history, but many lines of evidence, such as buried coastal marshes, indicate that such events occurred 41 times in the past 10,000 years *(see timeline)*. They strike, on average, about every 250 years -- occurring as close as 30 years apart and as far as 580 years apart according to recent data. The last megaquake hit the Pacific Northwest in January 26, 1700.

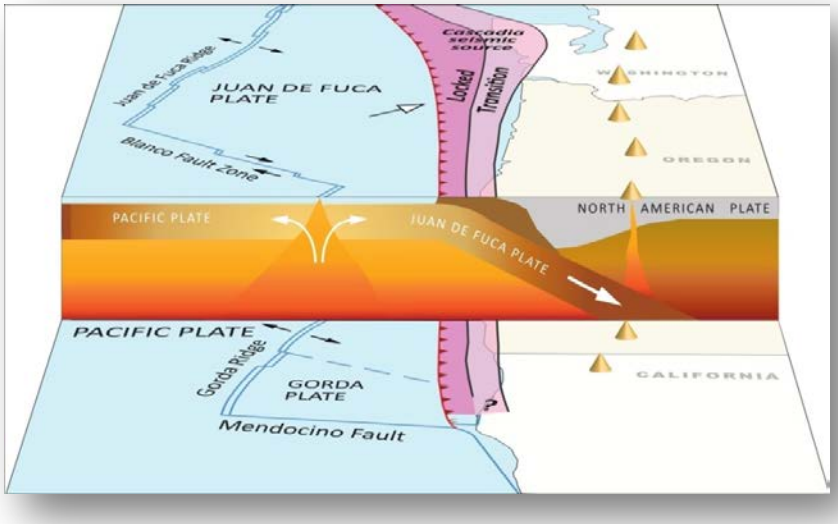
Figure 27: Cascadia Earthquake Timeline



Unlike the crustal earthquakes that produce shaking for a minute or less, subduction-zone quakes produce shaking that can last four or five minutes and deadly tsunamis as high as 30 to 50 feet. The 1964 Alaska quake generated a tsunami that killed four children at Oregon's Beverly Beach and 11 people in Crescent City, California.

Figure 28: Cascadia Subduction Zone Fault

Not only would coastal communities be severely impacted, but towns and cities as far inland as the Willamette Valley and the Puget Sound area would feel the effects of such lengthy shaking. In Oregon alone, researchers have estimated that such a quake could cause billions in damages and kill 5,000 people.



Earthquake Risk Study

It is clear that earthquake impacts to the CEI Hub could adversely affect energy lifelines. Consequently, it is critical for emergency planners and decision-makers to gain a better understanding of the seismic hazards, vulnerabilities, and consequences if the CEI Hub was compromised. The goal is to minimize direct earthquake damage to the CEI Hub and ensure a rapid recovery of the state's energy supply and distribution systems.

As a result, DOGAMI is conducting an earthquake risk study for Oregon's CEI Hub in Portland. The study assesses the seismic hazards, vulnerabilities and potential impacts to the energy sector facilities and systems, and possible impacts to the State of Oregon.

SEISMIC HAZARDS

DOGAMI's study confirms that the Portland Hills Fault and the Cascadia Subduction Zone earthquakes can trigger the following seismic hazards.

- GROUND SHAKING - The U.S. Geological Survey reports that extensive ground shaking is expected for western Oregon from the Cascadia fault. The figure below shows Oregon's ground shaking seismic hazards with higher expected shaking levels represented by the red colors (darker, if viewed in black and white). For the CEI Hub, strong ground shaking is expected to last for one to two minutes from a Cascadia earthquake. This prolonged duration of shaking would produce significant damage, particularly in areas of weak soils and weak infrastructure.

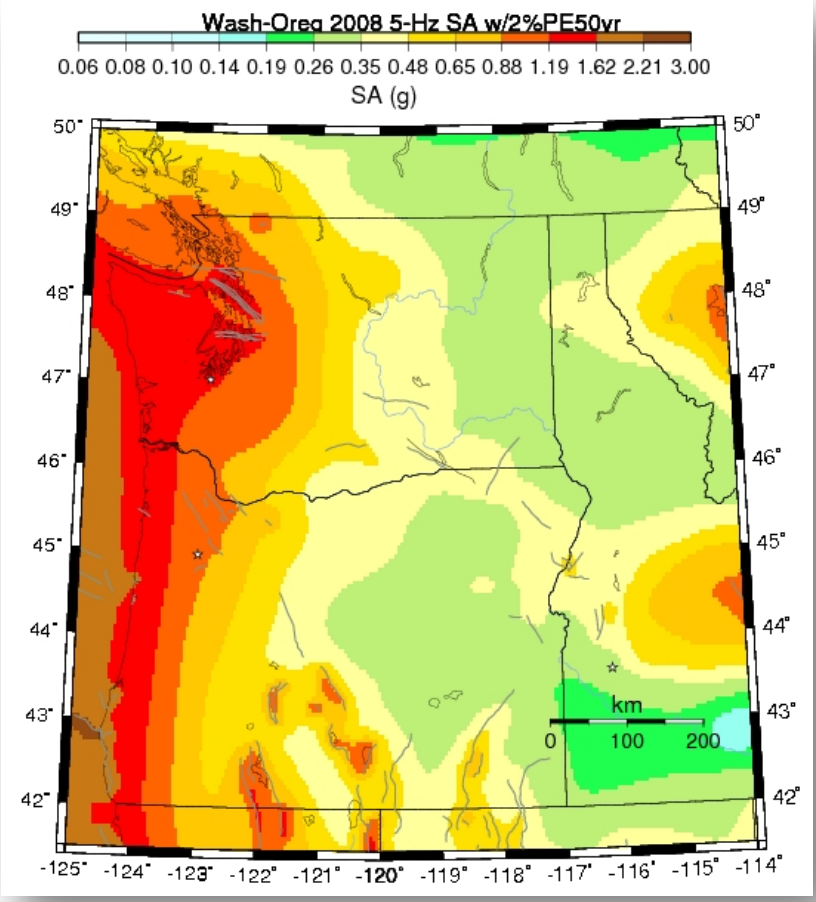


Figure 29: Ground shaking map
http://earthquake.usgs.gov/hazards/products/conterminous/2008/maps/wus/pacnw/3hzSA.OrWa.jpg

LIQUEFACTION - Liquefaction occurs when ground shaking agitates loose, water-saturated, sandy soils and results in liquefied soils. As a result, buildings can sink several feet into the ground and buried pipes can float to the ground surface. The CEI Hub is adjacent to the Willamette River and has extensive deposits of highly liquefiable soils. These soils have been naturally deposited by river activity as well as from manmade activities such as from river dredging.

LATERAL SPREADING - Lateral spreading occurs when the ground permanently moves laterally due to earthquake shaking. Lateral spreading is common along river fronts because river deposited soils are often weak and water-saturated. Lateral spreading can occur on gentle slopes and even on flat ground. The CEI Hub has extensive deposits of soils highly susceptible to lateral spreads.

LANDSLIDES - Landslides are land masses that move down hill and result in permanent ground deformation. Earthquakes can trigger landslides due to the ground shaking over a wide region and cause extensive damage. The CEI Hub area has several mapped landslides. This includes debris flows from the West Hills and rock falls and slumps along Highway 30. These mapped landslides are assumed to be triggered from rainfall events and not by earthquake activity.

CO-SEISMIC SETTLEMENT - Co-seismic settlement is where the ground surface is permanently lowered due to seismic shaking and occurs in certain types of soft, loose soils. The CEI Hub area has soils that are generally susceptible to co-seismic settlement. In some places, settlement could be on the order of a few inches or more. When soils experience uniform settlement, structures are often unharmed. However, when soils experience differential settlement, structures can incur damage.

BEARING CAPACITY FAILURES - Bearing capacity failures can occur when, during shaking, the foundation soils cannot support the structure that they are intended to support. This occurs when the subgrade soils have not been engineered and constructed adequately. The CEI Hub area has soils that are generally susceptible to co-seismic bearing capacity failures. When soils experience differential settlement, structures can tilt and incur damage.

SLOSHING - Sloshing occurs when liquid becomes agitated by ground shaking. Sloshing in tanks has produced damage from distant earthquakes. The CEI Hub has numerous tanks with liquid fuel and other products that are susceptible to sloshing. Waves and splashing of liquids can overtop and/or damage tanks.

SEICHES - Seiches are waves that oscillate in water bodies and can be initiated by ground shaking. Seiches can vary from minor (inches in height) to over ten feet and last up to hours. The Willamette River in the CEI Hub area could experience a seismically-induced seiche.

FIRES - Fires are often triggered as secondary effects from earthquakes. Numerous potential ignition sources are available in the CEI Hub area. Certain types of fires, such as fires with predominately petroleum fuel or transformer PCBs require advanced fire specialists to contain.

HAZARDOUS MATERIAL RELEASES - Hazardous materials are often released during earthquakes. Numerous potential sources for possible uncontrolled hazardous material releases exist in the proximity of the CEI Hub both onsite and at nearby energy facilities. These materials can pose different types of hazards. This includes corrosive, explosive, combustible, poisonous, and/or toxic risks. A few examples are: petrochemicals, liquefied natural gas, chlorine gas, and anhydrous ammonia.

ENERGY FACILITY AND SYSTEM VULNERABILITIES

Onsite meetings and tours were conducted at all relevant energy facilities in the CEI Hub to evaluate seismic vulnerabilities. The petroleum companies visited include: BP Terminal, Chevron Terminal, Conoco Phillips Terminal, KinderMorgan Terminal and Pipeline Company, McCall Oil Terminal, NuStar Terminal, and Shell Terminal. Key components evaluated include tank farms, marine docks, interconnecting pipelines, tank truck loading/off-loading racks, rail car loading/unloading racks, containment and drainage control areas, control rooms, and lube oil and additive blending facilities.

Onsite visits were also made to natural gas and utility companies in the CEI Hub. They include: Northwest Natural, Williams Northwest Pipeline, PGE, and BPA. No PacifiCorp facilities reside in the CEI Hub so no visits were made. Key components evaluated at the electrical facilities include electric substations that feed into the region's power grid. Substations include control buildings with control equipment and back-up batteries, transformers, circuit breakers, and bus structures. The power system also includes transmission lines and transmission towers. The natural gas system includes gate stations, transmission and distribution pipes, and an LNG terminal, which includes tanks, liquification and gasification processing equipment, and control equipment.

The study showed that the energy facilities and systems across the petroleum, electricity, and natural gas sectors vary to a great extent. Some facilities have infrastructure that range from about 100 years old and were built to no or very antiquated standards to new and built to the current state-of-practice standards. Because of the wide range of ages and associated construction practices, the seismic vulnerability of the facilities also spans a wide range.

Based on visual observations, engineering judgment and limited information from the facility operators, DOGAMI's study confirmed that major seismic vulnerabilities exist in the CEI Hub. Some critically important structures appear to be highly susceptible to significant damage in a major earthquake. In contrast, some structures are expected to have adequate seismic performance. All of the facilities in the CEI Hub are vulnerable to the seismic hazards described above.

SECTOR SPECIFIC FINDINGS

PETROLEUM

The CEI Hub petroleum facilities receive liquid fuel by pipeline and marine vessels. In general, 75 percent of the refined petroleum product is transported by pipeline and the remainder by tankers or barges. The transportation method and amounts do vary depending on product need, transportation costs, weather and other conditions. The liquid fuel pipeline was largely constructed in the 1960s when the regional seismic hazards were unknown and state-of-practice construction techniques at that time did not include any reference to seismic standards. The regional seismic hazards are now known to be significant and the soils at the river crossings are susceptible to liquefaction and lateral spreading. The 1960s vintage pipeline design did not consider ground movements from lateral spreading at river crossings or the stresses to the pipelines induced by earthquakes that may cause pipe damage and multiple breaks. A pipe break would have a significant impact on all of the petroleum facilities in the CEI Hub and could result in a statewide fuel shortage.

The navigational shipping channel from the Columbia River mouth to the lower Willamette River is used to transport fuel by marine vessels. The Columbia River mouth is expected to have tsunami damage and the channel is expected to experience slope failure, which would close the channel to traffic. It is possible that bridges and other river crossings, such as buried gas pipelines and electrical crossings, would be damaged and temporarily block the waterway. Closure of the shipping channel would prevent marine vessels from delivering liquid fuel and emergency response and recovery equipment.

All of the port facilities in the CEI Hub have significant seismic risks due to liquefaction, lateral spreading, and seiches. Some older piers were constructed without any seismic protection, have deteriorated, and are likely to fail in even a moderate earthquake. If oil products are released and contaminate the navigable waterway, the waterway may be closed to river traffic, thus impeding emergency response activities as well as the supply chain. The local capacity to fight fires and clean hazardous material spills is limited.

Only three existing tanks are known to have addressed liquefaction vulnerabilities. The fuel terminals in the CEI Hub on average have a three to five day supply in the tank farms for regular unleaded gasoline and diesel fuel. Premium gasoline is subject to the daily delivery and heavily dependent on whether the intercompany pipeline on Front Avenue is operational. If the supply chain is disrupted by pipe breaks north of the CEI Hub and closure of the shipping channel to the west, fuel would quickly become scarce. Options to transport fuel from the east and south and by air are limited.

Portland International Airport (PDX) receives 100 percent of its liquid fuels from a terminal in the CEI Hub. PDX has a limited onsite fuel supply. If the pipeline between the CEI Hub and PDX fails, then PDX would likely experience a shortfall and operations would be impacted.

NATURAL GAS

Oregon's largest natural gas service provider receives the majority of their natural gas from pipelines that cross under the Columbia River between Washougal, Washington and Troutdale, Oregon. One of the natural gas pipelines crosses under the Willamette River at Multnomah Channel near their gate station at the southern end of Sauvie Island. The soils at these river crossings are subject to liquefaction and lateral spreading. The pipes are 1960s vintage and constructed without seismic design. The consequences of potential pipe failures could be major for natural gas service territories and Oregon. The natural gas company's storage capacity is limited and pipe breaks could lead to a natural gas shortfall in the state as well as explosions or fires.

ELECTRICITY

Electrical facilities and systems have significant seismic risk due to ground shaking and ground failure, including liquefaction and lateral spreading. Seismically vulnerable facilities include substations and transmission towers in the CEI Hub as well as facilities outside of the CEI Hub, including power plants, substations and transmission lines, all which are important for distribution.

Major vulnerabilities in the CEI Hub include the control buildings, transformers and other electrical equipment in yards at the substations, and transmission towers near the Willamette River. Damage is likely to occur to both the transmission system and the distribution system in the CEI Hub. Damage to the electrical grid will likely result in a blackout in the CEI Hub and elsewhere.

Bonneville Power Administration (BPA) has conducted a comprehensive seismic vulnerability study and implemented a long-term seismic mitigation program. This includes seismic strengthening of substation yards, including anchoring and bracing high-voltage equipment to withstand earthquake motions. These mitigation techniques will improve the reliability of seismic performance.

BPA studies also indicate that transmission system failure due to a magnitude 9 Cascadia earthquake would require between 7 and 51 days to make emergency damage repairs to the transmission system in Oregon and Washington. This scenario assumed many ideal conditions, which includes BPA employees and contractor resources are immediately available to make repairs as well as all roads and bridges are passable and adequate fuel is available to support recovery operations.

BPA has conducted subsurface, liquefaction and lateral spreading analyses at one of the transmission tower sites at the Willamette River crossing. The analysis concluded that severe ground movement up to 25 feet towards the river channel is possible resulting in extensive damage to transmission towers. As a result, power lines could temporarily block river traffic, including the pathway to the oil terminals. BPA anticipates mitigation on these transmission towers to be completed by 2014.

RECOMMENDATIONS

DOGAMI makes four recommendations to both private and public energy sector stakeholders to improve energy sector resiliency in Oregon.

1. Energy sector companies should conduct Seismic Vulnerability Assessments on all of their systems or facilities, and should work with the appropriate local, state, tribal and federal government agencies and stakeholders to achieve timely completion of the assessments to understand existing vulnerabilities.

2. Energy sector companies should institutionalize long-term seismic mitigation programs, and should work with the appropriate local, state, tribal and federal government agencies and stakeholders to achieve timely and effective mitigation to ensure facility resilience and operational reliability.

3. The State of Oregon's Homeland Security Council should review the vulnerability and resilience of the energy sector to earthquakes and other natural disasters within the scope of their mission. This could involve partnering with ODOE, OPUC, DOGAMI, ODOT, Building Codes Division, and the Oregon Seismic Safety Policy Advisory Commission (OSSPAC).

4. Energy sector companies and the State of Oregon should build Oregon's seismic resilience to a Cascadia earthquake. Adopting pro-active practices and a risk management approach will help achieve seismic resilience. Encouraging a culture of awareness and preparedness concerning the seismic vulnerability of the energy sector including long range energy planning should be conducted.

The Earthquake Risk Study will assist emergency planners to design realistic earthquake drill scenarios to test plans and procedures in response to energy emergencies to ensure program readiness. The findings in this report will also assist the state to develop long-term risk management strategies for improved energy assurance and resiliency. A copy of the Earthquake Risk Study is available on OPUC's website at www.oregon.gov/PUC.

Chapter 6

Overview of Energy Sector-Specific Emergency Response Plans

OREGON STATE ENERGY ASSURANCE PLAN

INTRODUCTION

Despite efforts to reduce risk and implement mitigation measures to limit vulnerabilities to Oregon's energy lifelines, emergency planners and decision-makers recognize that it is impossible to plan for every contingency. Emergencies will occur. ODOE and OPUC developed and maintain sector-specific energy emergency response plans to prepare for, respond to, and recover from fuel, natural gas, and electricity emergencies. The goal is to protect public health and safety, the environment, and the region's economy.

AUTHORITY

In the event of an energy emergency, the Governor directs the state's overall response effort to protect public health and safety, the environment, and the region's economy. ORS Chapter 401, Section 035 states "the Governor is responsible for the emergency services system within the State of Oregon."

ORS Chapter 176, Section 785 authorizes the Governor to declare a state of emergency when he determines there is an existing or imminent severe disruption in the supply of one or more energy resources. The severe disruption can originate in Oregon or elsewhere. The Governor may by proclamation declare a state of emergency exists with regard to such resources only after consultation with the President and majority and minority leaders of the Oregon State Senate and the Speaker and majority and minority leaders of the Oregon State House of Representatives. In the proclamation, the Governor will cite with specificity the nature of the severe disruption in the supply of one or more energy resources.

OREGON DEPARTMENT OF ENERGY

ORS Chapter 176, Section 809 authorizes ODOE to develop and maintain the Oregon Petroleum Contingency Plan to maintain emergency services, continue productivity and reduce hardship during a severe fuel oil shortage or any other emergency threatening the availability of any energy oil resource necessary to maintain essential services and transportation. ODOE could implement a Fuel Allocation Program to ensure adequate fuel is provided to the state's emergency and essential service providers.

OREGON PUBLIC UTILITY COMMISSION

ORS Chapter 757, Sections 710-730 authorizes OPUC to regulate utility rates, safety, and reliability standards for individuals, firms, partnerships, corporations, associations, cooperatives, and municipalities who sell and distribute electricity and natural gas in Oregon. In an emergency, OPUC will respond to the Oregon State Emergency Coordination Center (ECC) to serve as the principal liaison between the state and utilities to ensure rapid recovery of the power and/or natural gas systems.

OREGON EMERGENCY MANAGEMENT

ORS Chapter 401, Section 270 authorizes Oregon Emergency Management (OEM) to develop, revise, publish, and distribute the State of Oregon Emergency Management Plan to coordinate the activities of all public and private organizations providing emergency services within the state. The Statutes also require OEM to provide for and staff the state ECC to aid the Governor and state agencies in responding to major emergencies and disasters.

CONCEPT OF OPERATIONS

ODOE and OPUC energy sector-specific emergency response plans establish a concept of operations that models the Emergency Support Functions (ESF) structure as outlined in the National Response Framework (NRF) and incorporates the National Incident Management System (NIMS). This concept of operations enables emergency responders at all levels of government and private industry across jurisdictional boundaries to work together more effectively to manage energy emergencies no matter the cause, size or complexity of the event.

Also, ODOE and OPUC's energy sector-specific emergency response plans are consistent with the State of Oregon Emergency Management Plan. State agency activities in this plan are organized as "Emergency Support Functions" (ESF) to coincide with the federal ESFs to:

- Establish fundamental disaster roles and responsibilities that enable close state/federal cooperation necessary to support the emergency management efforts of local jurisdictions involved in energy disaster operations during a State or Presidential declared disaster.

- Identify lines of cooperation and communications between state agencies and their corresponding federal response agencies as outlined in the NRF.

- Establish a concept of operations, which incorporates NIMS that provides a state level interagency mechanism to facilitate the delivery of state and/or federal response assistance.

Consistent with the federal ESFs, the state ESFs are mechanisms for grouping functions most frequently used to provide state-to-state and state-to-local support and to coordinate with federal ESFs for declared disasters and emergencies. There are 13 Emergency Support Functions.

EMERGENCY SUPPORT FUNCTIONS (ESFS)		
ESF	**SECTOR**	**PRIMARY AGENCY**
1	Transportation	Oregon Department of Transportation
2	Communications	Oregon Emergency Management Oregon Public Utility Commission
3	Public Works and Engineering	Oregon Department of Transportation
4	Firefighting	Oregon State Fire Marshal
5	Information and Planning	Oregon Emergency Management Lead State Agency for Declared Disaster
6	Mass Care	Oregon State Department of Human Resources
7	Resource Support	Oregon Department of Administrative Services
8	Health and Medical Services	Oregon State Department of Human Resources
9	Search and Rescue	Oregon Emergency Management
10	Hazardous Materials	Oregon State Fire Marshal Oregon Department of Environmental Quality
11	Food	Oregon Department of Agriculture
12	**Energy**	**Oregon Department of Energy** **Oregon Public Utility Commission**
13	Public Safety	Oregon State Police

SEE APPENDIX A

MEMORANDUM OF UNDERSTANDING

As primary agencies for ESF 12, ODOE and OPUC entered into a Memorandum of Understanding (MOU) to establish a framework for cooperation for preparedness and response to energy emergencies that impact the state. The MOU provides guidance on ODOE and OPUC roles and responsibilities for issuing emergency notifications; assessing the severity of events; issuing protective action decisions; providing emergency information; activating and responding to emergency operation centers; ensuring program readiness; as well as developing and maintaining emergency response plans for fuel, natural gas, and electricity shortages and disruptions. ***SEE APPENDIX B.***

ENERGY SECTOR-SPECIFIC EMERGENCY RESPONSE PLANS

While no plan can replace the common sense and good judgment of emergency responders and decision-makers, energy sector-specific emergency response plans provide a framework to guide the efforts of ODOE and OPUC to prepare for, respond to, and recover from energy emergencies.

Overview of the Oregon Petroleum Contingency Plan

INTRODUCTION

Because Oregon has virtually no refining capacity and no crude oil reserves, the state faces unique challenges in the event of a petroleum emergency. Preparing for a fuel shortage and anticipating the impacts of a prolonged supply disruption are critically important due to the lack of easily accessible alternative sources for refined petroleum products.

To mitigate the effects of a petroleum supply or distribution emergency, ODOE developed and maintains the Oregon Petroleum Contingency Plan. This Oregon Petroleum Contingency Plan specifies alert and notification procedures as well as actions to assure the protection of public health and safety during severe and long-term fuel disruptions or shortages, regardless of the cause.

The Oregon Petroleum Contingency Plan includes a fuel allocation program to provide gasoline and diesel to the state's emergency services (law enforcement, fire, and medical services) and essential service providers (utilities, telecommunications, public works, public transit, sanitation services and more).

The plan identifies the state's emergency and essential service providers along with pre-designated fueling locations in each county to ensure fuel allocation can proceed in a timely and orderly manner in times of petroleum supply and distribution system constraints.

EMERGENCY RESPONSE ACTIONS

The Oregon Petroleum Contingency Plan identifies emergency preparedness and response actions to monitor and track fuel disruptions. Tracking fuel disruptions allows ODOE decision-makers to assess the severity of supply shortages, determine appropriate mitigation measures, advise state policy makers, prioritize allocation of resources, keep state and local emergency organizations informed, and provide timely and accurate information to the public.

For planning purposes, the Oregon Petroleum Contingency Plan identifies four levels of fuel supply conditions to prepare for, respond to, and recover from. These four levels are consistent with NASEO's State Energy Assurance Guidelines.

Normal Conditions – Level 1 Monitor and Alert	
CONDITIONS	ODOE PREPAREDNESS ACTIONS
➢ No discernable shortage ➢ Possible shortages elsewhere	Review and update Petroleum Emergency Contact List (Quarterly)
	Review and update Oregon State Energy Assurance Plan (Annually or as needed)
	Update the Oregon Petroleum Contingency Plan (Annually or as needed)
	Conduct Petroleum Exercises and Training (As Needed)
	Serve as Liaison to Petroleum Industry Partners
	Participate in Regional and National Energy Infrastructure Events (As Needed and as Resources Allow)
	Monitor Petroleum Markets
	Monitor Petroleum Supply & Demand 1. Gasoline Consumption 2. Petroleum Product Demand 3. Wholesale and Retail Prices 4. Inventories and Production 5. Infrastructure Information 6. Source of Crude Oil
Shortage – Level 2 **Mild Fuel Shortage**	
CONDITIONS	STATE RESPONSE ACTIONS
➢ 5-10% reduction in petroleum supply for a week or more ➢ Isolated shortages could also trigger a Level 2 event.	Activate ODOE Emergency Operations Center (EOC) - Begin a limited activation of the ODOE EOC to monitor the event.
	Assess Severity of Petroleum Disruption - Contact petroleum industry partners to determine the nature, extent, and duration of a potential, impending, or actual fuel disruption. Assess potential impacts to the supply and distribution system. *APPENDIX C – FUEL SUPPLY TRACKING FORM*
	Issue Notifications - Alert and notify the governor's office, federal, state and local emergency response agencies as needed. *APPENDIX D – PETROLEUM CALL TREE* *APPENDIX E – PETROLEUM NOTIFICATION TABLE*
	Draft Situation Reports - Provide situation reports to keep the governor's office, legislative branch, federal, state, and local emergency response organizations informed about developing conditions in the event. *APPENDIX F – SAMPLE SITREP*

	Implement a Public Information Campaign - Issue news releases, conduct news conferences, compile media kits to provide information on Oregon's fuel supply and distribution system to promote voluntary conservation activities, and to prevent or limit panic buying and hoarding of fuel. Warn against price gouging as appropriate.
	Monitor Petroleum Energy Resiliency - The Infrastructure Security and Energy Restoration Division within DOE/OE provides information and critical updates during energy emergencies.
Shortage – Level 3 **Intermediate Fuel Shortage**	
CONDITIONS	STATE RESPONSE ACTIONS
➢ 10-15% reduction in petroleum products for three weeks or more ➢ Moderate to severe isolated shortages could also trigger a Level 3 event.	*Continue Response Actions from a Level 2 Shortage*
	Full Activation of ODOE EOC - Fully activate ODOE EOC to monitor the event. Procedures for ODOE EOC response positions are located in the Oregon Petroleum Contingency Plan. *APPENDIX G – ODOE EOC OPERATIONS CHART*
	Convene Petroleum Advisory Group - The ODOE Director chairs this group, which meets as needed. The Petroleum Advisory Group's role during a crisis is to assist ODOE in determining: 1. Appropriate voluntary conservation measures for the public to encourage less consumption. 2. The need for mandatory conservation measures if voluntary measures fail to mitigate the expected impacts of a shortage or disruption.
	Implement Fuel Allocation, as appropriate - Consider the need for and implement the Fuel Allocation Procedures as appropriate to ensure fuel for the state's emergency and essential services sectors. Emergency service providers include law enforcement, fire services, and medical services. Essential service providers include utilities, telecommunications, public works, transportation, public transit systems, sanitation, and other services as needed.
	Advise Governor - Recommend precautionary measures needed to end an existing shortage or to reduce the chances for or prevent a long-term disruption from occurring. ODOE will implement voluntary conservation measures directed by the Governor.
Shortage – Level 4 **Severe Fuel Shortage**	
CONDITIONS	STATE RESPONSE ACTIONS
➢ Greater than 15% reduction in availability of petroleum products	*Continue Response Actions from a Levels 2 and 3 Shortage*
	ODOE EOC Operation - Maintain full activation of the ODOE EOC to direct and control Oregon's response throughout the duration of the event.
	Declare State of Emergency, if appropriate - Advise the Governor to declare a state of emergency so mandatory conservation measures and fuel allocation procedures can be implemented if needed.

➢ Severe or long-term isolated or widespread shortages could also trigger a Level 4 event.	Issue Mandatory Conservation Measures, as appropriate - Consider and implement mandatory measures and recommend additional voluntary conservation measures as appropriate to mitigate a severe and/or long-term shortage or disruption.
	Implement Fuel Allocation, as appropriate - Consider the need for and implement the Fuel Allocation Procedures as appropriate to ensure fuel for the state's emergency and essential services sectors. Emergency service providers include law enforcement, fire services, and medical services. Essential service providers include utilities, telecommunications, public works, transportation, public transit systems, sanitation, and other services as needed.
	Implement Odd/Even Fuel Allocation, as appropriate - Consider the need for and implement the Odd/Even Fuel Allocation Procedures as appropriate to allocate fuel for the public.
	Issue Fuel Waivers, as appropriate - Consider waiving fuel or fuel additive requirements temporarily if doing so will alleviate the fuel supply emergency. Work with the Oregon Department of Environmental Quality and the U.S. Environmental Protection Agency to issue fuel waivers.
	Request Federal Assistance, as appropriate - Consider requesting federal assistance when severe petroleum events exhaust state resources and Oregon's ability to recover rapidly from supply and distribution problems.

VOLUNTARY AND MANDATORY CONSERVATION MEASURES

During petroleum shortages or disruptions, ODOE will recommend and implement various approaches to encourage the public to reduce fuel consumption depending on the severity of the event conditions. The goal of fuel conservation measures is two-fold. One is to reduce panic, prevent hoarding of fuel, and prevent price gouging at the gasoline pumps. The second is to reassure Oregon citizens that the state is taking the necessary steps to mitigate the impending or actual supply shortage situation.

Fuel conservation measures are designed to alleviate supply shortages or disruptions and hopefully prevent a crisis and the need to implement Oregon's Fuel Allocation Program. The state of Oregon's initial response to a forecasted supply problem is to implement a public information campaign to provide fuel saving tips to its citizens. If the supply shortage or disruption worsens, the plan establishes two broad types of efforts to reduce energy consumption. The first response is a public appeal for voluntary fuel conservation. If the voluntary conservation measures are ineffective in mitigating the fuel shortage situation, the second response is to issue a series of mandatory conservation measures to reduce petroleum consumption by all governmental agencies and political subdivisions in the state. Mandatory conservation measures require an Emergency Declaration by the Governor.

VOLUNTARY CONSERVATION MEASURES

PUBLIC INFORMATION CAMPAIGN - Launch public information campaign to encourage commuters to practice responsible driving and vehicle maintenance to save on fuel. This includes the following fuel saving tips:

- Slow Down and Watch Speed
- Consolidate Trips
- Accelerate and Brake Smoothly
- Reduce Idling
- Check Tire Pressure
- Travel Light
- Minimize Use of Heater and Air Conditioning
- Close Windows at High Speeds
- Choose the Right Oil
- Be Kind to Your Vehicle
- Other fuel saving tips as appropriate.

GAS PRICE REPORTER WEBSITE - Establish and manage the "Gas Price Reporter Website." The website enables Oregonians to report evidence suggesting unlawful conduct in gasoline pricing at www.doj.state.or.us. The Attorney General investigates and prosecutes individuals and companies that unlawfully fix the price of gasoline in Oregon.

RIDE SHARE PROGRAM - Initiate emergency rideshare program to save fuel by improving the attractiveness of car and vanpools.

MASS TRANSIT PROGRAM - Assist local agencies in expanding new transit service, reducing transit fare and instituting or expanding free transit fare zones.

BICYCLE PROGRAM - Encourage commuters who live within bicycling distance of their places of employment to use their bicycles. For this program to be successful, local governments and employers may need to provide more bicycle racks or secured parking areas for employees. Temporary bicycle lanes may be created to encourage cycling and to accommodate increases in the number of cyclists.

FLEXIBLE WORK HOURS - Encourage the use of flexible work hours for both short and long-term demand reduction, improvement in fuel efficiency, and reduction in traffic congestion.

THERMOSTAT SETTINGS - Set thermostats higher in the summer and lower in the winter to reduce the amount of fuel used for heating or air conditioning.

MANDATORY CONSERVATION MEASURES

ELIMINATE NON-ESSENTIAL DRIVING - Reduce or eliminate all non-essential government and commercial vehicle use.

STRICTLY ENFORCING SPEED LIMITS - Intensified speed limit enforcement by eliminating the use of warning tickets.

INTENSIFY FLEXIBLE WORK HOUR PROGRAMS - Programs include, but are not limited to the following:

- Staggered Work Hours
- Flextime
- Four-Day Work Week
- Parking Facility Limitations

MANDATORY VEHICLE TIRE PRESSURE INSPECTION

ONE DAY CLOSING OF RETAIL STORES

OREGON FUEL ALLOCATION PROGRAM

ODOE will implement the state's Fuel Allocation Program as appropriate. The purpose of Oregon's Fuel Allocation Program is to help mitigate shortages and hardships for priority users who are unable to acquire sufficient fuel at any price. ODOE will implement this program only after the governor proclaims a state of emergency and when market forces, voluntary conservation, or other mandatory programs are unable to provide for adequate and equitable distribution of fuel.

If fuel allocation becomes necessary, ODOE would administer the state's Fuel Allocation Program and designate the set-aside volume. ODOE is responsible for working with the state's petroleum suppliers and wholesalers to implement the set-aside volume for use by the state.

SET-ASIDE PRIORITY PROGRAM

The set-aside program is designed to interfere minimally with the market, using set-aside volumes that are sufficient only to satisfy hardship and emergency cases. The set-aside program makes no attempt to reduce or inhibit the market price of fuels. All fuel delivered through the program will be purchased at the market price, and whenever possible, through the usual supplier.

The percentage will be no larger than what is expected to be required to meet emergency supply needs. The percentage is based on the amount of fuel already in the state in storage and the amount estimated to enter the state from the prime suppliers each month.

Set-Aside Percentages

Monthly Fuel Volume from Oregon Suppliers

Motor Gasoline	up to 5 percent
Middle Distillate (diesel & heating oil)	up to 4 percent
Jet Fuel	up to 5 percent
Aviation Gasoline	up to 5 percent
Boiler Fuel (#4 & heavy fuel oil)	up to 3 percent
Propane	up to 3 percent
Kerosene	up to 2 percent

ODOE's Fuel Allocation Program is designed to ensure emergency fuel to priority users performing life saving functions, restoring Oregon's critical infrastructure, and preventing community hardships.

ODOE uses a three-tiered approach for allocating fuel to these priority users. Tier 1 covers the state's emergency services providers. Tier 2 covers the state's essential services providers. Tier 3 allows for a community to request fuel supplies from the state set-aside. A community must show it has an emergency or hardship caused by a shortage of fuel or is receiving relatively less than other areas of the state. Providing emergency fuel to communities is the only element where retail service stations may receive a set-aside allocation. However, the State will not direct set-aside volumes to specific stations. It will direct prime suppliers to release a certain volume to an area through normal supply channels.

PRIORITY FUEL USERS

Priority Fuel Users	
TIER 1 - Emergency Services Sector *Agencies and Organizations Performing Life Saving Functions* Emergency fuel requests from emergency services providers will be immediately reviewed and acted on by ODOE.	▪ Law Enforcement ▪ Fire Services ▪ Medical Services (Ambulances, Air Transport, and Hospitals) ODOE will work with and rely on the expertise and assessments of each county emergency management agency to determine fuel needs for their respective jurisdictions.
TIER 2 - Essential Services Sector *Agencies and Organizations Performing Critical Functions to Restore Oregon's Fuel Supply and Distribution System and Other Critical Infrastructure. Tier 2 involves the state's 13 Emergency Support Functions (ESFs).* Emergency fuel requests from essential services providers will be reviewed by ODOE on a case-by-case basis. Approval will depend on fuel availability and event conditions. Examples of essential services include, but are not limited: 1) agriculture production and distribution; 2) energy production (utilities crews); 3) public transit; 4) public works (sewer-water crews); 5) telecommunications crews; 6) transportation (highways, roads, and bridge crews); 7) sanitation (trash pickup crews); and 8) others as appropriate.	▪ ESF 1: Transportation ▪ ESF 2: Communications ▪ ESF 3: Public Works and Engineering ▪ ESF 4: Fire Fighting ▪ ESF 5: Emergency Management ▪ ESF 6: Mass Care ▪ ESF 7: Logistics Management ▪ ESF 8: Public Health and Medical Services ▪ ESF 9: Search and Rescue ▪ ESF 10: Oil and Hazardous Materials ▪ ESF 11: Agriculture and Natural Resources ▪ ESF 12: Energy ▪ ESF 13: Public Safety and Security ODOE will work with and rely on the expertise and assessments of each ESF lead state agency to determine fuel needs for their respective sector(s).
TIER 3 - Community Hardship *Cities and Counties Experiencing Hardships Caused By a Shortage of Fuel* Emergency fuel requests from communities will be reviewed by ODOE on a case-by-case basis. Approval will depend on fuel availability and event conditions.	▪ City ▪ County ▪ Other sectors as appropriate

FUEL USE DATABASE

To ensure the protection of public health and safety, the environment, and the state's economy during a fuel crisis, ODOE must ensure the delivery of fuel to emergency and essential service providers responsibly, efficiently, and without delay.

ODOE established and maintains a database containing fuel consumption figures, key contacts, and pre-designated emergency fueling locations for the state's emergency services and essential services sectors. Having a clear understanding of the fuel use needs of the state's emergency and essential services sectors prior to a fuel crisis allows ODOE to better anticipate and meet fuel needs during an actual emergency.

The database reflects fuel consumption for emergency and essential services sectors under normal day-to-day operations over a one week period. Additional fuel may be needed when agencies are responding to emergencies. Oregon's Fuel Use Database is reviewed and updated as needed. Fuel use figures for the state's emergency and essential services sectors are provided by county.

OREGON FUEL USE DATABASE SAMPLE SPREADSHEET

COUNTY	KEY CONTACT	
Sample County Emergency Management 1234 Sample Spreadsheet Street Sample City, OR 97000	Emergency Manager, Primary (503) 555-5555 Office (503) 555-5555 Fax (503) 555-5555 24/7 EmerMan@co.sample.or.us	Sheriff, Alternate (503) 555-5555 Office (503) 555-5555 Fax (503) 555-5555 24/7 Sheriff@co.sample.or.us

PRE-DESIGNATED FUELING LOCATIONS

FUELING LOCATION	SERVICE AREA	STORAGE	BACKUP POWER	SECURITY
ABC Motor Pool	Police Fire County Sheriff OR State Police	00,000 Unleaded 00,000 Diesel	Diesel generator with fuel supply for 72 hours	Restricted Access, Perimeter Fencing, Cameras

EMERGENCY SERVICES SECTOR

JURISDICTION	DIESEL (gal/week)	GASOLINE (gal/week)	OTHER FUELS (gal/week)	FUEL SOURCE
County Sheriff's Office	0	0	0	ABC Motor Pool
A City Police	0	0	0	ABC Motor Pool
A City Fire	0	0	0	ABC Card Lock
B City Police	0	0	0	ABC Service Station
B City Fire	0	0	0	ABC Card Lock
Sample Ambulance Service	0	0	0	ABC Service Station
Oregon State Police	0	0	0	ABC Motor Pool
TOTAL FUEL USE	000	000	000	

ESSENTIAL SERVICES SECTOR

UTILITIES

JURISDICTION	DIESEL (gal/week)	GASOLINE (gal/week)	OTHER FUELS (gal/week)	FUEL SOURCE
ABC Electric	0	0	0	ABC Card Lock
UTILITIES FUEL USE	0	0	0	

TELECOMMUNICATIONS

JURISDICTION	DIESEL (gal/week)	GASOLINE (gal/week)	OTHER FUELS (gal/week)	FUEL SOURCE
ABC Telephone Compan	0	0	0	ABC Service Station
TELECOM FUEL USE	0	0	0	

OREGON DEPARTMENT OF TRANSPORTATION (ODOT)

JURISDICTION	DIESEL (gal/week)	GASOLINE (gal/week)	OTHER FUELS (gal/week)	FUEL SOURCE
Region 2 District 4	0	0	0	ABC Motor Pool
ODOT FUEL USE	0	0	0	

OTHER

JURISDICTION	DIESEL (gal/week)	GASOLINE (gal/week)	OTHER FUELS (gal/week)	FUEL SOURCE
ABC Air Ambulance	0	0	Jet Fuel - 0	ABC Airport
OTHER FUEL USE	0	0	0	
TOTAL FUEL USE	000	000	000	

SAMPLE

FUEL APPLICATION PROCESS - WEBEOC

ODOE may receive fuel requests due to natural disasters or unforeseen emergencies at any time. Once ODOE activates WebEOC for a determined emergency, all priority users requesting emergency fuel must log onto ODOE's WebEOC, access the Emergency Fuel Request board and complete all fields provided as appropriate. Priority users requesting fuel must be prepared to provide information on the organization requesting the fuel, 24/7 contact information, type of fuel needed, the reason for the request, and the intended use of the fuel if approved.

ODOE will process fuel requests based on 1) the availability of fuel; 2) event conditions; and 3) the Governor's priorities. ODOE would follow general guidelines to provide fuel to perform life saving functions first, restoring critical services second, and all other requests will be handled as they are received.

If WebEOC becomes inoperable due to event conditions, fuel requests can be texted, faxed, emailed, mailed, or delivered directly to ODOE for review and approval.

UNUSED SET-ASIDE VOLUME

Maximum flexibility in the release of the unused portion of the monthly set-aside volume is achieved by balancing public benefit with logistical and administrative efficiency. The Petroleum Event Manager may choose either to release to the supplier unused portions of the set-aside no later than the 20th of each month, or to hold any unused volume until the first of the following month. This unused set-aside volume will not be counted in computing the subsequent month's set-aside volume, but must be distributed the following month. Whichever option the Petroleum Event Manager selects, all suppliers are required to comply ensuring uniformity in the release of supplies.

FUEL ALLOCATION FOR OREGON CITIZENS

During a fuel supply shortage situation, the need for a method to alleviate potentially long lines at retail service stations may arise. ODOE, at the direction of the Governor, could implement the Odd/Even Fuel Allocation Measure for the public. This measure is designed to help space purchases of gasoline and aids in its equitable distribution. The measure has the potential effect of shortening lines at gasoline retail outlets by cutting in half the number of customers that may attempt to get gasoline on any given day.

The Odd/Even Fuel Allocation Measure for the public may also provide a psychological benefit by reducing uncertainty regarding fuel availability. It may additionally encourage the conservation of fuel by causing trips to be better planned. Minimizing waiting lines may also reduce consumption by saving fuel that is used while idling. Under this plan, gasoline may be purchased or sold only in accordance with the following procedures.

ODD/EVEN FUEL ALLOCATION MEASURE

Odd/Even Fuel Allocation Measure		
ODD Days of the Month	EVEN Days of the Month	Sundays, Legal Holidays, & 31st of Any Month
Vehicles with Oregon license plates: • Ending with odd numbers • Ending with letters A-M	Vehicles with Oregon license plates: • Ending with even numbers • Ending with letters N-Z	Anyone may purchase gasoline on Sundays, legal holidays, or the 31st of any month.
EXEMPTIONS: The following vehicles are exempted from the odd/even gasoline purchase plan, but will wait their turn in line at any gasoline station: Common carriers, including taxis, rental vehicles, commercially licensed vehicles, or private vehicles used for designated commercial purposes, and vehicles with out-of-state license plates.		

The Odd/Even Measure does not directly save any calculable amount of gasoline. It is designed as a distribution aid and not a conservation measure. Enforcement responsibility rests with service station personnel.

FUEL LIMIT PURCHASE REQUIREMENT

Depending on the severity of the fuel shortage situation, ODOE may advise the Governor to also require motorists to purchase a certain amount of gasoline or diesel at the pumps. The measures include the Minimum Fuel Purchase Requirement and the Maximum Fuel Purchase Requirement. These measures should be implemented in conjunction with the Odd/Even Distribution Measure.

Fuel Limit Purchase Requirement	
Mimimum Fuel Purchase Requirement	Maximum Fuel Purchase Requirement
Minimize gasoline lines by discouraging the making of frequent but small gasoline purchases by consumers. This measure also discourages tank topping.	Ensures some gasoline will be available to motorists located or traveling through the state. Limiting the amount of gasoline purchased by motorists in one visit will help prevent supplies from running out prematurely at a particular retailer.
NOTE: ODOE will set the minimum and maximum purchase quantity as appropriate. Retailers may lower the set amount at their discretion due to market forces.	
ASSUMPTIONS: All retail stations will be assumed to normally operate one hundred hours per week unless evidence is provided to the contrary.	

LIMITED HOURS OF OPERATION

If the fuel shortage situation continues to worsen, ODOE may also advise the Governor to require retail gasoline and diesel outlets to reduce the hours of normal operations.

Limited Hours of Operation By Motor Fuel Retailers		
Percentage of Hours Rule	Designated Days Rule	Sunday Closings with Percentage Rule
Order retail gasoline and diesel outlets to reduce hours of weekly operation by a fixed percentage of normal operating hours.	Order retail gasoline and diesel outlets to close for business on specified days of the week. Pre-designated emergency fueling locations for priority users are exempt.	Order retail gasoline and diesel outlets to not operate on Sundays of any week and to reduce hours of normal operation on other weekdays.
NOTE: If any of the three rules are ordered, stations will post the hours of operation visibly upon the premises for all motorists to see.		
ASSUMPTIONS: All retail stations will be assumed to normally operate one hundred hours per week unless evidence is provided to the contrary.		

ODOE may advise the Governor to implement additional fuel allocation measures as appropriate.

REQUESTING FEDERAL ASSISTANCE

When an incident occurs that exceeds or is anticipated to exceed local and State resources, the Governor can request federal assistance under the Stafford Act. The Stafford Act authorizes the President to provide financial and other assistance to state and local governments to support response, recovery, and mitigation efforts following Presidential emergency or major disaster declarations.

FUEL SUPPLY

In the event of a severe or long-term fuel emergency, ODOE can advise the Governor to request the federal government assist Oregon to obtain fuel, (gasoline, diesel, jet fuel, etc), assist in fuel delivery, as well as provide portable fueling locations to support the state's response and recovery efforts. This includes requesting generators to ensure the state's petroleum distribution terminals and pipeline companies can assess and address damages promptly to restart facility and system operations without delay.

As the lead state agency for ESF 12, ODOE would work with the USDOE (the federal ESF 12 lead agency) to request and coordinate the delivery of supplies, equipment and systems, and personnel.

FUEL WAIVERS

ODOE can advise the Governor to request the federal government to waive a fuel or fuel additive requirement if doing so will alleviate the fuel supply crisis. The U.S. Environmental Protection Agency (EPA) with the concurrence of DOE/OE may temporarily waive a fuel or fuel additive requirement under the Clean Air Act Section 211(c)(4)(C). A fuels waiver can be issued only when the criteria specified in the Clean Air Act have been met and apply to gasoline and diesel fuel only. If the fuels waiver criteria have been met, EPA may grant a waiver to allow use of a fuel that normally is not allowed in a particular time period or geographic area.

In general, these criteria allow a fuels waiver only to address a temporary emergency fuel supply shortage that exists throughout a state or region that was caused by an unusual situation and that could not have been avoided by prudent planning. "Spot" or localized shortages generally are not fuel supply disruptions for which a waiver may be issued. A fuel supply disruption that meets the criteria for a waiver must be one that results in a generalized supply emergency. Fuels waivers cannot be issued to address concerns regarding the price of fuel.

If EPA and DOE/OE determines that a fuels waiver is necessary, ODOE will submit a formal written request for a fuels waiver to be made by or on behalf of the Governor to the EPA Administrator.

The EPA Administrator will consult with and seek concurrence by the Secretary of Energy upon receiving a formal written request for a fuels waiver. The EPA Administrator will issue a temporary waiver if it is determined that extreme and unusual fuel or fuel additive supply circumstance exist in Oregon which prevent the distribution of an adequate supply of the fuel or fuel additive to consumers. The waiver is effective for a period of 20 calendar days or less.

DRIVER HOUR WAIVERS

ODOE can also advise the Governor to request the Federal Motor Carrier Safety Administration (FMCSA) to lift driver hour requirements to ensure fuel deliveries proceed without delay to ensure public health and safety. Severe and long-term fuel disruptions have typically been widespread, affecting a number of states and caused by factors that exceed the petroleum industry's ability to respond.

FMCSA provides relief from compliance with most safety regulations when an emergency is declared. According to 49 CFR 390.5 an "emergency" means any storm, earthquake, explosion, blackout, or other occurrence, natural or manmade, that interrupts the delivery of essential services or supplies such as food and fuel or otherwise immediately threatens human life or public welfare.

When a state issues an emergency declaration, driver hour requirements are automatically lifted for up to 30 days from the date of the declaration. This applies to motor carriers or

drivers of commercial motor vehicles providing direct assistance to save lives or property or to protect public health and safety. A driver's manifest must clearly show a destination for delivery of essential service/commodity in the state declaring the emergency. It is the responsibility of each state to notify FMCSA of an emergency declaration. FMCSA will then post the state(s) emergency declaration(s) on its website for drivers to download.

DISSEMINATING EMERGENCY INFORMATION

During forecasted or actual fuel emergencies, ODOE is responsible for developing and disseminating emergency information to decision-makers, responders, the news media, and the public. Timely and accurate information increases awareness and understanding of the fuel crisis situation and helps minimize public panic, topping off gas tanks, and hoarding fuel.

ODOE will provide current event status information to decision-makers, responders, the news media, and the public. The information includes, but may not be limited to:

- Fuel Supply Information
- Conservation Measures – voluntary and mandatory
- Conservation Information and Education
- Oregon's Fuel Allocation Program

DRILLS AND EXERCISES

To ensure that Oregon is prepared to respond to a fuel crisis, ODOE will coordinate, implement, and participate in workshops and seminars, tabletops, drills, and exercises that provide opportunities for state and county decision-makers and responders to demonstrate the ability to:

- Alert and notify key responders to report to emergency centers or locations as appropriate.
- Activate, staff, and operate state and county Emergency Operations Centers throughout the duration of a fuel crisis.
- Direct and control the overall state response to petroleum emergencies. This includes assessing the severity of the event, determining potential impacts to Oregon, and determining appropriate protective actions.
- Issue voluntary and mandatory conservation measures.
- Implement Oregon's fuel allocation program.
- Provide timely emergency information and instructions to the public. This includes activating, staffing and operating the Telephone Information Center and the News Center.

- Communicate with industry, federal, state, and local emergency response organizations throughout the duration of the fuel crisis. This includes demonstrating primary and backup communication systems.

For major exercises, ODOE will establish or take part in an Exercise Planning Team. This Team includes representatives from industry, federal, state, and local agencies as appropriate. The Exercise Planning Team develops the exercise objectives and limitations, the extent-of-play, and the scenario.

After each drill or exercise, members of the Exercise Planning Team will report needed corrective actions to ODOE. ODOE will provide information about the corrective actions to the U.S. Department of Energy in the quarterly reports on the State Energy Program. ODOE will arrange for state or federal representatives to observe and provide comments to ODOE on Oregon's performance in the drills or exercises as needed.

PLAN REVIEW AND UPDATE

ODOE will review and update Oregon's Petroleum Contingency Plan annually or as needed. Revisions will include improvements identified through drills and exercises. ODOE's Emergency Preparedness Manager is responsible for conducting the review and coordinating revisions with industry, federal, state, and county emergency response agencies.

ODOE will work with state agencies and county emergency managers biennially to update and maintain the statewide fuel use database to ensure accurate fuel consumption numbers for the state's emergency and essential services sectors.

ODOE will work with industry, federal, State, and county emergency response agencies quarterly to update the petroleum emergency contacts list. ODOE will prepare quarterly reports detailing Oregon's petroleum emergency preparedness activities for the State Energy Program. This will ensure that Oregon's Petroleum Contingency Plan and state and local decision-makers and emergency responders authorized to implement the plan maintain a state of readiness to ensure the protection of Oregonians in the event of a fuel crisis.

Electricity Emergency Response Plan

INTRODUCTION

An electric power event can be categorized as an outage, an incident, or an emergency. Events can range from a high frequency, low impact outage or incident to a low frequency, high impact emergency. Examples of high frequency, low impact outages or incidents are cross-phasing of lines by surrounding vegetation or more serious, individuals coming in contact with high-voltage lines or equipment. Low frequency, high impact emergencies include earthquakes and man-made attacks. The following is the progressive response of the OPUC.

EMERGENCY RESPONSE PHASES AND ACTIONS

Level I: Normal Conditions[1]

Conditions: Normal—no electric power disruption, shortage, or constraints on reliable service delivery.
State Agency Lead: OPUC

OPUC Duty Officer measures include:

- Receive notices of reportable[1] outages or incidents from operators.
- Evaluate reportable outages or incident notices received to anticipate impact on electric power supply, relying heavily upon electric company experts.
- Maintain a contact list located in-house to aid in contacting individuals in the various public and private industries.
- Review previous situation reports to evaluate adequacy of OPUC's response practices.
- Review previous tabletop exercises, evaluate lessons learned, and implement into response plan procedures.
- Encourage energy utilities to hold in-house tabletop exercises.
- Update OPUC's emergency response plan as needed.

[1] Electric utilities experience reportable incidences often for various reasons, such that these minor events are normal operating conditions.

- Participate in collaborative efforts with state, local government and electric utility operators.

- Identify response vulnerabilities in cross-coordination between industries and state agencies.

LEVEL II: MILD SHORTAGE, OUTAGE, OR INCIDENT

Conditions: Mild Outage or Incident—an identifiable event that may have the potential to cause an electric power disruption, shortage, or become a constraint on reliable electric power service.
Lead: Electric Power Companies
State Agency Lead: OPUC
Support: Oregon Emergency Management, Oregon Department of Energy, Oregon Emergency Response System

Level II triggered by:

- Significant storms[2] or similar incidents without a declaration of emergency.

- Activation of electric utility EOC.

OPUC Duty Officer response measures include:

- Receive update notices, as required, from utility operator.

- Monitor state, regional and world events and forecasted weather conditions that may impact Oregon electric power and natural gas[3] supplies and service delivery.

- Keep informed by utility operators as they perform emergency response operations, procedures, and distribution of accurate event information to the public.

LEVEL III: MODERATE SHORTAGE, ESCALATING INCIDENT, OR DISRUPTION

Conditions: Imminent threat or escalating incident—an identifiable event that has been verified to lead to an electric power disruption, shortage, or become a constraint on reliable electric power service lasting two-to-four weeks.
Lead: Electric Power Companies
State Agency Lead: OPUC
Support: Governor's Office, Oregon Emergency Management, Oregon Department of Energy, Oregon Military Department, Oregon Department of Transportation, Civil Air Patrol, Oregon State Department of Human Resources, American Red Cross

[2] i.e. winter storm event 2006, 2007, and 2008
[3] The state of Oregon has many electric generation facilities that are fueled by natural gas and those are identified as interdependencies between the natural gas and electric sectors.

Level III triggered by factors, such as:

- Moderate shortage, escalating incident, or disruption.
- Utility Operator requests for limited assistance.
- Impact extends to interdependent[4] utility operators.

OPUC Duty Officer response measures include:

- Serve as a liaison—during Level III and Level IV status—between electric power operators and other state agencies to meet the needs of the operators on a state level. OPUC does not manage utility operations but assists in procuring state resources for the responding utility.
- Implement in-house Situation Report[4] to define the source and details of the outage or incident. The Situation Report includes information on the operator involved, area impacted, cause (if known), and expected duration.
- Maintain communication with electric power operator for updates.
- Notify Commissioners, PUC executives, and Public Information Officer[5] (PIO) with initial and interim situation reports as necessary.
- Send courtesy notifications to other utility operators, ODOE, OERS, and other state support agencies related to ESF 12.
- Update OERS with utility situation report.
- Evaluate geographical areas affected by the cascading effects of the event and notify stakeholders.
- Support necessary reconnaissance efforts to aid in evaluating energy infrastructure.
- Consider issuing public appeal for voluntary reduction of electric power and natural gas consumption in accordance with the Regional Curtailment Plan.

[4]Utility operators that are reliant upon the impacted energy resource provided by the originating impacted utility, which may warrant a request for assistance by the dependent utility operator.
[5]See Appendix H.
[6] The PUC's PIO does not actively release statements regarding these incidents to the public. However, if the public inquires, concerns will be resolved as needed.

- Implement voluntary reduction of electric power and natural gas consumption in accordance with stage 1 or 2 of the Regional Curtailment Plan, as necessary, by consumers, businesses, schools, institutions, and state building operators.

- Escalate to Level IV status as appropriate.

LEVEL IV: SEVERE SHORTAGE, DISRUPTION, OR EMERGENCY

Conditions: Disruption, shortage, or constraint has taken place causing loss of electric power supply that may last weeks or months.
Lead: Electric Power Companies
State Agency Lead: OPUC
Support: Governor's Office, Oregon Emergency Management, Oregon Department of Energy, Oregon Emergency Response System, U.S. Department of Energy, Oregon Military Department , Oregon Department of Transportation, Civil Air Patrol, Oregon State Department of Human Resources, American Red Cross

A Level IV status is triggered by several factors such as:

- Declaration of state of emergency by the Governor.

- Escalation of a high frequency, low impact outage or incident estimated to last a period of months, precluding the reliability of electric power service delivery.

- Electric power companies recognizing that either company resources—staff experts, materials, equipment—are being exhausted or a multi-jurisdictional emergency is occurring.

- A devastating natural or deliberate disaster that immediately impacts electric power infrastructure with little or no warning.

- Energy demand exceeds generation supply such that electric power shortage occurs and the situation becomes unmanageable by electric power operators, balancing authorities, and excess market supply.

Under the conditions listed the ECC will be activated under standby, limited, or full activation status determined by the Director of OEM[7]. OPUC works with the OEM team and other responders to the ECC to provide subject matter expertise.

OPUC Duty Officer response measures include:

[7] State of Oregon Emergency Management Plan: Vol. II, Annex A.III.

- Present initial situation report to OEM at ECC and OEM's PIO consolidates information for public media release.

- Notify OERS with appropriate updates.

- Notify USDOE if necessary.

- Maintain communication with electric power operator for updates and continue providing resource support.

- Update OEM with interim situation report.

- Evaluate geographical areas affected, cascading effects of the event and notify ECC State Support Functions 1-13.

- Advise Governor and OEM Director to implement curtailment of electric power and natural gas usage in accordance with the Regional Curtailment Plan stages 3, 4, and 5.

- Identify interdependencies between the electric power, natural gas, and petroleum sector to minimize impact upon sectors outside of the electric power industry.

- Facilitate utility operators with possible resources (See Table 6.1) from various state agencies.

Following event:

- Demobilize response-recovery as emergency abates and return to normal operational conditions.

- Return borrowed assets to originating agency.

Table 6.1: Various Agencies and Resources.

AGENCY	RESOURCES[7]								
	Fuel	Road Access	Shelter	Air Transport	Reconnaissance	Transportable Generators	Manual Labor Crews	Electricians & Technicians	Portable Kitchens
Oregon Department of Energy	X								
Oregon Department of Transportation		X							
Oregon State Police		X							
Oregon Military Department	X	X	X	X	X	X	X	X	X
Civil Air Patrol				X	X				
Oregon State Department of Human Resources			X						
Oregon Department of Forestry									X
Oregon Department of Agriculture									X
Department of Corrections	X						X	X	

The Regional Curtailment Plan[8] applies to all regional loads. Under this plan, curtailment is requested or ordered as a percentage of historical, weather-normalized (Base Billing Period) electric consumption. Although the curtailment stages are generally associated with increasing deficits, the stages are not necessarily implemented in a sequential manner. The plan is flexible, allowing the state to move from one curtailment stage to another as required to adapt to dynamic changes of the incident (See Table 6.2).

[8] In the event of an emergency, precedence is given to each agency to evaluate the needs of their own agency and if excess resources exist they may provide them for use in energy emergency response considerations.
[9] See Appendix I.

Table 6.2: Regional Curtailment Plan Summary

STAGE	NATURE	CURTAILMENT %	TYPE OF CURTAILMENT
1	Voluntary	No Specific %	Uniform among all regional consumers
2	Voluntary	5% +	Uniform among all regional consumers
3	Mandatory	5% – 15%	Uniform among all regional consumers
4	Mandatory	15 %	Residential consumers
		15% +	General use consumers
		15% +	Major use consumers
5	Mandatory	% consistent with Stage 4 + additional curtailment	Continued consumer curtailment with additional utility action including plant closures and possible rotating outages

Any additional curtailment activities will be done in accordance with the plan and stated in the tariffs approved by the Public Utility Commission. The Commission will be available to handle customer appeals from utility curtailment decisions.

It is noted that although the emergency response plan is centered on an outage, incident, or emergency that originates with a utility operator, this does not limit the scope of the response plan. For example, if events outside of the purview of utility operators become relevant to the respective operator, whether by notification to OPUC from OEM or other collaborative groups, OPUC will take an active part in notifying utility operators of these events.

Natural Gas Emergency Response Plan

INTRODUCTION

A natural gas event can be categorized as an outage, an incident, or an emergency. Events can range from a high frequency, low impact outage or incident to a low frequency, high impact emergency. Examples of high frequency, low impact outages or incidents are gas discharge identified by customers, residential or business, or more serious, excavation contact with pipelines. In the latter case, excavation contact that damages or punctures a pipeline has the potential to cause ignition of gas, which may produce a hazard to life, safety, and property. Low frequency, high impact emergencies include earthquakes and man-made attacks.

EMERGENCY RESPONSE PHASES AND ACTIONS

LEVEL I: NORMAL CONDITIONS[10]

Conditions: Normal—no natural gas disruption, shortage, or constraints on reliable service delivery.
State Agency Lead: OPUC

OPUC Duty Officer measures include:

- Receive notices of reportable outages or incidents from operators.
- Evaluate reportable outages or incident notices received to anticipate impact on natural gas supply, relying heavily upon company experts.
- Maintain a contact list located in-house to aid in contacting individuals in the various public and private industries.
- Conduct annual inspection of intrastate[11] natural gas operations, facilities, and pipeline systems according to state statute[12] and federal code regulations[13] to ensure reliable service delivery.
- Review previous situation reports to evaluate adequacy of OPUC's response practices.
- Review previous tabletop exercises, evaluate lessons learned, and implement into response plan procedures.

[10] Natural gas utilities experience reportable incidences often for various reasons, such that these minor events are normal operating conditions.
[11] The OPUC is directly responsible to conduct audits of intrastate natural gas pipeline. Interstate natural gas pipelines and intrastate liquid petroleum pipelines are under the jurisdiction of U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA).
[12] Oregon Administrative Rule: Chapter 860 Division 31.
[13] Code of Federal Regulations Title 49: Parts 191, 192, 193, 195, 198, and 199.

- Update OPUC's emergency response plan as needed.
- Participate in collaborative efforts with state, local government and utility operators.
- Identify response vulnerabilities in cross-coordination between industries and state agencies.

LEVEL II: MILD SHORTAGE, OUTAGE, OR INCIDENT

Conditions: Mild Outage or Incident—an identifiable event that may have the potential to cause a natural gas disruption, shortage, or become a constraint on reliable natural gas service.
Lead: Natural Gas Companies
State Agency Lead: OPUC
Support: Oregon Emergency Management, Oregon Department of Energy, Oregon Emergency Response System

Level II triggered by:

- Significant storms[14] or similar incidents without a declaration of emergency.
- Activation of gas utility Emergency Operation Center (EOC).

OPUC Duty Officer response measures include:

- Receive update notices, as required, from utility operator.
- Monitor state, regional, and world events and forecasted weather conditions that may impact Oregon natural gas supplies and service delivery.
- Keep informed by utility operators as they perform emergency response operations, procedures, and distribution of accurate event information to the public.

LEVEL III: MODERATE SHORTAGE, ESCALATING INCIDENT, OR DISRUPTION

Conditions: Imminent threat or escalating incident —an identifiable event that has been verified to lead to a natural gas disruption, shortage, or become a constraint on reliable natural gas service lasting two-to-four weeks.
Lead: Natural Gas Companies
State Agency Lead: OPUC
Support: Governor's Office, Oregon Emergency Management, Oregon Department of Energy, Oregon Military Department, Oregon Department of Transportation, Civil Air Patrol, Oregon State Department of Human Resources, American Red Cross

Level III triggered by factors, such as:

- Moderate shortage, escalating incident, or disruption.
- Utility Operator requests for limited assistance.
- Impact extends to interdependent[15] utility operators.

OPUC Duty Officer response measures include:

- Serve as a liaison—during Level III and Level IV status—between natural gas operators and other state agencies to meet the needs of the operators on a state level. OPUC does not manage utility operations but assists in procuring state resources for the responding utility.
- Implement in-house Situation Report[16] to define the source and details of the outage or incident. The Situation Report includes information on the operator involved, area impacted, cause (if known), and expected duration.
- Maintain communication with natural gas operator for updates.
- Notify Commissioners, PUC executives, and PIO with initial and interim situation reports as necessary.
- Send courtesy notifications to other utility operators, ODOE, OERS, and other state support agencies related to ESF 12.
- Update OERS with utility situation report.
- Evaluate geographical areas affected by the cascading effects of the event and notify stakeholders.
- Support necessary reconnaissance efforts to aid in evaluating energy infrastructure.
- Consider issuing public appeal for voluntary reduction of natural gas and electric[17] consumption in accordance with stage 1 or 2 of the Regional Curtailment Plan.
- Implement voluntary reduction of natural gas and electric power consumption in accordance with stage 1 or 2 of the Regional Curtailment Plan, as necessary, by consumers, businesses, schools, institutions, and state building operators.

[14] i.e. winter storm event 2006, 2007, and 2008.
[15] Utility operators that are reliant upon the impacted energy resource provided by the originating impacted utility, which may warrant a request for assistance by the dependent utility operator.
[16] See Appendix H.
[17] The state of Oregon has many electric generation facilities that are fueled by natural gas and are identified as interdependency between the natural gas and electric sectors.

- Escalate to Level IV status, as appropriate.

LEVEL IV: SEVERE SHORTAGE, DISRUPTION, OR EMERGENCY

Conditions: Disruption, shortage, or constraint has taken place causing loss of natural gas supply that may last weeks or months.
Lead: Natural Gas Companies
State Agency Lead: OPUC
Support: Governor's Office, Oregon Emergency Management, Oregon Department of Energy, Civil Air Patrol, Oregon Department of Transportation, Oregon Military Department, Oregon State Department of Human Resources, American Red Cross, Oregon Emergency Response System, U.S. Department of Energy

A Level IV status is triggered by:

- Declaration of state of emergency by the Governor.
- Escalation of a high frequency, low impact outage or incident estimated to last a period of months, precluding the reliability of natural gas service delivery.
- Natural gas companies recognizing that either company resources—staff experts, materials, equipment—are being exhausted or a multi-jurisdictional emergency is occurring.
- A devastating natural or deliberate disaster that immediately impacts natural gas infrastructure with little or no warning.
- Energy demand exceeds generation supply such that natural gas shortage occurs and the situation becomes unmanageable by natural gas operators, balancing authorities, and excess market supply.

Under the conditions listed the ECC will be activated under standby, limited, or full activation status determined by the Director of OEM[18]. OPUC works with the OEM team and other responders to the ECC to provide subject matter expertise.

OPUC response measures include:

- Present initial situation report to OEM at ECC and OEM's PIO consolidates information for public media release.
- Notify OERS with appropriate updates.
- Notify USDOE if necessary.

[18] State of Oregon Emergency Management Plan: Vol. II, Annex A-III.

- Maintain communication with natural gas operator for updates and continue providing resource support.
- Update OEM with interim situation report.
- Evaluate geographical areas affected by cascading effects of the event and notify ECC State Support Functions 1-13.
- Advise Governor and OEM Director to implement curtailment of natural gas and electric usage in accordance with the Regional Curtailment Plan stages 3, 4, and 5.
- Identify interdependencies between the natural gas, electric power, and petroleum sector to minimize impact upon sectors outside of the natural gas industry.
- Facilitate utility operators with possible resources (See Table 6.3) from various state agencies.

Following event:

- Demobilize response-recovery as emergency abates and return to normal operational conditions.
- Return borrowed assets to originating agency.

Table 6.3: Various Agencies and Resources

	RESOURCES[19]								
AGENCY	Fuel	Road Access	Shelter	Air Transport	Reconnaissance	Transportable Generators	Manual Labor Crews	Electricians & Technicians	Portable Kitchens
Oregon Department of Energy	X								
Oregon Department of Transportation		X							
Oregon State Police		X							
Oregon Military Department	X	X	X	X	X	X	X	X	X
Civil Air Patrol				X	X				
Oregon State Department of Human Resources			X						
Oregon Department of Forestry									X
Oregon Department of Agriculture									X
Department of Corrections	X						X	X	

The Regional Curtailment Plan[20] applies to all regional loads. Under this plan, curtailment is requested or ordered as a percentage of historical, weather-normalized (Base Billing Period) natural gas consumption. Although the curtailment stages are generally associated with increasing deficits, the stages are not necessarily implemented in a sequential manner. The plan is flexible, allowing the state to move from one curtailment stage to another as required to adapt to dynamic changes of the incident (See Table 6.4).

Table 6.4: Regional Curtailment Plan Summary

STAGE	NATURE	CURTAILMENT %	TYPE OF CURTAILMENT
1	Voluntary	No Specific %	Uniform among all regional consumers
2	Voluntary	5% +	Uniform among all regional consumers
3	Mandatory	5% – 15%	Uniform among all regional consumers
4	Mandatory	15 %	Residential consumers
		15% +	General use consumers
		15% +	Major use consumers
5	Mandatory	% consistent with Stage 4 + additional curtailment	Continued consumer curtailment with additional utility action including plant closures and possible rotating outages

Any additional curtailment activities will be done in accordance with the plan and stated in the tariffs approved by the Public Utility Commission. The Commission will be available to handle customer appeals from utility curtailment decisions.

It is noted that although the emergency response plan is centered on an outage, incident, or emergency that originates with a utility operator, this does not limit the scope of the response plan. For example, if events outside of the purview of utility operators become relevant to the respective operators, whether by notification to OPUC from OEM or other collaborative groups, OPUC will take an active part in notifying utility operators of these events.

[19] In the event of an emergency, precedence is given to each agency to evaluate the needs of their own agency and if excess resources exist they may provide them for use in energy emergency response considerations or as directed by the Governor.
[20] See Appendix I

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LNG Import Terminal Emergency Preparedness

INTRODUCTION

The LNG import-export terminals proposed for siting along the Oregon coast and Columbia River would be subject to natural disasters like earthquakes, tsunamis, floods, fires, and winter storms. LNG import-export terminals would also subject to man-made events such as industrial accidents (including fire), spills, terrorism, bomb threats, civil disturbances or violence in the work place. These events could affect Oregon citizens working at the import-export terminals, living adjacent to the terminals, or working, living, or recreating along the LNG vessel transit routes.

AUTHORITY

Should an LNG import-export terminal be built and operate in the state, ensuring the health and safety of Oregonians in the event of LNG emergencies is the responsibility of the Governor. The Governor designated ODOE the lead state agency to protect Oregonians from LNG emergencies involving leaks or fires. These events could jeopardize the health and safety of Oregon citizens.

ODOE works with LNG developers, the U.S. Coast Guard, other state agencies, and local emergency response organizations to create an LNG emergency preparedness and response plan for each proposed project. ODOE will develop and maintain the Oregon Statewide LNG Emergency Response Plan (LNG ERP) - a statewide strategy for responding to emergencies at LNG import-export terminals and incidents along the transit corridors involving LNG vessels.

GUIDING PRINCIPLES

The purpose of the LNG ERP is to ensure an effective and well-coordinated response with LNG developers, USCG, state, and local organizations to protect public health, safety, and the welfare of Oregonians in the event of an LNG emergency. The LNG ERP also ensures a consistent federal, state, and local response to LNG emergencies in Oregon regardless of which import-export terminal and local community in Oregon is impacted.

ODOE will direct and control the state's overall response to LNG emergencies that impact the state and will implement the LNG ERP as appropriate depending on event conditions. The LNG ERP will be developed in coordination with plans and procedures of industry and federal, state, and local emergency response organizations. These include:

- Federal Emergency Response Framework

- U.S. Coast Guard Navigational Vessel Inspection Circular No. 05-08
- Vessel Transit Management Plan
- LNG Import-Export Terminal Security Plans
- National Fire Protection Association Handbook
- Jordan Cove Emergency Response Plan
- Oregon LNG Emergency Response Plan
- Oregon Department of Energy Duty Officer Procedures
- Oregon Emergency Response System Duty Officer Procedures
- Clatsop County LNG Emergency Response Plan
- Coos County LNG Emergency Response Plan
- Local Fire and Law Enforcement LNG Emergency Response Plans

PROPOSED OREGON STATE LNG EMERGENCY RESPONSE PLAN FORMAT

The LNG ERP will address the unique conditions surrounding each LNG emergency and will take into account that it is not possible to plan for every contingency. As a result, the LNG ERP will be designed to cover all levels of LNG events regardless of the cause. These could range from minor inconveniences to the worst case situation – an LNG fire jeopardizing public health and safety.

The LNG ERP will also provide decision-makers the flexibility to assess the severity of each potential emergency, determine its potential risks to Oregonians and then implement the appropriate protective actions to mitigate the unique event conditions.

The LNG ERP will consist of three parts. They include:

1. An Overview of Oregon's LNG Supply and Distribution System – The overview will describe LNG, the LNG import-export terminal(s) in Oregon, and discuss LNG production capabilities and distribution systems associated with these projects.

2. Basic Plan – The Basic Plan will describe Oregon's strategy and approach to respond to LNG emergencies that impact the state. The Basic Plan will provide descriptions of the essential elements of advance planning that have been taken into consideration and provisions to cope with emergency situations. It will also identify the emergency response roles of lead and support organizations responding to LNG emergencies.

3. Procedures – Procedures will describe the objectives of each emergency response position at the ODOE EOC. The procedures will include check lists with specific tasks to be completed by each response position. This includes procedures for:

- Providing emergency notifications, providing event status updates, and terminating an event. Emergency contact information for LNG developers and federal, state, county, and local decision-makers and responders are also provided.
- ODOE EOC setup, staffing, and operations.
- ODOE Telephone Information Center setup, staffing, and operations.
- ODOE News Center setup, staffing, and operations.
- Members of the ODOE EOC Emergency Management Team, Assessment Team, Public Information Team, Operations Team, and Logistics Team.
- Determining and issuing protective actions and decisions.
- Declaring a state of emergency.
- Requesting federal support.
- Developing and issuing news releases. This includes boilerplate news releases, brochures, calendars, and other pre-printed public information materials.
- Other as appropriate.

REFER TO APPENDIX J - PROPOSED OREGON STATE LNG EMERGENCY RESPONSE PLAN FORMAT

Chapter 7

Ensuring Program Readiness

OREGON STATE ENERGY ASSURANCE PLAN

INTRODUCTION

To ensure that Oregon is prepared to respond to an energy crisis, ODOE and OPUC will work with industry and federal, state, and local emergency response organizations to conduct workshops and seminars, drills, tabletops, and exercises as appropriate and as resources allow. Training is essential to maintain program readiness to protect public health and safety in the event of a petroleum, electricity, or natural gas emergency impacting Oregon. ODOE will maintain open communications with USDOE and other western states to monitor regional, national, and international energy sector concerns and issues with potential impacts to Oregon's energy infrastructure. ODOE and OPUC will review and update the Oregon State Energy Assurance Plan annually or as needed.

TRAINING

ODOE is responsible for coordinating the training and Oregon's participation in drills and exercises involving the petroleum sector. ODOE will provide and coordinate training opportunities for decision-makers and responders at all levels of government and industry on Oregon's Petroleum Contingency Plan and procedures. This includes classroom instruction or participation in state or regional drills and exercises.

OPUC is responsible for coordinating the training and Oregon's participation in drills and exercises involving the electricity and natural gas sectors. OPUC will provide and coordinate training opportunities for decision-makers and responders at all levels of government and utilities on Oregon's Electricity and Natural Gas Emergency Response Plans.

Lessons learned from drills and exercises will be incorporated into the energy sector-specific emergency response plans as appropriate.

MAINTAINING REGIONAL, NATIONAL, AND INTERNATIONAL ENERGY OUTLOOK

DOE/OE is the lead federal agency in response to energy emergencies that impact the nation. As the lead federal agency, DOE/OE provides training and information sharing opportunities to the states. ODOE's Emergency Preparedness Manager and OPUC's Utility Safety, Reliability & Security Administrator will participate in the following DOE/OE activities as time and resources allow.

- Periodic conference calls to address energy issues
- Annual meeting, conference, or workshop
- Online training for new Software, communications tools
- Regional exercise

ODOE's Emergency Preparedness Manager will serve as the designated state contact for petroleum emergencies to provide DOE/OE and other western states with timely assessments of event conditions and other pertinent emergency information during petroleum emergencies.

OPUC's Utility Safety, Reliability & Security Administrator will serve as the designated state contact for electricity and natural gas emergencies to provide DOE/OE and other western states with timely assessments of event conditions and other pertinent emergency information during electricity and natural gas events.

PUBLIC INFORMATION AND OUTREACH

ODOE and OPUC will conduct a public education program for Oregonians to help ensure the public has access to information about:

- The potential impacts of energy lifeline shortages or disruptions to the community.
- Preventive measures to help avoid or reduce the impacts if energy supply shortages or disruptions were to occur.
- Conservation measures to be taken before, during and after energy emergencies to help the state recover from supply shortages and disruptions.

Activities include, but are not limited to:

- Providing information materials to the counties for distribution to local residents.
- Providing emergency response information on ODOE's and OPUC's web pages.
- Making emergency response information available to libraries, schools, hospitals, and other locations as appropriate.
- Providing speakers upon request to give presentations on the Oregon State Energy Assurance Plan and energy sector specific emergency response plans.
- Providing information upon request to the news media about the Oregon State Energy Assurance Plan and energy sector-specific emergency response plans as appropriate.

PLAN REVIEW AND UPDATE

ODOE and OPUC will review and update the Oregon State Energy Assurance Plan annually or as needed. Revisions will include improvements identified through drills and exercises. ODOE's Emergency Preparedness Manager will initiate the review and coordinate revisions with industry, federal, state, and county emergency response agencies as appropriate. ODOE will submit the Oregon State Energy Assurance Plan to USDOE annually as the plan of record.

Appendices

OREGON STATE ENERGY ASSURANCE PLAN

APPENDIX A: State of Oregon Emergency Operations Plan: Emergency Support Function 12

APPENDIX B: Memorandum of Understanding Between ODOE and OPUC

APPENDIX C: Fuel Supply Disruption Tracking Form

APPENDIX D: Petroleum Alert and Emergency Notification Call Tree

APPENDIX E: Notification & Activation of Oregon Emergency Response Organizations for Fuel Emergencies

APPENDIX F: ODOE Situation Report Sample for Fuel Emergencies

APPENDIX G: ODOE Emergency Operations Center Organizational Chart

APPENDIX H: Utility Emergency Incident & Outage Situation Report Form

APPENDIX I: Regional Curtailment Plan

APPENDIX J: Proposed Oregon State LNG Emergency Response Plan Format

APPENDIX K: Oregon Distributed Energy Resiliency Study Executive Summary

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ESF 12 Tasked Agencies	
Primary Agencies	Oregon Department of Energy (ODOE) Public Utility Commission (PUC)
Supporting Agencies	Department of Administrative Services (DAS) Department of Human Services (DHS) Oregon Military Department (OMD) Oregon Department of Transportation (ODOT)
Adjunct Agencies	

1 Purpose

- Facilitate restoration of damaged energy systems and components during a potential or actual emergency or major disaster.
- Manage state response to emergencies involving radioactive materials releases from fixed nuclear facilities (Hanford), commercial nuclear power plants (Columbia Generating Station and the Trojan Independent Spent Fuel Storage Installation), and research reactors (Oregon State University and Reed College).
- Manage state response to transportation accidents involving radioactive material shipments on Oregon highways.
- Manage state response to emergencies involving the severe or long-term shortage or disruption of petroleum products. This includes implementing the state wide fuel allocation program when appropriate.
- Manage state response to emergencies involving the transportation, transmission and distribution of Liquefied Natural Gas (LNG).

2 Scope

Gathers, assesses, and shares information on energy system damage and estimations of the impact of energy system outages within affected areas. Determine issues and implements appropriate protective actions to ensure the protection of public health and safety during energy emergencies. Works closely with, and aids in, meeting requests for assistance from local officials, energy industry suppliers and distributors. Within ESF 12, energy includes producing, refining, transporting, generating, transmitting, conserving, building, distributing and maintaining energy systems and system components.

3 Roles and Responsibilities

3.1 Primary Agencies

3.1.1 Department of Administrative Services

Provide restorative services including structural, HVAC and electrical systems within state-owned facilities during or after an incident in the state of Oregon which requires a coordinated response.

3.1.2 Oregon Department of Energy

- The Oregon Department of Energy is responsible for planning, preparedness, response, and recovery from petroleum disruptions (ORS 176), liquefied natural gas mishaps (496), and radiological emergencies (496).

- ODOE operates an agency Emergency Operations Center (EOC) in Salem. The agency EOC serves as the state-wide coordination point for ODOE emergency response activities. ODOE provides a liaison to the state Emergency Coordination Center (ECC) when activated. ODOE maintains six 24/7 duty officers. ODOE is responsible for ensuring state and local emergency response organizations are trained and prepared to respond to petroleum, LNG, and radiological emergencies.

- Petroleum Emergency Preparedness and Response - ODOE maintains Oregon's Petroleum Contingency Plan. The purpose of the plan is to ensure an effective, well-coordinated response with industry, federal, state, and local emergency response organizations to protect public health and safety, the environment, and the region's economy. The plan applies a free market approach with government intervention only when it becomes necessary to protect public health and safety.

- Lead agency for ensuring a coordinated response to severe or long-term petroleum emergencies that impact the state. ODOE developed and maintains the *Oregon Petroleum Contingency Plan* that includes a state-wide fuel allocation program. ODOE is also the lead agency for ensuring a coordinated response to transportation, transmission and distribution emergencies involving Liquid Natural Gas (LNG) vessels, pipelines, and facilities.

- Developed and maintains the state of Oregon's LNG Emergency Response Plan. The plan defines the state's role and responsibilities to prepare for, respond to, and recover from LNG emergencies that threaten the health and safety of Oregon citizens, the environment, and the region's economy.

- LNG Emergency Preparedness and Response - Three LNG import facilities are proposed for Oregon to serve the growing need for natural gas supplies in the region. The projects, if built, would receive LNG from ocean going vessels, temporarily store it, and then regasify it before sending it out by pipeline to homes, businesses, electrical generating plants and industries in the Pacific Northwest as well as other parts of the Western United States. Two of the state's LNG Import terminals are proposed the Columbia River and one is proposed in Coos Bay, Oregon.

- Nuclear Emergency Preparedness and Response - ODOE is the lead state agency on nuclear emergency preparedness, response, and recovery. This includes incidents involving fixed nuclear facilities, Independent Spent Fuel Storage Installations (ISFSI), Research Reactors, and radioactive materials transport on Oregon highways (ORS 469). ODOE developed and maintains the Oregon CGS/Hanford Emergency Response Plan, Trojan ISFSI Plan, and the Radioactive Materials Transportation Plan. These plans define the state's role and responsibilities to prepare for, respond to, and recover from radiological emergencies that threaten the health and safety of Oregon citizens, the environment, and the region's economy. ODOE also reviews Oregon State University and Reed College Research Reactor Emergency Response Plans.

- The Federal Emergency Management Agency evaluates ODOE's ability to respond to radiological emergencies biannually to ensure program readiness.

- Assess energy system damage and monitors repair work.

- Collect, assess and provide information to energy supply, demand, and market impacts.

- Identify supporting resources necessary to restore energy systems.

- May deploy DOE response teams as needed to affected areas to assist in response and restoration efforts.

3.1.3 Public Utility Commission

- Regulates the state's investor owned electric, natural gas and telephone utilities, and certain water companies.

- Ensure that utilities and companies have adequate emergency preparedness plans in place.

- During emergencies, disasters, and when the State ECC is activated, the PUC serves as the state's liaison to the utilities.

- Provide assistance to ensure public utilities and PUC regulated entities can effectively restore power, natural gas and other energy sources following a disaster which impact energy resources. Ensure public utilities and PUC regulated entities mobilize and employ the necessary resources available in accordance with emergency plans, as applicable.

3.2 Support Agencies

3.2.1 Department of Human Services

- Provide assistance as appropriate when a disaster occurs that impacts energy resources causing any public health concern or crisis.
- Provide restorative services including structural, HVAC and electrical systems within state-owned facilities during or after an incident in the state of Oregon which requires a coordinated response.

3.2.2 Oregon Military Department

- Provides support assistance as needed.

3.2.3 Oregon Department of Transportation

- Provide traffic control for response to transportation accidents involving radioactive material shipments on state highways.
- Provide staging areas for checkpoints of shipments of agriculture products coming from southeast Washington in the event of a radioactive materials release from Hanford or the Columbia Generating Station.
- Provide technical assistance to transit providers to help with additional riders a fuel crisis would bring to transit systems.
- Provide technical assistance to local governments that start or expand rideshare programs in response to a fuel shortage.
- Assist with distribution of fuel crisis information through local ODOT District and DMV offices.
- Impose highway restrictions as needed in the event of an energy resource emergency, to include actions such as reduced speed limits and new multi-occupant vehicle lane designations.

3.3 Adjunct Agencies

[TO BE DEVELOPED]

4 Concept of Operations

OEM will coordinate all requests for assistance and communicate with the state agencies to identify the appropriate action and state resources to be used. Once Energy assets have been identified to meet the request, OEM will create an action using Ops Center to the specific State agencies to accomplish the task.

ODOE operates an agency Emergency Operations Center (EOC) in Salem. The agency EOC serves as the state-wide coordination point for ODOE emergency response activities. ODOE provides a liaison to the state Emergency Coordination Center (ECC) when activated. ODOE maintains six 24/7 duty officers. ODOE is responsible for ensuring state and local emergency response organizations are trained and prepared to respond to petroleum, LNG, and radiological emergencies.

In the event of a petroleum emergency, ODOE would direct and coordinate the state's overall response effort. ODOE will assess the severity and duration of a supply shortage or disruption, identify potentially affected areas, determine the risks and potential impacts to Oregonians, and advise the Governor on how best to protect the health and safety of Oregonians and the state's economy. This includes recommending and implementing voluntary or emergency conservation measures to reduce the use of petroleum products in the state and implementing Fuel Allocation Procedures if necessary. ODOE is also responsible for coordinating all emergency information and instructions released to the public and news media regarding the state's response effort and emergency actions.

The Oregon Petroleum Contingency Plan includes a state-wide fuel allocation program. If fuel allocation becomes necessary, ODOE would administer the state's Fuel Allocation Program and designate the set-aside volume. ODOE is responsible for working with the state's petroleum suppliers and wholesalers to implement the set-aside volume for use by the state. The set-aside program is designed to interfere minimally with the market, using set-aside volumes that are sufficient only to satisfy hardship and emergency cases. The set-aside program makes no attempt to reduce or inhibit the market price of fuels. All fuel delivered through the program will be purchased at the market price, and whenever possible, through the usual supplier.

ODOE's Fuel Allocation Program is designed to ensure emergency fuel to priority users performing life saving functions, restoring Oregon's critical infrastructure, and preventing community hardships. ODOE uses a three-tiered approach for allocating fuel to priority users. Tier 1 covers the state's emergency services providers. Tier 2 covers the state's essential services providers. Tier 3 allows for a community to request fuel supplies from the state set-aside. A community must show it has an emergency or hardship caused by a shortage of fuel or is receiving relatively less than other areas of the state. Providing emergency fuel to communities is the only element where retail service stations may receive a set-aside allocation. However, the State will not direct set-aside

volumes to specific stations. It will direct prime suppliers to release a certain volume to an area through normal supply channels.

During a fuel supply shortage situation, the need for a method to alleviate potentially long lines at retail service stations may arise. ODOE would implement the Odd/Even Fuel Allocation Measure for the public as appropriate.

All fuel rationing activities requires an Energy Emergency Declaration from the Governor.

In the event of an emergency at an LNG import terminal or along the transport route, ODOE will direct and control the state's overall response effort. This includes:

- Receiving initial notifications from LNG developers about an event,
- Notifying and/or establishing contact with all affected federal, state, and county emergency response organizations to ensure a coordinated response,
- Working with the U.S. Coast Guard, state agencies, and local emergency response organizations to assess the severity of the event, determine impacts to Oregon, and advise the Governor on protective actions for the public, and
- Developing and disseminating emergency information to the public and the news media.

In the event of a radiological emergency, ODOE will direct and control the state's overall response. This includes:

- Alert and mobilize emergency responders,
- Provide timely and accurate information to the public and news media,
- Assess the severity of the radiological accident,
- Issue and implement appropriate protective action recommendations to protect public health and safety,
- Identify and track the radioactive release, and
- Sample, process, and analyze potentially contaminated soil, vegetation, air, and water.

5 Supporting Documents

- National Response Framework, ESF 12 – Energy
- County ESF 12 Annexes

- PUC-Utility Emergency Response Binder
- ODOE-OPUC Procedural Flowchart & existing MOU

6 Appendices

None at this time.

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UNDERSTANDING ON THE AREAS OF RESPONSIBILITIES PERTAINING TO EMERGENCY RESPONSE BETWEEN THE OREGON DEPARTMENT OF ENERGY AND THE OREGON PUBLIC UTILITY COMMISSION

PURPOSE

This Memorandum of Understanding (MOU) establishes a framework for cooperation and outlines responsibilities for the Oregon Department of Energy (ODOE) and the Oregon Public Utility Commission (OPUC) for preparedness and response to energy emergencies that impact the state. This includes petroleum disruptions and shortages, natural gas events, and electricity emergencies. While ODOE takes the lead in preparing for, responding to, and recovery from petroleum mishaps, OPUC is responsible for electricity and natural gas incidents.

RESPONSIBILITIES

❑ Initial Notifications

Petroleum Events – ODOE will provide courtesy notifications to the OPUC. No action is required by the OPUC unless the petroleum emergency impacts the natural gas or electricity supply and distribution systems.

Natural Gas Events – OPUC will provide courtesy notifications to the ODOE. No action is required by ODOE unless the natural gas event impacts the petroleum supply and distribution system.

Electricity Events – OPUC will provide courtesy notifications to ODOE. No action is required by ODOE unless the electricity event impacts the petroleum supply and distribution system.

❑ Event Assessment and Protective Action Decisions

Petroleum Events – ODOE will work with petroleum industry partners to assess the severity of the fuel disruption or shortage, determine its impact on Oregon, and implement protective actions as appropriate to protect the health and safety of Oregonians. This includes issuing voluntary and emergency fuel conservation measures as appropriate and the allocation of emergency fuel if it becomes necessary. Emergency conservation measures and the allocation of fuel require an Emergency Declaration by the Governor. ODOE will work with the Governor's Office and the appropriate state agencies to secure an Emergency Declaration, if appropriate. If fuel allocation becomes necessary, ODOE will work with and rely on the expertise of the OPUC to determine fuel needs for the electricity and natural gas sectors.

Natural Gas Events – OPUC will work with natural gas companies to assess the severity of the natural gas disruption or shortage, determine its impact on Oregon, and implement protective actions as appropriate to protect the health and safety of Oregonians.

Electricity Events – OPUC will work with utility companies and the Bonneville Power Administration to assess the severity of electricity outages, determine its impact on Oregon, and implement protective actions as appropriate to protect the health and safety of Oregonians.

❑ Emergency Information

Petroleum Events – ODOE will draft and disseminate emergency information to the news media and the public. ODOE will provide event status updates to the Governor, the legislative leadership, the Petroleum Advisory Group, state and local emergency response organizations including OPUC, states in the Petroleum Administration Defense District V, U.S. Department of Energy (USDOE), and other federal agencies as appropriate.

Natural Gas Events – OPUC will draft and disseminate emergency information to the news media and the public. OPUC will provide event status updates to the Governor, the legislative leadership, natural gas industry, state emergency response organizations including ODOE, USDOE, Pipeline Hazardous Materials Safety Administration, and other federal agencies as appropriate.

Electricity Events – OPUC will draft and disseminate emergency information to the news media and the public. OPUC will provide event status updates to the Governor, the legislative leadership, state emergency response organizations including ODOE, and other agencies as appropriate.

❑ Emergency Center

Petroleum Events – The ODOE Emergency Operations Center (EOC) will be activated in response to petroleum emergencies that impact the state. ODOE staff will direct and control the state's overall response to petroleum emergencies from the ODOE EOC. This includes assessing the severity of the event; determining the event's impacts on Oregonians; determining and implementing appropriate protective actions; and issuing emergency information to federal, state, and local response organizations, the news media, and the public. If the Oregon Emergency Coordination Center (ECC) at the Oregon Emergency Management Division (OEM) is activated, ODOE will send a liaison to the Oregon ECC to provide information on ODOE actions in response to the petroleum event as appropriate.

Natural Gas Events – OPUC will report to the Oregon ECC at OEM in response to natural gas emergencies that impact the state. OPUC staff will provide support to the state's overall response to natural gas emergencies from the Oregon ECC. This includes assessing the severity of the event; determining the event's impacts on Oregonians; determining and implementing appropriate protective actions; and issuing emergency information to federal, state, and local response organizations, the news media, and the public.

Electricity Events – OPUC will report to the Oregon ECC at OEM in response to electricity emergencies that impact the state. OPUC staff will provide support to the state's overall response to electricity emergencies from the Oregon ECC. This includes assessing the severity of the event; determining the event's impacts on Oregonians; determining and implementing appropriate protective actions; and issuing emergency information to federal, state, and local response organizations, the news media, and the public.

❑ Interface with the U.S. Department of Energy's (USDOE) Office of Energy Assurance

USDOE's Office of Energy Assurance (OE) is the lead federal agency in response to energy emergencies that impact the nation. OE will call the designated state contacts (noted below) for timely assessment of the event conditions and other pertinent emergency information during energy emergencies. OE will also provide training and information sharing opportunities to the states. They include:

- ⇨ Periodic Conference Calls to Address Energy Issues as Needed
- ⇨ Annual Meeting/Conference
- ⇨ Online Training for New Software/Communications Tools
- ⇨ Regional exercise (optional)

Petroleum Events -- ODOE will serve as OE's primary contact for information about emergencies impacting Oregon's petroleum supply and distribution system. ODOE will ensure that the agency's plans and procedures are consistent with OE's for information sharing. ODOE will also participate in activities conducted by OE as appropriate and as resources allow.

Natural Gas Events – OPUC will serve as OE's primary contact for information about emergencies impacting Oregon's natural gas supply and distribution system. OPUC will also participate in activities conducted by OE as appropriate and as resources allow.

Electricity Events – OPUC will serve as OE's primary contact for information about emergencies impacting Oregon's electricity supply and distribution system. OPUC will also participate in activities conducted by OE as appropriate and as resources allow.

❑ Emergency Response Training

Petroleum Events – ODOE will conduct drills and exercises to ensure the industry, federal, state, and local emergency response organizations are prepared to respond to petroleum emergencies that impact the state.

Natural Gas Events – OPUC will monitor industry-initiated drills and exercises to ensure the natural gas operators are prepared to respond to natural gas emergencies that impact the state.

Electricity Events – OPUC will monitor industry-initiated drills and exercises to ensure the utility operators are prepared to respond to electricity emergencies that impact the state.

❑ Plan/Procedures

Oregon State Energy Assurance Plan - ODOE and OPUC will review and update the Oregon State Energy Assurance Plan annually or as needed. Revisions will include improvements identified through drills and exercises. ODOE's Emergency Preparedness Manager will initiate the review and coordinate revisions with industry, federal, state, and county emergency response agencies as appropriate. ODOE will submit the Oregon State Energy Assurance Plan to USDOE annually as the plan of record.

Sector Specific Emergency Response Plans

Petroleum Events – ODOE will develop and maintain emergency plans and procedures for petroleum emergencies that impact the state. The Oregon Petroleum Contingency Plan will be reviewed annually and revised as appropriate to ensure that plans and procedures are consistent with: the changing trends of the world petroleum market; and the plans and procedures of federal, state, and local organizations that support ODOE's response to petroleum emergencies. ODOE will update the Oregon Petroleum Emergency Contacts List quarterly.

Natural Gas Events – OPUC will develop and maintain emergency plans and procedures for natural gas emergencies that impact the state. The Natural Gas Emergency Plan will be reviewed annually and revised as appropriate to ensure that plans and procedures are consistent with: the changing trends of the world natural gas market; and the plans and procedures of federal, state, and local organizations that support OPUC's response to natural gas emergencies.

Electricity Events – OPUC will develop and maintain emergency plans and procedures for electricity emergencies that impact the state. The Electricity Emergency Plan will be reviewed annually and revised as appropriate to ensure that plans and procedures are consistent with: the changing trends of the world electricity market; and the plans and procedures of federal, state, and local organizations that support OPUC's response to electricity emergencies.

EFFECTIVE DATES, EXPIRATION AND CHANGES TO THIS MEMORANDUM OF UNDERSTANDING

❑ Effective Date

This Memorandum of Understanding (MOU) is effective as of the date it is signed.

❑ Expiration

This MOU will remain in effect until formally cancelled by one of the parties to the MOU.

☐ Changes

This MOU can be changed by mutual agreement of the parties involved. In the event of changes, a new MOU will be issued and signed by the parties.

Bob Repine 5/9/12

Bob Repine Date
Acting Director
Oregon Department of Energy

5/8/12

Michael Dougherty Date
Interim Executive Director
Public Utility Commission of Oregon

Appendix C

FUEL SUPPLY DISRUPTION TRACKING FORM

DATE:	COMPLETED BY:
TIME: am/pm	TITLE:

1. PETROLEUM INFRASTRUCTURE AFFECTED

REFINERY(S)	DISTRIBUTION TERMINAL(S)	PIPELINE COMPANY(S)
☐ BP Cherry Point ☐ Conoco Phillips ☐ Shell Anacortes ☐ Tesoro Refining & Marketing Company	☐ BP ☐ Chevron ☐ Conoco Phillips ☐ Kinder Morgan ☐ McCall Oil ☐ NuStar ☐ Shell ☐ Tesoro	☐ Chevron Pipeline *(Salt Lake City to Spokane)* ☐ Kinder Morgan Pipeline *(Portland terminal to PDX and Eugene Terminal)* ☐ NuStar Pipeline (Umatilla to Union Pacific storage facility south of Hermiston) ☐ Olympic Pipeline *(WA refineries to Portland terminals – 230 miles)*

2. FACILITY OR SYSTEMS AFFECTED

SYSTEM AFFECTED

☐ Tank Farm(s) ☐ Pipelines ☐ Containment ☐ Marine Dock ☐ Loading Racks ☐ Other: _____

DESCRIPTION: _____

CAUSE OF SUPPLY DISRUPTION OR ACCIDENT

☐ Refinery or Terminal Shutdown ☐ Pipeline Failure ☐ Natural Disaster ☐ Terrorism or Sabotage ☐ War or Civil Unrest ☐ Fire or Explosion ☐ Other: _____

DESCRIPTION: _____

3. PRODUCT SUPPLY AFFECTED

☐ Crude	☐ Jet Fuel	☐ Fuel Oil	☐ Heating Oil (No. 2 Distillate)	☐ Other _____
☐ Gasoline	☐ Aviation Gasoline	☐ Additives		☐ Other _____
☐ Diesel		☐ Propane		

4. PETROLEUM INDUSTRY RESPONSE & RECOVERY ACTIONS

☐ *Facility operators must complete a Facility Operations Log following petroleum emergencies and a Facility Start-Up Plan prior to restarting operations. ODOE responders should obtain this information from operators during the state's assessment of fuel supplies. See Attachment 1B.*

☐ Power Yes ___ No ___

☐ Water Yes ___ No ___

☐ Communications Yes ___ No ___

5. PETROLEUM INDUSTRY REQUESTS OF ODOE

☐ Request ODOE coordinate acquiring waivers of federal and state driver hour limitations to increase bulk highway fuel transport.
☐ Request ODOE coordinate acquiring waivers from DEQ and EPA for the import of gasoline that does not meet local and federal air quality requirements.
☐ Request ODOE coordinate with USDOE to obtain Jones Act waivers for the import of petroleum products on non-US flag vessels.
☐ Request ODOE facilitate obtaining generators for distribution terminals in the event of a power outage to support recovery actions. .
☐ Other actions as appropriate: _____

_____

6. SUPPLY ASSESSMENT

REFINERIES

Capacity (B/D)

Washington State	Operating	Shut Down	Restarting	Reduced Runs	Back to Normal
BP Cherry Point - Blaine					
Conoco Phillips – Ferndale					
Shell – Anacortes					
Tesoro – Anacortes					
TOTAL SUPPLY DISRUPTION					

TERMINALS

Capacity (B/D)

Oregon State	Operating	Shut Down	Restarting	Reduced Runs	Back to Normal
BP – Portland					
Chevron – Portland					
Conoco Phillips – Portland					
Kinder-Morgan – Portland					
Kinder-Morgan – Eugene					
McCall Oil – Portland					
Shell Oil – Portland					
NuStar – Portland					
Tesoro – Vancouver, WA					
TOTAL SUPPLY DISRUPTION					

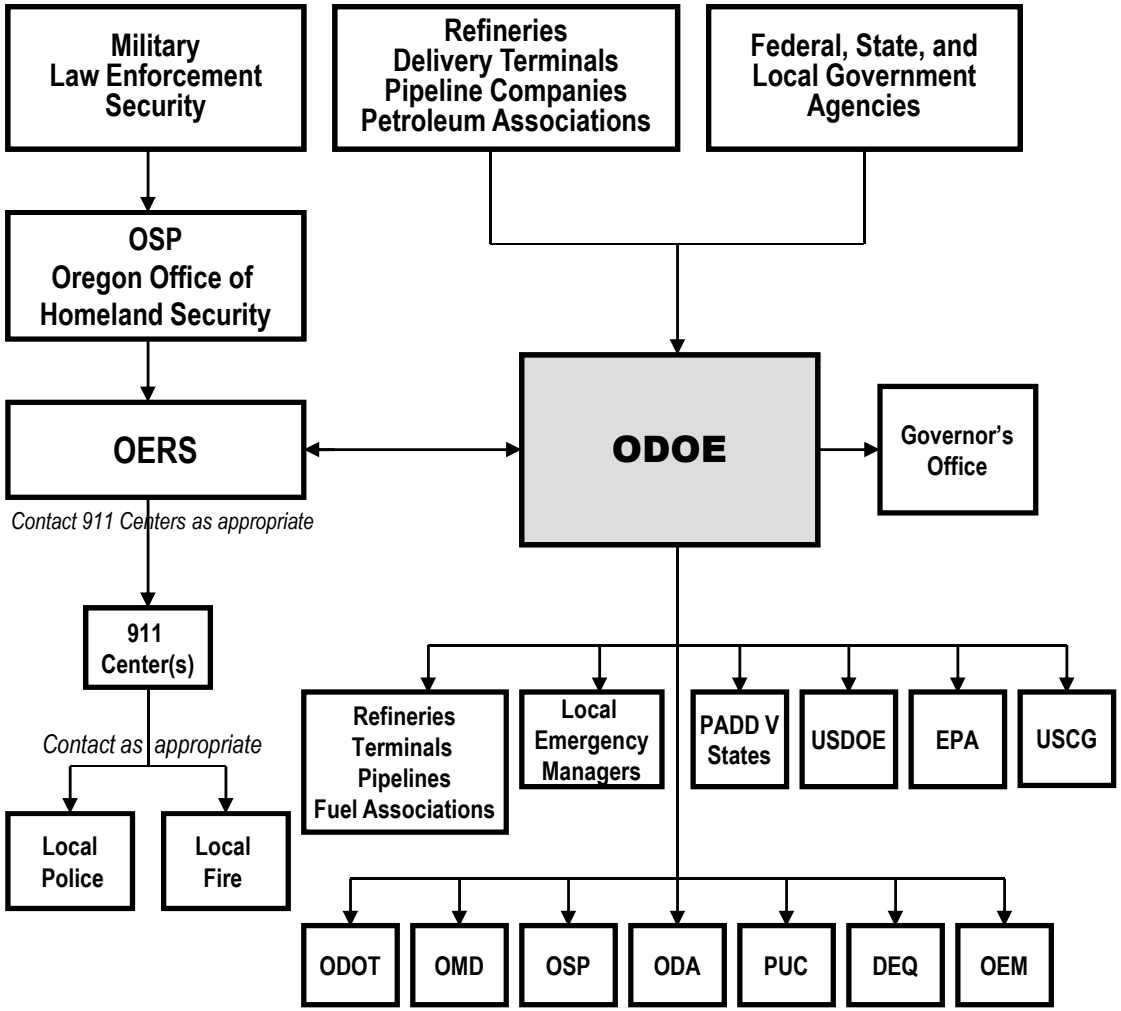
PIPELINE COMPANIES

Capacity (B/D)

Regional	Operating	Shut Down	Partial Shut Down	Reduced Rates	Back to Normal
Olympic Pipeline WA Refineries to Portland Distribution Terminals					
Chevron Pipeline Salt Lake City, UT to Spokane, WA – Supplies NE Oregon					
Kinder-Morgan Pipeline Kinder-Morgan Portland terminal to Portland International Airport and Eugene, OR Terminal					
NuStar Pipeline Umatilla to Union Pacific storage facility south of Hermiston					
TOTAL SUPPLY DISRUPTION					

Appendix D

Petroleum Alert and Emergency Notification Call Tree



Alert and Emergency Notifications:

- To report suspicious activity, actual attacks, or other emergency situation at the terminals or pipelines.
- To report forecasted petroleum shortage or disruption.
- To report potential or actual attacks on the petroleum supply or distribution system.
- To report other energy events that may impact the the state's petroleum supply or distribution system.

ACRONYMS

DEQ:	**Oregon Department of Environmental Quality**
ODA:	**Oregon Department of Agriculture**
ODOE:	**Oregon Department of Energy**
ODOT:	**Oregon Department of Transportation**
OERS:	**Oregon Emergency Response System**
OEM:	**Oregon Emergency Management**
OMD:	**Oregon Military Department**
OSP:	**Oregon State Police**
PADD V:	**Petroleum Administration for Defense District V:** *Alaska, Arizona, California, Hawaii, Nevada, Oregon, and Washington*
PUC:	**Public Utility Commission**
USCG:	**U.S. Coast Guard**
USDOE:	**U.S. Department of Energy**
US EPA:	**U.S. Environmental Protection Agency**

Appendix E

Notification and Activation of Oregon Emergency Response Organizations for Petroleum Emergencies

The Oregon Department of Energy (ODOE) will provide initial notifications to federal, state, and local emergency response organizations in the event a petroleum emergency. Upon activation of the agency's Emergency Operations Center, ODOE may request organizations send representatives to the ODOE EOC to support the state's response to fuel shortages and disruptions depending on the severity of event conditions.

Emergency Response Organization	Level 1 No discernable shortage. Possible shortages elsewhere	Level 2 5-10% reduction in supply for a week or more. Estimated shortage by days a terminal is closed or the number of substitutions of truck deliveries instead of normal pipeline supply.	Level 3 10-15% reduction in supply for three weeks or more. Curtailments by local gas distribution companies for two weeks or more.	Level 4 Greater than 15%* reduction in availability of petroleum products.
Governor	*ODOE routinely monitors international and domestic events to better anticipate problems with potential impacts to Oregon's petroleum supply, distribution system and prices.*	Notify. Standby for additional information.	Notify. Report to ODOE EOC if requested.	Notify. Report to ODOE EOC.
State Agencies: OERS, OEM, ODOT, OSP, OMD, PUC, ODA, DAS, and DEQ		Notify. Standby for additional information.	Notify. Report to ODOE EOC if requested.	Notify. Report to ODOE EOC.
County Agencies: 36 County Emergency Management Agencies		Notify. Standby for additional information.	Notify. Limited activation of county EOCs as appropriate.	Notify. Full activation of county EOCs as appropriate.
Federal Agencies: USDOE, EPA, and USCG		Notify. Standby for additional information.	Notify. Standby for additional information.	Notify. Standby for additional information. Support ODOE EOC as needed.
PADD V States: Alaska, Arizona, California, Idaho, Hawaii, Nevada, and Washington		Notify. Standby for additional information.	Notify. Standby for additional information.	Notify. Standby for additional information.
Refineries: BP Cherry Point Refinery, Conoco Phillips Refinery, Shell Anacortes Refinery, and Tesoro Refinery		Notify. Assess and report on supply situation.	Notify. Assess and report on supply situation.	Notify. Assess and report on supply situation.. Support fuel allocation measures as needed.
Terminals: BP, Chevron, Conoco Phillips, Kinder-Morgan Energy, McCall, Shell Oil Products, NuStar, and Tesoro Petroleum *(Vancouver, WA)*		Notify. Assess and report on supply situation.	Notify. Assess and report on supply situation.	Notify. Assess and report on supply situation. Support fuel allocation measures as needed.
Pipelines: Chevron Pipeline Company, Chevron Willbridge Products System, NuStar, Kinder-Morgan Pacific Operations, & Olympic Pipeline Company		Notify. Assess and report on supply situation.	Notify. Assess and report on supply situation.	Notify. Assess and report on supply situation. Support fuel allocation measures as needed.
Associations: OPMA and WSPA		Notify. Assess and report on supply situation.	Notify. Assess and report on supply situation.	Notify. Assess and report on supply situation.. Support fuel allocation measures as needed.

Appendix F

SITUATION REPORT #75

September 15, 2010 (9:00 a.m. PST)

OREGON DEPARTMENT OF ENERGY

http://www.energy.state.or.us/EOC/index.htm

EMERGENCY SUPPORT FUNCTION (ESF) 12: ENERGY

ORS 176.809 authorizes the Oregon Department of Energy (ODOE) to prepare and respond to petroleum emergencies that impact Oregon. ODOE continues to work with suppliers, wholesalers, and distributors to restore the petroleum infrastructure and ensure fuel is delivered to emergency and essential service providers in the state in the aftermath of the magnitude 9.0 earthquake Tuesday, June 15, 2010 at 10 a.m. The quake rocked the Pacific Northwest from Canada to Northern California and caused approximately four minutes of ground shaking which was felt significantly west of the Cascades and most severely along the coast.

BACKGROUND

There are no internal crude resources in Oregon and the state has no refining capabilities. Oregon imports 100 percent of its refined petroleum products. More than 90 percent of the fuel Oregon receives come from four refineries in the Puget Sound Area of Washington State. More than 70 percent of this fuel is transported 230 miles from the refineries to eight petroleum distribution terminals near the Linton Wilbridge and St. Helens Road area of Northwest Portland via the Olympic Pipeline. Once the fuel reaches the Portland distribution terminals, one pipeline, a fleet of about 1,500 trucks, and barges on the Columbia distribute fuel to roughly 2,250 retail service stations throughout the state.

On average there is a one week supply of diesel and unleaded gasoline in storage at the Portland distribution terminals. Retail service stations store a 2-3 day supply of fuel onsite. The Portland International Airport has a 3-day supply of jet fuel in storage on site.

Refineries and petroleum distribution terminals are not designed to withstand a 9.0 earthquake with four minutes of ground shaking. Damages to facilities, tanks, facility piping, and other systems was significant throughout western Oregon and Washington. While crude and product pipelines are flexible by design, earth movement from a catastrophic quake put significant stress on the pipelines and will likely caused leaks and damages throughout the lines. It will likely weeks or months to fully assess and repair anticipated damage to these facilities. Expect little to no production or product movement for more than one week.

Electricity, telecommunications, pipelines, bridges and roads, natural gas and city water supply are critical resources for facility operations, responding to emergencies onsite, and recovery efforts to restore the petroleum infrastructure following a catastrophic event.

0 – 72 HOURS

ODOE ACTIONS

- Activated ODOE EOC and established communications with refineries, petroleum distribution terminals, and pipeline companies servicing Oregon to assess impacts to the petroleum infrastructure.

SAMPLE

- ODOE Liaisons responded to the Joint Field Office to address fuel issues and concerns. ODOE requested generators for refineries and petroleum distribution terminals.

- Established contact with the U.S. Department of Energy, Lead Federal Agency for ESF 12. We participated in USDOE daily conference calls with all 50 states to assess regional and national fuel outlook and possible assistance to Oregon.

- Requested information from the Oregon Public Utility Commission (PUC) about damages to the electricity, natural gas, and telecommunications infrastructure. Power, natural gas, and communications capabilities are critical to the refineries, petroleum distribution terminals, and pipeline companies to conduct timely damage assessments of facilities, equipment, and systems and for operations.

- Requested information from the Oregon Department of Transportation (ODOT) on damages to roads and bridges to determine viable transportation corridors to support fuel deliveries.

- Requested the Oregon Department of Aviation conduct a flyover of the refineries and petroleum distribution terminals for a visual assessment of the conditions at these facilities.

- Requested U.S. Coast Guard provide special access for workers to enter distribution terminals during the lockdown of port facilities. MARSEC 3 puts the Port of Portland in lockdown stopping the movement of fuel and worker traffic into and out of the petroleum distribution terminals.

- Drafted and issued news releases providing information on impacts to Oregon's fuel supply and distribution system, protective action recommendations for the public and voluntary fuel conservation measures.

PETROLEUM INDUSTRY ACTIONS

REFINERIES - Onsite workers at four refineries in Washington State completed initial visual inspections of its facilities. All four refineries sustained severe damage to their facilities, equipment, and systems and remain in shutdown mode. All four refineries lost power as a result of the earthquake and do not have generators onsite. Refineries remain without power. Power is required for refinery workers to complete a detailed engineering inspection of pipes, vessels, structures, and tanks to evaluate mechanical integrity.

PETROLEUM DISTRIBUTION TERMINALS – Onsite workers at eight Portland petroleum distribution terminals completed initial visual inspections of their facilities. All eight distribution terminals report severe damages to terminal facilities, tanks, containment systems, additive systems and facility piping resulting in spills and leaks. All eight terminals are without power. Some terminals have small generators onsite to produce limited backup power for running boilers for steam heating of heavy oil lines and tanks and for providing minimal lighting. These generators do not produce enough power to drive operations or to complete a more detailed assessment of damages. Power is required for terminal workers to complete a detailed engineering inspection of pipes, vessels, structures, and tanks to evaluate mechanical integrity.

PIPELINE COMPANIES – Pipeline operators reported difficulty in assessing integrity of the pipeline system due to the loss of power. Aerial Patrols have conducted over-flights along the Right of Way and reported many releases requiring verification. Operators had to postpone dispatching personnel to inspect the pipeline Right of Ways until roads and bridges were viable. Inspecting the pipeline Right of Way must be done by vehicle and walking the length of the pipelines. Power is also necessary to verify the pressure and integrity of the pipelines.

SAMPLE

72 – 168 Hours

Assumptions: Limited telecommunications capabilities, generators delivered to refineries and petroleum distribution terminals, and limited viable roads and bridges.

- ODOE EOC remained fully operational and decision-makers and emergency responders continue to work with refineries, petroleum distribution terminals, and pipeline companies servicing Oregon to assess impacts to the petroleum infrastructure.
- ODOE Liaisons continued participation at the JFO to coordinate ESF 12 response and recovery efforts for the fuel sector. This included working with the Oregon Military Department to coordinate the delivery of generators to the petroleum distribution terminals and working with Washington State on the delivery of generators to the refineries.
- ODOE requested USDOE provide assistance in obtaining fuel from other regions to support emergency response efforts in Oregon. ODOE requested Oregon Military Department assistance in providing portable fueling locations to dispense fuel for emergency and essential services providers.
- Continued to work closely with PUC to monitor the restoration efforts of the electricity, natural gas, and telecommunications infrastructure to support fuel supply and distribution system damage assessment and restoration efforts.
- Continued to work closely with ODOT to monitor the restoration of roads and bridges to determine viable transportation corridors to support fuel deliveries.
- Continued to work closely with USCG to approve access of workers to the distribution terminals in a MARSEC 3 lockdown of port facilities.
- Began work with Oregon counties impacted by quake to assess fuel needs of emergency service providers. This included law enforcement, fire service, and medical service providers.
- Began work with state agencies to assess fuel needs for essential service providers. This includeds utilities, telecommunications, transportation, sanitation, public works, agriculture, and other essential service providers to assess fuel needs.
- Continued to draft and issue news releases providing information on impacts to Oregon's fuel supply and distribution system, protective action recommendations for the public and voluntary fuel conservation measures.

PETROLEUM INDUSTRY ACTIONS

Refineries, petroleum distribution terminals, and pipeline companies received generators allowing onsite workers the ability to begin detailed engineering inspections of pipes, vessels, structures, tanks, and pipelines to evaluate mechanical integrity. It took 24-48 hours to complete a detailed inspection of facilities with the available power. There was no production or movement of fuel at this time.

1 Week – 1 Month

Assumptions: Limited telecommunications capabilities, refineries and petroleum distribution terminals operating with generators, and limited viable roads and bridges.

SAMPLE

- ODOE EOC remained fully operational and decision-makers and emergency responders continue to work with refineries, petroleum distribution terminals, and pipeline companies servicing Oregon to get fuel production and movement restored.

- ODOE Liaisons continued participation at the JFO to coordinate ESF 12 response and recovery efforts for the fuel sector. This included working with the Oregon Military Department to identify locations to establish portable fueling stations and coordinate the delivery of fuel obtained from USDOE from other regions to the emergency and essential service providers in Oregon.

- Worked with ODOT to implement public campaign promoting mobility conservation measures like taking public transit, carpooling, bicycling, and other ways to limit driving personal vehicles.

- Implemented Odd/Even fuel allocation for the public.

- Worked with Oregon Department of Justice (DOJ) to suspend regulations on additives like boutique gasoline requirements until the supply chain was fully restored. Some fuels from outside the region did not meet Oregon standards.

- Worked with DOJ to suspend regulations on vapor recovery systems at dock facilities to allow all distribution terminals with working docks to receive fuel from tanker vessels. Both Chevron and Kinder Morgan dock facilities sustained significant damage. Of the eight distribution terminals, only Chevron and Kinder Morgan (docks located right next to each other) were permitted to receive gasoline products by tankers. The dock facilities at six of the terminals were not equipped with vapor recovery systems.

- Continued to work closely with PUC to monitor the restoration efforts of the electricity, natural gas, and telecommunications infrastructure to support fuel supply and distribution system damage assessment and restoration efforts.

- Continued to work closely with ODOT to monitor the restoration of roads and bridges to determine viable transportation corridors to support fuel deliveries.

- USCG change in its MARSEC 2 level (from MARSEC 3 to MARSEC 2) lifted lockdown of port facilities allowing access of workers to the distribution terminals without security clearance.

- Continued to draft and issue news releases providing information on impacts to Oregon's fuel supply and distribution system, protective action recommendations for the public and voluntary fuel conservation measures.

PETROLEUM INDUSTRY ACTIONS

Refineries, petroleum distribution terminals, and pipeline companies completed engineering assessments of facilities and systems. The assessments confirmed signification damages to the integrity of pipes, vessels, structures, tanks, and pipelines, which severely impacted operations. Industry personnel prioritized and repaired facilities, equipment and systems as needed to jumpstart fuel production and distribution. Limited fuel production and movement occurred during this period.

1 Month – Present

Assumptions: Moderate telecommunications capabilities, electricity restored to refineries and petroleum distribution terminals, and some viable roads and bridges to support fuel deliveries.

SAMPLE

- ODOE EOC continues 24/7 operation at a limited activation to continue working with petroleum distribution terminals to set aside and allocate available fuel for emergency and essential service providers as directed by ODOE.

- If JFO is still operational, ODOE Liaisons will continue to participate at the JFO to coordinate ESF 12 response and recovery efforts for the fuel sector.

- Monitor and determine when waivers for additives and vapor recovery systems are to be lifted. Trigger – viable roads and bridges allowing for delivery of additives.

- Monitor and determine when to terminate Odd/Even fuel allocation for the public.

- Monitor and determine when to terminate fuel allocation for emergency and essential services. Trigger – when emergency and essential services are able to fuel up at their normal fueling locations.

- Continue to work closely with PUC to monitor the restoration efforts of the electricity, natural gas, and telecommunications infrastructure.

- Continue to work closely with ODOT to monitor the restoration of roads and bridges to determine viable transportation corridors to support fuel deliveries.

- Continue to draft and issue news releases providing information on impacts to Oregon's fuel supply and distribution system, protective action recommendations for the public and voluntary fuel conservation measures.

PETROLEUM INDUSTRY ACTIONS

Refineries, petroleum distribution terminals, and pipeline companies continue repairs to facility, equipment, and systems. Moderate fuel production and movement during this period.

FOR MORE INFORMATION:

Deanna Henry
Emergency Preparedness Manager
Nuclear Safety & Energy Emergency Preparedness Division
Oregon Department of Energy
(503) 932-4428
deanna.henry@state.or.us

SAMPLE

Oregon Petroleum Supply & Distribution System Status

REFINERIES

REFINERY	Capacity (B/D)				
	OPERATING	SHUT DOWN	RESTARTING	REDUCED RUNS	BACK TO NORMAL
BP Cherry Point 4519 Grandview Road Blaine, WA 98230					
Conoco Phillips 3901 Unick Road Ferndale, WA 98248					
Shell Anacortes 8505 S.Texas Road Anacortes, WA 98221					
Tesoro Refining and Marketing Company March Point Road Anacortes, WA					

PETROLEUM DISTRIBUTION TERMINAL

TERMINAL	Capacity (B/D)				
	OPERATING	SHUT DOWN	RESTARTING	REDUCED RUNS	BACK TO NORMAL
BP 9930 NW St Helens Rd Portland, OR 97231					
Chevron 5924 NW Doane Ave Portland, OR 97208					
Conoco Phillips 5528 NW Doane Ave Portland, OR 97208					
Kinder-Morgan *(Third Party Terminal)* 5880 NW St. Helens Rd Portland, OR 97210					
McCall Oil 5550 NW Front Ave Portland, OR 97210					
Shell Oil 3800 NW St. Helens Rd Portland, OR 97210					
NuStar *(Third Party Terminal)* 9420 NW St. Helens Rd Portland, OR 97231					

SAMPLE

Tesoro *(Vancouver, WA Storage Terminal -Columbia River)* 2211 Saint Francis Ln Vancouver, WA 98660					
PIPELINE COMPANIES					
PIPELINE	**Capacity (B/D)**				
	OPERATING	**SHUTDOWN**	**PARTIAL SHUTDOWN**	**REDUCED RATES**	**BACK TO NORMAL**
Olympic Pipeline WA Refineries to Portland Distribution Terminals					
Chevron Pipeline Salt Lake City, UT to Spokane, WA – Supplies NE Oregon					
Kinder-Morgan Pipeline Kinder-Morgan Portland terminal to Portland International Airport and Eugene, OR Terminal					
NuStar Pipeline Umatilla to Union Pacific storage facility south of Hermiston					

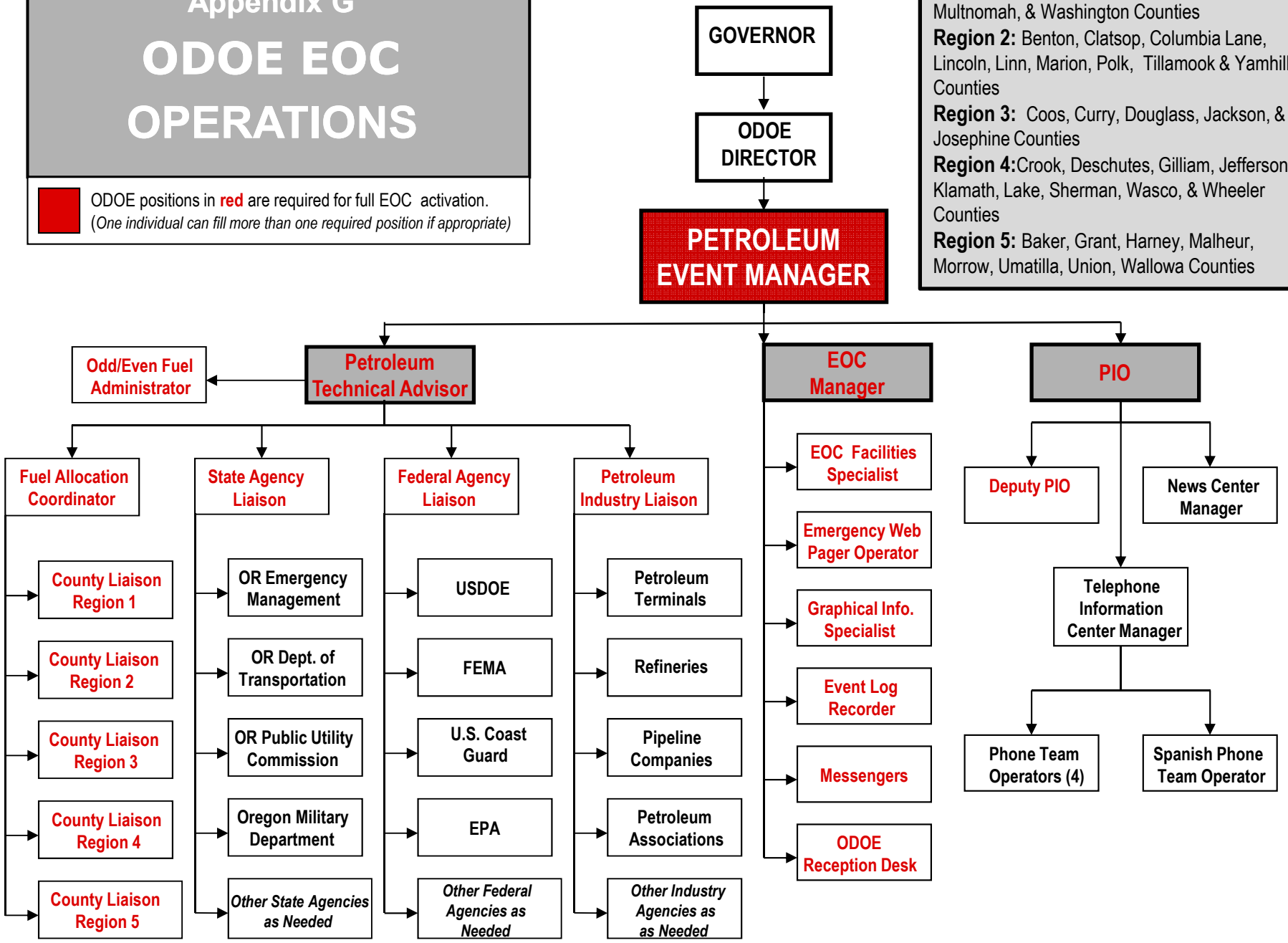
SAMPLE

Appendix G

ODOE EOC OPERATIONS

ODOE positions in **red** are required for full EOC activation.
(*One individual can fill more than one required position if appropriate*)

Region 1: Clackamas, Hood River, Multnomah, & Washington Counties
Region 2: Benton, Clatsop, Columbia Lane, Lincoln, Linn, Marion, Polk, Tillamook & Yamhill Counties
Region 3: Coos, Curry, Douglass, Jackson, & Josephine Counties
Region 4: Crook, Deschutes, Gilliam, Jefferson, Klamath, Lake, Sherman, Wasco, & Wheeler Counties
Region 5: Baker, Grant, Harney, Malheur, Morrow, Umatilla, Union, Wallowa Counties



Appendix H

UTILITY EMERGENCY INCIDENT & OUTAGE SITUATION REPORT FORM

DRAFT



OREGON PUBLIC UTILITY COMMISSION
March 31, 2010

Introduction

This document provides a Utility Emergency Incident & Outage Situation Report form to be used in the administration of the Oregon State Energy Assurance Plan.

OVERVIEW

The Oregon Public Utility Emergency Response Plan is incorporated in Part II of the Energy Assurance Plan. The Emergency Response Plan outlines four levels of alert with its associated triggering events as shown below.

	ACTIVATING EVENTS
LEVEL I	An injury causes hospitalization or death.
	Service to more than 50,000 electric customers (50 natural gas customers) is disrupted for over 2-hours.
LEVEL II	Activation of electric or natural gas utility Emergency Operation Center (EOC).
LEVEL III	Moderate shortage, escalating incident, or disruption.
	Utility Operator requests for limited assistance.
	Impact extends to interdependent utility operators.
LEVEL IV	Escalation of a high frequency, low impact outage or incident estimated to last a period of months, precluding the reliability of electric or natural gas service delivery.
	Utility companies recognizing that either company resources—staff experts, materials, equipment—are being exhausted or a multi-jurisdictional emergency is occurring.
	A devastating natural or deliberate disaster that immediately impacts electric or natural gas infrastructure with little or no warning.
	Energy demand exceeds generation supply such that electric or natural gas shortage occurs and the situation becomes unmanageable by natural gas operators, balancing authorities, and excess market supply.
	Implementation of mandatory Regional Curtailment Plan required.

When an event escalates and triggers Level III, the Public Utility Commission Duty Officer will complete this form in conjunction with other LEVEL III response actions. This form will serve as a situational report to collect relevant information to be used to brief PUC executive staff, Oregon Emergency Management, and other necessary parties.

DRAFT

OREGON PUBLIC UTILITY COMMISSION
UTILITY EMERGENCY INCIDENT & OUTAGE SITUATION REPORT

Section 1-General Information

Utility/Operator Name: Select
Reporting Individual: (Type Here)
Title: (Type Here)
Phone Number: (Type Here)
Fax Number: (Type Here)
Email: (Type Here)
Provider Type: Natural Gas
Disruption Origin: ☐ Within Utility System
☐ Outside Utility System
If Outside, Where? (Type Here)

Initial Incident & Outage Information
Date: Select
Time: Select
# of Affected Metering Points: (Type Here)
Location(s): Baker Baker City

Section 2-Incident & Outage Information

Hazard(s): ☐ Natural ☐ Accidental ☐ Deliberate ☐ Systemic

Level 1 Activation: ☐ Hospitalization ☐ Death ☐ Loss of Service to More Than 50 Customers ☐ Damage Greater than $5k

Level 2 Activation: ☐ Utility/Operator Activated Company Emergency Operation Center (EOC)

Level 3 Activation: ☐ Moderate shortage, escalating incident, or disruption
☐ Utility Operator requests for limited assistance
☐ Impacts extends to interdependent utility operators
☐ Other: _____

Explanation: (Type Here)

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Natural Gas Specific: ☐ Transmission Problem ☐ Distribution Problem ☐ Pressure Problem

Actions Taken: ☐ Shed Firm Load ☐ Shed Interruptible Load ☐ Repair/Restore
☐ Issuing Warning Alert ☐ Other: _____

Estimated Restoration Time: Select Select
Actual Restoration Time: Select Select

For PUC Staff Only					
Date Received:	Select	Time:	Select	Received By:	Select Name

OREGON PUBLIC UTILITY COMMISSION
UTILITY EMERGENCY INCIDENT & OUTAGE SITUATION REPORT

Section 1-General Information

Utility/Operator Name: Portland General Electric
Reporting Individual: (Type Here)
Title: (Type Here)
Phone Number: (Type Here)
Fax Number: (Type Here)
Email: (Type Here)
Provider Type: Electric
Disruption Origin: ☐ Within Utility System
☐ Outside Utility System
If Outside, Where? (Type Here)

Initial Incident & Outage Information
Date: Select
Time: Select
# of Affected Metering Points: (Type Here)
Location(s): Baker Baker City

Section 2-Incident & Outage Information

Hazard(s): ☐ Natural ☐ Accidental ☐ Deliberate ☐ Systemic

Level 1 Activation: ☐ Hospitalization ☐ Death ☐ Loss of Service to More Than 500 Customers ☐ Damage Greater than $100k

Level 2 Activation: ☐ Utility/Operator Activated Company Emergency Operation Center (EOC)

Level 3 Activation: ☐ Moderate shortage, escalating incident, or disruption
☐ Utility Operator requests for limited assistance
☐ Impacts extends to interdependent utility operators
☐ Other: _____

Explanation: (Type Here)

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Electric Specific: ☐ Generation Tripped ☐ Transmission Tripped ☐ Substation Related
Actions Taken: ☐ Shed Firm Load ☐ Shed Interruptible Load ☐ Repair/Restore
☐ Reduce Voltage ☐ Issuing Warning Alert ☐ Other: _____

Estimated Restoration Time: Select Select
Actual Restoration Time: Select Select

For PUC Staff Only
Date Received: Select Time: Select Received By: Select Name

ORDER NO. 93-084

ENTERED JAN 19 1993

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UM 500

In the Matter of the Commission's Investigation into an Electric Load Curtailment Plan.) ORDER

DISPOSITION: CURTAILMENT POLICIES ADOPTED

INTRODUCTION

Oregon Revised Statutes Chapters 757 and 758 require those who sell electricity (or natural or synthetic gas) to the public in Oregon to have in place load-curtailment plans approved by the Commission. The requirement applies to individuals, firms, partnerships, corporations, associations, cooperatives, and municipalities. The plans would apply during any energy emergency declared by the Governor pursuant to ORS 176.750 through 176.820. The current plans on file with the Commission have been in effect since the late 1970's.

Load-curtailment plans address energy shortages lasting months, rather than short-term shortages that might result from a period of unusually cold weather. ORS 757.710 directs that the plans address "any predictable circumstance that may jeopardize prolonged continuity of service."

During the past three years, a group of regulatory and utility representatives from Oregon, Washington, Idaho, and Montana have developed a regional electric load curtailment plan. Representatives from private and public utility companies, state regulatory commissions, the Bonneville Power Administration, the direct service industries, the Northwest Power Planning Council, the Oregon Department of Energy, and others, worked to develop the plan. They created a regional plan designed to deal effectively with long-term shortage situations and promote curtailment plan uniformity among the states. The plan was issued in May 1992.

The regional plan does not, by itself, have any enforcement authority. Sponsors of the plan encourage the four states to individually adopt curtailment plans consistent with the regional plan.

At its public meeting on August 4, 1992, the Commission considered a recommendation by its staff that it initiate an investigation into revising the Commission's electric load curtailment policies. The Commission adopted its staff's recommendations. The regional plan has served as a focal point for the investigation.

The Commission served notice of its investigation on a large number of individuals and organizations who might be interested in curtailment plans. Written comments were invited. During September 1992 hearing sessions were held in Salem, Grants Pass, Bend, and Baker City, Oregon. Those who commented on the plan agreed with the general principles stated in the regional plan.

Commission staff recommends that the Commission require each electric energy utility operating in Oregon to file a load curtailment plan with the Commission. Staff recommends that the filed plans be based on a model plan issued by the Commission. Staff also recommends that the Commission adopt the regional curtailment plan as a general policy guideline for dealing with long-term electric energy shortages.

PROPOSED CURTAILMENT POLICIES

The proposed model plan contains five phases of curtailment. The first two involve appeals for voluntary curtailment; the last three involve mandatory curtailment amounts. The model plan provides for enforcement of mandatory curtailment by the use of penalties.

The voluntary phases would consist of requests that customers curtail their consumption of electricity. Most people would be willing to reduce their consumption when faced with the consequences of a shortage.

If voluntary curtailment failed to bring resources and loads into balance, mandatory curtailment would be required. In phase one of mandatory curtailment, customers would be required to consume less electricity than they consumed during the corresponding billing period the previous year. A required percentage reduction would be established and would apply to all customers.

The second stage of mandatory curtailment would require an additional reduction in consumption of electricity. As more severe curtailment steps are required, differences among the customer classes become more important. Some will be able to take additional curtailment measures with less disruption than others. Therefore, it may not be practical or even possible to require the same percentage reduction for all customer classes. For instance, the Commission may decide that residential customers should continue curtailing at least 15 percent, general use customers should curtail 20 percent, and major use customers should curtail 25 percent. The required amount of curtailment would be at least 15 percent, and all customers within a customer class would be subject to the same requirements.

The third, and last, stage of mandatory curtailment would be the curtailment of last resort to keep the system functioning. Selective shutoffs of service and rolling blackouts could be ordered.

A system of escalating penalties would be used to enforce mandatory curtailment. The penalties would start at ten cents per kilowatt hour of excess use and go as high as forty cents per kilowatt hour of excess use plus disconnection of service.

Exemptions would be available to customers who demonstrated to their utility that the required curtailment would result in unreasonable exposure to health or safety hazards, would seriously impair their welfare, or would cause extreme economic hardship. For example, critical load customers like hospitals, police, and fire stations could obtain exemptions after demonstrating that nonessential energy use had been curtailed. A customer dissatisfied with the utility's response could appeal to the Commission.

CURTAILMENT POLICIES ADOPTED

The goal of utility companies and government officials is to have electric energy available to the public on a consistent, uninterrupted basis. However, many factors affect the balance between demand for electricity and the supply of it, and programs do not always work out as planned. A prolonged drought or loss of existing resources could put an unanticipated strain on the supply network. Utilities might be unable to obtain approval for and build new resources to timely meet increasing load demands.

The Commission does not expect a significant shortage of electrical energy in Oregon in the foreseeable future, but contingency plans are both prudent and required by law. At its public meeting on November 24, 1992, the Commission considered energy load curtailment issues. The Commission adopted the policies recommended by its staff.

The staff recommendation includes a model plan to be used by individual utilities in preparing their individual curtailment plans. Staff also recommends that the Commission adopt the regional plan as a statement of general principles and a declaration of its commitment to a regional approach to curtailment planning.

The model plan provides an appropriate balance between the need for flexibility in dealing with future events and the need for specificity so people will know how the plan will work. It allows decision-makers to match the level of curtailment to the shortage being experienced. As circumstances change, curtailment requirements can be adjusted. The plan is designed to require only the minimum necessary administrative burdens on utilities, but still ensure that customers are treated fairly and consistently. The plan imposes equal burdens on similarly situated customers.

In the event of a shortage of electricity, the Commission will initiate the statewide voluntary phases of the curtailment program, although utilities are at liberty to seek voluntary curtailment from their customers at any time. The Commission will publicly declare the need for curtailment and coordinate its activities with the utilities. Obtaining significant curtailment from the public will be crucial to the success of the voluntary portion of the program.

If voluntary curtailment is insufficient and there still is a shortage of electricity, the Governor may declare an emergency and start the mandatory portion of the program. If directed by the Governor in an executive order, the Commission will issue an order directing Oregon consumers of electricity to curtail the amount of electricity consumed. The percentage of required curtailment in phase one will be between five and 15 percent. The utilities will then administer their curtailment plans on file with the Commission.

Any additional curtailment activities will be done in accordance with the plan adopted in this order and stated in the tariffs approved by the Commission.

The Commission will be available to handle customer appeals from utility curtailment decisions. The Commission's existing procedures are adequate to handle any curtailment-related disputes.

The issues addressed in this order relate to the possibility of a long-term shortage of electricity. The effects of such a shortage would be regional. The Commission will work with people from other states as well as those from Oregon to best handle any shortage. The Commission urges others involved in supply/resource issues to cooperate and work together. Oregon, and other states, will be better able to effectively deal with a supply shortage if all parties in interest in the region work together.

CONCLUSIONS OF LAW

1. Utilities filing curtailment plans consistent with Attachment 1 to this order will meet the requirements of ORS 757.710(1);

2. The model plan is consistent with the public health, safety, and welfare, and with Oregon energy policies;

3. Implementation of the model plan is technically feasible and will minimize the effects of any shortages requiring curtailment;

4. The Commission consulted with the director of the Department of Energy about curtailment issues;

5. The Commission should direct utilities to file curtailment plans consistent with the attached model plan;

6. The Commission should adopt the regional plan as a statement of general principles.

ORDER

IT IS ORDERED that:

1. Within 90 days of the issue date of this order, each person defined in ORS 758.400 engaged in the business of sale or resale of electricity in Oregon shall present for approval a curtailment plan consistent with the model plan included as Attachment 1 to this order;

2. The Commission adopts as a statement of general principles the Regional Curtailment Plan for Electric Energy included as Attachment 2 to this order.

Made, entered, and effective JAN 19 1993.

Ron Eachus
Chairman

COMMISSIONER SMITH WAS UNAVAILABLE FOR SIGNATURE

Joan H. Smith
Commissioner

PUBLIC UTILITY COMMISSION OF OREGON

Roger Hamilton
Commissioner

A party may request rehearing or reconsideration of this order pursuant to ORS 756.561. A party may appeal this order pursuant to ORS 756.580.

CONDENSED VERSION

REGIONAL CURTAILMENT PLAN

FOR ELECTRIC ENERGY

within the States of Washington, Oregon, Idaho, and Montana

SECTIONS I AND II. PURPOSE AND OVERVIEW OF THE REGIONAL CURTAILMENT PLAN

This Plan identifies the process by which the States of Washington, Oregon, Idaho, and Montana would initiate and implement regional load curtailment. Included in the Plan are detailed procedures to be followed during a protracted regional electrical energy shortage to ensure uniform treatment of all regional consumers. The Plan is not intended to be activated for relatively short-term emergencies such as those caused by extremely cold weather or the temporary loss of a major transmission line, even if individual States take action to alleviate the problem.

The goal of this Plan is to accomplish curtailment while treating consumers fairly and equitably, minimizing adverse impacts from curtailment, complying with existing State laws and regulations, and providing for smooth, efficient, and effective curtailment administration. This Plan serves as a guideline or blueprint for each of the four Pacific Northwest States to use in developing their individual State curtailment plans.

SECTION III. DEFINITIONS

The following definitions apply to terms used in this Regional Curtailment Plan and in individual State plans. If the first letter(s) of the term are shown in parentheses, the term may appear in either upper case or lower case throughout the Plan.

A. Base Billing Period. One of the billing periods comprising the Base Year. Billing Periods are established by the utility and are normally either monthly or bimonthly. Base Billing Period data are weather-normalized before being used to calculate the amount of curtailment achieved.

B. Base Year. Normally, the 12-month period immediately preceding imposition of State-initiated load curtailment. If energy use during that period is atypical, States may select a different 12-month period.

C. Critical Load Consumer. A consumer that supplies essential services relating to public health, public safety, or energy production.

D. **Curtailment.** Load reduction, irrespective of the means by which that reduction is achieved.

E. **Curtailment Target.** The maximum amount of energy that a consumer may use and still remain in compliance with the State curtailment order; the Curtailment Target is figured individually for each consumer by Base Billing Period.

F. **Excess Power Consumption.** The lower of the following two values for loads subject to penalty: (1) the difference between a consumer's actual (or metered) consumption level during a billing period and the Curtailment Target, or (2) the difference between the consumer's weather-normalized energy use during a billing period and the Curtailment Target.

G. **Extra-Regional.** Any load, resource, or entity located outside of the region as defined in section 3.(14) of P.L. 95-501, the NW Power Act.

H. **General Use Consumer.** Any non-residential consumer who does not qualify as a Major Use Consumer.

I. **Implementation Record.** The collection of significant notes, memos, correspondence, and other material generated for each curtailment, whether such documents are formal or informal in nature. The Utility Coordinator is responsible for maintaining the Implementation Record.

J. **Major Use Consumer.** A consumer who has purchased over 5 average annual megawatts (43,800 MWh) during the Base Year.

K. **Non-Regional.** Any load, resource, or entity located outside of the region as defined in this Plan.

L. **Plan.** This Regional Curtailment Plan.

M. **Region.** The States of Washington, Oregon, Idaho, and those portions of Montana that are west of the Continental Divide and/or within the control area of the Montana Power Company.

N. **Regional Electric Energy Curtailment Analysis Model (REECAM).** A computer program used by the Utility Coordinator and other interested parties to evaluate the status of the regional electric power system and analyze the need for region-wide curtailment.

O. **Regional Load.** The load placed by ultimate consumers within the region on their respective utility suppliers; the load subject to curtailment under this Plan.

P. **State.** Any of the four Pacific Northwest States: Washington, Oregon, Idaho, and Montana.

Q. **State Contact(s).** Individuals who represent their respective States in connection with curtailment issues.

R. **State-Initiated.** Actions taken by the States to implement their individual State load curtailment plans.

S. **Threshold Consumption Level.** The maximum amount of energy that a consumer can use during mandatory load curtailment without being subject to penalties under this Plan.

T. **Utility Contact(s).** Individuals who represent their respective utilities in connection with curtailment issues.

U. **Utility Coordinator.** The Director of the Northwest Power Pool.

V. **Utility Curtailment Reports.** Report(s) summarizing curtailment data; such reports are to be submitted monthly by utilities to their respective States and the Utility Coordinator.

W. **Weather-Normalization.** The procedure that utilities use to reflect the impact of weather on utility load levels. Some utilities refer to this process as "weather-adjustment."

SECTION IV. CURTAILMENT STAGES

State curtailment directives apply to all Regional Loads. Under the Plan, curtailment is requested or ordered as a percentage of historical, weather- normalized (Base Billing Period) electric energy consumption. Although the curtailment stages are generally associated with increasing deficits, the stages are not necessarily implemented in a sequential manner; the Plan is flexible so as to allow States to move from one curtailment stage to another as required to adapt to rapid and dramatic changes in the energy supply situation.

The five curtailment stages are:

Stage #	Nature	Curtailment %	Type of Curtailment
Stage 1	Voluntary	No Specified %	Uniform among all regional consumers
Stage 2	Voluntary	5% +	Uniform among all regional consumers
Stage 3	Mandatory	5% - 15%	Uniform among all regional consumers
Stage 4	Mandatory	15% 15% + 15% +	Residential Consumers General Use Consumers Major Use Consumers
Stage 5	Mandatory	% Associated with Stage 4 + additional curtailment	Continued Consumer Curtailment plus Utility Action, including Plant Closures and possible Black-Outs

SECTION V. INITIATION OF REGIONAL LOAD CURTAILMENT

Using REECAM (described in Appendix A of the Plan) and other analytical tools, the Utility Coordinator shall monitor the region's energy situation and notify State and Utility Contacts when it appears that a protracted energy shortage could be developing. The State Contacts, in consultation with the Utility Coordinator, Utility Contacts, and other interested parties, will analyze the results of REECAM to determine if regional load curtailment is required. If they agree on the need, they will settle on the appropriate stage and level (percentage reduction), consult with others within their respective States using briefing materials prepared by the Utility Coordinator, and then again coordinate with each other. To the extent changes in the original recommendation are indicated as a result of such intra-State consultations, the State Contacts will work together to reach a new consensus. The State Contacts will then begin developing situation-specific curtailment implementation procedures. The States will initiate region-wide load curtailment by notifying the public, the Utility Coordinator, and all utilities operating within their respective borders that load curtailment is in effect.

SECTION VI. ADMINISTRATION OF STATE-INITIATED CURTAILMENT

A. Utility Activities

(1) Overview

(a) **Ability of Utilities to Comply with Plan Requirements.** Utilities will conform to the requirements of their respective State plans to the extent possible. Utilities may petition their States for exemption from specific requirements of their State plan.

(b) **Stage-by-Stage Utility Administrative Obligations.** Upon notice that their respective States have called for regional load curtailment, the region's utilities shall immediately begin complying with the directives of their State plan(s). All requirements for lower level stages continue to apply to higher level stages. Throughout the curtailment period, utilities will provide consumers with as much useful information as they reasonably can. The requirements specified below represent the minimum actions that each utility must take to remain in compliance with the Plan.

- **Stage 1.** Utilities must begin (or continue if they have already begun) providing curtailment information to their consumers. Both the nature of the information and the means by which they convey it to consumers (media communications, bill stuffers, etc.) are left to the utility. Utilities shall also assist States, as appropriate, in briefing the media about the shortage.

- **Stage 2.** In Stage 2, utilities must: (a) notify their consumers of the percentage level of State-initiated voluntary curtailment; (b) provide curtailment tips to consumers; (c) answer consumer questions about curtailment; (d) provide curtailment reports to the States and the

Utility Coordinator; and (e) provide more detailed information to the media than provided in Stage 1.

- **Stage 3.** In Stage 3, utilities must: (a) notify their consumers of the percentage level of State-ordered mandatory curtailment; (b) calculate weather-normalized Base Billing Period data and Curtailment Targets for all consumers who will be audited in the current billing period; (c) provide Curtailment Targets to all consumers who request such data for their own accounts; (d) provide audited consumers with information about how to apply for exemption and adjustment of Base Year data; (e) process requests for exemption and Base Year data adjustments from those consumers selected for audit who would otherwise be subject to penalties; and (f) implement the penalties aspect of the Plan.

- **Stage 4.** In Stage 4, utilities must notify their consumers of any applicable changes in State-initiated mandatory curtailment.

- **Stage 5.** In Stage 5, utilities must collaborate with the States to develop and implement the most effective methods for securing the required load curtailment.

(2) Suggested Curtailment Actions.

Utilities shall disseminate information to consumers regarding actions they can take to reduce their electric energy consumption. The States and utilities will work together to develop this material. The recommendations will be based on the actions described in Appendix C of the Plan, "Curtailment Measures." Utilities will be responsible for tailoring this curtailment information to their service areas, adding utility-specific information, printing, and disseminating the material to their consumers.

(3) Base Year Data and Curtailment Targets.

(a) Identification of the Base Year. Each time the Plan is activated, the States will identify the applicable Base Year. Once established, the Base Year for a shortage will remain unchanged throughout the curtailment period. Normally, the Base Year is the 12-month period immediately preceding initiation of load curtailment under this Plan. Base Year and Base Billing Period data shall be weather-normalized using the utility's standard procedures. The States may choose an alternative Base Year if they decide that the data for the 12-month period preceding load curtailment is atypical and its use would result in an inequitable allocation of curtailment among the region's consumers.

(b) Estimating Base Billing Period Data for Consumers for Whom No Base Billing Period Data Exists. Base Billing Period data must be obtained or developed for any consumer who is audited under this Plan. Utilities have the option of excluding residential and General Use

Consumers without actual Base Billing Period data from the random sample of audited consumers. Utilities must estimate the Base Billing Period data for any audited consumer for whom actual data does not exist or is found to be inaccurate.

(c) **Communicating Curtailment Target Information to Consumers.** During mandatory curtailment, utilities are required to provide retrospective, current billing period, and forthcoming billing period Curtailment Target information to any consumer who so requests. Utilities are also required to provide retrospective Curtailment Target information to any audited consumer who will be issued a warning or penalty. At their option, utilities may provide Curtailment Target information to other consumers or consumer classes as well.

(4) **Auditing Consumers for Compliance with State Orders for Mandatory Load Curtailment.** Each month, utilities must audit at least one percent of residential users, five percent of General Use Consumers, and 100% of their Major Use Consumers (including those Major Use Consumers with estimated Base Billing Period data) plus any consumers penalized in the previous billing period. The number of consumers exempted or excluded from audit does not affect the sample size.

New samples shall be drawn each month. Consumers penalized under this Plan shall continue to be audited until their energy use falls below the Threshold Consumption Level. Once their energy use falls below that level, they will be audited again only if selected by random sample.

Unless a utility is auditing 100% of its residential users and General Use Consumers, all such consumers selected for audit shall be chosen on a random sample basis, except that the following consumers are to be excluded: (a) consumers granted an exemption under this Plan; and (b) consumers with an estimated power bill in the current billing period. Utilities may also choose to exclude consumers with estimated Base Billing Period data, assuming the States do not require their inclusion in the pool of consumers subject to audit.

(5) **Penalties for Non-Compliance.**

(a) **Nature of Penalties.** The Plan identifies penalties for non-exempted consumers who fail to comply with State orders for mandatory curtailment. The penalties under this Plan are structured as follows:

Violation *	Penalty
First Bi-monthly Violation	10¢ per kWh of excess use
Second Bi-monthly Violation	20¢ per kWh of excess use
Third Bi-monthly Violation	40¢ per kWh of excess use
Fourth Bi-monthly Violation	1 Day Disconnection + 40¢ per kWh of excess use

Fifth Bi-monthly Violation	2 Day Disconnection + 40¢ per kWh of excess use
Sixth and All Subsequent Violations	Penalties are determined by the State. Civil penalties or other corrective actions would be possibilities.

* The penalty for violators who are billed every two months will escalate on every power bill in which they are subject to penalty. Consumers billed on a monthly basis will be assessed the same penalty on two successive occasions before incurring the next higher level penalty. During any continuous period of curtailment, assessed penalties remain "on the record" for the purposes of administration of subsequent penalties, even if there has been an intervening period of "compliance."

Utilities are expected to adhere to their standard disconnect criteria and procedures whenever disconnecting consumers in accordance with this Plan. Health, safety, and welfare considerations are to be taken into account, and consumers must pay normal disconnect and reconnect charges.

(b) Calculation of Financial Penalties. Financial penalties will be calculated by multiplying the consumer's Excess Power Consumption each billing period by the appropriate penalty level identified above.

(1) **Threshold Consumption Level.** The Threshold Consumption Level assigned to each consumer class is identified in the table below. If the required load reductions are not occurring during a curtailment period, the States may change the percentage relationship of the Threshold Consumption Level to the Curtailment Target so as to effect better compliance with the curtailment order.

Type of Consumer	Threshold Consumption Level
Residential Consumers	10% above Curtailment Target
General Use Consumers	10% above Curtailment Target
Major Use Consumers	2% above Curtailment Target

(2) **Excess Power Consumption Calculation.** Penalties are not assessed if a consumer's load (either actual load or weather-normalized load) is equal to, or less than, the Threshold Consumption Level. Excess Power Consumption is the lower of the following two values for each sampled load subject to penalty: (a) (Actual Load) minus (Curtailment Target) or (b) (Weather-Normalized Load) minus (Curtailment Target).

(c) **Assessment of Penalties.**

(1) **Penalties vs Warnings.** Consumers will be assessed penalties only if they have Excess Power Consumption and if they are to be penalized based on the utility's penalty assessment procedures described below. Any sampled consumer who is not penalized and whose use exceeds the Curtailment Target will receive a warning.

(2) **Penalty Assessment Procedures.** Utilities sampling at the mandated minimum percentages for each sector as specified in this Plan [1%-5%-100%] (or as otherwise specified by the States and reflected in the Implementation Record) shall assess penalties on all consumers with Excess Power Consumption.

Utilities sampling a higher percentage of consumers than required under the Plan may choose among the following penalty assessment options:

(a) Assess penalties on all sampled consumers with Excess Power Consumption; (this methodology must be used for Major Use Consumers even if the utility chooses option (b), below, for its other consumer sectors); or

(b) Develop a ratio of the minimum percentage sample size to the actual percentage sampled for the residential and/or General Use consumer sectors. Multiply the resulting percentages by the total number of violators in each respective consumer sector to determine the minimum number of penalties that must be assessed in each sector. Calculate the percentage violation for each individual consumer that has been sampled (Excess Power Consumption divided by Curtailment Target) and apply penalties to the "worst offenders" in the overall sample based on their percentage "Excess Power Consumption." Also penalize all consumers who were penalized in the previous billing period and who still have Excess Power Consumption.

(3) **Treatment of DSIs.** Penalties applicable to BPA's direct-service industrial customers will be assessed by the States based on billing data provided by BPA.

(d) **Billing Consumers for Penalties.** Utilities may describe the penalty on the power bill as "State-mandated" and shall include any State-provided material describing the penalty aspect of the Plan as a bill stuffer in the bills of penalized consumers. The States will consider printing this material on State letterhead so as to reinforce the public's understanding that penalties are due to a violation of State mandate. Utilities shall note

that failure to pay penalties will result in service disconnection in accordance with standard disconnect criteria and procedures.

(e) **Treatment of Penalties Pending Adjustment/Exemption Determinations.** Consumers who have applied for adjustment of Base Billing Period data and/or exemption from mandatory curtailment may request a stay of enforcement of the penalty aspect of the Plan pending a final decision regarding its request. Any consumer who has been granted such a stay shall be subject to retroactive penalties as applicable if the request is ultimately denied.

(f) **Use of Funds Collected under the Penalty Provisions of the Plan.** Funds collected under State-ordered penalty provisions of this Plan shall be set aside in a separate account. The ultimate disposition of these funds will be determined by the appropriate State commission in the case of investor-owned utilities and by the governing bodies of publicly-owned utilities.

(6) **Incentives.** Whenever curtailment is in effect, individual utilities are encouraged to implement creative incentive programs to motivate consumers to provide additional load reductions relative to their Curtailment Targets.

(7) **Exemptions and Adjustments.**

(a) **Consumer Application for Exemption/Adjustment.** Utilities are responsible for informing their consumers how to apply for exemption from Plan requirements or adjustment of Base Billing Period data. Utilities may elect to process exemptions and adjustments only for audited consumers. Consumers seeking an exemption or adjustment shall apply first to their utility and then, if dissatisfied with that outcome, to their respective State. The State will not consider any consumer's appeal unless it has first been processed by the consumer's utility.

(b) **Granting Consumer Requests for Exemption from Mandatory Curtailment.** No automatic consumer exemptions will be granted under mandatory State-initiated load curtailment. Exempted consumers should be told that exemption may not protect them from Stage 5 black-outs.

- **Critical Load Consumers.** Critical Load Consumers may be exempted once they have demonstrated to their utility that they have eliminated all non-essential energy use and are using any reliable, cost-effective back-up energy resources in load.

- **Other Consumers.** Exemptions for consumers not qualifying as Critical Load Consumers under this Plan will be evaluated based on whether curtailment would result in unreasonable exposure to health or safety hazards, seriously impair the welfare of the affected consumer, cause extreme economic hardship relative to the amount of energy saved, or produce counterproductive results.

(c) **Utility Record-Keeping Relative to Consumer Exemptions.** Utilities shall make their records regarding exemption determinations available to their respective States upon request.

(d) **Utility Exemption from State Plan Requirements.** Utilities may appeal to their respective States, requesting an exemption from any aspect of their State plan. Their petition for exemption should identify the specific requirements from which they wish to be exempted, the reason(s) behind their request, and alternative actions that they can reasonably take in lieu of such requirements.

(8) **Measurement of the Amount of Curtailment Achieved and Determination of Compliance.** At all times during State-initiated regional load curtailment, utilities shall provide their respective States and the Utility Coordinator with consumption and savings data on a monthly basis in the form specified in Appendix D of the Plan. To the extent that circumstances at the time of actual load curtailment dictate the need for additional data or more frequent data submittal, the States shall so inform the utilities and the utilities shall use best efforts to comply with the State request.

(9) **Special Arrangements.**

(a) **Use of Consumer-Owned Generation Facilities.** The States' mandatory curtailment orders apply only to electric energy purchased from a utility: all consumers are required to reduce their electric energy purchases from their utility by the required percentage. However, consistent with their respective utility's needs for safety and system protection, consumers having their own generation facilities or access to electricity from non-utility power sources may use energy from those other sources to supplement their curtailed power purchases from their electric utility.

(b) **Curtailment Scheduling.** During periods of mandatory curtailment, a consumer is obligated to provide the requisite amount of curtailment within each billing period. Within that period, and subject to equipment limitations and utility rules on load fluctuations, consumers are free to schedule their curtailment so as to minimize the economic cost, hardship, or inconvenience they experience as a result of the mandatory curtailment requirement.

(c) **Case-by-Case Arrangements.** Utilities may choose to work creatively with individual consumers to secure additional curtailments as appropriate.

B. **State Activities**

(1) **Providing Curtailment Information to Utilities.** States shall provide utilities with information regarding curtailment administration and work with utilities to

develop consumer curtailment tips for consumers. (See Plan Appendix B, "Types of Curtailment Information" and Appendix C, "Curtailment Measures.")

(2) **Processing Utility Requests for Exemption and Second Level Consumer Appeals for Adjustments and/or Exemptions.** The States shall process utility requests for exemption from Plan requirements and consumer requests for either exemption or adjustment of Base Year data in cases where the consumer is appealing its utility's determination. The States shall keep interested parties apprised of the status of appeals-in-process.

(3) **Periodic Reassessment of Administrative Decisions and Maintenance of the Implementation Record.** Together, the States will review the appropriateness and continued applicability of implementation decisions on a monthly basis, or as otherwise indicated. Significant decisions shall be recorded in the Implementation Record. The types of matters that will be addressed in the periodic reviews and which may be reflected in materials that will become part of the Implementation Record include:

- **Achievements and Objectives.** Analysis of the amount of curtailment actually achieved based on the data provided in the Utility Curtailment Reports and a review of the most recent REECAM results;

- **Curtailment Stage and Level.** Identification of the applicable curtailment stage and level; also, any identified procedures for changing the applicable curtailment stage and/or level;

- **Public Information.** The general agreement among the States as to how to disseminate the curtailment message: tenor of messages, dates of announcements, specifics as to utilized media, etc.;

- **Base Year Consumption.** The Base Year to be used for measuring curtailment impacts;

- **Procedural Matters.**

  (a) Development of additional administrative procedures as required;
  (b) Assessment of the need, if any, for making changes to the Plan to secure increased compliance with the curtailment directives;
  (c) Discussion of implementation problems and proposed solutions thereto; and
  (d) Evaluation of the appropriateness of the materials being made available to utilities and provided by utilities to the States, and a determination as to whether changes are required;

- **Curtailment Records.** The specific requirements on utilities and States regarding curtailment records (what needs to be recorded, how that information will be stored, who can access it...); and

- Return to Normal Operations. The general agreement among the States relative to announcing an end to regional load curtailment and resuming normal utility operations.

C. Return to Normal Operations. Once the shortage is alleviated, the States and utilities must bring closure to the curtailment process and effect a return to normal operations. The States will detail the process for utilities to follow. The nature of the actions to be taken will be influenced by the applicable stage of curtailment. At a minimum, the following types of activities need to occur: (1) The public must be informed that curtailment is no longer required; (2) Curtailment activities must officially cease as of the date that curtailment orders are lifted by the States. The States will provide utilities with guidelines to bring closure to curtailment activities such as: exemptions and appeals, penalty assessments, curtailment incentives (if any), and curtailment reports; and (3) State authorities will take whatever action is required to rescind any State orders for mandatory load curtailment.

SECTION VII. UTILITY LIABILITY AND FINANCIAL RELIEF

State law in each of the four Pacific Northwest States provides for waivers of, or exemptions from, liability in the case of utilities enforcing mandatory load curtailment ordered by the State. Individual consumer data will be treated as proprietary in accordance with standard utility practices and State law (identified in Plan Appendix F). If State law prohibits utilities from releasing consumer account information to the State, consumers seeking exemptions and/or adjustments shall expressly authorize such exchange. Utilities may seek financial relief for the extraordinary costs of curtailment using established channels, including utility rate case procedures and BPA power sales contract provisions.

SECTION VIII. ANNUAL REVIEW, POST-CURTAILMENT EVALUATION, AND UPDATE OF THE REGIONAL CURTAILMENT PLAN

At least once a year and after any curtailment, the Utility Coordinator will convene a meeting of all four State Contacts and interested utilities for the purpose of reviewing and updating the Plan and associated Appendices. Upon completion of the review, necessary changes will be made, a list of those changes prepared, and a revised plan issued. Changes will be noted in Appendix G.

SECTIONS IX AND X. APPENDICES AND RELATED CURTAILMENT INFORMATION

The following appendices are included in the Plan: (A) Regional Electric Energy Curtailment Analysis Model; (B) Curtailment Information; (C) Curtailment Measures; (D) Utility Curtailment Reports; (E) Contact Information Regarding the Utility Coordinator, State Contacts, and Utility Contacts; (F) State Statutes Citations and State Agencies; and (G) Annual Updates to the Plan. The following supplemental material is available under separate cover: (A) Individual State Plans and Summary of the Differences among the State Plans; (B) Utility Plans; and (C) State Statutes (copies of the actual statutory language).

APPENDIX J

Proposed Oregon State LNG Emergency Response Plan

Oregon Revised Statutes (ORS) 176.750-810 authorizes the Oregon Department of Energy (ODOE) to develop and maintain a statewide contingency plan in response to liquefied natural gas (LNG) emergencies that impact the state. This describes the format of the state's LNG Emergency Response Plan should an LNG import terminal be built in Oregon.

Introduction: Overview of Oregon's LNG Supply & Distribution System

BASIC PLAN	PROCEDURES
Plan Section 1 - Guiding Authority and Principles This section of the basic plan describes the Governor's Energy Resources Emergency Powers and ODOE authority to plan, prepare, and respond to LNG emergencies that impact the state.	**Procedures Section 1** – supports Section 1 of the basic Plan. Information includes a copy of the: • ORS 176.750-810 • Governor letter appointing ODOE lead state agency to plan, prepare, and respond to LNG emergencies
Plan Section 2 – Scope This section describes the purpose, scope, and concept of operations for the Oregon LNG Emergency Response Plan.	**Procedures Section 2** – supports Section 2 of the basic Plan. Information includes: • Emergency Planning Zone Map • Description of Zone 1, Zone 2, and Zone 3
Plan Section 3 - Emergency Response Organizations ODOE works with federal, state, local, law enforcement, and industry organizations to ensure a coordinated response effort to LNG emergencies. This section of the basic plan describes the roles and responsibilities of local, state, federal, and industry organizations responding to LNG emergencies in Oregon.	**Procedures Section 3** – supports Section 3 of the basic plan. Information includes: • Established agreements with local, state, federal, and industry organizations responding to LNG emergencies in Oregon as appropriate.
Plan Section 4 – Alert and Notifications This section describes how federal, state, local, law enforcement, and industry emergency response organizations are notified of LNG events that impact the Oregon.	**Procedures Section 4** – supports Section 4 of the basic plan. Information includes: • Alert & Emergency Notification Call Tree • Emergency Contact List • Maintenance Procedures for Emergency Contact List.
Plan Section 5 – Communications This section describes the need for effective communication and information sharing after initial notifications are made as described in Section 4. This section explains ODOE's approach to gather and disseminate emergency information and/or instructions to government officials, industry, emergency responders, news media, and the public.	**Procedures Section 5** – supports Section 5 of the basic plan. Information includes pre-printed materials including brochures, boilerplate news releases, event update forms, activity logs, commonly asked questions/answers, and procedures for communicating with the: • Governor's Office • Legislative Leadership • Local Emergency Response Organizations • State Emergency Response Organizations • Federal Emergency Response Organizations • LNG Terminal • News Media • Public

Plan Section 6 - Emergency Response Measures This section provides an overview of the Plan's five levels of readiness conditions. This includes information on the state's primary concern and response actions for each readiness condition. • Condition A - Normal • Condition B - Awareness • Condition C - Caution • Condition D - Alert • Condition E - Imminent Danger	**Procedures Section 6** – supports Section 6 of the basic plan. Information includes procedures for ODOE Emergency Operations Center (EOC) activation in response to LNG emergencies, ODOE EOC capabilities, and procedures for key ODOE EOC response positions. This includes: • Governor's Representative • ODOE Director • LNG Event Manager • Technical Advisor • LNG Facility Specialist • Public Information Officer (PIO) • Deputy PIO • County Liaison • State Agency Liaison • Federal Agency Liaison • LNG Terminal Liaison • EOC Manager • EOC Facilities Specialist • Graphical Information Specialist • Emergency Web Page Operator • News Center Manager • Telephone Information Center Manager • Phone Team Operator(s) • Other Positions as Appropriate
Plan Section 7 - Recovery This section describes the actions that will be taken by ODOE and other federal, state, and local emergency response organizations along with the LNG terminal after the emergency to return the facility and community back to pre-emergency conditions.	**Procedures Section 7** – supports Section 7 of the basic plan. Information includes procedures for key ODOE response positions for the Recovery Phase. This includes: • LNG Event Manager • LNG Facility Specialist • Public Information Officer (PIO) • County Liaison • State Agency Liaison • Federal Agency Liaison • LNG Terminal Liaison
Plan Section 8 – Maintaining Emergency Preparedness This section explains how ODOE will maintain the Oregon LNG Emergency Response Plan and ensure the state is prepared to respond to a LNG emergency in coordination with the local and federal emergency response organizations as well as the LNG terminal. This section will also describe how ODOE will work to increase public awareness of and confidence in the Oregon LNG Emergency Response Program.	**Procedures Section 8** – supports Section 8 of the basic plan. Information includes a schedule for: • Schedule for plan review updates. • Schedule for training, drills, and exercises. • Public education and outreach program.

Appendix K

Oregon Distributed Energy Resiliency Study

Introduction

This Report's overarching objective is to identify opportunities to improve energy resilience through the design and integration of distributed renewable energy investments into the existing energy network. This study considers how new technologies, including renewable energy resources, could provide local energy generation to communities and emergency service providers during energy emergencies, when their energy network supply may possibly be disrupted.

The Oregon Department of Energy (ODOE) will use the information that is provided by this Project to support its Energy Assurance Plan (EAP).

Highlights of this Report are briefly noted below. For a more complete understanding of such items, this Report should be read in its entirety.

Access to Information

This Report is broadly based on information, data, and reports that were provided by various organizations, including:

Bonneville Power Administration (BPA)

Idaho Power Company (IPC)

Oregon Department of Energy (ODOE)

Oregon Department of Transportation (ODOT)

Oregon Public Utility Commission (PUC)

PacifiCorp

Portland Gas and Electric (PGE)

United State Department of Energy (U.S. DOE)

U.S. DOE Energy Information Administration (EIA)

U.S. DOE National Energy Technology Laboratory (NETL)

Western Electricity Coordinating Council (WECC)

All such information is considered to be in the public domain. Confidential information was not provided or utilized.

Critical Facilities

Renewable Resources

Section 1 identifies the full spectrum of Oregon's existing and planned renewable resources. However, not all of Oregon's wind resources qualify as critical in an energy assurance context. In fact, there are reasons why none of Oregon's renewable resources are critical, including:

Renewable resources (most notably wind and solar) provide energy but not capacity.

Renewable resources cannot be dispatched and, therefore, are less likely to be useful during an energy crisis.

During a large-scale emergency, the complete restoration of the electric grid may take hours or even days. That period of time is sufficiently long to observe considerable variation in capacity and energy from renewable resources.

During a large-scale electric emergency, prevailing utility operating practices are to bring renewable resources back on-line after all other resources are dispatched.

Hydroelectric Resources

Hydroelectric resources are responsible for approximately 42 percent of the electricity consumed in Oregon. The dams of special importance include John Day, The Dalles, Bonneville, and McNary, which are all located along the Columbia River and collectively account for over 6,000 megawatts (MW) of capacity, or nearly 80 percent of Oregon's hydroelectric energy. Hypothetical events that affect the river (e.g., drought, floods, terrorist attacks, federal court decisions regarding salmon restoration) could result in the loss of approximately half of Oregon's electric supply.[1]

Conventional Resources

Conventional resources (excluding hydroelectric) account for approximately 54 percent of Oregon's electric supply with natural gas (14 percent) and coal (34 percent) ranking highest, on the basis of historical energy usage. The most critical non-hydroelectric conventional plants are Boardman (coal), Hermiston, Beaver, Klamath, Port Westward, and two Coyote Springs facilities (all natural gas).

Electric Transmission

All electric transmission lines in the Pacific Northwest at or above 345 kilovolts (kV) should be classified as being critical to Oregon. BPA is responsible for 5,568 miles of lines throughout the Pacific Northwest at or above 345 kV. While some of BPA's lines are outside of Oregon, the interconnected nature of the transmission system still requires such lines to be classified as being critical. BPA's regional 230-kV and

[1] It should be noted that the regional electric transmission and generation systems are highly interconnected. Some of the hydroelectric energy produced by plants that are located along the Columbia River is not intended for Oregon's use and other interconnected plants could be utilized as replacement energy.

287-kV transmission lines should also be considered to be critical, in the absence of any detailed determinations to the contrary. In addition, BPA's high-voltage substations should also be included. A delineated list of such lines and substations is not available due to security concerns.

Electric Distribution

Currently, there are no distribution lines that are considered to be critical from a regional or statewide perspective. Specific distribution lines that serve emergency service providers are critical, but cannot be delineated due to the absence of pertinent information.

Smart Grid and Advanced Metering Infrastructure

Currently, Smart Grid and Advanced Metering Infrastructure (AMI) are not widely utilized in Oregon, which precludes such assets from being considered a critical asset.

Blackstart Operations

A large-scale emergency in Oregon could cause the electric transmission and generation grid to become completely de-energized (e.g., dark). Such events would be followed by a blackstart start condition whereby certain generating units are called upon to initially re-energize the grid. While the identities of specific blackstart generating units have been withheld by Oregon's electric utilities for reasons of security, they are likely to include larger hydroelectric plants.

Emergency Service Providers

The energy requirements of certain service providers are considered to be of paramount importance during emergency conditions. The entities of highest priority include:

- 911 dispatch centers
- Airports
- Assisted care living facilities (e.g., senior citizen facilities, handicap persons facilities, homes of the disabled)
- Communications service providers (e.g., voice, data, Internet, television, cable television, radio)
- Correctional facilities (e.g., jails and prisons)
- Electric utilities (critical facilities such as warehouses and maintenance and repair centers)
- Emergency Operations Centers (EOC)
- Emergency shelters (e.g., designated locations such as schools, religious institutions, recreation centers)
- Fire stations

Petroleum Distribution Terminals

Gas stations (if required to serve the petroleum needs of other emergency service providers)

Health care (e.g., hospitals, ambulance services, and clinics which contain emergency room facilities)

National Guard

Oregon Department of Transportation (ODOT)

Other essential county, state, and federal departments

Police stations

Public Works (e.g., water, wastewater, street maintenance, traffic signals at priority intersections)

Railroad operations and crossings

Red Cross

Schools (short-term, until all students return home)

Providing reliable and resilient electric service to the above entities during a large-scale emergency is a critical matter that requires the PUC's attention. The PUC works with utilities to ensure timely restoration of the power grid during emergencies. Energy related characteristics are discussed in Section 2.

Vulnerability and Risk Assessment

Section 3 contains an assessment of the vulnerabilities and risks that are associated with Oregon's key energy categories, as summarized in the following table. Overall, findings indicate that hydroelectric resources are most critical to Oregon.

Table 1
Energy Sector Criticality and Vulnerability

CATEGORY	Market Dominance/ Relative Capacity	Number of Customers Served	Strategic Location	Seasonal Vulnerability	Degree of Redundancy	Historical Evidence of Disruption
Electric Generation (Conventional without Hydroelectric)	Low	Low	High	High	Medium	Low
Hydroelectric Generation	High	High	High	High	Medium	Low
Renewable Electric Resources	Low	Low	High	High	Medium	Medium
Electricity Transmission	Low	Low	High	Low	Medium	Low
Natural Gas Transmission/ Pipelines	High	High	Low	High	High	Low

Key issues that confront critical assets are found to include the following:

Critical Infrastructure Protection (CIP) and terrorist attacks: Critical infrastructure is defined to be assets that are so vital to Oregon, that their incapacity or destruction would have a debilitating impact on the state's security, economy, public health or safety. Large hydroelectric generating facilities and associated high-voltage transmission lines are considered critical to Oregon as they serve a significant percentage of state's electricity requirements. The U.S. DOE conducted an audit of BPA's critical infrastructure in 2010 and discovered that BPA did not, for the most part, implement a major physical control system (e.g., electronic perimeter intrusion motion detection and alarms).

High levels of precipitation or runoff: Periods of high spring runoff can have a significant impact on hydroelectric power and, thereby, cause a reduction in the utilization and pricing of renewable resources, as evidenced in April-May 2011.

Seismic activity: Earthquakes can significantly impact Oregon's electric, natural gas and petroleum resiliency. The Oregon Department of Geology and Mineral Industries (DOGAMI) is evaluating the impacts of earthquakes in Oregon and its report should be reviewed for additional information.[2]

Weather: Severe windstorms have historically impacted Oregon's electric grid, thereby causing widespread curtailments in electric service.

[2] "Oregon State Energy Assurance Plan", Oregon Department of Energy, Oregon Public Utility Commission, March 2011.

Integration of Renewable Energy and Smart Grid Technologies

Section 4 contains a discussion of the technical issues, which confront the integration of renewable resources, the role that Smart Grid technologies could play in addressing such matters, and the benefits that can be provided to Oregon's constituents. Some of the potentially more notable benefits include:

Improve electric reliability: Smart Grid technologies can improve the reliability of electric service by reducing the duration of outages and the number of customers without service.

Reduce electric production costs: Providing consumers with real-time electric pricing information and alternative tariffs (such as critical peak pricing) can yield reduced electric costs to consumers and the cost of electricity production.

Reduce peak electric demand: The amount of electricity demanded by Oregon's consumers varies greatly throughout the year, with peak electric demand occurring during the hottest and coldest points of time. Smart Grid applications can communicate the real-time price of electricity to consumers, especially during periods of peak demand. Consumers are expected to react to such price signals by reducing usage, and thereby reduce peak demand. Reductions in peak demand will cause delays or cancellations in the need for new electric power plants.

Reduce system losses: Smart Grid applications provide electric utilities with greater insight into the operation of their electric distribution systems. Such information can be used to configure the distribution system (e.g., the opening and closing of switches) in a manner that minimizes electric losses. Reductions in electric losses translate into a reduction in the total cost of electric supply and retail costs to consumers.

Future Renewable Energy Requirements

Section 5 contains a discussion of the regulatory and technological frameworks for promoting and facilitating energy resiliency in Oregon through the use of future renewable resources and Smart Grid applications. Examples of specific ways that renewable resources may be beneficial to Oregon's energy resiliency include:

Improve fuel diversity: Oregon is heavily dependent on hydroelectric resources to meet its electric requirements. Increasing resource diversity improves the state's energy resiliency and ability to respond to large-scale events that affect electric supply. Renewable resources promote Oregon's energy resiliency, as they are likely to be independent of emergencies that affect availability of hydroelectric energy. The role that Smart Grid plays in such cases is to provide electric utilities with greater insight into the real-time operations and control of renewable resources.

Reduce response times to emergencies: Damage to the electric grid could require significant repair and loss of service to Oregon's constituents. It is reasonable to

assume that repairs to larger facilities, such as high-voltage equipment or hydroelectric dams, would be more intrusive than that of smaller facilities. Since renewable resources are generally smaller in scale, it can then be argued that they might become operational faster than their large-scale counterparts.

Enhance reliability and dispatch: Oregon's largest electric utilities do not include renewable resources in their emergency operating plans. Two key reasons are that renewable resources are considered to be less reliable than conventional resources and they cannot be dispatched. These obstacles can be partly addressed through the two-way communications capabilities that are common in Smart Grid applications.

Capturing these benefits requires a technological roadmap, which is discussed in Section 5 and includes:

Identify key public facilities where electric service reliability is critical

Require utilities to revise their outage restoration plans to include important public facilities

Establish a minimum functionality requirements for any AMI project proposed by the state's utilities

Require utilities to describe how data from AMI and Smart Grid technologies will be archived and utilized to improve utility asset management, operations, maintenance, planning processes, and electric reliability

Evaluate market conditions that might impede the development of bulk wholesale renewable power sources

Recommended Next Steps

Lastly, Section 6 offers numerous candidate next steps that Oregon should consider to enhance the resiliency of electric supply. The broad categories under consideration include:

Identification and documentation of critical assets

Promotion of Smart Grid applications

Review of electric utility operations

Characterize emergency stakeholders (locations, energy requirements, backup capabilities and gaps)

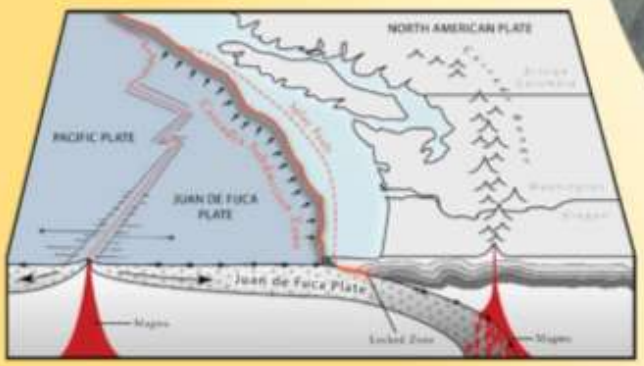
Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub

FINAL REPORT TO OREGON DEPARTMENT OF ENERGY & OREGON PUBLIC UTILITY COMMISSION

by
Yumei Wang,
Steven F. Bartlett,
and Scott B. Miles

Oregon Department of Geology and Mineral Industries

August 2012



Earthquake Risk Study
for Oregon's Critical Energy Infrastructure Hub

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Summary of Report
Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub

Six magnitude 5 or higher earthquakes have occurred within the Portland metropolitan area in the past 150 years. The Cascadia Subduction Zone has produced more than 40 large magnitude earthquakes in the past 10,000 years. The most recent occurred on January 26, 1700 with an estimated magnitude 9. These occurrences and extensive scientific understanding of seismic processes indicate that it is not a question of *if* Oregon will experience a catastrophic earthquake, but *when* it will occur.

Oregon's critical energy infrastructure (CEI) Hub is located in an area with significant seismic hazard. Significant liquid fuel, natural gas and electrical infrastructure and facilities are situated in this relatively small area in Portland. The CEI Hub covers a six-mile stretch on the lower Willamette River located between the south tip of Sauvie Island and the Fremont Bridge on US Highway 30. The energy sector facilities in the CEI Hub include:

- All of Oregon's major liquid fuel port terminals
- Liquid fuel transmission pipelines and transfer stations
- Natural gas transmission pipelines
- Liquefied natural gas storage facility
- High voltage electric substations and transmission lines
- Electrical substations for local distribution

More than 90 percent of Oregon's refined petroleum products come from the Puget Sound area of Washington State. Oregon imports the product by pipeline and marine vessels to the CEI Hub before it is distributed throughout Oregon to the end user. One large consumer is the Portland International Airport. In addition, much of NW Natural's natural gas passes through the CEI Hub. A high voltage electrical transmission corridor crosses the area as well as supplies distribution for this area.



Site map of the Critical Energy Infrastructure (CEI) Hub on the western bank of the Lower Willamette River area in NW Portland, Oregon. The CEI Hub, outlined in red, stretches for six miles. (Google Earth)



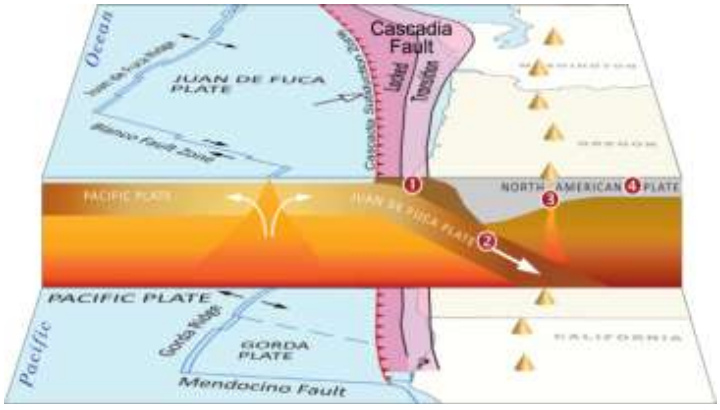
Oil terminals in the CEI Hub. (DOGAMI photo)

Earthquake Risk Study for Critical Energy Infrastructure Hub

The Oregon Department of Geology and Mineral Industries (DOGAMI) conducted an earthquake risk study on Oregon's CEI Hub as part of the Oregon Energy Assurance Project (EAP) with Oregon Department of Energy (ODOE) and Public Utility Commission of Oregon (OPUC). The study focuses on a large-magnitude Cascadia earthquake which because of widespread shaking and vulnerable infrastructure poses a high risk to the health and safety of Oregonians and the region's economy. The study identifies and defines the CEI Hub area, assesses the seismic hazards and identifies the vulnerabilities of the petroleum (liquid fuel), natural gas, and electric energy facilities in the CEI Hub.

Oregon's Natural Hazards

Oregon has numerous natural hazards. These range from high probability (fires) to low probability (volcanic eruptions). Earthquakes are considered to have a moderate probability because earthquakes in Oregon are rare. The earthquake vulnerability score for Oregon, however, is very high because a vast majority of Oregon's existing infrastructure has been designed and constructed without seismic resistance considerations. The earthquake consequence score is also very high because damage will likely be widespread and, in many places, severe. Finally, the earthquake overall risk score is very high because when a major earthquake occurs, it will likely result in a high loss of life, economic damages and long-term impacts.



Cascadia seismic source is Oregon's most threatening fault and can produce a magnitude 9 earthquake and accompanying coastal tsunami waves. (DOGAMI)

Energy Facilities in the CEI Hub

A significant portion of Oregon's electricity, natural gas, and fuel oil infrastructure is concentrated in the CEI Hub (a six-mile stretch in the lower Willamette River located between the south tip of Sauvie Island and the Fremont Bridge on US Highway 30). A magnitude 8 or 9 Cascadia Subduction Zone earthquake would impact the CEI Hub with:

- Ground shaking
- Liquefaction (soil behavior phenomenon in which a saturated sand softens and loses strength during strong earthquake ground shaking)
- Lateral spreading (where surficial soil permanently moves laterally due to earthquake shaking)
- Landslides
- Co-seismic settlement (where the ground surface is permanently lowered due to seismic shaking)
- Bearing capacity failures (when the foundation soil cannot support the structure it is intended to support)

In addition, secondary seismic hazards could be initiated and include:

- Seiches (waves that oscillate in water bodies often initiated by ground shaking)
- Fire
- Hazardous material releases, including by sloshing of liquid agitated by ground shaking

Liquefaction and lateral spreading hazards are of primary concern to the oil terminals that handle Oregon's fuel supply. The CEI Hub is adjacent to the Willamette River and has extensive deposits of highly liquefiable soils. These soils (made of sands, silts, gravels and clays) have been naturally deposited by river activity as well as been created from man-made activities, such as hydraulically placed material from river dredging or debris placed as landfill. For this reason, DOGAMI performed ground deformation analyses to better understand the nature of the hazard and the possible mitigation needs. A section on the deformation analyses is included in this study. Tsunamis are expected to damage the coastal areas, including ports along the coast and Columbia River mouth, but are not expected to cause significant damage in the Portland waterways.

DOGAMI staff and others visited all relevant energy companies with facilities in the CEI Hub. DOGAMI and ODOE staff conducted site visits at these petroleum facilities: BP, Chevron, ConocoPhillips, KinderMorgan (KM) fuel terminals and KM pipeline, McCall Oil, Nustar, and Shell. The fuel facilities often include: transmission and distribution pipelines, piers or wharves, tank farms, loading racks, control buildings, electric distribution equipment, and many other components. The liquid fuel transmission system includes gate stations, and transmission and distribution pipes at the Columbia and Willamette river crossings. DOGAMI and OPUC staff also conducted site visits of natural gas and electrical facilities owned by NW Natural, Portland General Electric, and the Bonneville Power Administration (BPA).

General Findings

The CEI Hub facilities have infrastructure that ranges from about 100 years old built to no or very antiquated standards to new infrastructure built to the current state-of-practice standards. Because of the wide range of ages and associated construction practices, the seismic

vulnerability of the facilities also spans a wide range. Based on visual observations, engineering judgment and limited information from the facility operators, major seismic vulnerabilities exist in the CEI Hub. The vast majority of the facilities are constructed on soils susceptible to liquefaction. Some critically important structures appear to be susceptible to significant damage in a major earthquake. In addition, DOGAMI discovered that older building codes and practices did not adequately address many non-building structures that exist in the CEI Hub, such as tanks, pipes, and piers. One explanation is because non-building structures typically hold few, if any, people and the focus of the building code has traditionally been on life safety. Current building codes do not adequately address the seismic deficiencies in existing CEI Hub facilities. The expected length of time to resume services after a Cascadia earthquake has not been evaluated by any company except BPA.

Sector Specific Findings

Liquid Fuel

Liquid fuel pipeline: The CEI Hub petroleum facilities receive liquid fuel via two methods: 1) the liquid fuel transmission pipeline, and 2) marine vessels. The transportation method and amounts vary due to product need, transportation costs, weather and other conditions. The liquid fuel pipeline was largely constructed in the 1960s when the regional seismic hazards were unknown and state-of-practice construction techniques at that time did not include any reference to seismic standards. The regional seismic hazards are now known to be significant and the soils at the river crossings are susceptible to liquefaction and lateral spreading. The 1960s vintage pipeline design did not consider ground movements from lateral spreading at river crossings or the stresses to the pipelines induced by earthquakes that may cause pipe damage and multiple breaks. A pipe break would have a significant impact on all of the petrochemical facilities in the CEI Hub and could result in a statewide fuel shortage.

Shipping channel: The navigational channel from the Columbia River mouth to the lower Willamette River is used to transport fuel by marine vessels. The Columbia River mouth is expected to have tsunami damage and the channel is expected to experience slope failure, which would close the channel to traffic. It is possible that bridges and other river crossings, such as buried gas pipelines and electrical crossings, would be damaged and temporarily block the waterway. Closure of the shipping channel would prevent marine vessels from delivering liquid fuel as well as emergency response and recovery equipment from being delivered.

Marine terminals: All of the port facilities in the CEI Hub have significant seismic risks due to liquefaction, lateral spreading, and seiches. Some older piers were constructed without any seismic protection, have deteriorated, and are likely to fail in even a moderate earthquake. If oil products are released and contaminant the navigable waterway, the waterway may be closed to river traffic thus impeding emergency response activities as well as the supply chain. The local capacity to fight fires and clean hazardous material spills is limited.

Fuel supply: Only three existing tanks are known to have addressed liquefaction vulnerabilities. The fuel terminals in the CEI Hub on average have a three to five day supply in the tank farms for regular unleaded gasoline and diesel fuel. Premium gasoline is subject to the daily delivery and heavily dependent on whether the intercompany pipeline on Front Avenue is operational. If the supply chain is disrupted by pipe breaks north of the CEI Hub and closure of the shipping

channel to the west, fuel would quickly become scarce. Options to transport fuel from the east and south and by air are very limited.

Portland International Airport (PDX): PDX airport receives 100 percent of their liquid fuels from a terminal in the CEI Hub. PDX has a limited on-site fuel supply. If the pipeline between the CEI Hub and PDX fails, then PDX would likely experience a shortfall and operations would be impacted.



Left: Lateral timber bracing for steel plumb piles in the CEI Hub is considered inadequate by California's MOTEMS standards. (DOGAMI photo) Right: An example of a damaged pier in the 2010 Chile earthquake (Technical Council on Lifeline Earthquake Engineering – TCLEE, 2010)



This under-designed oil terminal pier foundation (left) in area with high susceptibility for liquefaction and lateral spreading in the CEI Hub and the poor timber-to-concrete oil terminal pier connection and exposed rebar foundation (right) in the CEI Hub are considered inadequate. (DOGAMI photo)



The connection on this pier in the CEI Hub appears to have deteriorated due to a split in the timber beam. This type of damage suggests that the condition of the structure may not be routinely monitored and maintained and that the overall pier is seismically vulnerable. (DOGAMI photo)



The approach (foreground) to the 1966 Astoria-Megler Bridge that spans the Columbia River has major structural deficiencies that could lead to a collapse following an earthquake. Damaged bridge sections could block waterway access to the CEI Hub. (DOGAMI photo)

Natural Gas

Natural gas: Oregon's largest natural gas service provider receives the majority of their natural gas from pipelines that cross under the Columbia River both near Sauvie Island and also between Washougal, Washington and Troutdale, Oregon. One of the natural gas pipelines crosses under the Willamette River at Multnomah Channel near their gate station at the southern end of Sauvie Island. The soils at these river crossings are subject to liquefaction and lateral spreading, the pipes are 1960s vintage and constructed without seismic design provisions, and the consequences of potential pipe failures could be major for natural gas service territories and Oregon. The natural gas company's storage capacity is limited and pipe breaks could lead to a natural gas shortfall in the state as well as explosions or fires.

Electricity

Electrical facilities: Electrical facilities and systems have significant seismic risk due to ground shaking and ground failure, including liquefaction and lateral spreading. Seismically vulnerable

facilities include substations and transmission in the CEI Hub as well as facilities outside of the CEI Hub, including power plants, substations and transmission lines, all which are important for distribution.

Major vulnerabilities in the CEI Hub include the control buildings, transformers and other electrical equipment in yards at the substations, and transmission towers near the Willamette River. Damage is likely to occur to both the transmission system and the distribution system in the CEI Hub. Damage to the electrical grid will likely result in a blackout in the CEI Hub and elsewhere.

BPA: Bonneville Power Administration (BPA) has conducted a comprehensive seismic vulnerability study of their system and has had a long-term seismic mitigation program in place since 1993. BPA's long-term seismic mitigation program includes 1) investment protection (e.g. anchoring transformers), and 2) power system recovery of critical paths (e.g. hardening of equipment at one of multiple bays within a major substation). The first phase of BPA's mitigation program includes bracing and restraining critical equipment and seismically upgrading critical building facilities west of the Cascade Range. Seismic strengthening in the substation yard would typically include: anchoring high-voltage power transformers; bracing transformer conservators and radiators; replacing seismically vulnerable live tank circuit breakers with more robust dead tank circuit breakers; adding damping systems to existing live tank circuit breakers; hardening transformer bushing storage facilities; replacing rigid bus connections with flexible bus. These mitigation techniques will improve the reliability of seismic performance. Additional phases of the seismic mitigation program will include facilities east of the Cascade Range.

BPA has a critical 115 kV and 230 kV high voltage transmission river crossing in the CEI Hub as well as a substation. At the substation in the CEI Hub, some of the high-voltage equipment had been anchored and braced to withstand earthquake motions. BPA is in the process of conducting seismic strengthening of the control building and equipment inside the control building (e.g., brace computer floors, control cabinets, battery racks, ceiling, pipes, etc) and additional mitigation in the yard. BPA has conducted subsurface, liquefaction and lateral spreading analyses at one of the transmission tower sites at the Willamette River crossing and concluded severe ground movement up to 25 feet towards the river channel is possible. Until mitigated, it is likely that at least two transmission towers would experience extensive damage, be inoperable, require repair or replacement, and power lines could temporarily block river traffic, including the pathway to the oil terminals. The BPA transmission towers at the Willamette River crossing are scheduled to be seismically analyzed, have a seismic mitigation design completed in 2013, and be mitigated by 2014.

Recent unpublished BPA Cascadia earthquake scenario studies of the existing transmission line system indicate that their main grid would require between 7 and 51 days to make emergency damage repairs to the transmission line system (Oregon and Washington) from a magnitude 9 Cascadia earthquake. This scenario assumes many ideal conditions (BPA employees and contractor resources are immediately available, all roads and bridges are passable, available fuel, etc), which is optimistic.



Left: These high voltage electrical transmission towers are built on a river bank in the CEI Hub susceptible to lateral spreading. (DOGAMI photo) Right: Structural damage to a high voltage transmission tower located at a river crossing in 2010 Chile earthquake (Technical Council on Lifeline Earthquake Engineering – TCLEE)

Impacts to Oregon

Based on visual observations, engineering judgment, limited analyses, and limited information from the facility operators, city records, and available literature, significant seismic risk exists in the CEI Hub. Some critically important structures appear to be susceptible to significant damage in a major earthquake with catastrophic consequences. Multiple liquid fuel transmission pipe breaks and natural gas transmission pipe breaks are possible. Damage to liquid fuel, natural gas, and electrical facilities in the CEI Hub is likely. The waterway would likely be closed and require clean up.

Due to a combination of the existing seismic hazards, vulnerability of the exposed infrastructure and potential consequences, Cascadia earthquakes pose substantial risk to the CEI Hub and to Oregon. Not only are the energy sector facilities in the CEI Hub dependent on other sectors and systems in Oregon, including transportation and communication, they are interdependent upon each other. A major Cascadia earthquake and tsunami would likely produce an unprecedented catastrophe much larger than any disaster the state has faced.

Western Oregon will likely face an electrical blackout, extended natural gas service outages, liquid fuel shortage, as well as damage and losses in the tens of billions of dollars in a future major Cascadia earthquake. Preparing for a catastrophic disaster to become more resilient is needed to improve personal safety and security, and safeguard communities and businesses.

Recommendations

The most critical call-to-action that DOGAMI has concluded from this study of the CEI Hub is this: Energy sector companies must **pro-actively integrate seismic mitigation** into their business practices for Oregon's energy sector to adequately recover from a magnitude 8.5 to 9 Cascadia earthquake in a reasonable time period.

Although energy sector companies have made efforts to prepare for seismic events, such as through emergency planning and complying with the current building codes, these efforts are

limited and a timely restoration of energy sector services is questionable. As discussed in the Summary of Findings section, only one company has completed comprehensive seismic vulnerability assessments and instituted seismic mitigation plans. Energy sector companies must make earthquake mitigation an integral part of their overall business plan. This is not only prudent for the impact a large magnitude Cascadia earthquake would have on Oregonians and the environment; it is good business continuity management. Oregon homes, businesses and industries depend upon reliable energy sources. Liquid fuel, natural gas and electricity are critical to our economy, environment and everyday existence, and the energy sector must do more in order to assure those services and products in the event of a large earthquake.

In order for the energy sector to pro-actively integrate seismic mitigation into their operations, DOGAMI makes these four recommendations to both private and public energy sector stakeholders:

1. Energy sector companies should conduct ***Seismic Vulnerability Assessments*** on all of their systems or facilities, and should work with the appropriate local, state, tribal and federal government agencies and stakeholders to achieve timely completion of the assessments to understand existing vulnerabilities.
2. Energy sector companies should institutionalize long-term ***seismic mitigation programs;*** and should work with the appropriate local, state, tribal and federal government agencies and stakeholders to achieve timely and effective mitigation to ensure facility resilience and operational reliability.
3. The State of Oregon's ***Homeland Security Council*** should review the vulnerability and resilience of the energy sector to earthquakes and other natural disasters within the scope of their mission. This could involve the EAP partners (ODOE, OPUC, and DOGAMI) as well as ODOT, Building Codes Division, and the Oregon Seismic Safety Policy Advisory Commission (OSSPAC).
4. Energy sector companies and the State of Oregon should ***build Oregon's seismic resilience*** to a Cascadia earthquake. Adopting pro-active practices and a risk management approach will help achieve seismic resilience. Encouraging a culture of awareness and preparedness concerning the seismic vulnerability of the energy sector including long range energy planning should be conducted.



Emergency batteries, as well as other components such as generators and communication devices, should be braced or anchored to a withstand Cascadia earthquake. (DOGAMI photo)

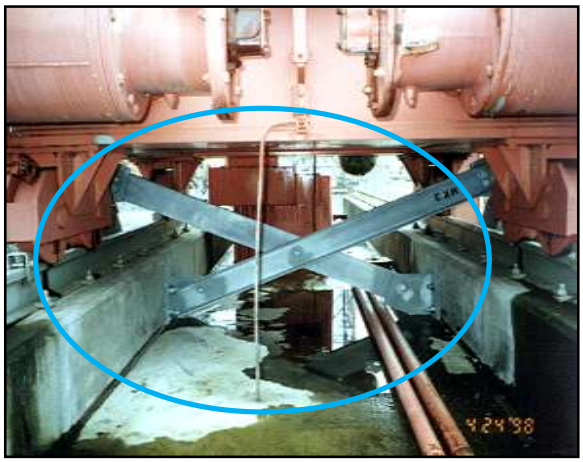


Photo shows the front view of an existing transformer with seismic anchorage including steel cross bracing as mitigation. (Photo: Leon Kempner)

The length of time to resume services after a Cascadia earthquake should be evaluated by each energy company to establish a baseline understanding, and improvements to achieve a satisfactory service level should be made. Improvements, for example, can involve adding stone columns to strengthen the ground against liquefaction-related damage and anchoring power transformers to prevent sliding-related damage.

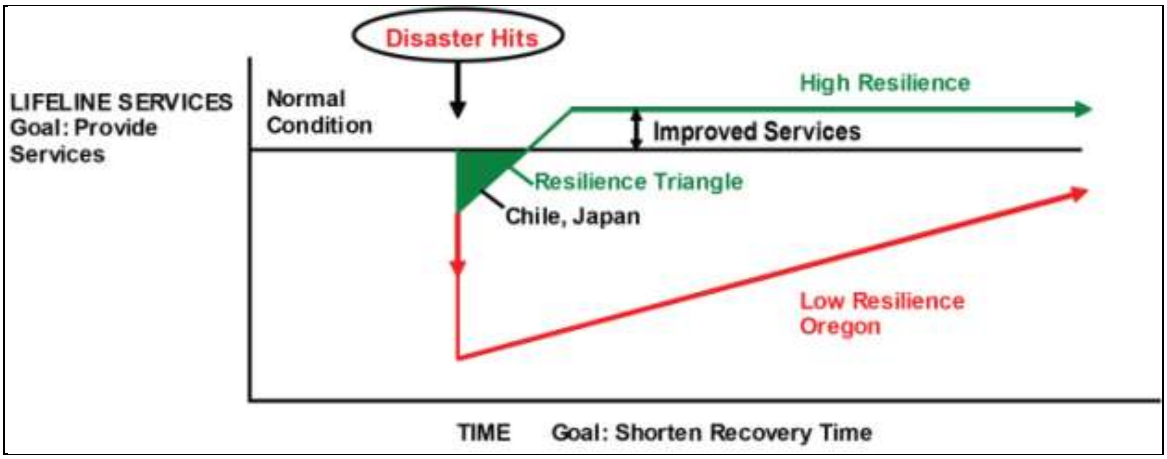
For the EAP, DOGAMI developed the resilience triangle graph with the resilience triangle shown in green. (*See figure)* The basic principle of the resilience triangle is that the smaller the triangle, the higher the resilience. Higher resilience requires minimal reductions in critical lifeline services after a disaster, speedy recovery of those services, and an overall improved service level as a result of rebuilding damaged systems and implementing better systems. The resilience triangle diagram indicates that Chile and Japan have high levels of earthquake resilience on the basis of their performance after the 2010 magnitude 8.8 earthquake in Chile and 2011 magnitude 9.0 earthquake in Japan (notwithstanding the nuclear energy issues). At the current stage, Oregon's energy sector has low resilience and is expected to have significant loss of energy sector services and a slow recovery time.

Funding is essential to increase Oregon's seismic resilience in the energy sector, and to:

- Pay for assistance and oversight to compel private sector companies into action to conduct Seismic Vulnerability Assessments and implement seismic mitigation programs
- Support an effective Homeland Security Council on energy security preparedness
- Build the State of Oregon's energy resilience
- Increase Oregonians' awareness of the effect of a Cascadia earthquake on energy availability

As part of this project, DOGAMI and EAP partners promoted seismic awareness of Oregon's critical energy infrastructure. We developed productive relationships with other state agencies, federal agencies, energy sector companies, associations, emergency response organizations and other major stakeholders regarding seismic preparedness. We conducted table-top exercises and

outreach and have more planned with energy companies and associations. The EAP partners have made more than 60 presentations to various stakeholders during the duration of this study.



Resilience Triangle (modified from MCEER)

These efforts were minimal, however, considering the task at hand. In order to build resilience in Oregon's energy sector, it is necessary to increase awareness on the risk to the energy sector and Oregonians from a Cascadia earthquake. There needs to be a cultural shift by Oregonians to become an earthquake-prepared culture. The energy sector must demonstrate transparency and accountability concerning Cascadia earthquake preparedness activity.

This study has demonstrated that Oregon's CEI Hub is vulnerable to a Cascadia earthquake, and that such an earthquake will impact our supply and sources of liquid fuel, natural gas and electricity throughout Oregon.

Oregonians should heed this study's findings, that:

- A Cascadia earthquake will occur.
- Oregon's CEI Hub – where critical energy infrastructure is located in a six-mile stretch of land – is vulnerable to a Cascadia earthquake.
- Oregon's resilience to a Cascadia earthquake is low.
- Energy sector companies must adopt best practices and pro-actively integrate seismic mitigation efforts into their business operations to prepare their facilities and systems to absorb and recover from a Cascadia earthquake and to sufficiently restore critical electric, natural gas and liquid fuel services to Oregon homes, businesses and industries in a reasonable time period. This has not happened to date, as this study has shown.
- More stringent oversight authority on seismic preparedness in the energy sector (liquid fuel, electricity and natural gas) may be needed.

Section 1
Introduction

The Oregon Department of Geology and Mineral Industries (DOGAMI) conducted an earthquake risk study of Oregon's Critical Energy Infrastructure (CEI) Hub in Portland, Oregon. This study was conducted as part of a larger U.S. Department of Energy (DOE)-funded Energy Assurance Project (EAP) conducted by the Oregon Department of Energy (ODOE), Public Utility Commission of Oregon (OPUC) and DOGAMI. More information on the EAP project is at http://www.oregon.gov/ENERGY/Recovery/Funding.shtml#Energy_Assurance_Planning, including the Oregon Energy Assurance Plan http://www.oregon.gov/ENERGY/docs/OregonStateEnergyAssurancePlan.pdf.

Background

Oregon is exposed to many natural hazards, including earthquakes, volcanoes, floods, landslides, and more. These hazards have varying characteristics, including frequency of occurrence and severity of possible damage and impact. For example, severe winter storms can occur every few years and sometimes as often as several times per year. Because of technological advances in weather forecasting, these storms typically have several days of advance warning. They typically have limited fatalities (e.g., tens of fatalities or fewer) and can result in flooding, landslides, and downed trees that impact communities, roads, and electrical service to a limited portion of the state. The economic impact can reach hundreds of millions of dollars.

In contrast, major earthquakes rarely occur, but there are no systems that allow for days or hours of advance warning of earthquakes. Major earthquakes in urban areas would likely result in more damage than winter storms because the existing building inventory has many seismically deficient buildings that were constructed before modern seismic building codes.

The most likely major earthquake to occur in Oregon is on the Cascadia Subduction Zone, which is an earthquake fault at the boundary of the Juan de Fuca and North American plates. The next Cascadia earthquake could be as large as a magnitude 9.2, which would shake a substantial portion of the Pacific Northwest and create a tsunami that would flood low-lying coastal areas. Although a magnitude 8 or higher Cascadia earthquake is an infrequent event, it would likely result in thousands of fatalities and widespread, devastating damage throughout western Oregon. The consequences from a major Cascadia earthquake would be much greater and farther reaching than any other natural hazard in Oregon. DOGAMI focused its study on a Cascadia earthquake of magnitude 8 or higher because of the potential consequences to the state of Oregon. Specific information on Oregon's hazards is included in Section 2: Characterization of Oregon's Natural Hazards and Section 4: Seismic Hazards in the CEI Hub.

Oregon's energy sector will be among many severely impacted industries after a major Cascadia earthquake. The energy sector involves the petroleum, natural gas and electricity industries. Each energy industry is a network. The petroleum supply chain involves oil resource development, oil refineries and distribution systems that include fuel terminals with products as well as multiple modes of transportation. Likewise, the natural gas supply chain involves resource development, processing and distribution systems. The electricity supply chain involves generation,

transmission and distribution. For Oregon to have a secure and stable energy supply, energy sector industries must ensure a resilient supply chain during normal operations as well as during extreme conditions, including a Cascadia earthquake.

This study evaluates seismic hazard, vulnerability, risk and resilience in the CEI Hub. These concepts have varying meanings among earth scientists, engineeres and social scientists, so for the purposes of this report, we define them as follows:

- Seismic Hazard: The combination of the severity of damaging seismic effects (shaking, liquefaction, landslides) at a particular location with the frequency with which those effects occur at that location. A very large earthquake that is very rare poses a small seismic hazard, as do very frequent but very small earthquakes. High levels of seismic hazard result from the combination of relatively frequent and relatively large earthquakes. Sesimic hazard is a function of the size and frequency of the earthquake, its location relative to the site in question, and geologic conditions at the site.
- Seismic Vulnerability: The degree to which a particular structure or system is likely to sustain damage when exposed to a particular level of damaging seismic effects like shaking, liquefaction or landsliding. Seismic vulnerability is an intrinsic characteristic of the structure or system.
- Seismic risk: The combination of seismic hazard affecting an area, the vulnerability of the structures and systems in that area, and the consequences of failure of those structures and systems.
- Seismic Resilience: The ability of a structure, system or community to recover from a damaging earthquake. Resilience includes not only the resistance of the system to initial damage, but also the ease and speed with which it can be brought back into service after the event.

Objective

This purpose of this study is to better understand the vulnerabilities of the energy sector when it is confronted with a magnitude 8 or larger Cascadia earthquake. This risk study focuses on Cascadia earthquakes because a large magnitude Cascadia earthquake poses the highest risk of all natural hazards to the state of Oregon (Wang, 2008).

Study goals were to:

- Characterize Oregon's natural hazards by developing qualitatively-derived risk scores to estimate the scale of potential disasters,
- Better understand CEI facility operations and learn about site conditions, structures, and components as well as the systems and interdependencies,
- Describe some of the potential critical seismic vulnerabilities in the energy sector, and
- Offer recommendations to improve energy sector resiliency to minimize earthquake impacts.

Use of this Study

This report provides information to help encourage a seismically resilient energy sector and protect Oregonians in the event of a future Cascadia earthquake. It can be used to develop scenarios, demonstrate objectives, and determine extent-of-play for table-top exercises. The findings in this report can be applied to the development of mitigation, response, and recovery strategies in the Oregon State Energy Assurance Plan and Energy Sector-Specific Emergency Response Plans. The findings can also be used in Oregon resilience planning efforts directed by the Oregon Seismic Safety Policy Advisory Commission (OSSPAC).

Scope of Work

DOGAMI was tasked to determine seismic hazard and risk information of critical energy facilities in Oregon in an intra-governmental agreement with OPUC. DOGAMI did not perform detailed seismic vulnerability assessments of any specific facility, system or asset.

Although DOGAMI had conducted previous studies on Oregon earthquake resilience, including Wang 1999, Wang 2008, and Wang 2010a, these studies did not focus on the energy sector. Because there were many unknowns involving the energy sector, DOGAMI's approach was to: 1) gather information and learn about the state's energy systems; 2) characterize Oregon's natural hazards and its impacts on the energy sector; 3) conduct scoping studies; 4) perform document reviews; 5) collect input and expert opinions from a wide range of professionals (see Section 8: Acknowledgements); 6) conduct visual screening assessments; and 7) perform our own state-of-practice engineering studies. The goal was to evaluate the overall vulnerability of the energy sector to damage at the CEI Hub from a magnitude 8 or larger Cascadia earthquake.

From these activities, DOGAMI created a natural hazard risk matrix based on the natural hazards recognized by the State of Oregon's Natural Hazard Mitigation Plan. DOGAMI also defined the CEI Hub project study area as the six-mile stretch of the lower Willamette River located between the south tip of Sauvie Island and the Fremont Bridge on US Highway 30. (*Figure 1*) The project entailed assessing the seismic hazards of the CEI Hub, identifying the major energy sector facilities in the CEI Hub, and surveying their seismic vulnerabilities.

DOGAMI staff conducted a review of building codes to help assess the vulnerability of the structures in the CEI Hub. DOGAMI conducted site visits to all major energy sector facilities in the CEI Hub (*Figure 1*) as well as several facilities outside of the CEI Hub. In each case, the facility's operator accompanied DOGAMI to visually survey their facilities, which is discussed in the following section: Study Methods.



Figure 1: Site map of the Critical Energy Infrastructure (CEI) Hub on the western bank of the Lower Willamette River area in NW Portland, Oregon. The CEI Hub, outlined in red, stretches for six miles. (base map: Google Earth)

DOGAMI also partnered with academic earthquake professionals to co-conduct a statewide economic study focusing on energy sector interdependencies (*Appendix A*) as well as a ground deformation analysis for this project *(Appendix B)*. These studies provide specialized technical information that is useful towards meeting the study objective.

As a result, this earthquake risk study provides generalized information on the seismic hazard, the exposed facilities, consequences of the seismic hazards to the exposed facilities, and key findings and recommendations to make the energy systems more resilient to earthquake impacts. The term "risk" is defined herein as a function of the threat of seismic hazard, the vulnerability of the exposed parts, and the severity of the consequences. Sections 4 and 5 of this report address the seismic hazards and seismic vulnerability of the exposed facilities in the CEI Hub. Section 6 starts with a discussion of consequences to help illustrate the concept, then addresses the conditions involving seismic risk in the CEI Hub, and ends with discussing impacts to Oregon. This information will allow the energy industry and decision-makers from all levels of government to collaborate on strategies to rapidly recover from a major disaster, and to protect public health and safety, the environment, and the region's economy.

Study Methods

The project method involved assessing the seismic hazard in the CEI hub area posed by a Cascadia earthquake (Section 4 of this study). Although local crustal faults exist in the CEI Hub, only the Cascadia fault was evaluated based on its higher probability of occurrence, many seismic hazards and high risk (Sections 2 and 4 of this study). Many seismic hazards were considered, which included ground shaking, soil susceptibility to earthquake-induced liquefaction, lateral spreading, landslides, and co-seismic settlement. Since liquefaction and lateral spreading hazards are the primary concerns, especially to the waterfront facilities, we co-conducted a ground deformation analyses to better understand the nature of the hazards and the possible mitigation needs.

DOGAMI reviewed the building code environment for facilities in the CEI Hub to determine the design conditions of the facilities. Building codes set forth minimum standards on new construction and for certain major changes. Building codes are frequently upgraded to reflect new design knowledge including seismic hazards. These codes play a vital role in the seismic robustness of structures. If the code requires a high level of seismic design, then the new structure is designed and built to resist seismic forces. In contrast, if past codes call for seismic design levels that are significantly lower than the levels in the current code, then those structures may be seismically deficient.

The EAP partners, which include staff from DOGAMI, ODOE, and OPUC, assessed the seismic vulnerability of CEI Hub facilities through a series of site visits and meetings. Key individuals are listed in Table 1 and contributors are listed in the acknowledgements (Section 8). The EAP assessments included on-site facility visits in the CEI Hub to meet with the operators and tour their facilities, as well as viewing facilities by boat and aerial reconnaissance. A few site assessments were conducted at facilities outside of the CEI Hub. DOGAMI co-organized two boat tours with the City of Portland and invited key stakeholders including Oregon leadership (director of Oregon Emergency Management, representative from Senate President's office), FEMA and EAP partners. DOGAMI, OPUC and Oregon Department of Transportation (ODOT) also conducted aerial reconnaissance with the Civil Air Patrol covering the CEI Hub to the Columbia River mouth to consider emergency response options using the Columbia River waterway.

Table 1: List of Key Individuals: EAP Partners and Stakeholders

EAP partners
Oregon Department of Energy Deanna Henry Emergency Preparedness Manager Nuclear Safety & Energy Emergency Preparedness Division
Oregon Department of Energy Rebecca O'Neil EAP Project Manager Senior Policy Analyst, Energy Technology Division

Table 1: List of Key Individuals: EAP Partners and Stakeholders (cont)

Public Utility Commission of Oregon
J. R. Gonzalez, P.E. (former)
Administrator
Safety, Reliability and Security Division

Public Utility Commission of Oregon
Rick Carter
Senior Utility Analyst
Emergency Management-Disaster Response and Recovery
Safety, Reliability and Security Division

Public Utility Commission of Oregon
Immanuel Runnels (former)
Utility Analyst, Intern

EAP stakeholders

Bonneville Power Administration
Leon Kempner
Structural Engineer

BP
Jim Swatman
Portland terminal manager
US Pipelines and Logistics

Chevron
Jerry Henderson
Willbridge terminal manager

ConocoPhillips
Tom Lyons
Portland terminal manager
Scott Edwards
Division Engineer, West Coast Terminals, Transportation Pipelines and Terminals
Rafael Rengifo
Tank Integrity Initiatives Lead

Kinder Morgan
Greg Westling, Area manager- Willbridge/Linnton Terminals
Ron Lown, Eugene Terminal, Lead Operator

McCall Oil
Ted McCall, Portland terminal owner

Table 1: List of Key Individuals: EAP Partners and Stakeholders (cont)

NuStar Energy LP
Ricky Hudiburgh
Portland terminal manager

NW Natural
Grant M. Yoshihara
Vice President, Utility Operations & Chief Engineer
Jon Huddleston
Director, Deliver Gas Process
Kerry Shampine,
Manager, Engineering Services
Robbie Roberts
Security Specialist, Business Continuity & Corporate Security

Olympic PipeLine Company
Kurt Hayashida
Lead Engineer
Jim Fraley Jr.
Damage Prevention Team Lead

Pacificorp
Jack Vranish
Director, Asset Risk and Strategy
Debbie Guerra
Director, T&D Dispatch, Emergency Management

Portland General Electric (PGE)
Bill Nicholson
Vice President Distribution
Dave Ford
Director, Business Continuity and Emergency Management
Dave VanBossuyt (retired)
General Manager Southern Region
Todd Jones
Civil Engineer, Substation Engineering

Shell
Mario Berrios
Operations Supervisor Portland - Tumwater Terminals
Billy Powell
Regional Response Manager, HSE Emergency Management

Table 1: List of Key Individuals: EAP Partners and Stakeholders (cont)

Williams Northwest Pipeline George Angerbauer Manager of Public Outreach Troy Robey Assistant District Manager, Battle Ground District

Assessment of the energy sector facilities in the CEI Hub included:

- All of Oregon's major liquid fuel port terminals
- Liquid fuel transmission pipelines and transfer points
- Liquefied natural gas (LNG) facility
- High voltage electric substation and transmission lines

Assessment of energy facilities outside the CEI Hub included:

- Four electrical substations
- Two power plants (Port Westward and Beavers in Western Oregon (Columbia County)
- A natural gas gate station on Sauvie Island
- A liquid fuel terminal in Eugene

ODOE organized site visits at these petroleum facilities: BP, Chevron, ConocoPhillips, KinderMorgan (KM) fuel terminals and KM pipeline, McCall Oil, Nustar, and Shell. Site visits were also conducted at Bonneville Power Administration (BPA), NW Natural, Portland General Electric (PGE), and Williams Northwest Pipeline. We did not visit any PacifiCorp facilities as all are located outside the CEI Hub.

DOGAMI reviewed US Coast Guard (USCG) inspection protocols for port facilities with petroleum terminals. Because USCG inspections of the Portland fuel terminals do not include a seismic component, the EAP partners worked with the California State Lands Commission to look at how California addresses seismic issues at port facilities with fuel terminals. With help from Martin Eskijian, Supervisor, Engineering Branch Marine Facilities Division from the California State Lands Commission (retired in 2011) and his staff, the EAP partners reviewed parts of the Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS), which is implemented and enforced by California State Lands Commission that incorporates seismic safety http://www.slc.ca.gov/Division_Pages/MFD/MOTEMS/MOTEMS_Home_Page.html.

The EAP partners joined MOTEMS staff on two oil refinery inspections in Richmond and Benecia, California, as well as observed a MOTEMS regulatory review meeting with a petroleum company at the MOTEMS office in Hercules, California. DOGAMI and ODOE, with the assistance of MOTEMS staff engineer Kendra Oliver at four of the Portland fuel terminals, conducted site visits to inspect the piers and the wharves used for transporting liquid fuel in the CEI Hub.

A significant part of the project involved identifying key stakeholders for all the energy sectors as well as government agencies and other stakeholders. These are listed in *Table 2.* Many other individuals provided their expertise upon request. These individuals are listed in Section 8: Acknowledgments. The EAP partners provided EAP information to the energy sector, as well as the public, at many meetings and through a variety of media in order to build awareness. For this report, the names of the companies have often not been identified, and in places, replaced with "*unnamed*". Furthermore, the location of their facilities in the CEI Hub have not been pinpointed. This action was taken to promote participation from privately-owned energy sector operators while respecting their privacy when obtaining seismic vulnerability data associated with their facilities.

Table 2: List of stakeholders in this Earthquake Risk Study for Critical Energy Infrastructure Hub.

Private sector fuel stakeholders	Private sector electricity natural gas stakeholders	Government Agency stakeholders	Non-profit stakeholders	Academic stakeholders
BP	NW Natural	Bonneville Power Administration (BPA)	American Society of Civil Engineers	University of British Columbia
Chevron	PacifiCorp	City of Portland	Western Energy Institute	University of Utah
ConocoPhillips	Portland General Electric (PGE)	City of Salem		Western Washington University
Kinder Morgan (KM) fuel terminals and pipeline	Williams Northwest Pipeline	Federal Emergency Management Agency (FEMA)		
McCall Oil		Oregon Dept. of Transportation		
NuStar Energy LP		Oregon Emergency Management		
Olympic Pipe Line Company (operated by BP Pipelines, North America)		Oregon Seismic Safety Policy Advisory Commission		
Shell		Port of Portland		
		US Coast Guard		
		US Dept. of Energy		
		US Geological Survey		

Limitations

This study did not entail site-specific vulnerability and risk studies, including studies of any particular facility or system, and provides only estimates of seismic vulnerability based on reconnaissance visual inspections, site-independent analyses and studies and existing site specific information conducted by CEI Hub facilities. The study is only an exploratory seismic risk study of the CEI Hub. Additional studies are required to obtain site specific conditions, and accurate and comprehensive vulnerability and risk data.

While tsunami damage is expected to impact coastal areas, including maritime fuel transport through Columbia River mouth, DOGAMI did not assess damages from tsunami impacts in the CEI Hub because it was outside the scope of this project. Models of likely tsunami inundation from Cascadia earthquakes suggest that tsunami effects in the Columbia River diminish rapidly east of Astoria, and the possibility of tsunami inundation in Portland is remote. (Priest et al, 1999). DOGAMI did not assess dam failure impacts to the CEI Hub because it was outside the scope of this project.

Report Organization

The report is organized into these sections:

Summary of Report
Section 1. Introduction
Section 2. Characterization of Oregon's Natural Hazards
Section 3. Oregon's Energy Sector
Section 4. Seismic Hazards in the CEI Hub
Section 5. Energy Facilities and Vulnerabilities in the CEI Hub
Section 6. Summary of Findings
Section 7. Recommendations
Section 8. Acknowledgments
Section 9. References
Section 10. Appendices

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Section 2
Characterization of Oregon's Natural Hazards

The section discusses the natural hazards and risks in Oregon and summarizes key results from previous statewide earthquake and tsunami studies.

Natural Hazards and Risk

Oregon is exposed to a wide range of natural hazards, each with its own characteristic frequency and severity. Floods, wind and winter storms are expected to occur frequently in limited geographic area, and are, therefore, considered to be high-probability, low-consequence events. In contrast, large Cascadia Subduction Zone earthquakes and tsunamis rarely occur, but would results with significant, widespread damage. Cascadia earthquakes are considered to be low-probability, high-consequence events.

The earthquake hazard in Oregon varies depending on the location. The likelihood of an earthquake occurring in western Oregon is higher than in eastern Oregon, thus the earthquake hazard is considered to be higher in western Oregon (Figure 2). Considering the entire state of Oregon as a whole, the overall earthquake hazard can be considered as high to moderate. The earthquake risk, however, may be considered as very high. The terms hazard and risk may be defined differently by engineers, business continuity specialists, social scientists, emergency managers, and others and may also vary depending on the specific context. In risk studies performed by engineers, the risk level is often determined as a function of the hazard (the probability of the earthquake occurring), the vulnerability of the exposure, and the consequences. Additional information on probability and risk concepts in engineering are covered in Ang and Tang (2007) and Garvey (2008).

The State of Oregon's Natural Hazards Mitigation Plan, produced by the Oregon Emergency Management with the assistance of many state agencies, is state government's plan to address natural hazards. This plan, available on http://opdr.uoregon.edu/stateplan, is in a continual process of being updated. Oregon's Governor last approved and adopted the plan in 2009. The major hazards identified for Oregon in this plan include: climate change, coastal erosion, drought, dust storm, earthquake, fire (wildland-urban interface), flood, landslide and debris flow, tsunamis, volcanic, windstorm and winter storm.

Development of Risk Matrix

In the early stages of this EAP, DOGAMI assessed how different natural hazards compare with each other with respect to the hazard, vulnerability and consequence to rank how Cascadia earthquakes compare with other hazards. DOGAMI used the identified hazards identified in the State of Oregon's Natural Hazards Mitigation Plan and created a qualitative statewide risk matrix for natural hazards. (See *Table 3)* The table was developed to provide a better understanding of the state's natural hazards and the risk to estimate the scale of potential future disasters. The risk scores include low, moderate, high and very high. The risk scores were subjectively determined by expert opinion and are based on the probability of the hazard, the vulnerability of the exposure, and the consequence of likely damage for the state as a whole. These scores do not specifically consider energy infrastructure.

Table 3: Statewide Risk Matrix for Natural Hazards (Oregon Emergency Management identified the hazards list; EAP partners created the risk matrix)

Description of Hazard	Hazard	Vulnerability	Consequence	Risk Score
Climate Change	NE	NE	NE	NE
Coastal Erosion	H	M	M	M
Drought	M	M	H	M
Dust Storm	L	L	M	L
Earthquake	**M**	**VH**	**VH**	**VH**
Fire (Wildland-Urban Interface)	H	M	M	M
Flood	VH	M	M	H
Landslides and Debris Flow	VH	M	M	H
Tsunamis	M	H	VH	H
Volcanic	L	M	M	M
Windstorm	M	M	H	M
Winter Storm	VH	H	H	H

Explanation: VH=very high; H=high; M=moderate; L=Low; NE=not estimated

The earthquake hazard is only moderate because earthquakes are rare. For example, a magnitude 8 or so Cascadia earthquake has a recurrence interval of about 250 years, and a magnitude 9 Cascadia earthquake has a recurrence interval of about 500 years. The earthquake vulnerability score is very high because the vast majority of Oregon's existing infrastructure has been designed and constructed without seismic resistance considerations. The consequence score is also very high because damage will likely be widespread and, in many places, severe. Finally, the earthquake risk score is very high because when a major earthquake occurs, it will likely result in a high loss of life, economic damages, and long-term impacts.

Method to Develop Risk Score

In developing the risk scores, DOGAMI gave broad consideration to numerous factors that would have a statewide significance. Factors include the hazard's: onset pattern (ie. earthquakes do not have forewarning, but tsunamis have at least minutes of warning); frequency (ie. earthquakes are rare, but storms are frequent); geographic location and spatial extent (ie. Cascadia earthquakes can suddenly impact all of western Oregon, whereas fires are localized); severity of impact resulting in many fatalities and/or high economic losses (ie. earthquakes can cause widespread physical damage to critical energy infrastructure, transportation, emergency response facilities and other essential facilities). As specific examples, coastal erosion and tsunamis are limited to the coastal areas, whereas winter storms and fires can occur anywhere in the state.

The risk matrix can be used to help determine and prioritize risk management strategies. For each hazard, a single ranking of low, moderate, high or very high was subjectively selected for the probability of the hazard, vulnerability, and consequence. Low, moderate, high and very high were assigned values of 1, 2, 3 and 4, respectively. The risk score was calculated by taking the square root of the sum of the squares, and assigned as low, moderate, high or very high for values less than 3, 3 to less than 4.5, 4.5 to less than 6, and 6 or greater, respectively.

Previous Statewide Earthquake Studies

For most of Oregon's history, the seismic potential was considered to be minimal. Even as late as 1980 during the Mt. St. Helens volcanic eruption, geologists were generally unaware of Oregon's major faults and their earthquake potential. During the 1980s, geologists learned about the Cascadia Subduction Zone and that it could produce large earthquakes. By the late 1980s, there was general consensus among earthquake scientists that the Cascadia fault could unleash a magnitude 8 or higher earthquake and accompanying tsunami (Wang, 1998a). Since that time, scientific research has continued to improve our understanding of the Cascadia fault and numerous earthquake and tsunami studies have been performed.

Figure 2 shows a current scientific model of the location of the Cascadia Subduction Zone. The potential rupture surface of the Cascadia fault extends from the western edge (white line with triangles) to the eastern edge (dashed black line). The eastern edge of the fault is important because, in general, the shaking levels are closer to the fault.

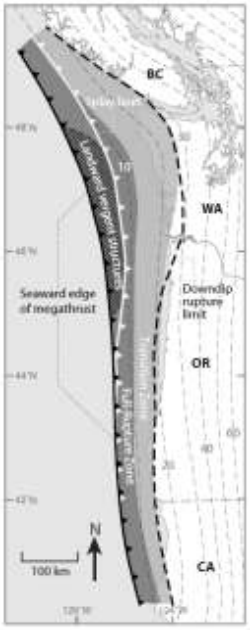


Figure 2: Cascadia Subduction Zone between the black dashed line and the white line with triangles. (Witter et al, 2011).

Statewide Damage and Loss Estimates

In 1998, Oregon was the first state in the nation to conduct a statewide earthquake damage and loss study (Wang, 1998b, Wang and Clark, 1999). Using HAZUS97, a damage and loss estimation software package from FEMA, DOGAMI produced a technical report that included evaluations of damage and losses for the entire state for 1) a magnitude 8.5 Cascadia earthquake and 2) a 500-year return interval probabilistic ground motions. In the second evaluation, the ground motions expected to be met or exceeded in a 500-year period are used in the building code to design for earthquake shaking.

As part of that study, DOGAMI developed a statewide soils map. Next, DOGAMI developed a suite of ground motions that integrated the soils map. The ground motions were used to estimate

damage to infrastructure from shaking. *Figure 3* illustrates how layers of information are used to determine damage where the uppermost layer depicts highest damage in red (Wang, 1998b). *Figure 4* shows a spectral velocity map of Oregon at 0.3 seconds, which was one of the ground motion maps used to estimate damage (Wang, 1998c). The statewide damage and loss assessment was conducted in two parts, both indicating severe losses. Building damage from a hypothetical magnitude 8.5 Cascadia earthquake was estimated using FEMA's HAZUS97 software and indicated almost 1,000,000 buildings with some level of damage from earthquake shaking (Wang and Clark, 1999). Fatalities were estimated using crude methodologies and indicated more than 3,000 fatalities from tsunamis, 2,000 fatalities from severe building damage, and many more casualties. (Wang, 1999)

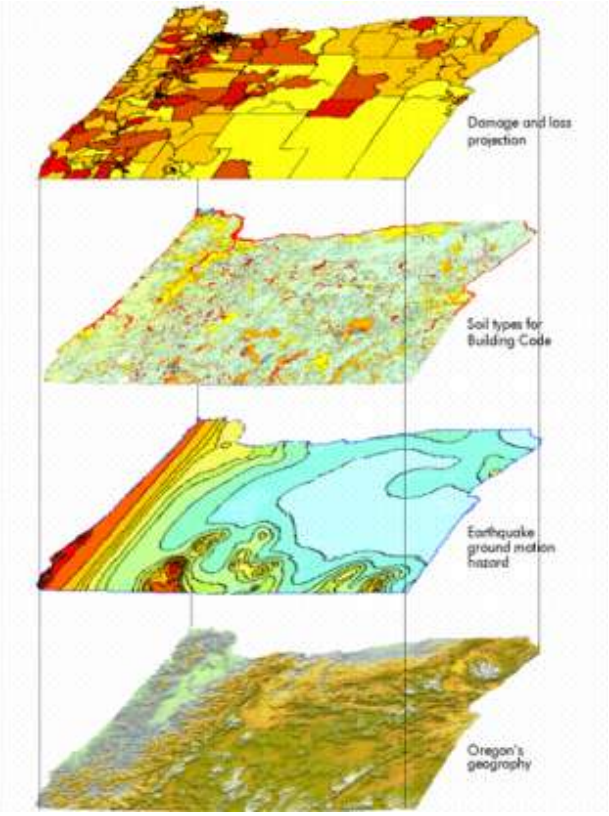


Figure 3: Schematic showing a statewide GIS-based (HAZUS97) study damage and loss assessment using probabilistic ground motions that represent equal seismic hazards throughout Oregon. (Wang, 1998b)

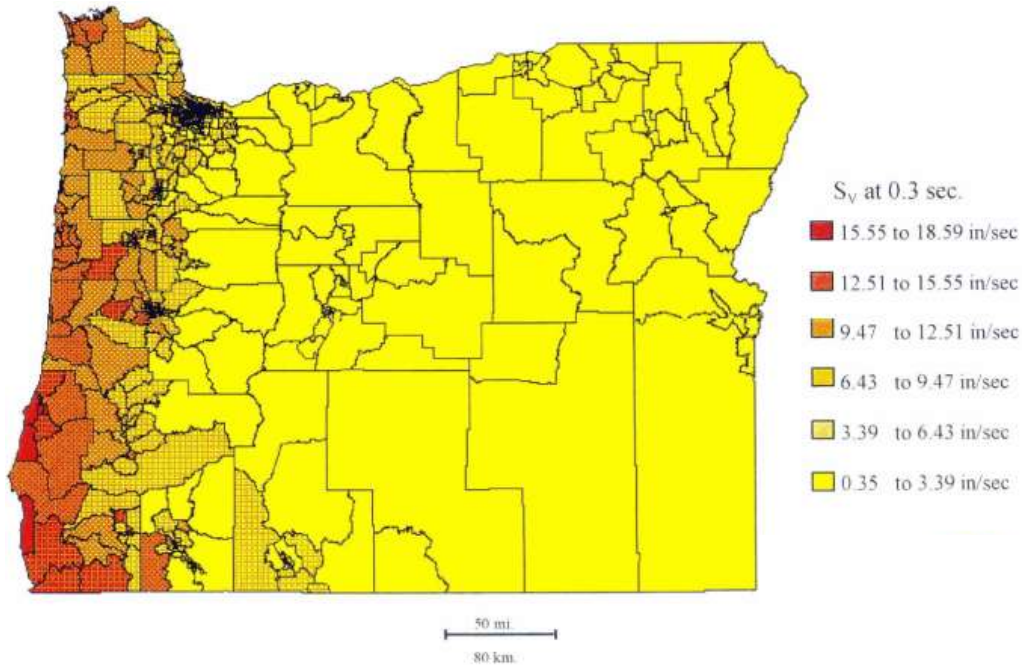


Figure 4: Spectral Velocity Map of Oregon at 0.3 seconds (Wang, 1998c)

Today, earthquake scientists have gained a better understanding of the Cascadia fault, the soils in Oregon, and expected ground motions. Researcher Chris Goldfinger and his colleagues have examined the offshore geologic record of large Cascadia earthquakes in the past 10,000 years. (Goldfinger et al, 2012) *Figure 5* shows a simplified timeline of Goldfinger's findings, which indicate over 40 earthquakes (DOGAMI, 2010). Seismic hazards are further discussed in Section 4.

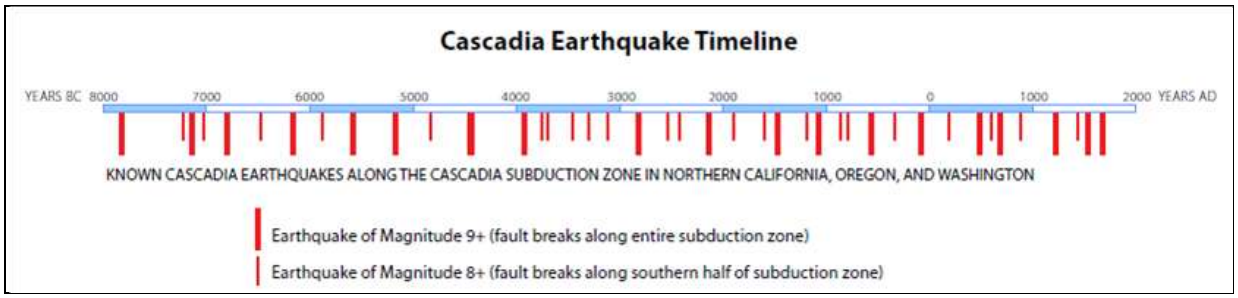


Figure 5: 10,000 year record of past large magnitude earthquakes on the Cascadia Subduction Zone. (DOGAMI, Cascadia Winter 2010)

Lessons from Recent Subduction Zone Earthquakes

In recent years, three significant earthquakes have occurred in subduction zones around the world. These include:

- 2004 magnitude 9.1 Sumatra earthquake
- 2010 magnitude 8.8 Chile earthquake
- 2011 magnitude 9.0 East Japan earthquake

Each time a major subduction zone earthquake occurs, earthquake professionals working in the Cascadia region gather important earthquake information and learn a great deal more about the Cascadia Subduction Zone.

In the Sumatra earthquake, one big lesson learned was that tsunamis can kill over 200,000 people from one side of the ocean to the other side. The tsunami hit and killed people in Sumatra, but also traveled across the Indian Ocean and killed people in 12 other countries including Thailand, India, and Sri Lanka. In 2009, stakeholders from the Pacific Northwest discussed tsunami vertical evacuation refuges as a new mitigation option. (Wang, 2010a)

In the 2010 Chile earthquake, moderate shaking damaged an oil refinery that was rendered inoperable for months. Earthquake professionals working in the Cascadia region learned lessons on the importance of critical infrastructure. (Wang, 2010b)

In the 2011 Japan disaster, the electrical sector was impacted not only by damaged nuclear and thermal power plants, but also by undamaged nuclear power plants, which were shut down due to the public's concern about their safety. Also, one electric company experienced damage to 85 of its high voltage transformers. The Oregon Seismic Safety Policy Advisory Commission adopted policy recommendations to address the issue of critical infrastructure (including fuel and electric) following the Japan earthquake. (http://www.oregon.gov/OMD/OEM/osspac/docs/lessons_recomm_7-11.pdf). They are reprinted in the Winter 2012 Cascadia (DOGAMI).

Based on observations from historical earthquakes, scientists have determined that 1) large earthquakes release more energy and produce stronger ground shaking than small earthquakes, 2) the level of ground shaking lowers with distance away from epicenter of the earthquake, and 3) damage is typically concentrated nearer the epicenter of the earthquake as well as in farther locations with soft soil deposits, such as old lake bed soils. Based on post-earthquake field visits after the 2004, 2010 and 2011 subduction zone earthquakes, co-author Yumei Wang, observed that the damage in those subduction zone earthquakes was concentrated in three areas:

1. Tsunami inundation zones,
2. Areas of permanent ground deformation, such as landslides and liquefaction zones, and
3. Seismically weak buildings and infrastructure.

Section 3: Oregon's Energy Sector

This section provides an overview of Oregon's energy sector, the CEI Hub project study area, and Oregon's economic interdependencies with the energy sector.

Overview of Energy Sector

Three energy sources are considered—electricity, natural gas and fuel oil. The energy sectors have separate systems for supplying their products and/or services. Not surprisingly, each has sector-specific seismic vulnerabilities.

The crude oil used in Oregon originates in the Alaska North Slope oil fields. The Trans Alaska Pipeline transports crude oil from these oil fields to the Valdez terminal in southern Alaska. From there, barges, tankers and pipelines carry the crude oil to four refineries located in the Puget Sound area of Washington State, which provide more than 90 percent of Oregon's refined petroleum product. About 75 percent of the product is transported via the Olympic Pipeline to seven petroleum distribution terminals located within close proximity of one another in the CEI Hub project study area, further described in the next section. The remaining fuel coming to Oregon from the Washington State refineries is transported by tanker vessels to the Portland facilities. (ODOE, 2011)

In 2010, Oregon's electrical power mix from a variety of power plants was 0.77% biomass, 35.46% coal, 0.12% geothermal, 38.74% hydroelectric, 0.04% landfill gases, 16.24% natural gas, 3.66% nuclear, 0.14% other, 0.17% petroleum, 0.34% waste, and 4.31% wind (ODOE Power Mix Fact Sheet, 4/4/12). The electrical grid that serves the state of Oregon is coordinated and highly interconnected with similar systems in the 13 western U.S. states, parts of northern Mexico and western Canada. Critical grid functions, in relation to Oregon, are most predominately the responsibility of the Bonneville Power Administration (BPA), Western Electricity Coordinating Council (WECC), PacifiCorp and PGE. On a local level, the electric distribution systems, as well as some transmission and generation, are also the responsibility of Oregon's numerous municipal and public power agencies. Being integrated, Oregon's generation and transmission systems are exposed to adverse events that may be caused over a thousand miles away. In theory, Oregon's electric resiliency (e.g., reliability) can be significantly impacted by transmission or generation related events that could occur anywhere in the entire interconnected region. Conversely, events emanating within Oregon could also significantly impact other states. The prudent management, operations, planning and maintenance of bulk power transmission and generation grids play a fundamental role in Oregon's electric resiliency (RW Beck, 2011).

Oregon receives natural gas from British Columbia, Alberta, Wyoming, Colorado and New Mexico. Two connected interstate pipelines currently serve Oregon customers. The Williams Company pipeline and the Gas Transmission Northwest (GTN) pipeline owned by the TransCanada Corporation bring product from the Rocky Mountains and Canada. The Ruby Pipeline transports domestic natural gas 675 miles across four states from Opal, Wyoming to the existing Gas Transmission Northwest (GTN) pipeline near Malin, Oregon. According to the Northwest Gas Association (NGWA), the Pacific Northwest is home to more than 48,000 miles of natural gas transmission and distribution pipelines (ODOE, 2011).

More information on the energy assurance project, including the Oregon Energy Assurance Plan is at http://www.oregon.gov/ENERGY/docs/OregonStateEnergyAssurancePlan.pdf.

Critical Energy Infrastructure (CEI) Hub: Project Study Area

The study region for this project was determined based on the location and importance of Oregon's liquid fuel oil terminals. Oregon's liquid fuel terminals are located along a six-mile stretch along the lower Willamette River in Portland. As part of this study, we identified and termed these six miles as the "critical energy infrastructure Hub" or CEI Hub. The CEI Hub is located in a region of high seismicity (*Figure 6*, FEMA 2002).

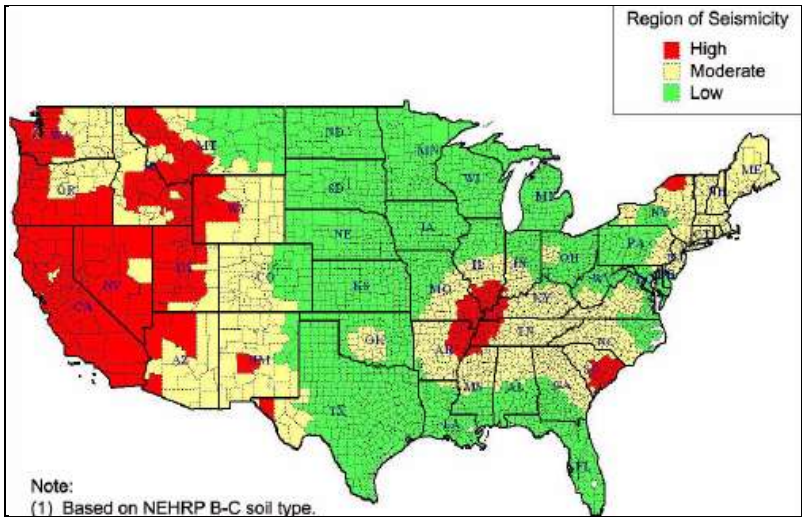


Figure 6: Map showing regions of high, moderate and low seismicity. The CEI Hub is in the high region (FEMA, 2002).

The CEI Hub covers a six-mile stretch of the lower Willamette River located between the south tip of Sauvie Island and the Fremont Bridge on US Highway 30. The energy sector facilities in the CEI Hub include:

- All of Oregon's major liquid fuel port terminals (see *Figures 7, 8 and 9*)
- Liquid fuel transmission pipelines and transfer terminals
- Natural gas transmission and distribution pipelines
- Liquefied natural gas (LNG) storage facility
- High voltage electric substations and transmission lines
- Electrical substations for local distribution

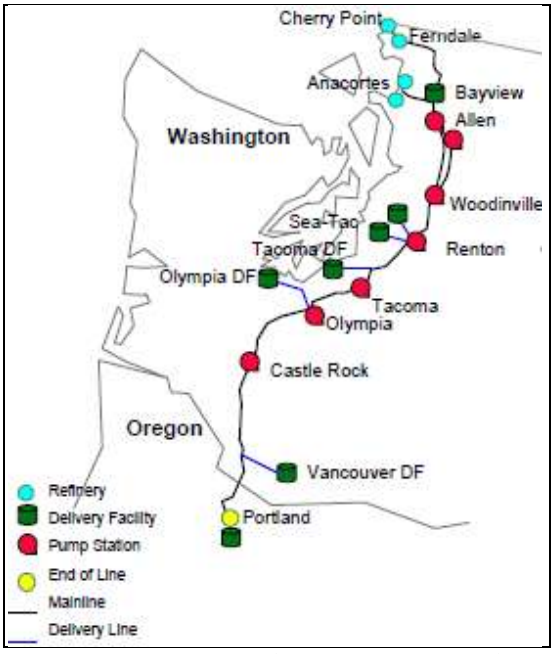


Figure 7: The liquid fuel oil terminals for more than 90 percent of Oregon's supply are located at the end of the line (yellow dot) in Portland, Oregon. (http://www.bppipelines.com/cartoon-maps/olympic.pdf)



Figure 8: Oil terminals in the southern portion of the CEI Hub. (DOGAMI photo)



Figure 9: Oil terminals in the northern portion of the CEI Hub (foreground of photo). (DOGAMI photo)

Petroleum enters the state by pipeline and marine vessels and is transferred to terminals at the CEI Hub before it is distributed throughout Oregon to the end user. Once the product reaches the CEI Hub, tanker trucks deliver fuel to customers in the Portland metro area, barges deliver fuel farther east on the Columbia River, and a pipeline continues south to a terminal in Eugene. Fuel is distributed throughout Oregon, including to the Portland International Airport and many other major consumers.

Oregon's oil terminals are located along the western bank of the Willamette River (*Figures 8 and 9*). The Portland fuel terminals are on a six-day delivery cycle. On average, terminals have a three to five day supply in the tank farm for regular unleaded gasoline and diesel fuel. Premium gasoline is subject to the daily delivery and heavily dependent on whether an inter-company pipeline on Front Avenue is operational. All seven terminals have the capability to receive product by vessel. However, only Chevron and Kinder Morgan terminals have the marine vapor recovery systems required to load unleaded fuel onto vessels for transport up the Columbia River to Pasco, Washington. Diesel can be loaded on vessels without the vapor recovery systems. Vessel deliveries vary. Chevron reports on average, its terminal receives a shipment by barge every three or four days and by ship every seven or eight days. (Portland PBEM, Earthquake Response Appendix, January 2012, http://www.portlandonline.com/oem/index.cfm?c=53895&a=382005)

A significant portion of Oregon's natural gas passes through the CEI Hub. Also, three high voltage (115 kV and 230 kV) electrical transmission lines cross the area as well as feed the distribution network for the local area.

Economic Interdependencies with the Energy Sector

In August 2003, Americans got a dramatic "wake up call" concerning the vulnerability of electrical systems and the resultant regional and national consequences as a result of the Northeast Blackout. The blackout affected five states, 50 million people, and caused an estimated $4 to $10 billion in business interruption losses in the central and eastern US. The power outage

caused "cascading" failures to water systems, transportation systems, hospitals, and numerous other critical infrastructures (National Research Council, 2011).

Oregon's economy, like all other states, has complex interdependencies. The reliability of energy lifelines is vital to ensure the protection of public health and safety. Any prolonged or severe disruption of one or more energy system could put many lives at risk as well as strain the state's economy. To better understand the economic interdependencies with the energy sector, co-author Miles conducted a statewide economic study to evaluate the economic interdependencies of Oregon's energy sector by comparing the interdependencies of electricity, natural gas and liquid fuel as well as critical infrastructure with the rest of Oregon's economy. This work is part of a National Science Foundation-funded research project (Grant #0927356) entitled *"Repeat Disaster Impact to Infrastructure Networks and Their Effects on Economic Agent Recovery."* This part of the study was peer reviewed and is included as Appendix A.

The findings show that if available electricity, natural gas and liquid fuels were significantly reduced, the direct and non-direct dollar losses would have major socio-economic consequences to Oregon. In a scenario where all energy sectors are disrupted, there would be $0.39 of economy-wide impact for every $1.00 of lost output by the energy sector. The sectors with the largest financial impact are Services, followed by Wholesale/Retail, Construction, Non-Durable Goods, Electricity, Communications, Mining, Durable Goods, Petroleum, and Transport by Rail. The impact to Services is about an order of magnitude greater than the other sectors. For employment impacts, a minimum of 2.42 jobs would be expected to be lost for every direct job lost in the energy sector. Electric companies have the greatest monetary and employment impact potential of the three energy sources. In summary, the study concludes that the total impact from a Cascadia earthquake on the energy sector would include the direct damage to energy facilities, the loss of sales, losses from secondary effects, including job losses, and a multitude of cascading functional impacts which would potentially have economic impacts of their own.

Comparison with Other Economic Studies

After the 1994 Northridge, California earthquake, Tierney (1997) found that the second most common reason for business closure, behind having to clean up debris, was a loss of electricity. The most significant impacts were seen in the finance, insurance, and real estate and construction industries. Finance, insurance and real estate services were also impacted the most in the WWU study on Oregon energy disruption. A study by Tierney and Nigg (1995) compared the dependency of businesses to five types of infrastructure between Memphis, Tennessee and Des Moines, Iowa with respect to potential (Memphis; earthquake disruption) and actual (Des Moines; 1993 Midwest floods) disruption. *Table 4* (Memphis) shows the results of that study. In both cases, businesses depend most on electricity, while depending on natural gas third most. In the study of the business impacts from the 1993 Midwest floods, Tierney (1994) wrote the following, which provides further insight into the importance of energy infrastructure:

> "Overall, electricity was rated as the most critical lifeline service by both large and small businesses, with the former considering electric service more important than the latter. Large manufacturing and construction firms and both large and small companies in the finance, insurance, and real estate sectors were more likely than other businesses to rate electricity as critical to their operations. While small businesses generally considered

telephone service to be the second most critical lifeline, large businesses appeared to view telephones, water, sewer service, and natural gas as equally critical."

Table 4. Results of surveys to businesses in Memphis, Tennessee asking the degree of importance on five types of infrastructure (Tierney and Nigg, 1995).

LIFELINE SERVICES					
IMPORTANCE	Electric	Water	Natural Gas	Water Treatment	Telephone
Very Imp	82%	27%	18%	23%	78%
Important	14	34	29	32	17
Not Very Important	3	31	39	33	3
Not Imp at all	1	8	13	13	2
Total	100%	100%	99%*	101%*	100%

*Does not total 100% due to rounding

A study by Rose et al. (2007) on the economic impacts of electricity outage due to a terrorist attack on Los Angeles, California found that the services sector was most impacted by a significant margin. This is not surprising as the input-output analysis found that services and manufacturing are the two main business users of electricity.

None of the studies included direct dependence on liquid fuel. Nonetheless, the studies have confirmed the general validity of our findings and the importance of resilient infrastructure, as well as the significant economic impact that would arise due to energy disruption from a Cascadia earthquake in Oregon.

Section 4
Seismic Hazards at the CEI Hub

For this study, DOGAMI used earthquake parameters that reflect magnitudes ranging from 8 to 9. A hypothetical magnitude 8 or 9 earthquake would be located about 63 miles (100 km) west of the CEI Hub in Portland, Oregon just offshore from the city of Tillamook. Both earthquakes assume the distance is from the down-dip rupture limit of the Cascadia Subduction Zone, which is the eastern-most edge of the fault, to the CEI Hub (Witter et al, 2011). The hypothetical magnitude 9 earthquake would stretch from coastal Cape Mendocino, California to Vancouver Island, British Columbia (*Figure 10*).



Figure 10: Cascadia Subduction Zone showing the fault's western boundary (red dashed line), which is closest to the ground surface, and the easterly dipping fault plane (yellow) (DOGAMI, 2012).

Seismic Hazards in the CEI Hub Area

The primary seismic hazards that would impact the CEI Hub area are:

- Ground shaking
- Liquefaction (soil behavior phenomenon in which a saturated sand softens and loses strength during strong earthquake ground shaking)
- Lateral spreading (where surficial soil permanently moves laterally due to earthquake shaking)
- Landslides

- Co-seismic settlement (where the ground surface is permanently lowered due to seismic shaking)
- Bearing capacity failures (when the foundation soil cannot support the structure it is intended to support)

In addition, secondary seismic hazards can be initiated and include:

- Seiches (waves that oscillate in water bodies often initiated by ground shaking)
- Fire
- Hazardous material releases, such as fuel overtopping tanks by sloshing (occurs when liquid becomes agitated by ground shaking)

Liquefaction and lateral spreading hazards are of primary concern to the fuel supply waterfront facilities. For this reason, DOGAMI performed ground deformation analyses to better understand the nature of the hazard and the possible mitigation needs. A section on the deformation analyses is included in this study. Tsunamis are expected to damage the coastal areas, including ports along the coast and Columbia River mouth, but are not expected to cause significant damage in the Portland waterways. Following is a summary of these seismic hazards:

Active Fault Sources

Many earthquake faults capable of producing damaging earthquakes exist in the area of the CEI Hub. The most threatening fault is the Cascadia Subduction Zone fault (Cascadia fault) which lies just offshore of the Oregon coast (see *Figures 10 and 11*). The Cascadia fault has produced over 40 large magnitude earthquakes during this past 10,000 years, with the last major earthquake occurring on January 26, 1700. The 1700 Cascadia earthquake likely caused extensive ground shaking that extended from the Cape Mendocino area in Northern California to British Columbia, Canada, as well as a large tsunami. This tsunami first hit the low lying areas along the Pacific Northwest coast, then traveled across the Pacific Ocean to cause damage to Japan's coast.

Based on the 10,000 year record of past Cascadia earthquakes (Goldfinger, 2012), Oregon will certainly experience another magnitude 8-9 earthquake in its future. This future earthquake, which has the same type of subduction zone process as the March 11, 2011 East Japan magnitude 9 earthquake, will be accompanied by a coastal tsunami.

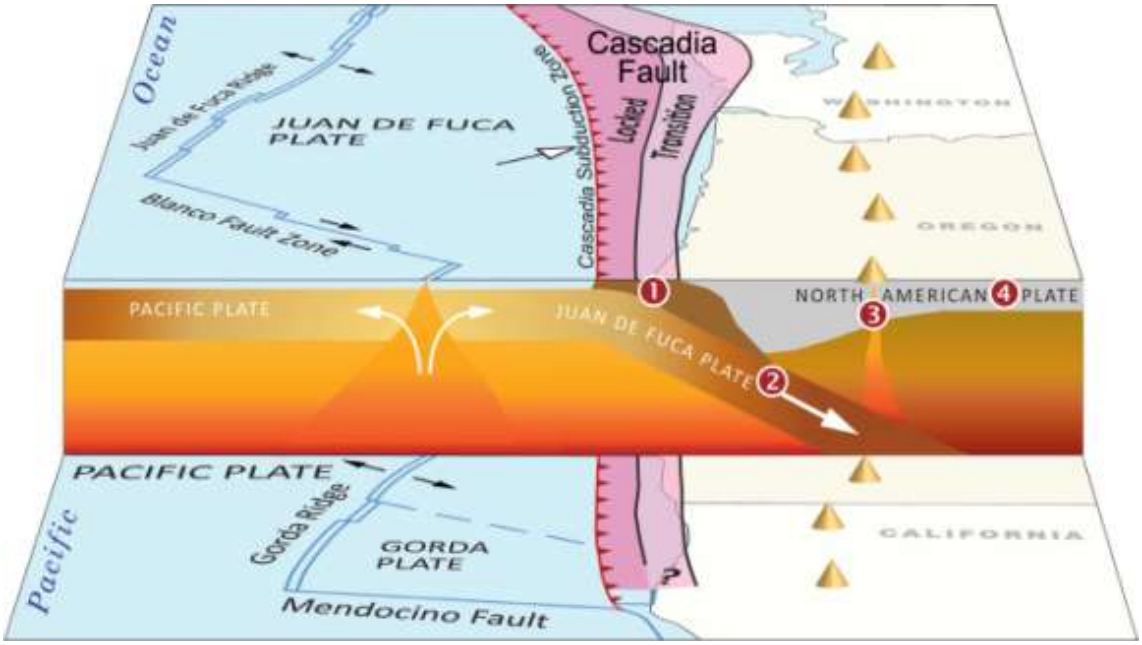


Figure 11:The Cascadia Fault is Oregon's most threatening fault and can produce a magnitude 9 earthquake and accompanying coastal tsunami waves. (modified from DOGAMI, 2010)

Based on data that was used to develop the U.S. Geological Survey's (USGS) probabilistic ground motion maps, the Portland Hills fault is located in the CEI Hub area and can produce a magnitude 7 earthquake (USGS, 2008). In addition, the likelihood of this earthquake occurring is approximately 1% in the next 50 years (USGS National Seismic Hazard Mapping Program: https://geohazards.usgs.gov/eqprob/2009/index.php) whereas a magnitude 9 Cascadia earthquake has a likelihood as high as 14% in the next 50 years (USGS, 2008).

Ground Shaking Characteristics

The USGS has determined the ground shaking characteristics caused by faults. The State of Oregon has adopted building codes that incorporate this information. All of Oregon is exposed to seismic hazards. Higher levels of ground shaking are expected for western Oregon due to the Cascadia fault on the Cascadia Subduction Zone. *Figure 12* shows Oregon's ground shaking seismic hazards with higher expected shaking levels represented by "hotter" (or red) colors. This is the 2008 USGS national seismic hazard maps for 0.2 second spectral acceleration for 2 percent probability of exceedence in 50 years with shaking expressed in percent gravity. This type of information is used by engineers for design purposes. The duration of shaking is not indicated by this map. Additional technical information on ground shaking characteristics is provided below. For a non-technical description of ground shaking, we suggest that you skip to the next section, earthquake intensity.

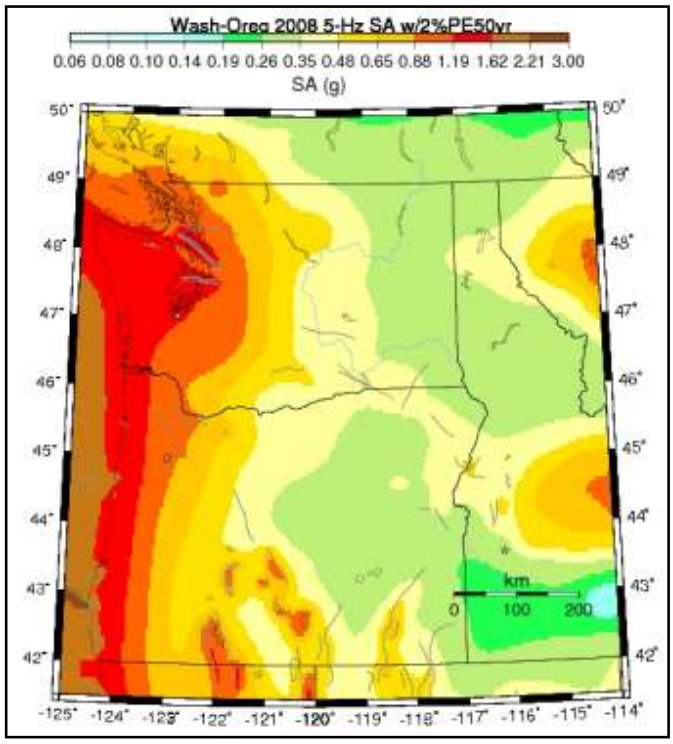


Figure 12: Ground shaking map of Oregon and Washington for rock conditions used in building codes. Red, orange, yellow areas indicate more shaking than beige, green areas.This map shows the shaking level from all possible earthquake sources, based on a probability of exceedance of 2% in the next 50 years.
http://earthquake.usgs.gov/hazards/products/conterminous/2008/maps/wus/pacnw/3hzSA.OrWa.jpg

For the CEI Hub, the ground motions induced by a magnitude 8 to 9 Cascadia earthquake are expected to produce significant damage, particularly in areas of weak soils and weak infrastructure. More specifically for a hypothetical magnitude 9 earthquake, the peak ground accelerations (PGA) in the CEI Hub at the ground surface would be expected to be on the order of 0.18 g (Clark and Roddey, 2005). This 0.18 g value was developed by the USGS national seismic hazard mapping project group as part of the Cascadia Region Earthquake Workgroup Cascadia earthquake scenario (http://earthquake.usgs.gov/hazards/). Earlier studies by Wong et. al (2000) provided a range between 0.15 and 0.20g at the ground surface. Based on past subduction zone earthquakes and on numerical modeling, strong shaking from a magnitude 8 earthquake is expected to last on the order of 80 seconds on firm rock sites (such as the Portland Hills) and about 120 seconds on soil sites (such as by the Willamette River (personal communication, Art Frankel, USGS). For a magnitude 9 earthquake, the duration of the shaking may be slightly longer than a magnitude 8 because about 32 times more energy is released.

The PGA values used for design purposes in the proximity of the CEI Hub are on the order of 0.36 g at the ground surface for sites with soils that commonly exist in the CEI Hub. This is based on a PGA value of 0.3 g on sites underlain by soft rock (defined as having a shear wave velocity of 760 m/s by the USGS). This value was determined using the USGS's web tools for a 975 year mean return time (https://geohazards.usgs.gov/deaggint/2008). The USGS method considers many fault sources. In this case, these fault sources are considered to be principal

sources: Cascadia megathrust, Cascadia intraplate, Western US crustal faults on a grid, crustal faults in Oregon and Washington, and the Portland Hills fault. For more information on the USGS method and the fault sources, please refer to the USGS national seismic hazard mapping project (http://earthquake.usgs.gov/hazards) and USGS Open-File Report 2008–1128, Documentation for the 2008 Update of the United States National Seismic Hazard Maps (USGS, 2008). For sites underlain by soil type Se, which is defined by the building code as soils that soil transmit shear waves at a velocity of 200 m/s or less for the upper 30m, shaking is expected to be stronger due to the site amplification effect in these types of soils. Soil type Se has been identified in geotechnical reports in the many parts of the CEI Hub. Using an amplification factor of 1.2, the PGA at the ground surface is expected to be about 0.36 g. The amplification factor is from the "Guide Specifications for LRFD Seismic Bridge Design", provided in Table 3.4.2.3.1 - Values of Fpga and Fa as a Function of Site Class and Mapped Peak Ground Acceleration or Short-Period Spectral Acceleration Coefficient (AASHTO, 2009).

Earthquake Intensity

The effects of an earthquake on people and objects is measured by the intensity scale, which in contrast to engineering ground motion characteristics used for design, is a scale designed for use by the general public. The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and finally - total destruction. The Modified Mercalli Intensity (MMI) scale, shown in *Figure 13*, comprises 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, and is designated by Roman numerals. It does not have a mathematical basis; instead it is an arbitrary ranking based on observed effects. The MMI value assigned to a specific site after an earthquake is a more meaningful measure of severity for the non-scientist than the magnitude, which expresses the energy released by the earthquake on a logarithmic scale, because intensity refers to the effects actually experienced at that place. In general, lower MMI values relate to the manner in which the earthquake is felt by people. Higher MMI values are based on observed structural damage. (http://earthquake.usgs.gov/learn/topics/mercalli.php) (Wald et al, 1999)

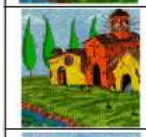
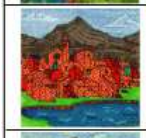
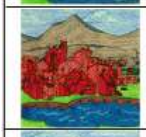
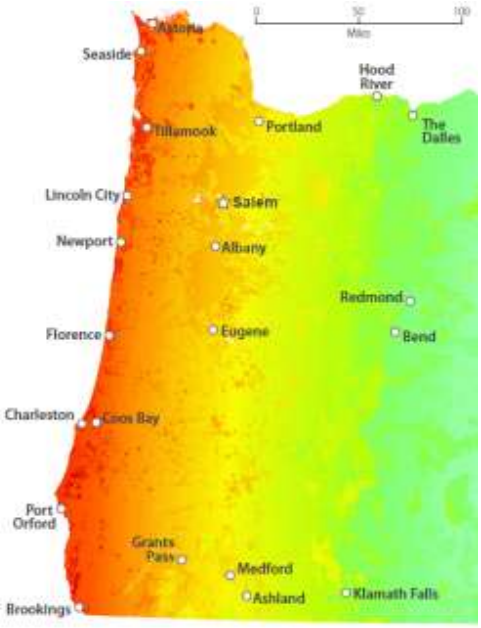
	MMI value	Summary description used on maps	Description of shaking severity	Full description shortened From Elementary Seismology
	I	Not mapped	Not mapped	Not felt
	II	Not mapped	Not mapped	Felt by people sitting or on upper floors of buildings
	III	Not mapped	Not mapped	Felt by almost all indoors. Hanging objects swing. Vibrations like passing of lights trucks. May not be recognized as an earthquake.
	IV	Not mapped	Not mapped	Vibration felt like passing of heavy trucks. Stopped cars rock. Hanging objects swing. Windows, dishes, doors rattle. Glasses clink. In the upper range of IV, wooden walls and frames creak.
	V	Light	Pictures move	Felt outdoors. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing. Pictures move. Pendulum clocks stop.
	VI	Moderate	Objects fall	Felt by all. People walk unsteadily. Many frightened. Windows crack. Dishes, glassware, knickknacks and books fall off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster, adobe buildings, and some poorly built masonry buildings cracked. Trees and bushes shake visibly.
	VII	Strong	Nonstructural damage	Difficult to stand or walk. Noticed by drivers of cars. Furniture broken. Damage to poorly built masonry buildings. Weak chimneys broken at roof line. Fall of plaster, loose bricks, tiles, cornices, unbraced parapets and porches. Some cracks in better masonry buildings. Waves on ponds.
	VIII	Very Strong	Moderate damage	Steering of cars affected. Extensive damage to unreinforced masonry buildings, including partial collapse. Fall of come masonry walls. Twisting, falling of chimneys and monuments. Wood-frame houses moved on foundations if not bolted, loose partition walls thrown out. Tree branches broken.
	IX	Violent	Heavy damage	General panic. Damage to masonry buildings ranges from collapse to serious damage unless modern design. Wood-frame structures rock, and if not bolted, shifted off foundations. Underground pipes broken.
	X	Very Violent	Extreme damage	Poorly built structures destroyed with their foundations. Even some well-built wooden structures and bridges heavily damaged and needing replacement. Water thrown on banks of canals, rivers, lakes, etc.
	XI	Not mapped because these intensities are typically limited to areas with ground failure		Rails bent greatly. Underground pipelines completely out of service.
	XII	Not mapped because these intensities are typically limited to areas with ground failure		Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

Figure 13: Earthquake Intensity Scale (http://quake.abag.ca.gov/shaking/mmi/)

A magnitude 9 Cascadia earthquake (Figure 14) would likely produce MMI values of VIII and IX along the coast in most locations except for areas with tsunami flooding and areas of unstable soils. Most areas with coastal tsunami flooding would experience major destruction with damage levels equivalent to MMI X to MMI XII values. Areas of unstable soils in western Oregon could experience major destruction reaching MMI IX to X, with very limited areas seeing even greater damage. The MMI values would decrease towards the east. The Willamette Valley would likely experience MMI VI and MMI VII with localized areas of MMI VIII associated with unstable soils. East of the valley would likely experience MMI V and lower.

Local earthquakes in 1877 and 1962 produced ground shaking levels as high as MMI VII in portions of Portland. (Bott and Wong, 1993)



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+
WHAT HAPPENS AT EACH INTENSITY? *Text descriptions from http://quake.abag.ca.gov/shaking/mmi/*	Not felt.	II. Felt by people sitting or on upper floors of buildings. III. Felt by almost all indoors. Hanging objects swing. Vibration like passing of light trucks. May not be recognized as an earthquake.	Vibration felt like passing of heavy trucks. Stopped cars rock. Hanging objects swing. Windows, dishes, doors rattle. Glasses clink. In the upper range of IV, wooden walls and frames creak.	Felt outdoors. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing. Pictures move. Pendulum clocks stop.	Felt by all. People walk unsteadily. Windows crack. Dishes, glassware, knickknacks, and books fall off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster, adobe buildings, and some poorly built masonry buildings cracked. Trees and bushes shake visibly.	Difficult to stand or walk. Noticed by drivers of cars. Furniture broken. Damage to poorly built masonry buildings. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices, unbraced parapets and porches. Some cracks in better masonry buildings. Waves on ponds.	Steering of cars affected. Extensive damage to unreinforced masonry buildings, including partial collapse. Fall of some masonry walls. Twisting, falling of chimneys and monuments. Wood-frame houses moved on foundations if not bolted; loose partition walls thrown out. Tree branches broken.	General panic. Damage to masonry buildings ranges from collapse to serious damage unless modern design. Wood-frame structures rack, and, if not bolted, shifted off foundations. Underground pipes broken.	Poorly built structures destroyed with their foundations. Even some well-built wooden structures and bridges heavily damaged and needing replacement. Water thrown on banks of canals, rivers, lakes, etc. Pipelines may be completely out of service.

Figure 14: Expected ground shaking from a Cascadia Subduction Zone earthquake with red as areas of highest shaking levels, which would result with the highest damage. (DOGAMI, Cascadia Winter 2012) (DOGAMI, 2012, http://www.oregongeology.com/pubs/cascadia/CascadiaWinter2012.pdf)

Potentially Unstable Soils

Near-surface soil deposits, those within the top 100 feet of the ground surface, can have a variety of ground responses when subjected to earthquake shaking. Soils with specific engineering properties, such as slow shear wave velocity, can increase or decrease the shaking levels depending on specific ground motion characteristics (e.g., frequency). The shear wave velocity of soil, which is related to the density of the soil, is the velocity at which specific seismic waves travel through the soil deposit. Some soils with slower shear wave velocity can also liquefy in a

process called liquefaction. (See Section 5) Soils with shear wave velocity of 1,200 feet per second (360 meters/second) or generally slower are typically found in valleys and near water bodies. (Wang et al, 1998) *Figure 15* is a statewide National Earthquake Hazard Reduction Program (NEHRP) soils map shows areas with potentially unstable soils with respect to earthquake shaking. Areas shown in red (Sf), orange (Se) and bold yellow (Sd) have the potential to amplify earthquake ground shaking. In addition, areas shown in red in western Oregon have the highest potential for liquefaction and lateral spreading. Areas shown in orange and dark bold yellow (often adjacent to areas in orange) in western Oregon have the potential for liquefaction. Eastern Oregon will not have significant liquefaction in a Cascadia earthquake because shaking will be much weaker there.

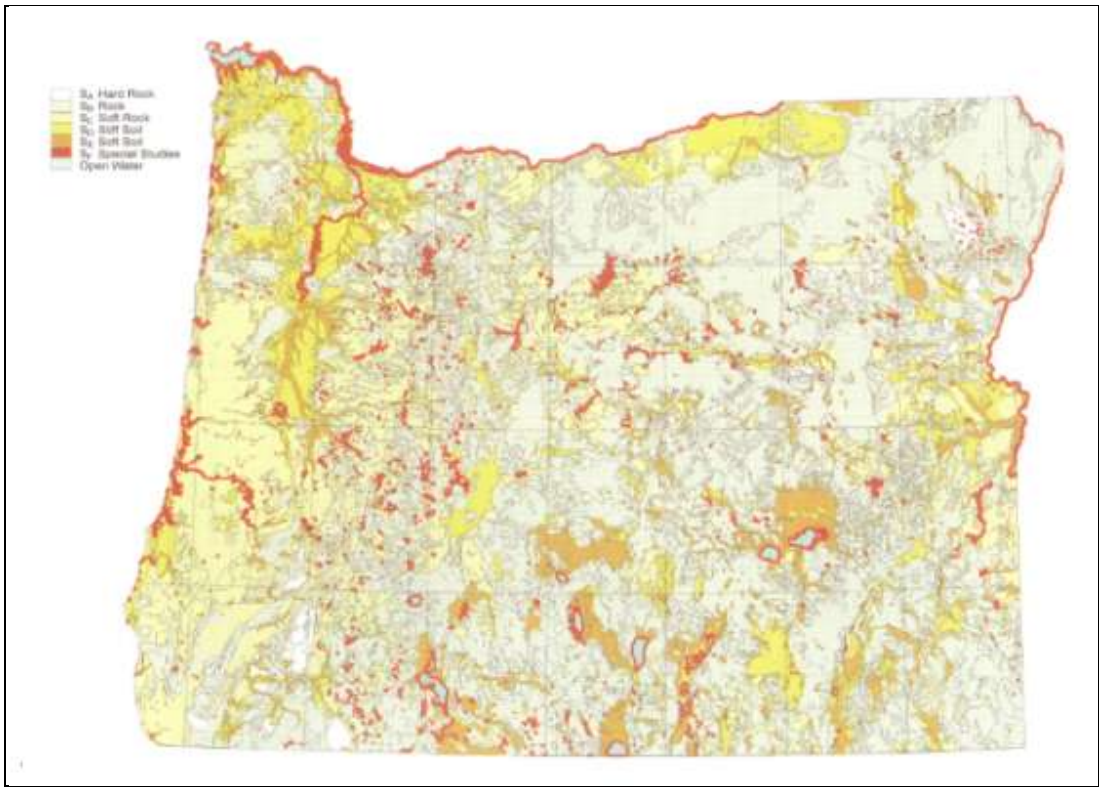


Figure 15: Statewide National Earthquake Hazard Reduction Program (NEHRP) soils map. Areas in red, orange and yellow have potentially unstable soils with respect to earthquake shaking. These areas can experience amplified ground shaking, liquefaction, and lateral spreading (Wang et al, 1998)

Figure 16 shows a portion of a relative earthquake hazard map of Portland area indicating areas with liquefaction, amplification of ground shaking, and landslide susceptibilities (Mabey et al, 1997). Areas in red and orange have a higher relative susceptibility to at least two of the hazards. In general, the areas by the rivers are susceptible to liquefaction and lateral spreading.

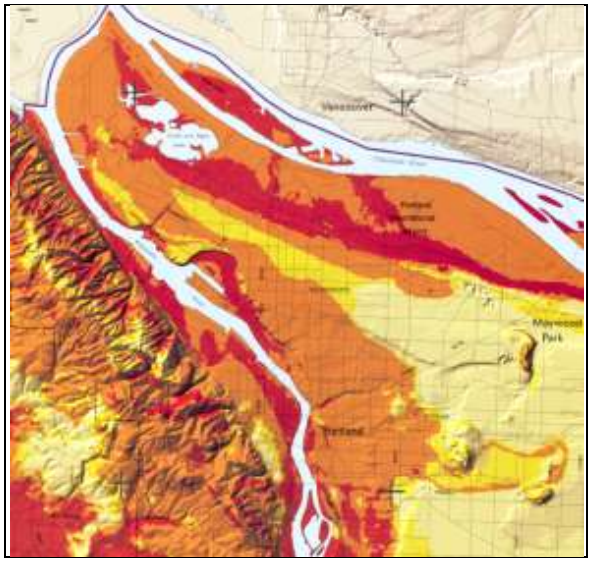


Figure 16: A portion of a relative earthquake hazard map of Portland area indicating areas with liquefaction, amplification, and landslide susceptibilities (in red, orange and yellow). (Mabey et al, 1997)

Liquefaction

Liquefaction can be triggered by earthquakes and occurs in loose, water-saturated, sandy soils and will result in liquefied soils with low strength (See *Figure 17*). Structures founded on or buried within liquefied soils can experience significant damage due to the reduction in soil strength. Buildings can sink several feet into the ground and buried pipes and tanks can float to the ground surface. (See *Figure 18*) The CEI Hub is adjacent to the Willamette River and has extensive deposits of highly liquefiable soils (See *Figures 19 and 20*, Mabey et al, 1996 and Mabey et al, 1993).. These soils (made of sand, silt, gravel and clay) have been naturally deposited by river activity or have been created from man-made activities, such as hydraulically placed material from river dredging (See *Figure 21*) or debris placed as landfill.

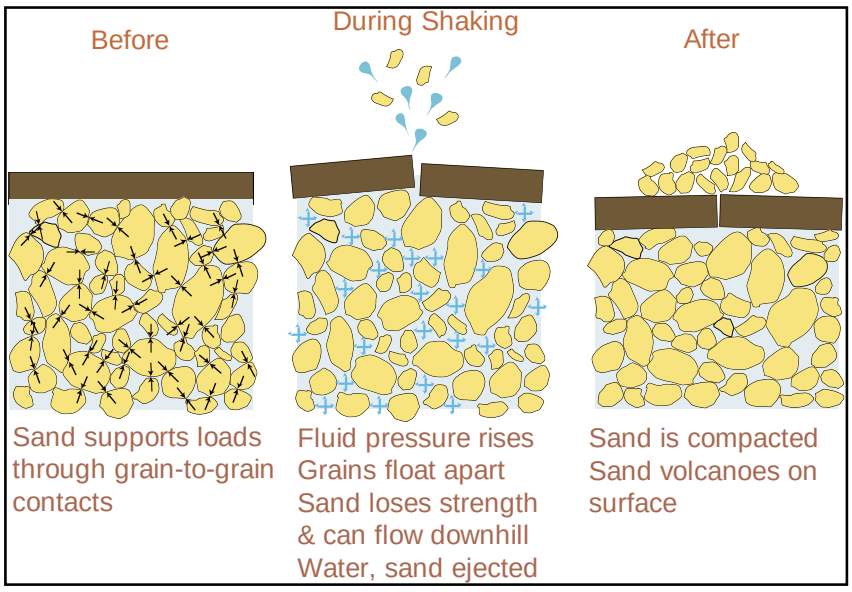


Figure 17: Liquefaction process explanation (US Geological Survey)



Figure 18: Buried tank in liquefied soil that was uplifted due to buoyancy forces in the 1993 Hokkaido-Nansei-Oki Earthquake and Tsunami in Japan (Photo permission on 1/9/12 from Youd; Youd, T.L. et al 1995, Photo taken by R. Chung)

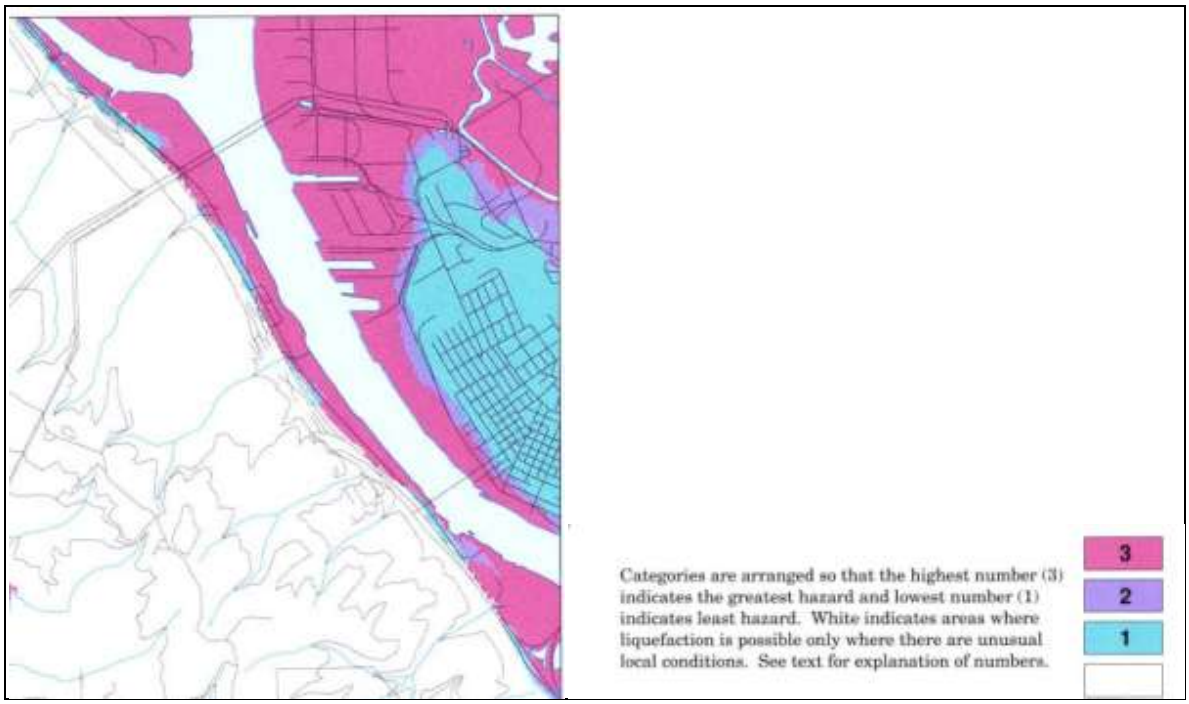


Figure 19: Map showing liquefaction potential in the northern part of the CEI Hub (Mabey et al, 1996)

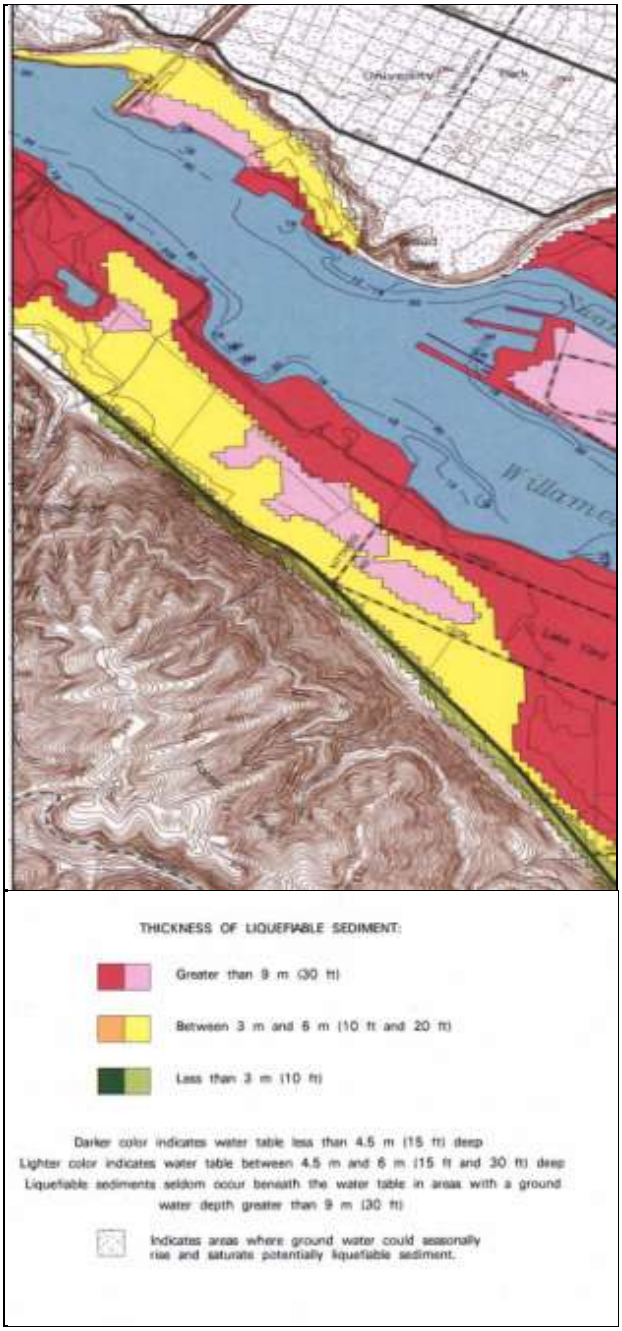


Figure 20: Map showing thickness of liquefiable sediment in the southern part of the CEI Hub (Mabey et al, 1993)



Figure 21: This photo was taken in the early 1900s and shows river dredging activity in the Guild's Lake area south and adjacent to the CEI Hub. Dredged material can be comprised of highly liquefiable soil. (Oregon Historical Society photo)

Lateral Spreading

Lateral spreading occurs when the ground permanently moves laterally due to earthquake shaking. (See *Figure 22*) Lateral spreading is common along river fronts because river deposited soils are often weak and water saturated, conditions that can increase susceptibility. Lateral spreading can occur on gentle slopes (e.g., less than 1 percent), on flat ground with a distant slope face, and by waterfront retaining structures. Lateral spreading often occurs in liquefied soils, but is not restricted to liquefied soils. The magnitude of lateral spreading can range from inches to several feet, and in extreme cases as in flow slides, hundreds of feet. Lateral spreading features include fissures and slumping. *Figures 23 and 24* are examples of lateral spreading from the 2010 magnitude 8.8 Chile earthquake.

The CEI Hub is adjacent to the Willamette River and has extensive deposits of soils highly susceptible to lateral spreads (*Figure 25*, Mabey et al, 1993). Due to the significant concerns about lateral spreading hazards in this area, DOGAMI performed dynamic analyses to model possible ground deformations. Results from a ground deformation analysis are located at the end of this section.

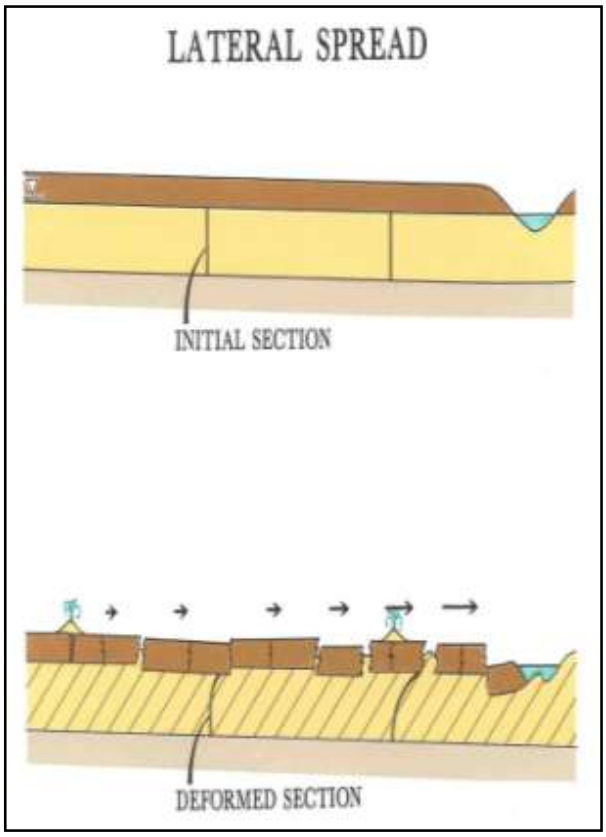


Figure 22: Lateral spreading process illustration (US Geological Survey)



Figure 23: Lateral spreading damage from the 2010 magnitude 8.8 Chile earthquake. (Technical Council on Lifeline Earthquake Engineering - TCLEE)



Figure 24: Lateral spreading damage from the 2010 magnitude 8.8 Chile earthquake. (Technical Council on Lifeline Earthquake Engineering - TCLEE)

Co-Seismic Settlement

Co-seismic settlement is where the ground surface is permanently lowered due to seismic shaking and occurs in certain types of soft, loose soils, such as liquefied soils. The CEI Hub area has soils that are generally susceptible to co-seismic settlement, in some places, on the order of a few inches or more. When soils experience uniform settlement, structures are often unharmed. However, when soils experience differential settlement, structures can incur damage. For example, rigid pipe fittings often break when the surrounding ground shifts.

Bearing Capacity Failures

Bearing capacity failures can occur during shaking when the foundation soil cannot support the structure it is intended to support. This occurs when the sub-grade soils have not been engineered and constructed adequately. The CEI Hub area has soils that are generally susceptible to co-seismic bearing capacity failures, including from liquefied soils. When soils experience differential settlement, structures can tilt and incur damage. For example, tanks can tilt and internal floating roof apparatus can become inoperable.

Landslides

Landslides are land masses that move down slope and result in permanent ground deformation. Many types of landslides exist, including fast moving and slow moving types and can occur on steep ground to even level ground. Earthquakes can trigger thousands of landslides due to the ground shaking over a wide region and can cause extensive damage. The CEI Hub area has several mapped landslides including debris flows from the West Hills and rock falls and slumps along US Highway 30. These mapped landslides are likely from past rainfall events and not by past earthquake activity.

Seiches

Seiches are waves that oscillate in water bodies and can be initiated by ground shaking. Seiches can vary from minor (e.g., centimeters in height) to over 10 feet and last up to hours. Theoretically, the Willamette River in the CEI Hub area can experience a seismically-induced seiche.

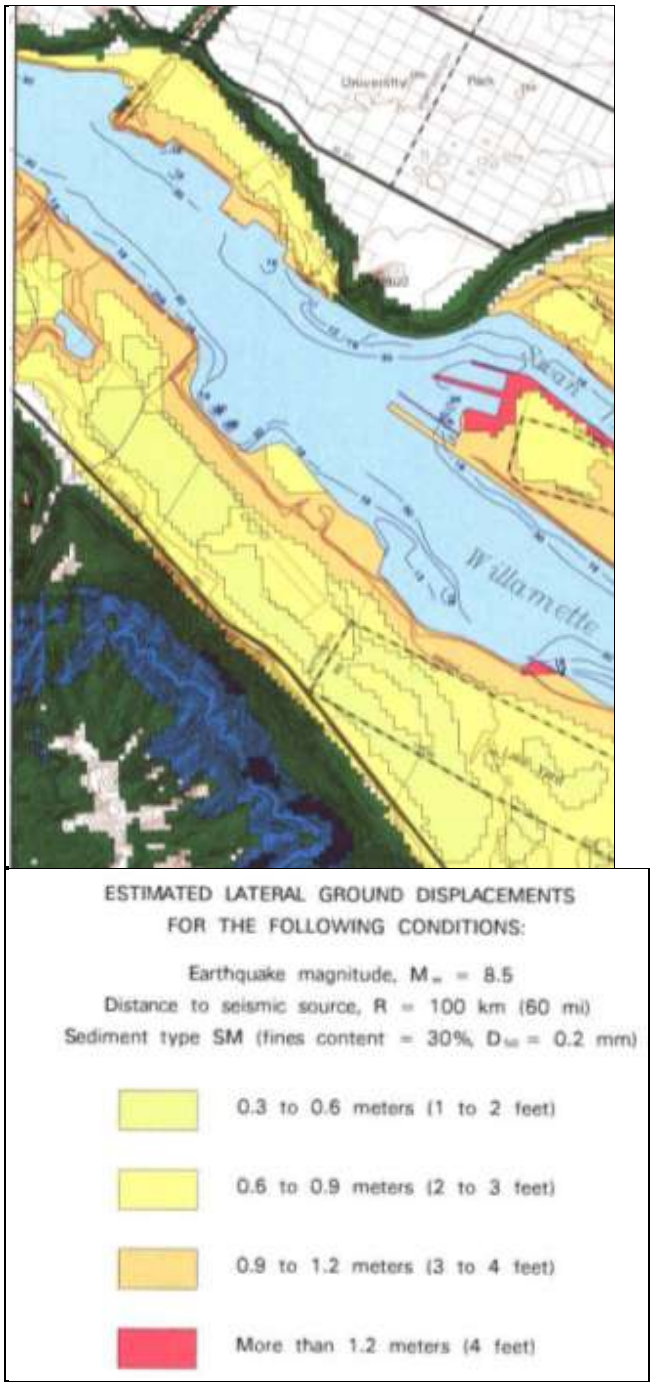


Figure 25: Lateral spreading susceptibility map of southern portion of CEI Hub (Mabey et al, 1993)



Figure 26: Welded steel water tank damaged in 1992 Landers, California earthquake. (Photo - Curt Edwards, Technical Council on Lifeline Earthquake Engineering - TCLEE)

Fires

Fires are often triggered as secondary effects from earthquakes. Numerous potential ignition sources are available in the CEI Hub area. Certain types of fires, such as fires with predominately petroleum fuel or transformer PCBs, require advanced fire specialists to contain. Water storage tanks may be damaged and the water supply system may be inoperable. (*Figure 26*)

Hazardous Material Releases

Hazardous materials are often released during earthquakes. Numerous potential sources for possible uncontrolled hazardous material releases exist in the proximity of the CEI Hub, both at and nearby the energy facilities. These materials can pose different types of hazards, such as being corrosive, explosive, combustible, poisonous, and/or toxic. A few examples are: petrochemicals, liquefied natural gas (LNG), chlorine gas, and anhydrous ammonia. Sloshing of hazardous materials in tanks can occur in earthquakes. Sloshing occurs when liquid becomes agitated by ground shaking. The CEI Hub has numerous tanks with liquid fuel and other products that are susceptible to sloshing. Waves and splashing of liquids can overtop tanks and/or damage tanks. (*Figure 27*)



Figure 27: Sloshing of crude oil during the 2010 Chile earthquake. Note the black oil stains on the outside of the fuel tank. (Wang photo)

Ground Deformation Analyses in the CEI Hub

The susceptibility for liquefaction and lateral spreading in the CEI Hub area has been evaluated in a number of past studies, including the development of liquefaction and lateral spreading susceptibility maps by DOGAMI (Mabey et al, 1993, Mabey et al, 1996). Studies have indicated a high potential for both. Liquefaction and lateral spreading can cause structures to move horizontally and vertically. The amount of potential horizontal movement of the land, termed lateral spreading, and the amount of potential vertical movement, or settlement, can be analyzed. The analyses can be performed on a site-specific basis using sub-surface data from the site or can be conducted using assumed parameters that represent the CEI Hub. Liquefaction and lateral spreading could cause significant damage to local facilities and the potential impact from the damage to certain facilities could be high.

DOGAMI reviewed selected site-specific work conducted by Bonneville Power Administration (BPA). Due to the engineering results from the BPA study indicating that the Willamette River bank soils can move towards the river by 10 to 25 feet in a Cascadia earthquake, DOGAMI contacted and collaborated with Dr. Steven Bartlett from the University of Utah (co-author) for a sensitivity study on lateral spreading to be conducted as part of this project. The sensitivity study incorporated soil properties obtained from the BPA study, and a variety of generic riverbank conditions that approximate the slopes at marine oil terminals in the CEI Hub. The ground deformation analysis is both summarized below and included in Appendix B.

BPA Study

Bonneville Power Administration (BPA) evaluated the liquefaction, liquefaction-induced settlement and lateral spreading potential of selected transmission tower and substation sites in the greater Portland area. The 2008 report, titled "*Liquefaction Assessment, Bonneville Power Administration Facilities, Portland Metropolitan Region*," includes the work conducted from

their investigation, provides summary information and includes subsurface data and analyses (BPA, 2008). A portion of their work and findings is summarized herein for two BPA sites. Although the BPA findings are site-specific for their facilities, their findings are generally consistent with findings from previous studies in the CEI Hub. Depending on the soils (underlying geology units and fill materials) and ground water conditions, the liquefaction susceptibility at other sites in the CEI Hub can be higher or lower than found at these BPA sites.

The 2008 BPA work included 11 cone penetration tests (CPT) and Lidar (light detection and ranging) technology which was used in their engineering analyses for liquefaction, liquefaction-induced settlement, and lateral spreading. For all of their sites, they used a ground motion input value of 0.2 g to evaluate for liquefaction.

One of the BPA study sites is the river crossing in the north end of the CEI Hub (*Figure 28*). The study group completed a CPT at the tower site that indicated soft to stiff clay and medium dense sand to silty sand to the maximum depth of exploration at 80 feet; the medium dense sand to silty sand occurs at depths of 7 to 31 feet and 44 to 66 feet, with the remainder of the profile being soft to stiff clay. The study said the depth to the groundwater at the site is expected to range from approximately 17 to 21 feet below the ground surface (BPA, 2008).

The tower site soils were interpreted to be susceptible to liquefaction. Their estimates indicated settlement from liquefaction will be around 12 inches. The results from the analyses of potential lateral spreading indicate that there could be 10 to 25 feet of lateral spreading of the surficial soils towards the Willamette River, depending on the magnitude and duration of strong ground shaking. These large displacements imply that there could be a flow of the liquefied material into the river channel that could result in even larger lateral spreading at the tower site. The potential for lateral spreading was analyzed using the methodology of Youd et al, (2002) (BPA, 2008).

The BPA study also evaluated a nearby substation (*Figure 28; see red pin on the map on right*) located in the Rivergate area between the Willamette and Columbia Rivers about one mile east of the Willamette River transmission crossing. The substation is located on nearly flat ground at an approximate elevation 46 feet. According to the study, the site appears to be fill soils situated on a cut-fill pad along the side of a low sloping hill above the abandoned, partially in-filled slough, which lies at an elevation of about 22 feet. The study indicates that the depth to ground water is approximately 30 feet below the ground surface. The site soils were interpreted to be susceptible to liquefaction at depths of more than about 30 feet. The study stated that the settlement from liquefaction will be around 0 to 2 inches. The results from the analyses of potential lateral spreading indicate that there could be up to 1 foot of lateral spreading of the surficial soils towards the slough to the north. (BPA, 2008)



Figure 28: Two towers in the CEI Hub are owned by BPA (center and right in photo on left, yellow pin in NW corner of map on right) and were analyzed in a BPA study conducted in 2008 to have the potential to move 25 feet towards the river during a magnitude 9 Cascadia earthquake. (The tower in the foreground - left–hand side of photo - is owned by an investor-owned utility.) (DOGAMI photo) (map: Google Earth)

Lateral Spreading Sensitivity Study

A number of geotechnical engineers have performed lateral spreading analyses to evaluate the potential for permanent ground deformation (PGD) for a variety of facilities in the CEI Hub. Many of these studies used a state-of-practice method developed by Youd, Hansen, and Bartlett in 2002 (Youd et al., 2002). This method provides mean (i.e., average) estimates of lateral spread PGD for cases where lateral spread is fully developed and not greatly affected by boundary conditions or lack of continuity in the liquefied zone for earthquakes with moment magnitudes, M_w, between 6 and 8 and ground slopes between 0.1 to 5.0 percent. Youd et al., (2002) have shown that the actual displacement may vary by a factor of 2 (plus or minus) of the mean estimate. In addition, this empirical method may under estimate the amount of PGD for cases where lateral spread is not fully developed due to changes in the subsurface conditions or lack of continuity in the liquefied zone. Further, its application to magnitude 9.0 subduction zone earthquakes has not been verified. Lastly, another limitation of the empirical approach of Youd et al. (2002) is its inability to estimate the effects that ground improvement may have on reducing PGD displacement. To answer this question, mechanistic or numerical modeling methods are required.

To help determine the potential range of PGD in the riverbank soils in the CEI Hub, and better understand the potential to mitigate future ground deformation, we conducted a numerical modeling study. This model is a generic sensitivity study where we vary the earthquake shaking characteristics and site parameters. This specialty study is technical in nature and is summarized

herein. Additional information on the input parameters, evaluation and results are presented in Appendix B.

The purpose of this sensitivity study was to determine a likely range of PGD in soils with slope conditions found along the lower Willamette River banks. Structures in areas with significant PGD are likely to incur damage. Depending on the specific structure, the amount of horizontal and vertical movement will affect the severity of the damage. This generic study does not represent any particular site in the CEI Hub. There likely exists sites more vulnerable to PGD in the CEI Hub that have a combination of soils with a higher susceptibility to liquefaction, steeper slopes and higher ground water conditions. For specific locales, site-specific evaluations are needed.

We selected representative acceleration time histories for M_w9.0 and M_w8.0 earthquakes and adjusted these time histories for use in the numerical model. The selected software was a nonlinear time domain analysis called FLAC (Fast Lagrangian Analysis of Continua) (Itasca, 2005). In-situ soil data from the BPA Rivergate South - Willamette River Towers site was used to develop the soil properties for the analyses in conjunction with other generic local data (BPA, 2008; CH2MHill, 2006).

The predicted results from the numerical modeling were also compared and calibrated with the lateral displacements results predicted by the Youd et al. (2002) regression model prior to completing the final runs. After numerous trial runs, we narrowed the earthquake motions input to six subduction zone earthquake time histories for the final computer runs. The estimation of horizontal displacement from liquefaction-induced lateral spread was performed for cases with and without ground improvement.

The modeling results indicate that the amount of PGD varies significantly with the ten different earthquake ground motion inputs and with varying slope conditions of 0.5, 1, 2, and 5 percent. The results from our sensitivity analysis, which models a fixed zone of liquefaction and ground water table at 5 m below the ground surface, are more sensitive to the input ground motions than the slopes. The PGD results range from negligible to extreme. Maximum PGD (on 5% slopes) for most input motions ranged from 0.2 m (8 inches) to 2.6 m (8.5 ft). One ground motion (1msoil, M_w9.0 earthquake) produced an extreme PGD result; the predicted displacements of the untreated soils range from 0.4 meters (1 foot) on a 0.5 percent slope to 17 meters (56 feet) on a 5 percent slope. Summary results of the lateral spread deformation analyses and the average displacement derived from the Youd et. al (2002) relations for both M_w8 and 9 earthquakes are presented in Appendix B for comparative purposes.

Although the results indicate that the soils are likely to move down slope towards the river, it is possible to mitigate the potential movement by strengthening the soil. Based on this deformation analyses, we estimated the amount of ground treatment required to mitigate the lateral spreading for two representative cases. According to our analyses, the required ground improvement to control deformation from lateral spreading could be achieved by increasing the composite undrained shear strength of the soil to about 1,000 psf using a soil mixing or other cementitious injection technologies. For soil densification technologies, the target improvement to achieve minimal lateral spread displacement is to densify the soil to a standard penetration test (SPT)

N_{160} blow count of 15, or greater, in the liquefiable zone. Nonetheless for actual sites, site-specific engineering studies would be required.

In summary, the evaluations in Appendix B verified that the soil in the CEI Hub could be vulnerable to damaging lateral spreading displacement during a Cascadia earthquake on a ground slope as low as 0.5 percent. In addition, for critical structures that cannot tolerate PGD, vulnerable soil conditions can be mitigated against lateral spreading using ground improvement. This is valuable information as we consider the many critical energy facilities located in the area.

Section 5
Energy Facilities and Vulnerabilities in the CEI Hub

Portland's critical energy infrastructure, including high voltage electricity transmission, fuel pipelines, tank farms, ports and facilities, is concentrated along the Willamette River in the critical energy infrastructure (CEI) Hub. Much of the existing infrastructure was constructed prior to current seismic safety specifications and many of the petroleum storage tanks, piers, marine docks and buildings may not be adequately hardened. This area consists primarily of man-made filled land overlying river sediments and is vulnerable to liquefaction and lateral spreading. The concentration of facilities and hazardous materials in this area has the potential to produce damaging cascading effects including fires from ruptured natural gas and fuel lines, hazardous material releases and debris blockage of the Willamette River.

There are a variety of structures at the oil terminals, natural gas facilities, and electrical substations, as well as transmission pipes for liquid fuel and natural gas, and transmission towers and lines for electricity. Most of the facilities include control buildings with control equipment, some with emergency generators and/or batteries. The fuel terminals often include: transmission and distribution pipelines, piers or wharves, tank farms, pipe and loading racks, pumps, electric distribution equipment, and many other components. The liquid fuel transmission system includes gate stations, and transmission and distribution pipes, including at the Columbia and Willamette river crossings. *Figure 29* shows infrastructure, including liquid fuel pipelines (dashed yellow), natural gas pipelines (yellow) and electrical transmission lines (pink) on potentially vulnerable soils in the CEI Hub. In addition to the major energy lines co-located in this area, water, waste-water, rail and a highway are located here. *Figure 29* is a close up of a larger map, which shows that the natural gas system has a loop configuration around the greater Portland area. Similarly, it shows that the electrical system includes a loop around the greater Portland area. The larger mapped can be accessed at:
http://pubs.usgs.gov/sim/3027/sim3027_front.pdf



Figure 29: Lifelines in the CEI Hub area, including liquid fuel and natural gas pipelines, and transmission lines. This is a close-up of a greater Portland area map showing co-located critical lifelines on various soil types. (modified from Barnett et al, 2009)
http://pubs.usgs.gov/sim/3027/sim3027_front.pdf

The electrical facilities include electric substations that feed into the region's power grid. Substations include control buildings with control equipment and back-up batteries, transformers, circuit breakers, and bus structures. The power system also includes transmission lines and transmission towers. The natural gas system includes gate stations, transmission and distribution pipes, and a liquefied natural gas (LNG) terminal, which includes tanks, liquefication and gasification processing equipment, and control equipment.

DOGAMI conducted evaluations of the facilities with varying levels of detail ranging from review of available engineering reports to conducting visual screening-level assessments. DOGAMI was assisted by professional specialists for much of the work (see acknowledgements). For example, DOGAMI worked with the local U.S. Coast Guard (USCG) and engineers from California's program called Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS) to perform some of the visual screening level assessments of the piers and wharves in the CEI Hub. William R. Clark, USCG Port Security Specialist was DOGAMI's key point of contact. Martin Eskijian, MOTEMS Engineering Branch Supervisor (retired in 2011), Kendra Oliver, Senior Engineer, Petroleum Structures, and several other staff, provided technical expertise, which is described in Oil Terminal Facilities.

This section reviews the facilities included in the study. It also includes a discussion on building codes. Building codes regulate the seismic design criteria, which in turn, controls seismic vulnerability. This section also includes a more detailed discussion on waterfront dock structures, land-based structures, seismic pipeline vulnerability and co-located facilities in the CEI Hub.

CEI Hub Facilities: Liquid Fuel, Natural Gas and Electricity

All of the facilities in the CEI Hub are exposed to a variety of seismic hazards. The energy sector facilities in the CEI Hub include:

- All of Oregon's major liquid fuel port terminals
- Liquid fuel transmission pipelines and a transfer station
- Natural gas transmission pipelines and a transfer station
- Liquefied natural gas facility
- High voltage electric substation and transmission lines
- Electrical distribution substations

The EAP partners visited all relevant energy companies with facilities in the CEI Hub. DOGAMI and ODOE jointly conducted site visits with the terminal managers at these petroleum facilities: BP, Chevron, ConocoPhillips, KinderMorgan (KM) fuel terminals and KM pipeline, McCall Oil, Nustar, and Shell. MOTEMS senior engineer, Kendra Oliver, participated in the visits to BP, Chevron, McCall and Shell. The fuel facilities often include: transmission and distribution pipelines, piers or wharves, tank farms, loading racks, control buildings, electric distribution equipment, and many other components. The liquid fuel transmission system includes gate stations, and transmission and distribution pipes at the Columbia and Willamette river crossings. It is important to note that more than 90 percent of liquid fuels consumed in Oregon pass through the CEI Hub, as does a significant portion of NW Natural's natural gas. Thus, this area is critically important to Oregon residents, businesses and industrial firms.

Figure 30 show some of the facilities in the CEI Hub which are located near the Willamette River on soils that have been mapped as artificial fill or modified ground (Madin et al, 2008) and which are potentially unstable. Loose fills, such as those placed without compaction, are very likely to be susceptible to liquefaction (Kramer, 1996). (*Figure 31*)



Figure 30: Fuel tank farms and marine terminals along the Willamette River's edge near US Highway 30. For geographic reference to Figures 29 and 31, note the three parallel water inlets. (Basemap: Google Earth)

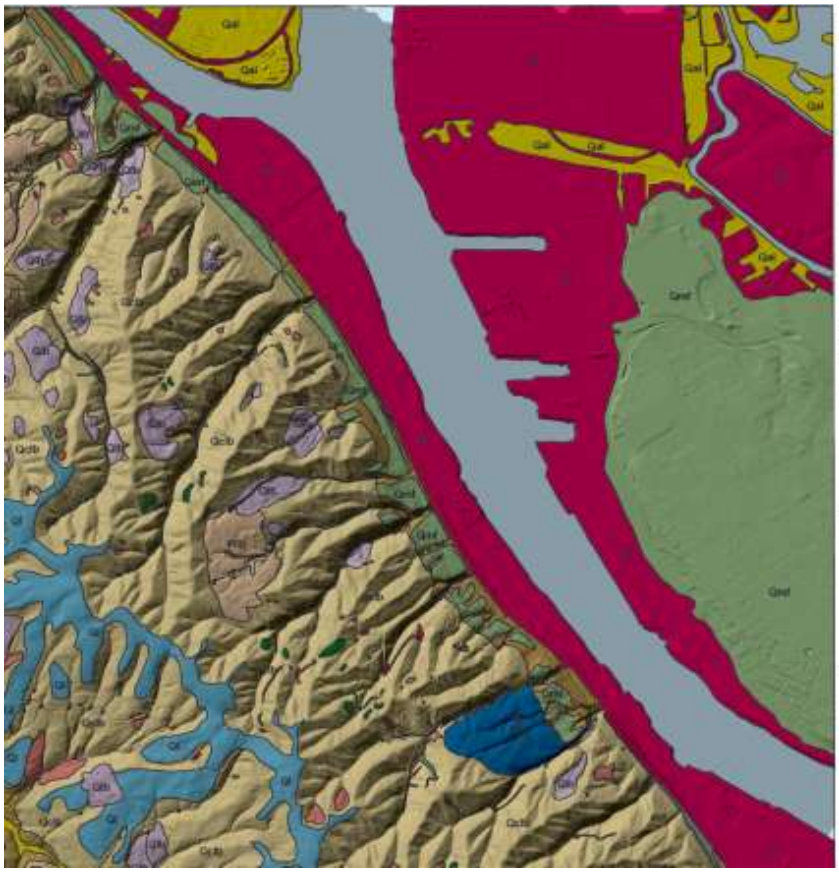


Figure 31: Surface geology map showing areas of fill materials (in pink) adjacent to the river. For geographic reference to Figures 29 and 30, note the three parallel water inlets. (Madin et al, 2008)

DOGAMI and OPUC conducted site visits with utility operators at Bonneville Power Administration, NW Natural, Portland General Electric (PGE), and Williams Northwest Pipeline electrical and natural gas facilities. (No PacifiCorp facilities are located in the CEI Hub.) BPA principal structural engineer, Leon Kempner Jr., provided technical expertise at all of BPA's electrical facilities. The electrical facilities include electric substations that feed into the region's power grid. Substations include control buildings with control equipment and back-up batteries, transformers, circuit breakers, and bus structures. The power system also includes transmission lines and transmission towers. The natural gas system includes gate stations, transmission and distribution pipes, and an LNG terminal, which includes tanks, liquefication and gasification processing equipment, and control equipment.

We also conducted selected site visits to important energy facilities located just outside of the CEI Hub. These included:

- Two large electrical substations on Front Street (*Figure 32*)
- A natural gas gate station on Sauvie Island

- Two Columbia County electric power plants that use natural gas (Port Westward and Beavers) are located next to the Columbia River. Both plants were developed on land susceptible to liquefaction triggered by a Cascadia earthquake; the soil at the newer plant was mitigated before construction.
- A liquid fuel terminal in Eugene that is dependent on the CEI Hub for its fuel and serves as an important distribution facility for Southern Oregon



Figure 32: Two large electric substations just south of the CEI Hub on Front Street that are separated by a railroad track (Basemap: Google Earth)

Some infrastructure in the CEI Hub facilities was built 100 years ago, to very antiquated standards while other infrastructure is new and built to the current state-of-practice standards. Because of the wide range of ages and associated construction practices, the seismic vulnerability of the facilities also spans a wide range. Based on visual observations, engineering judgment and limited information from the facility operators, major seismic vulnerabilities exist in the CEI Hub. Some critically important structures appear to be highly susceptible to significant damage in a major earthquake. In contrast, some structures are expected to have adequate seismic performance, including the new structures because of improved seismic design practices. Some existing structures have been strengthened or upgraded, such as evidenced by the newer dolphin structures used for mooring ships by older piers. No estimate has been made on the percentage of newer or upgraded structures.

Energy companies have operational interdependencies with the transportation and telecommunication sectors. To address seismic resilience for critical energy infrastructure operations and interdependencies, DOGAMI:

- Worked with the Oregon Department of Transportation (ODOT) to prioritize key bridges and highways in the CEI Hub for potential future upgrades to withstand Cascadia earthquake impacts. Highway 30 is essential for vehicular access to many of the CEI Hub energy facilities. Bridges are critical to supporting fuel deliveries from the CEI Hub to other parts of Oregon. In June 2012, ODOT issued its Oregon Seismic Lifeline Route Study, which includes Highway 30 and the I-405 bridge as tier 1 lifeline routes (See *Figure 33*). Co-author Wang was a steering committee member on the project. http://www.oregon.gov/ODOT/TD/TP/Reports/Lifeline%20Selection%20Summary%20Report.pdf
- Worked with ODOE and ODOT to ensure reliable alternate routes are identified and maintained to support distribution should the primary bridges for fuel deliveries become impassable. This included co-author Wang and Tova Peltz (ODOT geotechnical engineer) inspecting the Columbia River waterway in an air reconnaissance, as well as discussions with William Clark (USCG), and bridge engineers Albert Nako (ODOT) and David O'Longaigh (City of Portland Bureau of Transportation).
- Worked with OPUC and the investor-owned telecommunication providers in Oregon that the PUC regulates to promote reliable communications to energy companies located in the CEI Hub. This includes working with telecommunications providers to: 1) identify and resolve vulnerabilities to the system prior to an emergency, and 2) ensuring the rapid recovery of downed communication systems in the CEI Hub in the aftermath of an emergency. OPUC and DOGAMI have suggested to member of the telecommunication industry that they conduct seismic vulnerability assessments of their systems, including at Oregon Utility Safety Committee, OPUC's Energy Emergency Management Team and at invited talks, such as to the Oregon Telecommunications Association.

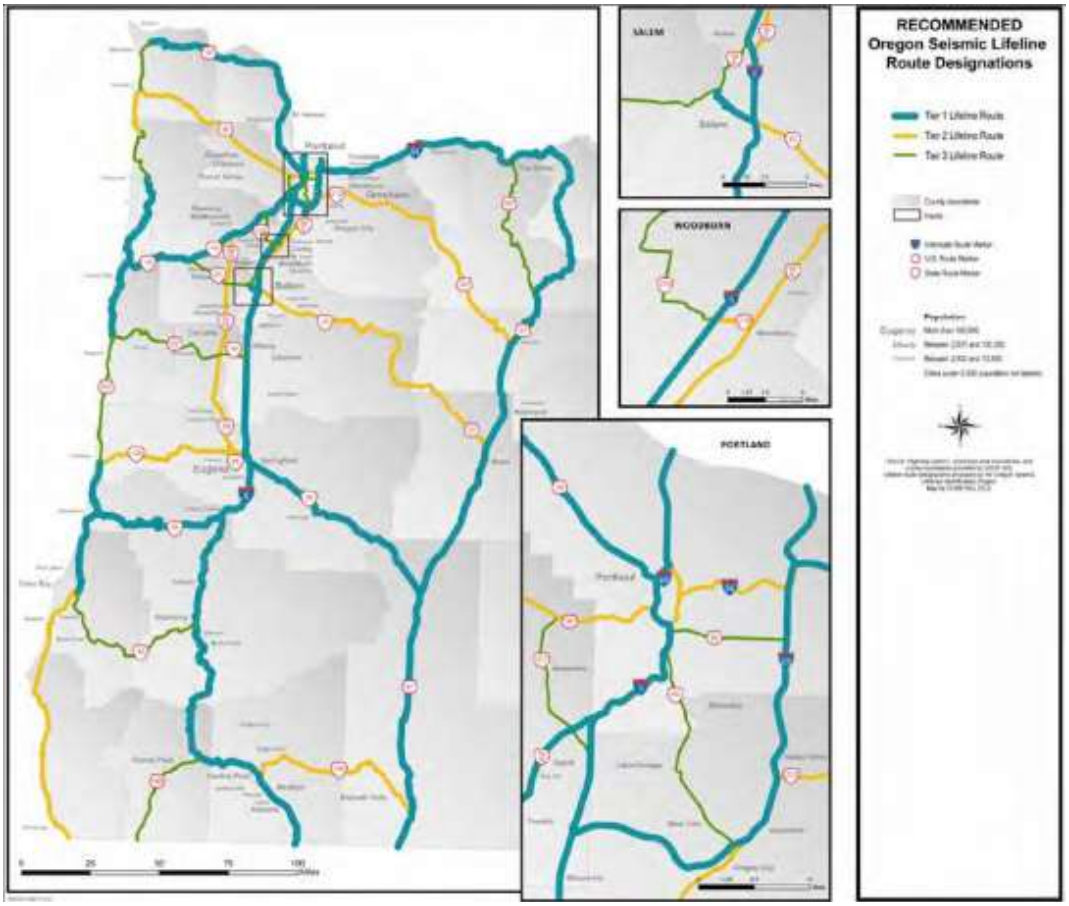


Figure 33 Map from the 2012 ODOT Oregon Seismic Lifeline Route Study, which includes Highway 30 and the I-405 bridge as tier 1 lifeline routes (Source: ODOT, 2012)

Oregon Building Code Influences in the CEI Hub

For the area of the CEI Hub, the City of Portland has responsibilities to enforce the requirements set forth by the building code. Building codes set forth minimum standards on new construction. Building codes are frequently upgraded to reflect new design knowledge including seismic hazards. These codes play a vital role in the seismic robustness of structures. If the code requires a high level of seismic design, then the new structure is designed and built to resist seismic forces. For existing structures, there are few, if any, regulations that require them to be upgraded to meet today's knowledge on seismic hazards. If past codes call for seismic design levels that are significantly lower than the levels in the current code, then those structures may have been designed with serious seismic deficiencies. DOGAMI reviewed the building code environment for facilities in the CEI Hub.

The history of Oregon's building codes is important because the structures in the CEI Hub have been built over the last century and the building codes can have a major influence on the seismic vulnerability of the exposed facilities. For buildings and certain other structures, the seismic design level is typically regulated by the building code. A history of Oregon's seismic building code is available at: http://www.cbs.state.or.us/external/bcd/programs/structural/Seismic_Codes-Oregon_History_020712.pdf (Oregon Building Codes Division, 2012).

Both Oregon and Portland have a complex building code history. The State of Oregon adopted its first building code in 1974. Building codes apply to new buildings, and not retroactively applied to existing buildings except under special conditions. Building codes that account for our basic understanding of the Cascadia fault and modern seismic loading conditions were not adopted until 1993.

Figure 34 illustrates the trend of increasing seismic load requirements in the past half-century. As a technical example, it specifically shows the increase to the seismic base shear for a low-rise shear wall building located in Portland, Oregon for an Occupancy Category III structure. Occupancy Category III as defined on Table 1-1 of the ASCE 7-05 publication includes certain facilities that handle hazardous fuels. Base shear is an important seismic loading parameter on structures. Note that the figure shows the required base shear value drops in 2004. This is because the 2004 Oregon Structural Specialty Code, which adopted the 2003 International Building Code, integrates new knowledge about seismic performance that previously used a more conservative approach. A shear wall building is a building that relies on certain walls designed to resist forces generated by an earthquake that are applied to the building. Ductility relates to the building's ability to be reshaped without breaking. The current construction requirements for "specialty" structures, such as piers, tanks, and loading racks are also contained within the current building code, which is the Oregon Structural Specialty Code (OSSC) adopted by the Oregon Building Code Division and local building departments, such as in the City of Portland.

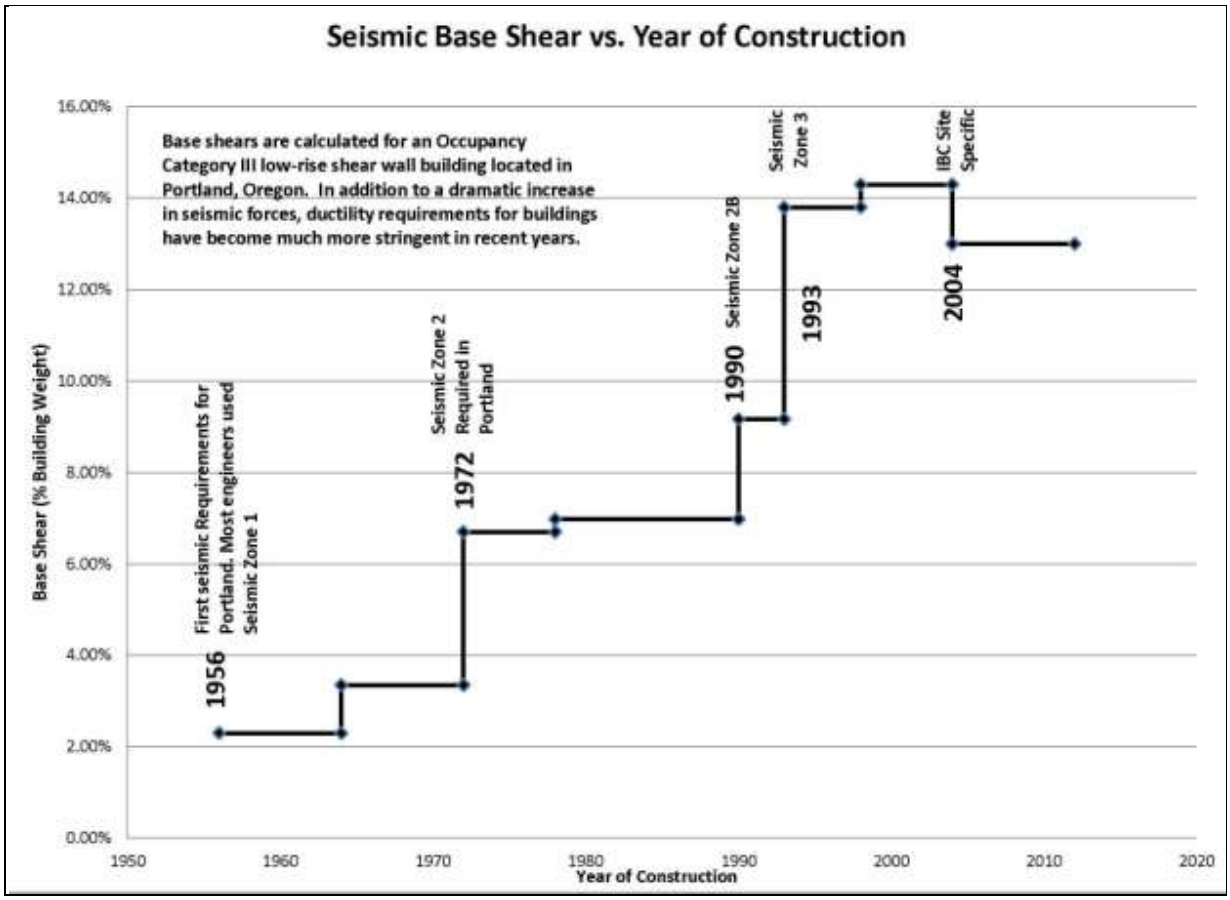


Figure 34: Seismic load requirements have increased over the decades to reflect the increasing understanding of Oregon's earthquake setting. For seismic design, 1993 was a landmark year. (Credit: KPFF consulting engineers)

Based on discussions with Jason Butler-Brown in the City of Portland Development Services department, facilities in the CEI Hub are required to obtain permits for new construction and conform with current building codes. Newly constructed structures are expected to have satisfactory performance in a design-level earthquake, that is, while they may sustain substantial structural damage, they should not collapse. It is possible for a structure to not be usable and still perform in a satisfactory manner that is in accordance with the building code. The level of compliance with past practices was not researched. In recent years, new building codes have been adopted as frequently as every three years. More recent building codes have progressively incorporated seismic design provisions. As an example, in October of 2010, the State adopted the 2010 Oregon Structural Specialty Code (OSSC), which refers to the 2009 International Building Code (IBC).

The first time geotechnical engineering reports were required to evaluate liquefaction potential and soil strength loss was in the 1996 OSSC which was based on the 1994 Uniform Building Code (UBC). At that time, it was widely accepted that silty soils were not prone to liquefaction. By approximately 2004, silty soils became widely recognized as being susceptible to liquefaction (Seed et al, 2003). As a result, the City of Portland began requesting that geotechnical

engineering reports evaluate the liquefaction susceptibility of silty soils (pers. comm. with Jason Butler-Brown, city of Portland geotechnical engineer on January 13, 2010). Therefore, structures constructed over soft silty soils that were granted permits by the City of Portland prior to 2004, such as those near the Willamette River, may have liquefaction vulnerabilities.

Although new buildings in the CEI Hub have been regulated by the City of Portland using the OSSC for decades, DOGAMI discovered that older building codes and practices did not adequately address many non-building structures that exist in the CEI Hub, such as tanks, pipes, and piers. This is based on discussions with state, city, and private sector engineers including Steve Judson (Oregon Building Codes Division), Jason Butler-Brown (City of Portland) and Kent Yu (Degenkolb Engineers and Oregon Seismic Safety Policy Advisory Commission). One explanation is because non-building structures typically hold few, if any, people and the focus of the building code has traditionally been on life safety.

In the early 2000s, non-building structures gained more attention in American Society of Civil Engineers (ASCE) 7, an engineering design document referenced by the OSSC and used by engineers. The 2004 OSSC referenced the 2003 International Building Code (IBC) and ASCE 7. For the first time the building code, through ASCE 7, specified more directly the design basis for a variety of non-building structures, including piers and wharves. Furthermore, it specified that the design shall account for the effects of liquefaction along with other marine based-loading criteria. In 2005, the ASCE 7-05 was published. It is considered to be a landmark design document because it specifies the loading criteria, including seismic design for a multitude of structures and structure types. By 2007, with the adoption of the 2007 OSSC and OSSC's reference to ASCE 7-05, ASCE 7-05 has gained significantly more influence among engineers designing non-building structures as a building standard. Design methods other than those in ASCE 7-05 are allowed by building officials.

Oil Terminal Facilities

The state EAP partners, which consists of ODOE, OPUC and DOGAMI, worked with the US Coast Guard (USCG) on the USCG's routine inspection of the petroleum terminals' port facilities, reviewed California's MOTEMS and conducted site visits with USCG personnel and MOTEMS engineers to better understand the seismic condition of the port structures, primarily the piers and the wharves for transporting liquid fuels.

Port Structures

Beginning in July 2009, EAP partners and USCG leadership and staff developed a working relationship to share information on the earthquake hazards to the port facilities in the CEI Hub that USCG regulates for port security. These include: BP, ConocoPhillips, Chevron, KinderMorgan, McCall Oil, and Nustar Energy. EAP partners arranged boat tours of ports for energy facilities, hosted earthquake table-top scenarios, and organized a meeting with Western Energy Institute and the USCG. The Western Energy Institute is a non-profit organization of energy sector businesses. They help develop memorandum of understandings (MOUs) between petroleum companies that deal with, for example, emergency situations. These MOUs could be helpful to the USCG in fulfilling their responsibilities on port security. In response to concerns raised at the Western Energy Institute meetings, the EAP partners alerted transportation officials about the need to have reliable transportation routes open during a major earthquake disaster.

EAP information was shared with transportation officials at the Oregon Department of Transportation (ODOT) at the Oregon Seismic Safety Policy Advisory Commission, the ODOT bridge section, and at a House Transportation committee legislative hearing held on May 24, 2010.

In December 2009, USCG Port Security Specialist William R. Clark arranged for ODOE and DOGAMI to meet with the USCG Facility Inspections Branch in their Portland office. The goal of the meeting was to determine whether USCG requests any information on the seismic condition of existing facilities and how they would address seismic disasters. At that meeting, it was determined that the USCG inspections did not include seismic information but would be willing to request information by selected port owners to assist the EAP partners. As a result of the meeting, DOGAMI developed two questions for the USCG to request seismic information on port facilities owned by the petroleum companies. The questions listed below were submitted to representatives at these six companies: BP, ConocoPhillips, Chevron, KinderMorgan, McCall Oil, and Nustar Energy.

In March 2010, the USCG provided the ODOE and DOGAMI with the responses from three of the six facilities, which include BP, Chevron, and ConocoPhillips. Terminal managers provided their responses via email, in part written by their engineers They range in detail and completeness and are provided below. No engineering reports were requested nor provided. For this report, very slight modifications to the responses have been made to help with clarity, such as renumbering the answers and correcting misspellings. Also, the names are each facilities have been removed and replaced with "*unnamed*". This action is consistent with the goals of the study, when possible, to respect the privacy of privately-owned energy sector operators when obtaining seismic vulnerability data. In late 2010, the USCG informed ODOE and DOGAMI that they never received responses from Kinder Morgan, Nustar or McCall Oil. Shell's port is not in operation and they were not included in the USCG request for information.

Question 1. What is the original construction date of the docks and waterfront structures (e.g., quay wall, anchored bulkhead, sheet-pile wall)? What level(s) of seismic design was used?

> Response 1. The *unnamed* Portland Terminal Dock was totally re-constructed in 1960 (approx). It should have been designed for seismic forces prescribed in the Uniform Building Code (UBC) at that time. Early (crude) provisions for seismic design were required in the UBC way back in the 1930's.
>
> A dock structural evaluation was completed in 2005. Part of its findings:
>
> Earthquake Load Analysis: A seismic analysis was performed on the existing structure, with the worst load condition being lateral earthquake forces perpendicular to the dock. These lateral forces are resisted by the batter piling at the wide bents (lines 23-58), and by bracing at the narrow bents (lines 1-22), except that the narrow bents at lines 17,18,19 have batter piles also. The methods outlined in IBC 2003 were used for seismic analysis, and this obviously results in higher lateral loads than what the dock was originally designed for. Our calculations indicate that the wide bents (lines 23-58) of the existing structure have adequate resistance for these seismic loads. However, the narrow braced

bents (lines 1-16, and 20-22) would be slightly overstressed due to these seismic loads and the bracing/connections would need to be reinforced. This would likely involve replacing the wood bracing with steel channels and adding some additional bolts. It's important to note that seismic upgrades to existing structures are typically only required when a structure is undergoing a change of occupancy or major design alteration, which is not the case here. So, while it's not legally required, we still recommend adding seismic reinforcing to the narrow dock area. This would increase the structure's resistance to seismic loads and help prevent failures in the product piping/spills into waterway.

Response 2. A comprehensive review of all of the local record drawings for the dock reveal the following:

The earliest drawing for the dock is from *unnamed*, dated June 1936, and it appears that the drawing may not have been an original construction drawing, but a modification. The dock could have been constructed several years earlier. Since the terminal had been in existence since about 1912, it is easy to believe that a wharf structure existed at that time.

In 1972 structural wood piling replacement and firewall improvements were made.

In 1974 major structural improvements were made. The work was performed under city of Portland permit 480690, 12/6/1973. The work added 3 reinforced concrete mooring sections, reconstructed the dock in entirety between bents #3 and #16, added two reinforced concrete dolphins at the head of the dock, and added a 40ft.x80ft.x8" thick reinforced concrete slab at the tanker unloading section. The work was designed and stamped by a licensed PE and work was completed to building codes in force at that time. Any seismic evaluation of the dock required by code would have been completed, however no specific seismic criteria was listed on design drawings.

In 1997 two significant steel-piled fenders were added to the upstream and downstream berths. The work was designed by a PE, Winzler and Kelly.

A new waterfront structure was added in 2007. A 100 ft. long sheet-pile wall was installed and armored with rip rap on the upstream side of the dock. The work was designed in accordance with the latest building codes in force and was permitted by the city or Portland. The downstream side of the dock do not include any significant improvements, e.g., quay wall, anchored bulkhead, or sheet-pile wall.

Response 3. The dock was completed 1993, no idea what level of seismic design was used. The sea wall was completed 2009 and was designed using a computer model to meet current UBC Seismic Zone 3 requirements.

Question 2. What is the post earthquake disaster restoration time for waterfront structures that handle fuel (e.g., operational capacity versus time curves)?

Response 1. The restoration time will depend on the extent of the damage. We'd establish a command post and us the IC system, then assess the damage. Any return to

normal operations would take place one component at a time, inspecting all equipment for leaks, etc.

Response 2. My professional opinion on the timing of a repair of a damage dock would rest entirely on the severity and breadth of the damage to critical marine facilities in the Port and the relative rank in priority that the *unnamed* fuel dock holds amongst all damaged facilities.

If damage were isolated to just the *unnamed* dock, I believe that significant damage could be repaired and the dock placed back in operation in 2 to 8 weeks, if emergency repairs were expedited.

Response 3. No idea.

Based on the information contained in the responses received, it was revealed that some CEI Hub ports were originally built around the early 1900s, and, most have had alterations, upgrades and additions over the decades, some recently. This is consistent with our field observations. Based on the above responses as well as discussions with terminal managers, the length of time to restore operations appeared to be difficult to estimate and is not well constrained.

MOTEMS and CEI Hub Ports

MOTEMS is a California program that regulates the state's petroleum companies' facilities (http://www.energy.ca.gov/2009_energypolicy/documents/2009-04-14-15_workshop/presentations/Day-1/03-Eskijian_Martin_MOTEMS.pdf). Earthquake experts consider the program's seismic regulations to meet a high standard (Percher and Bruin, 2009) . MOTEMS is part of the California Code of Regulations, Title 24, Part 2, Volume 2 of 2, 2007 California Building Code, Chapter 31F http://www.slc.ca.gov/Division_Pages/MFD/MOTEMS/MOTEMS_Home_Page.html. The MOTEMS program requires analysis and audits for every marine oil terminal in California. Seismic analyses are required based on the baseline inspection, current condition of the structure and site-specific ground motion input. Selected seismic-related portions include Division 1: Introduction; Division 2: Audit and Inspection; Division 3: Structural Loading Criteria; Division 4: Seismic Analysis and Structural Performance; Division 6: Geotechnical Hazards and Foundations; Division 7: Structural Analysis and Design of Components; Division 8: Fire Prevention, Detection and Suppression; Division 10: Mechanical and Electrical Equipment; and, Division 11: Electrical Systems. Over time, risks of catastrophic failures with environmental contamination, interruption of marine traffic, and serious long-term fuel shortage are being minimized in California.

MOTEMS requires all petroleum companies in the state to provide seismic information regarding their properties. MOTEMS division 2 prescribes the MOTEMS "audit" and requires as-built drawings, and, if not available, reconstructed drawings, along with an above and under-water inspection of facilities in California. If the initial drawings cannot be located, it will be difficult to determine the depth to fixity of the piles. Before any structural assessment can be made, soil conditions, including the presence or absence of potentially liquefiable layers needs to

be assessed with geotechnical borings. MOTEMS requires borings to a depth of 100 feet placed in strategic areas around or under the existing wharf/pier. As an example, some of the requirements for the seismic assessment of a marine oil terminal in California include:

- A site-specific seismic hazard study will be required to determine the appropriate response spectrum for the 72 and 475 year return period events. This is mandated for site class "F" and will probably be required with the soft river bottom and potential liquefaction and no shallow bedrock. However, one set of borings may be sufficient for many adjacent facilities to eliminate repetitive borings.

- The MOTEMS criteria (or ASCE u/w standards, Ref. 2) on an above and under-water inspection to the mudline is required. The criteria for the inspection requires that a registered civil or structural engineer to be in the water at least 25 percent of the dive time. As-built or "baseline" drawings may have to be constructed to evaluate the structural integrity of each facility if the original drawings are not available.

Martin Eskijian, MOTEMS Engineering Branch Supervisor (retired in 2011), and his staff provided expertise and assistance to the EAP. Mr. Eskijian provided assistance on one site visit comprised of a boat reconnaissance that included port facilities in Oregon in the CEI Hub. The EAP partners were invited to the MOTEMS northern California office in Hercules, California, where we visited the Chevron refinery in Richmond, California, the Tesero port facility in Vallejo, California, and participated as observers in a MOTEMS meeting with Shell. After that, MOTEMS senior engineer, Kendra Oliver, provided assistance on four terminal visits that included port facilities in Oregon in the CEI Hub.

The following photographs describe and illustrate some of the EAP partners' and MOTEMS engineers' major concerns about seismic readiness of the port structures operated by oil terminals in the CEI Hub. These issues largely fall under MOTEMS Divisions 3: Structural Loading Criteria, Division 4: Seismic Analysis and Structural Performance, Division 6: Geotechnical Hazards and Foundations, and Division 7: Structural Analysis and Design of Components.

Figure 35 shows steel plumb piles with lateral timber bracing as observed at facilities in the CEI Hub. MOTEMS does not permit the use of timber cross bracing to provide lateral restraint (seismic loading) for vertical piles. This was one of many major shortcomings of the observed facilities in the CEI Hub. With the large variation in water depth, dependent on dam release, tides and storms, the pile heights out of the water look high; buckling forces on the columns may well exceed current design standards and this may become critical for the seismic evaluation.



Figure 35: Lateral timber bracing for steel plumb piles in the CEI Hub is considered inadequate by California's MOTEMS standards. (DOGAMI photo)

MOTEMS provides liquefaction screening methodologies that could be used to evaluate whether or not there are slope stability issues, whether lateral spreading along the piers/wharves or trestles is likely, and the possibility of adverse seismic loading of the piles (e.g., out of phase with the inertial loads). It is possible that soil failures may be a significant contributor to compromising the structural integrity. If the seismic demand on the structural system (either above grade or below grade) is higher than the structural capacity and the structural integrity could be compromised, then upgrades would be required. MOTEMS allows for a dialogue between the operator and regulator on the proposed mitigation and schedule of mitigation; the regulator decides whether the time requested to rehabilitate is reasonable or excessive. *Figure 36* shows a foundation for a high traffic pier, shown in *Figure 37*, on highly liquefiable soils in the CEI Hub.



Figure 36: This under-designed foundation in part of an oil terminal pier in the CEI Hub is considered inadequate. Based on previous regional studies, boring logs from an adjacent facility, and on-site visual inspection of the surficial soils, this area has high susceptibility for liquefaction and lateral spreading. (DOGAMI photo)



Figure 37: The area by this pier in the CEI Hub is used to transport liquid fuel. Based on previous regional studies, boring logs from an adjacent facility, and on-site visual inspection of the surficial soils, this area has high susceptibility for liquefaction and lateral spreading. (DOGAMI photo)

Under the MOTEMS system, following on the seismic analyses of the port structure and the ground, a pipeline stress analysis may be required in order to be certain that no leaks will result from the seismic displacements. Facilities in the CEI Hub have flexible timber structures (some with pipelines under the piers) with hard points in locations that would likely indicate failure in a pipeline stress analysis.

During the site visits in the CEI Hub, DOGAMI and MOTEMS engineers observed many structures with pipelines with possible vulnerabilities, some of which were verified by the responses provided by the oil terminal facilities to the USCG. *Figure 38* shows transverse timber beams in seriously degraded condition, with one bolt connecting the beam to the steel plumb pile as observed during visual inspections. Some of the transverse beams support petroleum pipelines. The pile cap beam in the center of the photo, which should be level, has a clockwise rotation. Based on the professional judgment of DOGAMI and MOTEMS engineer Martin Eskijian from post-earthquake investigations, experience with engineering analyses, and from the body of knowledge in the earthquake profession, this configuration would be expected to fail in a moderate earthquake, without even considering lateral spreading or liquefaction.



Figure 38: This photo shows generally poor condition of transverse beams supporting petroleum pipelines and cap beam in the CEI Hub. Notice the clockwise rotation of the pile cap beam in the center of the photo. (DOGAMI photo)

Figures 39, 40, 41 and 42 illustrate some of the poor conditions observed of the oil terminal piers in the CEI Hub. Examples from working piers include: deteriorated concrete foundation, exposed rebar, split timber beams and broken timber piles.



Figures 39 and 40: The close-up photo on the right shows poor timber-to-concrete connection, broken concrete and exposed rebar. Energy sector companies should maintain and upgrade infrastructure to current standards in order to protect assets and limit down-time following an earthquake. (DOGAMI photos)



Figure 41: The connection on this pier in the CEI Hub appears to have deteriorated due to a split in the timber beam. This type of damage suggests that the condition of the structure may not be routinely monitored and maintained and that the overall pier is seismically vulnerable. (DOGAMI photo)



Figure 42: This pier in the CEI Hub appears to be poorly maintained with broken timber piles adjacent to working components of the pier. (DOGAMI photo)

Figure 43 shows a "hard point" (ie, fixed point that could concentrate stresses) for the petroleum pipelines, which may not be desirable due to structural displacement from an earthquake. In accordance to MOTEMS procedures, a pipe stress analysis should be performed, with the input seismic displacement and then the pipeline could be evaluated. In the case illustrated in *Figure 43*, it is unlikely that the ability to tolerate lateral motion was included in the original design.



Figure 43: "Hard point" fixity of petroleum pipeline is located under this pier in the CEI Hub and is considered to be seismically vulnerable. (DOGAMI photo)

It is common for waterfront structures that are under-designed to experience damage in earthquakes as evidenced by worldwide earthquakes. *Figure 44* shows a damaged pier from the 2010 Chile earthquake.



Figure 44: An example of a damaged pier in the 2010 Chile earthquake (Technical Council on Lifeline Earthquake Engineering – TCLEE - 2010)

As part of the EAP, the EAP partners considered possibly using MOTEMS seismic regulation as "best practices" in Oregon as a means to make Oregon petroleum terminals safer. DOGAMI held discussions with MOTEMS personnel, conducted a literature review, accompanied MOTEMS staff on tours of the port facilities in the CEI Hub, and toured California oil terminals to better understand the effectiveness of the program. Based on our findings, it appears that applying the seismic portion of MOTEMS to Oregon facilities and the CEI Hub facilities in particular would provide added safety.

Seismic Pipeline Vulnerability

The overall performance of oil and gas transmission pipeline systems in past worldwide earthquakes has been relatively good. However, failures have occurred in both older pipelines as well as modern pipelines, such as welded steel pipelines. Damage is typically concentrated in areas of unstable soils with permanent ground deformation (PGD) and/or liquefaction, including at river crossings and landslides.

For the EAP, DOGAMI did not obtain any information or reports on seismic vulnerability of existing pipelines in the CEI Hub from the City of Portland, facility owners, or regulators. Seismic vulnerability assessments can be conducted on specific pipelines, both above ground and buried, to address specific pipeline performance. A major liquid fuel transmission pipeline and two natural gas transmission pipelines that have river crossings at the southern tip of Sauvie Island, as shown on Figure 29 Lifelines in the CEI Hub area, as well as Columbia River crossings just north of the CEI Hub (refer to http://pubs.usgs.gov/sim/3027/sim3027_front.pdf) are in need of special attention.

Jason Butler-Brown, engineer at the City of Portland Bureau of Development Services, states that they do not review the structural design of proposed pipelines. Permits are reviewed and

issued for the excavation associated with the pipelines (on private property) and where pipelines are supported on structures that cross over private roadways or areas accessible by people (again on private property). Interstate fuel pipeline design is regulated under Title 49 of the Code of Federal Regulation. Part 192 of Title 49 of the Code of Federal Regulations addresses gaseous fuels, Part 193 addresses LNG and Part 195 deals with liquid fuels. These serve as minimum design standards and are applied to interstate pipelines connected to the CEI Hub.

Certain fuel pipelines are regulated for safety by the US Department of Transportation's Office of Pipelines and Hazardous Materials and Safety Administration (PHMSA) (http://www.phmsa.dot.gov/pipeline/regs). As part of this EAP, JR Gonzalez (former) the Administrator of the OPUC Safety, Reliability and Security Division informed Hossein Monfared, Pipeline Engineer, from PHMSA Western Region Office of Pipeline Safety that a liquid fuel transmission pipeline feeds petroleum tank farms situated on potentially liquefiable soils. This was part of a discussion to inquire about the content of PHMSA's audits. As an outcome of that discussion, DOGAMI discovered that, to date, PHMSA has not requested seismic information as part of their audits involving tank farms in Portland.

When soil liquefies, it behaves like a fluid and pipe embedded in it will be subjected to the buoyant force from below. This buoyancy due to liquefaction can occur at river crossings and sandy areas with high ground water tables. *Figure 45* is a schematic showing buoyancy forces (Fb) on a buried pipe with a burial depth of C (IITK, 2007). Pipes can fail due to buoyant forces.

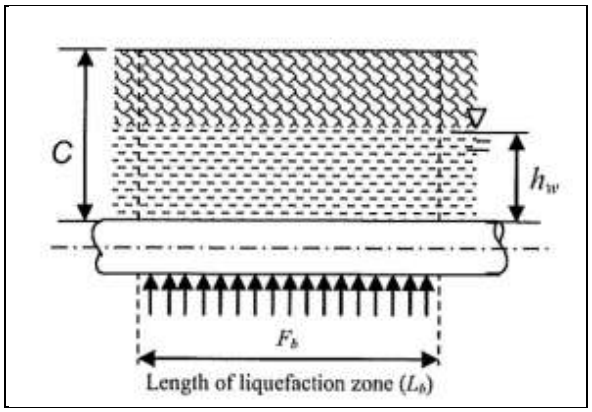


Figure 45: Buoyancy forces on a buried pipeline. (IITK, 2007)

In areas with permanent ground deformation (PGD), such as areas with lateral spreading (without the occurrence of liquefaction) or liquefied soils that have translated down slope towards the river channel (often referred to as a "free face"), the embedded pipe will be subjected to both compression and extensional forces. The total strain on the pipe can exceed the amount of strain the pipe can withstand creating unsafe pipeline conditions and even pipeline rupture. The maximum strain in the pipe both in tension and compression can be evaluated and compared with the allowable strain of the pipe. *Figure 46* is a schematic diagram that shows a pipeline perpendicular to the direction of PGD. *Figure 47* shows a pipeline that is parallel to the direction of PGD. In both figures, the area of unstable soils with PGD are illustrated before (purple zone) and after (gray zone) the ground movement. The actual pattern of PGD will depend on the earthquake ground motions, local soil conditions and the pipeline may cross the zone in any

direction. *Figure 48* shows areas of tension and compression due to longitudinal PGD (IITK, 2007).

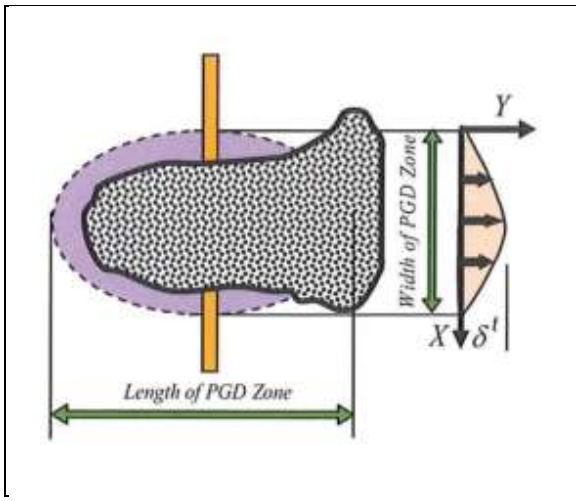


Figure 46: Transverse PGD schematic (IITK, 2007)

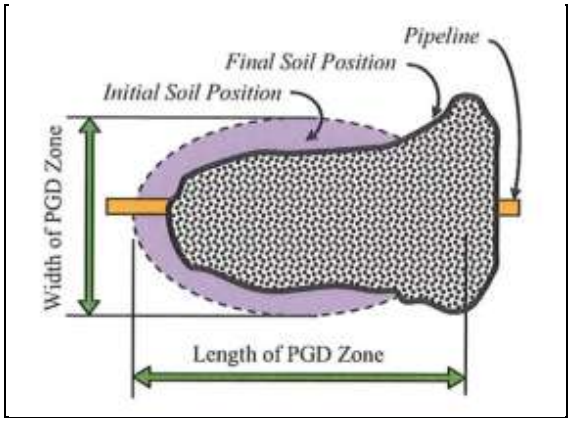


Figure 47: Longitudinal PGD schematic diagram (IITK, 2007)

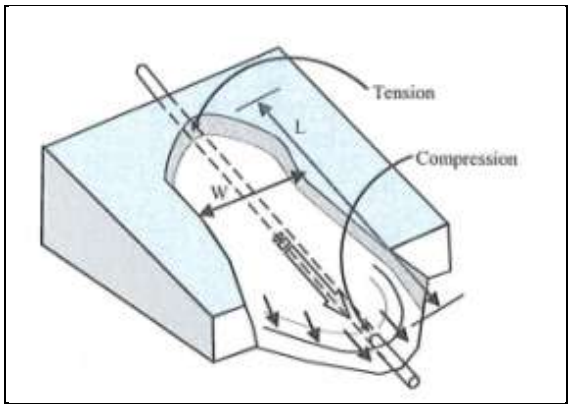


Figure 48: Areas of tension and compression from longitudinal PGD (IITK, 2007)

A variety of possible mitigation measures are available to improve the performance of pipes against PGD. Depending on the specific situation, some options might involve: soil improvement, increasing the load carrying capacity of the pipe system, reducing the friction between the pipe and soil, relocating the pipe, anchors to prevent uplift from buoyant forces, or special pipe joints or fittings that allow greater joint deflection, extension, or compression.

Non-Energy Facilities and Structures

Many other structures and facilities are located in the proximity of the CEI Hub. Structures include bridges over the Willamette River as well as other port facilities and overpasses that span the railroad tracks. Other industrial companies, including ones that handle petrochemicals and hazardous materials, are located in the CEI Hub. A major rail yard exists at the south end of the CEI Hub. A limited number of commercial and residential occupants are also located in the area. Although these facilities are not part of the energy sector and included in this study, it is important to be aware of these facilities and structures. They could become a concern after a Cascadia earthquake. For example, if the chemical company has a fire, it could spread to a nearby oil terminal, or vice versa.

Waterway Transportation to the CEI Hub

The navigational channel from the Columbia River mouth to the lower Willamette River is used to transport fuel by marine vessels. DOGAMI investigated the infrastructure and geologic conditions along the shipping channel and terminals and analyzed the situation based on discussions with engineers from the U.S. Corps of Engineers and ODOT and staff from the U.S. Coast Guard (USCG), engineering judgment from previous earthquake investigations, geotechnical engineering reports and publically available material. Our findings, which are preliminary and require additional studies, indicate that the shipping channel will be damaged and closed for river navigation until it is officially cleared for use by the USCG. Based on our findings, the likely damage includes four modes:

- Tsunami scour, damage and debris near the mouth of the Columbia River
- Underwater slope failures along portions of the steep banks of the navigable river channel
- Collapses of overhead structures such as bridges from earthquake shaking
- Broken buried pipelines at river crossing locations

Tsunami damage near the mouth of the Columbia River is based on tsunami hazard mapping (Priest et al, 1998) and DOGAMI's field observations of tsunami damage from the 2004 Sumatra and 2011 Tohoku Japan subduction zone earthquakes. Damage to the navigable river channel is based on the already marginally stable, underwater steep slopes that require periodic dredging to maintain the required channel depths during normal operating conditions. Based on discussions with the ODOT Bridge Section engineers and seismic bridge engineering practices, all of existing bridges including the bridge approach structures have been seismically under-designed compared to today's requirements and may incur damage (http://peer.berkeley.edu/events/caltrans-peer/files/Ashford_Abutment_2009_r1.pdf). Similarly, the pipe and transmission river crossings may be under-designed in particular to liquefaction and lateral spreading conditions. The structures that may be damaged and block the waterway extend from the Columbia River mouth to the fuel storage area in the CEI Hub. These structures, from west to east, include:

- 1966 Astoria-Megler Bridge crosses the Columbia River(*Figure 49*)
- Buried natural gas pipeline crosses the Columbia River to feed power plants (*Figure 50*)
- High voltage electrical transmission crossing the Columbia River (*Figure 51*)
- 1930 Lewis and Clark Bridge in the Longview, Washington area crosses the Columbia River (*Figure 52*)
- Several liquid fuel and buried natural gas pipelines at Columbia River and Willamette River crossings just north of the CEI Hub. Photo shows a natural gas gate station on Sauvie Island (*Figure 53*)
- High voltage electrical transmission crossing over Willamette River (*Figure 54*)
- 1931 St. Johns Bridge crosses Willamette River (*Figure 55*)
- 1908 BNSF rail bridge crosses Willamette River (*Figure 56*)
- 1973 Fremont Bridge, part of Interstate 405, crosses the Willamette River and is used for liquid fuel distribution by tank trucks (*Figure 57*)

Closure of the shipping channel would prevent marine vessels from delivering liquid fuel as well as emergency response and recovery equipment from being delivered.



Figure 49: The approach (foreground) to the 1966 Astoria-Megler Bridge that spans the Columbia River has major structural deficiencies according to ODOT Bridge Section. In a major Cascadia earthquake, the exterior (concrete) shear keys on the approaches would likely not withstand lateral displacement of the superstructure (approach deck) (DOGAMI photo)



Figure 50: A buried natural gas pipeline crosses underneath the Columbia River and supplies two Oregon power plants near Clatskanie, Oregon.(DOGAMI photo)



Figure 51: High voltage electrical transmission crossing over the Columbia River just west of Longview, Washington. (DOGAMI photo)



Figure 52: 1930 Lewis and Clark Bridge in the Longview, Washington area crosses the Columbia River (DOGAMI photo)



Figure 53: Several liquid fuel and buried natural gas pipelines at the Columbia River and Willamette River crossings just north of the CEI Hub. Photo shows a natural gas gate station on Sauvie Island. (DOGAMI photo)



Figure 54: The high voltage electrical transmission crossing showing transmission towers built on a river bank susceptible to lateral spreading (BPA, 2008) (DOGAMI photo)



Figure 55: The 1931 St. Johns Bridge crosses the Willamette River in the CEI Hub. The tall columns that are part of the approach are seismically deficient. (DOGAMI photo)



Figure 56: The 1908 BNSF rail bridge that crosses the Willamette River in the CEI Hub. The piers are seismically deficient. (DOGAMI photo)



Figure 57: The 1973 Fremont Bridge, part of Interstate 405, crosses the Willamette River and is used for liquid fuel distribution. (DOGAMI photo)

Section 6
Summary of Findings

To assess the overall seismic risk to the energy infrastructure in the CEI Hub, DOGAMI gathered information on the seismic hazards, the exposed facilities present in the CEI Hub, the seismic vulnerability of these facilities, and considered the potential consequences of earthquake-induced damage at the facilities. Our goal was to:

- Understand the facilities and system components that are present (what is "exposed")
- Assess the vulnerability of the exposed parts
- Assume failure of the highly vulnerable parts
- Evaluate the likely consequences

The consequences of the damage to the infrastructure must be considered to understand risk. For example, if a site experiences liquefaction that causes the bottom of a petrochemical tank to rupture spilling all of its contents, but the product is quickly contained and not in demand, then the consequences are manageable and the risk can be considered as low. In contrast, if a site experiences only minor shaking that temporarily jams a door opening to access fire suppressants and a fire grows to uncontrollable levels in an area with critical products, these consequences may be significant and the risk is considered as high.

Consequences can be immediate (e.g. those just described), short-term, long-term; direct or indirect; localized or far-reaching. Several examples taken from the 2010 Chile subduction zone earthquake are provided (Eidinger and Tang, in press). Limited water availability can impact immediate needs with respect to fire fighting capabilities as well as long-term needs for normal living conditions. (See *Figures 58 and 59*) In a similar vein, the lack of or limited electricity from a damaged transmission tower can impact businesses and the economy. *Figure 60* shows structural damage incurred from the 2010 Chile earthquake to a transmission tower at a major river crossing that serves a populated city. In addition, many interdependencies exist and cross cut many sectors of our society. This risk study takes initial steps to address likely consequences and interdependencies.

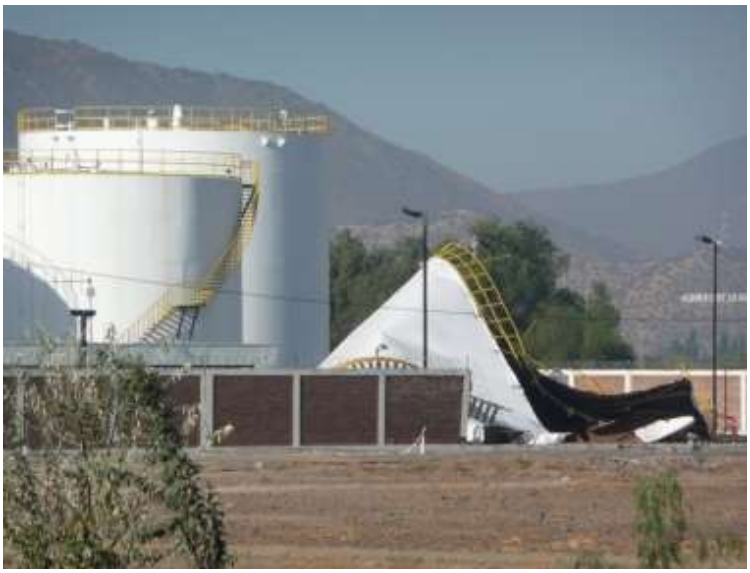


Figure 58: Structural damage to water tank located in fuel tank farm in Santiago from the 2010 Chile earthquake (Technical Council on Lifeline Earthquake Engineering - TCLEE)



Figure 59: An example of damaged water transmission pipelines in the 2010 Chile earthquake. This limited water availability for emergency response as well as for businesses and daily living. (Technical Council on Lifeline Earthquake Engineering - TCLEE, 2010)

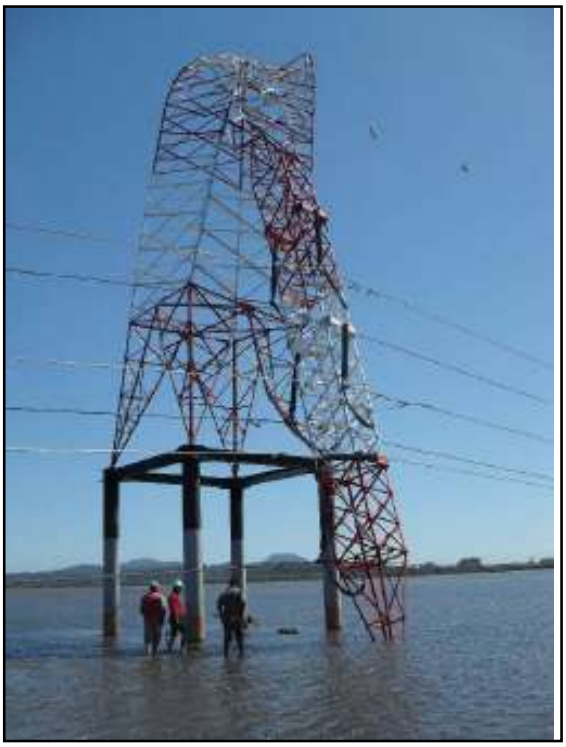


Figure 60: Structural damage to high voltage transmission tower located in river crossing in 2010 Chile earthquake. This limited electricity availability while temporary towers were installed (Technical Council on Lifeline Earthquake Engineering - TCLEE)

Seismic Risk in the CEI Hub

Figures 61 and 62 show the northern portion and southern portion of the CEI Hub where the major seismic vulnerable energy sector facilities—substations, river crossing, liquid fuel terminals, and an LNG storage facility—have been highlighted (yellow dashed lines). Also shown are potentially liquefiable soils in transparent red, existing mapped landslides in beige, and the Portland Hills fault is in red (Madin el al, 2008; Mabey et al, 1993; Burns et al, 2011; Beeson et al, 1991). Each of these highlighted facilities were visited. During our limited visual inspections we identified numerous structural elements with high seismic vulnerability that could cause serious damage and loss of function in a Cascadia earthquake. This includes the oil terminals, which have significant seismic vulnerabilities and limited redundancy.

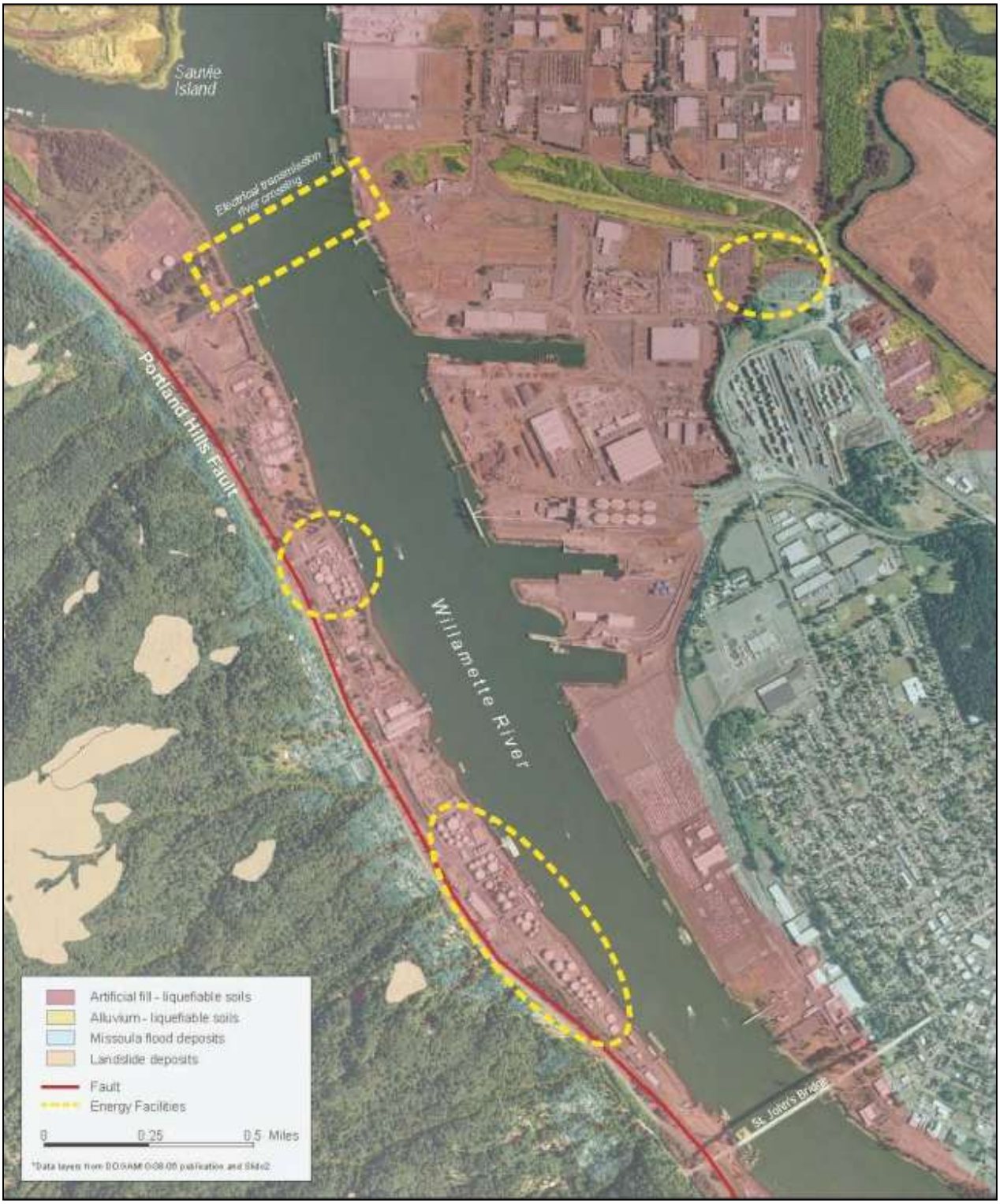


Figure 61: Northern portion of CEI Hub showing the major energy sector facilities vulnerable to damage in a Cascadia earthquake-- substations, river crossing, and liquid fuel terminals (yellow dashed lines) and potentially liquefiable soils (transparent red), existing mapped landslides (beige), and the Portland Hills fault (red). (DOGAMI)

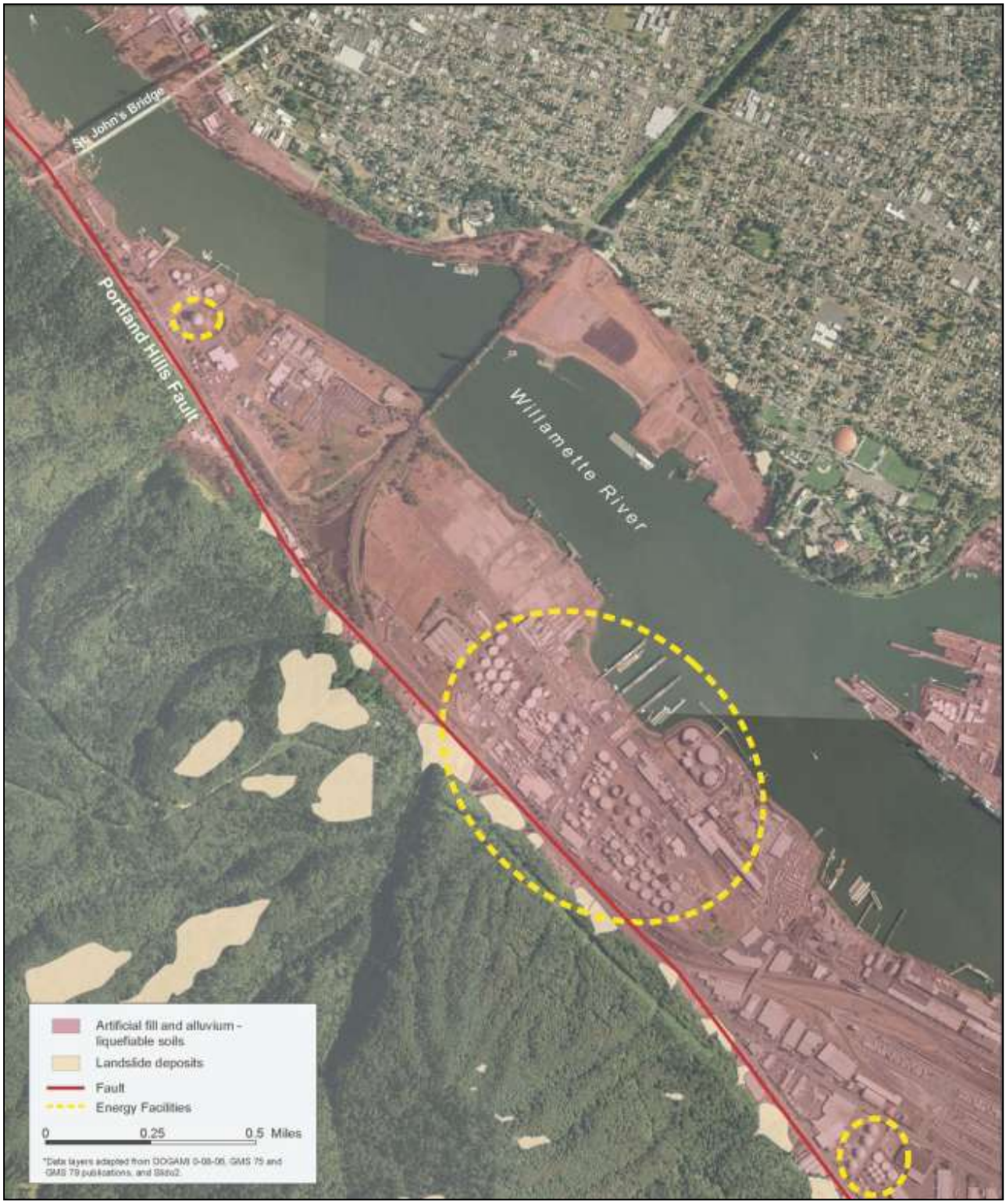


Figure 62: Southern portion of CEI Hub showing the major energy sector facilities vulnerable to damage in a Cascadia Subduction Earthquake -- LNG storage facility and liquid fuel terminals (yellow dashed lines), potentially liquefiable soils (transparent red), existing mapped landslides (beige), and the Portland Hills fault (red). (DOGAMI)

Based on the findings of this study, DOGAMI has identified the following as examples of high seismic risks to the energy sector with statewide importance. The first two risks are system-wide risks involving redundancies and interdependencies; the remaining risks are sector-specific seismic risks to liquid fuel, natural gas and electricity.

Lack of System Redundancies

DOGAMI determined that each energy source has a different level of redundancy in their transmission system. This determination was based on discussions with the EAP partners, interviews with personnel from the various energy sectors, and analyses of available data including maps, such as Earthquake Hazards of Lifelines along the Interstate 5 Urban Corridor: Woodburn, Oregon, to Centralia, Washington, and Earthquake Hazards of Lifelines along the Interstate 5 Urban Corridor: Cottage Grove to Woodburn, (Barnett el al, 2009), Western Electricity Coordinating Council (WECC, 2012) and US. Department of Transportation's National Pipeline Mapping System's Public Map Viewer (https://www.npms.phmsa.dot.gov/PublicViewer/composite.jsf). The redundancy of each of the systems influences the level of seismic resilience with more redundant systems favoring higher resilience. The transmission systems, such as the main electrical grid and transmission pipelines, are of key importance in the supply chain.

1. The electrical system has power generation facilities located throughout Oregon and has the most widespread and redundant transmission system. The level of redundancy surrounding and within the Portland metropolitan area is high because there exist a number of transmission systems and diminishes away from the Portland area.
2. The natural gas system in Oregon relies 100 percent on imported natural gas, most of it from the north, and has much less redundancy than the electrical system. The natural gas system has a loop configuration around the greater Portland area and this provides for some redundancy. If a break in the loop occurs, it is theoretically possible to provide natural gas to areas around the loop. The level of redundancy south of the Portland metropolitan area (e.g. Marion County) is considered to be low based on discussions with OPUC and the gas operator. In addition, the natural gas reserve capacity has limits.
3. Oregon's liquid fuel oil source relies 100 percent on imported fuel, most of it from the north, and has very limited redundancy and reserve capacity.

System Interdependencies

The three energy sources—electricity, natural gas, and liquid fuel—depend upon each other so if one system is inoperable, it will impact another. For example, all sources rely on electricity to operate their systems. Electricity is needed to power the control rooms for natural gas and liquid fuel transmission.

The energy sector also relies on the transportation and telecommunication sectors. For example, in order to transport liquid fuel to the marine oil terminals in the CEI Hub, ships enter through the Columbia River mouth and travel up the navigable waterway. If the river mouth is blocked by tsunami debris, the shipping channel is altered from sloughing of the underwater slopes or the shipping lane is blocked by downed electrical transmission lines or bridges, then moving fuel to the CEI Hub via the waterway would not be possible.

Liquid Fuel

Liquid fuel pipeline: The CEI Hub petroleum facilities receive liquid fuel via two methods: 1) the liquid fuel transmission pipeline, and 2) marine vessels. The transportation method and amounts vary due to product need, transportation costs, weather and other conditions. The liquid fuel pipeline was largely constructed in the 1960s when the regional seismic hazards were unknown and state-of-practice construction techniques at that time did not include any reference to seismic standards. The regional seismic hazards are now known to be high and the soils at the river crossings are susceptible to liquefaction and lateral spreading. The 1960s vintage pipeline design did not consider ground movements from lateral spreading at river crossings or the stresses to the pipelines induced by earthquakes that may cause pipe damage and multiple breaks. A pipe break would have a significant impact on all of the petrochemical facilities in the CEI Hub and could result in a statewide fuel shortage.

Shipping channel: The navigational channel from the Columbia River mouth to the lower Willamette River is used to transport fuel by marine vessels. DOGAMI conducted a preliminary investigation and found that the shipping channel would likely be damaged and closed for river navigation until it is officially cleared for use by the USCG. Based on our findings, the likely damage includes four modes:

- Tsunami scour, damage and debris near the mouth of the Columbia River
- Underwater slope failures along portions of the steep banks of the navigable river channel
- Collapses of overhead structures such as bridges from earthquake shaking
- Broken buried pipelines at river crossing locations

Closure of the shipping channel would prevent marine vessels from delivering liquid fuel as well as limit transport of emergency recovery equipment.

Marine terminals: All of the port facilities in the CEI Hub have significant seismic risks due to liquefaction, lateral spreading, and seiches. Some older piers were constructed without any seismic design provisions, have deteriorated, and may be damaged even in a moderate earthquake. If oil products are released and contaminate the navigable waterway, the waterway may be closed to river traffic thus impeding emergency response activities as well as the supply chain. The local capacity to fight fires and clean hazardous material spills is limited.

Fuel Tank Farms: All of the fuel tank farms in the CEI Hub have significant seismic risks due to the significant unmitigated liquefaction hazards largely posed by hydraulically-deposited river soils (also known as hydraulic fill) and native soils. Due to the long standing inadequate seismic hazard knowledge and the inadequate building code requirements, the majority of the tanks have been constructed without any or only limited seismic design criteria on unmitigated, potentially liquefiable soils. It was not until 2004 that city building officials required new construction projects, including tanks, to evaluate for liquefaction of silts. Based on discussions with City of Portland engineers from Bureau of Development Services and terminal operators, DOGAMI has identified only three existing tanks that have addressed liquefaction hazards.

Fuel supply: The fuel terminals in the CEI Hub on average have a three to five day supply in the tank farms for regular unleaded gasoline and diesel fuel. Fuel is stored in tanks and some tanks have seismic vulnerabilities (see *Figure 63*). Premium gasoline is subject to the daily delivery and heavily dependent on whether the intercompany pipeline on Front Avenue is operational. If the supply chain is disrupted by pipe breaks north of the CEI Hub and closure of the shipping channel to the west, fuel would quickly become scarce. Options to transport fuel from the east and south and by air are very limited.



Figure 63: The elements connecting the tops of these two tanks in the CEI Hub may cause damage to the tanks during shaking due to differential displacements. (DOGAMI photo)

Portland International Airport (PDX): The airlines operating at the PDX airport receive 100 percent of their liquid fuels from a terminal in the CEI Hub. There is limited on-site fuel supply at PDX. If the transmission pipe between the CEI Hub and PDX fails, then PDX would likely experience a shortfall and operations would be impacted.

Natural Gas

Natural gas pipelines: Oregon's largest natural gas service provider receives the majority of their natural gas from pipelines that cross under the Columbia River. One pipeline crosses the Columbia River to Sauvie Island and then crosses the Willamette River at Multnomah Channel near a gate station at the southern end of Sauvie Island and enters the CEI Hub. In addition to the CEI Hub, there are more natural gas pipelines at major river crossings, including crossings at the Columbia River between Washougal, Washington and Troutdale, Oregon and near Clatskanie, Oregon. The soils at these major river crossings are subject to liquefaction and lateral spreading hazards. Most of these pipelines are 1960s vintage and were constructed without seismic design provisions. The consequences of potential pipeline failures could be major for natural gas service territories and Oregon. Pipe breaks could lead to a natural gas shortfall in the state as well as explosions or fires. In addition to the above mentioned pipelines entering Oregon, there are more pipelines throughout the state.

LNG storage facility: The LNG storage facility in the CEI Hub was constructed in the late 1960s on what is strongly suspected to be highly liquefiable soils based on discussions with the operator and DOGAMI hazard maps. This facility, including the LNG tank built for the to

provide peaking gas supplies, could result in unsafe conditions during a major earthquake. Furthermore, although the facility has an on-site emergency generator, based on EAP partners' site inspection with the operator, it had seismic deficiencies and would likely not operate after a major earthquake.

At the February 13, 2012 OPUC hearing, the natural gas operator with facilities in the CEI Hub reported that they had not performed seismic vulnerability assessments of the natural gas system.

Electricity

Electrical facilities: Electrical facilities and systems have significant seismic risk due to ground shaking and ground failure, including liquefaction and lateral spreading. Seismically vulnerable facilities include substations and transmission in the CEI Hub as well as facilities outside of the CEI Hub, including power plants, substations and transmission lines. At the February 13, 2012 OPUC hearing, the investor-owned utility company with facilities in the CEI Hub reported that they had not performed seismic vulnerability assessments of the electrical system.

Major vulnerabilities in the CEI Hub include the control buildings, power transformers and other electrical equipment in yards at the substations, and transmission towers near the Willamette River. Damage is likely to occur to both the transmission system and the distribution system in the CEI Hub. Damage to the electrical grid will likely result in a blackout in the CEI Hub and elsewhere.

Bonneville Power Administration (BPA) has conducted a comprehensive seismic vulnerability study of their system and has had a long-term seismic mitigation program in place since 1993. BPA's long-term seismic mitigation program includes 1) investment protection (e.g. anchoring transformers), and 2) power system recovery of critical paths (e.g. hardening of equipment at one of multiple bays within a major substation). The first phase of BPA's mitigation program includes bracing and restraining critical equipment and seismically upgrading critical building facilities west of the Cascade Range. Seismic strengthening in the substation yard would typically include: anchoring high-voltage power transformers; bracing transformer conservators and radiators; replacing seismically vulnerable live tank circuit breakers with more robust dead tank circuit breakers; adding damping systems to existing live tank circuit breakers; hardening transformer bushing storage facilities; replacing rigid bus connections with flexible bus. These mitigation techniques will improve the reliability of seismic performance. Additional phases of the seismic mitigation program will include facilities east of the Cascade Range.

BPA has a critical 115 kV and 230 kV high voltage transmission river crossing in the CEI Hub as well as a substation. At the substation in the CEI Hub, some of the high-voltage equipment had been anchored and braced to withstand earthquake motions. BPA is in the process of conducting seismic strengthening of the control building and equipment inside the control building (e.g., brace computer floors, control cabinets, battery racks, ceiling, pipes, etc) and additional mitigation in the yard. BPA has conducted subsurface, liquefaction and lateral spreading analyses at one of the transmission tower sites at the Willamette River crossing and concluded severe ground movement up to 25 feet towards the river channel is possible. Until mitigated, it is likely that at least two transmission towers would experience extensive damage, be inoperable, require repair or replacement, and power lines could temporarily block river

traffic, including the pathway to the oil terminals. The BPA transmission towers at the Willamette River crossing are scheduled to be seismically analyzed, have a seismic mitigation design completed in 2013, and be mitigated by 2014.

Recent unpublished BPA Cascadia earthquake scenario studies of the existing transmission line system indicate that their main grid would require between 7 and 51 days to make emergency damage repairs to the transmission line system (Oregon and Washington) from a magnitude 9 Cascadia earthquake. This scenario assumes many ideal conditions (BPA employees and contractor resources are immediately available, all roads and bridges are passable, available fuel, etc), which is optimistic.

Impacts to Oregon

Based on visual observations, engineering judgment, limited analyses, and limited information from the facility operators, city records, and available literature, significant seismic risk exists in the CEI Hub. Some critically important structures appear to be susceptible to significant damage in a major earthquake with potentially catastrophic consequences. Multiple liquid fuel transmission pipe breaks and natural gas transmission pipe breaks are possible. Damage to liquid fuel, natural gas, and electrical facilities in the CEI Hub is likely. The waterway would likely be closed and require clean up.

Due to a combination of the existing seismic hazards, vulnerability of the exposed infrastructure and potential consequences, Cascadia earthquakes pose substantial risk to the CEI Hub and to Oregon. Not only are the energy sector facilities in the CEI Hub dependent on other sectors and systems in Oregon, including transportation and communication, they are interdependent upon each other. A major Cascadia earthquake and tsunami would likely produce an unprecedented catastrophe much larger than any disaster the state has faced.

Western Oregon will likely face an electrical blackout, extended natural gas service outages, liquid fuel shortage, as well as damage and losses in the tens of billions of dollars in a future major Cascadia earthquake. Preparing for a catastrophic disaster to become more resilient is needed to improve personal safety and security, and safeguard communities and businesses.

Section 7
Recommendations

The most critical call-to-action that DOGAMI has concluded from this study of the CEI Hub is this: Energy sector companies must **pro-actively integrate seismic mitigation** into their business practices for Oregon's energy sector to adequately recover from a magnitude 8.5 to 9 Cascadia earthquake in a reasonable time period.

Although energy sector companies have made efforts to prepare for seismic events, such as through emergency planning and complying with the current building codes, these efforts are limited and a timely restoration of energy sector services is questionable. As discussed in the Summary of Findings section, only one company has completed comprehensive seismic vulnerability assessments and instituted seismic mitigation plans. Energy sector companies must make earthquake mitigation an integral part of their overall business plan. This is not only prudent for the impact a large magnitude Cascadia earthquake would have on Oregonians and the environment; it is good business continuity management. Oregon homes, businesses and industries depend upon reliable energy sources. Liquid fuel, natural gas and electricity are critical to our economy, environment and everyday existence, and the energy sector must do more in order to assure those services and products in the event of a large earthquake.

Recommendations

In order for the energy sector to pro-actively integrate seismic mitigation into their operations, DOGAMI makes these four recommendations to both private and public energy sector stakeholders:

1. Energy sector companies should conduct ***Seismic Vulnerability Assessments*** on all of their systems or facilities, and should work with the appropriate local, state, tribal and federal government agencies and stakeholders to achieve timely completion of the assessments to understand existing vulnerabilities.
2. Energy sector companies should institutionalize long-term ***seismic mitigation programs;*** and should work with the appropriate local, state, tribal and federal government agencies and stakeholders to achieve timely and effective mitigation to ensure facility resilience and operational reliability.
3. The State of Oregon's ***Homeland Security Council*** should review the vulnerability and resilience of the energy sector to earthquakes and other natural disasters within the scope of their mission. This could involve the EAP partners (ODOE, OPUC, and DOGAMI) as well as ODOT, Building Codes Division, and the Oregon Seismic Safety Policy Advisory Commission (OSSPAC).
4. Energy sector companies and the State of Oregon should ***build Oregon's seismic resilience*** to a Cascadia earthquake. Adopting pro-active practices and a risk management approach will help achieve seismic resilience. Encouraging a culture of awareness and preparedness concerning the seismic vulnerability of the energy sector including long range energy planning should be conducted.

Recommendation #1: Conduct Seismic Vulnerability Assessments (SVAs)

To improve energy sector resilience to a catastrophic earthquake, energy sector companies will need to conduct Seismic Vulnerability Assessments (SVAs) of each individual energy facility in the CEI Hub and on a priority basis throughout Oregon. As part of the SVA, energy sector companies should identify key nodes or links at all of their facilities that, if they were to fail, would affect many customers over an extended duration. Companies should conduct an assessment to determine if the identified key nodes or links have high risk of failure during a magnitude 9 Cascadia earthquake. They should evaluate and prioritize the best mitigation options on their highest risk key nodes or links. Energy sector companies should consider a magnitude 8.5 to 9 Cascadia earthquake and tsunami during wet conditions (including co-seismic landslides, liquefaction and lateral spreading) as the basis of their assessments.

Following are suggestions regarding SVAs:

- Energy sector companies should use sector-appropriate guidelines and standards to conduct their SVAs. For example, the electric and natural gas companies can refer to the American Lifelines Alliance and the American Society of Civil Engineers or other industry guidelines and standards to conduct SVAs on facilities, systems, and components. (See *Table 3.*) This includes considering broader influences relating to: 1) co-location and interdependencies; 2) business continuity; 3) safety; 4) environmental damage/spills; 5) reliability of service; 6) other critical factors. The liquid fuel companies can refer to the Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS), a regulatory program implemented by California State Lands Commission that incorporates seismic safety.
- Energy sector companies should conduct SVAs on all their facilities and systems, including liquefaction vulnerabilities, and report to the appropriate authorities and stakeholders within a pre-determined time frame providing an overview of their assessment. This should include their evaluation in their current state of their expected down time in a Cascadia earthquake, which establishes baseline information, as well as expected recovery rate, and expected dependence on other sectors.
- Energy sector companies should report to the appropriate authorities and stakeholders within a pre-determined time frame providing an overview of their seismic mitigation plan, costs, and implementation timeframes.
- All energy sector companies should share assessments and mitigation plan with their ratepayers and shareholders in order to increase awareness and set realistic expectations for the public. This action would help develop support for a funding plan that is both transparent and accountable.
- State agencies (ODOE, OPUC, and DOGAMI) responsible for the Energy Assurance Project (EAP) should provide technical guidance to energy sector companies to achieve reliable energy-related services.
- Energy sector companies and public agencies should look for opportunities for public-private sector partnerships to prepare for Cascadia earthquakes. This would include pilot projects involving SVAs, risk management tools, and mitigation. For example, the Bonneville Power Administration (BPA) has plans to mitigate transmission towers at the lower Willamette River crossing by 2014. There could be significant cost advantages if the privately-owned adjacent towers were upgraded in coordination with the BPA effort.

Although building codes for energy sector facilities are limited, many guidelines on how to design seismically resistant systems and conduct seismic vulnerability studies for systems are available. DOGAMI compiled the *Table 5* Seismic Engineering Reference List as a service to energy facility owners as part of the EAP. DOGAMI recommends energy companies to use the sector-appropriate references, adopt high seismic standards and build for high seismic performance. *Table 5* Seismic Engineering Reference List is useful for new and existing energy-related structures and contains some information on best practices. The list should be updated as new key references are made available.

TABLE 5: SEISMIC ENGINEERING REFERENCE LIST

This Reference List was developed by DOGAMI staff for this EAP study in March 2010. It includes current and useful references for seismic vulnerability studies and mitigation efforts at energy facilities. Companies should consult with facility engineers to determine appropriate references and guidelines to conduct seismic assessment and mitigation. This will depend on each facility and their proposed or existing structures. Companies should consider the ground conditions at their facility, in particular, site-specific liquefaction and lateral spreading potential. We have listed websites where available. Some references need to be purchased.

Acronyms:
ALA - American Lifelines Alliance www.americanlifelinesalliance.org
ASCE - American Society of Civil Engineers
IBC - International Building Code
IEEE - Institute of Electrical and Electronics Engineers
MOTEMS – Marine Oil Terminal Engineering and Maintenance Standards, State of California
PRCI - Pipeline Research Council International
TCLEE - Technical Council on Lifeline Earthquake Engineering (under ASCE)

Buildings
Current IBC (for new buildings)
New IBC seismic provisions adopt ASCE 7 and only provide a few exceptions or alternatives to ASCE 7 (ref. ASCE 7-2005: Minimum Design Loads for Buildings and Other Structures, newest edition ASCE 7-10)

ASCE 31 and ASCE 41 (31 for evaluation of existing buildings; 41 for mitigation)
Seismic Evaluation of Existing Buildings, SEI/ASCE 31-03
Seismic Rehabilitation Of Existing Buildings ASCE/SEI 41/06
NOTE: Neither of these specify explicit retrofit requirements. The user needs to determine goals.

Electrical

IEEE 693 RECOMMENDED PRACTICE FOR SEISMIC DESIGN OF SUBSTATIONS (2005)

ALA Electric Power Systems Guidelines and Commentary (for scoping studies). April 2005

ASCE 113, Substation Structure Design Guide, Manuals of Practice, Editor: Leon Kempner Jr., 2008, 164 pp

ASCE Manual No 96.Guide to Improved Earthquake Performance of Electrical Power Systems. TCLEE. Editor: Anshel Schiff. 1999 http://fire.nist.gov/bfrlpubs/build98/PDF/b98069.pdf

TABLE 5: SEISMIC ENGINEERING REFERENCE LIST (cont.)

Petroleum and Natural Gas Facilities, including Waterfront Structures, Tank Farms, and Telecommunications

ASCE Petrochemical facilities seismic guidelines (1997 and forthcoming 2011)

Guidelines for the Seismic Evaluation and Design of Petrochemical Facilities (task committee of Petrochemical Committee of Energy Division of ASCE)

Waterfront
ASCE TCLEE monograph 12. Seismic Guidelines for Ports. March 1998. Editor: Stuart Werner

MOTEMS The most current version of MOTEMS (Rev. 0) is at:
http://www.slc.ca.gov/Division_Pages/MFD/MOTEMS/MOTEMS_Home_Page.html
MOTEMS Rev. 1 is expected to become law around Q4 2010, and has already been accepted by the CA Building Standards Committee. You can view all of the changes that will be adopted (the Express Terms) at: http://www.slc.ca.gov/Division_Pages/MFD/MFD_Home_Page.html

Tanks, Piping and Control Equipment, incl. Natural Gas Piping and Well Facilities
ASME/ANSI B31E-2008, Standard for the Seismic Design and Retrofit of Above-Ground Piping Systems

ASME Piping Codes:
ASME B31.4 (2006) Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids
ASME B31.8 (2007) Gas Transmission and Distribution Piping Systems
ASME B31.3 (2006) Process Piping

Honegger, D.G. and D.J. Nyman (2004), Guidelines for the Seismic Design and Assessment of Natural Gas and Liquid Hydrocarbon Pipelines, PRCI catalog no. L51927.
http://prci.org/index.php/pm/pubs_details/

API 620 (2008), Design and Construction of Large, Welded, Low-pressure Storage Tanks

ALA (2002) Guideline for the Design of Buried Steel Pipe

API 650 (2007) Welded Tanks for Oil Storage, 11th Edition, Addendum 1 (2008) and Addendum 2 (2009), American Petroleum Institute

California Accidental Release Prevention (*CalARP*)
http://www.oes.ca.gov/Operational/OESHome.nsf/97859617169196278825 6b350061870e/452A4B2AF244158788256CFE00778375?OpenDocument

ALA Guide for Seismic Evaluation of Active Mechanical Equipment, 2008 (for walk through assessments)

ALA Oil and Natural Gas Pipeline Systems Guidelines and Commentary (for scoping studies)

ALA Guideline for the Seismic Design and Retrofit of Piping Systems (for scoping study purposes; used to develop B31E)

For the EAP, DOGAMI considers the primary performance target as maintaining system reliability after a major Cascadia earthquake. Maintaining service reliability does not mean maintaining 100% operation. Instead it refers to minimizing the extent and length of service disruption and quick restoration of services to high priority customers (e.g., certain emergency facilities and critical infrastructure) and in logical geographic areas (e.g., large population centers

as opposed to tsunami inundated zones where people have been displaced). Other performance targets may also be important and largely depends on one's perspective. For the operator, protecting workers and preventing monetary losses may be the top priorities. As shown below, SVAs can be conducted to address one or more of these specific performance targets:

- Protect public and utility personnel safety
- Maintain system reliability
- Prevent monetary loss
- Prevent environmental damage (ALA, 2004)

Tables 6, 7 and *8* summarize examples of Seismic Vulnerability Assessments with varying scopes for liquid fuel, natural gas, and electricity. The tables are not meant to be all-inclusive.

As the first example in *Table 6*, SVAs of the liquid fuel sector could include engineering analyses of specific components, such as piers, tanks or loading racks. An SVA of the transmission system to deliver the fuel should be conducted. This would include assessing the transmission pipeline for vulnerabilities, such as river crossings, and assessing the reliability of the transportation route over water. An SVA of the facility itself could be conducted, including the waterfront structures, control building, tanks, pipes and loading racks. An SVA of the network system's interdependencies *on* other energy systems could be conducted, including the refineries, which are the upstream portion of the supply chain, the navigational waterway, and electricity for equipment such as pumps. The last example is an SVA of the system's interdependencies *by* other services, such as those who require fuel for emergency vehicles and emergency generators.

Liquid Fuel

Table 6: Seismic Vulnerability Assessment examples

Liquid Fuel **Scope of Seismic Vulnerability Assessments (SVA)**	**Example Target**
SVA of components	Pier, tank, or loading rack
SVA of transmission: pipelines and marine shipping	Transmission river crossings, Columbia river mouth tsunami damage
SVA of facility	Holistic analyses, including liquefaction potential
SVA of network system's interdependencies on others	Dependency on refineries, navigational waterway, electricity for pumps
SVA of network system's interdependencies by others	Emergency vehicles and generators

Natural Gas

Table 7: Seismic Vulnerability Assessment examples

Natural Gas **Scope of Seismic Vulnerability Assessments (SVA)**	**Example Target**
SVA of components	LNG storage tank
SVA of transmission path	Gate stations, bridge crossings, underground river crossings
SVA of network system	Holistic analyses
SVA of network system's interdependencies on others	Dependency on local communication systems
SVA of network system's interdependencies by others	Gas service reliability to hospital

Electricity

Table 8: Seismic Vulnerability Assessment examples

Electrical **Scope of Seismic Vulnerability Assessments (SVA)**	**Example Target**
SVA of components	Power transformer and switchyard equipment reliability
SVA of priority path	Path connecting critical substation components
SVA of network system	Holistic analyses including engineering data
SVA of network system's interdependencies on others	Dependency on local transportation systems
SVA of network system's interdependencies by others	Power disruption to water treatment plant and water systems to fight fires

Recommendation #2: Institutionalize Seismic Mitigation Programs

Mitigation programs should address life safety, environmental impacts, and recovery times as well as minimize potential damage. The Seismic Vulnerability Assessments should be followed by prioritized mitigation measures to protect critical links of the energy systems from irreparable damage as well as to ensure rapid recovery of energy services. After completing SVAs, energy companies should establish priorities and determine possible methods to reduce vulnerabilities and undesired effects. Assuming the costs associated with implementing the mitigation plans are significant, the high costs can be managed by implementing the mitigation plan over several years.

DOGAMI recommends energy companies in Oregon to develop and implement long-term mitigation plans and strategies to reduce damages from future disasters so as to maintain services. Following are suggestions regarding the development of seismic mitigation programs:

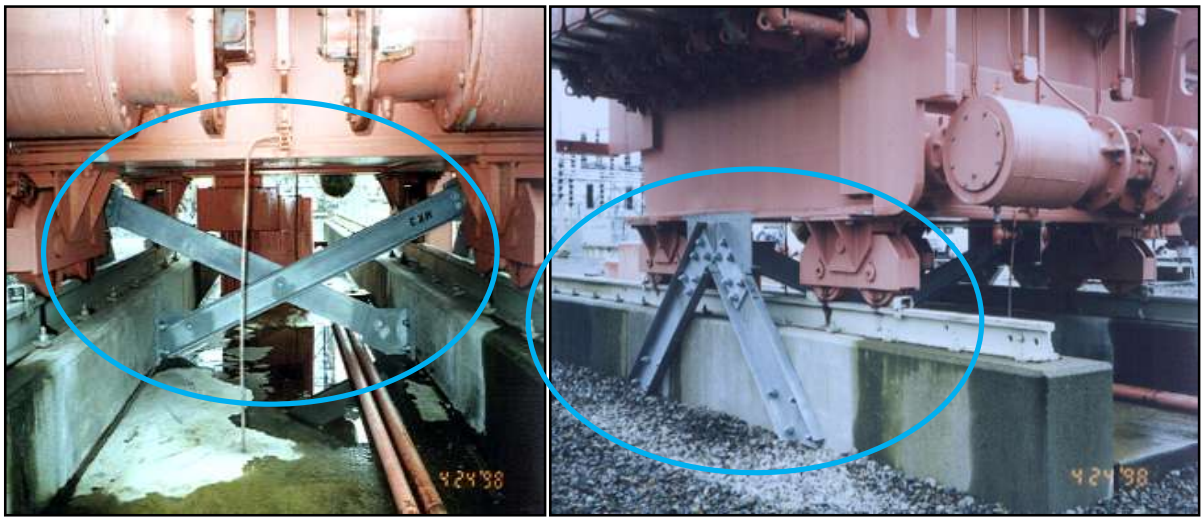
1) Consider benefits versus costs (e.g., using benefit-cost analyses) together with basic societal needs

2) Prioritize actions
3) Consider resilience (example: if there is redundancy in the system, then perhaps controlled/limited damage is acceptable)
4) Determine costs and funding source
5) Integrate plans and strategies into other company efforts, such as business continuity and emergency response planning
6) Provide updates to the appropriate authorities and stakeholders on their seismic mitigation plan, costs, and implementation timeframes.

The mitigation measures can range from changes to the energy system by strengthening, replacing, relocating, or adding redundant systems elsewhere. Liquefaction mitigation could involve a variety of approaches, including ground improvement techniques (e.g., dynamic compaction, stone columns, and compaction grouting) or specially designed liquefaction resistant foundations (e.g., pile or mat). A seismic mitigation program should consider a risk management approach in order to utilize funds efficiently for the best outcomes. Seismic mitigation program should also be integrated into the company's institutionalized programs, such as in the risk management or business continuity programs, and include stable funding. The following photos show two mitigation examples. *Figures 64 and 65* show a vulnerable battery configuration and a seismically ready battery rack for emergency purposes, which provides a reliable power source. *Figures 66* and *67* show an existing high voltage power transformer that has been seismically braced. *Figures 68* and *69* show improperly anchored transfomers. Protecting power transformers and other equipment that is difficult to replace should be a high priority.



Figures 64 and 65: Batteries should not be on a wheeled cart as in the photo on the left. Emergency batteries, as well as other components such as generators and communication devices, should be braced on an anchored rack to withstand Cascadia earthquake forces as in the photo on the right. (DOGAMI photos)



Figures 66 and 67: Left photo shows the front view of an existing transformer with seismic anchorage including steel cross bracing as mitigation. The right photo shows the side view of the same existing transformer with diagonal bracing. (Photos: Leon Kempner)



Figures 68 and 69: The photo on the left shows high voltage transformers (orange color) in the CEI Hub that require proper anchorage. The close-up photo on the right shows that the transformer is anchored, but the anchorage was poorly installed or poorly maintained as evidenced by the amount of grout that is missing. (DOGAMI photos)

Tables 9, 10 and *11* provide mitigation examples for the liquid fuel, natural gas, and electricity industries. The examples are not meant to be comprehensive, but rather convey basic ideas of possible weak areas coupled with possible strengthening methods. Companies will need to consider each and every facility, structure or system in a prioritized manner. Mitigation programs can involve short-term, medium-term, and long-term activities.

Mitigation measures for the liquid fuel sector (Table 9) could entail improving the strength of the ground at existing piers or wharves to control ground deformation from liquefaction and lateral spreading of the foundation soils. Mitigation could focus on the tank yards because of the liquefaction-induced ground settlement potential. The underlying soils and the foundation of the

tanks could be strengthened, the bottom of the tanks could be strengthened, or new tanks could be installed. Pipes with rigid connections could be mitigated by adding flexible connections or rerouting the pipe configuration. Similarly, emergency shut-off valves could be added to the pipe network in strategic places to isolate fuel and control damages. Control buildings could be mitigated by structural upgrades to the building and non-structural upgrades, such as strapping computers. The last example is that the loading racks could be mitigated to improve the operation of the pumps by providing a connection for an emergency generator.

Liquid Fuel

Table 9: Mitigation examples

Liquid Fuel	**Component Example**	**Mitigation Option Example**
Piers and wharves	Ground deformation from lateral spreading of soils	Improve ground to control ground failure
Tank yards	Ground settlement of tanks from liquefaction	Strengthen tank foundation
Piping	Pipes with rigid connections	Add flexible connections
Control building (inside)	Operations room	Strap computers
Loading racks	Electrical for pumps	Add connection for portable emergency generator

Natural Gas

Table 10: Mitigation examples

Natural Gas	**Component Example**	**Mitigation Option Example**
Gate station	Ground deformation from soil liquefaction	Ground improvement using drains and grout
LNG storage facility	LNG tank	Install base isolation system
Control building	Uninterruptible power supply (UPS)	Remove wheels and anchor rack
Control building (inside)	Back up batteries	Strap batteries on earthquake resistant battery rack Figure 9
Transmission pipe	Transmission pipes at river crossing	Strengthen soils to prevent liquefaction and lateral spreading

Electricity

Table 11: Mitigation examples

Electrical	Component Example	Mitigation Option Example
Substation control building	Structural stability of building	Add exterior shear walls
Substation control building (inside)	Stability of control equipment	Brace tall cabinets and communication trays
Substation yard	Power transformer	Anchor to prevent sliding (Figure 10)
Substation yard	Bus support structure	Add flexibility and slack to power connections between equipment
Transmission corridor	Transmission tower at river crossing	Strengthen foundation system for liquefaction

Recommendation #3: Oversight by Homeland Security Council

To secure a stable energy supply, Oregon must provide a resilient supply chain during normal operations as well as during extreme crisis conditions, such as after a Cascadia earthquake. In addition to performing mitigation activities on energy facilities, vulnerabilities of essential transportation and telecommunication systems that support energy sector operations and recovery need to be addressed in order to ensure that the energy sector is not hindered by interdependencies with other critical infrastructure. DOGAMI recommends the State of Oregon's ***Homeland Security Council*** review the vulnerability of the critical energy sector in Oregon and consider action within the scope of their mission to improve the resilience of the system to natural disasters. Important considerations would include the energy sectors' interdependencies with each other as well as with the transportation, telecommunication, and other critical sectors. The Council could involve the EAP partners (ODOE, OPUC, and DOGAMI) as well as other agencies and commissions, including ODOT, Building Codes Division, and the Oregon Seismic Safety Policy Advisory Commission (OSSPAC). The Council could consider long term energy planning and goal setting efforts and requiring accountability on progress in seismic energy security and reliability.

Seismic Energy Security Efforts

As part of this study, the EAP partners considered who could ensure that adequate progress is being made towards achieving reliable energy sector services after a major Cascadia earthquake. We identified a number of existing relevant organizations that could address reliability of services in the energy sector. We concluded that the current efforts being made by existing organizations were inadequate as they mostly focused on emergency response and not on reliability of energy sector services. As an example, Oregon Emergency Management's (OEM) Oregon Emergency Response System (OERS) includes Emergency Support Function #12 — which focuses on restoration of damaged energy systems and components during a potential or actual emergency or major disaster (http://www.oregon.gov/OMD/OEM/plans_train/docs/eop/esf_12.pdf). We considered recommending the formation of a new group with this specific focus but quickly determined rather than creating another group, that tapping into an existing organization would be

preferable. We determined that group of a high-level individuals who could make major decisions and create new policies was preferred. As such, we identified the Homeland Security Council as the best option. Its membership consists of: (a) Four members from the Oregon Legislative Assembly; (b) The Governor; (c) The Adjutant General; (d) The Superintendent of State Police; (e) The Director of the Office of Emergency Management; and (f) Additional members appointed by the Governor who the Governor determines necessary to fulfill the functions of the council, including state agency heads, elected state officials, local government officials, a member of the governing body of an Indian tribe and representatives from the private sector (http://www.oregonlaws.org/ors/401.109). In May 2012, OPUC and DOGAMI met with the General Mike Caldwell, director of OEM, and OEM staff to explore whether or not the Homeland Security Council would be an appropriate group to take on this task. At the meeting, we learned that the Homeland Security Council had limited productivity, was recently downsized, but also received very positive feedback on it as a likely appropriate group to address seismic security of the energy sector.

The EAP partners initiated efforts to evaluate possible emergency land, air and river transportation routes, including by air reconnaissance with the assistance of the Civil Air Patrol (CAP), in August 2010. Based on the initial findings, DOGAMI recommends that the Council examine the transportation and telecommunication sectors to better understand and address shortcomings in critical operational interdependencies. Reliable critical transportation routes during earthquake disasters are vital for emergency response and recovery, including fuel distribution. Information on telecommunication frameworks and seismic preparedness guidelines are provided in Appendix C: Telecommunications: Seismic Codes and Guidelines.

The Council could work with Building Code Division, OSSPAC, engineering and construction industries and other key stakeholders to identify and rectify existing gaps in the seismic provisions of the current building codes. For example, the current codes do not require facilities that are operating well beyond their design life to be re-examined even when there are significant public safety concerns.

Recommendation #4: Build Oregon's Seismic Resilience

Oregon energy facilities are generally prepared for most natural hazards, such as localized severe winter storms. However, the energy sector is not prepared for a catastrophic Cascadia earthquake disaster. The CEI Hub is one critical part of a state economy that is within a disaster-prone area. If damaged, Oregon's economy could result with catastrophic consequences. To date, there are inadequate safety protocols to protect Oregon from significant earthquake impacts to the CEI Hub as this study has shown. On the state level, Oregon is considered to have low resilience to a major Cascadia earthquake.

In contrast, on a national level, the U.S. will be able to absorb the shock from a major Cascadia earthquake and tsunami. Oregon would be assisted by many others, including the federal government, the non-profit sector, and a variety of private companies. Many energy sector organizations that operate in Oregon would have extensive assistance from their own companies as well as other energy sector companies that have mutual aid agreements in place. In order to build seismic resilience for critical energy infrastructure operations and interdependencies in Oregon, we need to pursue the recommendations listed on the following pages. In additional to

the recommendations, Oregon can adopt a risk management strategy. The concept of "resilience," which is a relatively new term in disaster preparedness, is described below.

"Resilience" has a variety of definitions. One definition of resilience is the capacity of a system or a structure to absorb and recover from a shock (Bruneau et al, 2005; http://mceer.buffalo.edu/research/resilience). Resilience can be defined to include four elements:

1. ***Robustness*** - strength, or the ability of elements, systems, and other units of analysis to withstand a given level of stress or demand without suffering degradation or loss of function;
2. ***Redundancy*** - the extent to which elements, systems, or other units of analysis exist that are substitutable, i.e., capable of satisfying functional requirements in the event of disruption, degradation, or loss of function;
3. ***Resourcefulness*** - the capacity to identify problems, establish priorities, and mobilize resources when conditions exist that threaten to disrupt some element, system, or other unit of analysis (resourcefulness can be further conceptualized as consisting of the ability to supply material - i.e., monetary, physical, technological, and informational - and human resources to meet established priorities and achieve goals); and
4. ***Rapidity*** - the capacity to meet priorities and achieve goals in a timely manner in order to contain losses and avoid future disruption. (http://mceer.buffalo.edu/research/resilience/resilience_10-24-06.pdf)

In 2011, the National Research Council (NRC) released a report, *"National Earthquake Resilience."* This report included the following list and *Table 12* addressing resilience:

- Relevant hazards are recognized and understood.
- Communities at risk know when a hazard event is imminent.
- Individuals at risk are safe from hazards in their homes and places of work.
- Disaster-resilient communities experience minimum disruption to life and economy after a hazard event has passed. (NRC, 2011)

The National Research Council's report made these observations on what condition a state with high resilience should be in following a catastrophic earthquake:

- *No systematic concentration of casualties.* Important or high-occupancy structures (e.g. schools, hospitals, and other major institutional buildings; high-rise commercial and residential buildings) do not collapse, and significant numbers of specific building types (e.g. hazardous unreinforced masonry structures) do not collapse. There are no major hazardous materials releases that would cause mass casualties.

- *Financial loss and societal consequences are manageable, not catastrophic.* Damage to the built environment is reduced to avoid catastrophic financial and societal losses due to overwhelming cost of repair, casualties, displaced populations, government interruption, loss of housing, or loss of jobs. Community character and cultural values are maintained following disasters; there is not wholesale loss of iconic buildings (including those designated as historic), groups of buildings, and neighborhoods of architectural, historic, ethnic, or other significance.

- *Emergency responders are able to respond and improvise.* Roads are passable, fire suppression systems are functional, hospitals and other critical facilities are functional. It is noteworthy that during the 9/11 attacks, New York City's response was hampered by the need to set up a new Emergency Operations Center as the existing one had been located in the World Trade Center.

- *Critical infrastructure services continue to be provided in the aftermath of a disaster.* Energy, water, and transportation are especially critical elements. Telecommunications are also very important. Continued service is needed for critical facilities such as hospitals to function, as well as for residents to remain sheltered in their homes.

- *Disasters do not escalate into catastrophes.* Infrastructure interdependencies have been anticipated and mitigated, so that disruptions to one critical infrastructure do not cause cascading failures in other infrastructures (e.g. levee failures in New Orleans escalated the disaster into a catastrophe). Fires are quickly contained and do not develop into major urban conflagrations that cause mass casualties and large-scale neighborhood destruction.

- *Resources for recovery meet the needs of all affected community members.* Resources for recovery are available in an adequate, timely, and equitable manner. To a large extent, local governments, non-profit organizations, businesses, and residents would have already materially and financially prepared for a major disaster (e.g. are adequately insured; have undertaken resilience activities on their own and in cooperation with others). Safety nets are in place for the most vulnerable members of society.

- *Communities are restored in a manner that makes them more resilient to the next event.* Experience is translated into improved design, preparedness and overall resilience. High-hazard areas are rebuilt in ways that reduce, rather than recreate, conditions of disaster vulnerability (NRC, 2011).

Table 12: Resilience applications to social, ecological, physical, and economic recovery by time period. (National Research Council - NRC, 2011)

Timescale	Emergency Response	Health & Safety	Utilities	Buildings	Environmental /Ecological	Economic
Immediate < 72 hours	Tactical emergency response	Deal with casualties/ Reunite families	Use of emergency back-up systems	Remove Debris	Limit further ecological damage	Maintain supply of critical goods & services
Emergency 3-7 days	Strategic emergency response	Provide mass care	Begin service Restoration	Provide shelter for homeless	Remove debris	Prioritize use of resources/ substitute inputs/conserve
Very short 7–30 days	Selective response	Fight infectious outbreaks	Continue restoration	Provide shelter for homeless	Protect sensitive ecosystems	Shore-up or over-ride markets
Short 1-6 months	Assist in recovery	Deal with post-traumatic stress	Complete service restoration	Provide temporary housing and business sites	Deal with ensuing problems	Cope with small business strain
Medium 6 months–1 year	Reassess for future emergencies	Deal with post-traumatic stress	Reassess for future emergencies	Provide temporary housing and business sites	Initiate remediation	Cope with large business strain/recapture lost production
Long >1 year	n.a.	Reassess for future emergencies	Mitigation for future events	Rebuild & Mitigation	Mitigation for future events	Cope with business failures/ mitigation

For the EAP, DOGAMI developed the resilience triangle graph with the resilience triangle shown in green. (*Figure 70*) The basic principle of the resilience triangle is that the smaller the triangle, the higher the resilience. Higher resilience requires minimal reductions in critical lifeline services after a disaster, speedy recovery of those services, and an overall improved service level as a result of rebuilding damaged systems and implementing better systems. Chile and Japan have high levels of earthquake resilience on the basis of their performance after the 2010 magnitude 8.8 earthquake in Chile and 2011 magnitude 9.0 earthquake in Japan (notwithstanding the nuclear energy issues). At the current stage, Oregon's energy sector has low resilience and is expected to have significant loss of energy sector services and a slow recovery time.

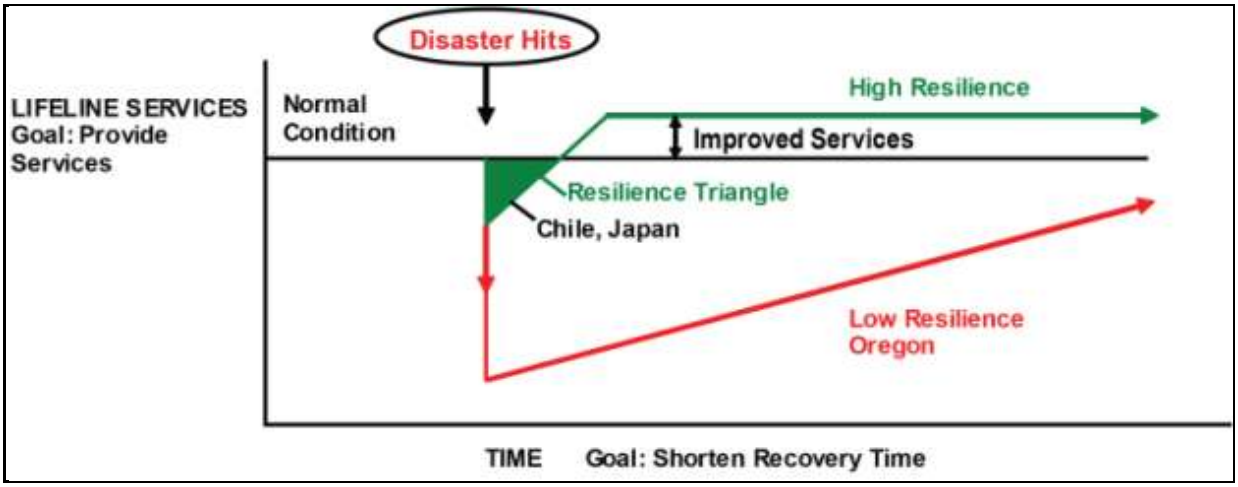


Figure 70: DOGAMI Resilience Triangle illustrates that high resilience is due to a combination of low losses, quick recovery and services improved to a higher level than before the disaster (DOGAMI modified from Bruneau et al, 2005)

Recommended Practices for Building Seismic Resilience

The following list is composed of suggested practices for energy sector companies. These suggestions are not prioritized and are not all-inclusive. The first four suggestions concern emergency response and recovery; the remaining suggestions pertain more to pre-disaster planning.

- Energy sector companies should have specific memorandums-of-understanding (MOUs) in place with energy sector organizations and nearby businesses/industries to assist one another during emergency situations. This would include MOUs with industry partners throughout the US who can be called upon for assistance. These MOUs must be in place and coordinated in advance of an earthquake.
- Energy sector companies should have essential spare parts readily available to repair damaged equipment and keep equipment operational. For example, electrical utilities should have an adequate supply of insulators on hand as insulators are susceptible to breakage during earthquakes. Oil companies should have fuel hoses available to keep equipment operational on a temporary basis.
- Energy sector companies should maintain safe conditions following a major Cascadia earthquake, and if necessary, have earthquake-resistant emergency generators, fuel cells or battery banks to power critical operations. Existing generators in flood prone areas may require relocation to higher points or placement in water-proof vaults.
- Energy sector companies should consider where they would set up company emergency headquarters if current facilities are unavailable. A reliable facility outside the CEI Hub and, perhaps, east of the Portland area, may be a good choice to serve as a control center following a Cascadia earthquake. The energy sector may want to establish a regional emergency operation center—perhaps a virtual clearing house—to help coordinate restoration of energy sector services.
- Both the public and private sector should assess what resources may be needed to continue critical energy operations following a Cascadia earthquake. They should

proactively make provisions to minimize the impact, rather than rely on a robust response operation. Existing entities, including the Department of Homeland Security (DHS) Fusion Center, DHS U.S. Coast Guard Area Maritime Security Committees, and the Oregon Emergency Response System Council should consider taking steps to reduce potential damage to the energy sector before a Cascadia earthquake, which requires partnering to ensure readiness.

- Energy sector companies should review and learn pertinent information from prior earthquakes, such as the 2004 magnitude 9.1 Sumatra earthquake, 2010 magnitude 8.8 Chile earthquake, and 2011 magnitude 9.0 Japan earthquake. Although it can be difficult to extract practical information depending upon the country and situation of the prior earthquake, two non-profit organizations provide sources of information on impacts from major earthquakes. These include: 1) American Society of Civil Engineers that publishes lifeline information, including the energy sector, on "Technical Council of Lifeline Earthquake Engineering" after major worldwide earthquakes (http://www.asce.org/Content.aspx?id=2147488653) , and 2) Earthquake Engineering Research Institute's (EERI) that has the Learning from Earthquakes Program (http://www.eeri.org/projects/learning-from-earthquakes-lfe/). The EERI focus is broad (geosciences, emergency response, building, and more).
- Energy sector companies should turn to industry-specific seismic documents to help evaluate and improve existing components and systems and design new construction. The goal is to reduce and control potential damage. For example, the Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS) is a regulatory program implemented by California State Lands Commission that incorporates seismic safety for the liquid fuel industry's oil terminals. *Figure 71* shows a seismic instrument at a facility regulated by MOTEMS. The American Lifelines Alliance and American Society of Civil Engineers provide similar seismic guidelines for the electrical, natural gas and liquid fuel industries.
- Energy sector companies should look for engineering solutions that are industry appropriate. For example: Liquid fuel companies could construct new tanks and piping to withstand liquefaction hazards by strengthening the underlying soils, designing robust foundations and installing flexible piping connections. Seismically mitigation for existing important tanks could also be conducted. Natural gas companies could consider in-ground LNG tanks such as those commonly built in Japan. In-ground tanks can be designed to address buoyancy forces in liquefiable soils. Oil and gas companies could design their systems to be able to isolate certain blocks of areas using control valves in order to better control or contain damage. Isolating areas prone to liquefaction to prevent cascading damage is a possibility. Electrical companies could build micro-grids for important facilities or districts so areas could be isolated and continue to operate if the main grid goes down. A micro-grid in Sendai, Japan performed well after the 2011 earthquake (http://spectrum.ieee.org/energy/the-smarter-grid/a-microgrid-that-wouldnt-quit).
- Energy sector companies should determine target performance levels to provide service after a Cascadia earthquake, and in time, achieve those performance objectives. For example, after a winter storm, an electricity company may determine that a target performance level to restore 75 percent of customers' within 24 hours, 90 percent within 48 hours, and 100 percent within one week is achievable. Energy sector companies

should evaluate the cost to achieve the "target" by using sound methods (e.g., benefit cost assessments to verify that the upgrades are cost effective). Any targets that are discovered to be unachievable (e.g., after reasonable mitigation efforts have been made) after should be adjusted on an iterative basis. For a Cascadia earthquake, target time frames should be longer than under typical downtime events, due to the expected widespread damage and interdependencies. Seismic mitigation efforts and temporary workarounds should be factored into this target performance level. For example of a possible workaround, temporary piping or hoses can be installed to bypass damaged pipes for liquid fuel or damaged oil terminal piers to address for fuel supply and distribution services. Restoration goals would likely vary between the heavy commercial areas in the Portland metro area, the heavily populated I-5 corridor, rural areas, and coastal areas. As an example, after 10 years of mitigation implementation, a target performance level for electricity restoration might be set for the Portland metro area at 75 percent restored by 48 hours, 90 percent by 4 days, 95 percent after 1 week and about 100 percent after 1 month. For the coastal area above the tsunami inundation zone, the target might be at 75 percent restored by 5 days, 90 percent by 2 weeks, 95 percent after 2 months and about 100 percent after 4 months. (These restoration rates for electricity are not recommendations, but provided as illustrations.)

- Energy sector companies should institutionalize comprehensive seismic mitigation plans that include costs and implementation timeframes.
- Both the public and private sectors should improve the available redundancy in systems where little or no redundancies are currently available. For example, oil companies should explore building expanded or new fuel terminals on stable ground (i.e., not susceptible to liquefaction). Likewise, natural gas companies should consider building redundancy into the natural gas system south of the greater Portland metropolitan area. The proposed Palomar transmission line to connect an eastern Oregon natural gas pipeline in Molalla and the proposed LNG terminal in Coos Bay are two options under recent consideration.
- Energy sector companies with co-located facilities can look at joint opportunities to make ground improvements to mitigate liquefaction.
- Energy sector companies should discuss the length of time for restoring services with critical customers such as water treatment plants. If the projected restoration time is too long for critical customers, those customers might be encouraged to find other emergency power sources such as emergency generators with ample fuel supply or alternative energy sources. Similarly, energy sector companies could discuss the anticipated restoration time for geographic areas such as along the Oregon coast. It may be prudent to install systems for emergency electricity purposes in distributed geographic regions expected to have slower restoration of services, for example, in Coos Bay, Newport, and Astoria.



Figure 71: This photo shows an example of an oil company in California that is following best practices learned from other earthquakes. The white box contains an accelerometer that records site-specific data. Having the recorded ground motion data will allow engineers to better understand the performance of the structures at the oil terminal and help them evaluate the structural performance and improve future designs. (DOGAMI photo)

Risk Management Approach

A major Cascadia earthquake and tsunami will deliver a simultaneous shock to many of the energy systems that Oregonians depend on to support our lives and communities. As damaging as a Cascadia earthquake will be, prudent investments in resilient energy infrastructure can save lives, minimize a catastrophe and accelerate economic recovery. Creating resilience by using an earthquake risk management strategy is recommended. (*Figure 72*)

Earthquake risk management includes five components:

1. Hazard identification
2. Risk assessment
3. Engaging stakeholders
4. Risk prioritization, and
5. Risk mitigation.

The approach should be holistic and realistic— it is not possible to eliminate the risk of damage and impacts, but it is possible to reduce the expected damage to a controllable level. Because Cascadia earthquakes occur infrequently, adopting a long-term view of building resilience is reasonable.



Figure 72: Earthquake Risk Management Strategy (Wang, 2010)

As part of this project, DOGAMI, OPUC and ODOE (the EAP partners) promoted seismic awareness of Oregon's critical energy infrastructure. We developed productive relationships with other state agencies, federal agencies, energy sector companies, associations, emergency response organizations and other major stakeholders regarding seismic preparedness giving about 60 presentations. We conducted table-top exercises and extensive outreach, including:

- 2009 EAP partner hosted fuel sector table-top held at NWN headquarters
- 2010 DOGAMI testimony to House of Representatives Transportation Committee
- 2010 DOGAMI testimony to House of Representatives Veterans and Emergency Services Committee
- 2010 Interagency Hazard Mitigation Team meeting held at the Oregon Emergency Management
- 2011 Energy Assurance: Lessons from Japan's Earthquake Disaster symposium held at the Oregon Capitol. Sponsored by OPUC and DOGAMI, co-sponsored by Cascadia Region Earthquake Workgroup and Oregon Seismic Safety Policy Advisory Commission. Speakers included Senate President Peter Courtney, Representative Deborah Boone, Susan Ackerman (PUC Commissioner), Chris Goldfinger (scientist), Kit Miyamoto (engineer). Participants included Vicki McConnell (director of DOGAMI), General Mike Caldwell (director of OEM), Carmen Merlo (director of Portland Bureau of Emergency Management), Eric Corliss (COO of Oregon Red Cross).
- 2011 EAP partners joint presentation to Oregon Emergency Response System held at the Oregon Emergency Management
- 2011 Pacific Northwest Economic Region Annual Summit, Disaster Resilience Energy Assurance session, co-organized by Alice Lippert, Program Manager, the U.S. Department of Energy's Energy Assurance Program and co-moderated by Ken Murphy, the then FEMA Region X Administrator (http://www.pnwer.org/2011AnnualSummit/LongAgenda.aspx).

These efforts were minimal, however, considering the task at hand. In order to build resilience in Oregon's energy sector, it is necessary to increase awareness on the risk to the energy sector and Oregonians from a Cascadia earthquake. There needs to be a cultural shift by Oregonians to become an earthquake preparedness culture. More transparency and accountability in the energy sector on Cascadia preparedness is required.

Encourage a Culture of Earthquake Preparedness

Since the terror attacks in the US on September 11, 2001, Americans have become much more aware of and supportive of security precautions. Rather than wait for an earthquake disaster to strike, Oregon should take precautions today and become better prepared.

It is not a question of *if* a large magnitude Cascadia earthquake will occur, but *when* it will occur. This study has demonstrated that Oregon's CEI Hub is vulnerable to a Cascadia earthquake, and its failure will impact our supply and sources of liquid fuel, natural gas and electricity throughout Oregon. Oregonians have experienced gas shortages during the 1970s, and power outages during winter storms.. Following a Cascadia earthquake, there will likely be *no* gas available to the public for a considerable period of time. During a winter storm, power outages last hours to days long. After a Cascadia earthquake, many Oregonians could be without heat and electrical power for months.

Oregonians should heed this study's findings, that:

- A Cascadia earthquake will occur.
- Oregon's CEI Hub – where critical energy infrastructure is located in a six-mile stretch of land – is vulnerable to a Cascadia earthquake.
- Oregon's resilience to a Cascadia earthquake is low.
- Energy sector companies must adopt best practices and pro-actively integrate seismic mitigation efforts into their business operations to prepare their facilities and systems to absorb and recover from a Cascadia earthquake and to sufficiently restore critical electric, natural gas and liquid fuel services to Oregon homes, businesses and industries in a reasonable time period.
- More stringent oversight on seismic preparedness in the energy sector (liquid fuel, electricity and natural gas) may be needed. ###

Section 8
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Section 10
Appendices

A Oregon Economic Interdependency Assessment of the Energy Sector
B Lateral Spreading Sensitivity Study
C Telecommunications: Seismic Codes and Guidelines

Appendix A
Oregon Economic Interdependency Assessment of the Energy Sector

Scott B. Miles, Associate Professor, and Alexis Blue, Graduate Student, Resilience Institute, Western Washington University

The goal of the study included in this appendix was determine the economic interdependencies of Oregon's energy infrastructure with itself, broader critical infrastructure, and Oregon's commercial economy. This study characterizes critical infrastructure and commercial economy for the entire state at a county resolution. Characterizing the interdependencies quantitatively facilitates the general understanding of potential economic ripple effects of earthquake-induced disruption of energy infrastructure on the State of Oregon. The primary task of the study was to model the effects of lower sales of electricity, fuel and natural gas -- the three Oregon Energy Assurance sectors –to other critical infrastructure industries and the rest of Oregon's economy. Limitations in this study approach are discussed in the analysis overview.

The objectives of this study were the following:

1. Aggregate industries to represent energy and critical infrastructure sectors to characterize the interdependencies of power, natural gas, and fuel industries with other critical infrastructure industries, and Oregon's commercial economy
2. Develop an energy infrastructure-focused input-output table for the State of Oregon
3. Analyze the economic impacts of financial loss within the created energy infrastructure sectors for a range of energy infrastructure financial loss scenarios

Analysis Overview

The study used input-output analysis to understand economic interdependencies between energy infrastructure sectors and other sectors, as well as to estimate economic impacts of various energy infrastructure financial loss scenarios. The financial loss scenarios are used as a rough proxy for energy infrastructure disruption. The analysis described below does not model physical infrastructure disruption or cascading functional impacts.

The software tool and data set called IMPLAN by MIG Inc., was used to conduct the input-output analysis of this study (http://implan.com/). IMPLAN data is a compilation of data for describing employment, employee compensation, proprietary income, other property income, indirect business taxes, output, inter-institutional transfers, and household and government purchases. For this study, the data is reported at the state level, even though the data is available at a finer resolution. IMPLAN was used to model the impact of negative sales as a proxy for infrastructure disruption. IMPLAN models how this loss of sales and jobs flows back through inter-industry purchasing.

Interdependency Assessment

The interdependency assessment was conducted using the 2008 IMPLAN database (the latest dataset available at the time of the study) with no additional or modified data. IMPLAN data describes 440 North American Industry Classification System (NAICS) industry classes in the dataset. The 440 NAICS industries were aggregated into 19 sectors for the purpose of this

analysis. The first priority of the aggregation was to group industries associated with each respective energy infrastructure sector (petroleum, natural gas, and electricity), while grouping the remaining industries in sectors typically used in similar input-output studies. The energy infrastructure groupings were based on input and review from the Oregon EAP Team. The 19 sectors for grouping the 440 NAICS industries are listed in Table A1.

After aggregation, an input-output (I-O) analysis was conducted to produce the input-output table shown as Table A2. The inside 19 by 19 matrix of the table (labeled 1 through 19) shows amount of sales and purchases between the 19 sectors. The columns represent the purchasing of inputs (payments) to create the respective sector's products or services. The rows indicate the selling of outputs (receipts) by each sector. The second to last row, labeled "Value Added" indicates the combination of payments for labor, profits, and imports. The sum of all intermediate inputs plus value added equals the last row, labeled "Total Inputs." The second to last column of Table 5 is labeled "Final Demand," which includes sales to consumption (by consumers), investments, governments, and exports. Final demand plus the sum of all intermediate outputs equals the final column, labeled "Total Outputs." The value in the cell of the intersection of the last row and last column is referred to as gross output. Gross output is equal to gross state product (net output) plus intermediate consumption.

Table A1: Sectors in Interdependency Assessment

01 Petroleum
02 Electricity
03 Natural Gas
04 Communication
05 Transport by Air
06 Transport by Rail
07 Transport by Water
08 Transport by Truck
09 Transport by Pipeline
10 All Other Transportation
11 Utilities
12 Agriculture/Forestry
13 Mining
14 Construction
15 Services
16 Wholesale/Retail
17 Non-Durable Goods
18 Durable Goods
19 Government Services - Public Safety

Table A2: Baseline Inputs-Outputs for Interdependency Assessment

Inputs (Receipts, $ Millions)	*Outputs (Payments, $ Millions)*																				
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	Final Demand	Total
01 Petroleum	11.9	40.5	29.0	1.4	14.5	2.7	0.0	19.4	0.1	11.2	0.0	21.1	0.3	31.6	27.7	11.9	43.5	14.4	11.8	236.8	530.0
02 Electricity	3.2	4.5	35.6	19.7	0.9	0.3	2.6	6.7	0.0	13.5	0.1	106.5	15.9	74.0	1035.9	328.4	303.6	621.7	23.0	2356.4	4952.5
03 Natural Gas	7.8	2.2	11.4	19.6	0.1	0.0	1.2	2.3	0.0	9.2	0.3	30.9	9.4	24.3	239.7	45.2	301.4	431.5	57.3	433.7	1627.6
04 Communication	0.6	8.0	0.9	1240.5	11.2	0.9	2.3	18.9	0.0	11.5	0.3	5.7	0.7	137.4	1672.8	261.4	59.8	239.9	7.3	3407.3	7087.3
05 Transport by Air	0.2	2.0	0.4	12.5	0.1	0.2	0.7	5.1	0.0	10.3	0.0	2.5	0.1	15.8	159.9	23.1	23.7	67.4	1.0	886.7	1211.6
06 Transport by Rail	0.7	74.7	1.8	2.1	0.4	2.5	0.1	25.7	0.0	7.9	0.0	25.0	5.5	20.3	26.7	4.5	113.3	175.1	2.9	364.6	853.9
07 Transport by Water	0.2	3.3	0.4	0.3	1.7	0.4	0.0	2.1	0.0	6.4	0.0	15.0	0.5	8.7	41.9	1.4	29.7	27.9	1.1	386.3	527.3
08 Transport by Truck	1.7	14.5	2.5	11.1	2.8	3.7	3.4	129.8	0.0	17.1	0.1	95.5	8.2	202.8	255.5	156.0	334.7	649.1	22.0	1493.0	3403.6
09 Transport by Pipeline	0.1	3.4	2.8	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.3	0.1	0.7	2.8	11.1
10 All Other Transportation	0.3	6.9	0.8	40.3	89.6	11.8	76.3	231.5	0.0	69.9	0.1	2.4	1.1	10.8	807.4	604.4	20.5	62.0	9.7	1139.9	3185.8
11 Utilities	0.1	14.8	0.3	6.1	0.1	0.2	1.8	0.6	0.0	14.5	0.0	34.2	0.1	11.7	155.2	18.3	22.6	38.4	36.8	-296.1	59.8
12 Agriculture/Forestry	0.4	0.3	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1774.4	1.5	41.0	107.6	20.1	1955.3	284.5	0.1	6096.5	10283.8
13 Mining	0.2	79.1	1.2	0.9	0.0	0.1	0.0	0.0	0.0	0.0	0.0	5.1	14.4	23.0	6.4	0.1	14.2	103.2	3.7	316.7	568.1
14 Construction	7.2	99.1	1.2	47.2	0.3	27.9	0.0	2.1	0.2	13.2	4.0	24.5	0.0	13.4	856.6	70.8	69.2	163.5	172.9	17016.0	18589.2
15 Services	41.0	329.9	54.4	1480.5	146.4	128.0	77.9	365.6	0.8	285.1	6.8	693.6	48.1	2343.2	29237.8	5486.9	2339.6	6725.0	541.9	74279.8	124612.2
16 Wholesale/Retail	8.4	20.5	10.2	49.8	12.4	11.0	2.2	75.1	0.1	32.1	0.2	256.5	7.1	1389.2	1356.4	895.1	1294.3	3733.1	43.9	23784.7	32982.3
17 Non-Durable Goods	5.6	4.4	7.4	32.2	0.5	1.3	0.8	10.7	0.0	9.5	0.0	400.3	2.3	170.3	1158.4	178.4	2266.0	907.6	18.9	17469.5	22644.2
18 Durable Goods	3.5	16.5	6.9	80.2	10.2	13.5	23.1	24.7	0.1	27.0	0.2	32.1	7.3	1109.2	612.1	124.0	234.8	5732.0	62.1	49927.9	58047.3
19 Government Services - Public Safety	0.0	0.0	0.1	5.1	0.0	0.0	0.0	0.3	0.0	5.2	0.0	0.2	0.0	0.0	140.3	9.8	11.1	16.5	42.4	19346.4	19577.5
Value Added	436.8	4227.8	1458.4	4037.9	920.3	649.4	334.7	2482.7	9.8	2642.3	47.5	6758.4	445.9	12962.2	86713.8	24742.3	13206.6	38054.3	18518.0		
Total	530.0	4952.5	1627.6	7087.3	1211.6	853.9	527.3	3403.6	11.1	3185.8	59.8	10283.8	568.1	18589.2	124612.2	32982.3	22644.2	58047.3	19577.5		310755.2

Note: * Value Added = Employee Compensation + Proprietor Income + Indirect Business Taxes + Other Property Type Income

The same information in Table A2, except for value added and final demand amounts, is provided in Figure A1 in graphical form, with the increasing dollar values represented by increasingly hotter colors from blue (cool) to red (hot). Note the hot colors, represent values of $100 million or greater, where maximum values listed in Table A2 are in the tens of billions. The threshold was chosen in order to easily visualize lower values.

Figure A2 presents the information of Table A2 in bar chart form to emphasize the relationship between each respective energy infrastructure sector and the rest of the Oregon economy to understand whether the particular energy sector is more or less dependent on the other 18 individuals sectors than each of the 18 sectors are on the respective energy sector. The outputs of each energy sector are represented by a dark color (blue for petroleum, red for electricity, and purple for natural gas, respectively) and inputs of the remaining sectors by a lighter respective shade. A higher dark bar (e.g., dark blue for 01 Petroleum) at the x-axis location of another sector (e.g., 08 Transport by Truck, represented by light blue) means that the transportation by truck sector purchases more petroleum than the petroleum sector purchases from the transportation by truck sector. In other words, the transportation by truck sector is more dependent on the petroleum sector than the petroleum sector is dependent on the transportation by truck sector. Figures A3, A4, and A5 show the same information as Figure A2 but include inputs and outputs for only one respective energy sector.

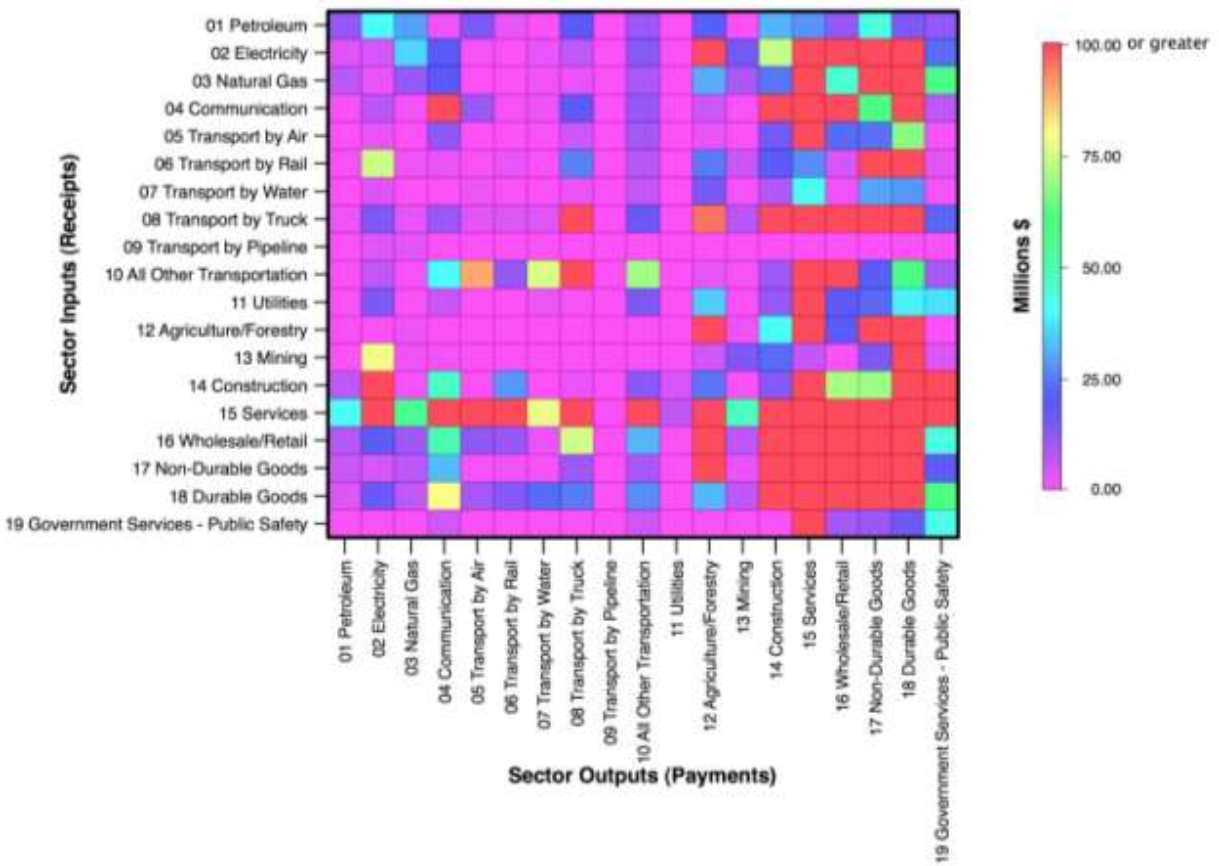

Figure A1. Visual representation of the input-output table of Table A2. Hotter colors (red, orange) indicate higher dollar value. Red indicates $100 million or greater.

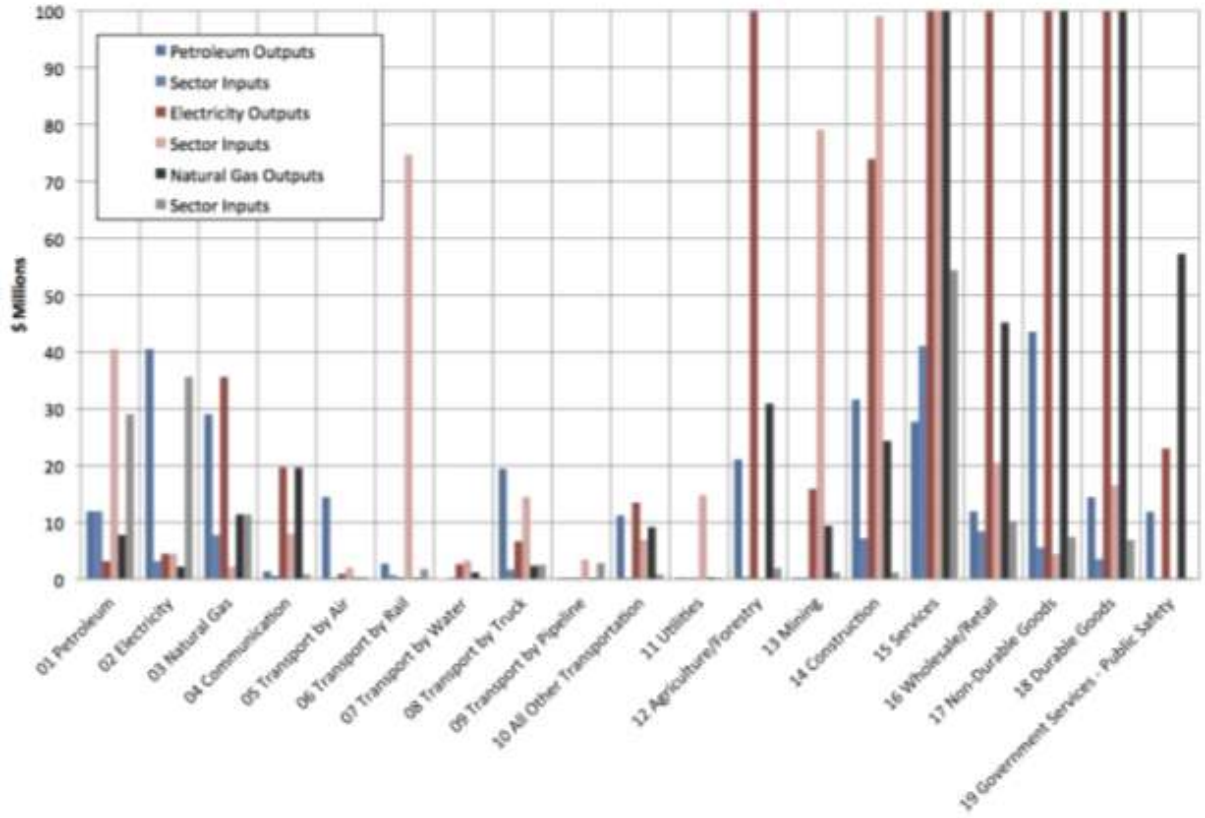

Figure A2. Petroleum, electricity and natural gas outputs (receipts) and inputs (payments) with respect to all analyzed sectors. Note: Vertical scale is capped at $100 million to facilitate comparison.

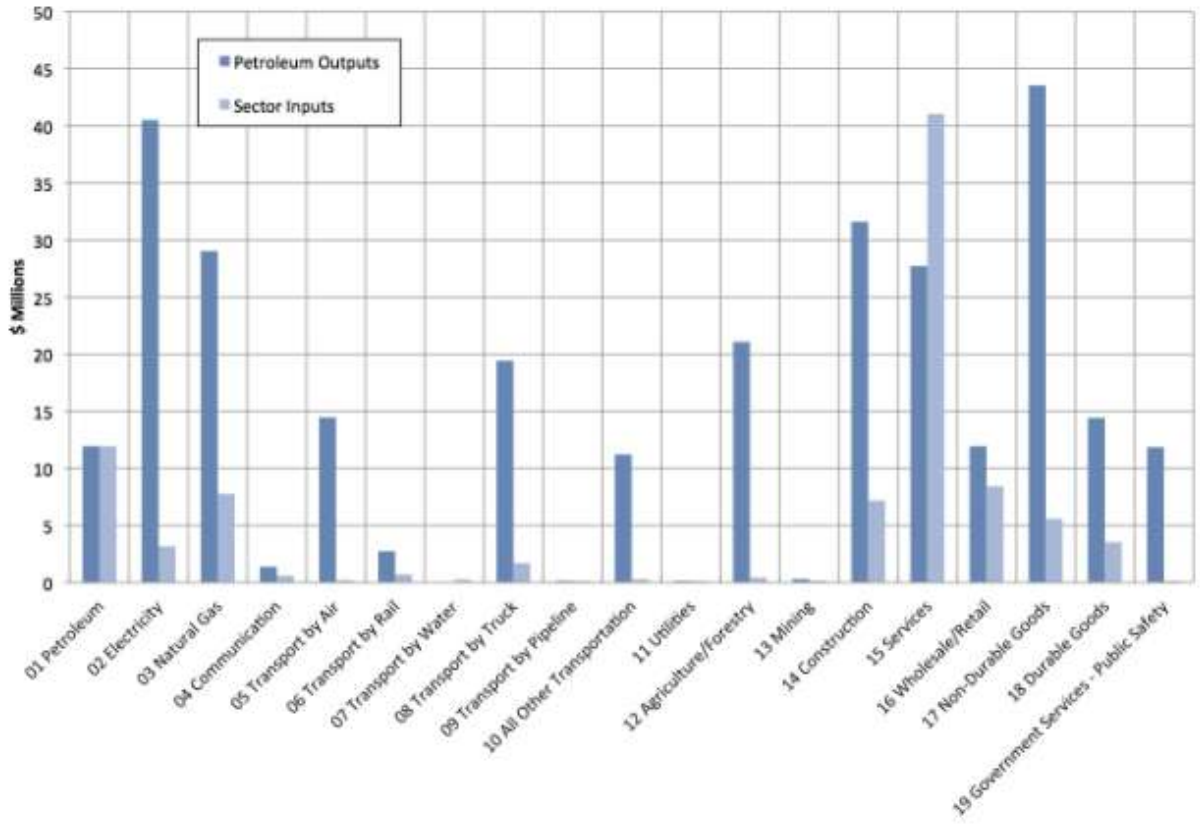

Figure A3. Petroleum outputs (receipts) and inputs (payments) with respect to all analyzed sectors.

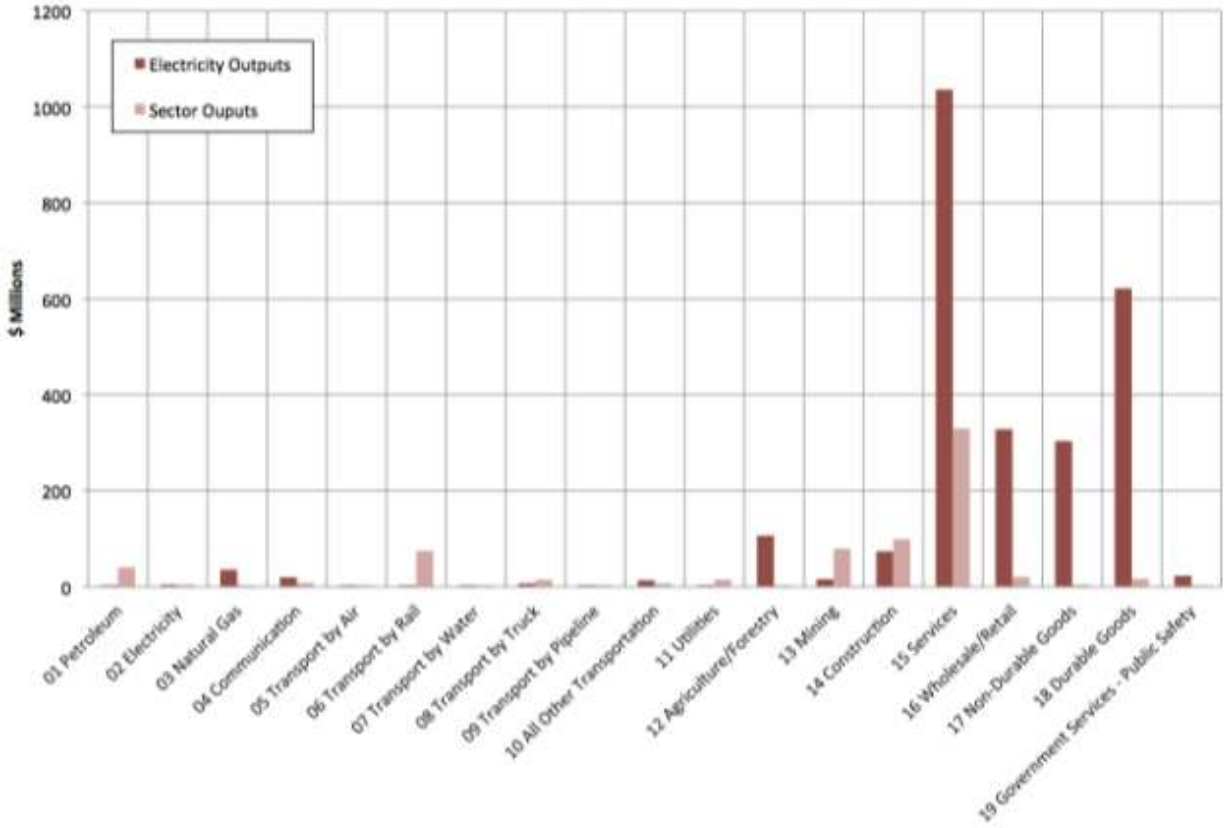

Figure A4. Electricity outputs (receipts) and inputs (payments) with respect to all analyzed sectors.

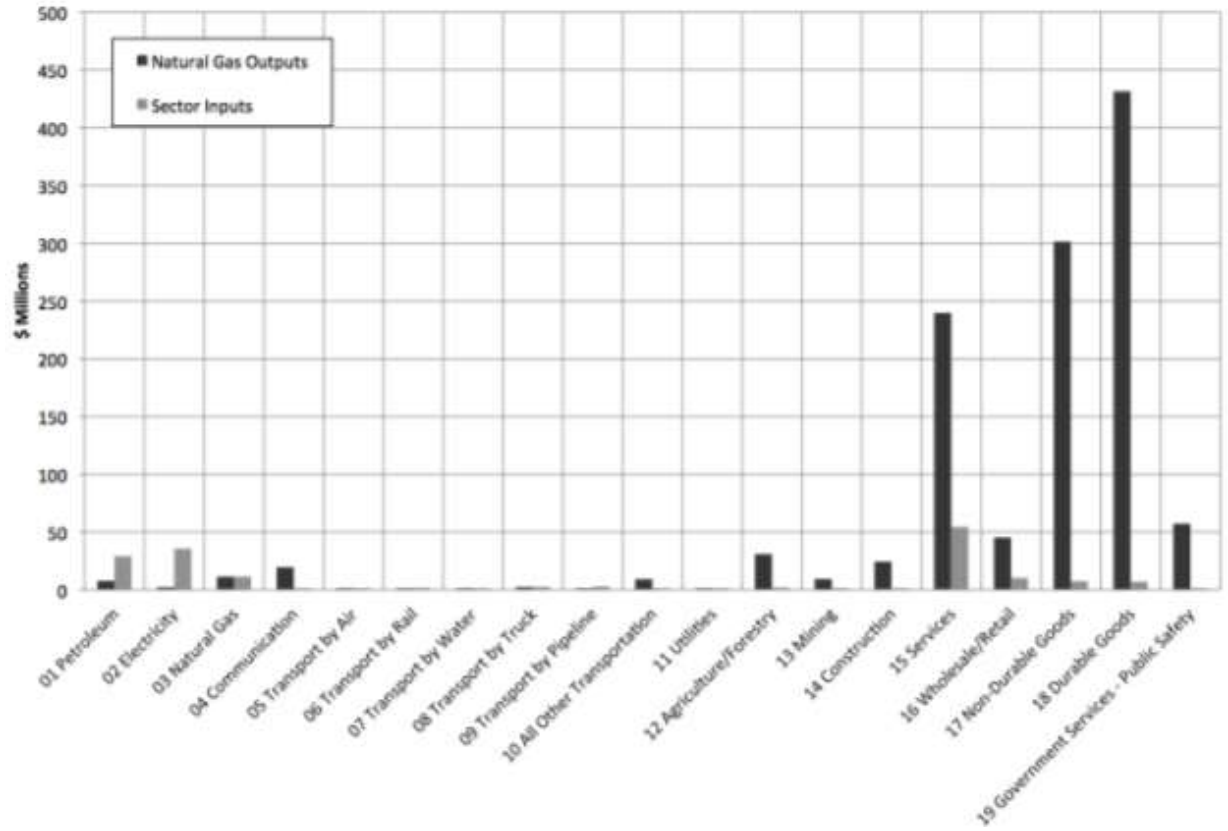

Figure A5. Natural gas outputs (receipts) and inputs (payments) with respect to all analyzed sectors.

Petroleum: Figures A2 and A3 show that the petroleum sector has relatively high unequal monetary relationships with several sectors. The electricity, natural gas, transport by air, transport by truck, other transportation, agriculture/forestry, construction, non-durable goods, durable goods, and government services are significantly more dependent on the petroleum sector than the other way around. The only other strong dependency of the petroleum sector on another sector is between it and the services sector.

Electricity: Figures A2 and A4 show that the electricity sector is more dependent on the transport by rail and mining sectors than the reverse. This is also minimally the case for the petroleum and construction sectors. Alternatively the agriculture/forestry, services, wholesale/retail, non-durable goods, and durable goods sectors are more dependent on electricity than the reverse

Natural Gas: Figure A2 and A5 show that there are strong monetary relationships with communications, agriculture/forestry, construction, services, wholesale/retail, non-durable goods, durable goods, and government services sectors are all more dependent on the natural gas sector than the other way around. The inverse is true for the petroleum and electricity sectors.

Impact Analysis

A suite of scenarios was developed to estimate the impacts of reduced levels of energy sector products being purchased *over the course of one year* (in this case 2008, the most recent year available for IMPLAN) as an approximate proxy for energy infrastructure loss. The impact analysis does not model the impact of physical or functional loss of the energy infrastructure, only loss of purchases of sector goods and services. The analysis also does not represent when within the year loss in purchases occurs. The results of the analysis are only representative of purchases loss within the year and don't include any losses in subsequent years. The scenarios analyzed using IMPLAN are summarized in Table A3. The values in Table A3 are percent reduction in purchases. In order to avoid divide by zero errors in IMPLAN, zero was approximated using a value close to zero. Table A4 lists, in the second column, the total output when each energy infrastructure sector purchases are normal (based on 2008 data in IMPLAN), which represents no hazard impact. The remaining columns to the right show the reduction in output for 75 percent, 50 percent, 25 percent and 0 percent of normal purchase levels to approximate hazard impacts.

Input-output analysis has some associated limitations in modeling economic impacts. For this particular application, again, input-output modeling does not model functional relationships of infrastructure. The loss modeled is financial in the form of reduced purchases of some good or product – in this case related to an energy infrastructure sector. Changes in inputs and, thus, outputs cannot be represented at any temporal resolution less than a year. Data for input-output analysis are only available a few years after the year the data describes. (In this case, the most recent data available are for 2008.) No consideration is made within the analysis for price effects, substitutions, or economies of scale. A basic input-output model, such as used here, is a demand-side model and so assumes that supplies are infinite. As a result, the absolute and relative financial relationships of purchases (inputs) and receipts (outputs) are reliable. The limitations in the context of modeling the influence of supply disruptions (such as a reduction of energy infrastructure service in a disaster) will results in significant under-estimation of actual loss. The predicted loss should be considered a lower-bound. Due to limitations of this interdependency model, the actual losses could be orders of magnitude higher because of supply-side and functional dependencies.

Table A3. Percent operability for the respective energy infrastructure sector

	Fuel	Electricity	Nat'l Gas
Baseline	100%	100%	100%
All 75	75	75	75
All 50	50	50	50
All 25	25	25	25
All 0	0	0	0
Fuel 75	75	100	100
Fuel 50	50	100	100
Fuel 25	25	100	100
Fuel 0	0	100	100
Elec 75	100	75	100
Elec 50	100	50	100
Elec 25	100	25	100
Elec 0	100	0	100
NatGas 75	100	100	75
NatGas 50	100	100	50
NatGas 25	100	100	25
NatGas 0	100	100	0

Table A4. Outputs values, in dollars, for each scenario.

	100%	75%	50%	25%	*0%
Petroleum	529,967,073	-132,491,768	-264,983,537	-397,475,305	-524,667,403
Electricity	4,952,514,064	-1,238,128,516	-2,476,257,032	-3,714,385,548	-4,902,988,923
Natural Gas	1,627,604,600	-406,901,150	-813,802,300	-1,220,703,450	-1,611,328,554

*The computations in the 0% scenario have been approximated and theoretically should be the negative equal value of the 100% scenario

Figure A6 shows the total impact (direct + indirect + induced) for all energy infrastructure loss scenarios. The three energy infrastructure types, as well as all infrastructure types simultaneously, are listed along the x-axis (all, electricity, natural gas, and petroleum) with each scenario listed in decreasing percent of operability (75%, 50%, 25%, 0%). The greatest amount of loss of any scenario is expectedly for all energy sectors with purchases 0% or normal for the year, at close to $7 billion dollars, with about $2.6 billion of that loss being non-direct (indirect + induced). The greatest loss associated with just one energy infrastructure sector is close to $7 billion (with about $2 billion of that non-direct loss) and is for the electricity purchases at 0% of normal scenario. Notice that the ratio between non-direct and direct loss is constant.

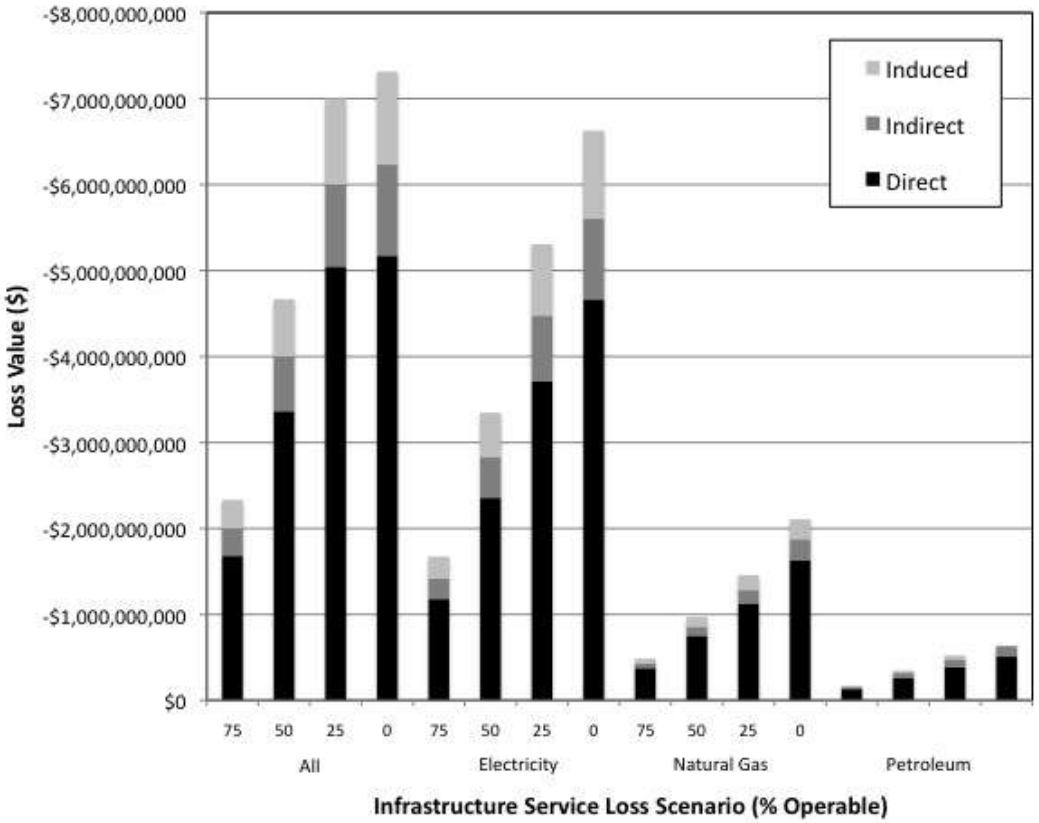

Figure A6. Total impact, including direct, indirect, and induced, for all energy infrastructure disruption scenarios.

Table A5 shows the indirect dollar losses and multipliers related to the disruption of each energy infrastructure (including all at once) with respect to output and employment. The second column of Table A5 shows the value in dollars of non-direct (indirect + induced) loss for each dollar of assumed direct loss. The direct loss is assumed as part of the energy infrastructure disruption scenarios. Thus, if $100,000 of direct loss were suffered for all energy infrastructure, an additional $39,000 would be lost as a result of non-direct loss. Similarly, the third column shows how many non-direct jobs are lost as result of one direct job lost. Thus if 1,000 jobs are lost as a result of disruption to all energy infrastructure, an additional 2,420 non-direct jobs would be lost. It is important to note that the two columns are not coupled. For example, $100,000 of direct loss to all energy infrastructure does not result in 242,000 non-direct jobs lost.

Table A5. Indirect Dollar and Jobs Loss Relationship For Energy Sectors. Data are preliminary.

	All		Petroleum		Electricity		Natural Gas	
Sector	In-Direct Loss for Every Dollar of Direct Loss	In-Direct Jobs Lost for Every Direct Jobs Lost	In-Direct Loss for Every Dollar of Direct Loss	In-Direct Jobs Lost for Every Direct Jobs Lost	In-Direct Loss for Every Dollar of Direct Loss	In-Direct Jobs Lost for Every Direct Jobs Lost	In-Direct Loss for Every Dollar of Direct Loss	In-Direct Jobs Lost for Every Direct Jobs Lost
Total	$0.387	2.4185	$0.357	1.6376	$0.420	2.6028	$0.295	2.1087
01 Petroleum	$0.011	0.0138	$0.021	0.0205	$0.008	0.0098	$0.016	0.0265
02 Electricity	$0.012	0.0127	$0.012	0.0094	$0.008	0.0077	$0.027	0.0343
03 Natural Gas	$0.004	0.0033	$0.014	0.0084	$0.002	0.0017	$0.007	0.0074
04 Communication	$0.012	0.0261	$0.009	0.0159	$0.013	0.0284	$0.008	0.0223
05 Transport by Air	$0.002	0.0052	$0.001	0.0030	$0.002	0.0056	$0.001	0.0048
06 Transport by Rail	$0.011	0.0260	$0.002	0.0033	$0.015	0.0344	$0.002	0.0050
07 Transport by Water	$0.001	0.0010	$0.001	0.0007	$0.001	0.0012	$0.000	0.0007
08 Transport by Truck	$0.006	0.0348	$0.005	0.0264	$0.006	0.0375	$0.004	0.0289
09 Transport by Pipeline	$0.001	0.0001	$0.000	0.0000	$0.001	0.0001	$0.002	0.0002
10 All Other Transportation	$0.005	0.0552	$0.004	0.0302	$0.006	0.0616	$0.003	0.0430
11 Utilities	$0.000	0.0011	$0.000	0.0003	$0.000	0.0013	$0.000	0.0005
12 Agriculture/Forestry	$0.004	0.0299	$0.004	0.0270	$0.003	0.0270	$0.004	0.0435
13 Mining	$0.012	0.0429	$0.001	0.0017	$0.016	0.0579	$0.001	0.0056
14 Construction	$0.018	0.1130	$0.016	0.0768	$0.023	0.1404	$0.003	0.0227
15 Services	$0.216	1.5755	$0.189	1.0580	$0.239	1.6944	$0.152	1.3831
16 Wholesale/Retail	$0.042	0.3563	$0.041	0.2626	$0.045	0.3672	$0.035	0.3642
17 Non-Durable Goods	$0.014	0.0295	$0.022	0.0342	$0.013	0.0266	$0.015	0.0388
18 Durable Goods	$0.012	0.0258	$0.013	0.0216	$0.012	0.0263	$0.010	0.0261
19 Government Services - Public Safety	$0.006	0.0662	$0.004	0.0375	$0.006	0.0739	$0.003	0.0512

If the available electricity, natural gas and liquid fuels were significantly reduced, then the non-direct dollar losses would have major socioeconomic consequences to Oregon. In the hypothetical scenario that 100% energy infrastructure is disrupted, a minimum of $0.39 of non-direct loss would be expected for every dollar of loss up to a maximum of the aggregate output value of the energy sectors. The sectors most impacted for this scenario are Services, followed next by Wholesale/Retail, followed by Construction, Non-Durable Goods, Electricity, Communications, Mining, Durable Goods, Petroleum, and Transport by Rail. The impact to Services is about an order of magnitude greater than the other sectors. For employment impacts, under the same scenario, a minimum of 2.42 jobs would be expected to be lost for every direct job lost in the energy sectors. Again, the greatest impacted by this scenario, by an order of magnitude, is the Service industry, followed again by Wholesale Retail, as well as Construction. The impact to services is very similar across the individual energy sector disruption scenarios. Most significant is the finding that the Electricity sector has the greatest monetary and employment impact potential of the three energy sectors.

The scenarios from this study have not been linked with specific studies of energy sector impacts from a Cascadia earthquake, and it is not possible to relate any of the modeled scenarios to estimated damage and losses to the energy sector due to a Cascadia earthquake.

Improving the energy sector's resilience to major disasters, in particular a Cascadia earthquake would require mitigation actions to reduce the restoration time of energy services. The total impact from a disaster to the energy sector would include the direct damage to the energy facilities, the loss of sales (such as by amounts as shown in the scenarios), non-direct losses and non-direct job losses (as shown in Table A5), and a multitude of cascading functional impacts, which would also potentially have economic impacts of their own.

Comparison with Other Studies

After the Northridge earthquake, Tierney (1997) found that after debris clean up, loss of electricity was the most commonly cited reason for business closure (Table A6). The most significant impacts were seen in the finance, insurance, and real estate industries (FIRE; classified as services in the current study) and construction. FIRE services were also impacted the most in the current study on Oregon energy disruption. In a study by Tierney and Nigg (1995) comparing the dependency of businesses to five types of infrastructure between Memphis, TN and Des Moines, IA with respect to potential (Memphis; earthquake disruption) and actual (Des Moines; 1993 Midwest floods) disruption. Table A7 (Des Moines) and Table A8 (Memphis) shows the results of that study. In both cases, businesses depend most on electricity, while depending on natural gas third most. Lastly, in the study of the business impacts from the 1993 Midwest floods, Tierney (1994) wrote the following, which provides further insight into the importance of energy infrastructure amongst other required business resources and the impacts of the services sector (FIRM) from these disruptions:

> Overall, electricity was rated as the most critical lifeline service by both large and small businesses, with the former considering electric service more important than the latter. Large manufacturing and construction firms and both large and small companies in the finance, insurance, and real estate sectors were more likely than other businesses to rate electricity as critical to their operations. While small businesses generally considered telephone service to be the second most critical lifeline, large businesses appeared to view telephones, water, sewer service, and natural gas as equally critical.

A study by Rose et al. (2007) on the economic impacts of electricity outage due to a terrorist attack on Los Angeles, CA found that the services sector was most impacted by a significant margin. This is not surprising as the input-output analysis found that services and manufacturing are the two main business users of electricity.

None of the above studies included direct dependence on liquid fuel. Looking at Table A6, one could conjecture that a few factors leading to business closure are related to lack of access to liquid fueling, putting disruption of fuel near the top of the factors. Even so, what studies have been done confirm the general validity of the findings of the current study and the importance of resilient infrastructure, as well as the significant economic impact that would arise due to energy disruption from a Cascadia earthquake in Oregon. The general lack of studies of the dependence of and impacts to businesses from energy infrastructure disruption suggests the importance and innovation of this study.

Table A6. Ranked factors determined to have lead to business closures after the 1994 Northridge earthquake (Tierney, 1997).

Reason	Percentage
Needed to Clean-up Damage	65.2
Loss of Electricity	58.7
Employees Unable to Get to Work	56.4
Loss of Telephones	49.8
Damage to Owner or Manager's Home	44.4
Few or No Customers	39.9
Building Needed Structural Assessment	31.5
Could Not Deliver Products or Services	24.0
Loss of Machinery or Office Equipment	23.7
Building Needed Repair	23.4
Loss of Inventory or Stock	21.9
Loss of Water	18.2
Could Not Get Supplies or Materials	14.9
Building Declared Unsafe	10.1
Could Not Afford to Pay Employees	9.5
Loss of Natural Gas	8.7
Loss of Sewer or Waste Water	5.3
Other	15.8
Number of Businesses That Closed	617

Table A7. Results of surveys to businesses in Des Moines IA asking the degree of importance on five types of infrastructure (Tierney and Nigg, 1995).

	LIFELINE SERVICES				
IMPORTANCE	Electric	Water	Natural Gas	Water Treatment	Telephone
Critical	55%	29%	37%	34%	36%
Very Imp	35	34	27	29	36
Important	8	30	26	28	15
Not Very Important	2	8	8	7	8
Not Imp at all	0	1	2	1	5
Total	100%	102%*	100%	99%*	100%

*Does not total 100% due to rounding

Table A8. Results of surveys to businesses in Memphis, TN asking the degree of importance on five types of infrastructure (Tierney and Nigg, 1995).

LIFELINE SERVICES					
IMPORTANCE	Electric	Water	Natural Gas	Water Treatment	Telephone
Very Imp	82%	27%	18%	23%	78%
Important	14	34	29	32	17
Not Very Important	3	31	39	33	3
Not Imp at all	1	8	13	13	2
Total	100%	100%	99%*	101%*	100%

*Does not total 100% due to rounding

References

Rose, A., Oladosu, G. and Liao, S., Business interruption impacts of a terrorist attack on the electric power system of Los Angeles: Customer resilience to a total blackout, Risk Analysis, 2007, Vol. 27, No. 3, pp 513-531.

Tierney, K.J., Business impacts of the Northridge earthquake, Journal of Contingencies & Crisis Management, 1997, Vol. 5 Issue 2, p87, 11p.

Tierney, K.J., Business vulnerability and disruption: Data from the 1993 Midwest floods, 41st North American Meetings of the Regional Science Association International, Niagara Falls, Ontario, November, 1994, pp.16-24.

Tierney, K.J. and Nigg, J.M., Business vulnerability due to disaster-related lifeline disruption, University of Delaware Disaster Research Center Preliminary Paper 223, 1995, 9p.

Acknowledgement

We are grateful for review from Dr. Stephanie Chang, Dr. Hart Hodges, Dr. Adam Rose, and Dr. Anne Wein for their helpful reviews. Any mistakes in this report are not the responsibility of the reviewers.

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Appendix B
Lateral Spreading Sensitivity Study

by Steven Bartlett, PE, University of Utah and Yumei Wang, PE, DOGAMI

Introduction

The potential amount of ground deformation resulting from liquefaction-induced lateral spread in the Critical Energy Infrastructure (CEI) Hub in Portland, Oregon was jointly evaluated. The University of Utah was the lead modeler, and DOGAMI was the lead in framing the sensitivity study and provided some of the input variables including the geotechnical soils data. The evaluations were done using empirical equations developed by Youd et al. (2002) and by nonlinear numerical modeling using a finite difference computer program called FLAC (Fast Lagrangian Analysis of Continua) (v.5) developed by Itasca, 2005. The lateral spread evaluations were done using several earthquake time histories and slope conditions for two cases of soil conditions: (1) unimproved ground, and (2) improved ground. Unimproved ground denotes analyses performed for the existing ground conditions that have not been modified by any type of ground improvement technology. Improved ground denotes analyses that were done to estimate the potential reduction in lateral spread displacement that might be achieved by modifying the properties of the potentially liquefiable soil using some type of ground improvement technology (e.g., stone columns, rammed aggregate piers, etc.).

Seismic Input

The evaluations involved selection of representative acceleration time histories for magnitude 9.0 (M9.0) and magnitude 8.0 (M8.0) earthquakes and slightly adjusting them for use in the numerical modeling. A total of ten subduction zone earthquake time histories were considered for the final numerical analyses (Figure B1). Two of these are synthetic time histories obtained from Art Frankel of the US Geological Survey (1msoil and 1ssoil), and the remaining eight time histories are from other subduction zone earthquakes from the 1985 Chilean and 1985 Mexican earthquakes. Each candidate time history was analyzed using both of its horizontal components. All candidate time histories were scaled to a peak ground acceleration (pga) value of 0.3 g to be more representative of the expected strong motion for a 1000-year return period event (Figure B2). For example, the pga value for a deterministic Cascadia M9.0 event is about 0.18 g; however, when this event is considered in probabilistic terms at a 1000-year return period, the expected pga increases to approximately 0.3 g for rock and stiff soil sites. In addition to the 0.3-g scaling of pga, the candidate time histories were baseline-corrected to ensure that no artificial displacement occurs when analyzing the records in the numerical model.

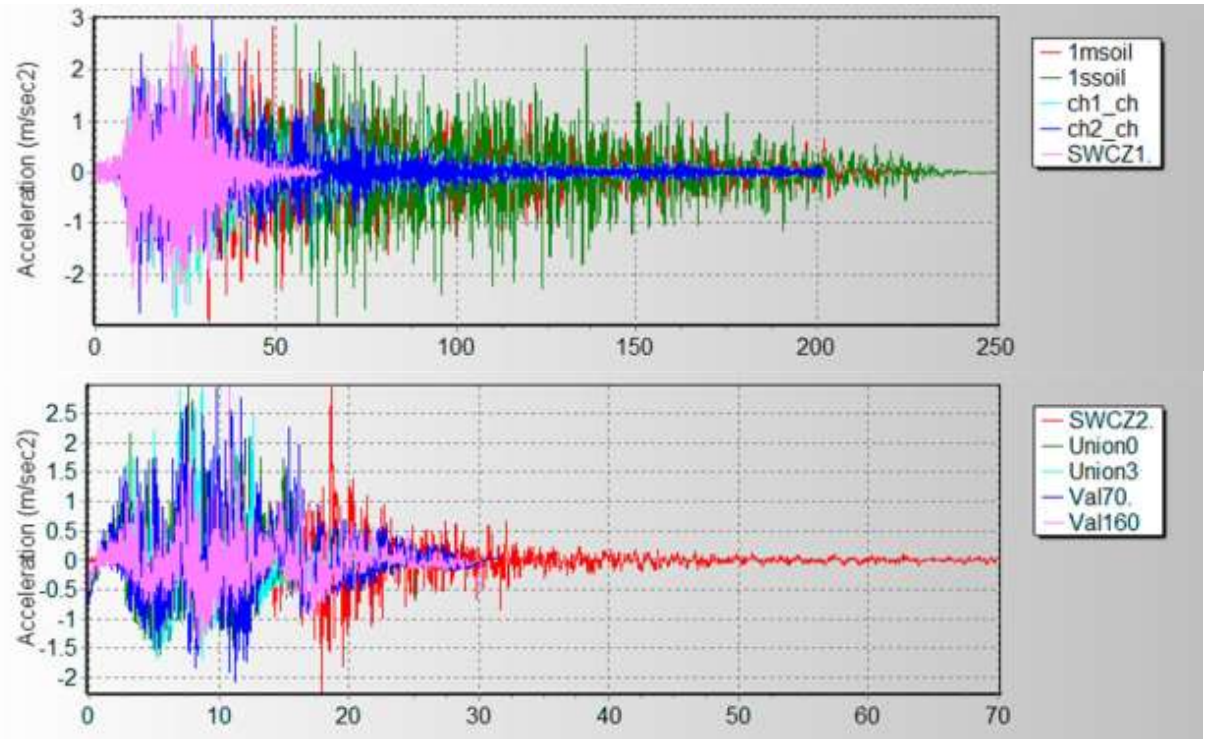


Figure B1. Representative time histories used in FLAC analysis

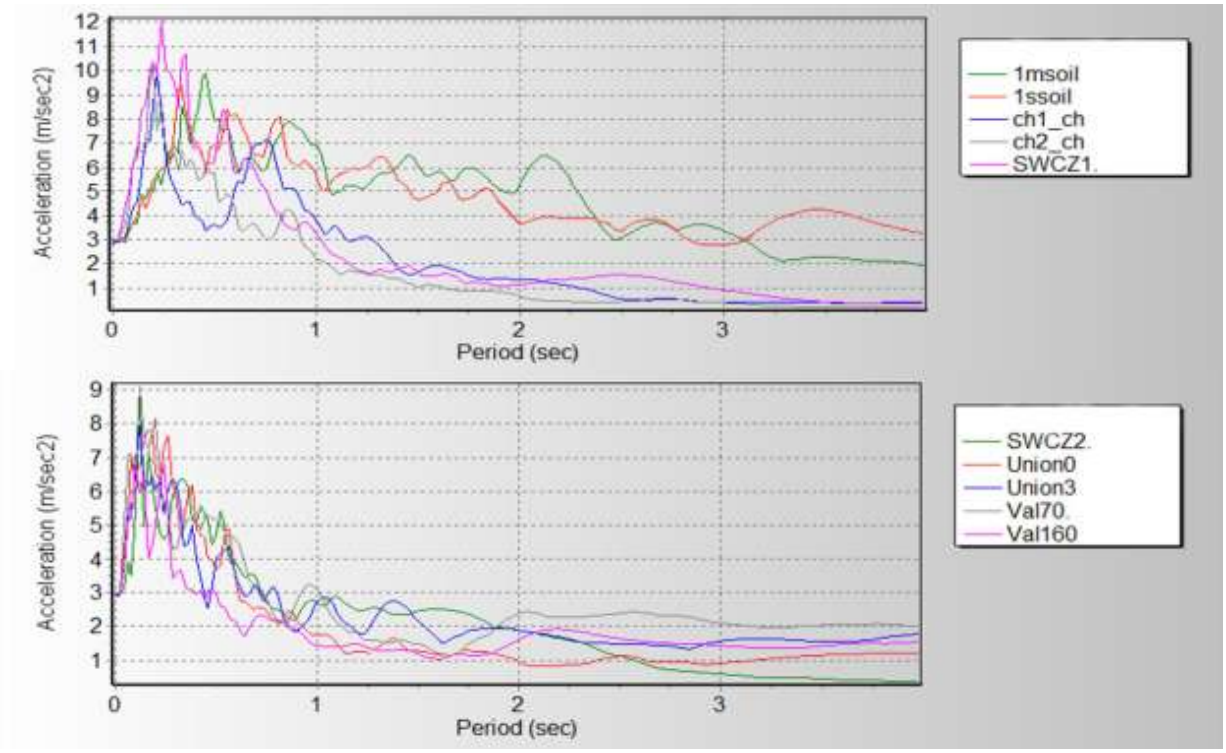


Figure B2. Acceleration response spectra for the time histories used in FLAC analysis

Subsurface Conditions

In-situ soil data from a BPA tower site in the CEI Hub were used to develop representative soil profiles and used in conjunction with other generic soil properties from the area (BPA, 2008; CH2MHill, 2006). Figure B3 shows in-situ soil data (cone penetrometer soundings) from the CEI Hub, which were used in the evaluations. From a lateral spread viewpoint, the primary zone of interest is that from about 21 to 46 feet deep. Much of this zone has q_{c1}values of 60 tons / sq. foot, and except for the zone between 38 to 40 feet, the soils appears to be granular and susceptible to liquefaction due to their low penetration resistance. (Note that materials with penetration resistance greater than 60 tons / sq. foot were not considered in the evaluations because they are probably not susceptible to damaging lateral spread displacement due to their higher density and strength.)

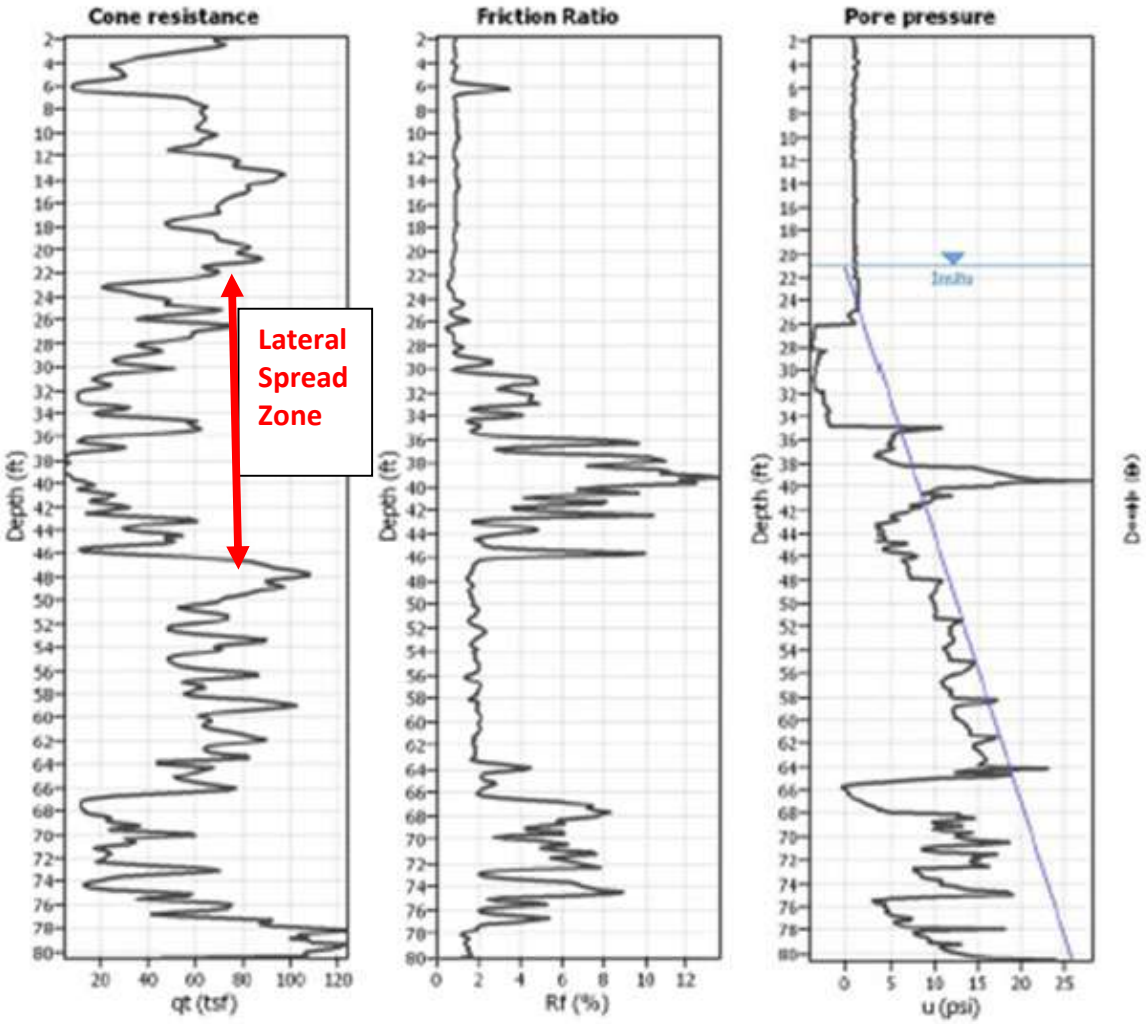


Figure B3. Soils layering and profile considered in FLAC analyses (modified from BPA, 2008)

Numerical Model

Figure B4 shows the FLAC cross sectional model that was used in the parametric analyses. It has the following dimensions 1,000 m wide; height at left and right edges was varied to evaluate a range of ground slope angles from 0.5 to 5 degrees; 5 m depth to ground water table; depth to base of lateral spread zone 12.5 m (41 feet) and 7.5 m (25 feet) of lateral spread zone. Note that because of the mesh spacing of the developed model, the lateral spread zone depth and thickness varies slightly from that shown in Figure B3. These slight differences do not significantly affect the modeling results.

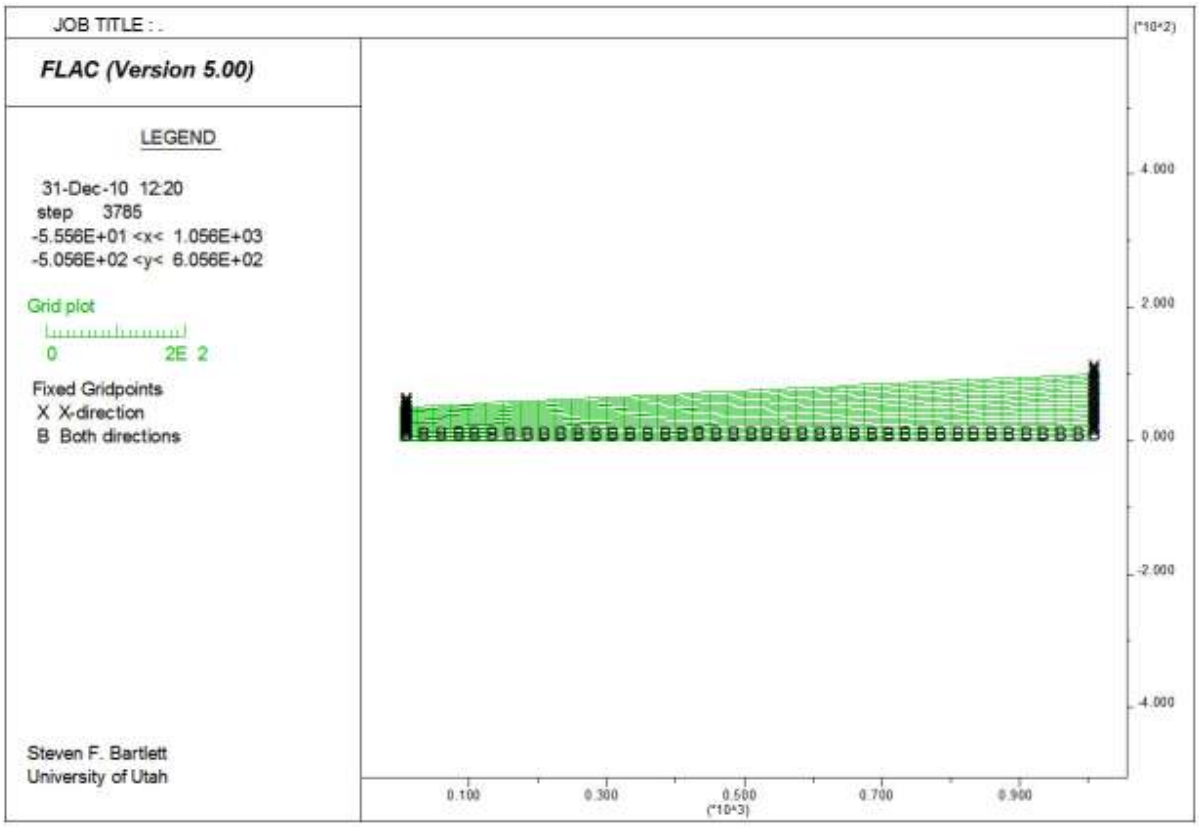


Figure B4. The FLAC model of a slope from the CEI Hub deformation analysis. This is an example run with the modeled slope gently sloping towards the left.

The following modeling approach was used to analyze the potential lateral spread displacement at the site:

- The model was first brought to static equilibrium for the groundwater conditions to calculate the state of in situ stress in the soil profile before the onset of the earthquake and liquefaction.
- The soil properties of the subsurface soils were set to a drained friction angle of 32 degrees and the initial (maximum) shear modulus was calculated based on a subsurface shear wave velocity of 150 m/s (500 feet/s).

- The candidate time histories were input at the base of the FLAC model and the earthquake motion was propagated through the model. Slight scaling of the time history was done to ensure that the 0.3 g was produced at the surface of the model without liquefaction effects present in the model.
- Each candidate time history was analyzed using both a positive polarity (+) and a negative polarity (-) to evaluate the sensitivity of lateral spread displacement to the polarity of the record.
- Liquefaction effects were introduced in the modeling using the following approach and assumptions:
    - Liquefaction is triggered approximately when the first 0.1 g acceleration spike is encountered in the candidate time history based on liquefaction triggering analyses.
    - Maximum shear strength and soil stiffness values for the soil profile were used at the onset of strong motion.
    - These values were linearly degraded to residual values to represent complete liquefaction at the time when the first 0.1 g acceleration spike occurred in the respective time history.
        - The initial shear modulus at the beginning of the earthquake record was degraded to 10 percent of its initial value at complete liquefaction.
        - The friction angle of the liquefied soil was degraded from its peak value of 32 degrees at the beginning of the earthquake record to 6 degrees when complete liquefaction was encountered. This residual value was selected because it allows the residual strength to be approximately 10 percent of the initial mean effective stress under hydrostatic conditions, which is a reasonable estimate of the residual strength for loose, liquefied sand.
- The lateral spread horizontal displacement was calculated for each of the candidate time histories. The slope of the FLAC model was varied from 0.5 to 5 degrees for each of the candidate time histories to account for potential variation of slope in the CEI Hub.
- The FLAC model results were also compared against displacements predicted from the Youd et al. (2002) regression equation to evaluate the reasonableness of the FLAC model.

Lateral Spread Displacement Estimates for Unimproved Ground

Using the modeling approach described above, a parametric study was conducted to estimate the order of magnitude and characteristics of the possible lateral spread displacement for unimproved ground. Table B1 shows the main parameters used in the study, as well as the deformation results for the various earthquakes and ground slope cases. In addition, the FLAC results are compared and complemented with empirically derived mean estimates of horizontal displacement obtained from the empirical relationships developed from the Youd et al. (2002) for M9.0 and M8.0 earthquakes (Figure B5). Note that Youd et al. (2002) found that actual

displacements can vary by a factor of 2 from the mean estimate. Thus for example, the upper bound lateral spread displacement for a 5 percent slope and a M9.0 event is approximately 10 m based on a mean estimate of about 5 m for that same event.

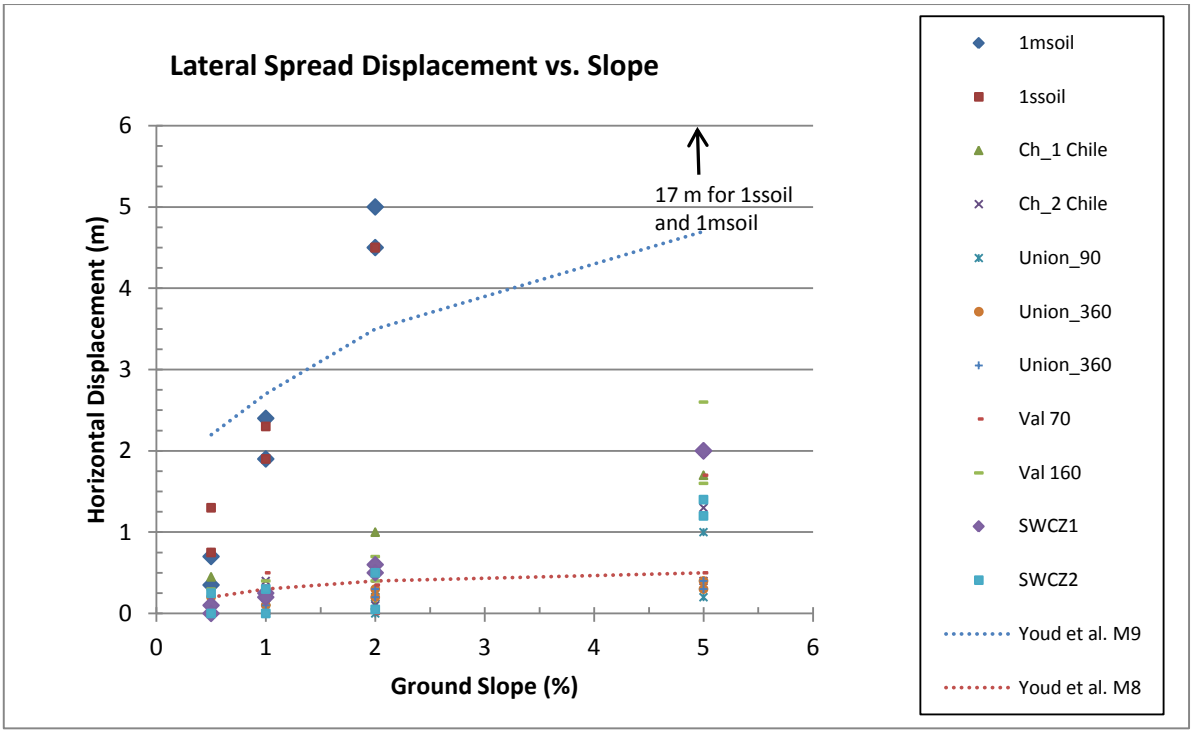


Figure B5. Estimates of horizontal displacement versus ground slope for M9.0 and M8.0 earthquakes compared with mean estimates from Youd et al. (2002) regression equation.

The FLAC modeling results for records 1msoil and 1ssoil produce about 17 m of predicted ground displacement for a M9.0 event on a 5 percent slope. This is somewhat higher than the 10 m upper bound estimated by the Youd et al. (2002) regression equation. The reason for the relatively large displacement produced by the FLAC model can be seen by comparing the magnitude and duration of the strong motion represented by histories 1msoil and 1ssoil with the other candidate time histories used in the modeling. The 1msoil and 1ssoil records both have strong motion duration that exceeds 200 s and ground accelerations that exceed 1 m/s^2 (0.1 g) for much of the record (Figure B1). The amplitude and duration of strong motion for these two records are notably higher than the other records used in the evaluations. Certainly the amount of lateral spread displacement would decrease if these records were used unscaled instead of the 0.3-g scaling that was used. However, we choose to use the scaled time histories for these events and evaluate the corresponding ground improvement needed to remediate the lateral spread, as discussed in the next section.

Lateral Spread Displacement Estimates for Improved Ground

The soil properties used in the FLAC model were modified to represent the case where the ground has been improved by some type of ground improvement technology. For these analyses, the soil properties were modified accordingly to represent the effects of improved ground in the lateral spread zone.

- The friction angle in the liquefied zone was increased from its residual value in the FLAC model to a value where deformations became small. From this, the shear strength required to ameliorate the lateral spread was calculated.
- The residual shear modulus for the treated zone was set equal to 30 percent of the initial unliquefied value of the shear modulus, G.
- The shear strength of the improved ground required to mitigate the lateral spread was uniformly distributed throughout the potential lateral spread zone.
- It was assumed that excess pore pressure generation from cycling (partial liquefaction) does not affect the shear strength of the improved ground.

The evaluation of improved ground was not repeated for all cases. Instead, representative time histories were used to estimate what treatment was required to mitigate the lateral spread hazard. The selected time histories were: (1) 1msoil, which was selected to represent a M9.0 event at a distance of 100 km, and (2) SWCZ1, which was selected to represent a M8.0 event at a distance of 100 km. These particular earthquake records were selected because they produced displacement near the upper bound displacement for the unimproved ground case (Figure B-5); hence they represent a conservative case to analyze the effects of improved ground.

The results of the improved ground evaluations presented in Table B-2. These analyses show that the improved soil must have a minimum composite strength of about 30 to 50 kPa (600 to 1000 psf) to mitigate the lateral spread hazard for a M9.0 event. The analyses also show that the improved soil must have a minimum composite strength of about 20 to 45 kPa (400 to 900 psf) to mitigate the lateral spread hazard for a M8.0 event. We anticipate that if these composite strengths can be obtained using ground improvement, then the expected lateral spread displacement will be 0.05 m (2 inches), or less. These preliminary evaluations were done using limited geotechnical data and simplifying assumptions. More detailed, site specific evaluations can be made for the individual facilities.

Table B1: Parametric Study Inputs and Results for FLAC Deformation Analyses for Unimproved Ground

Time History	Polarity	Untreated slope (%)	Untreated Residual residual phi' (deg)	Depth Ground Water (m)	Untreated Predicted Displace-ment (m)	Treated phi' (deg)	Mean eff. stress (kPa)	Equivalent S_u (kPa)	Treated Predicted Displace-ment (m)
1msoil	+	0.5	6	5	0.7	15	110.00	28	0.05
1msoil	-	0.5	6	5	0.35				
1msoil	+	1	6	5	1.9	19	110.00	36	0.05
1msoil	-	1	6	5	2.4				
1msoil	+	2	6	5	4.5	22	110.00	41	0.05
1msoil	-	2	6	5	5				
1msoil	+	5	6	5	17	27	110.00	50	0.15
1msoil	-	5	6	5	17				
1ssoil	+	0.5	6	5	0.75				
1ssoil	-	0.5	6	5	1.3				
1ssoil	+	1	6	5	1.9				
1ssoil	-	1	6	5	2.3				
1ssoil	+	2	6	5	4.5				
1ssoil	-	2	6	5	4.5				
1ssoil	+	5	6	5	17				
1ssoil	-	5	6	5	17				
Ch_1 Chile	+	0.5	6	5	0.45				
Ch_1 Chile	-	0.5	6	5	0.05				
Ch_1 Chile	+	1	6	5	0.15				
Ch_1 Chile	-	1	6	5	0.2				
Ch_1 Chile	+	2	6	5	1				
Ch_1 Chile	-	2	6	5	0.1				
Ch_1 Chile	+	5	6	5	2				
Ch_1 Chile	-	5	6	5	1.7				
Ch_2 Chile	+	0.5	6	5	0.05				
Ch_2 Chile	-	0.5	6	5	0.03				
Ch_2 Chile	+	1	6	5	0.06				
Ch_2 Chile	-	1	6	5	0.4				
Ch_2 Chile	+	2	6	5	0.1				
Ch_2 Chile	-	2	6	5	0.2				
Ch_2 Chile	+	5	6	5	1.3				

Ch_2 Chile	-	5	6	5	0.4				
Union_90	+	0.5	6	5	0.1				
Union_90	-	0.5	6	5	0.1				
Union_90	+	1	6	5	0.2				
Union_90	-	1	6	5	0				
Union_90	+	2	6	5	0				
Union_90	-	2	6	5	0.2				
Union_90	+	5	6	5	1				
Union_90	-	5	6	5	0.2				
Union_360	+	0.5	6	5	0				
Union_360	-	0.5	6	5	0.2				
Union_360	+	1	6	5	0.1				
Union_360	-	1	6	5	0.3				
Union_360	+	2	6	5	0.3				
Union_360	-	2	6	5	0.2				
Union_360	+	5	6	5	0.4				
Union_360	-	5	6	5	0.3				
Val 70	+	0.5	6	5	0				
Val 70	-	0.5	6	5	0.1				
Val 70	+	1	6	5	0				
Val 70	-	1	6	5	0.5				
Val 70	+	2	6	5	0				
Val 70	-	2	6	5	0.35				
Val 70	+	5	6	5	1.7				
Val 70	-	5	6	5	0.5				
Val 160	+	0.5	6	5	0.1				
Val 160	-	0.5	6	5	0.3				
Val 160	+	1	6	5	0.2				
Val 160	-	1	6	5	0.4				
Val 160	+	2	6	5	0.4				
Val 160	-	2	6	5	0.7				
Val 160	+	5	6	5	1.6				
Val 160	-	5	6	5	2.6				
SWCZ1	+	0.5	6	5	0.1	10	110.00	19	0.05
SWCZ1	-	0.5	6	5	0				
SWCZ1	+	1	6	5	0.25	15	110.00	28	0
SWCZ1	-	1	6	5	0.2				

SWCZ1	+	2	6	5	0.6	20	110.00	38	0.05
SWCZ1	-	2	6	5	0.5				
SWCZ1	+	5	6	5	2	25	110.00	46	0.05
SWCZ1	-	5	6	5	2				
SWCZ2	+	0.5	6	5	0.25				
SWCZ2	-	0.5	6	5	0				
SWCZ2	+	1	6	5	0.3				
SWCZ2	-	1	6	5	0				
SWCZ2	+	2	6	5	0.5				
SWCZ2	-	2	6	5	0.05				
SWCZ2	+	5	6	5	1.4				
SWCZ2	-	5	6	5	1.2				
Youd et al. M9		0.5			2.2				
		1			2.7				
		2			3.5				
		5			4.7				
Youd et al. M8		0.5			0.2				
		1			0.3				
		2			0.4				
		5			0.5				

Table B2: Parametric Study Inputs and Results for FLAC Deformation Analyses for Improved Ground

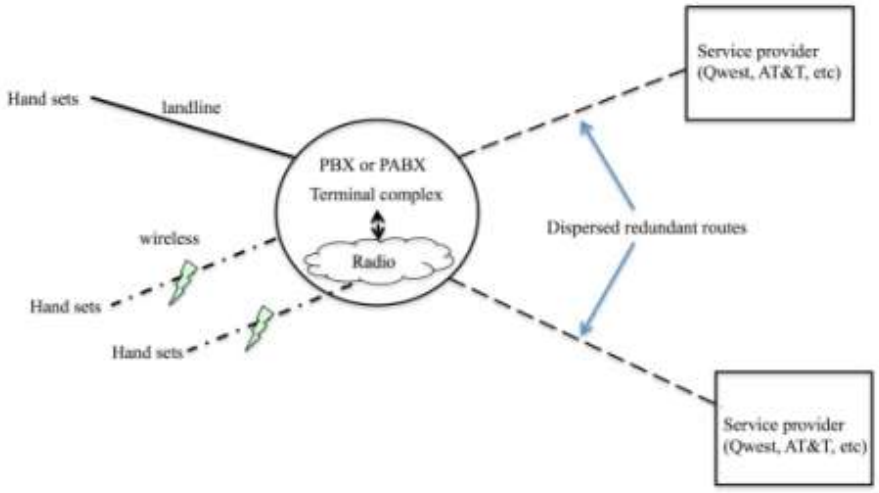
	Polarity	Untreated	Untreated	Depth	Untreated	Treated	Mean eff.	Equivalent Su	Treated
Time History		slope (%)	residual phi' (deg)	Grd Water (m)	Predicted Displacement (m)	phi' (deg)	stress (kPa)	(kPa)	Predicted Displacement (m)
1msoil	+	0.5	6	5	0.7	15	110.00	28	0.05
1msoil	-	0.5	6	5	0.35				
1msoil	+	1	6	5	1.9	19	110.00	36	0.05
1msoil	-	1	6	5	2.4				
1msoil	+	2	6	5	4.5	22	110.00	41	0.05
1msoil	-	2	6	5	5				
1msoil	+	5	6	5	17	27	110.00	50	0.15
1msoil	-	5	6	5	17				
SWCZ1	+	0.5	6	5	0.1	10	110.00	19	0.05
SWCZ1	-	0.5	6	5	0				
SWCZ1	+	1	6	5	0.25	15	110.00	28	0
SWCZ1	-	1	6	5	0.2				
SWCZ1	+	2	6	5	0.6	20	110.00	38	0.05
SWCZ1	-	2	6	5	0.5				
SWCZ1	+	5	6	5	2	25	110.00	46	0.05
SWCZ1	-	5	6	5	2				

Appendix C
Telecommunications: Seismic Codes and Guidelines

All companies with facilities in the CEI Hub are encouraged to conduct seismic vulnerability assessments that include interdependencies on other systems, such as telecommunication systems. Telecommunication systems are not only important for communication systems, but also many different types of systems, such as pipeline and electrical systems, need telecommunications to operate. Telecommunication systems can help monitor and control data and systems so many systems are dependent on them. Seismic codes and guidelines for telecommunication systems are provided below. The list should be updated as new key references are made available.

Telecommunications

To increase service reliability, facilities should incorporate redundancy of wired, wireless and radio services (see figure; PBX = Private branch exchange for private telephone network)



NEBS - Network Equipment-Building System, including GR-63 Physical Protection
Bellcore http://telecom-info.telcordia.com/site-cgi/ido/docs2.pl?ID=160834912&page=nebs

ASCE - American Society of Civil Engineers (ASCE) 7-10 American Society of Civil Engineers

ASCE - monograph No. 10 Methods of Achieving Improved Seismic Performance of Communications Systems

TIA/EIA-222-G (2009) Structural Standard for Antenna Supporting Structures and Antennas

Portland Harbor:
Industrial Land Supply Analysis

Prepared for the City of Portland:
Bureau of Planning and Sustainability

Prepared by ECONorthwest

in association with:

Maul Foster & Alongi, Inc.
and
Bonnie Gee Yosick llc

May 2012

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Preface

This report addresses four questions about land in the Portland Harbor area. It supports the City of Portland's efforts to update its Economic Opportunities Analysis, plan for the land use in the Harbor area, and address issues related to the development and conservation of West Hayden Island.

ECONorthwest was the lead consultant to the City on this evaluation, assisted by subconsultants Maul Foster & Alongi, and Bonnie Gee Yosick LLC. This consultant team had substantial and appreciated assistance from many sources, but especially: City of Portland Bureau of Planning and Sustainability, Port of Portland, Port of Vancouver, Working Waterfront Coalition, and BST Associates.

Despite the assistance, ECONorthwest and its subcontractors alone are responsible for the report's contents. The report has been reviewed by City staff and an advisory committee, but the views expressed are those of the consultants and may not be shared by others who contributed to or reviewed this report.

Throughout the report ECONorthwest has identified sources of information and assumptions used in the analysis. Within the limitations imposed by uncertainty and the project budget, staff at ECONorthwest and the Bureau of Planning and Sustainability at the City of Portland have made every effort to check the reasonableness of the data, methods, and assumptions and to test the sensitivity of the results to changes in key assumptions. Any forecast of the future is uncertain. The fact that ECONorthwest and its team members evaluate the assumptions in this report as reasonable does not guarantee that those assumptions will prevail.

PSC Recommended Draft - June 2012
EOA Section 1 Appendix C

Summary

This evaluation starts from the assumption, embedded in the economic development policies of all local governments in the region, that the retention, expansion, and relocation to the region of industrial sectors is something that the region desires. It addresses the capacity of industrial land in the Portland Harbor area to accommodate future development, both for new public marine terminals and private marine-dependent businesses. It addresses *four questions posed by the City*:

1. Are the methods the City used to estimate the location and amount of vacant, partially vacant, and potentially buildable industrial land in the Portland Harbor area likely to yield reasonable estimates?
2. Given the estimated land supply in the Portland Harbor area, how suitable for a public marine terminal are the few sites identified by the City as having the best potential to accommodate such a terminal?
3. If those sites do not develop as marine terminals (for whatever reasons) to what extent can the Port of Vancouver play a role in accommodating forecasted cargo demand in the Portland region?
4. Finally, if existing vacant land in the harbor area and in Vancouver is estimated to be insufficient to accommodate forecasted or desired transshipment or industrial activity, what is the potential for more efficient use of industrial land in the Portland Harbor study area? That question implies answering the question: What does more efficient use of industrial land mean, and how would it be measured?

SUPPLY OF VACANT OR UNDERUTILIZED INDUSTRIAL LAND

The methods used for the City's evaluation of the supply of vacant land in the Harbor Area are sound, state of the practice, and produce results that have been confirmed by independent methods. When looking for where in the Harbor Area is vacant land that could potentially be assembled into a 100-acre (or, at a minimum, a 50-acre) site with waterfront access? the City correctly identified the two sites with greatest potential: Atofina and Time Oil.

POTENTIAL FOR MARINE TERMINAL SITES

Public marine terminals have specific land use requirements that are difficult to find. Ideally, sites must be large and flat, inside of an industrial zone, have significant shoreline on a navigable river, be served by both rail and truck, and free of contamination, wetlands, or other environmental constraints. Excluding West Hayden Island, there are no sites in the Portland Harbor that meet these ideal requirements, though there are a few sites that come close. This should not imply that West Hayden Island meets all the ideal site requirements (in fact West Hayden Island lacks sufficient truck access, and is constrained by wetlands), but is simply stating that the West Hayden Island site is outside the boundary of our study area. The questions are: how close do they come, and is there a way to cost-effectively develop these sites as productive public marine terminals?

The City of Portland identified the two sites in the Portland Harbor that are most likely to be suitable for development of a new public marine terminal: the Atofina site, and the Time Oil site. Of these two sites, development is technically possible on either, but there are major hurdles that would add significant costs. Both sites have some level of contamination, both sites would require negotiation and property acquisition from numerous property owners, and both sites are smaller than desirable, which precludes the possibility of an onsite rail loop. Ultimately, issues related to the Superfund cleanup of the Willamette River make all sites in the Portland Harbor very challenging (if not altogether unfeasible) for development in the near future.

ROLE OF VANCOUVER IN PROVIDING HARBOR-AREA INDUSTRIAL LAND

Recent forecasts suggest that under mid-range assumptions about cargo demand, the Port of Portland's existing marine terminals will reach the limits of their capacity (for at least some cargo types) in the next several decades. Once these facilities meet their capacity, the Port will need to develop new facilities, or else turn away demand. The Port of Vancouver shares many of the same attributes that make the Port of Portland an attractive place for marine shipping. Thus, the Port of Vancouver is a logical place to site new marine terminals, if sites are unavailable in the 4,000-acre Portland Harbor.

Projecting future land needs to accommodate demand for public marine terminals is difficult, and even the best forecasts suggest a wide-range of potential outcomes. Given mid-range (and presumably most likely) scenario for future demand, the Port of Vancouver may, in theory, have

enough developable land to accommodate regional growth in cargo volumes through 2040. The assumptions in variation of the mid-range forecasts show the Portland-Vancouver Region needing an additional 200 to 600 acres for new terminals by 2040: there is vacant industrial land with water-access that is in that range. In practice, however, competing demands for Port of Vancouver lands, policies and competition among affected jurisdictions, and the potential for higher growth in cargo volumes all make it possible, if not likely, that the land controlled by the Port of Vancouver would not be able to accommodate all of the regional demand for marine cargo. The "high" forecast of cargo demand, for example, is three times the mid-range demand.

From a regional perspective, it makes little difference whether terminal development occurs in Portland or Vancouver. Both cities function as part of the same regional economy, and share the same infrastructure and labor pool. At a local level, however, if demand for public marine terminals is shifted from Portland to Vancouver, the City of Portland would lose some industrial jobs and the income they generate to Vancouver.

POTENTIAL FOR INCREASED EFFICIENCIES IN THE USE OF LAND

Typical measures of efficiency of land use include employment, real market value, and built space. Harbor industrial development tends to have low floor-area ratios (FAR) and a relatively low number of jobs per acre. Thus, typical measures of efficiency would all tend to improve if industrial land were converted to other commercial uses. But industrial lands in general, and harbor lands in the case of this study, are clearly an important piece of the regional economy. Therefore, we suggest two alternative measures of efficiency that are more appropriate for harbor industrial land: value added and tonnage of cargo.

Data from recent years show some measures of economic output have been increasing faster than vacant land is being converted to developed land, and other measures have not. The region should continue to track these measures and adopt policies with the intention of increasing measures of economic output faster than vacant land is converted to developed land. This seems like an objective that could appeal to people with different interests: economic development, environmental amenity, or smart growth.

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Chapter 1 INTRODUCTION

Section 1.1 describes events leading to this study and what the City hopes to learn from it. The City wants to evaluate the potential for the Portland Harbor to support economic activity. It has four questions about the capacity of land in the Portland Harbor to support future economic activity: (1) about the supply of vacant and underutilized land in the harbor area for marine terminals or water-dependent industrial uses; (2) about the land needs and potential land available for new port terminals; (3) about the role of Vancouver as a regional port; and (4) about potential changes in the use of industrial land (one aspect of which is referred to as "land efficiency"). **Section 1.2** describes how the rest of the report is organized.

1.1 BACKGROUND AND PURPOSE

The City of Portland (City) is the center of a large regional economy: there are about one million jobs in the seven-county metropolitan area, and almost 400,000 jobs within the city limits.

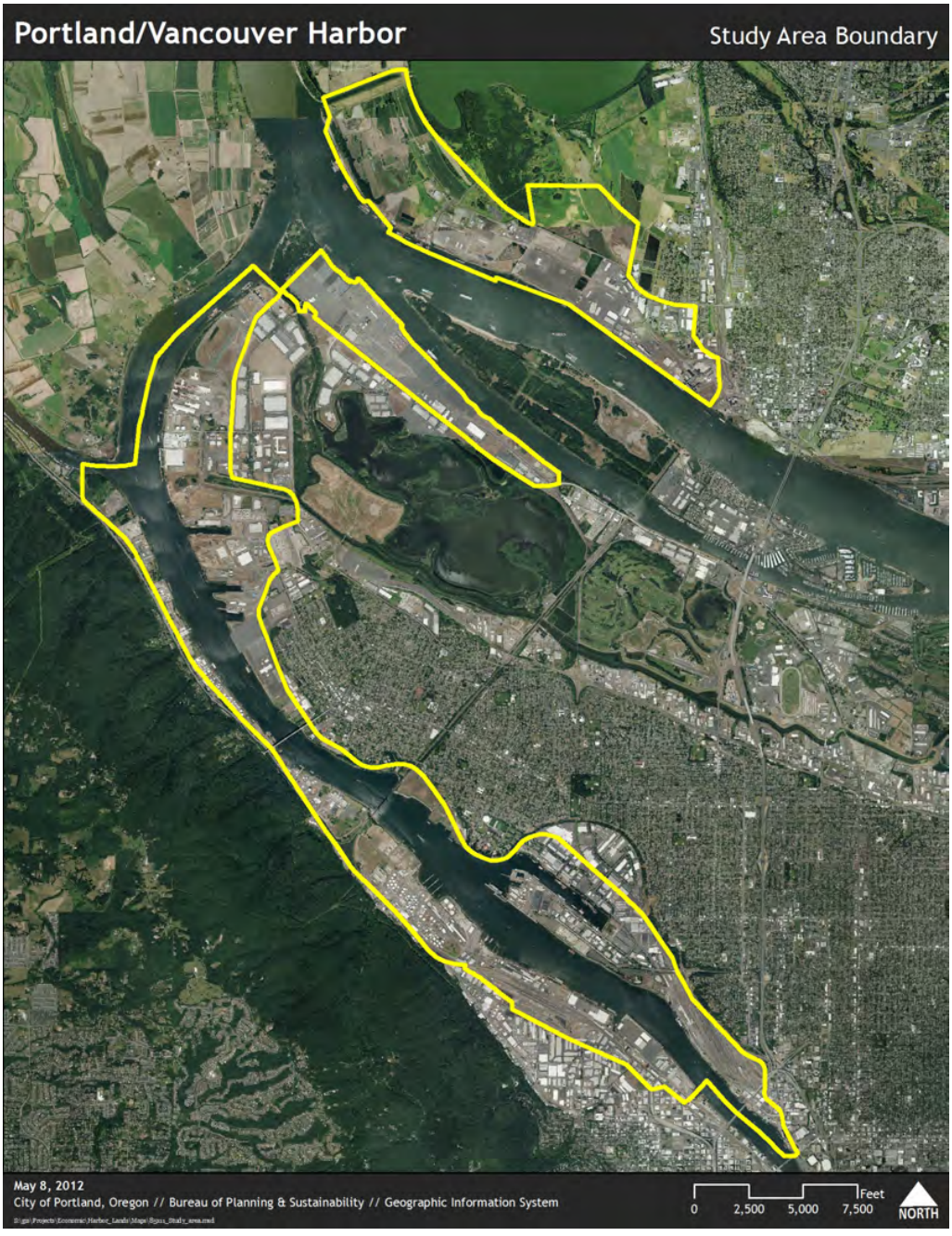
Many factors have contributed to the growth of the Portland economy, but one important factor is its ability to transport goods. Portland benefits from accessibility by highways (at the intersection of Interstates 5 and 84), rail (two Class 1 railroads - Union Pacific and BSNF, and short-line railroads), air (Portland International Airport), and sea (the Columbia and Willamette rivers).

The Portland Harbor is an industrial area located along the Willamette River that relies on the confluence of transportation infrastructure in the City (Exhibit 1.1). It contains about 4,000 acres of land located south of the Columbia River, west of I-5, and on both the east and west shores of the Willamette River. River-related industrial activities operate as a partnership between public marine terminals (owned and operated by the Port of Portland) and private businesses, including many marine-dependent industries. Key industrial sectors in the Portland Harbor include construction, manufacturing, warehousing, and transportation.

Over the past decade several studies of the Portland Harbor have been completed. The 2010 *West Hayden Island Economic Foundation Study* (prepared by Entrix for the City of Portland) summarized the conclusions of these studies:

> *"Portland Harbor serves as an economic engine for the metro regional economy… Past studies indicate that cargo and manufacturing activities dependent on waterborne transportation contribute significantly to the metro region's economy. These studies indicate that marine-related economic activity generates from 20,000 to 100,000 jobs and from $1.4 to 3.4 billion annually in regional income."*

Exhibit 1-1. Portland Harbor study area



Source: City of Portland, Bureau of Planning, 2011.

Another recent study, *Portland's Working Rivers: The Heritage and Future of Portland's Industrial Heartland* (2008 report prepared by Carl Abbott for the Working Waterfront Coalition) describes the impact of the harbor on the City. Some of its conclusions:

- The Portland Harbor is the nexus of a multi-modal system. The Willamette and Columbia rivers serve marine terminals, ocean shipping lines, barge lines, and bulk handling facilities. These waterborne facilities connect to railroads, interstates, commercial and general airports, and pipelines.
- Approximately 90% of harbor sites have access to rail routes, improving efficiency of transporting large loads from sea to land.
- Cargo forecasts by the Port of Portland further highlight the importance of the harbor: the volume of trade through Portland is expected to double by 2035.

In 2004, four river-related districts (Northwest Industrial District, Swan Island / Central Eastside, Rivergate, and Columbia Corridor) had employment about equal to the metropolitan area's three other industrial districts: the Sunset Corridor and 217 Corridor (where the electronics and computer industry is concentrated), and the Milwaukie/Clackamas Corridor (with a mix of manufacturing and distribution).

The importance of the harbor to the regional economy would be sufficient reason for the City to evaluate the harbor's needs for continued operation and expansion. But additional issues motivate the current evaluation. First, the City is in the process of concluding an extensive study of the City and regional economy (its *Economic Opportunities Analysis*, or EOA) as required by state land-use law. Second, the City has been engaged in studies of West Hayden Island, where there is a question about which land should be made available for future port development and which should preserved as natural areas.[1] Answering that question depends in part on whether alternative areas in or near the Portland Harbor study area have land that is appropriate and sufficient for the water- and port-related development that is expected or desired.

Thus, though several studies of development issues in the Portland Harbor area have occurred in the last five years, the City wanted an evaluation to (1) synthesize and evaluate the findings of previous studies as they relate to the harbor economy and industrial land uses, and (2) address three specific questions related to the development of industrial land in the Portland Harbor.

To that end, the City asked ECONorthwest (ECO) to re-examine the inventory of existing harbor lands, both in Portland and the broader region (including Vancouver). This report addresses the capacity of industrially-designated land in the harbor area to accommodate future development,

[1] A current proposal for West Hayden Island is to devote 300 acres of land for marine terminal development, while setting aside 500 acres for open space.

both for new public marine terminals and private marine-dependent businesses. It addresses four questions posed by the City, each new question building from the answer of the question preceding it:

1. Are the methods the City used to estimate the location and amount of vacant, partially vacant, and potentially buildable industrial land in the Portland Harbor area likely to yield reasonable estimates?
2. Given the estimated land supply in the Portland Harbor area, how suitable for a public marine terminal are the few sites identified by the City as having the best potential to accommodate such a terminal?
3. If those sites do not develop as marine terminals (for whatever reasons), to what extent can the Port of Vancouver play a role in accommodating forecasted cargo demand in the Portland region?
4. If existing vacant land in the harbor area and in Vancouver is estimated to be insufficient to accommodate forecasted or desired transshipment or industrial activity, what is the potential for more efficient use of industrial land in the Portland Harbor study area? That question implies answering the question: What does more efficient use of industrial land mean, and how would it be measured?

By answering these questions, this report helps the City move forward in its planning processes. It provides information to help with assumptions that the City's *Economic Opportunities Analysis* may be making about industrial land supply and the efficiency (density) at which that land is likely to develop. It helps the City assess the importance of West Hayden Island as a site for future development of new public marine terminals by evaluating the (limited) potential of suitable sites for such development elsewhere in the Portland Harbor.[2]

[2] This report does not, however, include any analysis regarding the applicability of its findings to state, regional or local planning policies: such information will presumably be provided as part of any additional analysis by the City.

1.2 ORGANIZATION OF THIS REPORT

This report has three additional chapters and three appendices:

Chapter 2, Framework and Methods: Summary of economic concepts underlying the analysis, and specific methods used to answer the four questions that are the focus of this report.

Chapter 3, Analysis: Current and likely future conditions for key factors affecting economic activity in the Portland Harbor.

Chapter 4, Summary of Findings: Briefly restates the important conclusions of our analysis.

Appendix A: Research Methods: Framework for understanding and methods for conducting our analysis (more detail than is provided in Chapter 2 of the main report).

Appendix B: Port Terminal Site Evaluation Criteria: Used by Maul Foster & Alongi, Inc. to evaluate the feasibility of potential sites in the Portland Harbor.

Appendix C: Analysis of Harbor Land Capacity and Demand, Portland and Vancouver: Provides greater detail (including a wealth of tables) on the data-driven methods used, in part, to determine the potential for the Port of Vancouver to accommodate forecast demand for the Portland Harbor, if there are insufficient sites in Portland to accommodate all of the expected demand.

Appendix D: Mapping Analysis: Presents the results of the City's visual survey of aerial maps of the Portland Harbor to classify the lands in one of several categories.

Chapter 2 FRAMEWORK AND METHODS

Section 2.1 discusses a *framework* for evaluation: concepts that underlie any evaluation of this type. It discusses (1) the role of industrial activity in the economy, (2) definitions of industrial use and industrial land, (3) factors relating to the supply of and demand for industrial land, and (4) the concept of land efficiency: what is it, why does it matter, and how is it measured. **Section 2.2** is more specific about the *methods* used for the evaluation (review of previous studies, secondary data, case studies, interviews) and how they are used to address this study's four questions. **Appendix A** provides a more detailed description of our framework and methods.

2.1 FRAMEWORK

2.1.1 WHY CARE ABOUT INDUSTRIAL LAND?

This study starts from the assumption, embedded in the economic development policies of all local governments in the region, that the retention, expansion, and relocation to the region of industrial sectors is something that the region desires. Industrial activity and employment is mainly classified as export oriented ("traded sector") and is likely to have jobs at higher than average wages.

2.1.2 DEFINING INDUSTRIAL LAND AND USERS

- **Industrial land:** What is commonly referred to as "industrial" land is land designated by a local government (in its comprehensive plan, and implemented by its zoning ordinances) to allow (but not necessarily require) industrial uses. In the Portland Harbor, the City does strictly limit non-industrial uses, and allows only river-related and river-dependent industry.
- **Harbor land:** A smaller subset of industrial land pertinent in this study is "harbor" land. For this study, we use the City's definition of the "Portland Harbor." A map of the Portland Harbor is shown previously in Exhibit 1-1.
- **Industrial users:** A recent analysis of industrial land published by the American Planning Association[3] used NAICS codes to define "industrial use" in urban areas, including a "strict" definition of construction, manufacturing, wholesale trade, and transportation and warehousing. This list, however, does not necessarily reflect the types of businesses that require industrial land. For example, many jobs in the construction industry are not physically located at a

[3] Howland, Marie. 2011. "Planning for Industry in a Post-Industrial World: Assessing Industrial Lands in a Suburban Economy." Journal of the American Planning Association. Winter, Vol 77, No 1. pp 39-53.

central, industrial location, but instead operate on sites throughout the region. Therefore, one should not focus exclusively on a list of NAICS codes to identify the range of businesses that could have demand for industrial land in Portland.

- **Public marine terminals:** Our analysis treats public marine terminals (i.e., the Port of Portland facilities) differently from other uses of harbor industrial land. These port terminals function as public infrastructure, facilitating economic activity for other industries in the region.

2.1.3 SUPPLY OF AND DEMAND FOR INDUSTRIAL LANDS

The total amount of land inside the Portland city limits is essentially fixed. Thus, for the City of Portland, the question of land supply focuses on how much land is vacant, partially vacant, or underutilized, and how much land is constrained (by environmental contamination, environmental overlays, and other issues).

In general, industrial land must accommodate most job growth in "industrial" sectors. It must also accommodate some job growth in "non-industrial" sectors. In other words, not all jobs in "industrial" sectors use industrially-designated land, and not all industrially-designated land is used by "industrial" sectors.

Analysis of land *supply* is about estimation, not forecasting. The use of "data layers" from Geographic Information Systems (GIS) is the standard technique for such estimation. Because it is estimation, the uncertainty is not about the future, but about the data and assumptions that are used to describe what is on the ground now. Our evaluation consists of a review of the data and assumptions.

Factors affecting supply and demand are not independent. Businesses and developers choose the land with the best value. Price makes a difference. In the Portland Harbor land may be more expensive (cost per acre) than at the region's periphery. But land in the Portland Harbor is also close to the downtown, labor markets, port terminals, and interstate highways. If it is only a little more expensive, it may still be a preferred location for growth. If it becomes too expensive, then prospective industrial users may locate elsewhere, on land that provides a better value (for example, because lower land cost and congestion are judged to more than offset the higher costs of being more distant from a preferred location). Businesses that need water access would have an incentive to bid more for land providing that access, and other businesses would find better value in alternative locations.

2.1.4 "EFFICIENT" USE OF INDUSTRIAL LAND

Efficiency is a measurement of how much output is produced per unit of input. In this case, the City's concern is about the amount of economic activity (output) generated per acre of land (input).

Traditional measures of efficiency

Typical measures of efficiency of land use include employment, real market value, and built space. These measures look at the amount of economic activity occurring on a property, but give relatively low marks to industrial development. Compared to an office tower, an acre of industrial development is likely to have much lower assessed value, employment, and gross square footage of built space. Thus, measures of the efficiency of employment land based on any of these measures in the numerator would all tend to improve if industrial land were converted to commercial uses.

But industrial lands (and harbor lands) are clearly important to the regional economy. If every jurisdiction allowed vacant industrial land to convert to commercial uses on the assumption that some other jurisdiction would provide the industrial land, the regional supply of industrial land would get smaller quickly. Land with port access is a particularly important and relatively rare component of all regional industrial land. Marine terminals provide access to other markets, facilitating commerce, and allowing traded-sector businesses to export their goods to other markets.

Alternative measures of the output component of efficiency

To evaluate the efficiency of the use of industrial land in the Portland Harbor, one needs a definition of efficiency that makes sense for industrial land. We suggest two alternative measures of efficiency that are most appropriate for harbor industrial land: value added, and tonnage of cargo.

- **Value added**: Value added is defined as the value of outputs (per unit or in the aggregate) minus the cost of inputs purchased from other firms used to create output.[4] Proponents of the industrial and manufacturing sectors point to its potential for high "value added." One measure of the efficiency of a fixed supply of industrial harbor land would be the amount of value added generated per acre for businesses located in the harbor.
- **Cargo:** There is a reasonable argument that much of the industrial land in the Portland Harbor area serves a regional need for

[4] In that sense, value added is a measure of a firm's contribution to GDP. Another way to think about this is that everything that a firm itself puts into the production of a product (primarily the labor of its employees and capital) "add value" to the raw materials and intermediate goods and services it purchases to make its final product.

transshipment. Therefore, a regional measure of transshipment activity might be appropriate for measuring the efficiency of such land. Some measure of cargo (e.g., tonnage, volume, value, berth utilization) is an obvious choice. Because data are more readily available for tonnage of cargo, that is an alternate measurement of land-use efficiency in the Portland Harbor that we examine in this report. If the City were interested in tracking these alternative efficiency measures in the future, then tracking multiple measures of cargo (i.e., tonnage and value) would provide a more complete picture of cargo trends.

2.2 METHODS

2.2.1 GENERAL DATA SOURCES AND TECHNIQUES

To conduct our analysis, we used the following data sources:

- **Existing studies**. Extensive analysis has been conducted regarding the Portland Harbor, industrial land, and port terminals. These efforts result in a library of reports and studies addressing different aspects of the regional economy. Appendix A includes a list of recent (or ongoing) studies that were reviewed in our analysis.
- **Secondary data sources**. ECO incorporated many secondary data sources into its analysis.[5] As with "existing studies," the objective is to leverage past research efforts to answer the questions posed in this study. Appendix A includes a list of the secondary data sources used in our analysis.
- **Interviews**: Many people in the Portland area have special knowledge of, and interest in, the Portland Harbor. ECO interviewed individuals from both the public and private sectors, and reviewed notes on past interviews that had been conducted for recent related studies.

2.2.2 EVALUATING CITY METHODS USED TO ESTIMATE PORTLAND HARBOR BUILDABLE LAND SUPPLY

ECONorthwest used the following methods to address this question:

[5] Secondary data sources are ones collected and readily available by someone other than the user (in this case ECONorthwest). Typical secondary sources are government agencies (e.g., U.S. Census, ODOT, Metro, Port of Portland).

- Review of studies summarizing industrial and harbor land supply: *Industrial Districts Atlas* (2004) and *Harbor ReDI Industrial Sites Analysis* (2009).
- Review of GIS shape files and cross-referencing to staff aerial analysis of harbor lands and Google Earth aerial photos (August 2011).
- Discussion of methods and BPS staff, and comparison to standard methods for developing land inventories and identifying buildable land.

2.2.3 ADDRESSING THE POTENTIAL SITES FOR NEW MARINE TERMINALS

To determine which sites might best accommodate a public marine terminal, we began by identifying the technical site requirements for a marine terminal. ECO interviewed representatives of the Port of Portland to identify their ideal site requirements, as well as which of these requirements could be reduced while still accommodating a working port facility. Members of the ECONorthwest team with experience running west coast ports looked for creative ways to adjust these site requirements to create a working terminal on smaller or otherwise constrained sites.

BPS staff identified sites that could potentially meet these criteria, based upon an aerial analysis of existing development in the Portland and Vancouver harbors.[6] ECO, reviewed the sites identified by the City of Portland, and toured the sites, conducting a visual inspection, documenting conditions affecting the suitability of each site for the proposed development.

2.2.4 ADDRESSING THE ROLE OF VANCOUVER IN HARBOR INDUSTRIAL LAND SUPPLY

We began by attempting a data-driven analysis. In principle, if we knew the capacity of existing marine terminals in Portland and Vancouver, and subtracted the forecast future demand for these areas, then we could identify the amount of demand that could not be accommodated by existing facilities. This demand (in tons of cargo) could then be translated into the acres of land necessary for new terminals to accommodate this growth. Comparing the required acres to support new terminals with the available land supply in the Portland Harbor and in Vancouver, we could identify how much of Portland's demand might need to be accommodated

[6] Aerial photos were taken in 2010 and 2011.

in Vancouver, and whether or not Vancouver had sufficient land to accommodate it.

This analysis established a high and low boundary for the potential land need. We also defined a "most-likely" scenario that falls between the two extremes. In order to give these numbers more context, and to help us arrive at the most-likely scenario, we conducted numerous interviews with representatives of the ports of Portland and Vancouver.

2.2.5 ADDRESSING THE POTENTIAL FOR INCREASED EFFICIENCIES

The City is interested in knowing if industrial land in the Portland Harbor can be used more efficiently in the future. To answer, we looked at recent economic trends in the Portland Harbor and in the City of Portland as a whole for changes in land-use efficiency for industrial users. For this analysis, we considered several measures of output in an efficiency measure: employment, real market value, value added, and tonnage.

We began by identifying all parcels in the Portland Harbor using GIS. We examined data from two different years: 2002 (one of the earliest years that data are available using North American Industry Classification System codes), and 2008 (the most recent year Quarterly Census of Earnings and Wages data are available). Comparing data from the two years we calculated the change in developed acreage in the Harbor, the corresponding change in real market value, and the net change in employment.[7]

We also collected data from different sources for two alternative measures of output (for the denominator): value added and cargo (volume, tonnage, and value). Unlike employment and real market value, data for value added and cargo tonnage is not tracked at a parcel-specific level. Instead, data is available at the regional, City, zip code or Census tract level. For our analysis, we used Port of Portland data on historical levels of cargo tonnage in the Portland Harbor, and the IMPLAN economic model for the zip codes that most closely align with the boundaries of the Portland Harbor for value added. We used the same years (2002 and 2008) as were used for other measures of efficiency.

[7] The time period used in this analysis, 2002 to 2008, does have limitations. Only having data for two years, doesn't allow for a detailed view of trends during the interim years. Moreover, a six-year period is relatively short, and may not be indicative of long-term trends. Nonetheless, these years allowed us to make the most efficient use of available data for our analysis. Moreover, the analysis focused on comparing how these different measures of efficiency changed relative to each other over the same period of time, and not on establishing long-term trends for each measure.

Chapter 3 ANALYSIS

Section 3.1 addresses whether or not the methods used by the City to estimate the location of buildable land in the Portland Harbor area yields reasonable estimates: it concludes that they are. **Section 3.2** addresses the potential for land in Portland Harbor (not including West Hayden Island) to accommodate a new Port terminal. It finds that the two areas that might have enough vacant land to be assembled into a development site of sufficient size are relatively constrained: they could, theoretically, accommodate small terminals of various types, but some of the costs of development would be high relative to alternative sites. **Section 3.3** addresses the potential for the Port of Vancouver to accommodate regional demand for expanded Port facilities. It concludes that under the most-likely scenario, the Port of Vancouver has about the right amount of land to accommodate the bulk of the region's forecast growth in marine cargo through 2040, but that alternative and reasonable assumptions lead to the conclusion that more land than what the Port of Vancouver now controls will be needed. **Section 3.4** addresses the potential for increased efficiency for the use of industrial land in the Portland Harbor. It concludes that value added and tonnage of cargo per acre are more appropriate than traditional measures of efficiency for harbor industrial lands, and that recent historical trends demonstrate the Portland Harbor has become more efficient by most efficiency measures.

3.1 EVALUATION OF METHODS USED BY THE CITY TO ESTIMATE BUILDABLE LAND

The question is whether the methods used by BPS to identify vacant and buildable land are likely to be accurate. Will they systematically over or under estimate the land supply? In particular, are they likely to miss areas of vacant, buildable land that are big enough for a marine terminal (sites of at least 50 acres of contiguous vacant of underutilized land that has river access and could be serviced)?

To begin to answer these questions, we looked at recent studies that sought to determine the supply of buildable land in the Portland Harbor. Exhibit 3-1 summarizes the findings of the City of Portland Economic Opportunities Analysis (EOA), including the first draft (Hovee, 2009), and final report (Hovee, 2012), as well as the West Hayden Island Economic Foundation Study (Entrix, 2011), and the City of Portland Bureau of Planning and Sustainability's internal effort to quantify buildable lands, described in Exhibit 3-2 as "BPS Aerial Survey."

Exhibit 3-1. Summary of previous study estimates of Portland Harbor buildable land supply

		City of Portland Harbor Land Supply		Parcels of Size: (3)	
Study	Year	Gross Acres (1)	Effective Acres (2)	50-250 Acres	250+ Acres
EOA Draft 1, Hovee	2009	266	61	0	0
EOA, Hovee, BPS	2012	326	108	0	0
Entrix, Inc.	2010	299	<50	2	0
BPS Aerial Survey	2011	590	178	3	0

Compiled by the City of Portland Bureau of Planning and Sustainability, from the following original data sources:
City of Portland Economic Opportunities Analysis, (E.D. Hovee and Company, 2012), and first draft (2009)
West Hayden Island Economic Foundation Study (Entrix, 2011)

Notes:
(1) Total acres of vacant land, without regard to environmental or contamination constraints
(2) Total acres adjusted for environmentally sensitive land, contaminated land, or land with insufficient infrastructure
(3) Number of individual parcels or polygons of the stated acreage

Although these recent studies come to different conclusions on the amount of vacant, buildable land, all of the studies show a relatively small supply of effective acres, ranging from less than 50 acres in the Entrix study, to 178 acres in the BPS Aerial Survey. For the purpose of identifying sites for public marine terminals, we need to consider not only the total acreage, but the size of the individual parcels Scattered small parcels of vacant land cannot accommodate a marine terminal, a single site (typically of 50 acres or more) is needed. These recent studies show that no more than three such sites are present in the Portland Harbor.

The City asked ECONorthwest to confirm that the methods used to identify these sites were reasonable. Some simple ideas and calculations help to answer that question:

- The state of the practice for land inventories is quite advanced. The Oregon statewide planning program's requirements for "buildable land analysis" (from the mid-1970s) spurred the use of Geographic Information Systems (GIS) throughout the state. All large cities and Metropolitan Planning Organizations in Oregon have been developing their GIS tools and datasets for over 25 years. Metro is looked to as a leader in the country on the use of GIS for land-use evaluation. The City of Portland has advanced its data in parallel with Metro. Databases that started as crude approximations have improved substantially. They have been reviewed and updated many times; data from more and more sources have been added (e.g.. tax assessment, public works); computer power and software have improved; digitized mapping of aerial photographs now allows accurate registration of those photographs to underlying layers of thematic maps. In short, the data are current and accurate, and the

ability to manipulate and summarize them is substantial, fast, and technologically reliable.

- The Portland Harbor area is not big by regional standards. The detailed BPS GIS data put it at just over 4,000 acres. As a back-of-the-envelop corroboration using different datasets and tools, ECO used Google-Earth to draw the approximate boundaries of the study area (Exhibit 1-1 above) and calculate areas: the result was 4,100 acres, the equivalent of a square 2.5 miles on a side. Just inspecting aerial photographs would allow one to find large, undeveloped acreages.
- The City has conducted three extensive studies of industrial and harbor land that resulted in detailed mapping: *Industrial Districts Atlas* (2004), *Harbor ReDI Industrial Sites Analysis* (2009), and the GIS-based inventory (2011). The 2011 inventory maps and data table are included as an Appendix to this report.
- ECO has worked on a dozen buildable land evaluations, and has written many reports on the steps for working from "all land" to "vacant, buildable land." ECO's conversations with BPS staff led to the conclusion that staff had used state-of-the-practice techniques. In summary, (1) from "all land" the land not in parcels is removed (e.g., water bodies, street and other rights of way); (2) of the land in parcels, the land that is developed and judged unlikely to redevelop easily (usually based on the value of improvements) is removed; (3) from the undeveloped or under-developed land, the land with physical or policy constraints is removed (e.g., wetlands, in flood ways, steep slopes).

All of the previous points strongly suggest that the information about the supply of developable industrial land in the Portland Harbor area that BPS has generated is very reliable. The buildable land inventory using GIS data that was done for the update of the Economic Opportunity Analysis looks reasonable by the tests we noted.

But despite good intentions and good analysis, there are details in any such analysis that require assumptions, and the assumptions can make a difference to the outcomes. For example:

- Which constraints are absolute, and which are restrictive? Does a slope of more than 10% preclude industrial development? 15%? What if the average slope on a large parcel is 10%, but half of the parcel has slopes less than 5%? What about soil contamination: can the site be remediated, or is the extent of the contamination and legal complexities such that the site is effectively off the market for the foreseeable future?
- When is land "underutilized"? Some vacant areas around buildings may be necessary for vehicle movement, production staging, or

occasional storage. Are large parking lots "vacant" or are they an essential part of the operations in the buildings adjacent to them? A low value for improvements does not necessarily mean that the owner has any interest in redevelopment.

- Ownership patterns. What might look like relatively large areas of vacant land on an aerial photograph may be in many parcels with many different owners. Land assembly and development may be very difficult. This point is illustrated by the findings in Exhibit 3-1, which show up to three sites with at least 50 acres using the BPS methods (ignoring parcel boundaries and looking at aerial photographs), but no sites of that size when using the methods in the Economic Opportunities Analysis (which did look at parcel boundaries).

For the Harbor Area land evaluation, our evaluation is that the buildable land inventory using GIS data that was done by BPS to update of the Economic Opportunity Analysis has generally made inclusionary rather than exclusionary assumptions: we think that is appropriate. BPS did not, for example, eliminate from its search for large, buildable parcels those with arbitrarily defined thresholds for buildability (e.g., proximity to services or the river, steep slopes, contamination), or those that had a particular ownership. All those parcels are still part of the dataset from which large sites were identified. The result, as Section 3.2 shows, is that the large sites identified have several challenges for development: challenges that were not screened out by earlier assumptions about buildability criteria. In other words, on that score, the methods used by BPS were inclusive, and the result is that there would be less chance of screening out land that might eventually prove to be capable of contributing to a large site for a marine facility.

An assumption that BPS did make, and that all buildable land evaluations that we are familiar with also make, is that developed parcels are, in general, not buildable parcels. They can, of course, become buildable parcels if their buildings are removed. Thus, it is theoretically possible that parcels that look developed (from assessment data, aerial photographs, and field surveys) could eventually be part of a land assembly large enough to accommodate a large marine terminal. The kind of detailed, property-level analysis needed to make judgments about land redevelopment and site assembly is not done as part of a regional or city buildable land evaluation.

But there is still the issue of "underutilized" land. A buildable land dataset, like the one BPS has developed, will be quite good (after field testing—and there has been plenty in the Harbor Area over the last 10 years) at distinguishing developed parcels from vacant parcels in most cases. But it is more difficult to determine when a generally vacant parcel is underutilized, and more difficult still to determine whether parcels that are

developed have underutilized remainders that might be considered as vacant and eligible for consolidation into a larger, developable site.

The documentation of the City of Portland's GIS-based Development Capacity Model[8] says that it (1) identifies (and presumably flags as undevelopable) "constrained" properties (i.e., significant environmental or historic resources), and (2) identifies developed parcels "significantly underutilizing their allowed development capacity (using less than 20% of available capacity, not including any development bonuses or incentives)" [that determination can be over-ridden by a judgment by BPS staff that a property is "likely" or "not likely" to redevelop]. The dataset has detailed information on parcel attributes (around 100 attributes per parcel), including building footprint (which allows a calculation of the amount of land not currently developed as a building). It has an algorithm for calculating "site area" by combining the acre of contiguous "underutilized" lots. In short, this is an extensive and well-documented dataset.

The BPS identification of potentially developable sites in the Portland Harbor did not rest entirely on technical analysis using GIS. Additional analysis done as part of the specific to the Harbor Lands Inventory also relied extensively on a review of aerial photographs, with staff performing a visual inspection of all sites along the Willamette River to ensure that any large areas of apparently vacant land had been included in the database of potential terminal sites, and that all of the sites identified by GIS appeared to have the development potential that was suggested by the data. Additionally, BPS staff made reasonable efforts to acquaint themselves with the sites, talking to Port of Portland officials, and visiting the areas, to make sure that the BPS analysis was grounded in a solid understanding of what was actually occurring on key sites in the Portland Harbor. In short, land uses and vacant lands identified in the visual survey were compared with the GIS/BLI data to ensure there were no large information gaps.

As a final check on the site inventory, we relied on our familiarity with the study area, the City documents cited above, and aerial photographs to see whether there were any large areas of vacant or underutilized land besides the two (Atofina and Time Oil sites) that the City identified as the best candidates for a new marine terminal. On the west bank of the Willamette River, we found nothing beyond the Atofina site: the north reach has only a narrow strip of mainly developed land; the south reach has a wider land area but is entirely developed along the waterfront. We found the following candidates on the east bank:

[8]http://www.portlandonline.com/cgis/metadata/viewer/display.cfm?Meta_layer_id=52965&Db_type=sde&City_Only=False

- Swan Island Industrial Park. Land at the south edge on the NE bank of the Willamette River could be classified as underutilized: it is an operation for transshipment of aggregate (10 acres). But even if the parking and storage on both sides of the site is counted, the site would still fall way short of the minimum threshold of 50 acres.
- McCormick and Baxter site, SE of BNSF bridge on east side of the Willamette River. Depending on what land is counted (e.g., backing out land for rail right of way, some existing buildings), this site may be 50 – 70 acres in size. This site was excluded from the City's analysis, primarily because it was recently proposed to be rezoned as EG2 in the River Plan, which (although it allows industrial development) does not allow rail yards, and requires greater setbacks and landscaping than other industrial zones (like IH for heavy industrial). Conversations with BPS staff indicate that the EG2 zone designation is one element of the River Plan that has been challenged, and there is a good chance that a revised River Plan will not propose the EG2 zoning for the site, which would make this site potentially available for marine terminal development.
- "Underutilized" land north of St. John's Bridge on east side of the Willamette. What may seem underutilized from a high-level aerial photograph is actually space for parking new cars from Asia—this is the Port of Portland's Terminal 4 operation (about 260 acres total, handling autos, forest products, steel, and dry and liquid bulks). This site is already part of the Portland area's supply of marine terminals and cannot be counted to add new capacity, unless it were redeveloped. Evaluating that possibility is beyond the scope of our study.
- Sites in the Terminal 5 and Terminal 6 area. There are some sites for infill (e.g., 50 acres off North Lombard in Terminal 6) but there is no water frontage available for a new terminal. Evaluating redevelopment of Port terminals is beyond the scope of our study.
- Kelly Point Park. About 50 acres at the confluence of the Willamette and Columbia Rivers, abutting Port properties of Terminals 5 and 6 is park land that is not available for development.

Of all the sites examined (beyond the Atofina and Time Oil sites already identified by BPS), the only one that met the minimum size requirements (and was not parkland) was the McCormick and Baxter site. The development potential of this site was studied extensively by the City in the past, and the results are described in the *McCormick & Baxter Site Reuse Assessment: Final Report* (June, 2001). The site could have potential for marine terminal development, but (as detailed in the 2001 site assessment) it is heavily constrained in several areas: relatively shallow water at the shoreline, inability to expand to adjacent parcels due to existing uses (Metro

open space and University of Portland campus), isolation from truck routes that require traveling through residential neighborhoods and up a relatively steep bluff, other infrastructure insufficiencies, and significant liens and encumbrances. While the challenges are substantial, they are not necessarily insurmountable, and the other sites identified by BPS face some similar challenges.

Ultimately, the site was excluded from further analysis, because it is less likely that adjacent lands could be assembled into the site, due to the adjoining zoning, and because past brownfield remediation work on the site was carried out in a way that limits future industrial uses, unlike the Atofina and Time Oil sites. Our brief review of the site constraints suggest it is at least as constrained as the Atofina and Time Oil sites, and would not be a better site for marine terminal development, due to the access constraints mentioned above. Thus, our answer to question posed is:

- BPS has used appropriate measures to identify vacant and buildable land.
- The two sites it has identified as meeting the minimum size requirements for a new marine terminal (Atofina and Time Oil) appear to be the two best sites that meet that size requirement with vacant land. Any other location would require assembling and redeveloping properties that now have buildings on them.[9]

3.2 POTENTIAL SITES FOR NEW MARINE TERMINALS

This section addresses the question: How suitable for a public marine terminal are the few sites in the Portland Harbor that have been identified by the City as having the best potential to accommodate such a terminal? Through previous planning efforts,[10] the City of Portland Bureau of Planning and Sustainability (BPS) identified the following minimum criteria to meet forecasted demand for new marine terminal sites in the Portland Harbor:

- Industrial zoning
- Deep-water harbor access
- Railroad access

[9] Whether such redevelopment could be, in some cases, financially feasible is a question beyond the scope of this study.

[10] West Hayden Island Economic Foundation Study, prepared by Entrix and Bonnie Gee Yosick LLC for the City of Portland Bureau of Planning and Sustainability, May 2010. City of Portland Economic Opportunities Analysis: Working Draft, prepared by E.D. Hovee and Company, LLC for the City of Portland Bureau of Planning & Sustainability, June 2011.

- Truck street access
- Vacant (unimproved or unoccupied brownfield) site-assembly area approaching 100 acres.

Using the methods described in Section 3.1 above, BPS staff identified only two sites that could potentially meet all these criteria. These are the two largest vacant sites in the Portland Harbor area: the 59-acre Atofina site, and the 43-acre Time Oil site. Both are brownfields, and both could potentially be assembled with nearby vacant sites.

This analysis looked only at vacant sites. It is always possible that some sites that are non-vacant today could be redeveloped as marine terminals in the future. When considering the opportunity to redevelop non-vacant sites, it is important to look at the net impact in economic activity. In other words, redeveloping existing sites would only be beneficial to the economy if the new use of the site were more efficient and able to accommodate more economic activity (whether measured by employment, output, cargo volumes, etc.) on the same acreage. Evaluating all non-vacant sites in the Portland Harbor to attempt to determine which might be most likely to redevelop in the future was beyond the scope of our analysis.

The ECONorthwest team reviewed the two vacant sites identified by the City of Portland, and evaluated maps of the Portland Harbor, including zoning, infrastructure and aerial photographs. Our preliminary review confirmed the City's findings: most of the Portland Harbor has active development on it, and these two sites have the greatest opportunity to accommodate new public marine terminals.

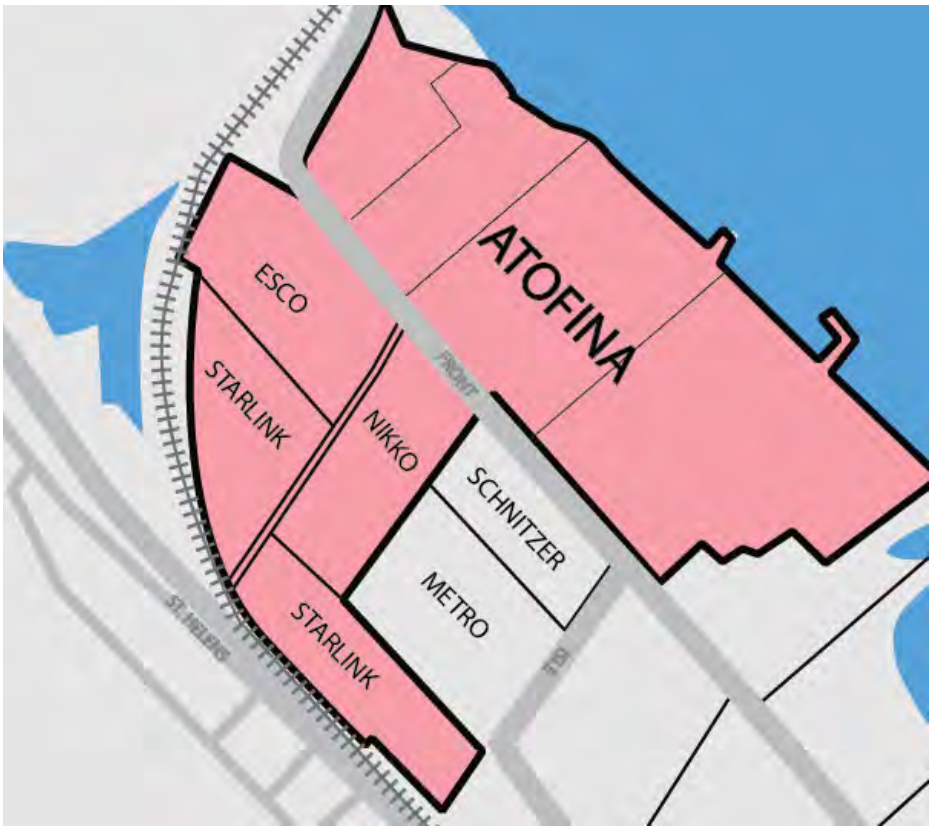
Staff from ECONorthwest and Maul Foster & Alongi toured these sites with BPS staff, documenting conditions affecting the suitability of each site for the proposed development. Key factors considered in the evaluation were: site access, existing uses, natural features, and contamination / remediation. After conducting this site visit, Maul Foster & Alongi developed a set of criteria for evaluating site feasibility for typical port terminals (see Appendix B).

Using these criteria, Maul Foster & Alongi evaluated the potential opportunities and constraints of these sites to accommodate development of a public marine terminal. A cursory site visit is insufficient to make a final determination of site feasibility. Nonetheless, the methods are consistent with the scope and budget, and are sufficient for identifying major opportunities and constraints for these potential sites, and for making a preliminary determination of site feasibility. Further investigation of these sites could be conducted to refine our feasibility findings.

3.2.1 ATOFINA

The Atofina site is a collection of parcels under several ownerships, which total approximately 114 acres (59 acres in the four main Atofina parcels, and an additional 55 acres in adjacent parcels across Front Ave.). The parcels are zoned heavy industrial (IH), and are bordered by industrial uses. The site is adjacent to SR 30 and fronts the Willamette River within the Portland Harbor. Exhibit 3-2 shows a map of the Atofina site.

Exhibit 3-2. Atofina site



Source: ECONorthwest, 2011.

The parcels that the Atofina site comprises have the following owners:

- Atofina: four vacant parcels totaling 59.14 acres
- Schnitzer: an 8.32-acre parcel, currently occupied by Air Liquide America Corporation
- Metro: a 10.43-acre parcel housing the regional solid waste transfer station
- Nikko (Gould Electronics): a 9.21-acre parcel, which is partially occupied by an operating RCRA C hazardous material landfill
- ESCO: a 10.51-acre parcel, which is a former landfill

- Starlink (Aventis Cropscience USA LP; Rhone Poulenc Ag): two significantly contaminated parcels totaling 16.42 acres, currently under remediation.

Access

Water depth in the Willamette River near the Atofina site ranges from 30 to 40 feet. The site has historically been used as a bulk-commodity manufacturing and shipping terminal. The waterside parcels (Atofina) provide a total of 2,700 feet of shoreline, and currently accommodate three existing piers on leases from the State of Oregon, Department of State Lands.

The aggregated Atofina site is served by a rail siding from the BNSF mainline. The siding is approximately 2,200 feet in length with three road 'at grade' crossings. While the site has rail access, it appears to be of insufficient size to accommodate a loop track, which would hamper efforts to build an efficient, modern port facility. Highway 30 access has been somewhat hampered by the closure of local streets accessing the highway.

Existing uses

Current industrial uses on the Schnitzer property as well as the Metro property seemingly eliminate 18.75 acres, while the existing Gould Superfund disposal site on the Nikko property reduces the available footprint by an additional 9.21 acres. The Nikko property contains an operational on-site 4.5-acre containment facility (Subtitle C closed hazardous waste landfill), and is approximately 25 to 30 feet higher in elevation than the surrounding property, with a structured fill containing 77,000 cubic yards of contaminated materials. The former ESCO landfill received non-recyclable wastes (e.g., foundry sand, slag, demolition debris) from ESCO's foundry operations from approximately 1953 to 1983. The landfill was closed with the approval of the Oregon Department of Environmental Quality (DEQ) and the Oregon State Health Division in 1983. The Starlink properties are undergoing extensive investigation and remediation.

Natural features

The property generally rises in grade from the Front Street ROW in the east to the rail ROW in the west, and has considerable natural gain exclusive of the Subtitle C landfill mass. Along the north and northwest perimeter of the site is a berm with a steep slope leading up to the BNSF main line on its approach to the rail bridge. Across the rail line, North Doane Lake and an environmental conservation land designation wrap the 'site' to the north and west.

The waterside parcel is partially within the FEMA Special Flood Hazard Area or was partially inundated by a 1996 flood event. The area is in a low to moderate earthquake hazard exposure area.

Contamination and remediation

The Atofina parcels are being remediated by Legacy Site Services (LSS), as the Atofina agent, under a consent order with DEQ, requiring source control and a site-wide feasibility study. The source control measures include both groundwater and stormwater migration controls. The site is included in the area of the Lower Willamette River that was designated a Superfund site in 2000 by the Environmental Protection Agency. Final remediation plans for the Portland Harbor Superfund site have not been determined. The potential liability for remediation of the Superfund adds a high level of risk for all affected properties, making prospective real estate transactions or development unlikely.

Other constraints

In addition to these property encumbrances the Atofina site is transected by Front Avenue (Service Level B; Priority Truck Route; peak-hour volume average of 106 vehicles and an average daily traffic volume of 640 vehicles, of which 92% are automobiles). Front Avenue separates the Atofina-owned parcels from the remainder of the site. Front Avenue provides primary access to the adjacent Siltronic site and is a public right of way. The Siltronic property does have alternate direct highway access to US 30, but there is an 'at-grade' rail crossing, and it does not readily serve the current land use configuration for the site. In addition to the Front Avenue ROW there is a pipeline easement adjacent to the east side of the street ROW.

While the total aggregated acreage appears to adequate for serving as a barge or bulk facility, current encumbrances, uses, and rights of way limit the useable area to 59 acres: the four parcels owned by Atofina to the East of Front Avenue, fronting the Willamette River.

Site assessment

Significant changes would need to be overcome to develop this site as a productive public marine terminal. To develop the entire site, NW Front Avenue would need to be closed, requiring additional infrastructure investments to provide alternative access to the Siltronic property. Without closing NW Front Avenue, this site is practically limited to 59 useable acres, with limited road and rail siding access.

While the site has rail access, site size and dimensions are insufficient to accommodate a rail loop track. Providing adequate rail service for the site is

even more challenging if development is limited to the 59 acres east of NW Front Avenue.

If NW Front Avenue were closed to accommodate development of the 114-acre site, the properties owned by Metro and Schnitzer are in active use, and would be unlikely to relocate. Property acquisition for the remaining parcels would be challenging, as it would require negotiations with five different private property owners. While acquiring these properties would provide additional acreage for development, acquisition would also involve additional costs as well as need for environmental remediation on these sites.

Ultimately, the site may be suitable for break bulk commodities, such as project cargoes, but the uncertainty of the planned and ongoing environmental remediation on the Atofina parcels--in addition to the uncertain liability for the Lower Willamette River Superfund remediation--probably make the cost of the land prohibitively high. The site *could* be big enough for a terminal, but the cost of preparing the site to accommodate such a terminal will make the effective land price very high relative to other industrial properties.

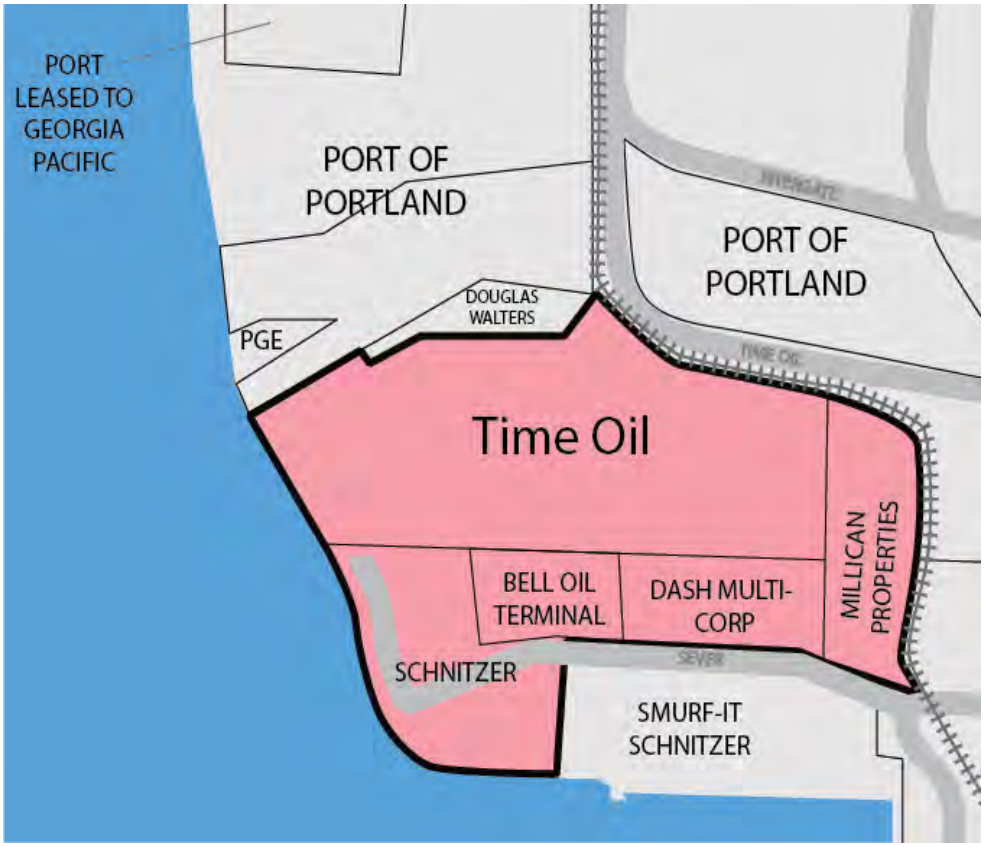
3.2.2 TIME OIL

The Time Oil site includes several separately owned parcels totaling approximately 84.2 acres. The subject parcels are adjacent to the Willamette River within the Portland Harbor and are zoned heavy industrial (IH) with a 'River' overlay designation. The site is bordered by industrial uses and also an area governed by a soon-to-expire natural resource management plan. Exhibit 3-3 shows a map of the Time Oil site.

The Time Oil site comprises parcels with the following owners:

- Time Oil: 43.41 acres
- Schnitzer Investment Corporation: 13.79 acres
- Bell Oil: 6.04 acres
- Dash Multi Corporation: 9.82 acres
- Millican Properties: 11.12 acres

Exhibit 3-3. Time Oil site



Source: ECONorthwest, 2011.

In addition to the aggregated property initially considered for the Time Oil site, there appears to be additional parcels totaling approximately 57 acres to the east of the Time Oil site, and bounded by Time Oil Street and Burgard Street. Including these parcels (not shown in Exhibit 3-3), the total potential aggregate site would be approximately 139 acres.

Access

Water depth in the Willamette River ranges from 30 to 40 feet. The aggregated site has approximately 1,400 feet of shoreline (pier head): the Time Oil parcels with 550 lineal feet, and the Schnitzer parcel with 850 lineal feet.

Historically there have been two piers on the parcels. The side channel serving the Schnitzer parcel is navigable, and is likely to be addressed in the Portland Harbor cleanup project.

The Time Oil site is served by a rail siding from the Union Pacific Railroad mainline of approximately 2,500 feet in length with two road 'at-grade' crossings and on-site railroad access. While the site has rail access, it appears to be of insufficient size to accommodate a loop track, which would

hamper efforts to build an efficient, modern port facility. Access to the specific site would require use of a private or Port-owned right of way, connecting to either Rivergate Blvd. or Burgard St., ultimately connecting to N Lombard St, a district collector and priority truck roadway.

Existing uses

Current industrial uses on the Schnitzer property appear to be temporary in nature. The Bell Oil Terminal is inactive; the Millican parcel is underutilized, and the Dash Multi Corp parcel is an operational tire recycler. There are several existing structures on the Time Oil and Schnitzer site, and evidence of removal of liquid storage tanks. The western half of the site is in a floodplain.

Contamination and remediation

Like most properties in the Portland Harbor, sediment in the adjacent channel and berthing area have known or suspected contamination. The upland properties have known or suspected contamination and are in various regulatory phases of investigation and remediation. The site is included in the area of the Lower Willamette River that was designated a Superfund site in 2000 by the Environmental Protection Agency. Final remediation plans for the Portland Harbor Superfund site have not been determined. The potential liability for remediation of the Superfund adds a high level of risk for all affected properties, making any real estate transactions or development highly unlikely.

Other constraints

To the north of the subject site there are high-tension power lines; a small parcel owned by PGE and a series of parcels owned by the Port of Portland with the presence of wetlands (some of these wetlands have environmental conservation zoning). The site is generally flat with mild slope to the river.

Site assessment

The Time Oil site faces challenges that would need to be overcome to be developed as a productive public marine terminal. While the core of the site (57 acres) has only two different private property owners, the remainder of the site is divided into several different owners. Depending on the desired use and scale of a proposed port terminal, additional property to the east of the site may need to be acquired. The number of private properties and owners makes site assembly a challenge, but not an insurmountable obstacle.

Compared to the Atofina site, the Time Oil site appears to have fewer challenges to redevelopment: it does not require closing a public street, it

appears to have less severe environmental contamination, and the possibility exists to acquire a larger aggregate site. The contamination is mainly along the river, not upland. It may be possible that lower lying contaminated land could be used as fill on other parts of the site and capped under the footprint of a new building.

The site would be a viable candidate for a marine terminal with the appropriate aggregation of key properties. Aggregating 80 to 140 acres would accommodate the transshipment of break bulk and some bulk commodities. Property configuration to make 1,400 feet of pier face accessible is critical to its usability. This site could be explored further for marine terminal use. It will be difficult, however, to negotiate any real estate transactions for this site while the liability for the Lower Willamette River Superfund remediation remains uncertain.

3.2.3 IMPLICATIONS

Public marine terminals have specific land use requirements that are difficult to find. Ideally, sites must be large and flat, inside of an industrial zone, have significant shoreline on a navigable river, be served by both rail and truck, and free of contamination, wetlands, or other environmental constraints. There are no sites in the Portland Harbor that meet these ideal requirements, though there are a few sites that come close. The questions are: how close do they come, and is there a way to cost-effectively develop these sites as productive public marine terminals?

The City of Portland identified the two sites in the Portland Harbor that are most likely to be suitable for development of a new public marine terminal: the Atofina site, and the Time Oil site. Of these two sites, development is technically possible on either, but there are major hurdles that would add significant costs. Both sites have some level of contamination, both sites would require negotiation and property acquisition from numerous property owners, and both sites are smaller than desirable, which precludes the possibility of an onsite rail loop.

Of the two sites, the Time Oil site is most suitable for development, as it does not have certain challenges faced by the Atofina site. The development of the Atofina site is further restricted by NW Front Ave. that bisects the site, and provides primary access to the Siltronic property. With this road in place, the site is limited to just 59 acres. Vacating the road would be costly, and would likely require significant infrastructure investments to be made to provide access to the Siltronic property. Even if the road were vacated, property on the other side of the road is contaminated or in active use. And the nature of the contamination on the Atofina site is considered to be more severe than contamination elsewhere in the Portland Harbor.

Ultimately, issues related to the Superfund cleanup of the Willamette River make all sites in the Portland Harbor unfeasible for development in the near future. Until a final agreement is reached, determining the specific liability for all property owners in the Harbor, there is too much cost uncertainty to negotiate a reasonable price for the land acquisition that would be necessary to assemble a site large enough for a new public marine terminal.

3.3 ROLE OF VANCOUVER IN HARBOR INDUSTRIAL LAND SUPPLY

The third question we were asked by the City is: What role can the Port of Vancouver play in accommodating forecast demand for cargo volumes in the Portland region? To answer this question, we reviewed estimates from recent studies on the current capacity and forecast demand for cargo in the region, and augmented this data-driven analysis through interviews with port officials. A more detailed description of our analysis is found in Appendix C: Analysis of Harbor Land Capacity and Demand, Portland and Vancouver.

3.3.1 EXISTING CAPACITY

The Port of Portland has four marine terminals located along the Willamette and Columbia Rivers. These terminals accommodated 575 ocean-going vessels in 2010, though over the past two decades it was not uncommon for the Port to accommodate 800 to 1,000 ocean-going vessels in a year. Not counting cargos received or shipped via inland barges, the Port of Portland shipped over 13 million short tons of cargo in 2010.

While the Port's existing marine terminals have excess capacity, that capacity is limited. As demand increases over time, the Port will reach a point when existing facilities are unable to accommodate the demand that is forecasted. If the Port is unable to find new ways to improve the efficiency of existing terminals, or find suitable sites to build new terminals, then the Port of Portland may miss potential cargo opportunities. The Port of Vancouver, located across the Columbia River from the Port of Portland, could accommodate some unmet demand.

Exhibit 3-4 summarizes the estimated capacity of public marine terminals in the Port of Portland. Total capacity for all cargo types in the Port of Portland is estimated to be over 21,000,000 metric tons. This capacity is significantly above current cargo volumes for all cargo types, except for grain, which saw a reduction in capacity when the Port closed the terminal

4 grain elevator in recent years, and is unable to accommodate historical levels.

Exhibit 3-4. Estimated capacity of public marine terminals, and recent peak cargo volumes, Port of Portland

Cargo Type	Estimated Capacity	Recent Peak Volume	Peak Year
Automobiles (units)	675,000	460,000	2006
Containers (TEUs)	700,000	330,000	1995
Metric Tons			
Automobiles	889,000	606,000	
Containers	3,999,000	1,885,000	
Breakbulk	2,100,000	1,130,000	2007
Grain	4,100,000	5,400,000	1995
Dry Bulk	10,700,000	5,460,000	2008
Liquid Bulk	-	-	N/A
Total	**21,788,000**	**14,481,000**	

Source: Estimates of capacity are from Port of Portland, reported in West Hayden Island Economic Foundation Study (Entrix, 2010), and confirmed through interviews with Port of Portland officials.
Reported recent peak cargo volumes are from Port of Portland Marine Terminal Statistics, 1980-2010.

3.3.2 FORECAST OF FUTURE CARGO VOLUMES

Our analysis did not include forecasting future cargo demand for the region. Instead, we were tasked with obtaining and reviewing the most recent forecasts. These forecasts were contained in the *Portland and Vancouver Harbor Forecast Update* (BST Associates, 2012). These forecasts were based on a 2010 study by BST Associates, but were refined to specifically call out cargo demand for the City's of Portland and Vancouver, and were updated with the most recent economic data.

Exhibit 3-4 shows the *capacity* of *existing public* marine terminals. Exhibit 3-5 shows the forecast *demand* for *existing and future public and private* marine terminals (measured as cargo volume) in the City of Portland in 2040. The forecast demand ranges from 28 million to 43 million metric tons. For context, in 2010 (the most recent year for which data is available) the Port of Portland reports it moved 13 million tons of cargo. Even the low scenario forecasts demand to be more than double 2010 levels by the year 2040, with an average annual growth rate of 1.5% per year.

Exhibit 3-5. Forecasted cargo volume, public and private, City of Portland, 2040

Cargo Type	Low	Medium*	High
Automobiles (units)	811,000	912,500	1,014,000
Containers (TEUs)	379,000	452,500	526,000
Metric Tons			
Automobiles	1,076,000	1,206,000	1,336,000
Containers	2,162,000	2,583,500	3,005,000
Breakbulk	1,132,000	1,242,000	1,352,000
Grain	6,686,000	9,078,000	11,470,000
Dry Bulk	10,278,000	14,093,500	17,909,000
Liquid Bulk	6,912,000	7,461,500	8,011,000
Total	**28,246,000**	**35,664,500**	**43,083,000**

Source: Low and High forecasts were made by BST Associates for the *Portland and Vancouver Harbor Forecast Update* (2012).
*Medium scenario is calculated by ECONorthwest as the average of the BST low and high scenarios.

Note that 2040 is an arbitrary date. It is not a key milestone. Demand for cargo does not stop growing for some assumed reason in 2040. It is simply the last date for which there is a forecast for cargo demand. Thus, our advice is not to focus on exact tonnage requirements, or exact acres needed to accommodate demand in 2040. It is more important to focus on the big picture. The City of Portland has a limited supply of land suitable for marine terminal development, and this supply will not increase. Demand for cargo has increased steadily for decades, and is forecast to continue to do so in the future. Over a long-enough period, the City will use its capacity to accommodate future growth. As it does, land prices will increase and redevelopment will become more possible than it appears now.

Nonetheless, the inevitable reduction of vacant land available for water-dependent uses in the Portland Harbor area is the motivation for considering ways to use the land efficiently, and whether neighboring jurisdictions might accommodate some additional amount of the forecasted growth. Looking at the 2040 gives good idea of how close the City (and the region) is to reaching its full capacity for public marine terminals.

3.3.3 CAPACITY SHORTFALL

Comparing the capacity of existing facilities with the forecast demand provides an estimate of the potential capacity shortfall for the Port of Portland is in 2040. Two factors complicate this analysis: (1) private marine terminals also handle a portion of the City's cargo volume, and there are not accurate estimates of the capacity of private terminals in the City; and (2) if the growth in cargo volumes comes from a different mix of clients and commodities than the terminals are currently handling, then the existing facilities may not be able to accommodate the new opportunities, which

means these facilities may not reach 100% of their capacity before new terminals are needed.

Our analysis needed to make assumptions on how to deal with these two issues. Variations in assumptions, combined with the wide range of the BST forecasts for cargo demand in 2040, result in an even wider range of estimates for capacity shortfall. To bookend our analysis, we created assumptions that would give us the lowest and highest possible shortfall, and then selected assumptions for a "most-likely" scenario.

The lowest shortfall scenario assumes the low demand forecast from BST, and assumes that existing facilities would be able to operate at 100% efficiency to accommodate forecast demand, and that private terminals will be able to continue accommodating cargo at their recent peak levels. The highest shortfall scenario uses the high demand forecast from BST, and assumes that existing facilities would continue operating at their historical peak levels, with all additional demand coming from new market opportunities that require new terminals. The most-likely scenario uses assumptions that fall between the range of these two bookends. Key assumptions for the most-likely scenario are existing facilities operate at 90% of capacity (i.e. to accommodate the forecast growth in cargo, we do not assume that existing facilities are able to use 100% of their capacity, since part of the growth in cargo volumes may be due to new users and new commodities that cannot use existing facilities), and we use the medium demand scenario, calculated as the average of the low and high scenario by BST Associates.

The results of these three scenarios are shown below in Exhibit 3-6. Note that the potential capacity shortfall ranges from less than 200,000 metric tons in the low shortfall scenario to more than 17 million metric tons in the high scenario. Ultimately, our most likely scenario shows a potential shortfall of 5,760,000 metric tons, with all of the shortfall occurring in dry bulk, grain, and automobiles.

Exhibit 3-6. Potential capacity shortfall, City of Portland, public and private marine terminals, 2040 (metric tons)

Cargo Type	Low	High	Most Likely
Automobiles (units)	(136,000)	(554,000)	(310,000)
Containers (TEUs)	-	(196,000)	-
Metric Tons			-
Automobiles	(187,000)	(730,000)	(410,000)
Containers	-	(1,120,000)	-
Breakbulk	-	-	-
Grain	-	(4,370,000)	(2,390,000)
Dry Bulk	-	(10,949,000)	(2,960,000)
Liquid Bulk	-	-	-
Total	**(187,000)**	**(17,169,000)**	**(5,760,000)**

Source: Calculated by ECONorthwest, with demand forecasts from BST Associates (2012).

3.3.4 LAND NEED FOR NEW PORT TERMINALS

Translating cargo volumes into acres for port terminals is challenging, and depends on a host of variables for which we have little or no data for this analysis. Will the terminal need rail access, if so will it need a dedicated rail loop, or will it be able to share rail infrastructure with adjacent terminals? Would another rail configuration like a ladder track work?[11]

The composition of the demand is important as well. For example, if you have demand for 10 million pounds of dry bulk, will that all be the same commodity type? If not, you may not be able to use the same terminal (for example a coal exporter and potash exporter may need to have completely separate terminals even though they are both dry bulk and would have very similar needs. Even the ownership of the cargos makes a difference (e.g., one exporter with a throughput of 10 million tons of potash may require different facilities, than 5 exporters each handling 2 million tons of potash a piece).

Because of the many variables, it is difficult to translate the potential shortfall numbers shown in Exhibit 3-6 into the number of terminals that would be needed to service that demand, and even more difficult to translate the number of terminals into acres. For the purposes of our analysis, we first looked to recent studies to find an industry standard or a rule of thumb for the size of marine terminals for various cargo types. The three sources we looked at were the *West Hayden Island Economic Foundation Study* (Entrix, 2010), the Draft Report on *Operational Efficiencies of Port/Terminal World Wide* (Worley Parsons, 2012), and the Maul Foster and Alongi evaluation criteria included with this report as Attachment B.

Unfortunately, there is little consensus among these sources on the land needed for each terminal. This is because the unique characteristics of each site, the needs of each unique user and commodity, and the market conditions and technologies available at the time existing facilities were built result in a wide-range of variables that are difficult to control for. In short, no conclusive rule of thumb exists, and if it did exist, it would not necessarily be applicable to each of the sites in the Portland and Vancouver harbors. Nonetheless, for the purposes of our analysis, we needed to make some assumptions on the acreage requirements for new terminals for various commodities. We again sought to use different assumptions to present a high and low bound on our analysis, and then to select

[11] Representatives of businesses in the Portland Harbor, as well as Port Officials, and other consultants with expertise in marine terminal development and cargo forecasts have stressed that there is no equal substitute for a loop track, and that other rail configuration such as a ladder track will not work, for attracting new port users in a competitive global economy.

assumptions in the middle of the range that we believe resulted in a most-likely scenario.

The details of these scenarios are shown in Appendix C: Analysis of Harbor Land Capacity and Demand, Portland and Vancouver. The most-likely scenario uses our most-likely capacity shortfall estimates, and assumptions on throughput (tons per acre of terminal land) from the *Operational Efficiencies of Port/Terminal World Wide* (Worley Parsons, 2012), based on tons per acre for case study ports in North America and Europe. It is optimistic, however, to think that all new terminals would achieve the level of efficiency identified in the Worley Parsons draft report, so we have shown another column for the "practical" (i.e., more conservative assumption of land need) land need, based on an average value of the assumptions in the various supporting documents used in our analysis. A final column was added to show the land need if a dedicated rail loop is included with the terminals that would require rail access. Exhibit 3-7 shows the results of our most likely scenario, with at least 170 acres of land needed, and up to 470 acres if rail access is included.

Exhibit 3-7. Acres of land needed for new public marine terminals in the City of Portland, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Acres Needed		
			Minimum	Practical	w / rail
Automobiles	(410,000)	Yes	120.0	270.0	270.0
Containers	-	No	-	-	-
Breakbulk	-	No	-	-	-
Grain	(2,390,000)	Yes	30.0	50.0	100.0
Dry Bulk	(2,960,000)	Yes	20.0	70.0	100.0
Liquid Bulk	-	No	-	-	-
Total	**(5,760,000)**		**170**	**390**	**470**

Source: Calculated by ECONorthwest
Note: This table estimates acreage needed, not the number of terminals needed. Terminal size can range from 150 to 200 acres for automobiles and containers, to as small as 5 acres for liquid bulk. Depending on terminal size assumptions, the acreage need for automobile cargo could be accommodated by anywhere from one to five terminals in the City of Portland.

Comparing the demand for land for public marine terminals in the City of Portland shown in Exhibit 3-7, with the supply of land in the Portland Harbor shown in Exhibit 3-1, shows an insufficient land supply. As described in Sections 3.1 and 3.2, the Portland Harbor has the potential for two (or perhaps three, if the barriers to development at the McCormick and Baxter site can be overcome) sites to accommodate public marine terminals. These sites (Atofina and Time Oil) have serious development constraints, and even if these constraints can be overcome, they would each only be able to accommodate one terminal of practical size.

The Portland Harbor probably has insufficient land to accommodate the forecast growth for public marine terminals in the City of Portland. An optimistic scenario would show the Portland Harbor with capacity to

accommodate perhaps two terminals of relatively small size (and without a modern rail loop to serve these terminals). A more conservative outlook (and a real possibility) is that the two potential sites in the Portland Harbor may be unable to overcome their significant barriers to redevelopment, which would mean the Harbor may not have any capacity to accommodate future development of marine terminals.

Given the expected growth in demand over the next 30 years, there are few easy solutions to accommodate the City of Portland's anticipated shortfall in land for public marine terminals. The City can take action to address the existing constraints to facilitate redevelopment, or look elsewhere for buildable land for public marine terminals. The following section addresses the latter solution: looking outside of the City of Portland for land for new marine terminals.

3.3.5 PORT OF VANCOUVER DEVELOPABLE LAND

This analysis presupposes that from a regional perspective, there is no benefit to having port development occur in Portland vs. Vancouver. Leadership for the ports, and for the cities, counties, and states they are located in, may have different opinions. Indeed many public policies exist that emphasize the importance of retaining and attracting industrial jobs, like those created by marine terminal development. However, the purpose of this analysis was to determine if it was *technically* possible (as opposed to *politically* desirable) to accommodate future marine terminal demand at the Port of Vancouver.

Additionally, our analysis assumed that the type of port users that would be attracted to the Port of Portland if land were available, would find the Port of Vancouver equally as attractive if there were no developable sites in Portland. This assumption may be true for many, but not necessarily all public marine terminal users. Portland and Vancouver are similar in many ways, sharing the same regional infrastructure and labor pool. But differences do exist between the two jurisdictions, and more so for specific sites within each jurisdiction. For the purposes of our analysis, we have assumed land at the Port of Vancouver would be an acceptable substitute for potential marine terminal users unable to find developable land in the Port of Portland.

Ideally, our analysis for the supply and demand for public marine terminals in the Port of Vancouver would have used the same methods as were used for the Port of Portland. Unfortunately, our analysis was constrained by both data limitations, and time/budget. Thus, we were asked to conduct a less rigorous analysis of the Vancouver land supply, making use of the best available data, gathered mostly from conversations and correspondence with officials from the Port of Vancouver.

ECO interviewed officials with the Port of Vancouver to understand their long-term plans for harbor industrial lands, and the challenges and opportunities that would arise from a greater share of regional industrial development locating in Vancouver versus Portland.

The Port of Vancouver is located along the banks of the Columbia River, with access to the same markets and same multi-modal transportation infrastructure as the Port of Portland. The port handles more than 500 ocean-going vessels each year, as well as river barges, with total annual cargo of more than 5 million metric tons.

The Port of Vancouver has room to grow. An analysis of aerial photos of Port land indicate roughly 750 vacant acres. The Port of Vancouver sent a memorandum to the City of Portland that further clarified their intentions for these 750 acres. The land includes approximately 450 acres of undeveloped greenfield land called Columbia Gateway. Approximately 350 acres of this property is planned to be developed as maritime, and the remaining 100 acres planned for heavy industrial. In addition, the port has 110 acres of available undeveloped light industrial land called Centennial Industrial Park. The light industrial properties could be available for development within 12-14 months, while the Columbia Gateway area is not expected to be ready for development for another 8-15 years. The Centennial properties are not waterfront parcels.

Terminal 5, now under development, added 200 acres of heavy industrial and maritime land. All but four acres of this property is river-dependent maritime land. The maritime portion has been, or will be, filled with rail infrastructure, new tenants, and cargos, including wind energy exports and a dry bulk exporter with up to 16 million ton export capacity. The sole industrial tenant is a rail-dependent propane distributor.

The Port of Vancouver is in a period of rapid growth and is currently undertaking a number of public and private development projects, including the West Vancouver Freight Access project. This public rail improvement project will create a unit train facility, more than doubling the miles of track within the port, along with adding a new, grade separate entrance from the BNSF Railway mainline. This project will increase capacity from 45,000 rail cars per year, to more than 160,000 per year, with 40 percent less delay.

Given the Port of Vancouver's holdings of vacant land, the recent dredging of the Columbia River to a depth of 43 feet, and ongoing investment in new rail infrastructure (i.e., the West Vancouver Freight Access project), the Port of Vancouver is well positioned to capture growth in the future. Officials from the Port of Vancouver believe that neither the Port of Portland or the Port of Vancouver have sufficient land and resources to accommodate **all** of the region's future growth on their own.

Instead, ports on both sides of the Columbia River will need to supply land for new public marine terminals.

The Port of Vancouver's undeveloped, unpermitted maritime and industrial land will accommodate some regional growth – from those businesses selecting the Washington business environment and requirements. Using the BST forecasts of cargo demand for the City of Vancouver, we conducted a similar capacity shortfall analysis for Vancouver as we did for Portland (as was described in sections 3.3.1 to 3.3.4).

Combining these analyses allows us to view the regional demand for and supply of land for public marine terminals. The result of this analysis is shown in Exhibit 3-8. Our most likely scenario shows that regional cargo volumes in 2040 could require between 210 and 570 acres of land for new marine terminals.

Exhibit 3-8. Acres of land needed for new public marine terminals in the Portland Metro Region (including Portland and Vancouver), 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Acres Needed		
			Minimum	Practical	w / rail
Automobiles	(570,000)	Yes	160.0	370.0	370.0
Containers	-	No	-	-	-
Breakbulk	(90,000)	No	-	-	-
Grain	(2,390,000)	Yes	30.0	50.0	100.0
Dry Bulk	(2,960,000)	Yes	20.0	70.0	100.0
Liquid Bulk	-	No	-	-	-
Total	**(6,010,000)**		**210**	**490**	**570**

Source: Calculated by ECONorthwest with demand forecasts from BST Associates, and other assumptions based on conversations with officials from the Port of Portland and Port of Vancouver, as well as supporting documents including: *Operational Efficiencies of Port/Terminal World Wide* (Worley Parsons, 2012) and *West Hayden Island Economic Foundation Study* (Entrix, 2010).
Note: This table estimates acreage needed, not the number of terminals needed. Terminal size can range from 150 to 200 acres for automobiles and containers, to as small as 5 acres for liquid bulk. Depending on terminal size assumptions, the acreage need for automobile cargo could be accommodated by anywhere from one to seven terminals in the Portland Region.

If each new port terminal requires a dedicated rail loop, the total acreage needed to accommodate regional cargo volumes in 2040 exceeds the current supply of 350 acres of vacant developable land at the Port of Vancouver planned for marine terminal development.[12] However, the Port of Vancouver has about 200 acres of vacant developable land that could technically accommodate marine terminal development, but is planned for other industrial uses. But about 100 acres of this amount is part of

[12] It is important to note that these projections are based on our "most-likely" scenario. The range of possible assumptions that could be used in this analysis is significant. When using our most conservative assumptions, our analysis showed a regional land need as low as 70 acres, and our most aggressive assumptions resulted in a land need of over 2,250 acres.

Centennial Industrial Park and are not on the waterfront parcels or linked to waterfront parcels, so 100 acres might be a more appropriate estimate. If these acres were included in the total supply, then the Port of Vancouver comes close to having a supply of land to accommodate regional cargo demand through 2040.

While this scenario is technically possible, it may not politically feasible or consistent with adopted policies of the affected jurisdictions: Vancouver's land supply could fall short. The high and low demand forecasts differ by + or – 20% from the most-likely forecast, and assumptions about whether a new terminal has rail loop access or not can easily double the need for land. Portland and Vancouver probably have adequate land now to accommodate a low-demand forecast with few new terminals sized for loop trains. But in our simulations, high demand plus loop-train access at all new terminals led to a overall land shortfall of almost 1,500 acres. If only 350 acres at the Port of Vancouver are available for marine terminal development (its current estimated based on policy) then unmet demand for public marine terminals in the region would be around 1,100 acres.[13]

3.3.6 IMPLICATIONS

The most recent forecasts for future cargo demand show the Port of Portland will be unable to accommodate forecast demand by 2040 without adding new capacity. However, the extent of that capacity shortfall depends on the assumptions used. Interviews with officials from the Port of Portland, and the author of the most recent cargo forecasts indicate that although actual tonnage for specific cargo types may differ from the forecasts, long-term trends have shown past forecasts for total cargo volume to be fairly accurate, and the most recent forecasts should be seen as reliable.

Taken at face value, these forecasts suggest that additional port capacity will likely by utilized in the future; however, accurately and reliably forecasting the future is impossible. Although our forecasts (and the BST forecasts which underpin them) include a broad range of assumptions, reflecting the high degree of uncertainty, there is no way to guarantee that the future will fall within our forecast range, let alone our "most-likely" scenario. No one knows exactly how demand for port facilities in the lower

[13] Although this is the "high-scenario," it is not also "highly unlikely." BST Associates, authors of the cargo forecasts used in this analysis, note that the high-scenario calls for 3.1% growth in cargo volumes per year, which is actually lower than the 4.1% average annual growth experienced on the Columbia River between 1962 and 2011.

Columbia will change in the future. Economist HE Haralambides effectively summarizes the difficulty forecasting port demand, stating:[14]

> "As a result of intertwined and extended hinterlands; abundant land infrastructure and short-sea feedering networks; continuously evolving liner shipping networks; and the infamous `mobility' of the container, demand is very volatile and unpredictable. Port market shares are unstable; investments in one region or country have an impact on another … In such a `fluid' environment, how could one forecast port demand with any degree of credibility?"

Competitive and volatile environments do not support reliable forecasting because outcomes depend on many randomly moving variables. Ultimately, whether or not demand for additional port facilities on the lower Columbia materializes will depend on market conditions – demand (what's produced and consumed in the Portland region), supply (what technologies are used to ship goods, what competing port capacity exists), and price. These factors will inevitably change over the next 30 years in ways that no one can predict, which means any attempt to forecast them should be taken with a grain of salt.

In other words, individual cargo types fluctuate year to year and are difficult to predict with accuracy, but long-term historical trends show that demand for total cargo volumes is less volatile, more predictable, and tends to grow at a pace that is linked to the global economy. While the Port's four public marine terminals are not operating at 100% of capacity today, it is very likely that they will reach the limits of their capacity in the next several decades, as demand increases. Once these facilities reach capacity, the Port of Portland will need to develop new facilities, or else turn away demand.

The Port of Vancouver shares many of the same attributes that make the Port of Portland an attractive place for marine shipping. Thus the Port of Vancouver is a logical place to site new marine terminals, if sites are unavailable in Portland.

From a regional perspective, it makes no difference whether terminal development occurs in Portland or Vancouver. Both cities function as part of the same regional economy, and share the same infrastructure and labor pool. However, at a local level, if demand for public marine terminals is shifted from Portland to Vancouver, the City of Portland would lose out on high-paying industrial jobs (and some of the residents that fill those jobs), which would have a detrimental effect on the Portland economy, and a

[14] Haralambides, H.E. (2002), Center for Maritime Economics and Logistics, "Competition, Excess Capacity, and the Pricing of Port Infrastructure".

positive impact on Vancouver's. In other words, some amount of economic activity (measured any number of ways: jobs, wages, output, value added, etc.) would occur in Vancouver, rather than Portland, and Portland would miss out on the resulting direct, indirect, and induced economic benefits.

Given the most recent forecasts of demand, and reasonable assumptions on current capacity and the likely size of new terminals, it would appear that the Port of Vancouver has a surplus of vacant industrial land to accommodate their likely future demand, and should the Port of Portland be unable to accommodate forecast growth, the Port of Vancouver could accommodate some (and perhaps all) of that growth. However, officials from the Port of Vancouver stress that a regional strategy will be necessary to respond to future demand for public marine terminals in the region, and if actual cargo volumes reflect the high-scenario projections from the BST forecasts, then the region is likely to have a significant shortfall of suitable land for new public marine terminals.

3.4 POTENTIAL FOR INCREASED EFFICIENCIES

What is the potential for more efficient use of industrial harbor land? The total amount of land inside the Portland city limits is essentially fixed. Unless submerged land is filled to create new dry land, the only way the City can get more land is to expand its boundaries, which is unlikely to occur due to the constraints of surrounding land. Therefore, the City is interested in using its supply of industrial land as efficiently as possible to accommodate the most economic activity.

3.4.1 RECENT TRENDS IN EFFICIENCY OF PORTLAND HARBOR LANDS

We examined trends in efficiency in the Portland Harbor using several measures. Because of data limitations (see Chapter 2 and Appendix A) we focused our analysis on the period between 2002 and 2008. We calculated the economic activity in the Portland Harbor for these years, measured in terms of employment, real market value, value added, and cargo tonnage. We then divided each of these measures by the number of developed industrial acres in the Portland Harbor for each year to get a measure of land efficiency: i.e., some amount of some measure of economic activity, per acre. We then looked as the change in that measure of efficiency over this period of time.

Recent trends in the Portland Harbor show different results, depending on the measure of efficiency used. These results are summarized in Exhibit 3-9.

Exhibit 3-9. Measures of economic activity per acre, Portland Harbor, 2002 and 2008

	2002	2008	AAGR
Value Added	$1,147,614	$1,217,173	1.0%
Real Market Value	$776,715	$838,091	1.3%
Employment	6.21	5.75	-1.3%
Cargo Tonnage	3,873	4,928	4.1%

Calculated by ECONorthwest with data from:
Value Added: IMPLAN
Real Market Value: Metro RLIS
Employment: Oregon Employment Department, Quarterly Census of Employment and Wages
Cargo Tonnage: Port of Portland
Acreage: Metro RLIS and Multnomah County Office of Assessment and Taxation

From 2002 to 2008, developed industrial land within the Portland Harbor increased from 2,757 acres to 2,863 acres, an average of 18 acres per year. Value added, real market value, and cargo tonnage all grew at a faster pace than developed industrial acres. By those measures, land was used more efficiently. Employment in the Portland Harbor, however, declined over that period (both in absolute terms, and per acre of developed industrial land). The measure of efficiency that is chosen makes a difference when evaluating trends in land use efficiency.

The next section explains each of these measures in more detail.

Employment

Employment density is a traditional measure of land-use efficiency. In fact, it is typically the basis for forecasting supply of and demand for employment land for all jurisdictions across the State, as they conduct periodic Economic Opportunity Analyses that are required by State law.

For our analysis, we obtained employment data from the Oregon Employment Department for all businesses in the City of Portland for 2002 and 2008. We used GIS software to isolate all employment located within the Portland Harbor for these two years. Total employment in the Portland Harbor declined from 17,134 to 16,466 over this period, a decline of roughly 111 jobs per year (or -0.7% per year).

The Oregon Employment Department QCEW data do have limitations that are worth noting:

- Although the geocoding process OED uses produces accurate results, it is possible that the exact location of some employers could be wrong by one or two hundred feet. This means that some employment in the Portland Harbor may appear outside the harbor boundary when using QCEW data, and conversely, some employment that is actually outside of the Portland Harbor may appear inside the harbor boundary.

- Some firms have multiple locations, but may only report employment at one location (such as at a company headquarters). Depending on how a company reports multi-site employment, all of the company's employment may be incorrectly reported as being inside or outside of the Portland Harbor boundary.

- QCEW data represents the number of *covered workers*. The data excludes members of the armed forces, the self-employed, proprietors, domestic workers, unpaid family workers, and railroad workers covered by the railroad unemployment insurance system. In the case of the Portland Harbor, the most important of these omissions is likely railroad workers. Other studies have shown a significant economic impact from railroad activity in the Portland Harbor, but these workers are excluded from the data.

We do not wish to imply that tracking employment density as a measure of economic activity is wrong or pointless. It is indeed an important measure, and one that the policy-makers, and the general public find useful for understanding the scale of economic activity. Despite the limitations listed above, the QCEW data is widely recognized as one of the most accurate employment data sources updated on an annual basis with site-specific data on all industries. We are just acknowledging that employment isn't the **only** measure of economic activity, and due to its limitations, other alternative measures may prove more useful for evaluating the economic performance of the Portland Harbor.

Real market value

Real market value is another typical measure of land-use efficiency. The relationship is a fundamental principle of urban economics: higher prices reflect the relative scarcity of some type of land or location, and that relative scarcity causes developers to substitute capital for land (i.e., to build more intensively). Higher-value development typically translates into higher assessed values and property taxes, which is seen as a benefit to local governments.

For our analysis, we obtained real market value for all parcels in the Portland region from Metro RLIS data for 2002 and 2008. Using GIS software, we calculated the sum of the real market value of all parcels within the Portland Harbor. The Harbor saw real market values grow from $2.14 billion in 2006 to $2.40 billion in 2008, an average annual increase of 1.9%. However, the US Consumer Price Index grew by 3.0% per year over this same time period, indicating that real market value in the Portland Harbor grew at less than the pace of inflation.

Data on real market value for this time period should be treated cautiously. The local and national real estate markets were booming during

this period. Multnomah County real estate values grew at above average rates: more than 8% during this period. The region has now had three consecutive years of declining real market values since 2008; a detailed analysis of property values in the Portland Harbor would probably mirror these broader regional trends. Over a long period (long enough to include the ups and downs of several business cycles—say, 20 years) inflation-adjusted changes in real market value in the Portland Harbor might be a useful indicator of land-use efficiency. For shorter periods, it is not a measure that can be used without interpretation.

Value added

Value added is a measure of economic activity that is not commonly used to measure land use efficiency. Value added, simply defined, is the difference between the sale price and the production cost of a good or service.[15] It is directly comparable to Gross Domestic Product (GDP) at the national level. Value added only considers the final cost of goods and services (the total of four components: wages, business income, other income, and indirect business taxes), and excludes the value of intermediate goods, to avoid double counting.

While value added is a good measure of economic activity at a regional level, the data are not typically collected at smaller geographic levels, and certainly are not available as time-series data at a parcel-specific level. This presents challenges for using value added as a measure of efficiency for the Portland Harbor.

We used the IMPLAN economic modeling software to obtain value added information for the smallest geographic areas possible (zip codes). ECO used the IMPLAN forecast of value added for the four zip codes that overlap the Portland Harbor for 2002 and 2008. Using a geographic boundary that is close to, but not exactly the same as, that of the Portland Harbor means that the measure of value added per gross developed acre should not be viewed as accurate in an absolute sense. But because our geographies and data sources were consistent in both years, the measure is still useful for observing trends over time.

Our analysis showed value added in the zip codes approximating the Portland Harbor increased from $3.16 billion in 2002 to $3.48 billion in 2008, an increase of 1.6% per year. However, the US Consumer Price Index grew by 3.0% per year over this same time period, indicating that value added in the Portland Harbor grew at less than the pace of inflation.

[15] More accurately, the production costs are the outside purchases of materials and services, but do not count payments to employees for wages, salaries, and benefits. Thus, a lot of value added is a "return to labor;" it also includes returns to land and capital.

Cargo

The Port of Portland tracks cargo tonnage on a monthly basis and publishes annual data, dating back 30 years. While the data are only available for Port of Portland public marine terminals, and not privately-operated terminals, they are a good proxy for cargo shipped in the Portland Harbor, and the most comprehensive historical data available. The Port data show cargo volumes (measured in short tons[16]) increased from 10.7 million in 2002 to 14.1 million in 2008, an increase of 4.8% per year. Over this period, cargo volumes experienced more robust growth than any of the other efficiency measures used in this analysis. In other words, despite a decline in employment, and modest gains in real market value and value added, the Portland Harbor saw strong growth in cargo volumes per developed acre of industrial land.

Note that is not the same as saying that land in the Portland Harbor is what generated or somehow caused that tonnage to go through the Port.

3.4.2 OPPORTUNITIES FOR INCREASED EFFICIENCIES

The available data provide limited answers for understanding the potential for industrial land in the Portland Harbor to be used more efficiently. To supplement them, we interviewed key stakeholders in the Portland Harbor to solicit their input on (1) ways to measure efficiency, (2) challenges to improving efficiency, and (3) strategies to overcome those challenges.

To conduct these interviews as efficiently as possible, ECO staff met with about a dozen members of the Working Waterfront Coalition (WWC), rather than conducting separate interviews with similarly qualified individuals. Established in 2005, the WWC is an organization of businesses concerned about the environmental health and economic vitality of the Portland Harbor. Members of the WWC who were interviewed for this project, included representatives of the following businesses and organizations:

[16] 2,000 pounds per ton, as opposed to metric tons (1,000 kilos, about 2,200 pounds).

- The Greenbrier Companies
- CalPortland
- Northwest Pipe Company
- Schwabe, Williamson & Wyatt
- Kinder Morgan
- Smart Decisions
- Port of Portland
- Perkins Coie
- Schnitzer Steel
- Columbia Pacific Planning
- Evraz Oregon Steel Mills

Group members had different views based on their individual experiences in the Portland Harbor, yet the group as a whole agreed on most key points. Although no votes were taken at the meeting, the following points seemed to achieve consensus:

- **The Portland Harbor has many attributes that provide a competitive advantage for water-dependent industrial activity**. The Harbor benefits from its amazing connectivity: the confluence of two rivers, access to domestic markets via two major rail lines, inland waterways via the Columbia/Snake River system, and I-5 and I-84, and access to global markets via the Pacific Ocean. Having all of this connectivity in the heart of the City of Portland, with strong local policies in place to preserve harbor land for industrial use, creates a special place for water-dependent industrial firms. Members of the WWC recognize the importance of the Portland Harbor, and are committed to maintaining and enhancing its competitive advantages.
- **The constrained land supply is an issue**. Members of the WWC recognize that the industrial harbor land supply in the Portland region is fixed, and vacant developable land is rare and constrained. They believe this limitation is an important issue, and one that will become more important over time.
- **Businesses adjust to these constraints by taking measures that have the effect increasing output on an existing site (i.e., of increasing land efficiency).** Such measures include extra shifts, better machinery, tighter processing procedures, and more.
- **There are bigger public policy issues that are affecting demand for new development in the Portland Harbor**. While members of the WWC were concerned about the constrained land supply, they were more concerned with issues affecting demand: Superfund liability and a burdensome permitting process.
    - **Superfund liability**. The specter of the Superfund is hanging over the heads of all property owners in the Portland Harbor. They know that their liability for the Willamette River cleanup effort will be significant, but they do not know what their individual liability will be, or when a final agreement will be

reached. Members of the WWC expressed concern that it is nearly impossible to sell land in the Portland Harbor for new industrial development until a final agreement has been reached on the Superfund liability.

- **Permitting process**. Members of the group believe the local permitting processes to be time consuming, costly, and uncertain. Such beliefs are typical of most cities. But members of the group who operate facilities across the globe expressed their view that Portland's permitting process is more costly and difficult than most other places they do business. An implication for land efficiency is that permitting, its other intended benefits notwithstanding, makes private sector efforts to improve sites and increase efficiency more difficult. Thus, the City should be sure that the intended benefits are worth the tradeoff, and adjust its permitting process if they do not appear to be.

- **Traditional measures of efficiency do not apply for harbor industrial land, and alternative measures should be used**. Regarding the efficiency of land use, members of the WWC supported the conclusions of this report, that traditional measures (employment, real market value, and FAR) are ill suited for measuring the performance of water-dependent industrial land. The group suggested other measures of economic output, such as value added and cargo tonnage, are more appropriate measures of land-use efficiency in the Portland Harbor.

3.4.3 IMPLICATIONS

In our opinion, the main value of this attempt to measure land-use efficiency was to show what a slippery notion it is, and why simple statements about that efficiency are more likely to derive from opinion and a simple causal model than from an even semi-rigorous empirical analysis. In other words, things are complicated.

For example, many would say that land is being used more efficiently if it accommodates more employees. That kind of definition would be consistent with land-use planning practice and law in Oregon. By that measure, land use efficiency in the Portland Harbor decreased from 2002 to 2008.

But an alternative view—and one more likely to be taken by economists—is that labor (employment) and land are both inputs to a production process. They may be substitutes, or at least there is no necessity that they move together. If a business can use less land and even less labor and still increase its production, it is getting more efficient. If a lot

of businesses in an area are increasing their output on the same land they have always been on, then "land efficiency" can be said to be increasing.

In Portland Harbor the data shows mixed results. Despite declining employment, and growth in real market value and value added that is less than the rate of inflation, the Portland Harbor experienced an increase in efficiency as measured by cargo tonnage. If the City is interested in generating the most economic activity on the fixed supply of harbor industrial land, then value added and cargo tonnage may be more appropriate measures than employment. But these measures are inconclusive on whether the harbor increased in land use efficiency from 2002 to 2008.

That last point leads to a suggestion for policy discussion: instead of talking broadly about "land efficiency," talk specifically about changes in certain economic output per acre. Accept that there are different measures of output, and track several of them. That is what we did above. Our conclusion is that some measures of economic output have been increasing faster than vacant land is being converted to developed land, and other measures have not. The region should continue to track these measures, and adopt policies with the intention of increasing measures of economic output faster than vacant land is converted to developed land. This seems like a good objective for people with different passions: economic development, environmental amenity, or smart growth.

Finally, our simple analysis does not answer other questions that could be important for policy, such as (1) What is causing the increase or decrease in economic activity? (2) How does that change compare with other areas in the Portland region, or with other port areas in the U.S.? and (3) What policies would allow for even greater growth?

PSC Recommended Draft - June 2012
EOA Section 1 Appendix C

Chapter 4 SUMMARY OF FINDINGS

This report focused on issues related to the demand for and supply of land for water-dependent industrial employment in the Portland Harbor (about 4,000 acres of land along the Willamette River, from approximately the I-405 Bridge north of downtown to the confluence of the Willamette and Columbia Rivers). Its main conclusions are:

- The City and its partner agencies have spent years in study and data development for the study area. The City's mapping of vacant parcels is detailed and support its conclusion that outside of land already in Port of Portland Terminals, the best potential sites in the study area of a location and size that a new marine terminal would require are Atofina and Time Oil.
- These two sites meet mandatory criteria for minimum size (more than 50 acres) and location (frontage on the Willamette River) for a new marine terminal. That makes them *possible* sites, but not necessarily *likely* sites. The analysis in this report reconfirms findings of previous studies: small size and a lot of site constraints (especially the need to deal with the legal liabilities of prior soil contamination) make development of these sites for a marine terminal challenging.
- Even using the most detailed and recent data available, it is difficult to predict future land needs for public marine terminals with precision. While the potential land need through 2040 varies greatly depending on key assumptions, the most-likely scenario shows that the Port of Vancouver may, in theory, have enough developable land to accommodate regional growth in cargo volumes through 2040. In practice, however, competing demands for Port of Vancouver lands, competition among and public policies of affected jurisdictions, and the potential for higher growth in cargo volumes all make it possible, if not likely, that the land controlled by the Port of Vancouver would not be able to accommodate all of the regional demand for marine cargo.
- Regarding the efficiency of land use, for the time periods evaluated, we found a decline in employment, modest growth in real market value and value added (though less than the rate of inflation), and stronger growth in cargo volumes per developed acre of industrial land. The mixed results of the various measures of economic activity prevent us from drawing a strong conclusion. The region should continue to track these measures, and adopt policies with the intention of increasing measures of economic output faster than vacant land is converted to developed land. This seems like an objective that could appeal to people with different interests: economic development, environmental amenity, or smart growth.

Appendix A Research Approach

Section A.1 describes why getting clear about definitions and assumptions at the beginning of a study is important. **Section A.2** discusses a *framework* for evaluation: concepts that underlie any evaluation of this type. It discusses (1) definitions of industrial use and industrial land, (2) factors relating to the supply of and demand for industrial land, (3) the role of industrial activity in the economy and (3) the concept of land efficiency: what is it, why does it matter, and how is it measured. **Section A.3** is more specific about the *methods* used for the evaluation (review of previous studies, secondary data, case studies, interviews) and how they are used to address four key questions: about land supply for water-dependent uses, a new marine terminal, the role of Vancouver in the regional land supply for marine terminals, and land efficiency.

A.1 OVERVIEW

The purpose of research on public policy issues to provide information to a public debate about public action. The research *informs* decisions; it does not *make* decisions. Those decisions are usually made by elected and appointed officials on behalf of the citizens they represent.

Some of the issues that require action are controversial. People and groups have different opinions about the extent of the problem, its causes, and best ways it can be mitigated. Ultimately, most solutions that get adopted are a result of debate and compromise. Fundamental to a productive debate about problems and solutions are (1) an agreement on definitions, and (2) clarity about assumptions. Many discussions fail to lead to consensus on action because there was never consensus on definitions. Moreover, it is common for evaluation results to depend more on the assumptions selected than on the data collected in support of those assumptions.

Thus, the analysis in this report starts by trying to describe clearly the context for the questions being asked. That context is a foundation from which to identify data sources and analytical methods. Stated another way, the methods used for evaluation should be consistent with generally accepted ideas about how a regional economy and industrial development work. What do theory and prior empirical work suggest are fundamental contributors to (causes of) economic activity and industrial development, and which of those factors are most closely related to the questions this study is addressing?

Section A.2 provides a *framework* for evaluation: evaluation concepts that underlie any evaluation of this type. Section A.3 then discusses more specific *methods* for data collection and analysis that are consistent with that framework.

A.2 FRAMEWORK FOR THE EVALUATION

This section discusses a *framework* for evaluation. It discusses (1) definitions of key concepts used in the analysis, (2) the role of industrial activity in the economy, (3) factors relating to the supply of and demand for industrial land, and (4) the concept of land efficiency: what it is, why it matters, and how it is measured.

A.2.1 WHY CARE ABOUT INDUSTRIAL LAND?

No city or region exists that does not engage in economic activity. A concentration of economic activity is a defining characteristic of all cities.

A substantial but inconclusive literature investigates which economic activities provide the greatest net benefits to cities. Most of that literature assumes, at least implicitly, that (1) specialization allows consumers to get a variety of goods and services at lower prices; (2) if places specialize where they have comparative advantages, they will (a) produce goods more efficiently and be more competitive, but (b) have to trade to get everything they want; and (3) trading requires having something to trade; it means exporting some goods and services so that that money is available to pay for imports. It is that logic that leads economic development specialists to emphasize the importance of growing and retaining local firms that export goods and services: the payment for those exports brings money into the local economy that, among other things, allows purchases of desired goods and services not provided in the local economy.

Whether industrial activity generates larger economic benefits than other economic activities is a matter of debate in the professional literature of development economics.[1] Most economic development practitioners, however, believe that:

- Manufacturing is central to a strong regional economy (for a variety of reasons related to assumptions about greater value added, export

[1] See a recent debate sponsored by *The Economist* on the motion "This house believes that an economy cannot succeed without a big manufacturing base." (http://www.economist.com/debate/days/view/714; accessed 24 August 2011). The opening remarks of the moderator stated "Our topic for the next few days is one that has divided economic practitioners and commentators for as long as anyone can remember: how important is manufacturing?" Hypothetically, if the U.S. were manufacturing more products being sold abroad, its debt would be less. But are global and U.S. economic conditions such that manufacturing is the comparative advantage of the U.S.; maybe it should be exporting services (e.g., financial, accounting, medical, engineering, and so on) instead. Pro and con arguments are posted on-line and readers vote. Readers voted 3 to 1 in favor of the proposition.

orientation, multiplier effects, average wages, and employment social diversity) and their missions.[2]

- By extension, the supply of land to accommodate manufacturing (i.e., industrial land) is important: too little industrial land hinders the growth or utilization of regional economic capacity. It is not uncommon for economic development discussions to include a statement that a region lacks sufficient land for industrial development at what someone has judged to be reasonable prices.

While proponents of manufacturing and industrial development have arguments and data to support their beliefs, so do groups that have different opinions about the importance of manufacturing relative to other sectors. Some of their arguments: too much industrial land could impose opportunity costs on the regional economy and hinder the growth or utilization of regional economic capacity; land markets and resulting land price should be allocating land to highest and best use, and that preserving land for industrial users at the exclusion of non-industrial users would reduce regional economic well-being.

The disagreement between groups stems from different assumptions about the value of industrial uses on particular parcels of land relative to alternative uses. In debates about public policy on land use and development, advocates for any particular use usually argue that:

- Their preferred use of the lands in question generates greater net benefits for a region than the other potential uses.
- Regions should preserve lands for their preferred use even if other users are willing to pay higher prices for these lands. Stated differently, all sides frequently assume that their uses produce positive externalities for a local economy that justify the effective subsidy associated with keeping other users that might pay more for the lands at issue.
- Where the alternative use would pay *less* for land than their preferred use, their arguments go the other way: the preferred uses generate greater net benefits to a region because the alternative uses will not generate sufficient positive externalities to offset the lost consumer and producer surplus that results from requiring the land to be used for purposes that the market prices do not show to be the highest and best use.

[2] One should note, however, the likelihood of self-selection bias here: local economic development has typically been funded with a mission to retain and attract manufacturing jobs, and people attracted to the field of economic development are likely to start with or acquire that point of view.

The arguments for public-sector involvement in urban land markets (e.g., planning, zoning, urban renewal) are based fundamentally on arguments about external effects that are not incorporated into the market price of land transactions. Proponents for policies favoring industrial land (or any type of land use[3]) might make both sides of the argument: because of the important external benefits of industrial use (1) protect industrial land from being converted to uses that will pay more for that land, and (2) do not prohibit industrial uses from converting other land to industrial uses when it is willing to pay more for the land than those other uses.

This study cannot resolve the longstanding debate about the net benefits of industrial uses and land relative to other uses and land. Rather, *this study starts from the assumption, embedded in the economic development policies of all local governments in the region, that the retention and expansion of industrial sectors is something that the region desires*. The City of Portland specifically addresses industrial land uses in its Comprehensive Plan and Zoning Code. The Urban Development goal of the Comprehensive Plan calls for industrial sanctuaries, where industrial land is preserved for manufacturing purposes exclusively. This stance is reiterated in Goal 5: Economic Development, which identifies retention of industrial sanctuary zones, including maximizing linkages with and within these areas, as a primary objective. These policies are implemented via the city's zoning code, which restricts certain commercial uses in industrial zones and only permits changes to Industrial and Employment Comprehensive Plan designations, if stringent criteria are met. These policies demonstrate the City of Portland's commitment to protecting industrial lands for industrial use. With this commitment in mind, this study then investigates land and in the Portland Harbor to see what capacity they have (given different assumptions about user types and changes in technology and operations) to accommodate industrial users.

A.2.2 DEFINING INDUSTRIAL LAND AND USERS

A.2.2.1 Industrial land

What is commonly referred to as "industrial" land is land designated by a local government (in its comprehensive plan, implemented by its zoning ordinances) to allow (but not necessarily require) industrial uses.[4] Thus, land may be defined by public policy (e.g., plan or zone designation) or by actual uses. Such definitions may lead to an identification of roughly the

[3] For example, the fundamental argument for the preservation for West Hayden Island is that such preservation has external natural and social benefits that make the land more valuable to the region in its natural state than in development.

[4] Much of the overview in section A.2.2 is drawn from previous work ECO has done on industrial lands, especially work for the City of Tukwila, WA.

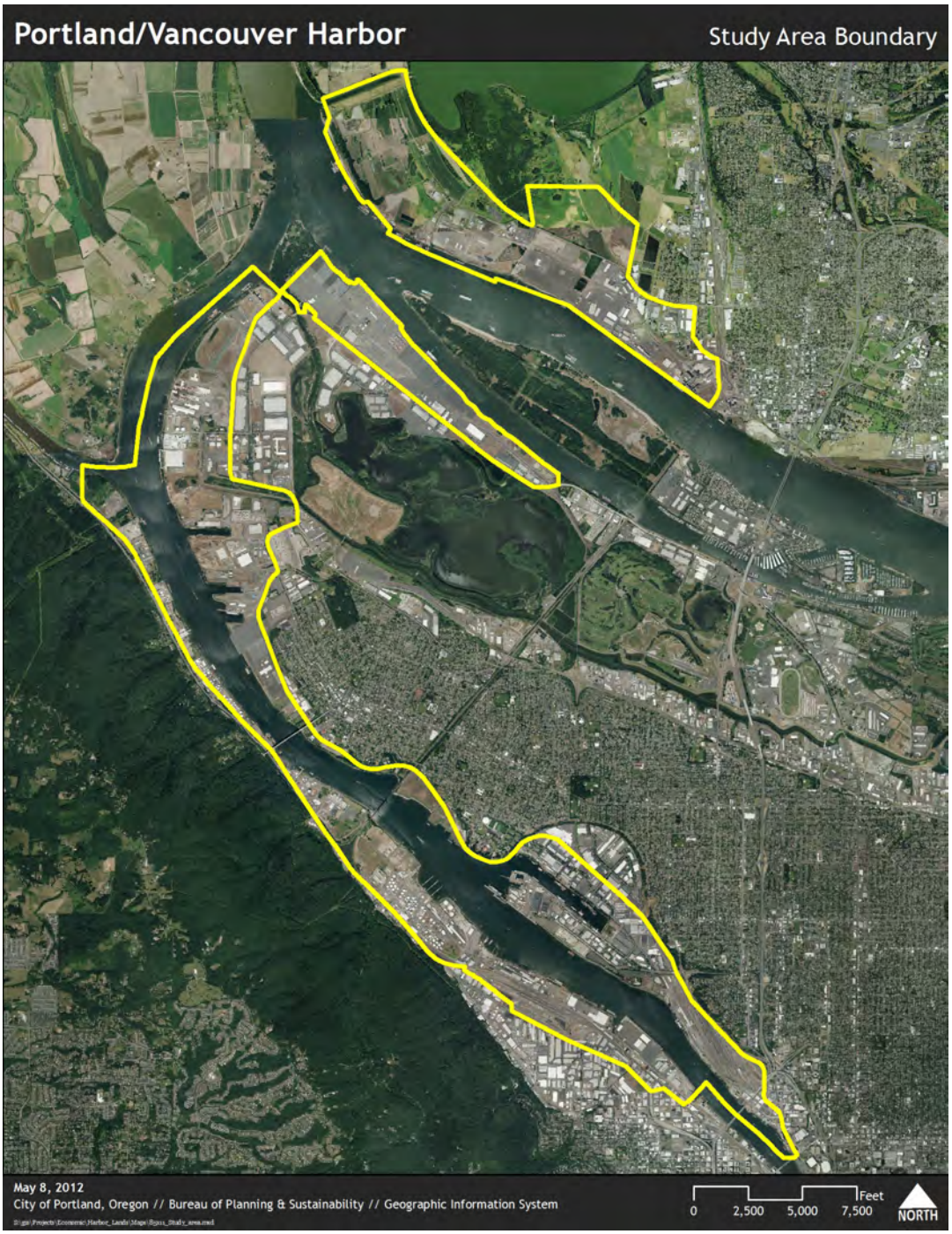
same land, but they are not identical. Industrial uses exist on land not zoned for those uses, and non-industrial uses exist on lands zoned industrial. Either definition, or both, may be appropriate for a particular policy issues.

A smaller subset of industrial land pertinent in this study is "harbor" land. That land could be defined in any of several ways. It could be, for example, land parcels that are within the boundaries defined for this study and also:

- With docking facilities
- Abutting a navigable waterway
- With active water-dependent industries (however "water-dependent" may be defined
- Owned by the Port of Portland
- Any combination of the above.

For this study, we use the City's definition of the "Portland Harbor," based on land designated industrial by the City's Comprehensive Plan in close proximity to the Willamette River. A map of the City's harbor lands is shown below in Exhibit A-1.

Exhibit A-1. Map of harbor lands in Portland



Source: City of Portland, 2011.

A.2.2.2 Industrial users

All industrial users

Land is designated industrial because it meets, or is intended to meet, the needs of the industrial users. These needs typically include proximity to transportation routes (interstate roadways, rail, water ports, airports),

relatively low-cost land (to accommodate the relatively large land needs of many industries), and a location that reduces conflict with other uses.

Industrial users are usually identified as a collection of sectors from the North American Industrial Classification System (NAICS). A recent analysis of industrial land published by the American Planning Association[5] used NAICS codes to define "industrial use" in urban areas. It described a *strict* definition and *loose* definition. The industries included in both definitions are shown in Exhibit A-2.

Exhibit A-2. NAICS codes presumed to be highly correlated with industrial land use

NAICS	Industry
Strict Definition	
23	Construction
31-33	Manufacturing
42	Wholesale trade
48-49	Transportation and warehousing
Loose Definition	
23	Construction
31-33	Manufacturing
42	Wholesale trade
48-49	Transportation and warehousing
221	Utilities
444	Building material and garden equipment and supplies dealers
511	Publishing industries (except Internet)
517	Telecommunications
518	Internet service providers, web search portals, and data processing services
562	Waste management and remediation services
811	Repari and maintenance
812	Personal and laundry services

Source: *Planning for Industry in a Post-Industrial World*, Marie Howland. See text for full citation.

These sectors share some basic characteristics. First, they are often referred to as part of the "traded" sectors, presumably because they have a greater propensity to be export-oriented and involved in direct creation of physical goods.[6] Second, they generally have the same building and land needs and site requirements. They cannot typically locate in high-rise office space or in storefront retail space, or in converted homes. This limitation is in part related to possible external effects that can make them unattractive neighbors; they can generate more noise, dust, smells, and visual impacts than other uses. (But many industrial uses can have *fewer* external impacts

[5] Howland, Marie. 2011. "Planning for Industry in a Post-Industrial World: Assessing Industrial Lands in a Suburban Economy." Journal of the American Planning Association. Winter, Vol 77, No 1. pp 39-53.

[6] But note that this distinction has always been fuzzy and is getting blurrier in today's economy. Many businesses in the Services sector are export-oriented: e.g., business services and tourism. Moreover, the notion of "basic" is also fuzzy and increasingly questioned.

of some types than businesses in other sectors have: e.g., on traffic). The limitation also relates to their general need for cheap land and proximity to transportation routes.

The industrial sectors shown in Exhibit A-2 are defined by industrial activities, but the list does not necessarily reflect the types of businesses that require industrial land. For example, many jobs in the construction industry are not physically located at a central, industrial location, but instead operate on sites throughout the region. Similarly, many utility jobs in the region are often in office towers in the Central City, and do not require industrial land. Therefore, the list of NAICS codes that constitute industrial uses (as defined by the American Planning Association) do not necessarily reflect the range of businesses that would have demand for industrial land in Portland.

Water-dependent industrial users

For this analysis, more important than "all industrial" users is the subset of industrial users that are either "water dependent" or "water related." Every type of job must, by definition, fit into one of 17 broad ("two-digit") NAICS categories. But at the most detailed level (six-digit) there are about 1,175 categories. If one wants information about "water-dependent" employment, one must define it as some combination of NAICS codes, and those codes, even at the finest level of disaggregation, may have firms that one might call water-dependent and others one would not. No standard data source defines business this way; one has to either combine NAICS codes or do primary research (e.g., site evaluations of phone surveys).

Even seemingly obvious NAICS codes like 3366, ship and boat building, may not be completely populated by water-dependent firms: smaller pleasure boats may be built or refurbished for shipping by truck or rail. And codes that may appear to have little to do with water (e.g., 3112, oil seed and grain milling) may have reasons to be close to the water because of the importance of bulk shipment. This report does not conduct analysis that requires a definition of water-dependent industrial users, and because of the difficulties of defining water-dependent industries by NAICS codes, we have not attempted to do so.

The City of Portland defines river-dependent uses as those that can be carried out only on, in, or adjacent to a river because they require access to the river for waterborne transportation or recreation. Included is any development, which by its nature, can be built only on, in, or over a river. The zoning language, however, does not distinguish specific water-dependent industrial uses.

Public marine terminals

Our analysis treats public marine terminals (i.e., the Port of Portland facilities) differently from other users of harbor industrial land. These port terminals function as public infrastructure, facilitating economic activity for other industries in the region. In this report, we examine certain questions related to broader harbor industrial land efficiencies, and other questions related to land supply specifically for new public marine terminals.

A.2.3 EVALUATING THE SUPPLY OF AND DEMAND FOR INDUSTRIAL LANDS

This section looks at how cities answer critical questions like: How much developable industrial land is there? How is it likely to be used? Will it be enough for the expected demand in the future?

A.2.3.1 Supply of industrial land

The total amount of land inside the Portland city limits is essentially fixed. Unless submerged land is filled to create new dry land, the only way the City can get more land is to expand its boundaries. But such expansions are unlikely, because the City is mainly surrounded by rivers, protected areas (Forest Park), and incorporated municipalities.

Thus, for the City of Portland, the question of land supply focuses on how much land is vacant, partially vacant, or underutilized, and how much land is constrained (by environmental contamination, environmental overlays, and other issues).

The Bureau of Planning and Sustainability (BPS) at the City of Portland has done extensive work to characterize the land supply in the Portland Harbor. It uses state-of-the-practice procedures (e.g., GIS data layers) consistent with Oregon planning law (e.g., statutes and administrative rules for statewide Goals 9 and 14).

Exhibit A-4 shows the typical process for categorizing and evaluating land supply. In summary:

- All land is either fully developed or not.
- If not, it is either (1) under development (in the pipeline), (2) buildable, or (3) not buildable (because of prohibitive physical or policy constraints.
- If buildable, a parcel of land may be (1) fully vacant, (2) partially vacant, or (3) potentially redevelopable.

- Buildable land in any of those categories has a *capacity* to accommodate new development. That capacity is defined by public policy and may be partially constrained by public policy.

Exhibit A-4. Conceptual framework for buildable land inventory and capacity analysis

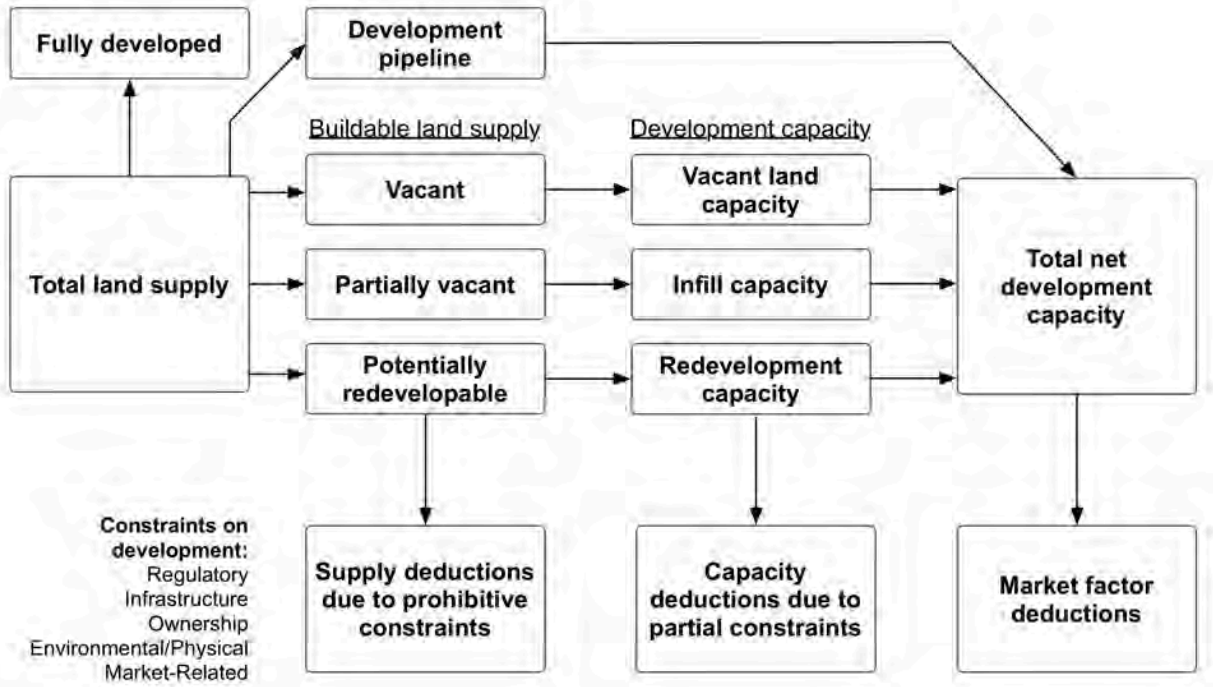


Fig. 7-4 Land supply and capacity analysis process. *Source: Moudon and Huber 2000. This material is used by permission of John Wiley & Sons, Inc.*

The concepts and definitions illustrated in Exhibit A-4 are relatively well understood in Oregon planning practice. Our investigation suggests that the extensive work by BPS on the land supply in the Portland Harbor generally accepts these concepts, even if its definitions and methods are slightly different.

A.2.3.2 Demand for industrial land

Forecasting demand for industrial demand begins by identifying what types of users will consider locating on land designated industrial. In general, industrial land must accommodate most job growth in "industrial" sectors. It must also accommodate some job growth in "non-industrial" sectors.

Not all jobs in "industrial" sectors use industrially-designated land. For example, a head office of a manufacturing company may be in a downtown office/commercial zone rather than in an industrial part of a city. Another

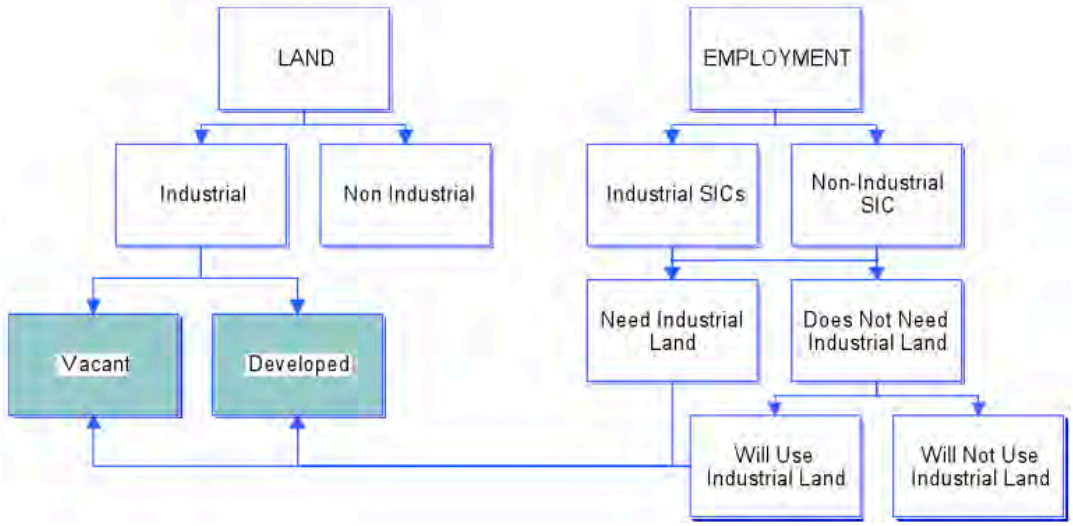
example is that some firms in the industrial sectors are allowed to locate in general commercial or mixed-use zones and may do so.

Not all industrially-designated land is used by "industrial" sectors. Some businesses that are referred to by the NAICS system as "services" need industrial land (for example, auto repair) because they share the same need for a location where land is cheap and where their activity is compatible with the surrounding neighborhood. In addition, non-industrial uses that don't necessarily *require* the characteristics of industrial land (low price, access to transportation, etc.) may nevertheless locate there if (1) they are not prohibited from doing so, and (2) the market conditions allow them to out-bid industrial uses. Big-box retailers with sufficient drawing power may not need surrounding retail: they can stand alone in industrial areas, where they may find cheaper land and better access to customers and suppliers. Services may locate in an industrial area to serve food and other convenience needs of industrial workers. Residential uses may also find an industrial area attractive if the environmental effects of industry are not too deleterious and the location is convenient for residential living. Most significantly, given the focus of this study, professional offices and other commercial uses may locate on industrial land because they can out-bid industrial uses.

This is one of the City of Portland's concerns: that large amounts of industrial land will convert to non-industrial uses. The City has already taken actions to alleviate this concern. Existing policies in the City's Comprehensive Plan and Zoning Ordinance (see Section A.2.1 of this document) aim to prevent the use of industrial land for non-industrial uses. Industrial sanctuary zones, for example, preserve land zoned as industrial for industrial purposes exclusively. The code does, however, allow for conditional use of industrial land for non-industrial purposes in these same areas.

Exhibit A-5 shows this relationship between "industrial" uses (as measured by industrial employment) and "industrial" land, and why studies of industrial land like this one are tricky.

Exhibit A-5. How industrial and non-industrial businesses use industrial land



Source: ECONorthwest, 2011.

On the "Land" side, the analysis in this study is concerned with only land designated as industrial, and is concerned with both vacant and developed industrial land. On the "Employment" side, the study cannot limit itself to industrial NAICS codes[7]: non-industrial users use industrial land. It also cannot limit itself to a subset of businesses that in some sense "need" industrial land, because many businesses that fail to meet whatever need criteria we might develop will still be users of industrial land.

In Oregon, state law requires that cities provide adequate land for 20 years of forecasted economic growth (Goals 9 and 14 of the statewide planning goals). As a matter of practice, (1) the common measure of economic growth used in a 20-year forecast is employment, and (2) some estimate of employees per developed acre, by broad industry type (e.g., retail, office commercial, industrial), is used to convert forecasted future employment to needed acres of land.

For several reasons related to market conditions and public policy, it is possible for (1) employment density to increase over time, and (2) an increasing amount of new employment-related development to occur as an intensification of development on an already developed parcel (rather than as new development on a "greenfield" parcel). If a region uses its land more "efficiently" (due to public policies, market forces, or a combination of both), then the ratio of employees per acre should increase, which would reduce the amount of demand for land in the forecast period.

[7] Formerly SIC codes, as shown in Exhibit A-3.

While employment is typically the measurement used to forecast demand for land, it may not be the best measurement for forecasting industrial land demand. Later, this appendix discusses other measurements that could be used to forecast demand, and to measure land efficiency.

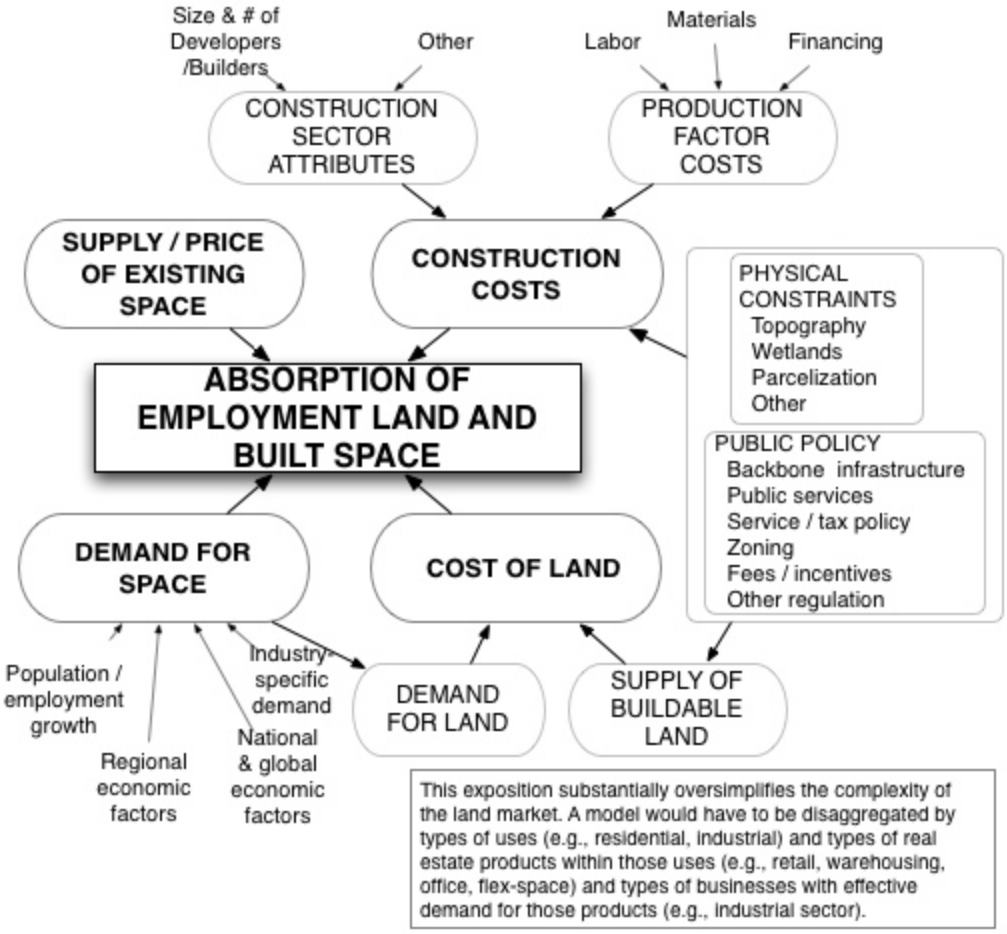
A.2.3.3 Comparing supply and demand

Factors affecting demand and factors affecting supply are not independent: in theory those factors interact to result in a market clearing price. Businesses and developers do not necessarily choose the cheapest land or the best (most expensive) land: they choose the land with the best value. In other words, price makes a difference. Below are some key points that describe how factors of supply and demand interact to determine where industrial development occurs:

- In any production processes, businesses try to economize on scarce (relatively expensive) resources by finding substitutes or changing the production process. For example, if serviced lands become scarcer, their prices should increase and businesses will substitute other factors (e.g., equipment) for land. In other words, as land gets scarcer, its price should rise and it should get used more intensively.
- With a fixed supply of total land, the supply of vacant, buildable land will decrease as development occurs.
- As the supply decreases (and as the real costs of providing services to that land increase), the price of land for new development will increase.
- As the price increases, users of land (businesses and developers) will try to economize on the use of land. They may do that by (1) using the available land in Portland more intensively, (2) choosing locations in other cities in the region more distant from the center that have more and less expensive buildable land, or, if no land elsewhere in the region has the desirable attributes at an affordable price, then (3) locating somewhere other than the Portland region.

Exhibit A-6 shows some of the many factors that affect the absorption of employment built space and land.

Exhibit A-6. Factors affecting the price and absorption of vacant land



Source: ECONorthwest, 2011

In the Portland Harbor, for example, land may be more expensive (cost per acre) than at the region's periphery. But land in the Portland Harbor is also close to the downtown, labor markets, port terminals, and interstate highways. If it is only a little more expensive, it may still be a preferred location for growth. If it becomes too expensive, then prospective industrial users may locate elsewhere, on land that provide a better value. If there is no land within the Portland region that provides this value, then the prospective industrial users may locate in other regions instead of Portland.

In an idealized market, such a value differential would be spotted by developers and businesses. In their efforts to secure the land they would bid up its price until it had little net advantage relative to all other land. In that idealized situation, all industrial land is equally suitable and every sub-area will, over time, get its share of new development.

But more realistically, a particular firm may have particular needs that are best met by land at a certain location. Though businesses on average

may be filling to pay only, say, $5 per square foot for the land, such a firm may be willing to pay, say, $8 per square foot. Thus, the question becomes one of making some assessment of whether the particular package of land attributes for properties in the Portland Harbor is going to be especially desired by some subset of businesses (e.g., water-dependent businesses).

A.2.4 "EFFICIENT" USE OF INDUSTRIAL LAND

Efficiency is a measurement of how much output is produced per unit of input. Thus, an efficiency measure requires a numerator (output) and a denominator (input). In this case, we care about the amount of economic activity (output) generated per acre of land (input). The denominator—acres—is relatively clear in theory and straightforward to measure. Thus, the bigger challenge is in choosing and measuring the numerator: economic activity. This section describes the various ways to measure efficiency of industrial land, and why some of these measures may be more appropriate than others.

If land use in an area becomes more efficient, then any given amount of economic activity will require less land than it would have otherwise. In an area with a fixed supply of industrial land, like the Portland Harbor, it makes sense to consider ways to use the land more efficiently to accommodate more economic activity. Typical measures of efficiency, however, may not be ideal for evaluating industrial land and marine terminals.

A.2.4.1 Traditional measures of efficiency

Typical measures in the numerator of an efficiency measure of land use include employment, real market value, and built space. These measurements look at the amount of economic activity occurring on a property. In general, advocates of economic development would prefer larger buildings, with higher value, and more employees to locate on a given parcel of land. But these measures of efficiency tend to give relatively low marks to industrial development.

Harbor industrial development tends to have low floor-to-area ratios (FAR) and a relatively low number of jobs per acre. Compared to an office tower, an acre of industrial development is likely to have much lower assessed value, employment, and gross square footage. Thus, measures of the efficiency of employment land based on any of these measures in the numerator would all tend to improve if industrial land were converted to commercial uses.

But industrial lands in general, and harbor lands in the case of this study, are clearly an important piece of the regional economy. If every

jurisdiction allowed vacant industrial land to convert to commercial uses on the assumption that some other jurisdiction would provide the industrial land, the regional supply of industrial land would get smaller quickly and, at the margin, industrial expansion would be slower than it would have been. Land with port access is a particularly important and relatively rare component of all regional industrial land. Marine terminals provide access to other markets, facilitating commerce, and allowing traded-sector businesses to export their goods to other markets.

In the context of the discussion in A.2.1 above, land with port access is necessary for the development of port and port-related facilities, and such facilities may have large external benefits for the region. Since the benefits are external (and, by definition, cannot be readily captured by owners of the land), they do not influence the price that private developers will pay for land. Thus, land prices that industrial users are willing to pay for land in the Portland Harbor probably do not reflect the full value to the Portland region of having that land in industrial use.[8]

A.2.4.2 Key issues for measuring efficiency

Regardless of what measure of economic activity is used in the numerator for calculating efficiency, there are fundamental issues that present challenges for defining and measuring efficiency and changes in efficiency for industrial land.

Efficient use of land versus efficient production of goods and services

Fundamental to land-use planning regulation in Oregon is the assumption that sprawl is inefficient, and that reducing sprawl saves valuable natural land (for farming, forestry, and the provision of ecosystem services) and promotes more intensive use of urban land (i.e., more density). This system intends to promote more efficient use of land. Denser development, however, does not necessarily mean more efficient production of goods and services for all types of businesses. Put another way, a public-sector mandated increase in certain measures of intensity of industrial land use (e.g., minimum FAR) may or may not increase the efficiency of a particular operation (measured by value added, employment, etc.).

This issue is critical when discussing land-use efficiency in the Portland Harbor. For some (perhaps many) industrial businesses located in the

[8] Proponents of other uses could make the same argument: that their external benefits are substantial and not capitalized in land value. A full technical evaluation of the relative net benefits would require extensive empirical work, is unlikely to be definitive, and is beyond the scope of this study.

Portland Harbor, pressure to develop at greater density is unlikely to increase the efficiency of their operations.

Site-specific land efficiency versus regional land efficiency

Site-specific efficiency refers to the economic activity on an individual site. If a user of a one-acre industrial parcel were to double some measure of economic activity (e.g., employment, value added, etc.) without developing more land, one could call that an example of increasing the efficiency of industrial land as a factor of production. This is often what is meant by increasing efficiency.

But what if a parcel serves the regional economy: in other words, what if it provides external benefits? For example, a warehouse may allow other businesses in the region to transport their goods. The warehouse could appear unchanged over time by many measures of economic activity (e.g., assessed value, employment, FAR), but it may be accommodating more goods for other businesses in the region, allowing these businesses to grow.

There are at least three implications. First, standard measures of economic activity like employment may be the wrong ones. The warehouse and its employment may not have changed: it may be that both are now more efficient because the warehouse is now processing more goods because of increases in demand, changes in technology, or some other factor. Second, even if the production per acre for that warehouse were to remain the same in terms of tons or cubic feet of cargo processed, the value of that cargo may have increased (so an argument can be made that efficiency should be measured as value, not tonnage). Third, and related, even if the value of cargo did not change much, its transshipment is a necessary component of what may be a different and rapidly growing industrial sector that is contributing to the regional economy.

An example of this regional land efficiency is the Port of Portland itself. A port's economic impacts extend well beyond its land and the land that surrounds it. In Oregon, the economy of eastern Oregon and Washington depend on the port facilities in the Portland area to ship grain and other products. Looking just at measures of production on land around a port can easily miss the point: a port is a regional facility that may benefit many businesses a great distance from the port. Thus, it may be "efficient" for a port to have relatively low-density uses that allow efficient transportation of goods, facilitating economic growth throughout the region.

Economies of scale and threshold effects

For many enterprises, as they grow for small and start-up to bigger and established, they achieve economies of scale. There are start-up costs that they have to incur, and there are relatively fixed ongoing operating costs

that must be amortized. It is common for costs per unit of output (or, in the case of transshipment) throughput to decline.

Economies of scale (because of declining marginal costs) almost certainly exist for port facilities. There is a large initial capital investment in facilities: once they are there, they can be used more intensively at a low additional (marginal) cost per unit of activity (e.g., tonnage handled). As more facilities, even of different types are available, the per-unit cost of operation and maintenance can decrease, and the attractiveness of and demand for the facilities may increase for users.

Politically, getting to some scale is probably important for users and for higher levels of government (state and federal) that provide financial assistance to ports: in the case of Portland especially, for dredging the Columbia River. In other words, there may be subtle or not-so-subtle threshold effects: if port operations drop below some level, its ability to sustain even those lower levels of activities may be seriously diminished.

Markets versus public policies

Many economists would argue that the best judges of the efficiency of a particular industrial use at a particular site are the owners and managers of the use in question. If they believe that they can operate more efficiently by adding employees, buildings, or equipment to their site, they will do so. If they believe they can profitably increase production without adding land, they will do so. If their land and land around their site has locational characteristics that make it particularly valuable for certain types of production, and if there are a number of businesses involved in that type of production, its price will rise, and the price is a measure of the increasing value (efficiency) of the land in production.

That argument, however, does not address a concern of cities like Portland about that market-based process: what if non-industrial and non-water-dependent commercial uses (e.g., offices and retail) outbid industrial uses for the land? Yes, the land value has increased (as have the cities' property-tax revenues), but perhaps at a greater cost to the regional economy.

A.2.4.3 Alternative measures of the output component of efficiency

In short, to address the question about the efficiency of the use of industrial land in the harbor area, one needs a definition of efficiency that makes sense for industrial land. Such a definition must make sense not only in theory, but also in the context of the data and methods that are available for measuring efficiency. We suggest two alternative measures of efficiency

that are most appropriate for harbor industrial land: value added, and tonnage of cargo.

Value added

Proponents of the industrial and manufacturing sectors point to its potential for high "value added." Value added means that the value of outputs (per unit or in the aggregate) less the cost of inputs purchased from other firms used to create output.[9] In economic terms, industrial activity is a "goods-producing" activity, and is generally considered to have strong potential for value added. A service industry, in contrast, tends mainly to sell transformed labor services. There is value added, of course, but this value added is often lower than in a goods-producing setting.[10]

Setting aside cross-sector comparisons, value added may be a better measure of output over time *within* sectors than employment or built square footage. A measure of the efficiency of a fixed supply of industrial harbor land would be the amount of value added generated per acre for businesses located in the harbor.

Cargo

There is a reasonable argument that much of the industrial land in the Portland Harbor area serves a regional need for transshipment. Therefore, a regional measure of transshipment activity might be appropriate for measuring the efficiency of such land. Some measure of cargo (e.g., tonnage, volume, value) is an obvious choice. Because data are more readily available, we suggest tonnage of cargo as an alternate measurement of land-use efficiency in the Portland Harbor.

The economic activity occurring on a parcel is only part of the impact that land has on the regional economy. Many users of harbor industrial land facilitate economic activity throughout the region. While most measures of efficiency fail to measure this broader impact, tonnage of cargo is a measurement that is consistent with the idea that port facilities have broader regional economic benefits.

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[9] In that sense, value added is a measure of a firm's contribution to GDP. Another way to think about this is that everything that a firm itself puts into the production of a product (primarily the labor of its employees and capital) "add value" to the raw materials and intermediate goods and services it purchased to make its final product.

[10] Often lower, but not always lower. Service sectors that use highly-trained human capital may have high productivity and high value added. In addition, as technology increases the productivity of physical capital, less manufacturing and construction activity is required to produce the same output. Communication systems, for example, are much more productive than they were in the past, but require much less "brick and mortar" type activities and, hence, less construction activity.

Methodologically, such an analysis should be done for the Portland Harbor in the aggregate, not for individual businesses or parcels. For this measure, it does not matter how much cargo occurs on a given parcel; it matters how much the amount of tonnage per developed acre of land is increasing.

A.3 METHODS

Section A.2 is a *framework*: it is about definitions and concepts related to the issues this study is investigating. It is a basis for selecting specific methods (data and analytical approaches) for addressing the four questions posed:

- Are the methods the City used to estimate the location and amount of vacant, partially vacant, and potentially buildable industrial land in the Portland Harbor area likely to yield reasonable estimates?
- How suitable for a public marine terminal are the few sites in the Portland Harbor that have been identified by the City as having the potential to accommodate such a terminal?
- What role can the Port of Vancouver play in accommodating forecast demand for cargo volumes in the Portland region?
- What is the potential for more efficient use of industrial harbor land?

We describe the methods we used to answer those questions in the rest of this section.

A.3.1 GENERAL DATA SOURCES AND TECHNIQUES

To conduct our analysis, we used the following data sources:

- **Existing studies**. Extensive analysis has been conducted regarding the Portland Harbor, industrial land, and port terminals. Local governments and service districts in the region (e.g., Metro, the City of Portland, the Port of Portland) are constantly evaluating past economic growth patterns, and planning for future economic development opportunities. These efforts result in a library of reports and studies addressing different aspects of the regional economy. These recent (as well as ongoing) efforts contain useful information for the analysis. *The scope for this study emphasized synthesizing and interpreting existing data over collecting new data*. Thus, ECO reviewed these related research efforts, and pulled their key findings into the analysis where appropriate.

  The City of Portland provided ECO with a list of over 30 recent, relevant documents. After an initial review of all of these documents,

ECO selected a subset of documents of particular value to its analysis:

- Portland Economic Opportunities Analysis (2010)
- West Hayden Island Economic Foundation Study (2010)
- West Hayden Island: Marine Cargo Forecasts & Capacity Assessment (2010)
- Portland Vancouver Trade Capacity Analysis (2006)
- West Hayden Island Planning Document
- Oregon Commodity Flow Forecast (2005)
- Portland's Working Rivers: The Heritage and Future of Portland's Industrial Heartland (2008)
- Port of Portland annual reports

ECO focused on data and text related to historical trends and future projections for economic growth: in the region in general and the Portland Harbor in particular.

- **Secondary data sources**. ECO incorporated many secondary data sources into its analysis.[11] As with "existing studies," the objective is to leverage past research efforts to answer the questions posed in this study. Examples of secondary data sources we used are:
  - Buildable Lands Inventory (City of Portland). This source includes multiple data layers in the City's Geographic Information System (GIS)
  - Port of Portland Marine Terminal Statistics
  - Multnomah County Assessment & Taxation
  - RLIS (Metro)
  - Quarterly Census of Employment and Wages
  - IMPLAN
- **Interviews**: Many people in the Portland area have special knowledge of, and interest in, the Portland Harbor. ECO interviewed individuals from both the public and private sectors, and reviewed notes on past interviews that had been conducted for recent related studies. Interviewees included:

[11] Secondary data sources are ones collected and readily available by someone other than the user (in this case ECONorthwest). Typical secondary sources are government agencies (e.g., U.S. Census, ODOT, Metro, Port of Portland).

- Port of Portland officials
- Port of Vancouver officials
- Authors of relevant studies and reports
- Members of the Working Waterfront Coalition
- Other local economic development professionals

Data from these sources were used to address the three specific questions that are the focus of this study. The next sections explain how.

A.3.2 EVALUATION OF PRIOR EFFORTS TO IDENTIFY LAND SUPPLY IN THE PORTLAND HARBOR

The City asked ECO to evaluate whether the methods the City used to estimate the location and amount of vacant, partially vacant, and potentially buildable industrial land in the Portland Harbor area likely to yield reasonable estimates? More specifically, the question was whether it is reasonable to assume that the two sites that the City identified (Atofina and Times Oil) are the only two in the Harbor study area (as defined in Exhibit A-1) that are of a size and location that they *might* be suitable for a new Port of Portland marine terminal?

To answer that question we needed an estimate of the minimum feasible size of a marine terminal. Maul, Foster & Alongi provided that estimate (documented in Section 3.2 of the report and Appendix B): 50 acres. We then looked for 50 acres of vacant land with waterfront access in the study area by:

- Reviewing studies summarizing industrial and harbor land supply: *Industrial Districts Atlas* (2004) and *Harbor ReDI Industrial Sites Analysis* (2009).
- Reviewing GIS shape files and cross-referencing to Google Earth aerial photos (August 2011).
- Discussing methods with BPS staff, and comparing those to standard methods for developing land inventories and identifying buildable land.

A.3.3 ADDRESSING THE POTENTIAL SITES FOR NEW MARINE TERMINALS

Much of the analysis in this report deals with the supply of harbor industrial lands in general: it includes both public and private ownership and uses of the land. This task deals specifically with land supply for new, public, marine terminals.

To determine which sites might best accommodate a public marine terminal, we began by identifying the technical site requirements for a marine terminal. ECO interviewed representatives of the Port of Portland to identify their ideal site requirements, as well as which of these requirements could be reduced while still accommodating a working port facility. ECO compared these site requirements with the findings of the Worley Parsons, a consultant to the City evaluating the potential site design of a new marine terminal on West Hayden Island. Finally, ECO turned to internal team members with experience running west coast ports, and looked for creative ways to adjust these site requirements to create a working terminal on smaller or otherwise constrained sites.

BPS staff identified only two sites that could potentially meet these criteria. ECO, reviewed the sites identified by the City of Portland, and evaluated maps of the Portland Harbor, including zoning, infrastructure and aerial photographs. Our preliminary review confirmed the City's findings, that most of the Portland Harbor has active development on it, and these two sites have the greatest opportunity to accommodate new public marine terminals.

The ECONorthwest Team, including Maul Foster & Alongi, Inc., toured these sites with BPS staff. Maul Foster & Alongi, Inc. conducted a visual inspection of the sites, documenting conditions affecting the suitability of each site for the proposed development. Key factors considered in our analysis were: site access, existing uses, natural features, and contamination/remediation. After conducting this site visit, we developed a set of criteria for evaluating site feasibility for typical port terminals. This set of criteria is included with this document as Appendix C.

Using these criteria, Maul Foster & Alongi evaluated the potential opportunities and constraints of these sites to accommodate development of a public marine terminal. A cursory site visit is insufficient to make a final determination of site feasibility. Nonetheless, our methods are consistent with our scope and budget, and are sufficient for identifying major opportunities and constraints for these potential sites, and making a preliminary determination of site feasibility.

A.3.4 ADDRESSING THE ROLE OF VANCOUVER IN HARBOR INDUSTRIAL LAND SUPPLY

The third question we were asked by the City is: What role can the Port of Vancouver play in accommodating forecast demand for cargo volumes in the Portland region? To answer this question, we used a combination of interviews with port officials and reviews of past reports.

We began by attempting a data-driven analysis. In principle, if we knew the capacity of existing marine terminals in Portland and Vancouver, and subtracted the forecast future demand for these areas, then we could identify the amount of demand that could not be accommodated by existing facilities. This demand (in tons of cargo) could then be translated into the acres of land necessary for new terminals to accommodate this growth. Comparing the required acres to support new terminals with the available land supply in the Portland Harbor and in Vancouver, we could identify how much of Portland's demand might need to be accommodated in Vancouver, and whether or not Vancouver had sufficient land to accommodate it.

The specific steps in our analysis, and detailed tables showing our results are contained in Appendix C: Analysis of Harbor Land Capacity and Demand, Portland and Vancouver. In short, we relied on the following data sources:

- Capacity of existing facilities: Estimates for the public marine terminals in the Port of Portland were taken from the *West Hayden Island Economic Foundation Study*, prepared by Entrix for the City of Portland in May 2010. These estimates were produced in interviews conducted by Entrix with Port of Portland staff. For estimates of capacity of private terminals in the City of Portland, as well as all terminals in the City of Vancouver, we relied on historical data on cargo volumes reported by BST Associates in their *Portland and Vancouver Harbor Forecast Update*, prepared for the Port of Portland in February 2012. Our estimates were confirmed and refined through interviews with Port of Portland officials.

- Future cargo demand: Estimates of cargo demand for all public and private terminals in the cities of Portland and Vancouver in the year 2040 were taken from the BST Associates *Portland and Vancouver Harbor Forecast Update*. These forecasts included a low and high scenario.

- Acreage necessary for new terminals: Estimates of the acreage required for new marine terminals were taken from a variety of sources, including the *West Hayden Island Economic Foundation Study* (Entrix, 2010), the Draft Report on *Operational Efficiencies of Port/Terminal World Wide* (Worley Parsons, 2012), and the Maul Foster and Alongi evaluation criteria included with this report as Attachment B.

- Available land supply: Finally, estimates of available land in the Portland Harbor are based on our own analysis of developable sights, described in Sections A.3.2 and A.3.3. Estimates of available

land in Vancouver, were based on the *West Hayden Island Economic Foundation Study* (Entrix, 2010), and verified through GIS analysis, and conversations with officials from the Port of Vancouver.

The data-driven method described above has many advantages: it is a logical way to conduct the analysis, it relies on the best and most recent data and forecasts, and with any one-set of assumptions used in the analysis, it results in a definitive answer of the acres of land needed for new terminal development. However, there is one major limitation to this method: it relies on so many assumptions, which can be pulled from such a broad range, with each assumption compounding on all previous assumptions, that using different sets of reasonable assumptions can create largely different results.

Therefore, our analysis uses the data to establish a high and low boundary for the potential land need, and describes a "most-likely" scenario that falls between the two extremes. In order to give these numbers more context, and to help us arrive at the most-likely scenario, we also conducted numerous interviews with representatives of the ports of Portland and Vancouver.

A.3.5 ADDRESSING THE POTENTIAL FOR INCREASED EFFICIENCIES

Section A.2.4 provides a context for defining and evaluating the efficiency of the use of industrial land. This section builds on that context to describe specific data and analytical techniques that this study uses.

The City is interested in knowing if industrial land in the Portland Harbor can be used more efficiently in the future. To answer we looked at recent economic trends in the Portland Harbor and in the City of Portland as a whole for changes in land-use efficiency for industrial users. For this analysis, we considered several measures of output in an efficiency measure: employment, real market value, value added, and tonnage.

Ideally, we would like to have data with a long time series (20 – 30 years) for each efficiency measure. But changes in the type, definition, and collection of data make it impossible to get consistent time-series data for both the numerators and denominators of efficiency measures. Our method is an approximation based on available data. We create different measures of efficiency for two different time periods: (1) 2002 – 2008, when detailed and consistent data are available on both output and land area, and (2) 1960 - 1997 when the Port of Portland did occasional studies of its land and activity.

For 2002- 2008 we began by identifying all parcels in the Portland Harbor using GIS. We examined data from two different years: 2002 (one of the earliest years that data are available using NAICS codes), and 2008 (the most recent year QCEW data are available). Comparing data from the two years we calculated the change in developed acreage in the Harbor, and the corresponding change in real market value, and employment.

We also collected data from different sources for two alternative measures of output (for the denominator): value added and cargo (volume, tonnage, and value). Unlike employment, and real market value, data for value added and cargo tonnage is not tracked at a parcel specific level. Instead, data is available at the regional, City, zip code or Census tract level. For our analysis, we used Port of Portland data on historical levels of cargo tonnage in the Portland Harbor, and the IMPLAN economic model for the zip codes that most closely align with the boundaries of the Portland Harbor for value added. We used the same years (2002 and 2008) as were used for other measures of efficiency.

In summary, we created various measures of change in land-use efficiency between 2002 and 2008.

This method has limitations. Six years is not a long time to observe economic trends and changes in land-use efficiency if one is hoping to use those trends as a basis for long-run forecasts. Moreover, the period includes the recent recession, which began in 2007. Ideally, our analysis would include years before 2002, as well as years later than 2008. However, data after 2008 are not yet available, and data before 2002 have significant limitations. Prior to 2000, employment was recorded by SIC codes, rather than NAICS. The change in classification makes comparing data across this time period difficult and unreliable for time-series analysis. Additionally, land-use data, including data from the County Assessor is less accurate prior to 2000, as GIS and other technology had not yet been widely adopted.

For a long-run look at trends, we used yet another method based on cargo tonnage as a measure of output. The Port of Portland conducts periodic studies of land use and development in the Portland Harbor. The earliest Port study dates back to 1960, with additional studies in 1990 and 1997. Additionally, various data sources, including the Port of Portland, the US Department of Transportation, and the Corps of Engineers track cargo tonnage that is shipped through the Portland Harbor. Comparing these datasets, we were able to calculate the tons of cargo that were shipped per developed acre in the Portland Harbor from 1960 through 1997, and observe trends over this 37-year period.

Appendix B Criteria for Evaluating Potential Sites for Marine Terminals

One of the four questions that this study addressed was, "How well do the characteristics of the Atofina and Time Oil sites (the two identified by the City as meeting the minimum requirements for size and waterfront access) match the characteristics that would be needed to create a reasonable probability the sites could be developed as marine terminals?" To answer that question the consultant team had to specify those characteristics. Team member Maul, Foster & Alongi created the evaluation criteria summarized in the table that follows. Those criteria are used in the evaluation reported in Section 3.2 of the main report.

Marine Terminal Criteria

Criteria	Considerations	Comments
Water Access	Depth	Both berth and channel water depth are limiting considerations on vessel size and ultimately cargo type: (1) Barge: 15 to 20'; (2) Bulk: 35 to 52'; (3)Break Bulk: 30 to 40'
	Dredge Maintenance	Ability to maintain navigational depth through routine dredging. It is a function of siltation rate, cost, regulatory hurdles and physical restraints such as the presence of contaminated sediments.
	Pier Face Capacity	Vessel length and number of number of berths determine cargo type: ▪ Barge: 200 to 500' ▪ Bulk: 330 to 1200' ▪ Break Bulk: 400 to 800
Land side transportation	Mainline Rail	Multiple rail service is desirable for competitive rates.
	Rail Siding	On site useable rail siding with sufficient on site car storage. The requirements for train length storage awaiting loading or unloading is a function of the cargo type. Bulk facilities including autos require 9.000 to 12,000 feet of track, whereas specialty project cargos can be managed on much smaller sidings and onsite storage track systems.
	Road	Proximity and ease of access to interstate freeway systems is an important criterion for marine terminals. Access should be on designated, all-weather truck routes with high levels of service including the access ramps to the interstate system.
Size	Total Acreage	Minimal acreage for cargo handling is required for various cargo types:* ▪ Barge: 10 to 75 acres (Mixed, bulk and project cargos) ▪ Bulk: 10 to 200 acres (Liquid and dry commodities) ▪ Break Bulk: 20 to 100 acres (Project cargos; autos)

Criteria	Considerations	Comments
Size (continued)	Unity of Ownership	Total acreage is a critical consideration and the assembly of property is often hampered by cost and timely assembly.
	Configuration	Parcel shape for marine terminals has an impact on terminal operating efficiency, most notably distance to pier face from remotest staging area. Configurations vary with cargo type and loading techniques. Dry conveyor and liquid piping configurations as well as auto handling are somewhat more forgiving.
Physical	Slope and elevation	Generally speaking facilities need to have minimal elevation change and slope. Bank heights have practical limitations, but fixed pier systems can be engineered to accommodate water to upland elevation differentials.
	Utilities	Power demands are limited to electricity for equipment operation and "at berth" vessel operations for on board systems to avoid ship engine fuel burn consistent with zero discharge environmental goals. Stormwater management is also a prime concern, but can readily be managed on most sites.
	Encumbrances	Encumbrances include easements, public rights of way and other deed restrictions that restrict or otherwise limit a site's efficient use.
Regulatory	Zoning	Appropriate zoning is required consistent with local land use regulations. In Portland, although several zoning classifications may be appropriate for some aspects of marine terminals, the heavy industrial (IH) zone allows for the widest range of primary and assessor uses necessary for marine terminals; such as rail yards or handling of hazardous materials.
	Overlay Regulations	While Oregon does not have shoreline regulations, the City of Portland has overlay zones which may impose additional restrictions and protections.

Criteria	Considerations	Comments
Environmental and Natural Resources	Contamination	Shipping terminals have historically been in industrial sites which quite frequently have been exposed to contamination. Remediation of these sites are typically held to a long time industrial use standard and as a result continuing industrial use for shipping are wholly compatible with industrial level cleanup standards. However it should be noted that previously remediated sites are likely to have deed covenants on future use such as restrictions on potable water wells (not an encumbrance in a serviced urban environment), penetrations into protective caps and disruption of in situ treatment processes.
	Flood Plain	Flood plains are a consideration as most shipping terminals are at elevations that are often included in exposure areas.
Cultural & Historic	Historical and Cultural Significant Sites	Like critical areas, industrial properties that have been historically used for industrial purposes are unlikely to present any encumbrances for cultural and historical uses.

*Acreages vary considerable depending on the precise cargo handling and storage requirements. Storage and handling approaches that dramatically affect the required acreage include: on site storage in rail cars, bulk tanks and silos; warehouses and open air facilities, as well as handling mechanisms such as cranes, loading ramps and bulk material (dry and liquid) conveyors. These ranges are generally useable for the cargo category, but need to be further refined for a specific cargo. In selecting a site, one would err to the higher side of the range to afford the maximum market flexibility. The planned use of rail storage sidings has the single greatest impact on size, and materially affects a site's usability.

Appendix C Analysis of Harbor Land Capacity and Demand, Portland & Vancouver

The City of Portland asked us: to what extent can the Port of Vancouver play a role in accommodating forecast cargo demand in the Portland region? This question is addressed Section 3.3 of the main report. This appendix provides additional tables with more detail than was presented in the main report. Our analysis finds that the Portland Harbor has very limited capacity to accommodate future demand for public marine terminals, but that the Port of Vancouver may technically have sufficient capacity to accommodate all forecast demand for cargo for both the cities of Portland and Vancouver through the year 2040.

C.1 DISCLAIMER

All of this analysis described in this appendix depends on estimates of current variables that are uncertain, and forecasts that are even more uncertain, and themselves dependent on a wide range of possible assumptions. Like any analysis of future economic conditions, this one is built upon many layers of assumptions: each assumption widens the range of potential outcomes, and each layer of assumptions compounds on the previous layer to provide an even wider range of potential results. That fact does not necessarily make the analysis irrelevant: it can definitely inform public policy about possible and likely futures. Despite the uncertainty inherent in this analysis, it is helpful for bookending the potential land need for public marine terminals. Assumptions in the middle of the range give conclusions that should be useful for planning purposes, even if actual results may vary.

C.2 DEMAND FOR MARINE CARGO

We were tasked with obtaining and reviewing the most recent forecasts. These forecasts were contained in the *Portland and Vancouver Harbor Forecast Update* (BST Associates, 2012). These forecasts were based on a 2010 study by BST Associates, but were refined to specifically call out cargo demand for the City's of Portland and Vancouver, and were updated with the most recent economic data. Exhibit C-1 shows the forecast demand for public and private marine terminals in the City of Portland in 2040.

Exhibit C-1. Forecast cargo demand, public and private marine terminals, City of Portland, 2040

Cargo Type	Low	Mid-Range	High
Automobiles (units)	811,000	912,500	1,014,000
Containers (TEUs)	379,000	452,500	526,000
Metric Tons			
Automobiles	1,076,000	1,206,000	1,336,000
Containers	2,162,000	2,583,500	3,005,000
Breakbulk	1,132,000	1,242,000	1,352,000
Grain	6,686,000	9,078,000	11,470,000
Dry Bulk	10,278,000	14,093,500	17,909,000
Liquid Bulk	6,912,000	7,461,500	8,011,000
Total	**28,246,000**	**35,664,500**	**43,083,000**

Calculated by ECONorthwest with source data from BST Associates (2012).

Exhibit C-2 shows the forecast demand for public and private marine terminals in the City of Vancouver in 2040.

Exhibit C-2. Forecast cargo demand, public and private marine terminals, City of Vancouver, 2040

Cargo Type	Low	Mid-Range	High
Automobiles (units)	159,000	197,000	235,000
Containers (TEUs)	-	-	-
Metric Tons			
Automobiles	226,000	278,500	331,000
Containers	-	-	-
Breakbulk	534,000	568,500	603,000
Grain	3,808,000	4,109,000	4,410,000
Dry Bulk	5,931,000	11,663,500	17,396,000
Liquid Bulk	510,000	802,500	1,095,000
Total	**11,009,000**	**17,422,000**	**23,835,000**

Calculated by ECONorthwest with source data from BST Associates (2012).

BST Associates estimates that the regional demand for cargo at marine terminals will range from 39,255,000 to 66,918,000 metric tons in 2040, with roughly two thirds of the demand coming from Portland, and the remainder from Vancouver. Dry bulk is forecast to be the cargo type with the most demand (as measured by tonnage) in 2040, comprising just over half of total tonnage in the region.

C.3 EXISTING CAPACITY

Estimates of existing cargo capacity are difficult to obtain, particularly since our analysis looked at multiple geographies (Portland and Vancouver), and multiple ownerships (public and private). We used two methods to bookend our estimates of existing capacity, based on two different assumptions (1) assuming current facilities operate at 100% of maximum capacity before new terminals are needed, and (2) assuming all

growth in demand is from new opportunities that require new facilities, and current facilities continue to operate at current levels.

The Port of Portland provided us with estimates of maximum capacity, as well as annual historical cargo volumes for each cargo type for public marine terminals in the City of Portland. These estimates of capacity are shown in Exhibit C-3.

Exhibit C-3. Existing cargo capacity, public marine terminals, City of Portland

Cargo Type	Estimated	Recent Peak Volume	Peak Year
Automobiles (units)	675,000	460,000	2006
Containers (TEUs)	700,000	330,000	1995
Metric Tons			
Automobiles	889,000	606,000	
Containers	3,999,000	1,885,000	
Breakbulk	2,100,000	1,130,000	2007
Grain	4,100,000	5,400,000	1995
Dry Bulk	10,700,000	5,460,000	2008
Liquid Bulk	-	-	N/A
Total	**21,788,000**	**14,481,000**	

Calculated by ECONorthwest with source data from the Port of Portland, 2012.
Note: Recent peak volume for grain is no longer applicable, as the Terminal 4 grain elevator has closed since 1995 when the peak was measured.

For private marine terminals in the City of Portland, we compared historical data for total cargo volumes for the years 2000 and 2010 from the BST report with anecdotal data and conversations with the Port of Portland to determine the estimated current capacity. Key assumptions are that all historical liquid bulk cargo, and that none of the automobile and container cargo shown in the BST report for the City of Portland is handled by private marine terminals. For private marine terminals we only used one method for estimating existing capacity, under the assumption that existing facilities do not have significant excess capacity, and that recent historical peaks are a reasonable estimate of capacity.

Exhibit C-4. Existing cargo capacity, private marine terminals, City of Portland

Cargo Type	Estimated	Notes
Automobiles (units)	-	No private auto terminals
Containers (TEUs)	-	No private container terminals
Metric Tons		
Automobiles	-	
Containers	-	
Breakbulk	250,000	Conversation with Port of Portland.
Grain	3,000,000	Existing private terminals are old and nearing obsolesence
Dry Bulk	1,500,000	Conversation with Port of Portland, recent historical peak.
Liquid Bulk	8,280,000	BST reports citywide liquid bulk in 2000.
Total	**13,030,000**	

Source: ECONorthwest, informed by "Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012) and conversations with officials from the Port of Portland.

For the City of Vancouver, we were unable to obtain estimates of capacity from the Port of Vancouver or from the Port of Portland. Nor were we able to obtain detailed historical data by cargo type isolating public terminals from private terminals. Instead, we relied on the BPS report, which reported cargo volumes for just two years: 2000 and 2010. In our evaluation of Port of Portland public marine terminals (described previously in this section), we found that the recent peak volumes were equal to 66% of the total capacity. We applied that same percentage to the recent peak volumes for the City of Vancouver to estimate the total capacity, shown in Exhibit C-5. One adjustment, however, had to be made. The Port of Vancouver is in the planning process of developing a potash terminal, which will have capacity for up to 16 million tons of dry bulk. We added this capacity to the estimated capacity shown in Exhibit C-5.

Exhibit C-5. Existing cargo capacity, public and private marine terminals, City of Vancouver

Cargo Type	Estimated	Recent Peak	Peak Year
Automobiles (units)	90,000	60,000	2010
Containers (TEUs)		-	
Metric Tons			
Automobiles	137,000	91,000	
Containers	-	-	
Breakbulk	531,000	354,000	2000
Grain	5,544,000	3,696,000	2010
Dry Bulk	17,556,000	1,037,000	2010
Liquid Bulk	1,110,000	740,000	2000
Total	**24,878,000**	**5,918,000**	

Source: ECONorthwest, informed by "Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012) and conversations with officials from the Port of Portland.

C.4 CAPACITY SHORTFALL

Determining the capacity shortfall should be as simple as subtracting the existing capacity from the projected demand. However, we have two different estimates of capacity, and three different estimates of demand. And since we are interested in identifying the shortfall for public marine terminals, we also need to make assumptions for what portion of future demand for what cargo types will be accommodated by private terminals.

We created three scenarios for cargo capacity: low, high, and most likely. These scenarios are based on the following assumptions:

- The low shortfall scenario takes the estimates of facility capacity and subtracts the low BST forecast for 2040 demand. This assumes that all existing facilities are pushed to 100% of capacity to accommodate the forecast future demand.
- The high scenario takes the recent peak volume for facility capacity, and subtracts the high BST forecast for 2040 demand. This assumes that all facilities continue to operate at their current levels and that all additional demand will need to be accommodated in new facilities.[1]
- The most-likely scenario takes the estimates of facility capacity and reduces them by 10% (this reduction reflects the fact that some forecast demand will be from new market opportunities that will not be able to take advantage of existing facilities, and therefore despite forecasting a capacity shortfall in the aggregate, not all existing facilities will be operating at 100% of capacity), then subtracts the mid-range demand forecasts (that we calculated as the average of the high and low BST forecasts). This scenario assumes that demand will fall in the middle of the range that BST forecast, and that existing facilities will be able to accommodate some of the future growth, but will never operate at 100% of capacity.

Exhibits C-6 through C-8 show the forecast of the cargo capacity shortfall for public marine terminals in 2040 for each of these three scenarios. In Exhibit C-6, we see the shortfall for the City of Portland public marine terminals could range from 187,000 metric tons to more than 17 million metric tons, with the medium scenario showing some shortfall for automobiles, grain, and dry bulk cargoes.

[1] Since the recent historical peak for grain for public marine terminals in the City of Portland is not applicable, due to the removal the Terminal 4 grain elevator, we used the estimated capacity for grain in this scenario.

Exhibit C-6. Forecast cargo capacity shortfall, public marine terminals, City of Portland, 2040

Cargo Type	Low	Medium	High
Automobiles (units)	(136,000)	(310,000)	(554,000)
Containers (TEUs)	-	-	(196,000)
Metric Tons		-	
Automobiles	(187,000)	(410,000)	(730,000)
Containers	-	-	(1,120,000)
Breakbulk	-	-	-
Grain	-	(2,390,000)	(4,370,000)
Dry Bulk	-	(2,960,000)	(10,949,000)
Liquid Bulk	-	-	-
Total	**(187,000)**	**(5,760,000)**	**(17,169,000)**

Calculated by ECONorthwest with source data from Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012) and conversations with officials from the Port of Portland.

Exhibit C-7 shows the forecast cargo capacity shortfall for public marine terminals in the City of Vancouver could range from less than 100,000 to 1.9 million metric tons, with the medium scenario showing a shortfall of 250,000.

Exhibit C-7. Forecast cargo capacity shortfall, public marine terminals, City of Vancouver, 2040

Cargo Type	Low	Medium	High
Automobiles (units)	(69,000)	(120,000)	(175,000)
Containers (TEUs)	-	-	-
Metric Tons		-	
Automobiles	(89,000)	(160,000)	(240,000)
Containers	-	-	-
Breakbulk	(3,000)	(90,000)	(249,000)
Grain	-	-	(714,000)
Dry Bulk	-	-	(359,000)
Liquid Bulk	-	-	(355,000)
Total	**(92,000)**	**(250,000)**	**(1,917,000)**

Calculated by ECONorthwest with source data from Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012) and conversations with officials from the Port of Portland.

Exhibit C-8 shows the combined shortfall for public terminals in the City of Portland and City of Vancouver for the year 2040. The total shortfall is estimated to range from 279,000 metric tons to more than 19 million metric tons, with a medium scenario showing a shortfall of 6 million metric tons.

Exhibit C-8. Forecast cargo capacity shortfall, public marine terminals, Portland / Vancouver region, 2040

Cargo Type	Low	Medium	High
Automobiles (units)	(205,000)	(430,000)	(729,000)
Containers (TEUs)	-	-	(196,000)
Metric Tons			
Automobiles	(276,000)	(570,000)	(970,000)
Containers	-	-	(1,120,000)
Breakbulk	(3,000)	(90,000)	(249,000)
Grain	-	(2,390,000)	(5,084,000)
Dry Bulk	-	(2,960,000)	(11,308,000)
Liquid Bulk	-	-	(355,000)
Total	**(279,000)**	**(6,010,000)**	**(19,086,000)**

Calculated by ECONorthwest with source data from Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012) and conversations with officials from the Port of Portland.

C.5 TERMINAL SIZE

We were asked to translate the forecast cargo capacity shortfalls (described in Section C.4) into acres of land for public marine terminals. To accomplish this, we need assumptions on the size of public marine terminals.

As stated in Section C.1, all of this analysis suffers from a high degree of uncertainty and a wide range of possible assumptions. This aspect of the analysis (converting tons of cargo into acres of land for new terminals) is probably the most uncertain. There is no accepted rule of thumb for the minimum size of marine terminals, let alone the standard or average size. Some aspects of marine terminal size can scale with cargo volumes (e.g., an automobile terminal moving 100,000 cars may require roughly half the acreage of an automobile terminal moving 200,000 cars.). However, other aspects of terminal size may not scale proportionately to cargo volume.

We attempted to assemble recent studies from the City of Portland to see what we could learn about the likely size of marine terminals that would be needed to accommodate future demand in the City of Portland. The West Hayden Island Economic Foundation Study (Entrix 2011), provided a summary of site characteristics for marine-related land uses, including an acreage approximation for terminals of various cargo types in the Portland Harbor and other west coast harbors. The Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011 – Draft) provides other assumptions for terminal sizes for automobiles, grain, and dry bulk, based on case studies from North American and European terminals. The Worley Parsons analysis also provides a range of potential throughput per acre based on these case study ports.

Ultimately, we looked at both of these sources of data, and the Criteria for Evaluating Potential Sites for Marine Terminal produced by Maul, Foster & Alongi as part of the consultant team for this study (included as Appendix B to this same report) to determine a range of reasonable terminal sizes. These assumptions are shown in Exhibit C-9. We show both a minimum size, and a practical, case study-supported size. Note that the size for these marine terminals does not necessarily reflect land required for rail infrastructure to support these terminals.

Exhibit C-9. Summary of assumptions on acreage requirements for public marine terminals by cargo type

	ENTRIX		Worley Parsons		For This Analysis	
Cargo Type	Minimum	Practical	Minimum	Practical	Minimum	Practical
Automobiles	75	100	47	150	50	150
Containers	50	200			50	200
Breakbulk	15	50			15	50
Grain	40	50	15	45	30	50
Dry Bulk	5	100	30	30	20	70
Liquid Bulk	5	20			5	20

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)

Other experts and stakeholders may have different opinions on what is truly a practical size for a new marine terminal. The assumptions used in this analysis, are not asserted as the definitive answer for what size terminal is best for any and all new marine terminals. These assumptions simply reflect the range of terminal sizes that were reported as reasonable and practical in the two source documents that we reviewed. For this reason, in the rest of this document, we refer to the "practical" terminal sizes in Exhibit C-9, as "case study supported" terminal sizes.

C.6 EVALUATION OF LAND NEED FOR PUBLIC MARINE TERMINALS

Determining the land needed for public marine terminals is as simple as multiplying the demand shortfall (in metric tons) by a ratio of tons per acre for cargo size. However, the estimate of shortfall does not tell us how many terminals will be needed. If for example, we see a shortfall of 10 million tons of dry bulk, it could potentially be accommodated in one terminal, or in many terminals. For each of the terminals, they could be operating at 100% of capacity, or at only a small fraction of capacity (if they were sized to accommodate future growth, beyond the 2040 horizon). Additionally, we have multiple scenarios for the cargo capacity shortfall (low, medium, and high), and multiple measures of cargo size (minimum, and case study-

supported). One final challenge is that some terminals will require rail access, and if a dedicated rail loop is needed, then it will require about 100 acres of land, regardless of our other assumptions on minimum or case study-supported terminal size.

In this section, we present results only in terms of the minimum number of acres needed to absorb the capacity shortfall, and do not estimate the number of terminals the acreage equates to. We ultimately provide assumptions for determining the number of terminals required to accommodate the projected cargo capacity shortfall.

Exhibits C-10 through C-12 show projected capacity shortfall, needed acreage to fulfill the shortfall, and whether new terminal space is needed for the six cargo types under the lowest scenario in the City of Portland, City of Vancouver, and the two combined. This scenario uses the low estimate of cargo capacity shortfall and assumes the minimum acreage requirement for each cargo type.

For the City of Portland automobile shortfall, we used an estimate of throughput per acre from the Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2012), which used case study examples to show that automobile terminals can achieve 2,688 autos per acre. For the City of Vancouver automobile shortfall, we assumed the 89,000 metric tons, could be accommodated by improved efficiencies at their existing facility, and would not be sufficient demand to necessitate development of a new terminal. Exhibits C-10 through C-12 show the results of the lowest scenario for public marine terminals in Portland and Vancouver.

Exhibit C-10. Lowest Scenario, Forecast land need for new public marine terminals, City of Portland, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Minimum Acres Needed
Automobiles	(187,000)	Yes	51.0
Containers	-	No	-
Breakbulk	-	No	-
Grain	-	No	-
Dry Bulk	-	No	-
Liquid Bulk	-	No	-
Total	**(187,000)**		**51.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

Exhibit C-11. Lowest Scenario, Forecast land need for new public marine terminals, City of Vancouver, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Minimum Acres Needed
Automobiles	(89,000)	No	-
Containers	-	No	-
Breakbulk	(3,000)	No	-
Grain	-	No	-
Dry Bulk	-	No	-
Liquid Bulk	-	No	-
Total	**(92,000)**		**-**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

Exhibit C-12. Lowest Scenario, Forecast land need for new public marine terminals, cities of Portland and Vancouver, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Minimum Acres Needed
Automobiles	(276,000)	Yes	51.0
Containers	-	No	-
Breakbulk	(3,000)	No	-
Grain	-	No	-
Dry Bulk	-	No	-
Liquid Bulk	-	No	-
Total	**(279,000)**		**51.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

The previous set of tables show that in the lowest scenario, demand for new public marine terminals in Portland and Vancouver could be as low as 51 acres. Exhibits C-13 through C-15 show the opposite bookend, the highest scenario. This scenario uses the high estimate of cargo capacity shortfall, assumes low estimates of throughput per acre for automobile terminals, and assumes terminals for dry bulk, grain, and containers require a dedicated rail loop.

Exhibit C-13. Highest Scenario, Forecast land need for new public marine terminals, City of Portland, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Maximum Acres Needed
Automobiles	(730,000)	Yes	577.0
Containers	(1,120,000)	Yes	100.0
Breakbulk	-	No	-
Grain	(4,370,000)	Yes	100.0
Dry Bulk	(10,949,000)	Yes	200.0
Liquid Bulk	-	No	-
Total	**(17,169,000)**		**977.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

Exhibit C-14. Highest Scenario, Forecast land need for new public marine terminals, City of Vancouver, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Maximum Acres Needed
Automobiles	(240,000)	Yes	180.0
Containers	-	No	-
Breakbulk	(249,000)	Yes	50.0
Grain	(714,000)	Yes	100.0
Dry Bulk	(359,000)	Yes	100.0
Liquid Bulk	(355,000)	Yes	50.0
Total	**(1,917,000)**		**480.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

Exhibit C-15. Highest Scenario, Forecast land need for new public marine terminals, cities of Portland and Vancouver, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Maximum Acres Needed
Automobiles	(970,000)	Yes	757.0
Containers	(1,120,000)	Yes	100.0
Breakbulk	(249,000)	Yes	50.0
Grain	(5,084,000)	Yes	200.0
Dry Bulk	(11,308,000)	Yes	300.0
Liquid Bulk	(355,000)	Yes	50.0
Total	**(19,086,000)**		**1,457.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

The previous set of tables for the highest scenario show that up to 1,457 acres of land could be needed to accommodate the 19 million metric tons of cargo capacity shortfall. Given the assumptions about minimum and case study-supported terminal size shown in Exhibit C-9, a shortfall of this size would probably require on the order of 10 new terminals of average size.

Both the lowest and highest scenarios are possibilities, but unlikely.[2] These scenarios do help to show the extreme ends of the spectrum, but it is better to focus our attention on the medium scenario. For this scenario, we used the medium estimate of cargo capacity shortfall, and assumed all demand for each cargo type in each City could be accommodated by one terminal.

Exhibit C-16 shows our medium forecast of acres needed for public marine terminals in the City of Portland in 2040. It shows a total land need ranging from 170 to 470 acres, depending on the size and efficiency of new terminals, and the need for dedicated rail infrastructure.

[2] This is not to imply the underlying "high-scenario" cargo forecast from BST is unreasonable. In fact, the forecast demand for cargo in the high scenario averages 3.1% growth per year, which is less than the 4.1% per year that has been experienced on the Columbia River between 1962 and 2011. However, the compounding assumptions for capacity (existing facilities only operate at current levels, and accommodate none of the future growth), terminal size (rail loops for every terminal), and number of terminals (e.g., 3 new auto terminals to accommodate total demand of less than 1,000,000 tons per year), all combine to make this scenario unrealistic.

Exhibit C-16. Medium Scenario, Forecast land need for new public marine terminals, City of Portland, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Acres Needed		
			Minimum	Case Study Examples	w / rail
Automobiles	(410,000)	Yes	120.0	270.0	270.0
Containers	-	No	-	-	-
Breakbulk	-	No	-	-	-
Grain	(2,390,000)	Yes	30.0	50.0	100.0
Dry Bulk	(2,960,000)	Yes	20.0	70.0	100.0
Liquid Bulk	-	No	-	-	-
Total	**(5,760,000)**		**170.0**	**390.0**	**470.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

Exhibit C-17 shows our medium forecast of acres needed for public marine terminals in the City of Vancouver in 2040. It shows a total land need ranging from 40 to 100 acres to accommodate 160,000 metric tons of automobiles.

Exhibit C-17. Medium Scenario, Forecast land need for new public marine terminals, City of Vancouver, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Acres Needed		
			Minimum	Case Study Examples	w / rail
Automobiles	(160,000)	Yes	40.0	100.0	100.0
Containers	-	No	-	-	-
Breakbulk	(90,000)	No	-	-	-
Grain	-	No	-	-	-
Dry Bulk	-	No	-	-	-
Liquid Bulk	-	No	-	-	-
Total	**(250,000)**		**40.0**	**100.0**	**100.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

The combination of demand for public marine terminals in the cities of Portland and Vancouver are shown in Exhibit C-18. It forecasts a need for 210 to 570 acres.

Exhibit C-18. Medium Scenario, Forecast land need for new public marine terminals, cities of Portland and Vancouver, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Acres Needed		
			Minimum	Case Study Examples	w / rail
Automobiles	(570,000)	Yes	160.0	370.0	370.0
Containers	-	No	-	-	-
Breakbulk	(90,000)	No	-	-	-
Grain	(2,390,000)	Yes	30.0	50.0	100.0
Dry Bulk	(2,960,000)	Yes	20.0	70.0	100.0
Liquid Bulk	-	No	-	-	-
Total	**(6,010,000)**		**210.0**	**490.0**	**570.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

In Exhibits C-10 through C-18 we purposely showed estimates of "acres needed" and not "number of terminals needed." Moving from cargo to land adds uncertainty; moving from acres to terminals adds even more. Exhibit C-9 is a basis for the conversion, but it shows a range of possible terminal sizes.[3] Moreover, terminals may not be used to capacity, technologies may change, and so on. That said, a rough application of estimates of terminal size supported by the case studies (in acres, Exhibit C-9) to estimates of needed acres under medium assumptions (Exhibit C-18), yields estimates of number of new terminals needed by 2040 as follows: automobiles, 1 – 4 terminals; grain, 1 – 3 terminals; dry bulk, 1 – 3 terminals.

[3] The ranges in Exhibit C-9 are based on all available data sources: existing terminal sizes at the Port of Portland and Vancouver, conversations with officials at both ports, and case studies included in the report on Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011 Draft). Ultimately, however, these assumptions were a judgment call on the part of ECONorthwest, and represent our best guesses for a lowest, highest, and medium scenario.

C.7 IMPLICATIONS

The City of Portland identified the two sites in the Portland Harbor that are most likely to be suitable for development of a new public marine terminal: the Atofina site, and the Time Oil site. Of these two sites, development is technically possible on either, but there are major hurdles that would add significant costs. Both sites have some level of contamination, both sites would require negotiation and property acquisition from numerous property owners, and both sites are smaller than desirable, which precludes the possibility of an onsite rail loop. Depending on the specific parcels that would be acquired and aggregated to make development of these sites possible, each site could range in size from 50 to 100 acres, for total developable acreage of 100 to 200 acres.

When considering the potential cargo capacity shortfall, the two sites in the Portland Harbor could potentially accommodate the one dry bulk and one grain terminal that are anticipated to be needed. These terminals are expected to require between 20 and 200 acres, which matches fairly well with the capacity of the two potential sites. However, if these potential terminals require a dedicated rail loop, or if they are unable to overcome the barriers to redevelopment at each site, then the forecast capacity shortfall will need to be accommodated elsewhere in the region.

Assuming each new port terminal requires a dedicated rail loop, it would appear that the total acreage needed to accommodate regional cargo volumes in 2040 exceeds the current supply of 350 acres of vacant developable land at the Port of Vancouver planned for marine terminal development.[4] However, the Port of Vancouver has about 200 acres of vacant developable land that could technically accommodate marine terminal development, but is planned for other industrial uses. If these acres were included in the total supply, then it would appear that the Port of Vancouver would have about the right supply of land to accommodate regional cargo demand through 2040. While this is technically possible, that does not mean that it is politically feasible or consistent with adopted policies of the affected jurisdictions.

While it is possible that the Port of Vancouver could accommodate the regional demand for cargo through 2040, it is also possible that Vancouver's land supply could fall far short. Using the high-scenario demand forecasts, and assuming rail loop access for all terminals, the region could have a

[4] It is important to note that these projections are based on our medium scenario. The range of possible assumptions that could be used in this analysis is significant. When using our most conservative assumptions, our analysis showed a regional land need as low as 70 acres, and our most aggressive assumptions resulted in a land need of over 2,250 acres.

shortfall of up to 1,457 acres. If only 350 acres at the Port of Vancouver are available for marine terminal development, as is their current stated policy, then that would leave over 1,100 acres of unmet demand for public marine terminals in the region.

Our analysis finds that the Portland Harbor has very limited capacity to accommodate future demand for public marine terminals, but that the Port of Vancouver has capacity to accommodate some (but not necessarily all) forecast demand for cargo for both the cities of Portland and Vancouver through the year 2040 under our medium scenario.

Appendix D Mapping Analysis

As part of the background research for the Harbor Lands Contract, Bureau of Planning and Sustainability staff conducted a visual survey of aerial maps of the Portland Harbor to classify the lands in one of several categories. The first reason for undertaking this review was to provide the consultant for the Harbor Lands Analysis, ECONorthwest (ECO), with a visual representation of current Portland Harbor development so that they could analyze this and confirm potential sites to consider for assembly into larger parcels. The second reason for this effort was to help validate the initial acreage findings of the draft Economic Opportunities Analysis (EOA).

Lands were split into various development types, including buildings, other structures/tanks, exterior work/storage areas, loading & maneuvering areas, parking areas, rail yards, vacant land and a few residual categories (see chart below). Once these lands were categorized, they were compared with the lands that are considered environmentally constrained or brownfields. The intent was to specifically consider whether vacant lands predominantly had one of these constraints applied to them. While the visual survey and analysis was initially considered to cover the lands that staff wanted ECO to review along the harbor, it was also refined to incorporate the boundary of the EOA for the Portland Harbor sub-geography to determine whether the acreage was significantly different. The findings are provided in a table attached to this summary.

Within the Portland Harbor sub-geography, the visual survey identified a total of 590 acres of lands that were considered vacant. However, of this acreage, approximately 412 acres either contained medium or high level natural resources (174.4 acres), were existing brownfields (145.2 acres), or were brownfield sites with resources as well (92.6 acres). This left approximately 174 acres that were not constrained. This number exceeds the amount of unconstrained vacant land determined by Hovee (108 acres). This is partially due to the fact that the visual survey included vacant portions of otherwise developed parcels, and was not constrained by lot lines. Thus vacant portions of lots were included in the aerial survey that were not included in the EOA. Within the EOA update, Hovee had separated out the Harbor Access Lands from the larger Columbia Harbor subgeography. In either case, the unconstrained land represents a minority of the overall vacant land in the harbor.

For the ECO analysis, the maps helped illustrate the potential vacant sites that could be looked in greater detail in their report. This led to the consideration of the Time Oil and Atofina sites as possible areas for consideration of a marine terminal. The report includes the analysis on these sites.

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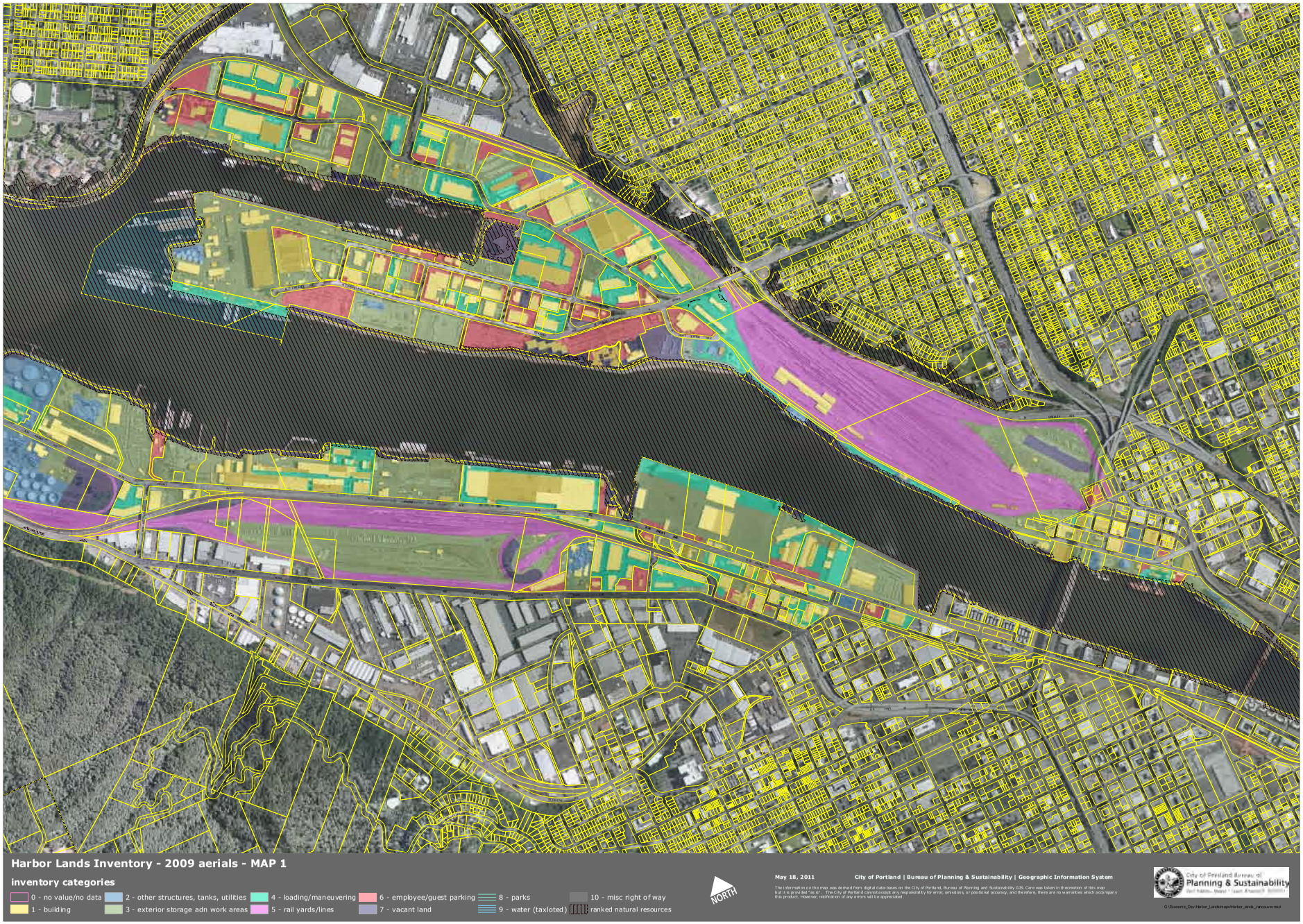
Category #	Category Description	**TOTAL Acres Harbor Lands Study Area**	(1)Acres in med/high NRI resources ONLY	(1) Acres both NRI & Brownfields	(1)Acres in vacant Brownfields ONLY (2009+11)	**TOTAL Acres PDX *Harbor Access Lands (2)**	**Acres in med/high NRI resources* ONLY (2)**	**Acres both NRI AND Brownfields (2)**	**Acres in vacant Brownfields ONLY(2009+11)* (2)**	Acres Port of Vancouver
1	building	**415.1**	0.6	0.1	5.2	**267.2**	0.4	0.1	4.8	65.7
2	other structures, tanks, utilities	**197.1**	2.6	0.0	1.5	**92.1**	2.2	0.0	1.5	72.6
3	exterior storage & work areas	**1,326.0**	26.9	1.1	20.7	**994.0**	23.9	1.0	10.3	435.7
4	loading/maneuvering	**295.0**	14.0	0.2	0.2	**181.9**	13.4	0.2	0.2	134.9
5	rail yards	**457.3**	38.4	0.3	3.3	**138.0**	5.2	0.3	0.0	72.1
6	employee/guest parking	**143.2**	6.7	0.1	1.1	**94.5**	1.5	0.0	1.1	12.0
7	vacant land	**1,739.4**	328.1	127.9	214.4	**586.0**	174.4	92.6	145.2	1,442.5
8	parks	**110.0**	103.2	0.8	0.4	**3.0**	1.0	0.0	0.0	0.0
9	taxloted water	**89.3**	88.9	0.0	0.0	**89.3**	88.9	0.0	**0.0**	101.8
10	misc right of way	**25.3**	6.8	0.0	0.0	**15.6**	4.1	0.0	0.0	0.0
	Total	**4,798**	**616**	**131**	**247**	**2,462**	**315**	**94**	**163**	**2,337**

Revised 3/19/2012
*Harbor Access Lands dataset = river overlay zones created by Hovee

(1)Acres within the Harbor Lands Boundary
(2)Acres within *Harbor Access Lands dataset (hovee's river overlay zone shapefile)

NOTE: West Hayden Island NRI not included.


Harbor Lands Inventory - 2009 aerials - MAP 1
inventory categories
0 - no value/no data
1 - building
2 - other structures, tanks, utilities
3 - exterior storage adn work areas
4 - loading/maneuvering
5 - rail yards/lines
6 - employee/guest parking
7 - vacant land
8 - parks
9 - water (taxloted)
10 - misc right of way
ranked natural resources
NORTH
May 18, 2011
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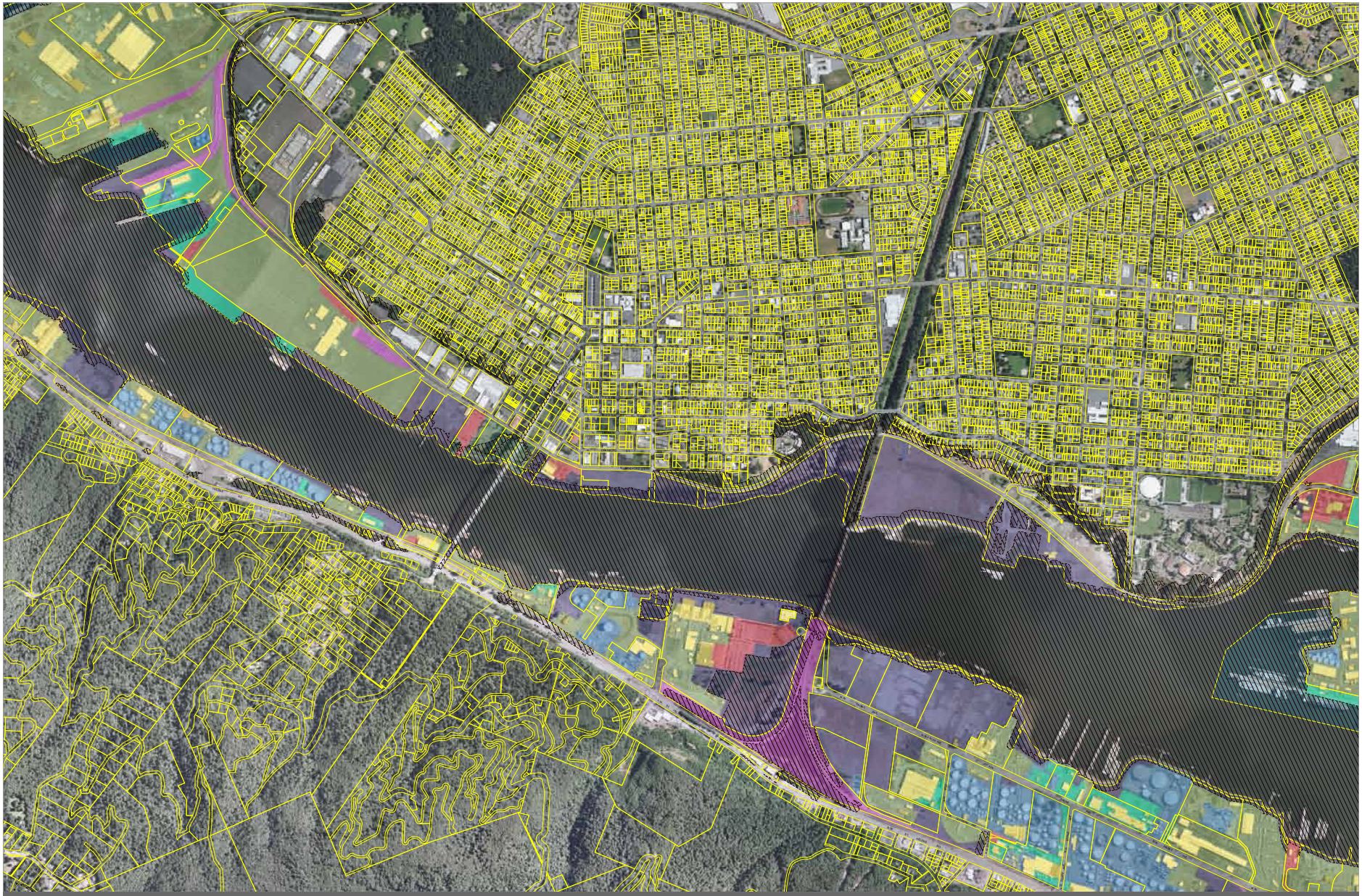
Harbor Lands Inventory - 2009 aerials - MAP 2
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3 - exterior storage adn work areas
4 - loading/maneuvering
5 - rail yards/lines
6 - employee/guest parking
7 - vacant land
8 - parks
9 - water (taxloted)
10 - misc right of way
ranked natural resources
NORTH
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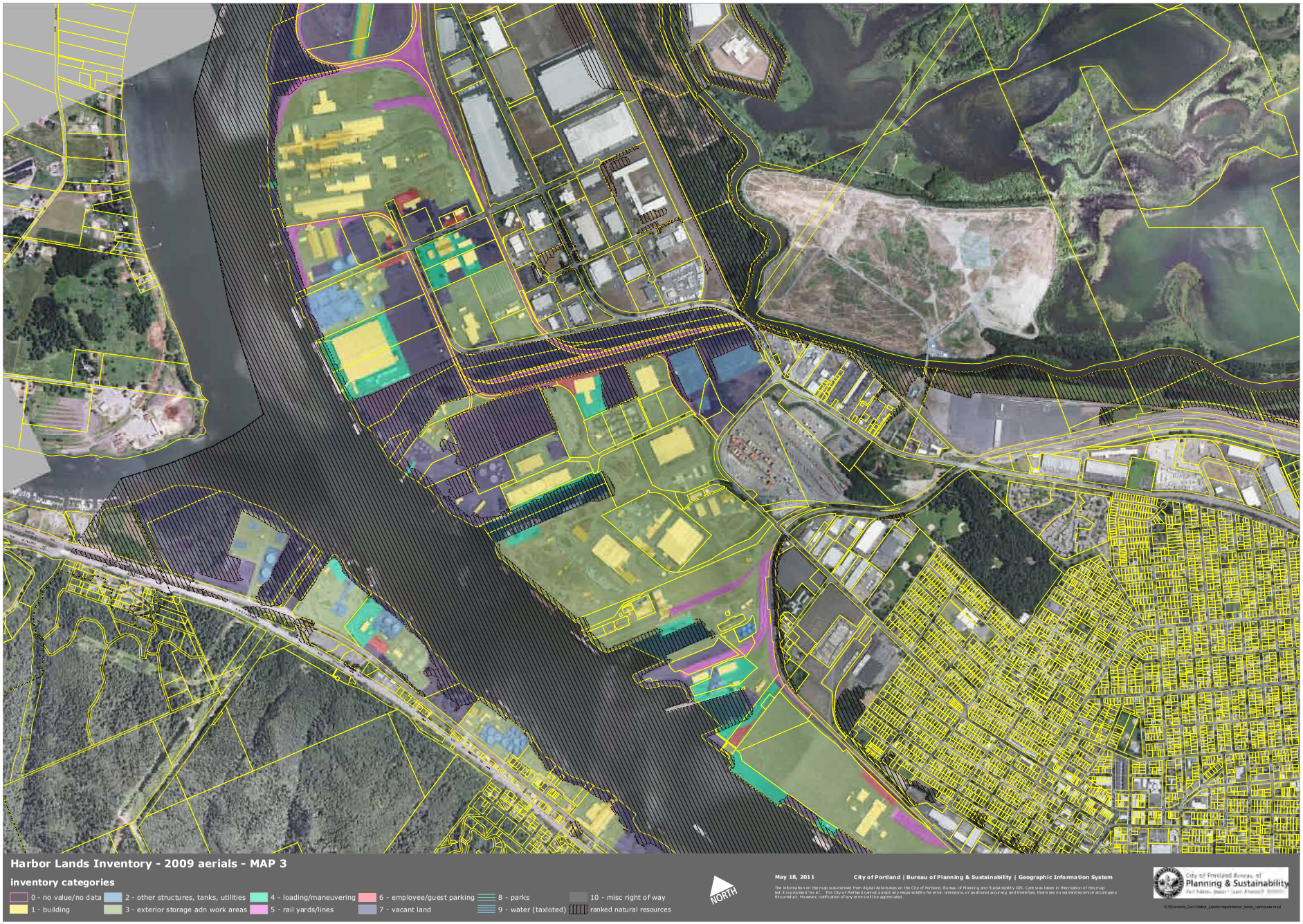
Harbor Lands Inventory - 2009 aerials - MAP 3
inventory categories
0 - no value/no data
1 - building
2 - other structures, tanks, utilities
3 - exterior storage adn work areas
4 - loading/maneuvering
5 - rail yards/lines
6 - employee/guest parking
7 - vacant land
8 - parks
9 - water (taxloted)
10 - misc right of way
ranked natural resources
NORTH
May 18, 2011
City of Portland | Bureau of Planning & Sustainability | Geographic Information System
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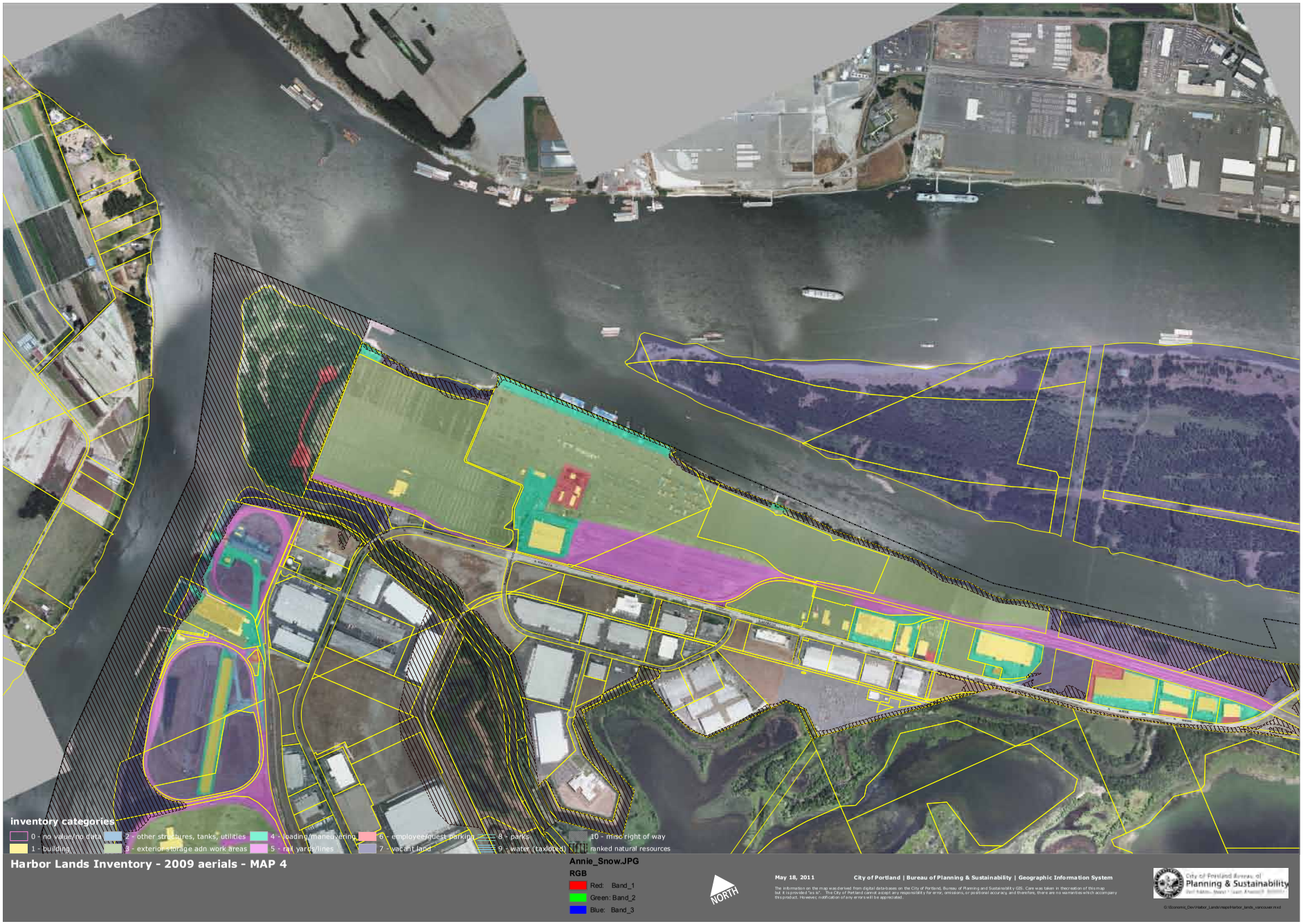
inventory categories
0 - no value/no data
1 - building
2 - other structures, tanks, utilities
3 - exterior storage adn work areas
4 - loading/maneuvering
5 - rail yards/lines
6 - employee/guest parking
7 - vacant land
8 - parks
9 - water (taxlotted)
10 - misc right of way
ranked natural resources
Harbor Lands Inventory - 2009 aerials - MAP 4
Annie_Snow.JPG
RGB
Red: Band_1
Green: Band_2
Blue: Band_3
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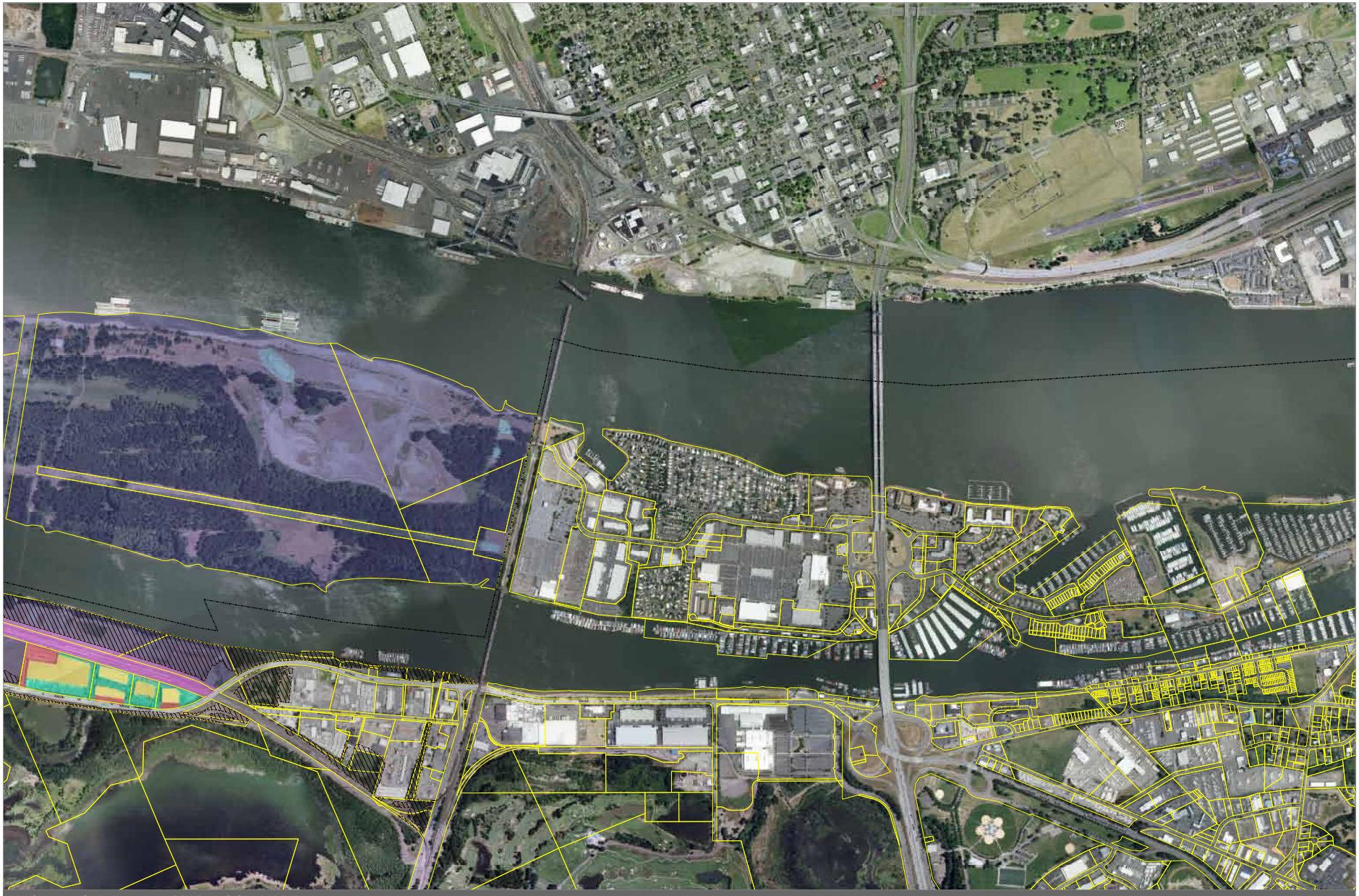
Harbor Lands Inventory - 2009 aerials - MAP 5
inventory categories
0 - no value/no data
1 - building
2 - other structures, tanks, utilities
3 - exterior storage adn work areas
4 - loading/maneuvering
5 - rail yards/lines
6 - employee/guest parking
7 - vacant land
8 - parks
9 - water (taxloted)
10 - misc right of way
ranked natural resources
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Harbor Lands Inventory - 2007 aerials - Vancouver
1 - building
2 - other structures, tanks, utilities, concrete plant
3 - exterior storage and work areas
4 - loading/maneuvering
5 - rail yards/lines
6 - employee/guest parking
7 - vacant land
9 - water (part of lot)
Not Port owned
Terminal 5
Terminal 4
Terminal 3
Terminal 2
Grain Elevator
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Portland and Vancouver Harbor Forecast Update

Final Report

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Prepared for
Port of Portland

February 2012

BST Associates
Market Research & Strategic Planning

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Introduction

This report provides a summary update of the marine cargo forecasts for the Portland-Vancouver area from the April 2010 report, "West Hayden Island Marine Cargo Forecasts & Capacity Assessment". . The marine cargo forecasts are unconstrained, which assumes that the necessary marine terminals and rail capacity will be in place to meet market demand.

The method for updating the prior forecast involved several steps. Current cargo volumes were updated by commodity and region using the most recent available data[1]. Volumes for 2011 were estimated based upon data from individual ports, the Pacific Maritime Association, U.S. Department of Agriculture, and other industry and government sources.

The forecasts include all public and private terminals for the following sub-regions:

- Portland Harbor,
- Vancouver Harbor.

The April 2010 forecast was based on an existing base of commodities that were moving through Lower Columbia River and PNW ports. It was a conservative forecast in that it excluded market opportunities. A key effort in this update was to consider the potential market opportunities that are being evaluated by individual ports in the PNW, defined to include all ports in Oregon and Washington. Potential new market opportunities included: ores, minerals, grain, containers and liquid bulks. These market opportunities were provided by the ports individually or allocated by BST Associates. As a result, the cargo opportunities that are expected at Portland and Vancouver are not expected to occur at the same level or on the same schedule.

In addition, the new market opportunities are based on reaching threshold volumes based upon current market expectations. When these thresholds are reached, the cargo volumes were constrained at that level. This explains the forecasts remaining at a fixed level later in the forecast period.

For each commodity group, two growth scenarios were considered. The high-growth forecast included all of the market opportunities currently under consideration. The low growth forecast included a portion of the market opportunities as well as baseline cargo volumes. An assumptive, most likely forecast would trend between the high and low, depending on market conditions.

The results of the forecast are presented below.

[1] 2010 data was available for commodities moving on international routes and 2009 for commodities moving on domestic routes.

Cargo Forecast Detail

This section briefly summarizes the factors impacting growth for each commodity group at the Portland Harbor.

Containers

The low growth scenario reflects near-term growth and intensified competition from ports in Canada and on all-water routes (after completion of the Panama Canal improvements).

Under the high growth forecast, container volumes are expected to increase due to increased market share of imports and exports to/from the Midwest region.

The revised annual growth for containers for the period from 2008[2] to 2040 ranges from 379,000 TEUs (low) to 526,000 TEUs (high) as compared with the April 2010 forecast, which ranged from 379,000 TEUs (low) to 614,000 TEUs (high).

Table 1-1: Portland Harbor Container Forecast (1,000 TEUs)

	April 2010 Study		2012 Update		Difference	
	Low	High	Low	High	Low	High
2008	245	245	245	245	-	-
2040	379	614	379	526	-	(88)
Compound Annual Growth Rate						
2008-2040	1.4%	2.9%	1.4%	2.4%		

Source: BST Associates

Autos

The revised auto forecasts reflect expected changes in production locations. Some Japanese auto manufacturers have announced that they are shifting production to North America. This will impact import volumes in the coming years. However, additional import volumes are expected from other auto manufacturers (e.g., Hyundai and manufacturers in China and India et al.), which is expected to increase imports.

In addition, auto exports from North American producers (from both foreign transplant and U.S. producers) are also expected to increase through the forecast period.

The revised annual growth autos for the period from 2008 to 2040 ranges from 811,000 units (low) to 1.0 million (high) as compared with the April 2010 forecast, which ranged from 925,000 units (low) to 1.4 million (high).

[2] The year 2008 was used as the starting year in the comparisons because it represents the last actual year of data for the 2010 forecast and is also the last pre-recession year.

Table 1-2: Portland Harbor Auto Forecast (1,000 Units)

	April 2010 Study		2012 Update		Difference	
	Low	High	Low	High	Low	High
2008	408	408	408	408		
2040	925	1,364	811	1,014	(114)	(350)
Compound Annual Growth Rate						
2008-2040	2.6%	3.8%	2.2%	2.9%		

Source: BST Associates

Breakbulk (including logs)

Under the low growth scenario, the forecast is slightly higher in the near-term due to increased forest product exports, which are expected to be relatively robust and then decline as the domestic housing industry begins to recover.

Under the high growth forecast, breakbulk volumes are expected to remain at higher levels. Log exports are projected to continue at a more rapid rate through approximately 2018 and then level out. Other breakbulk cargoes are also expected to grow, especially commodities such as steel and forest products, as U.S. and international economies improve.

The revised annual growth for breakbulk cargoes for the period from 2008 to 2040 ranges from 1.1 million tons (low) to 1.4 million tons (high) as compared with the April 2010 forecast, which ranged from 1.0 million tons (low) to 1.3 million tons (high).

Table 1-3: Portland Harbor Breakbulk Forecast (1,000 Metric Tons)

	April 2010 Study		2012 Update		Difference	
	Low	High	Low	High	Low	High
2008	977	977	977	977		
2040	1,010	1,295	1,132	1,352	122	57
Compound Annual Growth Rate						
2008-2040	0.1%	0.9%	0.5%	1.0%		

Source: BST Associates

Grain and related products

Grain and related products include wheat, barley, corn, soybeans, soy meal, beet pulp pellets and like products.

Pacific Northwest grain and oilseed exports have shown impressive growth over the past decade due primarily to exports of corn, soybeans and like products. This has primarily occurred at ports other than Portland and Vancouver (e.g., Kalama, Seattle, Tacoma, Grays Harbor and Longview).

The high growth scenario takes into account additional growth opportunities for grain exports, reflecting the shift of production from the Mississippi River Basin north and west into the Northern Plains, which is closer to Asia via PNW ports. Potential also exists for Canadian grain producers to shift cargo from Canadian export gateways to the PNW.

The revised annual growth rates for grain and related cargoes for the period from 2008 to 2040 ranges from 6.7 million tons (low) to 11.5 million tons (high) as compared with the April 2010 forecast, which ranged from 5.6 million tons (low) to 7.1 million tons (high).

Table 1-4: Portland Harbor Grain Forecast (1,000 Metric Tons)

	April 2010 Study		2012 Update		Difference	
	Low	High	Low	High	Low	High
2008	5,676	5,676	5,676	5,676		
2040	5,647	7,059	6,686	11,470	1,039	4,411
Compound Annual Growth Rate						
2008-2040	0.0%	0.7%	0.5%	2.2%		

Source: BST Associates

Dry bulk cargoes

Dry bulk cargoes include a wide variety of products, such as minerals, ores, chemicals, fertilizers, wood chips, gypsum, limestone, manufactured products and like products. In addition, there is strong interest in minerals and ores, among other bulk exports.

The expected growth in dry bulks is due to exports of potash, ores, coal and other commodities. Although there is uncertainty regarding volumes and export locations, the underlying basis of the export opportunity is sound for several reasons:

- There is strong international demand for these commodities,
- The regional transportation system is in place to move these commodities,
- North American producers (in the U.S. and Canada) have substantial supplies of key commodities, and
- U.S. and Canadian exports can be delivered via Pacific Northwest ports at prices below the required delivered price.

The revised annual growth rates for dry bulk cargoes for the period from 2008 to 2040 ranges from 10.3 million tons (low) to 18.0 million tons (high) as compared with the April 2010 forecast, which ranged from 6.5 million tons (low) to 10.0 million tons (high).

Table 1-5: Portland Harbor Dry Bulk Forecast (1,000 Metric Tons)

	April 2010 Study		2012 Update		Difference	
	Low	High	Low	High	Low	High
2008	6,458	6,458	6,458	6,458		
2040	6,547	10,018	10,278	17,909	3,731	7,891
Compound Annual Growth Rate						
2008-2040	0.0%	1.4%	1.5%	3.2%		

Source: BST Associates

Liquid bulk cargoes

The liquid bulk trades in the Pacific Northwest are dominated by petroleum, including crude oil and refined petroleum products. Other important commodities include chemicals, fertilizers and other liquid bulk products.

One significant change that is expected to impact liquid bulks is a shift in the source of crude oil for regional refineries. Refineries in the region are also expected to begin receiving crude oil by rail from North Dakota, which may impact waterborne volumes.

New opportunities for liquid bulk cargo are also considered; most notably LNG imports and/or exports.

The liquid bulk cargo forecast remains the same for the revised 2012 forecast and the April 10, 2010 forecast.

Table 1-6: Portland Harbor Liquid Bulk Forecast (1,000 Metric Tons)

	April 2010 Study		2012 Update		Difference	
	Low	High	Low	High	Low	High
2008	6,378	6,378	6,378	6,378		
2040	6,912	8,011	6,912	8,011	-	-
Compound Annual Growth Rate						
2008-2040	0.3%	0.7%	0.3%	0.7%		

Source: BST Associates

All cargoes

The primary differences in the revised 2012 forecast and the forecast prepared in April 2010 are due to the following factors:

- Decreases in expected cargo volumes for containers and autos due to changing industry conditions.
- Increases in breakbulk, grains and dry bulk cargoes due to consideration of new market opportunities.
- There was no change in the liquid bulk cargo forecast.

The revised annual growth rates for all cargoes on a metric ton basis for the period from 2008 to 2040 ranges from 28.0 million tons (low) to 43.0 million tons (high) as compared with the April 2010 forecast, which ranged from 24.0 million tons (low) to 32.0 million tons (high).

Table 1-7: Portland Harbor Summary Cargo Forecast (1,000 Metric Tons)

	Apr-10		2012 Update		Difference	
	Low	High	Low	High	Low	High
2008	22,000	22,000	22,000	22,000	-	-
2040	24,000	32,000	28,000	43,000	4,000	11,000
Compound Annual Growth Rate						
2008-2040	0.3%	1.2%	0.8%	2.1%		

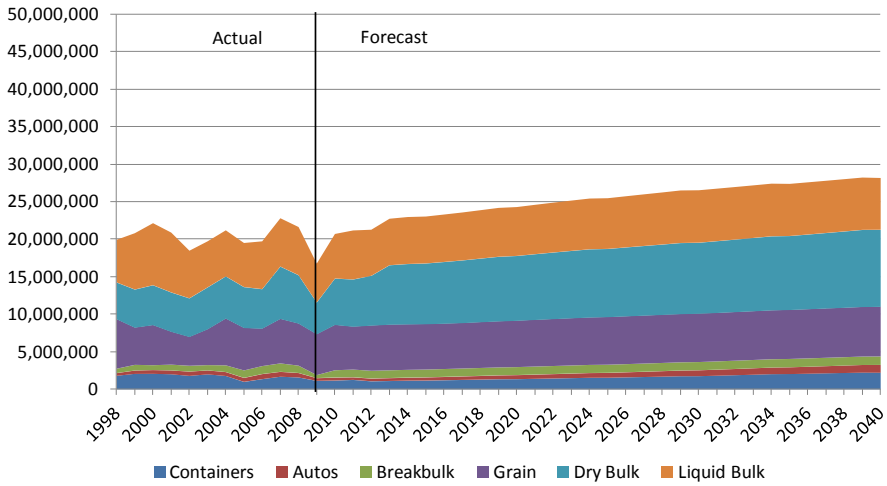
Source: BST Associates

Sub-region Forecasts

Portland Harbor - Low Growth Scenario

Under the low growth forecast, the volume for the Portland Harbor is projected to reach 28.3 million tons in 2040, with an average annual growth rate of 1.0 percent between 2008 and 2040. See Figure 1-1. This amounts to an increase of 7.5 million tons between 2010 and 2040.

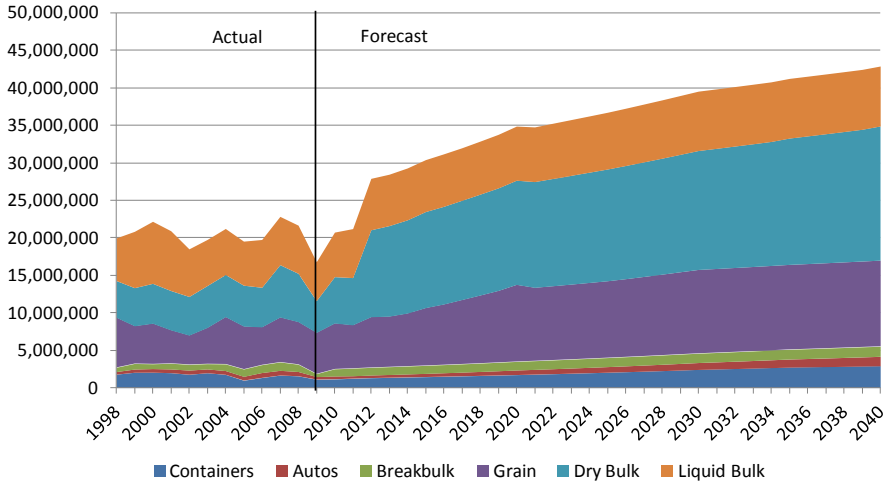
Figure 1-1: Portland Harbor Marine Cargo Forecast
Low Growth Scenario (metric tons)



Portland Harbor - High Growth Scenario

Under the high growth forecast, the volume for the Portland Harbor is projected to reach 43.0 million tons in 2040, with an average annual growth rate of 2.5 percent between 2010 and 2040. See Figure 1-2. This amounts to an increase of 22.2 million tons between 2010 and 2040.

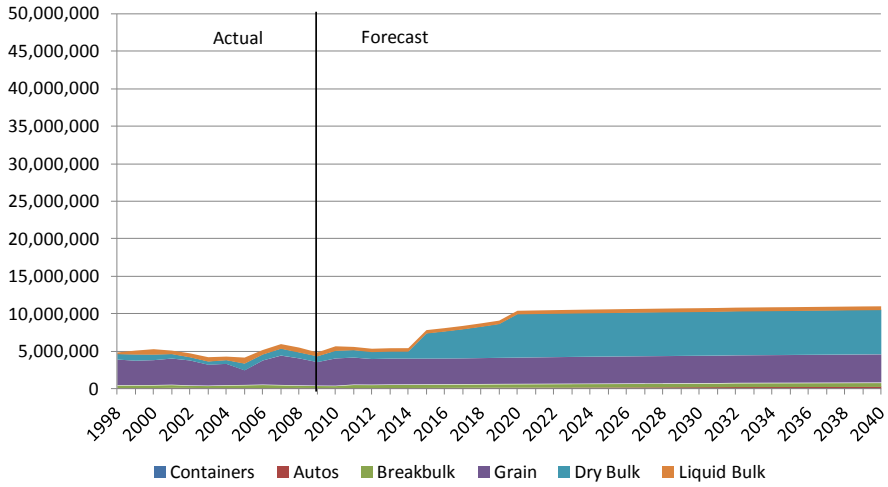
Figure 1-2: Portland Harbor Marine Cargo Forecast
High Growth Scenario (metric tons)



Vancouver Harbor - Low Growth Scenario

Under the moderate growth forecast, the volume for the Vancouver Harbor is projected to reach 11.0 million tons in 2040, with an average annual growth rate of 2.2 percent between 2010 and 2040. See Figure 1-3. This amounts to an increase of 5.3 million tons between 2010 and 2040.

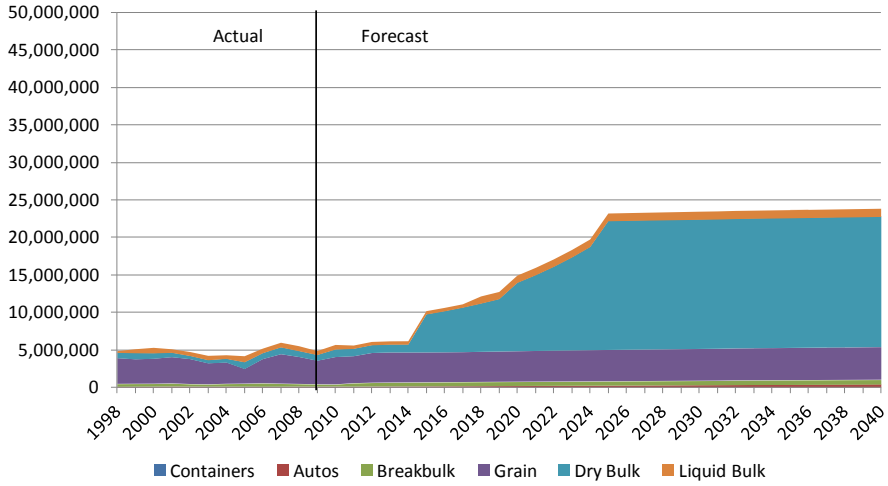
Figure 1-3: Vancouver Harbor Marine Cargo Forecast
Low Growth Scenario (metric tons)



Vancouver Harbor - High Growth Scenario

Under the high growth forecast, the volume for the Vancouver Harbor is projected to reach 23.9 million tons in 2040, with an average annual growth rate of 4.9 percent between 2010 and 2040. See Figure 1-4. This amounts to an increase of 18.2 million tons between 2010 and 2040.

Figure 1-4: Vancouver Harbor Marine Cargo Forecast
High Growth Scenario (metric tons)



Appendix

Table 1-8: Portland Harbor Marine Cargo Forecast
Low and High Growth Scenarios by Commodity Group
(1,000 TEUs, Units or Metric Tons)

Portland Harbor - Low									
	Containers	**Autos**	**Metric Tons**						
Year	**TEUs**	**Units**	**Containers**	**Autos**	**Breakbulk**	**Grain**	**Dry Bulk**	**Liquid Bulk**	**Total**
2000	291	346	2,015	490	644	5,406	5,327	8,281	22,164
2010	181	265	1,129	376	966	6,113	6,193	5,948	20,724
2020	220	373	1,313	521	1,060	6,247	8,654	6,521	24,316
2030	299	574	1,704	782	1,099	6,509	9,479	6,998	26,571
2040	379	811	2,162	1,076	1,132	6,686	10,278	6,912	28,246
Compound Annual Growth Rates									
2000-10	-4.6%	-2.6%	-5.6%	-2.6%	4.1%	1.2%	1.5%	-3.3%	-0.7%
2010-20	2.0%	3.5%	1.5%	3.3%	0.9%	0.2%	3.4%	0.9%	1.6%
2020-30	3.1%	4.4%	2.6%	4.1%	0.4%	0.4%	0.9%	0.7%	0.9%
2030-40	2.4%	3.5%	2.4%	3.2%	0.3%	0.3%	0.8%	-0.1%	0.6%
2010-2040	2.5%	3.8%	2.2%	3.6%	0.5%	0.3%	1.7%	0.5%	1.0%
Portland Harbor - High									
	Containers	**Autos**	**Metric Tons**						
Year	**TEUs**	**Units**	**Containers**	**Autos**	**Breakbulk**	**Grain**	**Dry Bulk**	**Liquid Bulk**	**Total**
2000	291	346	2,015	490	644	5,406	5,327	8,281	22,164
2010	181	265	1,129	376	966	6,113	6,193	5,948	20,724
2020	285	445	1,697	616	1,155	10,271	13,909	7,229	34,878
2030	418	701	2,386	947	1,249	11,167	15,874	7,932	39,554
2040	526	1,014	3,005	1,336	1,352	11,470	17,909	8,011	43,083
Compound Annual Growth Rates									
2000-10	-4.6%	-2.6%	-5.6%	-2.6%	4.1%	1.2%	1.5%	-3.3%	-0.7%
2010-20	4.6%	5.3%	4.2%	5.1%	1.8%	5.3%	8.4%	2.0%	5.3%
2020-30	3.9%	4.7%	3.5%	4.4%	0.8%	0.8%	1.3%	0.9%	1.3%
2030-40	2.3%	3.8%	2.3%	3.5%	0.8%	0.3%	1.2%	0.1%	0.9%
2010-2040	3.6%	4.6%	3.3%	4.3%	1.1%	2.1%	3.6%	1.0%	2.5%

Table 1-9: Vancouver Harbor Marine Cargo Forecast
Low and High Growth Scenarios by Commodity Group
(1,000 TEUs, Units or Metric Tons)

Vancouver Harbor - Low									
	Containers	**Autos**	**Metric Tons**						
Year	**TEUs**	**Units**	**Containers**	**Autos**	**Breakbulk**	**Grain**	**Dry Bulk**	**Liquid Bulk**	**Total**
2000	-	51	-	78	354	3,377	760	740	5,309
2010	-	60	-	91	253	3,696	1,037	619	5,697
2020	-	81	-	120	470	3,558	5,803	482	10,432
2030	-	119	-	173	506	3,708	5,865	517	10,769
2040	-	159	-	226	534	3,808	5,931	510	11,010
Compound Annual Growth Rates									
2000-10	NM	1.5%	NM	1.6%	-3.3%	0.9%	3.2%	-1.8%	0.7%
2010-20	NM	3.0%	NM	2.8%	6.4%	-0.4%	18.8%	-2.5%	6.2%
2020-30	NM	4.0%	NM	3.7%	0.8%	0.4%	0.1%	0.7%	0.3%
2030-40	NM	2.9%	NM	2.7%	0.5%	0.3%	0.1%	-0.1%	0.2%
2010-2040	NM	3.3%	NM	3.1%	2.5%	0.1%	6.0%	-0.6%	2.2%
Vancouver Harbor - High									
	Containers	**Autos**	**Metric Tons**						
Year	**TEUs**	**Units**	**Containers**	**Autos**	**Breakbulk**	**Grain**	**Dry Bulk**	**Liquid Bulk**	**Total**
2000	-	51	-	78	354	3,377	760	740	5,309
2010	-	60	-	91	253	3,696	1,037	619	5,697
2020	-	113	-	167	527	4,120	9,144	988	14,947
2030	-	171	-	248	568	4,293	17,264	1,084	23,457
2040	-	235	-	331	603	4,410	17,396	1,095	23,835
Compound Annual Growth Rates									
2000-10	NM	1.5%	NM	1.6%	-3.3%	0.9%	3.2%	-1.8%	0.7%
2010-20	NM	6.6%	NM	6.3%	7.6%	1.1%	24.3%	4.8%	10.1%
2020-30	NM	4.3%	NM	4.0%	0.8%	0.4%	6.6%	0.9%	4.6%
2030-40	NM	3.2%	NM	2.9%	0.6%	0.3%	0.1%	0.1%	0.2%
2010-2040	NM	4.7%	NM	4.4%	2.9%	0.6%	9.9%	1.9%	4.9%

Pacific Northwest Marine Cargo Forecast Update and Rail Capacity Assessment

Final Report

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Chapter 1
Executive Summary

The Pacific Northwest economy is inextricably tied to domestic and international markets. Efficient performance of the inland transportation system, especially in its linkage to the public and private port system, is critical to the economic health of the region.

Approximately every five years the Washington Public Ports Association (WPPA) and Washington State Department of Transportation (WSDOT) sponsor an update to the Washington State Marine Cargo Forecast. The most recent forecast was completed in March 2009, and provided unconstrained forecasts of cargo projected to move through public and private marine terminals on Puget Sound, the Washington Coast, and the Lower Columbia River in Washington and Oregon.

In the past two decades an increasing percentage of the commerce moving through Pacific Northwest ports has been carried by rail. The most recent two Marine Cargo Forecast studies have also included analyses of rail capacity. These rail capacity analyses modeled the various mainline rail segments in Washington, taking into account the projected marine cargo volumes as well as growth in domestic train traffic and passenger train traffic. Key outputs of these analyses were prioritized lists of rail system projects that would help to solve existing and anticipated capacity constraints.

The most recent marine cargo forecast was completed in the middle of the 2009 economic recession, a time of unusually sharp declines in marine cargo and rail traffic. However, since that report was completed rail traffic has rebounded to pre-recession levels. In addition, many of the ports in the region are anticipating major increases in cargo, especially exports of dry bulk such as grain, minerals, ores, and other bulk commodities. The anticipated volumes of these new cargos could significantly impact the mainline rail system in the northwest, impacting the marine cargos as well as passenger traffic and domestic cargo.

BST Associates (BST) and MainLine Management (MLM) were retained to prepare the following 2011 update to the 2009 report. The purpose of this analysis is to update the marine cargo forecasts, to compare the projected level of rail traffic with the capacity of the various mainline segments in the region, and to produce a prioritized list of projects to alleviate anticipated capacity constraints. An important addition to the 2011 analysis is the inclusion of the mainline rail system in Oregon.

The report was prepared at the request of the Ports of Everett, Seattle, Tacoma, Grays Harbor, Longview, Kalama, Vancouver and Portland. Additional entities participated in the preparation, including the Washington State Department of Transportation, Oregon Department of Transportation, and Washington Public Ports Association. The Class I railroads also participated in a review of the analysis, but this is not a Class I railroad product.

Marine Cargo Forecasts

The marine cargo forecasts produced for this analysis are unconstrained, which assumes that the necessary marine terminals and rail capacity will be in place to meet market demand. The method for updating the 2009 forecast involved several steps.

- First, cargo volumes were updated by commodity and region using the most recent data available.
- Second, the forecasts provided in the 2009 Marine Cargo Forecast were then updated based upon adjusted trends and forecast growth rates. A key part of this step was the inclusion of potential market opportunities that are being evaluated by individual ports.
- Finally, the mode of inland transportation was estimated for each scenario by commodity, sub-region and growth scenario.

Potential new market opportunities included: ores, minerals, grain, containers and liquid bulks. For each of the commodity types two growth scenarios were projected: the high-growth forecast included all of the market opportunities currently under consideration, while the moderate growth forecast included a portion of the market opportunities (approximately one half).

A summary of cargo projections through the year 2030 is presented below

Commodity Forecasts

Containers

In the 2009 marine cargo forecast, container traffic was projected to reach 10.4 million TEUs in 2030, with an average annual growth rate of 5.2 percent between 2010 and 2030.

Under the revised moderate growth forecast, containers are projected to reach 8.3 million TEUs by 2030 (4.1 percent annual growth). Under the revised high growth forecast, containers are projected to reach 12.3 million TEUs by 2030 (6.1 percent annual growth).

Breakbulk/Neobulk

In the 2009 marine cargo forecast, these commodities were projected to increase by an average annual 1.5 percent, reaching 11.1 million tons in 2030.

Under the moderate-growth scenario, breakbulk/neobulk cargoes are expected to grow by an average annual rate of 1.2 percent from 2010 to 2030, reaching 10.5 million tons in 2030. Under the high growth forecast, breakbulk/neobulk cargoes grow by an average annual rate of 2.2 percent from 2010 to 2030, reaching 12.7 million tons 2030.

A key difference between the 2009 study and the current one is that log exports grew rapidly over the past year and are expected to remain strong through the mid-term (approximately five years).

Grain and Related Products

Pacific Northwest grain and oilseed exports have shown impressive growth over the past decade, growing from approximately 20 million metric tons in 2000 to 34 million metric tons in 2010. Wheat, corn and soybeans are the most important commodities, but other products such as soybean meal and dried distiller's grains (DDGS) have become increasingly important.

BST Associates forecasts that Pacific Northwest grain and oilseed exports will increase from 34.1 million metric tons in 2010 to 39.1 million tons (moderate growth scenario) and 53.3 million metric tons in 2030 (high growth scenario).

Dry Bulk Cargoes

The 2009 forecast projected relatively modest gains in bulk traffic, with volumes expected to reach 31.8 million tons in 2030, or at an average annual growth rate of approximately 1.0 percent between 2010 and 2030. However, the dry bulk forecast was based upon the existing commodity base and did not anticipate the strong interest in additional export cargo opportunities.

Under the revised moderate growth forecast, dry bulk cargoes are expected to reach 97.1 million tons in 2030 (average annual growth of 6.8 percent per year between 2010 and 2030). Under the revised high growth forecast, dry bulk cargoes could reach 155.3 million tons in 2030 (average annual growth of 9.3 percent per year between 2010 and 2030). Growth is driven by increasing mineral and ore exports, among other commodities.

Liquid Bulks

The liquid bulk trades in the Pacific Northwest, which is dominated by crude oil, is expected to gradually change as regional refineries shift their source from Alaska to other domestic and foreign suppliers. The 2009 forecast projected modest growth for liquid bulk traffic, expecting volumes to reach 48.4 million tons in 2030 (0.8 percent annual growth).

Under the revised moderate growth forecast, liquid bulk cargoes are expected to reach 42.4 million tons in 2030 (0.2 percent per year), reflecting the changed sourcing patterns. Under the high growth forecast, liquid bulks are expected to reach 51.6 million tons in 2030 (1.2 percent per year). The high growth forecast incorporates new LNG imports/exports.

Sub-Region Forecasts

Lower Columbia Oregon and Oregon Coast

The Lower Columbia Oregon and Oregon Coast sub-region is projected to reach 44.6 million tons in 2030 under the moderate growth forecast (2.6 percent annual growth from 2010 to 2030) and 70.5 million tons in 2030 under the high growth forecast (5.0 percent annual growth).

Rail traffic is projected to reach 26.3 million tons in 2030 under the moderate growth forecast, and 47.5 million tons in 2030 under the high growth forecast.

Lower Columbia Washington

The Lower Columbia Washington sub-region is projected to reach 49.4 million tons in 2030 under the moderate growth forecast (4.3 percent annual growth) and 82.5 million tons in 2030 under the high growth forecast (7.0 percent annual growth).

Rail traffic is projected to reach 43.0 million tons in 2030 under the moderate growth forecast, and 74.9 million tons in 2030 under the high growth forecast.

Puget Sound and Washington Coast

The Puget Sound and Washington Coast sub-region is projected to reach 141.0 million tons in 2030 under the moderate growth forecast (2.6 percent annual growth) and 192.3 million tons in 2030 under the high growth forecast (4.2 percent annual growth).

Rail traffic is projected to reach 84.8 million tons in 2030 under the moderate growth forecast, and 131.6 million tons in 2030 under the high growth forecast.

Rail Capacity Assessment

This section summarizes the rail capacity analysis. As noted above, rail volumes fell markedly during the recent recession, but they recovered strongly in 2010, reaching pre-recession levels. Coupled with this rapid pace of recovery, there are significant opportunities for growth in rail traffic, particularly in bulk train exports of minerals, ores and grain.

The rail forecasts include a projection of the number of trains under moderate and high growth scenarios, under both average and peak operating conditions. The rail forecasts are driven by the marine cargo forecast, but also include domestic freight traffic and passenger train volumes. Domestic traffic and passenger traffic was based on studies prepared for WSDOT and ODOT as well as on discussions with rail service providers.

The analysis assumes that existing trains absorb most of the growth in rail traffic before new trains are added. However, operational requirements sometimes necessitate new train starts, and this is included in the forecast. The capacity of the various main line segments was estimated based upon discussions with rail service providers, recent studies and consultant judgment.

Table 1-1 summarizes study results. Under the moderate growth scenario, the only segments that experience sustained capacity constraints are the Vancouver to Pasco and the Everett to Blaine lines. Under the high growth scenario, the constraints on the Vancouver to Pasco and the Everett to Blaine segments occur earlier. In addition, constraints are expected in the Pasco to Spokane, Vancouver to Kalama/Longview, and King Street Station to Everett lines. These results assume that a series of physical improvements are completed, and that certain operational protocols are changed.

Table 1-1: Anticipated Year of Capacity Constraint, by Line Segment

Line Segment	Moderate Growth Scenario		High Growth Scenario	
	Avg. Day	Peak Day	Avg. Day	Peak Day
Pasco, WA to Vancouver, WA (BNSF)				
Pasco, WA to Wishram, WA	2030	2025	2025	2020
Wishram, WA to Vancouver, WA	---	2030	2025	2024
Hinkle, OR to Portland, OR (UP)	---	---	---	---
Pasco, WA to Spokane, WA (BNSF)	---	---	2030	2025
Spokane, WA to Sand Point, ID (BNSF)	---	---	---	---
Hinkle, OR to Eastgate, ID (UP)	---	---	---	---
Vancouver, WA to Tacoma, WA (Joint Line)				
Vancouver, WA to Kalama/Longview, WA	---	---	---	2030
Kalama/Longview, WA to Tacoma, WA	---	---	---	---
Tacoma, WA to Seattle, WA (Joint line)				
Tacoma, WA to Auburn, WA	---	---	---	---
Auburn, WA to Seattle, WA	---	---	---	---
Seattle, WA to Everett, WA (BNSF)	---	---	2023	2020
Everett, WA to Vancouver, BC (BNSF)	---	2030	2025	2020
Everett, WA to Spokane, WA via Stevens Pass (BNSF)	---	---	---	---
Auburn, WA to Pasco, WA via Stampede Pass (BNSF)	---	---	---	---

Source: MainLine Management

In order for rail capacity to meet the of projected freight volumes, the authors of this report recommend a series rail system improvements. These projects generally fall into two categories, mainline improvements and port access improvements. However, the projects labeled as port access improvements also provide benefits to the mainline system. Reducing the amount of time that it takes for trains to move between the port terminals and the mainline reduces delays on the mainline system, and thereby increases mainline capacity.

The recommended mainline projects include:

- **Peninsula Junction to North Portland Junction, Portland**. (Funding is in place to complete preliminary engineering and the NEPA analysis, but not construction.)
- **Vancouver, WA Freight Rail Bypass**. (Construction is under way, and is anticipated to be complete in 2013.)
- **Point Defiance Bypass, Tacoma to Nisqually**. (Construction of Phase 1 is under way; Phase 2 is anticipated to be complete 2016.)
- **Blakeslee Junction Improvements, Centralia. (**Phase 1A & 1B are partially funded, and the funds have all been moved to a future biennium. Phases 2-5 are not funded.)

- **Third main line Kalama to Kelso –WSDOT Passenger Plan Option 3.** (North portion is funded, engineering is under way).
- **Vancouver to Kelso - WSDOT Passenger Plan Option 4**. (funding is in place for several of these projects, engineering is under way)

The recommended port access projects include:

- **Port of Vancouver, WA Freight Access Project**. (First phases are finished, entire project is scheduled to be complete in 2017)
- **Unit Train Staging/Storage Yard near Woodland**. (No action currently under way.)
- **Cowlitz River Bridge – Longview**. (Partial funding is in place to begin preliminary engineering and the NEPA analysis, with remaining funding expected in January 2010. Construction not funded.)
- **Bullfrog Junction Realignment, Tacoma.** (Preliminary planning is complete, project proponents are seeking funding.)

Growth in the volume of export bulk trains is expected to increase the demands on existing rail capacity in the region, and even moderate growth will require BNSF and UP to assess the capacity requirements necessary to meet the growing demand. Both railroads have the ability to increase capacity through a combination of physical and operational improvements, and should be able to meet growing demand well into the future.

Chapter 2
Marine Cargo Forecasts

This section provides summary of the marine cargo forecast. These summaries are presented by commodity group and by sub-region in the Pacific Northwest. The marine cargo forecasts are unconstrained, which assumes that the necessary marine terminals and rail capacity will be in place to meet market demand.

The method for updating the 2009 forecast involved several steps. First, current cargo volumes were updated by commodity and region using the most recent data (2010 for commodities moving on international routes and 2009 for commodities moving on domestic routes). Volumes for 2011 were estimated based upon data from individual ports, the Pacific Maritime Association, U.S. Department of Agriculture, and other industry and government sources.

Commodity handling groups were defined to include:

- Containers,
- Neobulk/breakbulk cargoes – breakbulk, autos and logs,
- Grain and related products – wheat, barley, corn, soybeans, soy meal, beet pulp pellets and like products,
- Dry bulk cargoes – minerals, ores, chemicals, fertilizers, wood chips, manufactured products and like products,
- Liquid bulk cargoes – crude oil, petroleum products, chemicals and like products.

The forecasts include all public and private terminals, which were divided into the following sub-regions:

- Lower Columbia River Oregon and Oregon Coast,
- Lower Columbia River Washington,
- Puget Sound and Washington Coast.

Second, the forecasts provided in the 2009 Marine Cargo Forecast were updated based upon adjusted trends and forecast growth rates. In addition, a key effort in this update was to consider the potential market opportunities that are being evaluated by individual ports. This process included a discussion with participating ports and the Class I railroads and literature review of industry resources.

Potential new market opportunities included: ores, minerals, grain, containers and liquid bulks.

For each commodity group two growth scenarios were projected. The high-growth forecast included all of the market opportunities currently under consideration. The moderate growth forecast included a portion of the market opportunities (approximately one half).

Third, the inland mode of transportation was estimated for each growth scenario, commodity, and sub-region.

The results of the forecast are presented below.

Containers

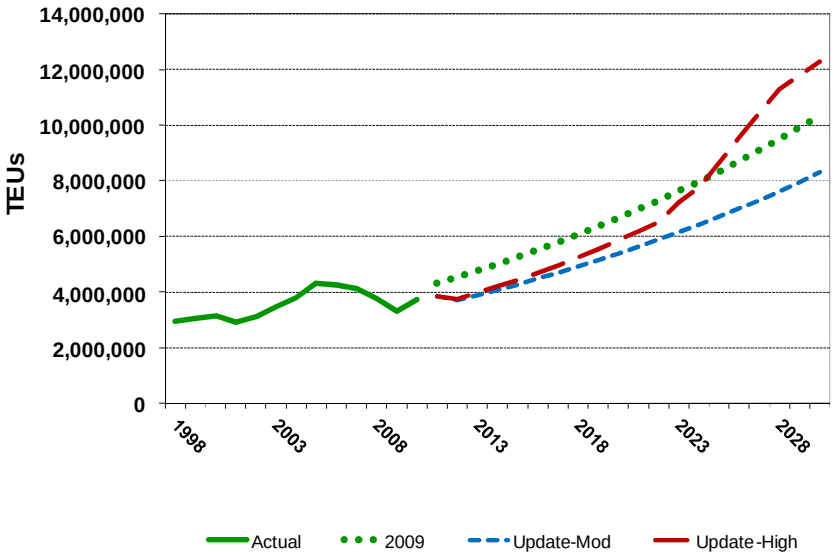
The revised Pacific Northwest container forecast is presented in Figure 2-1. The moderate-growth forecast is lower than the forecast presented in 2009 due to revised expectations about near-term growth and intensified competition from ports in Canada and on all-water routes (after completion of the Panama Canal improvements).

In the 2009 marine cargo forecast, containers were projected to reach 10.4 million TEUs in 2030, with average annual growth rate of 5.2 percent between 2010 and 2030. The revised forecast projects that container volumes will increase by:

- 4.1 percent under the moderate growth forecast, reaching 8.3 million TEUs, and,
- 6.1 percent under the high growth forecast, reaching 12.3 million TEUs,

Under the high growth forecast, container volumes are expected to increase at a slower rate than anticipated in the 2009 marine cargo forecast through 2020. However, the volumes expected for Puget Sound and Lower Columbia Oregon ports are comparable to the volumes expected in the prior forecast in 2030 (approximately 10 million TEUs). In the high growth scenario, container traffic is assumed to commence in Coos Bay in 2023 and increase to 2030.

Figure 2-1: Pacific Northwest Container Cargo Trends and Forecast



Source: Individual ports, BST Associates

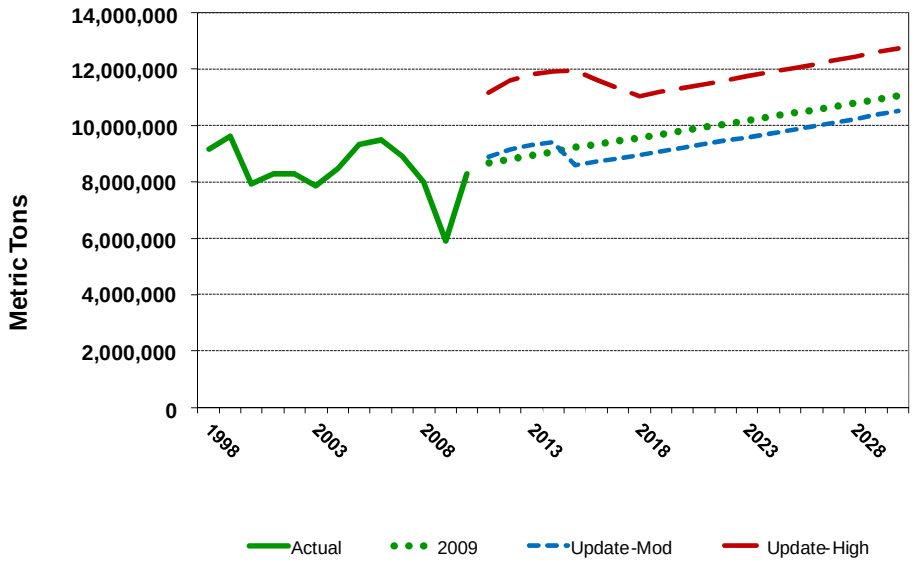
Break and Neobulk Cargoes

The revised forecast for Pacific Northwest breakbulk and neobulk cargoes is presented in Figure 2-2. In the 2009 marine cargo forecast, these commodities were projected to increase by an average annual 1.5 percent, reaching 11.1 million tons in 2030.

Under the moderate-growth scenario, the forecast is slightly higher in the near-term than in the 2009 forecast, mainly due to increased log exports, which are expected to be relatively robust and then decline as the domestic housing industry begins to recover. Under the moderate growth forecast, breakbulk/neobulk cargoes are expected to grow by an average annual rate of 1.2 percent from 2010 to 2030, reaching 10.5 million tons in 2030.

Under the high growth forecast, breakbulk and neobulk volumes are expected to remain at higher levels. Log exports are projected to continue at a more rapid rate through approximately 2018 and then level out. Under the high growth forecast, breakbulk/neobulk cargoes grow by an average annual rate of 2.2 percent from 2010 to 2030, reaching 12.7 million tons 2030.

Figure 2-2: Pacific Northwest Breakbulk and Neobulk Cargo Trends and Forecast



Source: BST Associates

Grain and Related Products

Pacific Northwest grain and oilseed exports have shown impressive growth over the past decade, increasing from approximately 20.1 million metric tons in 2000 to 34.1 million metric tons in 2010, or at an average annual growth rate of 5.4 percent per year.

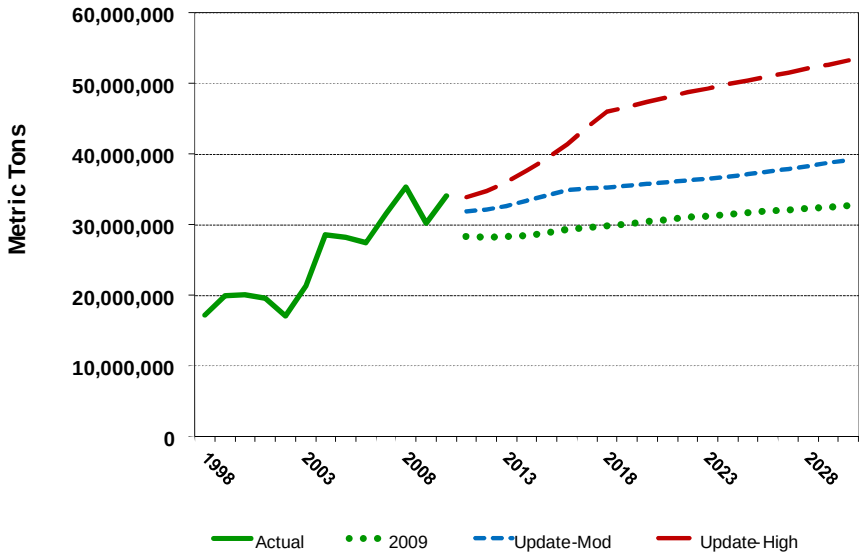
The 2009 forecast projected relatively modest gains in grain traffic, with volumes expected to reach 32.7 million tons in 2030. However, the forecast was based upon the reduced volumes in 2009 and did not anticipate the rapid increase in export volumes that occurred in 2010 (an increase of 4 million tons).

The revised Pacific Northwest forecast for grain and related products is presented in Figure 2-3. The new EGT elevator in Longview and expansion projects planned or under way in Portland, Vancouver, and Kalama will provide most of the capacity needed to absorb the forecast growth. The elevators in Seattle and Tacoma are operating at or near capacity and do not have expansion plans. Increased capacity is also being added at the AGP facility at the Port of Grays Harbor, and the proposed bulk port at Cherry Point north of Bellingham may include a grain facility.

Under the revised forecast, grain and related products are expected to reach:

- 39.1 million tons in 2030 under the moderate growth forecast, with average annual growth of 0.7 percent per year between 2010 and 2030,
- 53.3 million tons in 2030 under the high growth forecast, with average annual growth of 2.2 percent per year between 2010 and 2030.

Figure 2-3: Pacific Northwest Grain & Oilseed Trend and Forecast



Source: BST Associates, US Department of Commerce and WISERTrade data

Dry Bulk Cargoes

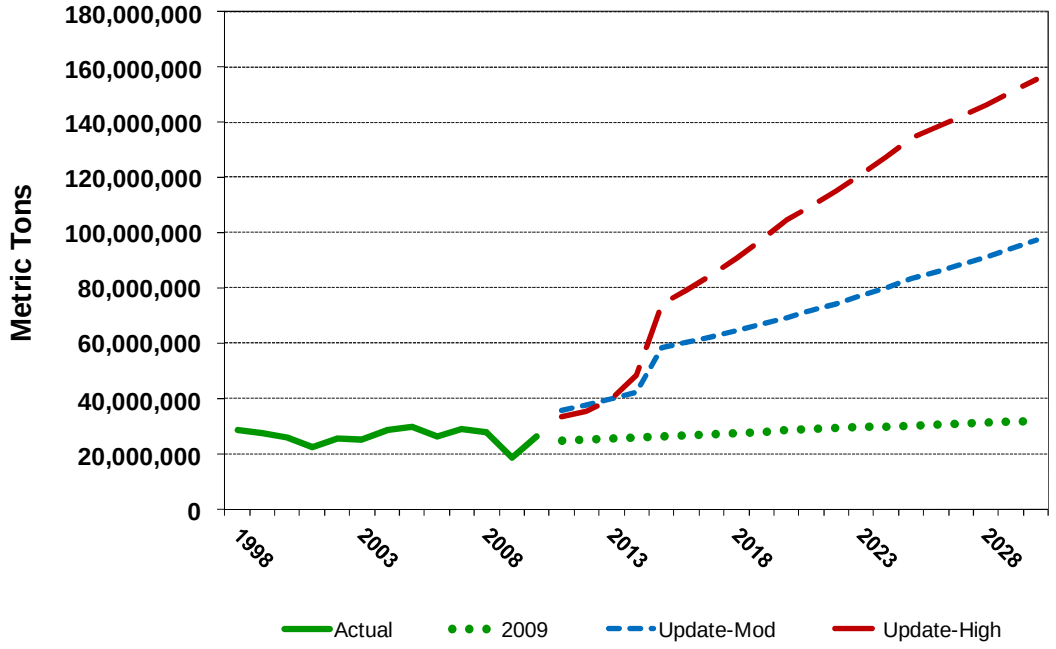
Dry bulk cargoes include a wide variety of products, such as woodchips, petroleum coke, potash, soda ash, gypsum, limestone, metal ores, and others. In addition, there is strong interest in coal, potash and ore exports. The revised Pacific Northwest forecast for dry bulk cargoes is presented in Figure 2-4.

The 2009 forecast projected 1.0 percent annual growth in bulk traffic, with volumes expected to reach 31.8 million tons in 2030. That forecast did not anticipate the rapid increase in dry bulk exports that actually occurred, where volumes jumped from 18.8 million tons in 2009 to 26.2 million tons in 2010.

Under the revised forecast, dry bulk cargoes are expected to reach:

- 97.1 million tons in 2030 under the moderate growth forecast, with average annual growth of 6.8 percent per year between 2010 and 2030,
- 155.3 million tons in 2030 under the high growth forecast, with average annual growth of 9.3 percent per year between 2010 and 2030.

Figure 2-4: Pacific Northwest Dry Bulk Cargo Trends and Forecast



Source: BST Associates

The expected growth in dry bulks is due to exports of potash, ores, coal and other commodities. Although there is uncertainty regarding volumes and export locations, the underlying basis of the export opportunity is sound for several reasons:

- there is strong international demand for these commodities,
- the regional transportation system is in place to move these commodities,
- the U.S. and Canada have substantial supplies of key commodities, and
- U.S. and Canadian exports can be delivered via Pacific Northwest ports at prices below the required delivered price.

Liquid Bulks

The liquid bulk trades in the Pacific Northwest are dominated by petroleum, including crude oil and refined petroleum products. Other important commodities include chemicals, fertilizers and other products.

The revised forecast for Pacific Northwest liquid bulk cargoes is presented in Figure 2-5. Under the revised forecast, liquid bulk cargoes are expected to reach:

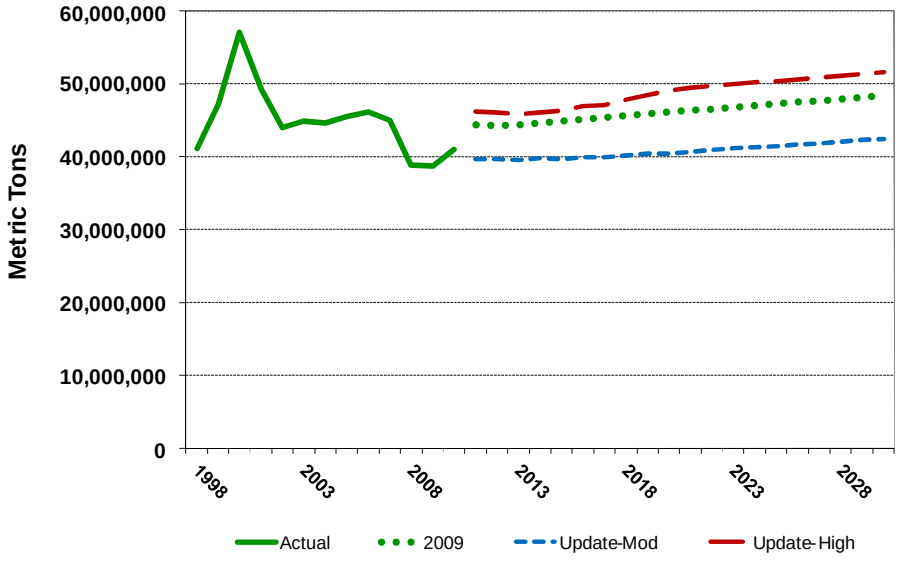
- 42.4 million tons in 2030 under the moderate growth forecast, with average annual growth of 0.2 percent per year between 2010 and 2030,
- 51.6 million tons in 2030 under the high growth forecast, with average annual growth of 1.2 percent per year between 2010 and 2030.

The 2009 forecast projected that liquid bulk traffic would reach 48.4 million tons in 2030, with average annual growth of approximately 0.8 percent between 2010 and 2030.

One significant change that is expected to impact liquid bulks is a shift in the source of crude oil for regional refineries. Under both the 2009 forecast and the current forecast the volume of crude oil from Alaska is expected to decline. The 2009 forecast assumed that the decline in domestic waterborne volumes from Alaska would be made up through a combination of waterborne foreign receipts and imports by pipeline. Under the current forecast the refineries in the region are also expected to begin receiving crude oil by rail from North Dakota, which may impact waterborne volumes. Under the moderate growth scenario, liquid bulk projections are lower to account for this shift.

New opportunities for liquid bulk cargo are also under consideration; most notably LNG imports (or perhaps exports) are being considered in Coos Bay and Astoria. The high growth scenario reflects these opportunities.

Figure 2-5: Pacific Northwest Liquid Bulk Forecast



Source: BST Associates

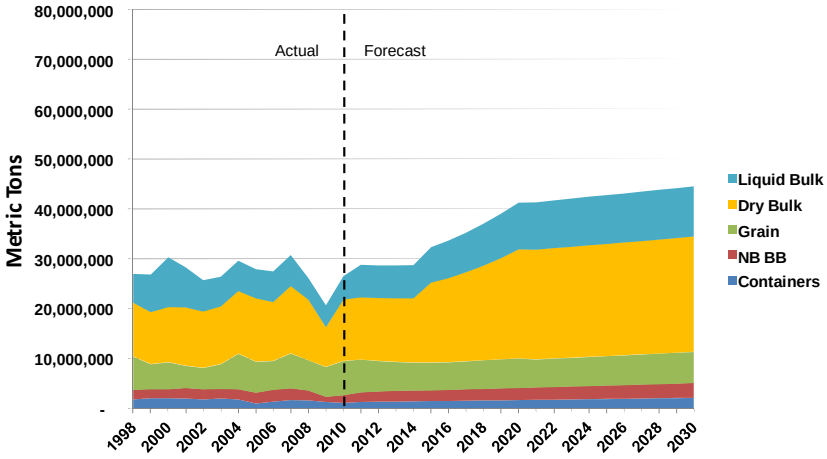
Regional Forecasts by Commodity

This section summarizes expected growth for each sub-region and commodity group.

Lower Columbia Oregon and Oregon Coast

Under the moderate growth forecast, the volume for the Lower Columbia Oregon region is projected to reach 44.6 million tons in 2030, with an average annual growth rate of 2.6 percent between 2010 and 2030. See Figure 2-6.

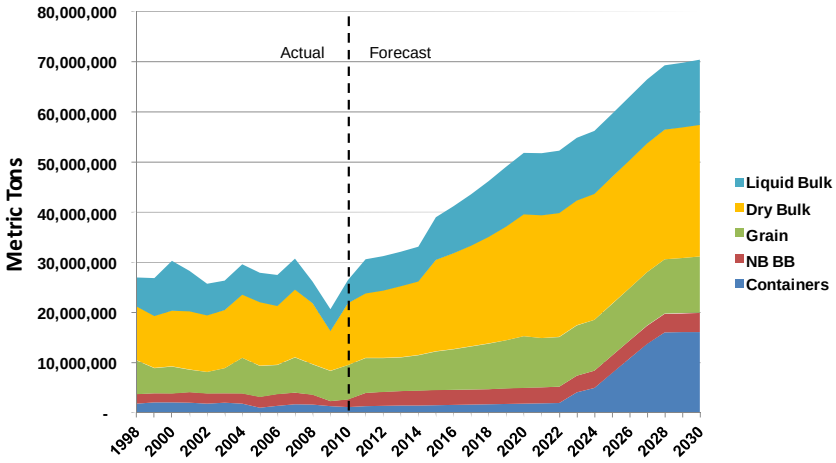
Figure 2-6: Lower Columbia Oregon and Oregon Coast Forecast
Moderate Growth Scenario



Source: BST Associates

Under the high growth forecast, the volume for the Lower Columbia Oregon region is projected to reach 70.5 million tons in 2030, with an average annual growth rate of 5.0 percent between 2010 and 2030. See Figure 2-7.

Figure 2-7: Lower Columbia Oregon and Oregon Coast Forecast
High Growth Scenario

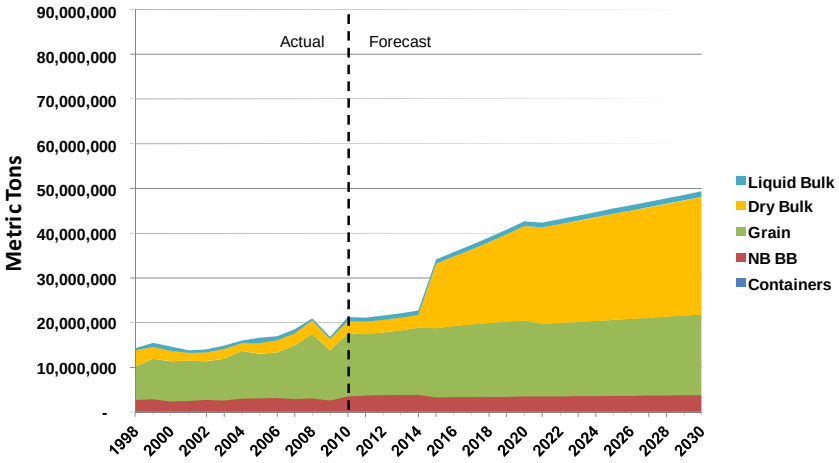


Source: BST Associates

Lower Columbia Washington

Under the moderate growth forecast, the volume for the Lower Columbia Washington region is projected to reach 49.4 million tons in 2030, with an average annual growth rate of 4.3 percent between 2010 and 2030. See Figure 2-8.

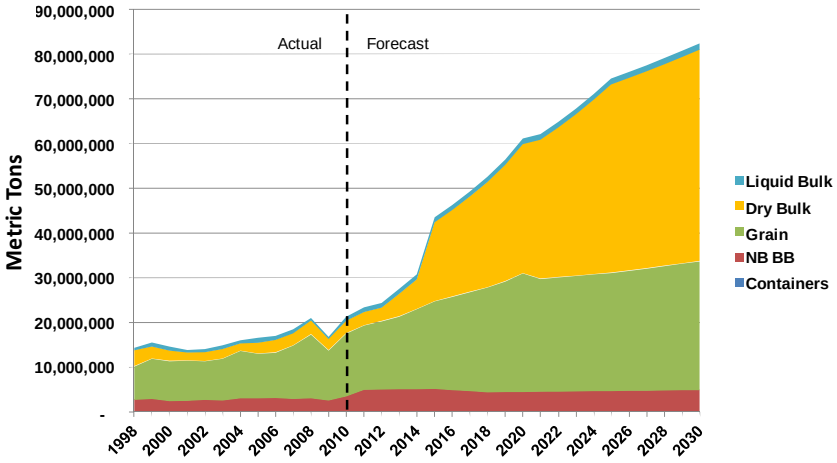
Figure 2-8: Lower Columbia Washington Forecast
Moderate Growth Scenario



Source: BST Associates

Under the high growth forecast, the volume for the Lower Columbia Washington region is projected to reach 82.5 million tons in 2030, with an average annual growth rate of 7.0 percent between 2010 and 2030. See Figure 2-9.

Figure 2-9: Lower Columbia Washington Forecast
High Growth Scenario

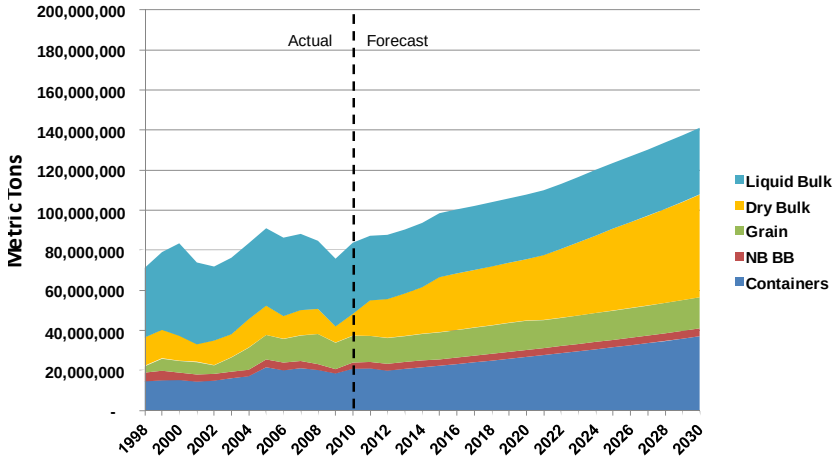


Source: BST Associates

Puget Sound and Washington Coast

Under the moderate growth forecast, the volume for the Puget Sound and Washington Coast region is projected to reach 141.0 million tons in 2030, with an average annual growth rate of 2.6 percent between 2010 and 2030. See Figure 2-10.

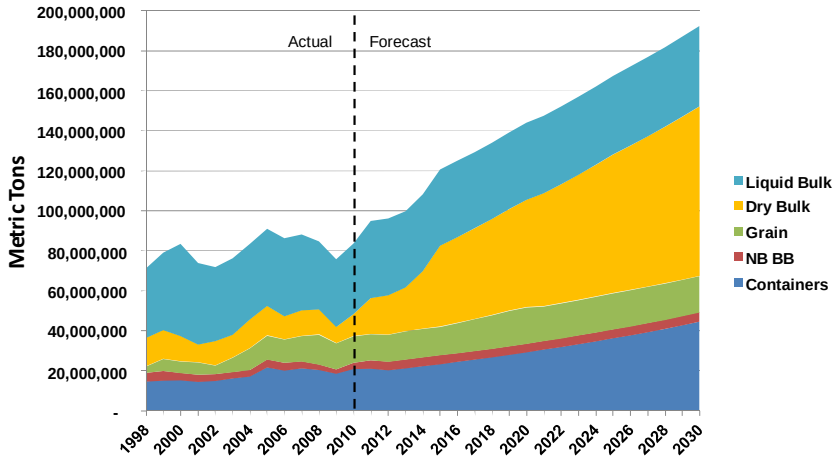
Figure 2-10: Puget Sound and Washington Coast Forecast
Moderate Growth Scenario



Source: BST Associates

Under the high growth forecast, the volume for the Puget Sound and Washington Coast region is projected to reach 192.3 million tons in 2030, with an average annual growth rate of 4.2 percent between 2010 and 2030. See Figure 2-11.

Figure 2-11: Puget Sound and Washington Coast Forecast
High Growth Scenario



Source: BST Associates

Rail Forecasts by Region

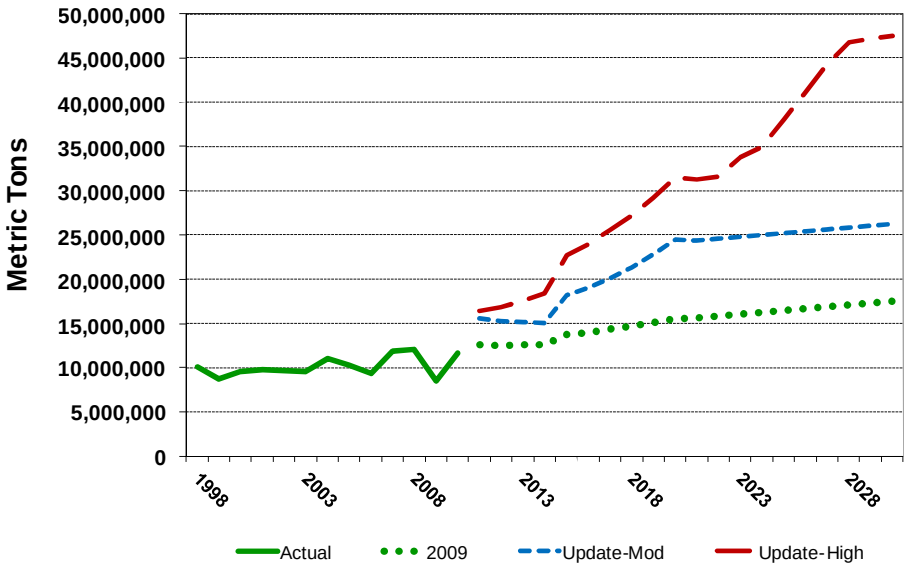
This section summarizes expected growth in rail traffic by sub-region.

Lower Columbia Oregon and Oregon Coast

Rail traffic in the Lower Columbia Oregon and Oregon Coast sub-region is projected to grow as follows:

- A rail traffic projection for Oregon ports was not undertaken in 2009. However, using a similar process as that undertaken for Washington state ports, marine-related rail volumes would have been expected to increase from 11.7 million tons in 2010 to 17.5 million tons in 2030, or at an average annual growth rate of 2.0 percent.
- Under the current moderate growth forecast, marine-related rail traffic in this region is projected to reach 26.3 million tons in 2030, with an average annual growth rate of 4.1 between from 2010 and 2030.
- Under the high growth forecast, marine-related rail traffic in this region is projected to reach 47.5 million tons in 2030, with an average annual growth rate of 7.3 percent between 2010 and 2030. (See Figure 2-12)

Figure 2-12: Lower Columbia Oregon and Oregon Coast Rail Traffic Forecast



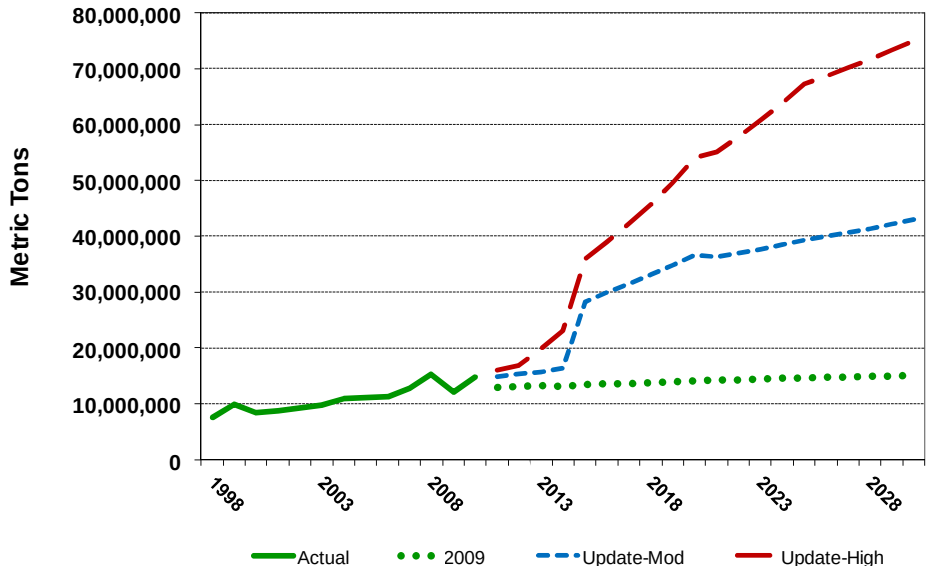
Source: BST Associates

Lower Columbia Washington

Rail traffic in the Lower Columbia Washington sub-region is projected to grow as follows:

- In the 2009 Marine Cargo Forecast, rail volumes were expected to increase modestly from 14.8 million tons in 2010 to 15.1 million tons in 2030, or at an average annual growth rate of less than 0.2 percent.
- Under the moderate growth forecast, marine-related rail traffic in this region is projected to reach 43.0 million tons in 2030, with an average annual growth rate of 5.5 percent between 2010 and 2030.
- Under the high growth forecast, marine-related rail traffic in this region is projected to reach 74.9 million tons in 2030, with an average annual growth rate of 8.4 percent between 2010 and 2030. (See Figure 2-13)

Figure 2-13: Lower Columbia Washington Rail Traffic Forecast



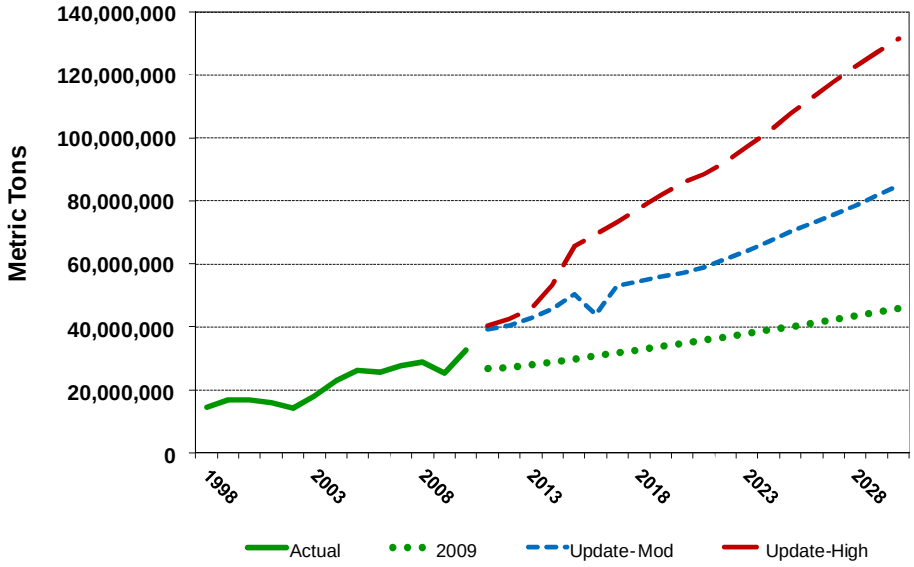
Source: BST Associates

Puget Sound and Washington Coast

Rail traffic in the Puget Sound and Washington Coast sub-region is projected to grow as follows:

- In the 2009 Marine Cargo Forecast, rail volumes were expected to increase from 32.6 million tons in 2010 to 45.9 million tons in 2030, or at an average annual growth rate of 1.7 percent.
- Under the moderate growth forecast, marine-related rail traffic in this region is projected to reach 84.8 million tons in 2030, with an average annual growth rate of 4.9 percent between 2010 and 2030.
- Under the high growth forecast, marine-related rail traffic in this region is projected to reach 131.6 million tons in 2030, with an average annual growth rate of 7.2 percent between 2010 and 2030. (See Figure 2-14)

Figure 2-14: Puget Sound and Washington Coast Rail Traffic Forecast



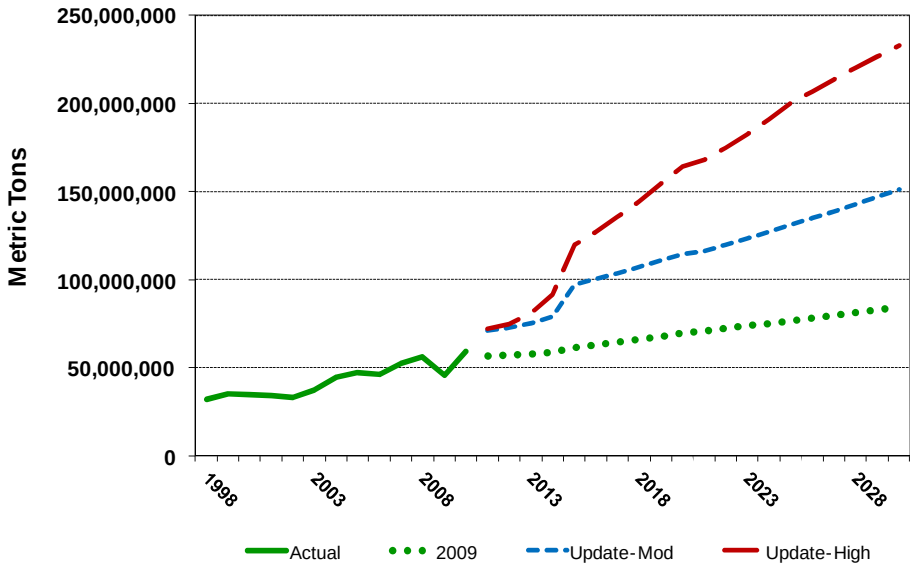
Source: BST Associates

Pacific Northwest Region

Rail traffic in the Pacific Northwest region is projected to grow as follows:

- In the 2009 Marine Cargo Forecast, rail volumes were expected to increase from 59.2 million tons in 2010 to 78.5 million tons in 2030, or at an average annual growth rate of 1.4 percent.
- Under the moderate growth forecast, marine-related rail traffic in this region is projected to reach 151.1 million tons in 2030, with an average annual growth rate of 4.8 percent between 2010 and 2030.
- Under the high growth forecast, marine-related rail traffic in this region is projected to reach 232.8 million tons in 2030, with an average annual growth rate of 7.1 percent between 2010 and 2030. (See Figure 2-15)

Figure 2-15: Pacific Northwest Rail Traffic Forecast



Source: BST Associates

Chapter 3
Assessment of Rail Capacity

The following chapter provides an assessment of rail capacity. A primary objective of the rail capacity update is to identify and prioritize capacity improvements that would help mitigate main line capacity conflicts as rail traffic grows. This chapter was prepared by MainLine Management (MLM).

Assumptions

Key assumptions about baseline conditions, train sizes and forecasts for domestic cargoes are summarized in the following section.

Baseline Conditions

Based on discussions with rail service providers, the rail traffic volumes in 2008 were considered representative of volumes occurring in 2010. More importantly, data was available for rail traffic operations for major rail line segments for 2008. As a result, 2008 was used as the baseline condition for 2010.

Train Sizes

Assumptions on train sizes are based upon discussions with rail providers, terminal operators and consultant experience:

- Unit grain sizes are expected to remain at approximately 110 cars.
- Unit coal trains are expected to remain at 115 to 120 cars.
- Export potash trains operate with 170 cars, approximately 8,500 feet in length.
- Container trains of 8,000 to 8,500 feet from the Puget Sound ports will continue to be operated as long as volumes are available and service requirements can be maintained. Otherwise, international container trains are sized to meet import demand and service requirements.
- Manifest trains will continue to operate at a maximum train size of approximately 7,000 feet.

Forecasts

The rail forecasts include a projection of the number of trains under moderate and high growth scenarios under both average and peak operating conditions.

The forecasts are driven by the marine cargo forecast, which is documented in Chapter Two. For other rail cargo (domestic traffic and passengers), the following assumptions were used:

- Forecasts for passenger trains were taken from studies prepared for WSDOT and ODOT.
- Merchandise trains are projected to grow at 2 percent annually.
- Domestic intermodal trains are projected to grow at 3.5 percent annually.

Figure 3-1: Map of Rail System



Absorption

Currently, many of the existing trains in the region do not run at their maximum potential length. It is assumed that traffic growth will usually be absorbed by existing trains before new trains are deployed. However, this assumption recognizes that service requirements sometimes necessitate new train starts even though existing trains are not running at maximum length.

Capacity by Mainline Segment

This section presents an assessment of the projected demand-capacity relationships at the key line segments over the study forecast period (through 2030). The line segments include:

- Pasco, WA to Vancouver, WA (BNSF)
- Hinkle OR to Portland, OR (UP)
- Pasco, WA to Spokane, WA (BNSF)
- Spokane, WA to Sand Point, ID (BNSF)
- Hinkle, OR to Eastgate, ID (UP)
- Vancouver, WA to Kalama/Longview, WA (Joint line)
- Kalama/Longview, WA to Tacoma, WA (Joint line)
- Tacoma, WA to Seattle, WA (Joint line)
- Seattle, WA to Everett, WA (BNSF)
- Everett, WA to Vancouver, BC (BNSF)
- Everett, WA to Spokane, WA via Stevens Pass (BNSF)
- Auburn, WA to Pasco, WA via Stampede Pass (BNSF)

In each of the following rail segment analyses, graphics are presented to illustrate the growth in rail traffic and growth in rail segment capacity. The increases in capacity indicated by the graphs reflect: 1) improvements that are currently planned or under way, and 2) other potential improvements that the consultants consider to be feasible. With the exception of projects that are contractually obligated under passenger rail plans, other improvements are up to the discretion of the individual railroads, and would likely be added only as needed to meet market demand.

Pasco, WA to Vancouver, WA (BNSF)

BNSF has undertaken several improvements along the section of mainline from Pasco to Vancouver. All meet/pass sidings between Pasco and Wishram (near the middle of the Columbia Gorge) are at least 8,000 feet in length. Between Wishram and Vancouver, six of 11 existing sidings are 8,000 feet in length or longer. BNSF has a priority plan to extend sidings that are not currently 8,000 feet in length, as demand requires.

Figures 3-2 and 3-3 illustrate the consultants' opinion of the capacity of this line segment as well as the projected train volumes under the moderate and high growth scenarios. The analysis implies that:

- Pasco to Wishram
  - Under the high growth scenario, capacity will be reached by 2020 (peak daily traffic) and 2025 (average daily traffic).
  - Under the moderate growth scenario, capacity will be reached by 2025 (peak daily traffic) and 2030 (average daily traffic).

- Wishram to Vancouver:
  - Under the high growth scenario, capacity will be reached by 2024 (peak daily traffic) and 2025 (average daily traffic).
  - Under the moderate growth scenario, capacity will be reached by 2030 (peak daily traffic).

However, the capacity on this route can be enhanced beyond previous study assumptions through a combination of siding extensions and revised operating protocols, as discussed below.

The Pasco to Vancouver route hosts Amtrak trains, and is subject to implementation of Positive Train Control (PTC), as mandated by Congress. Industry analysis of the implementation of PTC indicates that it may negatively impact capacity, especially on line segments in which "fleeting"[1] is used. This is because PTC requires a larger safety zone for following trains than is required under the existing Centralized Traffic Control (CTC).

BNSF is evaluating a plan that would change the traffic flows and volumes on this segment over time. Under this plan, full export bulk trains would move westbound through the Columbia River Gorge. Empty bulk trains from Portland and Vancouver would move eastbound through the Gorge, but empty export bulk trains from Kalama north (i.e., Longview, Grays Harbor, Tacoma, Seattle, etc.) would be routed to Auburn and then over Stampede Pass. Most of the other train types that currently use the Gorge would continue to do so.

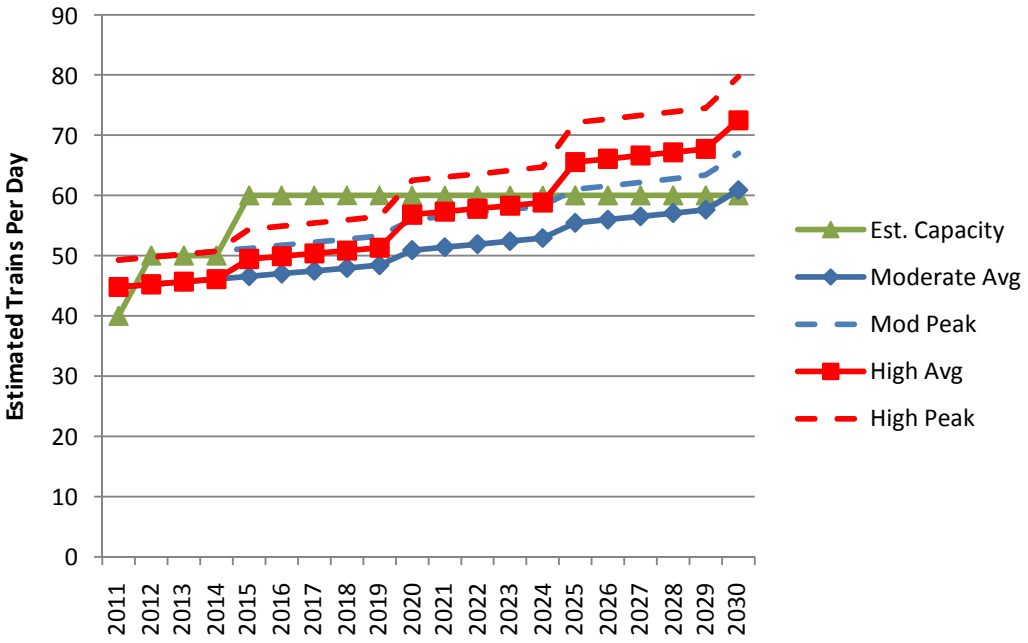
If implemented, this plan would create the opportunity for significant fleeting of westbound trains through the Columbia River Gorge.

One area of concern is the single track BNSF rail bridge over the Columbia River at Pasco. The estimated capacity in the segment analysis assumes that BNSF will be able to operate a sufficient number of trains over the bridge to meet the projected long-term demand. Congestion, however, could be expected to be a problem in near the end of the forecast period.

Two potential increases in capacity are illustrated in Figures 3-2 and 3-3. These include adoption of the new operating plan, connecting individual sidings into sections of double-track main line, and the addition of siding extensions.

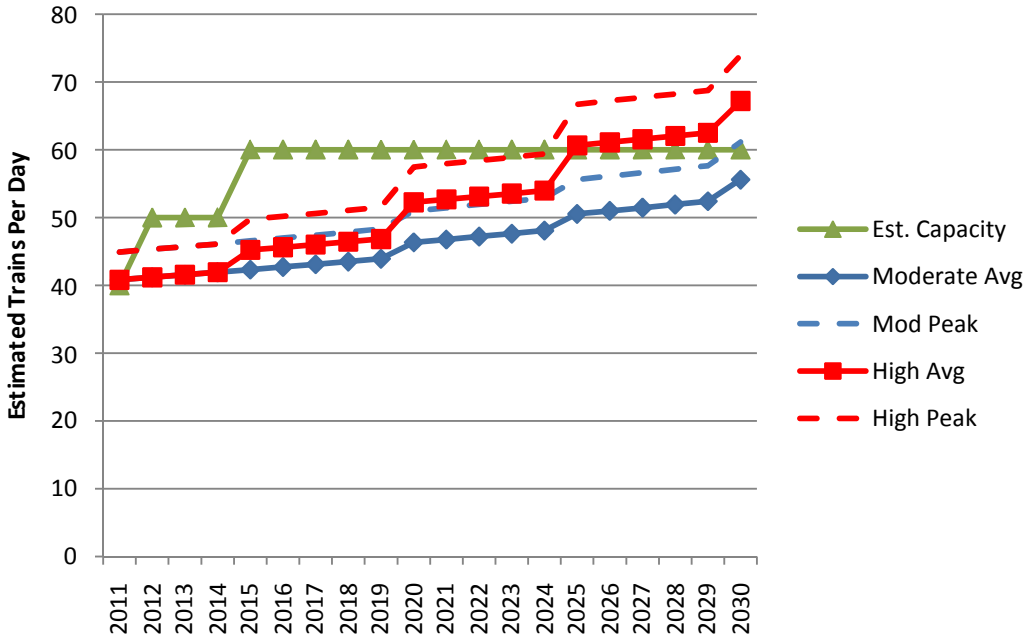
[1] "Fleeting" is a term used to describe train movements in which a series of trains are operated in one direction, and then in the other direction. This minimizes meet/pass requirements and can increase the practical capacity of a line segment.

Figure 3-2: Rail Corridor Capacity – Pasco to Wishram (BNSF)



Source: MainLine Management

Figure 3-3: Rail Corridor Capacity – Wishram to Vancouver BNSF



Source: MainLine Management

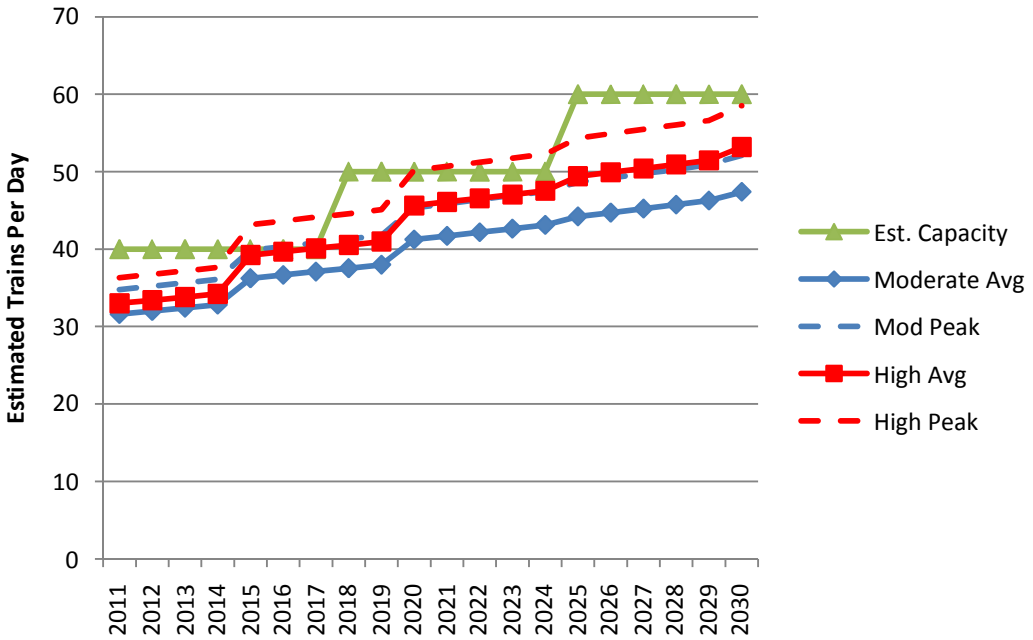
Hinkle, OR to Portland, OR (UP)

The UP main line runs along the Oregon side of the Columbia River between Hinkle and Portland, and is similar to the BNSF line on the Washington side of the Columbia River between Vancouver and Pasco.

Options for increasing capacity on this segment are similar to those for the BNSF. These include fleeting of trains, along with siding expansion where constructable.

As Figure 3-4 demonstrates, no capacity constraints are expected under either the moderate or high growth scenarios. The capacity improvements illustated in the graph are based on connecting individual sidings into sections of double-track main line, and the addition of siding extensions, and possible fleeting of trains.

Figure 3-4: Rail Corridor Capacity, Hinkle to Portland (UP)



Source: MainLine Management

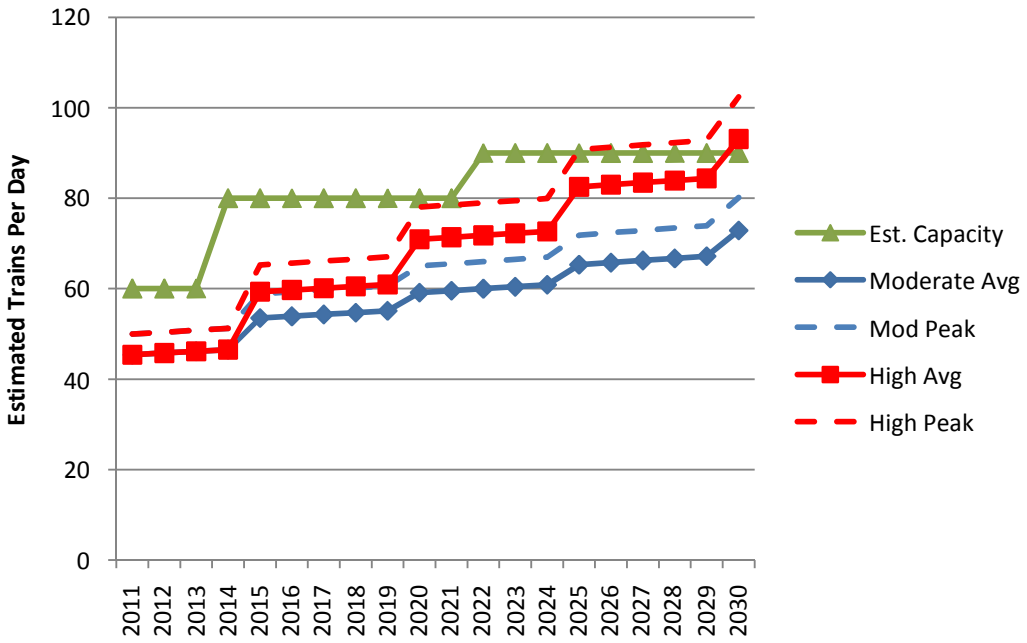
Pasco, WA to Spokane, WA (BNSF)

Between Pasco and Spokane all sidings are 8,000 feet in length or longer and capacity exists to operate several more trains in each direction on the segment. As a result of the projected growth in export traffic, BNSF is planning for capacity expansion on this segment. In the consultant's opinion, such an expansion would likely involve combining key sidings into long sections of double-track and adding high-speed crossovers to increase operational flexibility.

As shown in Figure 3-5, the analysis implies that the Pasco to Spokane segment will reach capacity by 2025 (peak) and 2030 (average) under the high growth scenario, but there are no capacity constraints under the moderate growth scenario.

Capacity increases illustrated in the graph result from connecting individual sidings into sections of double-track main line.

Figure 3-5: Rail Corridor Capacity – Pasco to Spokane (BNSF)



Source: MainLine Management

Spokane, WA to Sand Point, ID (BNSF)

There are two main line segments between Spokane, Washington and Sand Point, Idaho, one operated by the BNSF and one by the UP.

Most of the BNSF corridor features multiple main tracks, but there are short stretches of single track between Irvin and Otis Orchard, WA (3.1 miles), Rathdrum and Athol, ID (11.1 miles with a siding at Ramsey) and between Algoma and Cocolalla, ID (2 miles). It is likely that BNSF can increase the capacity of this segment to meet demand, primarily by double-tracking the remaining single track segments between Spokane and Sandpoint, although some of those sections present certain difficulties and enhanced costs.

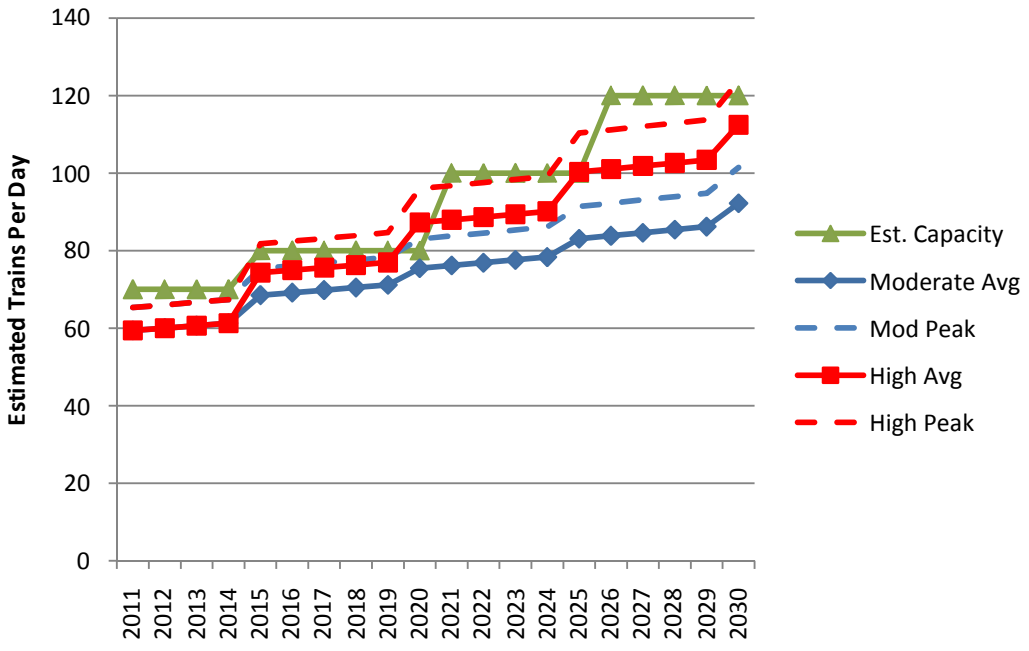
A capacity concern that may materialize over the long-term for BNSF is the single track bridge across Lake Pend Oreille. The train volumes indicated in the 2030 projections may require fleeting of traffic across the bridge. In addition, fleeting of trains may create the need for additional storage track on either side of the bridge to stage trains before crossing.

As shown in Figure 3-6, the analysis implies that the Sandpoint to Spokane segment has sufficient capacity under average conditions, but may be constrained under peak conditions. Under the moderate growth scenario, there are no sustained capacity constraints.

Capacity increases illustrated in the graph result from double-tracking three single-track segments, adding a third main line in key locations, and potentially adding staging tracks at either end of the Lake Pend Oreille Bridge.

The UP segment between Spokane and Sand Point is included in the next section of this chapter, Hinkle, OR to Eastgate, ID.

Figure 3-6: Rail Corridor Capacity – Spokane to Sand Point (BNSF)



Source: MainLine Management

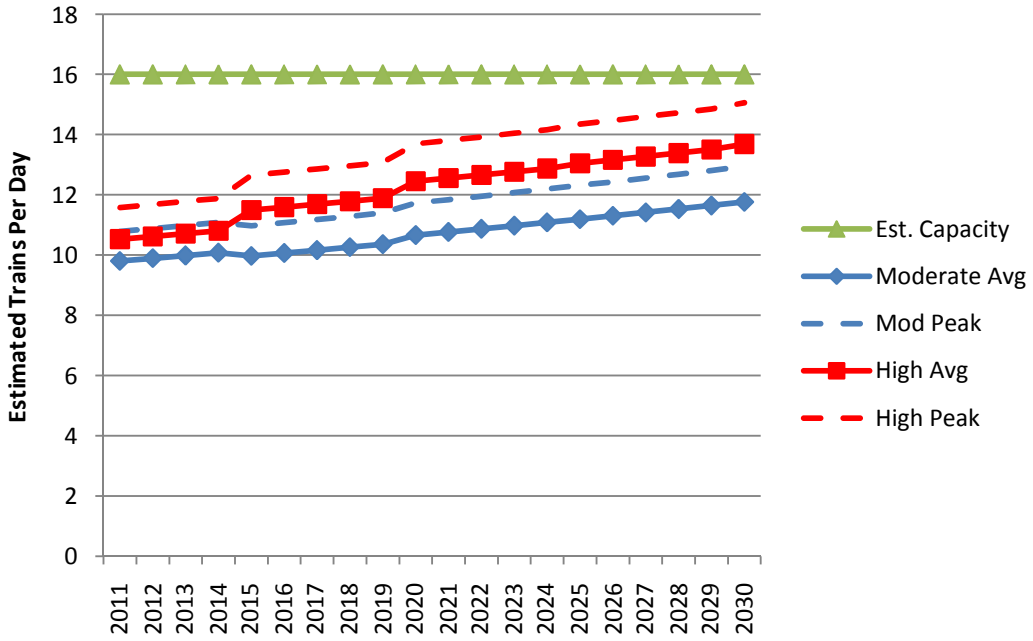
Hinkle, OR to Eastgate, ID (UP)

This segment of mainline is a key route for Canadian cargo exported through Pacific Northwest ports, such as potash, which originate on the Canadian Pacific Railway and are interchanged with the Union Pacific at Eastport, Idaho.

Much of this segment consists of a single track operation operated by Track Warrant Control, which is non-signalized. The distance between meet/pass sidings limits capacity, but current available capacity is sufficient to meet projected traffic volumes under both growth scenarios, as shown in Figure 3-7.

The UP may be able to increase capacity by constructing additional meet/pass sidings if warranted by growth in cargo traffic. However, these potential increases in capacity are not included in Figure 3-7.

Figure 3-7: Rail Corridor Capacity, Hinkle to Eastgate



Source: MainLine Management

Vancouver, WA to Tacoma, WA

Plans to increase volumes of intercity passenger rail have driven the infrastructure expansion proposals for this segment. The analysis of this segment is divided into two sections:

- Vancouver to Longview/Kelso, and
- Longview/Kelso to Tacoma.

The most significant capacity usage on this segment occurs in the Kalama/Longview area due to grain trains leaving/entering the main lines at Kalama and to yard operations at Longview Junction. In both cases, considerable main line capacity is consumed by trains slowly entering/departing the main lines to/from export grain facilities or while they are stopped to work in yard areas.

With the projected increase in loaded and empty bulk trains over this segment, it is possible that BNSF will consider fleeting loaded bulk export trains through the Gorge and running empty bulk trains eastbound over Stampede pass, as discussed above in the Vancouver to Pasco section. Empty and full export bulk trains on the UP system would continue to operate through the Gorge in both directions.

One potential capacity expansion project that may be revisited is the construction of a unit train staging/storage yard near Woodland. At one time this improvement was on the list of passenger-related improvements under consideration by WSDOT, but was cut when that plan was downsized. With the number of export bulk trains projected for this segment, an area for staging loaded bulk trains near Kalama may prove beneficial from a rail operating and service perspective.

Another potential project is to add a second single-track rail bridge to span the Cowlitz River or to replace the existing single-track Cowlitz River Bridge with a new double-track bridge. This bridge is located on the branch line that connects marine terminals at the Port of Longview as well as other industrial customers to the I-5 Corridor main line. The recent Port of Longview Master Plan demonstrated the need to for this project, and it was also identified in the SR432 Highway and Rail Improvement Project.

Passenger-related capacity improvements in the updated WSDOT *Amtrak Cascades Mid-Range Plan* focus on the Kalama/Longview area, and include adding a third main track that bypasses existing congestion points.

The following sections discuss the Vancouver to Tacoma segment in two parts, Vancouver WA to Kalama/Longview and Kalama/Longview to Tacoma.

Vancouver, WA to Kalama/Longview, WA (Joint Line)

Much of the congestion on this segment occurs at Vancouver, and between Vancouver and Kalama/Longview. At Vancouver, through traffic on intersecting main line routes compete for line capacity with operations at the Vancouver Yard, and with trains entering and leaving the Port of Vancouver. Additional passenger train operations are likely to aggravate these conflicts unless sufficient mitigation is constructed to improve efficiency for all train operations in the Vancouver Terminal area.

Between Vancouver and Longview numerous trains arrive and depart the main line to access marine terminals and other customers in the Kalama/Longview area. These trains arriving and departing the mainline move at slow speeds, aggravating congestion issues on this segment.

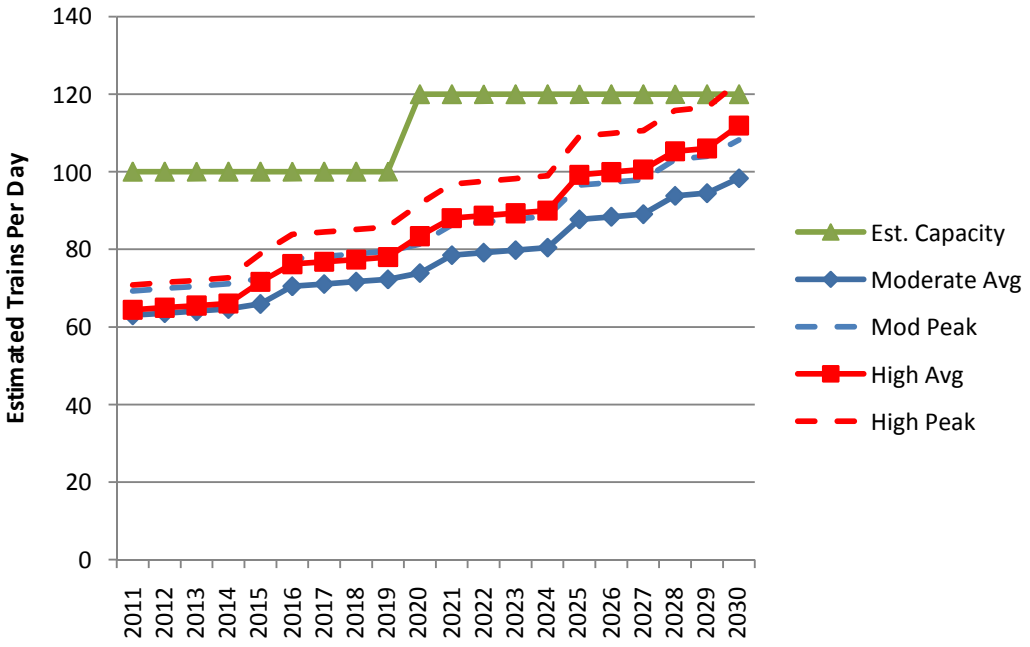
WSDOT's *Amtrak Cascades Mid Range Plan* (Options 3 and 4)[2] will continue to provide the rail capacity needed over time to ensure that intercity passenger growth can occur in conjunction with projected freight growth. The directional operation of loaded and empty bulk trains by BNSF, coupled with the planned passenger rail improvements, should reduce the impact of growing freight and passenger traffic.

In the consultants' opinion, the construction of a third main track through the Kalama/Longview area will be needed in the long-term, as well as construction of a bulk train staging and storage facility near Woodland.

As shown in Figure 3-8, the analysis implies that there is no capacity problem for the section of mainline from Vancouver to Longview under the moderate growth scenario. Under the high growth scenario, capacity is reached by 2030 during peak operations.

Capacity improvements reflected in this graph include completion of the Vancouver Bypass, the new Port of Vancouver Access Route, and the Option 3 passenger improvements (including construction of the third main track between Kalama and Kelso). Other improvements may include completion of third main track between Martin's Bluff and Rocky Point, and expansion of the Cowlitz River Bridge at Longview. In addition, construction of improvements at North Portland Junction will compliment these improvements, even though the junction is not located within this segment.

Figure 3-8: Rail Corridor Capacity – Vancouver (WA) to Kalama/Longview With Passenger Improvements



Source: MainLine Management

[2] For a full list of projects, please access the Amtrak *Cascades* Mid-Range Plan at http://www.wsdot.wa.gov/NR/rdonlyres/83B17378-CDC8-4D57-AA60-4CD64BAF6D94/0/AmtrakCascadesMidRangePlan.pdf

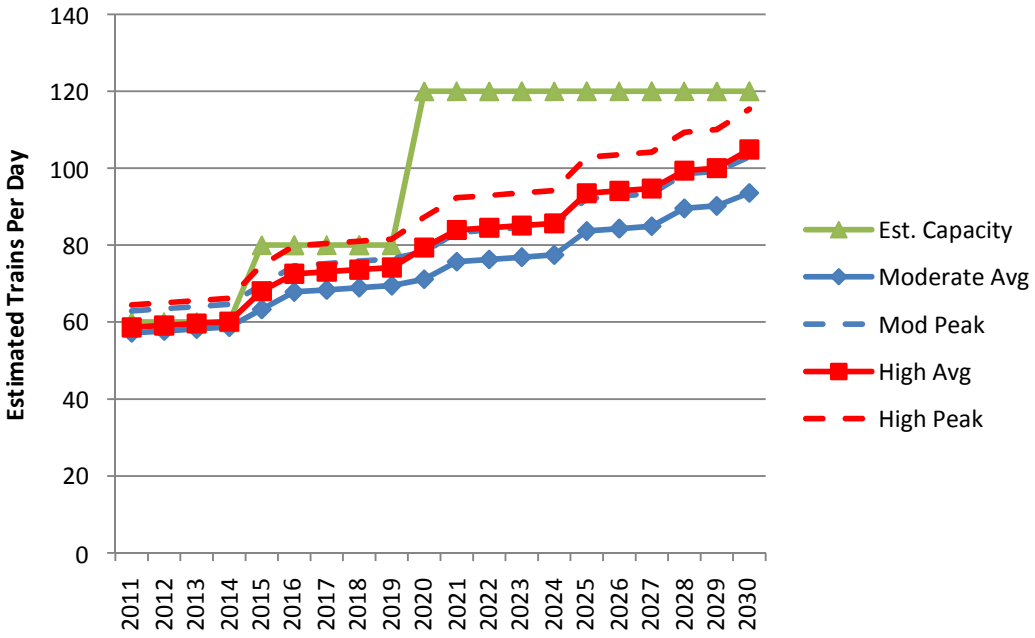
Kalama/Longview, WA to Tacoma, WA (Joint Line)

Two single track tunnels near Tacoma (Nelson-Bennett Tunnel and Ruston Tunnel) are the primary capacity constraints between Longview/Kalama and Tacoma. However, the Point Defiance Bypass, which is planned to be completed by 2017, will alleviate mainline capacity constraints by shifting passenger trains from the existing main line to an alternate route between Nisqually and Reservation Interlocking in Tacoma. In addition, planned CTC high-speed crossovers will provide additional flexibility for train operations across this segment.

Capacity improvements illustrated in Figure 3-9 include completion of the Point Defiance Bypass and the addition of high-speed crossovers. These two projects will allow the Longview/Kalama to Tacoma segment to operate at or below capacity over the 20-year forecast period under both the moderate and high growth scenarios.

In addition, the Blakeslee Junction rail project would allow faster access and egress between the mainline and the Puget Sound and Pacific Railroad branch at Centralia. This project was originally considered for WSDOT's Amtrak *Cascades* list of passenger-related capacity improvements. Completion of this project would also accommodate additional cargo opportunities at the Port of Grays Harbor.

Figure 3-9: Rail Corridor Capacity –Kalama/Longview to Tacoma With Point Defiance Bypass



Source: Mainline Management

Tacoma, WA to Seattle, WA (Joint Line)

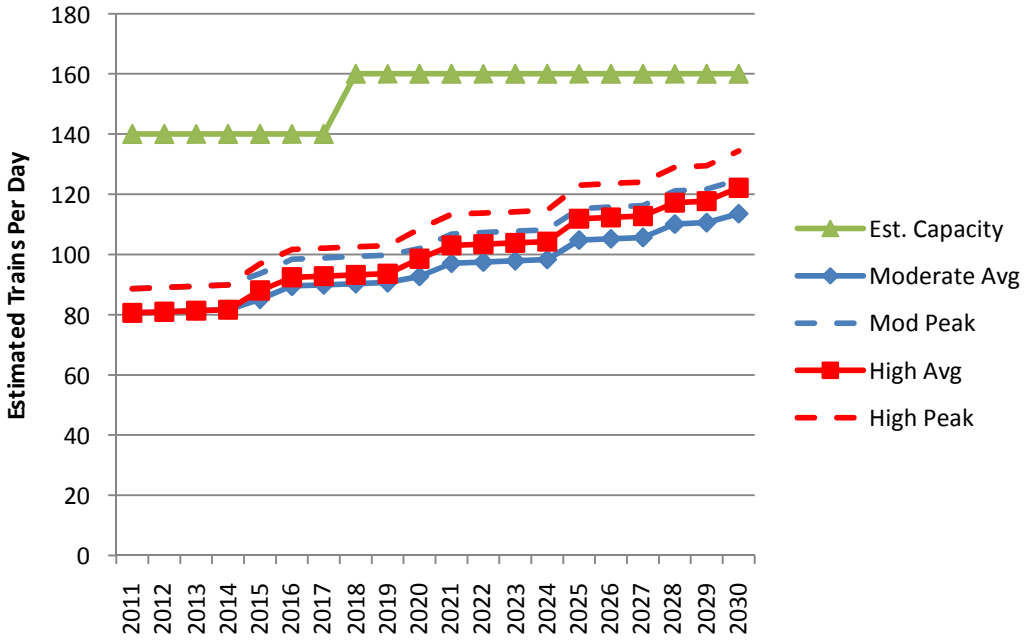
According to Sound Transit there are no conflicts between passenger and freight operations between Tacoma and Seattle, and the level of service provided by BNSF is very good. The Point Defiance Bypass project will further improve freight and traffic flows through Tacoma, and between Tacoma and Seattle.

Improvements at King Street Station in Seattle have improved the efficiency of freight and passenger operations in the Seattle area. BNSF is constructing a third main track approximately five miles long between Kent and Auburn. Approximately half of this track is on either side of the wye that accesses the Stampede Pass line. Presumably the purpose of this additional main line is to facilitate efficient freight operations between the existing main lines, Auburn Yard, and Stampede Pass. Given the potential to route empty bulk trains over Stampede pass, this additional track is needed to minimize the impact to current and projected commuter and intercity passenger trains.

The capacity of this segment was analyzed in two parts - Tacoma to Auburn and Auburn to King Street Station. The primary reason for splitting the analysis this way is that the traffic mix is likely to be different on each part if the BNSF routes empty bulk trains over Stampede Pass; the mix of loaded and empty bulk trains between Tacoma and Auburn would be slightly different than the mix north of Auburn.

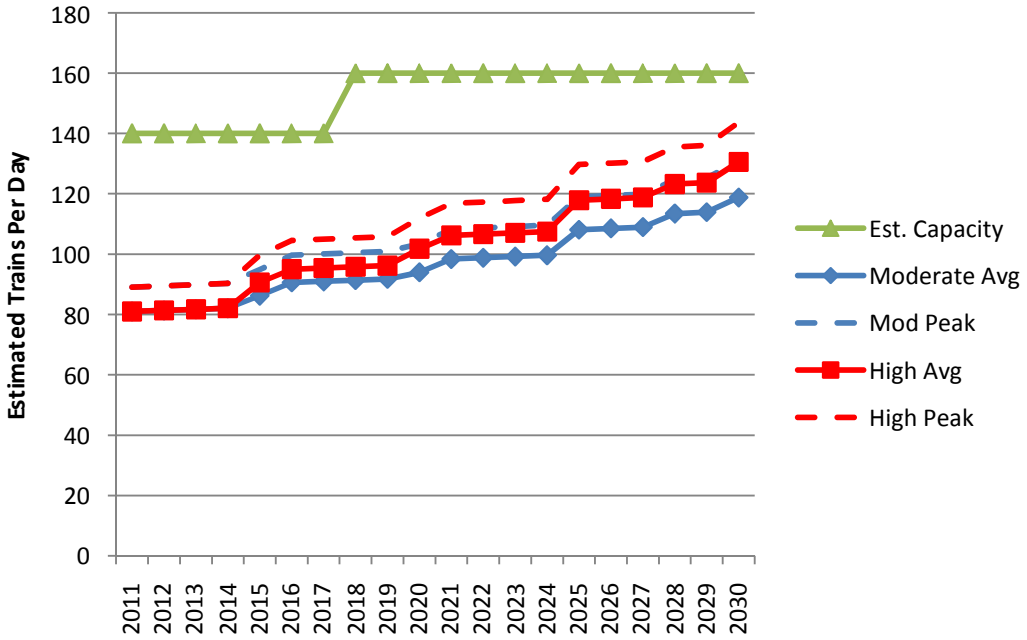
As shown in Figures 3-10 and 3-11, there are no capacity constraints under high-growth or moderate-growth scenarios.

Figure 3-10: Rail Corridor Capacity – Tacoma to Seattle
Joint Line Tacoma to Auburn



Source: MainLine Management

Figure 3-11: Rail Corridor Capacity – Tacoma to Seattle
Joint Line Auburn to Seattle



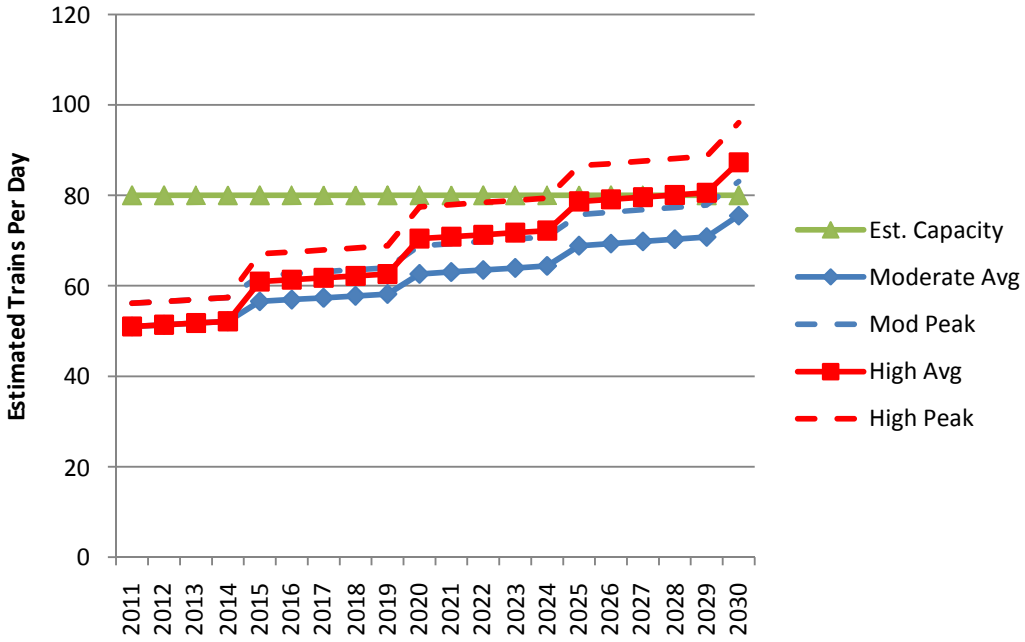
Source: MainLine Management

Seattle, WA to Everett, WA (BNSF)

Capacity expansion on this line segment is driven by passenger rail service requirements, with no freight-related improvements currently planned. Under the agreement between Sound Transit and BNSF for commuter train operations over this segment, Sound Transit purchased "slots", which guaranteed specific passenger volumes and service levels. Under this agreement BNSF must ensure that these passenger service requirements are met, regardless of freight demand.

As shown in Figure 3-12, however, growth in export bulk trains destined north of Everett could result in capacity constraints, starting between 2020 and 2023 under the high growth scenario. That may result in BNSF proactively constructing additional capacity improvements to meet the requirements of the slot purchase arrangement with Sound Transit. Under the moderate growth scenario, there are no capacity constraints until 2030 (under peak operations).

Figure 3-12: Rail Corridor Capacity – King Street Station to Everett



Source: MainLine Management

Everett, WA to Vancouver, BC (BNSF)

Capacity improvements currently planned for the Everett to Vancouver mainline segment are driven largely by passenger service. Three of the projects that are currently being designed or constructed include:

- Siding upgrade and extension at Stanwood,
- Siding upgrade and extension at Mount Vernon,
- Construction of a new siding at the Swift Customs Facility.

The siding extensions and upgrades at Stanwood and Mount Vernon would allow more efficient meet/pass operations involving freight and passenger operations. The new siding at Swift (Blaine) would allow additional capacity for freight train customs inspections while keeping the main line open for other train operations, including passenger.

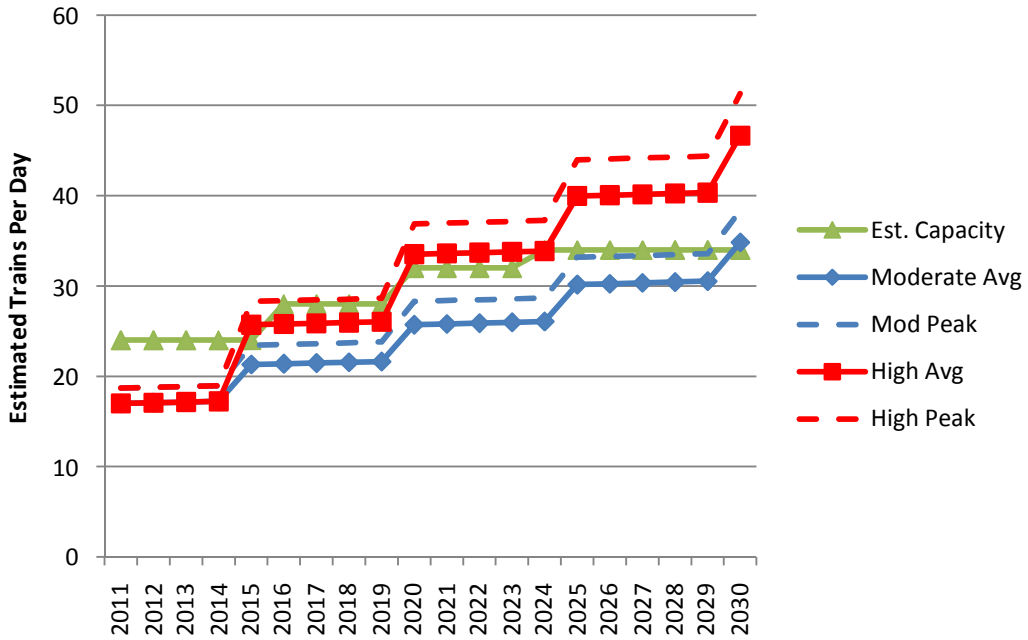
In addition to these improvements, BNSF recently constructed a 10,000 foot siding north of the border at Colebrook, BC. Colebrook is the location where the BNSF ties into the rail line that accesses the Deltaport and Westshore port facilities. Prior to construction of this siding BNSF had no meet/pass locations between the border and Brownsville, BC.

As shown in Figure 3-13, growth in export bulk commodities may lead to sustained capacity constraints along this segment. These constraints are projected to start between 2020 and 2025 under the high growth scenario, and between 2029 and 2030 under the moderate growth scenario.

The increases in sustainable capacity illustrated in Figure 3-13 reflect the consultants' view of potential improvements. Given the track profile of this segment, these potential improvements include the addition of new sidings and the extension of existing sidings.

In addition to the physical improvements, additional capacity improvements on this segment may be possible through the use of fleeting. Although this analysis does not assume a change in operating protocols, growth in the number of bulk trains may necessitate the use of fleeting operations. At lower traffic growth levels, targeted siding expansions would likely be able to accommodate traffic growth over the 20-year horizon.

Figure 3-13: Rail Corridor Capacity – Everett to Vancouver (BC)



Source: MainLine Management

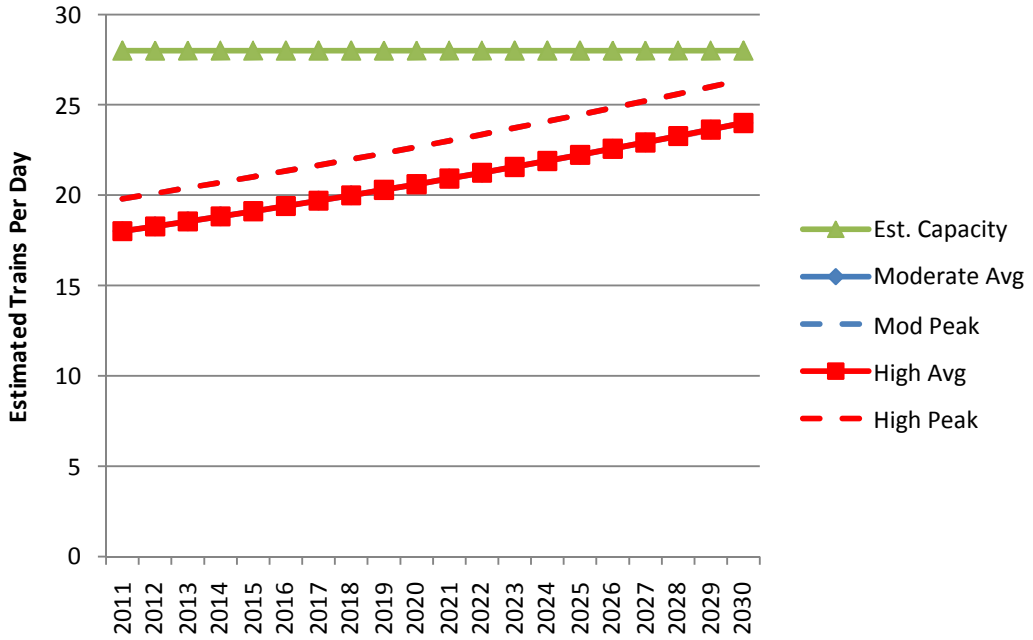
Everett, WA to Spokane, WA via Stevens Pass (BNSF)

The primary capacity constraints on this segment are the approaches to the Cascade Tunnel under Stevens Pass and the throughput of the tunnel. The approaches include heavy curvature and steep grades (i.e. 2.2 percent), which require slow operation. Additionally, the tunnel restricts capacity because the air in the tunnel must be flushed between trains. Flushing takes approximately 40 minutes following eastbound trains and 20 minutes following westbound trains. The maximum sustained capacity through the tunnel is estimated at approximately 28 trains per day, with surge capacity of 30 to 32 trains per day.

BNSF currently operates trains of up to 8,000 feet in length via Stevens Pass so long as they do not exceed 5,500 tons without Distributive Power (DPU)[3]. With DPU, trains via Stevens Pass can be increased to 7,000 tons, resulting in fewer trains. BNSF has indicated that Stevens Pass capacity will be reserved for intermodal traffic and Amtrak.

As shown in Figure 3-14, capacity of this line segment will likely not be exceeded over a 20-year horizon under the high growth scenario.

Figure 3-14: Rail Corridor Capacity – Everett to Spokane via Steven Pass (BNSF)



Source: MainLine Management

[3] With distributive power (DPU), remotely controlled helper engines are placed in the middle or at the end of trains.

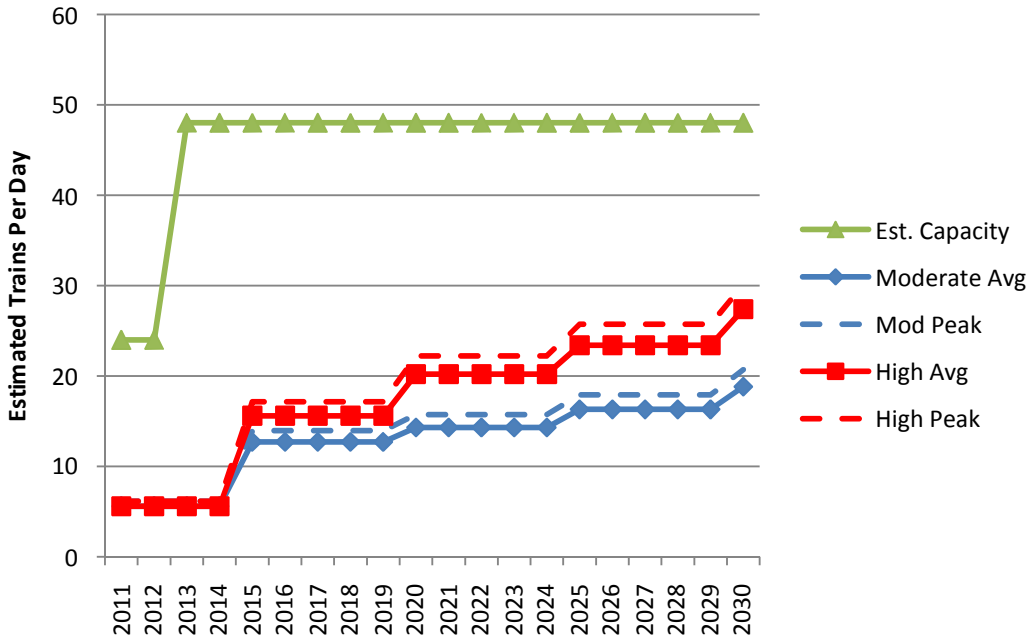
Auburn, WA to Pasco, WA via Stampede Pass (BNSF)

As discussed in the Pasco to Vancouver segment analysis section, BNSF has indicated the potential for Stampede Pass being utilized as a "directional" route for empty bulk trains. The trains using the pass would be those generated on the BNSF system from Kalama north, thereby relieving the BNSF Columbia Gorge route of eastbound empty bulk trains, except for those originating in Portland and Vancouver. It is unclear when this routing protocol would occur, but it will likely be driven by route congestion on the Columbia Gorge segment. If the route does become an eastbound routing for empty BNSF bulk trains, it is also possible that BNSF would utilize the route for eastbound merchandise trains that originate from Everett, Seattle and Tacoma and are destined for the Pasco processing yard.

At some point, increased train operations will likely require upgrading the signal system on the Stampede Pass line to full CTC. The route currently has limited CTC but is predominantly dispatched utilizing Track Warrant Control (TWC). However, if the preponderance of traffic utilizing the route is eastbound only, TWC would likely be sufficient for some time into the future.

As Figure 3-15 demonstrates, use of Stampede Pass as described creates significant additional capacity. The increase in capacity reflects that, under the new operating protocol, the majority of trains using Stampede Pass will move eastbound.

Figure 3-15: Rail Corridor Capacity – Auburn to Spokane
Current Operations



Source: MainLine Management

Project Priorities

A key element of this analysis was the development of a prioritized list of system improvements that would allow the capacity of the regional rail system to match increasing demand.

These projects generally fall into two categories, mainline improvements and port access improvements. However, the projects labeled as port access improvements also provide benefits to the mainline system. Reducing the amount of time that it takes for trains to move between the port terminals and the mainline reduces delays on the mainline system, and thereby increases capacity.

Four projects recommended in the previous report are currently in the construction or detailed planning phase, with completion for each ranging from 2012 through the 2017/2018 timeframe. Completion of these four projects will provide a solid foundation for passenger and freight capacity in the Pacific Northwest. Three of these projects are primarily mainline improvements:

- Vancouver WA Freight Rail Bypass.
- Point Defiance Bypass, Tacoma to Nisqually.
- Third main line Kalama to Kelso (WSDOT Mid-Term Passenger Plan Option 3).

The fourth project is primarily a port access improvement:

- Port of Vancouver USA Freight Access Project.

In addition to these projects, certain main line segments will likely require additional capacity enhancements due to projected growth in rail traffic. Both the BNSF and UP likely have the ability to add the capacity needed through a combination of infrastructure expansion and changes to operations.

Six additional capacity improvement projects that would enhance overall rail operations under the moderate and high growth forecasts are listed below. Three of these projects are listed as mainline projects and three are port access. As described above, however, port access improvements also benefit mainline capacity. Descriptions of each of the projects are provided below the lists

The mainline projects include:

- Portland - Peninsula Junction to North Portland Junction,
- Vancouver to Kelso - WSDOT Passenger Plan Option 3 and 4,
- Centralia - Blakeslee Junction.

The **Peninsula Junction to North Portland Junction** project is a key series of improvements that are needed to improve both passenger and freight train capacity in the Portland area. Among other things, these projects would include reconfiguring the connection between the UP and BNSF at North Portland Junction and easing the curvature at Peninsula Junction. This would reduce congestion on the Columbia Gorge routes of both the BNSF and UP, as well as on the I-5 Corridor, and would allow for faster passenger train speeds. These improvements near the south end of the Columbia River Bridge would complement current projects at the north end of the bridge, including the Vancouver Bypass project, the West Vancouver Access project and upgrades of the main line in Vancouver. Funding is currently in place to complete preliminary engineering and the NEPA analysis, but not construction.

The improvements included in the **WSDOT Passenger Plan Options 3 and 4**[4] between Vancouver and Kelso include the completion of a third main line between Martin's Bluff and Rocky Point and a new siding near Kalama, which will be necessary to reach projected passenger train volumes.

The **Blakeslee Junction** project would improve access/egress efficiency between the I-5 Corridor main lines, and both the Puget Sound and Pacific Railway (PSAP) and Tacoma Rail lines at Centralia. Growth in the number of unit trains moving to and from the Port of Grays Harbor via the Puget Sound and Pacific has increased congestion at the interchange. This project includes a number of elements designed to increase the speed of trains through the interchange, and to increase the capacity of the Grays Harbor branch line. This will benefit both freight and passenger trains. The project is divided into five phases. Early planning has been completed on the project, but only partial funding for Phase 1A and 1B are available. Construction will require additional funding.

In addition, the Puget Sound and Pacific has recently obtained the necessary permits to construct a meet/pass siding on the Grays Harbor branch line. This siding should also improve capacity on the I-5 Corridor mainline through Centralia by providing a place off of the mainline for Grays Harbor trains to wait.

The additional port access projects that are recommended include:

- Unit Train Staging/Storage Yard near Woodland.
- Cowlitz River Bridge – Longview.
- Bullfrog Junction Realignment – Tacoma.

A **Unit Train Staging/Storage Yard near Woodland** would also increase the efficiency of both the BNSF and UP routes through the Columbia River Gorge routes and the I-5 Corridor. The BNSF currently stages unit grain trains in Pasco for movement to export terminals on the Lower Columbia River, Puget Sound, and Grays Harbor. The distance between the Pasco staging yard and the export terminals increases the potential for train delays. A storage yard in Woodland would reduce the distance to the export terminals. This project would also benefit passenger trains by reducing conflicts with slower-moving freight trains. This project is not currently in the planning phase.

The **Cowlitz River Bridge** provides access from the I-5 Corridor mainline at Longview Junction to most of the marine terminals and industrial customers in Longview. This single-track bridge is nearly 90 years old, and projected growth in traffic along the Longview branch line may require the addition of a second line. Options include adding a second single-track bridge or replacing the existing bridge with a new double-track bridge. This project would reduce congestion on the I-5 Corridor mainline (benefitting both passenger and freight trains) and increase the capacity of the Longview branch line. It was also identified in the recent Port of Longview Master Plan as a critical link. The project is estimated to cost $36 million; partial funding is in place for preliminary engineering and NEPA analysis, with the remaining funding expected in January 2012. Construction is not funded.

The **Bullfrog Junction Realignment** project would increase the efficiency of access/egress between the I-5 Corridor mainline and the Port of Tacoma. All of the rail lines serving industries and port facilities on the Tacoma Tideflats currently funnel through the Bullfrog Junction area,

[4] See footnote 2 on Page 30

seriously limiting the number of trains that can enter or leave the port area. In addition, yard activities in the area often use the mainline, reducing mainline capacity on the I-5 Corridor. The Bullfrog Junction area includes a number of chokepoints, including the junction itself, a single single-track bridge over the Puyallup River, and others. A preliminary plan for realignment was developed in 2006, and project proponents are now seeking funding for design and construction.

Conclusion

Growth in the volume of export bulk trains is expected to increase the demand on existing rail capacity in the region. Even moderate growth will require BNSF and UP to assess the capacity requirements necessary to meet the growing demand. Both railroads have the ability to increase capacity through a combination of physical and operational improvements, and should be able to meet growing demand well into the future.

Table 5-1: Current and Projected Number of Trains, by Line Segment

		Moderate Growth				High Growth			
	2011	2020		2030		2020		2030	
Line Segment	Average	Average	Peak	Average	Peak	Average	Peak	Average	Peak
Pasco, WA to Vancouver, WA (BNSF)									
Pasco, WA to Wishram, WA	45	51	56	61	67	57	62	72	80
Wishram, WA to Vancouver, WA	41	46	51	56	61	52	57	67	74
Hinkle, OR to Portland, OR (UP)	32	41	45	47	52	46	50	53	59
Pasco, WA to Spokane, WA (BNSF)	45	59	65	73	80	71	78	93	102
Spokane, WA to Sand Point, ID (BNSF)	59	75	83	92	101	87	96	112	124
Hinkle OR to Eastgate, ID (UP)	10	11	12	12	13	12	14	14	15
Vancouver, WA to Tacoma, WA (Joint line)									
Vancouver, WA to Kalama/Longview, WA	63	74	81	98	108	83	92	112	123
Kalama/Longview, WA to Tacoma, WA	57	71	78	94	103	79	87	105	115
Tacoma, WA to Auburn, WA (Joint line)	81	93	102	114	125	99	108	122	134
Auburn, WA to Seattle, WA (Joint line)	81	94	103	119	131	102	112	131	144
Seattle, WA to Everett, WA (BNSF)	51	63	69	75	83	70	77	87	96
Everett, WA to Blaine, WA (BNSF)	17	26	28	35	38	34	37	47	51
Everett, WA to Spokane, WA via Stevens Pass (BNSF)	18	21	23	24	26	21	23	24	26
Auburn, WA to Pasco, WA via Stampede Pass (BNSF)	6	14	16	19	21	20	22	27	30

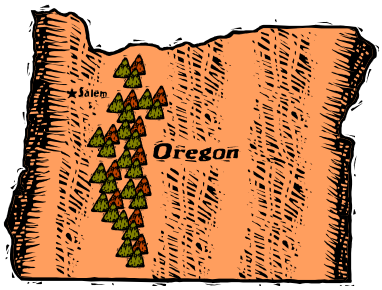
Note: Train numbers represent average daily volume. Short term peak volumes may exceed daily average by 10%. For all non-unit trains, growth is absorbed by existing trains before adding additional trains. Train volumes include locals, switchers and non-revenue movements.
Source: MainLine Management, BST Associates

Table 5-2: Summary of Capacity Improvements, by Line Segment

Line Segment
Pasco, WA to Vancouver, WA (BNSF)
Pasco, WA to Wishram, WA
- Siding extensions
- Connecting sidings into double track segments
- Westbound fleeting
Wishram, WA to Vancouver, WA
- Siding extensions
- Fleeting of trains westbound
Hinkle, OR to Portland, OR (UP)
- Siding extensions
- Connecting sidings into double track segments
Pasco, WA to Spokane, WA (BNSF)
- Connecting existing sidings into double track segments
Spokane, WA to Sand Point, ID (BNSF)
- Double tracking the existing single track segments
- Addition of third main track in key locations where available
- Staging tracks on both sides of the Lake Pend Oreille bridge
Hinkle, OR to Eastgate, ID (UP)
None
Vancouver, WA to Tacoma, WA (Joint line)
Vancouver, WA to Kalama/Longview, WA
- Completion of the Vancouver Bypass
- Completion of the new Port of Vancouver Access route
- Completion of WSDOT improvements for passenger plan Option 3, including construction of the 3rd main track between South Kalama and Kelso
- Additional improvements may include completion of 3rd main track between Martin's Bluff and Rock Point, expansion of the Skagit River Bridge at Longview
Kalama/Longview, WA to Tacoma, WA
- Completion of the WSDOT Option 3 and 4 improvements
- Addition of High-Speed crossovers
- Completion of Blakeslee Junction Project
- Completion of Point Defiance Bypass Project
Portland, OR to Vancouver, WA
- North Portland Junction and Peninsula Junction
Tacoma, WA to Seattle, WA (BNSF and UP)
- No projects specified. BNSF will meet passenger service agreements
Seattle, WA to Everett, WA (BNSF)
- No projects specified. BNSF will meet passenger service agreements
Everett, WA to Vancouver, BC (BNSF)
Siding extensions
Additional sidings
Everett, WA to Spokane, WA via Stevens Pass (BNSF)
None
Auburn, WA to Pasco, WA via Stampede Pass (BNSF)
New operating protocol with empty eastbound grain trains using Stampede Pass

Source: MainLine Management, BST Associates

Oregon Freight Plan Modeling Analysis Technical Memo



Prepared for the ODOT Freight Mobility Unit

Prepared by the ODOT Transportation Planning Analysis Unit

August 2010

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Executive Summary

The purpose of the Oregon Freight Plan analysis is to gain an understanding of the spatial land use and transportation implications of different economic conditions. This analysis illustrates the variation in statewide and regional activity and commodity flow in order to help evaluate the risk associated with economic volatility on alternative Freight Plan strategies. Decision makers will be able to better assess the robustness of freight strategies and avoid the creation of barriers that may prohibit the freight industry from reacting nimbly to economic change.

The StateWide Integrated Model 2 (SWIM2) was used for this analysis. Four model scenarios were produced: business-as-usual Reference; Optimistic Economic Forecast; Pessimistic Economic Forecast; and High Transportation Cost. Highlights of the analysis findings include:

- Future demands on the freight system will be large, even if economic growth is muted. Economic inertia causes the dominant commodity mix and geographic flow patterns in Oregon to remain intact, with relatively small changes over time under various scenarios.
- Higher per-mile highway transportation costs result in less congestion, providing the impetus for shippers to increase the length of individual truck tours to increase operating efficiency Higher transport costs result in reduced miles of travel and hours of travel statewide.
- Households relocate to reduce transport costs, causing urban density to rise and statewide auto miles of travel to fall.
- Commodities have unique and diverse patterns and logistics. Transportation services used to move these commodities are just as varied. Maintaining access to markets is key to economic competitiveness. Larger urban areas produce the state's top commodity Machinery, Instruments, Transportation Equipment, and Metals. Oregon production of Food and Kindred Products occurs in Central, East, and Northwest Oregon. Forest or Wood Products are produced in Southwest, South, and Central Oregon.
- Some regions have dominant industries, making them more susceptible to economic risk associated with these industries. This is evident for the dominant urban industry of Machinery, Instruments, Transportation Equipment and Metals, and the Eastern Oregon dominance of Food and Kindred Products
- The net results of thousand of shippers and buyers of goods and services are complex and at times counter intuitive. Modeling the dynamic nature of these forces provides valuable insight into the collective Oregon freight system needs.
- Oregon sells goods outside the state: Oregon is projected to export nearly 60% of goods produced in terms of value.
- Oregon buys goods from outside the state: Oregon is projected to import about 70% of all goods consumed within the state. This heavy global trading will require reliable highway, rail, air, and waterway systems.
- Assessing system performance and economic impacts is multifaceted. Attention must be given to regional issues, commodity characteristics, industry logistics, and employment patterns when evaluating alternative strategies.
- The largest commodity flows are on the I-5 and I-84 corridors, with significant flows on US-97 and US-20
- Highway traffic congestion will increase in the future under all scenarios. A slower economy will reduce congestion growth rates and an increase in transportation cost will slow congestion growth even more

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Oregon Freight Plan Modeling Analysis

Introduction

The purpose of this analysis is to gain an understanding of the spatial land use and transportation implications of different economic conditions. This analysis illustrates the variation in statewide and regional activity and commodity flow in order to help evaluate the risk of economic volatility to alternative Freight Plan strategies. The focus is not identifying the causes and effects on particular industries or commodity groups. The objective is to illustrate the variation of forecasted statewide and regional activities and commodity flows and the risk associated with economic uncertainty. This information will be used to evaluate alternative Freight Plan strategies and support formulation of policies sustaining the economic resilience of Oregon's freight system. Decision makers will be able to better assess the robustness of freight strategies and avoid the creation of barriers that may prohibit the freight industry from reacting nimbly to economic change.

Modeling Analysis Overview

The ODOT Transportation Planning Analysis Unit has a variety of tools available for analysis. The second generation StateWide Integrated Model (SWIM2) was used for the Freight Plan analysis to evaluate future conditions and identify implications for freight movement in Oregon. SWIM2 is an integrated model, incorporating land use, the economy and the transportation system into one dynamic environment. This tool supports analysis that accounts for the intricate connections and feedbacks amongst these three areas of activity. More information on the history, development and characteristics of the SWIM2 is provided in Appendix A.

SWIM2's integrated framework makes it ideal for illustrating economic activity, commodity flow patterns, travel and land use patterns at the state and regional level. This analysis tool is used to explore the potential risks to the Oregon freight system by evaluating the impacts of various economic forecasts on Oregon freight patterns. Further detailed analysis at the transportation facility level or within specific metropolitan areas would require additional time and analytical tools, such as metropolitan travel demand models.

The approach to this analysis is to use SWIM2 to evaluate hypothetical scenarios in order to provide a broad spectrum of potential futures. These alternative futures serve as "book ends," providing a range of conditions to be considered for long-range freight planning. This enables decision makers to identify areas of concern and formulate strategies to mitigate such conditions, if they were to arise. This supports the goal of creating a nimble long-range plan in the face of uncertainty. Information from scenario analysis will reveal how different areas of the state are affected, as well as the state as a whole. Decision makers will be able to better assess the robustness of freight strategies and avoid the creation of barriers that may prohibit the freight industry from reacting nimbly to change.

The first step of analysis is to create a Reference scenario representing business-as-usual, with which the other scenarios will be compared. This makes it easier to evaluate alternative futures when comparing conditions to a future based on current laws, general patterns and conditions.[1] Three other analysis scenarios were created using SWIM2: Optimistic Economic Forecast, Pessimistic Economic Forecast and a High Transportation Cost scenarios. The initial planned analysis included a forth

[1] An example of other statewide planning analysis can be found in the "Oregon Transportation Plan," adopted September 20, 2006.

scenario with higher levels of activity in key industries. However, once the Optimistic scenario was reviewed, the analysis team determined this additional scenario would not be different enough from the Optimistic scenario to significantly contribute to the analysis. The model was run out to year 2027 instead of 2035 to reduce runtime and expedite analysis. By year 2027 the long-range trends were evident enough to form robust analytical conclusions.

The following section presents detailed descriptions of the analysis scenarios and key findings. Brief descriptions of the Oregon Freight Plan scenarios are as follows. It should be noted that this analysis did not account for the impact of the economy or higher transport costs on freight mode split. Brief descriptions of the Oregon Freight Plan scenarios are as follows:

Reference Scenario: "business-as-usual" forecast of Oregon activity based on current trends and policies. Oregon's economy grows in accordance with the Office of Economic Analysis state forecast; the rest-of-the-world grows at rates consistent with national forecasts. Urban growth boundaries maintain 20-year land supplies. Projects in the Statewide Transportation Improvement Plan and Oregon Transportation Investment Act programs are built, but limited additional modernization will occur; the system will be operated similar to today. Transportation costs will remain stable. This forecast assumes the economy suffers no major shocks over the next twenty-five years. It grows smoothly over time and follows a similar pattern of long-run activity observed over the past 20 years; accounting for the current recession's dampening effects. SWIM2 industry output grows at a compound annual growth rate (CAGR) of 2.0%.

Optimistic Scenario: assumes a higher average economic growth rate than the Reference scenario, resulting from optimistic assumptions associated with changes in technology, faster productivity gains, and lower inflation. SWIM2 industry output grows at a CAGR of 2.7%.

Pessimistic Scenario: assumes a lower average economic growth rate than the Reference scenario, resulting from pessimistic assumptions associated with changes in technology, slower productivity gains, and higher inflation. SWIM2 industry output grows at a CAGR of 1.2%.

High Transport Cost Scenario: assumes the variable cost per-mile for highway transportation increases three-fold. The cause of such an increase is unspecified. It is treated as an increase in generalized network costs, which could be caused by higher fuel prices (all else being equal), mileage taxes, or emission taxes. The assumption is the higher costs are global, apply equally to all highway vehicles, and do not put Oregon at a competitive disadvantage. The higher transport costs were added to the Pessimistic scenario to reveal the added effects of higher transport costs when coupled with a weak economy.

Oregon Freight Plan "Business-As-Usual" Reference Scenario

The Freight Plan Reference scenario represents a forecast based on "business-as-usual" for Oregon. It serves as the basis of comparison for the other analysis scenarios. The Reference activity modeled using SWIM2 represents a likely future of Oregon activity given current trends and policies. Any forecast beyond a few years is subject to variability in the literal sense. However, such forecasts are quite useful when comparing system performance when specific changes occur, such as economic conditions or public policy. The scenarios can be used to reveal how long term trends are affected by change in terms of direction and magnitude, As such, they are helpful for "what if" analysis needed for long-range planning, such as the Oregon Freight Plan. The Reference scenario represents activity consistent with the most recent state forecasts of economic conditions, land use patterns, and transportation system investment. This scenario serves as a reasonable and understandable basis of comparison for other potential futures.

In order to create the Reference scenario, the following inputs were used:

- Employment figures are consistent with the "Oregon Economic and Revenue Forecast, March 2009" produced by the Office of Economic Analysis, Oregon Department of Administrative Services.[2]
- Outside of Oregon forecast is consistent with the IHS Global Insight forecast used for the Oregon March 2009 economic forecast. This forecast assumes the economy suffers no major mishaps over the next twenty-five years. It grows smoothly over time and follows a similar pattern of long-run activity observed over the past twenty years.
- Statewide commodity flows are consistent with the base year updated "Oregon Commodity Flow Forecast," October 2009[3].
- Transportation system maintenance, preservation and improvement assumptions are consistent with the current Statewide Transportation Improvement Plan (STIP), Metropolitan Transportation Improvement Plans (MTIP), and local capital improvement plans. Longer-term investment assumptions are consistent with the Oregon Transportation Plan (OTP), and Transportation System Plans (TSP.)
- Transportation costs are assumed to remain fairly stable over time in real [4]terms, consistent with IHS Global Insight national forecast.
- Urban growth boundaries maintain 20-year land supplies.
- Variation caused by business cycles is not forecasted, only average annual changes over time.

Further detail on the structure of the SWIM2 can be found in Appendix A. No significant changes to the SWIM2 structure were made for this analysis, only model input data were altered.

[2] https://www.oregon.gov/das/OEA/Pages/forecastecorev.aspx
[3] https://www.oregon.gov/ODOT/Planning/Pages/OMIP.aspx
[4] "real" in this sense means inflation adjusted

Industry Employment and Output

Table 1 illustrates employment shares by industry category across the state. Personal & Other Services cover the largest proportion of jobs across the state, with Retail Trade coming in at a close second. These two industries plus Finance, Insurance, Real Estate (FIRE), Business & Professional Services; and Health Services include over half of the state employment. Over eighty-five percent of the total state employment falls into the top 11 industry categories presented in Table 1. The statewide share of employment remains fairly stable over time across the industries; with the exception of Personal & Other Services increasing from 17% in year 2015 to 24% in 2035. Retail Trade has a slightly reduced proportion of employment over time, changing from 18% in year 2015 to 15% in year 2030.

Table 1. Statewide Employment by Industry: Percent of Total Employment

	Standard Industry Classification (SIC)	2015	2025	2035
1	Personal & Other Services & Amusements	17%	21%	24%
2	Retail Trade	18%	16%	15%
3	FIRE, Business & Professional Services	10%	10%	11%
4	Health Services	7%	6%	6%
5	Government	6%	6%	5%
6	Agriculture & Mining	6%	5%	5%
7	Other Durables	4%	5%	5%
8	Construction	6%	5%	5%
9	Lower Education	5%	5%	5%
10	Wholesale Trade	4%	5%	4%
11	Transport	4%	4%	4%
12	Electronics & Instruments	3%	2%	2%
13	Other Non-Durables	2%	2%	2%
14	Communications & Utilities	2%	2%	2%
15	Higher Education	2%	2%	1%
16	Accommodations	1%	1%	1%
17	Lumber & Wood Products	2%	1%	1%
18	Food Products	1%	1%	1%
19	Home-based Services	<1%	1%	1%
20	Pulp & Paper	<1%	<1%	<1%
21	Forestry & Logging	<1%	<1%	<1%

Table 2 presents economic activity with respect to the value of industry output statewide.[5] Oregon economic activity by output value is fairly concentrated in the Wholesale Trade and Distribution industry. The share of this industry's output is expected to grow to nearly a fourth of the total value of output. The top three largest industries in terms of industry output: Wholesale Trade; FIRE, Business

[5] The value of industry output is a common measure of economic activity, more commonly referred to as gross state product. For purposes of this memo, the term "industry output" will be used to differentiate between SWIM2 forecast output and other state forecasts for gross state product.

& Professional Services; and Retail Trade, make up about half of the total value of industry output for Oregon.

Personal Services has a much larger share of the state's employment than the state's industry output. This indicates a more labor-intensive, lower wage sector. Conversely, Wholesale industry's labor has a higher proportional impact on the state economy per employee.

Table 2. Statewide Industry Output by Industry: Percent of Total Output Value

	Standard Industry Classification (SIC)	2015	2025	2035
1	Wholesale Trade	16%	21%	23%
2	FIRE, Business & Professional Services	15%	15%	15%
3	Retail Trade	17%	15%	14%
4	Electronics & Instruments	9%	9%	8%
5	Communications & Utilities	5%	5%	5%
6	Personal & Other Services & Amusements	5%	5%	5%
7	Construction	5%	5%	4%
8	Government	5%	4%	4%
9	Health Services	4%	4%	4%
10	Other Durables	4%	3%	3%
11	Transport	3%	3%	3%
12	Lower Education	2%	2%	3%
13	Other Non-Durables	2%	2%	2%
14	Agriculture & Mining	3%	2%	2%
15	Food Products	2%	2%	1%
16	Pulp & Paper	1%	1%	1%
17	Lumber & Wood Products	1%	1%	1%
18	Accommodations	1%	1%	1%
19	Higher Education	1%	<1%	<1%
20	Forestry & Logging	<1%	<1%	<1%
21	Home-based Services	<1%	<1%	<1%

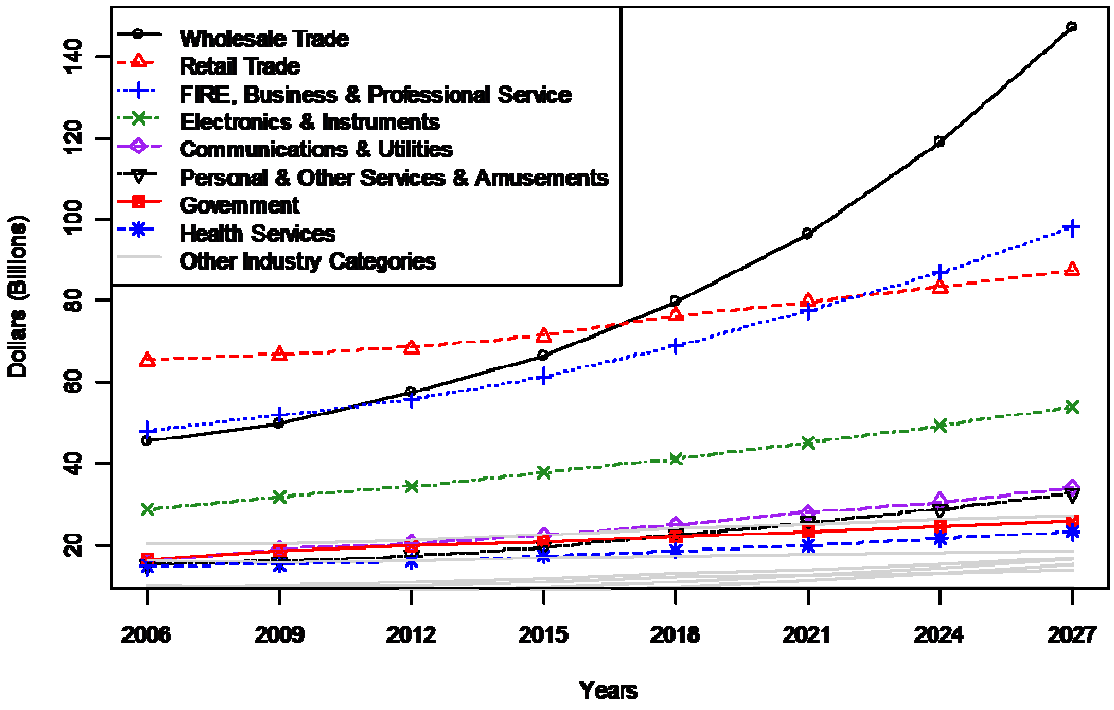
The next four largest industries include: Electronics & Instruments; Communications & Utilities; Personal & Other Services & Amusements; and Construction: which account for another 25% of total industry output value. The remaining fourteen industry groups account for the 25% of industry output by value.

Table 3 presents the top Oregon industries by employment and value of industry output for the state side-by-side. These eight industries represent over two thirds of the state employment and over three fourths of total industry output. These industries cover a broad set of freight needs, while the concentration of industries varies by Oregon location.

Table 3. Top Industries for Employment and Industry Output Value				
	Reference Scenario Year 2015			
	Share of State Employment	Rank	Share of Industry Output Value	Rank
Personal & Other Services & Amusements	17%	1	5%	6
Retail Trade	18%	2	17%	3
FIRE, Business & Professional Services	10%	3	15%	2
Health Services	7%	4	4%	9
Government	6%	5	5%	8
Wholesale Trade	4%	10	16%	1
Electronics & Instruments	3%	12	9%	4
Communications & Utilities	2%	14	5%	5
Total Statewide Share	67%		76%	

Figure 1 illustrates the change in the value of output by industry group over time for the largest industries of Oregon as presented in Table 3. These eight industry groups represent the top five industries by employment and industry output. The top three groups are Retail Trade; Wholesale Trade; and FIRE, Business and Professional Services. Retail Trade is expected to remain a large part of the Oregon economy into the future, but growth will be moderate. Wholesale Trade is expected to grow the fastest, and become the dominant industry in the future. FIRE, Business and Professional Services is expected to grow at a healthy rate and increase its future share of Oregon industry activity. Electronics and Instruments is expected to grow at a steady rate, similar to Retail Trade. The remaining four industries are expected to retain their share of activity into the future at moderate growth rates.

Figure 1. Industry Output Values Over Time



Some of these industries are more susceptible to business cycle fluctuations in industry output and employment than others. These patterns are revealed in the Optimistic and Pessimistic scenarios presented later in this memo, as well as at the regional level when results are reviewed for the ACTs.

Highway Travel Patterns

Table 4 presents the average truck travel times and distances reported out of SWIM2. Statewide travel patterns are expected to change, given the "business-as-usual" patterns continue into the future. Average truck tour[6] travel time is expected to increase about eight percent over the next twenty-five years, while tour travel distance is expected to decrease about ten percent. Congestion means truck tours are less efficient, serving fewer stops per tour, leading to larger than necessary increases in truck vehicle miles traveled (VMT) and vehicle hours traveled (VHT.) Auto travel patterns are expected to change as well. Average auto tour travel times are forecasted to increase thirteen percent, while average distance is expected to decrease about six percent. The rising travel times and decreasing distances indicate increasing congestion faced by highway users in the future, given Oregon continues with business-as-usual.

Table 4. Reference Scenario: Forecast Average Travel Times and Trip Distances

	Trucks		Autos	
	Average Tour Travel Time	Average Tour Distance	Average Tour Travel Time	Average Tour Distance
2012	12 hours	380 miles	30 minutes	15 miles
2027	13 hours	345 miles	34 minutes	14 miles
Change	8% increase	10% decrease	13% increase	6% decrease

Total statewide VMT are expected to rise at a CAGR of about two percent. Total statewide VHT are expected to rise at a CAGR of about three percent. Table 5 presents forecast growth for VMT and VHT along side major economic indicators Change in VMT closely follows economic activity, a pattern observed in past studies as well. The higher growth rate for hours traveled indicates the effect of increasing congestion.

Table 5. "Business-As-Usual" Forecast Compound Annual Growth Rates 2010 – 2035

	Statewide	Trucks	Autos
Vehicle Miles Traveled	2.0%	2.3%	1.9%
Vehicle Hours Traveled	3.1%	3.1%	3.1%
Industry Output	2.0%		
Employment	1.4%		
Population	1.4%		

Statewide VMT for trucks are expected to increase faster than auto VMT (2.3% vs. 1.9%), while VHT are forecasted to increase at a CAGR of 3.1% for trucks and autos alike. The difference in growth rates between miles traveled and travel time reveal the effects of increasing congestion.

[6] Travel is modeled as "tours" instead of trips to reflect the logistic behavior of trucks and autos. A tour starts at "home base," includes trips that start and stop within the tour, ending back at home base.

Reference Scenario Commodity Flow

Figure 2 illustrates commodity movement from, to and within Oregon for all freight modes, including exchanges with both foreign and domestic trade partners. Commodities outbound are produced in Oregon for sale elsewhere. Inbound commodities represent commodities used on Oregon production activity as well as goods for final sale. The largest commodity group by value is the Machinery, Instruments, Transportation Equipment and Metals category, for all three directions of movement. Outbound and internal flows of Food and Kindred Products are expected to maintain a steady rate over time, but inbound flows will increase. Other Miscellaneous goods include textiles, leather, furniture, mattresses, and miscellaneous manufactured products. This commodity group is expected to increase in the rate of inbound goods. Figure 2 reveals Oregon inbound goods are expected to grow faster than Oregon outbound goods. This may be caused by Oregon's relatively high level of economic activity in service industries relative to manufacturing.

Figure 2. Oregon Commodity Flow by Direction

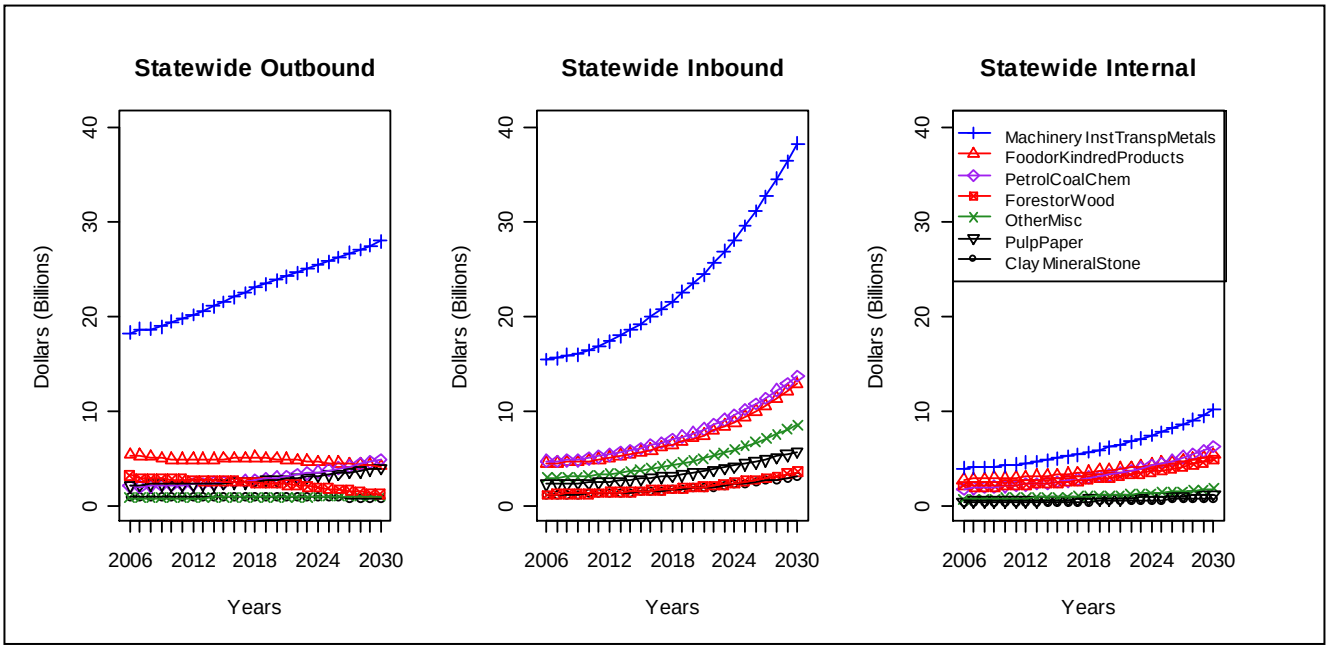
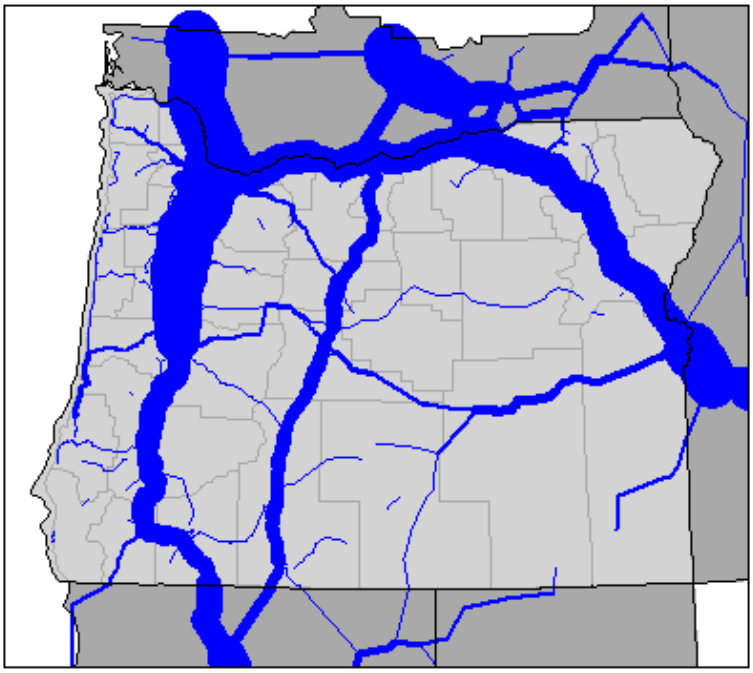


Figure 3 illustrates the relative flow of all commodities via highways in Oregon and into the bordering areas. The importance of the interstate corridors is evident. Figures 4 through 10 show average daily statewide highway (trucks) commodity flow by value and tonnage for years 2012 and 2027 for each of the seven commodity groups. Over three-fourths of commodity flow is via truck. Detailed description of commodity flows by truck and other freight modes, such as rail, air and water are provided in the Commodity Flow Forecast Update. Detailed listing of how commodities are classified and grouped is provided in Appendix B.[7] Note that the figures are not scaled relative to each other. Doing so conceals activity in the lower volume commodities.

Figure 3. Highway Commodity Flows

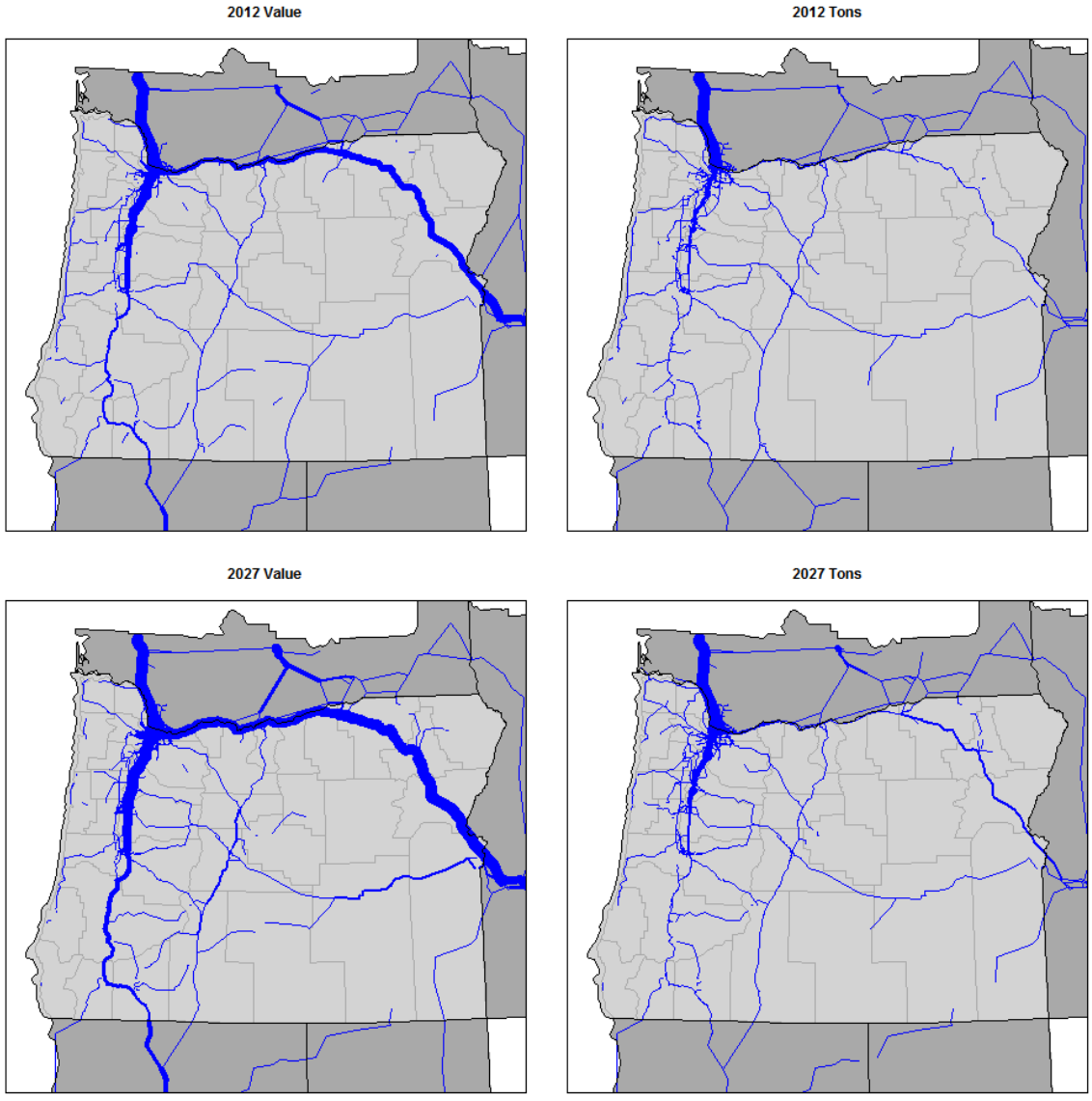


[7] SWIM2 uses the SCTG commodity classification, which is a little different from the STCC commodity classification used for the CFF. This report often uses 7 Commodity Groups, which are can be compared across classification systems. Further detailed description of the codes can be found in :SCTG Commodity Codes" booklet, 2007 Commodity Flow Survey, USDOT
https://www.bts.gov/archive_publications

Figure 4 presents highway flows for the Machinery, Instruments, Transportation Equipment and Metals commodity group. Commodities within this category include base metal in primary or semi-finished form; articles of base metal; machinery; electronic and other electrical equipment; motorized and other vehicles (including parts); transportation equipment; precision instruments and apparatus. This commodity group is the largest group by value for flows outbound, inbound and internal to the state (as previously shown in Table 2).

The value maps illustrate commodity flow in terms of total value of goods moving on an average day. The tons maps illustrate this same movement but in terms of weight in tons. The industries producing these commodities are predominantly located in the urban areas of the Willamette Valley, with some located in Bend, Astoria, and Medford. These goods are primarily trucked to Washington and Eastern states. It is evident in these flow maps the Machinery, Instruments, Transportation Equipment and Metals commodity group tends to be higher in value and lower in weight. Commodity flows by value predominantly move in the Willamette Valley corridor and on I-84. However, the heavier goods movement within this commodity group tends to flow in the Willamette Valley I-5 corridor and north of Portland. Future flows magnify this pattern, with the addition of a notable amount of additional flows on the southern portion of the I-5 corridor and I-84. Also evident is an overall increase in forecast

Figure 4. Machinery, Instruments, Transportation Equipment, Highway Flows

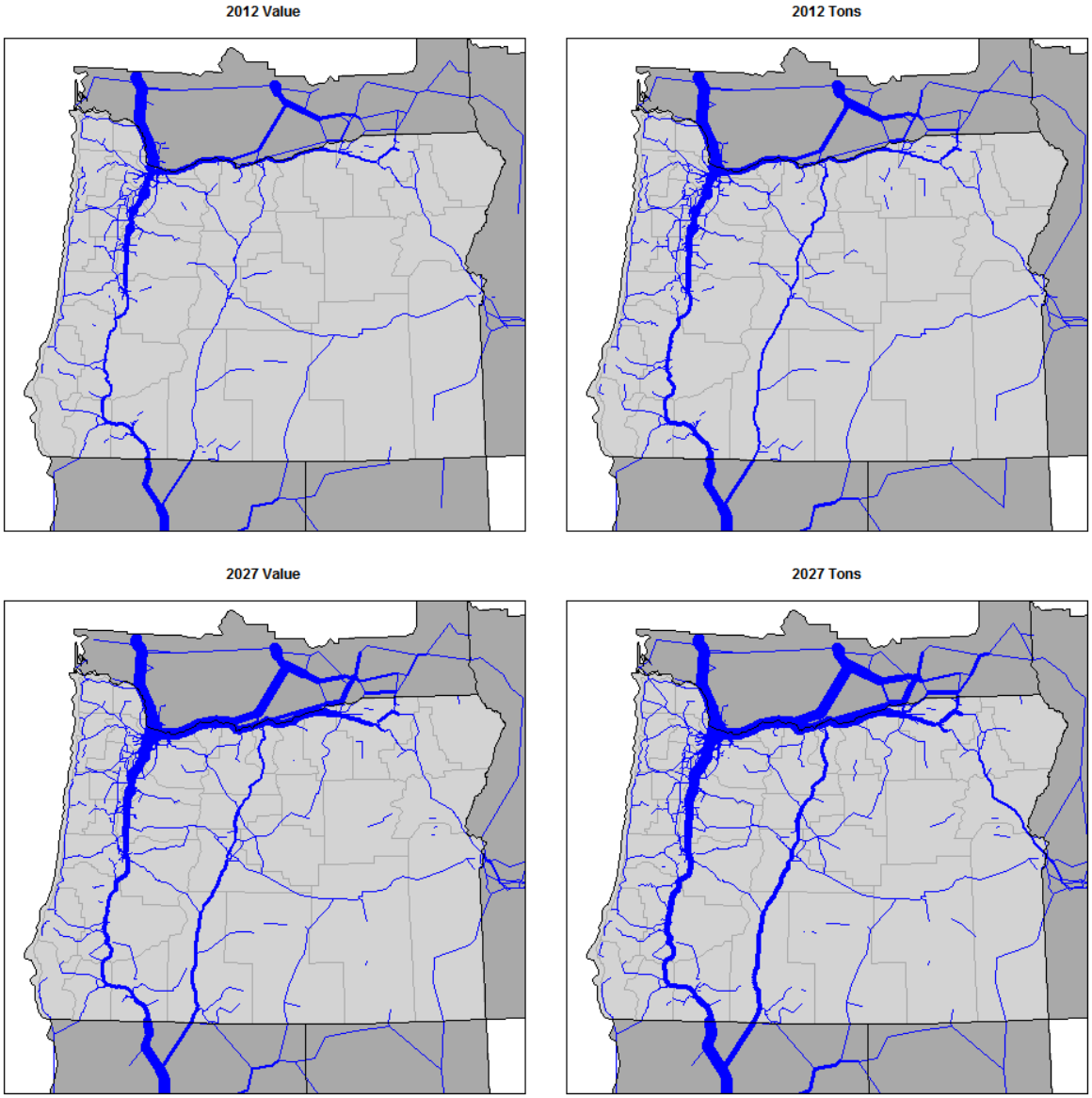


flows on the non-interstate highway system. These flows are forecast to increase in all three directions – outbound, inbound and internal.

Figure 5 presents highway flows for the Food and Kindred Products commodity group. Commodities within this category include live animals and fish; cereal grains; animal feed; meat, seafood; milled grain products; alcoholic beverages; and tobacco products. This group represents a wide range of products in terms of value and weight. As a group, the commodity represents a mid-range value per unit weight. Food and Kindred products are the second highest commodity group in terms of value for Oregon after Machinery.

Dominant production of these agriculture and food products is in the eastern and central areas of the state, as well as northwest Willamette Valley to Astoria. The flow maps reveal the most active highway corridors include the north-south I-5 corridor, particularly in the Willamette Valley area and southern central Washington State. However, there is considerable flow toward California from I-5 and US-97, as well as movement from the Portland area on I-84 to I-82 heading north into Washington. This pattern holds into the future and reveals even more commodity flows are forecast for this industry

Figure 5. Food and Kindred Products Highway Flows



in Oregon. Outbound flows are expected to remain the same level into the future, while inbound and internal flows are expected to increase a little in the future.

Figure 6 presents highway flows for the Petroleum, Coal, and Chemicals commodity group. Goods classified in this group include crude petroleum; gasoline and aviation fuel; fuel oils; pharmaceutical products; fertilizers; and plastics and rubber. This commodity group represents a mix of goods, and is characterized as a medium value-to-weight commodity. Commodity flow is predominantly from outside the state and flows in from the north on I-5 to the Willamette Valley corridor. There are flows east of Portland on I-84 and heading north into Washington State via US-97 and I-82.

Forecast flows for this commodity group appear to follow the current patterns of flow, with more flows moving south on I-5 from the Medford area into California as well as the southern portion of the Willamette Valley I-5 corridor between Salem and Eugene. The flows between Salem and Eugene show up on the value map and less on the tonnage map, implying the increased commodity flows are likely from the higher value, lower weight categories within the commodity group, such as pharmaceutical products. Statewide flows are expected to increase in the future at fairly low rates for outbound and internal, but inbound flows are expected to increase noticeably, at the same rate as Food and Kindred Products.

Figure 6. Petroleum, Coal and Chemicals Highway Flows

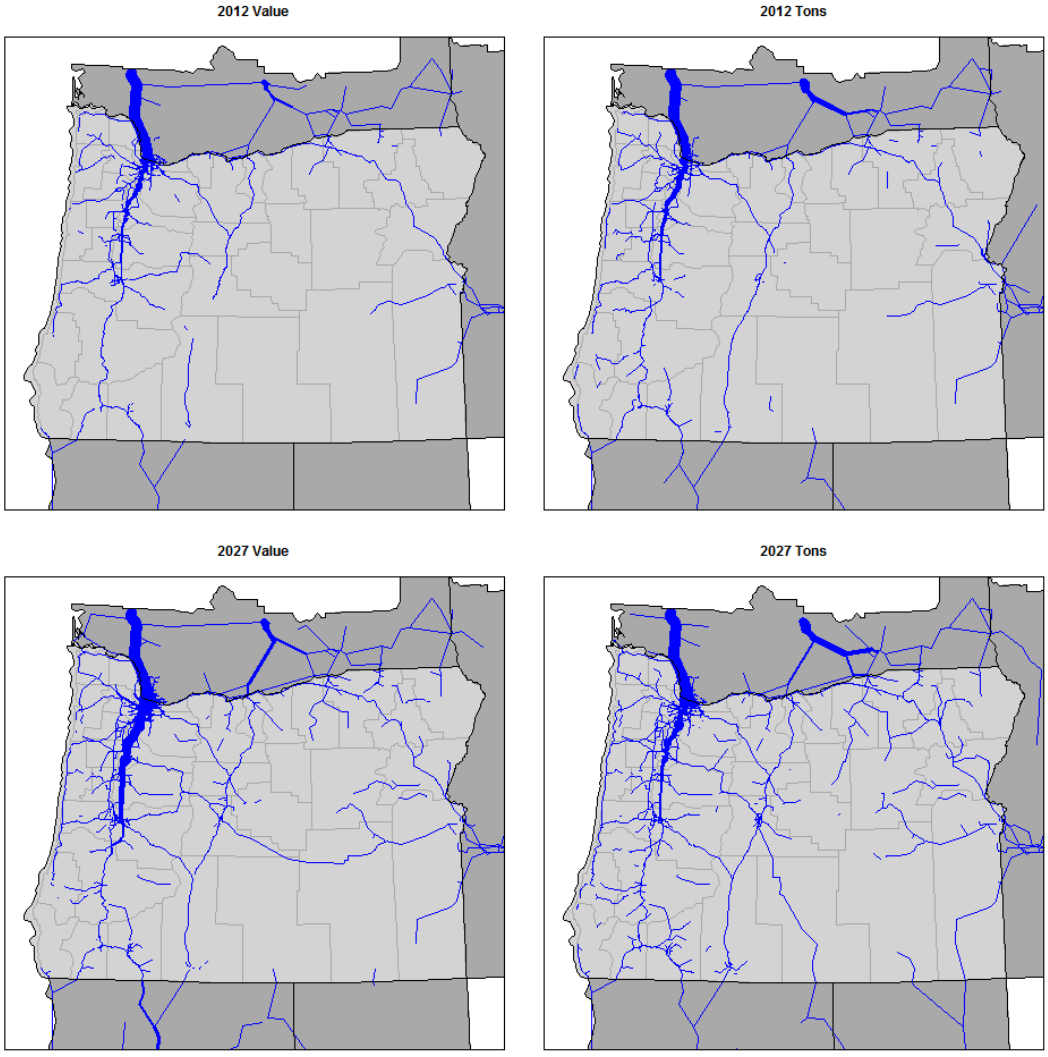


Figure 7 presents highway flows for the Other/Miscellaneous commodity group. Goods classified within this group include textiles; leather, articles of textiles or leather; furniture; mattresses; and miscellaneous manufactured products. Flows of this commodity group range across the entire state. More flows are concentrated in the Willamette Valley corridor of I-5. There is a notable high-value flow of this commodity on I-84. Lower value flows occur within the southern half of the I-5 corridor. Large lower value flows are forecast for this commodity group on the entire I-5 corridor, especially the southern portion. Significantly more high-value flow is forecast on the I-84 corridor, especially between the I-82 connection and Oregon/Idaho boundary. Statewide this commodity group is not expected to increase in outbound flows. However, inbound and internal flows are forecast to increase across the state.

Figure 7. Other Miscellaneous Goods Highway Flows

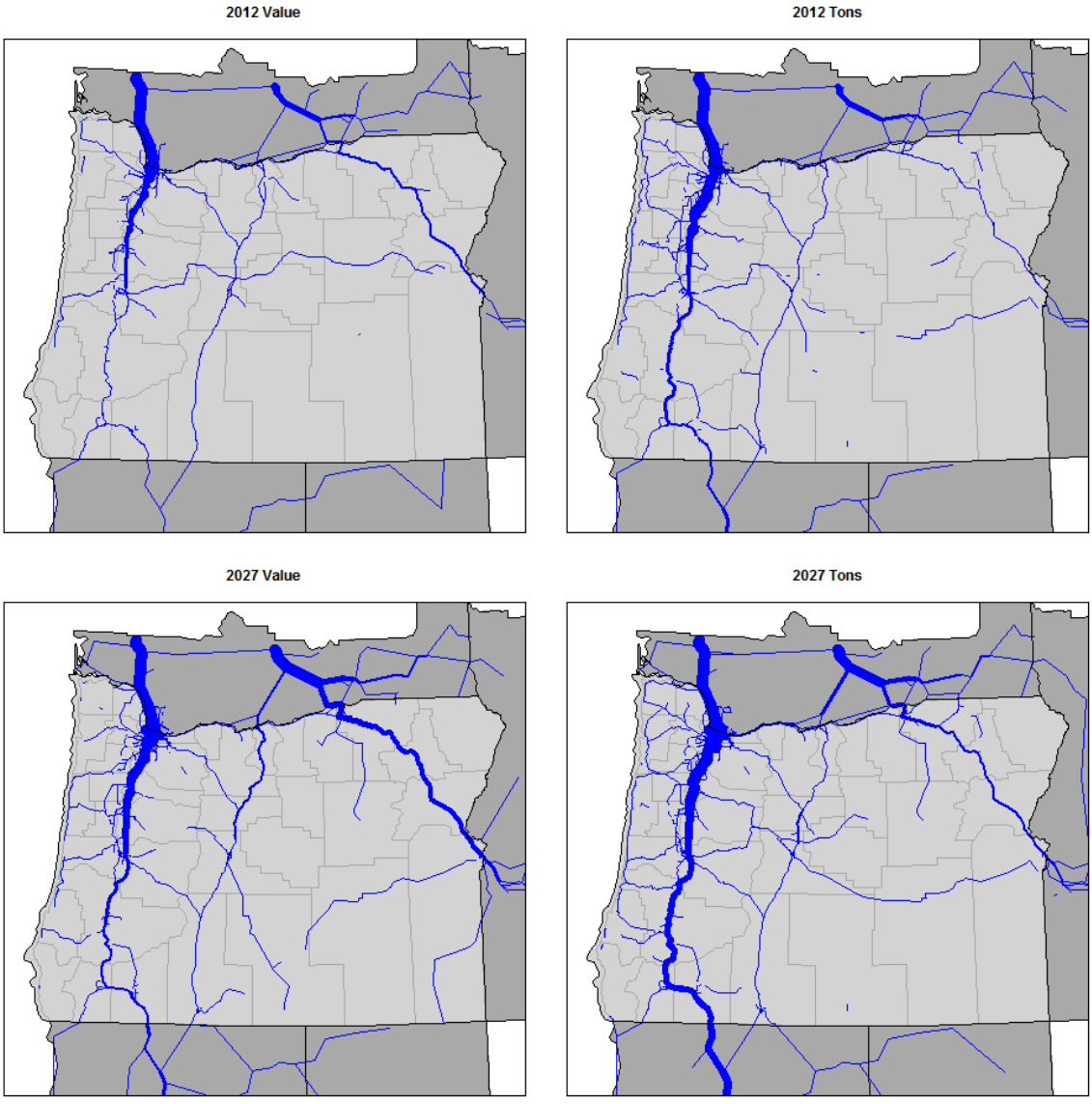


Figure 8 presents truck flows for the Pulp and Paper Products commodity group. Goods classified in this group include newsprint; paperboard; paper or paperboard products; and printed products. Northwest Oregon is a heavy production area for these products. Truck flows of this commodity group are concentrated in the upper Willamette Valley corridor of I-5 and further north into Washington State. The value maps reveal there is movement for this commodity dispersed across a wide range of locations in the state. Less movement is revealed when viewing flows by weight, as indicative of low value-to-weight goods. However, southern I-5 reveals some lower value-to-weight flows, while I-84 exhibits some higher value-to-weight flows in this commodity group. The central and southern ACTs have notable flows related to this commodity group, which is carried across the state. Statewide growth in this commodity category is expected to grow a little, although this is one of the more slowly growing groups. Flow is expected for grow for all directions of movement, outbound, inbound and internal.

Figure 8. Pulp and Paper Products Highway Flows

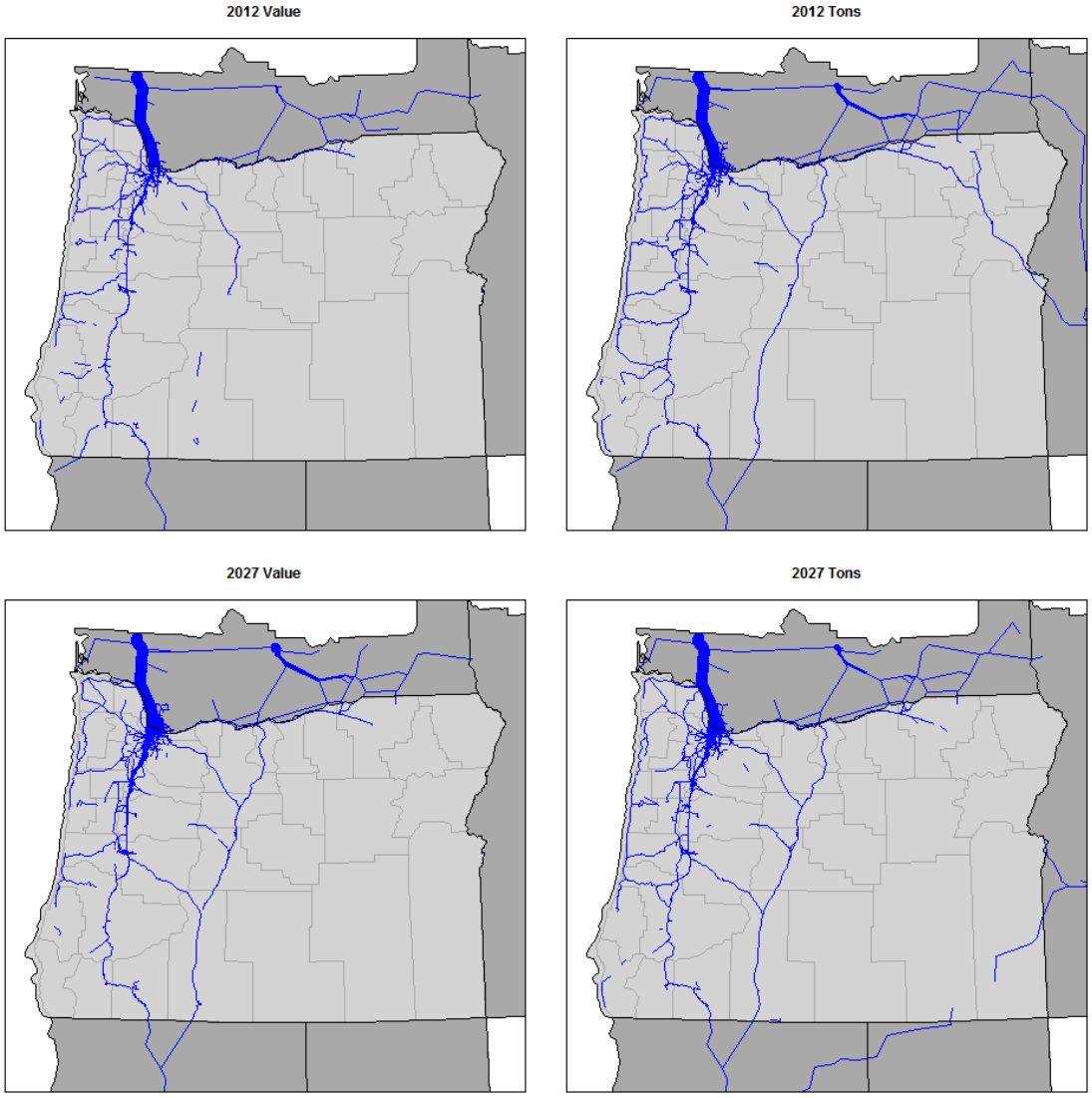


Figure 9 presents flows for the Forest or Wood Products commodity group. Goods classified within this group include logs and other wood in the rough and wood products. Production of these goods is concentrated in the southeast corner of the state. Whether you view this commodity by value or weight, the corridor of I-5 between Roseburg and Portland accommodates a large proportion of the daily flows for this commodity group, with links to the coast and the west side of the Cascades. There is significant amount of flow from the Cascades on US-20 toward Salem. The flow is more pronounced when looking at movement in tons, since this commodity group typically has a low value-to-weight ratio. Outbound flows are expected to remain about the same over time. Some increase in inbound flows is expected, but internal flows are anticipated to significantly increase at rates similar to Food and Kindred Products. This forecast flow is evident in the year 2027 flow maps which illustrate increased flows in the Willamette Valley corridor and continuing south on I-5 to the city of Roseburg. Flows between Salem and the Cascades increase in magnitude on the US-22 corridor, as well as on a segment of US-26 linking US-97 to the Portland area. There are noticeable increases in flows from several corridors leading to I-5 from the Coast Range, including US-26 west of Portland and OR-18 through Yamhill county.

Figure 9. Forest or Wood Products Highway Flows

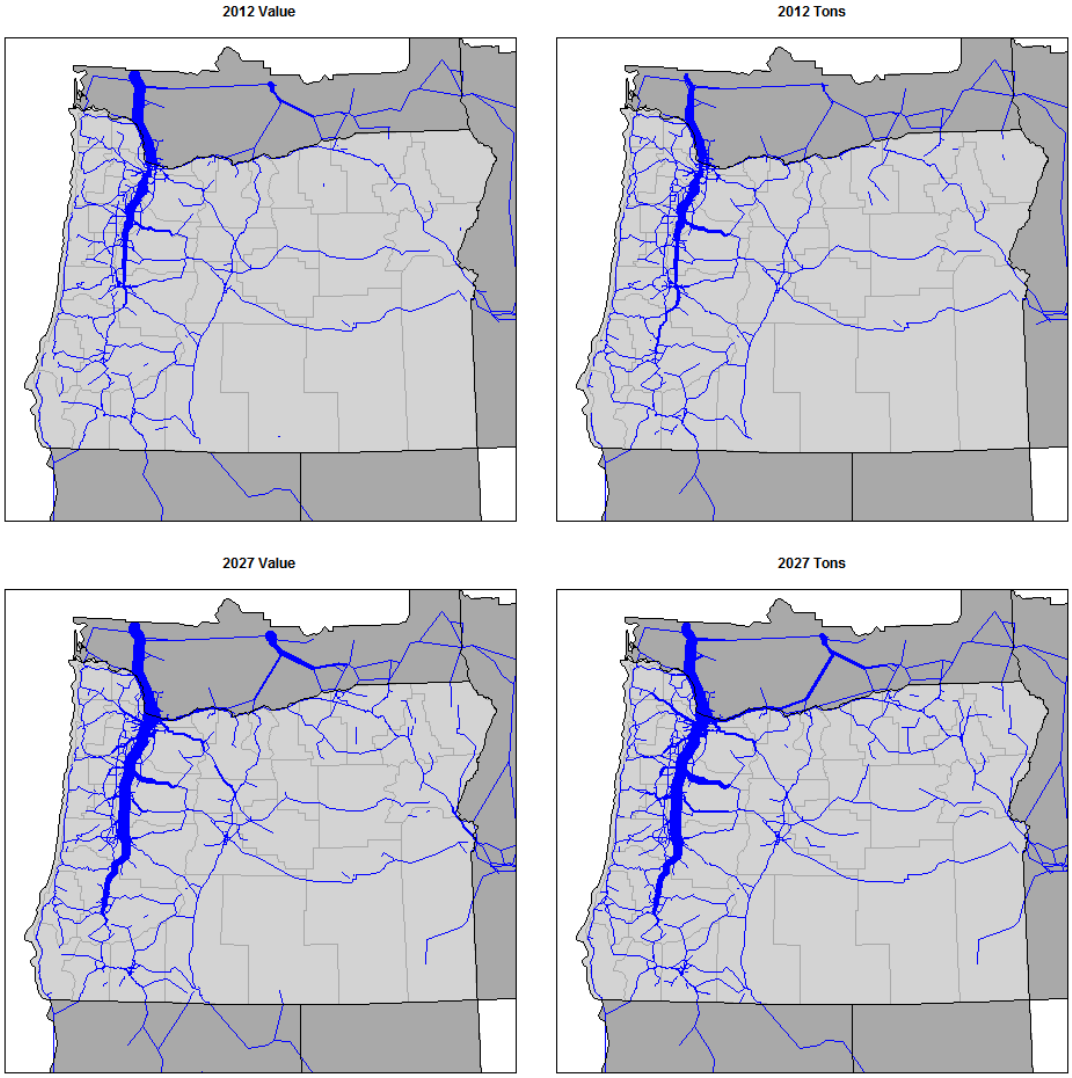
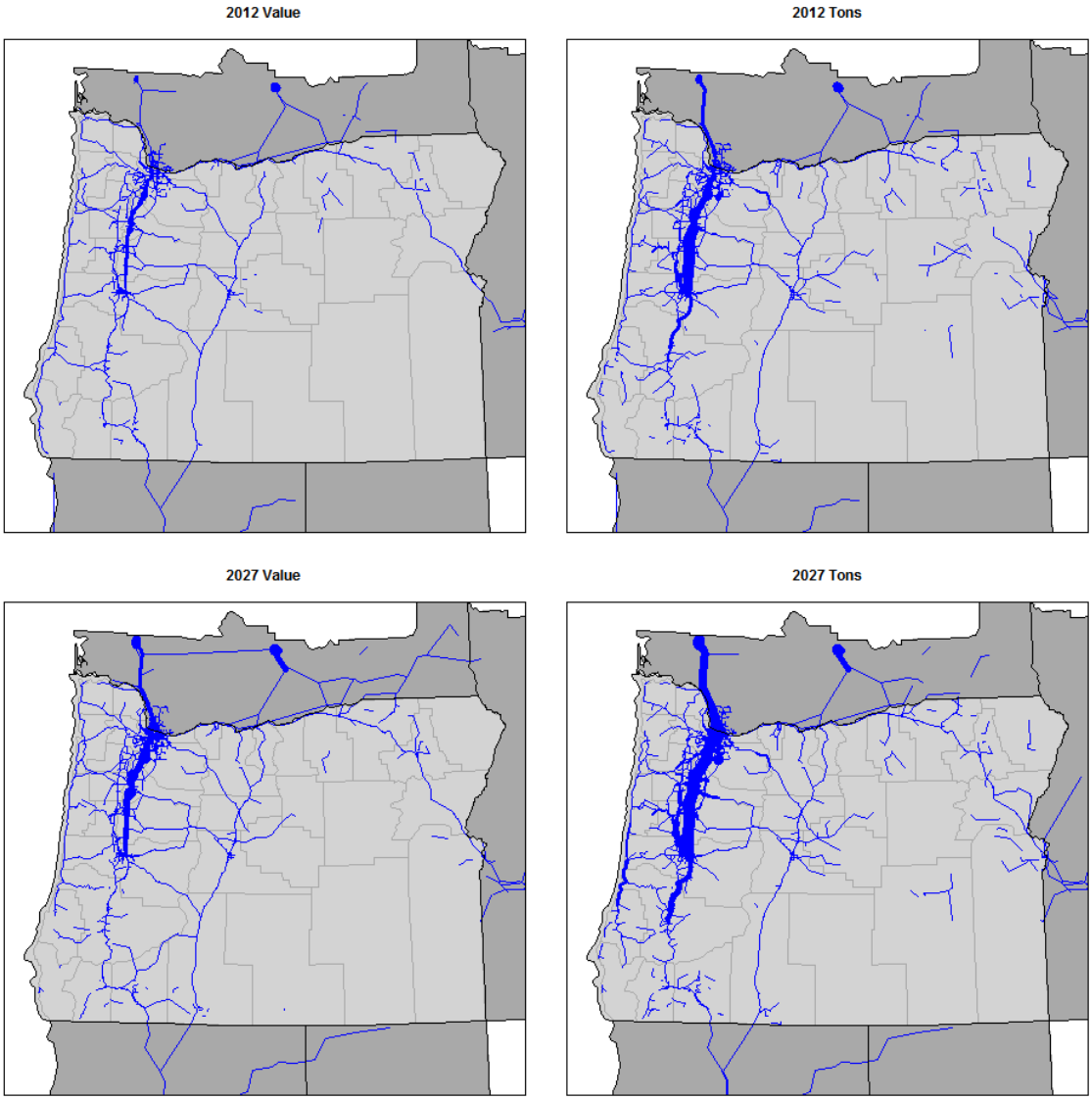


Figure 10 presents flows for the Clay, Mineral and Stone commodity group. Goods classified within this group include monument or building stone; natural sands; gravel and crushed stone; nonmetallic minerals; metallic ores and concentrates; and nonmetallic mineral products. This commodity group overall is a low-value high-weight group. This has pavement maintenance and preservation implications as the number of heavy trucks increases on specific highway segments, as well as the need for awareness of the effects of weight restrictions on bridges that could disrupt commodity movement and transport costs. Very little is outbound flow, of which the higher value, lower weight goods appear to dominate. The greatest share of flows is in the Willamette Valley corridor, although there is measurable flow on the southern half of I-5 between Eugene and Roseburg. These patterns are expected to hold into the future, revealing overall increases in forecast commodity flow for this group. The year 2027 map reveals increased flow by weight for sections of US-26, US-22, OR-99, and US-101.

Figure 10. Clay, Mineral and Stone Highway Flows



Oregon Freight Plan Analysis Scenarios

Freight is the Oregon economy in motion. In order to evaluate future risk to the freight system, several scenarios were created to observe regional differences and statewide patterns associated with future economic unknowns. SWIM2 was altered to create hypothetical future conditions in order to create analytical "bookends," from which to evaluate a range of reasonably possible long-run conditions. The purpose of these scenarios is to provide information to decision makers formulating freight policy to serve the needs of Oregon freight movement now and into the future. It should be noted that the model results do not reflect the impact of the economy and high transport costs on mode split. Estimating these impacts requires additional analysis.

Three hypothetical scenarios were produced using SWIM2, in addition to the Reference scenario:[8]

- Optimistic economic forecast
- Pessimistic economic forecast
- High transport costs

The Optimistic and Pessimistic forecasts provide a reasonable range of economic conditions that Oregon could experience over the next twenty-five years. Oregon industries rely on the transportation system for obtaining the factors of production needed to do business and get their goods to market. When economic activity changes, so do the demands placed on the transportation system. The High Cost scenario adds additional transportation costs to the Pessimistic scenario to reveal the long-range implications associated with this area of risk.

Several evaluation metrics were formulated to reveal the effects of changing underlying economic conditions at the statewide and regional level. These metrics were used to compare conditions in the analysis scenarios relative to the Reference scenario. Performance was evaluated with respect to:

- Transportation System – miles traveled, hours traveled, trip costs, commodity flow
- Economic Welfare – industry output, commodity value, and production costs

Analysis results were evaluated statewide as well as regionally, based on the twelve Oregon Area Commissions on Transportation (ACT) geographic boundaries. Variations in national and statewide economic conditions result in different regional conditions. Such differences arise from unique regional industry mix and commodity flows, which can be obscured when conditions are evaluated at the statewide level. Results at the ACT level are presented in a section after the statewide results.

Industry Employment and Output

Figure 11 illustrates statewide employment growth from all four scenarios. As with industry output, the blue x's representing results from the High Cost scenario are hidden under the red crosses of the Pessimistic scenario, indicating little statewide change despite regional differences. Oregon industries with employment most affected by economic uncertainty are discretionary services (Personal and Other Services; Accommodations) and some manufacturing (Other Durables; Other Non-Durables).

[8] A fourth scenario to evaluate growth in key Oregon industries was planned for this analysis. However, after reviewing the Optimistic forecast data, the differences between the planned industry scenario and the Optimistic scenario were too slight to warrant a separate SWIM2 scenario run. The information desired for the industry scenario is provided by the Optimistic scenario.

The employment levels of Electronics and Instruments; Communications and Utilities; Lumber and Wood Products; Food Products; Forestry and Logging, and Government and Education sectors are more stable amidst economic uncertainty.

Figure 11. Percent Change in State Employment by Industry from 2006 to 2027, All Scenarios (including percent of total employment by industry)

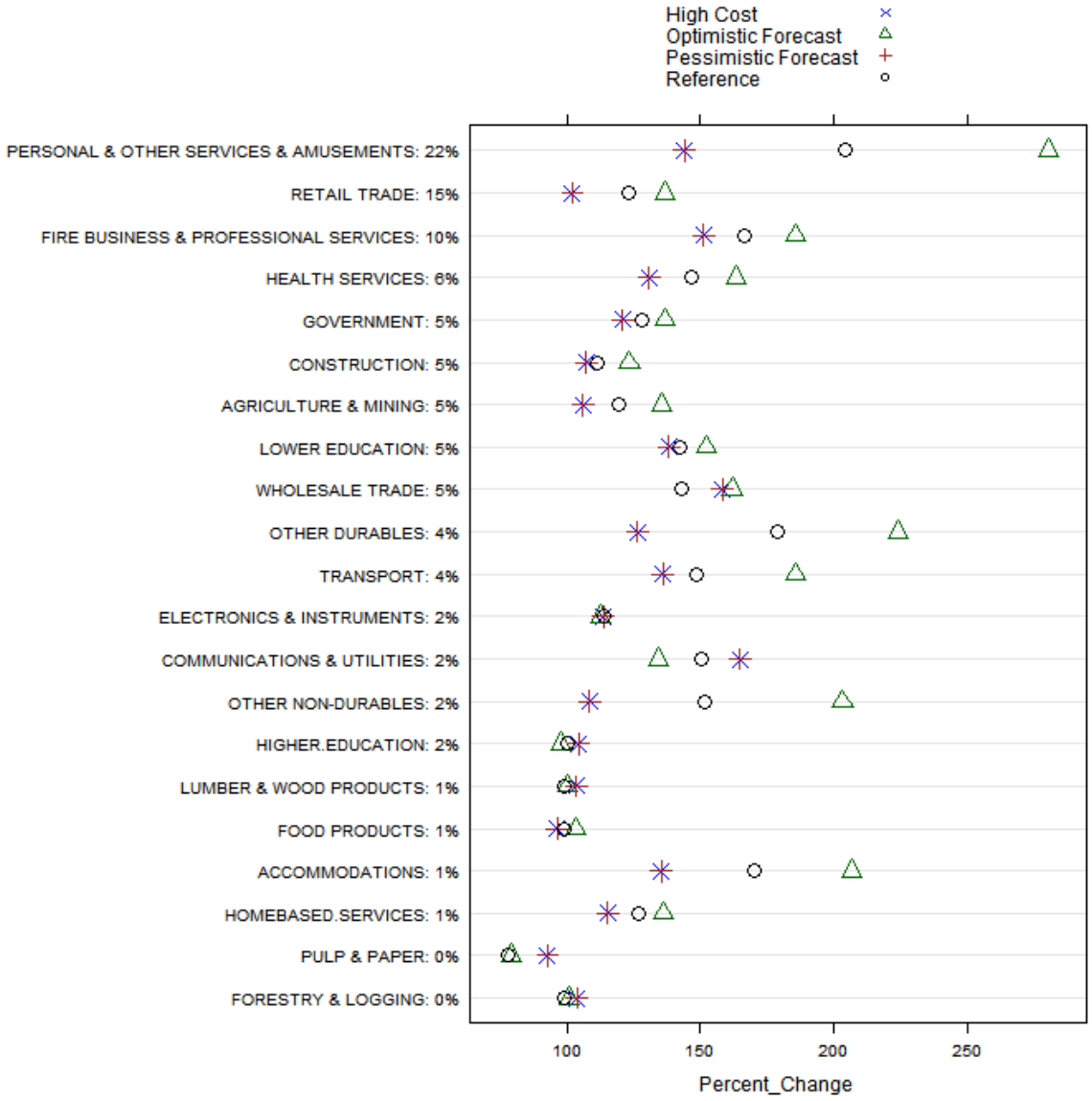
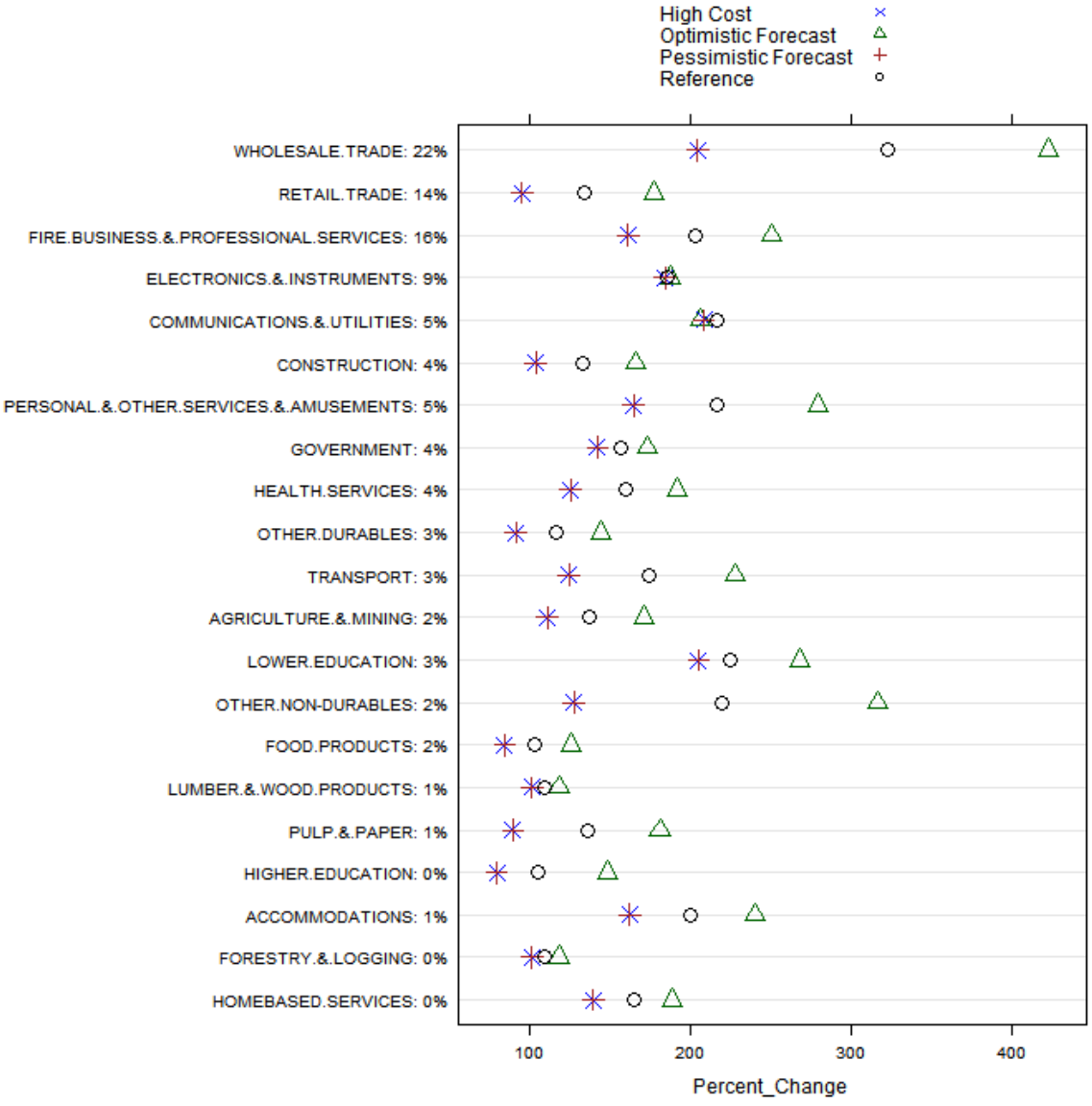


Figure 12 illustrates statewide industry output growth for all four scenarios. The blue x's representing results from the High Cost scenario are hidden under the red crosses of the Pessimistic scenario. This indicates higher transportation costs do not significantly affect statewide industry output relative to the underlying economic conditions, although region allocation of these industries across the state varies somewhat as higher travel costs lead to activity concentrations. Oregon industries most affected by economic uncertainty are Wholesale Trade, Other Non-Durables; Personal and Other Services, and Transport Services. In contrast, Electronics and Instruments; Communications and Utilities; Lumber and Wood Products; Forestry and Logging; and Food Products industry output are very stable in the midst of economic uncertainty.

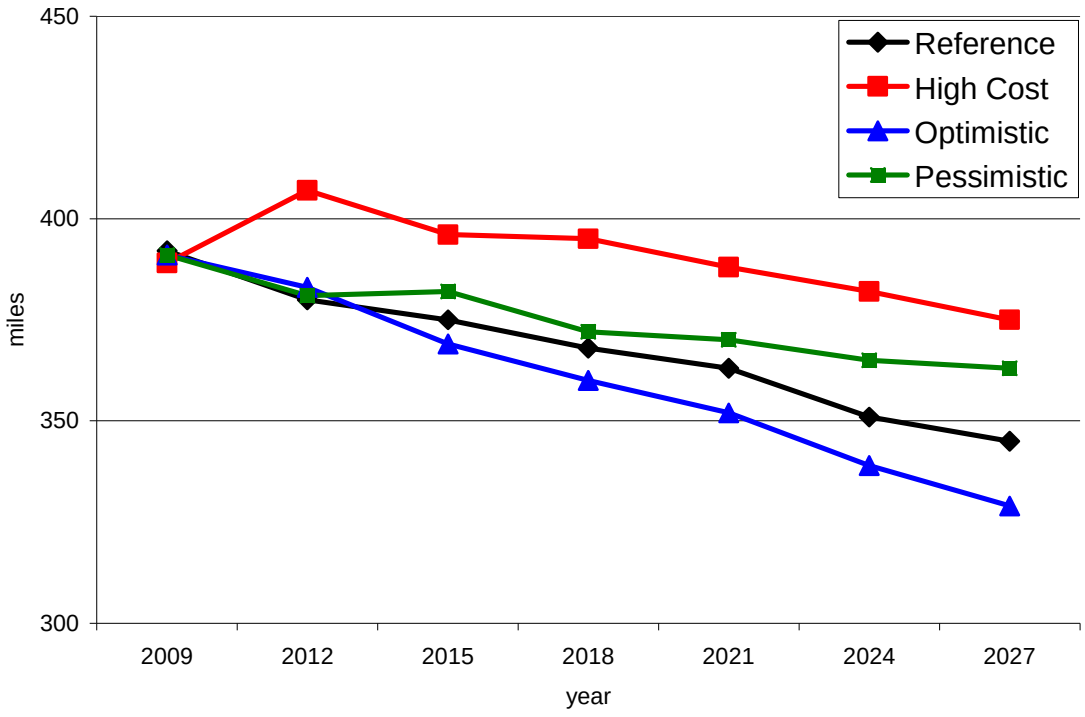
Figure 12. Percent Change in Industry Output by Industry from 2006 to 2027, All Scenarios (including percent of statewide output by industry)



Highway Travel Patterns

Truck movements within SWIM2 represent how trucks link trips over the course of a typical day, loading and off-loading cargo at several stops that are linked together as tours. We find that average truck tour distances decrease over time as congestion increases. The rate at which the decline occurs is affected by economic conditions. Figure 13 presents the forecast average truck tour distances for all four scenarios. The Reference scenario reveals the current average tour distance of 390 miles is expected to decline about twelve percent, to 345 miles. When the economy is strong, the average decline is larger, about sixteen percent. When the economy is slower, the average truck tour distances do not decline as quickly, especially when additional transportation costs are imposed on highway users, the distances are more stable over time. This illustrates how firms adapt to increasing congestion. When congestion is present, more trucks are put on the road in order to deliver the same quantity of goods within reliable delivery times to meet customer needs. While additional trucks improve service to customers, it exacerbates congested conditions and leads to overall increases in VMT. Indeed, looking at the VMT growth rates by scenarios, the lowest overall VMT growth occurs under the High Transport cost scenario. The limited congestion in this scenario allows longer and fewer tours, delivering more cargo per tour, meeting delivery times using fewer trucks, leading to the lowest overall VMT growth. Conversely, congestion leads to shorter tours to meet delivery times on a less reliable system, number of trucks used increases as well, resulting in higher total truck VMT.

Figure 13. Average Truck Tour Travel Distance



Truck travel time also changes under different economic conditions. Figure 14 illustrates forecasted average truck tour travel times for all four analysis scenarios. Under the "business-as-usual" Reference scenario, the average travel time is expected to increase about twelve percent, from about 11.6 hours to 13 hours. This pattern is more pronounced when the economy is strong, with expected travel times increasing eighteen percent, to 13.8 hours. When the economy is muted, travel times do not change as much. Travel times are forecast to increase about seven percent over twenty years in the Pessimistic scenario. The High Cost scenario, average tour time is forecasted to rise less, about three percent. Truck hours of travel are reduced when economic activity is lighter and even more so when the transport costs per mile are higher. VHT increases the least over time in the High Transport Cost scenario, where longer tours/fewer trucks more efficiently serve the demand for moving goods. In the more congested Optimistic and Reference scenarios, VHT increases significantly more than VMT.

Figure 14. Average Truck Tour Travel Time

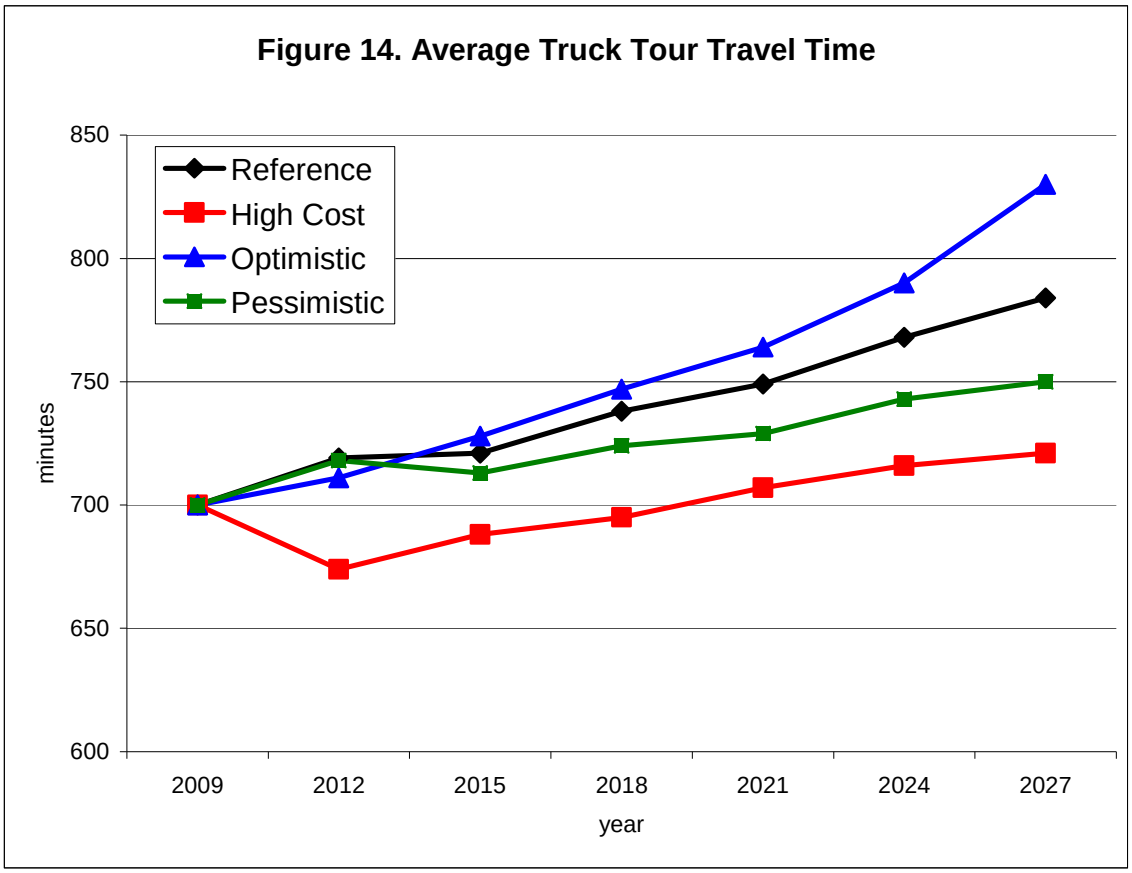


Table 6 illustrates the difference in compound average growth rates for VMT and VMT for all four scenarios. The relationship between economic growth and congestion is evident, as is the effect of higher transportation costs.

Table 6. Compound Average Growth Rates for Truck Vehicle Miles Traveled and Vehicle Hours Traveled: All Scenarios

Scenario	Truck Vehicle Hours Traveled	Truck Vehicle Miles Traveled
High Cost	1.4%	1.1%
Pessimistic	1.7%	1.3%
Reference	3.1%	2.3%
Optimistic	1.2%	3.0%

Auto tour distances and travel times are also responsive to different economic conditions. Table 7 provides auto tour travel statistics for all four scenarios. Auto tours show little variation in length among the four scenarios, with the exception of the High Cost scenario. Average auto tour distance starts out at 15 miles and is forecasted to be 14 miles by 2027 for the Reference, Optimistic, and Pessimistic scenarios. Auto tour distance is significantly reduced when there are higher transport costs, dropping to an average of 11 miles per tour.

Auto tour travel time does change. Table 7 reveals auto tour travel time increases when the economy is strong and decreases when economic activity is more muted, as observed with trucks. Increased per-mile transport costs combined with slower economic conditions result in a noticeable drop in travel times. Total VMT drops when the economy is slower, freeing up capacity and reducing congestion, resulting in faster travel times.

Table 7. Auto Tour Travel Statistics: Distance, Time, Compound Average Growth Rates (CAGR) of Auto VMT and VHT - All Scenarios

		Year 2027 by Scenario			
	Year 2010	Reference	Optimistic	Pessimistic	High Cost
Tour Distance	15 miles	14 miles	14 miles	14 miles	11 miles
Tour Travel Time	30 minutes	34 minutes	36 minutes	32 minutes	25 minutes
VMT CAGR	-	3.1%	4.3%	2.0%	0.6%
VHT CAGR	-	1.9%	2.8%	1.2%	-0.1%

Slower economic conditions alone have little effect on reducing average auto tour distance, but a measurable effect on travel time (half the increase in travel time of the Reference). Tour characteristics do not significantly change, but the number of tours drops due to decreased economic activity. Adding a three-fold increase in per-mile transport costs reduced tour distance, more than twenty percent below the Reference tour distance. Only a small portion of that reduction is attributable to reduced economic activity. Households and businesses are able to respond to changing economic conditions by relocating. This results in densification of urban areas as households choose homes closer to their workplaces and other areas of activity requiring travel, such as shopping.

As with trucks, change in overall auto VMT and VHT is reduced when per-mile transport costs increase. In the case of autos, the model suggests change in overall VMT and VHT could remain close to current levels with the introduction of a three-fold per-mile cost increase.

Analysis Scenarios Commodity Flow

The Optimistic and Pessimistic forecasts provide a reasonable range of economic conditions that Oregon could experience over the next twenty-five years. Oregon industries rely on the transportation system for obtaining the factors of production needed to do business and get their goods to market. When economic activity changes, demands placed on the transportation system change as a result. The High Cost scenario adds additional transportation costs to the Pessimistic scenario to reveal the long-range effects of this additional area of risk.

Figures 15, 16, and 17 illustrate the difference in highway commodity flows across the state for the three analysis scenarios compared to the Reference. The Reference scenario is represented by the blue layer.

Figure 15 presents the Optimistic scenario highway commodity flows in a green layer placed under the blue Reference flows in order to reveal the magnitude of the difference beween the two scenario flows. One can quickly see there is a noticeable difference between the two scenario flows in the I-84 corridor in terms of value and tonnage. Beyond that, the differences by value are spread across the state on highways from the coast and a few in southern Oregon. The differences between scenarios by weight are evident in the I-5 corridor south of Salem and a few state highways leading to the higher volume highways.

Figure 15. Commodity Flows for Optimistic Scenario Relative to Reference Scenario

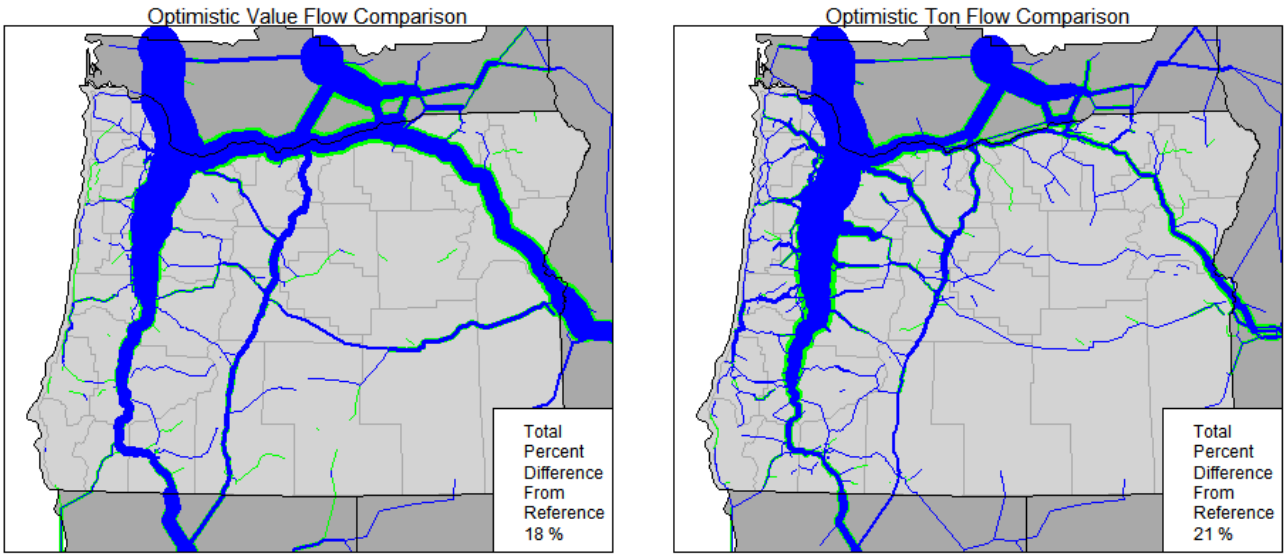


Figure 16 presents the Pessimistic scenario flows in a similar manner. Once again, blue represents the Reference scenario flows and red the Pessimistic scenario flows. Overall, the Pessimistic scenario shows slightly larger declines (-22% in value, -26% in tonnage) than the Optimistic scenario gains (18% in value, 21% in tonnage) in commodity flow. Looking at the difference in flows by commodity value, the greatest reduction in flows is on I-84 between Portland and The Dalles. Pessimistic scenario flow reductions become less pronounced as commodities disperse onto other highways into Washington State, further east on I-84 and onto US97 through central Oregon. The southern

Willamette Valley and further south on I-5 also reveal reduced flows by value under this Pessimistic scenario, which become more pronounced near the California border and on into California. When looking at flow differences by weight, the two most pronounced differences are on the mid-state section of I-5 between Salem and Roseburg and I-84 between Portland and the City of The Dalles, the same areas demonstrating increased flows in the Optimistic scenario. This indicates commodity flows on these sections are more responsive to economic conditions.

Figure 16. Commodity Flows for Pessimistic Scenario Relative to Reference Scenario by Value and Tonnage

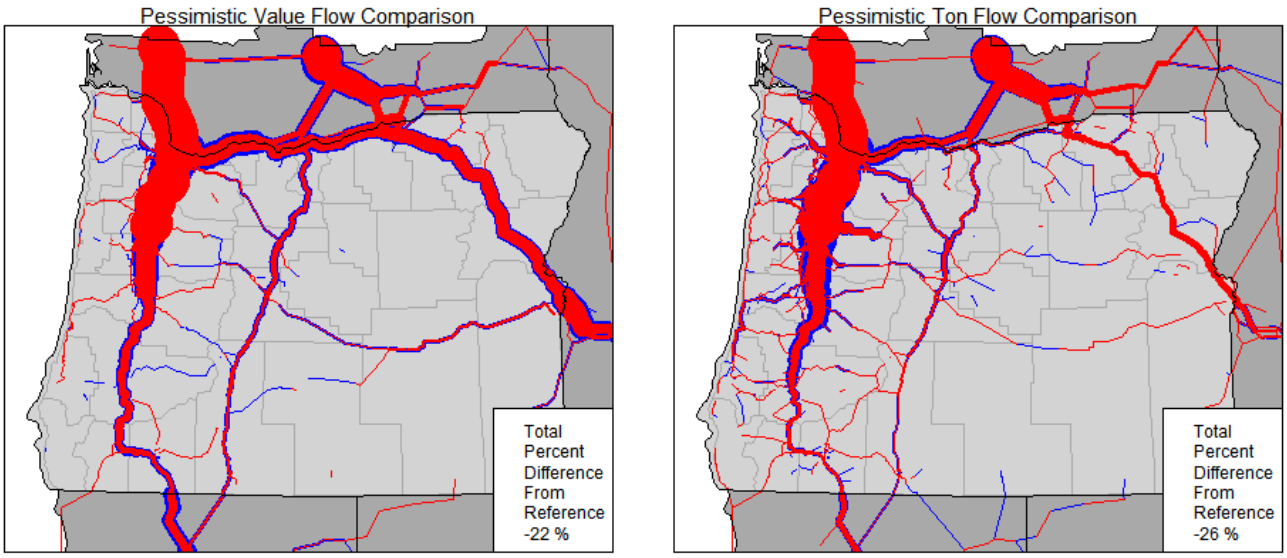


Figure 17 presents the High Cost scenario flows. This difference map looks very similar to the Pessimistic scenario map. The higher transport costs added to the slower economic conditions result in shifts in the location of economic activity, resulting in reduced flows in the I-84 corridor, US26 between Portland and US97, and US97 between I-84 and Bend. Higher transport costs induce higher concentrations of activity in the urban areas of the Willamette Valley. Clearly economic conditions affect commodity flow patterns. However, even when the economy slows, commodity flows are significant.

Tables 8 and 9 illustrate how the share of commodity flows by group may vary under different economic conditions statwide. The tables also reveal the relative rank of commodities in terms of value and weight. For example, Forest or Wood Products represent the largest commodity group by weight (37%), but has a small share of flows by value (5%.) Machinery, Instruments, Transportation Equipment, and Metals is the largest commodity group by value (49%), but has a small share of flows by weight (4%). Comparing the shares across all four scenarios reveals the commodity shares by weight are stable under different economic conditions, varying no more than one percentage point. The exception is Machinery & Instruments, which has a stable absolute value of flow under all scenarios, but the statewide share drops when the economy is strong as other commodity production picks up. When the economy is slower, this commodity group's share increases as other commodity activity drops. This is largely offset by slight declines in a number of other areas, particularly the large Forest or Wood Products commodity group, where a one-percent change translates into large tonnages, and the reduced demand for other largely inbound raw materials such as the Petroeum,Coal and Chemicals.

Figure 17. Commodity Flows for High Cost Scenario Relative to Reference Scenario by Value and Tonnage

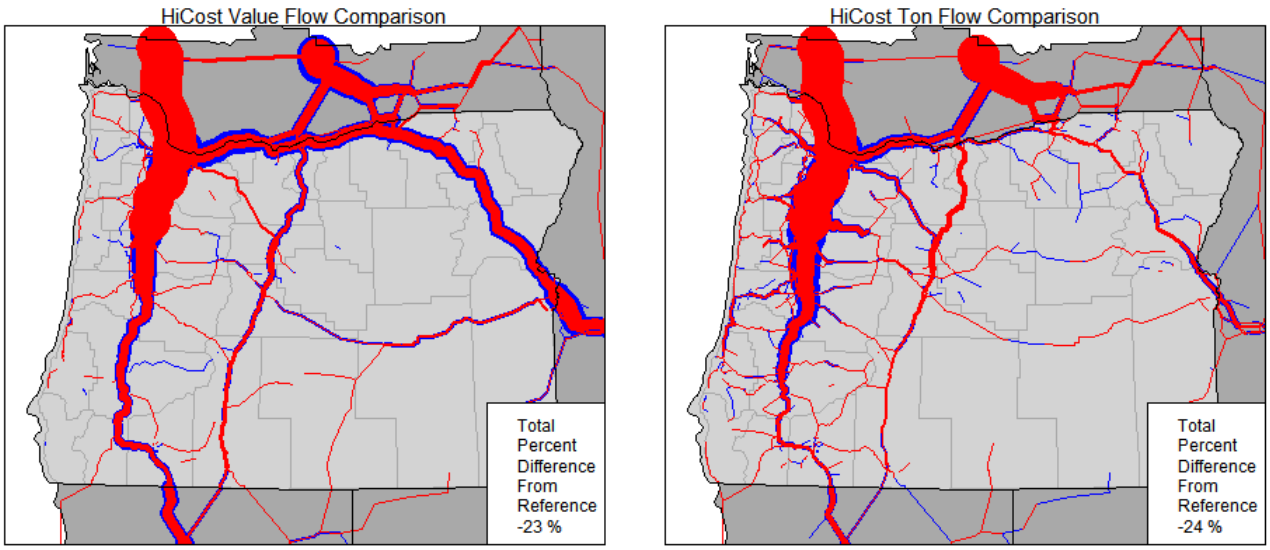


Table 8. Share of Total Statewide Commodity Flow by Weight for all Four Analysis Scenarios*

	Reference	High Cost	Pessimistic	Optimistic
Forest or Wood Products	37	36	37	36
Petroleum Coal Chemicals	25	26	24	25
Clay Minerals Stone	16	16	16	16
Food & Kindred Products	12	12	12	13
Machinery, Instruments, Transp Equip, Metals	4	5	5	4
Pulp Paper Products	4	3	3	4
Other Misc	2	2	2	2

* columns may not sum to 100 due to rounding

Table 9. Share of Total Statewide Commodity Flow by Value for all Four Analysis Scenarios*

	Reference	High Cost	Pessimistic	Optimistic
Machinery Instruments, Transp. Equip. Metals	49	55	54	46
Other Misc	17	14	14	18
Food & Kindred Products	12	12	12	13
Petroleum, Coal, Chemicals	10	8	9	11
Pulp, Paper Products	6	5	5	7
Forest, Wood Products	5	5	5	5
Clay, Minerals, Stone	1	1	1	1

* columns may not sum to 100 due to rounding

Figures 18 – 24 illustrate the differences in commodity flows on Oregon highways for seven commodity groups across the three analysis scenarios for year 2027. Each figure displays the difference from the Reference scenario for commodity value and tonnage. The first row of maps presents results for the High Cost scenario. The second row presents results for the Pessimistic scenario and the third row for the Optimistic scenario. Results in red indicate a reduction in flows compared to the Reference scenario, while green represents an increase in flows relative to the Reference scenario. The lower right corner of each map reports the statewide percent difference compared to the Reference scenario in terms of value adjusted by lane miles of travel and absolute valuel. This provides a sense of magnitude of the difference between scenarios.

Figure 18 presents commodity flows for Machinery, Instruments, Transportation Equipment and Metals for the three analysis scenarios. This commodity group is a high-value, low-weight group. For both the Pessimistic and High Cost scenarios, flows are reduced significantly, despite less decline in growth than other commodities as indicated by its ranking in Table 7. The decreased flows with respect to the Reference are illustrated in red. The greatest reduction in flows in terms of value is on I-5 north of Portland and in the Willamette Valley. But, there are also reductions along the I-84 corridor. I-5 North of Portland realizes the largest declines in terms of value in these scenarios. In absolute terms, the decreased commodity flow for this group is 14% less than the Reference flows for the Pessimistic scenario and 15% less for the High Cost scenario.

The differences between the Pessimistic and High Cost scenario are interesting to note. Added transportation costs results in greater reductions in commodity flow along the I-84 corridor, but less of a reduction in flows on I-5 south of the Willamette Valley. Higher transportation costs result in more flows on smaller interior state highways shown as green on the High Cost Value Flow Comparison map, but less of a difference from the Reference scenario in flow along the central US97 highway. A large segment of southern US97 has more commodity flow for this group relative to the Reference in terms of comodity value. There is a larger decline in tonnage flows along US20 running east of Bend when transport costs are higher. These changes likely reflect consolidation of shipping activity in urban areas, with less intercity flows, except between major urban centers, such as Bend and the Willamette Valley.

The Pessimistic scenario results indicate increased flow for this commodity group on US199 from Grants Pass to the California border and several state highways from I-5 to the coast as shown in green. A slower economy results in reduced flows for this commodity for all of US97 in central Oregon and several highways connecting to I-5, including US20 across the state toward Idaho.

Overall, commodity flows for this group increase by an absolute amount of 9% in the Optimistic scenario. There is increased commodity value on the I-84 corridor east of Portland and increased tonnage on I-5 north of Portland. There is a general pattern of increased commodity flow across Oregon highways, but there are some decreased flows relative to the Reference scenario. I-5 south of Salem realizes a small net reduction in flows all the way to the California border, indicating a shift from trade to South of the state to trade with Northern (low-value goods) and Eastern (high-value goods) markets. Flows also decrease on US26 west of Portland and east of Portland all the way to US97. Also, flows increase on US199, even more than they did in the Pessimistic scenario. On the I-84 corridor east of Hermiston, there are small decreases in commodity flow by weight, when the net difference by value is positive for the entire corridor.

Figure 18. Difference in Commodity Flow for Analysis Scenarios Compared to Reference Scenario: Machinery and Instruments, Transportation Equipment, and Metals

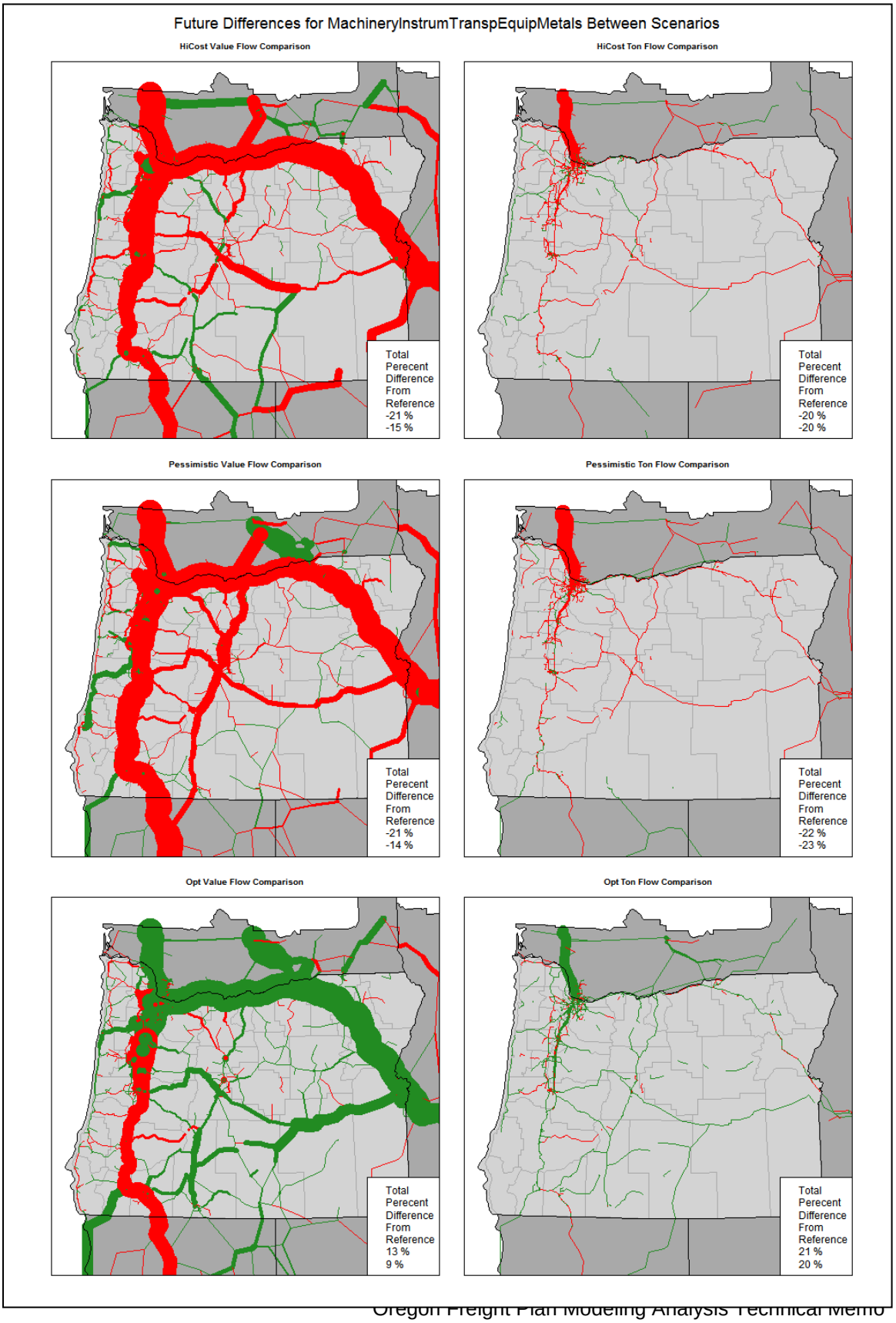


Figure 19 presents commodity flows for Food and Kindred Products for the three analysis scenarios. For both the High Cost and Pessimistic scenarios, flows are reduced across the state, although retaining its existing share of freight flows in the smaller economy. The greatest reduction in flow is on I-5 north of Portland and east of Portland on I-84 up to the Hermiston area, approaching the connection with I-82 heading north into Washington. There are also reductions in flow on US97 heading north toward I-82, as well as other routes, demonstrating some reduction in north-bound commodity flows for this group. These patterns are very similar in terms of commodity value and weight, with some greater reduction in flows on US97 by weight. Flows further south on I-5 and US97 show an larger reduction in flows relative to the Reference scenario. In terms of absolute value, the statewide reduction in flows for this commodity group is 24%.

There are no obvious differences in flow patterns for Food and Kindred Products when higher transport costs are included. This implies the greatest influence on this commodity group is economic conditions.

The results are quite the opposite for the Optimistic scenario, which represents a 27% increase in commodity flow in terms of absolute value with respect to the Reference scenario. Commodity flow increases on the main corridors of I-5 and I-84. The largest increases occur north of Portland on I-5, I-84 between Portland and I-82 via US 97 and the I-84/I-82 intersection at Hermiston. There are significantly more flows in the Willamette Valley I-5 corridor which continue further south and increase in size as the California border is approached. There are increased flows to a lesser extent on US20 east of Bend and US97 from I-84 to Bend, as well as highways connecting the Oregon coast to the I-5 corridor. The increased flows are noticeably greater in magnitude when looking at flows by weight on the I-5 corridor south of Portland. Interestingly, the Pessimistic scenario shows a decline on US97 that is not mirrored as gains in the Optimistic scenario.

Figure 19. Difference in Commodity Flow for Analysis Scenarios Compared to Reference Scenario: Food and Kindred Products

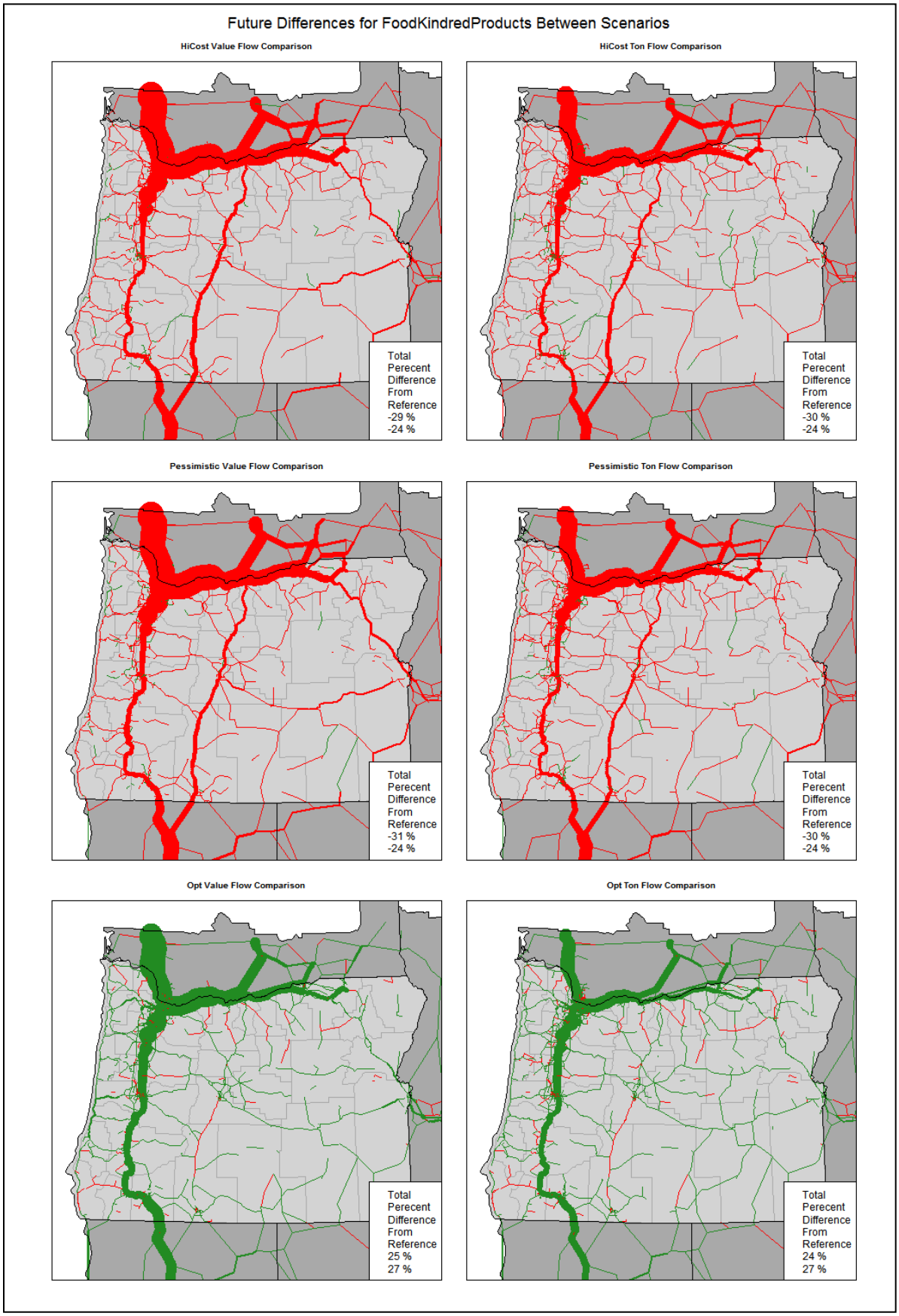


Figure 20 presents commodity flows for Other Miscellaneous Products for the three analysis scenarios. For the High Cost and Pessimistic scenarios, commodity flow is reduced across the state. The greatest reduction in flow is north of Woodburn on I-5 and into Washington State, with some reduction also on I-84 between the intersection with I-82 and the Idaho border. The reduction in flow is more pronounced by weight on the I-5 corridor in the upper Willamette Valley area starting in the vicinity of Salem. The addition of higher transport costs to a lagging economy resulted in greater reduction in flows on I-84 and US97 north of Bend and less reduction in flows on the I-5 corridor. Slower economic conditions do not alter the share of statewide commodity flows for this group; it remains 14% by value and 2% by weight (as presented earlier in Tables 6 and 7.) However, lane miles of commodity flow by value for the High Cost scenario is 37% lower than the Reference scenario, while the Pessimistic scenario is 30% lower. This demonstrates the freight consolidation effect, which reduces total truck VMT when transportation costs are higher.

The Optimistic scenario results in a greater share of commodity flows for this group in terms of value, rising to 18% of the statewide commodity flows. The most significant increased flows are on the I-5 corridor starting near Salem and continuing north to Portland and into Washington State. There are large increases in flows in terms of weight on the entire I-5 corridor. There is some additional flow on I-84, but the greatest increase in terms of value is between I-82 and LaGrande and in terms of weight between Portland and I-82. This commodity group represents a range of products in terms of value and weight which creates this variation in the weight and value flow patterns. Further insight on these patterns will be provided in the ACT profiles.

Figure 20. Difference in Commodity Flow for Analysis Scenarios Compared to Reference Scenario: Other Miscellaneous Goods

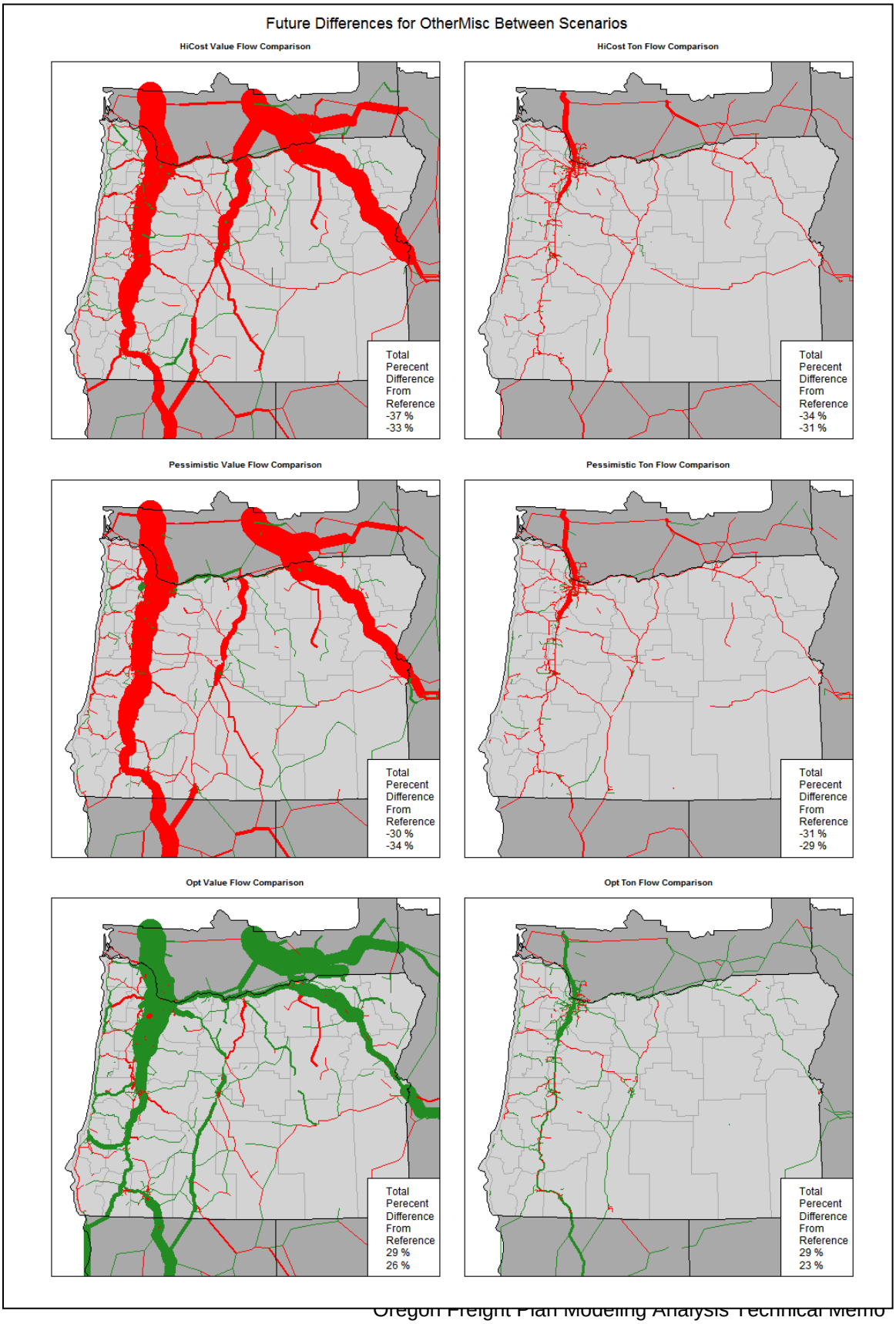


Figure 21 presents commodity flow for the Petroleum, Coal and Chemicals group. The fuels component of this commodity group is largely inbound flows, rising and falling in step with the overall economy, and higher-value chemicals. Evaluating this group in terms of value reveals flows are reduced on the I-5 corridor, especially in the Willamette Valley corridor when the economy contracts. The addition of higher transport costs reduces flows north of Portland on I-5 even more than reduced economic activity alone. The results are different when evaluating this group in terms of weight.

Reduced economic activity, as represented in the Pessimistic scenario, results in significant reduction of flow by weight north of Portland on I-5 and some reduction on I-5 in the Willamette Valley and further south. However, there is increase flow by weight on the I-84 corridor between the I-82 intersection near Hermiston and the Idaho border. When higher transport costs are added to a slow economy, as represented in the High Cost scenario, the results are quite different. Willamette Valley flows on I-5 are mostly higher than the Reference scenario, except for some segments within the corridor. The higher flows on I-84 are no longer present when higher transport costs exist, but US97 experiences increased commodity flow with higher transport costs.

Commodity flows from Idaho north to Washington via the I-84 corridor until intersecting with I-82. These flows increase somewhat for the heavier commodities within this group during slower economic times, likely reflecting the competitive advantage of other states relative to Oregon. Note that flows do not increase in terms of value on this corridor. For the purpose of the Freight Plan, the actual response of this commodity is less important than the realization that the freight plan strategies must support the economic resilience of Oregon firms and national freight flows.

The Optimistic scenario results in greater flows on I-5 north of Portland, with increased flows to a lesser extent on I-5 south of Portland for the Willamette Valley corridor both in terms of value and weight. The magnitude of flow increase is greater in terms of commodity value, than weight. In absolute terms, flows are 9% higher than the Reference scenario in terms of value and 20% higher in weight. Flow increases on the I-84 corridor between I-82 and Idaho in terms of weight, but very little in terms of value. Once again, this likely reflects activity of other states shipping relatively heavy, low value commodities within this group.

Figure 21. Difference in Commodity Flow for Analysis Scenarios Compared to Reference Scenario: Petroleum, Coal, and Chemicals

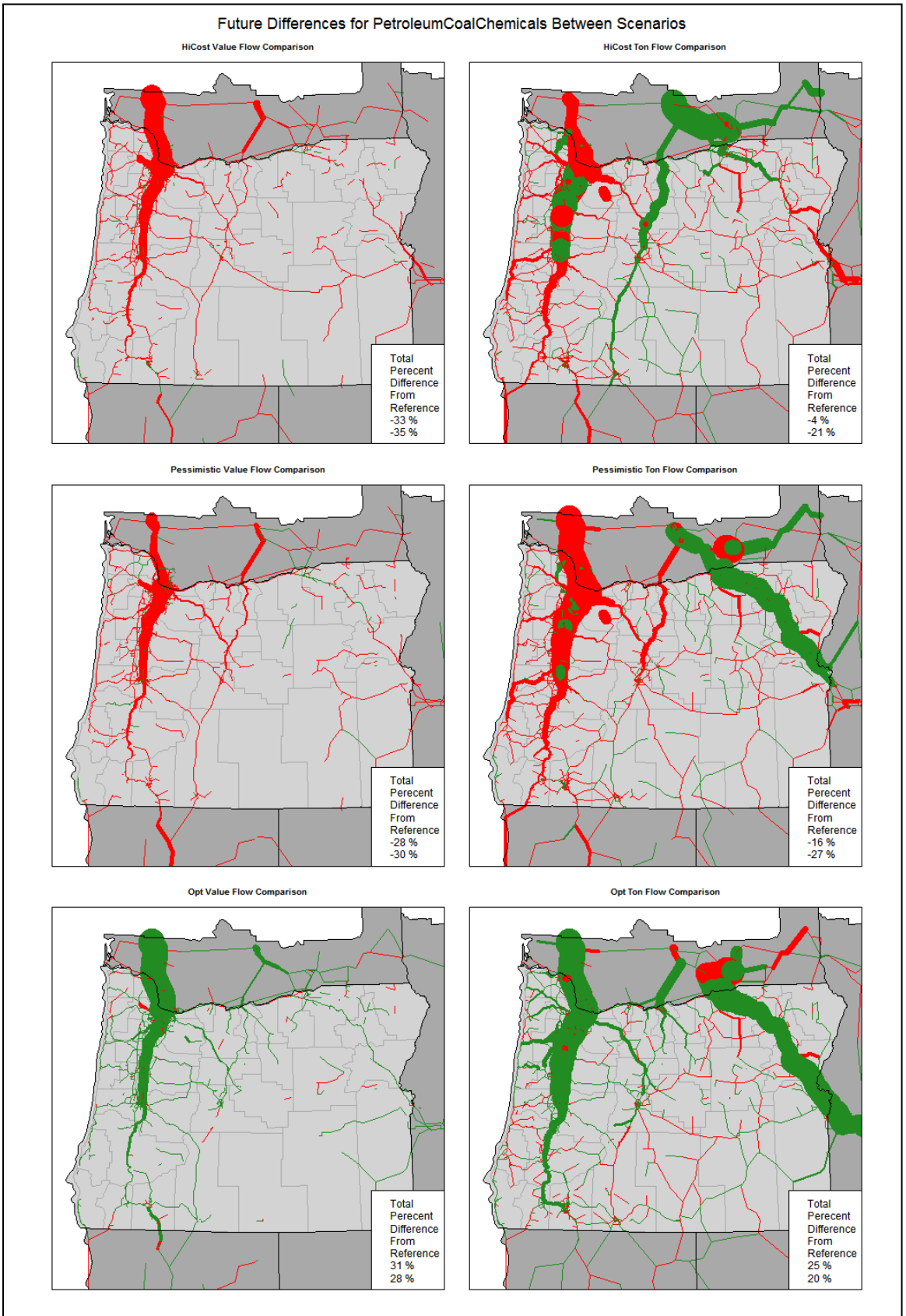


Figure 22 presents commodity flow for Pulp and Paper Products group. When economic activity slows, the greatest reduction in commodity flow for this group occurs north of Portland on the I-5 corridor. There is some reduction in flows on the I-5 corridor south of Portland to a lesser extent. Reductions can be seen on US 97, US 26 east of Portland and OR58 from Eugene to US97. A small increase in flow appears on OR31 in the Pessimistic scenario, but disappears when higher transportation costs are incurred. There are fairly small differences between the High Cost flows and the Pessimistic flows, indicating economic conditions have more influence on this particular commodity than transportation costs.

The Optimistic scenario mirrors the Pessimistic scenario. Additional flow occurs north of Portland on the I-5 corridor, with increases on the I-5 corridor south of Portland as well to a lesser extent. There is also more flow on US97 and US26 north of Bend in terms of weight, not so in terms of value. The source of such differences is illuminated further in the ACT Profile section, where production activity and flows are discussed by ACT.

Figure 22. Difference in Commodity Flow for Analysis Scenarios Compared to Reference Scenario: Pulp and Paper Products

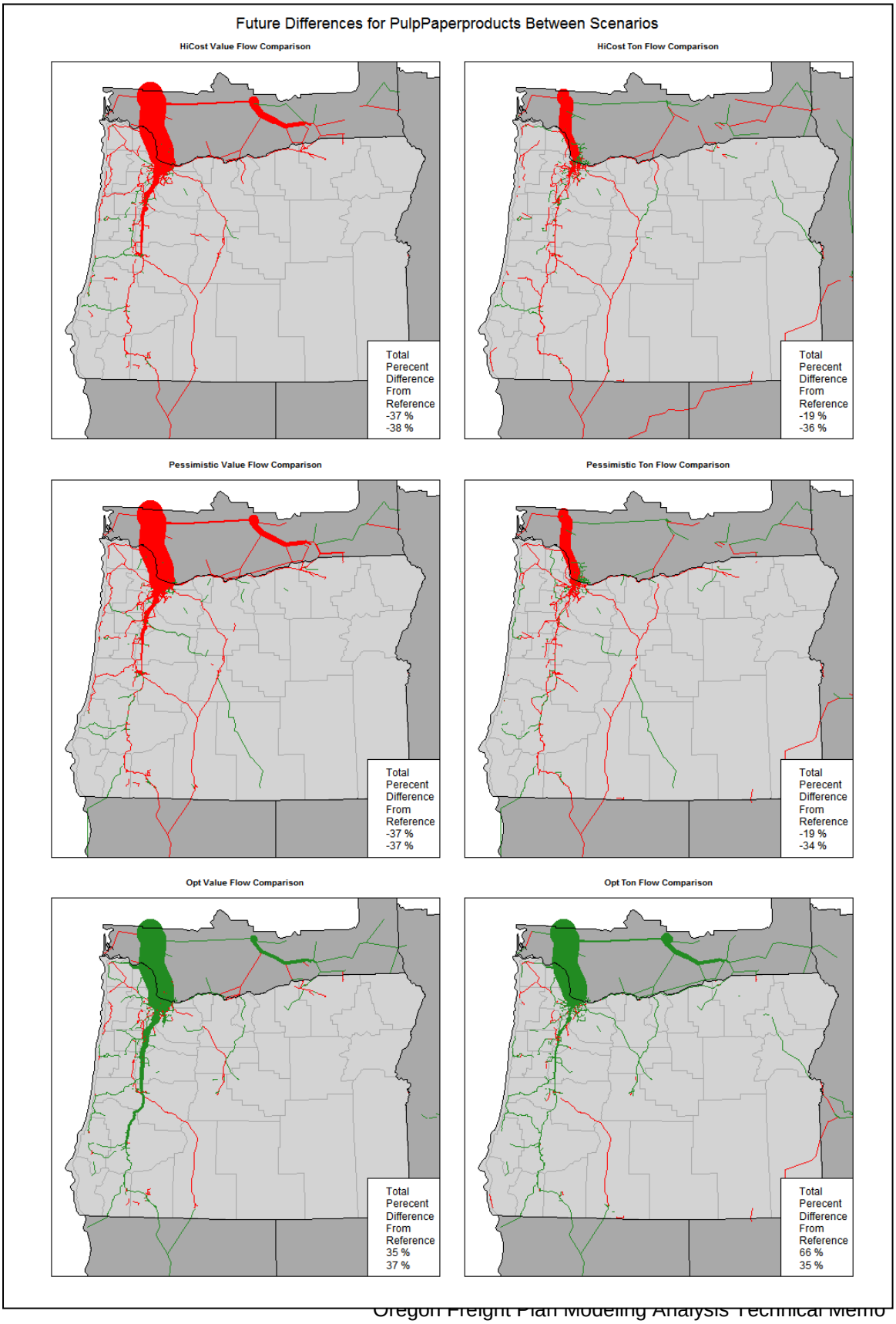


Figure 23 presents commodity flow for the Forest or Wood Products group. This commodity group is a relatively low-value, high-weight group. This group relies on the I-5 corridor for movement. When economic activity wanes, as represented in the Pessimistic scenario, flows are significantly reduced, 25% in absolute terms by weight and value. The greatest reduction in flow occurs on the I-5 corridor through the Willamette Valley south of Portland, with sizeable reduction in flows north of Portland and south of Eugene to Roseburg. There are further reductions in flow across the entire state. The addition of transportation costs do not appear to alter these results at the statewide level to a noticable extent.

A similar, yet opposite effect occurs for the Optimistic scenario. Flows increase on the I-5 corridor north of Portland, further south in the Willamette Valley and further down to Roseburg. The increase in flows are more pronounced in terms of value compared to weight. There are also notable increases in flows on I-84 and US26 east of Portland and US22 east of Salem.

Figure 23. Difference in Commodity Flow for Analysis Scenarios Compared to Reference Scenario: Forest or Wood Products

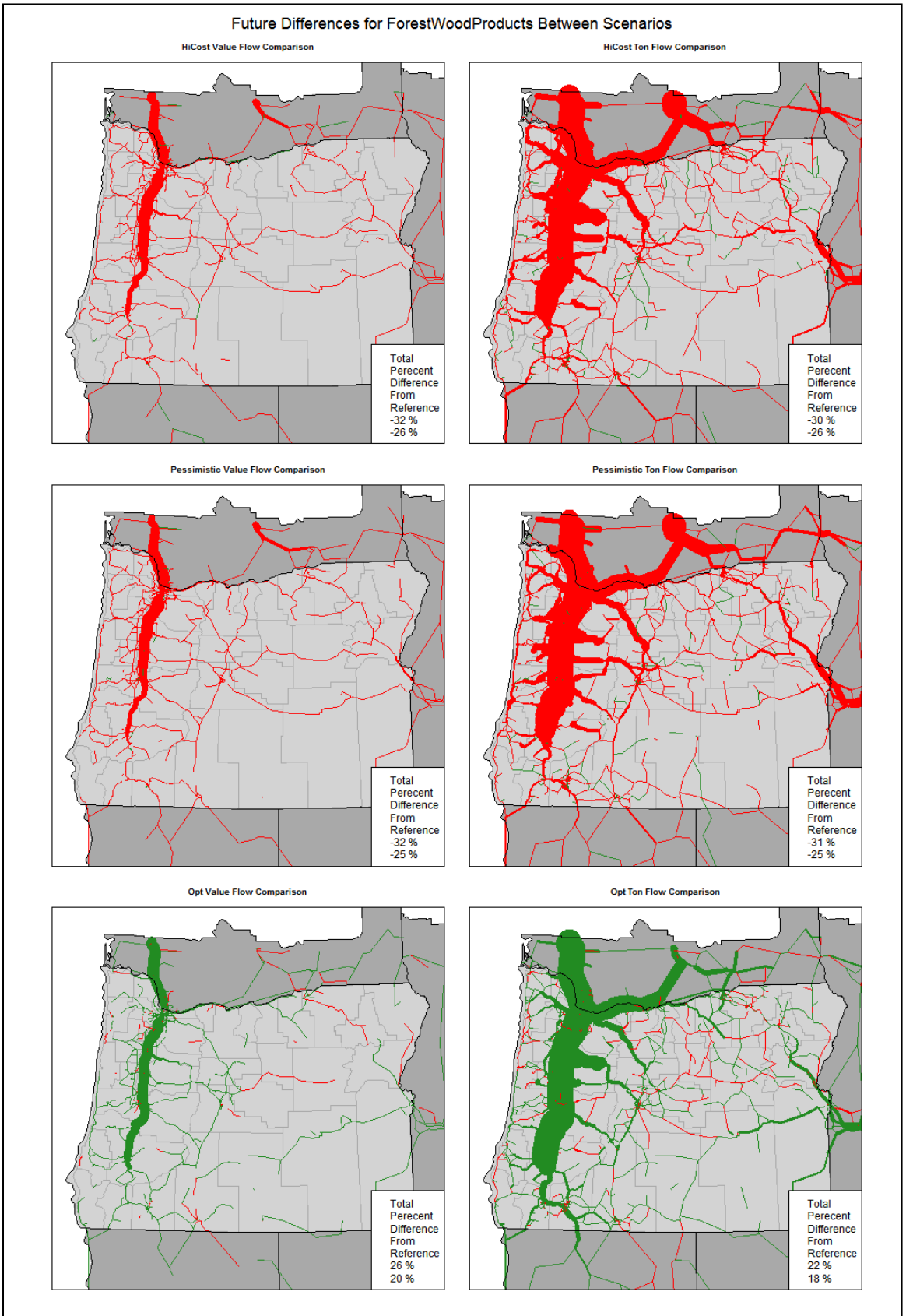
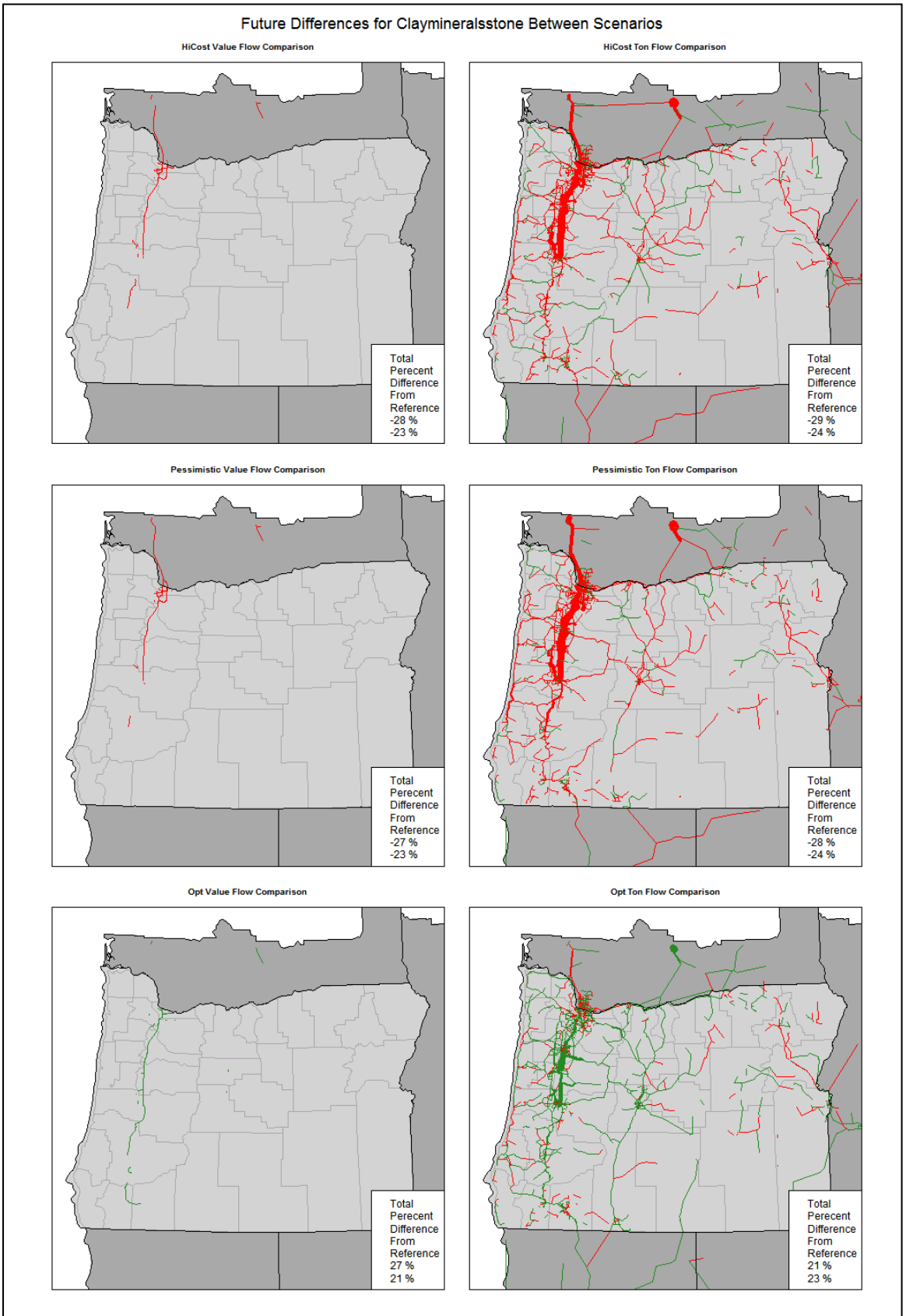


Figure 24 presents commodity flow for the Clay, Minerals and Stone group. This group is a low value, high weight group, representing one percent of statewide commodity flow in terms of value, and sixteen percent by weight. Thus, the change in flows are most evident when looking at tonnage flows. When economic activity wanes, as represented in the Pessimistic scenario, the bulk of flow reduction occurs in the Willamette Valley corridor. There is notable reduction in flows on the Oregon coast US 101 in the area of Coos Bay and Reedsport and some further north to Newport. US 97 north of Bend realized reduced flows as well. The addition of higher transportation costs results in similar patterns, but a net result of a little less reduction in flows compared to the Pessimistic scenario.

When the economy expands, as represented in the Optimistic scenario, flows for this group increase on the I-5 corridor predominantly in the Willamette Valley, notably in the vicinity of Salem and Eugene. Flows increase on US 97 north of Bend and OR 224 east of Portland. Flows north of Portland are less than the Reference scenario as the demands for this commodity change under new economic conditions.

Figure 24. Difference in Commodity Flow for Analysis Scenarios Compared to Reference Scenario: Clay, Minerals, and Stone

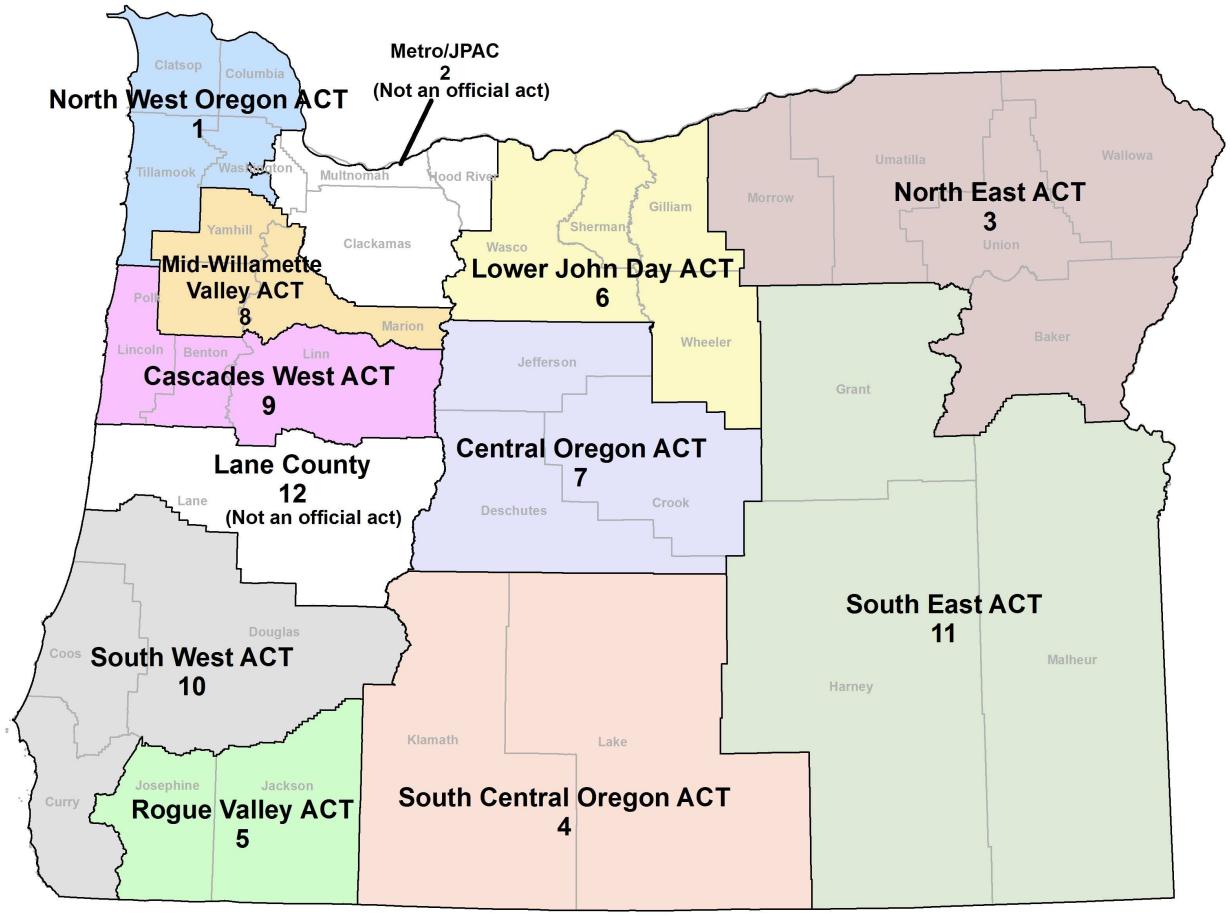


ACT Profiles

This section presents brief summaries of regional patterns in order to highlight the differences between areas of Oregon that may be obscured when reporting at the statewide level. The State of Oregon is divided into 12 Area Commissions on Transportation (ACTs) as illustrated in Figure 25. Regional patterns are evaluated at the ACT level for this analysis. For reporting purposes, several ACTs are grouped together because of the close regional economic interactions and similar use of highway corridors. ACT profiles are provided for the following:

- Northwest Oregon (ACT1)
- Willamette Valley (ACTs 8, 9, & 12)
- Central Oregon (ACTs 6 & 7)
- Portland Area (ACT2)
- Southwest Oregon (ACTs 4, 5, & 10)
- Eastern Oregon (ACTs 3 & 11)

Figure 25. Oregon Area Commissions on Transportation



For each of the six ACT groups profiled, four graphics will be presented to illustrate economic and freight activity for each area:

- Commodity production within the ACT group, indicated by the share of statewide production for each commodity group for each scenario
- Map of commodity flows produced by the ACT group destined to other ACTs and outside of the state [9]
- Table of highway corridors utilized to transport ACT goods to destination markets, i.e., the percentage of ton-miles for each commodity group produced by the ACT groups and moved by truck
- Forecast change in ACT group industry growth rates for output and employment, compared to the statewide rate for each scenario

ACT Profile Overview

ACT group profiles will also include commodity production levels for all four scenarios. Results are reported for seven commodity groups, presented in Table 10. Goods classified within the Machinery, Instruments, Transportation Equipment and Metals represent the largest share of statewide commodity flows by value, but very low in terms of weight. Forest and Wood Products represent the largest share of statewide commodity flows by weight, but very low in terms of flows by value. Figure 26 is provided as a reference of comparison for the ACT groups.

Table 10. Commodity Groups by Share of Statewide Production*

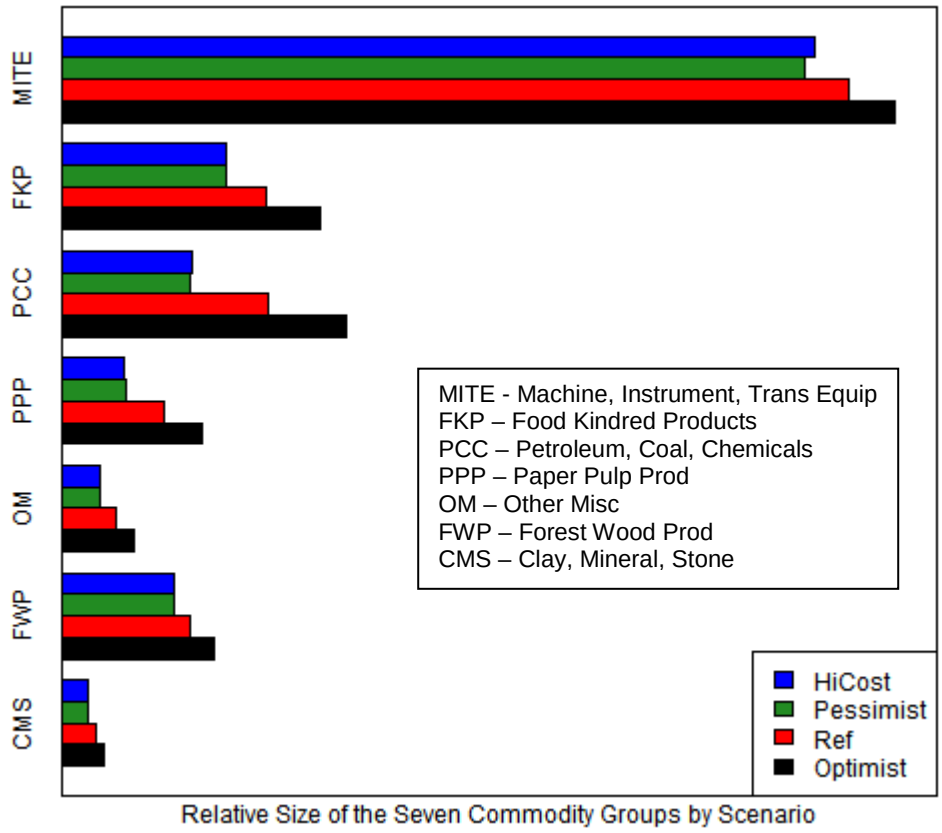
Commodity Group	Abbreviation	Statewide Share by Value	Statewide Share by Weight
Machinery, Instruments, Transport Equipment, and Metals	MITE	49	4
Other Miscellaneous	OM	17	2
Food & Kindred Products	FKP	12	12
Petroleum, Clay, Coal, & Chemicals	PCC	10	25
Paper & Pulp Products	PPP	6	4
Forest & Wood Products	FWP	5	37
Clay, Mineral & Stone	CMS	1	16

* Shares are from the Reference scenario. For more information on how the shares compare across all four scenarios, see Tables 6 and 7 in the previous section.

Figure 26 illustrates commodities produced and how they may vary under different economic conditions. This figure is provided for each ACT group. This can be used as a reference when evaluating ACT commodity production patterns. For example, the Northwest ACT's largest commodity group, Pulp and Paper Products, represents six percent of statewide commodity production by value, Over ten percent of this commodity group is produced within the Northwest ACT, making it a significant industry for the Northwest ACT, while remaining a relatively small sector for Oregon as a whole.

[9] Commodity consumption by ACT was evaluated. The ACTs followed similar consumption patterns to that of the state; no distinct differences were evident at the ACT level.

Figure 26. Range of Oregon Commodity Production Value: All Scenarios



Each ACT group profile includes a map of production flows destined to locations outside of the ACT. These maps allow the reader to quickly gauge the relative importance of other ACTs as destination markets, as well as export markets outside of Oregon. The relative importance of each commodity group to an ACT is evident by observing the relative size of the commodity pie pieces. Variation in commodity share of the ACT production across the four scenarios is also provided. The relative highway network flows for commodities transported by truck are also shown on the map to illustrate relative importance of corridors.[10]

A table reporting the share of commodity flows by ton-miles across Oregon's major corridors is presented for each ACT group. Each ACT has unique production activity and critical routes. However, the need to get goods to markets outside of Oregon is clearly needed by all areas of the state. Oregon is projected to ship approximately 60 percent of the value of goods it produces, out side state borders. On the other hand, Oregon is projected to ship roughly 70 percent of the value of goods consumed from outside of Oregon. This heavy global trading will require reliable highway, rail, and waterway networks. Table 11 illustrates the importance of the interstate corridors, since these corridors are used to move 53 to 73 percent of each commodity group flowing within Oregon.

Finally, each ACT profile will include industry growth figures similar to those presented earlier for the entire state. The ACT figures will be presented with the statewide figures to quickly reveal how the ACT differs from the state in general.

[10] To reduce the number of figures, network value flows are only shown for the Reference scenario. Flows for other scenarios are very similar to the Reference.

Table 11. Oregon Statewide Commodity Flow by Corridor, in Ton-Miles							
	Machine, Instrument, Trans Equip	Food Kindred Products	Petroleum, Coal, Chemicals	Paper Pulp Products	Other Misc	Forest or Wood Products	Clay, Mineral, Stone
I-5	37%	35%	40%	52%	54%	42%	46%
I-84	36%	29%	13%	8%	18%	9%	7%
US-97	3%	10%	9%	5%	7%	3%	3%
US-26	4%	4%	5%	6%	3%	7%	5%
US-20	4%	3%	3%	1%	2%	5%	4%
I-205	3%	2%	3%	5%	2%	2%	3%
US-101	1%	1%	3%	2%	1%	3%	5%
OR-30	2%	1%	2%	7%	1%	2%	1%
OR-22	1%	1%	1%	1%	1%	6%	3%
OR-126	1%	1%	1%	1%	1%	2%	2%
OR-99	1%	0%	1%	1%	0%	1%	2%
OTHER	7%	13%	19%	11%	10%	18%	19%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Northwest ACT (ACT 1)

The Northwest ACT includes Clatsop, Columbia, Tillamook and about two-thirds of Washington County. About 165,000 people currently reside in this area, representing 4% of Oregon's total population. Figure 27 presents a profile of the commodities produced in this ACT by value. There are large inventories of forested land in this ACT, supporting the Pulp and Paper Products (PPP) commodity production, a dominant area of activity for the Northwest ACT. While it may be small in terms of population, this ACT produces 11-13% of the Pulp and Paper Products produced in Oregon, with Pulp and Paper making up 12-18% of the Northwest ACT commodity production. It is important to note that demand for goods in this commodity group is affected by economic conditions, creating fluctuations in commodity production across scenarios. The other commodity groups remain fairly stable across scenarios for the Northwest ACT.

Figure 27. Northwest ACT Commodity Production by Value: All Scenarios

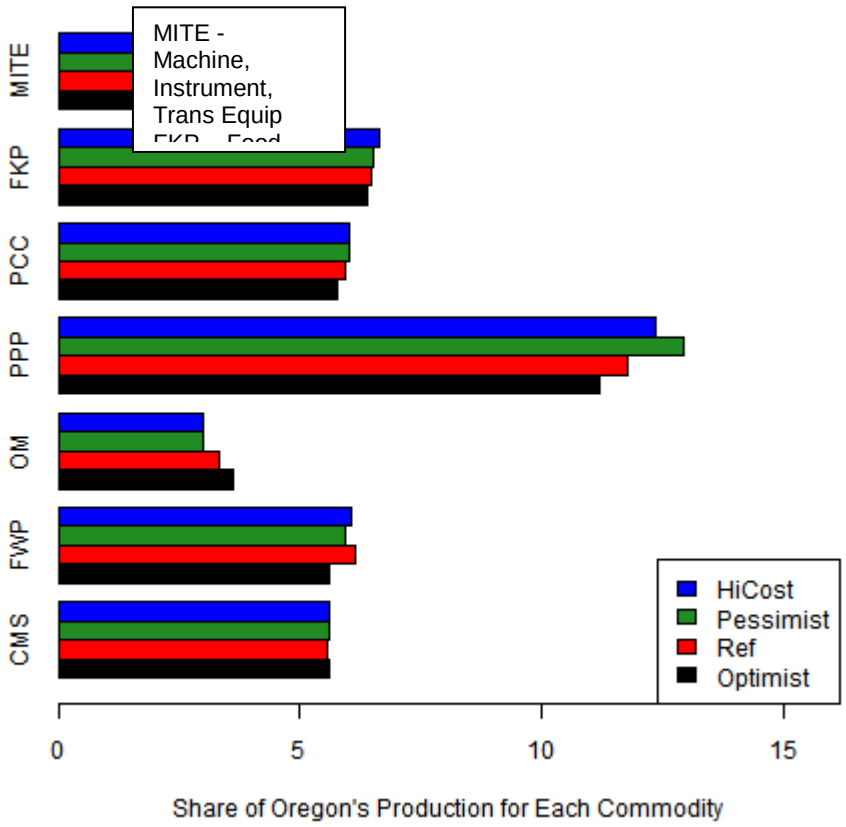


Figure 28 illustrates the destinations for commodities produced in the Northwest ACT. This ACT produces more than 4% of statewide commodities, with the exceptions of Other Miscellaneous Goods, and Machinery, Instruments, and Transportation Equipment. Since the ACT population share is 4%, this demonstrates the Northwest ACT is a relatively heavy producer of goods. The majority of Pulp and Paper products is shipped outside of Oregon. The Northwest ACT produces about 6% of Oregon's Forest and Wood Products, the majority of which is destined to the Portland area.

The upper right-hand corner of Figure 28 provides a table of shares by commodity group for the ACT economy, as well as the legend for the radar plot of commodity categories. The range of shares in this table reveals the variation in production shares across the four analysis scenarios. One can quickly see the most variation occurs in the production of the Machinery, Instruments, and Transportation Equipment group and Petroleum, Coal and Chemicals group. The lower right-hand corner of Figure 28 illustrates the relative shares of commodities destined outside of Oregon. One can quickly see that the largest export for the Northwest ACT in terms of value is Machinery and Instruments, followed by Food and Kindred Products.

Figure 28. Commodity Flow From Northwest ACT to All Destinations

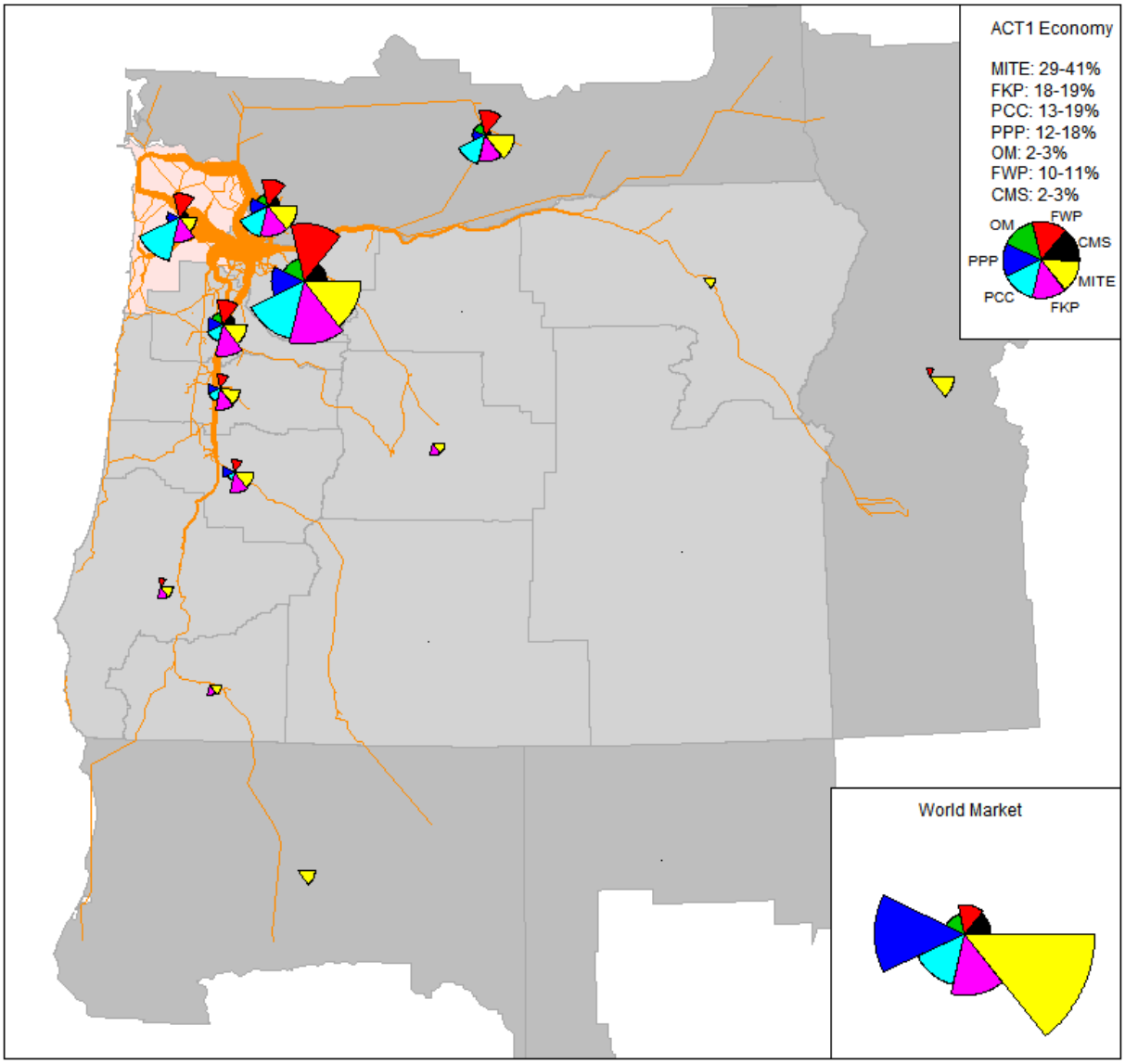


Figure 28 illustrates the relative destination flows of commodities produced in the Northwest ACT. This radar plot illustrates Northwest ACT commodity destinations for all 12 Oregon ACTs, as well as Vancouver, Washington and markets outside of Oregon to the north, south and east for all transportation modes. It is immediately apparent the top three commodities produced in the Northwest ACT, Machinery and Instruments; Food and Kindred Products; and Petroleum, Coal and Chemicals

are predominantly destined for the urban areas of Portland, Vancouver, Washington and the Willamette Valley ACTs. The remaining commodity sectors make up the balance of the ACT economy and are distributed fairly evenly across Oregon and the World Market based on relative size of these destination markets. The orange highway network flows represent commodities carried via truck only. To gain better insight into corridors of significance to each ACT, Table 12 provides the share of commodity ton-miles by highway corridor.

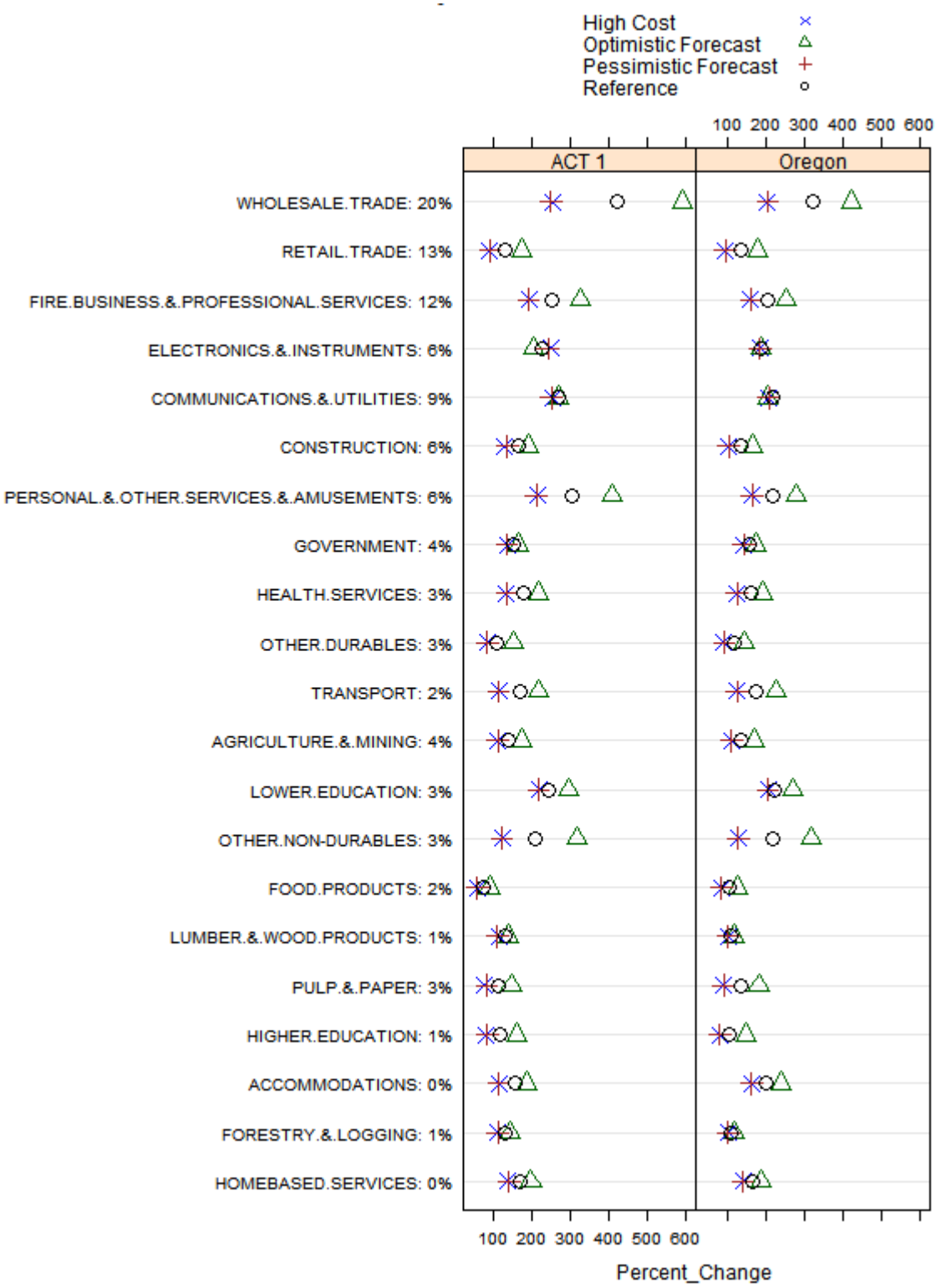
Given the location of the Northwest ACT, a relatively small number of corridors dominate commodity highway movement. The Northwest ACT relies on US-30, US-26 and US-101 to get goods to the interstate and other modes such as rail, air and water facilities. Table 12 illustrates the relative significance of the corridors utilized to transport goods to market from the Northwest ACT.

Table 12. Northwest ACT Commodity Flow by Corridor, in Ton-Miles

	Machine, Instrument, Trans Equip	Food Kindred Products	Petroleum, Coal, Chemicals	Paper Pulp Products	Other Misc	Forest or Wood Products	Clay, Mineral, Stone
I-5	25%	30%	13%	25%	30%	17%	21%
US-30	20%	11%	24%	41%	19%	14%	13%
US-26	14%	15%	22%	9%	15%	22%	14%
US-101	6%	8%	10%	5%	9%	9%	13%
OR-47	6%	4%	6%	3%	3%	8%	8%
I-84	11%	12%	1%	2%	5%	2%	2%
OR-6	3%	5%	9%	1%	3%	6%	3%
OR-22	2%	3%	2%	1%	5%	6%	5%
OR-103	1%	1%	1%	1%	1%	3%	4%
OTHER	12%	11%	12%	12%	10%	13%	17%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Twenty-year industry growth for the Northwest ACT is similar to that of the state as a whole. Figure 29 presents the percent change over twenty years of industry output for the ACT and state by industry group for all four scenarios. The industries are listed in order of ACT share of output and the shares are listed after the industry name. The top five industry groups represent sixty percent of total ACT industry output. The industries subject to the most economic volatility are Wholesale Trade; Personal and Other Services; and Other Non-Durables; combined they represent 29% of industry activity in the Northwest ACT. Growth in Wholesale Trade; FIRE, Business and Professional Services; Personal and Other Services is greater than the state as a whole.

Figure 29. Northwest ACT Percent Change in Output by Industry from 2006 to 2027, All Scenarios (including percent of statewide output by industry)



Portland Metro Area (ACT 2)

The Portland Metro Area contains the majority of Oregon's population, representing about 40% of statewide population. A large amount of commodity production for the state comes from the Portland Metro area: about sixty percent of statewide production of Machinery and Instruments and Other Miscellaneous goods and around fifty percent of Pulp and Paper Products, as illustrated in Figure 30. Production activity for Forestry or Wood Products is fairly low in this area. Growth rates for Other Miscellaneous, Pulp and Paper Products, and Petroleum, Coal and Chemicals are subject variation due to economic conditions.

Figure 30. Portland Metro Area Commodity Production by Value: All Scenarios

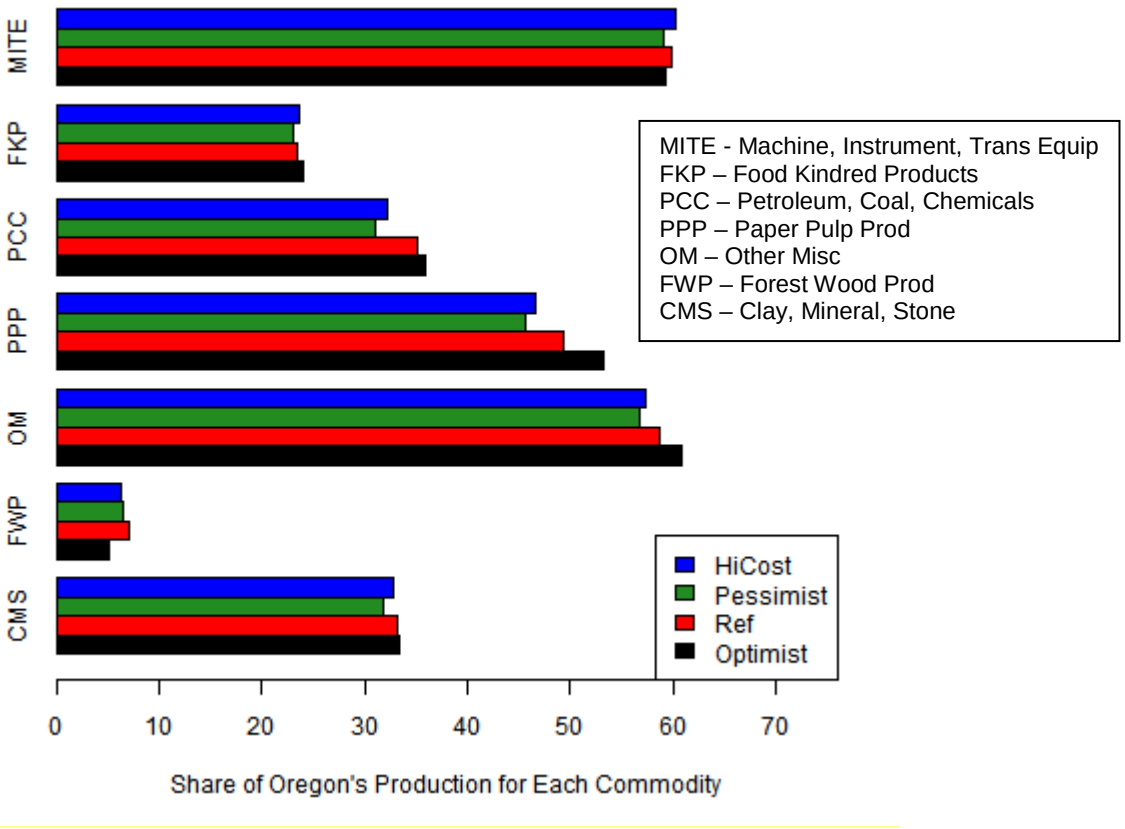


Figure 31 illustrates the destinations of commodities produced in the Portland Metro area for all transport modes. Sixty-two to seventy-six percent of the value of goods destined to market is Machinery and Instruments, which is predominantly destined to export markets, but consumed within the state as well. Other commodity production in Portland represent relatively small proportion of production in terms of value, none making up more than 15% of the Portland economy.

Figure 31. Commodity Flow From Portland Metro ACT to All Destinations

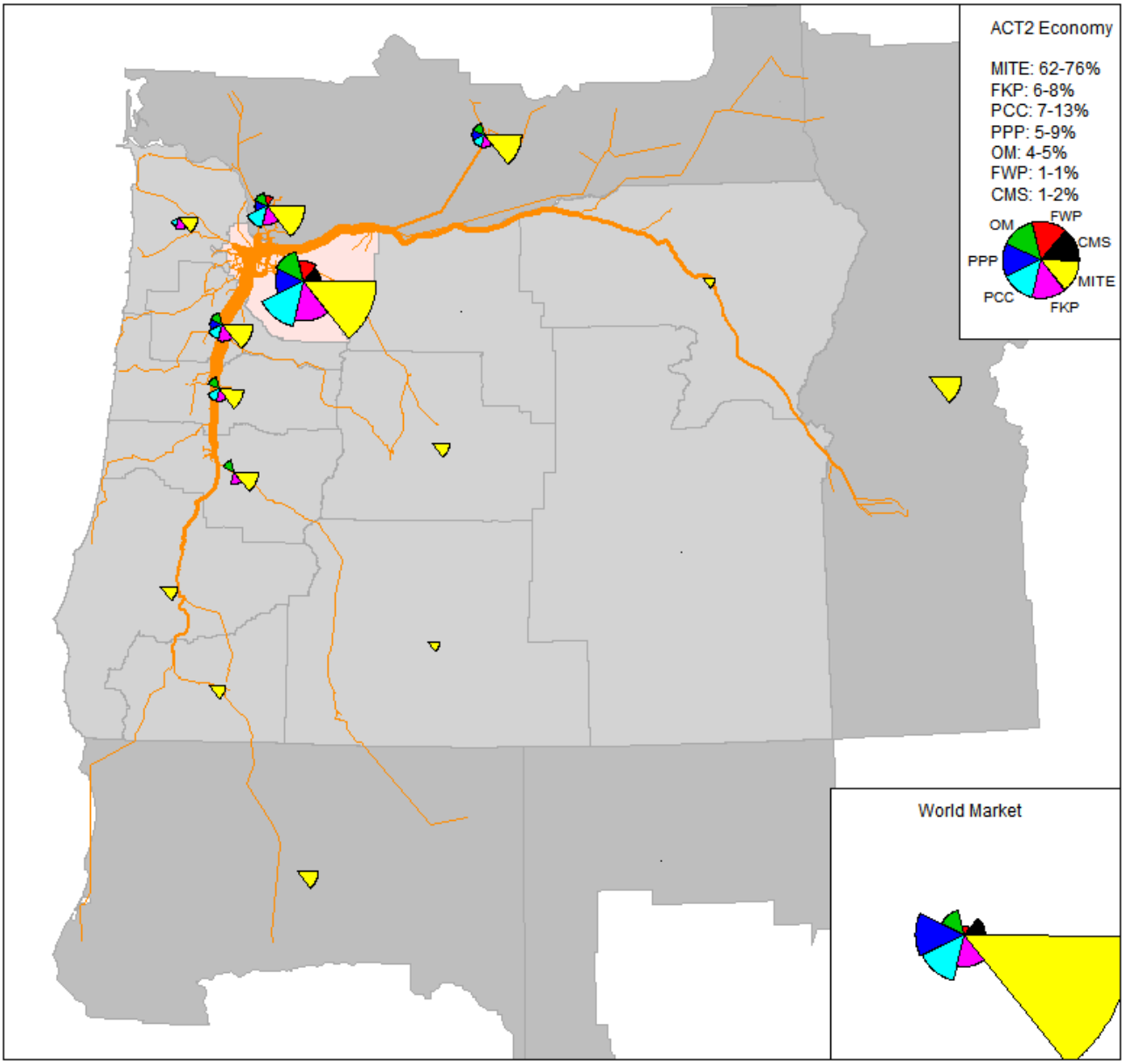


Table 13 presents the relative significance of highway corridors used to transport goods to market for the Portland Metro Area. The Portland Area relies significantly on US-26 and I-205, as well as throughways I-5 and I-84 for its highway commodity flows. Additionally, the Port of Portland and the rail network are critical to the area's (and State's) freight movement to markets. Depending on commodity group, between thirteen and twenty-eight percent of goods travel on other surrounding highways that flow into the main interstate corridors.

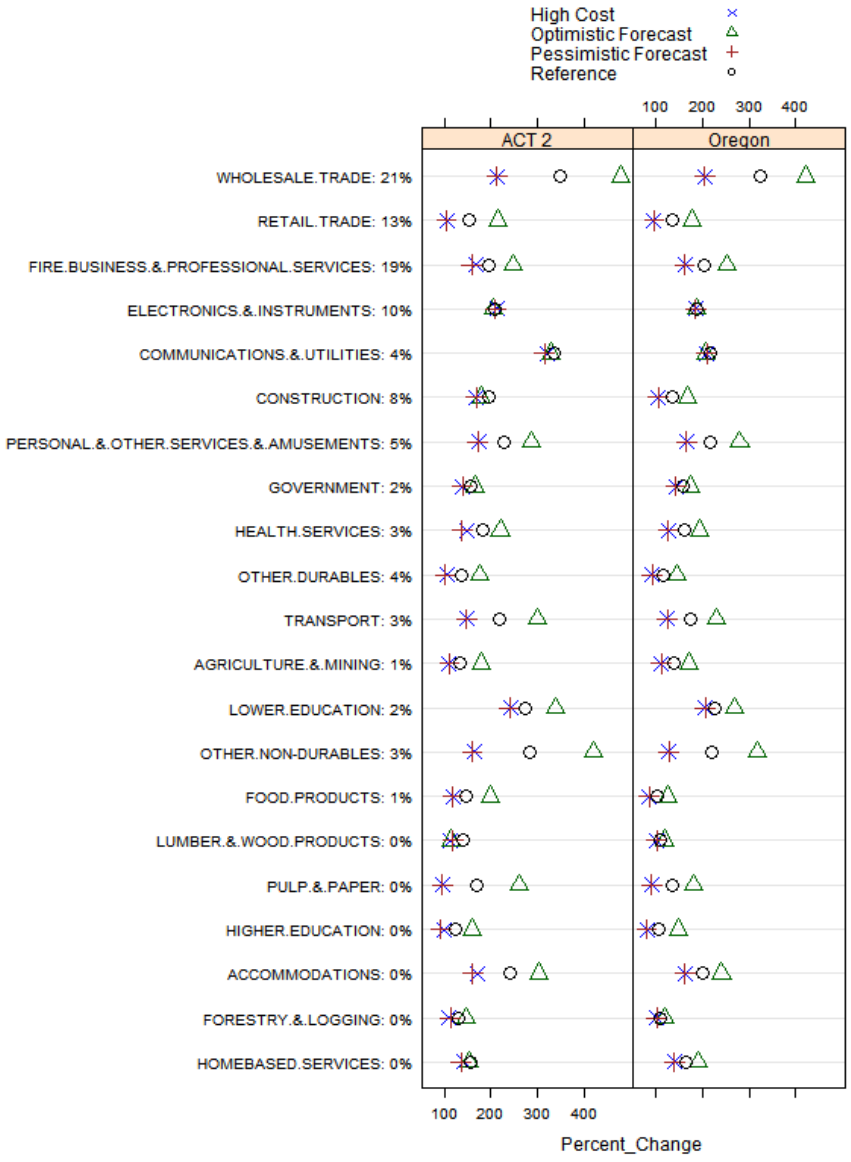
Figure 32 presents the percent change in output by industry over twenty years for all four scenarios. Over half of Portland's industry activity occurs within the industries of Wholesale Trade, Retail Trade and FIRE, Business and Professional Services (percentages are listed after the row's industry title).

Under the Optimistic scenario, the Wholesale Trade and Retail industries increase more than the state as a whole. Communications and Utilities, Transportation, Lower Education, Other Non-Durables, Food Products, Pulp and Paper, and Accommodations grow more over time than the state in its entirety.

Table 13. Portland Metro Commodity Flow by Corridor in Ton-Miles

	Machine, Instrument, Trans Equip	Food Kindred Products	Petroleum, Coal, Chemicals	Paper Pulp Products	Other Misc	Forest or Wood Products	Clay, Mineral, Stone
I-5	34%	33%	41%	46%	60%	47%	39%
I-84	38%	41%	9%	12%	12%	11%	12%
US-26	8%	6%	12%	8%	6%	11%	12%
I-205	7%	5%	10%	15%	9%	5%	10%
OTHER	13%	15%	28%	19%	13%	26%	27%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Figure 32. Portland Metro Area Percent Change in Output by Industry from 2006 to 2027, All Scenarios (including percent of statewide output by industry)

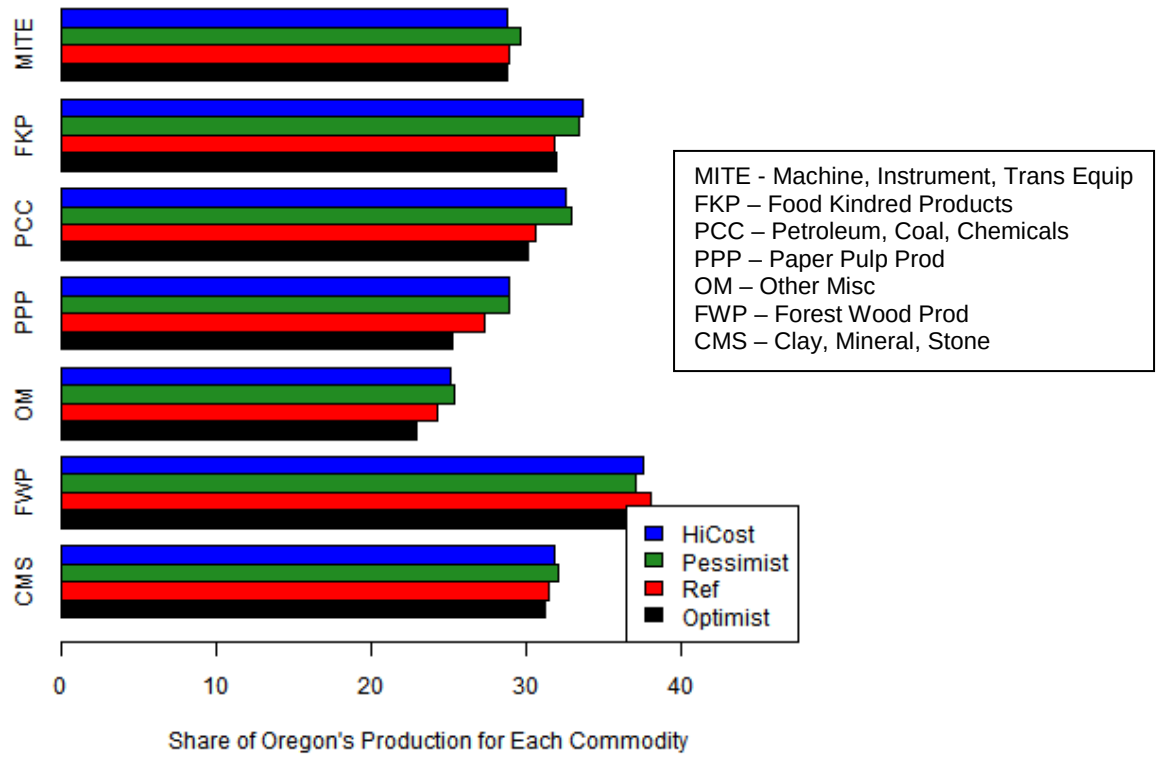


Willamette Valley Area (ACTs 8, 9, & 12)

The Willamette Valley area includes three ACTs: Mid-Willamette Valley, Cascades West, and Lane County, bound together by similar geography and use of the transportation network. All of these ACTs utilize I-5 as their major shipping artery along with the rail-line which runs alongside I-5. Direct access to these corridors enables Willamette Valley firms to quickly ship to areas along I-5 and to markets outside of Oregon. The Willamette Valley ACTs make up 28% of Oregon's Population (Mid-Willamette – 12%, Cascades West – 6%, and Lane County – 10%).

Figure 33 presents a profile of the commodities produced in the area by value. The magnitude of commodity production within these ACT's is consistent with its population share and balanced across many commodities. Production is somewhat pronounced in Forest and Wood Products, about thirty-five percent of state production, while Other Miscellaneous goods is less prominent. Willamette Valley is exposed to the effects of economic uncertainty given production shares for commodities sensitive to economic conditions, such as Pulp and Paper Products; Other Miscellaneous Goods; Petroleum, Coal and Chemicals; and Food and Kindred Products.

Figure 33. Willamette Valley Area Commodity Production by Value: All Scenarios



Figures 34, 35 and 36 map the destinations for commodities produced in the three Willamette Valley area ACTs. Unlike the rest of Oregon, nearly half of the goods produced in the Willamette Valley area are destined outside of the state, while close to half remains in the Willamette Valley and Portland Metro area. This pattern results in heavy reliance on the I-5 corridor for these ACTs, as well as OR18 and OR22 for the Mid-Willamette Valley ACT, US20, OR34 and OR58 for Cascades West ACT, and OR126 and US20 and OR58 for Lane County ACT. Detail regarding ACT reliance on specific highway corridors is provided in Tables 14, 15, and 16.

Figure 34. Commodity Flow From Mid-Willamette Valley ACT to All Destinations

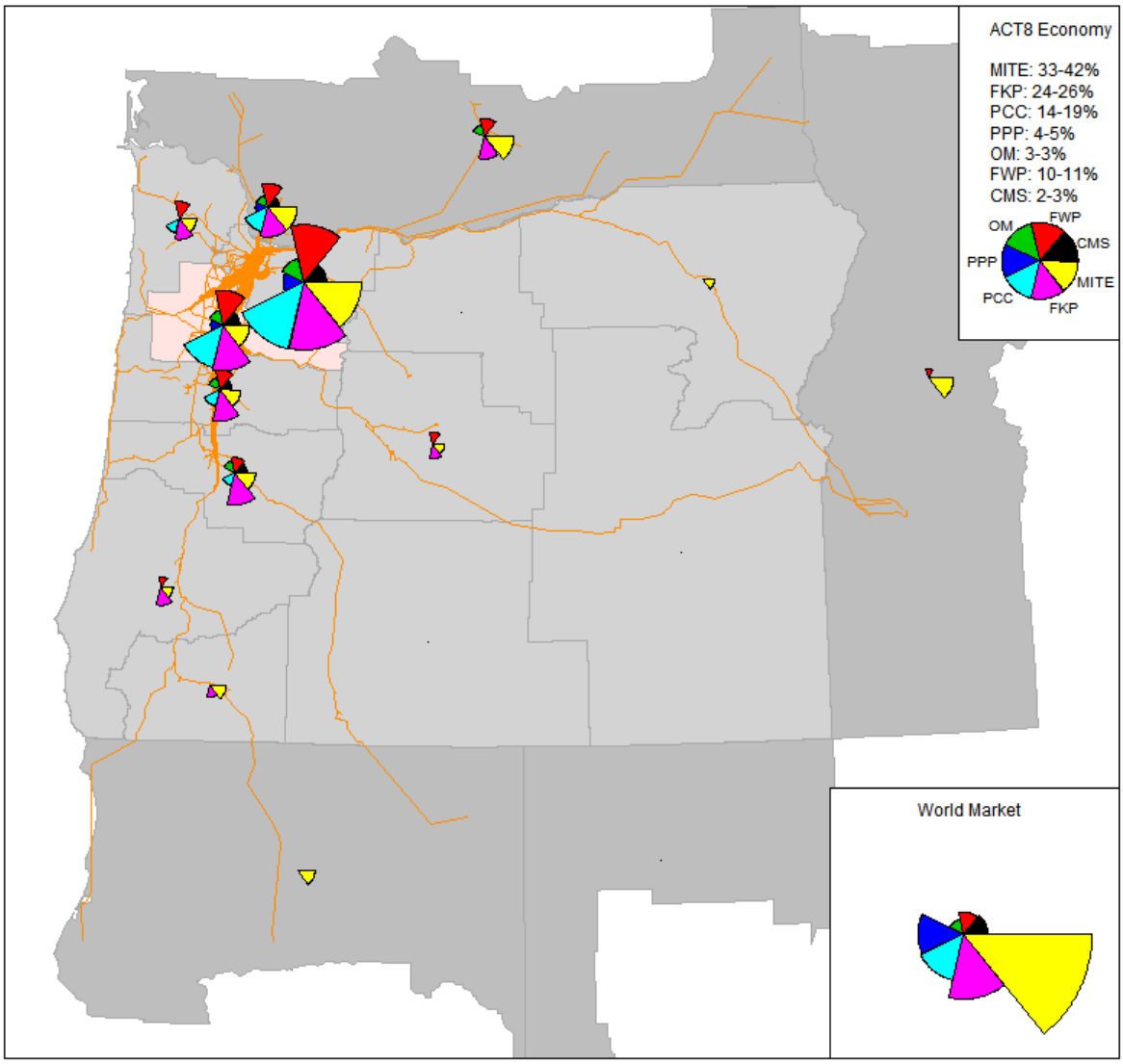


Table 14. Mid-Willamette Valley ACT Commodity Flow by Corridor in Ton-Miles

	Machine, Instrument, Trans Equip	Food Kindred Products	Petroleum, Coal, Chemicals	Paper Pulp Products	Other Misc	Forest or Wood Products	Clay, Mineral, Stone
I-5	55%	56%	63%	72%	67%	47%	57%
OR-22	3%	5%	7%	3%	5%	20%	9%
I-84	22%	17%	2%	3%	10%	2%	2%
OR-18	2%	2%	3%	1%	1%	5%	4%
US-20	1%	1%	2%	1%	1%	3%	2%
OR-223	1%	1%	1%	0%	0%	3%	2%
OTHER	16%	18%	22%	20%	16%	20%	24%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Figure 35. Commodity Flow From Cascades West ACT to All Destinations

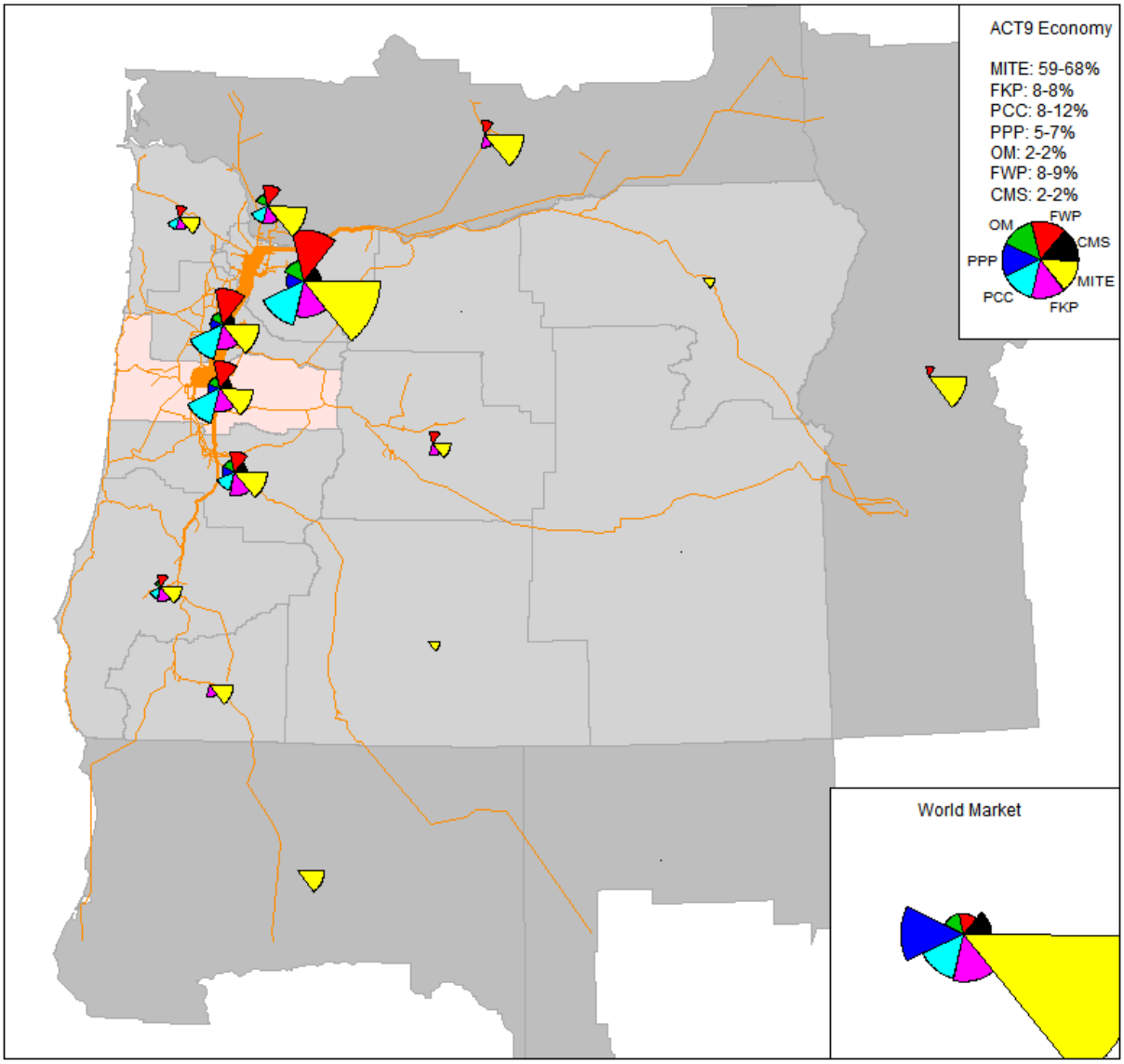


Table 15. Cascades West ACT Commodity Flow by Corridor in Ton-Miles

	Machine, Instrument, Trans Equip	Food Kindred Products	Petroleum, Coal, Chemicals	Paper Pulp Products	Other Misc	Forest or Wood Products	Clay, Mineral, Stone
I-5	52%	52%	60%	58%	68%	46%	47%
US20	8%	9%	7%	7%	7%	17%	12%
OR-22	1%	3%	3%	3%	2%	8%	4%
US-101	3%	5%	7%	5%	4%	4%	12%
OR-34	3%	3%	4%	6%	2%	6%	6%
I-84	25%	14%	1%	2%	5%	1%	0%
OTHER	8	14%	18%	19%	12%	18%	19%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Figure 36. Commodity Flow From Lane County ACT to All Destinations

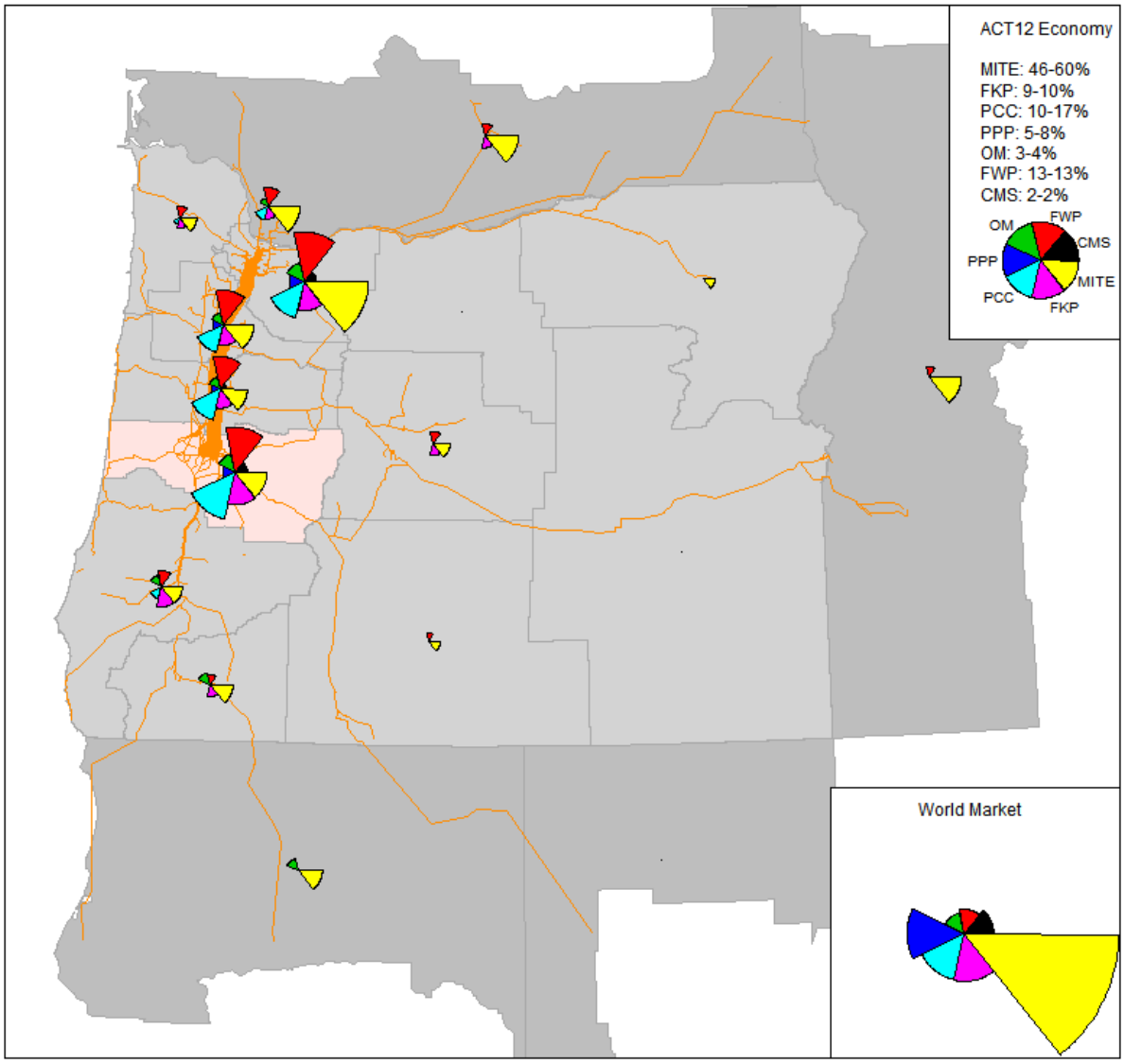
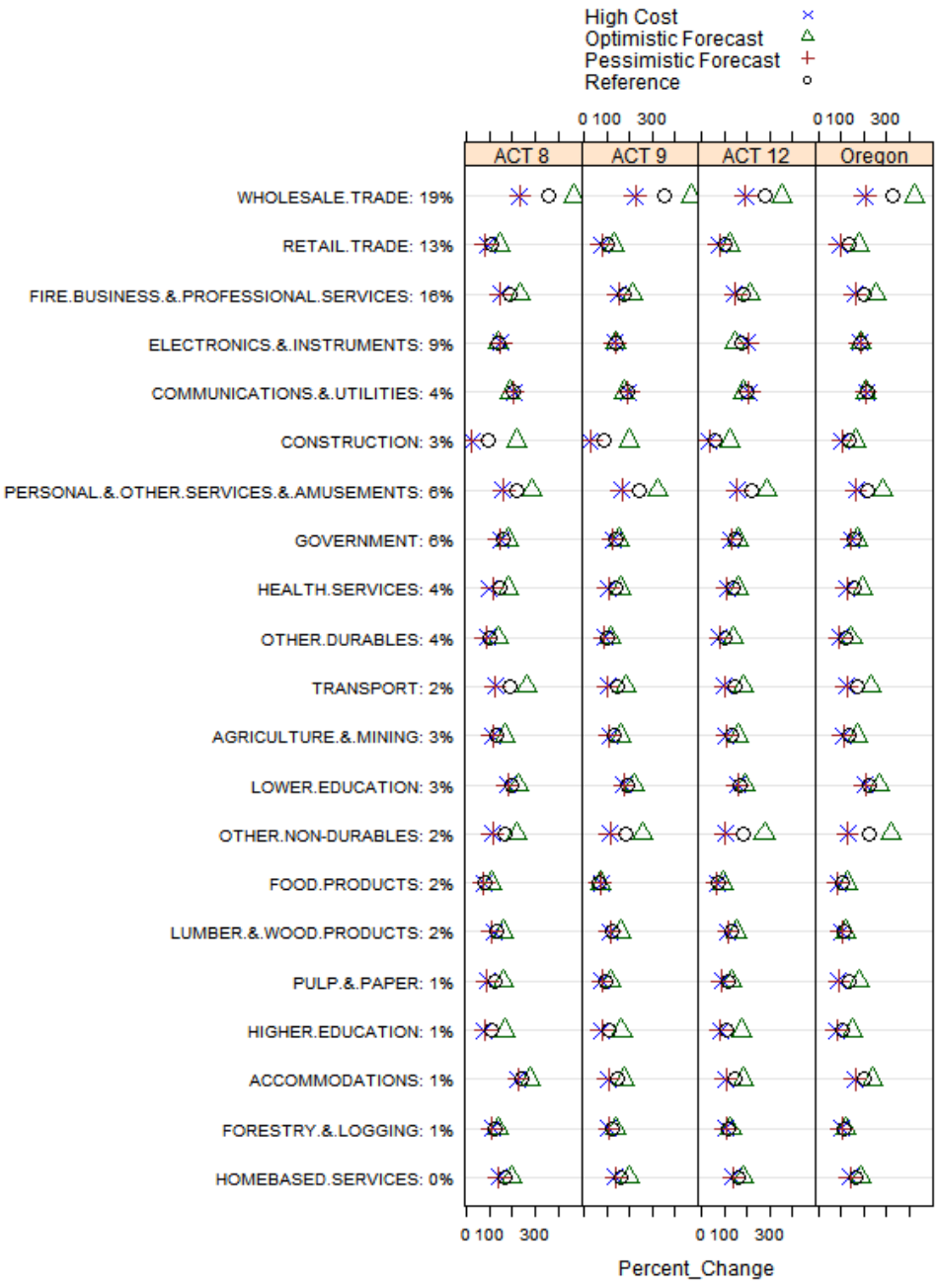


Table 16. Lane County ACT Commodity Flow by Corridor in Ton-Miles

	Machine, Instrument, Trans Equip	Food Kindred Products	Petroleum, Coal, Chemicals	Paper Pulp Products	Other Misc	Forest or Wood Products	Clay, Mineral, Stone
I-5	72%	70%	75%	81%	81%	63%	68%
OR-126	3%	3%	5%	4%	3%	8%	5%
OR-58	1%	2%	3%	1%	2%	5%	1%
US-20	10%	5%	2%	1%	3%	3%	3%
US-101	1%	1%	2%	2%	1%	2%	4%
OTHER	13%	19%	13%	11%	10%	19%	19%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Figure 37 presents the percent change in industry output over twenty years for all four scenarios. There is more variation across scenarios in Wholesale Trade activity in the Mid-Willamette Valley and Cascades West ACTs than the Lane County ACT or the state. The Electronics and Instruments group varies very little across scenarios, with the exception of the Lane County ACT. Construction activity in the Mid-Willamette Valley and Cascades West ACTs vary more across scenarios than the state or Lane County ACT. Mid-Willamette Valley ACT Construction activity varies more across scenarios than the state or the other two Valley ACTs. On the other hand, there is less variation in Other Non-Durables in the Mid-Willamette Valley than Cascades West, Lane County ACT and the state. Finally, higher education grows more for the three Willamette Valley ACTs under strong economic conditions that the state as a whole, which is understandable considering the number of universities in the area.

Figure 37. Willamette Valley ACTs Percent Change in Output by Industry from 2006 to 2027, All Scenarios (including percent of statewide output by industry)

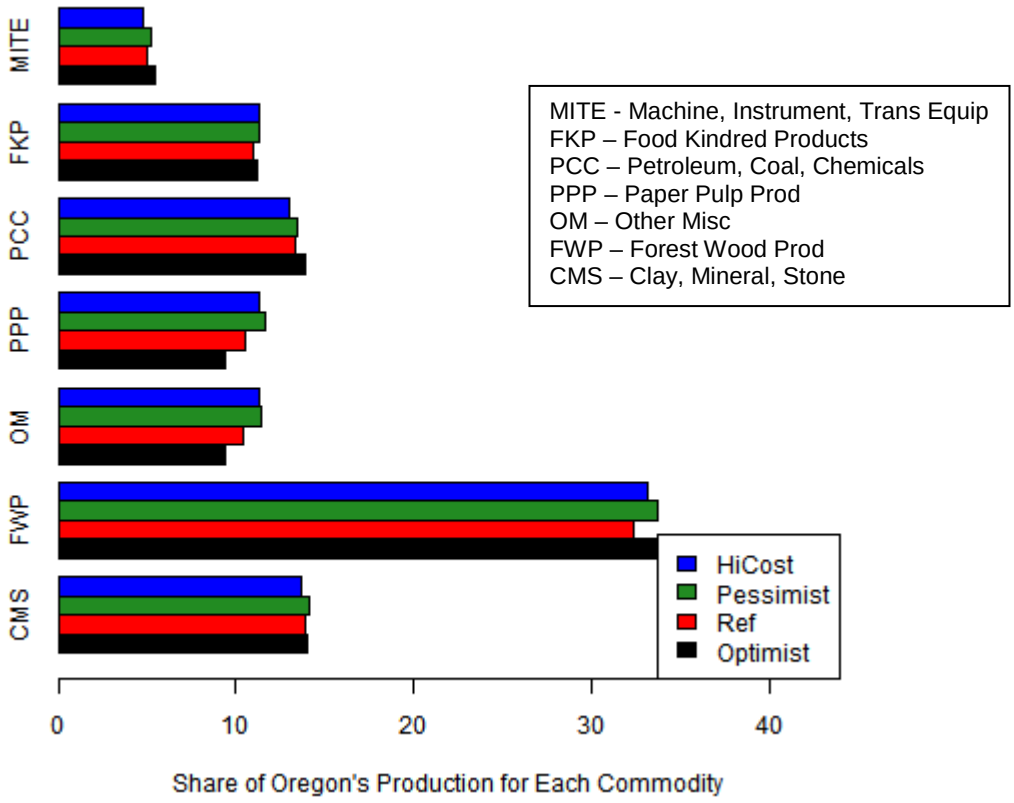


Southwest Oregon (ACTs 4, 5 & 10)

Southwest Oregon, consisting of Southwest ACT (10); Rogue Valley ACT (5); and South Central Oregon ACT (4), makes up about 15% of Oregon's population, including Rouge Valley MPO (RVMPO). Figure 38 provides a profile of the commodities produced in the area in terms of value. Southwest Oregon's economy is predominantly focused on Forest and Wood Products, with a full third of Oregon's statewide production coming out of this area.

Other commodity production shares more closely match the population share for the area, except for the relatively low share of Machinery and Instruments production, only five percent of Oregon's total production. However, this group is a high value commodity that represents a large proportion of the Southwest Oregon economy (South Central Oregon 12-18 percent; Rogue Valley ACT 32 – 41 percent; and South West ACT 18 to 22 percent of total commodity value produced).

Figure 38. Southwest Oregon Commodity Production by Value: All Scenarios



Figures 39, 40, and 41 map the destinations of commodities produced in the three Southwest ACTs. This area of the state requires well maintained local state routes to support access to the interstate routes to get commodities to distant markets. Machinery and Instruments; Food and Kindred Products; and Forest and Wood Products are primarily destined out of the immediate area to the World Market and larger population centers within Oregon.

Tables 17, 18 and 19 illustrate the relative importance of highway corridors used to transport goods to market for the Southwest Oregon area. To ship these commodities to destination markets, this area relies on Oregon routes (OR-140, OR-199, OR-126, and OR58,), as well as the interstate system (I-5, US-97, and US-101.)

Figure 39. Commodity Flow From South Central ACT to All Destinations

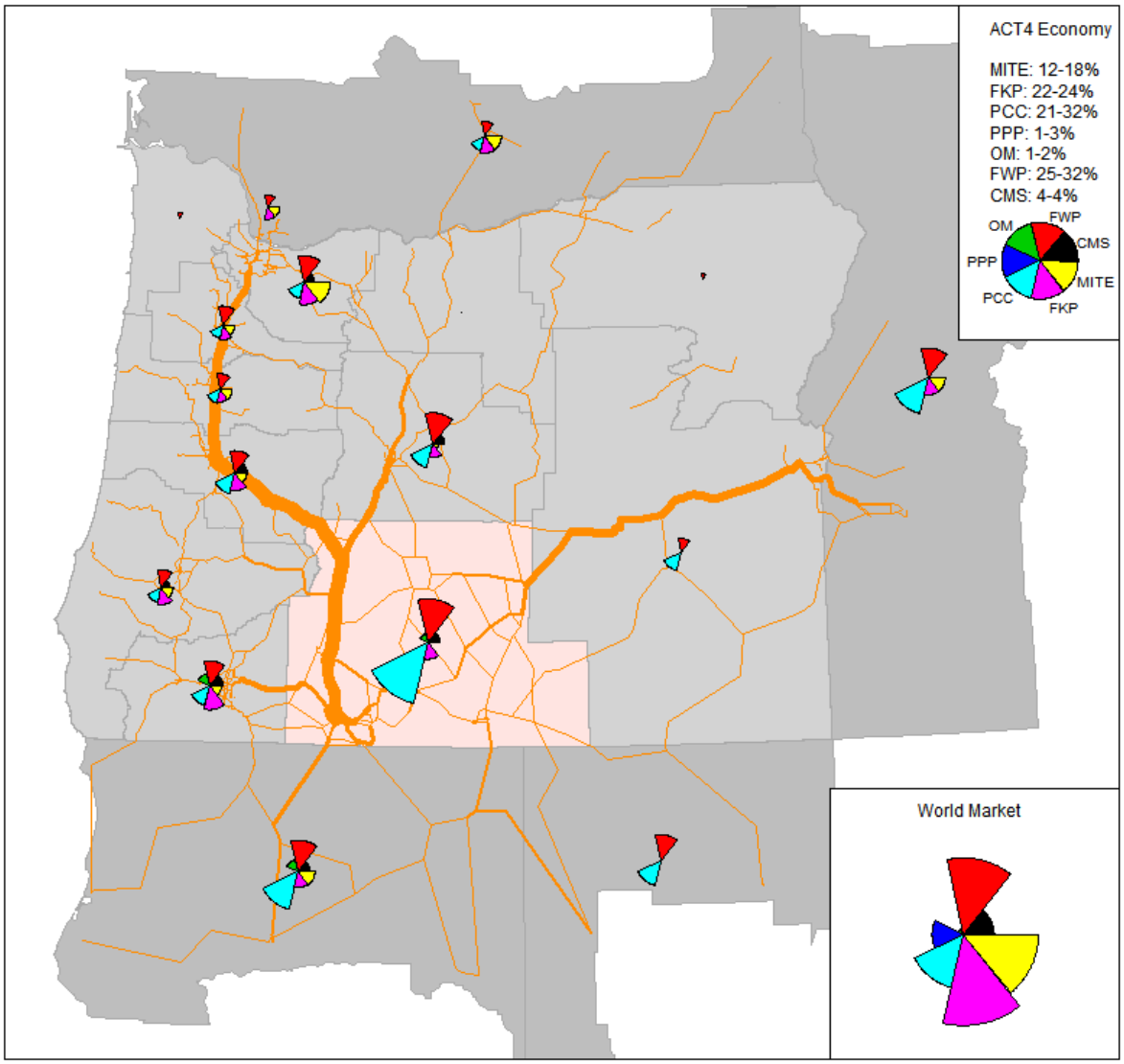


Table 17. South Central Oregon ACT Commodity Flow by Corridor in Ton-Miles							
	Machine, Instrument, Trans Equip	Food Kindred Products	Petroleum, Coal, Chemicals	Paper Pulp Products	Other Misc	Forest or Wood Products	Clay, Mineral, Stone
US-97	36%	41%	56%	39%	43%	32%	42%
OR-140	8%	11%	12%	2%	13%	18%	23%
OR-58	16%	9%	6%	23%	11%	16%	10%
I-5	15%	9%	5%	28%	9%	11%	9%
US-20	11%	10%	3%	0%	2%	5%	2%
OR-395	6%	6%	6%	2%	4%	2%	3%
OTHER	8%	14%	12%	6%	18%	16%	11%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Figure 40. Commodity Flow From Rogue Valley ACT to All Destinations

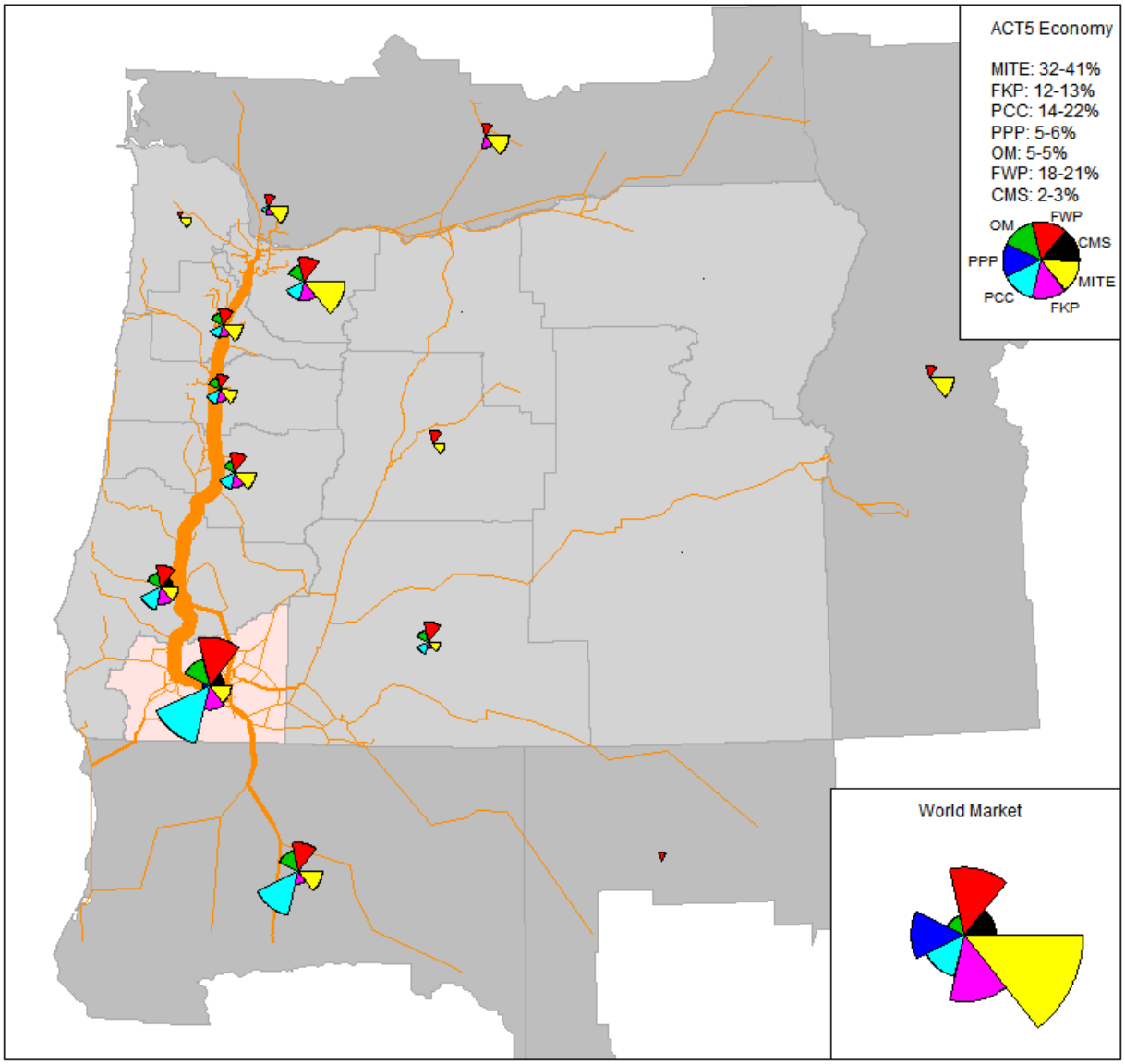


Table 18. Rogue Valley ACT Commodity Flow by Corridor in Ton-Miles							
	Machine, Instrument, Trans Equip	Food Kindred Products	Petroleum, Coal, Chemicals	Paper Pulp Products	Other Misc	Forest or Wood Products	Clay, Mineral, Stone
I-5	78%	76%	77%	88%	90%	64%	61%
OR-199	1%	2%	7%	1%	1%	5%	5%
OR-140	1%	2%	2%	0%	1%	6%	2%
US-97	4%	3%	2%	1%	2%	5%	4%
OR-62	2%	2%	3%	1%	1%	5%	2%
OTHER	14%	15%	9%	9%	5%	15%	26%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Figure 41. Commodity Flow From South West ACT to All Destinations

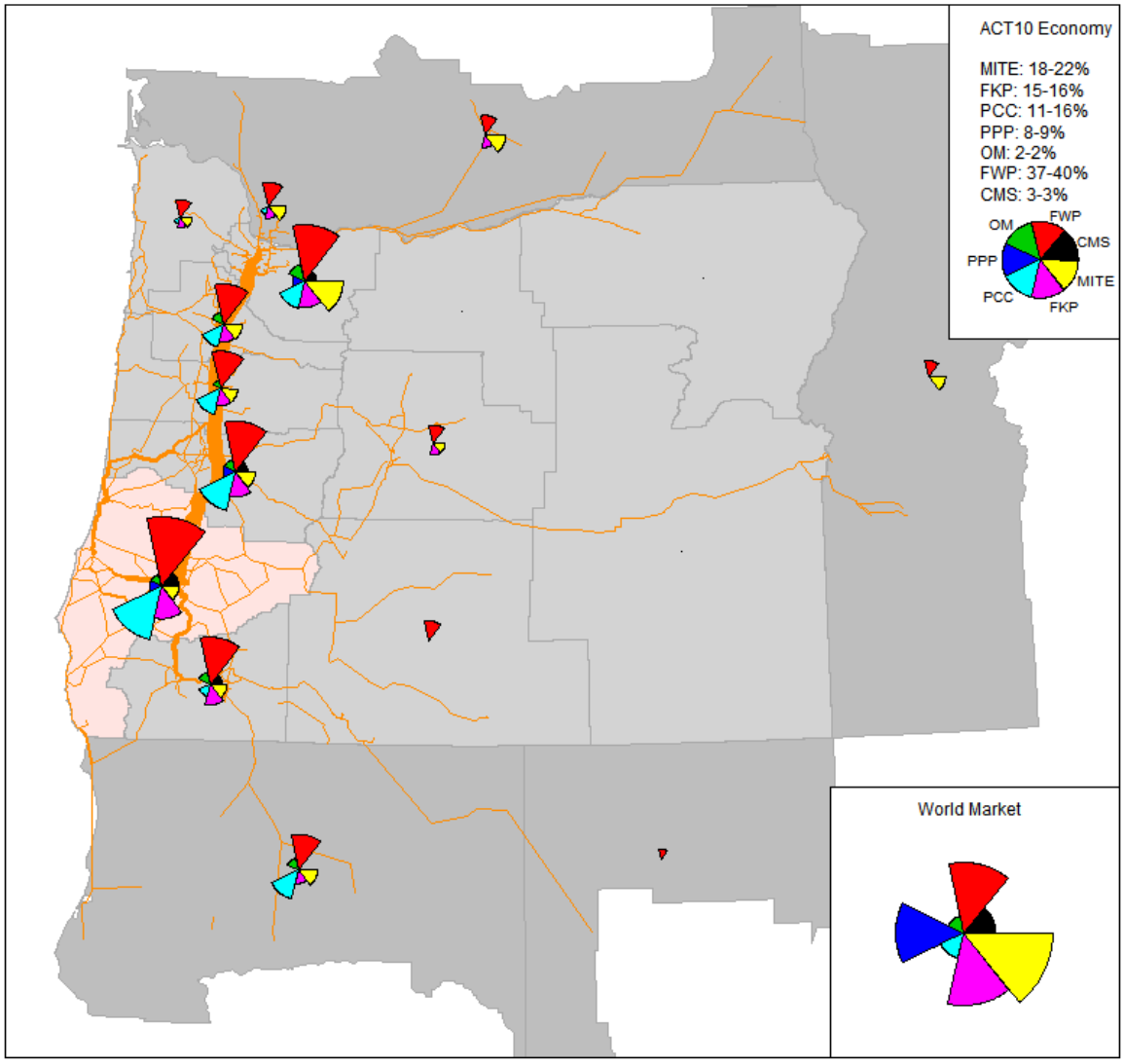
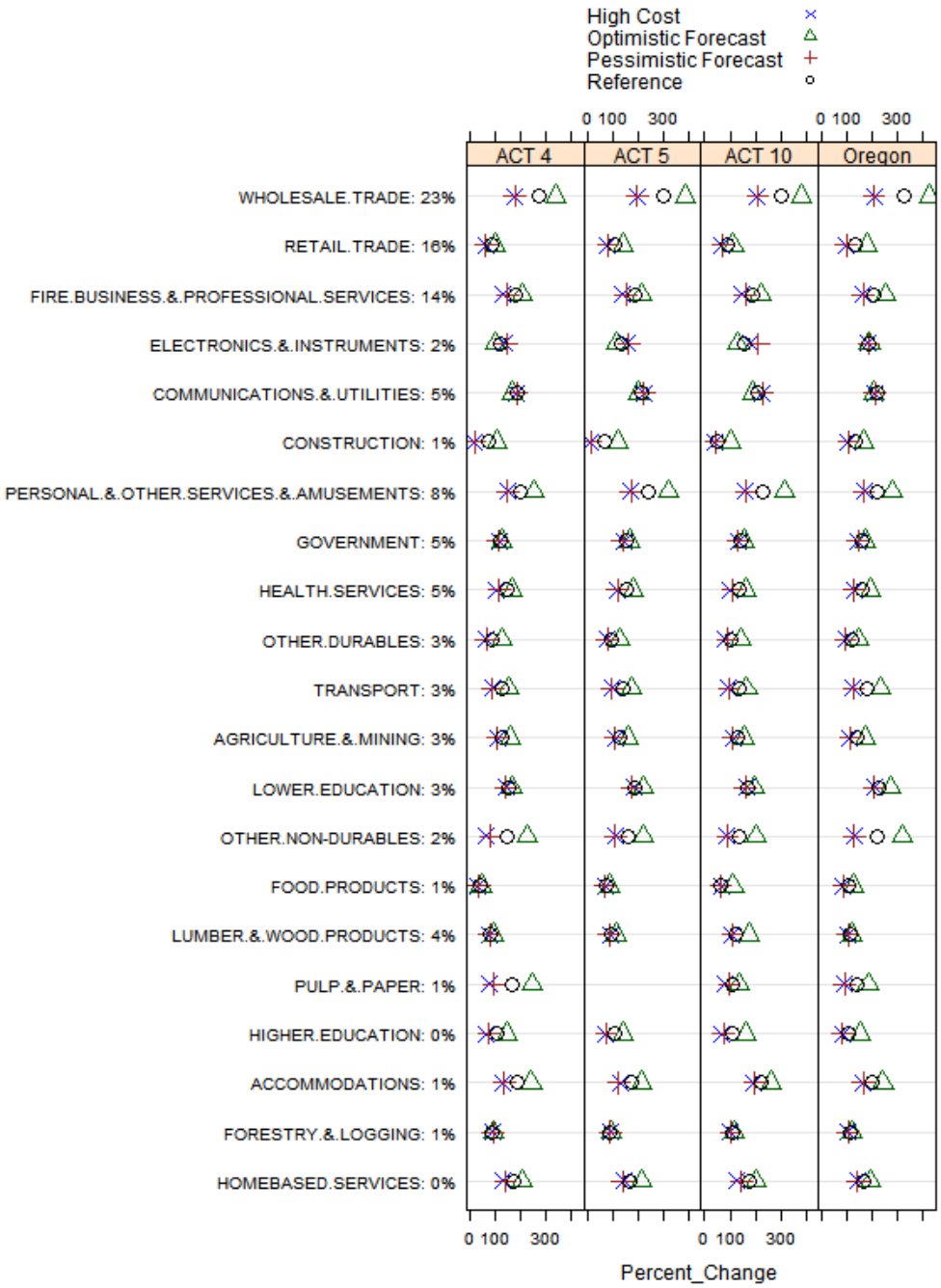


Table 19. South West ACT Commodity Flow by Corridor in Ton-Miles

	Machine, Instrument, Trans Equip	Food Kindred Products	Petroleum, Coal, Chemicals	Paper Pulp Products	Other Misc	Forest or Wood Products	Clay, Mineral, Stone
I-5	63%	72%	68%	60%	69%	67%	56%
US-101	11%	11%	14%	14%	11%	9%	25%
OR-126	6%	3%	6%	7%	6%	4%	4%
OR-42	1%	3%	3%	1%	2%	5%	4%
OR-38	0%	1%	1%	6%	2%	3%	1%
OTHER	19%	10%	8%	12%	10%	12%	10%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Figure 42 presents the percent change in industry output over twenty years for all four scenarios. South West Oregon follows the state trends very closely. Two industries that vary under different economic conditions play a significant role in the South West economy: Wholesale Trade and Personal & Other Services & Amusements, making up over 30 percent of the regional economy. Fluctuations in these industries impact regional production and employment. Note that the South Central Oregon Act (4) realizes greater variability in the Pulp and Paper industry than the state in general.

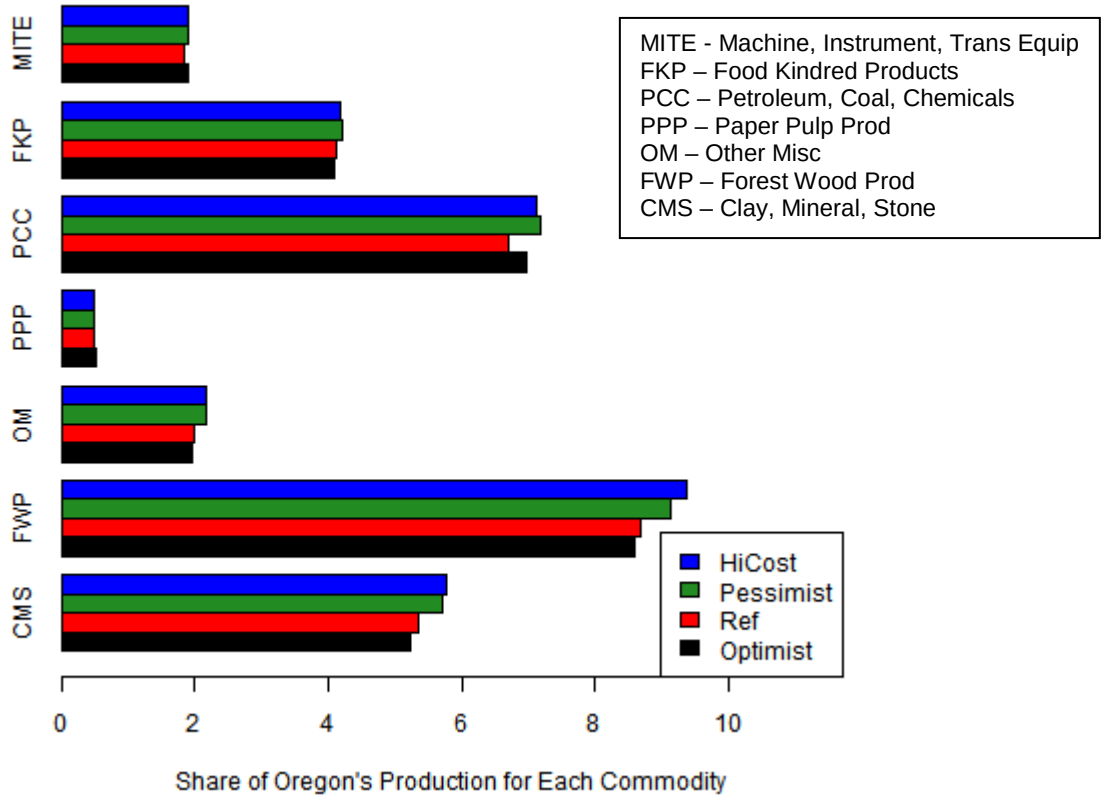
Figure 42. South West Oregon Percent Change in Output by Industry from 2006 to 2027, All Scenarios (including percent of statewide output by industry)



Central Oregon (ACTs 6 & 7)

Central Oregon includes two ACTs: Lower John Day (6) and Central Oregon (7.) Lower John Day ACT population center is the City of The Dalles along the Columbia Gorge. Central Oregon ACT includes the cities of Bend, Redmond and Prineville. Together, these two ACTs represent about 7% of Oregon's population, over eighty percent of which are located in the Central Oregon ACT. Figure 43 provides a profile of the commodities produced in the area in terms of value. Central Oregon's economy is predominantly focused on Forest and Wood Products and Petroleum, Coal and Chemicals group. This area produces a disproportionately high share of statewide production of Forest and Wood products. The share of commodity production remains fairly stable as economic conditions change, compared to other areas of Oregon.

Figure 43. Central Oregon Commodity Production by Value: All Scenarios



Figures 44 and 45 illustrate the destinations of commodities produced in the two Central Oregon ACTs. The Lower John Day ACT economy is dominated by production of Food and Kindred Products and Petroleum, Coal and Chemicals. Together these two groups cover between sixty and seventy percent of the commodity production in this ACT. Figure 44 includes commodity flows for all modes, so the port activity within the ACT is included. One can see the predominant destination for Petroleum, Coal and Chemicals is to the north, with internal destinations in the Portland area, internally within Lower John Day Act and to the east in the North East ACT. Food and Kindred Products are predominantly destined for the Portland and Vancouver area, and other population centers of the state. Machinery and Instruments group represents about twenty percent of the ACT economy, with destination markets to the north, Portland and Vancouver, and the Willamette Valley. Shipping via the Columbia River is important to the Lower John Day ACT, including the rail line. More

detail related to activity at the ports is available from other research done in support of the Oregon Freight Plan.

Several highway corridors are important for commodity flows for this area. Table 20 illustrates the relative importance of highway corridors used to transport goods to market for the Lower John Day ACT. A large share of goods are shipped to the Portland/Vancouver area and out of state, making both I-5 and I-84, US97, US26, US20 and US-197 important corridors for Central Oregon.

Figure 44. Commodity Flow From Lower John Day ACT to All Destinations

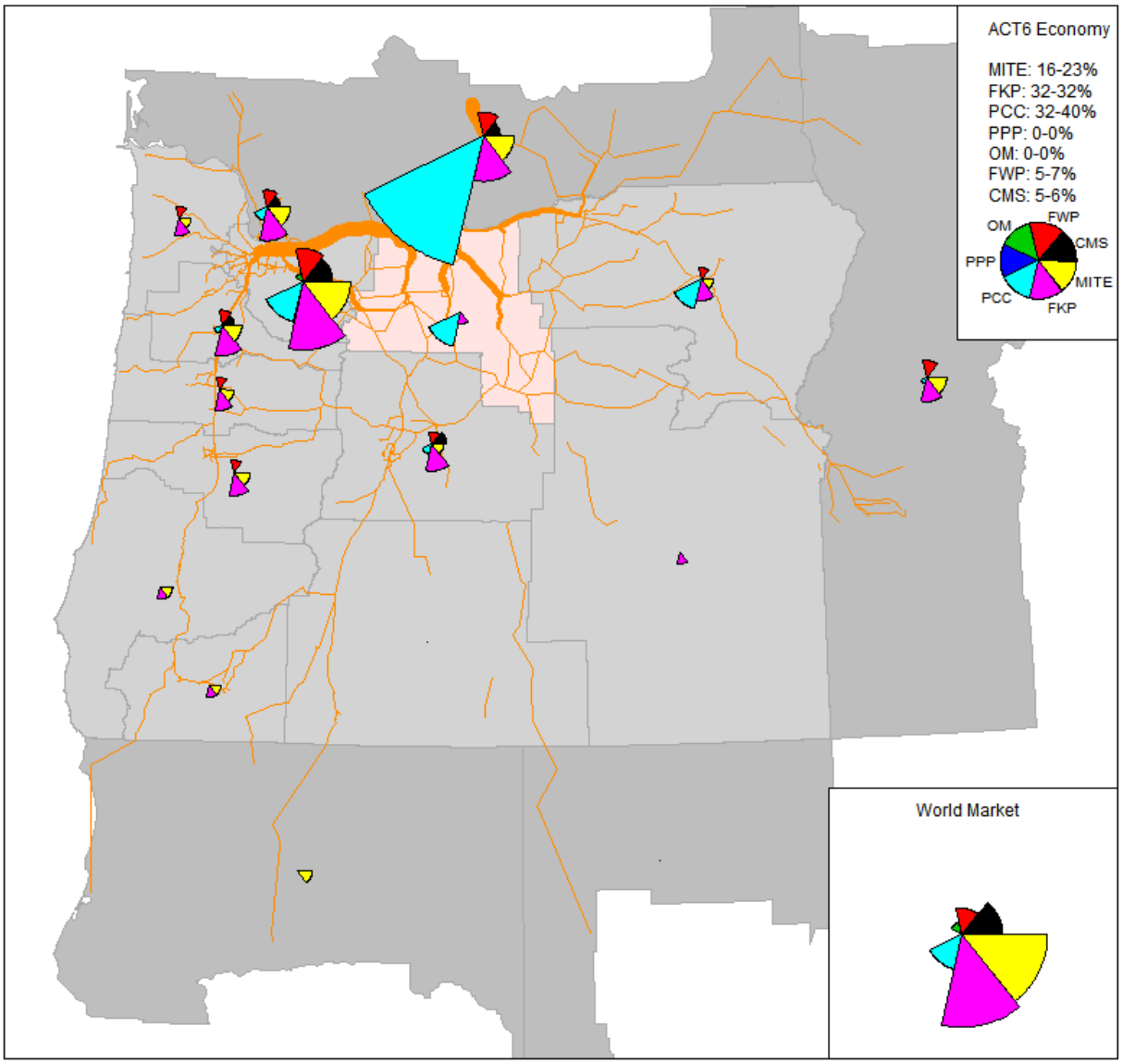


Table 20. Lower John Day ACT Commodity Flow by Corridor in Ton-Miles							
	Machine, Instrument, Trans Equip	Food Kindred Products	Petroleum, Coal, Chemicals	Paper Pulp Products	Other Misc	Forest or Wood Products	Clay, Mineral, Stone
I-84	70%	37%	29%	62%	47%	35%	19%
US-97	8%	17%	30%	21%	19%	10%	39%
US-26	2%	7%	9%	1%	1%	19%	22%
I-5	9%	14%	1%	7%	18%	8%	3%
US-197	6%	5%	10%	5%	6%	6%	9%
OR-206	1%	6%	7%	0%	3%	5%	1%
OR-19	1%	2%	5%	0%	1%	3%	1%
OTHER	3%	12%	9%	4%	5%	14%	6%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Figure 45 illustrates the destinations of commodities produced in the Central Oregon ACT. The Central Oregon ACT economy is dominated by four commodity groups: Machinery and Instruments; Forest or Wood Products; Petroleum, Coal and Chemicals; and Food and Kindred Products. These four groups make up over eighty percent of the economy. Destination markets for Machinery and Instruments are mostly the Portland area and out of state, Forest or Wood Products and Petroleum, Coal and Chemicals are shipped within the Central Oregon ACT, Portland, and out of state. Food and Kindred Products are destined for Portland, the Willamette Valley region, within the ACT itself, as well as outside of the state.

Most goods are transported via truck, as can be seen in Figure 45 by the orange highway network flows. Table 21 illustrates the relative significance of highway corridors used to transport Central Oregon goods to destination markets. Significant corridors for this area include US-97, US-26, and US-20.

Table 21. Central Oregon ACT Commodity Flow by Corridor in Ton-Miles							
	Machine, Instrument, Trans Equip	Food Kindred Products	Petroleum, Coal, Chemicals	Paper Pulp Products	Other Misc	Forest or Wood Products	Clay, Mineral, Stone
US-97	29%	49%	62%	45%	48%	18%	34%
US-26	27%	14%	17%	36%	17%	33%	22%
US-20	21%	13%	6%	5%	13%	16%	17%
OR-126	4%	2%	2%	3%	3%	8%	7%
OR-22	5%	2%	2%	2%	8%	6%	4%
I-84	4%	8%	2%	4%	3%	3%	1%
OTHER	10%	12%	9%	5%	8%	16%	15%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Figure 45. Commodity Flow From Central Oregon ACT to All Destinations

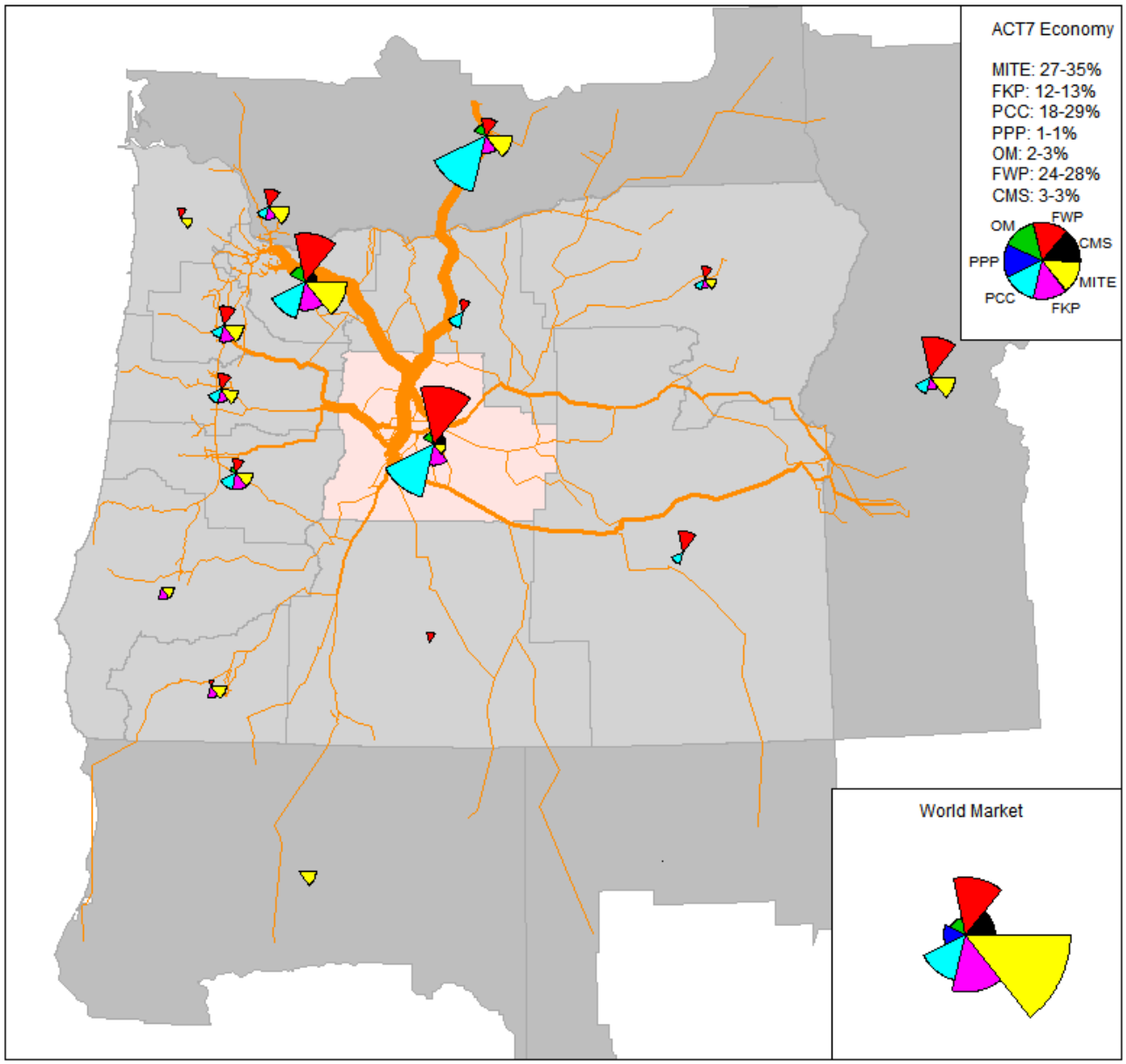
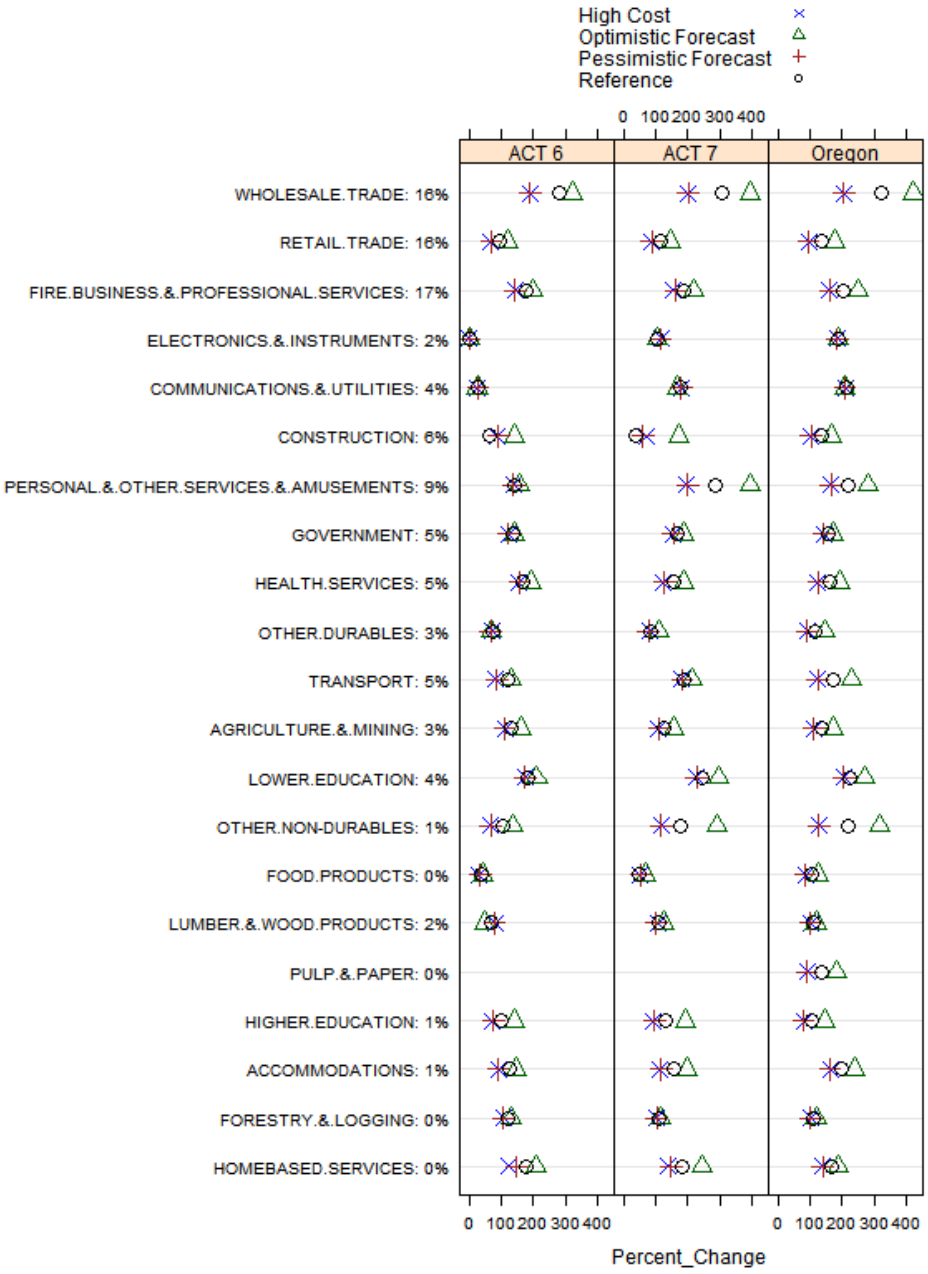


Figure 46 presents the change in industry output over twenty years for the Central Oregon ACTs and the state by industry group for all four scenarios. Central Oregon's Industry is more focused then Oregon as a whole, which exposes the region to economic variability. Wholesale Trade; Retail Trade; FIRE, Business and Professional Services; and Personal and Other Services make up nearly sixty percent of the industry output for the Central Oregon ACT. The variation in industry activity for this area is similar to the state as a whole, with a couple of exceptions. Wholesale Trade grows a little less that the state over the forecast twenty years. Change in Construction activity in the Central Oregon ACT (7) is higher than the entire state for the Optimistic Scenario. Personal and Other

Services, and Other Non-Durables industries are very stable in the Lower John Day ACT, but vary more for the Central Oregon ACT than the state as a whole.

Figure 46. Central Oregon Area Percent Change in Output by Industry from 2006 to 2027, All Scenarios (including percent of statewide output by industry)



Eastern Oregon (ACTs 3 & 11)

The Eastern Oregon area represents the least populous part of the state, less than four percent of state population, but more than one third of the area in land. Population centers include Pendleton, LaGrande and Baker City in the North East ACT (3), Ontario and Burns in the South East ACT (11.) A good deal of the land is used for agricultural production activity, such as producing Food and Kindred Products. Figure 47 illustrates the production shares for the state from Eastern Oregon. The Food and Kindred Products group produced in Eastern Oregon represents about 20 percent of the total statewide production. A relatively large share of Clay, Mineral and Stone; and Petroleum, Coal and Chemicals commodity groups are produced within this region as well.

Figure 47. Eastern Oregon Commodity Production by Value: All Scenarios

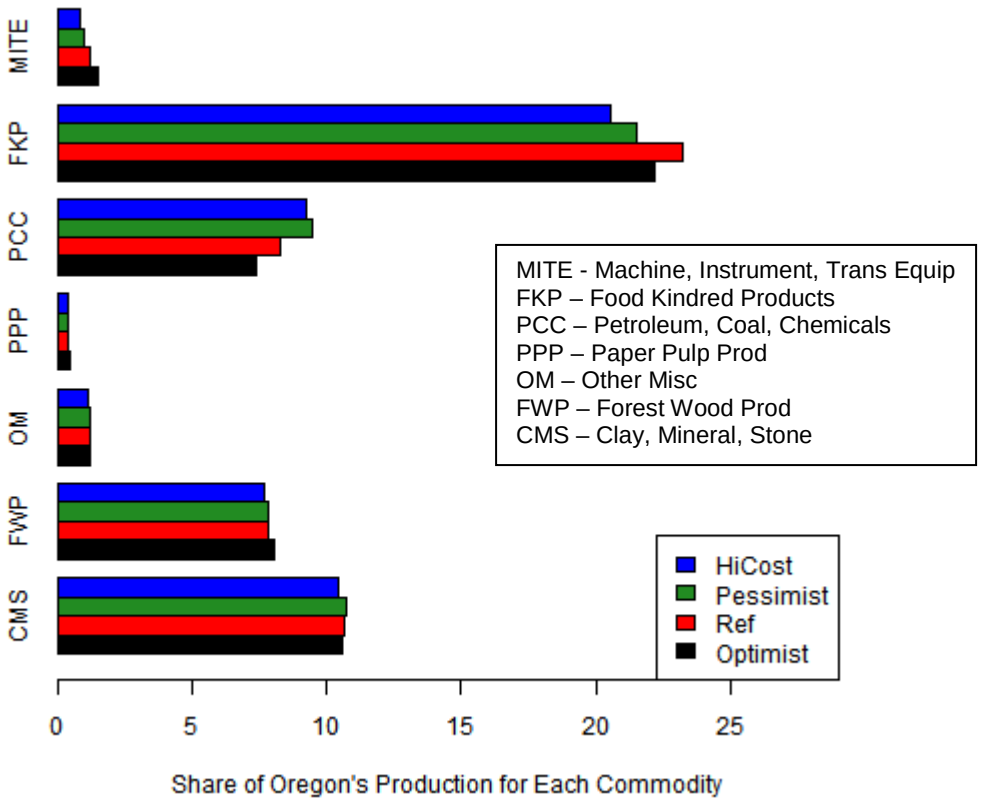


Figure 48 maps the destinations of commodities produced in the North East ACT. Food and Kindred Products make up over half of the ACT economy. A proportion of these goods are consumed within the ACT, but most are destined out of state or to the Portland/Willamette Valley area. The other commodities of regional significance are Petroleum, Coal and Chemicals; and Forest or Wood Products, most of which are destined outside of the state, within the ACT or to the Portland area. Machinery and Instruments represent more than ten percent of the regional economy, but this is a relatively small share in terms of statewide production (less than three percent.)

The Oregon highway flows illustrated in orange in Figure 48 demonstrate the relative significance of corridors on which ACT goods flow. Table 22 provides more detail by specific highways. I-84 (and I-82), along with US-97 and OR-11 are relied upon by the North East ACT to get goods to market destinations.

Figure 48. Commodity Flow From North East ACT to All Destinations

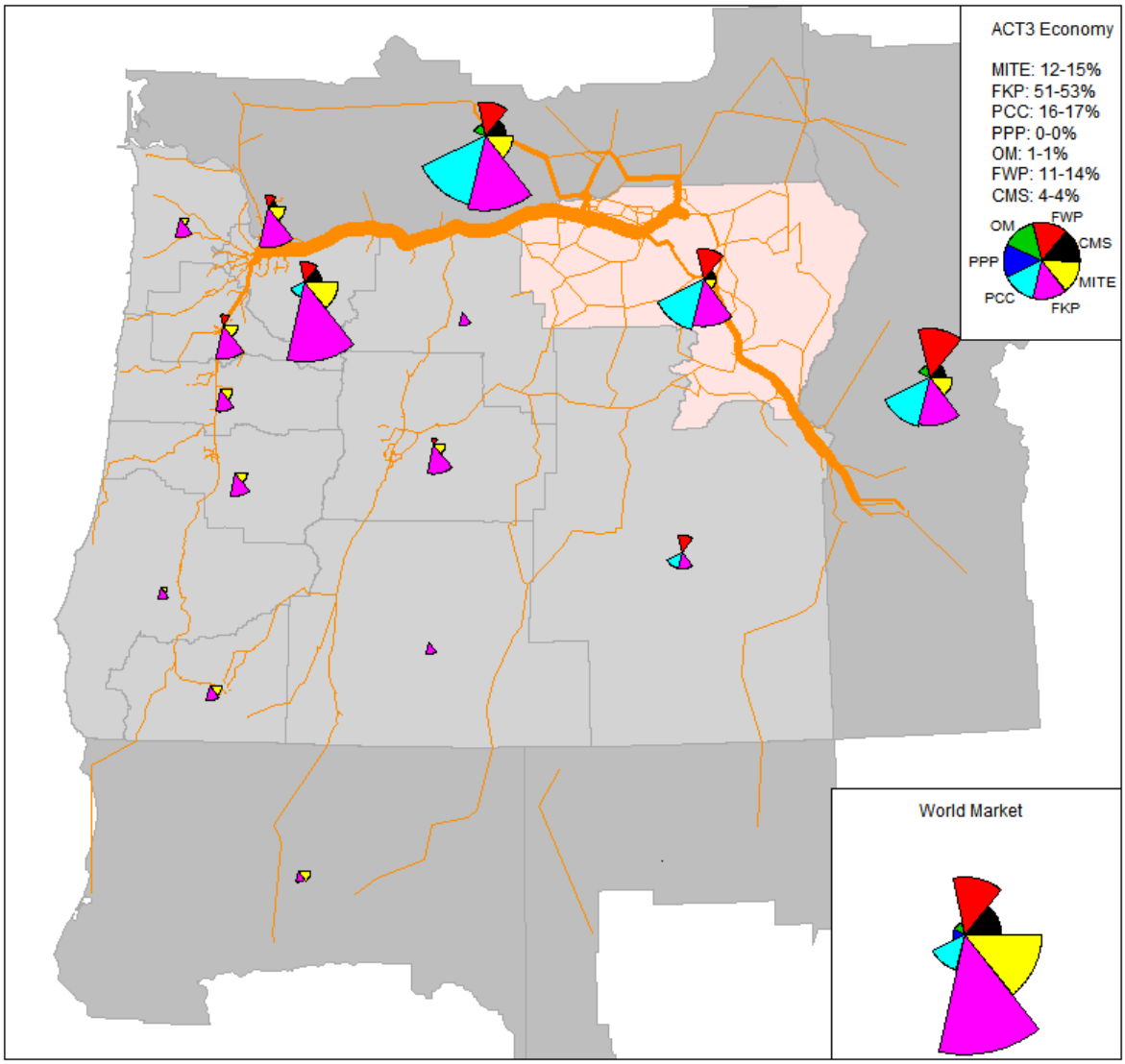


Table 22. North East ACT Commodity Flow by Corridor in Ton-Miles							
	Machine, Instrument, Trans Equip	Food Kindred Products	Petroleum, Coal, Chemicals	Paper Pulp Products	Other Misc	Forest or Wood Products	Clay, Mineral, Stone
I-84	75%	67%	60%	64%	70%	55%	47%
I-82	5%	2%	7%	7%	5%	5%	2%
US-97	4%	6%	2%	3%	5%	2%	1%
OR-11	1%	8%	3%	5%	4%	4%	8%
OR-207	1%	2%	5%	1%	2%	7%	7%
OTHER	14%	15%	23%	20%	14%	27%	35%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Figure 49 illustrates the destinations of commodities produced in the South East ACT. Food and Kindred Products play a dominant role in the South East ACT economy, representing over fifty percent of commodity production. This commodity group is predominantly destined to markets outside of Oregon, but Figure 49 demonstrates a significant amount is destined within the state. The second largest commodity group for the South East ACT is Petroleum, Coal and Chemicals group, which represents over twenty percent of the ACT commodity production. A large share of this commodity remains within the ACT, most of which destined out-of-state. Forest or Wood Products make up about ten percent of the ACT commodity production, destined to surrounding ACTs, but predominantly out-of-state.

The highway commodity flows illustrated in orange in Figure 49 reveal the relative significance of highway corridors on which South East ACT goods flow. Table 23 provides more detail by specific highways. I-84, US-20, US-26, and OR-395 are key facilities for getting goods to destination markets for this ACT.

Figure 49. Commodity Flow From South East ACT to All Destinations

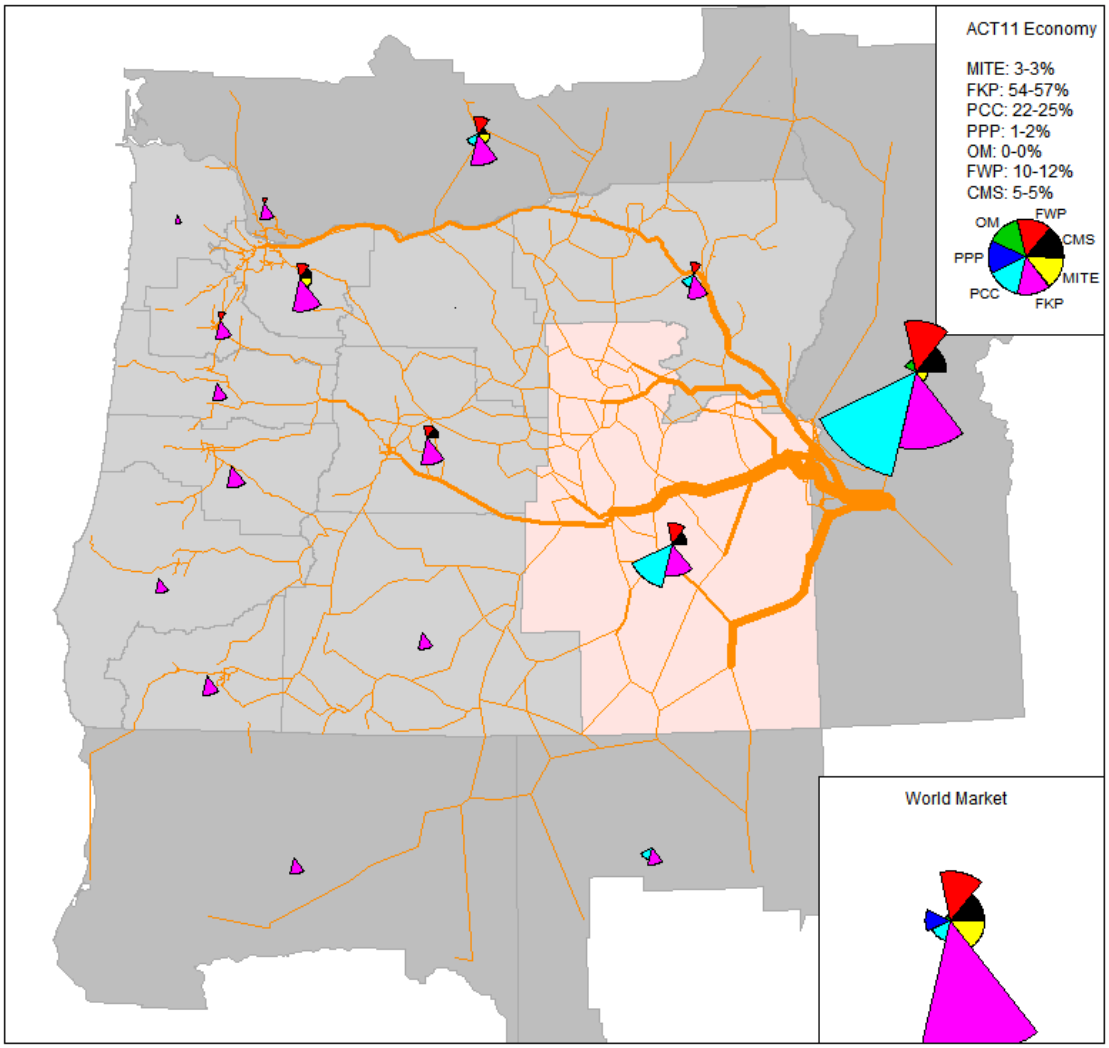
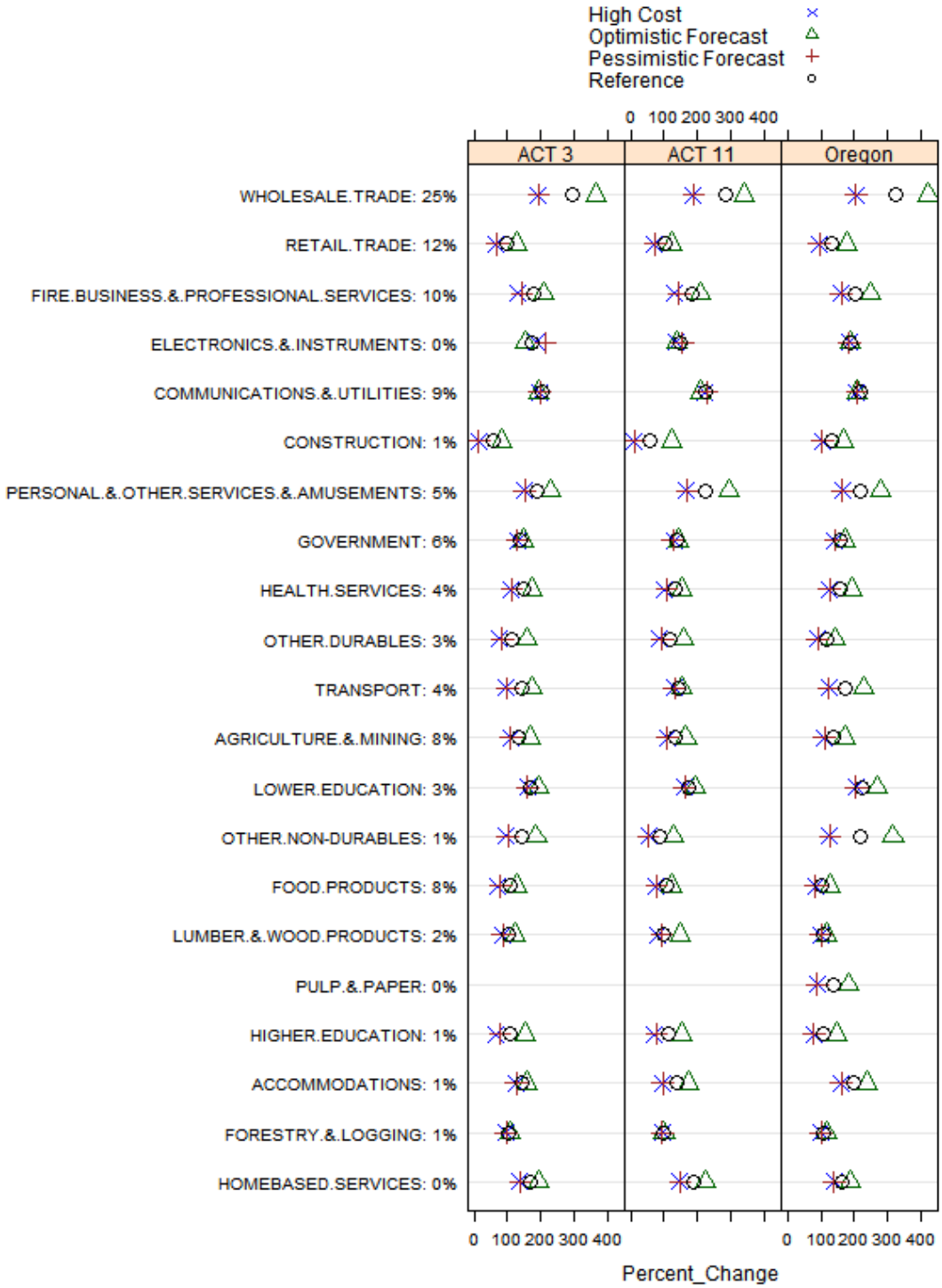


Table 23. South East ACT Commodity Flow by Corridor in Ton-Miles							
	Machine, Instrument, Trans Equip	Food Kindred Products	Petroleum, Coal, Chemicals	Paper Pulp Products	Other Misc	Forest or Wood Products	Clay, Mineral, Stone
US-20	44%	27%	30%	11%	10%	24%	32%
I-84	22%	31%	19%	36%	59%	24%	25%
US-26	11%	8%	7%	11%	7%	15%	23%
OR-395	9%	11%	15%	15%	12%	8%	3%
OR-95	0%	5%	9%	0%	0%	9%	0%
OTHER	14%	18%	20%	27%	12%	20%	17%
TOTAL	100%	100%	100%	100%	100%	100%	100%

Figure 50 presents the change in industry output over twenty years for Eastern Oregon ACTs and the state by industry group for all four scenarios. Eastern Oregon's Industry mix is dominated by three industries. Wholesale Trade (25%), Retail Trade (12%), and FIRE, Business and Professional Services (10%) make up nearly fifty percent of the industry output of Eastern Oregon. Variation in industry growth for these three sectors is dependent on economic conditions, similar to the state. Eastern Oregon industry growth is consistent with statewide patterns. Communications and Utilities, Agriculture and Mining, and Food Products represent another 25% of ACT production, with less growth variation under different economic conditions.

Figure 50. Eastern Oregon Percent Change in Output by Industry from 2006 to 2027, All Scenarios (including percent of statewide output by industry)



Conclusion

Oregon will realize significant increases in freight flows over the next thirty years. Even if the rate of growth is lower than current economic forecasts predict and the cost of transportation rises, the demands on the freight system will be great. While the precise mix of industry activity is challenging to predict, economic inertia causes the prevailing commodity mix and regional flow patterns to remain generally intact under different economic conditions. Oregon relies on a network of corridors to get goods to market. Many of Oregon goods are destined to locations within the state, while others are destined to markets beyond Oregon borders. These corridors also accommodate freight moving through the state

Oregon freight movement patterns result from the combined decisions and actions of thousands of "economic actors" – not only the buyers and sellers, but the links between them, such manufacturers, shippers, distribution centers, warehouses, distributers and consumers. Each industry follows a distinct logistics pattern, some requiring fast, reliable transportation of goods, while others look for the least expensive modes to take advantage of economies of scale. Some goods move via multiple freight modes, combinations of air and truck, or rail and truck, making adaptive changes to remain competitive as market conditions vary over time.

All this reveals the importance of creating a system that supports the activity of a variety of users, keeping in mind the facilities are shared with passenger transportation modes, as well as freight moving through the state. Not only does system use vary by industry and commodity, it also varies by region of the state.

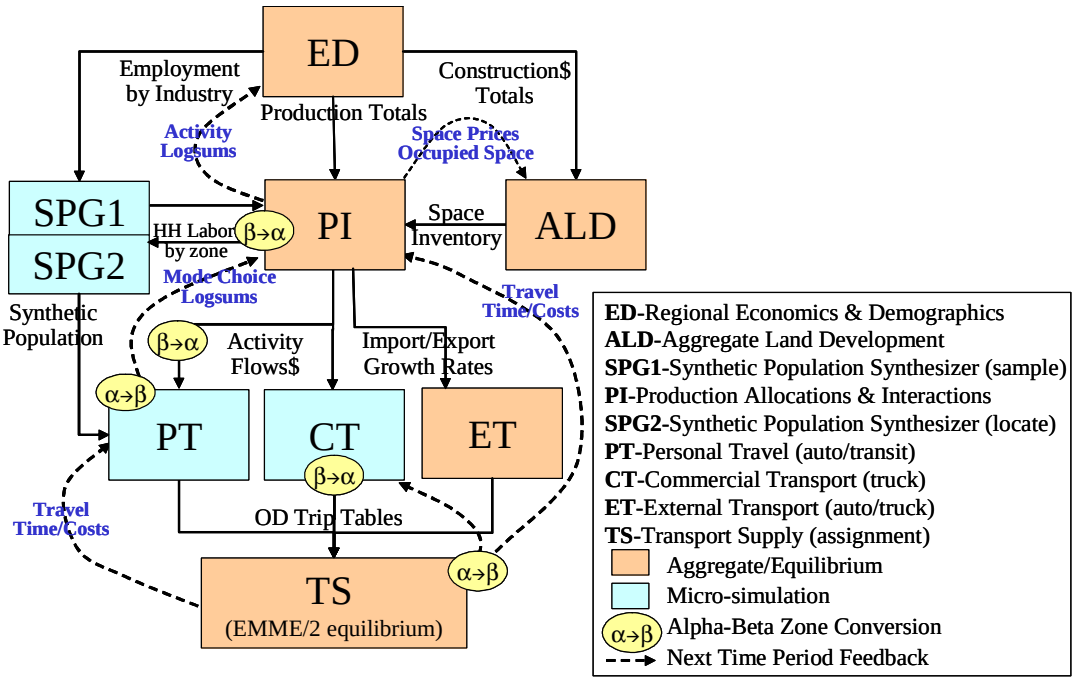
Appendix A – Oregon Statewide Integrated Model 2 (SWIM2) Overview

The Oregon Statewide Integrated Model (SWIM2) is an integrated land use transport model covering the entire State of Oregon. It is a second generation model, drawing on previous work done on the First Generation Statewide Model (SWIM1) and the Eugene-Springfield UrbanSim Model. The SWIM1 model was a customized version of the TRANUS software. SWIM2 is a more disaggregate and complex customized framework that combines a PECAS spatial model (Production, Exchange, and Consumption Allocation System) with activity-based transport models. SWIM2 augments the First Generation SWIM1 Model in more complex applications of Oregon statewide policy and investment decisions. Future SWIM2 model upgrades will be driven by policy application needs.

The development of both the first and second generation models was commissioned by the Oregon Department of Transportation as part of its Transportation and Land Use Model Improvement Program (TLUMIP) within the larger Oregon Model Improvement Program (OMIP). The model development has been undertaken by a series of teams led by Parsons Brinckerhoff, with Hunt Analytics, HBA Specto, EcoNorthwest and The University of Washington playing key roles as sub-contractors. The program has also been guided by an international Peer Panel.

SWIM2 contains nine modules as shown in Figure A.1. Each was developed and calibrated independently before proceeding with full system integration. The full model calibration of all modules in both a baseyear and trends over time was then completed and shared with the TLUMIP Peer Panel. The full model is run every 3 years, while the spatial-economic modules (ED-SPG1-ALD-PI) run every year.

Figure A.1. Modules and Flows in the Oregon Statewide Integrated Model (SWIM2)



SWIM2 operates at two geographic levels (Figure A.2). Both encompass 36 Oregon and 39 (Halo) adjacent state counties. The halo encompasses a roughly 50-mile buffer around Oregon. A system of alphazones (light and dark lines in Figure A.2) is the most disaggregate zone system. There are 2,950 alphazones within the model boundaries (2,575 zones in Oregon and 375 in the Halo) and 12 extermal stations (Table A.1 and Figure A.3). The External Stations serve as model area entry/exit points or gateways.

Figure A.2. SWIM2 alphazone and betazone Systems

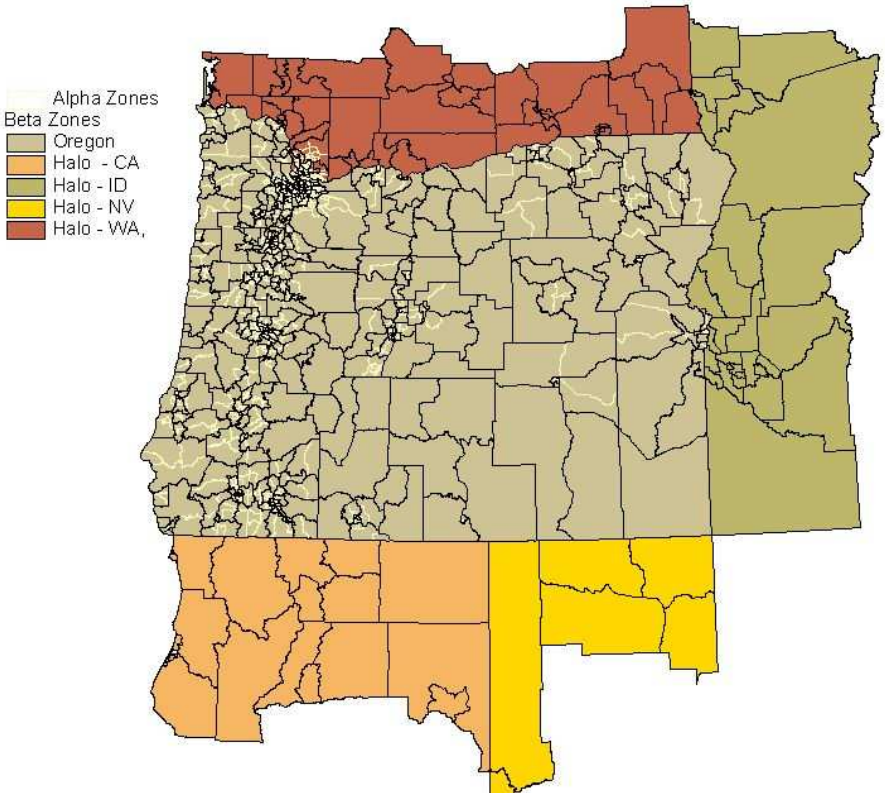
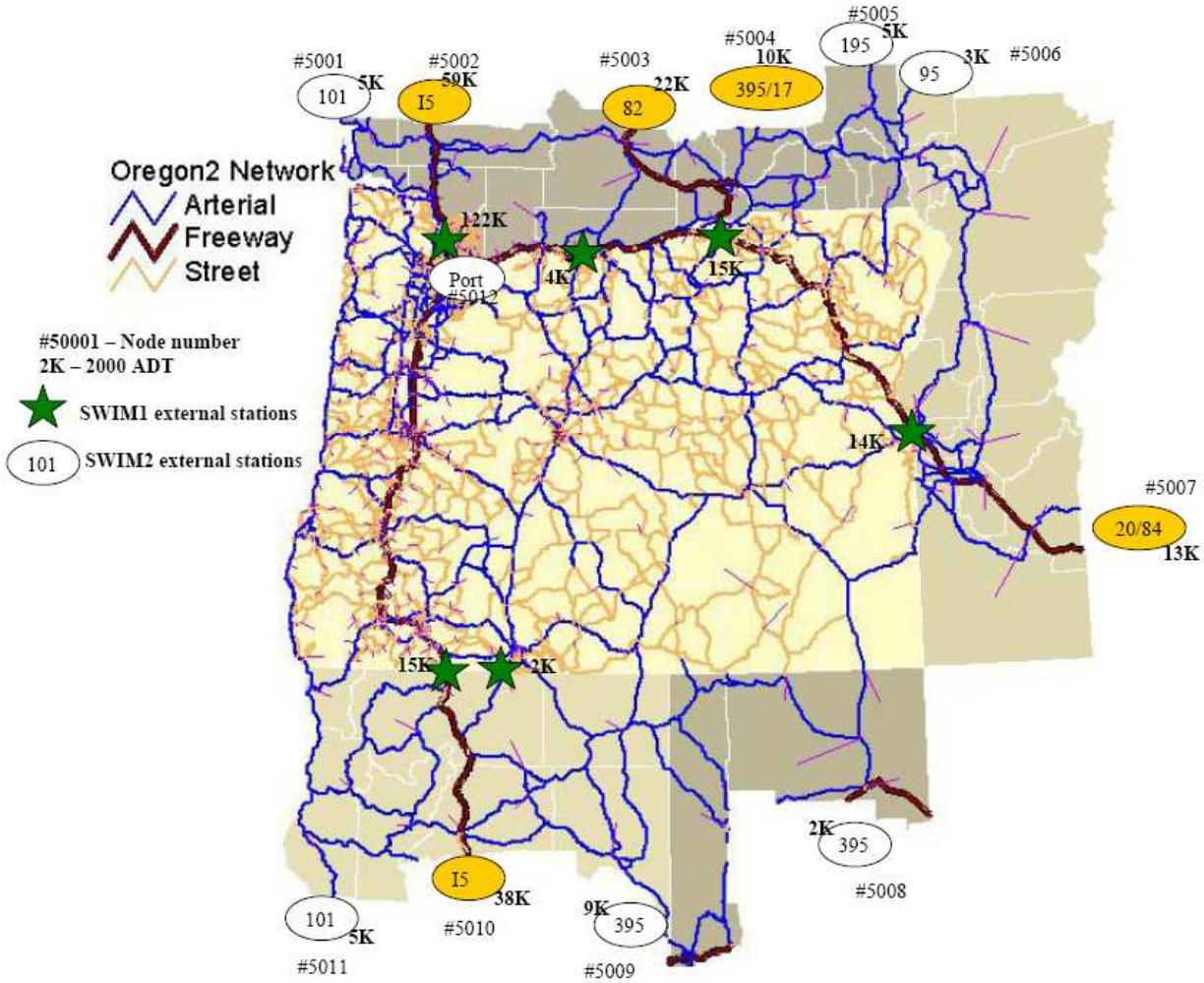


Table A.1. SWIM2 External Stations

SWIM2 Node#	External Station Description
5001	US101 (WA)
5002	I-5 (WA)
5003	I-82 (WA)
5004	US395/WA17 (WA)
5005	US195 (WA)
5006	US95 (ID near WA border)
5007	I-84/US20 (ID)
5008	US95 (NV, just north of I-80)
5009	US395 (CA, just north of I-80)
5010	I-5 (CA)
5011	US101 (CA)
5012	Port of Portland Terminal 6

Figure A.3. Map of SWIM2 External Stations



The Production Allocation and Interactions (PI) module operates on a more aggregated betazone system (dark lines in Figure A.2) and replace the 12 External Stations with six World Markets (Table 2.2). There are 518 betazones, collapsing zones only within Oregon, with a focus on the small urban zones. For example, the roughly 970 alphazones in Portland were collapsed to approximate a set of 66 employment regions used by the Metro MPO model. In other urban areas, zones were collapsed based on a sliding population scale (approximately 25,000 persons/zone), respecting similar employment clusters and transportation commute sheds. In rural areas, homogenous public lands (e.g., BLM, National Forests) were collapsed, while retaining most county and all ACT boundaries (Area Commissions on Transportation (ACTs), used in Oregon transportation planning, provide a convenient way to divide the State into 12 areas).

The six World Markets, used only in the PI module, are defined in Table A.2 and Figure A.4 and A.5 including the assumptions on distance to reach these markets beyond the model halo boundary. It is assumed that goods transported by truck and rail is limited to the US (except Hawaii), Canada and Mexico. Imports and Exports to other regions in the world are shipped by barge, either from the Portland port or from other US East or Southeast ports. The Air mode is not estimated, since it represents less than 1 percent of all goods movement in Oregon, and at most 2 percent of any single commodity's flows. Reporting for that mode is handled outside the SWIM.

The distance represents the weighted average distance from the halo boundary to the centroid of the World Market. In the case of the Oceanic market (zone 6005), an equivalent distance was identified that would result in the correct overall shipping costs. The 'local' World Market 6006 is assumed to support commodities that are traded within 75 miles of the model area.

These six World Markets link to the model transport network at the 12 External Stations of Figure A.3, as shown in Table A.2. These External Stations roughly parallel the likely rail as well as truck freight routes. The local 6006 world market, trading within 75 miles of the model boundary, is linked to the minor External Stations, which is all but I-5 (5002, 5010), I-84 (5007) and the Port of Portland (5012).

Table A.2. PI World Market Zones and Distance Assumptions

Zone Number	Code	Distance beyond halo (miles)*	External Station/ Relevant Roads	World Market Definition
6001	N	240	5002 I-5	Washington State and Canada
6002	NE	800	5003 I-82 5004 US 395	Northern states of the Midwest
6003	E	1,200	5007 I-84	Central and Eastern part of the US and barge traffic through East and South Coast US ports
6004	S	460	5010 I-5	Southwestern states and Mexico
6005	Ocean	1500 for imports, 600 for exports	Port of Portland (5012)	Rest of the world
6006	Local	75	5001, 5003, 5004, 5005, 5006, 5008, 5009, 5011	Local markets in neighboring states

* Assumes 50 mph beyond halo to calculate equivalent travel time. The assignment of external origin/destination regions to external stations is based on a fastest travel time analysis to the centroids of each external region. Oceanic shipping costs for zone 6005 were calibrated to truck transport costs so that all World Markets would compete on the same measure. This assumes $600-900 import and $700-2200 export costs to ship a Truck Equivalent Unit (TEU) between Portland and Japan (per may 2007 discussions with Port of Portland Staff).

Figure A.4. World Markets in North America

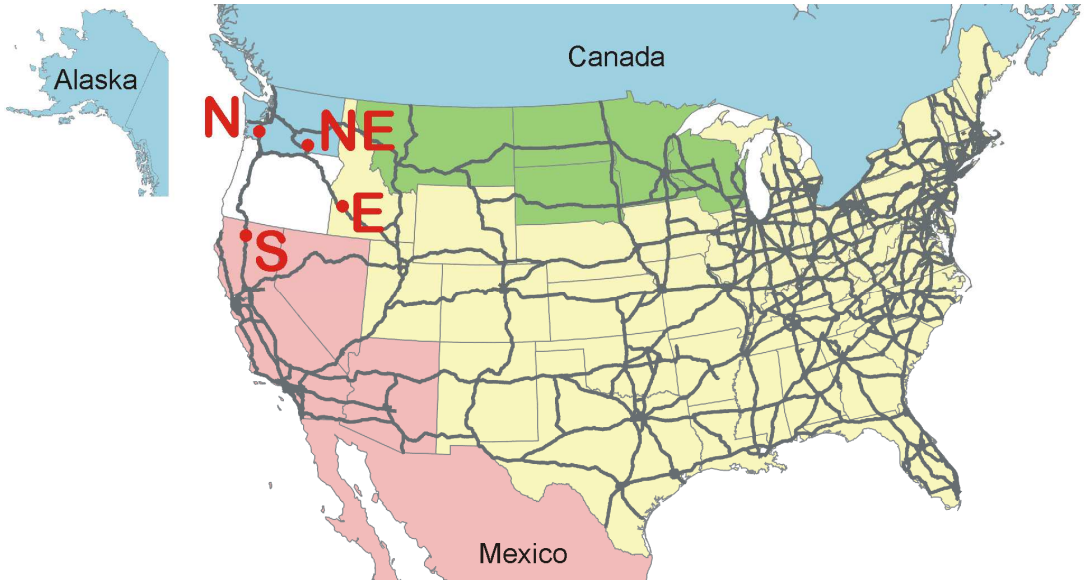
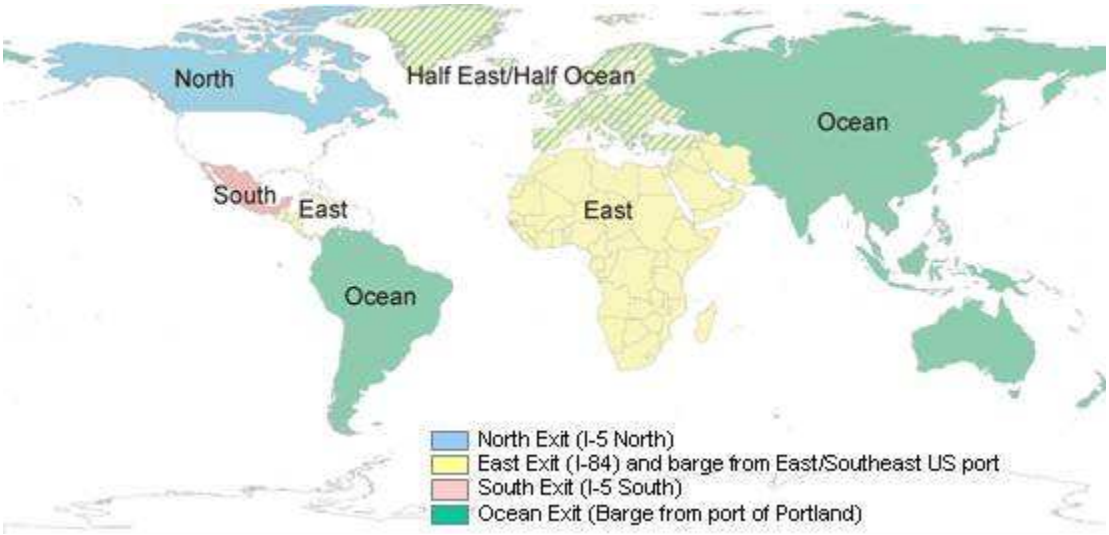
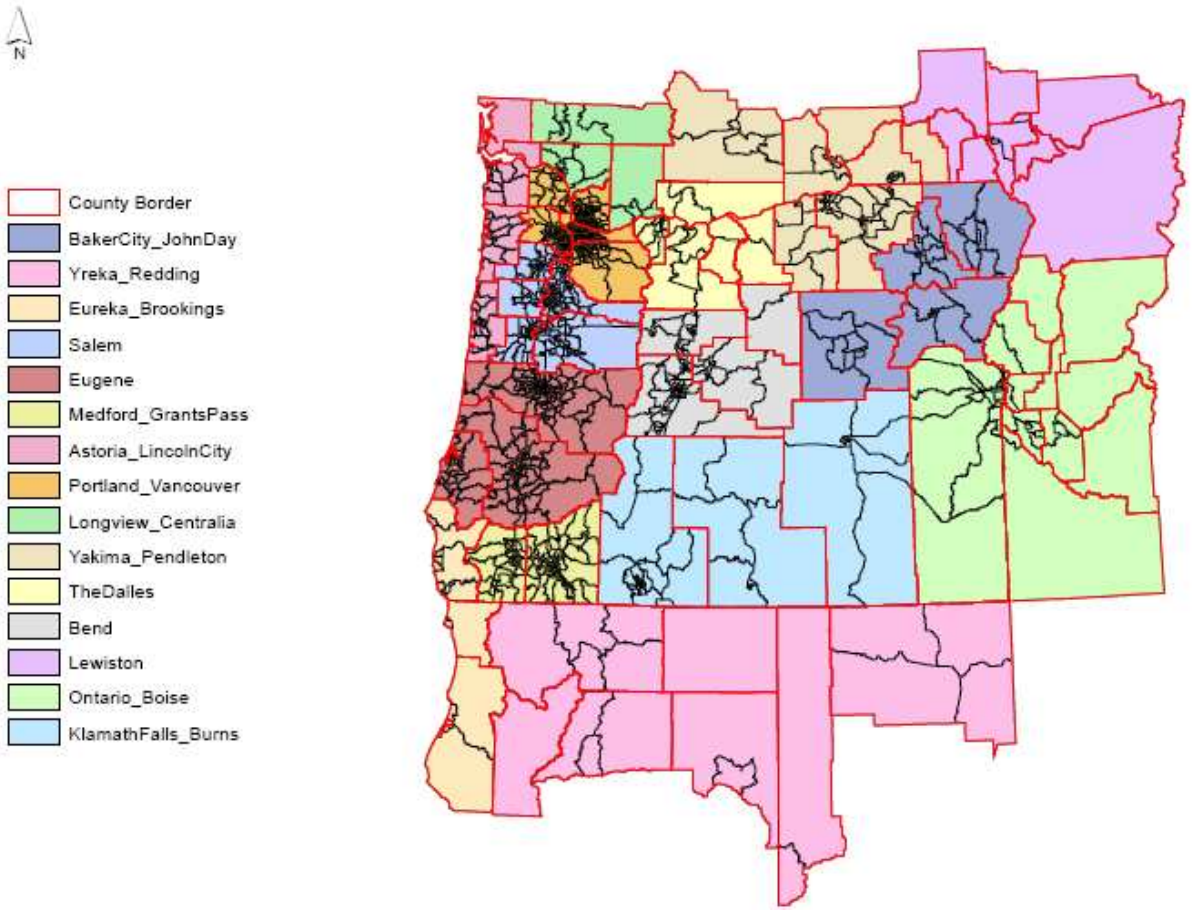


Figure A.5. World Markets outside US



The Aggregate Land Development (ALD) land use module uses a 15 region aggregation of the alphazones for making land development decisions. These regions, shown in Figure A.6, represent land development markets within the study area.

Figure A.6. ALD Land Market Regions



Tables A.3 lists the industry used in SWIM2. In general, a given industrial sector is split into blue-collar and white-collar (or 'management') components using associated 'production' and 'office' space, respectively. The industries are split this way so that the allocation processes in the module can consider the very different location behavior and space requirements of these two components separately. The few industries without separate management and production sites include FIRE (Finance, Insurance, Real-Estate), hotel, personal services, construction, and home-based services. Home-based services are self-employed workers who sell their services to households (e.g., housekeepers, nannies, handymen). The brokerage portion of real estate, which uses labor and floorspace, was folded into FIRE. The remaining rents of the 'real estate' category, and other non-spatial activities were folded into imports (if negative) or exports (if positive). These non-spatial activities don't consume floorspace or labor and include private and institutional money flows (rents, enterprises, capital, federal/state/local government funding and investment, accounting/financial transactions, change in inventories, salvage).

Internal management activities for the remaining industries require separate offices and employees that have different characteristics (income, location, trip generation) then the specific purpose of the industry.

Table A.3. Activities - Industries

Index*	Industry	Floorspace	Internal Service
2, 3	Agriculture And Mining	in Agriculture space	and Office space
7,8	Electronics And Instruments	in Light industry space	and Office space
10, 12	Food Products	in Heavy industry space	and Office space
11, 12	Food Products	in Light industry space	
23 , 24	Lumber And Wood Products	in Heavy industry space	and Office space
25, 27	Other Durables	in Heavy industry space	and Office space
26, 27	Other Durables	in Light industry space	
28, 30	Other Non-Durables	in Heavy industry space	and Office space
29, 30	Other Non-Durables	in Light industry space	
32, 33	Pulp And Paper	in Heavy industry space	and Office space
4, 5	Communications And Utilities	in Light industry space	and Office space
36, 37	Transport	in Depot space	and Office space
38, 39	Wholesale Trade	in Warehouse space	and Office space
34, 35	Retail Trade	in Retail space	and Office space
16, 18	Health Services	in Hospital space	and Office space
17, 18	Health Services	in institutional space	
19, 22	Higher Education	in institutional space	and Office space
21, 22	Lower Education	in Grade-school space	
14, 15	Government Administration	in Support space	and Office space
13	Forestry And Logging	in Logging space	
1	Accommodations	in Accommodation space	
9	FIRE, Business, and Professional Services	in Office space	
31	Personal & Other Services And Amusements	in Retail space	
20	Home-based Services		
6	Construction		

* Second index is for 'office' portion of split industry

Household categories (Table A.4) are base on the 1990 Census PUMS categories of household income (1990$) and persons per household. Household activities include the production of labor and consumption of various goods (primarily through retail) and services. Note that internal money flows commodity, 'Money and Unclassified Goods' does not produce commercial truck trips within CT and ET.

Table A.4. Activities - Household Income-Size Categories (1989$)

Code	Description	
HH0to5K1to2	Household Income $0 to 4,999	Household size 1 to 2 persons
HH5to10K1to2	Household Income $5,000 to 9,999	Household size 1 to 2 persons
HH10to15K1to2	Household Income $10,000 to 14,999	Household size 1 to 2 persons
HH15to20K1to2	Household Income $15,000 to 19,999	Household size 1 to 2 persons
HH20to30K1to2	Household Income $20,000 to 29,999	Household size 1 to 2 persons
HH330to40K1to2	Household Income $30,000 to 39,999	Household size 1 to 2 persons
HH40to50K1to2	Household Income $40,000 to 49,999	Household size 1 to 2 persons
HH50to70K1to2	Household Income $50,000 to 69,999	Household size 1 to 2 persons
HH70plusK1to2	Household Income over $70,000	Household size 1 to 2 persons
HH0to5K3plus	Household Income $0 to 4,999	Household size 3 or more persons
HH5to10K3plus	Household Income $5,000 to 9,999	Household size 3 or more persons
HH10to15K3plus	Household Income $10,000 to 14,999	Household size 3 or more persons
HH15to20K3plus	Household Income $15,000 to 19,999	Household size 3 or more persons
HH20to30K3plus	Household Income $20,000 to 29,999	Household size 3 or more persons
HH30to40K3plus	Household Income $30,000 to 39,999	Household size 3 or more persons
HH40to50K3plus	Household Income $40,000 to 49,999	Household size 3 or more persons
HH50to70K3plus	Household Income $50,000 to 69,999	Household size 3 or more persons
HH70plusK3plus	Household Income $70,000 and over	Household size 3 or more persons

Tables A.5 through A.8 identify various commodities produced and consumed in the model, including study area imports and exports. Table A.5 identifies the commodities tracked in the CT module, including 42 types of goods, based on standard commodity (SCTG) classifications.

Table A.5. Commodities – Goods Categories

Goods	
SCTG01: Live animals and live fish	SCTG25: Logs and other wood in the rough
SCTG02: Cereal grains	SCTG26: Wood products
SCTG03: Other agricultural products	
SCTG04: Animal feed and products of animal origin n.e.c.	
SCTG05: Meat fish seafood and their preparations	SCTG27: Pulp newsprint paper and paperboard
SCTG06: Milled grain and bakery products	SCTG28: Paper or paperboard articles
SCTG07: Other prepared foodstuffs and fats and oils	SCTG29: Printed products
SCTG08: Alcoholic beverages	
SCTG09: Tobacco products	
	SCTG31: Nonmetallic mineral products
	SCTG32: Base metal in primary or semi-finished forms and finished basic shapes
SCTG10: Monumental or building stone	
SCTG11: Natural sands	SCTG33: Articles of base metal
SCTG12: Gravel and crushed stone	SCTG34: Machinery
SCTG13: Nonmetallic minerals n.e.c.	SCTG35: Electronic/electrical equipment and components
SCTG14: Metallic ores and concentrates	SCTG36: Motorized and other vehicles (including parts)
	SCTG37: Transportation equipment n.e.c.
SCTG15: Coal	
SCTG16: Natural Gas & Crude Petroleum	
SCTG17: Gasoline and aviation turbine fuel	
SCTG18: Fuel oils	SCTG38: Precision instruments and apparatus
SCTG19: Coal and petroleum products n.e.c.	SCTG30: Textiles leather and articles of textiles or leather
	SCTG39: Furniture mattresses and mattress supports lamps lighting fittings and illuminated signs
SCTG20: Basic chemicals	
SCTG21: Pharmaceutical products	SCTG40: Miscellaneous manufactured products
SCTG22: Fertilizers	SCTG41: Waste and scrap
SCTG23: Chemical products and preparations n.e.c.	
SCTG24: Plastics and rubber	Money and unclassified goods (not used in CT/ET)

Table A.6 identifies the 16 services, including internal management services tracked in the Personal Travel (PT) Model. Internal Management Services, defined as 'value added office labor', spatially connect the production and office components of split industries. This commodity is the service provided by management and other office support workers to the production floor of the same industry. In many cases, this flow represents a relationship between two establishments of the same firm.

Table A.6. Commodities – Services Categories

Services	
Internal Management Services (B)	Transport (B)
Fire, Business, And Professional Services (B)	Communications And Utilities (B)
Personal And Other Services And Amusements (P)	Construction (B)
Health Services (P)	Government Administration (P)
Accommodations (B)	Higher Education (P)
Real Estate (P)	Lower Education (P)
Homebased Services (P)	
Retail Trade (P)	
Wholesale Trade (B)	

Note: Assumed to be primarily business (B) or personal (P) services

Labor, tracked in the PT module, is included as a commodity that is produced by households and consumed by economic production activities. Labor of different occupation categories is treated as different commodity categories, as shown in Table A.7.

Table A.7. Commodities - Labor Occupation Categories

Index	Labor Occupations	1990 US Census Occupation Codes
0	0_NoOccupation: Not employed	NA
1	1_ManPro: Managers/Professionals	0-82
2	1A_Health: Health Workers	83-112
3	2_PstSec: Post-Secondary Teachers	113-154
4	3_OthTchr: Other Teachers	155-162
5	4_OthP&T: Other Professional/Technical Office	163-262
6	5_RetSls: Retail Sales Workers	263-282
7	6_OthR&C: Other Retail/Clerical Office	283-402
8	7_NonOfc: Non-Office workers	all other

Floorspace categories are shown in Table A.8, while Table A.3 identifies which floorspace types are used by each industry category. The ALD Module adjusts the amount of space available in alphazones in any model period.

Table A.8. Commodities - Floorspace Categories

Residential Floorspace	NonResidential Floorspace	Other Floorspace
		FLR Agriculture (includes Mining)
FLR SFD (Single Family Home)	FLR Accommodation	
FLR MH (Manufactured Home)	FLR Office	FLR Logging
FLR AT (Attached Home)	FLR Government Support	
FLR MF (Multi-family, Institutional)	FLR Retail	
FLR RRSFD (Rural Residential SFD)	FLR Warehouse	
FLR RRMH (Rural Residential MH)	FLR Depot	
	FLR Light Industry	
	FLR Heavy Industry	
	FLR Hospital	
	FLR Institutional	
	FLR Grade-school	

Table A.9 identifies the various modes and vehicles used in the model to transport person and goods flows. Non-motorized passenger modes and non-truck freight modes are not assigned to the network.

Table A.9. Modes and Vehicle Types

Trip Code	SDT	LDT	CT	ET	Trip Mode	Trip Mode Definition
Passenger (PT SDT and PT LDT)						
DA	X	X			Drive-Alone	Single-occupant auto
SR2	X	X			Shared-Ride 2	2 person occupant auto
SR3P	X	X			Shared-Ride 3+	3+ person occupant auto
WALK*	X				Walk	Walk
BIKE*	X				Bicycle	Bicycle
TRANSIT_WALK		X			Walk-Transit	Walk-Access Transit
TRANSIT_DRIVE		X			Drive-Transit	Auto-Access Transit
SCHOOL_BUS*	X				School bus	School bus (not assigned to the network)
AIR		X			Drive-Air	Drive-Access Air travel within the modelarea
HSR_DRIVE		X			Walk-HSR	Drive-Access intercity Rail
HSR_WALK		X			Drive-HSR	Walk-Access intercity Rail
Freight						
STK			X		Truck	
TRK1			X		TRK1	<34,000 lbs. (likely single-unit)
TRK2			X	X	TRK2	34,000 -64,000 lbs.
TRK3			X		TRK3	64,000 -80,000 lbs. (articulated)
TRK4			X	X	TRK4	80,000 - 105,500 lbs. (articulated)
TRK5			X		TRK5	>105,500 lbs. (articulated)
SAA*			X		Air	
SRR*			X		Freight Rail	
SWA*			X		Waterborne Freight	
SPA*			X		Pipeline	

* Not assigned to the network.

Table A.10 provides a listing of all of the attributes of persons and households created in the Synthetic Population Generator (SPG) module and used in the PT module. The table also shows the Census-based coding categories for each attribute. The fields of the synthetic population used in the SWIM2 model are described below (asterisked values are synthesized by the model, others are drawn from PUMS records):

- Household-Person File Link (HH_ID, PER_ID). The household attributes were linked to each person in the household, by storing a household (HH_ID) and person (PER_ID) id in the person file. HH_ID are numbered sequentially across the whole sample (starting with 1). PER_ID are numbered sequentially across all persons in a household.
- Household Attributes (PERSONS, AUTOS*). The number of persons and the total number of autos in the household. The Census auto value is updated by the PT module.
- Home Location (ALPHAZONE). The alphazone location of the household, assigned by SPG2 (consistent with PI labor flows).
- Household Income (RHHINC). Total household income in units of 1989 dollars.
- Residential Floorspace Type (UNITS1, SINGLE_FAMILY*). The household's residential floorspace type is indicated by the number of units in the dwelling unit (UNITS1). In PT, a binary variable is created to indicate whether the dwelling unit is a single family unit.
- Demographics (AGE, SEX). Age and gender for each household member.
- Employment Information (RLABOR, OCCUP, INDUSTRY, ESR*, SW_OCC*, SW_SPLIT_IND*, WORKTAZ*). Employment status for each household member indicates whether each person is employed or not in labor force (RLABOR). If employed, PUMS occupation and industry from PUMS (OCCUP, INDUSTRY) are reassigned consistent with SWIM2 categories (SW_OCC and SW_SPLIT_IND). The PT module assigns a work location alphazone (WORKTAZ) and employment status code (ESR)
- School Status (SCHOOL). School status of each household member representing whether the person was currently enrolled in school.

Table A.10. Synthetic Population Household and Person Attributes

Household Attributes	
Code	Description
HH_ID	Household ID
AZONE	Home Location alphazone 0001-4141
PERSONS	Number of Person (person records) in household
RHHINC	Household income (1989$) 0000000 .N/A(GQ/vacant/no income) -999999..9999999 .Total household income
AUTOS (PUMS version, replaced by PT-version)	Vehicles (1 ton or less) available 0. N/A (GQ/vacant) 1 . No vehicles 2 . 1 vehicle 3 . 2 vehicles 4 . 3 vehicles 5 . 4 vehicles 6 . 5 vehicles 7 . 6 vehicles 8 . 7 or more vehicles
UNITS1	Units in structure 00 .N/A or Group Quarters (MF) 01 .Mobile home or trailer (MH or RRMH) 02 .One-family house detached (SFDor RRSFD) 03 .One-family house attached (AT) 04 .2 Apartments (AT) 05 .3-4 Apartments (MF) 06 .5-9 Apartments (MF) 07 .10-19 Apartments (MF) 08 .20-49 Apartments (MF) 09 .50 or more apartments (MF) 10 .Other (MF)
Household Attributes	

Person Attributes	
HH_ID	Household ID
PER_ID	Person ID
AGE	00 .Less than 1 year 01..89 .Age in years 90 .90 or more years old
SEX	0 .Male 1 .Female
SCHOOL	0 .N/A (less than 3 years old) 1 .Not attending school 2 .Yes, public school, public college 3 .Yes, private school, private college
RLABOR	Employment status 0 .N/A (less than 16 years old) 1 .Civilian employed, at work 2 .Civilian employed, with a job but not at work 3 .Unemployed 4 .Armed forces, at work 5 .Armed forces, with a job but not at work 6 .Not in labor force
OCCUP	Census Occupation ### (1990 Census Occupation codes)
INDUSTRY	Census Industry ### (1990 Census Industry codes)
SW_OCCUP	SWIM2 Occupation (based on PUMS OCCUP fields) See Table 2.7 Index
SW_SPLIT_IND	SWIM2 Split Industry ('office' split from 'production') (based on SW_OCCUP and INDUSTRY fields) See Table 2.3 Index
Person Attributes	

From SPG output files: SynPopP.csv and SynPopH.csv

Household Attributes	
Code	Description
SINGLE_FAMILY	Single Family 0. Multi-family household 1. Single-family household
AUTOS	Vehicles (1 ton or less) available 0. No vehicles 1 . 1 vehicle 2 . 2 vehicles 3 . 3 or more vehicles

Person Attributes	
WORKTAZ	Work Location alphazone 0001-4141 (assigned by PT work location choice model)
ESR	Simplified Employment Status 0. Not employed 1. Employed

From PT output files: personData.csv and householdData.csv

Appendix B. SCTG Commodity Groups Represented in SWIM2

Commodity Code	Category Description*	Commodity Group-7
SCTG01	Live animals and live fish	Food or Kindred Products
SCTG02	Cereal grains	Food or Kindred Products
SCTG03	Other agricultural products	Food or Kindred Products
SCTG04	Animal feed and products of animal origin, n.e.c.	Food or Kindred Products
SCTG05	Meat, fish, seafood, and their preparations	Food or Kindred Products
SCTG06	Milled grain products and preparations, and bakery products	Food or Kindred Products
SCTG07	Other prepared foodstuffs and fats and oils	Food or Kindred Products
SCTG08	Alcoholic beverages	Food or Kindred Products
SCTG09	Tobacco products	Food or Kindred Products
SCTG10	Monumental or building stone	Clay, minerals, stone
SCTG11	Natural sands	Clay, minerals, stone
SCTG12	Gravel and crushed stone	Clay, minerals, stone
SCTG13	Nonmetallic minerals, n.e.c.	Clay, minerals, stone
SCTG14	Metallic ores and concentrates	Clay, minerals, stone
SCTG15	Coal	Petroleum, Coal, Chemicals
SCTG16	Crude Petroleum	Petroleum, Coal, Chemicals
SCTG17	Gasoline and aviation turbine fuel	Petroleum, Coal, Chemicals
SCTG18	Fuel oils	Petroleum, Coal, Chemicals
SCTG19	Coal and petroleum products, n.e.c.	Petroleum, Coal, Chemicals
SCTG20	Basic chemicals	Petroleum, Coal, Chemicals
SCTG21	Pharmaceutical products	Petroleum, Coal, Chemicals
SCTG22	Fertilizers	Petroleum, Coal, Chemicals
SCTG23	Chemical products and preparations, n.e.c.	Petroleum, Coal, Chemicals
SCTG24	Plastics and rubber	Petroleum, Coal, Chemicals
SCTG25	Logs and other wood in the rough	Forest or Wood Products
SCTG26	Wood products	Forest or Wood Products
SCTG27	Pulp, newsprint, paper, and paperboard	Pulp or Paper products
SCTG28	Paper or paperboard articles	Pulp or Paper products
SCTG29	Printed products	Pulp or Paper products
SCTG30	Textiles, leather, and articles of textiles or leather	Other/Misc
SCTG31	Nonmetallic mineral products	Clay, minerals, stone
SCTG32	Base metal in primary or semi-finished forms and in finished basic shapes	Machinery, Instrum, Transp Equip, Metals
SCTG33	Articles of base metal	Machinery, Instrum, Transp Equip, Metals
SCTG34	Machinery	Machinery, Instrum, Transp Equip, Metals
SCTG35	Electronic and other electrical equipment and components, and office equipment	Machinery, Instrum, Transp Equip, Metals
SCTG36	Motorized and other vehicles (including parts)	Machinery, Instrum, Transp Equip, Metals
SCTG37	Transportation equipment, n.e.c.	Machinery, Instrum, Transp Equip, Metals
SCTG38	Precision instruments and apparatus	Machinery, Instrum, Transp Equip, Metals
SCTG39	Furniture, mattresses and mattress supports, lamps, lighting fittings, and illuminated signs	Other/Misc
SCTG40	Miscellaneous manufactured products	Other/Misc

* For detailed descriptions of commodities included in each group, see “SCTG Commodity Codes” booklet CFS-1200, October 2006, U.S. Department of Transportation and U.S. Department of Commerce.

Appendix C. Standard Industrial Codes (SIC)

	Industry	IndustryGroup-7
1	ACCOMMODATIONS	Gov't, Education, Biz Services, Accommodations
2	AGRICULTURE AND MINING-Agriculture	Ag, Mining, Food
3	AGRICULTURE AND MINING-Office	Ag, Mining, Food
4	COMMUNICATIONS AND UTILITIES-Light Industry	Retail, Personal Service, Communication
5	COMMUNICATIONS AND UTILITIES-Office	Retail, Personal Service, Communication
6	CONSTRUCTION	Electronics, Durables, Construction
7	ELECTRONICS AND INSTRUMENTS-Light Industry	Electronics, Durables, Construction
8	ELECTRONICS AND INSTRUMENTS-Office	Electronics, Durables, Construction
9	FIRE BUSINESS AND PROFESSIONAL SERVICES	Gov't, Education, Biz Services, Accommodations
10	FOOD PRODUCTS-Heavy Industry	Ag, Mining, Food
11	FOOD PRODUCTS-Light Industry	Ag, Mining, Food
12	FOOD PRODUCTS-Office	Ag, Mining, Food
13	FORESTRY AND LOGGING	Forestry, Wood
14	GOVERNMENT ADMINISTRATION-Government Support	Gov't, Education, Biz Services, Accommodations
15	GOVERNMENT ADMINISTRATION-Office	Gov't, Education, Biz Services, Accommodations
16	HEALTH SERVICES-Hospital	Health
17	HEALTH SERVICES-Institutional	Health
18	HEALTH SERVICES-Office	Health
19	HIGHER EDUCATION	Gov't, Education, Biz Services, Accommodations
20	HOMEBASED SERVICES	Retail, Personal Service, Communication
21	LOWER EDUCATION-Grade School	Gov't, Education, Biz Services, Accommodations
22	LOWER EDUCATION-Office	Gov't, Education, Biz Services, Accommodations
23	LUMBER AND WOOD PRODUCTS-Heavy Industry	Forestry, Wood
24	LUMBER AND WOOD PRODUCTS-Office	Forestry, Wood
25	OTHER DURABLES-Heavy Industry	Electronics, Durables, Construction
26	OTHER DURABLES-Light Industry	Electronics, Durables, Construction
27	OTHER DURABLES-Office	Electronics, Durables, Construction
28	OTHER NON-DURABLES-Heavy Industry	Paper, NonDurables
29	OTHER NON-DURABLES-Light Industry	Paper, NonDurables
30	OTHER NON-DURABLES-Office	Paper, NonDurables
31	PERSONAL AND OTHER SERVICES AND AMUSEMENTS	Retail, Personal Service, Communication
32	PULP AND PAPER-Heavy Industry	Paper, NonDurables
33	PULP AND PAPER-Office	Paper, NonDurables
34	RETAIL TRADE-Office	Retail, Personal Service, Communication
35	RETAIL TRADE-Retail	Retail, Personal Service, Communication
36	TRANSPORT-Depot	Retail, Personal Service, Communication
37	TRANSPORT-Office	Retail, Personal Service, Communication
38	WHOLESALE TRADE-Office	Retail, Personal Service, Communication
39	WHOLESALE TRADE-Warehouse	Retail, Personal Service, Communication

CITY OF PORTLAND BUREAU OF PLANNING AND SUSTAINABILITY

West Hayden Island Economic Foundation Study

FINAL

MAY, 2010

PREPARED BY

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Executive Summary

INTRODUCTION

The City of Portland (City) is considering annexation and development of a long-range land use plan for West Hayden Island (WHI). This process requires not only annexing and zoning the property, but also an assessment of natural resources, potential conflicting land uses, and marine industrial and recreational uses. WHI is approximately 800 acres and is the undeveloped western portion of Hayden Island, located in the Columbia River near the confluence with the Willamette River. WHI is owned by the Port of Portland, and was added to the region's urban growth boundary in 1983 for marine industrial purposes. It is both a potentially important economic resource and an important natural resource, containing undeveloped open space in a location with habitat value. WHI is designated as Marine Industrial Land on METRO's 2040 Growth Concept Map, and as a Regionally Significant Industrial Area on the Title 4 map in the Urban Growth Functional Plan. WHI is also identified by METRO as a high value riparian area and a Habitat of Concern in the regional inventory, and as a Moderate Habitat Conservation Area in Title 13.

The WHI Economic Foundation Study will serve as a foundation study for the zoning and annexation of WHI and is intended to provide background information for the current planning process and future WHI studies. The objective of the study is to identify likely marine-related economic development opportunities and corresponding land needs over a planning period of the next 30 years. The land demand analysis will also inform the Economic Social, Environmental and Energy (ESEE) Analysis to be completed as part of the City land use plan for WHI.

This Economic Foundation Study provides information about marine-related industrial land needs relative to WHI and its surroundings over the next 30 years. A companion study, the Environmental Foundation Study, provides a detailed understanding of the condition, function, and value of WHI natural resources. A third recreation study describes recreation participation, development potential, and value on and around WHI. Together these studies provide information on the importance and potential contribution of WHI in three different land uses: habitat, marine-industrial use, and recreation. The studies also provide information on potential compatibility and conflicts with multiple land uses on WHI.

Broadly, the scope of this work is to 1) assess the opportunities for marine-related economic growth in Portland Harbor, 2) estimate the land acreage and site characteristics necessary to accommodate this growth, 3) compare the available land supply to the land demand to identify marine industrial land shortages, and 4) identify the potential role of WHI and other sites in meeting projected land shortages. The scope of the analysis is marine-related uses, which includes both marine cargo and marine industrial uses. Marine cargo refers to activity and facilities related to the movement of waterborne cargo while marine industrial refers to industrial activity and facilities requiring waterborne transportation. Marine industrial activities may include manufacturing, vessel repair and construction, and rail yards at marine terminal sites.

In terms of geographic scope, the analysis is focused on Portland Harbor, with a limited review of the availability and relative suitability of alternative marine industrial land sites in the Lower Columbia River. The planning timeframe for the analysis is a 30-year horizon through 2040. Due to time and resource constraints, the scope of the analysis is based on existing data and readily available information.

HISTORY AND ECONOMIC ROLES OF PORTLAND HARBOR

The purpose of this section is to provide planning and policy context for the WHI decision process by describing the economic history and regional role of marine-related activities and land needs in Portland Harbor and surrounding areas. Furthermore, the section describes the economic contribution of marine-related uses to the regional economy. This section is intended to portray the broader economic context of marine-related uses and their regional importance.

For over 140 years, Portland has been a successful port city and continues today in this role due to its location at the nexus of excellent rail infrastructure, including the Olympic oil pipeline, two interstate freeways, the Columbia River deepwater shipping channel, and the Upper Columbia/Snake Rivers barge system. Marine cargo terminals handle and transport freight that is vital to numerous other industries located throughout Oregon, Southwest Washington, and beyond. Cargo movement through the Portland Harbor has grown steadily over the past century, and recent trends indicate continued future growth. A wide web of industries rely on waterborne transportation, including wholesalers and retailers who import consumer products, manufacturers that import raw and intermediate goods, and manufacturers and natural resource industries that export products.

Portland Harbor serves as an economic engine for the metro regional economy. The Portland Harbor is home not only to transportation and distribution activities linked to marine terminals, but also manufacturing facilities that rely on marine transportation. These marine-related industries are linked to other industries located in Portland Harbor and elsewhere in the metro area, including wholesale trade, local and regional transportation firms, manufacturing firms, and retail firms. These businesses depend on the transportation hub at Portland Harbor either for transport of their products to international or regional markets, or for the provision of inputs of the wide variety of freight materials imported through Portland Harbor, whether petroleum, consumer apparel, automobiles, or raw materials.

These water-dependent industries are then linked to other industries in the harbor and elsewhere throughout the metro region. Past studies indicate that cargo and manufacturing activities dependent on waterborne transportation contribute significantly to the metro region's economy. These studies indicate that marine-related economic activity generates approximately 20,000 jobs and $1.4 billion in income, while economic activity in the overall harbor area may support approximately 100,000 jobs and $3.5 billion in regional income.

Although there are several other ports in the Lower Columbia River, including the ports of Kalama, Longview, St. Helens, and Vancouver, Portland is distinguished in the level of its transportation connections and its location in a large metropolitan area. The metro area provides a larger population of skilled labor and a larger local industrial base that can generate cluster benefits and additional opportunity for marine-related businesses. As part of the Portland metropolitan area, Vancouver also has this advantage over other Lower Columbia River ports. However, Portland is differentiated from Vancouver and all other Lower Columbia Ports because it is the only port that handles large volumes of all cargo types (specifically, it is the only port that generally handles containers). While some marine industrial uses could be suitable at any Lower Columbia River port, for certain land uses that rely on all types of transportation connections and a large population or industrial base, marine industrial land in the Portland metropolitan area (in Vancouver or Portland) may not be as easily substituted for lands elsewhere in the Lower Columbia. While locating in Portland may be more desirable for some marine-related uses, other ports appear to be less land constrained (and have larger contiguous, shovel-ready sites), and may have less contamination.

Key findings from this section are summarized below:

- **Long-Term Leading Port.** From the late 19th century, Portland has been a leading West Coast port due to its position on the confluence of the Willamette and Columbia Rivers, its multi-modal transportation

infrastructure, and its proximity to areas producing substantial natural resources (primarily timber and grain) and associated finished products.

- **Continued Land Absorption for Marine-Related Activities**. Marine-related activities have experienced continued growth in Portland, with particular growth occurring during the world wars and continuing today. From 1960 to 1997, an annual average of 21 acres has been developed for river-dependent industrial uses in the Portland and Vancouver harbor area.
- **Marine-Related Activities Contribute Significantly to City's Economy.** Past studies indicate that cargo and manufacturing activities dependent on waterborne transportation contribute significantly to the region's economy. These studies indicate that river-dependent economic activity generates approximately 20,000 jobs and $1.4 million in income, while economic activity in the overall harbor area may support approximately 100,000 jobs and $3.5 million in income.
- **Regional Reliance on Marine-Cargo Activities**. A wide web of industries rely on waterborne transportation, including wholesalers and retailers who import consumer products, manufacturers that import raw and intermediate goods, and manufacturers and natural resource industries that export products.
- **Substitutability of Marine-Related Lands in Portland vs. Other Ports.** Portland is differentiated from other Lower Columbia Ports because it accommodates all cargo types (it is the only port that handles container cargo) and is closer to the population centers that utilize consumer goods that are shipped by marine freight. Additionally, as a metropolitan area Portland has a larger population of skilled labor and a larger local industrial base that can generate cluster benefits and additional opportunity for marine-related businesses; this advantage is also shared by the Port of Vancouver. Other ports, however, appear to be less land constrained (and have larger contiguous, shovel-ready sites), and may have less contamination. In general, Lower Columbia ports are distinguished by having access to two competing rail lines, which ensures more competitive rail rates.

GENERAL ECONOMIC AND MARINE INDUSTRIAL TRENDS

The purpose of this section is to identify the level of marine industrial economic activity likely to occur within Portland Harbor. The analysis consists of a 30-year (to the year 2040) forecast of job and cargo growth associated with marine industrial development opportunities. A review of economic and demographic trends is first provided, followed by a discussion of employment and land use trends more specific to marine industrial opportunities in Portland Harbor. These subsections rely on data from interviews as well as published data to provide historical and current context to the marine cargo and employment growth forecasts. A final subsection provides the marine cargo and job-growth forecast. The forecasts are based on different assumptions about the types of marine industrial development that could occur over the planning horizon, resulting in a low, medium, and high estimate of job growth. The three scenarios reflect uncertainty regarding overall economic growth, business location decisions, magnitude of cargo movement, and the Portland Harbor cargo market share.

Prior to the current recession, economic and population growth in the Portland metro region outpaced growth elsewhere in the nation. Economic activity is expected to begin recovering in 2010, with employment and population growth expected to average 1.4 percent and 1.5 percent, respectively, through 2030. A primary source of past economic growth in Portland has been marine-related economic activity, including marine industrial and marine cargo uses. These uses are projected to continue to grow over the next 30-years, with particular growth forecasted in the marine cargo and related transportation, warehousing, utility, and wholesale trade sectors.

The forecasts for cargo and employment have low, most likely, and high estimates, and yet still exclude the significant uncertainty represented by future markets development. New markets are perhaps the most

uncertain area since a new market can develop rapidly as a result of global economic forces, new technologies, and policy developments. Interviews with planners, industry representatives, and commodity forecasters, indicates that new markets are the most difficult to predict factors for both cargo and marine industrial growth, and the most important.

Growth in marine cargo over the 30 year planning horizon to 2040 is expected to vary by cargo type, but is projected to grow on a most likely average annual rate of between 0.2 percent for breakbulk to 3.3 percent for automobiles. Together, the marine cargo types measured in tonnage (dry bulks, grain, liquid bulks, and breakbulk) are expected to grow at a most likely average annual rate of 0.6 percent (average annual growth rate weighted by current tonnage), while containers are expected to increase at an annual rate of 2.4 percent for containers, and automobiles at a rate of 3.3 percent annually.

Growth in marine-industrial employment is expected to roughly mirror economic growth trends in the region, as some elements are expected to grow less slowly (manufacturing), while others are expected to grow more rapidly (transportation and warehousing). Growth rates in marine industrial employment are projected to vary from between 0.7 percent to 1.7 percent, with total employment estimated to increase by 2,100 jobs to 6,000 jobs.

As identified in the 2006 trade capacity analysis, availability of marine industrial land and adequate freight handling and transportation system infrastructure are critical to the growth of marine-related employment. Development of additional lands and facilities will likely be necessary to meet the projected growth in these sectors. If so, land availability for marine industrial development on West Hayden Island may be able to play a critical role in providing the infrastructure and lands necessary to take advantage of growth in these industries. These issues will be addressed in subsequent sections of this study.

Key findings from the general trend assessment are summarized below:

- **General Global Economic Outlook**. The current recession has caused a short-term decline on local cargo and employment, but this trend is expected to be reversed in 2010, with annual growth forecasted to be positive through 2040.
- **Population Growth.** Population growth in the Portland metro area has outpaced state and national growth, averaging 2.5 percent annually from 1980 to 2007. Annual growth from 2000 to 2060 is forecasted to average 1.2 percent, with growth to 2030 forecasted at the higher annual rate of 1.5 percent.
- **General Employment Growth.** Since 1981, Oregon has experienced average employment growth of 2 percent annually (compared to 1.7 percent nationally). Portland metro area employment is expected to nearly mirror population growth rate. Employment is forecasted to grow at an annual average rate of 1.2 percent from 2000 to 2060, with a higher annual growth rate of 1.4 percent expected through 2030. METRO forecasts employment growth of approximately 23,600 jobs in the Columbia Harbor area from 2010 to 2035.

Key findings from the cargo and employment forecasts are summarized below:

- **Cargo Forecasts.** Three cargo forecasts completed for the region were assessed: one for the Puget Sound and Columbia River system completed in 2009 for the Washington Public Ports Association, and two for Portland Harbor completed in 2009 (one by the Oregon Department of Transportation and one for the Port of Portland). Of these, the forecast completed for Portland Harbor (done for the Port of Portland) was utilized as it is the most recent, the most conservative, and utilized sound methodology. This forecast estimates growth in each cargo type in Portland Harbor through 2040, with estimated growth rates from 2007 to 2040 varying from 0.2 percent for breakbulk to 3.7 percent for automobiles. A recent trade capacity analysis for the Portland/Vancouver area indicates that this forecasted growth is feasible given the infrastructure in the region, since it is less than the doubling of freight volumes that the study suggested was possible (though challenging) for the region.

- **Marine and Rail-Dependent Industrial Job Forecast.** Data collected by the City of Portland indicates that in Portland Harbor there are 212 firms employing approximately 8,400 workers. Based on general population and employment growth trends in the region, these jobs are forecast to grow at an average annual rate of 1.2 percent a year. Barring constraints to growth such as land availability, this suggests that total employment in the Harbor area dependent on the multi-model transport system may increase to 12,000 jobs by 2040.

MARINE-RELATED SITE SUITABILITY

The purpose of this section is to provide an understanding of site suitability and constraints for marine-related uses, including both marine cargo and marine industrial uses. Site suitability is assessed for six marine cargo types: automobiles, liquid bulk, grain dry bulk, other dry bulk, containers, and breakbulk. Site suitability is also assessed for two marine industrial types: vessel related services and marine-dependent manufacturing.[1] Requirements for a given marine-related use vary depending on site and use-specific needs. This section is intended to provide a general sense of the site size, water access, and intermodal infrastructure requirements for each of these marine-related uses. Where available, information on trends in these requirements is presented. A brief discussion is also provided on site constraints for marine-related use related to natural resources and environmental contamination. The information presented in this section is used in later sections to assess the suitability of vacant, waterfront lands in Portland to meet the requirements for marine-related uses, and to assess the suitability of West Hayden Island (WHI) and other lands in the Lower Columbia River.

Marine-related uses share similar site requirements, including 1) zoning (industrial), 2) flat and contiguous lands with shoreline access of 400 feet or more, and 3) proximity to multimodal infrastructure (water, truck, and rail). Differences arise in acreage and water depth requirements, with marine cargo uses typically requiring more acreage and deeper water. Specifically, marine cargo facilities are usually sized at 50 acres or more (with the exception of local/regional dry bulk and liquid facilities that can be as small as five acres) and require a minimum draft depth of 35 feet. Marine industrial uses vary considerably in their site size requirements, but are typically at least five acres in size and can be as large as several hundred acres. A draft depth of 20 to 30 feet is required for most marine industrial uses.

Regarding site limitations, marine cargo and marine industrial uses alike face constraints related to sensitive natural resources and brownfield contamination. The presence of either can limit site usage or increase site acreage requirements for mitigation, and increase site development costs.

Table ES-1 summarizes the site characteristics of each marine-related use described above. **ES-1** is not an exhaustive analysis of specific businesses that fall into marine cargo and marine industrial classifications. Rather, the intended purpose of **Table ES-1** is to summarize general characteristics and potential requirements of marine cargo and marine industrial sites, based upon representative businesses in Portland Harbor as well as in other west coast ports.

In general, the table indicates that cargo facilities require sites that are typically 50 acres or larger, with the exception of local/regional dry bulk and liquid bulk facilities that may be much smaller. It is important to note that while many existing grain facilities are relatively small, industry trends show that newer facilities are larger to accommodate larger vessels and longer unit trains (to ensure competitive railroad rates). Many of the acreage sizes indicated in **Table ES-1** indicate the core terminal operation footprint, which excludes the rail infrastructure and ancillary structures and operations. Furthermore, the site sizes in **Table ES-1** do not include any acreage required for onsite mitigation or environmental protection. Total acreage, including

[1] Marine or vessel related services include barging, cargo handling services, and naval/coast guard services. Marine dependent manufactures are those firms that require marine facilities for the transport of raw and finished product.

rail infrastructure and support operations, for new marine cargo facilities handling containers, automobiles, national/international dry bulks, and grain are typically 100 acres or more.

All cargo facilities require minimum draft depths of 35 feet, with a deeper draft more suitable for many cargo types. Berth lengths of most cargo facilities are at least 550 feet, with many larger than 1,000 feet. As noted above, these lengths do not include dolphins, which extend the shoreline length for mooring vessels. This emphasizes the need for sites with at least 400 feet of shoreline length.

Marine industrial sites vary significantly in their requirements, both in terms of acreage, berth length, and channel depth. However with the exception of some vessel-related services, most marine industrial sites require at least a 20-foot draft and a five acre site. Nearly all marine industrial uses require a site with at least 400 feet of riverfront to accommodate a berth, and nearly all require access to rail and truck routes.

Table ES-1 Summary of Site Characteristics for Marine-Related Land Uses

	Acreage Approximation		Water Frontage Approximation		Berth Depth Requirement within 150' of Shore[2]	Rail Infrastructure Requirements
Site Type	Portland Harbor	Other West Coast Harbors	Portland Harbor	West Coast Ports		
Cargo						
Automobile	75 - 120	95 - 168	414' - 1,000	1,040' – 1,300'	35' or greater	Rail Ramp & Nearsite Rail Yard (5+ acres)
Container	193	50 - 385	Total of 2,850' (3 berths)	1,100' – 6,380'	40' or greater	Intermodal Yard (Onsite or Nearby Rail Yard) & Mainline Access
Breakbulk	20 - 50	15 - 75	2005' (2 berths)	600' – 1,750	35' or greater	Nearby Rail Yard & Mainline Access
Grain	40 – 100	40 - 100	327' – 928'	715'	40' or greater	Spur/loop & Nearby Rail Yard & Mainline Access
Dry bulk National/International	25 – 120	34 – 136	740'- 900+'	550' – 1,900	40' or greater	Spur/loop & Nearby Rail Yard & Mainline Access
Dry Bulk Local/Regional	5 – 27	5 – 23	N/A	550' – 1900'	40' or greater	Spur
Liquid bulk	5 – 45	10 - 20	700'	700' – 1,980'	35' or greater	Spur
Industrial						
Vessel Related Services	5 - 60		175' – 3,900'	150- - 1,400'	20' or greater	Spur / None
Marine dependent manufacturing	10 - 170 acres		994' – 1,800'	500' – 875'	20' or greater	Spur

Key findings from the suit suitability assessment are summarized below:

- **General Site Requirements.** Sites for marine industrial use must be zoned for industrial use, and be located on the waterfront with access to adequate channel depth—at least 20 feet for marine industrial sites and at least 35 feet water depth for marine cargo sites. Most marine-related uses require this draft depth for a length of 400 feet within 150 feet of shore, with depth close to shore most desirable. Marine cargo and marine industrial sites also both require easy access to rail and truck transportation routes.

[2] This distance from shore is based upon PHILS study, City of Portland, Portland Harbor Industrial Lands Study, February 2003, Prepared by E.D. Hovee & Company.

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- **General Acreage Requirements.** Acreage is required not only for the footprint of the marine terminal or marine industrial operations, but also for infrastructure such as access roads and rail lines. Acreage requirements differ by use, but in general, marine terminals require more acreage due to the large rail facilities required for many cargo facilities and associated warehousing and distribution facilities. Existing marine cargo terminals generally range in size from 20 acres to over 100 acres, while marine industrial sites typically range between 5 acres and 100 acres.
- **Variation in Specific Site Requirements.** Site size and configuration vary significantly based on specific use, operational requirements, site constraints, and local market conditions. An examination of just one use, such as container cargo terminals, will reveal very different site sizes and configurations at different ports and even at the same port.
- **Trends in Marine Cargo Facilities.** Ship size is increasing for most cargo types, resulting in larger desired berth lengths and deeper river depth. The trend towards unit trains for grain and international/national dry bulk cargoes means that larger sites (100+ acres) that can accommodate multiple unit trains are expected to be necessary for future competitiveness. Trends in Asia and other land-constrained areas are to minimize terminal footprint through a variety of methods; in general, these methods are costly, respond to specific local market conditions, and have not been implemented at Lower Columbia ports. The tradeoffs between cost and site efficiency, and the resulting impact on competitiveness and economic viability is not addressed in this analysis.
- **Natural Resources Site Constraints.** Waterfront areas often have sensitive natural resources. Local, state, and national regulations protect sensitive resources, and often require mitigation and avoidance of impact for development in areas with these resources. In addition to requiring lands to be set aside for environmental purposes, developing in areas with sensitive resources may increase site development cost and limit suitability.
- **Contamination Site Constraints.** By raising site development costs and raising long-term liability concerns, contamination in waterfront areas can reduce the market feasibility of a site for marine industrial use.

INVENTORY OF SUITABILITY MARINE-RELATED SITES

Following a brief overview of current land use in Portland Harbor, this section provides an inventory of vacant, waterfront lands in the industrial districts in Portland. The lands inventoried for this study are located along the Willamette River downstream of the Fremont Bridge and eastward along the Columbia River to Interstate 5. The purpose of the section is to provide an understanding of the available supply of industrial waterfront land in Portland Harbor, and the characteristics of the land supply relative to the site suitability requirements for marine-related uses outlined above. The section concludes with a comparison of site characteristics required for marine-related uses versus the characteristics of the available waterfront lands in Portland. The focus is an inventory of lands in Portland Harbor; the next section includes an overview assessment of the availability of industrial lands suitable for marine-related uses in other ports on the Lower Columbia River.

The site suitability analysis discussed above identified the desired or required site characteristics for each type of marine industrial use. As noted in that section, most marine cargo uses require channel depth of 35 feet or more and sites that are 60 to over 100 acres in size. There are no sites that meet these requirements currently vacant in Portland Harbor. Assuming that future dredging enables deep draft access to all sites, there are still no sites that are large enough to accommodate a new, modern marine cargo facility. The possible exceptions are liquid bulk and local/regional dry bulk facilities that may require a smaller site.

Marine industrial uses and their site size requirements are quite varied. However, it is expected that most marine industrial uses desire sites of at least five acres, draft of 20 feet within 150 feet of shore, and a

shoreline length of at least 400 feet. As indicated above, however, many marine industrial uses require large sites of over 100 acres. There are 11 sites in Portland Harbor that are five acres or more with shoreline length of 400 feet, of which nine have depth of 20 feet or more within 150 feet of shore. All but one of these sites are constrained as suspected brownfields. **Table ES-2** summarizes the number of available sites that may be potentially suitable for each type of marine-related use.

Waterfront vacant land suitable for marine cargo and marine industrial use is limited by site size and configuration, natural resource constraints, and contamination. There are 31 sites with 300 acres of vacant, waterfront industrial lands, of which 20 sites are smaller than five acres in size. No vacant sites are larger than 60 acres in size, which precludes development of many marine cargo uses and some marine industrial uses. There are, however, 11 sites larger than five acres that with channel deepening could become appropriate for local/regional market dry bulk or liquid bulk cargo or for marine industrial uses. All but one of these sites is a suspected brownfield, however, which constrains its suitability. Suitability of these sites for each use will depend on use-specific site requirements as well as the tolerance of the user for the potentially large liability associated with the Superfund site and upland brownfield contamination.

Table ES-2 Available, Potentially Suitable Sites by Marine-Related Use

Marine-Related Use	Number of Available, Potentially Suitable Sites	Notes
Cargo		
Automobile	0	No vacant sites large enough to accommodate new automobile terminal and associated infrastructure.
Container	0	No vacant sites large enough to accommodate new container terminal and associated infrastructure.
Breakbulk	0	No vacant sites large enough to accommodate new breakbulk terminal and associated infrastructure.
Dry Bulk (National/International)	0	No vacant sites are large enough to accommodate a new grain or international dry bulk commodity terminal and associated infrastructure.
Liquid Bulk	0-6	There are six sites that are larger than ten acres that are located in the Northwest industrial district proximate to the Olympic pipeline. All of these sites have suspected upland contamination. Only one of these sites (it is 13.5 acres in size and is owned by Northwest Natural Gas) currently has a draft of 35 feet.
Dry Bulk (Regional/Local)	1-11	There are 11 sites in Portland Harbor that are larger than five acres and have shoreline access of 400 feet. Only one of these sites does not have suspected upland contamination, and is owned by the Port of Portland. Only one other site (it is 13.5 acres in size and is owned by Northwest Natural Gas) currently has a draft of 35 feet.
Industrial		
Vessel Related Services	1-11	There are eleven vacant sites larger than five acres in size with adequate riverfront access, of which nine sites have draft depth of 20 feet or more. Only one site does not have potential upland contamination, and is owned by the Port of Portland.
Manufacturing	0 – 11	There are eleven vacant sites larger than five acres in size, and only two sites larger than 50 acres in size. Of these sites, nine sites have draft depth of 20 feet or more. There are no vacant riverfront sites larger than 60 acres in size. All sites larger than 15 acres are affected by upland contamination.

Key points from this site inventory include:

- **Marine cargo.** The industrial districts in Portland Harbor downstream of the Steel Bridge cover 5,932 acres of land in taxlots.[3] This land encompasses river-dependent marine industrial and marine cargo activities and facilities, as well as rail-dependent uses that are not directly dependent on water access but that utilize the intermodal transportation facilities available in the Harbor area.
- **Available, Vacant Lands.** In 2009, the Economic Opportunity Analysis (EOA) completed for the City of Portland inventoried the industrial lands available for development throughout the City. This study estimated the vacant industrial land supply at approximately 3,000 acres, of which approximately 1,900 acres are located in the Columbia Harbor area (which includes lands along the Willamette River downstream of the Fremont Bridge and eastward along the Columbia River to 82nd Street). Of all vacant industrial lands (as classified by the 2009 Economic Opportunities Analysis or EOA), only 33 sites in the Columbia Harbor geography are adjacent to the waterfront. Nearly all of these sites are located in Portland Harbor, but nine are located in the Rivergate industrial district with access to the Columbia River. Redevelopment of non-vacant lands was not examined in this analysis.
- **Size of Available Land.** There are a total of 300 acres on the 33 sites, with the average site size approximately 10 acres. Over 65 percent of sites are less than 5 acres in size, less than the minimum typically required for marine-related uses. Ten sites are larger than 10 acres, and three sites are larger than 30 acres. Adjacent parcels (including upland parcels) with the same landowner have been grouped into one 'site', as have been parcels with different land owners that may be feasible to aggregate. This aggregation results in 31 sites being analyzed (rather than 33 sites).
- **Waterfront Characteristics**. Twenty-five sites have the minimum waterfront access (400 feet) required by most marine-related uses, with 11 sites having minimum waterfront access that are larger than 5 acres. Only one site larger than 5 acres has access to deep draft channel depth of 35 feet, but access to deep draft waters will be increased once dredging resumes again on the Willamette River (currently dredging is suspended pending the outcome of the Portland Harbor Superfund cleanup).
- **Natural Resource Constraints.** All vacant waterfront sites are affected by at least one natural resource constraint. Of the 300 acres of vacant, waterfront lands, over half (170 acres) are affected by some level of natural resource constraint based on City of Portland overlay zoning. These constraints can affect the costs and required acreage for development, but do not prohibit development. It is expected that all waterfront lands suitable for marine industrial use will be affected by natural resource constraints, whether located in Portland Harbor or elsewhere.
- **Contamination.** The Willamette River in Portland Harbor has been identified by the Environmental Protection Agency as a Superfund site. This designation affects all waterfront acreage from Columbia Slough to the Fremont Bridge, and presents a challenge to the transfer and lease of property in the harbor. As assessed by Oregon Department of Environmental Quality (DEQ), nearly one-half of the 31 vacant, waterfront properties in Portland Harbor have potential upland contamination. This contamination can present costly clean up requirements and may limit the lease or sale of these properties.
- **Overall Summary**. There are no sites currently vacant on the waterfront that are suitable for marine cargo development, with the exception of liquid or small dry bulk facilities. There are 11 vacant sites larger than 5 acres with appropriate shoreline access, there are no sites available larger than 60 acres.

[3] Portland Bureau of Planning, 2003, Portland Harbor Industrial Lands Study Part One: Inventories, Trends and Geographic Context.

LAND ABSORPTION AND NEEDS FORECAST

This section concludes the economic foundation study, and provides a forecast of land absorption demand by marine-related uses in Portland Harbor together with a discussion of the potential role of WHI. The section draws from all preceding economic sections to evaluate the demand for additional lands for marine uses, and the potential role of WHI to meet this demand. The first two subsections forecast the land need for marine-related uses in Portland Harbor, including marine cargo and marine industrial uses. The forecast for marine cargo lands is based on an assessment of current capacity compared to forecast cargo volume. The forecast for marine industrial lands is based on past land absorption trends of marine industrial land combined with an existing forecast of land absorption in the Portland Harbor area. The final subsections focus on the availability of existing lands in Portland Harbor to meet demand compared to the suitability of WHI land and lands available at other Ports.

Provided there is adequate terminal infrastructure and land, marine cargo volume is projected to grow over the next 30 years in Portland, as is marine industrial land use. However, projected growth will not be realized if suitable lands are not available. In particular, lack of available, large developable sites suitable for marine industrial development constrains growth opportunities for marine cargo or large marine industrial manufacturers. As noted in METRO's 2009 urban growth report, the region must decide how it will accommodate forecasted population and employment growth and what investments we are willing and able make in transportation corridors and employment areas to support long-term employment growth.[4]

Forecasted demand for marine-related land uses (both marine cargo and marine industrial) ranges from 220 acres in the low forecast to 980 acres in the high forecast. Of this acreage, up to 130 acres may be accommodated on smaller parcels in the harbor area (potentially 55 acres of regional/local dry bulk terminal and liquid bulk terminal and up to 75 acres of marine industrial). This figure is based on the available lands in the harbor area and the proportion of brownfield sites that may be available for development.

WHI is the only parcel suitable in Portland Harbor for new uses that require 100 acres or more. Development of WHI for marine terminal use would likely allow Portland to capture the forecasted potential cargo opportunities, and associated jobs and income. Forecasted acreage demand that can not likely be satisfied in the harbor area ranges from 150 acres in the low scenario to 850 acres in the high scenario. Development on WHI for marine cargo purposes may also lead to more available lands in Portland Harbor for other industrial uses, if some existing cargo operations such as grain are consolidated at larger marine terminals. Growth in these marine-related industries is a major engine for the local economy, and has implications across a variety of sectors.

Key points in this section related to marine cargo land needs include:

- **Cargo Forecast**. Cargo is forecasted to increase in all cargo categories, but is concentrated in the automobile (growth of 280 percent by 2040) and container (growth of 212 percent by 2040) cargoes. Tonnage of all other cargoes is expected to grow by 22 percent by 2040 under the most likely scenario.
- **Cargo Forecast vs. Existing Capacity.** Capacity of existing Portland cargo facilities is shown in Table 1, as determined by the Port of Portland. As highlighted in grey in **Table ES-3**, in the most likely forecast scenario there is not adequate existing capacity for automobile, and there may not be adequate future capacity for grain cargo.

[4] METRO. 2009. 20 and 50 year Regional population and employment range forecasts. accessed online at: http://library.oregonmetro.gov/files/appendix_12_forecast.pdf.

Table ES-3 Forecast Cargo Volume versus Annual Cargo Capacity of Existing Terminals in Portland Harbor

			Cargo Forecast by 2040			
Cargo	Units	Current Practical Maximum Capacity	Low	Most Likely	High	Potential Capacity Shortfall
Automobiles	Units	675,000	925,000	1,145,000	1,364,000	350,000 – 700,000
Containers	TEU	700,000	379,000	585,000	744,000	0 - 50,000
Breakbulk	MT	2,100,000	1,010,000	1,181,000	1,295,000	0
Grain	MT	4,100,000 - 7,100,000	5,647,000	6,477,000	7,059,000	0 – 3,000,000
Dry Bulk National/international	MT	8,200,000	4,650,000	6,054,000	9,733,000	0 – 1,500,000
Dry Bulk Local / Regional	MT	2,500,000	2,089,000	2,471,000	2,852,000	0 – 500,000

Source: BST Associates, 2009 and 2010, Port of Portland Marine Terminal Master Plan, Personal communication with the Port of Portland and BST Associates.

- **Land Needs for Cargo Growth**. An important assumption is that future marine-related development in Portland will be similar in size and site requirements to new marine-related developments at other west coast and Lower Columbia ports. Also, to meet growing demand, ports throughout the United States have typically increased throughput capacity by building new terminals requiring new land for development. Ports around the world have also worked to increase efficiency and increase throughput at existing facilities by changing operating standards and implementing such practices as off-site storage and more efficient cargo management systems. While reducing acreage requirements in marine areas, these practices can substantially increase operating costs and reduce competitiveness of a port. There are thus tradeoffs associated with cost competitiveness and land use efficiency.
- **Marine Cargo Land Absorption Forecast**. Based on the size trends of new terminals being constructed on the west coast, the forecasted land need through 2040 for the Port of Portland to retain and attract potential cargo clients ranges from approximately 150 acres (low forecast for only automobiles) to approximately 680 acres (high forecast), with a most likely land need of approximately 425 acres. These forecasts indicate that this land would be required to build modern, operationally-efficient terminals to accommodate all projected cargo growth, but does not signify that these terminals would be operating at capacity.
- **Land Needs compared to Vacant Inventory**. Marine cargo land need is forecast to range from 150 acres to 680 acres, primarily in parcels larger than 100 acres. It is anticipated that up to 55 acres in the high forecast and 25 acres in the most likely forecast could be met by vacant lands available in the Portland Harbor. The remaining land need for marine cargo (150 acres in the low scenario, 400 acres in the most likely scenario, and 625 in the high scenario), is expected to be for parcels larger than 100 acres to accommodate rail access and ensure competitiveness. As discussed above, there are no vacant parcels of this size available in Portland Harbor. To accommodate these new marine terminals in Portland given the currently available land supply, it is expected that the Port of Portland would need to develop land on WHI.

Key points related to land need for marine industrial growth:

- **Existing River-Dependent Land Use and Employment**. River dependent uses were classified by the City, and were further divided for this study into marine cargo and marine industrial uses based ownership and existing use of the site. There are 47 parcels in Portland Harbor identified by the City as river-dependent, with a total of 1,790 acres. Of the 47 river-dependent parcels, there are 29 with available employment data. Data for these parcels indicate 2,780 employees in river-dependent uses, of whom approximately 77 percent (2,140 employees) are employed in marine industrial uses with the remaining 23 percent (640 employees) employed in marine cargo uses.

- **Marine Industrial Land Absorption.** Based on the City of Portland Economic Opportunities Analysis (EOA) job forecasts and proportion of land in marine industrial uses, a range of 70 to 300 acres is the forecasted land need for marine industrial uses.

Key points related to marine-related land need and vacant land supply:

- **Land Needs compared to Vacant Inventory**. Vacant parcels are available in Portland Harbor for marine industrial uses requiring less than 60 acres. There are 11 parcels (263 acres) of vacant lands in Portland Harbor that are larger than five acres and have adequate shoreline length. However, only one of the 11 potential sites (19 acres) does not have potential upland contamination, the presence of which carries significant costs and risks. Thus, while Portland Harbor has available brownfield sites for redevelopment that will accommodate smaller-sized marine industrial uses, it lacks sites for large river-dependent manufacturers and has limited opportunities for uses requiring uncontaminated sites on the river.
- **Suitability of WHI.** WHI has the land size, deepwater access, and proximity to rail and interstate infrastructure necessary for a marine terminal location. If marine terminal development were to take place on the island it is expected that a bridge for vehicular access would be constructed connecting WHI with Marine Drive in Portland. It is also expected that rail access would be developed by integrating with the existing BNSF rail bridge on the eastern limits of the WHI. The primary constraint to WHI development is expected to be impact to natural resources.
- **Concept Designs.** A recent study conducted for the Port of Portland provides some general design guidelines for potential marine terminal development of WHI.[5] This preliminary study analyzed terminals for automobiles (75 to 140 acres), dry bulk (110 to 175 acres), liquid bulk (125 to 155 acres), and container cargo (95 to 140 acres). Conceptual designs, include rail infrastructure, were generated for these terminals. Berths for each terminal type were described, and vary from floating platforms to split-level fixed berths to a traveling loader system. All berths would be located on the north side of the island.
- **Alternative Rail Layouts**. Two general design concepts were developed, one with a long track traversing east-west along the island parallel to the shoreline, and one with the tracks approximately extending only as far west as the power line corridor. Limiting the rail footprint to the east side the BPA power line corridor increases the amount of time for trains to enter or exit the mainline tracks by approximately 25 percent due to increased curvature in the track configuration. Other operational constraints would result from this configuration, including increased labor for train handling and maneuvering, and providing only one loop track of the desired 8,000 to 10,000 feet length which would require increased coordination between terminals.
- **Available Lands at Other Lower Columbia Ports.** At the Port of Vancouver there are 718 acres available, of which 218 acres are in the planned Terminal 5, and 350 to 400 acres are in the planned Columbia Gateway. At the Port of Longview, the only available parcels for additional marine terminal development are privately owned, but include approximately 730 acres.

CONCLUSIONS

Portland Harbor has been a leading west coast port for over 100 years, transporting and handling marine cargo products that sustain businesses and economic activity in the metro area and the greater region extending through Oregon, Southwest Washington, and into Idaho and beyond. Marine industrial activity in the Portland Harbor has also been an important component of the Portland economy, and includes businesses

[5] HDR Engineering, Inc. 2009. West Hayden Island Terminal Site and Operation Requirements and Addendum 1. Prepared for Port of Portland. Accessed at http://www.portlandonline.com/bps/index.cfm?a=279953&c=51508.

highly interdependent on each other and on the cargo handled at marine terminals in the area. As the Portland Harbor has continued to develop over the last century, land use needs have expanded with approximately 21 acres being developed every year from 1960 to 1997. Future growth is anticipated, particularly in the marine cargo sectors and the transportation, logistics, and distribution industries.

While there is uncertainty associated with the magnitude of marine cargo and marine industrial growth over the 30-year planning horizon, the current market position of Portland and historical and recent trends indicate significant growth opportunities. Based on the marine cargo and employment growth rates forecasted to 2040, marine-related land needs to accommodate growth are expected to exceed land supply in Portland Harbor. Land needs are forecasted to range from a low of 220 acres to a high of 980 acres, reflecting uncertainty in new market opportunities and rates of overall economic growth.

As in numerous past studies (Portland Harbor Industrial Lands Study, Trade Capacity Assessment, Economic Opportunities Analysis), this study finds that marine industrial land is limited in the region, particularly for large sites of 60 acres or more needed for marine terminals and large marine industrial operations. Furthermore, marine industrial redevelopment opportunities on the available land are constrained by both the Portland Harbor Superfund Site and the upland contamination present on many sites. Liability concerns and redevelopment costs affect the marketability of these sites to prospective buyers or new tenants.

In summary, to capture economic growth opportunities in marine-industrial land uses, Portland will need to provide large parcels for marine industrial growth. Barring considerable redevelopment and reconfiguration of existing sites in Portland Harbor, Portland will need to look to new sites such as WHI to ensure large site availability for significant growth opportunities. If WHI is not developed, it appears that the existing and planned terminals at ports located on the Washington side of the Lower Columbia River may be able to meet the forecasted cargo demand for the Lower Columbia. Under this scenario, however, it is expected that Portland would lose opportunities to expand marine-related economic activity and would forfeit the associated jobs and income. Additionally, if WHI is not developed, it is expected that fewer lands will be available for marine industrial uses in Portland Harbor, potentially resulting in less job growth in marine-related manufacturing and other sectors dependent on marine cargo activities.

Introduction

1.1 BACKGROUND

The City of Portland (City) is considering annexation and development of a long-term land use plan for West Hayden Island (WHI). This process requires not only annexing and zoning the property, but also an assessment of natural resources, potential conflicting land uses, and marine industrial and recreational uses. WHI is approximately 800 acres and is the undeveloped western portion of Hayden Island, located in the Columbia River near the confluence with the Willamette River. WHI is owned by the Port of Portland, and was added to the region's urban growth boundary in 1983 for marine industrial purposes. It is both a potentially important economic resource and an important natural resource, containing undeveloped open space in a location with habitat value. WHI is designated as Marine Industrial Land on METRO's 2040 Growth Concept Map, and as a Regionally Significant Industrial Area on the Title 4 map in the Urban Growth Functional Plan. WHI is also identified by METRO as a high value riparian area and a Habitat of Concern in the regional inventory, and as a Moderate Habitat Conservation Area in Title 13.

1.2 PURPOSE

The WHI Economic Foundation Study will serve as a foundation study for the zoning and annexation of WHI and is intended to provide background information for the current planning process and future WHI studies. The objective of the study is to identify likely marine-related economic development opportunities and corresponding land needs over a planning period of the next 30 years. The land demand analysis will also inform the Economic Social, Environmental and Energy (ESEE) Analysis to be completed as part of the City land use plan for WHI.

This Economic Foundation Study provides information about marine-related industrial land needs relative to WHI and its surroundings over the next 30 years. A companion study, the Environmental Foundation Study, provides a detailed understanding of the condition, function, and value of WHI natural resources. A third recreation study describes recreation participation, development potential, and value on and around WHI. Together these studies provide information on the importance and potential contribution of WHI in three different land uses: habitat, marine-industrial use, and recreation. Collectively, the studies also provide information on potential compatibility and conflicts with multiple land uses on WHI.

1.2.1 WHI Public Planning Process

The City of Portland's Bureau of Planning and Sustainability (BPS) is leading a collaborative public process to evaluate alternative long-term uses for West Hayden Island (WHI). To help the City in determining future plan designations on West Hayden Island, the City has created a Community Working Group (CWG). This study is intended to provide information for the Community Working Group (CWG), which is tasked with advising the Portland City Council on "how marine industrial, habitat, and recreational uses might be

reconciled on West Hayden Island (WHI); and if the CWG determines that a mix of uses is possible on WHI, to recommend a preferred concept plan."[6]

The CWG is made up of stakeholders with diverse backgrounds and interests in WHI land use. CWG members include representatives of local businesses and industries, non-profit organizations, surrounding neighborhoods, and staff with the City of Portland, Metro Region, and the Port of Portland. Reaching agreement on a planning framework for the site will allow planning, management and enhancement efforts to proceed. The City will coordinate this effort with planning work currently being done on the Columbia River Crossing (CRC) project and East Hayden Island.

1.3 SCOPE

Broadly, the scope of this work is to 1) assess the opportunities for marine-related economic growth in Portland Harbor, 2) estimate the land acreage and site characteristics necessary to accommodate this growth, 3) compare the available land supply to the land demand to identify marine industrial land shortages, and 4) identify the potential role of WHI and other sites in meeting projected land shortages. The scope of the analysis is marine-related uses, which includes both marine cargo and marine industrial uses. Marine cargo refers to activity and facilities related to the movement of waterborne cargo while marine industrial refers to industrial activity and facilities requiring waterborne transportation. Marine industrial activities may include manufacturing, vessel repair and construction, and rail yards at marine terminal sites.

In terms of geographic scope, the analysis is focused on Portland Harbor, with a limited review of the availability and relative suitability of alternative marine industrial land sites in the Lower Columbia River. The planning timeframe for the analysis is a 30-year horizon through 2040. Due to time and resource constraints, the scope of the analysis is based on existing data and readily available information.

1.4 LIMITATIONS

The study is intended to utilize the best available data to forecast the economic growth and associated land needs of marine industrial lands. To accomplish this scope of work within the allotted timeframe and resources, certain assumptions were necessary. Furthermore, the study is limited by the existing data and information collected from interviews, further data collection was not included in the scope of work. Summarized below are the key study assumptions used in the analysis as well as the data gaps that were identified.

1.4.1 Study Assumptions

This study is based on economic forecasts of marine cargo and marine industrial economic activity, including employment growth, land needs, and cargo tonnage. While based on the best available data, forecasts are derived using numerous assumptions which affect the certainty of the forecast. The certainty of marine industrial and marine cargo forecasts is also influenced by the fact that marine-related land uses require large sites of 60 to 100 acres. The development of one site can consequently dramatically alter the balance of available land supply and demand in the region, making projections of land need highly sensitive to assumptions regarding new market or growth opportunities.

The following assumptions were utilized to develop cargo and employment forecasts and associated land need forecasts:

[6] From the West Hayden Island Community Working Group Charter, March 17, 2009.

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- Economic growth will resume in 2010, and employment and cargo growth will resume during that timeframe and will, on average, be positive through 2040.
- Portland will continue to invest in the road and rail infrastructure necessary for it to thrive and grow as a marine cargo port and marine industrial center.
- Current economic conditions and historical trends are a good indicator of future economic and trade growth and associated land needs.
- The proportion of land use and employment that is marine industrial will remain fairly constant into the future.
- Future marine-related development in Portland will be similar in size and site requirements to new marine-related developments at other west coast and Lower Columbia ports. In other words, current site requirements are a good indicator of future site requirements for marine-related uses, including acreage size requirement for a given cargo type and annual cargo throughput.

1.4.2 Data Gaps

The study is also limited to existing, readily available data. The following key data gaps were among those identified during the course of the study:

- Lack of comprehensive information on marine-related employment in Portland Harbor and an associated lack of comprehensive studies on the total economic contribution of marine-related uses in Portland Harbor.
- Lack of uniform, comprehensive data on the characteristics of marine-industrial sites at ports. This information is confidential or unpublished, with entities reluctant to share information publically.
- Limited detailed information on the operation and cost tradeoffs associated with infrastructure design and footprint size of marine terminal and marine industrial sites. Information of this nature is very limited as these tradeoffs are specific to a particular market, cargo, and tenant rather than widely applicable across uses.

To compensate for these data gaps, the study utilized interviews with the City of Portland, Portland Development Commission, Port of Portland, industry professionals, and other consultants to augment available, published information.

1.5 REPORT ORGANIZATION

Following this introduction, there are six additional sections to this report. **Section 2** addresses the economic history and contribution of Portland Harbor, including information regarding the economic impact of marine-related land uses. **Section 3** addresses economic trends that will affect the growth in marine cargo and marine industrial uses, and provides cargo and employment forecast through 2040. **Section 4** identifies the characteristics that make a site suitable for marine cargo and marine industrial land uses, while **Section 5** inventories the available lands in Portland Harbor to identify which sites may be suitable for marine related uses. **Section 6** concludes the study by drawing from all previous sections to identify the land need in Portland Harbor to meet forecasted growth in marine-related uses, and to identify the land availability and suitability in Portland Harbor, West Hayden Island, and other Lower Columbia River sites to meet this demand. References are provided in **Section 7**, while **Appendix A** provides data and analysis related to **Section 2.**

SECTION 2

Economic History and Contribution of Portland Harbor

The purpose of this section is to provide planning and policy context for the WHI decision process by describing the economic history and regional role of marine-related activities and land needs in Portland Harbor and surrounding areas. Furthermore, the section describes the economic contribution of marine-related uses to the regional economy. This section is intended to portray the broader economic context of marine-related uses and their regional importance.

2.1 OVERVIEW OF DATA SOURCES

Data sources for this section include general sources about the history of land uses in Portland Harbor prepared for and by the City of Portland, interviews with Portland Harbor businesses, geospatial data on lands uses in Portland Harbor provided by the City of Portland, as well as employment data. Additionally, the section on the economic contribution of Portland Harbor businesses and marine-related uses draws from a variety of existing economic impact studies that have been prepared for the City of Portland, the Port of Portland, and other regional entities. Finally, the section also utilizes information from other ports in the area to compare the characteristics of Portland Harbor to other Lower Columbia River ports.

2.2 ECONOMIC HISTORY AND REGIONAL ROLE OF PORTLAND HARBOR

From the late 19th century, Portland Harbor has been a leading west coast port due to its position on the confluence of the Willamette and Columbia Rivers, its multi-modal transportation infrastructure, and its proximity to areas producing substantial natural resources (primarily timber and grain) and associated finished products. From its earliest days, the majority of Portland's exports have been raw materials (agricultural products, lumber, metals, and potash while imports are more likely to be finished products (autos, consumer materials) for distribution throughout the northwest and Midwest. Today, Portland Harbor is a 40-foot deep-water port that includes the lower 12 miles of the Willamette River and two miles along the Columbia River. Located at the nexus of excellent rail infrastructure, the Olympic oil pipeline, two interstate freeways, the Columbia River deepwater shipping channel, and the Upper Columbia/Snake Rivers barge system, Portland Harbor has continued to serve as an important gateway for the movement of goods to and from businesses located in Oregon, southwest Washington, Idaho, and further afield. In addition to regional domestic trade, Portland serves as an international gateway, particularly with respect to Asian markets. At the turn of the 21st century, Portland has become a 'trans-shipment center', with more goods moving through Portland to national and international destinations than are consumed locally in the region.[7]

Discussed below are the key developments in the history of Portland over the past 140 years as a significant shipping location. These include steps to ensure regular dredging and the creation of public docks, as well as the continued development of additional lands for expanding maritime industries. Lands to the north of downtown were filled in during the 1920s to create the Guilds Lake and Swan Island industrial areas, while port lands continued to be expanded to the north through the 1970s with the development of the Rivergate

[7] City of Portland, Bureau of Transportation, 2006, Freight Master Plan.

area. Portland's continued expansion to the north was due in part to the larger size of ships but also was due to the large parcels of vacant land that were available in these areas. Portland's harbor continues to be a major economic engine in the region and has experienced substantial growth in the past 40 years.

2.2.1 Economic History

True to its name, Portland has become a major port for the west coast, eclipsing other ports along the Lower Columbia, and competing with Seattle and Tacoma in Washington and Oakland and Los Angeles/Long Beach for a portion of the global trade market. This summary provides a history of Portland Harbor, the reasons behind its growth, and the subsequent growth of the city.

The dependably deep shoreline along Portland's waterfront was preferred for ocean-going vessels over the harder-to-navigate shallow water area adjacent to Ross Island. In 1846, Captain John Couch moved his operations from Oregon City to Portland, helping to establish Portland as a port city, where the first harbor facilities were privately-owned docks in the area now known as Tom McCall Waterfront Park. When gold was discovered in California in 1848, the resultant building boom created a demand for lumber to be transported to San Francisco. Portland was ideally situated near the confluence of the Willamette and Columbia Rivers and had close access both to large stands of timber and nearby wheat farms. The dominant export from Portland, from the mid nineteenth century into the 1930s, was lumber and wood products, and the Columbia River, the fourth largest river in the United States, provided an east/west passage through the adjacent mountain ranges.

2.2.1.1 Further Development at the End of the 19th Century

In the 1880s OSN (now the Oregon Railway and Navigation Company OR&N) set up a freight terminal in Albina, connecting with the east coast in 1882 and to San Francisco in 1887. While the completion of these rail lines altered how goods were moved within the country, they also gave Portland strength as a transfer point between rail and shipping modes. Industry growth paralleled trade growth. With the availability of raw timber, saw mills sprouted on both sides of the Willamette, as did other industries using wood products. Companies making furniture, windows and doors, architectural features and crates grew from the area along the downtown waterfront south to the Brooklyn neighborhood and SW Fulton Street and north to Linnton and St. Johns.

2.2.1.2 Portland in the Early 20th Century

The Lewis and Clark Centennial Exposition in 1905 brought thousands of visitors to the area, many of whom decided to move to Portland. Portland's population more than doubled during the decade, reaching 207,214 by 1910. This influx of people, combined with the increased rail connections (ten lines served the Portland area), resulted in a surge of industrial growth in the trade and transportation sectors as well as manufacturing. This growth included creation of many woolen textile firms including Jantzen, Pendleton, and the Portland Woolen Mills in St. Johns. Other major new businesses included the Swift and Company meat packing plant near the Columbia River rail bridge, which employed 1,500 workers. Portland was considered the number one lumber shipping and manufacturing center in the world according to *Harper's Weekly* in 1913. The city also emerged as the nation's number one wheat port in the 1910s.

The end of the first decade also brought about changes that ultimately resulted in the establishment of the Portland Dock Commission, which was a part of City of Portland government. In 1909, Portland voters approved the sale of $500,000 in dock bonds to address neglect of private docks beginning to fall into disrepair. The mission of the Portland Dock Commission was to construct and maintain municipally-owned docks, leading to development of Terminal 1 along NW Front Street between 14th and 17th Avenues, featuring a 955-foot dock intended to receive overseas ships. Soon after, Terminal 2, a smaller terminal, opened at the

foot of Washington Street on the east side, with a frontage of 525 feet. Meanwhile, the Federal Rivers and Harbors Act of 1912 granted the Port of Portland the responsibility for maintaining a channel depth of 35 feet in the Portland Harbor.

2.2.1.3 Growth after World War I

World War I created a surge in shipbuilding, as German U-boats were destroying cargo ships faster than they could be built. From 1917 through 1919, Portland shipyards launched 227 vessels, 96 of them steel ships. Shipyard employment climbed to 28,000 by the end of 1918. Ship building facilities ranged from the Northwest Steel Company at SW Sheridan Street, to the Grant-Smith-Porter yard in St. Johns.

The Portland Dock Commission continued to expand, constructing Terminal 3 in St. Johns with 540 feet of harbor frontage (later removed to make way for the St. Johns Bridge in 1931) and Terminal 4, along the north edge of St. Johns, completed in 1920. This terminal was the largest and most important of the municipal terminals with 3,035 feet of harbor frontage with three slips and five piers which could accommodate large shipments and storage of grain. Terminal 1 included a grain elevator, warehouses, additional covered and open storage, and bulk oil tanks. The completion of this terminal encouraged the growth of neighboring St. Johns, supported by development of a trolley line.

As of 1920, Portland's population had increased to 258,288, the 20th largest city in the US. The City of Portland continued to be a major manufacturing and shipping center. Also in 1920 Portland was the largest lumber manufacturing city in the world, and second in the shipping of wheat (which it became the leading shipper of by 1921) and wool. In addition, Portland was the largest flour manufacturing city on the Pacific Coast, the largest furniture manufacturer west of the Mississippi, and the largest livestock and meat packing center on the Pacific Coast. These industries contributed to the primary exports of lumber, wheat, flour, agricultural products, wool, livestock, meats, canned fruits, vegetables, and salmon.

The 1920s also brought a new mode of transportation to the Portland Harbor. In 1922, the Portland Dock Commission bought Swan Island, using the island to receive dredge spoils from the river and connecting it to the mainland. With this newly created land, the Port of Portland built the city's first airport in 1928, which operated as the City's airport until completion of a new airport at the current Columbia River site in 1941. During this time, the Portland Dock Commission also sent channel spoils to Guilds Lake (site of the Lewis & Clark Exposition) which opened this area for later industrial development.

2.2.1.4 The End of the Boom and the Depression Years

The end of the 1920s and the 1930s brought a general slowdown in activity and construction, though the City removed the aging docks and constructed a seawall in 1929. Reductions in the price of lumber and wheat were experienced in the 1920s and, along with the market crash, reduced exports and imports at many municipal ports. The longshoremen strike of 1934 and its ripple effect threw over 50,000 workers out of work, demonstrating the multiplier effect of maritime industries on the City. The Depression also brought Works Progress Administration (WPA) projects to the region, including construction of several major dams, including Bonneville. The resultant cheap power generated by these facilities would help encourage industries reliant on consistently inexpensive energy, such as aluminum smelters.

2.2.1.5 The Influence of World War II on Portland

In 1940, the Portland Dock Commission leased 80 acres north of Terminal 1 to the Oregon Shipbuilding Corporation for a shipyard and Swan Island was converted to a shipbuilding facility, where 147 T-2 tankers were constructed, creating opportunities for other metal industries. At its peak in 1943 and 1944, 140,000 workers were part of the metropolitan defense industries, including 92,000 employed by Henry Kaiser. Once

war was declared, the War Department took over much of the operations of Terminal 4 and designated it as "The Portland Sub-Port of Embarkation." Civilian maritime shipping was shifted to Terminals 1 and 2. Eventually, Terminal 2 was taken out of the public maritime portfolio when it was leased to Columbia Industries to use in airplane parts manufacturing from 1942 to 1945.

The influx of jobs also attracted a large number of workers who came to settle in Portland, and also in the separate city of Vanport, on the north edge of Portland (current location of Portland International Raceway and Delta Park). Before being flooded in 1948, Vanport was Oregon's second largest city in population, with many of its residents involved in the shipbuilding industry. Portland's population reached 373,628 in the 1950 census. Portland's population would remain stagnant for the next three decades as the region's population growth shifted to the suburbs and unincorporated areas, with the 1980 census population of 366,383. But, similar to many urban areas in the country, the metropolitan Portland region did see a large increase in population growing from 501,000 in 1940 to 889,000 in 1989.

Much of the manufacturing base remained in Portland, and the influx of skilled workers helped many of the evolving manufacturers that specialized in construction materials, transportation equipment, machinery and tools. Many of these firms, such as Schnitzer Steel, Hyster, and Precision Castparts are familiar names today.

2.2.1.6 Post World War II and Shifts in Port Activity

After the war, Swan Island remained the only ship repair yard available on the west coast, establishing a marine construction and repair industry associated with the ship yard. The remainder of Swan Island was developed into an industrial park in 1957. The migration of docks and shipping activity continued to move downstream, as construction of many downtown bridges slowed boat traffic on the Willamette River. The removal of shipping facilities in the downtown area led to the Portland Dock Commission's decision to maintain the dredge channel only downstream from the Broadway Bridge. The Portland Dock Commission renovated Terminal 4 after its return from the War Department, funded through a $6.5 million bond measure in 1954. Between 1945 and 1955, imports increased from 40,594 tons to 227,139 tons, and exports increased from 141,219 tons to 854,281 tons. This compares to 1925 volumes of 577,211 tons of imports and 580,219 tons of exports. By 1957, Portland was the leading dry cargo port of the Pacific Coast.

2.2.1.7 Changes in Transportation Infrastructure

Just as Portland's position made it a logical crossroads for trade and for the growth of railroads in the 1800s it provided an ideal place for the intersection of major north/south and east/west roadways. This growth started with the development of the U.S. Highways, where Highway 99 became the major north/south highway between Vancouver, British Columbia and Los Angeles, California, and U.S. Highway 30 provided a convenient, low-elevation linkage between Astoria on the coast through Portland and into the heartland of Eastern Oregon and Washington, and many mountain states. The Interstate Highway system, begun in 1956 paralleled these routes with Interstate 5 following U.S. 99 and Interstate 80N (now Interstate 84) following U.S. 30 through the Columbia Gorge. These highways augmented existing railroads to help encourage the increase in container shipping that was to come.

Additionally, the dam building on the Columbia and Snake Rivers changed shipping patterns by facilitating development of the barge system that enabled river-borne transport of agricultural and wood products, metals, and other commodities from as far east as Lewistown, Idaho to Portland's marine terminal facilities. Growth in barge traffic has played a large role in riverfront development, marine transportation, and growth of agricultural production in the Columbia River watershed.

2.2.1.8 The 1960s and Port Expansion

This period brought the emergence of new goods that were shipped through Portland facilities as Portland began receiving imported cars. This development corresponded with the opening of a Portland Dock Commission office in Tokyo, Japan. By the mid 1960s, approximately 1,000 autos per month were handled through Portland Dock Commission terminals, including almost all Volkswagens destined for the Northwest. A 400-foot floating automobile dock was installed at Terminal 4, helping to make Portland the busiest auto import terminus in the Pacific Northwest. Portland's favorable rail connections, with good service throughout the Northwest and more transcontinental rail service than any other West Coast port, increased the attractiveness of Portland as an auto importer.

Seeking land for future public port facilities, as well as areas to place dredge material, 2,000 acres were purchased in 1965 near the confluence of the Willamette and Columbia Rivers (an area which would eventually increase to 3,000 acres with subsequent purchases). Mostly ranchland and other lowland floodplain, this area within unincorporated Multnomah County beyond the border of the St. Johns district and Terminal 4 would eventually become the Rivergate Industrial area.

2.2.1.9 Port of Portland

In addition to maintaining the Columbia and Willamette River navigation channels, the Port of Portland had assumed a greater role as a development agency since the acquisition of Swan Island as the City's first municipal airport. The Port of Portland was created in 1891, and had been unrelated to the Portland Dock Commission until in 1971 the Port of Portland acquired the assets and function of the Portland Dock Commission. The Oregon legislature amended the Port's charter to "promote the maritme, shipping, aviation, commercial and industrial interests of the Port." In 1973, the Oregon Legislature expanded the Port of Portland to serve Washington and Clackamas counties, in addition to Multnomah County.

2.2.1.10 Development of Rivergate Area

Development of the Rivergate area became the responsibility of the Port of Portland, which expanded terminal operations, taking advantage of the large amounts of vacant land and its ideal location on the lower Willamette and Columbia Rivers which provided better river access for the now-larger container ships. Portland continued to be a major exporter of wheat, and one of the first maritime developments approved, after land in the Rivergate area was filled, was a new grain terminal with a capacity of 40,000 tons held in eight 140-foot concrete silos, allowing the more efficient movement of larger volumes of wheat. At about the same time, the Port began working on Terminal 6 featuring three container cranes, direct rail service, a container distribution center, and two berths on 1,800 feet of berth space. The first port facility with Columbia River frontage, it was located along the Oregon Slough, next to the western tip of Hayden Island.

As much of this area was under Multnomah County's jurisdiction and not zoned for industrial use, the Port needed to work first with the County, and later the City to rezone and annex the land into the City of Portland. The properties were annexed in 1979 and re-zoned under a 1976 master plan. The land mass of the Rivergate area allowed inclusion of new maritime activities with designated sites for complementary industrial activities as well as environmental mitigation and wetlands preservation. The process of development at Rivergate differed significantly from the previous harbor development process where wetlands such as Guilds Lake and the area near Terminal 4 were indiscriminately filled. The Rivergate area was the first terminal area to be developed under recently passed environmental guidelines, preserving and—in-some cases—augmenting Kelly Point Park, Columbia Slough, and the Smith & Bybee Wetlands.

Terminals at Rivergate have been expanded several times in the past 30 years, including expansions to the elevator system at Terminal 5 and expansions in container facilities and auto handling capacity at Terminal 6. Rivergate also was laid out for other industrial uses, with many of the sites now being used by industries that

complement the terminal activities including materials manufacturing such as steel, and several warehouse, distribution, and trucking companies.

2.2.2 Local Maritime Trends of the Last 20 Years

Unlike many mature cities, Portland's industrial base has shown steady growth over the past 20 years. Some of this growth may be due to the strong land use policies instigated by Metro and the City to ensure the preservation of industrial lands, allowing job growth in many industries, particularly electronic manufacturing, the construction trades, air transportation and wholesale trade.

Portland Harbor has kept much of its land in service for river industrial uses with some exceptions, such as the absorption of Terminal 1, just north of the Fremont Bridge and the area between it and the Steel Bridge, into the Central City—now making up the waterfront area for the new residential towers of the River District. This area was rezoned for housing as part of the Central City Plan in 1988, in order to allow Central City expansion and accelerate the housing development in the Central City and throughout the City, which are both regional growth management goals. In the early 1990s Portland adopted the goal that it would capture at least 20 percent of the region's growth. The dividing line at the Steel Bridge between the mixed use/higher density Central City and Portland Harbor Industrial districts was refined in the 2001 Guild's Lake Plan and the most recent Northwest District Plan. Other factors related to the conversion of Terminal 1 for mixed uses include the fact that the area did not have sufficient rail access for modern operations and was also located adjacent to Front Avenue, which prohibited expansion. In general, the absorption of Terminal 1 and the development of the Rivergate area highlight the overall trend of port facilities moving farther downstream on the Willamette River.

South of Downtown, much of the "South Waterfront" area has been rezoned for mixed use, and is being developed with condominiums and an expansion of medical facilities. The area still has Zidell Marine (a ship builder) and some other smaller industrial uses, but is undergoing transition, as was anticipated in the Central City Plan. Outside of the Central City, the area along the east bank of the Willamette River, between the University of Portland and the St. Johns Bridge is largely vacant, and some of the property has been purchased by the University of Portland.

However, most of the other harbor lands on the Willamette River between downtown and the confluence with the Columbia River have been preserved for industrial use. In the 1980s the City of Portland created industrial sanctuaries to encourage industrial growth and protect industrial districts from incompatible uses such as housing, high density uses, and high traffic uses. The Willamette Greenway Plan (1987) created this zone, better known as the River Industrial Zone.

Many of the older harbor industrial areas north of downtown house river-related industry. In 2000, a survey of businesses within Guild's Lake and Lower Albina areas revealed that 65 and 70 percent respectively of the river frontage is in river-dependent industrial use. The areas upland from these riverfront properties include two of Portland's four rail yards as well as a concentration of industrial uses that can supplement the river-dependent uses. The city anticipates that the tank farms will also be looking to expand their operations as new biofuels are anticipated. Overall, there have been $450 million of completed or funded capital investments made on 30 harbor area sites from 2004 to 2007. Many of these sites have river, rail and road access and use all three for portions of their activities. River-dependent industrial land (as defined in the river plan) along the Portland and Vancouver harbors has had an average absorption rate of 21 acres between 1960 and 1997. More recently, of the 232 acres that were vacant in 1990 and occupied by 1997 (including Port properties), 105 acres were developed as marine cargo uses, 43 acres as marine industrial, and 20 acres as marine infrastructure.

Marine cargo tonnage handled at Portland Harbor increased by 253 percent between 1960 and 2000, driven largely by growth in exports. Between 1985 and 2000, Portland captured an increased share of West Coast

marine cargo in dry bulks, autos, and breakbulks. Portland, Seattle, and Tacoma had declining shares of West Coast container cargo between 1985 and 2000, as an increasing share concentrated at the Los Angeles and Long Beach harbors. However, since 2000, Los Angeles has been experiencing capacity problems causing movement in the harbor to suffer. Portland dominates cargo volume for the Columbia River deepwater seaports, handling 66 percent of the total marine cargo tonnage in 2000.

Although truck traffic has become the dominant mode for delivery of goods to and from Port facilities, proximity of rail has continued to influence modal choice. Rail is a major mode of transportation for ocean-bound cargo, handling 37 percent of all tonnage in the metro area, in 1997. Twenty-one percent is handled by barge, and 42 percent by truck. Rail tonnage increased by 1.8 percent annually in the decade from 1993 through 2003. Both truck and rail tonnage is expected to grow approximately 2.5 percent annually, while barge is expected to become a smaller percentage of overall tonnage with forecast annual growth of 0.29 percent.

If the trends continue into the future, it is anticipated the Portland will continue to increase its cargo volume. Since these marine terminals have a fairly large multiplier effect in job creation, expansion of the port would also expand opportunities for various other industries.

2.2.3 Portland Harbor and Other Lower Columbia River Ports

Other ports along the Lower Columbia also provide potential sites for marine cargo and marine industrial businesses. However, differences between these ports influence a business decision to locate at one port over another. This section contrasts the characteristics of the Port of Portland to the other Lower Columbia ports, including the Ports of Kalama, Longview, and Vancouver. The available land at these sites and the associated facilities and future plans for each port are also discussed to provide context for the relative availability and substitutability of land at different ports in the Lower Columbia River.

Interviews were conducted with several businesses within the Portland Harbor. The purpose of these interviews was to determine the importance of marine industrial developments to businesses now and in the future. In addition, these interviews were used to verify results from previous research. Businesses interviewed included an automotive import company, a rail service provider, liquid bulk company, dry bulk company, and a representative from a rail consulting firm.

Interview topics covered current operations, future plans, issues of future uncertainty, and site suitability requirements. Common themes from these interviews were the importance of intermodal connections, commercial trends, and possible constraints for future growth. For example, every person interviewed spoke to the importance of rail and the advantages of multiple rail service providers within Portland Harbor. Many noted that the presence of two rail service providers results in beneficial rates for harbor businesses.

2.2.3.1 Portland Harbor Distinguishing Features and Cargo Types Handled

The Lower Columbia River Ports at times work cooperatively to maintain the healthy transportation economy that serves the region, but at times also compete with one another to attract a new client or new service area. Through published research and personal interviews, the advantages and disadvantages of each of the ports in the Lower Columbia are described below in order to portray the degree to which available land at one port can substitute for available land at another port in the region. This analysis is intended to merely identify the potential for substituting land at one port for another, and should not be interpreted as an assessment of which ports would be most suitable for different kinds of marine industrial expansion. A wide variety of factors influence final decisions on where to locate industrial activities, including uncertain future national and international economic drivers, availability of funding, private negotiations, and public permitting processes. Still, an overview of the differences can provide foundational information for planning in the Portland Harbor.

In general, Portland is distinguished as being the most significant transportation hub on the Lower Columbia River. Portland is located at the nexus of two interstate freeways (Interstate-5 and Interstate-84), the confluence of the Willamette and Columbia Rivers, the intersection of the north-south and east-west Class I rail lines, and also has an international airport. Due to its proximity to Portland, the Port of Vancouver has easy access to this transportation system. While all of the Lower Columbia ports (with the exception of St. Helens) are located on or near Interstate-5 and are located near the north-south lines of both Class I rail lines, the Ports of Vancouver and Portland are thus differentiated in their level of access to truck, rail, and air transportation.

As summarized in **Table 2-1**, Portland is further differentiated in that it is the only port on the Lower Columbia River that handles large quantities of all types of cargo. In particularly, Portland is distinguished in that container traffic on the Columbia River is centered at the Port of Portland. This is due to the fact that many of the inbound and outbound containers either originate or are destined for locations in the Portland metropolitan area. The Ports of Vancouver and Portland are also the only ports on the Lower Columbia River that handle liquid bulk (primarily petroleum products) and automobile cargoes. Location in a metropolitan area is not only important for attracting these cargo types, but it is also important to attract marine industrial businesses. These businesses benefit from the access to a large, highly skilled labor force as well as proximity to local suppliers and buyers. Interviews with Portland Harbor businesses attest to the fact that the industry clusters in the Harbor are highly interrelated and contribute to the overall success of the area.

Portland is thus differentiated from other Lower Columbia Ports because it handles large volumes of all types of cargo. Additionally, Portland has a larger population of skilled labor and a larger local industrial base that can generate cluster benefits and additional opportunity for marine-related businesses, particularly marine industrial businesses. However, the benefits of being located in a major metropolitan area are also enjoyed by the Port of Vancouver. The benefits of a metropolitan location may not be as important for such cargoes as grain, dry bulks, and breakbulk, as evident in the fact that these cargoes are handled at nearly all Lower Columbia ports. Depending on the specific cargo, its handling requirements, and its local transportation modes, marine industrial land in Portland may be highly substitutable for marine industrial lands at other Lower Columbia ports. For other marine cargo and marine industrial uses, marine industrial land in the Portland metropolitan area (in Vancouver or Portland) may not be as easily substituted for lands elsewhere in the Lower Columbia.

While locational considerations make lands in Portland more desirable for certain marine-related uses, other ports appear to be less land constrained and have less contamination. The Port of Portland has three sites available: the Suttle Road Site at Terminal 6 has approximately 30 acres available which could be suitable for expansion of the automobile terminal, the T-4 Pier 1 site is approximately 35 acres and could be suitable for liquid bulks or local/regional dry bulk use, while the 6.5 acres located at the upstream end of Toyota at Terminal 4 could be used to expand the Toyota facility. As summarized in **Table 2-1**, Portland has no large, shovel-ready sites, while several other ports do have such lands available. Furthermore, known contamination of in-water and upland areas is limited at other ports, while Portland Harbor is listed as a superfund site due to in-water contamination and many upland areas surrounding the harbor have suspected contamination. This contamination carries significant costs in terms of potential future liability as well as development costs that may deter marine-related use.

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Table 2-1 Land and Cargo Characteristics of Lower Columbia River Ports

Characteristic	Port of Kalama	Port of Longview	Port of Vancouver	Port of St. Helens	Port of Portland
Cargo Handled					
Containers	No	No	Yes (Very Limited)	No	Yes
Automobiles	No	No	Yes	No	Yes
Breakbulk	Yes	Yes	Yes	No	Yes
Grain	Yes	Yes	Yes	No	Yes
Dry bulk	No	Yes	Yes	Yes	Yes
Liquid bulk	No	No	Yes	No	Yes
Land Availability					
Total shovel ready acreage over 100 acres	Yes	No	Yes	Yes	No
Shovel ready contiguous sites over 50 acres	1	0	3	1	0
Access to adjacent additional/undeveloped land	Yes	No	Yes	Yes	Yes
Undeveloped sites greater than 100 acres	No	No	1	1	1
Contamination					
Contaminated sites	No	Limited (on private land not port property)	Limited (groundwater contamination on acquired site)	Limited (1 site has some contamination from previous owner)	Yes (Portland Harbor Superfund Site, Upland Contamination on Private lands)

2.3 ECONOMIC CONTRIBUTION AND VALUE OF MARINE-RELATED USES

As described above, economic development of the City of Portland and the region as a whole has always been closely linked with marine-related industry in Portland Harbor. The degree to which marine-related uses currently contribute to the regional economy (defined as the four-county area of Clackamas, Multnomah, Washington, and Clark County) can be analyzed using two related factors:

1. **Number and strength of the linkages between marine-related economic sectors and other economic sectors in the regional economy.** Linkages can be based on purchase of inputs for the marine-related sector (goods and services produced by other sectors) and purchase of outputs from the marine-related sectors (goods and services required by other sectors). The more numerous the industries connected to the marine-related uses, and the stronger the linkages and interdependencies, the greater the economic importance of the marine-related uses in the regional economy.
2. **Job and income impact of marine-related economic activity.** The relative size of employment and income in the marine-related economic sectors as well as the size of employment and income in closely related sectors dependent on marine-related uses indicates the overall economic importance of marine related uses.

This section discusses the existing studies and data that provide information on the degree of economic dependency and importance of marine-related uses in Portland. Although there are numerous existing studies to draw from, and several that estimate employment and income in marine-related industries, data gaps prevent full quantification of the total economic contribution in terms of jobs and income in sectors closely linked to marine-related uses. Given these data gaps, the intent of the section is to characterize the linkages

between marine-related uses and other economic sectors in Portland to give a sense of the potential total jobs and income contribution of marine-related activity in all sectors.

2.3.1 Overview of Economic Links

Marine-related industrial and marine cargo uses are linked to a great number of other industrial activities within Portland and the region. Marine industrial uses are situated on the river in order to utilize water transportation for import or export of their primary or finished goods. These marine industries are linked to other industries located in Portland Harbor and elsewhere in the region, including wholesale trade, local and regional transportation firms, manufacturing firms, and retail firms. Marine cargo terminals handle and transport freight that is vital to numerous other industries located throughout Oregon, Southwest Washington, and beyond. These businesses depend on the transportation hub at Portland Harbor either for transport of their products to international or regional markets (such as grain, steel, or minerals), or for the provision of inputs of the wide variety of freight materials imported through Portland Harbor, whether petroleum, consumer apparel, automobiles, or raw materials.

To identify these links, this section first discusses the primary marine-related sectors operating in Portland Harbor, including water transportation, warehousing and wholesale trade, metals manufacturing, and transportation equipment firms. The related, linked industries that are associated with these industries are then discussed. As a starting point, this analysis assesses the economic sectors that are linked with water transportation activities, as an indicator of which sectors depend on water-borne transportation provided by Portland Harbor. Following the linkages further, we find that all sectors in the Portland metro area and beyond are linked in some way to sectors that rely on water transportation. The challenge is to identify those industries that are most dependent on water transportation, and gain a sense of their economic importance in the region. This analysis is intended to verify and expand the body of economic impact research on the economic importance of marine-related uses in the Portland Harbor to help inform the question of how the annexation of West Hayden Island for marine industrial uses could help sustain a healthy future economy for the City.

There are some 1.3 million jobs across a range of industries in the Portland Metropolitan region, which are explored more fully in section 3 of this report. This section of the report reviews the activities of the Portland Harbor, and the Transport by Water industry within the harbor. This overview is intended to provide the context of the harbor-related activities within the region and the linkages of that activity to the rest of the region's economy.

2.3.1.1 Primary Sectors & Clusters Dependent on Marine Transportation

Employment by industry in Portland Harbor is analyzed using geospatial data provided by the City of Portland on 993 parcels totaling 5,979 acres. This data is from the City's Working Harbor analysis conducted in 2004; the working harbor geography is the same as the Portland Harbor geography. Employment data from the 2008 Quarterly Census of Employment and Wages is available for 481 parcels (4,334 acres), with an estimated 35,000 jobs. Excluding parcels designated as residential uses, there are 5,953 acres in 897 parcels in the Portland Harbor. Among these, 117 parcels are designated as river-dependent, rail-dependent, or both river- and rail-dependent. These lands comprise just over one-half of the total land area, and account for just under 24 percent of the area's estimated 35,000 employees. As employment data were not available for all parcels, the analysis is limited to those parcels for which complete data were available.

River dependent uses are defined in the *Portland Zoning Code* as "a use which can be carried out only on, in, or adjacent to a river because it requires access to the river for waterborne transportation or recreation." River dependent uses were classified by the City, and were further divided for this study into marine cargo and marine industrial uses based on ownership and existing use of the site. There are 46 parcels identified by the

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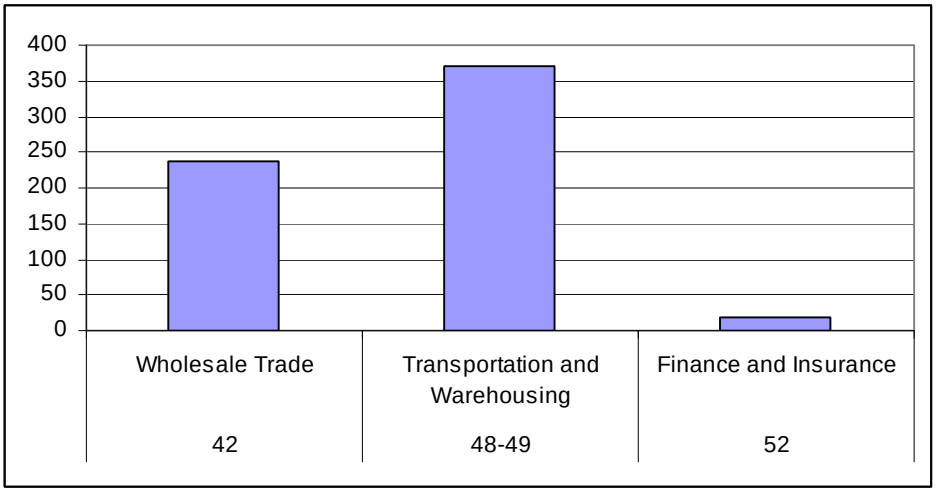
City as river-dependent, which aggregate to a total of 1,787 acres. Of the 46 river-dependent parcels, there are 28 with available employment data. Data for these parcels indicate 2,707 employees in river-dependent uses, of whom approximately 76 percent (2,067 employees) are employed in marine industrial uses with the remaining 24 percent (640 employees) employed in marine cargo uses. **Figures 2-1** and **2-2** display the employment distribution and the job categories for parcels designated as marine cargo.

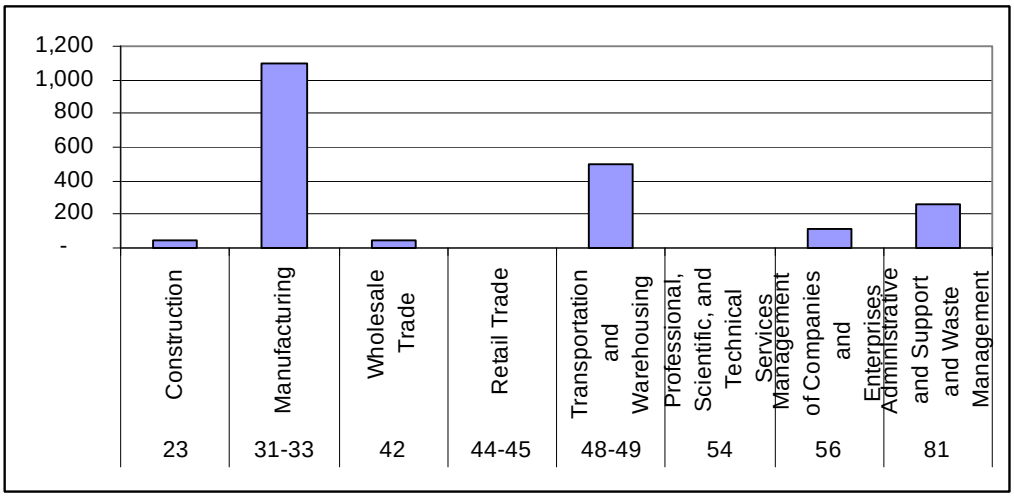
As would be expected, jobs on parcels classified as marine cargo are mostly in the wholesale trade and transportation and warehousing categories. Employment classification on marine industrial land uses is much more diverse. Of the 755 acres of marine industrial land, employment data are available for 542 acres that provide employment for 2,067 workers across a range of industries. Over half of these employees (1,098 jobs) are classified as working in Manufacturing, another 504 jobs in Transportation and Warehousing, and the remainder classified as a range of service, and construction jobs.



Note: Excludes parcels for which no employment data were available.

Source: Oregon Employment Division, 2008 Quarterly Census of Employment and Wages, City of Portland GIS, merged by ENTRIX, and tabulated by Bonnie Gee Yosick LLC.

Figure 2-1 Employment Distribution for Parcels Classified as Marine Cargo



Note: Excludes parcels for which no employment data were available.

Source: Oregon Employment Division, 2008 Quarterly Census of Employment and Wages, City of Portland GIS, merged by ENTRIX, and tabulated by Bonnie Gee Yosick LLC.

Figure 2-2 Category of Jobs for Parcels Classified as Marine Industrial

For the 1,524 acres of land designated as river-dependent for which employment data area available, there are an estimated 2,700 employees across a range of industries. Over one-third are classified as transportation equipment manufacturing.

According to the employment data from the 2008 Quarterly Census of Employment and Wages, over one-third of the employment on the rail-dependent parcels is in the railroad rolling stock manufacturing industry, most likely Oregon Iron Works. The economic impact of these 1,009 jobs in the railroad rolling stock manufacturing sector is quantified later in this report, as is the economic impact of the Transport by Water industry.

Within the context of the Portland Metropolitan region, these harbor jobs represent a small fraction of total employment within the region, but they are intricately linked to the overall economic activity of the region. As has been noted in numerous other reports, the region's economy is heavily dependent on the traded sectors, and all forms of transportation are integral to sustaining these economic sectors. Some of the connections are explored below.

2.3.1.1.1 Cluster and Linkage Analysis of Water Transportation Industry

Industry clusters are generally defined as geographic concentrations of interconnected companies and institutions in a particular field. Cluster analysis—the identification of groups of firms or industry sectors that share similar suppliers, skills, markets, and workers—has been used as part of the City of Portland economic development efforts for years. The City has used the results of cluster analysis to better understand the regional economy, to focus its economic development agenda, and to identify industry partners.

Cluster efforts typically analyze various traded sectors. According to a paper on how to include economic impact information into investment decisions for transportation projects by the Economic Development Research Group (2008),[8]

> *The traded industries serve as a primary generator of wealth by producing more than can be consumed locally. However, from a transportation perspective, traded industries are important because their products are traded and hence depend on long-distance transportation connections to customers in national or international markets. As a result, any major reduction in access to customers outside the region can have serious implications for many traded industries (and therefore the broader economy). Thus, transportation's support for traded industries not only enables those industries to generate wealth for the region, but transportation becomes an important determinant of their future economic prospects.*

There are several industry clusters that are most reliant on marine terminal and harbor activities. A cluster and linkage analysis of five primary industries dependent on water transportation was conducted for a four-county area, including Multnomah, Washington, and Clackamas counties in Oregon, and Clark County in Washington. These industries are handling of automobiles, transport manufacturing (including barge manufacturing companies), handling of steel slab, petroleum, and paper and cartons. The analysis uses the IMPLAN[9] 2007 dataset. In addition to being one of the most commonly used tools in economic impact

[8] Economic Development Research Group, Inc. 2008. Use of Freight and Business Impact Criteria for Evaluating Transportation Investments, Executive Summary. Prepared for the Portland Business Alliance and Port of Portland, Available at www.portofportland.com/.../Trade_Trans_Studies_EDR_ExecSmry.pdf.

[9] IMPLAN is a static equilibrium input-output model first developed in 1979 by the U.S. Forest Service in cooperation with the Federal Emergency Management Agency and the U.S. Bureau of Land Management to assist the Forest Service in land and resource planning and management. The program has been updated and improved over subsequent years and is now one of the most commonly-used economic modeling tools for measuring the economic impacts of development projects.

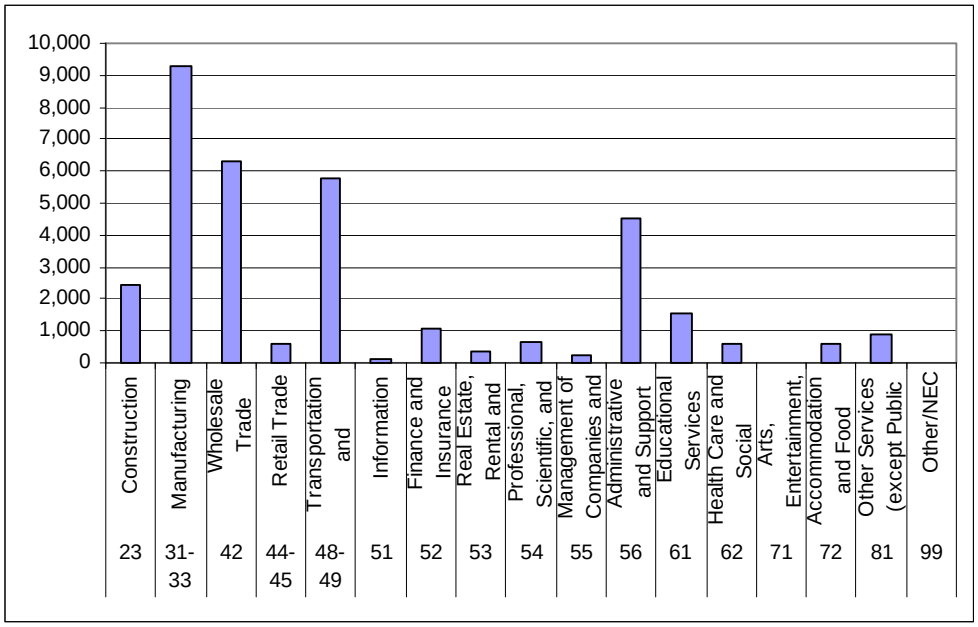
analysis; IMPLAN is also frequently used for cluster analysis, by examining the relationships of industries to their buyers and suppliers. The structure of the model mimics the monetary transactions for consumption within an economy, allowing a detailed examination of the effects of transactions between businesses and between businesses and final consumers.

Findings from the cluster analysis indicate that employees in these water transportation-dependent sectors have higher than average employee compensation. All of these sectors are also strongly linked with other manufacturers as well as wholesale trade, indicating the importance of trade and movement of goods to these industries. Detailed findings from the analysis are provided in **Appendix A**.

2.3.1.2 Other Sectors & Clusters Dependent on Multi-Modal Transportation

In addition to the industries analyzed above, there are other industries not strictly defined as marine dependent which benefit from the multi-modal transport available in the harbor. These industries, indirectly supported by the marine transport, might not locate in the harbor were it not for the combined multi-modal transport.

The industries with the greatest employment in the Portland Harbor include Manufacturing, Wholesale Trade, Transportation and Warehousing, Administrative and Support Services, and Construction. The distribution of employment provided by the Quarterly Census of Employment and Wages is shown in **Figure 2-3** below. Industries are shown by 2-digit NAICS code (for example, construction is NAICS sector 23).



Note: Excludes parcels for which no employment data were available.

Source: Oregon Employment Division, 2008 Quarterly Census of Employment and Wages, City of Portland GIS, merged by ENTRIX, and tabulated by Bonnie Gee Yosick LLC.

Figure 2-3 Employment Distribution by Sector in Portland Harbor

2.3.2 Regional Jobs and Income Impacts

Regional economic impact studies analyze how one or more sectors of an economic system ripple through a larger economy due to the interconnectedness of economic activity such as water transportation. Economic activity within the sector that is the focus of the study is called a direct effect. The economic 'ripple' that occurs when the economic activity within the study sector (i.e., water transportation) increases demand in

related economic sectors that either supply inputs to water transportation or utilize water transportation outputs is called the indirect effect. Another effect typically reported in impact studies is the induced effect that occurs when the change in economic activity affects incomes to workers and proprietors, which then increases their household spending, thus stimulating economic activity in retail, real estate, and other consumer-related sectors.

As described above, water transportation is an integral component to many industries located in the Portland Harbor. These water-dependent industries are then linked to other industries in the harbor and elsewhere throughout the metro region. This section describes existing economic impact studies as well as new analysis conducted for this study that quantifies elements of the economic activity supported by marine transportation. These studies were conducted for a range of purposes, and most limit their analysis to parts of single industries. None of the analyses attempt to quantify the overall economic impacts of the harbor activities. Similarly, the objective of this current assignment is to provide context for the many inter-related industries functioning in the harbor, rather than attempt to provide an overall analysis of economic impact from harbor-related activities.

2.3.2.1 Previous Studies

The impacts of Portland Harbor on the regional economy have been studied at different geographic scales focusing on different industry sectors. Previous studies have focused on the impact of Portland Harbor industry activity in the Portland economy for a number of different purposes including industrial land use planning. Other studies have focused on water transportation and marine terminal activity in an attempt to isolate the benefits of the harbor itself. Still other studies have addressed the idea that one of the most critical economic benefits of the harbor facilities is that it is part of a linked multimodal water/rail/truck transportation system that collectively attracts commerce. As such, it is difficult to isolate (or credit) any one element of that transportation system with economic results because it is the presence of all transportation modes that serves to attract economic activity. For this reason, some research has considered the impacts of industries that are dependent upon the transportation system. Previous efforts to quantify economic impact related to Portland Harbor include:

- A 2003 economic impact analysis of distribution industry by Martin Associates
- A 2003 economic impact analysis of Portland Harbor by E.D. Hovee & Company; and
- A 2003 economic impact analysis of Portland Harbor freight rail by Cambridge Systematics
- A 2007 economic impact analysis of Port of Portland Marine Terminals by Martin Associates

Approaches for this previous research have varied both in methodology and data. Data differences include differences in source, geographic scope, and the degree to which industries are aggregated. Methodological differences tend to follow from the purpose of the study, the way interdependence of harbor industries is handled, and the level of economic impact estimated (e.g. jobs, gross revenues, direct and indirect impacts, etc.). These studies are discussed below and then summarized in **Table 2-3**.

2003 Study of the Economic Impacts of Distribution Industry

One economic impact study was completed in 2003 by Martin Associates and estimates the economic impacts of the distribution industry on the Portland regional economy.[10] The research is based on 67 interviews with local business leaders within the Portland Harbor distribution industry including wholesale trade, warehousing, and transportation sectors. This information is then analyzed in an input-output model called

[10] Martin Associates, 2003, 'The Economic Impacts of the Value Added Regional Distribution Industry in the Portland area.'

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IMPLAN. This study defines the Portland region as the counties of Clackamas, Clark, Multnomah, and Washington (p. 2). Impacts estimated include direct, indirect, and induced jobs and income, as well as state/local taxes (see **Table 2-2**).

Table 2-2 Economic Impacts of Value Added Distribution Industry on Portland Regional Economy

	Economic Impact
Jobs	17,242
Direct	7,864
Induced	4,283
Indirect	5,095
Personal Income	$809,811
Direct	$278,287
Induced	$363,723
Indirect	$167,801
State/Local Taxes	$88,600
State Taxes	$60,300
County/Local Taxes	$21,000
Tri-Met Tax	$7,300

Note: Dollars in Thousands

Table Source: Martin Associates, 2003.

2003 Bureau of Planning Study of the Economic Impacts of Portland Harbor

In 2003, the Portland Bureau of Planning[11] and E.D. Hovee & Company[12] completed the Portland Harbor Industrial Lands Study. Based on the five-county region of Clackamas, Columbia, Multnomah, Washington, and Yamhill Counties (Portland Metropolitan Statistical Area, or Portland MSA), this study uses multipliers estimated by the Bureau of Economic Analysis through the Regional Input-Output Modeling System to find that the harbor is responsible for one in eight regional jobs in 2000 accounting for almost 100,000 jobs in the metro area with a payroll of $3.5 billion. At the water transportation level, employment grew 1.6 percent annually between 1980 and 2000. Over that same time period, the Portland MSA share of total national water transportation employment increased from 0.76 percent to 1.11 percent, a substantial shift. Additionally, the report indicates the water transportation industry employee earnings are 43 percent higher than the average employee earnings for all sectors in Multnomah County in 2000. At the transportation industry level, the report finds that every transportation employee in the harbor study area results in 2.4 jobs in the Portland MSA totaling 15,341 jobs (direct, indirect, and induced job impacts) with a payroll of $459.1 million.

2003 Study of the Economic Impacts of Portland Harbor Freight Rail

A study by Cambridge Systematics, titled *The Freight Rail and the Oregon Economy Study* reports that of the 10.5 million tons ($11.2 billion in value) that were shipped to or from the Port of Portland in 2002, fully 6.2 million or 59 percent arrived or departed by rail. The majority of these tons, 5.7 million, were loaded onto

[11] Portland Bureau of Planning. 2003. Portland Harbor Industrial Lands Study Part One: Inventories, Trends and Geographic Context.

[12] E.D. Hovee & Company. 2003. Portland Harbor Industrial Lands Study Part Two: Interviews and Analysis.

ocean going vessels and approximately 530,000 tons of rail shipments were loaded from marine vessels onto trains. If a similar percent of the of 1997 marine terminal tonnage (59 percent of 10.8 million tons in 1997) were assumed to have been moved by rail, this calculation would represent 6.35 million tons. When matched with the statewide volume of 55.2 million tons of rail moved in 1997, this volume suggests that roughly 11.5 percent of all rail movement in the state also moved by water through Portland Harbor. The study also found that Multnomah County, the location of the Port of Portland, ships 41 percent of all rail tonnage in the state and receives 69 percent of all rail tonnage, further strengthening the fact that transportation connectivity is a driver of economic activity.

With the connectivity between rail and water transportation in mind, the impacts from industries that are rail dependent are further examined. The study by Cambridge Systematics analyzes the Commodity Flow database to identify top commodities (ranked by weight) originating and terminating in the Portland Metropolitan region, focusing attention on the movement of specific commodities, including mineral bulks, grains, automobiles, containers, and breakbulk cargo. The study further analyzes USDOT data on estimated rail expenditures by industry group for the Portland Metro region and the state as a whole, noting that the lumber, wood, and paper product industry spent $159 million on rail service in 2002. With annual output of $2.9 billion, this industry supported 12,000 jobs. In addition, the second largest purchaser of rail service, the transportation equipment industry, spent $106 million on rail service. This industry produces $4.9 billion and supported a total of 11,200 jobs in 2002. The wholesale trade industry was found to spend $49 million on rail service and the industry's output was $15.2 billion which supported 55,600 jobs. The primary metals industry also spent a large amount of funds on rail, approximately $30 million in 2002. This industry's output was $1.4 billion and it supported 7,700 jobs. The chemical industry was the fifth largest purchaser of rail freight and spent approximately $13 million on rail, which supported an industry output of $777 million and 2,358 jobs.

2007 Study of the Economic Impacts of Port of Portland Marine Terminals

A later study also by Martin Associates focuses on the Port of Portland. Titled the *Local and Regional Economic Impacts of the Port of Portland*,[13] the study estimates the regional economic impacts generated by the cargo and vessel activity at marine terminals in Portland Harbor. The results suggest economic impacts of nearly $996 million and 6,568 jobs as a direct result of the Portland Harbor through public and private terminal activity in 2006. The analysis further estimates an average salary of $47,760 for the jobs directly attributable to marine terminal activity, nearly $996 million in business revenue, $1.4 billion in personal wage and salary income and local consumption expenditures, and nearly $146 million in state and local tax revenue. Including direct, indirect, and induced jobs, the study estimates total employment attributable to marine terminal activity at 19,036 jobs. This analysis was based on a survey of 295 employers with operations in Portland Harbor, and publicly-available data from the Census Bureau. The analysis also disaggregates employment impact by geography of residence and by type of commodity handled.

The analysis categorized the impact into five broad categories:

- Surface transportation;
- Maritime services;
- Port of Portland;
- Banking/Insurance/Law; and
- Shippers/Consignees.

[13] Martin Associates. 2007. The Local and Regional Economic Impacts of the Port of Portland, 2006.

Surface transportation is further divided into rail and truck, while the maritime services category is disaggregated into terminals, International Longshore and Warehouse Union (ILWU), towing, pilots, agents, surveyors/chandlers/maritime services, forwarders, warehouse & container repair, government, maritime equipment/construction, and barge. The information below summarizes findings from this report by cargo type handled by marine terminals. The Transport by Water industry analyzed corresponds roughly to the Terminals subcategory within Maritime Services in the Martin analysis. Other categories in the Martin analysis correspond to other industry sectors. As noted in the Martin report, some jobs cannot be accurately attributed to a particular commodity or industry.

- **Containers** -- In 2006, 1.5 million short tons of containerized cargo, or about 123,000 containers were moved on vessels calling the Port of Portland, creating 846 direct jobs. All containerized cargo was handled by Port of Portland facilities, the majority via Terminal 6. Three hundred one jobs were created in the local trucking industry. In addition to the truck impact, other key employment categories include members of the ILWU (173 full-time equivalent workers) and 180 jobs with warehouse and container repair firms. There are also 115 jobs with freight forwarders/customhouse brokers booking the freight and clearing imports through U.S. customs.
- **Breakbulk** -About 76,000 tons of breakbulk cargo moved via the Port of Portland terminals in 2006, creating 75 direct jobs, the majority of which are with members of the ILWU.
- **Soda Ash** -- 2.4 million tons of soda ash exports originate in Wyoming, arriving via unit train directly to the bulk loading facility. A total of 131 direct jobs were generated by this export move. The majority of these jobs are held by ILWU and rail employees.
- **Grain** -- The majority of the 6.4 million tons of grain exported via the Portland Harbor consists of wheat originating in Oregon, Washington and the Dakotas. Three elevators move this grain, two of which are private terminals, while the third elevator is located on Port of Portland property. About 60 percent of the grain is exported via the grain elevator leased from the Port of Portland. About 60 percent of the 840 direct jobs are with the railroads moving the grain.
- **Potash** -- The 1.9 million tons of potash exported from the Port of Portland facilities, creating 94 direct jobs, are primarily with ILWU and the railroads moving the potash from Canada.
- **Dry Bulk** -- Dry bulk commodities consist of cement, limestone, fertilizer, and sand and gravel. Nearly 4 million tons of dry bulk cargoes move via barge in the Portland Harbor and support 943 direct jobs with local truckers, terminal operations and barge operations.
- **Liquid Bulk** -- In 2006, 99,000 tons of other liquid bulk cargoes such as fertilizers and food oil moved via the Portland Harbor. These cargoes supported 47 direct jobs, primarily with local terminal operators and trucking firms
- **Autos** -- The Port of Portland is the leading automobile import port in the Pacific Northwest. In calendar year 2006, the Portland auto facilities handled 464,000 import and export automobiles. The handling of automobiles generated 796 direct jobs, of which 44 percent are with terminal operators and automobile processing facilities. About 30 percent of the direct jobs are in the surface transportation sector, and about 57 percent of the surface transportation sector jobs generated by the transport of automobiles are with the trucking firms, and the balance by rail. The movement of automobiles generates 161 full time jobs for the ILWU.
- **Iron and Steel** -- The 836,000 tons of steel slab imports and 148,000 tons of steel via the public marine terminals generated 727 direct jobs. These jobs are primarily associated with the receipt of slab, and the employees of the local steel mill importing the slab. The majority of this cargo is trucked to the local mill or to direct importers
- **Petroleum** -- About 5.8 million tons of petroleum products moved to and from the private terminals along the Columbia River System. The 5.8 million tons of petroleum generated 562 direct jobs, of which

60 percent is with local truck distribution from the river terminals handling the products. Other key job impacts are with barge operations distributing the petroleum products up-river, as well as bunkering activity.

- **Forest Products** -- The 214,000 tons of cartons and paper moved in the Portland Harbor by barge, creating 191 direct jobs, the majority with the local importer and distribution firms.

This analysis is the best estimate of the impact of economic activities occurring within Portland Harbor. However, the analysis is limited to cargo and marine-related activity, and does not include the marine-related industrial activity described in the previous section.

Summary of Previous Studies of Economic Impact

Even with their methodological differences, and differences in scope, findings from these previous analyses can inform this effort, including:

- The Portland Harbor is linked to a range of industries, particularly wholesale trade, transportation and warehousing, and other forms of transport.
- The multipliers result in higher numbers of jobs and output linked to the river than just direct jobs
- The movement of goods link the various transport-related industries (Transport by Rail, Transport by Water, Transport by Air, and Transport by Truck)

An overview of the different studies that have been completed including the different geographies, different approaches, and different purposes, is provided in **Table 2-3** below.

Table 2-3 Summary of Studies of Impacts of Portland Harbor Industry on Portland Metro Area

			Portland Metro Area Impacts				Portland Metro Area (Counties)					
Study	Industries	Study Area of Industries	Direct Jobs	Total Job	Total Earnings	Model	Clackamas	Clark	Multnomah	Skamania	Washington	Yamhill
Martin Associates, 2003	Wholesale Trade, Transportation, and Warehousing	Entire Portland metro region	7,864	17,242	$809,811	Implan	X	X	X		X	
Portland Bureau of Planning, 2003	Transportation	Harbor, Industrial Districts downstream of the Steel Bridge	6,460	15,341	$495,100	RIMSII	X	X	X		X	X
Portland Bureau of Planning, 2003	All Industry	Harbor, Industrial Districts downstream of the Steel Bridge	34,272	99,783	$3,510,000	RIMSII	X	X	X		X	X
Cambridge Systematics, Inc.	Freight Rail	Portland Metro, Freight Rail Dependent Industries		88,850	$355,000 Rail, $11,200,000 total	N/A	X		X	X	X	X
Martin Associates, 2007	Transportation, Marine Services, Banking, Government, Marine Construction	Portland Harbor	6,568	19,036	$1,426,777	Excel	X	X	X	X	X	

Note: Dollars in Thousands

2.3.2.2 Estimates of Impact of Marine-Related Uses in Portland Harbor

As noted above, the 2007 Martin Associates study presents the most comprehensive estimate of the impact of marine-related economic activities occurring within Portland Harbor. However, the analysis underestimates total economic impacts, as it is limited to cargo and marine-related activity and does not include the direct or total economic contribution of marine industrial activity. The 2003 Bureau of Planning study estimated the economic impact of all industry within the Portland Harbor, which likely results in an overestimate of the impact of marine-related uses, since not all harbor area industries depend on marine transportation. The total regional economic impacts of marine-related uses are thus estimated to range between the values from these two studies: total (direct, indirect and induced) employment is estimated to range from 19,000 to 100,000 jobs, while total income generated from these jobs is estimated to range from $1.4 billion to $3.5 billion annually.

Transport by Water

One critical component of marine-related activity is the Transport by Water industry, which enables and enhances the other terminal and marine-related industrial activities. This section of the analysis explores in more detail the economic impact of the Transport by Water industry. With only 834 direct employees, it accounts for less than 13 percent of the direct employees attributed to marine terminal activity in the Martin report. As such, it is important to note that the Transport by Water industry is but one small component of the employment and economic activity in the Portland Harbor.

Using a 2007 data set specific to the four-county Portland Metro region, an analysis using IMPLAN indicates that Transport by Water has 834 direct employees and approximately $540 million in output (see **Table 2-4**). This estimate is comparable—though slightly less than—the 976 employees estimated in terminal employment in maritime services from the Martin study.

Table 2-4 Economic Impact of Transport by Water Industry, 2007

	Direct	Indirect	Induced	Total
Output	$540,000,000	$247,709,000	$116,976,000	$904,685,000
Employment	830	2,020	1,010	3,860
Employee Compensation	$77,747,000	$89,809,000	$35,104,000	$202,660,000
Average Compensation per Employee	$93,200	$44,600	$34,700	$52,500

Source: IMPLAN 2007 dataset, analyzed by Bonnie Gee Yosick, LLC.

The estimated $540 million in direct economic output generates an additional nearly $248 million in indirect output and nearly $117 million in induced output for a total estimated economic output of nearly $905 million from transport by water.

The direct employment of 834 jobs and $540 million output in the Transport by Water industry supports over 2,010 indirect employees in a range of related industries, and another 1,010 employees from induced spending for a total impact of 3,860 jobs. Again, the Martin analysis estimated 976 in terminal employment in maritime services in 2006, but did not disaggregate the output and personal income impacts of those terminal employees from the total, so a direct comparison is not possible.

Finally, of the $540 million in Transport by Water output, nearly $78 million is direct employee compensation. Adding employee compensation to employees in direct and indirectly impacted industries results in total employment of nearly 3,900 jobs supported by the Transport by Water industry. As noted earlier, average compensation for the water transport industry sector is higher than the average for all industries. The resulting values generated by this analysis are different than those generated by the Martin

report due to definitional and methodological differences in the analyses. In particular, much of the terminal-related employment resulting from this analysis may not be as adequately captured as in the Martin study. This is because many of the pilots, towers, forwarders, and others are not categorized in the Transport by Water sector in the IMPLAN data. In these cases, the Martin study should have covered these types of firms, while the IMPLAN data would not. As such, the higher impact values from the Martin report are potentially consistent with the IMPLAN results presented here.

2.4 SUMMARY

This section has provided an overview of the economic history and regional economic contribution of Portland Harbor and marine industrial land uses. For over 140 years, Portland has been a successful port city and continues today in this role due to its location at the nexus of excellent rail infrastructure, including the Olympic oil pipeline, two interstate freeways, the Columbia River deepwater shipping channel, and the Upper Columbia/Snake Rivers barge system. Marine cargo terminals handle and transport freight that is vital to numerous other industries located throughout Oregon, Southwest Washington, and beyond. Cargo movement through the Portland Harbor has grown steadily over the past century, and recent trends indicate continued future growth. A wide web of industries rely on waterborne transportation, including wholesalers and retailers who import consumer products, manufacturers that import raw and intermediate goods, and manufacturers and natural resource industries that export products.

Portland Harbor serves as an economic engine for the metro regional economy. The Portland Harbor is home not only to transportation and distribution activities linked to marine terminals, but also manufacturing facilities that rely on marine transportation. These marine-related industries are linked to other industries located in Portland Harbor and elsewhere in the metro area, including wholesale trade, local and regional transportation firms, manufacturing firms, and retail firms. These businesses depend on the transportation hub at Portland Harbor either for transport of their products to international or regional markets, or for the provision of inputs of the wide variety of freight materials imported through Portland Harbor, whether petroleum, consumer apparel, automobiles, or raw materials.

These marine-related industries are then linked to other industries in the harbor and elsewhere throughout the metro region. Past studies indicate that cargo and manufacturing activities dependent on waterborne transportation contribute significantly to the metro region's economy. These studies indicate that marine-related economic activity generates from 20,000 to 100,000 jobs and from $1.4 to 3.5 billion to $1.4 billion annually in regional income.

Although there are several other ports in the Lower Columbia River, including the ports of Kalama, Longview, St. Helens, and Vancouver, Portland is distinguished in the level of its transportation connections and its location in a large metropolitan area. The metro area provides a larger population of skilled labor and a larger local industrial base that can generate cluster benefits and additional opportunity for marine-related businesses. As part of the Portland metropolitan area, Vancouver also has this advantage over other Lower Columbia River ports. However, Portland is differentiated from Vancouver and all other Lower Columbia Ports because it is the only port that handles large volumes of all cargo types (specifically, it is the only port that generally handles containers). While some marine industrial uses could be suitable at any Lower Columbia River port, for certain land uses that rely on all types of transportation connections and a large population or industrial base, marine industrial land in the Portland metropolitan area (in Vancouver or Portland) may not be as easily substituted for lands elsewhere in the Lower Columbia. While locating in Portland may be more desirable for some marine-related uses, other ports appear to be less land constrained (and have larger contiguous, shovel-ready sites), and may have less contamination.

SECTION 3

Trends and Forecasts for Marine Related Uses

The purpose of this section is to identify the level of marine industrial economic activity likely to occur within Portland Harbor. The analysis consists of a 30-year (to the year 2040) forecast of job and cargo growth associated with marine industrial development opportunities. A review of economic and demographic trends is first provided, followed by a discussion of employment and land use trends more specific to marine industrial opportunities in Portland Harbor. These subsections rely on data from interviews as well as published data to provide historical and current context to the marine cargo and employment growth forecasts. A subfinal section provides the marine cargo and job-growth forecast. The forecasts are based on different assumptions about the types of marine industrial development that could occur over the planning horizon, resulting in a low, medium, and high estimate of job growth. The three scenarios reflect uncertainty regarding overall economic growth, business location decisions, magnitude of cargo movement, and the Portland Harbor cargo market share.

3.1 OVERVIEW OF DATA SOURCES AND KEY ASSUMPTIONS

This section covers a review of relevant trends and data related to the economic environment, employment in general, population growth, and other factors that can support the marine industrial forecasts. The data and research presented in this section has been gathered from a variety of sources and is intended to provide a broad understanding and interpretation of the Portland economy. For this reason, data and information are not always comparable in terms of geography and classification. For example, much of the information pertains to the larger economic region known as the Portland Metropolitan Statistical Area (PMSA) which includes five Oregon counties plus Clark and Skamania counties in Washington State. Yet other information is presented at the county level, with a particular focus on Multnomah County, while other information is presented for the Oregon portion of the PMSA. Another example is that the classification of different types of industries varies from research organization to organization, and/or annual data may have been collected at different points in the year causing some discrepancy between sources. In all cases an attempt has been made to identify the geographic boundary of the information presented. Also, an effort has been made to calculate wherever possible average annual growth rates (AGRs). Annual growth rates allow for trend data to be compared in terms of the rate of growth or decline, and may be calculated for annual changes in any kind of time-series data.

Several elements of the approach to forecasting marine industrial cargo and employment are similar. These are:

- Both forecasts are developed under the assumption that public infrastructure is continually developed over the forecast horizon to accommodate increases within the sector.
- Both forecasts were developed by considering the larger regional growth within the sector, and then anticipating the share of the larger growth that would likely occur within the Portland Harbor.
- Both forecasts were developed by another organization, and reviewed and adjusted by the ENTRIX team for the purpose of this report.

- Both provide low, high, and most likely scenarios to accommodate uncertainty stemming from a variety of factors including overall economic growth, commodity flows, timing of the economic recovery, and competition from other regional and local marine industrial facilities.

3.2 GENERAL EMPLOYMENT AND POPULATION TRENDS

The recent economic downturn has had a substantial effect on employment in Portland and the region. Oregon's unemployment stands at 11.3 percent [14] as of October, 2009 compared with a rate of 7.2 in October of 2008, and 5.2 in 2007. For the Portland Metropolitan Statistical Area (PMSA), which covers seven counties including Clark and Skamania Counties in Washington State, seasonally adjusted unemployment was at a rate of 11.6 in October of this year, up from 6.8 at the same time last year, and 4.9 in 2007.

Businesses will expand more slowly than originally forecast and it will take some time for employment in the area to recover to 2007 levels. As yet it is unclear what effect this will have on population growth in the area. Fewer people are moving throughout the country because home prices have dropped and those who might have moved may be less likely to if there is a risk of losing money on their homes. On the other hand, with unemployment rates high throughout the country, some people may move in hopes of finding new opportunities, and the general redistribution of workers may mean that in migration continues to the area unabated.

In general, the current recession has caused a short-term decline on local cargo and employment, but this trend is expected to be reversed in 2010, with annual growth forecasted to be positive through 2040. The Portland metro region has grown faster in both employment and population than other areas of the country, and this trend is expected to continue in the immediate future, with growth slowing after 2030.

- **Population Growth.** Population growth in the Portland metro area has outpaced state and national growth, averaging 2.5 percent annually from 1980 to 2007. Annual growth from 2000 to 2060 is forecasted to average 1.2 percent, with growth to 2030 forecasted at the higher annual rate of 1.5 percent.
- **General Employment Growth**. Since 1981, Oregon has experienced average employment growth of 2 percent annually (compared to 1.7 percent nationally). Portland metro area employment is expected to nearly mirror population growth rate. Employment is forecasted to grow at an annual average rate of 1.2 percent from 2000 to 2060, with a higher annual growth rate of 1.4 percent expected through 2030. Metro forecasts employment growth of approximately 23,600 jobs in the Columbia Harbor area (which includes Portland Harbor but is a larger geographic area) from 2010 to 2035.

3.2.1 Employment

Non-farm employment in the PMSA includes significant industries such as health care and social assistance (10.2 percent), retail trade (10.2 percent), and manufacturing (9.9 percent). These employment levels are consistent with the state and national levels as detailed in **Table 3-1**. The PMSA has slightly greater employment concentrations in wholesale trade, and professional and technical services than the nation or the state. The region also has slightly lower concentrations of employment in accommodations and food services, government, and retail trade than the state or nation. Multnomah County, which is home to Portland Harbor and the majority of marine industrial employment, has a slightly higher concentration of employment in Transportation and Warehousing; Finance and Insurance; Professional, Scientific and Technical Services; and Management when compared to the state and nation.

[14] Oregon Employment Department. 2009. Unemployment Rates. accessed at www.qualityinfo.org.

Table 3-1 Employment by Non-Farm Industry, 2006

	Portland MSA		Multnomah		Oregon		US	
	Employees	%	Employees	%	Employees	%	Employees	%
Forestry, fishing, related activities, and other			N/A		35,770	1.6%	1,014,400	0.6%
Mining	1,700*	0.1%	N/A		3,681	0.2%	984,900	0.6%
Utilities	N/A*		1,618	0.3%	4,964	0.2%	576,500	0.3%
Construction	89,371	6.7%	29,534	5.1%	150,561	6.7%	11,641,100	6.5%
Manufacturing	132,671	9.9%	40,343	6.9%	217,114	9.6%	14,512,000	8.1%
Wholesale trade	67,334	5.0%	26,995	4.6%	89,537	4.0%	6,657,800	3.7%
Retail trade	137,704	10.2%	50,299	8.7%	255,349	11.3%	19,282,000	10.8%
Transportation and warehousing	37,200*	2.8%	25,524	4.4%	68,813	3.1%	5,887,700	3.3%
Information	29,740	2.2%	14,206	2.4%	42,724	1.9%	3,537,000	2.0%
Finance and insurance	61,041	4.5%	28,333	4.9%	85,602	3.8%	8,429,700	4.7%
Real estate and rental and leasing	59,203	4.4%	23,817	4.1%	89,921	4.0%	8,142,400	4.6%
Professional, scientific, and technical services	91,977	6.8%	46,647	8.0%	128,427	5.7%	11,866,300	6.7%
Management of companies and enterprises	23,682	1.8%	14,753	2.5%	31,849	1.4%	1,965,200	1.1%
Administrative and waste services	81,271	6.0%	32,770	5.6%	125,923	5.6%	11,180,300	6.3%
Educational services	37,688	2.8%	19,904	3.4%	50,770	2.3%	3,833,000	2.2%
Health care and social assistance	136,913	10.2%	63,409	10.9%	242,233	10.8%	18,204,900	10.2%
Arts, entertainment, and recreation	31,318	2.3%	15,778	2.7%	51,204	2.3%	3,736,900	2.1%
Accommodation and food services	90,382	6.7%	42,853	7.4%	161,529	7.2%	12,253,000	6.9%
Other services, except public administration	73,196	5.4%	31,404	5.4%	125,347	5.6%	10,140,700	5.7%
Government and government enterprises	143,743	10.7%	71,586	12.3%	291,065	12.9%	24,257,000	13.6%
Total Non-Farm	1,343,510	98.7%	580,688	100%	2,252,383	100%	178,102,800	100%

* For some categories, data were not available to avoid disclosure of confidential information, but he estimates are included in the total number of employees. In the case of transportation, warehousing, and utilities, and as well for mining, data from the Oregon Employment Department, and the category included utilities as well as transportation and warehousing. For mining, the category includes both mining and logging.

Source: Bureau of Economic Analysis, Regional economic Accounts accessed at www.bea.gov/regional/reis

National employment experienced rapid growth over the 1980s followed by reduced growth in the 1990s.[15] This decade has seen significantly less employment than the previous decades with the September 11th induced recession and the current global recession. Employment growth in Oregon since 1981 has outpaced has outpaced National employment growth averaging 2.04 percent compared with 1.72 percent nationally. The employment growth trend echoes the business cycle with Oregon having greater variance during the peak and trough phases than the national levels. The changes in employment for Oregon and the nation on an annual basis are presented in **Figure 3-1**.

[15] Bureau of Economic Analysis. Regional Economic Accounts. Table CA25N.



Source: Bureau of Economic Analysis, Regional Economic Accounts accessed at www.bea.gov/regional/reis

Figure 3-1 Oregon and US Employment Growth, 1981 to 2007

The recent preliminary Urban Growth Report[16] for Portland reports that employment growth within the PMSA is expected to increase substantially by 2030. Forecasts of employment growth predict as much as 1.87 percent annual growth in Portland area employment through 2030. Employment growth is forecasted in a range to account for uncertainty in variety of factors that influence employment including population growth, regional macro-economic issues, and national economic growth. The lower bound employment growth is predicted at 0.84 percent over the same time period. The range of forecast values is based on a 90 percent probability that employment growth will lie within the range of forecasted values presented in **Table 3-2**, and shown graphically in **Figure 3-2**.

Table 3-2 Portland Forecasted Employment Growth (PMSA)

Year	Low	Medium	High
2000	973,000	973,000	973,000
2030 (*average annual increase from 2000*)	1,252,200 (0.8%)	1,476,100 (1.4%)	1,700,000 (1.9%)
2060 (*average annual increase from 2000*)	1,648,400 (0.9%)	2,024,200 (1.2%)	2,400,000 (1.5%)

Source: METRO, Preliminary 2009, 2030 employment urban growth report, p.27.

[16] METRO. 2009. *Preliminary Urban Growth Report 2009 – 2030 Employment.* May.

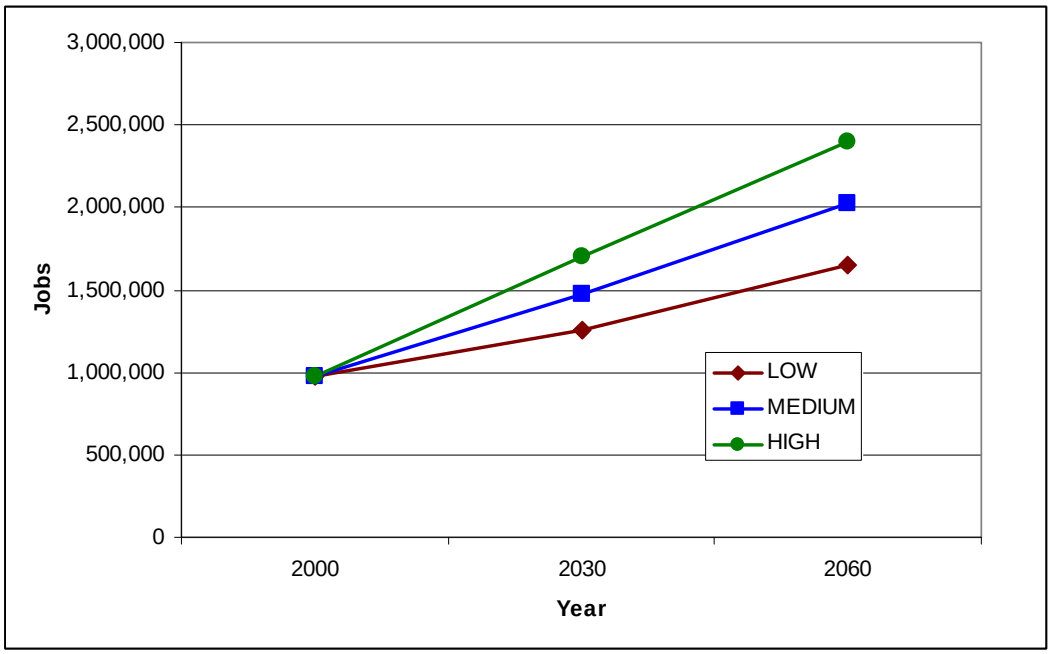


Figure 3-2 Portland Forecasted Employment Growth

The following table shows the range of employment growth rate by key industry for the Portland region. The annualized percentage growth rate range is within the 90 percent confidence interval for each sector. Total non-farm employment growth is forecasted to range from 0.7 percent to 1.8 percent annually for the next 40 years. As indicated in the table, most growth is expected to occur in the trade, transportation, and service industries.

Table 3-3 Annualized Wage and Salary Employment Growth Forecast in Portland Region 2008 - 2040

Industry Sector (NAICS)	High Growth Rate	Low Growth Rate
Nonfarm total employment	1.80%	0.70%
Manufacturing, total	0.60%	-1.10%
Durable Goods, total	0.60%	-1.20%
Wood Products	0.20%	-1.80%
Primary Metals	-0.80%	-3.70%
Fabricated Metals	-0.10%	-0.90%
Machinery	-0.50%	-1.00%
Electronics	1.00%	-0.90%
Transportation Equipment	0.70%	-1.50%
Nondurable Goods, total	0.40%	-0.80%
Nonmanufacturing, total	2.00%	-0.90%
Construction	2.00%	-2.50%
Wholesale Trade	1.50%	1.20%
Retail Trade	1.00%	0.20%
Transport., Warehousing, Utilities	1.70%	1.40%
Information Services	2.20%	0.50%

Industry Sector (NAICS)	High Growth Rate	Low Growth Rate
Financial Activities	1.80%	1.20%
Business Services	2.40%	0.60%
Education & Health Services	2.70%	2.20%
Leisure & Hospitality	1.60%	1.30%
Other & Personal Services	2.40%	1.10%
Government, civilian total	1.10%	0.80%
Federal	0.00%	-0.20%
State & Local	1.30%	1.00%

Source: METRO, 2009, Urban Growth Report, appendix 12: Population and Employment Forecast

3.2.2 Population

The PMSA has historically experienced greater population growth than the state or nation averaging an annual rate of 2.5 percent since 1980 compared with 1.5 percent for Oregon and 1.2 percent for the nation (see **Table 3-4**).

Table 3-4 Population Growth, 1980 to 2007

Geographic	Population (1,000s)								Average
Location	1980	1985	1990	1995	2000	2005	2006	2007	AGR
US	227,225	237,924	249,623	266,278	282,172	295,561	298,363	301,290	1.2%
Oregon	2,641	2,673	2,860	3,184	3,431	3,622	3,681	3,736	1.5%
Portland MSA	1,347	1,391	1,536	1,749	1,936	2,087	2,126	2,166	2.3%

Source: Bureau of Economic Analysis, Regional Economic Accounts, accessed online at www.bea.gov/regional/reis/.

Population growth in the PMSA is expected to outpace forecasted growth in Oregon and the US. Annual population growth is forecasted around 0.9 percent for the US, 1.16 percent for Oregon, and between 1.28 and 1.7 for the Portland metro region, depending on the source of the forecast. **Table 3-5** displays different annual population growth rates based on varying geographic areas and forecast sources.

Table 3-5 Population Growth Forecasts, 2000 to 2030

Geography	Growth Rate (APR)	Source
	2000 to 2030	
US	0.85%	Census
US	0.95%	Global Insight
Oregon	1.14%	Global Insight
Oregon	1.16%	US Census
Oregon	1.18%	OR OEA
Portland Metro, 3 Counties	1.28%	OR OEA
Portland Metro, 7 Counties	1.40%	Global Insight
Portland Metro, 7 Counties	1.37%	Metro
Portland Metro, 7 Counties	1.70%	Metro

Source: Metro, March 2009 draft, '20 and 50 year Regional population and employment range forecasts.'

The recent Urban Growth Report for Portland reports that population growth within the seven county PMSA is expected to increase substantially by 2030. Population growth is forecasted in a range to account for uncertainty in variety of factors that influence population growth, including regional macroeconomics, availability of housing, and national economic growth. The lower bound population growth rate is predicted at 1.4 per year to 2030, with growth slowing to 1.1 percent per year to 2060. There is a 90 percent probability that population growth will lie within the range of forecasted values presented in **Table 3-6**. **Figure 3-3** shows the projected population estimates graphically.

Table 3-6 Portland Forecasted Population Growth (PMSA)

Year	Low	Medium	High
2000	1,927,881	1,927,881	1,927,881
2030 (*average annual increase from 2000*)	2,903,300 (1.4%)	3,051,400 (1.5%)	3,199,500 (1.7%)
2060 (*average annual increase from 2000*)	3,609,300 (1.1%)	3,992,700 (1.2%)	4,376,100 (1.4%)

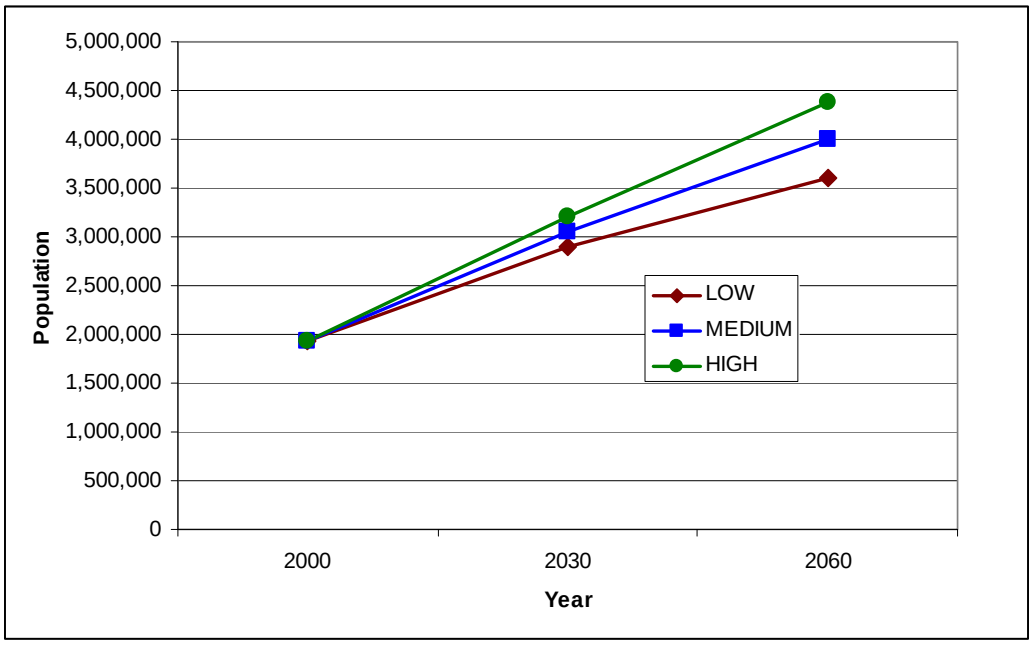


Figure 3-3 Portland Forecasted Employment Growth

Another source for population forecasts is the Oregon Office of Economic Analysis, which prepared forecasts in 2004. These forecasts to the year 2040 suggested an annual growth of 1.25 percent for the combined three counties of Washington, Multnomah, and Clackamas, with much faster growth rates expected toward the beginning of the forecast period. The period of analysis was between 2000 and 2040. For the three county area, the forecasts suggest that between 2000 and 2040, the population would grow by over 900,000 people in total, with nearly 57 percent expected to result from net in-migration versus natural population growth. This represents over 500,000 people expected to move to the three counties by 2040. The remainder of the growth results from natural growth –the number of expected births in a given year exceeds the number of expected deaths in that year.

3.3 MARINE-RELATED TRENDS

This section covers the relevant data and trends within the marine industrial sector that will influence the anticipated future marine-related activity within Portland Harbor. Factors influencing growth in marine-related uses include trends in domestic and international waterborne trade, capital intensiveness versus labor intensiveness of marine businesses, and overall growth rate of the regional, national, and international economies. Trends of marine-relate employment, regional trade capacity, and land use are discussed in preparation for the next section, which presents forecasts of employment and marine cargo trade.

Regarding marine industrial trends, many of the private marine-industrial firms in Portland Harbor have recently made site improvements that imply their continued investment in the area. These firms include Advanced American Diving, Ash Grove Cement, and Rinker (a concrete batch plant). US Barge has made improvements to their Portland Shipyard site and both Schnitzer Steel and Gunderson have made dock improvements. Overall, there have been $450 million of completed or funded capital investments made on 30 harbor area sites from 2004 to 2007. However, in the long-term, as identified in the 2003 Portland Harbor Industrial Lands Study, medium-larger firms anticipate minimal demand for more industrial land for expansion. Additionally, businesses note that Superfund uncertainty and competitive multi-modal transport are key determinants of business investment.

While marine cargo volumes have grown, across the United States maritime employment in marine cargo handling has declined over the past several decades due to increasing capital-intensiveness of marine terminal operations. Thus, the relationship between employment and land needs is changing due to technological advances.

3.3.1 Employment Trends

As discussed in **Section 2**, marine-related activity in Portland Harbor occurs in a variety of industrial sectors. The main sectors include distribution (transportation and warehousing), wholesale trade, and metals and equipment manufacturing. Past employment growth from 1976 to 2000 in these sectors is presented in **Table 3-7**. All of the predominant sectors in Portland Harbor grew more slowly during this period than the average rate of private employment growth of 3.2 percent. However, all grew at a healthy annual rate of between 1.2 to 2.3 percent, with the fastest growing sectors being wholesale trade (2.3 percent growth) and trucking and warehousing (2.0 percent growth). Water transportation also grew at a fast rate, with 1.7 percent growth.

Table 3-7 Selected Sector Employment Growth 1976 – 2000 in Portland MSA (Oregon Portion)

Sector	1976	1980	1985	1990	1995	2000	Annual Growth Rate 1976 to 2000
Private Sector Employment	353,416	440,145	440,581	555,117	643,902	747,378	3.2%
Water Transportation	1,492	1,696	1,194	1,224	1,513	2,223	1.7%
Wholesale Trade	54,846	67,269	65,926	78,927	89,850	94,051	2.3%
Trucking and Warehousing	9,536	10,560	11,529	14,463	17,242	15,389	2.0%
Manufacturing	88,700	108,320	95,584	107,006	115,870	128,275	1.5%
Transportation Equipment	9,104	9,209	6,974	9,980	10,260	12,126	1.2%
Primary Metal Industries	4,881	6,908	6,057	7,776	6,466	7,453	1.8%

Source: Oregon Labor Market Information System. Covered Employment and Wages, Industry Report, accessed online at: http://www.qualityinfo.org/olmisj/CEP.

3.3.1.1 Transportation and Warehousing Employment

One of the main sectors dependent on marine transportation is the Transportation and Warehousing (T&W) sector. This sector employs 37,800 employees within the PSA and 55,800 within Oregon.[17] This figure corresponds to 4.1 percent of the workforce in the PMSA area and 3.9 percent of the total Oregon workforce. Employees within the PMSA transportation and warehousing industry earn $42,260 annually compared with $46,570 across all industries (see **Table 3-8**). Employment in the transportation and warehousing industry within Portland has grown from 30,600 employees in 1992 to 37,800 employees in 2008, a growth of 24 percent. Oregon employment in the same sector grew 32 percent from the 1992 level of 42,200 to 55,800 in 2008. Within this sector, the subsector of Water Transportation represents just one to two percent of the total sector jobs. In these sectors, as for most employment sectors, the PMSA represents the majority of jobs. For all industries, the PMSA accounts for 64 percent of statewide jobs. In transportation and warehousing, the PMSA represents 68 percent of all jobs, and for water transportation, the PMSA represents 85 percent.

Table 3-8 Employment in the Water Transportation Industry, 2008

	Water Transportation	Transportation and Warehousing	All Industries
Oregon			
Employment	692	55,783	1,445,462
Average Salary	$63,648	$39,531	$41,700
Portland MSA			
Employment	589	37,812	930,387
Average Salary	$64,380	$42,258	$46,570

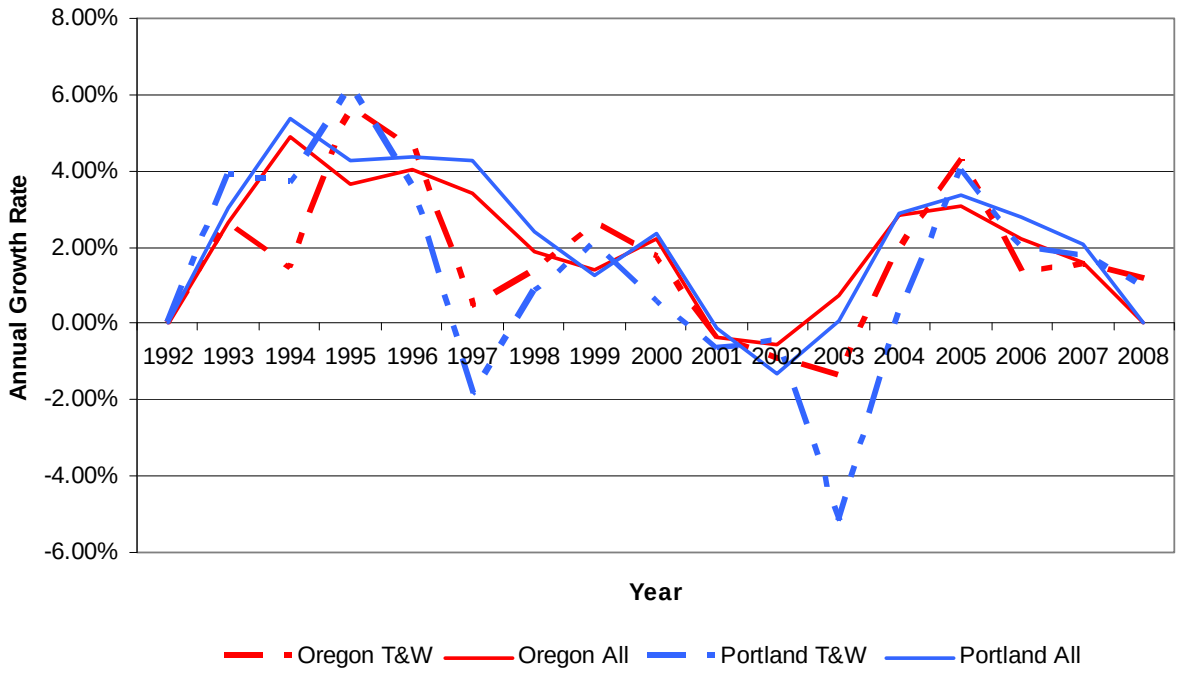
Source: U.S. Census Bureau, Local Employment Dynamics, accessed online at http://lehd.did.census.gov/led/datatools/qwi-online.html.

Note: No water transportation employment information is reported for the WA portion of Portland MSA

Though total employment in the water transportation industry is limited, employee salaries are significantly higher than the average industry salary. In 2008, he average annual salary for water transportation employees in Portland is $64,380 and $63,648 in the state.

Historic employment growth in the transportation and warehousing industry sector is show in **Figure 3-4** below for the period between 1992 and 2008. The dotted red and blue lines both show transportation and warehousing sector employment change, while the solid lines represent all sector employment growth. It is noticeable that transportation and warehousing tends to follow a similar pattern of growth as all sectors, although transportation and warehousing saw more severe declines in employment in 1997 and in the period between 2001 and 2004, than did the all sectors combined. All sectors saw declines in employment in 2001 and 2002.

[17] U.S. Census Bureau. Local Employment Dynamics, Average for 2007 Q4 through 2008 Q3. accessed online at http://lehd.did.census.gov/led/datatools/qwi-online.html.



Source: U.S. Census Bureau. Local Employment Dynamics. accessed online at http://lehd.did.census.gov/led/datatools/qwi-online.html.

Figure 3-4 Employment Growth in the Transportation and Warehousing Industry, 1992 to 2008

The Transportation, Warehousing, and Utilities (TW&U) industries are expected to grow substantially over the next five years both nationally and statewide. Annualized TW&U growth is expected to average 2.9 percent between 2010 and 2015 in Oregon and 3.7 percent nationally. This forecasted growth comes after a period of average declining employment since 2000. **Table 3-9** presents these figures below.

Table 3-9 Employment in the Transportation, Warehousing, and Utilities Industries, in 1000s

	1990	1995	2000	2005	2010	2015
US						
Total Nonfarm	109,489.8	117,306.6	131,793.6	133,699.2	131,441.9	142,911.9
Annualized Nonfarm Growth		1.4%	2.5%	0.3%	-0.3%	1.7%
Transportation, Warehousing, and Utilities	4,216.3	4,505.1	5,013.1	4,917.7	4,810.8	5,709.1
Annualized TW&U Growth		1.4%	2.3%	-0.4%	-0.4%	3.7%
Oregon						
Total Nonfarm	1,255.6	1,428.1	1,617.9	1,654.4	1,624.8	1,805.4
Annualized Nonfarm Growth		2.7%	2.7%	0.5%	-0.4%	2.2%
Transportation, Warehousing, and Utilities	46.9	54.6	57.6	57.2	53.8	61.5
Annualized TW&U Growth		3.3%	1.1%	-0.1%	-1.2%	2.9%

Source: Office of Economic Analysis, Employment by Industry: 1990 to 2015, accessed at http://www.oea.das.state.or.us/DAS/OEA/economic.shtml.

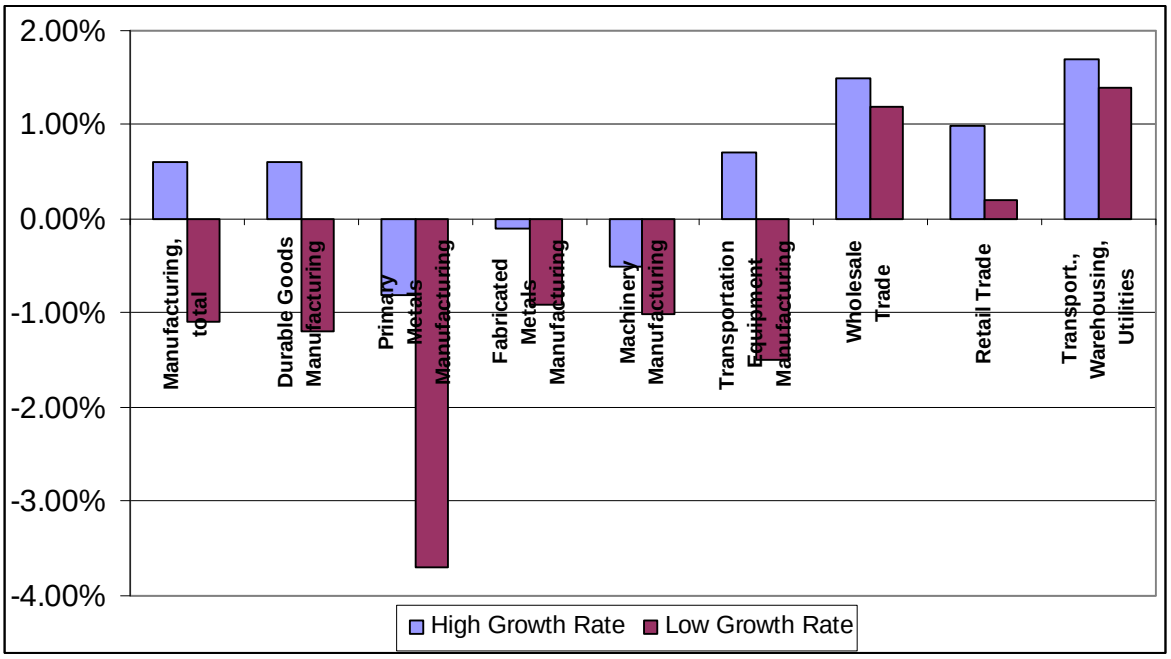
The TW&U industry is expected to outpace general growth in nonfarm employment both statewide and nationally. Forecasted total nonfarm employment is expected to grow annually by only 1.7 percent nationally and 2.2 percent statewide.

Employment growth within the transportation and warehousing industry was consistent across the nation, state and Multnomah County between 2002 and 2007 (see **Table 3-10**). Data from before the 2001 is not comparable to the 2001 to 2007 data since transportation and utilities employment was not recorded.

Table 3-10 Transportation and Warehousing Employment Growth, 2001 to 2007

	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
Multnomah	-2.6%	-2.4%	1.3%	1.4%	3.6%	4.0%
Oregon	-0.4%	-1.0%	3.3%	3.4%	2.4%	1.2%
US	-2.4%	-0.9%	2.1%	3.6%	2.6%	2.4%

This short-term pattern is reinforced by the long-term growth rates forecasted by METRO and presented above in **Table 3-3**. **Figure 3-5** below presents high and low forecasted growth rates for selected sectors in Portland. As indicated in the table, employment growth is forecasted in trade, transportation, and warehousing industries, while employment is expected to decline in manufacturing industries across the metro area. In particular, the transportation, warehousing, and utilities sectors are forecasted to grow by 1.4 to 1.7 percent annually and wholesale trade is expected to grow by 1.2 to 1.5 percent annually over the next thirty years.



Source: METRO, 2009, Urban Growth Report, appendix 12: Population and Employment Forecast

Figure 3-5 Selected Sectors: Annualized Wage and Salary Employment Growth Forecast in Portland Region 2008 - 2040

3.3.2 Marine Cargo Trends

Statistics from the U.S. Army Corps of Engineers indicate that waterborne cargo volume handled at ports in the Lower Columbia River has grown at a compound annual growth rate of 2.9 percent from 1962 to 2007.[18] Marine cargo movement on the Columbia River is dominated by the Port of Portland. In Portland Harbor, between 1960 and 2000 marine cargo tonnage shipped through Portland Harbor increased by 253 percent.[19] To accommodate this growth in marine cargo, from 1974 to 2010 there have been 1,297 acres of land developed for marine terminal uses in the Lower Columbia River, or 36 acres annually.[20] Of this acreage, 55 percent, or 719 acres, have been developed during this timeframe in Portland Harbor.

As discussed in **Section 1**, Portland has a competitive advantage in rail distribution of marine freight that has allowed the region to grow as a gateway for imports for the U.S. consumer market, such as automobiles, as well as exports, such as minerals and feed products. Growth in marine cargo thus depends not only on economic conditions in the local market, but also on broader regional, national, and international (particularly Pacific Rim) economic conditions.

International trade growth tends to be an amplified response to economic growth: when economic growth slows trade growth tends to decelerate even more, while when economic growth accelerates, trade growth accelerates even faster.[21] The current economic recession has substantially slowed international trade, but it is expected that trade will start to recover in 2010 with strong long-term growth. As a percent of world GDP, imports have been increasing to about 35 percent in 2008 and are expected to rise as high as 40 percent by 2040 (compared to 20 percent in the period 1980 to 1995).[22] This growth in trade will result in increased marine cargo transport.

3.3.2.1 Trade Capacity

The overall trade capacity for Portland/Vancouver area was recently analyzed in a collaborative fashion between METRO, Oregon Department of Transportation, Portland Development Commission, Port of Portland and Port of Vancouver.[23] This report comprises analyses by several different consultants and authors in order to determine the impact of increased international and domestic trade on the regional supply (and demand for) trade support infrastructure including industrial land. The report finds that Portland/Vancouver has a growth opportunity as rapidly growing Asian economies drive increased trade demand, but the area may face capacity strains in terms of industrial land supply, and the ability of highway and rail system to handle additional volumes. A component of the study, developed by Global Insight, Inc. identified regional population growth, workforce migration, trade with rapidly growing Asian states, as factors that will favorably impact the Portland/Vancouver trade future.

The study forecasts a doubling of freight volumes by 2035 for the region, though these opportunities depend on ensuring adequate infrastructure, including preserving the Columbia –Snake River barge system, creating short line rail to alleviate congestion and to carry local carload business, enhancing the roadway system, and preserving land for logistics operations. Improving the highway network capacity and preserving land for transportation/logistics industry were identified as actions that could be taken by the regional planners to avoid losing trade to new emerging port gateways such as Prince Rupert in British Columbia, and Punta

[18] BST Associates. 2010. West Hayden Island Marine Cargo Forecasts and Capacity Assessment. Prepared for the Port of Portland.

[19] E.D. Hovee & Company. 2003. Portland Harbor Industrial Lands Study. February. Prepared for City of Portland, Bureau of Planning, Portland Development Commission and Port of Portland.

[20] BST Associates. 2010. West Hayden Island Marine Cargo Forecasts and Capacity Assessment. Prepared for the Port of Portland.

[21] Ibid.

[22] Ibid.

[23] METRO, Oregon Department of Transportation, Portland Development Commission, Port of Portland and Port of Vancouver. 2006. Portland and Vancouver International and Domestic Trade Capacity Analysis.

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Colonet in Baja California were identified as challenges in the region. The study also notes that while marine industrial land is a scarce commodity in the region due to particular location and size requirements, additional land may need to be developed for marine terminals to capture trade growth opportunities.

3.3.2.2 Energy and Transportation Costs and Freight Transport Mode

As energy costs rise, shippers and supply-chain managers are increasingly trying to keep freight on the most energy efficient forms of transportation – rail and sea transport – longer. As a result, one strategy being considered is to move more freight to smaller regional distribution centers such as Portland, according to a recent study by Cushman and Wakefield completed for NAIOP, a national commercial real estate association.[24] This paper suggests that by using smaller, albeit more costly distribution centers such as Portland, the additional costs of smaller trucks (known as LTL – less than load) that deliver to individual facilities can be reduced. The article also states that a move to lower cost modes of transport would benefit the largest ports and the inland hubs with the best rail access. Southern California and Seattle/Tacoma could see an increase in loads that are headed for the traditional inland hubs of Chicago, Atlanta, and Dallas via rail. A more sea-oriented approach would bring more goods through the canals – Panama and Suez – straight to the major East Coast ports of New York/New Jersey, Hampton Roads, and Savannah. Recent investments in intermodal hubs and rail routes could give some advantage to Kansas City and Columbus, Ohio.

3.3.3 Portland Harbor Land Need Trends

Drawing on economic analysis coupled with 80 in-depth interviews with harbor area industry leaders and two focus groups, the Portland Harbor Industrial Lands Study identifies thirteen industries that possess a competitive advantage in Portland Harbor. The study determines that the harbor is in transition shifting towards wholesale-distribution and transportation activities and away from manufacturing. The expansion of foreign trade continues to be a primary driver of land development for marine cargo uses. The study identifies that limited land availability may constrain future growth opportunities, particularly for large industrial or marine cargo uses.

The study reports that 10,460 jobs are forecasted to be added to the Portland Harbor area between 2000 and 2020. Using a job density of eight jobs per acre, the current harbor area employment density, the study determines a need for 1,310 acres of new buildings to accommodate the additional 10,460 employees by 2020. Businesses interviewed suggested they would reconfigure layouts or add an additional shift to accommodate employee growth and very few indicated plans to expand. Historically, 20 acres per year have been developed in the Harbor area to accommodate maritime activities. Continuing this trend to 2020 (from 2000) results in a demand of 400 acres of riverfront industrial property.

Business interviews conducted by the Portland Development Commission (PDC) in 2006[25] of industry leaders in Portland Harbor suggest that industries are reinvesting in the harbor districts through building, equipment, rail, and dock improvements. These interviews imply industry leaders demand warehouse and truck distribution space, close-in industrial service space, and rail access. Limited land supply is seen as a limiting factor for growth. Available sites are viewed as requiring large investment related to environmental liability or other uncertainty which many businesses are not willing to accept. Interviews identified rail congestion and road congestion as areas requiring capital investment to reduce costs to businesses. Increased rail capacity is the most pressing need identified

[24] The New Age of Trade: The Americas (2009) Submitted by: Maria T. Sicola, Executive Managing Director, Research, Cushman & Wakefield, Inc. Research conducted for the NAIOP, available at: http://www.naiop.org/foundation/completedresearch.cfm.

[25] Portland Development Commission, 2006, Working Harbor Reinvestment strategy Business Interview Results.

The Portland Economic Opportunities Analysis (EOA) Summary Report,[26] completed in 2009 also analyzes employment and development trends. The study area for the report is Portland proper, but nine sub-areas within the Portland city boundary are created based on geographic location and industry or commercial focus for forecasting future trends. The study uses six focus groups with 58 participants were used to provide input on land demand topics including emerging trends and business location needs. This study identifies Columbia Harbor as a geographic sub-area, which includes Portland Harbor, the Columbia waterfront industrial zone to 82nd, and some of East Hayden Island. The Columbia Harbor sub-area is primarily geared towards manufacturing and distribution with sixteen percent of all jobs within Portland accounting for 64,000 jobs: the most of any sub-area.

The study identifies the vacant land supply for potential development. Much of the land in the Columbia Harbor region has constraints (such as environmental contamination) limiting potential growth decreasing the total land included in the vacant land supply. For example, only 476 acres of vacant, partially vacant, or re-developable land are available in Columbia Harbor with no natural resource zoning or other constraints of a total 1,910 acres of vacant land in the Harbor. Including non-employment related land demand of an estimated 640 acres for marine terminals (390 acres), rail infrastructure (200 acres), and airport expansion (50 acres), the study concludes there is a shortage of industrial land from 100 acres to 800 acres. If these regional transportation land needs are not included, the study estimates that there is sufficient available vacant acreage in the low and mid scenarios with a shortage of 170 acres in the high scenario. The data from the EOA on available lands needs is utilized in **Section 5** of this study to assess the availability and suitability of vacant waterfront lands in Portland Harbor specifically for marine-related uses.

3.4 MARINE-RELATED FORECASTS FOR PORTLAND HARBOR

This section presents 30-year forecasts for marine cargo and marine industrial employment in Portland Harbor.

3.4.1 Marine Cargo Forecasts

Three cargo forecasts completed for the region were assessed: one for the Puget Sound and Columbia River system completed in 2009 for the Washington Public Ports Association, and two for Portland Harbor completed in 2009 (by the Oregon Department of Transportation) and in 2010 (for the Port of Portland by BST Associates). Of these, the forecast completed by BST Associates for Portland Harbor was utilized as it is the most recent, the most conservative, and utilized sound methodology. This forecast estimates growth in each cargo type in Portland Harbor through 2040, with estimated growth rates from 2007 to 2035 varying from 0.2 percent for breakbulk to 3.7 percent for automobiles. A recent trade capacity analysis for the Portland/Vancouver area indicates that this forecasted growth is feasible given the infrastructure in the region, since it is less than the doubling of freight volumes that the study suggested was possible (though challenging) for the region.

The forecasts presented below represent the expected flow of cargo through Portland Harbor assuming that there is adequate marine industrial land available and adequate transportation infrastructure, including in marine terminals, rail and road infrastructure, and the barge system. The forecasts are for six primary cargo types: dry bulk, liquid bulk, grain, breakbulk, containers, and automobiles. Bulk cargoes are commodities that are transported unpackaged in large quantities, and can be in dry or liquid form. Grain is a dry bulk commodity that is large enough to merit its own forecast. Breakbulk are commodities that must be loaded individually, and are often palletized or in bales. Bulk and breakbulk cargoes are measured in metric tons (MT). Container cargoes are products that are transported in truck-size intermodal containers, known as

[26] E.D. Hovee & Company. March 2009 draft. City of Portland Economic Opportunities Analysis: Summary Report.

twenty foot equivalents (TEU). Automobiles are typically fully assembled vehicles that can roll on and roll off RO/RO of vessels; growth in auto cargoes is measured in units with each vehicle equal to one unit.

It is important to note that the cargo mix and mode of shipment of different cargo types is fairly dynamic and responds quickly to market factors. While past forecasts have predicted overall growth levels in cargo, the cargo commodities with the most growth have frequently been different than anticipated. An example of this is the largely unanticipated movement from breakbulk to containerized cargo that led to declines in breakbulk cargo but resulted in dramatic growth in the new cargo type of containers. In addition to technological change, as growth in cargo reflects overall economic activity, the cargo mix will change based on which economic sectors decline and grow and the subsequent change in the region's mix of imports and exports. Thus, there is more certainty regarding overall cargo volume than the specific future cargo mix that will be handled in Portland Harbor.

Also, as noted in the 2006 trade capacity analysis, growth in trade in Portland is likely to alternative between periods of slow to moderate growth and period of rapid expansion. This is due to Portland's relatively small market size, which makes it more strongly dependent on external forces in national and international markets.

3.4.1.1 Previous Cargo Forecasts

In 2009, a marine cargo was completed for the Washington Public Ports Association that projected cargo growth in Puget Sound and the Columbia River.[27] Although completed after the 2008 economic downturn, the results were developed prior to more recent assessments that suggest a global slowdown of trade. These results were developed for both the Puget Sound region, and for the Lower Columbia region broken into the Washington portion and the Oregon portion. **Table 3-11** shows the results for all areas. After each region, there is a column showing the average annual growth rate of that cargo from the year in the preceding row. For example, between 2002 and 2007, the Puget Sound region increased cargo volumes by an average of 3.8 percent per year; between 2007 and 2010, the forecast suggests that the same region will increase on average by 0.7 percent annually. The forecast for all regions shows a significant slowdown in annual growth between 2007 and 2010 due to do the global economic decline, but similarly all regions are forecast to see increases in the following years.

Table 3-11 Summary Forecasts for Puget Sound and Columbia River System in 1,000 metric tons

Year	Puget Sound	Annual Growth Rate	Columbia River - WA	Annual Growth Rate	Columbia River - OR	Annual Growth Rate
2002	66,639		12,481		18,051	
2007	80,396	*3.8%*	16,209	*5.4%*	20,765	*2.8%*
2010	82,208	*0.7%*	17,759	*3.1%*	20,837	*0.1%*
2015	90,720	*2.0%*	19,070	*1.4%*	22,460	*1.5%*
2020	99,859	*1.9%*	19,885	*0.8%*	24,099	*1.4%*
2025	110,958	*2.1%*	20,745	*0.9%*	25,895	*1.4%*
2030	120,202	*1.6%*	21,406	*0.6%*	27,665	*1.3%*
2007-2030		*1.8%*		*1.2%*		*1.3%*

Source: BST Associates and IHS Global Insight and Mainline Management Inc. (2009), 2009 Marine Cargo Forecast, Technical Report, prepared for Washington Public Ports Association, March.

[27] BST Associates and HIS Global Insight and Mainline Management Inc. (2009). 2009 Marine Cargo Forecast, Technical Report. Prepared for Washington Public Ports Association. March 23.

Another forecast is currently under development for the Oregon Department of Transportation for marine cargo to the year 2040. Preliminary results are shown below by type of cargo (see **Table 3-12**). Annual growth rates are shown for each commodity type in two ways. The first shows the 2010 – 2040 annual increases expected, and the second row shows the growth rate beginning with 2007, which was a recent high. The purpose of the second row of growth rates is to show that net increases are still anticipated, but are smaller when calculated to include the slowdown. Average annual growth rates provide a quick way to compare increases across both regions and commodities, and also provide a sense of what is expected into the future.

Table 3-12 Oregon Department of Transportation Forecast for Portland Harbor Cargo to 2035

Year	Breakbulk	Dry bulk	Liquid bulk	Grain	Total Bulk and Grain	Containers	Autos
2002	772,966	4,032,277	6,353,987	3,899,745	15,058,975	255,745	394,776
2007	1,125,955	5,402,217	6,448,519	5,992,325	18,969,016	260,128	449,307
2010	740,586	5,257,522	6,874,514	7,328,792	20,201,414	235,630	538,496
2020	935,919	6,239,386	7,104,274	7,696,568	21,976,147	306,539	755,427
2030	1,105,032	7,160,800	7,131,710	8,226,960	23,624,501	412,046	1,058,000
2035	1,205,762	7,710,395	7,145,865	8,505,712	24,567,733	487,093	1,252,086
2010-35	*2.0%*	*1.5%*	*0.2%*	*0.6%*	*0.8%*	*2.9%*	*3.4%*
2007-35	*0.2%*	*1.3%*	*0.4%*	*1.3%*	*0.9%*	*2.3%*	*3.7%*

Source: Oregon Department of Transportation in conjunction with PBWorld and IHS Global, October 2009.

3.4.1.2 Marine Cargo Forecast Utilized in this Study

The marine cargo forecast presented below was developed by BST Associates for this study. This cargo forecast is the potential cargo volume that could flow through Portland Harbor, assuming that there is adequate terminal capacity. The BST Associates forecast is the forecast utilized in this study for the following reasons:

1. **Most Recent Forecast**. The BST forecast was finalized in April, 2010 and is the most recent marine cargo forecast for Portland Harbor. This forecast considered the short and long-term economic effects of the economic recession that started in December, 2007.
2. **Geographic Area**. The BST forecast focuses on the Portland Harbor geography, which is the relevant area for this study.
3. **Conservative**. Compared to the ODOT forecast, the BST forecast is generally more conservative in estimating cargo growth in Portland Harbor. The BST forecast considers the short and long-term economic effects of the economic recession that started in December, 2007.
4. **Sound Methodology.** BST Associates has been conducting marine cargo forecasts since 1991 for a variety of public agencies in the Pacific Northwest. BST cargo forecasts have been accepted by regional agencies since at least 2002 when BST prepared the 2002 METRO Commodity Flow Forecast for METRO, Oregon Department of Transportation, Port of Vancouver, Regional Transportation Council, and Port of Portland.

The forecasts are based on a bilateral trade model developed by Global Insight. The forecast is by type of commodity, and the data provided by Global Insight has been adjusted by BST Associates according to the most up to date information available. The forecasts do not, however, cover new market opportunities which may well have the most profound influence on future trade. Instead, these estimates are based primarily on the historic growth trends in each cargo type in the Pacific Northwest, the Portland Harbor market share, as

well as regional, national, and domestic macroeconomic variables and trade patterns. For each type of commodity, a forecast has been developed for the Pacific Northwest region, and then market share estimates were developed for the Portland Harbor. For more information, the BST Associates report contains the complete forecast rationale for each commodity.

Growth in cargo is typically based on tonnage. For dry bulks, grain, liquid bulk, and breakbulk, trade growth is measured in metric tons (MT). Containers are measured by twenty-foot equivalent units (TEU), which is the standard container dimension. Finally, automobile cargo is measured by units, with each vehicle representing one unit.

Table 3-13 shows the most likely cargo forecasts, with a low and high forecast shown in **Table 3-14** and **Table 3-15** respectively. In addition to the forecasted growth of existing cargo types shown in **Tables 3-13** through **3-15**, BST Associates notes that new market opportunities of new cargo types may develop, particularly for dry bulks and containers. These opportunities may be in the magnitude of 3 million MT of dry bulk, and 150,000 TEU of containers.

Consistent with previous forecasts of marine cargo in Portland Harbor, the BST Associates forecast indicates that cargo tonnage will increase in nearly all cargo categories over the next 30 years. Over the forecast period, autos, containers and dry bulk cargos are expected to expand faster than the other types of cargoes. In particular, automobiles are expected to expand most rapidly, with compound annual growth from 2008 to 2040 expected to average from 2.6 to 3.8 percent, with a most likely average annual growth rate of 3.3 percent. Portland continues to be the number two in the west coast for imports of automobiles, and the forecast for continued imports is favorable in the wake of US automobile production declines.

Containers are expected to grow at the second fastest rate from 2008 to 2040, expected to range between 1.4 to 2.9 percent, with a most likely average annual growth rate of 2.4 percent annually. Containers are expected to continue to have an advantage for products that also experience competitive barge rates on the Columbia-Snake river system, container market share expansion is limited in the future because although the Columbia river channel has recently been deepened to 43-feet, more and more container ships will require 44-feet to 46-feet depths in the future. However, smaller container vessels, or vessels that are not fully loaded, can still navigate the 30-foot channel and there are opportunities for container growth. As evidence of this, since the BST forecast was finalized, the Port of Portland recently finalized a 25-year lease of container and breakbulk facilities at Terminal 6, to a new container terminal operator that specializes in small to mid-size terminals in niche markets. This new lease agreement is expected to increase container growth at Portland Harbor.

Dry bulk cargoes in the most likely forecast are also expected to continue to increase by 0.8 percent to 1.0 percent annually, in part due to stronger Asian currencies demanding exports of soda ash, potash, minerals ores, chemicals, and fertilizers. This growth is expected in the national/international dry bulk markets, which in Portland Harbor are currently dominated by mineral exports, as well as the local/regional dry bulk markets, which include construction materials as well as agricultural fertilizers.

Table 3-13 Most Likely Marine Cargo Forecast for Portland Harbor to 2040

Year	Breakbulk (1,000 MT)	Dry bulk National/International (1,000 MT)	Dry bulk Local/Regional (1,000 MT)	Liquid bulk (1,000 MT)	Grain (1,000 MT)	Containers (TEU)	Autos (Units)
Past							
2004	892,115	3,915,790	1,719,395	6,353,987	6,305,047	274,609	358,682
2006	1,057,375	3,426,618	1,856,345	6,143,518	5,045,963	214,484	463,557
2008	977,232	4,671,739	1,788,611	6,378,481	5,676,287	245,459	407,803
Forecast							
2010	440,476	2,373,000	1,315,000	5,948,000	5,129,000	195,000	248,000
2020	1,006,000	4,602,000	2,164,000	6,946,000	6,030,000	280,000	562,000
2030	1,091,000	5,317,000	2,331,000	7,558,000	6,306,000	394,000	844,000
2035	1,135,000	5,673,000	2,401,000	7,565,000	6,391,000	467,000	983,000
2040	1,181,000	6,054,000	2,471,000	7,571,000	6,477,000	520,000	1,145,000
2010-2035	*3.9%*	*3.5%*	*2.4%*	*1.0%*	*0.9%*	*3.5%*	*5.7%*
2008-2040	*0.6%*	*0.8%*	*1.0%*	*0.5%*	*0.4%*	*2.4%*	*3.3%*

Source: BST Associates. 2010. West Hayden Island Marine Cargo Forecasts and Capacity Assessment., Final Report. Prepared for Port of Portland.

Table 3-14 Low Marine Cargo Forecast for Portland Harbor to 2040 in 1,000 MT

Year	Breakbulk (1,000 MT)	Dry bulk National/International (1,000 MT)	Dry bulk Local/Regional (1,000 MT)	Liquid bulk (1,000 MT)	Grain (1,000 MT)	Containers (TEU)	Autos (Units)
Past							
2004	892,115	3,915,790	1,719,395	6,353,987	6,305,047	274,609	358,682
2006	1,057,375	3,426,618	1,856,345	6,143,518	5,045,963	214,484	463,557
2008	977,232	4,671,739	1,788,611	6,378,481	5,676,287	245,459	407,803
Forecast							
2010	411,199	2,152,000	1,220,000	5,557,000	5,046,000	157,000	209,000
2020	855,000	3,750,000	1,854,000	6,521,000	5,276,000	220,000	468,000
2030	933,000	4,197,000	1,985,000	6,998,000	5,498,000	299,000	693,000
2035	971,000	4,418,000	2,037,000	6,955,000	5,572,000	347,000	801,000
2040	1,010,000	4,650,000	2,089,000	6,912,000	5,647,000	379,000	925,000
2010-2035	*3.50%*	*2.90%*	*2.10%*	*0.90%*	*0.40%*	*3.20%*	*5.50%*
2008-2040	*0.10%*	*0.00%*	*0.50%*	*0.20%*	*0.00%*	*1.40%*	*2.60%*

Source: BST Associates. 2010. West Hayden Island Marine Cargo Forecasts and Capacity Assessment., Final Report. Prepared for Port of Portland.

Table 3-15 High Marine Cargo Forecast for Portland Harbor to 2040

Year	Breakbulk (1,000 MT)	Dry bulk National/International (1,000 MT)	Dry bulk Local/Regional (1,000 MT)	Liquid bulk (1,000 MT)	Grain (1,000 MT)	Containers (TEU)	Autos (Units)
Past							
2004	892,115	3,915,790	1,719,395	6,353,987	6,305,047	274,609	358,682
2006	1,057,375	3,426,618	1,856,345	6,143,518	5,045,963	214,484	463,557
2008	977,232	4,671,739	1,788,611	6,378,481	5,676,287	245,459	407,803
Forecast							
2010	455,256	2,690,000	1,378,000	6,208,000	5,389,000	221,000	287,000
2020	1,107,000	5,212,000	2,474,000	7,229,000	6,595,000	321,000	656,000
2030	1,197,000	5,976,000	2,678,000	7,932,000	6,872,000	458,000	995,000
2035	1,245,000	6,343,000	2,765,000	7,971,000	6,965,000	547,000	1,165,000
2040	1,295,000	6,733,000	2,852,000	8,011,000	7,059,000	614,000	1,364,000
2010-2035	*4.10%*	*3.50%*	*2.80%*	*1.00%*	*1.00%*	*3.70%*	*5.80%*
2008-2040	*0.90%*	*1.10%*	*1.50%*	*0.70%*	*0.70%*	*2.90%*	*3.80%*

Source: BST Associates. 2010. West Hayden Island Marine Cargo Forecasts and Capacity Assessment, Final Report. Prepared for Port of Portland.

As noted above, the 2010 most likely marine cargo forecast prepared by BST Associates and presented in **Table 3-13** above is conservative compared to the 2009 ODOT (presented in **Table 3-12**). **Table 3-16** below compares the two forecasts in terms of annual average growth between 2007 and 2035. As indicated in the table, the BST Associates forecast projects lower annual cargo growth rates for all cargo types in Portland Harbor except liquid bulk and containers.

Table 3-16 Comparison of Cargo Forecasts for Years 2007 – 2035, Average Annual Compound Growth Rate

Cargo Type	BST Associates for Port of Portland	ODOT
Breakbulk	0.03%	0.20%
Dry Bulk	0.51%	1.30%
Liquid Bulk	0.90%	0.40%
Grain	0.23%	1.30%
Containers	2.11%	0.90%
Autos	2.84%	3.70%

3.4.2 Marine Employment Forecast

This section draws from general employment forecasts conducted for the metro region, as well as for the sub area of the metro region (Columbia Harbor sub area) that includes the Portland Harbor. In particular, the analysis draws from the Economic Opportunities Analysis (EOA) that developed employment forecasts for the City by sub area to the year 2035 for the purpose of understanding employment land demand and supply. These sub area employment forecasts are, in turn, based on the total employment forecast by 2035 conducted by METRO for the seven county Portland Metropolitan Statistical Area. For the transportation, warehouse and utilities sector, total employment is expected to grow to 57,700, 61,350, and 65,010 jobs respectively for the low, medium, and high forecast scenarios. Citywide capture of the jobs in this category also varies in the estimation, assuming that 57, 63, and 68 percent respectively in this sector are located in the City. This represents a reduction in the current city capture of these jobs, which is closer to 74 percent.

Using these estimates, the EOA job forecast for the city ranges from a low of 32,889, to a high of 44,206, with the midpoint being 38,650 jobs forecast by 2035 for the City. The forecast was developed using an overall growth rate of 1.7 percent annually, identified as the medium scenario forecast from METRO at the time. These numbers are consistent with other current estimates of transportation and warehousing employment in Multnomah County, which was 25,524 in 2007.[28] At the 1.7 percent growth rate, the medium forecast of 38,650 is attained in 2035 if jobs in this sector were 25,359 in 2010. While all of the transportation and warehousing sector jobs are not marine industrial jobs, these jobs are linked to the intermodal transportation system which depends in part upon the marine transportation.

Another source of information about marine industrial jobs in the Portland Harbor is the Working Harbor data developed by the City. These data account for the types of economic activity in the based on whether the firm located in the harbor is dependent on marine transportation, dependent on rail facilities or dependent upon both. This provides yet another way to consider the employment related to marine transportation. Of the 212 firms located in the harbor, 47 firms with just under 2,000 employees are dependent on both the river and rail transportation while another 23 firms with 660 employees are dependent on the river but not necessarily the rail. This totals to 70 firms dependent on marine transportation, with approximately 2,625 employees. There are also 142 firms that employ over 5,800 people that are dependent on the rail transportation facilities. **Table 3-17** below shows this firm and employment information.

Table 3-17 River and Rail Dependent Firms and Employment in the Portland Harbor

Type of Industrial Facility	Number of Firms	Number of Employees
Both River and Rail Dependent	47	1,969
River Dependent Only	23	656
Rail Dependent Only	142	5,817
Both River and Rail Dependent	47	1,969
Total	212	8,442

Source: Data provided by the Bureau of Planning and Sustainability

It is expected that this employment information is incomplete as many firms have operations in the harbor area but may have main office locations elsewhere that results in undercounting of harbor area employment. For example, as discussed in Section 1, the Martin and Associates 2007 study of the economic impact of Portland Harbor marine terminals estimated that there are 6,570 jobs in Portland Harbor directly dependent on public and private marine terminals. This results in an estimate of river dependent jobs nearly three times higher than the Working Harbor data. This estimate even undercounts the total river-dependent employment as marine industrial facilities with docks are not classified as marine terminals in the Martin and Associates analysis.

As illustrated in **Table 3-17**, not all Portland Harbor businesses are directly dependent on the river and water transportation. However, as discussed in **Section 1**, businesses in the harbor area are highly interdependent and it is challenging to isolate the economic activity and jobs that are dependent upon the marine transportation network. Based on the interdependence of all Portland Harbor employment as well as the uncertainty associated with the number of marine industrial jobs that are in fact dependent on water transportation, this analysis bases the projection of marine industrial employment growth on the 8,440 river

[28] Office of Economic Analysis, Employment by Industry: 1990 to 2015, accessed at http://www.oea.das.state.or.us/DAS/OEA/economic.shtml.

and/or rail dependent jobs presented in **Table 3-17**. Growth rates in marine industrial employment will be based on the overall economic and population growth of the region and the nation, growth rate in international trade, and the local growth rate in marine-related industries such as heavy manufacturing and warehousing and distribution. As noted previously in this section, employment growth rates in manufacturing industries are expected to be slow or negative, while growth rates in transportation, warehousing, and distribution are expected to outpace growth in other industries. This analysis projects that marine industrial employment growth rates will be at a low rate of 0.7 percent per year, a medium growth rate of 1.2 percent per year, and a high growth rate of 1.7 percent per year. These growth rates are based on the following data points:

- Forecasted metro employment growth rate of 0.7 to 1.8 percent through 2040,
- Forecasted metro employment growth rate of 1.4 to 1.7 percent growth in transportation and warehousing through 2040,
- Projected population growth rate in the metro area of 1.4 to 1.7 percent through 2030, and
- Forecasted combined tonnage growth rate of 0.6 percent for dry bulks, liquid bulks, grain; and higher tonnage growth rates of 2.4 percent for containers and 3.3 percent for automobiles.

Assuming a low growth rate of 0.7 percent per year, a medium growth rate of 1.2 percent per year, and a high growth rate of 1.7 percent per year, the future marine industrial employment can be expected to increase to just over 12,370 jobs by 2040 under the most likely scenario, 10,550 under the slow growth scenario, and 14,480 jobs for the high growth scenario (see **Table 3-18**).

Table 3-18 Marine Industrial Employment Forecast for the Portland Harbor

Year	Low (0.7 % Growth Rate)	Most Likely (1.2 % Growth Rate)	High (1.7 % Growth Rate)
2008	8,440	8,440	8,440
2020	9,180	9,740	10,330
2030	9,840	10,980	12,230
2040	10,550	12,370	14,480

3.5 SUMMARY

Prior to the current recession, economic and population growth in the Portland metro region outpaced growth elsewhere in the nation. Economic activity is expected to begin recovering in 2010, with employment and population growth expected to average 1.4 percent and 1.5 percent, respectively, through 2030. A primary source of past economic growth in Portland has been marine-related economic activity, including marine industrial and marine cargo uses. These uses are projected to continue to grow over the next 30-years, with particular growth forecasted in the marine cargo and related transportation, warehousing, utility, and wholesale trade sectors.

The forecasts for cargo and employment have low, most likely, and high estimates, and yet still exclude the significant uncertainty represented by future markets development. New markets are perhaps the most uncertain area since a new market can develop rapidly as a result of global economic forces, new technologies, and policy developments. Interviews with planners, industry representatives, and commodity forecasters, indicates that new markets are the most difficult to predict factors for both cargo and marine industrial growth, and the most important.

Growth in marine cargo over the 30-year planning horizon to 2040 is expected to vary by cargo type, but is projected to grow on a most likely average annual rate of between 0.2 percent for breakbulk to 3.3 percent for automobiles. Together, the marine cargo types measured in tonnage (dry bulks, grain, liquid bulks, and breakbulk) are expected to grow at a most likely average annual rate of 0.6 percent (average annual growth rate weighted by current tonnage), while containers are expected to increase at an annual rate of 2.4 percent for containers, and automobiles at a rate of 3.3 percent annually.

Growth in marine-industrial employment is expected to roughly mirror economic growth trends in the region, as some elements are expected to grow less slowly (manufacturing), while others are expected to grow more rapidly (transportation and warehousing). Growth rates in marine industrial employment are projected to vary from between 0.7 percent to 1.7 percent, with total employment estimated to increase by 2,100 jobs to 6,000 jobs.

As identified in the 2006 trade capacity study, availability of marine industrial land and adequate freight handling and transportation system infrastructure are critical to the growth of marine-related employment. Development of additional lands and facilities will likely be necessary to meet the projected growth in these sectors. If so, land availability for marine industrial development on West Hayden Island may be able to play a critical role in providing the infrastructure and lands necessary to take advantage of growth in these industries. These issues will be addressed in subsequent sections of this study.

Marine-Related Site Suitability

The purpose of this section is to provide an understanding of site suitability and constraints for marine-related uses, including both marine cargo and marine industrial uses. Site suitability is assessed for six marine cargo types: automobiles, liquid bulk, grain dry bulk, other dry bulk, containers, and breakbulk. Site suitability is also assessed for two marine industrial types: vessel related services and marine-dependent manufacturing.[29] Requirements for a given marine-related use vary depending on site and use-specific needs. This section is intended to provide a general sense of the site size, water access, and intermodal infrastructure requirements for each of these marine-related uses. Where available, information on trends in these requirements is presented. A brief discussion is also provided on site constraints for marine-related use related to natural resources and environmental contamination.

The information presented in this section will be used to assess the suitability of vacant, waterfront lands in Portland to meet the requirements for marine-related uses (**Section 5**), and to assess the suitability of West Hayden Island (WHI) and other lands in the Lower Columbia River (**Section 6**).

4.1 OVERVIEW OF DATA SOURCES AND KEY ASSUMPTIONS

Sources drawn from include interviews with ports in the Lower Columbia River, master planning documents for the Port of Portland, interviews with river-dependent businesses, interviews with marine transportation planning consultants, and characteristics of marine-related sites in Portland and other ports.

For this analysis, information from a variety of ports regarding terminal characteristics was reviewed to provide generalized information on site requirements common to all marine related uses, as well as information on how site characteristics and requirements differ based on different cargo uses and local market conditions. Port-provided documents, including the rail analysis and conceptual site design for WHI conducted by HDR provide information on infrastructure requirements and a reference point for potential future development considerations for WHI. The recommendations from HDR were analyzed and found to be consistent with terminal size and infrastructure characteristics at other ports, and so were presented as one option for development on WHI.

Apart from review of the HDR conceptual plans, the current analysis does not include identification of WHI development options or an analysis of the tradeoffs associated with different facility sizes. Rather, the analysis presented in this section is a catalog of the range of sites suitable for marine-related uses likely to expand or locate in the study area. The purpose of the analysis is to provide an understanding of the types of sites needed to meet potential marine-related growth. Recognizing the desire for information regarding site design tradeoffs, available information on operational and cost tradeoffs associated with infrastructure design and footprint size is provided. Information of this nature, however, is very limited as these tradeoffs are specific to a particular cargo and tenant rather than widely applicable across uses.

Furthermore, the analysis assumes that characteristics of existing terminals and operating practices are a good predictor of future site requirements. It can be difficult to predict innovations and/or emerging markets in commodity forecasts. It is not part of the scope of this analysis to predict the viability of potential

[29] Marine or vessel related services include barging, cargo handling services, and naval/coast guard services. Marine dependent manufactures are those firms that require marine facilities for the transport of raw and finished product.

technological innovations, either here or abroad. The Port of Portland is in competition with other West Coast ports for market share. Innovations in Europe and Asia indicate what is operationally possible in those environments to increase efficiency, but it does not indicate what is economically or operationally feasible for Columbia River ports. The Port of Portland operates in a very different market, with different labor, land, and infrastructure constraints than those for European and Asian ports.

It is important, however, to recognize that port operating practices and technology are evolving and are improving land use efficiencies at ports worldwide. These practices include expansion of operating hours, smoothing of peak seasonal volumes, increasing capital and labor, and using off-site transfer and storage yards.[30] Such efforts can increase throughput, but also increase operating costs, which can lead shippers to find alternative locations.

4.2 GENERAL SITE SUITABILITY

In general, marine cargo site requirements differ from marine industrial site requirements due to the need for deeper vessel drafts and larger sites. However, the following general site characteristics are required for both marine cargo and marine industrial uses:

- **Sites must be zoned appropriately.** In Portland, appropriate zoning is heavy industrial (IH) or general industrial (IG).
- **Sites need to be relatively flat with contiguous acreage**, preferably in consolidated rectangular shape, with riverfront length of at least 400 feet and depth from the waterfront of at least 400 feet.[31]
- **Sites need to have sufficient draft depth within 150 feet of shore** For a site to be suitable for marine cargo, it typically needs to be able to accommodate vessels with draft depths of 40 feet or more, with minimum draft depth of 35 feet. [32, 33] The predominant trend is towards bigger vessels, with correspondingly deeper loaded vessel drafts and longer berth requirements. This compares to marine industrial uses that rely on barge transportation that require a 20 to 30-foot draft depth.
- **Marine cargo and marine industrial sites both require easy access to water as well as to rail and truck transportation routes.** Businesses interviewed for this analysis spoke repeatedly of the importance of intermodal transportation for their organization (see **Section 2**). Nearly all marine-related uses must be located on a truck route that provides easy access to an interstate highway network, such as Interstate 5 and Interstate 84. Additionally, many marine-related uses need access to an airport. All sites in Portland Harbor have this access with the nearby presence of Portland International Airport. Marine cargo facilities tend to have a greater need for intermodal transportation than that of marine industrial businesses because these facilities handle greater volumes of product. Therefore, marine cargo facilities tend to require land that can sustain a large quantity of rail, often configured as a rail yard or a loop to contain unit trains (in which all cars in the train carry the same cargo). A rail yard, or railroad yard, is a complex series of railroad tracks for storing, sorting, or loading/unloading, railroad cars and/or locomotives. Railroad yards have many tracks in parallel for keeping rolling stock stored off the mainline, so that they do not obstruct the flow of traffic. A site with multiple rail providers is preferred, since competition between rail companies helps to assure lower freight prices. [34]

[30] METRO, Oregon Department of Transportation, Portland Development Commission, Port of Portland and Port of Vancouver. 2006. Portland and Vancouver International and Domestic Trade Capacity Analysis.

[31] E.D. Hovee & Company and City of Portland. February 2003. Portland Harbor Industrial Lands Study.

[32] E.D. & Hovee and City of Portland. February 2003. Portland Harbor Industrial Lands Study.

[33] BST Associates. 2008. Waterfront Lands Analysis. Prepared for the City of Tacoma.

[34] Seher, Ben. Automotive Warehouse Company. October 12, 2009. Personal communication with Lee Elder, ENTRIX, Inc.

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- **Acreage requirements** for marine cargo sites also tend to be larger than for marine industrial due to the large rail facilities required for many cargo facilities and associated warehousing and distribution facilities.
- **Constraints to both marine cargo and marine industrial development include environmental contamination and requirements to protect natural resources**. For example, it is preferable to have less than 30 percent of a site be covered by wetlands and less than 10 percent of a site within the flood plain.[35] Upland and in-water environmental contamination is also a limitation in that it is costly and often carries high risk of future liability.
- **Security**. Many industrial sites, including marine cargo and marine industrial facilities, require separation with fences or other barriers from public areas for both security of materials and also for public safety. Furthermore, security measures required by the Security and Accountability for every Port Act of 2006 may slightly increase the footprint required for marine terminals sites. For example, random searches of containers by the Coast Guard may slow the movement of cargo through ports. In the future, the Container Security Initiative may also slow the movement of cargo from a foreign port.

Following a discussion of trends in railroad operations and vessel size, this section provides a brief overview of each type of marine related use, together with a discussion of the general characteristics of land use and infrastructure requirements, including draft depth, berth length, and rail access. Existing facilities in Portland and other Lower Columbia and west coast ports are described to provide a sense of existing facility parameters.

4.2.1 Trends

Several rail infrastructure and vessel trends are affecting marine industrial sectors. In general, changes in Class I railroad operations towards longer, unit trains and increasing sizes of marine vessels result in greater infrastructure and site size requirements for marine-related uses, but particularly for marine cargo uses.

4.2.1.1 Rail Requirements

The combined access to rail, marine, and road transportation is critical for many businesses located in Portland Harbor. Portland has a competitive advantage over many other west coast ports as it is served by two Class I railroads, Union Pacific and BNSF (Burlington Northern Sante Fe) Railways, that both have west coast and east-west continental rail lines. Portland is also served by several short line railroads, which serve local customers and also distribute freight to and from the Class I railroads. The east-west rail lines that serve Portland cross the Cascade Range through the Columbia Gorge at river elevation, compared to the more expensive railroad routes from the Puget Sound that cross the Cascade Range through Stevens Pass and Stampede Pass.

Four main line rail routes converge in Portland: 1) BNSF north to Seattle and Vancouver, British Columbia, 2) BNSF east to Chicago via Kansas City, 3) Union Pacific south to Oakland and Los Angeles, then across the Southwest to New Orleans, and 4) Union Pacific east to Chicago via Salt Lake City and Denver. Access to this rail infrastructure is a key requirement for many marine industrial and marine cargo uses, but the type of access and associated site requirements varies by use as will be described below. However, several trends affecting nearly all marine-related uses are noteworthy.

First, the railroads are using longer trains. BNSF has required that all of their intermodal trains will be 8,000 feet in length, which allows them to increase the amount of freight that can be handled on the mainlines

[35] E.D. Hovee & Company and City of Portland. February 2003. Portland Harbor Industrial Lands Study.

without having to increase the number of trains.[36] Use of these longer trains requires additional rail yard capacity to assemble and hold the longer trains and longer sidings to permit trains to meet and pass.

Second, due to increased demand on Class I railroads and resulting congestion, the railroads are changing their business model to become more wholesale carriers and focusing on long-haul trains with intermodal containers or unit trains with bulk commodities such as grain.[37] These types of cargoes are typically hauled long distances with few stops, putting the least pressure on the rail networks, thereby minimizing costs and congestion. Railroads have focused on mainline 'hook and haul' service; this requires short line railroads and truckers to consolidate shipments in larger terminals as the railroads have started declining requests to service smaller carload traffic (2, 5, or 10 cars).[38] For shippers that are located on a mainline that do not assemble unit trains, the railroads are requiring that the facility have siding tracks off of the mainline for loading and unloading and that all trains must enter and leave the sidings at relatively high speeds.

Unit trains are typically 8,000 to 10,000 feet long, and typically require storage track off of the main rail line near the terminal where trains can be 'chambered' until needed at the terminal. Also needed at the terminal are loop tracks or long working tracks for loading and unloading. As today's unit trains are typically 110-cars of 62 feet, working tracks plus track through the loading/unloading area requires approximately 3 acres of land without any at-grade crossings. Based on design specifications from BNSF and UPRR, the design of an industrial loop track for loading and unloading would require a footprint of approximately 1 mile long and over one-quarter of a mile wide.[39] Shorter tracks require doubling or tripling over into multiple tracks, which undesirably breaks the unit train.

These shifts towards longer trains and 'hook and haul' service of unit trains have consequences for the suitability of sites for both marine cargo and marine industrial uses. Marine cargo uses such as dry bulk, container, and auto should have access to on-site or adjacent rail facilities for loading unit trains; this requires more acreage than older facilities. Marine industrial uses will also require more services from short line railroads and also rail capacity to assemble their carloads.

4.2.1.2 Vessel Size

For nearly all cargo types, vessels are becoming larger, with deeper draft and longer berth requirements. **Table 4-1** summarizes forecasted vessel lengths and associated loaded drafts for existing and forecasted future vessels. This is particularly true for container vessels, as summarized in **Table 4-1**. Container vessels currently operating are classified as Panamax and Post-Panamax. The draft depth of 43 feet in the Lower Columbia River channel can accommodate Post-Panamax vessels up to 6,000 twenty foot equivalents (TEU), with a length of 1,001 feet. Vessels for automobiles, dry bulk, and liquid bulk cargoes are also expected to increase. Some of the largest vessels, if fully loaded, have deeper drafts than accommodated by the 43-foot Columbia River navigation channel. Thus, the largest vessels in the commercial fleets will either not carry cargoes through Portland, or will not be fully loaded.

[36] HDR Engineering, Inc. 2006. Trade Capacity Study, Task 3 Growth Opportunities Assessment, Outlook on Rail.

[37] METRO, Oregon Department of Transportation, Portland Development Commission, Port of Portland and Port of Vancouver. 2006. Portland and Vancouver International and Domestic Trade Capacity Analysis.

[38] HDR Engineering, Inc. 2006. Trade Capacity Study, Task 3 Growth Opportunities Assessment, Outlook on Rail.

[39] Ibid.

Table 4-1 Existing and Forecasted 30-Year Future Vessel Lengths and Loaded Drafts (Feet)

	Vessel Overall Length (feet)		Vessel Loaded Draft (feet)	
Cargo Type	Existing	Future (30-year forecast)	Existing	Future
Container	965	1,200	39.5	50.0
Auto	640	760	32.2	37.1
Dry Bulk	738	805	42.0	44.9
Liquid Bulk	804	935	42.98	47.9

Table source: HDR Engineering, 2009, West Hayden ISloand Marine Terminal Site and Operation Requirements.

This increasing vessel size has implications for site suitability as larger vessels require longer berth lengths. For example, existing auto vessels require a berth length of approximately 400 feet (assuming local availability of barges for use as floating dock platforms), while the forecasted future auto fleet will require a berth of up to 480 to 500 feet in length.[40] Additionally, larger vessel sizes indicate a greater spike in cargo volumes handled with each incoming or outgoing vessel. This, in turn, increases terminal capacity requirements, as more infrastructure and space is required to handle larger volumes of cargo at a given time.

4.3 MARINE CARGO SITE SUITABILITY

Marine cargo uses are assessed for six cargo types (similar to **Section 3**): automobiles, liquid bulk, grain dry bulk, other dry bulk, containers, and breakbulk. The text below describes specific characteristics of each of these marine cargo facility types. Site requirements differ amongst cargo types due to the differences in vessel size used for each cargo type, which affects berth length and draft depth requirements. A vessel's overall length (LOA) largely determines the berth length requirement, which in turn determines the shoreline length of acreage required at a site. Additionally, rail infrastructure and associated acreage requirements differ by cargo type. Following the narrative discussion of each cargo type, a summary section provides a table of general site requirements by cargo type (see **Section 4.6**).

Ranges are provided for site suitability characteristics. Even for one cargo type, site suitability depends on a wide range of factors, based on the specific cargo being handled, the operational characteristics of the terminal, labor market conditions and agreements, and specific site and local market considerations. An examination of just one use, such as container cargo terminals, will reveal very different site sizes and configurations at different ports and even at the same port.

As noted above, trends in marine cargo transportation that may affect the suitability of sites include larger vessels that have deeper drafts and longer unit trains that require larger rail yards. A recent report completed for the Port of Portland recommends that future terminal sites have a rail capacity to hold a minimum of an 8,500- foot train, and have working track lengths in the 2,500 to 3,500 foot range.[41]

It is also important to note that marine terminals typically require acreage not only for specific marine terminal operations for each cargo type as described below, but also for access roads, rail lines, maintenance areas, administrative buildings, and terminal storage space. For example, the Port of Portland's Terminal 6 has 522 acres. Of this acreage, there is a container terminal of 200 acres, of which 17 acres is presently used for breakbulk operations and two automobile terminals totaling 227 acres. The remaining acreage is used for rail, road, and general terminal operations, or is presently used for non-marine cargo (Suttle Road site). The

[40] HDR Engineering and Port of Portland. October 2009. West Hayden Island Marine Terminal Site and Operation Requirements.
[41] HDR Engineering and Port of Portland. October 2009. West Hayden Island Marine Terminal Site and Operation Requirements.

data on total acreage for all terminal operations was not available for many marine terminals, therefore acreages listed in the sections below often represent the size of core terminal operations, as noted in the text.

Finally, the berth lengths listed below typically represent the dockface length only and do not include berthing and mooring dolphins that extend the length of the berth or provide a mooring point. These dolphins can extend the dockface by 300 feet (150 feet on both ends of the dock).

4.3.1 Automobile

Automobiles are classified as roll on-roll off (RO/RO) cargo since they are driven on and off of transport ships. West coast ports serve as gateways for Asian automakers importing vehicles into the United States. Portland is the largest volume auto import port along the west coast, with Toyota, Hyundai, and Honda using Port of Portland facilities (Terminals 4 and Terminal 6).[42]

The Port of Portland is a desirable location for automobile importers due to lower rail rates and the fresh water environment, which results in less salt damage to the automobiles than in seawater ports. In addition, Portland is the gateway to the west for rail, and most automobiles imported through the Port of Portland are transported overland via rail.[43] Newer automotive rail ramps are double ended and can accommodate two blocks of five to seven cars. A rail design for a potential automotive terminal for the Port of Portland recommended 12 load lines of approximately 180 feet in length, and requiring five acres. Regarding draft requirements, automotive transport vessels that make calls to the Port of Portland typically require at minimum a draft depth of 32 feet (e.g. Toyota) and future vessels may require 37 feet.[44]

Automobile facilities at Port of Portland range in size from 75 to 120 acres. The Toyota facility has two berths, one that is 410 feet and another that is 950 feet. Other west coast ports with automobile imports, such as Long Beach, Vancouver, and Tacoma, have similarly sized automobile facilities. The Port of Long Beach Toyota facility is 168 acres in size and includes 110 acres of open storage area, 18 acres of rail facilities, four acres of warehousing/processing, 15 acres of truck staging, and 20 acres of employee parking.[45] The depth of this facility's docking area is 38 feet and the berth length is 1,300 feet.[46] The Subaru facility at the Port of Vancouver covers 90 acres and has a 1,040-foot berth.[47] The Marshall Avenue Auto Facility at the Port of Tacoma is approximately 165 acres in size and can handle 25,000 vehicles at any given time.[48] The acreage includes buildings covering 148,000 square feet (3.4 acres), as well as 72 dedicated railcar spots.[49]

Automobile manufacturers differ in how they operate their port facilities, which affects vehicle movement, number and type of employees (and associated parking requirements), building location and type, and overall site size requirements. For example, in Portland Harbor some automobile manufacturers such as Toyota and Honda aim to transport their vehicles from the harbor shortly after arrival by vessel, while others such as Hyundai store their vehicles at Port facilities for longer periods.[50] Site requirements also differ as Toyota adds accessories after manufacturing at their site, while Honda does not. Most automobile manufacturers also

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42 Port of Portland. Fast Facts. Website (http://www.portofportland.com/fastfacts_marine.aspx) accessed December 31, 2009.

43 Seher, Ben. Automotive Warehouse Company. October 12, 2009. Personal communication with Lee Elder, ENTRIX, Inc.

44 Ibid.

45 Freeeman, Audie. Toyota Logistics Services, National Logistics Manager. May 7, 2000. Personal communication with ENTRIX staff.

46 Port of Long Beach, Toyota Logistical Services. Website (http://www.polb.com/economics/cargotenant/bbroro/toyotalogistics.asp) accessed January 2, 2010.

47 Port of Vancouver, Autos. Website (http://www.portvanusa.com/marine-terminals/autos) accessed January 2, 2010.

48 Ibid.

49 Elmaleh, Andre, Director of Auto Imports. May 7, 2010. Personal communication with ENTRIX staff.

50 This is due to differences in supply chain management. Toyota operates on a pull strategy, in which shipments respond to consumer demand and 'pulls' the product through the supply chain. Honda operates on a 'push' strategy that is based on products being pushed through the supply chain based on manufacturing production levels set in accordance with historical demand from retailers.

desire space to have a facility to do repairs and touchups to the imported automobiles, and also require a fueling station to provide gasoline for newly arrived cars.[51]

Operational differences between manufacturers result in different land requirements for a given automobile throughput, but at a minimum, a large parcel of approximately 100 acres is required for an automobile cargo terminal. Automotive terminal design requirements completed recently for the Port of Portland recommend a terminal of 75 to 125 acres.[52] This design includes a marshalling area to manage cargo flow, 5 acres of loading and unloading area, a multimodal rail yard, and a processing center for offices, vehicle repairs and cleaning, employee parking, and a truck gate area. Total acreage requirement is 140 acres for the terminal area and 30 acres for the intermodal rail yard.

4.3.2 Container

The containerization of shipments began in 1960 and allows for greater ease in transferring goods between ships, docks, trucks and rail. Containers are standardized rectangular boxes used in the transport of cargo, with a width of eight feet, a height of either 8.5 feet or 9.5 feet, and a length of 10 feet to 40 feet. Goods transported by container are varied, including such products as tennis shoes and tires. The throughput capacity of a container terminal is measured in twenty foot equivalents (TEUs) and is equal to one 20 feet x 8.5 feet x 8 feet container. Containers are moved to and from ships with cranes, and are moved in the storage yard with a variety of stacking equipment.

Marine vessels for container cargo are currently in the 965 to 985 feet range and have a loaded draft requirement of 39.6 to 42.7 feet. Vessel size is expected to continue to grow, partly due to the planned construction of two sets of locks at the Panama Canal to accommodate larger container cargo ships. Future Panamax and Post-Panamax vessels will be in the 1,100 to 1,200 feet range with a draft requirement of approximately 46 to 50 feet.[53] Post-Panamax vessels are super-sized ships capable of carrying three times more cargo than ships now transiting the canal.

As the size of container vessels are increasing, many ports are taking the necessary steps to accommodate the larger vessels. For example, the Port of Oakland is dredging to achieve a draft of 50 feet and redeveloping the foundations of their wharf to sustain the weight of increased loads. The Port of Prince Rupert is anticipating expansion of their container facilities by 80 acres, and plans to add one berth that is 1,443 feet in length in water that is 59 feet deep. In total, this will bring the total acreage of this container facility to 139 acres.[54] This container terminal is relatively smaller than many other terminals as all containers at this facility go directly onto rail; there is no trucking or intermodal facility.

West coast container terminals range in size from approximately 50 to 400 acres. The Port of Portland has a container terminal at Terminal 6 that is 232 gross acres, including 20 acres of rail yard and 7 acres for road access. Approximately 193 of the Terminal 6 acres are for container terminal operations. The on-dock intermodal rail yard has annual capacity for 1,100 trains. The Port of Tacoma has six container terminals. Each has a draft depth of 51 feet and all but one has two berths, with each berth having a length of 1,100 to 1,300 feet.[55] The APM container terminal at the Port of Tacoma has 135 acres, but utilizes an intermodal rail yard that is an additional 32 acres.

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51 Seher, Ben, Automotive Warehouse Company. October 12, 2009. Personal communication with Lee Elder, ENTRIX, Inc.

52 HDR Engineering and Port of Portland. October 2009. West Hayden Island Marine Terminal site and Operation Requirements.

53 Ibid.

54 Prince Rupert Port Authority. January 2, 2010. The Prince Rupert Container Facility Development – Phase 2, Website (http://www.rupertport.com/container2.html).

55 Port of Tacoma, Container Terminals, Website (http://www.portoftacoma.com/Page.aspx?nid=102) accessed January 2, 2010.

The Port of Long Beach has seven container terminals ranging in size from 70 acres to 385 acres, with rail infrastructure occupying a large proportion of terminal acreage.[56] Of the container terminals in Long Beach, all but two have rail onsite or are located near rail yards, and these two terminals are currently expanding to have rail.[57] The terminal that is 70 acres in size does not have rail, so containers are moved to their destination via truck, which is the appropriate mode for the products handled at this terminal.[58] Each of the container terminals at Long Beach also has a truck queue area that requires additional space at the terminal. Additionally, customs officers inspect the containers two to three times each day, and require an inspection area of 100 square feet. Total berth lengths for these container terminals are between 1,800 and 6,379 feet and the design depths for the berths are between 36 and 55 feet.[59]

In the past, increases in container terminal throughput volumes were typically accomplished by expanding wharfs and increasing the amount of land within the container yard. As port land has become increasingly scarce, other methods of increasing throughput have been employed based on economic considerations related to local labor agreements/practices, scarcity of land, mix of intermodal rail versus local truck/barge transport, and capital costs.[60] These methods include the reduction of container dwell time, the use of 'off-dock' facilities, and by increasing container storage density.[61] As the ground space density increases, the labor costs of stacking operations also climbs, making these operations uncompetitive once density exceeds 200 to 300 TEU per acre.[62] The technology at the Port of Los Angeles and Long Beach container terminals require more labor and an increase in unproductive lifts. Therefore, higher ground space productivity is more suitable in ports where labor is relatively inexpensive and land costs are high.

Another method to reduce waterfront land requirements is to move containers to an offsite storage yard, although this creates an additional cost of transporting containers to the offsite yard. For example, the Port of Hong Kong and the Port of Long Beach are using a remote container yard to improve capacity.[63] At the Port of Hong Kong, imported containers are immediately loaded onto a train and moved to a sorting yard off of the terminal site. Export containers are directly delivered to the terminal by truck or rail. This reduces the amount of container storage space required within the container terminal, but does increase the handling time to transport the containers.[64] However, while such operations are competitive in the Long Beach and Hong Kong markets, ports in the Lower Columbia River face very different market factors including different levels of land constraints, labor conditions, and cargo products.

A recently completed Port of Portland report suggests a future container terminal with a 140-acre footprint.[65] This footprint includes the acreage required for a loop track to accommodate a unit train. Portland's competitive advantage for container traffic is its excellent rail service. Intermodal infrastructure that enables assemblage and storage of unit trains helps to compensate for the additional time required for traveling up the Columbia River from the ocean. The acreage required for a container cargo terminal and associated land uses varies based on configuration and throughput, but when evaluating acreage requirements for container

56 Martin, Caroline, Vice President of Customer Service International Transportation Service Inc. (Pier G). May 7, 2010. Personal communication with ENTRIX Staff.

57 Martin, Caroline, Vice President of Customer Service International Transportation Service Inc. (Pier G). May 7, 2010. Personal communication with ENTRIX Staff.

58 Baird, Ryan, SSA Marine-Terminal C. May 7, 2010. Personal communication with ENTRIX staff.

59 Port of Long Beach. Containerized. Website (http://www.polb.com/economics/cargotenant/containerized/default.asp) accessed January 2, 2010.

60 Ports and Marine, Inc. and Port of Portland. January 2003. Marine Terminal Master Plan.

61 Ports and Marine, Inc. and Port of Portland. January 2003. Marine Terminal Master Plan.

62 Le-Griffin, Hanh D. and Melissa Murphy. February 2006. Experiences at the Ports of Los Angeles and Long Beach. NUF Conference Proceedings.

63 Ibid.

64 Ports and Marine, Inc in association with Van Sickle Allen & Associates, Inc, JWD Group, HDR Engineering, Inc. January 2003. Marine Terminal Master Plan.

65 HDR Engineering and Port of Portland. October 2009. West Hayden Island Marine Terminal site and Operation Requirements.

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facilitates at west coast ports, at a minimum, 100 acres are required for a container cargo terminal and associated infrastructure.

4.3.3 Breakbulk

Breakbulk cargo is shipped in units such as bags, bales, barrels, boxes, cartons, drums, and pallets. In the past, breakbulk products shipped from the Pacific Northwest included forest and agricultural products. However, increasingly these products have been containerized. Many cargoes can be shipped as either breakbulk or container cargo, with the predominant mode being determined by pricing and shipping frequency. Now, the primary breakbulk cargo handled at the Port of Portland is inbound steel used by area manufacturers and the Class I railroads.

Port of Portland breakbulk facilities include Terminal 2 and portions of Terminal 6 used for breakbulk steel cargo.[66] Terminal 2 covers 49 acres, of which 28 acres are dedicated to breakbulk open storage. The remaining acreage is used for a covered warehouse, cranes, a truck lane, and other services.

There are nine breakbulk terminals at the Port of Long Beach that range in size from 15 to 22 acres. The Cooper/T. Smith (CTS) breakbulk Terminal (Pier F) has 21 acres, of which 4.1 acres are covered storage and the rest is open yard. At this facility, almost 100 percent of their product is shipped by truck as rail is less suitable for the goods they handle. In the past they utilized rail for timber/lumber, but they rarely handle this type of product now. The truck queue system for breakbulk is very different from container and requires much less space.[67] The berth lengths for these breakbulk terminals are between 600 and 1,985 feet and have a draft depth of between 32 feet and 43 feet (with the majority being 36 feet deep).[68]

The Port of Vancouver has two existing sites dedicated to breakbulk. There is a 40-acre site and a 70-acre site, with docks 1,250 feet and 1,750 feet in length, respectively, and a draft depth of 40 feet.[69] The Port of Vancouver also has a planned breakbulk facility at Terminal 5 that would be 218 acres.

As indicated above, site size for breakbulk varies substantially depending on the cargo and whether it will be transported by rail or by truck, as well as other operating considerations. Regarding rail infrastructure, to increase operational efficiency, a breakbulk terminal would have a loop track and on-dock track connectivity.[70] In general, sites for breakbulk cargo require a minimum of 20 acres if rail is not required, to up to 70 to 100 acres for cargoes requiring rail access. No designs for a breakbulk terminal have recently been completed for the Port of Portland.

4.3.4 Dry Bulk

Dry bulks include grain, potash, bentonite clay, copper, zinc, soda ash, and a variety of minerals. Typically dry bulks are separated into grain cargo and other dry bulk goods, a convention which is followed in this analysis. Other dry bulk goods can be further separated based on point of origin and destination into local/regional dry bulks and national/international dry bulks.

66 Ports and Marine, Inc. and Port of Portland. January 2003. Marine Terminal Master Plan.

67 Viner, Ed, Assistant Vice President and Manager of Operations, Cooper/T. Smith (CTS). May 7, 2010. Personal communication with ENTRIX staff.

68 Port of Long Beach. Breakbulk and RO/RO. Website (http://www.polb.com/economics/cargotenant/bbroro/weyerhaeuser.asp) accessed January 2, 2010.

69 Ibid.

70 Ports and Marine, Inc. and Port of Portland. January 2003. Marine Terminal Master Plan.

4.3.4.1 Local/Regional Dry Bulk

The local/regional dry bulks are typically smaller volume dry bulks that are imported/exported in support of industry located in the immediate region of the terminal. Examples here include cement, salt, gypsum, aggregates, etc. These terminals are usually a mix of rail and truck and do not need to support train activity on-site. They therefore tend to have smaller footprints.

The Port of Long Beach has seven terminals that specialize in local/regional dry bulks. Five out of these seven terminals are less than ten acres in size and do not have rail facilities. The largest of the seven is a 23-acre terminal that handles petroleum coke, coal, potash, borax, soda ash, and a variety of other minerals. This facility has rail capacity for two 100-car unit trains. The majority of these terminals have berths in the 550 to 650 feet range; however, two of the terminals have total berth lengths of 1,100 feet and 1,900 feet.[71] Among other facilities, local/regional dry bulks are handled at the 27-acre Simplot facility in Portland Harbor. Construction materials are handled at other local/regional dry bulk terminals in Portland Harbor. The Port of Vancouver, USA has a five-acre dry bulk terminal that has a berth 800 feet in length and a depth of 40 feet.

As indicated by the size of these facilities, local/regional dry bulk marine terminals can be quite small relative to other marine terminals, with footprints that vary from less than 10 acres to 30 acres in size. Their smaller size is due in part to the fact that they do not depend as heavily on rail infrastructure as national/international dry bulk terminals.

4.3.4.2 National/International Dry Bulk

The national/international terminals serve cargos that are railed in from other parts of the US or Canada in unit trains. These terminals require larger footprints to support terminal rail infrastructure. National/international dry bulks exported through the Port of Portland include potash mined in Saskatchewan (Terminal 5) and soda ash mined in Wyoming (Terminal 4).[72] The potash terminal at Terminal 5 is 120 acres, and has rail capacity for 220 tank cars on loop tracks. The soda ash terminal is 25 acres, but this acreage footprint does not include much of the rail and road acreage used to support terminal operations. National/international dry bulks typically arrive by barge and train at the Port of Portland, and are then transferred to dry bulk vessel, or freighters. Freighters are currently 738 feet LOA and require drafts of 42 feet. By 2040, it is anticipated that dry bulk vessels will increase to 805 feet LOA and have a draft requirement of 45 feet.[73]

At the Port of Vancouver, dry bulks such as copper concentrate and bentonite clay are exported through Terminal 2. Approximately 34 acres of this terminal are dedicated to dry bulk operations, but this acreage does not include rail infrastructure. The terminal includes a loop track capable of handling 104-car unit trains, bulk sheds with approximately 160,000 square feet of space, and a recently added 72,000 square foot storage facility for copper concentrate.[74] The Port of Prince Rupert has a state-of-the-art 136-acre dry bulk facility that handles coal. This facility is considered a world leader as it has sufficient rail infrastructure to efficiently transfer coal between marine vessels and unit trains.[75]

A study recently conducted for the Port of Portland anticipates that a future national/international dry bulk facility in Portland would require between 125 and 155 acres, including rail infrastructure with an overall

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71 Port of Long Beach. Dry Bulk, Website (http://www.polb.com/economics/cargotenant/dry/pierg.asp) accessed January 2, 2010.

72 BST Associates and Washington Public Ports Association and Washington Stage Department of Transportation. March 23, 2009. 2009 Marine cargo Forecast Technical Report.

73 HDR Engineering and Port of Portland. October 2009. West Hayden Island Marine Terminal site and Operation Requirements.

74 BST Associates. 2010. West Hayden Island Marine Cargo Forecasts and Capacity Assessment. Prepared for the Port of Portland.

75 Prince Rupert Port Authority. Riley Terminal: Most Advanced of Its Kind. Website (http://www.rupertport.com/ridleyterminals.htm) accessed January 12, 2010.

track length of 7,000 to 10,000 feet. [76] The terminal rail loop would be multi-tracked to provide adequate track length depending on the operation.

4.3.5 Grain

The Columbia River is the third largest grain exporting region in the world and Portland Harbor is the number one exporter of wheat along the Columbia River.[77] The majority of grain exported from the Port of Portland is wheat with barley, with increasing amounts of feed grains (corn and soybeans) from the mid-western United States also being exported. Grain is exported by three grain terminals in the Portland Harbor including Columbia Grain at Terminal 5 and Cargill Louis Dreyfus (CLD) Pacific Grains at Irving, and the LDC Berth or "O" Dock.[78] The CLD grain terminal berth is 327 feet in length and the Columbia Grain terminal is 928 feet in length.[79]

Approximately 40 percent of grain delivered to Portland arrives by barge, with the remainder delivered by rail.[80] Grain is moved by rail on unit trains, which are trains that comprised of cars with the same cargo. Bulk grain rail loading and unloading ideally requires a loop train that can handle a 110-car train in six to eight hours.

A new 108-acre grain terminal is being constructed at the Port of Longview. A unique feature of the terminal is the ability of the facility to hold four 110-unit trains simultaneously.[81] Similar to the existing Kalama Export Company terminal in Kalama, the new Longview terminal will be able to handle both wheat/barley and feed grains (corn and soybeans). Feed grains are shipped in unit trains from the Midwest. The relatively new grain terminal at the Port of Prince Rupert is 100 acres and has a draft depth of 48 feet. The older grain terminal at the Port of Vancouver USA is 45 acres. This terminal has a berth length of 715 feet and a draft depth of 40 feet.[82]

As previously described, existing dry bulk vessels are typically 738 feet and have a draft of 42 feet. It is anticipated that dry bulk vessels will increase to 805 feet in length and have a draft of 45 feet.[83] In addition to the need to accommodate larger vessels, new grain terminals such as the terminal at the Port of Longview are being constructed to handle unit trains. This capacity is necessary to ensure that a facility can efficiently load and unload trains according to the Class I railroads 'hook and haul' procedures, and also ensure the most cost effective rail rates. A grain terminal with loop tracks sufficient to have capacity for unit trains is expected to require a footprint of 100 acres or more.

4.3.6 Liquid Bulk

Waterborne liquid cargo is transported via a tanker or a tank ship. Typically tankers carry hydrocarbons, chemicals, water, and agricultural products. A liquid bulk vessel or tanker is approximately 804 feet in length and draws 43 feet of draft when loaded. It is anticipated that over the next 30 years, liquid bulk vessels will

[76] HDR Engineering and Port of Portland. October 2009. West Hayden Island Marine Terminal site and Operation Requirements.
[77] Port of Portland. Fast Facts. Website (http://www.portofportland.com/fastfacts_marine.aspx) accessed December 31, 2009.
[78] Port of Portland. January 2003. Marine Terminal Master Plan, Prepared by Ports and Marine, Inc.
[79] Columbia River Pilots. River Docks. Website (http://www.colrip.com/pages/Docks.aspx) accessed January 12, 2010.
[80] Carrtracks. International Container and Port Statistics, Website (http://www.carrtracks.com/portstat.htm) accessed December 31, 2009.
[81] *Seattle Times*, Joint Venture to Build Longview Grain Terminal, Website (http://seattletimes.nwsource.com/html/businesstechnology/2009287598_weblongview01.html) accessed January 2, 2010.
[82] Port of Vancouver. Dry bulk. Website (http://www.portvanusa.com/marine-terminals/dry-bulk) accessed January 2, 2010.
[83] HDR Engineering and Port of Portland. October 2009. West Hayden Island Marine Terminal site and Operation Requirements.

increase in size to 935 to 1,000 feet in length and will have a loaded draft of 48 feet.[84] In many respects, a liquid bulk terminal is configured and operated similarly to that of a dry bulk terminal.[85]

Liquid bulk facilities tend to be smaller than other cargo facilities. Port of Portland's Terminal 4 has a liquid bulk facility that is six acres in size and handles liquid fertilizer. Kinder Morgan's Linnton and Willbridge Cove liquid bulk operations are, respectively, located on 17 and 44-acre sites.[86] The vast majority of the liquid terminals in the Portland Harbor are petroleum terminals that are located along the western bank of the Willamette River in the Linton or Willbridge Cove area, because this area is adjacent to the Olympic Pipeline, which transports petroleum.

The Port of Long Beach has seven liquid bulk terminals with six of these being less than 11 acres in size and the largest being 18 acres. The range of berth length at these terminals ranges between 700 feet and 1,980 feet with depths between 36 feet and 52 feet.[87] The Port of Vancouver, USA liquid bulk terminal, operated by NuStar is 14 acres and has a berth of 400 feet in length and a berth depth of 40 feet.

Due to the potential environmental contamination associated with an oil spill, terminals that handle petroleum require a physical separation of their operations from the public. Ideally, operators of these facilities would desire their facilities to be remotely located and isolated from public spaces. However, liquid bulk facilities, including those handling petroleum product, are often located in areas that have only fences separating the facilities from public streets or recreation paths. As oil products are not typically explosive, the primary public safety risk is environmental contamination.[88]

A study recently conducted for the Port of Portland anticipates that a future, large liquid bulk facility in Portland could require between 125 and 155 acres, including rail infrastructure, truck loading, product blending, and tank storage areas. [89] This size of terminal could accommodate refining and pipeline operations within a rail storage loading loop. Terminal layout and size, however, would vary substantially based on the business operations and the type of product handled. Operations similar to existing facilities in Portland Harbor would utilize much less acreage, within the range of 10 to 50 acres.

4.4 MARINE INDUSTRIAL SITE SUITABILITY

A 2004 City of Portland study evaluated the businesses that are located along the Willamette River and rely on water access. In addition to marine cargo facilities, these river-dependent businesses include marine and vessel related services and marine-dependent manufactures.[90]

Marine or vessel-related services include barging, cargo handling services, and naval/coast guard services. Marine-dependent manufactures are those firms that require marine facilities for the transport of raw and finished product. The characteristics and general site requirements of these marine industrial businesses are discussed in greater detail below.

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84 HDR Engineering and Port of Portland. October 2009. West Hayden Island Marine Terminal site and Operation Requirements.

85 Ibid.

86 Kinder Morgan. Pacific Operations. Website (http://www.kindermorgan.com/business/products_pipelines/terminals_W_willbridge.cfm) accessed January 12, 2010.

87 Port of Long Beach. Liquid Bulk. Website (http://www.polb.com/economics/cargotenant/liquid/default.asp) accessed January 2, 2010.

88 U.S. Army Corps of Engineers. Pacific LA Marine Terminal LLC, Crude Oil Terminal Draft Project: Environmental Review. Accessed at http://www.portoflosangeles.org/EIR/PacificLAMarine/SEIR/_Overview.pdf.

89 HDR Engineering and Port of Portland. October 2009. West Hayden Island Marine Terminal site and Operation Requirements.

90 E.D. Hovee & Company and City of Portland. February 2003. Portland Harbor Industrial Lands Study.

4.4.1 Marine and Vessel-Related Services and Operations

Barging is the process of pulling or pushing a flat bottom floating platform with the assistance of a tug boat. Much of the barge traffic along the Lower Columbia River is supplying grain from eastern Washington and Oregon to terminals in the Port of Portland, Port of Vancouver, Port of Kalama, and the Port of Longview. Approximately 40 percent of the grain that these terminals receive is transported via barge. Barge companies require access to water in order to provide this service to grain elevators and to other companies. For example, Tidewater operates facilities in the Port of Vancouver USA and Foss Maritime operates a 10-acre site in Portland. The berth length at both of these facilities is 700 feet.[91]

Commercial barge traffic on the Columbia River upstream of Portland includes tugs and barges for the movement of commodities.[92] Typical commodities moved downstream include agriculture products and the upstream movement of goods includes petroleum, fertilizer, and chemicals. There are three to four tons of cargo moved downstream for every ton moved upstream.

Barges on the Columbia-Snake River system typically use one tug for multiple barges. These barges are based upon the size of the locks on the Columbia-Snake River system, and are typically 42 feet wide (with doublewides 84 feet in width). Individual barge lengths vary between 150 feet and 300 feet. Fully loaded barges on the Columbia River typically draw 13.5 feet of water.[93] Additional tug activity for the Port of Portland involves ship assist. In Portland, the business that operates these tugs is Foss Maritime.[94]

Other vessel-related services include shipyards that repair and build ships. Typical site characteristics of shipyards include docking facilities, dry docks, floating dry docks and onsite storage for boats while they are cleaned and repaired. Portland Shipyard is operated by Cascade General and is one of the world's largest ship repair facilities. It is located on a 60-acre site in the Swan Island area of Portland Harbor. It has two dry docks, one 661 feet long by 112 feet wide and the other is 598 feet long by 88 feet wide.[95] The berth lengths available at the Cascade General yard are between 780 feet and 3,900 feet.[96] The Port of Seattle has the Todd Pacific Shipyard and it occupies a 46-acre site and has multiple berths ranging from 590 feet through 1,400 feet.[97]

Finally, marine industrially uses include facilities to preserve marine safety. In Portland, the Coast Guard marine safety site is located on an eight-acre site in the Swan Island area, and has two berths, one is 175 feet and the other is 330 feet.[98] Other federal government presence occupying river frontage is that of the Army Corp of Engineers dredging base, which is located at the Port of Portland Terminal 2.

4.4.2 Marine-Dependent Manufacturing

There are a number of manufacturing firms that require deep water access to perform business operations. Some examples of this are barge manufacturing, recyclers, and steel product manufacturing. For example, Oregon Steel Mills previously used its docking facilities to unload material, but recently began using

91 Army Corp of Engineers. Total Waterborne Commerce, Columbia River Basin, OR, WA, and ID. Website (http://www.iwr.usace.army.mil/ndc/lpms/pdf/bydist/portland.pdf) accessed January 12, 2010.

92 PB Ports and Marine and Southwest Washington Regional Transportation Council. March 2003. SR-35 Bridge Feasibility Study.

93 Ibid.

94 Washington Business Magazine. Member Profile - FOSS MARITIME: Pulling Their Weight at Sea. Website (http://www.awb.org/articles/magazine-sepoct2005/member_profile_foss_maritime_pulling_their_weight_at_sea.htm) accessed January 6, 2010.

95 Cascade General. Portland Shipyard. Website (http://www.casgen.com/profile/portland_shipyard/index.htm) accessed January 3, 2010.

96 Army Corp of Engineers. Total Waterborne Commerce, Columbia River Basin, OR, WA, and ID. Website (http://www.iwr.usace.army.mil/ndc/lpms/pdf/bydist/portland.pdf) accessed January 12, 2010.

97 Todd Pacific Shipyards. The Todd Story, Website (http://www.toddpacific.com/company/todd_story.php) accessed January 12, 2010.

98 Army Corp of Engineers. Total Waterborne Commerce, Columbia River Basin, OR, WA, and ID. Website (http://www.iwr.usace.army.mil/ndc/lpms/pdf/bydist/portland.pdf) accessed January 12, 2010.

Terminal 6 for receiving. Schnitzer Steel disassembles machinery and other metal fabrication to send to Asia on barges for recycling into new metal components.[99] Schnitzer Steel is approximately 150 acres in size and has three berths with lengths between 600 and 700 feet, while Oregon Steel Mills is 170 acres in size and has 994 feet of berth space.[100] The Schnitzer Steel sites in the Port of Oakland and in the Port of Tacoma are 30 and 20 acres, respectively.[101] The Port of Oakland facilities have three berths sized at 500 feet, 700 feet, and 875 feet.[102]

Marine barges are typically larger than those that travel within the Columbia-Snake River system and are built to deal with rough seas. A typical marine barge can be 300 feet or larger.[103] Portland Harbor is the home of multiple marine barge manufactures including Gunderson and Zidell. These firms use deep water access to ship finished barges to clients. Zidell Marine Corporation builds marine barges up to 90 feet wide and up to 900 feet long.[104] The Zidell shipyard is located near the Ross Island Bridge, further upstream than the Steel Bridge. Gunderson is located on approximately 70 acres near Terminal 2.

4.5 SITE CONSTRAINTS

Two significant constraints to marine-related development in Portland Harbor frequently cited in recent studies are the sensitive natural resources and the environmental contamination that are frequently in riverfront areas. This section provides an overview of the constraints to marine-related development when these features are present.

4.5.1 Environmental Contamination Constraints

This section describes how upland contamination and Superfund contamination affects the suitability of sites for marine industrial development.

4.5.1.1 Brownfields

A brownfield is a site where environmental contamination or the possibility of contamination is preventing that property's redevelopment.[105] The Oregon Department of Environmental Quality tracks upland contamination, both from potentially leaking underground storage tanks and from other sources. Several studies on Portland Harbor have included interviews of local industrial land users about brownfield development.[106] These studies have found that industry representatives view the costs and the long term liability of these sites as a major constraint. Most of the industry representatives were interested in brownfield development, but were concerned about liability and financing of brownfield site purchase. Many people interviewed stated that brownfield development requires appropriate financial incentives and limited liability.

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99 Van Der Voo. Lee, August 27, 2007. *Portland Tribune*. Harbor Growth Stalls.

100 Army Corp of Engineers. Total Waterborne Commerce. Columbia River Basin, OR, WA, and ID. Website (http://www.iwr.usace.army.mil/ndc/lpms/pdf/bydist/portland.pdf) accessed January 12, 2010.

101 Broughton, Anne Clair. September 1995. Website (http://www.sdbmagazine.com/articles/article.asp?ID=3917&CatID=23&SubCatID=73) assessed January 12, 2010.

102 US Army Corp of Engineers. Navigational Data Center. Website (http://www.ndc.iwr.usace.army.mil/ports/ps/psbooks.htm) accessed January 12, 2010.

103 GlobalSecurity.org. Barges. Website (http://www.globalsecurity.org/military/systems/ship/barge.htm) accessed January 12, 2010.

104 Zidell Marine Corporation. Website (http://www.zidellmarine.com/index.htm) accessed January 12, 2010.

105 Portland Bureau of Environmental Services. Portland Brownfield Program. Website (http://www.portlandonline.com/bes/index.cfm?c=35008) accessed January 6, 2010.

106 Working Harbors Reinvestment Strategy. April 18, 2008. Website (http://www.portlandonline.com/bps/index.cfm?c=42598) accessed January 6, 2010. Portland Bureau of Planning. 2003. Portland Harbor Industrial Lands Study Part One: Inventories, Trends and Geographic Context. Davis and Hibbitts. 1998. Report on Industrial Lands Focus Groups.

The primary constraint associated with purchase or lease of a brownfield site is the clean up cost and potential liability for past contamination. **Table 4-2** below illustrates a recent case study comparing the costs of developing a brownfield site to that of developing a greenfield site. The study compared high tech manufacturing, industrial parks, warehouse distribution and general manufacturing business development on both brownfields and greenfields within the Portland area. In every situation the costs of redeveloping a brownfield for a new business venture exceeded the costs of developing a new greenfield site.

Table 4-2 Case Study of Brownfield Development verses Greenfield Development

Characteristics and Costs	High Tech Manufacturer		Industrial Park		Warehouse Distribution		General Manufacturing	
	City of Portland		City of Tualatin		City of Portland		Clackamas County	
	Brownfield	Greenfield	Brownfield	Greenfield	Brownfield	Greenfield	Brownfield	Greenfield
Acreage	37.95	53.20	45.50	44.50	37.95	25.91	37.75	37.95
Building size			630000	630000	400,000	400,000	450,000	450,000
High tech	250,000	250,000						
Office	60,000	60,000						
Cubical	40,000	40,000						
Parking	725 spots	725 spots	1,130 spots	1,130 spots	200 cars & 275 trailers	201 cars & 275 trailers	1,100 spots	1,100 spots
Development Costs								
On site	$127,080,000	$126,000,000	$27,703,800	$30,060,000	$13,722,300	$13,008,000	$25,029,000	$25,200,000
SDC's	$1,383,000	$1,782,663	$1,846,243	$1,713,209	$715,907	$730,069	$1,212,343	$868,675
SDC Credits	-$249,062	$0	-$25,368	$0	-$75,858	$0	-$249,062	$0
Off-Site	$24,000	$1,452,500	$558,000	$5,739,167	$735,000	$290,500	$24,000	$1,347,000
Remediation Costs	$11,100,000	$0	2190000	$0	$1,270,000	$0	$11,100,000	$0
Other Remediation	$16,927,441	$0	$6,558,863	$0	$6,551,776	$0	$11,880,451	$0
Total Costs	$156,265,379	$129,235,163	$38,831,538	$37,512,376	$22,919,125	$14,028,569	$48,996,732	$27,415,675

Source: Port of Portland, Portland Development Commission, City of Portland, METRO, December 2004, Brownfield/Greenfield Development Cost Comparison Study. Prepared by the Mackenzie Group.

4.5.1.2 Superfund

Vacant lands in Portland Harbor are not only potential brownfields with upland contamination, but they also lie adjacent to the Portland Harbor Superfund site. Starting in 2000, a six mile section of the Willamette River, the actual water body, was added to the Superfund site list. A Superfund site is an uncontrolled or abandoned place where hazardous waste is located, possibly affecting local ecosystems or people.[107] Currently, the lower 10 miles of the Willamette River from the Columbia Slough to the Fremont Bridge are within the Portland Harbor Superfund area.

4.5.2 Natural Resource Constraints

Lands bordering the Willamette and Columbia Rivers that may be appropriate for marine industrial uses often contain significant natural resources. Many of these natural resources are regulated by federal, state, regional and local agencies and those regulations can constrain development opportunities. In particular, site design to

[107] EPA. Superfund. Website (http://www.epa.gov/superfund/sites/) accessed January 6, 2010.

avoid impacts on natural resources can increase the cost of development or the amount of land required. Likewise, mitigation for impacts to natural resources may also increase the cost of development and land requirements. Development on sites located along the Columbia River will have to obtain multiple permits under various local, state, regional and federal regulations; however, some sites, due to the type and characteristics of the natural resources, may be more constrained than others.

Over the past 20 years, the City of Portland has identified specific significant natural resources within the city limits and applied overlay zones that require development to generally avoid and minimize impacts to natural resources and to mitigate unavoidable impacts. There are three types of environmental overlay zones in the Portland: protection (p-zone), conservation (c-zone), and river environmental (e-zone). These require protection of "some resources and function values that have been identified by the City as providing benefits to the public".[108] The p-zone provides the highest level of protection, and development will only be approved in this zone for a narrow set of circumstances (e.g., access). Within the c-zone, development is allowed but must avoid and minimize impacts to natural resources to the maximum extent practicable and mitigate unavoidable impacts. Regulations apply not only to development, but also to land divisions and property line adjustments, removal of native vegetation, planting of non-native vegetation, enhancement of resources, or changing of topography through grading, excavating or filling.

In the River Plan/North Reach, a new river environmental overlay (e-zone) is proposed. The e-zone applies in high and medium ranked riparian resource areas. The e-zone is similar to the c-zone, in that it requires avoiding, minimizing, and mitigating impacts, but the e-zone contains specific exemptions and standards for marine industrial development. Regulations that would apply to every proposal include a 50-foot setback for all non river-related/dependent development, enhancement requirements, balanced cut and fill, erosion control, and storm water management. [109]

Other regulations that apply to development along and within the rivers include: Federal Emergency Management Agency (FEMA), Endangered Species Act (ESA), Rivers and Harbors Act, and the Oregon Removal-Fill Law and Clean Water Act (CWA). Under FEMA, development must occur on elevations above the 100-year floodplain. For elevations below this level, fill is required, which must be offset by equivalent cut elsewhere. This cut and fill requirement thus increases costs of development within the 100-year floodplain. Under the federal ESA, federal agencies must ensure that their actions, including any actions they authorize, do not jeopardize listed species or adversely affect their critical habitat. If the project design and implementation plan are deemed adequate, applicants would need permits from state and federal agencies that may include conditions to avoid, minimize, or mitigate expected impacts of the proposed project.

Section 10 of the Rivers and Harbors Act of 1899 also regulates all activities in or over navigable waters of the United States, which extends to the 'ordinary high water mark' or the high tide line. All activities must be permitted that may affect the course, location, condition, or capacity of navigable waters. The Oregon Removal-Fill Law and Section 404 of the federal CWA protect waterways and wetlands in the State of Oregon by regulating the discharge of dredged and fill material into waters of the United States, including wetlands. Finally, the CWA sets standards for point sources of water pollution.

4.6 SUMMARY OF SITE SUITABILITY AND CONSTRAINTS

Marine-related uses share similar site requirements, including 1) zoning (industrial), 2) flat and contiguous lands with shoreline access of 400 feet or more, and 3) proximity to multimodal infrastructure (water, truck, and rail). Differences arise in acreage and water depth requirements, with marine cargo uses typically

[108] Portland Bureau of Development Services. 2007. Title 33, Planning and Zoning Chapter 33.430, Environmental Zones. Accessed online at: http://www.portlandonline.com/bds/index.cfm?c=43093.

[109] Industrial Development and Natural Resources Integration Task Group, March 20, 2008, Meeting #10.

requiring more acreage and deeper water. Specifically, marine cargo facilities are usually sized at 50 acres or more (with the exception of local/regional dry bulk and liquid facilities that can be as small as five acres) and require a minimum draft depth of 35 feet. Marine industrial uses vary considerably in their site size requirements, but are typically at least five acres in size and can be as large as several hundred acres. A draft depth of 20 to 30 feet is required for most marine industrial uses.

Regarding site limitations, marine cargo and marine industrial uses alike face constraints related to sensitive natural resources and brownfield contamination. The presence of either can limit site usage or increase site acreage requirements for mitigation, and increase site development costs.

Table 4-3 summarizes the site characteristics of each marine-related use described above. **Table 4-3** is not an exhaustive analysis of specific businesses that fall into marine cargo and marine industrial classifications. Rather, the intended purpose of **Table 4-3** is to summarize general characteristics and potential requirements of marine cargo and marine industrial sites, based upon representative businesses in Portland Harbor as well as in other west coast ports.

In general, the table indicates that cargo facilities require sites that are typically 50 acres or larger, with the exception of local/regional dry bulk and liquid bulk facilities that may be much smaller. It is important to note that while many existing grain facilities are relatively small, industry trends show that newer facilities are larger to accommodate larger vessels and longer unit trains (to ensure competitive railroad rates). Many of the acreage sizes indicated in **Table 4-3** indicate the core terminal operation footprint, which excludes the rail infrastructure and ancillary structures and operations. Furthermore, the site sizes in **Table 4-3** do not include any acreage required for onsite mitigation or environmental protection. Total acreage, including rail infrastructure and support operations, for new marine cargo facilities handling containers, automobiles, national/international dry bulks, and grain are typically 100 acres or more.

All cargo facilities require minimum draft depths of 35 feet, with a deeper draft more suitable for many cargo types. Berth lengths of most cargo facilities are at least 550 feet, with many larger than 1,000 feet. As noted above, these lengths do not include dolphins, which extend the shoreline length for mooring vessels. This emphasizes the need for sites with at least 400 feet of shoreline length.

Marine industrial sites vary significantly in their requirements, both in terms of acreage, berth length, and channel depth. However with the exception of some vessel-related services, most marine industrial sites require at least a 20-foot draft and a five acre site. Nearly all marine industrial uses require a site with at least 400 feet of riverfront to accommodate a berth, and nearly all require access to rail and truck routes.

Table 4-3 Summary of Site Characteristics for Marine-Related Land Uses

	Acreage Approximation		Water Frontage Approximation		Berth Depth Requirement within 150' of Shore[110]	Rail Infrastructure Requirements
Site Type	Portland Harbor	Other West Coast Harbors	Portland Harbor	West Coast Ports		
Cargo						
Automobile	75 - 120	95 - 168	414' - 1,000	1,040' – 1,300'	35' or greater	Rail Ramp & Nearsite Rail Yard (5+ acres)
Container	193	50 - 385	Total of 2,850' (3 berths)	1,100' – 6,380'	40' or greater	Intermodal Yard (Onsite or Nearby Rail Yard) & Mainline Access
Breakbulk	20 - 50	15 - 75	2005' (2 berths)	600' – 1,750	35' or greater	Nearby Rail Yard & Mainline Access
Grain	40 – 100	40 - 100	327' – 928'	715'	40' or greater	Spur/loop & Nearby Rail Yard & Mainline Access
Dry bulk National/International	25 – 120	34 – 136	740'- 900+'	550' – 1,900	40' or greater	Spur/loop & Nearby Rail Yard & Mainline Access
Dry Bulk Local/Regional	5 – 27	5 – 23	N/A	550' – 1900'	40' or greater	Spur
Liquid bulk	5 – 45	10 - 20	700'	700' – 1,980'	35' or greater	Spur
Industrial						
Vessel Related Services	5 - 60		175' – 3,900'	150- - 1,400'	20' or greater	Spur / None
Marine dependent manufacturing	10 - 170 acres		994' – 1,800'	500' – 875'	20' or greater	Spur

[110] This distance from shore is based upon PHILS study, City of Portland, Portland Harbor Industrial Lands Study, February 2003, Prepared by E.D. Hovee & Company.

Inventory of Portland Harbor Sites for Marine-Related Uses

Following a brief overview of current land use in Portland Harbor, this section provides an inventory of vacant, waterfront lands in the industrial districts in Portland. The lands inventoried for this study are located along the Willamette River downstream of the Fremont Bridge and eastward along the Columbia River to Interstate 5. The purpose of the section is to provide an understanding of the available supply of industrial waterfront land in Portland Harbor, and the characteristics of the land supply relative to the site suitability requirements for marine-related uses outlined in **Section 4**. The section concludes with a comparison of site characteristics required for marine-related uses versus the characteristics of the available waterfront lands in Portland. The focus is an inventory of lands in Portland Harbor; **Section 6** includes an overview assessment of the availability of industrial lands suitable for marine-related uses in other ports on the Lower Columbia River.

5.1 OVERVIEW OF DATA SOURCES AND KEY ASSUMPTIONS

The primary data sources for this section are the GIS and site inventory data from the Economic Opportunities Analysis completed in 2009 for the City of Portland that identifies the vacant land inventory in the City and the level of availability of these lands based on site constraints. Additional data sources include GIS data on designated truck routes from the City of Portland Freight Master Plan and GIS data on Willamette River depths from the Lower Willamette Group. A key assumption in the analysis is that future site requirements will be similar to existing site requirements.

5.2 CURRENT PORTLAND HARBOR LAND USE

The industrial districts in Portland Harbor downstream of the Steel Bridge cover 5,932 acres of land in tax lots.[111] This land encompasses river-dependent marine industrial and marine cargo activities and facilities, as well as rail-dependent uses that are not directly dependent on water access but that utilize the intermodal transportation facilities available in the Harbor area. Land use in Portland Harbor was categorized as river-dependent and/or rail-dependent by the City of Portland for the Working Harbor Reinvestment Strategy. Data from the City indicates that approximately one-third of all employers (33 percent) and jobs (31 percent) in the Portland Harbor are river-dependent, with approximately 1,790 acres in river-dependent uses in 2004.[112]

5.3 INVENTORY OF AVAILABLE LANDS FOR MARINE-RELATED USES

In 2009, the Economic Opportunity Analysis (EOA) completed for the City of Portland inventoried the industrial and commercial lands available for development throughout the City.[113] This analysis classifies

[111] Portland Bureau of Planning. 2003, Portland Harbor Industrial Lands Study Part One: Inventories, Trends and Geographic Context.

[112] Oregon Employment Division, 2008 as provided by Metro.; WH_taxlots010610: Multnomah County Assessment & Taxation(2010), as provided by City of Portland, Bureau of Planning & Sustainability; wkhrbr_Rail_User_sites datasets: City of Portland, Bureau of Planning, 2006; WH_sites_2004Atlas.shp: Prepared by City of Portland Bureau of Planning & Portland Development Commission.

[113] E.D. Hovee and Company, 2009, City of Portland Economic Opportunities Analysis: Task 2/3 – Supply and Demand, Prepared for the City of Portland Bureau of Planning and Sustainability.

lands based on their level of vacancy as well as the constraints on these sites due to the City of Portland's environmental overlay zoning and/or potential contamination. Vacancy is defined based on the proportion of the site that is vacant. Sites over 90 percent vacant are classified as vacant, while sites that are less than 90 percent vacant are classified as partially vacant. All vacant or partially vacant parcels larger than 0.5 acres are included in the analysis.

The EOA study estimated the vacant industrial and commercial land supply in the City of Portland at approximately 3,000 acres, of which 1,910 acres are located in the Columbia Harbor area (which is a geography broader than the Portland Harbor area, and includes lands along the Willamette River downstream of the Fremont Bridge and eastward along the Columbia River to 82nd street). The EOA data classifies industrial, employment, and commercial lands into five tiers depending on the proportion vacant, environmental protection constraints based on City of Portland environmental zoning, and potential contamination. Of the 1,910 acres of available land in the Columbia Harbor area, nearly half (46 percent, or 877 acres) were classified as potential brownfields based on data from the Oregon Department of Environmental Quality (DEQ). As indicated in **Table 5-1**, 21 percent of available land (396 acres) is over 90 percent vacant and has no environmental zoning constraints, while another 4 percent (80 acres) is partially vacant land that has no environmental zoning constraints. The remaining 29 percent of vacant lands (391 acres that are over 90 percent vacant, plus 167 acres that are partially vacant) have some environmental zoning constraints.

Table 5-1 EOA Classification of Available, Vacant Lands in the Columbia Harbor Area

Parcel Classification	Acreage	Proportion of Available Acreage
Over 90% Vacant, No Environmental Zoning Constraints	396	21%
Over 90% Vacant, Environmental Zoning Constraints	391	21%
Partially Vacant, No Environmental Zoning Constraints	80	4%
Partially Vacant, Environmental Zoning Constraints	167	9%
Vacant, Potential Brownfield	877	46%
Total	1,910	100%

Source: E.D. Hovee and Company, LLC, 2009, Economic Opportunities Analysis Task 2/3 – Supply and Demand.

The EOA dataset includes all lands classified as vacant (including vacant and partially vacant) by the City of Portland as of January, 2009. As marine-related uses require waterfront access, a small subset of the Columbia Harbor lands analyzed in the EOA were identified and assessed for this study. In this analysis of lands available for marine-related uses, the focus is industrial lands bordering the Willamette or Columbia Rivers in the Portland Harbor. Of all vacant industrial lands identified in the EOA, only 35 sites in the Columbia Harbor geography are adjacent to the waterfront in the Portland Harbor.[114]

Of these 35 waterfront sites, 33 are evaluated in this analysis. Two larger parcels, the 41-acre McCormick and Baxter site and the 28-acre Triangle Park site, which are adjacent sites located to the northwest of the University of Portland (Sites 13 and 15 on **Map 5-1**, both indicated with hatch marks), are not anticipated to be available for industrial development due to zoning and expected use for expansion by University of Portland.[115] The Triangle Park site is owned by the University of Portland,

[114] The EOA data on vacancy is by tax lot. Often, adjacent tax lots with the same owner are included in one site (Based on spatial data from WH_sites_2004Atlas.shp: Prepared by City of Portland Bureau of Planning & Portland Development Commission by aggregating taxlots with coincident ownership). Each site, as defined by the Working Harbor Atlas data, may be larger than the sum of vacant tax lots as some of the tax lots on a site may be occupied. To assess vacant site size, this analysis only includes the acreage in vacant tax lots in each site.

[115] As identified in the City's 2001 Site Reuse Assessment Report for the McCormick and Baxter site, the redevelopment costs contamination liability, property encumbrances, and infrastructure requirements exceed market value for industrial uses. Additionally, site access to both sites is limited to streets used for residential access. Truck transportation from an industrial site would negatively impact local neighborhoods. Based on these considerations, the City in 2001 recommended that the McCormick and Baxter site be utilized for recreational purposes.

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and is intended for use as athletic fields and a waterfront trail based on settlements between EPA, University of Portland, and the previous owner, Triangle Park LLC.[116] The McCormick and Baxter site is also intended for recreational uses based on the City of Portland's Site Use Assessment Report conducted in 2001, and the University of Portland has shown interest in acquiring this site as well.[117] These properties are removed from consideration (and highlighted in black in the **Table 5-2** below), leaving 33 vacant, waterfront sites. All of these 33 sites are zoned for industrial use.

Table 5-2 Summary of Vacant, Waterfront Sites in Portland Harbor

Site ID	Ownership	Acreage	Waterfront Length (Feet)	River Depth 150 feet from Shore (Feet)	Access to Olympic Pipeline	Acreage Not Zoned E / C / P or within Floodplain	Potential Brownfield Site
1	Becker Land Llc	2.0	1600	15	No	1.8	No
2	Union Pacific Railroad Co	1.1	505	30	No	1.1	No
3	Ash Grove Cement Co	2.8	2500	30	No	2.8	No
4	Sause Bros Inc	1.2	110	15	No	1.2	No
5	Portland City Of	8.3	600	5	No	7.3	Yes
6	Zidell Emery N Tr &	1.5	1800	15	Yes	1.5	No
7	Tanker Basin Llc	1.2	340	25	Yes	0.7	No
8	Atc Leasing Co Llc	1.1	335	20	No	1.0	Yes
9	Port Of Portland	2.8	1005	20	No	2.3	No
10	Gatx Terminals Corp	1.8	410	25	Yes	1.7	No
11	Genstar Roofing Co Inc	0.9	580	20	Yes	0.9	No
12	Atofina Chemicals Inc	59.4	3050	20	Yes	9.3	Yes
13	Triangle Park Llc	27.6	2800	20	No	18.4	Yes
14	Siltronic Corp	37.5	1450	30	Yes	27.2	Yes
15	Mc Cormick & Baxter Creosoting	40.9			No	6.4	Yes
16	Northwest Natural Gas Co	13.5	1205	35	Yes	7.0	Yes
17	Transloader International	2.3	620	35	Yes	1.7	Yes
18	Langley St Johns Llc	7.2	550	20	No	2.9	Yes
19	Port Of Portland	6.5	590	25	No	2.9	No
20	Linnton Plywood Assn	22.6	1850	25	Yes	5.5	Yes
21	Babcock Land Company Llc	1.3	560	10	Yes	1.2	No
22	R K Storage &	1.1	540	5	Yes	1.1	Yes
23	Owens Corning Roofing &	12.2	1030	20	Yes	6.8	Yes
24	Lacamas Laboratories Inc	0.4	340	15	No	0.4	No
25	Portland General Electric Co	1.4	75	10	Yes	1.1	No
26	Morrison Oil Co	1.1	420	15	No	1.1	No
27	Schnitzer Invest Corp	8.3	1400	30	No	12.4	Yes
28	Rhodia Inc	13.2	1750	20	No	12.1	Yes
29	Time Oil Co	43.4	560	30	No	35.7	Yes
30	Portland General Electric Co	11.4	1140	5	Yes	10.0	Yes
31	Port Of Portland	19.1	980	20	No	7.8	No

[116] EPA, Superfund, Website (http://www.epa.gov/superfund/sites/) accessed January 6, 2010.

[117] Bureau of Planning. City of Portland. 2001, McCormick and Baxter Site Reuse Assessment: Final Report.

Site ID	Ownership	Acreage	Waterfront Length (Feet)	River Depth 150 feet from Shore (Feet)	Access to Olympic Pipeline	Acreage Not Zoned E / C / P or within Floodplain	Potential Brownfield Site
32	Port Of Portland	4.8	940	20	No	4.8	No
33	Graphic Packaging	2.5	2130	20	No	2.5	Yes
34	Inland Holdings Inc	1.3	865	20	No	1.3	No
35	Private	3.3	160	10	Yes	2.5	Yes

Sites 13 and 15 highlighted in black are not available for industrial development based on expected recreational land use.Nearly all of the 33 vacant sites are located in Portland Harbor, but a few are located in the Rivergate industrial district with access to the Columbia River (for simplicity, hereafter all 33 sites will be referred to as Portland Harbor sites). To assess suitability for specific marine-related uses, these sites were further assessed based on the suitability characteristics identified in Section 4: size, access to infrastructure (rail, truck routes, and pipelines), waterfront characteristics (channel depth and shoreline length), natural resource constraints, and contamination.

The suitability of the 33 available sites for marine-related use is assessed below using the spatial dataset developed for the EOA as well as supplemental information on transportation infrastructure, channel depth, and waterfront access. Site characteristics related to size, ownership, waterfront access, proximity to infrastructure, environmental zoning constraints, and brownfield development constraints are summarized below.

5.3.1 Site Size

Based on the EOA data, there are 33 sites of vacant, waterfront land in Portland Harbor.[118] As indicated in **Map 5-1**, there are a few vacant waterfront sites that are located close to each other that could potentially be aggregated into larger sites.[119] Several were identified that could be aggregated to existing sites, these include two sites (Sites 18 and 19) that could be aggregated to the Port of Portland's Terminal 4. One of these sites (Site 19) is already owned by the Port, while the other site is currently owned by Langley St. Johns LLC (Site 18) and could potentially also be aggregated to Terminal 4.[120] Together, these two sites represent 14 acres of vacant property. Two other sites with aggregation potential for the Port of Portland include the Time Oil site (Site 29) and a property owned by Schnitzer Investment Corporation (Site 27), which together represent nearly 52 acres. Henceforth in this analysis, these sites remain aggregated into two sites of 14 and 52 acres (rather than 4 individual sites) such that the analysis considers 31 sites.

One other site with aggregation potential is the Linnton Plywood site (Site 20), which may potentially be acquired by Arco/BP and aggregated with its adjacent, existing terminal operation located to the south. As this site would be aggregated to a developed site, rather than aggregated with another vacant site, it was not aggregated for the purposes of this analysis.

On the 31 vacant waterfront sites in Portland Harbor, there are a total of 300 acres. The average site size is approximately 10 acres. However, 65 percent of all sites are less than 5 acres in size, less than the minimum typically required for marine-related uses. Ten sites (31 percent) are larger than 10 acres, and three sites (nine percent) are larger than 30 acres. No sites are larger than 60 acres, which is less than the size suitable for most marine cargo uses as described in **Section 4**.

Figure 5-1 presents the size distribution of the 31 sites of vacant, waterfront industrial lands in Portland Harbor. **Table 5-3** presents summary statistics for each size category. **Map 5-1** provides an overview of the location and size of these sites.

[118] Note that the there are 39 tax lot parcels in the EOA data that are vacant and located on the waterfront. These tax parcels, and adjoining vacant tax parcels with common ownership as indicated by the site number from the working harbor GIS dataset, were joined together to form 33 sites.

[119] Kountz, Steve, City of Portland Planner. March 11, 2010. Personal communication with ENTRIX, Inc.

[120] Theisen, Greg, Port of Portland. May 13, 2010. Personal communication with ENTRIX staff.

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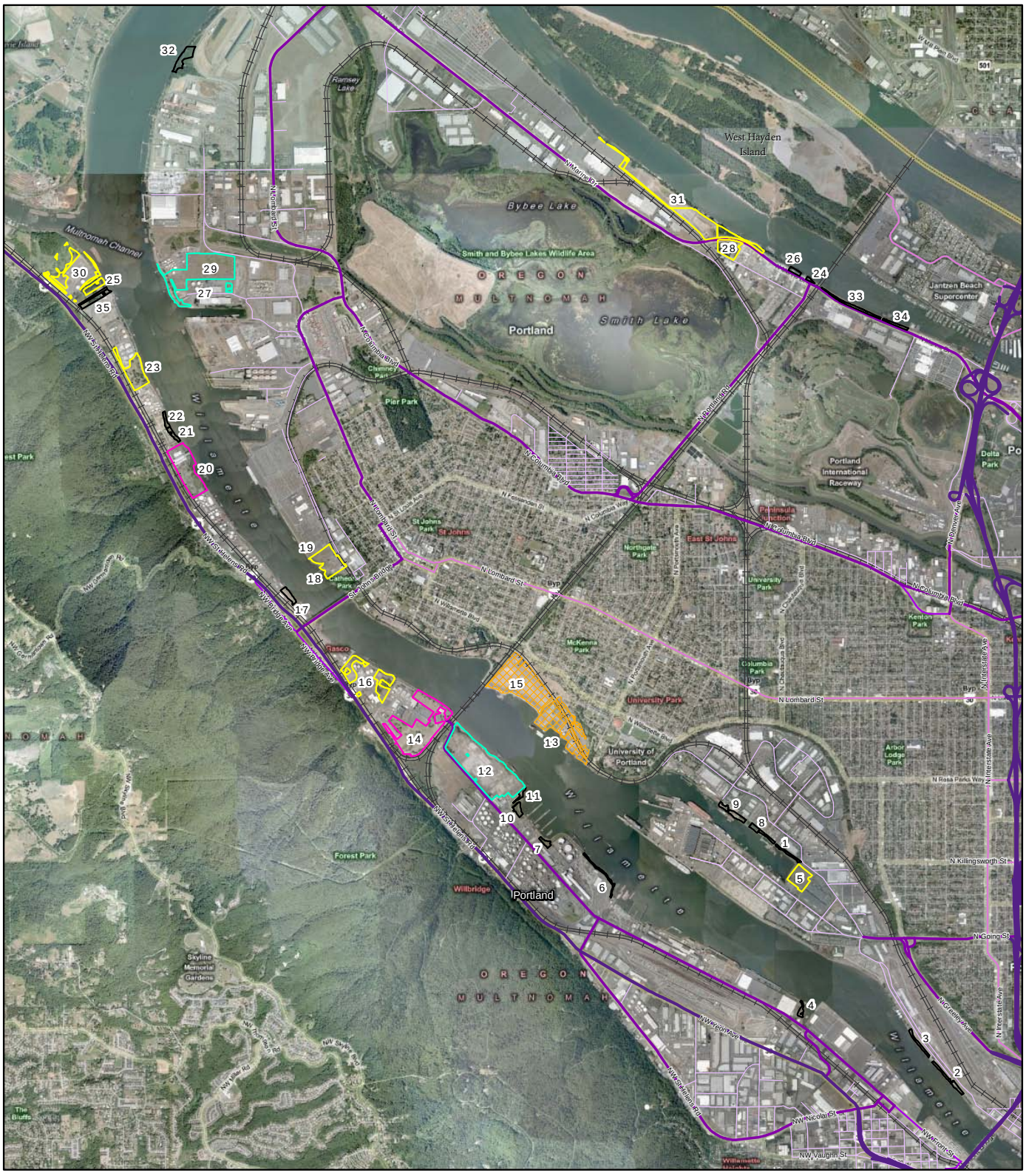

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Legend

- < 5 acres
- 5 - 20 acres
- 20 - 40 acres
- 40 - 60 acres
- University of Portland Not Considered Industrial
- Regional Truckway
- Priority Truck Street
- Major Truck Street
- Truck Access Street
- Freight District Street
- Railroad Main Line

Map 5-1
Distribution of Vacant Waterfront Parcels by Size

West Hayden Island
Economic Foundation Study

DRAFT
January 2010

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Map Projection: Mercator, WGS84

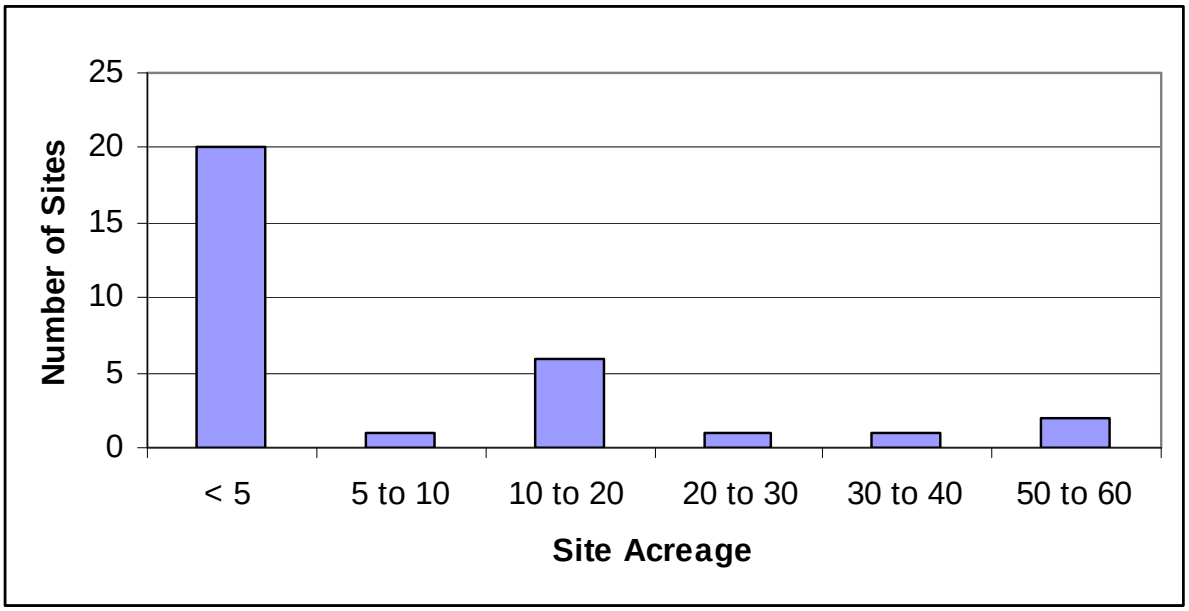


Figure 5-1 Size Distribution of Vacant, Waterfront Sites in Portland Harbor

Table 5-3 Vacant, Waterfront Parcels in Portland Harbor

Acreage Classification	Number of Parcels	Proportion of Parcels	Total Acreage	Average Size (Acres)
< 5 acres	20	65%	35.9	1.8
5 to 10 acres	1	3%	8.3	8.3
10 to 20 acres	6	19%	83.1	13.9
20 to 30 acres	1	3%	22.6	22.6
30 to 40 acres	1	3%	37.5	37.5
50 to 60 acres	2	6%	111.1	55.6
Total	31	100%	298.5	9.6

Source: Economic Opportunities Analysis Data prepared by Real Urban Geographics, ENTRIX analysis. Ownership

Ownership is also a factor for some marine-related users, and indicates whether a site would be available for sale or lease. During interviews, several Portland Harbor businesses stated that it is often more desirable to own a site, rather than lease from the port or another entity. The inventory of lands in Portland Harbor indicates that most vacant areas are owned by the private sector. A few smaller parcels are owned by the Port, the City (Bureau of Environmental Services), Utilities (Portland General Electric), or Railroads.

5.3.2 Waterfront Characteristics

The length of the waterfront and the depth of the adjacent channel are important characteristics for marine-related development. As identified in **Section 4**, waterfront of 400 feet is required for most marine-related uses, while water draft depth of at least 35 feet is required for most marine cargo uses while a draft depth of at least 20 feet is required for most barge uses.

The federal navigation channel on the Columbia River extends 11.6 miles into the Willamette River to the Broadway Bridge in Portland. The Willamette River is routinely dredged, but the last channel deepening

was in 1997. Historically, the Army Corps of Engineers has dredged 500,000 to 700,000 cubic yards of sediment from the lower Willamette navigation channel every three to five years. Other than an interim dredging action to address one site (Post Office Bar), the Army Corps has suspended dredging operations pending the outcome of the Portland Harbor Superfund cleanup. The lack of maintenance dredging over the last 13 years has resulted in shoaling of the channel, with many areas of the channel less than 40 feet deep.[121] Based on the uncertainty associated with dredging of the lower Willamette River, this analysis presents the current draft depth near vacant, waterfront areas. It is important to note however, that the channel depth at these sites could be deepened in the future, thereby increasing site suitability from a channel depth perspective.

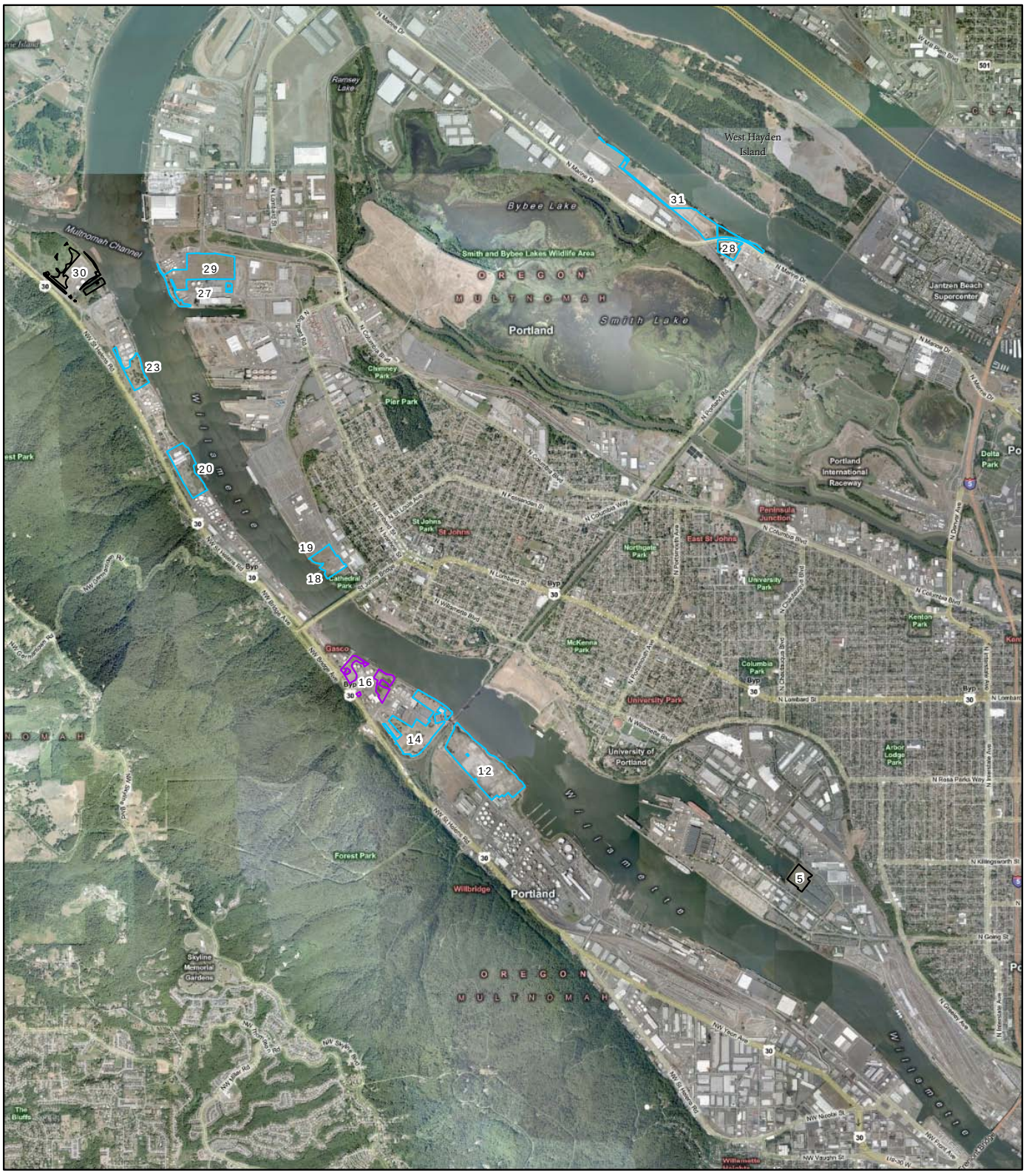
Table 5-4 summarizes channel depth and waterfront length for the 31 vacant waterfront sites. As indicated in the table, six sites have river frontage of less than 400 feet and are smaller than 5 acres in size, rendering them unsuitable for most marine industrial uses. An additional seven sites do not have access to channel depth of 20 feet within 150 feet of shore, but future dredging could remedy this shortfall. Currently, only two vacant sites have deep draft depth of 35 feet suitable for marine terminal use (one site is 2.3 acres in size while the other is 13.5 acres). **Map 5-2** presents the 11 sites indicated in the shaded area of the table that are larger than five acres and have water frontage greater than 400 feet. Of these 11 sites, nine sites currently have channel depth of 20 feet or more suitable for barge access.

Table 5-4 River Access at Vacant, Waterfront Areas (Channel Depth Measured at 150 feet from Shore)

Acreage Classification	Deep Draft Depth (Channel Depth > 35 feet River Length > 400 feet)	Barge Depth (Channel Depth > 20 feet River Length > 400 feet)	Depth Constraint (Channel Depth < 20 feet, Shoreline > 400 feet)	Shoreline Constraint (Shoreline < 400 feet))
< 5 acres	1	8	5	6
5 to 10 acres			1	
10 to 20 acres	1	4	1	
20 to 30 acres		1		
30 to 40 acres		1		
50 to 60 acres		2		
Total	2	16	7	6

Source: Economic Opportunities Analysis Data prepared by Real Urban Geographics, Lower Willamette Group GIS data, ENTRIX analysis.

[121] U.S. Army Corps of Engineers, Willamette River Dredged Material Management Plan Project, online at http://www.portlandonline.com/bps/index.cfm?&c=42601&a=145503. Port of Portland, Willamette River Dredged Material Management Plan, online at: http://www.portofportland.com/Prj_Mar_DMMP_Home.aspx.



0 0.2 0.4 0.8 1.2 1.6 Miles

0 0.9 1.8 2.7 Kilometers

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Legend

- < 20' deep
- > 20' deep
- > 35' deep

Map 5-2
Sites Larger than 5 Acres with Shoreline Greater Than 400 feet
West Hayden Island
Economic Foundation Study

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January 2010

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5.3.3 Proximity to Infrastructure

As noted in **Section 4**, proximity to intermodal transportation infrastructure is important for nearly all marine-related uses. All 31 sites in the harbor area provide good access to multi-modal transportation facilities. As noted throughout this analysis, access to intermodal transportation is a primary reason that many businesses locate in the harbor area. All of the sites identified as waterfront, vacant lands are located near a truck route and a rail line access point. In general, sites on the east side of the Willamette River are better served by rail, as they are closer to the mainline Class I rail roads running south-north and east-west from Portland.

Nearby access to freight truck routes is important for both marine cargo and marine industrial facilities. High truck volumes and tractor-trailer activity characterize industrial-serving freight movement, so efficient access to regional/interstate freight movement corridors is required. The Freight Master Plan developed by the City of Portland Office of Transportation has classified a hierarchy of five types of truck routes in Portland. As defined in the Freight Master Plan, these are:

- **Regional Truckway.** Routes for interregional and interstate movement of freight. Serves both industrial and commercial land uses via access ramps.
- **Priority Truck Street**. Principal route for truck mobility in Freight Districts, and between Freight Districts, and Regional Truckways. Provides truck access and circulation to industrial and employment land uses.
- **Major Truck Street**. Principal route for truck mobility between commercial centers and corridors. Provides truck access and circulation to regional main streets.
- **Truck Access Street.** Route for distribution of truck trips in neighborhoods. Provides truck access and circulation for delivery of goods and services to commercial and residential uses.
- **Local Truck Street.** Routes for local truck access and circulation to residents and businesses outside of the freight districts.

As illustrated in **Map 5-1**, all 31 sites in Portland Harbor have access to a priority truck street that leads to Interstate-5, which is a regional truckway. This access as well as the proximity to Interstate-5 varies by site. Sites on the east side of the Willamette River have better access to Interstate-5, and thus are preferred for those uses that rely heavily on truck transportation. Furthermore, some sites are constrained by the local level of congestion and ease of site ingress and egress. For example the Siltronic site (Site 14) has access issues, both with limited road capacity as it is at the end of a dead end road and upon exiting the site all traffic must flow back to Kittridge through the tank farms to reach Highway 30. This site of employee access constraint currently affects all westside waterfront locations, although options have been considered to construct an overcrossing to increase access to these sites.

In addition to road and rail connections, liquid bulk facilities that handle petroleum typically require access to the Olympic Pipeline which crosses the Multnomah Channel and then runs southward along the western shore of the Willamette River in the Northwest industrial district. Fifteen of the 31 vacant areas are located here, and as such are expected to have access to this pipeline. As indicated in **Table 5-5**, size of these vacant areas located near the pipeline ranges from 59 acres to just over one acre, with most sites sized less than five acres. As indicated in the shaded area of the table, six sites proximate to the Olympic pipeline are larger than 10 acres and have shoreline of at least 400 feet. One of these sites, with site size of 13.5 acres, currently has a draft depth of 35 feet that may be able to accommodate liquid bulk cargo vessels.

Table 5-5 Vacant, Waterfront Areas with Pipeline and Appropriate Shoreline Access

Acreage Classification	Number of Sites	Number of Sites with Shoreline > 400 feet
< 5 acres	9	6
10 to 20 acres	3	3
20 to 30 acres	1	1
30 to 40 acres	1	1
50 to 60 acres	1	1
Total	15	12

Source: Economic Opportunities Analysis Data prepared by Real Urban Geographics, Lower Willamette Group GIS data, ENTRIX analysis.

5.3.4 Natural Resource Constraints

As noted in **Section 4**, there are numerous types of requirements for proposed development in areas with significant natural resources and/or are located in the floodplain, which can affect the costs and required acreage for development. Analogous with the EOA study, this analysis utilizes the environmental overlay zoning by the City of Portland combined with mapping of the 100-year floodplain as an indicator of the level of natural resource constraint on development (although it is recognized that these are not the only regulations that may constrain the use of these sites). It is important to note that the City of Portland's environmental overlay zones do not prohibit development on these lands, but rather can affect the cost of development. The level of natural resource constraint is one factor among many that may affect where industrial development may occur. Every site on the river has some form of constraint, and all sites have to undergo multiple permits under various local, state and federal regulations to place development on, or near the river. Therefore, no available sites are removed from consideration due to natural resource constraints.

All vacant, waterfront sites are affected by at least one natural resource constraint. In fact, of the 300 acres of vacant, waterfront lands, over half (170 acres) are affected by some level of natural resource constraint. Sixteen sites are constrained on 90 percent or more of the site, while another five sites are constrained on 75 percent or more of the site. **Table 5-6** indicates that there are only four sites that are constrained on less than 50 percent of their area.

Table 5-6 Site Area Affected by Natural Resource Constraints

Acreage Classification	90% Constrained	75% to 90% Constrained	50% to 75% Constrained	25% to 50% Constrained	Less than 25% Constrained
< 5 acres	15	3	2		
5 to 10 acres		1			
10 to 20 acres	1	1	2	2	
20 to 30 acres					1
30 to 40 acres			1		
50 to 60 acres			1		1
Total	16	5	6	2	2

Source: Economic Opportunities Analysis Data prepared by Real Urban Geographics, ENTRIX analysis.

5.3.5 Portland Harbor Superfund

As noted in **Section 4** the Willamette River in Portland Harbor has been identified by the Environmental Protection Agency (EPA) as a Superfund site. According to the EPA, "more than a century of historical

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industrial use has resulted in Willamette River sediments being contaminated with many hazardous substances, such as heavy metals, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAH), dioxin/furans, and pesticides".[122] This designation affects all waterfront acreage from Columbia Slough to the Fremont Bridge, and presents a difficult challenge to the transfer and lease of all waterfront property in the harbor until a final cleanup plan and allocation of liability is determined. As discussed in the Portland Harbor Industrial Lands Study, many firms are reluctant to invest in riverfront and related sites until Superfund liability is resolved.

The All Appropriate Inquiries (AAI) rule establishes standards for environmental due diligence that will encourage more urban redevelopment by protecting purchasers of sites from liability for past contamination. However, the major unresolved issue with this rule is that the EPA does not review the due diligence performed by the prospective buyer. The Harbor Redevelopment Initiative (Harbor ReDI) is working to ensure that businesses can purchase sites within Portland Harbor and reduce the purchaser's liability to the Superfund site. Harbor ReDI is a multi-agency project that is aimed at developing processes and tools for restoring at least one or more contaminated sites along the Willamette River to productive industrial use with at least one site under development by 2013.[123]

Currently, the Harbor ReDI team is working with a company in the acquisition of a vacant Portland Harbor site and educating this business in the due diligence process to meet the AAI rule. Given that this business meets this AAI rule, it should separate the business's liability from in-river contamination within the water body (EPA authority) from liability for upland contamination (State authority).[124] It is hoped that this purchase will occur in the next nine months and serve as an example that the risk can be mitigated for waterfront sites along Portland Harbor.[125] However, until Superfund liability is resolved, in-water contamination will remain a limitation to redevelopment in Portland Harbor.

5.3.6 Brownfield Contamination and Redevelopment Potential

In addition to the Superfund site, there is upland contamination in the harbor area that is assessed by the Oregon Department of Environmental Quality (DEQ). The DEQ classifies a site as a brownfield if expansion on the property is complicated by actual or perceived environmental contamination. This analysis classifies a site to be a potential brownfield site if it is listed on the Environmental Cleanup Site Information (ECSI) database, the Leaking Underground Storage Tank (LUST) database, or is listed as a Portland Potential Contaminated Unit (PCU).

A site is listed in the ECSI database if there is a known or suspected contamination from a hazardous material. All sites in the ESCI database have documented, suspected, or remediated hazardous substance contamination in the groundwater, surface water, soil, and/or sediment. The DEQ adds sites to the ECSI when DEQ becomes aware of contamination or potential contamination from hazardous substances such as solvents, metals, PCBs, or petroleum hydrocarbons.[126] LUST is a listing of sites with reported releases of petroleum products from regulated underground storage tanks, unregulated underground storage tanks, and home heating oil tanks.

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122 Environmental Protection Agency. Region 10 Cleanup: Portland Harbor Website. Accessed at http://yosemite.epa.gov/R10/Cleanup.nsf/4ca19ed6a0fe79d588256ec90061cea7/75e7f27bd108f3eb88256f4a007ba018!OpenDocument.

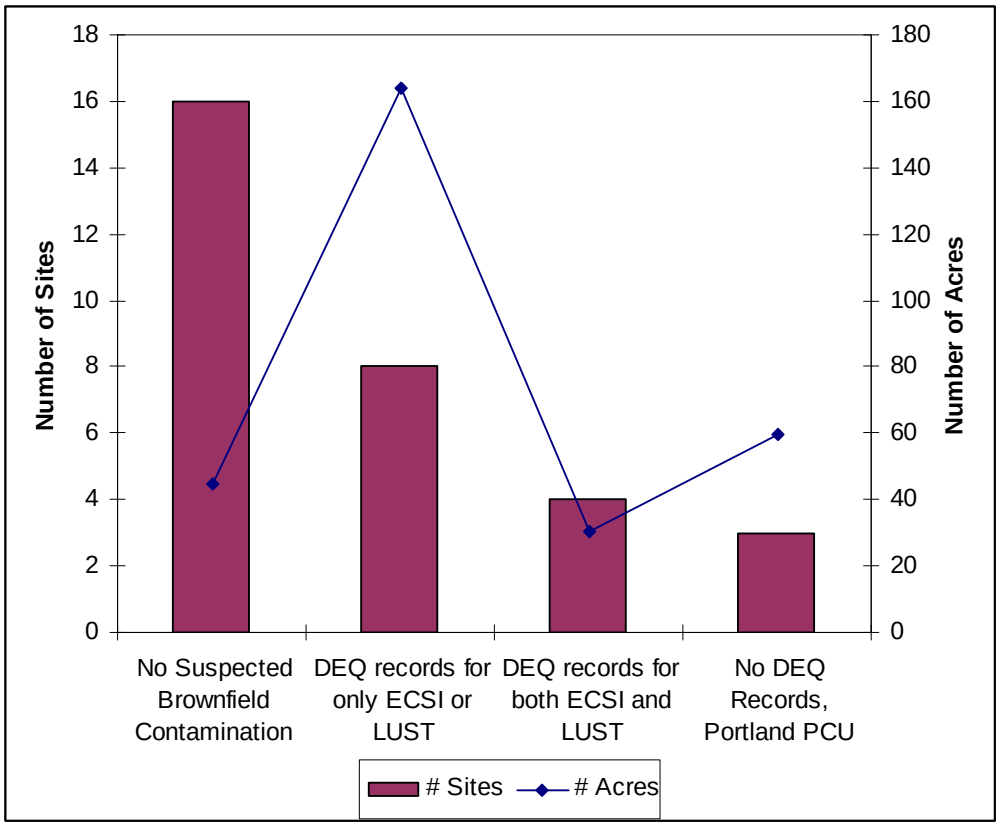
123 Portland Development Commission. Portland Harbor Redevelopment Initiative. Website (http://www.pdc.us/ura/willamette-industrial/harborredi.asp) accessed January 5, 2010.

124 Henry, Clark, City of Portland, Portland Brownfield Program, Personal communication with Lee Elder, ENTRIX, Inc., January 5, 2010.

125 Ibid.

126 Oregon Department of Environmental Quality, Land Quality: Environmental Cleanup site Information (ECSI). Accessed at www.deq.state.or.us/lq/esci/esci.htm.

The DEQ databases do not provide information on the degree of potential upland contamination, but rather the presence of a site in the database indicates that there is potential for contamination to exist at the site. As presented in **Figure 5-2** and **Map 5-3**, 15 of the 31 vacant properties, representing over 250 of the 300 available acres in Portland Harbor, are potential brownfields. For the 16 sites and 50 acres without suspected upland contamination, only one site is larger than 5 acres (Site 31), and it is owned by the Port of Portland.



Source: Economic Opportunities Analysis Data prepared by Real Urban Geographics, ENTRIX analysis.

Figure 5-2 Sites and Acreage of Contamination on Vacant Portland Harbor Sites

While there are very few vacant lands available in the Portland Harbor, particularly of any great size relative to need, liability issues surrounding the acquisition of brownfield sites limits redevelopment. Sites that are least constrained and are the easiest to develop, are typically developed first. However, as noted in the EOA, more constrained sites may be developed as they become the only options available. The EOA forecasts that in the entire Columbia Harbor geography (which includes many upland vacant sites that are not located on Portland Harbor), approximately 20 to 45 percent of sites with suspected brownfield contamination will be available for development by 2035. Assuming this same proportion of land is available for development in Portland Harbor, up to approximately 115 acres of the 270 acres in brownfield sites may be available for development.



0 0.25 0.5 1 1.5 2 Miles

0 1 2 3 Kilometers

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Legend

- No Suspected Upland Contamination
- Potential Brownfield

Map 5-3
Brownfields

West Hayden Island
Economic Foundation Study

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5.3.7 Summary of Site Inventory

As has been described in many prior documents (Portland Harbor Industrial Lands Study, Trade Capacity Analysis, Economic Opportunity Analysis), marine industrial land is in short supply in the region. In particular, large sites of 50 acres or more are rare. **Table 5-7** summarizes the characteristics of vacant waterfront sites with waterfront length of 400 feet or more. As indicated in the table, there are only eleven sites that have this access, and only four such sites that are larger than 20 acres. All four of these larger sites are identified as having not only potential Superfund liability, but also upland contamination. All of the sites also have natural resource constraints. The only two sites of 50 acres or larger are the aggregated Schnitzer/Time Oil site (Site 27 and Site 29) and the Atofina Chemicals site (Site 12). The Schnitzer/Time Oil site is 51.7 acres, with natural resource constraints on 74 percent of the property. The Atofina Chemicals site is 59.3 acres, with 9.5 acres constrained by environmental overlay zoning and floodplain restrictions. Both sites are listed in the ECSI database and are also a Portland PCU.

There is only one vacant site larger than 5 acres that is not listed as a potential brownfield due to upland contamination (Site 31). This site is owned by the Port of Portland and is 19.1 acres, and has conservation overlays and floodplain constraints on 7.8 acres.

Table 5-7 Summary of Available Sites Potentially Suitable for Marine-Related Uses

Site Size	Number of Vacant Sites Shoreline > 400 feet	Number of Vacant Sites Shoreline > 400 feet Not a Suspected Brownfield
5 to 10 acres	1	
10 to 20 acres	6	1
20 to 30 acres	1	
30 to 40 acres	1	
50 to 60 acres	2	
Total	11	1

Of the 11 sites potentially suitable for marine-related uses, there are nine sites with access to channel depths of 20 feet or more. One of these sites has access to channel depth of 35 feet or more within 150 feet of shore. This site is 13.5 acres and is owned by Northwest Natural Gas (Site 16, **Map 5-1**). Over half of the site is affected by floodplain and environmental zoning overlay restrictions, and the site is also listed as a PCU.

5.4 POTENTIAL ABSORPTION OF LAND BY NON-INDUSTRIAL USES

The State of Oregon passed legislation in the early 1970s as part of the statewide land use planning program that created urban growth boundaries to try and reduce urban sprawl.[127] In the 1980s the City of Portland created industrial sanctuaries to encourage industrial growth and protect industrial districts from incompatible uses such as housing, high density uses, and high traffic uses. The Willamette Greenway Plan (1987) created this zone, better known as the River Industrial Zone.

This zone limits the use of riverfront lands to river-dependent and river-related industry within Portland Harbor. The Willamette Greenway Plan stipulates that no building, structure, parking lots, or fills are to be

[127] City of Portland, Portland Development Commission. August 16-17, 2007. Portland Industrial Land Sanctuary Area.

located within the setback unless it can be proven to be necessary to the functioning of a river-dependent or river-related use.[128] Uses that are not river dependent or related must obtain a Greenway Goal Exemption.

Industrial sanctuary zoning does not allow housing and limits standalone retail, service, and office uses to 3,000 square feet per site or up to 25,000 square feet per site with a conditional use permit for those businesses serving industrial needs.[129] Due to this zoning, it is expected that there will be limited absorption of land by non-industrial uses in the Portland Harbor. Exceptions may include cases where brownfield or Superfund liability may preclude industrial development, or where other significant site constraints for industrial development apply (such as transportation access for the Triangle Park and McCormick and Baxter sites as discussed above).

5.5 SUMMARY OF LAND AVAILABILITY FOR MARINE USES

Section 4 identified the desired or required site characteristics for each type of marine industrial use. As noted in that section, most marine cargo uses require channel depth of 35 feet or more and sites that are 60 to over 100 acres in size. There are no sites that meet these requirements currently vacant in Portland Harbor. Assuming that future dredging enables deep draft access to all sites, there are still no sites that are large enough to accommodate a new, modern marine cargo facility. The possible exceptions are liquid bulk and local/regional dry bulk facilities that may require a smaller site.

Marine industrial uses and their site size requirements are quite varied. However, it is expected that most marine industrial uses desire sites of at least five acres, draft of 20 feet within 150 feet of shore, and a shoreline length of at least 400 feet. As indicated in **Section 4**, however, many marine industrial uses require large sites of over 100 acres. There are 11 sites in Portland Harbor that are five acres or more with shoreline length of 400 feet, of which nine have depth of 20 feet or more within 150 feet of shore. All but one of these sites are constrained as suspected brownfields. **Table 5-8** summarizes the number of available sites that may be potentially suitable for each type of marine-related use.

Waterfront vacant land suitable for marine cargo and marine industrial use is limited by site size and configuration, natural resource constraints, and contamination. There are 31 sites with 300 acres of vacant, waterfront industrial lands, of which 20 sites are smaller than five acres in size. No vacant sites are larger than 60 acres in size, which precludes development of many marine cargo uses and some marine industrial uses. There are, however, 11 sites larger than five acres that with channel deepening could become appropriate for local/regional market dry bulk or liquid bulk cargo or for marine industrial uses. All but one of these sites is a suspected brownfield, however, which constrains its suitability. Suitability of these sites for each use will depend on use-specific site requirements as well as the tolerance of the user for the potentially large liability associated with the Superfund site and upland brownfield contamination.

[128] Bureau of Planning. November 1987. Willamette Greenway Plan.
[129] City of Portland, Portland Development Commission. August 16-17, 2007. Portland Industrial Land Sanctuary Area.

Table 5-8 Available, Potentially Suitable Sites by Marine-Related Use

Marine-Related Use	Number of Available, Potentially Suitable Sites	Notes
Cargo		
Automobile	0	No vacant sites large enough to accommodate new automobile terminal and associated infrastructure.
Container	0	No vacant sites large enough to accommodate new container terminal and associated infrastructure.
Breakbulk	0	No vacant sites large enough to accommodate new breakbulk terminal and associated infrastructure.
Dry Bulk (National/International)	0	No vacant sites are large enough to accommodate a new grain or international dry bulk commodity terminal and associated infrastructure.
Liquid Bulk	0-6	There are six sites that are larger than ten acres that are located in the Northwest industrial district proximate to the Olympic pipeline. All of these sites have suspected upland contamination. Only one of these sites (it is 13.5 acres in size and is owned by Northwest Natural Gas) currently has a draft of 35 feet.
Dry Bulk (Regional/Local)	1-11	There are 11 sites in Portland Harbor that are larger than five acres and have shoreline access of 400 feet. Only one of these sites does not have suspected upland contamination, and is owned by the Port of Portland. Only one other site (it is 13.5 acres in size and is owned by Northwest Natural Gas) currently has a draft of 35 feet.
Industrial		
Vessel Related Services	1-11	There are eleven vacant sites larger than five acres in size with adequate riverfront access, of which nine sites have draft depth of 20 feet or more. Only one site does not have potential upland contamination, and is owned by the Port of Portland.
Manufacturing	0 – 11	There are eleven vacant sites larger than five acres in size, and only two sites larger than 50 acres in size. Of these sites, nine sites have draft depth of 20 feet or more. There are no vacant riverfront sites larger than 60 acres in size. All sites larger than 15 acres are affected by upland contamination.

Land Absorption and Needs Forecast

This section concludes the economic foundation study, and provides a forecast of land absorption demand by marine-related uses in Portland Harbor together with a discussion of the potential role of WHI. It draws from all preceding economic sections to evaluate the demand for additional lands for marine uses, and the potential role of WHI to meet this demand. **Section 2** described the history and economic role of the Portland Harbor area and provides the context and trends of land use and absorption by both marine cargo and marine industrial facilities. **Section 3** presented and discussed the specific cargo forecasts and associated employment that may be expected through the end of the planning period in 2040; these forecasts provide the basis for the land absorption forecast presented in this section. Furthermore, the information provided in **Sections 4 and 5** regarding the site requirements for marine-related land uses and the available land supply in Portland Harbor provide the information necessary to determine where and how growth may be accommodated.

The first two subsections forecast the land need for marine-related uses in Portland Harbor, including marine cargo and marine industrial uses. The forecast for marine cargo lands is based on an assessment of current capacity compared to forecast cargo volume. The forecast for marine industrial lands is based on past land absorption trends of marine industrial land combined with an existing forecast of land absorption in the Portland Harbor area. The final subsections focus on the availability of existing lands in Portland Harbor to meet demand compared to the suitability of WHI land and lands available at other ports.

This section focuses on the industrial lands expected to be required to meet the forecasted growth, and does not address the potential tradeoffs associated with these land uses. A discussion of these tradeoffs is provided in the Integrated Summary of the Environmental and Economic Foundation Studies.

6.1 OVERVIEW OF DATA SOURCES AND KEY ASSUMPTIONS

Key data sources for the marine cargo land absorption forecast include the 2010 BST Associates cargo forecasts and capacity assessments for Portland Harbor, as well as interviews with the Port of Portland regarding terminal capacity and future adjustments to terminal operations to meet cargo growth. Data sources for the marine industrial land absorption forecast include the 2009 Economic Opportunities Analysis (EOA) completed for the City of Portland, and the Portland Harbor Industrial Lands Study (PHILS) completed for the City of Portland in 2003.

An important assumption carried over from **Sections 4 and 5** is that future marine-related development in Portland will be similar in size and site requirements to new marine-related developments at other west coast and Lower Columbia ports. Another assumption is that the proportion of land use that is marine industrial will remain fairly constant into the future.

6.2 FORECAST OF LAND NEED FOR MARINE CARGO

Marine cargo land needs are directly related to future cargo volumes. **Table 6-1** summarizes the cargo volumes that could be expected to flow through Portland Harbor facilities by 2040, with the key assumption that there is adequate and efficient marine terminal capacity. These cargo forecasts are drawn from the forecast completed in December 2009 by BST Associates for the Port of Portland, as presented in **Section 3**. For existing cargo categories, three estimates provide (low, most likely, and high) a range of possible cargo

volume. These estimates have been supplemented by BST Associates to indicate the potential volume of cargo in containers and dry bulk if new market opportunities arise for new commodities.[130] For containers, these new markets are expected to be tied to increased intermodal traffic for regional markets, with containers handled in Portland transported to a broader market of the United States via rail. For dry bulk, these new markets would most likely be coal, iron ore, and like bulk materials that are not currently handled in Portland Harbor.

Table 6-1 Forecast Cargo Volumes for Portland Harbor

		Existing Cargo Products			New Cargo Products
Cargo	Units	Low	Most Likely	High	Potential Opportunity
Automobiles	Units	925,000	1,145,000	1,364,000	
Containers	TEU	379,000	520,000	614,000	130,000
Breakbulk	MT	1,010,000	1,181,000	1,295,000	
Grain	MT	5,647,000	6,477,000	7,059,000	
Dry Bulk	MT	6,739,000	8,525,000	9,585,000	3,000,000
National / International	*MT*	*4,650,000*	*6,054,000*	*6,733,000*	*3,000,000*
Local/Regional	*MT*	*2,089,000*	*2,471,000*	*2,852,000*	
Liquid Bulk	1,000 MT	6,912,000	7,571,000	8,011,000	

Source: BST Associates, 2010

6.2.1 Forecast Cargo Volume vs. Existing Capacity

Terminals and facilities handling marine cargo in Portland Harbor are located on both Port of Portland land and privately owned lands. The Port of Portland operates four marine cargo terminals (Terminals 2, 4, 5, and 6). These terminals handle all primary cargo categories. Terminals on private lands primarily handle liquid bulk, local/regional dry bulk, and grain cargoes. Data on capacity at these existing facilities is summarized in **Table 6-2**. The capacity estimated in **Table 2** takes into account that the annual sustainable practical capacity at terminal facilities is typically 75 to 85 percent of a terminal's maximum capacity. This is due to adjustments necessary to accommodate peak flows and seasonal variations in cargo flows, as well as recognizing that due to safety and economic considerations, terminals cannot operate at maximum capacity at all times. This practical capacity is utilized to estimate land needs based on projected cargo growth.

As liquid bulk facilities are often operated on private lands and data is difficult to obtain, the cargo volume versus capacity for this cargo type is not analyzed in the same manner for this cargo. Additionally, the annual growth forecast for liquid bulk, 0.5 percent, is lower than other cargoes, so additional capacity may not be needed for that cargo type.

[130] BST Associates. 2010. West Hayden Island Lower Columbia Port Capacity Assessment.

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Table 6-2 Acreage and Annual Cargo Capacity of Existing Terminals in Portland Harbor

Cargo	Capacity in Portland Harbor	Marine Terminal Acreage in Portland Harbor
Automobiles	675,000 Units	314
Containers	700,000 TEU	193
Breakbulk	2,100,000 MT	41
Grain	7,100,000 MT	42 (Public terminals only)
Dry Bulk	10,700,000 MT	188+
National / International	8,200,000 MT	161
Local/Regional	2,500,000 MT	27+[131]
Liquid Bulk	N/A	N/A

Source: BST Associates, 2009 and 2010, Port of Portland Marine Terminal Master Plan, Personal communication with the Port of Portland and BST Associates.
Abbreviations: TEU is twenty-foot equivalent units, MT is metric tons.

Comparing the cargo forecasts in **Table 6-1** with the estimated sustainable practical capacities in Portland Harbor does not represent the complete picture of the ability of existing facilities in Portland Harbor to meet increased demand. First, the capacity estimates in **Table 6-2** represent the likely maximum practical capacity of facilities and terminals in Portland Harbor, but do not reflect the operating constraints at these facilities that may render them uncompetitive in the future. As discussed in Section 4, trends in the marine cargo industry are for larger, more efficient facilities than those that exist in Portland Harbor. This is particularly the case for the grain and dry bulk facilities that may become outdated. Second, the capacities in **Table 6-2** represent the capacity of handling the same type of cargo being currently handled, when in reality future growth may occur in different commodities that may require different facilities and separate terminals.

The capacity for each type of cargo category (**Table 6-2**) compared to the cargo forecasted (**Table 6-1**) is discussed below.

6.2.1.1 Grain

The Port of Portland estimates the capacity of grain terminals in Portland Harbor at 7.1 million metric tons per year (MTPY). The two private grain cargo facilities in Portland Harbor are older facilities that are smaller and less efficient, and may not be able to continue competitively operating into the future.[132] These facilities have a maximum practical capacity of approximately 3.0 million MTPY. If these facilities cease operation, then the potential grain cargo through Portland Harbor may exceed capacity of grain facilities by 2020.

The new Longview grain terminal, which will have an estimated an annual practical capacity of 8 million MT when complete, is larger and more cost competitive than existing Portland Harbor terminals. The Longview terminal is located on over 100 acres and can accommodate four unit-trains, allowing for lower shipping rates from the railroads and more cost competitive overall operations. The new Longview grain terminal has a similar size, throughput capacity, and rail capability as the Kalama Export Company elevator in Kalama, previously the newest export elevator on the Columbia River.

[131] Note that this is the acreage of the JR Simplot marine cargo terminal, which receives both anhydrous ammonia from gas tank ships as well as urea from bulk transport ships and barges. There are other private dry bulk cargo terminals operating in Portland Harbor.

[132] Ports and Marine Inc, Van Sickle Allen & Associates, JWD Group, and HDR Engineering, 2003, Marine Terminal Master Plan 2020, Volume 3: Planning Inputs, Prepared for the Port of Portland. Personal communication with Paul Sorenson with Barbara Wyse on January 15, 2010.

6.2.1.2 Dry Bulk

Dry bulk cargo can be differentiated into two classes based on whether the cargo originates and terminates in a local/regional market or in a national/international market. Local/regional market dry bulks include cement, gypsum, aggregates, steel scrap, and fertilizers. The national/international market dry bulks include minerals, ores, and like products that originate or terminate in the Rocky Mountains, Midwest, or Canada. These national/international cargoes typically move by unit train to/from the Port while local/regional cargoes typically move by truck.

National/international dry bulk cargo is handled at Port of Portland Terminals 4 and 5. Soda ash is exported through Kinder-Morgan's facility at Terminal 4, while potash is exported through the Canpotex facility at Terminal 5. There are smaller, private terminals also operating in Portland Harbor handling the local/regional products such as aggregates and other materials used by the construction industry and agricultural fertilizers. One private terminal, owned and operated by Schnitzer Steel, exports shredded metal scrap in bulk form.

Total annual practical capacity is estimated at 10.7 million MTPY. There is an estimated capacity of 8.2 million MTPY at terminals handling the potash and soda ash national/international cargo, and an estimated 2.5 million MTPY practical maximum capacity at terminals handling local/regional cargo.[133] This compares to a forecasted volume of 4.7 to 9.7 million MTPY of national/international cargo by 2040 and a volume of 2.1 to 2.9 million MTPY of local/regional cargo. As noted above, these cargoes are handled by separate types of terminals and therefore should be evaluated separately.

For the national/international cargoes, volume is forecasted to exceed capacity only in the high forecast scenario in which Portland attracts a new cargo type. In this scenario, demand could exceed capacity as early as 2030. Potential new dry bulk markets include coal, iron ore, or like materials that may add another 3.0 million metric tons in dry bulk volume through Portland if terminal space is available. To attract these new markets, it is expected that additional land would be required for a new terminal. For the local/regional cargoes, volume is similarly forecasted to exceed capacity (by approximately 0.5 million MTPY) only in the high forecast scenario.

6.2.1.3 Automobile

There are three automobile terminals at the Port of Portland, with a combined annual throughput capacity of 675,000 units. There is a 100-acre Toyota facility at Terminal 4, which has a capacity of 250,000 units. Terminal 6 has two separate auto terminals for Honda and Hyundai. Honda has a 60-acre facility with a capacity of 190,000 units, while Hyundai has a 120-acre facility with annual capacity of 235,000 units. Capacity at these terminals is largely dependent on the storage capacity at the terminal as well as the length of time that vehicles stay at the terminal. Thus, suitable intermodal connections that allows efficient transfer of vehicles from the terminal is a key factor affecting capacity.

Actual throughput in 2008 at Port of Portland automobile terminals is estimated at approximately 408,000 units, down from a peak of 464,000 units in 2007.[134] Even under the low forecast scenario, potential total volume of auto imports to the Port of Portland is expected to exceed existing capacity by 2030. However, it is important to note that auto cargo volume may increase not just through increased imports by Toyota, Honda, and Hyundai, but also through other Asian automakers starting import operations in Portland. As multiple automakers do not typically operate at the same terminal, new facilities for other automakers may be required before cargo volumes reach 675,000 units.

[133] Cargo volume peaked in 2007. In that year, it is estimated that the private terminals in Portland handled 2.3 million MT local/regional cargo, and that this volume was near practical maximum capacity. Therefore, maximum practical capacity at these terminals is estimated at 2.5 million MTPY.

[134] BST Associates. 2010. West Hayden Island Marine Cargo Forecasts and Capacity Assessment, Prepared for the Port of Portland.

The date that auto cargo volumes may exceed terminal capacity largely depends on when and whether Portland attracts a new automaker. Attracting a new automaker to Portland would result in a large, sudden increase in auto imports rather than a gradual annual increase. To accommodate a new auto account in Portland Harbor, additional land would likely be required for a new terminal.

6.2.1.4 Container

The Terminal 6 container facility at the Port of Portland has an estimated annual capacity of 700,000 TEUs. Portland currently is not a large intermodal gateway for container imports railed to other parts of the country, but rather serves as a container port for the regional area. Even under the high forecast scenario, container volume for this market area is estimated to reach 614,000 TEUs by 2040. However, if Portland attracts intermodal container traffic destined for more distant markets, an additional 130,000 TEUs may be expected by 2040.[135] In this scenario, container volumes by 2040 could exceed the capacity of Terminal 6 due to constraints at the berth. If container cargo increases to the level forecast in the high scenario, then it is likely that container operations at Terminal 6 would expand into Berth 603, which is currently serving breakbulk. Breakbulk would then either be consolidated at Terminal 2, or would be handled in areas currently serving auto cargo at Terminal 6. This would either reduce the capacity of breakbulk to the 1.1 million MTPY handled at Terminal 2, or reduce the capacity of auto terminals. With the use of Berth 603, the maximum capacity for containers at Terminal 6 would increase to at least 1 million TEUs.

6.2.1.5 Breakbulk

Breakbulk cargoes are primarily handled at Port of Portland's Terminal 2 (capacity 1.1 million MTPY) and Terminal 6 Terminal 6 (capacity 1.0 million). Maximum practical capacity at these terminals is estimated at 2.1 million MTPY. The 2040 forecast for breakbulk volumes in Portland Harbor ranges from 1.0 to 1.3 million MTPY; thus potential cargo volume is not expected to exceed sustainable practical throughput capacity by 2040. However, as noted above, in the high container cargo growth forecast, demand for new container capacity could be met by converting Berth 603 from breakbulk to container use and relocating breakbulk operations either to Terminal 2 or to an area in Terminal 6 presently used by auto cargo.[136] In this case, space for breakbulk would need to be identified, likely at Terminal 6, potentially reducing acreage currently used in auto terminals. If this option were not available, then a new breakbulk facility could potentially be necessary.

6.2.1.6 Liquid Bulk

Liquid bulk facilities in Portland Harbor handle liquid chemicals such as fertilizer, but primarily consist of the petroleum bulk terminals concentrated on the west side of the Willamette River in the Linnton and Willbridge areas. This area has access to the Olympic Pipeline as well as marine, rail, and truck transportation, which are all important modes of transporting petroleum products to Oregon. The throughput capacity of these facilities to handle petroleum products is not known. However, industry interviews indicate that most facilities are fairly built out, with relatively small amounts of land available for expansion. Several operations have invested in infrastructure to increase site efficiency, including constructing pipelines between different companies operating in close proximity. Some operations are looking to expand on their existing properties. In the past, BP/ARCO has sought to purchase and expand their operations on the adjacent Linnton Plywood site, but due to the cost of remediation and potential Superfund liability, has not purchased the site. Though limited, the potential for facilities to expand on their existing acreage combined with the relatively low forecasted liquid cargo volume growth of 0.5 percent annually through 2040 indicates that there is limited

[135] BST Associates. 2010. West Hayden Island Lower Columbia Port Capacity Assessment.

[136] Daly, Jim, Port of Portland. January 20, 2010. personal communication with Barbara Wyse, ENTRIX, Inc..

additional land needed to meet projected liquid bulk cargo growth. Based on the interest shown by BP Arco to purchase the 23-acre Linnton Plywood site, the land demand for petroleum liquid bulk facilities in the energy cluster area of Linnton is estimated at approximately 25 acres.

6.2.1.7 Summary of Capacity vs. Forecasted Cargo Volume

Comparison of forecasted cargo volumes for Portland Harbor by 2040 compared to capacity at existing Portland marine terminal facilities indicates that additional lands will be required for Portland to retain and attract its full potential cargo market share. While there is still capacity for growth in most cargo areas, by 2040 cargo volumes of each type may reach the limits of existing facilities' practical capacity. Automobile cargo terminals are the most constrained, with maximum practical capacity potentially being reached as early as 2020 under the high forecast scenario. Other cargo types particularly limited are grain and dry bulk facilities. Grain is limited by the age and small size (and potential lack of competitiveness) of existing facilities, while growth in new dry bulk markets would be limited by lack of terminal capacity to accommodate a new operator. Finally, growth in container cargo for a broader regional market using intermodal transport may be limited by existing terminal capacity.

Table 6-3 summarizes existing capacity versus forecasted cargo volume. New market opportunities provided in **Table 6-1** are incorporated into the high cargo volume forecast, and one-half of the forecast new market opportunities are incorporated into the "most likely" forecast. The highlighted areas of the table indicate cargo volumes that exceed practical capacity of existing Portland cargo terminals.

Table 6-3 Forecast Cargo Volume versus Annual Cargo Capacity of Existing Terminals in Portland Harbor

			Cargo Forecast by 2040			
Cargo	Units	Practical Maximum Capacity	Low	Most Likely	High	Potential Capacity Shortfall
Automobiles	Units	675,000	925,000	1,145,000	1,364,000	250,000 – 700,000
Containers	TEU	700,000	379,000	585,000	744,000	0 - 50,000
Breakbulk	MT	2,100,000	1,010,000	1,181,000	1,295,000	0
Grain	MT	4,100,000 - 7,100,000	5,647,000	6,477,000	7,059,000	0 – 3,000,000
Dry Bulk National/international	MT	8,200,000	4,650,000	6,054,000	9,733,000	0 – 1,500,000
Dry Bulk Local / Regional	MT	2,500,000	2,089,000	2,471,000	2,852,000	0 – 500,000

Source: BST Associates, 2009 and 2010, Port of Portland Marine Terminal Master Plan, Personal communication with the Port of Portland and BST Associates.
Abbreviations: TEU is twenty-foot equivalent units, MT is metric tons.

The acreage of land potentially needed to accommodate and attract the cargo growth opportunities shaded in grey in **Table 6-3** is explored in the next section.

6.2.2 Marine Cargo Forecasted Land Need

Facility development for marine cargo uses requires long-range planning and flexibility to meet changing market conditions, including development of new markets and change in cargo volumes. To meet growing demand, ports throughout the United States have typically increased throughput capacity by building new terminals requiring new land for development. Ports around the world have also worked to increase efficiency and increase throughput at existing facilities by changing operating standards and implementing such practices as off-site storage and more efficient cargo management systems. While reducing acreage

requirements in marine areas, these practices can substantially increase operating costs and reduce competitiveness of a Port.

To retain and attract marine cargo tenants and customers, the Port of Portland must not only offer facilities that meet long-term operational requirements, but it must offer competitive and economically-efficient facilities. Additionally, to attract new tenants, the Port must be able to demonstrate that it has available facilities and land. Recently, several potential clients (such as the operator of the new grain terminal in Longview) have turned to competing ports due to the lack of large, available sites in Portland Harbor. To attract these clients, the Port likely needs to have land available for development – potentially before the specific client is known. Due to permitting processes, land designated for marine industrial uses has a long lead time to bring it into productive use. This makes it difficult to respond to markets and potential clients in a timely and flexible manner if lands are not available.

Thus, in addition to the marine cargo forecast, there are several important factors to consider when forecasting land needs for marine cargo uses. First, as suggested above, there is a feedback loop in developing new lands for marine cargo uses, as building a terminal can itself generate additional demand from new markets and new clients. Second, land need for marine terminal uses is not a gradual absorption as with most industrial land uses, but rather a sudden large absorption. A new marine terminal and associated facilities (including rail) should be constructed according to projected long-term needs and not just to satisfy short-term needs. Third, new cargo handling facilities are sometimes constructed as strategic, long-term investments by private businesses before demand exceeds capacity. Based on these factors, potential land absorption by marine cargo uses was not forecast for each year or decade, but rather forecast for the duration of the entire planning period to 2040.

A low, most likely, and high acreage need for marine cargo uses by 2040 is forecasted. This forecast is based on the marine terminal and associated infrastructure acreage that would be needed for Portland to capture its potential cargo market share as presented in **Table 6-1**. (**Section 6.4** below evaluates the availability of lands in Portland Harbor and other ports in the Lower Columbia to meet this potential need.)

As indicated in Table 3, under the low cargo forecast, automobiles are the only cargo for which cargo volume exceeds capacity. In this low forecast, potential auto cargo by 2040 exceeds capacity by 250,000 units. Existing auto import facilities at the Port of Portland and other ports have an average capacity of approximately 2,000 vehicles per year per gross acre.[137] These figures indicate that, at a minimum, approximately 150 acres (including rail yard) would be required to provide adequate terminal capacity to meet the forecast shortage of 250,000 units by 2040. This would be the total potential shortage of terminal acreage under the low cargo forecast.

Using the same methodology for the most likely and high cargo forecast scenarios, respectively, land requirements for automobile terminals by 2040 would be 260 and 370 acres. However, it is unlikely that automobile imports will grow at the same rate for each auto manufacturer. There is a need to allow for some automakers to grow faster than others, and therefore allow for the fact that some automakers may need to expand prior to others reaching capacity. Therefore, the total acreage to accommodate forecasted auto cargo growth is slightly increased for the most likely and high scenarios to 300 and 400 acres, respectively.

Under the most likely cargo forecast scenario, additional land would likely be required for automobiles (300 acres as described above) and grain. In the most likely scenario for grain cargo, it is expected that the grain terminals on private lands in Portland Harbor would cease operations during the planning period due to their age and the fact that they are very rail constrained. The grain facility at Terminal 5 will most likely remain

[137] This is slightly more annual throughput capacity per acre than recommended by recent work completed for the Port of Portland by HDR Engineering. This work assumed an annual throughput capacity of 2,000 vehicles per storage acre per year, plus additional space to accommodate terminal operations. This analysis indicated that approximately 125 acres would be required for an annual throughput of 200,000 cars.

competitive as it is a relatively modern elevator served by a major off-terminal railyard at South Rivergate, enabling it to be competitive despite a relatively small terminal footprint. Retirement of the two private grain facilities would result in a shortage of 2 to 3 million MTPY of grain cargo capacity compared to forecasted demand.

The most likely scenario would be that a new, larger grain terminal would replace the two older, private terminals that are rail constrained. These elevators handle wheat and barley but do not handle feed grains (corn and soybeans). New grain facilities are typically 100 or more acres in size and provide sufficient land for four unit trains, similar to the new facility in Longview. A new facility of this size, though necessary to provide the sufficient efficiency, would likely provide more capacity than initially required. However, other private grain terminals elsewhere in the Northwest may face similar age constraints (not accounted for in the grain cargo forecast for Portland Harbor), resulting in additional grain being handled through Portland if a new facility were constructed. Grain terminals can still be profitable when not operating at full capacity.

Under the most likely scenario, it is also anticipated that additional land would be demanded for liquid bulk facilities. As noted above, the interest shown by BP Arco to purchase the 23-acre Linnton Plywood site indicates a land demand for petroleum liquid bulk facilities in the energy cluster area of Linnton. Therefore, liquid bulk land demand is estimated at approximately 25 acres in the most likely and high scenarios.

Finally, under the high demand forecast, cargo volume is forecast to exceed capacity for cars, containers, grain, and dry bulk. As estimated above, approximately 400 acres is required to provide capacity for forecast automobile cargo. If Portland attracts new container traffic for a broader geographic area, then additional capacity could be required at Terminal 6 to handle this additional volume. As noted above, this additional capacity would likely be handled by converting Berth 603 to container use and re-locating the breakbulk cargo to another area at Terminal 6. One possible option would be to reduce acreage at one of the Terminal 6 auto terminals. Furthermore, the new lease of Terminal 6 prevents the Port of Portland from developing a new container terminal for the next 15 years.

Grain is forecast to rise to 7 million MTPY in the high forecast. A new grain facility of approximately 100 acres, as described in the most likely forecast, would provide sufficient capacity for this volume of grain.

While the volume of dry bulk cargo in the most likely forecast could be handled by existing terminals, under the high forecast a new, large terminal would be required to accommodate a new market opportunity in the national/international market. New dry bulk terminals with capacity of 5 to 8 million MTPY would likely require between 110 and 175 acres (125 acres used in **Table 6-4** below), including the associated rail infrastructure.[138] Additionally, in the high forecast scenario, growth is forecasted to exceed capacity. Depending on the product composition of the cargo increase, one or two additional small dry bulk facilities would likely need to be developed to meet this growth. Acreage requirements would likely be one or two parcels totaling approximately 30 acres of land.

Total forecasted land needs for marine cargo uses are summarized in **Table 6-4**. The forecasted land need through 2040 for the Port of Portland to retain and attract potential clients ranges from approximately 150 acres (low forecast) to approximately 665 acres (high forecast), with a most likely land need of approximately 400 acres. Though forecast by cargo type, this analysis indicates a general shortage of marine terminal land in Portland Harbor to meet cargo growth opportunities across the spectrum of waterborne products. The forecast should be interpreted as a general indication of land need across marine cargo types.

[138] HDR Engineering, Inc. 2009. West Hayden Island Terminal Site and Operation Requirements, Prepared for Port of Portland.

Table 6-4 Forecast Cargo Volume versus Annual Cargo Capacity of Existing Terminals in Portland Harbor

	Terminal Land Need Forecast by 2040 (Acres)		
Cargo	Low	Most Likely	High
Automobiles	150	300	400
Containers			
Breakbulk			
Grain		100	100
Dry Bulk National/International			125
Dry Bulk Local/Regional			30
Liquid Bulk		25	25
Total	150	425	680

This forecasted land need is relatively conservative when compared with historical marine cargo land absorption in Portland Harbor. As noted in Section 3, there have been 719 acres of land absorbed in Portland Harbor from 1974 to 2010 for marine terminals, or 20 acres annually. Assuming this same rate of land absorption over the next 30 years, there would be 600 acres of land absorbed for marine cargo uses by 2040.

6.3 FORECAST OF LAND NEED FOR MARINE INDUSTRIAL

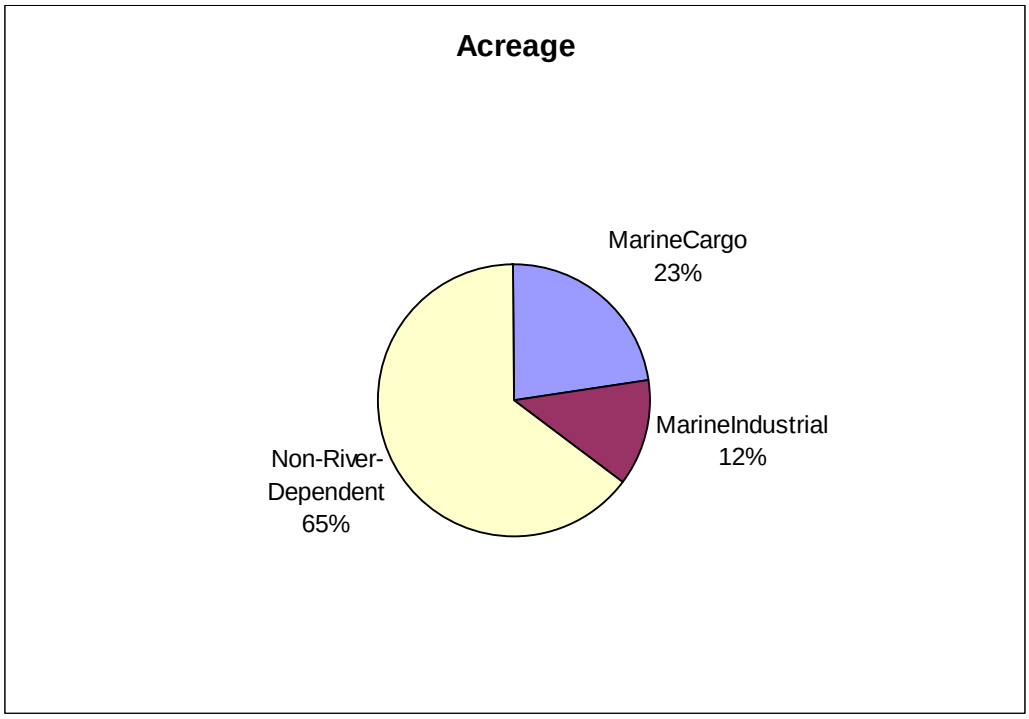
Land demand is forecast for marine industrial uses in this section. This forecast is based on the proportion of industrial lands in the Portland Harbor that are river-dependent (marine-related) as well as the employment land needs forecast in the 2009 Economic Opportunities Analysis (EOA) for the Columbia Harbor geography.

Four factors that influence which marine industrial uses will locate in the harbor area are: multimodal distribution infrastructure, industry clusters, heavy industrial character, and central urban location.[139] Between 1960 and 1997, an average of 5.6 acres annually of marine industrial development occurred, or 1 percent annual growth.[140] As identified in the Portland Harbor Industrial Lands Study, Portland is strongly competitive for 13 industrial sectors, of which four are already located in Portland Harbor. The future rate of growth in marine industrial lands will depend on the growth of specific industries as well as the availability of suitable waterfront land. The rate of absorption of lands will also depend on which industries are attracted to Portland Harbor, as site size varies radically amongst industry groups.

6.3.1 Marine Industrial Lands and Employment in Portland Harbor

As noted in section 2, the consultant team received geospatial data and employment data within the Portland Harbor. **Figures 6-1** and **6-2** summarize the employment and acreage in river-dependent uses and/or rail-dependent uses and other uses. **Table 6-5** displays the proportion of river-dependent acreage (henceforth, river dependent uses includes uses dependent only on river and uses dependent on both river and rail) and employment that is in marine industrial and marine cargo uses.

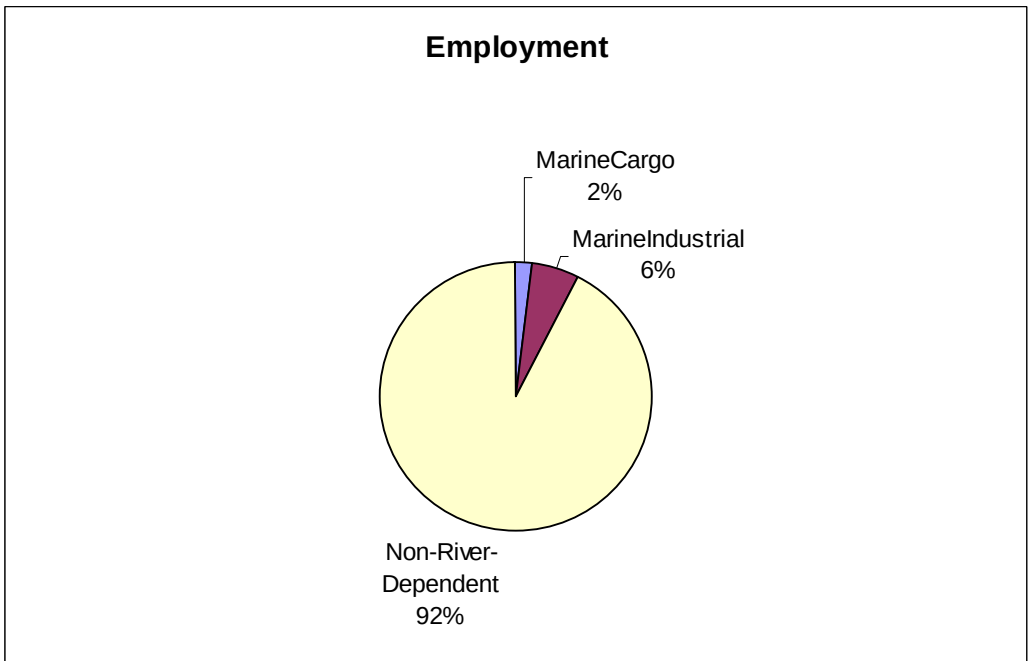
[139] Portland Bureau of Planning, 2003, Portland Harbor Industrial Lands Study, Part One: Inventories, Trends, and Geographic Context.
[140] Ibid.



Note: Excludes parcels for which no employment data were available.

Source Oregon Employment Division, 2008 Quarterly Census of Employment and Wages, City of Portland GIS, merged by Entrix, and tabulated by Bonnie Gee Yosick LLC.

Figure 6-1 Acreage for Portland Harbor Lands by Margo Cargo, Marine Industrial, and Other



Note: Excludes parcels for which no employment data were available.

Source: Oregon Employment Division, 2008 Quarterly Census of Employment and Wages, City of Portland GIS, merged by Entrix, and tabulated by Bonnie Gee Yosick LLC.

Figure 6-2 Employment for Portland Harbor Lands by River and Rail Dependency

As noted earlier, jobs on parcels classified as Marine Terminal are mostly classified as freight, with a small proportion classified as heavy manufacturing. The job density of these jobs is very low, averaging less than one job per acre, as shown in **Table 6-5**.

Table 6-5 Job Density Marine Terminal Uses

	Acres	Jobs	Job Density
Freight	978	598	0.61
Heavy Mfg	6	42	7.00
Total	984	640	0.65

Note: Excludes parcels for which no employment data were available.

Source: Oregon Employment Division, 2008 Quarterly Census of Employment and Wages, City of Portland GIS, merged by Entrix, and tabulated by Bonnie Gee Yosick LLC.

Classification of employment on land classified as marine industrial is much more diverse. Of the 751 acres of marine industrial land, employment data are available for 538 acres that provide employment for 2,067 workers across a range of industries. Over half of these employees (1,105 jobs) are classified as working in heavy manufacturing, another 644 jobs as freight, and the remainder classified as heavy transportation, services, and construction jobs. In general, parcels designated as marine-industrial are less employment-dense (average of 3.84 jobs per acre) as parcels not designated as river-dependent (average of 11.50 jobs per acre). Though not responsible for large numbers of employees, the most job-intensive of the marine-industrial categories included Services (at an average job density of 21.50 jobs per acre) and Heavy Transportation (at an average job density of 20.60 jobs per acre).

Table 6-6 Job Density Marine Industrial Uses

	Acres	Jobs	Job Density
Construction	11	67	6.09
Freight	325	644	1.98
Heavy Gov't/Public	18	4	0.22
Heavy Mfg	97	1,105	11.39
Heavy Transportation	5	103	20.60
Heavy Utilities	41	42	1.02
NOEmpsites	5	11	2.20
Services	4	86	21.50
Vacant	33	7	0.21
Total	538	2,067	3.84

Note: Excludes parcels for which no employment data were available.

Source: Oregon Employment Division, 2008 Quarterly Census of Employment and Wages, City of Portland GIS, merged by ENTRIX, and tabulated by Bonnie Gee Yosick LLC.

Table 6-7 Job Density Non-Marine Industrial Uses

	Acres	Jobs	Jobs per Acre
Construction	33	1,232	37.33
Freight	728	3,532	4.85
General Mfg	199	3,847	19.33
Gov't/Public	39	198	5.08
Greater 95	2	72	36.00
Heavy Gov't/Public	42	1,491	35.50
Heavy Mfg	451	4,358	9.66
Heavy Transportation	52	110	2.12
Heavy Utilities	10	73	7.30
Heavy Wholesale	117	1,380	11.79
Heavy mfg	5	1	0.20
M/T 2-3	202	3,018	14.94
MT_4_Plus	196	5,802	29.60
NOEmpsites	101	1,011	10.01
Repair, Rental, Laundry & Janitorial S	40	146	3.65
Retail	14	186	13.29
Services	22	419	19.05
Transportation	137	1,710	12.48
Utilities	8	61	7.63
Vacant	174	160	0.92
Wholesale	236	3,483	14.76
Total	2,808	32,290	11.50

Note: Excludes parcels for which no employment data were available.

Source: Oregon Employment Division, 2008 Quarterly Census of Employment and Wages, City of Portland GIS, merged by ENTRIX, and tabulated by Bonnie Gee Yosick LLC.

6.3.2 Forecasted Land Need

The City of Portland Economic Opportunities Analysis (EOA) forecasts an additional 16,360 jobs in the Columbia Harbor area by year 2035, with an associated requirement of 880 acres. This estimate is based on standards of square feet of space per employee (ranging from 350 square feet for office uses to 926 square feet for general industrial and 1,263 square feet for warehousing uses) and a 0.30 Floor-Area Radio (FAR).

According to the inventory, the Columbia Harbor currently contains 1,910 acres of vacant land. Using GIS data from the EOA and the City's Working Harbor analysis, it is estimated that the Portland Harbor contains 856 acres of vacant land, or approximately 45 percent of all vacant land within the Columbia Harbor area.

This analysis applied two methods to estimate land forecast for marine industrial use:

1. Apportioning EOA forecasted land need in Columbia Harbor by assuming that development occurs evenly throughout the Columbia Harbor with 45 percent occurring in Portland Harbor, and
2. Apportioning EOA forecasted land need in Columbia Harbor by assuming that 75 percent of development occurs in Portland Harbor, and

3. Apportioning EOA job forecast in Columbia Harbor to marine industrial employment based on current proportion of employment in river-dependent use, and then converting to land absorption based on job density currently observed in Portland Harbor marine industrial uses.

For both methods, intensification of development is likely as jobs and land uses become more water-dependent in the Portland Harbor.

The first way of estimating land development assumes vacant land across the Columbia Harbor geography is evenly developed. Based on this assumption, approximately 400 acres (45 percent of 880 acres) in Portland Harbor are expected to be developed by 2035 for both marine industrial and other non-river dependent uses (acreage for marine terminals is not included in the 880 acres EOA forecasted land need). As marine industrial accounts for 16 percent of the all land uses, it is estimated that approximately 60 acres (16 percent of the 400 acres forecast to be developed in the Portland Harbor) may be absorbed by marine industrial uses by 2035; this represents a low estimate of marine industrial land absorption in Portland Harbor by 2035.

With the urbanization and intensification of land uses in the Portland Harbor, as well as the greater land use per employee in Portland Harbor industries, the Portland Harbor may likely absorb a greater proportion of the forecast land development in the larger Columbia Harbor area. A high estimate of land absorption by marine industrial uses assumes that 75 percent of all land absorption in the Columbia Harbor geography occurs in Portland Harbor, or 660 acres. Assuming again that 16 percent of this is for marine industrial uses, provides a higher forecasted land absorption of approximately 100 acres for marine industrial uses by 2035. This estimate represents a 0.3 percent to 0.5 percent annual increase in industrial land use through 2035. This is still likely a conservative estimate, as attracting just one large manufacturing firm to the area could absorb this amount of land. For example, the Portland Development Commission is currently working to attract manufacturing businesses associated with the wind turbine industry that would likely require waterfront access.

A third method relies not on the land forecast from the Economic Opportunities Analysis, but on the jobs forecast of 16,350 new jobs by 2035 in the Columbia Harbor. Holding the proportion of marine industrial jobs constant in the Portland Harbor (about 6 percent of jobs estimated as marine industrial) yields about 980 marine industrial jobs by year 2035.[141] The currently observed average job density of 3.84 marine industrial jobs per acre suggests 250 acres of land in Columbia Harbor needed to accommodate these jobs. Given that the bulk of land in Columbia Harbor appropriate for marine industrial development is located within Portland Harbor, no apportionment of Columbia Harbor development to the Portland Harbor is necessary.

These methodologies suggest a range of land needs ranging from 60 to 250 acres for marine industrial activities by 2035. This corresponds to an average annual land demand of 2.4 to 10 acres. Assuming the same annual growth rate through 2040, then land needs are expected to range from 70 to 300 acres. The Portland Harbor Industrial Lands Study notes that average annual land absorption from 1960 to 1997 was 5.6 acres. If this rate were projected forward, it would suggest land need of approximately 170 acres by 2040, which falls within the range of projected land needs based on EOA forecasts.

[141] Note that this marine industrial employment growth is slightly lower than the combined marine industrial and marine terminal employment growth forecasted in Section 3.

Table 6-8 Forecast Land Need for Portland Harbor Development (Acres)

Timeframe	Low (land based)	Medium (land based)	High (jobs based)
Annual Demand	2.4	4	10
Total Demand by 2035	60	100	250
Total Demand by 2040	70	120	300

Source: Oregon Employment Division, 2008, Quarterly Census of Employment and Wages, E. D. Hovee & Company, ENTRIX, and Bonnie Gee Yosick LLC.
Note: Land projection is through 2035 as this is the time period analyzed in the Economic Opportunities Analysis.

6.4 LAND NEEDS COMPARED TO AVAILABLE LANDS INVENTORY

The discussion below compares land needs for marine cargo and marine industrial development in the Portland Harbor forecasted above to the inventory of suitable sites completed in **Section 5**.

6.4.1 Marine Cargo

Marine cargo land need is forecast to range from 150 acres to 680 acres, primarily in parcels larger than 100 acres. In the high forecast scenario, up to 30 acres of land may be required to accommodate growth in local/regional dry bulk cargo, such as aggregates or agricultural chemicals. Depending on the type of cargo product, this level growth may be accommodated in one larger or two smaller parcels. It is likely that the land requirement for this cargo type could be met by vacant lands available in the Portland Harbor, as long as business opportunities are willing to develop suspected brownfield sites with potential Superfund liabilities. As described in Section 5, the vacant lands in the harbor area include parcels of 30 acres in size, though many of them are potential brownfield sites and may be subject to liability associated with the Superfund site. Additionally, the most likely and high forecast scenarios indicate demand of approximately 25 acres for liquid bulk expansion in the Linnton area of the Portland Harbor. This demand is also subject to constraints related to contamination.

The remaining land need for marine cargo (150 acres in the low scenario, 400 acres in the most likely scenario, and 625 in the high scenario), is for parcels larger than 100 acres to accommodate rail access and ensure competitiveness. As discussed in Section 5, there are no parcels of this size available in Portland Harbor. To accommodate these new marine terminals given the currently available land supply, it is expected that the Port of Portland would need to develop land on WHI.

6.4.2 Marine Industrial

Marine industrial land need through 2035 is forecast to range from 70 to 300 acres. As discussed in Section 4, parcels for marine industrial development vary in size from 5 acres to more than 100 acres and require barge access. There are 11 parcels (263 acres) of vacant lands in Portland Harbor that are larger than five acres and adequate shoreline length. However, only one of the 11 potential sites (19 acres) does not have potential upland contamination, the presence of which carries significant costs and risks as discussed in Section 4. As noted in **Section 4,** the EOA forecasts that up to 45 percent of brownfield sites will be available for development by 2035. This indicates that in addition to the 19-acre site that is not contaminated, there may be up to 110 acres of brownfield sites that may be available, for a total of 130 acres. Thus, while Portland Harbor has available brownfield sites for redevelopment that will accommodate smaller-sized marine industrial uses, it lacks sites for large river-dependent manufacturers or other opportunities requiring uncontaminated sites on the river. This may make it difficult to attract new businesses to the region unless additional lands are available on WHI.

6.4.3 Summary of Unmet Land Needs

Forecasted demand for marine-related land uses (both marine cargo and marine industrial) ranges from 220 acres in the low forecast to 980 acres in the high forecast. Of this acreage, up to 130 acres may be accommodated on smaller parcels in the harbor area (potentially 55 acres of regional/local dry bulk terminal and liquid bulk terminal and up to 75 acres of marine industrial). Forecasted acreage demand that can not likely be satisfied in the harbor area ranges from 150 acres in the low scenario to 850 acres in the high scenario.

6.5 AVAILABILITY AND SUITABILITY OF LOWER COLUMBIA SITES

Marine cargo and marine industrial uses that desire to locate in the Portland metro area may also consider sites at other locations along the Columbia River (see **Section 2.2.3**). While the forecast of land needs is specific to Portland Harbor and does not include all Lower Columbia River forecasted land need, this section describes the suitability of WHI compared to other potential Lower Columbia marine industrial sites.

6.5.1 WHI

WHI consists of more than 800 acres of relatively undeveloped land on the western portion of Hayden Island. Hayden Island is located in the Columbia River just east of the confluence with the Willamette River. The main, deepwater channel of the Columbia River is on the north side of Hayden Island, while the North Portland Harbor is located on the south side. The Port of Portland acquired the land in 1993 for the purpose of marine industrial development. The land was designated in 1995 as Regionally Significant Industrial Area as well as a Regionally Significant Natural Area.

WHI has the land size, deepwater access, and proximity to rail and interstate infrastructure necessary for a marine terminal location. Interstate 5 bisects Hayden Island, as does the Burlington Northern Sante Fe (BNSF) mainline. As direct access to I-5 is difficult from WHI, if marine terminal development were to take place on the island it is expected that a bridge for vehicular access would be constructed connecting WHI with Marine Drive in Portland. It is also expected that rail access would be developed by integrating with the existing BNSF rail bridge on the eastern limits of the WHI. WHI is identified as regionally significant natural area and provides a large expanse of relatively undeveloped natural area within the Columbia River riparian corridor. Consequently, the primary constraint to WHI development is expected to be impact to natural resources, which is evaluated in the companion study to this economic foundation study.

A recent study conducted for the Port of Portland provides some general design guidelines for potential marine terminal development of WHI.[142] This preliminary study analyzed terminals for automobiles (75 to 140 acres), dry bulk (110 to 175 acres), liquid bulk (125 to 155 acres), and container cargo (95 to 140 acres). Conceptual designs, include rail infrastructure, were generated for these terminals. Berths for each terminal type were described, and vary from floating platforms to split-level fixed berths to a traveling loader system. All berths would be located on the north side of the island.

If the area is developed, rail infrastructure required for efficient and competitive terminals would vary by terminal type, but would include working track lengths (2,500 to 3,500 feet), storage tracks, and a railcar storage area. Regional market advantage can be achieved with rail infrastructure including 8,500 to 10,000-foot tracks. An intermodal railyard of 30 acres is included in the design concepts . Loop tracks of 8,500 feet for dry bulk facilities are also included in the design concepts for the dry bulk, liquid bulk, and grain

[142] HDR Engineering. Inc. 2009. West Hayden Island Terminal Site and Operation Requirements and Addendum 1. Prepared for Port of Portland. Accessed at http://www.portlandonline.com/bps/index.cfm?a=279953&c=51508.

terminals. Additional landside facilities that would be required on WHI include a gate complex (control point for cargo entering or leaving the terminal by road).

Two general design concepts were developed, one with a long track traversing east-west along the island parallel to the shoreline, and one with the tracks approximately extending only as far west as the power line corridor (see Addendum 1 to the Technical report). Limiting the rail footprint to the east side the BPA power line corridor increases the amount of time for trains to enter or exit the mainline tracks by approximately 25 percent due to increased curvature in the track configuration. Other operational constraints would result from this configuration, including increased labor for train handling and maneuvering, enable only one loop track of the desired 10,000 feet length, and require increased coordination between terminals.

6.5.2 Available Land at Other Lower Columbia Ports

There are four other ports located on the Lower Columbia River: St. Helens in Oregon, and Vancouver, Longview, and Kalama in Washington. Each of these ports has land available for marine terminal expansion as summarized in **Table 6-9**. The suitability of these sites for marine terminal purposes depends on the associated infrastructure, the size of the sites, natural resource constraints, and the intended land use for the sites.

Table 6-9 Lands Available for Marine Terminal Development at Other Columbia River Ports

	Available Lands		Available for Marine Terminals
Port	Port Lands	Private Lands	
Vancouver	568 - 618		718
Longview		600	600
Kalama	80 – 100		
St. Helens	200 – 450		

This analysis focuses on lands in the Ports of Longview and Vancouver as lands available at Kalama and St. Helens are unlikely to be used for marine terminal development. In Kalama, there are 80 to 100 acres vacant, but the Port is seeking users generally associated with manufacturing or processing. The St. Helens port has 200 acres available for development, but this acreage is in an energy park at Port Westward that is controlled by Portland General Electric. As such, it is not considered suitable for marine terminal development.

At the Port of Vancouver there are 718 acres available, of which 218 are in the planned Terminal 5, and 350 to 400 are in the planned Columbia Gateway. The planned Terminal 5 is located just to the west of the Port of Vancouver facilities and is expected to serve bulk and breakbulk cargoes on 140 acres. The Port is expecting that much of this facility will be used to handle increased volumes of wind turbine cargo. To serve this terminal with rail access, a unit train track is expected to be complete in 2010, which is a portion of the West Vancouver Rail Access Plan that is intended to be completed in 2017.

Another property owned by the Port of Vancouver, the Columbia Gateway property, is a 1,106-acre property, of which 350 to 400 acres may include marine terminals. A 2005 concept design for this property includes two auto facilities of 116 and 85 acres, respectively, as well as a dry bulk or grain facility on 110 acres.[143] The Port is expecting to use the Columbia Gateway site by 2018.

[143] Port of Vancouver. 2005. Developing Our Future. Vancouver Lake Watershed Partnership Power Point Presentation. Accessed at http://www.cityofvancouver.us/PublicWorks/vancouverlake/MapsMaterials/VLWP_PortPresentation_61505.pdf.

The Port of Longview is developing a new grain facility on more than 100 acres that is expected to have a capacity of 8 million MTPY. The only available parcels for additional marine terminal development are privately owned. The Chinook Ventures property has 416 acres and a dock, and may be used for cement production or other uses. It is not known if this site would potentially be available for marine terminal development. Another available, private property, Barlow Point is a private, greenfield property in Longview that is 318 acres and has rail connections to BNSF. This property has been available for sale for the last several years, and it is not known what constraints may apply to the site.

6.5.3 Summary and Comparison of Site Availability and Suitability

There are available lands and several planned facilities to accommodate forecasted growth in Columbia River cargo, including those at WHI. Land on WHI would be able to accommodate two marine cargo terminals, and would likely enable the Port of Portland to capture its potential cargo growth opportunities presented in **Section 3**. WHI provides the deepwater access, parcel size, proximity to rail and truck infrastructure, and configuration required for modern, efficient marine terminal facilities. WHI is also very suitable for marine industrial uses as it separates industrial use from residential areas and reduces the likelihood of incompatibilities or encroachment by non-industrial uses such as residential areas.

If WHI is not developed, it appears that the existing and planned terminals at ports located on the Washington side of the Lower Columbia River may be able to meet the forecasted cargo demand for the Lower Columbia (see **Table 6-10**). Under this scenario, however, it is expected that Portland would lose market share in marine cargo and associated jobs and income. Additionally, if WHI is not developed, it is expected that fewer lands will be available for marine industrial uses in Portland Harbor, resulting in less job growth in river-dependent manufacturing and other sectors dependent on marine cargo activities.

Table 6-10 2040 Cargo Forecast for the Lower Columbia River

		Portland Harbor Forecast 2040			Lower Columbia River, WA		Total Lower Columbia River
	Units	Low	Most Likely	High	2030[b]	2040[c]	Most Likely 2040
Automobiles	Units	925,000	1,145,000	1,364,000	118,000	123,000	1,268,000
Containers	TEU	379,000	520,000	614,000			520,000
Breakbulk	MT	1,010,000	1,181,000	1,295,000	294,000	295,000	1,476,000
Grain	MT	5,647,000	6,477,000	7,059,000	5,928,000	5,946,000	12,423,000
Dry Bulk	MT	6,547,000	8,524,000	1,018,000	4,355,000	4,377,000	12,901,000
Liquid Bulk	1,000 MT	6,912,000	7,571,000	8,011,000	1,282,000	1,297,000	8,868,000

a/ BST and Global Insight 2009 WHI Marine Cargo Trends and Forecasts

b/ BST and Global Insight 2009 Marine Cargo Forecast for Washington Public Ports Association

c/ Assuming growth rate from 2030 to 2040 is the same as from 2025 to 2030

6.6 SUMMARY AND IMPLICATIONS OF MARINE-RELATED DEVELOPMENT AT WHI

Provided there is adequate terminal infrastructure and land, marine cargo volume is projected to grow over the next 30 years in Portland, as is marine industrial land use. However, projected growth will not be realized if suitable lands are not available. In particular, lack of available, large developable sites suitable for marine industrial development constrains growth opportunities for marine cargo or large marine industrial manufacturers. As noted in METRO's 2009 urban growth report, the region must decide how it will

accommodate forecasted population and employment growth and what investments we are willing and able make in transportation corridors and employment areas to support long-term employment growth.[144]

Forecasted demand for marine-related land uses (both marine cargo and marine industrial) ranges from 220 acres in the low forecast to 980 acres in the high forecast. Of this acreage, up to 130 acres may be accommodated on smaller parcels in the harbor area (potentially 55 acres of regional/local dry bulk terminal and liquid bulk terminal and up to 75 acres of marine industrial). This figure is based on the available lands in the harbor area and the proportion of brownfield sites that may be available for development, as discussed in **Section 6.4.2**.

WHI is the only parcel suitable in Portland Harbor for new uses that require 100 acres or more. Development of WHI for marine terminal use would likely allow Portland to capture potential cargo opportunities forecast in **Section 3**, and associated jobs and income. Forecasted acreage demand that can not likely be satisfied in the harbor area ranges from 150 acres in the low scenario to 850 acres in the high scenario. Development on WHI for marine cargo purposes may also lead to more available lands in Portland Harbor for other industrial uses, if some existing cargo operations such as grain are consolidated at larger marine terminals. As discussed in **Section 2**, growth in these marine-related industries is a major engine for the local economy, and has implications across a variety of sectors.

In summary, to meet all projected cargo growth, particularly automobile, and provide large parcels for marine industrial growth, Portland is expected to need to develop WHI. (This assumes that there is not significant redevelopment and/or consolidation of land uses in Portland Harbor and also assumes similar future site requirements for marine cargo). If WHI is not developed, it appears that the existing and planned terminals at ports located on the Washington side of the Lower Columbia River may be able to meet the forecasted cargo demand for the Lower Columbia. Under this scenario, however, it is expected that Portland would opportunities to expand marine-related economic activity and would forfeit the associated jobs and income. Additionally, if WHI is not developed, it is expected that fewer lands will be available for marine industrial uses in Portland Harbor, potentially resulting in less job growth in marine-related manufacturing and other sectors dependent on marine cargo activities.

[144] Metro. 2009. 20 and 50 year Regional population and employment range forecasts. accessed online at: http://library.oregonmetro.gov/files/appendix_12_forecast.pdf.

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APPENDIX A

Marine Industrial Cluster and Linkage Analysis for Selected Industries

Cluster analysis—the identification of groups of firms or industry sectors that share similar suppliers, skills, markets, and workers—has been used as part of the City of Portland economic development efforts for years. The City has used the results of cluster analysis to better understand the regional economy, to focus its economic development agenda, and to identify industry partners.

Industry clusters are generally defined as geographic concentrations of interconnected companies and institutions in a particular field. They may include:

- Suppliers of specialized inputs, machinery, and services;
- Distribution channels and customers;
- Manufacturers of complementary products;
- Companies related by skills, technologies or common inputs; and
- Related institutions such as research organizations, universities, training entities, others.

Cluster efforts typically analyze various traded sectors. According to a paper on how to include economic impact information into investment decisions for transportation projects by the Economic Development Research Group (2008),[145]

> *The traded industries serve as a primary generator of wealth by producing more than can be consumed locally. However, from a transportation perspective, traded industries are important because their products are traded and hence depend on long-distance transportation connections to customers in national or international markets. As a result, any major reduction in access to customers outside the region can have serious implications for many traded industries (and therefore the broader economy). Thus, transportation's support for traded industries not only enables those industries to generate wealth for the region, but transportation becomes an important determinant of their future economic prospects.*

[145] Economic Development Research Group, Inc. 2008. Use of Freight and Business Impact Criteria for Evaluating Transportation Investments, Executive Summary. Prepared for the Portland Business Alliance and Port of Portland, Available at www.portofportland.com/.../Trade_Trans_Studies_EDR_ExecSmry.pdf.

As maritime services are not an export in and of themselves, the intent of this exercise is to explore and quantify those industries most reliant on marine terminal and harbor activities. The analysis uses the IMPLAN[146] 2007 dataset and defines the region as the four-county area, including Multnomah, Washington, and Clackamas counties in Oregon, and Clark County in Washington. In addition to being one of the most commonly used tools in economic impact analysis; IMPLAN is also frequently used for cluster analysis, by examining the relationships of industries to their buyers and suppliers. The structure of the model mimics the monetary transactions for consumption within an economy, allowing a detailed examination of the effects of transactions between businesses and between businesses and final consumers.

The top 30 industrial purchasers of water transportation services are shown in tabular form in **Appendix A** with the IMPLAN industry code and the percent represented of all industry-based intermediate commodity demand (see **Table A-1**). These results show that the two largest industrial "customers" of water transportation services are the scientific research and development services industry and flour mill and malt manufacturing industry, together accounting for over half of the intermediate industrial-based water transportation services demand. This reflects the fact that grain produced in the region relies heavily on water transportation to reach their global customers. Again, a primary challenge of this data is the fact that it is limited to the intermediate demand generated by other industrial users within the four-county region. In as much as the majority of demand is final demand from consumers and foreign and domestic trade, the conclusions derived from this data are limited.

A reverse type of analysis demonstrates the sectors upon which water transportation depends. These suppliers of intermediate inputs to the water transportation sector are linked in that some portion of their business depends upon the water transportation sector. For example, water transportation depends on fuel, and other supplies that are purchased when ships dock on the harbor. The top 30 suppliers (by gross value of goods and/or services provided) to the water transportation industry are also shown in tabular form in Appendix B along with the IMPLAN industry code and the percent the industry represents of all intermediate inputs to the water transportation industry (see **Table A-2**). Many of the industries represented in the list of suppliers are not well represented regionally. Consequently, much of the economic benefit of those purchases 'leaks' outside the region. To correct for this phenomenon, another review covers regional inputs estimated from Regional Purchase Coefficients, yielding a list more relevant to the region (**Table A-3**). The largest supplier to industries providing water transportation is Scenic and Sightseeing Transportation and Support Activities for Transportation, followed by Real Estate Services, the US Postal Service, and Couriers and Messengers.

Cluster analysis concepts were applied to the following industries in Portland Harbor that are dependent on water transportation:

- Handling of Automobiles;
- Transport Manufacturing, including barge manufacturing companies in the harbor, such as Gunderson and US Barge;
- Handling of Steel Slab;
- Petroleum; and

[146] IMPLAN is a static equilibrium input-output model first developed in 1979 by the U.S. Forest Service in cooperation with the Federal Emergency Management Agency and the U.S. Bureau of Land Management to assist the Forest Service in land and resource planning and management. The program has been updated and improved over subsequent years and is now one of the most commonly-used economic modeling tools for measuring the economic impacts of development projects.

- Paper and Cartons.

An analysis of the buyers and suppliers to these sectors shows how they are linked to the rest of the Portland economy.

Handling of Automobiles: According to the Martin report, the handling of autos accounted for 796 employees in 2006. In IMPLAN, these activities might be captured as motor vehicle parts manufacturing which accounted for nearly 2,000 employees and nearly $623 million in economic output. At nearly $61,000, its average employee compensation is about eight percent higher than the all-industry average of about $56,500. The top 30 industrial purchasers of motor parts manufacturing services are shown in **Appendix A** along with the IMPLAN industry code and the percent represented of all industry-based intermediate commodity demand (see **Table A-4**). The largest industrial "customers" of motor vehicle parts manufacturing services are the related industries of truck manufacturing and automotive repair and maintenance. The largest supplier to motor vehicle parts manufacturing industries is wholesale trade, reflecting the importance of trade and the movement of goods to this industry (see **Table A-5**).

Transport Manufacturing: Barge manufacturers in the harbor include Gunderson and US Barge. Classified as NAICS code 332312, this industry is included in IMPLAN industry group 186, described as "Plate Work and Fabricated Structural Product Manufacturing" which has 1,926 employees and nearly $572 in economic output. Earnings per worker average nearly $61,000, about the same as observed in handling of autos. The top purchasers of Plate Work and Fabricated Structural Product Manufacturing are two different sectors of Nonresidential Construction (commercial / health care structures and other nonresidential structures), followed by Transport by Water. Like Handling of Autos, a top supplier is Wholesale Trade, followed by Iron and Steel Mills.

Handling of Steel: One key element of the marine terminal activities is the handling of steel such as Schnitzer and Oregon Steel. According to the Martin report, the handling of steel slabs accounted for 676 employees in 2006, and the handling of steel breakbulk another 51. In IMPLAN, these activities might be captured as metal foundries which accounted for over 3,300 employees and over $860 million in economic output. At nearly $85,000, its average employee compensation is higher than the all-industry average of about $56,500, as was observed in transport by water and handling of autos. The largest industrial "customers" of metal foundries manufacturing services are generally durable good manufacturers, including motor vehicle parts manufacturing, pump equipment manufacturing, and equipment handling manufacturing (**Table A-6**). They might include employers in the harbor area such as Tube Forgings of America, Sulzer Pumps, NW Copper Works, Harmer Steel, and Gunderson. The largest supplier to metal foundries manufacturing industries is wholesale trade (**Table A-7**).

Handling of Petroleum: Chevron, Conoco Phillips, KinderMorgan, NuStar Energy, Northern Resources, and Western States Petroleum all operate facilities in Portland Harbor. According to the Martin report, the handling of petroleum accounted for 562 employees in 2006. In IMPLAN, these activities might be captured as petroleum distribution (which includes retail gas stations) which accounted for nearly 4,500 employees and over $540 million in economic output. At less than $20,000, its average employee compensation is just about 65 percent lower than the all-industry average of about $56,500. However, the inclusion of retail gasoline stations in the category is likely to pull down the average, despite a strong probability that compensation for employees at the private terminals handling the receipt of petroleum product is higher. The largest industrial "customers" of petroleum distribution services are the construction sectors (**Table A-8**). This phenomenon is due, in large part, to the inclusion of retail gas stations in this sector. The largest supplier to petroleum distribution manufacturing industries is real estate establishments, though these are probably lease/rent agreements for the retail gasoline stations included in this sector (**Table A-9**).

Paper and Cartons: Georgia Pacific in Rivergate and Smurfit on North Burgard Way have large operations in the harbor. According to the Martin report, the handling of paper accounted for 70 employees in 2006, and the handling of cartons another 99. In IMPLAN, these activities might be captured as the paperboard container industry which accounted for over 1,180 employees and over $405 million in economic output. At nearly $71,500, its average employee compensation is 26 percent higher than the all-industry average of about $56,500, as was observed in transport by water, handling of autos, and the handling of steel. The largest industrial "customers" of paperboard manufacturing services are other manufacturers, including a range of food and food product manufacturing, such as fruit and vegetable processing manufacturing, breweries, cookie/cracker/pasta and snack manufacturing, and some durables, such as cutlery/utensils/pot/pan manufacturing (Table A-10). The largest supplier to paperboard manufacturing industries is the wholesale trade sector, again highlighting the importance of trade and movement of goods to this industry (Table A-11). Other suppliers might include companies like Western Machine Works on North Burgard Way, which manufactures products for the pulp and paper industry

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Table A-1 Industrial Buyers of Water Transportation Services, Ranked by Value

Rank	Industry Code	Description	Percent of all Intermediate Commodity Demand
1	376	Scientific research and development services	28.46%
2	43	Flour milling and malt manufacturing	23.24%
3	170	Iron and steel mills and ferroalloy manufactu	3.58%
4	37	Construct new residential permanent site sing	2.64%
5	427	US Postal Service	2.62%
6	243	Semiconductor and related device manufacturing	2.29%
7	332	Transport by air	2.19%
8	430	* Not unique commod (S&LG passenger transit)	1.77%
9	335	Transport by truck	1.68%
10	36	Construct other new nonresidential structures	1.62%
11	39	Maint & repair construct of nonresident struc	1.43%
12	388	Services to buildings and dwellings	1.33%
13	179	Ferrous metal foundries	1.25%
14	31	Electric power generation- transmission- and	0.96%
15	319	Wholesale trade businesses	0.95%
16	63	Cookie- cracker- and pasta manufacturing	0.92%
17	34	Construct new nonresidential commercial and h	0.87%
18	66	Coffee and tea manufacturing	0.86%
19	38	Construct other new residential structures	0.80%
20	105	Paper mills	0.70%
21	54	Fruit and vegetable canning- pickling- and dr	0.68%
22	161	Ready-mix concrete manufacturing	0.63%
23	413	Food services and drinking places	0.62%
24	381	Management of companies and enterprises	0.56%
25	6	Greenhouse- nursery- and floriculture product	0.56%
26	432	Other state and local government enterprises	0.56%
27	174	Aluminum product manufacturing from purchased	0.54%
28	10	All other crop farming	0.53%
29	173	Secondary smelting and alloying of aluminum	0.49%
30	65	Snack food manufacturing	0.48%

Source: IMPLAN 2007 dataset, analyzed by Bonnie Gee Yosick, LLC.

Table A-2 Suppliers to the Water Transportation Industry Ranked by Gross Value of Goods/Services Supplied

Gross Rank	Commodity Code	Description	Percent of Gross Inputs
1	338	Scenic and sightseeing transportation and sup	15.30%
2	186	Plate work and fabricated structural product	11.71%
3	433	* Not an industry (Used and secondhand goods)	10.78%
4	360	Real estate establishments	10.16%
5	290	Ship building and repairing	6.24%
6	427	US Postal Service	5.94%
7	357	Insurance carriers	5.38%
8	339	Couriers and messengers	5.22%
9	356	Securities- commodity contracts- investments-	3.76%
10	390	Waste management and remediation services	3.10%
11	197	Coating- engraving- heat treating and allied	2.19%
12	383	Travel arrangement and reservation services	2.13%
13	377	Advertising and related services	2.07%
14	381	Management of companies and enterprises	1.99%
15	335	Transport by truck	1.28%
16	340	Warehousing and storage	1.22%
17	382	Employment services	0.93%
18	85	All other textile product mills	0.93%
19	31	Electric power generation- transmission- and	0.90%
20	351	Telecommunications	0.77%
21	374	Management- scientific- and technical consult	0.73%
22	319	Wholesale trade businesses	0.70%
23	384	Office administrative services	0.68%
24	367	Legal services	0.55%
25	389	Other support services	0.49%
26	368	Accounting- tax preparation- bookkeeping- and	0.40%
27	33	Water- sewage and other treatment and deliver	0.40%
28	332	Transport by air	0.38%
29	32	Natural gas distribution	0.37%
30	388	Services to buildings and dwellings	0.36%

Source: IMPLAN 2007 dataset, analyzed by Bonnie Gee Yosick, LLC.

Table A-3 Suppliers to the Water Transportation Industry, Ranked by Value of Goods/Services Supplied Regionally

Regional Rank	Gross Rank	Commodity Code	Description	Percent of Regional Inputs
1	1	338	Scenic and sightseeing transportation and sup	21.85%
2	4	360	Real estate establishments	14.49%
3	6	427	US Postal Service	8.80%
4	8	339	Couriers and messengers	7.45%
5	7	357	Insurance carriers	6.94%
6	10	390	Waste management and remediation services	4.77%
7	9	356	Securities- commodity contracts- investments-	4.65%
8	13	377	Advertising and related services	3.11%
9	14	381	Management of companies and enterprises	3.07%
10	12	383	Travel arrangement and reservation services	3.04%
11	15	335	Transport by truck	2.61%
12	16	340	Warehousing and storage	2.10%
13	19	31	Electric power generation- transmission- and	1.67%
14	17	382	Employment services	1.43%
15	22	319	Wholesale trade businesses	1.43%
16	11	197	Coating- engraving- heat treating and allied	1.09%
17	3	433	* Not an industry (Used and secondhand goods)	0.91%
18	24	367	Legal services	0.90%
19	21	374	Management- scientific- and technical consult	0.85%
20	20	351	Telecommunications	0.83%
21	27	33	Water- sewage and other treatment and deliver	0.82%
22	25	389	Other support services	0.75%
23	29	32	Natural gas distribution	0.73%
24	26	368	Accounting- tax preparation- bookkeeping- and	0.64%
25	30	388	Services to buildings and dwellings	0.55%
26	2	186	Plate work and fabricated structural product	0.53%
27	28	332	Transport by air	0.36%
28	34	369	Architectural- engineering- and related servi	0.26%
29	33	375	Environmental and other technical consulting	0.26%
30	35	386	Business support services	0.25%

Source: IMPLAN 2007 dataset, analyzed by Bonnie Gee Yosick, LLC.

Table A-4 Industrial Buyers of Motor Parts Manufacturing Services, Ranked by Value

Rank	Industry	Description	Percent of all Intermediate
1	278	Heavy duty truck manufacturing	43.37%
2	414	Automotive repair and maintenance- except car	10.18%
3	283	Motor vehicle parts manufacturing	6.14%
4	319	Wholesale trade businesses	4.21%
5	335	Transport by truck	3.97%
6	294	All other transportation equipment manufactur	2.36%
7	430	* Not unique commod (S&LG passenger transit)	1.89%
8	37	Construct new residential permanent site sing	1.56%
9	34	Construct new nonresidential commercial and h	1.53%
10	336	Transit and ground passenger transportation	1.48%
11	280	Truck trailer manufacturing	1.46%
12	427	US Postal Service	1.19%
13	38	Construct other new residential structures	1.16%
14	36	Construct other new nonresidential structures	0.88%
15	320	Retail Stores - Motor vehicle and parts	0.71%
16	390	Waste management and remediation services	0.58%
17	413	Food services and drinking places	0.58%
18	243	Semiconductor and related device manufacturin	0.55%
19	324	Retail Stores - Food and beverage	0.55%
20	381	Management of companies and enterprises	0.53%
21	20	Extraction of oil and natural gas	0.51%
22	329	Retail Stores - General merchandise	0.51%
23	39	Maint & repair construct of nonresident struc	0.49%
24	388	Services to buildings and dwellings	0.49%
25	205	Construction machinery manufacturing	0.48%
26	228	Material handling equipment manufacturing	0.47%
27	362	Automotive equipment rental and leasing	0.47%
28	415	Car washes	0.46%
29	282	Travel trailer and camper manufacturing	0.43%
30	327	Retail Stores - Clothing and clothing accesso	0.33%

Source: IMPLAN 2007 dataset, analyzed by Bonnie Gee Yosick, LLC.

Table A-5 Suppliers to the Motor Vehicle Parts Manufacturing Industry, Ranked by Value of Goods/Services Supplied Regionally

Regional Rank	Gross Rank	Commodity Code	Description	Percent of Regional Inputs
1	3	319	Wholesale trade businesses	20.43%
2	4	381	Management of companies and enterprises	14.17%
3	1	283	Motor vehicle parts manufacturing	10.03%
4	12	335	Transport by truck	4.37%
5	10	149	Other plastics product manufacturing	3.44%
6	20	31	Electric power generation- transmission- and	2.64%
7	28	147	Urethane and other foam product (except polys	2.11%
8	8	195	Machine shops	2.07%
9	2	170	Iron and steel mills and ferroalloy manufactu	2.05%
10	23	243	Semiconductor and related device manufacturin	2.00%
11	11	247	Other electronic component manufacturing	1.98%
12	24	376	Scientific research and development services	1.98%
13	26	356	Securities- commodity contracts- investments-	1.48%
14	38	39	Maint & repair construct of nonresident struc	1.41%
15	9	196	Turned product and screw- nut- and bolt manuf	1.11%
16	51	32	Natural gas distribution	0.99%
17	42	377	Advertising and related services	0.95%
18	43	380	All other miscellaneous professional- scienti	0.93%
19	41	360	Real estate establishments	0.93%
20	31	246	Printed circuit assembly (electronic assembly	0.90%
21	14	197	Coating- engraving- heat treating and allied	0.82%
22	50	388	Services to buildings and dwellings	0.79%
23	48	333	Transport by rail	0.78%
24	57	320	Retail Stores - Motor vehicle and parts	0.75%
25	56	366	Lessors of nonfinancial intangible assets	0.64%
26	66	413	Food services and drinking places	0.59%
27	6	180	Nonferrous metal foundries	0.58%
28	64	340	Warehousing and storage	0.57%
29	67	414	Automotive repair and maintenance- except car	0.56%
30	69	362	Automotive equipment rental and leasing	0.53%

Source: IMPLAN 2007 dataset, analyzed by Bonnie Gee Yosick, LLC.

Table A-6 Industrial Buyers of Metal Foundries Manufacturing Services, Ranked by Value

Rank	Industry Code	Description	Percent of all Intermediate Commodity Demand
1	283	Motor vehicle parts manufacturing	14.42%
2	226	Pump and pumping equipment manufacturing	9.55%
3	228	Material handling equipment manufacturing	6.84%
4	207	Other industrial machinery manufacturing	5.47%
5	333	Transport by rail	4.23%
6	209	Semiconductor machinery manufacturing	3.49%
7	170	Iron and steel mills and ferroalloy manufactu	3.46%
8	216	Air conditioning- refrigeration- and warm air	3.26%
9	198	Valve and fittings other than plumbing manufa	3.21%
10	202	Other fabricated metal manufacturing	2.92%
11	205	Construction machinery manufacturing	2.73%
12	195	Machine shops	2.71%
13	306	Surgical appliance and supplies manufacturing	2.22%
14	186	Plate work and fabricated structural product	2.13%
15	201	Fabricated pipe and pipe fitting manufacturin	2.00%
16	184	Cutlery- utensil- pot- and pan manufacturing	1.69%
17	222	Turbine and turbine generator set units manuf	1.67%
18	225	Other engine equipment manufacturing	1.65%
19	233	Fluid power process machinery manufacturing	1.60%
20	187	Ornamental and architectural metal products m	1.55%
21	273	Wiring device manufacturing	1.28%
22	294	All other transportation equipment manufactur	1.24%
23	229	Power-driven handtool manufacturing	1.19%
24	179	Ferrous metal foundries	1.09%
25	227	Air and gas compressor manufacturing	1.03%
26	185	Handtool manufacturing	1.01%
27	230	Other general purpose machinery manufacturing	1.00%
28	292	Motorcycle- bicycle- and parts manufacturing	0.98%
29	253	Electricity and signal testing instruments ma	0.91%
30	215	Heating equipment (except warm air furnaces)	0.88%

Source: IMPLAN 2007 dataset, analyzed by Bonnie Gee Yosick, LLC.

Table A-7 Suppliers to the Metal foundries Manufacturing Industry, Ranked by Value of Goods/Services Supplied Regionally

Regional Rank	Gross Rank	Commodity Code	Description	Percent of Regional Inputs
1	2	319	Wholesale trade businesses	18.00%
2	5	31	Electric power generation- transmission- and	12.68%
3	6	381	Management of companies and enterprises	10.01%
4	4	434	* Not an industry (Scrap)	4.93%
5	7	32	Natural gas distribution	4.72%
6	11	39	Maint & repair construct of nonresident struc	3.82%
7	13	335	Transport by truck	2.93%
8	8	356	Securities- commodity contracts- investments-	2.72%
9	1	170	Iron and steel mills and ferroalloy manufactu	2.40%
10	12	333	Transport by rail	2.32%
11	14	388	Services to buildings and dwellings	2.06%
12	15	380	All other miscellaneous professional- scienti	2.05%
13	10	246	Printed circuit assembly (electronic assembly	1.95%
14	18	370	Specialized design services	1.63%
15	23	414	Automotive repair and maintenance- except car	1.52%
16	21	369	Architectural- engineering- and related servi	1.38%
17	9	195	Machine shops	1.33%
18	24	417	Commercial and industrial machinery and equip	1.25%
19	25	367	Legal services	1.24%
20	26	386	Business support services	1.16%
21	27	377	Advertising and related services	1.09%
22	28	243	Semiconductor and related device manufacturin	0.99%
23	29	390	Waste management and remediation services	0.99%
24	30	382	Employment services	0.94%
25	37	413	Food services and drinking places	0.93%
26	35	340	Warehousing and storage	0.89%
27	20	354	Monetary authorities and depository credit in	0.83%
28	38	389	Other support services	0.72%
29	39	368	Accounting- tax preparation- bookkeeping- and	0.72%
30	31	351	Telecommunications	0.65%

Source: IMPLAN 2007 dataset, analyzed by Bonnie Gee Yosick, LLC.

Table A-8 Industrial Buyers of Petroleum Distribution Services, Ranked by Value

Rank	Industry Code	Description	Percent of all Intermediate Commodity Demand
1	37	Construct new residential permanent site sing	41.77%
2	38	Construct other new residential structures	13.55%
3	39	Maint & repair construct of nonresident struc	5.76%
4	361	Imputed rental activity for owner-occupied dw	4.57%
5	36	Construct other new nonresidential structures	3.94%
6	40	Maint & repair construct of residential struc	2.92%
7	414	Automotive repair and maintenance- except car	2.58%
8	34	Construct new nonresidential commercial and h	2.42%
9	413	Food services and drinking places	2.16%
10	319	Wholesale trade businesses	1.89%
11	335	Transport by truck	1.86%
12	326	Retail Stores - Gasoline stations	1.80%
13	397	Private hospitals	1.04%
14	294	All other transportation equipment manufactur	0.98%
15	283	Motor vehicle parts manufacturing	0.89%
16	394	Offices of physicians- dentists- and other he	0.74%
17	419	Personal care services	0.69%
18	295	Wood kitchen cabinet and countertop manufactu	0.39%
19	20	Extraction of oil and natural gas	0.37%
20	396	Medical and diagnostic labs and outpatient an	0.35%
21	253	Electricity and signal testing instruments ma	0.34%
22	388	Services to buildings and dwellings	0.32%
23	70	Soft drink and ice manufacturing	0.30%
24	362	Automotive equipment rental and leasing	0.30%
25	205	Construction machinery manufacturing	0.28%
26	355	Nondepository credit intermediation and relat	0.28%
27	423	Religious organizations	0.25%
28	280	Truck trailer manufacturing	0.24%
29	418	Personal and household goods repair and maint	0.23%
30	138	Soap and cleaning compound manufacturing	0.21%

Source: IMPLAN 2007 dataset, analyzed by Bonnie Gee Yosick, LLC.

Table A-9 Suppliers to the Petroleum distribution Manufacturing Industry, Ranked by Value of Goods/Services Supplied Regionally

Regional Rank	Gross Rank	Commodity Code	Description	Percent of Regional Inputs
1	1	360	Real estate establishments	19.91%
2	2	377	Advertising and related services	11.88%
3	3	31	Electric power generation- transmission- and	5.96%
4	5	319	Wholesale trade businesses	5.38%
5	7	340	Warehousing and storage	4.21%
6	4	357	Insurance carriers	3.46%
7	8	381	Management of companies and enterprises	3.21%
8	11	335	Transport by truck	3.11%
9	9	427	US Postal Service	2.98%
10	6	354	Monetary authorities and depository credit in	2.18%
11	18	39	Maint & repair construct of nonresident struc	1.97%
12	12	386	Business support services	1.88%
13	10	351	Telecommunications	1.86%
14	13	339	Couriers and messengers	1.72%
15	23	413	Food services and drinking places	1.52%
16	17	388	Services to buildings and dwellings	1.49%
17	19	382	Employment services	1.45%
18	14	355	Nondepository credit intermediation and relat	1.45%
19	20	368	Accounting- tax preparation- bookkeeping- and	1.43%
20	21	389	Other support services	1.34%
21	22	380	All other miscellaneous professional- scienti	1.29%
22	15	374	Management- scientific- and technical consult	1.27%
23	26	367	Legal services	1.06%
24	25	366	Lessors of nonfinancial intangible assets	1.02%
25	28	373	Other computer related services- including fa	0.96%
26	29	149	Other plastics product manufacturing	0.87%
27	35	414	Automotive repair and maintenance- except car	0.83%
28	32	338	Scenic and sightseeing transportation and sup	0.75%
29	34	417	Commercial and industrial machinery and equip	0.74%
30	30	326	Retail Stores - Gasoline stations	0.74%

Source: IMPLAN 2007 dataset, analyzed by Bonnie Gee Yosick, LLC.

Table A-10 Industrial Buyers of Paperboard Manufacturing Services, Ranked by Value

Rank	Industry Code	Description	Percent of all Intermediate Commodity Demand
1	54	Fruit and vegetable canning- pickling- and dr	6.71%
2	319	Wholesale trade businesses	4.38%
3	184	Cutlery- utensil- pot- and pan manufacturing	4.34%
4	70	Soft drink and ice manufacturing	4.12%
5	413	Food services and drinking places	3.39%
6	71	Breweries	3.21%
7	63	Cookie- cracker- and pasta manufacturing	3.07%
8	55	Fluid milk and butter manufacturing	3.02%
9	278	Heavy duty truck manufacturing	2.92%
10	105	Paper mills	2.81%
11	149	Other plastics product manufacturing	2.53%
12	69	All other food manufacturing	2.47%
13	65	Snack food manufacturing	2.39%
14	66	Coffee and tea manufacturing	2.34%
15	111	Sanitary paper product manufacturing	2.25%
16	62	Bread and bakery product manufacturing	1.76%
17	158	Glass container manufacturing	1.32%
18	51	Confectionery manufacturing from purchased ch	1.32%
19	246	Printed circuit assembly (electronic assembly	1.11%
20	58	Ice cream and frozen dessert manufacturing	1.03%
21	138	Soap and cleaning compound manufacturing	0.94%
22	248	Electromedical and electrotherapeutic apparat	0.89%
23	295	Wood kitchen cabinet and countertop manufactu	0.88%
24	243	Semiconductor and related device manufacturin	0.85%
25	113	Printing	0.82%
26	36	Construct other new nonresidential structures	0.79%
27	179	Ferrous metal foundries	0.78%
28	110	Stationery product manufacturing	0.74%
29	170	Iron and steel mills and ferroalloy manufactu	0.73%
30	107	Paperboard container manufacturing	0.68%

Source: IMPLAN 2007 dataset, analyzed by Bonnie Gee Yosick, LLC.

Table A-11 Suppliers to the Paperboard Manufacturing Industry, Ranked by Value of Goods/Services Supplied Regionally

Regional Rank	Gross Rank	Commodity Code	Description	Percent of Regional Inputs
1	3	319	Wholesale trade businesses	33.87%
2	4	381	Management of companies and enterprises	10.10%
3	5	335	Transport by truck	8.15%
4	6	333	Transport by rail	4.28%
5	7	31	Electric power generation- transmission- and	4.27%
6	8	360	Real estate establishments	3.23%
7	15	39	Maint & repair construct of nonresident struc	2.25%
8	9	140	Printing ink manufacturing	2.12%
9	18	32	Natural gas distribution	1.97%
10	13	243	Semiconductor and related device manufacturin	1.77%
11	20	369	Architectural- engineering- and related servi	1.53%
12	25	413	Food services and drinking places	1.53%
13	19	377	Advertising and related services	1.47%
14	21	388	Services to buildings and dwellings	1.36%
15	24	149	Other plastics product manufacturing	1.26%
16	12	246	Printed circuit assembly (electronic assembly	1.26%
17	27	362	Automotive equipment rental and leasing	1.22%
18	16	351	Telecommunications	1.16%
19	11	137	Adhesive manufacturing	1.09%
20	33	414	Automotive repair and maintenance- except car	0.90%
21	30	368	Accounting- tax preparation- bookkeeping- and	0.86%
22	31	367	Legal services	0.84%
23	38	340	Warehousing and storage	0.74%
24	34	417	Commercial and industrial machinery and equip	0.74%
25	36	366	Lessors of nonfinancial intangible assets	0.73%
26	32	411	Hotels and motels- including casino hotels	0.66%
27	23	195	Machine shops	0.59%
28	40	365	Commercial and industrial machinery and equip	0.59%
29	42	376	Scientific research and development services	0.52%
30	28	354	Monetary authorities and depository credit in	0.48%

Source: IMPLAN 2007 dataset, analyzed by Bonnie Gee Yosick, LLC.

Table A-12 Output Multipliers for Selected Industries, 2007

	Description	Type I	Type SAM Multiplier
34	Construct new nonresidential commercial and h	1.347818	1.695824
35	Construct new nonresidential manufacturing st	1.247283	1.572419
43	Flour milling and malt manufacturing	1.631547	1.812872
65	Snack food manufacturing	1.448068	1.605882
71	Breweries	1.466957	1.616010
73	Distilleries	1.282784	1.398359
93	Footwear manufacturing	1.404488	1.678583
107	Paperboard container manufacturing	1.327725	1.549690
115	Petroleum refineries	1.092528	1.151862
127	Plastics material and resin manufacturing	1.398903	1.541699
150	Tire manufacturing	1.318137	1.489358
179	Ferrous metal foundries	1.343446	1.640516
180	Nonferrous metal foundries	1.270487	1.564891
283	Motor vehicle parts manufacturing	1.385245	1.593363
290	Ship building and repairing	1.320907	1.634519
291	Boat building	1.339129	1.662660
292	Motorcycle- bicycle- and parts manufacturing	1.348357	1.532602
319	Wholesale trade businesses	1.313395	1.635329
329	Retail Stores - General merchandise	1.279351	1.629770
331	Retail Nonstores - Direct and electronic sale	1.204307	1.407589
332	Transport by air	1.381406	1.610460
333	Transport by rail	1.429962	1.679158
334	Transport by water	1.458720	1.675343
335	Transport by truck	1.372363	1.702793
336	Transit and ground passenger transportation	1.367757	1.662726
337	Transport by pipeline	1.200305	1.593843
338	Scenic and sightseeing transportation and sup	1.241495	1.667490
339	Couriers and messengers	1.141520	1.551702
340	Warehousing and storage	1.274571	1.686170
360	Real estate establishments	1.165514	1.298856
367	Legal services	1.267554	1.664331
380	All other miscellaneous professional- scienti	1.187127	1.320582
381	Management of companies and enterprises	1.406640	1.784543
388	Services to buildings and dwellings	1.286740	1.610395
394	Offices of physicians- dentists- and other he	1.279680	1.725709
411	Hotels and motels- including casino hotels	1.366223	1.666700
413	Food services and drinking places	1.373507	1.668029
414	Automotive repair and maintenance- except car	1.329171	1.654244

Source: IMPLAN 2007 dataset for the four-county Portland METRO region.

Oregon Department of Transportation

Oregon Commodity Flow Forecast

FINAL



Prepared by:

Parsons Brinckerhoff

October 14, 2009

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Introduction

As part of the planning effort leading up to the development of a statewide Freight Plan as a component of the Oregon Transportation Plan, the Oregon Department of Transportation (ODOT) has invested in an update to the statewide commodity flow forecast. This forecast will meet the needs of ODOT's first multi-modal Statewide Freight Plan with guidance from the Economic and Freight Working Group, and it will support modeling and analysis done by the ODOT Transportation Planning Analysis Unit (TPAU) and other future ODOT freight planning activities.

This report provides an overview of the methodology used to create this Oregon Commodity Flow Forecast (Oregon CFF), which aims to address the limitations of existing forecasts – inconsistent and separate databases for different modes, lack of transparency in data and assumptions, and data gaps – in a consistent methodology based on national and local data sources.

The Oregon CFF is a county level commodity flow forecast in tons and vehicles (where applicable) for truck, rail, marine, air, and pipeline modes from 2002 to 2035. Factors to convert the results to dollar value are also provided. The approach builds on the Federal Highway Administration (FHWA) Freight Analysis Framework (FAF2) national commodity flow forecast, which disaggregates the data to the sub-state level using local data and expertise on historical and forecast economic and modal trends. Local data is included to either verify that the national forecast provides accurate data for Oregon, or to modify or supplement the national data, as well as to disaggregate the data to the county level.

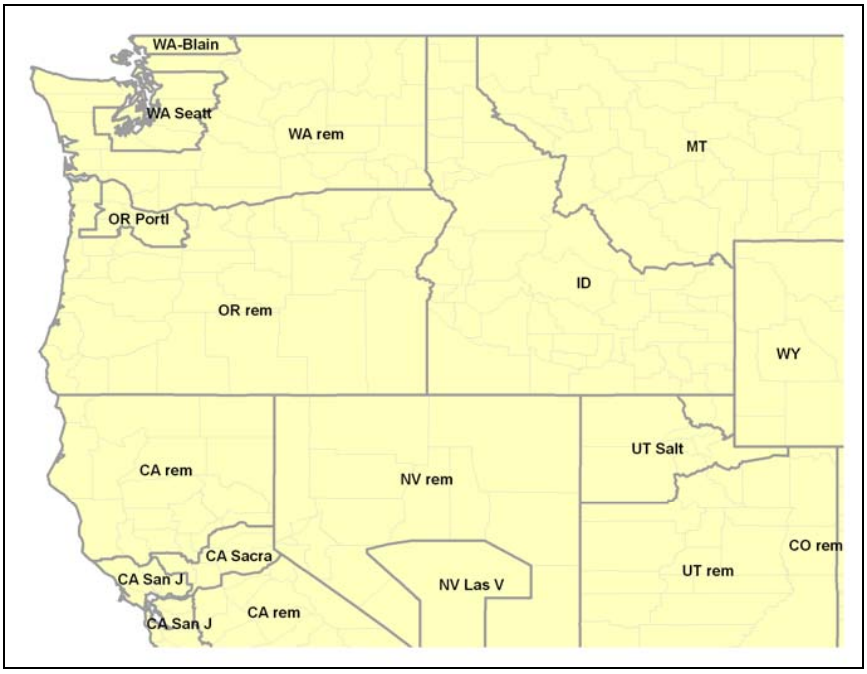
The report compares the results to other forecasts, including the prior commodity flow forecast used in the 2006 Oregon Transportation Plan (OTP), and summarizes general findings. The report first discusses the general methodology and assumptions used in the development of the Oregon CFF. That is followed by a summary of results by mode and across all modes. The report closes with a discussion about how the forecast can be modified to reflect alternative scenarios. A detailed methodology and descriptive items are contained in the appendices.

Methodology

A detailed methodology describing the data sources and processing used in the Oregon CFF is contained in Appendix A, and summarized here. The key data source for the Oregon CFF is the 2002 Freight Analysis Framework (FAF2), a national commodity flow forecast dataset published by the Federal Highway Administration (FHWA). The FHWA FAF2 commodity flow forecast was chosen because FAF2 is national in scope, highly regarded in terms of capturing interstate and international flows, uses a relatively recent base year (2002), and provides a quick way to complete a forecast in time for the Oregon Freight Plan work anticipated for Fall 2009.

FAF2 provides freight flows in tons or dollar values between 130 FAF2 regions encompassing the US for the year 2002 as well as forecasts from 2010 to 2035 in five year increments. The data is split by mode as well as by 43 commodities classified by Standard Classification Transported Goods (SCTG) codes. FAF2 regional zones are relatively coarse, as shown in Exhibit 1. Oregon is covered by two zones: Oregon Portland and Oregon Remainder. The Oregon Portland zone includes the Oregon portion of the Portland-Vancouver region covering Multnomah, Washington, Clackamas, and Yamhill Counties. The remaining 32 Oregon counties are included in the Oregon Remainder zone.

Exhibit 1. FAF2 Zones and Counties



For the Oregon CFF, the commodities were converted from SCTG classification into the Standard Transportation Commodity Code (STCC) classification to enable the use of local data sources, such as the Surface Transportation Board's Rail Waybill data.

In order to transform the coarse FAF2 zone flows into smaller geographic regions within Oregon, the data had to be disaggregated. Since the FAF2 dataset contains the whole

United States, flows with at least one trip ends within Oregon were disaggregated from FAF2 zones to Oregon counties. In the case of truck flows, this was done based on county employment and IMPLAN inter-industry coefficients. For rail flows, the FAF2 flows were compared to the Surface Transportation Board's Rail Carload Waybill data set which contains county level detail of origin and destinations. The overall numbers were found to be comparable, so the Waybill data for 2002 was used as the base, and the FAF2 growth rates were applied to obtain the forecast. The other modes relied on local data to allocate FAF2 flows to specific Oregon facilities (rail stations, airports, marine ports, or pipeline terminals), including US Corps of Engineers Waterborne Commerce data and the Oregon Energy Report. Zones outside of Oregon were aggregated from FAF2 zones to "Other Domestic" and "Other International" categories. Special consideration was made for air mail and fish commodities. The Oregon CFF methods and data are described further in Appendices A through D.

Statewide Commodity Flow Findings

The data for all the modes and years was compiled into a master database and then summarized by mode and across modes in order to study overall trends in freight. Since the base year for FAF2 is 2002, current economic trends are not reflected. The Oregon Office of Economic Analysis (OEA) Global Insight subscription forecasts (April and June 2009) show the current downturn having little to no impact on the 2035 forecasts, after a slight disruption to 2010. This should be kept in mind while reviewing the forecast values.

As shown in Exhibit 2, truck flows dominate throughout the Oregon CFF, with a share of roughly 72 to 78%. All modes retain a stable share over the forecast period. Air remains less than 0.1% in terms of overall tonnage, but represents six to 11% of flows in terms of value of all state freight movements. The Oregon CFF numbers obscure the importance of air in the state freight system as the ability to ship products by air is critical to seamless delivery of high-value products for business, industry, and personal uses. Such key commodities moved by air range from pharmaceuticals (e.g., blood and organs) to other time-sensitive deliveries (e.g., legal documents, auto parts).

The compound average growth rate (CAGR) of all Oregon freight averages 1.9% annually in tonnage, but goods are becoming more valuable, showing a 3.0% growth in value over the 2002-2035 period. Air and water grow faster than average, while pipeline and rail grow slower. For comparison, OEA forecasts of annual employment (June 2009) and population (2004) growth from 2003 to 2035 are 3.2% and 1.3%, respectively.

Exhibit 2: 2002-2035 Oregon Commodity Flow by Mode

Mode	2002	2010	2035	Growth Rate 2002-2035	Mode split 2002-2035	
Tonnage (1000s)						
Truck	259,213	294,458	508,331	2.1%	75%	78%
Rail	39,008	47,314	64,289	1.5%	11%	10%
Water	34,835	47,926	60,296	1.7%	10%	9%
Pipeline	13,599	13,436	17,401	0.7%	4%	3%
Air	236	288	767	3.6%	0.1%	0.1%
TOTAL	346,892	403,423	651,083	1.9%	100%	100%
Value (Millions of $ in 2002$)						
Truck	$159,878	$185,862	$411,465	2.9%	73%	72%
Rail	$15,631	$16,906	$27,434	1.7%	7%	5%
Water	$22,467	$31,660	$60,798	3.1%	10%	11%
Pipeline	$7,307	$6,828	$9,530	0.8%	3%	2%
Air	$13,253	$17,575	$61,408	4.8%	6%	11%
TOTAL	$218,536	$258,830	$570,635	3.0%	100%	100%

Notes: Growth Rate = Compound annual growth rate 2002-2035.
Excludes tonnage traveling through Oregon without an Oregon origin or destination.

Exhibit 3 summarizes commodity flows by direction of flow (inbound, outbound or internal). The outbound flows are growing the fastest, nearly twice the inbound flows,

reflecting the high FAF2 growth rates in domestic outbound truck flows for selected commodities.

Exhibit 3: 2002-2035 Oregon Commodity Flow Tonnage by Direction (1000 tons)

Direction	Year			Growth Rate 2002-2035
	2002	2010	2035	
Inbound	86,365	101,157	131,957	1.3%
Internal	197,993	223,356	364,482	1.9%
Outbound	62,533	78,909	154,644	2.8%

Notes: Growth Rate = Compound annual growth rate 2002-2035.

The Oregon CFF tonnage is summarized by Oregon region in Exhibit 4 and excludes pipeline flows. Overall the growth rates are relatively consistent, with Portland growing at the highest rate due to the fact that it provides a gateway, and thus an origin or destination for many state flows, resulting in compounding of flows that cause it to grow at a faster rate. Non-Portland regions are growing slightly faster than OEA population growth rate of 1.3%).

Exhibit 4: 2002-2035 Oregon Commodity Flow Tonnage by Region (1000 tons)

Oregon Region	Year			Growth Rate 2002-2035
	2002	2010	2035	
Portland	252,002	284,571	519,770	2.2%
Eastern Oregon	40,353	48,113	69,365	1.7%
Central Oregon	57,419	68,353	100,035	1.7%
Willamette Valley	100,928	119,292	174,615	1.7%
Southern Oregon	45,415	52,972	78,040	1.7%
Coastal Oregon	34,535	39,409	55,536	1.4%

Notes: Growth Rate = Compound annual growth rate 2002-2035.
Does not include pipeline flows. Internal flows counted in multiple regions
Regions defined by county groupings consistent with OEA forecasts.

Exhibit 5 shows that the top commodities shipped in terms of tonnage are: farm and associated food products (STCC 1 and 20), forest and associated wood/paper products (STCC 8, 24, 26, and 27), coal/fuels (STCC 11, 13, and 29), clay/stone/glass (STCC 32), and waste/scrap/misc shipments (STCC 40, 41, 46, 48, 49, and 50). Other sizeable commodities are transportation equipment and machinery (STCC 35 and 36), metal/metal products (STCC 33 and 34), and rubber/plastics (STCC 30). Of the larger commodities, forest and related wood/paper products as well as construction materials show lower than average growth, while equipment and rubber/plastics show higher than average growth.

Exhibit 5: 2002-2035 Oregon Tonnage by Commodity (1000 tons, all modes)

		Tonnage (1000 tons)			Growth Rate	Value ($M in 2002$)		
	STCC	2002	2010	2035	2002-2035	2002	2010	2035
1	Farm products	48,301	58,375	88,932	1.9%	$11,310	$13,941	$21,132
8	Forest products	18,033	16,470	16,888	-0.2%	$780	$713	$733
9	Fresh fish	347	414	745	2.3%	$1,617	$1,931	$3,476
10	Metallic ores	492	619	579	0.5%	$484	$648	$563
11	Coal	15,458	14,771	30,131	2.0%	$2,813	$2,671	$5,628
13	Petroleum, natural gas	5,017	5,074	8,767	1.7%	$5,765	$5,352	$8,007
14	Nonmetallic minerals	3,745	4,823	7,468	2.1%	$279	$362	$564
19	Ordnance or accessories	281	335	1,365	4.9%	$146	$174	$711
20	Food and kindred products	17,810	20,522	38,411	2.4%	$15,731	$18,345	$34,769
21	Tobacco products	486	553	1,202	2.8%	$882	$1,004	$2,182
22	Textile mill products	299	257	235	-0.7%	$5,617	$4,913	$4,544
23	Apparel & related prod	173	151	149	-0.5%	$9,985	$8,563	$7,954
24	Logs, lumber, wood prod	30,816	31,014	40,145	0.8%	$12,399	$12,445	$15,972
25	Furniture or fixtures	595	677	1,375	2.6%	$1,444	$1,635	$3,223
26	Pulp, paper, allied prod	6,603	7,150	10,325	1.4%	$5,737	$6,182	$8,822
27	Printed matter	1,236	1,310	1,657	0.9%	$2,849	$3,022	$3,821
28	Chemicals, allied products	17,354	21,721	38,210	2.4%	$13,918	$17,291	$34,775
29	Petroleum or coal prod	32,361	34,500	54,487	1.6%	$9,298	$10,013	$16,616
30	Rubber or misc plastics	1,857	2,465	5,579	3.4%	$4,928	$6,530	$14,765
31	Leather or leather prod	114	97	88	-0.8%	$702	$596	$536
32	Clay, concrete, glass, stone	100,463	128,072	168,924	1.6%	$3,458	$4,342	$5,929
33	Primary metal products	4,602	5,502	7,792	1.6%	$4,330	$5,099	$7,457
34	Fabricated metal products	3,603	4,664	9,646	3.0%	$10,019	$12,986	$27,165
35	Machinery	2,772	4,241	11,444	4.4%	$21,681	$33,017	$89,096
36	Electrical equipment	678	841	2,277	3.7%	$24,215	$30,855	$90,827
37	Transportation equipment	3,310	3,858	9,904	3.4%	$14,470	$17,596	$45,228
38	Instrum, photo/optical equip	104	111	623	5.6%	$2,154	$2,530	$13,905
39	Misc products of manuf.	1,060	1,281	4,713	4.6%	$4,084	$4,933	$17,868
	Waste/scrap(STCC40,48,49)	13,731	16,139	45,218	3.7%	$1,747	$2,083	$5,638
	Misc freight (STCC 41,46,50)	14,582	16,651	42,832	3.3%	$25,216	$28,460	$77,967
45	Shipping Containers (rail)	403	508	647	1.4%	$315	$397	$506
	Mail (STCC 43,45,47)	207	257	328	1.4%	$162	$201	$257
	TOTAL	346,892	403,423	651,083	1.9%	$218,536	$258,829	$570,635

Notes: Some rail waybill-only commodities combined with related categories, as noted.
Excludes tonnage traveling through Oregon without an Oregon origin or destination.
Growth Rate = Compound annual growth rate 2002-2035.

Truck

Of the 226 Mtons that originate as truck trips in Oregon in 2002, 85% stayed within Oregon, with the remainder shipped to the rest of the world, mainly to Washington (15.9 million short tons) and California (11.0 million short tons). The Washington flows include local trips within the Portland-Vancouver region that travel between states. This outbound truck flow is forecast to grow significantly (3.6%) while inbound and internal flows grow more slowly (1.3% and 1.8%, respectively). The outbound growth is dominated by a few commodities exhibiting significantly large domestic outbound growth.

The FAF2 truck growth forecasts imply that the currently balanced inbound (head-haul) and outbound (back-haul) flows for the state will become more outbound focused by 2035. This is primarily the result of a large growth in domestic outbound flows for the following selected commodities: farm products, food products, rubber/plastics, clay/concrete/glass/stone, fabricated metals, transportation equipment, waste/scrap, and miscellaneous freight shipments.

Even though the FAF2 Oregon Remainder zone is more than 20 times larger in area than the FAF2 Oregon Portland zone, Oregon Remainder receives only 46% more goods, receiving 133.5 million short tons in 2002 compared with Oregon Portland's 91.2 million short tons.

Clay, concrete, glass, or stone products (STCC 32) are the dominant commodity in terms of tons carried by truck, making up 41.6% of internal and 6.8% of outbound tonnage flows in 2002. FAF2 forecasts that this commodity will remain the highest tonnage level commodity transported by trucks, although its share of internal truck tons are forecast to decrease to 38.2 %. The largest outbound commodity in 2002 is machinery, excluding electrical (STCC 35), with 28.2% of all outbound flows.

Exhibit 6 shows the major shifts in commodity tonnage flows by trucks. The high growth rate of STCC13 (crude oil, natural gas or gasoline) is due to the small absolute numbers in the base year. According to FAF2, the largest growth in internal as well as inbound flows is in instruments, photo/optical goods (STCC 38), and waste/Scrap (STCC 40) is expected to grow more than 13-fold.

The FAF2 truck growth forecasts imply that the currently balanced inbound (head-haul) and outbound (back-haul) flows for the state (33.3 Mtons IB and 31.4 Mtons OB Truck), will change into a more outbound-focused balance by 2035 (50.6 Mtons IB and 101.7 Mtons OB Truck). This is primarily the result of large growth in outbound domestic flows for the following selected commodities: farm products, food products, rubber/plastics, clay/concrete/glass/stone, fabricated metals, transportation equipment, waste/scrap, and misc. freight shipments. While this growth may be optimistic, the commodities experiencing the domestic outbound growth seem reasonable. Indeed, the list includes Oregon's fastest-growing export commodities: Primary metal manufactures, Miscellaneous manufactures, and Transportation equipment all grew more than 94% between 2002 and 2006 per the Bureau of Census, Foreign Trade Division data. And

domestic demand for Oregon farm and food products and plastics is certainly strong. [1] As a result, no adjustment was made to alter these high FAF2 growth rates, keeping the integrity of the FAF2 forecast intact. It should be noted that these trends are being verified by discussions with weigh station staff and FAF2 forecasters

Exhibit 6: 2002-2035 Growth of Oregon Truck Tonnage Flows by Commodity

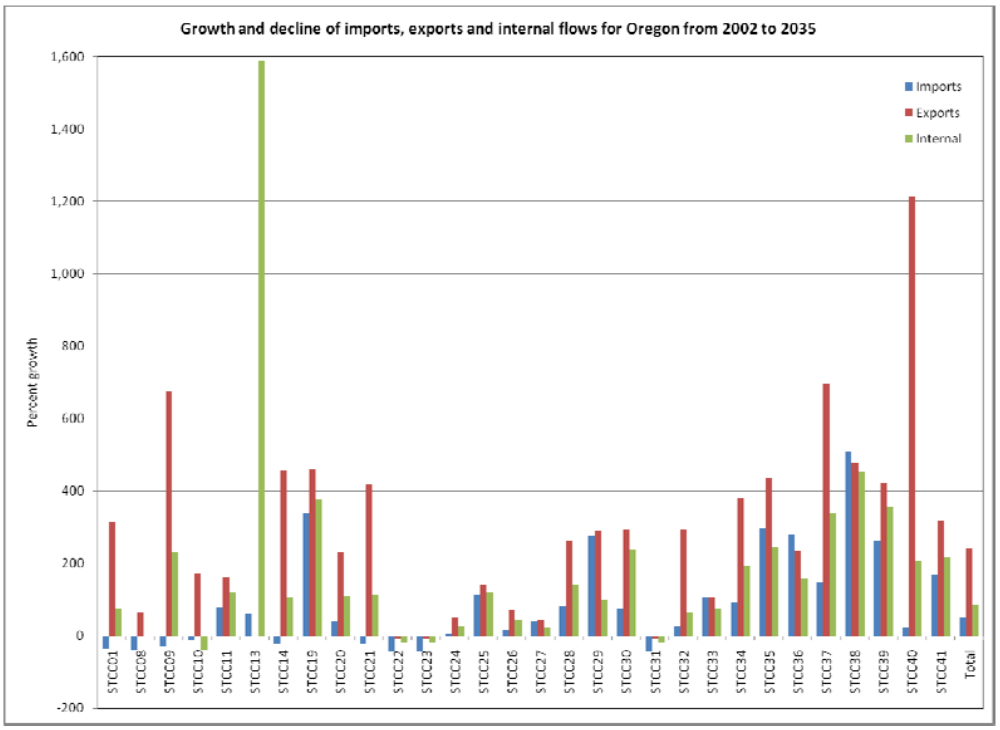
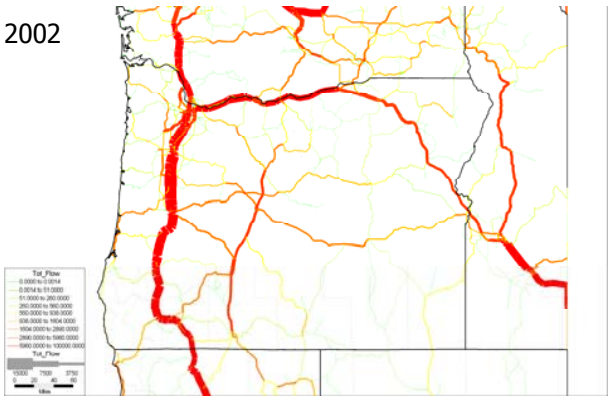


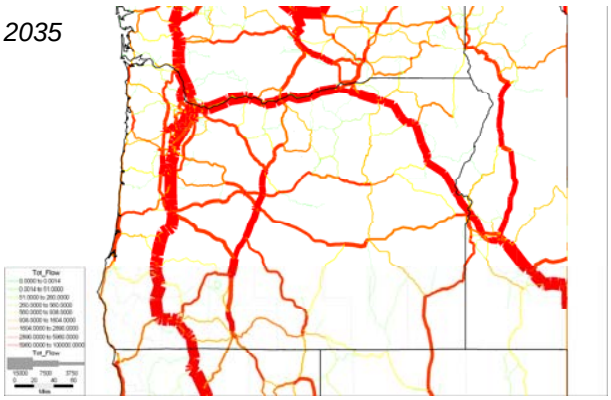
Exhibit 7 identifies the truck trips (vehicles) assigned to the Oregon network in base year 2002 and forecast year 2035. Some adjustment of FAF2 flows was required to replicate the higher flows on the north-south I-5 corridor versus the east-west I-84 corridor.

Exhibit 7: Oregon CFF Truck Assignment Results (vehicles)

2002



2035



[1] Sedcor Express: 'Oregon's domestic shipments dwarf foreign exports' May 2007
http://www.sedcor.org/pdfs/Express5_07.pdf

Rail

Approximately 25% of all rail tonnage is lumber or wood products; other top commodities include chemicals, pulp, farm products, and food products. Together, these commodities make up about 65% of all rail tonnage. By direction in 2002, 14 to 16% travel inbound-outbound to non-Portland Oregon locations, roughly in balance. The inbound flows to Portland exceed the outbound flows (29% versus 12%), while 26% of the tonnage travels through the state. The through flows include trains from Washington that travel east up the Oregon side of the Columbia River corridor without stopping in Oregon

All commodities are expected to grow over time, except for forest products, which is expected to decline by approximately 50% from 2002 to 2035.

Exhibit 8 summarizes rail tonnage in, out, within, and through Oregon, based on waybill data flow pattern and FAF2 growth rates. The largest rail tonnage for the year 2002 moved from the rest of the world (ROW) to Oregon Portland followed by through trips (origin and destination outside Oregon). The next tier of tonnage is from Oregon Remainder to the rest of the world, followed by the reverse direction, and then flows from Oregon Portland to the rest of the world. Over time, the pattern of flows does not change.

Exhibit 8: Summary of Oregon Rail Flows (1000 tons)

Origin	Destination	2002 Waybill	% of Total	2010 Forecast	% of Total	2035 Forecast	% of Total
ROW	Oregon Portland	15,269	29.10%	19,065	30.00%	24,060	28.10%
ROW	ROW	13,448	25.60%	16,271	25.60%	21,486	25.00%
Oregon Remainder	ROW	8,294	15.80%	9,642	15.20%	12,670	14.80%
ROW	Oregon Remainder	7,113	13.60%	8,270	13.00%	13,391	15.60%
Oregon Portland	ROW	6,206	11.80%	7,326	11.50%	10,059	11.70%
Oregon Remainder	Oregon Portland	625	1.20%	1,142	1.80%	1,215	1.40%
ROW	Oregon Portl_SeaPort	536	1.00%	565	0.90%	963	1.10%
Oregon Portland	Oregon Remainder	289	0.60%	555	0.90%	542	0.60%
Oregon Portl_SeaPort	ROW	249	0.50%	227	0.40%	542	0.60%
Oregon Portland	Oregon Portland	228	0.40%	320	0.50%	565	0.70%
Oregon Remainder	Oregon Remainder	196	0.40%	201	0.30%	277	0.30%

Oregon Portland – Multnomah, Washington, Clackamas, and Columbia Counties
Oregon Remainder – All other Oregon Counties
Oregon Portl_SeaPort - Port of Portland Sea Port
ROW – locations outside of Oregon

The rail tonnage origin-destination flows were assigned to the corridors as shown in Exhibit 9, using the corridors shown in Exhibit 10. Any rail flow using the corridor for any distance is counted in the Exhibit 9 tonnage for that corridor. Corridor 10 is actually a grouping of the four coastal rail corridors, including the currently inoperable Port of Tillamook Bay and Port of Coos Bay rail lines[2]. The largest corridor flows are in Corridor 9 (system of freeways in the Portland metropolitan area) and Corridor 6 (I-84

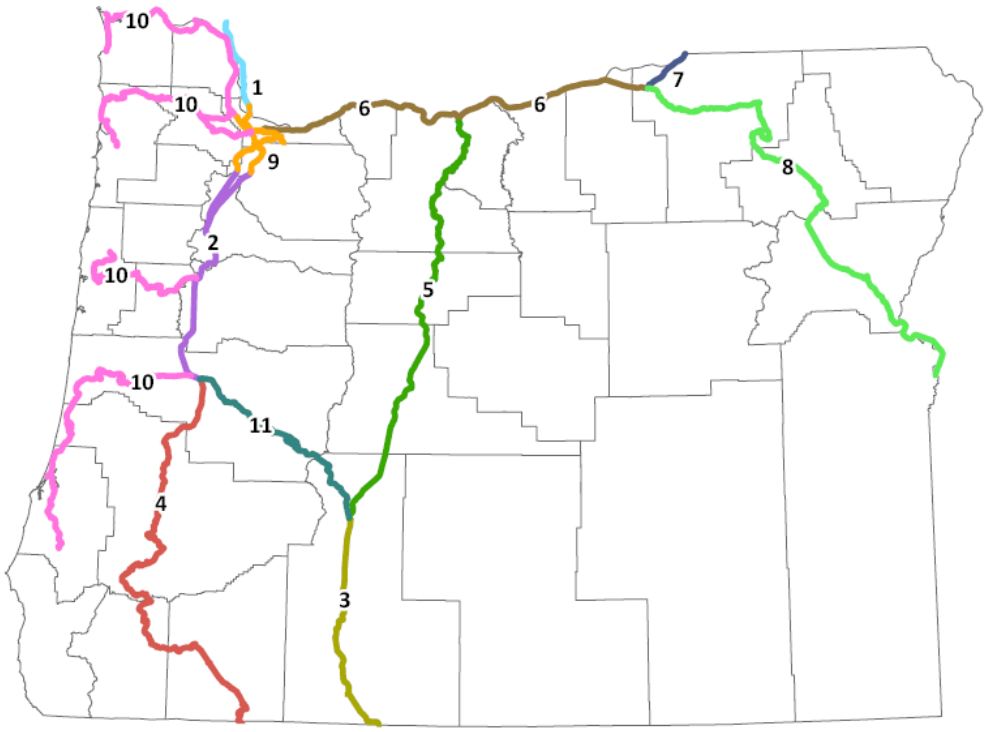
[2] The Port of Coos Bay intends to restore service on their rail line before 2012 (interview with Port of Coos Bay staff as part of the Oregon Strategic Port Plan, July 2009).

east of Portland metropolitan area). The lowest rail flows are on the coast (Corridor 10) and in southwest region of the state (Corridors 4 and 11).

Exhibit 9: Oregon Rail Tonnage Assignment by Corridor (1000 tons)

Corridor	Description	2002 Waybill	% of Total	2010 Forecast	% of Total	2035 Forecast	% of Total
9	Portland area	41,713	26.0%	56,489	26.1%	87,197	26.1%
6	Columbia River Corridor	37,022	23.1%	49,594	22.9%	77,379	23.2%
3	SW OR/I-97 Corridor	17,100	10.7%	23,227	10.7%	35,230	10.6%
2	Willamette Valley/I-5 Corridor	15,456	9.6%	20,732	9.6%	31,263	9.4%
8	SE OR/I-84 Corridor	12,721	7.9%	16,588	7.7%	24,127	7.2%
1	I-5 Corridor/Portland to WA	10,371	6.5%	14,303	6.6%	25,076	7.5%
7	Umatilla/I-82 Corridor	8,241	5.1%	11,783	5.4%	17,222	5.2%
5	Central OR/I-97 Corridor	6,876	4.3%	9,554	4.4%	14,647	4.4%
11	Central Cascades Crossing	5,580	3.5%	7,705	3.6%	11,028	3.3%
10	Oregon Coast	2,660	1.7%	3,499	1.6%	5,888	1.8%
4	SW OR/I-5 corridor	2,506	1.6%	3,065	1.4%	4,612	1.4%

Exhibit 10: Oregon Rail Corridor Network



Note: Coastal lines grouped into Corridor #10

Water

The Portland Harbor, at the confluence of the Willamette and Columbia Rivers, is the connection for 85% of all water flows in Oregon. It is dominated by the Port of Portland, with roughly half of the Portland Harbor commodity movements served by other nearby private facilities in 2002. The primary commodities moved in the harbor include grains, fuels, metals, mineral, machinery, motorized vehicles, and clay/concrete/glass/stone. The Portland Harbor's inbound and outbound flows are both forecast to grow annually by roughly 1.3 and 2.0%, respectively.

Commodity movements by water at coastal ports (Coos Bay and Astoria) are dominated by the exchange of wood chips and logs, with minor flows of fuel, lumber, fish, machinery and transport equipment. Port of Coos Bay is significantly larger than the Port of Astoria (1.4Mtons compared with 0.09Mtons in 2002), but its log flows are subject to dynamic changes in the value of the US and Canadian dollars, and these flows are forecast to decline over time (-1.8 % annually).[3] Other commodity flows at both ports are forecast to grow at a roughly 2-3 % annual rate between 2002 and 2035.

Columbia River ports (Morrow and Umatilla) downriver flows are dominated by the outbound flow of grains, animal feed (hay), and other agriculture products. Upriver flows are primarily waste, fuel, and some fertilizers. Port of Morrow is slightly larger than Port of Umatilla (662ktons compared with 548ktons in 2002), with significant container traffic and agriculture products, while the Port of Umatilla is dominated by the large grain and fuel facilities. The upriver growth is projected to grow by 1%, while the outbound downriver commodities are forecast to grow at a faster 5% growth.

Marine flows by port and direction are summarized in Exhibit 11.

[3] Port of Coos Bay indicated some additional forest product outbound flows not included in the US Army Corp of Engineers Waterborne Commerce Data. These data were not provided at the time of publication of this memorandum, so are not included here.

Exhibit 11. Water Mode Flows by Commodity and Direction

Oregon Commodity Flow Forecast - Water Mode Tons (1000s)

			Portland Harbor					Astoria				CoosBay				Morrow					Umatilla			
SCTG	STCC	Description	IB-Dom	IB-Intl	Internal	OB-Dom	OB-Intl	IB-Dom	IB-Intl	OB-Dom	OB-Intl	IB-Dom	IB-Intl	OB-Dom	OB-Intl	IB-Dom	IB-Intl	Internal	OB-Dom	OB-Intl	IB-Dom	IB-Intl	OB-Dom	OB-Intl
			Year 2002 (1000 tons)																					
1-4	1	Farm products	1,934	47	-	0	6,200	-	-	-	-	-	-	-	-	-	0	218	-	236	-	-	124	285
25	8	Forest products	-	228	-	-	99	-	7	-	-	-	154	-	1,216	-	-	-	-	-	-	-	-	-
1,5	9	Fresh Fish	90	-	-	-	16	11	-	-	29	11	-	-	7	-	-	-	-	0	-	-	-	-
13,14	10	Metallic ores	-	0	-	-	207	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	11	Coal	0	214	-	0	72	-	-	0	43	-	-	-	-	-	16	-	-	-	-	134	-	-
16	13	Crude petroleum, natural gas or gasoline	-	260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	14	Nonmetallic ores, minerals, excluding fuels	-	0	-	-	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5-7	20	Food and kindred products	31	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	24	Lumber or wood products, excluding furniture	9	30	-	6	26	-	-	-	-	-	5	0	0	-	-	-	-	-	-	-	-	-
39	25	Furniture or fixtures	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27,28	26	Pulp, paper, or allied products	8	12	124	1	329	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-
20,22	28	Chemicals or allied products	709	185	-	-	3,861	-	-	-	-	-	-	-	-	-	1	-	-	-	0	0	-	4
17,19	29	Petroleum or coal products	128	362	577	3,082	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	30	Rubber or miscellaneous plastics products	-	175	-	1	167	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
12	32	Clay, concrete, glass, or stone products	9,081	433	489	9	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30,32	33	Primary metal products	-	974	-	-	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	34	Fabricated metal products	0	340	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	35	Machinery, excluding electrical	-	758	-	-	78	-	-	-	-	3	-	-	0	-	-	-	-	-	-	-	-	-
35,38	36	Electrical machinery, equipment, or supplies	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36,37	37	Transportation equipment	0	592	-	0	-	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-	-
40	39	Miscellaneous products of manufacturing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	40	Waste or scrap materials not identified by producing industry	-	0	-	-	15	-	-	-	-	-	-	-	-	186	-	-	-	-	-	-	-	-
43	41	Miscellaneous freight shipments	-	28	-	-	24	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
		Total	11,990	4,640	1,190	3,098	11,217	11	7	0	73	14	160	0	1,225	186	17	218	-	241	0	135	124	289
			Year 2035 (1000 tons)																					
1-4	1	Farm products	1,444	98	-	0	10,035	-	1	-	-	-	-	-	-	0	1	3,247	0	240	0	1	2,554	489
25	8	Forest products	-	198	-	-	49	-	5	-	-	-	134	-	610	-	-	-	-	-	-	-	-	-
1,5	9	Fresh Fish	193	-	-	-	33	24	-	-	68	24	-	-	9	-	-	-	-	0	-	-	-	-
13,14	10	Metallic ores	-	0	-	-	250	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
15	11	Coal	0	348	-	0	75	0	-	0	45	-	-	-	-	-	27	-	-	-	-	236	-	-
16	13	Crude petroleum, natural gas or gasoline	-	466	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	14	Nonmetallic ores, minerals, excluding fuels	-	0	-	-	55	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-
5-7	20	Food and kindred products	90	-	-	0	-	-	-	-	-	-	0	-	-	-	0	-	0	-	0	0	-	-
26	24	Lumber or wood products, excluding furniture	13	87	-	11	25	-	-	-	-	0	14	0	0	-	0	-	-	-	-	1	-	-
39	25	Furniture or fixtures	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	2	-	-
27,28	26	Pulp, paper, or allied products	5	20	264	1	608	-	-	-	-	0	1	0	-	-	0	-	-	-	-	-	-	-
20,22	28	Chemicals or allied products	74	214	-	-	9,667	-	-	-	-	-	-	-	-	-	1	-	-	0	0	0	-	4
17,19	29	Petroleum or coal products	115	268	3,604	675	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	30	Rubber or miscellaneous plastics products	-	504	-	5	563	-	-	-	-	-	-	-	-	-	-	-	0	9	-	0	-	1
12	32	Clay, concrete, glass, or stone products	13,744	462	614	10	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
30,32	33	Primary metal products	-	1,649	-	-	108	-	1	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
33	34	Fabricated metal products	0	543	-	-	30	-	1	-	-	0	3	-	-	-	-	-	-	-	-	-	-	-
34	35	Machinery, excluding electrical	-	4,126	-	-	253	-	1	-	-	7	1	-	0	-	-	-	-	-	-	-	-	-
35,38	36	Electrical machinery, equipment, or supplies	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
36,37	37	Transportation equipment	0	586	-	0	-	-	-	-	-	0	4	-	7	-	-	-	0	-	-	2	-	-
40	39	Miscellaneous products of manufacturing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	3	-	-
41	40	Waste or scrap materials not identified by producing industry	-	0	-	-	42	-	-	-	-	-	-	-	-	207	-	-	-	-	-	1	-	-
43	41	Miscellaneous freight shipments	-	37	-	-	26	-	-	-	-	-	1	-	-	-	-	-	-	3	-	-	-	0
		Total	15,678	9,606	4,482	702	21,819	24	9	0	113	32	160	0	627	207	30	3,247	0	252	0	248	2,554	494

Air

PDX accommodates 99% of all international air cargo flows into and out of the state and 95% of all domestic flows in 2002. Shipments greater than 100 pounds from parcel carriers were included in freight; smaller shipments are included as air mail. International air freight, representing 18ktons of textiles, machinery, base metals, electronics, agriculture products, and precision instruments in 2002, grows annually by 5% for inbound and 3% outbound between 2002 and 2035.

A variety of commodities move by air in small quantities. Top domestic commodities moved by air to and from PDX include: electronics, prepared foodstuffs, base metals, transportation equipment, meat/fish/seafood, machinery, chemicals/chemical preparations, and miscellaneous manufactured products. PDX transports pharmaceuticals and mixed freight to other Oregon airports. Top air freight domestic commodities for the other Oregon airports include: prepared foodstuffs, base metals, meat/fish/seafood, and electronic equipment. Overall domestic freight grows annually by 3.5% for both inbound and outbound flows between 2002 and 2035 (less for non-PDX airports). Higher growth is forecast in agricultural products, pharmaceuticals, machinery, and precision instruments, with lower than average growth in chemicals, wood/paper products, metals, electrical equipment and mixed freight. Despite the high growth rates the tonnage moved remains a small but critical freight movement for the state.

All air mail (STCC50), representing 6.5ktons in 2002 was assumed to pass through PDX, before/after other Oregon airports. Since FAF2 does not provide forecasts of air mail, it was assumed to grow at the rate of population (1.3% per year per OEA population forecast) from 2002 to 2035.

FAF2 data was scaled to have inbound and outbound flows roughly in balance in 2002, growth rates of various commodities, led to non-PDX airports having 2:1 outbound flows in 2035.

Pipeline

Natural gas is 100% delivered via pipeline. Natural gas imports used by Oregon (4.7Mtons in 2002) are forecast to grow by 1.7% annually from 2002 to 2035. Natural gas passing through Oregon to California (13.7Mtons in 2002) grows by a slow 0.7% annually during this period, showing almost no growth at all until after 2010). Natural gas imports shift, less is imported via the Williams Eastern Oregon Branch from Salt Lake City via Ontario, balanced by an increase from the PGE Alberta line through Idaho and Umatilla.

Pipeline-delivered petroleum is imported to Oregon via the Olympic Pipeline from Washington via Portland (92%) and the Chevron Pipeline (8%) from Washington via Umatilla. The Kinder Morgan pipeline distributes petroleum from Portland to the Willamette Valley via Eugene. Oregon has no through petroleum pipeline flows. Petroleum delivered by pipeline to Oregon is expected to grow by less than 0.1% from 2002 to 2035.

Comparison to Other Forecasts

This section compares the Oregon Commodity Flow forecast to the following studies:

- Prior Oregon Commodity Flow Forecast (Global Insight base year 1997)
- Panama Canal Expansion Impact
- Port of Portland Portland/Vancouver Trade Capacity Analysis (Global Insight base year 1997)
- Oregon Agriculture statistics

Prior Commodity Flow Forecast

The most recent detailed study of Oregon's statewide commodity flow patterns was prepared by Global Insight in 2004. This prior forecast was used in the 2006 Oregon Transportation Plan (OTP). This section compares that prior commodity flow forecast with the results of this work.

In the base year, which was 1997 for the prior Global Insight commodity flow forecast and 2002 for the current FAF2 work, the Global Insight forecast is quite a bit higher in both tonnage and value terms (value numbers may reflect dollars in different year constant dollars). Global Insight had overall growth of 1.7% for 1997 to 2030 as compared with the FAF2 forecast of 2.2% for 2002 to 2035, with some variance by mode (see Exhibit 12). Global Insight has lower water growth rates and holds the pipeline flows fixed (0% growth).

The following tables use 2030 as the forecast year since it was included in the current ("Oregon CFF") and previous ("Global Insight") commodity flow forecasts and will be used as the point of comparison.

Exhibit 12: Global Insight and FAF2 Forecast (Mtons)

Mode	Oregon CFF			Global Insight			
	2002	2030	Growth Rate 2002-2030	1997	2000	2030	Growth Rate 1997-2030
Tonnage (MTons)							
Truck	259,213	466,782	2.1%	330,027	341,778	631,172	2.0%
Rail	39,008	61,395	1.6%	55,225	56,971	100,606	1.8%
Water	34,835	59,216	1.9%	38,266	35,238	45,092	0.5%
Pipeline	13,599	16,601	0.7%	10,713	10,713	10,713	0.0%
Air	236	624	3.5%	318	329	747	2.6%
Total	346,892	604,618	2.0%	434,549	445,029	788,330	1.8%
Value ($M)							
Truck	159,878	353,660	2.9%	399,272	419,364	1,114,936	3.2%
Rail	15,631	25,126	1.7%	70,583	72,889	138,403	2.1%
Water	22,467	52,989	3.1%	30,233	31,091	40,023	0.9%
Pipeline	7,307	8,939	0.7%	3.816	3,816	3,816	0.0%
Air	13,253	47,077	4.6%	3.232	3,316	10,536	3.7%
Total	218,536	487,790	2.9%	507.136	530,477	1,307,715	2.9%

Growth Rate = Compound annual growth rate 2002-2035.

Global Insight and the Oregon CFF forecast a similar growing truck share, and the rail and air shares are also consistent between the two forecasts. Global Insight shows smaller and declining water and lower pipeline forecast than the Oregon CFF.

As shown in Exhibit 13, the variation in growth rates can be attributed in large part to the FAF2's much higher forecast for tonnage heading out of the state of Oregon.

Exhibit 13: Global Insight and FAF2 Forecast, by Flow Direction

Flow	Oregon CFF (Mtons)			Global Insight (Mtons)			
	2002	2030	Growth Rate 2002-2030	1997	2000	2030	Growth Rate 1997-2030
Inbound	86	131	1.3%	215	222	386	1.8%
Internal	198	367	1.9%	77	76	132	1.6%
Outbound	63	152	2.8%	85	87	148	1.7%

Growth Rate = Compound annual growth rate 2002-2035.

In both forecast sets, base year major commodities are stones/minerals/ores, food products, and fuels, as shown in Exhibit 14. GI shows a higher share of forest/wood products, while the Oregon CFF shows higher shares for miscellaneous commodities and waste. Overall growth rates are very similar between the two forecasts, although there are some differences by commodity; specifically Oregon CFF exhibits higher growth for manufacturing products, chemicals, miscellaneous products and waste, and a much lower forest/wood products growth rate. The Global Insight forecast did not separately forecast Commercial Fish (Live Fish) commodity flow.

Exhibit 14: Global Insight and FAF2 Commodity Share

STCCs	Description	Commodity Mix (% of total)		Growth Rate	
		Oregon CFF 2002	Global Insight 1997	Oregon CFF 2002-2035	Global Insight 1997-2030
10,14,32	Stone Minerals Ores	27%	20%	1.6%	1.3%
1,9,20,21	Food Products	20%	21%	2.0%	1.9%
11,13,29	Petroleum Coal	14%	9%	1.7%	1.9%
8,24	Forest Wood Products	9%	27%	0.5%	1.5%
25,26,27	Pulp Paper Wood Products	2%	4%	1.4%	1.7%
28	Chemical Products	6%	5%	2.4%	1.8%
33,34	Metals	3%	3%	2.3%	2.5%
22,23,30,31, 39	Manufacturing products	2%	2%	3.5%	2.6%
37	Machinery Transportation	2%	2%	3.4%	3.7%
35,36,38	Instruments	2%	1%	4.3%	3.9%
19,41, 44-45	Miscellaneous	7%	4%	3.3%	2.1%
40	Waste	7%	2%	3.7%	2.4%
	TOTAL	100%	100%	1.9%	1.8%

Growth Rate = Compound annual growth rate 2002-2035.

Panama Canal Impacts/Forecasts

The Oregon CFF was compared with forecasts developed for the Panama Canal expansion study, by Parsons Brinckerhoff staff experienced with international freight movements. It is difficult to speak specifically about Oregon commodity movements within this larger international context given that there are other U.S. and West Coast ports (Tacoma, Seattle, Oakland, Los Angeles/Long Beach) that have a much larger share of the international export/import market compared to Portland Harbor. Additionally, forecasts from the Panama Canal work are proprietary; however, a few general comparisons can be drawn.

In general, the Panama Canal study found that international export commodity annual growth rates of 2 to 4% are within a reasonable range for nearly all commodities over the next 30 years. Oregon CFF has a 2002 to 2035 average annual growth rate for outbound (domestic and international flow) of 2.8%, 1.8% if considering only international non-truck mode[4] Forest, lumber and wood products (STCC8 and 24), fuels (STCC13), and primary metals (STCC33) outbound flows are forecast to grow less than 2% annually in the Oregon CFF. In the case of forest and wood products, this reflects Oregon's declines in this industry. In the case of fuels, the lower growth is consistent with the Oregon CFF assumption that fuel usage growth is population-based Commodities with a higher growth rate of 4 to 7% include rubber/plastics (STCC30), transportation equipment (STCC37), waste/scrap (STCC40), miscellaneous shipments

[4] International truck flows are not broken out, but include a small 100ktons in 2002, consisting primarily of motorized vehicles and plastics/rubber exported to Mexico.

(STCC39 and STCC41). Only the growth rates of the low growth commodities listed above fall outside of the 2 to 4% range when considering non-truck outbound international flows.

The expansion of the Panama Canal is expected to shift some container liner calls from West Coast to East Coast ports, as it becomes less expensive to reach East Coast markets via the Panama Canal rather than shipping across the U.S. mainland through West Coast ports. The impact to Oregon, however, is expected to be limited, if any. The Oregon CFF identifies only selected international commodities shipped through Oregon ports to the East Coast. Of such flows (roughly 65,000 tons in 2002), over 75% are machinery and base metals (STCC 35 and 34) shipped from Asia to the Port of Portland and then via air, land or rail to the East Coast. Automobiles handled through the Port of Portland are not expected to be impacted, as they are typically destined for the Midwest rather than East Coast.

Portland/Vancouver Trade Capacity Study

The Port of Portland commissioned Global Insight to prepare a Portland/Vancouver Trade Capacity Analysis (Trade Study) for the bi-state metro region in 2006, covering air, water, truck, and pipeline. The comparison with the Oregon CFF is complicated by the fact that the Trade Study includes both Oregon and Washington sides of the Portland-Vancouver region, while FAF2 includes an four-county Oregon-only Portland zone (Multnomah, Washington, Clackamas, and Yamhill Counties), and Vancouver is grouped with the rest of Washington State (outside Seattle and Blaine, Washington). Additionally, the Trade Study uses SCTG commodity classification, rather than the STCC codes used in the Oregon CFF. An effort to add the Vancouver share of flows to the Oregon CFF would require some in-depth analysis of the Trade Study and other relevant data sets such as Washington traffic counts, origin-destination truck surveys, rail waybill data, and employment by industry data.

As expected the Trade Study, which covers both Vancouver and Portland, includes quite a bit more tonnage - 261Mtons in 1997 as compared with 188Mtons in 2002 for the Oregon CFF within the Portland Harbor - with the difference representing the Washington side of the Metro area, and the inclusion of some local trips (express shipments) absent or under-reported in the Oregon CFF. After accounting for the different commodity classifications, the mix of commodities in the Portland region compares favorably between the two studies as shown in Exhibit 15. Oregon CFF shows more stones/minerals/ores and waste, while having slightly less food/forest products in the base year. Growth rates are largely consistent. Oregon CFF has lower growth for stone/minerals/ores, forest/wood growth, metals, and machinery rate, and higher growth for fuels and manufacturing products.

Exhibit 15: Commodity Mix of Port Trade Study and Oregon CFF

STCCs	Description	1997 Portland/Vancouver Trade Study Share	1997 Portland/Vancouver Trade Study Growth Rate	2002 (Portland Only) Oregon CFF Share	2002 (Portland Only) Oregon CFF Growth Rate
10,14,32	Stone Minerals Ores	20%	2.0%	34%	1.3%
1,9,20,21	Food Products	25%	2.1%	18%	2.0%
11,13,29	Petroleum Coal	16%	1.6%	14%	2.1%
8,24	Forest Wood Products	12%	1.6%	8%	1.0%
25,26,27	Pulp Paper Wood Products	3%	1.8%	2%	1.5%
28	Chemical Products	8%	2.1%	8%	2.0%
33,34	Metals	4%	3.2%	3%	2.1%
22,23,30, 31, 39	Manufacturing products	3%	2.4%	1%	3.0%
37,	Machinery Transportation	2%	4.4%	1%	2.9%
35,36,38	Instruments	1%	4.0%	1%	3.7%
19,41, 44-45	Misc	0%	5.9%	0%	4.5%
40	Waste	7%	3.7%	9%	0.5%
	TOTAL	100%	2.2%	100%	1.7%

Growth Rate = Compound annual growth rate 2002-2035.

Agriculture

National agricultural statistics, the Oregon Department of Agriculture, and the Oregon State University Extension Service provide Oregon agriculture facts and figures. Given the differences in commodity categories (crops, livestock, fish, and nursery products), units (ranging from bushels to hundredweights rather than tons), and years it is difficult to directly compare these data. Additionally, agriculture statistics are typically reported as production amounts that are consumed both within the state and exported both domestically and internationally. As an order of magnitude estimate, the Oregon agriculture facts and figures report 2008 agricultural production valued at $4.9 billion, a record high. The comparable figure for Oregon CFF is an outbound flow of $3.9 billion forecast for 2008 (given 2002 base year), excluding commodities in-state. Overall, the Oregon CFF agriculture estimates seem to be with a reasonable range of the reported statistics.

Potential Future Efforts

The Oregon CFF 2002 to 2035 forecast provides a basis for understanding the primary freight movements today and in the future under existing conditions. In several instances circumstances are likely to change, and the detail and transparency provided in Oregon CFF can provide a starting point for evaluating such changes. Alternative scenarios, as identified by groups such as the Freight and Economy Working Group or Freight Steering Committee, might include changes to transportation networks (e.g., reflecting the cessation of operations across the Coast Range of the Port of Tillamook Bay and Port of Coos Bay Railroads, one or more potential new liquid natural gas

terminal(s)), freight mode shifts (e.g., truck-rail diversion), changes in infrastructure capacity and/or operational philosophy (e.g., Union Pacific restrictions through the Siskiyou Mountains, bi-directional running between Class I railroads), or potential new cargo market opportunities (e.g., Port of Portland attracting new dry bulk cargos, closure of aluminum smelters, shipment of new wind turbines, truck driver shortage). In such cases, specific flows (by commodity or origin-destination pair) can be isolated and modified, such as changing the mode (truck-rail mode share changes), or the change in forecast growth rate.

One caution in the modification of the Oregon CFF is in keeping the intact nature of the overall flows. These are based on an underlying economic forecast (Global Insight forecast for FHWA FAF2 work). As such, changes in the economy (e.g., alternative economic conditions or linkage to WOC2 Economic Forecast) affect many sectors and thus multiple commodities, and for that reason it is hard to consistently capture all the likely effects without a careful analysis and accounting of the underlying economics.

Three other potential future enhancements to the Oregon CFF database are:

- Further classification of the marine flows to the handling group level, such as containers, bulk, break-bulk, autos, etc.
- Inclusion of shortline railroad commodity movements, using ODOT collected and processed data, combined with FAF rail commodity-specific growth rates.
- Inclusion of inter-modal commodity flows. These are flows that travel by more than one mode, such as truck transferring to rail. Because it is not possible to identify which leg of the trip was made by which mode within the FAF data, these flows were not evaluated for this effort. However, it would be possible to establish a methodology to split these trips, particularly the truck and rail trips which use established corridors.
- Update of the Oregon CFF based on more recent economic forecasts.
- Review of the Oregon CFF by industry and/or key commodities across all modes.

Conclusions

The Oregon CFF examines all commodity flow modes using a methodology derived from the FHWA FAF2 national commodity flow forecast. The Oregon CFF forecasts have undergone scrutiny from:

- The consultant teams' modal experts and quality assurance and control process,
- Port of Portland economic and planning staff,
- The Freight and Economy Working Group, and
- Comparisons with other efforts, including the Port of Portland's Trade Study.

The Oregon CFF method is transparent in its assumptions and data sources; the inability to alter the underlying FAF2 economic forecasts is a potential shortcoming, but the FAF2 commodity growth assumptions have shown a strong resilience in the face of close scrutiny. The Oregon CFF should provide a solid basis for ODOT freight planning work, including a strong basis for the upcoming multi-modal Oregon Freight Plan and a sound foundation for the evaluation of alternative scenarios.

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Appendix A: Detailed Methodology

The Oregon CFF approach of building on the FHWA FAF2 national commodity flow forecast was chosen because FAF2 is national in scope, highly regarded in terms of capturing interstate and international flows, uses a relatively recent base year (2002), and provides a quick way to complete a forecast in time for the Oregon Freight Plan work anticipated for Fall 2009. However, the inability to adjust or quantify the FAF2 underlying economic forecasts, particularly the optimistic economic conditions and low fuel price assumptions, poses some limitations that must be taken into account, which are partially addressed through adjustments noted herein. This section discusses the methodology and data sources used to develop the Oregon CFF, including the FHWA FAF2 dataset and disaggregation of each model to sub-state level within Oregon.

FHWA FAF2 Forecast Dataset

The key source for the Oregon CFF is the FAF2, published by FHWA in 2002. FAF2 provides freight flows in tons or dollar value between 130 FAF2 regions encompassing the US for the year 2002 plus forecasts from 2010 to 2035 in five year increments. The mode is distinguished as well as 43 commodities classified by Standard Classification Transported Goods (SCTG) codes. FAF2 is based on the national Commodity Flow Survey, which only captures freight flows of 50 miles or more; therefore short-distance flows, which are less important in analyzing freight flows at the statewide level, are underrepresented in the FAF2 dataset.

FAF2 does not make explicit assumptions about future mode split. The mode split for every commodity derived in the base year is kept constant in forecast years, and the mode split only changes if the share of a commodity grows or declines. For instance, if the amount of coal shipped in the US declines in a given year, the, that share of the rail mode also declines because most coal is currently shipped by rail.

FAF2 flows are provided in 43 SCTG commodity classes. For this study, the commodities were converted into the Standard Transportation Commodity Code (STCC) classification for two reasons. First, flows by truck were transformed into actual truck trips, using payload factors provided by Battelle (2002) given in STCC commodity classifications. Further, the Rail Waybill Data from the Surface Transportation Board, which is used to disaggregate rail flow forecasts, is provided in STCC categories.

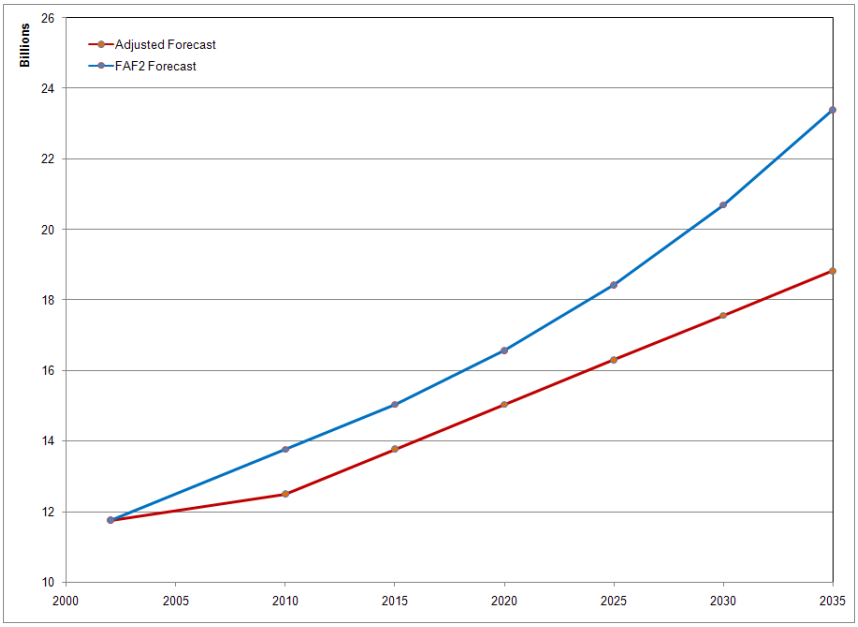
The SCTG-to-STCC conversion used by truck and rail modes is based on 1999 IMPLAN[5] freight data compiled under ODOT TPAU work done in support of the 2002 ODOT Bridge Limitation Study. The conversion process allocates each SCTG flow into multiple STCC flows in a many-to-many mapping, where each of the 43 SCTG categories is split into multiple STCC categories.

[5] IMPLAN, (Impact analysis for Planning), is a static model based on input-output modeling structures, adapted for geographic areas down to the county level.

For the air, water, and pipeline modes a more simplistic one-to-many mapping process is used.6 This approach is better suited to the select commodities moved by these modes, where the many-to-many proportional allocation would result in some commodity tonnage that is not transported by air, water or pipeline. Both the SCTG and STCC commodity codes were retained in the Oregon dataset for air, water, and pipeline modes because the SCTG categories are a more accurate description of the commodity as initially classified by FAF2, while the STCC code allows consistency with the other modes in the Oregon CFF. Appendix B provides a listing of both the FAF2 SCTG and the Oregon CFF STCC commodity codes.

The FAF2 forecasts for the years 2010 through 2035 are based on an economic forecast provided by Global Insight in 2002, specifically for FAF2. This underlying economic forecast is proprietary and unavailable for further analysis or adjustment. A paper by Battelle (2007) summarizes the forecasts' key assumptions on macro-economic growth. This economic forecast leads to fairly optimistic FAF2 growth rates for freight in the US, as shown by the blue line in Exhibit A1 which shows the growth of truck flows (in tons) as an example.

Exhibit A1. Original and Adjusted FAF2 Total Truck Commodity Growth Rates (Btons)



After 2015, FAF2 proposes an exponential growth of trucks flows, almost doubling the tons shipped by truck from 2002 to 2035, which appears too optimistic for two primary reasons. First, the current economic downturn could not have been foreseen when the

[6] For instance, for Oregon trucks STCG 13 "Nonmetallic minerals n.e.c." corresponds to 67% STCC 32 "Clay, concrete, glass, or stone product" and 33% STCC 14 "Nonmetallic ores, minerals, excluding fuel." However for air, SCTG 13 is likely only to correspond to STCC 14, as the heavier STCC 14 commodity is unlikely to travel by air.

FAF2 flows were released in 2006; the first forecast year 2010 is likely to generate significantly fewer truck trips then proposed by the FAF2 forecast. Second, Battelle (2007) assumes constant fuel prices until 2035, but the expected depletion of the oil reserves will most likely result in significant fuel cost increases that will affect truck flows more severely than rail or water flows. Though there is little consensus on the actual mode split after the oil price shock seen in recent years, it is likely to limit growth in freight traffic overall.

The red line in Exhibit A1 represents a more conservative growth rate for truck flows used in the Oregon CFF work, as compared with the FAF2 growth rate. The years 2005 and 2010 have been scaled down to account for the current economic downturn, consistent with the Oregon Office of Economic Analysis (OEA) recent forecast (Global Insight, April 2009), which assumes a 1.8% growth rate, relative to the 5% growth rate in FAF2. For future years after 2010, a linear growth rate was assumed, consistent with the nearly linear FAF2 growth rate from 2002 to 2015. The same 2% rate has been applied to FAF2 forecast freight flows from 2015 onward, as compared with the more optimistic 3% growth rate in the out-years of the OEA Global Insight forecast. This down-scaling only affects the total tonnage volume, as the flow patterns given by FAF2 remain unaffected. The resulting ratio of adjustment for FAF2 data for all modes was applied and is shown in Exhibit A2.[7]

Exhibit A2. Adjustment to FAF2 Growth Rates for All Modes

Year	Adjustment to FAF2 Growth Rate
2010	0.907703
2015	0.915536
2020	0.907576
2025	0.88464
2030	0.848849
2035	0.804833

While the effects of the economic downturn and fuel price changes on the air, rail, water, and pipeline modes are less certain than the effects on the truck mode, it was determined that all modes are impacted by the overly generous forecasts and thus are all impacted using the factors noted above. The impacts of fuel prices on rail, water and air are disputed and even more uncertain than for trucks. Therefore, while the FAF2 flows were down-scaled for all flows, it is important to recognize the uncertainties in these adjustments.

The FHWA FAF2 database provides both tonnage and value in its results. Exhibit A3 summarizes the 2002 average value density function ($/ton) for each commodity by mode, based on a sample of FAF2 domestic flows for Oregon, which can be applied to the tonnage in this report. Value density values are highly variable, depending upon the mix of commodities in each category and vary by state and mode, and over time.

[7] Fishing and air mail forecast tonnages, generated outside of the FAF2 forecast, were not adjusted.

For example, the values shipped by air are typically quite a bit higher than those shipped by rail.

Exhibit A3. Mode-Specific Commodity Value Density ($/ton)

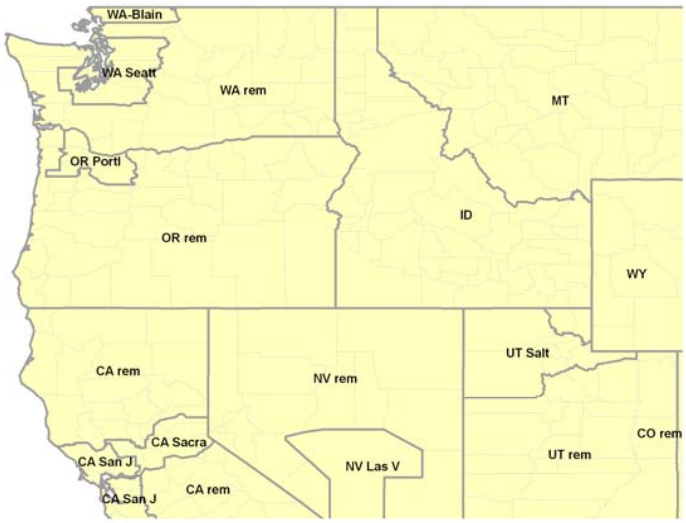
STCC	Description	Air	Pipe	Rail	Truck	Water
1	Farm products	434.3	NA	152.5	229.0	286.6
8	Forest products	NA	NA	138.2	43.7	36.5
9	Fresh fish	4,666.3	NA	4,666.3	4,666.3	4,666.3
10	Metallic ores	NA	NA	121.5	1,766.4	161.5
11	Coal	NA	NA	58.2	202.8	260.7
13	Crude petroleum, natural gas	NA	307.1	NA	305.9	305.9
14	Nonmetallic ores, minerals	1,315.0	NA	47.5	78.3	95.9
19	Ordnance or accessories	NA	NA	NA	520.6	NA
20	Food and kindred products	4,765.5	NA	519.3	921.2	1,141.1
21	Tobacco products	7,783.6	NA	NA	1,814.9	22,890.3
22	Textile mill products	69,043.8	NA	6,124.9	18,435.9	28,277.0
23	Apparel/finished textile products	NA	NA	21,576.8	64,946.2	NA
24	Lumber or wood products	6,187.5	NA	306.7	447.6	367.6
25	Furniture or fixtures	95,611.5	NA	286.4	2,444.7	2,818.4
26	Pulp, paper, or allied products	NA	NA	610.7	1,200.2	806.3
27	Printed matter	4,752.6	NA	85.2	2,338.9	3,619.9
28	Chemicals or allied products	23,829.6	NA	212.1	1,080.1	1,013.6
29	Petroleum or coal products	2,781.9	183.8	419.4	330.8	296.3
30	Rubber / plastics products	29,828.1	NA	1,132.3	2,748.7	2,495.0
31	Leather or leather products	NA	NA	2,072.8	6,239.2	NA
32	Clay, concrete, glass, stone	140,000.0	NA	17.5	36.8	12.0
33	Primary metal products	NA	NA	385.5	1,234.1	960.6
34	Fabricated metal products	2,315.2	NA	142.5	2,870.3	2,142.7
35	Machinery, excluding electrical	NA	NA	1,939.8	8,172.7	7,249.9
36	Elec machinery, equipment, supplies	179,097.1	NA	7,064.5	23,069.3	49,991.9
37	Transportation equipment	20,558.1	NA	2,514.9	4,955.8	5,666.5
38	Instruments, photo/optical goods	72,817.3	NA	1,617.1	1,001.8	NA
39	Misc. products of manufacturing	43,752.3	NA	2,141.7	3,544.3	3,349.2
40	Waste or scrap materials	NA	NA	191.6	107.1	118.5
41	Miscellaneous freight shipments	3,579.2	NA	781.5	1,931.8	1,716.9
42	Containers, carriers, returned empty	NA	NA	781.5	NA	NA
43	Mail	781.5	NA	781.5	781.5	NA
45	Shipper association traffic	NA	NA	781.5	NA	NA
46	Miscellaneous mixed shipments	NA	NA	781.5	NA	NA
47	Small packaged freight movements	NA	NA	781.5	NA	NA
48	Waste hazardous materials	NA	NA	191.6	NA	NA
49	Other Waste	NA	NA	191.6	NA	NA
50	Bulk in boxcar	NA	NA	781.5	NA	NA

NA = No Oregon CFF of this commodity by this mode.
Values are based on 2002 FAF2 Oregon dataset domestic sample, in units of $M and 1000tons.
High precision is retained, since this will be applied to large annual tonnages.
STCCs 42+ are not included in FAF2; their rates assumed to match STCC40 or STCC41.

Modal Disaggregation

FAF2 regional zones are relatively coarse, as shown in Exhibit A4. Oregon is covered by two zones: Oregon Portland and Oregon Remainder. The Oregon Portland zone includes the Oregon portion of the Portland-Vancouver region covering Multnomah, Washington, Clackamas, and Yamhill Counties. The remaining 32 Oregon counties are included in the Oregon Remainder zone.

Exhibit A4. FAF2 zones and counties



For those trip ends within Oregon, the FAF2 commodity flows for each mode were disaggregated from FAF2 zones to Oregon counties. In the case of truck flows, this was done based on county employment and IMPLAN inter-industry coefficients, while other modes relied on local data to allocate FAF2 flows to specific Oregon facilities (rail stations, airports, marine ports, or pipeline terminals). Zones outside of Oregon were aggregated from FAF2 zones to "Other Domestic" and "Other International" (including Canada and Mexico) categories.8 These methods and data are described in more detail below.

County Employment/IMPLAN Disaggregation Method (used by truck)

To increase spatial resolution, truck flows between 130 US FAF2 zones were disaggregated to flows between 3,241 US counties. Even though the disaggregation of flows in the eastern part of the US does not improve precision of Oregon flows, disaggregating all flows the same way enables a coherent method to be applied throughout the country and allows capture of through truck traffic.

[8] For example, a container of goods originating in Asia bound for Salem Oregon, would be represented as an International "SEA" flow with origin Asia FAF region and destination 'Oregon Remainder' and an gateway of Tacoma port. For the Oregon CFF, this is further broken down into an 'Other International' trip by water that we ignore, and a 'domestic' truck trip from "Other Domestic" (Tacoma) to Marion County (Salem, OR). Further, each different commodity within the container would be treated as a separate annualized flow between these trip ends.

Employment was used as a weight for the truck flow disaggregation to counties as counties with more employment are assumed to produce and attract more trucks. Within Oregon, nonfarm employment forecasts from the OEA Global Insight forecast (June 2009) were used for the following sectors: construction, natural resources, and mining; manufacturing; transportation, trade, and utilities; information; financial activities; professional and business services; educational and health services; leisure and hospitality; other services; and government. Oregon agriculture employment by county was added based on 2007 U.S. Department of Agriculture data.

The use of employment by industry type combined with inter-industry coefficients allows the allocation of the origins and destinations of flows to counties with the corresponding employment type. For instance, SCTG25 (logs and other wood in the rough) is produced in those counties that have agricultural employment; similarly, this commodity is shipped to those counties that have employment in industries consuming these types of products. The approach makes use of inter-industry coefficients, referred to as "make" and "use" coefficients, developed from 2007 Oregon IMPLAN input/output tables. These coefficients indicate the commodities each industry makes and uses in its production process.

For instance, if there is a flow of SCTG07 (other foodstuff) being shipped from FAF2 zone A to FAF2 zone B, and the IMPLAN data indicates that this commodity is produced by two industries: 3% by agriculture and 97% by manufacturing, then the employment of all counties in FAF2 zone A is used to distribute the origin of that flow over all counties, weighted by the make coefficients derived from IMPLAN data. In this example, the share of the origin of this flow for county C in FAF2 zone A is described by the following equation:

$$sf_{c \in A} = FAF_{A,B} \cdot \frac{0.03 \cdot agEmp_c + 0.97 \cdot manEmp_c}{\sum_{z \in A} 0.03 \cdot agEmp_z + 0.97 \cdot manEmp_z}$$

$sf_{c \in A}$	Share of flows originating in county c which is located in FAF2 zone A
$FAF_{A,B}$	FAF2 flows from FAF2 zone A to FAF2 zone B
$agEmp_c$	Employment in agriculture in county c
$manEmp_c$	Employment in manufacturing in county c

To disaggregate the destination of this flow, the use coefficients derived from the IMPLAN data are applied with the same procedure.

This disaggregation is applied to commodity flows where the origin or destination is within Oregon. No detailed employment forecast at the county level are available outside of Oregon so 2002 total employment is used to disaggregate flows with an origin and/or destination outside of Oregon, and the Global Insight employment forecast is used for future years. No forecast for agricultural employment is available for Oregon or outside of Oregon, so this employment type is kept constant over time.

The mode split forecasted in FAF2 should be used with care. In FAF2, the modal split is a function of the commodity composition. For each commodity, the modal split remains unchanged throughout the years. If, for instance, a commodity that is dominated by rail

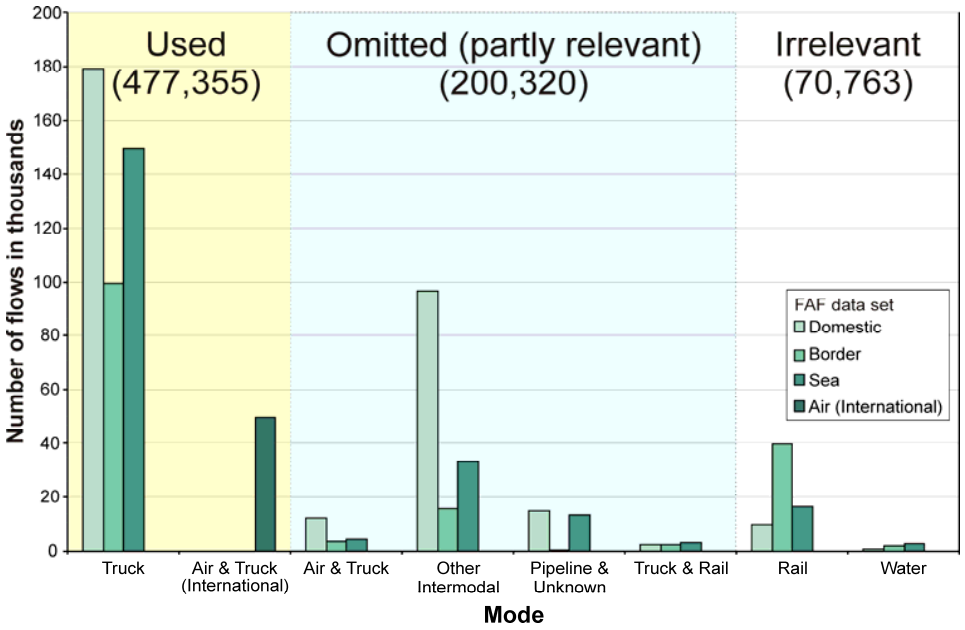
declines over time, the share of rail drops accordingly. No true mode choice is simulated within FAF2. The mode shift reported in FAF2 indicates the demand for modes but is not constrained by capacity, costs, or existence of modal alternatives.

Intra-county trips are not included in the data, and FAF2 data sources tend to under-represent short trips. Additionally, water flows on the Columbia River that do not utilize Oregon's Ports are not included. These limitations are of minimal consequence in the statewide view of freight movement within Oregon that is the goal of this effort.

Trucks

The FAF2 data distinguishes modes and mode combinations. For truck representation, only the mode 'Truck' and the domestic part of the international flow 'Air & Truck' were used, as shown in Exhibit A5. Combinations such as 'Truck & Rail' or domestic 'Air & Truck' were omitted assuming that the longer part of that trip is made by rail or air, and only a small portion of the trip relies on truck transportation; further the data set is not specific enough to distinguish which part of the trip is made by which mode. Of the 200,320 flows omitted, likely only a small portion of these trips are made by truck, and this shortcoming is assumed to be acceptably small. Data for land-border crossings included the portion of the trip from the border crossing to the domestic destination or from the domestic origin to the border crossing. Likewise, sea and air freight was included as a trip to or from the domestic port or airport. Truck trips to distribute air mail to each Oregon county, not included in FAF2, were added based on the OEA 2002 population distribution and forecast.

Exhibit A5: FAF2 Truck Data Used in the Oregon CFF



For the dominant modes, truck and rail, the Oregon CFF provides not only tonnage by origin-destination flows, but also vehicle flows on network links. After disaggregating the flows, commodity-specific payload factors (Battelle 2002: 29) were used to convert FAF2 goods flows in tons into number of truck trips. An average empty-truck rate of 19.4% was assumed for all flows based on US Census Bureau truck data (2008). The annual FAF2 flows were converted to flows of an average weekday. Flows were divided by 365.25 days and then a factor of 1.048 was applied to transform Annual Average Daily Traffic (AADT) into Annual Average Weekday Traffic (AAWDT), based on national truck data. Finally, trucks were split into the two truck types: medium-heavy duty trucks weighing below 26,000 pounds and heavy-heavy duty trucks weighing 26,000 pounds and above. The share of each truck type depends on the distance of the truck flow – a longer distance implies a larger share of heavy-heavy duty trucks. The share of each truck type for five distance classes is based on the 2002 Vehicle Inventory and Use Survey (VIUS), published by the US Census Bureau (2004).

The resulting truck vehicle flows were assigned to the US highway network using the TransCAD software and US network. It should be noted that these truck trips no longer retain the tonnage and commodity information of the origin-destination flows. Assigning flows from one county to another requires designating one point within each county as the origin or destination of the flow, with geographic centroids commonly used for these points. In many cases, however, the geographic centroid of the county does not match the activity center in that zone, so the centroid of the largest city within each county was used instead to ensure that the representation of flows within every county is more realistic. During assignment, Medium-Heavy Duty (MHD) trucks are assumed to have a passenger car equivalent (PCE) of 1.5, Heavy-Heavy Duty (HHD) trucks are assumed to have a PCE of 2.5. This accounts for the additional space trucks use on the road in comparison to autos. Additionally, to make trucks sensitive to congestion in the assignment step, a volume delay function is used with adjusted coefficients ($\alpha = 1$ and $\beta = 6$, in the Bureau of Public Roads volume-delay function). Air mail (STCC 43) is not captured in the FAF2 data, so air and truck separate forecasts were developed for traffic generate by air mail and were added to the FAF2 data. These estimates assumed airport mail tonnage from airport statistics was further distributed to each county, based on the OEA forecasted state employment share (see further discussion under the air mode discussion below).

A detailed analysis of the shipping of fish (STCC 09) revealed that FAF2 and the truck disaggregation method to Oregon origins and destinations using agricultural employment by county did not capture fish flows with the desired detail. Further information was collected, and a fish commodity flow dataset was created synthetically to replace the FAF STCC9 flows (see discussion of 'specialty area' at the end of this chapter with further detail in Appendix D). An average payload factor of five tons per truck was assumed for both air mail and fish flows.

Traffic counts from 133 of Oregon's Automatic Traffic Recorder (ATR) stations were geo-referenced to the network to validate the truck assignment results (ODOT 2009).

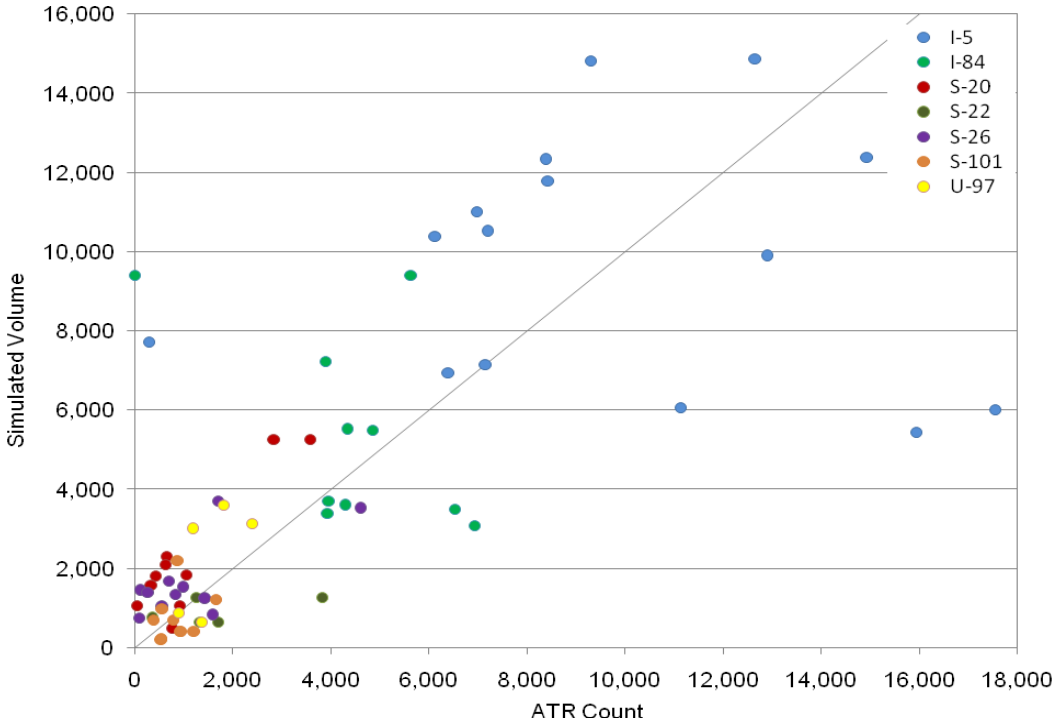
The ATR data provide total vehicle counts as well as counts by vehicle classification for year 2003. A first comparison of simulated truck volumes with ATR counts revealed a strong overestimation of traffic flows on I-84 and a comparable underestimation of truck flows on I-5, and a thorough network testing did not show any network problems. As the two highways I-5 (north-south) and I-84 (east-west) serve very different markets, this mismatch appears to result from underlying issues in the FAF2 data. A separate analysis of Internal-Internal (II), Internal-External/External-Internal (IE/EI) and External-External (EE) revealed that a significant contribution to this error was contributed by EE flows, which shows that long-distance trips are responsible for a large part of this mis-estimate.

Avoiding a reverse-engineering of the FAF2 data, an adjustment process was implemented that increases flows on I-5 and decreases flows on I-84. All origin-destination county pairs that generate trips using I-5 were isolated from those that contribute to traffic on I-84. Subsequently, tonnage flows for county pairs that use I-5 were scaled up, and flows using I-84 were scaled down. County pairs that use both I-5 and I-84 were not adjusted.

To develop the appropriate scaling factor for both I-5 and I-84, a weighted average deviation was calculated, giving more emphasis on count locations with higher volumes. Using the original flows, I-5 was underestimated by 53% and I-84 was overestimated by 78% – implying scaling factors of 2.169 and 0.357, respectively, to adjust the tonnage flows.

Exhibit A6 provides a validation of how the truck counts match assigned Oregon CFF truck trips. The averages of both I-5 and I-84 match the diagonal line (where the x-axis ATR traffic count would match the simulated Oregon CFF flow exactly), neglecting one unexplainable outlier on each highway with a truck count volume of 311 on I-5 and 8 on I-84. Overall, the match between estimated truck volumes and ATR counts is not unreasonable for truck simulation, but it should be noted that the commodities have been converted into truck loads based on national averages; through trips going through Oregon were disaggregated based on total employment numbers only; the highway network is a simplified national network that does not capture local capacity expansions; all intra-county trips are missing, reducing the simulated volumes and lacking congestion which may trigger detours in reality; and the count volumes represent an annual average, including all uncertainties when applied to comparisons with daily weekday volumes.

Exhibit A6: Validation of Truck Volumes



Rail

The rail mode data obtained from the FAF2 dataset was compared to Oregon's confidential historical 2002 Rail Waybill dataset obtained by ODOT from the Surface Transportation Board. The Rail Waybill data was used to identify the pattern of flows in the 2002 base year, while the correlation provided a way to apply the FAF2 growth rates to the base year waybill data.

The Rail Waybill data trip ends (origin or destination) inside of Oregon were grouped by Freight Station Accounting Code (FSAC), specific to a station and a rail line, and the county code; trip ends outside of Oregon were identified by state name (including Canadian provinces). The data was further classified as the FAF2 Oregon Portland zone (Clackamas, Multnomah, Washington, or Yamhill Counties), FAF2 Oregon Remainder zone (all other counties), Portland Sea Port, Other Oregon Sea Port, or Rest of World to correspond with the categories in the FAF2 dataset.

The Rail Waybill dataset is specific to Oregon and contains trips with an Oregon trip origin or destination, as well as trips that travel through Oregon without stopping for re-classification (i.e., trips from Washington to California). The FAF2 data covers the entire nation, and although it was possible to isolate the Oregon trip ends, it was difficult to identify rail through trips that do not stop for re-classification. It was therefore assumed that the origin-destination pairs (by county code, which is common between the two data sets) that appeared in the Rail Waybill data should be used instead of the same origin-destination trips from the FAF2 data. The total amount of through tonnage

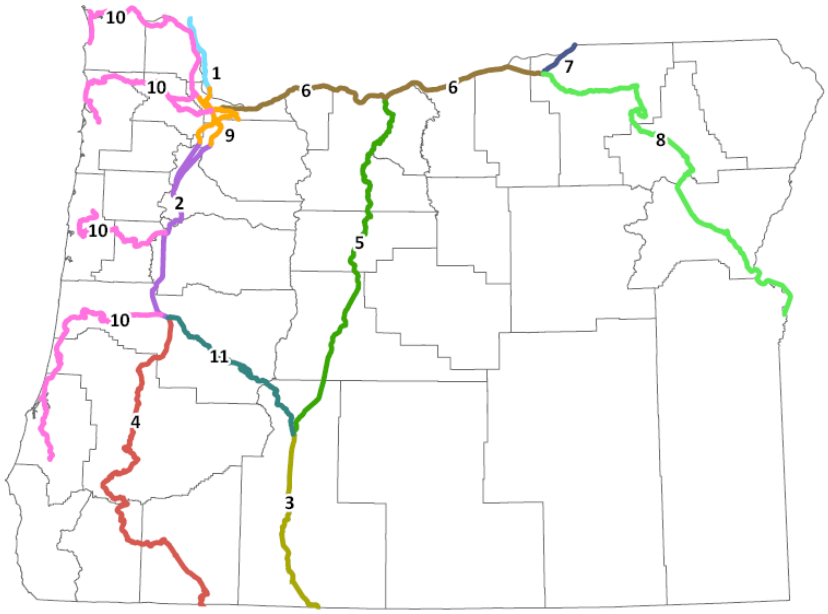
extracted from the Rail Waybill data was slightly larger (13,448 Ktons) than the tonnage in the same origin-destination pairs of the FAF2 data (12,083 Ktons). It should be noted that the Rail waybill dataset only includes traffic volumes that are reported by the Class I railroads (BNSF and UP). Traffic that moves locally on a shortline railroad or between multiple shortline railroads is not included in the dataset. For the base of year 2002, this volume is very small but is expected to grow in future years.

Because theses total amounts of tonnage are very close, the more geographically accurate and spatially disaggregated Rail Waybill data was used for the Oregon CFF baseline 2002 data.

The FAF2 dataset was used to calculate growth rates specific to each commodity from 2002 to 2035, which were applied to the base year rail waybill data. The total value of the future forecast was again very close to the FAF2 total tonnage forecast. The tonnage forecast maintains the city name for the Oregon rail stations and a US Census Bureau Federal Information Processing Standard (FIPS) code which identifies the county, for each trip end.

As with trucks, rail mode tonnage flows were assigned to the rail network, and the origin-destination tonnage data was aggregated by city or county. In addition to tonnage, rail cars were retained from the base year waybill dataset. Since the rail mode utilizes a pre-existing network of track infrastructure, it is logical to evaluate the tonnage flow by corridor; the dominant pre-existing corridors in Oregon are shown in A7. A uniform method was employed to assign the flows to the network, such that any flow starting and ending on the corridor was included in the full corridor flow. The detailed method of assigning certain origin-destination flows to each corridor is included in Appendix C.

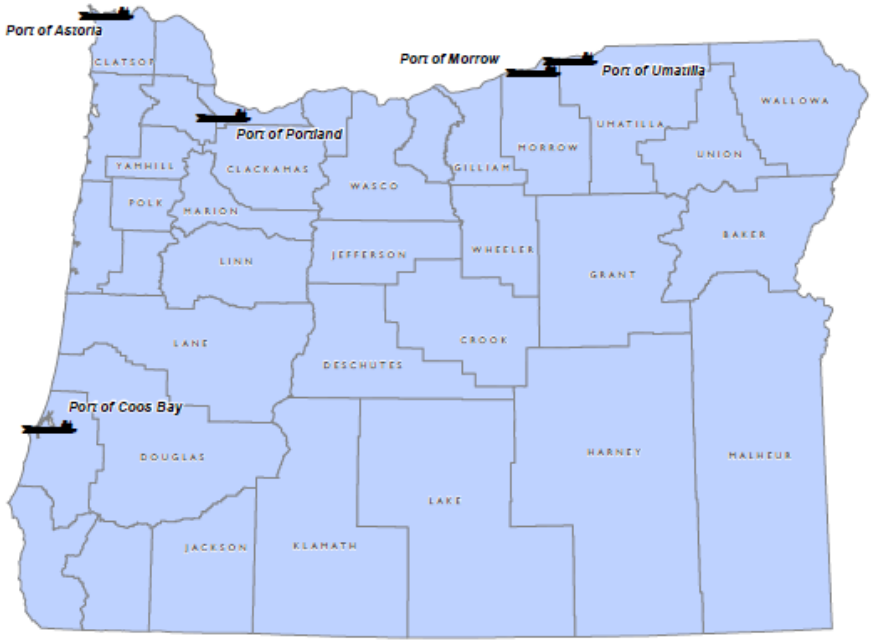
Exhibit A7. Oregon Rail Corridor Network (coastal lines grouped in #10)



Water

The Oregon CFF includes the Marine Ports shown in Exhibit A8 – including two coastal ports, a collective set of facilities in the Portland Harbor, and two ports upstream on the Columbia River. The Port of Newport was not included as it currently accommodates only limited commercial freight movement.

Exhibit A8. Oregon Ports



*Note: The Port of Newport was not included as it currently accomodates only limited commercial freight movement.

The water flows in the Oregon CFF rely on the FHWA FAF2 dataset for base year flows and growth rates. This dataset includes domestic and international marine flows that connect to land modes covered elsewhere in the Oregon CFF, to reach the true origin or destination points often outside of Oregon. The FHWA FAF2 dataset commodities (SCTG) were converted to STCC categories using a simplified one-to-many relationship.

The FAF2 data was disaggregated to ports within Oregon, using the US Corps of Engineers Waterborne Commerce reports, and data from the Port of Portland website. Through flows on the Columbia River, which is largely served by Washington and Idaho ports, and along the coast are not included in the Oregon CFF.

The FAF2 dataset water flows were aggregated to four regions: Other Domestic, Other International, Oregon Portland, and Oregon Remainder. In doing so, the true origin,

destination, intermodal flow is lost.9 All Oregon Portland FAF2 flows were assigned to "Portland Harbor" with flows to and from multiple ports within the three-county region on the Columbia and Willamette Rivers. Auto commodity flows, missing from the FAF2 dataset, were added to Portland Harbor flows as imports from Asia, which is consistent with Port of Portland statistics (613 Ktons forecast for 2010), and assumes the 1993-2008 3.5% annual growth rate in auto imports. Fuel flows were also missing, and were added to internal and outbound domestic flows (577Ktons and 3082ktons, respectively in 2002), assuming a growth rate consistent with OEA population forecasts.

FAF2 water flows were allocated among the Oregon coastal ports in Coos Bay and Astoria to roughly match the commodity mix from the 2002 Waterborne Commerce data. Newport was not included, as no data was provided in this dataset.

Remaining FAF2 flows were then allocated to the Columbia River ports in Umatilla and Morrow as follows:

- **Grain**: 65% allocated to Port of Umatilla, reflecting the Pendleton Grain Growers and CLD Pacific Grain facilities there for international and domestic grain imports. The remaining Columbia River grain exports were assumed to be shipped from the Port of Morrow via the Port of Portland.
- **Fuel**: 90% allocated to Umatilla tank farms, with the remainder to Morrow (linking to rail line).
- **Animal Feed**: Assumed to be hay from Morrow (100%).
- **Fertilizers**: Assumed to be allocated to the Umatilla Tidewater facility (100%)
- **Waste**: The significant quantity of waste/scrap (STCC 40) shipped from Washington to in containers, missing from FAF2 dataset, was added and grouped with Port of Morrow. Scrap/waste was assumed to represent the bulk of Arlington containers (200 Ktons in 2010, based on 22000 TEUs in 2008) and to grow consistent with the OEA's Oregon population forecast to 2035.
- **Gravel**: A large flow of gravel from Washington to Oregon non-Portland ports (2 Mtons in 2002) was not consistent with the Waterborne Commerce data or with expert understanding of the river commerce, so it was dropped. This flow may consist of dredging materials that are not expected to be sustained in the forecast periods. A large internal movement of gravel within the Portland Harbor remains.
- **Other**: The remaining mix of commodities (24 Ktons in 2002 of chemical products, agriculture products, mixed freight, etc.), mostly international exports, were split between Port of Morrow (75% and Port of Umatilla (25%)

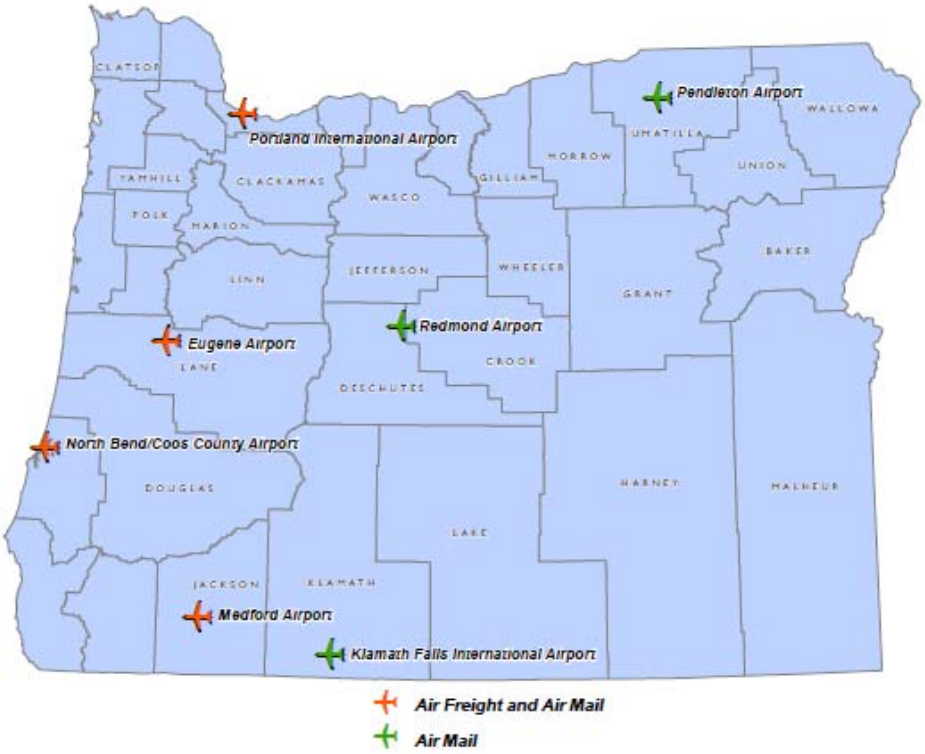
Air

Portland (PDX), Medford (MFR), Eugene (EUG), and North Bend/Coos County (OTH) airports serve air freight, while Redmond (RDM), Klamath Falls (LMT), Pendleton (PDT)

[9] For instance, an international import by sea to the Port of Portland that is shipped inland by rail or truck would be translated into two trips, an "Other Intl" trip to the "Portland Harbor", and a second trip from "Portland Harbor" to "Other Dom". The international origin is lost in the second leg of the trip.

airports primarily carry air mail services. The locations of these airports are shown in Exhibit A9.

Exhibit A9. Oregon Airports



The air mode commodity flows in the Oregon CFF rely on FHWA FAF2 dataset for base year flows and growth rates. This dataset includes both domestic and international air flows. The FHWA FAF2 dataset commodities (SCTG) were converted to STCC categories using a simplified one-to-many relationship.

FAF2 data include shipments that typically weigh more than 100 pounds that are shipped by air by commercial or private aircraft, not including express shipments.[10] The 2006 Portland/Vancouver Trade Capacity Analysis (Trade Study) shows air and express mail flows (STCC44) as 0.2% of Portland/Vancouver tonnage in 1997 (467 Ktons).

These small package flows are felt to be less important in a statewide freight view, and it should be noted that the limited data on mail and express shipping is also not very precise. The Port of Portland noted a significant shift in the reported air mail tonnage statistics when FedEx won the US Postal Service (USPS) contract and the actual mail volume for USPS was co-mingled with FedEx's freight volumes. Despite an increasing

[10] This would exclude FedEx's <100 lb package volume which comprises approximately 99% of its total airfreight volume to or from Oregon (average package weight is approximately 35 lbs.) and UPS' <100 lb package volume which comprises approximately 97% of its total airfreight volume to or from Oregon (average package weight is approximately 8 lbs). FedEx packages going in and out of Oregon generally pass through the main sort facility in Portland. Similarly, UPS sort facilities are in Portland, Tualatin, Roseburg and Hermiston.

shift of consumer spending to on-line retail, small package carriers (integrators – FedEx and UPS) have experienced express volume declines since 2002.

The FAF2 data was disaggregated to airports within Oregon, using airport air cargo and mail on/off tonnage statistics for 2007 and 2008 from websites and airport master plans. FAF2 flows were aggregated to flows between four regions: Other Domestic, Other International, Oregon Portland, and Oregon Remainder. In doing so, the true origin, destination, and intermodal flow are lost (see note under water flows above). Since total FAF2 2002 tonnage for the state was a reasonable match to 2008 airport statistics, after adjusting for different years' data, no overall adjustment was needed. Factors, shown in Exhibit A10, were applied to each aggregated flow among the state's airports to roughly balance 2002 inbound and outbound flows at each airport. Internal flows between PDX and other Oregon airports also had to be significantly reduced. The resulting 2035 flows are not very well balanced, for Oregon Remainder airports in particular, due to varying growth rates on FAF2 flows by commodity.

Exhibit A10: Air Adjustment Factors by Aggregated Flows Factors

	Factors	
Airport Flow	Inbound flow	Outbound flows
PDX International	0.34	0.62
Oregon Remainder International	1.00	0.05
PDX Domestic	2.25	0.90
Oregon Remainder Internal	1.00	0.15

The Oregon Remainder FAF2 zone was split into the three non-Portland airports, using the factors in Exhibit A11. A significant portion of FAF2 region Remainder flows were shifted to PDX, because although total tonnage for the state was reasonable, there were not enough PDX flows. All Oregon Remainder international flows were assigned to Medford (MFR).

Exhibit A11: Factors for Allocating Flows among Oregon Airports

Airport	Oregon Remainder Share1	Oregon Remainder Share2
Portland (PDX)	0.9435	NA
Medford (MFR)	0.0065	0.1147
Eugene (EUG)	0.0239	0.4236
North Bend/Coos Bay (OTH)	0.0260	0.4616

Note: Constant share for all years assumes airport relative size remains the same.

FAF2 does not include air mail flows, so air mail was added (assigned to STCC 50), based on tonnage statistics by airport in 2008. The growth in air mail was assumed to match statewide population annual growth of 1.3% from 2002 to 2035 and was assumed to travel to PDX before/after reaching other state airports.

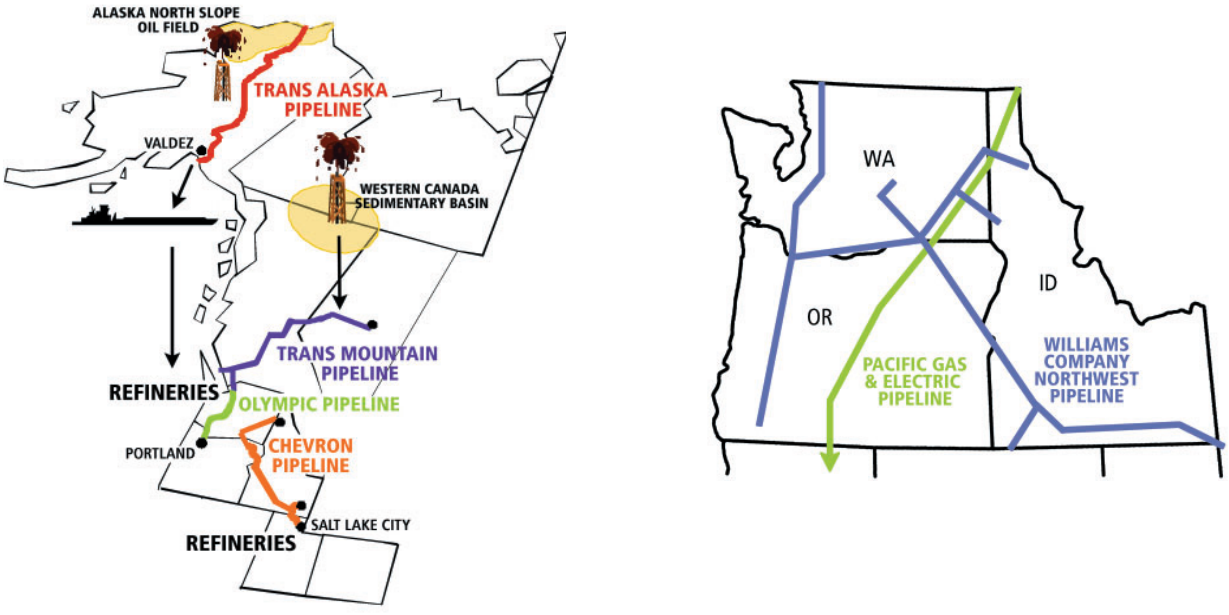
Pipeline

The pipeline flows in the Oregon CFF rely on FHWA FAF2 dataset for base year flows and growth rates. The FAF2 data was disaggregated to pipelines within Oregon using the 2007-2009 State of Oregon Energy Plan, and the websites of Oregon Department of Energy, Kinder Morgan Company, and various energy providers, as well as contact with representatives of these organizations. Natural gas was distributed among Oregon counties based on OEA population forecasts.

Pipeline flows cover two basic commodities: petroleum (SCTG17, SCTG18, and STCC29, which includes gasoline, jet fuel and diesel fuel) and natural gas (SCTG19, STCC13), which were treated separately. All other commodities in the FAF2 "Pipeline & unknown" mode were dropped, as non-pipeline flows. Petroleum is further distributed locally by trucks and barges, but these local trips are not included in the Oregon CFF. Natural gas was assumed to be distributed via local pipeline to each county from the nearest branch line.

Petroleum and natural gas pipeline networks for the Pacific Northwest are shown in Exhibit A12. FAF2 Petroleum flows (SCTG17 and SCTG18) were mapped to these pipeline routes, and volumes were scaled (0.79 factor applied to Olympic pipeline flows) to match Oregon Department of Energy data. Within Oregon petroleum flows consisted of the Kinder Morgan pipeline from Portland to Eugene, and it was assumed that a constant 34.6% share of the Olympic pipeline flow to Portland tank farms continues to be piped on to Eugene based on information from Kinder Morgan staff.

Exhibit A12. Pipeline Networks: Petroleum (left) and Natural Gas (right)



FAF2 natural gas flows were limited to pipeline flows from Idaho, Washington, and the Port of Portland (from British Columbia), and the proportions matched Oregon energy data. Significant through flows to California beyond Klamath Falls were teased out of the existing FAF2 flows, given known Oregon usage (FAF2 and Oregon statistics), and total flows through Oregon (FAF2). FAF2 forecasts capture the change in inbound sources starting in 2010, at which point, a price equalization plan will be in place that will mean Oregon receives more of its gas from the Rocky Mountains than it does today. FAF2 assumes 3M3M tons from the Williams Washington pipeline will shift to the PGE Idaho (Alberta) source. FAF2 further assumes a limited growth in through flows to California between 2002 and 2010. Oregon counties served by the Williams, WA I-5 pipeline exceeded FAF2 flows, so flows were shifted from the Williams Columbia River branch as needed. Flows were further distributed to each county based on OEA county population patterns and growth forecasts.

Specialty or targeted areas: Commercial Fishing

Initially, STCC9 fresh fish was assumed to be produced within Oregon in a spatial pattern of other agriculture products, following the pattern of Oregon agriculture employment. However, because of the high importance and special circumstances of this particular commodity, these initial assumptions were refined. The resulting approach combines fish landing data from the Dungeness Crab Association and Oregon Department of Fish and Wildlife plus port interview data. These fish flows, a total of 219Ktons in 2002 (0.07% of total state freight tonnage), were assumed to be produced on the Oregon coast or nearby fish farms or imported from Alaska or international origins. Half of this tonnage then was then assumed to move to points for internal consumption within the state, with the remainder sent outbound primarily by truck, water, and some air movements (70 Ktons for all modes in 2002). The modified fish commodity is thus housed separately from the modal datasets. A full description of the assumed fish commodity flows data and assumptions are included in Appendix D.

Structure and Design of the Commodity Flow Forecast Database

All five of the mode-specific processed data files plus special air mail and fish commodity datasets comprise a master commodity flow dataset containing two types of files:

- Origin-destination tonnage flow by commodity and mode
- Assigned flows by link/corridor and vehicle type (truck and rail only)

The origin-destination tonnage flow file contains the geographic identifier (county within Oregon) of the origin and destination, commodity code(s), mode, and tonnage for each origin-destination pair. This data covers the 2002 base year and the forecast years in 5-year increments out to 2035. The assigned flows cover the truck and rail modes, with the flows assigned to the associated network for each (see discussion in methodology section).

Appendix B: Commodity Codes (STCC and SCTG)

Exhibit B1: Standard Transportation Commodity Code (STCC)

STCC	Description
1	Farm products
8	Forest products
9	Fresh fish
10	Metallic ores
11	Coal
13	Crude petroleum, natural gas or gasoline
14	Nonmetallic ores, minerals, excluding fuels
19	Ordnance or accessories
20	Food and kindred products
21	Tobacco products, excluding insecticides
22	Textile mill products
23	Apparel or other finished textile products or knit apparel
24	Lumber or wood products, excluding furniture
25	Furniture or fixtures
26	Pulp, paper, or allied products
27	Printed matter
28	Chemicals or allied products
29	Petroleum or coal products
30	Rubber or miscellaneous plastics products
31	Leather or leather products
32	Clay, concrete, glass, or stone products
33	Primary metal products
34	Fabricated metal products
35	Machinery, excluding electrical
36	Electrical machinery, equipment, or supplies
37	Transportation equipment
38	Instruments, photographic goods, optical goods, watches, or clocks
39	Miscellaneous products of manufacturing
40	Waste or scrap materials not identified by producing industry
41	Miscellaneous freight shipments
42	Containers, carriers or devices, shipping, returned empty
43	Mail
45	Shipper association or other associated traffic
46	Miscellaneous mixed shipments
47	Small packaged freight movements
48	Waste hazardous materials or waste hazardous substances
49	Other Waste
50	Bulk in boxcar

Exhibit B2: Standard Classification of Transported Goods (SCTG) commodity codes

Code	Commodity Class
01	Live animals and live fish
02	Cereal grains
03	Other agricultural products
04	Animal feed and products of animal origin, not elsewhere classified (n.e.c.)
05	Meat, fish, seafood, and their preparations
06	Milled grain products and preparations, and bakery products
07	Other prepared foodstuffs and fats and oils
08	Alcoholic beverages
09	Tobacco products
10	Monumental or building stone
11	Natural sands
12	Gravel and crushed stone
13	Nonmetallic minerals n.e.c.
14	Metallic ores and concentrates
15	Coal
16	Crude Petroleum
17	Gasoline and aviation turbine fuel
18	Fuel oils
19	Coal and petroleum products, n.e.c.
20	Basic chemicals
21	Pharmaceutical products
22	Fertilizers
23	Chemical products and preparations, n.e.c.
24	Plastics and rubber
25	Logs and other wood in the rough
26	Wood products
27	Pulp, newsprint, paper, and paperboard
28	Paper or paperboard articles
29	Printed products
30	Textiles, leather, and articles of textiles or leather
31	Nonmetallic mineral products
32	Base metal in primary or semi-finished forms and in finished basic shapes
33	Articles of base metal
34	Machinery
35	Electronic and other electrical equipment and components and office equipment
36	Motorized and other vehicles (including parts)
37	Transportation equipment, n.e.c.
38	Precision instruments and apparatus
39	Furniture, mattresses and mattress supports, lamps, lighting fittings
40	Miscellaneous manufactured products
41	Waste and scrap
43	Mixed freight

Appendix C: Rail Corridors Assignment Method

This appendix describes the process used to aggregate rail flows to corridors. The rail origin-destination tonnages were assigned to the Oregon rail network. A rail corridor tonnage flow was counted in the origin corridor, destination corridor, and the corridors it had to traverse.

Exhibit C1 summarizes the corridors (Exhibit 10) assigned to each origin-destination flow. For the BNSF line, the regions outside of Oregon were defined as follows:

- BNSFNW: British Columbia, Saskatchewan, Alberta, and Washington State
- BNSFSW: California, Arizona, Nevada, New Mexico, Utah
- BNSFEAST: All other states and provinces

For the UP line, the regions out of Oregon were defined as follows:

- UPNW: Washington
- UPSW: California, Arizona, Nevada, New Mexico
- UPCAN: All Canadian Provinces
- UPEAST: All other US States

Inside of Oregon, each FSAC code tied a station to the corridor it falls into.

It was not possible to tie the 'through' flows between California and Canada to a specific corridor because there are two different corridors for entering the state from the north. Modal experts determined that a 25-75% split between flows traveling on Corridor 1 versus Corridor 7 from or to Canada should be assumed. The tonnage flowing through the state from the NW to the SW was summarized. The through tonnage was then multiplied by .25 and added to Corridors 1 and 5, and multiplied by .75 and added to Corridors 7 and 6. Corridors 9, 2, 11, and 3 received all of tonnage because they are the common corridors through the state for both entry corridors.

Exhibit C1: Assignment Logic for Rail Corridor Flows

OD1	OD2	Corridors Traveled					
BNSFNW	2	1	2	9			
BNSFNW	9	1	9				
BNSFNW	5	1	9	5	6		
BNSFNW	3	1	9	5	6		
BNSFNW	10	1	9	10			
BNSFNW	BNSFSW	1	5	3	6		
BNSFSW	3	3					
BNSFSW	5	3	5				
BNSFSW	9	3	5	6	9		
BNSFSW	2	3	5	6	9	2	
BNSFSW	10	3	5	6	9	10	
BNSFEAST	9	6	9				
BNSFEAST	2	6	9	2			
BNSFEAST	10	6	9	10			
UPNW	9	1	9				
UPNW	2	1	9	2			
UPNW	3	1	9	2	3	11	
UPNW	4	1	9	2	4		
UPNW	5	1	9	6	5		
UPNW	6	1	9	6			
UPNW	7	1	9	6	7		
UPNW	8	1	9	6	8		
UPSW	9	3	2	9			
UPSW	2	3	2				
UPSW	3	3					
UPSW	4	3	4				
UPSW	5	3	2	9	6	5	
UPSW	6	3	2	9	6	11	
UPSW	7	2	3	9	6	7	11
UPSW	8	2	3	9	6	8	11
UPCAN	9	7	6	9			
UPCAN	2	7	6	9	2		
UPCAN	3	7	6	9	2	3	11
UPCAN	4	7	6	9	2	4	
UPCAN	5	7	6	5			
UPCAN	6	7	6				
UPCAN	7	7					
UPCAN	8	7	8				
UPEAST	9	8	6	9			
UPEAST	2	8	6	9	2		
UPEAST	3	8	6	9	2	4	11
UPEAST	4	8	6	9	2	4	
UPEAST	5	8	6	5			
UPEAST	6	8	6				
UPEAST	7	8	7				
UPEAST	8	8					

Appendix D: STCC9 Fish Commodity Base Year and Forecast Assumptions

Commercial Fishing Methodology Memo

Objective

Oregon's commercial fishing industry is a substantial contribution to Oregon's coastal economy and is the livelihood for many Oregon residents. It also is a growing industry both domestically and internationally. Although the tonnage is less than 1% of the total commodity flow on a statewide basis, the impact on Oregon's economy and the value of the product cannot be understated.

This methodology memo is intended to list the process and assumptions used to develop a baseline commodity flow forecast for commercial fish in Oregon. This work is intended to provide a higher level of detail for Oregon than that which is included in national and international datasets such as the Freight Analysis Framework, but continues to utilize those datasets as one basis for estimating the distribution of commercial fish within and outside of Oregon.

For the purposes of this memo, commercial fishing includes salt-water seafood, fresh-water catch, as well as fish farm product.

Data Sources

This methodology is based on pulling together a variety of data sources. These sources, and how they are proposed to be used for the Commercial Fish commodity flow forecast, are listed below. For the commodity flow forecast, which is in terms of short or "English" tons, data sources reporting in Metric tons have been converted to short tons here. A Metric ton equals approximately 1.1 short tons.

- Pacific Coast Fisheries Information Network (PacFIN) database via a report by BST Associates.
- Oregon Aquaculture Association for information on small, commercial fish producers (fish farms; http://www.oregonaquaculture.org).
- Oregon Department of Fish and Wildlife, Commercial Fish Landings (by Port for ocean fishing, by county for fresh fish, above or below Bonneville Dam for Columbia River).
- "Oregon's Commercial Fishing Industry: Year 2005 and 2006 Review and Year 2007 Outlook", Oregon Department of Fish and Wildlife and Oregon Coastal Zone Management Association Inc., June 2007.
- Discussions with Pacific Seafood (Monica Isbell, July 2009) for mode split, direction and distribution of flow.

Definition of "Fresh Fish" In Commodity Flow Database

Detailed definition of the "Fresh Fish" commodity is by Standard Classification of Transported Goods Code (SCTG) and Standard Transportation Commodity Code (STCC) codes. The FAF2 provides SCTG that is converted to STCC for the Oregon Commodity Flow forecast. Thus, the components of the Commercial Fish commodity relevant to Oregon are, using the STCC coding:

- STCC09 FRESH FISH OR OTHER MARINE PRODUCTS
  - 091 FRESH FISH OR OTHER MARINE PRODUCTS EXC. PROCESSED
  - 0912 FRESH FISH PRODUCTS, OR FRESH UNPACKAGED (UNPROCESSED) FISH EXC. FRESH OR FRESH FROZEN PROCESSED FISH 2035
  - 09121 FINFISH
  - 09122 SHELLFISH
  - 0913 OTHER MARINE PRODUCTS
  - 09131 SHELLS, OYSTER, CRAB, CLAM, ETC.
  - 09139 MISC. MARINE PRODUCTS, NEC
  - 098 FISH HATCHERIES, FARMS, PRESERVES

Assumptions

A variety of assumptions are also necessary to develop a baseline forecast. These include:

- The commodity category of "Fresh Fish" includes commercial fish landed in Oregon (mostly the Oregon coast), plus fish transported to Oregon from Alaska, Hawaii, California and overseas.
- Ocean fish include fish, crab, oysters, and other shellfish.
- Oregon's commercial fishing industry accounts for approximately half (106,000 short tons out of 219,000 short tons) of the total fish/seafood commodity flow, based on the Pacific Coast Fisheries Information Network (PacFIN), ODFW and Freight Analysis Framework databases for the calibration base year of 2002.
- Oregon's fish farms (small, commercial fish producers of trout, steelhead, bass, etc.) account for approximately 0.5% of the fresh fish commodity flow in Oregon (based on information from the Oregon Aquaculture Association).
- Fresh fish tracked by ODFW includes trout, crayfish, and shrimp.

Based on the "Commercial Fishing Industry" report and outlook, and recent trends including establishment of marine preserves off the Oregon coast, the following assumptions are made regarding growth in the industry:

- The South Coast commercial fishing industry will experience continued declining of the fleet, reduction of fisheries and species depletion, and continued consolidation of the commercial fish processing industry. The ports have been making funding requests for cold storage and processing facilities, and it is assumed that these eventually will get built. Additionally, there is a small but growing industry of transporting live commercial fish commodity. Thus the forecast is for an offset between the fleet decline, new storage and processing centers, and the new live market, and commercial fishing growth in the South Coast will be flat.
- The North Coast will continue to experience constrained growth due to depletion of certain fish species, limits due to tribal fishing treaties, and competition from the Alaska and Washington fleets off the Oregon Coast. It will continue to see some growth in demand. Thus, growth rates for North Coast counties will be approximately 2-3% per year.
- To keep pace with increased demand in Oregon, domestically in the US, and internationally, Oregon's fish farming industry as well as the Columbia River fisheries will continue to see moderate growth, on the order of 2% per year.

Based on the BST report, using the Pacific Ocean commercial fish landings (tons) and value from 2002, adjusted to 2008 dollars, commercial fish is valued at $795,000 per kilo-Ton ($70,000,000 total value divided by 88 Ktons).

Commodity Flow Parameters

The commercial fishing supply chain is assumed to consist of the following:

- Ocean fish: fish are caught at sea and brought back to Oregon either for processing or for transporting live (a small, but growing industry). Processing consists of gutting and filleting the fish. Two products are created from this process- fresh fish for sale to the public via stores and restaurants and canned fish (including fish products) for domestic and export sales. Fresh Fish is distributed within a limited number of hours of processing either by refrigerated container/truck for local and regional delivery or by air cargo for national and international markets. Canned fish and fish products are packaged in containers and shipped both domestically (rail and truck) and internationally by ocean vessels.
- The parameters should then reflect the two product types.

Using the assumptions and data above, Exhibit C-1 below summarizes the 2002 commercial fish tonnage produced, by county, as well as 2035 projections. Exhibit C-2 summarizes value.

Other parameters are as follows:

- Domestic/International Split:
  - 34% international
  - 66% domestic.
- Mode Split
  - Ocean – 34%
  - Truck – 55%
  - Air – 10%
  - Rail – 1%.
- Direction of Domestic Flows Outside Oregon:
  - 35% north into Washington
  - 10% east (Idaho, Montana, others)
  - 55% south into California.
- Use FAF2-based method to split out within-Oregon vs. outbound flows
- County disaggregation of flow destinations within Oregon should roughly match population.

Additionally, the commodity flow forecast is being calibrated to the 2002 base year of the Freight Analysis Framework (FAF2). The studies and data referenced in this memo attempt to utilize 2002 data where possible. However, there have been some recent trends regarding fleet condition, depletion of fisheries for certain species while opening of new fisheries for other species, tribal fishing treaties and catch limits, and other events that are ever-changing the nature of commercial fishing. As a reasonableness check, the 2010 year for the commodity flow forecast will be checked against 2008 and 2009 catch data.

Exhibit D1: Calculation of Commodity Flow Tonnage, Production End

Commercial Fishing Baseline	Landed		Adjusted to Include Imported From Elsewhere		Annual Growth Rate	2035 Estimate
County	**Pounds (2002)**	**kTons (2002)**	**kTons(2002)**	**Share**		
Benton	100000	0.1	0.1	0.05%	2%	0.17
Clackamas	428371	0.2	0.4	0.21%	2%	0.74
Clatsop	105600000	52.8	110.9	49.59%	3%	232.16
Columbia	362234	0.2	0.4	0.17%	2%	0.62
Coos	13200000	6.6	13.9	6.20%	0%	13.86
Curry	8800000	4.4	9.2	4.13%	0%	9.24
Douglas	2200000	1.1	2.3	1.03%	0%	2.31
Gilliam	490554	0.2	0.5	0.23%	2%	0.85
Grant	100000	0.1	0.1	0.05%	2%	0.17
Hood River	738665	0.4	0.8	0.35%	2%	1.27
Jefferson	32619	0.0	0.0	0.02%	2%	0.06
Lake	161000	0.1	0.2	0.08%	1%	0.22
Lane	6700000	3.4	7.0	3.15%	0%	7.04
Lincoln	66000000	33.0	69.3	30.99%	2%	113.69
Marion	200000	0.1	0.2	0.09%	2%	0.34
Morrow	392443	0.2	0.4	0.18%	2%	0.68
Multnomah	226396	0.1	0.2	0.11%	1%	0.30
Tillamook	6600000	3.3	6.9	3.10%	2%	11.37
Wasco	490554	0.2	0.5	0.23%	2%	0.85
Washington	116000	0.1	0.1	0.05%	1%	0.16
TOTAL	212410463.6	106.5	219.0	100%	2.5%	396.09

Exhibit D2. Value of Commercial Fish Commodity Flow, Production End ($2008)

Commercial Fishing Baseline	Value	
County	**2002**	**2035**
Benton	$ 39,750	$ 83,475
Clackamas	$ 170,278	$ 357,583
Clatsop	$ 41,976,000	$ 88,149,600
Columbia	$ 143,988	$ 302,374
Coos	$ 5,247,000	$ 11,018,700
Curry	$ 3,498,000	$ 7,345,800
Douglas	$ 874,500	$ 1,836,450
Gilliam	$ 194,995	$ 409,490
Grant	$ 39,750	$ 83,475
Hood River	$ 293,619	$ 616,600
Jefferson	$ 12,966	$ 27,229
Lake	$ 63,998	$ 134,395
Lane	$ 2,663,250	$ 5,592,825
Lincoln	$ 26,235,000	$ 55,093,500
Marion	$ 79,500	$ 166,950
Morrow	$ 155,996	$ 327,592
Multnomah	$ 89,992	$ 188,984
Tillamook	$ 2,623,500	$ 5,509,350
Wasco	$ 194,995	$ 409,490
Washington	$ 46,110	$ 96,831

ENDANGERED SPECIES ACT SECTION 7 STREAMLINING AGREEMENT BETWEEN THE CITY OF PORTLAND, NOAA FISHERIES, U.S. ARMY CORPS OF ENGINEERS AND U.S. FISH AND WILDIFE SERVICE

February 14, 2003

PURPOSE

This agreement establishes a cooperative process for streamlining Endangered Species Act Section 7 consultations between the City of Portland (City), NOAA Fisheries, Army Corps of Engineers (Corps), and the U.S. Fish and Wildlife Service (USFWS). The streamlined consultation will provide a number of benefits including increased coordination for reviewing and providing analysis and documentation of City projects, programs and activities in order that they proceed in a timely manner while meeting Federal agency and City goals for ensuring ESA compliance and assisting in the conservation and recovery of listed and proposed species.

GOALS

The purpose of this agreement is to create a process to meet the following goals:

(1) To ensure that City project and program timeframes are met in a timely manner;

(2) To improve coordination, communication, and agreement on formal and informal consultation/conferencing on listed and proposed species prior to and during project/program proposal development; and

(3) To ensure that ongoing activities do not jeopardize listed and proposed species, result in the destruction/adverse modification of designated critical habitat, or result in unauthorized take during consultations on an existing project or activity;

(4) To support conservation and recovery of listed and proposed species.

PROCESS

Coordination between the City and Federal agencies early in the planning process for projects, programs and activities that require or would benefit from federal agency review is expected to result in the early identification of potential impacts to listed and proposed species and critical habitat and means to address such impacts. Early cooperation is also expected to conserve listed and proposed species while at the same time minimizing delay of proposed City projects, programs and activities.

The City and Federal agencies will convene a team to meet on a quarterly basis or when mutually deemed necessary by the parties to work towards the following:

(1) Ongoing and future Section 7 consultations with the City will be discussed and streamlined (e.g., batching similar projects or with similar timing needs, combining multiple agency consultations, etc.);

(2) Information, documentation, format, and timeframes will be developed for Biological Evaluations/Assessments (BE/BA) and Biological Opinions;
(3) Agreement on the use of the Programmatic Biological Opinion for Standard Local Operating Procedures for Endangered Species (SLOPES) for Certain Activities Requiring Department of Army Permits in Oregon;
(4) Development of additional compliance strategies in addition to Section 7 (e.g., 4(d) rule limit, sub-basin planning and programmatic opportunities) as needed for City projects, programs and activities; and
(5) Achieve better coordination between strategies to comply with the ESA and additional regulatory requirements with other state and Federal regulatory programs.

A regular assessment of the progress made towards achieving the goals of this agreement will be made on an annual basis. A process for resolution shall be developed in a timely and expeditious manner where issues, barriers, or disagreements that would preclude meeting the intent of the agreement are identified.

Successful implementation of the intent of the agreement will require full cooperation and coordination. The agreement will be carried out based on trust, mutual respect and accountability.

Vera Katz, Mayor
City of Portland

Michael Tehan
USDC, NOAA Fisheries

Colonel Richard Hobernicht, District Engineer
U.S. Army Corps of Engineers, Portland District

Kemper M. McMaster, State Supervisor
USDI Fish and Wildlife Service

ORDINANCE NO.

*Readopt remanded Ordinance No. 188142 to restrict bulk fossil fuel terminals. (Ordinance; Amend Title 33, Planning and Zoning)

The City of Portland ordains:

Section 1. The Council finds:

General Findings

1. The rapid development of fossil fuel resources in the western U.S. and Canada has resulted in numerous facility and infrastructure projects proposed to transport coal, diluted bitumen, natural gas, propane or other fossil fuels through the West Coast.

2. Fossil fuels pose risks to safety, health, and livability, including mobility of people, other freight, and other commercial vehicles.

3. The State of Oregon and the greater Pacific Northwest are vulnerable to powerful subduction zone earthquakes that occur with periodic frequency along the Juan de Fuqua and North American plates.

4. In the past, both the Huu-ay-aht First Nation peoples and the Makah tribe shared similar stories of lost land and peoples as a result of these earthquakes and tsunamis, which scientific research has matched with Japanese tsunami records and on-the-ground geologic field research to reconstruct the Cascadia earthquake of 1700. This research shows that subduction zone earthquakes have occurred along the Pacific Northwest with relative regularity over the last 10,000 years, and if averages from past events are predictive, the region could be overdue for another powerful subduction zone earthquake.

5. Many of the city's buildings and critical infrastructure were built before the city's seismic exposure was widely understood. This infrastructure includes Oregon's primary liquid fuel storage facilities, the Critical Energy Infrastructure (CEI) hub, which is located in northwest Portland and receives 90 percent of the state's liquid fuel supply either via pipeline or marine vessel. Most of the storage tanks within the CEI hub have been built prior to any design and performance lessons learned from the damaging Great Alaskan earthquake of 1964 and the many other documented earthquakes that followed.

6. The CEI hub is vulnerable to failure in the event of subduction zone earthquake. A 2012 Oregon Department of Geology and Mineral Industries (DOGAMI) Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report states that a magnitude 8 or 9 Cascadia Subduction Zone earthquake would impact the CEI Hub with: ground shaking; liquefaction (soil behavior phenomenon in which a saturated sand softens and loses strength during strong earthquake ground shaking); lateral spreading (where surficial soil permanently moves laterally due to earthquake shaking); landslides; co-seismic settlement (where the ground surface is permanently lowered due to seismic

shaking); and bearing capacity failures (when the foundation soil cannot support the structure it is intended to support). The study also notes that, at the time, only three existing storage tanks were known to have addressed liquefaction vulnerabilities.

7. The 2013 Oregon Resilience Plan raised concerns about the sturdiness of CEI facilities constructed on soils susceptible to liquefaction, and infrastructure not built to current standards given the hub's age-range of structures.

8. The Portland Bureau of Emergency Management's Mitigation Action Plan (MAP) identifies how natural hazard events like floods, landslides, and earthquakes might affect the City of Portland. The Portland area has experienced numerous earthquakes in the past, ranging from Magnitude 4.5 to 9.0. Portland is certain to experience seismic events in the future. Many of Portland's fossil fuel storage tanks were built before seismic design requirements in building codes were adopted.

9. Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake.

10. The extraction and combustion of fossil fuels are significant sources of greenhouse gas emissions and major contributors to climate change and pollution.

11. Coal contains toxic heavy metals, including mercury, arsenic and lead, and exposure to these toxic heavy metals is linked to cancer, birth defects and other health problems.

12. A Union Pacific train carrying oil from North Dakota to Tacoma derailed in Mosier, Oregon on June 3, 2016, spilling 42,000 gallons of crude oil, igniting a fire, and leading to the evacuation of one-quarter of the town's residents.

13. Tribal communities in Oregon and Washington have expressed concerns about the safety risks of fossil fuel infrastructure and the related threats to human health, cultural heritage, and environmental quality.

14. The City's 2015 Climate Action Plan (adopted by Resolution 37135) identifies the need to establish a "fossil fuel export policy that considers lifecycle emissions, safety, economics, neighborhood livability and environmental impacts" (Climate Action Plan, action 3G, page 69).

15. The City committed in its 2015 Climate Action Plan to advancing policy and programs to reduce local fossil fuel use both in the City's own operations and through community-wide initiatives.

16. In Resolutions 36959 and 36962 adopted in 2012, the Council expressed opposition to coal trains traveling through Portland until a programmatic, comprehensive and area-

wide Environmental Impact Statement and comprehensive Health Impact Assessment are completed.

17. Resolution 37168, adopted November 12, 2015, expressed the City Council's opposition to the "expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." It also expressed the Council's intent not to restrict improvements in safety, efficiency, or seismic resilience; the provision of service directly to end users; or infrastructure that will accelerate the transition to non-fossil fuel energy sources.

18. The 2035 Comprehensive Plan sets policy direction (Policies 4.75 and 4.76) to encourage disaster-resilient development and specifically to reduce natural hazard risks to critical energy and transportation infrastructure in Portland Harbor.

19. The first step in making the current situation better is to ensure that the situation does not get worse. Continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a moderate to high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals.

20. These Zoning Code amendments create a new land use category with development standards that limit the size of new terminals and prohibit the expansion of existing terminals.

21. The amendments promote major benefits to human health and safety, environmental health and resilience, with minor impacts to economic prosperity and equity.

22. The amendments will prohibit expansion at existing fuel terminals and limit new terminal development, potentially impacting associated job growth and tax revenue. At the same time, the code restrictions on fossil fuel terminal development will also limit potential financial risks from a major accident involving fossil fuel infrastructure.

23. The amendments will limit the risk of low, but potentially catastrophic, safety risks associated with fossil fuel infrastructure.

24. The amendments will allow for the continued operation, but prohibit expansion of storage capacity, with some exceptions, at existing fuel terminals and limit new terminal development.

25. The amendments will restrict development of fossil fuel terminals consistent with City and State objectives on climate change and public safety. While fossil fuels like natural gas and propane have the potential to replace higher-carbon fuels, substituting these fuels for higher-carbon fuels does not begin to approach the goal of an 80% reduction in

carbon emissions by 2050 established in Portland's Climate Action Plan or the State of Oregon's 75% reduction goal.

26. In Resolution 37168, the City Council expressed support for accelerating the transition to non-fossil fuel energy sources. As part of that transition, the Oregon Department of Environmental Quality (ODEQ) is implementing the Oregon Clean Fuels Program, which requires a 10 percent reduction in average carbon intensity by 2025. Fuels that could be used to achieve the standards include ethanol, biodiesel, electricity, hydrogen, natural gas, propane, and biogas, which may require additional storage capacity. In order to facilitate implementation of the Clean Fuels Program, non-fossil fuel storage tanks are not subject to the capacity limits.

27. Ordinance No. 188142 was appealed to the Oregon Land Use Board of Appeals (LUBA). LUBA issued a decision upholding two assignments of error in *Columbia Pacific Building Trades Council et al v. City of Portland*, LUBA Case No. 2017-001, July 19 2017).

28. LUBA's decision was appealed to the Oregon Court of Appeals, which overturned LUBA's decision which was affirmed in part and reversed in part in *Columbia Pacific Building Trades Council v. City of Portland*, 289 Or App 739 (2018).

29. The Oregon Court of Appeals decision was appealed to the Oregon Supreme Court, which denied review in *Columbia Pacific Building Trades Council v. City of Portland*, 363 Or 390 (2018).

30. On October 5, 2018, LUBA remanded *Columbia Pacific Building Trades Council et al v. City of Portland*, LUBA Case No. 2017-001 to assignments of error that LUBA sustained and were either affirmed or not challenged on appeal to the Court of Appeals.

31. A general notification of the November 20, 2019, City Council public hearing on the remand of Ordinance No. 188142 was sent to the City's legislative notice list, the fossil fuel terminal property owners, and the parties to the appeal.

32. On November 20, 2019, the Portland City Council held a public hearing and received testimony on the re-adoption of the fossil fuel terminal zoning restrictions.

Conclusion

33. The City Council has considered applicable policies, as described in Exhibit A, to determine that this ordinance on the whole complies with the 2035 Comprehensive Plan and on balance is equally or more supportive of the goals and policies of the 2035 Comprehensive Plan than the current regulations. In reaching this conclusion, City Council has weighed and balanced competing policy directions. In particular, the Council finds that:
    a. Statewide Planning Goal 7 (Natural Hazards) and 2035 Comprehensive Plan Goal 4.D with Policies 4.79 and 4.80, requires reducing risk to people and property from natural hazards. The FFTZ amendments further these goals and policies by

limiting the risks of storing large volumes of hazardous materials in an area with high susceptibility to an earthquake. Large fossil fuel terminals represent a risk to people, property and the natural environments that the City Council finds as a compelling reason to limit future risk by limiting the size of new facilities and prohibit the expansion of existing facilities. Continuing to allow an unlimited increase in storage capacity at FFTs in a high risk area would be less supportive of the 2035 Comprehensive Plan than adopting the FFTZ amendments

b. Policy 6.48 provides direction to limit fossil fuel terminals to what is necessary to serve the region. The City Council recognizes that Portland's fossil fuel terminals handle 90 percent of the fossil fuel for the State of Oregon and Southwest Washington. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs. In addition, limiting storage capacity to the existing facilities reduces risk from a major earthquake, which outweighs the policy direction to provide capacity to accommodate any potential future increase in fossil fuel consumption, in part, because continuing to consolidate fossil fuel storage capacity in Portland is counter to resiliency principles that emphasize redundancy and distributed facilities.
c. Statewide Planning Goal 9 (Economic Development) and 2035 Comprehensive Plan Goal 6.C with Policies 6.20 and 6.36, among others, provide for the retention and growth of businesses, especially those in the traded sector. The City Council interprets these policies apply to the economy in general, rather than specific types of business. These changes and restrictions only apply to a narrowly defined new land use category, Bulk Fossil Fuel Terminals, and do not have a significant effect on the other allowed uses in industrial and employment zones. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial and employment areas of Portland. These amendments are narrowly constructed to apply to one class of businesses that make up a small portion of the city, regional and state economy. Further, these regulations only limit future expansion of these fossil fuel terminals, with some key exceptions, and designate these businesses as a limited use that allows their continued operation.
d. Guilds Lake Industrial Sanctuary (GLIS) Plan policies provide direction to maintain, protect and enhance businesses in the sanctuary. This plan was adopted in 2001 and does not address the need for resiliency in a high and medium liquefaction susceptibility area. The City Council interprets these policies to apply to the GLIS as a whole and not individual businesses. The City Council interprets the legislative intent of the GLISP is to maintain the area as an industrial sanctuary and to prohibit incompatible land uses. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses that could undermine the viability of the industrial sanctuary. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The remaining industrial uses to continue to operate under current

regulations. The impact of the limits on fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and make upgrades and supports limited enhancement through exceptions to the storage capacity restrictions.

NOW THEREFORE, The Council directs:

a. Adopt Exhibit A as additional findings.
b. Amend Title 33, Planning and Zoning, as shown in Exhibit B, Fossil Fuel Terminal Zoning Amendments, Remand Report, dated October 30, 2019.
c. Adopt the commentary in Exhibit B, Fossil Fuel Terminal Zoning Amendments, Remand Report, dated October 30, 2019, as legislative intent and further findings.
d. Adopt Exhibit C. LUBA Record for *Columbia Pacific Building Trades Council et al v. City of Portland*, LUBA Case No. 2017-001, as additional evidence.
e. The Bureau of Planning and Sustainability shall report to City Council no later than December 31, 2021 on the implementation of this ordinance, including:
    - the number and description of any requests by existing terminal operators to upgrade and replace storage capacity at their facilities;
    - the number and description of building permits issued for fossil fuel tanks between 125,000 and 2 million gallons;
    - the trends in fossil fuel energy use and non-fossil energy use in Oregon;
    - the status of local and state regulatory proceedings that may improve seismic resilience of fossil fuel storage infrastructure; and
    - information on compliance with the Oregon Clean Fuels Program.

f. City Bureaus, including BDS, PBEM and Fire, shall work with the State of Oregon to develop policy options to require seismic upgrades of storage tanks within a firm deadline for replacement of older, unsafe tanks.

Section 2.
The Council declares that an emergency exists due to the fact that Portland is currently at risk of a major earthquake; therefore, this ordinance shall be in full force and effect from and after its passage by the Council.

Section 3.
If any section, subsection, sentence, clause, phrase, diagram, designation, or drawing contained in this Ordinance, or the plan, map or code it adopts or amends, is held to be deficient, invalid or unconstitutional, that shall not affect the validity of the remaining portions. The Council declares that it would have adopted the plan, map, or code and each section, subsection, sentence, clause, phrase, diagram, designation, and drawing thereof, regardless of the fact that any one or more sections, subsections, sentences, clauses, phrases, diagrams, designations, or drawings contained in this Ordinance, may be found to be deficient, invalid or unconstitutional.

Passed by the Council:

Mary Hull Caballero
Auditor of the City of Portland
By

Deputy

Mayor Ted Wheeler

Prepared by: T. Armstrong
Date Prepared: October 31, 2019

Agenda No.

ORDINANCE NO.

Title

*Readopt remanded Ordinance No. 188142 to restrict bulk fossil fuel terminals. (Ordinance; Amend Title 33, Planning and Zoning)

INTRODUCED BY Commissioner/Auditor: **Mayor Wheeler**	CLERK USE: DATE FILED _____
COMMISSIONER APPROVAL	Mary Hull Caballero Auditor of the City of Portland
Mayor—Finance & Administration - Wheeler	
Position 1/Utilities - Fritz	By: _____ Deputy
Position 2/Works - Fish	
Position 3/Affairs - Hardesty	**ACTION TAKEN:**
Position 4/Safety - Eudaly	
BUREAU APPROVAL	
Bureau: Planning and Sustainability Bureau Head: Andrea Durbin	
Prepared by: Tom Armstrong Date Prepared: 10/29/19	
Impact Statement Completed ☒ Amends Budget ☐	
Portland Policy Document If "Yes" requires City Policy paragraph stated in document. Yes ☐ No ☒	
City Auditor Office Approval: required for Code Ordinances	
City Attorney Approval: RAK required for contract, code, easement, franchise, comp plan, charter	
Council Meeting Date **11/20/19**	

AGENDA
TIME CERTAIN ☒ **Start time: 2:00 p.m.** **Total amount of time needed: 2 hours** **(for presentation, testimony and discussion)**
CONSENT ☐
REGULAR ☐ **Total amount of time needed: _____** **(for presentation, testimony and discussion)**

FOUR-FIFTHS AGENDA	COMMISSIONERS VOTED AS FOLLOWS:		
		YEAS	NAYS
1. Fritz	1. Fritz		
2. Fish	2. Fish		
3. Hardesty	3. Hardesty		
4. Eudaly	4. Eudaly		
Wheeler	Wheeler		

Passed by the Council:

Mary Hull Caballero
Auditor of the City of Portland
By

Deputy

Mayor Ted Wheeler

Prepared by: T. Armstrong
Date Prepared: October 31, 2019

Exhibit A:
Findings of Fact Report
October 2019

Text amendments to the zoning code must be found to be consistent with the Comprehensive Plan, Urban Growth Management Functional Plan, and the Statewide Planning Goals. In addition, the amendments must be consistent with the intent or purpose statement for the base zone, overlay zone, and plan district where the amendment is proposed, and any plan associated with the regulations. (33.835.040)

1. Finding: The City Council has identified and addressed all relevant and applicable goals and policies in this document.
2. Finding: The City Council has considered the public testimony on this matter and has weighed all applicable goals and policies and on balance has found the need to adopt the Fossil Fuel Terminal Zoning amendments (the FFTZ amendments).

Part I. Statewide Planning Goals

State planning statutes require cities to adopt and amend comprehensive plans and land use regulations in compliance with the Statewide Planning Goals.

The Statewide Planning Goals that apply to Portland are:

Goal 1 Citizen Involvement
Goal 2 Land Use Planning
Goal 5 Natural Resources, Scenic and Historic Areas, and Open Spaces
Goal 6 Air, Water and Land Resource Quality
Goal 7 Areas Subject to Natural Hazards
Goal 8 Recreational Needs
Goal 9 Economic Development
Goal 10 Housing
Goal 11 Public Facilities and Services
Goal 12 Transportation
Goal 13 Energy Conservation
Goal 14 Urbanization
Goal 15 Willamette River Greenway

There are approximately 560 acres of land both within Portland's municipal boundaries and beyond the regional urban service boundary that can be classified as rural land. In 1991, as part of Ordinance 164517, the City Council took an exception to Goal 3 and 4. the agriculture and forestry goals. Because of the acknowledged exception, the following goals do not apply:

Goal 3 Agricultural Lands
Goal 4 Forest Lands

Other Statewide Planning Goals apply only within Oregon's coastal zone. Since Portland is not within Oregon's coastal zone, the following goals do not apply to this decision:

Goal 16 Estuarine Resources

Goal 17 Coastal Shorelands
Goal 18 Beaches and Dunes
Goal 19 Ocean Resources

Goal 1. Citizen Involvement. To develop a citizen involvement program that insures the opportunity for citizens to be involved in all phases of the planning process.

3. Finding: The preparation of these amendments has provided numerous opportunities for public involvement, including:

Concept Phase. In 2016, prior to the initiation of the legislative project, BPS conducted four stakeholder focus groups meetings. These meetings included participants with a range of perspectives and experience, including community group representatives, fuel terminal representatives, environmental organizations, and business organizations. These meetings served as a forum for discussing issues and potential approaches, and to help inform project staff develop concepts. In addition to the stakeholder focus groups, BPS staff met with several fuel terminals to explain the proposal, answer questions, and discuss their individual concerns. These meetings were needed because antitrust regulations constrained discussion about certain topics, for example supply chains, in the presence of representatives from other fuel terminals.

Discussion Draft. On June 29, 2016, the Fossil Fuel Terminal Zoning Amendments Discussion Draft was published and posted on the Bureau website.

Proposed Draft. On August 12, 2016, the Fossil Fuel Terminal Zoning *Proposed Draft* was published in preparation for the Planning and Sustainability Commission (PSC) review and recommendation. In support of this process, the BPS website had a project page dedicated to this project, an email address for submitting testimony. As part of the Proposed Draft publication and legislative process requirements, the following legal notices were also sent:

- Form 1 35-day Notice
  Sent to the Department of Land Conservation and Development (DLCD)
- Legislative Notice
  Sent to interested parties, recognized organizations, affected bureaus, TriMet, Metro and ODOT and published in the Daily Journal of Commerce
- Measure 56 Notice
  Required by Ballot Measure 56, this mailed notice was sent to property owners with industrial or employment base zoning.

The PSC held a public hearing on September 13, 2016. On October 11, 2016, the Planning and Sustainability Commission voted to recommend the Fossil Fuel Terminal Zoning Amendments to City Council, including PSC-recommended modifications to the Proposed Draft. All PSC meetings were streamed live and available for viewing on the Bureau website.

Recommended Draft. On October 24, 2016. the Fossil Fuel Terminal Zoning Amendments *Recommended Draft* was published to present the PSC recommendations to City Council. On October 25, 2016, notice of the City Council hearing on the Fossil Fuel Terminal Zoning Amendments was mailed. The City Council held public hearings on November 10 and 16, 2016, to receive testimony on the *Recommended Draft*. On December 8, 2016, the City Council voted to adopt the Fossil Fuel Terminal Zoning Amendments.

As noted below in these findings, the FFTZ amendments are consistent with the goals and policies

of Chapter 2 (Community Involvement) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. The events and outreach strategies summarized here demonstrate consistency with the requirements of Statewide Planning Goal 1.

Goal 2. Land Use Planning. To establish a land use planning process and policy framework as a basis for all decisions and actions related to use of land and to assure an adequate factual base for such decisions and actions.

4. Finding: Goal 2, as it applies to the FFTZ amendments, requires the City to follow established procedures for legislative amendments to the Zoning Code, which are found in 33.740 (Legislative Procedure). The amendments support this goal because, as demonstrated by these findings, the FFTZ amendments were developed consistent with the Statewide Planning Goals, the Metro Urban Growth Management Functional Plan, and 2035 Comprehensive Plan, as detailed in this ordinance.
5. Finding: Other government agencies received notice from the 35-day DLCD notice and the City's legislative notice. In the initial adoption of the ordinance, the City received testimony from the Port of Portland. The City responded to the issues raised by the Port by amending the code to include an exception for the storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, drydock, ship or barge servicing facility, rail yard, or as part of a fleet vehicle servicing facility. The City did not receive any requests from other government agencies to modify the FFTZ amendments.
6. Finding: The City Council's decision is based on the findings in this document, which are based on the factual evidence presented to the Planning and Sustainability Commission and City Council as part of the initial adoption in 2016 as well as the evidence presented as part of the reconsideration of this ordinance that is incorporated in the record that provides the adequate factual base for this decision.

Goal 5. Open Space, Scenic and Historic Areas, and Natural Resources. To protect natural resources and conserve scenic and historic areas and open spaces.

7. Finding:

Open Spaces. The FFTZ amendments do not include Comprehensive Plan map or Zoning Map changes. There are no designated open spaces (OS map designations) on any of the existing FFTs.

Scenic Resources. In 1991, the City adopted the Scenic Resources Protection Plan and applied a scenic (s) overlay zone to protect significant scenic resources. Two of the FFTs (BP West Coast and NuStar/Shore Terminals) are in a (s) overlay zone. The scenic resource protections (Chapter 33.480) are not amended by this ordinance and the height limits associated with the (s) overlay zone will continue to apply to the two FFT sites.

Historic Resources. Historic resources are located throughout the City, but very few are in the industrial zones. There are no designated Historic Landmarks or Districts in or immediately adjacent to any of the existing FFTs. Existing historic resource protections are not being amended (Chapter 33.445).

Natural Resources. There are significant natural resources in industrial zones, especially along on the Willamette and Columbia Rivers. Six of the existing FFTs have frontage on the Willamette River with designated natural resources that are protected by the Greenway Overlay Zone (Chapters 33.440), which is not amended by this ordinance.

Generally. As noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 4 (Design and Development,

including Historic and Cultural Resources) and Chapter 7 (Environment and Watershed Health) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, FFTZ amendments are consistent with the requirements of Statewide Planning Goal 5.

Goal 6. Air, Water, and Land Resource Quality. To maintain and improve the quality of the air, water and land resources of the state.

8. Finding: Goal 6 requires the maintenance and improvement of the quality of air, water, and land resources. The State has not adopted administrative rules for complying with Statewide Planning Goal 6. The City complies with federal and state environmental standards and statutes, including the federal Clean Water Act and Clean Air Act. Existing City regulations including Title 10 (Erosion Control) and the Stormwater Management Manual will remain in effect and are applicable to future development. As noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 7 (Environment and Watershed Health) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, FFTZ amendments are consistent with the requirements of Statewide Planning Goal 6.

Goal 7, **Areas Subject to Natural Disasters and Hazards.** To protect people and property from natural hazards.

9. Finding: The State has not adopted administrative rules for complying with Statewide Planning Goal 7. Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. According to the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report, a magnitude 8 or 9 Cascadia Subduction Zone earthquake would impact the CEI Hub with: ground shaking; liquefaction (soil behavior phenomenon in which a saturated sand softens and loses strength during strong earthquake ground shaking); lateral spreading (where surficial soil permanently moves laterally due to earthquake shaking); landslides; co-seismic settlement (where the ground surface is permanently lowered due to seismic shaking); and bearing capacity failures (when the foundation soil cannot support the structure it is intended to support).

According to the 2012 DOGAMI report, liquefaction and lateral spreading hazards are of primary concern to the fossil fuel terminals. As described in the 2012 Oregon State Energy Assurance Plan, this Critical Energy Infrastructure Hub (CEI Hub) sits on top of very poor soils that are highly susceptible to earthquake-induced permanent ground deformation. The CEI Hub is adjacent to the Willamette River and has extensive deposits of highly liquefiable soils. These soils (made of sands, silts, gravels and clays) have been naturally deposited by river activity as well as been created from man-made activities, such as hydraulically placed material from river dredging or debris placed as landfill.

The FFTs have significant seismic risks because most of the tanks have been constructed without any or only limited seismic design criteria on soils with moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. Further, by

designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

As noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 7 (Environment and Watershed Health) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, FFTZ amendments are consistent with the requirements of Statewide Planning Goal 7.

Goal 8. Recreational Needs. To satisfy the recreational needs of the citizens of the state and visitors and, where appropriate, to provide for the siting of necessary recreational facilities including destination resorts.

10. Finding: Goal 8 focuses on the provision of destination resorts. However, it does impose a general obligation on the City to plan for meeting its residents' recreational needs: "(1) in coordination with private enterprise; (2) in appropriate proportions; and (3) in such quantity, quality and locations as is consistent with the availability of the resources to meet such requirements."

Goal 8 provides that "Recreation Needs -- refers to existing and future demand by citizens and visitors for recreations areas, facilities and opportunities." Goal 8 also provides that "Recreation Areas, Facilities and Opportunities -- provide for human development and enrichment, and include but are not limited to: open space and scenic landscapes; recreational lands; history, archaeology and natural science resources; scenic roads and travelers; sports and cultural events; camping, picnicking and recreational lodging; tourist facilities and accommodations; trails; waterway use facilities; hunting; angling; winter sports; mineral resources; active and passive games and activities."

The City of Portland has robust and diverse system of parks, recreation areas and open spaces. However, there are no parks adjacent to the existing FFTs. Further, the ordinance limits development for a single type of use, which will reduce negative impacts to parks that are near industrial areas, especially Forest Park, which is located across Highway 30 from the Northwest Industrial District where the existing FFTs are located.

As noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 8 (Public Facilities and Services) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, FFTZ amendments are consistent with the requirements of Statewide Planning Goal 8.

Goal 9. Economic Development. To provide adequate opportunities throughout the state for a variety of economic activities vital to health, welfare, and prosperity of Oregon's citizens.

11. Finding: Goal 9 requires cities to consider economic activities vital to the health, welfare, and prosperity of Oregon's citizens. Comprehensive plans for urban areas are required to include, among other things: an analysis of economic patterns, potentialities, strengths, and deficiencies; policies concerning economic development; and land use maps that provide for at least an adequate supply of sites for a variety of industrial and commercial uses.

The 2035 Comprehensive Plan demonstrates compliance with Goal 9. Land needs for a variety of industrial and commercial uses are identified in the Economic Opportunities Analysis (EOA), which was adopted (Ordinance 187831) and acknowledged by LCDC on April 25, 2017.

The City's acknowledged EOA analyzed and demonstrated adequate growth capacity for a diverse range of employment uses, which are organized into different geographies that represent a distinct mix of business sectors and building types. In each of the geographies, the City analyzed the future employment growth and the developable land supply to accommodate that growth.

The FFTZ amendments do not include comprehensive plan map amendments, and, therefore, do not affect the employment development capacity of Portland.

As noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 6 (Economic Development) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, FFTZ amendments are consistent with the requirements of Statewide Planning Goal 9.

Goal 10. Housing. To provide for the housing needs of citizens of the state.

12. Finding: Goal 10 specifies that each city must plan for and accommodate needed housing types. As used in ORS 197.307 "needed housing" means all housing on land zoned for residential use or mixed residential and commercial use that is determined to meet the need shown for housing within an urban growth boundary at price ranges and rent levels that are affordable to households within the county with a variety of incomes, including but not limited to households with low incomes, very low incomes and extremely low incomes, and includes attached and detached single-family housing and multiple family housing for both owner and renter occupancy;

Goal 10 requires each city to inventory its buildable residential lands, forecast future needs, and zone enough buildable land to meet those needs. The FFTZ amendments do not include comprehensive plan map amendments, and, therefore, do not affect the residential development capacity of Portland.

As noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 5 (Housing) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, FFTZ amendments are consistent with the requirements of Statewide Planning Goal 10.

Goal 11. Public Facilities and Services. To plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development.

13. Finding: Statewide Planning Goal 11, Public Facilities, requires cities to adopt and update public facilities plans. Public facilities plans ensure that urban development is guided and supported by types and levels of water, sewer and transportation facilities appropriate for the needs and requirements of the urban areas to be serviced, and that those facilities and services are provided in a timely, orderly and efficient arrangement.

The adopted 2035 Comprehensive Plan includes the Citywide Systems Plan (CSP), which was adopted (Ordinance 185657) and acknowledged by LCDC on April 25, 2017. The CSP includes the Public Facilities Plan with information on current and future transportation, water, sanitary sewer, and stormwater infrastructure needs and projects, consistent with the requirements of Statewide Planning Goal 11.

The FFTZ amendments do not include comprehensive plan map amendments. These regulations apply to only one type of use that makes up a minority part of the uses found in Portland's industrial districts. The remaining industrial uses continue to be regulated under the current

development regulations and do not intensify the development capacity. Therefore, these changes will not adversely impact the City's public facilities.

As noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 8 (Public Facilities and Services) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, FFTZ amendments are consistent with the requirements of Statewide Planning Goal 11.

Goal 12. Transportation. To provide and encourage a safe, convenient and economic transportation system.

14. **Finding:** OAR 660-012-0060 (1) If an amendment to a functional plan, an acknowledged comprehensive plan, or a land use regulation (including a zoning map) would significantly affect an existing or planned transportation facility, then the local government must put in place measures as provided in section (2) of this rule, unless the amendment is allowed under section (3), (9) or (10) of this rule. A plan or land use regulation amendment significantly affects a transportation facility if it would:
    (a) Change the functional classification of an existing or planned transportation facility (exclusive of correction of map errors in an adopted plan);
    (b) Change standards implementing a functional classification system; or
    (c) Result in any of the effects listed in paragraphs (A) through (C) of this subsection based on projected conditions measured at the end of the planning period identified in the adopted TSP. As part of evaluating projected conditions, the amount of traffic projected to be generated within the area of the amendment may be reduced if the amendment includes an enforceable, ongoing requirement that would demonstrably limit traffic generation, including, but not limited to, transportation demand management. This reduction may diminish or completely eliminate the significant effect of the amendment.
        (A) Types or levels of travel or access that are inconsistent with the functional classification of an existing or planned transportation facility;
        (B) Degrade the performance of an existing or planned transportation facility such that it would not meet the performance standards identified in the TSP or comprehensive plan; or
        (C) Degrade the performance of an existing or planned transportation facility that is otherwise projected to not meet the performance standards identified in the TSP or comprehensive plan.

The adopted 2035 Comprehensive Plan includes the Transportation Systems Plan (TSP), which was adopted in three phases (Ordinance 187832, 188177, and 188957). Phase 1 and 2 was submitted as part Task Four of Periodic Review; and both were approved by LCDC Order 18 – WKTSK – 001897 on August 8, 2018. Phase 3 of the Transportation System Plan was adopted as a post-acknowledgement plan amendment by Ordinance No. 188957, became effective on June 23, 2018. The TSP includes a congestion performance analysis of the 2035 Comprehensive Plan Map.

The FFTZ amendments do not change the functional classification of any existing or proposed transportation facility, nor do they change the standards implementing a functional classification system. Therefore, the amendments do not have a significant effect under (a) or (b).

The FFTZ amendments limit one type of use allowed in industrial areas. The remaining industrial uses continue to be regulated under the current development regulations and do not intensify the development capacity. Therefore, the amendments do not have a significant effect under (c).

Portland's Air, Rail, Water Pipeline Plan (ARWP) is adopted into the acknowledged TSP in compliance with OAR 660-012-0020(2)(e). The ARWP includes information on the location and extent of existing or planned facilities, as specified by the rule. The ARWP does not have functional classification or performance standards, and the rule does not require them.

Furthermore, as noted below in the findings for the 2035 Comprehensive Plan, the FFTZ amendments are consistent with the goals and policies of Chapter 9 (Transportation) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference. Therefore, the FFTZ amendments are consistent with the requirements of Statewide Planning Goal 12.

Goal 13. Energy Conservation. To conserve energy.

15. Finding: The State has not adopted specific rules for complying with Statewide Planning Goal 13. Goal 13 generally requires that land use plans contribute to energy conservation.

The FFTZ amendments do not adopt or amend a local energy policy or implementing provisions.

Goal 14. Urbanization. To provide for an orderly and efficient transition from rural to urban land use, to accommodate urban population and urban employment inside urban growth boundaries, to ensure efficient use of land, and to provide for livable communities.

16. Finding: Metro is responsible for Goal 14 compliance on behalf of Portland and other cities within the metropolitan region. Metro has adopted an Urban Growth Management Functional Plan and compliance with this plan by constituent cities assures compliance with Goal 14, which is discussed in Part II of this document and those findings are incorporated by reference.

As discussed above under Goal 9, the FFTZ amendments will not change the employment development capacity inside the urban growth boundary and the City will continue to have adequate capacity to accommodate its allocated forecasted growth. Therefore, FFTZ amendments are consistent with the requirements of Statewide Land Use Goal 14.

Goal 15. Willamette River Greenway. To protect, conserve, enhance and maintain the natural, scenic, historical, agricultural, economic and recreational qualities of lands along the Willamette River as the Willamette River Greenway.

17. Finding: Six of the 11 existing FFTs have frontage on the Willamette River. However, these parcels will continue to be subject to development regulations for flood plains or natural resources. Furthermore, no changes to existing protections afforded through the greenway overlay zones are proposed.

Therefore, FFTZ amendments are consistent with the requirements of Statewide Land Use Goal 15 because they do not change the protections to affected lands within the Willamette River Greenway Overlay Zone.

Part II. Metro Urban Growth Management Functional Plan

Under ORS 268.380 and its Charter, Metro has the authority to adopt regional plans and require city and county comprehensive plans to comply with regional plan. Metro adopted its Urban Growth Management Functional Plan under this authority.

In its June 2011 update to its 2010 compliance report Metro found, "The City of Portland is in compliance with all Urban Growth Management Functional Plan requirements in effect on December

15, 2010, except for Title 13, Nature in Neighborhoods." On January 16, 2013 the City received a letter from Metro stating that Portland had achieved compliance with Title 13.

Title 1. Housing Capacity. The Regional Framework Plan calls for a compact urban form and a "fair-share" approach to meeting regional housing needs. Title 1 requires each city and county to maintain or increase its housing capacity, especially in centers, corridors, main streets, and station communities, except as provided in section 3.07.120.

18. Finding: The FFTZ amendments do not reduce housing potential in any part of the City because the amendments affect a use of industrial land and does not change the designation of residential lands.

    Therefore, the FFTZ amendments are consistent with the requirements of Title 1.

Title 2. Regional Parking Policy. (repealed in 1997)

Title 3. Water Quality and Flood Management. To protect the beneficial water uses and functions and values of resources within the Water Quality and Flood Management Areas by limiting or mitigating the impact on these areas from development activities and protecting life and property from dangers associated with flooding.

19. Finding: Title 3 calls for the protection of the beneficial uses and functional values of resources within Metro-defined Water Quality and Flood Management Areas by limiting or mitigating the impact of development in these areas. Title 3 establishes performance standards for 1) flood management; 2) erosion and sediment control; and 3) water quality. The City has adopted overlay zones and land use regulations, including Title 10 Erosion Control and the balanced cut-and-fill standards in Title 24 Building Regulations, that, in the June 2011 update to its 2010 compliance report, Metro found sufficient to comply with Title 3. This ordinance does not change any of these overlays or regulations.

    FFTs are located in the 100-year floodplain. In the Zoning Code, the City of Portland's Title 3 program is implemented primarily through the greenway overlay zones, which are unchanged by these amendments and will ensure any new development will be done in a way to protect people and property and the functions and values of the floodplain.

Title 4. Industrial and Other Employment Areas. The Regional Framework Plan calls for a strong regional economy. To improve the economy, Title 4 seeks to provide and protect a supply of sites for employment by limiting the types and scale of non-industrial uses in Regionally Significant Industrial Areas (RSIAs), Industrial and Employment Areas. Title 4 also seeks to provide the benefits of "clustering" to those industries that operate more productively and efficiently in proximity to one another than in dispersed locations. Title 4 further seeks to protect the capacity and efficiency of the region's transportation system for the movement of goods and services and to encourage the location of other types of employment in Centers, Corridors, Main Streets and Station Communities. The Metro Council will evaluate the effectiveness of Title 4 in achieving these purposes as part of its periodic analysis of the capacity of the urban growth boundary.

20. Finding: The purpose of Title 4 is to maintain a regional supply of existing industrial and employment land by limiting competing uses for this land. Metro has not adopted a Statewide Planning Goal 9 economic opportunities analysis for the region, so Title 4 is not based on an assessment of the land needed for various employment types, nor do the Title 4 maps necessarily depict lands most suitable to accommodate future job growth. Rather, Title 4 seeks to protect the manufacturing, warehousing, and distribution of goods within three types of mapped areas by

limiting competing uses. These three areas are Regionally Significant Industrial Areas (RSIAs), Industrial Areas, and Employment Areas.

The FFTs are located in the northwest industrial district, which is a designated RSIA. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, the FFTZ amendments are consistent with the requirements of Metro Title 4.

Title 5. Neighboring Cities (repealed 1997)

Title 6. Centers, Corridors, Station Communities and Main Streets. The Regional Framework Plan identifies Centers, Corridors, Main Streets and Station Communities throughout the region and recognizes them as the principal centers of urban life in the region. Title 6 calls for actions and investments by cities and counties, complemented by regional investments, to enhance this role. A regional investment is an investment in a new high-capacity transit line or designated a regional investment in a grant or funding program administered by Metro or subject to Metro's approval.

21. Finding: Title 6 establishes eligibility criteria for certain regional investments, and the use of more flexible trip generation assumptions when evaluating transportation impacts. Title 6 also contains aspirational activity level targets for different Metro 2040 place types. This title is incentive-based, so these findings simply serve to document intent. There are no specific mandatory compliance standards in Title 6 that apply to this ordinance.

The existing FFTs are not located in designated Title 6 areas, therefore this title does not apply.

Title 7. Housing Choice. The Regional Framework Plan calls for establishment of voluntary affordable housing production goals to be adopted by local governments and assistance from local governments on reports on progress towards increasing the supply of affordable housing. It is the intent of Title 7 to implement these policies of the Regional Framework Plan.

22. Finding: Title 7 addresses housing choice. Metro adopted voluntary affordable housing goals for each city and county in the region for the years 2001 to 2006, but never updated them. Title 7 does not apply. The FFTZ amendments change the City's industrial zones and does not impact the City of Portland's residential development capacity or affordable housing programs.

Title 8. Compliance Procedures. Title 8 addresses compliance procedures and establishes a process for ensuring city or county compliance with requirements of the Urban Growth Management Functional Plan. A city or county proposing an amendment to a comprehensive plan or land use regulation shall submit the proposed amendment to METRO at least 35 days prior to the first evidentiary hearing on the amendment.

23. Finding: Metro was provided with the 35-day DLCD notice and the City's standard legislative notice. Title 8 also requires the City to provide findings of compliance with the *Urban Growth Management Functional Plan*, as described here. All applicable requirements of Title 8 have been met.

Title 9. Performance Measures. (repealed in 2010)

Title 10. Functional Plan Definitions. Title 10 contains definitions. When 2035 Comprehensive Plan uses a term found in Title 10 either the term has the same meaning found in Title 10, or the difference is explained.

24. Finding: The FFTZ amendments do not change any definitions in the 2035 Comprehensive Plan that are also found in Title 10. All applicable requirements of Title 10 have been met.

Title 11. Planning for New Urban Areas. (not directly applicable)

Title 12. Protection of Residential Neighborhoods. Existing neighborhoods are essential to the success of the 2040 Growth Concept. The intent of Title 12 of the Urban Growth Management Functional Plan is to protect the region's residential neighborhoods. The purpose of Title 12 is to help implement the policy of the Regional Framework Plan to protect existing residential neighborhoods from air and water pollution, noise, and crime and to provide adequate levels of public services.

25. Finding: Title 12 addresses protection of residential neighborhoods. This title largely restricts Metro's authority to plan and regulate density in single-family neighborhoods. Further, the 2035 Comprehensive Plan does not employ any of the optional provisions of Title 12. The FFTZ amendments were originated by the City's legislative process and do not affect residential neighborhoods. Therefore, this title does not apply to this ordinance.

Title 13. Nature in Neighborhoods. The purposes of this program are to (1) conserve, protect, and restore a continuous ecologically viable streamside corridor system, from the streams' headwaters to their confluence with other streams and rivers, and with their floodplains in a manner that is integrated with upland wildlife habitat and with the surrounding urban landscape; and (2) to control and prevent water pollution for the protection of the public health and safety, and to maintain and improve water quality throughout the region.

26. Finding: Title 13 is expressly intended to provide a minimum baseline level of protection for identified Habitat Conservation Areas. Local jurisdictions may achieve substantial compliance with Title 13 using regulatory and/or non-regulatory tools. The City of Portland implements Title 13 through its adopted Natural Resources Inventory (NRI) and subsequent protection measures through the environmental overlay zones, which Metro has found to be in substantial compliance with Title 13.

No changes to the environmental or greenway overlay zones are proposed as part of this project. Therefore, FFTZ amendments are consistent with the requirements of Title 13.

Title 14. Urban Growth Management Plan. Title 14 addresses the regional urban growth boundary. Since this ordinance does not require, nor initiate, a boundary change, Title 14 does not apply.

Summary, Urban Growth Management Functional Plan Findings

27. Finding: The Metro Title 10 definition of comply or compliance means "substantial" rather than absolute compliance. "Substantial compliance" means city comprehensive plans and implementing ordinances, on the whole, conform with the purposes of the performance standards in the functional plan and any failure to meet individual performance standard requirements is technical or minor in nature.

For the facts and reasons stated above this ordinance substantially complies with all Urban Growth Management Functional Plan requirements applicable to the FFTZ amendments.

Part III. Portland's Comprehensive Plan

Portland's 2035 Comprehensive Plan was adopted as part of Task Four of Periodic Review. Task Four was adopted by Ordinance No. 187832 on June 15, 2016. The 2035 Comprehensive Plan was amended as part of Task Five of Periodic Review, which was adopted by Ordinance No. 188177 on December 21, 2016. Both ordinances were made effective on May 24, 2018 by Ordinance No. 188695, and both Tasks Four and Five were approved by LCDC Order 18 – WKTSK – 001897 on August 8, 2018.

28. Finding: The City Council has identified the following guiding principles, goals and policies to be applicable to the FFTZ amendments.

Guiding Principles

The 2035 Comprehensive Plan adopted five "guiding principles" in additional to the goals and policies typically included in a comprehensive plan. These principles were adopted to reinforce that implementation of the plan needs to be balanced, integrated and multi-disciplinary, and the influence of each principle helps to shape the overall all policy framework of the plan. The FFTZ amendments further these guiding principles as described below.

Economic Prosperity. Support a low-carbon economy and foster employment growth, competitiveness and equitably distributed household prosperity.

29. Finding: This guiding principle is to support a robust and resilient regional economy, thriving local businesses and growth in living-wage jobs and household prosperity. The FFTZ amendments support a low-carbon economy by providing an exception for additional storage capacity for non-fossil, renewable fuels. If fosters employment growth, competitiveness, and contributes to more equitably distributed household prosperity because the regulations are narrowly crafted to apply to one type of use and maintains the development capacity of Portland's industrial areas. Further, the FFTZ amendments support economic prosperity as noted below in the findings for Chapter 6 (Economic Development) of the 2035 Comprehensive Plan and the findings in response to those goals and policies are incorporated by reference.

Human Health. Avoid or minimize negative health impacts and improve opportunities for Portlanders to lead healthy, active lives.

30. Finding: The FFTZ amendments further the objectives to avoid or minimize negative health impacts associated with FFTs by reducing the risks associated with a major earthquake. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district, the Willamette River and Portland as a whole. The first step in making the current situation better is to ensure that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a moderate to high risk. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which can minimize health impacts in the event of a major earthquake.

Environmental Health. Weave nature into the city and foster a healthy environment that sustains people, neighborhoods, and fish and wildlife. Recognize the intrinsic value of nature and sustain the ecosystem services of Portland's air, water and land.

31. **Finding:** The FFTZ amendments foster a healthy environment and sustain the ecosystem services of Portland's air, water and land by reducing the risk associated with a major earthquake. The first step in making the current situation better is to ensure that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a high risk area. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which can minimize environmental impacts in the event of a major earthquake. No changes to the environmental or greenway overlay zones are proposed as part of this project, therefore the natural resource values and functions will be sustained.

Equity. Promote equity and environmental justice by reducing disparities, minimizing burdens, extending community benefits, increasing the amount of affordable housing, affirmatively furthering fair housing, proactively fighting displacement, and improving socio-economic opportunities for under-served and under-represented populations. Intentionally engage under-served and under-represented populations in decisions that affect them. Specifically recognize, address and prevent repetition of the injustices suffered by communities of color throughout Portland's history.

32. **Finding:** This guiding principle provides a framework to ensure Portlanders more equitably share in the benefits and burdens of growth and development. A fundamental purpose of the FFTZ amendments is to reduce the risks associated with a major earthquake. Continuing to allow the increase in FFTs in a high risk area increases the risk to Portland's environment, especially the Willamette River. The first step in making the current situation better is to ensure that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a moderate to high risk. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which can minimize environmental impacts in the event of a major earthquake.

    The amendments also maintain socio-economic opportunities for under-served and under-represented populations because the regulations are narrowly crafted to apply to one type of use and maintains the development capacity of Portland's industrial areas, which is a good source of middle-wage jobs for people without college degrees.

Resilience. Reduce risk and improve the ability of individuals, communities, economic systems, and the natural and built environments to withstand, recover from, and adapt to changes from natural hazards, human-made disasters, climate change, and economic shifts.

33. **Finding:** The 2035 Comprehensive Plan describes resilience as "reducing the vulnerability of our neighborhoods, businesses, and built and natural infrastructure to withstand challenges – environmental, economic and social – that may result from major hazardous events." Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. The FFTZ amendments support this principle by taking the first step in making Portland more resilient is to stop increasing

the risk. The FFTs have significant seismic risks because most of the tanks have been constructed without any or only limited seismic design criteria on soils with moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district, the Willamette River and Portland as a whole. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

Chapter 1: The Plan

Goal 1.A: Multiple goals
Portland's Comprehensive Plan provides a framework to guide land use, development, and public facility investments. It is based on a set of Guiding Principles that call for integrated approaches, actions, and outcomes that meet multiple goals to ensure Portland is prosperous, healthy, equitable, and resilient.

34. Finding: The FFTZ amendments are an amendment to the Zoning Code and do not amend the 2035 Comprehensive Plan. As noted above, FFTZ amendments are consistent with the guiding principles of the 2035 Comprehensive Plan. As part of an integrated approach to meet multiple goals, the City Council has considered, weighed and balanced applicable policies, as described on page HTU-5 of the 2035 Comprehensive Plan, to determine that this ordinance on the whole complies with the 2035 Comprehensive Plan. As described below, the City Council's decision to adopt the FFTZ amendments have considered the multiple goals of the comprehensive plan, including the guiding principles, to determine that the adoption of this ordinance will ensure that Portland is prosperous, healthy, equitable, and resilient by minimizing the risk posed by fossil fuel terminals.

Goal 1.B: Regional partnership. Portland's Comprehensive Plan acknowledges Portland's role within the region, and it is coordinated with the policies of governmental partners.

35. Finding: The findings show how the amendments are consistent with Metro's Urban Growth Management Functional Plan and the Statewide Planning Goals, including Goal 2 which requires coordination. In 2016, as part of the original adoption process, Metro, TriMet, and other state agencies received notice of the proposed FFTZ amendments from the 35-day DLCD notice and the City's legislative notice. In 2019, as part of the re-adoption of the remanded ordinance, the City posted a new 35-day DLCD notice and sent a legislative notice for the November 20, 2019 City Council hearing.

Goal 1.C: A well-functioning plan. Portland's Comprehensive Plan is effective, its elements are aligned, and it is updated periodically to be current and to address mandates, community needs, and identified problems.

36. Finding: The City Council defines "effective" as being successful in producing a desired or intended result. The desired or intended result is embodied in the Guiding Principles and goals and policies of the 2035 Comprehensive Plan. These findings demonstrate how the FFTZ amendments are consistent with the 2035 Comprehensive Plan, including advancing multiple goals. These changes represent updating regulatory implementation tools that respond to community needs and identified problems, especially in addressing the considerable risks fossil fuel terminals pose in the

event of a major earthquake, as documented by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016).

Goal 1.D: Implementation tools. Portland's Comprehensive Plan is executed through a variety of implementation tools, both regulatory and non-regulatory. Implementation tools comply with the Comprehensive Plan and are carried out in a coordinated and efficient manner. They protect the public's current and future interests and balance the need for providing certainty for future development with the need for flexibility and the opportunity to promote innovation.

37. Finding: The City Council interprets this goal to mean that the first step in making the current situation better is to ensure that the situation does not get worse. Continuing to allow the increase in storage tank capacity in FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments are changes to the Zoning Code, which is a primary implementation tool. The City Council finds that the public's current and future interests are embodied in the Vision and Guiding Principles that address prosperity, human and environmental health, equity and resilience. In the event of a major earthquake, fossil fuel terminals pose considerable risks to all of those interests, as documented by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016). Continuing to allow the unlimited increase in storage capacity at FFTs in a high risk area does not protect the public's current or future interests. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will be an improvement compared to the current regulations that allow for unlimited growth in FFTs.

The Zoning Code amendments change development standards and limit future expansion of storage capacity at FFTs, which may create uncertainty for the existing terminals. However, the uncertainty is mitigated by designating the existing FFTs as a limited use, as opposed to a prohibited or non-conforming use, that allows the terminals to continue to operate and invest in upgrades, as well as supporting opportunities for enhancement through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions. If the existing FFTs had been designated as a prohibited use, as in the Proposed Draft of the amendments, then the existing FFTs would be nonconforming uses, which in some cases has been a barrier to obtaining financing for improvements and upgrades.

The City Council defines "flexibility" as a capability to adapt to new, different, or changing requirements and "innovation" as the introduction of something new. The amendments incorporate flexibility and innovation by designating the existing FFTs as a limited use that allows the terminals to continue to operate and invest in upgrades, as well as supporting opportunities for enhancement for aviation or renewable fuels among other exceptions.

Goal 1.E: Administration. Portland's Comprehensive Plan is administered efficiently and effectively and in ways that forward the intent of the Plan. It is administered in accordance with regional plans and state and federal law.

38. Finding: The 2035 Comprehensive Plan complies with state and federal law and is not amended by this ordinance. The FFTZ amendments add clear and objective regulations to the Zoning Code that can be administered by the City in an efficient and effective way that minimizes future risk and allows FFTs to invest in safety upgrades to decrease risk over time. These findings demonstrate how the FFTZ amendments are consistent with the intent of the 2035 Comprehensive Plan. As noted above, the findings show how the amendments are consistent with Metro's Urban Growth Management Functional Plan and the Statewide Planning Goals. The regulations are focused on

what the City has jurisdiction over – land use regulation for public health and safety – and does not exceed its authority into areas covered by state and federal law, such railroads and interstate commerce.

The Comprehensive Plan

Policy 1.1. Comprehensive Plan elements. Maintain a Comprehensive Plan that includes these elements:

- **Vision and Guiding Principles.** The Vision is a statement of where the City aspires to be in 2035. The Guiding Principles call for decisions that meet multiple goals to ensure Portland is prosperous, healthy, equitable, and resilient.
- **Goals and policies.** The goals and policies of the Comprehensive Plan, including the Urban Design Framework, provide the long-range planning direction for the development and redevelopment of the city.
- **Comprehensive Plan Map.** The Comprehensive Plan Map is the official long-range planning guide for spatially defining the desired land uses and development in Portland. The Comprehensive Plan Map is a series of maps, which together show the boundaries of municipal incorporation, the Urban Service Boundary, land use designations, and the recognized boundaries of the Central City, Gateway regional center, town centers, and neighborhood centers.
- **List of Significant Projects.** The List of Significant Projects identifies the public facility projects needed to serve designated land uses through 2035. including expected new housing and jobs. It is based on the framework provided by a supporting Public Facilities Plan (PFP). The Citywide Systems Plan (CSP) is the City's public facilities plan. The Transportation System Plan (TSP) includes the transportation-related list of significant projects. The list element of the TSP is also an element of the Comprehensive Plan.
- **Transportation policies, street classifications, and street plans.** The policies, street classifications, and street plan maps contained in the Transportation System Plan (TSP) are an element of the Comprehensive Plan. Other parts of the TSP function as a supporting document, as described in Policy 1.2.

39. Finding: The FFTZ amendments do not include changes to any of the Comprehensive Plan elements The FFTZ amendments do not change the List of Significant Projects, nor do they change policies, street classifications, or street plan maps contained in the Transportation System Plan (TSP).

Supporting Documents

Policy 1.2. Comprehensive Plan supporting documents. Maintain and periodically update the following Comprehensive Plan supporting documents.

1. **Inventories and analyses**. The following inventories and analyses are supporting documents to the Comprehensive Plan:
   - Economic Opportunities Analysis (EOA)
   - Buildable Lands Inventory (BLI)
   - Natural Resource Inventory (NRI)
   - Housing Needs Analysis (HNA)

40. Finding: The FFTZ amendments were developed consistent with the supporting documents of the adopted 2035 Comprehensive Plan. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not impact the industrial land designated in Portland and do not impact the employment development capacity identified in the EOA and the BLI.

    The FFTZ amendments do not change the NRI or the implementing environmental or greenway overlay zones.

    The FFTZ amendments do not impact residential land and do not change the Housing Needs Analysis.

2. Public Facilities Plan. The Public Facilities Plan (PFP) is a coordinated plan for the provision of urban public facilities and services within Portland's Urban Services Boundary. The Citywide Systems Plan (CSP) is the City's public facilities plan.

41. Finding: As demonstrated in the findings for Statewide Planning Goal 11, the FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not impact the provision of public services and are consistent with the adopted Citywide Systems Plan (CSP). The CSP, which was adopted (Ordinance 185657) and acknowledged by LCDC on April 25, 2017, includes the Public Facilities Plan with information on current and future transportation, water, sanitary sewer, and stormwater infrastructure needs and projects, consistent with the requirements of Statewide Planning Goal 11.

    The FFTZ amendments do not amend the Citywide System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the infrastructure in the northwest industrial area where the FFTs are located. As noted below in the findings for goals and policies of Chapter 8 (Public Facilities and Services), which are incorporated by reference, the FFTZ amendments are consistent with the CSP.

3. Transportation System Plan (TSP). The TSP is the detailed long-range plan to guide transportation system functions and investments. The TSP ensures that new development and allowed land uses are consistent with the identified function and capacity of, and adopted performance measures for, affected transportation facilities. The TSP includes a financial plan to identify revenue sources for planned transportation facilities included on the List of Significant Projects. The TSP is the transportation element of the Public Facilities Plan. Certain components of the TSP are elements of the Comprehensive Plan. S*ee Policy 1.1*.

42. Finding: As demonstrated in the findings for Statewide Planning Goal 12 (Transportation) and the goals and policies of Chapter 9 (Transportation), the FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not impact the transportation system. The FFTZ amendments do not amend the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located.

4. School Facility Plans. School facility plans that were developed in consultation with the City, adopted by school districts serving the City, and that meet the requirements of ORS 195 are considered supporting documents to the Comprehensive Plan.

43. Finding: The FFTZ amendments apply to only one type of industrial use that makes up a small part of the businesses found in Portland's industrial districts, therefore, these changes will not impact school facility plans.

Implementation tools

Policy 1.3. Implementation tools subject to the Comprehensive Plan. Maintain Comprehensive Plan implementation tools that are derived from, and comply with, the Comprehensive Plan. *Implementation tools include those identified in policies 1.4 through 1.9.*

Policy 1.4. Zoning Code. Maintain a Zoning Code that establishes the regulations that apply to various zones, districts, uses, and development types.

44. Finding: The FFTZ amendments include Zoning Code amendments create a new use category (bulk fossil fuel terminals) and applies it to the base zones. The development standards limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. The FFTZ regulations designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Further, the use limitations (33.140.100.B.17.a) provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs.

Policy 1.5 Zoning Map. Maintain a Zoning Map that identifies the boundaries of various zones, districts, and other special features.

45. Finding: The FFTZ amendments do not include Zoning Map amendments.

Policy 1.6 Service coordination agreements. Maintain coordination agreements with local governments of adjoining jurisdictions concerning mutual recognition of urban service boundaries; special service districts concerning public facilities and services within Portland's Urban Services Boundary; and public school districts concerning educational facilities within Portland's Urban Services Boundary.

Policy 1.7 Annexations. Provide a process incorporating urban and urbanizable land within the City's Urban Services Boundary through annexation. See policies 8.11-8.19 for service extension requirements for annexations.

Policy 1.8 Urban renewal plans. Coordinate Comprehensive Plan implementation with urban renewal plans and implementation activities. A decision to adopt a new urban renewal district, adopt or amend goals and objectives that will guide investment priorities within a district, or amend the boundaries of an existing district, must comply with the Comprehensive Plan.

Policy 1.9 Development agreements. Consider development agreements entered into by the City of Portland and pursuant to Oregon Revised Statute 94 a Comprehensive Plan implementation tool.

46. Finding: The FFTZ amendments do not include changes or amendments to service coordination agreements, annexation processes, urban renewal plans, or development agreements. Therefore, these policies are not applicable to the FFTZ amendments.

Administration

Policy 1.10. Compliance with the Comprehensive Plan. Ensure that amendments to the Comprehensive Plan's elements, supporting documents, and implementation tools comply with the Comprehensive Plan. "Comply" means that amendments must be evaluated against the Comprehensive Plan's applicable goals and policies and on balance be equally or more supportive of the Comprehensive Plan as a whole than the existing language or designation.

1.10.a Legislative amendments to the Comprehensive Plan's elements and implementation tools must also comply with the Guiding Principles.

1.10.b Legislative amendments to the Comprehensive Plan's elements should be based on the factual basis established in the supporting documents as updated and amended over time.

1.10.c Amendments to the Zoning Map are in compliance with the Comprehensive Plan if they are consistent with the Comprehensive Plan Map.

47. Finding: The City Council finds that this is a fundamental policy of the Comprehensive Plan that guides the manner in which the City Council considers amendments to the Plan itself or any implementing regulations, such as the Zoning Code. The City Council interprets the policy to require the Council to consider whether, after considering all relevant facts, an amendment is equally or more supportive of the Comprehensive Plan. The City Council finds that an amendment is equally supportive when it is on its face directly supported by goals and policies in the Plan. The City Council finds that an amendment is more supportive of the Comprehensive Plan when the amendment will further advance goals and policies, particularly those that are aspirational in nature. The City Council finds that the policy requires consideration as to whether amendments are equally or more supportive of the Plan *as a whole*. The City Council finds that amendments do not need to be equally or more supportive with individual goals and policies, but rather amendments must be equally or more supportive of the entire Comprehensive Plan. Therefore, the City Council finds that there may be instances where specific goals and policies are not supported by the amendments but still the amendment is equally or more supportive of the entire Comprehensive Plan when considered cumulatively. The City Council finds that there is no precise mathematical equation for determining when the Plan as a whole is supported but rather such consideration requires City Council discretion in evaluating the competing interests and objectives of the plan.

The FFTZ amendments are a legislative amendment to the Zoning Code, an implementation tool of the 2035 Comprehensive Plan. These findings identify how the FFTZ amendments comply with the 2035 Comprehensive Plan. That is, the amendments are evaluated against the 2035 Comprehensive Plan's Guiding Principles, goals, and policies, as detailed throughout this set of findings. As described in the finding for Policy 1.2, the factual basis of the supporting documents is not changed by this ordinance. Specifically, the employment capacity, as defined in the EOA, is not impacted by these changes – there are no map amendments, all industrial land use designations remain the same. The other supporting documents have been considered but are not impacted by these changes. The City Council finds that these amendments are equally or more supportive of the Comprehensive Plan than the existing Zoning Code regulations because they limit the considerable risks fossil fuel terminals pose in the event of a major earthquake, while allowing the existing terminals to continue to operate with limited opportunities for expansion, such as aviation fuel or renewable fuels.

The City Council finds that the evaluation to determine if the FFTZ amendments are on balance equally or more supportive than the existing language or designation must consider all of the goals and policies, as demonstrated by these findings. However, these amendments embody a situation where there are competing directions embodied by different policies. There are some policies where the amendments are equally supportive—not more or less so—but there are other policies where the amendments a more supportive and the code changes better embody the direction in the Comprehensive Plan as a whole.

For the reasons stated in these findings, the City Council concludes that the FFTZ amendments are on balance more supportive of the goals and policies of the 2035 Comprehensive Plan than the current regulations. The City Council has considered all applicable goals and policies to achieve an optimum outcome. Goals and policies are considered as factors which must be weighed, balanced and met on the whole, not as criteria that must be individually met. The purposes of the FFTZ amendments are to enhance public safety and protect the environment. The City council has weighed and balanced the applicable goals and policies and concludes that, on the whole, continuing to allow an unlimited increase in storage capacity at FFTs in a high risk area would be less supportive of the 2035 Comprehensive Plan than adopting the FFTZ amendments.

Policy 1.11. Consistency with Metro Urban Growth Management Functional Plan and Urban Growth Boundary. Ensure that the Comprehensive Plan remains consistent with the Metro Urban Growth Management Functional Plan and supports a tight urban growth boundary for the Portland metropolitan area.

Policy 1.12. Consistency with Statewide Planning Goals. Ensure that the Comprehensive Plan, supporting documents, and implementation tools remain consistent with the Oregon Statewide Planning Goals.

48. Finding: As noted earlier in these findings, the FFTZ amendments are consistent with and designed to further the applicable elements of the Metro Urban Growth Management Functional Plan and Statewide Planning Goals, consistent with the directives of policies 1.11 and 1.12.

Policy 1.13. Consistency with state and federal regulations. Ensure that the Comprehensive Plan remains consistent with all applicable state and federal regulations, and that implementation measures for the Comprehensive Plan are well coordinated with other City activities that respond to state and federal regulations.

49. Finding: The FFTZ amendments were developed to be consistent with applicable state and federal regulations and do not amend any Zoning Code sections that are required by state or federal regulations, including FEMA flood regulations and state building code requirements.

Policy 1.14. Public facility adequacy. Consider impacts on the existing and future availability and capacity of urban public facilities and services when amending Comprehensive Plan elements and implementation tools. Urban public facilities and services include those provided by the City, neighboring jurisdictions, and partners within Portland's urban services boundaries, as established by Policies 8.2 and 8.6.

50. Finding: As demonstrated in the findings for Statewide Planning Goal 11 and Chapter 8 (Public Facilities and Services) of the 2035 Comprehensive Plan, the FFTZ amendments do not significantly impact the provision of public services.

Policy 1.15. Intergovernmental coordination. Strive to administer the Comprehensive Plan elements and implementation tools in a manner that supports the efforts and fiscal health of the City, county and regional governments, and partner agencies such as school districts and transit agencies.

51. Finding: As demonstrated in the findings for Statewide Planning Goal 2, the City filed the required 35-day notice with Oregon Department of Land Conservation and Development to notify other government agencies of the proposed FFTZ amendments. In addition, the City sent a separate legislative notice to Multnomah County, adjacent cities, Metro and TriMet. The Port of Portland was the only government agency that raised issues or concerns with the original ordinance. The Port of Portland appreciated that the ordinance was amended to address their concerns about the supply of aviation fuel to Portland International Airport (PDX) and marine fuel suppliers.

Policy 1.16. Planning and Sustainability Commission review. Ensure the Planning and Sustainability Commission (PSC) reviews and makes recommendations to the City Council on all proposed legislative amendments to Comprehensive Plan elements, supporting documents, and implementation tools. The PSC advises City Council on the City's long-range goals, policies, and programs for land use, planning, and sustainability. The membership and powers and duties of the PSC are described in the Zoning Code.

52. Finding: The PSC reviewed and recommended the original FFTZ amendments in 2016. The PSC did not review the remand ordinance, as the City Council did not refer it back to the PSC or BPS for additional changes, but rather opted to re-adopt the original ordinance with minor technical changes to conform to the current zoning code.

Policy 1.17. Community Involvement Committee. Establish a Community Involvement Committee to oversee the Community Involvement Program as recognized by Oregon Statewide Planning Goal 1 – Community Involvement and policies 2.15-2.18 of this Comprehensive Plan.

53. Finding: The Citizen Involvement Committee was appointed in June 2018 and reviews and advises the way City staff engage with the public in land use and transportation planning. The Fossil Fuel Terminal Zoning were initially adopted in 2016, prior to the creation of the CIC, so was unable to consult on the community involvement program that informed the initial ordinance. The CIC did not review the remand ordinance, as the City Council did not refer it back to the PSC or BPS for additional changes, but rather opted to re-adopt the original ordinance with minor technical changes to conform to the current zoning code.

Policy 1.19. Area-specific plans. Use area-specific plans to provide additional detail or refinements applicable at a smaller geographic scale, such as for centers and corridors, within the policy framework provided by the overall Comprehensive Plan.

1.19.a Area-specific plans that are adopted after May 24, 2018, should clearly identify which components amend Comprehensive Plan elements, supporting documents, or implementation tools. Such amendments should be appropriate to the scope of the Comprehensive Plan; be intended to guide land use decisions; and provide geographically-specific detail. Such amendments could include policies specific to the plan area, land use designation changes, zoning map changes, zoning code changes, and public facility projects necessary to serve designated land uses.

1.19.b Area-specific plan components intended as context, general guidance, or directives for future community-driven efforts should not amend the Comprehensive Plan elements or implementation tools but be adopted by resolution as intent. These components include vision statements, historical context, existing conditions, action plans, design preferences, and other background information.

1.19.c Community, area, neighborhood, and other area-specific plans that were adopted by ordinance prior to January 1, 2018 are still in effect. However, the elements of this Comprehensive Plan supersede any goals or policies of a community, area, or neighborhood plan that are inconsistent with this Plan.

54. Finding: The only area-specific plan that applies to the FFTZ amendments is the Guilds Lake Industrial Sanctuary Plan (GLISP). The additional detail provided in that plan are addressed below. Council finds that the GLISP policies and objectives for preserving and enhancing industrial businesses and employment opportunities are consistent with the goals and policies in Chapter 6 (Economic Development) of the 2035 Comprehensive Plan. However, the GLISP does not address

other relevant policies identified in the 2035 Comprehensive Plan, especially Goal 4.D with Policies 4.79 and 4.80, which require reducing risk to people and property from natural hazards. Therefore, the City Council reads GLISP and the Comprehensive Plan together and finds that on balance, the FFTZ amendments are equally or more supportive of the comprehensive plan and GLISP.

Chapter 2: Community Involvement

Goal 2.A: Community involvement as a partnership. The City of Portland works together as a genuine partner with all Portland communities and interests. The City promotes, builds, and maintains relationships, and communicates with individuals, communities, neighborhoods, businesses, organizations, institutions, and other governments to ensure meaningful community involvement in planning and investment decisions.

Goal 2.B: Social justice and equity. The City of Portland seeks social justice by expanding choice and opportunity for all community members, recognizing a special responsibility to identify and engage, as genuine partners, under-served and under-represented communities in planning, investment, implementation, and enforcement processes, particularly those with potential to be adversely affected by the results of decisions. The City actively works to improve its planning and investment-related decisions to achieve equitable distribution of burdens and benefits and address past injustices.

Goal 2.C: Value community wisdom and participation. Portland values and encourages community and civic participation. The City seeks and considers community wisdom and diverse cultural perspectives, and integrates them with technical analysis, to strengthen land use decisions.

Goal 2.D: Transparency and accountability. City planning and investment decision-making processes are clear, open, and documented. Through these processes a diverse range of community interests are heard and balanced. The City makes it clear to the community who is responsible for making decisions and how community input is considered. Accountability includes monitoring and reporting outcomes.

Goal 2.E: Meaningful participation. Community members have meaningful opportunities to participate in and influence all stages of planning and decision making. Public processes engage the full diversity of affected community members, including under-served and under-represented individuals and communities. The City will seek and facilitate the involvement of those potentially affected by planning and decision making.

Goal 2.F: Accessible and effective participation. City planning and investment decision-making processes are designed to be culturally accessible and effective. The City draws from acknowledged best practices and uses a wide variety of tools, including those developed and recommended by under-served and under-represented communities, to promote inclusive, collaborative, culturally-specific, and robust community involvement.

Goal 2.G: Strong civic infrastructure. Civic institutions, organizations, and processes encourage active and meaningful community involvement and strengthen the capacity of individuals and communities to participate in planning processes and civic life.

55. Finding: The 2016 adoption of the ordinance provided opportunities for all interested parties to comment on and influence the Fossil Fuel Terminal Zoning proposal. The preparation of these amendments provided numerous opportunities for public involvement, including:

Concept Phase. In 2016, prior to the initiation of the legislative project, BPS conducted four stakeholder focus groups meetings. These meetings included participants with a range of perspectives and experience, including community group representatives, fuel terminal

representatives, environmental organizations, and business organizations. These meetings served as a forum for discussing issues and potential approaches, and to help inform project staff develop concepts. In addition to the stakeholder focus groups, BPS staff met with several fuel terminals to explain the proposal, answer questions, and discuss their individual concerns. These meetings were needed because antitrust regulations constrained discussion about certain topics, for example supply chains, in the presence of representatives from other fuel terminals.

Discussion Draft. On June 29, 2016, the Fossil Fuel Terminal Zoning Amendments Discussion Draft was published and posted on the Bureau website.

Proposed Draft. On August 12, 2016, the Fossil Fuel Terminal Zoning Proposed Draft was published in preparation for the Planning and Sustainability Commission (PSC) review and recommendation. In support of this process, the BPS website had a project page dedicated to this project, an email address for submitting testimony. As part of the Proposed Draft publication and legislative process requirements, the following legal notices were also sent:

Form 1 35-day Notice. Sent to the Department of Land Conservation and Development (DLCD)

Legislative Notice. Sent to interested parties, recognized organizations, affected bureaus, TriMet, Metro and ODOT and published in the Daily Journal of Commerce

Measure 56 Notice. Required by Ballot Measure 56, this mailed notice was sent to property owners with industrial or employment base zoning.

The PSC held a public hearing on September 13, 2016. On October 11, 2016, the Planning and Sustainability Commission voted to recommend the Fossil Fuel Terminal Zoning Amendments to City Council, including PSC-recommended modifications to the Proposed Draft. All PSC meetings were streamed live and available for viewing on the Bureau website.

Recommended Draft. On October 24, 2016. the Fossil Fuel Terminal Zoning Amendments Recommended Draft was published to present the PSC recommendations to City Council. On October 25, 2016, notice of the City Council hearing on the Fossil Fuel Terminal Zoning Amendments was mailed. The City Council held public hearings on November 10 and 16, 2016, to receive testimony on the Recommended Draft. On December 8, 2016, the City Council voted to adopt the Fossil Fuel Terminal Zoning Amendments.

Partners in decision making

Policy 2.1. Partnerships and coordination. Maintain partnerships and coordinate land use engagement with:

2.1.a Individual community members.

2.1.b Communities of color, low-income populations, Limited English Proficient (LEP) communities, Native American communities, and other under-served and under-represented communities.

2.1.c District coalitions, neighborhood associations, and business district associations as local experts and communication channels for place-based projects.

2.1.d Businesses, unions, employees, and related organizations that reflect Portland's diversity as the center of regional economic and cultural activity.

2.1.e Community-based, faith-based, artistic and cultural, and interest-based non-profits,

organizations, and groups.

2.1.f Institutions, governments, and Sovereign tribes.

Policy 2.2. Broaden partnerships. Work with district coalitions, neighborhood associations, and business district associations to increase participation and to help them reflect the diversity of the people and institutions they serve. Facilitate greater communication and collaboration among district coalitions, neighborhood associations, business district associations, culturally-specific organizations, and community-based organizations.

56. Finding: The FFTZ amendments were informed by a broad range of individuals and groups. A series of Stakeholder Working Group meetings were held that involved participants with a broad range of perspectives and experience, including community group representatives, business organizations and fossil fuel terminal owners.

Environmental justice

Policy 2.3. Extend benefits. Ensure plans and investments promote environmental justice by extending the community benefits associated with environmental assets, land use, and public investments to communities of color, low-income populations, and other under-served or under-represented groups impacted by the decision. Maximize economic, cultural, political, and environmental benefits through ongoing partnerships.

Policy 2.4. Eliminate burdens. Ensure plans and investments eliminate associated disproportionate burdens (e.g. adverse environmental, economic, or community impacts) for communities of color, low-income populations, and other under-served or under-represented groups impacted by the decision.

2.4.a, Minimize or mitigate disproportionate burdens in cases where they cannot be eliminated.

2.4.b, Use plans and investments to address disproportionate burdens of previous decisions.

57. Finding: The FFTZ amendments address issues that had been identified as particular burdens for low-income populations and communities of color, including public health and safety.

Invest in education and training

Policy 2.5. Community capacity building. Enhance the ability of community members, particularly those in under-served and/or under-represented groups, to develop the relationships, knowledge, and skills to effectively participate in plan and investment processes.

Policy 2.6. **Land use literacy.** Provide training and educational opportunities to build the public's understanding of land use, transportation, housing, and related topics, and increase capacity for meaningful participation in planning and investment processes.

Policy 2.7. Agency capacity building. Increase City staff's capacity, tools, and skills to design and implement processes that engage a broad diversity of affected and interested communities, including under-served and under-represented communities, in meaningful and appropriate ways.

58. Finding: Policies 2.5 through 2.7 concern broad approaches to educating community members and City staff about planning processes, and are not applicable to these Zoning Code amendments.

Community assessment

Policy 2.8. Channels of communication. Maintain channels of communication among City Council, the Planning and Sustainability Commission (PSC), project advisory committees, City staff, and community members.

59. Finding: The City Council interprets this policy to create the opportunity for the community and advisory committees to have opportunities to communicate their issues and concerns to the PSC and City Council outside of the formal legislative process. These changes are a legislative process with formal opportunities to testify to communicate directly with City Council. Therefore, this policy does not apply.

Policy 2.9. Community analysis. Collect and evaluate data, including community-validated population data and information, to understand the needs, priorities, and trends and historical context affecting different communities in Portland.

Policy 2.10. Community participation in data collection. Provide meaningful opportunities for individuals and communities to be involved in inventories, mapping, data analysis, and the development of alternatives.

Policy 2.11. Open Data. Ensure planning and investment decisions are a collaboration among stakeholders, including those listed in Policy 2.1. Where appropriate, encourage publication, accessibility, and wide-spread sharing of data collected and generated by the City.

60. Finding: Policies 2.9 through 2.11 concern how the City collects and makes available data that supports land use decisions. In this case, the City published data concerning the storage capacity of existing FFTs as part of the discussion draft, proposed draft, and recommendation draft with an opportunity for the community and terminal owners to validate that data.

Transparency and accountability

Policy 2.12. Roles and responsibilities. Establish clear roles, rights, and responsibilities for participants and decision makers in planning and investment processes. Address roles of City bureaus, elected officials, and participants, including community and neighborhood leadership, business, organizations, and individuals.

Policy 2.13. Project scope. Establish clear expectations about land use project sponsorship, purpose, design, and how decision makers will use the process results.

Policy 2.14. Community influence. At each stage of the process, identify which elements of a planning and investment process can be influenced or changed through community involvement. Clarify the extent to which those elements can be influenced or changed.

Policy 2.15. Documentation and feedback. Provide clear documentation for the rationale supporting decisions in planning and investment processes. Communicate to participants about the issues raised in the community involvement process, how public input affected outcomes, and the rationale used to make decisions.

61. Finding: As described in the findings for Statewide Planning Goal 1 (Citizen Involvement), the original legislative process was clearly outlined in notices, documents and on the project website as to how to testify to influence the Proposed Draft at the PSC, which amended the proposal. Then the Recommended Draft was published with the opportunity to testify to the City Council at the 2016 public hearings.

    For the re-adoption of the FFTZ amendments, the City Council received public testimony at the November 20, 2019 hearing on the substance of the regulations.

    The findings in this document respond to the public testimony and explain the rationale used to make this decision.

Community involvement program

Policies 2.16 through 2.23.

62. Finding: These policies concern the City's Community Involvement Program and are not applicable because the FFTZ amendments do not change this program.

Process design and evaluation

Policy 2.24. Representation. Facilitate participation of a cross-section of the full diversity of affected Portlanders during planning and investment processes. This diversity includes individuals, stakeholders, and communities represented by race, color, national origin, English proficiency, gender, age, disability, religion, sexual orientation, gender identity, and source of income.

Policy 2.25. Early involvement. Improve opportunities for interested and affected community members to participate early in planning and investment processes, including identifying and prioritizing issues, needs, and opportunities; participating in process design; and recommending and prioritizing projects and/or other types of implementation.

Policy 2.26. Verifying data. Use data, including community-validated population data, to guide planning and investment processes and priority setting and to shape community involvement and decision-making efforts.

Policy 2.27. Demographics. Identify the demographics of potentially affected communities when initiating a planning or investment project.

Policy 2.28. Historical understanding. To better understand concerns and conditions when initiating a project, research the history, culture, past plans, and other needs of the affected community, particularly under-represented and under-served groups, and persons with limited English proficiency (LEP). Review preliminary findings with members of the community who have institutional and historical knowledge.

Policy 2.29. Project-specific needs. Customize community involvement processes to meet the needs of those potentially affected by the planning or investment project. Use community involvement techniques that fit the scope, character, and potential impact of the planning or investment decision under consideration.

Policy 2.30. Culturally-appropriate processes. Consult with communities to design culturally-appropriate processes to meet the needs of those affected by a planning or investment project. Evaluate, use, and document creative and culturally-appropriate methods, tools, technologies, and spaces to inform and engage people from under-served and under-represented groups about planning or investment projects.

Policy 2.31. Innovative engagement methods. Develop and document innovative methods, tools, and technologies for community involvement processes for plan and investment projects.

Policy 2.32. Inclusive participation beyond Portland residents. Design public processes for planning and investment projects to engage affected and interested people who may not live in Portland such as property owners, employees, employers, and students, among others, as practicable.

Policy 2.33. Inclusive participation in Central City planning. Design public processes for the Central City that recognize its unique role as the region's center. Engage a wide range of stakeholders from the Central City and throughout the region including employees, employers, social service providers, students, and visitors, as well as regional tourism, institutional, recreation, transportation, and local/regional government representatives, as appropriate.

Policy 2.34. Accessibility. Ensure that community involvement processes for planning and investment projects are broadly accessible in terms of location, time, and language, and that they support the engagement of individuals with a variety of abilities and limitations on participation.

Policy 2.35. Participation monitoring. Evaluate and document participant demographics throughout planning and investment processes to assess whether participation reflects the demographics of affected communities. Adapt involvement practices and activities accordingly to increase effectiveness at reaching targeted audiences.

Policy 2.36. Adaptability. Adapt community involvement processes for planning and investment projects as appropriate to flexibly respond to changes in the scope and priority of the issues, needs, and other factors that may affect the process.

Policy 2.37. Process evaluation. Evaluate each community involvement process for planning or investment projects from both the City staff and participants' perspectives, and consider feedback and lessons learned to enhance future involvement efforts.

63. Finding: Policies 2.24 through 2.37 concern how the community involvement program is designed and developed to support planning and investment projects. The community involvement process conducted in support of initial adoption of the FFTZ amendments engaged a broad range of stakeholders. As part of the concept development of the zoning code changes, BPS held stakeholder focus group meetings with representatives from energy providers (the FFTs, the Western States Petroleum Association, Northwest Natural, and business organizations) and environmental organizations. The Discussion Draft was crafted in response to these discussions. In turn, comments on the Discussion Draft informed changes that were incorporated in the Proposed Draft. A large number of people testified at both the PSC and City Council public hearings, which resulted in amendments to the regulations.

    For this reconsideration of the remanded notice, a legislative notice was sent to the City's legislative notice list as well as the FFT owners and the attorneys that participated in the appeal. People testifies at the November 20, 2019, public hearing.

Information design and development

Policy 2.38. Accommodation. Ensure accommodations to let individuals with disabilities participate in administrative, quasi-judicial, and legislative land use decisions, consistent with federal regulations.

64. Finding: The City Council hearing on November 20, 2019 was held at City Hall, an accessible location.

Policy 2.39. Notification. Notify affected and interested community members and recognized organizations about administrative, quasi-judicial, and legislative land use decisions with enough lead time to enable effective participation. Consider notification to both property owners and renters.

65. Finding: For the original adoption of the FFTZ amendments, the City sent the required Measure 56 notice to all owners of industrial zoned properties when it published the Proposed Draft prior to the PSC hearing. The City also sent a legislative notice to interested parties, including neighborhood associations, business associations, and other affected jurisdictions, that have requested notice of proposed land use changes.

    The City sent a legislative notice to interested parties, FFT owners and the attorneys that participated in the appeal to inform them of the opportunity to testify at the November 20, 2019, City Council public hearing.

Policy 2.40. Tools for effective participation. Provide clear and easy access to information about administrative, quasi-judicial, and legislative land use decisions in multiple formats and through technological advancements and other ways.

Policy 2.41. Limited English Proficiency (LEP). Ensure that limited English proficient (LEP) individuals are provided meaningful access to information about administrative, quasi-judicial, and legislative land use decisions, consistent with federal regulations.

66. Finding: Regular communications about the original adoption of the FFTZ project and opportunities to participate and provide input were made available through the project website.

Chapter 3: Urban Form

GOAL 3.A: A city designed for people. Portland's built environment is designed to serve the needs and aspirations of all Portlanders, promoting prosperity, health, equity, and resiliency. New development, redevelopment, and public investments reduce disparities and encourage social interaction to create a healthy connected city.

67. Finding: The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes are consistent with the intent to maintain Portland's industrial districts over time. The FFTZ regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts, therefore it is not expected to have an impact on the goal of creating a healthy connected city.

GOAL 3.B: A climate and hazard resilient urban form. Portland's compact urban form, sustainable building development practices, green infrastructure, and active transportation system reduce carbon emissions, reduce natural hazard risks and impacts, and improve resilience to the effects of climate change.

68. Finding: Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. Continuing to allow the unlimited increase in storage capacity at FFTs in a high risk area does not reduce the risk or impact from a major earthquake. The FFTZ amendments are a regulatory approach that improves Portland's ability to withstand and recover from an earthquake by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which is an improvement over the current regulations that allow for unlimited growth in FFTs. The FFTZ regulations focus on limiting risk by limiting new development (storage capacity), but designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs.

The FFTZ amendments are consistent with this goal because they do not include map changes, nor do they allow for new incompatible land uses, and these regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. Therefore, these changes support business retention and expansion in Portland's industrial districts, which will contribute to maintaining a compact urban form. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments that support green infrastructure and active transportation.

GOAL 3.C: Focused growth. Household and employment growth is focused in the Central City and other centers, corridors, and transit station areas, creating compact urban development in areas with a high level of service and amenities, while allowing the relative stability of lower-density single-family residential areas.

69. Finding: The FFTZ amendments are focused on changes to allowed uses in the City's industrial areas and do not affect the City's goal in creating compact urban development.

GOAL 3.D: A system of centers and corridors. Portland's interconnected system of centers and corridors provides diverse housing options and employment opportunities, robust multimodal transportation connections, access to local services and amenities, and supports low-carbon complete, healthy, and equitable communities.

70. Finding: The FFTZ amendments are focused on changes to allowed uses in the City's industrial areas and do not affect the City's goal in creating a system of centers and corridors.

GOAL 3.E: Connected public realm and open spaces. A network of parks, streets, City Greenways, and other public spaces supports community interaction; connects neighborhoods, districts, and destinations; and improves air, water, land quality, and environmental health.

71. Finding: The FFTZ amendments are focused on changes to the City's industrial areas, which play a limited role in the City's connected network of parks and open spaces. Six of the existing FFTs have frontage on the Willamette River with designated natural resources that are protected by the Greenway Overlay Zone (Chapters 33.440), which is not amended by this ordinance.

GOAL 3.F: Employment districts. Portland supports job growth in a variety of employment districts to maintain a diverse economy.

72. Finding: The 2035 Comprehensive Plan defines the verb "maintain" to mean keep what you have; conserve; preserve; continue. As described in the Economic Opportunities Analysis (EOA), Portland has a diverse economy with a wide range of businesses and employment opportunities that are distributed across the Central City, neighborhood commercial areas, campus institutions and industrial areas. The FFTZ amendments maintain Portland's diverse economy because the changes do not include map changes, nor do they allow for new incompatible land uses in industrial areas. Therefore, these changes will continue to provide the same opportunities for employment in Portland's employment districts. The FFTZ regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's employment districts. The limits on expansion of storage capacity at fossil fuel terminals are mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their intermodal facilities and supports opportunities for growth through a number of exceptions, such as aviation or renewable fuels, to the storage capacity restrictions.

GOAL 3.G: Nature in the city. A system of habitat corridors weaves nature into the city, enhances habitat connectivity, and preserves natural resources and the ecosystem services they provide.

73. Finding: The Willamette and Columbia rivers play a major role in the habitat corridors that weave nature into Portland. Six of the existing FFTs have frontage on the Willamette River with designated natural resources that are protected by the Greenway Overlay Zone (Chapters 33.440), which is not amended by this ordinance. In considering the natural hazard risks that the FFTs pose to the ecosystem functions on the river, as identified by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016), the City Council finds that continuing to allow the unlimited increase in storage capacity at FFTs in a high risk area does not enhance the current or

future natural resource functions of the rivers. Therefore, the FFTZ regulations focus on limiting risk by limiting new development (storage capacity), but designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety. These regulations will limit the risks to the natural resource habitat functions and ecosystem services provided by the rivers.

Citywide design and development

Policy 3.1. Urban Design Framework. Use the Urban Design Framework (UDF) as a guide to create inclusive and enduring places, while providing flexibility for implementation at the local scale to meet the needs of local communities.

74. Finding: The UDF is a guide at the citywide scale. The UDF identifies the Rivers pattern area, which encompasses most of Portland's industrial and employment areas, including all of the existing FFTs. The FFTZ amendments are focused on changes to allowed uses in the City's industrial areas. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses. Therefore, these changes are consistent with this policy because they do not change the location or character of the Rivers pattern area.

Policy 3.2. Growth and stability. Direct most growth and change to centers, corridors, and transit station areas, allowing the continuation of the scale and characteristics of Portland's residential neighborhoods.

75. Finding: The FFTZ amendments are focused on changes to allowed uses in the City's industrial areas. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. These changes will not affect the City's policies to direct most growth to centers and corridors or affect the scale and characteristics of Portland's residential neighborhoods.

Policy 3.3. Equitable development. Guide development, growth, and public facility investment to reduce disparities, ensure equitable access to opportunities, and produce positive outcomes for all Portlanders.

3.3.a. Anticipate, avoid, reduce, and mitigate negative public facility and development impacts, especially where those impacts inequitably burden communities of color, under-served and under-represented communities, and other vulnerable populations.

3.3.b. Make needed investments in areas that are deficient in public facilities to reduce disparities and increase equity. Accompany these investments with proactive measures to avoid displacement and increase affordable housing.

3.3.c. Encourage use of community benefit agreements to ensure equitable outcomes from development projects that benefit from public facility investments, increased development allowances, or public financial assistance. Consider community benefit agreements as a tool to mitigate displacement and housing affordability impacts.

3.3.d. Consider use of exactions imposed on development and other tools to capture value created by plans and investments, to reduce or mitigate displacement and housing affordability impacts.

3.3.e. Coordinate housing, economic development, and public facility plans and investments to create an integrated community development approach to restore communities impacted by past decisions.

76. Finding: One of the ways to reduce disparities and produce positive outcomes for all Portlanders is to create more opportunities for middle wage jobs, especially for people without college degrees. Those opportunities can be found in Portland's industrial areas. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to encourage growth in Portland's industrial districts. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under current regulations. These changes support the retention of existing fossil fuel terminals by designating them as a limited use, as opposed to a non-conforming use, that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions.

The City Council finds that the other types of anti-displacement mitigation measures identified in this policy are not applicable to Zoning Code changes that affect allowed uses in industrial zones.

Policy 3.4. All ages and abilities. Strive for a built environment that provides a safe, healthful, and attractive environment for people of all ages and abilities.

77. Finding: The City Council interprets this policy to be focused on creating a supportive built environment for children, the elderly and people with disabilities. Specifically, the policy is focused on the built environment of centers, corridors and residential areas where children, the elderly and people with disabilities inhabit the city. The FFTZ amendments are focused on changes to allowed uses in the City's industrial areas, where very few children, the elderly and people with disabilities are found. Therefore, this policy does not apply.

Policy 3.5. Energy and resource efficiency. Support energy-efficient, resource-efficient, and sustainable development and transportation patterns through land use and transportation planning.

78. Findings: The City Council interprets this goal to apply to the city as whole. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, will not significantly change the development pattern in Portland's industrial districts. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan. Therefore, these changes will continue to support the sustainable development and transportation patterns across the city as a whole.

Policy 3.6. Land efficiency. Provide strategic investments and incentives to leverage infill, redevelopment, and promote intensification of scarce urban land while protecting environmental quality.

79. Findings: The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan. The City's Enterprise Zone program, which provides a property tax exemption to industrial firms, is one of the programs in which the City of Portland provides strategic assistance to businesses. These changes do not affect that program, and FFTs that make new capital investments remain eligible for that program. The FFTZ amendments do not amend the Greenway Overlay Zone standards or review process. Therefore, the City continues to plan for strategic investments and incentives in the industrial districts, while protecting environmental quality.

Policy 3.7. Integrate nature. Integrate nature and use green infrastructure throughout Portland.

80. Findings: No changes to greenway or environmental overlay zones, stormwater requirements, or tree code are a part of this ordinance. This policy does not apply.

Policy 3.8. Leadership and innovation in design. Encourage high-performance design and development that demonstrates Portland's leadership in the design of the built environment, commitment to a more equitable city, and ability to experiment and generate innovative design solutions.

81. Finding: The FFTZ amendments are use limitations for one type of use found in Portland's industrial areas. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations encourage innovation to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs.

Policy 3.9. Growth and development. Evaluate the potential impacts of planning and investment decisions, significant new infrastructure, and significant new development on the physical characteristics of neighborhoods and their residents, particularly under-served and under-represented communities, with attention to displacement and affordability impacts. Identify and implement strategies to mitigate the anticipated impacts.

82. Finding: The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to encourage growth in Portland's industrial districts. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under current regulations. These changes apply to one type of use in the industrial zones, therefore, these changes will not have a significant impact on industrial areas, including the employment opportunities. These changes will not impact the physical characteristics of neighborhoods or result in increased displacement or affordability impacts, therefore no mitigations strategies have been identified.

Policy 3.10. Rural, urbanizable, and urban land. Preserve the rural character of rural land outside the Regional Urban Growth Boundary. Limit urban development of urbanizable land beyond the City Limits until it is annexed and full urban services are extended.

83. Finding: The FFTZ amendments apply to one type of use in the industrial zones, therefore, these changes will not have a significant impact on rural land outside the UGB. This policy does not apply.

Policy 3.11. Significant places. Enhance and celebrate significant places throughout Portland with symbolic features or iconic structures that reinforce local identity, histories, and cultures and contribute to way-finding throughout the city. Consider these especially at:

- High-visibility intersections
- Attractions
- Schools, libraries, parks, and other civic places
- Bridges
- Rivers
- Viewpoints and view corridor locations

- Historically or culturally significant places
- Connections to volcanic buttes and other geologic and natural landscape features
- Neighborhood boundaries and transitions

84. Finding: The existing FFTs are near significant places, but not considered significant places that should be enhanced or celebrated. This policy does not apply.

Centers

Policy 3.12. Role of centers. Enhance centers as anchors of complete neighborhoods that include concentrations of commercial and public services, housing, employment, gathering places, and green spaces.

Policy 3.13. Variety of centers. Plan for a range of centers across the city to enhance local, equitable access to services, and expand housing opportunities.

Policy 3.14. Housing in centers. Provide housing capacity for enough population to support a broad range of commercial services, focusing higher-density housing within a half-mile of the center core.

Policy 3.15. Investments in centers. Encourage public and private investment in infrastructure, economic development, and community services in centers to ensure that all centers will support the populations they serve.

Policy 3.16. Government services. Encourage the placement of services in centers, including schools and colleges, health services, community centers, daycare, parks and plazas, library services, and justice services.

Policy 3.17. Arts and culture. Ensure that land use plans and infrastructure investments allow for and incorporate arts, culture, and performance arts as central components of centers.

Policy 3.18. Accessibility. Design centers to be compact, safe, attractive, and accessible places, where the street environment makes access by transit, walking, biking, and mobility devices such as wheelchairs, safe and attractive for people of all ages and abilities.

Policy 3.19. Center connections. Connect centers to each other and to other key local and regional destinations, such as schools, parks, and employment areas, by frequent and convenient transit, bicycle sharing, bicycle routes, pedestrian trails and sidewalks, and electric vehicle charging stations.

Policy 3.20. Green infrastructure in centers. Integrate nature and green infrastructure into centers and enhance public views and connections to the surrounding natural features.

85. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in centers. These policies do not apply.

Central City

Policy 3.21. Role of the Central City. Encourage continued growth and investment in the Central City, and recognize its unique role as the region's premier center for jobs, services, and civic and cultural institutions that support the entire city and region.

Policy 3.22. Model Urban Center. Promote the Central City as a living laboratory that demonstrates how the design and function of a dense urban center can concurrently provide equitable benefits to human health, the natural environment, and the local economy.

Policy 3.23. Central City employment. Encourage the growth of the Central City's regional share of employment and continue its growth as the region's unique center for innovation and exchange through commerce, employment, arts, culture, entertainment, tourism, education, and government.

Policy 3.24. Central City housing. Encourage the growth of the Central City as Portland's and the region's largest center with the highest concentrations of housing and with a diversity of housing options and services.

Policy 3.25. Transportation hub. Enhance the Central City as the region's multimodal transportation hub and optimize regional access as well as the movement of people and goods among key destinations.

Policy 3.26. Public places. Promote public places and the Willamette River waterfront in the Central City as places of business and social activity and gathering for the people of its districts and the broader region.

86. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in the Central City. These policies do not apply.

Gateway Regional Center

Policy 3.27 Role of Gateway. Encourage growth and investment in Gateway to enhance its role as East Portland's center of employment, commercial, and public services.

Policy 3.28 Housing. Encourage housing in Gateway, to create East Portland's largest concentration of high-density housing**.**

Policy 3.29 Transportation. Enhance Gateway's role as a regional high-capacity transit hub that serves as an anchor for East Portland's multimodal transportation system.

Policy 3.30 Public places. Enhance the public realm and public places in Gateway to provide a vibrant and attractive setting for business and social activity that serves East Portland residents and the region.

87. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in the Gateway Regional Center. These policies do not apply.

Town Centers

Policy 3.31 Role of Town Centers. Enhance Town Centers as successful places that serve the needs of surrounding neighborhoods as well as a wider area, and contain higher concentrations of employment, institutions, commercial and community services, and a wide range of housing options.

Policy 3.32 Housing. Provide for a wide range of housing types in Town Centers, which are intended to generally be larger in scale than the surrounding residential areas. There should be sufficient zoning capacity within a half-mile walking distance of a Town Center to accommodate 7,000 households.

Policy 3.33 Transportation. Improve Town Centers as multimodal transportation hubs that optimize access from the broad area of the city they serve and are linked to the region's high-capacity transit system.

Policy 3.34 Public places. Provide parks or public squares within or near Town Centers to support their roles as places of focused business and social activity.

88. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in town centers. These policies do not apply.

Neighborhood Centers

Policy 3.35 Role of Neighborhood Centers. Enhance Neighborhood Centers as successful places that serve the needs of surrounding neighborhoods. In Neighborhood Centers, provide for higher concentrations of development, employment, commercial and community services, and a wider range of housing options than the surrounding neighborhoods.

Policy 3.36 Housing. Provide for a wide range of housing types in Neighborhood Centers, which are intended to generally be larger in scale than the surrounding residential areas, but smaller than Town Centers. There should be sufficient zoning capacity within a half-mile walking distance of a Neighborhood Center to accommodate 3,500 households.

Policy 3.37 Transportation. Design Neighborhood Centers as multimodal transportation hubs that are served by frequent-service transit and optimize pedestrian and bicycle access from adjacent neighborhoods.

Policy 3.38 Public places. Provide small parks or plazas within or near Neighborhood Centers to support their roles as places of local activity and gathering.

89. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in neighborhood centers. These policies do not apply.

Inner Ring Districts

Policy 3.39 Growth. Expand the range of housing and employment opportunities in the Inner Ring Districts. Emphasize growth that replaces gaps in the historic urban fabric, such as redevelopment of surface parking lots and 20th century auto-oriented development.

Policy 3.40 Corridors. Guide growth in corridors to transition to mid-rise scale close to the Central City, especially along Civic Corridors.

Policy 3.41 Distinct identities. Maintain and enhance the distinct identities of the Inner Ring Districts and their corridors. Use and expand existing historic preservation and design review tools to accommodate growth in ways that identify and preserve historic resources and enhance the distinctive characteristics of the Inner Ring Districts, especially in areas experiencing significant development.

Policy 3.42 Diverse residential areas. Provide a diversity of housing opportunities in the Inner Ring Districts' residential areas. Encourage approaches that preserve or are compatible with existing historic properties in these areas. Acknowledge that these areas are historic assets and should retain their established characteristics and development patterns, even as Inner Ring centers and corridors grow. Apply base zones in a manner that takes historic character and adopted design guidelines into account.

Policy 3.43 Active transportation. Enhance the role of the Inner Ring Districts' extensive transit, bicycle, and pedestrian networks in conjunction with land uses that optimize the ability for more people to utilize this network. Improve the safety of pedestrian and bike connections to the Central City. Strengthen transit connections between the Inner Ring Districts and to the Central City.

90. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in the Inner Ring. These policies do not apply.

Corridors

Policy 3.44. Growth and mobility. Coordinate transportation and land use strategies along corridors

to accommodate growth and mobility needs for people of all ages and abilities.

Policy 3.45. Connections. Improve corridors as multimodal connections providing transit, pedestrian, bicycle, and motor vehicle access and that serve the freight needs of centers and neighborhood business districts.

Policy 3.46. Design. Encourage street design that balances the important transportation functions of corridors with their roles as the setting for commercial activity and residential living.

Policy 3.47. Green infrastructure in corridors. Enhance corridors with distinctive green infrastructure, including landscaped stormwater facilities, extensive tree plantings, and other landscaping that both provide environmental function and contribute to a quality pedestrian environment.

91. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in corridors. These policies do not apply.

Civic Corridors

Policy 3.48. Integrated land use and mobility. Enhance Civic Corridors as distinctive places that are models of ecological urban design, with transit-supportive densities of housing and employment, prominent street trees and other green features, and high-quality transit service and pedestrian and bicycle facilities.

Policy 3.49. Design great places. Improve public streets and sidewalks along Civic Corridors to support the vitality of business districts, create distinctive places, provide a safe, healthy, and attractive pedestrian environment, and contribute to quality living environments for residents.

Policy 3.50. Mobility corridors. Improve Civic Corridors as key mobility corridors of citywide importance that accommodate all modes of transportation within their right-of-way or on nearby parallel routes.

Policy 3.51. Freight. Maintain freight mobility and access on Civic Corridors that are also Major or Priority Truck Streets.

92. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in civic corridors. These policies do not apply.

Neighborhood Corridors

Policy 3.52. Neighborhood Corridors. Enhance Neighborhood Corridors as important places that support vibrant neighborhood business districts with quality multi-family housing, while providing transportation connections that link neighborhoods.

93. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in neighborhood corridors. These policies do not apply.

Transit Station Areas

Policy 3.53. Transit-oriented development. Encourage transit-oriented development and transit-supportive concentrations of housing and jobs, and multimodal connections at and adjacent to high-capacity transit stations.

Policy 3.54. Community connections. Integrate transit stations into surrounding communities and enhance pedestrian and bicycle facilities (including bike sharing) to provide safe and accessible connections to key destinations beyond the station area.

Policy 3.55. Transit station area safety. Design transit areas to improve pedestrian, bicycle, and personal safety.

Policy 3.56. Center stations. Encourage transit stations in centers to provide high density concentrations of housing and commercial uses that maximize the ability of residents to live close to both high-quality transit and commercial services.

Policy 3.57. Employment stations. Encourage concentrations of jobs and employment-focused land uses in and around stations in employment-zoned areas.

Policy 3.58. Transit neighborhood stations. Encourage concentrations of mixed-income residential development and supportive commercial services close to transit neighborhood stations. Transit neighborhood stations serve mixed-use areas that are not in major centers.

Policy 3.59. Destination stations. Enhance connections between major destinations and transit facilities and strengthen the role of these station areas as places of focused activity.

94. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in transit station areas. These policies do not apply.

City Greenways

Policy 3.60. Connections. Create a network of distinctive and attractive City Greenways that link centers, parks, schools, rivers, natural areas, and other key community destinations.

Policy 3.61. Integrated system. Create an integrated City Greenways system that includes regional trails through natural areas and along Portland's rivers, connected to neighborhood greenways, and heritage parkways.

Policy 3.62. Multiple benefits. Design City Greenways that provide multiple benefits that contribute to Portland's pedestrian, bicycle, green infrastructure, and parks and open space systems.

Policy 3.63. Design. Use design options such as distinctive street design, motor vehicle diversion, landscaping, tree plantings, scenic views, and other appropriate design options, to create City Greenways that extend the experience of open spaces and nature into neighborhoods, while improving stormwater management and calming traffic.

95. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located along city greenways. These policies do not apply.

Urban habitat corridors

Policy 3.64. Urban habitat corridors. Establish a system of connected, well-functioning, and diverse habitat corridors that link habitats in Portland and the region, facilitate safe fish and wildlife access and movement through and between habitat areas, enhance the quality and connectivity of existing habitat corridors, and establish new habitat corridors in developed areas.

Policy 3.65. Habitat connection tools. Improve habitat corridors using a mix of tools including natural resource protection, property acquisition, natural resource restoration, tree planting and landscaping with native plants, and ecological design integrated with new development.

Policy 3.66. Connect habitat corridors. Ensure that planned connections between habitat corridors, greenways, and trails are located and designed to support the functions of each element, and create positive interrelationships between the elements, while also protecting habitat functions, fish, and wildlife.

96. Finding: The Willamette and Columbia Rivers are considered urban habitat corridors. The FFTZ amendments support the urban habitat corridor policies by reducing the risk associated with a major earthquake. The first step in making the current situation better is to ensure that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a high risk area. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which can minimize environmental impacts in the event of a major earthquake. No changes to the environmental or greenway overlay zones are proposed as part of this project, therefore the natural resource values and functions that contribute the habitat functions will be maintained.

Employment areas

Policy 3.67. Employment area geographies. Consider the land development and transportation needs of Portland's employment geographies when creating and amending land use plans and making infrastructure investments.

97. As described in the Economic Opportunities Analysis (EOA), Portland has a diverse economy with a wide range of businesses and employment opportunities that are distributed across the Central City, neighborhood commercial areas, campus institutions and industrial areas. The FFTZ amendments maintain Portland's diverse economy because the changes do not include map changes, nor do they allow for new incompatible land uses in industrial areas. Therefore, these changes will continue to provide the same opportunities for employment in Portland's employment area geographies. The FFTZ regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's employment districts. The limits on expansion of storage capacity at fossil fuel terminals are mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their intermodal facilities and supports opportunities for growth through a number of exceptions, such as aviation or renewable fuels, to the storage capacity restrictions.

Policy 3.68. Regional Truck Corridors. Enhance designated streets to accommodate forecast freight growth and support intensified industrial use in nearby freight districts. *See Figure 3-7 — Employment Areas.* Designated regional truckways and priority truck streets (Transportation System Plan classifications are shown to illustrate this network).

98. Finding: The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The City Council interprets this policy to acknowledge the role that regional truck corridors play in our transportation system and to take steps to improve those functions. Portland's approach to regional truck corridors is unchanged because the FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan. Therefore, the City continues to plan for public infrastructure investments to maintain and strengthen the regional truck corridors in the northwest industrial area where the FFTs are located.

Rivers Pattern Area

Policy 3.69. Historic and multi-cultural significance. Recognize, restore, and protect the historic and multi-cultural significance of the Willamette and Columbia Rivers, including current activities such as

subsistence fishing of legally-permitted fish species.

99. Finding: The verb "recognize" is defined in the 2035 Comprehensive Plan as to acknowledge and treat as valid. The City Council interprets this policy to acknowledge the multi-cultural significance that the rivers play in our community and to take steps to improve those functions. Most of Portland's employment and industrial zones, including the Portland Harbor, are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. Continuing to allow the unlimited increase in storage capacity at FFTs in a high risk area increases the risk to the Willamette and Columbia Rivers. The FFTZ amendments are a regulatory approach to help protect the rivers by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which is an improvement over the current regulations that allow for unlimited growth in FFTs.

Policy 3.70. River transportation. Recognize and enhance the roles of the Willamette and Columbia rivers as part of Portland's historic, current, and future transportation infrastructure, including for freight, commerce, commuting, and other public and private transportation functions.

100. Finding: The verb "recognize" is defined in the 2035 Comprehensive Plan as to acknowledge and treat as valid. The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The City Council interprets this policy to acknowledge the role that the rivers play in our transportation system and to take steps to improve those functions. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will continue to provide the same opportunities for public and private transportation functions on the Willamette and Columbia rivers. The FFTZ regulations apply to only one type of business that makes up a minority part of the businesses found along the Willamette and Columbia rivers. The limits on expansion of storage capacity at fossil fuel terminals are mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their intermodal facilities and transportation functions. In considering the natural hazard risks that the FFTs pose to the transportation functions on the river, as identified by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016), the City Council finds that continuing to allow the unlimited increase in storage capacity at FFTs in a high risk area does not enhance the current or future transportation functions of the rivers.

Policy 3.71. Recreation. Improve conditions along and within the Willamette and Columbia rivers to accommodate a diverse mix of recreational users and activities. Designate and invest in strategically-located sites along the length of Portland's riverfronts for passive or active recreation activities that are compatible with nearby land uses, historically and culturally important sites, significant habitat areas, restoration sites, and native fish and wildlife usage.

101. Finding: Six of the 11 existing FFTs have frontage on the Willamette River. However, there are no recreation access points near these terminals. These amendments do not change any plans for recreation sites on the Willamette and Columbia rivers, therefore this policy does not apply.

Policy 3.72 Industry and port facilities. Enhance the regionally significant economic infrastructure that includes Oregon's largest seaport and largest airport, unique multimodal freight, rail, and harbor access; the region's critical energy hub; and proximity to anchor manufacturing and distribution facilities.

102. **Finding:** The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, that adversely affect the land supply and economic opportunities in Portland's industrial areas.

The FFTs make up a significant portion of the region's critical energy infrastructure hub in the Portland Harbor. The FFTZ regulations include limits on the expansion of storage capacity at existing fossil fuel terminals, but those limits are mitigated by designating existing FFTs as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their intermodal facilities. The changes support opportunities for enhancement and growth through exceptions to the storage capacity restrictions for aviation or renewable fuels. Further, the use limitations (33.140.100.B.17.a) provide flexibility to FFTs to replace and reconfigure existing storage tank capacity, such as consolidating smaller tanks into larger tanks, to meet future needs.

Policy 3.73. Habitat. Enhance the roles of the Willamette and Columbia rivers and their confluence as an ecological hub that provides locally and regionally significant habitat for fish and wildlife and habitat restoration opportunities.

103. **Finding:** Six of the 11 existing FFTs have frontage on the Willamette River. These parcels will continue to be subject to development regulations for flood plains and natural resources to protect significant habitat. Furthermore, no changes to existing protections in the greenway overlay zones are proposed.

Policy 3.74. Commercial activities. Enhance the roles of the Willamette and Columbia rivers in supporting local and regional business and commerce, including commercial fishing, tourism, recreation, and leisure.

104. **Finding:** The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, that adversely affect the land supply and economic opportunities along the Willamette and Columbia rivers.

The City Council interprets this policy to mean that the first step in making the current situation better is to ensure that the situation does not get worse. Continuing to allow the increase in FFTs in a high risk area increases the risk to other businesses that rely on the rivers. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will be an improvement compared to the current regulations that allow for unlimited growth in FFTs. The FFTZ regulations support other commercial uses of the rivers by designating existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Allowing the FFTs to continue to operate and invest in upgrades will help support a strong local economy by providing for a continuing supply of fossil fuels to support a strong local economy. Further, the use limitations (33.140.100.B.17.a) provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs.

Policy 3.75. River neighborhoods. Enhance the strong river orientation of residential areas that are located along the Willamette and Columbia Rivers.

105. **Finding:** The FFTZ amendments regulate the allowed uses in Portland's industrial areas. None of the FFTs are in residential areas. This policy does not apply.

Policy 3.76. River access. Enhance and complete Portland's system of river access points and riverside

trails, including the Willamette Greenway Trail, and strengthen active transportation connections between neighborhoods and the rivers.

106. Finding: Six of the 11 existing FFTs have frontage on the Willamette River. However, there are no access points near these terminals. These amendments do not change any plans for recreation sites on the Willamette and Columbia rivers, therefore this policy does not apply.

Policy 3.77. River management and coordination. Coordinate with federal, state, regional, special districts, and other agencies to address issues of mutual interest and concern, including economic development, recreation, water transportation, flood and floodplain management and protection, regulatory compliance, permitting, emergency management, endangered species recovery, climate change preparation, Portland Harbor Superfund, brownfield cleanup, and habitat restoration.

107. Finding: The City Council interprets this policy to guide intergovernmental coordination on the management of the rivers. Other government agencies received notice from the 35-day DLCD notice and the City's legislative notice. In the initial adoption of the ordinance, the City received testimony from the Port of Portland. The City responded to the issues raised by the Port by amending the code to include an exception for the storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, drydock, ship or barge servicing facility, rail yard, or as part of a fleet vehicle servicing facility. The City did not receive any requests from other government agencies to modify the FFTZ amendments.

The City has an established procedure for coordinated review of river-related development, including docks, in areas where city, state and federal agencies all have jurisdiction. The Streamlining Team was established pursuant to a 2003 Intergovernmental Agreement between the City of Portland (City), NOAA Fisheries, Army Corps of Engineers (Corps), and the U.S. Fish and Wildlife Service (USFWS). The FFTZ amendments do not change these procedures and there is no impact to this coordinated process.

Policy 3.78 Columbia River. Enhance the role of the Columbia River for river dependent industry, fish and wildlife habitat, subsistence and commercial fisheries, floating- and land-based neighborhoods, recreational uses, and water transportation.

108. Finding: The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The City Council interprets this policy to acknowledge the role that the Columbia River plays in our city and to take steps to improve those functions. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will continue to provide the same opportunities on the Columbia River. The City Council interprets this goal to apply to districts as whole and not to individual businesses or sectors of business. These regulations apply to only one type of business that is not found on the Columbia River. The remaining industrial uses continue to operate under current regulations.

Policy 3.79 Willamette River North Reach. Enhance the role of the Willamette River North Reach for river dependent industry, fish and wildlife habitat, and as an amenity for riverfront neighborhoods and recreational users.

109. Finding: The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The City Council interprets this policy to acknowledge the role that the Willamette River plays in our city and to take steps to improve those functions. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses. The City Council interprets this goal to apply to districts as whole and not to

individual businesses or sectors of business. These regulations apply to only one type of river dependent industry. The remaining industrial uses continue to operate under current regulations.

Policy 3.80. Willamette River Central Reach. Enhance the role of the Willamette River Central Reach as the Central City and region's primary riverfront destination for recreation, history and culture, emergency response, water transportation, and as habitat for fish and wildlife.

Policy 3.81 Willamette River South Reach. Enhance the role of the Willamette River South Reach as fish and wildlife habitat, a place to recreate, and as an amenity for riverfront neighborhoods and others.

110. Finding: For policies 3.80 and 3.81, the City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The City Council interprets this policy to acknowledge the role that the Willamette River plays in our city and to take steps to improve those functions. These regulations apply to only one type of business that is not found on Central and South reaches of the Willamette River. The remaining industrial uses continue to operate under current regulations. These policies do not apply.

Policy 3.82. Willamette River Greenway. Maintain multi-objective plans and regulations to guide development, infrastructure investments, and natural resource protection and enhancement within and along the Willamette Greenway.

111. Finding: The multi-dwelling zones are largely located outside areas along the Willamette and Columbia Rivers, with a few exceptions. These include areas of multi-dwelling zoning along the Willamette River near the east end of the Sellwood Bridge and areas around the Macadam Neighborhood Center. Portions of Hayden Island on the Columbia River also have multi-dwelling zoning. Existing rules for Willamette River Greenway and Macadam Plan District are not affected by these amendments. Similarly, the Hayden Island Plan District is not significantly affected.

Central City Pattern Area

Policy 3.83. Central City districts. Enhance the distinct identities of the Central City's districts.

Policy 3.84. Central City river orientation. Enhance and strengthen access and orientation to the Willamette River in the Central City and increase river-focused activities.

Policy 3.85. Central City pedestrian system. Maintain and expand the Central City's highly interconnected pedestrian system.

Policy 3.86. Central City bicycle system. Expand and improve the Central City's bicycle system.

112. Finding: The FFTZ amendments affect allowed uses in industrial zones outside the Central City. These policies do not apply.

Inner Neighborhoods Pattern Area

Policy 3.87 Inner Neighborhoods main streets. Maintain and enhance the Streetcar Era pattern of street-oriented buildings along Civic and Neighborhood corridors.

Policy 3.88 Inner Neighborhoods street patterns. Preserve the area's urban fabric of compact blocks and its highly interconnected grid of streets.

Policy 3.89 Inner Neighborhoods infill. Fill gaps in the urban fabric through infill development on vacant and underutilized sites and in the reuse of historic buildings on adopted inventories.

Policy 3.90 Inner Neighborhoods active transportation. Use the extensive street, sidewalk, and

bikeway system and multiple connections to the Central City as a key part of Portland's active transportation system

Policy 3.91 Inner Neighborhoods residential areas. Continue the patterns of small, connected blocks, regular lot patterns, and streets lined by planting strips and street trees in Inner Neighborhood residential areas.

113. Finding: The FFTZ amendments affect allowed uses in industrial zones. There are not existing FFTs in the Inner Neighborhoods Pattern Area. These policies do not apply.

Eastern Neighborhoods Pattern Area

Policy 3.92 Eastern Neighborhoods street, block, and lot pattern. Guide the evolving street and block system in the Eastern Neighborhoods in ways that build on positive aspects of the area's large blocks, such as opportunities to continue mid-block open space patterns and create new connections through blocks that make it easier to access community destinations.

Policy 3.93 Eastern Neighborhoods site development. Require that land be aggregated into larger sites before land divisions and other redevelopment occurs. Require site plans which advance design and street connectivity goals.

Policy 3.94 Eastern Neighborhoods trees and natural features. Encourage development and right-of-way design that preserves and incorporates Douglas fir trees and groves, and that protects the area's streams, forests, wetlands, steep slopes, and buttes.

Policy 3.95 Eastern Neighborhoods buttes. Enhance public views of the area's skyline of buttes and stands of tall Douglas fir trees.

Policy 3.96 Eastern Neighborhoods corridor landscaping. Encourage landscaped building setbacks along residential corridors on major streets.

Policy 3.97 Eastern Neighborhoods active transportation. Enhance access to centers, employment areas, and other community destinations in Eastern Neighborhoods by ensuring that corridors have safe and accessible pedestrian and bicycle facilities and creating additional secondary connections that provide low-stress pedestrian and bicycle access.

114. Finding: The FFTZ amendments affect allowed uses in industrial zones. There are not existing FFTs in the Eastern Neighborhoods Pattern Area. These policies do not apply.

Western Neighborhoods Pattern Area

Policy 3.98 Western Neighborhoods village character. Enhance the village character of the Western Neighborhoods' small commercial districts and increase opportunities for more people to live within walking distance of these neighborhood anchors.

Policy 3.99 Western Neighborhoods active transportation. Provide safe and accessible pedestrian and bicycle connections, as well as off-street trail connections, to and from residential neighborhoods.

Policy 3.100 Western Neighborhoods development. Encourage new development and infrastructure to be designed to minimize impacts on the area's streams, ravines, and forested slopes.

Policy 3.101 Western Neighborhoods habitat corridors. Preserve, enhance, and connect the area's network of habitat areas and corridors, streams, parks, and tree canopy.

Policy 3.102 Western Neighborhoods trails. Develop pedestrian-oriented connections and enhance the Western Neighborhoods' distinctive system of trails to increase safety, expand mobility, access to

nature, and active living opportunities in the area.

115. **Finding:** The FFTZ amendments affect allowed uses in industrial zones. There are not existing FFTs in the Western Neighborhoods Pattern Area. These policies do not apply.

Chapter 4: Design and Development

Goal 4.A: Context-sensitive design and development. New development is designed to respond to and enhance the distinctive physical, historic, and cultural qualities of its location, while accommodating growth and change.

116. **Finding:** The City Council interprets this goal to not apply to the City's industrial areas, where the physical, historic and cultural qualities are less sensitive to changes from new development.

The FFTs make up a significant portion of the region's critical energy infrastructure hub in the Portland Harbor. The FFTZ regulations include limits on the expansion of storage capacity at existing fossil fuel terminals, but those limits are mitigated by designating existing FFTs as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their facilities. The changes support opportunities for growth and change through exceptions to the storage capacity restrictions for aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity, such as consolidating smaller tanks into larger tanks, to meet future needs.

Goal 4.B: Historic and cultural resources. Historic and cultural resources are integral parts of an urban environment that continue to evolve and are preserved.

117. **Finding:** Historic and cultural resources are located throughout the City, but very few are located in the industrial zones where the FFTZ amendments change the allowed uses. There are no designated Historic Landmarks or Districts in or immediately adjacent to any of the existing FFTs. Existing historic resource protections are not being amended (Chapter 33.445).

Goal 4.C: Human and environmental health. Neighborhoods and development are efficiently designed and built to enhance human and environmental health: they protect safety and livability; support local access to healthy food; limit negative impacts on water, hydrology, and air quality; reduce carbon emissions; encourage active and sustainable design; protect wildlife; address urban heat islands; and integrate nature and the built environment.

118. **Finding:** Portland's FFTs are within a disaster-prone area that is at risk for a catastrophic Cascadia earthquake disaster. Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks to human and environmental health in the event of a major earthquake.

The City Council interprets this goal to mean that the first step in enhancing human and environmental health is to stop increasing the risk. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and Portland as a whole. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can protect human and environmental health.

Goal 4.D: Urban resilience. Buildings, streets, and open spaces are designed to ensure long-term resilience and to adjust to changing demographics, climate, and economy, and withstand and recover from natural disasters.

119. Finding: Portland's FFTs are within a disaster-prone area that is at risk for a catastrophic Cascadia earthquake disaster. Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks to human and environmental health in the event of a major earthquake.

The City Council interprets this goal to mean that the first step in making Portland more resilient is to stop increasing the risk. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

Context

Policy 4.1. Pattern areas. Encourage building and site designs that respect the unique built, natural, historic, and cultural characteristics of Portland's five pattern areas described in Chapter 3: Urban Form.

Policy 4.2. Community identity. Encourage the development of character-giving design features that are responsive to place and the cultures of communities.

Policy 4.3. Site and context. Encourage development that responds to and enhances the positive qualities of site and context — the neighborhood, the block, the public realm, and natural features.

120. Finding: The City Council interprets policies 4.1 through 4.3 as to provide general policy direction on how to consider context for design and development standards. The City Council finds that in the City's industrial areas, the physical design features are less important and are less sensitive to changes from new development. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones.

Policy 4.4. Natural features and green infrastructure. Integrate natural and green infrastructure such as trees, green spaces, ecoroofs, gardens, green walls, and vegetated stormwater management systems, into the urban environment. Encourage stormwater facilities that are designed to be a functional and attractive element of public spaces, especially in centers and corridors.

121. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones, including those that apply to natural features and green infrastructure.

Policy 4.5. Pedestrian-oriented design. Enhance the pedestrian experience throughout Portland through public and private development that creates accessible, safe, and attractive places for all those who walk and/or use wheelchairs or other mobility devices.

122. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones, including those that apply to pedestrian-oriented design features.

Policy 4.6. Street orientation. Promote building and site designs that enhance the pedestrian experience with windows, entrances, pathways, and other features that provide connections to the street environment.

123. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones, including those that apply to street orientation.

Policy 4.7. Development and public spaces. Guide development to help create high-quality public places and street environments while considering the role of adjacent development in framing, shaping, and activating the public space of streets and urban parks.

124. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones.

Policy 4.8. Alleys. Encourage the continued use of alleys for parking access, while preserving pedestrian access. Expand the number of alley-facing accessory dwelling units.

125. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones, including those that apply to alleys.

Policy 4.9. Transitional urbanism. Encourage temporary activities and structures in places that are transitioning to urban areas to promote job creation, entrepreneurship, active streets, and human interaction.

126. Finding: The City Council interprets this policy to relate to temporary commercial activities and public gathering places outside of industrial areas. This policy does not apply.

Health and safety

Policy 4.10. Design for active living. Encourage development and building and site design that promotes a healthy level of physical activity in daily life.

Policy 4.11. Access to light and air. Provide for public access to light and air by managing and shaping the height and mass of buildings while accommodating urban-scale development.

Policy 4.12. Privacy and solar access. Encourage building and site designs that consider privacy and solar access for residents and neighbors while accommodating urban-scale development.

Policy 4.13. Crime-preventive design. Encourage building, site, and public infrastructure design approaches that help prevent crime.

Policy 4.14. Fire prevention and safety. Encourage building and site design that improves fire prevention, safety, and reduces seismic risks.

127. Finding: The City Council interprets this policy to relate to development outside of industrial areas. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. This policy does not apply.

Residential areas

Policy 4.15. Residential area continuity and adaptability. Encourage more housing choices to accommodate a wider diversity of family sizes, incomes, and ages, and the changing needs of households over time. Allow adaptive reuse of existing buildings, the creation of accessory dwelling units, and other arrangements that bring housing diversity that is compatible with the general scale and patterns of residential areas.

Policy 4.16. Scale and patterns. Encourage design and development that complements the general scale, character, and natural landscape features of neighborhoods. Consider building forms, scale, street frontage relationships, setbacks, open space patterns, and landscaping. Allow for a range of architectural styles and expression.

Policy 4.17. **Demolitions.** Encourage alternatives to the demolition of sound housing, such as rehabilitation and adaptive reuse, especially affordable housing, and when new development would provide no additional housing opportunities beyond replacement.

Policy 4.18. **Compact single-family options**. Encourage development and preservation of small resource-efficient and affordable single-family homes in all areas of the city.

Policy 4.19. Resource efficient and healthy residential design and development. Support resource efficient and healthy residential design and development.

128. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. This policy does not apply.

Design and development of centers and corridors

Policy 4.20. Walkable scale. Focus services and higher-density housing in the core of centers to support a critical mass of demand for commercial services and more walkable access for customers.

Policy 4.21. Street environment. Encourage development in centers and corridors to include amenities that create a pedestrian-oriented environment and provide places for people to sit, spend time, and gather.

Policy 4.22. Relationship between building height and street size. Encourage development in centers and corridors that is responsive to street space width, thus allowing taller buildings on wider streets.

Policy 4.23. Design for pedestrian and bicycle access. Provide accessible sidewalks, high-quality bicycle access, and frequent street connections and crossings in centers and corridors.

Policy 4.24. Drive-through facilities. Prohibit drive through facilities in the Central City, and limit new development of new ones in the Inner Ring Districts and centers to support a pedestrian-oriented environment.

Policy 4.25. Residential uses on busy streets. Improve the livability of places and streets with high motor vehicle volumes. Encourage landscaped front setbacks, street trees, and other design approaches to buffer residents from street traffic.

Policy 4.26. Active gathering places. Locate public squares, plazas, and other gathering places in centers and corridors to provide places for community activity and social connections. Encourage location of businesses, services, and arts adjacent to these spaces that relate to and promote the use of the space.

Policy 4.27. Protect defining features. Protect and enhance defining places and features of centers

and corridors, including landmarks, natural features, and historic and cultural resources.

Policy 4.28. Historic buildings in centers and corridors. Protect and encourage the restoration and improvement of historic resources in centers and corridors.

Policy 4.29. Public art. Encourage new development and public places to include design elements and public art that contribute to the distinct identities of centers and corridors, and that highlight the history and diverse cultures of neighborhoods.

129. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. There are no existing FFTs in centers and corridors. This policy does not apply.

Transitions

Policy 4.30. Scale transitions. Create transitions in building scale in locations where higher-density and higher-intensity development is adjacent to smaller-scale single-dwelling zoning. Ensure that new high-density and large-scale infill development adjacent to single dwelling zones incorporates design elements that soften transitions in scale and limit light and privacy impacts on adjacent residents.

Policy 4.31. Land use transitions. Improve the interface between non-residential uses and residential uses in areas where commercial or employment uses are adjacent to residentially-zoned land.

Policy 4.32. Industrial edge. Protect non-industrially zoned parcels from the adverse impacts of facilities and uses on industrially zoned parcels using a variety of tools, including but not limited to vegetation, physical separation, land acquisition, and insulation to establish buffers between industrial sanctuaries and adjacent residential or mixed-use areas to protect both the viability of long-term industrial operations and the livability of adjacent areas.

130. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. These policies do not apply.

Off-site impacts

Policy 4.33. Off-site impacts. Limit and mitigate public health impacts, such as odor, noise, glare, light pollution, air pollutants, and vibration that public facilities, land uses, or development may have on adjacent residential or institutional uses, and on significant fish and wildlife habitat areas. Pay attention to limiting and mitigating impacts to under-served and under-represented communities.

131. Finding: Portland's FFTs are within a disaster-prone area that is at risk for a catastrophic Cascadia earthquake disaster. Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks to human and environmental health in the event of a major earthquake.

The City Council interprets this policy to mean that the first step in limiting public and environmental health impacts is to stop increasing the risk. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and Portland as a whole. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce

the risks and improve their ability to withstand a major earthquake, which ultimately can protect human and environmental health.

Policy 4.34. Auto-oriented facilities, uses, and exterior displays. Minimize the adverse impacts of highways, auto-oriented uses, vehicle areas, drive-through areas, signage, and exterior display and storage areas on adjacent residential uses.

Policy 4.35. Noise impacts. Encourage building and landscape design and land use patterns that limit and/or mitigate negative noise impacts to building users and residents, particularly in areas near freeways, regional truckways, major city traffic streets, and other sources of noise.

Policy 4.36. Air quality impacts. Encourage building and landscape design and land use patterns that limit and/or mitigate negative air quality impacts to building users and residents, particularly in areas near freeways, regional truckways, high traffic streets, and other sources of air pollution.

Policy 4.37. Diesel emissions. Encourage best practices to reduce diesel emissions and related impacts when considering land use and public facilities that will increase truck or train traffic.

Policy 4.38. Light pollution. Encourage lighting design and practices that reduce the negative impacts of light pollution, including sky glow, glare, energy waste, impacts to public health and safety, disruption of ecosystems, and hazards to wildlife.

132. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. These policies do not apply.

Scenic resources

Policy 4.41. Scenic resources. Enhance and celebrate Portland's scenic resources to reinforce local identity, histories, and cultures and contribute toward way-finding throughout the city. Consider views of mountains, hills, buttes, rivers, streams, wetlands, parks, bridges, the Central City skyline, buildings, roads, art, landmarks, or other elements valued for their aesthetic appearance or symbolism.

Policy 4.42. Scenic resource protection. Protect and manage designated significant scenic resources by maintaining scenic resource inventories, protection plans, regulations, and other tools.

Policy 4.43. Vegetation management. Maintain regulations and other tools for managing vegetation in a manner that preserves or enhances designated significant scenic resources.

Policy 4.44. Building placement, height, and massing. Maintain regulations and other tools related to building placement, height, and massing to preserve designated significant scenic resources.

Policy 4.45. Future development. Encourage new public and private development to create new public viewpoints providing views of Portland's rivers, bridges, surrounding mountains, hills and buttes, the Central City skyline, and other landmark features.

133. Finding: In 1991, the City adopted the Scenic Resources Protection Plan and applied a scenic (s) overlay zone to protect significant scenic resources. Two of the FFTs (BP West Coast and NuStar/Shore Terminals) are in a (s) overlay zone. The scenic resource protections (Chapter 33.480) are not amended by this ordinance and the height limits associated with the (s) overlay zone will continue to apply to the two FFT sites.

Historic and cultural resources

Policy 4.46. Historic and cultural resource protection. Protect and encourage the restoration of historic buildings, places, and districts that contribute to the distinctive character and history of

Portland's evolving urban environment.

Policy 4.47. State and federal historic resource support. Advocate for state and federal policies, programs, and legislation that would enable stronger historic resource designations, protections, and rehabilitation programs.

Policy 4.48. Continuity with established patterns. Encourage development that fills in vacant and underutilized gaps within the established urban fabric, while preserving and complementing historic resources.

Policy 4.49. Resolution of conflicts. Adopt and periodically update design guidelines for unique historic districts. Refine base zoning in historic districts to consider the character of the historic resources in the district.

Policy 4.50. Demolition. Protect historic resources from demolition. Provide opportunities for public comment, and encourage pursuit of alternatives to demolition or other actions that mitigate for the loss.

Policy 4.51. City-owned historic resources. Maintain City-owned historic resources with necessary upkeep and repair.

Policy 4.52. Historic Resources Inventory. Maintain and periodically update Portland's Historic Resources Inventory to inform historic and cultural resource preservation strategies.

Policy 4.53. Preservation equity. Expand historic preservation inventories, regulations, and programs to encourage historic preservation in areas and in communities that have not benefited from past historic preservation efforts, especially in areas with high concentrations of under-served and/or under-represented people.

Policy 4.54. Cultural diversity. Work with Portland's diverse communities to identify and preserve places of historic and cultural significance.

Policy 4.55. Cultural and social significance. Encourage awareness and appreciation of cultural diversity and the social significance of historic places and their roles in enhancing community identity and sense of place.

Policy 4.56. Community structures. Encourage the adaptive reuse of historic community structures, such as former schools, meeting halls, and places of worship, for arts, cultural, and community uses that continue their role as anchors for community and culture.

Policy 4.57. Economic viability. Provide options for financial and regulatory incentives to allow for the productive, reasonable, and adaptive reuse of historic resources.

Policy 4.58. Archaeological resources. Protect and preserve archaeological resources, especially those sites and objects associated with Native American cultures. Work in partnership with Sovereign tribes, Native American communities, and the state to protect against disturbance to Native American archaeological resources.

134. Finding: The City Council interprets that these policies relate to implementation approaches directly related to the preservation of historic and cultural resources, which is not the focus of the FFTZ amendments. Historic and cultural resources are located throughout Portland, but very few are in the industrial zones where the FFTZ amendments change the allowed uses. There are no designated Historic Landmarks or Districts in or immediately adjacent to any of the existing FFTs. Existing historic resource protections are not being amended (Chapter 33.445). Therefore, the policies do not apply.

Public art

Policy 4.59. Public art and development. Create incentives for public art as part of public and private development projects.

135. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not create incentives for public art. This policy does not apply.

Resource-efficient design and development

Policy 4.60. Rehabilitation and adaptive reuse. Encourage rehabilitation and adaptive reuse of buildings, especially those of historic or cultural significance, to conserve natural resources, reduce waste, and demonstrate stewardship of the built environment.

136. Finding: The FFTZ regulations encourage the rehabilitation of existing FFTs by designating them as a limited use, which allows the terminals to continue to operate and invest in facilities that improve their ability to withstand a major earthquake. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs.

Policy 4.61. Compact housing. Promote the development of compact, space- and energy-efficient housing types that minimize use of resources such as smaller detached homes or accessory dwellings and attached homes.

137. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to housing. This policy does not apply.

Policy 4.62. Seismic and energy retrofits. Promote seismic and energy-efficiency retrofits of historic buildings and other existing structures to reduce carbon emissions, save money, and improve public safety.

138. Finding: The FFTZ regulations encourage seismic retrofits of existing FFTs by designating them as a limited use, which allows the terminals to continue to operate and invest in facilities that improve their ability to withstand a major earthquake. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs.

Policy 4.63. Life cycle efficiency. Encourage use of technologies, techniques, and materials in building design, construction, and removal that result in the least environmental impact over the life cycle of the structure.

Policy 4.64. Deconstruction. Encourage salvage and reuse of building elements when demolition is necessary or appropriate.

Policy 4.65. Materials and practices. Encourage use of natural, resource-efficient, recycled, recycled content, and non-toxic building materials and energy-efficient building practices.

Policy 4.66. Water use efficiency. Encourage site and building designs that use water efficiently and manage stormwater as a resource.

Policy 4.67. Optimizing benefits. Provide mechanisms to evaluate and optimize the range of benefits from solar and renewable resources, tree canopy, ecoroofs, and building design.

Policy 4.68. Energy efficiency. Encourage and promote energy efficiency significantly beyond the Statewide Building Code and the use of solar and other renewable resources in individual buildings and at a district scale.

Policy 4.69. Reduce carbon emissions. Encourage a development pattern that minimizes carbon emissions from building and transportation energy use.

Policy 4.70. District energy systems. Encourage and remove barriers to the development and expansion of low-carbon heating and cooling systems that serve multiple buildings or a broader district.

Policy 4.71. Ecodistricts. Encourage ecodistricts, where multiple partners work together to achieve sustainability and resource efficiency goals at a district scale.

Policy 4.72. Energy-producing development. Encourage and promote development that uses renewable resources, such as solar, wind, and water to generate power on-site and to contribute to the energy grid.

139. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. These policies do not apply.

Designing with nature

Policy 4.73. Design with nature. Encourage design and site development practices that enhance, and avoid the degradation of, watershed health and ecosystem services and that incorporate trees and vegetation.

Policy 4.74. Flexible development options. Encouraging flexibility in the division of land, the siting and design of buildings, and other improvements to reduce the impact of development on environmentally-sensitive areas and to retain healthy native and beneficial vegetation and trees.

Policy 4.75. Low-impact development and best practices. Encourage use of low-impact development, habitat-friendly development, bird-friendly design, and green infrastructure.

Policy 4.76. Impervious surfaces. Limit use of and strive to reduce impervious surfaces and associated impacts on hydrologic function, air and water quality, habitat connectivity, tree canopy, and urban heat island effects.

Policy 4.77. Hazards to wildlife. Encourage building, lighting, site, and infrastructure design and practices that provide safe fish and wildlife passage, and reduce or mitigate hazards to birds, bats, and other wildlife.

Policy 4.78. Access to nature. Promote equitable, safe, and well-designed physical and visual access to nature for all Portlanders, while also maintaining the functions and values of significant natural resources, fish, and wildlife. Provide access to major natural features, including:

- Water bodies such as the Willamette and Columbia rivers, Smith and Bybee Lakes, creeks, streams, and sloughs.
- Major topographic features such as the West Hills, Mt. Tabor, and the East Buttes.
- Natural areas such as Forest Park and Oaks Bottom.

140. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. These policies do not apply.

Hazard-resilient design

Policy 4.79. Natural hazards and climate change risks and impacts. Limit development in or near areas prone to natural hazards, using the most current hazard and climate change-related information and maps.

141. **Finding:** The 2035 Comprehensive Plan defines "limit" as to minimize or reduce something or the effects of something relative to the current situation or to a potential future situation. Most of Portland's industrial zoning are in areas with high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. The FFTZ amendments will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will minimize the risk from a future major earthquake compared to the current regulations that allow for unlimited growth in FFTs.

Policy 4.80. Geological hazards. Evaluate slope and soil characteristics, including liquefaction potential, landslide hazards, and other geologic hazards.

142. Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. According to the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report, a magnitude 8 or 9 Cascadia Subduction Zone earthquake would impact the CEI Hub with: ground shaking; liquefaction (soil behavior phenomenon in which a saturated sand softens and loses strength during strong earthquake ground shaking); lateral spreading (where surficial soil permanently moves laterally due to earthquake shaking); landslides; co-seismic settlement (where the ground surface is permanently lowered due to seismic shaking); and bearing capacity failures (when the foundation soil cannot support the structure it is intended to support).

According to the 2012 DOGAMI report, liquefaction and lateral spreading hazards are of primary concern to the fossil fuel terminals. As described in the 2012 Oregon State Energy Assurance Plan, this Critical Energy Infrastructure Hub (CEI Hub) sits on top of very poor soils that are highly susceptible to earthquake-induced permanent ground deformation. The CEI Hub is adjacent to the Willamette River and has extensive deposits of highly liquefiable soils. These soils (made of sands, silts, gravels and clays) have been naturally deposited by river activity as well as been created from man-made activities, such as hydraulically placed material from river dredging or debris placed as landfill.

The FFTs have significant seismic risks because most of the tanks have been constructed without any or only limited seismic design criteria on soils with moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

Policy 4.81. Disaster-resilient development. Encourage development and site-management approaches that reduce the risks and impacts of natural disasters or other major disturbances and that improve the ability of people, wildlife, natural systems, and property to withstand and recover from such events.

143. **Finding:** The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives.

Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Continuing to allow the unlimited increase in storage capacity at FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments are a regulatory approach that improves Portland's ability to withstand and recover from an earthquake by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which is an improvement over the current regulations that allow for unlimited growth in FFTs. The FFTZ regulations focus on limiting risk by limiting new development (storage capacity), but designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs.

Policy 4.83. Urban heat islands. Encourage development, building, landscaping, and infrastructure design that reduce urban heat island effects.

144. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. These policies do not apply.

Policy 4.84. Planning and disaster recovery. Facilitate effective disaster recovery by providing recommended updates to land use designations and development codes, in preparation for natural disasters.

145. Finding: The FFTZ amendments are an update to the allowed uses in employment and industrial zones to prepare for a natural disaster. The FFTZ amendments are a regulatory approach that improves Portland's ability to withstand and recover from an earthquake by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which is an improvement over the current regulations that allow for unlimited growth in FFTs. The FFTZ regulations focus on limiting risk by limiting new development (storage capacity), but designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake.

Healthy food

Policy 4.85. Grocery stores and markets in centers. Facilitate the retention and development of grocery stores, neighborhood-based markets, and farmer's markets offering fresh produce in centers.

Policy 4.86. Neighborhood food access. Encourage small, neighborhood-based retail food opportunities, such as corner markets, food co-ops, food buying clubs, and community-supported agriculture pickup/drop-off sites, to fill in service gaps in food access across the city.

Policy 4.87. Growing food. Increase opportunities to grow food for personal consumption, donation, sales, and educational purposes.

Policy 4.88. Access to community gardens. Ensure that community gardens are allowed in areas close to or accessible via transit to people living in areas zoned for mixed-use or multi-dwelling development, where residents have few opportunities to grow food in yards.

146. Finding: The City Council interprets this policy to relate to development outside of industrial areas. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do

not change development standards that apply to development in those zones. These policies do not apply.

Chapter 5: Housing

Goal 5.A: Housing diversity. Portlanders have access to high-quality affordable housing that accommodates their needs, preferences, and financial capabilities in terms of different types, tenures, density, sizes, costs, and locations.

Goal 5.B: Equitable access to housing. Portland ensures equitable access to housing, making a special effort to remove disparities in housing access for people with disabilities, people of color, low-income households, diverse household types, and older adults.

Goal 5.C: Healthy connected city. Portlanders live in safe, healthy housing that provides convenient access to jobs and to goods and services that meet daily needs. This housing is connected to the rest of the city and region by safe, convenient, and affordable multimodal transportation.

Goal 5.D: Affordable housing. Portland has an adequate supply of affordable housing units to meet the needs of residents vulnerable to increasing housing costs.

Goal 5.E: High-performance housing. Portland residents have access to resource-efficient and high-performance housing for people of all abilities and income levels.

147. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not affect housing development. Except for Policies 5.11 to 5.16, which City Council interprets as requiring evaluation and analysis as to who will benefit and who will be burdened by a planning decision, the City Council finds that these goals and policies do not apply.

Diverse and expanding housing supply

Policy 5.1. Housing supply. Maintain sufficient residential development capacity to accommodate Portland's projected share of regional household growth.

Policy 5.2. Housing growth. Strive to capture at least 25 percent of the seven-county region's residential growth (Multnomah, Washington, Clackamas, Yamhill, Columbia, Clark, and Skamania counties).

Policy 5.3. Housing potential. Evaluate plans and investments for their impact on housing capacity, particularly the impact on the supply of housing units that can serve low- and moderate-income households, and identify opportunities to meet future demand.

Policy 5.4. **Housing types.** Encourage new and innovative housing types that meet the evolving needs of Portland households, and expand housing choices in all neighborhoods. These housing types include but are not limited to single-dwelling units; multi-dwelling units; accessory dwelling units; small units; pre-fabricated homes such as manufactured, modular, and mobile homes; co-housing; and clustered housing/clustered services.

Policy 5.5. Housing in centers. Apply zoning in and around centers that allows for and supports a diversity of housing that can accommodate a broad range of households, including multi-dwelling and family-friendly housing options.

Policy 5.6. Middle housing. Enable and encourage development of middle housing. This includes multi-unit or clustered residential buildings that provide relatively smaller, less expensive units; more units; and a scale transition between the core of the mixed use center and surrounding single family

areas. Where appropriate, apply zoning that would allow this within a quarter mile of designated centers, corridors with frequent service transit, high capacity transit stations, and within the Inner Ring around the Central City.

Policy 5.7. Adaptable housing. Encourage adaption of existing housing and the development of new housing that can be adapted in the future to accommodate the changing variety of household types.

Policy 5.8. Physically-accessible housing. Allow and support a robust and diverse supply of affordable, accessible housing to meet the needs of older adults and people with disabilities, especially in centers, station areas, and other places that are proximate to services and transit.

Policy 5.9. Accessible design for all. Encourage new construction and retrofitting to create physically-accessible housing, extending from the individual unit to the community, using Universal Design Principles.

Policy 5.10. Coordinate with fair housing programs. Foster inclusive communities, overcome disparities in access to community assets, and enhance housing choice for people in protected classes throughout the city by coordinating plans and investments to affirmatively further fair housing.

Housing access

Policy 5.11. Remove barriers. Remove potential regulatory barriers to housing choice for people in protected classes to ensure freedom of choice in housing type, tenure, and location.

Policy 5.12. Impact analysis. Evaluate plans and investments, significant new infrastructure, and significant new development to identify potential disparate impacts on housing choice, access, and affordability for protected classes and low-income households. Identify and implement strategies to mitigate the anticipated impacts.

Policy 5.13. Housing stability. Coordinate plans and investments with programs that prevent avoidable, involuntary evictions and foreclosures.

Policy 5.14. Preserve communities. Encourage plans and investments to protect and/or restore the socioeconomic diversity and cultural stability of established communities.

Policy 5.15. Gentrification/displacement risk. Evaluate plans and investments, significant new infrastructure, and significant new development for the potential to increase housing costs for, or cause displacement of communities of color, low- and moderate-income households, and renters. Identify and implement strategies to mitigate the anticipated impacts.

Policy 5.16. Involuntary displacement. When plans and investments are expected to create neighborhood change, limit the involuntary displacement of those who are under-served and under-represented. Use public investments and programs, and coordinate with nonprofit housing organizations (such as land trusts and housing providers) to create permanently-affordable housing and to mitigate the impacts of market pressures that cause involuntary displacement.

148. Finding: The City Council interprets Policies 5.11 to 5.16 as requiring evaluation and analysis as to who will benefit and who will be burdened by a planning decision, including amendments to the Zoning Code. The City Council finds that one factor in housing stability and displacement is access to job opportunities across a wide range of wage scales, especially middle wage jobs such as those found in Portland's industrial districts. The FFTZ amendments apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses,

therefore, these changes do not change the land capacity in Portland's industrial districts and continue to support continued growth in those districts.

The regulations are narrowly crafted to support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels.

Policy 5.17. Land banking. Support and coordinate with community organizations to hold land in reserve for affordable housing, as an anti-displacement tool, and for other community development purposes.

Policy 5.18. **Rebuild communities**. Coordinate plans and investments with programs that enable communities impacted by involuntary displacement to maintain social and cultural connections, and re-establish a stable presence and participation in the impacted neighborhoods.

Policy 5.19. **Aging in place.** Encourage a range of housing options and supportive environments to enable older adults to remain in their communities as their needs change.

Housing location

Policy 5.20. Coordinate housing needs in high-poverty areas. Meet the housing needs of under-served and under-represented populations living in high-poverty areas by coordinating plans and investments with housing programs.

Policy 5.21. Access to opportunities. Improve equitable access to active transportation, jobs, open spaces, high-quality schools, and supportive services and amenities in areas with high concentrations of under-served and under-represented populations and an existing supply of affordable housing.

Policy 5.22. New development in opportunity areas. Locate new affordable housing in areas that have high/medium levels of opportunity in terms of access to active transportation, jobs, open spaces, high-quality schools, and supportive services and amenities.

Policy 5.23. Higher-density housing. Locate higher-density housing, including units that are affordable and accessible, in and around centers to take advantage of the access to active transportation, jobs, open spaces, schools, and various services and amenities.

Policy 5.24. Impact of housing on schools. Evaluate plans and investments for the effect of housing development on school enrollment, financial stability, and student mobility. Coordinate with school districts to ensure plans are aligned with school facility plans.

Housing affordability

Policy 5.25. Housing preservation. Preserve and produce affordable housing to meet needs that are not met by the private market by coordinating plans and investments with housing providers and organizations.

Policy 5.26. Regulated affordable housing target. Strive to produce at least 10,000 new regulated affordable housing units citywide by 2035 that will be affordable to households in the 0-80 percent MFI bracket.

Policy 5.27. Funding plan. Encourage development or financial or regulatory mechanisms to achieve the regulated affordable housing target set forth for 2035.

Policy 5.28. Inventory of regulated affordable housing. Coordinate periodic inventories of the supply of regulated affordable housing in the four-county (Clackamas, Clark, Multnomah and Washington) region with Metro.

Policy 5.29. Permanently-affordable housing. Increase the supply of permanently-affordable housing, including both rental and homeownership opportunities.

Policy 5.30. Housing cost burden. Evaluate plans and investments for their impact on household cost, and consider ways to reduce the combined cost of housing, utilities, and/or transportation. Encourage energy-efficiency investments to reduce overall housing costs.

Policy 5.31. Household prosperity. Facilitate expanding the variety of types and sizes of affordable housing units, and do so in locations that provide low-income households with greater access to convenient transit and transportation, education and training opportunities, the Central City, industrial districts, and other employment areas.

Policy 5.33. Central City affordable housing. Encourage the preservation and production of affordable housing in the Central City to take advantage of the area's unique concentration of active transportation access, jobs, open spaces, and supportive services and amenities.

Policy 5.34. Affordable housing resources. Pursue a variety of funding sources and mechanisms including new financial and regulatory tools to preserve and develop housing units and various assistance programs for households whose needs are not met by the private market.

Policy 5.35. Inclusionary housing. Use inclusionary zoning and other regulatory tools to effectively link the production of affordable housing to the production of market-rate housing.

Policy 5.36. Impact of regulations on affordability. Evaluate how existing and new regulations affect private development of affordable housing, and minimize negative impacts where possible. Avoid regulations that facilitate economically-exclusive neighborhoods.

Policy 5.37. Mobile home parks. Encourage preservation of mobile home parks as a low/moderate-income housing option. Evaluate plans and investments for potential redevelopment pressures on existing mobile home parks and impacts on park residents and protect this low/moderate-income housing option. Facilitate replacement and alteration of manufactured homes within an existing mobile home park.

Policy 5.38. Workforce housing. Encourage private development of a robust supply of housing that is affordable to moderate-income households located near convenient multimodal transportation that provides access to education and training opportunities, the Central City, industrial districts, and other employment areas.

Policy 5.39. Compact single-family options. Encourage development and preservation of small resource-efficient and affordable single-family homes in all areas of the city.

Policy 5.40 Employer-assisted housing. Encourage employer-assisted affordable housing in conjunction with major employment development.

Policy 5.41 Affordable homeownership. Align plans and investments to support improving homeownership rates and locational choice for people of color and other groups who have been historically under-served and under-represented.

Policy 5.42 Homeownership retention. Support opportunities for homeownership retention for

people of color and other groups who have been historically under-served and under-represented.

Policy 5.43 Variety in homeownership opportunities. Encourage a variety of ownership opportunities and choices by allowing and supporting including but not limited to condominiums, cooperatives, mutual housing associations, limited equity cooperatives, land trusts, and sweat equity.

Policy 5.44 Regional cooperation. Facilitate opportunities for greater regional cooperation in addressing housing needs in the Portland metropolitan area, especially for the homeless, low- and moderate-income households, and historically under-served and under-represented communities.

Policy 5.45 Regional balance. Encourage development of a "regional balance" strategy to secure greater regional participation to address the housing needs of homeless people and communities of color, low- and moderate-income households, and historically under-served and under-represented communities throughout the region.

Homelessness

Policy 5.46. Housing continuum. Prevent homelessness and reduce the time spent being homeless by ensuring that a continuum of safe and affordable housing opportunities and related supportive services are allowed, including but not limited to Permanent Supportive Housing, transitional housing, self-built micro housing communities, emergency shelters, temporary shelters such as warming centers, and transitional campgrounds.

Health, safety, and well-being

Policy 5.47 Healthy housing. Encourage development and maintenance of all housing, especially multi-dwelling housing, that protects the health and safety of residents and encourages healthy lifestyles and active living.

Policy 5.48 Housing safety. Require safe and healthy housing free of hazardous materials such as lead, asbestos, and radon.

Policy 5.49. Housing quality. Encourage housing that provides high indoor air quality, access to sunlight and outdoor spaces, and is protected from excessive noise, pests, and hazardous environmental conditions.

Policy 5.50. High-performance housing. Encourage energy efficiency, green building practices, materials, and design to produce healthy, efficient, durable, and adaptable homes that are affordable or reasonably priced.

Policy 5.51. Healthy and active living. Encourage housing that provides features supportive of healthy eating and active living such as useable open areas, recreation areas, community gardens, crime-preventive design, and community kitchens in multifamily housing.

Policy 5.52. Walkable surroundings. Encourage active transportation in residential areas through the development of pathways, sidewalks, and high-quality onsite amenities such as secure bicycle parking.

Policy 5.53. Responding to social isolation. Encourage site designs and relationship to adjacent developments that reduce social isolation for groups that often experience it, such as older adults, people with disabilities, communities of color, and immigrant communities.

Policy 5.54 Renter protections. Enhance renter health, safety, and stability through education, expansion of enhanced inspections, and support of regulations and incentives that protect tenants

and prevent involuntary displacement.

Chapter 6: Economic Development

Goal 6.A: Prosperity. Portland has vigorous economic growth and a healthy, diverse economy that supports prosperity and equitable access to employment opportunities for an increasingly diverse population. A strong economy that is keeping up with population growth and attracting resources and talent can:

- Create opportunity for people to achieve their full potential.
- Improve public health.
- Support a healthy environment.
- Support the fiscal well-being of the city.

149. Finding: The City Council interprets this goal to apply to the city as whole and not to individual businesses or sectors of business. The City Council interprets this goal to mean that Portland has a strong economy with employment opportunities for a diverse population. The City Council finds that an important factor in a diverse economy is to provide access to job opportunities across a wide range of wage scales, especially middle wage jobs such as those found in Portland's industrial districts.

The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's employment land supply to create opportunities for a growing economy.

These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under the current development review system. The FFTZ amendments establish clear definitions for fossil fuels and the Bulk Fossil Fuel Terminal use category. These changes are fair to existing FFTs by designating them as a limited use that allows the terminals to continue to operate and. The limited use designation also allows the FFTs to invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity, such as consolidating smaller tanks into larger tanks, to meet future needs.

Goal 6.B: Development. Portland supports an attractive environment for industrial, commercial, and institutional job growth and development by: 1) maintaining an adequate land supply; 2) a local development review system that is nimble, predictable, and fair; and 3) high-quality public facilities and services.

150. Finding: The verb "support", which is defined in the 2035 Comprehensive Plan, means to aid the cause of. The City Council interprets this goal to apply to the city as whole and not to individual businesses or sectors of business. The City Council interprets this goal to mean that an attractive environment for economic development has three elements: 1) adequate land supply; 2) a predictable development review system; and 3) high-quality public services. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's employment land supply.

These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under the current development review system. The FFTZ amendments establish clear definitions for fossil fuels and the Bulk Fossil Fuel Terminal use category. These changes are fair to existing FFTs by designating them as a limited use that allows the terminals to continue to operate and. The

limited use designation also allows the FFTs to invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity, such as consolidating smaller tanks into larger tanks, to meet future needs.

The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the industrial districts where the FFTs are located.

Goal 6.C: Business district vitality. Portland implements land use policy and investments to:

- Ensure that commercial, institutional, and industrial districts support business retention and expansion.

151. Finding: The verb "ensure", which is defined in the 2035 Comprehensive Plan, means to make sure that something will happen or be available. The City Council interprets this goal to apply to the city as whole and not to individual businesses or sectors of business. Further, the City Council interprets this goal to mean that the City will provide an adequate land base that is supported by public infrastructure investments that are needed to support businesses. The FFTZ amendments are consistent with this goal because they do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to support business retention and expansion in Portland's industrial districts. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for expansion through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to meet future needs. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the industrial districts where the FFTs are located.

- Encourage the growth of districts that support productive and creative synergies among local businesses.

152. Finding: The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. The City Council interprets this goal to apply to districts as whole and not to individual businesses or sectors of business. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to encourage growth in Portland's industrial districts. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under current regulations. These changes support the retention of existing fossil fuel terminals by designating them as a limited use, as opposed to a non-conforming use, that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions.

- Provide convenient access to goods, services, and markets.

153. Finding: The verb "provide", which is defined in the 2035 Comprehensive Plan, means to supply, offer, or make available. The adjective "convenient", which is not defined in the 2035 Comprehensive Plan, means to be situated to allow easy access. The City Council interprets this

goal to apply to the city as whole and not to individual businesses or sectors of business. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the industrial districts where the FFTs are located. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under current regulations. These changes support the retention of existing fossil fuel terminals by designating them as a limited use, as opposed to a non-conforming use, that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions. The limits and exceptions will enable the FFTs to maintain their ability to provide goods and services to their markets.

These regulations continue to allow access to current volumes of fossil fuels that support the economy of the State of Oregon and SW Washington. The existing FFTs can continue to operate as a limited use. The regulations also provide exceptions to the storage capacity limits for aviation and renewable fuels. Further, the City finds that reducing risk from a major earthquake outweighs the marginal impact to accommodating future demand for fossil fuels. In addition, continuing to locate all of the fossil fuel storage capacity in a high risk area in Portland is counter to 2013 Oregon Resilience Plan that recommends the diversification of locations for the storage of liquid fuels and identification of new liquid fuel energy corridors.

- Take advantage of our location and quality of life advantages as a gateway to world-class natural landscapes in Northwest Oregon, Southwest Washington, and the Columbia River Basin, and a robust interconnected system of natural landscapes within the region's Urban Growth Boundary.

154. Finding: The City Council interprets this goal to apply to the city as whole and not to individual businesses or sectors of business. Further, the City Council interprets the intent of this goal is to leverage location, access and quality of life as an advantage to attracting and retaining businesses and employees to Portland. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, that could undermine business retention and expansion in Portland's industrial districts. Therefore, these changes do not conflict with the intent of this goal to encourage business district vitality in Portland.

Diverse, expanding city economy

Policy 6.1. Diverse and growing community. Expand economic opportunity and improve economic equity for Portland's diverse, growing population through sustained business growth.

155. Finding: The City Council interprets this policy to apply to the city as whole and not to individual businesses or sectors of business. The City Council finds that an important factor in improving economic equity is to provide access to job opportunities across a wide range of wage scales, especially middle wage jobs such as those found in Portland's industrial districts.

The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's employment land supply to create opportunities for a growing economy.

These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under the current development review system. The FFTZ amendments establish clear definitions for fossil fuels and the Bulk Fossil Fuel Terminal use category. These changes are fair to existing

FFTs by designating them as a limited use that allows the terminals to continue to operate and. The limited use designation also allows the FFTs to invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity, such as consolidating smaller tanks into larger tanks, to meet future needs.

Policy 6.2. Diverse and expanding economy. Align plans and investments to maintain the diversity of Portland's economy and status as Oregon's largest job center with growth across all sectors (commercial, industrial, creative, and institutional) and across all parts of the city.

Policy 6.3. Employment growth. Strive to capture at least 25 percent of the seven-county region's employment growth (Multnomah, Washington, Clackamas, Yamhill, Columbia, Clark, and Skamania counties).

Policy 6.4. Fiscally-stable city. Promote a high citywide jobs-to-households ratio that supports tax revenue growth at pace with residential demand for municipal services.

156. Finding: The City Council interprets Policies 6.2 through 6.3 to apply to the city as whole and not to individual businesses or sectors of business. The City Council interprets these policies to support a growing economy as described in the EOA. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's employment land supply to create opportunities for a growing economy consistent with the EOA.

Policy 6.5. Economic resilience. Improve Portland's economic resilience to impacts from climate change and natural disasters through a strong local economy and equitable opportunities for prosperity.

157. Finding: The verb "improve", which is defined in the 2035 Comprehensive Plan, means to make the current situation better; increase; enhance. The City Council interprets this policy to mean that the first step in making the current situation better is to ensure that the situation does not get worse. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will be an improvement compared to the current regulations that allow for unlimited growth in FFTs. Continuing to allow the unlimited increase in storage capacity at FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River in the event of a major earthquake. The FFTZ regulations improve resilience by designating existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Allowing the FFTs to continue to operate and invest in upgrades will help support a strong local economy by providing for a continuing supply of fossil fuels to support a strong local economy. Further, the use limitations (33.140.100.B.17.a) provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs.

Policy 6.6. Low-carbon and renewable energy economy. Align plans and investments with efforts to improve energy efficiency and reduce lifecycle carbon emissions from business operations. Promote employment opportunities associated with the production of renewable energy, energy efficiency projects, waste reduction, production of more durable goods, and recycling.

158. Finding: The City Council interprets this policy to support changes to business operations to become more energy efficient and reduce carbon emissions. Further, this policy encourages

renewable energy, including renewable fuels as an alternative to fossil fuels. The FFTZ amendments are consistent with this policy by providing an exception that allows for new storage capacity for renewable, non-fossil fuels.

Policy 6.7. Competitive advantages. Maintain and strengthen the city's comparative economic advantages including access to a high-quality workforce, business diversity, competitive business climate, and multimodal transportation infrastructure.

159. Finding: The verb "maintain", which is defined in the 2035 Comprehensive Plan, means to keep what you have; conserve; preserve; continue. The verb "strengthen", which is not defined in the 2035 Comprehensive Plan, means to make stronger, improve. The City Council interprets this policy to apply to the city as whole and not to individual businesses or sectors of business. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland, therefore will not have a significant impact on the workforce. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, that could undermine the business retention and expansion in Portland's industrial districts, which in turn supports Portland's business diversity across the city as a whole.

The regulations maintain a competitive business climate by being narrowly crafted to support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located.

Policy 6.8. Business environment. Use plans and investments to help create a positive business environment in the city and provide strategic assistance to retain, expand, and attract businesses.

160. Finding: The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. The City Council also determines that creating a positive business environment does not mean allowing for the unlimited expansion of all business types. These regulations are narrowly crafted to apply to only one type of business that makes up a minority part of the businesses found in Portland.

As outlined in Goal 6.B, the City Council defines a "positive business environment" as providing an adequate land capacity that is supported by high-quality infrastructure, with predictable and fair development review regulations. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not change the land capacity in Portland's industrial districts. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in Portland's industrial districts.

The regulations only limit one type of business (FFTs), due to the moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. However, the regulations maintain a competitive business climate by being narrowly crafted to support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate

and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions.

The City's Enterprise Zone program, which provides a property tax exemption to industrial firms, is one of the main ways in which the City of Portland provides strategic assistance to businesses. These changes do not affect that program, and FFTs that make new capital investments remain eligible for that program.

Policy 6.9. Small business development. Facilitate the success and growth of small businesses and coordinate plans and investments with programs that provide technical and financial assistance to promote sustainable operating practices.

161. Finding: These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, that could undermine the success and growth of small businesses in Portland's industrial districts, which in turn supports Portland's business diversity across the city as a whole. The ordinance does not change programs that provide technical and financial assistance to small businesses.

Policy 6.10. Business innovation. Encourage innovation, research, development, and commercialization of new technologies, products, and services through responsive regulations and public sector approaches.

162. Finding: The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. These changes support innovation at existing fossil fuel terminals by designating them as a limited use, as opposed to a non-conforming use, that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs.

Policy 6.11. Sharing economy. Encourage mechanisms that enable individuals, corporations, non-profits, and government to market, distribute, share, and reuse excess capacity in goods and services. This includes peer-to-peer transactions, crowd funding platforms, and a variety of business models to facilitate borrowing and renting unused resources.

163. Finding: The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. This policy does not apply.

Policy 6.12. Economic role of livability and ecosystem services. Conserve and enhance Portland's cultural, historic, recreational, educational, food-related, and ecosystem assets and services for their contribution to the local economy and their importance for retention and attraction of skilled workers and businesses.

164. Finding: The FFTZ map amendments do not affect Portland's cultural, historic, recreational, educational, food-related, and ecosystem assets and services for their contribution to the local economy. These regulations apply to only one type of business that makes up a minority part of the

businesses found in Portland's industrial districts. In considering the natural hazard risks that the FFTs pose to the ecosystem services on the river, as identified by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016), the City Council finds that continuing to allow the unlimited increase in storage capacity at FFTs in a high risk area does not enhance the current or future ecosystem services of the rivers. Therefore, the FFTZ regulations focus on limiting risk by limiting new development (storage capacity), but designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. These regulations will limit the risks to the natural resource habitat functions and ecosystem services provided by the rivers.

Land development

Policy 6.13. Land supply. Provide supplies of employment land that are sufficient to meet the long-term and short-term employment growth forecasts, adequate in terms of amounts and types of sites, available and practical for development and intended uses. Types of sites are distinguished primarily by employment geographies identified in the Economic Opportunities Analysis, although capacity needs for building types with similar site characteristics can be met in other employment geographies.

165. Finding: The verb "provide", which is defined in the 2035 Comprehensive Plan, means to supply, offer, or make available. The City Council interprets this policy to mean that the City will provide an adequate land base that is supported by public infrastructure investments that are needed to support businesses. The FFTZ amendments are consistent with this policy because they do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to provide an adequate land supply in Portland's industrial districts, as defined in the EOA. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the industrial districts where the FFTs are located.

Policy 6.14. Brownfield redevelopment. Overcome financial-feasibility gaps to cleanup and redevelop 60 percent of brownfield acreage by 2035.

166. Finding: The City Council interprets this policy to mean that the City will create programs to support the brownfield cleanup target. The FFTZ amendments are Zoning Code changes that are not directly related to the cleanup of brownfields. However, the changes designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities, including brownfield remediation.

Policy 6.15. Regionally-competitive development sites. Improve the competitiveness of vacant and underutilized sites located in Portland's employment areas using incentives, and regional and state assistance for needed infrastructure and site readiness improvements.

167. Finding: The verb "improve", which is defined in the 2035 Comprehensive Plan, means to make the current situation better; increase; enhance. The City Council interprets this policy to apply to the city as whole and not to individual businesses or sectors of business. The FFTZ amendments are consistent with this policy because they do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain an adequate land supply in Portland's industrial districts. Further, these regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public

infrastructure investments in the industrial districts where the FFTs are located. Finally, the City's Enterprise Zone program, which provides a property tax exemption to industrial firms, is one of the key incentives that the City of Portland offers to encourage businesses to invest in sites. These changes do not affect that program.

Policy 6.16. Regulatory climate. Improve development review processes and regulations to encourage predictability and support local and equitable employment growth and encourage business retention, including:

168. Finding: The verb "improve", which is defined in the 2035 Comprehensive Plan, means to make the current situation better; increase; enhance. The City Council interprets this policy to mean that changes to development regulations should consider how those changes affect predictability, equitable employment growth, and business retention. The City Council interprets this policy to apply to the city as whole and not to individual businesses or sectors of business.

In terms of predictability, these development regulations apply to only one type of business that makes up a minority part of the businesses found in Portland. The development regulations are clear and objective, with clearly defined terms, such as what is a fossil fuel, to provide predictability in regulating FFTs.

The City Council defines equitable employment growth as providing for job opportunities across a wide range of wage scales, especially middle wage jobs such as those found in Portland's industrial districts. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not change the land capacity in Portland's industrial districts and continue to support continued growth in those districts.

The regulations are narrowly crafted to support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels.

6.16.a. Assess and understand cumulative regulatory costs to promote Portland's financial competitiveness with other comparable cities.

169. Finding: The City Council interprets this policy to apply to a consideration of the cost, in terms of the time it takes to go through the development review process, the permit fees, and the system development charges, associated with the development review process. This policy applies to the city as whole and not to individual businesses or sectors of business. These regulations apply to only one type of business that makes up a small part of the businesses found in Portland's industrial districts, therefore the regulatory cost impact is limited. The FFTZ amendments do not change any of the associated permit fees or system development charges, therefore it does not impact Portland's financial competitiveness.

6.16.b. Promote certainty for new development through appropriate allowed uses and "clear and objective" standards to permit typical development types without a discretionary review.

6.16.c. Allow discretionary-review to facilitate flexible and innovative approaches to meet requirements.

170. Finding: The City Council interprets policy 6.16.b and 6.16.c to work in tandem. Under policy 6.16.b, the direction is to promote certainty through appropriate allowed uses and "clear and

objective" standards. apply to the city as whole and not to individual businesses or sectors of business. The regulations promote certainty by being narrowly crafted to apply only to fossil fuel terminals. Designating FFTs as a limited use, as opposed to a non-conforming use, allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, through clear and objective standards and definitions.

The City Council did not establish a discretionary conditional use review for the FFT use, due to the moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. The City Council finds that reducing risk from a major earthquake outweighs the policy direction to provide flexible and innovative approaches to accommodating additional storage capacity through a discretionary review process, in part, because continuing to locate all of the fossil fuel storage capacity in a high risk area in Portland is counter to the 2013 Oregon Resilience Plan that recommends the diversification of locations for the storage of liquid fuels and identification of new liquid fuel energy corridors.. The FFTs with access to the river are within the Greenway Overlay Zone (33.440), which establishes a discretionary review process to allow for industrial development, while preserving and enhancing the riparian habitat along the river. The FFTZ amendments do not amend the Greenway Overlay Zone standards or review process.

6.16.d. Design and monitor development review processes to avoid unnecessary delays.

171. Finding: The FFTZ amendments do not modify the development review process for FFTs. Designating the FFTs as a limited use does not subject those uses to new or additional development reviews. The ordinance includes a directive for BPS to monitor the effectiveness of this regulation and report back to City Council in two years.

6.16.e. Promote cost effective compliance with federal and state mandates, productive intergovernmental coordination, and efficient, well-coordinated development review and permitting procedures.

172. Finding: The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. The City has an established procedure for coordinated review of river-related development, including docks, in areas where city, state and federal agencies all have jurisdiction. The Streamlining Team was established pursuant to a 2003 Intergovernmental Agreement between the City of Portland (City), NOAA Fisheries, Army Corps of Engineers (Corps), and the U.S. Fish and Wildlife Service (USFWS). The FFTZ amendments do not change these procedures and there is no impact to this coordinated process.

6.16.f. Consider short-term market conditions and how area development patterns will transition over time when creating new development regulations.

173. Finding: The City Council interprets this policy to apply to the city as whole and not to individual businesses or sectors of business. As described in the adopted EOA, Portland has a tight supply of industrial land. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will not affect Portland's short-term industrial land supply. These regulations are consistent with Policy 6.37 (Industrial Sanctuaries) in that the City does not expect the industrial character and development pattern in these districts to transition over time. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in

upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels.

Policy 6.17. Short-term land supply. Provide for a competitive supply of development-ready sites with different site sizes and types, to meet five-year demand for employment growth in the Central City, industrial areas, campus institutions, and neighborhood business districts.

174. Finding: The verb "provide", which is defined in the 2035 Comprehensive Plan, means to supply, offer, or make available. The City Council interprets this policy to mean that the City will provide an adequate land base that is supported by public infrastructure investments that are needed to support businesses. The FFTZ amendments are consistent with this policy because they do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to provide an adequate land supply in Portland's industrial districts. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the industrial districts where the FFTs are located.

Policy 6.18. Evaluate land needs. Update the Economic Opportunities Analysis and short-term land supply strategies every five to seven years.

175. Finding: The City Council interprets this policy to provide direction to the city to update the EOA. The EOA was adopted in 2016 and is still within the time range. The FFTZ amendments do not amend the EOA. Therefore, this policy does not apply.

Policy 6.19. Corporate headquarters. Provide land opportunities for development of corporate headquarters campuses in locations with suitable transportation facilities.

176. Finding: The verb "provide", which is defined in the 2035 Comprehensive Plan, means to supply, offer, or make available. The City Council interprets this policy to mean that the City will provide an adequate land base that is supported by public infrastructure investments that are needed for corporate headquarters. The FFTZ amendments are consistent with this policy because they do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to provide an adequate land supply in Portland's industrial districts. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the industrial districts where the FFTs are located.

Traded sector competitiveness

Policy 6.20. Traded sector competitiveness. Align plans and investments with efforts to improve the city and regional business environment for traded sector and export growth. Participate in regional and statewide initiatives.

Policy 6.21. Traded sector diversity. Encourage partnerships to foster the growth, small business vitality, and diversity of traded sectors.

Policy 6.22. Clusters. Align plans and investments with efforts that direct strategic business development resources to enhance the competitiveness of businesses in traded sector clusters.

177. **Finding:** The 2035 Comprehensive Plan defines "traded sector" as a business sector consisting of companies that compete in markets extending beyond the metropolitan region. The City Council interprets policies 6.20 through 6.23 to apply to the city as whole and does not require the City to allow for the unlimited expansion of individual businesses or sectors of business. The City Council finds that fossil fuel energy is not identified as a key traded sector in city, regional or statewide initiatives. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to maintain Portland's industrial districts as part of the efforts to support trade sector and export growth over time. These changes support the retention of existing fossil fuel terminals by designating them as a limited use, as opposed to a non-conforming use, that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area as part of the City's traded sector economic development strategy.

Policy 6.23. Trade and freight hub. Encourage investment in transportation systems and services that will retain and expand Portland's competitive position as a West Coast trade gateway and freight distribution hub.

178. **Finding:** The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. The City Council interprets this policy to apply to the city as whole and not to individual businesses or sectors of business. The City Council interprets the policy in two ways. First, the City will promote and encourage public sector investments in the freight transportation system, including those by the City, the Port of Portland, Metro, and the State of Oregon. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located.

Second, these changes support the continuing investment in existing fossil fuel terminals by designating them as a limited use, as opposed to a non-conforming use, that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels.

Finally, the City's Enterprise Zone program, which provides a property tax exemption to industrial firms, is one of the key incentives that the City of Portland offers to encourage businesses to invest in their facilities, including private multi-modal transportation systems such as docks, pipelines and transloading facilities. These changes do not affect that program, and FFTs that make new capital investments remain eligible for that program.

Policy 6.24. Traded sector land supply. Foster traded sector retention, growth, and competitive advantages in industrial districts and the Central City. Recognize the concentration of traded-sector businesses in these districts.

179. **Finding:** The verb "foster", which is defined in the 2035 Comprehensive Plan, means to encourage or guide the incremental development of something over a long period of time. The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to maintain

Portland's industrial districts over time. These regulations are consistent with Policy 6.37 (Industrial Sanctuaries) in that the City does not expect the industrial character and development pattern in these districts to transition over time. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located.

Policy 6.25. Import substitution. Encourage local goods production and service delivery that substitute for imports and help keep the money Portlanders earn in the local economy.

180. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the intent to maintain Portland's industrial districts over time, which provides a land supply for import substitution businesses. Specifically, these changes exceptions for renewable fuels that can be substitutes for fossil fuels. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area that can support service delivery.

Policy 6.26. Business opportunities in urban innovation. Strive to have Portland's built environment, businesses, and infrastructure systems showcase examples of best practices of innovation and sustainability.

181. **Finding:** These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. This policy does not apply.

Equitable household prosperity

Policy 6.27. Income self-sufficiency. Expand access to self-sufficient wage levels and career ladders for low-income people by maintaining an adequate and viable supply of employment land and public facilities to support and expand opportunities in Portland for middle- and high-wage jobs that do not require a 4-year college degree.

6.27.a. Support the role of industrial districts as a leading source of middle-wage jobs that do not require a 4-year college degree and as a major source of wage-disparity reduction for under-served and under-represented communities.

6.27.b. Evaluate and limit negative impacts of plans and investments on middle and high wage job creation and retention.

182. **Finding:** The City Council finds income self-sufficiency is dependent on access to job opportunities across a wide range of wage scales, especially middle wage jobs such as those found in Portland's industrial districts. The FFTZ amendments apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not change the land capacity in Portland's industrial districts and continue to support continued employment growth in those districts.

The regulations are narrowly crafted to support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels.

Policy 6.28. East Portland job growth. Encourage investment in, and alignment of, poverty-reduction efforts that address economic development, land use, transportation, housing, social services, public health, community development, and workforce development.

183. Finding: There are no FFTs in East Portland. The FFTZ amendments apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not change the land capacity in Portland's industrial districts and continue to support continued employment growth in those districts.

Policy 6.29. Poverty reduction. Encourage investment in, and alignment of, poverty-reduction efforts that address economic development, land use, transportation, housing, social services, public health, community development, and workforce development.

Policy 6.30. Disparity reduction. Encourage investment in, and alignment of, public efforts to reduce racial, ethnic, and disability-related disparities in income and employment opportunity.

184. Finding: For policies 6.29 and 6.30, the City Council finds that access to job opportunities across a wide range of wage scales, especially middle wage jobs such as those found in Portland's industrial districts is a key element of poverty and disparity reduction efforts. The FFTZ amendments apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not change the land capacity in Portland's industrial districts and continue to support continued employment growth in those districts.

Policy 6.31. Minority-owned, woman-owned and emerging small business (MWESB) assistance. Ensure that plans and investments improve access to contracting opportunities for minority-owned, woman-owned, and emerging small businesses.

185. Finding: The City Council interprets this policy to focused on supporting minority-owned, woman-owned, and emerging small businesses through City programs and contracting procedures, and not the Zoning Code. This policy does not apply.

Policy 6.32. Urban renewal plans. Encourage urban renewal plans to primarily benefit existing residents and businesses within the urban renewal area through:

1. Revitalization of neighborhoods.
2. Expansion of housing choices.
3. Creation of business and job opportunities.
4. Provision of transportation linkages.
5. Protection of residents and businesses from the threats posed by gentrification and displacement.
6. The creation and enhancement of those features which improve the quality of life within the urban renewal area.

186. Finding: The City Council interprets this policy to focused on urban renewal plans and not the Zoning Code. There are three urban renewal areas (Central Eastside, Willamette Industrial and Airport Way) that have industrial zoning that is amended by this ordinance. None of the existing

FFTs are in the URAs. The FFTZ amendments do not include changes to any urban renewal plans. This policy does not apply.

Central City

Policy 6.33. Central City. Improve the Central City's regional share of employment and continue its growth as the unique center of both the city and the region for innovation and exchange through commerce, employment, arts, culture, entertainment, tourism, education, and government.

Policy 6.34. Central City industrial districts. Protect and facilitate the long-term success of Central City industrial districts, while supporting their evolution into places with a broad mix of businesses with high employment densities.

Policy 6.35. Innovation districts. Provide for expanding campus institutions in the Central City and Marquam Hill, and encourage business development that builds on their research and development strengths.

187. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in the Central City. These policies do not apply.

Industrial and employment districts

Policy 6.36. Industrial land. Provide industrial land that encourages industrial business retention, growth, and traded sector competitiveness as a West Coast trade and freight hub, a regional center of diverse manufacturing, and a widely-accessible base of family-wage jobs, particularly for under-served and under-represented people.

188. Finding: The verb "provide", which is defined in the 2035 Comprehensive Plan, means to supply, offer, or make available. The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not reduce the industrial land designated in Portland. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions.

Policy 6.37. Industrial sanctuaries. Protect industrial land as industrial sanctuaries identified on the Comprehensive Plan Map primarily for manufacturing and distribution uses and to encourage the growth of industrial activities in the city.

189. Finding: The verb "protect", which is defined in the 2035 Comprehensive Plan, means to defend or guard against loss, injury, or destruction. The City Council interprets this policy to apply to the city as whole and does not require the City to allow for the unlimited expansion of individual businesses or sectors of business. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will maintain Portland's industrial sanctuaries. These regulations are consistent with this policy in that the City does not expect the industrial character and development pattern in these districts to transition over time. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels, to the storage capacity restrictions. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain

and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located.

Policy 6.38. Prime industrial land retention. Protect the multimodal freight-hub industrial districts at the Portland Harbor, Columbia Corridor, and Brooklyn Yard as prime industrial land that is prioritized for long-term retention.

6.38.a. Protect prime industrial lands from quasi-judicial Comprehensive Plan Map amendments that convert prime industrial land to non-industrial uses, and consider the potential for other map amendments to otherwise diminish the economic competitiveness or viability of prime industrial land.

6.38.b. Limit conversion of prime industrial land through land use plans, regulations, or public land acquisition for non-industrial uses, especially land that can be used by river-dependent and river-related industrial uses.

6.38.c. Limit regulatory impacts on the capacity, affordability, and viability of industrial uses in the prime industrial area while ensuring environmental resources are also protected.

6.38.d. Strive to offset the reduction of development capacity as needed, with additional prime industrial capacity that includes consideration of comparable site characteristics. Offsets may include but are not limited to additional brownfield remediation, industrial use intensification, strategic investments, and other innovative tools and partnerships that increase industrial utilization of industrial land.

6.38.e. Protect prime industrial land for siting of parks, schools, large-format places of assembly, and large-format retail sales.

6.38.f. Promote efficient use of freight hub infrastructure and prime industrial land by limiting non-industrial uses that do not need to be in the prime industrial area.

190. Finding: The City Council finds that this policy is implemented through the Prime Industrial Overlay Zone. The FFTZ amendments do not include changes to the overlay zone or to the Zoning Map where it is applied.

Policy 6.39. **Harbor access lands**. Limit use of harbor access lands to river- or rail-dependent or related industrial land uses due to the unique and necessary infrastructure and site characteristics of harbor access lands for river-dependent industrial uses.

191. Finding: The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will maintain Portland's harbor access lands for river- or rail-dependent or related industrial uses.

Policy 6.40. **Portland Harbor Superfund Site**. Take a leadership role to facilitate a cleanup of the Portland Harbor that moves forward as quickly as possible and that allocates cleanup costs fairly and equitably. Encourage a science-based and cost-effective cleanup solution that facilitates re-use of land for river- or rail-dependent or related industrial uses.

192. Finding: The City Council interprets this policy to mean that the City will take a lead role to facilitate cleanup of the Portland Harbor. The FFTZ amendments are Zoning Code changes that are not directly related to the cleanup of Portland Harbor. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will maintain Portland's industrial sanctuaries for river- or rail-dependent or related industrial uses. However, the

changes designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities, including brownfield remediation related to the Portland Harbor cleanup efforts.

Policy 6.41. Multimodal freight corridors. Encourage freight-oriented industrial development to locate where it can maximize the use of and support reinvestment in multimodal freight corridors.

193. Finding: The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. The City Council interprets this policy to apply to districts as whole and not to individual businesses or sectors of business. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes continue to support freight-oriented industrial development. These regulations apply to only one type of business that makes up a small part of the businesses found in Portland's industrial districts. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located.

Policy 6.42. Columbia East. Provide a mix of industrial and limited business park development in Columbia East (east of 82nd Avenue) that expand employment opportunities supported by proximity to Portland International Airport and multimodal freight access.

194. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. None of the existing FFTs are located in these dispersed employment areas.

Policy 6.43. Dispersed employment areas. Provide small, dispersed employment areas for a flexible and affordable mix of office, creative services, small-scale manufacturing, traded sector and distribution, and other small-format light industrial and commercial uses with access to nearby freeways or truck streets.

195. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. None of the existing FFTs are located in these dispersed employment areas.

Policy 6.44. Industrial land use intensification. Encourage reinvestment in, and intensification of, industrial land use, as measured by output and throughput per acre.

196. Finding: The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. The City Council interprets this policy to apply to industrial districts as whole and not to individual businesses or sectors of business. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes are consistent with the intent to maintain Portland's industrial districts over time. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations (33.140.100.B.17.a) provide flexibility to

FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs.

The City's Enterprise Zone program, which provides a property tax exemption to industrial firms, is one of the key incentives that the City of Portland offers to encourage businesses to invest in their facilities, including private multi-modal transportation systems such as docks, pipelines and transloading facilities. These changes do not affect that program, and FFTs that make new capital investments remain eligible for that program.

Policy 6.45. **Industrial brownfield redevelopment**. Provide incentives, investments, technical assistance and other direct support to overcome financial-feasibility gaps to enable remediation and redevelopment of brownfields for industrial growth.

197. **Finding:** The City Council interprets this policy to mean that the City will create programs to support brownfield cleanup in industrial areas. The FFTZ amendments are Zoning Code changes that are not directly related to the cleanup of brownfields. However, the changes designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities, including brownfield remediation.

Policy 6.46. Impact analysis. Evaluate and monitor the impacts on industrial land capacity that may result from land use plans, regulations, public land acquisition, public facility development, and other public actions to protect and preserve existing industrial lands.

198. **Finding:** The City Council interprets this policy to provide direction to the city to evaluate and monitor industrial land capacity and development trends that result from plan and zoning changes. The ordinance includes a directive for BPS to monitor the effectiveness of this regulation and report back to City Council in two years.

Policy 6.47. Clean, safe, and green. Encourage improvements to the cleanliness, safety, and ecological performance of industrial development and freight corridors by facilitating adoption of market feasible new technology and design.

199. **Finding**: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. These changes designate existing FFTs as a limited use that allows the terminals to continue to operate and invest in upgrades that can improve the cleanliness, safety, and ecological performance of FFTs.

Policy 6.48. Fossil fuel distribution. Limit fossil fuels distribution and storage facilities to those necessary to serve the regional market.

200. **Finding:** The 2035 Comprehensive Plan defines "limit" as to minimize or reduce relative to the current situation or to a potential future situation. The City Council interprets the phrase "regional market" to mean the state of Oregon and Southwest Washington in recognition that Portland's fossil fuel terminals currently handle 90% of the fossil fuels consumed in Oregon and Southwest Washington. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations (33.140.100.B.17.a) provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs. In addition, limiting storage capacity to the existing facilities, with some exceptions, reduces risk from a major earthquake, which outweighs the policy direction to provide capacity to accommodate any potential future

increase in fossil fuel consumption, in part, because continuing to locate all of the fossil fuel storage capacity in a high risk area in Portland is counter to the 2013 Oregon Resilience Plan that recommends the diversification of locations for the storage of liquid fuels and identification of new liquid fuel energy corridors.

Policy 6.49. Industrial growth and watershed health. Facilitate concurrent strategies to protect and improve industrial capacity and watershed health in the Portland Harbor and Columbia Corridor areas.

201. Finding: The verb "improve", which is defined in the 2035 Comprehensive Plan, means to make the current situation better; increase; enhance. The City Council interprets this policy to mean that the first step in making the current situation better is to ensure that the situation does not get worse. Continuing to allow the increase in FFTs in a high risk area increases the risk to watershed health. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will be an improvement compared to the current regulations that allow for unlimited growth in FFTs. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's industrial capacity. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under current regulations. The FFTZ regulations designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Allowing the FFTs to continue to operate and invest in upgrades will help support a strong local economy by providing for a continuing supply of fossil fuels to support a strong local economy.

Policy 6.50. **District expansion**. Provide opportunities for expansion of industrial areas based on evaluation of forecasted need and the ability to meet environmental, social, economic, and other goals.

202. Finding: The City Council interprets this policy to apply to Comprehensive Plan Map and Zoning Map amendments. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's industrial capacity. This policy does not apply.

Policy 6.51. Golf course reuse and redevelopment. Facilitate a mix of industrial, natural resource, and public open space uses on privately-owned golf course sites in the Columbia Corridor that property owners make available for reuse.

203. Finding: The City Council interprets this policy to apply to Comprehensive Plan Map and Zoning Map amendments. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's industrial capacity. This policy does not apply.

Policy 6.52. Residential and commercial reuse. Facilitate compatible industrial or employment redevelopment on residential or commercial sites that become available for reuse if the site is in or near prime industrial areas, and near a freeway or on a freight street.

204. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. This policy does not apply.

Policy 6.53. Mitigation banks. Facilitate industrial site development by promoting and allowing environmental mitigation banks that serve industrial land uses on prime industrial land.

205. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. This policy does not apply.

Policy 6.54. **Neighborhood buffers**. Maintain and enhance major natural areas, open spaces, and constructed features as boundaries and buffers for the Portland Harbor and Columbia Corridor industrial areas.

206. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. This policy does not apply.

Policy 6.55. Neighborhood park use. Allow neighborhood park development within industrial zones where needed to provide adequate park service within one-half mile of every resident.

207. Finding: This policy addresses park development in industrial zones. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones. This policy does not apply.

Campus institutions

Policy 6.56. Campus institutions. Provide for the stability and growth of Portland's major campus institutions as essential service providers, centers of innovation, workforce development resources, and major employers.

Policy 6.57. Campus land use. Provide for major campus institutions as a type of employment land, allowing uses typically associated with health care and higher education institutions. Coordinate with institutions in changing campus zoning to provide land supply that is practical for development and intended uses.

Policy 6.58. Development impacts. Protect the livability of surrounding neighborhoods through adequate infrastructure and campus development standards that foster suitable density and attractive campus design. Minimize off-site impacts in collaboration with institutions and neighbors, especially to reduce automobile traffic and parking impacts.

Policy 6.59. Community amenities and services. Encourage campus development that provides amenities and services to surrounding neighborhoods, emphasizing the role of campuses as centers of community activity.

Policy 6.60. **Campus edges**. Provide for context-sensitive, transitional uses, and development at the edges of campus institutions to enhance their integration into surrounding neighborhoods, including mixed-use and neighborhood-serving commercial uses where appropriate.

Policy 6.61. Satellite facilities. Encourage opportunities for expansion of uses, not integral to campus functions, to locate in centers and corridors to support their economic vitality.

208. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located on campus institutions. These policies do not apply.

Neighborhood business districts

Policy 6.62. Neighborhood business districts. Provide for the growth, economic equity, and vitality of neighborhood business districts.

Policy 6.63. District function. Enhance the function of neighborhood business districts as a foundation of neighborhood livability.

Policy 6.64. Small, independent businesses. Facilitate the retention and growth of small and locally-owned businesses.

Policy 6.65. Home-based businesses. Encourage and expand allowances for small, low-impact home based businesses in residential areas, including office or personal service uses with infrequent or by-appointment customer or client visits to the site. Allow a limited number of employees, within the scale of activity typical in residential areas. Allow home-based businesses on sites with accessory dwelling units.

Policy 6.66. Neighborhood-serving business. Provide for neighborhood business districts and small commercial nodes in areas between centers to expand local access to goods and services. Allow nodes of small-scale neighborhood-serving commercial uses in large planned developments and as a ground floor use in high density residential areas.

Policy 6.67. Retail development. Provide for a competitive supply of retail sites that support the wide range of consumer needs for convenience, affordability, accessibility, and diversity of goods and services, especially in under-served areas of Portland.

Policy 6.68. Investment priority. Prioritize commercial revitalization investments in neighborhoods that serve communities with limited access to goods
and services.

Policy 6.69. Non-conforming neighborhood business uses. Limit non-conforming uses to reduce adverse impacts on nearby residential uses while avoiding displacement of existing neighborhood businesses.

Policy 6.70. Involuntary commercial displacement. Evaluate plans and investments for their impact on existing businesses.

6.70.a. Limit involuntary commercial displacement in areas at risk of gentrification, and incorporate tools to reduce the cost burden of rapid neighborhood change on small business owners vulnerable to displacement.

6.70.b. Encourage the preservation and creation of affordable neighborhood commercial space to support a broad range of small business owners.

Policy 6.71. Temporary and informal markets and structures. Acknowledge and support the role that temporary markets (farmer's markets, craft markets, flea markets, etc.) and other temporary or mobile-vending structures play in enabling startup business activity. Also, acknowledge that temporary uses may ultimately be replaced by more permanent development and uses.

Policy 6.72 Community economic development. Encourage collaborative approaches to align land use and neighborhood economic development for residents and business owners to better connect and compete in the regional economy.

Policy 6.73. Centers. Encourage concentrations of commercial services and employment opportunities in centers.

6.73.a. Encourage a broad range of neighborhood commercial services in centers to help residents and others in the area meet daily needs and/or serve as neighborhood gathering places.

6.73.b. Encourage the retention and further development of grocery stores and local markets as essential elements of centers.

6.73.c. Enhance opportunities for services and activities in centers that are responsive to the needs of the populations and cultural groups of the surrounding area.

6.73.d. Require ground-level building spaces in core areas of centers accommodate commercial or other street-activating uses and services.

6.73.e. Encourage employment opportunities as a key function of centers, including connections between centers, institutions, and other major employers to reinforce their roles as vibrant centers of activity.

209. Finding: The FFTZ amendments change allowed uses in the City's industrial areas. There are no FFTs located in neighborhood business districts. These policies do not apply.

Chapter 7: Environmental and Watershed Health

Goal 7.A: Climate. Carbon emissions are reduced to 50 percent below 1990 levels by 2035.

210. Finding: The FFTZ amendments will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. The FFTZ amendments help provide a transition to a reliable, low-carbon energy infrastructure by designating existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities to increase safety and reliability. In addition, the definition of fossil fuels explicitly does not include ethanol, biodiesel/renewable diesel other fuel additives that will allows FTTs to add storage capacity to provide reliable low-carbon fuels to help meet the carbon emissions reduction goals.

Goal 7.B: Healthy watersheds and environment. Ecosystem services and ecosystem functions are maintained and watershed conditions have improved over time, supporting public health and safety, environmental quality, fish and wildlife, cultural values, economic prosperity, and the intrinsic value of nature.

211. Finding: The FFTZ amendments foster a healthy environment and sustain the ecosystem services of Portland's air, water and land by reducing the risk associated with a major earthquake. The first step in making the current situation better is to ensure that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a high risk area. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which can minimize environmental impacts in the event of a major earthquake. No changes to the environmental or greenway overlay zones are proposed as part of this project, therefore the natural resource values and functions will be sustained.

Goal 7.C: Resilience. Portland's built and natural environments function in complementary ways and are resilient in the face of climate change and natural hazards.

212. **Finding:** The 2035 Comprehensive Plan defines "resilience" as the capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment. Portland's FFTs are within a disaster-prone area that is at risk for a catastrophic Cascadia earthquake disaster. Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake.

According to the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report, a magnitude 8 or 9 Cascadia Subduction Zone earthquake would impact the CEI Hub with: ground shaking; liquefaction (soil behavior phenomenon in which a saturated sand softens and loses strength during strong earthquake ground shaking); lateral spreading (where surficial soil permanently moves laterally due to earthquake shaking); landslides; co-seismic settlement (where the ground surface is permanently lowered due to seismic shaking); and bearing capacity failures (when the foundation soil cannot support the structure it is intended to support).

According to the 2012 DOGAMI report, liquefaction and lateral spreading hazards are of primary concern to the fossil fuel terminals. The CEI Hub is adjacent to the Willamette River and has extensive deposits of highly liquefiable soils. These soils (made of sands, silts, gravels and clays) have been naturally deposited by river activity as well as been created from man-made activities, such as hydraulically placed material from river dredging or debris placed as landfill.

The FFTs have significant seismic risks because most of the tanks have been constructed without any or only limited seismic design criteria on soils with high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. The City Council interprets this goal to mean that the first step in making Portland more resilient is to stop increasing the risk. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

Goal 7.D: Environmental equity. All Portlanders have access to clean air and water, can experience nature in their daily lives, and benefit from development designed to lessen the impacts of natural hazards and environmental contamination.

213. **Finding:** The City Council interprets this goal to mean that the first step in lessening the impacts of natural hazards and environmental contamination is to stop increasing the risk. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding neighborhoods and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake.

Goal 7.E: Community stewardship. Portlanders actively participate in efforts to maintain and improve the environment, including watershed health.

214. Finding: The City Council interprets this goal to mean that the City should have programs focused on community involvement in improving the environment. The FFTZ amendments change the Zoning Code and do not include other changes to stewardship programs. This goal does not apply.

Improving environmental quality and resilience

Policy 7.1. Environmental quality. Protect or support efforts to protect air, water, and soil quality, and associated benefits to public and ecological health and safety, through plans and investments.

Policy 7.2. Environmental equity. Prevent or reduce adverse environment-related disparities affecting under-served and under-represented communities through plans and investments. This includes addressing disparities relating to air and water quality, natural hazards, contamination, climate change, and access to nature.

215. Finding: The City Council interprets this goal to mean that the first step in lessening the impacts of natural hazards and environmental contamination is to stop increasing the risk. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding neighborhoods and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake.

Policy 7.3. Ecosystem services. Consider the benefits provided by healthy ecosystems that contribute to the livability and economic health of the city.

216. Finding: The FFTZ amendments foster a healthy environment and sustain the ecosystem services of Portland's air, water and land by reducing the risk associated with a major earthquake. The first step in making the current situation better is to ensure that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a high risk area. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which can minimize environmental impacts in the event of a major earthquake. No changes to the environmental or greenway overlay zones are proposed as part of this project, therefore the natural resource values and functions will be sustained.

Policy 7.4. Climate change. Update and implement strategies to reduce carbon emissions and impacts and increase resilience through plans and investments and public education.

7.4.a. Carbon sequestration. Enhance the capacity of Portland's urban forest, soils, wetlands, and other water bodies to serve as carbon reserves.

7.4.b. Climate adaptation and resilience. Enhance the ability of rivers, streams, wetlands, floodplains, urban forest, habitats, and wildlife to limit and adapt to climate-exacerbated flooding, landslides, wildfire, and urban heat island effects.

217. **Finding:** The FFTZ amendments help reduce carbon emissions by providing for a transition to a reliable, low-carbon energy infrastructure by designating existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities to increase safety and reliability. In addition, the definition of fossil fuels explicitly does not include ethanol, biodiesel/renewable diesel other fuel additives that will allows FTTs to add storage capacity to provide reliable low-carbon fuels to help meet the carbon emissions reduction goals.

The 2035 Comprehensive Plan defines "resilience" as the capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment. Portland's FFTs are within a disaster-prone area that is at risk for a catastrophic Cascadia earthquake disaster. The FFTs have significant seismic risks because most of the tanks have been constructed without any or only limited seismic design criteria on soils with high levels of liquefaction susceptibility. The City Council interprets this policy to mean that the first step in making Portland more resilient is to stop increasing the risk. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding to the Willamette River and associated floodplains. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. Further, by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

Policy 7.5. Air quality. Improve, or support efforts to improve, air quality through plans and investments, including reducing exposure to air toxics, criteria pollutants, and urban heat island effects. Consider the impacts of air quality on the health of all Portlanders.

Policy 7.6. Hydrology. Through plans and investments, improve or support efforts to improve watershed hydrology to achieve more natural flow and enhance conveyance and storage capacity in rivers, streams, floodplains, wetlands, and aquifers. Minimize impacts from development and associated impervious surfaces, especially in areas with poorly-infiltrating soils and limited public stormwater discharge points, and encourage restoration of degraded hydrologic functions.

Policy 7.7. Water quality. Improve, or support efforts to improve, water quality in rivers, streams, floodplains, groundwater, and wetlands through land use plans and investments, to address water quality issues including toxics, bacteria, temperature, metals, and sediment pollution. Consider the impacts of water quality on the health of all Portlanders.

Policy 7.8. Biodiversity. Strive to achieve and maintain self-sustaining populations of native species, including native plants, native resident and migratory fish and wildlife species, at-risk species, and beneficial insects (such as pollinators) through plans and investments.

Policy 7.9. Habitat and biological communities. Ensure that plans and investments are consistent with and advance efforts to improve, or support efforts to improve fish and wildlife habitat and biological communities. Use plans and investments to enhance the diversity, quantity, and quality of habitats habitat corridors, and especially habitats that:

- Are rare or declining.
- Support at-risk plant and animal species and communities.
- Support recovery of species under the Endangered Species Act, and prevent new listings.
- Provide culturally important food sources, including those associated with Native American fishing rights.

Policy 7.10. Habitat connectivity. Improve or support efforts to improve terrestrial and aquatic habitat connectivity for fish and wildlife by using plans and investments, to:

- Prevent and repair habitat fragmentation.
- Improve habitat quality.
- Weave habitat into sites as new development occurs.
- Enhance or create habitat corridors that allow fish and wildlife to safely access and move through and between habitat areas.
- Promote restoration and protection of floodplains.

Policy 7.11. Urban forest. Improve, or support efforts to improve the quantity, quality, and equitable distribution of Portland's urban forest through plans and investments.

7.11.a. Tree preservation. Require or encourage preservation of large healthy trees, native trees and vegetation, tree groves, and forested areas.

7.11.b. Urban forest diversity. Coordinate plans and investments with efforts to improve tree species diversity and age diversity.

7.11.c. Tree canopy. Support progress toward meeting City tree canopy targets.

7.11.d. Tree planting. Invest in tree planting and maintenance, especially in low-canopy areas, neighborhoods with under-served or under-represented communities, and within and near urban habitat corridors.

7.11.e. Vegetation in natural resource areas. Require native trees and vegetation in significant natural resource areas.

7.11.f. Resilient urban forest. Encourage planting of Pacific Northwest hardy and climate change resilient native trees and vegetation generally, and especially in urban habitat corridors.

7.11.g. Trees in land use planning. Identify priority areas for tree preservation and planting in land use plans.

7.11.h. Managing wildfire risk. Address wildfire hazard risks and management priorities through plans and investments.

Policy 7.12. Invasive species. Prevent the spread of invasive plants, and support efforts to reduce the impacts of invasive plants, animals, and insects, through plans, investments, and education.

Policy 7.13. Soils. Coordinate plans and investments with programs that address human-induced soil loss, erosion, contamination, or other impairments to soil quality and function.

218. Finding: The City Council interprets policies 7.5 through 7.13 as providing guidance to foster a healthy environment and sustain the ecosystem services of Portland's air, water and land resources. The FFTZ amendments support these policies by reducing the risk associated with a major earthquake. The first step in making the current situation better is to ensure that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a high risk area. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will be an improvement compared to the current regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that

reduce the risks and improve their ability to withstand a major earthquake, which can minimize environmental impacts in the event of a major earthquake. No changes to the environmental or greenway overlay zones are proposed as part of this project, therefore the natural resource values and functions will be sustained.

Policy 7.14. Natural hazards. Prevent development-related degradation of natural systems and associated increases in landslide, wildfire, flooding, and earthquake risks.

219. Finding: The 2035 Comprehensive Plan defines "prevent" as proactively avoid or hinder adverse impacts or outcomes. Development-related degradation means development that has adverse impacts on natural systems. For example, development in a floodplain that increases impervious surface can result in increased run-off that increases flooding. Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. The first step in making the current situation better is to ensure that the situation does not get worse. Continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a high risk area increases the risk to the Willamette River. The City Council interprets this policy to mean development regulations should not increase the risk from natural hazards. The current regulations that allow unlimited expansion of storage tank capacity increase the risk from natural hazards. The FFTZ amendments proactively limit future earthquake risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs.

Policy 7.15. Brownfield remediation. Improve environmental quality and watershed health by promoting and facilitating brownfield remediation and redevelopment that incorporates ecological site design and resource enhancement.

220. Finding: The City Council interprets this policy to mean that the City will create programs to support brownfield cleanup. The FFTZ amendments are Zoning Code changes that are not directly related to the cleanup of brownfields. However, the changes designate existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities, including brownfield remediation.

Policy 7.16. Adaptive management. Evaluate trends in watershed and environmental health using current monitoring data and information to guide and support improvements in the effectiveness of City plans and investments.

Policy 7.17. Restoration partnerships. Coordinate plans and investments with other jurisdictions, air and water quality regulators, watershed councils, soil and water conservation districts, Sovereign nations, and community organizations and groups including under-served and under-represented communities, to optimize the benefits, distribution, and cost-effectiveness of watershed restoration and enhancement efforts.

Policy 7.18. Community stewardship. Encourage voluntary cooperation between property owners, community organizations, and public agencies to restore or re-create habitat on their property, including removing invasive plants and planting native species.

221. **Finding:** The City Council interprets policies 7.16. through 7.18 to mean that the City will create programs to support restoration and community stewardship. The FFTZ amendments are Zoning Code changes that are not directly related to watershed restoration. These policies do not apply.

Planning for natural resource protection

Policy 7.19. Natural resource protection. Protect the quantity, quality, and function of significant natural resources identified in the City's natural resource inventory, including:

- Rivers, streams, sloughs, and drainageways.
- Floodplains.
- Riparian corridors.
- Wetlands.
- Groundwater.
- Native and other beneficial vegetation species and communities.
- Aquatic and terrestrial habitats, including special habitats or habitats of concern, large anchor habitats, habitat complexes and corridors, rare and declining habitats such as wetlands, native oak, bottomland hardwood forest, grassland habitat, shallow water habitat, and habitats that support special-status or at-risk plant and wildlife species.
- Other resources identified in natural resource inventories.

Policy 7.20. Natural resource inventory. Maintain an up-to-date inventory by identifying the location and evaluating the relative quantity and quality of natural resources.

Policy 7.21. Environmental plans and regulations. Maintain up-to-date environmental protection plans and regulations that specify the significant natural resources to be protected and the types of protections to be applied, based on the best data and science available and on an evaluation of cumulative environmental, social, and economic impacts and tradeoffs. *See Figure 7-2 — Adopted Environmental Plans.*

7.21.a. Improve the effectiveness of environmental protection plans and regulations to protect and encourage enhancement of ecological functions and ecosystem services.

Policy 7.22. Land acquisition priorities and coordination. Maintain a land acquisition program as a tool to protect and support natural resources and their functions. Coordinate land acquisition with the programs of City bureaus and other agencies and organizations.

222. **Finding:** The City Council interprets policies 7.19 through 7.22 as providing guidance to the City as to how to protect significant natural resources. The *2035 Comprehensive Plan* background documents included an updated Natural Resources Inventory (NRI), which was adopted (Ordinance 185657) and acknowledged by LCDC on June 13, 2014. The NRI identified the location, quantity, and quality of all significant natural resources as required by the inventory provisions of Statewide Planning Goal 5. From the set of all significant resources, high and medium quality resources, ranked primarily from riparian corridor and wildlife habitat considerations, were identified to comply with the inventory requirements of Title 13 of Metro's Urban Growth Management Functional Plan.

Environmental zones protect resources and functional values that have been identified by the City as providing benefits to the public. The FFTZ amendments are a regulatory approach that will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will be an improvement compared to the current

regulations that allow for unlimited growth in fossil fuel terminals. Further, by designating existing FFTs as a limited use allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which can minimize environmental impacts in the event of a major earthquake. No changes to the environmental or greenway overlay zones are proposed as part of this project, therefore the natural resource values and functions will continue to be protected.

Protecting natural resources in development situations

Policy 7.23. Impact evaluation. Evaluate the potential adverse impacts of proposed development on significant natural resources, their functions, and the ecosystem services they provide to inform and guide development design and mitigation consistent with policies 7.24-7.26. and other relevant Comprehensive Plan policies.

Policy 7.24. Regulatory hierarchy: avoid, minimize, mitigate. Maintain regulations requiring that the potential adverse impacts of new development on significant natural resources and their functions first be avoided where practicable, then minimized, then lastly, mitigated.

Policy 7.25. Mitigation effectiveness. Require that mitigation approaches compensate fully for adverse impacts on locally and regionally significant natural resources and functions. Require mitigation to be located as close to the impact as possible. Mitigation must also take place within the same watershed or portion of the watershed that is within the Portland Urban Services Boundary, unless mitigating outside of these areas will provide a greater local ecological benefit. Mitigation will be subject to the following preference hierarchy:

- On the site of the resource subject to impact with the same kind of resource; if that is not possible, then
- Off-site with the same kind of resource; if that is not possible, then
- On-site with a different kind of resource; if that is not possible, then
- Off-site with a different kind of resource.

Policy 7.26. Improving environmental conditions through development. Encourage ecological site design, site enhancement, or other tools to improve ecological functions and ecosystem services in conjunction with new development and alterations to existing development.

223. The City Council interprets policies 7.23 through 7.26 as providing guidance to the City as to how to protect significant natural resources. The City's environmental and greenway overlay zones are the regulations that control development in order to protect the resources and functional values while allowing environmentally sensitive urban development. No changes to the environmental or greenway overlay zones are proposed as part of this project, therefore the natural resource values and functions will continue to be protected.

Aggregate resources

Policy 7.27. **Aggregate resource protection.** Protect aggregate resource sites for current and future use where there are no major conflicts with urban needs, or where these conflicts may be resolved**.**

Policy 7.28. **Aggregate resource development**. When aggregate resources are developed, ensure that development minimizes adverse environmental impacts and impacts on adjacent land uses.

Policy 7.29. Mining site reclamation. Ensure that the reclamation of mining sites protects public health and safety, protects fish and wildlife (including at-risk species), enhances or restores habitat

(including rare and declining habitat types), restores adequate watershed conditions and functions on the site, and is compatible with the surrounding land uses and conditions of nearby land.

224. Finding: Policies 7.27 through 7.29 provide guidance on aggregate resources. The FFTZ amendments are Zoning Code changes that affect one allowed use in the employment and industrial zones and are not directly related to aggregate. These policies do not apply.

Watershed-specific policies

The policies above guide planning, actions, and investments citywide. The following policies are intended to augment the citywide Watershed Health and Environment policies by providing additional guidance relating and responding to the characteristics within each of Portland's distinctive watersheds. They address watershed-specific habitat types, hydrology, water quality issues, and stormwater management challenges. Together, the citywide and watershed-specific policies support the close coordination of watershed health and land use programs, guiding land use planning-related activities and future infrastructure investments. While these watersheds are not entirely within Portland's urban services boundary, Portland's actions can have significant benefits for the watershed as a whole.

Columbia River Watershed

Policy 7.30. In-water habitat. Enhance in-water habitat for native fish and wildlife, particularly in the Oregon Slough and near-shore environments along the Columbia River.

Policy 7.31. Sensitive habitats. Enhance grassland, beach, riverbanks, wetlands, bottomland forests, shallow water habitats, and other key habitats for wildlife traveling along the Columbia River migratory corridor, while continuing to manage the levees and floodplain for flood control.

Policy 7.32. **River-dependent and river-related uses.** Maintain plans and regulations that recognize the needs of river-dependent and river-related uses while also supporting ecologically-sensitive site design and practices.

225. Finding: None of the existing FFTs have frontage on the Columbia River. The Columbia River plays a major role in the habitat corridors that weave nature into Portland, with designated natural resources that are protected by the Environmental Overlay Zone, which is not amended by this ordinance. In considering the natural hazard risks that the FFTs pose to the ecosystem functions on the river, as identified by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016), the City Council finds that continuing to allow FFTs in a high risk area does not enhance the current or future natural resource functions of the Columbia River. These regulations apply to only one type of allowed that makes up a minority part of the uses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations, including other river-dependent and river-related uses.

Willamette River Watershed

Policy 7.33. Fish habitat. Provide adequate intervals of ecologically-functional shallow-water habitat for native fish along the entire length of the Willamette River within the city, and at the confluences of its tributaries.

Policy 7.34. Stream connectivity. Improve stream connectivity between the Willamette River and its tributaries.

Policy 7.35. River bank conditions. Preserve existing river bank habitat and encourage the rehabilitation of river bank sections that have been significantly altered due to development with more fish and wildlife friendly riverbank conditions.

Policy 7.37. Contaminated sites. Promote and support programs that facilitate the cleanup, reuse, and restoration of the Portland Harbor Superfund site and other contaminated upland sites.

Policy 7.38. Sensitive habitats. Protect and enhance grasslands, beaches, floodplains, wetlands, remnant native oak, bottomland hardwood forest, and other key habitats for native wildlife including shorebirds, waterfowl, and species that migrate along the Pacific Flyway and the Willamette River corridor.

Policy 7.39. Riparian corridors. Increase the width and quality of vegetated Riparian buffers along the Willamette River.

Policy 7.40. Connected upland and river habitats. Enhance habitat quality and connectivity between the Willamette riverfront, the Willamette's floodplain, and upland natural resource areas.

Policy 7.41. River-dependent and river-related uses. Develop and maintain plans and regulations that recognize the needs of river-dependent and river-related uses, while also supporting ecologically-sensitive site design and practices.

226. Finding: The eleven existing FFTs have frontage on the Willamette River. The Willamette River plays a major role in the habitat corridors that weave nature into Portland, with designated natural resources that are protected by the Greenway Overlay Zone, which is not amended by this ordinance. In considering the natural hazard risks that the FFTs pose to the ecosystem functions on the river, as identified by the Portland Bureau of Emergency Management's Critical Energy Infrastructure Hub Study (2016), the City Council finds that continuing to allow FFTs in a high risk area does not enhance the current or future natural resource functions of the Willamette River. These regulations apply to only one type of allowed that makes up a minority part of the uses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations, including other river-dependent and river-related uses.

Columbia Slough Watershed

Policy 7.43 **Fish passage.** Restore in-stream habitat and improve fish passage within the Columbia Slough, including for salmonids in the lower slough.

Policy 7.44 **Flow constriction removal.** Reduce constriction, such as culverts, in the slough channels, to improve the flow of water and water quality.

Policy 7.45 **Riparian corridors.** Increase the width, quality, and native plant diversity of vegetated riparian buffers along Columbia Slough channels and other drainageways within the watershed, while also managing the slough for flood control.

Policy 7.46 **Sensitive habitats.** Enhance grasslands and wetland habitats in the Columbia Slough, such as those found in the Smith and Bybee Lakes and at the St. Johns Landfill site, to provide habitat for sensitive species, and for wildlife traveling along the Columbia and Willamette river migratory corridors.

Policy 7.47 **Connected rivers habitats.** Enhance upland habitat connections to the Willamette and Columbia rivers.

Policy 7.48 **Contaminated sites.** Ensure that plans and investments are consistent with and advance programs that facilitate the cleanup, reuse, and restoration of contaminated sites that are adjacent, or that discharge stormwater, to the Columbia Slough.

Policy 7.49 **Portland International Airport.** Protect, restore, and enhance natural resources and functions in the Portland International Airport plan district, as identified in Portland International Airport/Middle Columbia Slough Natural Resources Inventory. Accomplish this through regulations, voluntary strategies, and the implementation of special development standards.

227. Finding: There are no existing FFTs in the Columbia Slough watershed. The Columbia River plays a major role in the habitat corridors that weave nature into Portland, with designated natural resources that are protected by the Environmental Overlay Zone, which is not amended by this ordinance. These regulations apply to only one type of allowed that makes up a minority part of the uses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations, including other river-dependent and river-related uses.

Fanno and Tryon Creek Watersheds

Policy 7.50 **Stream connectivity.** Encourage the daylighting of piped portions of Tryon and Fanno creeks and their tributaries.

Policy 7.51 **Riparian and habitat corridors.** Protect and enhance riparian habitat quality and connectivity along Tryon and Fanno creeks and their tributaries. Enhance connections between riparian areas, parks, anchor habitats, and areas with significant tree canopy. Enhance in-stream and upland habitat connections between Tryon Creek State Natural Area and the Willamette River.

Policy 7.52 **Reduced hazard risks.** Reduce the risks of landslides and streambank erosion by protecting trees and vegetation that absorb stormwater, especially in areas with steep slopes or limited access to stormwater infrastructure.

228. Finding: There are no existing FFTs in the Fanno and Tryon Creek watersheds, which play a major role in the habitat corridors that weave nature into Portland, with designated natural resources that are protected by the Environmental Overlay Zone, which is not amended by this ordinance. These regulations apply to only one type of allowed that makes up a minority part of the uses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations, including other river-dependent and river-related uses.

Johnson Creek Watershed

Policy 7.53 **In-stream and riparian habitat.** Enhance in-stream and riparian habitat and improve fish passage for salmonids along Johnson Creek and its tributaries.

Policy 7.54 **Floodplain restoration.** Enhance Johnson Creek floodplain functions to increase flood-storage capacity, improve water quality, and enhance fish and wildlife habitat.

Policy 7.55 **Connected floodplains, springs, and wetlands.** Enhance hydrologic and habitat connectivity between the Johnson Creek floodplain and its springs and wetlands.

Policy 7.56 **Reduced natural hazards.** Reduce the risks of landslides, streambank erosion and

downstream flooding by protecting seeps, springs, trees, vegetation, and soils that absorb stormwater in the East Buttes.

Policy 7.57 **Greenspace network.** Enhance the network of parks, trails, and natural areas near the Springwater Corridor Trail and the East Buttes to enhance habitat connectivity and nature-based recreation in East Portland.

229. Finding: There are no existing FFTs in the Fanno and Tryon Creek watersheds, which play a major role in the habitat corridors that weave nature into Portland, with designated natural resources that are protected by the Environmental Overlay Zone, which is not amended by this ordinance. These regulations apply to only one type of allowed that makes up a minority part of the uses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations, including other river-dependent and river-related uses.

Chapter 8: Public Facilities and Services

Goal 8.A: Quality public facilities and services. High-quality public facilities and services provide Portlanders with optimal levels of service throughout the city, based on system needs and community goals, and in compliance with regulatory mandates.

Goal 8.B: Multiple benefits. Public facility and service investments improve equitable service provision, support economic prosperity, and enhance human and environmental health.

Goal 8.C: Reliability and resiliency. Public facilities and services are reliable, able to withstand or recover from catastrophic natural and manmade events, and are adaptable and resilient in the face of long-term changes in the climate, economy, and technology.

Goal 8.D: Public rights-of-way. Public rights-of-way enhance the public realm and provide a multi-purpose, connected, safe, and healthy physical space for movement and travel, public and private utilities, and other appropriate public functions and uses.

Goal 8.E: Sanitary and stormwater systems. Wastewater and stormwater are managed, conveyed, and/or treated to protect public health, safety, and the environment, and to meet the needs of the community on an equitable, efficient, and sustainable basis.

Goal 8.F: Flood management. Flood management systems and facilities support watershed health and manage flooding to reduce adverse impacts on Portlanders' health, safety, and property.

Goal 8.G: Water. Reliable and adequate water supply and delivery systems provide sufficient quantities of high-quality water at adequate pressures to meet the needs of the community on an equitable, efficient, and sustainable basis.

Goal 8.H: Parks, natural areas, and recreation. All Portlanders have safe, convenient, and equitable access to high-quality parks, natural areas, trails, and recreational opportunities in their daily lives, which contribute to their health and well-being. The City manages its natural areas and urban forest to protect unique urban habitats and offer Portlanders an opportunity to connect with nature.

Goal 8.I: Public safety and emergency response. Portland is a safe, resilient, and peaceful community where public safety, emergency response, and emergency management facilities and services are coordinated and able to effectively and efficiently meet community needs.

Goal 8.J: Solid waste management. Residents and businesses have access to waste management services and are encouraged to be thoughtful consumers to minimize upstream impacts and avoid

generating waste destined for the landfill. Solid waste — including food, yard debris, recyclables, electronics, and construction and demolition debris — is managed, recycled, and composted to ensure the highest and best use of materials.

Goal 8.K: School facilities. Public schools are honored places of learning as well as multifunctional neighborhood anchors serving Portlanders of all ages, abilities, and cultures.

Goal 8.L: Technology and communications. All Portland residences, businesses, and institutions have access to universal, affordable, and reliable state-of-the-art communication and technology services.

Goal 8.M: Energy infrastructure and services. Residents, businesses, and institutions are served by reliable energy infrastructure that provides efficient, low-carbon, affordable energy through decision-making based on integrated resource planning.

230. Finding: The City Council interprets the Chapter 8 goals to provide general guidance to public agencies in how to provide basic to Portlanders. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the industrial districts where the FFTs are located.

Goal 8.M (energy infrastructure) is the one goal that is applicable to this ordinance. Oregon Administrative Rules (OAR 860-027-0400) define integrated resource plans (IRP) as investor-owned energy utility's written plan detailing its future long-term resource needs, its analysis of the expected costs and associated risks of the alternatives to meet those needs, and its action plan to select the best portfolio of resources to meet those needs. The NW Natural LNG Storage facility is the only FFT in Portland that is part of an investor-owned utility. NW Natural's 2018 IRP identifies the replacement of mechanical process equipment used for the liquefaction, vaporization, or storage of LNG, but not expansion of storage capacity. The FFTZ amendments only regulate fossil fuel storage tank capacity, therefore these changes are consistent with the NW Natural IRP.

As documented in the 2012 DOGAMI report, the current CEI hub infrastructure is not reliable in the event of a magnitude 8 or 9 Cascadia Subduction Zone earthquake. The FFTZ amendments will limit the size of new fossil fuel terminals and prohibit the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions, which will minimize the risk from a future major earthquake compared to the current regulations that allow for unlimited growth in FFTs. The FFTZ amendments help provide a reliable, low-carbon energy infrastructure by designating existing FFTs as a limited use, which allows the terminals to continue to operate and invest in facilities to increase safety and reliability. In addition, the definition of fossil fuels (33.910.030) explicitly does not include ethanol, biodiesel/renewable diesel other fuel additives that will allows FTTs to add storage capacity to provide reliable low-carbon fuels.

Public benefits

Policy 8.31. Application of Guiding Principles. Plan and invest in public facilities in ways that promote and balance the Guiding Principles established in The Vision and Guiding Principles of this Comprehensive Plan.

Policy 8.32. Community benefit agreements. Encourage the use of negotiated community benefit agreements for large public facility projects as appropriate to address environmental justice policies in Chapter 2: Community Involvement.

Policy 8.33. Community knowledge and experience. Encourage public engagement processes and strategies for larger public facility projects to include community members in identifying potential impacts, mitigation measures and community benefits.

Policy 8.34. Resource efficiency. Reduce the energy and resource use, waste, and carbon emissions from facilities necessary to serve designated land uses to meet adopted City goals and targets.

Policy 8.35. Natural systems. Protect, enhance, and restore natural systems and features for their infrastructure service and other values.

Policy 8.36. Context-sensitive infrastructure. Design, improve, and maintain public rights-of-way and facilities in ways that are compatible with, and that minimize negative impacts on, their physical, environmental, and community context.

Policy 8.38. Age-friendly public facilities. Promote public facility designs that make Portland more age-friendly.

231. Finding: The FFTZ amendments do not include new public facility or infrastructure projects. These policies do not apply.

Public rights-of-way

Policy 8.39. Interconnected network. Establish a safe and connected rights-of-way system that equitably provides infrastructure services throughout the city.

Policy 8.40. Transportation function. Improve and maintain the right-of-way to support multimodal transportation mobility and access to goods and services as is consistent with the designated street classification.

Policy 8.42. Stormwater management function. Improve rights-of-way to integrate green infrastructure and other stormwater management facilities to meet desired levels-of-service and economic, social, and environmental objectives.

Policy 8.43. Trees in rights-of-way. Integrate trees into public rights-of-way to support City canopy goals, transportation functions, and economic, social, and environmental objectives.

Policy 8.44. Community uses. Allow community use of rights-of-way for purposes such as public gathering space, events, or temporary festivals, if the community uses are integrated in ways that balance and minimize conflict with the designated through movement and access roles of rights-of-ways.

Policy 8.45. Pedestrian amenities. Encourage facilities that enhance pedestrian enjoyment, such as transit shelters, garbage containers, benches, etc. in the right-of-way.

Policy 8.46. Commercial uses. Accommodate allowable commercial uses of the rights-of-way for enhancing commercial vitality, if the commercial uses can be integrated in ways that balance and minimize conflict with the other functions of the right-of-way.

Policy 8.47. Flexible design. Allow flexibility in right-of-way design and development standards to appropriately reflect the pattern area and other relevant physical, community, and environmental contexts and local needs.

> **8.47.a.** Use a variety of transportation resources in developing and designing projects for all City streets, such as the City of Portland's Pedestrian Design Guide, Bicycle Master Plan-Appendix A, NACTO Urban Bikeway Design Guide, NACTO Urban Street Design Guide, Portland Parks and Recreation Trail Design Guidelines, Designing for Truck Movements and Other Large Vehicles, and City of Portland Green Street Policy, Stormwater Management Manual, Design Guide for Public Street Improvements, and Neighborhood Greenways. (TSP objective 8.1.e.).

Policy 8.48. Corridors and City Greenways. Ensure public facilities located along Civic Corridors,

Neighborhood Corridors, and City Greenways support the multiple objectives established for these corridors.

232. Finding: The City Council interprets these policies apply to new public facilities or infrastructure projects in the right-of-way. The FFTZ amendments do not include new public facility or infrastructure projects in the right-of-way. These policies do not apply.

Trails

Policy 8.53. Public trails. Establish, improve, and maintain a citywide system of public trails that provide transportation and/or recreation options and are a component of larger network of facilities for bicyclists, pedestrians, and recreational users.

Policy 8.54. Trail system connectivity. Plan, improve, and maintain the citywide trail system so that it connects and improves access to Portland's neighborhoods, commercial areas, employment centers, schools, parks, natural areas, recreational facilities, regional destinations, the regional trail system, and other key places that Portlanders access in their daily lives.

Policy 8.55. Trail coordination. Coordinate planning, design, improvement, and maintenance of the trail system among City agencies, other public agencies, non-governmental partners, and adjacent landowners.

Policy 8.56. Trail diversity. Allow a variety of trail types to reflect a trail's transportation and recreation roles, requirements, and physical context.

Policy 8.57. Public access requirements. Require public access and improvement of public trails along the future public trail alignments shown in Figure 8-2 — Future Public Trail Alignments**.**

Policy 8.58. Trail and City Greenway coordination. Coordinate the planning and improvement of trails as part of the City Greenways system.

Policy 8.59. Trail and Habitat Corridor coordination. Coordinate the planning and improvement of trails with the establishment, enhancement, preservation, and access to habitat corridors.

Policy 8.60. Intertwine coordination. Coordinate with the Intertwine Alliance and its partners, including local and regional parks providers, to integrate Portland's trail and active transportation network with the bi-state regional trail system.

233. Finding: The City Council interprets these policies to apply to designated trails. While designated trail alignments are included in public rights of way adjacent industrial zones, the FFTZ amendments do not amend the designated trail alignments. These policies do not apply.

Stormwater Systems

Policy 8.68. Stormwater facilities. Provide adequate stormwater facilities for conveyance, flow control, and pollution reduction.

Policy 8.69. Stormwater as a resource. Manage stormwater as a resource for watershed health and public use in ways that protect and restore the natural hydrology, water quality, and habitat of Portland's watersheds.

Policy 8.71. Green infrastructure. Promote the use of green infrastructure, such as natural areas, the urban forest, and landscaped stormwater facilities, to manage stormwater.

234. Finding: Stormwater is conveyed through the combined sewer system, pipes, ditches, or drainageways to streams and rivers. In some cases, stormwater is managed in detention facilities, other vegetated facilities, or allowed to infiltrate in natural areas. Safe conveyance of stormwater is

an issue in some areas, particularly in the hilly areas of west Portland and some parts of outer southeast which lack comprehensive conveyance systems and where infiltration is limited by geology or high groundwater. The FFTZ amendments affect one type of allowed use in employment and industrial zones and do not change development standards that apply to development in those zones, including those that apply to stormwater systems.

Flood management

Policy 8.76. Flood management. Improve and maintain the functions of natural and managed drainageways, wetlands, and floodplains to protect health, safety, and property, provide water conveyance and storage, improve water quality, and maintain and enhance fish and wildlife habitat.

Policy 8.77. Floodplain management. Manage floodplains to protect and restore associated natural resources and functions and to minimize the risks to life and property from flooding.

Policy 8.78. Flood management facilities. Establish, improve, and maintain flood management facilities to serve designated land uses through planning, investment and regulatory requirements.

235. Six of the existing FFTs have frontage on the Willamette River, with portions of the sites in the FEMA designated 100-year floodplain. For sites in flood prone areas, the FFTZ amendments do not amend the environmental overlay maps, nor do they change City programs that regulate development in the floodplain (i.e., Title 33.631 Sites in Flood Hazard Areas; Title 10 Erosion Control, and the balanced cut and fill requirements of Title 24).

Parks and recreation

Policy 8.92. Acquisition, development, and maintenance. Provide and maintain an adequate supply and variety of parkland and recreational facilities to serve the city's current and future population based on identified level-of-service standards and community needs.

Policy 8.93. Service equity. Invest in acquisition and development of parks and recreation facilities in areas where service-level deficiencies exist.

Policy 8.95. Park planning. Improve parks, recreational facilities, natural areas, and the urban forest in accordance with current master plans, management plans, or adopted strategies that reflect user group needs, development priorities, development and maintenance costs, program opportunities, financing strategies, and community input.

Policy 8.96. Recreational trails. Establish, improve, and maintain a complete and connected system of public recreational trails, consistent with Portland Parks & Recreation's trail strategy.

Policy 8.97. Natural resources. Preserve, enhance, and manage City-owned natural areas and resources to protect and improve their ecological health, in accordance with both the natural area acquisition and restoration strategies, and to provide compatible public access.

Policy 8.98. Urban forest management. Manage urban trees as green infrastructure with associated ecological, community, and economic functions, through planning, planting, and maintenance activities, education, and regulation.

Policy 8.99. Recreational facilities. Provide a variety of recreational facilities and services that contribute to the health and well-being of Portlanders of all ages and abilities.

236. Finding: The City Council interprets these policies to address City-owned parks and natural areas and not development on private land. These policies do not apply.

School facilities

Policy 8.113. School district capacity. Consider the overall enrollment capacity of a school district – as defined in an adopted school facility plan that meets the requirements of Oregon Revised Statute 195 – as a factor in land use decisions that increase capacity for residential development.

Policy 8.114. Facilities Planning. Facilitate coordinated planning among school districts and City bureaus, including Portland Parks and Recreation, to accommodate school site/facility needs in response to most up-to-date growth forecasts.

Policy 8.115. Co-location. Encourage public school districts, Multnomah County, the City of Portland, and other providers to co-locate facilities and programs in ways that optimize service provision and intergenerational and intercultural use.

Policy 8.116. Community use. Encourage public use of public school grounds for community purposes while meeting educational and student safety needs and balancing impacts on surrounding neighborhoods.

Policy 8.117. Recreational use. Encourage publicly-available recreational amenities (e.g. athletic fields, green spaces, community gardens, and playgrounds) on public school grounds for public recreational use, particularly in neighborhoods with limited access to parks.

Policy 8.118. Schools as emergency aid centers. Encourage the use of seismically-safe school facilities as gathering and aid-distribution locations during natural disasters and other emergencies.

Policy 8.119. Facility adaptability. Ensure that public schools may be upgraded to flexibly accommodate multiple community-serving uses and adapt to changes in educational approaches, technology, and student needs over time.

Policy 8.120. Leverage public investment. Encourage City public facility investments that complement and leverage local public school districts' major capital investments.

Policy 8.122. Private institutions. Encourage collaboration with private schools and educational institutions to support community and recreational use of their facilities.

237. Finding: The City Council interprets these policies to address school facilities and not development on private land. These policies do not apply.

Energy infrastructure

Policy 8.125. Energy efficiency. Promote efficient and sustainable production and use of energy resources by residents and businesses, including low-carbon renewable energy sources, district energy systems, and distributed generation, through land use plans, zoning, and other legislative land use decisions.

Policy 8.126. Coordination. Coordinate with energy providers to encourage investments that ensure reliable, equitable, efficient, and affordable energy for Portland residents and businesses.

238. Finding: The 2035 Comprehensive Plan defines "coordinate" as work together with others toward a common goal; collaborate. The verb "encourage", which is defined in the 2035 Comprehensive Plan, means to promote or foster using some combination of voluntary approaches, regulations, or incentives. As part of the concept development of the zoning code changes, in June 2016 BPS held stakeholder focus group meetings with representatives from energy providers - the FFTs, the Western States Petroleum Association and Northwest Natural. The Proposed Draft was crafted in response to these discussions and additional comments on the Discussion Draft. Further, in

response to testimony at the Planning and Sustainability Commission, changes were made to the use regulations to designate FFTs as a limited use (rather than a prohibited use) and allow for a ten percent expansion of storage capacity in conjunction with seismic safety upgrades. The City Council received testimony from energy providers that a ten percent capacity increase limit would be a severe limitation and would not justify the private investment needed to replace existing tanks. However, the City Council found that the energy providers' proposed Energy Corridor Overlay zone and definition of "region" as a seven state area (PADD-5) was not consistent with other City goals and policies to reduce seismic risk. Further, the City does not have the administrative authority and capacity to monitor and enforce regulations to control the destination of fossil fuels flowing through Portland to a seven-state region. Also, allowing for unlimited expansion of Portland's FFTs is not consistent with the DOGAMI recommendation to mitigate seismic vulnerability by increasing redundancy and reserve capacity in Oregon's liquid fuel supply by replacing, relocating, or adding redundant systems elsewhere. The FFTZ amendments designate existing FFTs as a limited use, as opposed to a prohibited or nonconforming use, allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake. Further, the use limitations (33.140.100.B.17.a) provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs.

Chapter 9 Transportation

GOAL 9.A: Safety. Transportation safety impacts the livability of a city and the comfort and security of those using City streets. Comprehensive efforts to improve transportation safety through engineering, education, enforcement and evaluation will be used to eliminate traffic-related fatalities and serious injuries from Portland's transportation system.

Goal 9.B: Multiple goals. Portland's transportation system is funded and maintained to achieve multiple goals and measurable outcomes for people and the environment. The transportation system is safe, complete, interconnected, multimodal, and fulfills daily needs for people and businesses.

GOAL 9.C: Great places. Portland's transportation system enhances quality of life for all Portlanders, reinforces existing neighborhoods and great places, and helps make new great places in town centers, neighborhood centers and corridors, and civic corridors.

GOAL 9.D: Environmentally sustainable. The transportation system increasingly uses active transportation, renewable energy, or electricity from renewable sources, achieves adopted carbon reduction targets, and reduces air pollution, water pollution, noise, and Portlanders' reliance on private vehicles.

GOAL 9.E: Equitable transportation. The transportation system provides all Portlanders options to move about the city and meet their daily needs by using a variety of safe, efficient, convenient, and affordable modes of transportation. Transportation investments are responsive to the distinct needs of each community.

GOAL 9.F: Positive health outcomes. The transportation system promotes positive health outcomes and minimizes negative impacts for all Portlanders by supporting active transportation, physical activity, and community and individual health.

GOAL 9.G: Opportunities for prosperity. The transportation system supports a strong and diverse economy, enhances the competitiveness of the city and region, and maintains Portland's role as a West Coast trade gateway and freight hub by providing efficient and reliable goods movement, multimodal access to employment areas and educational institutions, as well as enhanced freight

access to industrial areas and intermodal freight facilities. The transportation system helps people and businesses reduce spending and keep money in the local economy by providing affordable alternatives to driving.

239. Finding: The City Council interprets these goals to address transportation improvements, programming, funding priorities and maintenance and not development on private land.

The City Council interprets these goals to apply to districts as whole and not to individual businesses or sectors of business. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not reduce the employment land base and continue to support a strong and diverse economy.

The FFTZ amendments maintains Portland's role as a multimodal freight hub with enhanced freight access because they do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the industrial areas where the FFTs are located. Finally, the ordinance does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system.

Designing and planning

Policy 9.1. Street design classifications. Maintain and implement street design classifications consistent with land use plans, environmental context, urban design pattern areas, and the Neighborhood Corridor and Civic Corridor Urban Design Framework designations.

Policy 9.2. Street policy classifications. Maintain and implement street policy classifications for pedestrian, bicycle, transit, freight, emergency vehicle, and automotive movement, while considering access for all modes, connectivity, adjacent planned land uses, and state and regional requirements.

9.2.a. Designate district classifications that emphasize freight mobility and access in industrial and employment areas serving high levels of truck traffic and to accommodate the needs of intermodal freight movement.

9.2.b. Designate district classifications that give priority to pedestrian access in areas where high levels of pedestrian activity exist or are planned, including the Central City, Gateway regional center, town centers, neighborhood centers, and transit station areas.

9.2.c. Designate district classifications that give priority to bicycle access and mobility in areas where high levels of bicycle activity exist or are planned, including Downtown, the River District, Lloyd District, Gateway Regional Center, town centers, neighborhood centers, and transit station areas.

Policy 9.3. Transportation System Plan. Maintain and implement the Transportation System Plan (TSP) as the decision-making tool for transportation-related projects, policies, programs, and street design.

Policy 9.4. Use of classifications. Plan, develop, implement, and manage the transportation system in accordance with street design and policy classifications outlined in the Transportation System Plan.

9.4.a. Classification descriptions are used to describe how streets should function for each mode of travel, not necessarily how they are functioning at present.

240. Finding: The FFTZ amendments do not change the functional classification of any existing or proposed transportation facility, nor do they change the standards implementing a functional classification system.

Policy 9.5. Mode share goals and Vehicle Miles Travelled (VMT) reduction. Increase the share of trips made using active and low-carbon transportation modes. Reduce VMT to achieve targets set in the most current Climate Action Plan and Transportation System Plan, and meet or exceed Metro's mode share and VMT targets.

241. Finding: The FFTZ amendments remove regulatory barriers to encourage higher-density housing by providing for a wider range of housing types in the RM1 and RM2 zones throughout the city, which encompass 92 percent of the multi-dwelling zoning in Portland. The FFTZ amendments generally support reducing VMT and increasing non-automobile mode splits by creating more housing capacity in accessible locations because 86 percent of the acres with multi-dwelling zoning is located within ¼ mile of transit. The FFTZ amendments include mitigating strategies that serve to improve mode split performance and limit traffic impacts. which include eliminating or reducing minimum parking requirements; promoting a walkable urban form through regulations on the amount of building façade that can occupied with garages and prohibiting off-street parking between the building and the street. The FFTZ amendments also expand the TDM financial incentive requirements to multi-dwelling zones in locations close to frequent transit, projects with buildings with 10 or more units.

Policy 9.6. Transportation strategy for people movement. Design the system to accommodate the most vulnerable users, including those that need special accommodation under the Americans with Disabilities Act (ADA). Implement a prioritization of modes for people movement by making transportation system decisions per the following ordered list:

- Walking
- Bicycling
- Transit
- Fleets of electric, fully automated, multiple passenger vehicles
- Other shared vehicles
- Low or no occupancy vehicles, fossil-fueled non-transit vehicles

When implementing this prioritization ensure that:

- The needs and safety of each group of users are considered, and changes do not make existing conditions worse for the most vulnerable users.
- All users' needs are balanced with the intent of optimizing the right of way for multiple modes on the same street.
- When necessary to ensure safety, accommodate some users on parallel streets as part of multi-street corridors.
- Land use and system plans, network functionality for all modes, other street functions, and complete street policies, are maintained.
- Policy-based rationale is provided if modes lower in the ordered list are prioritized.

Policy 9.7. Moving goods and delivering services. In tandem with people movement, maintain efficient and reliable movement of goods and services as a critical transportation system function. Prioritize freight system reliability improvements over single-occupancy vehicle mobility where there are solutions that distinctly address those different needs.

242. Finding: The City Council interprets policies 9.6 and 9.7 to mean that people movement and freight movement are critical functions of the transportation system that should be prioritized over single-occupancy vehicles. Further, the City Council interprets this policy to apply to transportation system design and investment decisions, and not land use decisions. Portland's role as a multimodal freight

hub is maintained because the FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan. Therefore, the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located. The ordinance regulates storage capacity, it does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system.

Policy 9.8. Affordability. Improve and maintain the transportation system to increase access to convenient and affordable transportation options for all Portlanders, especially those who have traditionally been under-served or under-represented or have historically borne unequal burdens.

Policy 9.9. Accessible and age-friendly transportation system. Ensure that transportation facilities are accessible to people of all ages and abilities, and that all improvements to the transportation system (traffic, transit, bicycle, and pedestrian) in the public right-of-way comply with the Americans with Disabilities Act of 1990. Improve and adapt the transportation system to better meet the needs of the most vulnerable users, including the young, older adults, and people with different abilities.

Policy 9.10. Geographic policies. Adopt geographically-specific policies in the Transportation System Plan to ensure that transportation infrastructure reflects the unique topography, historic character, natural features, system gaps, economic needs, demographics, and land uses of each area. Use the Pattern Areas identified in Chapter 3: Urban Form as the basis for area policies.

9.10.a. Refer to adopted area plans for additional applicable geographic objectives related to transportation. Land use, development, and placemaking

243. Finding: Policies 9.8 through 9.10 address the design and planning of transportation facilities and not development on private land. These policies do not apply.

Land use, development, and placemaking

Policy 9.11. Land use and transportation coordination. Implement the Comprehensive Plan Map and the Urban Design Framework though coordinated long-range transportation and land use planning. Ensure that street policy and design classifications and land uses complement one another.

Policy 9.12. Growth strategy. Use street design and policy classifications to support Goals 3A-3G in Chapter 3: Urban Form. Consider the different design contexts and transportation functions in Town Centers, Neighborhood Centers, Neighborhood Corridors, Employment Areas, Freight Corridors, Civic Corridors, Transit Station Areas, and Greenways.

Policy 9.13. Development and street design. Evaluate adjacent land uses to help inform street classifications in framing, shaping, and activating the public space of streets. Guide development and land use to create the kinds of places and street environments intended for different types of streets.

244. Finding: For policies 9.11 through 9.13, the FFTZ amendments do not change the functional classification of any existing or proposed transportation facility, nor do they change the standards implementing a functional classification system. The FFTZ amendments limit one type of use allowed in industrial areas. The remaining industrial uses continue to be regulated under the current development regulations and do not intensify the development capacity. Therefore, the long-range transportation and land use plan continue to be coordinated.

Streets as public spaces

Policy 9.14. Streets for transportation and public spaces. Integrate both placemaking and transportation functions when designing and managing streets by encouraging design, development,

and operation of streets to enhance opportunities for them to serve as places for community interaction, environmental function, open space, tree canopy, recreation, and other community purposes.

Policy 9.15. Repurposing street space. Encourage repurposing street segments that are not critical for transportation connectivity to other community purposes.

Policy 9.16. Design with nature. Promote street alignments and designs that respond to topography and natural features, when feasible, and protect streams, wildlife habitat, and native trees.

245. Finding: These policies address the design and use of public streets and not development on private land. These policies do not apply.

Modal policies

Policy 9.17. Pedestrian transportation. Encourage walking as the most attractive mode of transportation for most short trips, within and to centers, corridors, and major destinations, and as a means for accessing transit.

Policy 9.18. Pedestrian networks. Create more complete networks of pedestrian facilities, and improve the quality of the pedestrian environment.

Policy 9.19. Pedestrian safety and accessibility. Improve pedestrian safety, accessibility, and convenience for people of all ages and abilities.

Policy 9.20. Bicycle transportation. Create conditions that make bicycling more attractive than driving for most trips of approximately three miles or less.

Policy 9.21. Accessible bicycle system. Create a bicycle transportation system that is safe, comfortable, and accessible to people of all ages and abilities.

Policy 9.22. Public transportation. Coordinate with public transit agencies to create conditions that make transit the preferred mode of travel for trips that are not made by walking or bicycling.

Policy 9.23. Transportation to job centers. Promote and enhance transit to be more convenient and economical than the automobile for people travelling more than three miles to and from the Central City and Gateway. Enhance regional access to the Central City and access from Portland to other regional job centers.

Policy 9.24. Transit service. In partnership with TriMet, develop a public transportation system that conveniently, safely, comfortably, and equitably serves residents and workers 24 hours a day, 7 days a week.

Policy 9.25. Transit equity. In partnership with TriMet, maintain and expand high-quality frequent transit service to all Town Centers, Civic Corridors, Neighborhood Centers, Neighborhood Corridors, and other major concentrations of employment, and improve service to areas with high concentrations of poverty and historically under-served and under-represented communities.

> **9.25.a.** Support a public transit system and regional transportation that address the transportation needs of historically marginalized communities and provide increased mobility options and access.

Policy 9.26. Transit funding. Consider funding strategies and partnership opportunities that improve access to and equity in transit service, such as raising metro-wide funding to improve service and decrease user fees/fares.

Policy 9.27. Transit service to centers and corridors. Use transit investments to shape the city's

growth and increase transit use. In partnership with TriMet and Metro**,** maintain, expand, and enhance Portland Streetcar, frequent service bus, and high-capacity transit, to better serve centers and corridors with the highest intensity of potential employment and household growth.

9.27.a. Locate major park-and-ride lots only where transit ridership is increased significantly, vehicle miles traveled are reduced, transit-supportive development is not hampered, bus service is not available or is inadequate, and the surrounding area is not negatively impacted.

Policy 9.28. Intercity passenger service. Coordinate planning and project development to expand intercity passenger transportation services in the Willamette Valley, and from Portland to Seattle and Vancouver, BC.

Policy 9.29. Regional trafficways and transitways. Maintain capacity of regional transitways and existing regional trafficways to accommodate through-traffic.

246. Finding: Policies 9.17 through 9.29 address the design and planning of transportation facilities and not development on private land. These policies do not apply.

Policy 9.30. Multimodal goods movement. Develop, maintain, and enhance a multimodal freight transportation system for the safe, reliable, sustainable, and efficient movement of goods within and through the city.

Policy 9.31. Economic development and industrial lands. Ensure that the transportation system supports traded sector economic development plans and full utilization of prime industrial land, including brownfield redevelopment.

Policy 9.32. Multimodal system and hub. Maintain Portland's role as a multimodal hub for global and regional movement of goods. Enhance Portland's network of multimodal freight corridors.

Policy 9.33. Freight network. Develop, manage, and maintain a safe, efficient, and reliable freight street network to provide freight access to and from intermodal freight facilities, industrial and commercial districts, and the regional transportation system. Invest to accommodate forecasted growth of interregional freight volumes and provide access to truck, marine, rail, and air transportation systems. Ensure designated routes and facilities are adequate for over-dimensional trucks and emergency equipment.

Policy 9.34. Sustainable freight system. Support the efficient delivery of goods and services to businesses and neighborhoods, while also reducing environmental and neighborhood impacts. Encourage the use of energy efficient and clean delivery vehicles, and manage on- and off-street loading spaces to ensure adequate access for deliveries to businesses, while maintaining access to homes and businesses.

Policy 9.35. Freight rail network. Coordinate with stakeholders and regional partners to support continued reinvestment in, and modernization of, the freight rail network.

Policy 9.36. Portland Harbor. Coordinate with the Port of Portland, private stakeholders, and regional partners to improve and maintain access to marine terminals and related river-dependent uses in Portland Harbor.

9.36.a. Support continued reinvestment in, and modernization of, marine terminals in Portland Harbor.

9.36.b. Facilitate continued maintenance of the shipping channels in Portland Harbor and the Columbia River.

9.36.c. Support shifting more long-distance, high-volume movement of goods to river and oceangoing ships and rail.

247. Finding: Policies 9.30 through 9.36 direct the City to develop, maintain, and enhance a multimodal freight transportation system. the City Council interprets this policy to apply to transportation system design and city investment decisions, and not decisions considering the appropriate land use. The FFTZ amendments support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the changes maintain Portland's multimodal freight hub because they do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments to maintain and strengthen the multimodal transportation infrastructure in the northwest industrial area where the FFTs are located. Finally, the ordinance does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system.

Policy 9.37. Portland Heliport. Maintain Portland's Heliport functionality in the Central City.

248. Finding: This policy applies to the Central City. There are no FFTs in the Central City. This policy does not apply.

Policy 9.38. Automobile transportation. Maintain acceptable levels of mobility and access for private automobiles while reducing overall vehicle miles traveled (VMT) and negative impacts of private automobiles on the environment and human health.

Policy 9.39. Automobile efficiency. Coordinate land use and transportation plans and programs with other public and private stakeholders to encourage vehicle technology innovation, shifts toward electric and other cleaner, more energy-efficient vehicles and fuels, integration of smart vehicle technology with intelligent transportation systems, and greater use of options such as car-share, carpool, and taxi.

Policy 9.40. Emergency response. Maintain a network of accessible emergency response streets to facilitate safe and expedient emergency response and evacuation. Ensure that police, fire, ambulance, and other emergency providers can reach their destinations in a timely fashion, without negatively impacting traffic calming and other measures intended to reduce crashes and improve safety.

249. Finding: Policies 9.38 through 9.40 address the design and use of public streets and not development on private land. These policies do not apply.

System management

Policy 9.45. System management. Give preference to transportation improvements that use existing roadway capacity efficiently and that improve the safety of the system for all users.

9.45.a. Support regional equity measures for transportation system evaluation.

Policy 9.46. Traffic management. Evaluate and encourage traffic speed and volume to be consistent with street classifications and desired land uses to improve safety, preserve and enhance neighborhood livability, and meet system goals of calming vehicle traffic through a combination of enforcement, engineering, and education efforts.

9.46.a. Use traffic calming tools, traffic diversion and other available tools and methods to create and maintain sufficiently low automotive volumes and speeds on neighborhood

greenways to ensure comfortable cycling environment on the street.

Policy 9.47. Connectivity. Establish an interconnected, multimodal transportation system to serve centers and other significant locations. Promote a logical, direct, and connected street system through street spacing guidelines and district-specific street plans found in the Transportation System Plan, and prioritize access to specific places by certain modes in accordance with policies 9.6 and 9.7.

9.47.a. Develop conceptual master street plans for areas of the City that have significant amounts of vacant or underdeveloped land and where the street network does not meet City and Metro connectivity guidelines.

9.47.b. As areas with adopted Street Plans develop, provide connectivity for all modes by developing the streets and accessways as shown on the Master Street Plan Maps in the Comp Plan.

9.47.c. Continue to provide connectivity in areas with adopted Street Plans for all modes of travel by developing public and private streets as shown on the Master Street Plan Maps in the Comp Plan.

9.47.d. Provide street connections with spacing of no more than 530 feet between connections except where prevented by barriers such as topography, railroads, freeways, or environmental constraints. Where streets must cross over protected water features, provide crossings at an average spacing of 800 to 1000 feet, unless exceptional habitat quality of length of crossing prevents a full street connection.

9.47.e Provide bike and pedestrian connections at approximately 330 feet intervals on public easements or rights-of-way when full street connections are not possible, except where prevented by barriers s such as topography, railroads, freeways, or environmental constraints. Bike and pedestrian connections that cross protected water features should have an average spacing of no more than 530 feet, unless exceptional habitat quality or length of connection prevents a connection.

Policy 9.48 Technology. Encourage the use of emerging vehicle and parking technology to improve real-time management of the transportation network and to manage and allocate parking supply and demand.

Policy 9.49 Performance measures. Establish multimodal performance measures and measures of system completeness to evaluate and monitor the adequacy of transportation services based on performance measures in goals 9.A. through 9.I. Use these measures to evaluate overall system performance, inform corridor and area-specific plans and investments, identify project and program needs, evaluate and prioritize investments, and regulate development, institutional campus growth, zone changes, Comprehensive Plan Map amendments, and conditional uses.

9.49.a. Eliminate deaths and serious injuries for all who share Portland streets by 2025.

9.49.b. Maintain or decrease the number of peak period non-freight motor vehicle trips, system-wide and within each mobility corridor to reduce or manage congestion.

9.49.c. By 2035, reduce the number of miles Portlanders travel by car to 11 miles per day or less, on average.

9.49.d. Establish mode split targets in 2040 Growth Concept areas within the City, consistent with Metro's targets for these areas.

9.49.e. By 2035, increase the mode share of daily non-drive alone trips to 70 percent citywide,

and to the following in the five pattern areas:

Pattern Area	2035 daily target mode share
Central City	85%
Inner Neighborhoods	70%
Western Neighborhoods	65%
Eastern Neighborhoods	65%
Industrial and River	55%

9.49.f. By 2035, 70 percent of commuters walk, bike, take transit, carpool, or work from home at approximately the following rates:

Mode	Mode Share
Walk	7.5%
Bicycle	25%
Transit	25%
Carpool	10%
Single Occupant Vehicle (SOV)	30% or less
Work at home	10% below the line (calculated outside of the modal targets above)

9.49.g. By 2035, reduce Portland's transportation-related carbon emissions to 50% below 1990 levels, at approximately 934,000 metric tons.

9.49.h. By 2025, increase the percentage of new mixed use zone building households not owning an automobile from approximately 13% (2014) to 25%, and reduce the percentage of households owning two automobiles from approximately 24% to 10%.

9.49.i. Develop and use alternatives to the level-of-service measure to improve safety, encourage multimodal transportation, and to evaluate and mitigate maintenance and new trip impacts from new development.

9.49.j. Use level-of-service, consistent with Table 9.1*, as one measure to evaluate the adequacy of transportation facilities in the vicinity of sites subject to land use review.

9.49.k. Maintain acceptable levels of performance on state facilities and the regional arterial and throughway network, consistent with the interim standard in Table 9.2*, in the development and adoption of, and amendments to, the Transportation System Plan and in

legislative amendments to the Comprehensive Plan Map.

9.49.l. In areas identified by Metro that exceed the level-of-service in Table 9.2* and are planned to, but do not currently meet the alternative performance criteria, establish an action plan that does the following:

- Anticipates growth and future impacts of motor vehicle traffic on multimodal travel in the area
- Establishes strategies for mitigating the future impacts of motor vehicles
- Establishes performance standards for monitoring and implementing the action plan.

*Note: Referenced Tables 9.1 and 9.2 are contained within the Transportation System Plan and should not be confused with tables or figures within the 2035 Comprehensive Plan.

9.49.m. Develop performance measures to track progress in creating and maintaining the transportation system.

Policy 9.50 Regional congestion management. Coordinate with Metro to establish new regional multimodal mobility standards that prioritize transit, freight, and system completeness.

9.50.a. Create a regional congestion management approach, including a market-based system, to price or charge for auto trips and parking, better account for the cost of auto trips, and to more efficiently manage the regional system.

Policy 9.51. Multimodal Mixed-Use Area. Manage Central City Plan amendments in accordance with the designated Central City Multimodal Mixed-Use Area (MMA) in the geography indicated in Figure 9-2. The MMA renders congestion / mobility standards inapplicable to any proposed plan amendments under OAR 660-0012-0060(10).

250. Finding: Policies 9.45through 9.51 address the management of the City's transportation system and not development on private land. These policies do not apply.

Transportation Demand Management

Policy 9.52. Outreach. Create and maintain TDM outreach programs that work with Transportation Management Associations (TMA), residents, employers, and employees that increase the modal share of walking, bicycling, and shared vehicle trips while reducing private vehicle ownership, parking demand, and drive-alone trips, especially during peak periods.

Policy 9.53. New development. Create and maintain TDM regulations and services that prevent and reduce traffic and parking impacts from new development and redevelopment. Encourage coordinated area-wide delivery of TDM programs. Monitor and improve the performance of private-sector TDM programs.

Policy 9.54. Projects and programs. Integrate TDM information into transportation project and program development and implementation to increase use of new multimodal transportation projects and services.

251. Finding: The FFTZ amendments affect one type of allowed use in employment and industrial zones. The City Council has not applied the TDM program to industrial development and those changes are not part of this ordinance.

Parking management

Policy 9.55. Parking management. Reduce parking demand and manage supply to improve

pedestrian, bicycle and transit mode share, neighborhood livability, safety, business district vitality, vehicle miles traveled (VMT) reduction, and air quality. Implement strategies that reduce demand for new parking and private vehicle ownership, and that help maintain optimal parking occupancy and availability.

Policy 9.56. Curb Zone. Recognize that the Curb Zone is a public space, a physical and spatial asset that has value and cost. Evaluate whether, when, and where parking is the highest and best use of this public space in support of broad City policy goals and local land use context. Establish thresholds to utilize parking management and pricing tools in areas with high parking demand to ensure adequate on-street parking supply during peak periods.

Policy 9.57. On-street parking. Manage parking and loading demand, supply, and operations in the public right of way to achieve mode share objectives, and to encourage safety, economic vitality, and livability. Use transportation demand management and pricing of parking in areas with high parking demand.

Policy 9.58. Off-street parking. Limit the development of new parking spaces to achieve land use, transportation, and environmental goals, especially in locations with frequent transit service. Regulate off-street parking to achieve mode share objectives, promote compact and walkable urban form, encourage lower rates of car ownership, and promote the vitality of commercial and employment areas. Use transportation demand management and pricing of parking in areas with high parking demand.

Policy 9.59. Share space and resources. Encourage the shared use of parking and vehicles to maximize the efficient use of limited urban space.

Policy 9.60. Cost and price. Recognize the high public and private cost of parking by encouraging prices that reflect the cost of providing parking and balance demand and supply. Discourage employee and resident parking subsidies.

Policy 9.61. Bicycle parking. Promote the development of new bicycle parking facilities including dedicated bike parking in the public right-of-way. Provide sufficient bicycle parking at high-capacity transit stations to enhance bicycle connection opportunities. Require provision of adequate off-street bicycle parking for new development and redevelopment. Encourage the provision of parking for different types of bicycles. In establishing the standards for long-term bicycle parking, consider the needs of persons with different levels of ability.

252. Finding: The FFTZ amendments do not change parking requirements or development standards affecting parking or the use of the right-of-way for parking. These policies do not apply.

Finance, programs, and coordination

Policy 9.62. Coordination. Coordinate with state and federal agencies, local and regional governments, special districts, other City bureaus, and providers of transportation services when planning for, developing, and funding transportation facilities and services.

Policy 9.63. New development impacts. Prevent, reduce, and mitigate the impacts of new development and redevelopment on the transportation system. Utilize strategies including transportation and parking demand management, transportation system analysis, and system and local impact mitigation improvements and fees.

Policy 9.64. Education and encouragement. Create, maintain, and coordinate educational and encouragement programs that support multimodal transportation and that emphasize safety for all modes of transportation. Ensure that these programs are accessible to historically under-served and

under-represented populations.

Policy 9.65. Telecommuting. Promote telecommuting and the use of communications technology to reduce travel demand.

Policy 9.66. Project and program selection criteria. Establish transportation project and program selection criteria consistent with goals 9A through 9I, to cost-effectively achieve access, placemaking, sustainability, equity, health, prosperity, and safety goals.

Policy 9.67. Funding. Encourage the development of a range of stable transportation funding sources that provide adequate resources to build and maintain an equitable and sustainable transportation system.

253. Finding: These policies address the funding and management of the City's transportation system and not development on private land. These policies do not apply.

Connected and Automated Vehicles

Policy 9.68 Connected and Automated Vehicles Priorities and Outcomes. Prioritize connected and automated vehicles that are fleet/shared ownership, fully automated, electric and, for passenger vehicles, shared by multiple passengers (known by the acronym FAVES). Develop and implement strategies for each following topic.

9.68.a. Ensure that all levels of automated vehicles advance Vision Zero by operating safely for all users, especially for vulnerable road users. Require adequate insurance coverage for operators, customers, and the public-at-large by providers of commercial connected and autonomous vehicle services.

9.68.b. Ensure that connected and automated vehicles improve travel time reliability and system efficiency by:

1. maintaining or reducing the number of vehicle trips during peak congestion periods;
2. reducing low occupancy vehicle trips during peak congestion periods;
3. paying for use of, and impact on, Portland's transportation system including factors such as congestion level, vehicle miles traveled, vehicle occupancy, and vehicle energy efficiency; and
4. supporting and encouraging use of public transportation.

9.68.c. Cut vehicle carbon pollution by reducing low occupancy "empty miles" traveled by passenger vehicles with zero or one passengers. Prioritize electric and other zero direct emission vehicles operated by fleets and carrying multiple passengers.

9.68.d. Make the benefits of automated mobility available on an equitable basis to all segments of the community while ensuring traditionally disadvantaged communities are not disproportionately hurt by connected and autonomous vehicle use. This includes people with disabilities, as well as communities of color, women, and geographically underserved communities.

9.68.e Identify, prevent, and mitigate potential adverse impacts from connected and automated vehicles.

Policy 9.69 Connected and Automated Vehicles Tools. Use a full range of tools to ensure that connected and automated vehicles and private data communications devices installed in the City right of way contribute to achieving Comprehensive Plan and Transportation System Plan goals and policies.

9.69.a. Maintain City authority to identify and develop appropriate data sharing requirements to inform and support safe, efficient, and effective management of the transportation system. Ensure that when connected and automated vehicles use City rights-of-way or when vehicles connect with smart infrastructure within the City they share information including, but not limited to, vehicle type, occupancy, speed, travel routes, and travel times, with appropriate privacy controls. Ensure that private data communications devices installed in the City right of way are required to share anonymized transportation data.

9.69.b. Design and manage the mobility zone, curb zone, and traffic control devices, e.g. to limit speeds to increase safety, to minimize cut-through traffic, evaluate future demand for pick-up and drop-off zones, and to prioritize automated electric vehicles carrying more passengers in congested times and locations;

9.69.c. Evaluate the public cost and benefit of investments in wayside communication systems serving connected and automated vehicles. Develop a criteria-driven automated vehicle wayside infrastructure investment plan.

9.69.d. Develop sustainable user-pays funding mechanisms to support connected and automated vehicle infrastructure and service investments, transportation system maintenance, and efficient system management.

9.69.e. Ensure that automated vehicles and vehicles that connect to smart City infrastructure, and private data communications devices installed in the City right of way, help pay for infrastructure and service investments, and support system reliability and efficiency. Develop a tiered pricing structure that reflects vehicle impacts on the transportation system, including factors such as congestion level, vehicle miles traveled, vehicle occupancy, and vehicle energy efficiency.

254. Finding: These policies address the management of automated vehicles and not development on private land. These policies do not apply.

Chapter 10: Land Use Designations and Zoning

Goal 10.A: Land use designations and zoning. Effectively and efficiently carry out the goals and policies of the Comprehensive Plan through the land use designations, Zoning Map, and the Zoning Code.

255. The FFTZ amendments do not change the land use designations, nor do they amend the Comprehensive Plan Map or the Zoning Map. These findings show how the changes carry out the goals and policies of the Comprehensive Plan through the Zoning Code.

Land use designations

Policy 10.1. Land use designations. Apply a land use designation to all land and water within the City's Urban Services Boundary. Apply the designation that best advances the Comprehensive Plan goals and

policies. The land use designations are shown on the adopted Land Use Map and on official Zoning Maps.

The Zoning Map and the Zoning Code

Policy 10.2. Relationship of land use designations to base zones. Apply a base zone to all land and water within the City's urban services boundary. The base zone applied must either be a zone that corresponds to the land use designation or be a zone that does not correspond but is allowed per Figure 10-1 — Corresponding and Less-Intense Zones for Each Plan Map Designation. In some situations, there are long-term or short-term obstacles to achieving the level of development intended by the land use designation (e.g., an infrastructure improvement to serve the higher level of development is planned but not yet funded). In these situations, a less intense zone (listed in Figure 10-1) may be applied. When a land use designation is amended, the zone may also have to be changed to a corresponding zone or a zone that does not correspond but is allowed.

Policy 10.3. Amending the Zoning Map.

10.3.a. Amending a base zone may be done legislatively or quasi-judicially.

10.3.b. When amending a base zone quasi-judicially, the amendment must be to a corresponding zone (*see Figure 10-1 — Corresponding and Allowed Zones for Each Land Use Designation*). When a designation has more than one corresponding zone, the most appropriate zone, based on the purpose of the zone and the zoning and general land uses of surrounding lands, will be applied.

10.3.c. When amending a base zone legislatively, the amendment may be to a corresponding zone or to a zone that is does not correspond but is allowed (*see Figure 10-1 — Corresponding and Allowed Zones for each Land Use Designation for zones that are allowed*). A legislative Zoning Map amendment may not be to a zone that is not allowed.

10.3.d. An amendment to a base zone consistent with the land use designation must be approved when it is found that current public services can support the uses allowed by the zone, or that public services can be made capable by the time the development is complete. The adequacy of services is based on the proposed use and development. If a specific use and development proposal is not submitted, services must be able to support the range of uses and development allowed by the zone. For the purposes of this requirement, services include water supply, sanitary sewage disposal, stormwater management, transportation, school district capacity (where a school facility plan exists), and police and fire protection.

10.3.e. An amendment to apply or remove an overlay zone or plan district may be done legislatively or quasi-judicially, and must be based on a study or plan document that identifies a specific characteristic, situation, or problem that is not adequately addressed by the base zone or other regulations.

Policy 10.4. Amending the Zoning Code. Amendments to the zoning regulations must be done legislatively and should be clear, concise, and applicable to a broad range of development situations faced by a growing city. Amendments should:

256. Finding: The FFTZ amendments were initially adopted by a legislative process and the reconsideration on remand is following a legislative procedure at City Council. The regulations are clear and concise in creating one use category with clear definition of terms and is applicable to all employment and industrial zones.

10.4.a. Promote good planning:

- Effectively and efficiently implement the Comprehensive Plan.

257. **Finding:** As demonstrated by these findings, the FFTZ amendments effectively and efficiently implement the Comprehensive Plan. Specifically:

The City Council has considered applicable policies to determine that this ordinance on the whole complies with the 2035 Comprehensive Plan and on balance is equally or more supportive of the goals and policies of the 2035 Comprehensive Plan than the current regulations. In reaching this conclusion, City Council has weighed and balanced competing policy directions.

In particular, the Council finds that Goal 4.D with Policies 4.79 and 4.80, requires reducing risk to people and property from natural hazards. The FFTZ amendments further these goals and policies because by limiting the risks of storing large volumes of hazardous materials in an area with high susceptibility to an earthquake. Large fossil fuel terminals represent a risk to people, property and the natural environments that the City Council finds as a compelling reason to limit future risk by limiting the size of new facilities and prohibit the expansion of existing facilities. Continuing to allow an unlimited increase in storage capacity at FFTs in a high risk area would be less supportive of the 2035 Comprehensive Plan than adopting the FFTZ amendments

Policy 6.48 provides direction to limit fossil fuel terminals to what is necessary to serve the region. The City Council recognizes that Portland's fossil fuel terminals handle 90 percent of the fossil fuel for the State of Oregon and Southwest Washington. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity to increase safety and meet future needs. In addition, limiting storage capacity to the existing facilities reduces risk from a major earthquake, which outweighs the policy direction to provide capacity to accommodate any potential future increase in fossil fuel consumption, in part, because continuing to consolidate fossil fuel storage capacity in Portland is counter to resiliency principles that emphasize redundancy and distributed facilities.

Goal 6.C with Policies 6.20 and 6.36, among others, provide for the retention and growth of businesses, especially those in the traded sector. The City Council interprets these policies apply to the economy in general, rather than specific types of business. These changes and restrictions only apply to a narrowly defined new land use category, Bulk Fossil Fuel Terminals, and do not have a significant effect on the other allowed uses in industrial and employment zones. There are no changes proposed to the Comprehensive Plan or Zoning Map that will impact the overall size or intensity of development in the industrial and employment areas of Portland. These amendments are narrowly constructed to apply to one class of businesses that make up a small portion of the city, regional and state economy. Further, these regulations only limit future expansion of these fossil fuel terminals, with some key exceptions, and designate these businesses as a limited use that allows their continued operation.

Guilds Lake Industrial Sanctuary (GLIS) Plan policies provide direction to maintain, protect and enhance businesses in the sanctuary. This plan was adopted in 2001 and does not address the need for resiliency in a high and medium liquefaction susceptibility area. The City Council interprets these policies to apply to the GLIS as a whole and not individual businesses. The City Council interprets the legislative intent of the GLISP is to maintain the area as an industrial sanctuary and to prohibit incompatible land uses. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses that could undermine the viability of the industrial sanctuary. These

regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The remaining industrial uses to continue to operate under current regulations. The impact of the limits on fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and make upgrades and supports limited enhancement through exceptions to the storage capacity restrictions.

- Address existing and potential land use problems.

258. Finding: Most of Portland's employment and industrial zones are in areas with high to very high levels of liquefaction susceptibility, as documented by the 2018 DOGAMI Earthquake Regional Impact Analysis. Fossil fuel infrastructure poses considerable risks in the event of a major earthquake. The FFTs have significant seismic risks because most of the tanks have been constructed without any or only limited seismic design criteria on soils with moderate to high levels of liquefaction susceptibility, as documented by the Portland Bureau of Emergency Management's 2016 Critical Energy Infrastructure Hub Study and the 2012 DOGAMI Earthquake Risk Study for Oregon's Critical Energy Infrastructure Hub report. Continuing to allow the increase in FFTs in a high risk area increases the risk to the surrounding industrial district and the Willamette River. The FFTZ amendments limit future risk by limiting the size of new fossil fuel terminals and prohibiting the expansion of storage capacity at existing fossil fuel terminals, with limited exceptions.

- Balance the benefits of regulations against the costs of implementation and compliance.

259. The FFTZ amendments balance the benefits and costs by designating existing FFTs as a limited use, as opposed to a prohibited nonconforming use, which allows the terminals to continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake, which ultimately can make Portland more resilient.

- Maintain Portland's competitiveness with other jurisdictions as a location in which to live, invest, and do business.

260. Finding: The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's employment land supply to create opportunities for a growing economy. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under the current development review system.

10.4.b. Ensure good administration of land use regulations:

- Keep regulations as simple as possible.

261. Finding: The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes maintain Portland's employment land supply to create opportunities for a growing economy. These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under the current development review system.

- Use clear and objective standards wherever possible.

262. Finding: The FFTZ amendments establish clear definitions for fossil fuels and the Bulk Fossil Fuel Terminal use category.

- Maintain consistent procedures and limit their number.
- Establish specific approval criteria for land use reviews.
- Establish application requirements that are as reasonable as possible, and ensure they are directly tied to approval criteria.
- Emphasize administrative procedures for land use reviews.

- Avoid overlapping reviews.

263. **Finding:** The FFTZ amendments do not establish new procedures or land use reviews. The FFTZ amendments establish clear definitions for fossil fuels and the Bulk Fossil Fuel Terminal use category. These regulations apply to only one type of use that makes up a minority part of the uses found in Portland's industrial districts. The other industrial uses continue to operate under current regulations. Designating the existing FFTs as a limited use, as opposed to a prohibited nonconforming or conditional use, allows the terminals to continue to operate and invest in upgrades without additional discretionary land use reviews. tank capacity, such as consolidating smaller tanks into larger tanks, to meet future needs.

10.4.c. Strive to improve the code document:

- Use clear language.
- Maintain a clear and logical organization.
- Use a format and layout that enables use of the document by lay people as well as professionals.
- Use tables and drawings to clarify and shorten the document.
- Identify and act on regulatory improvement suggestions.

264. **Finding:** The FFTZ amendments create a new use category consistent with the format used described and regulate other types of uses. The Zoning Code amendments are presented in as clear and objective of a way possible to ensure the intended users will be able understand and utilize the Zoning Code as it applies to their development proposals, land use, and properties, consistent with Comprehensive Plan Policy 10.4.

Part IV. Adopted Area Plans

The following adopted areas plans include policies related to the FFTZ amendments:

Guilds Lake Industrial Sanctuary Plan (2001)
The Guild's Lake Industrial Sanctuary (GLIS) Plan provides a policy framework to protect and promote the area's long-term economic viability as an industrial district for a broad variety of industrial land uses and businesses. The GLIS is an area that runs northwest of NW Vaughn Street along the Willamette River to the St. Johns Bridge. The plan recognizes the unique role of industrial land in Portland's economy and the importance of industrial businesses in providing living-wage jobs. The plan's vision statement, policies and objectives have been adopted as part of Portland's Comprehensive Plan and are implemented through the Zoning Code through the GLIS Plan District (33.531), which adds land use prohibitions and limits that were (at the time) above and beyond the limits in the industrial base zones.

Policy 1: Jobs and Economic Development
Maintain and expand industrial business and employment opportunities in the Guild's Lake Industrial Sanctuary. Stimulate investment in the area's public and private infrastructure and industrial facilities.

265. **Finding:** The City Council interprets this policy and objectives to apply to the GLISP area as whole and not to individual businesses or sectors of business. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes do not conflict with the policy intent to maintain the area as an industrial sanctuary. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The remaining industrial uses continue to operate under current regulations. The impact of the limits on fossil fuel terminals is mitigated by protecting existing fossil fuel terminals as a limited use,

as opposed to a prohibited or non-conforming use, that allows the terminals to continue to operate and invest in upgrades and supports opportunities for enhancement through exceptions, such as aviation or renewable fuels.

The City Council interprets the verb "stimulate" to mean "encourage", which is defined in the 2035 Comprehensive Plan as to promote or foster using some combination of voluntary approaches, regulations, or incentives. The FFTZ amendments apply to only one type of business that makes up a minority part of the businesses found in GLIS. The remaining industrial uses continue to operate under current regulations. The limits on expansion of storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and invest in upgrades. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the area.

As noted in the findings above, the FFTZ amendments are consistent with the goals and policies of Chapter 6 (Economic Development) of the 2035 Comprehensive Plan and Statewide Planning Goal 9. The findings in response to those goals and policies are incorporated by reference.

Objective 1. Provide new employment opportunities by reusing or redeveloping reclaimed, underutilized and vacant land and buildings in the GLIS.

266. Finding: The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will continue to provide opportunities for industrial redevelopment in the GLIS. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. These changes support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades, which maintains the current employment opportunities at these businesses. The regulations also provide opportunities for growth through exceptions, such as aviation or renewable fuels, which can provide additional employment opportunities.

Objective 2. Foster a business and public policy environment that promotes continued private and public sector investments in infrastructure, facilities, equipment and jobs.

267. Finding: The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will continue to provide opportunities for investment in the GLIS. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The limits on expansion of storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and invest in other types of upgrades. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the area.

Objective 3. Enhance the GLIS as a competitive and forward-thinking industrial area by fostering innovative and environmentally-sensitive industrial projects and practices that improve the operational efficiency of GLIS firms while conserving natural resources and reducing pollution.

268. Finding: The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The verb "foster", which is defined in the 2035 Comprehensive Plan, means to encourage or guide the incremental development of something over a long period of time. The City Council interprets this policy to mean that industrial development should incorporate green building practices, such as on-site stormwater management, and natural resource conservation, such as riverbank restoration. The City has achieved this objective through other regulatory programs, such as the Stormwater Management Manual and the Greenway Overlay Zone, that are not amended by this ordinance. The limits on

expansion of storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and invest in other types of upgrades that conserve natural resources and reduce pollution.

Policy 2: Transportation
Maintain, preserve and improve the intermodal and multimodal transportation system to provide for the smooth movement of goods and employees into and through the Guild's Lake Industrial Sanctuary.

269. **Finding:** The City Council interprets this policy and the objectives to apply to the GLISP area as whole and not to individual businesses or sectors of business. The transportation policy discussion and action plan in the GLISP is focused on a street system that accommodates all modes of traffic while preserving operational characteristics that support truck movement. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the area that seeks to accommodate all modes of traffic consist with the freight classifications for the district's roadways.

The fossil fuel terminals are privately-owned, specialized intermodal facilities that exclusively transport liquid bulk products into and out of the GLISP area via pipeline, barge, rail and truck. There is no evidence that these terminals are used by other businesses to move other types of goods. The limits on expansion of storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their intermodal facilities to provide for the continued movement of goods through the GLIS. Finally, the ordinance does not regulate transloading facilities, docks or pipelines – facilities that are key components of the multimodal freight transportation system. As noted in the findings above, the FFTZ amendments are consistent with the goals and policies of Chapter 9 (Transportation) of the 2035 Comprehensive Plan and Statewide Planning Goal 12. The findings in response to those goals and policies are incorporated by reference.

Objective 1. Maintain, protect, and enhance the public and private multimodal transportation investments in the GLIS, including rail and marine terminal facilities, to ensure its continued viability as a major center for the import and export of industrial products in the state of Oregon.

270. **Finding:** The 2035 Comprehensive Plan defines the verb "maintain" to mean keep what you have; conserve; preserve; continue. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will continue to provide the same opportunities for investment to provide for the continued movement of goods through the GLIS. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the area to provide for the continued viability as a major industrial center in Oregon.

The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The FFTZ regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The limits on expansion of storage capacity at fossil fuel terminals are mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their intermodal facilities to provide for the continued movement of fossil fuels through the GLIS and supports opportunities for enhancement through exceptions, such as aviation or renewable fuels.

Objective 2. Maintain operational characteristics on roads and at intersections that support truck movements and industrial economic growth, while accommodating traffic, transit, and emergency access needs.

271. **Finding:** The FFTZ amendments do not change the functional classification of any roads in the GLIS. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the area.

Objective 3. Minimize traffic conflicts between industrial and nonindustrial uses.

272. **Finding:** The City Council interprets the verb "minimize" to mean to reduce something to the smallest possible amount. Minimizing traffic conflicts is a function of transportation policy. The FFTZ amendments do not change any transportation policies, including the functional classification of any roads in the GLIS. The FFTZ amendments do not include map changes, nor do they allow for new incompatible nonindustrial land uses that could be expected increase traffic conflicts.

Objective 4. Manage congestion on highways and roads within the GLIS through regional and area-wide systems planning and maximize the efficiency of transportation facilities for all modes of travel, with the participation of private industry.

273. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, these changes will continue to provide the same opportunities for investment in the GLIS. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the area to manage congestion on highways and roads within the GLIS.

The City Council interprets the verb "maximize", which is not defined in the 2035 Comprehensive Plan, to mean to make the best use of. These regulations apply to only one type of business that makes up a minority part of the businesses found in GLIS. The limits on expansion of storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate and invest in other types of upgrades to all modes of travel. The FFTZ regulations allow terminals to maximize the efficiency of their private transportation facilities (docks and pipelines) by providing expanded opportunities through exceptions, such as for aviation or renewable fuels, to the storage capacity restrictions.

Objective 5. Develop alternative transportation options for employees of the GLIS, including transit, carpools, bicycling, and walking to reduce parking needs, vehicle emissions, and congestion levels.

274. **Finding:** The City Council interprets this policy to focus on the commute modes of employees of the GLIS. Developing alternative transportation options is a function of transportation policy. The FFTZ amendments do not change any transportation policies, therefore, this policy does not apply. Further, employment at FFTs is a small share of the overall employment of the GLIS. The limits on expansion of storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to continue to operate, which can maintain these employment levels, which can maintain ridership for the existing transit service. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore the City continues to plan for public infrastructure investments in the area to support this objective.

Objective 6. Locate safe pedestrian and bicycle routes within the GLIS that minimize conflicts with industrial traffic. Improve pedestrian and bicycle connections to nearby residential areas to reduce congestion levels and auto emissions, preserve capacity of the street system, and reduce parking needs.

275. **Finding:** The City Council interprets this policy to focus on the investment in pedestrian and bicycle routes in the GLIS, which is a function of transportation policy. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore this policy does not apply.

Objective 7. Recognize the role of NW Vaughn Street as an important multimodal access route to the Guild's Lake Industrial Sanctuary and Northwest Portland.

276. **Finding:** The City Council interprets this policy to focus on the functional classification of NW Vaughn Street, which is a function of transportation policy. The FFTZ amendments do not amend the Citywide System Plan or the Transportation System Plan, therefore this policy does not apply.

Policy 3: Land Use

Preserve and protect land primarily for industrial uses, and minimize land use conflicts in the Guild's Lake Industrial Sanctuary. Allow compatible nonindustrial uses within the GLIS that provide retail and business services primarily to support industrial employees and businesses.

277. **Finding:** The City Council interprets this policy and the objectives to apply to the GLISP area as whole and not to individual businesses or sectors of business. The City Council interprets this policy to mean that the most effective way to preserve and protect industrial uses is to minimize land use conflicts by limiting nonindustrial uses, which is the reason why the City Council applied the Prime Industrial Overlay Zone to the GLIS as part of the 2035 Comprehensive Plan adoption. The Prime Industrial Overlay Zone restricts additional uses, such as self-service storage and major event entertainment, that are allowed in the industrial base zones. The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, with these changes, the GLIS will continue to be used primarily for industrial uses and land use conflicts will be minimized.

Objective 1. Preserve the overall industrial character of the Guild's Lake Industrial Sanctuary.

278. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, the overall industrial character of the GLIS will be preserved.

Objective 2. Preserve the physical continuity of the area designated as Industrial Sanctuary within the Guild's Lake Industrial Sanctuary.

279. Finding: The FFTZ amendments do not include map changes, including to the plan district boundaries, therefore, with the physical continuity of the GLIS is preserved.

Objective 3. Minimize conflicts between industrial and nonindustrial land uses.

280. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, the GLIS will continue to be used primarily for industrial uses and land use conflicts will be minimized.

Objective 4. Prohibit new residential uses within the GLIS.

281. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new incompatible land uses, therefore, residential uses within the GLIS will continue to be prohibited.

Objective 5. Allow the provision of support services to employees and businesses in the GLIS to reduce trips outside of the GLIS.

282. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new nonindustrial land uses, therefore, this objective does not apply.

Objective 6. Encourage industrial businesses to locate their accessory offices and showrooms along NW Vaughn Street.

283. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new nonindustrial land uses. Additionally, there are no FFTs located on NW Vaughn, therefore, this objective does not apply.

Objective 7. Preserve the GLIS's Willamette River waterfront as a location for river-dependent and river-related industrial uses.

284. **Finding:** The existing fossil fuel terminals are designated as a limited use that allows the terminals to continue to operate and invest in upgrades, including their waterfront facilities. The FFTZ amendments do not include map changes, nor do they allow for new nonindustrial land uses, therefore, the Willamette River waterfront is preserved as a location for river-dependent and river-related industrial uses.

Objective 8. Recognize the Willamette River as a valuable economic, transportation, natural and recreational resource for the entire city. Coordinate GLIS Plan policies and implementation measures with ongoing and future citywide planning efforts that address the significance of the river and the city's industrial land supply.

285. **Finding:** The verb "recognize" is defined in the 2035 Comprehensive Plan as to acknowledge and treat as valid. The 2035 Comprehensive Plan defines "coordinate" as work together with others toward a common goal; collaborate. The FFTZ amendments do not include map changes, nor do they allow for new nonindustrial land uses, therefore, the city's industrial land supply is maintained. The FFTZ amendments do not include changes that impact the economic, transportation, natural, and recreational resource function of the Willamette River. The waterfront is preserved as a location for river-dependent and river-related industrial uses. Finally, the ordinance does not regulate transloading facilities, docks or pipelines – facilities that are key components of utilizing the Willamette River as part of the multimodal freight transportation system. As noted in the findings above, the FFTZ amendments are consistent with the policies 3.70, 3.72, 4.82, and 9.36 of the 2035 Comprehensive Plan, and the findings in response to those policies are incorporated by reference.

Objective 9. The industrial character and economic viability of the Guild's Lake Industrial Sanctuary must continue to be the priority when considering the public need for expanded access to the Willamette River. Design and implement any greenway enhancements along the river so as to avoid or minimize negative impacts on industrial operations.

286. Finding: The FFTZ amendments do not include changes to the greenway enhancement requirements in Chapter 33.440, therefore this objective does not apply.

Objective 10. Contribute to the maintenance and enhancement of all of Northwest Portland as a diverse urban environment that includes opportunities for housing, commercial services, and industrial employment in relatively close proximity.

287. **Finding:** The FFTZ amendments do not include map changes, nor do they allow for new nonindustrial land uses, therefore, the diverse urban environment of Northwest Portland is maintained.

The City Council interprets the verb "enhance", which is not defined in the 2035 Comprehensive Plan, to mean to intensify or improve. The FFTZ regulations apply to only one type of business that makes up a minority part of the industrial businesses found in GLIS. The limits on expansion of storage capacity at fossil fuel terminals is mitigated by designating existing fossil fuel terminals as a limited use that allows the terminals to maintain, preserve and continue to operate and improve their intermodal facilities to provide for the continued movement of fossil fuels through the GLIS and supports opportunities for enhancement through a number of exceptions, such as aviation or

renewable fuels, to the storage capacity restrictions; therefore the FFTZ changes contribute maintain and enhancing the industrial employment in this part of Northwest Portland.

Part V. Zoning Code Amendment Criteria

33.835.040 Approval Criteria

A. Amendments to the zoning code. Text amendments to the zoning code must be found to be consistent with the Comprehensive Plan, Urban Growth Management Functional Plan, and the Statewide Planning Goals. In addition, the amendments must be consistent with the intent or purpose statement for the base zone, overlay zone, plan district, use and development, or land division regulation where the amendment is proposed, and any plan associated with the regulations. The creation of a new plan district is subject to the approval criteria stated in 33.500.050.

288. Finding: The findings in this exhibit demonstrate how the FFTZ amendments are consistent with the 2035 Comprehensive Plan, the Urban Growth Management Functional Plan, and the Statewide Planning Goals.

The City Council interprets this criterion to require the FFTZ amendments show consistency on balance. The City Council has applied all applicable policies and the findings in this exhibit demonstrate how the FFTZ amendments to the zoning code are, on balance, consistent with the 2035 Comprehensive Plan, the Urban Growth Management Functional Plan, and with the Statewide Planning Goals.

No new plan district has been proposed, therefore the criteria in 33.500.050 do not apply.

Part VI. Zoning Code Purpose Statements

33.140 Employment and Industrial Zones
33.140.010 General Purpose of the Zones
The employment and industrial zones are for areas of the City that are reserved for industrial uses and for areas that have a mix of uses with a strong industrial orientation. The zones reflect the diversity of industrial and business areas in the City. The zones differ in the mix of allowed uses, the allowed intensity of development, and the development standards. The regulations promote areas which consist of uses and developments which will support the economic viability of the specific zoning district and of the City. The regulations protect the health, safety and welfare of the public, address area character, and address environmental concerns. In addition, the regulations provide certainty to property owners, developers, and neighbors about the limits of what is allowed.

289. Finding: The FFTZ amendments do not allow for new incompatible land uses, therefore, these changes are consistent with the intent to allow a mix of uses with a strong industrial orientation in Portland's industrial districts. These regulations apply to only one type of use that makes up a minority part of the uses found in Portland's industrial districts. The remaining industrial uses continue to operate under current regulations. The FFTZ amendments protect the health, safety and welfare of the public and address environmental concerns by reducing the risk associated with a major earthquake by ensuring that the situation does not get worse by continuing to allow the unlimited increase in fossil fuel terminal storage tank capacity in a high risk area. The regulations provide certainty by designating existing FFTs as a limited use, which allows the terminals to

continue to operate and invest in facilities that reduce the risks and improve their ability to withstand a major earthquake.

33.920 Description of Use Categories

33.920.010 Purpose

This Chapter classifies land uses and activities into use categories on the basis of common functional, product, or physical characteristics. Characteristics include the type and amount of activity, the type of customers or residents, how goods or services are sold or delivered, and certain site factors. The use categories provide a systematic basis for assignment of present and future uses to zones. The decision to allow or prohibit the use categories in the various zones is based on the goals and policies of the Comprehensive Plan.

290. **Finding:** The FFTZ amendments create a new use category – Bulk Fossil Fuel Terminals – based on the function, the type of product handled or produced, the type and amount of activity, and how the goods are sold or delivered. The use category has been assigned to the base zones. The designation of a prohibited or limited use is based on the findings in this exhibit that demonstrate how, on balance, the designation is consistent with the goals and policies of 2035 Comprehensive Plan.











Fossil Fuel Terminal Zoning Amendments

Exhibit B
Remand Report

City of Portland, Oregon

City Council Public Hearing
November 20, 2019 at 2:00 p.m.
City Council Chambers

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.
City of Portland, Oregon

Proposed Action

The City of Portland intends to reconsider and readopt the Fossil Fuel Terminal Zoning Amendments. On December 14, 2016, the Portland City Council adopted Ordinance No. 188142 which amended the Zoning Code to create a new land use category (Bulk Fossil Fuel Terminals) with development standards to regulate the storage tank capacity. The amendments prohibited expansion of storage tank capacity at existing fuel terminals and limited new terminal development to 2 million gallons of storage tank capacity. The storage of coal at Bulk Fossil Fuel Terminals was prohibited.

The amendments allowed for the continued operation of existing terminals as a limited use in the industrial and employment zones. Terminals can continue to operate and invest in seismic and safety upgrades. The prohibition on the expansion of storage capacity included exceptions to the storage capacity limits to address issues identified in previous City Council resolutions, particularly for aviation fuels and renewable fuels.

Ordinance No. 188142 was appealed to the Oregon Land Use Board of Appeals (LUBA). In *Columbia Pacific Building Trades Council v. City of Portland*, LUBA Case No. 2017-001, LUBA reversed the Ordinance holding that the City's decision was unconstitutional; failed to demonstrate compliance with the Guild's Lake Industrial Sanctuary Plan (GLISP) and Statewide Planning Goal 12; and was not supported by an adequate factual base.

LUBA's decision was appealed to the Oregon Court of Appeals. In *Columbia Pacific Building Trades Council v. City of Portland*, 289 Or App 739 (2018), the court reversed LUBA's decision in part and affirmed in part. The Court found that the amendments are constitutional, and the City adequately demonstrated compliance with Goal 12.

The Court of Appeals decision was appealed to the Oregon Supreme Court. The Supreme Court denied review in *Columbia Pacific Building Trades Council v. City of Portland*, 363 Or 390 (2018).

On October 5, 2018, LUBA remanded Ordinance No. 188142 for City Council to demonstrate compliance with GLISP and demonstrate that the decision was supported by an adequate factual base.

The City intends to readopt the Fossil Fuel Terminal Zoning Amendments to comply with LUBA's Order. The Zoning Code amendments are similar to the changes adopted in 2016, except for a few minor adjustments to reconcile the Fossil Fuel Terminal Zoning Amendments with subsequent changes to the Zoning Code that have been adopted since 2016.

The November 20, 2019, City Council public hearing will focus on the consideration of additional evidence to ensure that the amendments are supported by an adequate factual base. Additionally, the findings will demonstrate that the amendments comply with the goals and policies in the 2035 Comprehensive Plan, which was adopted subsequent to the initial adoption of Ordinance No. 188142.

Timeline

In Resolutions 36959 and 36962, adopted in 2012, the City Council expressed opposition to coal trains traveling through Portland until a programmatic, comprehensive and area-wide Environmental Impact Statement and comprehensive Health Impact Assessment are completed.

The City's 2015 Climate Action Plan (adopted by Resolution 37135) identifies the need to establish a "fossil fuel export policy that considers lifecycle emissions, safety, economics, neighborhood livability and environmental impacts" (Climate Action Plan, action 3G, page 69). The City committed in its 2015 Climate Action Plan to advancing policy and programs to reduce local fossil fuel use both in the City's own operations and through community-wide initiatives.

Resolution 37168, adopted November 12, 2015, expressed the City Council's opposition to the "expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways." It also expressed the Council's intent not to restrict improvements in safety, efficiency, or seismic resilience; the provision of service directly to end users; or infrastructure that will accelerate the transition to non-fossil fuel energy sources. The City Council also expressed support for accelerating the transition to non-fossil fuel energy sources. As part of that transition, the Oregon Department of Environmental Quality (ODEQ) is implementing the Oregon Clean Fuels Program, which requires a 10 percent reduction in average carbon intensity by 2025. Fuels that could be used to achieve the standards include ethanol, biodiesel, electricity, hydrogen, natural gas, propane, and biogas, which may require additional storage capacity. In order to facilitate implementation of the Clean Fuels Program, non-fossil fuel storage tanks are not subject to the capacity limits.

Portland's existing fossil fuel terminals

Portland's industrial districts are Oregon's largest seaport, rail hub and truck distribution center. The Northwest Industrial District in Portland is also the end of the Olympic Pipeline, which supplies most of Oregon's petroleum fuels from Puget Sound refineries. The ten petroleum terminals located in Northwest Portland are the gateway distribution facilities serving Oregon and Southern Washington markets. Additionally, NW Natural's GasCo terminal provides peak-consumption storage of natural gas for the region. In Northwest Portland, these "tank farm" storage facilities have direct access to pipeline, deep-water port, railroad and truck route infrastructure.



Figure 1. An example of petroleum terminals located in the Willbridge area of NW Portland.

Figure 2. Existing fossil fuel terminals in Northwest Portland

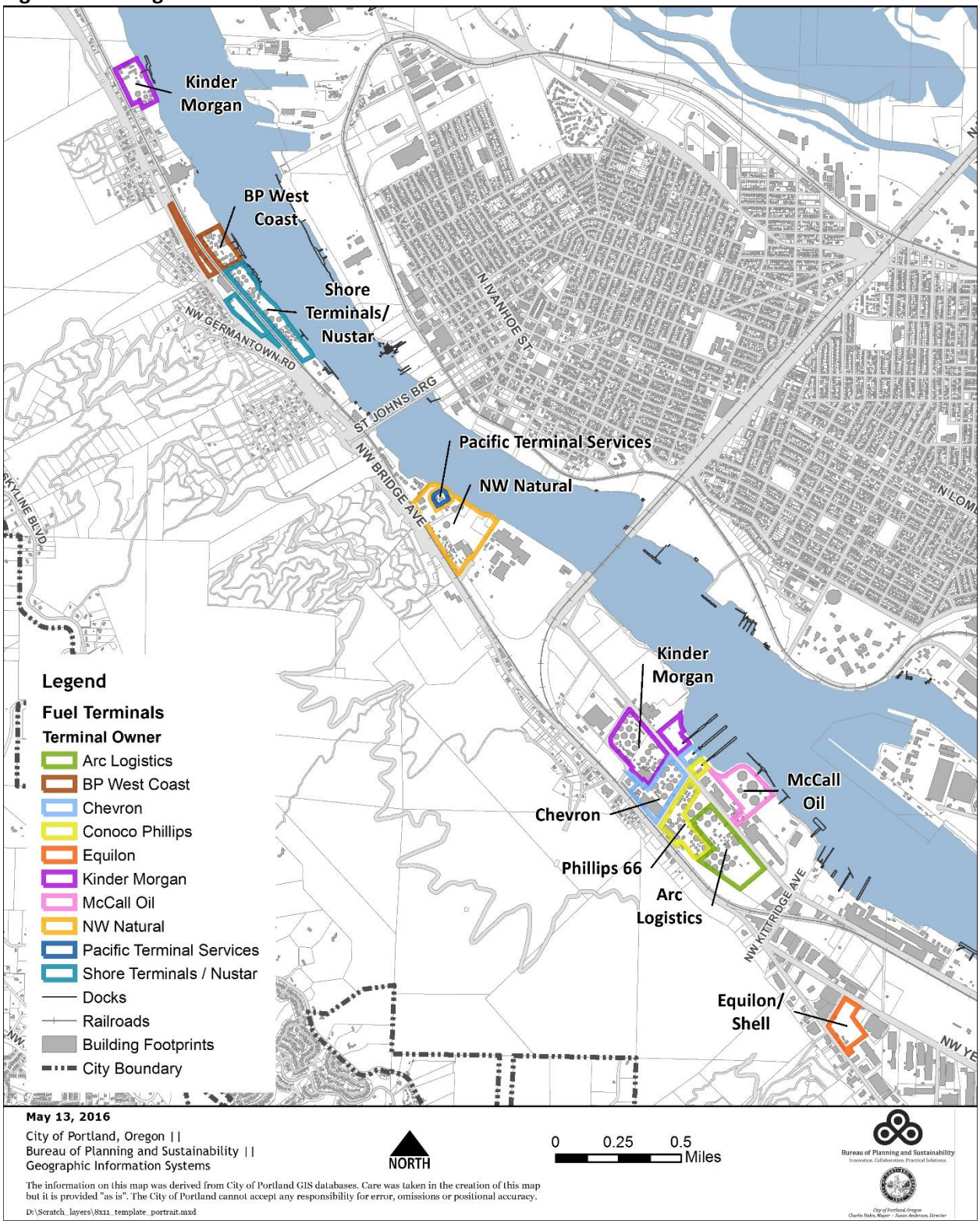


Figure 3. Estimated storage capacity at existing fossil fuel terminals

Operator	*Facility type*	*Site acres*	*Existing Storage capacity*	
Petroleum fuels			barrels	gallons
Chevron	Petroleum terminal	21	1,600,000	67,200,000
Kinder Morgan Willbridge	Petroleum terminal	33	1,551,000	65,142,000
Zenith (Arc Logistics)	Petroleum/crude oil	39	1,518,200	63,764,400
NuStar	Petroleum terminal	22	1,191,000	50,022,000
McCall Oil	Petroleum terminal	19	930,000	39,060,000
Conoco Phillips	Petroleum terminal	21	760,000	31,920,000
BP West Coast	Petroleum terminal	18	601,500	25,263,000
Kinder Morgan Linnton	Petroleum terminal	13	420,000	17,640,000
Equilon/Shell	Petroleum terminal	13	400,000	16,800,000
Pacific Terminal Services	Petroleum terminal	2	278,000	11,676,000
Total			*9,249,700*	*388,487,400*
Gaseous fuels			Dth	
NW Natural GasCo	LNG plant/terminal	41	7,500,000	

Terminology: bbls = barrels, Dth = decatherms, LNG = liquified natural gas
Sources: Oregon DEQ for petroleum tank data. NW Natural 2014 Integrated Resource Plan for existing capacity

Zoning code changes

This section of the report specifies the adopted code language, along with code commentary pages that clarify expected implementation. The section is formatted to facilitate readability, showing adopted code changes on the right-hand pages and related code commentary on the facing left-hand pages.

Commentary

Table 100-1 Open Space Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in the Open Space base zone.

Table 100-1 **Open Space Zone Primary Uses**	
Use Categories	**OS Zone**
Residential Categories	
Household Living	N
Group Living	N
Commercial Categories	
Retail Sales And Service	CU [1]
Office	N
Quick Vehicle Servicing	N
Vehicle Repair	N
Commercial Parking	N
Self-Service Storage	N
Commercial Outdoor Recreation	CU
Major Event Entertainment	N
Industrial Categories	
Manufacturing And Production	CU [6]
Warehouse And Freight Movement	N
Wholesale Sales	N
Industrial Service	N
Bulk Fossil Fuel Terminal	N
Railroad Yards	N
Waste-Related	N
Institutional Categories	
Basic Utilities	L/CU [5]
Community Service	CU [4]
Parks And Open Areas	L/CU [2]
Schools	CU
Colleges	N
Medical Centers	N
Religious Institutions	N
Daycare	CU
Other Categories	
Agriculture	L[7]
Aviation And Surface Passenger Terminals	N
Detention Facilities	N
Mining	CU
Radio Frequency Transmission Facilities	L/CU [3]
Rail Lines And Utility Corridors	CU

Y = Yes, Allowed L = Allowed, But Special Limitations CU = Conditional Use Review Required
N = No, Prohibited
Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.100.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Commentary

Table 110-1 Single-Dwelling Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in single-dwelling base zones.

Table 110-1 Single-Dwelling Zone Primary Uses						
Use Categories	**RF**	**R20**	**R10**	**R7**	**R5**	**R2.5**
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	CU	CU	CU	CU	CU	CU
Commercial Categories						
Retail Sales And Service	CU [10]	CU [10]	CU [10]	CU [10]	CU [10]	CU [10]
Office	N	N	N	N	N	N
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	N	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	N
Industrial Categories						
Manufacturing And Production	CU [6]	N	N	N	N	N
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	N
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]	L/CU [5]
Community Service	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]	CU [1]
Parks And Open Areas	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]	L/CU [2]
Schools	CU	CU	CU	CU	CU	CU
Colleges	CU	CU	CU	CU	CU	CU
Medical Centers	CU	CU	CU	CU	CU	CU
Religious Institutions	CU	CU	CU	CU	CU	CU
Daycare	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]	L/CU [3]
Other Categories						
Agriculture	L [7]	L [7]	L/CU [8]	L/CU [8]	L [9]	L [9]
Aviation And Surface Passenger Terminals	CU	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	CU	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]	L/CU [4]
Railroad Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.110.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Table 120-1 Multi-Dwelling Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in the multi-dwelling base zones.

Table 120-1 Multi-Dwelling Zone Primary Uses						
Use Categories	**R3**	**R2**	**R1**	**RH**	**RX**	**RMP**
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	N]
Commercial Categories						
Retail Sales And Service	L [12]	L [12]	L [12]	CU[2]	L/CU [3]	L [13]
Office	N	N	N	CU[2]	L/CU [3]	N
Quick Vehicle Servicing	N	N	N	N	N	N
Vehicle Repair	N	N	N	N	N	N
Commercial Parking	N	N	N	N	CU [4]	N
Self-Service Storage	N	N	N	N	N	N
Commercial Outdoor Recreation	N	N	N	N	N	N
Major Event Entertainment	N	N	N	N	N	CU
Industrial Categories						
Manufacturing And Production	N	N	N	N	N	CU
Warehouse And Freight Movement	N	N	N	N	N	N
Wholesale Sales	N	N	N	N	N	N
Industrial Service	N	N	N	N	N	CU
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	L/CU [10]	L/CU [10]	L/CU [10]	L/CU [10]	L/CU [10]	L/CU [10]
Community Service	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [5]	L/CU [6]
Parks And Open Areas	L/CU [7]	L/CU [7]	L/CU [7]	Y	Y	L/CU [7]
Schools	CU	CU	CU	CU	L/CU [5]	CU
Colleges	CU	CU	CU	CU	CU	CU
Medical Centers	CU	CU	CU	CU	CU	CU]
Religious Institutions	CU	CU	CU	CU	CU	CU
Daycare	L/CU [8]	L/CU [8]	L/CU [8]	L/CU [8]	Y	L/CU [8]
Other Categories						
Agriculture	L [11]	L [11]	L [11]	L [11]	L [11]	L [11]
Aviation And Surface Passenger Terminals	N	N	N	N	N	N
Detention Facilities	N	N	N	N	N	N
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]	L/CU [9]
Rail Lines And Utility Corridors	CU	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.120.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Commentary

Table 130-1 Commercial/Mixed Use Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in the commercial/mixed use base zones.

Table 130-1
Commercial/Mixed Use Zone Primary Uses

Use Categories	CR	CM1	CM2	CM3	CE	CX
Residential Categories						
Household Living	Y	Y	Y	Y	Y	Y
Group Living	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]	L/CU [1]
Commercial Categories						
Retail Sales And Service	L [2]	L [2]	Y	Y	Y	Y
Office	L [2]	L [2]	Y	Y	Y	Y
Quick Vehicle Servicing	N	L [2]	L [2]	L [2]	Y	N
Vehicle Repair	N	N	Y	Y	Y	L [5]
Commercial Parking	N	N	L [9]	L [9]	Y	CU [9]
Self-Service Storage	N	N	N	L [4]	L [4]	L [4]
Commercial Outdoor Recreation	N	N	Y	Y	Y	Y
Major Event Entertainment	N	N	CU	CU	CU	Y
Industrial Categories						
Manufacturing and Production	N	L/CU [3,5]	L/CU [3,5]	L/CU [3,5]	L/CU [3,5]	L/CU [3,5]
Warehouse and Freight Movement	N	N	N	L [3,5]	L [3,5]	N
Wholesale Sales	N	N	L [3,5]	L [3,5]	L [3,5]	L [3,5]
Industrial Service	N	N	CU [3,5]	CU [3,5]	CU [3,5]	CU [3,5]
Bulk Fossil Fuel Terminal	N	N	N	N	N	N
Railroad Yards	N	N	N	N	N	N
Waste-Related	N	N	N	N	N	N
Institutional Categories						
Basic Utilities	Y/CU [8]	Y/CU [8]	Y/CU [8]	Y/CU [8]	Y/CU [8]	Y/CU [8]
Community Service	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]	L/CU [6]
Parks and Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	Y	Y	Y
Colleges	N	Y	Y	Y	Y	Y
Medical Centers	N	Y	Y	Y	Y	Y
Religious Institutions	Y	Y	Y	Y	Y	Y
Daycare	Y	Y	Y	Y	Y	Y
Other Categories						
Agriculture	L [10]	L [10]	L/CU [11]	L/CU [12]	L/CU [12]	L/CU [11]
Aviation and Surface Passenger Terminals	N	N	N	N	CU	CU
Detention Facilities	N	N	N	CU	CU	CU
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	N	L/CU [7]	L/CU [7]	L/CU [7]	L/CU [7]	L/CU [7]
Rail Lines and Utility Corridors	N	CU	CU	CU	CU	CU
Mining	N	N	N	N	N	N
Radio Frequency Transmission Facilities	N	L/CU [7]	L/CU [7]	L/CU [7]	L/CU [7]	L/CU [7]
Rail Lines and Utility Corridors	N	CU	CU	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.130.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

33.140.050 Neighborhood Contact

As an alternative to a land use review, a public notice and meeting requirement applies to development of fuel storage structure, such as a new tank, at a Bulk Fossil Fuel Terminal, similar to the requirement for multi-dwelling residential development. This notice and meeting would create public awareness about the project and serve to discuss a proposal in an informal basis.

33.140 Employment and Industrial Zones

140

Sections:

General
- 33.140.010 General Purpose of the Zones
- 33.140.020 List of the Employment and Industrial Zones
- 33.140.030 Characteristics of the Zones
- 33.140.040 Other Zoning Regulations
- 33.140.050 Neighborhood Contact in EG and I Zones
- 33.140.055 Neighborhood Contact in EX Zone

Use Regulations
- 33.140.100 Primary Uses
- 33.140.110 Accessory Uses
- 33.140.130 Nuisance-Related Impacts
- 33.140.140 On-Site Waste Disposal

Site Development Standards
- 33.140.200 Lot Size
- 33.140.205 Floor Area Ratio
- 33.140.210 Height
- 33.140.215 Setbacks
- 33.140.220 Building Coverage
- 33.140.225 Landscaped Areas
- 33.140.227 Trees
- 33.140.230 Ground Floor Windows in the EX Zones
- 33.140.235 Screening
- 33.140.240 Pedestrian Standards
- 33.140.242 Transit Street Main Entrance
- 33.140.245 Exterior Display, Storage, and Work Activities
- 33.140.250 Trucks and Equipment
- 33.140.255 Drive-Through Facilities
- 33.140.265 Residential Development
- 33.140.270 Detached Accessory Structures
- 33.140.275 Fences
- 33.140.280 Demolitions
- 33.140.290 Nonconforming Development
- 33.140.295 Parking and Loading
- 33.140.300 Signs
- 33.140.310 Superblock Requirements
- 33.140.315 Recycling Areas

33.140.050 Neighborhood Contact in EG and I Zones

A. Purpose. Neighborhood contact is required when a new storage structure for any type of fuel will be built on a Bulk Fossil Fuel Terminal because of the impacts that fuel projects can have on the surrounding community.

B. Neighborhood contact requirement. Proposals meeting the following conditions are subject to the neighborhood contact requirement steps of 33.705.020.B., Neighborhood Contact II. All of the steps in 33.705.020.B. must be completed before an application for a building permit can be submitted:

1. The proposed development has not been subject to a land use review; and

2. The proposed development includes at least one new structure for the storage of any type of fuel.

Commentary

33.140.100 Primary Uses

The amendments to this section reflect changes to prohibit new Bulk Fossil Fuel Terminals in the employment and industrial base zones and reclassify existing terminals as limited uses. Regulation of Bulk Fossil Fuel Terminals implements policy direction in City of Portland Resolution 37168 (adopted November 2015) and, 2035 Comprehensive Plan Policies 4.79, 4.81, 4.82, 6.48, and 7.14 which address reducing natural hazard risks and fossil fuel distribution and storage facilities.

The limited use designation prohibits expansion of fossil fuel tank capacity at existing Bulk Fossil Fuel Terminals, but allows for the replacement and reconfiguration of existing tank capacity as a way to facilitate seismic and safety upgrades.

33.140.100 Primary Uses

A. No change

B. Limited uses. Uses allowed that are subject to limitations are listed in Table 140-1 with an "L". These uses are allowed if they comply with the limitations listed below and the development standards and other regulations of this Title. In addition, a use or development listed in the 200s series of chapters is also subject to the regulations of those chapters. The paragraphs listed below contain the limitations and correspond with the footnote numbers from Table 140-1.

1. – 16. No change

17. Bulk Fossil Fuel Terminals. This regulation applies to all parts of Table 140-1 that have a [17].

    a. Existing Bulk Fossil Fuel Terminals. Bulk Fossil Fuel Terminals that existed on [insert effective date] are allowed, but the total amount of fossil fuel that can be stored on the site in storage tanks is limited to the fossil fuel storage tank capacity that existed on [insert effective date]. Total fossil fuel storage tank capacity on the site in excess of the capacity that existed on [insert effective date] is prohibited. Storing coal on the site is prohibited.

    b. New Bulk Fossil Fuel Terminals are prohibited.

Commentary

Table 140-1 Employment and Industrial Zone Primary Uses

The amendments to this section reflect changes to prohibit new Bulk Fossil Fuel Terminals in all employment and industrial base zones and reclassify existing terminals as limited uses.

Table 140-1
Employment and Industrial Zone Primary Uses

Use Categories	EG1	EG2	EX	IG1	IG2	IH
Residential Categories						
Household Living	N	N	Y	CU [1]	CU [1]	CU [1]
Group Living	N	N	L/CU [2]	N	N	N
Commercial Categories						
Retail Sales And Service	L/CU [3]	L/CU [3]	Y	L/CU [4]	L/CU [5]	L/CU [6]
Office	Y	Y	Y	L/CU [4]	L/CU [5]	L/CU [6]
Quick Vehicle Servicing	Y	Y	N	Y	Y	Y
Vehicle Repair	Y	Y	Y	Y	Y	Y
Commercial Parking	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]	CU [15]
Self-Service Storage	Y	Y	L [7]	Y	Y	Y
Commercial Outdoor Recreation	Y	Y	Y	CU	CU	CU
Major Event Entertainment	CU	CU	CU	CU	CU	CU
Industrial Categories						
Manufacturing And Production	Y	Y	Y	Y	Y	Y
Warehouse And Freight Movement	Y	Y	Y	Y	Y	Y
Wholesale Sales	Y	Y	Y	Y	Y	Y
Industrial Service	Y	Y	Y	Y	Y	Y
Bulk Fossil Fuel Terminal	L [17]	L [17]	N	L [17]	L [17]	L [17]
Railroad Yards	N	N	N	Y	Y	Y
Waste-Related	N	N	N	L/CU [8]	L/CU [8]	L/CU [8]
Institutional Categories						
Basic Utilities	Y/CU [12]	Y/CU [12]	Y/CU [12]	Y/CU [13]	Y/CU [13]	Y/CU 13]
Community Service	L/CU [9]	L/CU [9]	L/CU [10]	L/CU [11]	L/CU [11]	L/CU [11]
Parks And Open Areas	Y	Y	Y	Y	Y	Y
Schools	Y	Y	Y	N	N	N
Colleges	Y	Y	Y	N	N	N
Medical Centers	Y	Y	Y	N	N	N
Religious Institutions	Y	Y	Y	N	N	N
Daycare	Y	Y	Y	L/CU [11]	L/CU 11]	L/CU 11]
Other Categories						
Agriculture	L [16]	L [16]	L [16]	L [16]	L [16]	L [16]
Aviation And Surface Passenger Terminals	CU	CU	CU	CU	CU	CU
Detention Facilities	CU	CU	CU	CU	CU	CU
Mining	N	N	N	CU	CU	CU
Radio Frequency Transmission Facilities	L/CU [14]	L/CU [14]	L/CU [14]	L/CU [14]	L/CU 14]	L/CU 14]
Rail Lines And Utility Corridors	Y	Y	Y	Y	Y	Y

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.140.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Commentary

Table 150-1 Campus Institutional Zone Primary Uses

The amendments to this table reflect changes to prohibit Bulk Fossil Fuel Terminals in the campus institutional base zones.

Table 150-1 Campus Institutional Zone Primary Uses			
Use Categories	**CI1**	**CI2**	**IR**
Residential Categories			
Household Living	N	Y	Y
Group Living	N	Y	Y [9]
Commercial Categories			
Retail Sales And Service	CU [1]	Y	L/CU [10]
Office	N	Y	L/CU [10]
Quick Vehicle Servicing	N	N	N
Vehicle Repair	N	N	N
Commercial Parking	N	Y	N
Self-Service Storage	N	N	N
Commercial Outdoor Recreation	N	N	N
Major Event Entertainment	CU	CU	CU
Industrial Categories			
Manufacturing And Production	L [2]	L/CU [2]	N
Warehouse And Freight Movement	N	N	CU
Wholesale Sales	N	N	N
Industrial Service	L [2]	L/CU [2]	N
Bulk Fossil Fuel Terminal	N	N	N
Railroad Yards	N	N	CU
Waste-Related	N	N	N
Institutional Categories			
Basic Utilities	L/CU [3]	L/CU [3]	L/CU [3]
Community Service	CU [4]	Y	CU [4]
Parks And Open Areas	L/CU [5]	L/CU [5]	L/CU [5]
Schools	N	N	L/CU [11]
Colleges	Y/CU [6]	Y/CU [6]	L/CU [11]
Medical Centers	Y	Y	L/CU [11]
Religious Institutions	CU	CU	CU
Daycare	Y	Y	L/CU [12]
Other Categories			
Agriculture	L [7]	L [7]	L [7]
Aviation And Surface Passenger Terminals	N	N	N
Detention Facilities	N	N	N
Mining	N	N	N
Radio Frequency Transmission Facilities	L/CU [8]	L/CU [8]	L/CU [8]
Rail Lines And Utility Corridors	CU	CU	CU

Y = Yes, Allowed
L = Allowed, But Special Limitations
CU = Conditional Use Review Required
N = No, Prohibited

Notes:

- The use categories are described in Chapter 33.920.
- Regulations that correspond to the bracketed numbers [ ] are stated in 33.150.100.B.
- Specific uses and developments may also be subject to regulations in the 200s series of chapters.

Commentary

33.910.030 Definitions

The definition of fossil fuels was added to clarify the land use category Bulk Fossil Fuel Terminals.

Petrochemicals that are used primarily for non-fuel products are excluded, such as asphalt, plastics, lubricants, fertilizer, roofing, and paints. However, methanol is an exception that is included as a fossil fuel, because large methanol storage and distribution facilities tend to have structural similarities to liquid natural gas (LNG) and liquid petroleum gas (LPG) terminals, including large-scale storage and gas pipeline access, and because they can have similar safety and climate impacts.

Fuels containing 5% or less fossil-fuel volume are not considered fossil fuels under this definition. For example, "pure" ethanol made from corn or other non-fossil source is required by the Alcohol and Tobacco Tax and Trade Bureau to be denatured in order to be transported to the site. Denatured ethanol typically contains up to 5% methanol, so that it is toxic and undrinkable.

Some fossil fuels under this definition are also classified as "renewable fuels" in the federal Renewable Fuel Standard and "clean fuels" in Oregon's Clean Fuel Standard, such as liquid natural gas and liquid propane gas. These federal and state standards require transportation fuel sold within their jurisdiction to contain a minimum volume of renewable or clean fuels. Renewable or clean fuels with more than 5 percent fossil fuel volume are defined as fossil fuels.

33.910.030 Definitions
The definition of words with specific meaning in the zoning code are as follows:

Fossil Fuel. Fossil fuels are petroleum products (such as crude oil and gasoline), coal, methanol, and gaseous fuels (such as natural gas and propane) that are made from decayed plants and animals that lived millions of years ago and are used as a source of energy. Denatured ethanol and similar fuel additives with less than 5 percent fossil fuel content, biodiesel/renewable diesel with less than 5 percent fossil fuel content, and petroleum-based products used primarily for non-fuel uses (such as asphalt, plastics, lubricants, fertilizer, roofing, and paints) are not fossil fuels.

Commentary

33.920 Descriptions of the Use Categories

920

Sections:

Introduction to the Use Categories
- 33.920.010 Purpose
- 33.920.020 Category Titles
- 33.920.030 Classification of Uses

Residential Use Categories
- 33.920.100 Group Living
- 33.920.110 Household Living

Commercial Use Categories
- 33.920.200 Commercial Outdoor Recreation
- 33.920.210 Commercial Parking
- 33.920.220 Quick Vehicle Servicing
- 33.920.230 Major Event Entertainment
- 33.920.240 Office
- 33.920.250 Retail Sales And Service
- 33.920 260 Self-Service Storage
- 33.920.270 Vehicle Repair

Industrial Use Categories
- 33.920.300 Bulk Fossil Fuel Terminal
- 33.920.310~~300~~ Industrial Service
- 33.920.320~~310~~ Manufacturing And Production
- 33.920.330~~320~~ Railroad Yards
- 33.920.340~~330~~ Warehouse And Freight Movement
- 33.920.350~~340~~ Waste-Related
- 33.920.360~~350~~ Wholesale Sales

Institutional Use Categories
- 33.920.400 Basic Utilities
- 33.920.410 Colleges
- 33.920.420 Community Service
- 33.920.430 Daycare
- 33.920.450 Medical Centers
- 33.920.460 Parks And Open Areas
- 33.920.470 Religious Institutions
- 33.920.480 Schools

Other Use Categories
- 33.920.500 Agriculture
- 33.920.510 Aviation And Surface Passenger Terminals
- 33.920.520 Detention Facilities
- 33.920.530 Mining
- 33.920.540 Radio Frequency Transmission Facilities
- 33.920.550 Rail Lines And Utility Corridors

Commentary

33.920.300 Bulk Fossil Fuel Terminal

Bulk Fossil Fuel Terminals are added as a new land use category to regulate their development in the Zoning Code. Regulation of Bulk Fossil Fuel Terminals implements policy direction in City of Portland Resolution 37168 and 2035 Comprehensive Plan Policies 4.79, 4.81, 4.82, 6.48, and 7.14 which address reducing natural hazard risks and fossil fuel distribution and storage facilities.

Bulk Fossil Fuel Terminals are characterized by having (1) marine, pipeline or railroad transport access and (2) either trans-loading facilities for transferring a shipment between transport modes (such as from rail to ship) or bulk storage facilities exceeding 2 million gallons of fossil fuels. The 2-million-gallon threshold is sized to include facilities that are large enough to unload unit trains. Functionally, these terminals tend to be regional gateway facilities, where fossil fuels enter and exit the region. Additionally, Policy 6.48 calls for limiting fossil fuel distribution and storage facilities to those necessary to serve the regional market. However, the use classification is intended to be clearly identifiable by physical characteristics and not rely on a definition of region.

The regional market area of Bulk Fossil Fuel Terminals varies by product and is difficult to define. Portland's 10 petroleum terminals generally serve Oregon and Southern Washington. This market area substantially exceeds the Portland metropolitan area, which is often colloquially referred to as the region.

The use description is clarified with criteria that are intended to prevent the aggregation of new facilities smaller than 2 million gallons on adjacent sites into a larger terminal that could effectively circumvent the terminal storage capacity threshold.

Resolution 37168 lists a specific exception to not restrict service directly to end users. At a small scale, services to end users include retail gasoline filling stations, natural gas access lines in street right-of-way to residential and business customers, and heating oil tanks at home sites. Larger scale end users with fossil fuel storage and access infrastructure also include manufacturers, jet fuel facilities for PDX Airport, vessel fuel facilities on Portland Harbor, and others, where fossil fuels are used as an input.

33.920.300 Bulk Fossil Fuel Terminal

A. Characteristics. Bulk Fossil Fuel Terminals are establishments primarily engaged in the transport and bulk storage of fossil fuels. Terminal activities may also include fuel blending, regional distribution, and wholesaling. The firms rely on access by marine, railroad, or regional pipeline to transport fuels to or from the site, and either have transloading facilities for transferring a shipment between transport modes, or have storage capacity exceeding 2 million gallons for fossil fuels. There is minimal on-site sales activity with the customer present.

B. Accessory uses. Accessory uses may include retail sales of petroleum products, offices, food membership distribution, parking, storage, truck fleet parking and maintenance areas, rail spur or lead lines, and docks.

C. Examples. Examples include crude oil terminals, petroleum products terminals, natural gas terminals, propane terminals, and coal terminals.

D. Exceptions.

1. Truck or marine freight terminals that do not store, transport or distribute fossil fuels are classified as Warehouse And Freight Movement uses.
2. Truck or marine freight terminals that do not have transloading facilities and have storage capacity of 2 million gallons or less are classified as Warehouse And Freight Movement uses. However, multiple fossil fuel facilities, each with 2 million gallons of fossil fuel storage capacity or less but cumulatively having a fossil fuel storage capacity in excess of 2 million gallons, located on separate parcels of land will be classified as a Bulk Fossil Fuel Terminal when two or more of the following factors are present:
   a. The facilities are located or will be located on one or more adjacent parcels of land. Adjacent includes separated by a shared right-of-way;
   b. The facilities share or will share operating facilities such as driveways, parking, piping, or storage facilities; or
   c. The facilities are owned or operated by a single parent partnership or corporation.
3. Gasoline stations and other retail sales of fossil fuels are not Bulk Fossil Fuel Terminals.
4. Distributors and wholesalers that receive and deliver fossil fuels exclusively by truck are not Bulk Fossil Fuel Terminals.
5. Industrial, commercial, institutional, and agricultural firms that exclusively store fossil fuel for use as an input are not Bulk Fossil Fuel Terminals.
6. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.
7. The storage of fossil fuels for exclusive use at an airport, surface passenger terminal, marine, truck or air freight terminal, drydock, ship or barge servicing facility, rail yard, or as part of a fleet vehicle servicing facility are not Bulk Fossil Fuel Terminals.
8. Uses that recover or reprocess used petroleum products are not Bulk Fossil Fuel Terminals.

Commentary

33.920.310~~300~~ Industrial Service

33.920.320~~310~~ Manufacturing And Production

33.920.330~~320~~ Railroad Yards

33.920.340~~330~~ Warehouse And Freight Movement

A. Characteristics. Warehouse And Freight Movement firms are involved in the storage, or movement of goods for themselves or other firms. Goods are generally delivered to other firms or the final consumer, except for some will-call pickups. There is little on-site sales activity with the customer present.

B. Accessory uses. Accessory uses may include offices, food membership distribution, truck fleet parking and maintenance areas, rail spur or lead lines, docks, and repackaging of goods.

C. Examples. Examples include separate warehouses used by retail stores such as furniture and appliance stores; household moving and general freight storage; cold storage plants, including frozen food lockers; storage of weapons and ammunition; major wholesale distribution centers; truck, marine, or air freight terminals; bus barns and light rail barns; parcel services; major post offices; grain terminals; and the stockpiling of sand, gravel, or other aggregate materials.

D. Exceptions.

1. Uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses.
2. Miniwarehouses are classified as Self-Service Storage uses.
3. Establishments that engage in the transfer or storage of fossil fuels, rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities or have storage capacity exceeding 2 million gallons for fossil fuels are classified as Bulk Fossil Fuel Terminal uses.

33.920.350~~340~~ Waste-Related

33.920.360~~350~~ Wholesale Sales

A. Characteristics. Wholesale Sales firms are involved in the sale, lease, or rent of products primarily intended for industrial, institutional, or commercial businesses. The uses emphasize on-site sales or order taking and often include display areas. Businesses may or may not be open to the general public, but sales to the general public are limited as a result of the way in which the firm operates. Products may be picked up on site or delivered to the customer.

B. Accessory uses. Accessory uses may include offices, food membership distribution, product repair, warehouses, parking, minor fabrication services, and repackaging of goods.

C. Examples. Examples include sale or rental of machinery, equipment, heavy trucks, building materials, special trade tools, welding supplies, machine parts, electrical supplies, janitorial supplies, restaurant equipment, and store fixtures; mail order houses; and wholesalers of food, clothing, auto parts, building hardware, and office supplies.

Commentary

D. Exceptions.

1. Firms that engage primarily in sales to the general public are classified as Retail Sales And Service.
2. Firms that engage in sales on a membership basis are classified as either Retail Sales And Service or Wholesale Sales, based on a consideration of the characteristics of the use.
3. Firms that are primarily storing goods with little on-site business activity are classified as Warehouse And Freight Movement.
4. Establishments that engage in the regional wholesaling of fossil fuels, rely on access by marine, railroad or regional pipeline to transport fuels to or from the site, and either have transloading facilities or have storage capacity exceeding 2 million gallons for fossil fuels are classified as Bulk Fossil Fuel Terminal uses.

IMPACT STATEMENT

Legislation title: *Readopt remanded Ordinance No. 188142 to restrict bulk fossil fuel terminals. (Ordinance; Amend Title 33, Planning and Zoning)

Contact name: Tom Armstrong, Bureau of Planning and Sustainability
Contact phone: 503-823-3527
Presenter name: Andrea Durbin and Tom Armstrong, Bureau of Planning and Sustainability

Purpose of proposed legislation and background information:
This ordinance is a reconsideration of Fossil Fuel Terminal Zoning amendments (Ordinance No. 188142) that were adopted in 2016. That ordinance was appealed to the Oregon Supreme Court and is now back before City Council. These code changes restrict development and expansion of Bulk Fossil Fuel Terminals.

- Bulk Fossil Fuel Terminals are characterized by (a) marine, railroad, or pipeline transport access and (b) either storage capacity exceeding 2 million gallons or transload facilities (such as rail-to-ship loading)
- Fossil fuels include petroleum products (such as crude oil and gasoline), coal, natural gas, and propane, and methanol, which is produced from natural gas.
- No new Bulk Fossil Fuel Terminals are allowed.

The existing Bulk Fossil Fuel Terminals in Industrial and General Employment zones become “limited uses” that can continue to operate. Expansion of fossil fuel storage at these existing terminals would be prohibited, with limited exceptions.

The code changes will not apply to gas stations; distributors and wholesalers that receive and deliver fossil fuels exclusively by truck; industrial, commercial, institutional, and agricultural uses that store fossil fuels for use as an input; uses that involve the transfer or storage of solid or liquid wastes are classified as Waste-Related uses. Fossil fuel storage facilities for airports, marine terminals, rail yards, and fleet vehicle fuel facilities are specifically exempted.

Previous Council Actions
- Resolutions 36959 and 36962 adopted in 2012, the Council expressed opposition to coal trains traveling through Portland until a programmatic, comprehensive and area-wide Environmental Impact Statement and comprehensive Health Impact Assessment are completed.
- Resolution 37168, adopted November 12, 2015, expressed the City Council’s opposition to the “expansion of infrastructure whose primary purpose is transporting or storing fossil fuels in or through Portland or adjacent waterways.” It also expressed the Council’s intent not to restrict improvements in safety, efficiency, or seismic resilience; the provision of service directly to end users; or infrastructure that will accelerate the transition to non-fossil fuel energy sources.

- The 2015 Climate Action Plan to advancing policy and programs to reduce local fossil fuel use both in the City's own operations and through community-wide initiatives.
- The 2035 Comprehensive Plan sets policy direction (Policies 4.75 and 4.76) to encourage disaster-resilient development and specifically to reduce natural hazard risks to critical energy and transportation infrastructure in Portland Harbor.
- The original version (Ordinance No. 188142) was adopted in 2016 and appealed to the Oregon Land Use Board of Appeals (LUBA), the Oregon Court of Appeals, and the Oregon Supreme Court. It has been remanded back to the City of Portland for reconsideration of policies and additional evidence.

Financial and budgetary impacts:
- There are no long-term financial impacts for the City (e.g. ongoing debt payments, purchase of property requiring operations and maintenance, ratification of labor contract, etc.)
- There are no budget impacts – the action does not amend the budget.
- The legislation does not authorize additional spending on a new or existing project or program.
- There is no expected change in current and future revenues.
- The legislation does not create, eliminate or re-classify positions now or in the future. This legislation will require staff time to defend an expected appeal of this ordinance and on-going monitoring of development permits associated with the existing fossil fuel terminals.
- The legislation does not result in a new or modified financial obligation or benefit, including IAs, IGAs, MOUs, grants, contracts or contract amendments.

Community impacts and community involvement:
These regulations apply to only one type of business that makes up a minority part of the businesses found in Portland's industrial districts. The remaining industrial uses continue to operate under the current development review standards. The FFTZ amendments support the retention of existing fossil fuel terminals by designating them as a limited use that allows the terminals to continue to operate and invest in upgrades and supports opportunities for growth through exceptions, such as aviation or renewable fuels. Further, the use limitations provide flexibility to FFTs to replace and reconfigure existing storage tank capacity, such as consolidating smaller tanks into larger tanks, to meet future needs.

Given that this ordinance is a reconsideration of a previously adopted ordinance, BPS relied upon the previous public testimony that informed that ordinance. This ordinance is substantially the same ordinance with a few minor adjustments to reconcile the code amendments with the current Zoning Code.

The community involvement process for the previous ordinance included stakeholder focus group meetings with terminal owners and business groups as well as environmental groups. The process also included extensive public testimony that informed the Planning and Sustainability Commission recommendation as well as the final adoption by the City Council.

100% Renewable Goal:

- This action does not affect the City's total energy use.
- This action supports the City's renewable energy use by allowing for additional storage tank capacity for renewable fuels at existing fossil fuel terminals.

Budgetary Impact Worksheet

Does this action change appropriations?

☐ **YES**: Please complete the information below.
☒ **NO**: Skip this section

Fund	Fund Center	Commitment Item	Functional Area	Funded Program	Grant	Sponsored Program	Amount

CERTIFICATE OF SERVICE

I hereby certify that I electronically served the foregoing RESPONDENT'S RECORD on:

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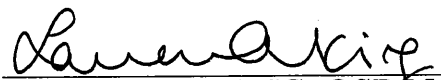
on March 9, 2020, as previously agreed upon by all parties, by e-mailing an internet link to a downloadable, text-searchable PDF copy of said Record.

I further certify that on March 6, 2020, I filed the original electronic RESPONDENT'S RECORD with the:

LAND USE BOARD OF APPEALS
775 SUMMER STREET NE., SUITE 330
SALEM, OR 97301-1283

by mailing two CDs containing identical, text-searchable PDFs of said Record, contained in a sealed envelope, with first class postage paid, and deposited with the post office at Portland, Oregon on said day.



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